PB99-964402
EPA541-R99-047
1999

EPA Superfund Record of Decision:

Jacobs Smelter Site OU 1
Stockton, UT
7/29/1999

RECORD OF DECISION
OPERABLE UNIT 1 - RESIDENTIAL SOILS
JACOBS SMELTER SUPERFUND SITE
STOCKTON, UTAH

The U.S. Environmental Protection Agency (EPA), with the concurrence of the Utah Department of Environmental Quality (UDEQ), presents this Record of Decision (ROD) for the Residential Soils Operable Unit (OU1) of the Jacobs Smelter Superfund Site in Stockton, Utah. Residential soils include those in residential yards, vacant lots, and unpaved streets and alleys located within the town boundaries of Stockton and not previously addressed during the EPA emergency response. The ROD is based on the Administrative Record for OU1. The ROD presents a brief summary of the Remedial Investigation/Focused Feasibility Study (RI/FFS), actual and potential risks to human health and the environment, and the Selected Remedy. EPA and UDEQ followed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the National Contingency Plan (NCP), and appropriate policy and guidance in preparation of the ROD. The three purposes of the ROD are to:

1. Certify that the remedy selection process was carried out in accordance with CERCLA and the NCP.

2. Outline the engineering components and remediation requirements of the Selected Remedy.

3. Provide the public with a consolidated source of information about the site history, site characteristics, and risk posed by the conditions of OU1, as well as a summary of the remedial alternatives considered, their evaluation, the rationale behind the Selected Remedy, and the agencies' consideration of, and responses to, comments received.

The ROD is organized into three sections.

1. The **Declaration** functions as an abstract for the key information contained in the ROD and is the section of the ROD signed by the EPA Assistant Regional Administrator and the UDEQ Director.

2. The **Decision Summary** provides an overview of the OU1 characteristics, the alternatives evaluated, and the analysis of those alternatives. It also identifies the Selected Remedy and explains how the remedy fulfills statutory and regulatory requirements.

3. The **Responsiveness Summary** addresses public comments received on the Proposed Plan, the RI/FFS, and other information in the Administrative Record.

DECLARATION

Statutory preference for treatment as a principle element is not completely met and five-year review is required.

SITE NAME AND LOCATION

Operable Unit 1 - Residential Soils
Jacobs Smelter Superfund Site
Stockton, Utah

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for OU1 within the Jacobs Smelter Superfund Site. EPA, with the concurrence of UDEQ, selected the remedy in accordance with CERCLA and the NCP.

This decision document is based on the Administrative Record for OU1. The Administrative Record is available for review at the Tooele Public Library, located at 47 E. Vine Street, Tooele, Utah. The State of Utah concurs with the Selected Remedy, as indicated by signature. UDEQ is the lead agency for the Jacobs Smelter Site.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for OU1 is Excavation and Off-Site Disposal. The major components of the Selected Remedy include:

- Excavation of soils within OU1 exhibiting (1) mean surface lead concentrations greater than 500 ppm, (2) mean subsurface lead concentrations greater than 800 ppm, or (3) mean surface arsenic concentrations greater than 100 ppm - to a maximum depth of eighteen inches.

- Pretreatment and off-site landfill disposal of contaminated soil classified as hazardous waste in accordance with Resource Conservation and Recovery Act (RCRA) Subtitle C.

- Off-site landfill disposal of contaminated soil *not* classified as hazardous waste in accordance with RCRA Subtitle D.

- Replacement of up to twelve inches of clean backfill, six inches of topsoil, and re-landscaping of affected properties. Properties will be returned to as close to original condition as possible.

- Interior cleaning of affected homes to remove any contaminated dust.

- Implementation of formal institutional controls to prevent exposure to any contamination remaining below eighteen inches or below existing structure.

STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment. It complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. However, because complete treatment of wastes was not found to be the most appropriate alternative, the remedy does not fully satisfy the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, or volume as a principle element.

Because the remedy will result in hazardous substances remaining on-site below eighteen inches, the remedy will be continually reviewed beginning five years after commencement of remedial action to ensure the remedy continues to provide adequate protection of human health and the environment.

DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary of this ROD. Additional information can be found in the Administrative Record for this site.

- Contaminants of concern (COCs) and their respective concentrations
- Baseline risk presented by the COCs
- Cleanup levels established for COCs and the basis for the levels
- Current and future land use assumptions used in the baseline risk assessment and the ROD
- Land use that will be available at the Site as result of the Selected Remedy
- Estimated capital, operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected
- Decisive factors that led to selecting the remedy

Max H. Dodson
Assistant Regional Administrator
U.S. Environmental Protection Agency
Region VIII

7/29/99
Date

Dianne R. Nielson
Executive Director
Utah Department of Environmental Quality

7/30/99
Date

DECISION SUMMARY

DECISION SUMMARY
TABLE OF CONTENTS

Decision Summary
List of Figures

Decision Summary
List of Tables

1.0 Site Location and Description

The Jacobs Smelter Site (UT0002391472) is located in and around Stockton, Utah, approximately 25 miles southwest of Salt Lake City, Utah and five miles south of Tooele, Utah (Figure 1-1). Approximate site boundaries are shown in Figure 1-2. The Site is bounded by the Stockton Bar (a gravel hill) to the north, Rush Lake to the west, and the Oquirrh Mountains to the east. The entire site is referred to as "Jacobs Smelter," taken from the name of a former smelting operation located in Stockton, Utah. To date, reports of up to nine former smelters within the site boundaries have been documented. The Jacobs Smelter was just one of these historic smelters; however, the entire Superfund site was named Jacobs Smelter as a matter of convenience.

The area surrounding Stockton is generally open grassland and is used primarily for grazing. The topography of the area is gently sloping from east to west towards Rush Lake. Several single family dwellings and farms exist in the area. The town of Stockton is mostly residential, with only a few small businesses. Approximately 500 persons reside within a four mile radius in and around Stockton. Due to its location, the area is prime for growth and residential development.

Rush Lake is the dominant surface water feature in the area. The lake is freshwater and is recharged primarily through ground water flow and several springs which empty into the lake. Discharge from the lake is through evaporation and ground water loss to the north. Water quality in the lake is generally good. Water levels in the lake have fluctuated greatly over the years, with the lake size changing drastically. Evidence suggests the lake is currently at a high stand, but for much of the century prior to the 1980s the lake was much smaller. Soldier Creek flows west from the Oquirrh Mountains and serves as the source of drinking water for Stockton. The creek is now ephemeral in its lower reaches, but at one time (prior to being tapped as a water source), surface flow in the creek likely reached all the way to Rush Lake during wet years.

The risks posed by the Site derive from mining activity which occurred primarily in the 1860's and 1870's. Mining wastes in the form of heavy metal contaminated soil, mill tailings, and smelter wastes are known to exist at several locations within the site boundaries. The primary contaminants are lead and arsenic. Little visible evidence exists of the former mining operations.

There are currently three operable units at the Site. Operable Unit One (OU1) addresses residential soil contamination within the town of Stockton, attributable primarily to the former Jacobs Smelter. Operable Unit Two (OU2) addresses soil and sediment contamination outside the town of Stockton (attributable primarily to the other smelters and mining operations), ground water, and potential ecological impacts. Operable Unit Three (OU3) addresses soil contamination on Union Pacific Property, also attributable primarily to the Jacobs Smelter.

An emergency response to address several areas of residential contamination in Stockton was commenced in March 1999. This decision document is directed at resolving soil contamination in

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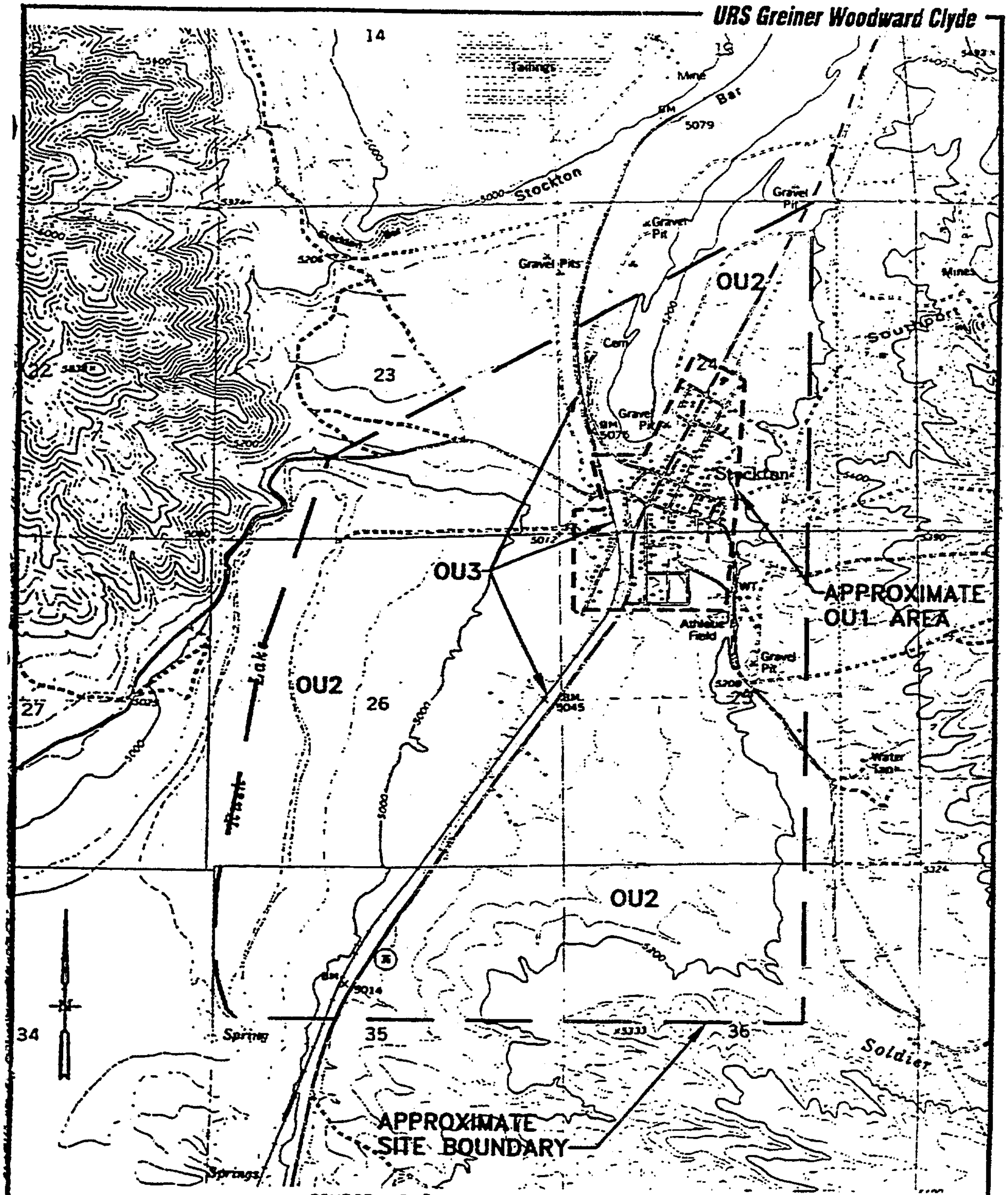

SOURCE: 7.5" TOPOGRAPHIC MAP, STOCKTON QUADRANGLE, UT. USGS 1980.

0 1000 2000 4000

SCALE IN FEET

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Prepared By :	B.L.B.
Date :	5/99

FIGURE 1-2
JACOBS SMELTER SITE
SITE LOCATION MAP
STOCKTON, UTAH

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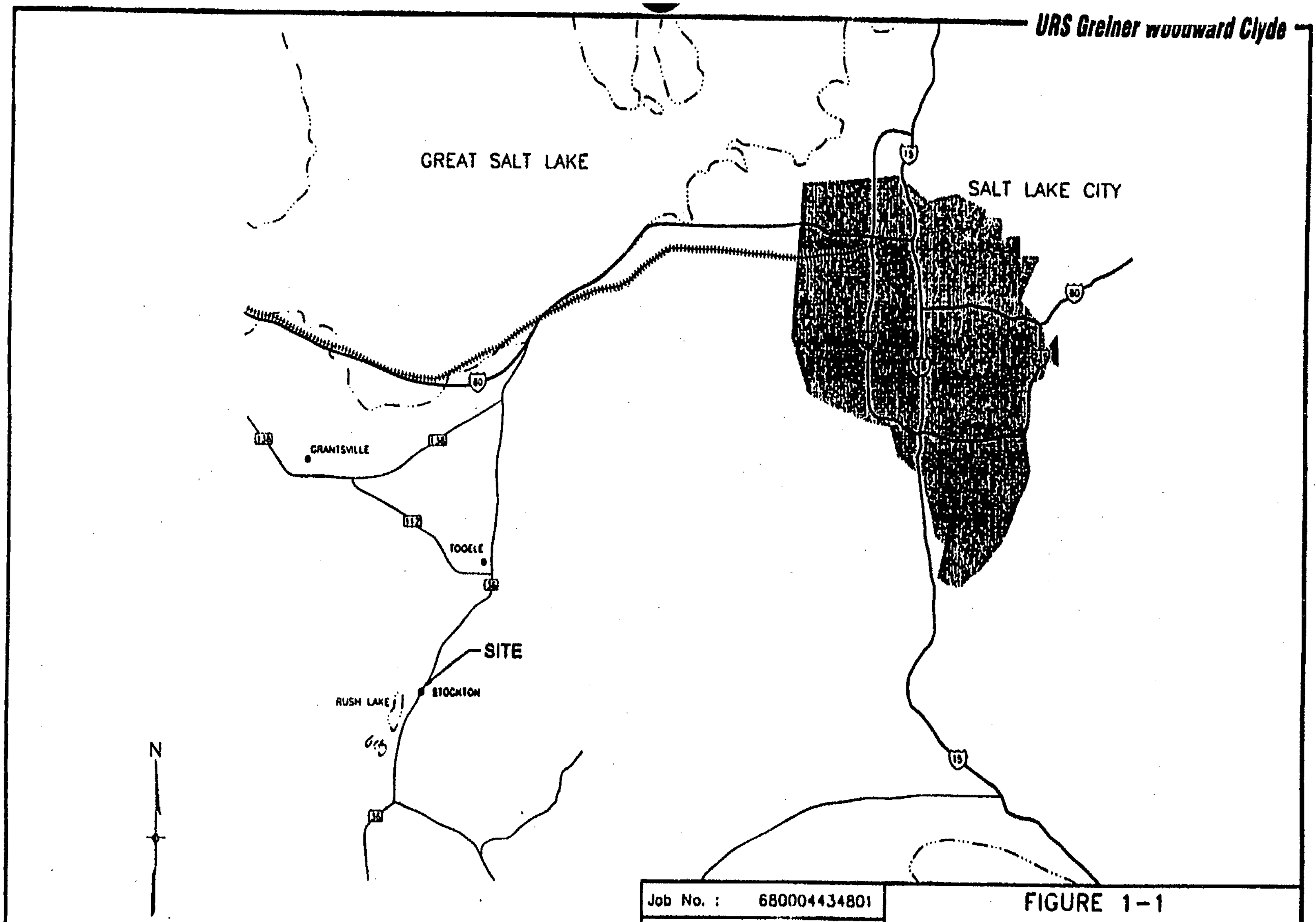

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Date :	05/99

FIGURE 1-1
VICINITY MAP
JACOBS SMELTER STOCKTON, UTAH

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the residential area of Stockton which will remain after completion of the emergency response. This is a final record of decision (ROD) and there were no interim RODs. The Utah Department of Environmental Quality (UDEQ) is the lead agency for the Site under a cooperative agreement with the United States Environmental Protection Agency (EPA).

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 SITE HISTORY

The Rush Lake/Stockton area was first settled in 1855 by the U.S. Army on a military reservation called Camp Floyd. The camp was soon abandoned. During the Civil War, the camp was reoccupied by California calvary volunteers and renamed Camp Relief.

In April 1864, volunteer soldiers discovered silver ore east of Stockton and organized the first mining district. The area around the military reservation became the base for small scale milling and smelting activities. The town of Stockton was laid out in 1864 and contained over 400 inhabitants by 1866. Several small smelting furnaces were built in the area, operated a short time with marginal results, and then were shut down. The exact locations of most of these furnaces remain unknown.

In 1869, the U.S. government sold Camp Relief. Mining in the area was beginning to expand and smelting processes were improved. By 1873, the Lincoln-Argent, Tucson, Bolivia, Silver King, St. Patrick, Quandary, Great Basin, Great Central, Our Fritz, and Flora-Temple-First National mines were in operation. Later mines included the National-Honerine, Ben Harrison-New Stockton, Calumet, Galena King, Muerbrook, Muscatine, Salvation-Hercules, and the Tiptop.

The largest smelter in the Stockton area was the Waterman Smelting Works, which opened in 1871 on the northern shore of Rush Lake, about ½ mile west of Stockton. This smelter was owned by I.S. Waterman and operated through 1886. The smelter reportedly produced a total of approximately 3,300 tons of flue dust and nearly 15,000 tons of smelter slag.

In 1872, the Jacobs Smelter (aka Jack Smelter), owned by Lilly, Leisenring & Company, began operation within the town limits of Stockton. The smelter processed ore from the Ophir Mining District, located ten miles south of Stockton, in three vertical blast furnaces. By 1880, each of these furnaces could reduce 25 tons of ore per day, resulting in 19.5 tons of smelter slag and flue dust per day. In 1879, the Great Basin Concentrator was constructed adjacent to the Jacobs Smelter and by 1880 was milling 100 tons of ore per day with approximately 80 tons of mill tailings produced as waste.

The Chicago Smelter opened in 1873 on the eastern shore of Rush Lake at Slagtown, two miles south of Stockton, within the boundary of the former military reservation. It was built by the Chicago Silver Mining Company, a British firm that also operated two nearby mines. The smelter operated sporadically through 1880. The Carson & Buzzo Smelter was located about ½ mile south of the Chicago Smelter, also on the shore of Rush Lake. The production rate of these smelters is unknown.

A total of at least nine smelting/milling operations are reported to have existed in the Stockton area, including the four mentioned here. Over the ensuing century, nearly all traces of these operations have vanished. Buried timbers, stained soils, and some foundations are virtually all of the physical evidence that remain. Homes were built upon a portion of the former Jacobs Smelter location. Much of the slag produced was likely reprocessed in other smelters located in Tooele or in the Salt Lake Valley. Through historical research and direct observation, the exact locations of the Jacobs, Waterman, Chicago, & Carson & Buzzo Smelters have been verified. The locations of other unnamed operations can only be speculated based upon sampling of soils to test for the presence of heavy metals. A map showing the probable locations of smelting/milling operations is shown in Figure 2-1.

In 1995, the area was added to the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) under the name Stockton Smelters. A PA/SI was completed in December 1998 and the name of the entire site was changed to Jacobs Smelter. Based upon a removal assessment conducted in late 1998, an emergency response action was initiated in March 1999 to address soil contamination of residential properties located in Stockton. A Remedial Investigation/Focused Feasibility Study (RI/FFS) for OU1 was completed in June 1999. An RI for OU2 is currently underway. The site was proposed for the National Priorities List on July 22, 1999.

2.2 ENFORCEMENT ACTIVITIES

EPA initiated a potentially responsible party (PRP) search when removal assessment activities began in late 1998. Due to the fact that nearly 100 years had passed since mining activity last occurred in the Stockton area, it was considered improbable that a viable responsible party still existed. Within OU1, it was considered even more unlikely because residences had been built upon the site of the former Jacobs Smelter. This assumption proved true. At the time of this ROD, none of the companies which operated mills or smelters within the site boundaries still existed or could be traced to current operating parties. EPA is continuing to search for any viable PRPs. Pursuant to EPA's policy of not considering residential home owners liable for contamination located on private residential property, residents were not considered PRPs.

During removal assessment activities, contaminated soils were discovered on Union Pacific property (railroad right of way) on the western edge of Stockton. EPA notified Union Pacific on April 26, 1999 requesting a time critical removal be performed to address the contamination. The area was designated as OU3. EPA and Union Pacific are negotiating the terms of the response through an Administrative Order on Consent (AOC). Under the terms of the AOC, Union Pacific was to cover the area of contamination located on the railroad property with twelve inches of clean soil and fence the area. This work is scheduled to be completed during summer 1999.

During sampling for the OU1 RI/FFS, contamination was found east of the Stockton town limits. Much of this land is owned by Kennecott. This land is being addressed under OU2.

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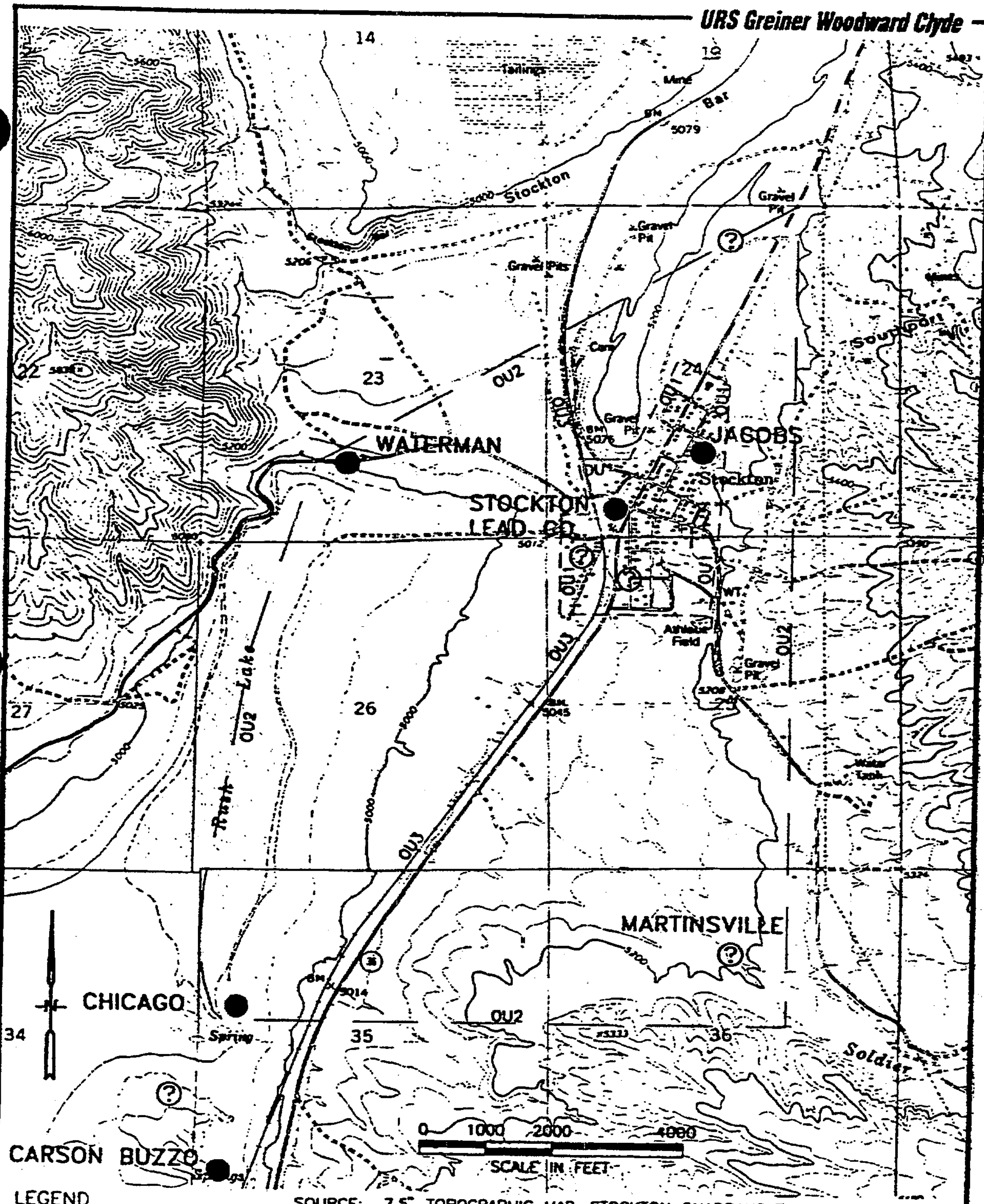

LEGEND

● KNOWN HISTORICAL SMELTER LOCATION

ⓘ UNCONFIRMED SMELTING LOCATION

SOURCE: 7.5" TOPOGRAPHIC MAP, STOCKTON QUADRANGLE, UT. USGS 1980.

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Date :	5/99

FIGURE 2-1
PROBABLE SMELTING/MILLING LOCATIONS
STOCKTON, UTAH

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public participation for OU1 began during emergency response activities. In late 1998, two public meetings were held. The first meeting occurred before removal assessment sampling occurred and the second was held after results were received. Attendance at both meetings was excellent, with nearly 50% of the town population attending. At the second meeting, residents were informed of the sampling results for their yards, and the activities which would likely ensue. Residents who did not attend were mailed their results and contacted separately. Also at the second meeting, representatives from both the EPA Superfund remedial program and UDEQ addressed the attendees and described the upcoming remedial process, including possible proposal to the National Priority List.

Upon commencement of the OU1 RI/FFS in January, 1999, a community forum meeting was instituted. This meeting occurs in Stockton monthly, and involves the town mayor, city and county officials, representatives from EPA and UDEQ, and a few citizens. The purpose of the meeting is to keep information flow frequent and timely. This meeting will continue through the completion of the remedial action(s).

The Administrative Record (AR) and information repository for both the emergency response and OU1 were established in April 1999. The AR is located in the Tooele Library, five miles north of Stockton in Tooele. A notice advertising the availability of the AR was published in the Tooele Transcript- Bulletin on April 29, 1999. An additional information repository for important documents was established in the town hall of Stockton for easier accessibility. Documents were added to both collections as they were produced.

A Community Involvement Plan, highlighting activities and opportunities for public participation, was developed by EPA and UDEQ in early 1999. The plan is based on numerous interviews with Stockton residents and government officials.

The proposed plan for OU1 was released for public comment by UDEQ on May 27, 1999. A public meeting for comment on the proposed plan was conducted on June 9, 1999 and the public comment period ran through July 15, 1999. Any comments submitted, as well as EPA and UDEQ responses to those comments, can be found in the responsiveness summary section of this document.

EPA proposed the Site for inclusion on the National Priorites List on July 22, 1999. The public comment period for this action will run for 60 days.

This decision document presents the selected remedial action for OU1, chosen in accordance with CERCLA, as amended by SARA, and the National Contingency Plan (NCP). The decision for this operable unit was based on the Administrative Record.

4.0 Scope and Role of Operable Unit Within Site Strategy

OU1 addresses the residential soils within the town of Stockton. Work within OU1 will include both the emergency response and the remedial action detailed in this ROD. OU2 addresses contaminated soils and sediments outside the town of Stockton, potentially contaminated ground water across the entire site, and potential ecological impacts of the entire site. OU3 addresses contaminated soil located on Union Pacific property.

The purpose of the emergency response and the planned remedial action at OU1 is two-fold. First, the direct exposure to contaminated soils must be addressed. Second, contaminated soil could serve as a potential source of ground water contamination and removal of this source would be consistent with any ground water remedy which may be required under OU2.

An RI for OU2 is underway. Investigations for this RI are planned to take at least two years. An emergency removal is currently being conducted by Union Pacific for OU3 and is scheduled to be complete this year. The OU3 removal will entail covering the contaminated area of the railroad property with twelve inches of clean fill and restricting access.

5.0 SUMMARY OF SITE (OU1) CHARACTERISTICS

5.1 PHYSICAL CHARACTERISTICS

The Jacobs Smelter Site is located in the Rush Valley. Rush Valley is bounded on the east by the Oquirrh Mountains, to the north by the Stockton Bar, and to the west by the Stansbury Mountains. The western flank of the Oquirrh Mountains is home to several mines which served as the primary source of ore for the smelters and mills in Stockton. This mining area is known as the Rush Valley Mining District.

Elevation at the Site ranges from approximately 5000 to 5120 feet above mean sea level. Precipitation in the area averages about 18.5" per year and the average annual temperature is about 50 degrees Fahrenheit. The area is frequently dry, dusty, and windy. Native vegetation consists primarily of short to medium grasses and small shrubs such as sagebrush. The condition of residential yards and lots varies throughout the town, but exposed soil is common and vegetative cover is often sparse. Many roads, driveways, and alleys are unpaved. Drinking water is obtained through a municipal system which uses flow in Soldier Creek as the sole source.

OU1 is roughly delineated by the town boundary of Stockton (shown in Figure 1-2). The area of OU1 is estimated at approximately 150-175 acres. Approximately 500 persons reside in and around Stockton. Within OU1, land use is almost completely residential and is anticipated to remain residential. Lots within OU1 range in size from approximately .1 acres to 1 acre. Most lots within OU1 contain single family dwellings, but a few small businesses and vacant lots exist as well.

The Jacobs Smelter was located in the northeastern corner of Stockton, on a topographic high relative to the town. At least two haul roads from the mines accessed the smelter location. At its peak, the operation processed approximately 100 tons of ore per day. Both milling and smelting operations were conducted. The processes were primitive and metals recovery was probably fairly poor, suggesting a great deal of residual metal contamination is likely.

Drainage in the vicinity of town is generally to the west/southwest, towards Rush Lake. Anecdotal evidence suggests at least one settling pond was located down gradient of the Jacobs Smelter, and possibly others. Wastes from the smelter were likely deposited in the settling pond(s) and flowed west toward Rush Lake. Heavy precipitation events would have likely caused the ponds to overflow. The gradient on the western edge of town is more gentle, and settling of wastes likely would have occurred here as flow velocities decreased. The construction of the Union Pacific railroad tracks on the edge of town in the 1940s may have exacerbated the ponding and settling effects here also.

A rail loading terminal (Stockton Lead Company) and smaller unnamed smelting/milling operations also existed in OU1. These smaller operations probably added to the contamination coming from the Jacobs Smelter and led to isolated areas of contamination around the town.

Soil sampling in town confirmed the anecdotal evidence and showed a number of residential properties and vacant areas within town contain elevated levels of lead, arsenic, and other heavy metals. In general, soil contamination was found at high levels in the vicinity of the former smelter and immediately down gradient. A discrete area of contamination also existed farther down gradient of the smelter location, along a general flow path to the west. A few isolated areas of contamination were also discovered. Nature and extent of the contamination are discussed in detail in Section 6 of this ROD.

Residential yards and vacant areas may have been impacted in two primary ways. First, early existing yards may have been contaminated directly with runoff from the smelter location, both during and after its period of operation. Second, after the smelter's period of operation, structures were built directly on top of contaminated soil and contaminated fill may have been used as fill material in the Stockton area. In either case, numerous lots in OU1 contain soil with elevated levels of arsenic and lead and conditions are such that exposure and migration is likely. The site conceptual model is shown in Figure 5-1.

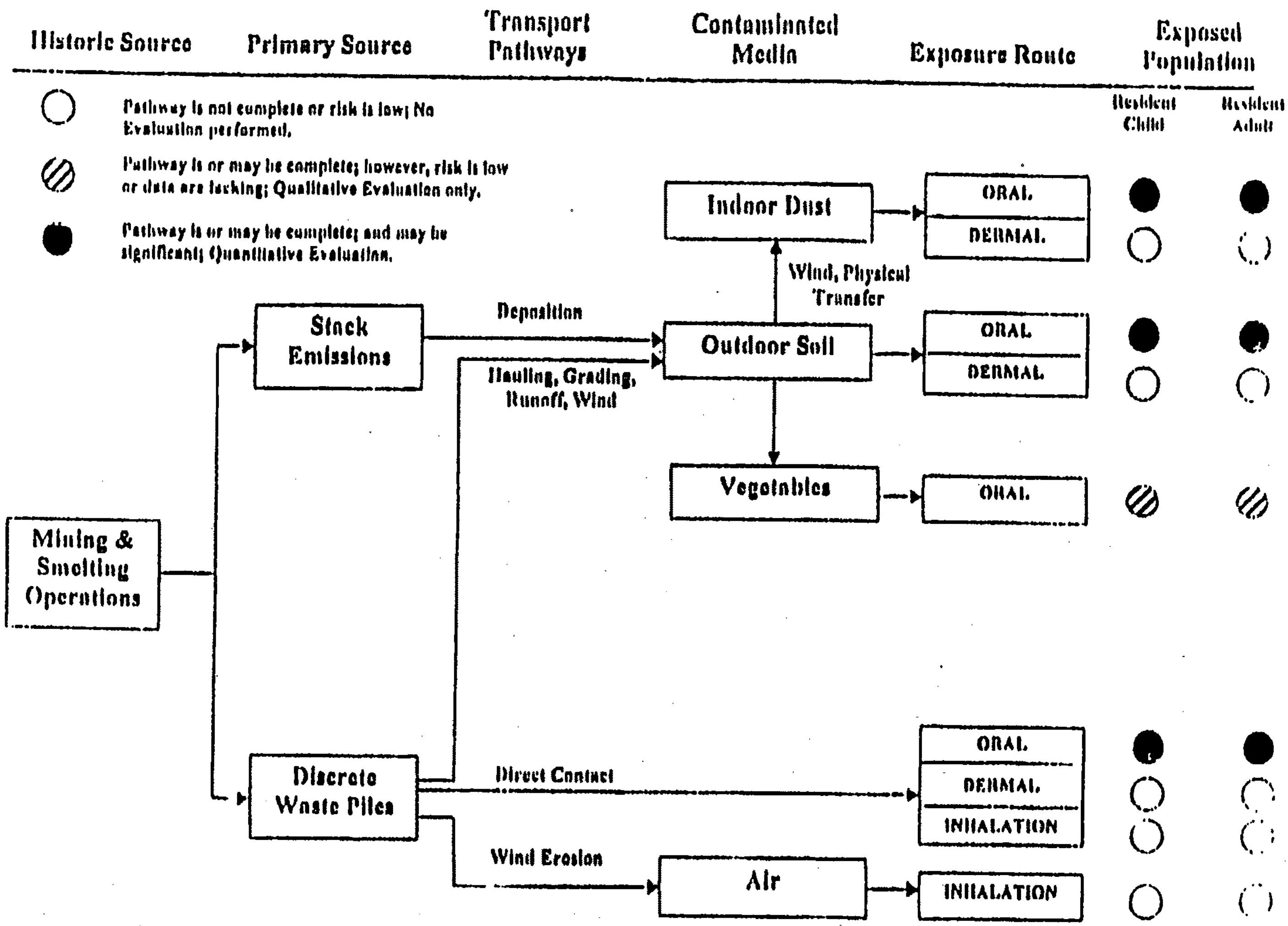
In addition to residential soil samples, other testing was performed during the removal assessment and RI/FFS:

- Interior dust was sampled for heavy metals in several homes. Only a few homes showed elevated levels of lead in interior dust and there was no significant correlation of exterior soil lead levels with interior dust lead levels.
- The drinking water in several homes was tested for the presence of heavy metal contamination. None of these samples showed any contaminant levels of concern.
- Several homes were tested for the presence of lead based paint. Only a few exterior samples showed elevated levels.
- Twenty six residents (including sixteen children) were tested for blood lead and urinary arsenic. The testing indicated no elevated levels of lead in blood and only one instance of elevated arsenic in urine. This lone arsenic result was later attributed to consumption of seafood, which is often high in organic, non-toxic arsenic. In general, the relatively small number of participants in the study makes it difficult to draw many conclusions. The study does indicate that there are currently no elevated blood leads among the individuals tested. The blood lead monitoring is further discussed in both the Biomonitoring Investigation Report (ISSI, 1999a) and the Baseline Human Health Risk Assessment (ISSI, 1999b).

Further information relating to site characterization can be found the RI/FFS Report (URSGWC, 1999) and Section 6 of this ROD.

5.2 Land Use

Current land use in OU1 is nearly completely residential. Future land use for the entire operable unit, including properties with small businesses and vacant lots, was considered residential. This decision was based on current zoning and conversations with local officials and residents.



FROM: BASELINE HUMAN HEALTH RISK ASSESSMENT, JACOBS SMELTER SITE, ISSI 1999

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Prepared By : BLB	
Date :	5/99

FIGURE 5-1
CONCEPTUAL SITE MODEL FOR RESIDENTAL EXPOSURE
JACOBS SMELTER STOCKTON, UTAH

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6.0 SUMMARY OF SITE (OU1) RISKS

6.1 CONTAMINANTS OF CONCERN

Contaminants of concern (COCs) are a subset of all contaminants that individually present relatively high human health or environmental risks. The COCs identified by UDEQ and EPA for OU1 are arsenic and lead. While other heavy metals are present at elevated levels in site soils, the levels of these metals were not considered harmful to human health. Human toxicity information is available for both COCs.

Based on the site conceptual model (Figure 5-1), EPA and UDEQ agree that ingestion of arsenic and lead contaminated soils presents the primary health threatening exposure pathway and presents an immediate and unacceptable risk to current and future residents of the Site.

6.2 NATURE OF CONTAMINATION

EPA and UDEQ identified contaminated soils as the principle threat waste for OU1. No low level threat wastes were identified. Speciation tests were performed on site soils to determine which forms of arsenic and lead were present. Certain types of heavy metal compounds are more available for uptake into the human body. Also, certain types dissolve more easily in water, and as such, are more available for dissolution into ground water or surface water.

The most common lead-bearing particles at the Site (i.e. those which were observed most often) were iron oxide and iron sulfate, accounting for an average of about 39% and 28% of all lead-bearing particles respectively. However, because the concentration of lead in these forms was relatively low, they accounted for only about 7% of the total lead mass. The form of particle which contributed the majority of the lead mass was cerussite, also known as lead carbonate. This form contained approximately 73% of the lead mass. Lead carbonate is considered extremely bioavailable for uptake into the human body.

The most common arsenic-bearing forms were also iron oxide and iron sulfate. However, the form of particle which contributed the majority of the arsenic mass was lead arsenic oxide, which is also very bioavailable.

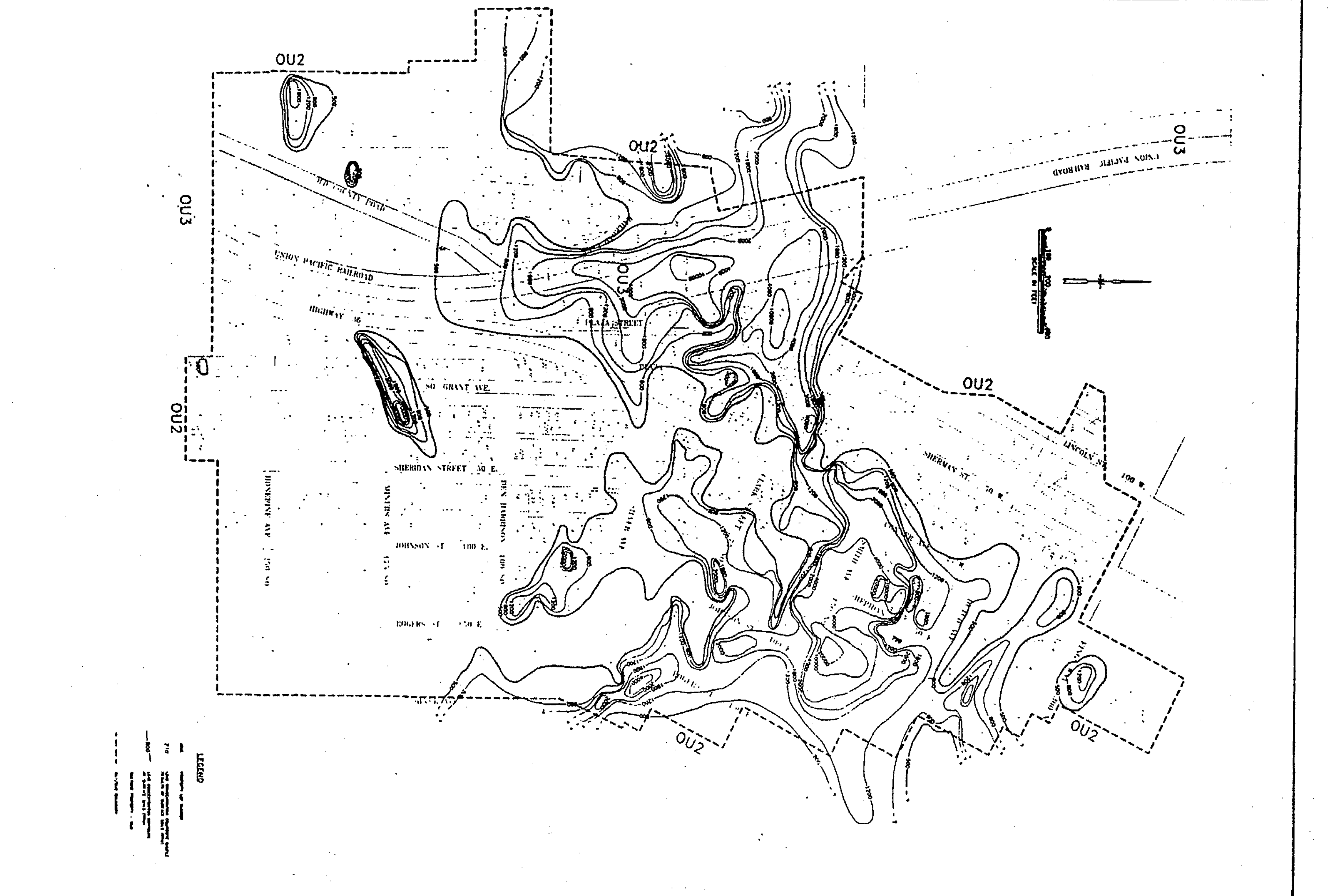
The physical characteristics of the site soils also tended to increase the bioavailability of the COCs. In general, lead and arsenic were found in particles which were extremely small (i.e. less than 50-100 micrometers) and separated from the surrounding soils. These small, liberated particles are often assumed to be more likely to adhere to the hands and be ingested and/or be transported into the home. They are also more readily digested in the stomach than larger particles. All samples collected during the removal assessment were sieved to 250 micrometers to screen out larger particles.

6.3 EXTENT OF CONTAMINATION

During the removal assessment, samples were collected from nearly every yard or vacant lot in Stockton. In general, the yards were divided into two zones, and six sample locations were identified for each zone. At each sample location, a composite sample was taken from each of the following depths: 0-2", 2-6", 6-12", and 12-18". Samples were analyzed quickly using X-Ray Flourescence (XRF), and values for each depth were averaged for the lot or yard. Sampling continued until lots or yards below the screening levels (400 ppm lead) were repeatedly encountered or the town limits were reached. Sampling performed for the RI/FFS following the same general scheme with minor deviations. With only minor exceptions, data collected in support of the RI/FFS and removal assessment were considered usable.

Arsenic and lead soil contamination was documented in a large portion of OU1. Figures 6-1 through 6-4 show lead concentration isopleth maps of OU1 for 0-2", 2-6", 6-12", and 12-18" and the exact boundaries of OU1. These figures are based upon sampling performed both during the removal assessment and in support of the RI/FFS. Soil lead concentrations ranged from a high of approximately 23,000 parts per million (ppm) near the former smelter location to below 500 ppm in several areas. Nearly the entire area exhibited soil lead concentrations above background levels. As seen from the figures, contamination generally decreased slightly with depth on an area basis. However, there are instances where this did not occur and contaminant concentrations at depth were higher than those found at the surface. This was particularly evident at the location of the former smelter and mill, where isolated pockets of mill tailings up to six feet deep were located. These tailings contained lead levels as high as 150,000 ppm. This area of high concentrations was removed during the emergency response.

Arsenic concentrations are strongly correlated with lead concentrations. The extent of contamination for arsenic roughly mimics those shown for lead in Figures 6-1 through 6-4. Arsenic concentrations ranged from a high of over 1800 ppm to a low of approximately 20 ppm at several areas around the Site. However, it should be noted that high lead concentrations tend to "mask" arsenic when a sample is analyzed using XRF. Because of this and the strong correlation between arsenic and lead concentrations, the highest arsenic concentrations were likely underestimated. This was corrected by using a mathematical correlation. A summary of data collected in support of the removal assessment (a total of 242 samples for each COC) is presented in Table 6-1.



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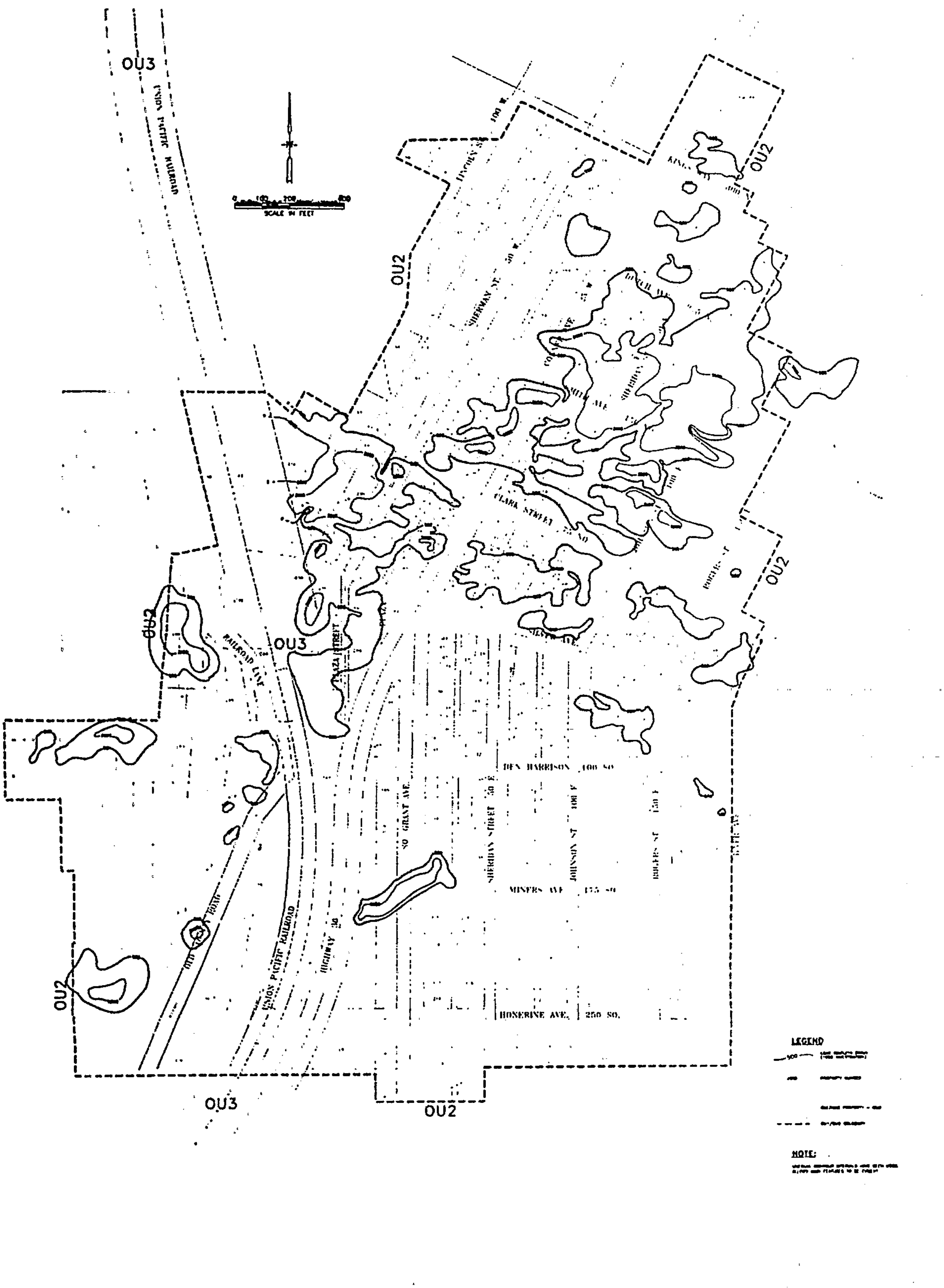
SURFACE SOIL LEAD CONCENTRATION CONTOURS 0" - 2" INTERVAL 1998 INVESTIGATION

FIG. 6-1



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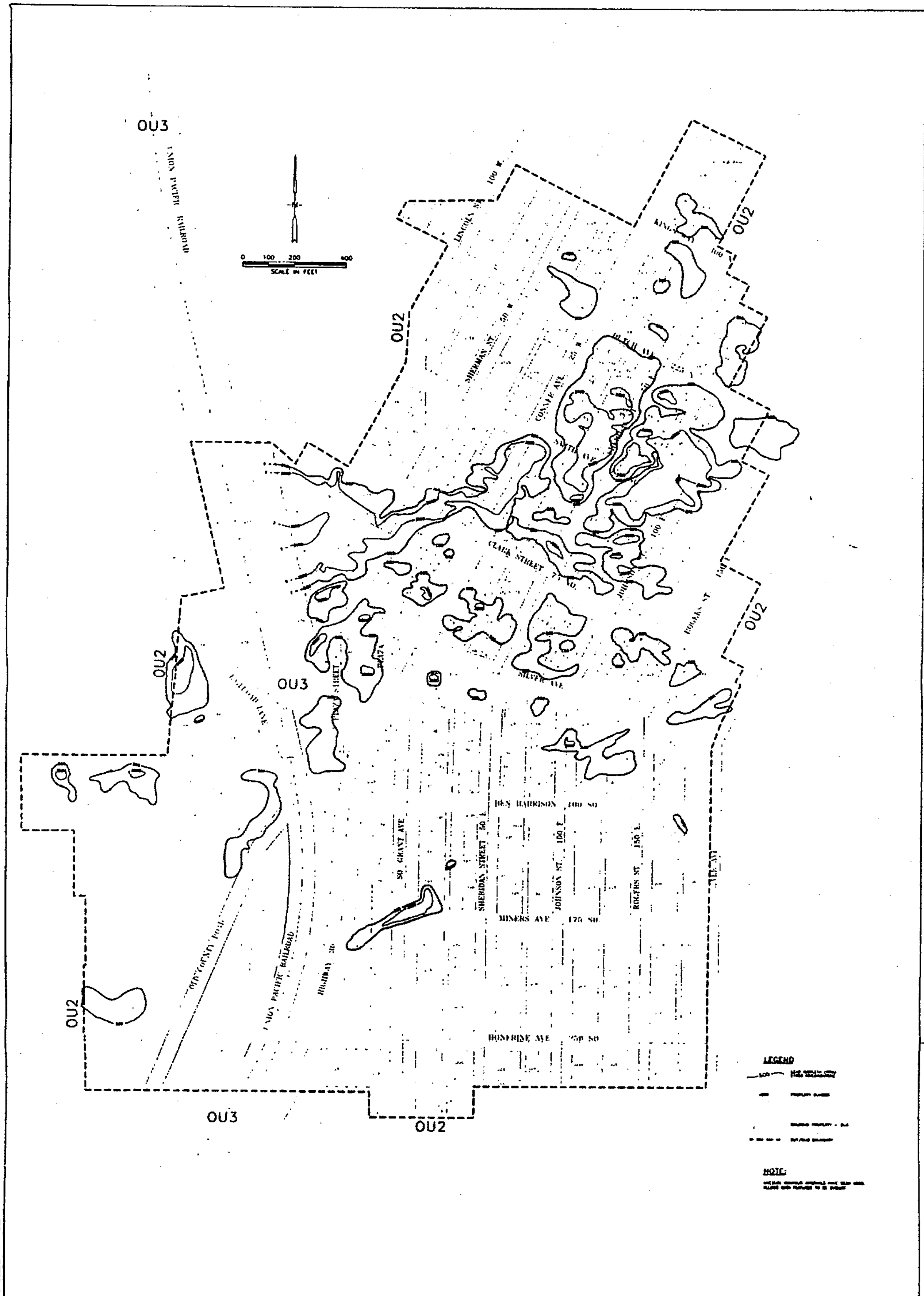
JACOBS SMELTER SITE — STOCKTON, UTAH

LEAD CONCENTRATION CONTOURS
2" - 6" INTERVAL
1998 INVESTIGATION

FIG. 6-2



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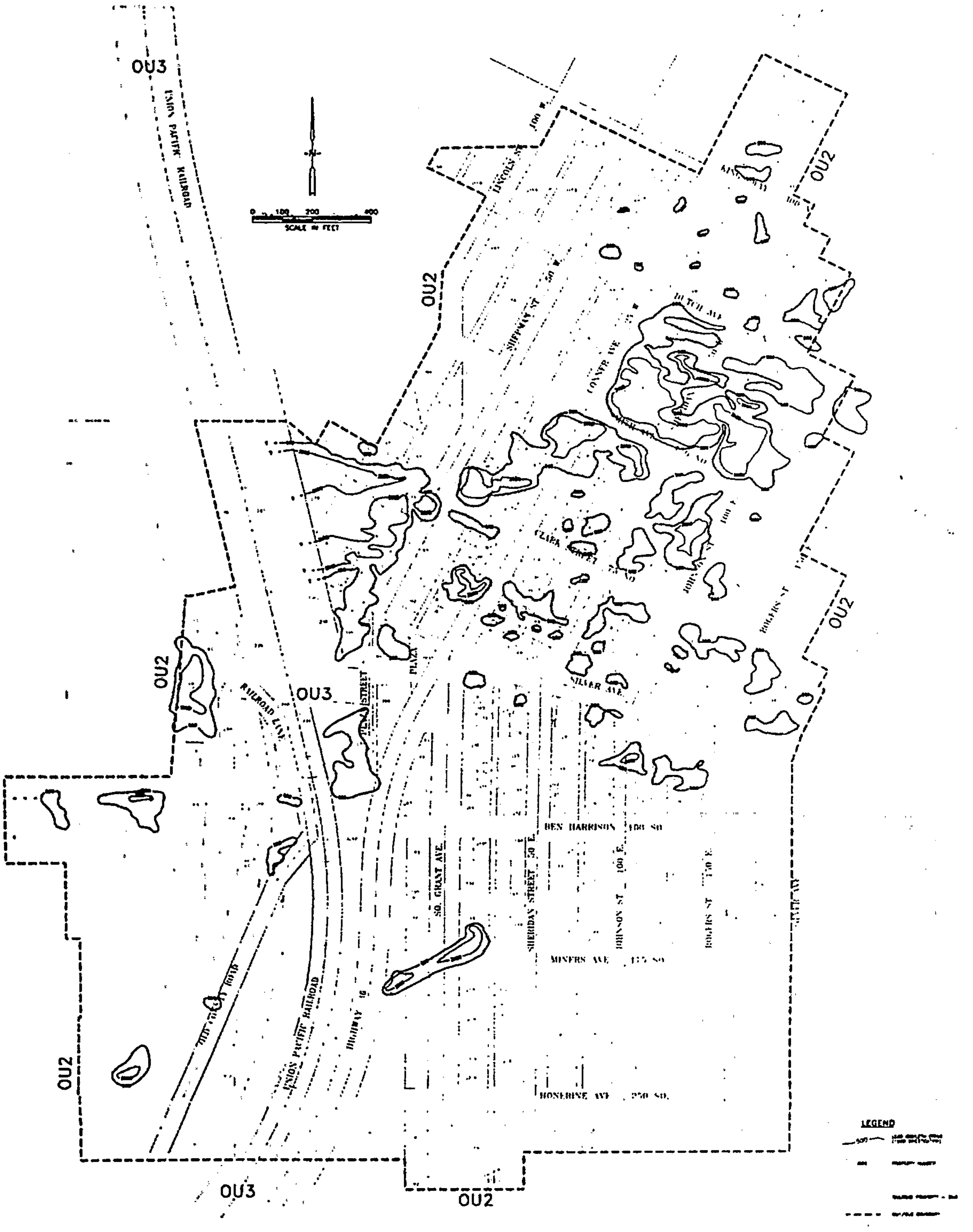
LEAD CONCENTRATION CONTOURS
6" – 12" INTERVAL
1998 INVESTIGATION



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LEAD CONCENTRATION CONTOURS
12" - 18" INTERVAL
1998 INVESTIGATION

FIG. 6-4

Table 6-1
Concentrations of COCs in Soil
Data Summary

COC	Depth	Maximum Concentration (ppm)	Minimum Concentration (ppm)	Average Concentration (ppm)
Arsenic	0-2"	1150	22	100
	2-6"	1837	20	112
	6-12"	1065	22	110
	12-18"	1306	22	104
Lead	0-2"	23,000	12	1,607
	2-6"	22,517	108	1,906
	6-12"	22,000	48	1,812
	12-18"	21,950	14	1,763

Except in the area of the former smelter, no samples were taken below eighteen inches. Previous risk and remediation evaluations for similar sites have shown that, in a residential setting, contamination below this depth presents little risk and is impractical to remediate. This is further explained below.

6.4 RISKS FROM LEAD

Excess exposure to lead can result in a wide variety of adverse effects in humans. Chronic low-level exposure is usually of greater concern for young children than older children or adults. For a variety of reasons, children are at risk of several neurological effects when excessively exposed to lead. These effects are subtle and difficult to detect. Common measurement endpoints include intelligence, attention span, hand-eye coordination, etc. Most studies observe effects in such tests at blood lead levels of 20-30 micrograms per deciliter of blood, though some have reported effects at levels below 10 micrograms per deciliter. Additionally, some effects on pregnancy and fetal development have been associated with elevated blood lead levels.

After a thorough review of all the data, EPA identified 10 micrograms per deciliter as the concentration level at which effects begin to occur which warrant avoidance. Further, EPA set a goal that there should be no more than a 5% chance that a child will have a blood lead value above that level (USEPA 1991). Likewise, the Centers for Disease Control (CDC) has established a guideline of 10 micrograms per deciliter in preschool children which is believed to prevent or minimize lead-associated cognitive deficits (CDC 1991).

In a residential scenario, it is EPA's policy to evaluate lead risk with the residential yard as the exposure unit and resident children as the most sensitive receptor. Soil lead levels protective of resident children are considered protective of any other exposed population, such as resident adults or workers exposed to soil. The mean soil lead concentration within the yard is considered the exposure point concentration, because within the yard a child has the greatest incidence of contact with soil. The primary exposure pathway is through incidental or direct ingestion of soil or dust particles (i.e. from the hands or objects). Other pathways, such as inhalation of airborne particles or consumption of vegetables grown in contaminated soil, may contribute to exposure but represent only a negligible fraction when compared to incidental or direct ingestion.

Using data collected for each property in OU1 and modeling risk using the Integrated Exposure, Uptake, and Biokinetic Model (IEUBK), the Baseline Human Health Risk Assessment (BRA) concluded that after the emergency response is complete, approximately 114 properties will still contain lead levels which could put resident children at excessive risk (i.e. > 5%) of having blood lead levels greater than 10 micrograms per deciliter. Site specific or regional information was used for input to the model to the greatest extent practical and only residential land use was considered for all properties. Again, the only site-specific exposure pathway evaluated was incidental or direct ingestion, though the model accounts for other sources of lead uptake such as diet.

The depth to which lead contaminated soils present an unacceptable risk to residents is not strictly defined. Surface soils (0-2") present the greatest risk because these soils are most frequently contacted. However, it is generally acknowledged that soils below the surface also pose some risk, as these soils may be contacted or brought to the surface when digging or performing other intrusive activities. In general, the deeper the soil, the less likely someone may disturb or encounter it, and hence less risk. Previous risk management evaluations at similar sites have recommended 12-18" as the depth to which action may be warranted. Remediation to these depths is generally considered protective of normal residential activities such as gardening and landscaping. Based upon this standard, contamination above 18" is considered a primary threat waste and contamination below 18" is considered a low-level threat waste. As stated previously, sampling in OU1 indicated contamination to a depth of at least eighteen inches. Residential properties remediated during the emergency response were excavated to a depth of eighteen inches.

6.5 RISKS FROM ARSENIC

As with lead, the primary exposure route for arsenic in soils is through incidental or direct ingestion. Excess exposure to arsenic is known to cause a variety of adverse health effects in humans.

Noncancer Effects

Oral exposure to high doses of arsenic produces effects such as nausea, vomiting, diarrhea, injury to blood vessels, kidney damage, and liver damage. The most diagnostic sign of chronic arsenic exposure is an unusual pattern of skin abnormalities, including dark and white spots and a pattern of small "corns," especially on the palms and soles of the feet (ATSDR 1991).

The risk of noncancer health effects from a chemical is expressed as its Hazard Quotient (HQ). If the value of the HQ is equal to or less than one, it is accepted that there is no significant risk of noncancer health effects. If the value of the HQ is greater than one, a significant risk of noncancer health effects may exist, with the likelihood increasing as the HQ increases. To evaluate risks from arsenic, the BRA broke the Site into eight zones, roughly corresponding to neighborhood blocks. These zones are shown in Figure 6-5. The exposure point concentration was considered as the 95% upper confidence limit on the arithmetic mean for each zone. As shown in Table 6-2 below, only one zone exhibited an HQ for arsenic greater than one for a reasonably maximally exposed resident.

Table 6-2
Arsenic Hazard Quotients for OU1
for a Reasonably Maximally Exposed (RME) Resident

Zone	RME HQ
1	.4
2	2
3	.3
4	.4
5	.4
6	1
7	1
8	.3
ALL ZONES	.6

Cancer Effects

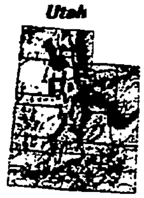
Cancer risk is described as the probability that an exposed person would develop cancer before age 70 as a result of exposure to site related contamination. EPA generally considers a risk below

Jacobs Smelter
Study Zones
Figure 6 –5

Legend

OU Boundary

Utah



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Sources

1×10^{-6} (i.e. one in a million) to be negligible, and risks above 1×10^{-4} (i.e. one in ten thousand) to require some sort of intervention. Risks between 1×10^{-4} and 1×10^{-6} usually do not require action, but this is evaluated on a case by case basis.

The BRA concluded that three zones within OU1 exceed the 1×10^{-4} standard for arsenic lifetime cancer risk. Table 6-3 summarizes the BRA's findings.

Table 6-3
Arsenic Cancer Risks for OU1
for a Reasonably Maximally Exposed (RME)
Resident

Zone	Lifetime RME Cancer Risk
1	8×10^{-5}
2	3×10^{-4}
3	7×10^{-5}
4	8×10^{-5}
5	8×10^{-5}
6	2×10^{-4}
7	2×10^{-4}
8	6×10^{-5}
ALL ZONES	1×10^{-4}

6.6 Ecological Risk

Ecological risk was not specifically evaluated for OU1 due to the residential setting. In such a setting, risks to residents will generally exceed any ecological risks, and as such, any remediation required to abate human health risks will also abate any ecological risks. Ecological risk for the entire site will be evaluated under OU2.

6.7 Ground Water

Because the citizens of Stockton receive drinking water from a municipal system taking water from Soldier Creek, ground water was not evaluated as a pathway for the BRA or investigated during the RI/FFS for OU1. However, ground water is present beneath the site and soil contamination may serve as a source of ground water contamination. Future users of ground water may be at risk if the ground water is impacted. As such, ground water contamination must be considered as a potential risk. This pathway will be further evaluated under OU2, but at a minimum, any remedy selected for OU1 should be consistent with ground water cleanup should it be required in the future.

6.8 REMEDIAL ACTION OBJECTIVES

The risks discussed above provide the basis for EPA's determination that the contaminated soils in OU1 present an imminent and substantial endangerment to public health and that remedial action is warranted. The nature of these risks, coupled with the current and future residential land use within OU1, lead to five Remedial Action Objectives (RAOs). In accordance with the NCP, EPA and UDEQ determined that the RAOs for OU1 are:

- Reduce risks from exposure to lead contaminated soil such that no child has more than a 5% chance of exceeding a blood lead level of 10 micrograms per deciliter.
- Reduce risks from exposure to arsenic contaminated soil such that no person has greater than a 1 x 10-4 chance of contracting cancer.
- Clean the site up to levels that allow for residential use.
- Remove as much contamination as practicable which could serve as source of contamination to ground water.
- Prevent the occurrence and spread of windblown contamination.

To achieve these objectives, it is crucial to develop media specific cleanup levels which will result in attainment. For OU1, these cleanup levels were arrived at through the use of health-based goals.

Using the same formulas and models used to evaluate risk, EPA developed a range of preliminary remediation goals (PRGs). These PRGs recommended a range of soil concentrations for the COCs which would equate to risk to residents at or below acceptable levels. These ranges were identified as 370-500 ppm for lead and 1.2-117 ppm for arsenic.

EPA and UDEQ then evaluated these PRGs, along with other risk management factors at OU1 (such as uncertainty in the risk calculations and the physical setting of the Site), and selected 500 ppm as the action level for lead and 100 ppm as the action level for arsenic. All residential yards or vacant lots which contain mean (i.e. average) surface soil concentrations in excess of the action levels, even those inside of zones identified as *not* presenting excessive risk in the BRA, will be subject to remediation. This distinction is important, as risk for arsenic was evaluated on a "zone" basis as opposed to a "yard" basis. Applying the arsenic action level to each individual yard or lot adds an extra level of protectiveness. Additionally, yards with mean subsurface soil lead concentrations greater than 800 ppm will also be subject to remediation. These action levels are summarized in Table 6-4.

Table 6-4
Surface Soil Action Levels for OU1

Contaminant	Action Level
Arsenic	100 ppm
Lead	500 ppm (surface)
	800 ppm (subsurface)

Comparison of the action levels with mean soil concentrations in individual properties within OU1 indicates approximately 122 properties will be subject to remediation. This figure does not include 29 parcels with mean soil lead concentrations greater than 3,000 ppm which were remediated during the emergency response. Of the 122 properties, only one exceeds the action level for arsenic but does not exceed the action level for lead. All properties which may be subject to remediation, including those addressed during the emergency response, are shown in Figure 6-6. The exact number of properties may change slightly as a result of further sampling during remedial design. Additionally, contaminated areas located outside of distinct properties (such as dirt streets, alleys, and right of ways) are also subject to remediation.

Again, it is important to note that the *mean* soil lead concentration within a yard or lot is the critical figure (the 95% UCL on the mean is not considered when evaluating lead risk, as statistical uncertainty is already accounted for in the IEUBK model). This is important for two reasons. First, it is assumed that over the life of a child (roughly 0-7 years), the child will have an equal chance of contacting/ingesting soil across the yard, as opposed to being focused on one area. Therefore, if the mean soil concentration for the entire yard is below the action level for lead but certain areas of the yard are not, the property is *not* considered to present excessive risk and is generally not subject to remediation. However, during the emergency response, EPA evaluated special circumstances where this is the case, such as localized areas of highly elevated concentrations (i.e. greater than 3000 ppm) where children frequent (i.e. play areas). These circumstances were addressed as necessary during the emergency response. Second, in only one instance does a lot exhibit a mean arsenic concentration exceeding 100 ppm but does not exhibit a mean lead level exceeding 500 ppm. Therefore, with only one exception, mean soil lead concentrations are the "driver" and mitigation of lead risk will also serve to mitigate arsenic risk.

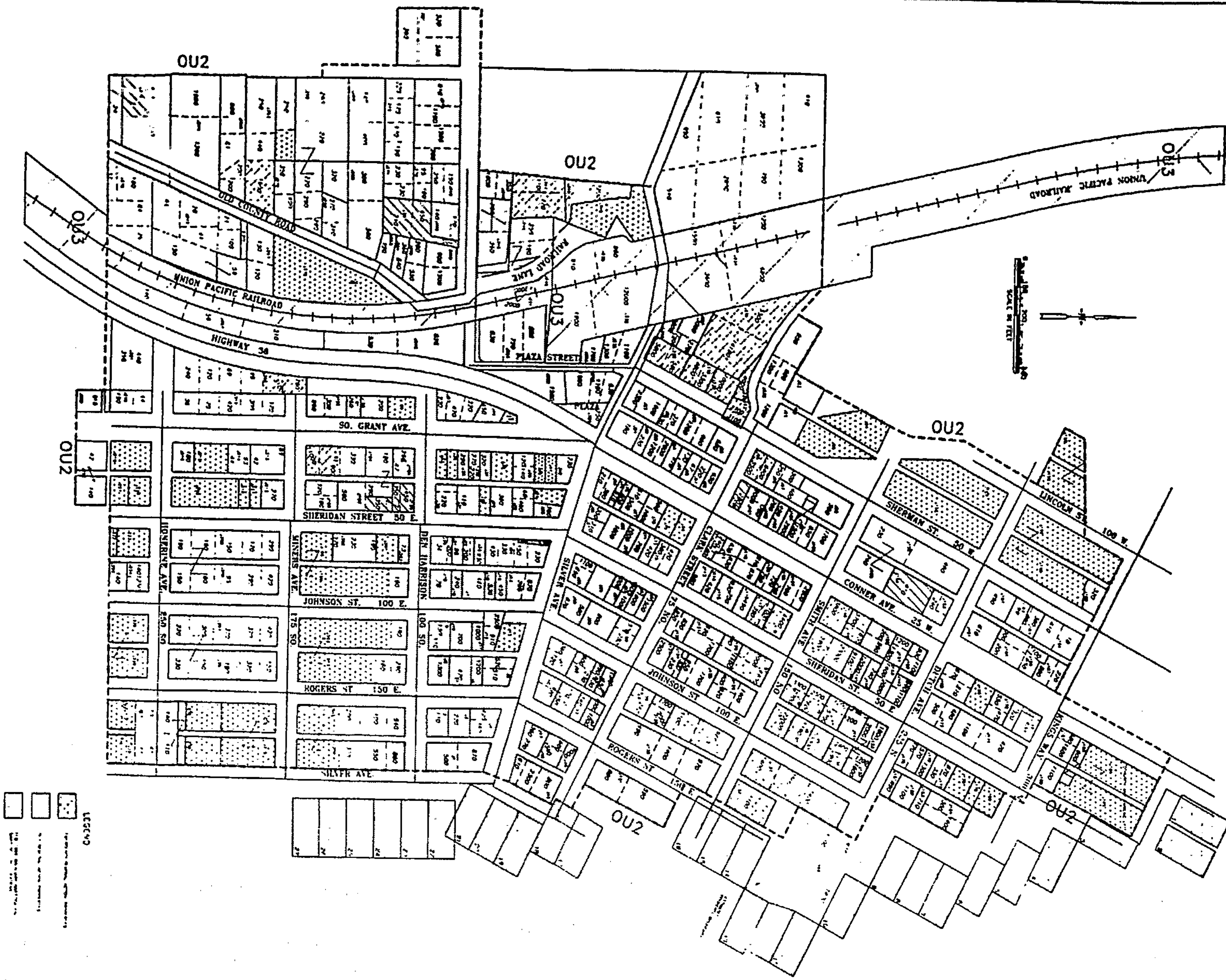

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FIG. 8-6

7.0 REMEDIAL ALTERNATIVES

7.1 DESCRIPTION OF ALTERNATIVES

This section describes the alternatives UDEQ and EPA believe are technically implementable and potentially able to meet the remedial action objectives for the Site. These alternatives were arrived at through a systematic screening process during the RI/FFS. In the FFS, many remedial alternatives were screened and those that were most reasonable were retained and investigated in detail. Using this systematic comparison, the ROD continues the evaluation and documents the decision making process. The numbering system for the alternatives discussed in this ROD (i.e. Alternative One, Alternative Two, etc.) is taken from the numbering of alternatives in the FFS.

All of the remedial technologies initially considered in the FFS are identified in Table 7-1. However, only those technologies which were retained as part of the alternative development process are described in detail in this ROD. The alternatives are:

Alternative 1: No Action

It is required by law that EPA evaluate the consequences of taking no action. This evaluation is intended to provide decision makers and the public a basis upon which all of the remedy alternatives may be compared. Alternative 1 would involve no remedial action beyond the emergency response being conducted by EPA.

Alternative 2: Soil Cover with Institutional Controls

This alternative includes placing a six inch soil cover (topsoil quality) over a geotextile membrane on all properties identified for remediation. This would involve: (1) removing and replanting affected vegetation; (2) raising, terracing, or protecting paved sidewalks, curbs, driveways, streets, and foundations that would be buried by an increase of six inches in adjacent soil elevations; (3) implementing institutional controls and maintenance requirements to prevent or control breaching of the soil cover and exposure to underlying soils; and (4) cleaning affected homes to remove contaminated interior dust.

Alternative 3: Excavation, Soil Washing, and Reuse

This alternative involves excavation and treatment of approximately 150,000 tons of contaminated soil from properties identified for remediation. Excavation would occur to a depth at which average concentrations are less than 500 ppm *or* to a maximum depth of eighteen inches. Excavated soils would be treated using a soil washing device to achieve action levels of 500 ppm lead and 100 ppm arsenic. Treated soils would be amended as necessary, returned to the excavated area, and revegetated as close to prior condition as possible. An additional 2,000 tons of clean soil will be required to account for cobbles and metals removed during washing. Treatment residuals may be recycled or disposed of in a suitable landfill based upon classification

TAB[illegible]

Initial Screening of Remedial Technologies

Technology	Effectiveness	Implementability		Costs		Retained for Detailed Analysis	Comments
		Technical	Administrative	Capital	O&M		
Soil cover	Low	Easy	Difficult	Low	High	Yes	Has not been used extensively for residential properties
Soil cap	Low	Easy	Difficult	Medium	High	No	Not feasible for residential properties
In-situ chemical stabilization	Medium	Difficult	Difficult	Medium	Medium	No	Not feasible for residential properties
Excavation and removal	High	Easy	Moderate	Medium	Low	Yes	Can be combined with stabilization for highly contaminated soils
Soil washing [b]	High	Moderate	Easy	High	Low	Yes	Can be combined with chemical separation for soil reuse
Chemical separation [b]	High	Difficult	Moderate	High	Low	Yes	Can be combined with soil washing
Stabilization [b]	High	Moderate	Easy	Medium	Low	Yes	Can be combined with excavation and removal
Solidification [b]	High	Difficult	Moderate	High	Low	No	Stabilization easier and less costly for same end result

Notes:

[b] Includes excavation prior to use of listed technology

O&M Operation and maintenance

of the soil as hazardous or nonhazardous in accordance with Subtitle C of the Resource Conservation and Recovery Act (RCRA). Institutional controls would be implemented to prevent exposure to contamination remaining below eighteen inches or below existing homes. Affected homes would be cleaned to remove contaminated interior dust.

Alternative 4: Excavation and Off-Site Disposal

This alternative involves excavation and disposal of approximately 150,000 tons of contaminated soil from all identified properties. Excavated soil would be disposed of in a suitable landfill based upon classification of the soil as hazardous or nonhazardous in accordance with Subtitle C of the Resource Conservation and Recovery Act (RCRA). Soil classified as hazardous would be solidified or stabilized using flyash or cement. Twelve inches of imported clean soil backfill and six inches of clean topsoil would be replaced on excavated areas. The areas will be revegetated as close to original condition as possible. Institutional controls would be implemented to prevent exposure to contamination remaining below eighteen inches. Affected homes would be cleaned to remove contaminated interior dust.

7.2 DETAILED ANALYSIS CRITERIA

To facilitate a complete and systematic screening (Section 7.3), each of the four alternatives discussed in this Record of Decision is evaluated against nine criteria as set forth in the National Contingency Plan (NCP). Of these nine criteria, the first two are considered "threshold factors" which must be satisfactorily met in order for a remedy to be considered for implementation. The next five criteria are considered "primary balancing factors" and are the primary criteria upon which the analysis is based. Finally, the last two criteria (State and Community Acceptance) are considered "modifying factors."

Threshold Factors

1. *Overall Protection of Human Health and Environment*

   Evaluation of the overall protectiveness of an alternative focuses on whether a specific alternative achieves adequate protection and how site risks are eliminated, reduced, or controlled. This evaluation also allows for consideration of whether an alternative poses any unacceptable short-term impacts.

2. *Compliance with ARARs*

   Laws, regulations, and ordinances from the federal, state, and local governments may be applicable or relevant and appropriate for many matters affecting the implementation of a remedy. These laws, regulations, and ordinances are generally referred to by EPA as ARARs (Applicable or Relevant and Appropriate Requirements). The chemical, location, and action specific ARARs are discussed along with any other appropriate criteria, advisories, and guidance as they apply to each alternative.

Primary Balancing Factors

3. Long-Term Effectiveness and Permanence

This evaluation criterion involves consideration of potential risks that may remain after the site has been remediated and the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants

There is a statutory preference for remedies that permanently or significantly reduce the health hazards (toxicity), movement of contaminants (mobility), and quantity (volume) of contaminants.

5. Short-Term Effectiveness

The focus of this criterion is the protection of the community, environment, and the workers during remediation and the duration of the remediation.

6. Implementability

This criterion establishes the practical aspect of implementing an alternative.

7. Cost

The cost (capital, operation, and maintenance) of an alternative is an important, practical criterion in evaluating potential remedies.

Modifying Factors

8. and 9. State and Community Acceptance

Community acceptance is addressed through means of a public meeting, an open public comment period, and ongoing community participation activities. The State may concur, oppose, or have no comment regarding the decision. These factors will be discussed only in Section 8, Summary of the Comparison of Alternatives.

7.3 *DETAILED ANALYSIS OF ALTERNATIVES*

7.3.1 Alternative 1 - No Action

Overall Protection of Human Health and the Environment

If Alternative 1 is implemented, the human health risk at OU1 will remain as is for all properties, except the 29 properties remediated during the EPA emergency response. As discussed in Section 6 of this ROD, EPA has determined the existing situation presents unacceptable health risks to residents. Therefore, Alternative 1 does not meet the threshold criterion for protection of human health.

Alternative 1 provides no added protection of the environment. However, due to the residential setting and lack of natural habitat, ecological risk was not specifically evaluated for OU1. Site-wide ecological risk will be further evaluated under OU2.

Compliance with ARARs

A detailed description of ARARs identified for OU1 is given in Appendix A. The only chemical-specific ARARs for OU1 relate to the concentration of contaminants in air. It is unclear if ambient conditions would cause exceedances of these ARARs, but it is possible. Therefore, the threshold criterion for compliance with ARARs may not be met under Alternative 1. The location-specific and action-specific ARARs identified in Appendix A are not applicable for this alternative because no remedial action is involved.

Long-term Effectiveness and Permanence

The source of exposure is not removed or isolated under Alternative 1 and none of the risk to human health would be mitigated. Although risk is being reduced by the emergency response, the BRA indicates that the remaining risk to children will still exceed the standards discussed in Section 6 . Therefore, Alternative 1 does not meet the threshold criterion for long-term effectiveness and permanence.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 contains no provision for treatment and provides no reduction of toxicity, mobility, or volume of the contamination. Therefore, Alternative 1 does not satisfy the statutory preference for treatment.

Short-term Effectiveness

Implementing Alternative 1 would not increase the short-term risk to the community from a remedial action. Because there would be no remediation under Alternative 1, there is no risk to OU1 remediation workers and no time is required to implement the alternative. The environmental impacts under Alternative 1 remain unchanged from existing conditions. Due to these factors, Alternative 1 is considered fully effective in the short-term.

Implementability

No construction or action would be required to implement Alternative 1, making it very easy to implement. Also, because monitoring of effectiveness is not required, it would be unnecessary to obtain approval from other agencies, and no equipment, specialists, materials, technologies, or services are required.

Cost

By definition, there are no capital or O&M costs associated with Alternative 1.

7.3.2 Alternative 2 - Soil Cover With Institutional Controls

Overall Protection of Human Health and the Environment

A soil cover would greatly reduce direct contact, ingestion, and inhalation of the contaminants and, therefore, would reduce human health risk to acceptable levels. The soil cover and vegetation layer also reduces the spread of contamination into the environment through erosion and deposition. However, all of the contaminated soil is left in place and may become exposed if the cover is breached through excavation, erosion, or construction below the cover layer. Six inches of cover is generally not considered protective for normal residential activities such as gardening and landscaping. Therefore, the alternative is very dependent on institutional controls and only marginally satisfies the threshold criterion for protection of human health.

Alternative 2 provides some protection of the environment. However, due to the residential setting and lack of natural habitat, ecological risk was not specifically evaluated for OU1. Site-wide ecological risk will be further evaluated under OU2.

Compliance with ARARs

Alternative 2 would meet chemical-specific air quality ARARs unless a breach in the cover occurs. It is unclear if a breach would cause exceedances of these ARARs, but it is possible. Institutional controls would be implemented to ensure breaches are minimized and do not cause exceedances of air quality ARARs. Monitoring for attainment of chemical-specifc air quality ARARs would be conducted during construction. Attainment of action-specific (such as those for dust suppression) and location-specific ARARs would also be required during construction. Therefore, the threshold criterion for compliance with ARARs is met by Alternative 2.

Long-term Effectiveness and Permanence

Alternative 2 relies on a six inch soil cover and a geotextile to provide a barrier between the potential receptors, especially small children, and the existing lead- and arsenic-contaminated soil. However, all of the contaminated soil remains in place, leaving residual contamination below the 6-inch depth of the cover.

Institutional controls, such as environmental easements and town ordinances, would be implemented to prevent exposure to contamination below the existing cover of clean soil. However, this cover could easily be breached during normal residential activities such as gardening and landscaping, making institutional controls difficult to enforce and a limitation to property owners. In addition, garden vegetables with roots extending below the geotextile might contain high levels of lead or arsenic contamination, though this pathway was considered incomplete (i.e. doesn't present any significant risk) in the BRA. Therefore, a public education campaign may also be required to prevent new residents from inadvertently breaching the integrity of the soil cover and creating new exposure pathways. If contaminated soil is exposed in an excavation, the homeowner may be responsible for its disposal in a hazardous waste landfill.

Reduction of Toxicity, Mobility, or Volume through Treatment

In the soil cover alternative, no treatment process is used; therefore, no contamination is destroyed or treated. Alternative 2 provides no reduction of either toxicity or volume, but does reduce the mobility of the contaminants to wind and water erosion by isolating the contamination. However, since no treatment is used, Alternative 2 does not satisfy the statutory preference for treatment.

Short-term Effectiveness

No residents would be relocated during implementation of Alternative 2, but house interiors would be cleaned after remediation is completed. When required, Level C protection for construction workers would be implemented to prevent inhalation or ingestion of lead- or arsenic-contaminated soil and dust. Dust generated during construction could create an environmental impact, but State and Occupational Safety and Health Administration (OSHA) regulations governing dust suppression would be enforced. The time required to implement Alternative 2 is estimated at approximately one and a half years.

Implementability

Standard soil excavation, hauling, backfilling, and grading techniques are used during construction of Alternative 2. Tree and shrub clearing and grubbing, geotextile placement, cover soil placement and grading, and revegetation contractors can be acquired locally without the need for highly specialized remediation personnel. The construction equipment, specialists, materials, technologies, services, and capacities needed are readily available from several Utah vendors.

Approximately 45,500 tons of soil would be required for the six inch soil cover. Soil excavated below the geotextile in planting trees and shrubs during post-remediation landscaping, estimated at approximately 1,000 cubic yards, would be hauled to a hazardous waste landfill.

The soil cover alternative is made more difficult to implement due to the difficulty in adjusting the height of structures and paved areas, especially basements, window wells, driveways, sidewalks, and patio slabs, to maintain positive drainage. Also, if additional remediation were required after construction of Alternative 2 is complete, the new remedial action would destroy the original remedy. Annual monitoring would be required to give notice of any failure of the remedy before significant exposure occurs. Intensive coordination with local agencies will be required to provide the necessary institutional controls and annual monitoring will require a significant commitment of State resources.

Cost

The costs to implement Alternative 2 are estimated at $6,219,912 for capital costs and $561,962 for 30 years of O&M, which includes annual monitoring, maintenance and reporting costs of $19,378. The capital cost includes purchase and placement of 1.3 million square feet of geotextile at a cost of $0.50 per square foot. These capital and O&M costs combine for a total present worth cost of $6,453,000.

7.3.3 Alternative 3 - Excavation, Soil Washing, and Reuse

Overall Protection of Human Health and the Environment

Excavation and removal of contaminated soil from each residential property would automatically reduce the risk of direct contact, inhalation, or ingestion of the contaminated soil and, therefore, reduce human health risk. Soil washing and chemical extraction would further reduce the potential for migration and future direct contact, ingestion, and inhalation of the contaminants because the heavy metals are entirely treated or recycled. The eighteen inches of clean soil backfill and vegetation layer would also reduce the spread of contamination into the environment through wind and water erosion. Therefore, Alternative 3 meets the threshold criterion for protection of human health.

Alternative 3 provides a high degree of protection of the environment. However, due to the residential setting and lack of natural habitat, ecological risk was not specifically evaluated for OU1. Site-wide ecological risk will be further evaluated under OU2.

Compliance with ARARs

Alternative 3 would meet chemical-specific air quality ARARs because contamination would be covered by eighteen inches of clean fill and not exposed to wind. Monitoring for attainment of chemical-specific air quality ARARs would be conducted during construction. Attainment of action-specific (such as those for dust suppression) and location-specific ARARs would also be required during construction. Therefore, the threshold criterion for compliance with ARARs is met by Alternative 3.

Long-term Effectiveness and Permanence

Alternative 3 would provide a high degree of long-term effectiveness and permanence. Excavation and treatment of all contaminated soils would minimize the chance of future exposure to the heavy metals. The only residual risk from lead- and arsenic-contaminated soil in Alternative 3 would come from the contamination remaining below eighteen inches. However, eighteen inches of clean backfill is considered protective of normal residential activities. Minimal institutional controls would be required to prevent exposure to residual contamination remaining below eighteen inches, such as those occurring during significant construction or excavations. Few restrictions would be placed on property owners and the institutional controls would be fairly easy to enforce provided resources remain available.

Contamination would be treated and disposed or recycled, making the possibility of future migration of contaminants minimal.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 3 satisfies statutory preference for treatment of the contaminated soil. The treatment process extracts lead and arsenic from soil by separating the uncontaminated coarse fraction of the soils from the contaminated fine fraction by soil sizing and washing. The fine fraction is then treated with chemicals to transfer the contaminants to the residual water. This water is then further treated through precipitation to remove the metals. The amount of soil treated is estimated at 140,000 tons. This process reduces the toxicity, mobility, and volume of the contaminated soil to a maximum residual of 2,000 tons of metal precipitates to be reprocessed or sold. The treatment process is irreversible and the washed soils, less the coarse gravel fraction, would be reused as a major part of the backfill for the excavated yards of Stockton.

Short-term Effectiveness

No residents would be relocated during implementation of Alternative 3, but house interiors would be cleaned after remediation is completed. When required, Level C protection for construction workers would be implemented to prevent inhalation or ingestion of lead- or arsenic-contaminated soil and dust. Dust generated during construction could create an environmental impact, but State and Occupational Safety and Health Administration (OSHA) regulations governing dust suppression would be enforced. The time required to implement Alternative 3 is estimated at approximately one and a half years.

Implementability

Standard soil excavation, hauling, backfilling, and grading techniques are used to excavate, haul, backfill, and grade the soils for Alternative 3. The construction equipment, specialists, materials, technologies, services, and capacities needed for this portion of the alternative are readily available from several Utah vendors. However, the soil washing and metals separation technologies required for this alternative are not readily available and require specialized vendors.

If additional remediation is required after construction of Alternative 3 is complete, the new remedial action would not impact the original remedy. Also, some minor coordination with local agencies would be required to provide the necessary institutional controls. Some coordination with state and federal agencies would also be required to obtain approval of a suitable soil washing/metals separation process for the lead- and arsenic-contaminated soil. Disposal of some soil excavated for the planting of trees and shrubs during post-remediation landscaping in a hazardous waste landfill or TCLP testing and stabilization/fixation of this soil may be required unless the soil washing/metals separation equipment remains at the site until this work is completed.

Cost

The costs to implement Alternative 3 are estimated at $52,383,000 for capital costs and $141,270 for 30 years of O&M. This O&M cost includes only an annual report, at $4,709 per year, documenting compliance with institutional controls in Stockton. These capital and O&M costs combine for a total present worth cost of $52,445,000.

7.3.4 Alternative 4 - Excavation and Off-Site Disposal

Overall protection of Human Health and the Environment

Excavation and disposal of contaminated soil from each residential property would automatically reduce the risk of direct contact, inhalation, or ingestion of the contaminated soil and, therefore, reduce human health risk. Soil stabilization and landfill disposal would further reduce the potential for migration and future direct contact, ingestion, and inhalation of the contaminants because the heavy metals are partially treated and entirely disposed of in an appropriate landfill. The clean soil backfill and vegetation layer would also reduce the spread of contamination into the environment through wind and water erosion. Therefore, Alternative 4 meets the threshold criterion of protection of human health and the environment.

Alternative 4 provides a high degree of protection of the environment. However, due to the residential setting and lack of natural habitat, ecological risk was not specifically evaluated for OU1. Site-wide ecological risk will be further evaluated under OU2.

Compliance with ARARs

Alternative 4 would meet chemical-specific air quality ARARs because contamination would be covered by eighteen inches of clean fill and not exposed to wind. Monitoring for attainment of chemical-specifc air quality ARARs would be conducted during construction. Attainment of action-specific (such as those for dust suppression and land disposal restrictions) and location-specific ARARs would also be required during construction. Therefore, the threshold criterion for compliance with ARARs is met by Alternative 4.

Long-term Effectiveness and Permanence

Excavation and disposal of contamination in an appropriate landfill provides a high level of long-term effectiveness and permanence. Stabilization of soils classified as hazardous under Alternative 4 should be very successful because the results of the geotechnical testing (Appendix C of the RI) indicate that the percentage of sand and gravel (soil particles with a diameter greater than 0.074 millimeters) in OU1 soils is approximately 100 percent. Soil pH averages 8.7 for 19 samples, with a range from 8.0 to 9.3. The average total organic carbon content is approximately 30,000 mg/kg, with a range from 14,000 to 65,000 mg/kg from 20 geotechnical samples. The ranges of values are confirmed by the parameters found in the Tooele County soil survey discussed in Section 2.4 of the RI. These parameters make the likelihood of success for stabilization very high.

The only residual risk from lead- and arsenic-contaminated soil in Alternative 4 would come from the contamination remaining below eighteen inches. However, eighteen inches of clean backfill is considered protective of normal residential activities. Minimal institutional controls would be required to prevent exposure to residual contamination remaining below eighteen inches. Few restrictions would be placed on property owners and the institutional controls would be fairly easy to enforce provided resources remain available.

Reduction of Toxicity, Mobility, or Volume through Treatment

In Alternative 4, no treatment process is used for soils which are classified as nonhazardous under RCRA Subtitle C. Therefore, no contamination would be destroyed or treated for this fraction of the excavated soils, which is about 114,000 tons. However, soils with a TCLP lead level greater than 5 mg/L would be stabilized with flyash or cement before disposal. These stabilization materials reduce both mobility and toxicity of contaminants in the excavated soil, but increase the volume by less than 10 percent. The amount that would be treated is estimated at 36,000 tons before treatment.

Alternative 4 provides no reduction of volume for any of the excavated soils, but further reduces the mobility of the contaminants by placing the soil in a permitted RCRA-solid or -hazardous waste facility. For those soils that are stabilized, the volume would increase slightly, but the treatment process is irreversible and the treatment residuals that remain would be contained in a RCRA landfill. Therefore, Alternative 4 does not satisfy statutory preference for treatment for all of the excavated soil, but does partially satisfy the requirement.

Short-term Effectiveness

No residents will be relocated during implementation of Alternative 4, but house interiors would be cleaned after remediation is completed. When required, Level C protection for construction workers would be implemented to prevent inhalation or ingestion of lead- or arsenic-contaminated soil and dust. Dust generated during construction could create an environmental impact, but State and Occupational Safety and Health Administration (OSHA) regulations governing dust suppression would be enforced. The time required to implement Alternative 4 is estimated at approximately one and a half years.

Implementability

Excavation and off-site disposal is a relatively simple process with proven procedures. It is a labor-intensive practice with little potential for further automation. Standard soil excavating, hauling, backfilling, and grading techniques are used in Alternative 4. The construction equipment, specialists, materials, technologies, services, and capacities needed are readily available from several Utah vendors. Soil excavated for the planting of trees and shrubs during post-remediation landscaping may be transported to a hazardous waste landfill for disposal, and toxicity testing and stabilization/fixation of this soil may be required. Significant coordination with local, state, and federal agencies will be required to obtain approval of a landfill suitable for disposal of the contaminated soil.

If additional remediation were required after construction of Alternative 4 is complete, the new remedial action would not destroy the original remedy. However, any soil removed from below a depth of up to 18 inches in formerly contaminated properties or contaminated streets, alleys, and public right of way should be tested for toxicity and sent to an appropriate landfill for disposal. Some minor coordination with local agencies would be required to provide the necessary institutional controls.

Cost

Capital costs are estimated at $13,627,649 for Alternative 4 and O&M costs are estimated at $141,270. The annual O&M cost includes only an annual report, at $4,709 per year, documenting compliance with institutional controls in Stockton. These capital and O&M costs combine for a total present worth cost of $13,689,000.

8.0 SUMMARY OF THE COMPARISON OF ALTERNATIVES

A comparative analysis is conducted to evaluate the relative performance of each alternative in relation to each specific evaluation criterion. This is in contrast to the detailed analysis of alternatives in Section 7, in which each alternative was analyzed independently without consideration of other alternatives. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another. Table 8-1 summarizing the comparison is located at the end of this section.

Overall Protection of Human Health and the Environment

Alternative 1 provides no additional human health or environmental protection over that accomplished by the EPA emergency response and does not provide a sufficient level of protection to mitigate the risks described in Section 6. Alternative 2 provides slightly more protection due to the addition of a six inch soil cover over the contaminated soil, but does not reduce any existing soil lead or arsenic levels. Alternative 3 provides the greatest protection because it removes contaminated soil to a depth of eighteen inches and treats 100 percent of the excavated soil and produces only recyclable metals and clean, reusable soil. Alternative 4 provides equal human health protection to Alternative 3 because it removes contaminated soil to an equal depth, but is less protective of the environment because only 25 percent of the soil is treated and placed in a landfill, while the other 75 percent receives no treatment. However, the percentage treated in Alternative 4 is the most highly contaminated portion, which contains much more than 25 percent of the total contaminant mass. Due to the lack of natural habitat within OU1, all remedies evaluated for OU1 are considered protective of the environment. Ecological risk will be further evaluated under OU2. Alternatives 3 and 4 provide the highest level of protection of the environment, Alternative 2 offers some added protection, and Alternative 1 offers no additional protection over current conditions.

Compliance with ARARs

All of the alternatives except Alternative 1 comply with ARARs.

Long-term Effectiveness and Permanence

Alternative 1 provides no means of mitigating risk over the long-term and is ineffective. Alternative 2 provides a higher level of protection, though the institutional controls required to make it effective and permanent over the long-term would be difficult to enforce and a burden to property owners. Alternative 3 provides the greatest amount of long-term effectiveness and permanence, because all excavated soils would be treated. Altervative 4 provides a similar degree of long-term effectiveness and permanence as Alternative 3, with the exception that some of the excavated soil would be placed untreated into a landfill which requires long-term management.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives 1 and 2 provide no treatment and no reduction of toxicity or volume of the contaminated soil, are reversible, and do not comply with the statutory preference for treatment. However, Alternative 2 provides some reduction in mobility through reduction in erosion potential by wind and water. Alternative 3 provides treatment of 100 percent of the excavated contaminated soils, is irreversible, leaves only recyclable metals as residuals, and complies with the EPA preference for treatment. Alternative 4 treats the most highly contaminated soil, approximately 25 percent of the total quantity excavated; disposes of all of the excavated soil in a RCRA-approved landfill; and is irreversible. However, Alternative 4 only partially complies with the statutory preference for treatment.

Short-term Effectiveness

Alternative 1 does not impact the community, workers, or the environment during remediation because there is no remedial action. Therefore, this alternative has the least amount of short-term impacts. Of the three other alternatives, Alternative 2 generates the least traffic, least dust, and fewer impacts to the community and to workers because it involves no excavation. Therefore, it has greater short-term effectiveness than either of the excavation alternatives (Alternatives 3 and 4). Alternative 3 has the potential for slightly more impact to the community and to remediation workers than Alternative 4 because the soil washing operation will be done in the community, whereas soil disposal in Alternative 4 will be done outside the community. If stabilization/fixation of the Alternative 4 soils is accomplished at OU1, instead of at the landfill, it will still impact the community less than Alternative 3 because fewer tons of soil will be treated and fewer truckloads of soil will be double handled. The time required to complete the remedial action is approximately the same for Alternatives 2, 3, and 4.

Implementability

Alternative 1 is the easiest alternative to implement technically because nothing will change from the past emergency response conditions at OU1. Alternative 2 is the second most easily implemented alternative technically because the necessary remediation equipment and personnel are readily available in Utah. However, this alternative will be extremely difficult to implement administratively because a strict, long-term health and compliance monitoring program is required to maintain its protectiveness. Alternative 3 is the most difficult to implement technically because the technology, services, specialized personnel, and equipment are not available in Utah or neighboring states. Administratively, Alternative 3 should be the easiest to implement because the soil is entirely treated and reused, reducing the concerns of regulatory agencies and requiring considerably less long-term maintenance than Alternative 2. Alternative 4 is the third easiest alternative technically, but second administratively, because it can be accomplished using locally available personnel and equipment, it removes all of the contaminated soil from the community, and it incorporates the same administrative maintenance requirements as Alternative 3. Additional remediation will have dramatic impacts on Alternative 1 and Alternative 2 and will have less serious, but equivalent, impacts on Alternatives 3 and 4.

Cost

By definition, the capital and O&M costs for Alternative 1 are zero, making it the least costly. The capital cost for Alternative 2 is the second least expensive, approximately $6 million, but the long-term O&M costs are the highest at $562,000 for 30 years (see Table 11-2). Alternative 3 has by far the highest capital cost at approximately $52 million, and the same O&M costs as Alternative 4—$141,000 for 30 years. Alternative 4 has capital costs 1/4 the comparable costs for Alternative 3, approximately $13.5 million, making the present worth cost of Alternative 3 approximately $52.5 million and that of Alternative 4 approximately $14 million.

State Acceptance

The Utah Department of Environmental Quality is the lead agency for the Site and prefers Alternative 4.

Community Acceptance

The community indicated acceptance Alternative 4 as the selected remedy during several town forum meetings and the public meeting. No comments opposing the selected remedy were received.

A summary of the comparative analysis for the threshold and balancing criteria using a number ranking system is presented in Table 8-1. The table uses a number evaluation scale, with 1 being the best and 4 being the worst. The numerical ranking shows Alternatives 3 and 4 rank similarly; however, the cost of Alternative 4 is much lower than that of Alternative 4. A summary of costs for the four remedial alternatives is presented in Table 8-2.

Table 8-1
Comparative Analysis of Alternatives

Criteria	Alternative 1 No Action	Alternative 2 Soil Cover/ Institutional Controls	Alternative 3 Soil Washing/Reuse	Alternative 4 Excavation/Disposal
OVERALL PROTECTIVENESS				
Human health	4	3	1	1
Environmental protection	4	3	1	2
COMPLIANCE WITH ARARS				
Chemical-specific ARAR	4	3	1	1
Location-specific ARAR	4	3	1	1
Action-specific ARAR	4	3	1	2
Other criteria/guidance	4	3	1	1
LONG-TERM EFFECTIVENESS AND PERMANENCE				
Magnitude of residual risk	4	3	1	2
Adequacy and reliability of controls	4	3	1	2
REDUCTION OF TOXICITY, MOBILITY, VOLUME				
Treatment process used	4	4	1	2
Amount destroyed or treated	4	4	1	2
Reduction of toxicity, mobility, or volume	4	3	1	2
Irreversible treatment	4	3	1	2
Type and quantity of residuals remaining after treatment	4	4	1	3
Statutory preference for treatment	4	4	1	2
SHORT-TERM EFFECTIVENESS				
Community protection	1	2	4	3
Worker protection	1	2	4	3
Environmental impacts	1	2	4	3
Time until action is complete	1	2	2	2
IMPLEMENTABILITY				
Ability to construct and operate	1	2	4	3
Ease of additional remediation, if needed	1	4	3	3
Ability to monitor effectiveness	1	4	2	2
Ability to obtain approval from other agencies	4	3	1	2
Availability of services and capacities	1	2	4	2
Availability of equipment, specialists, materials	1	2	4	2
Availability of technology	1	2	4	2
COST				
Capital	1	2	4	3
30-year O&M Cost	1	4	2	2
Present worth cost	1	2	4	3
RANKING TOTALS	**73**	**81**	**60**	**60**

Table 8-2
Summary of Remedial Alternative Costs

Alternative	*Total Capital Cost in 1999 Dollars*	*Estimated Yearly O&M Cost in 1999 Dollars*	*Duration of O&M*	*Total O&M Costs*	*Total O&M Present Worth Cost*[1]	*Total Cost in 1999 Dollars*[2]
1 - No Action	$0	$0	NA	$0	$0	$0
2 - Soil Cover with Institutional Controls	$6,219,912	$19,378	29 years	$581,340	$233,481	$6,453,393
3 - Excavation, Soil Washing, and Reuse	$52,383,447	$4,709	30 years	$141,270	$61,451	$52,444,898
4 - Excavation and Disposal	$13,627,649	$4,709	30 years	$141,270	$61,451	$13,689,100

1. A discount rate of 5% and an inflation rate of 1.6-2.1% were used to calculate present worth (1999) O&M costs. Rates were taken from *Economic Analysis Reference Guide, Army Military Construction* (USACE 1999).
2. Total costs accurate to within -30 to +50%.

9.0 EXCAVATION AND DISPOSAL - THE SELECTED REMEDY

9.1 DESIGNATION OF THE SELECTED REMEDY

Based upon the results of the systematic screening process described above, UDEQ and EPA agree that Alternative 4, Excavation and Disposal, most completely satisfies the analysis criteria and is designated as the selected remedy for OU1. While both Alternatives 3 and 4 score similarly in the ranking process, only Alternative 4 is both sufficiently protective of human health and the environment and cost-effective. Additionally, Alternative 4 is preferred by both the State of Utah and the local community. This remedy has been used successfully at a number of similar lead sites in Utah and throughout Region 8. The remedy will be considered complete when the following four performance measures, or key components, are accomplished:

- Excavate soils within OU1 exhibiting (1) mean surface lead concentrations greater than 500 ppm, (2) mean subsurface lead concentrations greater than 800 ppm, or (3) mean surface arsenic concentrations greater than 100 ppm. Excavation will occur to a depth at which mean concentrations are below 500 ppm lead and 100 ppm arsenic or to a maximum depth of eighteen inches. Affected properties include residential yards, vacant lots, rights of way, and unpaved streets and sidewalks. Test excavated material for characterization as hazardous waste. If material is classified as hazardous waste, treat off-site using fly-ash or cement stabilization and dispose of in an off-site, RCRA Subtitle C landfill. If material is classified non-hazardous waste, dispose of in an off-site, RCRA Subtitle D landfill.

- Replace the excavated soil with up to twelve inches of clean backfill and six inches of clean topsoil. Re-landscape affected properties.

- Clean the interior of affected properties to remove any previously contaminated indoor dust.

- Develop and implement institutional controls to restrict exposure to residual contamination below eighteen inches or below existing structures.

These four performance standards will ensure the RAOs are met by removing the principle threat wastes (contamination above eighteen inches) and providing controls to protect against exposure to any remaining low-level threat wastes (contamination below eighteen inches or below existing structures). The remedy would be consistent with any ground water remedy required under OU2, as removal of the contaminated soil to a depth of eighteen inches will prevent migration of these contaminants to ground water. Contamination below eighteen inches represents only a very small percentage of overall volume at the site, so protection of ground water does not depend upon removal of this small percentage.

9.2 IMPLEMENTATION OF THE REMEDY

The remedy will be implemented following remedial design activities. During design, each affected property owner will be consulted regarding the current and post remedial condition of their property. Affected properties are shown in Figure 6-6. Soil will not be removed from below existing concrete or asphalt structures, such as improved driveways or sidewalks. Soils will not be removed from below existing homes or from crawl spaces or basements. Wherever dirt floors exist and contamination above the action levels is identified, these dirt floors will be covered with a concrete slab to prevent exposure. Properties will be left in, or returned, to as close to original condition as possible, except in the cases in which (1) the property owner desires differently and there is no appreciable increase to the government in either costs or effort, and (2) it is unsafe to return the property to original condition. Physical construction will be considered complete when all properties and areas identified for remediation have been addressed and returned to satisfactory condition. Property owners will receive an assurance that construction and vegetation are warrantied for one year. Following construction, all homes affected by the remediation will be thoroughly cleaned to remove any contaminated dust. The physical construction involved in the remedial action is expected to take approximately one and a half years.

During excavation, sampling will be conducted to identify properties with contamination above 500 ppm lead or 100 ppm arsenic remaining below eighteen inches or existing structures. Using this information, a suitable Institutional Control Plan will be developed in conjunction with State and local governments. The purpose of the institutional controls will be to restrict exposure to residual contaminated soils below eighteen inches or below existing structures. UDEQ is ultimately responsible for implementing this plan, though local governments may be the actual implementing agency. At this time, it is considered too early to develop details of such a plan.

Sampling will be conducted in coordination with the selected landfill to determine which soils are classified as hazardous waste under RCRA Subtitle C using the Toxicity Characteristic Leaching Procedure and guidelines established in SW-846, Update Three (USEPA 1997). Based upon previous sampling, it is estimated that less than 1% of the excavated soil will be classified as hazarardous waste.

A detailed cost estimate for the selected remedy is given in Appendix B.

9.3 EXPECTED OUTCOMES OF THE REMEDY

Implementation of the remedy will allow for residential use within OU1. Future health risks due to lead or arsenic in soils will be reduced to acceptable levels and the health of the community with regards to these risks should improve. Property values are expected to increase as the stigma of contamination is removed. New landscaping should also improve property values and the overall appearance of Stockton. Residents will be able to conduct normal landscaping activities without fear of contacting contamination.

Institutional controls will impart a minor burden, as major excavation activities such as removing driveways, adding basements, or other deep digging will require working with the appropriate government agency and using management practices to protect against exposure.

10.0 STATUTORY DETERMINATIONS

The selected remedy must satisfy requirements set forth in the National Contingency Plan (NCP), 40 CFR 300.430(f). In accordance with these requirements the selected remedy must:

- Provide for the overall protection of human health and the environment and comply with ARARs (unless specific ARARs are waived).

- Be cost effective (meaning the costs are proportional to the overall effectiveness, where overall effectiveness accounts for long-term effectiveness, short-term effectiveness, and reduction in toxicity, mobility, and volume).

- Use the to the maximum extent practicable permanent solutions employing treatment and/or resource recovery technologies. This requirement is fulfilled by selecting an alternative that satisfies the threshold criteria (overall protection of human health and the environment, compliance with ARARs), provides the best balance of the five balancing criteria (long-term effectiveness; short-term effectiveness; and reduction in toxicity, mobility, or volume; implementability; and cost) and considers preference for treatment as a principal element of the remediation with a bias against off-site land disposal of untreated waste.

Based on these requirements and the following key considerations from the Detailed Analysis of Alternatives, both EPA and UDEQ agree that Excavation and Off-site Disposal meets all statutory requirements in the NCP except the preference for treatment:

- The selected remedy will satisfy all ARARs as well as provide a high level of protectiveness for human health and the environment.

- The selected remedy provides a similar level of overall effectiveness as Alternative 3 at roughly 1/4 the cost. Alternatives 1 and 2 do not provide sufficient overall protection or effectiveness.

- Few effective treatment technologies exist for heavy metals and those that do are not cost effective when compared to the selected remedy. The benefits gained for OU1 through the use of treatment do not justify an additional expenditure of roughly 39 million dollars. Additionally, under the selected remedy, all excavated wastes which are classified as hazardous will be treated prior to land disposal, resulting in partial attainment of the preference for treatment.

CERCLA Section 121(c) requires that five-year reviews be conducted if the remedial action results in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure. The review evaluates whether a remedy continues to provide adequate protection of human health and the environment. Because contamination above the action levels will be left in place below eighteen inches, five year reviews will be required for OU1 to ensure the institutional controls are functioning as intended.

11.0 Explanation of Significant Changes

No significant changes exist between the Proposed Plan and this ROD.

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APPENDIX A
DETAILED ANALYSIS OF ARARS

EVALUATION OF ARARs

To assist with the selection and implementation of the selected remedy, an evaluation of state and federal requirements was conducted to identify ARARs for OU1. The ARARs evaluation is a two-part process to determine (1) whether a given requirement is applicable and, if it is not applicable, then (2) whether it is both relevant and appropriate.

1. **Applicable requirements** are cleanup standards and environmental protection regulations per federal or state law that specifically address a hazardous substance, contaminant, remedial action, location, or other circumstance at a CERCLA site.

2. **Relevant and appropriate requirements** are cleanup standards and environmental protection regulations per federal and state law that do not directly and fully address a specific hazardous substance, contaminant, remedial action, location, or other circumstance at a CERCLA site, but address problems or situations similar to those encountered at the CERCLA site.

CERCLA actions may have to comply with several types of requirements. For this reason, ARARs are typically divided into three categories:

1. **Chemical-specific ARARs** are regulatory health or risk associated numerical values that govern acceptable concentrations of a chemical in different matrices, such as air, water, or soil. The most stringent standard should be used in the event a chemical has more than one requirement.

2. **Action-specific ARARs** are determined according to the specific technologies or activities taking place under each alternative.

3. **Location-specific ARARs** are determined according to site-related characteristics such as flood plains, wetlands, sensitive ecosystems and habitats, and historic places.

Additionally, **"To Be Considered" Criteria** (TBCs) are proposed standards, advisories, and guidance developed by federal and state regulators that are intended to provide useful information and recommendations but are not legally binding.

The following tables identify the chemical, action, and location-specific ARARs for OU1 as well as TBC criteria used in evaluating and selecting the preferred alternative..

Chemical-Specific ARARs

Title	Citation	ARAR
Clean Air Act	42 USC §7401-7642	Applicable
National Ambient Air Quality Standards	40 CFR Part 50	Applicable
Utah Air Conservation Act:	19-2 UCA	Applicable
• Fugitive emissions and fugitive dust	UAC R307-205	
• NAAQS standards	UAC R307-405	
• Visible emissions standards	UAC R307-201	

Notes:

CFR	Code of Federal Regulations
UAC	Utah Administrative Code
UCA	Utah Constitution Amended
USC	United States Code

Action-Specific ARARs

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Solid and hazardous waste definitions		Contaminated soils left in place or removed are defined in the regulations.	UAC R315-1 UAC R315-2	Applicable	Applies to all alternatives
Groundwater protection	Must meet requirements of Utah Groundwater Quality Protection Rules (19-5 UCA)	Alternatives must be designed to be protective of groundwater: • Residual contamination must not represent a leaching threat to groundwater. • Treatment process discharges that may impact groundwater must meet groundwater quality protection requirements.	UAC R317-6	Applicable	Applies to all alternatives
Air emissions	Must meet requirements of Utah Air Conservation Act (19-2 UCA): • Fugitive emissions and fugitive dust • NAAQS standards • Visible emissions standards	Alternatives must be designed to be protective of air quality and minimize fugitive dust and emissions.	UAC R307-205 UAC R307-405 UAC R307-201	Applicable	Applies to all alternatives
Construction Quality Assurance (QA) Plan	Construction QA program general facility standards required of all waste piles and landfills.	-Waste piles and landfills constructed after 1992 must meet all design criteria and specifications in the permit. -CQA officer must be a registered professional engineer.	40 CFR 264.19 UAC R315-8-2.10	Relevant and appropriate	One alternative leaves contaminated soil in place and covers it with clean soil. Two other alternatives may use temporary stockpiles.
General closure	General requirements to be considered in establishing cleanup standards under Cleanup and Risk-Based Closure Standards Policy for CERCLA and UST Sites.	Must establish risk-based cleanup and closure standards at OU1 for remediation or removal of contaminated soil to background levels.	40 CFR 254.11 UAC R311-211 UAC R315-101	Applicable	Applies to the remedial alternatives at OU1 pursuant to CERCLA.
Excavation	Placement on or in land outside area of contamination will trigger land disposal requirements and restrictions. Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the evacuated waste or closure requirements for the landfill in which the waste is being placed.	 Materials containing RCRA-hazardous waste subject to land disposal restrictions are placed in a landfill.	40 CFR 268 (Subpart D) 40 CFR 268 (Subpart D) UAC R315-13-1	Applicable	Applies to removal alternatives.

Action-Specific ARARs

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Location standards for hazardous waste facilities	Location of new disposal facilities must include geologic and hydrologic investigations.	Location of new disposal facilities must include: -Seismic safety investigation -Floodplain determination -Salt dome and salt bed determination -Underground mine and cave location	40 CFR 264.18 UAC R315-8-2.9	Relevant and appropriate	One alternative leaves contaminated soil in place and covers it with clean soil.
Operation and maintenance	30-year post-closure care to ensure that site is maintained and monitored.	Land disposal closure.	40 CFR 256.310; UAC R315-8-14.5	Applicable	Applies to alternative that leaves contaminated soil in place and covers it with clean soil.
Surface water control	Prevent run-on and control and collect runoff from a 24-hour, 25-year storm (waste piles, land treatment facilities, and landfills).	RCRA-hazardous waste treated, stored, or disposed after the effective date of the requirements.	40 CFR 264.251(c), (d); UAC R315-8-12.2(c)(d) 40 CFR 264.273(c), (d); UAC R315-8-13.4(c)(d) 40 CFR 264.310(c), (d); UAC R315-8-14.2(c)(d)	Applicable	Applies to removal alternatives that may use temporary stockpiles.
Waste pile storage	Waste temporarily placed in waste pile to use a double-liner and leachate collection system	RCRA-hazardous, non-containerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	40 CFR 264.251; UAC R315-8-12	Applicable	Applies to removal alternatives that may use temporary stockpiles.
Tank storage	Liquid waste temporarily placed in a tank during treatment	RCRA-hazardous, accumulation of liquid nonflammable hazardous waste in a tank that is used for treatment or storage.	40 CFR 264.251; UAC R315-8-10	Applicable	Applies to removal alternatives that may use tanks.
Container storage	Waste temporarily placed in a storage container or roll-on, roll-off container during treatment or in storage before shipment to a landfill.	RCRA-hazardous, containerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	40 CFR 264.251; UAC R315-8-9	Applicable	Applies to removal alternatives that may use containers.
UPDES standards	Apply to discharge to POTW or surface water	Treatment alternatives discharging water must meet UPDES standards.	UAC R317-8	Applicable	One alternative uses water that must be treated and reused for soil washing and metal precipitation.
Waste treatment	Treatment of restricted hazardous wastes prior to land disposal must attain concentration-based or technology-based treatment standards.	Wastes to be treated must be identifiable as restricted hazardous wastes.	40 CFR 268 (Subpart D); UAC R315-13	Applicable	Applies to the removal alternatives that treat soil.
Hazardous waste generator	Requirements apply to all hazardous waste removed from OU1.	Contaminated soil must be removed, not left in place	UAC R315-5	Applicable	Applies to the removal alternatives that treat soil.

Action-Specific ARARs

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Cap or cover	Placement of a cover over waste (e.g., closing a landfill, or closing a surface impoundment or waste pile as a landfill, or similar action) requires a cover design and construction to:	RCRA-hazardous waste placed at site after November 19, 1980, or movement of hazardous waste from one area of contamination or location into another area of contamination will make requirements applicable. Capping without such movement will not make requirement applicable, but technical requirements are likely to be relevant and appropriate.	40 CFR 264.310(a); UAC R315-8-14.5(a)	Relevant and appropriate	One alternative leaves contaminated soil in place and covers it with clean soil.
	• Provide long-term minimization migration of liquids through the capped area		40 CFR 264.228(b); UAC R315-8-11.5(a)		
	• Function with minimum maintenance				
	• Promote drainage and minimize erosion or abrasion of the cover				
	• Accommodate settling and subsidence so that the cover's integrity is maintained				
	• Have a permeability less than or equal to the permeability of any natural subsoils present		40 CFR 264.117(c); UAC R315-8-7		
	• Restrict post-closure use of property as necessary to prevent damage to the cover				
	• Prevent run-on and runoff from damaging cover		40 CFR 264.228(a)(2); UAC R315-8-11.5(a)(2)		
	• Protect and maintain surveyed benchmarks used to locate waste cells (landfills, waste piles)		40 CFR 26.228(a)(2) and 40 CFR 254.258(b); UAC R315-8-11.5(a)(2) and UAC R315-8-12.6(b)		
	• Eliminate free liquids by removal or solidification		40 CFR 264.310; UAC R315-8-14.5		
	• Stabilize the final cover to provide long-term minimization of filtration.				

Ac[illegible]pecific ARARs

Action	Requirement	Prerequisite	Citation	ARAR	Comment
Soil treatment and reuse	Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	May apply to contaminated soil, including soil from excavation, then returned to land.	40 CFR 264.111; 40 CFR 264.178; 40 CFR 264.197; 40 CFR 264.228(a)(1) and 40 CFR 264.258; UAC R315-8-9.9 and UAC R315-8-11.5	Applicable	Applies to the removal alternatives that treat soil.
Off-site management of CERCLA wastes	Applies to any remedial or removal action involving off-site transfer of any hazardous substance or contaminant taken pursuant to any CERCLA cleanup.	EPA Regional Office will determine acceptability of any facility selected for treatment, storage, or disposal of CERCLA waste.	40 CFR 300.440	Applicable	Applies to alternative that involves landfill disposal of RCRA-characteristic waste.

Notes:

CFR	Code of Federal Regulations
UAC	Utah Administrative Code
UCA	Utah Constitution Amended

Location-Specific ARARS

Title	Citation	ARAR
National Historic Preservation Act	16 USC §470,40 CFR §6.301b 36 CFR Part 800	Applicable
Archaeological and Historic Preservation Act	16 USC §469 40 CFR 6.301(c)	Applicable

Notes:

CFR	Code of Federal Regulations
USC	United States Code

Criteria "[redacted] Be Considered"

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Soil lead levels for children	Centers for Disease Control and Prevention (CDC) guidance for determining soil lead action levels	CDC recommends that there should be no more than a 5 percent chance that children aged 0—3 years have blood lead levels higher than 10 ug/dL.	"Preventing Lead Poisoning in Young Children" -CDC	TBC	Reference is CDC published statement dated October 1991
Soil treatment standards	Prior to adoption by states of the Phase IV soil treatment standards, other LDR standards (including Phase IV) apply (finalized May 26, 1998). See Table 8-2 and next column. The soil treatment standards are effective only for soil: (1) In states not authorized for the LDR program (2) In all states if the soil fails the TCLP test for one or more metal constituent (TC metal soil) (3) In all states if the soil is contaminated with a characteristic mineral processing waste.	Because the soil treatment standards are less stringent then existing federal requirements, they are generally not available in authorized states unless and until the states adopt the standards. To the extent they do not conflict with any independent state LDRs or treatment requirements, the soil treatment standards are also available in states in which EPA is responsible for implementation of the LDR program as follows: (1) <u>States in which EPA is responsible for implementing the LDR program in its entirety</u>. In these states, there are no authorized state LDR requirements against which to assess the relative stringency of the soil treatment standards. Therefore, as new HSWA requirements in a non-authorized state, the soil treatment standards are effective and implemented by EPA unless and until the state adopts and becomes authorized for the standards. (2) <u>States that are authorized to implement the LDR program but in which EPA is responsible for implementation of the land disposal restriction treatment standards for certain wastes</u>. Soil treatment standards are available for soil contaminated by the wastes for which EPA is responsible for implementation of LDR treatment standards, provided the state does not have a treatment standard in state law that is more stringent than the soil treatment standards. For example, for TC metal wastes, EPA is responsible for implementing the LDR treatment standards. Therefore, for TC metal soil, the soil treatment standards are available. However, many states have treatment standards for metals that are more stringent than the soil treatment standards; in this case the more stringent state treatment standards would control in lieu of the Federal soil standards. <u>For example, the soil treatment standard for lead is 90 percent reduction or 7.5 ppm (whichever is less stringent), but Utah currently has a treatment standard for lead of 5 ppm (which was adopted from the LDR Third rule). In this case, the more stringent state treatment standard of 5 ppm would apply to TC characteristic levels of lead in contaminated soil unless and until the state adopted the soil treatment standards</u>.	40 CFR 268.49	TBC	(1) If Utah adopts the Phase IV soil treatment standards before the OU1 ROD is signed, the Phase IV standards will be applicable to the lead disposal options instead of the current 5 mg/L TCLP standard. (2) Soil contaminated with TC metal wastes must meet LDRs for underlying hazardous constituents in all states. If a state becomes authorized only for Phase II and not for Phase IV, the soil standards for D012-D043 in Phase IV (i.e., 10 x UTS or 90 percent reduction) will be superseded at the time of authorization by the Phase II treatment standards, which provide no special standards for contaminated soil.

Criteria "To Be Considered"

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Transportation of hazardous materials	Regulates the manifesting and transport of hazardous materials	Manifests and placarding of trucks, shipping containers, or rail cars required for shipment of all hazardous materials.	-49 CFR Parts 172—179, 49 -CFR Part 1387 -DOT-E 8876 -UAC R315-4 -UAC R315-6	TBC	One alternative involves transportation of RCRA-characteristic waste to an off-site landfill.

Notes:

CDC Centers for Disease Control and Prevention
CLP Contract Laboratory Program
EPA U. S. Environmental Protection Agency
HSWA Hazardous and Solid Waste Act
LDR Land disposal restriction
TBC Other criteria to be considered
TC Toxicity characteristic
UTS Universal treatment standards

APPENDIX B
DETAILED COST ESTIMATE
FOR SELECTED REMEDY

JACOB SMELTER OU1
CAPITAL COST ESTIMATE

Alternative 4--Excavation with Disposal

Item Number	Description	Units	Quantity	Unit Costs	Extension
1	Mobilization	LS	1	$50,000	$50,000
2	Truck Scale	LS	1	$40,000	$40,000
3	Clear & Grub Concrete, Rock, Asphalt [1]	Ton	4,571	$30	$137,117
4	Clear and Grub Fences [1]	LF	24,785	$4	$99,140
5	Clear and Grub Trees [1]	Each	360	$700	$252,000
	Remove soils 500 ppm - 1,500 ppm				
6	Excavate Soil Alleys/Platted Roads	Ton	13,346	$5	$66,728
7	Excavate Soil Residential Lots	Ton	72,884	$5	$364,419
8	Excavate Soil inside ROW, Outside Pvmnt	Ton	17,595	$5	$87,977
9	Hand Excavate Soil inside Residential Lots [1]	Ton	134	$50	$6,700
	Remove soils >1,500 ppm	Ton			
10	Excavate Soil Alleys/Platted Roads	Ton	7,275	$5	$36,375
11	Excavate Soil Residential Lots	Ton	21,137	$5	$105,684
12	Excavate Soil inside ROW, Outside Pvmnt	Ton	7,417	$5	$37,086
13	Hand Excavate Soil inside Residential Lots [1]	Ton	46	$50	$2,300
14	Stabilize Soil >1500 ppm	Ton	35,875	$50	$1,793,750
15	Transport Soil from Alleys/Platted Roads	Ton	20,621	$2	$41,241
16	Transport Soil from Residential Lots	Ton	94,067	$2	$188,134
17	Transport Soil from ROW, Outside Pvmnt	Ton	25,013	$2	$50,025
18	Dispose Soil from Alleys/Platted Roads	Ton	20,621	$20	$412,410
19	Dispose Soil from Residential Lots	Ton	94,067	$20	$1,881,335
20	Dispose Soil from ROW, Outside Pvmnt	Ton	25,013	$20	$500,250
21	Dispose hazardous waste soil	Ton	840	$200	$168,000
22	Haul, Place Clean Soil to Alleys/Platted Roads	Ton	17,574	$10	$175,740
23	Haul, Place Clean Soil to Residential Lots	Ton	62,711	$12	$752,534
24	Haul, Place Clean Soil toROW, Outside Pvmnt	Ton	20,066	$10	$200,660
25	Haul, Place Top Soil [1]	Ton	31,356	$20	$627,112
26	Construct Ditches All Widths [1]	LF	9,240	$5	$46,200
27	Haul, Place Road Base [1]	Ton	9,972	$15	$149,575
28	Asphalt Paving [1]	Sq Ft	51,620	$5	$258,100
29	Storm Drain Culverts CMP & RCP [1]	LF	450	$20	$9,000
30	Utility coordination	Per House	90	$3,000	$270,000
31	Replace septic tank & leach field	Each	9	$7,500	$67,500
32	Remove and replace fences [1]	LF	24,785	$15	$371,775
33	Remove and Replace Fence Gates [1]	Each	180	$250	$45,000
34	Trees (2-inch caliber trees) [1]	Each	450	$350	$157,500
35	Sod	Sq Ft	773,810	$0.75	$580,358
36	Seeding	Acre	13	$2,000	$25,047
37	Landscaping, bedlines, rock, mulching etc	Per Lot	90	$5,000	$450,000
38	Remove and replace sheds	Each	45	$3,500	$157,500
39	Shrubs [1]	Each	900	$40	$36,000
40	Remove & replace retaining walls	Sq Ft	7200	$10	$72,000
41	Replace Irrigation Systems	Each	23	$4,500	$101,250
42	Remove, corral and return livestock	Per House	20	$2,000	$40,000
43	Dispose of exterior items	Per House	43	$1,500	$64,000
44	Clean house interior	Per House	90	$2,000	$180,000
45	Health & Safety Ambient Air Monitoring	LS	1	$20,000	$20,000
46	Final Site Wide Clean-up	LS	1	$50,000	$50,000
47	Demobilization	LS	1	$35,000	$35,000

[1] Basis for Costs was Sharon Steel - Average of Phases 2, 3 and 4.

Subtotal	$11,262,520
Unidentified Construction Costs (10%)	$1,126,252
Construction Management (10%)	$1,238,877
TOTAL	**$13,627,649**

JACOB SMELTER OU1
CAPITAL COST ESTIMATE

Assumptions Sheet

1 All alleys and proposed roads within the lead concentrations contour lines will be remediated.
2 Residential lots with surface soil lead values greater than 500 mg/kg will be remediated.
Residential lots with subsurface soil lead values greater than 800 mg/kg will be remediated.
3 If lead tests indicated that half of the lot is greater than the action level and half is less than the action level, the entire lot will be remediated.
4 All paved roads will not be remediated.
All paved roads will be damaged during material hauling and reconstructed with 6" base course and 4" asphalt.
5 All non-paved areas within the right-of-way (ROW) will be remediated that have lead concentration contours covering the segment of road.
6 All exposed areas on the residential lots will be remediated.
7 All residences having a house structure have a fence which extends across the full width of the back yard, extends half way up the side yards, and has 60 additional feet to connect from the property line to the house.
8 All vacant lots have no fences.
9 Four trees per lot having a house will be cleared and grubbed.
Five 2-inch caliber trees are estimated for each lot having a house.
10 10 bushes are estimated for planting at each lot having a house.
11 All residential lots have sod replacement, based on total square footage of the lot minus 1500 sq ft for the house footprint, minus 700 sq ft (20' x 35') for the driveway footprint.
12 All vacant lots will be topsoiled and hydroseeded.
13 10% of septic tanks and leach fields will need to be replaced per Tooele County Standards.
14 1/2 of the lots with houses have sheds that will be removed and replaced with new structures
15 1/4 of the lots with houses have irrigation systems that will be replaced.
16 1/3 of the lots have exterior items requiring disposal.

TABLE IV-1
Net Present Cost of Construction, Operation, Maintenance, and Monitoring
Alternative 4--Excavation/Disposal Alternative

Cost Component/Year	0	1	2	3	4	5	6	7	8	9	10
Capital costs	$13,627,649										
Annual monitoring costs	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709
Subtotal annual expenditures	$13,632,358	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709
Inflation factor (1.6% to 2.1%)[a]	1.000	0.983	0.967	0.945	0.920	0.901	0.883	0.865	0.847	0.829	0.812
Discount factor (5%)[b]	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present worth[c]	$13,632,358	$ 4,410	$ 4,130	$ 3,845	$ 3,565	$ 3,326	$ 3,102	$ 2,894	$ 2,699	$ 2,518	$ 2,349

Cost Component/Year	11	12	13	14	15	16	17	18	19	20
Capital costs										
Annual monitoring costs	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709
Subtotal annual expenditures	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709
Inflation factor (1.6% to 2.1%)[a]	0.796	0.779	0.763	0.748	0.732	0.717	0.702	0.688	0.674	0.660
Discount factor (5%)[b]	0.585	0.557	0.530	0.505	0.481	0.458	0.436	0.416	0.396	0.377
Present worth[c]	$ 2,191	$ 2,043	$ 1,906	$ 1,778	$ 1,659	$ 1,547	$ 1,443	$ 1,346	$ 1,256	$ 1,171

Cost Component/Year	21	22	23	24	25	26	27	28	29
Capital costs									
Annual monitoring costs	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709
Subtotal annual expenditures	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709	$4,709
Inflation factor (1.6% to 2.1%)[a]	0.646	0.633	0.620	0.607	0.595	0.583	0.571	0.559	0.547
Discount factor (5%)[b]	0.359	0.342	0.326	0.310	0.295	0.281	0.268	0.255	0.243
Present worth[c]	$ 1,093	$ 1,019	$ 951	$ 887	$ 827	$ 772	$ 720	$ 671	$ 626
Total Present Worth (30 years)									$ 13,659,100

Note:

[a] See "Economic Analysis Reference Guide" for Inflation; Inflation factor = 1/(1+Inflation rate)exponent"Year"

[b] See "Economic Analysis Reference Guide" for Discount Rate; Discount factor = 1/(1+Discount rate)exponent"Year"

[c] Present worth = Annual expenditures x Inflation factor x Discount factor

Assumes that Year 0 is the year 2000

TABLE IV-2

Monitoring Summary Reports—Annual

Description	Notes	Unit	Quantity per Event	Frequency (Events per Year)	Unit Cost	Total	Source
Other Direct Charges (ODC)							
Reproduction	10 copies, 25 pages per copy	Page	250	1	$0.10	$25	URS
Postage/packaging	Express Mail/FedEx	Package	3	1	$20.00	$60	FedEx
ODC Subtotal						$85	
Labor Charges							
Project management (PM)	PM labor rate	Hour	12	1	$148.45	$1,781	URS
Off-site labor	Assume 1 person, 3 days, 8 hr/day/chemist rate	Hour	24	1	$68.14	$1,635	URS
Off-site drafting/graphics	Assume 1 person, 2 days, 8 hr/day/CADD operator rate	Hour	8	1	$61.96	$496	URS
Off-site support	Office clerical staff rate	Hour	16	1	$44.49	$712	URS
Labor subtotal						$4,624	
Contingency allowance			10%		$85	$9	
Monitoring report costs						$4,70[illegible]	

Note:

URS = URS Greiner Woodward Clyde

RESPONSIVENESS SUMMARY

The proposed plan for Jacobs Smelter, Operable Unit 1, was issued for public comment on May 27, 1999. The comment period ran through July 15, 1999. No written comments were received during the comment period. A public meeting for receiving comments on the proposed plan was held June 9, 1999 at the Stockton Town Hall. All comments received during the meeting were addressed directly. A copy of the transcript of the meeting can be found in the Administrative Record.

Persons attending the monthly town forum meetings indicated acceptance of the proposed plan. Minutes from these meetings can also be found in the Administrative Record.

No other comments on the proposed plan were received.