PB98-964409
EPA 541-R98-177
March 1999

EPA Superfund
Record of Decision:

Portland Cement
(Kiln Dust #2 & 3)
Salt Lake City, UT
8/17/1998

Portland Cement Superfund Site
(Kiln Dust #2 and #3)
Salt Lake City, Utah

Record of Decision
Operable Unit Three - Ground Water

United States Environmental Protection Agency
Region VIII

August 17, 1998

RECORD OF DECISION
DECLARATION

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

SITE NAME AND LOCATION

Portland Cement Site (Kiln Dust # 2 & 3)
Salt Lake City, UT

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 3 of the Portland Cement Site in Salt Lake City, Utah (the "Site"). The remedy was chosen in accordance with CERCLA, as amended by SARA, and the National Contingency Plan. This decision is based on the administrative record file for the Site.

The Utah Department of Environmental Quality (UDEQ) has jointly worked with the United States Environmental Protection Agency (EPA) to select a remedy for OU3.

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 record of decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This operable unit is the final action of three operable units for the Site. The first two operable units addressed cement kiln dust (CKD) and chromium-bearing refractory bricks which were landfilled at the Site. The remedy for these operable units involved excavation and disposal of over 500,000 cubic yards of CKD, bricks, and contaminated soil. This operable unit deals with residual heavy metal groundwater contamination which occurred as a direct result of the CKD. The groundwater contamination is the only threat remaining at the Site. The selected remedy is Monitored Natural Attenuation, which relies on existing conditions and natural processes to contain the contamination within Site boundaries and gradually reduce contaminant concentrations in the groundwater. It is expected that over 100 years will be required to achieve clean-up goals; EPA considers this time frame reasonable given the particular circumstances of the Site.

The major components of the selected remedy include:

- Long-term ground and surface water monitoring to ensure the efficacy of the remedy and protection of human health and the environment.

- Formal institutional controls in the form of groundwater use restrictions to prevent human exposure.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relavent and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. However, because treatment of the principal threat at the Site was not found to be the most appropriate alternative, this remedy does not satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in contaminated ground water remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

EPA has determined that its future response at this site does not require physical construction. Therefore, the site now qualifies for inclusion on the construction completion list.

Max Dodson — 6/17/98

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

Date

"The UDEQ has worked in partnership with EPA throughout the RI/FS and concurs with the selected remedy, although it does so on the basis that it is technically impracticable to achieve MCLs in a reasonable time frame."

Dianne R. Nielson — 7/31/98

Dianne R. Nielson
Executive Director
Utah Department of Environmental Quality

Date

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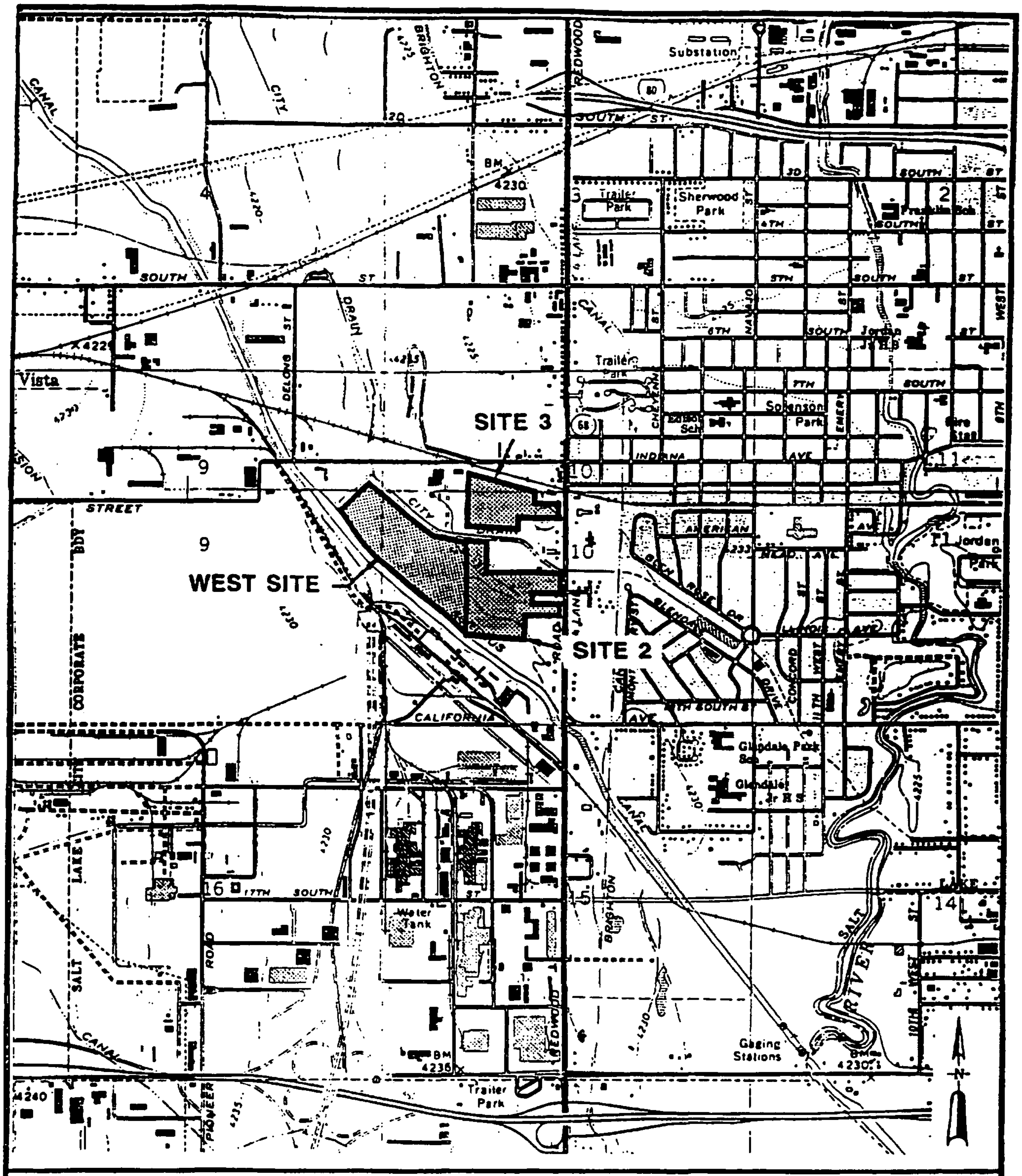
1.0 SITE LOCATION AND DESCRIPTION

The Portland Cement Superfund Site (Site ID # 0800690) is located in Salt Lake City, Utah (Figure 1-1). The Site is bounded by Redwood Road to the east, Interstate 215 to the west, the Jordan River overflow canal (Surplus Canal) to the south, and Indiana Avenue to the north (Figure 1-2). It comprises approximately 71 acres and is divided into three smaller areas known as Site Two, Site Three, and the West Site (Sites One, Four, and Five are located in different areas and are not NPL sites). The topography of the area is relatively flat.

The area surrounding the Site is primarily industrial and borders low-density residential and vacant or agricultural land. The land use to the north, west, and south is commercial and light industrial. Residential areas exist east of the Site and include single-family dwellings, mobile home parks, and some high-density multi-family residential units. There are currently no buildings on the Site. A high capacity underground sanitary sewer pipe with above ground manholes traverses the Site from north to south. A chain-link fence was constructed around the Site in 1989 to prevent unauthorized entry.

The risks posed by the Site derive from cement kiln dust (CKD) and chromium bearing bricks which were landfilled within the Site boundaries. CKD contains several heavy metals including arsenic, cadmium, chromium, lead, manganese, and molybdenum. These metals are present in both surface soils and ground water at the Site at concentrations potentially harmful to human health. Additional characterization information is included in Sections Five and Six of this document entitled "Summary of Site Characteristics" and "Summary of Site Risks."

The surface soil contamination was addressed beginning in 1992. The remedy, which consisted primarily of the removal and disposal of over 500, 000 cubic yards of CKD and contaminated soil, was implemented by the Utah Department of Environmental Quality (UDEQ) and was completed in December 1997. This decision document is directed at resolving the ground water contamination problem at the Portland Cement Site, referred to as Operable Unit Three (OU3). This is a final record of decision (ROD) and there were no interim RODs. This operable unit is a combined EPA/State lead.



from: USGS 7.5 QUAD., SALT LAKE CITY NORTH & SOUTH, UTAH

SCALE: 1" = 2000'

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MANAGERS DESIGNERS/CONSULTANTS
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PORTLAND CEMENT SUPERFUND SITE

SITE VICINITY MAP

FIGURE 1-1

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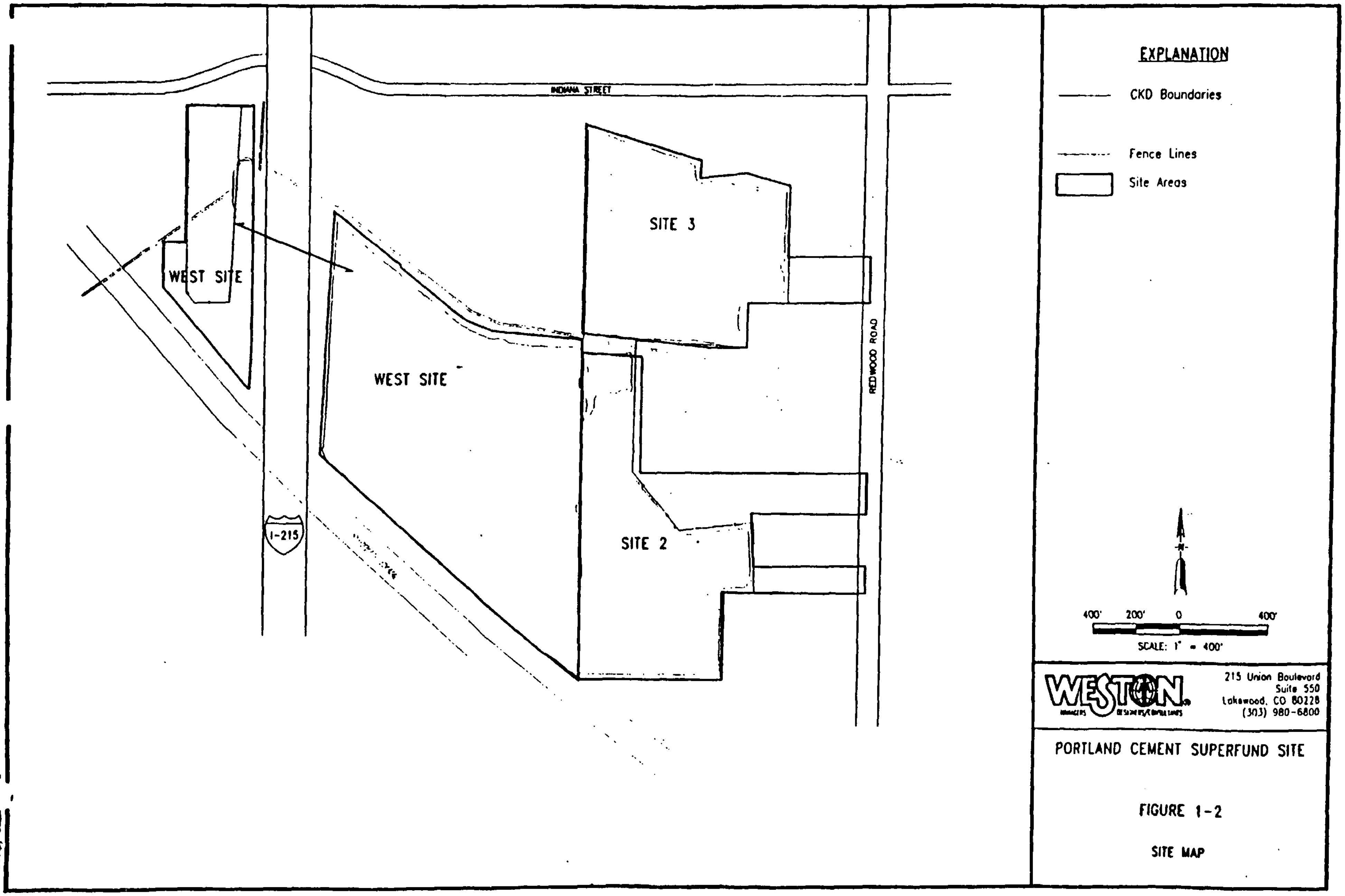


PORTLAND CEMENT SUPERFUND SITE

FIGURE 1-2

SITE MAP

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 SITE HISTORY

Between 1965 and 1983, CKD and chromium-bearing refractory bricks were deposited on the Site resulting in soil, surface water, and ground water contamination. All waste CKD was the result of operations at the Portland Cement plant located at 619 West 700 South in Salt Lake City, Utah. The plant was owned and operated by Portland Cement Company of Utah (PCU) until September 1979, when Lone Star Industries (LSI) purchased the stock of PCU. The name of the company was then changed to Utah Portland Quarries, Inc. Although the waste CKD was placed on the Site by PCU and LSI, neither company owns the land comprising the Site.

In response to complaints from area residents who were concerned about windblown waste CKD, the EPA initiated a Preliminary Assessment, which indicated a potential for human health risk to the nearby community. In April 1984, LSI voluntarily began environmental investigations at the Site that included installing ground water monitoring wells to determine if ground water contamination was present.

Sites Two and Three (but not the West Site) were proposed for inclusion on the National Priorities List (NPL) in September 1984. In 1985, the investigation was organized and expanded as a Remedial Investigation/Feasibility Study (RI/FS) under a Consent Decree issued by the State of Utah. The entire Site (including the West Site) was formally placed on the NPL on June 10, 1986. For construction management purposes, the Site was originally divided into two operable units:

- OU1, which was defined as the "pure" CKD deposited on the Site, and
- OU2, which was defined as the chromium-bearing bricks and contaminated on-site soils.

LSI completed a Phase I and Phase II Remedial Investigation Report for OU1 and OU2 in 1989 (Dames & Moore, 1989a).

EPA issued a ROD for OU1 in July 1990. The selected remedy consisted of excavation and off-site disposal of the the CKD, as well as separation and temporary on-site storage of the chromium-bearing bricks and ground water monitoring. In March 1992, the OU2 ROD was issued. The OU2 remedy called for excavation of contaminated soil (defined as soil containing concentrations of lead greater than 500 milligrams per kilogram of soil [mg/kg] or concentrations of arsenic greater than 70 mg/kg), treatment of contaminated soil and chromium bearing bricks to enable land disposal, and off-site disposal. A 18 inch protective layer of clean fill was to be installed on the Site. The OU2 ROD also called for ground water monitoring to evaluate the nature and extent of ground water contamination at the Site. In May 1992, OU1 and OU2 were merged into a single operable unit through a ROD amendment for the purpose of implementing the selected remedies for both OUs concurrently. Among other things, this amendment also eliminated the soil treatment requirement of the original OU2 ROD. The remedies were completed in December 1997, resulting in the removal of nearly all CKD, contaminated soil, and chromium bearing bricks from the Site.

More recently, a third (and final) operable unit was defined (OU3) consisting of contaminated ground water beneath the Site. A Streamlined Human Health Risk Evaluation (SRE) prepared in December 1995 concluded that the ground water contamination poses an unacceptable risk to humans exposed to Site ground water. These risks are discussed further in Section Six (Summary of Site Risks) of this document.

2.2 Enforcement Activities

EPA sent a Special Notice Letter to the Potentially Responsible Parties (PRPs) on September 17, 1990 advising them of their potential liability. The PRPs at this Site are:

Lone Star Industries,
Williamsen Investment Co.,
Lawrence D. Williamsen,
Sidney M. & Veoma H. Horman,
Horman Family Trust, and
Southwest Investment, Inc.

With the exception of Lone Star Industries, all PRPs are past or present property owners.

Under a Consent Decree negotiated with the State of Utah in 1985, LSI performed the RI/FS. LSI filed for bankruptcy in 1990, and as part of the settlement of the claim, a total of 18.5 million dollars in securities was paid to the EPA, US Department of Interior, and the State of Utah. With this action, the liability of LSI was fully resolved.

As of this writing, only negotiations with the Williamsen's are ongoing. All other parties have resolved their liabilities at the Site.

3.0 Highlights of Community Participation

Throughout the entire Portland Cement OU1 and OU2 remediation, the public was extensively involved. Detailed discussion of public participation activities for OU1 and OU2 can be found in the Record of Decision for those units. At this late stage, little public interest remains concerning this operable unit. However, concern over the ground water contamination during the OU1 and OU2 actions was high. These concerns were largely alleviated once the ground water problem was properly characterized and source materials were removed.

The Proposed Plan for OU3 was released by UDEQ for public comment on January 20, 1998. Prior to preparation of this ROD, a public meeting (January 21, 1998) and comment period (January 20 - February 21, 1998) were conducted which addressed the Proposed Plan. Notices were published in the Salt Lake City Tribune and the Deseret News. Only one attendee was present at the public meeting and indicated agreement with the plan. More information on these recent community involvement efforts is found in the Responsiveness Summary of this document (Appendix B).

Information repositories for the Site are located at the Utah Division of Environmental Response and Remediation in Salt Lake City and the EPA Superfund Records Center in Denver, CO.

This decision document presents the selected remedial action for OU3, 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

Operable Unit Three is the final operable unit and response action for the Portland Cement Site and deals exclusively with residual ground water contamination. All other response actions are complete. As discussed in subsequent sections, ground water contamination is contained within Site boundaries and in the shallowest aquifer. The source of the ground water contamination, (overlying CKD and contaminated soil) was removed during remedial actions for OU1 and OU2. The area was regraded nearly level with clean backfill and seeded. This source removal was effectively the first stage of ground water remediation.

5.0 Summary of Site (OU3) Characteristics

The Site is located in the Salt Lake Valley, Utah. The Salt Lake Valley is bounded on the west by the Oquirrh Mountains and on the east by the Wasatch Range.

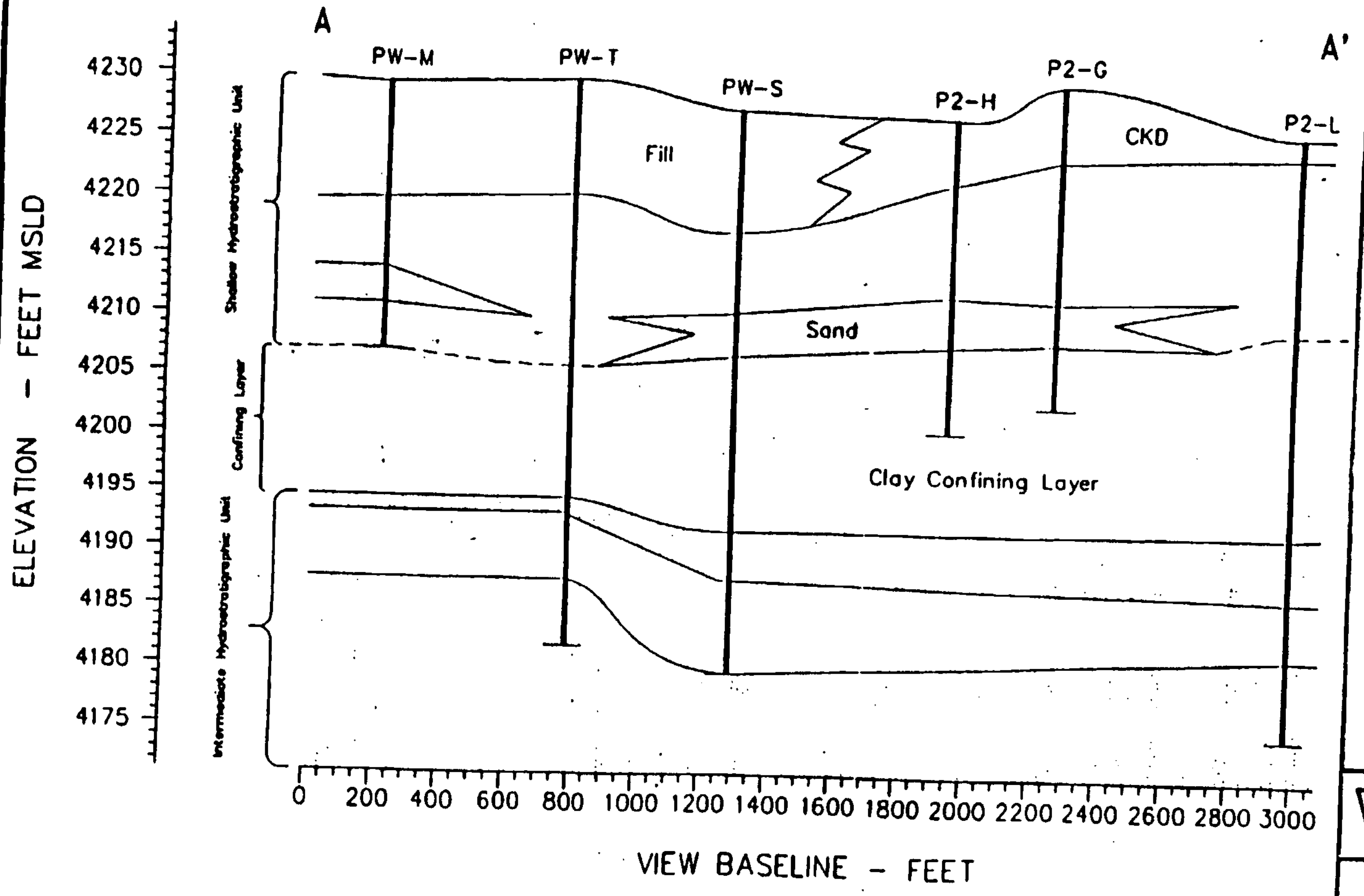
There is one major and several minor aquifers in the Salt Lake Valley. The deep aquifer, referred to as the Principal Aquifer, is confined throughout most of the Valley and serves as the primary source of ground water for wells in the Salt Lake City area. Over portions of the Valley, a clay layer as thick as 360 feet separates the Principal Aquifer from overlying aquifers.

The aquifers investigated at the Site are referred to as the shallow aquifer and the intermediate aquifer. Both are located above the Principal Aquifer. The shallow aquifer is unconfined, while the intermediate aquifer is confined between two laterally continuous clay layers. The upper clay layer separates the shallow and intermediate aquifers and is approximately ten feet thick. The lower clay layer separates the intermediate aquifer from underlying aquifers (including the Principal Aquifer) and is of unknown thickness.

Geologically, the shallow aquifer is comprised of silt and fine-grained sand from the water table down to the upper clay layer at approximately 25 to 30 feet below ground surface. Hydraulic conductivity in the shallow zone varies from one foot/day in Site Three to approximately 50 feet/day near the Surplus Canal. Depth to water varies seasonally and across the Site, but is generally less than ten feet. Total dissolved solids (TDS) concentration in the shallow aquifer is generally greater than 30, 000 milligrams/liter (mg/L).

The intermediate zone occurs below the upper clay layer as a continuous layer of poorly sorted, silty, fine-grained sand to well sorted medium-grained sand. The intermediate aquifer is typically five to twelve feet thick, at depths of 40 to 55 feet below ground surface. Figure 5-1 shows a geologic cross section through the Site with the two aquifers noted. The location of the cross section in Figure 5-1 is shown on the map in Figure 5-3. Ground water flow in the intermediate aquifer is generally to the northwest.

Any flow occurring between the intermediate and shallow aquifers appears to be upward from the intermediate aquifer into the shallow aquifer. This can be shown by the difference in potentiometric head for adjacent wells screened in each unit. Figure 5-3 is a map showing the difference in head between the intermediate and shallow aquifers during August 1994 and July 1995. As shown in the figure, there was an upward vertical gradient between the two aquifers everywhere beneath the Site during the August 1994 and July 1995 monitoring events. A review of available historical water level data reveals that this trend is persistent throughout the year. Thus, any movement of ground water between the two aquifers is upward from the intermediate aquifer to the shallow aquifer. This is important with respect to the migration of contamination as



EXPLANATION

VERTICAL SCALE: 1" = 10'
HORIZONTAL SCALE: 1" = 350'

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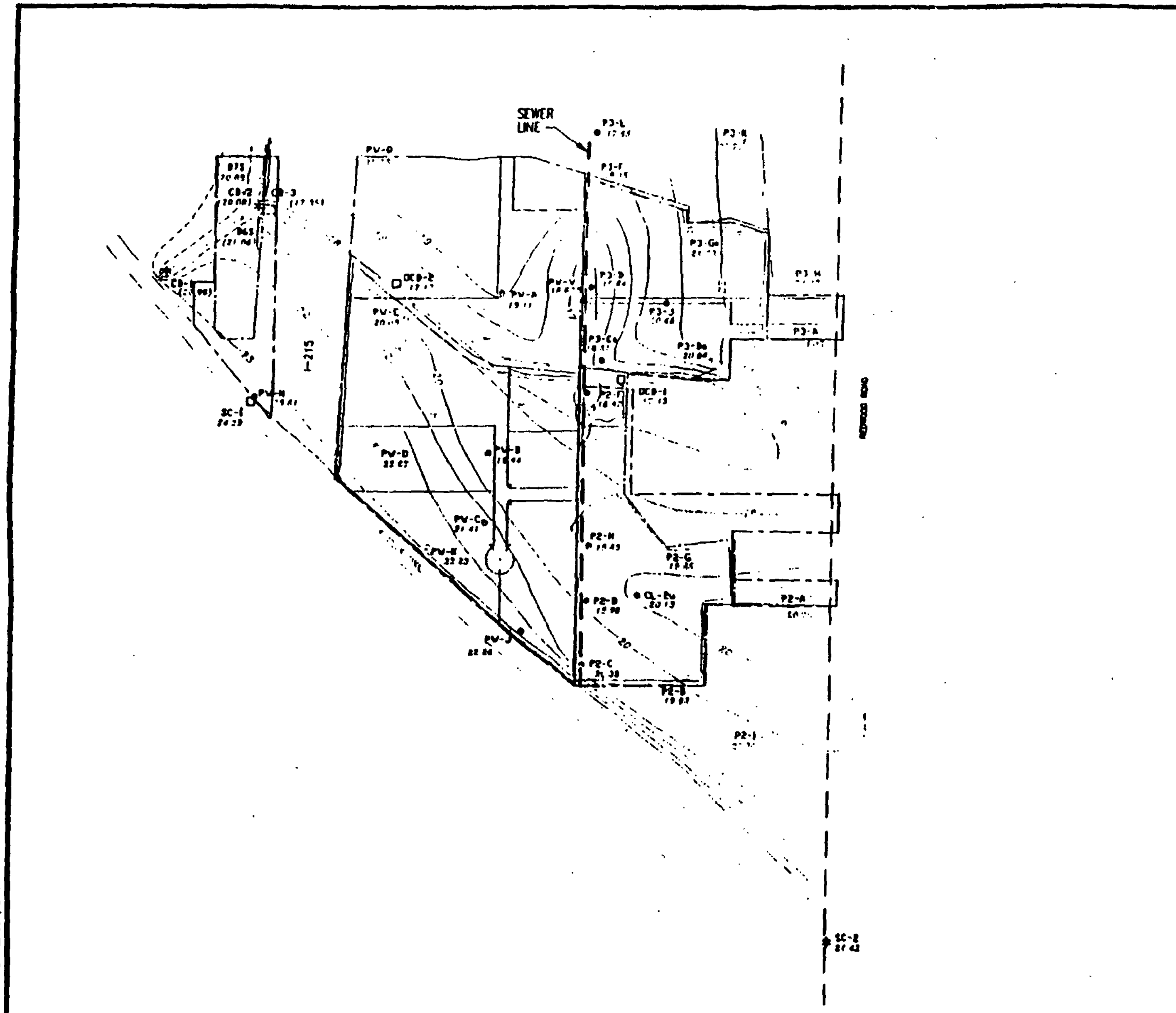
PORTLAND CEMENT SUPERFUND SITE
FOCUSED FEASIBILITY STUDY-OU3

FIGURE 5-1

CROSS-SECTION
VIEW A-A'



EXPLANATION

SHALLOW HSU WELL

SURFACE WATER MEASUREMENT POINTS (WESTON)

SURFACE WATER MEASUREMENT POINTS (UPS)

INFERRED POTENTIOMETRIC SURFACE

EXTENT OF WASTE CKD

DATUM IS 4200 FEET ABOVE MSL BASED ON OCTOBER 1993 SURVEY BY UPS CONSULTANTS AND JULY 1995 SURVEY BY WASATCH ENVIRONMENTAL

DATA IS FROM JULY 25, 1994, EXCEPT DATA IN PARENTHESES, WHICH IS FROM JULY 1995

N

SCALE: 1" = 500'

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PORTLAND CEMENT SUPERFUND SITE
FOCUSED FEASIBILITY STUDY-OU3

FIGURE 5-2

POTENTIOMETRIC SURFACE MAP
SHALLOW HSU - SURPLUS CANAL HIGH

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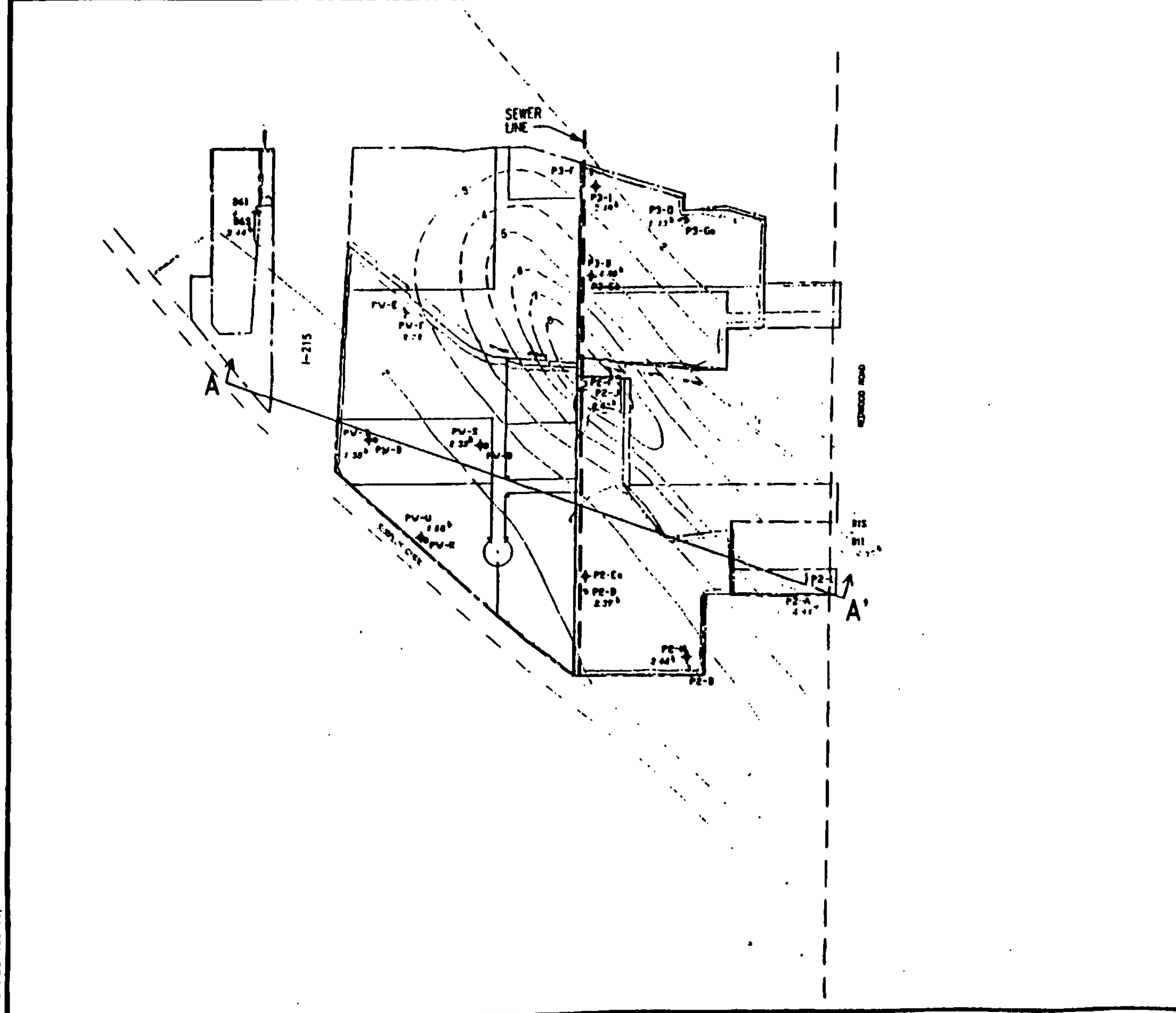

EXPLANATION

- SHALLOW HSU WELL
- INTERMEDIATE HSU WELL
- EXTENT OF WASTE CKD

CONTOURS SHOW HEAD DIFFERENCE BETWEEN THE INTERMEDIATE ZONE AND THE SHALLOW ZONE ($HEAD_I - HEAD_S$).

a DATA FROM AUGUST 15, 1994

b DATA FROM JULY 15, 1995

N

SCALE: 1" = 500'

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PORTLAND CEMENT SUPERFUND SITE
FOCUSED FEASIBILITY STUDY-OU3

FIGURE 5-3

GROUNDWATER HEAD DIFFERENCE MAP
SHOWING LOCATION OF CROSS-SECTION A-A'

it precludes downward migration of shallow contaminants. To date, sampling of the intermediate aquifer has revealed no contamination.

Ground water flow in the shallow (contaminated) aquifer is complex due to interaction with local surface water and underground utility pathways. Figure 5-2 is a potentiometric surface map for ground water in the shallow aquifer. Primary areas of recharge are the unlined Surplus Canal along the southern boundary of the Site and underflow along the eastern Site boundary. Minor contributions from infiltrating precipitation occur as well, though this contribution is minimal because the Salt Lake Valley is relatively arid. All shallow ground water eventually discharges to the City Drain, an unlined storm water ditch that bisects the Site and flows east to west. Some discharge is direct underflow, while some occurs as discharge to the sanitary sewer and an unlined storm water ditch on the western portion of the Site, both of which empty directly into the City Drain.

The sanitary sewer is buried at an average depth of 17 feet below grade and bisects the Site from south to north. From approximately 150 feet south to 500 feet north of the City Drain, the bedding material of the sewer line appears to be removing ground water from the shallow aquifer and routing it to the City Drain (Figure 5-2). The effect of the sewer line bedding material is much more pronounced to the north of City Drain. The unlined, southwest/northeast trending storm water ditch empties into the City Drain west of Interstate 215. The water level in this ditch is approximately two feet below the water level in the shallow aquifer, providing the other shallow ground water collection point which empties into City Drain. Together with direct underflow, the sanitary sewer and the unlined stormwater ditch ensure all shallow ground water beneath the Site discharges to the City Drain.

Together, the City Drain, Surplus Canal, sanitary sewer, and the unnamed stormwater ditch on the west end of the Site serve as ground water 'boundaries" for the contaminated shallow aquifer. The effect of these complex ground water interceptions, the upper clay layer, and the upward vertical gradient across the clay layer is to contain the ground water contamination largely within the site borders and only in the shallow unit. No elevated concentrations (relative to naturally occurring levels) of contaminants have been found in ground water outside the Site boundaries or in the intermediate aquifer. The only contamination leaving the Site exits as surface water via the City Drain, but is so diluted its presence is not detectable. The City Drain discharges to the Great Salt Lake, specifically the Farmington Bay Waterfowl Management Area.

As stated previously, CKD and contaminated surface soil (OU1 and OU2) overlying the Site were excavated. The Site was backfilled with clean soil and regraded nearly level. This effectively removed the entire source of the ground water contamination. However, significant levels of contaminants still remain in the ground water, both dissolved and adsorped to the sediments.

6.0 Summary of Site (OU3) 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 at the Site are arsenic, cadmium, chromium, manganese, molybdenum, lead, and pH (a water quality parameter). Human toxicity information or ARARs are available for all of the COCs except for pH, which has been retained as a COC due to the high alkalinity of Site ground water (pH > 8) and the associated potential for irritation to mucous membranes in exposed individuals.

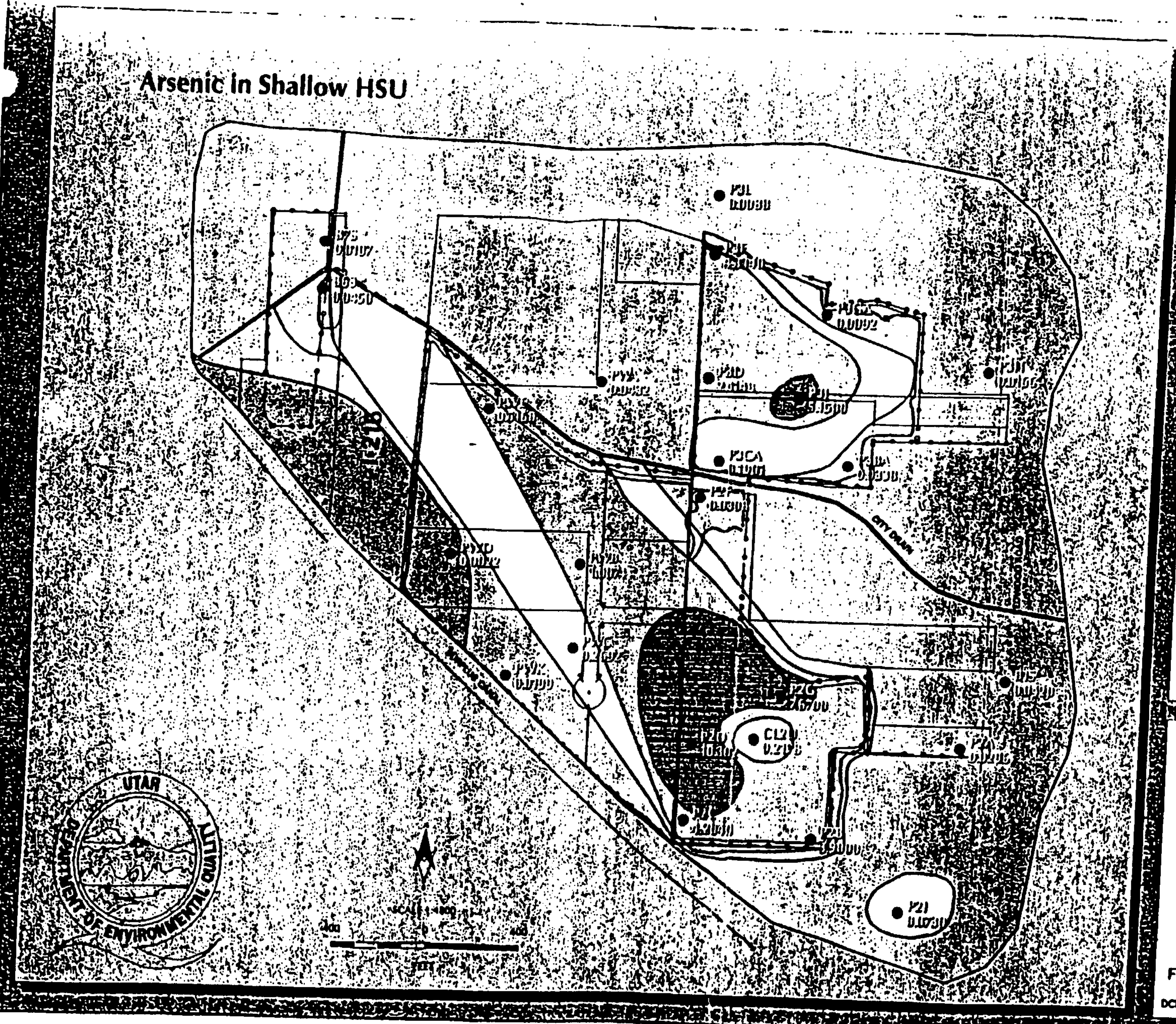
EPA and UDEQ agree that ingestion of contaminated ground water (the only media addressed in OU3) presents the primary health threatening exposure pathway and presents an immediate and unacceptable risk to any future residents of the Site. The number of potential future residents affected by this pathway is unclear.

Of all the COCs present at the Site, arsenic is the most widespread at concentrations exceeding the Federal Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act (SDWA). All COCs in the ground water roughly mimic the distribution pattern of arsenic, although with less significant exceedances of their MCLs. Therefore, arsenic levels were deemed a "worst case" representation of the magnitude and extent of contamination in the shallow ground water and were used as a basis for all predictive modeling.

6.2 Level and Extent of Contamination

Studies on the extent of ground water contamination indicate that water in the shallow aquifer has been impacted over the entire Site, with the highest degree of contamination occurring in locations formerly overlain by CKD deposits. As discussed previously, surface water channels in and around the Site create natural barriers to the migration of contaminated ground water and no impacts have been observed in off-site ground water. Likewise, the clay layer separating the shallow and intermediate aquifers - and the associated upward vertical gradient - prevents downward migration of contamination. No impacts have been observed in the intermediate aquifer.

Figure 6-1 illustrates the distribution of arsenic in OU3 ground water. Again, the distribution of arsenic is considered representative of the maximum aerial extent of contamination for all COCs. Two distinct arsenic plumes are apparent and originate from the former CKD deposits on Sites Two and Three (the southeast and northeast CKD deposits respectively). A more diffuse arsenic plume is located on the West Site and is inferred to have resulted from leachate generation from CKD deposited on the West Site and also from migration of the plume originating on Site Two.



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- ≤ 0.005 ppm = concentration below 1E-04 cancer risk level
- > 0.005 and ≤ 0.05 ppm concentration below MCl
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc., Summer, 1995. Reported value based on mean of three samples collected in July and August, 1995. Other values based on mean of four or five quarterly samples collected in 1993 and 1994.

** - Risk estimates based on upper confidence of mean are discussed in the "Draft Human Health Risk Evaluation" by Roy F. Weston, Inc.

Portland Cement Superfund Site

Arsenic in Shallow HSU

FIGURE 6-1

WESTON

DCN: 10093-007-M030 Revision Date: 04-OCT-1995

As discussed previously, potentiometric head measurements indicate shallow ground water discharges to the City Drain, the north-south trending sanitary sewer, and the unnamed stormwater ditch on the west side of the Site. The concentration contours support this interpretation. The arsenic plume on Site Three is truncated at the north-south sewer line. Ground water at this location is discharging to the presumed high permeability material in which the pipe is embedded or, possibly, to the sewer pipe itself. The diffuse plume originating from Site Two and the West Site is truncated at both the City Drain and the unnamed stormwater ditch. Based on this analysis, under current conditions the shallow contaminant plume appears to be well contained by discharge boundaries. This containment allows the classification of the ground water as a low-level threat waste (principal threat wastes included the CKD addressed in OU1 and OU2).

Because the plume is contained, the volume of impacted water can be estimated. Assuming a saturated thickness of 30 feet and an areal extent of 61.5 acres, an estimated 461 acre feet of ground water is contaminated with arsenic at concentrations exceeding the preliminary remediation goal of 64 micrograms per liter.

No surface water impacts are evident. The Surplus Canal is a losing stream at all times and receives no contribution from contaminated ground water. Though all contaminated ground water eventually discharges to the City Drain, its impact is minimal. The effects of dilution and the slow rate of ground water discharge make the presence of additional arsenic nearly undetectable. During the Remedial Investigation, measurements taken both upstream and downstream of the Site showed no difference in arsenic concentrations. Modeling conducted as part of the Focused Feasibility Study (FFS) indicates that ground water discharge is slow enough to preclude hazardous levels of arsenic from ever being discharged to City Drain. The effects of dilution are more pronounced the farther downstream one moves from the Site. No other surface water features (other than the stormwater ditch which empties directly into City Drain) receive flow from the contaminated ground water.

6.3 Cancer Risks from Contaminated Ground Water

Arsenic is the only COC identified for this site which is known to be carcinogenic when ingested. Cancer risk is described as the probability that an exposed person would develop cancer before age 70 as result of exposure to site related contamination. In this case, if shallow ground water were used by future residents for drinking, the cancer risk for a reasonably maximally exposed individual may be greater than 1 out of 1000 at 16 of 21 on-site wells. The cancer risk may also be greater than 1 out of 10 for 6 of 21 on-site wells. A complete analysis and discussion of cancer risk can be found in the Streamlined Human Health Risk Evaluation (SRE) and FFS.

6.4 Acute (Non-Cancer) Risks from Contaminated Ground Water

The risk of non-cancer health effects (such as decreased liver function) 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 non-cancer health effects. If the value of the HQ exceeds one, a risk of non-cancer health effects may exist, with the likelihood increasing as the HQ increases. As shown in Table 6-1, all COCs (except lead which is evaluated separately) exceed an HQ of one in many portions of the Site for reasonably maximally exposed individuals. A complete analysis and discussion of non-cancer risk can be found in the SRE.

Table 6-1

CHEMICAL OF CONCERN	NUMBER OF WELLS WITH HAZARD QUOTIENT GREATER THAN ONE	MAXIMUM HAZARD QUOTIENT DETECTED
Arsenic	20/21	1000
Cadmium	1/21	2
Lead	N/A	N/A
Chromium	4/21	20
Manganese	3/21	100
Molybdenum	17/21	1000

Lead in the ground water may also be of concern. The potential health risks from lead are posed primarily to children who may be future residents at the Site. These risks were evaluated using EPA's Integrated Exposure, Uptake, and Biokinetic Model (IEUBK) with standard default values. At most wells, the risks from lead were low, with less than a 5% chance that a child ingesting ground water from that particular well would have a blood lead value above the EPA's and the Center for Disease Control's blood level of concern (10 micrograms lead/deciliter blood). However, five of the on-site wells would pose a risk between 5% and 10% and one well would pose a risk of 100%.

There are no methods for quantifying risks associated with the ingestion of water with high pH, but values greater than 8.5 may cause irritation to the mouth, throat, or stomach. Fifteen of the wells have pH values greater than 8.5.

6.5 ECOLOGICAL RISK

No ecological risk has been identified for OU3. Surface features have been completely remediated and, as such, there are no natural habitats associated with the Site. Therefore, no ecological risk assessment was completed for OU3. The impacts to City Drain, the only surface water feature receiving contaminated ground water, are minimal as discussed above and decrease with distance from the Site. No impacts attributable to the Site are expected in Farmington Bay, as contaminant levels discharging to City Drain are far below levels established for protection of fauna. However, detailed standards were adopted to ensure protection of the City Drain and its discharge area and are discussed in Section 6.6 below.

6.6 Remedial Action Objectives

The risks discussed above provide the basis for EPA's decision that the contaminated ground water at the Portland Cement Site presents an imminent and substantial endangerment to public health and that remedial action is warranted. The nature of these risks lead to four cleanup goals or Remedial Action Objectives (RAOs). In accordance with the National Contingency Plan (NCP), EPA and UDEQ have determined that the RAOs at this site are:

- Prevent human exposure to Site ground water that would result in an excess cancer risk equal to or exceeding 1×10^{-6} (one additional cancer per million persons) or a hazard quotient exceeding one for a reasonably maximally exposed individual.

- Prevent off-site migration of contaminants to protect uncontaminated ground water.

- Restore ground water to its beneficial use to the extent practicable.

- Prevent unacceptable impacts to surface water associated with the Site.

To achieve these objectives, it is crucial to define and understand the anticipated future land use on and near the Site. Currently, the Site is undeveloped and does not have any specific residential, industrial, or recreational use. The Site is currently zoned commercial and is surrounded by commercial/industrial properties to the north, south, and west. Commercial and residential land use exists to the east.

Typically, both commercial and residential land use would be considered plausible for the Portland Cement Site based on current zoning and surrounding land use. Because the surface soils of the Site have been remediated to a level suitable for future residential use, the presumed future use for OU3 is residential and cleanup levels were considered in that regard.

It is also crucial to determine the media specific cleanup levels which will result in attainment of the stated RAOs. These remediation goals can be arrived at through consideration of applicable or relevant and appropriate regulations (ARARs), through the use of health-based goals, or through consideration of local background water quality. All were considered for OU3 and applied on a case-by-case basis for each COC. Each "standard' is described below.

ARARs

With respect to beneficial uses of ground water at the Site, the State classifies the ground water as Class IIB, a potential source of drinking water. As such, Federal MCLs are potentially relevant and appropriate. The MCLs for each COC are shown in Table 6-2 below:

Table 6-2
Federal MCLs for COCs

Contaminant	*MCL (micrograms/Liter)*
Arsenic	50
Cadmium	5
Chromium	100
Lead	15
Manganese	50[1]
Molybdenum	NA[2]
pH	NA[2]

1. Secondary MCL; not based on health protection.
2. No MCL exists.

Health-Based Goals

Section 121 of CERCLA mandates that the selected remedy be protective of human health and the environment, therefore consideration of health-based goals is warranted. For Portland Cement, health-based goals were derived from the maximum allowable concentration of a contaminant deemed to provide a cancer risk no higher than 1×10^{-6} or an HQ no higher than one for a reasonably maximally exposed resident. These goals were based on cancer effects for arsenic and non-cancer effects for other COCs. The methods used to determine health-based goals are discussed further in the SRE. Health-based goals for a resident are shown in Table 6-3 below:

Table 6-3
Health-Based Goal for a Resident

Contaminant	*Health-Based Goal (micrograms/Liter)*
Arsenic	.05
Cadmium	18
Chromium	182
Lead	20
Manganese	182
Molybdenum	182
pH	< 8.0

Background Water Quality

EPA Publication 9234.2-01/FS-A, 'General Policy, RCRA, CWA, SDWA, Post-ROD Information and Contingent Waivers," states that if attainment of Federal MCLs is impossible because the background level of the chemical subject to CERCLA authority is higher than that of the standard, attainment is not relevant and appropriate. Thus, it is critical to examine naturally occurring background levels of contaminants at the Site. Naturally occurring background levels for each COC are shown in Table 6-4 below:

Table 6-4
Local Background Water Quality[1]

Contaminant	*Background (micrograms/Liter)*
Arsenic	64
Cadmium	6.2
Chromium	24
Lead	1.9
Manganese	440
Molybdenum	63
pH	7.8

1. UCL_{95} of the mean of concentration values from wells P3L, P3H, B1S, and P2I assuming a lognormal distribution.

Again, these three "standards" (MCLs, health-based goals, and local background water quality) were applied on a case-by-case basis for each COC to determine the cleanup goal. For contaminants where local background concentrations exceed the MCL, the MCL was not deemed relevant and appropriate, and the cleanup goal shall only be the attainment of background concentrations. If local background concentrations are below the MCL, the cleanup goal shall be the more protective (lower) of the MCL and health-based goal. For pH, the cleanup goal shall be attainment of water with a pH lower than 8.0, which is below the threshold for potential mucous membrane irritation. Using this rationale, the final cleanup goals for each COC are shown below in Table 6-5:

Table 6-5
Cleanup Goals for Contaminants of Concern at Portland Cement OU3.

Contaminant	*Health-Based Goal[1] for a Resident*	*MCL*	*Local Background Water Quality[2]*	*Cleanup Goal*
	All concentrations in micrograms of contaminant per liter of ground water.			
Arsenic	.05	50	64	64
Cadmium	18	5	6.2	6.2
Chromium	182	100	24	100
Lead	20	15	1.9	15
Manganese	182	50[3]	440	440
Molybdenum	182	NA[4]	63	182
pH	< 8.0	NA	7.8	< 8.0

1. Based on cancer effects for arsenic and non-cancer effects for all other chemicals.
2. UCL_{95} of the mean of concentration values from wells P3L, P3H, B1S, P2I, assuming a lognormal distribution.
3. Secondary MCL; not based on health protection.
4. No MCL exists.

It is also important that surface water quality in City Drain be protected. This is achieved through the establishment of alternate concentration limits (ACLs) which are to be enforced at the ground water discharge boundary. Section 121(d)(2)(B)(ii) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) allows EPA to establish ACLs to those limits otherwise applicable under the following conditions:

> The ground water must have a known or projected point of entry to surface water with no statistically significant increase in contaminant concentration in the surface water from ground water to the point of entry, or at any point where there is reason to believe

accumulation of constituents may occur downstream. In addition, the remedial action must include enforceable measures that will preclude human exposure to the contaminated ground water at any point between the facility boundary and a known and projected point of entry of such ground water into surface water.

Both EPA and UDEQ agree the Portland Cement Site satisfies these criteria and that the establishment of ACLs for the purpose of protection of water quality in the City Drain is appropriate. The City Drain is classified as Class VI surface water by the State and discharges to the Great Salt Lake (specifically the Farmington Bay Waterfowl Management Area). Discharge requirements for Class VI waters are determined on a case-by-case basis. The performance standard determined by UDEQ for Portland Cement is that the in-stream concentrations at the point of compliance (confluence of City Drain and north-south trending ditch west of I-215) will not exceed 125% of the Class IIID water standards. Class IIID is set to be protective of waterfowl, shorebirds, and other water-oriented wildlife and the associated food chain. To establish numeric standards, denoted here as ACLs, UDEQ calculated the individual concentrations of chemicals (including COCs) in ground water at the Site which, if discharged to the City Drain, would cause exceedance of the performance standard at the point of compliance. These site-specific ACLs are shown in Table 6-6.

It is important to understand that for Portland Cement, ACLs are applied only for the protection of the City Drain and are only appropriate where the ground water discharges to the City Drain. The site-wide cleanup standards (Table 6-5) are substantially more stringent goals; ACLs in this case are only safeguards which serve to protect City Drain and are enforced only at or near ground water discharge points (along the City Drain, at the unlined storm water ditch, and near the sanitary sewer). The remediation will be considered complete only when cleanup goals (Table 6-5) are achieved throughout the Site.

A more detailed explanation of ARARs applied to OU3 is found in Appendix A.

Table 6-6
Alternate Concentration Limits (ACLs) for Discharges to City Drain

Chemical	*ACL (micrograms per liter)*	*Chemical*	*ACL (micrograms per liter)*
Aluminum	4,502.33	Lead	666.71
Arsenic	9,832.68	Mercury	.62
Cadmium	139.08	Nickel	20,667.94
Chromium III	26,339.81	Selenium	258.75
Chromium VI	569.26	Silver	6.21
Copper	1,564.5	Zinc	13,914.05
Iron	25,875.48		

7.0 REMEDIAL ALTERNATIVES

7.1 DESCRIPTION OF ALTERNATIVES

This section describes the alternatives EPA and UDEQ believe are technically implementable and potentially able to meet the agencies' remedial action objectives at this site. These alternatives were arrived at through a systematic screening process beginning with the FFS. In the FFS, many remedial alternatives are screened and those that are most reasonable are retained and investigated in detail. Using this investigation, 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 explored in the FFS for OU3. This allows interested parties to cross reference information between this decision document and 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 for this document. The alternatives are:

Alternative One: No Action

It is required by law that the 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. In this case, "no action" would include ground water monitoring of the shallow and intermediate aquifers, but no active ground water treatment or institutional controls to restrict future land uses. Natural processes such as flushing and dilution will be relied upon to reduce contamination levels.

Alternative Two: Monitored Natural Attenuation

The "monitored natural attenuation" alternative is similar to the "no action" alternative except that it includes formal ground water use restrictions (deed restrictions) as an institutional control to prevent human exposure to ground water until OU3 remediation goals are achieved. This alternative also relies on natural processes to contain contamination on-site and gradually reduce contaminant levels over time. The institutional controls would be implemented and enforced by the Federal Government and State of Utah. Ground water and surface water will be monitored until remediation goals are achieved to ensure the efficacy of the remedy.

Alternatives Three A, B, and C: Ground water Collection, Treatment by Precipitation, and Discharge to Surface Water at Varying Pumping Rates

This alternative considers ground water extraction at varying rates (19, 27 and 37 gallons per minute) from some or all of the three subsections of the Site. Extracted water would be treated using above-ground physical/chemical processes to reduce the pH and dissolved contaminant concentration through precipitation of the heavy metals. The treatment system would be constructed on-site and treated water would be discharged on-site to the City Drain. Resulting sludge (assumed to be RCRA hazardous waste) would be transported directly to a RCRA Subtitle C treatment, storage, and disposal facility (TSD) for final disposition. Institutional controls restricting ground water usage and ground water monitoring would remain in force until contaminant concentrations meet or exceed the remediation goals. Treatability studies were performed and are discussed in the FFS.

Alternatives Four A, B, and C: Ground water Collection, Treatment by Distillation, and Discharge to Surface Water at Varying Pumping Rates

This alternative is identical to Alternative Three except that the above-ground treatment method will be distillation. This technology will permit additional removal of contaminants and TDS beyond that achievable through precipitation and will generate a less hazardous sludge (assumed RCRA non-hazardous), though in very high quantities. Sludge would be tranported to a RCRA Subtitle D storage facility.

Table 7-1.
Remedial Technologies Evaluated by EPA and UDEQ

General Remedial Technology	*Process Option*	*Screening Comments*
No Action	Ground water monitoring	Retained per CERCLA guidance
Natural Attenuation	Ground water monitoring	Retained as representative process option.
	Water use restrictions	
Containment	Slurry Wall	Not retained. Hydraulic boundary exists at Site.
Ground water Extraction	Interception Trench	Potentially applicable.
	Extraction	Potentially applicable and retained as representative process option.
Ground water Treatment	pH adjustment	Retained as representative process option.
	Sedimentation	Retained as representative process option.
	Filtration	Retained as representative process option.
	Reverse osmosis	Not retained due to probable membrane fouling from high TDS.
	Strong base anion exchange	Not retained; non-selective for COCs.
	Immobilized ligands	Not retained; non-selective for COCs.
	Distillation	Retained for further evaluation.
Treated Water Disposal	Surface water discharge	Potentially applicable; retained as representative site option.
	Injection	Potentially applicable but not retained due to potential negative impacts on lower aquifer.
	POTW discharge	Potentially applicable but not retained because POTW will not accept TDS concentrations > 1000 mg/L
Secondary Sludge Management	On-site stabilization and disposal (Subtitle D landfill)	Potentially applicable but not retained due to economic reasons.
	Off-site treatment and disposal	Potentially applicable; retained as a representative site option.
	On-site evaporation ponds	Not retained due to large land requirements.

Alternatives described as "Retained" or "Not Retained" refer to those cleanup approaches which were included (retained) for consideration in the Focused Feasibility Study (FFS) or not. Only those alternatives described in the preceding discussion of this section were considered promising enough to be carried forward for discussion in the Record Of Decision. Additional information on all alternatives is located in the FFS.

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."

<u>Threshold Factors</u>

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.

<u>Primary Balancing Factors</u>

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.

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.

<u>Modifying Factors</u>

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 Eight, Summary of the Comparison of Alternatives.

7.3 DETAILED ANALYSIS OF ALTERNATIVES

7.3.1 Alternative One - No Action

<u>Overall Protection of Human Health and the Environment</u>

Ground water contamination presents a health risk if ingested as drinking water. However, it is unlikely that local ground water will be used for human consumption without prior treatment due to naturally occurring contamination (arsenic, total dissolved solids, etc.) at levels above drinking water standards. Nonetheless, human exposure to ground water at most areas of OU3 should be avoided, but the No Action alternative has no provision for the prevention of human exposure to Site ground water and does not offer sufficient protection of human health.

This alternative relies on natural flushing and dilution of the shallow aquifer and the ongoing, gradual discharge of contaminated ground water to the City Drain as the principal mechanisms for achieving ground water restoration. Data generated in the Remedial Investigation (RI) and FFS indicate that the water quality in the City Drain would not be degraded through implementation of this alternative.

Ground water contaminant transport modeling conducted under the FFS indicates that the ground water discharge rate from the shallow aquifer (within the Site) to the City Drain is approximately 20 gallons per minute (gpm). The flow measured in City Drain during the RI was approximately 449 gpm. A comparison of these flow rates suggests that impacts to water quality in the City Drain due to discharge of contaminated ground water are negligible due to dilution. In fact, during the RI, flow and arsenic concentration measurements were taken in the City Drain in locations upstream and downstream of the Site. The data indicate no discernable difference in either flow or arsenic concentrations from the upstream to the downstream locations.

As discussed in Section 6.6, ACLs were established for the protection of City Drain. However, because the source of contamination has been completely removed (OU1 and OU2) and current maximum concentrations of contaminants are already below ACLs, the possibility of exceeding ACLs at any point on the Site is remote. However, establishment of ACLs provides an extra measure of protection for the City Drain.

<u>Compliance with ARARs</u>

Chemical-specific ARARs (Federal MCLs) exist for select Contaminants of Concern in ground water (except pH). As discussed in Section 6.6, the Federal MCL was deemed relevant and appropriate ONLY for contaminants for which the background water quality did not exceed the MCL. Under the No Action alternative, it is expected that natural flushing and dilution of the ground water will ultimately result in compliance with relevant MCLs. However, predictive modeling suggests that attainment of cleanup standards under this alternative will require longer than 100 years.

Chemical-specific ACLs were also established to ensure protectiveness of the City Drain and Farmington Bay WMA. Because maximum ground water concentrations for all COCs are already lower than ACLs and the source of contamination has been removed, this alternative will result in compliance with ACLs.

No location specific ARARs were applied.

This alternative does not involve active remediation, therefore no action-specific ARARs were applied.

Appendix A of this document gives a complete description of chemical, action, and location-specific ARARs applied to OU3.

Long-Term Effectiveness and Permanence

Under this alternative, significant risk remains for a long period of time (more than 100 years) under any potential drinking water scenario. However, both EPA and UDEQ agree that site conditions and natural processes will be fully successful in reducing contaminant concentrations to cleanup goals over the long-term. Flushing and dilution will continue to decrease the concentrations of contaminants, but even background water quality, when achieved, would require significant treatment prior to use as drinking water. This alternative provides no institutional controls over the long-term to prevent exposure to ground water, making the long-term effectiveness of this remedy poor. It is anticipated that once contaminant concentrations reach remediation goals, improvement in ground water quality would be permanent.

Reduction of Toxicity, Mobility, or Volume of Contaminants

In this alternative, there is no active remediation process (treatment, containment, or otherwise) for reducing the toxicity, mobility, or volume of contaminated ground water. However, natural processes and existing features serve to contain the contamination on-site and will ultimately reduce the toxicity (due to dilution) and volume of contaminants.

Short-Term Effectiveness

Workers face minimal physical and chemical hazards during the installation and sampling of monitoring wells; however, these hazards are manageable through administrative and engineering controls. There is also a risk of contaminating the intermediate aquifer and the deeper, principal drinking water aquifer by drilling through the contaminated shallow aquifer. Proper drilling techniques and the existence of an upward vertical hydraulic gradient will greatly reduce the risk of cross-contamination of aquifers.

Implementability

There are no technical or administrative obstacles to implementation of the No Action alternative.

Costs

The 100 year present worth cost is estimated at approximately $560,000; most of which is operation and maintenance cost associated with ground water monitoring. Detailed cost comparisons are found in Table 8-2.

7.3.2 Alternative Two - Monitored Natural Attenuation - The Selected Remedy

Overall Protection of Human Health and the Environment

This alternative also relies on natural flushing and dilution of the shallow aquifer and the ongoing, gradual discharge of contaminated ground water to the City Drain as the principal mechanisms for achieving ground water restoration. However, this alternative adds an additional measure of protection through the use of formal institutional controls to restrict the use of contaminated ground water for drinking purposes. This addition, along with the implementation of the ACL, makes Alternative Two sufficiently protective of human health and the environment.

Compliance with ARARs

As discussed in Section 7.3.1, the Federal MCL was deemed relevant and appropriate as a chemical-specific requirement only for contaminants for which the background water quality did not exceed the MCL. Under the Monitored Natural Attenuation alternative, it is expected that natural flushing and dilution of the ground water will ultimately result in compliance with relevant MCLs. However, predictive modeling suggests that attainment of cleanup standards under this alternative also will require significantly more than 100 years. Modeling was conducted to estimate arsenic concentrations at 50 and 100 years. Figure 4-2 illustrates the current distribution of arsenic in ground water. Figures 7-1 and 7-2 illustrate the arsenic concentration expected at 50 and 100 years in the future, respectively. As seen from the figures, achieving background concentrations for arsenic (and MCLs or health-based goals for other COCs) will take longer than 100 years.

Chemical-specific ACLs were also established to ensure protection of the City Drain and Farmington Bay WMA. Because maximum ground water concentrations for all COCs are already lower than ACLs and the source of contamination has been removed, this alternative will result in compliance with ACLs.

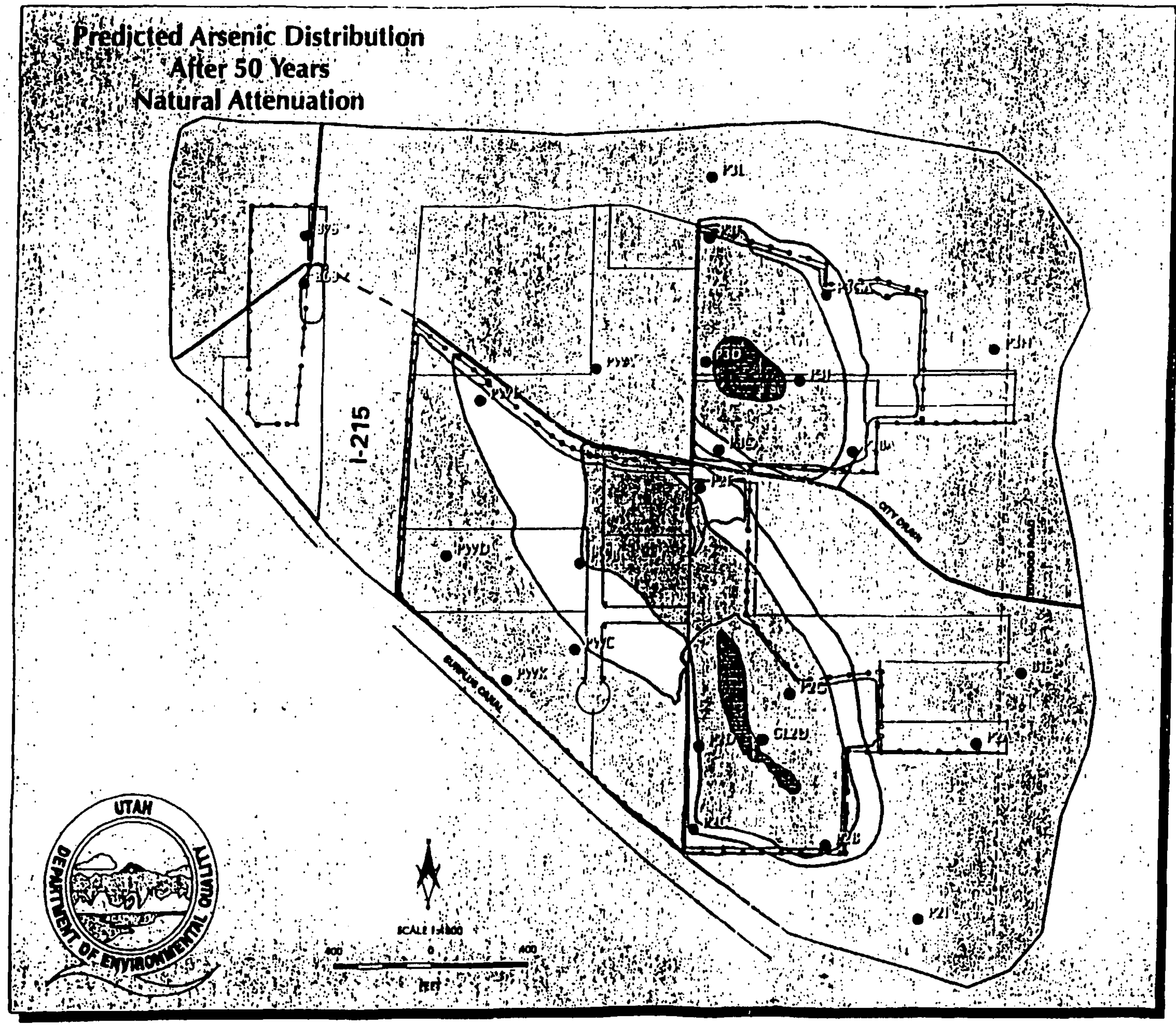
No location-specific ARARs were applied.

This alternative does not involve active remediation, therefore no action-specific ARARs apply.

Appendix A of this document gives a complete description of chemical, action, and location-specific ARARs applied to OU3.

Long-Term Effectiveness and Permanence

Under this alternative, significant risk remains for a long period of time (more than 100 years) under any potential drinking water scenario. However, both EPA and UDEQ agree that site conditions and natural processes will be fully successful in reducing contaminant concentrations to



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc. Summer, 1995. Reported values reflect the results of the contaminant transport model.

Portland Cement Superfund Site

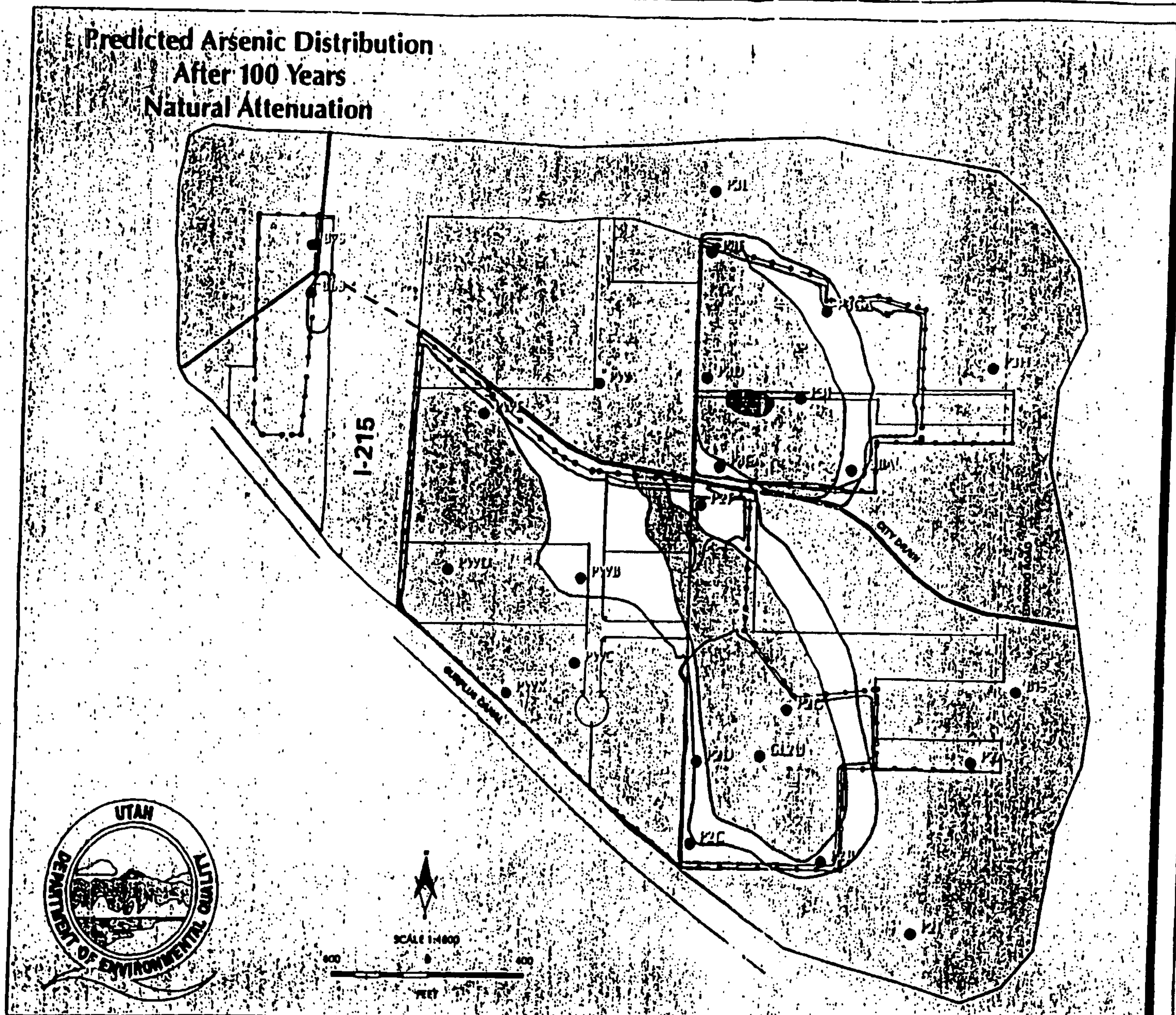
Predicted Arsenic Distribution
After 50 Years
Natural Attenuation

FIGURE 7-1

WESTON

DCN: 10093-007-MOxx

Revision Date: 13-OCT-1998



Legend

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- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells Installed by Roy F. Weston, Inc. Summer, 1995. Reported values reflect the results of the contaminant transport model.

Portland Cement Superfund Site

Predicted Arsenic Distribution
After 100 Years
Natural Attenuation

FIGURE 7-2

WESTON

DCN: 10082-007-MOxx

Revision Date: 13-OCT-1995

cleanup goals over the long-term. Flushing and dilution will continue to decrease the concentrations of contaminants, but even background water quality, when achieved, would require significant treatment prior to use as drinking water. However, the implementation of institutional controls makes this alternative effective over the long-term. It is anticipated that once contaminant concentrations reach remediation goals, improvement in ground water quality would be permanent. Five year ROD reviews would be required to ensure that adequate protection of human health and the environment is maintained.

Reduction of Toxicity, Mobility, or Volume of Contaminants

In this alternative, there is no active remediation process (treatment, containment, or otherwise) for reducing the toxicity, mobility, or volume of contaminated ground water. However, natural processes and existing features serve to contain the contamination on-site and will ultimately reduce the toxicity and volume of contaminants.

Short-Term Effectiveness

Workers face minimal physical and chemical hazards during the installation and sampling of monitoring wells; however, these hazards are manageable through administrative and engineering controls. There is also a risk of contaminating the intermediate aquifer and the deeper, principal drinking water aquifer by drilling through the contaminated shallow aquifer. Proper drilling techniques and the existence of an upward vertical hydraulic gradient will greatly reduce the risk of cross-contamination of aquifers.

Implementability

There are no technical or administrative obstacles to implementation of the Monitored Natural Attenuation alternative.

Costs

The 100 year present worth cost is estimated at approximately $630,000; most of which is operation and maintenance cost associated with ground water monitoring. Detailed cost comparisons are shown in Table 8-2.

7.3.3 Alternatives 3a, 3b, and 3c - Ground water Collection, Treatment by Precipitation, and Discharge to Surface Water

Overall Protection of Human Health and the Environment

Alternatives 3a, 3b, and 3c would offer protection of human health and the environment through active ground water extraction and treatment. Because the rate of cleanup is proportional to the rate of ground water extraction, the protectiveness of the remedy increases incrementally from Alternative 3a (19 gpm) through Alternative 3c (37 gpm). Figures 7-3 through 7-8 illustrate the expected arsenic concentrations for the three pumping options at 50 and 100 years into the future based on the results of predictive ground water transport modeling (discussed in more detail in the FFS). Figure 7-8 indicates that even at maximum sustained pumping rates, arsenic concentrations will still exceed the agencies' remedial goals by over 100 times at 100 years into the future. A comparison of the predicted concentrations obtained via this alternative with those predicted using natural processes reveals only a marginal difference.

In addition to the ACL, this alternative provides an additional level of protection for the City Drain by capturing and treating ground water.

Compliance with ARARs

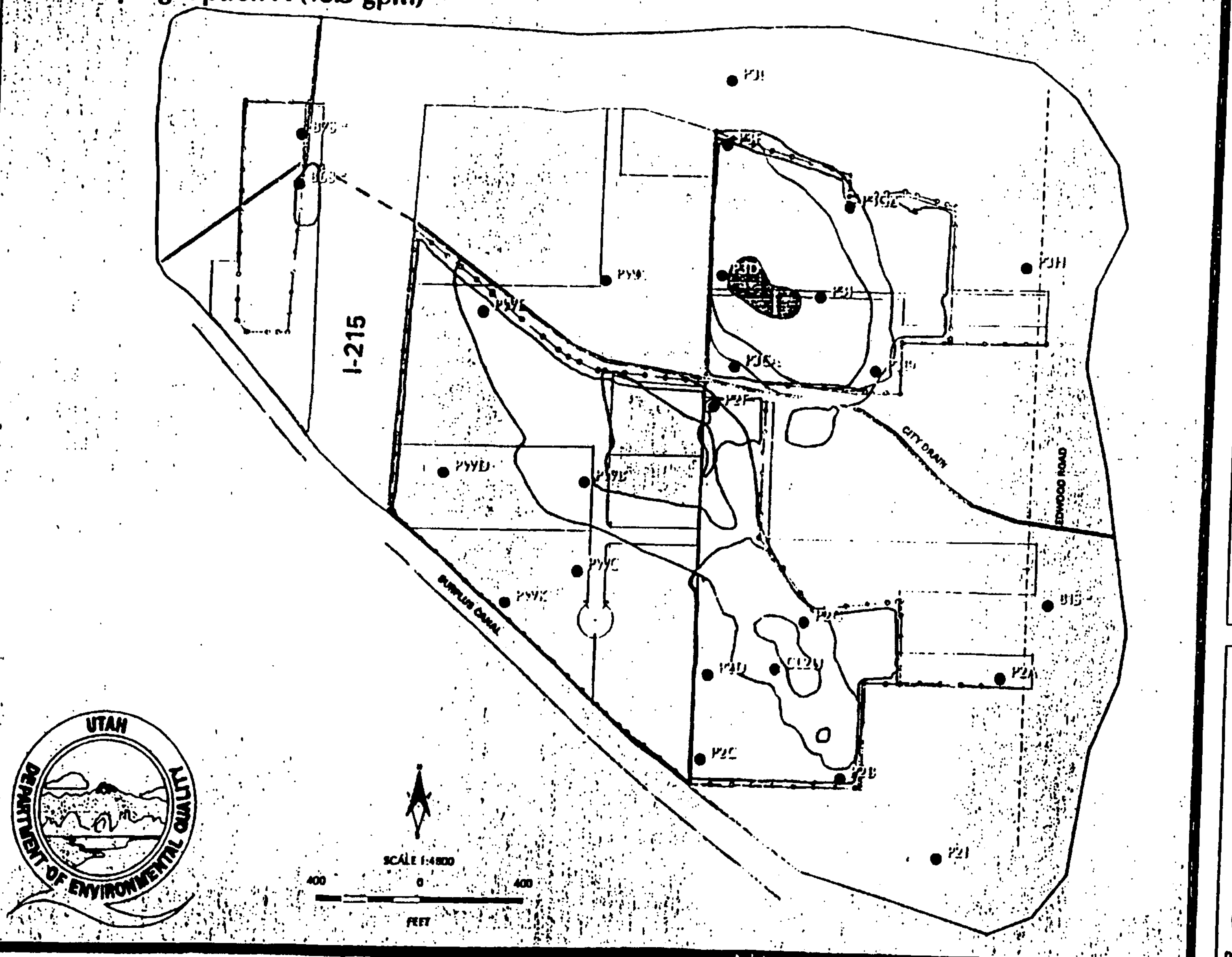
Again, the Federal MCL was deemed relevant and appropriate as a chemical-specific requirement only for contaminants for which the background water quality did not exceed the MCL. Under Alternative Three, active extraction and treatment of the ground water will ultimately result in compliance with relevant MCLs. However, predictive modeling suggests that attainment of cleanup goals with active treatment also will require significantly more than 100 years. The results of this modeling are described in detail in the RI/FFS.

Chemical-specific ACLs were also established to ensure protection of the City Drain and Farmington Bay WMA. Because maximum ground water concentrations for all COCs are already lower than ACLs and the source of contamination has been removed, this alternative will result in compliance with ACLs.

No location-specific ARARs were applied.

Because active remediation is being conducted, several action-specific ARARs apply. Proper implementation of this alternative will result in attainment of all action-specific ARARs. The remediation system would be constructed in accordance with the substantive requirements of the Resource Conservation and Recovery Act (RCRA) concerning handling of characteristic hazardous wastes (extracted ground water and sludge residuals). The City Drain, which will receive treated water, is classified as Class Six surface water by the State. Though no Utah Pollution Discharge Elimination System (UPDES) discharge permit would be required (CERCLA Section 121(e)(1) states that on-site actions require no permit), the selected remedy should meet the SUBSTANTIVE requirements of a UPDES permit. For Portland Cement, in accordance with Section 121, only the substantive requirements were considered, and as such, this is NOT an ARAR. Numeric standards for treated effluent prior to discharge for Class Six waters are determined on a case-by-case basis by the UDEQ. The performance standard determined by UDEQ is that the in-stream concentrations at the confluence of City Drain and north-south trending ditch west of I-215 will not exceed 125% of the Class IIID water standards. Predicted

Predicted Arsenic Distribution After 50 Years Pumping Option A (18.5 gpm)



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc, Summer, 1995. Reported values reflect the results of the contaminant transport model.

Portland Cement Superfund Site

Predicted Arsenic Distribution After 50 Years Pumping Option A (18.5 gpm)

FIGURE 7-3

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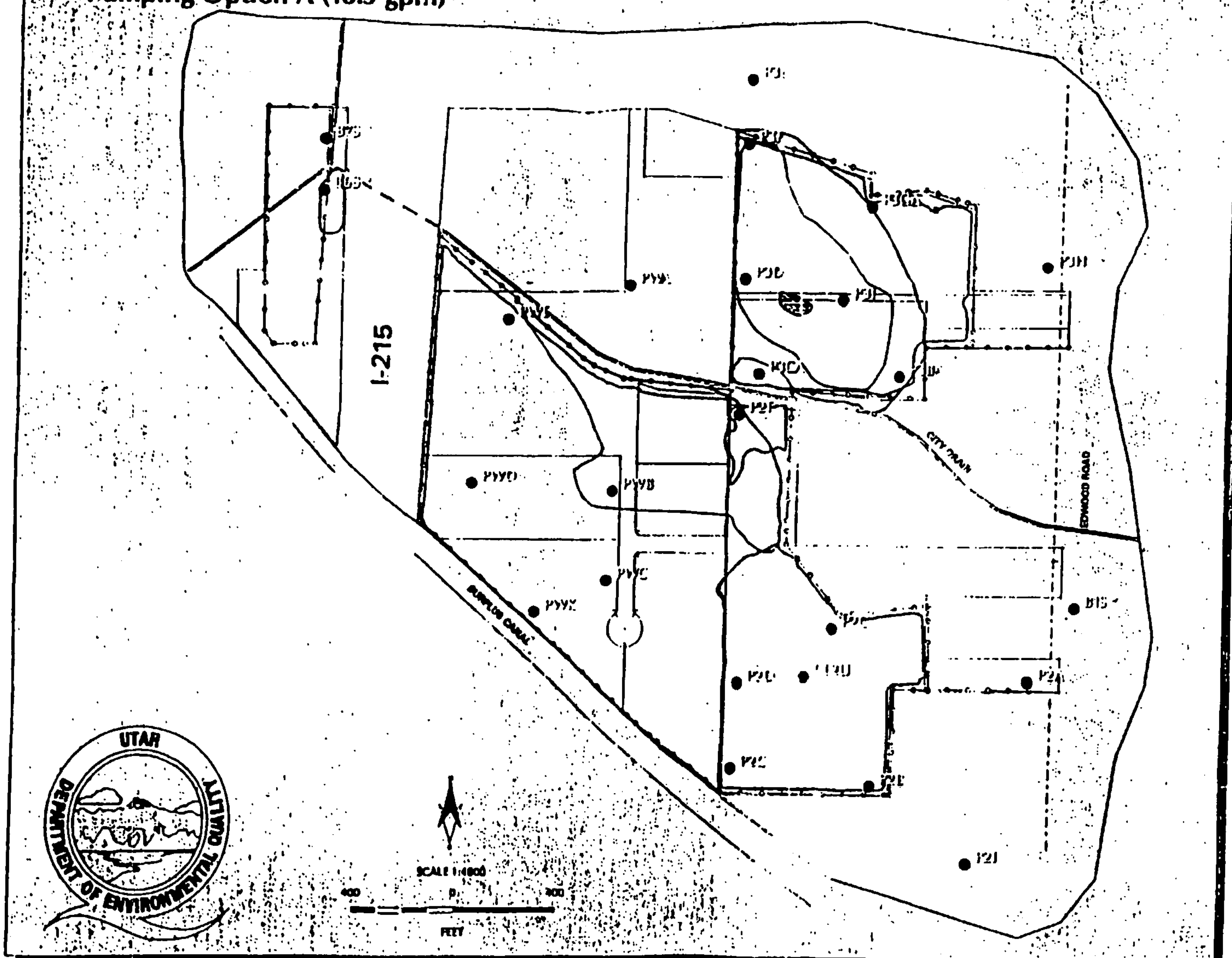
Predicted Arsenic Distribution After 100 Years Pumping Option A (18.5 gpm)



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc, Summer, 1995. Reported values reflect the results of the contaminant transport model.

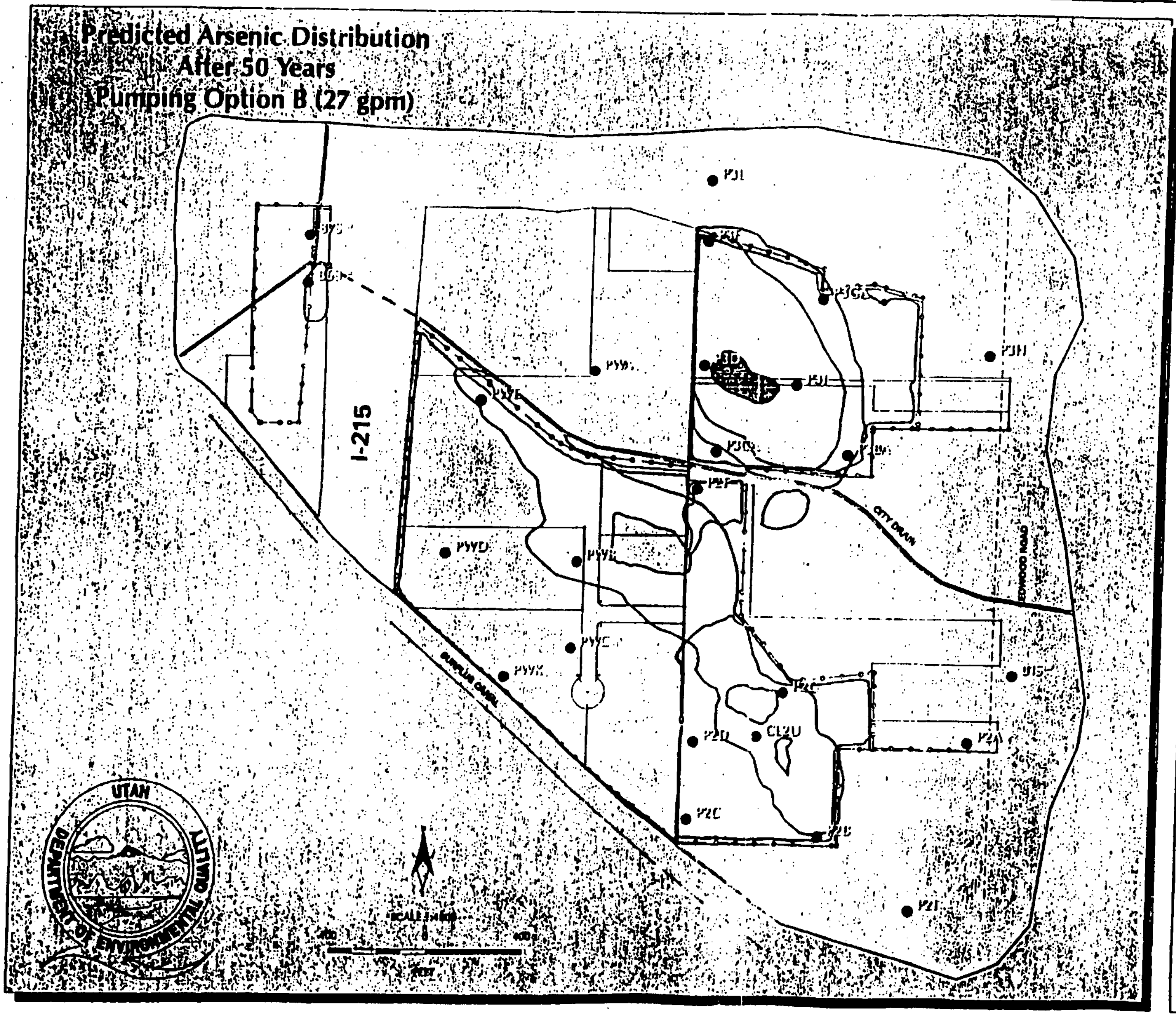
Portland Cement Superfund Site

Predicted Arsenic Distribution
After 100 Years
Pumping Option A (18.5 gpm)

FIGURE 7-4

WESTON

DCN: 10093-007-MOxx Revision Date: 12-OCT-1995



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc, Summer, 1995. Reported values reflect the results of the contaminant transport model.

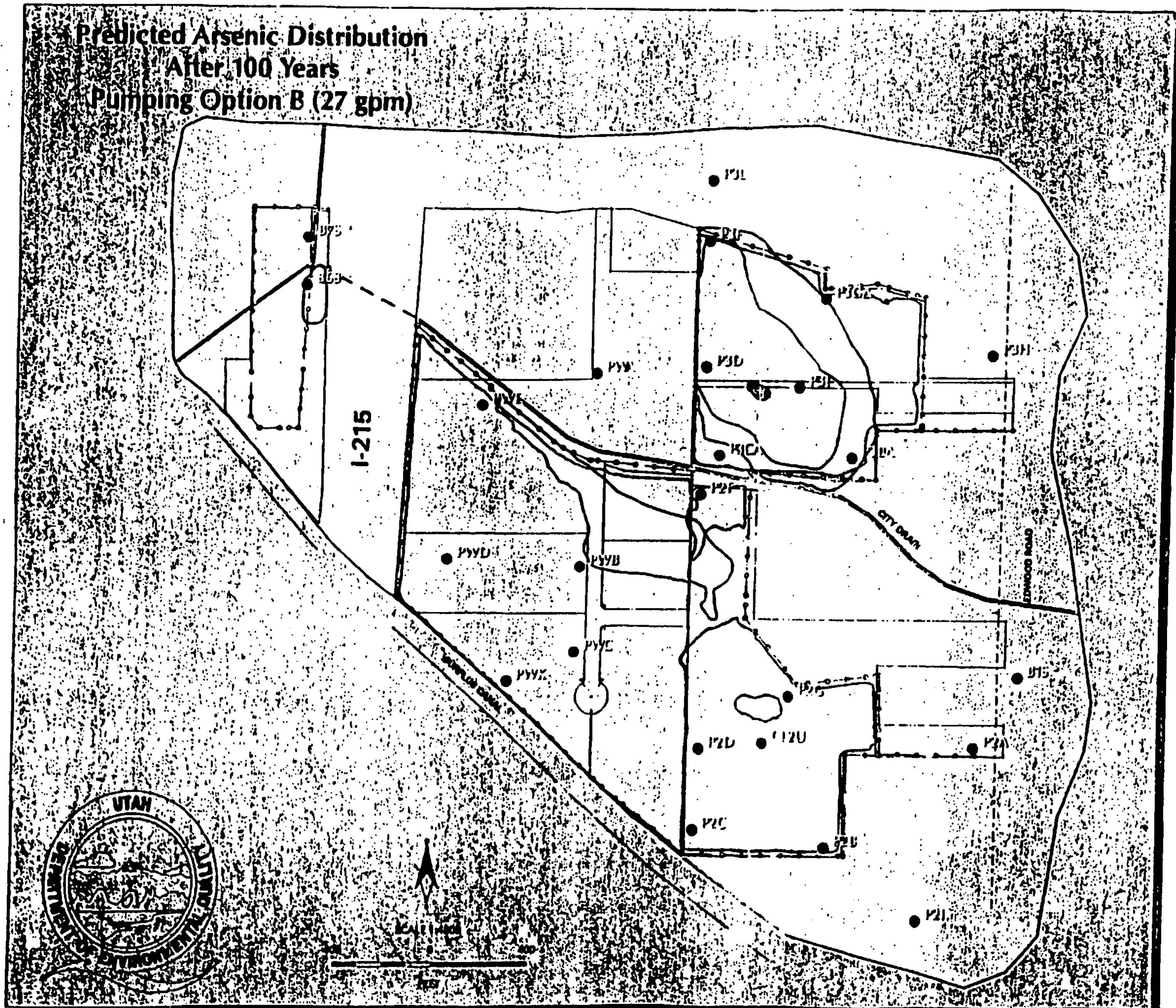
Portland Cement Superfund Site

Predicted Arsenic Distribution
After 50 Years
Pumping Option B (27 gpm)

FIGURE 7-5

WESTON

DCN: 10082-007-MOxx   Revision Date: 13-OCT-1995



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc. Summer, 1995. Reported values reflect the results of the contaminant transport model.

Portland Cement Superfund Site

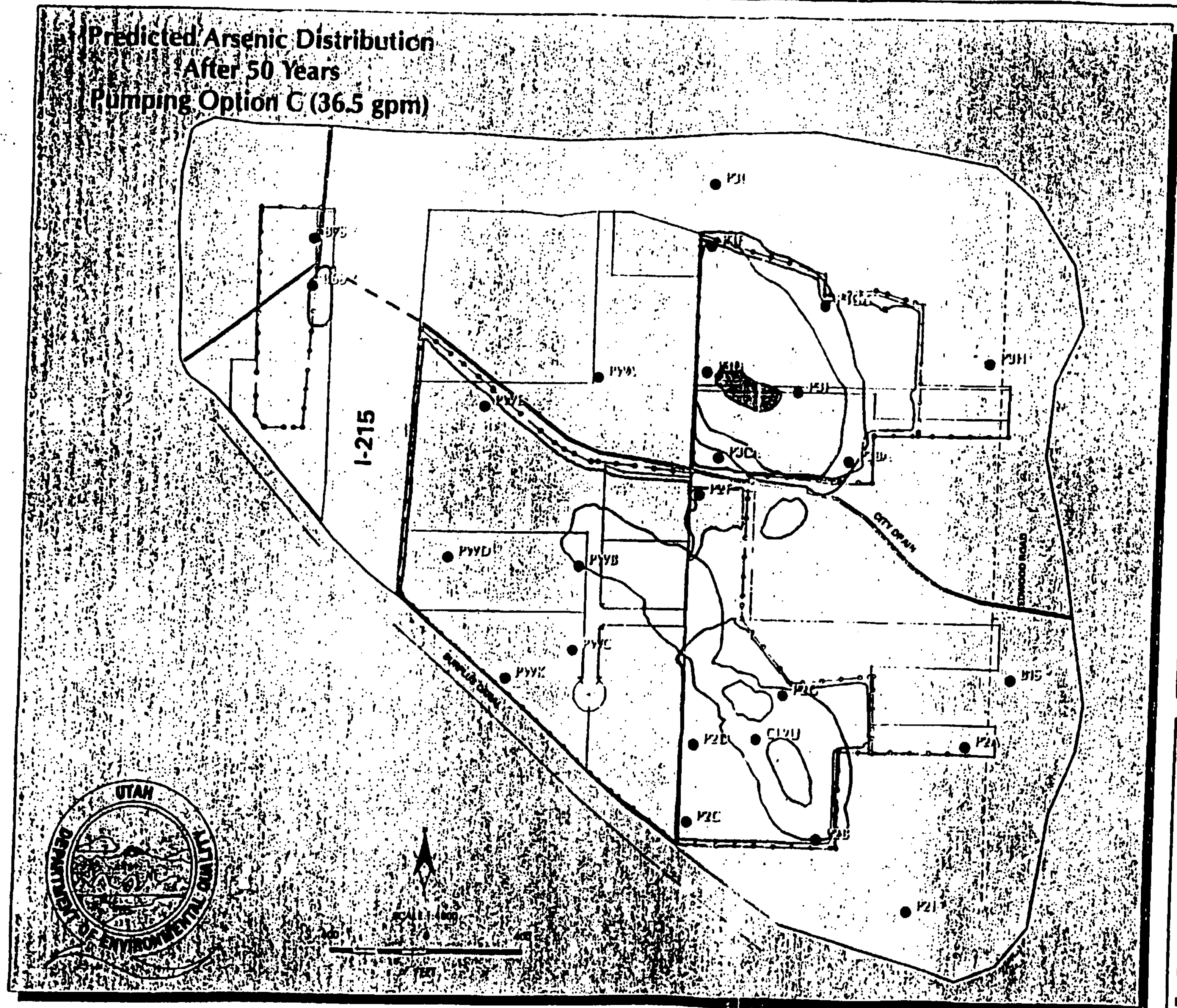
Predicted Arsenic Distribution After 100 Years Pumping Option B (27 gpm)

FIGURE 7-8

WESTON

DCN: 10092-007-MOxx

Revision Date: 13-OCT-1995



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- ● Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc. Summer, 1995. Reported values reflect the results of the contaminant transport model.

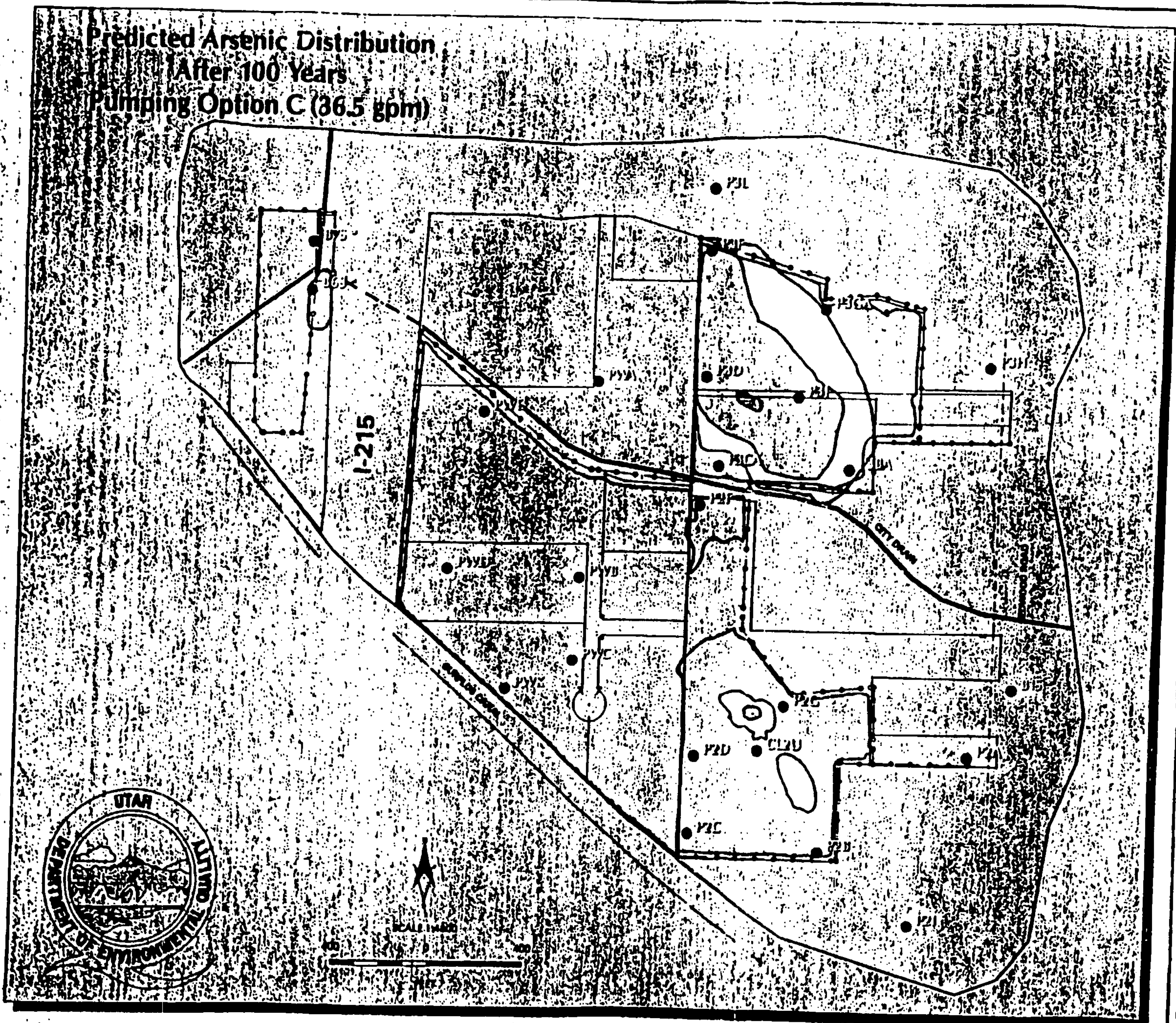
Portland Cement Superfund Site

Predicted Arsenic Distribution
After 50 Years
Pumping Option C (36.5 gpm)

FIGURE 7-7

WESTON

DCN: 10002-007-M0xx Revision Date: 13-OCT-1995



Legend

- CKD Boundaries
- Deed Lines
- Fence Lines
- ● Well Locations, Well Name, Analyte Concentration

Concentrations Key

- > 0.005 and ≤ 0.05 ppm concentration below MCL
- > 0.05 and ≤ 0.5 ppm
- > 0.5 and ≤ 5 ppm
- > 5 and ≤ 50 ppm

References

Map and analytical data provided by URS, 1995.

* - Wells installed by Roy F. Weston, Inc. Summer, 1995. Reported values reflect the results of the contaminant transport model.

Portland Cement Superfund Site

Predicted Arsenic Distribution
After 100 Years
Pumping Option C (36.5 gpm)

FIGURE 7-8

WESTON

DCN: 10082-007-M[illegible]

Revision Date: 13-OCT-1998

effluent quality for the precipitation process will likely meet Class IIID metals standards but would not meet a reasonable standard for reduction of TDS. However, it should be noted that Site ground water naturally discharges to City Drain, and any treatment would represent an improvement (albeit immeasureable) to City Drain water quality.

Appendix A of this document gives a complete description of chemical, action, and location-specific ARARs applied to OU3.

Long-Term Effectiveness and Permanence

Under this alternative, significant risk remains for a long period of time (more than 100 years) under any potential drinking water scenario. Time periods to reach remediation goals under this alternative would likely be less than those required when relying solely on natural processes; however, long periods of time would still be required. This alternative also includes institutional controls, and thus is also very effective over the long term. It is anticipated that once contaminant concentrations meet remediation goals, the improvement in ground water quality would be permanent.

Reduction in Toxicity, Mobility, or Volume of Contaminants

Under this alternative, the mobility and volume of contaminants in ground water would be reduced through extraction and treatment. Contaminants would be precipitated, stabilized, and disposed in a Subtitle C landfill, further reducing the mobility.

Short-Term Effectiveness

Workers would face chemical and physical hazards as a result of the operation and maintenance of the water treatment and sludge handling facilities. Workers would be exposed to corrosive and toxic metal fumes, as well as liquids and solids from strong acids and bases associated with treatment chemicals and sludges. Although these risks are significant, they are controllable through administrative and engineering means.

CKD and contaminated soils at the Site were removed. Therefore, there is little risk of exposure to contaminated soils or dust during construction or operation. Workers will need to take special precautions to avoid contact with contaminated ground water during the installation of ground water collection wells or trenches.

Implementability

Alternative Three construction activities are readily implementable, though extensive effort would be required. The proposed ground water collection and treatment method uses common construction methods and the chemicals required for treatment are readily available in the Salt

Lake City area. The high TDS present in the ground water could pose fouling problems during operation of the system.

Costs

The 100-year present worth costs for the three options (a, b, and c) are estimated at 9.1, 10.2, and 11.2 million dollars respectively. Detailed cost comparisons are found in Table 8-2.

4.3.4 Alternative 4a, 4b, and 4c - Ground water Collection, Treatment by Distillation, and Discharge to Surface Water

Overall Protection of Human Health and the Environment

Alternatives 4a, 4b, and 4c (similar to Alternatives 3a, 3b, and 3c with the exception that treatment would be by distillation as opposed to precipitation) would offer protection of human health and the environment through active ground water extraction and treatment. Because the rate of cleanup is proportional to the rate of ground water extraction, the protectiveness of the remedy increases incrementally from Alternative 4a (19 gpm) through Alternative 4c (37 gpm). The rate of restoration and degree of protection would be identical to that discussed for Alternative Three, with the added benefit of complete removal of TDS by virtue of the distillation process.

Compliance with ARARs

Again, the Federal MCL was deemed a relevant and appropriate chemical-specific regulation only for contaminants for which the background water quality did not exceed the MCL. Under Alternative 4, active extraction and treatment of the ground water will ultimately result in compliance with relevant MCLs. However, predictive modeling suggests that attainment of cleanup goals with active treatment also will require significantly more than 100 years. The results of this modeling are described in detail in the RI/FFS.

Chemical-specific ACLs were also established to ensure protection of the City Drain and Farmington Bay WMA. Because maximum ground water concentrations for all COCs are already lower than ACLs and the source of contamination has been removed, this alternative will result in compliance with ACLs.

No location-specific ARARs were applied.

Because active remediation is being conducted, several action-specific ARARs apply. Proper implementation of this alternative would result in attainment of all action-specific ARARs. The remediation system would be constructed in accordance with Resource Conservation and

Recovery Act (RCRA) requirements for handling of characteristic hazardous wastes (extracted ground water and sludge residuals). City Drain, which will receive treated water, is classified as Class Six surface water by the State. Though no Utah Pollution Discharge Elimination System (UPDES) discharge permit would be required (CERCLA Section 121(e)(1) states that on-site actions require no permit), the selected remedy should meet the SUBSTANTIVE requirements of a UPDES permit. For Portland Cement, in accordance with Section 121, only the substantive requirments were considered, and as such, this is NOT an ARAR. Numeric standards for treated effluent prior to discharge for Class Six waters are determined on a case-by-case basis by the UDEQ. The performance standard determined by UDEQ is that the in-stream concentrations at the confluence of City Drain and north-south trending ditch west of I-215 will not exceed 125% of the Class IIID water standards. Predicted effluent quality for the distillation process will meet both Class IIID metals standards and standards for reduction of TDS.

Appendix A of this document gives a complete description of chemical, action, and location-specific ARARs applied to OU3.

Long-Term Effectiveness and Permanence

Under this alternative, significant risk remains for a long period of time (more than 100 years) under any potential drinking water scenario. Time periods to reach remediation goals under this alternative would likely be less than those required when relying solely on natural processes; however, long periods of time would still be required. This alternative also includes institutional controls, and thus is also effective over the long term. It is anticipated that once contaminant concentrations meet remediation goals, the improvement in ground water quality would be permanent.

Reduction in Toxicity, Mobility, or Volume of Contaminants

Under this alternative, the mobility and volume of contaminants in ground water would be reduced through extraction and treatment. A high degree of reduction for all dissolved and suspended solids, including metals, would be achieved in the extracted ground water. This allows the cleanest water to be discharged to the City Drain. However, the volume of contaminants in the subsurface would decline at a similar rate to Alternative Three. Sludge generated with this process is not anticipated to be hazardous.

Short-Term Effectiveness

Workers would face physical hazards as a result of the operation and maintenance of the water treatment and sludge handling facilities. Although these risks are significant, they are controllable through administrative and engineering means.

CKD and contaminated soils at the Site were removed. Therefore, there is little risk of exposure to contaminated soils or dust during construction or operation. Workers will need to take special precautions to avoid contact witih contaminated ground water during the installation of ground water collection wells or trenches.

Implementability

Alternative Four construction activities are readily implementable, though extensive effort would be required. The water treatment equipment is complex but adequate resources exist in the Salt Lake City area to construct and operate the equipment. Operation of the distillation equipment would entail a very large energy demand, either electric or natural gas. The high TDS present in the ground water would result in high volumes of generated sludge, estimated at 90 times the amount in Alternative Three. However, the sludge is not anticipated to be classified as a RCRA hazardous waste and could be disposed of at a Subtitle D facility.

Costs

The 100-year present worth costs for the three options (a, b, and c) are estimated at 34.6, 36.1, and 47.4 million dollars, respectively. Detailed cost comparisons are found in Table 8-2.

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 the previous section, 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 to both decision-makers and the public. Table 8-1 summarizing the comparison is located at the end of this section.

<u>Overall Protection of Human Health and the Environment</u>.

Protection of human health is provided by all four of the alternatives discussed in this document, although at varying degrees. Protection is achieved primarily through reliance on the fact that Site ground water is not a current source of drinking water, nor is it likely to be a future source of drinking water due to its non-potable characteristics. Additional protection is provided by existing hydraulic barriers which effectively prevent the spread of contamination to unimpacted areas (both off-site and lower, uncontaminated aquifers). Monitoring also serves to protect unimpacted areas of the environment. Protection of surface water is achieved through establishment of ACLs and monitoring to ensure they are not exceeded.

Alternative One offers the least protectiveness relative to the other alternatives because there are no formal institutional controls to prevent future exposure. This level of protection is unacceptable.

Alternatives Two, Three, and Four offer a higher, and acceptable, level of protectiveness because institutional controls would be implemented.

Alternatives Three and Four offer a somewhat shorter remediation time than Alternatives One and Two, thereby lessening duration of risk and affording a slightly higher level of protection. Alternatives Three and Four also offer some containment advantages as a large portion of residual contaminants would be placed in a secure RCRA landfill.

All alternatives offer similar degrees of protection of the environment. Modeling indicates that impacts to the City Drain will be negligible under all alternatives. Alternatives One and Two rely on existing hydraulic barriers and conditions to prevent the spread of contamination to off-site ground water and lower aquifers, whereas Alternatives Three and Four provide an extra measure of protection due to active capture from pumping which reduces contaminant loading.

Compliance with ARARs

A detailed description of ARARs applied for OU3 is given in Appendix A. All evaluated alternatives would comply with all chemical, location, and action-specific ARARs.

All alternatives are expected to achieve chemical-specific ARARS, both relevant MCLs and ACLs.

No location-specifc ARARs were applied to any of the alternatives.

Alternatives One and Two do not involve active remediation, and as such, there are no identified action-specific requirements. Alternatives Three and Four would be constructed as to comply with all substantive action-specific requirements.

Long-Term Effectiveness and Permanence

Residual risks under all alternatives will remain significant over the long-term; however, somewhat more timely risk reduction is afforded by Alternatives Three and Four. The degree of improvement is unclear but marginal, at best. Alternative One exhibits a lesser, and unacceptable, degree of effectiveness and reliability relative to the other alternatives because no institutional controls are provided. Institutional controls, which are components of Alternatives Two, Three, and Four, will be reliable if enforced. Only minor government agency coordination would be required to implement all alternatives. Once remedial goals are achieved, restoration under all alternatives is expected to be permanent.

Reduction in Toxicity, Mobility, or Volume of Contaminants

Alternatives Three and Four provide a higher degree of reduction in volume of contaminants compared to Alternatives One and Two. All alternatives affect the toxicity of the ground water through dilution as contaminants are removed (essentially a reduction in volume). Alternatives Three and Four pose the additional problem of generation of sludge, with Alternative Three producing a smaller volume of RCRA hazardous waste, and Alternative Four producing a higher volume of non-hazardous waste.

Short-Term Effectiveness

Alternative One provides the least amount of short term effectiveness, as no institutional controls will be in place while restoration is ongoing. Short-term risks to workers implementing the remedy under Alternatives One and Two are lower than Alternatives Three and Four, though these risks could be effectively managed through administrative and engineering controls. No alternative provides ground water restoration in less than 100 years.

Implementability

There are no major technical obstacles to the implementation of any of the remedial alternatives. Alternatives Three and Four present extensively more effort in implementation, though both are certainly achievable. The high amount of TDS in the ground water will produce a very large amount of sludge under Alternative Four. TDS could also cause operational challenges in both treatment alternatives.

Cost

Detailed cost comparisions are found in Table 8-2. Only Alternatives Two, Three, and Four are sufficiently protective of human health and the environment and warrant comparisons of cost. Alternatives Three and Four are not considered cost effective as neither would result in ground water restoration in a substantially shorter time frame than Alternative Two; nor would they provide any substantive increase in protection of human health and the environment. In other words, the higher costs for Alternatives Three and Four are not commensurate with small level of additional risk reduction afforded. Alterntive Two is the most cost effective.

State Acceptance

The UDEQ has worked in partnership with the USEPA throughout the RI/FS and accepts the proposed remedy on the basis that it is technically impracticable to achieve MCLs in a reasonable time frame.

Community Acceptance

The Proposed Plan was issued in January 1998. A public meeting was held on 21 January 1998 at the UDEQ offices in Salt Lake City, Utah. One member of the community attended the meeting and made a brief statement. No opposition to the Proposed Plan was expressed. Written comments and questions were received prior to the close of the public comment period. Those comments and responses are presented in the Responsiveness Summary (Appendix B) of this ROD.

Table 8-1
Comparative Analysis of Alternatives

Criteria	Alternative One No Action	Alternative Two Natural Attenuation	Alternative Three Chemical/Physical Treatment	Alternative Four Treatment by Distillation
Overall Protectiveness	Poor	Good	Good	Good
Compliance with ARARs	Yes	Yes	Yes	Yes
Long-Term Effectiveness and Permanence	Poor	Good	Good	Good
Reduction of Toxicity, Mobility, or Volume of Contaminants	Fair	Fair	Good	Good
Short-term Effectiveness	Poor	Good	Good	Good
Implementability	Easy	Easy	Difficult	Difficult
Costs	Low	Low	High	Extremely High
State Acceptance	Poor	Good	Fair	Poor
Community Acceptance	N/A[1]	N/A[1]	N/A[1]	N/A[1]

1. As discussed previously, community feedback was limited. Only one person attended the public meeting held on the proposed plan. No opposition to the selected remedy was expressed.

Table 8-2
Summary of Remedial Alternative Costs

Treatment Alternative	*A* 19 GPM	*B* 27 GPM	*C* 37 GPM	*Total Capital Cost (1997 $)*	*Total O&M Present Worth Cost (100 yr, i=7%)*	*Total Cost*[1,2] *(1997 $)*
1. No Action	NA			90,000	470,000	560,000
2. Natural Attentuation	NA			160,000	470,000	630,000
3. Pump and Treat with Co-precipitation	x			1,100,000	8,000,000	9,100,000
		x		1,500,000	8,700,000	10,200,000
			x	1,500,000	9,700,000	11,200,000
4. Pump and Treat with Distillation	x			5,500,000	29,000,000	34,600,000
		x		6,300,000	32,600,000	36,100,000
			x	7,000,000	40,400,000	47,400,000

1. Costs accurate to within -30 to +50%
2. No discount rate used to calculate costs

9.0 Monitored Natural Attenuation - The Selected Remedy

9.1 Designation of the Remedy

Based upon the results of the systematic screening process described above, UDEQ and EPA agree that Alternative Two, Monitored Natural Attenuation, most completely satisfies the screening criteria and is designated as the selected remedy for OU3. While all alternatives have specific merits, only Alternative Two is both sufficiently protective of human health and the environment and cost-effective. Alternative Two has provisions which ensure attainment of all four remedial action objectives:

- Institutional controls will prevent human exposure to Site ground water that would result in an excess cancer risk exceeding 1×10^{-6}.

- Site conditions are adequate to prevent off-site migration of contaminants to uncontaminated ground water and long-term monitoring will continue to ensure that no unacceptable off-site migration is occurring.

- Natural attenuation processes will restore the ground water to its natural background state and maximize its potential as a drinking water source. Long-term monitoring will ensure natural attenuation is achieving the expected results.

- The implementation and enforcement of ACLs at the ground water discharge boundaries, as well as Site conditions, will adequately protect surface water associated with the Site.

9.2 Implementation of the Remedy

The remedy will be implemented until such a time that the cleanup goals given in Table 6-5 and discussed in Section 6.6 of this document are attained and all remedial action objectives are met. Cleanup goals will be considered achieved when monitoring and statistical analysis indicates with reasonable confidence that all portions of OU3 are less than the cleanup goals. EPA expects in excess of 100 years to be required to achieve these goals.

A suitable long-term monitoring plan will be developed subsequent to this Record of Decision and will provide for statistically significant evidence as to the state of contamination in the ground water and.the migration of contaminants to unimpacted areas (both off-site and lower uncontaminated aquifers), if any.

Numerous safeguards will be implemented to ensure the remedy is continuing to provide satisfactory protection of public health and the environment. If monitoring indicates significant off-site migration of contamination is likely to occur or has occurred, a review of the remedy will be conducted. If monitoring at discharge boundaries indicates that ground water with contaminants exceeding ACLs established for the protection of the City Drain (Table 6-3) is likely to discharge or is discharging to the City Drain, a review of the remedy will be conducted. Monitoring will remain in effect until cleanup goals are achieved. Surface water monitoring will also be conducted to ensure water quality standards established for the City Drain are not exceeded. Institutional controls will remain in effect throughout the remediation period and as appropriate after completion to prevent human exposure to ground water presenting unacceptable health risks. Five-year reviews will also be conducted.

Because arsenic is the only identified carcinogen, and its background concentration (64 ppm) exceeds the health-based 1×10^{-6} cancer risk goal established for a residential drinking water scenario, it is recognized that absent reductions in naturally occurring background, this health-based goal will not be met. Based on this and other natural water quality issues, it is understood that any future use of ground water (even after attainment of remediation goals) for drinking water purposes would require active treatment.

10.0 STATUTORY DETERMINATIONS

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

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

· Be cost effective; i.e., the costs are proportional to the overall effectiveness, where overall effectiveness accounts for long-term effectiveness; reduction in toxicity, mobility, and volume; and short-term effectiveness.

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

EPA's Ground water Policy listed in the NCP preamble provides guidance on determining when active remediation is necessary and the appropriate remediation timeframe for a particular ground water classification:

· EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site. (40 CFR 300.430(a)(1)(iii)(F)). For the most highly valued uses, such as drinking water, the most rapid remediation will be employed to the extent practicable. Ground water that is naturally unusable because of characteristics such as high salinity may not be actively remediated.

· The minimum restoration timeframe will be determined by hydrogeological conditions, specific contaminants at a site, and the size of the contaminant plume. If there are readily available drinking water sources of sufficient quality and yield that may be used as alternative water supply, the necessity for rapid restoration of the contaminated ground water may be reduced.

· More rapid restoration of ground water is favored in situations where future demand for drinking water is likely and other potential sources are not sufficient. Rapid restoration may also be appropriate where the institutional controls to prevent the utilization of contaminated ground water for drinking water purposes are not clearly effective or reliable. Institutional controls will usually be used as supplementary protective measures during implementation of ground water remedies.

· Natural attenuation is generally recommended when active restoration is not practicable, cost-effective, or warranted because of site-specific conditions (e.g. Class IIB or III ground water which is unlikely to be used in the foreseeable future or ground water plumes that are not expanding and/or impacting usable ground water and/or surface water resources).

Based on this guidance and the following key considerations from the Detailed Analysis of Alternatives (Section Seven), both EPA and UDEQ agree that Monitored Natural Attenuation meets all statutory requirements in the NCP and CERCLA 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.

· Active pump and treat restoration is not cost-effective when compared to other alternatives.

· OU3 is not a current source of drinking water and, though classified by the State as Class IIB, is not likely to be a future drinking water source due to poor quality and the availability of alternate sources.

· Rapid ground water restoration is not mandated and is not practicable. The most aggresive remedial alternatives involving extraction and treatment require in excess of 100 years to approach remediation goals. Other drinking water sources are readily available in sufficient quality and quantity, and institutional controls would be implemented and enforced so as to be reliable over the long-term. EPA believes the particular circumstances of the Site make 100+ years a reasonable time frame to achieve cleanup goals. UDEQ does not agree that 100+ years is a reasonable time frame, but agrees that there are no technically practicable alternatives that would achieve cleanup goals in a lesser time frame.

· Natural physical processes such as flushing and dilution will ultimately reduce the concentrations of contaminants in groudwater to levels that are reflective of natural, background conditions present at the Site. Though background concentrations for some contaminants exceed drinking water standards and health-based goals, it is impracticable to attempt to remediate beyond these levels.

- Existing hydraulic barriers effectively contain the ground water contamination within Site boundaries and prevent the spread of contamination to unimpacted areas. Both EPA and UDEQ agree that these barriers and conditions will be sufficient over the long-term.

- The establishment of ACLs, along with the Site hydraulics, adequately protect surface water associated with the Site.

11.0 Explanation of Significant Changes

No significant differences exist between the Proposed Plan and this Record of Decision.

APPENDIX A
DETAILED ARARs ANALYSIS
(Applicable or Relevant and Appropriate Requirements)

POTENTIAL CHEMICAL SPECIFIC ARARS

OU3

The potential chemical-specific ARARs for the COCs at OU3 were developed using the following sources:

- Safe Drinking Water Act MCLs (Title 40 CFR, Part 141)
- Utah Primary and Secondary Drinking Water Standards (R309-103 U.A.C)
- Utah Ground Water Quality Protection Rules (R317-6 U.A.C)
- Utah Classifications of Waters of the State (R317-2 U.A.C)
- Utah Pollutant Discharge Elimination System Rules (R317-8 U.A.C)
- Clean Water Act - Water Quality Criteria (Title 40 CFR, Part 131) and
- Corrective Action Clean-Up Standards Policy - UST and CERCLA Sites (R311-211 U.A.C)

Table 1 provides a summary of the chemical-specific ARARs which have been evaluated as potential performance standards (or PRGs) for groundwater restoration.

SAFE DRINKING WATER ACT MCLs

The SDWA MCLs are the minimum state and federal standards for underground or aboveground sources of public drinking water. The Utah Primary and Secondary MCLs are found in U.A.C. R309-103 and generally parallel the federal MCLs which are found in Title 40 CFR Part 141. The application of MCLs as ARARs for groundwater restoration is addressed in EPA guidance (EPA, 1991c). The guidance states that MCLs are generally relevant and appropriate for groundwater that is or may be used for drinking considering its use, value, and vulnerability. Neither EPA nor the State of Utah has formally classified the Site groundwater; however, a comparison of the EPA and State of Utah groundwater classification criteria, with the existing background quality of the shallow HSU groundwater, indicates that the Site groundwater would be classified as a potential drinking water source. The relationship between the federal and state groundwater classifications, existing Site groundwater quality, and the application of federal and state MCLs as ARARs for groundwater cleanup is described further in the following paragraphs.

EPA Groundwater Classification

EPA's groundwater classification system establishes three categories for groundwater. Class I groundwaters are considered to be resources of unusually high value. Class II groundwater includes all other groundwater which is currently (Class IIa) or potentially (Class IIb) a source of drinking water. Groundwaters which are not considered to be a potential source of drinking water are classified Class III. Within EPA's classification system, the two factors considered in designating groundwater as Class II are: (1) water quality, and (2) yield. Water is considered to be suitable for drinking if it has a total dissolved solids (TDS) concentration of less than

10,000 mg/l, and either can be used without first being treated, or can be rendered drinkable after being treated by methods reasonably employed in a public water supply system. The groundwater quantity factor which defines a drinking water source is 150 gallons per day of sustainable yield (Lavelle, 1997).

With a background TDS concentration of approximately 5,000 mg/l (Dames & Moore, 1989a), and a yield exceeding 150 gallons per day, the Site groundwater is consistent with an EPA Class II classification. Under EPA's classification system, the groundwater would meet a Class IIb designation because background groundwater quality exceeds SDWA MCLs for arsenic, cadmium, and manganese, and would require treatment prior to use as public drinking water.

Utah Groundwater Classification

The Utah Groundwater Quality Protection Rules found in R317-6 U.A.C, list the criteria for groundwater classifications. Under these rules, Site groundwater would be classified as Class III, Limited Use Groundwater, to be protected as a potential source of drinking water, and as a source of water for industry and agriculture. Class III groundwater exhibits the following characteristics:

- TDS greater than 3,000 mg/l and less than 10,000 mg/l (Site background TDS is approximately 5,000 mg/l), or;

- One or more contaminants exceed the ground water quality standards listed in Table 1 [of R317-6-2 U.A.C]. Table 1 of R317-6-2 U.A.C generally lists the SDWA MCLs as the Groundwater Quality Standard. In the case of Site groundwater, background concentrations of arsenic and cadmium exceed these standards.

MCLs as ARAR for Groundwater Restoration

The EPA guidance on the application of MCLs as ARAR indicates that "if the attainment of a non-zero MCLG or MCL is impossible because the background level of the chemical is higher than that of the MCLG or MCL, attainment of the MCLG or MCL would not be relevant and appropriate." Therefore, because background levels of arsenic, cadmium and manganese exceed their respective MCLs, the MCL is neither applicable nor relevant and appropriate. Conversely, the MCL has been determined to be relevant and appropriate for a COC whose background concentration does not exceed its respective MCL (as in the case of chromium).

Table 1
Summary of Potential Chemical Specific ARARs Evaluated As PRGs in Groundwater
Portland Cement Site: OU3

Constituent of Concern	Federal MCL	State of Utah MCL	State of Utah GW Quality Standard (R317-6-2)	State of Utah Cleanup Standard - Policy (R311-211)
Arsenic	0.05	0.05	0.05	0.064[a]
Cadmium	0.005	0.005	0.005	0.0062[a]
Chromium	0.10	0.10	0.10	0.10
Lead	0.015[b]	0.015[b]	0.015	0.015
Manganese	None	0.05	None	0.44[a]
Molybdenum	None	None	None	0.182[c]
pH[d]	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	<8.0

Note: Units in mg/ℓ except for pH.
a Standard is the background concentration *(upper 95% confidence limit of the mean).*
b Action level for lead at tap.
c Standard is a health-based goal.
d Secondary MCL (SMCL).

UTAH GROUNDWATER QUALITY PROTECTION RULES

The Utah Groundwater Quality Protection Rules are found in R317-6, U.A.C. According to section R317-6-6.15 "Corrective Action," the groundwater class protection levels should be considered in this ARARs analysis, but are not intended to be ARARs for federal or state Superfund sites. However, the Utah "groundwater class protection levels" are separate and distinct from the "groundwater quality standards." Groundwater Quality Standards, numeric pollutant limits listed at R317-6-2, U.A.C., are relevant and appropriate at this Site by operation of R317-6-6.4, which provides that discharges may never cause groundwater quality standards to be exceeded*. The Groundwater Quality Standards for the OU3 COCs are shown in Table 1.

* *The DERR has agreed not to include R317-6-6.15, U.A.C. in the list of ARARs for this Site. DERR maintains that the provision is applicable, but does not believe that it is necessary to include as an ARAR at this Site because other ARARs, specifically Ground Water Quality Standards, are duplicative given the site-specific circumstances. Application of R317-6-6.15 would therefore not result in any different remedial action or remedial action goal. The U.S. EPA does not agree that this provision is applicable.*

CORRECTIVE ACTION CLEAN-UP STANDARDS POLICY

Utah rule R311-211, "Corrective Action Clean-Up Standards Policy – UST and CERCLA Sites," establishes the federal MCLs under the SDWA as the minimum standard for clean-up of hazardous substances for water-related corrective actions. However, the rule further states that:

> "In the case of contamination above the MCL..., if after evaluation of all alternatives, it is determined that applicable minimum standards cannot reasonably be achieved, clean-up levels above these minimum standards may be established on a case-by-case basis utilizing R311-211-3 and R311-211-4."

R311-211-3 presents the case-by-case evaluation criteria which are:

- The impact or potential impact of the contamination on the public health.
- The impact or potential impact of the contamination on the environment.
- Economic considerations and cost effectiveness of clean-up options.
- The technology available for use in clean-up.

R311-211-4 addresses prevention of further degradation of existing contamination levels in water, soils, or air. R311-211-5(c) states that: "in assessing the evaluation criteria, the following factors shall be considered:

1. Quantity of materials released.

2. Mobility, persistence, and toxicity of materials released.

3. Exposure pathways.

4. Extent of contamination and its relationship to present and potential surface and groundwater locations and uses.

5. Type and levels of background contamination.

6. Other relevant standards and factors as determined appropriate by the Board."

CLEAN WATER ACT - USE DESIGNATIONS AND WATER QUALITY CRITERIA

The Clean Water Act (CWA), Section 304, and Title 40 CFR Part 131 require states to develop "Water Quality Criteria" and antidegradation criteria to protect the designated uses of surface water in the state. CERCLA 121(d) requires that CWA Water Quality Criteria be attained where relevant and appropriate. These criteria and policies must protect aquatic life and human health, keeping the stream's designated use in mind. Human health standards include those established for drinking water and fish consumption as well as fish consumption alone.

The State of Utah water use designations and water quality criteria are codified in R317-2-6 and

2-14 U.A.C, respectively. To determine the appropriate chemical-specific limits for discharge into a surface water body, it is necessary to determine how Utah has classified the designated uses of the surface water body. According to R317-2-13.10 U.A.C, drainage canals and ditches statewide are classified as "Class 6," unless specifically classified under R317-2-13 U.A.C. The portion of Surplus Canal running past the Site is specifically listed under R317-2-13.5 U.A.C and is classified 2B, 3B, 3D, and 4. Use classifications for waters of the state are listed below:

Class 1:	Protected for use as a raw water source for domestic water systems
Class 1C:	Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Department of Health.
Class 2:	Protected for in-stream recreational use and aesthetics.
Class 2A	Protected for primary contact recreation such as swimming.
Class 2B:	Protected for secondary contact recreation such as boating, wading, or similar uses.
Class 3:	Protected for in-stream use by aquatic wildlife.
Class 3A:	Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
Class 3B:	Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
Class 3C:	Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.
Class 3D:	Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.
Class 4:	Protected for agricultural uses including irrigation of crops and stock watering.
Class 5:	The Great Salt Lake. Protected for primary and secondary contact recreation, aquatic wildlife, and mineral extraction.
Class 6:	Waters requiring protection when conventional uses as identified in [Class 1 through 5] do not apply. Standards for this class are determined based on environmental and human health concerns.

The City Drain, because it was not specifically listed in R317-2-13.5 is assigned a default use designation of "Class 6". However, as discussed below, the Utah Department of Environmental Quality, Division of Water Quality (UDEQ/DWQ) has established a site-specific classification and numeric criteria for City Drain based on the environmental and human health concerns posed by discharge of Site groundwater to City Drain.

Several meetings were held between DERR and the DWQ, both within the UDEQ, to establish numeric standards for parameters of concern for City Drain, and to establish a point of compliance (POC). This analysis is ordinarily conducted by DWQ as part of the water quality permitting process, but because this is a CERCLA action, only the substantive, not the administrative permit requirements are necessary. Because the City Drain eventually discharges to the Great Salt Lake, specifically the Farmington Bay Waterfowl Management Area, the DWQ and DERR have classified City Drain as 3D. Numerical levels were calculated for City Drain based on the following factors:

- Protected uses and numeric criteria established for Class 3D;
- City Drain background surface water quality;
- City Drain flow rates;
- Groundwater discharge flow rate to City Drain;
- Proximity, flow rates, and water quality of tributaries to City Drain.

The performance standard defined by DWQ is that the in-stream concentrations at the POC will not exceed 125% of the Class 3D water quality standards. To establish numeric standards, DWQ calculated the individual concentrations of contaminants in groundwater at the Site that, if discharged to City Drain, would cause exceedance of the performance standard at the POC. These numeric criteria are listed in Table 2.

Table 2
Concentration Limits for Groundwater Discharges from the Site to City Drain

Chemical	*Concentration (µg/l)*	*Chemical*	*Concentration (µg/l)*
Aluminum	*4,502.33*	*Lead*	*666.71*
Arsenic	*9,832.68*	*Mercury*	*0.62*
Cadmium	*139.08*	*Nickel*	*20,667.94*
Chromium III	*26,339.81*	*Selenium*	*258.75*
Chromium VI	*569.26*	*Silver*	*6.21*
Copper	*1,564.5*	*Zinc*	*13,914.05*
Iron	*25,875.48*		

The POC is in City Drain immediately downstream of the confluence of the City Drain and the north-south trending ditch (engine-block ditch) located on the west side of I-215 (McNeal & Moellmer, 1995 & 1997). These site-specific numeric criteria are considered applicable for the OU3 remedial action.

Utah's antidegradation policy is found in R317-2-3 U.A.C. This rule states that no water quality degradation is allowable which would interfere with or become injurious to existing instream water uses. This section also affords protection to "High Quality Waters," categories 1 and 2. Site-specific water quality criteria developed for the City Drain will not affect its "existing use."

Utah Pollutant Discharge Elimination System (UPDES) regulations are found in R317-8 U.A.C. These regulations set standards for discharge of pollutants into surface water bodies in the State of Utah, and for discharge of wastewater by land application. The regulations specify that for toxic pollutants such as arsenic, cadmium, chromium, and lead, the Best Available Technology economically achievable (BAT) must be used to treat the wastewater before discharge. The actual pollutant limits are developed on a case-by-case basis where there are no applicable industry category standards. Therefore, these levels would be negotiated with the State as part of the substantive requirements of a UPDES permit. Effluent limitations for wastewater that is land applied are also calculated (UAC R317-8-2). They are calculated by using effluent guidelines, total concentrations in the waste stream, amount of wastewater to be treated, and the total wastewater flow.

LOCATION SPECIFIC ARARS

OU 3

Planned remedial activities for OU1 and OU2 involve excavation with off-site disposal of CKD and underlying contaminated soils. As a result, all existing surface features will be obliterated and the post remediation surface will be entirely man-made. It is expected that the remedy for OUs 1 and 2 will be implemented before the OU3 remedy. Because the new land surface will not have any established animal or plant habitats, there will be no sensitive species "location-specific" ARARs to review. In addition, the Portland Cement site is not a seismically active area. Based on this information, no location-specific ARARs were reviewed for OU 3 activities.

Action-Specific ARARs – Portland Cement Site: OU3

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Remediation of Groundwater			40 CFR 264, Subpart F UAC R315-8-6	ARAR	Requirements are relevant and appropriate for groundwater monitoring.
Discharge of Water into Surface Water Bodies	All surface water discharges must be in compliance with promulgated Utah Pollutant Discharge Elimination System rules.	Discharge of pollutants into Utah surface water.	40 CFR 122 and 125 UAC 317-8	ARAR	Applicable
Treatment, Storage, or Disposal in Waste Pile		RCRA hazardous waste treated, stored, or disposed in a waste pile	40 CFR 264 Subpart L UAC R315-8-12	ARAR	Applicable if waste pile is used
RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage or Disposal Facilities		Operation of treatment, storage or disposal facilities for hazardous wastes.	40 CFR Part 264, Subparts A H UACR 315-8 (1-8)	ARAR	Applicable for waste pile facility
Generation of Hazardous Waste	Must identify waste (hazardous or non-hazardous). Store correctly.	Generation of RCRA hazardous waste	40 CFR 261, 262 UAC R315-5	ARAR	Applicable
Treatment/Storage in Tanks	Tanks must have sufficient shell strength (thickness), and, for closed tanks, pressure controls, to assure that they do not collapse or rupture.	RCRA hazardous waste (listed or characteristic), held in a tank for treatment, storage or disposal. (40 CFR 264.10).	40 CFR 264.190 UAC R315-8-10	ARAR	Applicable.
	Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191 UAC R315-8-10	ARAR	Applicable
	New tanks or components must be provided with secondary containment.		40 CFR 264.193 UAC R315-8-10	ARAR	Applicable
	Existing tanks must install secondary containment by certain dates, depending on age, if known. Most piping systems must be fitted with secondary containment.				
	Tanks must be provided with controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.194 UAC R315-8-10	ARAR	Applicable

Action-Specific ARARs – Po...nd Cement Site: OU3 (Continued)

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Treatment/Storage in Tanks (con't.)	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks, (to assess their structural integrity) and the area surrounding the tank (to identify signs of leakage).		40 CFR 264.195 UAC R315-8-10	ARAR	Applicable
	Repair any corrosion, crack, or leak.		40 CFR 264.196 UAC R315-8-10	ARAR	Applicable
	At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment and discharge confinement structures.		40 CFR 264.197 UAC R315-8-10	ARAR	Applicable
	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association, 1976 or 1981).		40 CFR 264.198 UAC R315-8-10	ARAR	Applicable
Container Storage	Containers of hazardous waste must be:	Storage of RCRA hazardous waste (listed or characteristic) not meeting exempt small quantity generator criteria held in a container for less than 90 days before treatment, storage, or disposal.		ARAR	Applicable
	· Maintained in good condition		40 CFR 264.171 UAC R315-8-9.2		
	· Compatible with hazardous waste to be stored; and		40 CFR 264.173 UAC R315-8-9.3		
	· Closed during storage (except to add or remove waste).		40 CFR 264.174 UAC R315-8-9.4	ARAR	Applicable
	Inspect container storage areas weekly for deterioration.		40 CFR 264.175 UAC R315-8-9.5	ARAR	Applicable
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175 UAC R315-8-9.6	ARAR	Applicable
	Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176 UAC R315-8-9.7	ARAR	Applicable
	Keep incompatible materials separate with a dike or other barrier.		40 CFR 264.177 UAC R315-8-9.8	ARAR	Applicable
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178 UAC R315-8-9.9	ARAR	Applicable

Action-Specific ARARs - Po...nd Cement Site: OU3 (Continued)

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Construction	Fugitive dust control	Generation of fugitive dust emissions.	UAC 307-12	ARAR	Applicable
State Cleanup Action and Risk Based Closure Standards for USTs and CERCLA sites	· Lists requirements to be considered in establishing cleanup standards for groundwater, surface water, soils, and air. · Requires cleanup goal of 1×10^{-6} risk level for carcinogens and a Hazard Index of <1 for non-carcinogens. · Risk level of 1×10^{-5} for carcinogens allowed if also have institutional controls such as monitoring, deed notations, site security, etc. For water-related corrective action, MCLs established under the SDWA are the minimum standards to be met. If it is determined after evaluation that applicable minimum standards cannot reasonably be achieved, clean-up levels above these standards may be established on a case-by-case basis	Management of hazardous waste or hazardous constituents that exist in environmental media.	UAC R311-211	ARAR	Applicable
Clean Closure for Tanks, Containers, and Waste Piles	General closure performance standard for tanks and containers: minimization of need for further maintenance and control; minimization or elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to ground surface water or atmosphere. Disposal or decontamination of equipment, structures and soils.	RCRA hazardous waste (listed or characteristic) management units.	40 CFR 264.111; UAC R315-8-7 UAC R-315-8-11.5	ARAR	Applicable.
	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.		40 CFR 264.111 (general) 40 CFR 264.178 (containers) 40 CFR 264.197 (tanks) 40 CFR 264.258 (waste pile) UAC R315-8-9.9 UAC R315-8-11.5	ARAR	Applicable.
	Ensure closure is protective of human health		40 CFR 264.111 UAC R315-8-7	ARAR	Applicable.
Emergency Controls	Spill reporting.	In the event of a spill of hazardous waste or material, which when spilled becomes a hazardous waste.	UAC 315-9	ARAR	Applicable.

APPENDIX B
RESPONSIVENESS SUMMARY

APPENDIX B
RESPONSIVENESS SUMMARY
OPERABLE UNIT NUMBER 3: GROUNDWATER
PORTLAND CEMENT SITE

The following comments were submitted by Terry Sadler, Director of the Division of Environmental Health, Salt Lake City & County Health Department in a letter to Mr. Bill Townsend, Project Manager for the Division of Environmental Response and Remediation (DERR) of the Utah Department of Environmental Quality (UDEQ) dated 28 January 1998. The letter is attached.

Comment 1: Considering there is only a ten foot separation between the shallow hydrostratigraphic unit (HSU) and the intermediate HSU, contamination of this intermediate HSU is likely. Has this been taken into account in regards to drinking water sources?

Response: The DERR and Region VIII EPA feel that contamination of the intermediate HSU is unlikely as long as the prevailing hydrogeologic conditions are not perturbed through natural or man-induced causes. The current site conditions that minimize the likelihood of downward migration of the shallow HSU contaminants are: 1) a strong upward hydraulic gradient (caused by confined conditions in the intermediate HSU); and, 2) the adsorptive/reactive capacity of the shallow HSU sediments.

Contamination of the intermediate HSU would likely occur if the vertical gradient were reversed. Conditions that would reverse the gradient include a sustained period of flooding or high water in the Surplus Canal, or extensive localized pumping of water from the intermediate HSU. These exigencies were considered during the evaluation of remedial alternatives and support the decision by DERR and EPA to refrain from pumping groundwater as part of an engineered remedy. Deed restrictions that preclude future pumping of water from the shallow or intermediate HSUs are measures to ensure that contaminants from the shallow HSU do not migrate downward.

Comment 2: The Department would like more information on the health effects of allowing this contaminated water to discharge to the surrounding surface water bodies. Has DEQ calculated the rate of discharge and likely contaminant levels? Have the effects on wildlife been evaluated?

Response: The contaminated water is currently discharging to the City Drain and the sanitary sewer that bisects the Site. UDEQ, DERR and the Division of Water Quality (DWQ) have evaluated the rate of discharge and contaminant levels and concluded that there is no measurable degradation of the City Drain or the sanitary sewage leaving the Site. The details of these evaluations are presented in Appendix D of the Final Focused Feasibility Study (December 1997).

The effects on wildlife were evaluated as part of this process. The State of Utah water use designations and water quality criteria are codified in R317-2-6 and 2-14 U.A.C, respectively. DWQ established a site-specific classification and numeric criteria for City Drain based on the environmental and human health concerns posed by discharge of Site groundwater to City Drain. Because the City Drain eventually discharges to the Great Salt Lake, specifically the Farmington Bay Waterfowl Management Area, the DWQ and DERR have classified City Drain as 3D. Class 3D is set to protect waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

Numerical levels were calculated for City Drain based on the following factors:

- *Protected uses and numeric criteria established for Class 3D;*
- *City Drain background surface water quality;*
- *City Drain flow rates;*
- *Groundwater discharge flow rate to City Drain;*
- *Proximity, flow rates, and water quality of tributaries to City Drain.*

The performance standard defined by DWQ is that the in-stream concentrations at the Point-of-Compliance (POC) will not exceed 125% of the Class 3D water quality standards. To establish numeric standards, DWQ calculated the individual concentrations of contaminants in groundwater at the Site that, if discharged to City Drain, would cause exceedance of the performance standard at the POC. The POC is the confluence of City Drain with the drainage ditch on the west side of I-215.

Comment 3 : In the preferred alternative, what is the length of time groundwater monitoring will be conducted? The comment is made that surface water monitoring will be conducted to ensure that City Drain downstream users are protected. Will DEQ be performing this surface water monitoring and at what frequency? In the event elevated levels are detected in City Drain, what protective measures will be taken?

Response: It was intended that groundwater and surface water monitoring be conducted until remediation goals for groundwater have been achieved. This duration is expected to exceed 100 years. The details of the monitoring activities, such as sample location, sample frequency, analytes to be monitored, and corrective actions (if necessary), will be documented in a Groundwater Restoration Performance and Compliance Monitoring Plan to be completed as part of the Superfund Remedial Design and Remedial Action for OU3. This plan will incorporate surface water monitoring as well.

Comment 4 : What is the expected time frame for natural attenuation to restore the site to acceptable groundwater levels for Alternative 2?

Response: The expected duration for groundwater restoration under Alternative 2 is in excess of 100 years.

Comment 5 : In alternative's 3 and 4, the statement is made that this treatment would not involve RCRA hazardous waste. Later in the document, the statement is made that locational requirements for a hazardous waste treatment facility would have to be met.

Response: Under both Alternatives 3 and 4, the proposed treatment system would be treating groundwater that would meet the definition of a characteristic toxic hazardous waste as defined under Subtitle C of RCRA (by virtue of arsenic concentrations exceeding 5 mg/l). This necessitates that the groundwater treatment system be designed, under both alternatives, in accordance with certain RCRA requirements. The distinction between the two alternatives is that treatment residuals (i.e. sludges generated as a result of the treatment of groundwater) under Alternative 3 are expected to be RCRA hazardous waste, whereas the residuals under Alternative 4 are not. Therefore, RCRA locational design prerequisites are not considered necessary for Alternative 4 facilities designed to store the treatment residuals.

Comment 6 : How do you propose to enforce institutional controls?

Response: Restrictions on future groundwater use will be noted on property deeds. This notation is expected to be a sufficient deterrent to future development of groundwater resources. These restrictions may also be added to the Salt Lake Valley Water Resource Master Plan to preclude permitting of drinking water wells for OU3.

Comment 7 : According to the document, in excess of 100 years will be required to naturally attenuate groundwater to acceptable levels. The costs under alternative 2 do not appear to include monitoring for such an extended period of time. Has the difference in monitoring costs between alternatives 2, 3 and 4 been projected out over the length of the entire project and factored for inflation? Also, the costs assume no unacceptable surface water impacts.

Response: Long-term monitoring costs have been included in all four alternatives and are calculated as the present worth assuming a duration of 100 years and an average rate of return of 7% including inflation. These costs are documented in Appendix E of the Final Focused Feasibility Study for OU3, dated December 1997. Costs do not include the remediation of unacceptable surface water impacts because this is considered highly unlikely based on a rigorous modeling effort and calculations by the DWQ on the numeric criteria for City Drain.

Comment 8 : The statement is made that alternatives 3 and 4 would require over 100 years to achieve remediation. Were pumping rates the limiting factor in this calculation? Can pumping rates be increased to achieve a faster cleanup? We would be interested in seeing the rationale for the choice of the two pumping rates proposed.

Response: Limitations on the pumping rate for the shallow HSU is a major contributing factor to the long duration for groundwater restoration; however, the principal factor affecting the duration of restoration is posed by the desorption kinetics for arsenic. Under current pH conditions, arsenic is strongly sorbed onto shallow HSU sediments due to reaction with charged clay particles and adsorption to organic matter. In order to achieve groundwater restoration, the arsenic must be desorbed from the sediments. The rate of desorption under current conditions is slow, thus prolonging the duration for restoration. The modeling effort accomplished as part of the FFS incorporates the desorption kinetics for arsenic.

The maximum pumping rate of 37 gallons per minute is not arbitrary. This rate is a function of the shallow HSU hydraulic characteristics and represents an upper bound limit of the potential yield from wells or drains installed throughout Sites 2 and 3 and the West Site. Other lesser pumping rates were included in the FFS to compare to this maximum calculated pumping rate. This comparison allowed decision makers to evaluate the cost/benefit of lowering the remediation pumping rate below the maximum calculated rate. Based on the groundwater modeling it was determined that there was no significant difference in the predicted duration of restoration for the various pumping rates. It was concluded then, that the duration of restoration is most sensitive to the desorption kinetics for arsenic.