7-7-1993

Record of Decision Utah Power & Light/American Barrel Site Salt Lake City, Utah

United States Environmental Protection Agency

United States
Environmental Protection
Agency

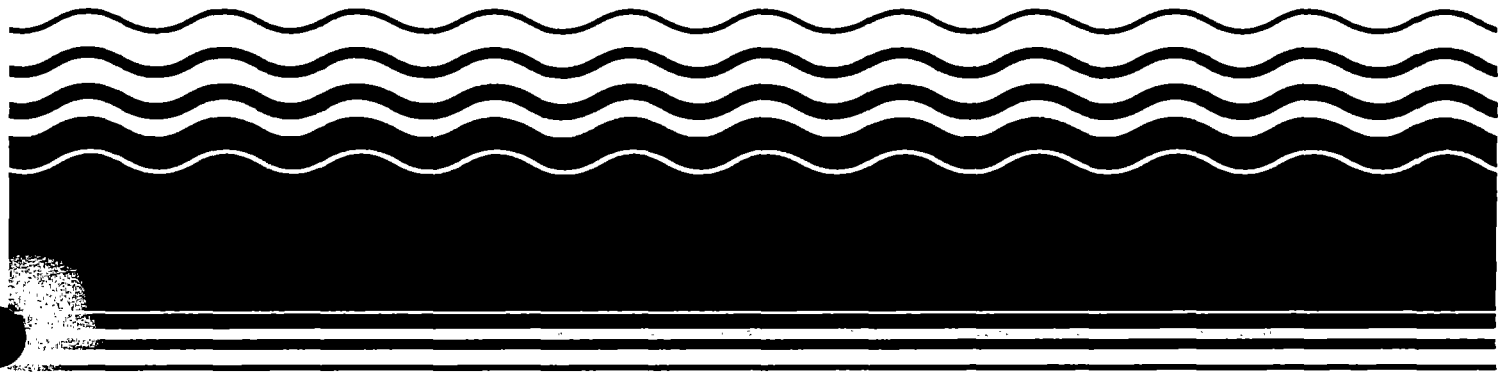
Office of
Emergency and
Remedial Response

EPA/ROD/R08-93/073
July 1993

EPA

Superfund Record of Decision:

Utah Power & Light/ American Barrel, UT



RECORD OF DECISION

UTAH POWER & LIGHT/AMERICAN BARREL SITE

SALT LAKE CITY, UTAH

JULY 7, 1993

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Utah Power & Light/American Barrel Site, Salt Lake City, Utah

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Utah Power & Light/American Barrel Site in Salt Lake City, Utah, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

The Utah Department of Environmental Quality concurs with the remedy selected by the U.S. Environmental Protection Agency (EPA).

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE SELECTED REMEDY

The objective of this Record of Decision (ROD) is to provide a remedy to address all contamination caused by previous site activities located on the American Barrel Yard and adjacent properties which affect surface soils, subsurface soils, and groundwater. Contamination from historical operations and contaminant sources left on-site at the time of abandonment have migrated into soil and groundwater. Remediation will be to the extent of contamination emanating from the American Barrel Yard and Denver Rio Grande and Western properties.

The response actions described in this ROD will permanently address all principal threats through treatment. Soil contamination will be reduced to health based levels for all contaminants of concern. These levels are based on a future industrial use of the site but will provide for future residential development with acceptable risks within EPA's risk range of 10^{-4} to 10^{-6}. Groundwater remediation levels are based on the Safe Drinking Water Act maximum contaminant levels or acceptable risk levels for future residential exposure.

The major components of the selected remedy include:

* Excavation of soils which are principal threats based on visual observation, to the extent possible given physical limitations resulting from locations of existing railroad lines, or until the concentrations of EPA target compound list PAHs are below 9,000 mg/kg. The quantification of principal threats is based on EPA guidance, "A Guide to Principal Threat and Low Level Threat Wastes" which suggests defining principal threats as having a risk of 10^{-3} or greater.

* Excavation of soils exceeding health based remediation levels, based on a 10^{-6} worker exposure, that have a potential exposure pathway. Soils down to a depth of 10 feet are considered to have an exposure pathway.

* Treatment of excavated soils through offsite recycling of soils into a cold mix asphalt product suitable for paving roads. Incorporation of contaminated soils as a raw material into the asphalt product involves treatment through solidification.

* If any RCRA characteristic hazardous wastes are encountered, these contaminated soils will be shipped offsite for incineration and will not be utilized in the asphalt treatment process.

* Soil vapor extraction (SVE) will be used to remediate principal threat light non-aqueous phase liquid (LNAPL) contamination. Location of the SVE extraction wells will be based on a principal threat definition where benzene in soils exceeds 10^{-3} risk levels for residential exposure to groundwater. In conjunction with SVE, groundwater will be extracted from vapor extraction wells to enhance the SVE process. Off-gas from the SVE system will be treated prior to discharge to the atmosphere.

* Groundwater extracted from SVE wells, water pumped from excavations, and decontamination water will be treated to POTW discharge standards and then discharged to the Salt Lake City POTW for further treatment.

* The dissolved phase aqueous groundwater contamination plume is expected to naturally attenuate once the principal threat sources for groundwater contamination are remediated. If monitoring of groundwater contamination indicates that natural attenuation is not restoring groundwater to remediation levels, additional source removal or more active groundwater remediation may be required.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, except certain requirements for RCRA waste piles where a waiver is appropriate based on 40 C.F.R. § 300.430(f)(1)(ii)(C)(4). The selected remedy will attain a standard of

performance that is equivalent to that required under the otherwise applicable standard. This remedy is cost effective, utilizes permanent solutions and alternative treatment and resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will not achieve the remediation levels for groundwater within five years, 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. Five-year reviews will be conducted as required under Section 121(c) of CERCLA and 40 C.F.R. § 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Contingency Plan.

Jack W. McGraw — 7/7/93

Jack W. McGraw
Acting Regional Administrator
EPA Region VIII

Date

Dianne R. Nielson — 7/19/93

Dianne R. Nielson, PhD
Executive Director
Utah Department of Environmental Quality

Date

DECISION SUMMARY

UTAH POWER & LIGHT/AMERICAN BARREL SITE

SALT LAKE CITY, UTAH

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THE DECISION SUMMARY

I Site Name, Location, and Description

The Utah Power and Light/American Barrel Site (UP&L/ABS or the site) is an approximately four-acre parcel in Township 1 North, Range 1 West, Section 36 in Salt Lake City, Utah (Figure 1). The site is defined as the American Barrel Yard and the extent of contamination originating from past activities on the yard. The city block bounded by North Temple, South Temple, 5th West and 6th West streets is referred to as the study area.

The study area is divided into geographic areas consisting of the American Barrel Yard (ABY or yard), the Denver and Rio Grande Western Railroad property or Southeast Area (SEA), the Union Pacific Railroad property or Northwest Area (NWA), the residential area and the industrial area or Deseret Paint Site. (Figure 2).

The principal topographic features of the site are a gentle (1%) slope towards the Jordan River (one mile to the west) and a surface cut up to 8 feet deep for the Denver and Rio Grande railroad track along the eastern boundary of the yard. The railroad track just outside the western border of the ABY is at grade.

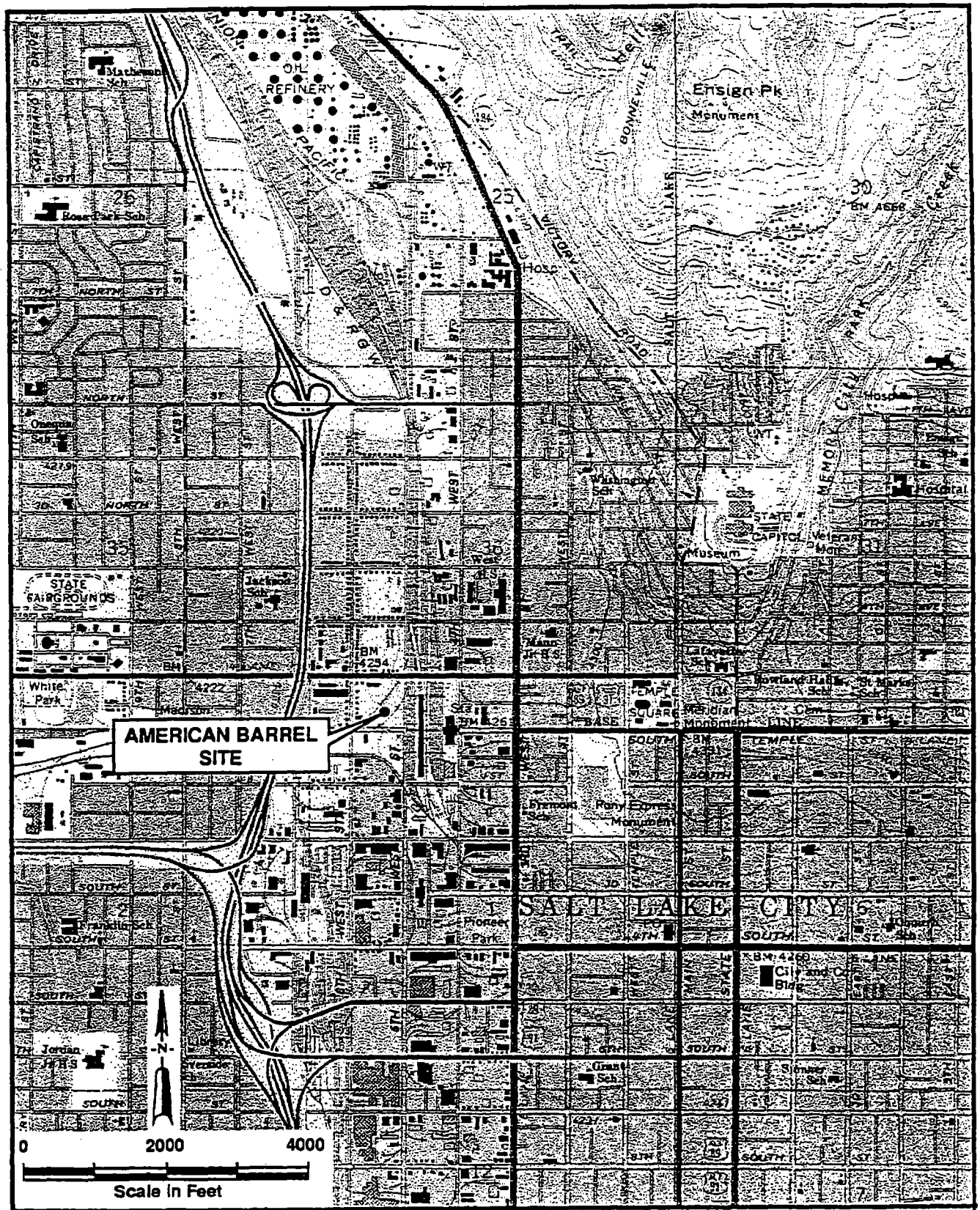
The ABY boundary is marked by a secured chain link fence; gates are located at the property's southwest corner and the middle of its northern edge. The yard is sparsely vegetated and while there are no intact buildings or large trees remaining within the fenced yard, there are several remnants of structures in and around the yard.

Residential lots and one light industrial lot are present along the western boundary of the study area. Surface features in this area include small buildings, mixed grass and gravel yards, old shade trees in some yards, and wood or sheet metal fences. To the north lies a vacant lot, formerly an auto wrecking property area, which is partially bounded by a woven wire fence and covered with sparse vegetation and bare soil.

The Union Pacific Railroad Company property comprises the area west and north of the ABY. This area is sparsely vegetated and the only surface features are the railroad tracks and overhead lines. Southeast of the ABY is the Denver and Rio Grande Railroad property. There are two small buildings in this area used intermittently by railroad personnel. The lot is sparsely vegetated and includes stone foundation remnants and some paved portions along the eastern boundary. The cut for the railroad track exposes old building foundations. Gravel-size ballast underlies all of the railroad tracks at this site.

City property forms a paved border around all four sides of the study area. Sixth West Street receives moderate traffic and forms the western boundary of the study area. The North Temple Street overpass carries traffic along the study area's north side, with a paved but only occasionally used right-of-way at ground level. The east and south margins of the study area contain railroad tracks just outside the paved right-of-way.

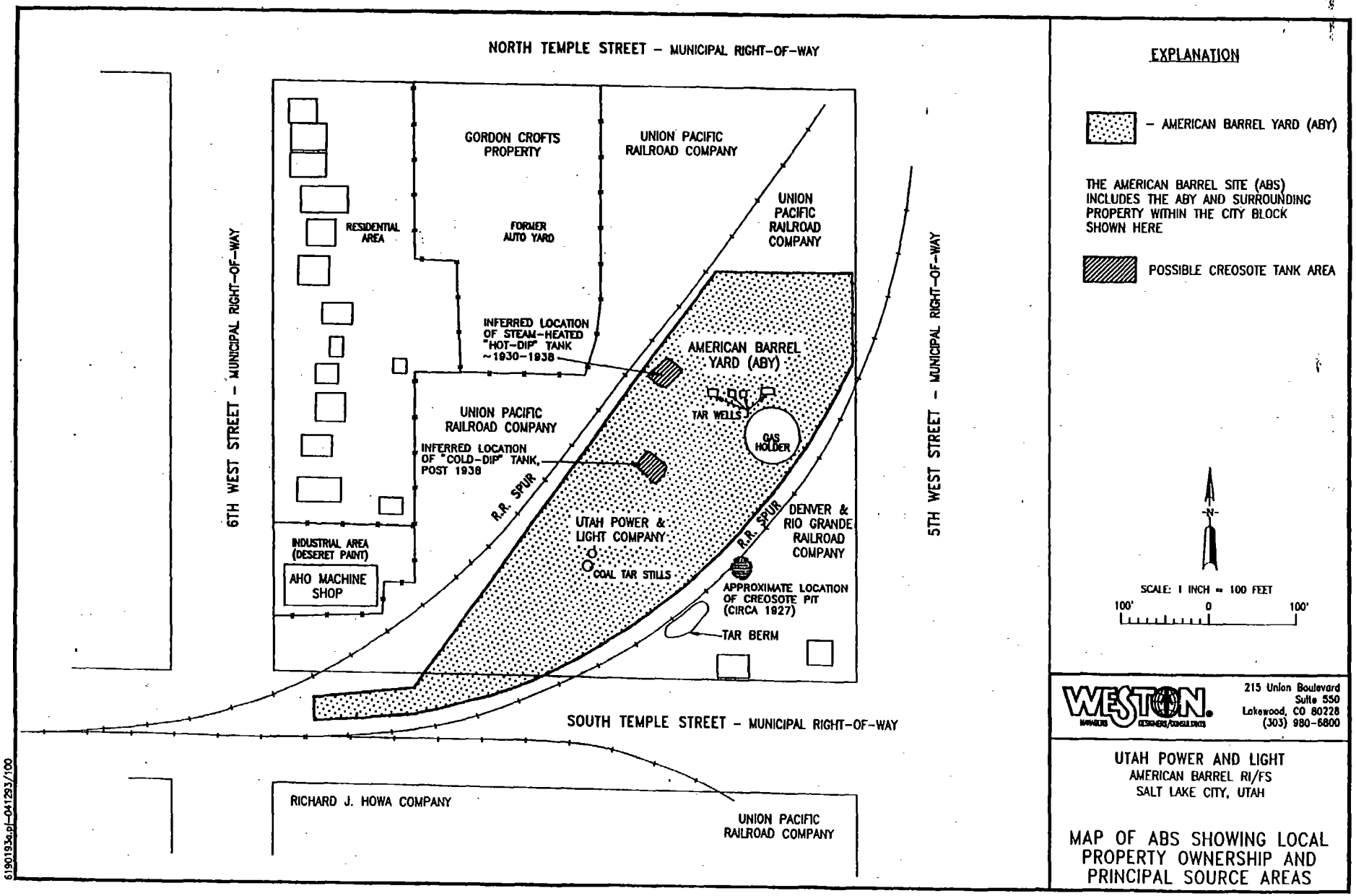
The nearest population to the site are those residents who live in the homes which lie 200 feet west of the ABY. There are also a number of transients who frequent the area. In the past,



Source: USGS 7.5 minute quadrangle - Salt Lake City North, Utah

SITE LOCATION MAP

FIGURE 1



EXPLANATION

– AMERICAN BARREL YARD (ABY)

THE AMERICAN BARREL SITE (ABS) INCLUDES THE ABY AND SURROUNDING PROPERTY WITHIN THE CITY BLOCK SHOWN HERE

POSSIBLE CREOSOTE TANK AREA

N

SCALE: 1 INCH = 100 FEET

100' 0 100'

WESTON
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800

UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH

MAP OF ABS SHOWING LOCAL PROPERTY OWNERSHIP AND PRINCIPAL SOURCE AREAS

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FIGURE 2

transients may have had extensive contact with on-site media. However, under current conditions, there is a fence around the ABY to discourage trespassers and little on site which would attract visitors.

II Site History and Enforcement Activities

History of Site Activities

Activities began at the UP&L/ABS as early as 1873 and continued until 1987. The first process to be conducted on the site was coal gasification. The major features of this operation included coal storage sheds, a gas-o-meter (gas holder), tar wells, a coal tar still, the gas works (which included the retort house, exhauster room, condenser, lime house, and tar scrubbers), and the purifying house. The gas plant was located on the American Barrel Yard, the SEA, and a portion of the NWA. Locations of these structures are depicted on Figure 3. The gas-o-meter was a buried tank used to store gas following production and before metering out to customers. It was built of 30 inch thick brick masonry construction topped with sandstone building stone. The process of cooling the gas produced a tar/water condensate which was separated in the tar well. The tars were subsequently used as fuel, sold, or managed on site. The coal gasification plant included a distillation procedure to separate usable oils from tars. The final purification step in coal gasification involved a purifying house. In this step, the gas was passed through long, shallow boxes of hydrated iron oxide, thereby producing ferric sulfide. By the early 1900s this step was eliminated by switching to a scrubber technology.

Normal coal gasification procedures produced a variety of by-products having some commercial value. These included coke, ammonia, and lighter tars and sludges which were sold to refiners or to the public. Distillation by-products from the refinement of tars included toluene, naphthalene, anthracene, and phenols. By-products having no commercial value were also produced: ash, clinkers, heavy tars, sludges, lime sludges, spent iron oxides, liquid wastes, and steam condensates. These products were commonly disposed of in onsite pits and offsite landfills. Coal gasification operations ceased in 1908.

Creosote pole treating operations were conducted on the ABY and SEA as early as 1927. Creosote was brought to the site in drums and stored within and just north of the northeastern corner of the ABY. Historical information shows there were two pole dipping tanks on the ABY and possibly one tank on the SEA. Design plans indicated one was a semi-open tank with walls of 12-gage iron and wooden supports, buried six feet underground, and built on buried concrete walls. The other was a 400-gallon capacity steam heated tank used in conjunction with a boiler house and hot well tank to pressure treat poles in hot creosote. This tank was made of welded or riveted iron walls, painted with red lead paint (on the outside), and buried at a depth of 8.5 feet underground. It was tipped at an angle to allow for drainage into six inches of sand. No identifiable tank structures from this operation remain on site. The specific chemical composition of the creosote used at this site is unknown. However, typical creosote compounds include a variety of polycyclic aromatic hydrocarbons (PAHs), phenolic compounds, and nitrogen-, sulfur-, and oxygen-heterocyclic components. Locations of former creosote wood treating structures are shown on Figure 4.

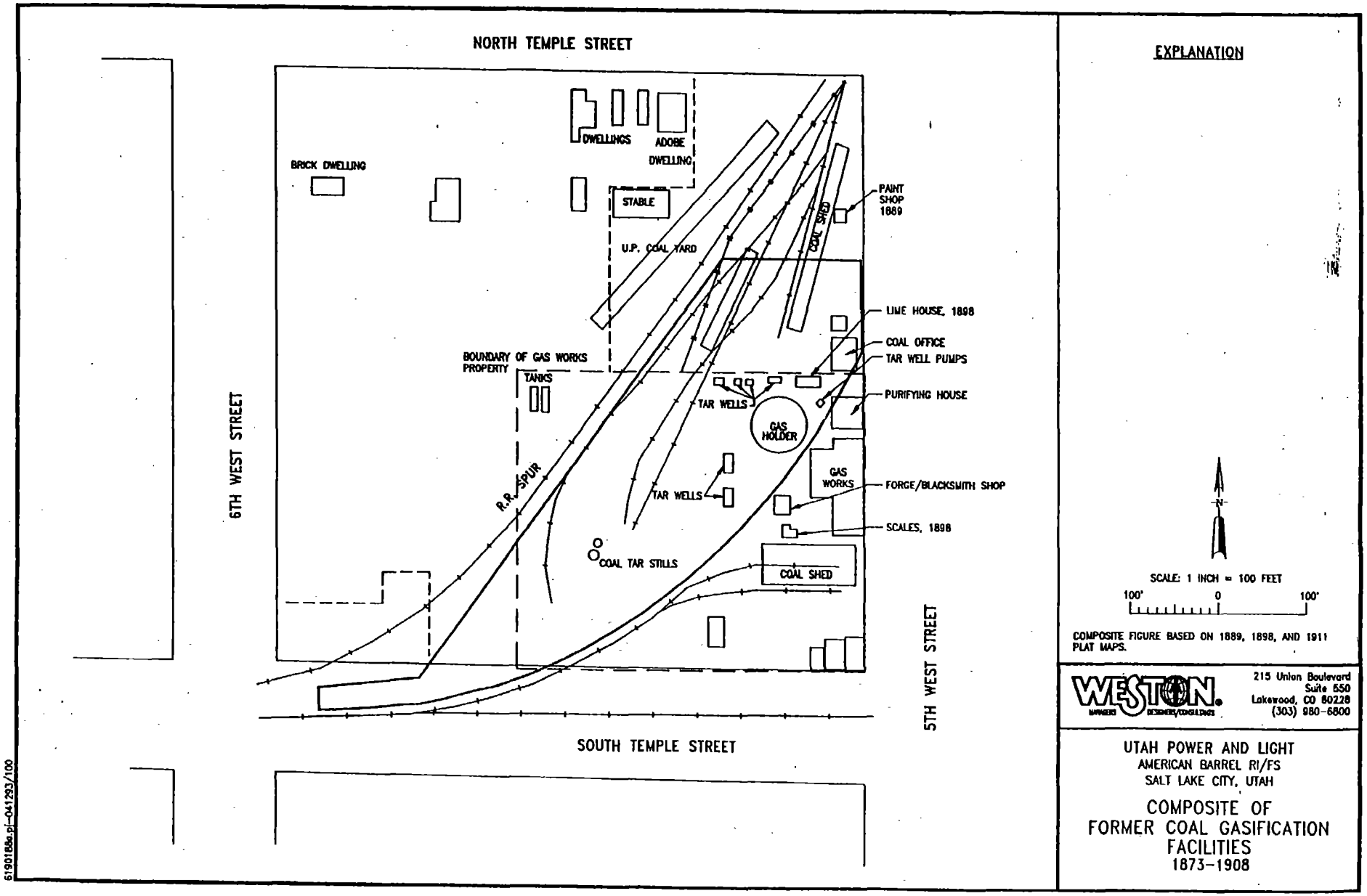
NORTH TEMPLE STREET
SOUTH TEMPLE STREET
6TH WEST STREET
5TH WEST STREET
DWELLINGS
ADOBE DWELLING
BRICK DWELLING
STABLE
U.P. COAL YARD
COAL SHED
PAINT SHOP 1889
LIME HOUSE, 1898
COAL OFFICE
TAR WELL PUMPS
PURIFYING HOUSE
BOUNDARY OF GAS WORKS PROPERTY
TANKS
TAR WELLS
GAS HOLDER
GAS WORKS
FORGE/BLACKSMITH SHOP
SCALES, 1898
R.R. SPUR
TAR WELLS
COAL TAR STILLS
COAL SHED
EXPLANATION
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
COMPOSITE FIGURE BASED ON 1889, 1898, AND 1911 PLAT MAPS.
WESTON
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
COMPOSITE OF FORMER COAL GASIFICATION FACILITIES 1873-1908
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FIGURE 3

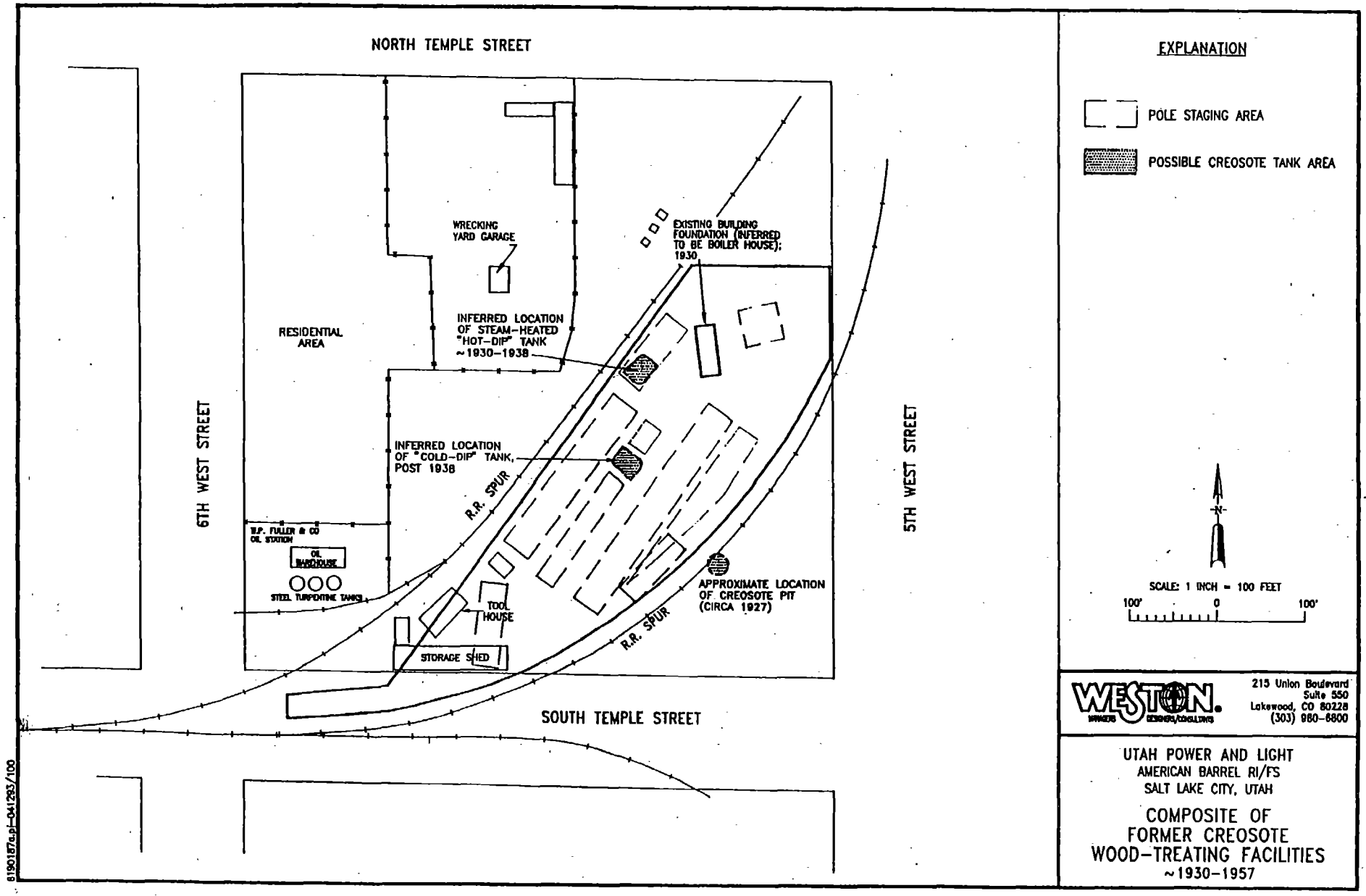
NORTH TEMPLE STREET
6TH WEST STREET
5TH WEST STREET
SOUTH TEMPLE STREET
RESIDENTIAL AREA
WRECKING YARD GARAGE
EXISTING BUILDING FOUNDATION (INFERRED TO BE BOILER HOUSE); 1930
INFERRED LOCATION OF STEAM-HEATED "HOT-DIP" TANK ~1930-1938
INFERRED LOCATION OF "COLD-DIP" TANK, POST 1938
R.R. SPUR
R.R. SPUR
W.P. FULLER & CO OIL STATION
OIL WAREHOUSE
STEEL TURPENTINE TANKS
TOOL HOUSE
STORAGE SHED
APPROXIMATE LOCATION OF CREOSOTE PIT (CIRCA 1927)
EXPLANATION
POLE STAGING AREA
POSSIBLE CREOSOTE TANK AREA
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
WESTON
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
COMPOSITE OF FORMER CREOSOTE WOOD-TREATING FACILITIES ~1930-1957
8190187a.prj-041293/100

FIGURE 4

When the pole treating operations ceased, the ABY was used as a storage yard for 55-gallon drums. Up to 50,000 drums were stored at any one time on virtually all portions of the ABY except for the yard margins, areas allowing for vehicles, and the extreme southwest extension of the crescent-shaped area. While no cleaning of drums or recycling of contents was reported to have taken place on the yard, some barrels contained residual products and leaks occurred. According to labels found on some of the drums, the variety of contents included: pesticides, solvents, resins, paints and paint removers, kerosene, gasoline, acetone, etc. It is assumed that the entire ABY was vulnerable to leaks and spills of the drum contents.

Several other activities have occurred within and immediately adjacent to the UP&L/ABS study area over the past century which may have had an influence on the study area properties. Some of these operations included: railroads, Deseret Paint Company, W.P. Fuller Oil Company, a Chevron gasoline station, Richard J. Howa Company underground storage tanks, and the existing Amoco diesel pipeline.

History of Federal and State Site Investigations

The U.S. Environmental Protection Agency (EPA) Field Investigation Team (FIT) conducted a site inspection in May of 1986 in response to discussions with the Utah Bureau of Solid and Hazardous Waste (BSHW). The BSHW is currently the Division of Environmental Response and Remediation (DERR) and is part of the Utah Department of Environmental Quality (UDEQ) (formerly the Utah Department of Health). The BSHW subsequently submitted a Draft Preliminary Assessment to the EPA, and the EPA Technical Assistance Team (TAT) observed drum characterization activities at the ABY being conducted by the American Barrel and Cooperage Company. The FIT followed up on the TAT observations of stained soils and product-containing drums by completing a two-phase site investigation in May, 1987 and February, 1988.

The FIT collected surface and subsurface soil samples and installed three monitor wells from which groundwater samples were collected. Analytical results indicated an abundance of PAHs and phenolic compounds present on-yard and extending to some undefined distance off-yard in surface soils. Concentrations of PAHs as high as tens of thousands of micrograms per kilogram (μg/kg) were reported in soil samples. The FIT investigation report also indicated evidence of contamination by some heavy metals (cadmium, copper, chromium, lead, and zinc) and BTEX compounds (benzene, toluene, ethylbenzene, and xylenes). Chlorinated pesticides were found in some on-yard soils, indicating that contamination could have occurred from leaking drums. The investigation did not provide sufficient data to permit evaluation of the air pathway, although preliminary reports of surface soil contamination indicated that further study of the air pathway was warranted. Due to the diverse, toxic substances reported on many of the drum labels, FIT recommended further investigation of all media in the study area.

On-yard groundwater contamination was found consisting primarily of BTEX and styrene. Little information was collected to infer the extent of off-yard contamination. However, groundwater was determined to potentially be a principal pathway of concern. While the investigation demonstrated contamination of the shallow onsite aquifer, it did not characterize

relationships to underlying or adjacent aquifer material.

Information provided by the FIT investigation indicated that surface water was not a pathway of concern.

On June 8, 1988 Utah Power and Light entered into an Administrative Order on Consent under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Section 106. Under this order, Utah Power & Light repaired portions of the existing fence and installed new fence to completely surround the yard. In addition, they cut down trees and vegetation at the yard.

The Utah Power and Light/American Barrel Site was proposed for listing on the National Priorities List (NPL) on May 5, 1989. The Site was finalized on the NPL on October 4, 1989.

Pursuant to the findings of contamination by the FIT investigation, an Administrative Order on Consent was entered into by Utah Power & Light requiring them to conduct a Remedial Investigation/Feasibility Study (RI/FS) to characterize the extent of contamination and identify alternatives for cleaning up the site. The RI/FS report, which was completed in 1993, concluded that the contaminants found at the UP&L/ABS generally reflect the historical activities of the site. Results of the RI are presented in Section V.

As part of the RI/FS, EPA conducted a baseline risk assessment (BRA) in May of 1992 to estimate potential health and environmental risks which could result if no action were taken to clean up the site. The BRA indicated that if the site should be developed in the future, exposure to groundwater and soil could result in significant risks due to the contaminants present. Details of the BRA are summarized in Section VI.

Outcome of Potentially Responsible Party Search

Under CERCLA, a search is conducted to identify those responsible for the contamination in order to recover monetary compensation for the costs incurred to investigate and clean up the site. Results of an historical investigation are presented below.

The coal gasification plant was first operated by the Salt Lake City Gas Company from approximately 1873 until 1893. This company merged with two other utility companies in 1893 and became the Salt Lake and Ogden Gas and Electric Light Company, which operated the plant until 1897. Another merger took place in 1897 forming the Union Light and Power Company, which took control of the coal gasification facility and operated it until 1899. That same year, Union Light and Power became Utah Light and Power Company which had control of the facility until 1904. The company was then reorganized and merged with a railway company to become Utah Light and Railway Company. The plant was operated under this owner until 1908.

Railroad lines were present across the ABY and SEA throughout the operations of the gas plant. Rail cars were used to haul coal to the gas plant. Figure 3 is a composite from several plat maps showing the locations of railroad tracks.

The coal gasification plant ceased operating in 1908. From 1909 through 1929, the site was utilized as a storage yard for equipment, wood power poles, and other items. During this period the site was owned by Utah Light and Traction and leased by Utah Power and Light (UP&L) after 1917.

A creosote pole-treating facility was in operation in 1927 until the late 1950s. UP&L was leasing the facility from Utah Light and Traction and became the owner after 1944. The Phoenix Utility Company operated the first pole-treating operation using a "hot-dip" process to treat utility poles. This process was continued until 1938 when the operations were taken over by UP&L, which used a "cold-dip" process until 1957.

Pole treating operations ceased in 1958 and UP&L leased the crescent shaped yard to American Barrel and Cooperage, Inc., which used the yard for the storage of 55-gallon drums awaiting refurbishing at a local facility. In 1987, Utah Power & Light notified American Barrel of their intention to deny the renewal of their lease (which was to expire in 1988) and required that they remove all barrels and debris from the yard. During the barrel removal it was apparent that barrel contents had leaked and spilled onto the ground.

As a result of the historical investigation, the following companies are considered to be Potentially Responsible Parties (PRPs) for the UP&L/ABS and will be issued Special Notice Letters:

American Barrel & Cooperage Co.
Salt Lake City, Utah

Union Pacific Railroad Co.
Salt Lake City, Utah

Utah Power & Light Co.
Salt Lake City, Utah

Denver & Rio Grande Western Railroad
Denver, Colorado

Boise Cascade Corporation
Boise, Idaho

EBASCO Services Inc.
New York, New York

III Highlights of Community Participation

From the fall of 1986 to 1988, students from a local school, Jackson Elementary, showed a great deal of interest in the UP&L/ABS. They contacted the U.S. EPA, the Utah Department of Health (UDOH), and the Salt Lake City Health Department in regard to the barrels stored on the yard. The students were concerned with the effects the chemicals in the barrels would have on the soil and groundwater and lobbied companies in the area to provide voluntary participation in the clean-up costs. The students' work resulted in Utah House Bill 199, the "Hazardous Waste Fund for Voluntary Contributions". This provided a mechanism by which the UDOH could accept and deposit contributions from companies. The students also solicited for public contributions and were recognized both statewide and nationally for their efforts.

UDEQ has been holding periodic meetings with the West Side Community Council to brief them on the American Barrel Site since 1988. Fact sheets and news releases have been generated by both UDEQ and EPA during this time.

In 1990 a general mailing was made by UDOH to 240 residents within a five block radius of the site to announce the RI/FS work and request their input on the development of a community relations plan to provide residents with site information. Also included was a brief questionnaire and a form to request inclusion on the mailing list for future information. Generally, public interest in the site is considered to be low to moderate. Less than five percent of the questionnaires were returned, although those responding showed much interest in the work being performed at the site.

The adjacent neighborhood is primarily rental properties and few residents demonstrated an interest in being interviewed for the community relations plan. Those who were interviewed expressed concerns pertaining to potential groundwater contamination and storm water run-off. Some residents questioned whether it was safe to grow garden vegetables due to their concern that their property might be contaminated. All of those interviewed wanted to know what measures would be taken to control dust during clean-up activities. One resident stated that it is important that the final appearance of the site be aesthetically pleasing due to its location in the downtown Salt Lake City area.

Local business owners seemed to be more interested in the site than local residents. Their concerns were more towards the future development plans of the area which may be contingent upon the timing of the clean-up. The issue of long-term health effects was raised and a number of those interviewed questioned whether the site contamination had migrated beyond the UP&L/ABS boundaries to their properties.

A Proposed Plan, outlining EPA and UDEQ's preferred remedy and the public participation process was mailed March 26, 1993. Briefings were held for Salt Lake City and Salt Lake County officials and the Westside Community Council. A display advertisement was placed in the Salt Lake Tribune and Deseret News advertising the availability of the Proposed Plan and announcing the public meeting. The Jackson Elementary teacher involved with the initial site discovery was invited to the public meeting.

A public meeting was held on April 22, 1993 in Salt Lake City. Several members of the community were present, including a former Jackson Elementary student who was involved in the early stages of UP&L/ABS site activity. Numerous questions regarding the Site were asked at the public meeting, but no formal comments were made regarding EPA and UDEQ's preferred alternative. The public comment period closed on April 29, 1993. Only one comment was received from Utah Power & Light that expressed concerns about future liability for the preferred alternative. A response has been included in this ROD. The requirements of CERCLA section 113(k)(2)(B)(i-v) and 117 were met in the remedy selection process.

IV Scope and Role of Response Action Within Site Strategy

The objective of this Record of Decision (ROD) is to provide a remedy to address all contamination caused by site activities on the ABY which affect surface soils, subsurface soils, and groundwater at the UP&L/ABS. Contamination from historical operations and contaminant sources left onsite at the time of abandonment have migrated into soil and groundwater.

Principal threats found in soils and low level threats will be dealt with by the final remedy discussed herein.

V Summary of Site Characteristics

Surface and Subsurface Features

The UP&L/ABS is located in the Jordan River Valley within a sediment-filled basin surrounded by fault-block mountains characteristic of the Basin and Range Province. The Wasatch Mountains bound the east side of the valley and the west is bordered by the Oquirrh Mountains. The valley has been filled with lacustrine sediments deposited in ancient Lake Bonneville (precursor to the Great Salt Lake), interlayered with coalescing alluvial fans derived from the adjoining mountains.

Most of the surface soils of the ABY consist of dark silty sand, typically accompanied by variable mixtures of coal, slag, brick, concrete, wood, rusted steel barrel fragments, and miscellaneous paper, plastic, and metal trash. Most of the surficial material within the fenced area of the site appears to be fill rather than native soil. Fill thickness ranges from three to seven feet and extends up to 21 feet within the former gas-o-meter.

Holocene (10,000 years old to present) marsh deposits consisting of interfingered lenses of silt, clay, and clayey silt deposits underlie this site. These sediments typically contain significant percentages of clay size fractions even if they are classified as a silt, sandy silt or silty sand. The clay content results in relatively low permeability geologic units. Additionally, some sand and gravel layers occur within these deposits. The shallow section (0-30 feet) is mostly silt and clayey silt with discontinuous thin sand and gravel layers. Below this section is a permeable sand unit (2 to 6 feet) which overlies a blue clay aquitard at approximately 35 to 40 feet deep.

Surface Water and Groundwater

Surface runoff patterns for rain or snowmelt are not well developed at the site with infiltration and puddling in low areas (e.g., the railroad beds) the main pathway of drainage. The only surface water body located in the immediate vicinity of the study area is City Creek, which flows from east to west (toward the Jordan River) in a buried storm drain located near the northern study area boundary. The elevation of the buried drain is above the groundwater surface, therefore flow from groundwater into the drain is not expected.

Groundwater hydrogeology beneath the site appears to occur in a single aquifer with two distinct zones. The first zone (the shallow or unconfined zone) extends from the surface down to about 40 feet. The unconfined zone has variable water quality throughout the Jordan River Valley area and is not utilized as a drinking water source at the Site. Groundwater flow is from the east to west across the site, from the Wasatch Mountain Front to the Jordan River drainage.

The second zone (the deep or confined zone) begins about 130 feet below the surface,

and extends downward over 1,000 feet. Between the shallow, unconfined zone and the deep, confined zone is a blue clay aquitard. The aquitard contains thin gravel and sand layers. The deeper zone is commonly artesian, providing recharge to the shallow zone by up-welling at localized areas of interconnection. Groundwater flow is generally to the west toward the Jordan River, which flows into the Great Salt Lake. The confined zone is utilized as a drinking water source in some areas of the valley.

Known and Suspected Sources of Contamination

There are no discrete, undisturbed waste sources remaining at the UP&L/ABS. The gas-o-meter consists of a buried tank constructed of masonry walls that appears to be intact. The gas-o-meter still contains material that was left at the time of abandonment of the gasification operations. Contents are thought to be primarily coal gas distillate materials consisting of free-flowing tars, wastewater contaminated with soluble organics from the tar, and a non-pumpable coal tar sludge. These wastes are typically high in BTEX compounds, phenolic compounds, cyanide and PAHs. When operations ceased, the gas-o-meter was back-filled with site related debris, bricks, and soil on top of the gasification related wastes.

All other tanks and structures required for the coal gasification and creosote pole-treating operations have been removed. However, estimates of volumes of contaminant sources which may have been left on-site at the time of abandonment can be made from the history of site activities and records of other sites where similar operations have occurred. The largest building associated with the coal gasification process was the coal storage building. Coal and slag left on site from past railway activities are found throughout the surface soil of the site. Coal is a source of PAH contaminants and slag provides a source of lead. Although structures have been removed from the site, remains from their contents or from waste disposal practices can be found in several areas. These include contamination found in the area of the tar stills, the gas-o-meter and an area referred to as the tar berm (Figure 2). Locations of possible contaminant sources are depicted on Figures 3 and 4.

Barrel storage operations likely resulted in the release of contaminants to the surface soils. Labels from empty barrels stored on the ABY included a wide range of possible contaminants. The barrels have been removed and no sources of contamination are left on the yard.

Distribution of Contamination/Affected Media

Surface and Subsurface Soils

Composite surface soils samples were collected from the 0 to 0.5 foot depth throughout the study area. Analytical results indicate a number of organic and inorganic chemicals present consistent with coal and slag material found throughout the ABY and SEA in shallow soils. Semi-volatile organics are prevalent across the ABY and SEA, primarily consisting of PAH compounds from coal and some tarry areas related to creosote pole treating and/or coal gasification operations. PAH concentrations range from less than 1 mg/kg to several hundred

mg/kg in the vicinity of the coal tar still. Surface soils were also found to contain numerous other contaminants, including: toluene, trichloroethane, chlorinated pesticides, organophosphorus pesticides, organochlorine herbicides, inorganic compounds (primarily metals related to the slag), and cyanide. The wide variety of pesticides and herbicides are attributed to barrel leakage or application for weed control. Surface soils in the NWA and residential areas did not have the coal and slag materials present and related high levels of PAHs.

Another area of contamination at the site is a layer of calcareous fill material found over a broad area in shallow soil. This material is likely a lime sludge associated with water treatment processes which had been commonly used at coal gasification facilities. This calcareous material contains cyanide, a byproduct of coal gasification operations.

The layer of calcareous material found across a large area of shallow soil has been sampled, analyzed, and found to contain lead, chromium, and zinc at trace concentrations. Cyanide was detected at concentrations as high as 427 mg/kg in a test pit excavated in the SEA and up to 647 mg/kg in a surface soil sample collected on-yard.

The primary contaminants present in subsurface soils are PAHs, naphthalenes, and BTEX compounds associated with the history of coal gasification and creosote pole-treating operations. The wide range of pesticides, herbicides and trichloroethane are noticeably absent from deeper soils. Dense non-aqueous phase liquids (DNAPLs) and light non-aqueous phase liquids (LNAPLs) have been observed in subsurface soils during drilling and monitoring well installation. The NAPLs are visibly present in some areas but are not in a form which is considered free or recoverable. DNAPLs have not been recovered in any monitoring wells. LNAPLs are present as a sheen on top of water recovered from monitoring wells.

Generally across the site, with the exception of three areas, the unsaturated subsurface soils are relatively clean. The three areas of concern include the vicinity of the gas-o-meter and tar wells; the suspected vicinity of the coal tar still; and a zone of tarry contamination in the SEA. While the intermediate contaminated soil zones do not cover a large percentage of the site, they are important because they have contributed to deeper soil and groundwater contamination.

Styrene and BTEX compounds are the only volatile organic compounds (VOCs) contaminants found at depths below 4 feet. Total xylenes are the dominant compound of the BTEX group, reaching a maximum concentration of 17 mg/kg near the gas-o-meter. Styrene was found in areas that also contain high BTEX compounds, however, not all areas contaminated with BTEX also contain styrene.

Two concentration levels of PAH contamination can be described in onsite subsurface soils.

- Soils at intermediate depths between the surface and the water table (4 to 15 feet) contain relatively low PAH concentrations, ranging from 0.1 to 20 mg/kg.

- Soils near groundwater in contaminated zones of the site contain several hundred up to several thousand mg/kg.

Investigations at the Site have determined that there are no RCRA listed hazardous wastes. No soils tested have failed the toxicity characteristic leachate procedure (TCLP) analysis. At present, no RCRA hazardous wastes have been found at the Site. Testing during remediation may find some soils that are RCRA characteristic hazardous wastes.

Tables 1 and 2 list minimum, maximum and average concentrations for only the contaminants of concern. Deriving the contaminants of concern is explained in Section VI, Summary of Site Risks. More detailed information on all contaminants found at the Site and concentrations can be found in the Remedial Investigation Report.

Table 1 Surface Soil Concentrations
Contaminants of Concern

Contaminant	(mg/kg)		
	Minimum	Maximum	Mean
Chrysene	.130	52.000	16.255
Benzo(b)fluoranthene	.077	52.000	12.273
Benzo(k)fluoranthene	.087	34.000	12.702
Benzo(a)pyrene	.095	51.000	16.080
Indeno(1,2,3-cd)pyrene	.078	25.000	8.440
Dibenzo(a,h)anthracene	.054	10.000	3.899
Dieldrin	.002	.980	.168
Lead	.003	5.610	.756

Table 2 Subsurface Soil Concentrations
Contaminants of Concern

Contaminant	(mg/kg)		
	Minimum	Maximum	Mean
Chrysene	.057	150.000	115.096
Benzo(b)fluoranthene	.050	110.000	8.254
Benzo(k)fluoranthene	.042	130.000	8.617
Benzo(a)pyrene	.076	130.000	9.613
Indeno(1,2,3-cd)pyrene	.057	77.000	7.674
Dibenzo(a,h)anthracene	.060	34.000	3.824
Lead	.002	1.350	.123

Groundwater

Groundwater samples were collected from beneath some of the most contaminated areas of the site. Based on the results of sampling one well in the deep aquifer, the deep, confined aquifer zone does not appear to be contaminated. In addition, water from within the confining layer, close to the shallow aquifer, was found to be free from contamination.

Contamination found in the unconfined aquifer generally parallels that of the subsurface soils in nature and extent. The principal contaminants are benzene, styrene, phenols, and naphthalene, with secondary contamination by inorganic compounds, primarily cyanide. Figure 5 presents the approximate boundaries of the extent of detectable organic and inorganic aqueous plumes.

A layer of LNAPL was also found during the site investigation. The LNAPLs occur in the uppermost levels of the groundwater in the unconfined aquifer, primarily in the vicinity of the gas-o-meter in the northeast portion of the site. The presence of LNAPLs in groundwater has been described as a "sheen" on the very top of the groundwater, and is not considered a free, recoverable product.

The DNAPLs at the site occur primarily in the form of tar-like materials, which are solid or viscous. These wastes are saturating subsoils in some areas, yet have not been demonstrated to enter any of the monitor wells, even those installed in visibly contaminated locations. The most prominent DNAPL contamination is at the 20 to 25 foot depth, west of the gas-o-meter.

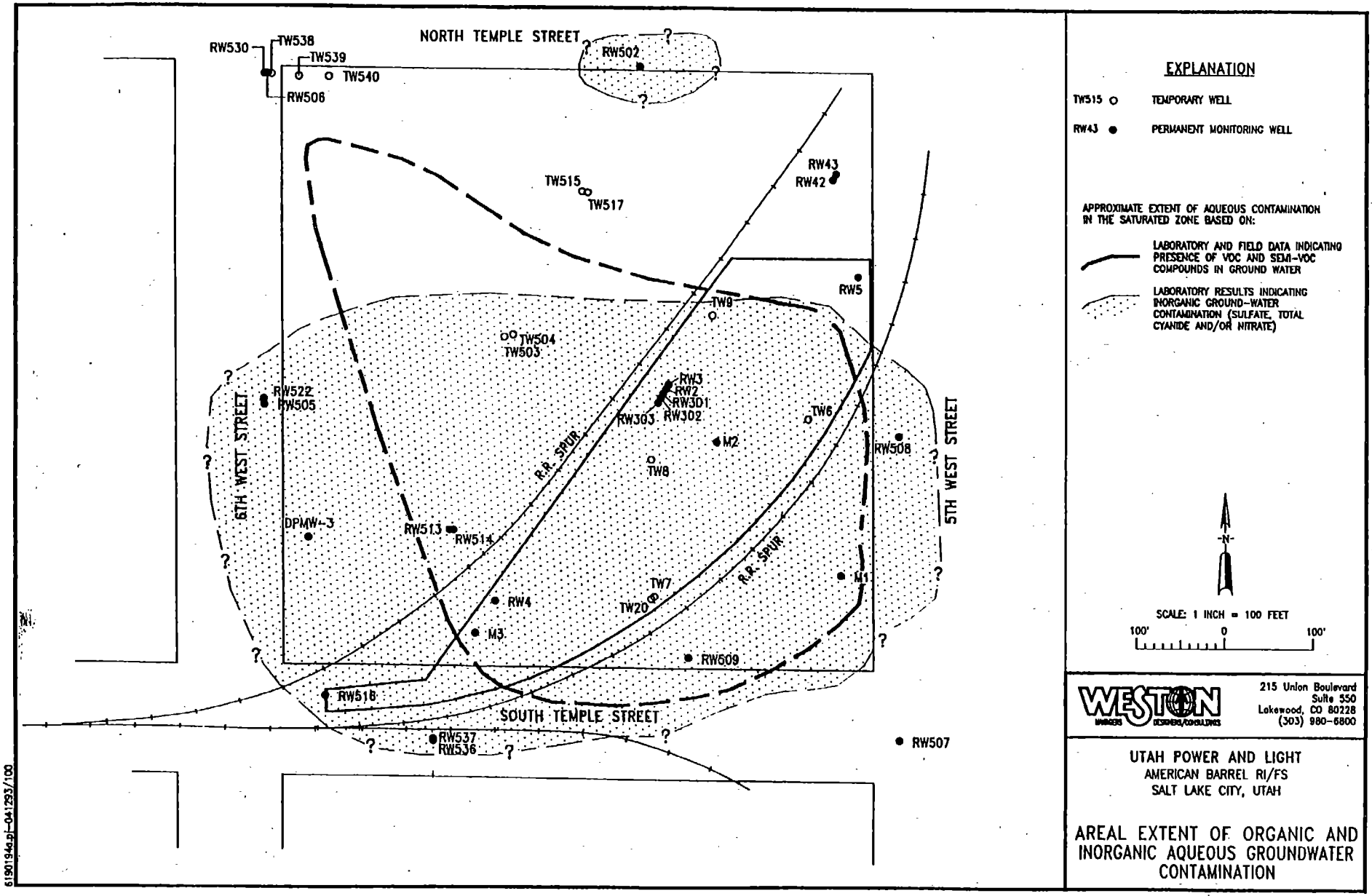
NORTH TEMPLE STREET
SOUTH TEMPLE STREET
6TH WEST STREET
5TH WEST STREET
R.R. SPUR
R.R. SPUR
RW530
TW538
TW539
TW540
RW506
RW502
TW515
TW517
RW43
RW42
RW5
TW9
TW504
TW503
RW3
RW2
RW3D1
RW303
RW302
TW6
RW508
M2
TW8
RW522
RW505
DPMW-3
RW513
RW514
M1
TW7
TW20
RW4
M3
RW509
RW518
RW537
RW536
RW507
N
EXPLANATION
TW515 TEMPORARY WELL
RW43 PERMANENT MONITORING WELL
APPROXIMATE EXTENT OF AQUEOUS CONTAMINATION IN THE SATURATED ZONE BASED ON:
LABORATORY AND FIELD DATA INDICATING PRESENCE OF VOC AND SEMI-VOC COMPOUNDS IN GROUND WATER
LABORATORY RESULTS INDICATING INORGANIC GROUND-WATER CONTAMINATION (SULFATE, TOTAL CYANIDE AND/OR NITRATE)
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
WESTON
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
AREAL EXTENT OF ORGANIC AND INORGANIC AQUEOUS GROUNDWATER CONTAMINATION
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FIGURE 5

Groundwater concentrations of benzene exceed TCLP regulated levels in some areas.

Table 3 lists minimum, maximum and average concentrations for groundwater contaminants of concern.

Table 3 Groundwater Concentrations
Contaminants of Concern

Contaminant	(mg/l)		
	Minimum	Maximum	Mean
Benzene	.002	25.000	3.832
Toluene	.001	7.700	1.303
Styrene	.005	1.400	.492
Xylene	.006	3.100	.784
Phenol	.001	67.000	8.713
2-Methylphenol	.009	35.000	9.492
4-Methylphenol	.001	57.000	15.320
2,4-Dimethylphenol	.002	18.000	2.573
Napthalene	.001	6.800	1.132
2-Methylnapthalene	.001	.630	.105
Acenapthalene	.002	.270	.057
Antimony	.022	.052	.031
Lead	.003	.069	.029
Cyanide	.011	6.100	.525

Principal Threats/Low Level Threats

In order to devise clean-up strategies that are acceptable for the site-specific wastes and conditions, EPA developed the concept of defining the waste sources as either principal threat wastes or low level threat wastes (A Guide to Principal Threat and Low Level Threat Wastes, EPA Publication 9380.3-06FS, November, 1991). The definitions of each are as follows.

- A **principal threat waste** has one or all of the following characteristics: it may be highly toxic or highly mobile, generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. Where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, generally treatment alternatives should be evaluated. Based on this definition, principal threats at the UP&L/ABS include those materials within and adjacent to the gas-o-meter (excluding the surface fill and gas-o-meter fill) and the tar berm of the southeast area. Other areas that contain non-aqueous phase liquids (NAPLs), mobile tarry material, or visibly contaminated soils saturated with NAPLs are defined as principal threats. A quantified definition of principal threats is based on the 10^{-3} risk level (see Appendix A).

- A **low level threat waste** can generally be reliably contained and would present only a low risk in the event of release. This would include source materials that exhibit low toxicity, low mobility in the environment, or are found at or near health-based concentration levels. Low level threats at the UP&L/ABS include all soils from 0.5 to 10 feet in depth which exceed remediation levels. These soils have a potential exposure pathway for direct ingestion of soil.

  Low level threat residuals are also present at the UP&L/ABS and include those contaminated soils below 10 feet in depth which do not have a potential exposure pathway. These residuals are generally viscous, immobile tarry materials that are not migrating in the subsurface. These visibly contaminated soils were sampled for treatability studies and analyzed by the TCLP test. This test method showed these soils to leach low levels of contaminants. Although contaminants may leach from this material to groundwater, these materials are considered to be secondary sources and not the primary source of groundwater contamination.

Figure 6 illustrates the location of the areas where principal threat wastes have been defined and Figure 7 depicts those areas of low level threat wastes. Table 4 presents estimates of volumes of waste source materials as defined by principal threat or low level threat.

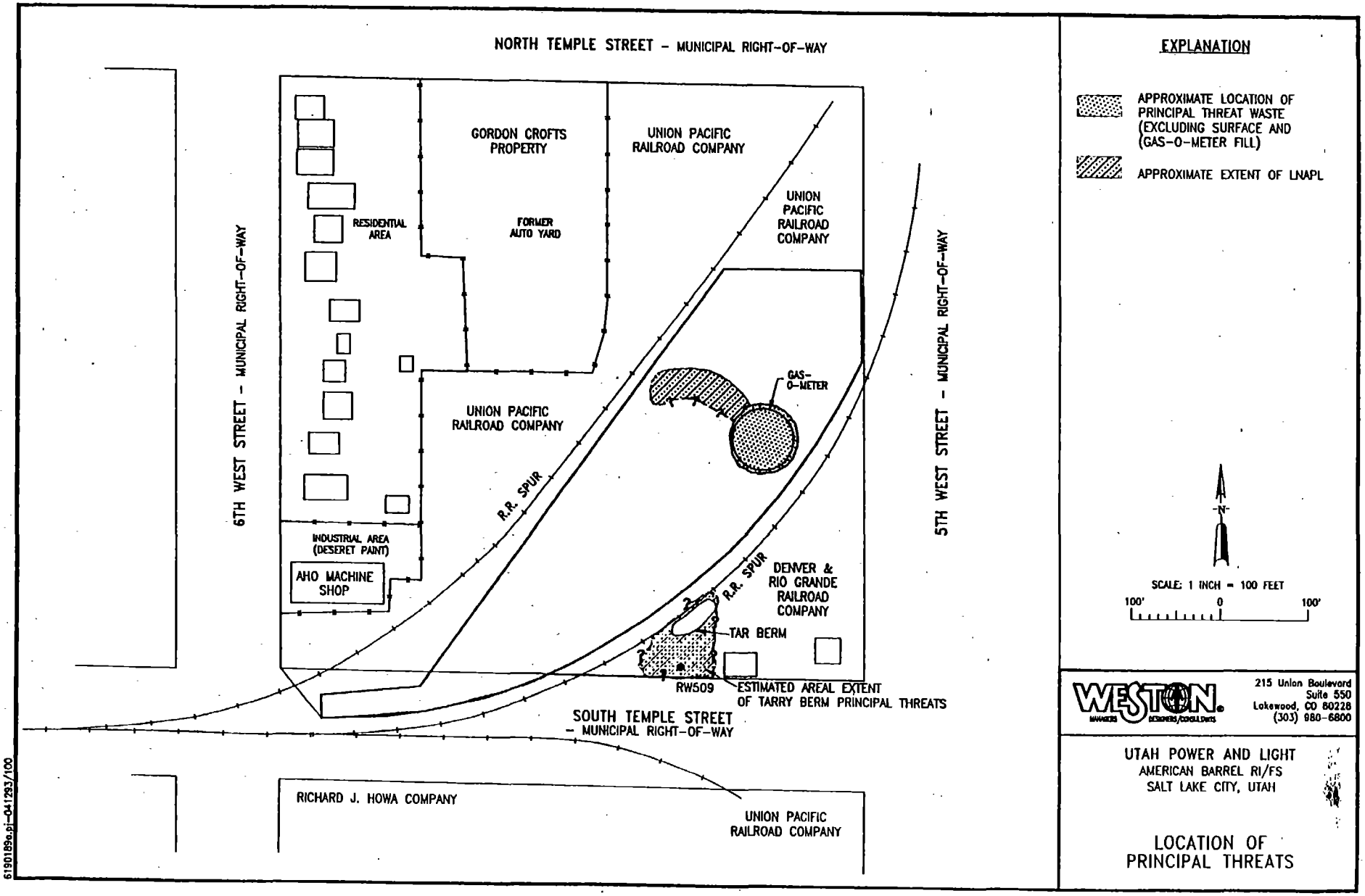

NORTH TEMPLE STREET – MUNICIPAL RIGHT-OF-WAY
6TH WEST STREET – MUNICIPAL RIGHT-OF-WAY
5TH WEST STREET – MUNICIPAL RIGHT-OF-WAY
GORDON CROFTS PROPERTY
UNION PACIFIC RAILROAD COMPANY
RESIDENTIAL AREA
FORMER AUTO YARD
UNION PACIFIC RAILROAD COMPANY
GAS-O-METER
UNION PACIFIC RAILROAD COMPANY
R.R. SPUR
INDUSTRIAL AREA (DESERET PAINT)
AHO MACHINE SHOP
R.R. SPUR
DENVER & RIO GRANDE RAILROAD COMPANY
TAR BERM
RW509
ESTIMATED AREAL EXTENT OF TARRY BERM PRINCIPAL THREATS
SOUTH TEMPLE STREET – MUNICIPAL RIGHT-OF-WAY
RICHARD J. HOWA COMPANY
UNION PACIFIC RAILROAD COMPANY
EXPLANATION
APPROXIMATE LOCATION OF PRINCIPAL THREAT WASTE (EXCLUDING SURFACE AND (GAS-O-METER FILL)
APPROXIMATE EXTENT OF LNAPL
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
WESTON MANAGERS DESIGNERS/CONSULTANTS
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
LOCATION OF PRINCIPAL THREATS
6190189a.pj-041293/100

FIGURE 6

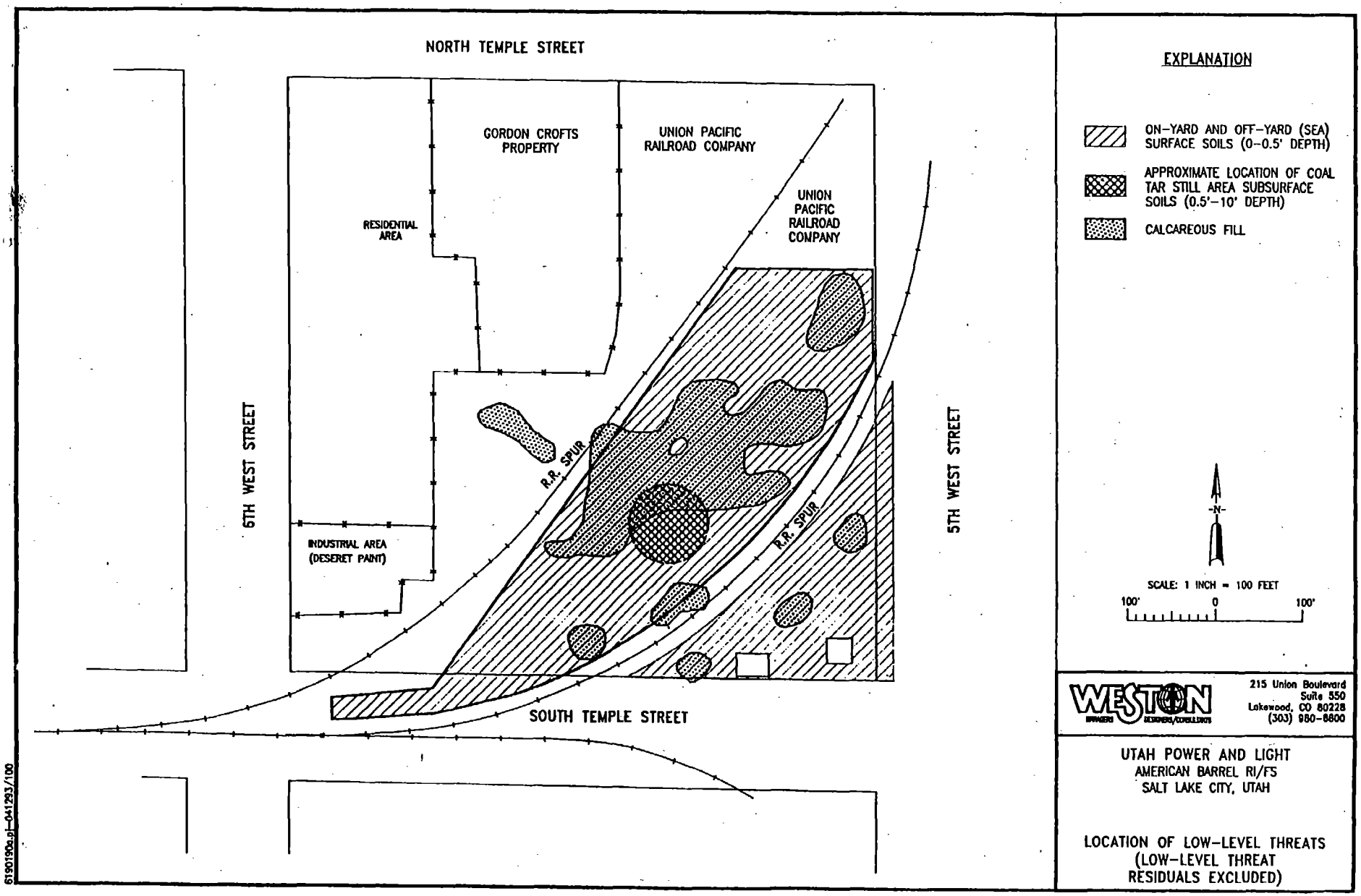

NORTH TEMPLE STREET
GORDON CROFTS PROPERTY
UNION PACIFIC RAILROAD COMPANY
RESIDENTIAL AREA
UNION PACIFIC RAILROAD COMPANY
6TH WEST STREET
5TH WEST STREET
R.R. SPUR
R.R. SPUR
INDUSTRIAL AREA (DESERET PAINT)
SOUTH TEMPLE STREET
EXPLANATION
ON-YARD AND OFF-YARD (SEA) SURFACE SOILS (0-0.5' DEPTH)
APPROXIMATE LOCATION OF COAL TAR STILL AREA SUBSURFACE SOILS (0.5'-10' DEPTH)
CALCAREOUS FILL
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
WESTON ENGINEERS DESIGNERS/CONSULTANTS
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-8800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
LOCATION OF LOW-LEVEL THREATS
(LOW-LEVEL THREAT
RESIDUALS EXCLUDED)
6190190a.pl-041293/100

FIGURE 7

Table 4 Summary of Waste Volume Estimates

Waste Category	Estimated Volume (cubic yards)
Principal Threat Wastes	
Gas-o-meter contents	4,250
10% external gas-o-meter soils	425
Tar Berm	985
LNAPL west of gas-o-meter	570
LNAPL SEA	included with tar berm
Low-Level Threat Wastes	
Coal tar still tars and soils	3,065
On-yard calcareous fill	3,445
Off-yard calcareous fill	750
On-yard surface soils (0 to .5 foot depth plus gas-o-meter fill)	4,600
Off-yard surface soils	950

Population and Environmental Areas Potentially Affected

The UP&L/ABS is a relatively small site and is located in an urban area characterized by a mixture of residential, commercial, and industrial land use. Populations most likely to be exposed to site contaminants are trespassers on the ABY and SEA portions of the study area. Transients and local residents would be the most likely trespassers. Local workers could also possibly be exposed to site contaminants.

Contaminated groundwater (the plume) is presently located only within the city block which the UP&L/ABS occupies and has not been demonstrated to affect other groundwater zones or surface water. In addition, the groundwater at the site is not used as a drinking water source at the present time.

Based on the investigations for the Risk Assessment, there are no known threatened or endangered plant or animal species in the area that are likely to be affected by direct on-site exposure. Runoff of contaminants to rivers or wetlands is not believed to be a significant problem. Therefore, based on these considerations, the ecological impact of on-site contamination is judged to be minimal.

Potential Pathways of Contaminant Migration

The RI/FS stated that organic chemical contaminants are migrating in directions away from the site via groundwater and will continue to do so if the site is left in its present condition. Under current conditions, results of analytical data from the RI suggests that the contaminated plume has not migrated outside of the city block comprising the study area. Rates of migration can be estimated from groundwater computer models with input parameters based on the observed extent of contamination and inferences regarding the source and age of wastes present in the saturated soil zones. For example, it was estimated in the RI that contamination has moved 500 feet in 100 years (5 feet per year) assuming the gas-o-meter/tar well is the principal contaminant source. However, assuming the creosote component is a major contributor to the observed northwesterly limit of contamination, and the suspected creosote pit locations are the source, then organic chemical contaminants have migrated approximately 400 feet in 50 years (8 feet per year). Modeling of groundwater shows biodegradation may be a significant factor in the dynamic equilibrium of the organic contaminant plume.

Modeling of airborne transport of contamination in the Risk Assessment indicates that wind blown dust is not a major concern for off-site transport of contaminants.

VI Summary of Site Risks

A Baseline Risk Assessment (BRA) was conducted for the UP&L/ABS to determine the potential adverse effects on humans and the environment which may result, either now or in the future, from the presence of hazardous chemicals at the site. By definition, a BRA evaluates the site in its current condition (that is, in the absence of any remedial activities or institutional controls that reduce exposure or risk).

Contaminants of Concern

Chemical contaminants of potential human health concern were identified based on the results of the RI performed at the site. Any chemical detected in any sample of surface soil, subsurface soil, or groundwater was included in the list of potential contaminants of concern, except for eight naturally-occurring beneficial minerals (calcium, iron, zinc, etc.) and nine organic chemicals which were detected so infrequently (only once or twice out of all samples) that their impact was judged to be minimal. This resulted in the identification of 74 contaminants of potential concern, including 14 volatile organic compounds, 31 semi-volatile organic compounds (of which 17 are PAHs), 13 pesticides, 3 PCBs, and 13 inorganics.

Although some of these chemicals (especially the inorganics) may be partly or entirely natural in origin, and others may have originated from off-site sources, chemicals were not eliminated during the risk assessment process on the basis of comparison to "background" in order that risk calculations would yield the best possible estimate of total risk from the site. This list of chemicals of potential concern were used to evaluate site risks.

Exposure Assessment

The second step in risk assessment is to identify exposed populations and the extent to which these populations are exposed to site related contamination. The exposed populations include persons currently exposed and those that may be exposed in the future. Currently exposed populations include residents living within the study area and trespassers on the site. Future populations potentially exposed would include resident adults and children who could possibly live on the American Barrel Yard or workers exposed if the site is developed for commercial use. Additionally, future potential exposure includes the use of and exposure to contaminated groundwater.

Currently, the ABY is a fenced, vacant lot in a primarily industrial area which is zoned for industrial use. Under these conditions, the populations most likely to be exposed to site-related contaminants are the residents who currently live along the western boundary of the study area, as well as site visitors or trespassers who periodically go onto the vacant areas of the ABY or SEA. These populations are most likely to be exposed to site-related contaminants by direct contact with soil. This includes incidental ingestion, dermal contact, and inhalation of soil particles in air. The soil ingestion and inhalation pathways were evaluated, but current risk assessment methods do not allow for reliable evaluation of exposure and risks from dermal contact with soil for many of the site contaminants, so this pathway was not quantified.

In the future, the ABY or SEA might be developed for either residential or industrial use. Although commercial development is probably more likely, both options appear possible, so risks to both future residential and industrial/ commercial worker populations were evaluated. These populations would be exposed to contaminated soils by the same pathways as described above, except that future construction and excavation activities might bring contaminated soil from the subsurface to the surface. Thus, exposure to both current surface soils and subsurface soils was assessed.

Future workers or residents could possibly be exposed to contaminants through use of groundwater from on-yard or nearby off-yard wells. Exposure pathways of concern would include not only ingestion of the water, but also dermal contact and inhalation of VOCs released from the water into indoor air. As in the case for exposure to soils, both the ingestion and inhalation pathways were evaluated for groundwater exposure. The dermal pathway was not evaluated in a quantitative manner because dermal exposure to water is expected to be relatively brief (typically 7 to 12 minutes per day for residents during showering), and reliable values for dermal permeability constants are currently available for only a small number of chemicals.

The second part of the exposure assessment is to determine what levels of contamination an exposed person would encounter. The dose of a chemical to which a human is exposed depends upon the concentration of the chemical in environmental media (air, water, soil, etc.), and the amount of time the human is in contact with each medium (how much air breathed, how much water ingested, etc.). For the purposes of estimating exposure at this site, the study area was divided into four areas: 1) the current residential area (CRA), located along the western side of the city block; 2) the American Barrel Yard (ABY), located in the center of the block

between the two railroad lines; 3) the Northwest Area (NWA), located northwest of the ABY; and 4) the Southeast Area (SEA), located southeast of the ABY. The concentration of each chemical in each of these four areas was calculated for surface soil, subsurface soil, and groundwater. Human exposure levels were estimated using either the upper 95th percentile confidence limit of the arithmetic mean (reasonable maximum exposure-RME) or the highest detected value (whichever was smaller). For samples where a chemical was not detected, the concentration was usually assumed to be one-half the detection limit. Table 5 summarizes the levels of human contact with environmental media that were assumed for each population and each pathway.

Table 5 Summary of Human Exposure Parameters

Exposed Population	General Parameters	Exposure Medium	Exposure Route	Route Parameters (RME)
Resident Adult	Body Weight = 70 kg Exp. Freq. = 350 day/yr Exp. Duration = 30 yr	Groundwater	Oral	2 l/day
		Indoor Air	Inhalation (VOCs)	(five x oral intake)
		Soil	Oral	100 mg/day (24 yr) 200 mg/day (6 yr)
		Air (PM_{10}s)	Inhalation	20 m^3/day
Resident Child	Body Weight = 15 kg Exp. Freq. = 350 day/yr Exp. Duration = 6 yr	Groundwater	Oral	1 l/day
		Indoor Air	Inhalation (VOCs)	(five x oral intake)
		Soil	Oral	200 mg/day
		Air (PM_{10}s)	Inhalation	24 m^3/day
Worker	Body Weight = 70 kg Exp. Freq. = 250 day/yr Exp. Duration = 25 yr	Groundwater	Oral	1 l/day
		Indoor Air	Inhalation (VOCs)	(five x oral intake)
		Soil	Oral	50 mg/day
		Air (PM_{10}s)	Inhalation	20 m^3/day
Trespasser (7-16 years)	Body Weight = 43 kg Exp. Freq. = 60 day/yr Exp. Duration = 10 yr Time/Visit = 2 hr/day	Soil	Oral	100 mg/day
		Air (PM_{10}s)	Inhalation	1.4 m^3/hr

kg = kilogram
l/day = liter per day
m^3/day = cubic meters per day
m^3/hr = cubic meters per hour
mg/day = milligrams per day
yr = year
PM_{10} = particulates less than 10 microns
VOCs = volatile organic compounds

Toxicity Assessment

The third step in risk assessment is to determine the toxic effects of exposure to site contamination. Toxic effects are separated into cancer causing effects and non-cancer effects.

Cancer slope factors (SFs) have been developed by EPA's Carcinogen Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Table 7 lists cancer slope factors for contaminants of concern and the source.

There are two sets of slope factors available for evaluating PAHs. One set conservatively assumes that all PAHs are as potent as benzo(a)pyrene. The other set of slope factors is based on the relative potency to benzo(a)pyrene, based on structural-activity comparisons between PAHs. Because of the uncertainty associated with these slope factors, cancer risks from PAHs were evaluated using both sets of values. Slope factors presented in Table 7 are based on relative potency relationships.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from non-carcinogenic chemicals. Reference doses are listed in Table 6 for non-carcinogenic contaminants of concern.

Risk Characterization

The final step in the risk assessment process is to evaluate the risks, both current and potential, to exposed populations.

Excess lifetime cancer risks are determined by multiplying the lifetime average intake level by the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation, for example 1 X 10^{-6} (or 1E-06). An excess lifetime cancer risk of 1 X 10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. EPA has established an acceptable risk range of 10^{-4} to 10^{-6}.

Risk management decisions were made by EPA and UDEQ during the RI/FS process to consider those chemicals that contributed the most risk. Chemicals which were determined to present only minor contributions to risk, were detected infrequently, or were naturally occurring for the geographic area and were not detected significantly above background concentrations, were excluded. Arsenic in soils is one example of a chemical which was eliminated based on regional background data collected from the Salt Lake Valley. As a result, the 74 chemicals of potential concern were reduced to a list of 24 chemicals contributing significant risk. The 24 chemicals are presented in the tables of the Risk Characterization section. Other pathways of exposure and other chemicals were calculated to contribute less than 1 x 10^{-6} risk and were not considered in developing the final remediation levels.

Table 6 shows the estimated total excess cancer risks for the populations exposed in the study area. Estimated risks to current residents exposed to soils in their yards and visitors/trespassers exposed to contaminated soils on the ABY, NWA or SEA range from about 6×10^{-5} to 5×10^{-7}. The risks are within or below EPA's range of acceptable risks (1×10^{-4} to 1×10^{-6}). The risks to current residents is primarily due to background levels of arsenic in soil.

However, potential cancer risks to hypothetical future residents or workers are much higher, ranging from 5×10^{-2} to 3×10^{-4}. Most of the risk to these populations is attributable to benzene in groundwater, but PAHs in soil also contribute to the total risk.

Risks to future workers or residents shown in Table 6 are based on exposure to current surface soils in the exposure location shown and include exposure to contaminated groundwater. If future residents or workers were exposed to excavated subsurface soil, the estimated excess cancer risks would be similar to or perhaps slightly lower than those shown for current surface soils. This lower risk is derived from lower concentrations of contaminants in the subsurface.

Table 7 provides cancer risk estimates by exposure pathway for the contaminants of concern. This table only shows unacceptable risks based on EPA's risk range. Other pathways and chemicals not presented here contributed minor risk, below EPA's acceptable risk range. Also given is information necessary to calculate the risk.

Table 6 Population Total Excess Cancer Risks

Exposed Population	Exposure Location	Total Excess Cancer Risk
Current On-Site Residents	Current Residential Area	4×10^{-5}
Current On-Site Visitor/Trespasser	Northwest Area	5×10^{-7}
	Southeast Area	1×10^{-5}
	American Barrel Yard	6×10^{-5}
Future On-Site Residents	Northwest Area	1×10^{-3}
	Southeast Area	3×10^{-3}
	American Barrel Yard	5×10^{-2}
Future On-Site Workers	Northwest Area	3×10^{-4}
	Southeast Area	9×10^{-4}
	American Barrel Yard	1×10^{-2}

Table 7 Cancer Risk Estimates for Contaminants of Concern

Chemical	Exposure Point Concentration (mg/kg)	Future Resident DI (mg/kg-day)	Future Worker DI (mg/kg-day)	SF (mg/kg-day)$^{-1}$	Weight of Evidence	Type of Cancer	SF Source	Chemical-Specific Risk	
								Future Resident	Future Worker
Exposure Pathway: Ingestion of Surface Soil - ABY									
Benzo(a)pyrene	35.5	5.7×10^{-5}	6.0×10^{-6}	1.2×10^{1}	B2	Stomach	HEAST	7×10^{-4}	7×10^{-5}
Benzo(a)anthracene	29.1	4.7×10^{-5}	4.9×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST[b]	6×10^{-6}	6×10^{-7}
Chryesne	35.8	5.7×10^{-5}	6.1×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	7×10^{-6}	7×10^{-7}
Benzo(b)fluoranthene	30.2	4.8×10^{-5}	5.1×10^{-6}	1.2×10^{1}	B2	(a)	HEAST	6×10^{-4}	6×10^{-5}
Benzo(k)fluoranthene	27.0	4.3×10^{-5}	4.6×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	5×10^{-6}	6×10^{-7}
Indeno(1,2,3-cd) pyrene	18.1	2.9×10^{-5}	3.1×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	3×10^{-6}	4×10^{-7}
Dibenz(a,h)anthracene	7.3	1.2×10^{-5}	1.2×10^{-6}	1.2×10^{1}	B2	(a)	HEAST	1×10^{-4}	1×10^{-5}
Dieldrin	.47	7.5×10^{-7}	8.0×10^{-8}	1.6×10^{1}	B2	Liver, Lung	IRIS[c]	1×10^{-5}	1×10^{-6}
Total Pathway Risk								1.4×10^{-3}	1.4×10^{-4}
Exposure Pathway: Ingestion of Surface Soil - SEA									
Benzo(a)pyrene	18.0	2.9×10^{-5}	3.1×10^{-6}	1.2×10^{1}	B2	Stomach	HEAST	3×10^{-4}	4×10^{-5}
Benzo(a)anthracene	20.0	3.2×10^{-5}	3.4×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	4×10^{-6}	4×10^{-7}
Chryesne	22.0	3.5×10^{-5}	3.7×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	4×10^{-6}	4×10^{-7}
Benzo(b)fluoranthene	9.4	1.5×10^{-5}	1.6×10^{-6}	1.2×10^{1}	B2	(a)	HEAST	2×10^{-4}	2×10^{-5}
Benzo(k)fluoranthene	14.0	2.2×10^{-5}	2.4×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	3×10^{-6}	3×10^{-7}
Indeno(1,2,3-cd) pyrene	10.0	1.6×10^{-5}	1.7×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	2×10^{-6}	2×10^{-7}
Dibenz(a,h)anthracene	5.0	8.0×10^{-6}	8.5×10^{-7}	1.2×10^{1}	B2	(a)	HEAST	1×10^{-4}	1×10^{-5}
Total Pathway Risk								6.1×10^{-4}	7.1×10^{-5}

Table 7 Cancer Risk Estimates for Contaminants of Concern (cont.)

Chemical	Exposure Point Concentration (mg/kg)	Future Resident DI (mg/kg-day)	Future Worker DI (mg/kg-day)	SF (mg/kg-day)$^{-1}$	Weight of Evidence	Type of Cancer	SF Source	Chemical-Specific Risk	
								Future Resident	Future Worker
Exposure Pathway: Ingestion of Subsurface Soil - ABY									
Benzo(a)pyrene	13.9	1.9×10^{-5}	2.0×10^{-6}	1.2×10^{1}	B2	Stomach	HEAST	3×10^{-4}	3×10^{-5}
Benzo(a)anthracene	11.9	2.2×10^{-5}	2.4×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	2×10^{-6}	2×10^{-7}
Chrysene	16.2	2.6×10^{-5}	2.8×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	3×10^{-6}	3×10^{-7}
Benzo(b)fluoranthene	12.2	2.0×10^{-5}	2.1×10^{-6}	1.2×10^{1}	B2	(a)	HEAST	2×10^{-4}	2×10^{-5}
Benzo(k)fluoranthene	13.3	2.1×10^{-5}	2.3×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	3×10^{-6}	3×10^{-7}
Indeno(1,2,3-cd) pyrene	9.1	1.5×10^{-5}	1.5×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	2×10^{-6}	2×10^{-7}
Dibenz(a,h)anthracene	3.8	6.0×10^{-6}	6.4×10^{-7}	1.2×10^{1}	B2	(a)	HEAST	7×10^{-5}	8×10^{-6}
Total Pathway Risk								5.8×10^{-4}	5.9×10^{-5}
Exposure Pathway: Ingestion of subsurface Soil - SEA									
Benzo(a)pyrene	9.2	1.5×10^{-5}	1.6×10^{-6}	1.2×10^{1}	B2	Stomach	HEAST	2×10^{-4}	2×10^{-5}
Benzo(a)anthracene	9.1	1.5×10^{-5}	1.5×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	2×10^{-6}	2×10^{-7}
Chrysene	11.0	1.8×10^{-5}	1.9×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	2×10^{-6}	2×10^{-7}
Benzo(b)fluoranthene	8.9	8.2×10^{-6}	8.7×10^{-7}	1.2×10^{1}	B2	(a)	HEAST	1×10^{-4}	1×10^{-5}
Benzo(k)fluoranthene	7.4	1.2×10^{-5}	1.3×10^{-6}	1.2×10^{-1}	B2	(a)	HEAST	1×10^{-6}	2×10^{-7}
Indeno(1,2,3-cd) pyrene	4.7	7.5×10^{-6}	8.0×10^{-7}	1.2×10^{-1}	B2	(a)	HEAST	9×10^{-7}	1×10^{-7}
Dibenz(a,h)anthracene	2.0	3.2×10^{-6}	3.4×10^{-7}	1.2×10^{1}	B2	(a)	HEAST	4×10^{-5}	4×10^{-6}
Total Pathway Risk								3.5×10^{-4}	3.5×10^{-5}

Table 7 Cancer Risk Estimates for Contaminants of Concern (cont.)

Chemical	Exposure Point Concentration (mg/kg)	Future Resident DI (mg/kg-day)	Future Worker DI (mg/kg-day)	SF $(mg/kg\text{-}day)^{-1}$	Weight of Evidence	Type of Cancer	SF Source	Chemical-Specific Risk	
								Future Resident	Future Worker
Exposure Pathway: Ingestion of Subsurface Soil - NWA									
Benzo(a)pyrene	.25	4.0×10^{-7}	4.3×10^{-8}	1.2×10^{1}	B2	Stomach	HEAST	5×10^{-6}	5×10^{-7}
Benzo(a)anthracene	.25	4.0×10^{-7}	4.3×10^{-8}	1.2×10^{-1}	B2	(a)	HEAST	5×10^{-8}	5×10^{-9}
Chrysene	.28	4.5×10^{-7}	4.8×10^{-8}	1.2×10^{-1}	B2	(a)	HEAST	5×10^{-8}	6×10^{-9}
Benzo(b)fluoranthene	1.0	1.6×10^{-6}	1.7×10^{-7}	1.2×10^{1}	B2	(a)	HEAST	2×10^{-5}	2×10^{-6}
Benzo(k)fluoranthene	.25	4.0×10^{-7}	4.3×10^{-8}	1.2×10^{-1}	B2	(a)	HEAST	5×10^{-8}	5×10^{-9}
Indeno(1,2,3-cd) pyrene	1.0	1.6×10^{-6}	1.7×10^{-7}	1.2×10^{-1}	B2	(a)	HEAST	2×10^{-7}	2×10^{-8}
Total Pathway Risk								2.5×10^{-5}	2.5×10^{-6}
Exposure Pathway: Ingestion and Inhalation of GroundWater - ABY									
Benzene	21.0 (mg/l)	1.5×10^{0}	4.3×10^{-3}	2.9×10^{-2}	A	Leukemia	IRIS	5×10^{-2}	1×10^{-2}
1,2-Dichloroethane	.31	2.3×10^{-2}	6.6×10^{-3}	9.1×10^{-2}	B2	[Insert 1]	IRIS	2×10^{-3}	6×10^{-4}
Styrene	1.4	9.7×10^{-2}	2.9×10^{-2}	2.7×10^{-2}	B2	[Insert 2]	HEAST	7×10^{-4}	2×10^{-4}
Total Exposure Risk: Ingestion and Inhalation of GroundWater								5.3×10^{-2}	1.1×10^{-2}

[Insert 1]: Forestomach, circulatory system, mammary gland, lung
[Insert 2]: Leukemia, lung, bronchi

(a) This PAH is less well studied than benzo(a)pyrene; however, the tumor types are assumed to be equivalent to benzo(a)pyrene for each route of exposure.
(b) U.S. Environmental Protection Agency, 1991. Office of Research and Development. Health effects assessments summary tables, Washington, D.C. U.S. Environmental Protection Agency. OERR 9200.6-303 (91-1).
(c) U.S. Environmental Protection Agency, 1991. Office of Health and Environmental Assessment. Retrieved from the Integrated Risk Information System (IRIS), December, 1991.

DI = Daily Intake
SF = Slope Factor

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

HI values for the populations exposed at this site are summarized in Table 8. As shown, values for current onsite residents and site visitors/trespassers are all less than one, indicating noncancer risks are not of concern under current exposure conditions.

HI values exceed one for all hypothetical future populations, with values ranging from 1 to 139. These risks are due to hypothetical exposures to groundwater, both by ingestion of semi-volatile organics (phenols, naphthalenes) and inorganics (cyanide, arsenic, antimony) and by inhalation of VOCs released to indoor air from water (toluene, xylene). Exposure to soils does not present unacceptable non-cancer risks based on the risk assessment. Detailed information used for the HI calculations are presented in Table 9.

Table 8 Summary of Population Total Hazard Index Values

Exposed Population	Exposure Location	Screening Level HI Value
Current On-Site Resident Adults	Current Residential Area	0.3
Current on-Site Resident Children	Current Residential Area	0.5
Current On-Site Visitor/Trespasser	American Barrel Yard Southeast Area Northwest Area	0.04 0.007 0.01
Future On-Site Resident Adults	American Barrel Yard Southeast Area Northwest Area	140 4 4
Future On-Site Resident Children	American Barrel Yard Southeast Area Northwest Area	65 7 4
Future On-Site Workers	American Barrel Yard Southeast Area Northwest Area	55 1 1

Noncancer risks from exposure to soil do not appear to be of significant concern, except that elevated levels of lead in soil would pose potentially significant risks to hypothetical future child residents. This conclusion is based on the results of EPA's lead uptake/biokinetic model, using

national average default values for human exposure parameters, coupled with site specific measurements of lead in soil and groundwater. Based on these data, it appears that 19 to 76% of hypothetical future populations of resident children would have blood levels higher than currently considered acceptable (10 μg/dl).

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

Uncertainties

There are a number of steps in the risk assessment process where uncertainty exists. In general, EPA employs conservative assumptions when uncertainties arise and data gaps exist. For example, EPA intentionally seeks to calculate doses to humans that on average are higher than most people would actually receive, but are still within a reasonable range. Likewise, in order to provide an adequate margin of safety, EPA employs estimates of chemical toxicity that are intentionally conservative; that is, they are more likely too high than too low. An example of this is cancer slope factors in which the "upper-bound" reflects the conservative estimate of the risks calculated from the cancer slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. Another example is that of RfDs. RfDs are derived from human epidemiological studies or animal studies to which adverse health effects from exposure to chemicals exhibiting uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. When reference doses are not yet available for a compound, such as many of the PAHs, data gaps are filled by extrapolation of reference dose values for compounds having similar chemical structures.

There is often uncertainty inherent in calculating exposure point concentrations, especially if the available data have a high frequency of non-detects, or if there are only a few data points in the data set. Other uncertainties in the data are further discussed in the full BRA report. Because of these uncertainties, both those which tend to overestimate and underestimate exposure and risk, all of the risk estimates contained in the risk assessment should be considered to be only approximations of the true risk levels.

Table 9 Subchronic Hazard Index Estimates
Exposure to Ground Water - Ingestion and Inhalation
Future Adult Residents at the ABY

Chemical	Exposure Point Concentration (mg/l)	CDI (mg/kg-day)	RfD (mg/kg-day)	Confidence Level	Critical Effect	RfD Source	RfD Basis (Vehicle)	Hazard Quotient
Toluene - Ingest.	7.0	1.9×10^{-1}	2.0×10^{-1}	Medium	Liver, kidney weights	IRIS (a)	Corn Oil	0.9
Toluene - Inhal. (VOCs)	7.0	9.5×10^{-1}	5.7×10^{-1}	-	CNS	HEAST	Air	2
Xylenes	3.1	4.1×10^{-1}	8.6×10^{-2}	Medium	CNS, devel. effects	HEAST		5
Naphthalene	6.6	1.8×10^{-1}	4×10^{-3}	-	Several	HEAST	-	40
2-Methylnaphthalene	1.6	4.2×10^{-2}	4×10^{-3} (c)	-	-	(c)	-	10
Acenaphthene	1.5	4.1×10^{-2}	6×10^{-2}	Low	Liver	IRIS	-	0.7
Acenaphthylene	1.4	3.7×10^{-2}	6×10^{-2} (d)	-	-	(d)	-	0.6
Anthracene	1.5	4.2×10^{-2}	3×10^{-1}	Low	None	IRIS	-	0.1
Phenanthrene	1.5	4.1×10^{-2}	3×10^{-2} (e)	-	-	(e)	-	1
Fluorene	1.5	4.1×10^{-2}	4×10^{-2}	Low	Dec. RBC, hemoglobin	IRIS	Corn Oil	1
Phenol	57	1.5×10^{0}	6×10^{-1}	Low	Devel., kidney effects	IRIS	Water	3
2,4-Dimethylphenol	18	4.9×10^{-1}	2×10^{-2}	Low	Clinical hemato.	IRIS	Corn Oil	20
2-Methylphenol	33	8.9×10^{-1}	5×10^{-2}	Medium	Red. body wt. gain, neuro. tox.	IRIS	-	20
4-Methylphenol	54	1.4×10^{0}	5×10^{-2}	Medium	Red. body wt. gain, neuro. tox.	IRIS	-	30
Cyanide	3.1	8.2×10^{-2}	2×10^{-2}	Medium	Weight loss, thyroid, myelin degen.	IRIS	Food	4
Antimony	.03	7.1×10^{-4}	4×10^{-4}	Low	Dec. longevity, blood chem.	IRIS	Water	2
Total Exposure Hazard Index								140.3

Table 9 (cont.)
Subchronic Hazard Index Estimates
Exposure to Ground Water - Ingestion and Inhalation
Future Child Residents at the ABY

Chemical	Exposure Point Concentration (mg/l)	CDI (mg/kg-day)	RfD (mg/kg-day)	Confidence Level	Critical Effect	RfD Source	RfD Basis (Vehicle)	Hazard Quotient
Toluene - Ingest.	7.0	4.5×10^{-1}	2×10^{0}	-	Liver, kidney weights	HEAST	Corn Oil	0.2
Toluene - Inhal. (VOCs)	7.0	2.2×10^{0}	5.7×10^{-1}	-	CNS	HEAST	Air	4
Xylenes	3.1	9.8×10^{-1}	8.6×10^{-2}	-	CNS, devel. effects	HEAST	Air	10
Naphthalene	6.6	4.2×10^{-1}	4.0×10^{-2}	-	Several	HEAST	-	10
2-Methylnaphthalene	1.6	1.0×10^{-1}	4.0×10^{-2}[e]	-	-	(c)	-	3
Acenaphthene	1.5	9.8×10^{-3}	6.0×10^{-1}	-	Liver	HEAST	-	0.2
Acenaphthylene	1.4	8.9×10^{-2}	6.0×10^{-1} [d]	-	-	(d)	-	0.1
Anthracene	1.5	9.8×10^{-3}	3.0×10^{0}	-	None	HEAST	-	0.03
Phenanthrene	1.5	9.8×10^{-2}	3.0×10^{-1}[e]	-	-	(e)	-	0.3
Fluorene	1.5	9.8×10^{-2}	4.0×10^{-1}	-	Decr. RBCs, hemoglobin	HEAST	Corn Oil	0.2
Phenol	57	3.6×10^{0}	6.0×10^{-1}	-	Devel., kidney effects	HEAST	Water	6
2,4-Dimethylphenol	18	1.2×10^{0}	2.0×10^{-1}	-	Clinical hemato.	HEAST	Corn Oil	6
2-Methylphenol	33	2.1×10^{0}	5.0×10^{-1}	-	Red. body wt. gain, neuro. tox.	HEAST	-	4
4-Methylphenol	54	3.4×10^{0}	5.0×10^{-1}	-	Red. body wt. gain, neuro. tox.	HEAST	-	7
Cyanide	3.1	2.0×10^{-1}	2.0×10^{-2}	-	Weight loss, thyroid, myelin degen.	HEAST	Food	10
Antimony	.03	1.7×10^{-3}	4.0×10^{-4}	-	Dec. longevity, blood chem.	HEAST	Water	4
Total Exposure Hazard Index								65

Table 9 (cont.)
Subchronic Hazard Index Estimates
Exposure to Ground Water - Ingestion and Inhalation
Future Workers at the ABY

Chemical	Exposure Point Concentration (mg/l)	CDI (mg/kg-day)	RfD (mg/kg-day)	Confidence Level	Critical Effect	RfD Source	RfD Basis (Vehicle)	Hazard Quotient
Toluene - Ingest.	7.0	6.9×10^{-2}	2.0×10^{-1}	M	Liver, kidney weights	IRIS (a)	Corn Oil	0.3
Toluene - Inhal. (VOCs)	7.0	3.4×10^{-1}	5.7×10^{-1}	-	CNS	HEAST	Air	0.6
Xylenes	3.1	1.5×10^{-1}	8.6×10^{-2}	M	CNS, devel. effects	HEAST		2
Naphthalene	6.6	6.4×10^{-2}	4×10^{-3}	-	Several	HEAST	-	20
2-Methylnaphthalene	1.6	1.5×10^{-2}	4×10^{-3}	-	-	(c)	-	4
Acenaphthene	1.5	1.5×10^{-2}	6×10^{-2}	L	Liver	IRIS	-	0.2
Acenaphthylene	1.4	1.4×10^{-2}	6×10^{-2} (d)	-	-	(d)	-	0.2
Anthracene	1.5	1.5×10^{-2}	3×10^{-1}	L	None	IRIS	-	0.05
Phenanthrene	1.5	1.5×10^{-2}	3×10^{-2} (e)	-	-	(e)	-	0.5
Fluorene	1.5	1.5×10^{-2}	4×10^{-2}	L	Dec. RBCs, hemoglobin	IRIS	Corn Oil	0.4
Phenol	57	3.5×10^{-1}	6×10^{-1}	L	Devel., kidney effects	IRIS	Water	0.9
2,4-Dimethylphenol	18	1.8×10^{-1}	2×10^{-2}	L	Clinical hemato	IRIS	Corn Oil	9
2-Methylphenol	33	3.2×10^{-1}	5×10^{-2}	M	Red. body wt. gain, neuro. tox.	IRIS	-	6
4-Methylphenol	54	5.2×10^{-1}	5×10^{-2}	M	Red. body wt. gain, neuro. tox.	IRIS	-	10
Cyanide	3.1	3.0×10^{-2}	2×10^{-2}	M	Weight loss, thyroid, myelin degen.	IRIS	Food	1
Antimony	.03	2.6×10^{-4}	4×10^{-4}	L	dec. longevity, blood chem.	IRIS	Water	0.6
Total Exposure Hazard Index								55.8

(a) U.S. EPA, 1991. Office of Health and Environmental Assessment, Retrieval from the Integrated Risk Information System (IRIS), December, 1991.

(b) U.S. EPA, 1991. Office of Research and Development. Health effects assessment summary tables. Washington, DC : U.S. EPA, OEAR 9200.6-303 (91-1).

(c) Value estimated by using the RfD for naphthalene.

(d) Value estimated by using the RfD for acenaphthylene. (e) Value estimated by using the RfD [illegible]pyrene.

H = Variation in human sensitivity
A = Animal to human extrapolation
S = Extrapolation from subchronic to chronic NOAEL
L = Extrapolation from LOAEL to NOAEL
CDI = Chronic Daily Intake
RfD = Reference Dose

VII Remedial Action Objectives

Remedial action objectives were developed by EPA and UDEQ based on an evaluation of the Baseline Risk Assessment. These objectives incorporate joint decisions on risk management issues and were used to guide the development of alternatives and performance standards. The objectives developed are:

1. Remediate groundwater contamination on the site throughout the area of attainment resulting from past activities on the ABY to: 1) remediation levels identified in Table 8; and 2) levels which result in a total carcinogenic risk of less than $1x10^{-4}$ and a total non-carcinogenic hazard quotient of less than one for residential exposure.

2. Remediate soil contamination resulting from past activities on the ABY to acceptable risk based levels allowing for unrestricted exposure and unlimited use of the site. Soils down to a depth of 10 feet are considered to have a potential exposure pathway and will be remediated to health based remediation levels in Table 7. Soils below 10 feet do not have a potential direct ingestion exposure pathway.

An analysis of the Risk Assessment in conjunction with the Remedial Action Objectives indicates remediation is required for the following areas and media:

- American Barrel Yard: surface soils and subsurface soils
- Southeast Area(Denver Rio Grande Western property): surface and subsurface soils; tar berm area;
- Groundwater beneath the entire site exceeding remediation levels including but not limited to the ABY, SEA, and NWA.

Remediation Levels

Remediation levels were developed by considering the non-carcinogenic and carcinogenic exposure limits (ELs), as well as applicable or relevant and appropriate requirements (ARARs). ELs are health-based acceptable concentrations and have been calculated using standard exposure models for workers (commercial/industrial use) and children/adults (residential use). The ARARs used are the most stringent of the potential ARARs identified in the Site Characterization Report.

ARARs do not exist for soils, so remediation levels are determined by the EL for future workers at the risk level of 1×10^{-6}. These remediation levels will also provide an acceptable risk to future residential exposure within the acceptable risk range of 10^{-4} to 10^{-6}.

The remediation level for lead in soil is based on use of the IU/BK model and national average default values for human exposure parameters and the goal of less than 5% of the most sensitive population (children) having blood lead levels exceeding 10 μg/dl.

For groundwater, the remediation level is the MCL or proposed MCL for the COC. However, if no MCL or proposed MCL exists for the contaminant, the remediation level is the EL for a future residential exposure through inhalation plus ingestion exposure equivalent to a carcinogenic risk of $1x10^{-6}$ or a HQ of 1. The remediation level for lead in groundwater is the

National Primary Drinking Water Regulation "Action Level".

Remediation levels for soil and water are shown on Tables 10 and 11, respectively. These remediation levels are the result of an evaluation of the risks as estimated in the risk assessment, combined with risk management decisions. Cleaning up contamination to these levels will result in acceptable risks to current and future exposed populations.

Table 10 Health Based Remediation Levels for Soil (0' to 10' depth)

Chemical	Remediation Level (mg/kg)
Benzo(a)pyrene	0.48
Benzo(a)anthracene	47.7
Chrysene	47.7
Benzo(b)fluoranthene	0.48
Benzo(k)fluoranthene	47.7
Indeno(1,2,3-cd)pyrene	47.7
Dibenzo(a,h)anthracene	0.48
Dieldrin	0.36
Lead	500

Table 11 Remediation Levels for GroundWater

Chemical	Remediation Level (μg/l)	Basis for Remediation Level
Benzene	5	MCL
Styrene	100	MCL
1,2-Dichloroethane	5	MCL
Toluene	1000	MCL
Xylenes	10000	MCL
Naphthalene	1460	EL
2-Methylnaphthalene	1460	EL
Acenaphthylene	2190	EL
Phenol	21900	EL
2,4-Dimethylphenol	730	EL
2-Methylphenol	1830	EL
4-Methylphenol	1830	EL
Antimony	5	MCL
Cyanide	200	MCL
Lead	15	"Action Level"

VIII Description of Alternatives

A feasibility study was conducted to develop and evaluate remedial alternatives for the contaminated soils and groundwater of the UP&L/ABS. Within the FS Report, many technologies and process options are presented. Criteria used to evaluate the alternatives for applicability at this site and to conduct the initial screening of the alternatives are explained within the FS Report. Remedial alternatives were assembled from applicable remedial technology process options and were initially evaluated for effectiveness, implementability, and cost. The alternatives meeting these criteria were then evaluated and compared to the nine criteria as required by the NCP. Summaries of the alternatives retained for final consideration to address the overall site problems are listed below. More detailed descriptions can be found within the FS Report. In addition to the remedial alternatives, the NCP requires that a no-action and a limited action alternative be considered at every site. The no-action alternative serves primarily as a point of comparison for other alternatives.

Alternative 1 - No Action

The no-action alternative includes groundwater monitoring and maintenance of the existing fence around the UP&L/ABS, but no measures to address contaminated groundwater, or principal or low-level threat wastes. A groundwater monitoring program would be conducted under this alternative for a period of 30 years, or until such time when the migration of contaminants is not considered a potential threat to human health or the environment. A groundwater sampling program would be developed as part of the remedial design process.

Institutional controls preventing land development and groundwater use would be required. These controls would be through deed restrictions on property titles that would prohibit development of the surface and the drilling of water wells. If necessary to prevent groundwater use, water rights would be purchased from current owners in the area of contamination. Usage of the residential portion of the property would probably continue as is for the short term.

The potential risk to the public is not mitigated by this alternative. Contaminants would remain in soil and exposure to contaminated soils would be restricted only by the fence on the ABY. Exposure to contaminated soils on the SEA would not be prevented. Contaminant transport modeling estimates that groundwater plume contamination would not appreciably change over the next 100 years by the no-action alternative. Groundwater ARARs (MCLs) would not be achieved in the foreseeable future.

The time frame to implement Alternative 1 is 14 days. Capital costs are $26,800 for the installation of new monitoring wells. Operation and maintenance (O&M) costs for 30 years for the collection and analysis of groundwater samples and inspection and repair of the fence are estimated at $698,000. The 30-year present worth cost for Alternative 1 would be $725,000.

Alternative 2 - Limited Action

Alternative 2 includes capping of the entire ABY and SEA areas of the site with a low-permeability clay cap and soil cover to preclude direct human contact exposure with principal and low-level threat wastes, and to reduce infiltration of precipitation into these source areas. RCRA ARARs for capping would be applicable if RCRA characteristic hazardous wastes are present at the Site. Even if RCRA characteristic hazardous wastes are not present, RCRA capping requirements are to be considered (TBC) and would be followed. Site closure would include final grading and establishing vegetative cover to minimize erosion. The components of groundwater monitoring, fence maintenance, and institutional controls from Alternative 1 would also be included in this alternative.

Placement of the clay cap would act to minimize exposure beyond the no-action alternative and would also minimize infiltration and thus leaching of contaminants to groundwater. However, Alternative 2 offers little long-term effectiveness and permanence. This alternative relies on natural attenuation processes for groundwater restoration, and without source removal, groundwater ARARs would not be achieved in the foreseeable future.

The time frame to implement Alternative 2 is 36 days. The capital and O&M costs for this alternative would be $1,049,000 and $1,391,000, respectively, yielding a total present worth cost of $2,440,000.

Alternative 3 - Treatment and/or Disposal of Principal Threat Wastes Only; Groundwater Remediation through Principal Threat Remediation and Natural Attenuation

There are three different options for treating contaminated soils under Alternative 3:

- Alternative 3a: On-Site Stabilization/Solidification of Principal Threat Wastes (excluding on-yard and off-yard LNAPL) and Disposal of Treated Soils Onsite
- Alternative 3b: On-Site Thermal Desorption of Principal Threat Wastes (excluding on-yard and off-yard LNAPL) and Disposal of Treated Soils Onsite
- Alternative 3c: Offsite Disposal of Principal Threat Wastes (excluding on-yard and off-yard LNAPL)

Alternative 3 includes the excavation of principal threat wastes in the gas-o-meter and tar berm areas consisting of approximately 5,660 cubic yards of contaminated soils. Principal threat wastes would be characterized by TCLP test methods and classified and segregated into RCRA hazardous wastes and contaminated soils.

Prior to treatment or offsite shipment, contaminated soils would be temporarily stored onsite in waste piles. RCRA characteristic hazardous wastes would be subject to the applicable sections of RCRA regulations for waste piles. Waste pile regulations would be relevant and appropriate for other contaminated soils waste piles. Waste piles would be placed on asphalt

pads within the area of contamination and any runoff from the pads would be collected and treated with other waste water streams.

Under Alternatives 3a and 3b, soils from the treatment of principal threat wastes would be disposed onsite in excavated areas. RCRA land disposal restrictions (LDRs) are relevant and appropriate for the onsite disposal of treated soils. Treatability testing of solidification and thermal desorption indicated treated soils would meet any LDR requirements. Concentrated contaminant waste streams from thermal desorption would be sent offsite for incineration. Thermal desorption treatment would be subject to Utah air emission limitations and RCRA ARARs for treatment or storage in tanks.

After excavation of principal threat wastes, and after treated wastes are disposed onsite, the entire ABY and SEA would be covered with a low-permeability cap to prevent direct human contact with the treated wastes and the remaining low-level threat wastes. RCRA ARARs for RCRA caps may be relevant and appropriate.

For Alternative 3c, principal threat wastes would be excavated and disposed at a RCRA permitted Subtitle C or Subtitle D land disposal facility. The CERCLA Offsite Policy would be applicable for the offsite disposal. Any RCRA characteristic hazardous wastes would be subject to applicable RCRA ARARs for handling and transporting hazardous wastes.

Under all three alternatives, the LNAPL in the principal threat waste areas would be treated by in-situ soil vapor extraction (SVE) combined with groundwater depression. Approximately 570 cubic yards of soil are estimated to be contaminated with LNAPLs. This is a rough estimate and further delineation of the area to be remediated will be determined during remedial design.

A treatability study conducted at the site revealed that SVE technology would be effective at the UP&L/ABS for removal of VOCs in the vadose zone and capillary fringe in the principal threat waste areas. A maximum of 3.0 pounds per day (lbs/day) of total petroleum hydrocarbons (TPH) and 0.43 lbs/day of benzene were recovered from a single vent well. The emission rate from multiple vapor extraction wells would likely exceed Utah emission limitations of 40 lbs/day of total hydrocarbons and 6 lbs/day of benzene, requiring off-gas treatment prior to discharge. The off-gas produced from SVE would be processed by granular activated carbon (GAC) treatment prior to discharge. Additional biodegradation is expected to occur as a result of the venting although the effects have not been measured or estimated.

Groundwater recovered by the vent well water depression pumps would be treated by air stripping and/or GAC to meet industrial wastewater discharge standards and discharged to the Salt Lake City publicly owned treatment works (POTW) for further treatment. Treatment for cyanide in groundwater may be required to meet POTW discharge standards. Utah air emission regulations for discharges from air strippers would be applicable to the groundwater treatment. ARARs for POTW discharges would be applicable to any wastewater discharges.

Removal of principal threat waste would result in significant reductions in potential risks to the public and groundwater contamination would be expected to achieve remediation levels in 10+ years through natural attenuation of the remaining contaminant plume. However,

surface soils in the SEA and ABY areas are not proposed for removal under these alternatives. These soils present potential carcinogenic risks due to direct exposure that exceed 1 X 10^{-4}. Capping would prevent exposure.

Site closure would include final grading and establishing vegetative cover to minimize erosion. The components of Alternative 1, groundwater monitoring, fence maintenance, and institutional controls would also be included for all three options of Alternative 3. For all options of Alternative 3, long-term effectiveness is reduced by the requirements to maintain the cap, fencing and deed restrictions.

The time frame to implement Alternatives 3a, 3b, and 3c are 127 days, 179 days, and 112 days. Capital Costs are $3,815,000, $5,420,000 and $3,266,000. Operations and maintenance costs are $3,588,000, $3,600,000 and $3,586,000 and 30-year present worth costs are $7,403,000, $9,020,000, and $6,852,000, respectively.

Alternative 4 - On-Site Thermal Desorption of Principal Threats and Low-Level Threat Wastes; Groundwater Remediation through Principal Threat Remediation and Natural Attenuation

This alternative includes the excavation of all principal threat and low-level threat wastes that exceed remediation levels down to a depth of 10 feet on the ABY and SEA (excluding on-yard and off-yard LNAPL). All principal threat wastes and coal tar still tars and soils (low-level threat wastes) with an estimated volume of 8,725 cubic yards would be treated on site with thermal desorption technology. The treated soils would be disposed on site. Based on treatability studies, soils are expected to be treated to acceptable risk levels for exposure to future workers and residents, achieve remediation levels, and also meet any RCRA LDRs. Other major ARARs identified for Alternative 3 would apply to Alternative 4.

Contaminated soils not treatable by thermal desorption would be transported and disposed at an offsite RCRA permitted land disposal facility in compliance with the CERCLA Offsite Policy. These soils include ABY and SEA surface soils containing lead and calcareous fill material containing cyanide excavated during remediation. A high estimate is that approximately 9,745 cubic yards of contaminated soils would be disposed.

SVE of the on-yard and off-yard LNAPL would be implemented as described for Alternative 3, including off-gas and groundwater treatment.

Site closure would include final grading, vegetation, and groundwater monitoring as described under Alternative 1. Institutional controls preventing the use of groundwater would be required until groundwater is restored to remediation levels.

Alternative 4 would be more effective in reducing exposures than the similar treatment option, Alternative 3b, as low level threat wastes (soils) are treated. Long term effectiveness is not dependent on capping or institutional controls under this alternative.

Significant reductions in groundwater contaminant concentrations are expected with Alternative 4 due to natural attenuation mechanisms once the principal threat wastes are removed from the site. Additionally, the level of protection offered by this alternative is high for onsite

exposures because site contaminants in soils with an exposure pathway would be treated to acceptable exposure levels.

The time frame to implement Alternative 4 is 300 days. The capital and annual O&M costs for this alternative are $8,744,000 and $2,879,000, respectively, yielding a 30-year present worth cost of $11,623,000.

Alternative 5 - Off-Site Disposal of Principal Threats and Low-Level Threat Wastes; Groundwater Remediation through Principal Threat Remediation and Natural Attenuation

This alternative includes the excavation of all principal threat and low-level threat wastes for disposal at a RCRA permitted Subtitle C and/or Subtitle D land disposal facility (except for the on-yard and off-yard LNAPL). Approximately 18,740 cubic yards of contaminated soils would be disposed of in this alternative. Contaminated soils would be classified by TCLP as RCRA characteristic hazardous wastes or non-hazardous wastes. Excavation, transportation and disposal of contaminated soils would be in accordance with applicable RCRA regulations including transportation of hazardous wastes, waste pile regulations, LDRs and the CERCLA Offsite Policy.

SVE of the on-yard and off-yard LNAPL would be implemented as described for Alternative 3, including off-gas and groundwater treatment.

As in Alternatives 3 and 4, groundwater contaminant concentrations are expected to achieve remediation levels in 10+ years due to natural attenuation mechanisms once the principal threat wastes are removed from the site. Similarly, the level of protection offered on-site by this alternative is high because exposure to contaminants in soils would be eliminated through excavation and offsite disposal. However, long term effectiveness and permanence is reduced because wastes that are disposed in a landfill require long term monitoring to assure that they are reliably contained. Principal threat wastes have the potential for future releases because they are considered highly mobile.

Closure would include importing clean fill, grading, establishing vegetation, and groundwater monitoring as described under Alternative 1. Institutional controls preventing the use of groundwater would be required until remediation levels are achieved.

The time frame to implement Alternative 5 is 155 days. The capital and annual O&M costs for this alternative are $5,241,000 and $2,836,000, respectively, yielding a 30-year present worth cost of $8,077,000.

Alternative 6 - Asphalt Batching of Principal Threats and Low-Level Threat Wastes; Groundwater Remediation through Principal Threat Remediation and Natural Attenuation

There are two different options under Alternative 6.

- **Alternative 6a: Asphalt Batching of All Principal and Low-Level Threat Wastes with offsite disposal of any RCRA characteristic hazardous wastes;**

Alternative 6a includes the excavation of all principal threat (excluding on-yard and off-yard LNAPL) and low-level threat wastes and incorporation of these contaminated soils into an asphalt product. Approximately 13,850 cubic yards of contaminated soils would be treated and recycled through asphalt batching. Contaminated soils would be characterized by TCLP test methods and segregated into RCRA characteristic hazardous wastes and non-hazardous wastes. Temporary storage of contaminated soils in piles would be subject to the applicable sections of RCRA waste pile regulations.

The contaminated soils would be transported to a local asphalt batching plant and incorporated as raw material in the production of a cold mix asphalt product. Commercial asphalt road products are made with petroleum based asphalt oil or coal tar based asphalt oil. These asphalt oils contain various percentages of PAHs, similar to site contamination. Utilizing site soils as a raw material mixed with virgin raw materials in the asphalt process will result in producing a product similar or identical to commercial asphalt.

The asphalt plant would be subject to the CERCLA Offsite Policy regulations. The Offsite Policy requires that the plant be operating in accordance with all applicable regulations and not have any releases of hazardous wastes or constituents. The Policy allows the shipment of non-hazardous wastes to non-RCRA facilities, as long as the facility is in compliance with all of its applicable regulations.

Calcareous fill and contaminated soils determined to meet the definition of a hazardous waste (approximately 4,620 cubic yards) would be segregated from the other contaminated soils and disposed of at an offsite RCRA Subtitle D and Subtitle C land disposal facility, respectively. Transportation of characteristic hazardous wastes would be subject to applicable RCRA regulations for transportation. The disposal facilities would be subject to the CERCLA Offsite Policy.

SVE of the on-yard and off-yard LNAPL would be implemented as described under Alternative 3, including off-gas and groundwater treatment.

Site closure would include backfilling excavations with clean soil and establishing stable vegetation on the site. Deed restrictions requiring the proper handling of any soils below 10 feet in depth should they be excavated would be implemented.

Onsite exposure under this alternative would be reduced as in Alternative 4, but this alternative has the advantage of satisfying the statutory preference of treatment and resource recovery as a main element of the remedial action.

- **Alternative 6b: Asphalt Batching of Principal and Low-Level Threat Wastes with offsite incineration of any RCRA characteristic hazardous wastes;**

Alternative 6b is similar to the description of Alternative 6a except that contaminated soils characterized as a RCRA hazardous waste would be treated by offsite incineration. Offsite incineration would be subject to the CERCLA Offsite Policy.

As in Alternatives 4 and 5, significant reductions in groundwater contaminant concentrations are expected with Alternatives 6a and 6b due to natural attenuation mechanisms once the principal threat wastes are removed from the site. Additionally, since contaminants in soils would be removed or treated (by Alternatives 4 through 6) the level of protection offered is high allowing for unrestricted exposure and unlimited use of the site. Site closure would include importing clean fill, final grading, vegetation, and groundwater monitoring as described under Alternative 1. Institutional controls would be required to prevent groundwater use until remediation levels are achieved.

The time frame to implement Alternatives 6a and 6b are 155 days. The capital and 30-year O&M costs for Alternative 6a would be $6,767,000 and $2,836,000, respectively, yielding a 30-year present worth cost for Alternative 6a of $9,603,000. The capital and 30-year O&M costs for Alternative 6b would be $7,747,000 and $2,836,000, respectively, yielding a 30-year present worth cost for Alternative 6b of $10,583,000.

Alternatives 7 through 10 - Alternatives 3 through 6 with Groundwater Extraction and Treatment

Alternatives 7 through 10 add groundwater extraction and treatment (pump and treat) to the principal and low-level threat waste remedial actions as described in Alternatives 3 through 6. The pump and treat actions would include the installation of four fully penetrating extraction wells at the western perimeter of the ABY and a means for controlling the migration of the dissolved phase organic plume. Recovered groundwater would be combined with groundwater recovered from SVE and dewatering operations, and the combined stream would be pretreated onsite using air stripping and/or GAC to levels suitable for discharge to the POTW.

As in Alternative 3, removal of the sources which contaminate groundwater would allow the natural, passive attenuation processes to restore groundwater to remediation levels in 10+ years. For this option, not only would sources be removed, but in addition, soluble contaminants in the groundwater would be removed through extraction and treatment. Pump and treat would be expected to shorten the timeframe to achieve remediation levels by approximately 2 years.

Installation of the pump and treat remedy is expected to take 30 days, but operation of the system would likely continue for up to 10 years. Incremental costs for the pump and treat portion only are $151,000 in capital costs and $839,000 for 30 years of operation and maintenance.

The 30-year present worth costs for these alternatives are as follows:

- Alternative 7a — On-Site Stabilization/Solidification of Principal Threat Waste and Groundwater Extraction and Treatment, $8,393,000
- Alternative 7b — On-Site Thermal Desorption of Principal Threat Wastes and Groundwater Extraction and Treatment, $10,011,000
- Alternative 7c — Off-Site Disposal of Principal Threat Waste and Groundwater Extraction and Treatment, $7,842,000

- Alternative 8 — On-Site Thermal Desorption of Principal and Low-Level Threat Wastes and Groundwater Extraction and Treatment, $12,613,000
- Alternative 9 — Off-Site Disposal of Principal and Low-Level Threat Wastes and Groundwater Extraction and Treatment, $9,503,000
- Alternative 10a — Asphalt Batching of Principal and Low-Level Threat Wastes and Groundwater Extraction and Treatment, $10,593,000
- Alternative 10b — Asphalt Batching of Principal and Low-Level Threat Wastes and Groundwater Extraction and Treatment, $11,573,000

IX Summary of Comparative Analysis of Alternatives

The comparative analysis provides the basis for explaining how the selected remedy satisfies the statutory requirements as to the effectiveness and implementability of the alternative. The remedial alternatives presented in Section VIII were analyzed in detail in the FS using the nine evaluation criteria. The nine criteria include: 1) overall protection of human health and the environment; 2) compliance with applicable or relevant and appropriate requirements (ARARs); 3) reduction of toxicity, mobility, or volume through treatment; 4) long-term effectiveness and permanence; 5) short-term effectiveness; 6) implementability; 7) cost; 8) state acceptance; and 9) community acceptance. The resulting comparisons of each alternative by the nine criteria are discussed below.

Criterion 1: Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Overall protection of human health and the environment is achieved in all of the alternatives except Alternative 1 (No action). The highest level of protection is through Alternative 6b (Asphalt batching with offsite incineration) and Alternative 4 (Thermal desorption). Alternative 6b is preferred over Alternative 4 because less contaminated soils are to be disposed in a landfill in 6b. Alternative 6a (Asphalt batching with disposal) is not as protective because RCRA characteristic hazardous wastes are disposed in a landfill without treatment which will require long term maintenance to ensure protection. Alternative 6b removes all contaminated soils exceeding remediation levels down to a depth of 10 feet, thereby eliminating onsite exposure. Institutional controls provide further protection for exposure to soils below 10 feet through deed requirements for proper handling should these soils ever be excavated. Alternatives 4 through 10 provide this same protection to soil exposure, but Alternative 5 (Disposal) utilizes offsite disposal without treatment and is not as reliable in the long term. Alternatives 2 (Capping) and 3 (Principal Threat remediation and capping) utilize a cap and fencing to prevent exposure to soils and rely on institutional controls for long term public health protection. Alternative 1 provides unreliable protection to soil exposure through

fencing and no action for groundwater remediation.

Alternative 6b utilizes contaminated soils as a raw material to produce a cold mix asphalt product suitable for road paving. Asphalt normally contains PAHs, similar to site contaminated soils. Incorporation of contaminated soils into the asphalt product will not make the product any more hazardous than normal asphalt. Contamination will be further stabilized and solidified when producing the asphalt product. Upon recycling contaminated soils into the asphalt product, the product would not be a CERCLA waste. "Once the CERCLA waste is finally... treated to substantially reduce its mobility, toxicity, or persistence, it is no longer considered a CERCLA waste and subsequent transfers of the waste would not be regulated under this rule," (Preamble to 40 CFR §300.440, proposed ruling, CERCLA Off-site Response Actions). Producing the asphalt product results in a permanent remedy for site contaminated soils.

Alternative 4 treats contaminated soils through thermal desorption. Contaminants are volatized and extracted from soils, leaving a clean soil suitable for replacement on the site. Treatability tests showed the process to be effective in remediating contaminated soils. Remediation levels were achieved for all contaminants of concern except one which was only slightly above the remediation level. Lead in surface soils is not treatable through thermal desorption and surface soils would be disposed in a landfill. Concentrated contaminant waste streams would be shipped offsite for incineration, permanently destroying the contaminants.

Although Alternative 5 removes contaminated soils from the site and eliminates this exposure, landfilling of the soils is not as protective as treatment.

Alternative 3a solidifies principal threat wastes and replaces the treated soils back on the site. Protection from exposure to solidified principal threats and contaminated soils is through a cap which is not as effective and permanent as other treatment alternatives.

Alternatives 3 through 6 include removal of principal threat wastes which are sources for groundwater contamination. This is expected to result in significant reductions in groundwater contamination by the natural processes of adsorption, biodegradation, and dispersion. Groundwater is expected to be cleaned to remediation levels in approximately 10 years. Alternatives 7 through 10, which add groundwater extraction and treatment to the remedial activities specified for Alternatives 3 through 6, do not offer any significant additional overall protection relative to Alternatives 3 through 6. The pump and treat option is not expected to significantly improve the rate at which groundwater is remediated. Alternatives 1 and 2 do not include principal threat source removal for groundwater remediation. Protection to groundwater exposure is through institutional controls which are not as effective and reliable in the long term.

Criterion 2: Compliance with Applicable Relevant and Appropriate Requirements (ARARs)

Compliance with ARARs addresses whether a remedy will meet all Federal and State environmental laws and/or provide a basis for a waiver from any of these laws. The ARARs are divided into chemical specific, action specific, and location specific groups.

There are no chemical quality standards for soils promulgated through Federal or State regulations. Therefore, compliance with ARARs is not applicable for contaminated soils at the

UP&L/ABS. ARARs do exist for groundwater, they include Federal and State drinking water standards such as MCLGs, or MCLs when MCLGs are zero.

Alternatives 3 through 10 would comply with all ARARs identified in Appendix B except for the RCRA waste pile ARARs. The CERCLA Offsite Policy would be followed for any offsite treatment or disposal of contaminated soils. The CERCLA Offsite Policy allows for CERCLA wastes that are not RCRA hazardous wastes to be sent to a non-RCRA facility. Any non-RCRA facility must be operating in accordance with all of its applicable regulations and have no releases of hazardous substances. RCRA regulations for the transport of RCRA hazardous wastes would be applicable for offsite shipment.

RCRA land disposal restrictions would be applicable to any RCRA characteristic hazardous wastes disposed onsite or offsite. LDRs are not applicable or relevant and appropriate to contaminated soils not characterized as RCRA hazardous. Contaminated soils treated onsite and rendered no longer hazardous would not be subject to LDRs. LDRs would be complied with for all of the Alternatives.

Contaminated soils would be temporarily stockpiled onsite for characterization prior to treatment or offsite shipment. RCRA waste pile regulations are applicable for RCRA characteristic hazardous wastes and relevant and appropriate for contaminated soils. Applicable sections of these regulations require the use of double-lined pads and leachate collection systems for hazardous waste piles. Since the temporary waste piles will not be constructed in accordance with RCRA regulations but will be constructed to provide an equivalent level of performance, an ARAR waiver is appropriate based on 40 C.F.R. § 300.430(f)(1)(ii)(C)(4). This waiver allows for situations where "the alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through the use of another method or approach". Waste piles will be placed on asphalt pads within the area of contamination and any runoff from the pads will be collected and treated with other waste water streams.

Alternatives 1 and 2 do not comply with ARARs as groundwater contamination is expected to remain above MCLs. Alternatives 1 and 2 do nothing to remove site contaminants, thus COCs will continue to exceed ARARs for groundwater. Alternatives 3 through 6 include remediation of principal threat wastes. The principal threats, which are sources for groundwater contamination, would be remediated through excavation of DNAPL principal threats and soil vapor extraction of LNAPL principal threats. It is difficult to predict when ARARs would be achieved, although modeling of groundwater contamination indicates achieving remediation levels in approximately 10 years. Alternatives 4 through 6 include the additional treatment or offsite disposal of low level threat wastes and therefore provide additional assurance that groundwater ARARs should be achieved as these soils may contribute some groundwater contamination. Alternatives 7 through 10 will comply with all ARARs, however the ability to comply is not significantly greater than Alternatives 3 through 6, except the remediation timeframe should be shorter.

Criterion 3: Long-Term Effectiveness and Permanence

This evaluation criterion involves consideration of the risks that remain after the site has been remediated. Items of concern are the presence of any receptors near the site, magnitude of the remaining risk from untreated waste or treatment residuals, adequacy of controls that are used to manage treatment residuals or untreated waste, and reliability of these controls.

Alternative 6b offers a high level of long-term effectiveness and permanence due to the removal of principal and low-level threat wastes from the site. Contaminated soils would be made into a cold mix asphalt product and used for paving roads. Once these contaminated soils are treated and made into a product, they are not considered a waste. Over time, the road will likely degrade and at some point would reach the end its useful life. At that time, the road materials would likely be paved over or recycled into new asphalt road material. Alternative 6b would require the offsite incineration of any characteristic hazardous wastes which permanently destroys the organic contaminants.

Alternative 6a is the same as 6b except any RCRA characteristic hazardous wastes would be disposed in a landfill. This option is less permanent and effective than Alternative 6b. The no-action alternative will not reduce long-term risks from exposure to site contaminants and Alternative 2 offers only a slightly higher degree of long-term effectiveness and risk reduction when compared to Alternative 1.

Alternative 4 offers a high degree of long-term effectiveness and permanence, only slightly less than Alternative 6b because some contaminated soils would be disposed in a landfill rather than treated. Thermal desorption was demonstrated to remove contaminants in soils down to acceptable risk levels, at or only slightly above remediation levels. The treated soils would then be acceptable for disposing onsite. Contaminants volatilized and removed from the soils would be further treated through offsite incineration or through carbon absorption. Ultimately, these contaminants would be permanently destroyed.

Alternative 5 has a lower long term effectiveness and permanence than that of alternative 4 because of the disposal of untreated, principal threat and low level threat wastes. These wastes are considered highly mobile and highly toxic which presents the problem of long term monitoring and maintenance after disposal.

Long-term effectiveness and permanence is improved by Alternative 3 over that of Alternatives 1 and 2 because sources for groundwater contamination are addressed. Alternatives 2 and 3 rely on capping and institutional controls for preventing exposure to contaminated soils which is only moderately effective in the long term.

There would be little or no increase in long-term effectiveness and permanence for Alternatives 7 through 10 because groundwater extraction is a poor mass recovery process for the sparingly soluble contaminants at the site. The addition of groundwater extraction and treatment for Alternatives 7 through 10 is unlikely to significantly reduce the time required to achieve ARARs relative to source removal and passive remediation alone.

Criterion 4: Reduction of Toxicity, Mobility, or Volume through Treatment

Treatment is a component of all the alternatives with the exceptions of Alternatives 1 and 2. It is a major feature of Alternative 4 where principal threats and a significant portion of the low level threat waste are to be thermally treated. Contaminants in soils are concentrated through thermal desorption and then sent offsite for incineration, resulting in reductions in toxicity, mobility and volume.

Alternative 6b treats contaminated soils through stabilization and incorporation into a cold mix asphalt product, thereby reducing the mobility of contaminants. Alternative 6b provides for the additional thermal destruction of RCRA characteristic hazardous wastes which reduces the toxicity, mobility and volume.

Alternatives 3a and 3b utilize treatment for thermal desorption and incineration (3b) or stabilization (3a) of the principal threat wastes; however, in both alternatives, greater than 50% of the contaminated soils would remain on site without treatment.

Alternatives 3c and 5 include offsite disposal in a secure landfill with treatment being employed only as required to meet facility specific disposal criteria. These alternatives do not result in any reductions in toxicity, mobility or volume. Containment in a landfill could be considered as a reduction of mobility, although the contaminated soils themselves would not have any reduction in mobility.

Alternatives 3 through 10 include additional reduction of toxicity by treatment through SVE of principal threat wastes. Contamination is removed by SVE and extracted from the air stream by carbon absorption. The spent carbon is then sent offsite for regeneration which involves the thermal destruction of the contaminants.

Criterion 5: Short-Term Effectiveness

This criterion involves investigation of the effects of the alternatives during construction and implementation. Items of concern are the protection of the community and the workers during implementation of remedial measures, potential environmental impacts, and the time required to achieve remedial response objectives.

No unacceptable or unmanageable short-term risks are anticipated by the any of the alternatives.

Alternative 1 offers no incremental risk to the community above that which already exists due to the presence of site contaminants. The time required onsite to install additional monitoring wells is only a few days.

Placement of the clay cap in Alternative 2 would cause some disturbances of the contaminated soils, but dust control measures could be implemented to minimize exposure to nearby residents. Trucking of materials for cap construction presents short term effects from increases in truck traffic. The estimated time to complete this alternative is 36 days.

Short-term risks for Alternative 3 exceed those for Alternatives 1 and 2 due to excavation and treatment of principal threat wastes on site. Excavated soils will release volatile contaminants to the atmosphere, but onsite monitoring will be conducted to ensure that workers or nearby residents are not exposed to harmful levels of contaminants. Stabilization and thermal desorption will also result in the release of some volatiles even though thermal desorption will be in a sealed vessel.

Alternatives 3c, 5 and 6 involve the excavation of contaminated soils including principal threats and low level threats. Once excavated, these soils will be transported offsite for treatment or disposal. The time to implement these alternatives is from 122 days to 155 days. Because soil treatment activities will not occur onsite for Alternatives 3c, 5 and 6, short-term risks are reduced, in comparison to Alternative 4, for onsite exposures. However, transporting wastes offsite for disposal or treatment will present increased risks offsite due to truck transport of wastes.

The additional on-site treatment of the low-level threat wastes in Alternatives 3b and 4 pose greater short-term risks to workers and residents. Onsite treatment would range from 179 days to 300 days.

The greatest short-term risks are posed by Alternatives 7 through 10 because of prolonged remedial activities and potential for exposure to contaminated groundwater and secondary wastes. Long term groundwater extraction and treatment through air stripping would result in air emissions for up to 10 years.

Criterion 6: Implementability

This criterion refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution. It also includes coordination of Federal, State, and local governments to clean up the site.

All of the alternatives evaluated were considered to be implementable, both technically and administratively. Alternative 6b is implementable through the use of an existing asphalt batching plant. EPA has conducted a visit to the facilities for a preliminary inspection. Formal inspection under the Offsite Policy will be conducted prior to shipping contaminated soils to the plant. Offsite incineration facilities are available nearby that could accept any contaminated soils requiring incineration.

Treatability studies were conducted to evaluate the technical feasibility of any cleanup technologies that required further information. Studies were conducted on asphalt batching (Alternative 6a and 6b), solidification (Alternative 3a), thermal desorption (Alternatives 3b and 4), groundwater extraction (Alternatives 7 through 10) and soil vapor extraction (Alternatives 3 through 10). These studies showed that all of the technologies presented in the alternatives were implementable. Additionally, air stripping and carbon absorption technologies (Alternatives 3 through 10) were evaluated using site specific information.

Administrative requirements for each alternative and remediation technology were

evaluated. No administrative obstacles to implementing any of the remedies were encountered. Difficulties might be encountered in permitting air emissions from the thermal desorption unit and gaining community acceptance. Other considerations included permits for POTW discharges, air emissions from air strippers and soil vapor extraction systems, transportation of hazardous wastes, offsite disposal, offsite incineration and institutional controls.

Criterion 7: Cost

This criterion evaluates capital, operation and maintenance costs of each alternative, and compare costs among similarly protective remedies.

Alternatives 6b and 4 provide the highest levels of protection, but Alternative 6b is estimated to cost $1,100,000 less than Alternative 4. Actual costs for Alternative 6b depend on the end use of the asphalt product. Total costs for this alternative could be $2,100,000 less than Alternative 4.

Alternatives 5 and 6a cost less than Alternative 6b but have lower levels of protectiveness. Alternative 3a, 3b and 3c are generally less costly, but less contaminated soils are treated and protection relies on capping and institutional controls which is less reliable and effective as compared to treatment.

With the exception of Alternatives 7 through 10, all of the other alternatives are cost effective, that is, their costs are commensurate with their level of effectiveness. Alternatives 7 through 10 employ "pump and treat" as an additional measure for groundwater remediation which is not expected to be significantly more effective than natural, passive groundwater remediation once the principal threat wastes are removed.

Criterion 8: State Acceptance

The Utah Department of Environmental Quality has worked in partnership with EPA throughout the RI/FS and concurs with the selected remedy for this Site.

Criterion 9: Community Acceptance

The Proposed Plan was issued on March 26, 1993. A public meeting was held on April 22, 1993 at the UDEQ offices in Salt Lake City. Members of the community attended the meeting and asked questions regarding the proposed remedy. Meeting attendees expressed no opposition to the proposed remedy. No additional written or verbal comments were received from the community.

X Selected Remedy

Alternative 6b, Asphalt batching of principal threats and low level threats has been selected as the remedy for the Utah Power & Light/American Barrel Site.

Principal threat wastes as defined qualitatively in Section V, Summary of Site Characteristics of this ROD and quantitatively in Section XI, Performance Standards, shall be excavated where found on the Site. Current information indicates two areas that contain principal threat wastes: the gas-o-meter contents and the tar berm area. The areas where tar wells and creosote tanks were located based on plat maps of the Site (see Figure 2) shall be investigated further to determine if unknown principal threat wastes are located in these areas. Principal threat excavation shall be to the extent of the wastes as defined qualitatively and confirmed quantitatively. Excavation shall be to the extent feasible as determined by EPA, within the limits of current site activity and structures, limited primarily by active railroad tracks and a high pressure diesel pipeline. Shoring of excavations and pumping of groundwater shall be utilized as necessary to complete the excavations. Excavated principal threat wastes shall be tested using the TCLP test methods and segregated onsite into RCRA characteristic hazardous wastes and non-hazardous wastes prior to offsite shipment.

Low level threats consisting of surface soils and subsurface soils on the ABY and SEA exceeding remediation levels shall be excavated down to a depth of 10 feet. These soils shall be segregated onsite from principal threat RCRA characteristic hazardous wastes.

All contaminated soils except soils determined to be RCRA characteristic hazardous wastes and calcareous soils, shall be sent offsite for processing into a cold mix asphalt product. The facility receiving these wastes shall be in compliance with the CERCLA Offsite Policy. RCRA hazardous wastes shall be sent to an offsite RCRA Permitted Subtitle C TSD facility for incineration that is in compliance with the CERCLA Offsite Policy.

Investigation derived wastes from the RI/FS shall be characterized by TCLP test methods and handled in accordance with the remedial actions for other contaminated soils and wastes.

Any calcareous fill material uncovered or excavated during the soil removal actions shall be segregated from other contaminated soils. Segregation shall be based on visual observations. The calcareous fill material shall be tested for characteristics of reactivity as described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", 1986a (EPA/SW-846, 3rd Edition) or any subsequent finalized editions. Characteristic hazardous wastes shall be disposed in accordance with ARARs in an approved RCRA Subtitle C facility. Non-hazardous contaminated soils shall be disposed in a RCRA Subtitle D facility.

The excavated areas shall be backfilled with clean fill and regraded to allow proper site drainage. A uniform and compacted layer of top soil shall be placed over the disturbed areas to restore the soil cover in these areas to a depth suitable for supporting the germination and propagation of vegetative cover. Soil cover shall be compacted at a density and installed with a grade designed to minimize erosion and prevent ponding.

A soil vapor extraction (SVE) system shall be installed to remediate principal threat

LNAPL areas located on the ABY and SEA. The system shall combine SVE with groundwater depression through pumping of groundwater from vapor extraction wells. Vapor and groundwater collection will be accomplished by vent wells screened across the water table. Contaminated soil vapor will be collected by applying vacuum to wells using a vacuum blower.

Recovered vapor shall be treated by methods other than incineration or catalytic oxidation to achieve the standards for off-gas treatment established by ARARs prior to discharge to the atmosphere. Extracted groundwater shall be treated to achieve pretreatment standards established by the Salt Lake City Publicly Owned Treatment Works (POTW) prior to discharge to the POTW. An industrial wastewater discharge permit shall be obtained from the Salt Lake City POTW prior to any discharges. All discharges shall be in compliance with the permit.

Decontamination water, leachate collected from waste piles, and groundwater pumped from excavations shall also be treated to POTW pretreatment standards and discharged to the POTW for further treatment.

Groundwater shall be monitored during and after remediation of sources for groundwater contamination (principal threats) to evaluate the progress of natural attenuation in restoring groundwater to remediation levels.

Institutional controls that prevent exposure to contaminated groundwater shall be implemented. The Responsible Parties, together with EPA and UDEQ, shall inform the State Engineer for the Division of Water Rights, Utah Department of Natural Resources of the potential risks associated with the use of ABS groundwater.

A deed notice shall be placed on the chain of title to the Utah Power & Light property and Denver and Rio Grande Western property disclosing the presence of contaminated soils below a depth of 10 feet on these properties and the presence of contaminated groundwater, further prohibiting the drilling of any water wells. Any excavation of this material will require handling in accordance with all applicable CERCLA, RCRA and DOT regulations.

XI Performance Standards

Principal Threat Excavation

Excavation of principal threat soils shall begin with the identified areas consisting of the gas-o-meter and tar berm area. Excavation shall be primarily guided by visual observation based on the principal threat definition of: NAPLs, mobile tarry material and soils saturated with NAPLs. Further delineation of principal threats for excavation shall be based on a concentration of PAHs and/or benzene equating to a carcinogenic risk of 10^{-3}. The 10^{-3} risk level is suggested as a guideline in "A Guide to Principal Threat and Low Level Threat Wastes," (OSWER Directive 9380.3-06FS). Contaminant concentrations that equate to a 10^{-3} incremental cancer risk are derived assuming worker exposure levels for PAHs in soil and residential exposure through ingestion of benzene in groundwater.

Based on data collected during the RI, the concentration of total EPA Target Compound

List (TCL) PAHs that equates to an incremental carcinogenic risk of 10^{-3} is 9,000 mg/kg (Principal threat quantification, see Appendix A). The extent of excavation of principal threats shall be until visibly contaminated principal threats as defined above are removed or the concentrations of total EPA TCL PAHs are below 9,000 mg/kg. A Sampling and Analysis Plan shall be developed and submitted for EPA review and approval that provides for demonstration that residual soil concentrations, as determined by composite samples collected from the walls and floors of the excavation do not exceed the numerical criterion of 9,000 mg/kg total TCL PAH compounds. An analytical field screening method for measurement of total PAHs may be utilized for confirmation sampling upon demonstration of suitable correlation between TCL PAH measurements and field screening total PAH measurements and approval by EPA.

Additional areas of contamination outside of the identified principal threat areas may be principal threats based on the above definitions and shall be excavated to the extent feasible as determined by EPA.

Excavated principal threats shall be segregated in RCRA characteristic hazardous wastes and contaminated soil piles based initially on visual observations, confirmed by sampling and analysis using TCLP test methods. A sampling and analysis plan shall be developed and submitted for review and approval by EPA that provides for demonstration to EPA's satisfaction, that waste determinations as required under 40 CFR Subpart 262.11 accurately represent the characteristics of the waste. The waste piles shall be constructed and operated in accordance with the minimum operating standards for waste piles listed in 40 CFR Part 264.251.

Low Level Threat Soil Excavation

Low level threats defined as those soils from the surface down to 10 feet in depth that exceed the remediation levels as listed in Table 7 shall be excavated and transported off-site for processing into a cold mix asphalt product. A Sampling and Analysis Plan shall be developed and submitted to EPA for review and approval that provides for demonstration that soils exhibiting concentrations in excess of the remediation levels have been excavated.

Asphalt Product Standards

The principal threat and low level threat soils shall be processed into a cold mix asphalt product meeting industry standards for emulsified asphalt base mixtures. The emulsified asphalt base mix shall be produced at the processing plant location. The finished product shall then be suitable for road construction use and shall be utilized for road construction or private parking lot paving. Any debris not suitable for processing into the product shall be sent to an EPA approved RCRA Subtitle C or D TSD facility.

Soil Vapor Extraction of LNAPL Principal Threats

The SVE system shall be installed in the areas of LNAPL contamination defined as those areas where concentrations of benzene have a potential 10^{-3} risk. The risk is based on a resident ingesting water contaminated with benzene and is equal to a benzene concentration of 2.8 mg/l. Using soil partitioning theory, a soil concentration that can be estimated to result in a water concentration of 2.8 mg/l is 8.0 mg/kg (see Appendix A). A soil sampling program shall be

developed that collects saturated and unsaturated soil samples and analyzes these samples for benzene. Reported analytical results shall be calculated on a dry weight basis. Areas where benzene concentrations exceed 8.0 mg/kg shall be remediated with SVE.

The SVE system shall be operated and monitored until groundwater performance standards are achieved or until sufficient data has been collected to demonstrate that contaminant concentrations in the extracted soil vapors are at statistically significant asymptotic values based on a four point moving average or other statistical test for 12 months of monthly monitoring at each extraction well. If asymptotic conditions are reached, before operations are discontinued, it will also be necessary to demonstrate that best efforts have been used to optimize system performance. Best efforts shall include at a minimum,

(1) modifying the SVE system by: alternating vacuum extraction wells to eliminate stagnation points, pulse pumping of vacuum wells allowing time for contaminants to vaporize, vary extraction rates and pressures, and installing additional vacuum extraction wells to facilitate or accelerate cleanup of the LNAPL plume;

(2) identifying and remediating any additional or previously uncharacterized sources of LNAPL contamination within the Site boundaries;

(3) modifying the groundwater extraction from vacuum extraction wells by increasing pumping rates to expose additional contaminated soil to vacuum extraction and increase mass recovery rates of contaminated groundwater.

(4) evaluating the effectiveness of biodegradation related to SVE to determine if the SVE system should be operated to enhance natural degradation of contaminated soils.

Performance and Compliance Monitoring Program

A sampling program for monitoring the SVE performance and for determining compliance with the performance standards shall be implemented during the remedial action. This program will be developed during remedial design and shall include, at a minimum, the following: locations of LNAPL principal threats, locations of performance monitoring points within the SVE system including influent and effluent from the blower/treatment system; frequency of monitoring of the performance of the SVE system, analytical parameters (focusing on COCs, with the possible use of indicator chemicals), analytical methods for laboratory and field chemical analysis (with possible use of non-CLP analysis), field sampling methods, and statistical methods for evaluating data.

Groundwater Restoration

Area of Attainment. The area of attainment for the ground water restoration shall be the entire ABS and any part of the plume exceeding ARARs or remediation levels identified in Table 8 of this ROD irrespective of the ABS boundary.

Performance Standards. Specific performance standards used to ensure attainment of the remedial action objectives for ground water are:

1) Over the first 5 years of remedial action, benzene concentrations within the area of attainment, on the average, shall not deviate from the predicted concentrations presented as modeling scenario V in Appendix F of the final Feasibility Study Report, by more than 50%. This determination will be made by first calculating the expected benzene mass within the attainment area after every year, and then estimating the percent deviation of the actual contaminant mass from the expected mass. Methods for calculating benzene mass and statistics used in the analysis shall be included in the groundwater monitoring plan and reviewed and approved by EPA.

2) Other organic contaminants and cyanide within the area of attainment shall show a significant decrease in concentration as determined by EPA over the 5 year period based on performance monitoring. A statistical trend analysis will be used to make this determination. The presence of any upgradient sources of contamination would be considered as off-setting factors in achieving this standard.

3) Contaminants shall not migrate beyond the study area (city block) at concentrations exceeding remediation levels.

4) Contaminant levels in the groundwater within the area of attainment shall be ultimately reduced to remediation levels.

In the case of non-compliance with performance standards (1) and (2), additional sources of contamination will be investigated if they appear to be present based on the ground water monitoring data collected. If additional sources are found to be contributing to groundwater contamination, alternate remedial actions will be employed to address these sources for groundwater contamination. If additional sources do not appear to be present, revised remediation rates will be estimated. If at any time EPA determines that there is unacceptable protection of human health and the environment, EPA will require the implementation of more aggressive remedial measures.

In the case of non-compliance with performance standard (2) specifically for cyanide in groundwater, further evaluation of the calcareous material shall be conducted to determine the significance of this material as a source of groundwater contamination.

If it is shown that performance standard (3) is not being met, EPA will require implementation of contaminated groundwater containment actions unless all of the following three requirements are satisfied:

a) deed restrictions preventing groundwater use are placed in the deeds of the affected properties;

b) there is no potential for exposure to the contaminated ground water; and

c) the elevated concentrations are transitory and will be reduced to levels below

remediation levels in a reasonable time frame as determined by EPA.

EPA will determine if these conditions are being met and whether groundwater containment actions are required.

Although this ROD refers to approval and decision making by EPA, UDEQ will have a substantial role in the review of any decisions and plans. Specific roles and responsibilities for UDEQ will be detailed in a Consent Decree for this Site and/or in a Site Specific Enforcement Agreement between EPA and UDEQ. Plans are for the Consent Decree to provide UDEQ with direct reimbursement by the PRPs for any oversight expenses incurred at this Site.

Performance and Compliance Monitoring Program

A sampling program for monitoring the remedial action performance and for determining compliance with the performance standards shall be implemented during the remedial action. This program will be developed during remedial design and shall include, at a minimum, the following: locations of performance monitoring wells for water quality sampling, frequency of monitoring of performance wells, analytical parameters (focusing on COCs with possible use of indicator chemicals), sampling field methods, water level measurement frequency, analytical methods for chemical analysis (with possible use of non-CLP analysis), locations and methods for water level measurements, and statistical methods for evaluating the analytical data.

The performance monitoring system will be designed to provide information that can be used to evaluate the effectiveness of the remedial action with respect to the following:

* horizontal and vertical extent of the plume and contaminant concentration gradients, including a mass balance calculation;

* rate and direction of contaminant migration;

* changes in contaminant concentrations or distribution over time;

* effects of any modifications to the original remedial action.

The groundwater within the ABS and Area of Attainment shall be monitored for contaminants throughout the implementation of the remedy and for at least five years following the completion of the source removal activities. Once it is statistically shown that ARARs and remediation level concentrations of contaminants (Table 8) have been reached, the wells shall be sampled for twelve consecutive quarters. If contaminants are shown to statistically remain below ARARs and remediation levels for twelve consecutive quarters, monitoring can be discontinued. Statistical methods will be established in the compliance monitoring plan.

XII Statutory Requirements

Protection of Human Health and the Environment

Soil exposure is eliminated through excavation and offsite treatment of all soils exceeding a 10^{-6} risk and which have an exposure pathway. Asphalt covers and roads are not known to present unacceptable risks to the public. Site contaminants are similar or identical to constituents in commercial asphalt. Additionally, contaminants will be solidified in the asphalt product and will not present additional risks to the public or environment.

Based on site modeling, groundwater is expected to achieve contaminant reductions of 99% in 5 years through principal threat source remediation and natural attenuation. Achieving remediation levels is uncertain given the presence of LNAPLs and DNAPLs at this site, but modeling results imply that natural attenuation processes would reduce contaminant concentrations to remediation levels in a reasonable time frame (10+ years). Contaminated groundwater is not currently utilized but use restrictions will be required until remediation levels are achieved. No unacceptable short term risks to workers or residents are anticipated. The soil excavation actions should take approximately 155 days. Soil vapor extraction is estimated to take up to 3 years.

As the remedy is expected to take longer than five years to achieve groundwater remediation levels, a five-year review as required under Section 121(c) of CERCLA, 40 C.F.R. 300.430(f)(4)(ii), and applicable guidance will be conducted.

Compliance with ARARS

Actions under Alternative 6b will comply with all ARARs except RCRA waste pile regulations. An ARAR waiver based on 40 C.F.R. § 300.430(f)(1)(ii)(C)(4), that the remedy will attain an equivalent standard of performance is appropriate. Following is a list of chemical specific, action specific and location specific ARARs for the selected alternative.

Cost Effectiveness

Alternative 6b provides overall effectiveness as high as alternative 4 and higher than all other alternatives. Alternative 6b is expected to cost about $1,000,000 less than alternative 4 based on costs in the Feasibility Study, but actual costs could be $2,500,000 less depending on the use of the recycled asphalt product.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

Alternative 6b maximizes treatment and the use of resource recovery technologies through asphalt batching. Site soils are processed into a useable product that can be utilized to make asphalt roads. Principal threats are further treated through soil vapor extraction and off-gas treatment. A minimum amount of material is to be disposed of in this alternative (cyanide bearing calcareous material). The preferred alternative provides a high level of long term effectiveness and permanence as all soils on the site with a potential exposure pathway are

removed and treated. Groundwater is expected to be restored to drinking water standards.

Preference for Treatment as a Principal Element

All principal threats are treated under this alternative. Soils classified as principal threats are excavated and treated offsite. Residual LNAPL at the water table is classified as a principal threat and is treated through soil vapor extraction. Only low level threat residual tarry material below 10 feet in depth is left in place untreated. This contamination is not expected to migrate or contribute significantly to groundwater contamination.

APPENDIX A

DERIVATION OF MEDIA CONCENTRATIONS THAT DEFINE PRINCIPAL THREAT MATERIALS

The preferred remedial alternative for the ABS specifies excavation of principal threat materials in and adjacent to the gas-o-meter structure (located on the ABY) and the tarry berm (located in the SEA). Principal threat materials have been defined by EPA and UDEQ qualitatively as those materials within and adjacent to the gas-o-meter and tarry berm that are liquid, non-aqueous phase liquids (NAPLs), mobile tarry material, and visibly contaminated soils saturated with NAPLs. Principal threats are defined quantitatively as those materials that represent an excess lifetime cancer risk of 1E-03 or greater (UP&L, 1993b). The findings of the Baseline Risk Assessment conclude that polynuclear aromatic hydrocarbons (PAHs) and benzene are the contaminants of concern in soils and groundwater that, under reasonable maximum exposure scenarios, contribute the majority of the carcinogenic risk at the ABS (U.S. EPA, 1992). This appendix documents the derivation of soil concentrations for both PAHs and benzene that represent a carcinogenic risk equal to or greater than 1E-03 and thus define quantitative values for the extent of principal threat materials requiring remediation.

1.0 Derivation of PAH Soil Concentration Equivalent to a Carcinogenic Risk of 1E-03

The concentration of PAH compounds in soils that represents a principal threat was derived by plotting the risk values associated with the carcinogenic PAHs versus the total PAH concentrations detected in subsurface soil samples. This risk based approach was initially developed in the context of deriving soil action levels for PAHs, and is described in "Statistical Methods to Derive Cleanup Goals for a Multichemical Impacted Site" (Jupin and McCausland, 1992). The regression equation resulting from the log-log plot of risk versus total PAH concentrations allows for derivation of the total PAH concentration equal to or greater than a risk of 1E-03.

Table 1 presents a summary of the site specific PAH data and resulting risk values used to develop the plot of risk versus total PAH concentrations shown in Figure 1. The resulting

Table 1

Summary of PAH Soil Data Used to Quantify Principal Threats Containing PAHs

Soil Sample Number[a]	Station #	Sum of Carcinogenic PAHs[b] (mg/kg)	Sum of Total PAHs[c] (mg/kg)	Factored Carcinogenic Risk[d]
BH001001	BH1	70.6	131.6	5.1E-05
BH002005	BH1	5.8	11.7	4.2E-06
BH003011	BH1	1.4	3.4	1.2E-06
BH004014	BH1	1.5	3.6	1.3E-06
BH005021	BH1	70.9	380.1	6.1E-05
BH009001	BH4	25.4	65.7	1.7E-05
BH010002	BH4	22.8	59.7	1.6E-05
BH012001	BH4	297	1467	2.2E-04
BH013016	BH4	1.7	3.9	1.6E-06
BH015001	BH5	3.0	9.7	2.1E-06
BH016002	BH5	2.3	6.8	1.9E-06
BH017003	BH5	1.4	3.4	1.2E-06
BH019008	BH5	1.5	3.7	1.4E-06
BH020014	BH5	1.8	4.3	1.6E-06
BH024001	BH6	8.1	12.9	5.9E-06
BH025003	BH6	47.6	113.2	3.2E-05
BH026004	BH6	42.8	92.6	3.1E-05
BH028009	BH6	6.0	41.3	4.1E-06
BH030013	BH6	10.3	75.5	7.4E-06
BH032001	BH7	50.5	101.5	3.6E-05
BH033003	BH7	61.0	125.0	4.2E-05
BH034009	BH7	0.96	2.7	8.0E-07
BH035010	BH7	1.6	3.9	1.4E-06
BH038001	BH8	718	1216.6	5.7E-04
BH039002	BH8	3.9	6.4	3.1E-06
BH040004	BH8	1.5	3.6	1.3E-06
BH042008	BH8	1.3	3.2	1.2E-06

Table 1 (Continued)

Summary of PAH Soil Data Used to Quantify Principal Threats Containing PAHs

Soil Sample Number[a]	Station #	Sum of Carcinogenic PAHs[b] (mg/kg)	Sum of Total PAHs[c] (mg/kg)	Factored Carcinogenic Risk[d]
BH043013	BH8	1.6	3.9	1.4E-06
BH047001	BH9	2.7	6.3	2.3E-06
BH048003	BH9	0.8	2.8	8.0E-07
BH049005	BH9	0.7	2.2	7.0E-07
BH050010	BH9	1.5	3.6	1.3E-06
BH051014	BH9	1.8	4.3	1.6E-06
BH053001	BH10	25.7	52.4	1.8E-05
BH055003	BH10	124.2	229.4	9.2E-05
BH057015	BH10	21.6	198.8	1.2E-05
BH153042	BH310	1.8	4.4	1.6E-06
BH156048	BH302	1.8	4.3	1.6E-06
BH160058	BH302	1.8	4.4	1.6E-06
BH150065	BH303	1.8	4.4	1.6E-06
LITH.TAR	LITH.TAR	3597	23,099	2.3E-03
CONT. FILL	CONT. FILL	93.8	643.6	6.4E-05
CLAY W/TAR	CLAY W/TAR	3.3	25.9	2.1E-06
TP-9	TP-9	597	4364	3.9E-04
TP-12	TP-12	772	6419	6.3E-04
TS1	TS1	108.5	611.9	7.1E-05
TS2	TS2	62.2	366.8	4.3E-05
TS3	TS3	70.8	414.7	4.6E-05

[a] Subsurface soil samples collected during site characterization or treatability studies (UP&L, 1993a).

[b] This value is the sum of the following carcinogenic PAH compounds which are a subset of the EPA target compound semi-volatile organic list:

benzo(a)anthracene
chrysene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(a)pyrene
indeno(1,2,3-c,d)pyrene
dibenz(a,h)anthracene

Table 1 (Continued)

Summary of PAH Soil Data Used to Quantify Principal Threats Containing PAHs

[c] This value is the sum of all the PAH compounds on the EPA Target Compound semivolatile organic list including:

naphthalene	anthracene	benzo(k)fluoranthene
2-methyl naphthalene	fluoranthene	benzo(a)pyrene
acenaphthylene	pyrene	indeno (1,2,3-cd)pyrene
acenaphthene	benzo(a)anthracene	dibenz(a,h,)anthracene
fluorene	chrysene	benzo(g,h,i)perylene
phenanthrene	benzo(b)fluoranthene	

[d] The factored risk value is the sum of the risks calculated for the individual carcinogenic PAH compounds detected in each sample (U.S. EPA, 1992 and Jupin and McCausland, 1992)

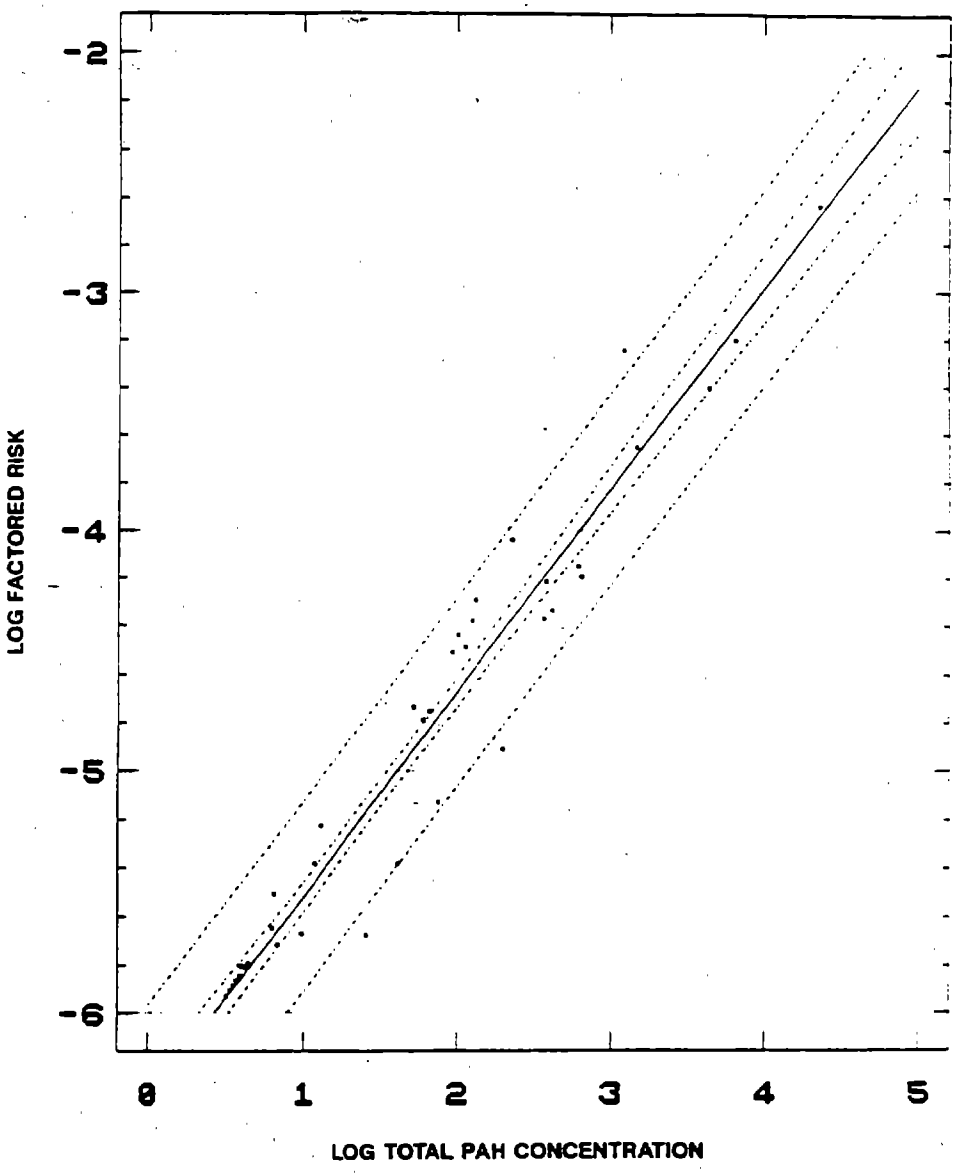
The risk for an individual carcinogenic PAH compound is calculated by:

Risk = (HIF) (SF) (detected concentration in soil)

where HIF = Human Intake Factor. The HIF is an algorithm used in risk assessment modeling that incorporates several exposure variables. The HIF used for the risk calculation in Table 1 is based on a lifetime worker oral exposure. The value is 1.7E-07 mg/kg-day.

SF = Slope factor (oral). The slope factor is a route specific estimate of a compound's carcinogenic potency. Oral slope factors for carcinogenic PAHs are:

benzo(a)pyrene	=	1.2E+01	$(mg/kg\text{-}day)^{-1}$
benzo(a)anthracene	=	1.2E-01	$(mg/kg\text{-}day)^{-1}$
chrysene	=	1.2E-01	$(mg/kg\text{-}day)^{-1}$
benzo(b)fluoranthene	=	1.2E+01	$(mg/kg\text{-}day)^{-1}$
benzo(k)fluoranthene	=	1.2E-01	$(mg/kg\text{-}day)^{-1}$
indeno(1,2,3-cd)pyrene	=	1.2E-01	$(mg/kg\text{-}day)^{-1}$
dibenz(a,h)anthracene	=	1.2E+01	$(mg/kg\text{-}day)^{-1}$



Regression Analysis - Linear model: Y = a+bX

Dependent variable: UPLRISK.LOG10TRISK Independent variable: UPLRISK.LOG10TPA

Parameter	Estimate	Standard Error	T Value	Prob. Level
Intercept	-6.36482	0.0487831	-130.472	.00000
Slope	0.845856	0.0264834	31.9391	.00000

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	Prob. Level
Model	37.6106	1	37.6106	1020.108	.00000
Error	1.695987	46	.036869		
Total (Corr.)	39.306614	47			

Correlation Coefficient = 0.978188 R-squared = 95.69 percent
Stnd. Error of Est. = 0.192014

FIGURE 1 - PLOT OF FACTORED RISK VS. TOTAL PAH CONCENTRATION

regression equation (r^2 = 95.7 %) was then used to calculate the concentration of total PAHs that is equivalent to a risk of 1E-03 as shown below:

Regression Equation:	log y	=	0.845856 log x - 6.36482
where	log y	=	-3
	log x	=	3.97
therefore	x	=	9,332 mg/kg (~9,000 mg/kg)

2.0 Derivation of Benzene Soil Concentration Equivalent to a Carcinogenic Risk of 1E-03

Principal threat soils at depths greater than 10 feet are defined relative to their potential to contaminate groundwater with a benzene concentration that equates to a carcinogenic risk of 1E-03, assuming groundwater ingestion at residential exposure levels. Soil benzene concentrations that equate to a risk of 1E-03 via groundwater ingestion are derived through soil:water partitioning relationships as follows (U.S. EPA, 1992):

Risk = (HIF)(SF)(Benzene Concentration in Groundwater)

Where:

HIF = Human Intake Factor. The Human Intake Factor is an algorithm used in risk assessment modeling that incorporates several exposure variables. The HIF for Residential groundwater ingestion is 1.2E-02 liters/kg-day.

SF = Slope factor (oral). The Slope Factor is a route specific estimate of a compound's carcinogenic potency. Units are $(mg/kg\text{-}day)^{-1}$. The oral SF for benzene is 2.9E-02.

Rearranging the equation to solve for the benzene concentration in groundwater equivalent to a carcinogenic risk of 1E-03:

$$\text{Benzene concentration in GW @ 1E-03 risk} = \text{Risk}/(\text{HIF})(\text{SF}) = \frac{1E\text{-}03}{(1.2E\text{-}02)(2.9E\text{-}02)} = 2.9\ mg/\ell$$

The concentration of benzene in soils that constitutes a principal threat is derived from the soil:water sorption model presented in the document entitled "Development of Superfund Soil Action Levels" (Truesdale, 1992). The basis for the model is the Freundlich equation:

(1) $$K_d = C_s/C_w^n$$

Where:
- K_d = Freundlich adsorption constant (ℓ/kg)
- n = Freundlich exponent (dimensionless)
- C_w = solution concentration (mg/ℓ)
- C_s = concentration sorbed on soil (mg/kg)

Assuming sorption is linear (n=1) and rearranging:

(2) $$C_s = (K_d)C_w$$

For soils with significant inorganic and organic sorption, the following equation has been developed to describe K_d as a function of soil organic and inorganic content:

(3) $$K_d = (K_{oc}f_{oc}) + (K_sf_{io})$$

Where:
- K_{oc} = organic carbon partition coefficient (ℓ/kg)
- f_{oc} = fraction organic carbon (mg/mg)
- K_s = surface-specific distribution coefficient
- f_{io} = fraction inorganic material ($f_{io} + f_{oc} = 1$)

(4) K_s is further defined as $K_s = (SA/200)(K_{ow})^{0.16}$, where SA is the soil surface area in units of m^2/g, and K_{ow} is the octanol-water partition coefficient. Values for SA are listed in the table below:

Soil Surface Area (SA, m^2/g)	
Soil Type	SA
Coarse Sand	0.00113
Sand	0.0186
Fine Sand	0.036
Silt	0.57
Clay	50

Substituting equations 4 and 3 into 2 yields the following expression:

(5) $$C_s = [(K_{oc}f_{oc}) + [(SA/200)(K_{ow})^{0.16}(f_{io})]]C_w$$

For silty clay soils at the ABS, the following values are posted to solve for C_s in equation (5):

				Source
$K_{oc,BENZENE}$	=	66 ℓ/kg	→	Truesdale, 1992
f_{oc}	=	0.035 mg/mg	→	ABS, RI Report (UP&L, 1993a)
SA	=	20 m^2/g	→	Estimated value from Truesdale, 1992
$K_{ow,BENZENE}$	=	138	→	Truesdale, 1992
f_{io}	=	0.965 mg/mg	→	Calculated value
C_w	=	2.9 mg/ℓ	→	Calculated value

Solving for C_s equates to approximately 8.0 mg/kg benzene in soil. This represents the concentration of benzene in soils equivalent to a carcinogenic risk of 1E-03 assuming a residential groundwater ingestion exposure scenario.

Appendix A References

Jupin, Robert J. and Diane McCausland. 1992. Statistical Methods to Derive Cleanup Goals for Multichemical Impacted Site. HMC/Superfund '92 Conference Proceedings. Dec. 1 to Dec. 3, 1992. Washington, D.C.

Truesdale, Robert S. 1992. Development of Superfund Soil Action Levels. Draft Interim Report. Hydrogeology Department, Center for Environmental Measurements and Quality Assurance, Research Triangle Institute. Aug. 7, 1992. Research Triangle Park, North Carolina.

U.S. EPA. 1992. Baseline Risk Assessment for the American Barrel Superfund Site. Salt Lake City, Utah.

UP&L. 1993a. American Barrel Site RI/FS, Remedial Investigation Report. Salt Lake City, Utah.

UP&L. 1993b. American Barrel Site RI/FS Draft Feasibility Study Report. Salt Lake City, Utah.

Appendix B-1
Chemical-Specific ARARs
for Remedial Actions at American Barrel

Chemical Specific ARAR	Requirement	Prerequisite	Citation	ARAR	Comments
Safe Drinking Water Act	Establishes health based standards for drinking water supplies in public water systems. Standards are established as Maximum Contaminant Level Goals (MCLGs) or Maximum Contaminant Levels (MCLs).		40 CFR Part 141 UAC R309-101 UAC R309-103	Applicable at the tap, R and A for ground water in situ	Groundwater beneath the Site is a potential drinking water source and is potentially interconnected with current drinking water supplies.
Utah Air Conservation Act	Regulates particulates and particulate monitoring.		UAC R307-1-3.2	Applicable	
	Specifies technology requirements for dust control.		UAC R307-1-3.1.8(A) UAC R307-1-4.5.2	Applicable	Applies to controlling dust from site after remedy is complete.
Clean Air Act	Establishes standards for particulate matter.		40 CFR Part 50	Applicable	Applicable to temporary air pollution sources constructed at the Site during Remedial Action.
Utah Water Quality Act	Establishes ground water quality standards.		UCA 19-5-101, UAC R 317-6-2	Applicable	
RCRA	Establishes criteria for identifying hazardous wastes, establishes ground water MCLs for releases from SMUs, and maximum concentration limits for hazardous waste constituents which will be land disposed		40 CFR 261, 264, and 268	Applicable	
Corrective Action Cleanup Standards Policy for RCRA, UST, and CERCLA Sites	Lists general requirements to be considered in establishing cleanup standards.		UAC R315-101	Applicable	Applicable to setting cleanup standards at the ABS.

Appendix B-2
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Excavation	Placement on or in land outside unit boundary or area of contamination will trigger land disposal requirements and restrictions.		40 CFR 268 UAC R315-13-1	R&A	Requirements are applicable for RCRA hazardous waste. Excavated soils will be tested to determine if they exhibit any hazardous waste characteristics and applicable land disposal restrictions will be identified as applicable requirements. According to EPA guidance, the land disposal restrictions will generally not be relevant and appropriate where wastes are not identified as hazardous. American Barrel principal threat wastes are currently only expected to be hazardous due to the presence of benzene (EPA Waste Code D018), which has not yet been addressed by the land disposal restrictions.
	Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit.	40 CFR 268 Subpart D UAC R315-13-1		
	Area from which materials are excavated may require cleanup to levels established by closure requirements.	RCRA hazardous waste placed at site after the effective date of the requirements.	See Closure in this exhibit.		
Treatment or 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 temporary period before treatment, disposal, or storage elsewhere, (40 CFR 264.10).	40 CFR 264 Subpart J UAC R315-8-10	R&A	Treatment and collection of hazardous wastes occurs for Alternative 6b.
	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		
	New tanks or components must be provided with secondary containment.		40 CFR 264.193 UAC R315-8-10		
	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		
Treatment or storage in tanks	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		

Appendix B-2 (Continued)
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
	Repair any corrosion, crack, or leak.		40 CFR 264.196 UAC R315-8-10		
Treatment or Storage in Tanks (con't)	At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment and discharge confinement structures. 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 264.197 UAC R315-8-10 40 CFR 264.198 UAC R315-8-10		
Container Storage (on-site)	Use and management of containers. Containers of hazardous waste must be: • Maintained in good condition. • Compatible with hazardous waste to be stored; and • Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held in a container for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere. A generator who accumulates or stores hazardous waste on site for 90 days or less in compliance with 40 CFR 262.34(a)(1-4); 40 CFR 264.176, UAC R315-8-9.6 is not subject to full RCRA storage requirements. Small quantity generators are not subject to the 90-day limit [40 CFR 262.34(c), (d), and (e); UAC R315-5-10].	40 CFR 264 Subpart I 40 CFR 264.171 UAC R315-8-9.2 40 CFR 264.173 UAC R315-8-9.3 40 CFR 264.174 UAC R315-8-9.4 40 CFR 264.175 UAC R315-8-9.5	R&A	A variety of materials (PPE, spent carbon, spent ion exchange resin, etc.) that may be identified as hazardous wastes, will be generated and stored in containers. Container storage requirements are considered applicable to this alternative.
Container Storage (on-site)	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		

Appendix B-2 (Continued)
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
	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		
Container Storage (on-site)	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177 UAC R315-8-9.8		
	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		
Clean Closure	Closure and Post-Closure. General performance standard requires 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. Disposal or decontamination of equipment, structures,and soils.	RCRA hazardous waste (listed or characteristic) placed at site after November 19, 1980, or movement of hazardous waste from one unit, area of contamination, or location into another unit or area of contamination. Not applicable to material undisturbed since November 19, 1980.	40 CFR 264 Subpart D 40 CFR 264.111; UAC R315-8-7 UAC R-315-8-11.5	R&A	At the completion of remedial efforts, all units constructed as part of remediation will be dismantled and removed. Any contamination resulting from the use of these units will also be removed.
	Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	May apply to surface impoundment and container or tank liners and hazardous waste residues; contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, and returned to land.	40 CFR 264.111 40 CFR 264.178 40 CFR 264.197 40 CFR 264.228(a)(1) and 40 CFR 264.258 UAC R315-8-9.9 UAC R315-8-11.5		Because the intent of remediations involves closure with wastes in place, clean closure will not be attained and this requirement is not ARAR.
	Meet health-based levels at unit.		40 CFR 264.111 UAC R315-8-7		

Appendix B-2 (Continued)
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Off-Site Treatment Storage or Disposal	In the case of any removal or remedial action involving the transfer of any hazardous substance or pollutant or contaminant off-site, such hazardous substance or pollutant or contaminant shall only be transferred to a facility which is operating in compliance with section 3004 and 3005 of the Solid Waste Disposal Act (or where applicable, in compliance with the Toxic Substances Control Act or other applicable Federal law) and all applicable State requirements. Such substance or pollutant or contaminant may be transferred to a land disposal facility only if the President determines that both of the following requirements are met: • The unit to which the hazardous substance or pollutant or contaminant is transferred is not releasing any hazardous waste, or constituent thereof, into the ground water or surface water or soil. • All such releases from other units at the facility are being controlled by a corrective action program approved by the Administrator under Subtitle C of the Solid Waste Disposal Act.	Transfer off-site of CERCLA hazardous substance, pollutant, or contaminant.	CERCLA section 121(d)(3) 40 CFR 300.440 (Proposed ruling)	Applicable	Applicable to the off-site treatment, storage, or disposal of wastes generated during on-site remedial actions.
Identification and listing of hazardous wastes	Requires the identification of hazardous wastes through listed wastes or testing by TCLP for characteristics of hazardous waste.		40 CFR 261 UAC R315-1 to R315-101	R&A	RCRA characteristic hazardous wastes may be found. Excavated soils need to be tested using TCLP methods.
Generators of Hazardous Waste	Sets forth the standards applicable to generators of hazardous waste.	Hazardous wastes are generated by operations on the site.	40 CFR 262 UAC R315-1 to R315-101	R&A	Onsite excavation of hazardous soils constitutes generation of hazardous waste.
Transporters of Hazardous Waste	Sets forth the standards and requirements for transporters of hazardous waste.	Hazardous wastes are transported offsite.	40 CFR 263 UAC R315-1 to R315-101	Applicable	If hazardous wastes are found during excavation, transportation offsite to an incinerator requires compliance with this section.

Appendix B-2 (Continued)
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Discharge to Storm Sewers	Requires storm water discharges to be permitted under the Federal (or state) National Pollution Discharge Elimination Systems (NPDES) program. Different requirements are applicable for different classes and types of discharges.	Protection of surface waters against degradation resulting from site discharges	40 CFR 122 40 CFR 125 UAC R317-8	Applicable	Applicable to the discharge of storm waters on-site.
Discharge of Water into Surface Water Bodies	An NPDES permit is required for discharging water offsite into surface water bodies. All surface water discharges must be in compliance with promulgated Utah Stream Discharge Standards	Protection of surface waters against degradation resulting from site discharges	40 CFR 122 and 40 CFR 125 UAC 317-8	Applicable	The remedial alternatives at American Barrel may include the discharge of treated or untreated surface water.
Discharge to Publicly-Owned Treatment Works (POTW) (off-site activity)	Discharge of pollutants that pass through the POTW without treatment, interfere with POTW operation, contaminate POTW sludge, or endanger health/safety of POTW workers is prohibited. • Discharge must comply with local POTW pretreatment program, including POTW specific pollutants, spill prevention program requirements, and reporting and monitoring requirements. • RCRA permit-by-rule requirements (including corrective action where the NPDES permit was issued after Nov. 8, 1984) must be complied with for discharges of RCRA hazardous wastes to POTWs.	Discharge to a POTW. Transport of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe (i.e., pipe solely dedicated for hazardous waste [as defined in 40 CFR 264] which discharges from within the boundaries of the CERCLA site to within the boundaries of the POTW).	40 CFR 403.5 UAC R317-8-8.4 UAC R317-3 through R317-5 UAC R317-10 40 CFR 270.60(c) UAC R315-3-18(b)	Applicable	Groundwater and other wastewater generated during remedial activities will be pretreated and discharged pursuant to existing industrial waste pretreatment permit with the SLC POTW.
Groundwater Protection	Governs pollutants that will or are likely to enter into groundwater.		UAC R317-6	R&A	

Appendix B-2 (Continued)
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
U.S. EPA Ground-Water Protection Strategy	The strategy includes guidelines on classifying ground water for EPA decisions affecting ground water protection and corrective actions. Criteria include ecological importance, replaceability, and vulnerability consideration.	The protection strategy does not involve applicable ARARs but does contain policy statements to be considered.		TBC	This strategy is to be considered regarding ground water remedial alternatives for American Barrel.
New Source Performance Standards	Standards for new sources of air emissions. Requirements are source-specific.	Need to determine if these standards apply to potential remedial actions.	CAA Section III UAC R307-1-3	R&A	
Emissions for Air Strippers and Soil Venting	Establishes emissions limits for de minimus emissions from air strippers and soil venting and triggers the requirement to obtain an air quality approval order if the limits are exceeded.	The protection strategy does not involve applicable ARARs but does contain policy statements to be considered.	UAC R307-6-1	TBC	Alternative 6b includes point source emissions generated by soil and/or groundwater treatment.
Corrective Action Cleanup Standards Policy for RCRA, UST, and CERCLA Sites	Lists general requirements to be considered in establishing cleanup standards.		UAC R315-101	Applicable	Applicable for CERCLA sites. Consistent with activities currently being undertaken at ABS pursuant to CERCLA.
Waste Treatment	Treatment of restricted hazardous wastes prior to land disposal must attain concentration-based or technology-based treatment standards.	Wastes to be treated must be identifiable as restricted hazardous wastes.	40 CFR 268 (Subpart D) UAC R315-13	Applicable	No listed hazardous wastes have been identified at the ABS. Although not identified during the RI, it is assumed that some wastes will meet the definition of characteristic hazardous waste for toxicity (D018). No concentration or technology based treatment standards have been established for wastes newly identified as hazardous by characteristic toxicity.

Appendix B-2 (Continued)
Action-Specific ARARs
for Remedial Actions at American Barrel

Action	Requirement	Prerequisite	Citation	ARAR	Comments
Placement of Liquid Waste in Landfill	Liquids in Landfills Prohibition: No bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids, or solid waste containing free liquid, may be disposed of in landfills. Containers holding free liquids may not be placed in a landfill unless the liquid is mixed with an absorbent or solidified.	Placement of a bulk or non-containerized RCRA hazardous waste or solid waste in a landfill. Placement of containerized RCRA hazardous waste in a landfill.	40 CFR 258.28 40 CFR 264.314 UAC R315-8-14.8 40 CFR 264.314(d) UAC R315-8-14.8(a)(2)	Applicable	Applies to the offsite disposal of any characteristic hazardous wastes.
Surface Water Control	Prevent runon and control and collect runoff from a 24-hour, 25-year storm (waste piles, land treatment facilities, landfills).	RCRA hazardous waste treated, stored, or disposed after the effective date of the requirements.	40 CFR 264.251(c), (d) UAC R315-8-12.2(c)(d) 40 CFR 264.273(c), (d) UAC R315-8-13.4(c)(d) 40 CFR 264.310(c), (d) UAC R315-8-14.2(c)(d)	TBC	Application of these requirements represents good engineering practice.
Waste Pile	Use a double-liner and leachate collection system. Waste put into waste pile subject to land disposal restrictions regulations.	Non-containerized accumulation of solid, nonflammable hazardous waste or hazardous substance that is used for treatment or storage.	40 CFR 264.251 UAC R315-8-12 40 CFR 268.2, UAC R315-13-1	R&A	Alternative 6b involves short-term ($\leq$ one year) staging of soils in a pile. These soils may be identifiable as hazardous wastes. Accordingly, the RCRA waste pile requirements are either applicable or relevant and appropriate. However, because use of a pile will only involve temporary staging and because the pile is to be constructed on existing site soils which may already be contaminated, this ARAR will not be attained.

Appendix B-3

Identification of Potential Location ARARs for the American Barrel Site

Standard Requirement, Criteria, or Limitation	Citation	Description	ARAR	Comment
Historic Sites, Building and Antiquities Act	16 USC Sec. 461-467 40 CFR Sec. 6.30(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural landmarks to avoid undesirable impacts upon such landmarks.	Relevant and Appropriate	UDEQ has been notified that the gas-o-meter may qualify for inclusion in the national register of historic places. Every effort will be made to protect the structural integrity of the gas-o-meter during remedial actions.
National Historic Preservation	16 USC Sec. 470 40 CFR Sec. 6.301(B)	Requires Federal agencies to take into account the effect of any Federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the national register of historic places.	Applicable	UDEQ has been notified that the gas-o-meter may qualify for inclusion in the national register of historic places. Every effort will be made to protect the structural integrity of the gas-o-meter during remedial actions.
Migratory Bird Conservation Act	UAC R 574		Relevant and Appropriate	Migratory birds are present in the Salt Lake City area.
Archaeological and Historic Preservation	16 USC Sec. 469 UAC, Title 63 Chapter 18; UAC R224	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a Federal construction project or a Federally-licensed activity or program.	Relevant and Appropriate	UDEQ has been notified that the gas-o-meter may qualify for inclusion in the national register of historic places. Every effort will be made to protect the structural integrity of the gas-o-meter during remedial actions.

APPENDIX C

RESPONSIVENESS SUMMARY
UTAH POWER & LIGHT/AMERICAN BARREL SITE

Overview

In accordance with Sections 113(k)(2)(B)(i-v) and 117 of CERCLA, a public meeting on the Proposed Plan was held on April 22, 1993. A transcript of the meeting is in the Administrative Record for the Site. The meeting was attended by members of the community and representatives of Utah Power & Light. Questions were asked by a community representative and a local family who had children attending Jackson Elementary. The questions asked were primarily for clarification of the proposed plan and were answered during the meeting. There were not any comments opposing the preferred alternative or suggesting a different approach to remediating the Site.

A written comment was received from Utah Power & Light regarding liability for the asphalt in the preferred alternative. A response is included in this summary.

UDEQ has submitted a written letter regarding the extent of cleanup specifically addressing the Deseret Paint Site and the adjacent residential properties. A response to this letter is also included in this summary.

As discussed in Section III of this ROD, the community has expressed very little interest in this Site and the planned cleanup. Community relations activities will continue throughout the remedial design and remedial action to keep the community informed of activities.

Specific Comments

Comment by PacifiCorp, parent of Utah Power & Light:

PacifiCorp is concerned that the use of site materials in the asphalt may lead to claims of future cleanup liability at the place where the asphalt is installed. Because PacifiCorp will have no control over how or where the asphalt will be used, it must be assured that it will not incur future cleanup expenses at the various locations where the asphalt may be installed. It seems that PacifiCorp's concern can be alleviated by use of a "special covenant not to sue" as contemplated by 42 USC § 9622(f)(2).

EPA response:

The EPA Model RD/RA Consent Decree provides for a covenant not to sue at the Completion of the Remedial Action. The special covenant not to sue has only been used in a limited number of cases nationwide. Discussions of the covenants not to

sue are appropriate for the negotiations phase of the RD/RA consent decree. A determination on the use of a special covenant not to sue is not appropriate for the ROD.

Comment by Utah Department of Environmental Quality:

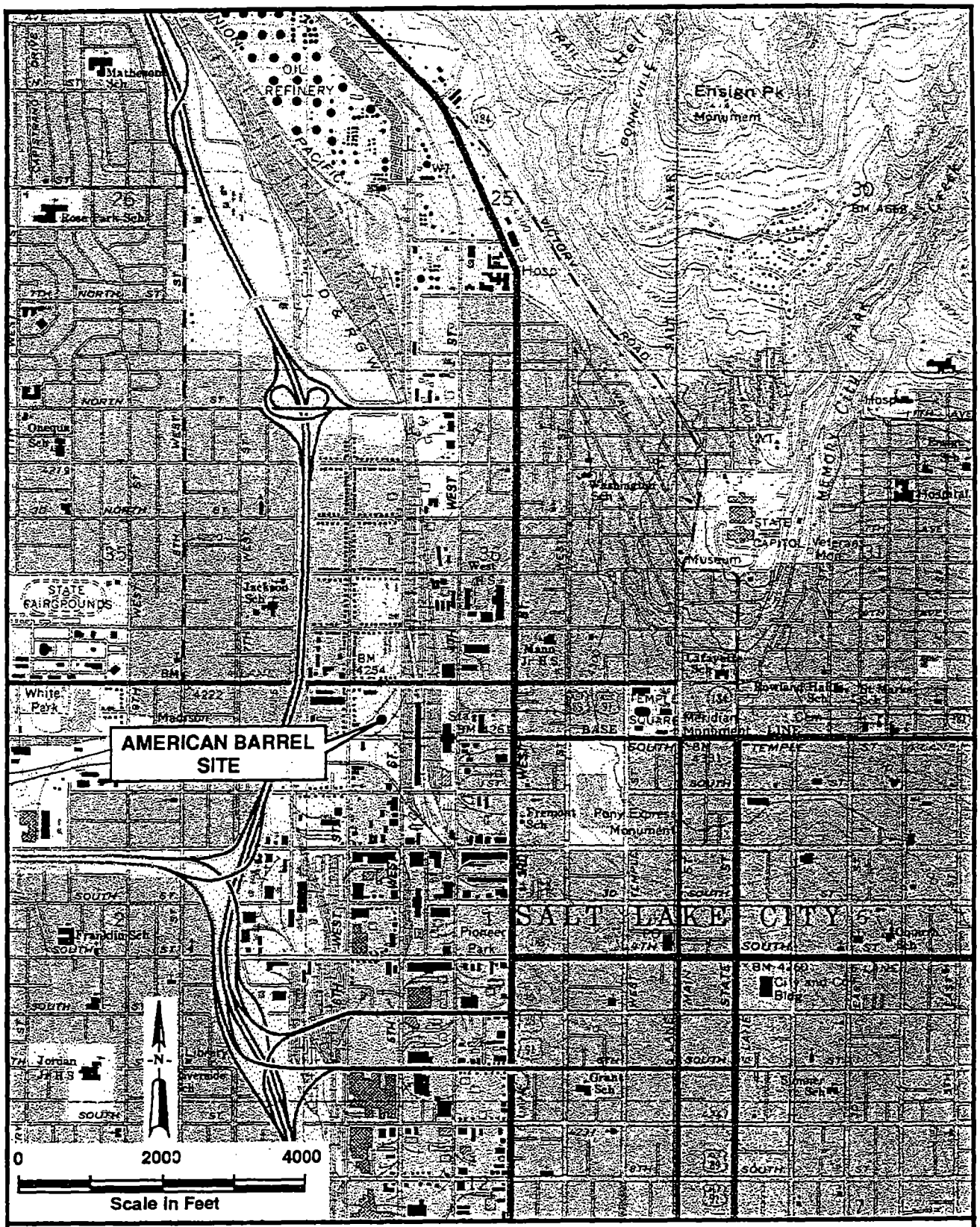
The Preliminary Assessment (PA), Site Investigation (SI) and Remedial Investigation Feasibility Study (RI/FS) investigations at the American Barrel Superfund Site and the Deseret Paint CERCLIS Site (DPS) indicated elevated lead levels in soils of both the DPS and the residential area of the ABS. Concentrations of lead up to 2200 ppm in the residential soils and up to 6100 ppm in the Deseret Paint soils have been documented. EPA and UDEQ have held many discussions concerning this issue. The Record of Decision (ROD) for the ABS is about to be finalized, and it calls for no action on the soils of the residential area. Additionally, the Deseret Paint Site was investigated during the SI stage and it is our understanding that the EPA has decided that it does not pose a serious enough health threat to warrant any further action.

UDEQ disagrees with both of these positions. It is UDEQ's position that both the residential soils of the ABS as well as the soils on the Deseret Paint property contain significant levels of lead that pose a potential health risk to current or future residents and/or workers at the sites. UDEQ feels that any remedial action proposed should include addressing these two areas.

EPA Response:

In assessing risks at Superfund Sites, EPA utilizes sampling techniques that combine samples throughout potential exposure areas. For input into the IU/BK model for assessing lead risks, EPA uses average concentrations for the media being sampled. The lead values referred to in the residential area in UDEQ's letter were based on SI samples which are biased towards visibly contaminated areas. The purpose of these samples is to determine if there is any contamination, and not to assess risk. As part of the ABS RI/FS, soil samples were collected from yards throughout two residential properties. The analytical results from these samples were used to estimate risk. The estimated risk for children exposed to lead levels in these properties were within acceptable guidelines. Based in this assessment, EPA decided that cleanup of the residential properties was not required.

The DPS has been evaluated in the Superfund Program as a separate site. This property has a history of industrial use with activities that are consistent with contamination found on the property. This property is separate and distinct from activities that occurred on the ABS. The Superfund Site Assessment Program has concluded that while this property is contaminated, it is not a National Priority based on application of the Hazard Ranking System evaluation. Without a sufficiently high score on the HRS, this site is not an NPL Superfund Site requiring cleanup activities.



Source: USGS 7.5 minute quadrangle - Salt Lake City North, Utah

SITE LOCATION MAP

FIGURE 1

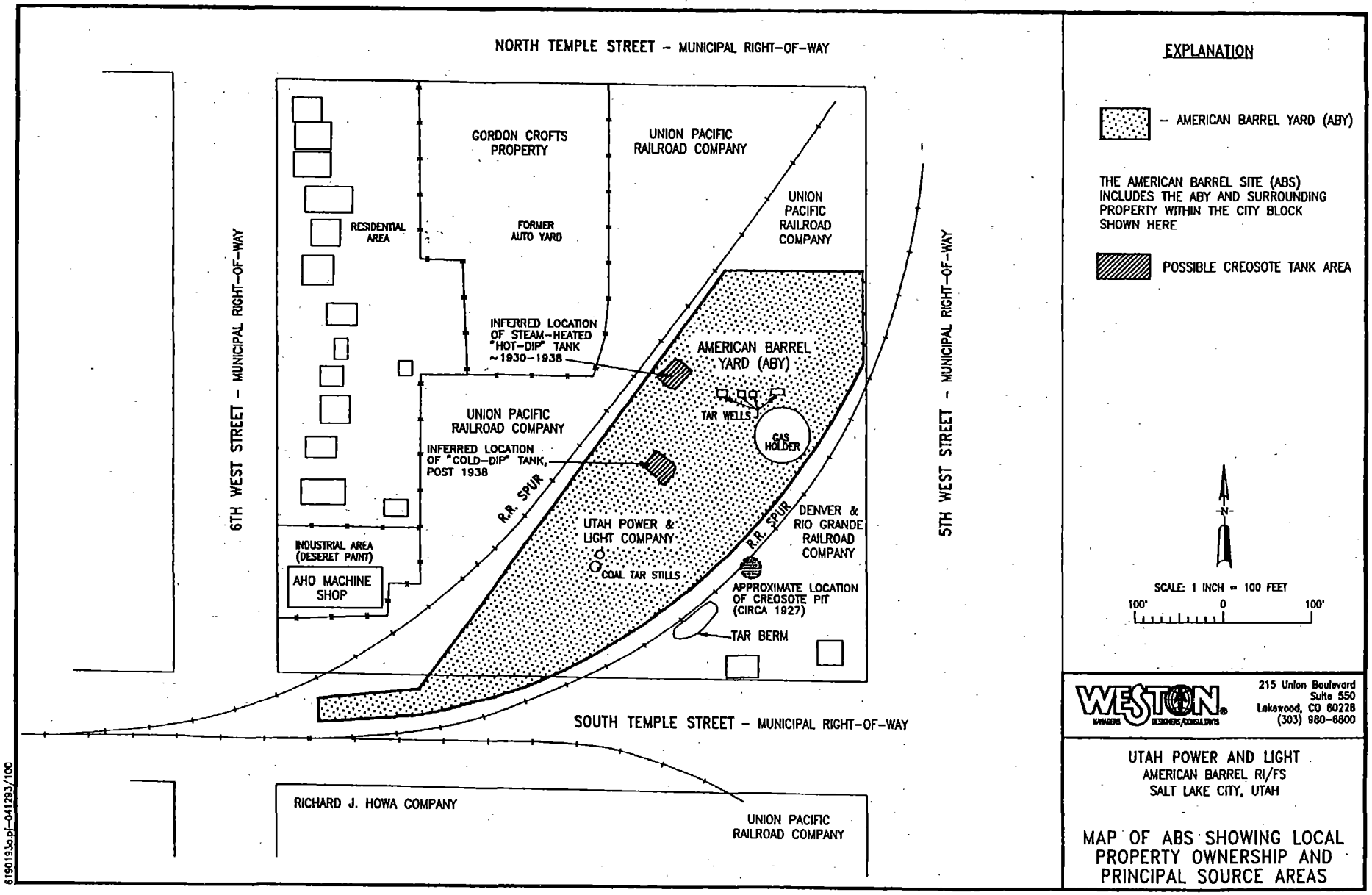

NORTH TEMPLE STREET – MUNICIPAL RIGHT-OF-WAY
6TH WEST STREET – MUNICIPAL RIGHT-OF-WAY
5TH WEST STREET – MUNICIPAL RIGHT-OF-WAY
SOUTH TEMPLE STREET – MUNICIPAL RIGHT-OF-WAY
GORDON CROFTS PROPERTY
UNION PACIFIC RAILROAD COMPANY
RESIDENTIAL AREA
FORMER AUTO YARD
INFERRED LOCATION OF STEAM-HEATED "HOT-DIP" TANK ~1930-1938
AMERICAN BARREL YARD (ABY)
TAR WELLS
GAS HOLDER
INFERRED LOCATION OF "COLD-DIP" TANK, POST 1938
R.R. SPUR
INDUSTRIAL AREA (DESERET PAINT)
AHO MACHINE SHOP
UTAH POWER & LIGHT COMPANY
COAL TAR STILLS
DENVER & RIO GRANDE RAILROAD COMPANY
APPROXIMATE LOCATION OF CREOSOTE PIT (CIRCA 1927)
TAR BERM
RICHARD J. HOWA COMPANY
UNION PACIFIC RAILROAD COMPANY
EXPLANATION
– AMERICAN BARREL YARD (ABY)
THE AMERICAN BARREL SITE (ABS) INCLUDES THE ABY AND SURROUNDING PROPERTY WITHIN THE CITY BLOCK SHOWN HERE
POSSIBLE CREOSOTE TANK AREA
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
WESTON MANAGERS DESIGNERS/CONSULTANTS
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
MAP OF ABS SHOWING LOCAL PROPERTY OWNERSHIP AND PRINCIPAL SOURCE AREAS
6190193a.pl-041293/100

FIGURE 2

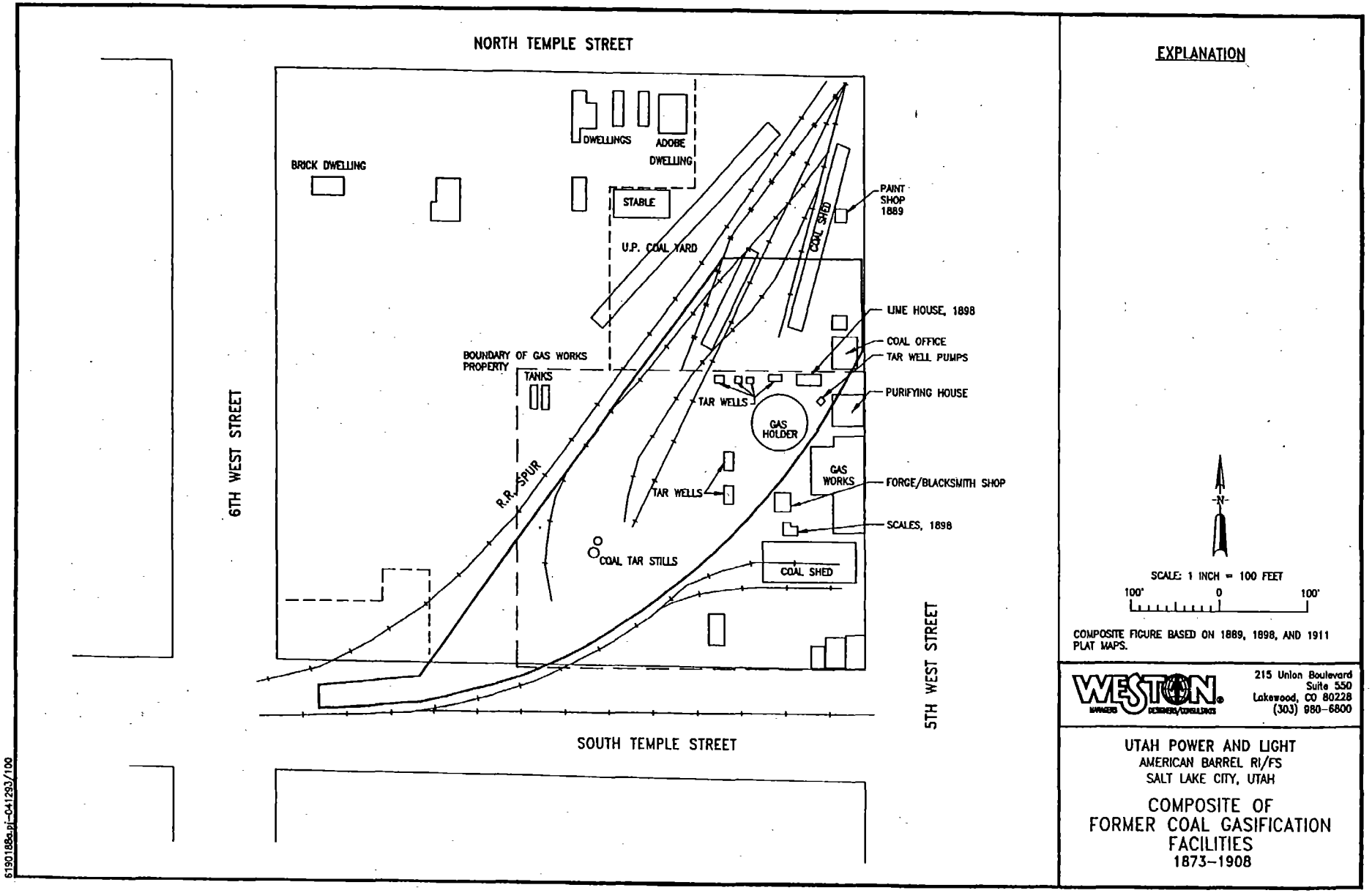

NORTH TEMPLE STREET
6TH WEST STREET
5TH WEST STREET
SOUTH TEMPLE STREET
DWELLINGS
ADOBE DWELLING
BRICK DWELLING
STABLE
U.P. COAL YARD
COAL SHED
PAINT SHOP 1889
LIME HOUSE, 1898
COAL OFFICE
TAR WELL PUMPS
PURIFYING HOUSE
BOUNDARY OF GAS WORKS PROPERTY
TANKS
TAR WELLS
GAS HOLDER
GAS WORKS
FORGE/BLACKSMITH SHOP
SCALES, 1898
R.R. SPUR
TAR WELLS
COAL TAR STILLS
COAL SHED
EXPLANATION
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
COMPOSITE FIGURE BASED ON 1889, 1898, AND 1911 PLAT MAPS.
WESTON
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
COMPOSITE OF FORMER COAL GASIFICATION FACILITIES 1873-1908
6190188a.prj-041293/100

FIGURE 3

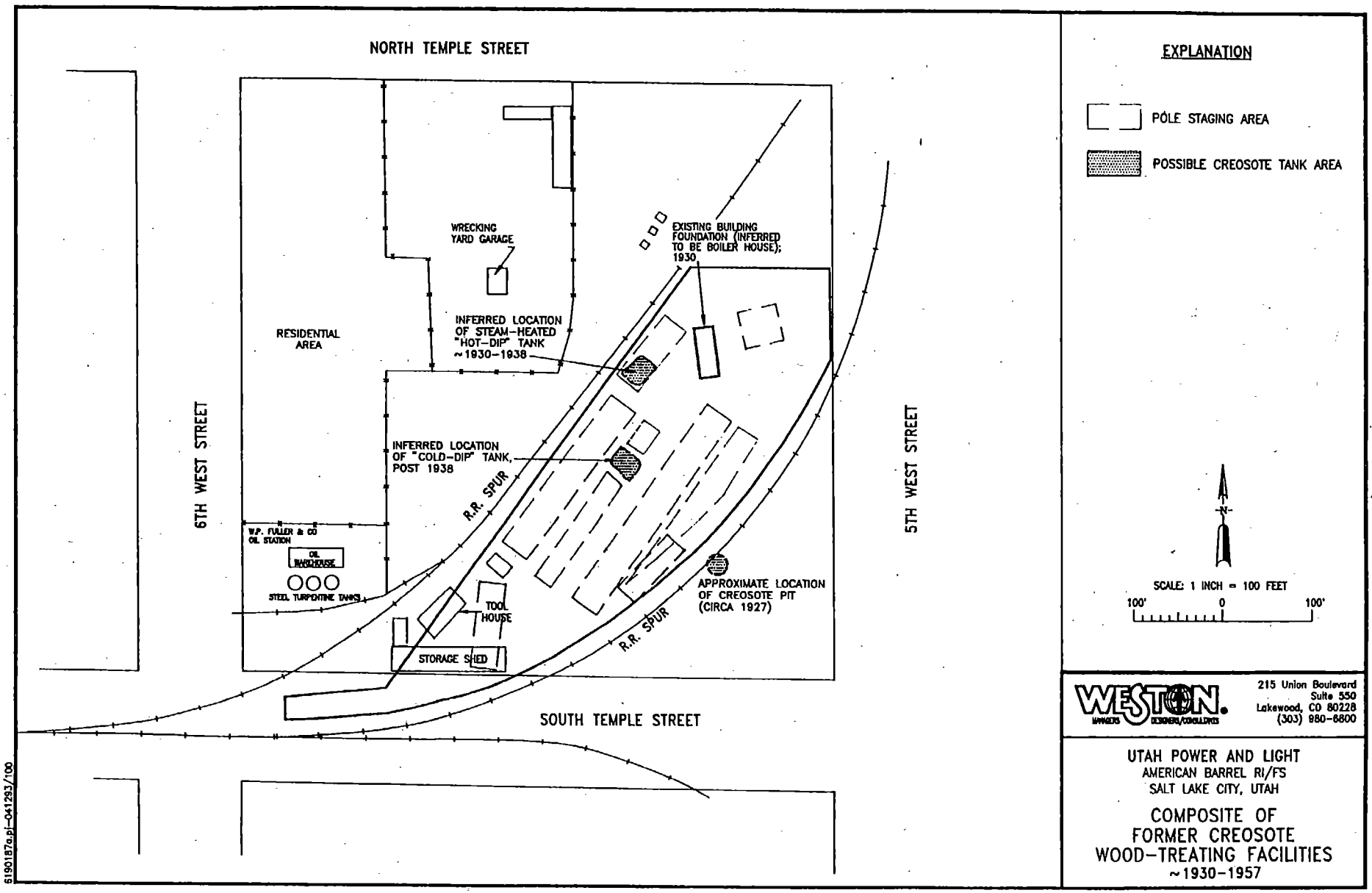

NORTH TEMPLE STREET
WRECKING YARD GARAGE
EXISTING BUILDING FOUNDATION (INFERRED TO BE BOILER HOUSE); 1930
RESIDENTIAL AREA
INFERRED LOCATION OF STEAM-HEATED "HOT-DIP" TANK ~1930-1938
6TH WEST STREET
INFERRED LOCATION OF "COLD-DIP" TANK, POST 1938
R.R. SPUR
5TH WEST STREET
W.P. FULLER & CO OIL STATION
OIL WAREHOUSE
STEEL TURPENTINE TANKS
TOOL HOUSE
STORAGE SHED
APPROXIMATE LOCATION OF CREOSOTE PIT (CIRCA 1927)
R.R. SPUR
SOUTH TEMPLE STREET
EXPLANATION
POLE STAGING AREA
POSSIBLE CREOSOTE TANK AREA
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
WESTON. MANAGERS DESIGNERS/CONSULTANTS
215 Union Boulevard
Suite 550
Lakewood, CO 80228
(303) 980-6800
UTAH POWER AND LIGHT
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
COMPOSITE OF FORMER CREOSOTE WOOD-TREATING FACILITIES ~1930-1957
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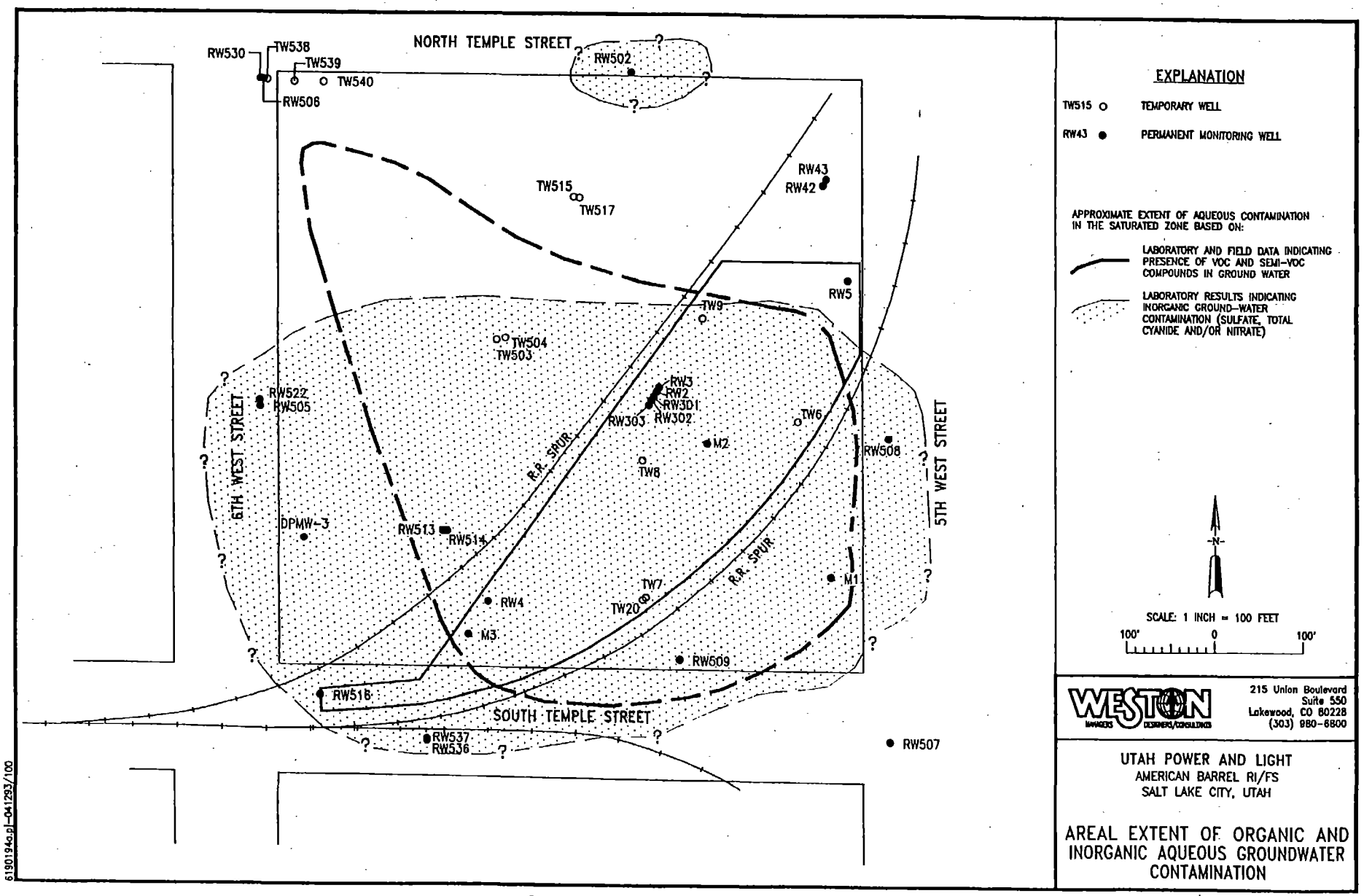
FIGURE 4



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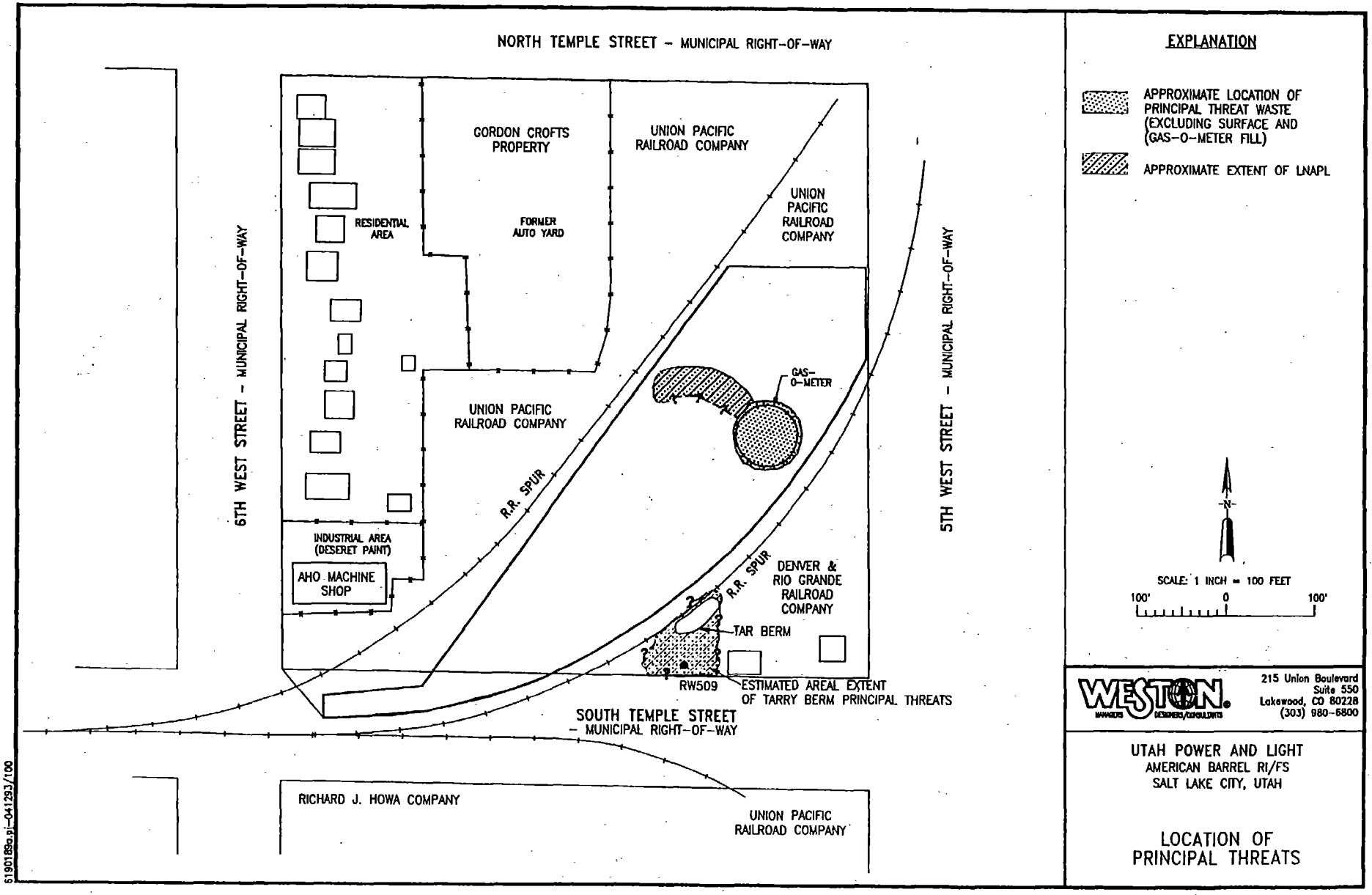
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH

AREAL EXTENT OF ORGANIC AND INORGANIC AQUEOUS GROUNDWATER CONTAMINATION

6190194a.pl-041293/100

FIGURE 5


NORTH TEMPLE STREET – MUNICIPAL RIGHT-OF-WAY
6TH WEST STREET – MUNICIPAL RIGHT-OF-WAY
5TH WEST STREET – MUNICIPAL RIGHT-OF-WAY
SOUTH TEMPLE STREET – MUNICIPAL RIGHT-OF-WAY
GORDON CROFTS PROPERTY
UNION PACIFIC RAILROAD COMPANY
RESIDENTIAL AREA
FORMER AUTO YARD
UNION PACIFIC RAILROAD COMPANY
GAS-O-METER
UNION PACIFIC RAILROAD COMPANY
R.R. SPUR
INDUSTRIAL AREA (DESERET PAINT)
AHO MACHINE SHOP
R.R. SPUR
DENVER & RIO GRANDE RAILROAD COMPANY
TAR BERM
RW509
ESTIMATED AREAL EXTENT OF TARRY BERM PRINCIPAL THREATS
RICHARD J. HOWA COMPANY
UNION PACIFIC RAILROAD COMPANY
EXPLANATION
APPROXIMATE LOCATION OF PRINCIPAL THREAT WASTE (EXCLUDING SURFACE AND (GAS-O-METER FILL)
APPROXIMATE EXTENT OF LNAPL
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
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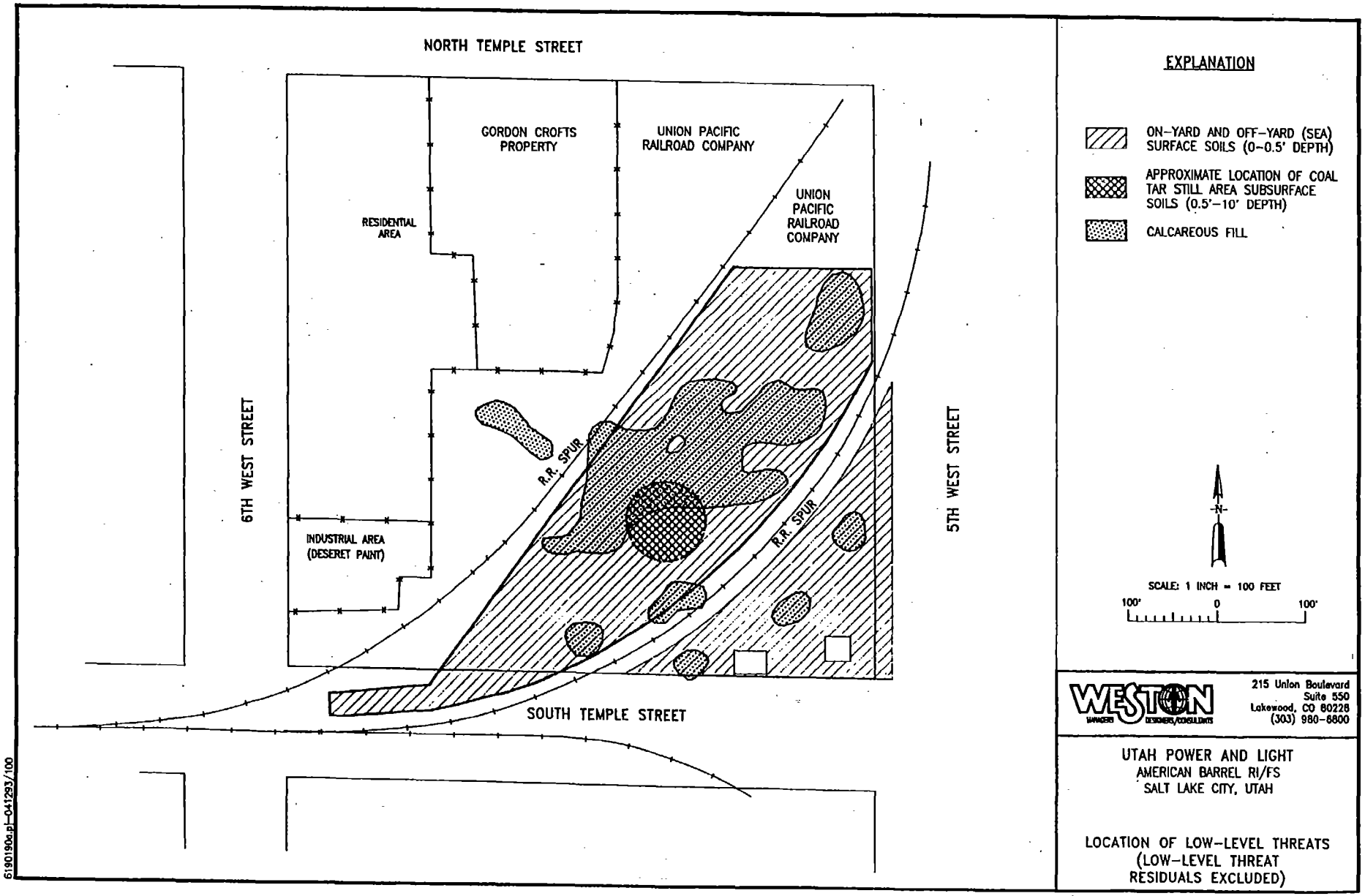
AMERICAN BARREL RI/FS
SALT LAKE CITY, UTAH
LOCATION OF PRINCIPAL THREATS
5190189a.pi-041293/100

FIGURE 6


NORTH TEMPLE STREET
GORDON CROFTS PROPERTY
UNION PACIFIC RAILROAD COMPANY
UNION PACIFIC RAILROAD COMPANY
RESIDENTIAL AREA
6TH WEST STREET
5TH WEST STREET
R.R. SPUR
R.R. SPUR
INDUSTRIAL AREA (DESERET PAINT)
SOUTH TEMPLE STREET
EXPLANATION
ON-YARD AND OFF-YARD (SEA) SURFACE SOILS (0-0.5' DEPTH)
APPROXIMATE LOCATION OF COAL TAR STILL AREA SUBSURFACE SOILS (0.5'-10' DEPTH)
CALCAREOUS FILL
N
SCALE: 1 INCH = 100 FEET
100' 0 100'
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LOCATION OF LOW-LEVEL THREATS
(LOW-LEVEL THREAT
RESIDUALS EXCLUDED)
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FIGURE 7