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Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R08-90/027
November 1989

EPA

Superfund Record of Decision:

East Helena, MT

50272-101

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First Remedial Action

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16. Abstract (Limit: 200 words)

The 80-acre East Helena site, in East Helena, Lewis and Clark County, Montana, is a primary lead smelting facility that has been in operation since 1888. In 1927 the Anaconda Company constructed a plant adjacent to the lead smelter to recover zinc from the smelter's waste slag. Asarco, the owner and operator of the smelter facility, purchased the zinc plant in 1972 and operated the plant until 1982. Prickly Pear Creek flows near the site and has been found to contain elevated levels of arsenic and lead. Air quality and soil investigations also revealed the presence of contaminated soil in East Helena residential areas, contaminated process ponds over shallow ground water near the plant, and elevated blood-lead levels in school children. A 1984 remedial investigation identified elevated levels of metal contamination in soil, livestock, plants, and ground and surface waters with the sources of onsite contamination being primary and fugitive emissions and seepage from process ponds and process fluid circuitry. The site has been segregated into five operable units, consisting of the process ponds, the ground water, the surface water, the slag pile, and the ore storage areas. This ROD addresses four process fluid ponds which are used for process water retention and include the Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and the former Thornock Lake, now dry. The primary contaminants of concern in the process ponds are metals including arsenic and lead.
(Continued on next page)

17. Document Analysis a. Descriptors
Record of Decision - East Helena, MT
First Remedial Action
Contaminated Media: soil, sediment, sw
Key Contaminants: metals (arsenic, lead)

b. Identifiers/Open-Ended Terms

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OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

16. Abstract (Continued)

The selected remedial action for this site includes excavating and smelting 55,150 cubic yards of soil and/or sediment from all four process ponds and multi-media monitoring after individual remedial activities are implemented at three of the process pond areas. Process pond remediation activites include replacing the speiss granulating pond with a tank and a secondary containment facility and replacing the pit with a lined facility; replacing the settling system at the acid plant water treatment facility with a closed circuit filtration treatment system; in-situ co-precipitation of the process wastes from the Lower Lake, replacing the Lower Lake with two steel tanks to contain process wastes, and constructing a lined pond for emergency containment of storm runoff. If pilot-scale testing of in-situ co-precipitation proves to be impractical, a contingency plan will be implemented, which includes treatment of Thornock Lake water at an onsite water treatment facility to removal metals, followed by discharge to a POTW. The estimated present worth cost for this remedy is $9,644,500 which includes an annual O&M cost of $611,200.

U.S. EPA REGION VIII
Montana Operations Office

RECORD OF DECISION

East Helena Smelter Site
Process Ponds Operable Unit
East Helena, Montana

November 1989

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RECORD OF DECISION

DECLARATION

East Helena Smelter Site
Operable Unit 1; Process Ponds
East Helena, Montana

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Asarco smelter process ponds, an operable unit of the East Helena Smelter Site, in East Helena, Montana, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 USC Sec. 9601-9675 and the National Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the administrative record for the site.*

By signature below, the State of Montana concurs in this Record of Decision (ROD). All determinations reached in the Record of Decision were made in consultation with the State of Montana, which has participated fully in the development of this Record of Decision.

*The administrative record is available for public review at the U.S. Environmental Protection Agency, 301 South Park, Helena, Montana, 8 a.m. to 5 p.m., Monday through Friday.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This response action is the first such action at the East Helena Smelter Site. In 1987, the site was segregated into five operable units:

- Process ponds and fluids
- Groundwater
- Surface water, soils, vegetation, livestock, fish, and wildlife
- Slag pile
- Ore storage areas

Also in 1987, EPA identified the process ponds as the first operable unit for remedial action under an accelerated schedule. Existing data indicated that the process ponds were the most significant and well characterized sources impacting the groundwater, both on and off the plant site.

The response action selected by the Environmental Protection Agency was developed as a remediation strategy for cleanup of the process ponds. The process ponds consist of four discrete areas:

- Lower Lake
- Speiss granulating pond and pit
- Acid plant water treatment facility
- Former Thornock Lake

Each of the four process ponds poses near- and long-term public health and environmental threats of varying magnitude. The response action for each process pond is described briefly below, and in greater detail in the Decision Summary. The response actions selected will eliminate future contact between process waters and the underlying soils and groundwater. Soils and sediments from all four process ponds will be excavated and treated by onsite smelting. Other major components of the selected remedy include:

LOWER LAKE

- Replace Lower Lake with two large steel tanks as the plant's primary holding facility for process waters

- Treat Lower Lake water in place by coprecipitation of metals and arsenic

- Construct lined, contained drying pads for saturated sediments

- Excavate the most highly contaminated sediments and treat by smelting onsite. It is estimated that approximately 45,000 cubic yards (wet volume) of contaminated sediments will require excavation; however, the actual volume will not be known until additional sampling is conducted in the remedial design phase and actual excavation is underway. After drying, the sediment volume will be reduced to 18,000 cubic yards of sediments which will be smelted.

- Construct a lined pond for emergency containment of storm runoff

SPEISS GRANULATING POND AND PIT

- Replace existing pond with tank and secondary containment facility

- Replace existing speiss granulating pit with a new, lined facility

- Excavate soils and treat by smelting onsite. Approximately 3,700 cubic yards of contaminated soils will be excavated and treated; however, the actual volume will not be known until additional sampling is conducted in the remedial design phase and actual excavation is underway.

ACID PLANT WATER TREATMENT FACILITY

- Remove existing settling dumpsters and pond

- Excavate contaminated soils and return the metals to the process by which they were generated by smelting onsite. Approximately 6,250 cubic yards of contaminated soils will require excavation; however, the actual volume will not be known until additional sampling is conducted in the remedial design phase and actual excavation is underway. This includes both sediment drying areas for the acid plant water treatment facility.

- Replace existing settling dumpsters and pond with closed circuit filtration treatment system

FORMER THORNOCK LAKE

- Excavate sediments and treat by smelting onsite. Approximately 200 cubic yards of contaminated sediments will be excavated and smelted; however, the actual volume will not be known until additional sampling is conducted in the remedial design phase and actual excavation is underway.

CONTINGENCY REMEDY

The selected remedy involves innovative technology with respect to treatment of water in Lower Lake. Small-scale laboratory tests have shown promising results for precipitating arsenic and metals in place. This coprecipitation process is expected to be successful in reducing the concentrations of metals and arsenic to acceptable levels. However, because large scale testing has not been conducted, a more proven water treatment process is included in this Record of Decision as a contingency remedy.

If pilot scale testing of in situ coprecipitation methods proves this innovative technology to be impractical or inadequate, the EPA will require construction of a water treatment facility on the smelter site that would be capable of removing metals and arsenic to prescribed standards for discharge to a publicly-owned waste water treatment plant.

DECLARATION

The selected remedy and the contingency remedy are protective of human health and the environment, comply with most Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost-effective. The legally applicable or relevant and appropriate requirements (ARARs) with which the selected remedy does not comply are hereby waived (Refer to Chapter 10 of the Decision Summary, "Statutory Determinations"). This remedy utilizes permanent solutions, alternative treatment, and resource recovery technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature:

James J. Scherer — Date: Nov. 22 19
Regional Administrator (Region VIII)
U.S. Environmental Protection Agency

In Concurrence:

Donald E. Pizzini, Director — Date: 11/30/8
Montana Department of Health and
Environmental Sciences

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RECORD OF DECISION

SUMMARY

1 DESCRIPTION OF SITE

The East Helena Smelter Site is located in the community of East Helena, in Lewis and Clark County, Montana (see Figure 1-1). The site is the location of a primary lead smelter that has operated for 100 years and has also recovered zinc during much of its existence. The plant site, occupying approximately 80 acres, is owned and operated by Asarco, formerly American Smelting and Refining Company, and the sources of contamination are from within the plant site.

The community of East Helena has a population of 1,676 according to the 1980 census. Approximately 3 miles to the west is the City of Helena, with a population of over 35,000. Residential areas of East Helena are within 1/4 mile of the main area, separated from the site by U.S. Highway 12 and a rail line.

The site is located in the Helena Valley of western Montana. Seasons typically consist of cold winters, warm summers with moderate thunderstorm activity, and a fairly consistent wet spring. Much of the moisture in the area comes in the form of late spring and early summer rain, and there are significant winter snow accumulations at higher elevations in

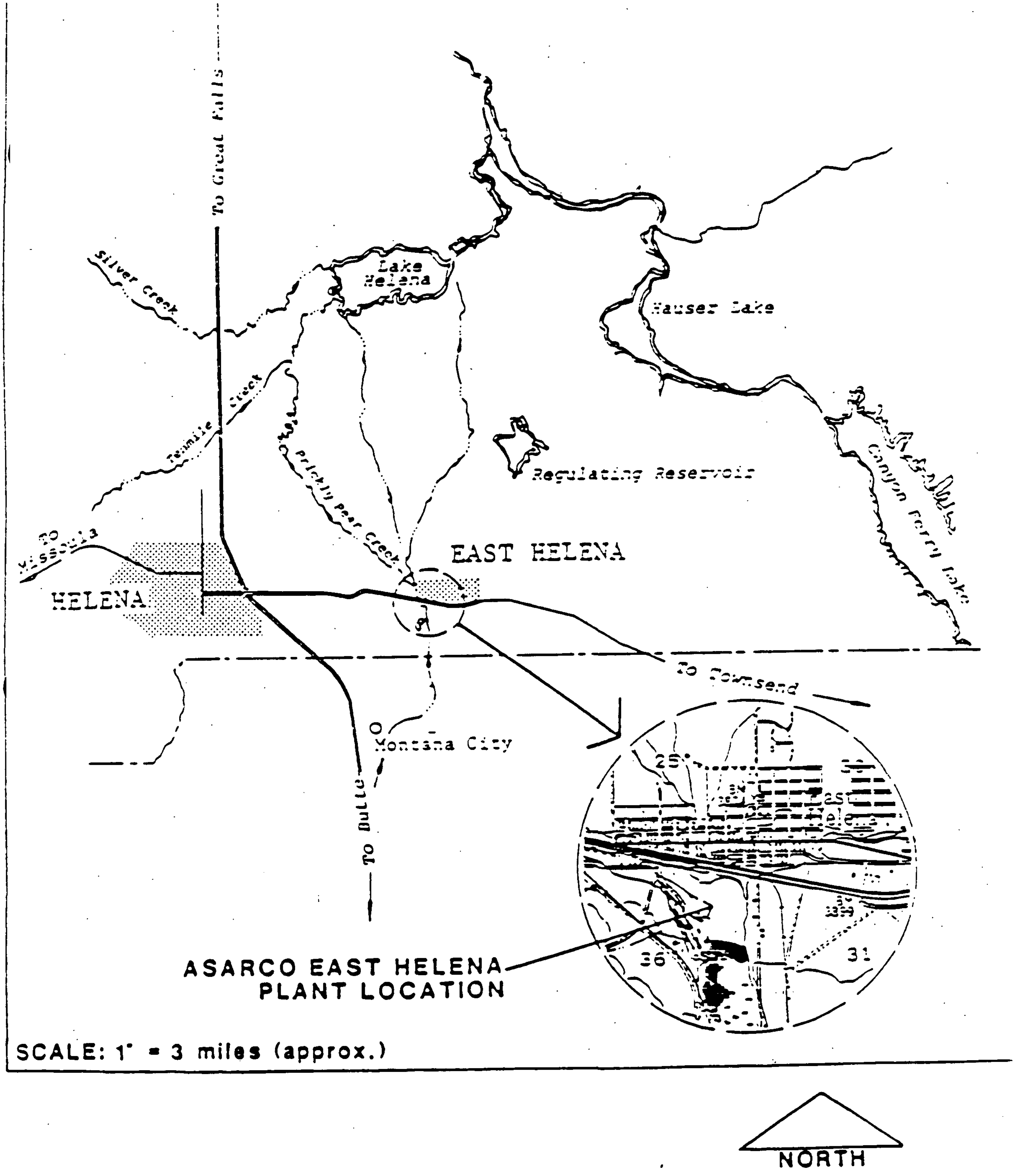

Figure 1-1. Location Ma

the mountains peripheral to the Helena Valley. Annual precipitation averages about 10 inches in the Helena area.

The East Helena Smelter Site is adjacent to Prickly Pear Creek. The site is underlain by unconsolidated alluvium deposited by the ancestral Prickly Pear Creek. The alluvial deposits have variable permeabilities and consist of layers and mixtures of cobbles, gravel, sand, silt, and clay. Underlying the alluvium and present exposures west and north of the site are fine-grained Tertiary volcanic ash tuff deposits, having low permeabilities, and having weathered to a fine-grained clay in some locations. Surface water and groundwater in the area flow from south to north, exiting in the northeastern corner of the Helena Valley into Lake Helena.

The sources of contamination at the site are primary and fugitive emissions and seepage from process ponds and process fluid circuitry. The affected media include underlying soils, groundwater, surface water, vegetation, livestock, fish, and other aquatic organisms, wildlife, and the air of the Helena Valley. The effects of the contamination have been measured over a 100-square-mile area.

The areas covered by this ROD include the process ponds: Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and former Thornock Lake. Their locations are shown in Figure 1-2.

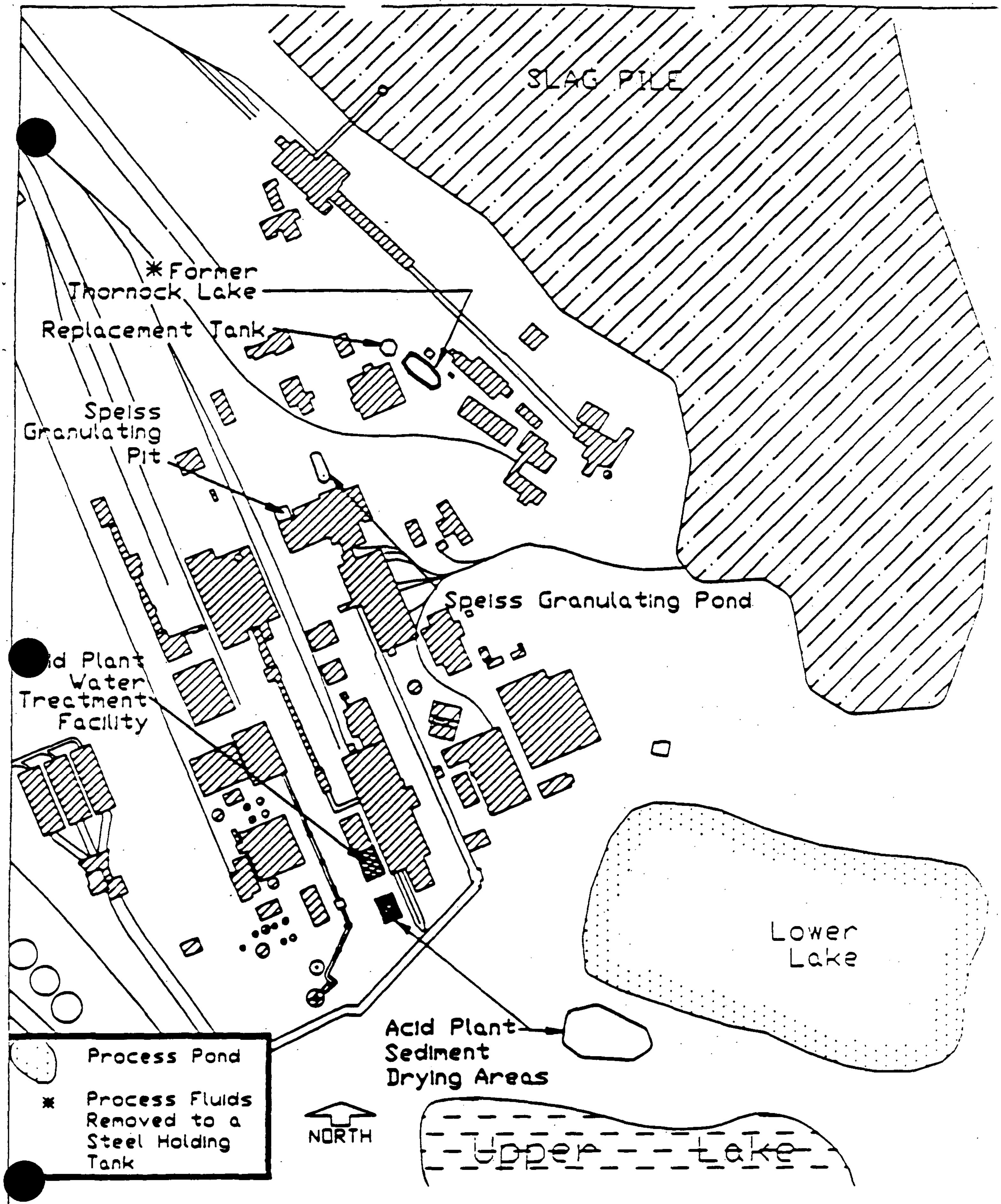

Figure 1-2
Process Pond Location Ma

Lower Lake collects and stores water utilized in the main smelter process water circuit as well as storm water runoff. The speiss pond stores water that is used in the speiss pit to cool the hot speiss from the dross plant as part of a granulation process. The acid plant water treatment facility removes particulates from the scrubber fluid. Former Thornock Lake was used to settle suspended solids from the main process water circuit. In October 1986, the lake was replaced by a tank and the lake is no longer in use.

The primary contaminants are arsenic and heavy metals in the process fluids beneath the process ponds which are in turn the principal sources of groundwater contamination at the site. The stratigraphy underlying Lower Lake consists of 1 to 3 feet of artificially deposited sludge and partially suspended silt and clay, underlain by 13 to 15 feet of fine-grained sediments. Concentrations of arsenic and metals in Lower Lake sediments are the highest in the upper 1 to 3 feet and generally decrease with depth. Strata near the speiss granulating pond and pit and the acid plant water treatment facility consist predominantly of gravels and cobbles in a sandy silt matrix. Arsenic and metals concentrations are higher near the surface and generally decrease with depth with some increase in the saturated zone. Former Thornock Lake bottom sediments generally consist of fine-grained, plastic organic clay with elevated concentrations of arsenic and metals, and are underlain by coarse-grained sand, gravel, and cobbles. Arsenic and metals concentrations decrease with depth.

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2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 SMELTER OPERATIONS

The Asarco smelter began operations in 1888 and currently processes ores and concentrates from around the world. In 1927, the Anaconda Company constructed a plant adjacent to the lead smelter for the purpose of recovering zinc from the smelter's waste slag. This zinc plant was purchased by Asarco in 1972, but operations were discontinued in 1982. In 1955, the American Chemet Corporation constructed a paint pigment plant adjacent to the smelter; it is still operating. Both Anaconda, which is now a division of the ARCO Coal Company, and American Chemet Corporation have been identified as potentially responsible parties (PRPs) at this site, in addition to Asarco.

2.2 ENVIRONMENTAL INVESTIGATIONS

The site was the focus of several environmental investigations prior to its listing on the National Priorities List (NPL) in 1983. The following studies have been prepared for the site:

- A joint EPA-State Air Quality Bureau (AQB) study in 1969 of arsenic, lead, zinc, and sulfur dioxide emissions, followed by monitoring and sampling studies through the mid-1970s

- A 1969 study of contaminants in soils in the smelter area by the United States Geological Survey (USGS)

- Asarco's annual soil and vegetation surveys conducted between 1974 and 1983

- A 1972 area environmental pollution study by the EPA, which included vegetable samples from local gardens

Many of the studies conducted at the site were intended to measure compliance of the smelter with state and federal emissions and air quality standards. Monitoring conducted by the state in 1972 revealed that sulfur dioxide (SO_2) exceeded ambient air quality standards. In 1974 the state held hearings with the industrial contributors to work toward developing control strategies to reduce SO_2 in emissions and ambient air. Between 1974 and 1977, an acid plant was built by Asarco to control SO_2 emissions. Subsequently, lower SO_2 levels were measured in the smelter vicinity. During 1978 and 1980, SO_2 standards were violated occasionally. A tall stack was added to the blast furnace baghouse in 1981 to generally prevent stack gases from impacting areas close to the smelter where most people reside. The smelter has been in continual compliance with state and federal Ambient Air Quality Standards for sulfur dioxide since 1983.

2.3 BLOOD-LEAD STUDIES

The Montana Department of Health and Environmental Sciences (MDHES) and the National Centers for Disease Control (CDC) in Atlanta conducted the first blood-lead studies of residents in the area in 1975 to determine if their blood-lead levels exceeded action levels. An action level is a level at which, based on available information, a contaminant is considered to be a human health risk.

The CDC's action level for blood-lead has been reduced over time. The level was 30 micrograms of lead per deciliter of blood at the time of the 1975 testing. It was changed to 25 micrograms per deciliter in 1984 to reflect new evidence on health risks from lead poisoning. The 1975 blood-lead studies of children were conducted prior to installation of air pollution equipment at the smelter by Asarco. The CDC has indicated that another reduction in the action level is forthcoming. The Lewis and Clark County Health Department conducted additional blood-lead studies in 1983. Blood-lead studies were also conducted for Asarco in 1987 and 1988 by the county health department. Asarco is considering additional blood-lead studies in the future. These studies will be carried out at different times of the year to determine whether blood-lead levels vary during different seasons of the year.

The 1975 study found that 34 percent of the 90 children tested had blood-lead levels above the action level. The 1983 study, performed after Asarco installed air pollution control equipment at the plant, disclosed only one of 396 children above the action level. According to CDC, after retesting, that child's blood-lead level was found to be below the action level. However, if the action level had been 25 micrograms per deciliter in 1983, 6 children would have been above the action level. The CDC concluded that the blood-lead levels of all other children tested showed no cause for public health concern.

The results of a recent study, performed by Asarco between October and December 1987, indicated that four out of the 363 residents tested (including approximately 50 adult women) had blood-lead levels above the action level of 25 micrograms per deciliter.

2.4 SUPERFUND INVESTIGATION WORK AND ENFORCEMENT ACTIVITIES

There have been two Administrative Orders on Consent entered into with Asarco for activities at the East Helena smelter site:

- Docket number CERCLA VIII-84-006: Phase I remedial investigations of surface water and groundwater, and site endangerment assessment

- Docket number CERCLA VIII-89-10: Phase II remedial investigations, endangerment assessment, and feasibility study of all contaminated media at this site

General Notice Letters and Requests for Information, pursuant to 104(e) of CERCLA were sent to the American Chemet Corporation on February 23, 1987, and to the Arco Coal Company on March 12, 1987.

The administrative record, available for public review at the EPA (301 South Park, Helena, Montana), contains a complete documentation of administrative orders for the site. The site was listed on the National Priorities List (NPL) of Superfund sites in September 1983. The events that led to the site's listing on the NPL included findings of contaminated soils in East Helena residential areas, elevated metals levels in the air, and contaminated process ponds over shallow ground water near the plant.

The EPA began its Remedial Investigation (RI) field work in May 1984. The resulting Phase I RI data report for soils, vegetation, and livestock was released in May 1987. Asarco began the field work for its water resources investigation in November 1984, including studies of groundwater, surface water, process ponds, and the process fluids circuitry.

The EPA and Asarco released the results of their RI studies about the possible effects of site contamination on soils, plants, livestock, and water resources in June 1987. The studies showed metals and arsenic contamination in soils, plants, livestock, surface water, and groundwater. The EPA determined that Asarco's water resources investigation and report were inadequate in defining the nature and extent of surface and groundwater contamination. Therefore, Phase II studies were ordered by the EPA.

Both study phases indicate the contamination to be greatest in all media nearest the smelter. Arsenic and lead were found at elevated concentrations in Prickly Pear Creek. Contamination was found occasionally in some Prickly Pear Creek samples at levels above federal drinking water standards. Blood-lead -arsenic, -cadmium, and -zinc levels in eight cattle herds from near the smelter were found to be higher than in a control herd tested for comparison.

Asarco has completed the Phase II studies of surface and groundwater, soils, vegetation, and livestock. The feasibility study for the process ponds operable unit was published by Asarco in August 1989. All Phase I and Phase II RI reports, the feasibility study for the process ponds, and other pertinent documents and data relied on for this ROD are contained in the Administrative Record for this site.

Special Notice for remedial design and remedial action as described in Section 122 of CERCLA has not yet been provided to the Responsible Party. The EPA anticipates issuing Special Notice approximately 2 weeks subsequent to finalization of this Record of Decision. Negotiations are predicted to commence shortly thereafter and culminate in a judicial consent decree for implementation of remedial design and remedial action, recovery of all past EPA expenditures related to the site, and provision for ongoing reimbursement for oversight costs. The consent decree should be formalized no later than 120 days after issuance of Special Notice.

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3 COMMUNITY RELATIONS ACTIVITIES

To date, the EPA and MDHES have initiated several community relations activities at the East Helena Smelter Site. These include:

- Preparation of a community relations plan in 1984 and revisions of that plan in 1988
- Preparation and distribution of fact sheets
- Holding several public meetings
- Onsite interviews with residents and officials regarding community concerns about the site
- Joint EPA and MDHES meetings with the media to update them on current and future events
- Periodic meetings with local and state officials to discuss the status of EPA and MDHES activities
- Formation of a citizen's advisory group, the East Helena Superfund Task Force, as a result of the need for discussions between the task force and the EPA, with numerous meetings having been conducted

- Esta..ishment of an information repository at EPA's offices in Helena to make site-related documents available to the community

- Progress reports to community members

- Additional information concerning community relations is available in the Responsiveness Summary (Appendix A)

Asarco has participated extensively with the EPA and MDHES in community relations activities such as public meetings and press releases.

The EPA and MDHES have maintained an active community relations program during RI/FS activities. Local media, including Helena television station KTVH and the Helena newspaper, The Independent Record, have regularly covered site issues and concerns. Fact sheets or project updates were prepared at various stages to inform East Helena residents of the status of site activities. The EPA and MDHES conducted interviews of local officials and residents to determine the adequacy of the agencies' information distribution system.

An administrative record has been established for the East Helena Smelter Site. The record is available near the site in the docket review room of the U.S. Environmental

Protection Agency's Montana Operations Office, 301 South Park, Helena, Montana. Records at this location may be reviewed during normal business hours.

To assure that interested persons, including potentially responsible parties, were given the opportunity to participate in the development of the East Helena Smelter Site administrative record, the following actions have been taken:

1. Pursuant to Section 117(a) of CERCLA, a Proposed Plan for remediation of the process ponds was made available to East Helena citizens, legislators, potentially responsible parties, and other persons. The plan summarized the RI/FS process, described the response action alternatives, and provided a brief analysis of the alternatives preferred by the EPA and MDHES. The Proposed Plan was mailed to persons on the EPA mailing list, published in the local newspaper, and made available at the Helena office of the EPA and MDHES. Notification of the availability of the plan was made by newspaper notice in the Helena Independent Record on August 30 and 31, and on September 1, 1989.

2. Concurrent with distribution of the Proposed Plan was the initiation of a 21-day public comment

peric_ to allow persons to provide official comment on the FS and the proposed plan for the process ponds.

3. To provide another opportunity for public comment and discussion on the Proposed Plan and other East Helena Smelter Site issues as necessary, a public meeting was held on September 12, 1989, in the East Helena Firemen's Recreation Hall. The date, time, and place of this public meeting was published in the Proposed Plan. Also, public service announcements were broadcast as news items on the local radio and television stations.

4. Verbal comments and questions were noted during the meeting. In many instances, responses were immediately supplied to the public at the meeting. Written comments were accepted for the duration of the public comment period. A response has been prepared for each of these written comments. The comments, questions, and responses are contained in the Responsiveness Summary attached to this document.

The EPA has published this Record of Decision as a final plan for remediation of the process ponds. Included in this final plan is a discussion of any significant changes from the Proposed Plan, and responses to each of the significant comments or questions submitted during the public comment period. Announcement of the availability of this ROD will be made by notice in the local newspaper. This ROD will be made available for review in the public repository, and for review and copying at the EPA office in Helena, Montana.

The availability of technical assistance grants for citizen groups was publicly noticed in various Montana newspapers during 1988. Further notice was verbally issued in East Helena during a presentation to the East Helena Superfund Task Force, a citizens' advisory group of five people. No grants were requested or awarded for this action.

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4 SCOPE AND ROLE OF RESPONSE ACTIONS

4.1 OPERABLE UNIT IDENTIFICATION

In 1987, the East Helena Smelter Site was segregated into five operable units. The purpose of the operable unit approach was to expedite remedial investigation and feasibility studies on well-characterized units. The operable units at the East Helena Smelter Site are:

- Process ponds and fluids
- Groundwater
- Surface water, soils, vegetation, livestock, fish, and wildlife
- Slag pile
- Ore storage areas

The potential interactions among these operable units were evaluated. The interactions were evaluated from the perspective of how the remedial action taken on each operable unit would affect the subsequent remediation of other units. Some interactions of operable units in this final list were identified; however, by proper planning and scheduling, any potential inconsistencies can be minimized. The separation of the site into these five operable units will allow for faster action on those units that are well-characterized.

The process ponds are known to be the primary sources of groundwater contamination and can be remediated separately from other sources. The extent and degree of groundwater contamination, although potentially caused by several sources, can be remediated as a separate unit with some consideration of how it interacts with the process ponds.

The ore storage areas and the slag pile represent distinct sources of contamination, and although they have some common exposure pathways, they can be remediated as separate sources. The contaminated offsite surface soils represent the major contaminated media from the smelter's air emissions and represent a logical operable unit containing not only the contaminated surface soils and surface water, but also the vegetation, livestock, wildlife, and aquatic life contained in the study area. The following subsections present a brief description of each operable unit.

4.1.1 PROCESS PONDS AND FLUIDS

The process ponds operable unit includes Lower Lake, former Thornock Lake, the speiss granulating pond and pit, and the acid plant water treatment facility. For each process pond, the operable unit includes the process water and contaminated sediments and soils under each pond to the depth that they are a source of groundwater contamination or intersect with groundwater.

4.1.2 GROUNDWATER

The groundwater operable unit includes all groundwater that has been contaminated above levels posing a threat to public health or the environment, or levels exceeding applicable or relevant and appropriate requirements. This unit also includes the sediments above and below the aquifer that have elevated heavy metals concentrations caused by attenuation of metals from the groundwater or surface water as it passed through the sediments.

4.1.3 SURFACE WATER, SOILS, VEGETATION, LIVESTOCK, FISH, AND WILDLIFE

This operable unit includes all contaminated surface soil both on the Asarco site as well as offsite. Also included are contaminated surface water, vegetation, livestock, aquatic life, and wildlife.

4.1.4 SLAG PILE

This operable unit includes the slag pile and any contaminated soil under the slag pile. The primary potential impact on other operable units is the potential of groundwater contamination from the slag piles. Current investigations will determine if this is occurring.

4.1.5 ORE STORAGE AREAS

This operable unit includes the ore storage areas and any contaminated soils under the paved or unpaved portions of the storage areas.

4.2 RESPONSE ACTIONS

The EPA has identified the process ponds as the first operable unit under the accelerated schedule. Existing data indicate that process ponds were the most significant and well-characterized sources of contamination impacting the groundwater. The process fluids circuitry will be addressed in the Comprehensive Remedial Investigation/Feasibility Study (RI/FS) to be completed in the fall of 1989.

This ROD details the remedy selection process for the process ponds consisting of four areas: Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and former Thornock Lake. The Process Ponds RI/FS was conducted in accordance with the Comprehensive RI/FS Work Plan. The RI/FS activities were performed by Asarco with oversight by and approval of the United States Environmental Protection Agency under the authority of the

Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The response actions selected for implementation at the process ponds are designed to: alleviate the primary threats to public health and the environment, prevent current or future exposure to the contaminated soils, and reduce contaminant migration into the groundwater. This operable unit will be the first response action for this site, it will be cost-effective, and it will be consistent with the permanent remedy for all operable units.

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5 SUMMARY OF SITE CHARACTERISTICS

5.1 CONTAMINATION SOURCES

There are five potential sources of contamination at the East Helena Smelter Site: smelter air emissions, the slag pile, ore storage areas, process ponds, and process fluids. The contaminants of primary concern are arsenic, cadmium, lead, copper, and zinc. Contamination from the plant has been found in air, surface soils, groundwater, and surface water. Dissolved arsenic in the shallow groundwater under portions of East Helena has been measured at approximately 1.2 mg/L. Contamination from these media has affected humans, livestock, vegetation, and fish, although the effects have not been fully defined. Under certain conditions, heavy metals contamination can lead to several human health problems including central nervous system damage, kidney disease, and cancer. Analytical data for water and sediments are shown in Table 5-1 and Figure 5-1, respectively. Locations of sampling points are shown in Figure 5-2.

Several ponds at the site are used for storing water from Prickly Pear Creek as well as for retention of process water. This ROD addresses four major process fluid ponds: Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and former Thornock Lake (refer to Figure 1-2).

Table 5-1

RANGES AND AVERAGE VALUES OF ARSENIC, CADMIUM, AND LEAD IN THE SPEISS POND/PIT, ACID PLANT, AND LOWER LAKE PROCESS FLUID CIRCUITS.

Location		Arsenic Range	Arsenic Average	Cadmium Range	Cadmium Average	Lead Range	Lead Average
Speiss Pond/Pit							
SP-1	Total	55 - 3750	1690	0.018 - 3.9	0.69	0.257 - 24	4.45
	Dissolved	55 - 3733	1494	0.005 - 1.13	0.27	0.018 - 0.061	0.028
SP-2	Total	2858 - 3800	3329	<0.004 - 0.300	0.152	0.153 - 1.750	0.951
	Dissolved	3650 - 3733	3691	<0.004 - 0.107	0.055	<0.030 - 0.076	0.053
Acid Plant							
AP-1 (Input process line to Lower Lake)	Total	0.043 - 0.41	0.19	0.008 - 0.205	0.080	0.156 - 0.433	0.298
	Dissolved	0.035 - 0.354	0.16	0.0038 - 0.153	0.057	0.0062 - 0.0166	0.045
AP-2 (Treatment facility inlet)	Total	1625 - 3475	2477	37.5 - 550	228	8.42 - 843	109
	Dissolved	1625 - 2920	2369	37.5 - 550	211	6.75 - 25	15.6
AP-3 (Treatment outlet)	Total	17 - 23.3	19.6	0.405 - 1.78	0.858	1.63 - 4.06	2.31
	Dissolved	15.1 - 18.8	17.8	0.029 - 0.451	0.233	0.01 - 0.045	0.025
Lower Lake							
LL-1	Total	14.7 25.0	21.1	0.408 5.09	2.77	0.93 48.3	26.7
	Dissolved	15.3 23.5	17.6	0.051 2.76	1.33	0.004 0.538	0 12
LL-2	Total	15.6 20.6	19.1	0 394 1.62	0.81	1.13 2.45	1.7
	Dissolved	14.8 19.5	17.2	0.016 0.476	0.250	0.003 0.029	0.01
Lower Lake Process fluid (1984-1987)	Total	10.5 36 0	19.9	0.225 2.05	1.05	1.25 24.7	5 11
	Dissolved	8.25 29.0	17.2	0.175 0.750	0.39	0.022 0.238	0.08

Note: All concentrations are in milligrams per liter.
Source: ESE, 1988

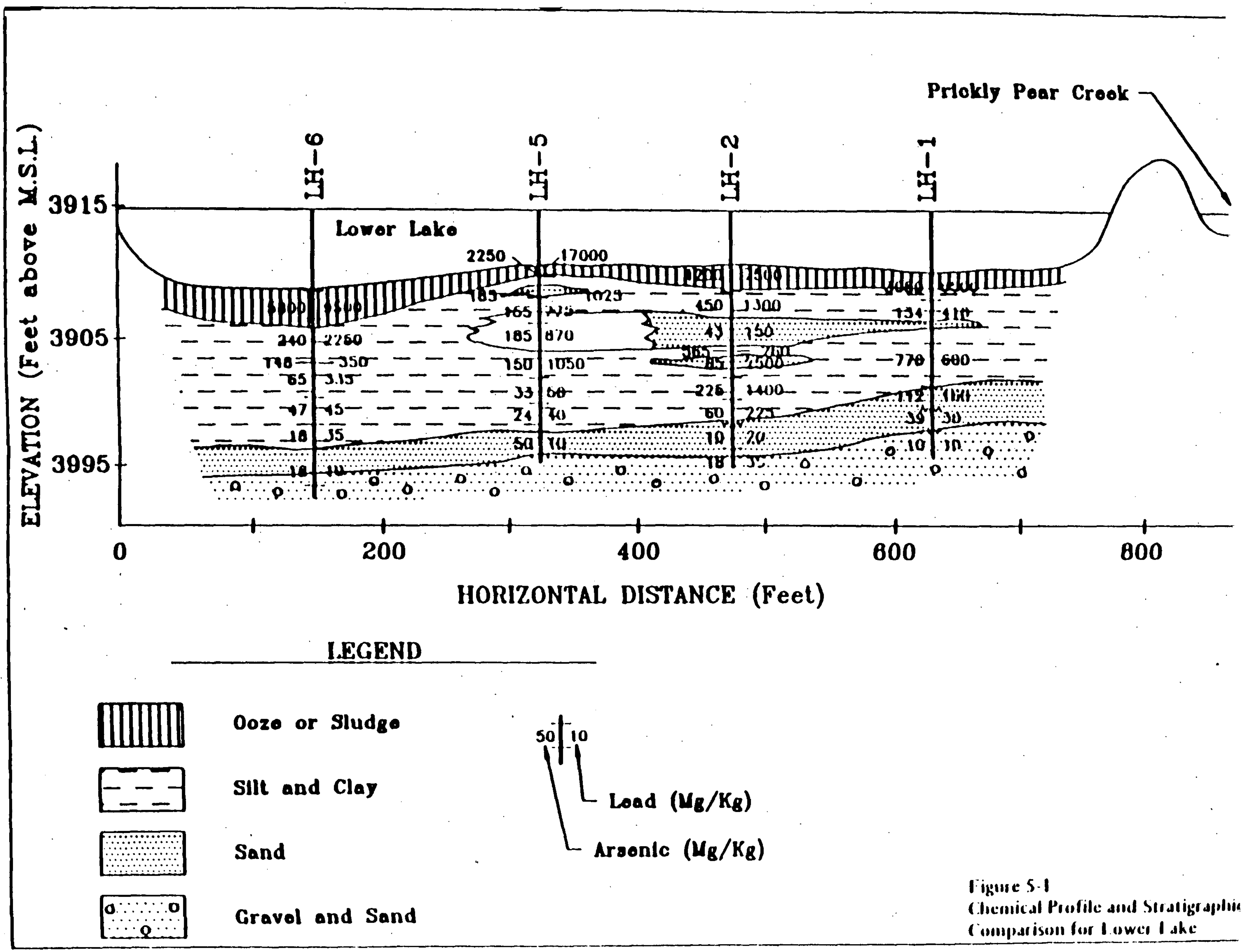
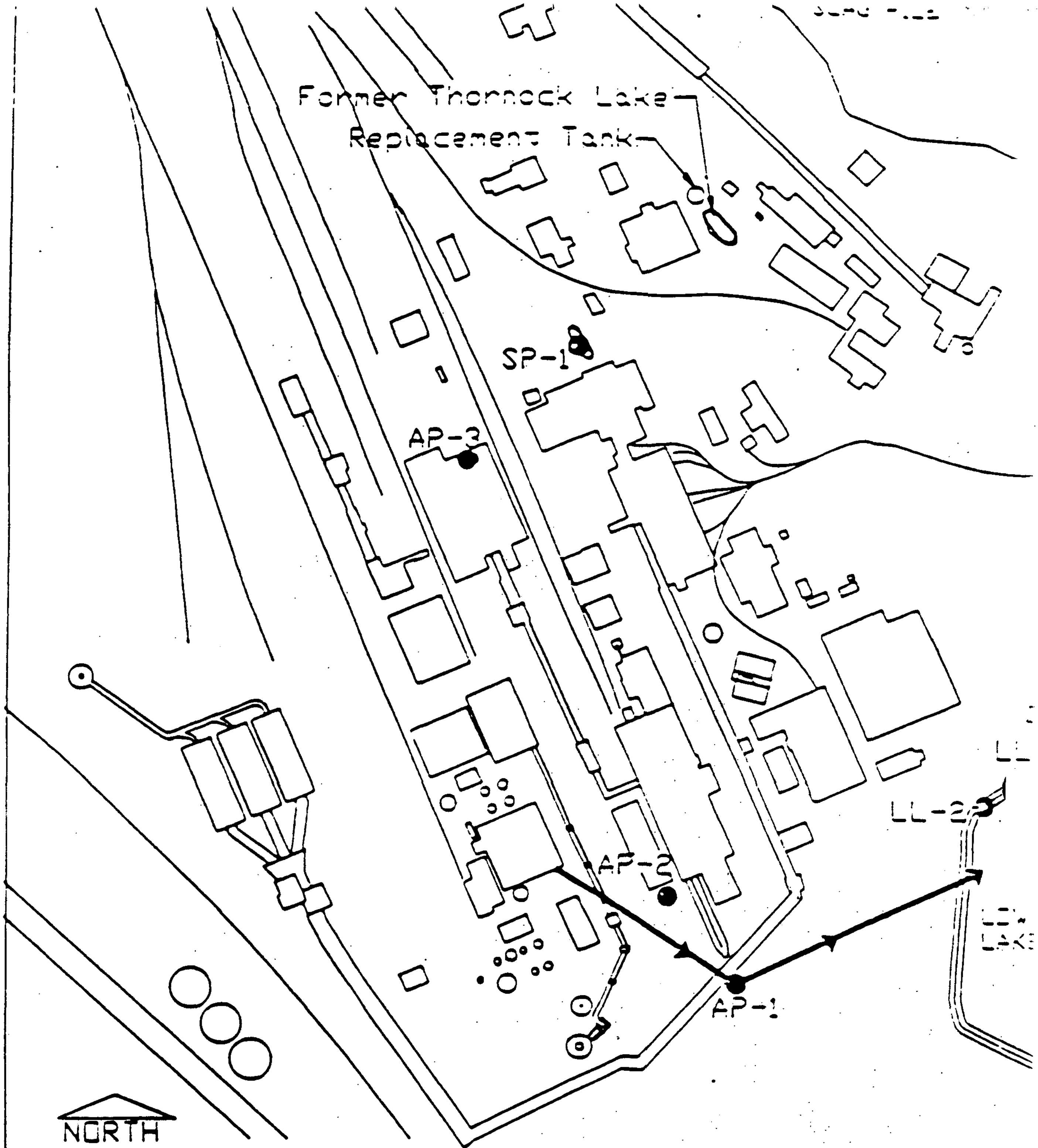


Figure 5-1
Chemical Profile and Stratigraphic
Comparison for Lower Lake



L E G E N D

Acid Plant Blowdown Drainline

● Process Pond Sample Sites

Figure 5-2
Process Pond
Sample Sites

5.1.1 LOWER LAKE

Lower Lake collects and stores water used in the main plant process circuits and runoff from the plant site. The pond is approximately 7 acres in surface area and has a capacity of about 11 million gallons.

Lower Lake process waters contain up to 25 mg/L total arsenic and 48 mg/L total lead. Concentrations of other metals in the process waters are similarly elevated. The bottom sediments of Lower Lake contain up to 2,800 mg/kg arsenic and 15,000 mg/kg lead. Concentrations of other elements in the bottom sediments are similarly elevated and these concentrations decrease with increasing depth (refer to Figure 5-1). The EPA has classified such bottom deposits in surface impoundments at all lead smelters as a hazardous waste.

5.1.2 SPEISS GRANULATING POND AND PIT

The speiss granulating pond provides storage for water used to cool the hot speiss from the dross plant. During speiss granulation, molten material is allowed to flow into the pit. Water pumped from the speiss pond is fed through sprayers onto the hot speiss material in the pit.

The water then drains through a 12- to 14-inch-diameter mild steel pipe back to the speiss granulating pond. This water is again recirculated during the granulating process. Plant process water from Lower Lake is added to the pond when makeup water is needed. The speiss granulating pit was constructed on the original concrete slab on the ground floor of the dross reverb building. Mild steel plating was used to make an enclosure for this pit. The speiss granulating pond is lined with 8 inches of concrete and is approximately 20 by 70 feet with a maximum depth of 4 feet. In August 1988, a high density polyethylene (HDPE) liner was installed over the concrete in the speiss pond.

Soils under the speiss granulating pond and pit contain up to 1,750 mg/kg arsenic and 5,500 mg/kg lead. Concentrations of all elements decrease with increasing depth. Dissolved arsenic in saturated soils under this area is as high as 700 mg/L.

5.1.3 ACID PLANT WATER TREATMENT FACILITY

The acid plant water treatment facility consists of a wooden trough fluid transport system, five particulate settling dumpsters, and a 68- by 35- by 9-feet-deep settling pond. The facility is used to remove particulates from the scrubber fluid which is then recirculated to the scrubbers or the sinter plant. A concrete pad underlies the five in-line dumpsters. There are no berms around the pad, and fluids leaking onto the pad spill over onto the ground surface. The wooden trough transport system is underlain by concrete and the natural ground surface. The settling pond is lined with concrete which is protected from the acidic process fluids by an asphalt liner. Soils under the acid plant contain up to 12,000 mg/kg arsenic and 14,000 mg/kg lead. Concentrations of all elements decrease with increasing depth; however, the soils under the acid plant differ from soils and sediments under the other process ponds by exhibiting characteristics of EP toxicity throughout the soil profile tested.

5.1.4 FORMER THORNOCK LAKE

Former Thornock Lake was also part of the main plant process water circuit and was used primarily for preliminary settling of suspended solids. However, in October 1986, Thornock Lake was replaced by a steel holding tank. This former lake no longer contains process fluids and only bottom sediments remain.

Sediments from former Thornock Lake (now dry) contain up to 120,000 mg/kg arsenic and 38,000 mg/kg lead. Concentrations of other elements are similarly elevated and these concentrations decrease with increasing depth. Bottom sediments of former Thornock Lake and all other bottom sediments at all lead smelters have been classified by the EPA as a hazardous waste.

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6 SUMMARY OF SITE RISKS

6.1 HUMAN HEALTH RISKS

An endangerment assessment (EA) was prepared in support of the feasibility study for the process ponds. This EA evaluated the current and potential future risks to onsite workers at the Asarco smelter and discussed the contaminant release and migration mechanisms responsible for transport of contaminants from onsite source areas to offsite areas or other environmental media. The following discussion is based on the EA presented as part of the process ponds feasibility study.

6.1.1 CONTAMINANT IDENTIFICATION

The media of concern include contaminated sediments in Lower Lake and former Thornock Lake, contaminated soils at the acid plant water treatment facility and the speiss granulating pond and pit, process water in all areas except former Thornock Lake, surface water in Prickly Pear Creek, and groundwater below the site and East Helena.

Twenty seven chemicals (metals and arsenic) were analyzed in the media identified above. Inorganic contaminants are present throughout the soils, sediments, surface water, and groundwater at the site. Indicator chemicals were selected from the parameter list to identify the contaminants that pose the greatest potential risk to public health and the environment at the areas associated with the process ponds. The contaminants selected as indicator chemicals based on their potential to promote or cause adverse human health effects were arsenic, cadmium, and lead. Copper and zinc were added to account for the potential adverse environmental impacts particularly relative to aquatic biota. It is important to note that, although only five indicator chemicals were selected, there are 18 total hazardous elements at elevated concentrations in the surface water, groundwater, soils, and sediments at the site.

Analytical data for water and sediments are presented in Table 5-1 and Figure 5-1. Selection of indicator chemicals was based in part on the available analytical data and on toxicity to human and environmental receptors. Mobility and persistence in the environment were also considered.

6.1.2 EXPOSURE ASSESSMENT

The exposure assessment uses site description and environmental fate-and-transport information in identifying potential exposure pathways to onsite receptors. An exposure pathway is the pathway by which human or environmental receptors may be exposed to the contaminants from a contaminant source. The exposure assessment evaluates the exposure pathways and includes examination of the following:

1. Known contaminant sources

2. C taminant migration pathways

3. Locations where human or environmental receptors could be exposed

4. Likely route of exposure (i.e., ingestion, dermal absorption, and inhalation)

If all of these components are present, then the exposure pathway is considered to be complete and would be expected to contribute to the total exposure from the process ponds. Only those exposure pathways associated with the process ponds that are considered to pose a health risk will be addressed.

Cancer Potency Factors (CPFs) and Reference Doses (RFDs) for the contaminants of concern are presented in Table 6-1. The CPFs have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. The CPFs, which are expressed in units of $(mg/kg/day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies of chronic animal bio-

Table 6-1

CANCER POTENCY VALUES AND REFERENCE DOSES

Parameter	TOXICITY VALUES FOR NONCARCINOGENIC EFFECTS				TOXICITY VALUES FOR CARCINOGENIC EFFECTS			
	Oral Route		Inhalation Route		Oral Route		Inhalation Route	
	AIC[a] (mg/kg/day)	RfD[b] (mg/kg/day)	AIC[a] (mg/kg/day)	RfD[b] (mg/kg/day)	Potency Factor (mg/kg/day)-1	W/E[c]	Potency Factor (mg/kg/day)-1	W/E
Arsenic					1.5[d]	A	50	A
Cadmium		5.0E-04					6.1	B1
Copper	3.7E-02		1.3E-02					
Lead	1.4E-03[e]		4.3E-04			B2[b]		B2[b]
Zinc	2.1E-01		1.0E-02					

[a] Source: U.S. EPA, 1986c.
[b] Source: EPA 1989a, EPA 1989e
[c] W/E - Weight of Evidence rating
[d] Source: Thomas, 1988.
[e] This value has been withdrawn by EPA.

NOTE: Scientific notation used for ease in reading small values. For example, the notation 3.0E-04 is the value 0.0003.

assays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting non-carcinogenic effects. The RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. The RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse non-carcinogenic effects to occur.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1E-6). An excess lifetime cancer risk of 1E-6 indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential concern for non-carcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or, the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Environmental monitoring activities performed at the process pond areas have confirmed the presence of contaminants of concern in surface water, groundwater, subsurface soils, and sediments. The primary sources include:

1. Process fluids associated with the process ponds (i.e., Lower Lake, speiss pond/pit, and acid plant water treatment facility)

2. Soils and sediments associated with the process ponds (Lower Lake, speiss pond/pit, acid plant water treatment facility, and former Thornock Lake)

Contaminants detected in the process pond areas have migrated toward the downgradient receptor areas and other environmental media onsite as well as offsite.

The environmental fate and transport analysis presented in the feasibility study identified subsurface soil- and sediment-to-groundwater, and groundwater-to-surface water as the primary migration pathways for metals and arsenic from the process ponds. Other migration pathways of potential importance, surface soil-to-air, surface soil-to-surface water, and air-to-surface soil, were not considered in the feasibility study.

Based on the results of the environmental fate and transport analysis, a screening of current and potential future exposure pathways was conducted to determine which pathways could potentially expose receptors to arsenic, cadmium, lead, copper, and zinc migrating from the source areas. The screening step removes from consideration those exposure scenarios in which arsenic, cadmium, lead, copper, and zinc may be released from the site but for which there is less potential for exposure. The relative importance of these exposure scenarios compared to other exposure routes is not defined.

The elevated levels of arsenic, cadmium, lead, copper, and zinc identified in the process fluids, sediments, subsurface soil samples, and groundwater samples collected during the process pond RI in conjunction with the results of the contaminant migration pathway analysis indicate that onsite workers have the potential for direct contact with contaminants in the process ponds and other affected media onsite. Exposure pathways exist for those receptors that may come into contact with groundwater, surface water, subsurface soils, and sediments associated with the process ponds. Although onsite workers' occupational health and well-being is regulated under OSHA, the exposure pathways are complete for those workers who may inadvertently contact contaminants in the course of their workday.

The groundwater, surface water, subsurface soils, and sediment exposure pathways are also considered to be complete for offsite receptors. Offsite receptors include public, livestock, wildlife, and vegetation. These exposure pathways are considered in the site-wide endangerment assessment.

Other sources at the plant may also contribute to potential exposures to onsite workers. Therefore, risks were not quantified in the process ponds feasibility study. The following information evaluates all onsite exposure pathways associated with the process ponds.

Based on results of the sampling performed at the process ponds area, the process fluids, stratigraphic soils, and sediments were found to contain elevated levels of arsenic, cadmium, lead, copper and zinc. The primary exposure to these contaminants is to workers during the course of daily occupational activities. The OSHA worker requirements are in place; however, only consistent application of OSHA protective measures will minimize exposure. Consequently, some level of exposure to site contaminants is foreseeable. Assuming that some level of exposure to site contaminants occurs, the potential for adverse human health effects can be suggested. The contaminant intakes and resulting risks were not qualified in the process ponds feasibility study.

Other source areas exist onsite that may contribute to elevated levels of arsenic, cadmium, lead, copper, and zinc. These source areas, offsite contamination, and offsite receptors, both human and environmental, are addressed in the comprehensive, site-wide endangerment assessment.

According to U.S. EPA, 1987, the East Helena population was estimated at 1,647 in 1980. The population nearest to the Asarco smelter resides in the city of East Helena and in rural areas surrounding the smelter site.

6.1.3 TOXICITY ASSESSMENT

The toxicity assessment describes the potential human health hazards associated with contaminants identified as indicator chemicals for human exposure routes and present within the process ponds areas. The following summarizes some of the toxicity effects of the contaminants of concern.

6.1.3.1 Arsenic

Arsenic is a known human carcinogen (Group A) through both ingestion and inhalation exposures. Oral exposures are associated with skin cancer, and inhalation exposures are known to cause lung cancer. Acute oral exposure can result in muscular cramps, facial swelling, cardiovascular reactions, severe gastrointestinal damage, and vascular collapse leading to death. Inhalation exposures can cause severe irritation of nasal lining, larynx, and bronchi.

Chronic oral or inhalation exposure can produce changes in skin, including hyperpigmentation and hyperkeratosis. Oral exposures are associated with peripheral vascular disease (blackfoot disease.)

6.1.3.2 Cadmium

Cadmium is a known human carcinogen (Group A) as a result of inhalation exposures. Increased risk of prostate cancer and perhaps respiratory tract cancer in workers exposed to cadmium through inhalation have been documented. There is no evidence of carcinogenicity from chronic oral exposure.

For acute exposures by ingestion, symptoms of cadmium toxicity include nausea, vomiting, diarrhea, muscular cramps, salivation, spasms, drop in blood pressure, vertigo, loss of consciousness, and collapse. Exposure by inhalation can cause irritation, coughing, labored respiration, vomiting, acute chemical pneumonitis, and pulmonary edema.

Respiratory and renal toxicity are major effects in workers. Chronic oral exposures can produce kidney damage. Inhalation can cause chronic abstractive pulmonary disease, including bronchitis, progressive fibrosis, and emphysema. Chronic exposure may be associated with hypertension. Cadmium can produce testicular atrophy, and teratogenic effects in experimental animals.

6.1.3.3 Lead

Lead salts have some evidence of carcinogenicity in animals. However, the U.S. EPA Carcinogen Assessment Group has not established a slope factor despite listing lead as a Group B2 carcinogen.

Acute inorganic lead intoxication in humans is characterized by encephalopathy, abdominal pain, hemolysis, liver damage, renal tubular necrosis, seizures, coma, and respiratory arrest.

Chronic low levels of exposure to lead can affect the hematopoietic system, the nervous system, and the cardiovascular system. The developing child appears especially sensitive to lead-induced nervous system injury. Epidemiological studies have indicated that chronic lead exposure may be associated with increased blood pressure in humans. Exposure to lead is associated with sterility, abortion, neonatal mortality, and morbidity.

6.1.3.4 Copper And Zinc

Copper and zinc are generally less toxic to humans than arsenic, cadmium, and lead, but can cause adverse environmental impacts on aquatic biota.

6.1.4 RISK CHARACTERIZATION INFORMATION

Results of the field investigations have identified that the process ponds contribute arsenic and metals to subsurface soils, groundwater, surface waters, and sediments. This presents a health risk to offsite receptors (humans, livestock, wildlife) that may come into contact with arsenic and metals which may have migrated offsite and have been released into other media. Additionally, other source areas exist onsite that may also contribute to elevated levels of arsenic and metals of these same media. Therefore, a set of offsite exposure pathways exists for each medium.

Because of the comprehensive nature of the offsite exposure pathways, the quantification of these exposure pathways will be performed in the Comprehensive RI. The Comprehensive RI will evaluate the contribution of all onsite source areas to the exposure pathways for offsite receptors, which include:

1. Direct contact with contaminated surface soils and sediments

2. Ingestion or inhalation of contaminated offsite surface soils

3. Consumption of contaminated plants, livestock or wildlife by Helena Valley residents

4. Ingestion and dermal exposure to surface water

5. Ingestion and dermal exposure to groundwater

The Comprehensive RI will address the overall health risks associated with exposure to chemicals released form each of the source areas in each of the environmental media in the study area. The health risks for all completed exposure pathways onsite and offsite of the facility will be presented in the Comprehensive RI, and will be based on the data base obtained from the Comprehensive RI. The quantitative EA will be presented in the Comprehensive RI report and will include a health risk assessment for workers and the public.

6.2 ENVIRONMENTAL RISKS

Surface water and sediment samples collected from Prickly Pear Creek indicate the presence of contamination. Contamination from Prickly Pear Creek migrates to nearby Lake Helena, which was previously used for commercial whitefish farming. Endangered species, particularly bald eagles, and critical habitats have been identified in the Helena Valley, and may be threatened by exposure to contaminants migrating from the Asarco site. Upper Lake, adjacent to the smelter site, supports habitat for numerous migratory waterfowl and supports limited recreational fishing by Asarco personnel. The potential for continued contaminant leaching from sediments and soils for the various contaminant source areas into the groundwater and surface water poses a long-term threat to the environment. Seepage and leakage from the process ponds are evident and impacts have been recognized. Seepage from Lower Lake impacts on the water quality at Prickly Pear Creek. The water quality of Prickly Pear Creek is already in violation of surface water quality standards intended to protect fish and aquatic wildlife.

Environmental risks to animal and vegetation habitat and residents were not quantified in the process ponds feasibility study. These risks, if present, will be quantified in the comprehensive RI/FS report. The Helena Valley area supports a wide diversity of plant and animal habitat. No endangered plant species are known to exist in the Helena Valley. However, there is the possibility for endangered birds, particularly migratory bald eagles (Haliaeetus leucocephalus) and peregrine falcons (Falco peregrinus), to travel through the Valley. There is also the potential for these birds to nest because of suitable habitat that is presently unoccupied. Eagles and falcons have been observed in the Sleeping Giant-Hauser Lake area (BLM, 1983: U.S. EPA, 1987).

Other wildlife consists of both game and non-game species indigenous to west-central Montana. Game species of importance include the white-tailed deer (Odocoileus virginianus), mule deer (O. hemionus), elk (Cervus canadensis), pronghorn antelope (Antilocar pa americana), both native and introduced trout (Salmo and Salvelinus spp.) hungarian partridge (Perdix perdix), ring-necked pheasant (Phasianus colchicus), and grouse (Dandragapus sp., Bonasa sp.). Also present during certain periods are migrating waterfowl.

The major vegetative rangeland types in the Helena Valley are foothill grasslands and Lodgepole pine/Douglas fir forests. The foothill grasslands are at a higher elevation than the Montana plains grasslands and consequently receive more precipitation and produce more forage. Lodgepole pine (Pinus contorta)/Douglas fir (Pseudotsuga menziesii) forest can be found on mesic north-facing slopes at intermediate elevations (U.S. EPA, 1987).

6.3 CONCLUSIONS

Fluids contained within the four process ponds exhibit high concentrations of some 18 to 20 elements that are hazardous substances, including arsenic, cadmium, copper, lead, and zinc. These elements have seeped into the soils and groundwater both on and off the plant site. Although the highest concentrations are found underneath and adjacent to the four process ponds, the more mobile elements, such as arsenic, have been transported by natural groundwater movement into aquifers and soils underlying East Helena.

Arsenic, because of its mobility relative to the heavy metals, and because it is a human carcinogen, is the element of greatest concern in this analysis. Monitoring wells show that arsenic from the process ponds has migrated into East Helena at concentrations greater than 20 times the federal drinking water standard (maximum contaminant level) of 50 parts per billion. Fortunately, such elevated levels have thus far been found only in shallow groundwater.

Because the affected shallow aquifers are not a source of drinking water in East Helena, there is currently no direct human exposure to arsenic through groundwater. Nonetheless, the potential does exist for human health risk to materialize if someday there is a need to tap into shallow aquifers for drinking water, or if the arsenic migrates into deeper aquifers.

Environmental risks associated with seepage and leakage from the process ponds are already a problem. Seepage from Lower Lake into Prickly Pear Creek adds to existing violations of water quality standards caused by mining leachate entering the creek upstream of the smelter. These water quality standards are intended to protect fish and aquatic wildlife. In addition, seepage from Lower Lake and leakage from the acid plant water treatment facility and the speiss granulating pit and pond have introduced arsenic to the groundwater under East Helena.

The remedial actions presented in this ROD will remove future contact between process fluids and underlying soils and groundwater. Such source removal is a vital first step in reducing the potential human health risks and current environmental risks discussed above. Still, source removal is only the first step. The Comprehensive RI/FS report will address problems associated with the contaminated soils and groundwater under East Helena, which is beyond the scope of the Process Ponds RI/FS.

The risks identified in the Endangerment Assessment (EA) component of the FS were briefly summarized in this section. The remedial actions presented in the following chapters of this ROD should alleviate the risks identified in the EA. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

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7 DESCRIPTION OF ALTERNATIVES

During the Feasibility Study, Asarco developed more than 200 potential cleanup alternatives. The alternatives were compared to one another in terms of their effectiveness, implementability, and cost. Alternatives judged to be most promising on the basis of these three screening factors were retained for detailed analysis in accordance with the NCP. These alternatives were also evaluated based upon their expected compliance with the following nine criteria:

- Protection of human health and the environment
- Compliance with legally applicable or relevant and appropriate requirements (ARARs)
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Long-term effectiveness and permanence
- Implementability
- Cost
- Community acceptance

- State acceptance

The alternatives described in this ROD best meet the above criteria and, at the same time, provide a reasonable range of cleanup options for addressing the source contamination problems in the four process ponds. In some cases, alternatives were combined to provide greater assurance that the essential criteria will be met in this cleanup. All of the engineering estimates presented in this chapter, including assumptions concerning site characteristics, are based on the September 1989 process ponds FS developed by Asarco. However, the volumes of soils and sediments to be excavated will be greater than what was presented in the FS because deeper excavation is needed to assure effectiveness and protectiveness.

The Superfund program requires consideration of a "No Action" alternative at every site. Under the No Action alternative, contaminated material would be left as is; however, the EPA could require warning signs, or land use restrictions, or continuous monitoring of the affected soil and water.

All of the alternatives summarized below and shown in Table 7-1, except No Action, involve soil or sediment removal. Because the soils and sediments underneath and adjacent to the process ponds show elevated arsenic and heavy metals concentrations down to the groundwater-bearing

Table 7-1

SPECIFIC ACTIONS FOR EACH ALTERNATIVE

AREA	ACTION DESCRIPTION	ALTERNATIVE 4A	ALTERNATIVE 4B	ALTERNATIVE 4D	ALTERNATIVE 4E	ALTERNATIVE 5S	ALTERNATIVE 8B + 7E	ALTERNATIVE 8B + 7H	ALTERNATIVE 11D	ALTERNATIVE 11E	ALTERNATIVE 11F	ALTERNATIVE 14	ALTERNATIVES 9, 12 (No
LOWER LAKE	Replace Lower Lake with tanks as the primary holding facility. Construct a lined pond on the north end of the plant property for emergency containment of storm runoff.	●	●	●	●	●							
	Dispose of 50-70 gpm gain in main process fluid circuit and water stored in Lower Lake through evaporative processes of plant.					●							
	Remove sediments with high metals concentrations by dredge, dragline, and/or industrial vacuum. Dry sediment for handling and disposal.	●	●	●	●	●							
	Treat/dispose of sediments in smelter process.	●	●			●							
	Dispose of sediments in a hazardous waste facility			●									
	Dispose of sediments in a hazardous waste facility to be constructed in the East Helena area.				●								
	Treatment of Lower Lake process fluids and discharge in East Helena publicly owned sewage treatment plant	●		●	●								
	Treatment of Lower Lake process fluids and discharge in Prickly Pear Creek (requires NPDES permit).		●										
	Treatment of process waters in place by coprecipitation. Remove precipitate with sediments after treatment is complete					●							
SPEISS GRANULATING POND AND SPEISS PIT	Replace existing pond with tank and secondary containment facility.						●	●					
	Replace existing speiss granulating pit with a new lined facility.						●						
	Upgrade existing pit by treatment of existing concrete and/or replacement of existing concrete.							●					
	Excavation of soils with high metals concentrations. A five foot buffer zone around the perimeter of replaced facilities will be excavated.						●	●					
ACID PLANT WATER TREATMENT FACILITY	Replace main settling pond with tank(s) and secondary leak containment facility. Line sediment drying area to stop infiltration of fluids to groundwater. Replace existing dumpsters with corrosion resistant settling dumpsters. Replace wooden troughs with a corrosion resistant fluid transport network. Underline dumpster pad with clay or a geomembrane and replace concrete pad								●	●			
	Line existing settling pond.									●			
	Replace existing pond and settling dumpster system with closed circuit filtration treatment system.										●		
	Excavation of contaminated soils. Treat and dispose of sediments in smelter process								●	●	●		
TH[illegible]OCK L[illegible]	Excavate bottom sediments by backhoe. Treat and dispose of [illegible] in smelter process. Line former pond with clay or other liner if pond i[illegible]nded for use as an emergency holding facility											●	

gravels (at approximately 20 to 22 feet), it may be argued that excavation should be done to that depth. However, concentrations of arsenic and metals in soils and sediments are greatest in the uppermost few feet and they decrease as depth increases.

In any feasibility study involving contaminated soils, the question of how much contamination may be left in place is a perplexing one. In the case of Lower Lake, it would be necessary to remove about 18 feet of wet sediments over a 7-acre area (180,700 cubic yards) to eliminate all arsenic- and metals-laden sediments. There is no assurance that removing all sediments is more effective than removing the uppermost 3 to 4 feet. In addition, the cost of removing all of the contaminated sediments is prohibitive (approximately $78 million).

The results of soil leach (EP toxicity) tests may provide a reasonable alternative to complete removal of sediments. These tests examined the potential of arsenic and metals for leaching from soil as water comes into contact with them. The leachate was collected from test soil samples and analyzed to see if it had picked up or dissolved the elements bound in the soil. These tests were run on soils and sediments from all process ponds except former Thornock Lake. Concentrations of arsenic and metals in the test leachate varied among the soil samples but analysis showed that at some soil depth (except for soils under the acid plant) leachate produced in these tests meets federal drinking water standards.

With that concept as the basis for determining the minimum extent to which soils and sediments should be excavated, many modifications of the alternatives were developed to examine whether other important factors might require deeper excavation. State water quality standards, which are more stringent than federal drinking water standards, were examined, as were technical practicability and sheer soil volume.

There may be residual contamination in the remaining sediments and soils that could potentially impact the groundwater. For all alternatives, a groundwater and surface water monitoring plan for all areas of the process ponds will be implemented during the remedial design phase to verify the effectiveness of excavation and other remedial actions.

7.1 ALTERNATIVES FOR LOWER LAKE

There are five alternatives for Lower Lake, including No Action (refer to Table 7-1). All the alternatives (except No Action) contain common actions. The actions comprising alternatives are described in detail followed by a description of alternatives and a presentation of the applicable or relevant and appropriate requirements (ARARs).

. NO ACTION

With the No Action alternative, Lower Lake would continue be used as the primary settling and runoff storage pond. Seepage of process fluids and potential leaching of arseni from the lake bottom sediments would continue.

7.1.2 ALTERNATIVE 4A

Alternative 4A involves the following actions:

- Replace Lower Lake with tanks
- Treat process fluids and discharge to the East Helena Sewage Treatment Plant
- Excavate and dry sediments
- Smelt sediments in smelter process
- Construct a lined pond for storm runoff

Lower Lake currently functions as the main process fluid circuit settling pond and provides storage of rainfall and snowmelt runoff from within the plant. Under Alternative 4A, two large steel tanks would replace Lower Lake as the plant's primary water holding facility, and a lined pond or additional tanks would be constructed in the northwest corner of the property for emergency containment of storm runoff.

The tanks would be sized at 1,000,000 gallons each to allow one day's operation on one tank while cleaning the other. Accumulated sediments would be periodically suctioned out and reprocessed. The tanks would be similar in design to Thornock Tank, which has a leak detection and secondary containment system. The potential location for the tank is near existing Lower Lake (see Figure 7-1).

Effluent from the process water treatment plant would be discharged to the East Helena sanitary sewer system, a publicly-owned treatment works (POTW). Pretreatment standards for discharge to the POTW would be developed before remedial design of an onsite pretreatment facility. The EPA, state, and local community would follow the federal effluent guidelines (40 CFR 421.72, in part) in developing a community pretreatment program for the constituents of concern.

Achieving the effluent standards established in that process will require construction of a water treatment facility at the plant to reduce metals and arsenic concentrations in plant wastewaters prior to discharge. The plant would provide 2-stage treatment. Typical treatment would be to first remove arsenic by co-precipitation. Metals would then

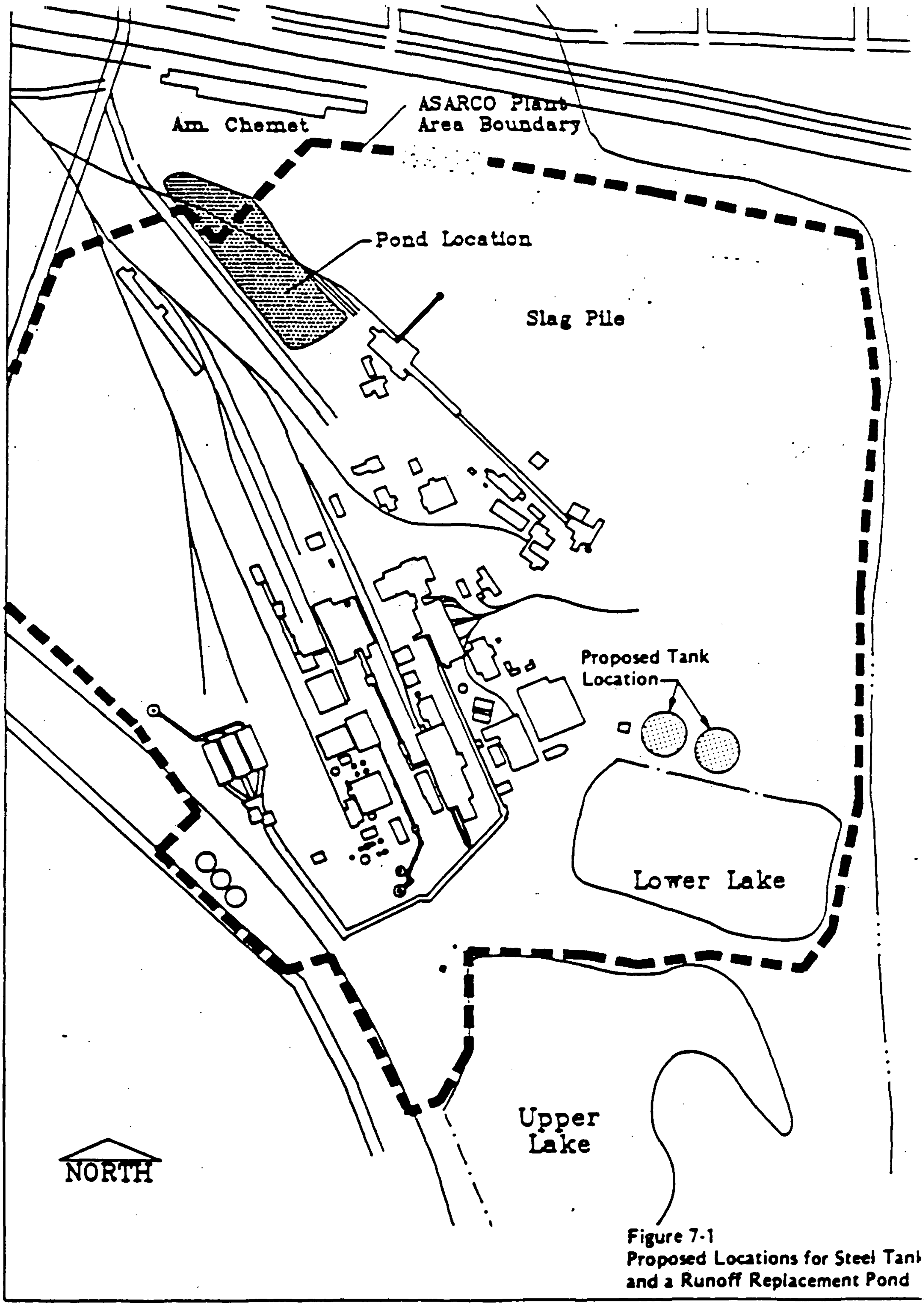

Figure 7-1
Proposed Locations for Steel Tank
and a Runoff Replacement Pond

be removed by raising the pH and neutralizing. Capacity of the treatment plant is estimated to be between 20 and 100 gpm. Costs and implementation time for alternative 4A are shown in Table 7-2.

Excavation of sediments would be performed to remove the artificially deposited sediment and sludge layer (approximately 1 to 3 feet) at the bottom of Lower Lake. The EPA has classified such bottom deposits in surface impoundments at all lead smelters as hazardous waste; therefore, they must be removed and treated or safely disposed.

Based on information obtained from soil leach (EP toxicity) tests, water coming into contact with sediments found at the lower limit of the artificially deposited layer may not meet federal primary drinking water standards. A key modification to this alternative would require excavation of an additional 2 feet below the artificially deposited sediment and sludge layer. This modification provides a margin of safety and it offers greater assurance that Lower Lake water, once treated, may meet federal drinking water standards after coming into contact with the remaining sediments (refer to Figure 5-1).

The sediments from Lower Lake would be removed by suction dredge or dragline and placed in a lined facility at the south or west edge of the plant to dry. Because of the width of the lake, dredging with a small floating suction

Table 7-2

COSTS AND IMPLEMENTATION TIMES FOR REMEDIATION ALTERNATIVES

Area	Alternative	Capital Cost ($)	Annual O&M Cost ($)	Present Worth ($)	Implementation Time Excluding Smelting of Sediments and Soils (YRS)
Lower Lake	No Action	0	0	0	0
	4A	8,520,600	734,300	12,729,700	5
	4B	8,566,100	756,300	13,113,400	5
	4D	8,520,600	2,577,600	17,749,400	4 [a]
	4E	9,731,200	217,800	12,904,900	4 [a]
	5S	3,538,600	621,600	6,015,300	5
Speiss Granulating Pond and Pit	8B+7E	649,400	6,600	750,900	2 [b]
	8B+7H	590,500	2,200	624,300	2
Acid Plant Water Treatment Facility	11D	1,865,500	5,500	1,958,500	2
	11E	1,746,700	525	1,754,800	2
	11F	1,927,000	33,000	2,859,300	2
Former Thornock Lake	14	19,000	0	19,000	.5

[a] Alternatives 4D and 4E do not involve smelting of excavated sediments.
[b] Remediation of the Speiss Pit may be delayed 12 to 18 months.

pump (hydraulic Mud Cat type) would be more feasible than removing material using a shore-based dragline or clamshell. Additionally, a dragline would require hauling of material from Lower lake to the drying area. A dredge can pump material directly to a drying area; thus, hauling is unnecessary.

The volume of sediments requiring removal is estimated to be the area of the pond (7 acres), by 4 feet deep. This includes an average of 2 feet of artificially deposited sludge plus 2 feet of contaminated natural sediments as a safety margin for removal. Based on this requirement, the total volume is estimated to be 45,000 cubic yards wet. The solids content of the sediment is about 40 percent. The estimated dry volume of the sediment would be 18,000 cubic yards or 27,000 tons.

The tentative size of the drying area is 2.4 acres at a depth of 1 foot. This will allow drying for about 3,900 cubic yards of wet material. Evaporation data at the plant for 1987 indicate that about 0.25 in./day of net evaporation occurs from May through September. A conservative drying time for 5,600 cubic yards of material would therefore be about 60 days. At three drying periods per year, 3 years may be required to remove the sediments. After drying, the material would be smelted in the smelter process.

The drying area would consist of a 325- by 325-foot concrete pad underlain by 12 to 18 inches of sand with a leakage detection and secondary collection system. This system would be underlain by a geomembrane liner.

After drying, and before smelting, sediments would be temporarily stored in the new ore storage building. Sediments would be smelted as part of normal smelter operations. Smelting would enable Asarco to recover small amounts of lead and other metals contained in the sediments; but more importantly, it will immobilize the remaining arsenic and metals within the slag produced in the process (vitrification). The excavated and dried sediments would be handled like ores to prevent fugitive emissions.

A proposed containment pond at the northwest corner of the East Helena plant would replace Lower Lake as a containment facility for excess storm runoff water (see Figure 7-1). The northwest location provides the following advantages:

1. Elimination of pumping for storm water runoff. Since the plant area topography slopes to the northwest, all runoff from the plant would flow by gravity to the proposed pond. This would eliminate pumping storm water that occurs now in the plant.

2. Favorable construction conditions. The soft saturated sediments of Lower Lake and large dewatering demands during construction reduce the technical feasibility of lining this pond. The proposed northwest pond location is approximately 30 feet above the water table and has soils suitable for construction of a lined facility.

The proposed pond construction would consist of a primary geomembrane liner underlain by a secondary leachate monitoring and collection system which in turn would be underlain by a secondary geomembrane liner. The pond would be designed to contain all plant runoff from the 100-year, 24-hour storm event (assuming 95 percent paved conditions within the plant). Currently only about 40 percent of the plant area is paved; however, the pond has been sized to contain potential runoff if 95 percent of the plant area is paved.

The required storage capacity for the designed pond is approximately 4.75 million gallons. Rough dimensions of the pond using available space are 600 feet by 200 feet with a total depth of about 6.5 feet. Runoff that would accumulate during a major storm is expected to evaporate within 1 or 2 years and sediments would be reprocessed.

7.1.3 ALT IATIVE 4B

Alternatives 4A and 4B are alike in that they share common actions. Differences are in the methods utilized to handle treated process water. As for Alternative 4A, Alternative 4B would replace Lower Lake with steel tanks, provide a lined facility to contain excess storm runoff, dredge the lake to remove sediments, dry the sediments, and process the sediments in the smelter operation. For Alternative 4B, excess process water would be treated to remove metals and arsenic, then discharged to Prickly Pear Creek.

Discharge of treated process water to Prickly Pear Creek would be required to meet the substantive requirements of a Montana Pollutant Discharge Elimination System (MPDES) permit if discharge occurs onsite. If discharge occurs offsite, procedural requirements would also have to be met. Typical treatment would be as described for Alternative 4A, except that treatment effluent standards may be more stringent than those developed for discharge to the POTW. Costs and implementation time for Alternative 4B and for other alternatives are shown in Table 7-2.

7.1.4 ALTERNATIVE 4D

For Alternative 4D, Lower Lake sediments would be hauled and disposed at an approved RCRA hazardous waste facility. The closest facility is located near Salt Lake City, Utah; a distance of about 500 miles. Sediment would be transported in gondola-type (20-ton) containers.

Alternative 4D shares remedial actions described for Alternative 4A, except for the handling of Lower Lake sediments. This alternative would replace Lower Lake with steel tanks, provide a lined facility to contain excess storm runoff, dredge the lake to remove sediments, dry the sediments, and discharge treated excess process water to the East Helena POTW sewage treatment lagoons. In Alternative 4D, sediments would be transported and disposed at an approved RCRA facility. Costs and implementation time for Alternative 4D are shown in Table 7-2.

7.1.5 ALTERNATIVE 4E

Alternative 4E is essentially the same as Alternative 4D, except that sediments from Lower Lake would be disposed in a permitted hazardous waste landfill close to the plant. Construction would be preceded by a site survey to determine soils and water table conditions. Approximate size of the facility would be 250 feet by 250 feet by 9 feet deep. The landfill would be constructed to include a double membrane liner, a leakage detection system, and a secondary collection system. Based on available soils and geological data, the most favorable locations would be 1 to 2 miles south of the smelter site. In this area, groundwater is reported to be in excess of 100 feet below the ground surface and is overlain by 45 feet of low permeability volcanic ash tuff (Hydrometrics, 1988b). This is probably the same ash tuff unit that underlies the East Helena Area. Costs and implementation time for Alternative 4E are shown in Table 7-2.

7.1.6 ALTERNATIVE 5S

Alternative 5S is essentially the same as Alternative 4A, with one major exception: process waters in Lower Lake would be treated in-place rather than discharged to either Prickly Pear Creek or the POTW, and evaporative processes of the plant would be used to treat the 50 to 70 gpm gain in the process fluid circuit.

Prior to treatment of the process waters, two large tanks would be installed to replace Lower Lake as a process pond as in Alternative 4A, and a lined pond or additional tanks would contain any unexpected runoff. The bottom sediments would be excavated in the same manner as for the key modification of Alternative 4A; that is, excavation would extend to 2 feet below the artificially deposited layer.

The in-place treatment of Lower Lake process waters would involve batch treatment with excess concentrations of ferric chloride to precipitate arsenic and other metals.

Treatment standards for in-place coprecipitation of arsenic and metals have been established by the EPA.[b] The requirements for arsenic, cadmium, copper, lead, and zinc are 0.02, 0.01, 0.004 to 0.008, 0.05, and 0.11 mg/L, respectively. It is required that in-place coprecipitation result in concentrations of metals at or below these requirements.

After treatment, water would be left in place or possibly discharged. Precipitate would accumulate on the pond bottom and would be removed by dredge along with the Lower Pond bottom sediments as described for Alternative 4A. The removed precipitate, along with the bottom sediments, would be dried and smelted, as described for Alternative 4A.

Evaporation processes to reduce gains in the proces circuit would be implemented after the installation of storage tanks and removal of Lower Lake from the main process fluid circuit as described in Alternative 4A. The existing gain in the main process fluid circuit is estimated at 50 to 70 gpm. The following actions would address the main process fluid circuit gains:

1. Removal of groundwater collected in the drainline near the existing ore storage and mixing area from the main process fluid circuit. Pumping collected

[b]Refer to Chapter 10, "Statutory Determinations," for descriptions of these standards and the basis for their selection.

groundwater from a collection sump into the main process fluid circuit would be terminated and the lower basement of the existing ore storage and mixing area would be allowed to flood (returned to a state of equilibrium with the normal groundwater level). This action would cause the groundwater level to rise approximately 2 feet and reduce gains to the main process circuit by 30 to 40 gpm.

2. Removal of potable water input from freezing prevention bleeders. This action would be accomplished by:

    a. Rerouting potable water bleeders to the sanitary sewer system

    b. Heating trace potable water lines so bleeder lines are no longer necessary

    c. Replacing the existing potable water supply with bottled water

3. Elimination of the remaining gains in the process fluid circuit by existing evaporative processes within the plant or by new methods of evaporation developed using waste heat from the smelter processes are being evaluated. Wastewater from the change house is the remaining source of gains to

the main process circuit. Sources of this waste water are the laundering facilities and personnel showers. An estimated 10 to 20 gpm is generated from these sources.

An additional output to Lower Lake that also needs to be eliminated is the acid plant blowdown coolant water. Flow in this circuit averages about 9 gpm but has occasional short flow peaks (20 minutes) up to 120 gpm.

Cooling towers that are a part of the smelter facility are a potential source of fluid elimination. Consumption of water for this facility varies seasonally from a low of about 5 gpm to a high of about 25 gpm. Additional evaporative devices and methods are currently being investigated.

Costs and implementation time for Alternative 5S are shown in Table 7-2.

7.1.7 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND SEDIMENT CLEANUP OBJECTIVES FOR LOWER LAKE ALTERNATIVES

The Occupational Safety and Health Administration (OSHA) requirements for sediments handling would be the same as for routine smelter operation. Ambient Air Quality Standards for smelting sediments, the same as for smelting ore, are expected to be met once the new State Implementation Plan for reducing emissions takes effect. Ambient Air Quality Standards for airborne lead in the proposed sediment drying area also are expected to be met.

Disposal actions under Alternatives 4D and 4E would require that the hazardous waste disposal facility be licensed under Resource Conservation and Recovery Act (RCRA) regulations. Disposal of sediments would be in accordance with RCRA regulations; Alternative 4E would require RCRA permitting.

Process fluids pretreatment for discharge to the East Helena POTW (Alternatives 4A, 4D, and 4E) is expected to meet most ARARs. However, meeting the State's more stringent water quality standards for long-term protection of aquatic life would be technically impracticable. Waivers of those ARARs would be justified on the basis of technical impracticability.

The water treatment component of Alternative 5S will meet prescribed standards for in-place treatment of process fluids. The proposed in situ treatment process has not been proven on a large scale. If the in situ treatment method proves to be ineffective, the contingency remedy will be invoked at which time pretreatment standards for discharge of treated Lower Lake waters into the East Helena POTW will be identified for the constituents of concern.

All Lower Lake alternatives involve the same cleanup objective for excavation of sediments. The depth of sediment excavation, which will be 2 feet beyond the lower limit of the artificially deposited sediment layer, was determined, in part, by the results of EP toxicity tests (the ability of the leachate to meet federal drinking water standards at some depth) and, in part, costs. Drying areas will be constructed in accordance with the substantive requirements of RCRA.

7.2 ALTERNATIVES FOR THE SPEISS GRANULATING POND AND PIT

The following are detailed descriptions of remediation alternatives for the speiss granulating pond and pit. Within each alternative (except No Action) are individual actions and combinations of actions that together will meet remediation goals. Costs and implementation times for speiss granulating pond and pit alternatives are shown in Table 7-2.

7.2.1 NO ACTION

With the No Action alternative the speiss granulating pond and pit would continue to be used as under current operations. Existing conditions would remain. This alternative would incur no additional operational or capital costs.

7.2.2 ALTERNATIVE 8B+7E

Alternative 8B+7E involves the following actions:

- Replacement of existing pond with tank and secondary containment facility

- Replacement of existing pit with a new lined facility

- Excavation of contaminated soils

In Alternative 8B+7E, a steel tank with a liner, leak detection system, and secondary containment and recovery capability would replace the existing speiss granulating pond (see Figure 7-2). The tank would be constructed at an elevation to allow gravity draining of the speiss granulating pit. Accumulated sediments in the tank would be periodically suctioned out and reprocessed.

The current speiss granulating pit is constructed of concrete and normally contains water with elevated arsenic and metals concentrations. The pit would be replaced with a watertight facility constructed of concrete with a steel liner. According to Asarco's process engineers, pit

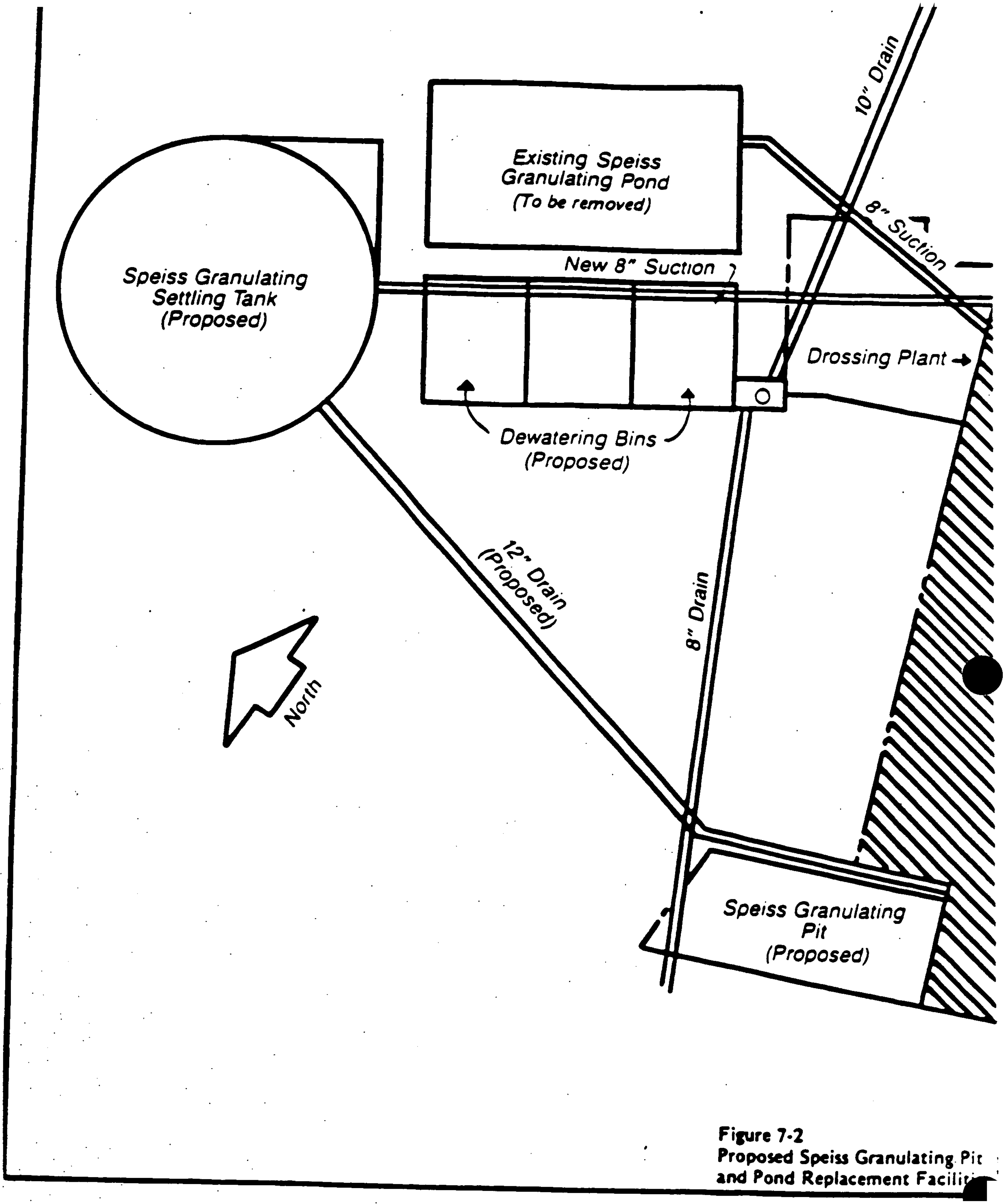

Figure 7-2
Proposed Speiss Granulating Pit and Pond Replacement Facilit

replacement may require interruption of plant operations for about 30 days. The pit would be allowed to drain by gravity to the speiss pond when the speiss pit is not in use. A lined secondary leak detection and recovery system would be included.

During construction of these replacement structures, soils underneath and adjacent to the existing pond and pit would be excavated and set aside for smelting later. Prior to smelting, the same precautions against fugitive emissions that are afforded the ore piles would apply to the soils. Large cobbles and boulders would be separated from the soil, washed, and stored onsite, thus reducing the amount of material required for smelting and hence the time required to smelt the soils.

The cleanup objectives based on EP toxicity test data, will be excavation of soils with leachate concentrations exceeding MCLs, or excavation to maximum practical limits (approximately 20 feet). These objectives may require additional soil core sampling at the speiss granulating pond and pit.

Although EP toxicity tests indicate that leachate from soils at a depth of 6 feet may meet federal drinking water standards, excavation to the groundwater table (approximately 20 feet) is recommended to avoid potential conflicts with future construction activities in the area. For example, new structures will be built in the area once excavation cavities are refilled. Excavation to the groundwater table will provide a margin of safety which will decrease the likelihood of a need for future excavation in the area and subsequent disassembly or moving of future structures. Because of the relatively small area of the speiss granulating pond and pit, deep excavation will not require substantially greater cost than excavation to a depth of 6 feet.

Excavation will include a 5-foot buffer zone outside of the perimeter of removed portions of the pond and pit facilities. Although soils outside this zone are potential sources of arsenic and metals to groundwater, 5 feet is considered the practical areal limit associated with the speiss pond and pit installation. Soils outside this zone will be addressed as part of the groundwater and surface soil operable units in the Comprehensive Feasibility Study. Soil would be smelted as described for Lower Lake alternatives. Sediment removal will occur in conjunction with speiss pond and pit replacement.

The estimated volume of material to be removed from the speiss pond and pit area as part of this alternative is 3,700 cubic yards and includes the area 5 feet around the pond and pit perimeter excavated to a depth of approximately 20 feet.

new structures will be built in the area once excavation cavities are refilled. Excavation to the groundwater table will provide a margin of safety which will decrease the likelihood of a need for future excavation in the area and subsequent disassembly or moving of future structures. Because of the relatively small area of the speiss granulating pond and pit, deep excavation will not require substantially greater cost than excavation to a depth of 6 feet.

Excavation will include a 5-foot buffer zone outside of the perimeter of removed portions of the pond and pit facilities. Although soils outside this zone are potential sources of arsenic and metals to groundwater, 5 feet is considered the practical areal limit associated with the speiss pond and pit installation. Soils outside this zone will be addressed as part of the groundwater and surface soil operable units in the Comprehensive Feasibility Study. Soil would be smelted as described for Lower Lake alternatives. Sediment removal will occur in conjunction with speiss pond and pit replacement.

The estimated volume of material to be removed from the speiss pond and pit area as part of this alternative is 3,700 cubic yards and includes the area 5 feet around the pond and pit perimeter excavated to a depth of approximately 20 feet.

7.2.3 ALTERNATIVE 8B+7H

For Alternative 8B+7H, as with Alternative 8B+7E, the speiss granulating pond would be replaced by a steel tank with a liner, leak detection system, and secondary containment and recovery capability. In this alternative, the pit would be repaired rather than replaced. Repairs would be performed to eliminate leakage and would include a leak detection system and secondary containment capability. A liner would be placed between a new insert and the existing concrete floor and walls. Plant operations could continue uninterrupted. Although soils excavation in the pond area would be conducted similar to that described in Alternative 8B+7E, the excavation of soils beneath the pit would not be possible in this alternative.

Repair of the speiss granulating pit would include relining the pit with concrete to make it watertight and to improve the drainage. Presently, about 4 to 6 inches of water are contained in the pit constantly. Relining the pit with concrete would allow complete drainage and reduce the residence time of water in the speiss pit to about 45 to 60 minutes per day. An alternative to lining the pit with concrete would be to construct a steel insert and place it in the existing structure. A steel liner would be more durable, is less likely to be damaged by hauling equipment, and therefore would provide a greater safety margin against leaks than concrete.

7.2.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND SOIL CLEANUP OBJECTIVES FOR SPEISS GRANULATING POND AND PIT ALTERNATIVES

Ambient Air Quality Standards for smelting soils, the same as for smelting ore, are expected to be met once the new State Implementation Plan for reducing emissions takes effect. The OSHA requirements for soils handling would be the same as for routine smelter operation.

The soil cleanup level for the speiss granulating pond and pit alternatives is similar to those described for Lower Lake. Based on information obtained from EP toxicity tests, leachate produced meets federal drinking water standards for soils at and below depths of about 6 feet. However, excavation of soils to 20 feet provides a margin of safety which will decrease the likelihood of a need for future excavation in the area and subsequent disassembly or moving of future structures.

7.3 ALTERNATIVES FOR THE ACID PLANT WATER TREATMENT FACILITY

The purpose of the acid plant water treatment facility is to reduce the solids content of the scrubber blowdown water and to treat and supply water to the sinter plant. Because of moisture in the atmosphere and feed stock, the scrubbers produce an excess of water. Part of this water is recirculated to the scrubbers and part is neutralized and pumped to the sinter plant. Areas of primary concern in the acid plant water treatment facility are the dumpsters and the main settling pond which provide gravity settling for blowdown water before it is neutralized and returned. Typical pH of blowdown water prior to neutralization is 1.3 to 1.9. The following are detailed descriptions of remediation alternatives for the acid plant water treatment facility. Within each alternative are individual actions and combinations of actions that together will meet remediation goals. Costs and implementation times for acid plant water treatment facility alternatives are shown in Table 7-2.

7.3.1 NO ACTION

For the No Action alternative, no action would be taken. The existing condition of the main settling pond, dumpster, fluid transport troughs, and the sediment drying area would remain. No additional work would be conducted.

7.3.2 ALTERNATIVE 11F

Alternative 11F would remove the settling pond, dumpster system, and sediment drying area and replace them with an enclosed, aboveground mechanical separation system. The new system would include cyclone separators and a clarifier with tube settlers. The system would include leak detection and secondary containment features. Accumulated sediments would be periodically suctioned out and reprocessed. Existing and proposed sediment-drying areas would be equipped with liners and containment capability.

Presently, all water is neutralized before leaving the treatment plant. The new process would neutralize only water that is pumped to the sinter plant. Scrubber makeup water would not require treatment beyond simple solids removal.

With the existing settling basins and lines removed, excavation of underlying and adjacent soils would proceed. The cleanup objectives, based on EP toxicity test data, will be excavation of soils with leachate concentrations exceeding MCLs, or excavation to maximum practical limits (approximately 20 feet). These objectives may require additional soil core sampling at the acid plant water treatment facility.

Results of past soil leach tests indicate that soils underlying the acid plant water treatment facility should be excavated down to the coarse, groundwater-bearing gravels (approximately 20 feet). This is based on the knowledge that soils under the acid plant water treatment facility exhibit characteristics of EP toxicity throughout the soil profile. The leachate from these tests fails to meet federal drinking water standards, regardless of soil depth. Because of the acidic condition of the soils, lime will be added prior to replacement with fill to reduce mobility of arsenic and metals associated with acidic soils underlying the acid plant water treatment facility.

It is estimated that approximately 6,250 cubic yards of soil would be excavated; however, the actual volume will not be known until additional sampling is conducted in the remedial design phase and actual excavation is underway. Excavated soils that exhibit characteristics of EP toxicity will be temporarily stored within the new ore storage building or in an area that is sufficiently secure to handle hazardous waste. Excavated soils that do not exhibit characteristics of EP toxicity will be temporarily stored alongside the ore piles and treated as ores are treated to prevent fugitive emissions. All excavated soils will be smelted in the smelter process, as described for Lower Lake sediments (Alternative 4A). Large cobbles and boulders would be separated from the soil, washed, and stored onsite, thus reducing the amount of material required for smelting and the time required to smelt the soils.

7.3.3 ALTERNATIVE 11D

Alternative 11D would involve excavation of contaminated soils, as described for Alternative 11F. The existing concrete- or asphalt-lined tank would be replaced with a freestanding steel tank with exposed side walls. The tank would include a leak detection and secondary containment system. Also, the primary settling area consisting of dumpsters would be relined with acid-resistant concrete. The sediment drying area would be double-lined and equipped with a secondary leachate detection and recovery system. The drying area is assumed to be 100 feet by 100 feet and would be constructed using concrete underlain by sand and a PVC or high density polyethylene (HDPE) liner. The existing steel dumpsters would be replaced with plastic or stainless steel containers. The containers would be constructed to limit overflow of solute. Also, the wooden trough system would be replaced with acid-resistant piping. Although the existing neutralizing tanks would not be replaced, steps would be taken to eliminate or contain leakage.

7.3.4 ALTERNATIVE 11E

Alternative 11E is essentially the same as Alternative 11D, with one exception: the main settling pond would not be replaced. Steps would be taken to eliminate leakage from the existing structure; a concrete basin similar to a swimming pool. Excavation of soils under the main settling pond would not be possible. Excavation of soils from the area under the dumpsters would occur, as described in the modification of Alternative 11D.

The existing concrete pond would be lined with a flexible geomembrane liner of PVC or HDPE. The pond would be drained, inspected for large cracks, lined, tested for leaks, and returned to service. The existing dumpsters and trough system would be replaced. The dumpster area and sediment drying area would be lined as described in Alternative 11D.

7.3.5 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND SOIL CLEANUP OBJECTIVES FOR ACID PLANT WATER TREATMENT FACILITY ALTERNATIVES

Ambient Air Quality Standards, similar to those described for the speiss granulating area, are expected to be met. OSHA requirements for soils handling would be the same as for routine smelter operation. Tank design and construction (Alternative 11D) will meet RCRA requirements for leak detection and secondary containment. For Alternative 11E, the lining in the pond will meet RCRA requirements for leak detection and secondary containment.

Soil cleanup objectives for soil removal at the acid plant water treatment facility are similar to those described for Lower Lake, except that soil leach (EP toxicity) test results indicate that the soils under the acid plant exhibit characteristics of EP toxicity throughout the soil profile. Therefore, the EPA recommends deep excavation at the acid plant water treatment facility.

7.4 ALTERNATIVES FOR FORMER THORNOCK LAKE

In 1986, Thornock Lake was drained and replaced with a steel tank, complete with a liner, leak detection system, and secondary containment and recovery capability. Dry sediments remain in the existing cavity. The EPA has classified these sediments of surface impoundments (including former impoundments) at all lead smelters as hazardous wastes that must be removed and treated or safely disposed.

7.4.1 NO ACTION

There are two alternatives for former Thornock Lake, including No Action. Under the No Action alternative, no further work would be conducted on the sediments in former Thornock Lake. The existing sediment conditions would remain. No direct costs would be incurred if the sediments are left in place.

7.4.2 ALTERNATIVE 14

Alternative 14 consists of excavating the remaining bottom sediments, stockpiling them temporarily, and smelting them. Until the pond was abandoned in 1986, this was the normal procedure. About 100 tons of sediment were reprocessed in the plant from each cleaning. Sediments would be excavated and smelted in the same manner as sediments from Lower Lake. Depth of excavation would be determined as it was described for Alternative 4A (for Lower Lake): excavate to 2 feet beyond the artificially deposited layer of sediments. In the past, sediments were temporarily stockpiled alongside the ore piles before smelting. In this alternative, since these sediments are bottom deposits of a surface impoundments at a lead smelter, the EPA has classified them as a hazardous waste. Therefore, it will be necessary to temporarily stock-pile the excavated sediments in the new ore storage building.

Treating sediments in the smelter process would enable Asarco to recover small amounts of lead and other metals; but more importantly, it will immobilize the remaining arsenic and metals within the slag produced in the process (vitrification). A modification of this alternative is to dispose of the sediments at a licensed hazardous waste facility (refer to Alternatives 4D and 4E for Lower Lake). The costs and implementation time for Alternative 14 are shown in Table 7-2.

7.4.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND THE SEDIMENT CLEANUP OBJECTIVES FOR FORMER THORNOCK LAKE ALTERNATIVES

Ambient Air Quality Standards for smelting sediments, the same as for smelting ore, are expected to be met once the new State Implementation Plan for reducing emissions takes effect.

The sediment cleanup objective for sediments in former Thornock Lake is the same as that for Lower Lake. The depth of sediment removal will be 2 feet beyond the lower limit of the artificially deposited sediment layer. This alternative is not expected to interfere with future remedial actions in the area.

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8 ALTERNATIVES COMPARATIVE ANALYSES

During the feasibility study, Asarco developed more than 200 potential cleanup alternatives. Alternatives were evaluated according to the requirements of the NCP. In addition, their expected compliance with nine essential criteria were evaluated:

1. Protection of human health and the environment
2. Compliance with legally applicable or relevant and appropriate requirements (ARARs)
3. Reduction of toxicity, mobility, and volume
4. Short-term effectiveness
5. Long-term effectiveness and permanence
6. Implementability
7. Cost
8. Community acceptance
9. State and local agency acceptance

Four groups of alternatives were evaluated, one group for each area to be remediated: Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and former Thornock Lake. Each group of alternatives was evaluated separately. Alternatives within each group were evaluated by the nine criteria and against each other. For a comprehensive evaluation of alternatives, refer to the August 1989 Process Ponds Remedial Investigation and Feasibility Study (RI/FS) report.

8.1 LOWER LAKE

8.1.1 PROTECTIVENESS, SHORT- AND LONG-TERM EFFECTIVENESS, AND PERMANENCE

All alternatives (except No Action) reduce the risks from metal- and arsenic-bearing Lower Lake fluids and sediments. Risks to the community and to workers associated with the implementation of these alternatives would be low. Smelting of excavated sediments would expose workers to metals and arsenic at levels similar to those of routine smelting activities.

The EPA has classified bottom sediments of surface impoundments at all lead smelters as hazardous waste. An effective way of treating this hazardous waste would be to dry the material on lined pads, then dispose of it in the smelting process (Alternatives 4A, 4B, and 5S). Smelting sediments would allow recovery of small amounts of metals, but more importantly, smelting immobilizes residual metals and other materials in slag. This process would be similar to vitrification.

During implementation of the alternatives, sediments would remain as a potential source of groundwater contamination until sediment removal is complete. Even after excavation, residual arsenic and metals in remaining sediments may impact the groundwater. The liner in the proposed storm runoff containment pond would be protective, but it might break. Continuous groundwater monitoring would be required to verify that there is no leakage from the containment pond. The equipment life associated with these alternatives is expected to be approximately 20 years.

Risk is involved with transporting contaminated sediments to an offsite hazardous waste disposal facility (Alternative 4D). The other Lower Lake alternatives do not incur such risk. However, Alternative 4E may pose some risk to the community in that locating a hazardous waste landfill near the City of East Helena increases the risk of additional groundwater contamination, particularly if the landfill liner breaks.

Treatment of process fluids would protect human health and the environment. For Alternative 4B, the discharge of process fluids to Prickly Pear Creek would require treatment of arsenic and metals to bring levels to standards that would be specified by an MPDES permit. For Alternative 5S, in-place treatment of process fluids is expected to reduce arsenic and metals concentrations in the process fluids, but the technology has not been proven on a large scale.

8.1.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

The Occupational Safety and Health Administration (OSHA) requirements for sediments handling would be the same as for routine smelter operation. Ambient Air Quality Standards for smelting sediments, the same as for smelting ore, are expected to be met once the new State Implementation Plan for reducing emissions takes effect. Ambient Air Quality Standards for airborne lead in the proposed sediment drying area also are expected to be met. Drying areas will be constructed in accordance with the substantive requirements of RCRA.

Disposal actions under Alternatives 4D and 4E would require that the hazardous waste disposal facility be licensed under Resource Conservation and Recovery Act (RCRA) regulations and CERCLA offsite policy. Disposal of sediments would be in accordance with RCRA regulations, and Alternative 4E would require RCRA permitting.

Alternative 5S will meet prescribed standards described for in-place treatment of process fluids. Large-scale applications of the proposed treatment process have not been proven; therefore, a contingency remedy has been developed. The prescribed federal and state water quality standards are identified in Chapter 10, Statutory Determinations. If the contingency remedy is invoked, process fluids pretreatment will meet yet-to-be-determined standards for the constituents of concern.

8.1.3 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME

Alternatives for Lower Lake would decrease mobility of the principal contaminants, arsenic and metals. Compared to hazardous waste landfill disposal actions (Alternatives 4D and 4E), smelting sediments (Alternatives 4A, 4B, and 5S) would reduce the volume of waste. By smelting sediments, some metals could be recovered and residual hazardous metals would be immobilized in the slag.

Both smelting and landfill sediment disposal actions would reduce the mobility of contaminants. However, for the landfill alternatives, if the liner in the hazardous waste landfill breaks, contaminants could move into the groundwater.

All process fluids treatment processes would reduce the volume of contaminants. Alternative 5S is expected to reduce the mobility of contaminants as well; however, the actions described for treatment under this alternative need to be demonstrated on a large scale.

8.1.4 IMPLEMENTABILITY

Availability of work force, equipment, materials, and locations are not anticipated to be a problem for most alternatives. However, locating a hazardous waste disposal facility near East Helena (Alternative 4E) may be difficult. Alternatives could be designed not to interfere with potential future remedial actions for other operable units.

All fluids treatment components of the alternatives are implementable. However, the in-place treatment action (Alternative 5S) proposes using technologies that need to be demonstrated on a larger scale. Asarco is investigating the technical feasibility of eliminating the gain in the process fluids circuitry by treating 10 to 20 gallons per minute by evaporation processes (Alternative 5S). Pilot-scale testing would be required prior to full-scale implementation of the fluids treatment components of all alternatives.

8.1.5 COSTS

The total present worth of alternatives ranges from $6,015,300 (Alternative 5S) to $17,749,400 (Alternative 4D). Other Alternatives (4A, 4B, 4E) have present worth costs of approximately $13,000,000. Refer to Table 7-2 for specific capital, operating, and maintenance costs.

8.1.6 LOWER LAKE ALTERNATIVES EVALUATION SUMMARY

Five alternatives (other than No Action) were evaluated for Lower Lake. Disposal of sediments in the smelter process and in-place treatment of process fluids by co-precipitation appear to be the most attractive actions. These actions are part of Alternative 5S.

8.2 SPEISS GRANULATING POND AND PIT

8.2.1 PROTECTIVENESS, SHORT- AND LONG-TERM EFFECTIVENESS, AND PERMANENCE

Alternatives would involve excavation of contaminated soils. The partial or complete removal of contaminated soils, combined with actions to prevent leakage of fluids, would help prevent further groundwater contamination. Current data indicate that 6 feet of excavation would be required for protecting groundwater, but excavation to approximately 20 feet is recommended. Regardless of excavation depth, residual arsenic and metals could potentially impact the groundwater.

... associated with xcavation activities are expected Risks to workers are typical of risks within the smelter, and include potential exposure to arsenic- and metals-bearing sediment and air particulates. The long-term reliability of both alternatives is expected to be good.

In Alternative 8B+7H, protectiveness is achieved by upgrading the existing pit and replacing the pond. With this alternative, there is some risk of breaking the upgraded liner and releasing contaminants. More protectiveness would be offered by replacing the existing pit and pond with new structures (Alternative 8B+7E).

8.2.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Ambient Air Quality Standards for smelting soils, the same as for smelting ore, are expected to be met once the new State Implementation Plan for reducing emissions takes effect. OSHA requirements for soils handling would be the same as for routine smelter operation.

8.2.3 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME

Mobility and volume of the contaminants in soils would be permanently reduced. Arsenic and metals would be treated in the smelting process. The mobility of metals in speiss fluids would be reduced by leak prevention.

8.2.4 IMPLEMENTABILITY

Equipment, personnel, and facilities required for implementation are available. The technology for excavation and smelting soils is demonstrated and reliable. If necessary, soils could be excavated to a maximum practical depth of approximately 20 feet.

Potential conflicts with future groundwater remedial actions may involve the impact of residual contaminants on groundwater. The effect of these alternatives on the groundwater system may be monitored by a groundwater network.

8.2.5 COSTS

The total present worth of the alternatives are $750,900 (Alternative 8B+7E) and $624,300 (Alternative 8B+7H). Refer to Table 7-2 for specific capital, operating, and maintenance costs.

8.2.6 SPEISS GRANULATING POND AND PIT ALTERNATIVES EVALUATION SUMMARY

Either alternative would be appropriate for remediation of this area. However, Alternative 8B+7E is preferred because it offers more protection through replacement of both the pond and the pit.

8.3 ACID PLANT WATER TREATMENT FACILITY

8.3.1 PROTECTIVENESS, SHORT- AND LONG-TERM EFFECTIVENESS, AND PERMANENCE

Soil leach (EP toxicity) test results indicate that soils under the acid plant water treatment facility exhibit characteristics of EP toxicity throughout the soil profile. For that reason, soil removal would be to approximately 20 feet to protect the groundwater. Soils will be smelted. Although these soils exhibit characteristics of EP toxicity, the metals contained within them are a by-product of the smelting process and may therefore be returned to the original process by which they were generated.

The risks associated with excavation are low and are similar to those described for the speiss granulating pond and pit alternatives. The long-term reliability is good. However, residual contaminants could potentially impact the groundwater.

Alternative 11E includes relining the settling pool instead of replacing it. The use of a liner would be less protective than replacement of the pool because the liner could break. The effectiveness of the liner could be monitored by a secondary leak protection system and a monitoring well network. Remaining risks to groundwater would include potential contamination from soils underlying the relined ponds. Long-term reliability depends on proper operation, inspection, and maintenance of the facility. If facilities are properly maintained, no long-term problems should occur.

Alternatives 11D and 11F would be more protective than Alternative 11E. Risks associated with acid plant fluid leakage to groundwater and potential leaching of contaminants from underlying soils would be reduced. The effectiveness of tank installation can be monitored by a secondary leak detection system and a monitoring well network.

In the long-term, the settling pond and soils beneath the existing facility and sediment drying area could contaminate groundwater. Long-term reliability is dependent on proper operation and maintenance of the facility.

8.3.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Ambient Air Quality Standards, similar to those described for the speiss granulating pond and pit area, are expected to be met. OSHA requirements for soils handling would be the same as for routine smelter operation. Tank design and construction (Alternative 11D) are expected to meet RCRA requirements for leak detection and secondary containment. For Alternative 11E, the lining on the pond may not meet RCRA requirements for leak detection and secondary containment.

8.3.3 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME

For Alternatives 11D and 11F, the acid plant water treatment facility would be replaced (except for the neutralizing tanks), thereby reducing a source of groundwater contamination. The mobility of acid plant fluids would be reduced. Smelting would reduce both mobility and volume of contaminants in the soils, as well as return the metals to the process by which they were generated. Reduction of contaminant mobility would be accomplished by lining the settling pond and by replacing settling dumpsters and troughs. Soils under the settling pond remain as potential sources of groundwater contamination.

For Alternatives 11D and 11F, the mobility of fluid contaminants from the settling dumpsters, troughs, and sediment drying area is reduced. However, the main settling pond remains a potential source of groundwater contamination. Contaminated soils remaining beneath troughs, dumpsters, and the sediment drying area after excavation could contaminate the groundwater. All alternatives (except No Action) are expected to be effective in reducing the volume and mobility of contaminants in the soils and groundwater.

8.3.4 IMPLEMENTABILITY

Adequate work force, equipment, and materials are available. Excavation technology and disposal in the smelter process is demonstrated and reliable. Contaminated soils could be excavated to a maximum practical depth. No conflicts with future remedial actions are expected, except for potential impacts of remaining soils on the groundwater. The effect of this alternative on the groundwater system can be monitored by a monitoring well network. There will be no long-term operation and maintenance for soil removal and processing.

For Alternative 11D, tank construction was previously demonstrated successfully at former Thornock Lake. The tank could be constructed within the existing pool. This may require temporary shutdown of the acid plant water treatment facility. Proper maintenance of the lined facility and the tank would be required.

For Alternatives 11D and 11E, temporary storage of acid plant fluids during tank construction would have to be provided. For Alternative 11E, the settling pool would require draining, sediment removal, and possibly some concrete repair work prior to installation of the liner. Liners are generally reliable and easy to install.

All fluids treatment components of the alternatives are implementable. In the long-term, proper operation and maintenance must be performed to achieve proper handling of contaminant fluids.

8.3.5 COSTS

The total present worth of alternatives ranges from $1,754,800 (Alternative 11E) to $2,859,300 (Alternative 11F). Alternative 11D has a total present worth of $1,958,500. Refer to Table 7-2 for specific capital, operating, and maintenance costs.

8.3.6 ACID PLANT WATER TREATMENT FACILITY ALTERNATIVES EVALUATION SUMMARY

For all alternatives (except No Action) excavation to practical limits would remove soil contaminants and help protect the groundwater. Smelting contaminated soils would reduce contaminant mobility and volume, as well as return the metals to the process by which they were generated. Alternative 11D includes lining the dumpster pad and replacing the concrete pad. Alternative 11F, which involves replacing the facility, also would prevent leakage of acid plant fluids. Alternative 11F is the preferred alternative.

8.4 FORMER THORNOCK LAKE

Only one alternative (other than No Action) exists for the remediation of former Thornock Lake. Variations of this alternative, including disposal of sediments at a hazardous waste facility, could be considered. This alternative was evaluated against the essential criteria.

8.4.1 PROTECTIVENESS, SHORT- AND LONG-TERM EFFECTIVENESS, AND PERMANENCE

Excavation of sediments would offer protection similar to that described in alternatives for Lower Lake, except that there are no process fluids. Also, community and worker risks would be similar. Residual risks would include contaminants already in the groundwater system. The process of sediment removal and smelting is reliable in the long term.

8.4.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Ambient Air Quality Standards for smelting sediments, the same as for smelting ore, are expected to be met once the new State Implementation Plan for reducing emissions takes effect. Ambient Air Quality Standards for airborne lead in the proposed sediment drying area are also expected to be met. The OSHA requirements for sediments handling would be the same as for routine smelter operation.

8.4.3 REDUCT_ _N OF TOXICITY, MOBILITY, AND VOLUME

Sediments would be removed. Smelting similar to that described for Lower Lake sediments would permanently reduce contaminant mobility and volume.

The excavation and smelting of sediments has already been implemented for part of former Thornock Lake. The reliability of excavation and disposal has been demonstrated. This alternative will not interfere with future remedial actions. However, contaminants remaining after excavation could impact the groundwater.

Effectiveness is dependent on total removal of fine-grained contaminated sediments. Removal can be visually monitored and verified by sampling. No long-term operation and maintenance would be necessary if the former lake is not reused. If the pond is intended as an overflow storage facility, then long-term maintenance of the liner system would be required.

8.4.4 IMPLEMENTABILITY

This alternative can be implemented as a smelter operating improvement. Approvals from the EPA and MDHES would be required. An adequate work force and materials are available for implementation of this alternative.

8.4.5 COSTS

The present worth of Alternative 14 is estimated at $19,000. Refer to Table 7-2 for capital, operating, and maintenance costs.

8.4.6 STATE AND COMMUNITY ACCEPTANCE

The general reaction to the Proposed Plan and preferred alternatives was positive. Refer to the Responsiveness Summary (Appendix A) for detailed comments on the Proposed Plan.

8.4.7 FORMER THORNOCK LAKE ALTERNATIVES EVALUATION SUMMARY

Since no other alternatives (except No Action) are under consideration for former Thornock Lake, Alternative 14 is the preferred alternative.

8.5 ALTERNATIVES EVALUATION PROCESS SUMMARY

Through the evaluation process, one alternative for each area was identified as the most appropriate means of remediation. For Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and former Thornock Lake, these alternatives are 5S, 8B+7E, 11F, and 14, respectively. The EPA and MDHES believe that these alternatives will satisfy most of the statutory requirements presented in the ARARs analysis. The choice of preferred alternatives reflects the preference for treatment as the principal element.

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9 THE SELECTED REMEDY

The remedy selected for the process ponds operable unit is a combination of remedies, one for each of the four areas: Lower Lake, the speiss granulating pond and pit, the acid plant water treatment facility, and former Thornock Lake. This chapter presents details of the selected alternatives for each area, including:

- Treatment and containment actions
- Costs
- Remediation goals and points of compliance
- Explanation of how the actions meet the statutory requirements or prescribed standards

9.1 LOWER LAKE

The selected remedy for Lower Lake, Alternative 5S, includes the following actions:

- Replace Lower Lake with storage tanks
- Construct a lined pond for storm water runoff

- . -place co-precipitation of Lower Lake process waters

- Remove sediments by dredge, dragline, or industrial vacuum

- Dry sediments on drying pad

- Smelt sediments in the smelter process

Since the in-place treatment of process waters has not seen proven on a large scale, a contingency remedy, Alternative 4A, has been selected for implementation in case implementation of the selected alternative fails to result in achieving ARARs (or prescribed standards). Alternative 4A is identical to Alternative 5S, except for the way in which process waters are treated. Alternative 4A involves pretreatment of process waters followed by discharge to the POTW.

Preparation for the implementation of the contingency remedy, Alternative 4A, should commence immediately, so that remedial actions will not be delayed if the selected remedy, Alternative 5S, does not meet prescribed standards for in-place treatment. The EPA, state, and local community should follow the federal effluent guidelines (40 CFR 421.72, in part) in developing a community pretreatment program, including development of pretreatment standards, for the contaminants of concern.

Actions for both alternatives are described in detail in Chapter 7. The volumes of contaminants addressed by these alternatives are also described in Chapter 7. The time required to implement Alternatives 4A or 5S will be 5 years, excluding smelting time.

Smelting of Lower Lake sediments will take precedence over smelting sediments and soils from other areas. However, during the time it takes to prepare Lower Lake sediments for smelting, soils and sediments from other areas should be smelted. The materials requiring smelting are, in order of decreasing priority: Lower Lake sediments, former Thornock Lake sediments, soils from the acid plant area, and soils from the speiss granulating area. It is expected to take 12 to 15 years to smelt all the excavated soils and sediments.

For the selected remedy, Alternative 5S, the EPA will require a treatability study plan before any treatability study tests will be done. As soon as possible, Asarco will submit to the EPA a treatability study work plan and, by June 15, 1990, a treatability study report. The report should document whether or not in-place co-precipitation of Lower Lake process waters is expected to meet the prescribed standards presented in Chapters 7 and 10.

9.2 SPEISS GRANULATING POND AND PIT

The selected remedy for the speiss granulating pond and pit, Alternative 8B+7E, includes the following actions:

- Excavate soils
- Smelt soils in the smelter process
- Replace existing pond with tank and secondary containment facility
- Replace existing pit with a new lined facility

Descriptions of these actions and of the volumes of material addressed by this alternative are presented in Chapter 7. Capital and O&M costs are shown in Table 7-2. The time required to implement Alternative 8B+7E will be 2 years, not including the smelting of excavated soils and complete remediation of the speiss pit. The EPA may grant an additional 12 to 18 months to completely replace the speiss granulating pit and excavate the underlying soils. Although remediation of the speiss pit may be deferred to 1992, leakage from the speiss granulating pit must be stopped immediately by use of a liner or other comparable technology. Smelting of excavated soils may take up to 12 to 15 years. Soils excavated from the speiss granulating pond and pit will be smelted after sediments and soils from all other areas are smelted.

The cleanup objectives based on EP toxicity test data, will be excavation of soils with leachate concentrations exceeding MCLs, or excavation to maximum practical limits (approximately 20 feet). These objectives will require additional soil core sampling at the speiss granulating pond and pit.

9.3 ACID PLANT WATER TREATMENT FACILITY

The selected remedy for the acid plant water treatment facility, Alternative 11F, includes the following actions:

- Replace existing pond and settling system with closed circuit filtration treatment system
- Excavate contaminated soils
- Smelt contaminated soils in the smelter process, thus returning metals to the process by which they were generated.

Descriptions of these actions and of the volumes of material addressed by this alternative are presented in Chapter 7. Capital and O&M costs are shown in Table 7-2. The time required to implement Alternative 11F will be 1 year, not including the time required for smelting excavated soils. Soils excavated from the acid plant water treatment facility will be smelted after smelting sediments excavated from Lower Lake and former Thornock Lake, and before smelting soils excavated from the speiss granulating pond and pit.

The cleanup objectives, based on EP toxicity test data, will be excavation of soils with leachate concentrations exceeding MCLs, or excavation to maximum practical limits (approximately 20 feet). These objectives will require additional soil core sampling of the acid plant water treatment facility.

9.4 FORMER THORNOCK LAKE

The selected remedy for former Thornock Lake, Alternative 14, includes the following actions:

- Excavate sediments
- Smelt sediments in smelter process

Descriptions of these actions and of the volumes of material addressed by this alternative are presented in Chapter 7. Capital and O&M costs are shown in Table 7-2. The time required for excavation will be 6 months.

Although sediments from Lower Lake have high priority for smelting, some or all of the sediments from former Thornock Lake will be smelted first, until Lower Lake sediments have been dried and readied for the smelter process. Then, the smelting of Lower Lake sediments would take precedence.

9.5 PERFORMANCE REQUIREMENTS

Remediation goals for all areas are the requirements that have been identified as applicable or relevant and appropriate requirements (ARARs) or soil and sediment clean-up objectives. These goals were determined by the EPA based on data collected during the remedial investigation (RI).

The Occupational Safety and Health Administration (OSHA) requirements for sediments handling would be the same as for routine smelter operation. Ambient Air Quality Standards for smelting sediments, the same as for smelting ore, are expected to be met once the new State Implementation Plan takes effect. Ambient Air Quality Standards for airborne lead in the proposed sediment drying area also are expected to be met. Tank design and construction are expected to meet RCRA requirements for leak detection and secondary containment.

The in-place treatment of process fluids will require meeting prescribed standards identified by the EPA.[c] Some of the ARARs will be waived. The prescribed standards for arsenic, cadmium, copper, lead, and zinc are 0.02, 0.01, 0.004 to 0.008, 0.05, and 0.11 mg/L, respectively. The point of compliance will be within Lower Lake. In-place treatment by co-precipitation is expected to achieve the prescribed standards.

The depth of sediment excavation has been determined, in part, by the results of EP toxicity tests and the ability of the leachate to meet federal drinking water standards. Residual contaminants in remaining sediments may cause problems with meeting federal and state water quality standards for groundwater. For example, results of EP toxicity tests indicate that soils at the acid plant from the surface down to coarse, groundwater-bearing gravels exhibit characteristics of EP toxicity. Extracts from EP toxicity tests of these soils will not meet the federal primary drinking water standards regardless of depth.

It is important to note that, although only five elements of concern were selected for the identification of treatment standards, there are some 18 to 20 total hazardous elements at elevated concentrations in the surface water,

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[c]Refer to "Statutory Determinations," Chapter 10, for specific information on waivers and prescribed standards.

groundwater, soils, and sediments at the site. The in-place co-precipitation of surface waters is expected to lower the concentrations of the five selected elements as well as of the other hazardous elements. Continued monitoring of the process pond areas is recommended for all the elements. If it is determined that in-place treatment of process waters will not meet prescribed standards, then the contingency remedy, Alternative 4A, must be implemented immediately. Excavation will not be delayed. Detailed cost estimates of the various alternatives are presented in Table 7-2.

9.6 CHANGES DURING REMEDIAL DESIGN

During the design and construction phase of remedial actions, changes may be made to selected remedies. Such changes, in general, reflect modifications resulting from the engineering design process.

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10 STATUTORY DETE INATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve protection of human health and the environment. Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

The selected remedy is protective of human health and the environment, will comply with federal and state requirements that are legally applicable or relevant and appropriate or will justify noncompliance with applicable requirements by exercise of the appropriate statutory waiver, and is cost-effective. The selected remedy utilizes alternative treatment and resource recovery technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining onsite above health-based levels, the 5-year review will apply to this action.

10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedies for the various contaminant sources including in-place treatment of Lower Lake process waters, excavation, and smelting of soils and sediments, protects human health and the environment through removal and treatment of contaminated soils, sediments, and process fluids. The remedies for all four areas of the process ponds will eliminate the direct contact threat currently present and will minimize future effects on groundwater and surface water by removing the sources of contamination. The selected and contingency remedies for all four areas of the process ponds protect human health and the environment as described in the follow subsections.

10.1.1 LOWER LAKE

The removal of Lower Lake from the process stream will eliminate the primary source of groundwater contamination. The construction of a new lined pond for stormwater runoff will eliminate plant stormwater as a contaminant source. The removal of pond sediments and their subsequent smelting will reduce the volume of contaminated soils beneath Lower Lake and their potential for further contamination of the groundwater beneath the lake. The in-place treatment of Lower Lake water by co-precipitation will be conducted in accordance with RCRA and water quality standards. In-place treatment will eliminate the process waters as a source of groundwater contamination.

The contingency for remedy for Lower Lake, Alternative 4A, differs from the selected remedy only with respect to the treatment of Lower Lake process waters in requiring pretreatment and discharge to a POTW as opposed to in situ treatment. The contingency remedy is protective of human health and the environment. If the in situ component of the selected remedy for remediation of process fluids from Lower Lake proves to not be an effective treatment for remediation on a large scale, pretreatment of the process fluids prior to discharge to a POTW will become the preferred remedy by which to attain the level of protectiveness set by Section 121 of CERCLA.

10.1.2 SPEISS GRANULATING POND AND PIT

The replacement of the existing speiss pond and pit will eliminate the leakage from these facilities as a contamination source. The excavation and smelting of the soils beneath the pond and pit will reduce the volume of contaminated soils and permanently remove those soils as a source of groundwater contamination.

10.1.3 ACID PLANT WATER TREATMENT FACILITY

The replacement of the existing settling system and drying area will remove those facilities as contaminant sources. The excavation and smelting of the contaminated soils will reduce the volume of contaminated soils, remove them as a source of groundwater contamination, and return the metals to the process by which they were generated.

10.1.4 FORMER THORNOCK LAKE

The excavation and smelting of the sediments will reduce the volume of contaminated soils and eliminate their potential for further contamination of the groundwater.

10.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The selected and contingency remedies will either meet or statutorily justify the waiver of the applicable or relevant requirements. The EPA selected the ARARs for remediation at this site and a matrix and a narrative discussion of these are in the Feasibility Study. In addition to the ARARs, the

EPA and the state have agreed to consider a number of procedures that are not legally binding (EPA, 1988). These requirements are To-Be-Considered (TBC) in the implementation of remedial actions. The ARARs and TBCs are presented and described in Tables 10-1 and 10-2.

10.2.1 WAIVERS AND PRESCRIBED STANDARDS

Federal law recognizes there may be instances in which ARARs cannot be met with respect to remedial actions onsite. It, therefore, identifies six circumstances under which ARARs may be waived. However, other statutory requirements, specifically the requirement that remedies be protective of human health and the environment, cannot be waived. Waivers occur as the exception, not the rule. Waivers for noncompliance are appropriate if:

- The remedial action selected is an interim remedy and only part of a total remedial action that will attain ARARs when completed.

- Compliance with ARARs at the site would result in greater risk to human health and the environment than alternative options.

- Compliance with ARARs is technically impracticable, from an engineering perspective.

Table 10-1
DESCRIPTION AND ANALYSIS OF
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
CHEMICAL-SPECIFIC						
Safe Drinking Water Act	40 U.S.C. 300f, 300g-1, 300g-4, 300g-5					
National Primary Drinking Water Standards	40 C.F.R. Part 141, subpart A, 141.11, 141.23, 141.27, 141.28	Establishes health-based standards for public water systems (maximum contaminant levels).	R&A	The MCLs for inorganic contaminants are relevant and appropriate.	Lower Lake 4A, 5S	Relevant and appropriate to sediment dredging. The goal of sediment removal is to help groundwater impacted by Lower Lake meet MCLs.
					5S	Relevant and appropriate to in-place treatment of Lower Lake. The goal of in-place treatment is to improve groundwater quality to meet MCLs.
					SP/SP, APWTF and TL* 8B+/E, 11F, 14	Relevant and appropriate to excavation of sediments. The goal of sediment removal is to improve groundwater quality to meet MCLs.
National Secondary Drinking Water Standards	40 C.F.R. Part 143	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels).	TBC	Secondary MCLs for inorganic contaminants should be treated as "other criteria, advisories, and guidance."		Not a federal ARAR since secondary MCLs are not based on health concerns, but is a State ARAR as part of the Ambient Water Quality Criteria.

*SP = speiss pond/speiss pit; APWTF = acid plant water treatment facility; TL = Thornock Lake.

Table 10-1 (Continued)
DESCRIPTION AND ANALYSIS OF
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
Maximum Contaminant Level Goals	Pub L. No. 99-339, 100 Stat. 642 (1986)	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety.	TBC	Proposed MCLGs for inorganic contaminants should be treated as "other criteria, advisories, and guidance."		Not an ARAR.
Solid Waste Disposal Act	42 U.S.C. 6901, 6902, 6903, 6907, 6921, 6922, 6924	(Discussed in detail under Action-Specific section, below)				
Resource Conservation and Recovery Act (RCRA)						
Identification and Listing of Hazardous Waste	40 C.F.R. Part 261, Subpart B	Defines those solid wastes which are subject to regulation as hazardous wastes under 40 C.F.R. Parts 262-265 and Parts 124, 270, 271.	A	RCRA requirements may be applicable and/or relevant and appropriate if sludges generated by treatment processes are listed wastes or EP toxic.	4A, 5B, 8B+7E, 11F	Applicable to sediment removal in Lower Lake and potentially applicable for handling of sediments associated with the apeiss pond and pit and the acid plant water treatment facility and former Thornock Lake.
ACTION-SPECIFIC						
Clean Water Act	33 U.S.C. 1251, 1311, 1312, 1313, 1314, 1317, 1318, 1341, 1342					

Table 10-1 (Continued)
DESCRIPTION AND ANALYSIS OF
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
National Pollutant Discharge Elimination	40 C.F.R. Part 125	Requires permits for the discharge of pollutants from any point source into waters of the United States.	A	Prickly Pear Creek is a water of the United States, so any discharge thereto would have to be evaluated to determine whether discharge takes place on- or offsite (for purposes of determining whether a permit is required). If discharge is onsite, compliance with substantive requirements is required.	Lower Lake 4A, 5B	Applicable for alternatives involving discharge to Prickly Pear Creek. Based on this standard, treated waters must meet aquatic and human health standards. Also relevant and appropriate for dredging of Lower Lake, although the potential for impacts to Prickly Pear Creek is not expected.
National Pretreatment Standards	40 C.F.R. Part 403 (except sections 403.6, 403.10, 403.11)	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly-owned treatment works or which may contaminate sewage sludge.	A	The alternatives developed anticipate a discharge to a publicly-owned treatment works as an industrial user.	4A	These standards are applicable to alternatives involving discharge to the East Helena POTW. Standards for discharge after on-site treatment to the POTW have not yet been developed, but it is anticipated the numbers will be similar to the plant's existing permit.
Stormwater Regulations	40 C.F.R. Parts 122, Subpart C, 504	Sets standards for discharges of stormwater.		This is a proposed rule. If a discharge does occur, these regulations could be an ARAR.		This is not an ARAR. No discharge from the stormwater runoff pond is expected; water collected would be evaporated.

Table 10-1 (Continued)
DESCRIPTION AND ANALYSIS OF
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
Standards for Owners and Operators of Hazardous Waste Disposal Facilities	40 C.F.R. Part 264	Establishes minimum national standards which define the acceptable management of hazardous waste for owners and operators of permitted facilities.	A, R&A	The alternatives contemplate onsite disposal of hazardous wastes.	4A, 5S, 8B+7E	Applicable or relevant and appropriate to construction of tanks for all process ponds, sediment drying, and onsite landfill. Secondary containment and leak detection systems would be required.
Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40. C.F.R. Part 265	Establishes minimum national standards that define the acceptable management of hazardous waste during the period of interim status and until certification of final closure, or if the facility is subject to post-closure requirements, until post-closure responsibilities are fulfilled.	A	Compliance with Part 265 is consistent with CERCLA's goal of long-term protection of human health and the environment. Considers the SARA provision regarding no permit would be required for activities conducted onsite.	4A, 5S, 8B+7E	Applicable to construction of tanks for all process ponds, sediment drying and onsite landfill. Secondary containment and leakage detection systems would be requirements.
Occupational Safety and Health Act	29 U.S.C. 651, 652, 653, 654, 655, 678	Regulates worker health and safety.	A	Under 40 C.F.R. 300.38, requirements of the Act apply to all response activities under the NCP.	All alternatives except No Action.	Applicable to all alternative actions except No Action alternatives.

Table 10-1 (Continued)
DESCRIPTION AND ANALYSIS OF
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
LOCATION-SPECIFIC						
National Historic Preservation Act	16 U.S.C. 470 40 C.F.R. 6.301(b) 36 C.F.R. Part 800	Requires federal agencies to take into account the effect of any federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.	A	The action could affect a district, site, building, structure, or object listed on or eligible for the National Register. Coordination with the State Historic Preservation Officer is required.	Lower Lake Alternatives	There is a remote chance that this ARAR applies to Lower Lake. The pond itself is less than 50 years old. Generally artifacts or structures less than 50 years old are not subject to this Act. Coordination with the State Historical Office is required.
Archeological and Historic Preservation Act	16 U.S.C. 469 40 C.F.R. 6.301(c)	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a federal construction project or a federally-licensed activity or program.	A	The action could affect historical or archeological data.	Lower Lake Alternatives	There is a remote chance that this applies to Lower Lake. Coordination with the State Historic Preservation Officer is required.
Historic Sites, Buildings, and Antiquities Act	16 U.S.C. 461-467 40 C.F.R. 6.301(a)	Requires federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	A	The action could affect a Natural Landmark. Coordination with the State Historic Preservation Officer is required.	Lower Lake Alternatives	There is a remote chance that this applies to Lower Lake. Coordination with State Historic Preservation Officer is required.

Table 10-1 (Continued)
DESCRIPTION AND ANALYSIS OF
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
Executive Order on Floodplain Management	Exec. Order No. 11988	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid adverse impacts associated with direct and indirect development of a floodplain.	A	The Lower Lake is within a 100-year floodplain.	4A, 5B	Alternatives involving sediment removal on Lower Lake include actions on the Prickly Pear Creek 100-year floodplain.
Clean Water Act Section 404 (Wetlands) (Dredge & Fill Req(s).)	40 C.F.R. Parts 230, Subpart A, Sections 230.1, 230.2, 230.3, 230.4, 230.5, 230.6, Subpart B, Subpart C, Subpart D, Subpart E, Section 230.41, Subpart F, Subpart G, Subpart H, 33 C.F.R., Parts 321, 328, 329, Executive Order No. 12088	Action to prohibit discharge of dredged or fill material into wetlands without permit. Action to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible.	R&A	The process ponds may be wetlands, or wetlands may result from the proposed activity. A permit is not required for onsite CERCLA response actions, but compliance with substantive requirements is necessary if the activities qualify.	4A, 5B	Lower Lake is a former wetlands area and may return as a wetlands.

Table 10-2
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
1. CLEAN AIR ACT	MCA-75-2-102, 211	Policy Statement & permit requirement	R&A		All construction activities related to all alternatives.	The Clean Air Act and its provisions are generally applicable to the process ponds. All remedial action activities, including construction and sediment drying (4A and 5B), must meet ambient standards for Pb (1.5 ug/m³) and particulate matter. Procedures during remedial activities can provide compliance with these standards.
a. General Provisions	ARM-16.8.815, 818, 821	Ambient	A	Applies to construction and sediment drying activities.		
b. Ambient Air Quality	ARM-16.8.809, 926	Defines ambient air quality	A	Applies to construction and sediment drying activities.		
	ARM-16.8.1401(4)	Airborne particulate matter	R&A	Applies to construction and sediment drying activities.		
2. MONTANA WATER POLLUTION CONTROL ACT	MCA-75-5-101	To prevent, abate, and control pollution of waters and improve water quality	R&A			
	MCA-75-5-303	Nondegradation	A		4A, 5B	Based on this standard, treated process waters must meet existing upstream water quality so no degradation occurs. May also be relevant and appropriate in relation to seepage of Lower Lake water into Prickly Pear Creek.

Table 10-2 (Continued)
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
	MCA-75-5-605	Unlawful to cause pollution of any State waters	A	Activities proposed could cause pollution of Prickly Pear Creek.	4A, 5S	Based on these standards, treated process waters must meet MCLs, SMCLs and standards for pH, DO and temperature based on the stream's B-1 classification. May also be applicable in relation to seepage of Lower Lake water to Prickly Pear Creek.
a. Surface Water Quality	ARM-16.20.602	Classification and water quality standards by class	A	State "B-1" classification for Prickly Pear Creek.		
	16.20.603 16.20.607 16.20.618 16.20.623 16.20.631 16.20.633 16.20.635		R&A A A R&A R&A A R&A	State "B1" classification for Lake Helena.	4A, 5S	Based on these standards, treated process waters must meet MCLs, SMCLs and AWQC standards for pH, DO and temperature based on the B-1 classification. May also be applicable in relation to seepage of Lower Lake water to Prickly Pear Creek.
b. Nondegradation of streams	ARM-16.20.702	Nondegradation policy	A	Applies to any discharge that would increase pollution in Prickly Pear Creek.	4A, 5S	Based on this standard, treated process must meet existing upstream water quality so no degradation occurs. May also be relevant and appropriate in relation to seepage of Lower Lake water into Prickly Pear Creek.

Table 10-2 (Continued)
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
c. Pollution Discharge Elimination System Permit	ARM-16.20.907	List conditions and terms for permitting and scheduling	R&A		4A	Applies only to alternative that discharges through the POTW to Prickly Pear Creek.
d. Groundwater Pollution Control Systems	ARM-16.20.1002, 1003, 1011	Classification, standards, nondegradation, and permitting for groundwater	R&A		4A, 5B	Based on these standards, treated waters must meet groundwater MCLs and not contribute other substances that would make groundwater harmful, detrimental, or injurious to public health.
	16.20.1013	Montana groundwater pollution control system permit requirements	R&A	Substantive requirements apply	4A, 5B, 8B+/E, 11F, 14	This ARAR specifies substantive requirements of the permit application that must be met.
3. PUBLIC WATER SUPPLIES	MCA-75-6-101 75-6-112	Deals with water treatment and pollution of public supplies	A	Policy statement which is generally applicable	4A, 5S, 8B+/E, 11F, 14	
a. Procedural Rules	ARM-16.20.203 16.20.211 16.20.212-219	Contaminant levels defined, sampling protocol	R&A	Defines MCLs and other drinking water-related parameters	4A, 5S, 8B+/E, 11F, 14	
4. SOLID WASTE MANAGEMENT	MCA-75-10-202, 212, 214 MCA-75-10-221	Deals with contaminated soils that are not hazardous waste	R&A R&A		4A, 5S, 8B+/E, 11F, 14	The requirements of solid waste regulations are relevant to alternatives where solid waste may be generated.

Table 10-2 (Continued)
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
a. Refuse Disposal	ARM-16-14-505, 508, 509, 520, 521, 523	Solid waste disposal site regulations	R&A	Siting standards will apply for solid waste excavated from process ponds	4A, 5S, 8B+/E, 11F, 14	Standards guiding the handling of solid waste.
5. MONTANA HAZARDOUS WASTE ACT	MCA-75-10-402, 406, 409	Implements RCRA on state level	R&A		4A, 5S, 8B&/E 4A, 5S, 8B+/E	Relevant and appropriate to construction of tanks for all process ponds, sediment drying, and onsite landfill. These requirements include assurances for environmental protection, and preclude construction of a facility without reviews and approvals for the facility. However, if the facility is constructed onsite, a permit is not required under CERCLA.
a. Permit conditions	ARM-16.44.109-110	Permit conditions	R&A	CERCLA does not require permits for activities conducted onsite.		Relevant and appropriate to construction of tanks for all process ponds, sediment drying, and onsite landfill. These requirements establish monitoring, record keeping, and reporting requirements. A permit is not required if facilities are constructed onsite.

Table 10-2 (Continued)
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
Application requirements	ARM-16.44.120, 16.44.701-702	Contents of Part B permits	R&A		4A, 5S, 8B+/E	Relevant and appropriate to construction of tanks for all process ponds, sediment drying, and on-site landfill. Requirements in this standard would be incorporated into facility construction. However, a permit would not be required.
Wastes characterized	ARM-16.44.310-324	Identification and listing of hazardous waste	A	RCRA requirements may be applicable if sludges generated by treatment processes are listed wastes or EP toxic.	4A, 5S, 8B+/E, 11F	Applicable to sediment removal in Lower Lake and potentially applicable for handling of sediments associated with the speiss pond and pit and the acid plant water treatment facility and former Thornock Lake.
					4A, 5S	Alternatives include combinations of one of the above alternatives.
b. Standards Applicable Generators of Hazardous Waste	ARM-16.44.401, 403, 405, 416	Manifest, packaging, and documentation requirements for hazardous waste generators	A	Generator regulations apply if hazardous waste is generated during treatment of process pond waters.		Applies to any generation of hazardous waste.

Table 10-2 (Continued)
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
c. Standards for Permitted Hazardous Waste Facilities	ARM-16.44.609		A, R&A		4A, 5B, 8B+/E	Applicable or relevant and appropriate to construction of tanks for all process ponds, sediment drying, and onsite landfill. Secondary containment and leak detection systems would be required.
6. FLOODPLAIN AND FLOODWAY MANAGEMENT	MCA-76-5-101 & 102 76-5-402, 404, 406	Establishes sound land and water use management practices	R&A	Substantive requirements only apply if activities are on-site	4A, 5B	Relevant and appropriate for alternatives involving sediment removal of Lower Lake, which is in the 100-year floodplain.
a. Regulation and Enforcement	ARM-36.15.216		R&A	Some alternatives may involve use of floodplain	4A, 5B	Relevant and appropriate for alternatives involving sediment removal of Lower Lake, which is in the 100-year floodplain.
b. Non-Floodway Uses	ARM-36.15.801	Uses allowed on non-floodways or where flood elevations not available	R&A		4A, 5B	Relevant and appropriate for alternatives involving sediment removal of Lower Lake, which is in the 100-year floodplain. However, permitting would not be a requirement under CERCLA.

Table 10-2 (Continued)
DESCRIPTION AND ANALYSIS OF
MONTANA STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Standard, Requirement Criteria, or Limitation	Citation	Description	Applicable (A)/ Relevant and Appropriate (R&A) or To Be Considered (TBC)	Comment	Alternatives Addressed by ARAR	Alternative/ARARs Analysis Comment
7. ANTIQUITIES	ARM-12.8.501	Procedures and requirements for identification, evaluation, and mitigation of impacts on heritage properties. Also paleontological remains.	R&A		All Lower Lake alternatives	A remote chance that this ARAR applies to Lower Lake. The pond itself is less than 50 years old, but may have been used previously. Generally, artifacts or structures less than 50 years old are not subject to this or similar Acts. Coordination with the State Historical Office is necessary.
8. OCCUPATIONAL HEALTH	MCA-50-70-101	Protection of human health and safety in the work place.	A	Worker safety will need to be addressed for all alternatives.	All alternatives except No Action	Applicable to all alternative actions except No Action alternatives. This standard specifies worker health and safety requiremetns for air contaminants and noise levels in the work place.
a. Noise and Air Contaminants	ARM-16.42.101, 102	Noise and air contaminant levels in the work place.	A	Worker safety will need to be addressed for all alternatives.		

- The remedial actions selected will attain an equivalent standard of performance, although ARARs are not met.

- With respect to state ARARs, the state has inconsistently applied ARARs in similar circumstances at other remedial actions within the state.

- In the case of fund-financed remedial actions, financial restrictions within the Superfund program require fund-balancing such that satisfaction of ARARs at the site must give way to a greater need for protection of public health and welfare and the environment at other sites.

The feasibility study, which provides a detailed analysis of the remedial action alternatives, identifies how each alternative complies with ARARs. The ARARs that will not be met, those for in-place treatment of Lower Lake process waters, will require waivers.

The EPA and state have identified state water quality standards for water and fish ingestion (arsenic only) and for long-term protection of aquatic life (remaining elements) as the applicable numerical limits for remediation. These numerical limits are:

Arsenic	2.2 nanograms per liter
Cadmium	0.0011 milligram per liter

Copper	0.012 milligram per liter
Lead	0.0032 milligram per liter
Zinc	0.11 milligram per liter

Neither the preferred remedy component of in situ treatment nor known standard treatment methods (water treatment facility) will attain the applicable numerical limit for arsenic, cadmium, or lead. These applicable numerical limits (ARARs) cannot be met because of technical impracticability, as elaborated below. Instead, attainable standards hereinafter referred to as prescribed standards have been established. The applicable numerical limits for copper and zinc are attainable by either the preferred or contingency remedy.

10.2.1.1 **Arsenic**

The prescribed standard for arsenic in Lower Lake process waters after in-place treatment is 0.02 mg/L. The state water quality standard for arsenic, 2.2 nanograms per liter (0.0000022 mg/L) will be waived on the basis of technical impracticability. It is technically impracticable to attain such a level by existing water treatment methods and it is impractical to measure arsenic at this concentration. The reason for selecting 0.02 mg/L as the prescribed standard is that this concentration is in the upper range of water quality data measured for Prickly Pear Creek, as measured in Phase I and II remedial investigations. This concentration of arsenic, 0.02 mg/L is an achievable standard and is below the federal primary MCL of 0.05 mg/L.

10.2.1.2 Cadmium

The prescribed standard for cadmium in Lower Lake process waters after in-place treatment is 0.01 mg/L The state water quality standard for cadmium, 0.0011 mg/L, which is based on long-term protection of aquatic life, will be waived on the basis of technical impracticability. It is impractical to treat process waters for removal of cadmium to this concentration. The next promulgated standard above the state water quality standard is the federal primary MCL. The prescribed standard for in-place treatment of cadmium in Lower Lake waters, the primary MCL, 0.01 mg/L, is technically achievable.

10.2.1.3 Lead

The prescribed standard for lead in Lower Lake process waters after in-place treatment is 0.05 mg/L. The state's ambient water quality standard for lead, which offers long-term protection of aquatic life, 0.0032 mg/L (at a water hardness of 100 mg/L $CaCO_3$), will be waived on the basis of technical impracticability. The existing water quality of Prickly Pear Creek is slightly above the state water quality standard of 0.0032 mg/L lead. Lead concentrations in Prickly Pear Creek above the smelter range from 0.005 to 0.007 mg/L. Ideally, the treatment objective for lead should be within this range. However, treatment of water to within this range of lead concentrations, 0.005 to 0.007 mg/L, is not technically practicable. The prescribed standard of 0.05 mg/L lead, which is the next promulgated standard above the state water quality standard, is achievable by current water treatment methods.

10.2.1.4 Copper and Zinc

The prescribed standard for copper in Lower Lake process waters after in-place treatment is 0.004 to 0.008 mg/L. The most stringent promulgated standard identified for copper (0.012 mg/L) is based on long-term protection of aquatic life. However, copper levels in Prickly Pear Creek, both above and below the smelter, are in the range of 0.004 to 0.008 mg/L. Because current treatment methods can be expected to reduce elevated copper in Lower Lake to within this range, the prescribed standard is selected on the basis of nondegradation.

The prescribed standard for zinc in Lower Lake process waters after in-place treatment is 0.11 mg/L. This state water quality standard is based on long-term protection of aquatic life and it is the most stringent promulgated standard identified for zinc. Current treatment methods can be expected to reduce elevated zinc in Lower Lake to this standard. The existing water quality of Prickly Pear Creek, above the smelter, occasionally exceeds 0.11 mg/L zinc.

10.3 COST-EFFECTIVENESS

The selected remedial alternatives are cost-effective options for cleanup of the process ponds operable unit. This determination is based on the cost and overall effectiveness of the selected remedies when viewed in light of the cost and overall effectiveness of other alternatives. A discussion of the cost-effectiveness for selected alternatives for each area follows.

10.3.1 LOWER LAKE

The selected alternative for remediation of Lower Lake, Alternative 5S, includes in-place treatment of Lower Lake process water. This alternative is attractive because of the relatively low cost, approximately $6 million (present worth). However, in-place treatment of process waters is an unproven technology on as large a scale as would occur herein and may not meet remediation goals. Sediments would be excavated and disposed in the smelter process. The contingency remedy for Lower Lake is Alternative 4A which includes replacement of Lower Lake, excavation and smelting of sediments, pretreatment of process fluids, and further treatment of process fluids in the East Helena POTW.

The principal difference between alternatives is the proposed means of sediment disposal: smelting the sediments, disposal in an offsite hazardous waste disposal facility, and disposal in a proposed new hazardous waste disposal facility in the East Helena area. Both the selected and contingency remedies include treatment and disposal of sediments in the smelter process. This process allows recovery of trace metals and reduction of contaminant mobility and volume. The disposal of sediments in a proposed RCRA landfill to be constructed in the East Helena area was of comparable cost, approximately $12 million, but does not include treatment as a principal element and does not reduce the volume of contaminants. The disposal in an offsite hazardous waste disposal facility was determined to be approximately $5 million more expensive than disposal in a new hazardous waste disposal facility in the East Helena area.

Other variations on alternatives for Lower Lake include the means of disposal of Lower Lake fluids. Pretreatment of fluids followed by treatment at the East Helena Sewage Treatment works may be less cost-effective than in-place co-precipitation, but more cost-effective than disposal to Prickly Pear Creek. Disposal to the POTW would cost approximately $1 million less than disposal of process fluids to Prickly Pear Creek. The extra costs involved with disposal to Prickly Pear Creek arise from the more stringent pretreatment requirements to be met prior to stream discharge.

10.3.2 SPEISS GRANULATING POND AND PIT

The selected alternative for the speiss granulating pond and pit, Alternative 8B+7E, includes replacing the speiss granulating pond and pit, and excavation and smelting of soils. Replacement of the pond and pit would offer more protectiveness than Alternative 8B+7H, which would replace the pond and repair the pit. The difference in cost is approximately $130,000.

10.3.3 ACID PLANT WATER TREATMENT FACILITY

The preferred alternative for the acid plant water treatment facility, Alternative 11F, includes replacing the settling dumpsters and pond with a closed-circuit filtration system, and excavating and smelting soils. This alternative offers more protection than Alternative 11E, which involves repair of the pond (instead of replacement). Alternative 11F is approximately $1 million more expensive than Alternative 11E. Alternative 11F would also be more protective than Alternative 11D, which involves replacement of the settling dumpsters with new settling dumpsters and replacement of the pond with a steel tank. Alternative 11D would cost less than Alternative 11F (approximately $2 million versus approximately $2.9 million). Alternative 11F, the selected remedial action, includes a closed-circuit filtration system and, although it costs more, it offers more protection for the underlying groundwater than the other alternatives.

10.3.4 FORMER THORNOCK LAKE

Since only one alternative was considered for remediation of former Thornock Lake, a cost-effectiveness evaluation was unnecessary. However, several means of sediment disposal were considered for this alternative. As discussed for the Lower Lake alternatives, smelting the sediments was determined to be the most protective and cost-effective means of disposing of the sediments.

10.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedies satisfy the statutory preference for utilization of permanent solutions and alternative treatment technologies. Treatment is a principal element of the alternatives selected for all areas. They are permanent solutions in that they will decrease the concentrations of contamination sources. Selected alternatives for all areas include treatment or recycling of soils and sediments in the smelter process. The process waters of Lower Lake will also be treated. The selected alternative includes in-place treatment of process waters by co-precipitation. The contingency alternative includes pretreatment of process waters, followed by treatment in the East Helena POTW.

BOIT727/010.50/jms

11 DOCUMENTATION OF SIGNIFICANT CHANGES

11.1 PREFERRED ALTERNATIVES AS PRESENTED IN THE PROPOSED PLAN

The Proposed Plan for the East Helena smelter site was released for public comment in August 1989. The Proposed Plan identified preferred alternatives for each area. The preferred alternative for Lower Lake, Alternative 4A, was to replace Lower Lake, excavate and smelt sediments, pretreat process fluids, and treat fluids in the East Helena sewage treatment facility. The preferred alternative for the speiss granulating pond and pit, Alternative 8B+7E, was to replace the speiss granulating pond and pit, and excavate and smelt soils. The preferred alternative for the acid plant water treatment facility, Alternative 11F, was to replace the settling dumpsters and pond with a closed-circuit filtration system, and excavate and smelt soils. The preferred alternative (Alternative 14) for former Thornock Lake was to excavate and smelt the sediments. The EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

11.2 CHANGE IN SELECTED REMEDY FOR LOWER LAKE

The EPA has determined, based on information received during the comment period, that the preferred alternative for Lower Lake, Alternative 4A, no longer provides the most appropriate balance of tradeoffs among the alternatives with respect to the evaluation criteria. Information available to the EPA has suggested that another alternative from the Proposed Plan and RI/FS report, Alternative 5S, provides the best balance of tradeoffs. As indicated in the Responsiveness Summary, the EPA has acknowledged, in both the Proposed Plan and the public meeting, that Alternative 5S should be re-evaluated if new and relevant information became available. In light of Asarco's September 20, 1989, proposal for pilot-scale tests, in light of requests by concerned residents and local government officials, and in light of independent assessments by the U.S. Bureau of Mines and the Montana College of Mineral Science and Technology, the EPA has determined that the in situ treatment method using ferric chloride is the preferred method to be applied in this remedy. The public was apprised previously that Alternative 5S might be selected as the remedy; thus, the public had adequate opportunity to review and comment on it.

If pilot-scale tests of in situ co-precipitation methods prove this innovative technology to be ineffective in terms of treating Lower Lake waters to prescribed standards, the EPA will require construction of a water treatment facility.

Such a facility will be designed to remove metals and arsenic to yet-to-be-determined levels for discharge to the East Helena publicly-owned wastewater treatment plant.

11.3 CHANGE IN IMPLEMENTATION TIMES FOR SELECTED ALTERNATIVES

The EPA has made a change to a component of the selected alternatives that has resulted in an alteration to the scope of the remedy. The overall waste management approach represented by the alternatives has not been affected. In the Proposed Plan, the implementation times for Alternatives 5S, 8B+7E, 11F, and 14 were 4, 2, 1, and 0.5 years, respectively. However, these time estimates did not account for:

- The recommended depths of excavation
- The additive effects of smelting times

The depths of excavation recommended by the EPA in the Proposed Plan were greater than those which Asarco used to calculate implementation times. Also, the implementation times presented in the FS and the Proposed Plan did not account for the slow rate of smelting excavated sediments and soils. The smelting of all excavated soils and sediments may take longer than anticipated. The estimated implementation times for alternatives in this ROD are presented in the following subsections.

11.3.1 LOWER LAKE

In the FS, the time for remediation of Lower Lake under Alternative 5S is 4 years, assuming an average excavation depth of 3 feet. The EPA has decided, based on EP toxicity data and other data from the RI, that excavation to an average of 4 feet would provide greater protection to the groundwater. The EPA has determined that 5 years should provide ample time for remediation of Lower Lake, considering the increase in excavation depth. Smelting of Lower Lake sediments will take precedence over smelting sediments and soils from other areas. However, during the time it takes to prepare Lower Lake sediments for smelting, soils and sediments from other areas should be smelted. The materials requiring smelting are, in order of decreasing priority: Lower Lake sediments, former Thornock Lake sediments, soils from the acid plant area, and soils from the speiss granulating area.

11.3.2 SPEISS GRANULATING POND AND PIT

In the FS, the time required for remediation of the speiss granulating area under Alternative 8B+7E is 2 years, assuming an excavation depth of 6 feet. The EPA has decided, based on EP toxicity data, that excavation will be as deep as 20 feet, or to the practical limit of excavation, to provide greater protection to the groundwater. The EPA has determined that remediation of the speiss granulating pond, except for smelting the excavated soils, should take 2 years. Remediation of the speiss pit may require an additional 12 to 18 months. Smelting of excavated soils may take 12 to 15 years, considering that soils from this area have low priority for smelting.

11.3.3 ACID PLANT WATER TREATMENT FACILITY

In the FS, the time required for remediation of the acid plant water treatment facility under Alternative 11F is 1 year, assuming an excavation depth of 5 feet. The EPA has decided, based on EP toxicity data, that excavation will be as deep as 20 feet, or to the practical limit of excavation, to provide greater protection to the groundwater. The implementation time for remediation excluding the time for smelting soils should be 2 years. Soils will be smelted after all excavated sediments from Lower Lake and former Thornock Lake have been smelted.

11.3.4 FORMER THORNOCK LAKE

In the FS, the time required for remediation of former Thornock Lake under Alternative 14 is 6 months, assuming excavation to 5 feet below the surface. Based on RI data, the EPA has decided that excavation will be 2 feet below the layer of artificially-deposited sediments to provide greater protection to the groundwater. The data from the RI indicate that the average depth of the artificially deposited layer is 3 feet. Therefore, the EPA concurs with the estimated implementation time of 6 months, excluding the time for smelting sediments. The excavated sediments can be smelted during the initial stages of implementing remediation of Lower Lake, until Lower Lake sediments are ready to smelt. Then, the smelting of Lower Lake sediments would take precedence, with Thornock Lake sediments second in priority.

BOIT727/011.50/jms

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RESPONSIVENESS SUMMARY

PROCESS PONDS OPERABLE UNIT OF THE
EAST HELENA SMELTER SUPERFUND SITE

EAST HELENA, MONTANA
October 1989

The U.S. Environmental Protection Agency (EPA) held a 21-day public comment period from August 31 to September 20, 1989, to provide an opportunity for interested parties to comment on EPA's Proposed Plan for the Process Ponds Operable Unit of the East Helena Smelter Superfund site. Comments were also sought concerning the Feasibility Study Report (FS Report) recently completed by Asarco Incorporated (Asarco).

A responsiveness summary is required by the Superfund law to provide EPA and the public with a summary of concerns about the site, and EPA's responses to those concerns. EPA must consider such public input before making a final decision on a cleanup remedy, which is then documented in the Record of Decision (ROD).

This responsiveness summary contains three main sections:

I. <u>Overview</u>. This section briefly describes the proposed remedial alternatives evaluated in the FS and presents EPA's preferred remedial alternative for each component of the Process Ponds Operable Unit.

II. <u>Background on Community Involvement</u>. This section provides a brief history of community involvement at the site.

III. Summary of Questions and Comments Received During the Public Comment Period and EPA's Responses to Those Comments. This section presents comments submitted to EPA during the public comment period and provides EPA's responses to those comments.

I. OVERVIEW

The East Helena smelter is an active lead-smelting facility operated by Asarco in East Helena, Montana. The plant covers approximately 80 acres. The smelter began operations in 1888 and processes ores and concentrates from around the world. The plant produces lead bullion for shipment to another Asarco facility, where it is further refined. From 1927 to 1982 the plant also recovered zinc from the smelter's waste slag. American Chemet Corporation operates a paint pigment plant next to the smelter.

The site was added to EPA's National Priorities List of hazardous waste sites in 1983. To better manage the site studies and cleanup work, EPA divided the site into five operable units: process ponds and fluids (the subject of this responsiveness summary); ground water; surface water and soils; the slag pile; and the ore storage areas. Studies indicate that the process ponds are a major source of the metals (especially lead and cadmium) and arsenic found in site soils, ground water, and surface water. EPA has determined that remediation of the process pond contamination is the highest priority for the East Helena site. The remaining operable units are being studied in a Comprehensive Site-Wide Remedial Investigation/Feasibility Study (RI/FS).

The process ponds have been divided into four components: Lower Lake, the speiss granulating pit and pond, the acid plant water treatment facility, and Thornock Lake. Lower Lake collects and stores water used in the main plant process circuit as well as storm water run-off. The speiss granulating pond and pit store water that is used to cool the hot speiss as part of the granulation process, and the acid plant water treatment facility removes particulates from scrubber fluid. Thornock Lake was used to settle suspended solids from the main process water circuit until October 1986, when it was replaced by a tank.

The Proposed Plan of August 1989 announced EPA's preferred alternative for each of the process pond subunits. These alternatives are described below.

Lower Lake (Alternative 4a). Two large steel tanks would replace Lower Lake as the plant's primary water holding facility, and a lined pond or additional tanks would be constructed for emergency containment of storm runoff. Sediments would be excavated to remove the artificially deposited sediment and sludge layer (approximately 1-3 feet) at the bottom of Lower Lake. EPA has classified such bottom deposits in surface impoundments at lead smelters as hazardous wastes. EPA requires that these sediments and sludges be removed and treated or disposed of safely. The preferred treatment in this alternative is to dry them on lined drying pads and then smelt them. Smelting these wastes would enable Asarco to recover small amounts of lead and other metals contained in the sediments. More importantly, it would immobilize the remaining arsenic and metals within the slag produced in the process.

Many modifications to Alternative 4a were examined. Based on information obtained from soil leach tests, fresh water percolating through sediments at the bottom of the artificially deposited layer would still meet federal primary drinking water standards. However, a key modification to this alternative would require excavation of an additional two feet below the artificially deposited sediment and sludge layer. This modification provides a margin of safety and it offers greater assurance that Lower Lake water, once treated, will still meet federal drinking water standards after coming into contact with the remaining sediments.

Once the sediments are excavated and placed on drying pads for eventual smelting, the water in Lower lake would be treated to meet specified standards before being discharged into the East Helena Publicly Owned Treatment Works (POTW).

Speiss Granulating Pit and Pond (Alternative 8b+7e). A steel tank with a liner, leak detection system, and secondary containment and recovery capability would replace the existing speiss granulating pond. The speiss granulating pit would also be replaced by a new leakproof concrete pit with a liner, leak detection system, and secondary containment and recovery capability. Pit replacement may require interruption of plant operations for about 30 days.

During construction of these replacement structures, soils underneath and adjacent to the existing pond and pit would be excavated and set aside for smelting. Prior to smelting, the same precautions against fugitive air emissions that are afforded the ore piles would apply to the soils.

The required depth of soil excavation, based upon results of soil leach tests, would be approximately six feet. However, a key modification of this alternative considers other factors that suggest the advantage of deeper excavation. New structures will be built once excavation cavities are refilled. If for any reason it is determined later that more excavation of contaminated soils should have been performed, the new structures would have to be moved or disassembled. Further, because the volume of soils involved in excavating beyond six feet--perhaps down to 20 feet--is relatively small at the speiss granulating pond and pit (a few hundred square feet of ground, as opposed to many acres in the case of Lower Lake), the greater depth is recommended.

Acid Plant Water Treatment Facility (Alternative 11f). A closed-circuit water filtration and treatment system would replace the four settling dumpsters, main settling pond, troughs, and fluid lines currently used by Asarco. The system would include leak detection and secondary containment features. Existing and proposed sediment-drying areas would be equipped with liners and containment capability.

Once the existing settling basins and lines are removed, excavation of underlying and adjacent soils would proceed. Results of soil leach tests indicate that these soils should be excavated down to the coarse, ground water-bearing gravels (20-22 feet), if practicable. This modification of the FS Report's Alternative 11d is based on the knowledge that fresh water coming into contact with soils under the acid plant fails to meet federal drinking water standards, regardless of depth. The same results also show that soils under the acid plant exhibit characteristics of EP toxicity.

Excavated soils would await smelting alongside the ore piles and be treated to prevent fugitive emissions.

Thornock Lake (Alternative 14). EPA's preferred alternative consists of excavating the remaining bottom sediments, stockpiling them temporarily alongside the ore piles, and smelting them.

In 1986, Thornock Lake was drained and replaced with a steel tank, complete with a liner, leak detection system, and secondary containment and recovery capability. Dry sediments remain in the existing depression. EPA has classified sediments of surface impoundments (including former impoundments) at all lead smelters as hazardous wastes that must be removed and treated or disposed of safely. The preferred treatment of Thornock Lake sediments is to smelt them in the same manner as for dried sediments from Lower Lake. Smelting these wastes would enable Asarco to recover small amounts of lead and other metals, but more importantly, it will immobilize the remaining arsenic and metals within slag produced in the process. A modification of this alternative would be to dispose of the sediments at a licensed hazardous waste facility.

Depth of excavation would be determined as for Alternative 4a (for Lower Lake): excavate to two feet below the artificially deposited layer of sediments.

The pond floor would be lined with bentonite or an impermeable membrane (fabric) if it is to be used to receive emergency overflow.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

EPA added the East Helena site to the National Priorities List (NPL) of hazardous waste sites in 1983. In May 1984, EPA completed a Community Relations Plan for the area, and the following month held a public meeting to explain the upcoming site investigation and answer citizens' questions.

Most of the other community involvement activities prior to 1987 focused on lead and its potential effects on human health. For instance, the Montana Department of Health and Environmental Sciences (MDHES) and the National Centers for Disease Control (CDC) conducted a blood lead study in 1975. The Lewis and Clark County Health Department conducted another one in 1983, with funding from EPA. Asarco conducted a third study in 1987. Community outreach activities led by state and local agencies reflected this concern about lead.

Results of Phase I and Phase II of the site investigation, completed in 1987 and 1989, indicated that high levels of arsenic and cadmium, as well as lead, exist in East Helena soils and water. EPA broadened the scope of material it presented to the public to include this information, and increased the frequency of public contact. For each phase of the site investigation, EPA conducted a public meeting and published a fact sheet to present study results. EPA, MDHES, and Asarco also met with members of the press. In addition, MDHES published Progress Reports that included information about the East Helena site, and sent a letter to East Helena citizens outlining precautions for use of garden vegetables. At EPA's request, in June 1988

Mayor Larry Moore established a citizens' advisory group that has met several times.

The most recent community relations activity was the public meeting of September 12, 1989, at which EPA, MDHES, and Asarco described the preferred alternatives for addressing contamination of the process ponds. Copies of the Proposed Plan were available at this meeting, for those who were not on the mailing list. Topics discussed at this meeting are included in the summary of comments received during the public comment period.

III. SUMMARY OF QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA'S RESPONSES TO THOSE COMMENTS

From August 31 to September 20, 1989, EPA received public comments on the FS Report and the Proposed Plan. EPA, MDHES, and Asarco also held a public meeting on September 12 to describe the preferred alternatives and answer any questions from residents. Twenty people attended the meeting, most of whom represented public agencies, contractors, or potentially responsible parties. In addition to comments taken from this meeting, this summary includes material from letters submitted on behalf of ARCO, Asarco, and the East Helena Superfund Task Force. Comments are categorized by the following topics:

- Treatment of Lower Lake fluids;
- Implementation time;
- Extent of excavation;
- Retention of speiss pond for emergency overflow; and
- Public comment period.

Only comments that EPA has responded to are given below; comments that Asarco or its subcontractor responded to are included in the meeting summary (Attachment B).

Treatment of Lower Lake Fluids

At the September 12 meeting, Asarco and EPA voiced their different preferences for treatment of Lower Lake fluids. Asarco would like to implement Alternative 5s instead of Alternative 4a, EPA's choice. Under Alternative 5s, Lower Lake fluids would be treated in place, rather than pretreated at a facility that would be built for that purpose and then discharged to the East Helena POTW. Alternative 5s is less expensive than Alternative 4a. (Other aspects of the remedies are the same.) Since the meeting, a Task Force member (who is also an American Chemet employee), ARCO's attorneys, and Asarco have sent EPA letters that state a preference for Alternative 5s instead of 4a.

Comment: (Task Force; Asarco; Parcel, Mauro, Hultin & Spaanstra, for ARCO): It seems reasonable to attempt the in-situ treatment as long as Asarco agrees to install a treatment facility if such treatment does not reduce contaminants to State and Federal standards.

In-situ treatment offers the advantages of lower costs, simplicity, on-site treatment, and reduction of risk to the environment. The U.S. Bureau of Mines and Montana College of Mineral Science and Technology have demonstrated the method's technical feasibility on a laboratory scale, and Asarco would conduct a pilot-scale field test before attempting full-scale application. Successful in-situ treatment also could serve as a model for application at other sites.

Response: EPA and the State of Montana orginally concluded that Alternative 4a would protect human health and the environment to a greater degree than would the other alternatives. This conclusion was reached in the absence of an independent assessment of the prospects for successful in-place treatment, in the absence of a proposal from Asarco to conduct large-scale treatability tests, and in the absence of public involvement. However, on September

20, Asarco provided the State and EPA with a plan for conducting pilot-scale tests of the proposed method, and acknowledged the need for a back-up plan should those tests prove unsuccessful. Also, EPA has taken into consideration the assessments performed by the U.S. Bureau of Mines and the Montana College of Mineral Science and Technology. For these reasons, EPA has reconsidered Asarco's proposed treatment for Lower Lake fluids and changed its preferred alternative to Alternative 5s, Asarco's choice, but will keep Alternative 4a, EPA's original preference, as the contingency plan should in-situ treatment fail to reduce the contaminants of concern to specified levels.

Implementation Time

Comments regarding implementation time concerned both time for smelting and time for replacement of the speiss pit.

Comment: (Asarco): EPA requires replacement of the speiss pit within two years. Asarco agrees with the recommended action but recommends that it take place in 1992, when Asarco has scheduled major renovations to the dross reverberatory operation. Replacing the speiss pit as part of this larger project would minimize production downtime, and make best use of construction equipment and manpower.

Response: Replacing the speiss pit according to EPA's schedule assures that all known source problems will be corrected at the same time. Installing a steel liner might serve as an interim measure to eliminate leakage of fluids from the speiss pit. However, EPA thinks it is important to weigh the costs of replacing the speiss pit ahead of Asarco's proposed schedule against the costs of interim measures.

Comment: (Mayor Larry Moore): Why do the estimates of required smelting time differ?

Response: There are two reasons for the different smelting times. Asarco, which performed the Feasibility Study, originally didn't plan to excavate as deeply as EPA believes is necessary. Therefore, Asarco's estimated volume of soils to be excavated and smelted is less than EPA's. Consequently, the estimated time for smelting the smaller amount is shorter than EPA's time. Also, the soil being excavated contains boulders and cobbles, which are more difficult to handle than sand.

Comment: (Asarco): EPA estimates that the quantity of materials to be excavated is over 50,000 tons. This projected quantity represents a little more than 20% of the smelter's annual capacity (normal capacity is 20,000 tons per month, or 240,000 tons per year). The material to be excavated contains a low concentration of expected recoverable metals, and is considered "dead charge." Smelting more than 0.5% dead charge (100 tons per month) has produced blast furnace upsets which, in turn, have created air quality problems. Keeping the dead charge to 0.5% of total charge means that it will take 500 months, or over 41 years, to smelt 50,000 tons.

Response: EPA's estimation of smelting times was based on the assumption that the times given in Asarco's FS are accurate. The information concerning problems that would result from using more than 0.5% dead charge does not appear to have been considered in the FS.

Comment: (Asarco): Soils scheduled to be removed from the acid plant water treatment facility and soils that have already been excavated from the speiss area contain gravels, cobbles, and boulders that would have to be crushed prior to smelting, thereby increasing the amount of time required for the overall remedy. Asarco believes that these large materials should be separated, washed, and stored on-site rather than smelted.

Response: EPA agrees with Asarco on this matter.

Extent of Excavation

Commenters recommended less excavation at Lower Lake, the speiss granulating pit and pond, and the acid plant water treatment facility than EPA had outlined in the Proposed Plan.

Comment: (Asarco; Parcel, Mauro, Hultin & Spaanstra, for ARCO): EPA's Proposed Plan recommends removal of Lower Lake artificially-deposited sludge, plus an additional two-foot layer. The FS Report recommended removing the sludge plus a one-foot layer. Asarco does not believe the removal of additional material has been technically justified by EPA. Concentrations of leachate from samples of the underlying material pass the EP toxicity test and meet primary drinking water standards.

Response: The layer of bottom sediments at Lower Lake is a hazardous waste and must be removed and treated. In addition, Asarco's RI data show that even at two feet below this layer, the sediments contain up to 770 mg/kg arsenic and 2,500 mg/kg lead. The EP toxicity tests are conducted under laboratory conditions; under natural conditions, fresh water coming into contact with contaminated sediments will not necessarily meet the same standards.

Comment: (Asarco; Parcel, Mauro, Hultin & Spaanstra, for ARCO): EPA's Proposed Plan recommends removal of sediment in the speiss pit and pond area to 20 feet, if practical. However, the FS considered excavation of the upper six feet of sediments, not 20, because arsenic and metals concentrations in leachate from sediment samples at six to 20 feet were below drinking water standards.

Although Asarco has already implemented deep excavation underneath the speiss pond replacement tank area, it does not appear that any significant benefit has been obtained by doing so.

Response: [EPA did not respond directly to this question.]

Comment: (Asarco; Parcel, Mauro, Hultin & Spaanstra, for ARCO): EPA's Proposed Plan recommends excavation to 18 to 20 feet at the acid plant water treatment facility, if practical. However, the FS Report called for removal of the upper five feet of sediments only, plus capping or paving the surface to prevent water from moving down through underlying sediment.

Response: EPA recommended excavation to 18 to 20 feet because soil sampling and analysis showed that soils in this area exhibited characteristics of EP toxicity. However, this recommendation was based upon results from only one drill hole. More holes will be drilled before excavation takes place, to better determine the volume of soils requiring treatment and the depth of excavation.

Comment: (Asarco): Practical limits to excavation at the acid plant water treatment facility must be taken into consideration. These limits include such items as the structural integrity of buildings in the area and the depth to which normal excavating equipment can reach to effectively excavate soils.

Response: EPA agrees that practical limits to excavation must be considered. Nevertheless, we do not agree that such limits can be defined as "the depth to which normal excavating equipment can reach to effectively excavate soils." EPA is withholding judgment on this issue until the remedial design phase begins.

Retention of Speiss [illegible]d for Emergency Overflow

Comment: (Asarco): Asarco would like to retain the existing speiss granulating pond for emergency overflow purposes. The pond normally would remain dry, but it would provide additional holding capacity (beyond that offered by the steel tank) if the system malfunctioned. After the malfunction was corrected, the water would be moved out of the pond and back to the new tank. Keeping the pond would mean no excavation could occur underneath it, but use of an impermeable liner would stop rain or other fluids from leaching metals in the underlying soils.

Response: EPA cannot approve this request. Soils under the speiss pond and pit are the most significant contributors to ground water contamination north of the plant. The reason for putting the process ponds work ahead of the other operable units is to effect a source removal without unnecessary delay, and leaving these highly contaminated materials in place would be inconsistent with long-term goals for cleaning up the site.

Public Comment Period

Comment: (Asarco): Is there any mechanism for extending the public comment period?

Response: A decision on extending the public comment period would depend on the source of the request. If the request came from the general public, an extension would be possible. Another factor would be whether new information was provided that could affect decisions.

Comment: (Parcel, Mauro, Hultin & Spaanstra, on behalf of ARCO): ARCO received a copy of the Proposed Plan from EPA on September 12, 1989, the day of the public meeting. The RI/FS Report did not arrive until September 15. Also, the RI/FS Report was not available in the EPA Region VIII library (Denver, Colorado) or other information repositories in the Denver metro area. Nor was notice of the RI/FS or of the East Helena meeting published in the Denver metro area. Therefore, ARCO requests that EPA extend the public comment period to at least October 6, 1989, to allow time for careful consideration of these documents.

Response: EPA, the State of Montana, Asarco, and the community of East Helena all agree in principle on the major components of the remedial alternatives. Therefore, EPA considers the allotted 21 days to be adequate.

Comment: Did EPA announce the September 12 public meeting?

Response: A public notice was printed in the newspaper on August 30 and 31, and on September 1. There was also an announcement in the newspaper. Copies of the Proposed Plan, which also announces the meeting, were mailed directly to about 200 people currently on the mailing list. There are also copies of the Proposed Plan at EPA and at the library.

Attachment A

Chronology of Community Involvement Activities

after 1975:	MDHES conducted public awareness campaign to present results of 1975 blood lead study and to suggest precautions against lead exposure.
1983:	MDHES Solid and Hazardous Waste Bureau established citizens' advisory committee to prepare residents for another blood lead study. The committee held several meetings held in late 1983.
9/83:	Montana Health Board, Asarco, City of East Helena, State Highway Department, and MDHES met to discuss plan for reducing airborne lead in East Helena to below the federal standards.
5/84:	EPA completed Community Relations Plan.
6/6/84:	EPA held public meeting at East Helena Firemens' Hall to explain upcoming site investigation and to receive comments and questions.
6/87:	EPA issued Fact Sheet on Phase I of the RI; Phase I included soils, vegetation, and livestock studies.
6/11/87:	EPA and Asarco held public meeting at East Helena Firemens' Hall to present findings of Phase I.
1/88:	EPA, City of East Helena, MDHES, and state and local agencies held public meeting.
2/88:	EPA, City of East Helena, MDHES, and state and local agencies held public meeting.
3/88:	MDHES issued Progress Report (update on recent studies and results).
3/2/88:	EPA, MDHES, and Asarco held press meeting.
5/88:	EPA, MDHES, and Asarco met with TV and newspaper reporters to discuss the status of studies in East Helena.
6/88:	East Helena Mayor Larry Moore, at EPA's request, established citizens' advisory group; the first meeting was held the same month.
8/88:	Citizens' advisory group met.
9/88:	MDHES sent letter to population of East Helena outlining precautions for use of garden vegetables, to reduce ingestion of metals and arsenic.

4/89: Citizens' advisory group met.

4/89: EPA and MDHES issued Fact Sheet on Phase II of the RI; Phase II included vegetation, soils, livestock, and ground water.

4/27/89: EPA held public meeting at Radley School, East Helena, to present results of Phase II RI.

8/89: EPA and MDHES issued Proposed Plan for the Process Ponds Operable Unit.

8/31 to 9/20/89: Public comment period on Proposed Plan.

9/12/89: EPA held public meeting in East Helena Firemens' Hall to present preferred alternatives for the Process Ponds Operable Unit.

Attachment B

Summary of Public Meeting
Held September 12, 1989

MEETING SUMMARY

SEPTEMBER 12, 1989, PUBLIC MEETING

EAST HELENA, MONTANA

Location:	Firemen's Hall
Start Time:	7:30 p.m.
Finish Time:	9:30 p.m.
Participants:	Scott Brown (EPA); Eric Finke (EPA); Jon Nickel (Asarco Incorporated); Bob Miller (Hydrometrics); Greg Mullen (MDHES); Jane Stiles (MDHES); Larry D. Moore (Mayor, East Helena); Dave Bunte (CH2M Hill); Eric Palmer (Task Force); Holly Luh (Senator Baucus' office); Grant Sasek (The Independent Record); Ken Vreeling (Asarco Incorporated); Patty Lee (ICF); W.P. Buland; Dolly Lamping; Jay Reardon; Sandy Stash; Andrew Zdnak; Tom Rolfe; B.J. Mazurek
Subject:	Proposed Plan for Process Ponds Cleanup at East Helena Smelter Site

Opening Statements

Scott Brown of the U.S. Environmental Protection Agency opened the meeting by announcing that, after considerable study of possible actions, cleanup work on the process ponds was about to begin. He emphasized that the State, Asarco, and EPA all had cooperated in coming up with solutions to the site contamination.

Mr. Brown then introduced the following persons: Greg Mullen, who recently joined the staff of the Montana Department of Health and Environmental Sciences (Solid and Hazardous Waste Bureau); Jon Nickel of Asarco Incorporated; Larry Moore, Mayor of East Helena and East Helena Superfund Task Force member; and Eric Palmer of the East Helena Superfund Task Force. Mr. Brown urged citizens to contact Moore, Palmer, or any of the three other Task Force members, stating that they are the residents' liaison with EPA and the State on Superfund activities.

Mr. Brown informed the audience that the meeting fell in the middle of the public comment period for the Proposed Plan, which he referred to as the "Reader's Digest" of Asarco's Feasibility Study. (Copies of the Proposed Plan had been mailed directly to the approximately 200 people on the mailing list, and extra copies were available at the meeting.) He stated that the Proposed Plan described EPA's recommended alternatives from the Feasibility Study, as well as some other plausible alternatives. He encouraged people to comment on these alternatives until September 20, the end of the public comment period. While EPA, the State, and Asarco were mostly in agreement, he added, there were some differences of opinion that would be discussed in the next part of the meeting.

Due to the small size of the group, Mr. Brown asked that people raise questions at any time rather than save them for the end of the meeting.

Overview of the Site's Five Operable Units

Mr. Brown listed the East Helena site's five operable units: process ponds (the subject of this meeting); ground water; surface water, soils, vegetation, livestock, fish, and wildlife; ore storage areas; and slag pile. He stated that EPA had separated the process ponds operable unit from the others for the first Feasibility Study; the other units would be covered together in a Comprehensive Site-Wide Feasibility Study, to be completed this winter. The process ponds should be treated first, he said, because they constitute a source of contamination to shallow ground water in East Helena.

Next, Mr. Brown briefly described the four subunits of the process ponds and illustrated his talk with slides of Lower Lake, the speiss granulating pit and pond, the acid plant water treatment facility, and Thornock Lake. Mr. Brown noted that while these subunits differ from each other, they all contribute arsenic and metals to the ground water by seepage and leakage of process fluids. It is important, he stated, to dry the removed sediments on special drying pads so that further seepage to underlying soils will not occur.

Mr. Brown re-stated that because the process fluids are the source of ground water contamination, they must be cleaned up first. The general theme behind the cleanup alternatives is to isolate the fluids from the soils, replace existing fluid bodies with tanks or install leak-proof liners, and excavate contaminated soils beneath them.

Proposed Plan for Cleanup of the Process Ponds

Mr. Brown proceeded to summarize the recommended alternatives for each of the process ponds' subunits.

EPA's and the State's (but not Asarco's) preferred alternative for Lower Lake is to replace the lake with two million-gallon storage tanks, excavate the sludge layer (containing high levels of arsenic and lead) plus two feet of wet sediments below the layer, dry the sediments on lined pads, and smelt the sediments. Water from Lower Lake would be pretreated for discharge to the East Helena Publicly Owned Treatment Works (POTW). As a sidenote, Mr. Brown explained that the sludge layer must be excavated by law. The additional two feet to be excavated is a safety margin; soil leach tests indicate that water passing underneath the sludge layer will meet drinking water standards. Although it would be safest to excavate <u>all</u> soils underneath the sludge, the cost would be about $80 million instead of $8.5 million.

According to Mr. Brown, the major part of the cleanup cost with the above alternative arises from construction of a treatment facility to reduce fluid contaminant levels to acceptable levels.

EPA's and the State's preferred alternative for the speiss granulating pit and pond is to replace them, excavate soils "to the practical limit," and smelt those soils. Again, Mr. Brown explained that soils should be excavated to the limit because structures will be built at the site; if it should turn out that not enough soil was excavated the first time, these structures would have to be removed prior to additional excavation. It would be more efficient to remove as much contaminated soil as possible the first time. Because the volume of soils at this area is much less than that of Lower Lake, the additional cost is not prohibitive. Total cost: approximately $700,000.

For the acid plant water treatment facility, EPA and the State recommend replacing the leaky settling dumpsters with a closed-circuit filtration system, excavating the soils to practical limits, and smelting the soils. The cost would be about $1.9 million.

For Thornock Lake, EPA and the State recommend excavating the sludge layer plus an additional two feet, smelting the sediments, and lining the cavity to prevent any collected fluids from contaminating the underlying soils. Cost: $19,000 to $52,000 ($52,000 with the liner).

Mr. Brown repeated that while the above alternatives are EPA's choices, other alternatives do exist. Greg Mullen said that the State of Montana basically agrees with EPA's choices.

Report and Comments by Asarco Incorporated

Jon Nickel explained Asarco's preferences for the process ponds and also highlighted his talk with slides.

Mr. Nickel said that Lower Lake had originally been formed to collect stormwater runoff and to contain process waters, particularly from Asarco's zinc fuming operations. Because the zinc fuming operations ended in 1982, it was now possible to replace the 11 million-gallon lake with a pair of million-gallon tanks. With EPA's approval, Asarco has begun construction of these tanks, plus secondary containment facilities. Asarco agrees with EPA on the extent of excavation for Lower Lake, and on the choice of smelting to destroy metals in the sediments.

However, Asarco would prefer to treat process water in-place rather than construct a separate treatment facility. Mr. Nickel cited the following advantages to in-place treatment: 1) no treatment facility would have to be built; 2) the East Helena POTW would not have to accommodate discharge from the Lower Lake subunit; and 3) successful in-place treatment would lower costs by about $5 million (from $8.5 million to $3 million). Asarco plans to ask EPA and the State for additional time to test in-place treatment methods; if successful, they would like to implement such treatment for Lower Lake. If test results are unsuccessful, Mr. Nickel said, then the only alternative is to treat water in a special facility before discharging to the East Helena POTW.

Another area in which Asarco differs from EPA and the State is implementation time. Mr. Nickel said Asarco feels that the four years cited by EPA is not enough time to include smelting the volume of sediments involved. Asarco recommends a phased approach to cleanup with four years allowed for all work except the smelting, and additional time for the smelting.

According to Mr. Nickel, speiss is a copper-bearing substance that comes out of the furnaces in a molten state and turns into a sand-like material after being cooled with water. Speiss contains arsenic and antimony, which enter the process waters. Mr. Nickel admitted that although the pit and pond are currently lined, management practices have resulted in leakage of process fluids. He said Asarco agrees that the speiss granulating pit and the pond should be replaced, and EPA and the State have given their approval for Asarco to begin replacement.

Asarco differs from EPA and the State in two aspects of the remedy for the speiss pit and pond. First, Asarco recommends that a portion of the existing speiss pond be retained as emergency overflow. However, keeping the pond would preclude excavation below it. Second, as with Lower Lake, Asarco feels more time is necessary for smelting. Mr. Nickel explained that the soils Asarco has excavated so far near the speiss pond include boulders and cobbles--material that is time-consuming to process--rather than just sand.

For the acid plant water treatment facility, Asarco agrees with EPA and the State that the existing settling tanks should be replaced with a closed-circuit filtration system. Mr. Nickel said excavation would be limited because of the presence of structures that are being used. He also repeated the need for additional time to smelt soils.

Mr. Nickel stated that, as with the other process pond areas, more time is needed to smelt Thornock Lake sediments.

[Here, Mr. Brown introduced Bob Miller (Hydrometrics, Asarco's contractor), Jane Stiles (MDHES: Community Relations), Eric Finke (Mr. Brown's supervisor at EPA), Dave Bunte (CH2M Hill, EPA's contractor), and Patty Lee (ICF: Community Relations).]

Public Comments and Questions

Mr. Brown invited the audience to comment or ask questions.

Mr. Nickel interrupted to explain an aspect of Asarco's plans for the speiss granulating pit and pond. Asarco plans to replace its "dross reverb furnace" (which includes the speiss granulating area) in two or three years. EPA's estimated implementation time for replacing the pit and pond is 1.5 years. Mr. Nickel said it would make sense to wait on replacing the pit; if the pit was replaced according to EPA's schedule, it would have to be removed when the other work is done.

Q: Eric Palmer (Task Force): What is the in-place treatment proposed for Lower Lake? After the water is clean, what happens to it?

A: The water is treated to meet certain standards and then left in place. The arsenic in the water settles to the bottom of the pond and is excavated with the other sediments for smelting.

Q: Would the clean water be discharged to the POTW? Would Lower Lake stay?

A: With in-place treatment, Lower Lake would stay as a natural surface water depression. Water would not go to the POTW. The elevation of Upper Lake, which is fresh water, is slightly elevated compared to the surface elevation of Lower Lake. Pumping the water out of Lower Lake to treat and discharge it would only allow Upper Lake water to flow in, so the water may as well stay there in the first place. It'll be cleaned to remove the metals, and Lower Lake may eventually go back to its natural state.

Q: Grant Sasek (The Independent Record): The four sites you're presenting are all wet areas. Are there other major wet sites that could be a problem?

A: The four subunits previously described are the only known major sources of contamination.

Q: Grant Sasek: Do the dry areas have much impact?

A: Assuming that "dry areas" refers to soils, the degree to which such areas could affect contamination depends upon their potential to carry metals down from percolation of water through the sediments. A "head," or force, must be present to move metals through the soil into the ground water. That force has always been water overlying soil or sediment. For example, some water that was contaminated by ore processes has moved through the soil and into the ground water. The objective of this Proposed Plan is to remove such forces.

Q: Larry Moore: On the Lower Lake preferred alternative (Alternative 4a), how much water will be discharged to the city water system?

A: Lower Lake currently holds 11 million gallons. One of the tanks to be installed will hold one million gallons; the other tank will be used just for emergency holding. Therefore, there will be at least 10 million gallons to discharge. Unfortunately, as soon as water is pumped out of Lower Lake, new water (from Upper Lake) comes in to take its place.

Also, there is a process water gain of approximately 25 to 50 gallons per minute (gpm), which translates to approximately 70,000 gallons per day. If nothing is done with that gain, which comes from several sources in the plant, there will be an increase of water needing treatment, in addition to the Lower Lake fluids.

Q: Once these projects are completed, how much will arsenic and lead levels be reduced?

A: If the right conditions exist, arsenic is naturally removed from the aqueous phase, or water phase, as the ground water moves north from the plant.

Jon Nickel introduced Ken Vreeling, who works at Asarco's plant and is involved with the water-handling system.

Scott Brown summarized the following points of disagreement between EPA and Asarco. Asarco feels that more time is required for smelting at all four process areas. For Lower Lake, Asarco recommends in-place treatment of process fluids rather than treatment at a special facility followed by discharge to the POTW. For the speiss area, Asarco would like to retain half the pond, and they would like more time for pit replacement. Mr. Brown also acknowledged Asarco's statement that the acid plant includes a number of structures whose presence should be accommodated during excavation.

Q: Jon Nickel: Is there any mechanism for extending the public comment period?

A: Whether or not to extend the comment period would depend on where the request came from. If it came from the general public, an extension would be possible. If the comment came from Asarco, the extension probably would not occur. Another factor would be whether new information was provided that could affect decisions.

Q: Did you announce the public meeting?

A: A public notice was printed in the newspaper on August 30 and 31, and on September 1. There was also an announcement in the newspaper. Copies of the Proposed Plan, which also announces the meeting, were mailed directly to about 200 people currently on the mailing list. You can add yourself to the list by contacting Patty Lee. There are also copies of the Proposed Plan at EPA and at the library.

Q: Why aren't more people here?

A: Simultaneous scheduling of a school board meeting and an election probably drew some people who would otherwise have attended this meeting.

Q: Mayor: Why do the estimates of required smelting time differ?

A: There are two reasons for the different smelting times. Asarco, who performed the Feasibility Study, didn't originally plan to excavate as deeply as EPA feels is necessary. Asarco's estimated volume of soils to be excavated, and thereafter smelted, is less than EPA's. Consequently, the estimated time for smelting the smaller amount is shorter than EPA's time. Also, the soil being excavated is not just sand--it contains boulders and cobbles, which are more difficult to handle.

Q: Does the sediment contain enough metals to make smelting profitable?

A: Smelting these sediments is not a profitable operation. Each ton of material that goes through carries about an ounce of silver in the slag pile. Starting with material that contains less than an ounce of silver, as is probably the case with these sediments, actually results in money being lost. Some of the smelting cost is profit loss, rather than engineering cost, but it's nevertheless a cost. On the other hand, smelting is a cost-effective method of treatment. The other alternative is to send it away to a hazardous waste material storage area, and the cost benefits of smelting outweigh those of sending it out.

With no further questions being asked by the public, Mr. Brown concluded the meeting at 9:30 p.m.