

# Five-Year Review Report

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

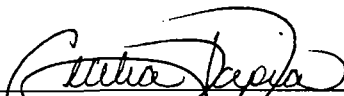
September 2007

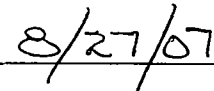
PREPARED BY:

U.S. Environmental Protection Agency  
Region VII  
Kansas City, Kansas

Approved:

Date:

  
\_\_\_\_\_  
Cecilia Tapia, Director  
Superfund Division

  
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# Five-Year Review Report

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## List of Acronyms & Initialisms

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
DA	Designated Area
EE/CA	Engineering Evaluation/Cost Analysis
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
PSWD	Public Water Supply District
PRP	Potentially Responsible Party
RI/FS	Remedial Investigation/Feasibility Study
RAO	Remedial Action Objectives
ROD	Record of Decision
UAO	Unilateral Administrative Order
$\mu\text{g}/\text{dl}$	Microgram per deciliter

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## **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, 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, Ground Water, has been completed 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, are in the design phase. Cleanup of the mine waste is expected to commence in the fall 2007.

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 expected to be protective. Ecological risks have not yet been addressed but will be with the cleanup of mine waste in Operable Unit 1.

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## Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Oronogo-Duenweg Mining Belt Site		
EPA ID (from WasteLAN): MOD 980686281		
Region: VII	State: MO	City/County: Jasper County
SITE STATUS		
NPL status: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify)		
Remediation status: <input checked="" type="checkbox"/> Under Construction <input type="checkbox"/> Operating <input type="checkbox"/> Complete		
Multiple OUs? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Construction completion date: 2015	
Has site been put into reuse? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO    Some areas		
REVIEW STATUS		
Lead agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency		
Author name: D. Mark Doolan		
Author title: Remedial Project Manager	Author affiliation: U.S. EPA	
Review period: Nov. 2001 to Nov. 2006		
Date(s) of site inspection: N/A		
Type of review: <input checked="" type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion		
Review number: <input type="checkbox"/> 1 (first) <input checked="" type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify)		
Triggering action: <input type="checkbox"/> Actual RA On-site Construction at OU # _____ <input checked="" type="checkbox"/> Actual RA Start at OU#2&3 <input type="checkbox"/> Construction Completion <input type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify)		
Triggering action date (from WasteLAN): November 15, 1996		
Due date (five years after triggering action date): September 27, 2007		

## Five-Year Review Summary Form Continued

### Issues:

1. The Environmental Protection Agency (EPA) identified approximately 40 residential properties that exceeded the residential yard soil remedial action level of 800 parts per million (ppm) for lead where the homeowner denied access for cleanup. Several of these properties exceed the removal action level of 1,200 ppm lead. EPA Region 7 has developed a policy for denied access to residential properties which requires cleanup of all properties over 1,200 ppm and deed notices to be placed on properties between 1,200 ppm and the remedial action level. EPA has not yet ordered cleanup or placed deed notices on properties where owners denied access for cleanup of soil.
2. 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, EPA does not plan to conduct the additional phosphate treatment at the Site.
3. The mine waste piles on the Site have not been remediated. Significant ecological risk and some human health risk still exist at the Site due to erosion of the piles to surrounding soils and streams and people continuing to build homes near the piles.

### Recommendations and Follow-up Actions:

1. To date, the Missouri Department of Natural Resources (MDNR) has not fulfilled its ten percent match requirement to EPA for remediation of residential yard soils. EPA and MDNR have reached agreement for MDNR to clean up the denied access properties, as in-kind services, to meet the match requirements. EPA will place deed notices on the properties where soil lead levels are below 1,200 ppm but above the action level of 400 ppm where owners continue to deny access.
2. 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 EPA exceeded its goal for reducing blood-lead concentrations at the Site. Therefore, EPA has determined additional phosphate treatment of yards below 800 ppm lead is not warranted.
3. EPA has issued a contract to Back & Veatch to conduct the remedial design for cleanup of mine waste at the Site. Remedial action of the wastes is expected to begin in fall 2007 and continue until 2015.

### Protectiveness Statement(s):

The remedy at OUs 2 and 3 currently is considered protective of human health because all but a few properties where access was denied 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 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 MDNR.

A site-wide remedy for OU 1 was selected in the 2004 ROD. Cleanup actions have not yet begun; therefore, the mining wastes still present a significant risk to the environment at the Site.

**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 Environmental Protection Agency (EPA) 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.*

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.*

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 2001 through November 2006. This report documents the results of the review.

This is the second 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 are or will be left on-site above levels that allow for unlimited use and unrestricted exposure. The five-year review assesses each OU at the Site.

## 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 (OUs 2& 3)	1995 - 1996
Record Of Decision for Residential Yard Soil (OUs 2 & 3)	1996
Remedial Design for Residential Yard Soil (OUs 2 & 3)	1996
Remedial Action of Residential Yard Soil (OUs 2 & 3)	1996 - 2002
Follow-up Exposure Study by Missouri Department of Health and Senior Services	1999 - 2002
Record Of Decision for Ground Water (OU 4)	1998
Remedial Design for Ground Water (OU 4)	2000 - 2001
Remedial Action for Ground Water (OU 4)	2001 - 2006
Engineering Evaluation/Cost Analysis for use of mine waste in highway construction	2000
Non-time-Critical Removal Action, highway construction using mine waste	2001 - present
Record Of Decision for Mine Waste (OU 1)	2004
Remedial Design for Mine Waste (OU 1)	2006
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, ground water, and surface soils. In addition, smelting operations dispersed air-borne 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, agricultural use to urban. Growth in the communities is high. Development in many areas is spreading into mine-scarred lands. Prior to EPA's ground water 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 (NPL) on June 24, 1988, and was listed as Final on August 30, 1990. EPA began negotiation with a group of potentially responsible parties (PRPs) to perform a remedial investigation/feasibility study (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 ten designated areas (DAs) for investigations. The PRP group agreed to perform the RI/FS at seven of the DAs while EPA performed the RI at the other three DAs. 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 EPA's four DAs into one FS for the Site.

EPA has 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.; and (15) Eagle-Picher Industries, Inc. The first nine companies listed participated in the RI/FS. EPA settled with Connor Investment; FSN, Inc.; DuPont Company; Brown & Root; and USX, Inc., through a peripheral party settlement. EPA settled a claim in bankruptcy court with Eagle-Picher Industries, Inc., and currently has a claim in bankruptcy court with ASARCO, Inc.

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. 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, EPA issued a second UAO to the PRPs expanding the number of homes to receive bottled water based on additional sampling conducted as part of the December 24, 1993, UAO. EPA and the responsible parties signed a Consent Decree in January 2001 to settle the responsible parties' liability for ground water. Under the settlement, the parties made a cash payment to EPA for their share of the installation costs for the public water supply system.

On June 30, 1994, 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 summer 1994.

### **Basis for Site Actions**

In 1991, the Missouri Department of Health (MDOH), now the Missouri Department of Health and Senior Services (MDHSS), funded by 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 approximately 14 percent of children less than seven years of age at the Site had blood-lead levels exceeding 10 micrograms per deciliter ( $\mu\text{g}/\text{dl}$ ).

In response to the health study, 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 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 EPA and the PRPs. The U.S. Fish and Wildlife Service, under an interagency agreement with EPA, identified a federally listed endangered species and critical species habitat in the Site streams. The Ecological Risk Assessment (completion in May 1998) identified significant risk to both aquatic and terrestrial life.

### **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. In order to manage the interrelated problems identified at the Site, 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: (1) areas with similar contaminated media (soils, dust, ground water, etc.); (2) areas with similar geographic area; (3) areas that will be remediated using similar techniques; (4) areas that will be remediated within a similar time frame; and (5) 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) Ground Water, 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, 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 source area remediation in OU I.

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 ground water 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 chat 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. EPA is currently completing the Remedial Design for the first phase of cleanup which is anticipated to start in September 2007.
- 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 yard 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, 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.
- OU 3: This OU was established to tract remedial actions conducted in the mining areas. The remedial action performed for the residential yard OU was conducted by EPA and covered under the OU 2 ROD but tracked separately for cost recovery purposes from the PRPs.



OU 4: This OU was established to deal with the contaminated shallow ground water 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 ground water 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.

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 are planned for summer 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**

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 beside the federal, state, and county agencies, include local citizens, business owners, and county commissioners. In general, EPA provides documents generated from Site activities such as the RI report, risk assessments, and FS for review and comment. EPA, MDNR, MDHSS, ATSDR, and Jasper County Health Department 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 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. EPA, ATSDR, MDNR, and MDHSS 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 has primarily been on

the actions EPA is conducting 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. EPA has shared and discussed with the group results of investigations, risk assessments, and cleanup actions. EPA's work with the group has resulted in a 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, EPA signed an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action of mining waste located in the Oronogo-Duenweg DA on the east side of the Site for cleanup of mining waste located in and adjacent to the construction corridor of the Route 249 Highway project. The highway is being 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 specifies the burial of approximately 600,000 cubic yards of mining waste under the roadway. EPA is funding MHTD to move the mining waste located outside of the corridor into the footprint of the roadway for disposal. To date, MHTD has moved

approximately 50,000 cubic yards of waste into the corridor and has incorporated the wastes into the construction fill.

EPA signed a ROD for the cleanup of the remaining mine wastes at the Site in September 2004. Currently, EPA is preparing the remedial design for a portion of OU 1 to address mine and mill waste piles located in the Site. Remedial action is scheduled to begin in September 2007. The cleanup actions will include the following:

- Removal of mine/mill wastes, contaminated soil, and selected stream sediments
- 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 OUs 2 & 3
- ICs to regulate future residential development in contaminated areas and the use of the disposal areas

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

These OUs both address cleanup of residential yard soils. Response actions were identical and were conducted simultaneous for both OUs. Initial actions conducted for residential yards consisted of a time-critical removal initiated by EPA in late 1995 on 294 residential yards and six day care centers in the smelter area. Soil removal and replacement were 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  $\mu\text{g}/\text{dl}$ . This time-critical removal was completed in May 1996. 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 remedial action objective (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

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, 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. At homes where owners denied access for cleanup and yard soil exceeds 1,200 ppm lead, EPA will order owners to allow cleanup of the soil. MDNR will be conducting the cleanup actions to reduce the state match requirement owed to EPA for the remedial action. Where soil concentrations are less than 1,200 ppm lead but exceed 800 ppm, EPA will be placing deed notices in the Recorder of Deeds Office or place other property controls to notify potential buyers of the presence of lead contamination. All contaminated soils were placed in the repository near the Route 249 corridor at 17<sup>th</sup> and Pine Street, southeast of Webb City.

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. EPA and MDNR have agreed although phosphate amendment will additionally reduce soil-lead toxicity, the goal for the Site of blood-lead reduction has been exceeded and additional soil treatment is not economically justified. However, a pilot study of phosphate treatment on ten properties will be conducted to assess the actual costs associated with the treatment technology. This pilot study will aid EPA in determining the usefulness of phosphate treatment on other lead-contaminated residential sites.

In addition to the soil replacement actions conducted by 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, Jasper County Health Department, MDHSS, ATSDR, Joplin and Jasper County school districts, and the local Girl Scout chapter. EPA has provided funding to ATSDR, MDHSS, and the Jasper County Health Department 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 pre-school 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 health 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 (22,000 copies) of a community news letter devoted to lead awareness, health education, and lead poisoning prevention
- Providing lead educational materials to schools, day care centers, and the Parents and Teachers Association
- Off-site blood-lead screening activities at local community events

EPA worked with the Task Force and local governments to establish the ICs 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, Ground Water

OU 4 was established to address ground water 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. 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. EPA and the PRPs provided bottled water to those homes with private drinking water wells contaminated with lead, cadmium, or zinc from 1994 to 2002. A 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.

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 ground water." Installation of the public water supply systems began in June 2001. EPA funded Public Water Supply District 3, Public Water Supply District 1, the cities of Webb City and Duenweg, and Missouri American Water Company to install the new water supply systems to the areas of ground water contamination, which will cover approximately 25 square miles. During the design phase, 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 by October 2006.

#### Operation and Maintenance

To date, the only response action completed requiring operation and maintenance (O&M) is the cleanup of the residential yard soils (OUs 2 and 3). O&M associated with this action is limited to inspection and maintenance of the soil disposal repository. Other than inspections of the repository and periodic burning for weed control by EPA, no costs have been incurred for O&M.

## **V. Five-Year Review Process**

### **Administrative Components**

EPA notified the public and the responsible parties of the intention to conduct a five-year review in November 2006. EPA placed ads in the local newspapers, notified the local media, and mailed fact sheets to citizens on the Site mailing list. Both the newspaper ads and fact sheets invited comments from the public of the effectiveness of the remedy completed to date.

### **Community Involvement**

This is the second five-year review conducted for the Site. EPA discussed the first five-year review process with the public through quarterly meetings with the citizens' Task Force during the first five-year review and while conducting the follow-up exposure study. The public was informed of the completion of this five-year review through the media and mailed fact sheets in September 2002. No comments were received from the public on the five-year review or the effectiveness of the remedies conducted to date.

### **Progress Since the Last Review**

EPA completed the first five-year review for the Site in 2002. During the first review, the only remedial actions completed for the Site were the cleanups of the residential yard soils in OUs 2 and 3. Since that review, the remedial actions for OU 4 have been completed. Actions at OU 4 included the installation of public water supply mains to homes with private drinking water wells contaminated with lead and cadmium. Construction of the new public water supply lines began in September 2001 and were completed in July 2007.

In addition to the engineered actions at the Site, the ICs specified in the OUs 2 and 3 and the OU 4 ROD have been implemented. The OUs 2 and 3 ROD specified an IC for controlling the development of new residential dwellings in metals-contaminated areas of the Site. In 2005, the Jasper 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 to control the installation of drinking water wells in the contaminated shallow aquifer at the Site. In 2001, the MDNR Division of Geology and Land Survey 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 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.

## Data Review

The remedial actions completed to date are the cleanups of residential yard soils 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 Jasper County Health Department now tests the yard soils 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, 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  $\mu\text{g}/\text{dl}$ . 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  $\mu\text{g}/\text{dl}$ , down from 14 percent in 1991. Additionally, the mean blood-lead in 1999 was 3.81  $\mu\text{g}/\text{dl}$ , down from 6.24  $\mu\text{g}/\text{dl}$  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  $\mu\text{g}/\text{dl}$  of 86 percent.

## Site Inspection

EPA inspected the soil repository where contaminated yard soils were placed during the remedial action in November 2006. The soil repository created as part of the OUs 2 and 3 remedial action was well vegetated, and no significant erosion was noted. Discussions with representatives of Public Water Supply District 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.

## VI. Technical Assessment

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

#### *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 but a few residential yards where owners denied access for cleanup. Some of these yards will be cleaned up by MDNR while others will be addressed through ICs in the form of deed notices. 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 citizens' Task Force for the Site assumed the task of developing local ordinances and development plans that could be adopted by the various governmental entities to ensure safe residential development in the Site. 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 that are elevated. 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.

#### *OU 1*

Only minimal cleanup in the Highway 249 corridor has occurred in the mining waste. EPA is currently developing the remedial design for mine waste. Remedial actions are expected to begin in fall 2007.

#### *OU 4*

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 and 3 or the OU 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 identified in the RODs are still valid and have been met.



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.

**VII. Issues**

The only issue affecting the protectiveness of the remedial actions conducted to date is the residential properties that exceeded action levels for lead where EPA was denied access for cleanup. MDNR and EPA will be addressing these properties in the near future through ordered cleanup actions and deed notices.

**VIII. Recommendations and Follow-up Actions**

The contaminated residential properties will be addressed within the next year. MDNR will excavate those yards soils exceeding 1,200 ppm lead; and EPA will place deed notices or other property controls on the properties with soil lead between 400 and 1,200 ppm if access is still denied.

**IX. Protectiveness Statement(s)**

The remedy at OUs 2 and 3 currently is considered protective of human health and the environment because all but a few residential yards, where access was denied, exceeding the soil action level for metals have been cleaned up. The follow-up exposure study conducted at the Site shows EPA exceeded the goal for blood-lead reduction in small children. However, in order for the remedy to remain protective in the long term, ICs in the form of residential development ordinances must be maintained by the local governments to ensure safe development in contaminated areas until the completion of the mine waste cleanup. Additionally, placing deed notices or other property controls on properties where owners continue to deny access for cleanup will protect future buyers of those properties.

The remedy at OU 4 is protective of human health and is expected to be fully protective for the long term due to the completion of the installation of the public water supply systems.

A site-wide remedy for OU 1 has been selected and remedial design is underway. However, the mining wastes still present a significant risk to the environment and to small children living adjacent to mining wastes that may recreate on the piles.

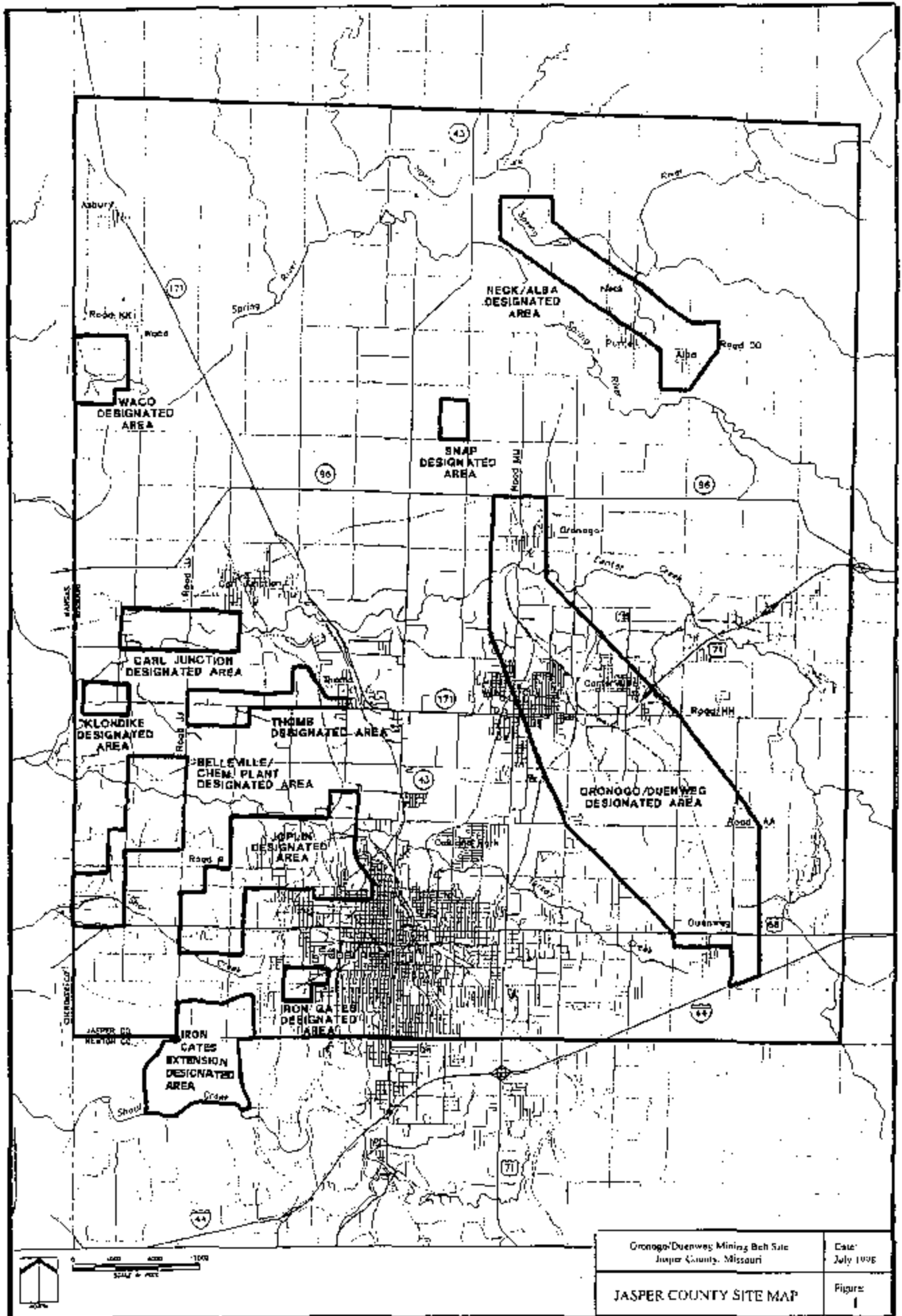
The RI has been initiated in OU 5. Data collected to date indicate significant risk to the aquatic environment is being caused by contaminated sediments. However, cleanup of the source material (mine wastes in OU 1) must be completed before the sediments are addressed to prevent recontamination.

**X. 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 2011.

**ATTACHMENT 1**

**Site Location Map**



Gronogo/Duenweg Mining Belt Site Jasper County, Missouri	Date: July 1998
<b>JASPER COUNTY SITE MAP</b>	Figure: 1

**INSERT SITE MAP HERE**

**ATTACHMENT 2**

**List of Documents Reviewed**

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	<b>O&amp;M Documents</b> <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date  <input type="checkbox"/> Up to date  <input type="checkbox"/> Up to date	X N/A  <input type="checkbox"/> N/A  <input type="checkbox"/> N/A
2.	<b>Site-Specific Health and Safety Plan</b> <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date  <input type="checkbox"/> Up to date	X N/A  <input type="checkbox"/> N/A
3.	<b>O&amp;M and OSHA Training Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
4.	<b>Permits and Service Agreements</b> <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____	<input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date  <input type="checkbox"/> Up to date  <input type="checkbox"/> Up to date	X N/A  <input type="checkbox"/> N/A  <input type="checkbox"/> N/A  <input type="checkbox"/> N/A
5.	<b>Gas Generation Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
6.	<b>Settlement Monument Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
7.	<b>Groundwater Monitoring Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
8.	<b>Leachate Extraction Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
9.	<b>Discharge Compliance Records</b> <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____	<input type="checkbox"/> Readily available  <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date  <input type="checkbox"/> Up to date	X N/A  <input type="checkbox"/> N/A  <input type="checkbox"/> N/A
10.	<b>Daily Access/Security Logs</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A





<b>C. Institutional Controls (ICs)</b>			
<b>1. Implementation and enforcement</b>			
Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive by) _____ MDNR Annual Report _____			
Frequency _____			
Responsible party/agency _____			
Contact _____			
Name	Title	Date	Phone no.
Reporting is up-to-date <span style="float: right;"><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</span>			
Reports are verified by the lead agency <span style="float: right;"><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</span>			
Specific requirements in deed or decision documents have been met <span style="float: right;"><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</span>			
Violations have been reported <span style="float: right;"><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</span>			
Other problems or suggestions: <input type="checkbox"/> Report attached			
_____			
_____			
_____			
<b>2. Adequacy</b> <span style="margin-left: 50px;"><input checked="" type="checkbox"/> ICs are adequate</span> <span style="margin-left: 50px;"><input type="checkbox"/> ICs are inadequate</span> <span style="float: right;"><input type="checkbox"/> N/A</span>			
Remarks _____			
_____			
_____			
<b>D. General</b>			
<b>1. Vandalism/trespassing</b> <input type="checkbox"/> Location shown on site map <span style="margin-left: 50px;"><input checked="" type="checkbox"/> No vandalism evident</span>			
Remarks _____			
_____			
<b>2. Land use changes on site</b> <input type="checkbox"/> N/A			
Remarks _____ None _____			
_____			
<b>3. Land use changes off site</b> <input type="checkbox"/> N/A			
Remarks _____ None _____			
_____			
<b>VI. GENERAL SITE CONDITIONS</b>			
<b>A. Roads</b> <input type="checkbox"/> Applicable <span style="margin-left: 50px;"><input checked="" type="checkbox"/> N/A</span>			
<b>1. Roads damaged</b> <input type="checkbox"/> Location shown on site map <span style="margin-left: 50px;"><input type="checkbox"/> Roads adequate</span> <span style="float: right;"><input type="checkbox"/> N/A</span>			
Remarks _____			
_____			

<b>B. Other Site Conditions</b>			
Remarks _____ _____ _____ _____			
<b>VII. LANDFILL COVERS</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
<b>A. Landfill Surface</b>			
1.	<b>Settlement (Low spots)</b> Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> Settlement not evident
2.	<b>Cracks</b> Lengths _____    Widths _____    Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Cracking not evident
3.	<b>Erosion</b> Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> Erosion not evident
4.	<b>Holes</b> Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> Holes not evident
5.	<b>Vegetative Cover</b> <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____	<input type="checkbox"/> Grass <input type="checkbox"/> Cover properly established	<input checked="" type="checkbox"/> No signs of stress
6.	<b>Alternative Cover (armored rock, concrete, etc.)</b> Remarks _____		<input checked="" type="checkbox"/> N/A
7.	<b>Bulges</b> Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<input checked="" type="checkbox"/> Bulges not evident

8.	<b>Wet Areas/Water Damage</b> <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____	<b>X Wet areas/water damage not evident</b> <input type="checkbox"/> Location shown on site map      Areal extent _____ <input type="checkbox"/> Location shown on site map      Areal extent _____ <input type="checkbox"/> Location shown on site map      Areal extent _____ <input type="checkbox"/> Location shown on site map      Areal extent _____
9.	<b>Slope Instability</b> <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____	<b>X No evidence of slope instability</b>
<b>B. Benches</b> <input type="checkbox"/> Applicable <b>X N/A</b> (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.	<b>Flows Bypass Bench</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
2.	<b>Bench Breached</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
3.	<b>Bench Overtopped</b> Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
<b>C. Letdown Channels</b> <input type="checkbox"/> Applicable <b>X N/A</b> (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.	<b>Settlement</b> Areal extent _____      Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement
2.	<b>Material Degradation</b> Material type _____      Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation
3.	<b>Erosion</b> Areal extent _____      Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion

4.	<b>Undercutting</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks _____		
5.	<b>Obstructions</b>	Type _____	<input type="checkbox"/> No obstructions
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Size _____		
	Remarks _____		
6.	<b>Excessive Vegetative Growth</b>	Type _____	
	<input type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Remarks _____		
<b>D. Cover Penetrations</b> <input type="checkbox"/> Applicable    X N/A			
1.	<b>Gas Vents</b>	<input type="checkbox"/> Active	<input type="checkbox"/> Passive
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Good condition	
	<input type="checkbox"/> N/A	<input type="checkbox"/> Needs Maintenance	
	Remarks _____		
2.	<b>Gas Monitoring Probes</b>	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
3.	<b>Monitoring Wells (within surface area of landfill)</b>	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
4.	<b>Leachate Extraction Wells</b>	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
5.	<b>Settlement Monuments</b>	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed
	<input type="checkbox"/> N/A		
	Remarks _____		

<b>E. Gas Collection and Treatment</b>			<input type="checkbox"/> Applicable	X N/A
1.	<b>Gas Treatment Facilities</b>	<input type="checkbox"/> Flaring	<input type="checkbox"/> Thermal destruction	<input type="checkbox"/> Collection for reuse
		<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	Remarks	_____		
	_____			
2.	<b>Gas Collection Wells, Manifolds and Piping</b>	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	Remarks	_____		
	_____			
3.	<b>Gas Monitoring Facilities</b> (e.g., gas monitoring of adjacent homes or buildings)	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks	_____		
	_____			
<b>F. Cover Drainage Layer</b>			<input type="checkbox"/> Applicable	X N/A
1.	<b>Outlet Pipes Inspected</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A	
	Remarks	_____		
	_____			
2.	<b>Outlet Rock Inspected</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A	
	Remarks	_____		
	_____			
<b>G. Detention/Sedimentation Ponds</b>			X Applicable	<input type="checkbox"/> N/A
1.	<b>Siltation</b> Areal extent _____	Depth _____	<input type="checkbox"/> N/A	
	X Siltation not evident			
	Remarks	_____		
	_____			
2.	<b>Erosion</b> Areal extent _____	Depth _____		
	X Erosion not evident			
	Remarks	_____		
	_____			
3.	<b>Outlet Works</b>	X Functioning	<input type="checkbox"/> N/A	
	Remarks	_____		
	_____			
4.	<b>Dam</b>	<input type="checkbox"/> Functioning	X N/A	
	Remarks	_____		
	_____			

<b>H. Retaining Walls</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Deformations</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
	Horizontal displacement _____	Vertical displacement _____	
	Rotational displacement _____		
	Remarks _____		
2.	<b>Degradation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
	Remarks _____		
<b>I. Perimeter Ditches/Off-Site Discharge</b>		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Siltation</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Siltation not evident
	Areal extent _____	Depth _____	
	Remarks _____		
2.	<b>Vegetative Growth</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
	<input checked="" type="checkbox"/> Vegetation does not impede flow		
	Areal extent _____	Type _____	
	Remarks _____		
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
	Areal extent _____	Depth _____	
	Remarks _____		
4.	<b>Discharge Structure</b>	<input type="checkbox"/> Functioning	<input checked="" type="checkbox"/> N/A
	Remarks _____		
<b>VIII. VERTICAL BARRIER WALLS</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Settlement</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Areal extent _____	Depth _____	
	Remarks _____		
2.	<b>Performance Monitoring</b>	Type of monitoring _____	
	<input type="checkbox"/> Performance not monitored		
	Frequency _____	<input type="checkbox"/> Evidence of breaching	
	Head differential _____		
	Remarks _____		

<b>C. Treatment System</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Treatment Train</b> (Check components that apply)	<input type="checkbox"/> Metals removal <input type="checkbox"/> Air stripping <input type="checkbox"/> Filters <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) <input type="checkbox"/> Others	<input type="checkbox"/> Oil/water separation <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Bioremediation
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	<input type="checkbox"/> Sampling ports properly marked and functional		
	<input type="checkbox"/> Sampling/maintenance log displayed and up to date		
	<input type="checkbox"/> Equipment properly identified		
	<input type="checkbox"/> Quantity of groundwater treated annually		
	<input type="checkbox"/> Quantity of surface water treated annually		
	Remarks		
2.	<b>Electrical Enclosures and Panels</b> (properly rated and functional)	<input type="checkbox"/> N/A	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance
	Remarks		
3.	<b>Tanks, Vaults, Storage Vessels</b>	<input type="checkbox"/> N/A	<input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance
	Remarks		
4.	<b>Discharge Structure and Appurtenances</b>	<input type="checkbox"/> N/A	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance
	Remarks		
5.	<b>Treatment Building(s)</b>	<input type="checkbox"/> N/A	<input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair
	<input type="checkbox"/> Chemicals and equipment properly stored		
	Remarks		
6.	<b>Monitoring Wells</b> (pump and treatment remedy)	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> All required wells located	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks		
<b>D. Monitoring Data</b> <input checked="" type="checkbox"/> N/A			
1.	Monitoring Data	<input type="checkbox"/> Is routinely submitted on time	<input type="checkbox"/> Is of acceptable quality
2.	Monitoring data suggests:	<input type="checkbox"/> Groundwater plume is effectively contained	<input type="checkbox"/> Contaminant concentrations are declining

<b>D. Monitored Natural Attenuation</b> X N/A			
1.	<b>Monitoring Wells</b> (natural attenuation remedy)		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
	<input type="checkbox"/> All required wells located	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> Good condition
	Remarks _____		<input type="checkbox"/> N/A
<b>X. OTHER REMEDIES</b>			
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.			
<b>XI. OVERALL OBSERVATIONS</b>			
<b>A. Implementation of the Remedy</b>			
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>B. Adequacy of O&amp;M</b>			
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 \_\_\_\_\_

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**D. Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

\_\_\_\_\_ None \_\_\_\_\_

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**ATTACHMENT 3**

**Site Inspection Checklist**

## Site Inspection Checklist

I. SITE INFORMATION										
<b>Site name:</b> Oronogo-Duenweg Mining Belt Site	<b>Date of inspection:</b> November 1, 2006									
<b>Location and Region:</b> Jasper County, Missouri Region 7	<b>EPA ID:</b> MOD 980686281									
<b>Agency, office, or company leading the five-year review:</b> EPA	<b>Weather/temperature:</b> Cloudy, windy, 40 degrees									
<b>Remedy Includes:</b> (Check all that apply) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input checked="" type="checkbox"/> Landfill cover/containment  <input type="checkbox"/> Access controls  <input type="checkbox"/> Institutional controls  <input type="checkbox"/> Groundwater pump and treatment  <input type="checkbox"/> Surface water collection and treatment  <input type="checkbox"/> Other _____             </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Monitored natural attenuation  <input type="checkbox"/> Groundwater containment  <input type="checkbox"/> Vertical barrier walls             </td> </tr> </table>		<input checked="" type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____	<input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls							
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<b>Attachments:</b> <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached										
II. INTERVIEWS (Check all that apply)										
<b>1. O&amp;M site manager</b> _____ <table style="width: 100%; border: none; margin-top: 5px;"> <tr> <td style="width: 40%; text-align: center;">Name</td> <td style="width: 30%; text-align: center;">Title</td> <td style="width: 30%; text-align: center;">Date</td> </tr> <tr> <td colspan="3">           Interviewed <input type="checkbox"/> at site   <input type="checkbox"/> at office   <input type="checkbox"/> by phone   Phone no. _____         </td> </tr> <tr> <td colspan="3">           Problems, suggestions; <input type="checkbox"/> Report attached _____         </td> </tr> </table>		Name	Title	Date	Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____			Problems, suggestions; <input type="checkbox"/> Report attached _____		
Name	Title	Date								
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____										
Problems, suggestions; <input type="checkbox"/> Report attached _____										
<b>2. O&amp;M staff</b> _____ <table style="width: 100%; border: none; margin-top: 5px;"> <tr> <td style="width: 40%; text-align: center;">Name</td> <td style="width: 30%; text-align: center;">Title</td> <td style="width: 30%; text-align: center;">Date</td> </tr> <tr> <td colspan="3">           Interviewed <input type="checkbox"/> at site   <input type="checkbox"/> at office   <input type="checkbox"/> by phone   Phone no. _____         </td> </tr> <tr> <td colspan="3">           Problems, suggestions; <input type="checkbox"/> Report attached _____         </td> </tr> </table>		Name	Title	Date	Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____			Problems, suggestions; <input type="checkbox"/> Report attached _____		
Name	Title	Date								
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____										
Problems, suggestions; <input type="checkbox"/> 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 Resources  
Contact John Weber SPM Nov. 1, 2006  
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.


**Record of Decision, Ground Water, 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**