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September 17, 2009

Scott Brown
US EPA, Region 8 Montana Office
Federal Building
10 W. 15th Street, Ste 3200
Helena, MT 59626

Project: **RAC2 Region 8 – East Helena Superfund Site OU2**
Residential Soils and Undeveloped Lands

Subject: **Final Record of Decision**

Dear Dr. Brown:

Pacific Western Technologies, Ltd. (PWT) is pleased to provide the Final Record of Decision for the East Helena Superfund Site, Operable Unit No. 2, Residential Soils and Undeveloped Lands.

As directed, the Final ROD is submitted in the form of sections that replace the corresponding sections in the Draft Final ROD. These sections are the only sections that have been revised from the Draft Final ROD. Replacement sections include the following:

- Spine
- Title Page
- All of Parts I and II, Declaration and Decision Summary
- Portions of Part III, Responsiveness Summary, consisting of the following:
    - Introduction
    - January 25, 2007 Public Meeting Minutes
    - Response to Public Comments
    - Supplemental Comments
        - Lewis and Clark County's Comments dated September 16, 2009
        - MDEQ's Letter of Non-Concurrence dated September 15, 2009

If you have any questions about the Final ROD, please do not hesitate to call. PWT trusts that the enclosed meets U.S. Environmental Protection Agency's immediate requirements and looks forward to supporting the EPA in future efforts.

Sincerely,

Levi Todd, P.E.
Project Manager
Pacific Western Technologies, Ltd.

Enclosures

SDMS # 1118773

East Helena Superfund Site, Operable Unit No. 2, Residential Soils and Undeveloped Lands

Final Record of Decision

September 2009

PART I

DECLARATION

SITE NAME AND LOCATION

The East Helena Superfund Site (Site) consists of the decommissioned Asarco smelter, an industrial facility operated by American Chemet Corporation, all of the City of East Helena, Montana, nearby residential subdivisions, numerous rural developments such as homes on small acreage plots and several large farms or ranches and their associated cultivated fields or pastures (see Figure D-1). The U. S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site Identification Number for the East Helena Superfund Site is MTD006230346.

This Record of Decision (ROD) addresses Operable Unit 2 (OU 2), East Helena Residential Soils and Undeveloped Lands, which consists of non-smelter property surface soils of residential areas, rural developments, and surrounding agricultural land. During early Site characterization (1984 – 1987), EPA's Superfund program divided the East Helena Site into five separate OUs. In 1998 EPA's Resource Conservation and Recovery Act (RCRA) program became responsible for the smelter property and its ancillary features, including the slag pile, former ore storage areas, Upper Lake, Lower Lake, Prickly Pear Creek and its riparian corridor, and all ground water.

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedy for the East Helena Superfund Site, Operable Unit 2, Residential Soils and Undeveloped Lands.

EPA Region 8 chose the selected remedy in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, 42 U. S. Code (USC) §9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.

EPA's decision is based on the Administrative Record for the Site. The Administrative Record and copies of key documents are available for review at the EPA Montana Office, located at 10 West 15th Street, Suite 3200, Helena, Montana. Most key documents are also available for review at the Montana Department of Environmental Quality, located at 1100 North Last Chance Gulch, Helena, and the East Helena Lead Education and Abatement Program Office, 2 South Morton, East Helena.

ASSESSMENT OF THE SITE

The response action set forth in this Record of Decision (ROD) was chosen to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. Such release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

Figure D-1. East Helena, Montana

The components of the selected remedy are summarized in the following section and detailed in Section 12 of the Decision Summary.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the East Helena Site OU2 consists of residential soil excavation and disposal in an EPA-approved repository, cleanup of undeveloped lands as land use changes necessitate, and institutional controls to protect the integrity of the completed actions.

The major components of the selected remedy are briefly summarized here, and discussed in detail in the Decision Summary.

- Contaminated soil remaining in qualified residential yards and vacant lots will be excavated and disposed of in an EPA-approved soil repository. A lead cleanup level of 1,000/500 milligrams per kilogram (mg/kg) will be applied to residential yards. When any section of a yard is found to have a soil lead concentration greater than 1,000 mg/kg, all portions of the yard with soil lead greater than 500 mg/kg will also be cleaned up. Soil from excavated areas will be replaced with clean topsoil, revegetated and landscaped.

  The two-part residential cleanup action level adopted for East Helena (1,000/500 ppm lead) is uniquely suited to the variability of lead concentrations in residential soils, and provides a protective, yet cost-effective remedy. The selected cleanup action level overcomes the inherent variability and ensures that this response action will result in no soils remaining with lead concentrations above 1,000 ppm. The cleanup action level for lead is expected to achieve a community-wide post-cleanup average lead concentration that is substantially less than 500 ppm. The result will be protective of human health.

- Yards where the yard-wide average soil arsenic concentration exceeds 100 ppm will be cleaned up regardless of the lead concentration. The cleanup action level for arsenic is expected to achieve a community-wide post cleanup average arsenic concentration that is substantially less than 100 ppm. The result will be protective of human health.

- Unpaved streets, aprons, and alleys of residential areas, with lead levels greater than 1,000 ppm or arsenic levels greater than 100 ppm, will be cleaned up.

- Historic irrigation ditches and water spreading channels that contain lead concentrations above 1,000 ppm or arsenic levels above 100 ppm will be cleaned up when they are located within or in close proximity to residential areas. Portions of the railroad right-of-way that are adjacent to residential areas, and where the lead concentration exceeds 1,000 ppm or arsenic levels exceed 100 ppm, will be cleaned up.

- Excavated contaminated soil will be disposed in an EPA-approved soil repository

- EPA anticipates that the Lewis and Clark County Board of Health and City of East Helena will establish and administer local regulations to protect the selected remedy. Institutional controls are required for residential areas, agricultural lands, and all undeveloped lands proposed for development. Institutional controls are discussed more fully in Section 12.

- The community-wide education program, designed to monitor and protect children against exposures to residual lead, will be continued for as long as Lewis and Clark County health professionals, in consultation with other federal, state and local health officials, deem it to be necessary and beneficial.
- Undeveloped land will be evaluated whenever a change in land use is proposed and, if necessary, cleaned up to appropriate levels for the proposed use. A lead cleanup level of 500 mg/kg and an arsenic cleanup level of 100 mg/kg in soil will be applied to undeveloped land proposed for residential development in the future. Separate lead and arsenic cleanup levels will be applied to undeveloped lands proposed for future commercial or recreational use.

The selected remedy includes incorporation of the ongoing non-time critical removal action, which is being conducted pursuant to an AOC and which has resulted in a comprehensive, albeit yet-to-be-completed, cleanup of residential soils, unpaved roads, aprons and alleyways, commercial and public-use areas, and portions of the undeveloped lands, including irrigation ditches, water spreading channels, and railroad right-of-way.

EPA anticipates that all remaining properties eligible for cleanup under the on-going non-time critical removal action will be completed by the end of 2009. Additional confirmation sampling will be conducted in 2009 and into 2010.

Montana DEQ has elected not to concur with this ROD. However, EPA guidance (OSWER Directive 9200.1-23P) states, "When a State is the support agency, its concurrence on a ROD is not a prerequisite to EPA's selecting a remedy (i.e., signing a ROD)."

In order to assist local entities, EPA is committed to funding additional sampling and maintenance of institutional controls to the extent allowed by law or policy.

The EPA also acknowledges that a change to this remedy through a ROD Amendment or other means is possible due to unforeseen or unknowable conditions.

STATUTORY DETERMINATIONS

EPA has determined that the selected remedy for the East Helena Superfund Site, OU2, Residential Soils and Undeveloped Lands, is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate for the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the extent practicable.

In-place treatment through deep tilling and addition of lime and other amendments is an element of the selected remedy for undeveloped lands. These amendments render lead less mobile in the soil and potentially less bio-available. Therefore, the selected remedy also satisfies the statutory preference for treatment as a principal element of the remedy.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure, a statutory review (Five-Year Review) will be conducted within a period not to exceed 5 years after initiation of the remedial action to ensure that the remedy is performing as intended and is protective of human health and the environment. This Five-Year Review will be conducted in accordance with the National Contingency Plan, §300.430(f)(4)(ii).

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD.

- Contaminants of concern (COCs) and their respective concentrations (Sections 5.3 and 7.1)
- Baseline risk posed by the COCs (Section 7)
- Risk-based concentrations (RBCs) established for COCs and the basis for cleanup levels (Sections 7.1.3.5, and 7.1.7.1)
- Whether source materials constituting principal threats are found at the Site (Section 11)
- Current and future land use assumptions (e.g. groundwater is not a part of OU2) used in the baseline risk assessment and ROD (Section 6)
- Potential land use (groundwater is not a part of OU2) that will be available at the Site as a result of the selected remedy (Section 6)
- Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate for the remedy, as well as and the number of years over which the remedy cost estimates are projected (Section 9)
- Key factors in selecting the remedy (Section 12.1).

Additional information can be found in the Administrative Record for this Site. In addition, information considered critical to the selection of the remedy is summarized below.

INFORMATION CRITICAL TO SELECTION OF THE REMEDY

EPA identified several factors that are critical and necessary to selecting a remedy that is protective of human health and the surrounding environment; factors that are particularly critical for protecting children from residual lead in their environment.

- Parents and educators strongly support continuation of the county-administered Lead Education and Abatement Program and its vital role in the community. They support blood lead monitoring for children as the preferred means of measuring the success of their in-home and community-wide efforts to reduce their children's exposures to lead.

- The empirical evidence gathered from more than 25 years of blood lead testing shows that children's blood lead levels have steadily and significantly decreased to the extent that 95% of children tested since 2000 – 2001 are at 4 ug/dl or less and the incidence of children greater than 10 ug/dl is near zero. Results of the most recent 10 to 15 years of testing are in stark contrast to blood lead levels observed in prior years, when the majority of children tested were greater than 10 ug/dl and roughly half were greater than 15 ug/dl.

- The decreases in children's blood lead levels are due to a combination of cooperative efforts and actions taken by the community, Asarco (originally American Smelting and Refining Company and then Asarco, Inc., and after the filing for bankruptcy in 2005, Asarco, LLC; collectively referred to as Asarco hereafter), local governments, and state and federal regulators. The evidence gathered supports the conclusion that all of the following actions contributed to the decreases in children's blood lead levels: improvements and upgrades to emissions controls within the smelter, a comprehensive residential soil cleanup, an intensive program of street sweeping and washing over several years, a multi-faceted education and abatement program and national efforts to reduce lead in the environment.

- The East Helena blood lead data are representative of the population of children in East Helena and surrounding areas, both temporally and spatially. Based on participation rates over time, broad spatial coverage (areal extent of addresses of participants) and the narrow bands of statistical uncertainty, a high degree of confidence exists with respect to the long-term, county-administered blood lead data.

- Statistical analysis of paired, collocated soil lead and blood lead data show no measurable relationship (the line of best fit is flat) when soil lead concentrations are less than 1,000 to 1,500 ppm. This lack of a correlation is also demonstrated when recent East Helena soil lead and blood lead data are grouped by their remediated vs. unremediated status. These analyses support the conclusion that, unless soil lead concentrations are greater than 1,000 to 1,500 ppm, their contribution to blood lead levels is too small to be detected.

- Statistical analysis of 1983 and 1991 blood lead, soil lead, and air lead data support the conclusion that the prevalence of high concentrations of lead in the fine particulates that were being emitted from the smelter operations was an important contributor to children's elevated blood lead levels. Above soil lead concentrations of 1,000 to 1,500 ppm, which were common at that time, soil lead also contributed to children's blood lead levels to a significant extent.

- Cleanup levels for lead and arsenic in soil at this Site have been shown to be protective and are well within ranges of acceptability. For lead, EPA's National Lead Sites Consultation Group requires special consultation if the proposed cleanup action for lead in residential soil is outside the range of 400 to 1,200 ppm. For arsenic, the residential cleanup action level is within EPA's generally accepted risk range for excess cancer risks (risk of one excess cancer for every 10,000 to 100,000 individuals exposed) and is within the acceptable range of residential cleanup levels for arsenic in Region 8 (generally 70 to 240 ppm).

- When large tracts of agricultural land undergo a change in land use and remediation is needed, the costs for such an action can be less than the cost of sampling alone at the intensity required within residential areas. In contrast to the high degree of variability of soil lead concentrations within residential yards, soil lead concentrations of undeveloped lands surrounding East Helena exhibit little variability. This homogeneity on agricultural lands is due to the lack of disturbances that accompany development and human activity in residential and commercial areas. EPA's preference for in-place treatment in such instances is cost-effective and it eliminates the need for expensive, large-scale excavation and disposal, and mining of soils from productive farmlands for use as topsoil.

- EPA, Agency for Toxic Substances and Disease Registry (ATSDR) and the State Medical Officer for Montana have concluded that residual lead concentrations in the soils and dust of East Helena and its surrounding environment cannot be reduced to levels low enough to eliminate the need for institutional controls, irrespective of the cleanup action level selected. Institutional controls and other remedy protection measures are a critical and necessary component of the remedy and must be maintained over the long term. Uncertainty over when, if ever, and which, undeveloped lands will undergo changes in land use to a residential or recreational or commercial use further necessitates long term administration of institutional controls.

- The remedial objectives and goals established for East Helena are more stringent than national goals generally recommended for lead sites, and they have been met or exceeded for the past several years. That aspect of this Site, together with all the factors discussed above, support the EPA's decision to retain the procedures, methods and criteria that have been successfully established over the course of the ongoing residential cleanup action and have produced results protective of human health.

AUTHORIZING SIGNATURE

This ROD documents the selected remedy to address the contamination at the East Helena Superfund Site, Operable Unit 2, Residential Soils and Undeveloped Lands.

EPA, as the Lead Agency for the East Helena Superfund Site (MTD006230346) OU2, formally issues this ROD.

Carol L Campbell
Carol Campbell
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U. S. Environmental Protection Agency, Region 8

9/17/09
Date

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AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ARBC	Acute Risk-Based Concentration
Asarco	American Smelting and Refining Company and then Asarco, Inc., and after the filing for bankruptcy in 2005, Asarco, LLC;
ATSDR	Agency for Toxic Substances and Disease Registry
BAMP	Best Agricultural Management Practices
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
BRA	Baseline Risk Assessment
CAG	Community Advisory Group
CDC	Center for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Conservation and Liability Information System
COCs	Contaminants of Concern
COPCs	Contaminants of Potential Concern
COPECs	Contaminants of Potential Ecological Concern
CRBC	Chronic Risk-Based Concentration
CTE	Central Tendency Exposure
CSM	Conceptual Site Model
EPA	U. S. Environmental Protection Agency
EPCs	Exposure Point Concentrations
Existing residential areas	Areas that are residential or that have been developed for residential purposes prior to issuance of the ROD. These areas are differentiated from land that is undeveloped at the time of issuance of the ROD that may or may not be developed in the future.
FS	Feasibility Study
ft	Foot/feet
gpd	Gallons per Day
HI	Hazard Index
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
HRS	Hazard Ranking System
ICs	Institutional Controls
IEUBK	Integrated Exposure, Uptake, and Biokinetic
LCCHD	Lewis and Clark County Health Department
MDEQ	Montana Department of Environmental Quality
MDHES	Montana Department of Health and Environmental Sciences
MDPHHS	Montana Department of Public Health and Human Services
mg/kg	Milligrams per Kilogram
mg/kg/day	Milligrams of Chemical Ingested per Kilogram Body Weight per Day
mg/l	Milligrams per Liter
NAS	National Academy of Sciences

NCP	National Oil and Hazard Substance Pollution Contingency Plan
NHANES	National Health and Nutrition Examination Survey
NPL	National Priorities List
O&M	Operations and Maintenance
OU2	Operable Unit 2, which is defined in Section 4 of this ROD
PbB	Lead in Blood
PbS	Lead in Soil
PRGs	Preliminary Remediation Goals
PRPs	Potentially Responsible Parties
RAGS	Risk Assessment Guidance for Superfund
RAOs	Remedial Action Objectives
RCRA	The Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976
ROW	Right-of-Way
RBA	Relative Bioavailability
RBC	Risk-based Concentration
RI	Remediation Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund and Reauthorization Act
Site	East Helena Superfund Site
TBC	To Be Considered
TDS	Total Dissolved Solids
TRVs	Toxicity Reference Values
UCL	Upper Confidence Level
USC	U. S. Code
USGS	U. S. Geological Survey
°F	Degrees Fahrenheit
µg/dl	Microgram per Deciliter
µg/l	Microgram per Liter
XRF	X-ray Fluorescence
%	Percent
1998 RCRA Decree	Consent Decree entered in 1998 in *United States v. Montana*

PART II

DECISION SUMMARY

DECISION SUMMARY

SECTION 1

SITE NAME, LOCATION, AND DESCRIPTION

The East Helena Superfund Site (Site), Comprehensive Environmental Response and Liability Identification System (CERCLIS) No. MTD006230346, is located in the community of East Helena, in Lewis and Clark County, Montana (Figures 1-1 and 1-2). East Helena is approximately 3 miles east of Helena, Montana. According to the Montana Department of Commerce, the estimated 2006 population of East Helena was 2,068.

The Site consists of the smelter, all of the City of East Helena, nearby residential subdivisions, numerous rural developments such as farms and homes on small acreage plots, and surrounding undeveloped lands. The smelter is located in Section 36, Township 10 North, Range 3 West, at 46° 34' 51" north latitude and 111° 55' 13" west latitude. The smelter, which primarily recovered lead and operated for over 100 years, covers approximately one-half square mile and is owned by Asarco Incorporated (originally American Smelting and Refining Company and then Asarco, Inc., and after the filing for bankruptcy in 2005, Asarco, LLC; collectively referred to as Asarco hereafter). Residential areas of East Helena are within one-quarter mile of the smelter area.

Originally, the Site was divided into five operable units (OUs):

- Process Ponds and Fluid (smelter property)
- Surface Soils and Surface Water
- Groundwater
- Slag Pile (smelter property)
- Ore Storage Areas (smelter property)

Because the facility was still operating, the Resource Conservation and Recovery Act (RCRA) program became responsible for all OUs except OU 2, including the process ponds, slag pile, and ore storage areas on the smelter property. Asarco entered bankruptcy in 2005. As a result of the claims adjudication proceedings in the bankruptcy, in 2009, RCRA assumed responsibility for certain additional Asarco-owned properties within OU2. The Asarco-owned properties described here are not subject to the final remedy selected by EPA in this ROD at this time. Final remedies for these properties will be selected by the Agency under the 1998 RCRA Decree. Thus, although they remain part of the Site, for administrative convenience, they are at this time not part of OU2.

The Asarco-owned properties that are not part of OU2 are described as follows (with numbers shown on the Asarco Ownership Map in Appendix A corresponding to these areas):

- The East Fields west of State Highway 518 (Numbers 10, 11, and 17)

- Upper Lake and immediately surrounding environs, down to the smelter property boundary and bounded on the west by the railroad tracks (Numbers 12, 23, and portions of Number 15)
- The area immediately west of the smelter property extending to the railroad tracks and including the rodeo grounds (portions of Number 15)
- An area southwest of the Asarco smelter property and railroad tracks (Number 19)
- Portions of Prickly Pear Creek riparian corridor running through or immediately adjacent to property designated on the ownership map as Numbers 2 and 5.

The Superfund Program retained responsibilities for cleaning up OU2, which includes non-smelter property surface soils in the residential areas, irrigation ditches, rural developments, and surrounding undeveloped land. This Record of Decision (ROD) addresses OU 2, Residential Soils and Undeveloped Lands, and describes the final remedy selected by EPA for OU2.

EPA Region 8 is the lead agency for the potentially responsible party (PRP)-financed Site, with support from the Montana Department of Environmental Quality (MDEQ).

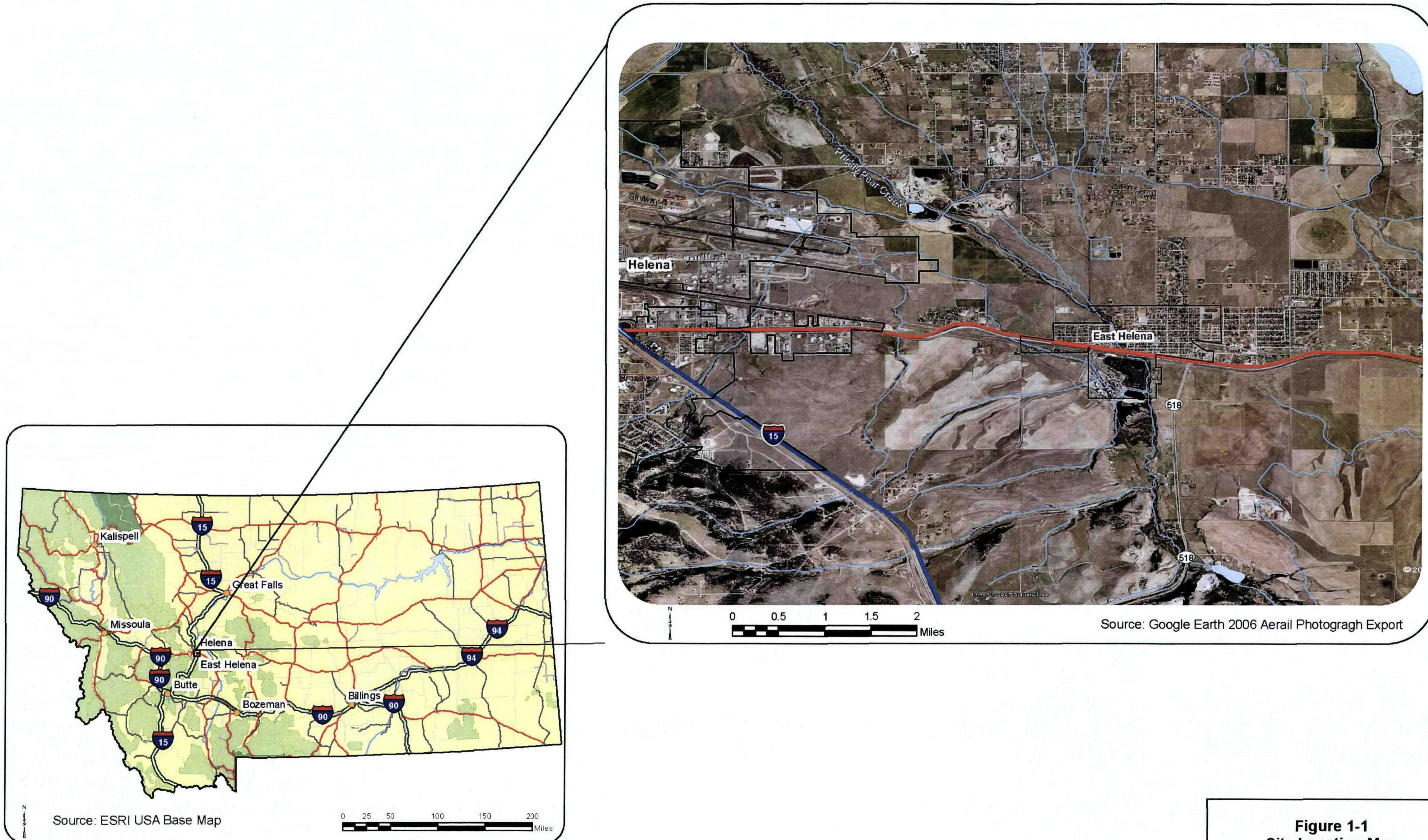


Figure 1-1
Site Location Map

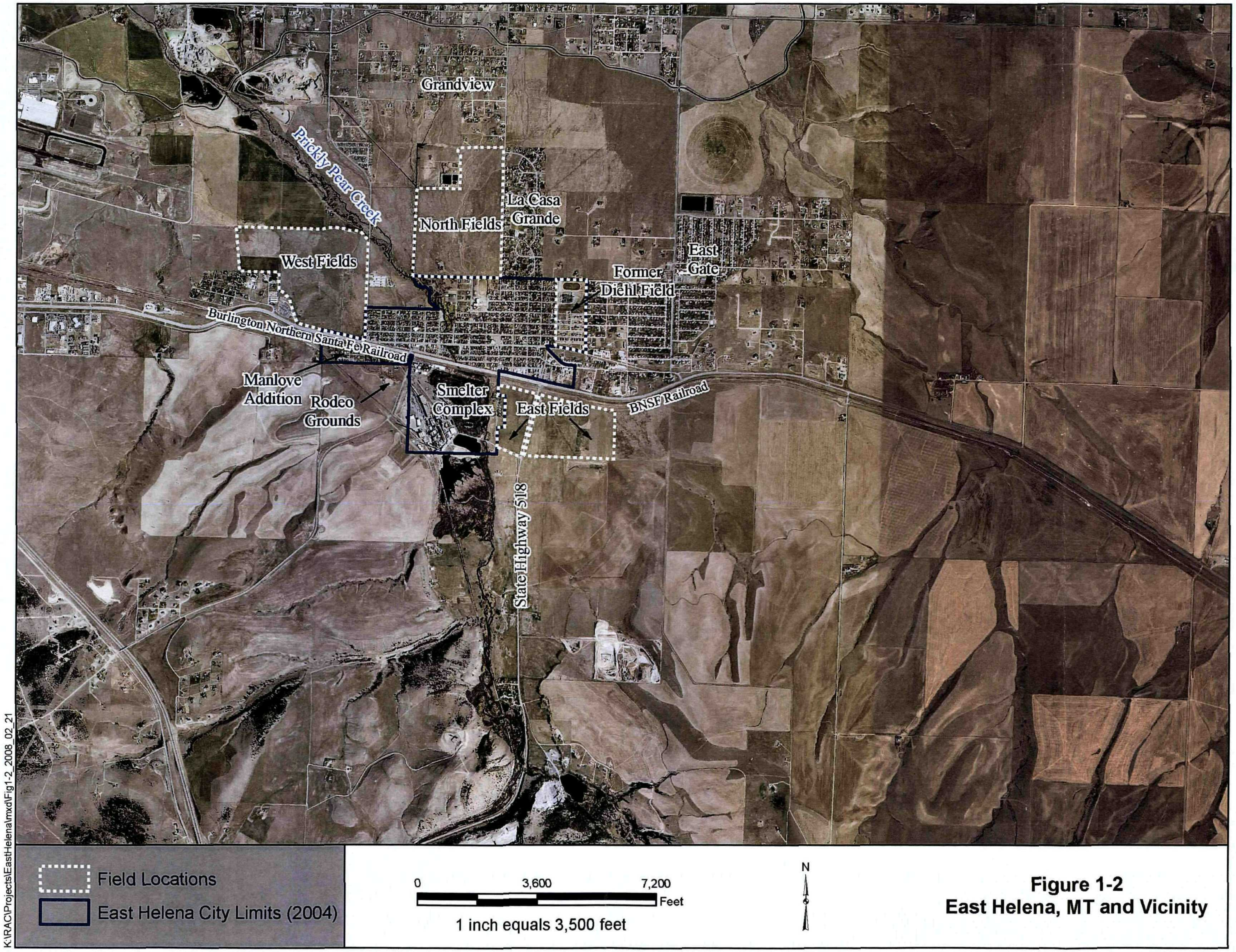


Figure 1-2
East Helena, MT and Vicinity

SECTION 2

SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 HISTORICAL LAND USE

The Site consists of the smelter facility, all of the City of East Helena, nearby residential subdivisions, numerous rural developments such as farms and homes on small acreage plots, and surrounding undeveloped lands (Figure 1-2). Agriculture practices were established in the Helena Valley in the latter 1800s in association with the discovery and development of mines in the area. East Helena originated as a result of workers' desire to live near to their work.

The smelter adjacent to East Helena operated from 1888 until April 2001. Asarco bought the property in 1895 from Helena and Livingston Lead Smelting and continued operations until the smelter was closed in 2001 (see Photograph 2-1 for a view of the smelter, circa 1900). Asarco owns the smelter grounds and much of the undeveloped land around East Helena that is part of OU2 (see Appendix A). During its operation, the smelter produced lead bullion, but also recovered copper, gold, silver, and platinum for refining at other Asarco facilities.

Photograph 2-1. Asarco Smelter, circa 1900

The former Anaconda Minerals Company constructed and operated a zinc plant at the smelter site from 1927 through 1972, which produced zinc oxide by fuming the slag from the lead smelter. Anaconda subsequently became part of Atlantic Richfield Company (ARCO) and is now a subsidiary of British Petroleum called BP West Coast Products LLC. The American Chemet Corporation (Chemet) began producing zinc-based paint pigments at a facility next to the smelter property in 1947. Chemet still operates their facility, but has modified and upgraded its zinc and copper product lines over the years. Burlington Northern (now the Burlington Northern Santa Fe Railway) owns a portion of the Site, which it leased to Chemet from 1969 through 1988. Burlington Northern Santa Fe Railway and Montana Rail Link also operate rail lines and own or lease property adjacent to the smelter and zinc plant properties.

All five of the companies noted above have been named as PRPs at this Site. All of the operations associated with the five PRPs have contributed to contamination at this Site; however, the major contribution came from lead smelting and zinc fuming operations.

2.2 SITE INVESTIGATION HISTORY

During the early 1970s, the State of Montana's Air Quality and Water Quality Bureaus, exercising authorities under the National Clean Air and Clean Water Acts, conducted investigations of smelter facility emissions and surface water discharges. These investigations revealed elevated levels of metal contamination in air, soil, and surface water in East Helena. Evidence of environmental contamination was observable in large areas of barren soils, reduced agricultural production, and reduced abundance and diversity of aquatic invertebrates in Prickly Pear Creek. More recent investigations that began in the 1980's and continue to the present have revealed elevated concentrations of metals in soils, vegetation, livestock, surface water, and groundwater.

A Preliminary Assessment of the Site was conducted in 1981 and a Site Inspection was conducted in 1983. In September 1984, EPA listed the Site on the National Priorities List (NPL) pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

As mentioned above, the Site consists of the smelter, all of the City of East Helena, nearby residential subdivisions, numerous rural developments such as farms and homes on small acreage plots, and surrounding undeveloped lands. The EPA has divided the Site into separate OUs. This ROD addresses OU2, which comprises residential and commercial areas, and surrounding rural agricultural and undeveloped lands, and describes the selected remedy for OU2.

The following summary of site investigations pertains only to OU2 and shows elevated lead concentrations in soil and sediments. Investigation results are discussed in Section 5 in the context of Site characterization. In addition, sampling and site characterization are discussed in Section 2.3 and Section 5.

2.2.1 1983 Center for Disease Control and Prevention (CDC)/MDEQ Study

In 1983, MDEQ (then called the Montana Department of Health and Environmental Sciences), in cooperation with the Center for Disease Control (CDC), conducted a comprehensive epidemiologic study in the Helena Valley to assess children's blood-lead levels and the relationship of those levels to different environmental media, one of which was soil. Blood samples were collected from residents in East Helena and surrounding neighborhoods.

The CDC/MDEQ Child Lead Study also collected 674 soil samples from the yards of 296 residences in and around the East Helena. Soil samples were collected from the 0- to 1-inch deep zone and analyzed by x-ray fluorescence for silver, arsenic, cadmium, chromium, copper, mercury, manganese, lead, antimony, selenium, and zinc. An intentionally biased sampling scheme was followed, focusing on households with children between the ages of 1 and 5 who had lived in the study area for 3 months or more.

In addition, dust samples were collected from household vacuum bags in 179 households as well as from vacuum filter samples in 50 randomly selected homes, and by linoleum dust swabs.

2.2.2 Phase I Remedial Investigation for Soils, Vegetation, and Livestock

In 1984, EPA collected 157 soil samples throughout the 100-square mile Helena Valley using a geometric grid sampling plan. In addition, three "background" surface soil samples were collected from an area approximately 27 miles southeast of the Site. All samples were collected from a 0- to 4-inch deep zone and analyzed for silver, arsenic, cadmium, chromium, copper, mercury, manganese, lead, selenium, zinc, aluminum, barium, beryllium, cobalt, iron, nickel, tin, thallium, and vanadium. These data were used to generate spatial distribution maps of soil metal concentrations using geostatistical techniques. Of the 157 sample locations, only 5 were within the East Helena city limits; however, an additional 13 sample locations lie sufficiently in and around the greater East Helena area closely enough to contribute to the characterization of residential soil. More details on the soil, livestock, and vegetation investigations are found in Section 5.0

2.2.3 Comprehensive Phase II Remedial Investigation

To supplement soil data collected by EPA during the Phase I RI and the CDC/MDHES (now MDEQ) Child Lead Study, 24 residential soil samples were collected from East Helena properties in 1987. An additional 26 surface soil samples were collected from the smelter property. Other subsurface soil samples were collected from the Site property as part of the groundwater RI (not addressed in this ROD). As part of the RI of Wilson Ditch, samples were collected and analyzed from surface water, bottom sediment, and underlying strata at four locations along the irrigation ditch. The vegetation portion of the RI called for collection and analysis of vegetable samples from residential gardens and Helena Valley grains.

The following activities were also conducted during the RI:

- Flow measurements and surface water sampling and analysis at Prickly Pear Creek, Upper Lake, and Wilson Ditch
- Sampling and analysis of fish tissue in Prickly Pear Creek and Lake Helena
- Waterfowl/sediment comparison literature review

As part of the RI, EPA conducted a Comprehensive Endangerment Assessment (EA) to human health and the environment. The EA addressed current and potential future exposures to indicator contaminants identified during the Phase I RI, including arsenic, cadmium, copper, iron, lead, manganese, and zinc.

2.3 SITE RECLAMATION AND REMEDIATION HISTORY

The East Helena Site was listed on the NPL in 1984. Remedial investigations of the smelter area and surrounding area started in 1984. In 1987, the Site was divided into Operable Units, which separated residential and related areas into a separate OU. Emission reductions and cleanup actions have occurred on the smelter property since at least 1983 and residential soil cleanup has been on-going since 1991.

2.3.1 Smelter Property

The smelter property is approximately 160 acres in size and until recently, included a number of process buildings, administrative buildings, materials holding areas, storage tanks, process ponds, and other facilities (see Photograph 2-2). Reclamation of the smelter property is managed under RCRA authority; however, because the smelter was a source of contamination to property in OU2, actions mitigating the smelter property sources are relevant to OU2 and are also discussed below.

Prior to termination of operations, various controls were implemented at the smelter facility to reduce airborne emissions and greatly reduce the potential for recontamination of East Helena soils. As part of a 1983 Clean Air Act State Implementation Plan (SIP), actions taken to reduce emissions included isolating and containing material stockpiles from wind and precipitation, unloading and storing unprocessed ore in a negative pressure concentrate storage and handling building, paving surfaces on the plant property (including 95 percent of all traffic surfaces), and wetting and chemical stabilization of plant roads during high traffic hours and unpaved parking areas when required by the weather.

During the remedial investigation, ore storage areas were identified as the source of approximately 35% of all lead particulates measured in East Helena. As mentioned, Asarco constructed an enclosed ore concentrates storage and handling building in 1989. In 1990, Asarco changed its practice from depositing hot granulated slag on a slag pile to preparation of cast slugs, which dramatically reduced the available fine-sized materials subject to wind and water transport. The Agency for Toxic Substances and Disease Registry (ATSDR) in their May 2008 Health Consultation for the Site pointed out that these changes to Asarco's operation report resulted in a 61% reduction in lead emissions (see Appendix B).

In 1993 the SIP was revised to further reduce fine particulate emissions to meet the National Ambient Air Quality Standard (NAAQS) for lead of 1.5 ug/m^3 by 1996. Emission controls were updated for the acid dust handling and conveying system, the dross plant ventilation system, blast furnace ventilation system, and the sinter building ventilation system. In addition, the speiss pit stack and crushing mill were eliminated and access to Asarco property was restricted. ATSDR also notes that Asarco's lead emissions were reduced further in 1999 by an additional 21% as compared to pre-1990 levels.

A November 1989, ROD identified the Process Ponds (OU1) on the smelter property as a source of contamination to the groundwater and Prickly Pear Creek. Remedial actions under the ROD included installation of storage tanks for Lower Lake water, construction and operation of a water treatment plant, dredging of sediments, smelting of sediments, and construction of stormwater controls. Later, some sediments were placed in a Corrective Action Management Unit as a result of a RCRA Consent Decree (described below). Actions were taken under the CERCLA authority until 1998 at which time EPA's RCRA Program took responsibility for the Process Ponds through implementation of the 1998 RCRA Decree.

Asarco closed the smelter in 2001. Because of this, wind blown lead particulates from the property are unlikely to recontaminate residential areas. An on-going monitoring program to check for recontamination of previously remediated properties indicates that residential properties have stable "background" lead concentrations.

2.3.2 OU 2

EPA's actions to clean up soils in residential yards, parks, schools, surrounding areas, and areas of undeveloped land have been ongoing at OU2 since 1991.

Photograph 2-2. Smelter Property

2.3.2.1 Residential Areas

At the completion of the RI and the 1990 Endangerment Assessment, EPA estimated that approximately half of the yards, playgrounds, and parks in East Helena were contaminated by more than 1,000 mg/kg lead in their surface soils. Some surface soil lead concentrations were detected as high as approximately 8,000 mg/kg. Soils in the East Helena community also showed elevated levels of arsenic up to 218 mg/kg. Lead exposure can cause a decrease in the concentration of blood proteins that transport oxygen throughout the body, and can impair the body's utilization of iron, which can produce neurobiological defects such as learning disabilities and behavioral problems in children. Arsenic exposure has been linked to increased incidence of human lung and skin cancer. Therefore, in 1991, EPA and Asarco entered into an Administrative Order on Consent (AOC), EPA Docket No. CERCLA-VIII-91-17, to begin a non-time critical but expedited soil removal action to protect public health and welfare. The State of Montana and Lewis and Clark County supported this removal action and associated cleanup levels.

The removal action started by removing contaminated soils within the "yellow zone" in the City of East Helena (Figure 2-1 and Sheet 1). It was expected that removal of soils with lead concentrations in excess of 1,000 mg/kg would also address arsenic contamination. The yellow zone is comprised of approximately 30 city blocks located directly across the railroad tracks and highway from the smelter, where historic soil contamination was more severe than elsewhere. Under the Administrative Order, soil from the entire yard was removed from all properties within the "yellow zone" to a depth at which the final excavated surface contained no lead concentrations greater than 500 ppm. Excavated areas were backfilled with "clean" backfill soil and sod. Removal priority was given to the following categories of property (in descending order):

- Yards with households having small children or expectant mothers
- Playgrounds, daycare centers, parks, and school yards
- Other residential yards, gardens, and vacant lots
- Soil along unpaved streets and alleys
- Commercial property

Since 1991, through agreements among Asarco, EPA, MDEQ, and LCHD, protocols have been modified to expedite the cleanup in the most protective and cost-effective manner, and to include a few innovative and experimental cleanup approaches.

Outside the "yellow zone," all properties require sampling. If any portion of a yard had a soil lead concentration greater than the upper 95% confidence limit of 1,000 ppm, then all portions (sections) of that yard found to be greater than 500 ppm lead are removed and replaced. Ditches are also cleaned up when they are adjacent to, or part of yards. Yards are generally excavated to a depth of 12 inches, but exceptions have been made for yards within the 100-year flood plain of Prickly Pear Creek where excavation was conducted to a depth of 18 inches. After excavation, the final excavated surfaces are sampled to ensure they are below cleanup levels.

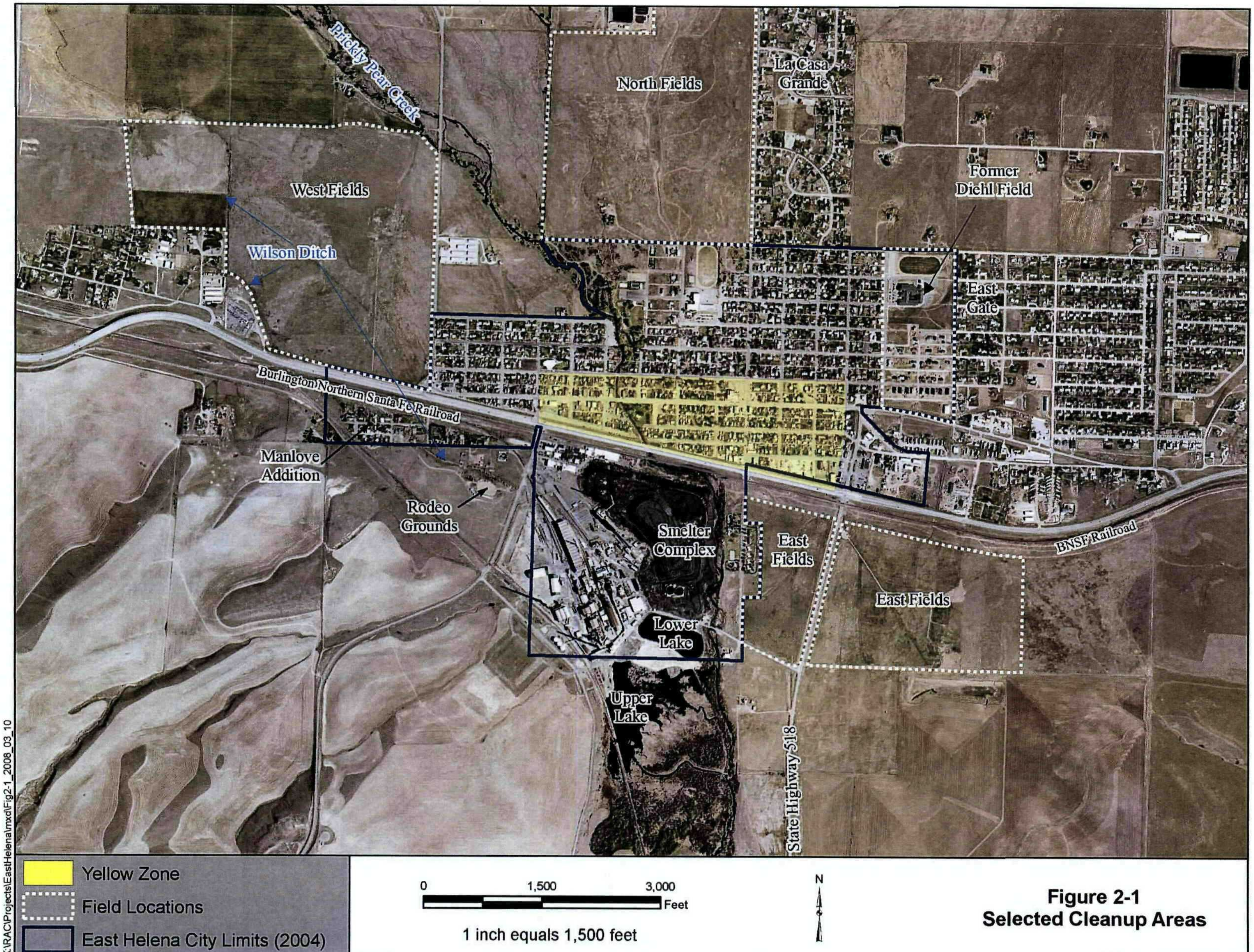


Figure 2-1
Selected Cleanup Areas

Outside the yellow zone, particularly in the northeast neighborhoods of East Helena and in La Casa Grande and East Gate subdivisions, EPA found that most yards that had at least one section with lead-concentrations greater than 1,000 mg/kg, also had an average yard concentration of less than 1,000 mg/kg lead. Many yard sections had lead concentrations less than 500 mg/kg, even when one or more other sections in the same yard exceeded 1,000 mg/kg lead. Accordingly, in such yards only partial yard removals were conducted.

The sampling protocols and procedures followed to determine which properties qualified for cleanup are discussed in Section 5. Photographs 2-3 and 2-4 show examples of soil response actions conducted at residential properties and Photograph 2-5 shows removal along a road apron.

The following is a summary of the actions completed since 1991. Sheet 1 shows the properties that have been cleaned up at East Helena pursuant to the Administrative Order on Consent between EPA and Asarco with support from the State of Montana and Lewis and Clark County.

1991. A total of 26 sites were remediated, including 20 residential yards, 3 daycare centers, and 3 multiple housing units. Soil was removed from the football field at Radley School and the play area at the Main Street School. Excavated soils were temporarily stockpiled in a fenced area on Asarco's East Fields, located directly east of the smelter (see Figure 2-1).

July 23, 1992 AOC Modification. The AOC removal schedule was modified to require cleanup of no fewer than 55 residential yards, the adjacent unpaved streets and alleys (including road aprons), and Main Street Park. Emphasis was placed on "priority residences" (i.e., a residence with children under 7 years of age, pregnant women, or child day care).

1992. A total of 78 properties were remediated during the construction season. Sixty of these were residential, 28 of which had children from the ages of 1 to 18. Thirteen of the properties were "priority residences" (i.e., a residence with children under 7 years, pregnant women, or child day care). In addition, 4 parking lots, 5 road aprons, 1 alley, 1 vacant lot, 2 gas stations, the volunteer fire hall, East Helena City property, the Methodist Church, and Main Street Park were completed. Photograph 2-4 shows a road apron on which response actions were conducted.

May 4, 1993 AOC Modification. An AOC modification required Asarco to remediate no fewer than 27 EPA-approved priority residences in 1993, including all of the priority residences that were identified by November 1st of the preceding year and before December 31st of the following year.

Photograph 2-3. Small Yard Removal Action

Photograph 2-4. Yard Removal Action

Photograph 2-5. Road Apron Removal Action

1993. The major goal of the 1993 construction season was to remediate 85 residential sites, 27 of which were priority residences. That goal was surpassed when 102 sites were completed, including 28 priority residences. Thirty-three road apron sections and four ally sections were also remediated.

The scope of the AOC included cleanup of those portions of Wilson Ditch that are within residential areas. Cleanup began in 1993, and all but approximately 90 feet of Wilson Ditch between the smelter property and Highway 12 was excavated and backfilled. Soils removed from Wilson Ditch were high in arsenic and lead, and were stockpiled separately in a second temporary storage area in the East Fields pending results of the land application demonstration project, and were ultimately disposed at the East Fields.

In the spring of 1993, a land application demonstration /direct haul project was initiated on 19 acres of the East Fields to evaluate whether the East Fields could be used as a repository for residential soils excavated from East Helena and whether those soils could be hauled and placed directly on the East Fields. The project involved ripping existing soils, which were largely devoid of vegetation due to low soil pH and elevated metals, and applying crushed limestone. This demonstration is discussed in greater detail, below.

A treatability study was also conducted in the East Fields, nearby the "land demonstration." The three-year treatability study was initiated to evaluate the effects of different treatments on soil metal concentrations, vegetation yield, and vegetation metal loadings. This treatability study is also discussed in greater detail, below.

1994. One hundred twenty-two residential properties were remediated, 29 of which were priority sites. The remaining 90-foot section of the Wilson Ditch also was remediated. Overall, in 1993 and 1994, approximately 3,700 feet of the Wilson Ditch from the smelter property to U.S. Highway 12 were cleaned up.

Data collected from the 19-acre land application demonstration/direct haul project initiated in 1993 showed that soil concentrations were reduced and vegetation was established to a degree sufficient to continue this activity into 1994. The treatability study initiated in 1993 also continued.

A park in La Casa Grande Subdivision (Figure 2-1) was cleaned up by the addition of limestone gravel and tilling to mix the limestone and soils to a depth of approximately 15 inches. The area was then covered by clean soil. The La Casa Grande tilling project is discussed in greater detail below in this section.

1995. In 1995, the removal action continued under the same protocols as in 1994. A total of 135 residential sites were completed. Of these, 104 residential sites were located in the yellow zone. One hundred and seventy-eight road apron sections, 39 sections of alleys, and six road sections were remediated.

Another demonstration project was initiated in the East Fields using limerock neutralization and a "Baker Plow" to achieve deeper tilling. The project evaluated cost-effective ways to remediate portions of the East Fields because the quantity of residential soil being excavated from East Helena and placed at the East Fields was insufficient to cover all of the East Fields. This project is discussed in greater detail, below.

The East Helena Lead Education and Abatement Program was established in 1995 to help the community protect children from lead contamination.

June 20, 1996 AOC Modification Beginning in 1996, residential yards with soil lead concentrations greater than 1,000 mg/kg were removed and replaced only when a child who was younger than 7 years of age or an expectant mother resided at that property year-round. The residential yards identified by Asarco were to be completed by December 31, 1996. Residential yards with elevated soil lead concentrations, but where no children less than 7 years of age or expectant mothers resided year round, were not cleaned, except in special circumstances, as determined by EPA in consultation with the State and County. All public areas, including parks, playgrounds, unpaved streets and parking lots, road aprons, and alleys with soil lead concentrations exceeding 1,000 mg/kg lead, were to be cleaned up in 1996 except Kennedy Park. Kennedy Park was scheduled for cleanup in 1997.

A voluntary program encouraged area residents whose yards had not been cleaned to replace their garden soils with clean soils provided by ASARCO. Vegetable gardens with contaminated soils may have been excavated as part of the remediation irrespective of lead concentration in the surrounding yard because vegetable gardens pose a significant potential for exposure to soils.

1996. Fifty-one residential sites, 43 road aprons and 1 alley section were remediated in 1996. The City of East Helena withdrew permission from EPA for access to some road apron sections which, therefore, could not be cleaned.

The land application demonstration/direct haul and deep tilling projects in the East Fields were completed. Deep-plow mixing technology was also used to reduce contamination in surface soils of a 40-acre agricultural tract (Diehl fields) that was scheduled to be subdivided into residential lots. The deep-plow treatment is discussed in greater detail, below.

With the exception of approximately six to eight properties, all residential yards, vacant lots, commercial lots, parks, playgrounds, unpaved streets and alleys in the yellow zone were cleaned up between 1991 and 1996. Removal actions continued after 1996 as warranted based on soil concentrations and whether children under 7, or expectant mothers resided at the property.

1997. The 1997 construction season included cleanup of two public parks and 28 residential properties. Soils were placed in the East Fields soil repository.

1998. The 1998 construction season included remediation of 13 residential priority properties and one vacant lot. Two historic flood channels of Prickly Pear Creek, north of East Helena, were cleaned up to prevent recontamination of adjacent properties during flood events.

1999. Six residential priority properties and one vacant lot were remediated. Two flood channels located on two of the remediated properties also were excavated and replaced.

2000 Twelve residential properties, 3 vacant lots, and 7 sections of flood channel were remediated. Eleven of the 12 residential properties were classified as priority. An additional yard was cleaned up even though documented soil lead levels were less than 1,000 mg/kg because of concerns about the blood-lead level of the child living there.

2001. Twelve priority residences, 2 road apron sections, and 14 flood plain channels were cleaned up. In addition, excavated soils were removed from 7 temporary storage locations and disposed of in the East Fields.

2002. Nine priority residences and 79 flood plain channels were remediated

2003. Seven priority residences, 2 vacant lots, and 5 road apron sections were remediated.

2004. Six priority residences, 5 vacant lots, and 1 flood plain channel were remediated.

2005. Approximately 23 residences and the McDonald trailer court were remediated.

2006. Forty-eight residences were remediated.

2007. Forty-six residences were cleaned up.

2008. Sixty residences were cleaned up.

2009. Anticipate that all remaining properties requiring cleanup will be completed before the end of 2009.

From 1991 through December 2008, the Removal Action cleaned up the following: 716 residential yards; 368 unpaved roadways and road aprons; 75 unpaved alleys; 6 public parks; 2 school playgrounds; 44 commercial and public areas; 4,200 linear feet of irrigation ditch; 156 flood channel and ditch sections; and 36 vacant lots.

By the end of 2009, approximately 30 more residential yards determined to require cleanup should be completed and that will complete all the known eligible yards. In 2009, 16 unpaved roadways have been cleaned up and all known eligible unpaved roadways remaining (24) are expected to be completed. Five commercial properties are expected to be cleaned up in 2009. Some additional confirmation sampling will be conducted in 2009 and into 2010.

2.3.2.2 Undeveloped Land

The following treatability studies/response actions conducted in the East Fields and East Helena showed that treatment (deep tillage with/without lime amendment) can be successful in reducing concentrations of lead in surface soils:

- East Fields Land Application/Direct Haul Project
- East Field Treatability Study
- Baker Plow Study

- La Casa Grande Subdivision
- Diehl Fields
- Manlove Addition

These studies demonstrated the success of in-place treatment by deep tilling to reduce lead concentrations in surficial soils with or without the addition of lime. The results of these studies support the use of capping and in-place treatment as elements of the cleanup remedy for undeveloped land.

The East Fields area still has concentrations of lead in soil remaining above 1,000 ppm below the capped/covered areas and institutional controls will therefore be required to prevent future disturbance of soils and exposure to lead. The areas of the La Casa Grande subdivision, Diehl fields, and Manlove Addition were remediated to lower levels of lead concentrations and have been subsequently developed into residential and public use areas. They require no further remedial action.

East Fields Land Application Demonstration/Direct Haul Project

Pursuant to the 1991 AOC, disposal alternatives for residential soils and for remediation of the Asarco property east of the smelter area (i.e., the East Fields) were evaluated. The East Fields is an area directly east of the smelter property comprising approximately 225 acres impacted by elevated concentrations of lead and other metals in soil (see Figure 2-1). Much of the East Fields area was largely devoid of vegetation due to low pH and elevated concentrations of metals as shown in Photograph 2-6. The evaluation resulted in a plan to conduct a demonstration project to evaluate whether the East Fields could be used as a repository for residential soils excavated from East Helena and whether those soils could be hauled and placed directly on the East Fields.

Photograph 2-6. East Fields Pre-Reclamation Soil Close-up

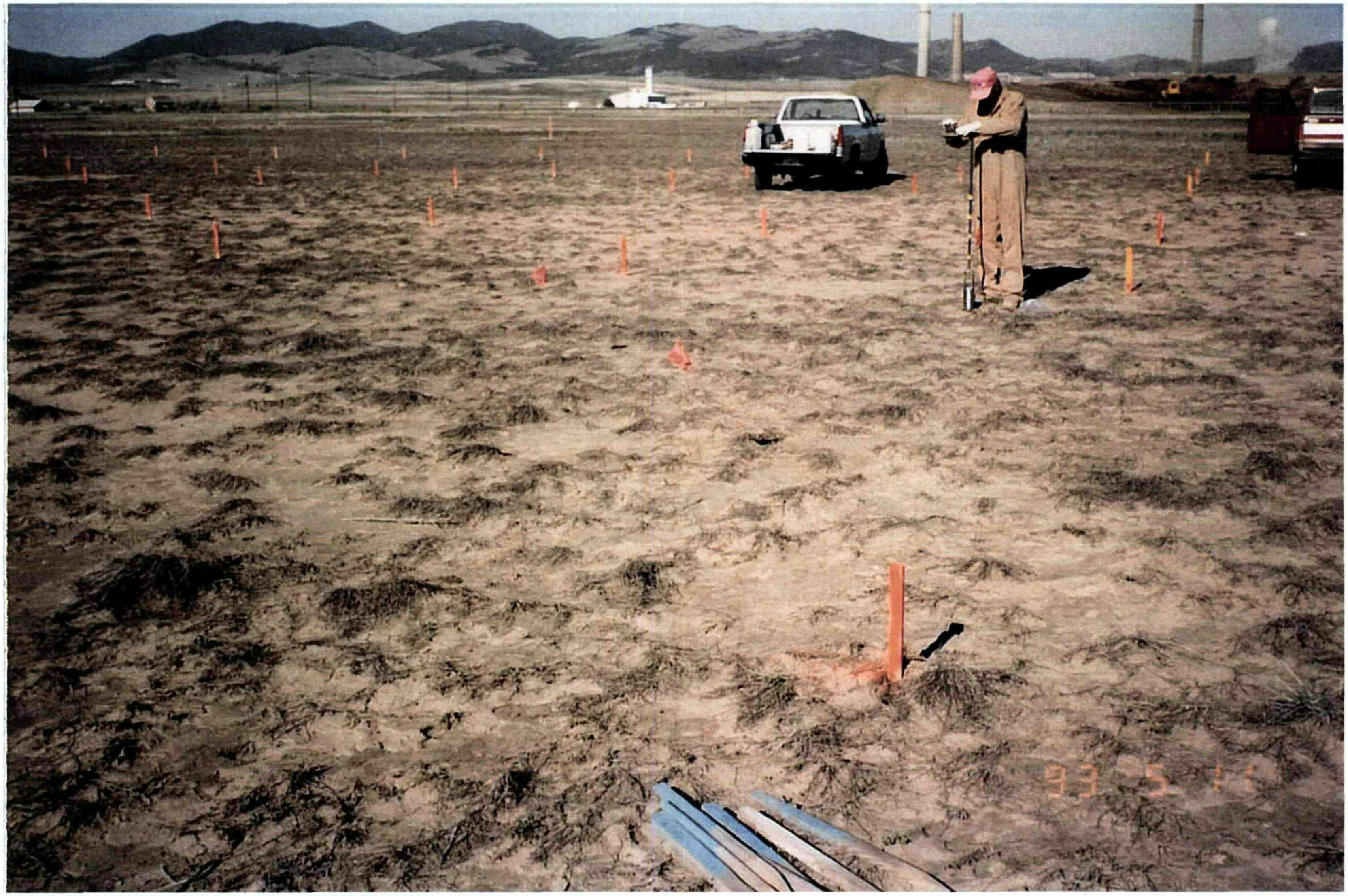
The demonstration project initiated in 1993 at the East Fields involved ripping the existing soils, applying crushed limestone, and capping, or otherwise incorporating excavated residential soils. The area was approximately 19 acres in size and could accommodate approximately 20,000 cubic yards of soil, the amount Asarco expected to excavate from East Helena in 1993. This area was partitioned into 1.44 acre plots (250 ft x 250 ft) and each plot divided into four soil sampling quadrants. Photograph 2-7 shows East Fields being staked out in preparation of the demonstration. The demonstration area was first ripped, and then crushed limestone and residential soil were added. Limestone was added to raise the pH of the soil in order to aid the establishment of vegetation. Finely crushed limestone (-60 mesh) was applied at a rate of approximately 5.2 tons/acre of carbonate equivalent and incorporated with a double disc to a depth of at least 8 inches into plots in the southern portion of the demonstration area. Agricultural grade crushed limestone (-1/4 inch) was applied on sections in the northern portion of the demonstration area at the rate of about 10 tons/acre. Photographs 2-8 and 2-9 show the tilling and lime amendment treatment process. A cap consisting of residential soils excavated from East Helena was applied through recapping and replotting to a number of plots at an average depth of approximately 12 inches until the lead level results averaged approximately 1,000 mg/kg lead per plot.

The hauling of residential soils directly to the East Fields continued throughout the 1994, 1995, and 1996 work seasons, based on the initial success of the demonstration. A dozer was used to blend and mix residential soils to below a concentration of 1,000 mg/kg lead. The residential soil cap was graded to approximately 1-foot thickness, after which each plot was partitioned into four quadrants and sampled. Samples were analyzed for lead, arsenic, cadmium, and zinc to ensure that the average lead level was less than 1,000 mg/kg. The plots were then seeded, fertilized, and controlled for weeds.

The demonstration project was also designed to compare pre-liming soil pH values with post--liming pH values for the two different materials and application rates discussed above. The areas to which fine limestone was mixed had a pre-liming average pH of 5.5 and a post-mixing pH of 7.3, whereas the areas to which agricultural grade limestone was mixed had a pre-liming average pH of 5.6, and a post-mixing pH of 6.4. In 1995, the demonstration included the addition of -1/4 inch agricultural limestone to that years' plots at approximately 6 tons per acre. A Baker plow with 32 inch discs was used to incorporate the limestone into the soil to an approximately 15-inch depth. Statistically, the addition of limestone resulted in a significant increase in pH from an average pre-treatment pH of 5.3 to a post-treatment pH of 6.7, thereby making the soils more suitable for revegetation.

The land application demonstration project showed that lime application, combined with a residential soil cap with concentrations of lead below 1,000 mg/kg, was successful in increasing pH, producing a sustainable vegetative cover, and demonstrating that the East Fields could be used as a repository for residential soils excavated from the East Helena area. It was understood that this area would not be developed for residential use, but might be used as rangeland in a limited capacity.

Photograph 2-7. East Fields Pre-Reclamation – Staking of Demonstration Plots



Photograph 2-8. Tilling with Lime Amendment

Photograph 2-9. Close-up of Tilling with Lime Amendment

East Fields Treatability Study

A three-year treatability study was initiated at the East Fields in 1993 to evaluate soil treatment effects on soil metal concentrations, vegetation yield, and vegetation metal loadings. To evaluate these effects, eight treatments were tested singly or in combination with others to make up the eight treatments. Treatments were replicated four times with three distinct lead concentrations (1,500 mg/kg, 2,000 mg/kg, and 3,000 mg/kg). A treatment consisted of excavation, adding lime to contaminated soils, covering the area with a clean soil cap (4-inch, 6-inch, and 12-inch), and tilling with a moldboard plow.

The study showed that treatment had a significant influence on yield of perennial grasses. Data from the second growing season showed that several treatments had mean soil lead, arsenic, and zinc concentrations above levels typically considered toxic to many plants. However, these same treatments had excellent grass yield, measured by annual production and percent of aerial cover. Overall, the results indicated that the perennial grasses were more tolerant of metal concentrations than literature suggested.

This treatability study showed that a 12-inch soil cap produced the highest production of grasses. Excavation of contaminated soil resulted in soil with the lowest metal concentrations, however, excavation did not perform as well as the cap of residential soils when vegetative metal loading was measured. The cap outperformed all other treatments in vegetative growth and percent of cover.

All treatments yielded vegetative loadings for lead and cadmium that exceeded National Research Council (NRC) forage concentrations chronically tolerated by livestock. However, vegetative arsenic and zinc loadings from all treatments were less than the NRC-identified levels tolerated by livestock. These results suggested that East Fields could be used as pasture for cattle for at least part of the year.

The treatability study indicated that the East Fields, previously virtually devoid of vegetation, could be successfully remediated and revegetated to create a sustainable upland habitat that could be used for pasture on a limited basis.

Baker Plow Study (Deep tilling)

While good yields of perennial grasses were produced on the demonstration project/direct haul cap as discussed above, not enough residential soils could be obtained to cap all areas of the East Field exhibiting low plant yield. Cost-effective ways to remediate remaining portions of the East Field, without covering them with soils removed from East Helena residences had to be found. Borrowing a remediation technique from a site in Anaconda, Montana, EPA used a "Baker Plow" in 1995 to reduce surface metals concentrations at the East Fields. Deep tilling with the Baker Plow, which has 38 inch discs, was also intended to improve vegetation and stabilize soil to prevent particulate migration during wind storms and reduce infiltration of water.

Surface samples were collected before and after tilling. In addition, samples were collected throughout the soil profile to a depth of 24 inches and in some pits to the depth of till, which averaged 31 inches. The Baker Plow technique was able to reduce surface lead concentrations from 1,800 mg/kg to 500 mg/kg, and arsenic, cadmium, and zinc concentrations in the demonstration area. Lead concentrations in soil after tilling at the Baker Plow demonstration area were less than lead concentrations in the cap of residential soils..

The Baker Plow study successfully demonstrated that this approach is useful on large parcels of land, to:

- Reduce surface soil concentrations of arsenic, cadmium, and lead
- Raise surface soil pH
- Eliminate any metals/pH gradient in the surface soil by mixing soil in the plow zone

After the demonstration, Western Reclamation, the contractor who owned the Baker Plow, modified the plow to couple the discs more closely to the pulling dozer to facilitate a shorter turning radius. The modified plow, of which the Baker Plow was a prototype, is called the Western Reclamation Plow.

The Western Reclamation Plow was used to remediate 31 acres in the eastern portion of the East Field that might otherwise have been capped. Deep tilling this acreage, which lay along the 1,400 to 1,700 mg/kg lead isocontours, contributed to the cost effectiveness of the remediation, and allowed residential soils to be applied as a cap where there were greater surface metals concentrations.

In 1996 EPA also used the Western Reclamation Plow to deep till the western part of the East Fields prior to covering it with contaminated residential soils. This area is directly east of the Asarco smelter and west of the Montana City Highway (State Highway 518). A tillage depth of approximately 20 inches was achieved, rather than the goal depth of 30 inches, because of rocky soils. The results showed that the achievable tilling depth is dependent on the stratigraphy and the pre-tillage ripping depth and intensity.

This effort showed that surface lead concentrations in excess of 7,000 mg/kg can be reduced to less than 2,700 mg/kg by deep tilling. The mean post-tillage surface lead concentration was 1,419 mg/kg. This concentration is lower than the mean surface lead concentrations on the East Fields directly across the Montana City Highway, which did not have the benefit of deep tilling prior to capping with residential soil.

La Casa Grande Subdivision

La Casa Grande Park is a 6.5 acre park in La Casa Grande Subdivision, north of East Helena (see Figure 2-1). In July 1993, twenty two surface soils (0-1 inch bgs) were collected throughout the park. Ten of these samples showed lead concentrations above 1,000 mg/kg. In addition, five pit samples were collected from 4 to 5, 5 to 6, 6 to 7, 7 to 8, and 8 to 9 inches bgs. Lead concentrations from pit samples were 1,875 mg/kg, 134 mg/kg, 701 mg/kg, 119 mg/kg, and 132 mg/kg, respectively. EPA concluded that lead concentrations above the trigger level of 1,000 mg/kg are confined primarily to the 0 to 8 inches bgs soil horizon, indicating that deep tillage/liming treatment might be effective to reduce soil lead concentrations, increase soil pH, and reduce costs of excavation in the outlying areas of East Helena. The La Casa Grande Homeowners Association volunteered their 6.5 acre park as a demonstration area.

Before tillage or liming, 0 to 8 inch bgs soil samples were collected from six random locations and analyzed for pH. A dozer was used to till and mix 6 tons/acre of minus 1/4 inch agricultural limestone to a depth of 12 inches. A composite of 5, 0 to 1 inch bgs post treatment surface soil sampling points were collected from each sampling unit. Deep tilling and liming of La Casa Grande Park was completed by October, 1994.

Deep tillage significantly decreased lead concentration in the 0 to 1 inch bgs zone from a pre-treatment concentration average of 836 mg/kg to a post-treatment mean of 536 mg/kg, an average decrease of 300 mg/kg. Soil pH also increased as a result of the lime treatment. Deep tillage successfully remediated this large public area and provided a cost-effective alternative to soil excavation.

Diehl Fields

The Diehl property was an approximately 40 acre agricultural field on the eastern boundary of East Helena's city limits that was considered a candidate for residential development (Figure 2-1). The field lies within a subdivision where surface (0 to 1 inch) lead concentrations generally exceed 1,000 mg/kg and occasionally exceed 2,000 mg/kg. The subdivision is in an area where EPA requires lead soil sampling for every residence.

The field was prepared by ripping with a dozer (D-8) and 15-inch ripper teeth to loosen the soil prior to tilling. Lime was applied at 0.6 tons $CaCO_3$/acre based on twelve soil samples with a pH of less than 7.0. Four right-angle passes of the Western Reclamation Plow were conducted, achieving an average tilling depth of 19.9 inches. Rocks and cobbles in the subdivision soils prevented the plow from attaining its full tillage depth of 30 inches and reduced the amount of soil available for mixing. After tilling the property was rolled flat.

Sixteen pre- and post-tillage composite surface samples (0 to 1 inch) were collected per acre and analyzed by X-ray fluorescence (XRF) for lead, arsenic, and cadmium. Eighty-three percent of the pre-tillage surface lead concentrations in the subdivision exceeded 1,000 mg/kg, while 23 percent exceeded 2,000 mg/kg. The mean surface lead concentration before tilling was 1,539 mg/kg. Tilling reduced ninety percent of post-tillage soils to lead concentrations less than 500 mg/kg, and 100 percent of all samples were less than 1,000 mg/kg. The post-tillage mean surface lead concentration was 401.6 mg/kg.

In addition to surface sampling, soil profile samples were collected from three intervals (0 to 4 inches, 4 to 16 inches and 16 to 30 inches) at a frequency of 1 pit per acre (40 total) and analyzed for lead, arsenic and cadmium. Pre-tilling lead concentrations decreased with depth throughout the soil profile. The post-tilling soil profile samples had mean concentrations of lead in each horizon less than 500 mg/kg and no single sample exceeded 1,000 mg/kg. After tilling lead concentrations throughout the soil profile were more or less uniform to a depth of approximately 16 inches.

Tilling proved successful in reducing lead concentrations to below the cleanup level of 1,000 mg/kg in all of the acres tilled. The plow was only partially effective in mixing soils deeper than 16 inches, in part because rocky soils hindered the plow's ability to reach a specified depth. EPA expects that where this remedial approach is applied, future soil treatments will include deeper ripping of the soil before tilling. Even with more shallow soil ripping prior to tilling, however, the Western Reclamation Plow has proven to be a cost-effective remediation tool for lead contamination in soils.

The Diehl Fields have been developed into a residential area including a public middle school. (See Photograph 2-10)

Manlove Addition

Site IC25 is an area in the Manlove Addition of East Helena that is 0.84 acres in size and consists of 6 vacant lots which were proposed for residential development in 1997 (see Figure 2-1). In October 1996, surface soil samples were collected from 9 units in IC25, 60 feet by 60 feet in size. Eight of the 9 units had lead soil concentrations above 1,000 mg/kg, but it was agreed at a biweekly EPA meeting that this site qualified for the application of deep-tilling remediation technology.

First, the site was ripped by a dozer with 15-inch ripper teeth from east to west and south to north. Then the Western Reclamation Plow was used to deep till the area with 38 inch discs. The plow made 4 passes at right angles to accomplish an estimated plowing depth of 25 to 30 inches.

In addition, individual pre- and post-tillage pits were excavated approximately within the same location and soil samples were collected from the 0 to 4 inch, 4 to 16 inch, and the 16 to 30 inch depths. Samples were analyzed for lead, arsenic, and cadmium. The results indicated that the tilling was successful in reducing the surface lead concentrations to below the cleanup action level of 1,000 ppm.

The plow depth achieved by tilling was 25 inches. The depth of tilling appears to be partially related to soil stratigraphy, where soils containing cobbles limit the plow's ability to achieve greater depths. This effort also confirmed that ripping of the soil to a greater depth before tilling would result in deeper tilling and mixing of soils over a greater interval. The final phase of deep-tillage remediation of this site consisted of fertilizing and seeding.

Deep tilling was successful in remediating this site so that it could be developed for residential use.

Photograph 2-10. Diehl Fields Post-Remediation

2.4 ENFORCEMENT HISTORY

Enforcement-related actions at East Helena Superfund Site, OU2 include:

1984, September 21:	EPA lists the Site on the Superfund National Priorities List
1988, December:	Administrative Order on Consent regarding Remedial Investigation and Feasibility Study, EPA Docket No. CERCLA VIII-89-10, signed December 1988.
1991 - 2007	Administrative Order on Consent for Removal Action (soils), EPA Docket No. CERCLA-VIII-91-17, and annual amendments.
1998, May 5	Resource Conservation and Recovery Act Consent Decree regarding instituting improved materials screening and management procedures, performing a comprehensive RCRA corrective action investigation and, as appropriate, remediation at Asarco's East Helena smelter facility; and wetlands restoration.
2006	EPA filed a claim in the Asarco bankruptcy proceedings to recover past and future costs of completing the East Helena OU2 cleanup at properties not owned by Asarco (in re Asarco et al., Debtors, Case No. 05-21207, Southern Dist. Texas).
2005	EPA notifies the Asarco bankruptcy court of an administrative expense claim for remaining investigations and cleanup work at Asarco-owned properties in East Helena, including owned properties in OU2, and for groundwater contaminated by historic Asarco activities.
2009	Anticipated RCRA Consent Decree

SECTION 3

COMMUNITY PARTICIPATION

This section summarizes the community relations activities performed by EPA and MDEQ during the investigations, Removal Action, and remedy selection process.

EPA and MDEQ completed a community involvement plan for the Site shortly after it was listed. This plan is intended to enhance communication with the public so that those who may be affected by the Superfund cleanup can be more informed about Site activities and be involved in the agencies' decision making process. The plan was drafted after discussions with residents, local officials and business leaders, and it enlisted the support of local groups, individuals and elected officials to collect and distribute information.

EPA and MDEQ have maintained regular contact with the community and implemented a variety of community relations activities as new information about the Site has become available. Activities have included public meetings; distribution of fact sheets, brochures, and flyers; meeting with community leaders and local officials; developing and maintaining an EPA internet fact sheet; and sharing information with local media.

By the autumn of 1990, EPA, MDEQ, and the County had examined risks to East Helena residents, especially children, posed by contaminated soils, and determined that an expedited removal action was needed. Because any action was likely to physically disrupt residential or municipal areas, the agencies wanted full public involvement in the decision-making process. On October 3, 1990, EPA sponsored a public meeting to discuss the cleanup alternatives that EPA had examined and to present the EPA's preferred cleanup action (yard replacement). Approximately 250 people attended to discuss the effect an expensive cleanup would have on Asarco's financial health, what authority EPA could or would use to force cleanup if homeowners were resistant, and to hear pleas from individuals to protect their families' health by reducing the potential for lead exposure. EPA followed up that meeting with a mailing to all East Helena residences, summarizing the highlights of the public meeting and listing three more meeting dates for informal meetings with EPA officials. EPA also encouraged residents to call EPA with any concerns or questions. In addition, because one aspect of EPA's preferred action involved cleaning up contaminated soils in area school yards and parks, EPA met twice with the East Helena School Board.

One result of these informal meetings was the formation of the East Helena Citizens Advisory Committee (EHCAC), consisting of a varying number of people and several core members. The group began holding regularly scheduled public meetings in January 1991. In 1992, a second, separate group formed under the name East Helena Citizens Advisory Council/Committee (EHCAC/C). Over the next seven years, the two groups held approximately 95 meetings. EPA or MDEQ representatives attended a majority of these meetings, which became a major aspect of EPA's community involvement. Through these meetings, EPA learned about remediation concerns, the community was informed about progress, and a consistent dialogue was maintained. By 1994, EHCAC/C was the sole remaining group. When necessary, EPA held public meetings in conjunction with the group, but EPA also sponsored public meetings independently. As a result of this close public contact, EPA was able to implement an extensive soil cleanup program to reduce health threats to children, while maintaining a constructive relationship with the community.

In 1995, EPA and Asarco agreed to establish and fund the county-administered Lead Education and Abatement Program. Since that time, the program's local health professionals have been at the forefront of educating the community and advising EPA and Asarco on how to protect the children of East Helena from lead. The program developed into one of the more effective education and abatement programs in the United States. This program is discussed further in Section 5.

In October 1997, EPA published a Proposed Plan under section 117(a) of CERCLA to continue remediation of the residential and agricultural (undeveloped) soils in and around East Helena. The plan was made available to private citizens, state and local officials, legislators, PRPs, and other persons. The plan summarized the site and project histories and Site risks, described the response action alternatives, provided an analysis of the alternatives evaluated by the EPA, and described EPA's preferred alternative. Availability of the plan was announced in notices published in the Helena Independent Record on October 30, 1997.

When the Proposed Plan was issued, a 30-day public comment period began, allowing the public to provide written comments. The formal public comment period was to run from October 30, 1997, through December 1, 1997; however, to provide an additional opportunity for public comment and discussion on the Plan, a public information meeting was held on November 12, 1997, in East Helena. After the public information meeting, EPA held a formal public hearing on November 29, 1997, to receive and record oral and additional written comments on the Proposed Plan. EPA made a transcript of the hearing available by placing it in the Administrative Record for the Site.

A ROD following this Proposed Plan was never issued. In 1997-1998, the Lead Education and Abatement Program was still relatively new, there hadn't been much sampling beyond the known extent of where the concentration of lead exceeded the action level (1000 ppm), suspicions regarding the contribution of the operating Asarco smelter to dust in the community and the air pathway were not yet fully realized, additional risk assessment was deemed appropriate, and institutional controls were not yet well developed.

In 1999, Lewis and Clark County and EPA evaluated the Lead Education and Abatement Program. The evaluation included the results of a community survey and an external peer-review, and produced a series of recommendations. The program's successes were noted, and recommendations were made to expand the role and importance of local health professionals in managing health risks in the long term. Over the following two and one-half years, Lewis and Clark County presided over monthly meetings that included EPA, MDEQ and the City of East Helena. Interested East Helena area residents also participated. Among other things, the participants discussed the need for institutional controls to (a) protect the ongoing removal action, (b) protect the residential cleanup once it was completed, and (c) manage the long-term land use changes anticipated for undeveloped lands.

A new Proposed Plan for the East Helena Superfund Site (Operable Unit No. 2) was issued on January 12, 2007. Public meetings on the Proposed Plan were held January 25, 2007 and March 1, 2007, at the East Helena Fire Hall. Notice of the Proposed Plan and meetings were published in the Helena Independent Record on January 24 and 25, 2007 and February 28 and March 1, 2007. Over 4,000 Fact Sheets announcing the Proposed Plan and meetings were direct mailed to residents of East Helena and surrounding communities, as well as to other stakeholders. In addition, EPA conducted a 60-day public comment period from January 16, 2007 to March 16, 2007. Public comments and responses to those comments are set out in Part III, Responsiveness Summary, of this ROD.

EPA has continued to coordinate on a regular basis with all stakeholders, including monthly meetings of the Lead Education and Abatement Advisory Committee comprised of EPA, MDEQ, Lewis and Clark County Health Department, City of East Helena, Asarco and interested residents and school administrators. Notifications and agendas were sent to stakeholders prior to the meetings. EPA coordinates with the East Helena Lead Education office at least weekly, and at time more often.

EPA's active community involvement activities include:

- EPA Superfund Program in the Helena, Montana office meets approximately monthly with City Council members and frequently attends their meetings
- Personnel in EPA's Montana Superfund Program are readily available on request to attend Lewis & Clark County Commission or Health Board Meetings
- EPA communicates frequently with the County regarding soil lead and blood lead data, and the mapping and statistical evaluations of these data. All of the soil and blood lead databases are maintained by the L&C County GIS office.

In 2008 and 2009, EPA participated in meetings and discussions on institutional controls that involved all stakeholders, and regional and national experts. These meetings were successful in producing an increased understanding by all stakeholders regarding the scope of institutional controls for OU2 and stakeholder's roles. This increased understanding is reflected in the description of institutional controls for this remedy.

EPA has committed to continue to coordinate with all local authorities and programs as they develop, refine and administer institutional controls throughout the remedial design and remedial construction phases.

The complete Administrative Record is available for public review at the EPA Records Center in the Federal Building, 10 West 15" Street, Suite 3200, in Helena, Montana. Most key documents are also available for review at the Montana Department of Environmental Quality, located at 1100 North Last Chance Gulch, Helena, and the East Helena Lead Education and Abatement Program Office, 2 South Morton, East Helena.

SECTION 4

SCOPE AND ROLE OF RESPONSE ACTION

The East Helena Superfund Site includes the property of a lead smelter that operated from 1888 to 2001, the town of East Helena, several residential subdivisions, and surrounding agricultural lands. In 1987, this large, diverse Site was segregated into the following five operable units (OUs):

- Process Ponds and Fluids (including the process ponds and process fluids circuits; all physically located within the smelter property; however, effects on ground water migrated, and continue to migrate, beyond the smelter property);
- Surface Soils and Surface Water (including residential and agricultural soils, vegetation and livestock, fish and wildlife, Prickly Pear Creek, and Wilson Ditch);
- Ground Water (beneath the smelter property as well as beyond);
- Slag Pile; and
- Ore Storage Areas.

EPA divided the Site into OUs to begin work on the Process Ponds while continuing to study other parts of the Site. A Record of Decision for the Process Ponds (OU 1) was issued by EPA in November 1989. The remedy for the process ponds was to contain the pond water in tanks or lined facilities, and treat the pond water and sediments. Between 1990 and 1998, Asarco conducted remedial actions at the Process Ponds and implemented associated stormwater controls under CERCLA. Ancillary to the CERCLA actions, Asarco obtained a storm water discharge permit through the Water Quality Bureau because the plant was still an operating facility at the time.

In 1998, another enforcement program under EPA's authority, the Resource Conservation and Recovery Act ("RCRA") Program, took responsibility for the process ponds in conjunction with a 1998 Consent Decree with a 1998 Consent Decree with Asarco, which settled allegations of violations of RCRA and the Clean Water Act ("1998 RCRA Decree"). Asarco currently has a stormwater discharge permit from MDEQ's Permitting and Compliance Division, Water Protection Bureau.

In addition to the process ponds, the groundwater, surface water (including Prickly Pear Creek), the slag pile and former ore storage areas (as well as the entire operations area) also are being addressed under the 1998 RCRA Decree. This partial transfer of authority was based upon a determination that the RCRA Corrective Action program is better suited than CERCLA for cleaning up a property that (at the time) was still operating. Groundwater beneath the former smelter, residential properties, and undeveloped lands are all being addressed under the 1998 RCRA Decree.

The Superfund Program retained responsibilities for cleaning up OU2, which includes non-smelter property surface soils in the residential areas, irrigation ditches, rural developments, and surrounding undeveloped land. In 2009, as a result of actions in Asarco's bankruptcy proceedings, RCRA assumed responsibility for some additional properties owned by Asarco. These properties are located in close proximity to, or are contiguous with, the Asarco smelter property, owned by Asarco, and, in the case of Prickly Pear Creek and riparian areas, are downstream of areas historically under the 1998 RCRA Decree. The Asarco-owned properties specified here are not subject to the final remedy selected by EPA in this ROD at this time. Final remedies for these properties will be selected by the Agency under the 1998 RCRA Decree. Thus, although they remain part of the Site, for administrative convenience, they are at this time not part of OU2.

The Asarco-owned properties that are not part of OU2 are described as follows (with property numbers shown on the Asarco Ownership Map in Appendix A corresponding to these areas):

- The East Fields west of State Highway 518 (Numbers 10, 11, and 17)
- Upper Lake and immediately surrounding environs, down to the smelter property boundary and bounded on the west by the railroad tracks (Numbers 12, 23, and portions of Number 15)
- The area immediately west of the smelter property extending to the railroad tracks and including the rodeo grounds (portions of Number 15)
- An area southwest of the Asarco smelter property and railroad tracks (Number 19)
- Portions of Prickly Pear Creek riparian corridor running through or immediately adjacent to property designated on the ownership map as Numbers 2 and 5.

It is noted that the Asarco smelter property and associated property to the east have been under the 1998 RCRA Decree since 1998 (Numbers 16 and 18). The areas under the 1998 RCRA Decree remain part of the Superfund Site. The inclusion of these Asarco-owned properties in the RCRA process does not preclude possible future action under CERCLA. Local government may administer institutional controls on these properties similar to properties under CERCLA authority.

This ROD describes the final remedy selected by EPA for OU2, which includes non-smelter property surface soils in the residential areas, irrigation ditches, rural developments, and surrounding undeveloped land, including Asarco-owned land not specifically described immediately above.

As discussed above in Section 2.3, the actions Asarco took to reduce air and fugitive emissions, in addition to closing the smelter in 2001, significantly reduced the release of lead particulates from the smelter property. A long-term monitoring program has been established to check for potential recontamination of previously remediated properties.

In addition, future surface water or sediment transport of lead at levels of concern to residential or undeveloped properties within OU2 is not anticipated because of surface water and runoff control actions conducted on the smelter property (see Section 2.3). Even so, EPA will assess whether unanticipated surface transport has actually occurred during mandatory Five Year Reviews, and at other appropriate times.

Therefore, cleanup actions taken on residential and other properties at OU2 do not depend on the nature or status of any pending or potential future cleanup actions on the smelter property or other Asarco-owned properties conducted pursuant to the 1998 RCRA Decree.

Based on the risk assessment, EPA determined that exposure to contaminated soils above the cleanup levels via ingestion pose a risk to human health and the environment under current and future residential, commercial, and visitation uses. The selected remedy is intended to mitigate or abate risks posed by ingestion of contaminated soil and sediments in ditches within OU2. This ROD describes in detail the final remedy EPA has selected for contaminated soil on residential, undeveloped, commercial, and public property in the community of East Helena and surrounding areas in OU2. The cleanup remedy selected by EPA and documented in this ROD is necessary to protect human health and the environment.

SECTION 5

SUMMARY OF SITE CHARACTERISTICS

This section includes a summary of information obtained by Site investigations and studies, a description of the Conceptual Site Model (CSM) on which the investigations, risk assessment, and response actions are based, and a description of the nature and extent of Site contamination. More detailed information is available in the Administrative Record for the Site.

5.1 CONCEPTUAL SITE MODEL

The CSM is depicted in Figure 5-1 and shows potential contaminant of concern (COC) sources and interconnecting relationships with pathways to receptors, i.e., this figure shows the sources of lead and how that lead may come into contact people and the environment. This figure provides the basic framework for assessing and finding risks from exposure to COCs. The CSM and exposure pathways are discussed in greater detail in Section 7 of this ROD as part of the Summary of Site Risks.

The CSM identifies the sources of contamination and pathways for transport historically associated with smelter facilities in general and specifically with this Site. The primary source materials associated with the smelter include ore storage, residue waste, tailings discharged from the mill, and stack emissions. Surrounding areas have been contaminated through deposition from wind and water erosion, and leaching. As a result, humans, animals and plants, have come in contact with hazardous substances in the air (wind), soil, surface water, sediments, and groundwater.

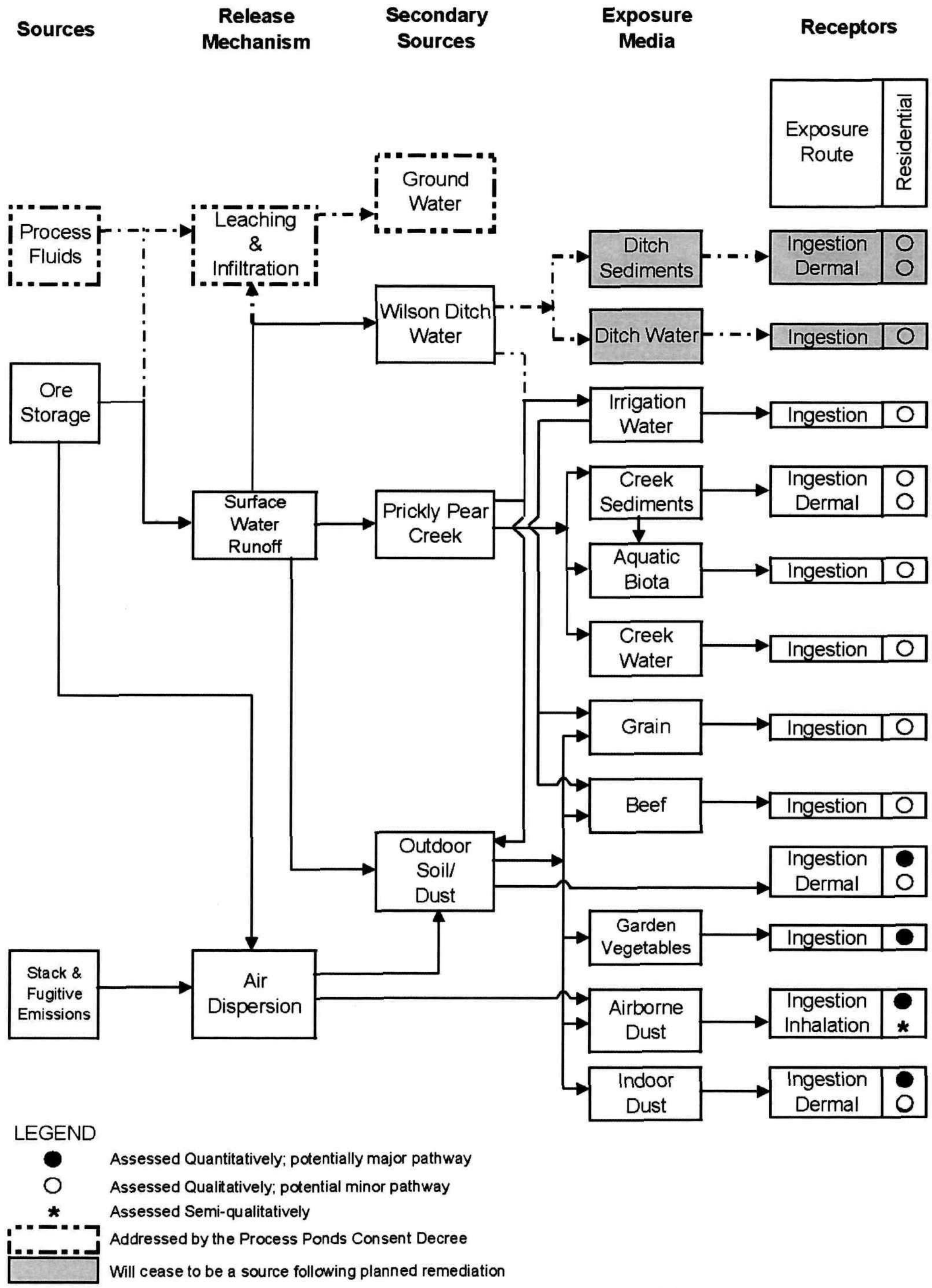
The two primary historical mechanisms for contaminating East Helena soils were aerial and surface water deposition of lead discharged from the smelter facility. The predominant wind directions in East Helena are towards the east, north, and northeast. However, when there was little or no wind, air movement and deposition followed the natural topography, which in this case is the Prickly Pear Creek watershed. These air patterns resulted in the highest concentrations of metals deposition in residential portions of East Helena and the East Fields area. All areas surrounding the smelter, however, were contaminated to a measurable extent. Periodic flooding and overflow of Prickly Pear Creek also caused contaminants in sediments to be carried away from the smelter site, and deposited in areas within East Helena and downstream to the north.

5.2 PHYSICAL CHARACTERISTICS OF THE SITE

5.2.1 Climate and Meteorology

The climate of the Helena Valley, including the Site, may be described as modified continental. A continental climate is a climate that is characterized by winter temperatures cold enough to support a fixed period of snow cover each year, and relatively moderate precipitation occurring mostly in summer. Modifying characteristics include 1) invasion by Pacific Ocean air masses, 2) drainage of cool air into the valley from surrounding mountains, and 3) protection by mountains in all directions.

Figure 5-1. Conceptual Site Model



From the Human Health Risk Assessment for Residual Soil, East Helena Plant, East Helena, Montana. Kleinfelder, July 1995.

CONCEPTUAL SITE MODEL
EAST HELENA
SUPERFUND SITE
FIGURE 5-1

Seasons typically consist of cold winters, wet springs, and warm summers with moderate thunderstorm activity. Much of the moisture in the area comes from late spring and early summer rain and runoff from significant winter snow accumulations at higher elevations. The mean monthly temperatures in the Helena Valley range from 18 degrees Fahrenheit (°F) to 68 °F annually.

Total precipitation amounts vary widely throughout the Helena Valley, from a semi-arid total of less than 10 inches in the northern and eastern portions of the valley, to a sub-humid 30 inches or more along the Continental Divide to the west. Precipitation occurs primarily as snow from November through March, and as rain during the remainder of the year. The greatest amount of precipitation normally occurs in May and June, with precipitation fairly evenly distributed throughout the remainder of the year.

Mean annual evaporation for shallow lakes and reservoirs, estimated by the U.S. Soil Conservation Service for the Helena Valley, is approximately 36 to 38 inches. The greatest evaporation occurs in July and August with monthly totals from 7 to 11 inches.

In the East Helena area, wind direction is primarily from the south. Westerly winds are the next most common. Highest wind speeds also come from the west.

5.2.2 Geology and Soils

The Site is located on unconsolidated Quaternary alluvium from the Prickly Pear Creek drainage, which is underlain by fine-grained Tertiary deposits. These Tertiary deposits consist mainly of yellow-white to light-gray, compact, siliceous, volcanic ash.

The Tertiary deposits are older stream and lake deposits consisting of gray and tan clays and silts with occasional sand and gravel layers and may be more than 1,600 feet thick in the central Helena Valley. These deposits commonly are overlain by up to 200 feet of unconsolidated, stream-deposited Quaternary alluvium consisting of layers and mixtures of silt, sand, and gravel from tributary drainages including Ten Mile Creek, Last Chance Gulch, and Prickly Pear Creek. The Helena Valley is bounded by Precambrian metasedimentary rocks, Paleozoic and Mesozoic age sedimentary rocks, and igneous rocks of Tertiary age.

Soils in the Helena Valley developed on valley fill derived from surrounding mountain ranges, and on lake sediments of Tertiary age. The silt and clay soils are moderately calcareous and have little organic matter. Soil profiles are only poorly to moderately developed. Soils in the Canyon Ferry Lake area, to the east of Helena, are rich in tuffaceous materials of volcanic origin.

5.2.3 Hydrogeology

The Site is located on the southern edge of the Helena Valley, a 100-square mile intermontane basin. Valley-margin deposits are comprised of sand and gravel with varying amounts of silt and clay, while the deposits toward the center of the valley are predominantly silt and clay with sand interbeds. Smaller stream channel and colluvial deposits locally interfinger with the alluvial and lacustrine deposits. Stream channel deposits are typically well sorted and very permeable, whereas the colluvial deposits are poorly sorted and have low permeability. Layers and mixtures of Quaternary silt, sand, and gravel in the Helena Valley form a complex, but generally hydraulically interconnected, system of unconfined and semi-confined aquifers. Shallow clay layers may restrict vertical movement of groundwater from shallow to deeper zones. Generally, the underlying Tertiary-age deposits are less permeable than the overlying Quaternary sands and gravels and usually contain groundwater under confined or semi-confined conditions.

Groundwater in the Helena Valley generally moves north and east toward Lake Helena, which is a discharge point for the valley groundwater system. Groundwater recharge in the Helena Valley comes from precipitation in the valley and surrounding mountains, and from streams and irrigation canals that cross the valley floor. In the vicinity of the Site, groundwater in the unconsolidated Quaternary deposits generally flows to the north and receives recharge from Prickly Pear Creek as the stream enters the valley near East Helena. Depth to groundwater in the Helena Valley varies seasonally and usually ranges from about 10 to 50 feet bgs. The regional shallow groundwater hydraulic gradient in the East Helena area averages about 0.0162 feet per foot.

5.2.4 Hydrology

The Helena Valley is part of the Missouri River basin. Several major reservoirs, including Canyon Ferry Lake, Hauser Lake, Holter Lake, and Lake Helena are located near the northern extent of the Helena Valley. Major streams that enter the Helena Valley, including Prickly Pear Creek, drain into Lake Helena.

Surface water in the area of the Site includes Prickly Pear Creek and several small ponds and lakes. Prickly Pear Creek has its headwaters in the Elkhorn and Boulder Mountains about 30 miles south and west of the Site. Prickly Pear Creek flows along the east and north boundaries of the East Helena Plant and drains into Lake Helena approximately seven miles north of the Site.

Other surface water features at the Site include Upper Lake, Lower Lake, and Wilson Ditch (see Figure 2-1). Lower Lake was used for collection and storage of smelter process waters. Upper Lake receives flow from a diversion on Prickly Pear Creek about one-half mile south of the smelter. Upper Lake provided smelter make-up water and historically supplied irrigation water to Wilson Ditch. Flow into Wilson Ditch was historically controlled with a headgate at Upper Lake where water entered an underground pipeline beneath the smelter and surfaced in an open ditch at the western property boundary.

Historically, stormwater runoff from the smelter plant flowed into Prickly Pear Creek and Wilson Ditch. In addition, Wilson Ditch historically transported irrigation water from Upper Lake to fields northwest of the smelter area. Wilson Ditch flowed only during the irrigation season. Wilson Ditch from the smelter to Highway 12 was remediated in 1993 and 1994 and currently only exists north of Highway 12.

5.3 SITE CHARACTERIZATION

This section summarizes information on the nature and extent of contamination at the Site. EPA previously identified five potential sources of contamination: smelter air and particulate emissions (both primary and fugitive), the slag pile, ore storage areas, process ponds, and process fluids. These sources produced the contaminants of primary concern, identified as lead and arsenic (though selenium recently was identified as a contaminant of primary concern for groundwater under the 1998 RCRA Decree). Elevated levels of lead and arsenic had been found in the air, surface soils, groundwater, and surface water. EPA determined that contamination from these media had affected humans, livestock, vegetation, and fish.

The major facility operations that contributed to contamination were lead smelting and zinc fuming conducted by Asarco. The two primary modes of contaminant deposition in the East Helena soils are aerial and surface water deposition. The predominant wind directions in East Helena are towards the north, east, and northeast and caused the highest concentration of airborne metals to be deposited in the East Fields and the eastern portions of East Helena. Other areas surrounding the smelter are also contaminated with metals from airborne particulates, albeit at lesser concentrations. In addition, storm water runoff through Wilson Ditch (a major irrigation ditch) and Prickly Pear Creek transported fine-grained concentrates and other contamination from the smelter to residential and undeveloped areas along the creek and lands that are served by Wilson Ditch (see Figure 2-1).

Investigations that began in the mid-1980s and which continue today reveal substantially elevated levels of some 18 to 20 elements in Site soils. All of these elements are found naturally in the Earth's crust, but generally at much lower concentrations. However, at the Site many of these elements are found at elevated concentrations several miles downwind or downstream of the smelter facility. Lead and arsenic are the elements of concern under CERCLA.

5.3.1 Soil, Dust, and Sediment

5.3.1.1 CDC/MDHES East Helena Child Lead Study Report

In 1983, MDEQ (formerly MDHES), in cooperation with the Center for Disease Control (CDC), conducted a comprehensive epidemiologic study in the Helena Valley to assess children's blood-lead levels and the relationship of these levels to different environmental media, including soil. (CDC, 1986) The CDC study involved the collection of 674 soil samples from the 0- to 1-inch depth in yards at 296 residences in and around the City of East Helena. An intentionally biased sampling scheme was followed, focusing on households with children between the ages of 1 and 5 who had lived in the study area for 3 months or more. Soil samples were collected and analyzed by x-ray fluorescence for total silver, arsenic, cadmium, chromium, copper, mercury, manganese, lead, antimony, selenium, and zinc.

The 1983 CDC/MDHES Soil Lead Investigation found that lead concentrations ranged from 3.1 to 7,965.0 mg/kg in the 674 surface soils samples collected from the yards of homes within a 2.25-mile radius of the plant site. A statistical comparison of the geometric mean lead levels from four zones (0 to 0.5 mile, 0.5 to 0.75 mile, 0.75 to 1.0 mile, and 1.0 to 2.25 miles from the smelter) indicated that soil lead levels decreased significantly with each increasing distance zone away the smelter property. A geometric mean surface soil lead concentration of 1,213 mg/kg was found within concentric zone extending 0.5 mile from the center of the smelter. The highest soil lead concentrations by city block were found in the first two streets north of the plant where there were geometric mean concentrations of 1,807 and 1,870 mg/kg, respectively. Mean arsenic concentrations ranged from 126 (three-inch core) to 155 mg/kg (one-inch core).

Lead levels in grab samples of household dust collected from vacuum cleaner bags ranged from 80 to 18,361 mg/kg and were highest in areas closest to the smelter. Floor wipe samples showed low levels of lead with the highest concentration reported at 2.35 mg/kg. Lead levels found in household dust samples collected from one square meter of carpet ranged only as high as 6.7 mg/kg. The concentration of arsenic in floor wipe samples was not reported.

5.3.1.2 EPA Phase I Remedial Investigation

In 1984, EPA collected a total of 157 soil samples throughout the 100-square-mile Helena Valley using a geometric grid sampling plan. In addition, three "background" surface soil samples were collected from an area approximately 27 miles southeast of the Site. All samples were collected from the 0-to 4-inch zone and 47 sites were sampled to a 30-inch depth (samples collected from 4-8, 8-15, 15-30 inch depths). Metal analyses were conducted for total silver, arsenic, cadmium, chromium, copper, mercury, manganese, lead, selenium, and zinc, as well as aluminum, barium, beryllium, cobalt, iron, nickel, tin, thallium, and vanadium. These data were used to calculate metal concentrations in the East Helena area relative to background samples, and to generate spatial distribution maps using geostatistical techniques (EPA, 1987b). Of the 157 sample sites, five were within the city limits of East Helena; however, an additional 13 sites lie sufficiently in and around the greater East Helena area to be used for residential soil characterization (i.e., 18 samples total). As described subsequently, extensive sampling has been conducted within East Helena itself.

The Phase I RI found that silver, arsenic, cadmium, copper, mercury, manganese, lead, selenium, tin, thallium and zinc concentrations on the average were 1.3 to 27.3 times higher than background. Cadmium and lead had the highest factors of 27.3 and 17, respectively. In general, the maximum concentrations of metals in soils were located immediately east of the smelter and decreased in all directions toward the valley perimeter. Soil contamination tended to be skewed to the east in the prevailing wind direction. The maximum concentrations of lead, arsenic, and cadmium detected in soil were 8,300 mg/kg, 570 mg/kg, and 104 mg/kg, respectively. The lowest soil pH values (4.7 – 5.3) were located immediately east of the smelter.

Metal contamination was also present to a depth of 30 inches at the Site. Eight elements were found in higher concentrations than background in project area soils at the 4 to 8 inch depth. They were arsenic, cadmium, copper, lead, mercury, selenium, thallium, and zinc. Most soils also had concentrations of arsenic, cadmium, copper, lead, and zinc above background in the 8 to 15 inch horizon. Most soils demonstrated levels near background concentrations for the 15 to 30 inch depth. Overall these data suggest that metals migrated from the surface down to the 15 to 30 inch depth horizon. EPA found that metals had leached deeper into soils near the smelter, primarily due to the higher concentration of metals in the surface soil, rather than to pH or other factors.

Sample results from plowed and unplowed land in undeveloped areas showed little difference in concentrations of arsenic, cadmium, lead, and zinc.

The Phase I results indicated that a Phase II investigation was warranted.

5.3.1.3 Asarco Comprehensive Phase II RI

In 1987, Asarco collected 24 soil samples from within the city limits of East Helena. Of these samples, 20 were collected from the same locations sampled by the CDC/MDHES in 1983 in order to assess the quality of the larger CDC/MDHES database. The other four 1987 samples were collected from two public schools and two parks that had not been previously sampled. Composite samples were collected within a 0.7 meter square area from 0 to 2 inches from the front, back, and side yards. In addition, the front and back yard composite samples were combined into one sample. All 24 samples were analyzed for silver, arsenic, cadmium, chromium, copper, mercury, manganese, lead, antimony, selenium, thallium, and zinc.

Based on the similarity of the 1983 data to the 1987 data that were collected from the same locations, the lead data from the 1983 CDC/MDHES soil investigation were determined to be suitable to include in the data set of the Phase II RI.

A summary of the Site soil characteristics based on the combined 1984 and 1987 data showed:

- For 42 surface soil samples collected within East Helena during 1984 and 1987, total concentrations of cadmium ranged from 4.2 to 112.0 mg/kg, lead ranged from 126.0 to 7,225.0 mg/kg, and arsenic ranged from 8.8 to 218.0 mg/kg.
- Of the 42 surface sampled sites distributed across the East Helena residential area, 90 to 100 percent had silver, cadmium, copper, mercury, manganese, lead, and zinc concentrations above background. Seventeen to 88 percent of these sites were above background for arsenic, chromium, antimony, selenium, and thallium.
- Total concentrations of each element, except for chromium and manganese, appear to be elevated in the two public parks. Concentrations of lead in both parks exceeded 1,000 mg/kg. The highest arsenic concentration was 140 mg/kg, and the highest cadmium concentration was 50 mg/kg.
- Concentrations of lead in surface soils (0 to 1 inch) at East Gate School were 152 mg/kg, and at Radley School they were 1,160 mg/kg. Concentrations of arsenic were 23 mg/kg and 75 mg/kg, and concentrations of cadmium were 4.2 mg/kg and 20 mg/kg, respectively.
- Lead levels were highest nearest the smelter facility in the 0-to 0.5-mile zone and decreased significantly as distance from the facility increased with each 0.25-mile increment.

5.3.1.4 Removal Action Characterization

Additional characterization of soil lead concentrations has been conducted as part of the residential soils removals beginning in 1991. The following protocol, developed by EPA, MDEQ, and LCC, was used to collect and analyze soil samples from residential yards, business property, playgrounds, parks, and along streets and alleys in the East Helena project area during the soil Removal Action.

Initially, samples were collected from 50 to 60 locations to help calibrate XRF sampling equipment and to determine the optimum depth for soil removal. After this initial sampling was completed, samples were collected from yards within the "yellow zone," (Figure 2-1) to determine if remediation was necessary. The yellow zone is comprised of approximately 30 city blocks located directly across the railroad tracks and highway from the smelter, where historic soil contamination of soils was more severe than elsewhere. Each average-sized yard was divided into 4 to 6 sampling units, or sections, from which 20 to 40 total samples were collected. Samples from each section were composited. The composite samples were analyzed for lead by XRF. The "exposure unit" was defined as the entire yard or lot, not the individual sampling section.

At properties inside the yellow zone, all yards, parks, streets and alleys automatically qualified for cleanup. Not all of the yards in the yellow zone were sampled prior to removal, because RI and removal action sampling indicated that concentrations of lead in the yellow zone were 6,000 to 10,000 mg/kg, and it was highly unlikely that any yard would be below the 1,000 ppm. This approach was applied only in the "yellow zone," because of the high frequency and level of lead concentrations detected in this area, which is closest to the smelter.

Sampling of lots in residential areas outside the yellow zone consisted of collecting no fewer than 20 samples per lot. Often 32 to 40 samples were collected. Once again the entire lot was considered the exposure unit. The cleanup level for lots outside the yellow zone was a soil lead concentration of 1,000/500 ppm or less. In other words, if any one section of the lot exceeded 1,000 ppm, all sections of the lot greater than 500 ppm were cleaned down to 500 ppm or less.

The initial depth of soil removal was determined by prior sampling. After removal activities were completed at a property and prior to backfilling with clean soil, the yard was sampled again and analyzed for lead, arsenic, cadmium, copper, and zinc using XRF. If lead concentrations were below 500 ppm, the yard was then backfilled with clean topsoil. If not, additional contaminated soil was removed from the excavation and the soil was resampled.

The sampling approach for public areas differed slightly from that for residential lots. Again, biased sampling was conducted, in which areas where water tended to accumulate, causing lead to potentially accumulate there as well. The approach for public areas such as playgrounds, school yards, parks, alleys, areas between roads and private property, and land associated with municipal buildings, was as follows:

- For playgrounds and parks, the area was divided into units of approximately 60 feet by 60 feet, or an equivalent area, and soil from three sampling points was composited for analysis by XRF.
- Unpaved road apron areas were divided into sampling units 150 feet long. The width of each unit was the distance between the paved area and the private property. Soil from three sampling points was composited for analysis by XRF.
- Unpaved alleys were divided into sampling units 150 feet long where the width was determined by the private property boundaries. Within each unit, soil from three sampling points was composited for analysis by XRF.

The same cleanup level for residential yards was applied to public use areas to determine whether cleanup was required. If so, after contaminated soil was removed from each public area, the property was resampled and analyzed with XRF for lead, arsenic, cadmium, copper, and zinc. The area was then backfilled with topsoil obtained from uncontaminated agricultural lands.

In 1994, EPA modified its sampling and analysis methods to incorporate biased sampling and the use of the 95th percentile upper confidence limit (UCL) to obtain more conservative sampling results than outlined in EPA's national guidance. In order to "bias" sampling results, samples were taken from areas in yards most likely to have the highest lead concentrations, including depressions and drip lines that collect runoff; play areas without a protective grass barrier; undisturbed areas around the property's edges; worn paths from shops or garages; parking areas for trucks and equipment; areas showing signs of fallen chipped paint; junk storage areas (batteries, oil, etc.); and kennels and pet runways. Over 180 yards, not previously requiring remediation, were resampled and reevaluated using this approach, and new lots not previously sampled also used this sampling and evaluation method. As a result of this modification, approximately 60% of the resampled yards were found to qualify for cleanup that had not, or would not have, qualified otherwise. The result is that sampling protocols have been continually updated and consistently applied at East Helena.

In addition, the Agency for Toxic Substances and Disease Registry's (ATSDR) Health Consultation for the East Helena Superfund Site noted that historical protocols at East Helena have concentrated sampling efforts in the top few inches of soil, which is where individuals are generally exposed. ATSDR found that the sampling protocols support the identification of residential yards that may require cleanup actions due to elevated lead levels.

Sample Results

All sampling results were evaluated in an effort to delineate the areal extent and degree of lead concentrations in the soils in and around the smelter property, and to identify the outer sampling boundary for all residential areas around the smelter and East Helena. The East Helena area was divided into eight sectors, extending radially away from the smelter to the west, east, and north. (Figure 5-2) Analytical results from soil samples collected from 1991 through 1996 were plotted annually to determine which residential yards were candidates for remediation. Yards for those residents who said they were "not interested" were not sampled. In addition, soil samples collected from the Prickly Pear Creek flood plain and drainage ditches running through properties in the northern outlying areas were not included because they were assumed to already have been contaminated by metal deposition associated with drainage areas that were outside the scope of the report. By 1996, more than 1,400 residential samples were collected and analyzed. No samples from undeveloped areas were included.

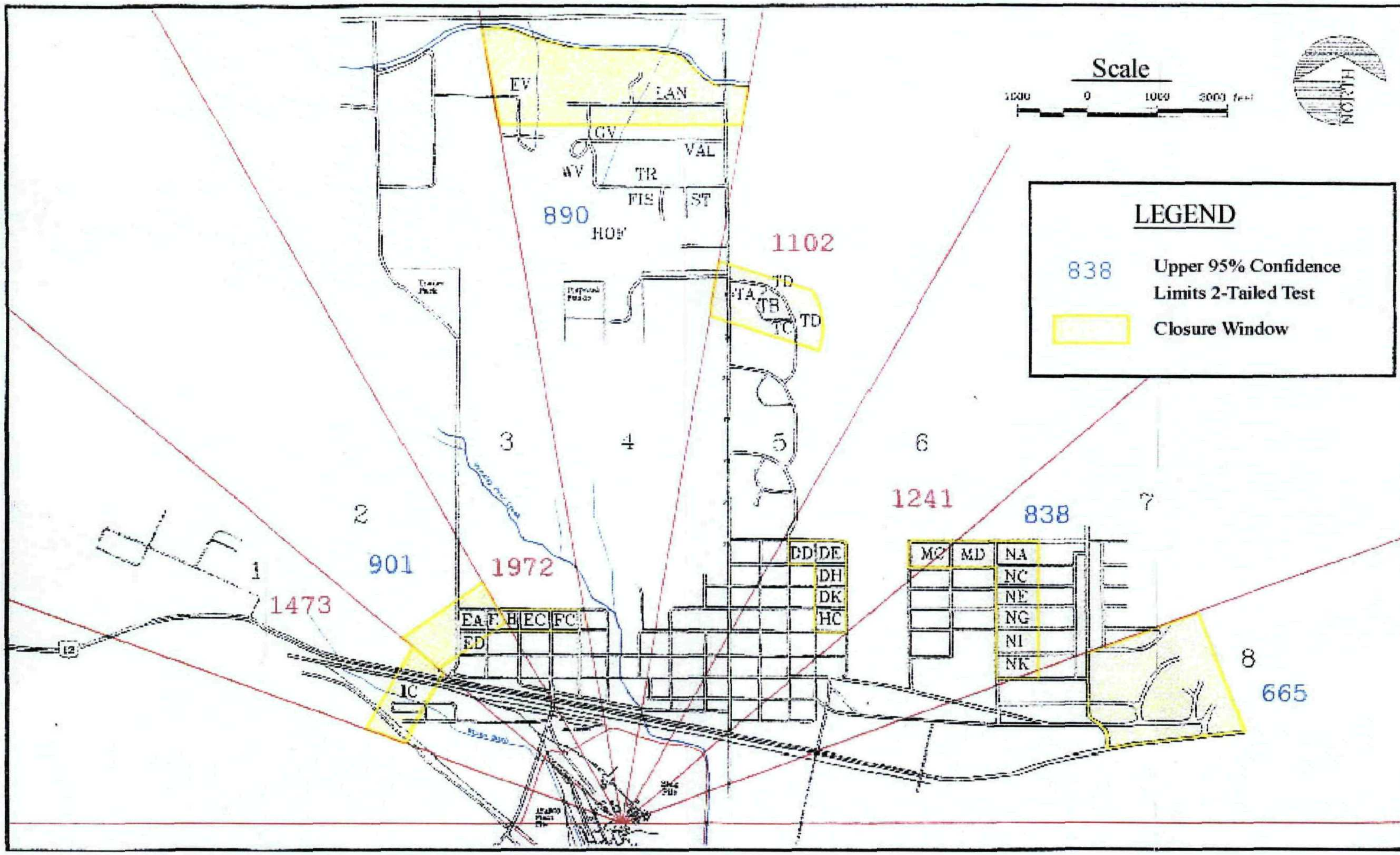
Within each of the eight sectors, soil sample results were analyzed and a "closure window" was statistically calculated. A closure window is defined as an area in the identified sector beyond which no further sampling is required to identify additional lots where there may be elevated lead levels in residential soils. The criteria for closure of a sector window were either a data set having an upper 95 percent confidence limit that there would be less than 1,000 mg/kg lead (based on a 2-tailed test), or the outer limits of a residential area, whichever came first. Sectors

2, 4, 7 and 8 met this criterion using a 2-tailed test for calculating the upper confidence limits. Sector windows 1, 3, 5, and 6 met the criterion on the basis of sampling conducted at the outer physical limits of the residential areas. The boundaries of each closure window are identified in Figure 5-2.

EPA has required residential soil sampling since 1996 because development has occurred beyond some sector closure windows; however, few of the properties sampled had soils with lead concentrations high enough to require a removal action. Figure 5-3 presents the extent of soils in the East Helena area with lead concentrations likely to be greater than 1,000 mg/kg, based upon removal action sampling results. Properties outside of this boundary may have lead concentrations in soil greater than 1,000 ppm, however, it is expected that these will be relatively few in number.

Figure 5-4 presents the general extent of arsenic contamination; however, a limited number of residential areas outside of the contours shown on Figure 5-4 have had arsenic concentrations above 176 mg/kg and 100 mg/kg, respectively. Sampling to date has shown that only approximately five properties have yard-wide average arsenic concentrations greater than 100 ppm arsenic in association with lead concentrations less than 1,000 ppm. These properties are located north of East Helena's city limits where historical ditches and channels are present. Historical runoff from the smelter property that flowed through these channels and ditches contributed to the arsenic contamination on these properties, and results from sampling of these ditches as part of the residential sampling likely caused the property to exceed a concentration of 100 ppm. It is also noted that these five properties have average lead concentrations less than 700 ppm, and most have lead concentrations less than 500 ppm.

The median concentration of arsenic across the Site is approximately 50 ppm and the maximum arsenic concentration is 230 ppm for those properties that have lead concentrations in soil less than 1,000 ppm.



Adapted from Hydrometrics, Inc. from 12/30/96

Figure 5-2
Sector Closure Windows

East Helena Residential Soils
1996 Sector Sampling Summary

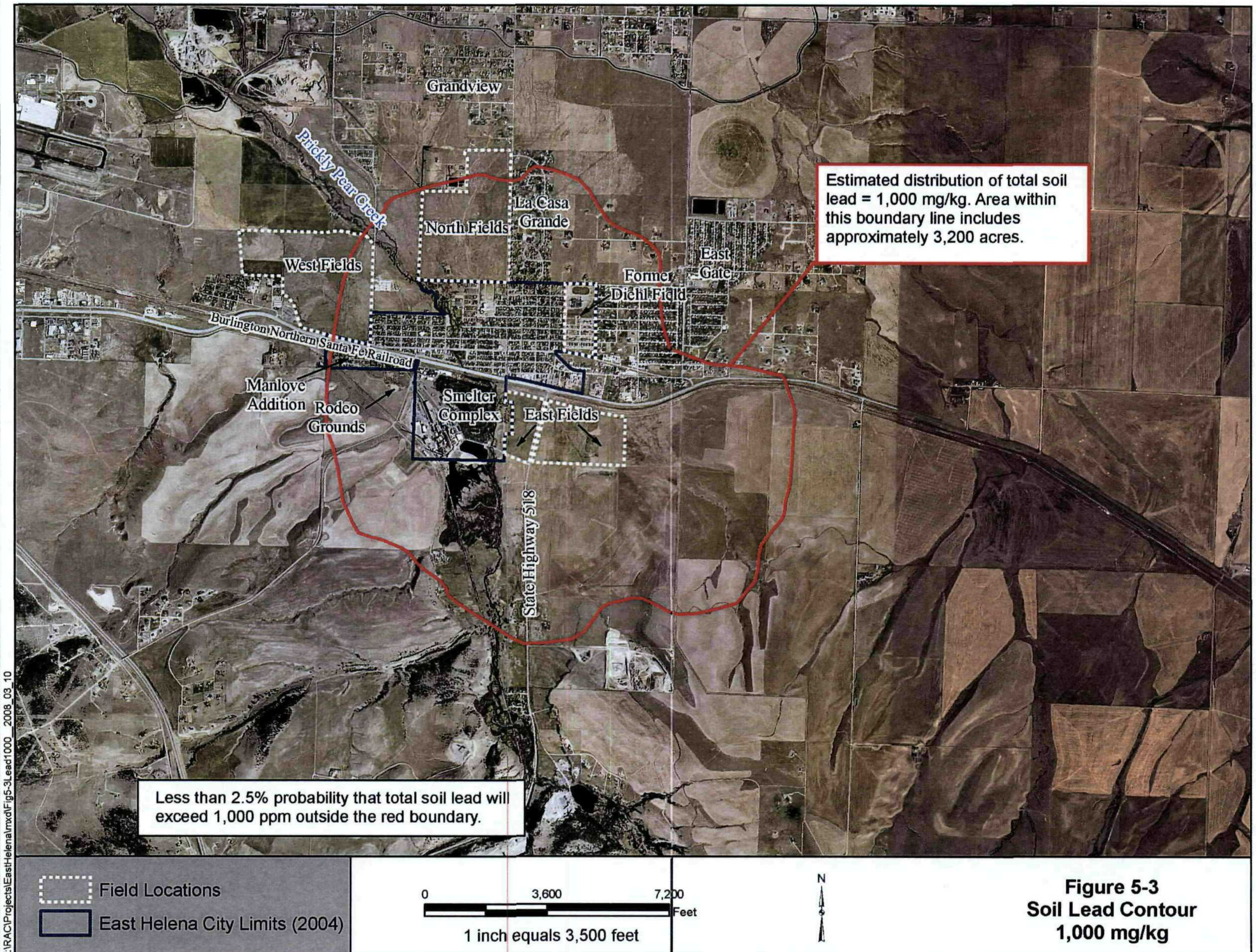


Figure 5-3
Soil Lead Contour
1,000 mg/kg

Field Locations

East Helena City Limits (2004)

0 2,000 4,000 Feet

1 inch equals 2,000 feet

N

Figure 5-4
Soil Arsenic Contours
0-4 Inch

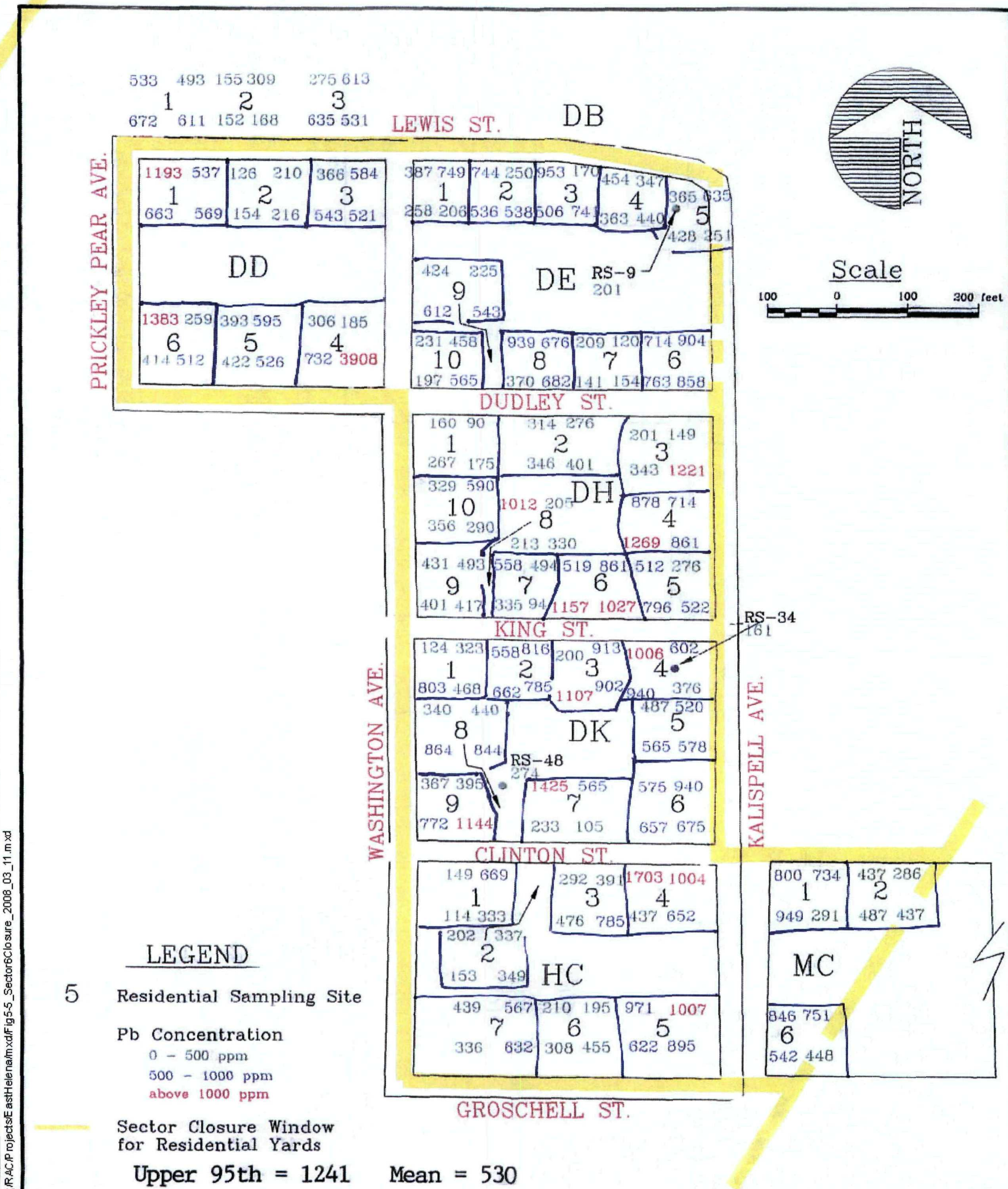
Soil lead concentrations of soils at residential properties in East Helena exhibit an extraordinarily high degree of variability (also termed heterogeneity). This high degree of variability became apparent in the late 1980s. Lead concentrations within a single yard commonly range from lows of 150 to 300 ppm to a maximum value of 1,500 to 2,000 ppm or higher. Concentrations from one yard to the next also are unpredictable. This phenomenon is not surprising, given the disturbances that have occurred during normal excavation, construction, laying out of streets, alleys, sidewalks and driveways, and yard development.

Because of high variability in lead concentrations, EPA chose a soil sampling protocol for existing residential areas that requires a minimum of 20 samples per yard. In medium- to large-sized yards 32 to 40 or more samples are taken per yard in order to ensure that each yard is adequately characterized.

The extraordinary degree of variability present in residential settings is illustrated by Figure 5-5. This figure shows actual soil lead concentrations in 48 individual yards in a neighborhood near the East Valley Middle School. For example, Yard No. 3 of Block DH has a high lead value of 1221 ppm, a low lead value of 149 ppm, and a yard mean of 478 ppm. This yard qualifies for cleanup by virtue of a single high value exceeding 1,000 ppm, as does Yard No. 4 "next door," with a lead level of 1269 ppm. These examples are typical of properties throughout all the peripheral neighborhoods of East Helena. While the central neighborhoods of East Helena, including the "Yellow Zone," have already been cleaned up, these outer neighborhoods remain to be evaluated.

Figure 5-5 also shows that several yards with a single value of greater than 1,000 ppm lead would not qualify for a cleanup under an approach for which the yard average would have to exceed either 500 ppm or 600 ppm lead. Using the example from Yard No. 3, the yard average lead is less than 500 ppm.

The two-part residential removal action level adopted for East Helena (1,000/500 ppm lead) is uniquely suited to the variability of lead concentrations in residential soils, and provides a protective, yet cost-effective remedy. This approach overcomes the inherent variability and ensures that this response action will result in no soils remaining with lead concentrations above 1,000 ppm. The two-part cleanup action level is expected to achieve a community-wide post-cleanup level for lead substantially less than 500 ppm. The result will be protective of human health.



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Adapted from Hydrometrics, Inc. from 12/30/96

Figure 5-5
Sector 6 Closure Window

East Helena Residential Soils
1996 Sector Sampling Summary

5.3.1.5 Agricultural/Undeveloped Lands

Since 1987 soil sampling of agricultural/undeveloped lands for arsenic and lead has been focused primarily on the fields east of the smelter in order to conduct experimental studies and to identify areas for disposal of the excavated residential soils.. Based on this sampling and RI data, EPA believes that soils as far as 2 to 3 miles from the smelter may contain lead concentrations ranging from 500 to 1,000 mg/kg (Figure 5-6). Figure 5-4 presents the extent of arsenic contamination in soil in the East Helena area. Concentrations of lead or arsenic may exceed the values shown on the contours in areas beyond the contours; however, as undeveloped lands within a several mile area of East Helena are developed, sampling and additional characterization for arsenic and lead will be conducted.

Figure 5-6 also shows the rodeo grounds immediately west of the smelter. This property is owned by Asarco and includes the rodeo arena and approximately 20 acres of surrounding, undisturbed land that is used primarily for parking. Lead levels in these soils range from 1,144 ppm to 5,304 ppm. The rodeo grounds are used occasionally in the summer, typically less than 10 days per year.

Soil sampling conducted on several hundreds of acres of agricultural land and other undeveloped lands around East Helena reveals fairly uniform and predictable lead concentrations. For example, the concentrations of lead in soil in the West Fields exhibit relatively little variability when compared to residential areas as shown on Figure 5-7. Uniformity in lead concentrations in the soils of undeveloped lands is expected because they have not yet been subjected to development activities that disturb soils during excavation, construction, laying out of streets, alleys, sidewalks and driveways, and yard development.

Recognizing the difference in variability of lead concentrations between residential properties and undeveloped properties early in the Removal Action drove EPA, MDEQ, and LCCHD to adopt a less intense sampling strategy for undeveloped lands. The high variability of concentrations in residential soils necessitated intensive soil sampling to adequately characterize properties, whereas less intensive soil sampling was needed to adequately characterize lead concentrations in the more consistent undeveloped property soils. As previously mentioned, sampling in residential areas requires a minimum of 20 samples per yard, but medium- to large-sized yards require as many as 32 to 40 or more samples to ensure that each yard is adequately characterized. For residential yards, sampling costs can range as high as $2,000 to $3,500 per one-quarter to one-half acre lot.

In contrast, experience showed that soil sampling of undeveloped lands typically requires 16 samples per acre to adequately characterize the nature and extent of contamination where the lead concentrations are less variable than in residential areas. Remediation of open undeveloped lands was readily achieved by methods that are not possible to implement in residential confined spaces at significantly lower costs than residential methods. In addition, costs for remediation of undeveloped land were less than the cost of sampling these areas at the same intensity as residential areas. Thus, the lower intensity sampling was also found to allow undeveloped lands to be remediated at a lower cost than the cost of sampling at a residential intensity.

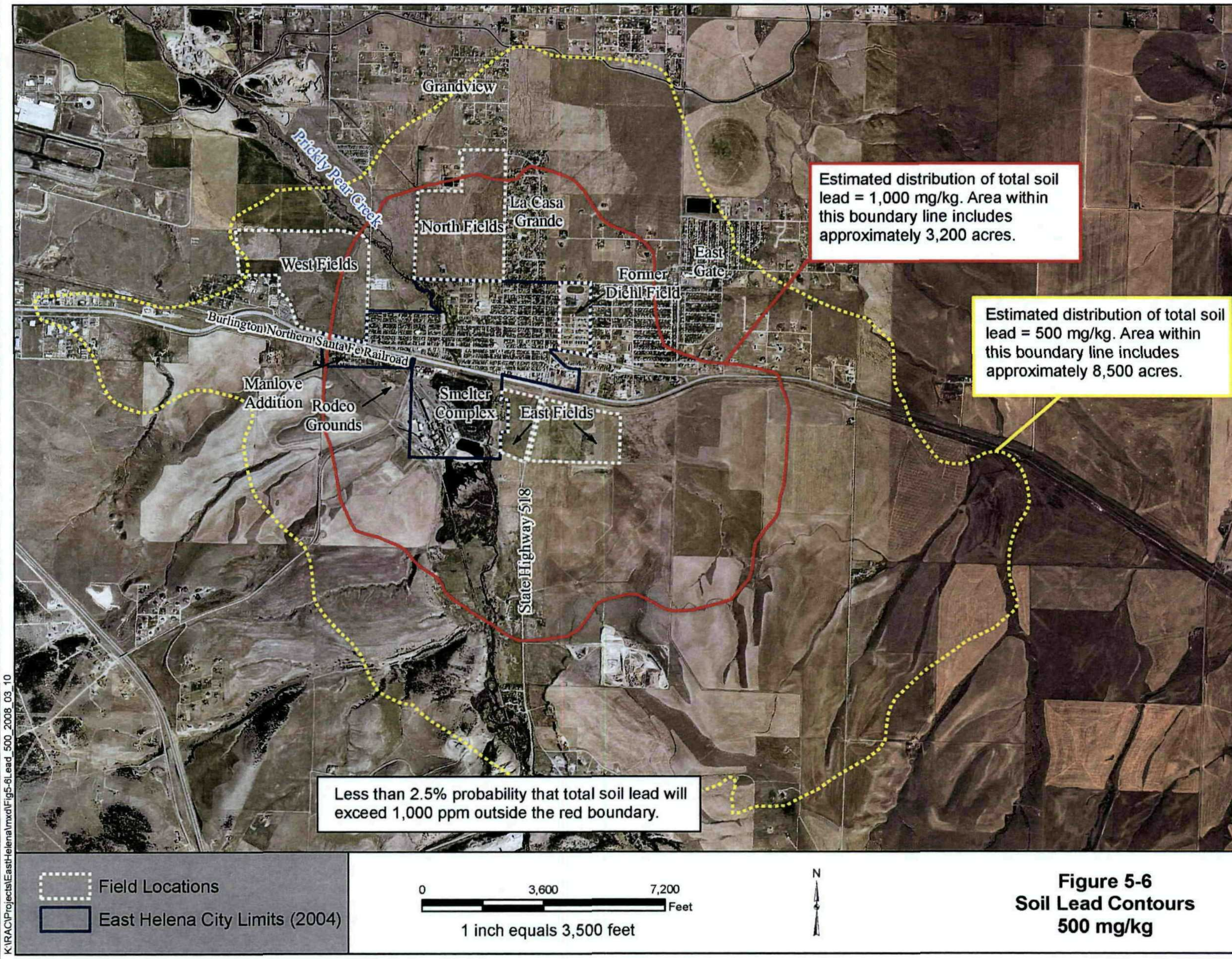


Figure 5-6
Soil Lead Contours
500 mg/kg

992	740	653	707	601	675	576	611	831	772	771	830
583	802	881	682	575	682	559	499	506	534	857	690
716	674	772	896	524	571	544	625	688	590	899	636
788	646	584	719	625	623	788	594	679	763	791	645
660	554	385	397	580	588	629	705	784	696	835	654
734	644	447	503	460	652	1100	664	690	371	806	802
682	715	688	484	631	652	922	954	533	468	649	867
638	948	919	436	530	662	399	597	467	580	807	821
514	768	622	440	481	496	311	570	459	770	980	667
1709	510	662	366	350	454	377	370	407	1112	1372	1221
	1517	528	398	407	551	481	392	587	1391	1422	2174
	1120	1029	366	516	468	538	463	616	1174	2077	1504
		1242	638	465	550	383	842	782	1315	1991	1908
		1015	648	482	484	529	572	862	1788	2689	2148
						746	800	1366	2545	3558	4042
										3627	

Adapted from Hydrometrics, Inc.
Samples November 2001

715 Lead 95% UCL (mg/kg)

Figure 5-7
Example of Soil Lead Concentrations In Undeveloped Lands (ASARCO Lamping Property)

Both of these sampling protocols are consistent with *Guidance for Data Usability in Risk Assessment* (EPA 1999). This guidance states that soil samples should be collected in a manner which is spatially representative of how a receptor contacts the area, and enough samples should be collected in order to have statistical confidence that the range of contaminant variability is captured at the site. In other words, the more heterogeneous the contamination, the more samples are needed to achieve that confidence.

5.3.1.6 Sediment and Surface Water

Sediments originate as surface soils that have eroded into finer particulates, which then become suspended in stream flows and deposited elsewhere. Sediments can become contaminated by COCs before they are taken up by water flow or after they are deposited by a stream. Historically, stormwater runoff from the smelter property flowed into Prickly Pear Creek and Wilson Ditch; however remedial action for the Process Ponds (OU1) conducted under CERCLA and ancillary runoff control actions have controlled this runoff. Stormwater runoff is now collected in tanks and managed under the Montana Stormwater Discharge Permit Program. Asarco currently has a stormwater discharge permit from MDEQ's Permitting and Compliance Division, Water Protection Bureau. Asarco's stormwater controls are based on a 100-year storm event.

In November of 1984 and June of 1985, during the Phase I RI, bottom sediment samples were collected from Prickly Pear Creek and Wilson Ditch adjacent to the smelter property; and from Upper Lake. Additional sediment samples from Wilson Ditch were collected and analyzed in December 1987. The results are discussed below and the evaluation of risk posed by creek and ditch water and sediments is discussed in Section 7.

<u>Prickly Pear Creek</u>

Prickly Pear Creek sediment quality is the product of two basic factors: 1) upstream physical and chemical conditions, and 2) sediment that has been transported by runoff and process waters from the smelter and deposited downstream. Prickly Pear Creek sediment quality upstream of the smelter probably reflects conditions resulting from historical mining, milling, and other disturbances. During storm events, the high concentrations of suspended sediment come mostly from bank erosion along the main stem and tributaries of the creek. Abandoned mine dumps, eroding channel banks, breached settling ponds and periodic flushing of sediment from behind the Asarco dam in East Helena contribute to the high concentrations of suspended sediment. Sediment at locations downstream of the smelter property are noticeably higher in arsenic and metals.

The results of the Phase I RI conducted in the 1980s did not show contamination in Prickly Pear Creek at levels of concern other than slight arsenic loading from the Process Ponds. Concentrations of arsenic in creek water ranged from 6 to 89 micrograms per liter (ug/l or ppb; total) and from less than 4 to 79 ug/l (dissolved). Mean concentrations of arsenic were 21 ug/l total and 16 ug/l dissolved. Concentrations of metals in sediments ranged from 10 to 84 mg/kg for arsenic, and from 60 to 1,450 mg/kg for lead. Additional COCs may be identified during the 1998 RCRA Decree investigations.

Wilson Ditch

Samples taken during the Remedial Investigation showed that the water quality of Wilson Ditch is essentially the same as in Prickly Pear Creek above the plant. However, analytical results, although variable, generally showed elevated concentrations of metals, particularly arsenic and lead. In addition, concentrations of arsenic and lead were generally higher than those in Upper Lake.

Wilson Ditch bottom sediments contained elevated metals, with highest concentrations near the surface of the sediment at locations nearest the plant site. The highest concentrations, 2,658 mg/kg for arsenic and 6,528 mg/kg for lead, were immediately downstream of the smelter property. Samples collected from the 0- to 30-inch interval showed that the highest concentrations are typically within the 0 to 8 inch horizons, decreasing significantly with depth. Generally, concentrations of arsenic and lead were less than 100 mg/kg in the 19 to 30 inch interval.

The source of metal contamination in Wilson Ditch, other ditches in East Helena and those in surrounding lands, was stormwater runoff from the smelter property, particularly from the ore storage areas.

As discussed in Section 2.3, that reach of the Wilson Ditch extending from the smelter property to U.S. Highway 12 was cleaned up in 1993 and 1994 as part of the Removal Action conducted for OU2. The ditch was backfilled and filled in to the extent that the ditch no longer exists from the smelter property to a point in the Manlove Addition.

Wilson Ditch north of the U.S. Highway 12 in the West Fields may require additional characterization and possible cleanup in the future, particularly if these lands are developed.

Other Water-Spreading Ditches and Channels

There are numerous other water-spreading ditches and channels (primarily associated with irrigation) in the East Helena vicinity. These ditches and channels, which extend 2 to 3 miles to the north of East Helena, have elevated levels of lead and arsenic in their surface soils and sediments. This contamination is thought to have been transported from outdoor piles of concentrates on the smelter grounds during flood events. These ditches, too, have been and will be characterized as necessary during the residential soil Removal Action, and as the undeveloped lands through which they run are developed.

5.3.1.7 Railroad Rights-of-way and Adjacent Areas

In 1998, EPA sampled soils on the Burlington Northern Santa Fe railroad right-of-way (ROW), from the smelter west to where the tracks pass underneath U.S. Highway 12 and east to approximately where the tracks intersect the 1,000 ppm lead contour on Figure 2-1. Biased sampling was conducted where vegetation appeared distressed or there were tracks left by bicycles or cars. In addition, ROW areas in close proximity to neighborhood yards were sampled as well as any area within the right-of-way where soils had been disturbed or scraped. Soil samples revealed high concentrations of lead and arsenic.

To the west of the smelter facility, lead levels in the right-of-way ranged from 246 mg/kg to 43,906 mg/kg, the upper end of which greatly exceeds concentrations found anywhere else outside the smelter property. Arsenic levels in the right-of-way to the west of the smelter facility ranged from 167 mg/kg to 2,018 mg/kg. Sampling results also showed elevated concentrations of lead, arsenic, and cadmium within the railroad right-of-way to the east of the plant. Lead levels ranged from 2,849 to 15,137 mg/kg, and arsenic levels ranged from 167 to 1,421 mg/kg. High metal concentrations may be the result of incidental spillage during railroad operations or at least one incident of intentional dumping of ores and concentrates, rather than from aerial deposition.

5.3.2 Vegetation

5.3.2.1 EPA Phase I Remedial Investigation

The Remedial Investigation on OU2 gathered site-specific data to characterize the nature and extent of contamination in the soil, vegetation, and cattle resources of the Helena Valley. In 1983, during the Phase I RI, 59 plant tissue samples and 24 grain samples were collected from a total of 58 different locations. Vegetation samples were also collected from three control sites east of Canyon Ferry Lake. Plant tissues were analyzed for arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, arsenic, vanadium, and zinc. Grain samples were analyzed for the same suite of elements and nitrogen, phosphorous, and potassium.

The following conclusions were drawn from this 1984 sampling event:

- Concentrations of arsenic, cadmium, copper, lead, mercury, and zinc in plant tissues (alfalfa, winter wheat, and needle-and-thread grass) and wheat and barley grain were higher than background. Of all the elements, lead was consistently found in the highest concentrations.
- No significant correlations were exhibited between element levels in plant tissue and element levels found in the wheat and barley grain heads.
- Vegetation within an approximate 1-square-mile area near East Helena revealed lead concentrations exceeding 30 mg/kg, which is the recommended maximum dietary level for cattle suggested by the National Academy of Science (NAS, 1980).
- In general, strong, and in some cases significant, correlations were found between both total and extractable concentrations of metals in soils and concentrations of metals found in plant tissue. These relationships were not found between soil levels and concentrations in grain (heads).

The risk assessment in Section 7 discusses the implications of these findings.

5.3.2.2 Asarco Comprehensive Phase II Remedial Investigation

One objective of the Phase II Remedial Investigation was to determine levels of arsenic, cadmium, copper, mercury, lead, and zinc in area crops Wheat was chosen as the species to investigate and 42 samples were collected in 1987.

The RI concluded that some grains in the study area contain elevated concentrations of arsenic, cadmium, and lead. The grains were sampled from fields relatively close to the smelter (to the east, northeast and southeast). Only cadmium had significantly elevated concentrations above background levels for fields located more than 3 miles from the plant. Fields located more than 4 miles from the plant do not show significantly elevated concentrations above background for any element. The risk assessment in Section 7 discusses the implications of these findings.

5.3.3 Cattle

5.3.3.1 EPA Phase I Remedial Investigation

In 1985, EPA's Phase I Remedial Investigation surveyed cattle resources within the Helena Valley, including an investigation of metal uptake in cattle. Two hundred twenty-two animals representing nine herds (eight herds within the Helena Valley and one control herd near Townsend) were selected for detailed studies. Samples of whole blood, blood serum, and hair were collected and analyzed for arsenic, lead, cadmium, and zinc. The main conclusions regarding lead uptake in cattle are discussed below and the risk assessment in Section 7 discusses the implications of these findings.

- All cattle herds tested in the Helena Valley exhibited significantly elevated blood-lead levels over those of the control herd (not in the valley). All control herd animals were found to have normal blood lead concentrations.
- A significant correlation was found between the mean blood-lead concentrations of a tested herd and surface soil lead levels; herds with high blood-lead levels were located on surface soils containing high lead concentrations.
- Herds closer to the smelter had higher mean blood-lead levels than herds further away.
- Five of the eight herds included individual animals with blood lead levels that exceeded the diagnostic toxicity criteria of 35 ug/dl. Eighty percent of the cattle tested in the valley exhibited blood-lead levels in the normal diagnostic range.

5.3.3.2 Asarco Comprehensive Phase II Remedial Investigation

The Phase II RI also assessed metal concentrations in cattle to help determine the human health risk posed to humans who may eat beef from locally-raised cattle. Samples of kidney, muscle, and liver tissue were collected from eighteen animals, six each from two herds located near the smelter and one control herd located near Townsend, Montana. Tissues analysis for concentrations of arsenic, cadmium, lead, and zinc found instances of slightly elevated levels of cadmium and arsenic in the liver, kidney, and muscle tissue samples, but not lead. The risk assessment in Section 7 discusses the implications of these findings.

The interpretation of these data, specifically those for cadmium, was complicated by several factors, including animal age and distribution within each test group, and by gender. However, in general, arsenic, cadmium, and lead concentrations in muscle and liver tissue do not exceed typical ranges for cattle raised throughout the United States based on comparisons to local and national background data.

5.4 EAST HELENA LEAD EDUCATION AND ABATEMENT PROGRAM

The East Helena Lead Education and Abatement Program, established in July 1995, is administered by the LCHD as a multi-pathway lead risk prevention and abatement program. The program works to provide lead education, health intervention and childhood blood screening, development and implementation of institutional controls, environmental assessment and sampling, and multi-pathway lead abatement.

The overall purpose of the program is to reduce or prevent elevated blood-lead levels in children and to collect data relevant to long-term planning, institutional controls, and long-term management of lead risks. Program activities are designed to reduce children's mean blood-lead level to national levels, and to continue the current trend toward fewer children in the East Helena area with elevated blood-lead levels.

The program provides broad-based education to the public in homes, day-care centers and schools, focusing on nutrition, hygiene, continued health monitoring (blood lead testing) of the area's children, "safe play" programs, and continued risk reduction. The program also:

- provides education to area residents on the need to avoid areas with elevated soil lead levels and to maintain soil and sod barriers.
- provides information to future buyers and sellers of property, lending institutions, and realtors regarding both site-wide and individual property-specific conditions.
- promotes environmental assessments of residential yard soils, household dust, water and paint, to identify sources of and pathways by which people may be exposed to lead.

Program tasks include the following:

- **Educate East Helena families about lead exposure.** Increase public awareness about lead hazards through one-to-one education. Provide educational programs to children at schools and day care centers. Provide written educational information in fliers, articles, and ads in newspapers. Distribute information at schools, day care centers, and at the Health Department. Participate in community events.
- **Continue screening children in the East Helena area for blood lead levels.** Plan and conduct fall screening events at elementary schools. Offer screening to East Helena day care centers. Host screening clinics at the program office and screen other individuals on a by-request basis. Provide education and guidance about rescreening to parents with children having blood-lead levels equal to or greater than 10 micrograms per deciliter (µg/l). Compile and track information on East Helena children who are screened for lead levels.
- **Encourage and maintain open communication among stakeholders.** Continue to host Lead Program Advisory Committee meetings, attend East Helena Citizens Advisory

Council/Committee meetings, and attend City Council meetings. Respond to questions in a timely manner.

- **Promote Environmental Assessments.** Publicize free environmental testing services, including soil, dust, paint, and water sampling, available to East Helena area residents with children. Perform up to 50 environmental assessments each year.
- **Continue oversight of remediation and soil monitoring in East Helena.** Work with Asarco and the EPA to find homes that meet the guidelines for yard replacement, and participate in remediation design and planning. Coordinate sampling of potentially contaminated soils with the EPA and Asarco.
- **Administer the Exterior Lead-based Paint Abatement Contract**. This program is designed to prevent residential yards from becoming recontaminated by lead paint after they have been cleaned. The program will continue with Superfund funds until this risk is substantially reduced or eliminated. The Lead Program will inspect houses and select high-priority sites on the basis of abatement criteria, and select contractors to assess each property and to remove lead paint.

In 1999, the LCHD and EPA evaluated the Lead Education and Abatement Program and produced a summary document, a community survey, and an external peer-review. Results of the evaluation indicate that the program had been successful as a supplement to EPA's soil removal action and the Asarco facility improvements that reduced blood lead levels in East Helena children. The review led to the following important program enhancements to better serve the community:

- Continue blood lead screening as a voluntary program; however, the program should be supplemented with more aggressive, focused blood lead screening
- Implement a quality control program to assure that laboratory performance remains uniform over time and that precise and accurate protocols are followed
- Measure improvements in interior and exterior dust lead levels
- Reach more community members, such as pregnant women, babysitters, physicians, workers in the building trades, realtors, and gardeners
- Place information in the GIS on the location of remediation activities, environmental levels, and the location of gardens
- Sharing other beneficial hygiene and health practices with families in the community.

EPA agrees that the above-mentioned recommendations in the peer review will contribute to the effectiveness of the Lead Education and Abatement Program. Modifications to the program were incorporated into the Five-Year Plan.

SECTION 6

CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

EPA policy directs decision makers to take into account "reasonably anticipated future land uses" when making remedial decisions. This information forms the basis for reasonable exposure assessment assumptions and risk characterization conclusions presented in Section 7.

6.1 LAND USES

Current land uses include established residential areas and commercial businesses, newer residential subdivisions and acreage home sites, agricultural lands and open spaces, and industrial facilities (primarily the former Asarco smelter and American Chemet plant).

EPA reasonably anticipates that existing residential properties will remain residential and that, based on historical growth patterns, new residential subdivisions may be developed on land that is currently agricultural or undeveloped. Some agricultural lands will remain as productive resources. The East Fields have been used as a repository for contaminated soil and, consequently, future development there will be restricted.

6.2 WATER USE

Prickly Pear Creek water historically was, and currently is, used for irrigation water. However, during the 1990 RI/FS EPA found that Prickly Pear Creek is not extensively used for irrigation. Recharge to groundwater in the Helena Valley comes from infiltration of precipitation on the valley floor and surrounding mountains, and particularly from water losses from streams and irrigation canals that cross the Helena Valley.

Prickly Pear Creek is classified as B-1 by the State of Montana as discussed in detail in Appendix C. Waters classified B-1 are, after conventional treatment for removal of naturally present impurities, suitable for drinking, culinary and food processing purposes. These waters are also suitable for bathing, swimming and recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers, and use for agricultural and industrial purposes. Prickly Pear Creek is not currently used as source of drinking water, nor is it reasonably anticipated to be used as a source of drinking water in the future. Prickly Pear Creek is occasionally used in warmer seasons for recreational purposes, particularly fishing and wading. However, much of the creek has limited access because of brush. Swimming and wading in the creek are limited because of the cold, shallow waters and rocky, slippery bottom. The occasional recreational use of the creek is usually by older children.

There is growing interest in the community to enhance the riparian zones of Prickly Pear Creek, and, where applicable, to integrate that enhancement with expanded recreational or open space use where use will not compromise riparian habitat. Because of this, future RCRA investigations and remedial activities may include these areas.

Groundwater is not part of OU2; and therefore use was not assessed for this ROD. EPA does not anticipate that water use will change as a result of the remedy for OU2. Groundwater is being addressed under the 1998 RCRA Decree.

SECTION 7

SUMMARY OF SITE RISKS

Several risk assessments and other risk-related studies were conducted for the East Helena Superfund site. The main focus of these assessments was on human health in residential settings, with particular emphasis on evaluating and protecting younger children (age 6 years and under) from exposures to lead. Arsenic, cadmium, and some 12 or more other elements were found to be present at concentrations requiring evaluation, not only for human receptors but for environmental receptors as well. However, the potential for children's exposures to lead dominated EPA's concern here.

A baseline risk assessment was performed to evaluate the potential for adverse human health and environmental effects that might occur from exposure to Site-related contaminants. Current and future risks were estimated for a baseline scenario (i.e., risks that might exist if no remediation or institutional controls were applied). The baseline risk assessment and other studies provided the basis for past cleanup actions, for taking additional actions at the Site and for identifying the chemicals, their sources, and exposure pathways that must be addressed by the remedial action. This section summarizes the results of the risk assessments and other risk-related studies that were conducted.

7.1 HUMAN HEALTH RISK ASSESSMENT

The 1989 Comprehensive Endangerment Assessment (EA) identified chemicals of concern and exposure pathways, and assessed health risks for local residential areas based on data collected from 1983 to 1987. However, in 1991, after the EA was completed, EPA finalized its standardized default exposure guidance for Superfund risk assessments. The parameters specified in that guidance differ from many of the assumptions that were used in the EA. In addition, toxicity criteria for evaluating noncarcinogenic and carcinogenic effects have been updated on the basis of new scientific information regarding some of the chemicals evaluated in the EA. Furthermore, changes in the levels of exposure occurred, resulting from actions such as pollution control devices being installed at the plant, street sweeping and flushing, and soil response actions. Background levels of lead in the environment and food have also decreased since 1990.

As a result of these Site condition changes and guideline revisions, an updated and revised human health risk assessment was conducted in 1995 (Human Health Risk Assessment for Residential Soils, East Helena, July 1995). More recently, EPA has supplemented the 1995 assessment, including reevaluations of risks posed by arsenic (1999 – 2001, 2007), updated IEUBK model runs (2005), and updated calculations of lead and arsenic preliminary remediation goals (PRGs) for commercial workers and recreational visitors (2007). PRGs determined as part of the risk assessment efforts are risk-based concentrations of elements of concern. Therefore, the term risk-based concentration (RBC) is generally applied in this ROD, as opposed to the term preliminary remediation goal (PRG).

The comprehensive human health risk assessment (HHRA) performed in 1995 characterized risks to area residents from smelter-related contaminants in the air, on streets and alleys, inside homes, in residential soils and from other sources. This risk assessment included an evaluation of the reasonable maximum exposure scenario for East Helena residents, with the assumption that all scheduled residential soil cleanup work would be completed as prescribed by the 1991 administrative order on consent.

7.1.1 Contaminants of Concern

A screening-level evaluation was conducted to identify contaminants of potential concern. Contaminants of Potential Concern (COPCs) are chemicals in the environment at concentration levels that might be of concern for humans, and which might be derived from site-related sources. The human health risk assessment (HHRA) identified COPCs to human health based on guidance and experience gained from other, similar mining sites. Site-specific data were extensively utilized. The COPCs considered for East Helena soils were antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, selenium, silver, thallium, and zinc.

Contaminants of concern (COCs) are those COPCs that were determined through the risk assessment process to pose a current or future risk to human populations that may be above acceptable limits. EPA's risk assessment showed that lead and arsenic were a concern for residents, but other metals were not. Lead is the primary COC and contributed most to human health risks. Arsenic, although also a COC, poses a relatively low risk. Cadmium and the other Site chemicals are not a concern in residential soil. Furthermore, it was demonstrated that once areas are cleaned up to remove lead and arsenic, low-level risks of exposure to the other, co-existing contaminants are further minimized.

7.1.2 General Exposure Assessment

The exposure assessment identified scenarios through which people could come into contact with COCs in Site media and estimated the extent of that potential exposure. The Conceptual Site Model (Figure 5-1) illustrates media, exposure pathways, and human populations that were evaluated in the HHRA.

One of the primary pathways by which humans were exposed to lead and arsenic was by ingesting or inhaling fine particulate dust transported through the air from the smelter. The Asarco smelter, like other smelters of its period, processed and handled many materials containing heavy metals. Source materials for the airborne fine particulate pathway included stack, blast furnace, sinter plant, acid dust, and dross plant emissions, and ore storage areas, residue waste, the crushing mill, and other processes.

The predominant wind directions in East Helena are towards the east, north, and northeast. However, even with little or no wind, air movement and particulate deposition followed the Prickly Pear Creek watershed. These air patterns deposited the highest concentrations of metals in residential areas of East Helena and in the East Fields.

The 1995 HHRA considered the potential for human exposure to Prickly Pear Creek water and sediment. Prickly Pear Creek water has been and is currently used for irrigation. Prickly Pear Creek occasionally is used in warmer seasons for recreation, particularly fishing and wading. Incidental ingestion of creek water is most likely to occur during swimming, or for young children, wading; however, older children are more likely to use the creek for recreation. Much of the creek has limited access because of brush, and swimming and wading in the creek are limited because of the cold, shallow waters and rocky, slippery bottom. Because of this, the HHRA indicated that the incidental ingestion of arsenic and lead with Prickly Pear Creek water and sediment is unlikely to be a significant pathway.

The 1995 HHRA concluded that that pathway need not be evaluated separately from residential soil ingestion for arsenic or lead, because (1) concentrations of arsenic and lead in sediment are lower or similar to that in residential soils, (2) the likelihood of sediment ingestion is small compared to soil ingestion, (3) the EPA daily soil ingestion rate is assumed to be from all sources, and (4) significant exposure to metals in this manner is unlikely. The 1995 HHRA also indicated that incidental ingestion of arsenic and lead from Prickly Pear Creek water is unlikely to be significant.

Groundwater is not part of OU2; therefore, the risk of human exposure to contaminated groundwater was not assessed in this ROD. Groundwater is being addressed under RCRA authority.

The 1995 HHRA also evaluated the risks to area residents posed by consumption of locally-grown grain and locally-raised beef cattle. Health hazards from consumption of locally-grown grain were found to be unlikely and do not pose a current risk. Consumption of grain might pose a future concern if grains are grown near the plant and consumed in high amounts.

The 1995 HHRA found that cadmium would be a concern for those who consume locally-raised beef because of cattle's greater tendency to accumulate cadmium than other metals in organ tissues. However, cadmium concentrations in cattle near the plant were similar to that in the control herd. Furthermore, the HHRA did not find a complete exposure pathway because residents do not exclusively consume locally-grown beef, in part because the surrounding area is not large enough to support a continuous supply of beef. Because no significant risks were connected to consumption of locally-grown grain or locally-raised beef, the evaluation of risk focused on the ingestion or inhalation of soil or dust.

As discussed in Chapter 2, beginning as early as 1983, various controls at the plant have been implemented to reduce airborne fine particulate emissions. Ore storage areas were identified during the remedial investigation to be a source of approximately 35% of all lead particulates measured in East Helena. In 1989, Asarco completed construction of a completely enclosed ore and concentrates storage and handling building. Asarco also changed its smelter practice of depositing hot, granulated slag onto the slag pile, to preparation of cooled cast slugs. These practices dramatically reduced the available fine-sized materials subject to wind and water erosion. In the 1990s, emission controls were updated for the plant's acid dust handling and conveying system, the dross plant ventilation system, blast furnace ventilation system, and the sinter building ventilation system. In addition, the speiss pit stack and crushing mill were eliminated and access was further restricted to Asarco property. As a result, Asarco achieved the National Ambient Air Quality Standard for lead of 1.5 ug/m^3 in 1998 – 1999. Therefore, sources of lead particulates at the Site have been significantly reduced during the past 15 to 20 years and when Asarco shut the plant down in 2001 emissions were essentially eliminated. The airborne fine particulate exposure pathway involving dust ingestion and inhalation is discussed further in parts of this section below.

The 1995 risk assessment considered residents and particularly young children as the exposed population, and examined:

- incidental ingestion of indoor and outdoor dust;
- incidental ingestion of outdoor soil;
- inhalation of soil particles in air; and
- ingestion of vegetables grown in local gardens.

Direct ingestion of contaminated soil can result from eating soil or otherwise mouthing contaminated objects. Children are most likely to be exposed to lead contaminated soils by direct ingestion.

Dust containing various levels of contaminants can be eaten or inhaled. Vegetables grown in contaminated soils within East Helena, when eaten, become another exposure route. Vegetables can actively take up contaminants from the soil and incorporate them into their fleshy parts. Heavy metals, including lead, adhere to roots, and wind-blown or rain-splashed particles are readily deposited onto plant surfaces. These are the primary mechanisms by which edible vegetables can become contaminated.

7.1.3 Risks Associated with Exposure to Arsenic

7.1.3.1 Exposure Assessment

Exposures to arsenic, at concentrations known to have been present in soils and dust prior to 1995, can increase the risks of and cancer and non-cancer illnesses. An estimated "reasonable maximum exposure" (RME) to arsenic as a daily dose of the chemical per body weight (i.e., daily chemical intake) was calculated using standard U.S. EPA exposure assumptions. The residential scenario was also evaluated for more average ("typical") exposure conditions, as specified by risk assessment guidelines. The 1995 HHRA identifies the specific intake values used in the risk assessment.

7.1.3.2 Toxicity Assessment

The toxic effects of a chemical generally depend on its inherent toxicity, the pathway of exposure (ingestion, inhalation, contact with skin), exposure frequency and duration, and the level of exposure (intake). Chemical toxicological information derived from either epidemiological or animal studies is used to estimate toxicity criteria, which are numerical expressions of the relationship between dose (exposure) and response (adverse health effects).

Arsenic was assessed for its potential to cause skin cancer by the oral route and lung cancer by inhalation.

The toxicity assessment reviewed and summarized the potential for each COC to cause adverse effects in exposed individuals, and evaluated the relationship between the dose of a chemical and the occurrence of adverse effects. There is generally a positive relationship between dose (chemical intake through an exposure pathway) and adverse effect. In other words, as the dose increases, the type and severity of adverse response also increases.

Toxicity criteria for arsenic considered both noncarcinogenic and carcinogenic effects. Carcinogenic toxicity criteria for arsenic are provided as cancer slope factors that are an estimate of risk per unit dose of chemical. Cancer slope factors are based on the assumption that no safe threshold of exposure to arsenic exists for carcinogenic effects and that any amount is associated with some finite carcinogenic risk. The chemical-specific cancer slope factor is multiplied by the estimated daily chemical intake to provide an upper-bound estimate of the increased likelihood of cancer resulting from exposure to the chemical. This risk calculated is in addition to any "background" risk of developing cancer over a lifetime due to other causes. Consequently, risk estimates in this assessment are referred to as incremental, or excess, lifetime cancer risks.

Noncarcinogenic toxicity criteria for arsenic are provided as reference doses (RfDs) and represent a daily intake of the chemical without resulting adverse effects, even if the exposure occurred continuously over a lifetime. Chemical intakes that are less than the RfD are not likely to be of concern even to sensitive individuals. Chemical intakes that are greater than the RfD indicate a possibility for adverse effects.

Accurate assessment of human exposure to ingested metals requires knowledge of the amount of metal absorbed from the gastrointestinal tract into the body. This information is especially important for environmental media such as soil or residues at mine sites because metals in these media may exist, at least in part, in a variety of minerals that do not readily solubilize in water or may exist inside particles of inert matrix, such as rock or slag. These chemical and physical properties may tend to influence (usually decrease) the absorption (bioavailability) of the metals when ingested. Accordingly, adjustments were made to the toxicity criteria to account for the relative bioavailability (RBA).

7.1.3.3 Risk Characterization

Risks of non-cancer effects are described in terms of a Hazard Quotient (HQ), which is the ratio of the dose of contaminant predicted to occur at the site divided by the RfD that is believed to be safe.

HQ = predicted dose from site divided by reference dose

If exposure occurs by more than one pathway, HQ values are summed to yield the Hazard Index (HI). If the HQ or HI value is 1 or less, it is concluded that the site-related exposure is not a concern. If the HQ or HI value exceeds 1, then there is a risk that non-cancer effects might occur, with the likelihood or severity of effects tending to increase as HQ or HI increases. Some non-cancer effects that may result from extended exposure to arsenic in soils include persistent skin lesions or abnormal skin pigmentation.

The risk of getting cancer is described as the probability that an individual will develop cancer from the site-related exposure before the end of his or her lifetime. Risks associated with elevated levels of arsenic are termed "excess risk" because the exposed individuals also face cancer risks from sources unrelated to ingestion of soil. Excess cancer risks are summed across all COPCs and all exposure pathways that contribute to exposure of an individual in a given population. The HHRA calculated cancer risk associated with exposure to Site COPCs by multiplying the chemical-specific exposure estimates (i.e., lifetime dose) by the chemical and route specific cancer slope factor. The result is a unitless measure (e.g., 1 in 10,000) of an individual developing cancer as a result of chemical exposures at the Site. Because the excess risks must be expressed in terms of probability, the value derived will always lie between zero and one.

Excess risks to a population of exposed individuals are often relatively low numbers, and they are customarily expressed in scientific format, as shown in Table 7-1. For example, a risk of 1 excess case of cancer per 10,000 individuals exposed is often expressed as 0.0001 or 1E-04. For sites such as East Helena, EPA frequently uses a risk of 1 in 10,000 (1E-04) as the upper-end of the acceptable risk range for cancer risks. Risks above one additional case in 10,000 deserve careful consideration and may require remedial action. However, the level of cancer risk that is ultimately deemed to be acceptable for a particular site is a decision for risk managers, based upon several site-specific factors, including a thorough knowledge of the community and good judgment.

Table 7-1. 1995 Estimates of Excess Non-cancer and Cancer Risks Based on Reasonable Maximum Exposure to Arsenic

Exposure pathway	Non-cancer HI	Cancer Risk
Ingestion of soil and dust	0.2 – 0.5	3E-05 – 9E-05
Ingestion of garden vegetables	0.01 – 0.02	2E-06- 4E-06
Inhalation of soil in air	--[a]	7E-05 – 1E-04
Total	0.2-0.5	1E-04 – 2E-04[b]

[a]Not evaluated quantitatively
[b]The highlighted value exceeds EPA's acceptable risk range.

The 1995 HHRA estimates of non-cancer and cancer risks are shown in Table 7-1. Based upon the levels of arsenic that were present in 1995 in residential soils and dust, estimates of both non-cancer and cancer risks were found to vary slightly (about 2- to 3-fold) among the different neighborhoods of East Helena (East Helena proper, Manlove Addition, Eastgate, La Casa Grande, Grandview area). Non-cancer risks from arsenic did not reach a level of concern in any neighborhood (HI did not exceed 1.0). However, the total of all excess cancer risks, based on a reasonable maximum exposure scenario, did exceed EPA's upper limit of acceptable risk (1 excess risk of cancer in 10,000 individuals exposed, or 1E-04) in the La Casa Grande and Grandview neighborhoods.

This total excess risk was attributed primarily to incidental ingestion of soil and dust, and also to inhalation of soil particles in the air. Risks from eating garden vegetables were much lower and were not considered a cause for concern because the consumption of garden vegetables would not measurably add to the risks posed by ingestion or inhalation of soil particles.

Risks posed by "typical" exposure assumptions are six times less than the risk posed by the reasonable maximum exposure shown in Table 7-1. Exposure point concentrations and toxicity data used in the determination of these risk values are provided in the 1995 HHRA, but they have been superseded by values used in the reevaluation of risk posed by arsenic.

EPA reevaluated risks posed by arsenic at this Site (1999 through 2001), in part, because more yards in the La Casa Grande and Grandview neighborhoods were cleaned up by 1999. Numerous irrigation channels that extend into the Grandview area, many of which were known to have transported concentrates from the plant site during floods, had recently been cleaned up. Also by 1999, significant reductions of fine particulate emissions from the smelter were believed to have reduced the importance of the fine particulate pathway involving dust ingestion and inhalation routes (see Sections 2, 5, and parts of this section).

The exposure point concentrations (EPCs) for this reevaluation of risk (after cleanup) ranged from 41.1 to 92.8 mg/kg for different neighborhoods. In this case, the EPCs are the 95% UCL of the arsenic concentrations in each neighborhood. The cancer and non-cancer toxicity criteria for arsenic for ingestion exposure toxicity values are presented in Table 7-2.

Table 7-2. Arsenic Cancer and Non-Cancer Toxicity Data Summary

COC	Oral Exposure Route				
	oRfD (mg/kg/day)	Source	Cancer WOE	oSF (mg/kg/day)-1	Source
Arsenic	0.0003	I	A	1.5	I

Sources: I = IRIS; A = HEAST Alternate

COC	Contaminant of Concern	oRfD	Oral Reference Dose (non-cancer)
HEAST	Health Effects Assessment Summary Tables	oSF	Oral Slope Factor (cancer)
IRIS	Integrated Risk Information System	WOE	Weight of Evidence

The reevaluation of risks again showed that non-cancer risks from arsenic did not reach a level of concern in any neighborhood (HI did not exceed 1.0). The reevaluation of risks also showed that the excess cancer risk from the ingestion of soil and dust, based on a reasonable maximum exposure scenario, did slightly exceed EPA's upper limit of acceptable risk (1 excess risk of cancer in 10,000 individuals exposed) in the Grandview neighborhood (1.7 in 10,000).

7.1.3.4 Uncertainty

The reevaluation of risk posed by arsenic found that the uncertainty assessment in the 1995 HHRA was acceptable. The 1995 HHRA concluded that because the exact degree of uncertainty is impossible to quantify, reasonable maximum exposure (RME) is intended to overestimate rather than underestimate risk because the probability that a "RME" combination of assumptions would occur is likely to be remote. "Typical" risks are calculated as a comparison to the RME risk to provide conservative estimates that are closer to what individuals within a possible exposed population might experience. The results of the risk assessment therefore are unlikely to underestimate the actual risks to public health despite the inherent uncertainties in the process.

The dermal pathway was not included in the calculation of risk because dermal absorption of metals from soil is generally considered minor. For example, if an individual is dermally exposed to outdoor soil over about 30% of their body for 100 days per year (this is considered to be quite unlikely for a resident), the absorbed dose is less than 10% of the oral absorbed dose. Studies have shown that while 2 to 6% of soluble arsenic acid is absorbed through the skin, Colorado and New York soils containing arsenic (both wet and dry) exhibited negligible dermal absorption of arsenic. This is a source of uncertainty, but the magnitude of the underestimation is likely to be small.

The relative bioavailability (RBA) value (50%) that was used to derive the RBC is based on measured values in soil at a number of other mining and smelting sites, where most values ranged from 10% to 30%. Based on bioavailability studies in cynamologus monkeys and in immature swine (EPA study), the evidence strongly supports reduced bioavailability of arsenic from soil. In the cynamologus monkey study, arsenic bioavailability was measured for 14 soil samples from 12 different sites, including mining and smelting sites, pesticide facilities, cattle dip vat soil, and chemical plant soil. The relative bioavailabilties ranged from 5% to 31%. In a USEPA study, 26 test materials from mining and smelting sites were investigated with relative bioavailabilities ranging from 10% to 60%. Thus, a RBA of 50% is considered conservative and protective of human health.

7.1.3.5 Risk-based Concentrations

In the reevaluation, EPA calculated a human health RBC for arsenic in soil for residents. The RBC, 176 ppm arsenic in soil for residents, was based on a maximum acceptable cancer risk of 1.499E-04 and standard USEPA assumptions about residential exposure to soil (i.e., exposure for 350 days a year for 30 years, with intake rates of 200 mg/day for children and 100 mg/day for adults). It was also based on the assumptions that (a) the relative bioavailability of arsenic in soil was not likely to be more than 50% of the bioavailability of arsenic in water (RBA = 0.5), and (b) the concentration of arsenic in dust was unlikely to be more than 50% of the concentration of arsenic in soil (C (dust)/C (soil) = 0.5). An RBA of 50%, based on measurements of arsenic RBA at mining sites, is considered conservative because nearly all measured values are lower.

Likewise, based on data from numerous other mining and smelting sites, the concentration of arsenic in indoor dust was assumed to be 50% of that in outdoor soil. This value too is considered conservative, because the observed ratios are nearly always lower. Based on these inputs, the RBC for arsenic in residential soil is 176 ppm. (It should be noted here that although the reevaluation resulted in an RBC of 176 ppm, EPA has selected in this ROD a lower cleanup action level for arsenic in residential soil (100 ppm), which is the concentration of arsenic that is readily and cost-effectively attained in combination with the selected cleanup action level for lead in residential soil (1,000/500 ppm) and is within the range of EPA's generally accepted risk range of 1 x10^{-4} to 1x10^{-6}.)

In 2007, RBCs for arsenic in soil were also calculated for commercial workers and recreational visitors. The RBC for arsenic was calculated as the concentration that yields a specified excess cancer risk level. For the purposes of this calculation, the target excess cancer risk was set at 1.499E-04 in order to be consistent with the approach taken previously for residential exposure to soil. These values are intended to represent a Reasonable Maximum Exposure (RME) scenario for each land use. The resulting RBCs are summarized in Table 7-3.

Table 7-3. Risk-based Concentrations (RBCs) for Arsenic

Land Use	RBCs for Arsenic (ppm)
Resident	176
Commercial	572*
Recreational	794*

* These RBCs differ from those presented in the Proposed Plan. The target excess cancer risk was revised to be consistent with the approach used for residential exposure to soil (EPA 2007).

7.1.3.6 Conclusions Regarding Arsenic Risks

The most recent data and updated risk calculations support the conclusion that arsenic contamination remaining in the soils is not likely to be a source of concern in the East Helena community. Rare exceptions may be found in the future where elevated levels of soil arsenic approach or exceed the RBC value of 176 ppm or the cleanup action level of 100 ppm, yet may co-exist with soil lead levels which are below the EPA-recommended clean-up action levels for lead.

The Risk Assessment Guidance for Superfund defines an exposure unit as a geographical area over which the receptor is exposed to the contaminated media during the exposure duration of concern (EPA, RAGS, Vol. III, Part A 2001). EPA Region 8 typically assumes a residential exposure unit for arsenic based on a neighborhood scale. However, in the case of East Helena, risk assessment managers chose to adjust the soil arsenic action level downward, to 100 ppm, and to further apply that adjusted action level to each residential yard. The adjusted soil arsenic cleanup action level (100 ppm) is within EPA's risk range of 10^{-4} to 10^{-6} (risk of one excess cancer for every 10,000 to 1,000,000 people) and still within the range of residential cleanup levels for arsenic in soil in Region 8 (70 – 250 ppm).

7.1.4 Risks Associated with Exposure to Lead

The 1995 comprehensive human health risk assessment indicated that lead was a concern for East Helena children. Long before 1995, however, there was strong evidence that lead in the air, street dust, household dust, and yard soils were major contributors to the high numbers and percentages of local children who then had elevated blood-lead levels.

7.1.4.1 Toxicity Assessment

The health effect of most concern that might result from lead exposure is impairment of the nervous system, especially in young and unborn children. The relationship between adverse effects of lead and the level of human exposure has been studied using blood lead as the measure of lead intake and absorption. Blood lead is usually reported in terms of micrograms of lead per deciliter of blood (ug/dl). The CDC and the USEPA reviews of the data on the effects of lead have shown that a blood lead level above 10 ug/dl can cause health effects that warrant avoidance. Several years ago, EPA set a national goal that a child should have no more than a 5% chance of having a blood level greater than 10 ug/dl. The probability of exceeding 10 ug/dl is referred to as "P10." In other words, the national health-based goal that EPA has established is that P10 = 5%.

7.1.4.2 Risk Characterization

At East Helena, children's blood lead levels have been measured for more than 20 years, and are continuing to be measured. Parents and educators strongly support blood lead monitoring for children in this community. These blood lead level data have been determined to be reliable and appropriate for use by risk managers, as described in the ensuing sections. Since 2001, 95% of children tested have exhibited blood lead levels of 4 ug/dl or below, whereas in 1983, 45% of East Helena's children exhibited blood lead levels greater than 10 ug/dl and 17% exhibited levels greater than 15 ug/dl.

Achieving blood lead levels of 4 ug/dl or below in the majority of children has been a goal for the East Helena area for several years. This goal is more stringent than the national goal that a child should have no more than a 5% chance of having a blood level greater than10 ug/dl. East Helena children, as a whole, have surpassed the national goal and have lower blood lead levels than those determined to be protective of human health.

Additional site-specific data, including concentrations of lead in air and in soil, have also been collected at the site over the last 20 years, and some of these data are co-located with the blood lead data. For example, soil samples for lead have been collected from the same residences where children have had blood lead levels tested in the same year. The East Helena site-specific data are a primary basis for the soil lead cleanup levels identified in Section 8 of this ROD, and were selected in lieu of results from EPA's lead model as a basis for selection of cleanup levels.

"In 1995, EPA initially used the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children to evaluate the potential health risks to young children. EPA revised its original risk assessment in 2005 by incorporating site-specific or locally-derived data. For East Helena, locally-derived data were used for the soil to dust ratio (the fraction of yard soil determined to be present in household dust) and the bioavailability of lead (the fraction of ingested soil lead that is absorbed). Using these two locally-derived values, and national default values for all other input parameters, the IEUBK model predicts that a concentration of lead in soil of 520 ppm will result in no more than a 5% chance that a child would have a blood lead level greater than 10 m g/dL, which is EPA's health protection goal for lead."

7.1.5 Blood Lead Testing and Observations

7.1.5.1 Blood Lead Data

Numerous tests of East Helena children's blood lead have been conducted since the 1970s. In the past, average blood lead values for young children were high and values above 10 ug/dl were common. Over time, however, average levels and the frequency of values above 10 ug/dl have declined significantly. Table 7-4 summarizes blood lead data for children, ages 0 - 84 months, that have been gathered from 1975 through 2008 (see also Figure 7-1).

Blood lead data gathered through 1992, summarized in Table 7-4, showed a clear relationship between distance from the smelter and both the mean blood lead values and the frequency of values above 10 ug/dl. That is, mean blood lead values and frequency of values above 10 ug/dl decreased with increased distance from the smelter. The majority of children who lived within one mile of the smelter, prior to 1992, faced a high probability that their blood lead levels would be greater than 10 ug/dl. The 1995 risk assessment noted that high blood lead levels may have been influenced by levels of lead in air and in paint, in addition to the levels of lead in soil. Prior to the 1990s, street and alley dust, yard soils, and household dust – all arising from continuous smelter emissions and reentrainment of dust within the community -- were among the primary contributors to children's elevated blood lead levels.

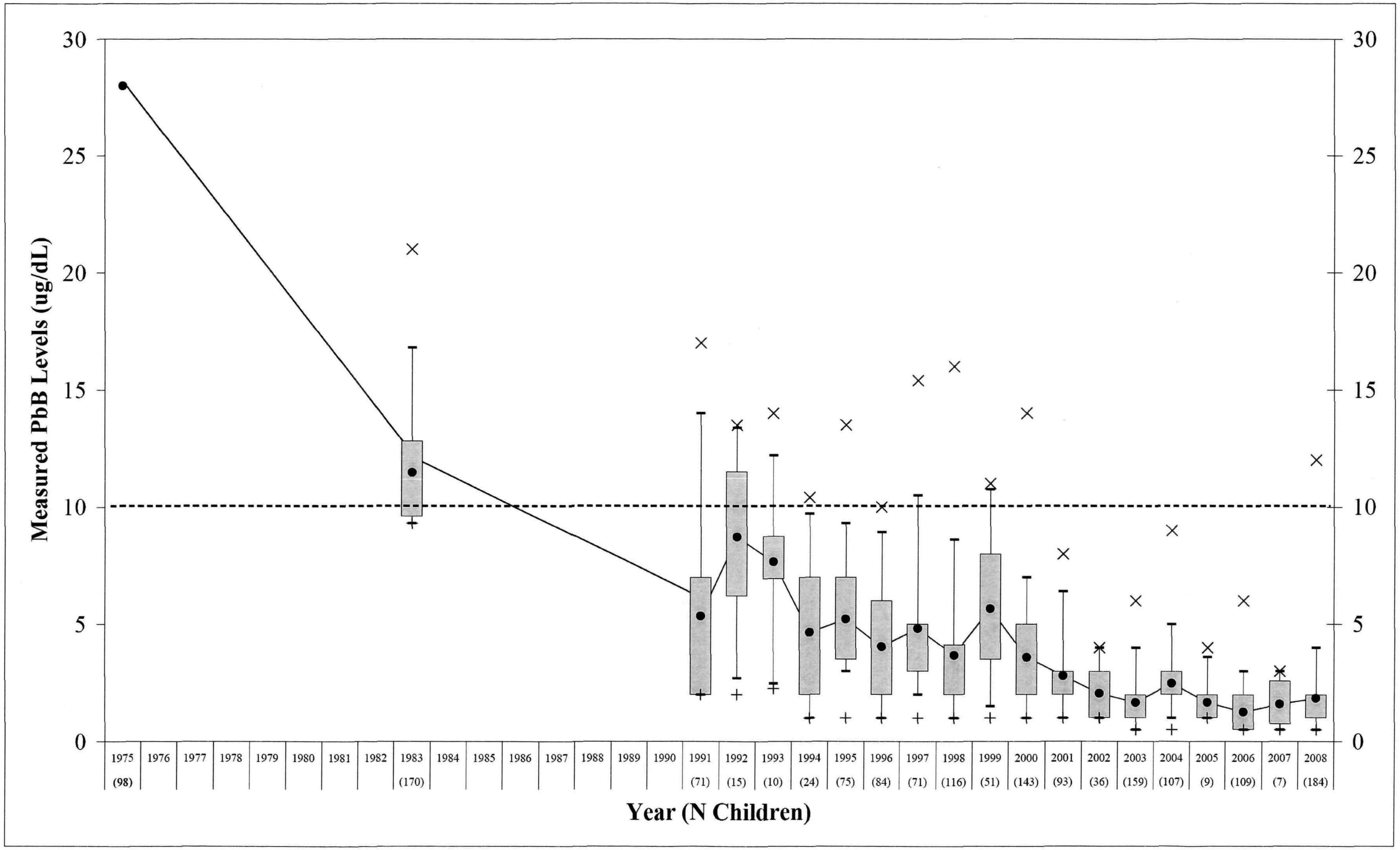
As shown in Table 7-4 and Figure 7-1, East Helena children's blood lead levels have steadily declined. The substantial decline in blood lead levels from 1975 through the early 1990s occurred before any effect might have been realized from the non-time critical soil removal action and before the East Helena Lead Education and Abatement Program was started in 1995. The decline during this period is clearly associated with the numerous efforts to control fine particulates from smelter operations and from national programs to reduce lead in the environment.

Table 7-4. Blood Lead Levels of East Helena Children 0 to 84 Months of Age (1975-2008)

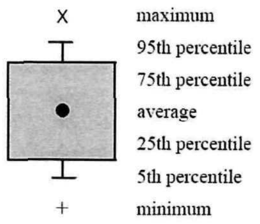
Year	No. of children tested	No. with blood lead levels of 10 µg/dl or greater	Average blood lead level (µg/dl)
1975	(90)	(All 90)	28
1983	170[a]	77	11.5
1991-92	239	16	4.7
1993-94	34	2	5.5
1995-96	159	2	4.6
1997-98	187	7	4.1
1999-00	194	5	4.1
2001-02	129	0	2.6
2003-04	266	0	2.0
2005	9	0	1.7
2006	109	0	1.3
2007	7	0	1.6
2008	184	2	1.8

[a] Ninety-eight children residing within 1 mile of the smelter.

Figure 7-1. Blood Lead Values for Children (0 to ≤ 84 Months) in East Helena from 1975 to 2008



Restricted to children in East Helena aged 0-84 months (at the time of PbB collection).
PbB values reported as <1 ug/dL evaluated at 0.5 ug/dL.
If multiple PbB samples are available for a child within a year, the mean PbB value across samples was used.



In 1983, 45% of East Helena's children exhibited blood lead levels greater than 10 ug/dl and 17% exhibited levels greater than 15 ug/dl. For the 98 children who resided within one mile of the smelter and were tested, 67% exhibited blood lead levels greater than 10 ug/dl and 33% were greater than 15 ug/dl. Although the national "level of concern" for lead in children's blood was 25 ug/dl in 1983, many health professionals at the time advocated a lower level of concern.

Since its inception in 1995, the East Helena Lead Education and Abatement Program, administered by the County Health Department, has encouraged and conducted biennial blood lead testing for children residing in or near to East Helena. The data from this long-standing survey, which is supported by the community and has produced spatially and temporally representative results, show that blood lead values have decreased substantially over time, and that the incidence of blood lead level above 10 ug/dl is now very close to zero. Since the program's inception in 1995, 1,244 individual blood lead tests have been conducted for children in East Helena under the age of 7 years. Approximately 1% of the children tested during this period exhibited blood lead values greater than 10 ug/dl. Since 1999, there has been a significant decrease in the numbers of children above the detection limit of 1 ug/dl lead in blood. Since 2001, 95% of children tested were at 4 ug/dl or below (achieving blood lead levels of 4 ug/dl or below in the majority of children has been a goal for the East Helena area for several years, see Section 8). Since 2001, only two children, of 704 children tested, had a blood lead value above 10 ug/dl. Both of these children had blood lead levels of 12 ug/dl. The blood lead level of one of these children was attributable to lead-based paint through an environmental assessment. The cause of the blood lead level of the other child could not be determined because the parent did not allow an environmental assessment.

The reduction in blood lead levels is thought to be due to the combined effect of multiple actions, including the reduction and elimination of the fine particulate pathway, the residential soil removal action, and national programs to reduce lead in air, water and food. For example, as discussed in Section 2.3.1, in the latter 1980s and through the 1990s Asarco implemented numerous actions to control fine particulates. In 1998 – 1999, the smelter achieved the National Ambient Air Quality Standard for lead of 1.5 ug/m3. These changes reduced the emission of fine particulates from the smelter as reflected in air quality data collected at the surrounding stations (see Figure 7-2). The Agency for Toxic Substances and Disease Registry (ATSDR) in its May 2008 Health Consultation for the Site pointed out that these changes to Asarco's operation report resulted in a 61% reduction in lead emissions. ATSDR also notes that Asarco's lead emissions were reduced further in 1999 by an additional 21% as compared to pre-1990 levels.

Figure 7-2. Firehall Air Monitoring Station

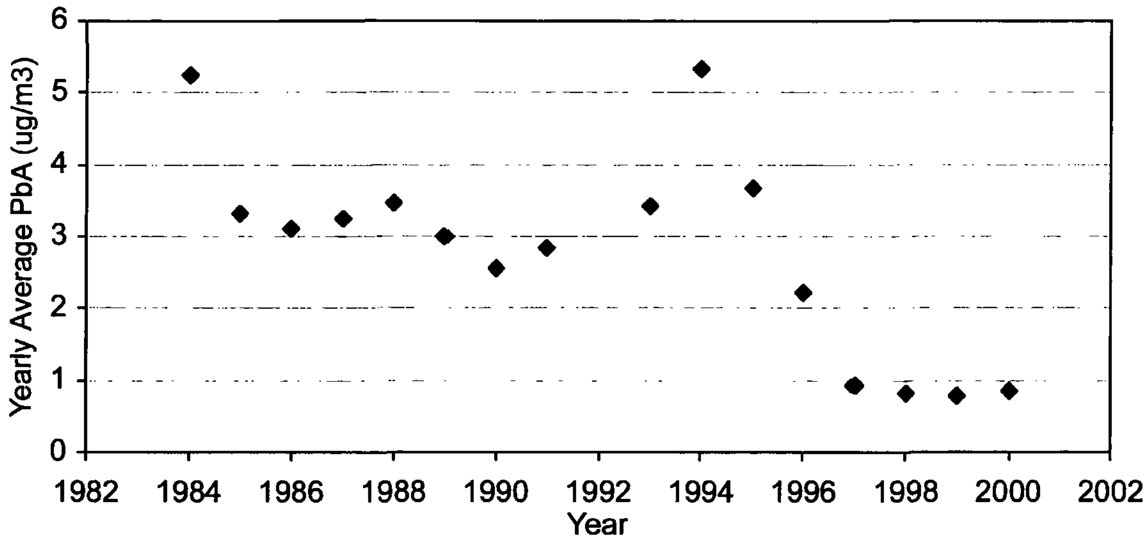


Table 7-5 shows the number and percentage of children tested with blood lead values above 4 ug/dl as a function of year. The table shows a decrease from 2000 to 2002 in the percentage of children with blood lead levels greater than 4 ug/dl. Prior to 2000, greater percentages of children had blood lead levels greater than 4 ug/dl. The most plausible explanation for this observation is the shutdown of the Asarco operations and smelter in 2001.

TABLE 7-5. Fraction of Children Above 4 UG/DL by Year

Year	No. of Children	PbB > 4 ug/dl
1991	224	37%
1992	15	87%
1993	10	80%
1994	24	46%
1995	75	51%
1996	84	33%
1997	71	37%
1998	116	25%
1999	51	65%
2000	143	27%
2001	93	14%
2002	36	0%
2003	159	3%
2004	107	7%
2005	9	0%
2006	109	2%
2007	7	0%
2008	184	4%

In addition, household dust was more prevalent when the smelter was operating. More recently, the Lead Education and Abatement Program environmental assessments indicate that dust is no longer a significant exposure pathway. These assessments included inspection for lead-based paint with a field portable x-ray fluorescence (XRF) instrument and screening evaluations for dust that included the collection of wipe samples according to the Health and Urban Department (HUD) protocol, but biased with respect to location. Results from dust samples were compared against the HUD criteria of 40 ug lead/ft^2 for samples collected from floors, 250 ug lead/ ft^2 from window sills, and 400 ug lead/ ft^2 from window troughs. Of the approximately 150 assessments and follow-up dust analyses, only 6 to 7 have shown elevated lead concentrations relative to the HUD criteria that were not interpreted as associated with suspected lead-based paint.

These data support the conclusion that reduction and elimination of fine particulate emissions, cleanup activities at the Site, and the effects of national programs to reduce lead in the environment, have been successful in reducing lead exposures from all sources in East Helena to acceptable levels.

7.1.5.2 Quality of the Blood Lead Data

In order to assess further the foregoing conclusion, it is important to examine the quality of the blood lead data set. Based on a consideration of participation rate, statistical uncertainty, spatial representativeness, and soil lead representativeness, as discussed below, it is concluded that the blood lead data generated by the County program are acceptable for use by risk managers and other health professionals in assessing site conditions.

Participation Rate

The percentage of East Helena children who participated in blood lead screenings ranges from 15 to 52 percent by neighborhood for the period from 1991 to 2006 (see Table 7-6). The total number of individual participants from each neighborhood is contained in the blood lead database maintained by Lewis and Clark County.

Table 7-6. Children Blood-Level Sampling Participation Rate

Neighborhood	Total number of children age 0-6 who have participated between 1991-2006	Participation Rate
Grandview	56	34%
East Gate 2	160	26%
Sunny Lane + East Gate 1	148	25%
La Casa Grande	70	52%
Canyon Ferry	60	28%
Manlove	9	15%
E. Helena + West E. Helena	240	41%

When a blood survey is part of an on-going program, as is the case at East Helena, both the total number of children who have participated and the size of the eligible population (the total number of children who were age 0 to 6 at any time during the study) will increase each year. Accordingly, the participation rate (PR) is a function of time. As shown in Table 7-8, the participation rate varies among neighborhoods, but is generally about 25 to 50%. Assuming that the blood lead program will continue to operate for some time into the future, and that the number of new children recruited each year will remain similar to current values, these participation rates will tend to increase over time.

There are two key factors to consider when deciding whether the participation rate can provide a reliable data set for drawing conclusions about blood lead levels in area children: statistical uncertainty and representativeness.

Statistical Uncertainty

Statistical uncertainty is a key factor in deciding whether the participation rate is sufficient to provide a reliable data set from which to conclusions can be drawn about blood lead levels in area children. For East Helena, the number of children who have blood lead levels exceeding 10 ug/dl is of interest because EPA has established a health-based goal that there should be no more than a 5% chance that a child will have a blood lead level above 10 ug/dl. The probability of exceeding 10 ug/dl is referred to as "P10," and in the context of EPA's health-based goal, P10 = 5%. Determining uncertainty in the number of children in the community who have blood lead levels exceeding 10 ug/dl is necessary because not every single child in East Helena and the surrounding communities was tested. The result of the uncertainty analysis conducted by EPA's risk assessors indicates that the number of children participating in the blood lead program is sufficient to evaluate compliance with heath-based objectives with acceptable confidence.

The second key factor when deciding whether the participation rate is sufficient to provide a reliable data set from which conclusions can be drawn about blood lead levels in area children is representativeness of the individuals tested. If a study of a population is based on a sample that includes some but not all of the members of the population, it is important to ensure that the sample that is evaluated is representative of the entire population.

Spatial Representativeness

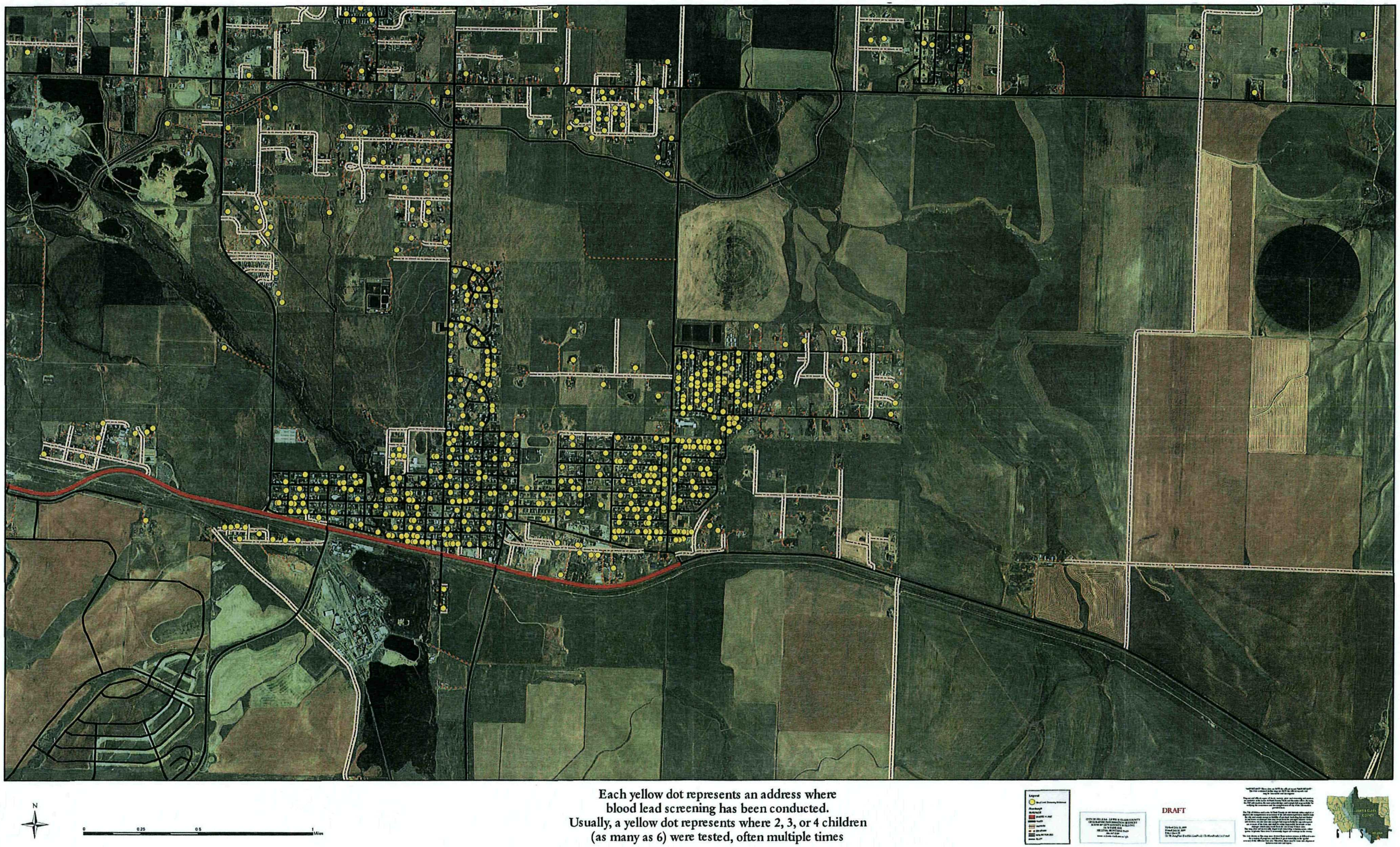
Key variables that influence blood lead values (e.g., lead levels in soil and other sources, socioeconomic status, nutritional status, behaviors) are likely to differ from neighborhood to neighborhood. If a variable does not differ between locations, then it is not an important determinant of representativeness. Thus, an assessment of the spatial representativeness of blood lead values that have been collected is a good way for ensuring that a number of potentially important demographic variables are properly represented in the blood lead data set.

Figure 7-3 shows the location of properties from which one or more children's blood lead samples have been collected by the County (see also Sheet 2 for a large-scale view). As shown, there are numerous samples from each neighborhood, supporting the conclusion that the data set is spatially representative. This is supported by the results presented above which indicate that the participation rate in most neighborhoods is about 25 to 50 %. More than 1,700 blood tests on children have been administered since 1991 involving more than 1,200 children.

Sheet 3 shows the locations of homes where one or more children had more than one blood lead value collected. Homes where children have been evaluated more than once are distributed across the city's many neighborhoods and outlying subdivisions in a manner that also demonstrates a high degree of spatial representativeness. Approximately 480 multiple blood lead tests have also been administered. Multiple tests are more than one (2, 3, 4 and, rarely up to 6) tests on a single child.

The data indicate that children with high initial blood lead values tended to have more follow-up blood lead measurements (an average of 1.7 follow-ups per child) than children with lower initial blood lead values (about 0.3 follow-up visits per child). This pattern may tend to bias the blood lead data set in an upwards (overestimation) direction, since children with elevated values contribute data more frequently than children with lower values.

Figure 7-3
1995-2008 East Helena Child Blood Lead Screening



Each yellow dot represents an address where
blood lead screening has been conducted.
Usually, a yellow dot represents where 2, 3, or 4 children
(as many as 6) were tested, often multiple times

Representativeness Based on Soil Lead Values

One important variable in the assessment of representativeness is the soil lead levels at the homes where participants in the blood lead study reside. For example, if 10% of the children in the community live at properties where current soil lead values are higher than 1,000 ppm, but only 5% of the children in the blood lead survey came from homes with soil above 1,000 ppm, this could underestimate the number of children with elevated blood lead values.

Table 7-7 shows the comparison between the percentage of properties with soil lead levels greater than 500 ppm and the percentage of participants in the blood lead survey who came from homes with soil lead levels above 500 ppm.

Table 7-7. Participant Comparison

Year	% of all properties with PbS > 500 ppm	% of all PbB participants who came from properties with PbS > 500 ppm
1991-92	63%	60%
1993-94	50%	50%
1995-96	34%	22%
1997-98	26%	14%
1999-00	24%	8%
2001-02	22%	21%
2003-04	21%	7%
2005-06	19%	11%

As shown, in the early years of the program (1991-1994), the percentage of children in the blood lead program who resided at properties with soil lead levels > 500 ppm was similar to the overall percentage of soils > 500 ppm in the community. Starting in the mid 1990's, the percentage of participating children from yards with soil lead > 500 began to decrease in comparison to the percentage of yards with soil > 500 ppm. However, this is probably not a valid indication that the population of children who participate in the blood lead program is biased toward children from low soil lead yards. Rather, this low rate is more likely a direct consequence of the active efforts EPA has made to clean up lead in yards where children reside.

The trigger for a yard cleanup is any quadrant of a yard where the 95% upper confidence limit (UCL) on the measured concentration UCL exceeds 1,000 ppm. Of all properties where the yard wide average is 500 to 1,000 ppm, nearly 70% exceed this trigger. This highlights that the effective action level for lead in East Helena soil is closer to 500 ppm than 1,000 ppm (based on yard-wide averages), and explains why continued operation of the cleanup program is expected to selectively eliminate properties where children are present and the soil lead level is > 500 ppm. This preferential remediation strategy likely accounts for the low number of children tested in recent years from properties with soil lead levels > 500 ppm.

7.1.6 Co-located Pairs of Soil Lead and Blood Lead

Soil lead results from residences and blood lead results from children living at that residence were evaluated to assess the relationship among them. These results from different media at a single location are termed "co-located pairs," which are also known as matched pairs.

A 1991 study by Lewis and Clark County Health Department of child blood levels and their relationship to soil and air lead concentrations were evaluated in 1993. This evaluation also compared 1991 data and 1983 data to determine if trends for the East Helena area could be established.

The report indicated that mean child blood lead concentrations in East Helena decreased exponentially from 28 ug/dl in 1975 to 4.4 ug/dl in 1991. Based on evaluation of only the 1991 soil and blood level data, evaluation of explicitly matched pairs and inferred pairs both resulted in the conclusion that the contribution to blood lead levels from soil concentrations less than 1,000 ppm is likely to be small. Using available explicitly matched pairs for concentrations of soil in lead up to just slightly greater than 2,000 ppm showed a correlation coefficient of r = -0.05. Using inferred pairs, the data showed that the child blood level will increase only approximately 2 ug/dl for each 1,000 ppm increase in soil lead. This finding, namely, that the contribution of soil lead (at lower concentrations) to blood lead is likely to be small, (in this case approximately 2,000 ppm) as reflected by poor correlation coefficients and relatively flat slopes, is consistent with the findings of matched pairs of blood lead and soil lead from 2001 – 2007 discussed subsequently in this section.

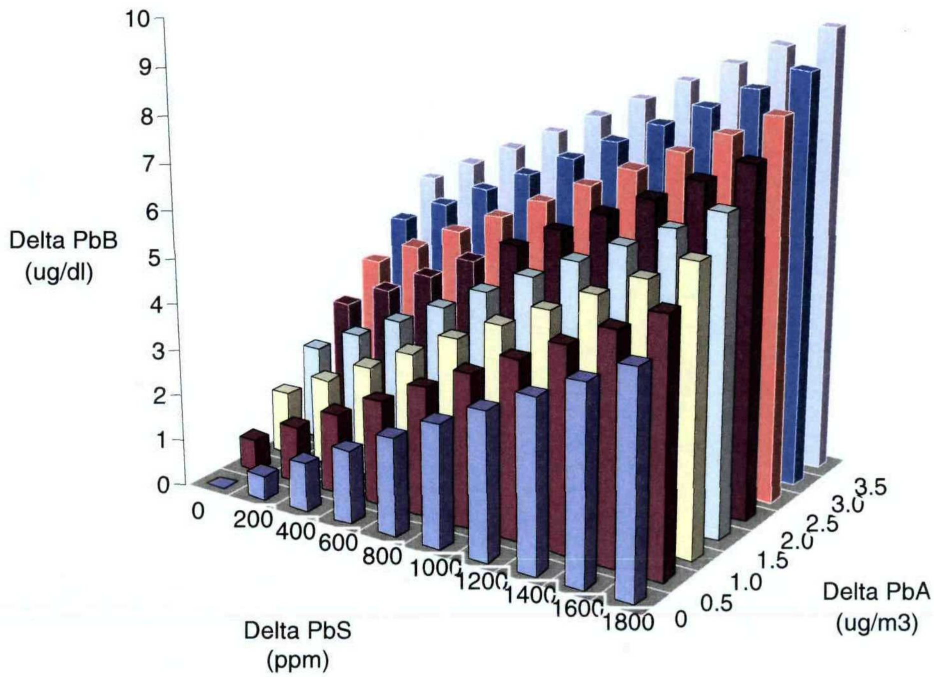
The 1983 through 1991 air lead and soil lead, and the mean blood level data for 1983 and 1991, were evaluated to estimate the relative importance of the air pathway compared to the soil pathway as a source of elevated blood lead levels in children in East Helena during the time period that the smelter was in operation.

Figure 7-4 shows the relationship between soil, air, and children's blood lead levels as a result of this evaluation. The figure shows the importance of air lead particulate as an important contributor to blood lead as well as the contribution of soil lead at higher concentrations to blood lead. The figure also shows that, with respect to soil, the contribution to blood lead levels from soil concentrations less than 1,000 ppm is likely to be small. As seen, the revised analysis supports the conclusion that lead in air is likely to have been the predominant contributor to blood lead levels in both 1983 and 1991, at least for locations where soil lead concentrations did not exceed the national average by more than about 1,000 to 1,500 ppm. Above soil lead concentrations of 1,000 to 1,500 ppm, which were common at that time, soil lead also contributed to children's blood lead levels to a significant extent.

More recent data (2001 – 2007) on soil lead and blood lead may also be used to evaluate the importance of soil lead as a contributor to blood lead. Figure 7-5 shows a plot of blood lead versus soil lead for each of several years. Summary statistics are presented below the figure. As seen, there is no clear tendency for blood lead to increase as soil lead increases, and the average slope (ug/dl in blood per 1,000 ppm of soil lead) across seven years of observation is not different from zero. These more recent data support the conclusion that, at least below 1,000 ppm lead in soil, lead in soil is only one of many sources of blood lead, and that its contribution to blood lead in children is small compared to other sources in this community. Also, it should be noted that values much above 1,000 ppm are not available because there are no properties remaining at East Helena and the surrounding community with average concentrations of lead at this level.

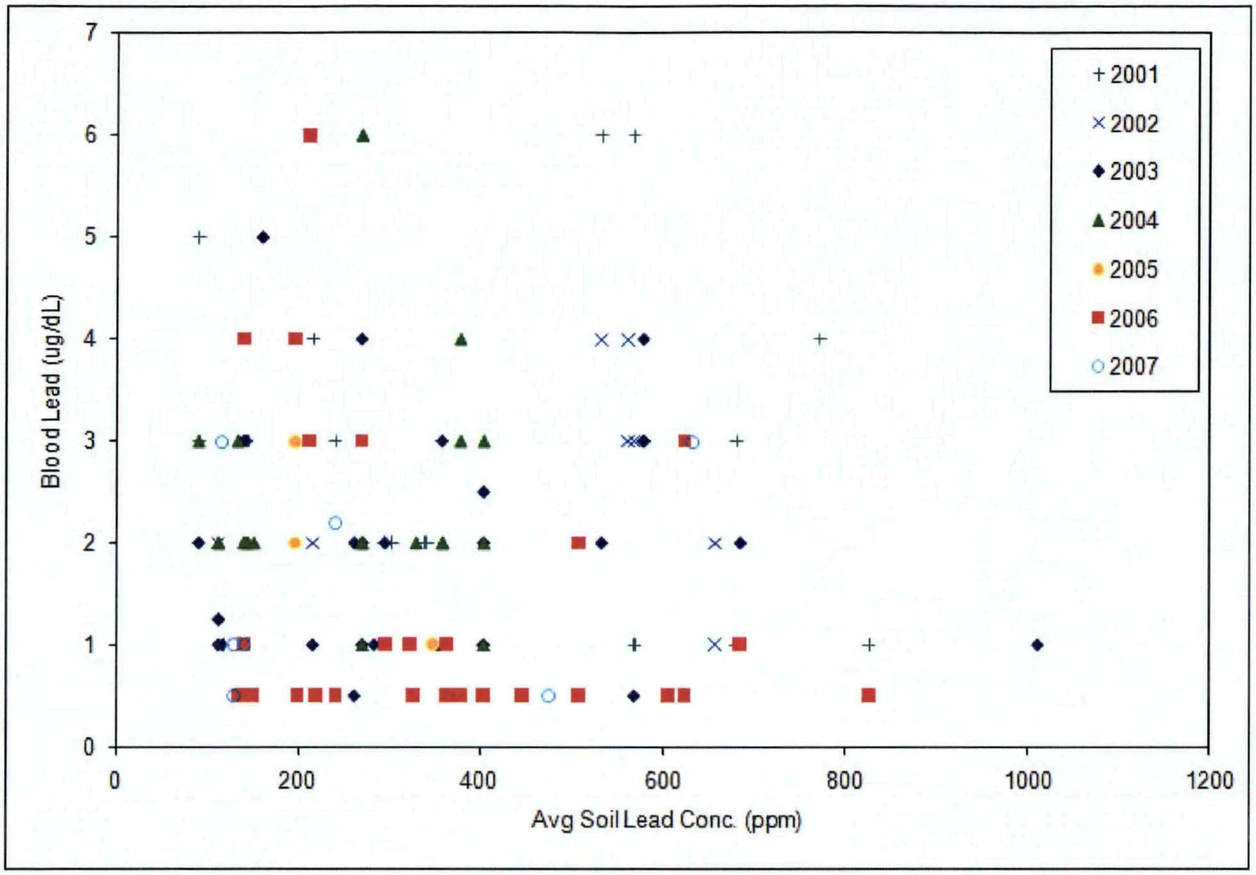
This finding is also supported by a comparison of the distribution of blood lead values in children stratified by soil lead level, as shown in Figure 7-6. As seen, there is no apparent difference between children who live at properties that have been remediated with clean fill, and at properties where remediation has not occurred and average soil lead levels are either < 500 ppm, or are between 500 and 1,000 ppm. In addition, if maximum soil lead values are considered, there is no real difference between children who live at properties that have been remediated with clean fill and at properties where remediation had not occurred, even for a group of matched pairs with concentrations of soil lead above 1,000 ppm. As above, this indicates that, at this Site, the contribution of soil lead < 1,000 ppm to blood lead is sufficiently small that the effect cannot be detected. These data also indicate that the level at which soil lead starts to have a distinguishable effect on blood lead level is greater than 1,000 ppm at East Helena.

FIGURE 7-4.
Model Predictions



Year	ΔPbA ug/m3	ΔPbS ppm	PbB Increase Over Baseline (ug/dL)		
			From Soil	From Air	% From Air
1983	2.61	250	0.66	3.60	84%
		500	1.33	3.60	73%
		750	1.99	3.60	64%
		1000	2.66	3.60	58%
		1500	3.98	3.60	47%
1991	1.83	250	0.66	2.52	79%
		500	1.33	2.52	66%
		750	1.99	2.52	56%
		1000	2.66	2.52	49%
		1500	3.98	2.52	39%

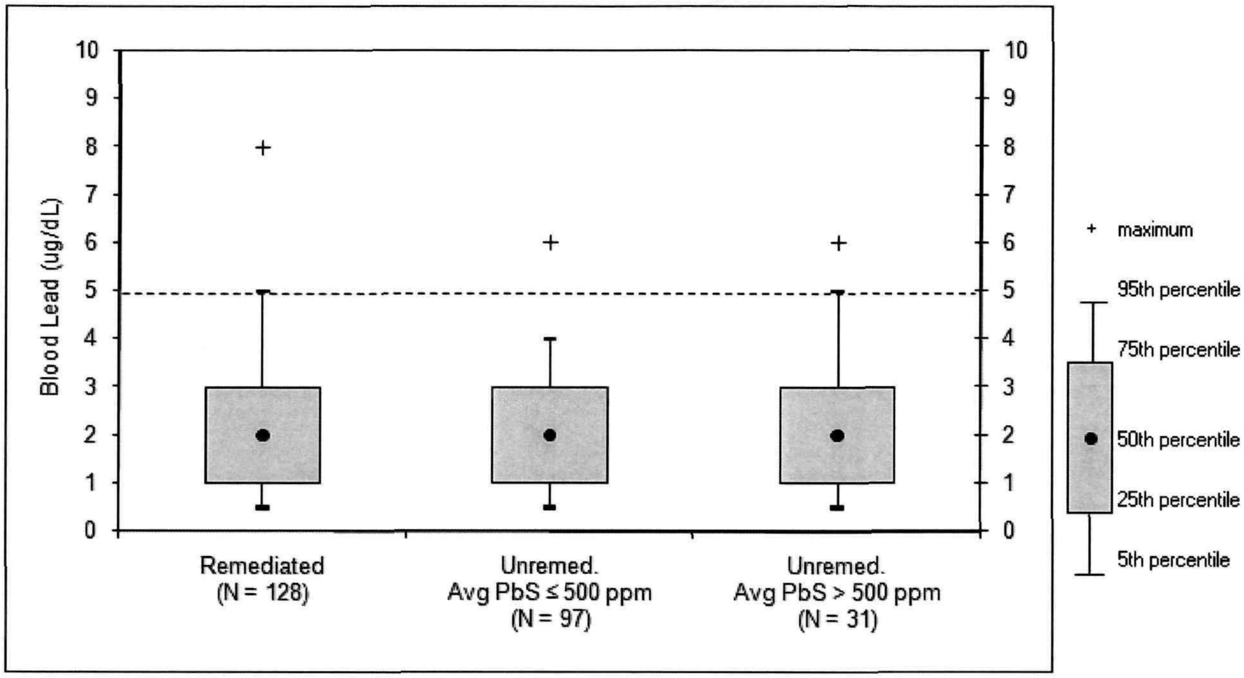
Figure 7-5. Relation Between Average Soil Lead and Blood Lead Values for Children (0 to 84 Months) at Unremediated Properties in East Helena, 2001- 2007



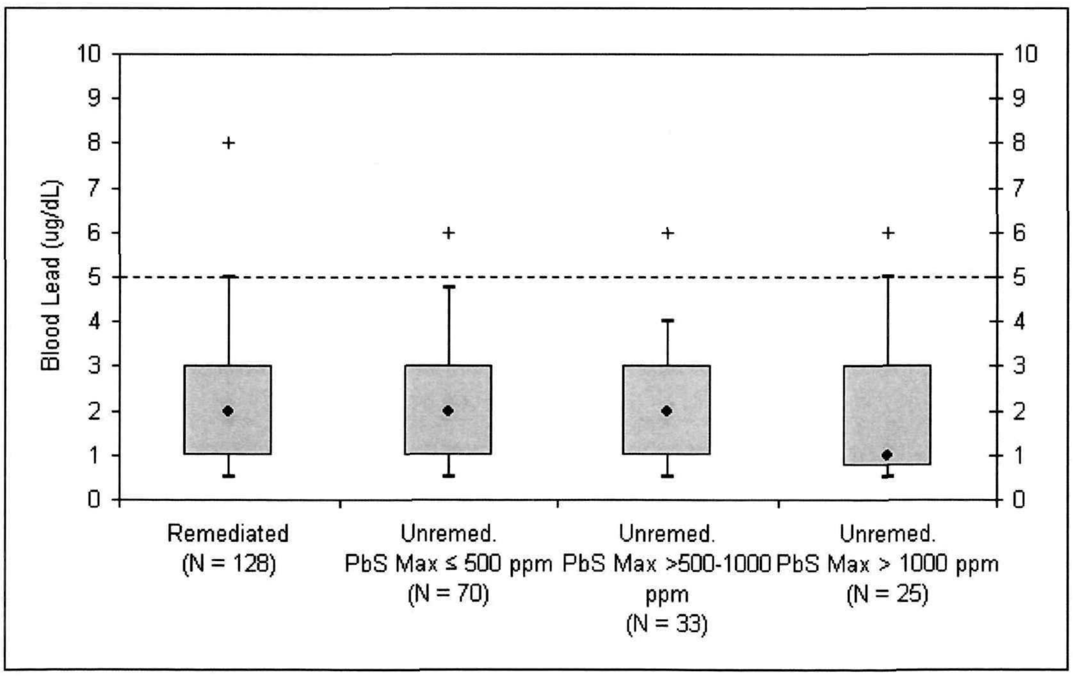
Year	N	Intercept ug/dL	Slope ug/dL per 1000 ppm	P value
2001	18	3.1	-0.70	0.699
2002	10	2.7	0.08	0.985
2003	37	1.9	0.01	0.989
2004	22	2.0	0.90	0.691
2005	4	4.4	-9.82	0.095
2006	33	1.9	-1.80	0.197
2007	7	1.2	1.44	0.565

Figure 7-6. Blood Lead Values for Children (0 < 84 Months) in East Helena from 2001 to 2007 in Relation to Remediation Status and Soil Lead Concentrations

PANEL A: BASED ON YARD-WIDE AVERAGE SOIL LEAD



PANEL B: BASED ON MAXIMUM SOIL LEAD



7.1.7 Conclusions Regarding Lead Risks

Reductions in blood lead levels in East Helena's children are due to the combined effects of the elimination of the airborne fine particulate pathway, a comprehensive residential soil removal action, the implementation of national programs to reduce lead in air, water and food, and an effective local education and abatement program.

Empirical evidence gathered over many years, involving blood lead data from over 1,700 tests of East Helena children, thousands of soil samples, decades of air quality data, and results of a few hundred in-home environmental assessments conducted by qualified health professionals, all lead to the conclusion that the actions taken by EPA to date have been protective of human health and risks have been reduced to acceptable levels for East Helena's children. EPA's cleanup efforts to date, based on the AOC between EPA and Asarco, with an action level of 1,000/500 ppm for lead and 100 ppm arsenic, have resulted in a community-wide average concentration that is well below 500 ppm lead and approximately 40 ppm arsenic.

The Agency for Toxic Substances and Disease Registry (ATSDR), in response to a formal request by MDEQ for a Health Consultation, evaluated the environmental health aspects of the proposed final remedial action for lead in residential soil to determine whether it is protective of public health. The ATSDR concluded that the lead levels that trigger cleanup for residential areas in East Helena are protective of public health. ATSDR concluded further: "Because there will always be residual levels of lead in East Helena, ATSDR finds that the Lead Education and Abatement Program is a necessary and critical component in the protection of public health," and "provided that local government entities work together to implement, monitor, and enforce appropriate and feasible regulations, ATSDR finds the general institutional controls are a critical and necessary component in the protection of public health."

Lead in household dust is no longer considered a significant exposure hazard in East Helena. However, home repairs or remodeling that open up attics, basements, heating ducts, or outside walls and windows may raise previously isolated dust that could increase the risk of exposure to lead in the home. This possibility supports the continuation of the community-wide education and abatement program, one of the purposes of which is to inform the public of circumstances such as this, and the need for environmental assessments as part of that program.

7.1.7.1 Commercial and Recreational Risks

Lead RBCs for commercial workers and recreational visitors were calculated using the Adult Lead Model recommended by EPA (2003). This model determines the central estimate of blood lead levels using soil lead concentrations, intake factors, absorption factors, exposure frequency assumptions, and ratios of blood lead levels increases for a unit increase of lead uptake.
The RBC for lead is defined as the concentration in soil that yields a 95th percentile blood lead value of 10 ug/dl in a fetus.

The resulting RBCs shown in Table 7-8 are slightly higher than those presented in the Proposed Plan. Selected input values into the Adult Lead Model were revised from those values used to determine the RBCs in the Proposed Plan. Updated site-specific and national input values were used in the revised calculation.

Table 7-8. Commercial and Recreational Risk-Based Concentrations for Lead	
Land Use	RBCs for Lead (ppm)*
Commercial	1482
Recreational	3245
* These RBCs differ from those presented in the Proposed Plan.	

7.2 ECOLOGICAL RISKS

The ecological risk assessment evaluated the potential for adverse effects (risks) to ecological receptors that may be exposed to contaminants released to the environment during historical activities at the East Helena Smelter. The risk assessment described the likelihood, nature, and extent of adverse effects to ecological receptors. This information and other relevant Site information were used by risk managers to decide whether remedial actions are needed to protect ecological receptors from Site-related releases.

Risks to ecological receptors were first evaluated in a Comprehensive Endangerment Assessment in 1989. Regarding risks to terrestrial plants from direct contact with metals in surface soil, the EA concluded that although maximum concentrations exceeded tolerance levels for some species of plants, the reported levels in soil were not sufficiently high to expect that metals in soil would result in widespread damage to plants.

Risks to livestock from ingestion of soil and plants, dermal contact with surface water, and inhalation of dust were also evaluated in the EA (Hunter ESE, 1989). The EA evaluated risks. This analysis indicates that the primary exposure is from consumption of contaminated forage. Ingestion of soil from grazing and drinking water from Prickly Pear Creek also provide exposure pathways, but these are orders of magnitude less than from forage consumption. Exposure through inhalation is negligible. In addition, the EA assessed livestock exposure based on measured tissue levels in cattle from the Helena Valley. Based on these evaluations, the EA concluded that although levels in livestock were elevated, they were not high enough to cause adverse effects.

Although the EA evaluated impacts to plants and livestock, there were significant data gaps in the 1989 assessment with respect to wildlife. No direct analysis of the risk to wildlife was conducted as part of the EA. Therefore, in 2003, EPA collected additional ecological information. The Supplemental Ecological Risk Assessment report was published in January 2005.

The Supplemental Ecological Risk Assessment (ERA) estimated risks to aquatic receptors (fish and benthic invertebrates) in Prickly Pear Creek and terrestrial receptors (plants, soil invertebrates, livestock and wildlife) in the surrounding areas. The new data collected were not sufficient to provide a basis for revising the assessment of risks to plants, no additional evaluation of risks to plants was provided in the 2005 Risk Assessment. The new data collected in 2003 were not sufficient to refine the exposure assessment to livestock; a re-evaluation of risks to livestock was not performed as part of the supplemental ecological risk assessment. A summary of the assessment and conclusions pertaining specifically to OU2 follows (see especially Section 7.2.7, Ecological Risk Conclusions). Further ecological risk characterizations of Upper Lake and the marsh areas, Lower Lake, the smelter and surrounding owned lands and Prickly Pear Creek is being conducted pursuant to work plans developed under the RCRA Consent Decree.

In 2009 or 2010, Asarco plans to conduct additional ecological risk assessment work on Asarco-owned land under the 1998 RCRA Decree. This additional effort does not affect selection of the remedies for OU2.

7.2.1 Contaminants of Ecological Concern (COECs)

The 2005 Supplemental Risk Evaluation considered the historical characterization of the Site and the 2003 additional characterization data. Contaminants of potential ecological concern (COPECs) for each ecological receptor and exposure pathway were selected based on a conservative screening process that eliminated those chemicals that were not likely to contribute significant risks to these receptors. Depending on the pathway and receptor, the metals and inorganics that might be of potential concern included aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, mercury, nickel, potassium, phosphorous, selenium, silver, sodium, sulfide, thallium, vanadium, and zinc. However, the ERA showed that the only contaminant of ecological concern (COEC) is lead.

7.2.2 Ecological Conceptual Site Model/Exposure Pathways

Figure 7-7 presents a Site Conceptual Model for exposure of ecological receptors in the East Helena area. Ecological receptors that may be exposed include aquatic receptors (fish and aquatic invertebrates), terrestrial receptors (plants and soil invertebrates), wildlife receptors (birds and mammals), and livestock. Each receptor class may be exposed to chemical contamination through contact with surface water, sediment, soil, and aquatic or terrestrial food items. However, not all, of these exposure pathways are likely to be of equal concern.

Exposure pathways selected for quantitative evaluation were based on the level of potential concern with that pathway and the existence of sufficient data to support that evaluation. Evaluated pathways include:

direct exposure of fish to surface water and ingestion of food and sediment;
direct exposure of benthic invertebrates to surface water and sediment;
direct contact of plants and soil invertebrates with soil; and
ingestion of surface water, sediment, soil, and food by wildlife (birds and mammals).

For the purposes of the risk assessment, an evaluation of potential risks from Prickly Pear Creek was limited to areas upstream from the smelter and downstream from the smelter to Lake Helena.

7.2.3 Selected Representative Receptors

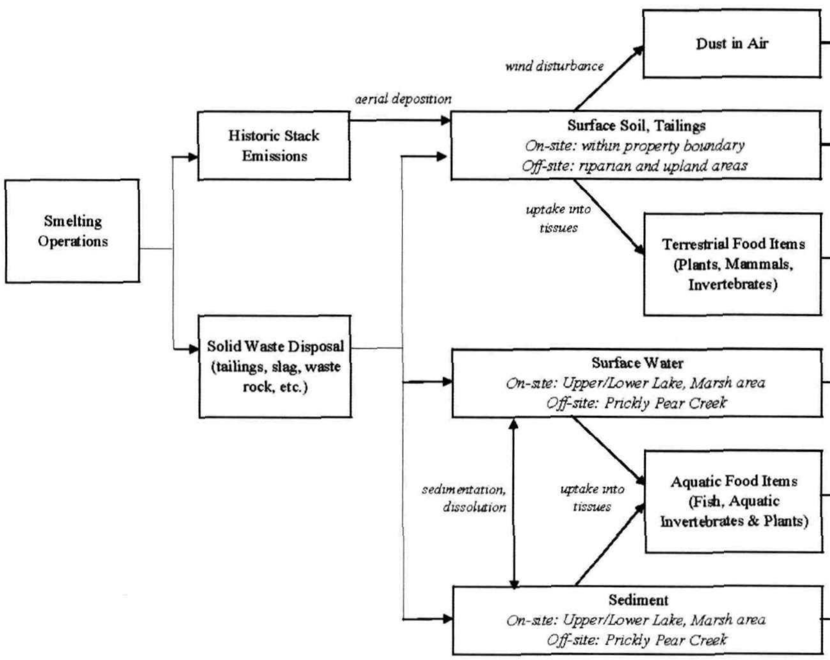
Aquatic and terrestrial ecological communities were evaluated in the ecological risk assessment. The aquatic receptors were fish, including several species of trout and the fathead minnow, and benthic organisms. The terrestrial communities included riparian areas along Prickly Pear Creek and off-site upland areas.

Several representative riparian wildlife receptors were selected for evaluation of risks in riparian areas of Prickly Pear Creek because it is not feasible to evaluate exposures and risks for each species potentially present at the Site. These riparian wildlife receptors were selected to represent a variety of simplified food chain scenarios based on habitat types, site observations, and general site knowledge. Selected riparian wildlife receptors include the following:

<u>Waterfowl:</u> Mallard
<u>Fish-eating bird:</u> Belted Kingfisher
<u>Fish-eating mammal:</u> Mink
<u>Terrestrial Insectivore:</u> Cliff Swallow

Representative wildlife receptors were not selected for the off-site upland terrestrial environment. As discussed subsequently for exposure point concentrations (EPCs), the approach for terrestrial risks to birds and small mammals in the upland community was to consider using the biomonitoring results from the Anaconda Smelter site, in which numerous birds and small mammals were included.

Figure 7-7. Ecological Site Conceptual Model



Potentially Impacted Environmental Media	Exposure Route	Aquatic Receptors		Terrestrial Receptors (Plants & Invert.)		Wildlife Receptors (Birds & Mammals)		Livestock
		Fish	Benthic Organisms	Plants	Soil Organisms	Riparian	Upland	Upland
Dust in Air	Inhalation					X	X	X
	Direct Contact			X				
Surface Soil, Tailings	Ingestion						●	●
	Direct Contact			●	●		X	X
Terrestrial Food Items	Ingestion						●	●
Surface Water	Ingestion					●		●
	Direct Contact	●	●			X		X
Aquatic Food Items	Ingestion	●[a]	X			●		
Sediment	Ingestion	●[a]	X			●		
	Direct Contact	X	●			X		

LEGEND

(blank)	Pathway is not complete; no evaluation required
X	Pathway is complete, but is judged to be minor compared to other exposure pathways; qualitative evaluation
○	Pathway is complete and might be significant; but insufficient data are available for quantitative evaluation
●	Pathway is complete and might be significant; sufficient data are available for quantitative evaluation

Footnotes:

[a] Can only be evaluated quantitatively for a subset of metals (arsenic, cadmium, copper, lead, and zinc).

Fig7-8ConceptualSiteModelEco_2008_03_10.xls

7.2.4 Exposure Point Concentrations (EPCs)

The basis of the EPCs used in the risk characterization depended upon the receptor being evaluated. For receptors that are immobile or have limited mobility (i.e., aquatic invertebrates, plants, terrestrial invertebrates), EPCs were calculated for each sampling station. The 2005 ERA provide summary statistics for the maximum concentrations for surface water, bulk sediment, and sediment porewater. The EPC for lead in surface water (Prickly Pear Creek) was 10 ug/l (non-detect), 1,090 mg/kg in sediment (adjacent to the smelter), and 10 ug/l (non-detect) in sediment porewater.

For wildlife receptors (birds and small mammals), rather than calculate EPCs, the risk assessment used a different approach. The EA did not include an evaluation of risks to smaller mammals and birds. An HQ approach was initially considered to address this data gap. However, the results of other mining-related ecological risk assessments often indicate that the receptors in upland areas with the highest exposures tend to be insectivorous rather than herbivorous wildlife. Terrestrial and soil invertebrate tissue concentrations have not been measured in the upland areas surrounding the East Helena Site. While HQs for insectivorous wildlife could be estimated using default bioaccumulation factors for the uptake of metals from soil into invertebrate tissues, these uptake factors have been demonstrated at other mining-related sites to overestimate levels of metals in invertebrate tissues.

One way to avoid the assumptions and uncertainties associated with the estimation of dietary exposures is to perform a wildlife biomonitoring study that directly measures receptor endpoints related to exposure and toxicity. Although wildlife biomonitoring has not been conducted at the East Helena Site, a multi-year biomonitoring assessment has been conducted for the Anaconda Smelter site in Deer Lodge County, Montana. The Anaconda Smelter site is similar to the East Helena Site with regard to the primary source materials, the mechanisms of exposure, and potential contaminants of concern. The primary objective of the Anaconda Smelter biomonitoring project was to quantify exposure to arsenic, cadmium, copper, lead, and zinc and the resultant effects in mammals and birds inhabiting the Anaconda Smelter.

In brief, the Anaconda Smelter Biomonitoring study was conducted from the spring of 1999 through the fall of 2000. Small mammals were captured from sites with varying levels of metals contamination, and tissue concentrations and health effect endpoints were measured to assess differences in small mammal exposure and toxicity between sites. In addition, American kestrels, European starlings, mountain bluebirds, tree swallows, and black capped chickadees were studied using nestboxes placed at sites with varying levels of metals contamination. Concentrations of metals in eggs, nestlings, and food items were analyzed and compared to nestbox reproductive endpoints.

Based on the results of the Anaconda Smelter wildlife biomonitoring evaluation, it was concluded that the primary receptors of concern were insectivorous passerine species (e.g. perching and song birds) and the primary contaminant of concern was lead. The extent of possible impact to ecological receptors is generally within one mile of the smelter because of the presence of elevated soil lead concentrations. Elevated lead levels in soil spatially extend farther east of the Site (about one mile) compared to west of the Site (about 1/4 to 1/2 mile). This is probably because prevailing winds from the west carried smelter emissions east of the Site.

7.2.5 Toxicity Assessment

Toxicological literature was reviewed to identify toxicological benchmarks for COPCs in soil that were protective of the indicator species at the Site. These benchmarks may be concentration-based (e.g., the concentration in soil, sediment, surface water), or may be dose-based (e.g., milligram of chemical ingested per kilogram body weight per day, [mg/kg BW/day]). Toxicity benchmarks are contaminant-specific, receptor-specific, and usually medium-specific. All toxicity benchmarks used in the risk characterization were based on values developed by various regulatory agencies and published in the literature. The 2005 Supplemental Ecological Risk Assessment summarizes the toxicity benchmarks used to evaluate risks to wildlife from ingestion exposures.

7.2.6 Risk Characterization

Assessment and measurement endpoints were selected for the risk characterization. The assessment endpoint selected was the protection of ecological receptors from adverse effects related to exposure and overall health and integrity of the ecosystem. Measurement endpoints selected to evaluate this assessment endpoint consisted of hazard quotient calculations (exposure to a site contaminant relative to the toxicity reference value), site-specific toxicity tests, and observations of population and community demographics. Because each type of measurement endpoint has advantages and limitations, conclusions based on only one method of evaluation may be misleading. Risks to ecological receptors were therefore assessed by a weight of evidence approach based on findings from all the lines of evidence for which data were available, taking the relative strengths and weaknesses of each method into account.

7.2.7 Ecological Risk Conclusions

According to the 2005 supplemental ecological evaluations the following conclusions were drawn based on a weight-of-evidence approach considering multiple lines of evidence and uncertainties:

- the risk of population-level effects to fish in Prickly Pear Creek is minimal to low;
- the risk of population-level effects to benthic invertebrates in Prickly Pear Creek is low;
- the reported levels of metals and arsenic in terrestrial soils were not sufficiently high to expect that there would be a widespread ecological impact on plants or soil invertebrates. Some areas of impact, however, do persist within one mile of the smelter to the east and north;
- insect-eating birds or small mammals that inhabit open and undeveloped terrestrial areas within approximately one mile of the smelter may be exposed to elevated soil lead concentrations that exceed hazard criteria;
- adverse effects to waterfowl, fish-eating birds, and insect-eating birds may also occur due to the ingestion of several metals, including lead, copper, and zinc, in the aquatic food chain. Because no other lines of evidence are available to support these risk conclusions and risk estimates are based on a limited dataset, there is low confidence in these

conclusions. Ingestion of water from Prickly Pear Creek is not likely to adversely impact birds or mammals; and

- risks to livestock from ingestion of soil and plants, dermal contact with surface water, and inhalation of dust are believed to be the primary exposure pathways for livestock. Although exposures to livestock are noted in the assessment, and livestock were affected for decades prior to 1990, exposures are not currently causing observable adverse effects.

Because the risk of population-level effects to fish and benthic invertebrates in Prickly Pear Creek is low, specific ecological contaminants of concern for aquatic environments have not been identified that require response actions.

The ecological contaminant of concern for terrestrial environments is lead. However, past and present cleanup actions for residential areas and selected agricultural lands, conducted by Asarco with EPA's oversight, together with land management programs instituted cooperatively on company owned agricultural lands surrounding East Helena, are expected to reduce these ecological risks. Section 5 discussed in-place treatment and land application of removed soils in the East Fields. Photographs 7-1 and 7-2 show the pre-treatment and post-treatment conditions in the East Fields. Future response actions may need to address risks posed by lead and other metals to ecological receptors.

7.2.8 Uncertainties

Quantitative evaluation of ecological risks is generally limited by uncertainty in the data. This uncertainty is usually addressed by making estimates based on whatever limited data are available, or by making assumptions based on professional judgment when no reliable data are available. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

Assuming that exposure and toxicity at the East Helena Site are similar to the Anaconda Smelter Site, passerine insectivores (small birds) may be exposed to concentrations of metals that exceed hazard criteria. Lead toxicity may depend upon the chemical form of contamination. If the form of lead contamination at the East Helena Site is different from that at the Anaconda Smelter Site, a lead concentration in soil that is protective at the East Helena Site may be different from that identified at the Anaconda Smelter Site.

Uncertainties include factors pertaining to the nature and extent of contamination, exposure assessment, toxicity assessment, and risk characterization. Factors identified by the ecological risk assessment that could possibly be significant include the assumption that metal absorption from site media is the same as in laboratory studies and that toxicity benchmarks are often based on limited data. Because of the inherent conservatism in the derivation of many of the exposure estimates and toxicity benchmarks, risk estimates should generally be viewed as being more likely to be high than low, which leads to an overestimation of risk.

7.3 OVERALL CONCLUSIONS REGARDING SITE RISKS AND BASIS OF REMEDIAL ACTION

Numerous human health-based assessments and reevaluations have been conducted in conjunction with the ongoing non-time critical removal action for residential areas. Each assessment and reevaluation was objectively designed, first, to be consistent with risk assessment guidelines and procedures, but also with two overarching questions in mind: Is the residential removal action protective? And, how will EPA know if it is or is not appropriate to retain for the final remedial action the procedures, methods, and criteria that guided the removal action?

The answers to these questions revealed themselves more clearly with each successive assessment. The findings and conclusions of the assessments, particularly when considered altogether, enable EPA to conclude that (a) the residential removal action is protective of human health and (b) the evidence gathered supports the conclusion that the procedures, methods and criteria applied during the removal action are appropriate for completing the cleanup under a final remedial action. By so doing, as set forth in this Record of Decision, all remaining site risks will be reduced to acceptable levels and the remedial goals and objectives will be met or exceeded.

Cleanup levels for lead and arsenic in surface soils that are protective of workers, recreational visitors, and residents were derived for the Site. Interim Removal Actions at East Helena, based on the AOC between EPA and Asarco, and supported by MDEQ and LCC, have greatly reduced the number and extent of areas where soil contaminated with lead and arsenic remain above cleanup levels. Soils at a limited number of properties, both private and public, remain above cleanup levels and therefore could pose an unacceptable risk to human health. The selected remedy will reduce those risks to acceptable levels.

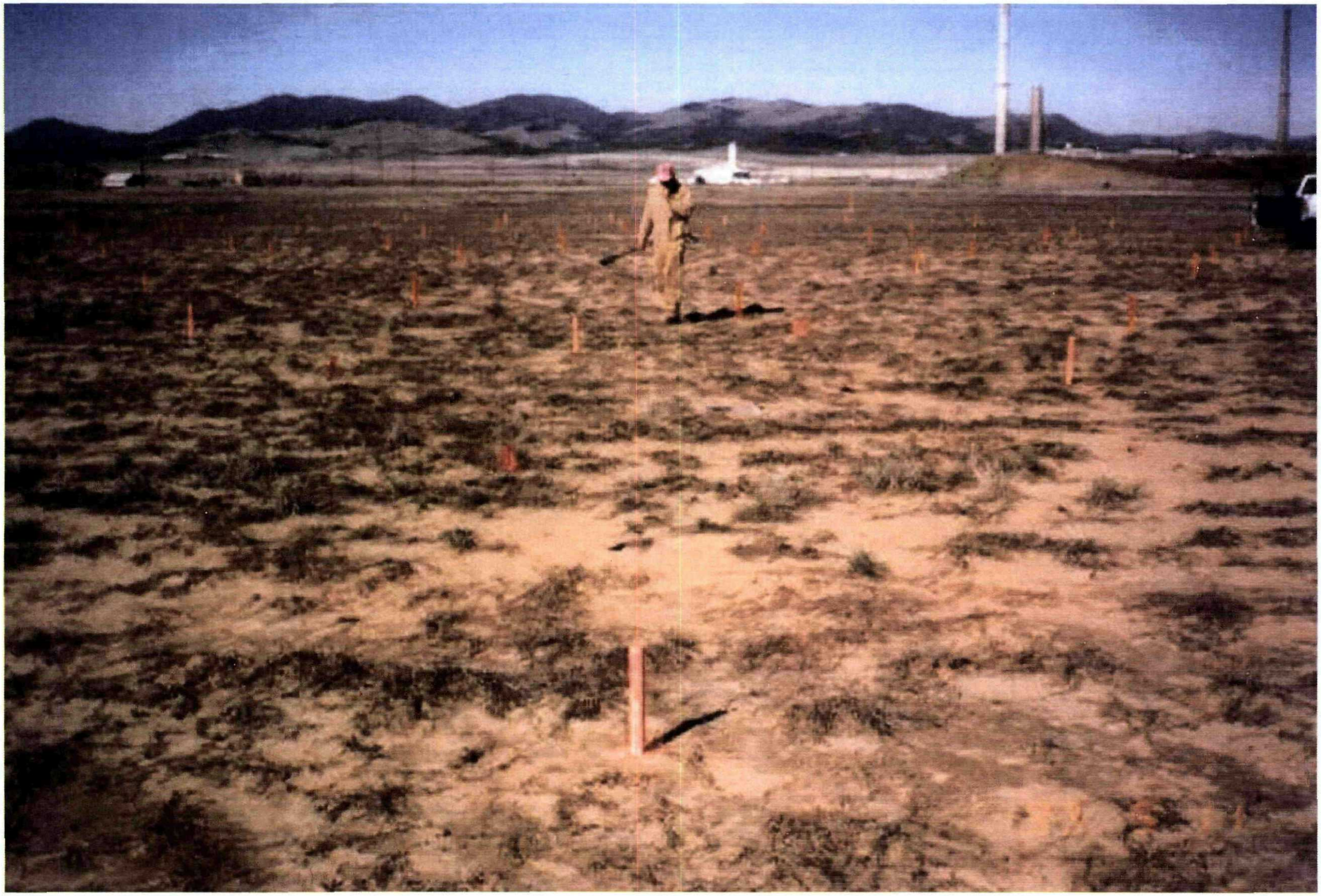
Actions taken for the East Fields have reduced the area where contaminated soil may impact ecological receptors. The continued cleanup of residential and undeveloped lands for the protection of human health will further mitigate risks posed to livestock, wildlife, and other ecological receptors.

Ecological risks have been reduced by periodic rangeland inspections and the recommendations that followed such inspections, which have markedly improved vegetative cover over large areas of agricultural land known to have significantly elevated levels of metals.

Finally, additional ecological risk characterization is being conducted for aquatic, riparian and upland terrestrial receptors, under the 1998 RCRA Decree, for Upper Lake and the marsh areas, Lower Lake, the smelter and surrounding owned lands and Prickly Pear Creek.

The response actions selected in this Record of Decision are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Photograph 7-1. East Fields prior to In-Place Amendments and Land Application of Soils Removed from Residential Areas



Photograph 7-2. East Fields after In-Place Amendments and Land Application of Soils Removed from Residential Areas

SECTION 8

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) consist of medium-specific or location-specific goals for protecting human health and the environment. This section presents the RAOs for residential soil and undeveloped lands at the Site and provides the basis for evaluating the cleanup options presented in Section 9.

8.1 NEED FOR REMEDIAL ACTION

Historic smelting operations at the Site contaminated residential soils and undeveloped land. The Site's Removal Action has been successful in cleaning up soil contaminated with lead and arsenic above cleanup levels. Remedial action is required to address current and future risks that result from concentrations of lead and arsenic above cleanup levels at remaining residential properties, ditches, and on undeveloped land, in the event it is developed.

8.2 REMEDIAL ACTION OBJECTIVES

A remedial action objective is the overarching or overall statement regarding what needs to be achieved, and the goal is the quantifiable measure or criteria for determining whether the objective has been achieved. The final cleanup of residential soils and undeveloped lands in and around East Helena requires a thorough reexamination of the objectives and goals that were originally established in 1991, as well as the more stringent objectives and goals developed over the course of events since 1991.

8.2.1 Initial Objectives and Goals

When the residential soil removal action was initiated in 1991, the general, overarching objective was to reduce children's exposures to lead, which would in turn reduce their blood lead levels. The goal in 1991 was to reduce children's blood lead levels so that no more than 5 % of the exposed children would have blood lead levels greater than 10 ug/dl (P10 = 5%) and no child's level would be greater than 15 ug/dl. At the time, a majority of East Helena children had blood lead levels above 10 ug/dl and a third of the blood lead levels were above 15 ug/dl. The goal was to be achieved through a combination of reductions in smelter emissions, implementation of soil response actions, and health intervention and education.

EPA established two focus areas for the soil response action: 1) the "yellow zone" near the vicinity of the smelter property (see Figure 2-1) and 2) outside the "yellow zone." Inside the yellow zone, all yards, parks, streets and alleys automatically qualified for cleanup, due to the fact that soil lead concentrations within that zone were known to be significantly greater than 1,000 ppm and often greater than 2,000 to 3,000 ppm. Outside the yellow zone, all properties required sampling. If any portion of a yard had a soil lead concentration greater than the upper 95% confidence limit of 1,000 ppm, then all portions (sections) of that yard found to be greater than 500 ppm lead would be removed and replaced. The goal for children's blood lead levels

(P10 = 5%) and the cleanup level (1,000/500 ppm) were consistent with EPA's national guidance.

By 1995 and 1996, fine particulate emissions were significantly reduced (see Section 2.3.1). The non-time critical soil removal action had been initiated in 1991 and reached significant activity in 1993 when more than 100 residential properties were cleaned up. Education and intervention efforts by EPA, MDEQ and the Lewis and Clark County Health Department had intensified.

The initial goal was achieved. In fact, it was surpassed. Of 157 children tested in 1995 and 1996, only two (1.3%) had blood lead levels above 10 ug/dl.

A community-wide street sweeping effort was initiated. Cleanup efforts continued over the next four years, and from 1997 to 2000, of 371 children tested only 12 (3.3%) had blood lead levels above 10 ug/dl. Education and intervention efforts by EPA, MDEQ and the Lewis and Clark County Health Department continued and fine particulate emissions were being significantly reduced.

The achievement of the 1991 initial goals to reduce blood lead levels in children (see Figure 7-1) is thought to be due in large part to the reduction of fine particulates from the Asarco property. As discussed in Section 2.3.1, in 1989, Asarco finished construction of a completely enclosed ore concentrates storage and handling building. During the early 1990s, emission controls for the acid dust handling and conveying system, the dross plant ventilation system, blast furnace ventilation system, and the sinter building ventilation system were updated. As a result, in 1998 and 1999 the Asarco smelter achieved the National Ambient Air Quality Standard for lead of 1.5 ug/m^3. These changes reduced the quantity of fine particulates from the smelter. ATSDR stressed the importance of these reductions in their Health Consultation report.

With achievement of initial goals, the newly-established Lead Education and Abatement Program, housed in East Helena, together with Asarco, EPA, MDEQ and a small group of local resident advisers, began to consider that a new goal was within reach; namely, to reduce exposures further, to the point where no child in East Helena would have a blood lead value above 10 ug/dl and the majority of them would be below 4 ug/dl.

Table 7-5 shows the number and fraction of children with blood lead values above 4 ug/dl as a function of year. The table shows a decrease from 2000 to 2002 in the percentage of children with blood lead levels greater than 4 ug/dl. Prior to 2000, there were greater percentages of children with blood lead levels greater than 4 ug/dl. The most plausible explanation for this observation is the shutdown of the Asarco operations and smelter in 2001.

The shutdown of the smelter in 2001 also corresponds to the period when the maximum blood lead values measured in East Helena's young children dropped from 14 – 16 ug/dl to less than 10 ug/dl (see Figure 7-1), and the number of children with blood lead levels greater than 10 ug/dl dropped to zero for the first time. Both the original source for the fine particulate pathway and the opportunity for smelter workers to inadvertently bring dust home ceased at this time.

In 2001, the mean air lead concentrations at the Prickly Pear air station dropped from 1.02 ug/m^3 to 0.08 ug/m^3. This association between children's blood lead levels and the corresponding decrease in air lead concentrations with the smelter's shutdown is consistent with an understanding of the importance of the historic airborne fine dust particulate pathway to those blood lead levels that were so significantly elevated.

An additional potential exposure pathway, inhalation and ingestion of household dust, was more of a concern when the smelter was operating. More recently, the Lead Education and Abatement Program environmental assessments indicate that inhalation and ingestion of indoor dust is no longer a significant exposure pathway. The County's assessments included inspection for lead-based paint with a field portable XRF and general screening evaluations for dust, including the collection of wipe samples according to the Health and Urban Department (HUD) protocol, but biased with respect to location. Results from the dust samples were compared against HUD criteria for samples collected from floors (40 ug lead/ft^2), windowsills (250 ug lead/ ft^2), and from window troughs (400 ug lead/ ft^2). Of the approximately 150 assessments and follow-up dust analyses, only 6 to 7 have showed lead concentrations in dust higher than the HUD criteria that could not be associated with suspected lead-based paint.

The low blood lead levels in East Helena and the results of the environmental assessments suggest that lead in household dust is no longer considered a significant exposure hazard in East Helena. However, home repairs or remodeling that opens up attics, basements, heating ducts, or outside walls and windows may raise previously isolated dust that could increase the risk of exposure to lead in the home. This possibility supports the continuation of the community-wide education program, one of the purposes of which is to inform the public of circumstances such as this, and the need for environmental assessments as part of that program.

Since 2001, 95% of children tested had levels at 4 ug/dl or below. The second set of goals, more protective than the first, was achieved. East Helena children's blood lead levels now surpass all national and local goals for lead sites. Nevertheless, EPA believes that yet another, more stringent and protective set of objectives and goals are achievable by implementation of the remedy identified in this ROD.

8.2.2 Final Remedial Objectives and Goals

As of the end of 2008, soil lead levels of an estimated 24 existing residential yards and their adjacent unpaved street aprons and alleys, as well as large tracts of surrounding undeveloped land, continue to exceed levels deemed safe for children in residential settings. Although children do not currently reside at these locations, property ownership changes and development of undeveloped lands are occurring at a rapid pace. Children will sooner or later reside at these locations. Accordingly, the remedial action objectives for the Site are as follows:

- Continue to have no child in the East Helena area exhibit a blood lead concentration greater than 10 ug/dl;
- Continue the Lead Education and Abatement Program and continue to seek ways to improve its effectiveness and outreach;
- For the Lead Education and Abatement Program: maintain 95% or more of the children at or below 4 ug/dl blood lead and the average blood lead concentration for area children at a level less than the national average for children less than 7 years old (the national average is approximately 1.7 ug/dl at the time of this ROD);

- For human receptors in existing residential areas, prevent direct contact/ingestion with soil having concentrations in excess of the cleanup level of 1,000/500 ppm lead. Once cleanup is triggered by a section of the yard exceeding 1,000 ppm, all sections of the yard with concentrations of lead exceeding 500 ppm will be cleaned up;
- For human receptors in residential areas, prevent direct contact/ingestion with soil having concentrations in excess of the cleanup level of a yard average 100 ppm arsenic;
- Prevent recontamination of areas already cleaned up, such as from undeveloped areas that have not been cleaned up, or from buried soils or remodeling debris with residual lead levels above risk-based concentrations;
- Minimize wind-borne migration of lead into residential areas;
- Minimize exposures to livestock and wildlife;
- For undeveloped lands that may be used by workers (farmer, rancher, irrigator, commercial retailer, etc.) or recreational visitors, prevent direct contact/ingestion with soil having concentrations in excess of cleanup levels. For lead, these cleanup levels are 1,482 ppm for commercial workers and 3,245 ppm for recreational visitors. For arsenic, these cleanup levels are 572 ppm for commercial workers and 794 ppm for recreational visitors;
- For undeveloped areas that are proposed for residential development in the future, ensure that soil lead and arsenic concentrations do not exceed 500 ppm lead or 100 ppm arsenic. A lead cleanup level of 500 ppm for the remediation of undeveloped lands with fewer samples (than residential areas) allows undeveloped lands to be remediated at a cost less than the cost of sampling at a residential intensity.

The final remediation objectives are protective of existing residential areas by providing continuing cleanup of qualified properties, so that there can be full use of all existing residential areas with minimal risk to the area's residents, mainly young children. The remediation objectives are protective of the surrounding undeveloped lands, such that the current uses (primarily agricultural) can continue with minimal risk to humans, as well as livestock and wildlife. In addition, the remediation objectives and goals are protective of potential future residential development on currently undeveloped lands, such that the risks from lead and arsenic contamination in these soils will be reduced, if necessary, to acceptable levels prior to development for any anticipated use, including residential, recreational and commercial uses.

The remedial actions resulting from meeting the RAOs will address the risks posed to current and future human populations by the contact, ingestion, and/or inhalation of soil containing lead and arsenic.

SECTION 9

DESCRIPTION OF ALTERNATIVES

Alternatives for the Site were developed by identifying remedial technologies and process options which are applicable to metal contamination (primarily lead, and to a lesser extent, arsenic) in residential soils and undeveloped lands (mainly agricultural).

As of October 2008, the removal action has resulted in the cleanup of approximately 1405 properties. Of these, 718 were residential, 44 were commercial sites and public areas, 36 were vacant lots, and the remaining were road aprons, alleys, schools, parks, flood channels, and ditches. The cleanup alternatives discussed in this section are based, in part, on the successful cleanup demonstrated to date. The Removal Action conducted to date is fully discussed in Section 2.

The cleanup alternatives presented in this ROD are modified versions of those developed in Site feasibility studies. All of the cleanup alternatives presented herein, with the possible exception of the No Further Action alternative, are well suited to current Site conditions and capable of reducing Site risks to acceptable levels.

9.1 CLEANUP ALTERNATIVES FOR EXISTING RESIDENTIAL AREAS

The remaining residential-related areas to be cleaned up based on the 1,000/500 ppm cleanup level include approximately 24 existing residential yards, 9 vacant lots, and 40 sections of road aprons or alleys. EPA anticipates that these areas will be cleaned up in 2009 as part of the on-going Removal Action conducted at the Site.

Cleanup alternatives for residential areas were originally developed in the 1990 remedial investigation and feasibility study reports, and in a 1991 engineering evaluation and cost analysis report. The alternatives evaluated in detail in the original Site feasibility studies included no action, institutional controls (remedy protection measures), capping (covers), excavation, treatment, and disposal options. However, some of the these alternatives are no longer considered viable; due principally to the substantial amount of cleanup that has since occurred. In addition, feasibility and treatability studies conducted during the Removal Action have resulted in the elimination of some alternatives. For example, the original feasibility study considered disposal of excavated residential soils in a RCRA facility, as well as disposal in East Fields. Treatment of the East Fields soil and placement of excavated residential soils at East Fields has since been shown to be effective. Therefore, alternatives that incorporate many of the features of the original alternatives, but are relevant for current conditions have been evaluated. There are no "new" alternatives – all of the alternatives described below were included in the original feasibility studies.

The remedial alternatives for existing residential areas are:

- Alternative 1R—No Further Action

- Alternative 2R—Selected Soil Removal (1,000/500 ppm lead), Community Education, and Institutional Controls
- Alternative 3R—Selected Soil Removal (500 ppm lead), Community Education, and Institutional Controls

Each of these alternatives is described below, along with an approximate time frame for implementation, and the estimated cost. Net present value costs are presented so that alternatives can be accurately compared.

9.1.1 Alternative 1R - No Further Action

Capital Cost:	$0
Annual Cost:	$18,400
Total Cost:	$284,000 NPV (see Table 9-1 at the end of Section 9)
Time to Implement:	0 years

Under this alternative, no further action would be implemented, other than continuation of blood lead monitoring for children and limited environmental monitoring. Existing conditions would remain as they are, and the Lead Education and Abatement Program may or may not be kept intact, depending upon the availability of funds from other sources and a determination of need. EPA is required to evaluate this alternative against alternatives that require action. Costs are estimated for continuation of blood tests, soil monitoring, and preparation of a Five-Year Review Report.

9.1.2 Alternative 2R - Selected Soil Removal (1,000/500 ppm lead), Community Education, and Institutional Controls

Capital Cost:	$1.8M
Annual Cost:	$194,000
Total Cost:	$4.7 million NPV (see Table 9-1 at the end of Section 9) This cost is less than the cost for this alternative identified in the Proposed Plan. Because the Removal Action continued in 2007 and 2008, the number of residential properties currently requiring remediation is less than the estimate in the Proposed Plan.
Time to Implement:	1 to 2 years after EPA issues a Record of Decision

Under Alternative 2R, the remedy would consist of completing the residential soil cleanup according to protocols that are currently in place for the ongoing removal action. All remaining residential yards, vacant lots near residences, and unpaved areas such as streets and alleys within residential areas, that qualify under current protocols for the ongoing residential soil removal action, would be cleaned up. Yards and other properties within residential areas would qualify for cleanup whenever any one (or more than one) sampling section has soil lead concentrations above 1,000 ppm. Once a yard qualifies for cleanup, all other sections (or quadrants) that are above 500 ppm lead would also be cleaned up. Local governments would, when applicable, adopt and administer institutional controls to prevent or reduce recontamination of areas cleaned up, and protect response actions once implemented at the Site. The county-administered, community-wide education program, designed to monitor and protect children against exposures to residual lead would be continued for as long as Lewis and Clark County and stakeholders deem it to be necessary and beneficial.

The following details further define how Alternative 2R would be implemented, and how institutional controls play a role in the overall cleanup.

- Where soil sampling indicates that any section of a residential property has at least one section greater than 1,000 ppm lead, soil from sections greater than 500 ppm lead would be excavated, placed into dump trucks that can be covered, and hauled to an EPA-approved repository. Qualified yards where young children reside receive priority each construction season.
- Cleanup of those yards where the average soil arsenic concentration exceeds 100 ppm.
- Excavating soils to a depth of 18 inches, or to a depth at which all remaining lead concentrations, after excavation, are less than 500 ppm, whichever occurs first.
- Backfilling excavated areas with clean topsoil, generally mined from farmlands in the Helena Valley. Restoring the property to its pre-response action condition with sod, or reseeding, replacement of shrubs, and other actions.
- Excavating unpaved roads, alleys and aprons that are adjacent to qualified properties at the same time and under the same protocols.
- At this time, there are no properties in the existing residential areas with soils that are known to exceed the commercial and recreational visitor cleanup levels.
- Whenever blood lead tests of a child and a follow-up environmental assessment of a home by health professionals demonstrate that exposure to lead in the soils of that yard is responsible for a blood lead level above 10 ug/dl, then that yard qualifies for immediate remedial action regardless of the yard soil lead concentration.

This remedial action alternative is consistent with the the ongoing non-time critical removal action, which is being conducted pursuant to an AOC. EPA anticipates that all remaining properties eligible for cleanup will be completed by the end of 2009. Additional confirmation sampling will be conducted in 2009 and into 2010. This sampling may identify a limited number of additional properties that will require cleanup. An additional 24 residential yards and 9 vacant lots, as well as their adjacent unpaved roads, aprons and alleys, are assumed to qualify for cleanup under Alternative 2R. It is anticipated that approximately one to two years will be required to clean up all remaining qualifying residential properties after EPA issues a Record of Decision.

<u>Institutional Controls (Remedy Protection Measures) for Residential Areas</u>

Institutional controls for residential areas are measures that protect against exposure to contamination that remains in place after (or during) a cleanup. ICs also protect response actions once they are implemented at a Superfund site. ICs such as zoning regulations, deed restrictions, easements, and public education serve to limit use of reclaimed areas to acceptable activities or guide behavior to avoid exposure to lead that may exceed health-based levels. ICs guide behavior to avoid potential exposure to lead that may be in the soil at depth or lead in areas that have not been sampled or cleaned up.

In order for institutional controls to be an effective component of a remedy and protect the community, they must be practical, implementable and enforceable. EPA has worked closely with city, county and state governmental entities to develop such ICs for this site. And, during the final phases of this remedy, EPA will continue to work closely with these entities, with the expectation that they will eventually assume responsibilities for administering ICs that will conform to applicable ordinances or other local regulations, such as planning and zoning regulations.

The cleanup levels for lead and arsenic contamination in soil are considered protective for children and adults. Once cleanup levels have been achieved, residents can engage in their usual activities. Nevertheless, residual levels of lead will remain in place, sometimes in excess of safe levels for certain uses, beneath foundations, sidewalks and temporary structures, in unfinished basements or attics, and on undeveloped lands that surround the community. Institutional controls for residential, recreational, commercial and other developed areas community-wide are necessary because lead in the environment cannot be completely eliminated or contained, such as for those situations described below:

- Lead-contaminated soils remain in place beneath clean cover soils within residential portions of East Helena. Within the Prickly Pear floodplain, nearly all yard soils were removed to a depth of 18 to 22 inches, and replaced with clean cover soils.
- Despite all reasonable efforts to remove and replace lead-contaminated soils of all qualified yards, soils under decks and porches, sheds and garages, sidewalks, large trees, and other inaccessible areas cannot be removed without a significant increase in disruption to the resident.
- Surface soils of approximately 2,500 to 3,000 acres of undeveloped lands surrounding East Helena have lead levels that are currently not suitable for residential use, and may or may not be suitable for recreational or commercial uses. The question of whether and when these lands may be developed cannot be answered at this time. ICs, such as best management practices, are needed for the long term in order to prevent these soils from becoming a source of wind-blown contamination into residential areas.
- Commercial developments in and around East Helena require soil displacement, leveling, ground preparation, etc. These areas are commonly contaminated with lead above levels that are acceptable for sale or transport to other areas of the Helena Valley.
- Historical interior lead sources, such as dust under carpets, in heating ducts, attics, and earthen basements may present a potential for exposure when renovation or demolition is conducted.
- Exterior (and possibly interior) lead-based paint of older homes may peel off and recontaminate areas previously cleaned up. Educational efforts, such as periodic reminders to homeowners to inspect their homes, followed by in-home environmental assessments conducted by health professionals (at no cost to the homeowner) have proven to be an effective IC.

Institutional Controls are often referred to as remedy protection measures. They may be implemented by a governmental entity, by a private property owner, or by a combination of the two. Governmental ICs, for example, may create restrictions such as building codes, permits or zoning regulations to be administered by the appropriate local agencies. Proprietary controls, either private, governmental, or a combination of the two, typically involve landowner agreements or easements that restrict certain activities on the property.

Under Alternative 2R, local governments, would, when applicable:

- adopt and administer local regulations designed to prevent or reduce recontamination of areas already cleaned up;
- adopt and administer regulations that require, or policies that encourage, coordination of planning and zoning efforts (East Helena city government, Lewis and Clark City-County Board of Health, L&C County Planning Department, L&C County Commission);
- adopt and administer local use and permitting requirements;
- continue to provide oversight of cleanup activities and monitor areas previously cleaned up; and
- administer restrictions and requirements at the EPA-approved soils repository.

Deed notices or similar proprietary ICs may be required for areas where wastes were capped and left in place, where engineered controls were constructed, or where other discrete wastes are left in place. Such notices will tell current and subsequent landowners of the presence of these wastes or engineered controls, and ensure that the wastes are not disturbed. In addition, fencing and signs may be used to protect the integrity of caps and engineered controls. When EPA considers such actions, the Agency will be careful to avoid negative impacts on the neighborhood or community.

If necessary, city and county zoning and permit requirements may be implemented to clearly identify capped or covered areas and to see that soil excavated from these areas is properly handled and disposed. ICs will inform residents who conduct remodeling activities that there may be a risk of exposure to lead in household dust, and of mitigation measures they can take.

Community Education Program

The East Helena Lead Education and Abatement Program is an important part of the ICs component of the overall remedy. The county-administered, community-wide education program, designed to monitor and protect children against exposures to residual lead would be continued for as long as Lewis and Clark County and stakeholders deem it to be necessary and beneficial. The program, through its presence, visibility, oversight, and responsiveness to community concerns, provides a comfort level to the community that the risk posed by lead is being assessed and managed appropriately.

The primary role of its staff of health professionals is to conduct the educational component within the community and supervise blood lead testing for children. However, the Lead

Education and Abatement Program also acts as a liaison for other city, county or state governmental entities that administer or enforce ICs (e.g., subdivision review, which may or may not require sampling, and approval). EPA will continue to work cooperatively with the city, county and state to ensure that workable and adequate permit requirements are enacted and administered. EPA recognizes that local growth policies and ordinances, including zoning, may be used as effective ICs.

9.1.3 Alternative 3R—Selected Soil Removal (500 ppm lead), Community Education, and Institutional Controls

Capital Cost:	\$42 M (over 6 years)
Annual Cost:	\$194,000
Total Cost:	\$40.3 million NPV (This is less than the capital cost because the capital cost was assumed to be over 6 years)
Time to Implement:	5 to 7 years after EPA issues a Record of Decision

Under Alternative 3R, the remedy would consist of completing the residential soil cleanup according to revised, more stringent protocols than are currently in place for the ongoing removal action. All remaining residential yards, vacant lots, and unpaved areas such as streets and alleys, that would qualify under the revised protocols, would be cleaned up. Local governments would, when applicable, adopt and administer institutional controls to prevent or reduce recontamination of areas cleaned up, and protect response actions once implemented at the Site.

Under this alternative, yards and all other properties, including unpaved streets, alleys and open areas within residential areas, would qualify for cleanup whenever the property average lead concentration is above 500 ppm. Once a property qualifies under this alternative, the entire property would be cleaned up.

The following details further define how Alternative 3R would be implemented, and how continuing education and institutional controls play a vital role in the overall cleanup.

- Where soil sampling indicates that a parcel of residential property has an average soil lead concentration greater than 500 ppm, all soils of that property are excavated, placed into dump trucks that can be covered and hauled to an EPA-approved soil repository.
- All unpaved roads, alleys, aprons, commercial areas, and vacant residential lots or open areas within residential areas, that have an average soil lead concentration above 500 ppm, are cleaned up.
- Cleanup of those yards where the average soil arsenic concentration exceeds 100 ppm.
- Soils are excavated to a depth of 18 inches, or until all remaining lead concentrations are less than 500 ppm, whichever occurs first.
- Clean topsoil, generally mined from farmlands in the Helena Valley, is used to backfill the areas from which soils are removed. Sod or reseeding, replacement of shrubs, and other actions are implemented in order to restore the property to its pre-response action condition.

- Whenever blood lead tests of a child and a follow-up environmental assessment of a home, performed by health professionals, demonstrate that exposure to lead in the soils of that yard is responsible for a blood lead level above 10 ug/dl, then that yard qualifies for immediate remedial action, regardless of the yard soil lead concentration.

It is estimated that approximately 900 yards, lots, and open areas would qualify for remedial action under Alternative 3R. This estimate has some associated uncertainty because all existing residential properties within a radius of approximately 2.5 miles from the smelter would require pre-sampling. Extensive additional pre-sampling and the estimated number of properties that are likely to qualify under Alternative 3R result in an estimated time of construction of 5 to 7 years, after a Record of Decision is issued by EPA.

Under Alternative 3R, institutional controls would be necessary for all the reasons that they are necessary under Alternative 2R. The institutional controls discussed for Alternative 2R apply equally to Alternative 3R. Although more areas would be cleaned up under this alternative, extended construction times and the same concerns regarding residual levels of lead that exist for any of the other alternatives also exist for Alternative 3R (remaining lead at depth, wind-blown dust from undeveloped lands, residual levels of lead in attics and roof shingles, soil beneath ground structures, and lead-based paint among other).

Similar to Alternative 2R, the county-administered, community-wide education program, designed to monitor and protect children against exposures to residual lead would be continued for as long as Lewis and Clark County and stakeholders deem it to be necessary and beneficial.

9.2 UNDEVELOPED LANDS SURROUNDING EAST HELENA AND THE SMELTER

The former smelter, City of East Helena and neighboring subdivisions are surrounded by undeveloped lands, primarily agricultural lands. Lead, and to a lesser extent arsenic, are the contaminants of concern for future residential development. Current risks to grazing livestock and wildlife are low. Careful land management—best management practices—provide adequate protection from overgrazing, which in turn prevents or reduces wind-blown erosion and over-exposure to grazing animals.

Soils as much as 2 to 3 miles from the smelter may contain lead levels ranging from 500 to 1,000 ppm. It will be necessary to perform additional sampling to determine the concentration and extent of contamination in the soils at individual sites prior to any cleanup decision for lands within these agricultural areas.

Undeveloped lands are being developed, and proposed for development, in the vicinity of East Helena. As these lands become developed, particularly for residential purposes, the levels of lead become a matter of concern. Much of the undeveloped land shown in Figure 5-6, within the outer isopleth, and some beyond, would likely require some remedial action prior to being developed for residential purposes. These include agricultural lands, areas adjacent to water-spreading ditches and channels, and large residential yards. Remedial action may or may not be necessary if the proposed new land use is recreational or commercial. For lands that are undeveloped (or agricultural), a proposed new land use is considered to occur when an application for residential or commercial development is made to the city and/or county.

No one can accurately predict which undeveloped lands may be developed next; when they might be developed; or what the new use might be. Therefore, the cleanup alternatives for undeveloped lands were assembled in recognition of that uncertainty. They were also developed in recognition of features unique to undeveloped lands. The following features of undeveloped land are defined in order to guide remedial decisions that will be consistent with the current or possible future use:

- Farm or range lands and open spaces, generally within 2 to 3 miles of the smelter, which may be developed in the future. The majority of these lands around East Helena produce grain crops or are used for livestock grazing, but are being developed for residential purposes at a rapid rate;
- Areas generally north of East Helena, within the Prickly Pear Creek flood zone, where water-conveying ditches and channels are common. High concentrations of lead and arsenic found in these ditches and channels are thought to have been transported, during floods, from outdoor piles of concentrates on the smelter grounds. Residences have been constructed, and will continue to be constructed, on or near these ditches and channels. While many were cleaned up during the mid-1990s, additional ones will require some remedial action as residential development continues in this area. Cleanup of this area will be decided on a case-by-case basis, depending upon sampling results, proximity to residences, and the estimated risk of exposure under current conditions;
- Areas along the railroad right-of-way, particularly between the tracks and the nearby residences of Manlove Addition. Sampling along the railroad right-of-way revealed comparatively high levels of lead and arsenic, indicating that concentrates were spilled or unloaded here. The right-of-way and adjacent areas are not likely to be developed for other purposes in the future. However, they are believed to pose risks for children who ride bicycles or play between the Manlove Addition and the tracks. Cleanup will be required of the entire length of the railroad right-of-way from where Wilson Ditch passes underneath Hwy 12 west of town, to East Gate subdivision, east of town to provide protection from risk of exposure;
- Although the rodeo grounds were originally part of OU2 they are now being addressed under the 1998 RCRA Decree, and therefore are not included within this remedy; and
- The East Fields soil repository. The East Fields are located east of the smelter and are currently owned by Asarco. They encompass an area of approximately 160 acres and have been used since 1991 as a repository for soils excavated as part of the removal action. Prior to becoming the repository the severely contaminated East Fields were treated with lime by means of deep plowing. Once treated, soils excavated during the removal action, being rich in organic matter, were land applied (18 inch lifts) over the treated areas. As of 2009, most of the 160 acre area has received removed soils, has been revegetated and supports livestock grazing and wildlife use. Long-term administration of institutional controls will assure the proper management of this repository.

9.3 CLEANUP ALTERNATIVES FOR UNDEVELOPED LANDS

On undeveloped lands proposed for development in the future some remedial action would be required if lead or arsenic levels in soils exceed the concentrations identified in the RAOs. For development as residential use, the concentrations shall not exceed 500 ppm lead or 100 ppm arsenic.

Undeveloped lands surrounding East Helena exhibit very little variability. This fact, combined with EPA's preference for in place treatment of undeveloped lands (see ensuing sections) that require some form of remediation to accommodate a new land use, substantially reduces uncertainty. Post-treatment soil lead concentrations as low as 100 to 300 ppm lead can be readily achieved by means of in-place treatment, at a cost that is approximately one-tenth the cost of other alternatives for undeveloped lands and less than one-tenth the cost of cleaning up yards in existing residential areas. The cost associated with bringing undeveloped lands easily into conformance with residential standards ($4,800 per acre) is a more effective use of funds than would be requiring an equivalent sum of money, or significantly more money, to subject undeveloped lands to the same sampling requirements as is necessary for developed residential properties, and then still have to be remediated.

The undeveloped land areas remaining to be cleaned up include approximately 7 acres of railroad track right-of-way, approximately 1.8 acres of flood channels and ditches north of East Helena, and undeveloped privately-owned lands undergoing a change in land use.

Remedial alternatives for undeveloped lands were originally presented in the 1990 Site feasibility studies. The alternatives evaluated in detail in the original Site feasibility studies included no action, institutional controls (remedy protection measures), capping (covers), excavation, treatment, and disposal options. Some of the alternatives developed at that time, however, are no longer considered viable due principally to the substantial amount of cleanup that has since occurred. In addition, the results of feasibility and treatability studies conducted during the Removal Action have eliminated some alternatives. For example, treatments of the East Fields and placement of excavated residential soils at East Fields have since been shown to be effective. Therefore, alternatives that incorporate many of the features of the original alternatives, but are relevant for current conditions, have been evaluated. There are no "new" alternatives – all of the alternatives described below were included in the original feasibility studies.

The alternatives for the undeveloped lands are:

- Alternative 1U—No Further Action
- Alternative 2U—Soil Removal and Replacement
- Alternative 3U—Capping
- Alternative 4U—In-Place Treatment

The cost and time to implement each of the alternatives can be estimated only for specific undeveloped areas—particularly the areas with ditches and channels and the railroad right-of-way. It is not possible to estimate costs or time to implement cleanups for the majority of undeveloped lands, which may or may not be developed in the future. This is because the specific lands that will be developed, the type of development that will occur, and the time when development might occur are unknown. Therefore, present worth costs have been estimated only for the ditches and channels and for the railroad right-of-way. The estimated costs for developing all other lands are presented on a per-acre basis, and at 2008 prices. Costs for each of the cleanup alternatives for undeveloped lands are summarized in Table 9-1.

9.3.1 Alternative 1U—No Further Action

Capital Cost: $0
Annual Cost: $7,700
Total Cost: $118,000 NPV (see Table 9-1 at the end of Section 9)

Under this alternative, no further action is implemented. Existing conditions would remain as they are on undeveloped lands. There would be no requirement to sample undeveloped lands or to evaluate whether or not a cleanup may be needed before development. It is possible that local or state government could impose restrictions on future land use changes, or not allow development at all on these mainly agricultural lands and open spaces. Costs are estimated for limited administrative and five-year review tasks.

9.3.2 Alternative 2U—Soil Removal and Replacement

Capital Cost: $4.6 M
Annual Cost: $30,000
Total Cost: $4.8 million NPV (estimated cost for ditches and railroad right-of-way)
Estimated Cost for Future Developments: $40,700/acre (capital cost) (see Table 9-1 at the end of Section 9)

Cleanup of undeveloped lands under Alternative 2U consists of excavation, generally by means of heavy equipment, such as large scrapers or dozers and track hoes. Excavation continues at depth until all sample results indicate that surface or near-surface soil concentrations are less than the cleanup levels for the proposed new use. For proposed residential development, for example, it is expected that 8 to 12 inches of soil will need to be removed in order to reduce lead concentrations to below 500 ppm. The removed soils are loaded into haul trucks that can be covered, and are then taken to an EPA-approved repository, or are managed on site. Clean replacement topsoil, mined from farmlands in the Helena Valley, is hauled to the site and stock-piled until the new developments are ready for backfill.

In certain limited cases, such as for new commercial developments, lesser amounts of replacement soil or possibly no topsoil would be needed. Replacement fill other than topsoil in commercial developments may be more cost-effective and produce fewer environmental consequences than stripping farmland topsoil for use as backfill.

Cleanup along the railroad right-of-way and ditches and channels under this alternative consists of removal of 12 to 18 inches of surface and near-surface soil, with disposal at an EPA-approved repository, or management on site. Cleanup is expected within two years of the issuance of the Record of Decision. Cleanup of the entire length of the railroad right-of-way from where Wilson Ditch passes underneath Hwy 12 west of town to East Gate subdivision east of town is required to provide protection from risk of exposure. Clean replacement topsoil, mined from farmlands in the Helena Valley, may be used as backfill. The mean lead concentration of topsoil mined from the north Helena Valley is about 60 ppm. The backfill soil is revegetated.

Following development, institutional controls and monitoring will be implemented and administered by the Lewis and Clark County Planning and Zoning Commission and the Lead Education and Abatement Program, similar to the institutional controls identified for the existing residential areas.

9.3.3 Alternative 3U—Capping

Capital Cost: $800,000
Annual Cost: $30,000
Total Cost: $1.2 million NPV (estimated cost for ditches and railroad right-of-way)
Estimated Cost for Future Developments: $36,400/acre (capital cost) (see Table 9-1 at the end of Section 9)

Under Alternative 3U, cleanup of undeveloped lands in the future would consist of a cap, or cover, over surfaces that do not meet remedial goals for the intended new use. Caps do not reduce the concentrations of metals or arsenic in the soil; however, they do provide a barrier to exposures that would otherwise occur. Caps may be a layer of soil, or gravel, or pavement placed over the surface of the undeveloped area. The pathway for exposure is therefore interrupted.

Capping can be a cost-effective alternative and can be protective when the intended new use is industrial, commercial, or recreational. In these cases, because exposure is limited, the thickness of the cover material can be as little as a few inches yet still provide an effective barrier. Soccer fields or baseball and softball fields could be constructed over some undeveloped lands surrounding East Helena with little preparation but leveling and a few inches of cover soil and vegetation. Capping reduces or eliminates the need for extensive alteration of the land and hauling removed soils to a soil repository.

Capping is rarely used in areas where the intended new use is residential. The few known examples of capping for future residential areas require a cap that is at least 24 to 48 inches thick. That usually results in capping becoming more costly than other alternatives suited to the future use. Capping is also not a suitable alternative in areas that are subject to periodic erosion by flooding, such as in or near an active flood plain or along drainage ditches or water conveyance channels.

Following development of lands capped, or covered under Alternative 3U, institutional controls and monitoring would be implemented similar to Alternative 2U.

9.3.4 Alternative 4U—In Place Treatment

Capital Cost: $4,400,000
Annual Cost: $30,000

Total Cost: $4.8 million NPV (estimated cost for excavation and disposal of ditches and railroad right-of-way)

Estimated Cost for Future Developments: $4,800/acre (capital cost) (see Table 9-1 at the end of Section 9)

Under Alternative 4U cleanup of undeveloped lands undergoing a change in use in the future would consist of deep tillage of the surface and near-surface soils and simultaneous application and incorporation of lime and other soil amendments. Highly specialized plows that mix, rather than turn over the soil, are used in this innovative technique. Multiple, perpendicular passes of the plow ensure mixing and incorporation of the amendments. This technique is also known as in-situ treatment of soils.

In-place treatment can be most successfully applied when the surface soil (i.e., 0 to 4 inches or 0 to 6 inches) concentrations of lead or arsenic are above acceptable levels for a new use, but the subsurface soil concentrations of the same contaminants are significantly lower or near natural levels. This remedial alternative does not remove contaminants from the soil, but reduces their concentrations to levels that are safe and protective for the new use.

Amendments, such as lime, organic matter, phosphorus, and fertilizers can be incorporated into the soils at the time of deep tillage. These amendments render lead less mobile in the soil and less bio-available. In some soils, lime enhances arsenic mobility. However, the concentrations of arsenic found in soils of undeveloped lands that are likely to be changed to residential development are low under existing conditions.

Under Alternative 4U, neither excavation nor replacement of soil is required in undeveloped areas. Therefore, there is no need for large numbers of haul trucks or heavy equipment. There is no need for a repository because no soil would be excavated. And, there is no need for mining large areas of productive farmland topsoil to be used as replacement fill. Implementation costs are a fraction of the implementation costs required for other remedial alternatives.

Most undeveloped lands that are likely to be developed in the future for residential and commercial uses, near East Helena, are well-suited to in-place treatment. In-place treatment can readily be implemented in large open areas being prepared for residential development. The after-treatment lead concentrations of most of these lands would be in the range of 100 to 300 ppm. Once lands are developed they will be subject to institutional controls already in place for similar use areas as described in Section 9.3.5.3.

This alternative includes cleanup of the railroad right-of-way, and ditches and channels, by excavation and disposal, not tilling.

9.3.5 Elements Common to All Action Alternatives for Undeveloped Lands

The following are elements common to all of the alternatives for undeveloped lands, with the exception of Alternative 1U—No Further Action.

9.3.5.1 Institutional Controls for Agricultural Lands

Institutional controls for existing agricultural lands are required until such time as these lands are developed for other purposes, at which time the ICs for developed lands would apply. Institutional controls would be designed to maintain and improve appropriate Best Agricultural Management Practices (BAMPs). The best management practices program would be primarily an educational program and would be implemented in concert with the residential Lead Education and Abatement Program. The BAMPs will reduce the possibility of wind-blown soil, and reduce the low-level risks to livestock and wildlife discussed in Section 7.2 on ecological risk assessment. Because best management practices would be different for farmlands than for rangelands, the program would have two different educational components.

The majority of the farmlands around East Helena are planted with grain, primarily wheat and barley. The education program for lands within 2 to 3 miles of the smelter would encourage the following, primarily to reduce the creation of fugitive dust:

- Minimum tillage practices. Rather than tilling with standard plows and discs, tilling would be accomplished with chisel bars and by only a single tillage pass. The chisel bars till soil only about 1 inch deep and reduce the disturbance of the soils; and
- Minimize autumn burning and tilling. Rather than burning or turning under the stubble after the autumn harvest, stubble should be allowed to remain in the fields over the winter. This will tend to hold the soil and reduce winter dust production. For winter wheat (which requires autumn tilling) minimize the time between tilling and planting to encourage plant cover as soon as possible in the autumn.

For rangelands, the following best management practices would be encouraged, primarily through careful livestock grazing and the avoidance of overgrazing:

- Adequate amounts of vegetative cover should be promoted and maintained, including standing plant material and litter, to support infiltration, maintain soil moisture storage, and stabilize the soils;
- Subsurface soil conditions that support permeability rates appropriate to climate and soils should be promoted; and
- The opportunity for seedling establishment of appropriate plant species when climatic conditions and space allow should be promoted.

Range and farmlands should be inspected periodically to identify areas where improvements in management practices are possible. The inspection program should consist of the following:

- An on-the-ground inspection by a team of agricultural specialists, including soil scientists, range scientists, farm scientists, and regulatory personnel will periodically survey the lands for ground cover, tillage practices, grazing rotations, etc.;
- Contact with the owners of any properties where management practices can be improved; and
- Encouragement of improvement in management practices and distribution of educational materials on the most current best practices.

9.3.5.2 Institutional Controls When Undeveloped Lands are Proposed for Development.

When areas are developed for residential, commercial, or recreational uses, institutional controls will be extended to these areas, consistent with those ICs already in place for similar use areas, including requirements for the handling and disposal of contaminated soils.

Government ordinances and permit programs administered by the Lewis and Clark County, L&C County Health Department and the City of East Helena will apply to future developable areas where metal concentrations are known to or are likely to exceed one or more future anticipated use cleanup levels, as set forth in this ROD. If soil concentrations of lead or arsenic exceed these cleanup levels, the administrator of these ICs will work with the developer or landowner to facilitate cleanup any actions that may be needed to accommodate the new land use. Limited funding may be available to assist developers in further characterization of the property to be developed. If such funding assistance is not available, however, the ICs administrator will advise the developer or landowner of voluntary options allowed in accordance with this ROD for treating, capping, or removing soil that exceeds the cleanup level for the new use.

Developers or landowners seeking to change the use of undeveloped land, such as from agricultural to residential, recreational or commercial, will be required to meet all standards for the new use. These standards may include:

- Coordination between the planning and zoning staff in Lewis and Clark County and the city of East Helena and the Lead Education and Abatement Program to assist developers and their contractors in understanding regulations governing development in areas with elevated lead and arsenic;
- Soil sampling prior to development to determine the extent and concentrations of lead and arsenic in soils;

    Lead concentrations in soils of undeveloped lands surrounding East Helena exhibit very little variability, which reduces the need for intense sampling. In addition, remediation of open undeveloped lands can be readily achieved at significantly lower costs than residential methods by methods that are not possible to implement in residential confined spaces. Furthermore, costs for remediation of undeveloped land are less than the cost of sampling these areas at the same intensity as residential areas. Requiring a lead cleanup level of 500 mg/kg for the remediation of undeveloped lands with fewer samples is consistent with residential standards and allows undeveloped lands to be remediated at a cost less than the cost of sampling at a residential intensity. However, any property owner or developer who may be developing lands into a residential use may propose a sampling protocol and intensity consistent with existing residential use

- Where there are unacceptable levels of lead or arsenic in the soils of areas to be developed, requirements for cleaning up the affected areas prior to development;
- Protocols for sampling soils after cleanup to determine whether the cleanup was effective and that development can proceed; and

- Appropriate management of any excavated soils. Soil will be disposed of at an EPA-approved repository. Access to the repository for soils removed by developers or landowners in the future will be provided on an as-needed basis

This ROD makes it possible for developers to move ahead and bear the cost of development, including any environmental assessments or actions. Given EPA's preference for in-situ treatment in preparing undeveloped land for residential use where it can be shown to be effective, developers and landowners have some control over their own investments.

It is anticipated that the Lewis and Clark County Health Department and the City of East Helena, with assistance as necessary from an ICs administrator, EPA and MDEQ, will manage the ICs program for soil in residential and commercial areas and currently undeveloped lands. Local involvement will help ensure the implementation and enforceability of such ICs. The performance and adequacy of the institutional controls will be reviewed by EPA on a periodic basis, such as during mandatory Five-Year Reviews.

9.3.5.3 Community Education and Institutional Controls Following Development

The county-administered, community-wide lead education and abatement program, designed to monitor and protect children against exposures to residual lead would be continued for as long as Lewis and Clark County and stakeholders deem it to be necessary and beneficial. The program is described in the discussion of Alternative 2R, as well as in Section 5. The program, through its presence, visibility, oversight, and responsiveness to community concerns, will help maintain a level of comfort in the community that the risk posed by any lead remaining at the Site is managed appropriately.

The program provides broad-based public education, in homes, day-care centers and schools, focusing on nutrition, hygiene, continued health monitoring (blood lead testing) of children, "safe play" programs, and continued risk reduction. The program also provides education to residents about the need to avoid areas with elevated soil lead levels and maintaining soil and sod barriers. In addition, the program provides information to purchasers and sellers of property, lending institutions, and realtors about site-wide and individual property-specific conditions. Finally, the program promotes environmental assessments in homes, including soil, dust, water and paint sampling to identify all sources of and pathways for lead exposure. These assessments are done at no cost to the homeowner.

Table 9-1. Estimated Costs for Remedial Alternatives[1]

Alt. No.	Description	Capital Costs	Annual Costs	Present Worth Costs	Capital Costs for Lands to be Developed in the Future (per acre basis)
	Residential Areas				
1R	No Further Action	$0	$18,500	$284,000	
2R	Selected Soil Removal and Disposal (1,000/500 ppm lead), Community Education and Institutional Controls	$1,800,000	$193,9000	$4,700,000	
3R	Selected Soil Removal and Disposal (500 ppm lead), Community Education and Institutional Controls	$42,000,000	$193,900	$40,300,000	
	Undeveloped Lands				
1U	No Action	$0	$7,700	$118,000	$0
2U	Soil Removal and Disposal	$4,400,000	$30,000	$4,800,000	$40,700
3U	Capping	$800,000	$30,000	$1,200,000	$36,400
4U	In Place Treatment (Deep Tilling and Amendments)[(2)]	$4,400,000	$30,000	$4,800,000	$4,800

(1) At the time of preparation of this Draft Final ROD, the most recent costs are being obtained for excavation, disposal, transportation, sod, and fuel. Final costs will be provided in the Final ROD.
(2) The capital cost reflects the cost for remediation of ditches and railroad right-of-way. This cost is based on excavation and disposal. The future cost (per acre basis) is for in place treatment.

SECTION 10

SUMMARY OF COMPARATIVE ANALYSES OF ALTERNATIVES

The National Contingency Plan requires that each remedial alternative analyzed in detail be evaluated according to specific criteria. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of remedies offering the most effective and efficient means of achieving site cleanup goals. Feasible remedial alternatives are evaluated against nine criteria, as described below.

Threshold Criteria

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Primary Balancing Criteria

- Long-term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment
- Short-term Effectiveness
- Implementability
- Cost

Modifying Criteria

- State acceptance
- Community acceptance

The first two criteria, overall protection of human health and the environment, and compliance with regulations (called ARARs), are considered threshold criteria. Threshold criteria must be attained by the action selected for implementation. The next five criteria, short- and long-term effectiveness, treatment, implementability and cost, are considered balancing criteria. Balancing criteria permit tradeoffs to achieve the best overall cleanup solution. The last two criteria, state and community acceptance, are considered modifying criteria. They are last, but not because they are least important. Rather, comments and concerns expressed by the State and affected communities are important. EPA can modify a preferred remedy based on state and community input.

The comparison of alternatives with respect to these criteria is discussed below.

Evaluation Criteria for Superfund Remedial Alternatives
Overall Protection of Human Health and the Environment examines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering, treatment, or combinations.
Compliance with ARARs examines whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the Site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value.
State/Support Agency Acceptance considers whether the state agrees with the EPA's analyses and recommendations.
Community Acceptance considers whether the local community agrees with EPA's analyses and recommendations. Comments received on the Proposed Plan are an important indicator of community acceptance.

10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

The No Further Action Alternatives (1R and 1U) ultimately would not provide overall protection of human health. As residential properties change hands, it can be reasonably assumed that families with small children will move into residences with yards that have not yet been cleaned up. Likewise, many undeveloped areas surrounding East Helena have elevated levels of lead, and in some instances arsenic. As these areas are developed over time, it can be assumed that families with small children will move into areas where the soils have not been cleaned up. In addition, the elimination of the Lead Education and Abatement Program, should that occur, would lower the awareness of residents, who may revert to behaviors that increase the risks from residual levels of lead.

For existing residential areas, all of the action alternatives would reduce the potential of lead exposure by lowering surface soil concentrations. Alternative 2R and 3R are considered equally protective because Site data do not suggest any differences. These considerations include the importance of the airborne fine particulate pathway in contributing to blood lead levels, residual lead levels in sources other than soils, pre- and post-cleanup exposure unit average soil lead levels, community-wide long-term blood lead data, and no detectable correlation between soil lead concentrations and co-located blood lead concentrations (at soil concentrations < 1,000 ppm). These data indicate that Alternatives 2R and 3R are equivalent in terms of overall protection of human health and the environment. Additionally, implementation of remedy protection measures would reduce recontamination of areas cleaned up, and reduce the likelihood of exposure to lead in undeveloped lands. The ongoing Lead Education and Abatement Program, which is important to any course of action selected, is a component of both alternatives.

Depending upon the type and location of non-residential future use of undeveloped lands, such as for commercial, recreational, or industrial use, any of the three action alternatives (2U, 3U, 4U) can provide adequate protection of human health. For the undeveloped areas, Alternatives 2U and 4U are considered equally protective because both alternatives will meet the specified cleanup levels. Alternative 3U, capping, is the least protective of the alternatives because high concentrations of lead remain beneath the cap. In all three cases, residual levels of lead will remain in the soils above natural levels.

10.2 Compliance with ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA §121(d)(4). Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes or provides a basis for invoking a waiver.

Applicable requirements are those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

The NCP Final Rule for CERCLA defines relevant and appropriate requirements as those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate.

In addition to applicable or relevant and appropriate requirements, the NCP provides a list of federal non-promulgated criteria, advisories and guidance and state standards "to be considered" (TBC).

EPA evaluated the alternatives in terms of compliance with ARARs. All of the action alternatives can be implemented in ways that would meet federal and state regulations and requirements. The no action alternative is not expected to meet ARARs. ARARs for East Helena are provided in Appendix C.

10.3 Long-term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on site following remediation and the adequacy and reliability of controls.

The No Action Alternatives (1R and 1U) would not be effective in the long term. As existing residences change ownership, or as development occurs on undeveloped lands, families with small children will enter the picture and they would risk being exposed to elevated lead concentrations. The possible elimination of the Lead Education and Abatement Program would lower the awareness of residents, who may revert to behaviors that increase the risks from the remaining lead and arsenic.

For existing residential areas, Alternatives 2R and 3R are rated essentially equivalent in terms of long-term effectiveness and permanence because soil removal and replacement has proven effective in residential areas. Alternatives 2R and 3R are considered equivalent in terms of long-term effectiveness and permanence based on residual lead levels in sources other than soils, pre- and post-cleanup exposure unit average soil lead levels, community-wide long-term blood lead data, and no detectable correlation between soil lead concentrations and co-located blood lead concentrations (at soil concentrations < 1,000 ppm). Additionally, implementation of remedy protection measures would reduce the potential for recontamination of areas cleaned up, and reduce the likelihood of exposure to lead in undeveloped lands. The ongoing Lead Education and Abatement Program, which is important to any course of action selected, is a component of both alternatives.

For undeveloped lands proposed for residential development, Alternative 2U is rated highest. Removal and replacement (2U) would be more permanent than either capping (3U) or in-place treatment (4U) at the point that property is being developed. However, excavated soils would be placed elsewhere (EPA-approved soil repository) which require long-term management. In all cases, however, residual levels of lead will remain above natural levels. Depth of removal and replacement must be sufficient to achieve levels less than 500 ppm lead, whereas in-place treatment can achieve levels significantly less than 500 ppm lead. The surface soils (backfill) of removed and replaced areas will have lower lead concentrations than surface soils of treated areas.

Long-term effects associated with the removal/replacement and capping alternatives include the environmental consequences of mining, or stripping farmland topsoil from the north Helena Valley. As the area and depth of removal increases, so does the area and depth of removing high quality topsoil from productive agricultural areas. These mined areas become more prone to weed infestations and prone to the loss of remaining subsoil due to erosion. Thus, in-place treatment is rated higher than either removal/replacement or capping in terms of land disturbances and associated environmental consequences.

10.4 Reduction of Toxicity, Mobility, and Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

The No Action Alternatives (1R and 1U) for both the residential areas and the undeveloped lands would do nothing to reduce toxicity, mobility, or volume of hazardous substances at the Site.

For existing residential areas, removing and relocating the soils with elevated lead and arsenic, as described under Alternatives 2R and 3R, would not reduce the toxicity, mobility, and volume of metal contaminants available for human exposure. Although soils are being excavated and removed from the immediate point of possible human exposure, they are not being treated in any form, and will contain the same level of toxicity, mobility, and volume is present at the end point of disposal (an EPA-approved repository). These alternatives are rated essentially equivalent against this criterion.

For undeveloped areas, Alternative 4U (in place treatment) is rated higher than the other alternatives because it would reduce the volume of soil that contains concentrations of lead above cleanup levels, and the mobility of lead is also reduced. Alternatives 2U and 3U would not reduce toxicity, mobility, or volume. Alternative 2U (excavation and disposal) results in the material being moved and placed elsewhere, and Alternative 3U (capping) simply renders the volume of affected soils virtually inaccessible.

10.5 Short-term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

The No Action Alternatives (1R and 1U) would provide some limited effectiveness in the short term, since most of the residential yards of the at-risk population have been replaced and because the exposure risk in undeveloped areas is currently low. However, as the population distribution changes over time, more families will likely move into areas requiring a cleanup, which may increase the risk of elevated blood lead levels among those children.

For residential areas, Alternative 2R is rated highest for short-term effectiveness because the cleanup would be completed in the shortest time and would pose the least safety risk to local residents and workers during construction. Alternative 3R is less effective because the time required for completing a cleanup would be significantly longer and the number of yards required to be cleaned up would be significantly greater, both of which would increase safety risks and extend the disruption period. ATSDR acknowledges that the heavy construction associated with cleaning up yards will impact the community because operation of heavy equipment can present a substantial risk to children's safety.

For undeveloped areas, Alternatives 3U and 4U are rated highest for short-term effectiveness because they would pose the least safety risks and disruption to residents and workers during construction. Alternative 2U is less effective because it would generate more construction traffic, greater disruption, and more short-term environmental consequences, both at the construction sites and the areas from which topsoil would be mined.

10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability for services and materials, administrative feasibility, and coordination with other government entities are also considered.

All of the alternatives are considered implementable. Technologies and equipment for each method of cleanup are well-developed and are currently widely used in Montana as well as across the United States.

10.7 Cost

The No Action Alternatives (1R and 1U) would be the least costly, requiring only costs associated with environmental monitoring, and if continued, the Lead Education and Abatement Program.

For existing residential areas, Alternative 2R is less costly than Alternative 3R and would be completed at an estimated capital cost of $1.8 million over one to two more years. In fact, these remaining yards may be completed in 2009 during the ongoing Removal Action. Under Alternative 3R, approximately 960 yards and substantial areas that are unpaved (streets, open areas, etc.) remain to be completed at an estimated capital cost of $42 million over 5 to 7 more years.

For undeveloped lands, the cost breakdown for the railroad right-of-way and water-conveying ditches and channels is based on the assumption that these areas can be cleaned up within two years. Therefore, a net present value is presented. For the majority of undeveloped lands, however, which may or may not undergo a change in land use from agricultural to residential, recreational, or commercial, costs are estimated only on a per-acre basis and at 2008 prices.

Alternative 2U would be the most costly because it involves removal and replacement of very large volumes of soil. Alternative 3U (capping) is slightly less costly than Alternative 2U because capping requires little or no excavation (some ground leveling may be needed). But, approximately an equivalent volume of imported soil as required for Alternative 2U would be required for a soil cap, or cover (Alternative 3U). Alternative 4U is, by a substantial margin, the least costly because it involves no removal or importation of topsoil for backfill.

Estimated costs for implementing each of the alternatives are summarized in Table 9-1.

10.8 State Acceptance

The Montana Department of Public Health and Human Services acknowledges that it is impossible to remove all lead-bearing soils or dust, and has stated that the overall plan (including the action levels) proposed by EPA is feasible and desirable. The Department's perspective is that continuation of the East Helena Lead Education and Abatement Program and establishment of other needed ICs to (a) prevent disturbances of contaminated soil that remain in East Helena and (b) prevent human exposure to interior household dust during renovation or demolition, are essential elements of the remedy. These programs, according to MDPHHS, "must have the highest possible priority." The MDPHHS' comments are included in Part III, Responsiveness Summary.

The Montana Department of Environmental Quality (MDEQ) has supported the cleanup Removal Action conducted to date; however, MDEQ has chosen not to concur with this Record of Decision. In their comments on the 2007 Proposed Plan MDEQ indicated that they would support a soil lead cleanup action level of 610 ppm for residential yards, rather than the 1,000/500 ppm cleanup level. The MDEQ's comments are included in Part III, Responsiveness Summary. MDEQ's decision not to concur is influenced by their interpretation that a lower lead-in-soil cleanup level for the final remedy is needed in order to be protective. MDEQ's letter stated concerns as to the remedy's protectiveness as well as the remedy implementability. MDEQ's letter pertaining to concurrence is provided in Part III, Supplemental Comments.

10.9 Community Acceptance

This criterion evaluates whether the local community agrees with EPA's analyses and selected remedy.

The East Helena City Council has expressed support for the selected remedy. The council supports current cleanup protocols and a continuation of the Lead Education and Abatement Program. The council emphasizes that the combination of the residential soil cleanup, as conducted to date, and the education and abatement program, have more than met goals set for protection of East Helena's children. The council further emphasized that all cleanup options described in the proposed plan, for future development of undeveloped lands surrounding East Helena, must be retained and made available for landowners and developers. Otherwise, the city will remain "land-locked," unable to expand its much-needed tax base. East Helena City Council comments are included in Part III, Responsiveness Summary.

During public meetings on the Proposed Plan, and in particular in a meeting on March 1, 2007, community members expressed support for the preferred alternative identified in the Proposed Plan (the selected remedy in this ROD). Community members expressed support for Alternative 2R and the cleanup level of 1,000/500 ppm. Members were concerned that expanding the cleanup over a longer period of time would create more harm than good. Members were also concerned with whether there was a way to control dust during the remediation. Community members believed that the cleanup should end so that people could get back to their normal lives. The community also expressed support for the Lead Education and Abatement Program and didn't see a need to continue with the lead cleanup with that program in place. Comments by residents of the community are included in Part III, Responsiveness Summary.

The Lewis and Clark County has been supportive of the ongoing Removal Action with a cleanup level of 1,000/500 ppm for the last 10 to 15 years, and with the actions taken to date on undeveloped lands. More recently, however, after publication of the Proposed Plan, the L&C County Board of Health supports Alternative 3R with modifications identified in comments provided in the Responsiveness Summary. Lewis and Clark County comments are included in Part III, Responsiveness Summary.

The EPA believes that the selected remedy is fully protective of human health and the environment, while providing the best balance of trade-offs in terms of the five balancing criteria while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering state and community acceptance.

SECTION 11

PRINCIPAL THREAT WASTE VERSUS LOW LEVEL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address principal threats at a site wherever practicable (NCP 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile, which generally cannot be contained in a reliable manner or will present a significant risk to human health if exposure occurs. Conversely, low level threat wastes are those source materials that generally can be reliably contained and present a low risk to human health in the event of exposure (OSWER Publication 93803.3-06FS). The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

No threshold level of risk has been established to identify principal threat waste. A general rule of thumb is to consider as a principal threat those source materials with toxicity and mobility characteristics that combine to pose a risk several orders of magnitude greater than the risk level that is acceptable for the current or reasonably anticipated future land use, given realistic exposure scenarios (Rules of Thumb for Superfund Remedy Selection, EPA 540-R-97-013, August 1997).

The secondary source material identified at this Superfund site is contaminated soil. Residential soils and soils of undeveloped lands became contaminated by means of aerial deposition, flood deposition and redistribution due to human disturbances. These source materials are neither highly toxic nor highly mobile, and do not pose a risk several orders of magnitude greater than acceptable risk levels. The contaminated soils are considered low level threat waste and do not constitute a principal threat waste.

Some residual concentrations of lead and arsenic remain in and around East Helena and some exceed health-based concentrations. These soils form the basis for the selected remedial action. These wastes, being neither highly mobile nor highly toxic, can be readily excavated and reliably contained within an engineered repository.

SECTION 12

THE SELECTED REMEDY

The selected remedy for the East Helena Superfund Site, Operable Unit 2, Residential Soils and Undeveloped Lands, is a combination of strategies designed to reduce risk of exposure to the remaining lead- and arsenic-contaminated soils. The selected remedy addresses both existing residential areas and undeveloped lands.

For contaminated soils in existing residential areas, the selected remedy is Alternative 2R, Selected Soil Removal (1,000/500 ppm Lead), Community Education and Institutional Controls. For cleanup, if the soils in any section of a yard exceed 1,000 ppm, all sections of the yard with lead concentrations exceeding 500 ppm will also be cleaned up.

For currently undeveloped lands that require remedial action when a change in land use is proposed, the preferred remedy is Alternative 4U, In-Place Treatment. This alternative consists of in-place treatment of currently undeveloped lands that have soil lead concentrations, and possibly soil arsenic concentrations, above cleanup levels. However, any of the four alternatives for undeveloped lands, either singly or in combination, are viable and may be appropriate depending upon the proposed use.

12.1 RATIONALE FOR THE SELECTED REMEDY

The key factors on which the remedy decision is based are:

- The selected remedy will meet the Remedial Action Objectives, be protective of human health and the environment, comply with ARARs, and be cost-effective;
- The selected remedy provides future protectiveness through the cleanup of residential yards and undeveloped lands proposed for development, the continued operation of the East Helena Lead Education and Abatement Program, and the application of institutional controls (ATSDR found the Lead Education and Abatement Program and institutional controls to be critical and necessary components in the protection of public health);
- Evidence gathered over many years, involving blood lead data of East Helena children, thousands of soil samples, decades of air quality data, and results of a few hundred in-home environmental assessments conducted by qualified health professionals, all lead to the conclusion that the actions taken by EPA to date have been protective of human health;
- The blood lead data for East Helena's children are representative and support the conclusions that the cleanup to date, on which Alternative 2R is based, and other programs and efforts to reduce lead in the environment, have been a success;
- Co-located soil lead and blood lead data for East Helena's children support the conclusion that, at least below 1,000 to 1,500 ppm lead in soil, the contribution of soil lead to blood lead in children is sufficiently small that the effect cannot be detected and is small compared to other sources in this community;

- The importance of the fine particulate pathway in contributing to blood lead levels and statistical analysis of the 1983 and 1991 blood data, soil lead, and air lead data support the conclusion that lead in air was an important contributor to children's elevated blood lead levels in both 1983 and 1991, at least for locations where soil lead concentrations did not exceed the national average by more than about 1,000 to 1,500 ppm. Above these soil lead concentrations, which were common at that time, soil lead also contributed to children's blood lead levels to a significant extent;

- Cleanup levels for lead and arsenic in soil at this Site are well within ranges of acceptability. For lead, EPA's National Lead Sites Consultation Group requires special consultation if the proposed cleanup action for lead in residential soil is outside the range of 400 to 1,200 ppm. For arsenic, the residential cleanup action level is within EPA's generally accepted risk range for excess cancer risks (risk of one excess cancer for every 10,000 to 100,000 individuals exposed) and is within the acceptable range of residential cleanup levels for arsenic in Region 8 (generally 70 to 240 ppm);

- The selected remedy for residential areas, and two-part cleanup level of 1,000/500 ppm, addresses the inherent variability in residential soil lead concentrations and ensures that this response action will result in no soils remaining with lead concentrations above 1,000 ppm. The two-part cleanup action level is expected to achieve a community-wide post-cleanup level for lead substantially less than 500 ppm;

- The ATSDR, in response to a formal request by MDEQ for a Health Consultation, evaluated the environmental health aspects of the proposed final remedial action for lead in residential soil and concluded that the lead levels that trigger cleanup for residential areas are protective of public health; and

- The preferred remedy for undeveloped lands is suited to low variability of lead concentrations and large open spaces amenable to treatment by tilling, and provides a cost-effective solution to combined sampling/remediation requirements.

The selected remedy provides the best balance of tradeoffs among alternatives for residential and undeveloped lands, and attains an equal or higher level of achievement of the threshold and balancing criteria than other site-wide alternatives that were evaluated. The success of the selected remedy has been demonstrated by years of response action removal of residential soils, reclamation performance monitoring at response action sites in the OU, and the success of the East Helena Lead Education and Abatement Program.

The selected remedy includes a variety of effective and practical components to address the type of waste and the associated level of risk at OU2. The components of the selected remedy for soils accomplish overall protection of human health and the environment and compliance with ARARs equally as well or better than other alternatives evaluated. Threshold criteria are achieved through residential soil removal; removal, capping, or treatment of undeveloped lands; and the application of institutional controls and monitoring. The selected remedy achieves substantial risk reduction and is feasible, implementable, and cost effective. The selected remedy includes treatment of lead-contaminated soil through the application of lime amendments and tilling when appropriate. The selected remedy effectively eliminates, mitigates, or manages residual risk and provides for long-term protection through residential contamination abatement, management and remediation of undeveloped lands, a proactive community education and medical monitoring program, appropriate institutional controls, and continuous evaluation and performance monitoring. As discussed in Section 11, the soil contamination still remaining in OU2 does not constitute a "principal threat", which reduces the need and expectation for treatment of wastes.

The selected remedy is compatible with land reuse and redevelopment within East Helena and Lewis and Clark County, and EPA and the State will continue to work cooperatively with the local county government and Asarco to ensure redevelopment is protective of human health and the environment.

12.2 DESCRIPTION OF THE SELECTED REMEDY FOR RESIDENTIAL SOILS

The major components of the selected remedy include:

1. Contaminated soil remaining in qualified residential yards and vacant lots will be excavated and disposed of in an EPA-approved soil repository. A lead cleanup level of 1,000/500 milligrams per kilogram (mg/kg) will be applied to residential yards. When any section of a yard is found to have a soil lead concentration greater than 1,000 mg/kg (UCL 95%), all portions of the yard with soil lead greater than 500 mg/kg (UCL 95%) will be cleaned up. Soil from excavated areas will be replaced with clean topsoil, revegetated and landscaped.

2. Yards where the yard-wide average soil arsenic concentration exceeds 100 ppm will be cleaned up regardless of the lead concentration. The cleanup action level for arsenic is expected to achieve a community-wide post cleanup average arsenic concentration that is substantially less than 100 ppm. The result will be protective of human health.

3. Remaining unpaved streets, aprons, and alleys in existing residential areas where the lead levels exceed 1,000 ppm (UCL 95%), or arsenic levels greater than 100 ppm, will be cleaned up.

4. Soils in historic irrigation ditches and water spreading channels that contain lead above 1,000 ppm (UCL 95%) or arsenic levels above 100 ppm will be cleaned up when they are within or adjacent to residential areas. Wilson irrigation ditch, which passes through the Manlove Addition, and many irrigation ditches and water-spreading channels that extend north of the City were cleaned up in the mid-1990s. However, extensions of these channels and ditches reach into nearby residential developments, and these will be cleaned up under the selected remedy.

5. Portions of the railroad right-of-way adjacent to residential areas, where the lead concentration exceeds 1,000 ppm (UCL 95%) or arsenic levels exceed 100 ppm, will be cleaned up. The railroad right-of-way will be cleaned up from west of the smelter where the railway crosses underneath U.S. Highway 12 to the east of the smelter approximately to where the railway line intersects the 1,000 ppm lead contour in this area, excluding the smelter property;

6. Institutional controls are a necessary component of the final remedial action for the East Helena Superfund Site because lead in the environment cannot be completely eliminated or contained. Residual levels of lead will remain in place, sometimes in excess of safe levels for certain uses, beneath foundations, sidewalks and temporary structures, in unfinished basements or attics, and on undeveloped lands that surround the community. Institutional controls for residential areas and developed lands are described more fully in Section 12.4.

   Some undeveloped land around East Helena, in its current state, is unsuitable for residential development. Some land may be unsuitable for recreational or commercial development. Institutional controls for existing agricultural lands are required until such time as these lands are developed for other purposes, at which time the ICs for developed lands would apply. When areas are developed for residential, commercial, or recreational uses, institutional controls for developed lands will be extended to these areas, consistent with those ICs already in place for similar use areas, including requirements for the handling and disposal of contaminated soils.

   Regarding dust, lead in dust is no longer considered a significant exposure hazard in East Helena. However, home repairs or remodeling that open up attics, basements, heating ducts, or outside walls and windows may raise previously isolated dust that could increase the risk of exposure to lead in the home. This possibility supports the continuation of the community-wide education program, one of the purposes of which is to inform the public of circumstances such as this, and the need for environmental assessments as part of that program.

7. The county-administered, community-wide education program, designed to monitor and protect children against exposures to residual lead would be continued for as long as Lewis and Clark County and stakeholders deem it to be necessary and beneficial. This vital program has been in existence since 1995 and is administered by the Lewis and Clark County Health Department. Health professionals maintain an office in the East Helena community and their education programs, carried out in homes, day-care facilities and schools, are a major reason why the community of East Helena is supportive of, and comfortable with, the remedy.

8. Whenever blood tests of children and a follow-up environmental assessment by a health professional demonstrate that exposure to lead in yard soils is responsible for a blood lead level in a child above 10 ug/dl, that child's yard will qualify for immediate remedial action regardless of the yard soil lead concentration.

9. Soils excavated as a result of this remedy will be disposed at an EPA-approved soil repository.

The East Fields are approximately 160 acres in size and have been used since 1991 as a repository for soils excavated as part of the removal action. Soils have been deposited in a manner, and the area managed with respect to revegetation, that has enabled the area to be returned to a functional grassland with cattle grazing and wildlife use. Long-term management of this area requires institutional controls.

The selected remedy is patterned after the residential soil removal action that has been in place since 1991, which is implementable and has exceeded remedial action objectives initially established. A continuation of these successful cleanup approaches will meet the more rigorous final remedial objectives and goals of this ROD. EPA believes that the removal action has proven to be safe, effective, and protective of children's health. The selected remedy will cause minimal disruption within the community and will be less costly than other cleanup alternatives examined. Accordingly, EPA's selected final cleanup remedy for residential soils formalizes the previous several years of work conducted cooperatively by Asarco, EPA, MDEQ, Lewis and Clark County, City of East Helena, and owners of more than 700 individual properties.

EPA anticipates that all remaining properties eligible for cleanup under the on-going non-time critical removal action will be completed by the end of 2009. Additional confirmation sampling will be conducted in 2009 and into 2010.

The selected remedy calls for completing a cleanup of all residential yards, water-conveying ditches and channels, and the railroad right-of-way adjacent to residential areas. After the final remedy is implemented, no residential yard within East Helena or its adjacent subdivisions will have soil lead levels greater than 1,000 ppm. Equally important, the community-wide average of soil lead will be reduced to well below 500 ppm.

12.3 DESCRIPTION OF THE SELECTED REMEDY FOR UNDEVELOPED LANDS

The selected remedy specifies requirements for undeveloped lands that surround residential developments. Under current land uses, livestock, wildlife, and vegetation on undeveloped lands are found by EPA to be minimally affected by the levels of contamination present in the soils. However, BAMPs, as described in 12.3.2, will reduce the possibility of wind-blown soil as a transport mechanism, and reduce the low-level risks to livestock and wildlife discussed in the section on ecological risk assessment.

Undeveloped lands are being developed, and proposed for development, in the vicinity of East Helena. As these lands become developed, particularly for residential or recreational purposes, the levels of lead become a matter of concern. Much of the undeveloped land shown in Figure 5-6, within the outer isopleth, and some beyond, will likely require some remedial action prior to development for residential purposes. These include agricultural lands, areas adjacent to water-spreading ditches and channels, and large residential yards. Remedial action may or may not be necessary if the proposed new land use is industrial or commercial. The selected remedy provides for orderly, cost-effective development of these lands, with administration and enforcement of the regulations by Lewis and Clark County.

Undeveloped land will be evaluated whenever a change in land use is proposed and, if necessary, cleaned up to appropriate levels for the proposed use. A lead cleanup level of 500 mg/kg and an arsenic cleanup level of 100 mg/kg in soil will be applied to undeveloped land proposed for residential development in the future. Separate lead and arsenic cleanup levels will be applied to undeveloped lands proposed for future commercial or recreational use.

Where a change in use is proposed, undeveloped land will be cleaned up to appropriate levels through in place treatment (deep tilling and lime amendment), excavation, or capping. The preferred remedy for undeveloped lands that are proposed for development is generally Alternative 4U, In Place Treatment, which satisfies EPA's statutory preference for treatment as a principal element of the remedy. This alternative is most cost-effective and the environmental consequences associated with its implementation are minimal.

Although the preferred remedy for undeveloped lands to be developed in the future is generally Alternative 4U, it is emphasized that circumstances in the future may allow implementation of one or more of the other alternatives described and evaluated, including Alternative 2U, Soil Removal and Replacement, and Alternative 3U, Capping. For example, EPA has determined that Alternative 2U—Soil Removal and Replacement—is the selected remedy for water-conveying ditches and channels and for the railroad right-of way. The combination of removal, proper disposal, and replacement of soils in areas such as these, with particularly high concentrations of lead and arsenic on the surface, or with lead and arsenic reaching to depths greater than about 18 to 24 inches, has been shown to be more effective and permanent, albeit more costly, than in-place treatment or capping. 9. Excavated soils excavated will be disposed at an EPA-approved soil repository or managed on site.

As another example, Alternative 3U—Capping—may eventually prove to be a more effective and cost-effective strategy than other strategies for some undeveloped lands. A large tract of undeveloped land may in the future be proposed for strictly commercial development. In this instance, commercial buildings, parking lots and landscaped areas would all require some ground preparation, earth moving, and leveling. It is conceivable that, given the proposed use and the levels of contamination currently known at some of the undeveloped tracts, a more cost-effective remedy—still adequately protective of the proposed use—may be minimal excavation and disposal, followed by a cover or cap (such as pavement or sidewalks) in selected areas.

Therefore, in respect to implementation of a remedy that may be decades into the future, any of the four alternatives for undeveloped lands, either singly or in combinations, are viable and may be appropriate depending upon the proposed use, the physical and chemical properties of the particular parcel of land, and the role of institutional controls in place at that time.

In most circumstances known to exist currently, however, the combination of remedial strategies involving Alternative 2R and Alternative 4U best satisfies EPA's required criteria, as compared to the other alternatives or strategies considered. This combination will continue to be protective of children's health and will satisfy applicable or relevant and appropriate legal requirements (ARARs). The selected remedy will continue to be effective in reducing to minimal levels the lead in soils, and it will represent a cost-effective approach to cleanup with the least amount of disturbance or environmental consequence.

The remedy for undeveloped lands has been structured to allow flexibility in the manner in which it is implemented. EPA emphasizes that it will ensure that the remedy encompassed by the range of options is fully protective of human health and the environment. However, this approach requires EPA to take a more active oversight role than it might otherwise have done. Therefore, EPA is committed to conducting annual assessments of sampling protocols and protectiveness.

12.4 INSTITUTIONAL CONTROLS (REMEDY PROTECTION MEASURES)

Institutional Controls (ICs) are measures that protect against exposure to contamination that remains in place after (or during) a cleanup. ICs also protect response actions once they are implemented at a Superfund site. In this case, ICs may also provide for an orderly change in land use, such as when someone proposes that agricultural lands be put to commercial or residential uses.

ICs are a necessary component of the final remedial action for the East Helena Superfund Site because lead in the environment cannot be completely eliminated or contained. Residual levels of lead will remain in place, sometimes in excess of safe levels for certain uses, beneath foundations, sidewalks and temporary structures, in unfinished basements or attics, and on undeveloped lands that surround the community.

ICs are non-engineering components of the overall remedy. ICs such as zoning regulations, deed restrictions, easements, and public education limit use of reclaimed areas to acceptable activities or guide behavior to avoid exposure to lead that may exceed health-based levels.

Institutional Controls are often referred to as remedy protection measures. They may be implemented by a governmental entity, by a private property owner, or by a combination of the two. Governmental ICs, for example, may create restrictions such as building codes, permits or zoning regulations to be administered by the appropriate local agencies. Proprietary controls, either private, governmental, or a combination of the two, typically involve landowner agreements or easements that restrict certain activities on the property.

Remedy protection measures may be strictly informational. For example, State registries and advisories may provide information to individuals living within or near to a Superfund site that has undergone or is undergoing a cleanup. Another type of IC may be created by an enforcement action or document, such as in an administrative order or a consent decree that is lodged in court.

In order for institutional controls to be an effective component of a remedy and protect the community, they must be practical, implementable and enforceable. EPA has worked closely with city, county and state governmental entities to develop such ICs for this site. And, during the final phases of this remedy, EPA will continue to work closely with these entities, with the expectation that they will eventually assume responsibilities for administering ICs that will conform to applicable ordinances or other local regulations, such as planning and zoning regulations.

Under the selected remedy, local governments would, when applicable:

- adopt and administer local regulations designed to prevent or reduce recontamination of areas already cleaned up;
- adopt and administer regulations that require, or policies that encourage, coordination of planning and zoning efforts (East Helena city government, Lewis and Clark City- County Board of Health, L&C County Planning Department, L&C County Commission);
- adopt and administer local use and permitting requirements;

- continue to provide oversight of cleanup activities and monitor areas previously cleaned up; and
- administer restrictions and requirements at the EPA-approved soils repository.

Deed notices or similar proprietary ICs may be required for areas where wastes were capped and left in place, where engineered controls were constructed, or where other discrete wastes are left in place. Such notices will tell current and subsequent landowners of the presence of these wastes or engineered controls, and ensure that the wastes are not disturbed. In addition, fencing and signs may be used to protect the integrity of caps and engineered controls. When EPA considers such actions, the Agency will be careful to avoid negative impacts on the neighborhood or community.

If necessary, city and county zoning and permit requirements may be implemented to clearly identify capped or covered areas and to see that soil excavated from these areas is properly handled and disposed. ICs will inform residents who conduct remodeling activities that there may be a risk of exposure to lead in household dust, and of mitigation measures they can take.

The East Helena Lead Education and Abatement Program is an important part of the ICs component of the overall remedy. The primary role of its staff of health professionals is to conduct the educational component within the community and supervise blood lead testing for children. However, the Lead Education and Abatement Program also acts as a liaison for other city, county or state governmental entities that administer or enforce ICs (e.g., subdivision review, which may or may not require sampling, and approval). EPA will continue to work cooperatively with the city, county and state to ensure that workable and adequate permit requirements are enacted and administered. EPA recognizes that local growth policies and ordinances, including zoning, may be used as effective ICs.

In order to assist local entities, EPA is committed to funding additional sampling and maintenance of all institutional controls to the extent allowed by law or policy.

12.4.1 Institutional Controls for Residential Areas

The cleanup levels for lead and arsenic in residential soils are protective for children and adults. Once cleanup levels have been achieved, residents can engage in their usual activities. Nevertheless, institutional controls for residential, recreational, commercial and other developed areas community-wide are necessary because lead in the environment cannot be completely eliminated or contained. ICs such as zoning regulations, deed restrictions, easements, and public education serve to limit use of reclaimed areas to activities that do not compromise public health or the remedy's effectiveness. They guide behavior to avoid potential exposure to lead that may be in the soil at depth or lead in areas that have not been sampled or cleaned up.

12.4.2 Institutional Controls for Undeveloped Lands

Institutional controls for existing agricultural lands are required until such time as these lands are developed for other purposes, at which time the ICs for developed lands would apply. Institutional controls would be designed to maintain and improve appropriate Best Agricultural Management

Practices (BAMPs). The best management practices program would be primarily an educational program and would be implemented in concert with the residential Lead Education and Abatement Program (LEAP). LEAP would distribute information and provide referrals to other qualified agricultural organizations such as the Natural Resource Conservation Service. Because BAMPS would be different for farmlands than for rangelands, the program would have two different educational components.

The majority of the farmlands around East Helena are planted with grain, primarily wheat and barley. The education program for lands within 2 to 3 miles of the smelter would encourage the following, primarily to reduce the creation of fugitive dust:

- Minimum tillage practices. Rather than tilling with standard plows and discs, tilling would be accomplished with chisel bars and by only a single tillage pass. The chisel bars till soil only about 1 inch deep and reduce the disturbance of the soils; and
- Minimize autumn burning and tilling. Rather than burning or turning under the stubble after the autumn harvest, stubble should be allowed to remain in the fields over the winter. This will tend to hold the soil and reduce winter dust production. For winter wheat (which requires autumn tilling) the time between tilling and planting should be minimized to encourage plant cover as soon as possible in the autumn.

For rangelands, the following best management practices would be encouraged, primarily through careful livestock grazing and avoidance of overgrazing:

- Adequate amounts of vegetative cover should be promoted and maintained, including standing plant material and litter, to support infiltration, maintain soil moisture storage, and stabilize the soils;
- Subsurface soil conditions should be promoted and maintained in a manner that would support permeability rates appropriate to climate and soils; and
- Promote the opportunity for seedling establishment of appropriate plant species when climatic conditions and space allow.

Range and farmlands should be inspected periodically to identify areas where improvements in management practices are possible. The inspection program should consist of the following:

- An on-the-ground inspection by a team of agricultural specialists, including soil scientists, range scientists, farm scientists, and regulatory personnel will periodically survey the lands for ground cover, tillage practices, grazing rotations, etc.
- Contact with the owners of any properties where management practices can be improved; and
- Encouragement of improvement in management practices and distribution of educational materials on the most current best practices

12.4.3 Institutional Controls when Undeveloped Lands Are Proposed for Development

When areas are developed for residential, commercial, or recreational uses, institutional controls will be extended to these areas, consistent with those ICs already in place for similar use areas, including requirements for the handling and disposal of contaminated soils.

Government ordinances and permit programs administered by the Lewis and Clark County, L&C County Health Department and the City of East Helena will apply to future developable areas where metal concentrations are known to or are likely to exceed one or more future anticipated use cleanup levels, as set forth in this ROD. If soil concentrations of lead or arsenic exceed these cleanup levels, the administrator of these ICs will work with the developer or landowner to facilitate cleanup any actions that may be needed to accommodate the new land use. Limited funding may be available to assist developers in further characterization of the property to be developed. If such funding assistance is not available, however, the ICs administrator will advise the developer or landowner of voluntary options allowed in accordance with this ROD for treating, capping, or removing soil that exceeds the cleanup level for the new use.

Developers or landowners seeking to change the use of undeveloped land, such as from agricultural to residential, recreational or commercial, will be required to meet all standards for the new use. These standards may include:

- Coordination between the planning and zoning staff in the Lewis and Clark County and the city of East Helena and the Lead Education and Abatement Program to assist developers and their contractors in understanding regulations governing development in areas with elevated lead and arsenic;
- Soil sampling prior to development to determine the extent and concentrations of lead and arsenic in soils;
- Where there are unacceptable levels of lead or arsenic in the soils in areas to be developed, requirements for cleaning up the affected areas prior to development;
- Protocols for sampling soils after cleanup to determine whether the cleanup was effective and that development can proceed; and
- Appropriate management of all excavated soils.

This ROD makes it possible for developers to move ahead and bear the cost of development, including any environmental assessments or actions. Given EPA's preference for in-situ treatment in preparing undeveloped land for residential use where it can be shown to be effective, developers and landowners have some control over their own investments.

It is anticipated that the Lewis and Clark County Health Department and the City of East Helena, with assistance as necessary from an ICs administrator, EPA and MDEQ, will manage the ICs program for soil in residential and commercial areas and currently undeveloped lands. Local involvement will help ensure the implementation and enforceability of such ICs. The performance and adequacy of the institutional controls will be reviewed by EPA on a periodic basis, such as during mandatory Five-Year Reviews.

12.4.4 Community Education and Institutional Controls Following Development

The county-administered, community-wide education program, designed to monitor and protect children against exposures to residual lead would be continued for as long as Lewis and Clark County and stakeholders deem it to be necessary and beneficial. The program, through its presence, visibility, oversight, and responsiveness to community concerns, will help maintain a level of comfort in the community that the risk posed by any lead remaining at the Site is managed appropriately.

The program provides broad-based public education, in homes, day-care centers and schools, focusing on nutrition, hygiene, continued health monitoring (blood lead testing) of children, "safe play" programs, and continued risk reduction. The program also provides education to residents about the need to avoid areas with elevated soil lead levels and maintaining soil and sod barriers. In addition, the program provides information to purchasers and sellers of property, lending institutions, and realtors about site-wide and individual property-specific conditions. Finally, the program promotes environmental assessments in homes, including soil, dust, water and paint sampling to identify all sources of and pathways for lead exposure. These assessments are done at no cost to the homeowner.

12.5 ESTIMATED REMEDY COSTS

The estimated capital cost for the residential cleanup part of the remedy is approximately $1.8 million. Annual operation and maintenance costs are estimated to be approximately $194,000 per annum, resulting in a net present value of $4.7 million, calculated for a period of 30 years. Tables 12-1 and 12-2 (attached) show the breakdown of these costs. The cost estimate includes cleanup of approximately 24 residential yards, 9 vacant lots, and 40 road aprons.

The estimated capital cost for the cleanup of the railroad right-of-way and ditches is approximately $4.6 million. Annual operation and maintenance costs are estimated to be approximately $30,000 per annum, resulting in a net present value of $4.8 million, calculated for a period of 30 years. The cost estimate includes cleanup of 2,000 feet of ditches and over 11,000 feet of railroad right-of-way. Tables 12-3 (attached) and 12-4 (attached) show the breakdown of these costs. The estimated cost per acre for in-place treatment (Alternative 4U) is $4,800 (Table 12-5, attached).

12.6 EXPECTED OUTCOMES OF THE SELECTED REMEDY

EPA expects that, upon implementation, this remedy will protect human health and the environment and comply with ARARs.

All future direct and indirect contact risks presented by potential exposure to COCs are eliminated through soil removal for residential properties, and treatment, removal, or capping for undeveloped lands, and institutional controls.

The OU encompasses all land use types typical of urban areas: residential, industrial, commercial, and recreational, and surrounding agricultural use. It includes several public schools, parks, and playing fields. Land use is not expected to change as a result of the selected remedy. Land use is expected to continue to comprise primarily residential, commercial, industrial, recreational, and agricultural uses. Additional remedial action may be required in cases where current agricultural or recreational land is developed for residential, commercial, or industrial purposes. Over time, agricultural use is expected to diminish as it is developed for primarily residential purposes.

Land Use and Time Frame. All remaining residential properties within OU2 that have not been sampled previously will be sampled and remedial action will be taken for properties exceeding remediation goals within 2 years. This may be completed in 2009 as part of the ongoing Removal Action.

Anticipated Socio-Economic and Community Revitalization Impacts. The residential program will be protective of human health and particularly protective of sensitive populations (children, pregnant or nursing mothers, etc.) by prioritizing abatement of their residences. By quantifying COC concentrations at all residential properties, conditions sitewide are known to all residents and Lewis and Clark County.

Anticipated Environmental and Ecological Impacts. In general, yard removals would mitigate a pathway between source areas and the environment and address human health risks at OU2 effectively.

Because the remedy does not allow for unlimited use and unrestricted exposure, the East Helena Superfund Site will be subject to reviews of how well the remedy is meeting the objectives. These reviews are conducted at least every five years and are referred to as Five-Year Reviews.

SECTION 13

STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions to the extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off site disposal of untreated wastes.

The selected remedy satisfies the statutory requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), notably Section 121, subsection (b), and:

- Is protective of human health and the environment;
- Complies with applicable, or relevant and appropriate requirements (ARARs);
- Is cost-effective;
- Utilizes permanent solutions and alternative technologies to the maximum extent practicable; and
- Satisfies the preference for treatment as a principal element.

13.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will protect human health and the environment by:

- Preventing unacceptable exposure risks to current and future human populations posed by ingestion of contaminated soils;
- Preventing unacceptable exposure risks to current and future ecological receptors posed by direct contact or ingestion of contaminated soils;
- continuation of the county-administered Lead Education and Abatement Program;
- Implementation of institutional controls and maintenance to ensure the existing remedial features are protected and maintained, and that undeveloped lands, if developed, will be required to meet the same standard of protection previously implemented for residential soils.

The selected remedy includes components to address human health and environmental risks associated with contaminated soils and sediments in residential and non-residential areas. The selected remedy addresses elevated lead and arsenic in residential areas and undeveloped lands. The approach prioritizes residential cleanups to take into account the presence of affected or sensitive populations. For undeveloped lands, the selected remedy protects human health and the environment by treatment, removal, or capping of contaminated soils exceeding cleanup standards. EPA believes that the comprehensive sampling and remediation program ensures that all properties within OU2 that exceed risk-based concentrations will ultimately be addressed.

The selected remedy will be monitored and maintained through comprehensive programs using institutional controls and monitoring. The Community Education and Abatement Program continues to provide a level of comfort to the community that risks from lead are being appropriately managed and evaluated. There are no short-term threats associated with the selected remedy that cannot be readily controlled through applicable health and safety requirements, monitoring, and standard construction practices. In addition, no adverse cross-media impacts are expected from the selected remedy.

13.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121(d) of CERCLA requires that remedial actions attain a degree of cleanup that ensures protection of human health and the environment and that those remedial actions comply with or appropriately waive applicable or relevant and appropriate requirements (ARARs). There are three types of ARARs: contaminant-specific, action-specific, and location-specific. The ARARs for the remedy are included in Appendix C.

ARARs for OU2 of the East Helena Superfund Site were identified and thoroughly evaluated by EPA. The selected remedy will comply with federal and state ARARs that have been identified. No waiver of any ARAR is being sought for the selected remedy. Only the State ARAR is identified when a situation occurs in which the state ARAR is more stringent than the corresponding Federal ARAR, or where requirements from the state program have been Federally authorized.

13.3 COST-EFFECTIVENESS

In EPA's judgment, the selected remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" [NCP § 300.430(f)(1)(ii)(D)].

This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfy the threshold criteria. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and, hence, this alternative represents a reasonable value for the money to be spent.

Net present worth costs for each alternative were compared (see Table 9-1). The cost of the selected remedy for residential soil is expected to be approximately $4.7 million. EPA believes an appropriate balance between cost-effectiveness and adequate protectiveness is achieved in the selected remedy. For comparison, Alternative 3R (not selected) provides for cleanup of residential soils to a yard average of 500 ppm, but has no demonstrable additional protectiveness, and would cost approximately $40 million.

13.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

This determination looks at whether the selected remedy provides the best balance of trade-offs among the alternatives with respect to the balancing criteria set forth in NCP §300.430(f)(1)(i)(B), such that it represents the maximum extent to which permanence and treatment can be practicably utilized at this Site. NCP §300.430(f)(1)(ii)(E) provides that the balancing shall emphasize the factors of "long-term effectiveness" and "reduction of toxicity, mobility, or volume through treatment," and shall consider the preference for treatment and bias against off-site disposal.

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance. The selected remedy includes treatment through the application of lime amendments and tilling.

13.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy satisfies the statutory preference for treatment as a principal element of the remedy. In-situ treatment through tilling and amendment with lime is an element of the selected remedy for undeveloped lands.

Treatment consists of deep tillage of the surface and near-surface soils and simultaneous application and incorporation of lime and other soil amendments. Highly specialized plows that mix, rather than turn over the soil, are used in this innovative technique. Multiple, perpendicular passes of the plow ensure mixing and incorporation of the amendments. Amendments, such as lime, organic matter, phosphorus, and fertilizers can be incorporated into the soils at the time of deep tillage. These amendments render lead less mobile in the soil and less bio-available.

In-situ treatment does not remove contaminants from the soil, but reduces their concentrations to levels that are safe and protective for the new use. Post-treatment soil lead concentrations as low as 100 to 300 ppm lead can be readily achieved by means of in-place treatment, at a cost that is approximately one-tenth the cost of other alternatives for undeveloped lands and less than one-tenth the cost of cleaning up yards in existing residential areas. In-place treatment can readily be implemented in large open areas being prepared for residential development.

13.6 FIVE-YEAR REVIEW REQUIREMENTS

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

SECTION 14

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Cost Tables

Table 12.1. Alternative 2R, Cost Detail

Cost Estimate Summary for the Selected Remedy - East Helena Superfund Site

Residential Areas - Alternative 2R - Remove / Dispose / Replace Existing Residential Sites with Lead Levels greater than 1,000 ppm

Capital Cost for Remedy - (2 years)

DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	Notes / Assumptions
EPA Oversite / Administration	2	year	$60,000	**$120,000**	Estimate at 500 hours per year at $120 per hour
Site Remediation - Excavation / Replace					Construction activities for unremediated sites with lead-in-soil levels greater than 1,000 ppm. Assumes a total of 128 existing unremediated residential sites to be cleaned up over 2 years.
Vacant Lots	9	site	$30,600	**$275,400**	Assumes an average yard size of 15,300 square feet per site at 8-9 inches depth. Assume $2.00 per square foot to excavate, replace, landscape which yields $30,600 per site (15,300 sf x $2.00 per sf).
Residential Lots	24	site	$30,600	**$734,400**	Assumes average yard size of 15,300 square feet per site at 8-9 inches depth. For estimating purposes, assume 1/3 of a site has structures therefore 10,200 square feet of the site will be cleaned up. Assume $3.00 per square foot to excavate, replace, landscape which yields $30,600 per site (10,200 sf x $3.00 per sf).
Road Aprons / Alleys	40	section	$3,000	**$120,000**	Estimate 40 known sections of Road Aprons have been pre-sampled and have lead levels greater than 1,000 ppm. Each section is approximately 150 feet long and 10 feet wide (1,500 square feet). Assume approximate cost of $2.00 per square foot to clean up ($3,000 per section).
Ditches and Channels	12000	square feet	$3	**$36,000**	Assume certain ditches and channels adjacent to sites may require remediation at linear areas. Assume 50 linear feet by 10 foot width by 73 residential sites.
Sampling, Collection, and Analysis					
Residential Lots - Pre-Remediation	100	site	$350	**$35,000**	Approximately 100 sites require sampling. Assumes $350 per site for collection, analysis, and shipping of 7 samples per site.
Road Aprons / Alleys - Pre-Remediation	40	section	$95	**$3,800**	Assumes 40 new sections require sampling. Assume $95 per sample which includes collection, analysis, and shipping of one sample per site.
SUBTOTAL Capital Costs				**$1,324,600**	
Mobilization / Demobilization & Division 1 Costs				**$52,984**	Assumes 4% of Capital Costs
Contractor Overhead and Supervision				**$105,968**	Assumes 8% of Capital Costs
Fuel cost adjustment for site remediation				**$57,793**	Fuel cost adjustment applied to Site Remediation tasks only.
Contingencies (20%)				**$264,920**	Assumes contingencies at 20% of Capital Costs
TOTAL CAPITAL COSTS				**$1,806,265**	

Annual Costs - Operation and Maintenance (30 years)

DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	Notes / Assumptions
Construction at Previously Remediated Sites	10	site	$440	**$4,400**	Assumes 20 cubic yards (CY) per project, haul costs = $5 per CY (for small quantities), replacement soil = $17 per CY delivered, ($440 per site). Assumes 10 sites per year.
Gardens - Excavation / Replace	5	site	$750	**$3,750**	Assumes 5 gardens per year at $750 per garden to haul the excavated soils and provide new soil.
Monitor Children's Blood-Lead Level	150	each	$60	**$9,000**	Assumes 150 children randomly sampled per year at $60 per test.
Institutional Controls and Lead and Education and Abatement Program				**$120,000**	Estimate based on historical costs of Lead Education and Abatement Program
Five-Year Review					
Soil Monitoring	10	site	$285	**$2,850**	Assumes sampling every year, samping 10 sites per year, total $285 per site includes collection, analysis, and shipping.
Prepare 5-year Report	0.20	lump sum	$18,000	**$3,600**	Assumes 150 hours for analysis and report development at $120 per hour. Assumes 1/5 of costs incurred on an annual basis.
SUBTOTAL Annual Costs				**$143,600**	
Project Management and Support (15%)				**$21,540**	
Contingencies (20%)				**$28,720**	
TOTAL ANNUAL COSTS				**$193,860**	

TOTAL PROJECT COSTS		
Present Value of Capital Costs	**$1,763,258**	Assumes 2 year construction period. Present worth costs assumes 1/2 of capital costs incurred each year. Assumes 5% discount rate for 2 years.
Present Value of Annual Costs	**$2,980,103**	Assumes 5% discount rate for 30 years

TOTAL PRESENT VALUE - Alternative 2R	**$4,743,362**

Table 12-2. Alternative 2R, Present Worth Analysis

East Helena Superfund Site - Preferred Remedy Alternative 2R

Year	Capital Cost	Annual O&M Cost	Total Cost	Discount Factor (5%)	Present Worth
0	$903,132		$903,132	1.000	$903,132
1	$903,132	$193,860	$1,096,992	0.952	$1,044,755
2		$193,860	$193,860	0.907	$175,837
3		$193,860	$193,860	0.864	$167,464
4		$193,860	$193,860	0.823	$159,489
5		$193,860	$193,860	0.784	$151,894
6		$193,860	$193,860	0.746	$144,661
7		$193,860	$193,860	0.711	$137,773
8		$193,860	$193,860	0.677	$131,212
9		$193,860	$193,860	0.645	$124,964
10		$193,860	$193,860	0.614	$119,013
11		$193,860	$193,860	0.585	$113,346
12		$193,860	$193,860	0.557	$107,949
13		$193,860	$193,860	0.530	$102,808
14		$193,860	$193,860	0.505	$97,912
15		$193,860	$193,860	0.481	$93,250
16		$193,860	$193,860	0.458	$88,809
17		$193,860	$193,860	0.436	$84,580
18		$193,860	$193,860	0.416	$80,553
19		$193,860	$193,860	0.396	$76,717
20		$193,860	$193,860	0.377	$73,064
21		$193,860	$193,860	0.359	$69,585
22		$193,860	$193,860	0.342	$66,271
23		$193,860	$193,860	0.326	$63,115
24		$193,860	$193,860	0.310	$60,110
25		$193,860	$193,860	0.295	$57,247
26		$193,860	$193,860	0.281	$54,521
27		$193,860	$193,860	0.268	$51,925
28		$193,860	$193,860	0.255	$49,452
29		$193,860	$193,860	0.243	$47,098
30		$193,860	$193,860	0.231	$44,855
TOTALS	**$1,806,265**	**$5,815,800**	**$7,622,065**		**$4,743,362**

PV Capital	*$1,763,258*
PV O&M	*$2,980,103*

Table 12-3. Alternative 4U, Cost Detail

Cost Estimate Summary for the Selected Remedy - East Helena Superfund Site

Undeveloped Lands - Alternative 4U - In Situ Treatment (500 ppm lead) for Ditches, Channels, and Railroad Right-of-Way

Capital Cost for Remedy - (3 years)

DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	Notes / Assumptions
EPA Oversite / Administration	0	year	$60,000	**$0**	Assumes that remediation of ditches and channels and railroad ROW occurs during the same time frame as residential cleanups, and EPA oversight/administrative costs are therefore already accounted for in the residential alternatives.
Site Remediation - Excavation / Replace & Deep Till					
Excavate / Replace - Areas Adjacent to Ditches and Channels	20000	square feet	$2.00	**$40,000**	Assumes clean up of 2,000 lineal feet of 20 foot wide diches/channels over 3 years (40,000 sf). Assume 50% of the ditches (20,000 sf) excavated and replaced at historic site cost of $2 per square foot.
Excavate / Replace - Railroad Right-of-Way (*excludes central section thru Smelter Complex)*	1538874	square feet	$2.20	**$3,385,523**	Assumes three segments of railroad right-of-way (ROW) at 135.5 feet wide from previous estimate documents in Jan. 2006. The first segment is 5,918 feet west of the smelter complex and the second segment is 2,792 feet thru the Smelter Complex, and the third segment is 5,439 feet east of the Smelter Complex. For this estimate only the segments west and east of the Smelter Complex are used for a total area of 1,538,874 square feet. ROW will be excavated and replaced at historic site cost of $2.00 per square foot. Assume an additional 10% for insurance, flaggers, or other additional cost required to work on the railroad property (total $2.20 per square foot).
Sampling, Collection, and Analysis					
Ditches / Channels Pre-Remediation Sampling	102	section	$55	**$5,610**	Assumes approximately 15,300 lineal feet of ditches/channels that have not been sampled to date. Assume they are sampled in 150 foot sections (102 sections), $55 per section includes collection, analysis, and shipping.
Railroad Right-of-Way Pre-Remediation Sampling	23	acre	$54	**$1,242**	Assumes area sampled same as area for excavation / replace of railroad ROW, about 23 acres. Assume 23 samples (16 spot composites) are collected, $54 per acre includes collection, analysis, and shipping.
SUBTOTAL Capital Costs				**$3,432,375**	
Mobilization / Demobilization & Division 1 Costs				**$137,295**	Assumes 4% of Capital Costs
Contractor Overhead and Supervision				**$274,590**	Assumes 8% of Capital Costs
Fuel cost adjustment for Site Remediation				**$41,280**	Fuel usage adjustment applied to Site Remediation tasks only. Estimated fuel usage based off total soil volume removal of approximately 48,000 cubic yards of materials. Machine handling fuel quantities assumed for excavation work using one medium duty loader/excavator at a fuel rate of 6 gallons per hour and one haul truck at 12 cubic yard capacity at a fuel rate of 8 gallons per hour. Cycle times are 125 cubic yards per hour for loader and 15 minutes for haul truck. These conservative rates yield a cummulative fuel usage is 8,000 to 10,000 gallons. Original remediation estimates are in 2003 costs. Fuel on average has increased 144% from 2003 to first quarter 2008. Rate of fuel increase in outyears is expected at 25% per year. Use 14,000 gallons fuel total at 2003 rate $1.305 per gallon and 2008 rate of $3.455 per gallon. Two years added at 25% per year rate increase.
Contingencies (20%)				**$686,475**	Assumes contingencies at 20% of Capital Costs
TOTAL CAPITAL COSTS				**$4,572,015**	

Annual Costs - Operation and Maintenance (30 years)

DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	Notes / Assumptions
Implement BAMP Program for Remaining Undeveloped Lands	1	year	$15,000	**$15,000**	Assumes 2 day inspections by 3 agricultural specialists per year and 10 days followup / education by county agent per year.
5-Year Review					Assumes 1/5 of costs incurred on an annual basis
Soil Monitoring	0.20	lump sum	$16,800	**$3,360**	Assumes sampling every 5 years, approximately 5,000 to 6,000 acres, 10% of acreage sampled at 1 sample per acre, $28 per sample for collection, preparation and measurement using XRF instrument.
Prepare 5-year Report	0.20	lump sum	$18,000	**$3,600**	Assumes 150 hours for analysis and report development at $120 per hour. Assumes 1/5 of costs incurred on an annual basis.
SUBTOTAL Annual Costs				**$21,960**	
Project Management and Support (15%)				**$3,294**	
Contingencies (20%)				**$4,392**	
TOTAL ANNUAL COSTS				**$29,646**	

TOTAL PROJECT COSTS		
Present Value of Capital Costs	**$4,357,756**	Assumes 3 year construction period. Present worth costs assumes 1/3 of capital costs incurred each year. Assumes 5% discount rate for 3 years.
Present Value of Annual Costs	**$455,732**	Assumes 5% discount rate for 30 years
TOTAL PRESENT VALUE - Alternative 4U	**$4,813,488**	

Table 12-4. Alternative 4U, Present Worth Analysis

East Helena Superfund Site - Preferred Remedy Alternative 4U

Year	Capital Cost	Annual O&M Cost	Total Cost	Discount Factor (5%)	Present Worth
0	$1,524,005		$1,524,005	1.000	$1,524,005
1	$1,524,005	$29,646	$1,553,651	0.952	$1,479,668
2	$1,524,005	$29,646	$1,553,651	0.907	$1,409,207
3		$29,646	$29,646	0.864	$25,609
4		$29,646	$29,646	0.823	$24,390
5		$29,646	$29,646	0.784	$23,228
6		$29,646	$29,646	0.746	$22,122
7		$29,646	$29,646	0.711	$21,069
8		$29,646	$29,646	0.677	$20,066
9		$29,646	$29,646	0.645	$19,110
10		$29,646	$29,646	0.614	$18,200
11		$29,646	$29,646	0.585	$17,333
12		$29,646	$29,646	0.557	$16,508
13		$29,646	$29,646	0.530	$15,722
14		$29,646	$29,646	0.505	$14,973
15		$29,646	$29,646	0.481	$14,260
16		$29,646	$29,646	0.458	$13,581
17		$29,646	$29,646	0.436	$12,934
18		$29,646	$29,646	0.416	$12,319
19		$29,646	$29,646	0.396	$11,732
20		$29,646	$29,646	0.377	$11,173
21		$29,646	$29,646	0.359	$10,641
22		$29,646	$29,646	0.342	$10,134
23		$29,646	$29,646	0.326	$9,652
24		$29,646	$29,646	0.310	$9,192
25		$29,646	$29,646	0.295	$8,755
26		$29,646	$29,646	0.281	$8,338
27		$29,646	$29,646	0.268	$7,941
28		$29,646	$29,646	0.255	$7,563
29		$29,646	$29,646	0.243	$7,202
30		$29,646	$29,646	0.231	$6,859
TOTALS	**$4,572,015**	**$889,380**	**$5,461,395**		**$4,813,488**

PV Capital	*$4,357,756*
PV O&M	*$455,732*

Table 12-5. Alternative 4U, Cost Detail for In-place Treatment

Undeveloped Lands - Alternative 4U - Costs for Future Development of Undeveloped Land

Capital Costs for Lands to be Developed in the Future

DESCRIPTION	QUANTITY	UNIT	UNIT COST	COST	Notes / Assumptions
Cleanup Undeveloped Lands Planned for Development - Deep Tilling	1	acre	$3,500	**$3,500**	Historic site cost for deep tilling is $3,500 per acre including deep tilling and soil amendments.
Pre-remediation Sampling Undeveloped Lands	1	acre	$135	**$135**	Assumes one 16-spot composite sample per acre, $25 per sample analysis, 2 hour per sample to collect and prepare sample and provide data management at $40 per hour, $30 per sample shipping for total $135 per sample.
SUBTOTAL Capital Costs per acre				**$3,635**	
Mobilization / Demobilization & Division 1 Costs				**$145**	Assumes 4% of Capital Costs
Contractor Overhead and Supervision				**$291**	Assumes 8% of Capital Costs
Contingencies 30% (20% base plus 10% for fuel costs)				**$673**	Assumes contingencies at 30% of Capital Costs (10% fuel incr.)
TOTAL CAPITAL COSTS				**$4,744**	The capital cost per acre is based on 2006 costs. These costs will change in the future depending on market conditions.

Sheets

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1118773

SITE NAME: EAST HELENA NPL

DOCUMENT DATE: 09/17/2009

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☑ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

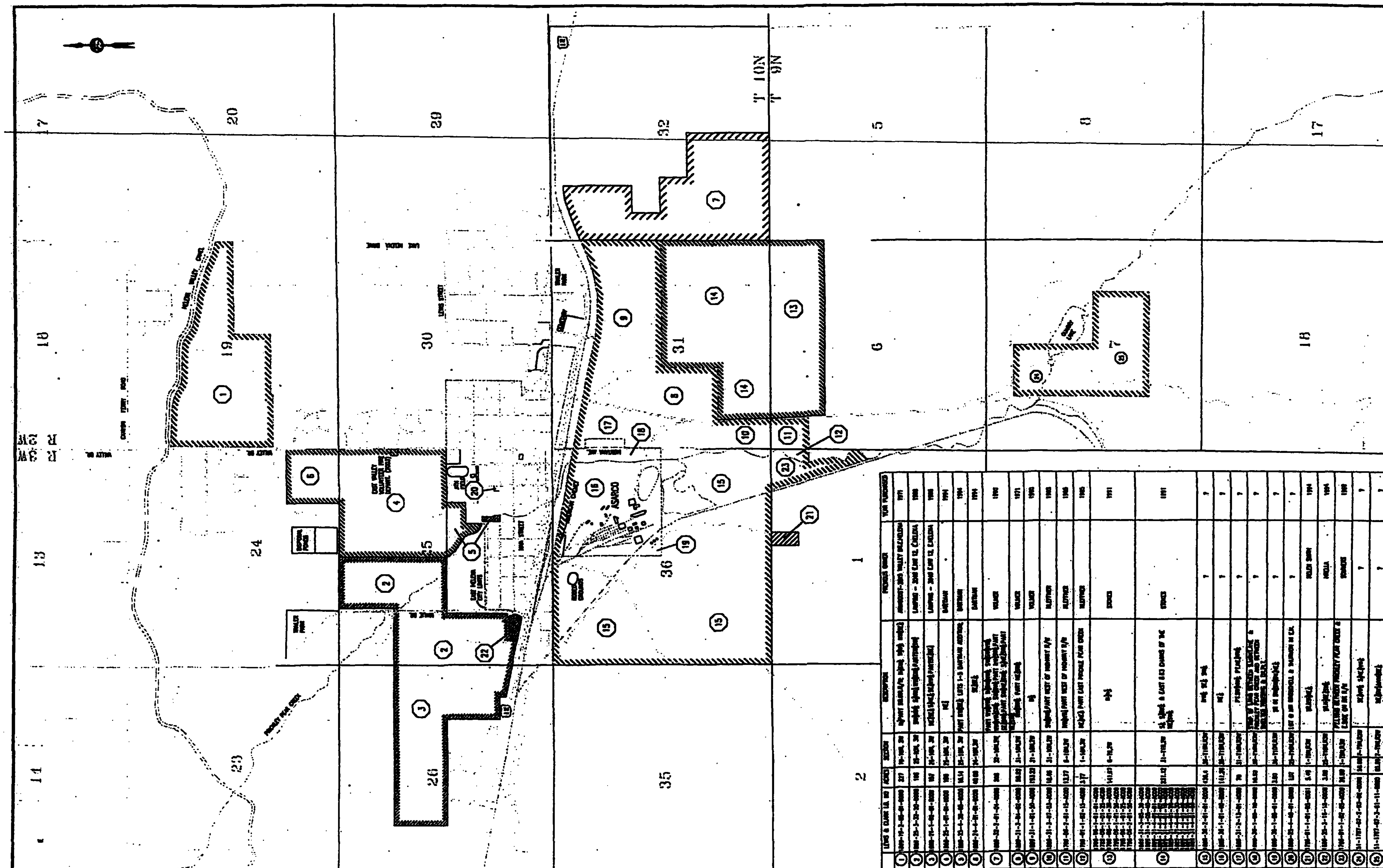
DOCUMENT DESCRIPTION:

SHEET 1 SOIL RESPONSE ACTION LOCATIONS
SHEET 2 1995 - 2008 EAST HELENA CHILD BLOOD LEAD SCREENING
SHEET 3 1995 - 2008 EAST HELENA CHILD BLOOD LEAD SCREENING (CHILDREN SCREENED MORE THAN ONCE)

Contact the Superfund Records Center to view available document.
(303) 312-6473

APPENDIX A

ASARCO OWNERSHIP MAP



DRWG NO.	REFERENCE DRAWINGS	DRWG NO.	REFERENCE DRAWINGS	DRWG NO.	REFERENCE DRAWINGS
08-1-7435	MAP ASARCO PROPERTY				
08-1-7656	PROPERTY AS OF 11-10-88				

NO	BY	DATE	DESCRIPTIONS
	RLK	[illegible]	ADDITIONAL INFORMATION TO PROPERTY DESCRIPTIONS
	RLK	[illegible]	ADDED HRELLA PROPERTY
	KEM	[illegible]	ADDED SMITH PROPERTY

NO	BY	DATE	DESCRIPTIONS
	RLK	[illegible]	ADDED HRELLA PROPERTY
	PWH	[illegible]	ADDED HARTMAN PROPERTY
	RLK	[illegible]	ADDED STOKES PROPERTY
	RLK	[illegible]	ADDED VOLMEN PROPERTY

		DATE
DRAWN BY	CCSA	6-6-88
CHECKED BY	[illegible]	8-18-88
APPROVED BY		
SCALE	APPROX 1"=1000'	

ASARCO Incorporated
EAST HELENA PLANT
EAST HELENA, MONTANA 59635

ASARCO MAPS
ASARCO PROPERTY MAP SHOWING ALL PROPERTY OWNED BY ASARCO

08-1-7805

APPENDIX B

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY HEALTH CONSULTATION

Health Consultation

EAST HELENA SUPERFUND SITE

EAST HELENA, LEWIS AND CLARK COUNTY, MONTANA

EPA FACILITY ID: MTD006230346

May 20, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR, which in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

HEALTH CONSULTATION

Review of Preferred Cleanup
Alternatives 2R and 3R

EAST HELENA SUPERFUND SITE

EAST HELENA, LEWIS AND CLARK COUNTY, MONTANA

EPA FACILITY ID: MTD006230346

ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

Prepared by:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Table of Contents

1 Statement of Issues

The Montana Department of Environmental Quality (MDEQ) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) determine whether two proposed cleanup alternatives for lead contamination in residential areas of the East Helena Superfund site are protective of public health. These two cleanup alternatives, which are documented in the US Environmental Protection Agency's (EPA's) proposed plan for final cleanup [EPA 2007a], are referred to as

- Alternative 2R—Selected Soil Removal [1,000/500 parts per million (ppm) lead], Continuing Community Education, and Institutional Controls; and
- Alternative 3R—Selected Soil Removal (500 ppm lead), Continuing Community Education, and Institutional Controls.

ATSDR understands that a level of flexibility is needed to best respond to different site conditions, communities, and uncertainties at lead-contaminated residential sites. In this health consultation, ATSDR evaluates whether two of the proposed cleanup alternatives developed specifically for the East Helena Superfund site are protective of public health.

2 Background

The following background text will first provide information about lead, the primary contaminant of concern. Then, ATSDR provides a summary of the history and characteristics of the East Helena Superfund site as described in EPA's January 2007 proposed plan for final cleanup [EPA 2007a].

2.1 Lead

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing [ATSDR 2007c].

Lead can affect almost every organ and system in the body, although the main target for lead toxicity is the nervous system. Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomach-ache, muscle weakness, and brain damage. Unborn children can be exposed to lead through their mothers. Harmful health effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children [ATSDR 2007c].

Previously, the Centers for Disease Control and Prevention (CDC) responded to the accumulated evidence of adverse effects associated with lead exposures by lowering the blood lead level (BLL) of concern from 60 micrograms of lead per deciliter of blood (µg/dL) to 25 µg/dL. In 1991, CDC recommended lowering the level for individual intervention to 15 µg/dL and implementing communitywide primary lead poisoning prevention activities in areas where many children have BLLs greater than 10 µg/dL. However, this level, which was originally intended to trigger communitywide prevention activities, has been misinterpreted frequently as a definitive toxicologic threshold. Although there is evidence of adverse health effects in children with blood lead levels below 10 µg/dL, CDC has not changed its level of concern, which remains at levels greater than 10 µg/dL [CDC 2005].

Because there is no clear threshold for some of the more sensitive health effects, no guidelines for a safe dose of lead intake have been established. EPA has no reference dose (RfD) and ATSDR has no minimal risk revel (MRL) to serve as a safe oral dose below which adverse health effects are unlikely to occur. However, lead cannot be entirely eliminated from soil so there will always be some residual levels following cleanup actions at lead-contaminated sites. When deriving a site-specific cleanup level for lead, EPA considers aspects such as site-specific variability in exposure, lead geochemistry, and projected land use. EPA can also factor in other considerations such as cost, technical feasibility, compliance with state and federal regulations, and community acceptance. These factors result in large variations in proposed cleanup levels at different lead-contaminated sites.

2.2 Site Characteristics

The East Helena Superfund site consists of an abandoned smelter and adjoining areas including all of the City of East Helena, nearby residential subdivisions, numerous rural developments such as farms and homes on small acreage plots, and surrounding undeveloped lands (see Figure 1, Appendix A).

The smelter operated from 1888 until April 2001. Asarco took ownership of the smelter in 1895 and continued to operate it until its closure in 2001. Asarco still owns the smelter grounds and much of the undeveloped lands surrounding East Helena. During its operation the smelter produced lead bullion, but also recovered copper, gold, silver, and platinum for refining at other Asarco facilities. Ores and concentrates were shipped to East Helena for smelting from mines as far away as Indonesia and South America.

Other facilities included a former zinc plant, constructed and operated by the Anaconda Minerals Company from 1927 through 1972. The company produced zinc oxide from the lead smelting by-product, slag. The American Chemet Corporation also began producing zinc-based paint pigments in 1947. American Chemet continues to operate, but has modified and upgraded its zinc and copper product lines numerous times over the years. Burlington Northern Railroad and Montana Rail Link also operate rail lines and own or lease property adjacent to the industrial complexes. All five of these companies have been named as potentially responsible parties at this Superfund site.

Operations by these five companies have contributed to the present contamination in East Helena; however, the major contribution came as air emissions from the lead smelting and zinc fuming operations. In addition, storm water runoff and Wilson Ditch (a major irrigation ditch) transported fine-grained concentrates and other contamination from the smelter to residential and undeveloped areas along Prickly Pear Creek and lands served by Wilson Ditch.

Investigations conducted as early as the mid-1980s (and continuing to the present) reveal substantially elevated levels of 18 to 20 elements. All of these elements are found naturally in the Earth's crust, but generally at much lower concentrations. Many of these elements are classified as hazardous substances at the concentrations measured in soils on and around the smelter, and as far away as several miles downwind or downstream. Lead, arsenic, cadmium, copper and zinc are the elements of concern. Lead, however, is the element of greatest public health concern at the site. Figure 1, Appendix A, shows soils likely to have lead concentrations greater than 1,000 ppm, and between 1,000 ppm and 500 ppm. These boundaries are not clearly defined because over the course of 114 years of emissions, soil lead concentrations can vary depending upon land use, topography and other factors.

2.3 Land Use

Current land uses in East Helena include established residential areas and commercial businesses, newer residential subdivisions and acreage home sites, agricultural lands and open spaces, and industrial facilities (mainly the former Asarco smelter and American Chemet's operating plant). It is anticipated that future land use of existing residential properties will remain residential and that, based on historical growth patterns, new residential subdivisions will be developed on existing agricultural or undeveloped lands. Some of the agricultural lands will remain as productive agricultural resources. Some lands, such as the East Fields, will be used as a soil repository and, consequently, future development may be restricted there.

2.4 Superfund Involvement

In September 1984, EPA listed the site on the National Priorities List (NPL). Asarco conducted numerous investigations to identify soil, groundwater, and surface water impacted by past smelter operations. EPA and MDEQ provided oversight and direction.

In 1987, this large, diverse site was segregated into five operable units:

- Process Ponds and Fluids (including the process ponds and process fluids circuits),
- Surface Soils and Surface Water (including residential and agricultural soils, vegetation and livestock, fish and wildlife, Prickly Pear Creek, and Wilson Ditch),
- Ground Water (beneath the smelter property as well as beyond),
- Slag Pile, and
- Ore Storage Areas.

EPA divided the site into operable units partly to begin work on the process ponds while continuing to study other parts of the site. A Record of Decision (ROD) for the process ponds was issued by EPA in November 1989. Between 1990 and 1995, Asarco conducted the required remedial actions for the process ponds until another enforcement program under EPA's authority, the Resource Conservation and Recovery Act (RCRA) Program, became responsible for the process ponds, ground and surface water, the slag pile and former ore storage areas. The Superfund Program retained responsibilities only for residential soils and agricultural lands.

In March 1990, a comprehensive remedial investigation and feasibility study were completed by Asarco. With regard to residential soil sampling throughout the community, the remedial investigation included a characterization effort involving sampling at the surface and at depth intervals, generally down to 32 inches. Based on these depth-intergraded samples, EPA concluded that (1) metals, particularly lead, were deposited primarily by aerial deposition, and (2) depth of penetration of the soil profile, by lead and all other elements of concern, generally approaches background concentrations at depths of 18 to 24 inches [EPA 2008d].

In March 1991, in response to EPA's request, Asarco produced a revised and more focused remedial investigation and feasibility study for residential soils, Wilson Ditch, and vegetation. In July 1991, EPA and Asarco entered into a formal agreement to conduct an expedited removal action for residential properties, parks and school playgrounds, unpaved streets and alleys, irrigation ditches and commercial areas. As the removal action proceeded, approximately 1,500 additional yards and other properties were sampled, but mostly surface soil samples were collected (0-1 inch) [EPA 2008d].

Asarco, with EPA and MDEQ oversight and direction, has been removing soils with high concentrations of lead and other contaminants from residential yards, parks, roads, alleys, and street aprons since 1991. Throughout the years, the direction and protocols have been changed to reflect changing and updated information and to expedite the cleanup in a safe and protective, yet cost-effective manner. A number of innovative and experimental approaches to this project have been incorporated into the cleanup.

From 1991 to 2006, the removal action resulted in the cleanup of the following: 620 existing residential yards; 450 sections of alleys, roads, and road aprons; 6 public parks; 2 school playgrounds; 45 commercial and public areas; 4,200 linear feet of irrigation ditch; 150 flood channel and ditch sections; and 36 vacant lots.

2.5 Lead Education and Abatement Program

The Lewis and Clark City-County Health Department provides staff for and administers the East Helena Lead Education and Abatement Program. The program was established in July 1995 and maintains an office in East Helena. It is a multi-pathway lead exposure prevention and risk abatement program. The program promotes environmental assessments in homes, including sampling of yard soil, interior dust, drinking water, and lead-based paint in order to identify all sources of and pathways for lead exposure.

The program provides broad-based education to the public, in homes, day-care centers and schools. Education efforts are focused on nutrition, personal hygiene, health monitoring (blood lead testing) of area children, "safe play" practices, and risk reduction and management. The program provides information to area residents on the need to avoid areas with elevated soil or dust lead levels and to maintain barriers inside and outside the house. It provides information to future purchasers and sellers of property, lending institutions, and realtors regarding both site-wide and individual property-specific conditions. Appendix C provides a copy of the East Helena Lead Education and Abatement Program, Second Program Evaluation [LCCCHD 2005].

2.6 Community Involvement

Since 1984, EPA's public involvement program has included multiple actions to educate local residents and government officials concerning site risks and to inform them about the progress of Superfund activities. Community involvement activities include:

- Regularly scheduled public meetings in East Helena to inform the public and to obtain public input;
- Meetings with the East Helena City Council and Lewis and Clark County Commissioners to provide updates;
- Informal meetings with affected residents concerning the cleanup of their yards;
- Meetings with the East Helena School Board, administrators and teachers, including classroom presentations;
- Regular meetings with two separate citizens' advisory groups;
- Preparation and distribution of fact sheets and educational materials;
- Assistance with blood lead screenings for area children; and
- Ongoing assistance to the Lead Education and Abatement Program.

2.7 Blood Lead Screening

Children's blood lead levels (BLLs) have been a high priority health concern in East Helena. Beginning as early as 1975, and continuing throughout the late 1980s and early 1990s, studies involving children living in and around East Helena demonstrated elevated levels of lead in their blood [CDC 1986, LCCCHD 2005]. Two-thirds of East Helena children tested in 1983 had blood-lead levels greater than 10 micrograms per deciliter (µg/dL).

BLLs of East Helena children have been studied extensively since 1975. In the past, average blood lead values were high and the occurrence of values well above 10 µg/dL was common (see Table 1, Appendix A). Over time, average levels and the frequency of values above 10 µg/dL have declined significantly.

Figure 2, Appendix A, reveals a steady decline in East Helena children's BLLs. Since 2001, 531 children were tested and none have exceeded a blood lead level of 10 µg/dL. Of these children, 98% had BLL at or below 4 µg/dL [EPA 2007a]. The decline of observed BLLs in East Helena children is attributable to several factors. The one most important factor was the continual reduction of airborne lead emissions from the Asarco Lead Smelter. In 1991, Asarco altered its operations, which resulted in a 61% drop in the average lead emissions from the smelter (i.e., reduced average lead emissions from 90,000 pounds per year to approximately 34,700 pounds per year). As particulates in air were significantly reduced in the early 1990s, BLLs also showed significant reductions. In 1999, Asarco again reduced the lead emissions an additional 21%, from 34,700 pounds per year to 16,400 pounds per year. Asarco made its final reduction in 2001, dropping the lead emissions another 18%, from 16,400 pounds per year to 0 pounds per year, and ultimately closed the smelter in April 2001.

Other activities that have helped with the decline in children's BLLs are the East Helena Lead Education and Abatement Program and the cleanup and soil excavation efforts initiated in 1991 that are still ongoing. Additional factors not illustrated in Figure 2, Appendix A, that have influenced children BLLs in East Helena are EPA's National Lead Abatement Program (i.e., national reduction of lead fuel in automobiles and lead paint and plumbing within residential and commercial properties) and a nationwide reduction of dietary lead found in market foods, as inferred by the NHANES III Survey [CDC 1997].

3 Proposed Plan for Cleanup of East Helena's Residential Soils

Since 1984, EPA's public involvement program has included multiple actions to educate local residents and government officials concerning site risks and to inform them about the progress of Superfund activities. As part of the community involvement program, a proposed plan for East Helena residential soils was previously issued in October 1997. However, a Record of Decision was, for several reasons, never finalized. As a result of the lapse in time, and in an effort to provide the community a renewed opportunity to participate in the selection of a final remedy, a new and revised proposed plan was issued in January 2007.

In January 2007, the EPA announced its recommendations and plans for cleaning up the remaining contaminated soils in residential areas within the East Helena Superfund site. Because this health consultation focuses on only two of the proposed alternatives, ATSDR has not summarized all of the potential cleanup alternatives in this section. The following text summarizes the overall components of Alternatives 2R and 3R.

3.1 Overview of Proposed Alternative 2R

Alternative 2R will complete the residential soil cleanup according to protocols that are currently in place for the ongoing removal action [EPA 2007a]. Yards and other properties within residential areas would qualify for cleanup whenever any one (or more than one) sampling section has a composite soil lead concentration above 1,000 ppm lead. Once a yard qualifies, all other sections greater than 500 ppm lead would also be cleaned up.

As has been the practice in East Helena for over 10 years, residential yard soil sampling followed a protocol that required "biased sampling" and incorporation of an "adjustment factor" to the raw analytical results [EPA 2008b]. Approximately 1,500 yards have been sampled using this sampling protocol [EPA 2008d]. Under Alternative 2R, EPA would use these available data to determine which yards to remediate. However, some additional yards may require further sampling efforts, which will follow these historical protocols. EPA did not provide ATSDR with the sampling and analysis plan describing these historical protocols; however, EPA did describe these protocols in several emails to ATSDR staff. These protocols would include [EPA 2008b, EPA 2008d]:

- <u>Sampling Location and Depth:</u> A "biased sampling" method will be used. Sample locations will be selected to locate the highest lead concentrations in each section of the yard. At least 3 of the 5 locations that make up the composite within each section will be biased to detect the highest lead concentrations. Generally, surface soil samples will be collected (0-1 inch).

- Yard Sections: A five-point composite sample will be collected from each section. Small to medium yards will be divided into 4 sections. However, any *yard larger than 14,400 square feet in area (about 1/3 of an acre) must be* subdivided into 60 by 60 foot sections. It is estimated that the yards in East Helena's outlying subdivisions will have 8 to 12 sections. Some will have as many as 16 (or more) sections. Thus, in a yard divided into 12 sections, 60 individual soil samples will be taken and 36 or more of them must be biased for locating the highest lead concentrations.
- Sample Analysis: After the composited samples are analyzed, by standard laboratory procedures, the Montana Office will apply a statistical certainty factor, or "adjustment factor", to the raw analytical results. For example, a property with a raw reading for one section of 717 ppm could, after applying the adjustment factor to achieve the upper 95th percentile confidence, have a reported concentration of 836 ppm lead [EPA 2008b]. Reporting the 95th percentile results in a more conservative estimate of the soil concentration.

EPA indicated that Alternative 2R has these conservative practices "built in" and that they will be retained if Alternative 2R is selected as the remedial action [EPA 2008b].

Also under Alternative 2R, the county would continue to administer the East Helena Lead Education and Abatement Program for as long as necessary. In addition, institutional controls would be developed and administered by the local government to protect against recontamination of areas cleaned up and assure that protective regulations and policies are adhered to.

In January 2007, the Superfund Program estimated that approximately 100-110 existing residential yards would qualify for remediation under Alternative 2R. In its January 2007 proposed plan, EPA chose Alternative 2R as the preferred cleanup alternative for contaminated soils in existing residential areas. EPA recommended Alternative 2R because it is patterned after the residential soil removal action that has been in place since 1991. EPA believes that the removal action has proven to be safe, effective, and protective of children's health, and will satisfy applicable or relevant and appropriate legal requirements (ARARs). EPA stated that Alternative 2R represents a cost-effective approach to cleanup with the least amount of disturbance or environmental consequence [EPA 2007a].

For additional information regarding this cleanup alternative, as presented in EPA's January 2007 proposed plan for cleaning contaminated surface soils in East Helena, please refer to Appendix B.

3.2 Overview of Proposed Alternative 3R

For Alternative 3R, when soil sampling indicates that a parcel of residential property has an average soil lead concentration greater than 500 ppm, all soils of that property would be excavated. Under Alternative 3R, the same community education and institutional control components discussed for Alternative 2R would apply.

Although not stated in the January 2007 proposed plan, it is ATSDR's understanding that EPA first assumed Alternative 3R would follow the same sampling protocol as Alternative 2R (i.e., historical protocols) [ATSDR 2008d]; however, EPA is currently considering following the sampling protocols described in EPA's 2003 Superfund Lead-Contaminated Residential Sites Handbook instead [EPA 2008d]. All of the existing non-remediated residential properties within a radius of approximately 2.5 miles from the smelter would require additional sampling (see Figure 1, Appendix A, and note the probability of locating properties with soils greater than 500 ppm lead) [EPA 2007a]. According to the 2003 handbook, residential yard soil sampling protocols include [EPA 2003]:

- Sampling Location and Depth: One five-point composite of aliquots collected at equal spacing and from the same depth interval should be obtained from each section. Composite samples should be collected at 6 inch depth intervals, i.e., 0-6 inches, 6-12 inches, 12-18 inches, and 18-24 inches. Each aliquot should be collected away from influences of the drip zone and any other painted surfaces.
- Yard Sections: For residential yards with a total surface area less than 5,000 square feet, a five-point composite samples should, at a minimum, be collected from each of the following locations—the front yard, the back yard, and the side yard (if the size of the latter is substantial). For residential yards with a total surface area greater than 5,000 square feet, the property should be divided into four quadrants of roughly equal surface area. Properties over one acre in size should be divided into 1/4 acre sections. In addition, soil samples should also be collected from distinct play areas and gardens if they are present.
- Sample Analysis: Composited samples will be analyzed by standard laboratory procedures.

In the January 2007 proposed plan, EPA estimated that approximately 900 existing residential yards would qualify for remediation under Alternative 3R. Although EPA considers Alternative 3R protective of public health, EPA did not choose Alternative 3R as the preferred cleanup alternative for contaminated soils in existing residential areas in its January 2007 proposed plan.

For additional information regarding this cleanup alternative, as presented in EPA's January 2007 proposed plan for cleaning contaminated surface soils in East Helena, please refer to Appendix B.

4 Discussion

East Helena residents are exposed to lead contaminated surface soil in their residential yards. Exposure to soil occurs primarily through dermal contact. In addition, people might accidentally ingest soil as well as dust that is generated from disturbing the soil. Preschool age children tend to swallow more soil or dust than do any other age group because they have more contact with soil through their play activities, they tend to exhibit mouthing of objects, and some exhibit pica behavior. Pica behavior refers to the intentional ingestion of non-food items, such as soil. Children in elementary school, teenagers, and adults tend to swallow much smaller amounts of soil or dust. The amount of grass cover in an area, the amount of time spent outdoors, and weather conditions also influence people's exposure to soil.

For the East Helena Superfund site, there are elevated lead levels in soil. This health consultation evaluates two alternatives proposed by EPA for cleaning up the remaining lead-contaminated soil. In the following text, ATSDR evaluates several components of each alternative: community education and intervention, institutional controls, soil sampling protocols, and lead cleanup levels. Other considerations are also acknowledged, such as the impact of heavy construction on the community.

4.1 Community Education and Intervention

When lead contamination is identified at a site, remedial actions usually include community health education and intervention. It is difficult to document the impact of health education, by itself, since it is usually done in concert with source removal and abatement. Nevertheless, there is some evidence that community-wide education and intervention have been partly responsible for declines in community blood lead levels [Hilts et al. 1998].

Under both Alternatives 2R and 3R, the Lewis and Clark City-County-administered Lead Education and Abatement Program will continue to operate within the community for as long as needed to protect children from exposures to residual levels of lead. Currently, Asarco is funding this program, with county health professionals stationed within the community and its schools [EPA 2008a]. As described in Section 2.5, the program provides broad-based education to the public, in homes, day-care centers and schools. The focus of education is on nutrition, hygiene, continued health monitoring (blood lead testing) of the area's children, "safe play" programs, and continued risk reduction. Also as mentioned in Section 2.5, the program provides information to future purchasers and sellers of property, lending institutions, and realtors regarding both site-wide and individual property-specific conditions. Further details regarding this program can be found in Appendix C, which provides a copy of the East Helena Lead Education and Abatement Program, Second Program Evaluation [LCCCHD 2005].

In 1999 and 2005, the program's effectiveness was reviewed using door to door surveys, focus groups, and other evaluation methods [LCCCHD 2005]. During both reviews, the program received high grades for its performance. ATSDR's review found the program's goals and accomplishments to be comprehensive and far-reaching. For the East Helena community, there appears to be a heightened awareness regarding lead exposures. Although the most likely reasons for the substantial reduction in children's BLLs over the years were the reduction of airborne lead emissions and the subsequent closure of the Asarco Smelter, other actions that have helped with the decline include the Lead Education and Abatement Program's activities. ATSDR believes the program is effective because activities such as community health education are combined with other measures such as BLL testing and in-home environmental assessments (see Appendix C). Because there will always be residual levels of lead in East Helena, regardless of the cleanup alternative chosen, ATSDR finds the Lead Education and Abatement Program to be a critical and necessary component in the protection of public health as outlined in the January 2007 proposed plan for Alternatives 2R and 3R.

4.2 Institutional Controls

Institutional controls (ICs) are legal and administrative tools used to maintain protection of human health at sites. ICs are often a part of the remedy at a site. ICs can be used to restrict site use, modify behavior, and provide information to people. Because there may be residual contamination at the site, ICs are a way to insure the protection of public health [ATSDR 2007b].

As described in the January 2007 proposed plan, the ICs for the East Helena Superfund site are:

- Adopt and administer local regulations designed to reduce opportunities for recontamination of areas already cleaned up;
- Adopt and administer regulations that require, or policies that encourage, coordination of planning and zoning efforts (East Helena city government, Lewis and Clark County Health Board, Lewis and Clark County Planning and Zoning Commission);
- Continue to provide oversight of cleanup activities and monitor areas previously cleaned up; and
- Administer restrictions and requirements at the EPA-approved soils repository.

The Lewis and Clark City-County-administered Lead Education and Abatement Program will, after a final remedy is selected and a Record of Decision is issued, administer institutional controls and associated guidelines [EPA 2007a]. However, ATSDR cautions that the success of an IC is dependent on implementation, monitoring, and enforcement activities. Therefore, success depends on the commitment of the local government entities, who may have some overlapping responsibility for an IC, to work together. Provided that the local government entities work together to implement, monitor, and enforce appropriate and feasible regulations, ATSDR finds the general ICs to be a critical and necessary component in the protection of public health as outlined in the January 2007 proposed plan for Alternatives 2R and 3R.

4.3 Soil Sampling Protocols

For each residential yard, the overall goal of sampling is to estimate an average soil lead concentration that can be used to determine whether the yard, or a section of the yard, requires cleanup actions. During the development of its 2003 Superfund Lead-Contaminated Residential Sites Handbook, EPA reviewed various sampling designs historically employed at lead-contaminated residential sites and assessed the ability of these sampling designs to support the development of cleanup levels [EPA 2003]. In the 2003 handbook, EPA proposed a sampling strategy the agency felt would promote consistent procedures, criteria and goals in the investigation of lead-contaminated residential sites.

Although not described in the January 2007 proposed plan for East Helena, it is ATSDR's understanding that Alternative 3R might follow the same sampling protocol as outlined in EPA's 2003 handbook. As such, ATSDR finds that the sampling protocol of

Alternative 3R would support the identification of residential yards that may require cleanup actions due to elevated lead levels if the EPA 2003 handbook is followed.

Alternative 2R will follow the historical sampling protocols that have been in practice at the East Helena site for over 10 years. At this time, it is unclear to ATSDR whether Alternative 3R will follow these historical sampling protocols, although there is that possibility. The historical sampling protocols used in East Helena were developed and instituted before EPA released its 2003 handbook and therefore do not follow the 2003 handbook sampling protocols.

Based on the information provided to ATSDR for this health consultation, the major differences between the sampling protocols appear to be that the historical protocols require "biased sampling" and the incorporation of an "adjustment factor" to the raw analytical results whereas the 2003 handbook sampling protocols do not require these measures [EPA 2008b]. It also appears the historical sampling protocol results in more sections per yard than the 2003 handbook sampling protocol. In addition, historical protocols have concentrated sampling efforts on top soil (0-1 inch). ATSDR notes that people are generally exposed to only the top inches of soil [ATSDR 1994].

Overall, ATSDR believes that these differences in historical sampling protocols would most likely result in higher lead concentrations being found in top soil. Because Alternative 2R follows historical protocols, ATSDR finds that Alternative 2R's sampling protocol supports the identification of residential yards that may require cleanup actions due to elevated lead levels. Similarly, ATSDR finds that Alternative 3R's sampling protocol would support the identification of residential yards that may require cleanup actions due to elevated lead levels if historical protocols are followed.

4.4 Lead Cleanup Levels

As previously mentioned, neither ATSDR nor the EPA has developed a MRL or RfD for exposure to lead. Therefore, the usual approach of estimating exposure to an environmental contaminant and then comparing this dose to a health guideline (such as an RfD or MRL) cannot be used. Instead, exposure to lead is evaluated by using a biological model that predicts a blood lead concentration that would result from exposure to environmental lead contamination. The most widely used model for this purpose is EPA's Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) model.

The IEUBK model is designed to integrate exposure from lead in air, water, soil, dust, diet, paint, and other sources with pharmacokinetic modeling to predict blood lead concentrations in children 6 months to 7 years of age. The four main components of the current IEUBK model are: (1) an exposure model that relates environmental lead concentrations to age-dependent intake of lead into the gastrointestinal tract; (2) an absorption model that relates lead intake into the gastrointestinal tract and lead uptake into the blood; (3) a biokinetic model that relates lead uptake in the blood to the concentrations of lead in several organ and tissue compartments; and (4) a model for uncertainty in exposure and for population variability in absorption and biokinetics [EPA 1994].

The IEUBK model results can be a tool for the determination of site-specific cleanup levels. In this context, the model is viewed as a predictive tool for estimating changes in blood concentrations as exposures are modified [EPA 1994]. In setting a soil lead cleanup level at a site, EPA's goal is to "limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead level of 10 µg/dL" [EPA 1998].

The IEUBK model provides choices a user may make in estimating a child's blood lead concentration. These are referred to "user-specified" parameters or decisions. The reliability of the results obtained using the model is very dependent on the selection of the various coefficients and default values that were used.

The use of solely default parameters in the IEUBK model yields a soil lead level of about 400 ppm, which EPA recommends as a screening level for lead in soil at residential properties [EPA 1998]. Using a combination of default assumptions and site-specific information on lead relative bioavailability (RBA) and soil to dust ratios obtained at East Helena, the model-predicted lead level is estimated to be 520 ppm [EPA 2007b]. For this health consultation, the model-derived values are only one aspect considered when determining whether a cleanup level is protective of public health at East Helena. Other important aspects factored into ATSDR's evaluation of cleanup levels for the East Helena Superfund site include the site's history, BLL data, community education and intervention, and institutional controls.

Alternative 2R proposes cleanup of residential yards when any one section has soil lead greater than 1,000 ppm. Once a yard qualifies, all sections of the yard above 500 ppm will be cleaned up. Overall, with the continuation of the Lead Education and Abatement Program and the adoption and enforcement of appropriate and feasible institutional controls, ATSDR finds the lead levels that trigger cleanup in Alternative 2R protective of public health. The following text documents several factors considered in ATSDR's evaluation:

1. Site history: Beginning in 1991, Asarco altered its operations, which resulted in a 61% drop in the average lead emissions from the smelter. As particulates in air were significantly reduced in the early 1990s in East Helena, children's BLLs also showed significant reductions. Similarly, another smelter in Trail, British Columbia, showed a rapid decline in children's BLLs levels following reductions in air lead levels [Hilts 2003]. In 1999 and 2001, Asarco again reduced lead emissions. In April 2001, the smelter closed, thereby stopping a major source of lead contamination in East Helena.

   Since 1991, there has been ongoing removal of soils with high concentrations of lead from residential yards. The lead levels that trigger cleanup proposed in Alternative 2R are the same as the levels used to trigger cleanup during past residential yard removal actions. Furthermore, the comprehensive Lead Education and Abatement Program, which was established in 1995, is an ongoing program. Overall, a review of the site's history has shown a continued decline in adverse impacts of lead-contamination on public health for the East Helena community. As long as all critical components of the January 2007 proposed plan are maintained in the final remedy, ATSDR finds that the site's history supports the public health protectiveness of Alternative 2R's lead cleanup levels, which have been used to trigger cleanup actions at the East Helena site for many years.

2. Blood lead data: As stated in ATSDR's guidance, blood lead data, by itself, should not be the sole basis for determining whether lead contamination at a site poses a hazard [ATSDR 2007a]. Blood lead levels reflect exposure for the time period in which the children were tested, but it may not be representative of past or future exposures for different children. Therefore, when comparing the results of blood lead screening to estimated results from the IEUBK model, ATSDR considers items such as whether the blood lead data are representative of the community [ATSDR 2007a]. Although ATSDR did not perform its own review of the BLL data, an EPA analysis found that based on consideration of participation rates, narrowing bands of statistical uncertainty over time, spatial representativeness, and soil lead representativeness, a high level of confidence exists in the blood lead data generated by the County-administered program. The EPA analysis concluded that these long-term data are reliable and appropriate for use by risk managers and other health professionals in assessing conditions in East Helena and for setting a protective soil lead cleanup level [EPA 2007b].

   Application of the IEUBK model indicates the recommended default parameters can over-predict BLLs when site-specific data are not used [von Lindern et al. 2003]. Alternative 2R's lead cleanup levels (1,000/500 ppm lead) are above the IEUBK model-derived default soil lead cleanup level of about 400 ppm. However, for East Helena, the average BLLs and the frequency of values above 10 μg/dL have declined significantly over time. Since 2001, 531 children were tested and no children have had blood lead levels above 10 μg/dL. Of these children, 98% had BLL at or below 4 μg/dL [EPA 2007a]. As mentioned previously, there is some evidence that community-wide education and intervention have been partly responsible for declines in community blood lead levels [Hilts et al. 1998]. As long as all critical components (like community education) are maintained in the final remedy, ATSDR finds that these BLL data support the public health protectiveness of Alternative 2R's lead cleanup levels, which have been used to trigger cleanup actions at the East Helena site for many years.

3. Community education and intervention: As described in Section 4.1, ATSDR found the Lead Education Abatement Program's goals and accomplishments to be comprehensive and far-reaching. For example, under the program, whenever blood lead tests of a child and a follow-up environmental assessment of a home demonstrate that exposure to lead in the soils of that yard is responsible for a blood lead level above 10 μg/dL, then that yard would qualify for immediate remedial action irrespective of the yard soil lead concentration [EPA 2007a]. Also, the program offers free BLL testing and free environmental lead hazard assessments (i.e. water, soil, dust, paint, hobbies) to all East Helena area residents upon request [EPA 2007b]. Overall, ATSDR finds that the public health protectiveness of Alternative 2R is greatly enhanced by the Lead Education and Abatement Program.

4. Institutional controls: As described in Section 4.2, ATSDR found that the general ICs outlined in the January 2007 proposed plan are protective of public health. According to the January 2007 proposed plan, these ICs could include regulations needed to (a) prevent disturbances of contaminated soils that remain in and around East Helena and (b) prevent exposures to interior household dust (attics, unfinished basements, heating ducts, etc.) during remodeling or demolition [EPA 2007a]. Overall, ATSDR finds that the public health protectiveness of Alternative 2R will be greatly enhanced by the adoption and enforcement of appropriate and feasible regulations.

Overall, as long as the aforementioned critical components are maintained in the final cleanup remedy, ATSDR finds the lead levels that trigger cleanup as outlined in the January 2007 proposed plan for Alternative 2R to be protective of public health.

Alternative 3R proposes cleanup of yards when soil sampling indicates that a residential property has an average soil lead concentration greater than 500 ppm. All soils of that property would be excavated. Under Alternative 3R, the same community education and institutional control components discussed for Alternative 2R would apply. Although Alternative 3R's lead cleanup level (500 ppm lead) is above the IEUBK model-derived default soil lead cleanup level of about 400 ppm, ATSDR believes the site's history and BLL data would also support the protectiveness of this alternative over time. Therefore, as long as all critical components of the January 2007 proposed plan are maintained in the final remedy, ATSDR finds the lead level that triggers cleanup of residential yards for Alternative 3R to be protective of public health as well.

4.5 Other Considerations

The choice between various cleanup alternatives is ultimately a risk management decision. At lead-contaminated residential sites, a variety of considerations are evaluated to determine the best site-specific alternative. For this health consultation, ATSDR evaluated specific environmental health aspects of Alternatives 2R and 3R to determine whether the alternatives are protective of human health. However, the agency acknowledges that many other considerations not evaluated in this health consultation must be addressed by risk managers in the final selection of a cleanup alternative. For example, ATSDR acknowledges that the heavy construction associated with cleaning up yards will impact the community. That is, the operation of heavy equipment, dump trucks, street sweepers, etc., in yards where young children reside can present a substantial risk to their physical safety, regardless of the cleanup alternative chosen.

Another consideration is the accuracy of the lead boundary lines noted in Figure 1, Appendix A. This figure, developed by EPA, shows soils likely to have lead concentrations greater than 1,000 ppm, and between 1,000 ppm and 500 ppm. However, EPA states that these boundaries are not clearly defined and that relatively little sampling has been done outside the red boundary line [EPA 2007a, EPA 2008d]. ATSDR finds that regardless of the cleanup alternative chosen, additional efforts to characterize the extent of lead contamination may be warranted.

Lastly, although ATSDR did not review original site documents in some instances, such as the historical sampling and analysis plan, the agency has assumed for the purpose of this health consultation that the information provided by EPA to ATSDR in emails is accurate and reliable. ATSDR acknowledges that our analyses, conclusions, and recommendations are valid only if the information we received to evaluate are complete and reliable.

5 Child Health Considerations

ATSDR recognizes the unique vulnerabilities of children from exposure to hazardous substances in their environment. Children are at greater risk than are adults from certain kinds of exposures to hazardous substances because they often have greater exposure than do adults. For instance, children frequently play outdoors and are more likely to come in contact with soil than are adults. Children are more likely to get dirt on their hands, and are more likely to swallow some of that dirt if they do not wash their hands properly before eating. Children are also smaller than adults, resulting in higher doses of chemical exposure per body weight. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care. Consequently, whenever soil is a pathway of concern—as it is in East Helena—children will have greater exposure to substances in the soil than will adults. For this reason, sampling and cleanup efforts in East Helena have been prioritized for yards where children resided.

As mentioned previously, children with soil pica behavior are of particular concern because they could possibly have significant exposures to lead-contaminated soil. Because there will always be residual levels of lead in East Helena, regardless of the cleanup alternative chosen, ATSDR finds the Lead Education and Abatement Program to be a critical and necessary component in the protection of children's health for Alternatives 2R and 3R. The planned institutional controls are also a critical and necessary component in the protection of children's health for Alternatives 2R and 3R. Overall, ATSDR finds Alternatives 2R and 3R protective of public health, including children, as long as these critical components are maintained in the final cleanup remedy.

6 Conclusions

ATSDR understands that a level of flexibility is needed to best respond to different site conditions, communities, and uncertainties at lead-contaminated residential sites. For this health consultation, ATSDR evaluated the environmental health aspects of proposed cleanup Alternatives 2R and 3R for the East Helena Superfund site to determine whether the alternatives are protective of human health. ATSDR has reached the following specific conclusions:

- Because there will always be residual levels of lead in East Helena, ATSDR finds that the Lead Education and Abatement Program is a critical and necessary component in the protection of public health as outlined in the January 2007 proposed plan for Alternatives 2R and 3R.
- Provided that local government entities work together to implement, monitor, and enforce appropriate and feasible regulations, ATSDR finds the general institutional controls are a critical and necessary component in the protection of

public health as outlined in the January 2007 proposed plan for Alternatives 2R and 3R.

- ATSDR finds the sampling protocols associated with Alternatives 2R and 3R support the identification of residential yards that may require cleanup actions due to elevated lead levels.
- As long as the aforementioned critical components are maintained in the final cleanup remedy, ATSDR finds the lead levels that trigger cleanup as outlined in the January 2007 proposed plan for Alternatives 2R and 3R to be protective of public health.
- Because relatively little sampling has been done outside the red boundary line (see Figure 1, Appendix A), ATSDR finds that regardless of the cleanup alternative chosen, additional efforts to characterize the extent of lead contamination may be warranted.

Overall, ATSDR concludes the proposed cleanup Alternatives 2R and 3R for lead contamination in existing residential areas are protective of public health.

7 Recommendations

1. Because ATSDR's evaluation of the protectiveness of both Alternatives 2R and 3R is dependent on the continuation of the Lead Education and Abatement Program and the adoption and enforcement of appropriate and feasible institutional controls, ATSDR recommends these critical components are maintained in the final cleanup remedy.
2. Because relatively little sampling has been done outside the red boundary line (see Figure 1, Appendix A), ATSDR recommends that additional efforts to characterize the extent of lead contamination be considered regardless of the cleanup alternative chosen.

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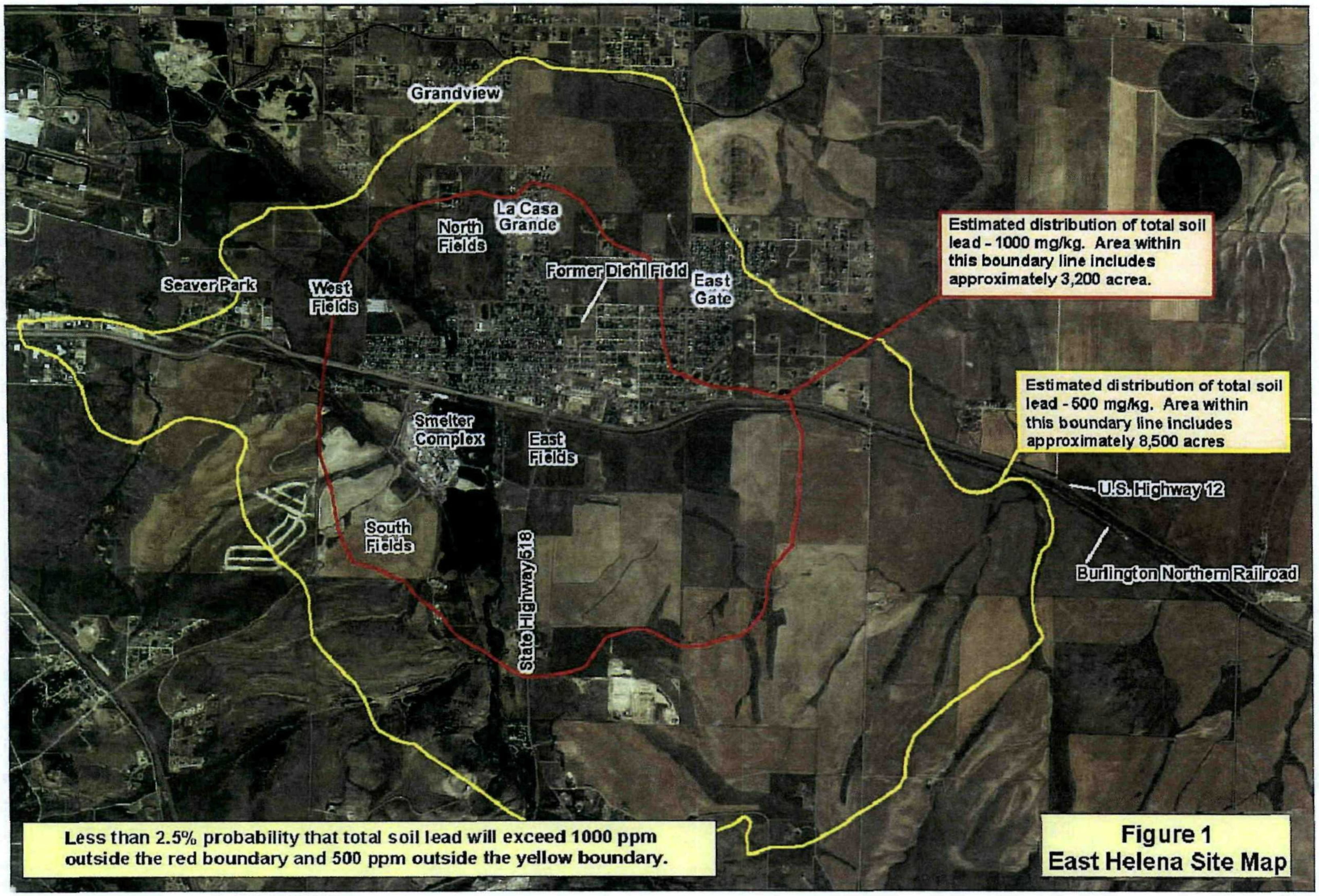
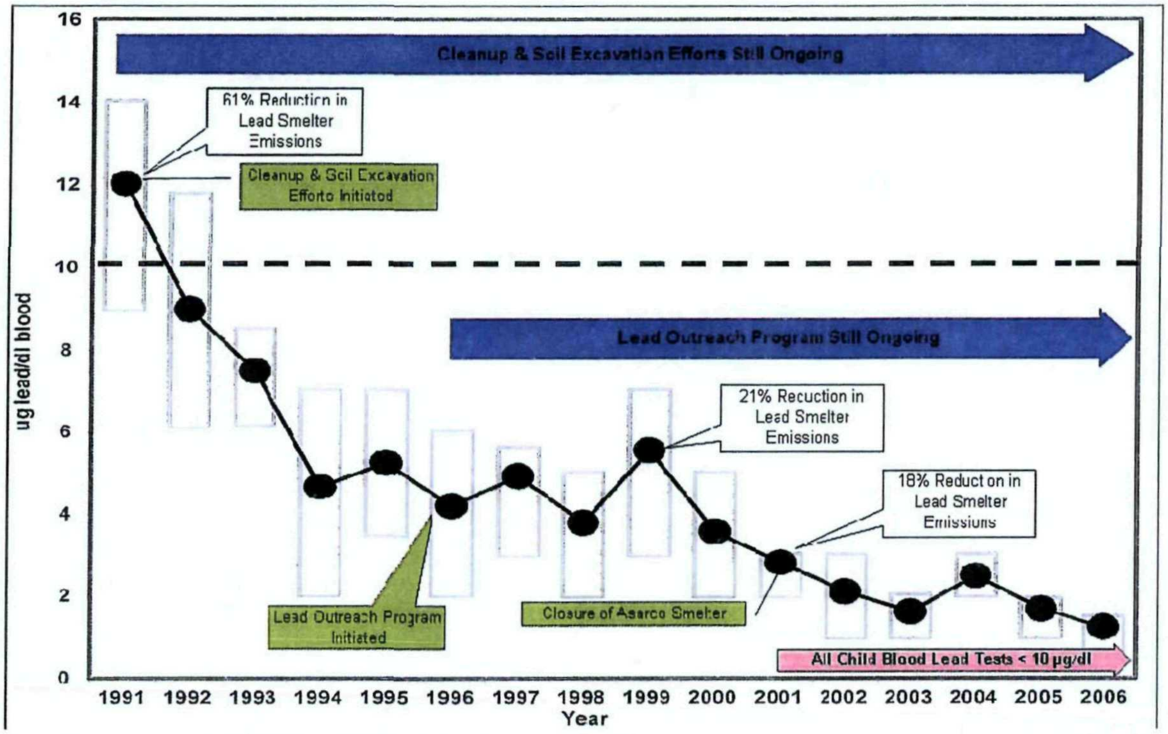
Appendix A—Figures and Tables



Source: courtesy of EPA 2007a

Figure 2. Children's Average (•) Blood Lead Concentrations from 1991 through 2006



Source: courtesy of EPA 2007a, LCCHD 2005

Figure notes:
Rectangles represent the central 50% of the concentration data

µg = micrograms

dL = deciliter

Table 1. Blood Lead Levels of East Helena Children 6 to 72 Months of Age (1975-2006)

Year	No. of children tested	No. with lead-in blood levels 10 µg/dl or greater	Average (µg/dl)	Relative Prevalance (%) of blood lead levels greater than 10 µg/dl
1975	90	90	28	100
1983	98[a]	67	14	68.4
1991-92	23	11	10.2	47.8
1993-94	36	2	5.5	5.6
1995-96	157	2	4.7	1.3
1997-98	185	7	4.2	3.8
1999-00	186	5	4.1	2.7
2001-02	130	0	2.6	0
2003-04	254	0	2	0
2005	10	0	1.7	0
2006	137	0	1.3	0

[a]Ninety-eight children residing within 1 mile of the smelter.

Source: EPA 2007a

Table notes:

µg = micrograms
dL = deciliter

Appendix B—Cleanup Alternatives 2R and 3R

Cleanup Alternatives 2R and 3R

The following paragraphs provide documentation regarding yard remediation under the cleanup Alternatives 2R and 3R, as presented in EPA's January 2007 proposed plan for cleaning up lead and arsenic contaminated surface soils in East Helena, Montana [EPA 2007a].

Alternative 2R—Selected Soil Removal (1,000/500 ppm lead), Continuing Community Education, and Institutional Controls

Cost—$ 10 million (net present value)

Time to Implement—2 years after EPA issues a Record of Decision

Under Alternative 2R, the remedy would consist of completing the residential soil cleanup according to protocols that are currently in place for the ongoing removal action. All remaining residential yards, vacant lots near residences, and unpaved areas such as streets and alleys within residential areas, that qualify under current protocols for the ongoing residential soil removal action, would be cleaned up. The county administered, community-wide education program, designed to monitor and protect children against exposures to residual lead, would be continued for as long as necessary. And, institutional controls would be developed and administered by local government to protect against recontamination of areas cleaned up and assure that protective regulations and policies are adhered to.

Under Alternative 2R, yards and other properties within residential areas would qualify for cleanup whenever any one (or more than one) sampling section, or quadrant, is above 1,000 ppm lead. Once a yard qualifies, all other sections (or quadrants) that are above 500 ppm lead would also be cleaned up.

The following further defines how Alternative 2R would be implemented.

- Where soil sampling indicates that any section or quadrant of a residential property qualifies that property for cleanup (i.e., at least one section greater than 1,000 ppm lead), all sections greater than 500 ppm lead would be excavated, placed into dump trucks that can be covered, hauled to the East Fields soil repository and disposed of by means of land application over ground that was severely impacted by past smelter emissions. Qualified yards where young children reside receive first priority each construction season.
- Unpaved roads, alleys and aprons that are adjacent to qualified properties would be excavated at the same time, under the same protocols.
- Soils would be excavated to a depth of 18 inches, or until all remaining lead concentrations, after excavation, are less than 500 ppm, whichever occurs first.
- Clean topsoil, generally mined from farmlands in the Helena Valley, would be used to backfill the areas from which soils are removed. Sod or reseeding,

replacement of shrubs, and other actions would be implemented in order to restore the property to its pre-response action condition.

- Whenever blood lead tests of a child and a follow-up environmental assessment of a home by health professionals demonstrate that exposure to lead in the soils of that yard is responsible for a blood lead level above 10 μg/dL, then that yard qualifies for immediate remedial action irrespective of the yard soil lead concentration.
- In the unlikely circumstances where a yard average soil arsenic concentration exceeds 176 ppm, but the yard does not otherwise qualify (e.g., no quadrant above 1,000 ppm lead), then the yard qualifies for remedial action.

An estimated 100 to 110 residential yards and 9 vacant lots, as well as their adjacent unpaved roads, aprons and alleys, are known to qualify for cleanup under Alternative 2R. It is anticipated that approximately 2 years would be required to clean up all remaining qualifying residential properties after EPA issues a Record of Decision.

Alternative 3R—Selected Soil Removal (500 ppm lead), Continuing Community Education, and Institutional Controls

Cost—$38 million (net present value)

Time to Implement—5 to 7 years after EPA issues a Record of Decision

Under Alternative 3R, the remedy would consist of completing the residential soil cleanup according to revised, more stringent protocols than are currently in place for the ongoing removal action. All remaining residential yards, vacant lots, and unpaved areas such as streets and alleys, that would qualify under the revised protocols, would be cleaned up. The county administered, community-wide education program, designed to protect against exposures to residual lead, would continue for as long as necessary. Institutional controls would be developed and administered by local government to protect against recontamination of areas cleaned up and assure that protective regulations and policies are adhered to.

Under this alternative, yards and all other properties, including unpaved streets, alleys and open areas within residential areas, would qualify for cleanup whenever the property average lead concentration is above 500 ppm. Once a property qualifies under this alternative, the entire property would be cleaned up.

The following details further define how Alternative 3R would be implemented.

- Where soil sampling indicates that a parcel of residential property has an average soil lead concentration greater than 500 ppm, all soils of that property would be excavated, placed into dump trucks that can be covered, hauled to the East Fields soil repository and disposed of by means of land application over ground that was severely impacted by past smelter emissions.

- All unpaved roads, alleys, aprons, commercial areas, and vacant residential lots or open areas within residential areas, that have an average soil lead concentration above 500 ppm, would be cleaned up.
- Soils would be excavated to a depth of 18 inches, or until all remaining lead concentrations are less than 500 ppm, whichever occurs first.
- Clean topsoil, generally mined from farmlands in the Helena Valley, would be used to backfill the areas from which soils are removed. Sod or reseeding, replacement of shrubs, and other actions would be implemented in order to restore the property to its pre-response action condition.
- Whenever blood lead tests of a child and a follow-up environmental assessment of a home, performed by health professionals, demonstrate that exposure to lead in the soils of that yard is responsible for a blood lead level above 10 µg/dL, then that yard qualifies for immediate remedial action, irrespective of the yard soil lead concentration.
- In the unlikely circumstances where a yard average soil arsenic concentration exceeds 176 ppm, but the yard average soil lead concentration does not exceed 500 ppm, then the yard qualifies for remedial action.

It is estimated that approximately 900 yards, lots, and open areas would qualify for remedial action under Alternative 3R. This estimate has some associated uncertainty because all existing residential properties within a radius of approximately 2.5 miles from the smelter would require pre-sampling. (See Figure 1 in Appendix B and note the probability of locating properties with soils greater than 500 ppm lead.) Extensive additional pre-sampling and the estimated number of properties that are likely to qualify under Alternative 3R result in an estimated time of construction of 5 to 7 years, after a Record of Decision is issued by EPA.

Appendix C—East Helena Lead Education and Abatement Program, Second Program Evaluation

EAST HELENA LEAD EDUCATION AND ABATEMENT PROGRAM

SECOND PROGRAM EVALUATION

MAY 3, 2005

Prepared by:

Lewis and Clark City/County Health Department
Resource Development Division and
East Helena Lead Education and Abatement Program

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1.3 From the last Five Year Review the program put together a Five Year Work Plan. The program continues to implement the following components of the Work Plan:

1. Health Intervention and Prevention Program

Identify children and others in East Helena area that may have a potential for negative effects as a result of exposure to environmental lead. The program staff continues to expand its efforts in finding children and pregnant women who are at risk of lead exposure.

Children 6 years and younger are at a greater risk to lead exposure than older children and adults and the program continues to try new methods of reaching these children. One such method involved the Women, Infants and Children (WIC) program.

In 2004, 298 postcards were sent out to all participants of the WIC program who lived in the East Helena Area. Approximately 17 % of all the postcards were returned due to change of address and no forwarding address in place. At the screenings many of the participants stated that they had received a postcard in the mail and that was how they learned of the screening. The program felt that the postcards sent were a good resource in reaching parents of young children and continues yearly outreach in this manner.

Monitor Blood Lead Levels in children. The program continues to input all information from the lead screenings held each year into a database. The information has been used in creating maps to determine if there are trends of participation rates for different areas of the community. Along with the participation rates the information is also used to determine the percentages for repeat screenings. The program continues to use the information from the database in creating maps and charts.

Coordinate with Montana Lead (CDC-funded) **Program** on childhood blood lead monitoring. The program reported all blood-lead levels to the Montana Lead Program. This blood-lead data was put into a larger database and the state analyzed the information to determine what kind of trends were happening statewide with regards to blood-lead levels in children.

The Montana Lead Program lost its funding in 2001 and has not received any additional funding at this time. The state laboratory continues to report all blood-lead levels in children to the Department of Public Health and Human Services (DPHHS). The DPHHS would like to have a tracking system in place for environmental health issues; which would include childhood blood lead levels. Funding for the new system has not been explored as of yet.

Coordinate with the Lead Awareness Program (HUD-funded) to raise community awareness of lead-related health issues. The program worked in conjunction with the Lead Awareness Program in promoting safety around lead. The two programs shared educational resources and presentations.

The Lead Awareness Program screened all children in Lewis & Clark County, while the East Helena Lead Education Program screened children in the East Helena Superfund area. The East Helena Program found five children with elevated blood lead levels through their screenings held in 2000. In contrast, the Lead Awareness Program found only one child with elevated blood lead levels in the two years they held screenings countywide. The Lead Awareness Program was a two-year grant from HUD. Lewis & Clark County was not eligible for additional funding.

Survey the various sectors of the community to determine the effectiveness of the program and make program adjustments as indicated. The program held four focus groups in December of 2004. The groups were broken into different target groups: East Helena residents, East Helena business owners, East Helena area residents (outside the City of East Helena) and East Helena elected officials. The results of these focus groups will be addressed in a separate chapter of this report.

Institutional Controls in the Superfund site. The program, at this time is not able to implement any Institutional Controls (ICs) for the East Helena Superfund Site. In order for the county to adopt any controls the EPA would have to incorporate the ICs in the Record Of Decision (ROD). The EPA has not released a ROD for East Helena at this time. The IC's are on hold until further decisions are made concerning the ROD.

Although the IC's are on hold the Program encourages citizens of East Helena to voluntarily dispose of excess soil from building projects to the East Fields, which is a designated repository for contaminated soils. The repository was created, by ASARCO, when remediation of East Helena yards began. ASARCO allows all citizens to use the repository at no charge.

Establish a system of tracking data related to residential soils and residents blood lead levels (intending to use a Geographic Information System). The program staff continues to use the database in creating maps depicting areas of high, medium and low soil lead concentrations and blood lead levels of children screened in those areas. The program staff currently is working on a map representing the location of all children screened over the past 10 years and locations of available soil lead levels.

Project Management, Organization and Schedule

Maintain a Program office, which is accessible to the public for information, and occasionally for blood lead screenings. Lewis & Clark City-County Health Department continues to maintain an office in the City of East Helena. This office provides ready access to the local residents.

Staff the Program appropriately to deliver consistent service to the community. The program has undergone a number of changes with regards to staffing. Currently the program employs two ¾ time Environmental Health Specialists who are available throughout the week. The number of staff working, at this time, is sufficient for the office to maintain consistent service to the public.

Explore additional funding streams leveraging current funding to enhance program activities. The program staff has continually investigated new grants, some of which are through the EPA and other Federal agencies. The program staff will continue to explore new grants and funding sources.

6.2.1 Community Outreach

In the last five years the program staff has continued its outreach programs. The program staff attends East Helena City/Council meetings; in doing so the staff has fostered a good working relationship with the Mayor and the East Helena City Council. Copies of the minutes from the Advisory Committee Meeting are sent to the Mayor and invitations for him to attend are also extended. There is a feeling of cooperation between the Program and the East Helena City Hall.

The program tracks all new babies born in the East Helena area and deliver "New Baby Packets" to all new parents in the East Helena area. Program staff sends out birthday cards once the children are a year old. The birthday cards reminds parents to have their children screened for blood lead.

School presentations for all first graders and kindergartners are given just before they are released for the summer. The presentations concentrate on where lead can be found and how to live and play safely around lead. The program staff has had positive feedback from parents of children participating in the presentations. School officials also are very positive about the presentations.

The program continues to participate in the East Helena Christmas stroll. The program's involvement with the stroll continues to increase each year. As in 2003, when the Program hosted Santa Clause. Continued participation in this event strengthens the Program's relationship with the citizens and businesses of East Helena.

In addition to the above-mentioned programs the program introduced a new outreach event, The Kiddie Parade. In 2002 the program started sponsoring a kiddie parade, which is on the Thursday before the East Helena Rodeo. Children are encouraged to dress up in western clothing or any other costume and walk in the parade.

The parade starts at the VFW and ends at the Main Street Park. After the parade children are given information packets and are treated to a picnic at the Park. The parade has been a wonderful way for the public to get to know the program staff and to participate in a community event.

Table 6.2.1 Summary of Community Outreach

Target Population	Event	Frequency	Number Affected
Parents of New Babies	New baby packets Follow up phone contacts Reminder postcard for screening when child is 1 year old.	Continually throughout the year	50-100 packets are distributed each year.
Day care providers	Phone calls and site visits	Annually	15-30
Kindergartner and first grade students, at Eastgate Elementary School	Presentation on how to live and play safely around lead. Approximately 30 minutes	Annually	Approximately 400 students per year
Entire Community	Christmas Stroll and Kiddie Parade	Annually	150-200 participants per year
City Officials	East Helena City Council Meetings	Bi-monthly	5-30 people per meeting
East Helena Residents with unremediated yards	Notification of the remediation guidelines	Annually	190 annually This number decreases each year with yearly remediation.
Day care providers	Training on lead sources, effects of lead and prevention methods	Annually	Approximately 80 daycare providers attend the training.
General public	Posters at paint and hardware supply stores.	9 retail stores in the Helena area	Unknown

6.2.2 BLOOD LEAD SCREENING

In accordance with the previous peer review, the program staff encourages participation and provides incentives for children to participate in blood lead screening events in the fall of each year. In the fall of 2002 the program was not allowed into the schools to hold their annual screening events during open house. The superintendent told the program that they were too controversial and hence would not be allowed to do any education in the schools. This was a set back to the program's educational and blood lead-screening plan. The superintendent left shortly thereafter.

Program staff approached the new superintendent and inquired if they could resume their presentations in the schools. The new superintendent (Ron Whitmoyer) granted permission for the program to give their presentations and hold screenings in the schools. The participation rates for blood lead screenings went up with the program being allowed back in the schools.

In the last five years the program has continued to expand its outreach for these events. In the fall of 2003 the program tried incentives as a way to increase the number of children being screened. Each child seven years and younger received a free large pizza and a $20.00 bill. Children older than seven received a free large pizza.

The numbers increased dramatically from 44 children in 2002 to 205 children in 2003. The program had 4 screening events in 2003, two in January and two in the fall. Of these four screening events all but one were held in the school, one of which was the fall open house. Two hundred children participated in the two fall events, of those 211 children 179 were seven years and younger. The program has decided to continue the incentives as they have increased the number of children being screened greatly.

Table 6.2.2

1995 – 2004 BLOOD LEAD DATA FOR CHILDREN 0-72 MONTHS

YEAR	NUMBER	MEAN µG/DL	NUMBER NON-DETECT	NUMBER 1-4 µG/DL	NUMBER 5-9 µG/DL	NUMBER 10 –15 µG/DL	NUMBER 16-25 µG/DL
1995	82	5.6	0	37	38	7	0
1996	95	4.3	0	60	31	5*	0
1997	89	5.6	0	48	28	11	2*
1998	137	3.9	0	100	30	5	2
1999	66	6.6	1	25	37	5	0
2000	190	3.7	30	110	45	6*	0
2001	135	2.4	34	88	13	0	0
2002	44	2.0	18	26	0	0	0
2003	205	1.7	84	115	6	0	0
2004	123	2.4	12	104	7	0	0

*The same child had 2 tests done (split), one as a follow up to the first.

The blood-lead levels have continued to decline over the last five years. The last elevated blood-lead level the program reported was in 2000, since that time the program continues to see decreases in blood-lead levels. The smelter closure in the spring of 2001 might be a contributing factor in the continued decline in blood lead levels. Many children who had a parent working at the smelter also had elevated blood lead levels. Since the closure these children are now below the action level of 10 µg/dL. Continued education of the public on lead and its hazards has also contributed in the declining blood-lead levels.

In tables 2.3 through 2.7 first time screenings and subsequent repeat screenings are presented through the last five years.

Table 6.2.3 **2000 Screenings**

Child's First Test	147	79%
Child's Second Test	32	17%
Child's Third Test	2	1%
Child's Fourth Test	3	2%
Child's Fifth Test	2	1%
Child's Sixth Test	1	1%
2000 Total	187	

Table 6.2.4 **2001 Screenings**

Child's First Test	79	60%
Child's Second Test	39	30%
Child's Third Test	10	8%
Child's Fourth Test	2	1%
Child's Fifth Test	1	1%
Child's Sixth Test	0	0%
2001 Total	131	

Table 6.2.5 **2002 Screenings**

Child's First Test	36	84%
Child's Second Test	4	9%
Child's Third Test	0	0%
Child's Fourth Test	1	2%
Child's Fifth Test	0	0%
Child's Sixth Test	1	2%
Child's Ninth Test	1	2%
2002 Total	43	

Table 6.6.6 **2003 Screenings**

Child's First Test	165	80%
Child's Second Test	25	12%
Child's Third Test	9	5%
Child's Fourth Test	2	1%
Child's Fifth Test	1	.005%
Child's Sixth Test	2	1%
Child's Seventh Test	1	.005%
2003 Total	205	

Table 6.6.7 **2004 Screenings**

Child's First Test	66	54%
Child's Second Test	37	30%
Child's Third Test	16	13%
Child's Fourth Test	1	1%
Child's Fifth Test	2	2%
Child's Seventh Test	1	1%
2004 Total	123	

The tables above represent the number of children who are 6 years and younger at the time of each screening held in the last five years.

6.4.1 Lead Based Paint Abatement

The program continues to oversee the lead based paint abatement project. The program had seven houses from the second phase completed in 2000. Of these seven, three had exterior siding, windows and doors replaced. The remaining four houses had partial abatement done. Western States Abatement, Inc. was the contractor hired to do the work.

In 2002 four more houses were abated for lead based paint. Of those four, two had complete component replacement done and siding replaced. The other two had partial component replacement and paint removal completed. The contractor for these homes was Environmental Management Services.

The program had enough money left to complete one more house that was on the list to have abatement work done. The work on the house started in the fall of 2004 and will be completed in the spring of 2005. The contractor for this house was Safetech Inc. At this time there are no other homes slated to have lead based paint abatement work done.

6.5.1 Special Projects

Program staff started sampling interior dust in 12 houses, in 2002. Sampling took place for 14 months. The sampling was conducted in response to complaints from homeowners that lived along Valley Drive. Concerns were expressed that dust from the Dartman Property was contaminating their yards and homes. Prevailing winds come out of the west and blow dust onto the yards of residences along Valley Drive. ASARCO felt that the property was not contributing to increased lead in soils or interior dust; ASARCO asked the program to conduct the study. The study had four homes on Valley Drive, which is just east of the Dartman Property, four homes in the La Casa Grande sub-division and four homes in the East Helena Proper. The residences in East Helena served as the control group.

Sample locations were designated in each home (one location per home). The sampling sites were chosen where the dust would collect the most in a month's time. The dust sampling collection followed the Residential Sampling for Lead: Protocols for Dust and Soil Sampling Report put out by the EPA.
The samples were sent to the State Environmental Laboratory to be analyzed. The program would get the results back in approximately two weeks.

The results were put into a spreadsheet and from the data, it does not appear that the Dartman Property is causing recontamination of yards or increasing lead in dust in homes.

This information was presented to representatives from Department of Environmental Quality and Environmental Protection Agency.

6.6.1 Focus Groups

The purpose of the focus group meetings was to receive input from the residents of East Helena on the effectiveness of the Lead Education and Abatement Program and what role it can play in improving the community to make it a better place to live and work.

Four general groups were chosen to represent the East Helena community, which included: city leaders & elected officials, business leaders, subdivision residents, and city of East Helena residents. The focus groups were given a list of the goals and objectives of the program and asked how well the program had done in accomplishing them. The primary goals and objectives covered three general areas including: health intervention & prevention, education, and program management. *Specific projects were listed under each of those general* areas for the focus groups to determine the effectiveness of the program and to offer additional input. Those objectives and goals along with the specific projects are as follows:

I. Health Intervention and Prevention Program

A. Monitor blood-lead levels
- Free blood-lead screenings are offered to all East Helena area residents - They can participate in the Lead Education and Abatement Program's annual blood-lead screening or schedule an *appointment at the Helena Medical Lab in Helena to have an* individual test ran free of charge anytime during the year.

B. Identify sources of lead in the environment that may affect blood-lead levels.
- Free environmental lead hazard assessments (i.e. water, soil, dust, paint, hobbies) to all East Helena area residents upon request.
  The Lead Program oversees all yard remediation projects.

C. Implement and monitor abatement actions where necessary.
- Through additional funding from EPA, the Lead Program provides free exterior lead abatement procedures to East Helena area homes that have had their yards remediated.

II. Education Program

A. Provide Lead-Safe information to the public.

- Provide presentations to schools, homes, daycares, and individuals or groups on various aspects of "How to Live Safely Around Lead".
- Publish a quarterly newsletter on Lead Safe Information.
- Distribute mother/baby packets for all new babies in the East Helena area.

III. Program Management

A. Maintain program office that is accessible to the public for information and blood-lead screenings.
   - Provide information, assistance and lead education brochures and pamphlets at a staffed office in the East Helena area.
   - Free blood-lead screenings are available to all East Helena area residents.

B. Staff the program appropriately to deliver consistent service to the community.
   - Two ¾ time personnel are available to assist the needs of the community 5 days a week.

Questions asked of the focus group participants and the results of each of the focus group meetings are listed below:

Given these objectives and what we have just discussed, do you think we have accomplished our goals?

Is anyone new to the area? What role has it played in influencing your decision buy a house in the area. For those that have lived in the area for a long time… have we got the word out about how to live safely around lead?

How can the lead program play a role in improving the community to make it a better place to live and work? (The Health department's role is not to spearhead economic development, but should it play a part? If so, what could it do to improve the business climate?

Do you read the quarterly newsletter? What kind of information would you like to see in it? Is the newsletter the best way to communicate with you, or is there another medium that we could use such as e-mail.

City Leaders/Elected Officials

Health Intervention and Prevention Program

Monitor blood lead levels with the goal of reducing blood lead levels in East Helena area residents to the national average.

All focus group participants stated the program had fully met its objectives.

Comments:

- Participate in more community events
- Get in contact with OPI – for home-schooled children

Identify sources of lead that are affecting or have the potential to impact blood lead levels.

All participants stated the program had fully met its objectives.

Implement and monitor abatement actions where necessary with the goal of reducing blood lead levels in East Helena residents to the national average.

All participants stated the program had fully met its objectives.

Comments:

- Contact East Helena city offices about remodeling (right now structural changes need a city building permit)
- EPA money is not a consistent source

Education Program

Provide information to the general public on how to live safely around lead.

All focus group participants stated the program had fully met its objectives.

Comments:

- Give presentations to church groups
- Check business licenses and provide information to new businesses
- Economic development – contact "Gateway" to attend meetings provide information and assistance
- Citizens or legislators - write letters to the editor about various issues concerning East Helena's economic development, clean –up levels, safe place to work and live etc.
- Send soil samples to different environmental labs for verification

Quarterly newsletter ideas:
Comments:

- Add "school" corner
- Put in important dates of East Helena happenings
- Add city and school phone numbers
- Add section for grandparents on how to "child safe" their homes
- Add, "Story" of the quarter (positive event or personal contribution or activity that a business or individual contributed to the community)

Program Management

Maintain program office, which is accessible to the public for information and blood lead screenings.

All focus group participants stated the program had fully met its objectives.

Comments:

- Very beneficial to keep the program office in East Helena.

Staff the program appropriately to deliver consistent service to the community.

All participants stated the program had fully met its objectives.

Additional Comments:

- Show people how to put up barriers when remodeling.
- Improve the community by keeping the action level at 1000 parts per million
- Improve the business climate by letting business owners know this is a safe place to live and work - possibly get a letter from Scott Brown at EPA
- Get an updated list every month of new employers (Go to City Hall and get list from them – keep businesses up to date on any changes made dealing with the lead issues)
- Get an updated list from realtors of new residents to East Helena
- Put together information about the program and distribute to realtors' offices
- Contact realtors, contractors and give a presentation on lead issues.

East Helena Business Leaders

Health Intervention and Prevention Program

Monitor blood lead levels with the goal of reducing blood lead levels in East Helena area residents to the national average.

All focus group participants stated the program had fully met its objectives.

Comments:

- Stress more of the positive results from the blood-lead screenings
- Sufficient blood-lead testing has been done - "When is enough, enough?"

Identify sources of lead that are affecting or have the potential to impact blood lead levels.

All participants stated the program had fully met its objectives.

Implement and monitor abatement actions where necessary with the goal of reducing blood lead levels in East Helena residents to the national average.

All participants stated the program had fully met its objectives.

Education Program

Provide information to the general public on how to live safely around lead.

All focus group participants stated the program had fully met its objectives.

Comments:

- Distribute brochures in city hall about the lead program
- Offer informational presentations to new businesses
- Work on stating the positive successes of our program and not on the negative aspects of living in a superfund site
- Go to East Helena improvement association meetings
- Discourage image that we are a "monitoring" program. Encourage the idea that we are working with the East Helena community, not against them
- The business owners did not feel they had to "jump through hoops" to start or operate a business in East Helena

Program Management

Maintain program office, which is accessible to the public for information and blood lead screenings.

All participants stated the program had fully met its objectives.

Comments:

- Very beneficial to keep the program office in East Helena.

Staff the program appropriately to deliver consistent service to the community.

All participants stated the program had fully met its objectives.

East Helena Area Subdivision Residents

Health Intervention and Prevention Program

Monitor blood lead levels with the goal of reducing blood lead levels in East Helena area residents to the national average.

All focus group participants stated the program had fully met its objectives.

Comments:

- The program has done an excellent job screening children

Identify sources of lead that are affecting or have the potential to impact blood lead levels.

The majority of the participants said the program had fully met the objectives.

Comments:

- One resident would like to have an environmental assessment done on his home.
- One resident would like his home checked for lead-based paint

Implement and monitor abatement actions where necessary with the goal of Reducing blood lead levels in East Helena residents to the national average.

The majority of the focus group participants said the program fully met the objectives

Comments:

- One resident questioned why a home couldn't qualify for abatement even if the yard hasn't been remediated because the possible hazard is still there.
- One resident was unaware of this objective

Education Program

Provide information to the general public on how to live safely around lead.

All focus group participants stated the program had fully met its objectives.

Comments:

- *Have had very positive experiences with the program through screenings and baby packet distribution*
- Visit more homes, offices and businesses to drop off information
- Personal contact and follow up with the residents is good
- Talk with the individuals who still have yards that are contaminated and keep them informed on where issues stand
- Give presentations to realtors

- Check with SBA or other loan institutions and give them information to distribute to people starting businesses or moving into East Helena
- Attend East Helena improvement association meetings and become familiar with what they are doing and join them in promoting East Helena or organizing activities or events
- Use public service announcements as an additional media source
- Use Childcare Partnerships' (referral service) because people check on this when they are new to the area - get brochures and pamphlets to them and use them for an information source.

Quarterly newsletter idea

- Put in helpful information for people new to the area like a "welcome wagon"
- Put in important dates of East Helena happenings
- Add city and school phone numbers
- Add section for community events
- Put in a section on "Things to Do With Your Kids" or a "Fishing Report" as one-way to get everyone to look at the newsletter
- Number the newsletters or put in a hidden word and those that have the number or find the word win a prize (donated by a business)
- Add a "Story" of the quarter (positive event or personal contribution or activity that a business or individual contributed to the community)

Program Management

Maintain program office that is accessible to the public for information and blood lead screenings.

All focus group participants stated the program had fully met its objectives.

Comments:

- Very beneficial to keep the program office in East Helena.

Staff the program appropriately to deliver consistent service to the community.

All participants stated the program had fully met its objectives.

City of East Helena Residents

Health Intervention and Prevention Program

Monitor blood lead levels with the goal of reducing blood lead levels in East Helena area residents to the national average.

All focus group participants stated the program had fully met the objectives.

Comments:

- The program has done an excellent job screening children

Identify sources of lead that are affecting or have the potential to impact blood lead levels.

All participants said the program had fully met the objectives.

Comments:

- The program and personnel are very helpful, courteous, and have done an excellent job with environmental assessments.
- Yard remediation are done much more professional now than when the project first started

Implement and monitor abatement actions where necessary with the goal of reducing blood lead levels in East Helena residents to the national average.

All participants stated the program had fully met the objectives.

Education Program

Provide information to the general public on how to live safely around lead.

All focus group participants stated the program had fully met its objectives.

Comments:

- *Residents have had very positive experiences with the program through blood-lead screenings and baby packet distribution*
- For all people new to the area, distribute a "Welcome to East Helena" packet of lead information
- Additional follow up after yard remediation and environmental assessments would be good public relations
- Give presentations to realtors
- All residents felt safe living around this superfund site
- Join or attend Home Builder's Association meetings
- Become a member or entity of the East Helena City Council meetings
- Put information about the lead program in the mayor's newsletter
- Put information about the lead program on the East Helena website

Quarterly newsletter ideas:

Comments:

- Do a feature success story of a business/family/or individual in the East Helena area
- Add a section for community events.

Program Management:

Maintain program office that is accessible to the public for information and blood lead screenings.

All focus group participants stated the program had fully met its objectives.

Comments:

- Very beneficial to keep the program office in East Helena.

Staff the program appropriately to deliver consistent service to the community.

All participants stated the program had fully met its objectives.

APPENDIX C

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Appendix C

Identification and Description of Applicable or Relevant and Appropriate Requirements

for the

Record of Decision East Helena Superfund Site, Operable Unit No. 2 Residential Soils and Undeveloped Lands

1.0 INTRODUCTION

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9621(d), the National Oil and Hazardous Substances Pollution Contingency Plan (the "NCP"), 40 CFR Part 300 (1990), and guidance and policy issued by the U.S. Environmental Protection Agency (EPA) require that remedial actions under CERCLA comply with substantive provisions of applicable or relevant and appropriate standards, requirements, criteria, or limitations (ARARs) from State of Montana and federal environmental laws and state facility siting laws during and at the completion of the remedial action. These requirements are threshold standards that any selected remedy must meet, unless an ARAR waiver is invoked.

This document identifies final ARARs for remedial actions to be conducted for the East Helena Superfund Site, Operable Unit 2 (OU2). The entire East Helena Superfund Site (Site) consists of the decommissioned ASARCO smelter, all of the City of East Helena, Montana, nearby residential subdivisions, numerous rural developments such as farms and homes on small acreage plots, and surrounding undeveloped lands. Operable Unit 2 (OU 2) consists of non-smelter property surface soils in the residential areas, irrigation ditches, rural developments, and surrounding undeveloped land. The EPA previously divided the East Helena Site into separate OUs; however, because the smelter portion of the Site was active, the Resource Conservation and Recovery Act (RCRA) program became responsible for all properties outside of OU2, including the process ponds, slag pile, and ore storage areas on the smelter property, and surface water (Prickly Pear Creek). In addition, RCRA became responsible for groundwater beneath the smelter property as well beneath residential properties and undeveloped land. EPA's Superfund program continued to address contamination in OU2.

The following ARARs or groups of related ARARs are each identified by a statutory or regulatory citation, followed by a brief explanation of the ARAR and how and to what extent the ARAR is expected to apply to the activities to be conducted under this remedial action.

Substantive provisions of the requirements listed below are identified as ARARs pursuant to 40 Code of Federal Regulations (CFR) § 300.400. ARARs that are within the scope of this remedial action must be attained during and at the completion of the remedial action.[1] No permits are anticipated for this remedial action in accordance with Section 121(e) of CERCLA.

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1 40 CFR Section 300.435(b)(2); Preamble to the National Oil and Hazardous Substances Pollution Contingency Plan, 55 Federal Register (FR) 8755-8757 (March 8, 1990).

2.0 TYPES OF ARARs

ARARs are either "applicable" or "relevant and appropriate." Both types of requirements are mandatory under CERCLA and the NCP.[2] Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental and facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.[3]

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to hazardous substances, pollutants, contaminants, remedial actions, locations, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.[4]

The determination that a requirement is relevant and appropriate is a two-step process: (1) determination if a requirement is relevant and (2) determination if a requirement is appropriate. In general, this involves a comparison of a number of site-specific factors, including an examination of the purpose of the requirement and the purpose of the proposed CERCLA action; the medium and substances regulated by the requirement and the proposed requirement; the actions or activities regulated by the requirement and the remedial action; and the potential use of resources addressed in the requirement and the remedial action. When the analysis results in a determination that a requirement is both relevant and appropriate, such a requirement must be complied with to the same degree as if it were applicable.[5]

ARARs are contaminant, location, or action specific. Contaminant specific requirements address chemical or physical characteristics of compounds or substances on sites. These values establish acceptable amounts or concentrations of chemicals which may be found in or discharged to the ambient environment.

Location specific requirements are restrictions placed upon the concentrations of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location specific ARARs relate to the geographical or physical positions of sites, rather than to the nature of contaminants at sites.

Action specific requirements are usually technology based or activity based requirements or limitations on actions taken with respect to hazardous substances, pollutants or contaminants. A given cleanup activity will trigger an action specific requirement. Such requirements do not themselves determine the cleanup alternative, but define how chosen cleanup methods should be performed.

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2 CERCLA § 121(d)(2)(A), 42 U.S.C. § 6921(d)(2)(A). See also, 40 CFR § 300.430(f)(1)(i)(A).

3 40 CFR § 300.5.

4 40 CFR § 300.5.

5 CERCLA Compliance with Other Laws Manual, Vol. I, OSWER Directive 9234.1-01, August 8, 1988, p. 1-11.

Many requirements listed as ARARs are promulgated as identical or near identical requirements in both federal and state law, usually pursuant to delegated environmental programs administered by EPA and the state. The Preamble to the NCP provides that such a situation results in citation to the state provision and treatment of the provision as a federal requirement.

Also contained in this list are policies, guidance or other sources of information which are "to be considered" in the selection of the remedy and implementation of the record of decision (ROD).

Although not enforceable requirements, these documents are important sources of information which EPA and the State of Montana Department of Environmental Quality (DEQ) may consider during selection of the remedy, especially in regard to the evaluation of public health and environmental risks; or which will be referred to, as appropriate, in selecting and developing cleanup actions.[6]

This Appendix constitutes EPA's and DEQ's formal identification and detailed description of ARARs for the implementation of the remedial action within the East Helena OU2. The Selected Remedy is expected to meet all ARARs. EPA and DEQ have determined that no ARAR waiver will be necessary for this remedial action. The Final ARARs will be set forth as performance standards for any and all remedial design or remedial action work plans.

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6 40 CFR Section 300.400(g)(3); Preamble to the NCP, 55 Fed. Reg. 8744-8746 (March 8, 1990).

3.0 CONTAMINANT-SPECIFIC ARARs

Groundwater is not part of OU2, and there is no potential impact to groundwater from soil remediation activities. Therefore, groundwater-related statutes and regulations are not ARARs for the East Helena Superfund Site, OU2.

Surface water and air-related standards are included due to the potential impact of soil remediation on these two media. These ARARs are applicable only to controlling potential releases of hazardous substances during construction and operation and maintenance of the remedy for OU2.

Surface water within OU 2, specifically Prickly Pear Creek, is currently not a source for drinking water. Further, it is anticipated that Prickly Pear Creek will not become a source for drinking water in the future due to senior agricultural water rights that often are not fully exercised under current conditions.

3.1 Federal ARARs

3.1.1 Clean Water Act

Federal Surface Water Quality Requirements, Clean Water Act, 33 USC § 1251, et seq. (applicable). As provided under Section 303 of the Clean Water Act, 33 U.S.C. § 1313, the State of Montana has promulgated water quality standards. See the discussion concerning State surface water quality requirements.

3.1.2 Safe Drinking Water Act

Safe Drinking Water Act, 42 U.S.C. ' 300f, et seq., National Primary and Secondary Drinking Water Regulations, 40 CFR Parts 141 and 142 (relevant and appropriate). The National Primary and Secondary Drinking Water Regulations (40 CFR Parts 141 and 143) establish maximum contaminant levels (MCL) for chemicals in drinking water distributed in public water systems. These are enforceable in Montana under the Public Water Supplies, Distribution, and Treatment Act and corresponding regulations, MCA ' 75-6-101, et seq., and ARM ' 17.38.203. Safe Drinking Water Act MCLs are relevant and appropriate to this remedial action because the water in Prickly Pear Creek is a potential source of drinking water.

The determination that the drinking water standards are relevant and appropriate for the East Helena Superfund Site, OU 2 remedial action is fully supported by the regulations and guidance. The Preamble to the NCP clearly states that the MCLs are relevant and appropriate for ground or surface water that is a current or potential source of drinking water. See 55 Fed. Reg. 8750, March 8, 1990, and 40 CFR ' 300.430(e)(2)(I)(B). MCLs developed under the Safe Drinking Water Act generally are ARARs for current or potential drinking water sources. See, e.g., EPA Guidance On Remedial Action For Contaminated Groundwater at Superfund Sites, OSWER Dir. #9283.1-2, December 1988.

In addition, maximum contaminant level goals (MCLG) may also be relevant and appropriate. See 55 Fed. Reg. 8750-8752. MCLGs are health-based goals which are established at levels at which no known or anticipated adverse effects on the health of persons occur and which allow an adequate margin of safety. According to the NCP, MCLGs that are set at levels above zero must be attained by remedial actions for ground or surface waters that are current or potential sources of drinking water. Where the

MCLG for a contaminant has been set at a level of zero, the MCL promulgated for that contaminant must be attained by the remedial actions.

The MCLs and MCLGs for contaminants of concern are:

Contaminant	MCL (mg/L)	MCLG[a] (mg/L)
Antimony	0.006	0.006
Arsenic	0.01	NE
Cadmium	0.005[b]	0.005[b]
Copper	1.3[c]	1.3[c]
Iron	0.3[d]	NE
Lead	0.015[c]	0
Manganese	0.05[d]	NE
Mercury	0.002[b]	0.002[b]
Silver	NE	NE
Thallium	0.002[b]	0.0005
Zinc	5.0[d]	NE

NE - Not Established

[a] 40 CFR ' 141.51(b)

[b] 40 CFR ' 141.62(c)

[c] 40 CFR ' 141.80(c) B No MCL, but specifies BAT to be applied.

[d] 40 CFR ' 143.3 B Secondary MCL

ARM 17.38.203 incorporates by reference into State law the MCLs for inorganic substances set forth in 40 CFR Part 141 (Primary Drinking Water Standards).

3.1.3 National Ambient Air Quality Standards

National Ambient Air Quality Standards, 40 CFR § 50.6 (PM-10); 40 CFR § 50.16 (lead) (applicable). These provisions establish standards for PM-10 and lead emissions to air. The PM-10 standard is 150 micrograms per cubic meter (μg/m 3), 24-hour average concentration, and the lead standard is 0.15 μg/m^3, arithmetic mean concentration over a 3-month period. The federal standards are incorporated by reference by State regulation, ARM §17.8.202. Additional State standards are included in Section 3.2.3 below.

3.2 State ARARs

3.2.1 Groundwater Protection

Groundwater is not part of OU2 and impacts to groundwater as part of remedial actions are not anticipated. Therefore, there are no groundwater-related ARARs.

3.2.2 Montana Water Quality Act

State of Montana Surface Water Quality Requirements, Montana Water Quality Act, Section 75-5-101, et seq., MCA, and implementing regulations (applicable). General. The Clean Water Act, 33 U.S.C. § 1251, et seq., provides the authority for each state to adopt water quality standards (40 CFR Part 131) designed to protect beneficial uses of each water body and requires each state to designate uses for each water body. The Montana Water Quality Act, Section 75-5-101, et seq., MCA, establishes requirements to protect, maintain and improve the quality of surface and groundwater. Montana's regulations classify State waters according to quality, place restrictions on the discharge of pollutants to State waters, and prohibit degradation of State waters. Pursuant to this authority and the criteria established by Montana surface water quality regulations, ARM § 17.30.601, et seq., Montana has established the Water-Use Classification system. Under ARM § 17.30.610, tributaries to the Missouri River have been classified "B-1". Prickly Pear Creek is part of the Missouri River drainage. State of Montana regulations, Administrative Rules of Montana (ARM), classify Prickly Pear Creek within the East Helena OU2 as a level B-1 surface water body for drinking, culinary, and food processing purposes after conventional treatment. Prickly Pear Creek changes to "I" Classification one mile northwest of East Helena.[7]

ARM 17.30.623 (applicable). Waters classified B-1 are, after conventional treatment for removal of naturally present impurities, suitable for drinking, culinary and food processing purposes. These waters are also suitable for bathing, swimming and recreation, growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers, and use for agricultural and industrial purposes. This section provides also that concentrations of carcinogenic, bioconcentrating, toxic or harmful parameters which would remain in water after conventional water treatment may not exceed standards set forth in department circular DEQ-7.

ARM 17.30.628 (applicable). (1) The goal of the state of Montana for waters classified I are to have these waters fully support the following uses: drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. These beneficial uses are considered supported when the concentrations of carcinogenic, bioconcentrating, toxic or harmful parameters do not exceed standards set forth in department circular DEQ-7.

DEQ-7 provides that "whenever both Aquatic Life Standards and Human Health Standards exist for the same analyte, the more restrictive of these values will be used as the numeric Surface Water Quality Standard." These numerical standards for the contaminants of concern are listed below.

[7] As provided under ARM 17.30.602(33), " 'surface waters' means any waters on the earth's surface, including but not limited to, streams, lakes, ponds, and reservoirs; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir or other surface water. Water bodies used solely for treating, transporting or impounding pollutants shall not be considered surface water."

Montana DEQ-7 Surface Water Quality Standards[1]

Aquatic Life Standards

Contaminant	Acute (µg/L)	Chronic (µg/L)	Human Health Standards (µg/L)
Aluminum[a]	750	87	NE
Antimony	NE	NE	5.6
Arsenic	340	150	10
Cadmium	2.1[b]/1.1[c]/0.52[d]	0.27[b]/0.16[c]/0.10[d]	5
Copper	14[b]/7.3[c]/3.8[d]	9.3[b]/5.2[c]/2.8[d]	1,300
Iron[e]	NE	1,000	NE
Lead	82[b]/34[c]/14[d]	3.2[b]/1.3[c]/0.54[d]	15
Manganese[e]	NE	NE	NE
Mercury	1.7	0.91	0.05
Silver	4.1[b]/1.2[c]/0.37[d]	NE	100
Thallium	NE	NE	0.24
Zinc NE	120[b]/67[c]/37[d]	120[b]/67[c]/37[d]	2,000

Not Established

[a] The aluminum standard is based on the dissolved fraction. All other parameters are based on the total recoverable fraction.

[b] The aquatic life standard is based on hardness. Value shown is for a hardness of 100 mg/L as CaCO3.

[c] The aquatic life standard is based on hardness. Value shown is for a hardness of 50 mg/L as CaCO3.

[d] The aquatic life standard is based on hardness. Value shown is for a hardness of 25 mg/L as CaCO3.

[e] Concentrations of iron and manganese must not reach values that interfere with the uses specified in the surface and groundwater standards (ARM 17.30.601 et seq. and ARM 17.30.1001 et seq.). The secondary maximum contaminant levels of 300 µg/L and 50 µg/L, respectively, may be considered guidance to determine levels that will interfere with the specified uses.

[1] Montana Department of Environmental Quality, Water Quality Division, Circular DEQ-7, Montana Numeric Water Quality Standards (February 2008).

The B-1 classification standards at ARM 17.30.623 also include the following criteria:1) dissolved oxygen concentration must not be reduced below the levels given in department circular DEQ-7; 2) induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH unit. Natural pH outside of this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0; 3) the maximum allowable increase above naturally occurring turbidity is 5 nephelometric turbidity units; 4) temperature increases must be kept within prescribed limits; 5) no increases are allowed above naturally occurring concentrations of sediment or suspended sediment, settleable solids, oils or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other wildlife; 6) true color must not be increased more than five color units above naturally occurring color.

The I classification standards at ARM 17.30.628 also include the following criteria:1) dissolved oxygen concentration must not be reduced below the applicable standards given in department Circular DEQ-7;

2) hydrogen ion concentration must be maintained within the range of 6.5 to 9.5; 3) no increase in naturally occurring turbidity is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife; 4) no increase in naturally occurring temperature is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife; 5) no increases are allowed above naturally occurring concentrations of sediment or suspended sediment and settleable solids, oils, or floating solids, which will or are likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife; 6) no increase in naturally occurring true color is allowed which will or is likely to create a nuisance or render the waters harmful, detrimental, or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish, or other wildlife; 7) no discharges of toxic, carcinogenic, or harmful parameters may commence or continue which lower, or are likely to lower, the overall water quality of these waters.

ARM 17.30.637 (applicable). Provides that surface waters must be free of substances attributable to industrial practices or other discharges that will: (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines; (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials; (c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible; (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; (e) create conditions which produce undesirable aquatic life.

ARM 17.30.637 also states that no waste may be discharged and no activities conducted which, either alone or in combination with other waste activities, will cause violation of surface water quality standards.

In addition, ARM 17.30.637 provides that leaching pads, tailings ponds, or water or waste or pr product holding facilities must be located, constructed, operated and maintained in such a manner and of such materials to prevent any discharge, seepage, drainage, infiltration, or flow which may result in pollution of state waters, and a monitoring system may be required to ensure such compliance.

Section 75-5-605, MCA (applicable) provides that it is unlawful to cause pollution of any state waters or to place or cause to be placed, any wastes where they will cause pollution of any state waters.

Section 75-5-303, MCA (applicable) states that existing uses of state waters and the level of quality of state waters necessary to protect those uses must be maintained and protected.

ARM 17.30.705 (applicable). Existing and anticipated uses of surface water and water quality necessary to support those uses must be maintained and protected.

3.2.3 Montana Ambient Air Quality Regulations

Montana Ambient Air Quality Regulations, ARM 17.8.206, -.222, -.220, and -.223 (applicable). The following provisions establish air quality standards.

ARM 17.8.202. This provision incorporates by reference 40 CFR Part 50, which specify the national ambient air quality standards and ambient air quality monitoring reference methods.

ARM 17.8.206. This provision establishes sampling, data collection, and analytical requirements to ensure compliance with ambient air quality standards.
ARM 17.8.222. Lead emissions to ambient air shall not exceed a ninety (90) day average of 1.5 micrograms per cubic liter of air.

ARM 17.8.220. Settled particulate matter shall not exceed a thirty (30) day average of 10 grams per square meter.

ARM 17.8.223. PM-10 concentrations in ambient air shall not exceed a 24 hour average of 150 micrograms per cubic meter of air and an annual average of 50 micrograms per cubic meter of air.

4.0 LOCATION-SPECIFIC ARARS

The statutes and regulations set forth below relate to solid waste, floodplains, floodways, streambeds, and the preservation of certain cultural, historic, natural or other national resources located in certain areas that may be adversely affected by this remedial action.

4.1 Federal

4.1.1 National Historic Preservation Act

National Historic Preservation Act, 16 USC § 470, 40 CFR § 6.301(b), 36 CFR Part 63, Part 65, and Part 800 (NHPA) (applicable). This statute and implementing regulations require Federal agencies to take into account the effect of this response action upon any district, site, building, structure, or object that is included in or eligible for the Register of Historic Places. Compliance with NHPA requirements will be attained through agreements entered into with EPA, the State of Montana, and the town of East Helena during the implementation of the remedial action.

4.1.2 Archaeological and Historic Preservation Act

Archaeological and Historic Preservation Act, 16 USC § 469, 40 CFR § 6.301(c) (applicable). This statute and implementing regulations establish requirements for the evaluation and preservation of historical and archaeological data, which may be destroyed through alteration of terrain as a result of a Federal construction project or a federally licensed activity or program. This requires EPA or potentially responsible parties (PRP) to survey the site for covered scientific, prehistorical or archaeological artifacts. The results of this survey will be reflected in the Administrative Record. Preservation of appropriate data concerning the artifacts is hereby identified as an ARAR requirement, to be completed during the implementation of the remedial action.

4.1.3 Historic Sites Act of 1935

Historic Sites Act of 1935, 16 USC § 461, et seq., 40 CFR § 6.310(a) (applicable). This statute and implementing regulations require federal agencies to consider the existence and location of land marks on the National Registry of National Landmarks and to avoid undesirable impacts on such landmarks.

4.1.4 Protection and Enhancement of the Cultural Environment

Executive Order 11593 Protection and Enhancement of the Cultural Environment, 16 USC § 470 (applicable). Directs federal agencies to institute procedures to ensure programs contribute to the preservation and enhancement of non-federally owned historic resources. Consultation with the Advisory Council on Historic Preservation is required if remedial activities should threaten cultural resources.

4.1.5 The Archaeological Resources Protection Act of 1979

The Archaeological Resources Protection Act of 1979, 16 USC §§ 470aa-47011 (relevant and appropriate). Requires a permit for any excavation or removal of archeological resources from public lands or Indian lands. Substantive portions of this act may be relevant and appropriate if archeological resources are encountered during remedial action activity.

4.1.6 American Indian Religious Freedom Act

American Indian Religious Freedom Act, 42 U.S.C. § 1996, et seq. (applicable). This Act establishes a federal responsibility to protect and preserve the inherent right of American Indians to believe, express and exercise the traditional religions of American Indians. This right includes, but is not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites. The Act requires Federal agencies to protect Indian religious freedom by refraining from interfering with access, possession and use of religious objects, and by consulting with Indian organizations regarding proposed actions affecting their religious freedom.

4.1.7 Native American Graves Protection and Repatriation Act

Native American Graves Protection and Repatriation Act, 25 U.S.C. § 3001, et seq. (applicable). The Act prioritizes ownership or control over Native American cultural items, including human remains, funerary objects and sacred objects, excavated or discovered on Federal or tribal lands. Federal agencies and museums that have possession or control over Native American human remains and associated funerary objects are required under the Act to compile an inventory of such items and, to the extent possible, identify their geographical and cultural affiliation. Once the cultural affiliation of such objects is established, the Federal agency or museum must expeditiously return such items, upon request by a lineal descendent of the individual Native American or tribe identified.

4.1.8 Fish and Wildlife Coordination Act

Fish and Wildlife Coordination Act, 16 USC § 661, 40 CFR § 6.302 (applicable). This statute and implementing regulations require that Federal agencies or federally funded projects ensure that any modification of any stream or other water body affected by any action authorized or funded by the Federal agency provides for adequate protection of fish and wildlife resources. Compliance with this ARAR requires EPA to consult with the U.S. Fish and Wildlife Service and the Montana Department of Fish, Wildlife, and Parks. Further consultation will occur during remedial design and remedial action.

4.1.9 Endangered Species Act

Endangered Species Act, 16 USC § 1531, 50 CFR Parts 17 and 402 (applicable). This statute and implementing regulations provide that federal activities not jeopardize the continued existence of any threatened or endangered species. Compliance with this ARAR will be achieved through EPA consultation with the U.S. Fish and Wildlife Service and the Montana Department of Fish, Wildlife and Parks during remedial design and remedial action. Specific avoidance or other mitigation measures identified shall be incorporated into the remedial design and implemented as part of the remedial action.

4.1.10 Floodplain Management Regulations

Floodplain Management Regulations, Executive Order No. 11988 and 40 CFR § 6.302(b) (applicable). These require that actions be taken to avoid, to the extent possible, adverse effects associated with direct or indirect development of a floodplain, or to minimize adverse impacts if no practicable alternative exists.

4.1.11 Protection of Wetlands Regulations

Protection of Wetlands Regulations, 40 CFR Part 6, Appendix A, and Executive Order No. 11990 (applicable). Steps will be taken to avoid or mitigate the adverse impacts associated with the destruction or loss of wetlands to the extent possible and avoidance of new construction in wetlands if a practicable alternative exists. Wetlands are defined as those areas that are inundated or saturated by groundwater or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Compliance with this ARAR will be achieved through EPA consultation with the U.S. Fish and Wildlife Service and the

U.S. Army Corps of Engineers, to determine the existence and category of wetlands present at the site, and any avoidance or mitigation and replacement which may be necessary.

4.1.12 Clean Water Act

Section 404, Clean Water Act, 33 USC §§ 1251 et seq., 33 CFR Part 330 (applicable). Regulates discharge of dredged or fill materials into waters of the United States. Substantive requirements of portions of Nationwide Permit No. 38 (General and Specific Conditions) are applicable to remedial activities conducted within waters of the United States within the East Helena OU2.

4.1.13 Migratory Bird Treaty Act

Migratory Bird Treaty Act, 16 USC § 703, et seq. (applicable). This requirement establishes a federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the USFWS during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds. Specific mitigative measures may be identified for compliance with this requirement.

4.1.14 Bald Eagle Protection Act

Bald Eagle Protection Act, 16 USC § 668, et seq. (applicable). This requirement establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation with the U.S. Fish and Wildlife Service during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagles. Specific mitigative measures may be identified for compliance with this requirement.

4.1.15 Resource Conservation and Recovery Act

Resource Conservation and Recovery Act and regulations, 40 CFR § 264.18 (a) and (b) (relevant and appropriate). These regulations provide seismic and floodplain restrictions on the location of a waste management unit.

4.2 State

4.2.1 Montana Antiquities Act

Montana Antiquities Act, Section 22-3-421, et seq., MCA (relevant and appropriate). The Montana Antiquities Act addresses the responsibilities of State agencies regarding historic and prehistoric sites including buildings, structures, paleontological sites, archaeological sites on state owned lands. Each State agency is responsible for establishing rules regarding historic resources under their jurisdiction which address National Register eligibility, appropriate permitting procedures and other historic preservation goals. The State Historic Preservation Office maintains information related to the responsibilities of State Agencies under the Antiquities Act.

4.2.2 Montana Human Skeletal Remains and Burial Site Protection Act

Montana Human Skeletal Remains and Burial Site Protection Act (1991), Section 22-3801, MCA (applicable). The Human Skeletal Remains and Burial Site Protection Act is the result of years of work by Montana Tribes, State agencies and organizations interested in ensuring that all graves within the State of Montana are adequately protected. If human skeletal remains or burial sites are encountered during remedial activities within the East Helena OU2, then requirements will be applicable.

4.2.3 Montana Floodplain and Floodway Management Act

Montana Floodplain and Floodway Management Act and Regulations, Section 76-5-401, et seq.,MCA, ARM 36.15.601, et seq. (applicable). The Floodplain and Floodway Management Act and regulations specify types of uses and structures that are allowed or prohibited in the designated 100-year floodway[8] and floodplain.[9] Since the East Helena OU2 contains Prickly Pear Creek that runs through areas that can flood, these standards are applicable to all actions within these floodplain areas.

A. **Prohibited uses.** Uses prohibited anywhere in either the floodway or the floodplain are:

- solid and hazardous waste disposal; and
- storage of toxic, flammable, hazardous, or explosive materials.

ARM 36.15.605(2) and 36.15.703 (applicable); see also ARM 36.15.602(5)(b) (applicable). These provisions effectively prohibit the placement of mine waste repositories within the 100-year floodplain and require mine wastes addressed in response actions be removed from the floodplain.

In the floodway, additional prohibitions apply, including prohibition of:

- a building for living purposes or place of assembly or permanent use by human beings;
- any structure or excavation that will cause water to be diverted from the established floodway, cause erosion, obstruct the natural flow of water, or reduce the carrying capacity of the floodway; and
- the construction or permanent storage of an object subject to flotation or movement during flood level periods.

Section 76-5-403, MCA (applicable).

B. **Applicable considerations in use of floodplain or floodway.** Applicable regulations also specify factors that must be considered in allowing diversions of the stream, changes in place of diversion of the stream, flood control works, new construction or alteration of artificial obstructions, or any other nonconforming use within the floodplain or floodway. Many of these requirements are set forth as factors that must be considered in determining whether a permit can be issued for certain obstructions or uses. While permit requirements are not directly applicable to remedial actions conducted entirely on site, the substantive criteria used to determine whether a proposed obstruction or use is permissible within the floodway or floodplain are applicable standards. Factors which must be considered in addressing any obstruction or use within the floodway or floodplain include:

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8 The "floodway" is the channel of a watercourse or drainway and those portions of the floodplain adjoining the channel that are reasonably required to carry and discharge the floodwater of the watercourse or drainway. ARM 36.15.101(13).

9 The "floodplain" is the area adjoining the watercourse or drainway that would be covered by the floodwater of a base (100-year) flood except for sheetflood areas that receive less than one foot of water per occurrence. The floodplain consists of the floodway and flood fringe. ARM 36.15.101(11).

- the danger to life and property from backwater or diverted flow caused by the obstruction or use;
- the danger that the obstruction or use will be swept downstream to the injury of others;
- the availability of alternate locations;
- the construction or alteration of the obstruction or use in such a manner as to lessen the danger;
- the permanence of the obstruction or use; and
- the anticipated development in the foreseeable future of the area which may be affected by the obstruction or use.

See Section 76-5-406, MCA; ARM 36.15.216 (applicable, substantive provisions only). Conditions or restrictions that generally apply to specific activities within the floodway or floodplain are:

- the proposed activity, construction, or use cannot increase the upstream elevation of the 100-year flood a significant amount (2 foot or as otherwise determined by the permit issuing authority) or significantly increase flood velocities, ARM 36.15.604 (applicable, substantive provisions only); and
- the proposed activity, construction, or use must be designed and constructed to minimize potential erosion. See ARM 36.15.605.

For the substantive conditions and restrictions applicable to specific obstructions or uses, see the following applicable regulations:

- Excavation of material from pits or pools - ARM 36.15.602(1).
- Water diversions or changes in place of diversion - ARM 36.15.603.
- Flood control works (levees, floodwalls, and riprap must comply with specified safety standards) - ARM 36.15.606.
- Roads, streets, highways and rail lines (must be designed to minimize increases in flood heights) - ARM 36.15.701(3)(c).
- Structures and facilities for liquid or solid waste treatment and disposal (must be floodproofed to ensure that no pollutants enter flood waters and may be allowed and approved only in accordance with Montana Department of Environmental Quality (DEQ) regulations, which include certain additional prohibitions on such disposal) - ARM 36.15.701(3)(d).
- Residential structures - ARM 36.15.702(1).
- Commercial or industrial structures - ARM 36.15.702(2).

4.2.4 Montana Stream Protection Requirements

Montana Natural Streambed and Land Preservation Act and Regulations, Section 75-7101, et.seq., MCA, and ARM 36.2.401, et.seq., (applicable). Applicable if this remedial action alters or affects a streambed or its banks. The adverse effects of any such action must be minimized.

ARM 36.2.410 (applicable) establishes minimum standards which would be applicable if a response action alters or affects a streambed, including any channel change, new diversion, riprap or other streambank protection project, jetty, new dam or reservoir or other commercial, industrial or residential development. Projects must be designed and constructed using methods that minimize adverse impacts to the stream (both upstream and downstream) and future disturbances to the stream. All disturbed areas must be managed during construction and reclaimed after construction to minimize erosion. Temporary structures used during construction must be designed to handle high flows reasonably anticipated during the construction period. Temporary structures must be completely removed from the stream channel at the conclusion of construction, and the area must be restored to a natural or stable condition. Channel alterations must be designed to retain original stream length or otherwise provide hydrologic stability. Streambank vegetation must be protected except where removal of such vegetation is necessary for the completion of the project. When removal of vegetation is necessary, it must be kept to a minimum. Riprap, rock, and other material used in a project must be of adequate size, shape, and density and must be properly placed to protect the streambank from erosion. The placement of road fill material in a stream, the placement of debris or other materials in a stream where it can erode or float into the stream, projects that permanently prevent fish migration, operation of construction equipment in a stream, and excavation of streambed gravels are prohibited unless specifically authorized by the district. Such projects must also protect the use of water for any useful or beneficial purpose. See Section 75-7-102, MCA.

Sections 87-5-502 and 504, MCA (applicable – substantive provisions only). provide that a state agency or subdivision shall not construct, modify, operate, maintain or fail to maintain any construction project or hydraulic project which may or will obstruct, damage, diminish, destroy, change, modify, or vary the natural existing shape and form of any stream or its banks or tributaries in a manner that will adversely affect any fish or game habitat.

While the administrative / procedural requirements, including the consent and approval requirements set forth in these statutes and regulations are not ARARs, consultation with the Montana Department of Fish, Wildlife and Parks, and any conservation district or board of county commissioners (or consolidated city/county government) is encouraged during the design and implementation of the remedial action for the East Helena OU2, to assist in the evaluation of the factors discussed above.

4.2.5 Montana Solid Waste Management Act

Montana Solid Waste Management Act and regulations, Section 75-10-201, et seq., MCA, ARM 17.50.505 (applicable). Sets forth requirements applying to the location of any solid waste management facility. Among other things, the location must have sufficient acreage, must not be within a 100-year floodplain, must be located so as to prevent pollution of ground, surface, and private and public water supply systems, and must allow for reclamation of the land.

Under ARM 17.50.505, a facility for the treatment, storage or disposal of solid wastes:

1. must be located where a sufficient acreage of suitable land is available for solid waste management;
2. may not be located in a 100-year floodplain;
3. may be located only in areas which will prevent the pollution of ground and surface waters and public and private water supply systems;
4. must be located to allow for reclamation and reuse of the land;

5. drainage structures must be installed where necessary to prevent surface runoff from entering waste management areas; and

6. where underlying geological formations contain rock fractures or fissures which may lead to pollution of the ground water or areas in which springs exist that are hydraulically connected to a proposed disposal facility, only Class III disposal facilities may be approved.[10]

Even Class III landfills may not be located on the banks of or in a live or intermittent stream or water saturated areas, such as marshes or deep gravel pits which contain exposed ground water. ARM 17.54.505(2)(j).

These standards apply to any facility for the treatment, storage, or disposal of mine wastes, including, for example, any mine waste repository, tailings deposit, or waste rock pile that is actively managed as part of a response action.

Section 75-10-212, MCA. For solid wastes, Section 75-10-212, MCA, prohibits dumping or leaving any debris or refuse upon or within 200 yards of any highway, road, street, or alley of the State or other public property, or on privately owned property where hunting, fishing, or other recreation is permitted.

4.2.6 Endangered Species and Wildlife

Sections 87-5-106, 107 and 111, MCA (applicable). Endangered species should also be protected in order to maintain and to the extent possible, enhance their numbers. These Sections list endangered species, prohibited acts, and penalties. Section 87-5-201, MCA (applicable) concerns protection of wild birds, nests and eggs and under ARM 12.5.201 certain activities are prohibited with respect to specified endangered species.

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10 Group III consist of primarily inert wastes, including industrial mineral wastes which are essentially inert and non-water soluble and do not contain hazardous waste constituents. ARM 17.50.503(1)(b).

5.0 ACTION-SPECIFIC ARARS

5.1 Federal and State Water Protection Requirements

5.1.1 Clean Water Act

Clean Water Act, Point Source Discharges requirements, 33 USC § 1342 (applicable, substantive provisions only). Section 402 of the Clean Water Act, 33 USC § 1342, et seq., authorizes the issuance of permits for the "discharge" of any "pollutant." This includes storm water discharges associated with "industrial activity." See, 40 CFR § 122.1(b)(2)(iv). "Industrial activity" includes inactive mining operations that discharge storm water contaminated by contact with or that has come into contact with any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations, see, 40 CFR § 122.26(b)(14)(iii); landfills, land application sites, and open dumps that receive or have received any industrial wastes including those subject to regulation under RCRA subtitle D, see, 40 CFR § 122.26(b)(14)(v); and construction activity including clearing, grading, and excavation activities, see, 40 CFR § 122.26(b)(14)(x). Because the State of Montana has been delegated the authority to implement the Clean Water Act, these requirements are enforced in Montana through the Montana Pollutant Discharge Elimination System (MPDES). The MPDES requirements are set forth below.

5.1.2 Montana Pollutant Discharge Elimination System Requirements

Substantive MPDES Permit Requirements, ARM 17.30.1342-1344 (applicable). These set forth the substantive requirements applicable to all MPDES and National Pollutant Discharge Elimination System (NPDES) permits. The substantive requirements, including the requirement to properly operate and maintain all facilities and systems of treatment and control are applicable requirements for a repository containing mine waste.

Technology-Based Treatment, ARM 17.30.1203 and 1344 (applicable). Provisions of 40 CFR Part 125 for criteria and standards for the imposition of technology-based treatment requirements are adopted and incorporated in MPDES permits. Although the permit requirement would not apply to on-site discharges, the substantive requirements of Part 125 are applicable, i.e., for toxic and nonconventional pollutants treatment must apply the best available technology economically achievable (BAT); for conventional pollutants, application of the best conventional pollutant control technology (BCT) is required. Where effluent limitations are not specified for the particular industry or industrial category at issue, BCT/BAT technology-based treatment requirements are determined on a case by case basis using best professional judgment (BPJ). See CERCLA Compliance with Other Laws Manual, Vol. I, August 1988, p. 3-4 and 3-7.

5.1.3 Montana Water Quality Statutes and Regulations

Causing of Pollution, Section 75-5-605, MCA (applicable). This section of the Montana Water Quality Act prohibits the causing of pollution of any state waters. Pollution is defined as contamination or other alteration of physical, chemical, or biological properties of state waters which exceeds that permitted by the water quality standards. Also, it is unlawful to place or caused to be placed any wastes where they will cause pollution of any state waters.

Nondegradation, Section 75-5-303, MCA (applicable). This provision states that existing uses of state waters and the level of water quality necessary to protect the uses must be maintained and protected. Section 75-5-317, MCA, provides an exemption from nondegradation requirements which allows changes of existing water quality resulting from an emergency or remedial activity that is designed to protect the public health or the environment and that is approved, authorized, or required by the department. Degradation meeting these requirements may be considered nonsignificant. In determining that remedial actions are protective of public health and the environment and in approving, authorizing, or requiring such remedial activities, no significant degradation should be approved.

Surface Water, ARM 17.30.637 (applicable). Prohibits discharges containing substances that will: (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines; (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials; (c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible; (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; or (e) create conditions which produce undesirable aquatic life.

ARM 17.30.705 (applicable). This provides that for any surface water, existing and anticipated uses and the water quality necessary to protect these uses must be maintained and protected unless degradation is allowed under the nondegradation rules at ARM 17.30.708.

ARM 17.30.1011 (applicable). This provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless degradation may be allowed under the principles established in Section 75-5-303, MCA and the nondegradation rules at ARM 17.30.701, et seq.

5.1.4 Stormwater Runoff Control Requirements

ARM 17.24.633 (applicable). All surface drainage from a disturbed area must be treated by the best technology currently available.

General Permits (applicable). Pursuant to ARM 17.30.1341, DEQ has issued general storm water permits for certain activities. The substantive requirements of the following permits are applicable for the following activities: for construction activities – General Permit for Storm Water Discharge Associated with Construction Activity, Permit No. MTR100000 (April 16, 2007); for mining activities – General Discharge Permit for Storm Water Associated with Mining and with Oil and Gas Activities, Permit No. MTR300000 (November 17, 2002);[11] and for industrial activities – General Permit for Storm Water Discharge Associated with Industrial Activity, Permit No. MTR000000 (October 1, 2006).[12]

Generally, the permits require the permittee to implement best management practice (BMP) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment. However, if there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with the activity, an individual MPDES permit or alternative general permit may be required.

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[11] This permit covers point source discharges of storm water from mining and milling activities (including active, inactive, and abandoned mine and mill sites) including activities with Standard Industrial Code 14 (metal mining).

[12] Industrial activities are defined as all industries defined in 40 CFR " 122, 123, and 124, excluding construction, mining, oil & gas extraction activities and storm water discharges subject to effluent limitations guidelines. This includes wood treatment operations, as well as the production of slag

A related mine reclamation requirement is set out in ARM 17.24.633 (relevant and appropriate), which requires that all surface drainage from disturbed areas that have been graded, seeded or planted must be treated by the best technology currently available (BTCA) before discharge. Sediment control through BTCA practices must be maintained until the disturbed area has been reclaimed, the revegetation requirements have been met, and the area meets state and federal requirements for the receiving stream.

5.2 Federal and State RCRA Subtitle C Requirements

Federal and State RCRA Subtitle C Requirements, 42 U.S.C. Section 6921, et seq. (relevant and appropriate for solid wastes, applicable for hazardous wastes). The presentation of RCRA Subtitle C requirements in this section assumes that there will be solid wastes left in place in "waste management areas" (i.e., the repository) as a result of this remedial action. Because of the similarity of this waste management area to the RCRA "waste management unit," certain discrete portions of the RCRA Subtitle C implementing regulations will be relevant and appropriate for the East Helena OU2 remedial action. RCRA Subtitle C and implementing regulations are designated as applicable for any hazardous wastes that are actively "generated" as part of this remedial action or that were "placed' or "disposed" after 1980. Also, should hazardous wastes be discovered as part of any remedial design or remedial action, EPA reserves the right to identify RCRA Subtitle C requirements in more detail at a later date. All federal RCRA Subtitle C requirements set forth below are incorporated by reference as State of Montana requirements as provided for under ARM 17.53.105 unless mentioned otherwise below.

40 CFR Part 264 Subpart F.

General Facility Standards. These are potentially relevant and appropriate for solid wastes at this site. Any waste management unit or similar area would be required to comply with the following requirements.

40 CFR § 264.92, .93. and .94. Prescribes groundwater protection standards.

40 CFR § 264.97. Prescribes general groundwater monitoring requirements.

40 CFR § 264.98. Prescribes requirements for monitoring and detecting indicator parameters.

Closure requirements.

40 CFR § 264.111. This provides that the owner or operator of a hazardous waste management facility must close the facility in a way that minimizes the need for further maintenance, and controls or eliminates the leaching or escape of hazardous waste or its constituents, leachate, or runoff to the extent necessary to protect human health and the environment.

40 CFR § 264.117. This provision incorporates monitoring requirements in Part 264, including those mentioned at Part 264.97 and Part 264.303. It governs the length of the post-closure care period, permits a lengthened security period, and prohibits any use of the property which would disturb the integrity of the management facility.

40 CFR § 264.310. This specifies requirements for caps, maintenance, and monitoring after closure.

40 CFR § 264.301. Prescribes design and operating requirements for landfills.

40 CFR § 264.301(a). This provides for a single liner and leachate collection and removal system.

40 CFR § 264.301(f). This requires a run-on control system.

40 CFR § 264.301(g). This requires a run-off management system.

40 CFR § 264.301(h). This requires prudent management of facilities for collection and holding of run-on and run-off.

40 CFR § 264.301(i). This requires that wind dispersal of particulate matter be controlled.

5.3 Federal and State RCRA Subtitle D and Solid Waste Management Requirements

40 CFR Part 257 establishes criteria under Subtitle D of the Resource Conservation and Recovery Act for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment. See 40 CFR § 257.1(a). This part comes into play whenever there is a "disposal" of any solid or hazardous waste from a "facility." "Disposal" is defined as "the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters." See 40 CFR § 257.2. "Facility" means "any land and appurtenances thereto used for the disposal of solid wastes." Solid waste requirements are either applicable to mine wastes as solid waste or are relevant and appropriate for the management, handling, storage, monitoring and disposal of the mine wastes to be addressed in this remedial action.

5.3.1. Federal Requirements

40 CFR § 257 (applicable). Criteria for Classification of Solid Waste Disposal Facilities and Practices. The activities to be performed for the East Helena OU2 remedial action are expected to comply with the following requirements.

40 CFR § 257.3-1. Washout of solid waste in facilities in a floodplain posing a hazard to human life, wildlife, or land or water resources shall not occur.

40 CFR § 257.3-2. Facilities shall not contribute to the taking of endangered species or the endangering of critical habitat of endangered species.

40 CFR § 257.3-3. A facility shall not cause a discharge of pollutants, dredged or fill material, into waters of the United States in violation of Sections 402 and 404 of the Clean Water Act, as amended, and shall not cause non-point source pollution, in violation of applicable legal requirements implementing an area wide or statewide water quality management plan that has been approved by the Administrator under Section 208 of the Clean Water Act, as amended.

40 CFR § 257.3-4. A facility shall not contaminate an underground source of drinking water beyond the solid waste boundary or beyond an alternative boundary specified in accordance with this section.

40 CFR § 257.3-8(d). Access to a facility shall be controlled so as to prevent exposure of the public to potential health and safety hazards at the site.

5.3.2. State of Montana Solid Waste Requirements.

The Montana Solid Waste Management Act, Section 75-10-201 et seq., MCA, and regulations are applicable to the management and disposal of all solid wastes, including mine wastes at sites that are not currently subject to operating permit requirements.

ARM § 17.50.505(1) and (2) (applicable). Sets forth standards that all solid waste disposal sites must meet, including the requirements that (1) Class II landfills must confine solid waste and leachate to the disposal facility. If there is the potential for leachate migration, it must be demonstrated that leachate will only migrate to underlying formations which have no hydraulic continuity with any state waters; (2) adequate separation of group II wastes from underlying or adjacent water must be provided[13]; and (3) no new disposal units or lateral expansions may be located in wetlands. ARM 17.50.505 also specifies general soil and hydrogeological requirements pertaining to the location of any solid waste management facility.

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[13] The extent of separation shall be established on a case-by-case basis, considering terrain and the type of underlying soil formations, and facility design.

ARM 17.50.506 (applicable). Specifies design requirements for landfills. Landfills must either be designed to ensure that MCLs are not exceeded or the landfill must contain a composite liner and leachate collection system which comply with specified criteria.

ARM 17.50.511 (applicable). Sets forth operational and maintenance and design requirements for solid waste management facilities using land filling methods. Specific requirements specified in ARM 17.50.511 that are applicable are run-on and run-off control systems requirements, requirements that sites be fenced to prevent unauthorized access, and prohibitions of point source and nonpoint source discharges which would violate Clean Water Act requirements.

ARM 17.50.523 (applicable). Specifies that solid waste must be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.

ARM 17.50.530 (applicable). Sets forth the closure requirements for landfills. Class II landfills must meet the following criteria: (1) install a final cover that is designed to minimize infiltration and erosion; (2) design and construct the final cover system to minimize infiltration through the closed unit by the use of an infiltration layer that contains a minimum 18 inches of earthen material and has a permeability less than or equal to the permeability of any bottom liner, barrier layer, or natural subsoils or a permeability no greater than 1 X 10-5 cm/sec, whichever is less; (3) minimize erosion of the final cover by the use of a seed bed layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth and protecting the infiltration layer from frost effects and rooting damage; (4) revegetate the final cover with native plant growth within one year of placement of the final cover.

ARM17.50.531 (applicable). Sets forth post closure care requirements for Class II landfills. Post closure care must be conducted for a period sufficient to protect human health and the environment. Post closure care requires maintenance of the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cover and comply with the groundwater monitoring requirements found at ARM Title 17, chapter 50, subchapter 7.

Section 75-10-206, MCA, allows variances to be granted from solid waste regulations if failure to comply with the rules does not result in a danger to public health or safety or compliance with specific rules would produce hardship without producing benefits to the health and safety of the public that outweigh the hardship.

5.4 Federal and State Mine Reclamation Requirements

5.4.1 Surface Mining Control and Reclamation Act

Surface Mining Control and Reclamation Act, 30 USC § 1201-1326 (relevant and appropriate). This Act and implementing regulations found at 30 CFR Parts 784 and 816 establish provisions designed to protect the environment from the effects of surface coal mining operations, and to a lesser extent non-coal mining. These requirements are relevant and appropriate to the covering of discrete areas of contamination. The regulations require that revegetation be used to stabilize soil covers over reclaimed areas. They also require that revegetation be done according to a plan which specifies schedules, species which are diverse and effective, planting methods, mulching techniques, irrigation if appropriate, and appropriate soil testing. Reclamation performance standards are currently relevant and appropriate to mining waste sites.

5.4.2 Montana Statutory and Regulatory Requirements

Montana Strip and Underground Mine Reclamation Act, Section 82-4-201, et seq., MCA (relevant and appropriate) and Montana Metal Mining Act, Section 82-4-301, et seq., MCA (relevant and appropriate). The specified portions of the following statutory or regulatory provisions, as identified below, are relevant and appropriate requirements.

Section 82-4-231, MCA. Requires operators to reclaim and revegetate affected lands using most modern technology available. Operators must grade, backfill, topsoil, reduce high walls, stabilize subsidence, control water, minimize erosion, subsidence, land slides, and water pollution.

Section 82-4-233, MCA. Operators must plant vegetation that will yield a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area and capable of self-regeneration.

Section 82-4-336, MCA. Disturbed areas must be reclaimed to utility and stability comparable to adjacent areas.

ARM 17.24.501. Provides general backfilling and grading requirements. Backfill must be placed so as to minimize sedimentation, erosion, and leaching of acid or toxic materials into waters, unless otherwise approved. Final grading must be to the approximate original contour of the land and final slopes must be graded to prevent slope failure, may not exceed the angle of repose, and must achieve a minimum long term static safety factor of 1:3. The disturbed area must be blended with surrounding and undisturbed ground to provide a smooth transition in topography.

ARM 17.24.519. Requires monitoring of settling of regraded areas.

ARM 17.24.631(1), (2), (3)(a) and (b). Requires minimization of disturbances to the prevailing hydrologic balance. Changes in water quality and quantity, in the depth to groundwater and in the location of surface water drainage channels will be minimized. Other pollution minimization devices must be used if appropriate, including stabilizing disturbed areas through land shaping, diverting runoff, planting quickly germinating and growing stands of temporary vegetation, regulating channel velocity of water, lining drainage channels with rock or vegetation, mulching, and control of acid-forming, and toxic-forming waste materials.

ARM 17.24.633. Surface drainage from a disturbed area must be treated by the best technology currently available (BTCA). Treatment must continue until the area is stabilized.

ARM 17.24.634. Requires disturbed drainages be restored to the approximate pre-disturbance configuration. Drainage design must emphasize channel and floodplain dimensions that approximate the pre-mining configuration and that will blend with the undisturbed drainage above and below the area to be reclaimed. The average stream gradient must be maintained with a concave longitudinal profile. This regulation provides specific requirements for designing the reclaimed drainage to: (1) approximate an appropriate geomorphic habit or characteristic pattern; (2) remain in dynamic equilibrium with the system without the use of artificial structural controls; (3) improve unstable pre-mining conditions; (4) provide for floods and for the long-term stability of the landscape; and (5) establish a pre-mining diversity of aquatic habitats and riparian vegetation.

ARM 17.24.635 through 17.24.637 set forth requirements for temporary and permanent diversions.

ARM 17.24.638. Sediment control measures must be implemented during operations.

ARM 17.24.639. Sets forth requirements for construction and maintenance of sedimentation ponds.

ARM 17.24.641. Establishes practices to avoid drainage from acid or toxic forming spoil material into ground and surface water.

ARM 17.24.643 through 17.24.646. Provisions for groundwater protection, groundwater recharge protection, and groundwater and surface water monitoring.

ARM 17.24.701 and 702. Requirements for redistributing and stockpiling of soil for reclamation. Also, outlines practices to prevent compaction, slippage, erosion, and deterioration of biological properties of soil.

ARM 17.24.703. When using materials other than, or along with, soil for final surfacing in reclamation, the operator must demonstrate that the material (1) is at least as capable as the soil of supporting the approved vegetation and subsequent land use, and (2) the medium must be the best available in the area to support vegetation. Such substitutes must be used in a manner consistent with the requirements for redistribution of soil in ARM 17.24.701 and 702.

ARM 17.24.711. Requires that a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area of land to be affected shall be established except on road surfaces and below the low-water line of permanent impoundments. See also Section 82-4-233, MCA (relevant and appropriate). Vegetative cover is considered of the same seasonal variety if it consists of a mixture of species of equal or superior utility when compared with the natural vegetation during each season of the year. This requirement may not be appropriate where other cover is more suitable for the particular land use or another cover is requested by the landowner.

ARM 17.24.713. Seeding and planting of disturbed areas must be conducted during the first appropriate period favorable for planting after final seedbed preparation.

ARM 17.24.714. Mulch or cover crop or both must be used until adequate permanent cover can be established.

ARM 17.24.716. Establishes method of revegetation.

ARM 17.24.717. Relates to the planting of trees and other woody species if necessary, as provided in Section 82-4-233, MCA, to establish a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the affected area and capable of self-regeneration and plant succession at least equal to the natural vegetation of the area, except that introduced species may be used in the revegetation process where desirable and necessary to achieve the approved land use plan.

ARM 17.24.718. Requires soil amendments, irrigation, management, fencing, or other measures, if necessary to establish a diverse and permanent vegetative cover.

ARM 17.24.721. Specifies that rills or gullies in reclaimed areas must be filled, graded or otherwise stabilized and the area reseeded or replanted if the rills and gullies are disrupting the reestablishment of the vegetative cover or causing or contributing to a violation of water quality standards for a receiving stream. ARM 17.24.723. States that operators shall conduct approved periodic measurements of vegetation, soils, water, and wildlife, and if data indicate that corrective measures are necessary, shall propose such measures.

ARM 17.24.724. Specifies that revegetation success must be measured against approved technical standards or unmined reference areas. Reference areas and standards must be representative of vegetation and related site characteristics occurring on lands exhibiting good ecological integrity. Required management for these reference areas is set forth.

ARM 17.24.726. Requires standard and consistent field and laboratory methods to obtain and evaluate revegetated area data with reference area data and/or technical standards, and sets out the required methods for measuring productivity.

ARM 17.24.731. If toxicity to plants or animals on the revegetated area or the reference area is suspected due to the effects of the disturbance, comparative chemical analyses may be required.

ARM 17.24.751. Sets forth requirements to protect and enhance fish and wildlife habitat.

ARM 17.24.824. If land use is to be other than grazing land or fish and wildlife habitat, areas of land affected by mining must be restored in a timely manner to higher or better uses achievable under criteria and procedures set forth.

5.5 Air Requirements

Remedial activities will comply with the Ambient Air Quality Regulations (above) and with the following requirements to ensure that existing air quality will not be adversely affected by the East Helena OU2 remedial action.

ARM 17.8.308(1), (2) and (3) (applicable). Airborne particulate matter. There shall be no production, handling, transportation, or storage of any material, use of any street, road, or parking lot, or operation of a construction site or demolition project unless reasonable precautions are taken to control emissions of airborne particles. Emissions shall not exhibit an opacity exceeding 20% or greater averaged over 6 consecutive minutes.

ARM 17.8.304(2) (applicable). Visible Air Contaminants. Emissions into the outdoor atmosphere shall not exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.

ARM 17.8.604 (applicable). Lists certain wastes that may not be disposed of by open burning, including oil or petroleum products, RCRA hazardous wastes, chemicals, and treated lumber and timbers. Any waste which is moved from the premises where it was generated and any trade waste (material resulting from construction or operation of any business, trade, industry, or demolition project) may be open burned only in accordance with the substantive requirements of ARM 17.8.611 or 612.

ARM 17.24.761 (relevant and appropriate). Specifies a range of measures for controlling fugitive dust emissions during mining and reclamation activities. Some of these measures could be considered relevant and appropriate to control fugitive dust emissions in connection with excavation, earth moving and transportation activities conducted as part of the remedy at the site. Such measures include, for example, paving, watering, chemically stabilizing, or frequently compacting and scraping roads, promptly removing rock, soil or other dust-forming debris from roads, restricting vehicle speeds, revegetating, mulching, or otherwise stabilizing the surface of areas adjoining roads, restricting unauthorized vehicle travel, minimizing the area of disturbed land, and promptly revegetating regraded lands.

5.6 Noxious Weeds

Noxious Weeds, Section 7-22-2101(8)(a), MCA. Defines "noxious weeds" as any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities and that is designated: (I) as a statewide noxious weed by rule of the department; or (ii) as a district noxious weed by a board, following public notice of intent and a public hearing. Designated noxious weeds are listed in ARM 4.5.201 through 4.5.204 and must be managed consistent with weed management criteria developed under Section 7-22-2109(2)(b), MCA.

6.0 TO BE CONSIDERED (TBC) DOCUMENTS

A list of TBC documents is included in the Preamble to the NCP, 55 Fed. Reg. 8765 (March 8, 1990). Those documents, plus any additional similar or related documents issued since that time, were considered by EPA and DEQ during the conduct of the remedial investigation (RI)/feasibility study (FS), remedy selection and will be further considered during the conduct of the remedial design and implementation of the remedial action.

7.0 OTHER LAWS (NON-EXCLUSIVE LIST)

CERCLA defines as ARARs only federal environmental and state environmental and siting laws. Remedial design, implementation, and operation and maintenance must nevertheless comply with all other applicable laws, both state and federal.

The following "other laws" are included here to provide a reminder of other legally applicable requirements for response actions being conducted at the East Helena OU2. They are not intended to be an exhaustive list of such legal requirements, but are included because they set out related concerns that must be addressed and, in some cases, may require some advance planning. They are not included as ARARs because they are not "environmental or facility siting laws." As applicable laws other than ARARs, they are not subject to ARAR waiver provisions.

7.1 Other Federal Laws

Occupational Safety and Health Regulations. The federal Occupational Safety and Health Act regulations found at 29 CFR Part 1910 and Part 1926 are applicable to worker protection during the conduct of all remedial activities.

7.2 Other State Laws

A. Groundwater Act

The Groundwater Act, Section 85-2-501, et seq., MCA, and implementing regulations, ARM 17.30.601, et seq. govern uses of groundwater and provide measures to protect groundwater from depletion or contamination. The regulations also set requirements for water wells.

Section 85-2-505, MCA, precludes the wasting of groundwater. Any well producing waters that contaminate other waters must be plugged or capped, and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.

Section 85-2-516, MCA, states that within 60 days after any well is completed a well log report must be filed by the driller with the DNRC and the appropriate county clerk and recorder.

B. Public Water Supply Regulations

If remedial action at the site requires any reconstruction or modification of any public water supply line or sewer line, the construction standards specified in ARM 17.38.101(4) (applicable) must be observed.

C. Water Rights

Section 85-2-101, MCA, declares that all waters within the state are the state's property, and may be appropriated for beneficial uses. The wise use of water resources is encouraged for the maximum benefit to the people and with minimum degradation of natural aquatic ecosystems.

Parts 3 and 4 of Title 85, Chapter 2, MCA, set out requirements for obtaining water rights and appropriating and utilizing water. All requirements of these parts are laws which must be complied with in any action using or affecting waters of the state. Some of the specific requirements are set forth below.

Section 85-2-301, MCA, of Montana law provides that a person may only appropriate water for a beneficial use.

Section 85-2-302, MCA, specifies that a person may not appropriate water or commence construction of diversion, impoundment, withdrawal or distribution works therefor except by applying for and receiving a permit from the Montana Department of Natural Resources and Conservation. While the permit itself may not be required under federal law, appropriate notification and submission of an application should be performed and a permit should be applied for in order to establish a priority date in the prior appropriation system.

Section 85-2-306, MCA, specifies the conditions on which groundwater may be appropriated, and, at a minimum, requires notice of completion and appropriation within 60 days of well completion.

Section 85-2-311, MCA, specifies the criteria which must be met in order to appropriate water and includes requirements that:

1. there are unappropriated waters in the source of supply;
2. the proposed use of water is a beneficial use; and
3. the proposed use will not interfere unreasonably with other planned uses or developments.

Section 85-2-402, MCA, specifies that an appropriator may not change an appropriated right except as provided in this section with the approval of the DNRC.

Section 85-2-412, MCA, provides that, where a person has diverted all of the water of a stream by virtue of prior appropriation and there is a surplus of water over and above what is actually and necessarily used, such surplus must be returned to the stream.

D. Controlled Ground Water Areas

Pursuant to Section 85-2-507, MCA, the Montana Department of Natural Resources and Conservation may grant either a permanent or a temporary controlled ground water area. The maximum allowable time for a temporary area is two years, with a possible two-year extension.

Pursuant to Section 85-2-506, MCA, designation of a controlled ground water area may be proposed if: (i) excessive ground water withdrawals would cause contaminant migration; (ii) ground water withdrawals adversely affecting ground water quality within the ground water area are occurring or are likely to occur; or (iii) ground water quality within the ground water area is not suited for a specific beneficial use.

E. Occupational Health Act, Section 50-70-101, et seq., MCA.

ARM 17.74.101 addresses occupational noise. In accordance with this section, no worker shall be exposed to noise levels in excess of the levels specified in this regulation. This rule is applicable only to limited categories of workers and for most workers the similar federal standard in 29 CFR § 1910.95 applies.

ARM 17.74.102 addresses occupational air contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. In accordance with this rule, no worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the rule. This rule is applicable only to limited categories of workers and for most workers the similar federal standard in 29 CFR § 1910.1000 applies.

F. Montana Safety Act

Sections 50-71-201, 202 and 203, MCA, state that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe. The employer must also do every other thing reasonably necessary to protect the life and safety of its employees. Employees are prohibited from refusing to use or interfering with the use of safety devices.

G. Employee and Community Hazardous Chemical Information

Sections 50-78-201, 202, and 204, MCA, state that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used. Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals.

PART III

RESPONSIVENESS SUMMARY

INTRODUCTION

PART III RESPONSIVENESS SUMMARY

INTRODUCTION

This Responsiveness Summary provides the comments received during the public comment period on the Proposed Plan (the Plan) for the remedy of the East Helena Superfund Site (Operable Unit No. 2) and the responses of the U.S. Environmental Protection Agency (EPA) to the comments. Minutes and transcripts of public meetings are included as are Supplemental comments (and responses) received from local government entities after the public comment period was closed. All comments in this document have been considered in EPA's final decision on selection of the remedy to address the contamination at the site.

The East Helena Superfund Site (Site) OU 2 consists of the smelter, all of the City of East Helena, Montana, nearby residential subdivisions, numerous rural developments such as farms and homes on small acreage plots, and surrounding undeveloped lands. This Responsiveness Summary addresses Operable Unit 2 (OU 2), which consists of non-smelter property surface soils in the residential areas, irrigation ditches, rural developments, and surrounding undeveloped land.

OVERVIEW OF THE PROPOSED PLAN

EPA released the Plan in January 2007, after consultation with MDEQ, Lewis and Clark City-County Board of Health (BOH), and City of East Helena. The Plan describes the cleanup alternatives considered for the site, identified the preferred cleanup alternative, and provided a rationale for selection of the preferred cleanup remedy.

The major components of the Preferred Alternative in the Proposed Plan (and selected remedy in the ROD) are briefly summarized here, and discussed in detail in the Decision Summary.

- Cleanup by excavation and disposal in the East Fields soil repository the existing, qualifying residential yards and vacant lots based on a cleanup level of 1,000/500 milligrams per kilogram (mg/kg) for a residential lot, the exposure unit. When any section of a yard has soil lead greater than 1,000 mg/kg, that yard qualifies for cleanup. Once a yard qualifies, all portions of the yard with soil lead greater than 500 mg/kg will also be cleaned up.
- Cleanup of unpaved streets, aprons, and alleys in existing residential areas where the lead levels exceed 1,000 mg/kg.
- Whenever blood lead tests of a child and a follow-up environmental assessment of a home by health professionals demonstrate that exposure to lead in the soils of that yard is responsible for a blood lead level above 10 ug/dl, then that yard qualifies for immediate remedial action regardless of the yard soil lead concentration.
- Cleanup of those yards where the average soil arsenic concentration exceeds 176 mg/kg (revised to 100 mg/kg in the ROD), but the yard does not otherwise qualify (e.g., no section contains soil concentrations of lead above 1,000 mg/kg), then the yard qualifies for remedial action.

- Cleanup of historic irrigation ditches and water spreading channels that contain lead above 1,000 mg/kg when they are located within or adjacent to residential areas.
- Cleanup of the portion of the railroad right-of-way that is adjacent to residential areas where the lead exceeds 1,000 mg/kg.
- Disposal of excavated contaminated soil at the East Fields soil repository (revised to an EPA-approved repository in the ROD) by means of land application.
- Establish institutional controls (remedy protection measures), that will enable the Lewis and Clark City-County Board of Health and City of East Helena to administer local regulations to protect the selected remedy. Institutional controls are required for residential areas, agricultural lands (such as best management practices), and agricultural lands proposed for development.
- Continue the existing East Helena Lead Education and Abatement Program for as long as long as Lewis and Clark County health professionals, in consultation with other federal, state and local health officials, deem it to be necessary and beneficial.
- Clean up undeveloped land appropriate to the future use when undeveloped land use changes are proposed through in place treatment (deep tilling and lime amendment), excavation, or capping. For undeveloped areas that are proposed for residential development in the future, ensure that soil lead and arsenic concentrations do not exceed 500 ppm lead or 176 ppm arsenic (revised to 100 ppm in the ROD).

SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

The Proposed Plan was published on January 16, 2007, and made available to the public in the information repositories maintained at the EPA Records Center, 10 West 15th Street, Suite 3200, Helena, Montana; the Montana Department of Environmental Quality (MDEQ) Records Center, 1100 North Last Chance Gulch, Helena Montana; the East Helena Lead Education and Abatement Program Office, 2 South Morton, Helena Montana; and the EPA web site at <https://www.epa.gov/region8/sf/mt/east_helena>.

Approximately four thousand fact sheets summarizing the Proposed Plan were sent to residents in the East Helena, Montana area during the month of January 2007. These fact sheets provided information regarding two impending public meetings, and identified locations where copies of the Plan could be obtained. Articles appeared in the local newspaper and a notice was published immediately prior to each public meeting. Copies of the Plan were distributed to selected local officials and interested parties. An original 60-day public comment period starting on January 25, 2007, the date of the first public meeting, was extended by 60 days at the request of several agencies, resulting in a public comment period from January 25 to May 25, 2007.

Two public meetings were held after publication of the Plan. These meetings provided an opportunity for the public to ask questions, discuss their concerns, and provide comments on the Proposed Plan. The first public meeting was held on January 25, 2007 in the East Helena, Montana Fire Hall. Local residents and representatives of the City of East Helena, BOH, MDEQ, EPA, and Asarco were in attendance. Minutes of this meeting were prepared and are included with this Responsiveness Summary.

A second public meeting was held on March 1, 2007, in the East Helena Fire Hall. Local residents and representatives of the City of East Helena, Lewis & Clark City-County Board of Health, Montana Department of Environmental Quality, EPA, and Asarco were in attendance. A transcript of this meeting was prepared and is included with this Responsiveness Summary.

ORGANIZATION OF RESPONSIVENESS SUMMARY

This Responsiveness Summary contains the following:

- Introduction
- Public Meetings
  - Minutes of January 25, 2007 Public Meeting
  - Transcript of the March 16, 2007 Public Meeting
- Public Comments on Proposed Plan and EPA Responses
- Supplemental Comments and EPA Responses
  - Questions Posed by Lewis and Clark City-County Board of Health
  - Letter from the City of East Helena

CONTACT FOR PUBLIC INQUIRIES

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PUBLIC MEETINGS

Minutes of the January 25, 2007, Public Meeting

Transcript of the March 16, 2007, Public Meeting

**SUMMARY OF JANUARY 25, 2007 PUBLIC MEETING
FOR THE
PROPOSED PLAN FOR FINAL CLEANUP OF EAST HELENA'S
RESIDENTIAL SOILS AND UNDEVELOPED LANDS**

Meeting Place: East Helena Volunteer Fireman's Hall, East Helena, Montana
Meeting Time: 7:00 PM
Itinerary: Introduction, Presentations, Questions, Comments

The following transcript was prepared by Pacific Western Technologies, Ltd., from audio tapes of the meeting. The meeting was held in an informal atmosphere and there were frequent questions and responses conducted in a conversational manner. The questioners did not identify themselves so only the question is listed below. The answers were frequently provided by two or more of the EPA representatives. The following summary is not a direct transcription of the audio tapes but rather a summary of the questions and responses.

Introduction

Scott Brown (US EPA) – Opens meeting, welcomes attendees, introduces Dr. Susan Griffin and Dr. William Brattin, and summarizes purpose of the meeting, Proposed Plan, and Record of Decision. The purpose of the meeting was to discuss the risk assessment and the setting of an appropriate action level for lead cleanup of residential soils and undeveloped lands in East Helena.

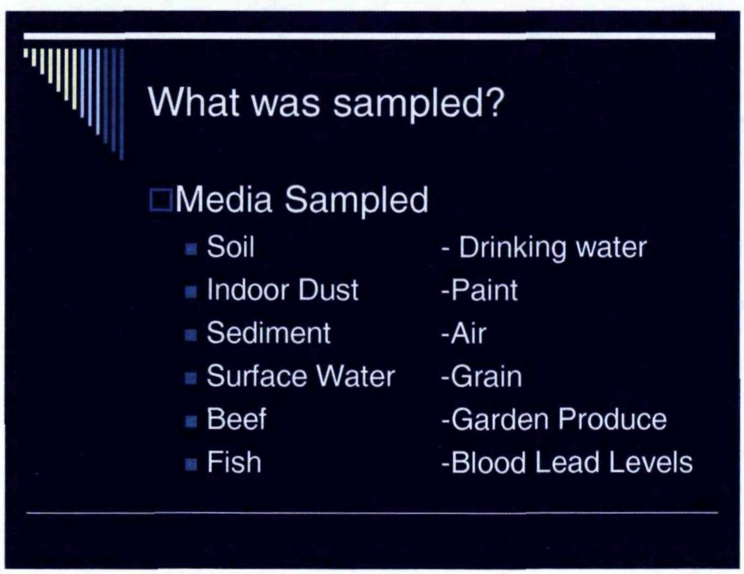
Presentations

Dr. Griffin (US EPA) – The site has been sampled extensively since 1983. Lead, arsenic and cadmium were identified as the contaminants of concern for the East Helena site. Receptors of concern are the children and adults living in the community. The exposure pathways of concern include ingestion of soil, indoor dust, surface water and sediment, groundwater, drinking water, vegetables, fish, beef, and grain; inhalation of airborne dust; and dermal exposure to soil and sediment.

Assessment of exposure may be completed through direct measurement by collection of blood and urine samples. Direct measurements provide a reliable method for assessing current exposure. Do not have to make assumptions of what the sources are or how much of the source is assimilated into the body. Some disadvantages of direct measurements are that there may not be benchmarks with which to compare the direct measurement, and that the data only represent recent exposure. We have benchmarks for lead and after about 60 days the children become equilibrated to the lead in their environment. This suggests that for children who have lived in the community longer than 60 days the available blood lead data are representative of the exposure that is occurring within the community.

Another way to assess exposure is to model it. One model is the IEUBK (Integrated Exposure Uptake Biokinetic Model). The model inputs are based on reasonable maximum exposure. Advantages of models include that they are not invasive (do not have to sample children's blood), that they can look at alternate land uses, and that they can identify different sources of exposure. The disadvantages of models include accuracy of assumptions, and that models often do not reflect what is actually happening. For example, one assumption is that the blood lead concentration is correlated to the soil concentration. A plot of blood lead concentrations by the soil lead concentrations in East Helena shows that there is no correlation.

To assess risk the preferred approach is to use the direct measurements coupled with site-specific public health and regulatory models to identify elevated blood lead levels, sources of blood lead levels, and develop a remedy that will be effective in reducing the blood lead levels.



What was analyzed for?

- Inorganics commonly associated with mining and smelting related wastes
  - Antimony, Arsenic, cadmium, chromium, copper, zinc, lead, manganese, mercury, selenium, and silver
  - Lead, arsenic and cadmium selected as contaminants of concern

Who is exposed and how are they exposed?

- Receptors
  - Children and adults living in the community
- How are they exposed?
  - Ingestion of soil, indoor dust, drinking water, sediment, surface water, groundwater, garden produce, fish, beef and grain
  - Inhalation of airborne dust
  - Dermal exposure to soil and sediments
  - All of these exposure pathways were evaluated for residents living in the community

HOW MUCH ARE PEOPLE EXPOSED TO?

- Direct Measurements
  - Collect and analyze biological fluids, such as blood or urine, for chemicals
  - Compare results to known medical benchmarks

HOW MUCH ARE PEOPLE EXPOSED TO?

- Advantages of direct measurements
  - We know exactly what current exposure is
  - Don't have to make assumptions about the sources of exposure or how often or how much people contact that source
  - Health professionals combine direct measurements with epidemiological tools to identify sources of exposure

HOW MUCH ARE PEOPLE EXPOSED TO?

- Disadvantages of direct measurements
  - Don't have medical tests or benchmarks for most chemicals
  - Invasive
  - May reflect only recent exposures

MODELING EXPOSURE

- Uses equations to estimate how often and how much people contact a given media to derive a site-specific estimate of exposure
- Inputs to the equation represent high end or "reasonable maximum" exposures

- Intake =CxIRxEFxED/BWxAT
- c=concentration
- IR=intake rate
- EF=exposure frequency
- ED=exposure duration
- BW=body weight
- AT=period over which exposure is averaged

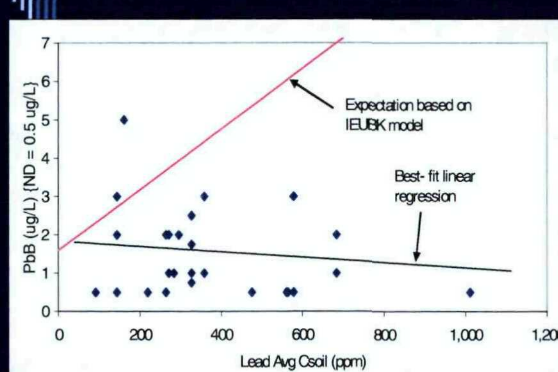
MODELING EXPOSURE

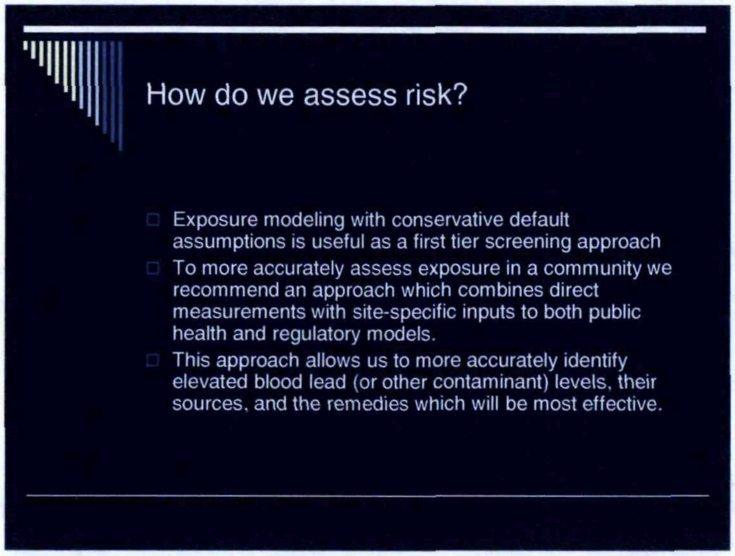
- Advantages of modeling approach
  - Non-invasive
  - Can assess alternate land uses in the future as well as current ones
  - Can identify sources of exposure
  - USEPA uses this approach

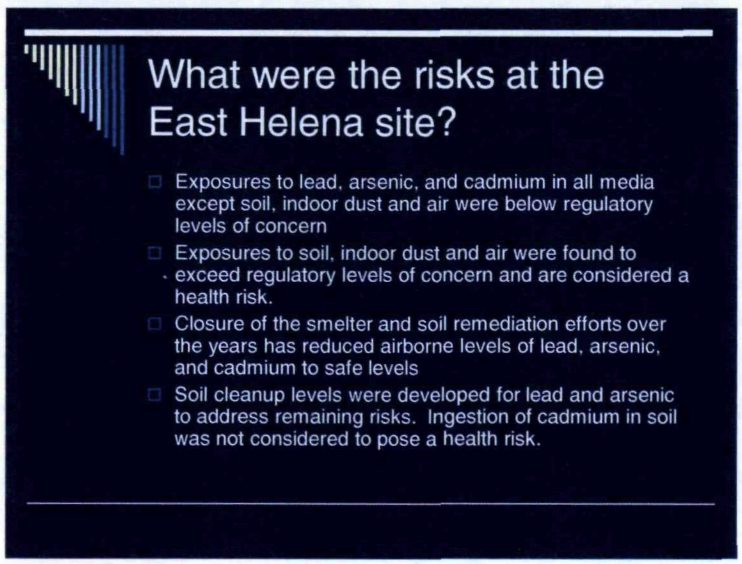
MODELING EXPOSURE

- Disadvantages of modeling approach
  - Must make assumptions on sources of exposure, contact rates and frequencies
  - USEPA policy dictates that these assumptions are based on the most susceptible individual who receives the maximum exposure which is plausible, therefore, the results are conservative
  - The models used are useful screening tools, but may not always be sophisticated enough to accurately reflect real life exposures

OBSERVED vs PREDICTED

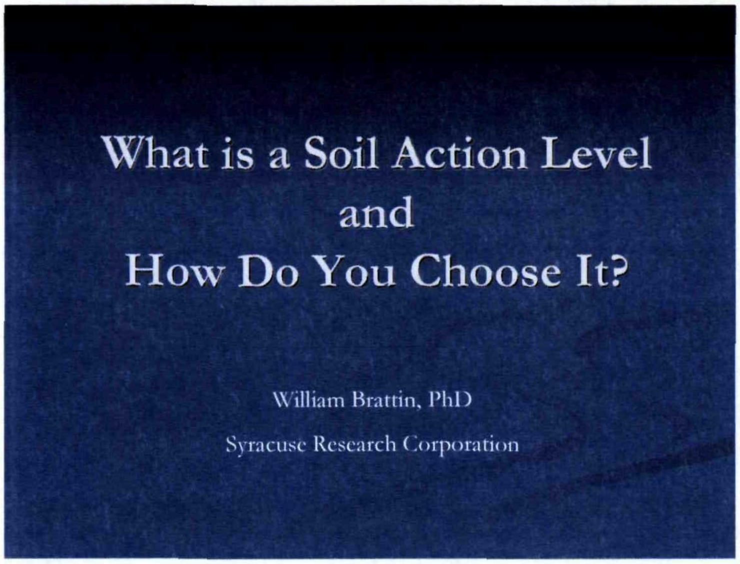




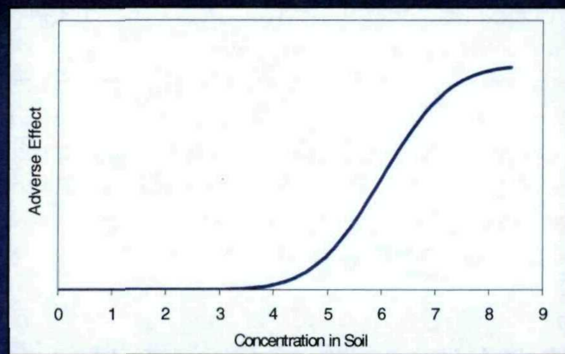


Dr. Brattin (Syracuse Research Corporation) – The EPA-proposed action level for lead in residential soils is 1,000 parts per million (ppm). The most important principle is the concept of the dose-response curve. The shape of the line for the dose-response curve for most non-carcinogenic effects is as represented on the displayed figure. The most important point on the curve is where an effect starts to occur. This point is known as the threshold concentration. The action level is targeted to the threshold concentration. At most sites the dose-response curve is unknown. At East Helena the IEUBK model results in an action level of 520 ppm for lead. The degree of uncertainty in the assumptions used in the IEUBK model was evaluated. The uncertainty evaluation demonstrates that the IEUBK model results in a concentration (520 ppm) that is very conservative and almost certainly protective. Other data are available for East Helena and may be used to assess whether the IEUBK model result is appropriate. First, if the IEUBK model was correct, the blood lead levels in children in East Helena should rise as the lead concentration in soil increased. The blood lead and soil lead data from East Helena show that there is no correlation. This indicates that the IEUBK model is overestimating the importance of lead in soil as a source of exposure in children in East Helena. At East Helena, there is no longer an observed relationship between soil lead concentrations and blood lead concentrations. Furthermore, a plot of blood lead data grouped in 2-year periods shows that there has been a pronounced drop in blood lead concentrations over time. The reasons for the decrease are likely (1) federal programs to reduce exposure to lead in gasoline, paint, solder, and food, and (2) the actions that have been taken at the East Helena site like capping airborne dust source areas, cleanup of lead in soil, and the education program. The plot of blood lead data grouped in 2-year periods also shows that blood lead concentrations in East Helena are low. If the IEUBK model were correct between 5 and 15 percent of the children in East Helena should have elevated blood lead concentrations. The existing data show that in the last 5 years no tested child has had a blood lead concentration greater than 10 [µg/dl].

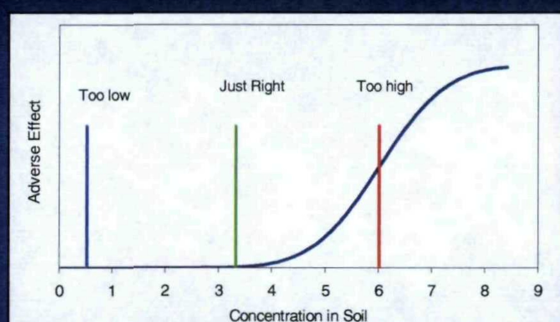
Dr Brattin concluded that the 520 ppm action level computed by the IEUBK model is lower than is required or necessary to protect public health. The levels of lead in soil that remain in the community today do not cause an observable increase and we can not detect its effect on the blood lead levels of children. Whatever the continuing contribution of lead in soil is it is so low as to be of no substantive public health concern. The action level proposed in the Proposed Plan (1,000 ppm) is fully effective in achieving its goal.



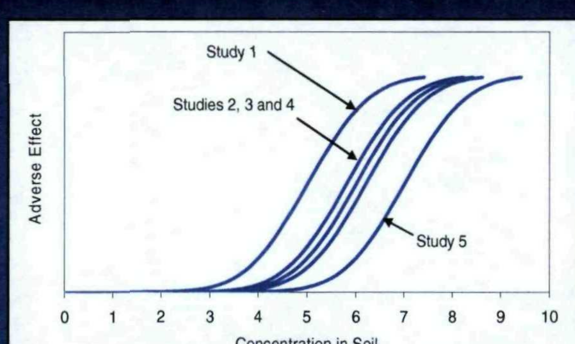
Basic Concept: Dose-Response Curve



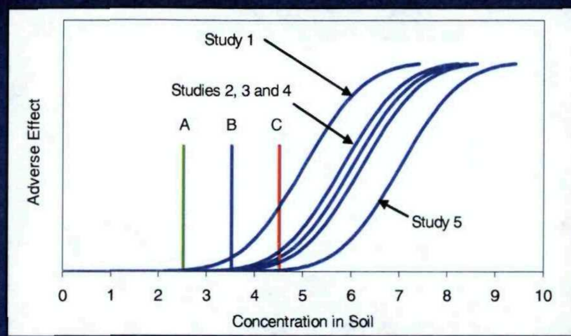
Question: What soil concentration is should be picked as the Action Level ?



What if The Data Are Not Consistent?



Now What Action Level is Best?



EPA Approach

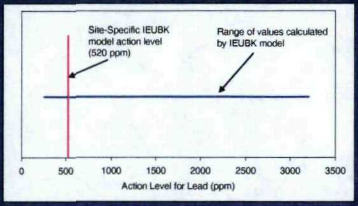
- In the absence of other information, err on the side of caution: Choose Action Level A
- Advantages: Will provide protection, even if the toxicity is a high as reported in Study 1
- Disadvantages: Action Level A is probably lower than really needed (4 out of 5 studies indicate this); may result in wasted resources

ACTION LEVEL FOR LEAD

- Action Levels calculated by EPA's IEUBK model are like Choice A:
  - Definitely protective
  - Probably lower than needed
  - Appropriate when no other information is available

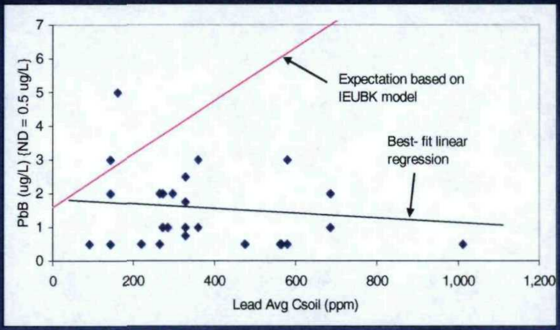
What About East Helena?

- Action Level based on IEUBK model = 520 ppm
- Uncertainty in calculations is pretty wide (250-3200 ppm)

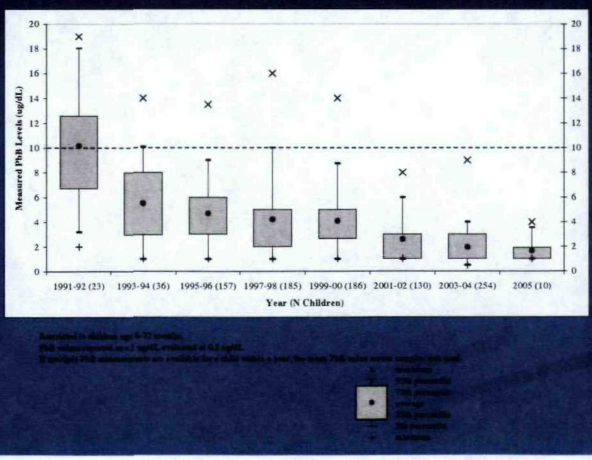


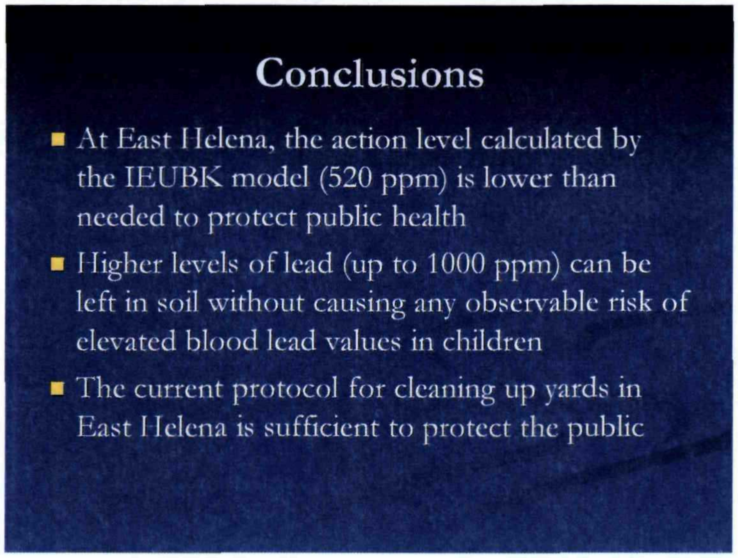
- In absence of other information, Action Level would probably be about 520 ppm
- However, blood lead data suggest IEUBK model is over-predicting risk from soil

OBSERVED vs PREDICTED



Time Trends





Questions

Question – While lead concentrations are going down partly due to remediation are they also going down due to the lead being pushed down into the soil by rain? Does the lead migrate down and at what time do we have to worry about the lead entering our water systems or wells?

Answer – In general lead is immobile in soil. Concern over lead in groundwater is low. If there are continuing concerns over lead in groundwater the groundwater can be tested. Rain can wash lead dust into the soil but the lead will not go very far (1 to 3 inches) into the soil. Lead will form mineral complexes in the soil which will act to stabilize the respirability of the lead.

Question – I own 6 acres of land in East Helena that borders Highway 12. 77% of the soils are above 1,000 ppm [lead], the highest 3,300 ppm. Is that soil a hazard to the community?

Answer – Because lead is relatively stable in soil, unless it is blowing (which it is) that is the only way that the high levels might impact nearby locations. We could calculate how much soil would need to erode to impact surrounding properties.

Question – What you have just shown us with your data is that that property is having no impact on the city. Am I correct?

Answer – If the property is undeveloped and there is no child lead data there is no way to assess whether there would be an elevated risk to future child residents. The IEUBK model would suggest that there would be an elevated risk. Direct observations might demonstrate that there is risk. At this time concentrations greater than 1,000 may result in an elevated risk to future residents.

Questions – I have an undeveloped parcel of land in the City of East Helena with lead concentrations above 3,000 ppm. I have subdivided the land and would like to sell the parcels. Are you going to clean it up? Why do I or the purchasers of my property have to pay to clean up ASARCOs mess? Will I be liable if I sell the land?

Answer – Under the Proposed Plan ASARCO will not be required to clean up undeveloped land. There are several alternatives in the proposed plan that may be used to cleanup the land. There is no answer about liability until the ROD is approved.

Question – If the smelting over 100 years has resulted in the top 3 inches of soil being contaminated, if you rototilled the top foot, it would reduce lead concentrations below 1,000 ppm. Why not do that?

Answer – The depth of contamination may be 3 inches; it may be 4 or 6; but it is not 20 feet. Tilling the soil is an option that has been considered at this site and others.

Question – And you have done it on several areas. Is that correct?

Answer – It has been completed in several areas as a demonstration and it is offered as one of three alternatives for undeveloped lands.

Question – Tilling the land would be a viable option for the previous questioner?

Answer – Assuming that after we get through the public review process that all the alternatives for undeveloped land survive the review. There may be portions of the Proposed Plan that are not acceptable to other enforcement agencies or the community.

Question – There are going to be separate acceptable levels for residential, recreational, and commercial. What is the acceptable level for recreational use and define the recreational uses?

Answer – Recreational and commercial uses are different from residential use because residential use assumes that young children will be present while recreational and commercial uses assume that young children will not be present at all, or present infrequently. There are also differences in the assumptions of how frequently people are exposed and how much soil they will ingest. The commercial action level in the Proposed Plan is 1,300 ppm and the recreational action level is 2,800 ppm as an average over an area.

Question – What is a recreational use?

Answer – Hiking, camping, hunting.

Question – We are talking in town. Are we talking about parks?

Answer – Yes.

Question – Are school playgrounds treated as recreational?

Answer – Schools are generally treated as a stand-alone category because of the high certainty that young children will be present. Years ago ASARCO and EPA agreed that all the schools and parks in town will be cleaned up to residential level.

Question – You cleaned up the schools without testing them?

Answer – We tested them but were sure going in that the residential action level would apply. All the parks and schools have been cleaned up and the levels that remain are typical of those found near the Lake Helena area – between 60 and 80 ppm lead.

Question – Could you go back to the regression slide that showed blood lead and soil concentrations? Where did you come up with 1,000? There are no data shown at higher soil lead levels.

Answer – There are no blood lead data available where soil lead concentrations are 2,000 to 5,000 ppm. It might be possible to use older data to add to the diagram. 1,000 was selected as an interim action level.

Question – The risk assessor have made the point that the 500 ppm action level is to low. Why do you agree to the 1,000 ppm action level?

Answer – Because today the community is largely in the state that it will be in if 1,000 ppm were accepted as the action level. If the 1,000 ppm action level was not protective and a 500 ppm action level was required then the blood lead data would not be where they are. They would be up. We would be seeing kids with blood lead levels above 10.

Question – Out of the hundreds of blood lead measurements there are only 30 or so shown on the figure. How were those data points selected?

Answer – The data points are all children blood lead concentrations where we also know the soil lead concentration at the time the blood lead concentration was measured.

Question – The few samples shown seem like a weak database.

Answer – The data shown are only a small fraction of the available data. We do know the soil lead concentration in yards across the community. We do know the blood lead levels of the children in the East Helena area. You can put those two together to get a much larger database. What the figure shows is that the direct relationship between soil lead and blood lead in the IEUBK model does not always hold true and tends to over-predict blood lead levels.

Question – Then you have many more data points that could be shown?

Answer – We have lots more soil lead and lots more blood lead but the data are not paired. We do not have a lot of matched pairs. This data set while not complete is a statistically valid number of samples of a child's blood lead and soil lead level from where that child was living. In 2006 [I got data for] another 157 children and we developed another database where we had these matched pairs and if we wanted to incorporate those into the figure. I am almost certain that they would lend greater significance to this lack of a relationship. While we did not apply them statistically you can look at them and see that there is no relationship. There were 3 kids out of 157 with blood lead above 4 µg/dl and the soil lead levels were all 200 to 300 ppm up to 600 to 700 ppm and yet all the blood lead levels were low.

Question – That could also be that the kids were living in an older house or newer house.

Answer – That is why there is a lead education and abatement program that takes it to the next step. If there is an elevated blood lead concentration the County lead program tries to find out why. Is there lead paint, hobby, or pica child? Is it related to the soils? They have been unable to find any situation where the yard soils are a significant source.

Question – Do you think that the additional data should be added to the figure?

Answer – There are 60 some matched pairs. The figure should have been updated. More data are better.

Question – What do the dots on the figure represent?

Answer – The dots represent the blood lead level of a child at the average yard concentration.

Question – The blood lead standard is 10 μg/dl. There are some organizations that feel this level is too high. Do you have any comment?

Answer – There is a lot of debate in the scientific community as to whether the 10 μg/dl is too high. It is widely believed that neurological effects of lead have no threshold. Can we clean up to zero? No, it is impossible; there are too many sources of lead including diet, air; multiple sources. As a matter of policy the regulatory community must establish some type of level at which to take action. And for blood lead the CDC, EPA, and medical community have established 10 μg/dl as the level of concern.

Question – Did the CDC propose lowering the level of concern at one point?

Answer – It has been considered but at this time the level has not been changed. After the ROD has been signed the Superfund process has a Five-Year Review to evaluate whether the remedy is successful and if there have been any regulatory changes. If the level of concern is lowered in the future the remedy would have to be reevaluated and potentially modified at that time.

Question – Based on last years testing (of blood lead), how do our kids compare to the national average of lead levels?

Answer – The national average is 1.7 μg/dl and the East Helena average for children 6 years old and younger is 1.3 μg/dl.

Question – Is that only of the children that have lived here before? Or is it including children who moved in at age 3?

Answer – The data include all children who have been tested even if they moved in 2 days before testing.

Question – Is taking an average of the soil concentration from the four quadrants typical of the way EPA address other sites across the nation?

Answer – About 10 years ago EPA nationwide got together to decide how to sample yards for lead sites and how they were going to evaluate the risk. It is fairly standard to divide yards into quadrants and composite samples and look at the average for the yard.

Question – Can you define quadrant?

Answer – The average yard in East Helena is a small property. The yards in old East Helena proper are generally less than 8,000 to 10,000 square feet. When a yard is that size it is divided into 4 quadrants. In the agreement that DEQ, EPA, and ASARCO had, three samples would be collected from each quadrant and brought together or composited. This would result in four numbers, [one] for each of the four quadrants. Let's say that you had 800, 200, 150, and 2,000 ppm; and it is not an exaggeration. You rarely find a yard that is 700, 600, 400, 800 ppm. I could show you hundreds of yards that are so variable that you wonder what is going on there. But when you average the yards, after the cleanups that have already been completed, you rarely find a yard that has an average that is greater than 700 or so. We talk about an action level of 1,000 for East Helena. That action level is based on quadrants. It is a conservative approach. If one sample in a yard is above 1,000 ppm the entire yard is cleaned up to 500 ppm. This approach was negotiated in 1991 between ASARCO, the community, county, DEQ, and EPA. There were a lot of yards 8,000 to 9,000 ppm and they are all gone. They were all cleaned up. The flour consistency concentrates that used to be outdoors and blow into town are gone. The streets have all been swept. Now the plant has closed and the air is no longer a concern but the yards are cleaned up if any portion is above 1,000 ppm. The average concentration of yards yet to be cleaned up is 700 to 800 ppm.

Question – The concern with quadrants is that some lots are 6 acres. How would you break that up?

Answer – On undeveloped land every other acre is sampled. Each sampled acre has 16 sub-samples collected and composited. Much less intensive sampling therefore there is much more uncertainty than compared to yards. At La Casa Grand or Eastgate the yards are sometimes 30,000 to 40,000 square feet. What we do is divide the yard into 60 by 60 foot sections and then in every section composite samples are collected. There are some yards in the outlying areas that are one quarter to one half acres that are developed where there are 40 or more samples.

Question – Are the concentrations generally less when you get further away from the smelter?

Answer – They are generally less but until you look at yards neighborhood by neighborhood there are some baffling things that we know are there but cannot explain them. For example, years ago there were water-spreading ditches that spread out across the north end of town and we have found very high arsenic and lead levels. We sort of stumbled onto them in areas where we did not expect to find anything.

Question – Do you think they washed out there?

Answer – They washed out of the plant at the time when fine concentrates were stored outdoors. Floods came and washed them down the stream and deposited them in fingers in the water-spreading ditches. They were deposited way out by Canyon Ferry Lake.

Question – One of the things you mentioned in the Proposed Plan was that there was going to be some kind of remediation around the irrigation ditches. I have property north of East main and there is a ditch that runs out towards Eastgate. Are they going to take the ditch out?

Answer – No. We know the areas with flood waters that may have received concentrates from the plant. In the 1960s and the floods in the 1980s we know that there is a high probability that there is some deposition of lead and arsenic in those areas. They need special attention and have not been fully characterized. We are proposing that they will be treated separately from the yards.

Question – How often do you sample?

Answer – We sample a yard once.

Question – If you sample a yard once before the plant closed is that good enough?

Answer – Those yards that have been cleaned up we take about 10 percent of them and sample them again. It is called confirmation sampling to ensure that when the plant was operating the remediation worked and the yards were not being re-contaminated.

Question – Do you continue to knock down the stack?

Answer – We continue to do that each year. We take a percentage that have been cleaned up and resample them. We have not seen any changes over time.

Question – Is that the five-year review you mentioned?

Answer – No. We do it every year. The contamination was deposited over 100 years and there are few changes over the last 10 to 15 years.

Question – I got one here that says 13 years ago with one concentration of 966.

Answer – I don't know your individual property.

Question – You said sorry, tough. We don't care if your little boy is playing in the yard.

Answer – We never said tough. We have an action levels and now is your opportunity if you feel they are not suitable, we invite your comment.

Question – Back at the very beginning you were talking about your modeling. You mentioned that you used default site information values. Could you talk a little bit about the default site information?

Answer – I'm not sure what part you are talking about.

Question – It was back when you were talking about the children's lead model. You mentioned that you used default values. Given that there is so much data available for this area why wasn't this data used? Why did you use the IEUBK model with default data when there are other models that could use that would take into account all the data? If you say that the IEUBK model is not working and that 520 ppm is not the correct number and that 1,000 is acceptable what would the other models say that have more data?

Answer – When we were screening out all the other analytes the IEUBK model and other children's models were used with the default values in it. As such it is a conservative screen meaning that anything that is below it is clearly not a risk. Anything above that number is something that we are going to evaluate further using community-specific and mining and smelting-specific information. That was the first step. The most recent application of the IEUBK model at this site does utilize all the reliable site-specific data that we can obtain. When you apply the IEUBK model using all default data and no site data the action level is 400 ppm. That is the national default number. At this site EPA invested the effort to collect additional data of two main types. The first is how well the lead in the soil is absorbed. The lead at this site is absorbed somewhat more than is assumed by the default IEUBK value. That has the effect of pushing the action level down. But we also collected data on the lead levels of indoor dust. The IEUBK model assumes as the default value that the lead level of indoor dust is 70 percent of that in outdoor soil. For example, if the outdoor soil lead concentration is 1,000 ppm the IEUBK model assumes that the indoor dust would have a lead concentration of 700 ppm. The direct measurement shows that that is a substantial overestimation. We have observed this at many sites. On average the relationship between soil and indoor dust is between 10 and 40 percent with 20 to 25 percent being common. At this site we found a value of 17 percent. When you add the 17 percent value to the model it drives the action level back up to 520 ppm. Those are only two of the things that go into the IEUBK model. If we could we would measure the amount of soil and dust ingested by children but that project is of such incredible difficulty, cost, and complexity that it was decided to be infeasible. We have collected the data on the things we can collect it on that is feasible and that is why the number is 520 ppm and not 400 ppm.

Question – Since you addressed the second part of my question as why this model [audio indecipherable]. Are there other modeling techniques out there that were used?

Answer – Yes there were. When we were talking earlier about the blood lead data what we were advocating is a combined weight of evidence approach that utilizing the blood lead data, the blood lead model with community specific and smelter specific inputs, and statistical and epidemiological models which look directly at the relationship between the blood lead levels and different sources of lead. Bringing all these tools and all this experience together is how we arrived at the conclusion of a 1,000 ppm cleanup level with the confidence that is was going to protect the public.

Question – The 10 µg/dl number you haven't really talked about, especially with an action level of 1,000 ppm, of the chronic effects of exposure to low levels of lead to children. This gentleman over here has 900 ppm lead in his yard and with young children may be pushing it. There are also differences in children themselves. This is saying that all children are statistically the same with lead uptake.

Answer – We are not. As I mentioned before we are looking at the most susceptible members of the population which are children less than 7 years in age. Older children and adult need to have much larger doses of lead to see the same effects. One thing in the model is a parameter that looks at the variability among children as a result of physiological differences and behavioral differences. I talked earlier about the bell curve and how by law we are required to focus on the people on the high end of the bell curve. This parameter for variability requires us to go to the high end of the curve and look at the children who are getting the most exposure who have the behavior that brings them into contact with lead the most and have the physiology that would allow them to absorb the most. So we are accounting for the variability of children.

Question – If 520 is not the number and 1,000 is the number would a number in between be a better alternative? The alternative 2R and 3R that is the 1,000 down to 500, would some level in between or a mixing of the alternatives be more appropriate?

Answer – I think it is important to separate risk considerations from risk management considerations. If you believe that the weight of evidence is sufficient to conclude that 1,000 is protective and that is not uncertain, there would be no clear benefit to choosing an action level below 1,000. If you say that there is substantial uncertainty that 1,000 is protective then you could conclude that a lower action level would be appropriate. This argument comes down to an issue of confidence in the observations and understanding as to why they are inconsistent with the predictions. And deciding whether a prediction based on a model that uses a lot of the inputs that you would be surprised how weak some of them are or would you prefer to lay your confidence on the observations. When assessing the observations you must ask how good are the observations. Twenty-five data points does not seem like much. That is a valid point. This is another point where judgment enters the evaluation. How much evidence is required? We do not have just 25 data points. We have 25 or now about 50 paired data points. We have over 1,000 blood lead data points and thousands and thousands of soil lead data points. So don't get too focused in on the graph. One of the arguments that is often made is that the blood lead data are not representative so they shouldn't be relied upon. I believe that by looking at the map to see where the samples were collected to see that the blood lead data cover the spectrum of the community. Can there be difference of opinion between individuals as to how much confidence to place in the data? You bet. That is where the judgment comes in.

Question – There has been a very good education program. What would the model results be if there were no lead education program? Might those blood lead levels be up higher?

Answer – One of the studies that I have been involved with was the Three Cities Study – Boston, Baltimore, and Philadelphia. The purpose of the study was to look at how effective education alone is for reducing blood lead levels, environmental abatement alone would be, and a combination of the two. One of the findings was—these were not kids with low blood lead levels, these were kids with high levels from lead-based paint dust in the homes etc.—was that blood lead levels dropped in the first year for education alone; however, by the second year they started to go back up again. When you combined environmental abatement with education the lead levels stayed down. But education alone will not keep blood lead levels down. What I find comforting here is that we have serial blood lead studies going back to 1994 or 1995 that are showing this trend (downward). I don't believe that education alone is doing this. I think there are a number of factors here including the federal program to reduce lead in gasoline and lead-based paint.

Question – When did that occur?

Answer – I don't remember exactly. The late 70s or mid 80s, somewhere in there.

Question – I think it was 1976.

Answer – Just because the law was passed in a certain year doesn't mean it was instantaneously out of the environment. In fact leaded gasoline was still available for much of the 80's. The combination of federal regulations, reduced smelter emissions, and yard removal has resulted in reduced blood lead levels.

Question – On the regression of the soil lead to blood lead data you have the yard average. What does the graph look like when you use the highest sample from the yard? Does it show an upward trend?

Answer – I don't think I have generated that. We could generate it. I would be surprised if it would show a clear pattern. I think if anything it would be more nearly random. I will generate that graph.

Question – You spoke in your presentation about how you used a model to come up with your action levels for East Helena. I am curious why you are dismissing the model understanding that you have site specific data. But it also seems to me that based on what I believed I heard about action levels that the 1,000 ppm action level was developed in the early 90s based on the fact that there were a lot of properties to clean up. And I haven't heard that the action level is based on anything risk based other than that you can correlate it to your blood lead data and that you don't think you see an increase so it must be OK. I find it interesting that you used this model to predict what you are going to use a cleanup levels on all other sites that you would still simply dismiss it here and double your cleanup level. I am curious as to why you would dismiss the model?

Answer – There are a couple of question in there. The first is that I am not dismissing modeling approaches. It is what EPA prefers because at a majority of sites we collect very little data and hence we will use the little data that we have along with generic national default values in the model. Are we cleaning up more than we need to? More than likely. Do I have information to move away from that? No. So when there is all kind of doubt, when the information is simply not available we need to be prudent and conservative. However, when we do have community specific information and information specific to mining and smelting sites we have confidence to move away from the default position and that is what I was advocating here. We don't need to rely on a generic out of the box model and apply it to everyone. It is very conservative. When we have reliable blood lead data, when we have site specific information, we can use a variety of other tools to look at a strong weight of evidence approach.

Question – Do you want to use site specific information? I though that you said that you used site specific information in the model?

Answer – That's true, but it is for a short list of the inputs. I have never counted how many inputs are required to run the model, but it is a long list. We filled in a few of the ones we could alter but the rest remained default values. The amount of soil ingested remains default and, while I may be going beyond what I could defend if pressed, I personally think that is the input parameter that is most suspicious, most likely to account for substantial disagreements between the direct observations and the predictions. It happens to be a parameter that we have no capability of doing anything about.

Question – Aren't there studies that show when you have lead in your system it never leaves your body but that it migrates from your blood into your bones?

Answer – Pharmacokinetics of lead have been extensively studied. Once lead in absorbed into your system it will be absorbed into your bone matrix and different tissues. Over time you come into equilibrium with your environment. If you have a very low lead environment you will tend to excrete the lead in either urine, feces, skin, hair, nails but you will never get to zero. There is always a background level of lead that you are exposed to. Every time you eat something there is a small amount of lead. So there will always be a small amount of lead in your blood. And the lead that is in bones will tend to stay there until you have some stressful event like childbirth. If you have a lot of lead stored in your bones it may come out in childbirth. If you loose a lot of weight that may cause lead to come out of the bone. But the general rule is that you come into equilibrium with your environment.

Question – So if it comes out of your bone will it go back into your blood?

Answer – It will go back into your blood. In the past when mothers had very high blood lead levels, on the order of 20, 30, 40 μg/dl, there was a concern that the fetus could be exposed—where lead would come from the bone and pass through the placenta to the fetus.

Question – When you are relying on these tests of the blood lead levels that is only a snapshot of that point in time?

Answer – It is an idea of what your blood is in relation to your environment. If someone has lived in an environment more than two months then that gives us a good idea of what the sources of lead exposure to you are.

Question – How long does the lead stay in your blood? If I ingest something that had lead how long would it stay in your blood?

Answer – First of all it in important to recognize that the adverse effects of lead are generally thought of being the result of long-term exposure as opposed to a short pulse of exposure. That isn't to say that if you had a short high pulse there might not be a problem. It is just that the toxicological community doesn't have any clear idea as to how to deal with that and so when we talk about 10 µg/dl it is not a never-to–be-exceeded or something bad will happen. That is, a long term average of an individual should be less than 10. If you happen to be an individual with a low exposure and your blood lead was normally low, 2 to 3 µg/dl, and you underwent some event where you had high exposure your blood lead would rise over a day or two. Then if your exposure were just that one event your blood lead would fall back to where it was or slightly higher with another 2 to 5 days. The kinetics of how blood lead levels change over time has been well studied both in humans and in animals. It does not respond instantly. It responds rather slowly compared to other things like alcohol. It responds over a matter of days to weeks. Nevertheless, it does change. As your typical lead exposure changes your blood lead levels will also change accordingly.

Question – It sounds as if lead has a relatively short residence time in blood. Would it be true if you are sampling children you would want to be sampling them during the time of greatest potential exposure to dust, meaning summer or the dry season?

Answer – That is often an important consideration in the design of a blood lead study. You typically, if you are only going to sample once, you would sample in late summer or early fall, because it is considered that that is the time of year when outdoor exposure to dry soil will be at a maximum. Studies have been done to see how different it would be if you collected them in the middle of the winter. Depending on the quality of the study you can definitely see some trends but it isn't a roller coaster; it is a gentle roll. If the community wide average is 5 in the summer it is 4 in the winter. It is an issue and that is why blood lead studies are typically timed for the peak exposure so that you don't over look anything. But you shouldn't think of that as something that is an absolutely critical element. You have blood lead data collected in March or December it would be pretty representative.

Question – You said that the 10 µg/dl level is based on long term exposure. What do you mean by long term?

Answer – Like several years in the life of a child. When the IEUBK model is applied it computes the average blood lead from age 0 to age 6. During that time the blood lead levels will be fluctuating as the body weight changes, as the behavior of the child changes. The IEUBK model assumes, without much data, that children aged 2 to 3 ingest more soil than children aged 1 or 4 and 5. The model has age specific inputs. If you examine blood lead as a function of age it sort of wobbles around and it is a little higher at ages 2 and 3. What the model reports out as the key parameter to determine whether you have a problem or not is the average.

Question – So if a child had high blood lead for a year of their life and it was fairly low at other time the average could well come below 10.

Answer – I would never personally say that is OK. And I doubt there is anyone in the lead risk assessment community that would say that 30 for a year was nothing to worry about. The EPA and federal agencies don't have firm toxicological basis for knowing how to deal with transient health issues. One way, highly conservative, would be to say the highest it ever gets is 10 then the average must always be below 10 and therefore you are safe. So every once in a while when you are worried about short-term transient exposure that you think there is going to be a spike, I have seen cases where people say I don't know how high is a problem but I know if it doesn't get higher than 10 it isn't a problem. We need to keep the adverse effects in perspective too, because in studies of children 2, 3, 4 years old we know that blood lead levels of 10 to 15 μg/dl are associated with IQ deficits of 1 or 2 points, short attention span, and hand-eye coordination. You can see small statistically significant differences between populations but you can never tell on an individual. So all we can say is that children that we have measured in those age groups have shown those small deficits. What we do say as a general rule is that anyone [with a blood lead level] above 10 μg/dl is unacceptable and we want to bring that down. Whether that occurs over one year, two years; I don't know. I don't know if anyone can tell you but we just say that if you measure it one time it is too much, and has to come down.

Question – Back in 1975 and 1983, 90 children and then a couple of hundred children were tested. In 1975 the average blood lead level was around 30 μg/dl and the average blood lead level of children in 1983 was around 20 μg/dl. Two thirds of the children were above 10 and one third were above 15 μg/dl. What of those people?

Answer – Anyone growing up in the 50s, 60s, 70s, your average blood lead level was between 15 and 20 μg/dl.

Question – Right now?

Answer – When you were children in that time period.

Question – Are the graphs up there of East Helena?

Answer – In general, Yes.

Question – With 2000 you have a little 10 next to it and then 2005. What is that?

Answer – That is the number of individuals observed in that year.

Question – I am trying to grasp the significance.

Answer – This is a graphical summary of the blood lead data collected from 2000 to 2004. The data set of blood lead levels shown in this graph, which I believe is restricted to children 0 to 6 years old, there may have been more blood lead levels collected but older children are less susceptible and of less concern so we focused on the most susceptible 0 to 6. There were 254 of them. How should I summarize them for you? This is the lowest value of the 254, this is the highest of the 254, 90 percent of all the values fall within those two lines, and 50 percent of all the values fall between these two lines, and that is the average. This is another graph that I should have updated. In 2006, there were 157 and if they are combined with the 2005 data there are 170 data points. And it stays very low.

Question – How do these data compare to other sites you have experience with?

Answer – Better.

Question – Can you be more specific about where and how many kids participated?

Answer – The site I am most familiar with is the Leadville, Colorado site, where a similar community blood lead program has been in place. At that site the soil action levels is 3,500 ppm. Because that level was higher than people were accustomed to a community program was put in place to monitor the blood lead levels to guard against the possibility that the 3,500 was a bad choice. If so what would have happened is that what we would have seen is the blood lead levels staying high. But just like here they fell partly due to actions at the site and partly due to national actions. We developed a rather complex statistical procedure for declaring how good is good. This (East Helena) would have passed in the first test. At Leadville, it took 5 years. And they just now—after 5 years of continuous cleanup driving down the lead levels—they passed.

Question – The residential action level was 3,500 ppm?

Answer – Yes. We have another mine site in Aspen, Colorado which had soil lead concentration in excess of that. The community did not want a remediation program but what they agreed to was 3 year blood lead monitoring program. At the end of three years if all kids were below the 10 μg/dl EPA agreed to leave town. And that is what we did. For three solid years not one child exceeded 10 μg/dl.

Question – Where have you cleaned up sites to less than 1,000 ppm?

Answer – We have cleaned up a number of sites to 400 ppm simply because we did not collect any additional data. Typically they tend to range from 400 to 1,200 ppm as cleanup levels.

Comments

No comments were made.

Concluding Statement

Scott Brown (US EPA) – It is true that the 1,000 ppm action level for East Helena can be described as a negotiated figure. Many of the community leaders at that time said that we know there are many yards above 1,000; let's get them cleaned up. Then see if that was adequate. We on the other hand are following guidance and used the lead model because we wanted to be as conservative as we could. So we said that it should be about 500 ppm. The community asked us to give 1,000 ppm a try and evaluate it over time. So we did that. But we negotiated with ASARCO that if any portion of the yard is above 1,000 the entire yard would be cleaned up to 500 ppm. The action level can be characterized today as negotiated or many things. The real overarching question is does it work? Our goal was to get [to where] 95 percent of the kids were below 10 μg/dl. We thought that was impossible, that we would never get that in East Helena. We got there within a few years and then set the goal of getting the average down to the national average. We achieved that and in the past few years we have had no child above 10 μg/dl and 98 percent are 4 μg/dl or below. It is an action level that is not accurately depicted as 1,000 ppm because it is not really twice as high as an action level of 500 ppm. When you understand the makeup of the yards in East Helena, when you have looked at a few thousand yards and what they are like and the great variability that exists here you get the understanding why the two part cleanup level does make sense for East Helena. As far as I know it is unique in the United States. When you have an action level of 1,000 or 1,200 ppm you take the yard average and that is what you get. I am pretty sure that if the average isn't 1,200 then the yard is not cleaned up.

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PROPOSED PLAN FOR FINAL CLEANUP
OF EAST HELENA'S RESIDENTIAL SOILS
AND UNDEVELOPED LANDS

TRANSCRIPT OF PUBLIC HEARING

Held at the East Helena Fire Hall
East Helena, Montana

March 1, 2007
6:40 p.m.

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ORIGINAL

I N D E X

COMMENTS PAGE

WHEREUPON, the following proceedings were had:

(The public hearing was opened by Scott Brown at 6:40 p.m. Mr. Brown explained the process of arriving at the Record of Decision and gave a background of EPA's involvement in East Helena.)

(The floor was opened up for public comment at 7:05 p.m.)

MR. BROWN: Who would like -- I'll get the list, and whoever signed up first gets to talk first.

MR. BOURNS: Hi, my name is Tom Bourns. I'm actually a resident of Helena, but I'm a concerned citizen and a very good friend of one of your neighbors, Sally Nyland. I have a little bit of background in the sciences and in soil sampling and so forth, so Sally assumed that I was an instant expert and has asked me if I could help her with some of the information that is being put out here. It looks like a lot of data has been collected and a lot of analyses have been conducted on that data, and I'm trying to help her make some sense of it.

But some questions arise as I look through this. I guess the first question is -- and I just picked up on this this evening -- regarding the minimum levels that are, that it's been decided trigger the remediation. There seems to be some controversy between the State and the EPA on this issue. The State is suggesting, according to this newspaper article, a level of 500, and the State (sic) 1,000. I'm wondering if any of the state representatives are here, specifically Daryl Reed.

I guess if I can just make one more comment on that subject. I believe that it wasn't perhaps so much a discussion about the levels that are being defined as a result of this study, but perhaps down the road, what happens if subsequent analyses indicate that, woops, it should have been 500 ppm; what do we do now, since the vehicle for remediating the problem has long since left? That was what I got out of this article. But I wonder if you could expound on that comment a little bit, your 500 level versus the -- and the EPA's 1,000 level. Is that a...

Am I correct in saying that it had more to do with the time element; if we don't take care of it now, what are we going to do down the line if it becomes an issue? Would that be a correct paraphrasing your position on that?

MR. REED: Well, I'm not sure about whether I should be answering in a public hearing or not.

MR. WARDELL: Could I make a suggestion? I'm from the EPA. I would prefer that you ask the question at the end of the meeting but before everyone leaves. You're certainly welcome to sit down, and that will give him an opportunity to sit with you one-on-one and have a dialogue.

MR. BOURNS: I accept that. And actually, it just came up, and it proceeds to my next point, and that has to do with my concerns over the quality of the data that were put into the system for the evaluation process. I'm convinced that you guys did a lot of work to draw the proper conclusions, but ASARCO, as I understand from this presentation, did the primary work. They may have hired the consultants, but the work and the soil sampling was collected by ASARCO or their representative and not by the EPA; is that correct?

MR. BROWN: Not entirely. We have sampled some percentage of the properties ourselves, and we provide oversight on practically a daily basis.

MR. WARDELL: Again, I'd ask that you ask those questions -- Scott will be here, as well, and we're happy to talk about what we've done in that regard.

MR. BOURNS: Okay. I would probably want to pursue that. But let me get down to the nuts of my issue, because there's other people here that want to submit a comment.

I'm struck by this rather interesting summary map that shows a picture of the town. And it shows two -- two concentric circles. One is the likelihood of the soil levels to be in excess of 1,000 ppm, that's the red line here (indicating), and the yellow line being the 500 threshold. And I have kind of taken the liberty to dash an intermediate line in between the centroid of this ellipse and the -- and the 1,000 level. And I see that most of the contamination is proximal to the smelter and probably asymmetric with respect to the wind direction, so it extends from the smelter in kind of a west-northwest -- or east-northeasterly direction.

But because I'm trying to work with Sally to explain some of the issues here, one of the questions that arises is that Sally's residence is virtually in the center of this bullseye (indicating), and none of her sample values -- And this will extend to some of the others of you that are here this evening, because you're interested to find out whether your yard is going to get cleaned up or not. But none of her sample levels have exceeded the 500 -- or the 1,000 ppm threshold, whereas neighbors on all sides of her obviously have had their yards replaced.

So the fallout from this smelter was rather selective, it would appear. But that's not the case. The fallout from these smelters is probably going to be ubiquitous, and it's going to be concentrated in some central area and then it's going to diffuse laterally from that.

So I call into question the validity of the actual data that was collected, possibly as a result of sample error or sample procedures -- maybe different samplers did it different ways -- or perhaps analytical error. This is a common problem that could arise. And this may be as good an answer as any to the reason that Sally's lead values are lower than all of her neighbors, it may have something to do with the actual sample error.

So the question that arises from that is, what can we do about this? Is there any recourse that Sally has for resampling of her property or bringing in a qualified expert that's acceptable by the EPA or the administrators of this plan to -- to double-check these values? And for that matter, do any of you others have that opportunity to resample your property, just in case there is some kind of sampling procedure problems involved with this? If, having done that, the results show that, indeed, these soils are contaminated, would the EPA then consider -- or whoever the watchdog is for this then consider that property eligible for cleanup?

That's my questions, and I think those are concerns that are shared by others in this room. But I would like to see if we could arrive at some answers for those questions.

Thank you.

MR. BROWN: Thank you.

Sally, did you wish to make a statement.

MS. NYLAND: (Indicating negatively.)

MR. BROWN: Chris Anderson.

You know what, I need to be more careful with this. We said we were going to hear public comments first.

MR. ANDERSON: It is a public comment. I'm not a city official. I was last time. I'm a resident. I've been a resident for resident for 33 years. My name is Chris Anderson. All my kids were born in East Helena and raised in East Helena; and they're gone now, of course, moved on.

I'd like to show my support for the Record of Decision and the two-year plan. Now, I'm giving my support behind that as a resident of East Helena. And I'd also like to say that I believe that if you expand this cleanup over a period of years, that you're going to create more harm to our children through the fact that all the remediation work going on at the sites, the heavy equipment work is more dangerous to the children at this point in time than the residual lead that's still around. And the residual lead is going to be addressed in the plan through -- through your monitoring the blood levels and everything, through the Health Department's lead program.

And secondly, I think it's pretty important to move on so that we can free up the agencies that deal with environmental pollution so that they can move on from here and move to areas within the county, within the state that also have pollution problems. And I would hate to think that they're tied up here, hanging here just simply because ASARCO happens to have deep pockets. And that's really what I believe the reason is. And further than that, go on past that, I would like to say that EPA being the parent agency, I think your children are misbehaving and they need to be spanked and they need to have their allowance taken away from them. So don't spare the ROD. That's all I have to say.

MR. BROWN: Thank you, Mr. Anderson.

Mr. Schnittgen.

MR. SCHNITTGEN: Good evening. I've been in contact with Mr. Brown some. My wife and I moved into Eastgate about three-and-a-half years ago, and we just had a baby this fall. We live downwind from most of the dirt roads that are in the East Helena area, it seems like, and in the summer, our house is in a cloud dust. And with some of the airborne lead pollution subjects here, I'm really worried about that dust posing a hazard to our daughter, and even to us, because in the summer, there's a dust cloud; there's no wind, we live in a dust cloud. And that's one of my major concerns: Is there anything as far as being able to find ways to control that dust or maybe pave the roads or use some dust abatement techniques to keep that dust control down?

And also, there's a ditch that runs along the western edge of our property, and that, too, there's a lot of kids in our neighborhood that love to go play in there, and I'm sure there's a hazard to them. Because when the water drains off the soil -- and our ditch doesn't exactly flow fast -- I'm sure there is a lot of sedimentation. And I'm worried about that being a hot spot, as well. And also, we live on the edge of park land, and I'm not sure what kind of testing, if any, was done in that.

So those are my main concerns. Anyway, that's what I have for comments for now.

MR. BROWN: Thank you, Mr. Schnittgen.

Mr. Lindberg, are you here as a citizen of East Helena?

MR. Lindberg: I just signed up. I don't need to comment.

MR. BROWN: Is anyone else here as a citizen of East Helena?

Mr. Stipich.

MR. STIPICH: Thank you, Scott.

I am up here speaking as a citizen of East Helena. I have lived here all my life. And what I want to say is that I have feelings and care for children and want them to have their health and everything, but I believe that EPA, at this time, their findings and that -- and there's no emissions from ASARCO anymore, which I hated to see go -- that I think that it should stay at 1,000 parts per million. I agree that there should be testing and everything on the children in the future, but I think we should put an end to the cleanup in East Helena and let the people get back to their normal lives.

Thank you very much.

MR. BROWN: Thank you, Mr. Stipich.

I see no more residents of the East Helena area, but if there is another person would who like speak at this time. And may I again remind you that if you want to submit written comments, by all means, do so. And those of you who have already given oral comments, you're free to send us written comments, as well. I encourage that.

If there are no more citizens, then --

Mike, were you going to make a statement?

UNIDENTIFIED SPEAKER: Not at this time.

MR. BROWN: Then shall we go to Mayor Terrie Casey on behalf of the East Helena City Commission.

MAYOR CASEY: Hi. I feel like I did this just a couple weeks ago.

I've said before that I think everyone, the City, the County, the State, and the EPA, all agree that the important thing here is the health of the kids. And I think the blood lead levels and their improvement over this period of time show that we're doing great. We're better than the national average.

At the last meeting in January, the doctors from EPA, with their presentation, basically said that there could be no expected improvement in the blood lead levels; even if we do make the change that DEQ is requesting, that there will be no improvement. So the point would be, if you can't make it any better by lowering that standard, that number, making it more stringent, what's the point? I think at this time, we have the county lead education office; they do a great job. I give them a lot of credit for the improvement in our blood lead levels. And I think with them in place, I just don't see any need for this to continue on.

We need to get on with things. Once we come out from underneath that Superfund status, and with the closure of ASARCO, this area is going eligible for Brownfields grants. And that's not a primary focus, but it is something to look forward to. There could be some more improvement in this area. And if we can't improve the health of the kids and the community health-wise, we may as well try and move on and get on to a new future. This one is gone, it's time to move on.

Thanks for your time.

MR. BROWN: Thank you, Mayor Casey.

Is there anyone else representing the City of East Helena who would like to speak?

(No response.)

MR. BROWN: Let's move on to the County, then. Melanie Reynolds.

MS. REYNOLDS: Hi, my name is Melanie Reynolds, and I'm the county health officer. I'm here representing the Lewis and Clark City-County Health Department and the Lewis and Clark City-County Board of Health. I'd like to take this opportunity to make some comments on the Proposed Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands.

The mission of the Lewis and Clark City-County Health Department is to promote and protect the health of all county residents. The City-County Health Department administers, as has been mentioned earlier, the East Helena Lead Education and Abatement Program and has worked with the East Helena community, EPA, and DEQ since 1996. During this time, we have provided education to East Helena residents about living around lead. During this time, we have provided education to East Helena residents, and we have -- and overall, the purpose of the East Helena Lead Education and Abatement Program is to prevent and reduce elevated blood levels in children, and we assist in these efforts in several ways. One is we coordinate blood lead screenings; we provide education to at-risk groups; and we conduct voluntary environmental assessments in folks' homes, as we've discussed earlier.

We're really pleased with the working relationship that we have with the community and both agencies. We also acknowledge that the work we do will be changing considerably in East Helena moving into the development of a Record of Decision or ROD. The primary change for the Health Department and the Board of Health is that we become responsible for implementation and management of institutional controls. We would be doing that with other folks, as well, after major cleanup activities have been completed.

As most of you are probably aware, institutional controls are the mechanisms or programs which ensure that the past efforts to abate lead are continued and that all citizens, current and future, are protected from the lead and other contaminants that remain in the East Helena environment. It would be irresponsible to have invested so much time and money, as has been described today, in a cleanup only to walk away and leave it.

EPA requires that after a cleanup is completed, a local government agency must step in and protect the results or remedy. That is where we come in. Since institutional controls are an integral part of the Record of Decision, and since the Proposed Plan is the starting point for the ROD, we feel our responsibility includes a thorough review of the plan from a public health perspective. Board of Health members and staff have been reading the plan, discussing it at Board of Health meetings and informational sessions. And a special thank you to EPA, DEQ, and the East Helena City Council with Mayor Casey coming and doing a very informative presentation to the Board of Health.

Among the Board of Health's focal points are verifying the process and epidemiological systems that have been used for selecting alternatives in the plan, understanding the modeling and the data used to support different interpretations, and considering the ongoing process for developing and implementing effective long-term institutional controls. Since the health of the public in Lewis and Clark County is our specific purview, we feel an obligation to understand which data was used and why and carefully consider the implications of the proposed plan.

In summary, as the Board of Health and Health Department analyze the information available to us about the modeling and the data used in it, and the structure and function of the institutional controls, we can determine which, if any, of the proposed alternatives might best serve the interest of public health in East Helena.

Thanks again for the opportunity to provide the comments. And I did make some extras copies, if anybody is interested. Thank you.

MR. BROWN: Thank you, Ms. Reynolds.

Did Mr. Martinka wish to make a statement?

(No response.)

MR. BROWN: Those are all of the people who have an asterisk by their name. If anyone wishes to stand up and speak, you're certainly welcome to do so.

If not, I want to thank you again for coming.

John, is there anything that you would like to add?

MR. WARDELL: Again, echoing Scott's comments, thank you for coming. I know there are some folks that wanted to talk about the State and the EPA, and we're happy to stay as long as necessary to sit down and talk with you one-on-one. So we welcome that opportunity, and thank you very much.

(The proceedings were concluded at 7:30 p.m.)

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COURT REPORTER'S CERTIFICATE

STATE OF MONTANA)
ss.
COUNTY OF LEWIS AND CLARK)

I, CHERYL ROMSA, Court Reporter, Notary Public in and for the County of Lewis and Clark, State of Montana, do hereby certify:

That the foregoing proceedings were reported by me in shorthand and later transcribed into typewriting; and that the -16- pages contain a true record of the proceedings to the best of my ability.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal this 12th day of March 2007.

CHERYL A. ROMSA
Court Reporter - Notary Public
My Commission Expires 8/4/2007

PUBLIC COMMENTS ON PROPOSED PLAN

SUMMARY OF PUBLIC COMMENTS AND EPA RESPONSES REGARDING THE PROPOSED PLAN FOR FINAL CLEANUP OF EAST HELENA'S RESIDENTIAL SOILS AND UNDEVELOPED LANDS

East Helena Superfund Site (Operable Unit No. 2), Lewis and Clark County, MT

TABLE OF CONTENTS

To go directly to a topic, place your cursor over the heading of your choice, then press "control" and "click" your mouse simultaneously.

Commenters on the Proposed Plan included the mayor and City Council of East Helena, East Helena School Board and the Superintendent of Schools, Lewis & Clark City-County Board of Health, Montana Department of Environmental Quality, Montana Department of Public Health and Human Services, Asarco, and citizens. The original submitted comments are included as an appendix to this section of the Responsiveness Summary.

Numerous comments were similar, and that comments were focused on a limited number of topics. In addition, it was recognized that the comments required comprehensive responses. Rather than respond to each comment individually (which would have resulted in repetitive responses), or respond by referring back to the first comment /response on a particular topic (which would have resulted in undue emphasis on that first comment or response), comments were grouped into the subjects shown in the Table of Contents. Many of these subjects are interrelated and readers are urged to review the Responsiveness Summary in its entirety. In addition, in a very limited number of cases a comment which seemed best suited to more than one category was included in other appropriate categories.

For ease of reading, the comments received are presented in normal text and EPA's responses are in italics.

I. CHILDREN'S BLOOD LEAD TEST RESULTS

COMMENTS

- **Ron Whitmoyer, Superintendent of Schools - Blood Lead Data Support Moving Forward - East Helena Public Schools,**

  The concerns that I have regarding this ROD are more about making an educated decision than any other point. The City of East Helena deserves to have this process move forward. The data supports the recommendation of the EPA scientists, not the feeling of the opponents of the ROD. Since individuals felt that there was not enough data I decided to look into the matter myself and requested and received the 2006 lead data comparisons with the lead concentrations in the soil of their residence and graphed them. That data is attached. ... Since not a single child in East Helena has had a blood level over 10 in the last 7 years, I would be hesitant to conclude that the IEUBK model accurately picks a protective level for our town. Further the average blood lead level of all sampled children in 2006 was 1.3 ug/dl when the national average was 1.7 ug/dl.

  The IEUBK is an extremely close match to the 1993 Hydrometrics Inc. data when graphed with a third data point, the airborne lead particulates. When the air becomes a pathway for ingestion of lead you can clearly see that between 1.5 and 2.5 micrograms of lead dust in a cubic meter of air nearly matches the IEUBK model. My concern is that East Helena has tested hundreds of children and has data to prove that the IEUBK model is not an accurate depiction of the real information we have about East Helena lead pathways. Please consider these details in making a decision regarding approving the ROD. This decision has many far reaching effects on the community that include the economic viability of the town as well as the health of its residents.

Certainly the protection of the residents and the children are paramount, but let's not build a vehicle that has child seat restraints, helmets, pillows and already deployed air bags when making a Record of Decision.

- **Ed Stipich, East Helena Councilman and Lewis and Clark County Board of Health Representative – "Bring Closure to the Cleanup"**

  Since its inception I have been involved in the East Helena Superfund Cleanup. Back then I was mayor of East Helena and I have always had the health and well-being of our citizens at heart. I have not always agreed with the EPA's politics and methods during the clean-up, but after all these years I do agree that it is time to bring the clean-up to an end. As experts have repeatedly stated, it has been a success. Blood lead level studies show that children in the East Helena area have lower blood lead levels than the national average. ASARCO is closed now, and there are no longer any concerns about the toxic emission. Yards have been replaced. Is the country willing to replace yards again, when expert doctors from the EPA have asserted this action would not improve blood lead levels in our children and at what costs?

  I say enough is enough. The City of East Helena has been in financial and economic limbo without the ability to expand business, and enlarge our tax base. It is time to bring closure to the cleanup, so we can move forward, allow economic development and ease the burden on our citizens.

- **Terrie Casey, Mayor of East Helena, Montana on behalf of the East Helena City Commission - Blood Lead Levels Better than National Average; No Need to Continue**

  I've said before that I think everyone, the City, the County, the State and the EPA; all agree that the important thing here is the health of the kids. And I think the blood lead levels and their improvement over this period of time show that we're doing great. We're better than the national average.

  At the last meeting in January, the doctors from EPA, with their presentation, basically said that there could not be expected improvement in the blood lead levels; even if we do make the change that DEQ is requesting, that there will be no improvement. So the point would be, if you can't make it any better by lowering that standard, that number, making it more stringent, what's the point? I think at this time, we have the county lead education office; they do a great job. I give them a lot of credit for the improvement in our blood lead levels. And I think with them in place, I just don't see any need for this to continue on.

- **Lewis & Clark City-County Board of Health - "Blood lead studies are not true epidemiological studies"**

  Furthermore, although the lead studies appear to be representative both spatially and based on lead concentrations the blood-lead studies are not true epidemiological studies that incorporate several additional factors, such as socioeconomics and education level of the parents.

- **Montana Department of Environmental Quality – "Blood lead data does [sic] not document protectiveness"**

  The proposed plan asserts that Alternatives 2R and 3R are "by all known measures" equivalent in terms of overall protection. EPA bases this assertion on the recent blood lead monitoring. However, the blood lead monitoring does not document this protectiveness. Nor is EPA's basis supported by the EPA Superfund Lead-Contaminated Residential Sites Handbook (Lead Sites Handbook August 2003) that states "blood lead studies ... should not be used for establishing long-term remedial ... cleanup at lead sites." In addition, the past blood lead monitoring can not be used as a measure of future protectiveness. The recent (past 10 years) participation in the blood lead monitoring program is not representative with participation of only 25-50% of self-selected individuals. More importantly, the blood lead monitoring results may have also been influenced by awareness and the education efforts and thus blood levels are likely lower than if the current education effort was not effective.

- **Lewis & Clark City-County Board of Health – "The BOH does not agree that the data from the blood lead studies should be used in establishing the lead cleanup level"**

  Although not clearly described in the Proposed Plan, the BOH understands (through correspondence and discussions with EPA) the lead cleanup level was determined based on the blood lead data from East Helena and a quantitative uncertainty analysis using EPA's Integrated Exposure Uptake (IEUBK) Model.

  First, the BOH does not agree that the data from the blood lead studies should be used in establishing the lead cleanup level. EPA guidance indicates, "The Office of Solid Waste and Emergency Response (OSWER) recommends that blood-lead studies not be used to determine future long-term risk where exposure conditions are expected to change over time; rather, they be considered a snapshot of ongoing exposure under a specific set of circumstances (including community awareness and education) at a specific time" USEPA, 2006a). It is the opinion of the BOH that several factors are likely contributing to the measured blood lead levels in East Helena and do not represent the future, potential health risks to soil and dust exposures. Factors that may be affecting the blood lead studies include, but are not limited to, community awareness education, evaluation of a non-random, convenience sample (i.e., voluntary participation), the cleanup of several residential yards in East Helena since 1991, the cessation of smelter emissions, and the discontinuation of leaded gasoline.

- **Moriah Bucy – "Blood lead studies should not be used for cleanup levels"**

  The statement in the proposed plan that "the model derived predictions are but one aspect, of several equal or more important aspects, that were considered..."is interesting. It appears that the "more important" aspects that were considered are the blood lead studies conducted on children in the East Helena area. The EPA Superfund Lead-Contaminated Sites Handbook (August 2003) states that blood lead studies should not be used for cleanup levels. However, it appears that EPA is giving these studies (which are conducted on a completely voluntary basis by people who choose to bring their children in to be tested, and are therefore not representative of the population of the area) more importance than the lead model, which is used across the nation to calculate risk-based cleanup levels.

EPA RESPONSE TO COMMENTS PERTAINING TO THE USE OF BLOOD LEAD DATA

EPA agrees that the blood lead level data support the conclusions of its scientists and agrees that the cleanup to date, and other programs and efforts to reduce lead in the environment, have been a clear success. EPA also agrees with the desire to conclude the cleanup based on the residential cleanup levels identified in the Preferred Alternative. The following category, Category II, National Guidance For Lead Sites And East Helena's Role In Its Development, addresses guidance-related comments.

East Helena children's blood lead levels have declined over time as shown in Table I -1 and Figure 7- 1 in the Decision Summary. The data show a substantial decline in blood lead levels from 1975 through the early 1990s, and continued declines to the present. Table I – 1 and Figure 7- 1 show statistics for child blood lead level tests between 1975 and 2008. The trend stands out, but more importantly the data demonstrate that by 1994-1995 national goals had already been achieved, and of more than 700 children tested after air quality standards were met (1999- 2000), approximately 97% tested at or below 4 ug/dl. Although eligible yards where children lived had been cleaned up by this time, many more yards with lead levels above the cleanup levels remained. Therefore, the cleanup continued due to the expectation that at some time it was likely that children would reside at these remaining properties.

The remedial action goals for East Helena include the following statement: No child should exhibit a blood lead level greater than 10 ug/dl and at least 95% of children should remain at or below 4 ug/dl. The goal that at least 95% of children should remain at or below 4 ug/dl was first achieved in 2001, it continues to be met or exceeded, and it surpasses the national goal for blood lead levels based on applications and predictions of the mathematical model. Should this more stringent, site-specific goal for East Helena fail to be met in the future, for any reason, there are procedures in place or proposed in the Record of Decision (ROD) to reexamine all relevant aspects of the remedy, including the soil cleanup action level.

East Helena children's blood-lead levels are significantly lower in recent years as compared to levels observed prior to the 1990s. Since 2001, 95% of children tested were at 4 ug/dl or below and only two children, of 704 children tested, had a blood lead value above 10 ug/dl. Both of these children had blood lead levels of 12 ug/dl. Through an environmental assessment the blood lead level of one of these children was attributable to lead-based paint. The cause of the blood lead level of the other child could not be determined because the parent did not allow an environmental assessment. The average of blood lead levels in East Helena and the surrounding community have been 2 ug/dl or less for the last five years, and have been approximately at or less than the national average since 2005.

Table I-1. Blood Lead Levels of East Helena Children 0 to 84 Months of Age (1975-2008)

Year	No. of children tested	No. with blood lead levels of 10 µg/dl or greater	Average blood lead level (µg/dl)
1975	90	All 90	28
1983	170[a]	77	11.5
1991-92	239	16	4.7
1993-94	34	2	5.5
1995-96	159	2	4.6
1997-98	187	7	4.1
1999-00	194	5	4.1
2001-02	129	0	2.6
2003-04	266	0	2.0
2005	9	0	1.7
2006	109	0	1.3
2007	7	0	1.6
2008	184	2	1.8

[a] Ninety-eight children residing within 1 mile of the smelter.

Asarco shut down the smelter and operations in 2001. The time period of the shutdown of the smelter corresponds to the time period when the maximum blood lead values measured in the East Helena area dropped from 14 – 16 ug/dl to less than 10 ug/dl (see Figure 7-1 in the Decision Summary), the number of children with blood lead levels greater than 10 ug/dl dropped to zero for the first time (see Table I-1), and the percentage of children with blood lead levels > 4 ug/dl decreased (see Table I-2). Both the original source for the fine particulate pathway and the opportunity for smelter workers to inadvertently bring dust home ceased at this time.

Multiple factors affect children's blood lead levels. The 1995 risk assessment noted that blood lead levels might have been influenced by factors such as the levels of lead in air and in paint, in addition to the levels of lead in soil. As previously discussed, the fine particulate pathway has had a significant effect at East Helena. In addition, it is not debated that, prior to the 1990s, street and alley dust, yard soils, and household dust – all arising from continuous smelter emissions and reentrainment of dust within the community -- were among the primary contributors to the elevated blood lead levels observed in East Helena children.

TABLE I-2. Fraction of Children Above 4 UG/DL by Year		
Year	No. of Children	PbB > 4 ug/dl
1991	224	37%
1992	15	87%
1993	10	80%
1994	24	46%
1995	75	51%
1996	84	33%
1997	71	37%
1998	116	25%
1999	51	65%
2000	143	27%
2001	93	14%
2002	36	0%
2003	159	3%
2004	107	7%
2005	9	0%
2006	109	2%
2007	7	0%
2008	184	4%

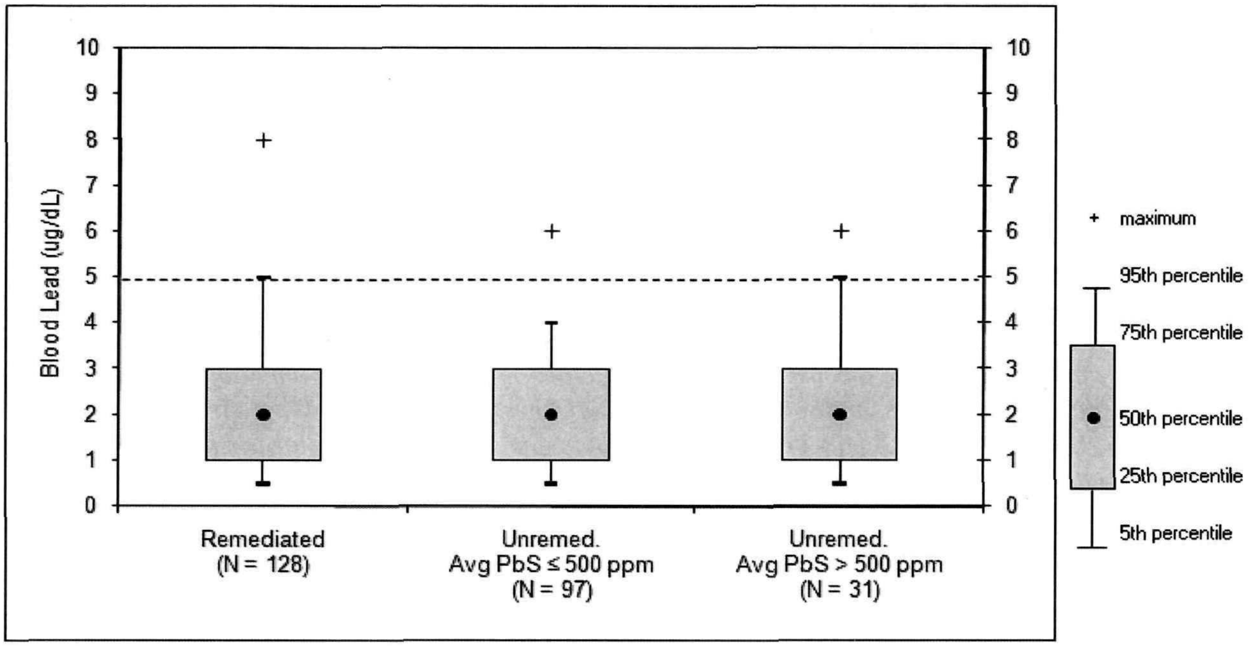
Figure 7-4 of the Decision Summary of the ROD shows the relationship between soil, air, and blood lead levels based on 1983 and 1991 data. The figure shows the importance of air lead particulate as the principal contributor to blood lead at least for locations where soil lead concentrations did not exceed the national average by more than about 1,000 to 1,500 ppm. Above these soil lead concentrations, which were common at that time, soil lead also contributed to children's blood lead levels to a significant extent, as seen in Table I-3.

Table I-3. Contribution to Blood Lead from Soil Lead or Air Lead					
	ΔPbA	ΔPbS	PbB Increase Over Baseline (ug/dL)		
Year	ug/m3	ppm	From Soil	From Air	% From Air
1983	2.61	250	0.66	3.60	84%
		500	1.33	3.60	73%
		750	1.99	3.60	64%
		1000	2.66	3.60	58%
		1500	3.98	3.60	47%
1991	1.83	250	0.66	2.52	79%
		500	1.33	2.52	66%
		750	1.99	2.52	56%
		1000	2.66	2.52	49%
		1500	3.98	2.52	39%

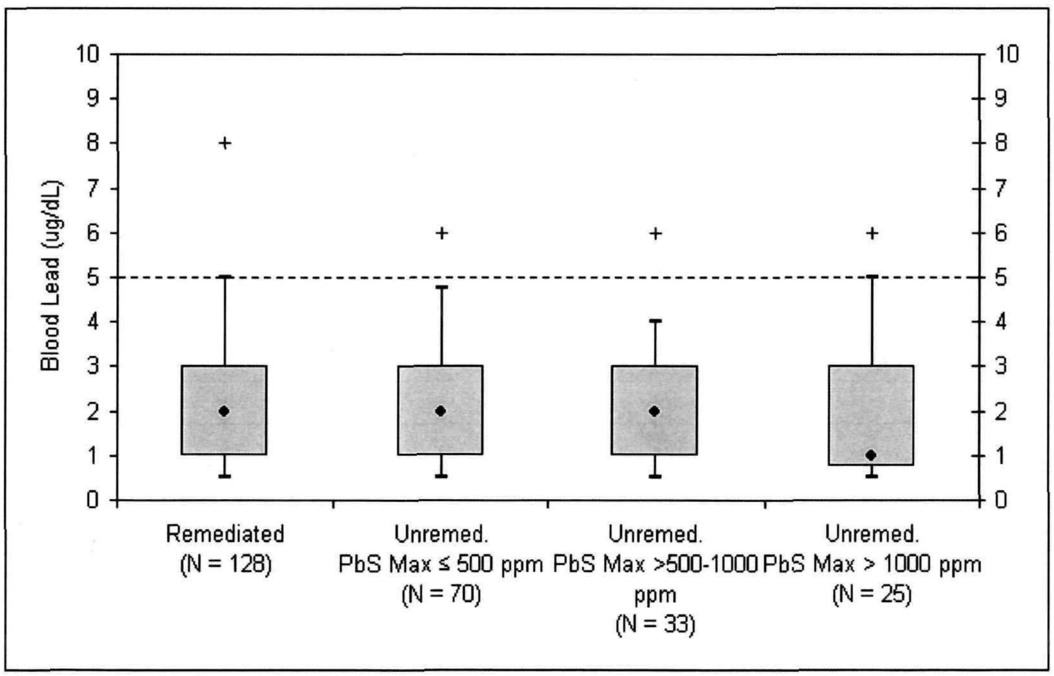
Figure I-1 depicts the relationship between blood lead levels in children and the remediation status of the residential properties where children were living. As seen, there is no measurable difference between children who live at properties that have been remediated with clean fill, and at properties where remediation has not occurred and average soil lead levels are either < 500 ppm, or are between 500 and 1,000 ppm. In addition, if maximum soil lead values are considered, there is no real difference between children who live at properties that have been remediated with clean fill and at properties where remediation had not occurred, even for a group of matched pairs with concentrations of soil lead above 1,000 ppm. This indicates that, at this site, the contribution of soil lead < 1,000 ppm to blood lead is sufficiently small that the effect cannot be detected. These data also indicate that the level at which soil lead starts to have a distinguishable effect on blood lead level is greater than 1,000 ppm.

Figure I - 1. Relation Between Average Soil Lead and Blood Lead Values for Children (0 to 84 Months) at Unremediated Properties in East Helena, 2001- 2007 2001 to 2007 in Relation to Remediation Status and Soil Lead Concentrations

PANEL A: BASED ON YARD-WIDE AVERAGE SOIL LEAD



PANEL B: BASED ON MAXIMUM SOIL LEAD IN YARD



Reliability and Appropriateness of Blood Lead Data

Based on an evaluation of the data, the data may be used to draw conclusions regarding the site, even though the data were not collected in the same way that data would be collected for a traditional epidemiological study.

The following summary of the analysis of the blood lead sampling program was given in a letter from EPA to Lewis and Clark City-County Department of Health dated March 13, 2007. EPA's Region 8 toxicologists and risk assessors prepared the analysis. The letter and attachment state, "The East Helena Lead Education and Abatement Program, administered by the City-County Health Department, has been performing a blood lead survey in East Helena for a number of years. The data from this survey show that blood lead values have decreased substantially over time, and that the incidence of PbB above 10 ug/dL is now very close to zero. These data support the conclusion that cleanup activities at the site, coupled with the effects of national programs to reduce lead in the environment, have been successful in reducing lead exposures from all sources in East Helena to acceptable levels. However, in order for this conclusion to be valid, it is important to examine the quality of the blood lead data set. Based on a consideration of participation rate, statistical uncertainty, spatial representativeness, and soil lead representativeness, it is concluded that the blood lead data generated by the County program are reliable and are appropriate for use by risk managers and other health professionals in assessing site conditions."

The detailed analysis is contained in the referenced letter and attachment that can be provided upon request. The percentage of East Helena children that participated in blood lead screenings ranges from 15 to 52 percent by neighborhood for the period from 1991 to 2006 (see Table I-4). The total number of unique participants who have participated from each neighborhood has been determined from the blood lead database maintained by Lewis and Clark City-County.

Table I-4. Children Blood-Level Sampling Participation Rate

Neighborhood*	Number of children age 0-6 based on 2000 survey	Total number of children age 0-6 who have participated between 1991-2006	Participation Rate
Grandview	53	56	34%
East Gate 2	198	160	26%
Sunny Lane + East Gate 1	187	148	25%
La Casa Grande	43	70	52%
Canyon Ferry	68	60	28%
Manlove	19	9	15%
E. Helena + West E. Helena	188	240	41%

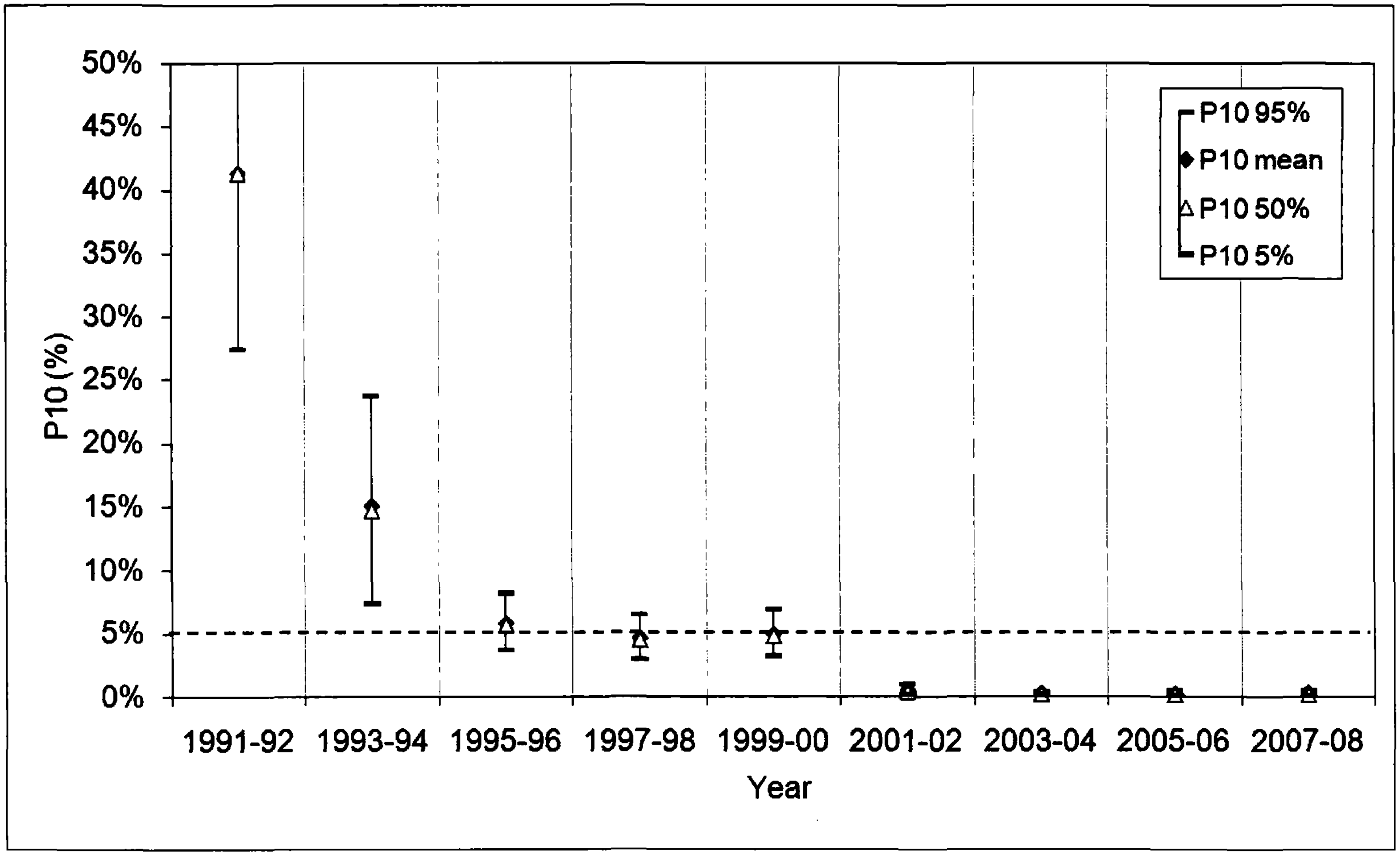
* See Figure 1-2 in the Decision Summary of the main body of the ROD

When a blood survey is part of an on-going program, as is the case at East Helena, both the total number of children who have participated and the size of the eligible population (the total number of children who were age 0 to 6 at any time during the study) will increase each year, so the participation rate (PR) is a function of time. As seen in Table I-3, the *participation rate varies between neighborhoods, but is generally about 25 to 50 %. Assuming that the blood lead program will continue to operate for some time into the future, and that the number of new children recruited each year will remain similar to current values, these rates will tend to increase over time.*

There are two key factors to consider when deciding if the participation rate is enough to provide a reliable data set for drawing conclusions about blood lead levels in area children: statistical uncertainty and representativeness. The analysis showed that the data are highly representative, both temporally and spatially. Blood level data have been collected at the site since 1975 and through the Lewis and Clark County Lead and Education Abatement Program since 1995. The data span a wide range of time and they cover all of East Helena's neighborhoods. Sheets 2 and 3 of this ROD show the residential locations at which children tested for blood lead levels resided, and reflect the spatial representativeness. Another factor in the assessment of the data is the level of uncertainty. Figure I - 2 shows the uncertainty associated with the blood level data at East Helena. As seen, the uncertainty in the data set is low indicating that the data are sufficient to evaluate compliance with heath-based objectives with acceptable confidence.

It is unlikely that the low blood lead levels observed in East Helena are due in significant measure to public education and awareness. Although the current program of lead education is valuable in providing citizens with knowledge they may utilize to reduce risk from lead exposure, EPA does not believe that this program could be responsible for generating a bias in the data set that could account for the current observations. Previous study results suggest that awareness of lead hazards may result in temporary changes in behavior which reduce exposure to lead hazards and blood lead levels, but the changes are not long term. For example, in the Urban Soil Lead Abatement Demonstration Project, (USEPA, 1996), blood lead levels had rebounded by the second year of the study. The blood lead studies in East Helena have been conducted for more than 15 years. The results are consistently low, and the trend is downwards. It is unlikely that the data are influenced to any large extent by public awareness, and therefore the changes observed in the blood lead data are considered to be permanent, and not a result of temporary behavioral changes. Moreover, the blood lead data indicate that current exposure levels are sufficiently far from 10 ug/dl that even if there were some small bias in the data (which is thought to be unlikely), the judgment that the blood lead data indicate the current soil cleanup program is effective remains valid.

Figure I - 2. Uncertainty in P10 Values for Children (0 to ≤ 84 Months) in East Helena



II. NATIONAL GUIDANCE FOR LEAD SITES AND EAST HELENA'S ROLE IN ITS DEVELOPMENT

COMMENTS

- **Laura and Brian Vachowski – "If the lead cleanup levels were based on blood lead study data as the plan suggests, such a basis is contradicted by EPA's own guidance"**

  We additionally note that if the lead cleanup levels were based on blood lead study data as the plan suggests, such a basis is contradicted by EPA's own guidance. See EPA Superfund Contaminated Residential Sites Handbook (August 2003) at pg. B-4 ("OSWER recommends that blood lead studies not be used for establishing long-term remedial ... cleanup levels at lead sites.")

- **Lewis and Clark City-County Board of Health – "BOH does not agree that the data from the blood lead studies should be used in establishing the lead cleanup level"**

  . . . First, the BOH does not agree that the data from the blood lead studies should be used in establishing the lead cleanup level. EPA guidance indicates, "The Office of Solid Waste and Emergency Response (OSWER) recommends that blood-lead studies not be used to determine future long-term risk where exposure conditions are expected to change over time; rather, they be considered a snapshot of ongoing exposure under a specific set of circumstances (including community awareness and education) at a specific time" USEPA, 2006a).

- **Montana Department of Environmental Quality - Adopt Risk Based Cleanup Levels that Conform to Guidance**

  Adopt risk-based cleanup levels for lead (and arsenic) for current and reasonably anticipated residential soils that conform to EPA regulations and guidance.

  EPA RESPONSE TO COMMENTS PERTAINING TO NATIONAL GUIDANCE

  The first few child lead studies involving East Helena's children preceded both the development of directives (i.e., guidance) for lead sites and the development and application of a mathematical model for predicting blood lead levels from environmental and biological data. In fact, East Helena's early childhood lead studies were often referred to as "the model for the model," during the developmental stages of the lead model.

  Some of the earliest directives issued by EPA regarding lead sites (circa late 1980s and early 1990s) were developed in consultation with toxicologists and other medical professionals and scientists who participated in the design, conduct and interpretation of childhood lead studies performed at East Helena.

  Quoting from one of the earliest of directives (OSWER Directive #9355.4-02, September 1989):

"The purpose of this directive is to set forth an interim soil cleanup level for total lead, at 500 to 1,000 ppm, which the Office of Emergency and Remedial Response and the Office of Waste Programs Enforcement consider protective for direct contact at residential settings.

"This [directive] adopts the recommendation contained in the 1985 Centers for Disease Control (CDC) statement on childhood lead poisoning and is to be followed when the current predicted land use is residential. The CDC recommendation states that.... "lead in soil and dust appears to be responsible for blood levels in children increasing above background levels when the concentration in the soil or dust exceeds 500 to 1,000 ppm." Site-specific conditions may warrant the use of soil cleanup levels below the 500 ppm level or somewhat above the 1,000 ppm level."

Pertinent excerpts from a July 1994 OSWER Directive (# 9355.4-12), read as follows:

"Recent developments. Following discussions among senior regional and OSWER management, the OSWER workgroup.... recommended ...a "two step" decision framework.... [To] identify a single level of lead in soils that could be used as...the PRG [Preliminary Remediation Goal] for CERCLA site cleanups... but would also allow site managers to establish site-specific cleanup levels (where appropriate) based on site-specific circumstances."

"Findings from the three cities (Baltimore, Boston, and Cincinnati) of the Urban Soil Lead Abatement Demonstration Project...indicate that dust and paint are major contributors to elevated blood lead levels in children. ***Furthermore, ...any strategy to reduce overall lead risk at a site needs to consider not only soil, but other sources and their potential exposure pathways."[Emphasis added]***

"Use of Blood Lead Data: In conducting remedial investigations for CERCLA.... [This] interim directive recommends evaluating available blood lead data. In some cases, it may be appropriate to collect new or additional blood lead samples.... Therefore, any available blood lead data should be carefully evaluated by EPA regional risk assessors to determine their usefulness."

In respect to the last paragraph above, but as well to excerpts of other directives noted above, it was appropriate for EPA to consider the East Helena blood lead data then, and it remains appropriate to this day. The coordination that occurred among regional toxicologists, project managers, local health professionals (who conducted the studies according to carefully coordinated protocols) and OSWER was exemplary.

While it is accurate to conclude that EPA guidance through the mid- to late 1990s reflects a shift of emphasis towards greater dependence on the IEUBK lead model, it is equally accurate to see and conclude that the blood lead data for East Helena's children were recognized as vital, were consistent with recommendations made through directives issued by OSWER, and were given careful consideration by OSWER during the development of a predictive model and the evolving guidance that followed.

EPA does not interpret past or current guidance to mean that the model—and only the model—should be used to finish the cleanup at East Helena, to the exclusion of arguably the most complete collection of site-specific data available for a lead site. EPA believes that *other people involved in the early coordination efforts and the coincident decisions would support that interpretation.*

OSWER Directive # 9200.4-27P, as cited in Superfund Lead-Contaminated Residential Sites Handbook (USEPA, 2003), states that ***the IEUBK model is not the only factor to be considered in establishing lead cleanup goals, and that EPA decision makers retain the discretion to adopt approaches on a case-by-case basis .... as appropriate. EPA's Risk Assessment Guidance for Superfund: Process for Conducting a Probabilistic Risk Assessment (USEPA, 2001), recommends that multiple criteria form the basis of the remedial decision when selecting a final cleanup level within the plausible range. The consideration of biomonitoring data (blood lead data) is listed as one example of such criteria.[Emphasis added]***

The first section of this Responsiveness Summary describes children's blood lead test results and the relationship to the lead fine particulate pathway, and the absence of any meaningful relationship between blood lead data and remaining soil lead data. National guidance supports use of these blood lead data in the determination of cleanup goals.

A remedial action goal for East Helena is that no child should exhibit a blood lead level greater than 10 ug/dl and at least 95% of children should remain at or below 4 ug/dl. The goal that at least 95% of children should remain at or below 4 ug/dl was first achieved in 2001, it continues to be met or exceeded, and it surpasses the national goal for blood lead levels based on applications and predictions of the mathematical model.. Should this more stringent, site-specific goal for East Helena fail to be met in the future, for any reason, there are procedures in place or proposed in the ROD to reexamine all relevant aspects of the remedy, including the soil cleanup action level.

III. PREDICTIVE MODELING (IEUBK MODEL)

COMMENTS

- **Moriah Bucy – "Default values should be input for all variables for which site-specific data is not available"**

  EPA chose to input "regional data" from the Butte and Anaconda Superfund sites in its IEUBK model to come up with a site-specific risk-based cleanup level for East Helena. Data from another Superfund site is not specific to East Helena and therefore is inappropriate to use in the model. Default values should be input for all variables for which site-specific data is not available.

- **Montana Department of Environmental Quality – "It is inappropriate to use 'regional data' if site-specific input parameters cannot be calculated"**

  EPA's Technical Review Workgroup's (TRW) recommendation for running the lead model (IEUBK model) is to use default values unless representative site-specific data appropriate to the variable in question are available. It is inappropriate to use "regional data" if site-specific input parameters cannot be calculated. Thus, the Record of Decision should not reference or use regional data in the text or in the tables. EPA Region 8 chose the parameters, many of which DEQ and the EPA Technical Review Workgroup (February 17, 2006, memo) consider to be invalid or unrepresentative, and not equally plausible.

- **Lewis & Clark City-County Board of Health – "The BOH believes it is appropriate to use the site-specific data obtained for the soil dust absorption fraction and the fraction of soil in dust term. The remainder of the exposure parameters should not be adjusted from the default values"**

  In performing the IEUBK modeling, the BOH believes it is appropriate to use the site-specific data obtained for (1) the soil dust absorption fraction of 71% relative bioavailability (35.5% when expressed as an absolute bioavailability) (USEPA, 1999b) and (2) the fraction of soil in dust term of 0.17. The remainder of the exposure parameters should not be adjusted from the default values, as described below:

  Soil Ingestion Rates -EPA guidance indicates the default soil and dust ingestion values are based on several observation studies of soil ingestion in children and are appropriate and representative estimates of soil ingestion for U.S. children. The IEUBK Model was calibrated and validated with the default ingestion values; therefore, EPA (2006a) indicates it is unknown how the use of alternate ingestion rates would impact the model predictions. Adjustments to the ingestion rates may only be made after approval by EPA's Office of Emergency and Remedial Response (OERR).

  Before the ingestion rates measured in the Anaconda study could be used in the IEUBK Model, the ingestion study (Stanek and Calabrese, 2000) must be submitted to OERR for review by the Technical Review Workgroup for metals and asbestos (TRW). If the OERR approves of the adjustment to the ingestion rates, they will be incorporated into the guidance and shared among other EPA Regions (USEPA 1999a). Therefore, the BOH believes the default soil and dust ingestion values are most appropriate.

  Geometric Standard Deviation (GSD) - EPA guidance (USEPA, 2006a) indicates that site-specific estimates of GSD should not be substituted for the default value without detailed, scientifically defensible studies documenting site-specific differences in child behavior or lead biokinetics. Such site-specific studies are not available for East Helena. Therefore, the BOH believes the default GSD is most appropriate.

  The BOH appreciates the responses from and the discussions held with EPA Region [8] toxicologists regarding this issue. We understand from these discussions that the EPA Region VIII toxicologists have a differing opinion than the TRW regarding the use of variable inputs, specifically for soil ingestion rates and GSD (TRW, 2006). In the interest of protecting public health, we have chosen the more conservative of the EPA opinions (i.e., TRW).

  Using the appropriate input values (as described above), the IEUBK Model predicts a lead cleanup concentration of 520 ppm (using the geometric mean as the point estimate). In other words, a lead cleanup concentration of 520 ppm would limit the risk of childhood blood lead levels exceeding 10 micrograms per deciliter (ug/dl) to 5% of the population (i.e., the current OSWER cleanup goal) (EPA, 1994).

- **Lewis & Clark City-County Board of Health - "A deterministic approach using predictive blood lead modeling should be used to establish a health-protective cleanup level for lead"**

. . . Second, differing opinions regarding the quantitative uncertainty analysis exist within EPA. It is the BOH'S understanding that the EPA Region [8] toxicologists believe a quantitative uncertainty analysis can be used in conjunction with the IEUBK to develop a range of potential cleanup values, while EPA's Technical Review Workgroup for metals and asbestos (TRW) believe a deterministic assessment resulting in a single cleanup value is appropriate (TRW, 2006). The TRW is an EPA interoffice workgroup with the specific mission to review applications of lead risk assessment methodologies and is responsible for developing national guidance and documentation on the structure, application, and validation of the IEUBK Model. The BOH does not have the level of expertise to determine which EPA opinion is the most scientifically valid for East Helena. In the interest of protecting public health; we believe it is prudent to use the more conservative approach, in which the deterministic assessment is used to generate a single cleanup value.

Consequently, the BOH believes that a deterministic approach using predictive blood lead modeling should be used to establish a health-protective cleanup level for lead in East Helena. Blood lead modeling should be focused on the most-sensitive potential receptors (i.e., children and fetuses). The IEUBK Model is appropriate for childhood receptors; however, the BOH has specific recommendations for input values that are described in the following section. EPA's Adult Lead Model is appropriate for estimating fetal blood lead concentrations for pregnant women exposed to lead contaminated soil (USEPA, 1996). Fetal blood modeling should be included in the development of a health protective lead cleanup level in East Helena. Specifically, a soil contact-intensive scenario should be evaluated to assess the health protectiveness of the lead cleanup level for fetal receptors (e.g., a pregnant female construction worker exposure scenario) (USEPA, 2004b).

- **Montana Department of Environmental Quality - "There should be no conversion of the model's output to a new [Geometric Mean]"**

  The Lead Model Re-Evaluation report shows that lead from residential soils and homes still present a risk of unacceptable lead exposure with soil lead levels above 520 ppm. The Record of Decision should include the Results statement from the report, "Based on the site-specific inputs to the model... the value of 5% at a soil concentration of approximately 520 ppm. This value is identified as the site-specific RBC for lead in soil." DEQ accepted the site-specific parameters used to calculate this RBC but agreed with EPA's Technical Review Workgroup (TRW) in their recommendation "that there should be no conversion of the model's output to a new [Geometric Mean]. Use of the arithmetic mean produces a RBC of 610 ppm lead (which DEQ has previously accepted as appropriately protective).

- **Montana Department of Environmental Quality - Implement the Technical Review Workgroup's Recommendations**

  Implement the EPA Technical Review Workgroup's recommendations in their February 17, 2006 memo.

- **Lewis & Clark City-County Board of Health - Identify the members of the risk management team**

  Page 10, 2nd column, paragraph 2 (of the Proposed Plan) - Who is the risk management team? The proposed plan states, "All of the *alternative input values utilized* were specifically requested by the *risk management team* and are deemed to be scientifically valid." Please identify the composing members of the risk management team.

- **Lewis & Clark City-County Board of Health – "The lead cleanup level should also allow for the uncertainty associated with the toxicity of lead"**

  The development of the lead cleanup level should also allow for the uncertainty associated with the toxicity of lead, a probable human carcinogen. Recent data indicates that blood lead levels below 10ug/dl may cause significant health effects. EPA (2006b) indicates "Even children with low lead exposure levels (having blood lead levels of 5 to 10 ug/dl or, possibly, somewhat lower) are at notable risk, due to the apparent non-linear dose-response relationships between blood lead levels and neurodevelopmental outcomes". Further, EPA (2006a) indicates "There is no level of lead exposure that has yet been identified, with confidence, as clearly not being associated with possible risk of deleterious health effects". Regarding fetal exposure, studies have found that women who have been exposed to lead in childhood have accumulated large stores in their bones that may mobilize from bone to blood during late pregnancy and lactation. An increased risk of spontaneous abortion, neurobehavioral deficits in offspring, and, in some studies, gestational hypertension, have been reported at pregnancy blood lead levels at concentrations.

  The BOH appreciates the information provided from EPA (2007) regarding the Centers for Disease Control explanation for the present level of concern of blood lead levels (used in the current OSWER cleanup goal). Indeed from this explanation, and recognition that many current environmental and public health policies at the federal level do not represent scientific consensus, it is possible that the level of concern may not be lowered at anytime in the foreseeable future. Then again, over the past few decades, the blood lead level of concern has decreased from 40 ug/dl to 10 ug/dl. The BOH believes it is reasonable to anticipate the level may decrease again in the future. Our belief is supported by substantial current scientific literature. EPA has noted as recently as October, 2006: "Some recent studies of Pb neurotoxicity in infants have observed effects at population average blood-Pb levels of only 1 or 2 ug/dl; and some cardiovascular, renal, and immune outcomes have been reported at blood-Pb levels below 5 ug/dl." (EPA 2006b). As such, the lead cleanup level should be developed taking into consideration this possibility.

- **Laura and Brian Vachowski - Lead effects and age**

  Recent studies demonstrate that detrimental lead effects are not limited to children under the age of 7, but in fact, can be seen in children up to the age of 18. Nothing in the proposed plan appears to recognize that fact.

<u>EPA RESPONSES TO COMMENTS PERTAINING TO PREDICTIVE MODELING</u>

At East Helena, children's blood lead levels have been measured for more than 20 years, and are continuing to be measured. Parents and educators strongly support blood lead monitoring for children in this community. These blood lead level data have been determined to be reliable and appropriate for use by risk managers (see Section I of this Responsiveness Summary). Additional site-specific data, including concentrations of lead in air and in soil, have also been collected at the site over the last 20 years, and some of these data are co-located with the blood lead data. For example, soil samples for lead have been collected from the same residences where children have had blood lead levels tested in the same year. The East Helena site-specific data are a primary basis for the soil lead cleanup levels identified in Section 8 of this ROD, and were selected in lieu of results from EPA's lead model as a basis for selection of cleanup levels.

Nonetheless, EPA ran the Integrated Exposure, Uptake and Biokinetic (IEUBK) lead model that can be used at other lead sites to predict soil lead concentrations anticipated to meet the national goal that a child should have no more than a 5% chance of having a blood level greater than10 ug/dl. The IEUBK model was run originally in 1995 in accordance with guidance at the time. In 2005, the updated IEUBK model was run using nationally and locally-derived data. East Helena data were used for the soil to dust ratio (the fraction of yard soil determined to be present in household dust in East Helena) and the relative bioavailability of lead. Using these two values, and national default values for all other model input parameters, the IEUBK model predicts that a concentration of lead in soil of 520 ppm will result in no more than a 5% chance that a child would have a blood lead level greater than 10 ug/dl.

IV. LEAD CLEANUP ACTION LEVELS

COMMENTS

- **Mr. Stipich, East Helena Resident – "It [lead cleanup level] should stay at 1,000 parts per million"**

  . . . I agree that there should be testing and everything on the children in the future, but I think we should put an end to the cleanup in East Helena and let people get back to their normal lives. . .

- **Terrie Casey, Mayor, City of East Helena - "We want to see the Record of Decision with the continuation of the remediation level at 1,000 ppm"**

  The proposed plan has one alternative 3R that recommends remediation when there is a measurement of 500-ppm lead in the soil. Since 1991 there have been 570 residential lots cleaned up using the trigger action level of 1,000 ppm. How will this new plan affect yards that have already been remediated? Will some residences be seen as "contaminated" even though their yards have been remediated under the initial regulations? It seems like a poor plan to begin remediation under one set of regulations and then to change the standards when the end of the cleanup and a Record of Decision is in sight. This has the potential to create conflict within the community and has legal ramifications as far as citizens purchasing property through a realtor and being assured, not only by the realtor, but also by the Lewis and Clark Lead Abatement office, as well as Hydrometrics that their yard has been cleaned up to the designated standards....

  We want to see the Record of Decision with the continuation of the remediation level at 1,000 ppm. The statistics that the Lead Abatement office has, will support this.

- **Tom Bourns – "What happens if subsequent analyses indicate that . . . it [lead cleanup level] should have been 500 ppm?"**

  ...What happens if subsequent analyses indicate that, woops, it [1000 ppm lead concentration in soils Risk Assessment based cleanup level] should have been 500 ppm; what do we do now...?

- **Laura and Brian Vachowski – "EPA's selection of lead levels have[sic] no apparent rational basis and . . . are not protective of human health."**

The EPA's selection of lead levels have no apparent rational basis, and as applied, are not protective of human health. The EPA has failed to provide any legitimate basis for requiring a 500 ppm lead cleanup level for undeveloped lands, all the while allowing developed residences to contain levels of lead between 500 ppm and 1,000 ppm. Either 1,000 ppm is protective or 500 ppm is protective. If they both are equally protective or the difference is negligible (as is suggested on page 12 of the plan), then there is no rational basis for the undeveloped land lead cleanup level to be 500 ppm. If 1,000 ppm is not protective, then every property exceeding 500 ppm should be cleaned up by the EPA to 500 ppm.

Furthermore, under the plan, neighbor A could have 999 ppm of lead on his developed property and the EPA would require no cleanup. Neighbor B, right next door, could have 1,001 ppm lead on his developed property (or 501 ppm on his undeveloped property) and the property would be required to be cleaned up to 500 ppm. This would result in a patchwork of properties, some meeting a protective level of 500 ppm and others having lead levels almost twice as high. Indeed, under the existing plan, should we develop our undeveloped land and have to cleanup the property to 500 ppm, it would be contiguous to our house area, where the lead levels exceed 500 ppm. Such results clearly cannot be deemed protective.

- **Montana Department of Environmental Quality – "DEQ supports EPA in proposing a soil lead action level of 500 ppm"**

  DEQ supports EPA in proposing a soil lead action level of 500 ppm for the undeveloped lands proposed for development but would also support the risk-based concentration of 610 ppm throughout the operable unit. DEQ also tentatively supports EPA's proposed recreational and commercial exposure cleanup levels although DEQ needs to review the assumptions, calculations, and risk management basis used to develop these new cleanup levels.

- **Montana Department of Environmental Quality - "DEQ requests that EPA modify its alternative based on qualifying yard quadrants greater than 610 ppm lead"**

  For existing residential yards, DEQ supports continuing with all the sampling and cleanup protocols developed in the past 15 years under the removal action's administrative order on consent, with the exception of the soil lead level needed for a yard to qualify for cleanup. DEQ supports cleanup of all qualifying quadrants or sections of the yard with soil lead concentrations above the risk-based concentration (RBC) of 610 parts per million (ppm). DEQ requests that EPA modify its alternative based on qualifying yard quadrants greater than 610 ppm lead (and associated cost estimate with time frame for implementation) in the Record of Decision, and identify that alternative as a component of the selected remedy.

<u>EPA RESPONSES TO COMMENTS PERTAINING TO LEAD CLEANUP ACTION LEVELS</u>

<u>*Residential*</u>

EPA agrees that the cleanup level should remain at 1,000/500 ppm soil lead.

<u>*Undeveloped Lands*</u>

Undeveloped lands surrounding East Helena exhibit relatively little variability, as shown in Figure 5-7 of the Decision Summary for the Asarco Lamping property (West Fields). Soil *sampling that has been conducted on several hundreds of acres of agricultural land consistently reveals fairly uniform and predictable lead concentrations across each field. This fact, combined with EPA's preference for in place treatment of undeveloped lands that require some form of remediation to accommodate a new land use, substantially reduces uncertainty. Therefore, in order to keep the costs of preparing undeveloped lands affordable, but without compromising the need for an outcome that is adequately protective of the new land use, a readily achievable 500-ppm lead cleanup action level was adopted. The cost associated with bringing undeveloped lands easily into conformance with residential standards ($4,800 per acre) is a more effective use of funds than would be requiring an equivalent sum of money, or significantly more money, to subject undeveloped lands to the same sampling requirements as is necessary for developed residential properties.*

The final outcome for undeveloped lands undergoing sampling and a change in land use will not be so different from what will be achieved for residential areas. In the end, as newly-developed residential areas blend into existing residential areas, all will exhibit neighborhood average lead values less than 500 ppm. Already, this has been demonstrated in East Helena: Compare, for example, the former Diehl Fields (treated to less than 500 ppm lead and recently developed with a school and homes) and the adjacent neighborhoods that have undergone cleanup of qualified properties according to current protocols. Despite the unavoidable variability within individual yards and from yard to yard, existing residential neighborhoods as a whole will average out to approximately the same as new neighborhoods that are yet to be developed.

More important is the fact that once remedial action construction is completed, lead levels of all properties—developed or undeveloped, cleaned up or not qualified—will be well below EPA's threshold of concern for lead in soils at this site. This conclusion is strongly supported by multiple lines of evidence. EPA's remedial action goals and objectives (Section 8 of the Decision Summary) were developed to assure that soil lead and arsenic levels that remain after the cleanup is completed will be more than adequately protective for residents and visitors alike, particularly children.

V. INSTITUTIONAL CONTROLS (REMEDY PROTECTION MEASURES)

COMMENTS

- **Laura and Brian Vachowski - "Proposed plan fails to properly identify anticipated institutional controls"**

  The proposed plan fails to properly identify anticipated institutional controls and appears to attempt to place at least partial responsibility for developing those controls in the hands of local government. As EPA's own guidance makes clear, developing appropriate institutional controls is the EPA's responsibility, not local government's. *See Institutional Controls: A* Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at and RCRA Corrective Action Cleanups" (EPA 540-F-00-005, 09/2000).

- **Lewis & Clark City-County Board of Health - "The BOH . . .will only accept the responsibility of Institutional Controls as long as there is funding in place."**

  Page 19 (of the Proposed Plan) - The BOH requests that the EPA state the local government will only accept the responsibility of Institutional Controls as long as there is funding in place.

- **Lewis & Clark City-County Board of Health - "The BOH has several concerns with the implementability of the institutional controls"**

  The BOH has several concerns with the implementability of the institutional controls that must be addressed prior to the selection of the Final Cleanup Alternative. These concerns are listed below:

  Effectiveness in Preventing Exposures - The institutional controls, common to all the cleanup alternatives (except "No Action"), play a significant role in the protection of human health in East Helena and the surrounding area. Considering the health protectiveness of the cleanup alternatives rely heavily on the effectiveness of the institutional controls, the BOH would like information regarding their anticipated effectiveness prior to the selection of the Final Cleanup Alternative. Such information should be gathered from other hazardous waste sites where the selected remedy relied heavily on institutional controls. In addition, an approach should be defined to monitor or measure the effectiveness of the institutional controls in East Helena over time. For example, will future blood lead data be the only measure of effectiveness, or will additional data, such as in-home environmental assessments, community interviews, or enforcements, also measure/monitor effectiveness?

  Content - To effectively develop and implement institutional controls, the BOH requires more information regarding their content. EPA should provide a list of recommendations and ideas that have been used successfully at other hazardous waste sites, as well as operational/management ideas. In addition the BOH requests examples of the specific legal language used to establish "successful" institutional controls at other sites.

  Enforceability - The BOH has concerns with enforceability of the institutional controls. Prevention of certain potential exposures does not appear to be enforceable, such as exposures within residences (e.g., attic dust) and the long-term Best Management Practices (BMP) for agricultural areas. Prior to the selection of the Final Cleanup Alternative, EPA must provide examples of specific mechanisms to be included in the Institutional Controls for such exposures.

Funding - The City-County Health Department does not have the financial resources to develop, implement, manage, and enforce the institutional controls. As such, the BOH will accept responsibility for the institutional controls only if sufficient funding will be available.

The BOH requests that the EPA provide detailed information and justification regarding the development of the cost estimates for the institutional controls, as well as the proposed funding mechanisms. Specifically, the BOH would like to ensure the following types of services are included in the cost estimates:

- Soil sampling and analysis
- Blood lead monitoring
- In-home environmental assessments and contaminant abatement
- Management of agricultural areas - the City-County Health Department does not have expertise in agricultural BMPs, nor does Lewis Clark County have a department specializing in agricultural practices.
- Air quality monitoring to evaluate the effectiveness of the agricultural BMPs
- Expansion of the community education programs to include families not residing in East Helena, but whose children attend school or in East Helena.
- Free permits - EPA emphasized free permits, presumably to ensure that homeowners and landowners are not unduly burdened by the institutional controls. The permits may have a significant cost to the City-County Health Department through permit preparation, review and administration, soil testing, and in-home environmental assessments.
- Contingencies - the cost estimates should allow for the possibility that the cost estimates will not be sufficient to adequately manage the Institutional Controls.

- **Montana Department of Environmental Quality – "The Proposed Plan did not include adequate discussion of anticipated institutional controls"**

The Proposed Plan did not include adequate discussion of anticipated institutional controls (ICs). The Proposed Plan identified Lewis and Clark County as responsible for determining necessary institutional controls. EPA has published a guidance document entitled "Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional controls at Superfund and RCRA Corrective Action Cleanups" (EPA 540-F-00-005, 09/2000). This guidance clearly defines the steps that EPA, not a county or other entity, uses to identify and evaluate the appropriate [ICs] for a site. DEQ supports the involvement of local and state governments as well as other affected parties in the ICs decision making process; however, the responsibility of identifying and evaluating potential institutional controls is EPA's, in consultation with the state, and should not be a burden unilaterally placed on the County. ICs should be considered and included in the selected remedy for the Record of Decision. ICs are a critical part of the remedy and the success of the implemented remedy where active response measures are impracticable. Please provide details of anticipated institutional controls, including information regarding costs, enforcement, implementation, funding, etc., in the Record of Decision.

Identify and evaluate potential institutional controls, as that is the responsibility of EPA, in consultation with the state. The remedy required institutional controls for soil disturbance, proposed development, and the soils repository. The Record of Decision should include funding mechanisms, development, implementation, and enforcement of institutional controls.

- **Lewis & Clark City-County Board of Health - "Describe the "other sources" of funding"**

  Page 17, 2nd column, first complete paragraph, under the 1R alternative (of the Proposed Plan) - Please describe the "other sources" of funding that may be available? Who would be responsible for securing those sources of funding?

- **Montana Department of Environmental Quality – "Include a discussion on the long-term management and institutional controls for the East Fields soil repository"**

  The Record of Decision should include a discussion on the long-term management and institutional controls for the East Fields soil repository. This may include a cap, dust control, weed control, inspections, deed restrictions, groundwater monitoring.

- **Lewis & Clark City-County Board of Health - Provide more details regarding the East Fields soil repository**

  Page 21, 2nd Column, Paragraph 2 (of the Proposed Plan) - Who will have the ultimate long-term responsibility for the management, operation, and monitoring of the soil repository at the East Fields? Who covers the cost of this? Will other soil repository areas be needed for the cleanup? Please provide more details regarding this topic and the area.

- **Montana Department of Public Health and Human Services - Establish ICs that prevent disturbance of contaminated soil and prevent human exposure to interior dust**

  Establish institutional controls that prevent disturbances of contaminated soil that would remain in East Helena, and prevent human exposure to interior household dust during renovation or demolition of existing housing stock in East Helena. Achieving these two parts of the EPA proposed plan must have the highest possible priority. To the extent funds are available to implement and evaluate implementation of the proposed plan; these funds need to be preferentially targeted to these two components of the plan.

- **Lewis & Clark City-County Board of Health - Describe EPA's 5-Year Review**

  Page 2, 2nd column, paragraph 2 (of the Proposed Plan) - Please provide a description of EPA's 5-year review. Who will perform the 5-year review? Will random sampling be conducted? Will an evaluation plan or protocol be developed and in place? How will it be determined whether the cleanup was sufficient or whether the institutional controls are working? What if problems are found?

PREFACE TO EPA'S RESPONSES TO COMMENTS PERTAINING TO INSTITUTIONAL CONTROLS

Institutional controls (ICs) for residential areas are measures necessary to provide long-term protection of the remedy and protect against exposures to residual levels of lead that were inaccessible during the cleanup. Institutional controls for undeveloped areas are also necessary. They are designed to prevent migration of contamination (e.g., wind-blown dust, indiscriminate transport by humans, etc.) from areas such as agricultural fields and provide for orderly, cost-effective means of changing the type of use (e.g., from agricultural to commercial or residential).

This preface provides a summary of the efforts pertaining to ICs that have occurred at the site over the past several years. EPA coordinated the development of institutional controls with Lewis and Clark County, the City of East Helena, and the Montana Department of Environmental Quality. Specific legal language was developed for proposed ICs during this process.

From a risk management perspective, EPA emphasizes that the cleanup levels for lead, arsenic and all other contaminants that are or were present are fully protective. Once the cleanup is complete, residents can engage in any and all activities that they would normally engage in, with minimal risk. However, because no level of cleanup can totally eliminate all of the residual contamination, and because undeveloped areas surrounding the community will continue to have elevated levels of lead for decades into the future—in many cases, in perpetuity—residents should continue to exercise good judgment and take reasonable precautions. These measures, when formalized and put into routine practice, are institutional controls.

Need for Institutional Controls

Irrespective of the selected cleanup action level, there are conditions that exist in East Helena, and the persistence of such conditions calls for long-term institutional controls:

- *Lead-contaminated soils remain in place beneath clean cover soils within some residential portions of East Helena. Within the Prickly Pear floodplain, nearly all yard soils were removed to a depth of 18 to 22 inches, and replaced with clean cover soils. ICs are needed to protect against displacement of the soils left buried beneath the protective cover.*

- *Despite all reasonable efforts to remove and replace lead-contaminated soils of all qualified yards, soils under decks and porches, sheds and garages, sidewalks, large trees, and other inaccessible areas cannot be removed without a significant increase in disruption to the resident. Generally, no more than 75 percent to 80 percent of the lead-contaminated soils of any single residential yard are accessible for removal and replacement. ICs are needed to periodically remind homeowners of such conditions and to ensure proper handling and disposal of soils as these residual, currently inaccessible sources may become open in the future.*

- *Surface soils of approximately 2,500 to 3,000 acres of undeveloped lands surrounding East Helena have lead levels that are currently not suitable for residential use, and may or may not be suitable for recreational or commercial uses. The question of whether and when these lands may be developed cannot be answered at this time. ICs such as best management practices are needed for the long term in order to prevent these soils from becoming a source of wind-blown contamination into residential areas. Periodic monitoring is the most effective and cost-efficient way to manage these undeveloped lands over time. As changes in land use are proposed, such as through a Subdivision Review, county zoning and planning sections* *are best suited to oversee and advise the development.*

- *Commercial developments in and around East Helena require soil displacement, leveling, ground preparation, etc. These areas are commonly contaminated with lead above levels that are acceptable for sale or transport to other areas of the Helena Valley. There is currently no legal mechanism, or IC, to prevent such sales or transport out of the East Helena area. Once a Record of Decision is issued, Lewis and Clark County has stated that its proposed regulations will be enacted and administered. They are designed to minimize disturbances and reduce the indiscriminate transport of soil; however, they are neither difficult nor costly.*

- *Interior lead sources, such as dust under carpets, in heating ducts, attics, and earthen basements may present a potential for exposure when renovation or demolition is conducted. ICs, such as a simple, no cost permit system, or education requirement, or both mechanisms, will enable local government to advise the renovator in these cases. The Lead Education and Abatement Program has already incorporated interior lead sources and pathways into its routine education program. The City of East Helena has expressed a willingness to cooperate in continuing efforts to educate and administer "noninvasive" means of minimizing residents' inadvertent exposures during home remodeling or demolition.*

- *Exterior (and possibly interior) lead-based paint of older homes may peel off and re-contaminate areas previously cleaned up. Educational efforts, such as periodic reminders to homeowners to inspect their homes, followed by in-home environmental assessments conducted by health professionals (at no cost to the homeowner) have proven to be an effective IC.*

EPA emphasizes again that the conditions described above, which call for long-term education and administration of reasonable institutional controls, will persist, unchanged, whether the lead cleanup levels are set at their current levels (1,000/500 ppm), at 610 ppm, at 400 ppm, or at any lesser level. Exterior (and possibly interior) lead-based paint of older homes may peel off and re-contaminate areas previously cleaned up. Thus, selecting a lower cleanup action level will have no effect on minimizing, or reducing the need for institutional controls. The single, overarching goal for setting a cleanup action level for East Helena is that it should be protective. EPA believes that it has selected a protective level.

The Montana Department of Public Health and Human Services (MDPHHS) also acknowledges that it is impossible to remove all lead-bearing soils or dust, and has stated that the overall plan proposed by EPA is feasible and desirable. The Department's perspective is that continuation of the East Helena Lead Education and Abatement Program and establishment of other needed ICs will (a) prevent disturbances of contaminated soil that remain in East Helena and (b) prevent human exposure to interior household dust during renovation or demolition. These programs, according to MDPHHS, "must have the highest possible priority."

<u>Lead Education and Abatement Program</u>

A cornerstone of the ICs program for East Helena is the county-administered Lead Education and Abatement Program. It began in 1995, following an agreement between EPA and Asarco to establish and fund a program that would put local health professionals at the forefront of educating the community and advising EPA and Asarco in respect to protecting the children of East Helena from lead. The program developed rapidly into one of the more effective education and abatement programs in the United States.

In 1999, Lewis and Clark County and EPA initiated an evaluation of the Lead Education and Abatement Program. The evaluation included a community survey, an external peer-review, and a series of recommendations. The program's successes were noted, yet recommendations were made to expand the role and importance of local health professionals in managing health risks in the long term. It had become increasingly evident by 1999 that local government and local health professionals are the most logical and most qualified to develop, administer and enforce all aspects of institutional controls that would be needed both presently and in the future. Thus, a coordinated effort was initiated to develop a long-term institutional controls program, and Lewis and Clark County expressed the willingness and a strong desire to take the lead.

Development of Regulations

County officials, including the health officer, division administrator and assistant county attorney took the lead in drafting proposed regulations that would become institutional controls aimed at minimizing the redistribution of residual contaminated soils within the community. The Lewis and Clark City-County Board of Health concluded that specific authority to issue such regulations should be granted to local boards of health, statewide. Therefore, Lewis and Clark County officials took the proposed regulations to the Montana Legislature as an example of the types of regulations that are needed as institutional controls at Superfund sites across the State. EPA and MDEQ concurred. Rep. Chris Ahner, an East Helena resident, sponsored Montana House Bill No. 331, "An Act Authorizing Local Boards of Health in Montana to Adopt and Enforce Institutional Controls at Federal Superfund Sites." The bill was passed into law (50-2-116 MCA) on March 31, 1999.

Shortly thereafter, the Lewis and Clark City-County Board of Health wrote to EPA that it was their intention to utilize the statutory authority and adopt "appropriate measures to protect the remediation which has taken place in the residential areas of East Helena." The May 7, 1999, letter further urged EPA and MDEQ to complete the Record of Decision for East Helena residential soils and undeveloped lands so that the regulations could become effective for East Helena.

Over a period of about two and one-half years following, Lewis and Clark County presided over roughly monthly meetings involving EPA, MDEQ and the City of East Helena. At times, interested East Helena area residents participated. These discussions covered institutional controls that were needed to (a) protect the ongoing removal action, (b) protect the residential cleanup once it is completed, and (c) manage the long-term land use changes anticipated for undeveloped lands.

EPA has steadfastly supported the County's efforts to take the lead throughout ICs development process. The County's draft regulations are attached at the end of the Responsiveness Summary as an example of the degree to which progress on ICs has been made by the County, City, State and EPA.

EPA believes that it has provided a balance between specificity and flexibility in the identification and discussion of ICs in the alternatives. Having general language in the ICs without being too specific allows local entities the flexibility to structure ICs as needed to meet specific community needs and desires. This approach also allows local entities to use existing programs, such as the Lead and Education Abatement Program, and County Planning and County Zoning Departments, in the administration of ICs. EPA has worked closely with Lewis and Clark County and the City of East Helena, and will continue to do so throughout remedial action construction and beyond.

EPA will continue to seek adequate funding for the administration and enforcement of ICs, noting that steps have repeatedly been taken by EPA to support the County's need for funding.

EPA RESPONSES TO COMMENTS REGARDING INSTITUTIONAL CONTROLS

- *In light of Lewis and Clark County's expressed preference for taking the lead in developing ICs for East Helena, and MDEQ's participation in the extensive dialogue that occurred over the years, as explained in the Preface above, EPA believes that it has identified all types of institutional controls that apply to the site. EPA accepted the responsibility to develop ICs and worked with local government to develop them. EPA identified categories of institutional controls and provided examples of situations requiring institutional controls, which the County acted upon. Examples of ICs identified in the Proposed Plan and developed in coordination with the County as the lead include:*

  - *Continue the existing East Helena Lead Education and Abatement Program for as long as necessary*
  - *Continue blood lead screening for children*
  - *Develop and administer institutional controls that will enable the Lewis and Clark City-County Board of Health and City of East Helena to adopt and enforce regulations needed to (a) prevent displacement of contaminated soils that remain in and around East Helena, and (b) to prevent exposures to interior household dust (attics, unfinished basements, heating ducts, etc.) during remodeling or demolition, through the promotion of environmental assessments*
  - *Requirements and protocols for sampling soils prior to development of undeveloped lots or lands, to determine the extent and concentrations of lead and arsenic in soils, and after cleanup, to assure that the cleanup was effective and that development can proceed*
  - *Define requirements and specifications for land use changes, such as when undeveloped lands are proposed for residential, recreational, or commercial development*
  - *Apply Best Management Practices for agricultural land and rangeland communicated through an education program and assessed through inspections. For agricultural land, the Proposed Plan indicated that best management practices included minimum tilling practices and minimization of autumn burning and tilling to reduce the production of fugitive dust. For rangeland, the Proposed Plan primarily identified maintenance of adequate amounts of vegetative cover to control fugitive dust.*

  Final language for institutional controls belongs in the hands of local government, as demonstrated by Lewis and Clark County's extensive efforts. Prior to publication of the Proposed Plan, the EPA, MDEQ, Lewis and Clark City-County, and the City of East Helena met numerous times over several years for the specific purpose of identifying ICs that would be expected to be necessary. The scope of these discussions covered the ICs for both the period during ongoing removal action, and following completion of the final remedy. It was clear to the EPA that Lewis and Clark City-County Health Department expressed a strong desire to take the lead role in both the identification and implementation of ICs. County officials took the lead and drafted proposed BOH regulations. The most recent version of the draft regulations was transmitted to the EPA RPM from Lewis and Clark City-County Board *of Health on April 11, 2006. In this letter, the Lewis and Clark City-County Board of Health indicated that the draft regulations were being provided to EPA specifically for consideration during preparation of the Proposed Plan. These draft regulations are provided in an attachment to this Responsiveness Summary.*

- *Information regarding specific content of institutional controls and associated legal language has been provided in the preface and in previous comments. The Proposed Plan (and the ROD) identifies the need to utilize a combination of regulatory controls and education to prevent exposures. Regulatory ICs designed to prevent exposure, such as limitations on activities where soils might be disturbed, are enforceable. In addition, effective communication with the public through education of the existence of the potential risks is a preventative measure. Specific mechanisms for preventing exposures will be identified as a component of the educational program.*

  EPA believes that the ICs have been explained in the Proposed Plan at an appropriate level of detail. The exact details and specific language contained within an effective ICs program, such as regulations and ordinances, are generally worked out during the Remedial Design stage of the Superfund process. In this case, draft regulations currently exist, but EPA will still be available to work with the local entities to revise specific language, if so desired, during the Remedial Design stage. The degree to which institutional controls have been developed and described is consistent with EPA guidance. The EPA guidance document, Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at and RCRA Corrective Action Cleanups"(EPA 540-F-00-005, 09/2000) identifies the determinations that a site manager should make. These determinations are identified in the table below with the location where they are discussed in the Proposed Plan.

Site Manager Determinations	Proposed Plan – Location of ICs
Objective – clearly state what will be accomplished through the use of ICs.	Objectives of the East Helena ICs are identified in Section 4, Pages 15 and 16, and Section 7, Page 30.
Mechanism – Determine the specific types of ICs that can be used to meet the various remedial objectives.	The types of ICs are identified in Section 5, Pages 17, 18, 19, 24, and 25, and Section 7, Pages 30 and 31.
Timing – Investigate when the IC needs to be implemented and/or secured and how long it must be in place.	Timing is discussed in Section 5, Page 18, and Section 7, Pages 30, 31, and 32.
Responsibility – Research, discuss, and document any agreement with the proper entities on exactly who will be responsible for securing, maintaining, and enforcing the control	Responsibility is discussed in Section 5, Pages 17, 18, 19, 24, and 25, and Section 7, Pages 30, 31, and 32.

The EPA Project Manager provided the local entities with this guidance during the collaborative development of the ICs program. The guidance was used as a benchmark on which to begin, consistent with the way in which guidance is often applied. Should greater detail be required in the future, additional regulations or ordinances may be considered when need arises. In this case, draft regulations currently exist. EPA will continue to be *available to work with local governments, if such is desired, during the Remedial Design and Remedial Action construction phases.*

- *State and local governments are responsible for adopting and implementing institutional controls. EPA in the past has successfully secured funding from viable Potentially Responsible Parties for implementation and administration of ICs. EPA has successfully provided for funding through 2008 and is seeking a settlement from Asarco that will ensure long-term funding for administration and enforcement of the ICs program. However, the status of ASARCO's bankruptcy remains unclear. Therefore, EPA must consider the possibility that East Helena may become a Fund-lead site. Although unlikely, if that becomes the case, EPA can only seek funding from national sources, year-to-year, with no absolute assurance that funding will be provided. If it were to become a Fund-lead site, the State of Montana has an obligation to match or fund long-term ICs administration, particularly during operations and maintenance (O&M). The most likely scenario is that necessary funding will be secured.*

  The County has considerable control over costs of the ICs program, by specifying or modifying the type of ICs. For example, EPA and the County have together periodically assessed range conditions over surrounding agricultural lands with assistance from Montana State University. The cost has been minimal, and may in fact be continued as a service to counties through the university's extension services. This simple, yet effective measure allows a qualitative evaluation of range conditions that in turn offers assurances that wind-blown erosion will not become a problem.

  Detailed costs, which include institutional control costs, are provided in the main text of the ROD.

- *Identification of ICs in the Proposed Plan was based on anticipation that they would be effective based on the site-specific needs for East Helena, and experience at other hazardous waste sites. Providing comprehensive case histories of ICs at other sites may be misleading, because effectiveness is a function of how well the local entity implements, administers, and enforces the ICs.*

  Effectiveness of the ICs will be monitored because the site is subject to Five-Year Reviews. Five-Year Reviews are required because the remedy does not allow for unlimited use. These reviews are conducted by EPA no less frequently than every five years to assess the effectiveness of the remedy, and can include both record reviews and on-site inspections. More frequent reviews can be conducted at the discretion of the entities responsible for the ICs. The measure of effectiveness could include such things as determinations of whether the proper permits have been obtained and procedures have been followed during the development of agricultural land. The frequency and content of reviews can be determined during the Remedial Design stage after the remedy has been selected in the Record of Decision, but will be no less than every five years.

- *As stated in the Proposed Plan, it is anticipated that a small portion of the East Fields will continue to be used as a repository. Further cleanup of this area is not planned. The East Fields currently support vegetation and the level of lead contamination in soil disposed in the East Fields in the future is anticipated to allow vegetative cover to continue to thrive. As stated in the Proposed Plan, the long-term management of the East Field repository requires institutional controls, which in this case include Best Management Practices to maintain vegetative cover to minimize generation of fugitive dust. EPA anticipates that the State of*

Montana and Lewis & Clark County, in coordination with the City of East Helena, will manage the institutional controls and have long-term responsibility for them. EPA negotiates with the designated Responsible Parties on cost recovery. Ultimately, the State of Montana has responsibility for sharing costs.

It is conceivable that some new industrial or commercial or recreational use may fit the circumstances present in the East Fields, leaving a small portion of them open for future disposal of small amounts of waste soil assuming a mechanism is found to ensure appropriate ownership and management of the East Fields and subject to approval by EPA, State of Montana, Lewis & Clark County, and City of East Helena.

- *The Preferred Cleanup Alternative in the Proposed Plan includes institutional controls that will enable the Lewis and Clark City-County Board of Health and City of East Helena to adopt and enforce regulations needed to (a) prevent displacement of contaminated soils that remain in and around East Helena and (b) to prevent exposures to interior household dust (attics, unfinished basements, heating ducts, etc.) during remodeling or demolition, through the promotion of environmental assessments. The ICs identified in the Proposed Plan specifically include continuation of the existing East Helena Lead Education and Abatement Program for as long as necessary. The program promotes environmental assessments in homes, including sampling of yard soil, interior dust, drinking water, and lead-based paint in order to identify all sources of and pathways for lead exposure. The program provides broad-based education to the public, in homes, day-care centers and schools. Education efforts are focused on nutrition, personal hygiene, health monitoring (blood lead testing) of area children, "safe play" practices, and risk reduction and management. The program provides information to area residents on the need to avoid areas with elevated soil or dust lead levels and to maintain barriers inside and outside the house. It provides information to future purchasers and sellers of property, lending institutions, and realtors regarding both site-wide and individual property-specific conditions.*

- *The Comprehensive Five-Year Review Guidance, OSWER Directive 9355.7-03B-P, dated June 2001, is intended to promote consistent implementation of the Five-Year Review process. Section 121 of CERCLA, as amended by SARA, requires that remedial actions, which result in any hazardous substances, pollutants, or contaminants remaining at the site, be subject to a Five-Year Review. The NCP further provides that remedial actions which result in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years to ensure continued protection of human health and the environment.*

  The Five-Year Review requirement applies, subject to the conditions mentioned above, to all remedial actions selected under CERCLA §121, including institutional controls. Consistent with Executive Order 12580, other Federal agencies are responsible for ensuring that Five-Year Reviews are conducted at sites where Five-Year Reviews are required or appropriate.

  EPA Region 8 is responsible for completing the Five-Year Reviews for East Helena. Two Five-Year Reviews have been conducted to date for the East Helena Superfund Site; the second Five-Year Review was completed on March 31, 2006. The Five-Year Review includes several components, such as site background, response actions, progress since last review, community involvement, site inspections, and technical assessments.

  The East Helena site requires ongoing Five-Year Reviews in accordance with CERCLA § 121 (c). The next Five-Year Review for the East Helena Site will be performed by January 2011, *five years from the date of the second 5-year review in 2006. The remedy elements that are part of OU2 will be part of that Five-Year Review, including institutional controls as previously mentioned, provided the ROD has been signed.*

VI. LEAD CLEANUP LEVELS AND PROTECTIVENESS OF HUMAN HEALTH

COMMENTS

- **Jeri Dwan – "Use a lower cleanup level"**

It seems to me that it may be more protective to use a lower cleanup level to ensure that these children are protected. This is particularly true given that the Lead Abatement Program is not necessarily accomplishing all that it attempts to. While the program seems like a great idea, it wouldn't need to be relied on to such an extent if more cleanup work was done. I encourage EPA to use a lower cleanup level and ensure protection of the children of East Helena.

- **Lewis & Clark City-County Board of Health - Develop alternatives to remediate lead and arsenic contamination to health protective levels**

... the BOH believes the Preferred Cleanup Alternative relies too heavily on institutional controls, including community education, which, in turn, minimizes the alternative's long-term effectiveness and permanence. Because institutional controls play a very significant role in the Preferred Cleanup Alternative, the BOH believes it will necessitate in-perpetuity blood lead monitoring of the children of East Helena. In addition, contamination will remain at undeveloped lands (until the land use is changed) requiring the City-County Health Department and other local government entities to oversee these undeveloped lands and their potential, future remedial actions.

It is the opinion of the BOH that additional alternatives should be developed and evaluated that will focus on the Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment and, thereby, maximize the Long-Term Effectiveness and Permanence of the remedy.

Specifically, the BOH requests that alternatives be developed and evaluated with the goal of fully remediating the lead and arsenic contamination in East Helena to health protective levels that would minimize the complexity and longevity of the institutional controls.

- **Moriah Bucy - "More emphasis must be placed on the risks to the people"**

I think that more emphasis must be placed on the risks to the people (specifically the children) of the community and ensuring that the cleanup is done correctly the first time. ... I hope that EPA will choose to do the right thing and make sure that the people of East Helena are adequately protected.

- **Moriah Bucy - "Lower cleanup level advocated"**

The lead model resulted in a risk-based cleanup level of 520 ppm lead in soils. It appears that EPA is completely disregarding the model in choosing a preferred remedy that has a "trigger" value of 1,000 ppm. If EPA feels it is important to cleanup soils to 500 ppm in soils that are "triggered" by a 1,000 ppm concentration, then why not use a "trigger" of something closer to 500 ppm in the first place?

- **Montana Department of Environmental Quality – "DEQ reserves further comment on the proposed action level pending the ATSDR evaluation"**

Earlier in 2007 DEQ requested the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate the protectiveness of the proposed soil lead action level of 1,000 ppm compared to the RBC. ATSDR recently informed DEQ that they would complete their evaluation after close of the public comment period. Therefore, DEQ reserves further comment on the proposed action level pending the ATSDR evaluation.

- **Montana Department of Environmental Quality – "Reduce reliance on education"**

DEQ agrees that the Lead Program has been strong and effective with its outreach and education in helping to reduce exposure to lead and arsenic in the past, and acknowledges that the should continue in the future. However, reducing children's exposure to soils where lead levels remain above the RBC relies on the parent's knowledge and intervention actions. The proposed plan discussed the possibility of "lower awareness of residents, who may revert to behaviors that increase the risks from the remaining lead and arsenic." This possibility exists even with the Lead Education and Abatement Program. Remediating residential soils to the risk-based lead cleanup levels is more protective and effective and has more long-term permanence. Thus, DEQ supports the more protective alternative of removing yard soils with soil lead levels greater than the RBC, thereby eliminating the unacceptable soil exposure pathway. DEQ proposes the remedial action objective should be to remediate residential yard soils to risk-based lead levels that reduce children's lead exposure. This will reduce the reliance on education.

- **Christine Deveny, Vice Chair, Lewis Clark City-County Board of Health, and Melanie Reynolds, M.P.H., Health Officer, Lewis and Clark City-County Health Dept. – "Preferred cleanup relies too heavily on institutional controls"**

The BOH has concerns regarding the long-term protectiveness of the preferred cleanup alternative and believes it relies too heavily on institutional controls like community education and blood lead testing. Clearly, an education and testing program would always be subject to adequate funding levels, advocate support, and changing political priorities. Our preference is for a remedy that would eliminate, or at least substantially reduce, the need for perpetual oversight, monitoring, education and intervention. We believe lower cleanup levels may achieve that objective.

<u>EPA RESPONSES PERTAINING TO LEAD CLEANUP LEVELS AND PROTECTIVENESS OF HUMAN HEALTH</u>

The cleanup levels for lead and arsenic in soil are protective for children and adults. Reduction of risks for young children was the highest priority for EPA, and those risks have been reduced significantly. Residents and visitors can engage in all activities that they would normally engage in, with minimal risk and reasonable precautions.

Multiple criteria formed the basis of the remedial decision when selecting a final cleanup level within that plausible range. These criteria included the quality and quantity of the environmental data collected, the quality and quantity of the biological data collected, and the most current scientific studies available. The cleanup levels for lead and arsenic were developed using the risk assessment process recommended by existing EPA guidance documents. The cleanup levels are *within the range of cleanup levels selected for lead and arsenic at other mining and smelting sites in Region 8.*

Responses to Category I, Children's Blood Lead Test Results, discuss and explain why the East Helena blood level data are reliable for drawing conclusions about the site, how the data and associated statistics show the lack of any meaningful correlation between soil lead data and blood lead data at the concentrations of soil lead remaining in East Helena, and how the data show that the cleanup levels are protective. EPA's responses to Category II, East Helena's Role in Development of National Lead Guidance, discuss why the use of blood lead data is consistent with guidance.

The risk-based cleanup levels for lead in soil are protective for all residents of East Helena, particularly for the most susceptible: children. The concept that a lower cleanup action level "may be more protective," appears to have arisen from an assumption that soils with lead above about 800 to 1,000 ppm are unsafe, yet soils less than about 520 to 600 ppm are safe. However, there are no empirical data to support that assumption. In fact, numerous lines of empirical evidence gathered over many years, involving over 1,700 East Helena children, thousands of soil samples, decades of air quality data, and results of several hundred in-home environmental assessments conducted by qualified health professionals, all lead to the conclusion that the cleanup levels are protective, and that several other factors besides soil, including lead in paint, family hobbies, father's occupation, and an air pathway that disappeared when the smelter closed down, were as important to interrupt as the soil pathway, if not more important.

EPA notes that the Agency for Toxic Substances and Disease Registry (ATSDR), in response to a formal request by MDEQ for a Health Consultation, evaluated the environmental health aspects of the remedy for residential properties to determine whether it is protective of human health. ATSDR is a federal public health agency of the U.S. Department of Health and Human Services independent of the EPA. ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. The ATSDR concluded that the lead levels that trigger cleanup (1000/500 ppm) for residential areas are protective of human health as long as institutional controls and the Lead Education and Abatement Program are included in the final cleanup remedy(see ATSDR's Health Consultation included as Appendix C to the ROD).

Cleaning up soils to a level of 500 ppm, when the trigger is exceeded does not imply that EPA believes lead levels above 500 ppm are of concern. If a yard cleanup is triggered, the goal is to reduce the concentration to a level that is well-removed from the trigger—and therefore protective--and reasonably cost-effective. This provides an extra margin of safety in the cleanup, but also is within the realm of reasonableness in terms of cost. EPA has presented ample evidence that the trigger level for East Helena, which is uniquely suited to the variability within individual yards, is well below the level of concern for lead in soil and therefore protective.

EPA emphasizes again that the conditions described above, which call for long-term education and administration of reasonable ICs, will persist, unchanged, whether the lead cleanup levels are set at their current levels (1,000/500 ppm), at 610 ppm, at 400 ppm, or at any lesser level. Exterior (and possibly interior) lead-based paint of older homes may peel off and re-contaminate areas previously cleaned up. Because of this, and because the 1,000/500 ppm cleanup level for lead and 100 ppm for arsenic are fully protective, more stringent ICs would be contrary to other EPA guidance. Thus, selecting a lower cleanup action level will have no effect on minimizing or reducing the potential need for ICs. The single, overarching objective for setting a cleanup action level for East Helena is that it should be protective. EPA has accomplished that objective.

As discussed in Category I above, it is unlikely that the low blood lead levels observed in East Helena are due to public education and awareness. Previous study results suggest that awareness of lead hazards may result in temporary changes in behavior which reduce exposure to lead hazards and blood lead levels, but the changes are not long term. Although the current program of lead education is valuable in providing citizens with knowledge they may utilize to minimize risk from lead exposure, EPA does not believe that this program could be responsible for modifying behaviors to the extent that it could account for the steadily decreasing trend in blood lead levels over the last 15 years, and for the consistent low levels remaining over the last several years.

Regardless of the cleanup level, some lead-bearing soil will always remain, as the Montana Department of Public Health and Human Services and the U.S. Agency for Toxic Substances and Disease Registry have also acknowledged (see ATSDR's Health Consultation included as Appendix C to the ROD). Even if the cleanup level was set at a natural, background lead concentrations, conditions would exist that require long-term institutional controls. The State's Medical Officer agrees with EPA in concluding that continuation of the East Helena Lead Education and Abatement Program and establishment of other needed ICs will (a) prevent disturbances of contaminated soil that remain in East Helena and (b) prevent human exposure to interior household dust during renovation or demolition. These programs, according to MDPHHS, "must have the highest possible priority."

Continuing education is highly desirable to parents and educators in this community. The Lead Education and Abatement Program should continue for that reason, but the program also should continue for the reason that, regardless of the cleanup action level, institutional controls will be necessary in the community and the program is best suited and qualified to administer, or act as liaison or coordinator for, institutional controls both presently and in the future.

VII. UNDEVELOPED LANDS AND FUTURE CHANGES IN LAND USE

COMMENTS

- **Laura and Brian Vachowski – Landowners should not bear cleanup costs**

  The proposed plan states that "landowners seeking to change the use of undeveloped land . . . will bear all associated cleanup costs." Such a requirement flies in the face of both CERCLA and EPA's own internal guidance. Under CERCLA, innocent landowners such as ourselves, bona fide prospective purchasers, and contiguous property owners are conditionally exempt from any cleanup costs associated with contamination in Superfund sites. Moreover, the EPA Superfund Lead-Contaminated Residential Sites Handbook (August 2003) plainly states, "EPA ... generally will not take CERCLA enforcement actions against an owner of residential property unless the residential homeowner's activities lead to a release or threat of release of hazardous substances resulting in the taking of a response action at a site." See Handbook at pg. 62. EPA's proposed plan essentially constitutes an enforcement action against residential landowners and attempts to circumvent both the spirit and black letter law of CERCLA, as well as the EPA's own guidance, by trying to hold residents liable for the cleanup of contaminated areas. Such an attempt is not only inappropriate, but likely illegal.

- **Montana Department of Environmental Quality – Landowners should not bear cleanup costs**

  The proposed plan states, "Developers or landowners... will bear all associated cleanup costs." The selected remedy should not state that developers and landowners will pay for remediation. Certainly developers and landowners could work out an agreeable arrangement with the Potentially Responsible Parties (PRPs) but specifically identifying liability of developers and landowners is not a component of the remedy. Allocating liability is not part of the remedy; the liability should remain with the PRPs. The Proposed Plan also states, "Undeveloped lands are being developed, and proposed for development, in the vicinity of East Helena." The Record of Decision addresses that anticipated land use. The Lead Sites Handbook states that EPA generally will not take CERCLA enforcement actions against an owner of residential property. In addition, the Handbook notes that landowners may qualify under CERCLA for protection from CERCLA liability as a contiguous property owner, bona fide prospective purchaser, or innocent landowner.

- **Montana Department of Environmental Quality**

  Remove the requirement that CERCLA liability shifts the responsible parties to the property owners and developers.

- **Lewis & Clark City-County Board of Health – Undeveloped land cleanup cost responsibility**

  The Proposed Plan indicates (p. 25) that developers or landowners that wish to change the use of undeveloped lands must meet all the requirements and specifications for the new use and will bear all associated cleanup costs. This element of the Preferred Cleanup Alternative could have significant economic impacts to the community of East Helena. Therefore, the EPA should provide justification for transferring the cost of cleanup of undeveloped lands from the PRP to the landowner and/or developer. EPA should also provide a legal analysis regarding liability under the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA) describing how the liability is transferred from the PRP to the landowner/developer.

- **Moriah Bucy - Cleanup cost responsibility**

  The idea that landowners who currently have undeveloped land should be responsible for paying cleanup costs should they decide to develop the property is outrageous. Not only that, but those who currently have a home on property that may later be subdivided may end up in a situation of having to cleanup their undeveloped property to a more stringent level than where they currently live. Again, this brings up the issue of the cleanup level. If EPA feels that 500 ppm is protective for future development, then why should those of us who live in the East Helena be less important?

- **Montana Department of Environmental Quality - "Include total estimated costs for the undeveloped lands"**

  The proposed plan provided "total costs" in the estimates for cleanup of the railroad right-of-way and water conveying ditches but not for the undeveloped lands. The Record of Decision should include total estimated costs for the undeveloped lands.

- **Laura and Brian Vachowski – "Proposed plan fails to include any cost estimate for future development of undeveloped residential areas"**

  The proposed plan fails to include any cost estimate for future development of undeveloped residential areas similar to our property.

- **Lewis & Clark City-County Board of Health – "Will undeveloped lands be monitored only through institutional controls"**

  Page 1, 1st paragraph 3 (of the Proposed Plan) -The proposed plan applies only to existing residential soils and offers recommendations only for undeveloped lands. Will undeveloped lands be monitored only through institutional controls after the Record of Decision (ROD) is approved?

- **Lewis & Clark City-County Board of Health – "Deep tillage should not be presented as a treatment remedy"**

  The BOH has concerns with the implementability of the deep tillage remedy for undeveloped lands proposed under the Preferred Cleanup Alternative. These concerns must be addressed prior to the selection of the Final Cleanup Alternative. These concerns are listed below:

  In Place Treatment - deep tillage should not be presented as a treatment remedy, nor is it an innovative technology (it has been used on sites for many years, and was included as an option for undeveloped lands in East Helena more than 16 years ago; Hydrometrics 1991). Deep tillage dilutes the contaminant concentration in the surface soil through mixing with deeper soil. Further, EPA's characterization of the "reductions" in lead concentrations are misleading, as the Proposed Plan does not point out that the total mass of contaminant in the subsurface is not lessened by tilling.

  Mobilization - deep tillage may mobilize contaminants to concentrate in other, deeper strata at levels even greater than were found in the target shallow zone. The BOH believes the EPA should provide a more detailed assessment of the mobilization potential associated with this remedy.

  Rocky geology - rock out-croppings in the surface and near surface geology may prevent effective deep tillage of soils. In a treatability plot performed in the Asarco West Field, the maximum attainable tillage depth was 20 inches even with prior field preparation using a dozer to rip to 15 inches below ground surface (Hydrometrics, 1997). The desired tillage depth for the treatability plot was 30 inches. Considering that numerous subsurface rocks will likely be encountered in many locations, the BOH believes the EPA must provide an alternate remedy for such locations conditions.

  Increased soil volume -deep tillage will likely increase the volume of soil as "loose" soil volumes are typically significantly greater than "compact" soil volumes. The Preferred Cleanup Alternative must consider options for the increased soil volume, particularly if the approach is not successful in achieving the lead and arsenic cleanup levels.

  Weed management -disturbance of soil through deep tillage may cause weed infestation problems. Weed management practices and funding should be considered for the Preferred Cleanup Alternative.

- **Montana Department of Environmental Quality – "EPA Handbook explains that tilling is not an acceptable cleanup method for lead soils because it is not protective"**

  One of the alternatives for undeveloped lands in the proposed plan is Place Treatment (or tilling). The EPA Lead Sites Handbook explains that tilling is not an acceptable cleanup method for lead soils because it is not a protective remedy. This is because no lead removal occurs, and adequate mixing of soil is difficult, if not impossible, to achieve. The handbook further states that tilling may increase the volume of soil, which ultimately requires remediation. The Record of Decision needs to be more precise in its discussion of tilling as a remedy.

  DEQ agrees that in limited site-specific situations, such as non-residential surgical contamination, tilling may be appropriate; however, tilling failed in the Uttick Subdivision in East Helena. After much effort and numerous tilling passes and subsequent sampling, most soils still contained lead above the negotiated cleanup level and had to be excavated and replaced. This was due to the deposits in the flood channels, which had much higher contaminant levels. The adjacent Fields would likely also not be amenable to tilling due to similar fluvial deposits. Also, the rocky sub-soils in the undeveloped land surrounding East Helena may make deep tilling difficult to implement.

  The Record of Decision needs to define the sampling protocols and the decision criteria for suitability of tilling.

- **Laura and Brian Vachowski – "Capping undeveloped property is not a feasible final remedy"**

  Capping undeveloped property is not a feasible final remedy and should not have been included as if it were one. Any cap put in place will only be disturbed when development occurs. At the most, capping is a temporary, remedy.

<u>EPA RESPONSES PERTAINING TO UNDEVELOPED LANDS AND FUTURE CHANGES IN LAND USAGE</u>

Cost responsibility

EPA's response actions under Superfund are not an enforcement action against landowners. Over the last two decades, Congress has enacted a series of amendments to CERCLA that reflect rules and policies EPA has adopted to address landowner liability issues. Among these are the innocent landowner defense to liability set out in the 2002 amendments to 42 U. S. C. Section 9607(b)(3). This provision protects an innocent landowner who did not know or had no reason to know about the contamination before purchasing the property. This defense is premised on the innocent owner of contaminated property taking "reasonable steps to stop any continuing release, prevent any threatened future release, and prevent or limit any human, environmental or natural resource exposure to any previous release . . .." In addition to the requirement for reasonable steps, an innocent landowner is required to "comply with any land use restrictions and institutional controls established in connection with a response action." 42 U. S. C. Section 9601 (35)(A)(i). Compliance with institutional controls established by the County or other local government entity to control future development of land and to control handling of residential contamination that may remain in place would constitute "reasonable steps."

The ROD makes it possible for developers to bear the cost of development, but does not make it mandatory. In fact, this provision was included after consulting with local landowners and developers, who were concerned that Asarco's bankruptcy might languish for years, or worse, leave Asarco unable to cover any such remedial costs. Given affordable means of preparing undeveloped land for residential use, as is provided for by the proposed plan's preferred remedy, developers and landowners have some control over their own investments.

This provision does not necessarily excuse Asarco from liability. EPA has sought to receive a settlement on behalf of private landowners whose lands have been impacted by the smelter's operations. Nevertheless, it is possible that Asarco's liabilities will be capped, nationally, thus leaving EPA with little choice but to enable private landowners or developers to bear some or all of the costs that might be required to bring undeveloped lands into conformance with a new use. The precedent for such circumstances has already been set at other Superfund sites. The provision is consistent with both policy and law. It enables landowners and recognizes the reality of a prolonged, complex and uncertain bankruptcy proceeding.

The Superfund Lead-Contaminated Residential Sites Handbook (EPA 2003) (Handbook) states, "However, it is not the intent of EPA to clean up tracts of remote, undeveloped, lead-contaminated land that may be developed into residential lots in the future. ***This clean-up responsibility should be borne by the land developer. Institutional controls should be developed to ensure safe development in these areas, since under CERCLA developers could be held liable for improper cleanup." In addition, OSWER Directive 9355.7-04 states, "If landowners or others decide at a future date to change the land use in such a way that makes further cleanup necessary to ensure protectiveness, CERCLA does not prevent them from conducting such a cleanup as long as protectiveness of the remedy is not compromised. In general, EPA would not expect to become involved actively in the conduct or oversight of such cleanups." [Emphasis added]*** *The Proposed Plan includes cost estimates for alternatives associated with undeveloped land.*

- *The Proposed Plan applies to both existing residential areas and undeveloped lands. However, EPA presented a separate preferred remedial alternative for each property type. Whereas the preferred remedial alternative for residential properties is removal and replacement, if the property requires it, the preferred remedial alternative for undeveloped lands is dependent upon the new, proposed use. If the new use is residential, and the undeveloped lands do not already conform to the requirements of that new use, then in place treatment is the preferred remedial method. Other uses, such as commercial or recreational uses, may not require anything more than land preparation such as leveling or paving, or a cap of topsoil and sod.*

- *Undeveloped lands will be monitored, as needed, after the Record of Decision. Undeveloped lands do not currently present unacceptable risks to nearby residential areas, or to occasional users or to agricultural workers. Practical application of institutional controls is already being done and the County has processes in place to cover changes in land use. Five-year Reviews are conducted by EPA no less frequently than every five years to assess the effectiveness of the remedy, and can include both record reviews and on-site inspections. More frequent reviews can be conducted at the discretion of the entities responsible for the*

ICs, although EPA does not see a need for that.

In-place treatment (deep tillage and amendment)

- *Deep tillage with lime or other suitable chemical amendment is recognized as a treatment technology. This method has been successfully used at other sites, as well as East Helena.*

  Deep tilling with the use of a modified Baker plow was evaluated at East Helena. This plow is a large disc implement used in agriculture for the deep tilling of soils. Use of the Baker plow in the East Fields area demonstrated the following:

  - *Lead concentrations in surface soils were reduced to safe levels*
  - *Subsurface soil lead concentrations were increased slightly to moderately, yet not to levels of concern*
  - *Soil pH was raised, thus reducing bioavailabilityof lead*
  - *Mixing of the soil profile in the plow zone significantly reduced the metals/pH gradient*

  The method described as being inappropriate in EPA's Handbook is rototilling. Rototilling is a shallow soil tilling method that does not amend the soil profile. Deep tillage is widely recognized as a treatment technology throughout the western United States. Many reclamation scientists—perhaps the majority--consider in place treatment of soils for metals amelioration as an innovative technology. They note further that the technology has undergone significant improvement in terms of equipment, application and effectiveness in the past decade. Indeed, the State of Montana plans to employ this technology on a massive scale in the Clark Fork River floodplain.

  The deep-plow mixing technology was successfully used in 1995-1996 to reduce contamination in surface soils of a 40-acre agricultural tract on the outskirts of East Helena. Before treatment, surface lead concentrations were as high as 2,800 ppm and averaged 1,500 ppm. After treatment, the highest surface soil lead concentration was 550 ppm (2 of 40 tests were slightly greater than 500 ppm) and the field average was slightly less than 400 ppm lead. Depth of incorporation of lead into the soil profile did not cause lead to exceed 150 to 250 ppm below 10 to 12 inches beneath the surface. The cost of remediation was a fraction of what removal and replacement would have cost. And, importantly the environmental impact to another 40 acres or more of farmlands in the Helena Valley, which otherwise would have required strip mining of topsoil, was avoided. A new school and about 120 homes and apartments were built shortly after the land was treated and groomed.

  EPA is unaware of studies that suggest that deep tillage may mobilize contaminants to deeper strata to the extent that concentrations of contaminants are greater than those found in the target shallow zone. Deep tillage may redistribute contaminants, but experience and studies have shown that the redistributed concentrations are less than the pre-till surface concentrations.

  The desired tillage depth is partly dependent on the level of contamination, the distribution of contamination in the vertical soil profile, and on the composition of the site soils. The desired end use of land is also an important factor. Deep tillage with chemical amendments is a suitable and effective alternative for undeveloped lands that, once they are characterized and evaluated in terms of their ability to meet post-treatment criteria, demonstrate that in place treatment is likely to be successful. Post-sampling results after tilling will be available to assess the success of tilling. In East Helena's Utick Subdivision, where deep tillage was *demonstrated, a small percentage of the total area treated did not meet post-treatment criteria. Inadequate depth of tillage appeared to be the cause, and those areas were excavated and replaced with fresh backfill soil.*

In the case of the Utick Subdivision, it is important to note that (a) post-treatment sampling revealed that criteria were not met, (b) the problem was readily corrected, and (c) the cost associated with preparing this 7-acre field for residential development was substantially less, despite having to perform partial removal and replacement, than if the area had undergone total removal and replacement. Within two to three years after the Utick Subdivision was treated, the area was fully developed with affordable homes for low-income families.

In areas where tilling does not appear likely to be successful or to be feasible, other alternatives such as capping and excavation, which are identified in the Proposed Plan, can be considered by landowners and developers contemplating changes in land use that would require a remedial action.

The potential increase in soil volume would only need to be considered if the soil was excavated. Deep-tilling does not significantly increase the soil volume for soil that remains in place. The elevation of the land will remain essentially unchanged from before tilling to after tilling.

Sites that are deep tilled are planned for further development. Therefore, the tilled area would reasonably be expected to be landscaped or built upon, which indirectly addresses weed management. In any case, imported soil (following removal) presents just as many challenges for controlling weeds as any other soil disturbance.

- *EPA agrees with MDEQ regarding sampling protocols and decision criteria; however, final protocols and criteria may not be fully developed until remedial design. Whether to specify sampling protocols and decision criteria is left to the local entities. Existing methods for predicting success and for determining depth of tillage, lime application rates, etc., are well developed for East Helena largely because of the lessons learned from site-specific applications of the technology and demonstration projects discussed above. Ultimately, the results of sampling and remediation, whether by treatment with tilling and amendments or by other means, will need to meet the remedial action objectives for the site that have been identified in the Record of Decision.*

- *Capping has been used at numerous metal-contaminated sites including Anaconda and Butte. The ROD for the Butte Priority Soils Operable Unit (BPSOU) includes engineered covers (soil with vegetation) or other covers to address solid media in non-residential areas including commercial areas and open areas where concentrations of lead or arsenic may exceed action levels. Capping (covers) has been used successfully at other sites for creating open space parks where more expensive alternatives would have prevented remediation of the site. The handbook (EPA, 2003) recommends capping in residential settings as an effective, affordable method of remediation of lead-impacted soils. Capping is a viable remedy at East Helena for undeveloped land under certain situations as described in the Proposed Plan.*

COMMENTS

- **Steven D. Helgerson, MD, MPH, State Medical Officer, Montana Department of Public Health and Human Services – "Protecting the public's health with regard to exposure to lead"**

  I am writing in response to "Plans for a final cleanup of East Helena's residential soils and undeveloped lands" which EPA announced in January 2007 for the East Helena Superfund site (Operable Unit No. 2). My comments concern the parts of the plan that, in my view, are the most important for protecting the public's health with regard to exposure to lead.

  While it would be ideal to eliminate lead and other heavy metals from areas both exterior (e.g., soil) and interior (e.g., dust or old paint) to living units, it is not feasible to achieve this ideal. In contrast, the plan proposed by the EPA appears to be feasible. The plan included cleanup of a residential yard in which any quadrant has soil with lead concentration exceeding 1000 ppm. Cleanup in those yards would include all areas with lead concentrations exceeding 500 ppm.

  I agree this reduction in soil lead concentration is desirable. However, because it is impossible to remove all lead-bearing soils, there will continue to be a risk of ambient exposure in people's living environments from contaminated dust (not to mention lead-based paint), and continuing efforts to minimize those exposures will be important. As long as any lead concentration is detectable in interior dust, the following parts of the EPA proposed plan are essential for protecting he public health:

  A. Continue the existing East Helena Lead Education and Abatement Program, and
  B. Establish institutional controls that prevent disturbances of contaminated soil that would remain in East Helena, and prevent human exposure to interior household dust during renovation or demolition of existing housing stock in East Helena.

  Achieving these parts of the EPA proposed plan must have the highest possible priority. To the extent funds are available to implement and evaluate implementation of the proposed plan; these funds need to be preferentially targeted to these components of the plan.

- **City Council of East Helena - Unanimous in Support of Alternative 2R**

  The City Council of East Helena has been involved in its area's Superfund Cleanup since inception. The City Council wants to be on the record as having unanimously voted in support of Alternative 2R of the Proposed Record of Decision by the EPA.

  It is our belief that the blood lead studies show that the clean up program has been a success. The children in East Helena have lower blood levels than the national average. When the program started, the action plan was to clean a yard if any quadrant contained lead levels in excess of 1000 ppm. This action level has remained to date. The information provided during the public meeting in East Helena on January 25, 2007, clearly demonstrates that no benefit would be gained by changing that action level.

  ... It is the City Council's belief that yard cleanup at the existing action level in conjunction with the Lead Education Program appears to be the reason the program has been such a success. The evidence just doesn't support changing that action level when there is no expectation of blood level improvement. Nor does it support the expenditure of many more thousands of dollars.

The City Council is hopeful you will choose Alternative 2R of the Proposed Record of Decision. It is time for the superfund status of the City of East Helena to come to an end and allow us to look forward to the future.

- **East Helena Public Schools - Support for Finalization of the ROD**
  Joe Cohenour, Chairman
  Marcia Ellermeyer, Vice-Chair
  Mark Diehl, Trustee
  Don Hoffman, Trustee
  Kit Johnson, Trustee
  Ann Marie Thompson, Trustee

  The East Helena Public Schools (EHPS) Board of Trustees would like to express their support for the finalization of the EPA Record of Decision (ROD). We believe that the ROD is an essential element to the continued well being of our community, its citizens and our children. We believe that the scientific evidence that has been examined by experts in the field has sufficient credibility to support the finalization of this decision. Realizing that this evidence has been examined extensively we now request that the plan be completed quickly for the well being of our community.

  The EHPS Board of Trustees strongly supports the ideals of protection of human health and the environment. As a board we believe that the continued support of the EPA, DEQ, Lewis & Clark County officials and the Asarco Corporation will create an umbrella of oversight that guarantees the continued good health of our community from unforeseen challenges.

- **Montana Department of Environmental Quality – Supports selected components of the preferred alternative**

  DEQ supports the following components of the Preferred Alternative:

  - Continuing the existing East Helena Lead Education and Abatement (Lead Program) for as long as necessary to help reduce children's exposure to lead.
  - Completing cleanup of streets, alleys, road aprons, irrigation ditches and railroad right-of-way that are adjacent to or within residential areas.
  - Establishing institutional controls to prevent disturbance of soils, prevent exposure to interior dust, and to define land use changes.

- **Chris Anderson, East Helena Resident – Supports "the two-year plan"**

  I'd like to show my support for the Record of Decision and the two-year plan.

- **Baker Botts LLP, representing ASARCO LLP - Adopt Alternative 2R for residential settings and Alternative 4U for future development of undeveloped lands**

  ("ASARCO") submits the following comments regarding the United States Environmental

Protection Agency's ("EPA's") Proposed Plan for soil in Operable Unit 2 of the East Helena Super Fund Site ("Proposed Plan"). As outlined in more detail below, ASARCO generally supports EPA's selected cleanup alternatives both for residential and undeveloped areas.

Residential Soils

- Alternative 2R is an effective choice for addressing residential soils.
- ASARCO agrees with EPA's selection of Alternative 2R to address residential soils in East Helena. As noted in the EPA's announcement of the Proposed Plan (the "Announcement"), Alternative 2R consists of completing the residential soil cleanup according to protocols that are currently in place for the ongoing removal action." Implementation of these protocols has significantly lowered children's blood-lead levels in East Helena.
- Alternative 2R is superior to Alternative 3R as the most cost-effective alternative.
- In Choosing removal alternatives: EPA must select a remedy that is consistent with CERCLA and the nine National Contingency Plan (NCP) criteria. Of the nine criteria, two are viewed as threshold criteria—protection of human health and the environment and compliance with applicable or appropriate and relevant requirements ("ARARs"). ...Alternatives that meet these threshold criteria are to be compared to one another based upon the remaining seven criteria. As noted by EPA, Alternative 2R and 3R are functionally equivalent as to the threshold criteria. ... Of the remaining seven criteria, cost-effectiveness is the one that most distinguished Alternative 2R from Alternative 3R.
- EPA estimates that Alternative 3R will be almost four times as expensive to implement as Alternative 2R - $38 million versus $10 million. As previously noted, Alternative 3R does not provide any comparative advantage as to protection of human health and the environment or compliance with ARARs. Accordingly, this cost discrepancy alone is enough to warrant adoption of Alternative 2R as the appreciably more cost-effective remedy.
- The selection of the most cost-effective remedy among various options - all being generally equivalent in terms of protection of public health and the environment, has long been a central tenet of CERCLA. ...
- ASARCO believes that selection of Alternative 2R is on all fours with the requirements of CERCLA and the NCP.
- Community acceptance strongly favors adopting Alternative 2R instead of Alternative 3R.
- As noted by EPA, key constituencies including the East Helena City Council and the Lewis and Clark City-County Board of Health have expressed support for Alternative 2R. ... As a member of the East Helena community, ASARCO supports the adoption of Alternative 2R. Moreover, judging by the comments made by various citizens in public meetings concerning the adoption of this Proposed Plan, the vast majority of local citizens in East Helena support the adoption of Alternative 2R. Indeed, many of the vociferous objections voiced at these meetings were from citizens concerned that EPA would implement Alternative 3R and needlessly inconvenience the people in East Helena with an unnecessary program of more extensive remediation.

Undeveloped Land

- For the same reasons outlined above, ASARCO agrees with EPA's selection of Alternative 4U to address undeveloped lands in East Helena.

Conclusion

- In light of the foregoing, ASARCO respectfully urges that EPA formally adopt Alternative 2R as the preferred alternative for residential soils and Alternative 4U as the preferred alternative for undeveloped land at the East Helena Site. We appreciate the opportunity to submit these comments and would welcome a chance to discuss these alternatives with EPA at a convenient time.

- **Christine Deveny, Vice Chair, Lewis Clark City-County Board of Health; Melanie Reynolds, M.P.H., Health Officer, Lewis and Clark City-County Health Dept. – "EPA has not substantiated the rationale for selection of the Preferred Cleanup Alternative"**

  Our review of the Proposed Plan and numerous supporting documents, including epidemiological and toxicological studies as well as EPA guidance and reports from other similar projects at listed National Priorities List (NPL) sites, has convinced us that EPA has not substantiated the rationale for selection of the Preferred Cleanup Alternative. Our reasons ... are generally based on a lack of supporting documentation, inconsistency with EPA guidance, and the use of uncertain assumptions by EPA to document contaminant exposure potential and predicted health risks.

- **Lewis & Clark City-County Board of Health – "Range of alternatives for residential soils was too limited"**

  The BOH does not believe a sufficient number of cleanup alternatives were developed in the Proposed Plan. In particular, the range of alternatives for residential soils was too limited. The Proposed Plan does not:

  - Describe the other remedial alternatives that were considered and dismissed from consideration; or
  - Provide rationale for why protective remedies (such as testing of indoor spaces and insulation removal, where warranted) are not included in the alternatives.

  EPA should expand the development of alternatives to allow for a more thorough review of potential remedies for East Helena soils. Funding mechanisms should be included in and described for all of the alternatives.

- **Lewis & Clark City-County Board of Health – "The Proposed Plan does not appear to conform with EPA guidance or statutory requirements"**

  The BOH has concerns that the Proposed Plan does not appear to conform with EPA guidance or statutory requirements. In particular, the lack of transparency in development and screening of alternatives has prevented the public from understanding the range of possible alternatives considered, or the benefits and drawbacks associated with these options. Typically, a proposed plan is tiered from a remedial investigation/feasibility study (RI/FS), which provides the detailed supporting documentation for possible alternatives: costs, effectiveness, technical feasibility, and so forth. However the only RI/FS referenced in the Proposed Plan dates to 1991 (Hydrometrics, 1991). Considering the 16 years of experience EPA has gained since that RI/FS, studying and attempting to remediate metals-contaminated sites across the U.S., there surely have been technological and policy advances that should be incorporated into the alternatives. It should be noted that most of the EPA guidance concerning risk assessment, remedial actions, site studies, and decision-making has been published or revised since 1991, strongly indicating that the sole RI/FS for soils cleanup should have been revised, or at least supplemented, before publication of a Proposed Plan.

EPA has indicated that the RI/FS has been updated, and notes on page 17 of the Proposed Plan: "Many of the alternatives developed at that time, however, are no longer considered viable; due principally to the substantial amount of cleanup that has since occurred. Therefore, EPA developed new alternatives that incorporate many of the features of the original alternatives, but are relevant for current conditions." If this is the case, EPA should provide the new analysis disclosing how and why some alternatives are no longer viable. The supporting documentation for new alternatives should be made available to the public for review, and the Proposed Plan should specifically reference these documents.

One example of the problems raised in using a 15+ year old RI/FS is conformance with guidance and statute. For example, as noted in the Proposed Plan (page 26) the alternatives must be evaluated against nine criteria. One of the threshold criteria that must be met is compliance with state and federal regulations (i.e., Applicable or Relevant and Appropriate Requirements [ARARs]). The Proposed Plan indicates the EPA has evaluated the alternatives for compliance with ARARs, but there was no documentation referenced or available for public review that would substantiate this conclusion. The only document discussing ARARs that we found applicable to the East Helena residential soils is the 1991 RI/FS (Hydrometrics, 1991). It is reasonable to expect that some state and federal regulations will have changed since that time, and an updated analysis is critical. If this has been done (for example, with the "new" alternatives that EPA references on page 17 of the Proposed Plan) then EPA should make the analysis readily available to the public.

Similarly and in general the EPA should supply a specific list of reference documentation pertinent to the Proposed Plan. Otherwise, it is very difficult for the public and public agencies to identify and locate documentation relevant to the subject.

According to EPA guidance, the Proposed Plan should provide "either a summary of the support agency's agreement with the plan or its dissenting comments (EPA 1999c). This requirement is clearly supported by statute, as "EPA must respond to State comments ...on the Preferred Alternative when making the RI/FS and Proposed Plan available for public comment" (NCP §300.515(d)(4)). A responsiveness summary addressing comments from MDEQ was not included in the Proposed Plan. By not making interested parties fully aware of dissenting comments and publishing them in the proposed plan, EPA has failed to meet its statutory public disclosure obligations or follow its own guidance for the CERCLA decision-making process.

- **Sally K. Nyland – "I favor Alternative 3R"**

I am strongly opposed to the "preferred cleanup alternative (2R)" recommended by the EPA and I favor Alternative 3R for the following reasons:

The State MDEQ has raised sufficient concerns and questions over the 1000 ppm limit as opposed to the 500 ppm in that lead blood level tests in children are based on a biased sampling of participants rather than a random sampling. The use of biased sampling is not scientific and does not lead to reliable test results.

The EPA by their own analysis has presented a different standard for "Clean up Goals for Undeveloped Lands" and is setting the requirements for remediation of undeveloped residential-use land at a maximum level of 500 ppm not 1000 ppm. These two standards are in contradiction with one another.

The difference between the two standards (residential versus undeveloped/future residential) appears to be related to availability of funding for cleanup. In other words, there is just enough money available in the ASARCO reclamation fund to implement 2R and nowhere near enough to support 3R. In the case of undeveloped lands, however, since funding will likely be paid out of the developer's pockets, the level for remediation is set at 500 ppm. This reasoning ignores the actual health issues.

The plan that the EPA implements should require a uniform standard regardless of whether it involves developed or undeveloped land. Implementation of the 500 ppm level (i.e. 3R) is the safest plan and would stand the test of time. ASARCO should be required by the EPA to meet this standard (just like private developers will be required). Because of ASARCO'S current shaky financial condition they may not be around to resolve recurring issues in the future. They need to be held accountable now while there is still opportunity!

- **Moriah Bucy – Consider costs based on the lower cleanup level leaving all other aspects the same**

The two alternatives that require action be taken are completely different and can't be accurately compared. The action alternative that was not selected is based on a yard average, which in itself is completely inappropriate, as lead handbook referred to in the previous comment specifies that yard averages should not be used. Additionally, the costs for this alternative are going to be much higher, as the soil removal will inevitably be much larger given that the entire yard would have to be removed. It would be more useful, and more accurate, to simply change the cleanup level and leave all other aspects of the remedy the same. I expect that this would result in a much lower dollar figure for overall cleanup costs. I would like to see EPA consider what the costs would be for cleanup based on the lower cleanup level from the model (520 ppm) leaving all other aspects of the chosen remedy the same.

- **Lewis & Clark City-County Board of Health – Question regarding yard average versus individual quadrant**

Page 19, 2nd column, Paragraph 1 (of the Proposed Plan) - Why are yard averages or property averages being used versus the protocol in place which uses individual quadrant analysis? Does EPA propose changing the protocol to yard averages?

- **Montana Department of Environmental Quality – Contingencies**

The Record of Decision should include a discussion of contingencies if the remedy fails to be protective. Also, it should describe the contingencies if the city or county can't / doesn't want to implement or, if it implements, but at some point can't / doesn't want to continue the institutional controls.

- **Lewis & Clark City-County Board of Health – Regarding community acceptance**

Page 29, Community Acceptance, Paragraph 2. This paragraph is incorrect. While the BOH does support protection of human health, we do not link human health protection to such criterion as "at the most reasonable cost." The BOH requests this paragraph be omitted.

- **Montana Department of Environmental Quality – Regarding formal comments from the support agency**

  The NCP, at 40 CFR 300.430(f)(2)(iii), requires at a minimum that the proposed plan provide a summary of any formal comments received from the support agency. The proposed plan did not include that but stated, "After consideration of public and local government concerns and comments, MDEQ will present formal comments to EPA." DEQ would have appreciated its own input into the Proposed Plan.

- **Lewis & Clark City-County Board of Health – Explanation for use of the term "all known measures"**

  Page 26 and 27 (of the Proposed Plan) - The Proposed Plan indicates that Alternatives 2R and 3R are "by all known measures" equally protective. Please explain further. What are "all known measures"?

- **Montana Department of Environmental Quality – Disagrees with statements regarding protectiveness and risk reduction**

  Eliminate the conclusion that the preferred alternative is protective of human health based on blood lead sampling. Also, alter the conclusion that remedy alternatives are equally capable of reducing risks.

- **Montana Department of Environmental Quality – Different goals and objectives for removal actions vs. remedial actions**

  The preferred alternative in the proposed plan involves continuing with cleanup criteria established through the removal actions. The Record of Decision should include a discussion to notify the reader as to the different goals and objectives of a removal action compared to a remedial action. As set forth in the NCP, 55 Fed. Reg. 8695, "Although all removals must be protective of human health and the environment within their defined objectives, removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively addressing all threats at a site."

EPA RESPONSES TO COMMENTS PERTAINING TO SELECTION OF REMEDIAL ALTERNATIVES

Responses in this category are also closely related to those pertaining to cleanup levels and institutional controls. Readers are urged to consult comments and responses within Sections IV, V, and VI, in addition to the responses provided below.

EPA's primary concern is protection of the residents of East Helena, particularly children. This concern expressed itself in the form of an interim action involving removal of lead-impacted soils from yards surrounding East Helena residences and placing the soils in the East Fields repository. This action was undertaken after careful consideration of the National Contingency Plan (NCP) threshold criteria requiring protection of human health and the environment and compliance with ARARs.

The interim action was supported by initiating the East Helena Lead Education and Abatement Program. Strong and active support by local government, their associated agencies, and the citizens of East Helena lead to a successful implementation of this program. Today, children's blood lead concentrations are below or near the national average indicating that the interim action and the Lead Education and Abatement Program have achieved their goals.

EPA agrees with all commenters who support Alternative 2R, for East Helena residential soils, and Alternative 4U, for undeveloped property. EPA agrees that the Lead Education and Abatement Program should be continued and the proposed institutional controls should be adopted. This plan is feasible and will protect the citizens of East Helena.

The selected remedy is comprised of strategies for both existing residential areas and undeveloped lands. As discussed in detail in Section IV, the selected remedy for residential areas, Alternative 2R and its two-part cleanup level of 1,000/500 ppm are uniquely suited to the variability in residential soil lead concentrations. The selected remedy for undeveloped lands is suited to the conditions of low variability in lead concentrations and large open spaces amenable to treatment by tilling, and provides a cost-effective solution to combined sampling/remediation requirements. In the end, as newly-developed residential areas blend into existing residential areas, both will exhibit neighborhood average lead values less than 500 ppm.

Past Removal Actions have addressed areas with soil containing concentrations of COCs above cleanup levels through excavation, backfill, and re-landscaping in residential areas, and treatment or capping/covering for undeveloped lands;

The selected remedy provides future protectiveness through the cleanup of residential yards and undeveloped lands proposed for development, and the application of institutional controls. In addition, the East Helena Lead Education and Abatement Program will continue to operate;

The selected remedy will be protective of human health and the environment, comply with ARARs, and be cost-effective.

The selected remedy provides the best balance of tradeoffs among alternatives for residential and undeveloped lands, and attains an equal or higher level of achievement of the threshold and balancing criteria than other site-wide alternatives that were evaluated. The successful performance of the selected remedy is demonstrated by years of response action removal of residential soils, reclamation performance monitoring at response action sites in the OU, and the success of the Lead Education and Abatement Program.

The selected remedy includes a variety of components that together represent an effective and practical remedial solution for the type of waste and the associated level of risk at OU2. The components of the selected remedy for soils accomplish overall protection of human health and the environment and compliance with ARARs equally as well or better than other alternatives evaluated. Threshold criteria are achieved through residential soil removal; removal, capping, or treatment of undeveloped lands; and the application of institutional controls and monitoring. The selected remedy achieves substantial risk reduction and is feasible, implementable, and cost effective. The selected remedy includes treatment of lead-contaminated soil through the application of lime amendments and tilling when appropriate. The selected remedy effectively eliminates, mitigates, or manages residual risk and provides for long-term protection through residential contamination abatement, management and remediation of undeveloped lands, appropriate institutional controls, and continuous evaluation and performance monitoring of the remedy.

The selected remedy is compatible with land reuse and redevelopment within East Helena and Lewis and Clark County. EPA and the State will continue to work cooperatively with the local county government and Asarco to ensure redevelopment is protective of human health and the environment.

Cleanup alternatives for residential areas were originally developed in the 1990/1991 remedial investigation and feasibility study reports, and a 1991 engineering evaluation and cost analysis report. The alternatives evaluated in detail in the original site feasibility studies included no action, institutional controls (remedy protection measures), capping (covers), excavation, treatment, and disposal options. Some of the alternatives developed at that time, however, are no longer considered viable; due principally to the substantial amount of cleanup that has since occurred. In addition, the results of feasibility and treatability studies conducted during the removal actions have eliminated some alternatives. For example, the original feasibility study considered disposal of excavated residential soils in a RCRA facility, as well as disposal in East Fields. Treatment of the East Fields, and placement of excavated residential soils at East Fields have since been shown to be effective. Therefore, alternatives that incorporate many of the features of the original alternatives, but are relevant for current conditions, have been evaluated. Capping and in-place treatment were not alternatives presented in the Proposed Plan for residential cleanup because it has been EPA's experience that these options were not feasible for remediation of residential yards. Two removal alternatives were considered and presented rather than alternatives that are not applicable for residential yards. There are no "new" alternatives – all of the alternatives were included in the original feasibility studies. It is also noted that the final RI/FS guidance was published in 1988 and hasn't been updated since; therefore the 1991 RI/FS was prepared in accordance with current guidance. In addition, the removal actions are conducted in accordance with the guidance issued by EPA in 1993, Conducting Non-Time Critical Removal Actions under CERCLA (OSWER Directive 9360.0-32), and the selected remedy is consistent with the non-time critical removal actions.

The Proposed Plan is supported by information in the Administrative Record. Correspondence and reports subsequent to the 1991 RI/FS are available in the Administrative Record. Although some regulations may have been modified since 1991, and new regulations may have come into effect, the remedy is a risk-based cleanup, not an ARAR-based cleanup. Therefore, any slight changes to the ARARs since 1991 are not anticipated to affect the cleanup and the ARARs currently identified in the Administrative Record were considered sufficient to support the selection of the remedy. The Superfund Lead-Contaminated Residential Sites Handbook (EPA 2003) also points out that the Toxic Substances Control Act (TSCA) § 403 Soil Hazard Rule, which establishes a soil-lead hazard of 400 ppm for bare soil in play areas and 1,200 ppm for bare soil in non-play areas of the yard, should not be treated as an ARAR to modify approaches to addressing NPL sites. The Record of Decision will identify the ARARs for the site

- *EPA has in the past sought funding from viable Potentially Responsible Parties for implementation and administration of ICs. However, the status of ASARCO's bankruptcy remains unknown, therefore EPA must consider the possibility East Helena will become a Fund-lead site. If that becomes the case, EPA can only seek funding from national sources, year-to-year with no absolute assurance that funding will be provided. Further, if it were to become a Fund-lead site, the State of Montana has some obligation to either match or fund long-term IC administration during operation and maintenance. Funding mechanisms are typically not described in a Proposed Plan.*

- *A value of 500 ppm has been selected as the action level for undeveloped properties to account for the differences between the methods that were used to sample undeveloped property soils and residential property soils, and to overcome uncertainty that arises from fewer samples per unit area.*

- *Funding by ASARCO was not considered during selection of the cleanup levels. See EPA Response in Category IV, Lead Cleanup Action Levels, for a detailed explanation regarding the standards for residential properties and undeveloped land.*

- *EPA provided the alternatives for consideration in the Proposed Plan coordinated with the cleanups and lessons learned over the past 15 years. The alternative selected is patterned after the residential soil removal actions that have been in place and utilized since 1991, which have been updated as appropriate (see sampling and analysis), and which EPA believes have proven safe, effective, and protective of human health. Additionally, the national EPA regulatory goals for lead of 400 ppm (by weight) in bare soil in play areas, and 1200 ppm for bare soil non-play areas, was established under TSCA in 2001 (see EPA 40 CFR Part 745 Lead; Identification of Dangerous Levels of Lead; Final Rule, January 5, 2001). Generally, a comparison of the established East Helena cleanup levels with EPA final standards, released 10 years later, illustrate that these site specific processes and cleanups are credible and should continue to be supported.*

- *EPA is required to summarize in a proposed plan other cleanup alternatives that were examined during the feasibility study. Alternative 3R was examined, but rejected because a cleanup level of 500-ppm lead, overall, is deemed unnecessary (Alternative 2R is protective) and the cost of Alternative 3R would be many times greater than the cost of Alternative 2R. Alternative 2R is still the EPA's preferred remedial alternative, as EPA considers its cleanup action levels (1,000/500 ppm lead) to be protective. Future cleanup activities are not warranted.*

- *While some RODs may contain contingent remedies, those are restricted for unique cases where there is a reasonable doubt as to the implementability of the primary remedy. In the case of East Helena, the remedies identified in the ROD are readily implementable, and therefore, contingent remedies are not identified. In addition, the site will be subject to Five-Year Reviews, and if an element of the remedy is not protective (this is not expected), then that part of the remedy can be reconsidered and changed, if necessary.*

- *EPA is required to include cost considerations as part of the regulatory remedial selection process and evaluation of preferred cleanup alternatives. Extensive investigation, evaluation, and documentation provided in the administrative record support the recommended alternatives, in addition to the consideration given to costs.*

- *The State's acceptance of, or perspective on, the Selected Remedy is one of the nine evaluation criteria discussed in the ROD. In addition, responses to formal comments, including the State's, are included in the ROD. The ROD is also required to identify significant changes, if any, to the Remedy between the time of publication of the Proposed Plan and the ROD, as a result of comments or for other reasons.*

- *The reference to "by all known measures" simply means an evaluation of the level of protectiveness for the two alternatives. The soil cleanup lead levels for each remedial alternative are both at levels for which no measurable effect on blood lead levels is observed* *for a residential setting. The blood lead data do not support differing levels of protectiveness for the cleanup levels associated with these alternatives. They are therefore both considered to be equal in terms of protectiveness of human health and the environment and reducing risks. The key difference in reducing the cleanup levels between Alternative 2R and 3R is a significant cost increase.*

- *With respect to removal and remedial actions, the quotation from NCP, 55 Fed. Reg. 8695 states, "Although all removals must be protective of human health and the environment within their defined objectives, removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively addressing all threats at a site" indicates that the removal action may mitigate or stabilize the threat. It doesn't mean that any given Removal Action at a specific site has not comprehensively addressed all threats at a site. In the case of East Helena, it is EPA's perspective and conclusion that the previously conducted Removal Actions have comprehensively addressed the risk posed by the sites on which Removal Actions were conducted. Similarly, the EPA believes that the Preferred Alternative in the Proposed Plan (selected remedy in this ROD) also comprehensively addresses the risk posed by the site. The ROD discusses and clarifies that this is the case.*

IX. INTERIOR DUST

COMMENTS

- **Lewis & Clark City-County Board of Health – The Preferred Cleanup Alternative should address attic dust and other potential pathways for metal exposure**

  The Preferred Cleanup Alternative should address the following:

  - Attic Dust. To prevent sub-chronic, acute exposures to high concentrations of metals that may be present in the attic dust of homes in East Helena, the Preferred Cleanup Alternative should include measures to prevent such exposures. Acute exposures to attic dust have been reported in other smelter areas (Montana Standard, 2004). In addition, the Record of Decision (ROD) for the Butte Priority Soils Operable Unit of the Silver Bow Butte Area Superfund Site includes measures to mitigate attic and other household dust traps that may have accumulated substantial metal and metalloid concentrations during operational years of the smelter.

  - Other potential pathways for metal exposure - for example contaminated soil in earthen walled basements or crawl spaces, and dust in heating and venting ducts.

- **Montana Department of Environmental Quality – Include interior dust in the remedy**

  Include interior dust removal in the remedy.

- **Montana Department of Environmental Quality – Selected remedy should require removal of dust if there is a complete or partially complete exposure pathway**

  DEQ supports the Lead Program's environmental assessment approach to assess possible sources of lead exposure routes within a home and then provide education on how to reduce exposure. However, the selected remedy should proactively reduce unacceptable exposure, including unacceptable exposure to interior dust, and require removal of dust if there is a complete or potentially complete exposure pathway.

EPA RESPONSE TO COMMENTS PERTAINING TO INTERIOR DUST

Several commenters expressed concern for health effects that may be associated with exposure to attic dust. The Preferred Cleanup Alternative, however, includes institutional controls (ICs) as a measure to prevent or minimize exposures to all known sources of interior, household dust. The Selected Remedy will, "Establish institutional controls that will enable the Lewis and Clark City-County Board of Health and City of East Helena to adopt and enforce regulations needed to . . . [among other needs] (b) prevent exposures to interior household dust during remodeling or demolition of attics, unfinished basements, heating ducts or exterior walls and windows."

Active remediation of household dust does not appear to be warranted at East Helena because of an incomplete exposure pathway, except in some instances during remodeling or demolition. This is a situation similar to the Butte Priority Soils Operable Unit (BPSOU), for which the Record of Decision states, "In most homes, there is not a complete attic dust exposure pathway because attics are not living spaces and are infrequently accessed by Butte and Walkerville residents."

In addition, the Superfund Lead-Contaminated Residential Sites Handbook (EPA 2003) states, "Areas such as attics, crawl spaces, and other non-living spaces need not be addressed unless they are shown to be a continued source of contamination to the living areas . . . ." Because of the multi-source aspects of interior dust contamination, potential for recontamination, and the need for a continuing effort to manage interior dust exposure, OSWER recommends the use of an aggressive health education program to address interior dust exposure."

Nevertheless, the ROD provides for the selected remedy to include active efforts to clean up interior dust sources or pathways. If, in administering ICs, county health professionals determine that interior dust, such as attic dust or any other source of interior dust, presents unacceptable exposure in their judgment, then action is both warranted and required. EPA has considered this possibility, albeit it is unlikely to be administered except under extraordinary circumstances, and will seek funding as in the case of administration of all other ICs.

X. LEAD EDUCATION AND ABATEMENT PROGRAM

COMMENTS

- **Montana Department of Public Health and Human Services - Continue the existing Lead Education and Abatement Program**

  Continue the existing East Helena Lead Education and Abatement Program

- **Jeri Dwan – "The program is not all that well known or advertised"**

  It seems to me that the Proposed Plan places a lot of emphasis on the East Helena Lead Abatement Program to continue to provide information to the public about the risks of lead and ways to prevent exposure to lead, particularly since the cleanup level is higher than that recommended by the state agency, DEQ. I also understand that this program is the one that conducts the blood screenings to make sure our children have not been exposed to unsafe levels of lead. The problem with this scenario is that this program is not all that well known or advertised. I feel that I can say this with certainty because I have lived in this community for nearly five years and have only seen one postcard having anything to do with the Lead Abatement Program. The troubling part is that I have a four year old son who plays outside in our yard on an almost daily basis and another baby on the way. From what I have been told, my particular neighborhood may be a lesser concern than others, as it is farther away from the source. However, as I mentioned before, I have not received any real information about risks to my children, nor have I been made aware that such information was available. I consider myself to be a well educated and concerned parent and worry that if I was not aware of the risks available information sources, there must be a lot of other parents in the community who have no idea about this issue either.

EPA RESPONSES TO COMMENTS PERTAINING TO THE LEAD EDUCATION AND ABATEMENT PROGRAM

EPA considers the continuation of the Lead Education and Abatement Program of great importance as well. East Helena residents have expressed how important the program is to their feeling of well-being. Local health professionals are best suited and most qualified to continue to educate the community and to work with the community to develop and administer sensible, effective institutional controls that are neither too invasive nor onerous. This has been a clearly expressed desire of the majority of East Helena residents.

Continuing education is highly desirable to parents and educators in this community. The Lead Education and Abatement Program should continue for that reason, but the program also should continue for the reason that, regardless of the cleanup action level, institutional controls will be necessary in the community and the program is best suited and qualified to administer institutional controls both now and in the future.

Recently, the State Medical Officer for the State of Montana Department of Public Health and Human Services supported EPA's cleanup recommendations in a letter to EPA on April 16, 2007. The State Medical Officer supports continuation of the existing East Helena Lead Education and Abatement Program and establishment of institutional controls to prevent disturbances of contaminated soil and prevent human expose on renovation / demolition of existing houses in East Helena.

The program staff strives to reach all families in the community; however, it appears that some families may have not have been sufficiently informed. EPA has passed this information on to the County. The office is located at 2 South Morton in East Helena and the phone number is (406) 227-8451. Residents can visit the office, or call for an in-home consultation that will be provided at no cost to the resident.

Community Involvement

Currently, ASARCO is funding a county-administered health education and abatement program using health professionals stationed within the community and its schools. The community is advised by health professionals, school administrators, and teachers. The vast majority of East Helena's children are tested at least once during early childhood. Many children are tested repeatedly, although not because they have elevated blood lead levels.

The East Helena Lead Education and Abatement Program manages and implements a successful *and comprehensive education program for residents within the East Helena areas affected by lead. The program is limited to notification of residents located within local zip code 59635. This zip code primarily covers all the areas of affected residents of the past operations of the ASARCO smelter. The lead education and abatement program provides substantial documentation to residents in many forms, including:*

- *Publishing and distributing a quarterly newsletter that talks about the cleanup activities going on in East Helena project areas*
- *Distributing the newsletter to about 3,400 people each quarter*
- *Providing "New Baby" packets, which are sent out six times per year to mothers and/or parents to raise awareness of lead issues. Overall, 300 to 400 packets have been distributed in the last five years*
- *Personnel trained in lead education routinely visit day care centers and schools*
- *At schools, lead education and abatement materials are given out and sent home with students.*
- *Conducting monthly meetings for public input*

Additionally, numerous documents can be referenced online and by visiting the local offices of the EPA, MDEQ, and Lewis & Clark City-County Board of Health. Contact details are provided in the Proposed Plan and additional publicly available resources.

> *EPA Records Center, 10 West 15th Street, Suite 3200, Helena, Montana.*
> *Montana Office of EPA at (406) 457-5000.*
> *www.epa.gov/region8/superfund/mt/east_helena/index.html*

Program Effectiveness

In spring 1999, EPA, ATSDR, the county, MDEQ, and ASARCO reviewed the program's effectiveness using door to door surveys and other evaluation methods. A final report is available from the county health department. The program received high grades for its performance.

Since the program's inception in 1995, 1,060 individual blood lead tests have been conducted for children in East Helena under the age of 7 years. About 1% of the children tested during this period exhibited blood lead values greater than 10 ug/dl. Since 1999, there has been a significant decrease in the numbers of children above the detection limit of 1 ug/dl lead in blood. Since 2001, 95% of children tested were at 4 ug/dl or below and only two children, of 704 children tested, had a blood lead value above 10 ug/dl. Both of these children had blood lead levels of 12 ug/dl. The blood lead level of one of these children was attributable to lead-based paint through an environmental assessment. The cause of the blood lead level of the other child could not be determined because the parent did not allow an environmental assessment. The average of blood lead levels in East Helena and the surrounding community have been 2 ug/dl or less for the last five years, and have been approximately at or less than the national average since 2005. Yet, prior to 1985, two-thirds of East Helena's children exhibited blood lead ratios greater than 10 micrograms per deciliter and one-third exhibited ratios greater than 15 micrograms per deciliter.

East Helena parents have made it clear they desire a continuation of blood lead testing. They recognize that the predictive model provides for no measure of success or attainment of goals. Most parents in this community consider their efforts and those of EPA, the county *administered lead education and abatement program, and Asarco to be a success that may be unparalleled, anywhere. Continued testing eliminates the need for guessing or uncertainty.*

XI. SOIL SAMPLING AND ANALYSIS

COMMENTS

- **Lewis & Clark City-County Board of Health – "The BOH requests that a detailed Standard Operating Procedure (SOP) be provided"**

  The soil sampling and analysis approach is not described in the Proposed Plan for either residential yards or undeveloped land. A Modification of the Administrative Order on Consent for the East Helena Residential Soils Removal Action 1992) indicates that 5 sampling points are used within each removal unit (i.e., residential yard quadrant). Soil is removed to the depth needed to reduce the remaining lead concentration to below 440 ppm and the arsenic concentration to below 100 ppm. The BOH requests that a detailed Standard Operating Procedure (SOP) be provided describing the soil sampling and analytical approach, including the justification for determining the depth to which soils are excavated in residential yards.

  The analytical method is not described in the Modification, but we understand that field portable X-Ray Fluorescence (XRF) analyzers are used to determine arsenic concentrations. Because XRF technology is a field screening approach and is not considered as accurate as laboratory analyses (i.e., EPA Method 600017000 Series using EPA SW-846 protocols for Quality Control requirements [QA/QC]), the BOH recommends that a Quality Assurance Project Plan (QAPP) be implemented to validate the accuracy and precision of the field screening data (at least to a limited extent).

- **Lewis & Clark City-County Board of Health – "It is the opinion that the lead cleanup level should be based on the fine soil fraction"**

  In addition, it is the opinion that the lead cleanup level should be based on the lead concentration in the fine soil fraction. EPA guidance for sampling and analysis of soil at lead sites (USEPA, 2000) indicates that the concentration of lead from the fine fraction of soil (< 250 microns) is relevant for exposure from incidental soil ingestion and should be used over bulk soil analysis. The fine soil fraction is the particle size soil fraction expected to stick to fingers and, thus, become incidentally ingested. In addition, the fine soil fraction is the most likely fraction to accumulate in indoor environments as dust. The Technical Review Workgroup for metals and asbestos (TRW) reviewed data from several Superfund sites and demonstrated that the concentration of lead in the fine soil fraction differs from the concentration in the bulk soil with an enrichment of lead and other metal contaminants observed in the fine soil fraction.

  The EPA lead models consider the fine soil fraction to be the primary source of the ingested soil and dust. Fine soil fraction lead concentrations are the recommended input for both the IEUBK and the Adult Lead Model (USEPA, 2000). A site-specific lead enrichment equation can be developed to relate lead concentrations in the bulk soil and fine fraction (USEPA, 2000).

EPA RESPONSES TO COMMENTS PERTAINING TO SOIL SAMPLING AND ANALYSIS

- *Development of Standard Operating Procedures (SOPs) is outside the scope and detail of the Proposed Plan. However, the subsequent remedial design process requires detailed Work Plans and Sampling and Analysis Plans. EPA considers it prudent to revisit all aspects of the Sampling and Analysis Plan during the remedial design process, including review, updates, and modifications to existing protocols and procedures, if warranted. However, EPA has used a conservative sampling approach to date, as described below.*

  EPA collected soil samples utilizing a protocol for residential yards that produced "biased" results. That is, early in the cleanup process, sampling methods were improved and modified in order to locate the highest lead concentrations of each yard. Depressions and drip lines that collect runoff; play areas that lacked a protective grass barrier; undisturbed areas around the property's periphery; parking areas for trucks and equipment; worn paths from shops or garages; areas showing signs of fallen chipped paint; junk storage areas (batteries, oil, hobbies, etc.); and kennels and pet runways were all areas that sampling teams were required to seek out and collect soil for analysis.

  Analytical results for lead were adjusted to ensure that a statistically-derived upper 95th percentile confidence limit was achieved. That is, every soil sample analyzed for lead was reported first as a raw value and second as the UCL 95% value. The adjusted lead values were used to determine whether or not a yard qualifies for cleanup. Biased sampling and the UCL 95% adjustment, together, resulted in a significantly more conservative outcome than is "required" by EPA's national guidance. To illustrate, the following actual examples are presented:

  1. The residential yard with site code HC05 was sampled in 1991 without biasing the collection of samples and without the UCL 95% adjustment. The analytical results for lead (in parts per million) were Q1 = 658, Q2 = 588, Q3 = 813, Q4 = 685. It did not qualify for cleanup. In 1994, this yard, and an additional 180 other residential yards, were resampled using the biased approach and the UCL 95% adjustment. The analytical results for this same property in 1994, using the biased approach and the UCL 95% adjustment, were Q1 = 1069, Q2 = 957, Q3 = 684,and Q4 = 1033 (ppm lead). This property was cleaned up and all 4 quadrants qualified for cleanup based on the 1,000/500 ppm criteria.

  2. Another residential property (Site Code TK03) was sampled in 1991without biased sampling and without the UCL 95% adjustment. The analytical results for lead (ppm) were Q1 = 336, Q2 = 497, Q3 = 263, Q4 = 338. It did not qualify for cleanup. This yard was resampled in 1994 using the biased approach, which resulted in dividing the yard into 7 sections rather than 4, and the UCL 95% adjustment. The analytical results for this property in 1994 were Sec 1 = 1370, Sec 2 = 747, Sec 3 = 429, Sec 4 = 369, Sec 5 = 872, Sec 6 = 742, and Sec 7 = 510 (ppm lead). This property was cleaned up and 5 of the 7 sections qualified for cleanup.

  These are not isolated examples. Following modification of the sampling and analysis plan in 1994, approximately 60% of the resampled yards were found to qualify for cleanup.

- *The Spectrase 5000 XRF spectrometer has been utilized to accurately and effectively implement the East Helena residential soil cleanup in a timely and cost effective manner. EPA will continue to utilize this tool, or a similar tool, together with the requisite number of cross-checks and data validation procedures (see XRF Technologies for Measuring Trace*

Elements in Soil and Sediment, Innovative Technology Verification Report, EPA/540/R-06/002, February 2006).

XII. COMMERCIAL AND RECREATIONAL RISK-BASED CLEANUP LEVELS

COMMENTS

- **Lewis & Clark City-County Board of Health – "Please provide information regarding how Burlington Northern and Montana Rail Link will be in the railroad right-of-way cleanup"**

  Page 1, 2nd column, last bullet (of the Proposed Plan) - Please provide information regarding how Burlington Northern and Montana Rail Link will be in the railroad right-of-way cleanup.

- **Lewis & Clark City-County Board of Health – "The Preferred Cleanup Alternative should include measures to prevent sub-chronic, acute exposures"**

  Page 21, 2nd column, Paragraph 1 (of the Proposed Plan) - this states "...it is simply not practical to eliminate all sources of and pathways for lead exposure from this large site (the rodeo grounds)." EPA provides no substantiation for this conclusion.

  The soils of the rodeo grounds contain very high concentrations of lead and arsenic. To prevent sub-chronic, acute exposures largely due to fugitive dust emissions, the Preferred Cleanup Alternative should include measures to prevent such exposures.

- **Montana Department of Environmental Quality – The ROD should require cleanup of portions of the rodeo grounds**

  The Record of Decision should require cleanup of the portions of the rodeo grounds with soil levels above the recreational cleanup level of 2,800 ppm lead and 1,000 ppm arsenic.

- **Lewis & Clark City-County Board of Health – Include measures to address upstream contaminant sources to prevent recontamination of creek sediments**

  Prickly Pear Creek Upstream Contaminant Sources - The Proposed Plan should include measures to assure that upstream contaminant sources, such as slag piles, ore storage areas, and the process ponds, are adequately contained or removed to prevent re-contamination of the Creek sediments during major storm and flooding events.

- **Montana Department of Environmental Quality – Provide the supporting basis used to determine the cleanup levels for commercial and recreational use**

  Please provide the assumptions, risk calculations, and risk management basis used to determine the newly proposed soil cleanup levels for commercial and recreational land use. DEQ requests copies of this documentation for review and comment as soon as possible. Also, the Record of Decision should make clear that the soil cleanup levels for commercial and recreational land use apply to the entire operable unit and not just undeveloped lands.

- **Lewis & Clark City-County Board of Health – Please provide the reference for recent calculations establishing RBCs for workers and recreationists**

Page 16, 1st column, last paragraph (of the Proposed Plan) - Please provide the reference for the recent calculations establishing risk-based concentrations of lead and arsenic in soils for undeveloped lands for workers and recreationists.

EPA RESPONSES TO COMMENTS PERTAINING TO COMMERCIAL AND RECREATIONAL RISK-BASED CLEANUP LEVELS

- *EPA has identified both Burlington Northern and Montana Rail Link as Potentially Responsible Parties (PRPs) and both companies are aware that EPA considers them as PRPs. These PRPs, as well as the principal PRP, Asarco, either collectively or individually will be given opportunities to enter into a negotiated consent decree for performance of Remedial Design (RD)/Remedial Action (RA), after the ROD for East Helena is issued. Cleanup of the railroad right-of-way is part of the selected remedy.*

- *Although the rodeo grounds were originally part of OU2 they are now being addressed under the 1998 RCRA Decree, and are therefore not part of OU2.*

- *Contaminant transport from the smelter, during historic floods, occurred primarily because fine, powdery concentrates were stored in piles outdoors until 1988-1989. Floods, such as in 1964 and 1980-1981, as well as numerous other floods that occurred during the first half of the 20th Century, are known to have carried fine concentrates in suspension and deposited them across a broad flood plain downstream. Evidence of these events exists to this day in the formerly irrigated fields north of town and all the way downstream to Lake Helena. However, in 1988-1989, Asarco constructed a large ores and concentrates storage and handling building, which eliminated outdoor storage of raw materials. Shortly after, Asarco also constructed a smelter runoff collection and flood routing system. These were cooperative efforts involving Asarco, MDEQ (then MDHES) and EPA, and they eliminated any further potential for flooding or transport of contamination. Existing residential neighborhoods that were impacted by flooding and contaminant transport were among the first yards, parks, playgrounds, street aprons and alleys to be cleaned up ("yellow zone," 1992-1996). Furthermore,the selected remedy requires completion of a cleanup involving the former irrigation ditches and channels north of town. Approximately 60% of the impacted ditches and channels were cleaned up before the smelter discontinued operations in 2001. All remaining impacted ditches and channels have been characterized and will be cleaned up in 2009 or 2010.*

- *The PRGs referred to in the Proposed Plan for exposure of workers and recreational visitors to lead and arsenic were based on initial calculations that have subsequently been revised to be fully consistent with revised EPA guidance and with PRG calculations for residential exposures. These revised PRGs are described in an EPA technical memorandum dated July 30, 2007. The revised PRGs are as follows: 1482 ppm lead for workers, 3245 ppm lead for recreationists, 572 ppm arsenic for workers, and 794 ppm arsenic for recreationists. The revised PRGs (also referred to as risk-based concentrations) are fully explained and incorporated in the Record of Decision.*

XIII. RISK-BASED CLEANUP ACTION LEVEL FOR SOIL ARSENIC

COMMENTS

- **Lewis & Clark City-County Board of Health – Include cleanup alternatives for arsenic**

  The Proposed Plan does not present cleanup alternatives specific to arsenic. Rather, it indicates that because arsenic is with lead, it should be mitigated through the remedy directed at lead in soils. It is the opinion of the BOH that the Preferred Cleanup Alternative should be revised to ensure the arsenic cleanup level is attained. For example, Alternative 2R should be revised as follows: Selected Soil Removal (lead cleanup level [ppm] and arsenic cleanup level [ppm], Continuing Community Education, and Institutional Controls.

- **Montana Department of Environmental Quality – "The remedy should require that residential soils with arsenic greater than the action level should qualify a yard for cleanup"**

  The remedy should require that residential soils with arsenic greater than the action level should qualify a yard for cleanup.

- **Lewis & Clark City-County Board of Health – Recalculate the arsenic preliminary remediation goal**

  The BOH does not agree that the arsenic Preliminary Remediation Goal (PRG) of 176 parts per million (ppm) is health protective. The PRG was calculated using a target risk of 1.499E-04, which exceeds EPA's acceptable risk range of 1E-06 to 1E-04 (i.e., one in one million to one in ten thousand) (USEPA, 1991) and MDEQ's acceptable risk range of 1E-05 to 1E-06 (i.e., one in one hundred thousand to one in one million). Although EPA guidance indicates that when risks are being estimated they should be considered accurate to one significant figure the BOH does not believe it appropriate to intentionally select the largest target risk that may mathematically be rounded down to 1.0E-04. In addition, EPA indicates a preference for remedies that will achieve the more protective end of the range (i.e., 1.0E-06). Therefore, the arsenic PRG should be recalculated using a target risk within both EPA's and MDEQ's acceptable risk ranges, as well as considering appropriate background concentrations. The BOH acknowledges that background concentrations in Montana may exceed 1.0E-05 (MDEQ, 2005) and must, therefore, be considered in the development of the site-specific PRG for arsenic in East Helena.

  The recalculation of the arsenic PRG should include the contribution from the dermal exposure pathway that was previously omitted (ISSI, 1999). Considering a site-specific relative bioavailability (RBA) for arsenic is not available, the RBA should be conservatively estimated in the 80 to 100% range (as was used in the 1989 [Hunter Services] and 1995 [Kleinfelder] risk assessments), rather than the estimate of 50% used to calculated the arsenic PRG (ISSI, 1999, 2001).

  Cleanup levels selected for arsenic in soils at other mining and mineral processing sites also suggest the East Helena PRG is not protective. For example, 70 ppm of arsenic or greater in soils is the threshold selected by EPA for residential yard removal and replacement at the Vasquez Boulevard & 1-70 superfund site in Denver. Arsenic cleanup levels for residential soils are all 100 ppm or less for the ASARO/El Paso Smelter site, Coeur d' Alene basin, Jacobs Smelter in Utah, Smelter in Utah, Sharon Steel in Utah, and ASARCO/Globe Site in Colorado. Closer to home, Montana DEQ has established a "generic" 40 ppm action level for arsenic in soil that is based on carcinogenic and non-cancer risk analysis (MDEQ 2005).

It is also worth referring to the 1991 Remedial Investigation/Feasibility Study (RI/FS) which presumably provides the basis for the Proposed Plan. This document assessed concentrations of a number of metals and metalloids in residential soils, and used a risk-based modeling approach to develop remedial goals. The target concentration identified in the RI/FS for arsenic is 45 ppm, approximately ¼ the PRG noted in the Proposed Plan (Hydrometrics 1991; see Table 1 0-6-I).

It is the opinion of the BOH that the arsenic contamination remaining in soils may well be a "source of concern" to the community in that cancer probability from exposure to these soils may exceed EPA's range of acceptable risk. It should be noted that EPA's Proposed Plan seems to acknowledge this possibility, in stating: "As arsenic concentrations in soil rise above that value, however, long term exposures (timeline) present risks that may be unacceptable." (page 32).

The development of the arsenic PRG should also allow for the uncertainty associated with the toxicity of arsenic, a known human carcinogen. For example, the California Environmental Protection Agency considers arsenic more toxic than EPA and has adopted a cancer slope factor for arsenic that is 9 times greater than the arsenic cancer slope factor available from EPA (USEPA, 2004a).

- **Montana Department of Environmental Quality – The Record of Decision should list the arsenic Preliminary Remediation Goal of 117 ppm**

  The calculated cancer risk of 1.499E-04 exceeds EPA's "acceptable" risk level of 1.0E-04, as well as DEQ's "acceptable" risk of 1.0E-05. The correct application using 1.0E-04 in the calculation gives an arsenic PRG of 117 ppm. The Record of Decision should list the arsenic PRG of 117 ppm.

- **Lewis & Clark City-County Board of Health – It is erroneous to equate average arsenic levels below 80 ppm to "near natural levels"**

  We would also note that it is erroneous to equate average arsenic levels below 80 ppm to "near natural levels." According to EPA's supporting documentation for East Helena, the background arsenic levels used for comparison range from 15 to 18 ppm, with an average of 16.5 ppm. (Hydrometrics 1991, Table 5-1-1).

<u>EPA RESPONSES TO COMMENTS PERTAINING TO DEVELOPMENT OF ARSENIC RISK BASED CONCENTRATIONS</u>

- *The Proposed Plan presents a summary of how risks from exposure to arsenic were evaluated, explains EPA's rationale for conducting a supplemental arsenic risk evaluation from 1999 to 2001, and outlines the development of cleanup alternatives. The supplemental arsenic risk evaluation resulted in a site-specific, risk-based remediation goal for arsenic in residential settings of 176 mg/kg (ppm). A follow-on comparison was conducted to see if* *there were any individual residential yards or lots that might have arsenic greater than 176 ppm, where lead did not exceed 1,000 ppm. None was found. Moreover, as additional sampling has been conducted each and every year since 2001, this relationship has held together without exception. In addition, only six properties were identified where the average arsenic concentration exceeded 176 ppm. However, after implementation of the lead-based cleanup, all six of these properties will be cleaned up and no property will exceed an average value of 176 ppm.*

Additionally, all soils requiring sampling in the future—residential, commercial, recreational and industrial alike—will continue to undergo analysis for lead, arsenic, and cadmium.

- *Although the reevaluation resulted in an RBC of 176 ppm, EPA has selected in this ROD a lower cleanup action level for arsenic in residential soil (100 ppm), which is the concentration of arsenic that is readily and cost-effectively attained in combination with the selected cleanup action level for lead in residential soil (1,000/500 ppm) and the risk associated with both the RBC of 176 ppm and the selected action level of 100 ppm are within EPA's generally accepted risk range of 1 x10-4 to 1x10-6.).*

- *As mentioned previously, this ROD includes Remedial Action Objectives and cleanup levels for arsenic that are not dependent on the soil lead concentration. Alternatives other than soil removal for remediation of arsenic were not identified because arsenic will be mitigated when lead is removed. For further detail, please see the supplemental response to questions at the end of this responsiveness summary.*

- *The National Contingency Plan for the Superfund program defines EPA's acceptable risk range for known or suspected carcinogens as 10^{-6} to 10^{-4}, not 1.0×10^{-6} to 1.0×10^{-4} (NCP, 1990). The proposed cleanup level for arsenic is within the acceptable risk range as defined by the NCP. The choice of a target risk of 1.499E-04 is intended to avoid the occurrence of what would be considered to be an internal inconsistency. If the target risk used to derive a PRG is based on a target risk of 1.00E-04, this implies that EPA will take action at all locations that exceed the preliminary remediation goal (PRG). However, all properties whose concentration is above the PRG but below 1.499 times the PRG will have a computed risk of 1E-04, which is judged to be acceptable. In that scenario, action would be taken on properties determined to have an acceptable level of risk, thus the inconsistency.*

  The dermal pathway has not been included in the calculation because dermal absorption of metals from soil is generally considered to be minor. For example, if an individual experiences dermal exposure to outdoor soil over about 30% of their body for 100 days per year (this is considered to be quite unlikely for a resident), the absorbed dose is less than 10% of the orally absorbed dose. Studies by Lowney (2005) have shown that while 2-6% of soluble arsenic acid is absorbed percutaneously, Colorado and New York soils containing arsenic (both wet and dry) exhibited negligible dermal absorption of arsenic. EPA agrees this is a source of uncertainty, but considers the likely magnitude of the underestimation to be small.

  The relative bioavailability (RBA) value that was used to derive the PRG is based on measured values in soil at a number of other mining and smelting sites, where most values are observed to range from 10% to 30%. Based on bioavailability studies conducted by Roberts et al (2006) in cynamologus monkeys and USEPA (2005) in immature swine, the evidence strongly supports reduced bioavailability of arsenic from soil. In Roberts et al (2006) arsenic bioavailability was measured for 14 soil samples from 12 different sites, *including mining and smelting sites, pesticide facilities, cattle dip vat soil, and chemical plant soil. The RBAs ranged from 5% to 31%. In USEPA (2005) 26 test materials from mining and smelting sites were investigated with RBAs ranging from 10% to 60%. Thus, a choice of 50% is judged to be more realistic than a value of 80% to 100%, but still protective of human health.*

The observation that other sites have selected PRGs that are different from East Helena is not surprising, because the factors that go into the derivation of the PRG and the risk management strategy vary from site to site. Residential cleanup levels for arsenic in soil range from 70 – 250 ppm in Region 8. The 176 ppm proposed for East Helena is site-specific, is risk-based and is within that range.

While EPA agrees that there is uncertainty in the calculation of the PRG for arsenic, EPA does not believe that the approach employed by California is necessary to protect public health. Rather, EPA believes that there is sufficient conservatism inherent in the exposure factors and toxicity factors that the PRG derived for this site will be protective despite the uncertainties.

- *The comment by the Board of Health, regarding arsenic background concentrations, appears to have confused two different concepts that are discussed consecutively in the Proposed Plan text. The first states, "It is noteworthy that all of the remaining 100 to 110 yards and nine vacant lots that are known to qualify for a cleanup (based upon their lead levels) have an average arsenic concentration well below 176 ppm. The majority of them are below 80 ppm." The second states, "Due to the cleanup already conducted, the community-wide average arsenic-in-soil concentration is now near natural levels." The first concept addresses arsenic-in-soil concentrations for residential yards that have not been remediated. The second concept refers to the fact that the average arsenic-in-soil of any given neighborhood, as well as the community-wide average, already approaches natural levels (i.e., approximately 40 mg/kg) and will be further reduced once the cleanup has been completed. The expression "near natural levels" was not being defined as an arsenic soil concentration of 80 ppm.*

XIV. EXTENT OF CONTAMINATION

COMMENTS

- **Laura and Brian Vachowski - The plan suggests EPA has no knowledge of the extent of contamination on undeveloped property**

  The plan suggests EPA has no knowledge of the actual extent of contamination on undeveloped property. We therefore question the accuracy of the boundary map provided in the plan. Moreover, it is premature to be proposing a final plan for a Superfund site if, in fact, the EPA does not even know the extent of the contamination because, for instance, if that is indeed the case, the cost estimates used for alternative comparisons cannot possibly be accurate.

- **Lewis & Clark City-County Board of Health – "Provide a figure depicting the extent of arsenic contamination in East Helena"**

Page 5 (of the Proposed Plan) - Please provide a figure depicting the extent of arsenic contamination in East Helena (similar to Figure 1 that depicts the extent of lead contamination).

- **Lewis & Clark City-County Board of Health Revise Figure 1 – Provide a map showing the East Helena City Boundary, lands owned by ASARCO, the railroads, and other major landowners.**

  Page 5, Figure 1 (of the Proposed Plan) - Please provide a map showing the East Helena City Boundary, lands owned by ASARCO, the railroads and other major landowners.

EPA RESPONSES TO COMMENTS PERTAINING TO EXTENT OF CONTAMINATION

- *Regarding the figure showing the extent of lead contamination, the lead isoline depicting the outermost extent of properties likely to exhibit a single value exceeding 1,000 ppm lead (red isoline) has an associated confidence of 97.5%. That means, outside of the isoline, there is less than a 2.5% chance that additional sampling will reveal a single value in a yard greater than the action level. Thus, confidence is high and uncertainty is low that this isoline marks the outer limit of the residential cleanup based on the selected remedial action. Nevertheless, confirmation sampling will be conducted whenever appropriate.*

  The yellow isoline (outer isoline) gave EPA an indication, albeit with less confidence and less certainty, due to lesser sampling frequency, the location of properties that are likely to exceed 500 ppm lead. This isoline was useful for the Proposed Plan and for consideration of an alternative action level for residential yards (i.e., 500 ppm lead, for example, included properties within and around the outer, yellow isoline). Sampling of at least another 900 to 1,000 properties would have been necessary in order to identify the likely outer extent of that alternative action level. The outer isoline, though less certain, gave EPA the best information available for estimating the cost differential between Alternative 2R and Alternative 3R. The outer, yellow isoline does lend some assistance to administrators of ICs, who will in the future make decisions about the need for additional sampling whenever a change in land use is to be considered. As more and more sampling is performed around the outer isoline, statistical certainty and confidence will approach levels of certainty and confidence now afforded by the intensity of sampling that has already been conducted within and around the inner, red isoline.

  As undeveloped lands come under consideration for a change in land use, sampling will be required. This approach is already in practice and has proven to be the most efficient and cost-effective way to deal with proposed changes in land use for undeveloped lands. Landowners and developers are benefited when they work with the County's subdivision review process after a new use is proposed.

- *EPA has provided in the Record of Decision a figure showing the extent of arsenic contamination. The extent of arsenic contamination has been presented in previous site characterization studies. For example, Figure 5-1-6. Isoline map of total surface soil arsenic (ug/g) in the East Helena Area was presented in the Comprehensive Remedial Investigation/Feasibility Study, vol. 1, 1990.*

- *EPA purposely has not established a site boundary. Early soil characterization efforts revealed that the effect of the smelter's emissions were measurable over a large area in the Helena valley. Final cleanup standards and procedures are established in this final ROD,* *which in turn give regulators and administrators of ICs greater authority to correct and manage impacts on human health and the environment than an arbitrary boundary.*

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ATTACHMENT

Lewis and Clark City-County Board of Health
Draft Regulations

SECTION 1. AUTHORITY, SCOPE, AND REVISIONS

TITLE

(1) These regulations will be known and cited as: THE REGULATIONS GOVERNING SOIL DISPLACEMENT AND DISPOSAL FOR LEAD CONTAMINATED SOIL FROM EAST HELENA AND THE SURROUNDING AREA IN LEWIS AND CLARK COUNTY, MONTANA.

AUTHORITY

(1) The Lewis and Clark City-County Board of Health promulgates these regulations under the authority of Section 50-2-1 16(2)(l)(i), MCA.

FINDINGS

(1) The Lewis and Clark City-County Board of Health finds that:

(a) The United States Environmental Protection Agency (EPA) has identified and designated East Helena and the surrounding area as a Superfund site, and in 1984 placed such site on the EPA's National Priorities List for clean up and remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

(b) The primary lead smelter, owned by ASARCO, is the source of contamination.

(c) East Helena and the surrounding area, as shown in Figure 1, contain lead contaminated soils; and

(d) Regulation of soil displacement is necessary to prevent lead contamination of uncontaminated areas, prevent recontamination of remediated areas, and prevent potential health risks to humans, especially small children; and

(e) These regulations are necessary to protect public health and to control environmental lead pollution within the boundaries of Figure 1.

SCOPE

(1) These regulations apply to any soil displacement, with the exception of landscaping and tilling of agricultural fields and gardens, within the boundaries shown in Figure 1.

(2) ASARCO's primary lead smelter in East Helena, American Chemet, Helena Sand and Gravel, and Helena Regional Airport are excluded from these regulations except when large redevelopment projects are proposed. Prior notification to the East Helena Lead Program is required.

REVISION

(1) After notice and public hearing, the Lewis and Clark City-County Board of Health may revise these regulations to ensure proper administration and to allow for improved mitigation measures for lead-contaminated soil in the area depicted in Figure 1.

SECTION 2. GENERAL REGULATIONS

2.1 PROHIBITED ACTIVITY

(1) No person shall displace soil, with the exception of landscaping and tilling of agricultural fields and gardens, within the area shown in Figure 1 without first complying with the permit procedures and requirements as provided in Section 3, except that, in accordance with Section 9621(e) of Title 42 of the United States Code, nothing contained in this section shall require or be construed to require the obtaining of a permit by any agency, employee, or contractor of the United States, the State, or ASARCO for activities conducted entirely within the East Helena Superfund site carried out in compliance with the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S. C Section 9601, et seq. and the Resource Conservation and Recovery Act, 42 U.S.C. Section 6901, et seq., and approved by EPA in consultation with the State.

2.2 VIOLATIONS

(1) Failure to have a permit.
(2) Failure to post the permit at the site.
(3) Failure to comply with the permit.

2.3 FEES

No fees will be charged to obtain a permit.

SECTION 3. PERMIT PROCEDURES AND REQUIREMENTS
3.1 APPLICATION PROCESS FOR PERMIT

(1) All persons will abide by the following requirements prior to displacement of soil in the area shown in Figure 1:

(a) Apply for permit.

(b) Make an appointment to meet with Health Department staff to discuss a project plan. The project plan will include, but not be limited to, such information as the location and nature of the proposed activity or development; the dimensions of all surface areas to be displaced; the depth of any proposed excavation and volume of soil to be excavated or displaced. Staff will meet with applicant within five working days.

(c) Submit the project plan for approval.

(1) [sic] At this point, the Health Department staff will examine existing soil sampling records to determine lead levels of the property. If no record of previous sampling exists, the Health Department staff may require sampling of the soil as soon as possible. The soil sampling will occur in the area to be displaced. The soil sampling will be done at no cost to the property owner.

(2) Health Department staff may approve or modify the project plan, which contains the results of soil sampling and the method for controlling contaminated-soil disposal. Approval of plan and issuing a permit will be made within five working days after all information is supplied to staff.

(3) Individual education will be provided for each applicant.

(4) Only after the Health Department staff approves the project plan, will the permit be granted.

(a) The applicant or the applicant's representative must comply with the approved project plan.

(5) The applicant must prominently display the permit tag supplied' by the Health Department at the site until Health Department staff completes the final inspection.

(a) The applicant or the applicant's representative must notify Health Department staff when the project is ready for a final inspection.

(6) Permits will be valid for one year after date of issue.

3.2 CONTROL OF SURPLUS SOIL DISPOSAL

(1) Surplus soil from residential areas may be reused only on the property of origin.

(2) Surplus soils will be transported by the homeowner or by the East Helena Lead Education Program, for disposal to an EPA-approved repository.

(3) Commercial properties may use all of the existing soils on site as long as appropriate plans for barriers and capping have been reviewed and approved by Health Department staff. Excess soils must be transported to an EPA approved repository.

(4) Applicants will be responsible for placing excess soil in an area that is directly accessible to the East Helena Lead Education Program or their contractor, so that the soil can be easily transported. Soil must be stored as directed by Health Department staff.

SECTION 4. ENFORCEMENT AND SEVERABILITY

4.1 ACCESS RIGHTS

(1) The Lewis and Clark City-County Health Department is authorized and directed to make such inspections as are necessary to determine compliance with these regulations.

(2) It is the responsibility of the owner, occupant, or contractor of a property to give the Lewis and Clark City-County Health Department free access to the property at reasonable times for the purpose of making such inspections as are necessary for determining compliance with these regulations.

(3) No person may interfere with representatives of the Lewis and Clark City-County Health Department in the discharge of their duty.

4.2 PENALTIES FOR VIOLATIONS

(1) Violations of any of the provisions of these regulations are a misdemeanor and are punishable as provided for in Section 50-2-124, Montana Code Annotated.

4.3 INJUNCTIONS

(1) The County Attorney may commence an action to restrain and enjoin acts in violation of these regulations. Violation of any such injunction is subject to punishment by the issuing court.

4.4 SEVERABILITY

(1) In the event that any section, subsection, or other portion of these regulations is for any reason held invalid or unconstitutional, such section, subsection, or portion will be considered a separate provision of these regulations and such holding will not affect the validity of the remaining portions of these regulations which will remain in full force and effect.

SECTION 5. DEFINITIONS

CERCLA - The Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986,42 U.S.C. Section 9601, et seq. CERCLA is the law that governs Superfund activity.

COMMERCIAL PROPERTY OR SITES Property or sites having profit as a chief aim, excluding daycares, schools, and agricultural property.

EPA U. S. Environmental Protection Agency.

LEAD-CONTAMINATED SOIL Soil that contains lead in concentrations sufficient to pose unacceptable health risks to children.

PERMIT Means the written authorization from the Lewis and Clark City-County Health Department to disturb the soil in the area shown in Figure 1.

PPM LEAD Lead in soil expressed in parts per million.

RCRA The Resource Conservation and Recovery Act, 42 U.S.C. Section 6901, et seq.

REPOSITORY An EPA-approved location for the disposition of contaminated soils.

RESPONSIBLE PARTY The responsible party is ASARCO.

SOIL DISPLACEMENT Relocation of soil on a single piece of property. Soil displacement does not include landscaping, tilling of agricultural land or gardens when no surplus soil is removed from the area.

SOIL SAMPLING Collection and analysis of surface soil samples taken either as part of the Superfund cleanup action or taken in response to meeting conditions of this permit process. The soil sampling, if required, shall be conducted at no cost to the property owner.

SECTION 6. REPEALER AND EFFECTIVE DATE

6.1 All previous rules, regulations, resolutions and ordinances as adopted by the Lewis and Clark City-County Board of Health governing soil disturbances in Lewis and Clark County are hereby repealed.

6.2 These regulations will be in full force and effect on the day of ______.

6.3 These regulations will be reviewed and evaluated by the Lewis and Clark City- County Board of Health two years from the effective date, and every two years thereafter.

Lewis and Clark City & County Board of Health

Jennifer Winterstenen, Chair
Board Of Health

Melanie Reynolds, Health Officer
Lewis and Clark City-County Health Department

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1.07.06.00
P&E

ADMINISTRATIVE RECORD

City of East Helena

Mayor
Terrie Casey

Council Members
Chris Anderson
Wayne Krieger
Ed Stipich
Anthony Strainer

City Attorney
Mike Rieley

City Clerk
Sandra Milsten

Deputy Clerk
Susan Spotorno

Public Works Director
Jim Rice

Wastewater Superintendent
Bill Casey

Chief of Police
Mac Cummings

City Judge
Larry Murphy

Fire Chief
Troy Maness

P.O. Box 1170
East Helena
Montana 59635

City Offices
406-227-5321

City Fax
406-227-5456

Police Admin.
406-227-8686

ENVIRONMENTAL PROTECTION AGENCY
DEC - 4 2006
MONTANA OFFICE

Site # EH File 1.07.06.00
Confidential: Yes ____ No ✓
Admin. Record: Yes ✓
Key Words/Comments: City of East Helena comments on draft proposed plan

November 28, 2006

John Wardell, Director
Region VIII
Helena EPA Office
10 West 15th Street
Suite 3200
Helena, Montana 59626

Dear Mr. Wardell:

The City of East Helena recently received the revised "Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands", which is the predecessor of the Record of Decision. We have some concerns with this plan. The City of East Helena and its residents have been working with EPA for many years to correct the environmental contamination brought about by ASARCO. For nearly 15 years the action level for remediation on residential soils was at 1,000ppm lead. If there was any quadrant of a residential lot that measured 1,000ppm or greater, that yard was cleaned in all areas that had lead levels of 500ppm. This was deemed an adequate measure of cleanup by the EPA and appears to be so as evidenced by the continued success of the blood lead screenings of local children. Our children's blood lead levels are <u>well below</u> the national average. I attribute this success to a number of things, obviously the cleanup of soils, and education of children and their parents, along with making everyone in the community aware of the hazards. The proposed plan has one alternative, 3R, that recommends remediation which there is a measurement of 500ppm lead in the soil. Since 1991 there have been 570 residential lots cleaned up using the trigger action level of 1,000ppm. How will this new plan affect yards that have already been remediated? Will some residences be seen as "contaminated" even though their yards have been remediated under the initial regulations? It seems like a poor plan to begin remediation under one set of regulations and then to change the standards when the end of the cleanup and a Record of Decision is in sight. This has the potential to create conflict within the community and has legal ramifications as far as citizens purchasing property through a realtor and being assured, not only by the realtor, but also by the Lewis and Clark Lead Abatement office, as well as Hydrometrics that their yard has been cleaned up to the designated standards. The City of East Helena has done it's best to maintain a great place for families to live, work, recreate and attend school. We have lived through the troubles of

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being named a Super Fund Cleanup Site and then with the closure of ASARCO. We have been able to maintain the standard of service for our residents, but have begun to use our cash reserves due to the lack of tax dollars from ASARCO. The City and our residents need to see this come to closure. We want to be able to attract new commercial businesses to replace our tax base. If the remediation is too onerous, we will not be able to do this. We want to see the Record of Decision with the continuation of the remediation level at 1,000ppm. The statistics that the Lead Abatement office has, will support this.

We have worked well with the Lewis and Clark County Lead Abatement office and would like to see funding in place for them to continue with the blood testing and education of citizens of the community. They have blended into the community well and they continue to aid the community with site visits to day cares, educating children and parents in nutrition and good hygiene habits. They currently are the handlers of institutional controls (which are voluntary, due to no Record of Decision) and are the most reasonable entity to continue to do so. They work in conjunction with the Lewis and Clark Department of Health, East Helena City Council, and Lewis and Clark County Health Department.

The City of East Helena has worked with the EPA in the past and expects to continue to do so in the future. We need some help. We have a city to continue to operate, the health of the residents is in better condition with the changes that have been implemented over the years. We want the Record of Decision to continue with the level of remediation that was originally put in place so we can move on. The Council and I are available to meet with you to discuss this letter and any concerns you may have. Thank you.

Sincerely,

Terrie Casey

Terrie Casey, Mayor

Cc: Scott Brown – EPA
Richard Opper – DEQ
Jan Williams – Lead Abatement Office
Deb Tillo – Lead Abatement Office

ADMINISTRATIVE RECORD

EAST HELENA PUBLIC SCHOOLS

School District No. 9
P.O. Box 1280 * East Helena, MT. 59635
Superintendent/Administration Office (406) 227-7700
Eastgate Elementary School (406) 227-7770 * Radley Elementary School (406) 227-7710
East Valley Middle School (406) 227-7740

"Success For All"

ENVIRONMENTAL PROTECTION AGENCY
MAR 19 2007
MONTANA OFFICE

March 12, 2007

Mr. Scott Brown
USEPA
Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

Dear Scott,

The East Helena Public Schools (EHPS) Board of Trustees would like to express their support for the finalization of the EPA Record of Decision (ROD). We believe that the ROD is an essential element to the continued well being of this community, its citizens and our children. We believe that the scientific evidence that has been examined by experts in the field has sufficient credibility to support the finalization of this decision. Realizing that this evidence has been examined extensively we now request that the plan be completed quickly for the well being of our community.

The EHPS Board of Trustees strongly supports the ideals of protection of human health and the environment. As a board we believe that the continued support of the EPA, DEQ, Lewis & Clark County officials and the Asarco Corporation will create an umbrella of oversight that guarantees the continued good health of our community from unforeseen challenges.

Sincerely,

Joe Cohenour Chairman	Marcia Ellermeyer Vice-Chair	Mark Diehl Trustee
Don Hoffman Trustee	Kit Johnson Trustee	Ann Marie Thompson Trustee

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EAST HELENA PUBLIC SCHOOLS
School District No. 9
P.O. Box 1280 * East Helena, MT. 59635
Superintendent/ Administration Office (406) 227-7700
Eastgate Elementary School (406) 227-7770 * Radley Elementary School (406) 227-7710
East Valley Middle School (406) 227-7740
"Success For All"

March 28, 2007

Scott Brown
USEPA
Federal Building
10 West 15th Street
Suite 3200
Helena, MT 59626

Dear Scott,

As the Superintendent of East Helena Schools, my chief concern is for the well being of the children and residents of this community. As a teacher, principal and superintendent in this school district for the past 23 years, I feel I have a unique perspective of the current situation. This perspective allows me to see that this community has many protective needs, not just from the lead in the soil, but from the economic damage of <u>not</u> making a decision on proper protective levels as well.

After listening to a number of experts speak on the protective levels recommended by the EPA and hearing the arguments for and against those recommendations, I am concerned about the emotional involvement in this decision and how that has been used to influence an appropriate decision. I'm concerned that a guess or an emotional untested set point will be given credibility when there is scientific evidence and research that shows accurate depictions of protective level set points. I hope that science and common sense rule this decision and not emotional, arbitrary input. Unproven opinions that lack data and scientific evidence, that offer feelings as the basis for decision making, should be weighed carefully in deciding the future of East Helena.

Residents question the validity of such irrational thinking as simply a means to perpetuate for the Asarco business to finance state and federal agencies for their own benefit, not that of the community as a whole. The lack of East Helena community members at the EPA hearings should be an excellent indicator that the community is very satisfied with the proposed plan. Certainly the absolute chaotic meetings of the 80's when the community did NOT support the decisions should be a very good indicator of their support with these recommendations.

The concerns that I have regarding this ROD are more about making an educated decision than any other point. The City of East Helena deserves to have this process move forward. The data supports the recommendation of the EPA scientists, not the feeling of the opponents of the ROD. Since individuals felt that there was not enough data I decided to look into the matter myself and requested and received the 2006 blood lead data comparisons with the lead concentrations in the soil of their residence and graphed them. That data is attached. Using simple Microsoft Excel graphing tools I was able to plot the points and compare them to the IEUBK prediction and the best fit linear regression line drawn by the EPA scientists (Bill Brattin, et al.). I ask that you review this graph and draw your own conclusions. Since not a single child in East Helena has had a blood level over 10 in the last 7 years, I would be hesitant to conclude that the IEUBK model accurately picks a protective level for our town. Further the average blood lead level of all sampled children in 2006 was 1.3 ug/dl when the national average was 1.7 ug/dl.

The IEUBK is an extremely close match to the 1993 Hydrometrics Inc. data when graphed with a third data point, the airborne lead particulates. When the air becomes a pathway for ingestion of lead you can clearly see that between 1.5 and 2.5 micrograms of lead dust in a cubic meter of air nearly matches the IEUBK model. My concern is that East Helena has tested hundreds of children and has data to prove that the IEUBK model is not an accurate depiction of the real information we have about East Helena lead pathways. Please consider these details in making a decision regarding approving the ROD. This decision has many far reaching effects on the community that include the economic viability of the town as well as the health of its residents.

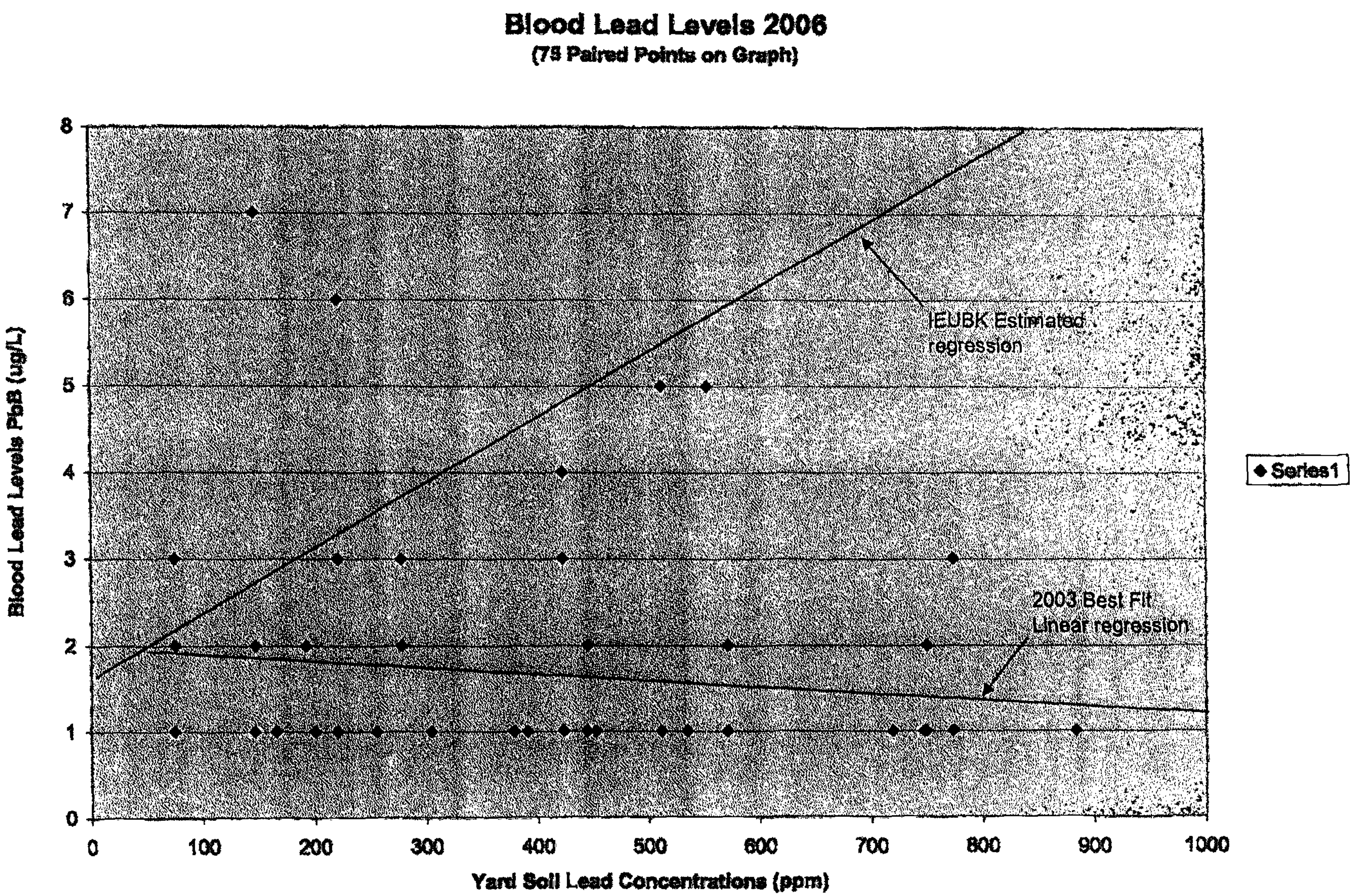
Certainly the protection of the residents and the children are paramount, but let's not build a vehicle that has child seat restraints, helmets, pillows and already deployed air bags when making a Record of Decision.

Sincerely,

RWhitmoyer

Ron Whitmoyer
Superintendent

Attachments:
Blood Lead Graph - Excel
Blood Lead Graph -- Hydrometrics



Blood Lead Levels 2006
(75 Paired Points on Graph)
Blood Lead Levels PbB (ug/L)
8
7
6
5
4
3
2
1
0
0
100
200
300
400
500
600
700
800
900
1000
Yard Soil Lead Concentrations (ppm)
IEUBK Estimated regression
2003 Best Fit Linear regression
◆ Series1

EAST HELENA LEAD EVALUATION
Soil/Air/Blood

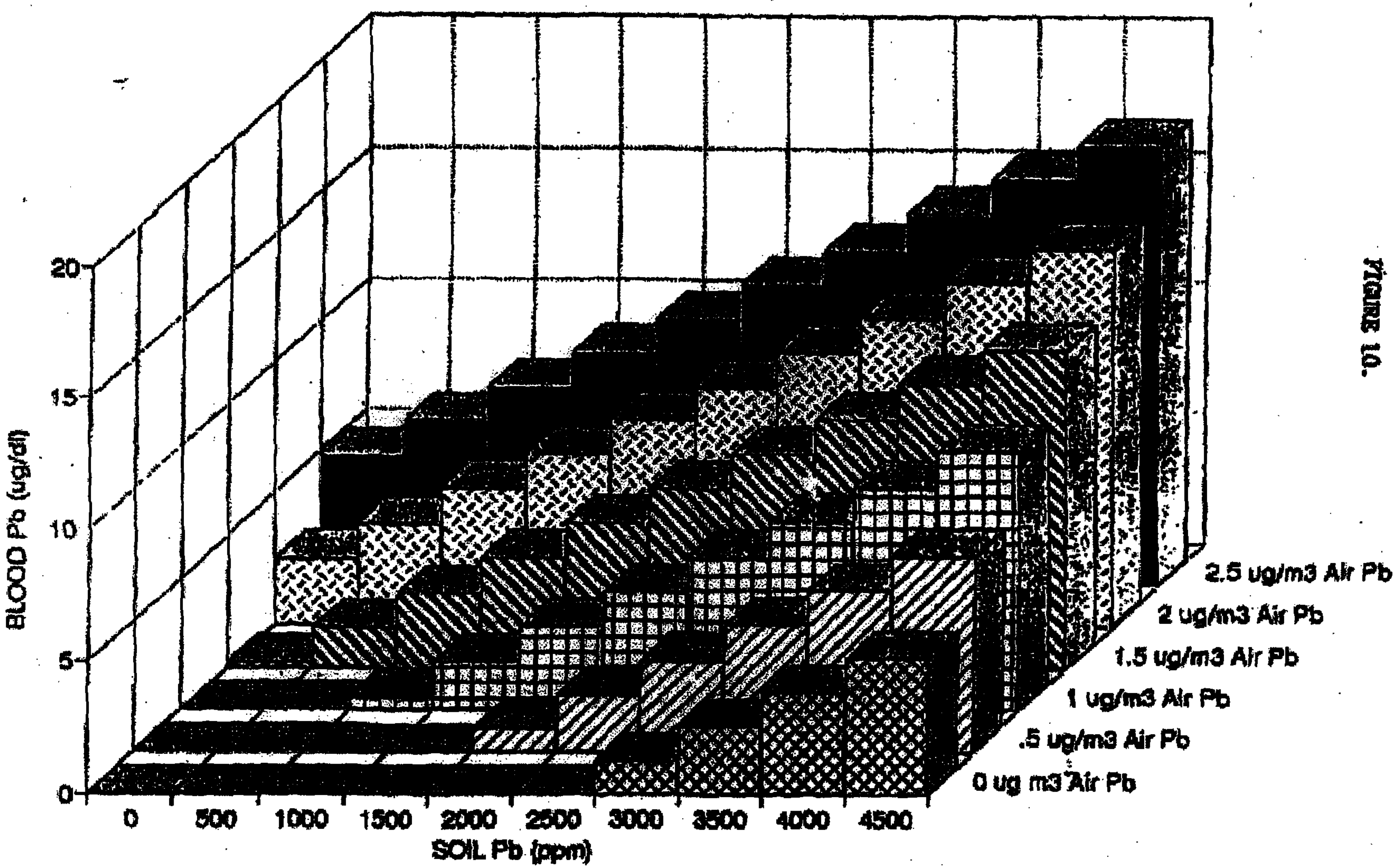


FIGURE 10.

(Source: East Helena, Montana, Soil, Blood and Air Lead Data Evaluation, Hydrometric, Inc, 1993)

ADMINISTRATIVE RECORD

City of East Helena

APR 12 2007
MONTANA OFFICE

Site # EH File 1.07.06.00
Confidential Yes ___ No ✓
Admin. Record Yes ✓ No ___
Key Words/Comments: Comments on proposed plan

Mayor
Terrie Casey

Council Members
Chris Anderson
Wayne Krieger
Ed Stipich
Anthony Strainer

City Attorney
Mike Rieley

City Clerk
Sandra Milsten

Deputy Clerk
Susan Spotorno

Public Works Director
Jim Rice

Wastewater Superintendent
Bill Casey

Chief of Police
Mac Cummings

City Judge
Larry Murphy

Fire Chief
Troy Maness

P.O. Box 1170
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Montana 59635

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City Fax
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Police Admin.
406-227-8686

April 10, 2007

Mr. Scott Brown
Mr. John Wardell
USEPA
Federal Building
10 West 15th Street
Suite 3200
Helena, MT 59626

Dear John Wardell and Scott Brown:

The City Council of East Helena has been involved in its area's Superfund Cleanup since inception. The City Council wants to be on the record as having unanimously voted in support of Alternative 2R of the Proposed Record of Decision by the EPA.

It is our belief that the blood lead studies show that the clean up program has been a success. The children in East Helena have lower blood levels than the national average. When the program started, the action plan was to clean a yard if any quadrant contained lead levels in excess of 1000ppm. This action level has remained to date. The information provided during the public meeting in East Helena on January 25, 2007, clearly demonstrates that no benefit would be gained by changing that action level.

During the presentation the IEUBK model was discussed. If one had limited, or no background data, it might seem reasonable that the numbers produced from that model could be accurate. However, since many years of data does exist, it seems more reasonable that existing information should be included in the model. The numbers from the blood level studies obviously demonstrate and substantiate the success of the existing action plan and action level. As stated by doctors from the EPA itself, there would be no expectation of improved blood lead levels by cleaning up yards with over 500ppm lead instead of 1,000ppm. If indeed any substantive probability of enhancing the children's health had been shown to result from lowering the action level, the City Council would be supportive of doing so. However, given the information at hand, this late stage of the program is not the time to change the plan.

It is the City Council's belief that yard cleanup at the existing action level in conjunction with the Lead Education Program appears to be the reason the program has been such a success. The evidence just doesn't support changing that action level when there is no expectation of blood level improvement. Nor does it support the expenditure of many more thousands of dollars.

The City Council is hopeful you will choose Alternative 2R of the Proposed Record of Decision. It is time for the superfund status of the City of East Helena to come to an end and allow us to look forward to the future.

Sincerely,

Terrie Casey, Mayor

cc: Sandra Olson, DEQ
Daryl Reed, DEQ

APR-16-2007 08:59 From:CITY OF EAST HELENA 4062275456 To:4064575056 P.1/1

ADMINISTRATIVE RECORD

EDWARD STIPICH

219 E Riggs
PO Box 1726
East Helena, MT 59635
406-227 6682
Stypich@yahoo.com

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Site # EH File 1.07.06.00
Confidential Yes ____ No ✓
Admin. Record: Yes ✓ No ____
Key Words/Comments: Comments on proposed plan

footnote: Mr. Stipich is currently a member of the County Board of Health, and a City Councilman; former mayor.

April 16, 2007

Scott Brown
EPA
Federal Building
10 West 15th Street
Helena, MT 59626

Dear Scott,

Since its inception I have been involved in the East Helena Superfund Clean-up. Back then I was mayor of East Helena and I have always had the health and well-being of our citizens at heart. I have not always agreed with the EPA's politics and methods during the clean-up, but after all these years I do agree that it is time to bring the clean-up to an end. As experts have repeatedly stated, it has been a success. Blood lead level studies show that children in the East Helena area have lower blood lead levels than the national average. ASARCO is closed now, and there are no longer any concerns about toxic emission. Yards have been replaced. Is the county willing to replace yards again, when expert doctors from the EPA have asserted this action would not improve blood lead levels in our children and at what cost?

I say, enough is enough. The City of East Helena has been in financial and economic limbo without the ability to expand, attract new business, and enlarge our tax base. It is time to bring closure to the clean-up, so we can move forward, allow economic development and ease the tax burden on our citizens.

Sincerely,
Ed Stipich
Ed Stipich
Councilman

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1.07.06.00 P1 of 1

LEWIS AND CLARK CITY-COUNTY BOARD OF HEALTH

ADMINISTRATIVE RECORD

Joan Miles, J.D.
Director
MT DPHHS
PO Box 4210
Helena MT 59604

Re: Request for Comments by DPHHS on Proposed Plan

Dear Joan:

On behalf of the Lewis and Clark City-County Board of Health, I am writing to request that the Montana Department of Public Health and Human Services (DPHHS) review and submit comments on the Proposed Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands. The comment period ends March 16, 2007. A request to EPA by the Board of Health is pending to extend the comment period.

The issues involved in the Proposed Plan are complex and have significant, far-reaching public health implications for our county. Because responsibility for implementing institutional controls and protecting public health in East Helena may involve the Board of Health and City-County Health Department, we respectfully request review and comments by your agency.

I would be happy to discuss this request in more detail. Thank you for your assistance.

Sincerely,

Melanie Reynolds

Melanie Reynolds, M.P.H.
Health Officer
Lewis and Clark County

Cc: Board of County Commissioners
✓ Scott Brown, E.P.A.
John Wardell, E.P.A.
Richard Opper, D.E.Q.
Daryl Reed, D.E.Q.
Steve Helgerson, DPHHS
Jane Smilie, DPHHS

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LEWIS AND CLARK
CITY-COUNTY BOARD OF HEALTH

1930 Ninth Avenue
Helena, Montana 59601
Telephone 4-HEALTH or dial 443-2584
Fax 406-457-8990

April 13, 2007

Mr. Scott Brown
U.S. EPA, Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

Subject: Comments on the Proposed Plan for East Helena Residential Soils

The Lewis & Clark City-County Board of Health (BOH) would like to take this opportunity to present comments to the United States Environmental Protection Agency (EPA) regarding the Proposed Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands (Proposed Plan). The mission of the Lewis & Clark City-County Health Department (the "Health Department") is to improve and protect the health of all County residents. The Health Department administers the East Helena Lead Education and Abatement Program and has worked collaboratively with the East Helena community, EPA, and the Montana Department of Environmental Quality (MDEQ) since 1996. Once the BOH received the Proposed Plan in January 2007, we performed a detailed review of the Plan, numerous supporting documents, as well as epidemiological, toxicological, and EPA guidance reports. In addition, the BOH has been involved in several discussions and informational sessions and has attended training for long-term stewardship of hazardous waste sites. A thorough review was necessary to provide substantive comments from the BOH's long-term public health perspective.

The role of the Health Department (including its governing Board of Health) will increase significantly once the EPA and Potentially Responsible Parties have completed remedial actions to alleviate health threats posed by contaminated soils in and around East Helena. Indeed, the Health Department will be the entity primarily responsible for implementation and management of the institutional controls associated with the cleanup alternatives, including not only the continuation of educational programs, but potentially verification sampling at proposed land developments and assessment of indoor contaminant levels.

Our primary responsibility for the East Helena cleanup is protection of public health. However, because of the management responsibilities and potential liability that would be imposed on the Health Department by the use of institutional controls, we also must comment on long-term efficacy of the Proposed Plan. Our review of the Proposed Plan and numerous supporting documents, including epidemiological and toxicological studies as well as EPA guidance and reports from other similar projects at listed National Priorities List (NPL) sites, has convinced us that EPA has not substantiated the rationale for selection of the Preferred Cleanup Alternative. Our reasons, provided in the form of general comments, specific comments and questions on the following pages, are generally based on a lack of supporting documentation, inconsistency with EPA guidance, and the use of uncertain assumptions by EPA to document contaminant exposure potential and predicted health risks.

The most obvious concern we have with the Preferred Cleanup Alternative, and one that has received the most public attention, has to do with cleanup levels for residential soils. EPA has proposed an action level of 1,000 parts per million (ppm) lead in soil for cleanup, despite the Agency's own deterministic risk assessment indicating a protective cleanup level would be 520 ppm. We acknowledge two elements of this debate. First, as EPA has pointed out and used as a justification for the higher action level, lead concentrations in children's blood have steadily decreased the past 10 years, and are now equivalent to national averages. This is a notable success for the agencies involved and the community of East Helena. The second component of the debate is, however, more compelling and stems from the Health Department's responsibility for health protection, now and in the future.

EPA's preferred remedy may only be currently protective of children's health (with respect to lead) because of the education and outreach program. This means the program will have to be implemented in perpetuity; otherwise, without adult awareness and intervention (in the form of voluntary testing of children) blood lead levels may well increase given the exposure scenarios remaining in East Helena yards and surrounding lands. Indeed, this is what EPA's own risk assessment would predict, with an action level of 1,000 ppm in residential soils.

The BOH has concerns regarding the long-term protectiveness of the preferred cleanup alternative and believe it relies too heavily on institutional controls like community education and blood lead testing. Clearly, an education and testing program would always be subject to adequate funding levels, advocate support, and changing political priorities. Our preference is for a remedy that would eliminate, or at least substantially reduce, the need for perpetual oversight, monitoring, education and intervention. We believe lower cleanup levels may achieve that objective.

This is not to say that the BOH is in disagreement with all aspects of the EPA's Preferred Alternative. We believe there are many positive attributes to alternatives incorporated in the Proposed Plan, not least of which are the achievements of the blood-lead education and monitoring program. However, we are convinced that a more protective remedy can and should be implemented, and this can only be done through a collaborative process involving, at a minimum, EPA, MDEQ, the East Helena community, the Health Department, and other appropriate stakeholders.

We understand the urgency felt by many in East Helena to make a final decision on residential soils and implement the remedy. Residents of East Helena deserve closure, not just from the disruption of yards and neighborhoods, but also with respect to future economic development of properties in and around the city. We concur that all effort should be taken to reach a decision. However, the BOH believes we should not sacrifice deliberative and substantiated decision-making to expedite a process that has already consumed more than twenty years of study and response. The BOH will commit all available resources to work with East Helena, MDEQ, EPA and other stakeholders in the coming months to develop a remedy that is fully protective of residents and minimizes, to the extent possible, future liability to the County and landowners.

Please do not hesitate to contact Melanie Reynolds, County Health Officer at 457-8910 should you have questions concerning our comments, or to discuss future deliberations for this important decision.

Sincerely,

Christine Deveny

Christine Deveny
Vice Chair
Lewis & Clark City-County Board of Health

Melanie Reynolds

Melanie Reynolds, M.P.H.
Health Officer
Lewis and Clark City-County Health Dept.

Cc: John Wardell, EPA
Sandi Olsen, MDEQ
Daryl Reed, MDEQ
Mary Capdeville, MDEQ
Mayor Terrie Casey, East Helena
Lewis & Clark Board of County Commissioners
City-County Board of Health

Attachment: Lewis & Clark City-County Board of Health's comments

LEWIS & CLARK CITY-COUNTY BOARD OF HEALTH'S COMMENTS FINAL CLEANUP OF EAST HELENA'S RESIDENTIAL SOIL AND UNDEVELOPED LAND

1.0 INTRODUCTION AND PURPOSE

The Lewis & Clark City-County Board of Health (BOH) would like to thank the United States Environmental Protection Agency (EPA) for this opportunity to comment on the Proposed Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands (Proposed Plan). The mission of the Lewis & Clark City-County Health Department is to improve and protect the health of all County residents. The City-County Health Department administers the East Helena Lead Education and Abatement Program and has worked with the East Helena community, EPA, and the Montana Department of Environmental Quality (MDEQ) since 1996. Once the BOH received the Proposed Plan in January 2007, we performed a detailed review of the Plan, numerous supporting documents, as well as epidemiological, toxicological, and EPA guidance reports. In addition, the BOH has been involved in several discussions and informational sessions and has attended training for long-term stewardship of hazardous waste sites. A thorough review was necessary to provide substantive comments reflecting the BOH's responsibility to improve and protect the long-term health of residents in our communities. Our comments are presented below.

2.0 GENERAL COMMENTS

2.1 ARSENIC CLEANUP LEVEL, PRG OF 176 PPM

The BOH does not agree that the arsenic Preliminary Remediation Goal (PRG) of 176 parts per million (ppm) is health protective. The PRG was calculated using a target risk of 1.499E-04, which exceeds EPA's acceptable risk range of 1E-06 to 1E-04 (i.e., one in one million to one in ten thousand) (USEPA, 1991) and MDEQ's acceptable risk range of 1E-05 to 1E-06 (i.e., one in one hundred thousand to one in one million). Although EPA guidance indicates that when risks are being *estimated* they should be considered accurate to one significant figure (USEPA, 1989), the BOH does believe it appropriate to intentionally select the largest target risk that may mathematically be rounded down to 1.0E-04. In addition, EPA indicates a preference for remedies that will achieve the more protective end of the range (i.e., 1.0E-06). Therefore, the arsenic PRG should be recalculated using a target risk within both EPA's and MDEQ's acceptable risk ranges, as well as considering appropriate background concentrations. The BOH acknowledges that background concentrations in Montana may exceed 1.0E-05 (MDEQ, 2005) and must, therefore, be considered in the development of the site-specific PRG for arsenic in East Helena.

The recalculation of the arsenic RPG should include the contribution from the dermal exposure pathway that was previously omitted (ISSI, 1999). Considering a site-specific relative availability (RBA) for arsenic is not available, the RBA should be conservatively estimated in the 80 to 100% range (as was used in the 1989 [Hunter Services] and 1995 [Kleinfelder] risk assessments), rather than the estimate of 50% used to calculated the arsenic PRG (ISSI, 1999, 2001).

Cleanup levels selected for arsenic in soils at other mining and mineral processing sites also suggest the East Helena PRG is not protective. For example, 70 ppm of arsenic or greater in soils is the threshold selected by EPA for residential yard removal and replacement at the Vasquez Boulevard & I-70 superfund site in Denver. Arsenic cleanup levels for residential soils are all 100 ppm or less for the ASARCO/El Paso Smelter site, Coeur d' Alene basin, Jacobs

Smelter in Utah, Midvale Smelter in Utah, Sharon Steel in Utah, and ASARCO/Globe Site in Colorado. Closer to home, Montana DEQ has established a "generic" 40 ppm action level for arsenic in soil that is based on carcinogenic and non-cancer risk analysis (MDEQ 2005).

It is also worth referring to the 1991 Remedial Investigation/Feasibility Study (RI/FS) which presumably provides the basis for the Proposed Plan. This document assessed concentrations of a number of metals and metalloids in residential soils, and used a risk-based modeling approach to develop remedial goals. The target concentration identified in the RI/FS for arsenic is 45 ppm, approximately ¼ the PRG noted in the Proposed Plan (Hydrometrics 1991; see Table 10-6-1).

It is the opinion of the BOH that the arsenic contamination remaining in soils may well be a "source of concern" to the community in that cancer probability from exposure to these soils may exceed EPA's range of acceptable risk. It should be noted that EPA's Proposed Plan seems to acknowledge this possibility, in stating: "As arsenic concentrations in soil rise above that value, however, long term exposures (lifetime) present risks that may be unacceptable."(page 32). We would also note that it is erroneous to equate average arsenic levels below 80 ppm to "near natural levels." According to EPA's supporting documentation for East Helena, the background arsenic levels used for comparison range from 15 to 18 ppm, with an average of 16.5 ppm. (Hydrometrics 1991; Table 5-1-1).

2.1.1 Soil Sampling and Analysis for Arsenic

The soil sampling and analysis approach is not described in the Proposed Plan for either residential yards or undeveloped land. A Modification of the Administrative Order on Consent for the East Helena Residential Soils Removal Action (USEPA, 1992) indicates that 5 sampling points are used within each removal unit (i.e., residential yard quadrant). Soil is removed to the depth needed to reduce the remaining lead concentration to below 440 ppm and the arsenic concentration to below 100 ppm. The BOH requests that a detailed Standard Operating Procedure (SOP) be provided describing the soil sampling and analytical approach, including the justification for determining the depth to which soils are excavated in residential yards.

The analytical method is not described in the Modification, but we understand that field portable X-Ray Fluorescence (XRF) analyzers are used to determine arsenic concentrations. Because XRF technology is a field screening approach and is not considered as accurate as laboratory analyses (i.e., EPA Method 6000/7000 Series using EPA SW-846 protocols for Quality Assurance/Quality Control requirements [QA/QC]), the BOH recommends that a Quality Assurance Project Plan (QAPP) be implemented to validate the accuracy and precision of the field screening data (at least to a limited extent).

2.1.2 Arsenic Toxicity

The development of the arsenic PRG should also allow for the uncertainty associated with the toxicity of arsenic, a known human carcinogen. For example, the California Environmental Protection Agency (Cal-EPA) considers arsenic more toxic than EPA and has adopted a cancer slope factor for arsenic that is 9 times greater than the arsenic cancer slope factor available from EPA (USEPA, 2004a).

2.2 LEAD CLEANUP LEVEL OF 1,000 PPM

Although not clearly described in the Proposed Plan, the BOH understands (through correspondence and discussions with EPA) the lead cleanup level was determined based on the blood lead data from East Helena and a quantitative uncertainty analysis using EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model.

First, the BOH does not agree that the data from the blood lead studies should be used in establishing the lead cleanup level. EPA guidance indicates, "The Office of Solid Waste and Emergency Response (OSWER) recommends that blood-lead studies not be used to determine future long-term risk where exposure conditions are expected to change over time; rather, they be considered a snapshot of ongoing exposure under a specific set of circumstances (including community awareness and education) at a specific time" (USEPA, 2006a). It is the opinion of the BOH that several factors are likely contributing to the measured blood lead levels in East Helena and do not represent the future, potential health risks to soil and dust exposures. Factors that may be affecting the blood lead studies include, but are not limited to, community awareness/education, evaluation of a non-random, convenience sample (i.e., voluntary participation), the cleanup of several residential yards in East Helena since 1991, the cessation of smelter emissions, and the discontinuation of leaded gasoline. Furthermore, although the blood-lead studies appear to be representative both spatially and based on soil lead concentrations (USEPA, 2007), the blood-lead studies are not true epidemiological studies that incorporate several additional factors, such as socioeconomics and education level of the parents.

Second, differing opinions regarding the quantitative uncertainty analysis exist within EPA. It is the BOH's understanding that the EPA Region VIII toxicologists believe a quantitative uncertainty analysis can be used in conjunction with the IEUBK to develop a range of potential cleanup values; while, EPA's Technical Review Workgroup for metals and asbestos (TRW) believe a deterministic assessment resulting in a single cleanup value is appropriate (TRW, 2006). The TRW is an EPA interoffice workgroup with the specific mission to review applications of lead risk assessment methodologies and is responsible for developing national guidance and documentation on the structure, application, and validation of the IEUBK Model. The BOH does not have the level of expertise to determine which EPA opinion is the most scientifically valid for East Helena. In the interest of protecting public health, we believe it is prudent to use the more conservative approach, in which the deterministic assessment is used to generate a single cleanup value.

Consequently, the BOH believes that a deterministic approach using predictive blood lead modeling should be used to establish a health-protective cleanup level for lead in East Helena. Blood lead modeling should be focused on the most-sensitive potential receptors (i.e., children and fetuses). The IEUBK Model is appropriate for childhood receptors; however, the BOH has specific recommendations for input values that are described in the following section. EPA's Adult Lead Model is appropriate for estimating fetal blood lead concentrations for pregnant women exposed to lead contaminated soil (USEPA, 1996). Fetal blood modeling should be included in the development of a health protective lead cleanup level in East Helena. Specifically, a soil contact-intensive scenario should be evaluated to assess the health protectiveness of the lead cleanup level for fetal receptors (e.g., a pregnant female construction worker exposure scenario) (USEPA, 2004b).

2.2.1 IEUBK Modeling

In performing the IEUBK modeling, the BOH believes it is appropriate to use the site-specific data obtained for (1) the soil/dust absorption fraction of 71% *relative* bioavailability (35.5% when expressed as an *absolute* bioavailability) (USEPA, 1999b) and (2) the fraction of soil in dust term of 0.17. The remainder of the exposure parameters should not be adjusted from the default values, as described below:

- Soil Ingestion Rates - EPA guidance indicates the default soil and dust ingestion values are based on several observation studies of soil ingestion in children and are appropriate and representative estimates of soil ingestion for U.S. children. The IEUBK Model was calibrated and validated with the default soil/dust ingestion values; therefore, EPA (2006a) indicates it is unknown how the use of alternate ingestion rates would impact the model predictions. Adjustments to the soil/dust ingestion rates may only be made after approval by EPA's Office of Emergency and Remedial Response (OERR).

Before the soil/dust ingestion rates measured in the Anaconda study could be used in the IEUBK Model, the ingestion study (Stanek and Calabrese, 2000) must be submitted to OERR for review by the Technical Review Workgroup for metals and asbestos (TRW). If the OERR approves of the adjustment to the soil/dust ingestion rates, they will be incorporated into the guidance and shared among other EPA Regions (USEPA, 1999a). Therefore, the BOH believes the default soil and dust ingestion values are most appropriate.

- Geometric Standard Deviation (GSD) - EPA guidance (USEPA, 2006a) indicates that site-specific estimates of GSD should not be substituted for the default value without detailed, scientifically defensible studies documenting site-specific differences in child behavior or lead biokinetics. Such site-specific studies are not available for East Helena. Therefore, the BOH believes the default GSD is most appropriate.

The BOH appreciates the responses from and the discussions held with EPA Region VIII toxicologists regarding this issue. We understand from these discussions that the EPA Region VIII toxicologists have a differing opinion than the TRW regarding the use of variable inputs, specifically for soil ingestion rates and GSD (TRW, 2006). In the interest of protecting public health, we have chosen the more conservative of the EPA opinions (i.e., TRW).

Using the appropriate input values (as described above), the IEUBK Model predicts a lead cleanup concentration of 520 ppm (using the geometric mean as the point estimate). In other words, a lead cleanup concentration of 520 ppm would limit the risk of childhood blood lead levels exceeding 10 micrograms per deciliter (μg/dl) to 5% of the population (i.e., the current OSWER cleanup goal) (EPA, 1994).

2.2.2 Soil Sampling and Analysis for Lead

The soil sampling and analysis approach is not adequately described in the Proposed Plan for either residential yards or undeveloped land. A Modification of the Administrative Order on Consent for the East Helena Residential Soils Removal Action (USEPA, 1992) indicates that 5 sampling points are used within each removal unit (i.e., residential yard quadrant). Soil is removed to the depth needed to reduce the remaining lead concentration to below 440 ppm and the arsenic concentration to below 100 ppm. The BOH requests that a detailed SOP be provided describing the soil sampling and analytical approach, including the justification for determining the depth to which soils are excavated in residential yards.

The analytical method is not described in the Modification, but based on communications and discussions with EPA we understand that field portable XRF analyzers are used to determine lead concentrations. In addition, XRF measurements were initially validated against laboratory analyses, but were discontinued as the level of confidence increased with the XRF data. Because XRF technology is a field screening approach and is not considered as accurate as laboratory analyses (i.e., EPA Method 6000/7000 Series using EPA SW-846 protocols for Quality Assurance/Quality Control requirements [QA/QC]), the BOH recommends that a QAPP be implemented to validate the accuracy and precision of the field screening data (at least to a limited extent).

In addition, it is the BOH's opinion that the lead cleanup level should be based on the lead concentration in the fine soil fraction. EPA guidance for sampling and analysis of soil at lead sites (USEPA, 2000) indicates that the concentration of lead from the fine fraction of soil (<250 microns) is relevant for exposure from incidental soil ingestion and should be used over bulk soil analysis. The fine soil fraction is the particle size soil fraction expected to stick to fingers and, thus, become incidentally ingested. In addition, the fine soil fraction is the most likely fraction to accumulate in indoor environments as dust. The Technical Review Workgroup for metals and asbestos (TRW) reviewed data from several Superfund sites and demonstrated that the concentration of lead in the fine soil fraction differs from the concentration in the bulk soil with an enrichment of lead and other metal contaminants observed in the fine soil fraction.

The EPA lead models consider the fine soil fraction to be the primary source of the ingested soil and dust. Fine soil fraction lead concentrations are the recommended input for both the IEUBK and the Adult Lead Model (USEPA, 2000). A site-specific lead enrichment equation can be developed to relate lead concentrations in the bulk soil and fine fraction (USEPA, 2000).

2.2.3 Lead Toxicity

The development of the lead cleanup level should also allow for the uncertainty associated with the toxicity of lead, a probable human carcinogen. Recent data indicates that blood lead levels below 10 µg/dl may cause significant health effects. EPA (2006b) indicates "Even children with low lead exposure levels (having blood lead levels of 5 to10 µg/dl or, possibly, somewhat lower) are at notable risk, due to the apparent non-linear dose-response relationships between blood lead and neurodevelopmental outcomes". Further, EPA (2006b) indicates "There is no level of lead exposure that has yet been identified, with confidence, as clearly *not* being associated with possible risk of deleterious health effects". Regarding fetal exposure, studies have found that women who have been exposed to lead in childhood have accumulated large stores in their bones that may mobilize from bone to blood during late pregnancy and lactation. An increased risk of spontaneous abortion, neurobehavioral deficits in offspring and, in some studies, gestational hypertension, have been reported at pregnancy blood lead levels at concentrations less than 10 µg/dl (EPA 2006b).

The BOH *appreciates the information provided from* EPA *(2007) regarding the Centers for* Disease Control explanation for the present level of concern of 10 µg/dl (used in the current OSWER cleanup goal). Indeed from this explanation, and recognition that many current environmental and public health policies at the federal level do not represent scientific consensus, it is possible that the level of concern may not be lowered at anytime in the foreseeable future. Then again, over the past few decades, the blood lead level of concern has decreased from 40 µg/dl to 10 µg/dl. The BOH believes it is reasonable to anticipate the level may decrease again in the future. Our belief is supported by substantial current scientific literature. EPA has noted as recently as October, 2006: "Some recent studies of Pb neurotoxicity in infants have observed effects at population average blood-Pb levels of only 1 or 2 µg/dl; and some cardiovascular, renal, and immune outcomes have been reported at blood-Pb levels below 5 µg/dl." (EPA 2006b) As such, the lead cleanup level should be developed taking into consideration this possibility.

2.3 CLEANUP ALTERNATIVES

The BOH does not believe a sufficient number of cleanup alternatives were developed in the Proposed Plan. In particular, the range of alternatives for residential soils was too limited. The Proposed Plan does not:

- Describe the other remedial alternatives that were considered and dismissed from consideration; or
- Provide rationale for why protective remedies (such as testing of indoor spaces and insulation removal, where warranted) are not included in the alternatives.

EPA should expand the development of alternatives to allow for a more thorough review of potential remedies for East Helena soils. Funding mechanisms should be included in and described for all of the alternatives.

Specifically, the BOH requests that alternatives be developed and evaluated with the goal of fully remediating the lead and arsenic contamination in East Helena to health protective levels that would minimize the complexity and longevity of the institutional controls. Elements of such an alternative should include, but not be limited to, the following:

- Complete the remediation of residential soils to health protective cleanup goals
- Complete the remediation of streets and road aprons to health protective cleanup goals
- Prepare a projected land use forecast through the Joint Consolidated City-County Planning Board and the East Helena City Council with public participation, so as to accurately forecast and designate future land uses (and thereby establish appropriately protective soils cleanup levels)
- Develop a cost estimate to remediate undeveloped lands based on the projected land use forecast
- Fully fund remedial approaches based on projected land use
- Provide funding for residents of homes (that were constructed prior to closure of the smelter) within the East Helena study area to replace exposed insulation (such as in attics) that may have accumulated substantial quantities of airborne contaminants
- Establish Institutional Controls to manage the remediation fund and oversee remediation and to track mandatory and voluntary remedial actions.

2.4 PREFERRED CLEANUP ALTERNATIVE

The BOH has concerns that the Proposed Plan does not appear to conform with EPA guidance or statutory requirements. In particular, the lack of transparency in development and screening of alternatives has prevented the public from understanding the range of possible alternatives considered, or the benefits and drawbacks associated with these options. Typically, a proposed plan is tiered from a remedial investigation/feasibility study (RI/FS), which provides the detailed supporting documentation for possible alternatives: costs, effectiveness, technical feasibility, and so forth. However the only RI/FS referenced in the Proposed Plan dates to 1991 (Hydrometrics, 1991). Considering the 16 years of experience EPA has gained since that RI/FS, studying and attempting to remediate metals-contaminated sites across the U.S., there surely have been technological and policy advances that should be incorporated into the alternatives. It should be noted that most of the EPA guidance concerning risk assessment, remedial actions, site studies, and decision-making has been published or revised since 1991, strongly indicating that the sole RI/FS for soils cleanup should have been revised, or at least supplemented, before publication of a Proposed Plan.

EPA has indicated that the RI/FS has been updated, and notes on page 17 of the Proposed Plan: "Many of the alternatives developed at that time, however, are no longer considered viable; due principally to the substantial amount of cleanup that has since occurred. Therefore, EPA developed new alternatives that incorporate many of the features of the original alternatives, but are relevant for current conditions." If this is the case, EPA should provide the new analysis disclosing how and why some alternatives are no longer viable. The supporting documentation for new alternatives should be made available to the public for review, and the Proposed Plan should specifically reference these documents.

One example of the problems raised in using a 15+ year old RI/FS is conformance with guidance and statute. For example, as noted in the Proposed Plan (page 26), the alternatives must be evaluated against nine criteria. One of the threshold criteria that must be met is compliance with state and federal regulations (i.e., Applicable or Relevant and Appropriate Requirements [ARARs]). The Proposed Plan indicates the EPA has evaluated the alternatives for compliance with ARARs, but there was no documentation referenced or readily available for public review that would substantiate this conclusion. The only document discussing ARARs that we found applicable to the East Helena residential soils is the 1991 RI/FS (Hydrometrics, 1991). It is reasonable to expect that some state and federal regulations will have changed since that time, and an updated analysis is critical. If this has been done (for example, with the "new" alternatives that EPA references on page 17 of the Proposed Plan) then EPA should make the analysis readily available to the public.

Similarly and in general, the EPA should supply a specific list of reference documentation pertinent to the Proposed Plan. Otherwise, it is very difficult for the public and public agencies to identify and locate documentation relevant to the subject.

According to EPA guidance, the Proposed Plan should provide "either a summary of the support agency's agreement with the plan or its dissenting comments" (EPA 1999c). This requirement is clearly supported by statute, as "EPA must respond to State comments.....on the Preferred Alternative when making the RI/FS and Proposed Plan available for public comment" (NCP §300.515(d)(4)). A responsiveness summary addressing comments from MDEQ was not included in the Proposed Plan. By not making interested parties fully aware of MDEQ's dissenting comments and publishing them in the proposed plan, EPA has failed to meet its statutory public disclosure obligations or follow its own guidance for the CERCLA decision-making process.

2.4.1 Scope of Preferred Cleanup Alternative

For the Preferred Cleanup Alternative to be protective of human health and environment, it is the BOH's opinion that the scope of the alternative must be expanded. Specifically, the Preferred Cleanup Alternative should address the following:

- Arsenic - The Proposed Plan does not present cleanup alternatives specific to arsenic. Rather, it indicates that because arsenic is co-located with lead, it should be mitigated through the remedy directed at lead in soils. It is the opinion of the BOH that the Preferred Cleanup Alternative should be revised to ensure the arsenic cleanup level is attained. For example, Alternative 2R should be revised as follows: Selected Soil Removal (lead cleanup level [ppm] and arsenic cleanup level [ppm]), Continuing Community Education, and Institutional Controls.

- Attic Dust – To prevent subchronic, acute exposures to high concentrations of metals that may be present in the attic dust of homes in East Helena, the Preferred Cleanup Alternative should include measures to prevent such exposures. Acute exposures to attic dust have been reported in other smelter areas (Montana Standard, 2004). In addition, the Record of Decision (ROD) for the Butte Priority Soils Operable Unit of the Silver Bow Creek/ Butte Area Superfund Site includes measures to mitigate attic and other household dust traps that may have accumulated substantial metal and metalloid concentrations during operational years of the smelter.

- Other potential pathways for metal exposure - for example contaminated soil in earthen – walled basements or crawl spaces, and dust in heating and venting ducts.

- Rodeo Grounds – The soils of the rodeo grounds contain very high concentrations of lead and arsenic. To prevent subchronic, acute exposures largely due to fugitive dust emissions, the Preferred Cleanup Alternative should include measures to prevent such exposures.

- Prickly Pear Creek Upstream Contaminant Sources – The Proposed Plan should include measures to assure that upstream contaminant sources, such as slag piles, ore storage areas, and the process ponds, are adequately contained or removed to prevent re-contamination of the Creek sediments during major storm and flooding events.

2.4.2 Long-Term Effectiveness and Permanence of the Preferred Cleanup Alternative

The City-County Health Department administers the East Helena Lead Education and Abatement Program. The purpose of this Program is to prevent and reduce elevated blood lead levels in children and we assist in this effort by coordinating blood lead screenings, providing education to at-risk groups, and conducting voluntary environmental assessments. The BOH believes this program has been effective and are pleased with our working relationship with EPA and MDEQ. However, the BOH believes the Preferred Cleanup Alternative relies too heavily on institutional controls, including community education, which, in turn, minimizes the alternative's long-term effectiveness and permanence. Because institutional controls play a very significant role in the Preferred Cleanup Alternative, the BOH believes it will necessitate in-perpetuity blood lead monitoring of the children of East Helena. In addition, contamination will remain at undeveloped lands (until the land use is changed) requiring the City-County Health Department and other local government entities to oversee these undeveloped lands and their potential, future remedial actions.

It is the opinion of the BOH that additional alternatives should be developed and evaluated that will focus on the Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment and, thereby, maximize the Long-Term Effectiveness and Permanence of the remedy.

2.4.3 Implementability of the Preferred Cleanup Alternative

2.4.3.1 Deep Tillage for Undeveloped Lands

The BOH has concerns with the implementability of the deep tillage remedy for undeveloped lands proposed under the Preferred Cleanup Alternative. These concerns must be addressed prior to the selection of the Final Cleanup Alternative. These concerns are listed below:

- In Place Treatment - deep tillage should not be presented as a *treatment* remedy, nor is it an *innovative* technology (it has been used on sites for many years, and was included as an option for undeveloped lands in East Helena more than 16 years ago; Hydrometrics 1991). Deep tillage dilutes the contaminant concentration in the surface soil through mixing with deeper soil. Further, EPA's characterization of the "reductions" in lead *concentrations are misleading, as the Proposed Plan does not also point out that the total* mass of contaminant in the subsurface is not lessened by tilling.

- Mobilization - deep tillage may mobilize contaminants to concentrate in other, deeper strata at levels even greater than were found in the target shallow zone. The BOH believes the EPA should provide a more detailed assessment of the mobilization potential associated with this remedy.

- Rocky geology – rock out-croppings in the surface and near surface geology may prevent effective deep tillage of soils. In a treatability plot performed in the Asarco West Field, the maximum attainable tillage depth was 20 inches even with prior field preparation using a dozer to rip to 15 inches below ground surface (Hydrometrics, 1997). The desired tillage depth for the treatability plot was 30 inches. Considering that numerous subsurface rocks will likely be encountered in many locations, the BOH believes the EPA must provide an alternate remedy for such locations/conditions.

- Increased soil volume – deep tillage will likely increase the volume of soil as "loose" soil volumes are typically significantly greater than "compact" soil volumes. The Preferred Cleanup Alternative must consider options for the increased soil volume, particularly if the approach is not successful in achieving the lead and arsenic cleanup levels.

- Weed management – disturbance of soil through deep tillage may cause weed infestation problems. Weed management practices and funding should be considered for the Preferred Cleanup Alternative.

2.4.3.2 Institutional Controls

The BOH has several concerns with the implementability of the institutional controls that must be addressed prior to the selection of the Final Cleanup Alternative. These concerns are listed below:

- Effectiveness in Preventing Exposures - The institutional controls, common to all the cleanup alternatives (except "No Action"), play a significant role in the protection of human health in East Helena and the surrounding area. Considering the health protectiveness of the cleanup alternatives rely heavily on the effectiveness of the institutional controls, the BOH would like information regarding their anticipated effectiveness prior to the selection of the Final Cleanup Alternative. Such information should be gathered from other hazardous waste sites where the selected remedy relied heavily on institutional controls. In addition, an approach should be defined to monitor or measure the effectiveness of the institutional controls in East Helena over time. For example, will future blood lead data be the only measure of effectiveness, or will additional data, such as in-home environmental assessments, community interviews, or enforcements, also measure/monitor effectiveness?

- Content – To effectively develop and implement institutional controls, the BOH requires more information regarding their content. EPA should provide a list of recommendations and ideas that have been used successfully at other hazardous waste sites, as well as operational/management ideas. In addition, the BOH requests examples of the specific legal language used to establish "successful" institutional controls at other sites.

- Enforceability – The BOH has concerns with enforceability of the institutional controls. Prevention of certain potential exposures does not appear to be enforceable, such as exposures within residences (e.g., attic dust) and the long-term Best Management Practices (BMP) for agricultural areas. Prior to the selection of the Final Cleanup Alternative, EPA must provide examples of specific mechanisms to be included in the Institutional Controls for such exposures.

- Funding – The City-County Health Department does not have the financial resources to develop, implement, manage, and enforce the institutional controls. As such, the BOH will accept responsibility for the institutional controls only if sufficient funding will be available. The BOH health requests that the EPA provide detailed information and justification regarding the development of the cost estimates for the institutional controls, as well as the proposed funding mechanisms. Specifically, the BOH would like to ensure the following types of services are included in the cost estimates.

    - Soil sampling and analysis
    - Blood lead monitoring
    - In-home environmental assessments and contaminant abatement
    - Management of agricultural areas – the City-County Health Department does not have expertise in agricultural BMPs, nor does Lewis & Clark County have a department specializing in agricultural practices.
    - Air quality monitoring to evaluate the effectiveness of the agricultural BMPs
    - Expansion of the community education programs to include families not residing in East Helena, but whose children attend school or daycare in East Helena.
    - Free permits – EPA emphasized free permits, presumably to ensure that homeowners and landowners are not unduly burdened by the institutional controls. The permits may have a significant cost to the City-County Health

Department through permit preparation, review and administration; soil testing; and in-home environmental assessments.

- Contingencies – the cost estimates should allow for the possibility that the cost estimates will not be sufficient to adequately manage the Institutional Controls.

2.4.4 Community Acceptance

The Proposed Plan indicates (p. 25) that developers or land owners that wish to change the use of undeveloped lands must meet all the requirements and specifications for the new use and will bear all associated cleanup costs. This element of the Preferred Cleanup Alternative could have significant economic impacts to the community of East Helena. Therefore, the EPA should provide justification for transferring the cost of cleanup of undeveloped lands from the PRP to the landowner and/or developer. EPA should also provide a legal analysis regarding liability under the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA) describing how the liability is transferred from the PRP to the landowner/developer.

3.0 SPECIFIC COMMENTS

Page 1, 1st column, paragraph 3 – The proposed plan applies only to existing residential soils and offers recommendations only for undeveloped lands. Will undeveloped lands be monitored only through institutional controls after the Record of Decision (ROD) is approved?

Page 1, 2nd column, last bullet – Please provide information regarding how Burlington Northern and Montana Rail Link will be involved in the railroad right-of-way cleanup.

Page 2, 2nd column, paragraph 2 – Please provide a description of EPA's 5-year review. Who will perform the 5-year review? Will random sampling be conducted? Will an evaluation plan or protocol be developed and in place? How will it be determined whether the cleanup was sufficient or whether the institutional controls are working? What if problems are found?

Page 5, Figure 1 - Please provide a map showing the East Helena City Boundary, lands owned by ASARCO, the railroads and other major landowners.

Page 5 – Please provide a figure depicting the extent of arsenic contamination in East Helena (similar to Figure 1 that depicts the extent of lead contamination).

Page 10, 2nd column, paragraph 2 – Who is the risk management team? The proposed plan states, "All of the *alternative input values* utilized were specifically requested by the *risk management team* and are deemed to be scientifically valid." Please identify the composing members of the risk management team.

Page 16, 1st column, last paragraph – Please provide the reference for the recent risk-calculations establishing risk-based concentrations of lead and arsenic in soils for undeveloped lands for workers and recreationists.

Page 17, 2nd column, first complete paragraph, under the 1R alternative – Please describe the "other sources" of funding that may be available? Who would be responsible for securing those sources of funding?

Page 19, The BOH requests that the EPA state the local government will only accept the responsibility of Institutional Controls as long as there is funding in place.

Page 19, 2nd column, Paragraph 1 - Why are yard averages or property averages being used versus the protocol in place which uses individual quadrant analysis? Does EPA propose changing the protocol to yard averages?

Page 21, 2nd column, Paragraph 1 – this states "...it is simply not practical to eliminate all sources of and pathways for lead exposure from this large site (the rodeo grounds)." EPA provides no substantiation for this conclusion.

Page 21, 2nd Column, Paragraph 2 - Who will have the ultimate long-term responsibility for the management, operation, and monitoring of the soil repository at the East Fields? Who covers the cost of this? Will other soil repository areas be needed for the cleanup? Please provide more details regarding this topic and the area.

Page 26 and 27 – The Proposed Plan indicates that alternative 2R and 3R are "by all known measures" equally protective. Please explain further. What are "all known measures"?

Page 29, Community Acceptance, Paragraph 2. This paragraph is incorrect. While the BOH does support protection of human health, we do not link human health protection to such criterion as "at the most reasonable cost." The BOH requests this paragraph be omitted.

4.0 REFERENCES

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ADMINISTRATIVE RECORD

DEPARTMENT OF PUBLIC HEALTH AND HUMAN SERVICES

BRIAN SCHWEITZER
GOVERNOR

JOAN MILES
DIRECTOR

STATE OF MONTANA

www.dphhs.mt.gov

Site # EH File 1.07.06.00
Confidential: Yes ____ No ✓
Admin. Record: Yes ✓ No ____
Key Words/Comments: Comments on proposed plan from the Montana State epidemiologist

April 16, 2007

Scott Brown
US EPA, Federal Building
10 West 15th Street
Suite 3200
Helena, MT 59626

Dear Mr. Brown:

I am writing in response to "Plans for a final cleanup of East Helena's residential soils and undeveloped lands" which EPA announced in January 2007 for the East Helena Superfund Site (Operable Unit No. 2). My comments concern the parts of the plan that, in my view, are the most important for protecting the public's health with regard to exposure to lead.

While it would be ideal to eliminate lead and other heavy metals from areas both exterior (e.g., soil) and interior (e.g., dust or old paint) to living units, it is not feasible to achieve this ideal. In contrast, the plan proposed by the EPA appears to be feasible. The plan includes cleanup of a residential yard in which any quadrant has soil with lead concentration exceeding 1000 ppm. Cleanup in those yards would include all areas with lead concentrations exceeding 500 ppm.

I agree this reduction in soil lead concentration is desirable. However, because it is impossible to remove all lead-bearing soils, there will continue to be risk of ambient exposure in people's living environments from contaminated dust (not to mention lead-based paint), and continuing efforts to minimize those exposures will be important. As long as any lead concentration is detectable in interior dust, the following parts of the EPA proposed plan are essential for protecting the public health:

A. Continue the existing East Helena Lead Education and Abatement Program, and
B. Establish institutional controls that prevent disturbances of contaminated soil that would remain in East Helena, and prevent human exposure to interior household dust during renovation or demolition of existing housing stock in East Helena.

Achieving these two parts of the EPA proposed plan must have the highest possible priority. To the extent funds are available to implement and evaluate implementation of the proposed plan, these funds need to be preferentially targeted to these two components of the plan.

Sincerely,

Steven D. Helgerson

Steven D. Helgerson, MD, MPH
State Medical Officer

cc: Melanie Reynolds, MPH
Health Officer, Lewis and Clark County Health Department

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ADMINISTRATIVE RECORD

PROTECTION AGENCY
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MONTANA OFFICE

Montana Department of
ENVIRONMENTAL QUALITY

Brian Schweitzer, Governor

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D&E

April 12, 2007

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Key Words/Comments: Comments on proposed plan

John Wardell
U. S. Environmental Protection Agency
Region VIII, Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626

SUBJECT: Department of Environmental Quality Comments on the Proposed Plan, East Helena Superfund Site, Montana.

Dear Mr. Wardell:

Thank you for the opportunity to provide State input on the issued proposed plan received January 11, 2007. DEQ supports EPA in proposing a soil lead action level of 500 ppm for the undeveloped lands proposed for development but would also support the risk-based concentration of 610 ppm throughout the operable unit. DEQ also tentatively supports EPA's proposed recreational and commercial exposure cleanup levels although DEQ needs to review the assumptions, calculations, and risk management basis used to develop these new cleanup levels. DEQ requests that EPA address the following concerns in the Record of Decision:

- Adopt risk-based cleanup levels for lead and arsenic for current and reasonably anticipated residential soils that conform to EPA regulations and guidance.
- Implement the EPA Technical Review Workgroup's recommendations in their February 17, 2006 memo.
- Eliminate the conclusion that the preferred alternative is protective of human health based on blood lead sampling. Also, alter the conclusion that remedy alternatives are equally capable of reducing risks.
- Include interior dust removal in the remedy.
- Identify and evaluate potential institutional controls, as that is the responsibility of EPA, in consultation with the state. The remedy requires institutional controls for soil disturbance, proposed development, and the soils repository. The Record of Decision should include funding mechanisms, development, implementation, and enforcement of institutional controls.

- Remove the requirement that CERCLA liability shifts from the responsible parties to the property owners and developers.

Following are DEQ's specific comments on the proposed plan that EPA should address through development of the Record of Decision.

1. DEQ supports the following components of the Preferred Alternative:

   - Continuing the existing East Helena Lead Education and Abatement Program (Lead Program) for as long as necessary to help reduce children's exposure to lead.
   - Completing cleanup of streets, alleys, road aprons, irrigation ditches and railroad right-of-way that are adjacent to or within residential areas.
   - Establishing institutional controls to prevent disturbance of soils, prevent exposure to interior dust, and to define land use changes.

   For existing residential yards, DEQ supports continuing with all the sampling and cleanup protocols developed in the past 15 years under the removal action's administrative order on consent, with the exception of the soil lead level needed for a yard to qualify for cleanup. DEQ supports cleanup of all qualifying quadrants or sections of the yard with soil lead concentrations above the risk-based concentration (RBC) of 610 parts per million (ppm). DEQ requests that EPA modify its alternative based on qualifying yard quadrants greater than 610 ppm lead (and associated cost estimate with time frame for implementation) in the Record of Decision, and identify that alternative as a component of the selected remedy.

   Earlier in 2007 DEQ requested the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate the protectiveness of the proposed soil lead action level of 1,000 ppm compared to the RBC. ATSDR recently informed DEQ that they will complete their evaluation after close of the public comment period. Therefore, DEQ reserves further comment on the proposed action level pending the ATSDR evaluation.

2. DEQ agrees that the Lead Program has been strong and effective with its outreach and education in helping to reduce exposure to lead and arsenic in the past, and acknowledges that the program should continue in the future. However, reducing children's exposure to soils where lead levels remain above the RBC relies on the parent's knowledge and intervention actions. The proposed plan discussed the possibility of "lower awareness of residents, who may revert to behaviors that increase the risks from the remaining lead and arsenic." This possibility exists even with the Lead Education and Abatement Program. Remediating residential soils to the risk-based lead cleanup levels is more protective and effective and has more long-term permanence. Thus, DEQ supports the more protective alternative of removing yard soils with soil lead levels greater than the RBC, thereby

eliminating the unacceptable soil exposure pathway. DEQ proposes the remedial action objective should be to remediate residential yard soils to risk-based lead levels that reduce children's lead exposure. This will reduce the reliance on education.

3. The proposed plan asserts that Alternatives 2R and 3R are "by all known measures" equivalent in terms of overall protection. EPA bases this assertion on the recent blood lead monitoring. However, the blood lead monitoring does not document this protectiveness. Nor is EPA's basis supported by the EPA Superfund Lead-Contaminated Residential Sites Handbook (Lead Sites Handbook August 2003) that states "blood lead studies...should not be used for establishing long-term remedial...cleanup levels at lead sites." In addition, the past blood lead monitoring can not be used as a measure of future protectiveness. The recent (past 10 years) participation in the blood lead monitoring program is not representative with participation of only 25-50% of self-selected individuals. More importantly, the blood lead monitoring results may have also been influenced by awareness and the education efforts and thus blood levels are likely lower than if the current education effort was not effective.

4. The Lead Model Re-Evaluation report shows that lead from residential soils and homes still present a risk of unacceptable lead exposure with soil lead levels above 520 ppm. The Record of Decision should include the Results statement from the report, "Based on the site-specific inputs to the IEUBK model... the value of P10 reaches a value of 5% at a soil concentration of approximately 520 ppm. This value is identified as the site-specific RBC for lead in soil." DEQ accepted the site specific parameters used to calculate this RBC but agreed with EPA's Technical Review Workgroup (TRW) in their recommendation "that there should be no conversion of the model's output to a new [Geometric Mean]." Use of the arithmetic mean produces a RBC of 610 ppm lead (which DEQ has previously accepted as appropriately protective).

5. DEQ supports the Lead Program's environmental assessment approach to assess possible sources of lead exposure routes within a home and then provide education on how to reduce exposure. However, the selected remedy should proactively reduce unacceptable exposure, including unacceptable exposure to interior dust, and require removal of dust if there is a complete or potentially complete exposure pathway.

6. The Proposed Plan did not include adequate discussion of anticipated institutional controls (ICs). The Proposed Plan identified Lewis and Clark County as responsible for determining necessary institutional controls. EPA has published a guidance document entitled "Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups" (EPA 540-F-00-005, 09/2000). This guidance clearly defines the steps that EPA, not a county or other entity, uses to identify and evaluate the appropriate ICs for a site. DEQ supports the

involvement of local and state governments as well as other affected parties in the ICs decision making process; however, the responsibility of identifying and evaluating potential institutional controls is EPA's, in consultation with the state, and should not be a burden unilaterally placed on the County. ICs should be considered and included in the selected remedy for the Record of Decision. ICs are a critical part of the remedy and the success of the implemented remedy where active response measures are impracticable. Please provide details of anticipated institutional controls, including information regarding costs, enforcement, implementation, funding, etc., in the Record of Decision.

7. The proposed plan states, "Developers or landowners...will bear all associated cleanup costs." The selected remedy should not state that developers and landowners will pay for remediation. Certainly developers and landowners could work out an agreeable arrangement with the Potentially Responsible Parties (PRPs) but specifically identifying liability of developers and landowners is not a component of the remedy. Allocating liability is not part of the remedy; the liability should remain with the PRPs. The Proposed Plan also states, "Undeveloped lands are being developed, and proposed for development, in the vicinity of East Helena." The Record of Decision should address that anticipated land use. The Lead Sites Handbook states that EPA generally will not take CERCLA enforcement actions against an owner of residential property. In addition, the Handbook notes that landowners may qualify under CERCLA for protection from CERCLA liability as a contiguous property owner, bona fide prospective purchaser, or innocent landowner.

8. The proposed plan provided "total costs" in the estimates for cleanup of the railroad right-of-way and water conveying ditches but not for the undeveloped lands. The Record of Decision should include total estimated costs for the undeveloped lands.

9. One of the cleanup alternatives for undeveloped lands in the proposed plan is In-Place Treatment (or tilling). The EPA Lead Sites Handbook explains that tilling is not an acceptable cleanup method for lead soils because it is not a permanent, protective remedy. This is because no lead removal occurs, and adequate mixing of soil is difficult, if not impossible, to achieve. The handbook further states that tilling may increase the volume of soil, which ultimately requires remediation. The Record of Decision needs to be more precise in its discussion of tilling as a remedy.

   DEQ agrees that in limited site-specific situations, such as non-residential surficial contamination, tilling may be appropriate However, tilling failed in the Uttick Subdivision in East Helena. After much effort and numerous tilling passes and subsequent sampling, most soils still contained lead above the negotiated cleanup level and had to be excavated and replaced. This was due to the fluvial deposits in the flood channels which had much higher contaminant levels. The adjacent Dartman Fields would likely also not be amenable to tilling due to similar fluvial deposits. Also, the rocky sub-soils in the undeveloped land surrounding East Helena may make deep tilling difficult to implement.

The Record of Decision needs to define the sampling protocols and the decision criteria for suitability of tilling.

10. The Record of Decision should include a discussion on the long-term management and institutional controls for the East Fields soil repository. This may include a cap, dust control, weed control, BAMPs, inspections, deed restrictions, and/or groundwater monitoring.

11. The Record of Decision should require cleanup of the portions of the rodeo grounds with soil levels above the recreational cleanup level of 2,800 ppm lead and 1,000 ppm arsenic.

12. The Record of Decision should include a discussion of contingencies if the remedy fails to be protective. Also, it should describe the contingencies if the city or county can't / doesn't want to implement or, if it implements, but at some point can't / doesn't want to continue the institutional controls.

13. The preferred alternative in the proposed plan involves continuing with cleanup criteria established through the removal actions. The Record of Decision should include a discussion to notify the reader as to the different goals and objectives of a removal action compared to a remedial action. As set forth in the NCP, 55 Fed. Reg. 8666, 8695, "Although all removals must be protective of human health and the environment within their defined objectives, removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively addressing all threats at a site."

14. Please provide the assumptions, risk calculations, and risk management basis used to determine the newly proposed soil cleanup levels for commercial and recreational land use. DEQ requests copies of this documentation for review and comment as soon as possible. Also, the Record of Decision should make clear that the soil cleanup levels for commercial and recreational land use apply to the entire operable unit and not just undeveloped lands.

15. The calculated cancer risk of 1.499E-04 exceeds EPA's "acceptable" risk level of 1.0E-04, as well as DEQ's "acceptable" risk of 1.0E-05. The correct application using 1.0E-04 in the calculation gives an arsenic PRG of 117 ppm. The Record of Decision should list the arsenic PRG of 117 ppm.

16. The remedy should require that residential soils with arsenic greater than the action level should qualify a yard for cleanup.

17. EPA's Technical Review Workgroup's (TRW) recommendation for running the lead model (IEUBK) is to use default values unless representative site-specific

data appropriate to the variable in question are available. It is inappropriate to use "regional data" if site-specific input parameters cannot be calculated. Thus, the Record of Decision should not reference or use regional data in the text or in the tables. EPA Region 8 chose the parameters, many of which DEQ and the EPA Technical Review Workgroup (February 17, 2006, memo) consider to be invalid or unrepresentative, and not equally plausible.

18. The NCP, at 40 CFR 300.430(f)(2)(iii), requires at a minimum that the proposed plan provide a summary of any formal comments received from the support agency. The proposed plan did not include that summary but stated, "After consideration of public and local government concerns and comments, MDEQ will present formal comments to EPA." DEQ would have appreciated its own input into the Proposed Plan.

DEQ is available to meet with EPA to discuss these issues and concerns. I look forward to its continued meaningful and substantial participation by the department in development of the ROD, and to working together for the best remedy. Please feel free to contact me with any questions or concerns. I can be reached at 406-841-5001.

Sincerely,

Sandi Olsen

Sandi Olsen
Division Administrator
Remediation Division

cc: Richard Opper
Vic Andersen
Daryl Reed
Mary Capdeville, DOJ
Jill Cohenour, State Representative House District 78
Melanie Reynolds, Lewis & Clark County

ADMINISTRATIVE RECORD

APR 1 6 2007
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April 13, 2007

USEPA, Federal Building
ATTN: Scott Brown
10 West 15th Street, Suite 3200
Helena, MT 59626

Re: Comments to EPA's January 2007 Proposed Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands (Operable Unit No. 2)

Dear EPA:

We live outside of East Helena proper, near the Eastgate community water tower. Our residence consists of 17 acres, 10 of which are undeveloped and are subdividable into two 5-acre parcels.

In spring 2005, prior to purchasing our residence, we contacted the EPA, the Lewis and Clark County Health Department and the Montana Department of Environmental Quality to inquire whether the residence was part of the East Helena superfund site and whether any cleanup would be necessary at the residence. We were told that no cleanup level for lead had yet been established by EPA, but that it would likely be in the neighborhood of 1,000 ppm. We were provided copies of lead sampling results taken for our residence, all of which were near our house. We requested copies of sampling results done near our neighbors' homes, but were told those results could not be released to us. The highest sampling result for our residence was between 500 ppm and 1,000 ppm; most were below 400 ppm. We were also told us that based on the sampling results of our residence, our property was not part of the superfund site and was not targeted for cleanup by the EPA.

We recently reviewed the EPA's proposed plan for the East Helena Superfund Site (Operable Unit 2) and were quite surprised to see that, contrary to what we were told, our residence appears to be included in the East Helena superfund site boundary. We are also deeply troubled by what we read in the proposed plan. Our major concerns are set forth below.

- The proposed plan states that "landowners seeking to change the use of undeveloped land . . . will bear all associated cleanup costs. " Such a requirement flies in the face of both CERCLA and EPA's own internal guidance. Under CERCLA, innocent landowners such as ourselves, bona fide prospective purchasers, and contiguous property owners are conditionally exempt from any cleanup casts associated with contamination in superfund sites. Moreover, the EPA Superfund Lead-Contaminated Residential Sites Handbook (August 2003) plainly states, "EPA . . . generally will not take CERCLA enforcement actions against an owner of residential property unless the residential homeowner's activities lead to a release or threat of release of

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hazardous substances resulting in the taking of a response action at a site." *See* Handbook at pg. 62. EPA's proposed plan essentially constitutes an enforcement action against residential landowners and attempts to circumvent both the sprit and black letter law of CERCLA, as well as the EPA's own guidance, by trying to hold residential landowners liable for the cleanup of contaminated areas. Such an attempt is not only inappropriate, but likely illegal.

- The EPA's selection of lead levels have no apparent rational basis, and as applied, are not protective of human health. The EPA has failed to provide any legitimate basis for requiring a 500 ppm lead cleanup level for undeveloped lands, all the while allowing developed residences to contain levels of lead between 500 ppm and 1000 ppm. Either 1,000 ppm is protective or 500 ppm is protective. If they both are equally protective or the difference is negligible (as is suggested on page 12 of the plan), then there is no rational basis for the undeveloped land lead cleanup level to be 500 ppm. If 1,000 ppm is not protective, then every property exceeding 500 ppm should be cleaned up by the EPA to 500 ppm.

Furthermore, under the plan, neighbor A could have 999 ppm of lead on his developed property and the EPA would require no cleanup. Neighbor B, right next door, could have 1,001 ppm lead on his developed property (or 501 ppm on his undeveloped property) and the property would be required to be cleaned up to 500 ppm. This would result in a patchwork of properties, some meeting a protective level of 500 ppm and others having lead levels almost twice as high. Indeed, under the existing plan, should we develop our undeveloped land and have to cleanup the property to 500 ppm, it would be contiguous to our house area, where the lead levels exceed 500 ppm. Such results clearly cannot be deemed protective.

We additionally note that if the lead cleanup levels were based on blood lead study data as the plan suggests, such a basis is contradicted by EPA's own guidance. *See* EPA Superfund Lead-Contaminated Residential Sites Handbook (August 2003) at pg. B-4 ("OSWER recommends that blood lead studies not be used for establishing long-term remedial . . . cleanup levels at lead sites.")

- The proposed plan fails to properly identify anticipated institutional controls and appears to attempt to place at least partial responsibility for developing those controls in the hands of local government. As EPA's own guidance makes clear, developing appropriate institutional controls is the EPA's responsibility, not local government's. *See* Institutional Controls: A Site Manager's Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups" (EPA 540-F-00-005, 09/2000).

- The proposed plan fails to include any cost estimate for future development of undeveloped residential areas similar to our property.

- Capping undeveloped property is not a feasible final remedy alternative and should not have been included as if it were one. Any cap put in place will only be disturbed when development occurs. At the most, capping is a temporary, short-term remedy.

- Recent studies demonstrate that detrimental lead effects are not limited to children under the age of 7, but in fact, can be seen in children up to the age of 18. Nothing in the proposed plan appears to recognize that fact.

- The plan suggests EPA has no knowledge of the actual extent of contamination on undeveloped property. We therefore question the accuracy of the boundary map provided in the plan. Moreover, it is premature to be proposing a final plan for a superfund site if, in fact, the EPA does not even know the extent of the contamination because, for instance, if that is indeed the case, the cost estimates used for alternative comparisons cannot possibly be accurate.

Sincerely,

Laura and Brian Vachowski

Laura and Brian Vachowski

ADMINISTRATIVE RECORD P/E

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April 13, 2007

Scott Brown
U.S. Environmental Protection Agency
Region VIII, Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626

Subject: Comments on the Proposed Plan for Residential Soils and Undeveloped Lands at the East Helena Superfund Site

Dear Mr. Brown:

I appreciate the opportunity to comment on the proposed plan for the East Helena Superfund Site. While I do not have much background in this type of issue, I do have one major concern about the contamination issues in my community. It seems to me that the Proposed Plan places a lot of emphasis on the East Helena Lead Abatement Program to continue to provide information to the public about the risks of lead and ways to prevent exposure to lead, particularly since the cleanup level is higher than that recommended by the state agency, DEQ. I also understand that this program is the one that conducts the blood screenings to make sure our children have not been exposed to unsafe levels of lead. The problem with this scenario is that this program is not all that well known or advertised. I feel that I can say this with certainty because I have lived in this community for nearly five years and have only seen one postcard having anything to do with the Lead Abatement Program. The troubling part is that I have a four year old son who plays outside in our yard on an almost daily basis and another baby on the way. From what I have been told, my particular neighborhood may be a lesser concern than others, as it is farther away from the source. However, as I mentioned before, I have not received any real information about risks to my children, nor have I been made aware that such information was available. I consider myself to be a well educated and concerned parent and worry that if I was not aware of the risks and/or available information sources, there must be a lot of other parents in the community who have no idea about this issue either.

It seems to me that it may be more protective to use a lower cleanup level to ensure that these children are protected. This is particularly true given that the Lead Abatement Program is not necessarily accomplishing all that it attempts to. While the program seems like a great idea, it wouldn't need to be relied on to such an extent if more cleanup work was done. I encourage EPA to use a lower cleanup level and ensure protection of the children of East Helena.

Thank you for consideration of my comments.

2675 Cody Drive
East Helena, MT

P&E

April 13, 2007

Scott Brown
U.S. Environmental Protection Agency
Region VIII, Montana Office
10 West 15th Street, Suite 3200
Helena, MT 59626

Subject: Comments on the Proposed Plan for Residential Soils and Undeveloped Lands at the East Helena Superfund Site

Dear Mr. Brown:

Thank you for the opportunity to provide input on the above-referenced Proposed Plan. As a resident of the East Helena community and the mother of a toddler (with a baby on the way), I think it is important to take note of this issue. I have thoroughly reviewed the Proposed Plan and have some major issues with the chosen alternative for residential yards. I also believe there are issues with the chosen alternative for undeveloped land, but as it has less impact on my family, I will not provide many comments associated with that portion of the Proposed Plan.

Overall, I appreciate that EPA has taken the time and effort to ensure that Asarco is not able to ignore its responsibility to cleanup the mess it has left in the East Helena area. That being said, I feel that EPA is attempting to take the easy way out with its proposed cleanups of both residential yards and undeveloped lands. As a person who deals with these types of issues in my job, I feel somewhat disappointed that EPA has chosen to pursue a remedy that I believe is not as protective as it should be, and is assuring the public that the basis for the chosen remedy is sound science. It is my opinion that EPA has chosen to ignore science altogether in hopes of pushing something through that will be quick, easy, and relatively inexpensive (in the grand scheme of things), at the potential expense of human health.

Specifically, I have the following comments that I would like to see taken into consideration in EPA's Record of Decision:

1. EPA chose to input "regional data" from the Butte and Anaconda Superfund sites in its IEUBK model to come up with a site-specific risk-based cleanup level for East Helena. Data from another Superfund site is not specific to East Helena and therefore is inappropriate to use in the model. Default values should be input for all variables for which site-specific data is not available.

2. The lead model resulted in a risk-based cleanup level of 520 ppm lead in soils. It appears that EPA is completely disregarding the model in choosing a preferred remedy that has a "trigger" value of 1,000 ppm. If EPA feels it is important to cleanup soils to 500 ppm in soils that are "triggered" by a 1,000 ppm concentration, then why not use a "trigger" of something closer to 500 ppm in the first place?

3. The statement in the proposed plan that "the model derived predictions are but one aspect, of several equal or more important aspects, that were considered..." is interesting. It appears that the "more important" aspects that were considered are the blood lead studies conducted on children in the East Helena area. The EPA Superfund Lead-Contaminated Sites Handbook (August 2003) states that blood lead studies should not be used for establishing cleanup levels. However, it appears that EPA is giving these studies (which are conducted on a completely voluntary basis by people who choose to bring their children in to be tested, and are therefore not representative of the population of the area) more importance than the lead model, which is used across the nation to calculate risk-based cleanup levels.

4. The two alternatives that require action be taken are completely different and cannot be accurately compared. The action alternative that was not selected is based on a yard average, which in itself is completely inappropriate, as EPA's lead handbook referred to in the previous comment specifies that yard averages should not be used. Additionally, the costs for this alternative are going to be much higher, as the soil removal will inevitably be much larger given that the entire yard would have to be removed. It would be more useful, and more accurate, to simply change the cleanup level and leave all other aspects of the remedy the same. I expect that this would result in a much lower dollar figure for overall cleanup costs. I would like to see EPA consider what the costs would be for cleanup based on the lower cleanup level from the model (520 ppm) leaving all other aspects of the chosen remedy the same.

5. The idea that landowners who currently have undeveloped land should be responsible for paying cleanup costs should they decide to develop the property is outrageous. Not only that, but those who currently have a home on property that may later be subdivided may end up in a situation of having to cleanup their undeveloped property to a more stringent level than where they currently live. Again, this brings up the issue of the cleanup level. If EPA feels that 500 ppm is protective for future development, then why should those of us who already live in the East Helena be less important?

I understand that something needs to be done to cleanup the East Helena Superfund Site and that Asarco is in bankruptcy and money is an issue. I also understand that the East Helena City Council would like to move forward with cleanup to help expand the economy of the town. However, I think that more emphasis must be placed on the risks to the people (specifically the children) of the community and ensuring that the cleanup is done correctly the first time. That is really the most important thing.

I appreciate your consideration of my comments and look forward to the future cleanup of my community. I hope that EPA will choose to do the right thing and make sure that the people of East Helena are adequately protected.

Sincerely,

Moriah Bucy

Site # EH File 10 10600 PER
Confidential: Yes ______ No ✓
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Words/Comments: Public comment

ADMINISTRATIVE RECORD

ENVIRONMENTAL PROTECTION AGENCY
MAR 13 2007
MONTANA OFFICE

~~COMMENT~~ FOR EPA-EAST HELENA LEAD-SOIL CLEANUP PLANS
March 12, 2007

I am strongly **opposed** to the "preferred cleanup alternative (2R)" recommended by the EPA" and I favor Alternative R3 for the following reasons:

1. The State MDEQ has raised sufficient concerns and questions over the 1000 ppm limit as opposed to the 500 ppm in that lead blood level tests in children are based on a biased sampling of participants rather than a random sampling. The use of biased sampling is not scientific and does not lead to reliable test results.

2. The EPA by their own analysis has presented a different standard for "Clean up Goals for Undeveloped Lands" and is setting the requirement for remediation of undeveloped/ residential-use land at a maximum level of 500 ppm not 1000 ppm. These two standards are in contradiction with one another.

The difference between the two standards (residential versus undeveloped/future residential) appears to be related to availability of funding for cleanup. In other words, there is just enough money available in the ASARCO reclamation fund to implement 2R and nowhere near enough to support 3R. In the case of undeveloped lands, however, since funding will likely be paid out of the developer's pockets, the level for remediation is set at 500 ppm. This reasoning ignores the actual health issues.

The plan that the EPA implements should require a uniform standard regardless of whether it involves developed or undeveloped land. Implementation of the 500 ppm level (i.e. 3R) is the safest plan and would stand the test of time. ASARCO should be required by the EPA to meet this standard (just like private developers will be required). Because of ASARCO'S current shaky financial condition they may not be around to resolve recurring issues in the future. They need to be held accountable now while there is still opportunity!

Submitted by:
Sally K. Nyland
203 North Prickley Pear Avenue
East Helena, MT 59635

Sally K. Nyland

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VIA FEDERAL EXPRESS

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Helena, MT 59626

Re: ASARCO LLC Comments
Proposed Plan For Final Cleanup of East Helena's Residential Soils and Undeveloped Land (OU2)

Dear Mr. Brown:

ASARCO LLC ("ASARCO") submits the following comments regarding the United States Environmental Protection Agency's ("EPA's") Proposed Plan for soil remediation in Operable Unit 2 of the East Helena Super Fund Site ("Proposed Plan"). As outlined in more detail below, ASARCO generally supports EPA's selected cleanup alternatives both for residential and undeveloped areas.

A. Residential Soils

1. Alternative 2R is an Effective Choice For Addressing Residential Soils.

ASARCO agrees with EPA's selection of Alternative 2R to address residential soils in East Helena. As noted in the EPA's announcement of the Proposed Plan (the "Announcement"), Alternative 2R "consist[s] of completing the residential soil cleanup according to protocols that are currently in place for the ongoing removal action." Announcement at 17. Implementation of these protocols has significantly lowered children's blood-lead levels in East Helena.

As noted by EPA, not a single child sampled since 2001 has had a blood-lead level that exceeded 10 ug/dl and 98% of the these children have had blood-lead levels of 4 ug/dl or less. Announcement at 12. To date, the program has surpassed all goals established locally, as well as national goals for lead sites. *See id.* at 14. Indeed, average children's blood-lead levels in East Helena are below the national average. *See id.* at 16. These data are compelling proof that the protocols upon which Alternative 2R is based are proven to be an effective means of protecting human health and the environment in East Helena.

2. Alternative 2R is Superior to Alternative 3R as the Most Cost-Effective Alternative.

In choosing removal alternatives, EPA must select a remedy that is consistent with CERCLA and the nine National Contingency Plan ("NCP")[1] criteria. Of the nine criteria, two are viewed as threshold criteria - protection of human health and the environment and compliance with applicable or appropriate and relevant requirements ("ARARs"). *See* EPA, *The Role of Cost in the Super Fund Remedy Selection Process*, OSWER 9200.3-23, 4-5 (Sept. 1996) ("*1996 Cost Guidance*"). Alternatives that meet these threshold criteria are to be compared to one another based upon the remaining seven criteria. *Id.* As noted by EPA, Alternative 2R and 3R are functionally equivalent as to the threshold criteria. *See* Announcement at 26-7.[2] Of the remaining seven criteria, cost-effectiveness is the one that most distinguishes Alternative 2R from Alternative 3R.

EPA estimates that Alternative 3R will be almost four times as expensive to implement as Alternative 2R - $38 million versus $10 million[3]. As previously noted, Alternative 3R does not provide any comparative advantage as to protection of human health and the environment or compliance with ARARs. Accordingly, this cost discrepancy alone is enough to warrant adoption of Alternative 2R as the appreciably more cost-effective remedy.

The selection of the most cost-effective remedy among various options - all being generally equivalent in terms of protection of public health and the environment - has long been a central tenet of CERCLA. CERCLA dictates that EPA "shall select appropriate remedial actions determined to be necessary to be carried out under [CERCLA] which are in accordance with the section and, to the extent practicable, the national contingency plan, and *which provide cost-effective response*." 42 U.S.C. § 9621(a) (emphasis added). Moreover, CERCLA emphasizes that when selecting a remedy, EPA "shall select a remedial action...*that is cost effective*." *Id.* § 9621(b)(1) (emphasis added). In implementing this cost-effectiveness mandate, EPA has emphasized that gross discrepancies in relative costs of equally protective alternatives are a sound bases upon which to eliminate an alternative. *See* 40 C.F.R. § 300.430(e)(7)(ii) ("costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one or several factors used to *eliminate* alternatives.") (emphasis added). As such,

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[1] The nine NCP criteria are (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term efficiency; (6) implentability; (7) cost; (8) state acceptance; and (9) community acceptance.

[2] ASARCO agrees with EPA's conclusion regarding the lack of any statistical differences between child blood-lead levels in areas with soil leads in the 500 - 1000 ppm range and these with soil leads off less that 500 ppm. Reliance on such "real world" data is an appropriate way of measuring risk and setting action and cleanup levels at residential lead sites. *See* EPA, *Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA sites and RCRA Corrective Action Facilities*, OSWER 9200.4-27P, 2-3 (1998).

[3] ASARCO takes no position as to whether these figures accurately reflect an appropriate estimate of the costs of implementing the identified remedies except to note that Alternative 3R would obviously cost far more to implement than would Alternative 2R.

ASARCO believes that EPA's selection of Alternative 2R is on all fours with the requirements of CERCLA and the NCP.

3. Community Acceptance Strongly Favors Adopting Alternative 2R Instead of Alternative 3R.

As noted by EPA, key constituencies including the East Helena City Council and the Lewis and Clark City Council Board of Health have expressed support for Alternative 2R. *See* Announcement at 29. As a member of the East Helena community, ASARCO supports the adoption of Alternative 2R. Moreover, judging by the comments made by various citizens in public meetings concerning the adoption of this Proposed Plan, the vast majority of local citizens in East Helena support the adoption of Alternative 2R. Indeed, many of the most vociferous objections voiced at these meetings were from citizens concerned that EPA would implement Alternative 3R and needlessly inconvenience the people in East Helena with an unnecessary program of more extensive remediation.

B. Undeveloped Land

For the same reasons outlined above, ASARCO agrees with EPA's selection of Alternative 4U to address undeveloped lands in East Helena.[4]

C. Conclusion

In light of the foregoing, ASARCO respectfully urges that EPA formally adopt Alternative 2R as the preferred alternative for residential soils and Alternative 4U as the preferred alternative for undeveloped land at the East Helena Site. We appreciate the opportunity to submit these comments and would welcome a chance to discuss these alternatives with EPA at a convenient time.

Respectfully submitted,

BAKER BOTTS, LLP

By: J. Scott Janoe

JSJ:138

cc: Tom Aldrich
J. Chris Pfahl

[4] ASARCO takes no position as to whether these figures accurately reflect an appropriate estimate of the costs of implementing the identified remedies.

SUPPLEMENTAL COMMENTS

1 - Lewis and Clark City-County Board of Health Questions, EPA's Responses and Supplemental Comments

2- Letter of Support from the City of East Helena and EPA's Response

3- Montana Department of Environmental Quality's Letter of Non-Concurrence

Site # EH File 1.07.06.00 P&E
Confidential: Yes ______ No ✓
Admin. Record: Yes ✓ No ______
Key Words/Comments: re: questions raised by Health Board

ADMINISTRATIVE RECORD

Scott Brown/MO/R8/USEPA/US
02/09/2007 03:44 PM

To Melanie Reynolds <mreynolds@co.lewis-clark.mt.us>
cc Bill Brattin <brattin@syrres.com>, Jan Williams <janwilliams@co.lewis-clark.mt.us>, John Wardell/MO/R8/USEPA/US@EPA, Julie
bcc
Subject Re: Questions for EPA's toxicologists

Thanks, Melanie. Please let us know if additional questions arise. John Wardell and I have requested technical/toxicological support from Dr. Griffin and Dr. Brattin regarding these and other questions.
Melanie Reynolds <mreynolds@co.lewis-clark.mt.us>

Melanie Reynolds <mreynolds@co.lewis-clark.mt.us>
02/08/2007 04:02 PM

To Jan Williams <janwilliams@co.lewis-clark.mt.us>, Kathy Moore <kmoore@co.lewis-clark.mt.us>, Scott Brown/MO/R8/USEPA/US@EPA
cc Julie DalSoglio/MO/R8/USEPA/US@EPA, Susan Griffin/EPR/R8/USEPA/US@EPA, John Wardell/MO/R8/USEPA/US@EPA, Bill Brattin <brattin@syrres.com>
Subject Re: Questions for EPA's toxicologists

Hi Scott:

Yes, we would appreciate it if you would forward these questions to the toxicologists for their responses. I am working with the board of health to see if they have some additional questions that they would like to have answered.

Thanks again for your presentation last week.

Melanie

Melanie Reynolds, M.P.H.
Health Officer
Lewis and Clark City-County Health Dept.
1930 Ninth Ave
Helena MT 59601
(406) 457-8910 (phone)
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>>> <Brown.Scott@epamail.epa.gov> 2/2/2007 4:25 PM >>>
Melanie, Kathy and Jan: Below are the questions that were posed during
last evening's meeting with the Health Board, which John Wardell and I offered to forward on to EPA's toxicologists. I took special note of the questions last night, to the best of my recollection; however, I would appreciate your review and concurrence that the Board members' questions are as accurately portrayed as possible.

1. In light of evidence that children may be affected by blood lead levels as low as 4 or 5 ug/dl, and evidence that any level of lead is unhealthy for developing children, "why did the EPA and CDC not lower

1070600

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the level [of concern] below 10 micrograms [lead per deciliter blood]?"

2. "Won't the level [of concern] be lowered in the future? What if the level is lowered to 5 [micrograms per deciliter] sometime in the future?"

3. "Is it accurate that the model output for East Helena is 520 ppm?" [Clarification added: This question arose during the discussion, I assumed, in response to Daryl Reed's statements that (a) the model output specific for East Helena is 520 ppm and (b) the EPA's most recent guidance on setting cleanup levels "at sites like East Helena, says to use the model."]

4. "Why are the action levels at several other sites, like the Vasquez Boulevard site near Denver, 400?"

5. What percentage of [East Helena] children participate in blood lead screenings and is that enough? [Clarification added: This two-part question arose during discussion of (a) how many children participate each year, (b) how the numbers of participants vary each year, and (c) whether or not children in East Helena are still "elevated." An important corollary question should be: Are the East Helena blood lead data representative and useable?]

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Ref: 8MO

March 13, 2007

Ms. Melanie Reynolds, Health Officer
Lewis and Clark City-County Department of Health
316 North Park
Helena, MT 59623

Dear Melanie:

Enclosed are responses to questions posed by Board of Health members during the recent briefing regarding the East Helena proposed final cleanup plan, which required the expertise and assistance of Dr. Susan Griffin, Senior Toxicologist, Region 8, Denver, and Dr. William Brattin, Syracuse Research Corporation, Denver.

Dr. Griffin and Dr. Brattin have researched childhood exposures to lead extensively, both nationally and internationally. They are highly respected experts, particularly in the disciplines of toxicology and risk assessment at mining and smelter sites. Their response to Question 5, regarding the adequacy of blood lead screenings conducted for East Helena children over the past two decades, required considerable coordination with your staff members, Debb Tillo and Jan Williams. EPA appreciates their invaluable input and their thorough knowledge of East Helena-specific data. Moreover, their health evaluations, as well as those of their predecessors, provided insight into the analysis of the contribution of soil lead to blood lead values. The findings of this important analysis support the conclusion that the contribution of residual soil lead concentrations in East Helena- is sufficiently small that the effect cannot be detected.

Based on consideration of participation rates, narrowing bands of statistical uncertainty over time, spatial representativeness, and soil lead representativeness, the findings of the analysis performed in response to the Board's last question support a high level of confidence in the blood lead data generated by the County-administered program. It is concluded that these long-term data are reliable and appropriate for use by risk managers and other health professionals in assessing conditions in East Helena and for setting a protective soil lead cleanup level.

Should the Board members or yourself so desire, Dr. Griffin and Dr. Brattin welcome an opportunity to "meet" via video-conference at your earliest convenience.

Respectfully,

D. Scott Brown, Ph.D.
Montana Office, Region 8

Enclosure: Responses to Questions Posed by Health Board

cc: Hon. Terrie Casey, Mayor, East Helena
Dr. Susan Griffin, Region 8 Senior Toxicologist
Dr. William Brattin, Toxicologist, Syracuse Research Corp.
Dr. John Wardell, Director, 8MO
Julie DalSoglio, Deputy Director, 8MO
Steven Moores, Enforcement Attorney
Dan Strausbaugh, ATSDR
Darryl Reed, MDEQ

USEPA REGION 8 RESPONSES TO QUESTIONS ASKED BY THE CITY-COUNTY HEALTH BOARD

Question 1: In light of evidence that children may be affected by blood lead levels as low as 4 or 5 ug/dL, and evidence that any level of lead is unhealthy for developing children, why did the EPA and CDC not lower the level of concern below 10 ug/dL?

Response:
This question is addressed most clearly by the Centers for Disease Control and Prevention in their 2005 document entitled *Preventing Lead Poisoning in Young Children.* The rationale is as follows:

"In 1991 the CDC recommended lowering the level for individual intervention to 15 ug/dL and implementing community-wide primary lead poisoning prevention activities in areas where many children have blood lead level greater than 10 ug/dL. Some activities, such as taking an environmental history, educating parents about lead, and conducting follow-up blood lead monitoring were suggested for children with blood lead levels greater than 10 ug/dL. However, this level, which was originally intended to trigger communitywide prevention activities, has been misinterpreted frequently as a definitive toxicologic threshold. Evidence exists of adverse health effects in children at blood lead levels less than 10 ug/dL. The available data are based on a sample of fewer than 200 children whose blood lead levels were never above 10 ug/dL and questions remain about the size of the effect. At this time there are valid reasons not to lower the level of concern established in 1991 including the following:

- No effective clinical or public health interventions have been identified that reliably and consistently lower blood lead levels that already are less than 10 ug/dL.
- No one threshold for adverse effects has been demonstrated. Thus the process for establishing a lower level of concern would be arbitrary and no particular blood lead level cutoff can be defended on the basis of the existing data. In addition, establishing a lower level of concern may provide a false sense of safety about the well being of children whose blood lead levels are below the threshold.
- The adverse health effects associated with elevated blood lead levels are subtle. Individual variation in response to exposure and other influences on developmental status, make isolating the effect of lead or predicting the overall magnitude of potential adverse health effects exceedingly difficult.
- Efforts to identify and provide services to children with blood lead levels less than 10 ug/dL may deflect needed resources from children with higher blood lead levels who are likely to benefit most from individualized interventions."

Question 2. Won't the level of concern be lowered in the future? What if the level is lowered to 5 ug/dL sometime in the future?"

Response:
At this time, neither the CDC nor the EPA is proposing to lower the blood lead level of concern below 10 ug/dL. Superfund sites are required by law (CERCLA 121) to undergo reviews every 5 year to determine if the remedy selected for the site remains effective and health protective. If the remedy is no longer health protective because of changes in the blood lead level of concern, then action will be taken to bring the remedy into compliance.

It is important to note, however, that if the CDC or EPA were to lower the level of concern to 4 ug/dL, which was deliberated at length before being rejected for reasons discussed above, 98% of East Helena's children already meet or surpass that level.

Question 3. Is it accurate that the model output for East Helena is 520 ppm?

Response: The IEUBK model is a screening tool whose output depends on the assumptions used as inputs. It is not appropriate to think of any one specific model output as if it were "truth". Using only national average default assumptions, the IEUBK model predicts that a soil action level of 400 ppm would be protective. Using a combination of default assumptions and reliable site-specific information on lead relative bioavailability (RBA) and soil to dust ratios obtained at East Helena, the predicted level is estimated to be 520 ppm. If best scientific information available from other mining and smelting sites in Region 8 were used in addition to the site-specific information from East Helena, the soil action levels could range up to 3000 ppm. The choice between these values is a matter of professional judgment, based on a consideration of the credibility of the alternative input values, as well as other relevant information (e.g., blood lead data, data obtained by in-home environmental assessments, soil sampling protocols, etc.) from the site.

Question 4: Why are the action levels 400 ppm at several other sites, like the Vasquez Boulevard site near Denver?

Response:
Action levels for lead in soil that have been selected for use at residential sites in Region 8 range from 300 ppm to 3,500 ppm. The difference between the action levels selected at differing sites is typically related to the amount of information available at a site. In general, sites with relatively little data (beyond lead levels in soil) may have action levels at or close to the national default level (400 ppm), while sites that have been studied more extensively may have action levels that differ from the national default level. There is no basis for supposing that an action level of 400 ppm is needed at all sites.

EPA's most recent guidance on lead in residential settings (August 2003) reads as follows: "If the proposed clean-up level is outside of the range of 400 ppm to 1,200 ppm lead, then the draft decision document for the site is sent to the [national] Lead Sites Consultation Group (LSCG) for review." This emphasizes that there is no singular lead action level that is considered to be appropriate for use at all sites, and that values in the range of 400-1200 ppm may be reasonable in many cases. The final soil lead cleanup action level deemed by EPA to be more than adequately protective for the East Helena site, which results in an equivalent level of between 650 ppm and 750 ppm lead, is below the mid-point of this range and is supported by extensive site studies.

Question 5: What percentage of East Helena children participate in blood lead screenings, and is that enough?

Response to Part 1: What is the participation rate?

When a blood lead survey is conducted as a single event, the participation rate (PR) is given by:

$$PR = \frac{n}{N}$$

where:

n = Total number of children who participated
N = Total number of children eligible to participate (age 0-6 years)

When a blood survey is part of an on-going program, both the total number of children who have participated and the size of the eligible population (the total number of children who were age 0-6 at any time during the study) will increase each year, so PR is a function of time:

$$PR(t) = \frac{n(t)}{N(t)}$$

The value of n(t) is obtained simply by summing the number of new individuals age 0-6 years who participate each year. For years 1 to T, the value is given by:

$$n(t) = \sum_{i=1}^{T} new(i)$$

The value of N(t) may be estimated by assuming that, for each year of study, the size of the eligible population increases by 1/7 as new children age 0-1 enter the population. Because an equal number of children age 6 will "graduate" from the group each year, the number of children age 0-6 at any point in time (N0) will remain constant. Based on these assumptions, the values of N(t) is given by:

$$N(t) = N0\left(1 + \frac{T-1}{7}\right)$$

Thus, the participation rate after T years is given by:

$$PR(t) = \frac{\sum_{i=1}^{T} n(i)}{N0\left(1 + \frac{T-1}{7}\right)}$$

The value of N0 for each neighborhood near the site can be estimated from the community survey performed in 2000. The total number of unique participants who have participated from each neighborhood can be calculated from the blood lead database maintained by the County. The results, based on data from 1991 to 2006 (T = 16 years) are shown below:

Neighborhood	N0 (Number of children age 0-6 based on 2000 survey)	Σn(i) (Total children age 0-6 who have participated between 1991-2006)	Participation Rate
Grandview	53	56	34%
East Gate 2	198	160	26%
Sunny Lane + East Gate 1	187	148	25%
La Casa Grande	43	70	52%
Canyon Ferry	68	60	28%
Manlove	19	9	15%
E. Helena + West E. Helena	188	240	41%

As seen, the participation rate varies between neighborhoods, but is generally about 25-50%. Assuming that the blood lead program will continue to operate for some time into the future, and that the number of new children recruited each year will remain similar to current values, these rates will tend to increase over time.

Response to Part 2: Is this participation rate enough?

There are two key factors to consider when deciding if the participation rate is enough to provide a reliable data set for drawing conclusions about blood lead levels in area children: statistical uncertainty and representativeness. Each of these two factors is discussed below.

Statistical Uncertainty

Statistical uncertainty arises whenever a population statistic is estimated from a sample drawn from the population. The magnitude of the statistical uncertainty is related to the size of the sample (large samples result in lower uncertainty) and the degree of variation between the individual values (higher variation results in higher uncertainty).

In this situation, the population statistic of interest is the fraction of all children age 0-6 years that have a blood lead value above 10 ug/dL. For convenience, this statistic is referred to as "P10". The national goal is to ensure that P10 is not larger than 5%. For East Helena, the proposed plan's remedial action goals are designed to ensure that P10 will remain close to zero.

The value of P10 may be estimated in two ways. First, it may be calculated simply by counting the number of children with an observed yearly average blood lead value above 10 ug/dL, and dividing by the total number of children for whom blood lead values were measured. While direct, this approach may yield values that are not accurate, especially when the number of children expected to be above 10 ug/dL is small.

One way to avoid this problem is assume that the data set of blood lead values is characterized by a lognormal distribution, and to estimate the parameters of the distribution (μ and σ) by log-probability plotting, as described by Gilbert (1987). Given the values of μ and σ estimated from the data (these are referred to as $\hat{\mu}$ and $\hat{\sigma}$, respectively), the value of P10 for that data set may be calculated using the following function that is available in Microsoft Excel:

$$P10 = 1 - \mathrm{LOGNORMDIST}(10, \hat{\mu}, \hat{\sigma})$$

Because the values of $\hat{\mu}$ and $\hat{\sigma}$ are derived by fitting a lognormal distribution to the data, both values are uncertain, and hence there is uncertainty in the calculated value of P10. This statistical uncertainty around the fitted value of P10 may be estimated by Monte Carlo simulation, in which the uncertainty in $\hat{\mu}$ and $\hat{\sigma}$ are modeled as follows (Crow and Shimizu 1988):

$$\mu \sim \hat{\mu} - \frac{\hat{\sigma}}{T(n-1) \cdot \sqrt{n}}$$

$$\sigma \sim \sqrt{\frac{(n-1) \cdot \hat{\sigma}^2}{CHISQ(n-1)}}$$

where:

μ = true (but unknown) log-mean of blood lead values

$\hat{\mu}$ = observed log-mean of blood lead values

σ = true (but unknown) value of log-standard deviation of blood lead values

$\hat{\sigma}$ = observed log-standard deviation of blood lead values

T(n-1) = T distribution with n-1 degrees of freedom

CHISQ(n-1) = Chi-squared distribution with n-1 degrees of freedom

n = number of blood lead values in the data set

The results are shown in Figure 1. As seen, there has been a clear time-trend toward decreasing P10 values, and in recent years (2000 to present), the calculated P10 value is very low and the uncertainty bounds are quite narrow and do not overlap the health based goal (P10 $\leq$ 5%). This result indicates that the number of children participating in the blood lead program is sufficient to evaluate compliance with heath-based objectives with acceptable confidence.

In considering these results, it is important to recognize that statistical uncertainty in a statistic is a function of the absolute size of the sample (n), and not the fraction of the population. For example, in surveys of the U.S. population such as NHANES III (DHHS 2005), the number of children age 0-5 years for whom blood lead values are obtained is sufficiently high (about 700 to 900) that statistical confidence in blood lead statistics is high, even though the fraction of the total population of all children age 0-5 years contained in the sample is very small (about 0.005%).

Representativeness

If a study of a population is based on a sample that includes some but not all of the members of the population, it is important to ensure that the sample that is evaluated is representative of the entire population. If this is not true, conclusions based on the sample may not apply to the population, leading to potentially misleading decisions.

The list of variables that must be considered when assessing the representativeness of a sample depends on what is being evaluated. In the case of blood lead values, the factors to consider include all of the variables that are known or suspected to influence blood lead values in children, including:

- Lead levels in soil
- Lead levels in other sources (paint, diet, water, other indoor sources)
- Behaviors that cause exposures (e.g., mouthing frequency)
- Socioeconomic status
- Nutritional status

The East Helena Lead Education and Abatement Program does not routinely collect data on these variables as part of the blood lead survey, but does collect qualitative data on some of these variables during their in-home environmental assessments. Hence, a detailed statistical evaluation of representativeness based on the parameters is not possible. However, data are available to support two important evaluations of representativeness, as follows.

Spatial Representativeness

Many of the key variables that tend to influence blood lead values (e.g., lead levels in soil and other sources, socioeconomic status, nutritional status, behaviors) are likely to differ from neighborhood to neighborhood. Indeed, if a factor does not differ between locations, then it is not an important determinant of representativeness. Thus, an assessment of the spatial representativeness of blood lead values that have been collected is a good way for ensuring that a number of potentially important demographic variables are properly represented in the blood lead data set.

Figure 2 is a map showing the location of properties from which one or more blood lead samples has been collected by the County. As seen, there are numerous samples from each neighborhood, supporting the conclusion that the data set is spatially representative. This is supported by the results presented above which indicate that the participation rate in most neighborhoods is about 25-50%.

Representativeness Based on Soil Lead Values

One important variable to consider in this project is the representativeness of soil lead levels at the homes where participants in the blood lead study reside. For example, if 10% of the children in the community live at properties where current soil lead values are higher than 1000 ppm, but only 5% of the children in the blood lead survey came from homes with soil above 1000 ppm, this could lead to an underestimate of the number of children with elevated blood lead values. The following table provides the data needed to make this assessment:

Year	% of all properties with PbS > 500 ppm	% of all PbB participants who came from properties with PbS > 500 ppm
1991-92	63%	60%
1993-94	50%	50%
1995-96	34%	22%
1997-98	26%	14%
1999-00	24%	8%
2001-02	22%	21%
2003-04	21%	7%
2005-06	19%	11%

As seen, in the early years of the program (1991-1994), the fraction of children in the blood lead program who resided at properties with soil lead levels > 500 ppm was similar to the overall fraction of soils > 500 ppm in the community. Starting around the mid 1990's, the fraction of participating children from yards with soil lead > 500 began to decrease in comparison to the fraction of yards with soil > 500 ppm. However, this is probably not a valid indication that the population of children who participate in the blood lead program is biased toward children from low soil lead yards. Rather, this low rate is more likely a direct consequence of the active efforts EPA has made to clean up lead in yards where children are residing. Recall that the trigger for a yard cleanup is any quadrant of a yard where the 95% upper confidence limit (UCL) on the measured concentration UCL exceeds 1000 ppm. Of all properties where the yard wide average is 500-1000 ppm, nearly 70% exceed this trigger. This highlights that the effective action level for lead in East Helena soil in closer to 500 ppm than 1000 ppm (based on yard wide averages), and explains why continued operation of the cleanup program is expected to have been selectively eliminating properties where children are present and the soil level is > 500 ppm. This preferential remediation strategy likely accounts for the low number of children tested in recent years from such properties.

Contribution of Soil Lead to Blood Lead Values

These same data on soil lead and blood lead may also be used to evaluate the importance of soil lead as a contributor to blood lead. Figure 3 shows a plot of blood lead *vs* soil lead for each of several years. Summary statistics are presented below the figure. As seen, there is no clear tendency for blood lead to increase as soil lead increases, and the average slope (ug/dL in blood per 1000 ppm of soil lead) across six years of observation is not different from zero. These findings support the conclusion that, at least below 1,000 ppm, lead in soil is a minor source of blood lead in this community. This may be contrasted with the predictions of the IEUBK model, which indicate an increase of 7.9 ug/dL in blood lead per 1000 ppm of soil lead.

This finding is also supported by a comparison of the distribution of blood lead values in children stratified by soil lead level, as shown in Figure 4. As seen, there is no apparent difference between children who live at properties that have been remediated with clean fill, and at properties where remediation has not occurred and soil lead levels are either < 500 ppm or are between 500 and 1000 ppm. As above, this indicates that, at this site, the contribution of soil lead < 1000 ppm to blood lead is sufficiently small that the effect can not be detected.

These findings based on current data are also consistent with the results that were obtained at this site in the past (Hydrometrics 1993). In this analysis (shown in Figure 5), multivariate regression of the relationship between blood lead, soil lead and lead in air indicated that lead in soil does not begin to contribute substantially until the soil lead level exceeds 3000 ppm, and that in the past, the chief contributor to elevated blood lead values was the airborne dust pathway, which would have been associated with continuous, day-to-day deposition of fine particulates with elevated lead content onto streets and other surfaces, which ultimately found its way into homes.

Summary of Response to Question 5

The East Helena Lead Education and Abatement Program, administered by the City-County Health Department, has been performing a blood lead survey in East Helena for a number of years. The data from this survey show that blood lead values have decreased substantially over time, and that the incidence of PbB above 10 ug/dL is now very close to zero. These data support the conclusion that cleanup activities at the site, coupled with the effects of national programs to reduce lead in the environment, have been successful in reducing lead exposures from all sources in East Helena to acceptable levels. However, in order for this conclusion to be valid, it is important to examine the quality of the blood lead data set. Based on a consideration of participation rate, statistical uncertainty, spatial representativeness, and soil lead representativeness, it is concluded that the blood lead data generated by the County program are reliable and are appropriate for use by risk managers and other health professionals in assessing site conditions.

References

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Gilbert RO. 1987. Statistical methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York, pp. 181-182.

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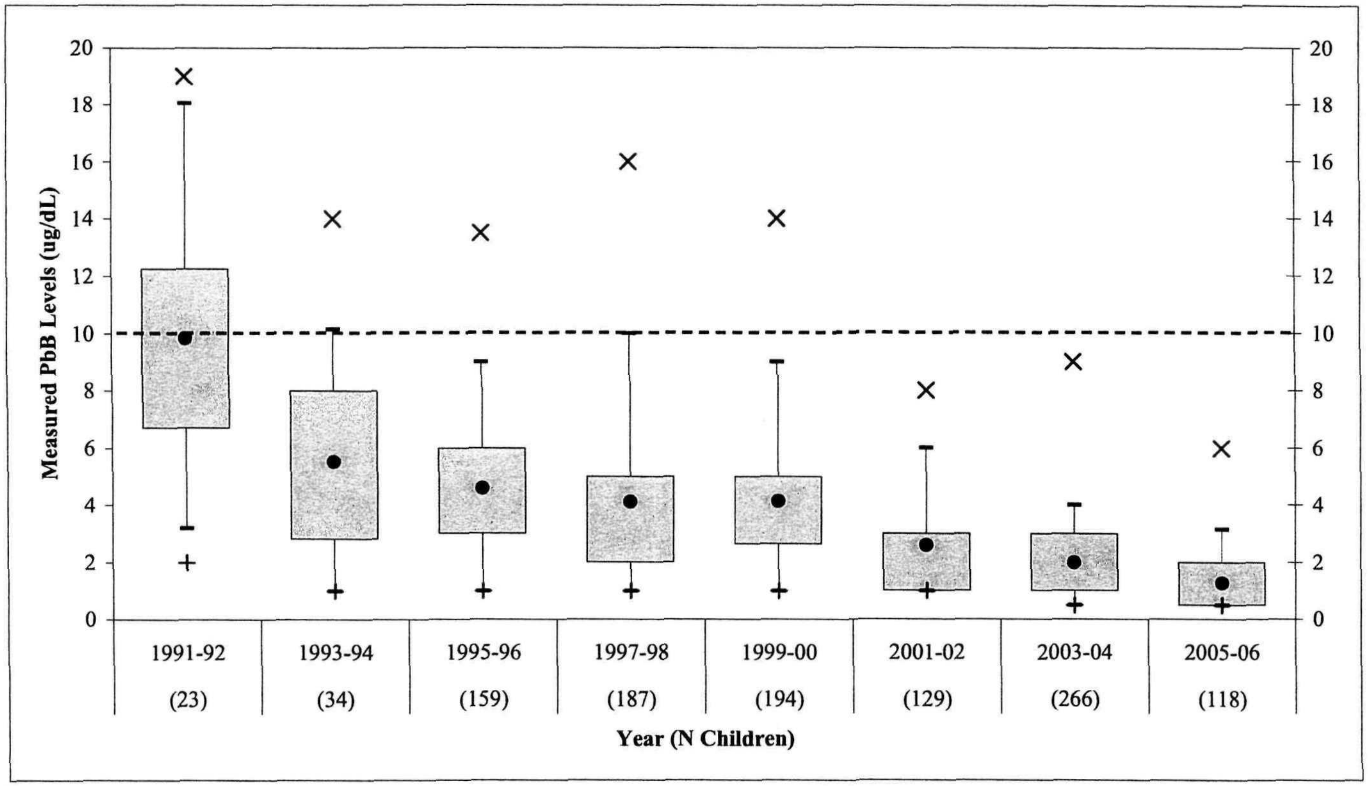
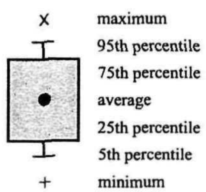
BLOOD LEAD VALUES FOR CHILDREN (0 to ≤ 84 mos) IN EAST HELENA FROM 1991 TO 2006



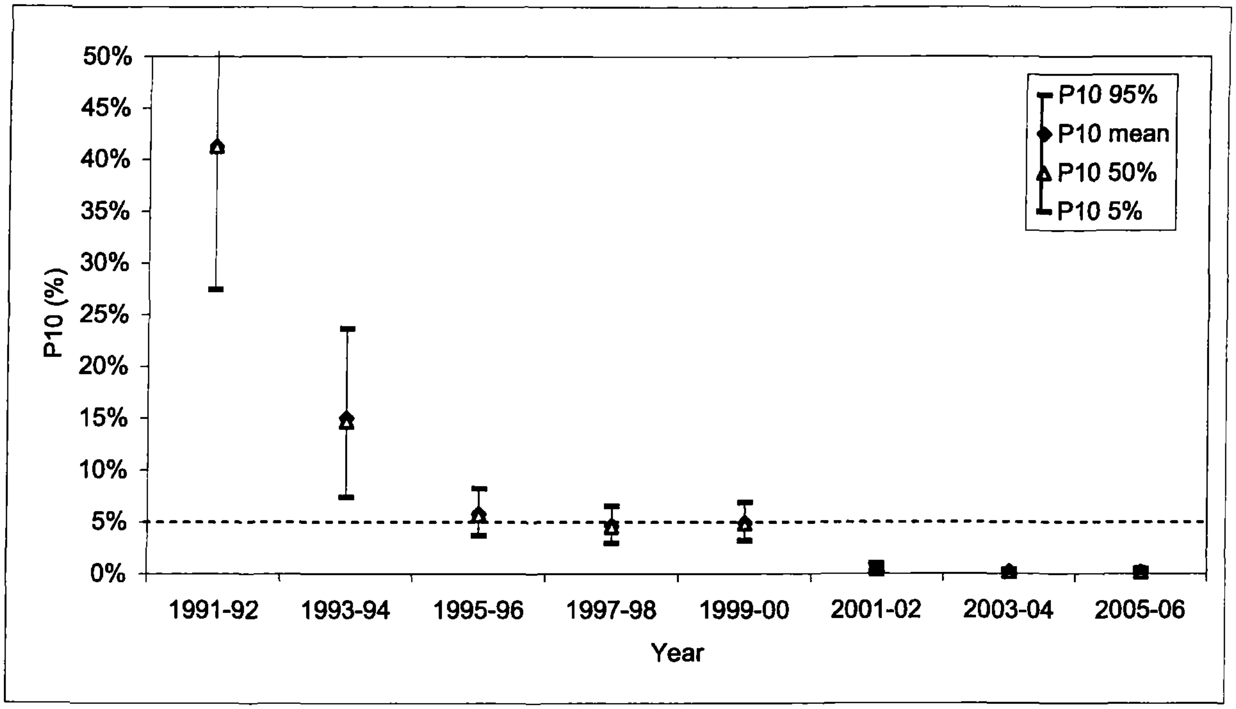
Restricted to children in East Helena aged 0-84 months (at the time of PbB collection).
PbB values reported as <1 ug/dL evaluated at 0.5 ug/dL.
If multiple PbB samples are available for a child within a year, the mean PbB value across samples was used.



PbB vs PbS new_2-28-07 rev2.xls, PbB B&W by 2yrs
3/2/2007

FIGURE 1

UNCERTAINTY IN P10 VALUES FOR CHILDREN (AGE 0 to ≤ 84 mos) IN EAST HELENA



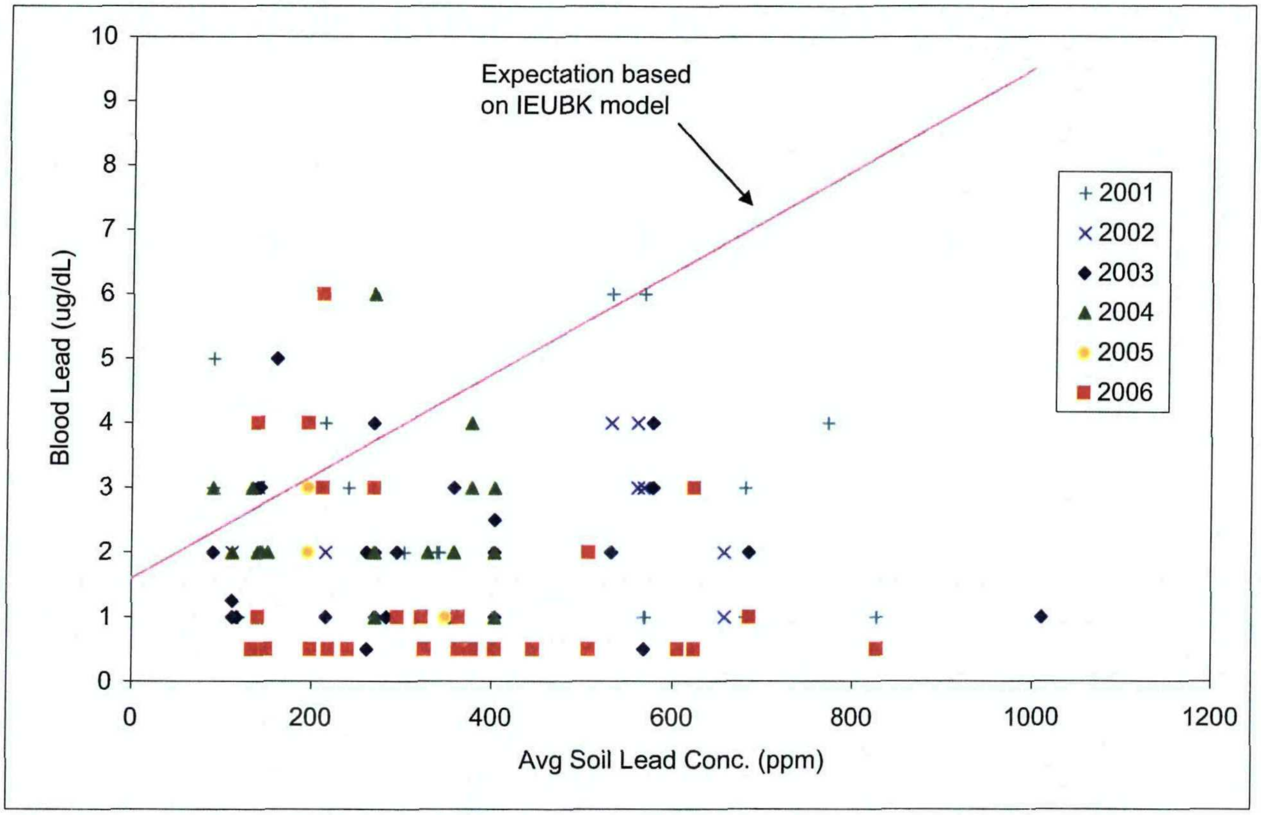
Uncertainty in P10 v3.xls, results

FIGURE 2
LOCATION OF BLOOD LEAD MEASUREMENTS
NEAR THE EAST HELENA SMELTER (1995-2006)

Image based on map provided by Lewis & Clark County GIS

FIGURE 3

RELATION BETWEEN SOIL LEAD AND BLOOD LEAD VALUES
FOR CHILDREN (0 to ≤ 84 mos) AT UNREMEDIATED PROPERTIES
IN EAST HELENA 2001 - 2006



Year	N	Slope
2001	18	-0.70
2002	10	0.08
2003	37	0.01
2004	22	0.90
2005	4	-9.82
2006	33	-1.80

Mean (obs)	-0.0019	-1.89
Expected (IEUBK)	0.0079	7.90

FIGURE 4

BLOOD LEAD VALUES FOR CHILDREN (0 to ≤ 84 mos)
IN EAST HELENA FROM 2001 - 2006 IN RELATION TO
REMEDIATION STATUS AND SOIL LEAD CONCENTRATIONS

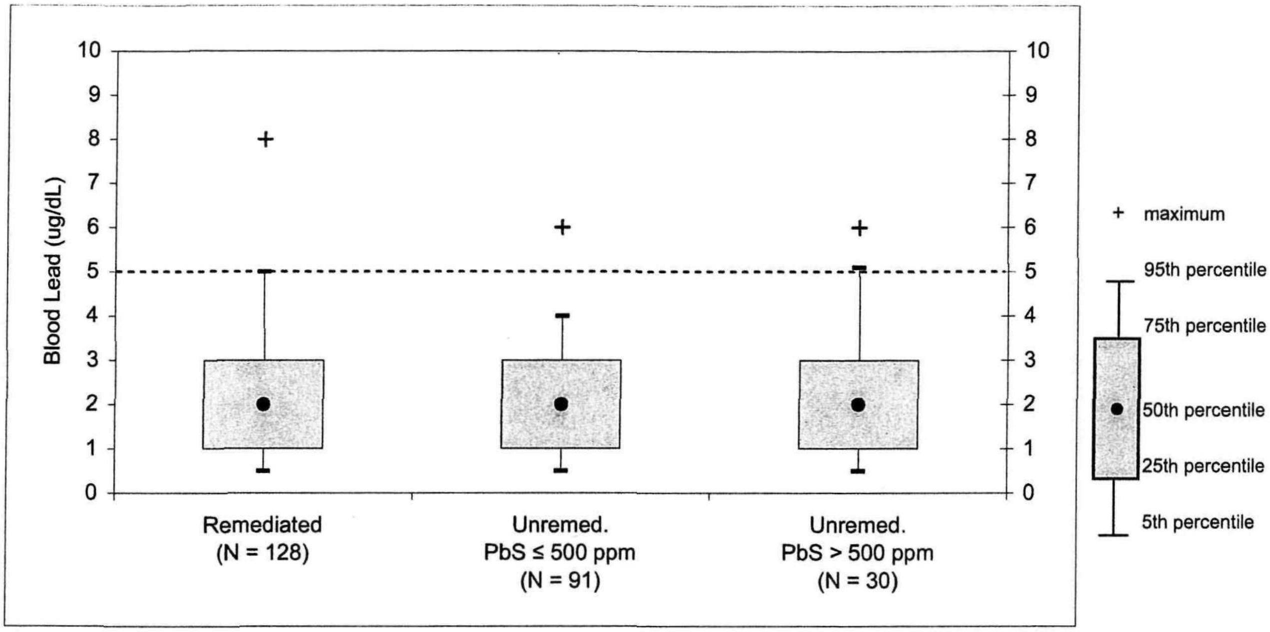
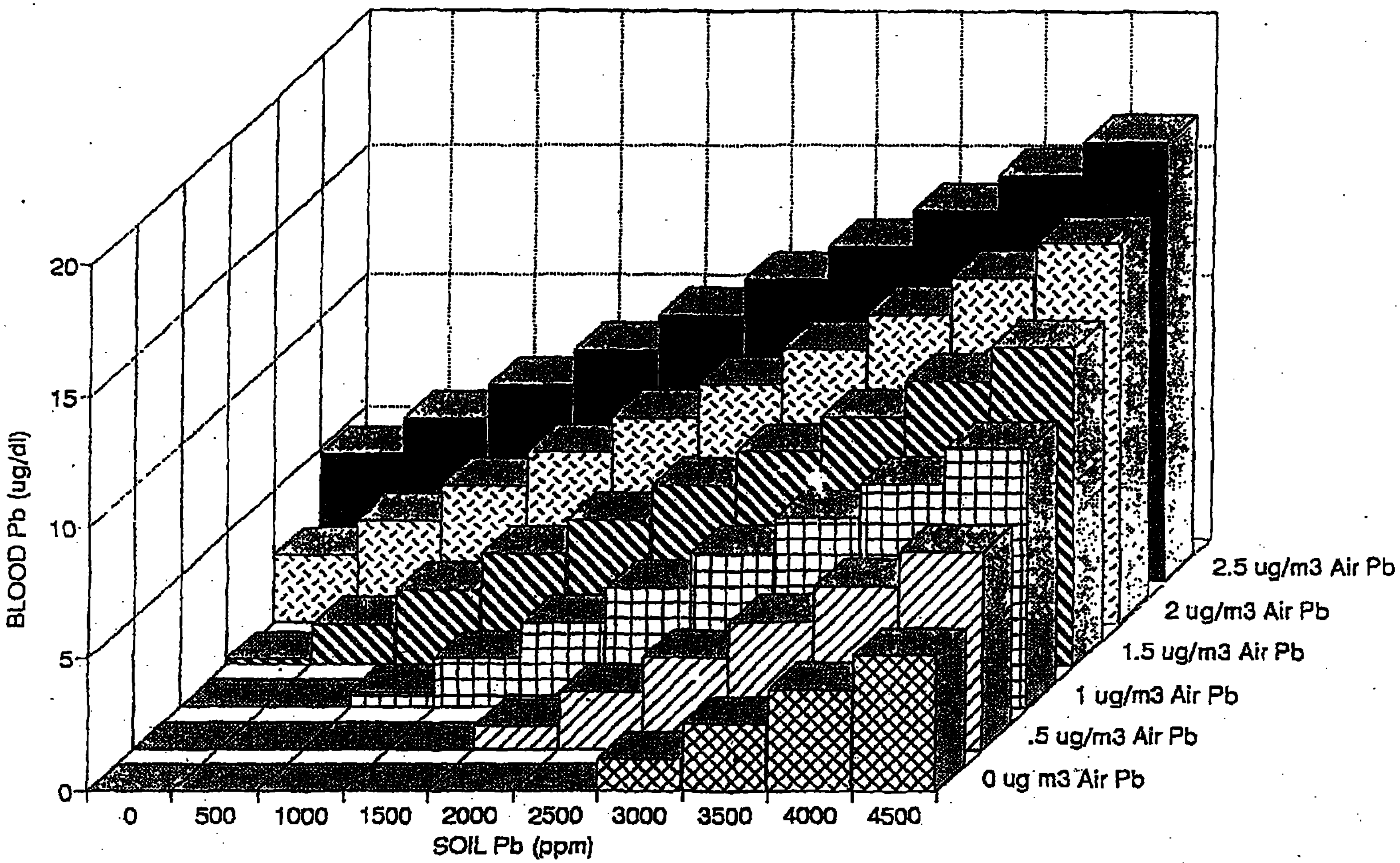


FIGURE 5

EAST HELENA LEAD EVALUATION
Soil/Air/Blood



(Source: East Helena, Montana, Soil, Blood and Air Lead Data Evaluation, Hydrometric, Inc, 1993)

EPA RESPONSES TO QUESTIONS FROM
LEWIS AND CLARK COUNTY HEALTH BOARD
Based on meeting held December 17, 2007

1. **Discuss the rationale for EPA's decision (on a national level) against lowering the "level of concern" for lead in children's blood (now 10 ug/dL) and discuss implications of a site-specific lowering of the "level of concern" to 5 ug/dl or 2 ug/dl.**

The rationale for EPA and CDC not lowering the blood lead level of concern below 10 ug/dL is addressed by the Centers for Disease Control and Prevention in their 2005 document entitled *Preventing Lead Poisoning in Young Children.* It reads as follows:

"In 1991 the CDC recommended lowering the level for individual intervention to 15 ug/dL and implementing community-wide primary lead poisoning prevention activities in areas where many children have blood lead level greater than 10 ug/dL. Some activities, such as taking an environmental history, educating parents about lead, and conducting follow-up blood lead monitoring were suggested for children with blood lead levels greater than 10 ug/dL. However, this level, which was originally intended to trigger communitywide prevention activities, has been misinterpreted frequently as a definitive toxicologic threshold. Evidence exists of adverse health effects in children at blood lead levels less than 10 ug/dL. The available data are based on a sample of fewer than 200 children whose blood lead levels were never above 10 ug/dL and questions remain about the size of the effect. At this time there are valid reasons not to lower the level of concern established in 1991 including the following:

- No effective clinical or public health interventions have been identified that reliably and consistently lower blood lead levels that already are less than 10 ug/dL.
- No one threshold for adverse effects has been demonstrated. Thus the process for establishing a lower level of concern would be arbitrary and no particular blood lead level cutoff can be defended on the basis of the existing data. In addition, establishing a lower level of concern may provide a false sense of safety about the well being of children whose blood lead levels are below the threshold.
- The adverse health effects associated with elevated blood lead levels are subtle. Individual variation in response to exposure and other influences on developmental status, make isolating the effect of lead or predicting the overall magnitude of potential adverse health effects exceedingly difficult.
- Efforts to identify and provide services to children with blood lead levels less than 10 ug/dL may deflect needed resources from children with higher blood lead levels who are likely to benefit most from individualized interventions."

At the East Helena site, the Lead Education and Advisory Committee, consisting of the EPA, MDEQ, Lewis and Clark County Health Department, City of East Helena, and Asarco have established a Remedial Action Objective that there should be no more than a 5% probability a child will have a blood lead value greater than 4 ug/dL. This is a goal more stringent than the national goal (no more than a 5% chance of exceeding 10 ug/dL), and this goal has been achieved in East Helena in every year from 2002 to the present.

2. Discuss in greater detail the extent to which education and outreach are thought to affect children's blood lead levels in East Helena.

EPA believes that it is unlikely that the extremely low blood lead levels observed in East Helena are due to public education and awareness. While EPA agrees that the current program of lead education is valuable in providing citizens with knowledge they may utilize to reduce risk from lead exposure, EPA does not believe that this program could be responsible for generating a bias in the data set that could account for the current observations. From 1989 – 1991, EPA conducted the Urban Soil Lead Abatement Demonstration Project in Baltimore, Boston, and Cincinnati (USEPA, 1996). The study examined the effectiveness of soil, interior dust and lead abatement in reducing children's blood lead levels. In the control groups which received no abatement, but were aware of the study and the hazards associated with lead, the investigators found significant decreases in children's blood lead levels in the first 6 months. These blood lead levels rebounded to pre-study levels by the 2nd year of the study. This study suggests that awareness of lead hazards may result in temporary changes in behavior which reduce exposure to lead hazards, but the changes are not long term. The blood lead studies in East Helena have been conducted for more than 15 years. The results are consistently low, and the trend is downwards. It is unlikely that they are influenced to any large extent by public awareness. Moreover, the blood lead data for East Helena children indicate that current exposure levels are sufficiently far from a level of concern that even if there were some small bias in the data (this is not thought to be true), the judgment that the blood lead data indicate the current soil cleanup program is effective remains valid.

Reference

US Environmental Protection Agency (1996). Urban Soil Lead Abatement Demonstration Project Volume I: EPA Integrated Report. National Center for Environmental Assessment, Research Triangle Park, NC. EPA/600/P-93/001aF.

3. Can the need for institutional controls be reduced (minimized) by adopting a more stringent soil cleanup action level? Provide an in-depth discussion and breakdown of each component of institutional controls, including estimated short- and long-term costs per component. For clarification, Kathy Moore added: The Board seeks assurances that funding will be adequate, and that EPA and MDEQ will "be there" to provide assistance, advice and coordination.

EPA has demonstrated that, irrespective of the soil cleanup action level, the need for both short-term and long-term institutional controls remains unchanged because residual levels of lead will remain in place. Institutional controls are best defined as remedy protection measures, and EPA has described in the Proposed Plan, Decision Summary and Responsiveness Summary that ICs are an essential part of the remedy.

As for the second part of the question, EPA has provided a "breakdown" of ICs by their components in the Decision Summary and Responsiveness Summary. However, cost estimates cannot be prepared by EPA alone. The annual cost for maintaining the Lead Education and Abatement Program is approximately $140,000. The extent to which ICs administration will be carried out by the lead abatement program, or perhaps another county program, is unknown. Also unknown is whether or not the county will seek fees to carry out ICs that are routinely conducted by the county already (e.g., subdivision planning and reviews, best management practices and weed control on undeveloped lands, maintaining a GIS database to keep track of sampling results, etc.). These are but two examples of cost estimates that EPA cannot provide without the county's input.

EPA is prepared to continue work with the county, as before, once the Record of Decision is issued and throughout the remedial design and remedial action construction phases of remedy implementation. With input from the county, and exchange of information, the ICs components may be refined and costs estimated. EPA anticipates that the Board of Health will resume deliberations regarding its vital role in administering ICs. The Board may adopt regulations and develop policies regarding ICs.

It would be both presumptuous and very likely unsuccessful for EPA to "specify" or "prescribe" ICs beyond the extent to which ICs have to date been identified. Thus, development, funding and administration of ICs must be a cooperative effort. EPA has numerous times demonstrated its commitment to supporting the county, and EPA will continue to work with and support the county for as long as is necessary.

4. Some East Helena children have been tested multiple times. How were multiple tests treated in the representations of data to date? Plot on an aerial photo data that represent children who were tested multiple times. Scott Brown and Kathy Moore discussed this request with Jan Williams and Debb Tillo and the following conclusions were made: EPA's contractor has access to the county-managed data base. EPA can plot these data on an aerial photo (in a manner similar for all children tested between 1995 and 2006, irrespective of how many times each child had been tested). However, EPA's contractor will need assistance from Jan and Debb, as before, and from the County's GIS unit, also as before. The new plots should be considered in combination with existing plots.

When an individual child was tested more than one time, all values from the same child within the same calendar year were averaged. If a child was tested in more than one year, these values were kept separate when calculating yearly summary statistics and evaluating time trends.

Sheet 3 in the Record of Decision, prepared by the County, shows the locations of homes where one or more children had more than one blood lead value collected. As seen, the locations of homes where children have been evaluated more than one time are distributed across the city's many neighborhoods and outlying subdivisions in a manner that demonstrates a high degree of spatial representativeness.

In interpreting this information, it is useful to contemplate reasons why a child would have more than one blood lead result. EPA believes the most likely reason is that the first blood lead result would have been higher than what the parents felt was appropriate, and that follow-on tests were performed to determine if the first value was correct or to see if values decreased over time. However, a complicating factor in this analysis is the incentive program offered by the County, which may have encouraged some parents to have multiple tests of their children's blood lead, even when initial blood lead values were low.

Table 1 shows summary statistics that test this hypothesis. As seen, the data indicate children with high initial blood lead values tended to have more follow-up blood lead measurements (an average of 1.7 follow-ups per child) than children with lower initial blood lead values (about 0.3 follow-up visits per child). Note that this pattern may tend to bias the blood lead data set in an upwards (overestimation) direction, since children with elevated values contribute data more frequently than children with lower values.

TABLE 1.
RELATION BETWEEN INITIAL BLOOD LEAD RESULT
AND NUMBER OF REPEAT MEASUREMENTS

Initial PbB Result (ug/dL)	N Children	N Follow-up PbB Measurements							Avg. Follow-up Visits
		0	1	2	3	4	5	6	
0-3	550	436	79	24	6	3	2		0.30
3-6	206	154	45	4	1	1		1	0.32
6-10	84	47	20	14	2	1			0.69
>10	24	7	8	2	4		2	1	1.67

5. Reexamine the apparent "upward trend" of higher blood lead values for East Helena children observed in 2006, as compared to previous years. Kathy Moore's follow-up memo (attached) clarifies this point:

> ***I wrote, "there are more children over 4 (ug/dl) than there were 6 years ago." This may be what Vic was talking about. I also wrote that there is, "a 30% increase in kids over 4, the trend is increasing." I believe this addresses your question about the statistical bump in 2005.***

Table 2 shows the number and fraction of children with blood lead values above 4 ug/dl as a function of year. As seen, the percentage of children above 4 ug/dl trended downward through the 1990s. This initial downward trend, EPA believes, is explained primarily by reductions of fine particulates being emitted from plant operations. By 1998-2000, Asarco began meeting the federal and state standards for lead in air. Then, as seen in Table 2, the percentage of children above 4 ug/dl decreased substantially more in 2001 and has since remained low. This decrease corresponds to the time frame in which the smelter ceased operations and all emissions from the smelter to the surrounding community were eliminated.

EPA does not interpret the data as being an "upward trend" in either 2005 or 2006. And, the fraction of children above 4 ug/dl in 2006-2007 is not higher than the fraction of children above 4 ug/dl in 2000-2001. In 2004, the fraction was slightly higher (7%) than in the two preceding years (0-3%), but that did not continue into 2005, 2006, or 2007. It is important to recognize that yearly statistics of this type are inherently variable, and it would not be appropriate to make judgments about trends based on one or two years of data. Rather, in order to determine the presence of time trends, the data must be considered in their entirety.

TABLE 2
FRACTION OF CHILDREN ABOVE 4 UG/DL AS A FUNCTION OF YEAR

Year	Number of Children	PbB > 4 ug/dL
1991	71	51%
1992	15	87%
1993	10	80%
1994	24	46%
1995	75	51%
1996	84	33%
1997	71	37%
1998	116	25%
1999	51	65%
2000	143	27%
2001	93	14%
2002	36	0%
2003	159	3%
2004	107	7%
2005	9	0%
2006	109	2%
2007	7	0%
2008	184	4%

6. Update the multiple regression analysis graph (1993 report, using Lewis and Clark County's 1991 blood lead data) to include all of the more recent matched pairs of soil-lead

and blood-lead data and more recent air pathway inputs after 1993. Recalculate the estimated contribution arising from exposure to soils (i.e., the contribution to actual, observed blood lead levels) based on the more recent data set.

Multi-variate regression to quantify the relationship between blood lead and the concentration of lead in soil and air is confounded if blood lead values are changing because of factors other than changes in soil or air. In particular, it is well established that there has been an on-going downward trend in blood lead levels at the national level due the success of several national programs that have reduced lead exposures from food, water, automobile exhaust, and consumer products.

As a starting point, EPA recognized that one potential limitation to the previous multiple regression analysis is that it assumes that 100% of the decrease in blood lead between 1983 and 1991 is due to the change in air concentration in East Helena. However, as mentioned, there has been an on-going downward trend in blood lead levels at the national level. Therefore, EPA reevaluated the 1983 and 1991 data set to account for the success of national programs in reducing lead exposures.

Figure 1 plots the prediction of this reevaluation.

FIGURE 1.
REVISED ANALYSIS

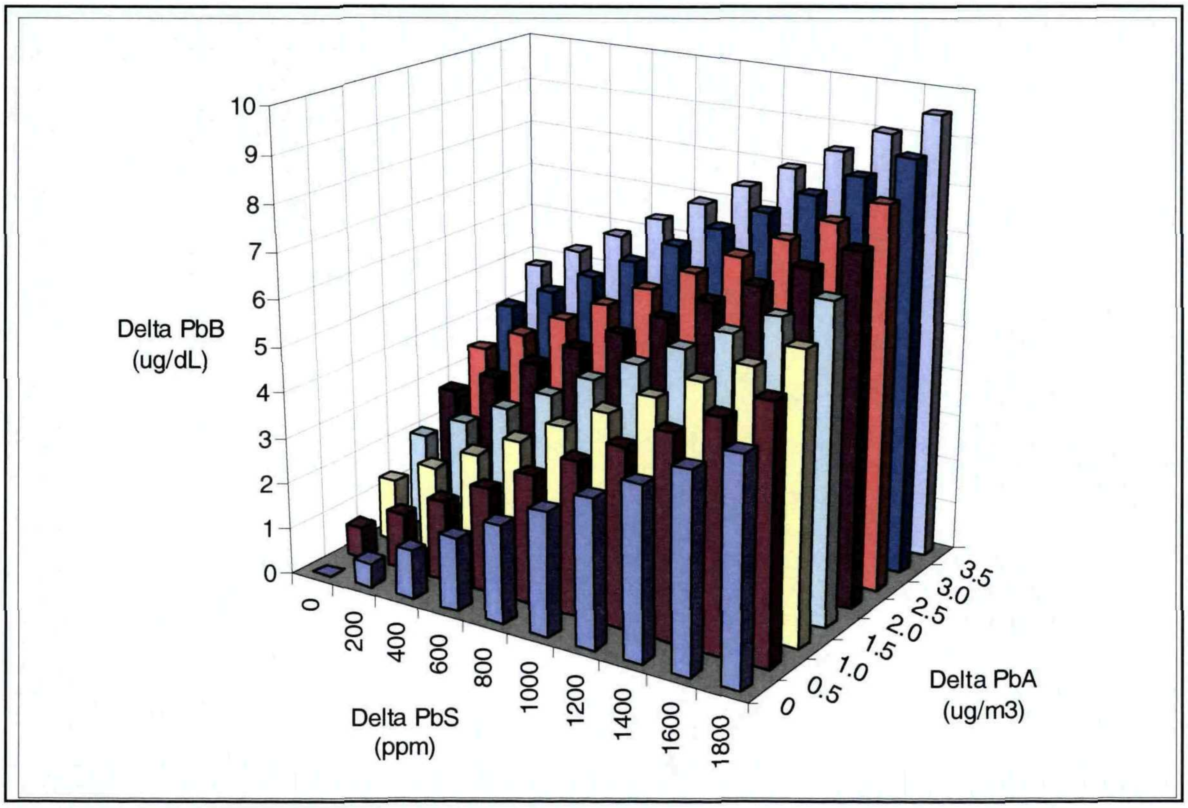


TABLE 3
RELATIVE INCREMENT DUE TO AIR COMPARED TO SOIL

Year	ΔPbA ug/m3	ΔPbS ppm	PbB Increase Over Baseline (ug/dL)		
			From Soil	From Air	% From Air
1983	2.61	250	0.66	3.60	84%
		500	1.33	3.60	73%
		750	1.99	3.60	64%
		1000	2.66	3.60	58%
		1500	3.98	3.60	47%
1991	1.83	250	0.66	2.52	79%
		500	1.33	2.52	66%
		750	1.99	2.52	56%
		1000	2.66	2.52	49%
		1500	3.98	2.52	39%

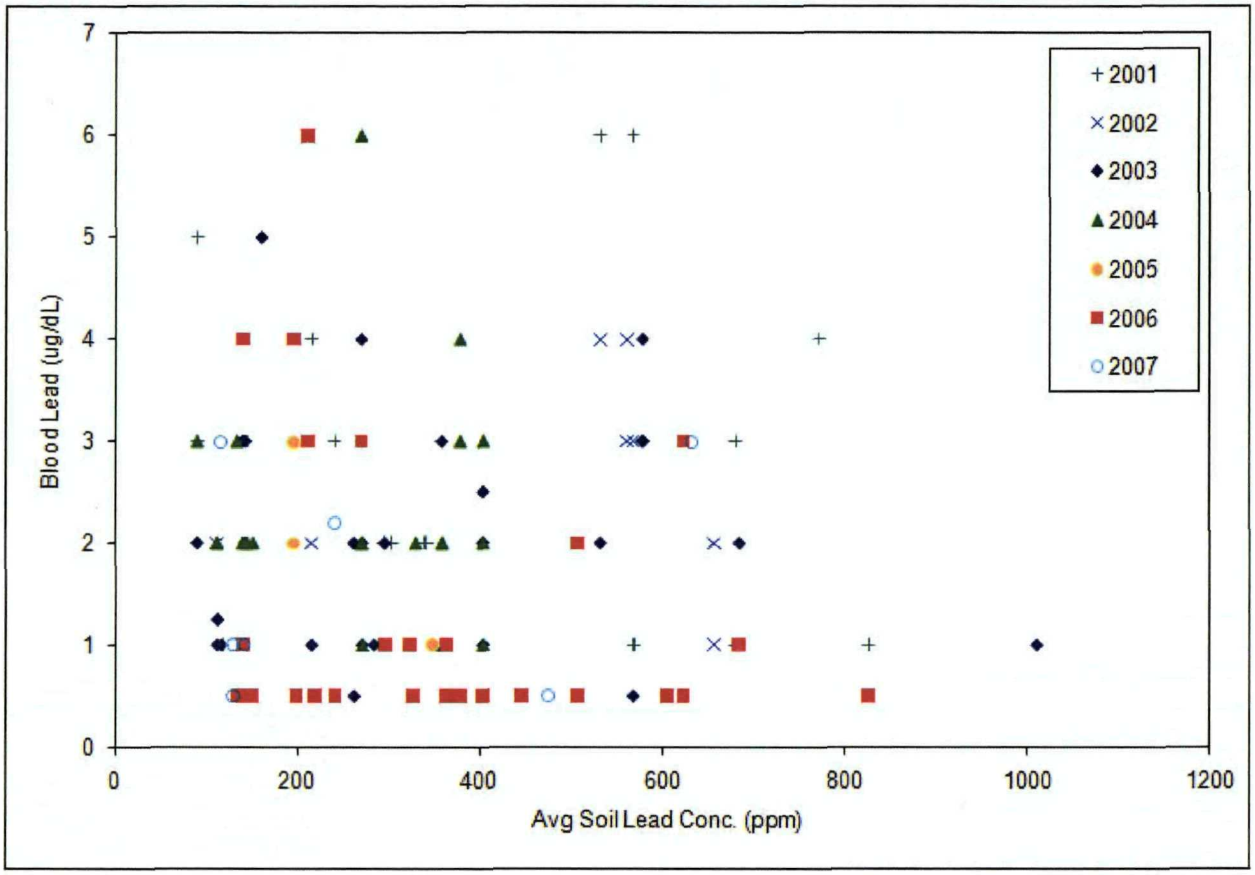
As seen, the revised analysis supports the conclusion that lead in air is likely to have been the predominant contributor to blood lead levels in both 1983 and 1991, at least for locations where soil lead concentrations did not exceed the national average by more than about 1000-1500 ppm.

For more recent data, it is appropriate to analyze the data in a series of time strata because multivariate regression to quantify the relationship between blood lead and the concentration of lead in soil and air is confounded if blood lead values are changing because of factors (national trends) other than changes in soil or air. An approach using data for individual years helps minimize the confounding caused by the decreasing trends in national blood lead levels. Results of an analysis of this type are shown in Figure 2. In this graph, blood lead values, stratified by calendar period, are plotted as a function of soil lead. Stratification based on air lead is not included because air levels are now quite low and are unlikely to be a significant contributing source of elevated blood leads. Based on data from four air monitoring stations in East Helena in 2000 and 2001, the average concentration of lead in air was about 0.5 ug/m^3, and decreased to near zero background concentrations after 2001.

If soil lead is a major source of blood lead, it is expected the data will tend to display an upward trend. However, as shown in the figure and table below (Figure 2), the slopes of the lines in all years are quite shallow. Based on all of the data, the average slope is close to zero, even with excluding the high negative slope observed in 2005, which is based on only 4 values[1]. These data indicate that, under recent site conditions, lead in soil is only one of many sources of blood lead, and that its contribution to blood lead in children is small compared to other sources.

[1] Note that it is not possible to plot a line that displays the average slope on the graph because the intercept term is time-dependent.

FIGURE 2
RELATION BETWEEN AVERAGE SOIL LEAD AND BLOOD LEAD VALUES
FOR CHILDREN (0 TO 84 MONTHS) AT UNREMEDIATED PROPERTIES
IN EAST HELENA 2001 - 2007



Year	N	Intercept ug/dL	Slope ug/dL per 1000 ppm	P value
2001	18	3.1	-0.70	0.699
2002	10	2.7	0.08	0.985
2003	37	1.9	0.01	0.989
2004	22	2.0	0.90	0.691
2005	4	4.4	-9.82	0.095
2006	33	1.9	-1.80	0.197
2007	7	1.2	1.44	0.565

7. Reexamine all other relevant data pertaining to sources and pathways of lead exposure, particularly results of numerous in-home environmental assessments conducted by health professionals. Does the weight of evidence suggest that attic dust, heating system dust, unfinished basements, carpets or furniture, wall insulation, hobbies, garden vegetables,

pets, parents' workplace, interior or exterior paint, or any other possible sources or pathways do contribute or do not contribute to children's blood lead levels?

A data table was provided to EPA by the County that summarized the results of 111 Exposure Assessment (EA) visits. Of these 111 EAs, 25 occurred at locations where no data were available on the level of lead in the soil. Of the 86 properties for which yard lead levels are known, about 2/3 had soil that exceeded EPA's cleanup triggers for lead, and where the soil had either been cleaned up at the time of the visit or were scheduled for cleanup.

For each EA, information was provided regarding the occurrence of non-soil sources of lead exposure such as leaded paint, elevated lead in indoor dust, lead in drinking water, a parent who worked at the smelter, etc. Of these EAs, a blood lead value (the highest observed at the property) was reported for 63 visits. Table 4 summarizes data on the frequency that non-soil sources were identified, stratified as a function of maximum blood lead for these 63 EAs. As seen, the average number of alternative sources tends to increase as the maximum observed blood lead increases. For the highest category (maximum blood lead > 10 ug/dL), alternative sources of lead exposure were identified in 90% of the visits, with an average of 1.6 alternative sources per location. These results support the conclusion that there are multiple sources of lead exposure in the community, and that there is an association between alternative sources (i.e., sources other than yard lead) and the occurrence of elevated blood lead values.

TABLE 4
SUMMARY OF ENVIRONMENTAL ASSESSMENTS FOR
ALTERNATIVE SOURCES OF LEAD EXPOSURE

PbB (ug/dL)	N	Number of Alternate Sources								
		0		1		2		3		Count weighted average
0 - 6	35	19	54%	13	37%	3	9%	0	0%	0.54
>6 - 10	18	8	44%	5	28%	2	11%	3	17%	1.00
>10	10	1	10%	3	30%	5	50%	1	10%	1.60
Total	63	28	44%	21	33%	10	16%	4	6%	0.84

8. Reexamine soil arsenic data. Provide all pre-sample results for arsenic and show distribution contours for soil arsenic, at varying concentrations, in the same manner as

distribution contours are provided for lead at varying concentrations. Kathy Moore's follow-up memo clarifies this point.

> ***Also, the questions about how the arsenic level was chosen and is it a scientifically supported cleanup level or a cleanup level that is coincidental to lead levels is still a big question.***

The method used to compute the risk-based concentration (RBC) for arsenic is based on standard EPA methods. The equation is:

$$RBC = \text{target risk} / (HIF \cdot RBA \cdot oSF)$$

where:

HIF	=	Human Intake Factor. This describes the average amount of soil ingested per day (kg/kg-day).
RBA	=	Relative bioavailability of arsenic in soil compared to water
oSF	=	Oral slope factor for arsenic $(mg/kg\text{-}day)^{-1}$

The target risk chosen was 1.499E-04, since this will yield the concentration value where risk change from 1E-04 (acceptable) to 2E-04 (unacceptable). The HIF is based on standard USEPA assumptions about residential exposure to soil (350 days year for 30 years, with intake rates of 200 mg/day as a child (age 0-6) and 100 mg/day as an adult (age 7-30)). Based on measurements of arsenic RBA at many mining sites, a value of 50% was used. This is considered to be conservative, since nearly all measured values are lower than this. Likewise, based on data from numerous other mining and smelting sites, the concentration of arsenic in indoor dust was assumed to be 50% of that in outdoor soil. This too is considered to be conservative, since the observed ratios are nearly always lower than this. Based on these inputs, the RBC for arsenic in residential soil is 176 ppm.

Figure 3 shows the relationship between arsenic and lead in soil samples from the site. As seen, although there is variability, there is a clear relation between the two. This implies that, on average, elevated levels of arsenic will be associated with elevated levels of lead. At a RBC of 176 ppm, all properties (6) with arsenic concentrations greater than 176 ppm would have been cleaned up as part of the cleanup for lead. However, EPA has selected in this ROD a lower cleanup action level for arsenic in residential soil (100 ppm), which is the concentration of arsenic that is readily and cost-effectively attained in combination with the selected cleanup action level for lead in residential soil (1,000/500 ppm).

Sampling to date has shown that only approximately five properties have yard-wide average arsenic concentrations greater than 100 ppm arsenic in association with lead concentrations less than 1,000 ppm. These properties are located north of East Helena's city limits where historical ditches and channels are present. Historical runoff from the smelter property that flowed through these channels and ditches contributed to the arsenic contamination on these properties. Results from sampling of these ditches as part of the residential sampling likely caused the property to exceed a concentration of 100 ppm. It is also noted that these five properties have average lead concentrations less than 700 ppm, and most have lead concentrations less than 500 ppm. These properties are scheduled for cleanup in 2009 under the on-going removal action.

EPA Region 8 typically assumes a residential exposure unit for arsenic based on a neighborhood scale. However, in the case of East Helena, risk assessment managers chose to apply the adjusted action level to each residential yard. The adjusted soil arsenic cleanup action level (100 ppm), once implemented, will ensure that residual risks fall within EPA's risk range of 10^{-4} to 10^{-6} (risk of one excess cancer for every 10,000 to 1,000,000 people) and within the range of residential cleanup levels for arsenic in soil in Region 8 (70 – 250 ppm).

LEWIS & CLARK CITY-COUNTY
Health Department

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September 16, 2009

To: Richard Opper, Director, Montana Department of Environmental Quality

From: Melanie Reynolds, Health Officer, Lewis and Clark County

Re: Comments on Draft Record of Decision for the East Helena Superfund Site

Thank you for the opportunity to provide you with our comments on the East Helena Superfund Site, Operable Unit No. 2, Residential Soils and Undeveloped Lands Draft Final Record of Decision (ROD).

Inaccurate Statements

Of first importance, the ROD states that *'the LCC concurred on the cleanup level of 1000/500 ppm lead and 100 ppm arsenic' (page 7-26, 2nd paragraph).'* Neither the Lewis and Clark City-County Board of Health (Board) nor the Lewis and Clark County Commission (Commission) have done so. In fact, the Board, in a letter to EPA dated April 13, 2007 and included in the ROD documentation, specifically states disagreement with this soil cleanup level. This statement should be removed.

Similarly, on page 26 of the Summary of Public Comments and EPA Responses Regarding the Proposed Plan for Final Cleanup of East Helena's Residential Soils and Undeveloped Lands (in the Response Summary Section), the first bullet item contains the sentence, *"Once a Record of Decision is issued, Lewis and Clark County has stated that its proposed regulations will be enacted and administered. They are designed to minimize disturbances and reduce the indiscriminate transport of soil; however, they are neither difficult nor costly."* To clear the record, Lewis and Clark County has not stated that its "proposed regulations" will be enacted and administered. The Board at its April 2006 meeting did not agree to the proposed regulations, included in the ROD in the Response Summary Section, in April 2006. The Commission has not reviewed the proposed regulations and has never considered their adoption. As of the date of this letter, there are no proposed regulations being considered. The use of the term Lewis and Clark County adds confusion. It is not clear whether these discussions occurred with the Commissioners, the Board, or staff, (compare to the distinction between RCRA and CERCLA). They are different agencies with different authorities.

A statutorily authorized decision-making body, such as the Board or the Commission, must adopt regulations. Neither of these bodies has made decisions or public statements, which support the ROD statement. The assumption that the Board or the county will administer and enforce an existing proposed regulation is implied throughout the document and should be corrected (see page 12-5 for an example of this implication).

Vague and Conflicting Language

The Board needs more information on institutional controls (ICs) in order to move forward. Development relies on knowable and predictable requirements for land use, but the ROD is very unclear about what will be required to develop new lands. In some instances (page 12-10) language used in the ROD seems to define cleanup as voluntary if funding is not available. As an example:

Limited funding may be available to assist developers in further characterization of the property to be developed. If such funding assistance is not available, however, the ICs administrator will advise the developer or land owner of voluntary options allowed in accordance with this ROD for treating, capping or removing soil that exceeds the cleanup level for the new use. (2nd paragraph, last sentence).

The next paragraph goes on to discuss a requirement to meet all standards for the new use (mandatory language), and gives a listing of standards that may be considered (voluntary language).

Rewording of the first italicized paragraph would clarify the expectation and requirements. For example:

Limited funding may be available to assist developers in further characterization of the property to be developed. Regardless of the availability of funding assistance, the ICs administrator will assist the developer or land owner in selecting from the list of cleanup options allowed in accordance with this ROD for treating, capping or removing soil that exceeds the cleanup level for the new use.

Rewording removes the confusion of whether cleanup is voluntary or required. The existing wording appears to give developers a choice of whether to clean up or not, depending on availability of funding.

Funding

The Board questions the adequacy of the funding provided by the responsible parties for the implementation and long-term support of ICs. Of concern to the Board of Health are comments made in the September 8, 2009 meeting with EPA and DEQ in which health department representatives were notified that the county has a "financial obligation" in East Helena and the "increase in the tax base" would provide the funding necessary to meet this obligation. As outlined in our comments of the Proposed Plan, the Board strongly states that the responsible party, ASARCO, should clean up contamination from the Asarco smelter, rather than shifting the cost to a health department already struggling to provide core public health services county-wide.

Clarify What the ROD Covers

Throughout the document, questions arise about what the specific components of Operable Unit 2 (OU2) are and what they aren't. Reviewing the ROD discussion of both Prickly Pear and the Wilson Ditch raises public health concerns that are not addressed adequately in the ROD. The Board would like to know who is taking responsibility for characterization and cleanup of what appears to be a significant source of metals - Wilson Ditch. If the focus of activities in East Helena is indeed shifting to RCRA from CERCLA, this should be stated clearly and EPA must clearly designate RCRA as the responsible party. This allows both the Board and the Commission to follow up on the public health implications of issues that are not addressed in the ROD without confusion over on the appropriate contact.

Page 5-20, Wilson Ditch discussion

The first paragraph is very confusing. It implies that water quality in the Wilson Ditch is <u>not</u> essentially the same as Prickly Pear above the plant, because arsenic and lead concentrations in particular are elevated – directly in conflict with the plain English of the paragraph. We must guess where the highest levels are, because it is not clearly stated or discussed. Is it the Upper Lake, the upper reach of Prickly Pear or Wilson ditch? Were samples taken? What reference can we consult to obtain the data used to make these statements? If Superfund OU2 is indeed looking at surface water, then this issue must be clearly addressed in the ROD. Otherwise, surface water should immediately be transferred to RCRA for investigation.

The next paragraph indicates Wilson Ditch sediments are significantly high in lead and arsenic. This ditch is an actively used irrigation ditch and livestock have access to this water and can drink the water, at least "part of the year". Livestock access is not discussed. Is it a concern? Where is the irrigation water applied? Application of water with potentially elevated metals concentrations across large areas of agricultural land implies that we are spreading contamination, and increasing concentrations of contamination. Though the discussion suggests that the source of metals (stormwater from the plant site) has been eliminated, it is possible that the contaminated sediments of Wilson Ditch are a second source. Wilson Ditch sediments contain 2,658 ppm arsenic and 6,528 ppm lead at the highest levels (near the plant site). Is this an area of open flow through the ditch? Furthermore, high concentrations are found to a depth of 8". This appears to be a fairly significant source and is subject to constant movement through water flow.

Statements in the third paragraph on page 5-10 highlight the importance of the discussion on Wilson ditch and other ditches. The ROD notes, *"Sampling to date has shown that only approximately five properties have yard-wide average arsenic concentrations greater than 100 ppm arsenic in association with lead concentrations less than 1,000 ppm. These properties are located north of East Helena's city limits where historic ditches and channels are present."* The implication that ditches and channels are likely to contribute to elevated levels of arsenic, in the potential absence of lead, leads to the conclusion that the Wilson ditch also contributes arsenic to irrigated lands. With arsenic sediments at 2,658 ppm, the Board believes this ditch requires significantly more attention than it is receiving.

The 4th paragraph of this section indicates that a section of the ditch was cleaned up in 1993 and 1994. However, this is still an active irrigation ditch and runs openly through a portion of Manlove Subdivision and extends North of Highway 12. The point of diversion, the nature of the ditch's construction through the plant site, and other pertinent details are not discussed here. There is inadequate information to claim that exposure risk is not an issue with the Wilson Ditch.

Page 6-1, Section 6.2 Water Use

The ROD indicates DEQ has classified Prickly Pear Creek as a B-1 stream. However, beginning at the northeast corner of the West Fields, Prickly Pear is classified as Impaired (I) ((17.30.610, (1)(a)(ix), Administrative Rules of Montana. Impairment is due to sediment, nutrients, metals (particularly arsenic and lead), and dewatering. The Montana DEQ has issued a load reduction goal for Prickly Pear Creek on the impaired section beginning at the northeast corner of the West Fields in the Framework Water Quality Restoration Plan & Total Maximum Daily Loads for the Lake Helena Watershed Planning areas. The identified stream segment (MT411006_030) is within the Superfund planning area and is adjacent to an area identified as containing contaminated soils (West Fields).

The fact the draft ROD doesn't mention the impaired status of this stream is of concern and indicates that surface water has been ignored. This stream is used as a source of water for livestock, and it recharges the Helena Valley aquifer, a source of drinking water for thousands of people. While the ROD suggests that enhancement of riparian zones of Prickly Pear Creek may spur RCRA investigations and remedial actions, it is the potential for contaminated sediments, heavy concentrations of metals and interaction of surface water with ground water that should be of interest to both Superfund and RCRA. Of concern to us is the error of misclassification of this impaired stream and the potential for spreading contamination.

Page 2-21, 4th paragraph
"All treatment yielded vegetative loadings for lead and cadmium that exceeded National Research Council (NRC) forage concentrations chronically tolerated by livestock. However, vegetative arsenic and zinc loadings from all treatments were less than the NRC-identified levels tolerated by livestock. These results suggested that East Fields could be used as pasture for cattle for at least part of the year."

There is no discussion of the level of exceedances, or what "part of the year" means. Is that one month or perhaps six months? How can institutional controls be developed to manage this potential problem when we have no substantive information about acceptable levels of exposure?

Soil Levels
As described in the Board's comments on the Proposed Plan, the Board does not agree that the lead cleanup level for residential soils of 1,000 ppm is health protective. The Board disagrees with the approach used by EPA to establish the 1,000 ppm cleanup level, which is based on (1) blood lead data from East Helena and (2) a quantitative uncertainty analysis of the human health risk assessment during which several "model runs" were conducted using predictive blood lead models.

Additionally, the Board believes the Preferred Cleanup Alternative relies too heavily on institutional controls, including community education, which, in turn, minimizes the alternative's long-term effectiveness and permanence.

Summary

The Lewis and Clark County Commissioners and the Board of Health are committed to participating to the full extent available to us, in the successful development and implementation of institutional controls in the East Helena Superfund area. We rely on the finalization of the ROD to understand what those institutional controls may include. In summary,

- The ROD, as it now stands, does not contain adequate information to determine what an effective set of ICs may require.
- The existing draft IC regulation included in the ROD is inadequate to protect public health.
- Contradictory language in the ROD (some of which is illustrated above) makes unclear what EPA's intent is and brings into question the protectiveness of the selected remedy.
- The overlap between RCRA and CERCLA confuses the issue and tends to obscure the importance of other public health threats, like the groundwater arsenic and selenium plumes, the levels of contaminated soils in ditches and waterways and the possibility of their continued spreading, and, virtually unmentioned, the connectivity between groundwater and surface water and the potential for contamination of larger portions of the Helena valley alluvial aquifer.

The Board, Commission, and Health Department staff would like to continue to discuss and review the ROD with you and your DEQ staff so that we can continue to work toward a protective remedy in East Helena.

City of East Helena

ENVIRONMENTAL PROTECTION AGENCY
APR 04 2008
MONTANA OFFICE

Scott, Leslie

Post-it® Fax Note 7671
Date 4/14/08 | # of pages ▶ 2
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Council Members
Anthony Strainer
Chris Anderson
Wayne Krieger
Ed Stipich

City Attorney
Mike Rieley

City Clerk
Sandra Milsten

Deputy Clerk
Susan Spotorno

Public Works Director
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April 1, 2008

John F. Wardell
Director
Montana Office of the US EPA
10 W. 15th St.
Helena, MT 59626

Dear John Wardell,

I am writing to request the EPA come to a resolution regarding the Record of Decision for the East Helena ASARCO site. The residents of the city have been waiting since last September when we were told a final decision would be made. We were then told it would be moved to December, and then March. Most recently, we have been told, it has once again been put on hold. It would seem that with all the years of scientific studies and information that has been gathered, we should be able to move forward to a Record of Decision. As the evidence from the blood lead levels demonstrate, we are well below the national average. It seems obvious that the remediation that has been completed, along with the education program, we have achieved what we were striving for, to ensure the health of the children of our community. The concerns of MTDEQ and Lewis and Clark City County Health Board are not reasonable. The action levels to which the yards and surrounding areas have been remediated are an adequate level. There is nothing to demonstrate that making these levels more stringent will achieve a greater level of success regarding the health of the children. Since our blood lead levels are lower than the national average and much lower than when East Helena was designated a Super Fund site, what is to be gained by changing the standards at this time?

The land that is known as K&R subdivision, where East Valley Middle School and several blocks of housing is now located had varying levels of lead, cadmium and arsenic. The ground was deep till plowed, mixing the soils with a good end result. This is a relatively inexpensive manner of treatment that is very effective. By utilizing this type of treatment, it made development of the area affordable, which in turn, led to affordable housing. This same type of treatment could be used on the land to the west of the city, known as Lamping field, as well as other undeveloped land surrounding the city. This property could give the city a "hand up" if reasonable methods of remediation can be used. If developers could purchase this property, the city is willing to annex the area, providing water, sewer and other city services. The location of this is ideal for development. The area closest to the highway could be used for commercial purposes, which could help to offset the loss of tax base to the city, as well as School District #9. The area to the north could be used for residential housing.

We Support Fair Housing

We aren't asking to have the rules bent or changed to accommodate the city. We are asking that the same standards that were initially placed continue to be utilized to the end of the project. Both MTDEQ and Lewis/Clark City County Board of Health were involved from the beginning. There is no logic in changing the standard at this time and nothing to be gained. We are in a holding pattern until there is a Record of Decision. We would like to move forward, looking to the future. This could involve Brownfield's grants, which we don't qualify to apply for, because we are designated a Super Fund site. We encourage you to continue to move forward to a final decision and not allow other entities to influence your decision.

Sincerely,

Terrie Casey

Terrie Casey
Mayor

CC: Carol Rushin

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Ref: 8MO

April 17, 2008

Honorable Terrie Casey
Mayor
City of East Helena
P.O. Box 1170
East Helena, MT 59635

Dear Mayor Casey:

Thank you for your letter of April 1 in which you asked EPA to complete the East Helena Record of Decision (ROD), and reiterated the City of East Helena's support for the preferred alternative in EPA's East Helena Proposed Plan. I regret I have not been able to meet the previous target dates to complete the ROD. It has been approximately one year since the close of the public comment period for the Proposed Plan.

As you know, EPA and Montana Department of Environmental Quality (MDEQ) disagree over several aspects of EPA's preferred alternative in the Proposed Plan. EPA and MDEQ have met several times to discuss the areas of disagreement particularly the difference in the lead soil remedial action level. The ROD completion was delayed in hopes of an agreement being reached with the State of Montana which has not yet happened.

Next month, I will be sending the ROD to EPA Headquarters for its review and concurrence. After EPA Headquarters has reviewed the document and I make any needed adjustments, the ROD will be forwarded to MDEQ. At that time, MDEQ will complete its review, and I anticipate will be ready to make its decision about the selected remedy.

The above-described schedule means the ROD may not be finalized until late July at the earliest. I am committed to complete the ROD as expeditiously as possible and will update you periodically on its status. Please do not hesitate to call me at (406) 457-5001 with your questions or concerns.

Sincerely,

John Wardell
Director
Montana Office

Montana Department of
ENVIRONMENTAL QUALITY

Brian Schweitzer, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • www.deq.mt.gov

September 15, 2009

Carol Campbell
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U. S. Environmental Protection Agency, Region 8
1595 Wynkoop St
Denver, CO 80202-1129

Re: Letter of Non-Concurrence for Operable Unit 2 ("OU 2") of the East Helena Superfund Site

Dear Ms. Campbell:

The East Helena Site was listed on the National Priorities List in 1984. The Environmental Protection Agency (EPA) and ASARCO signed an Administrative Order on Consent in 1991. EPA issued the first proposed plan in 1997, and the second in January 2007. Throughout these years, the evidence of the detrimental effects of lead continues to mount, and lead has become more strictly regulated by EPA on a national level.

Much of the evidence is summarized in EPA's October 2008 regulatory impact analysis of its proposed revisions to the National Ambient Air Quality Standards for Lead, which states, "Very importantly, the newly available toxicologic and epidemiologic information ... includes assessment of new evidence substantiating risks of deleterious effects on certain health endpoints being induced by distinctly lower than previously demonstrated Pb exposures indexed by blood-Pb levels extending well below 10 μg/dL in children and/or adults."

The Department of Environmental Quality (DEQ), cognizant of the ongoing research and national efforts for protectiveness from lead, continues to advocate a trigger level for all residences of 500 ppm. The DEQ trigger level would not undo EPA's removal action. Those residences addressed under the removal action have soil lead levels of less than 500 ppm, protective of human health and the environment.

But EPA's negotiated 1,000-ppm lead trigger level for existing residences should not be viewed as mission accomplished. As made clear by the National Contingency Plan, removal actions, by their nature, "are distinct from remedial actions in that they mitigate or stabilize the threat rather than comprehensively addressing all threats at a site." 55 Fed. Reg. 8666, 8695 (1990).

The 500-ppm trigger cleanup level, unlike EPA's 1,000-ppm level, would be consistent with the Integrated Exposure Uptake Biokinetic model and current federal lead policy and guidance. The state of Montana has been clear about its preference for the more protective clean up level.

As for funding of further actions for lead contamination at OU 2, it is unfortunate that publication of EPA's 2007 Proposed Plan, based on the 1,000-ppm trigger level, played a large role in limiting EPA's and DEQ's future cost recovery against ASARCO in the bankruptcy arena. However, this should not preclude the agencies from further actions needed for protectiveness, nor should it lead to transferring the fiscal burden onto local government and landowners.

The points made by DEQ in its April 12, 2007, comments on the Proposed Plan continue to be valid, and apply to the ROD as well.

In addition, the Section 10.2.8, "State Acceptance," is required, in its entirety, to read:

> "The State's consistent interpretation that a lower lead in soil cleanup level is needed to be protective, as well as the State's disagreement with other facets of EPA's OU 2 remedy, influenced the State's final decision not to concur. DEQ's concerns pertaining to OU 2 focus on concerns as to the remedy's protectiveness as well as the remedy's implementability. DEQ considered public comment received on the Proposed Plan prior to making its determination as to State concurrence. The State's letter pertaining to concurrence is provided in Appendix D."

DEQ looks forward to working closely with the EPA, responsible parties, local government, landowners, and the public in ensuring a clean and healthful environment for the citizens of the State, and significantly, for those who live or work in East Helena and the associated counties.

Sincerely,

Richard H. Opper
Director