United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R08-91/049
September 1991

EPA

# Superfund Record of Decision:

## Hill Air Force Base, UT

502/2-101

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Hill Air Force Base, UT
First Remedial Action

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 6,700-acre Hill Air Force Base (Hill AFB) site is an active military facility situated between the cities of Ogden and Salt Lake City, covering portions of Davis and Weber Counties, Utah. This Record of Decision (ROD) addresses part of Operable Unit 2 (OU2), which consists of two unlined disposal trenches, seeps, and springs, and confined and unconfined aquifers. Land use in the area is mainly agricultural and residential. Both South Weber and Hill AFB obtain drinking water from deep wells in confined aquifers. Because the base covers a large area, the Air Force has grouped geographically adjacent contaminated areas into seven OUs. From 1967 to 1975, Hill AFB disposed of waste solvents and sludge from degreasing operations in the onsite disposal trenches. It is estimated that 100,000 to 1,000,000 gallons of TCE bottoms from the solvent recovery unit, sludge from vapor degreasers, and plating-tank sludge bottoms were disposed of in these trenches. Federal investigations from 1983 to 1986 identified VOC contamination in onsite and offsite ground water. As a result of these investigations, Hill AFB began collection and treatment of contaminated ground water from seeps and springs in 1986. In addition, an alternate water supply was provided to five properties to prevent the use of contaminated ground water from seeps and springs.

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Hill Air Force Base, UT
First Remedial Action
Contaminated Media: soil, gw
Key Contaminants: VOCs (PCE, TCE, toluene, xylenes)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

| Availability Statement | 19. Security Class (This Report) None | 21. No. of Pages 32 |
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(See ANSI-Z39.18) *See Instructions on Reverse*

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(Formerly NTIS-35)
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EPA/ROD1/R08-91/049
Hill Air Force Base, UT
First Remedial Action

Abstract (Continued)

This ROD addresses the interim remediation of OU2 subsurface soil and ground water by removing a DNAPL source and thus preventing contaminants from reaching aquifers currently used as drinking water sources. A subsequent ROD will provide a final remedy for OU2 soil, ground water, surface water, and air. The primary contaminants of concern affecting the soil and ground water are VOCs including PCE, TCE, toluene, and xylenes.

The selected remedial action for this interim remedy includes installing and maintaining a source recovery system to remove DNAPL contamination from the subsurface; pumping DNAPL-contaminated ground water, with onsite discharge to a pretreatment facility to separate DNAPL from ground water using a steam stripper; temporarily storing the DNAPL onsite in steel tanks, followed by transporting the waste offsite for incineration; installing a pipeline from the site to the base Industrial Wastewater Treatment Plant (IWTP); treating the pretreated ground water at the IWTP using air stripping, followed by carbon adsorption; discharging the treated water offsite to a publicly owned treatment works (POTW); and monitoring DNAPL collection and treatment during remediation activities. The estimated present worth cost for this remedial action is $3,710,000, which includes an annual O&M cost of $1,000,000 for 2 years.

PERFORMANCE STANDARDS OR GOALS: Actual chemical-specific standards or goals will be set in a future ROD.


# Hill Air Force Base, Utah

*Final*

## *Record of Decision for Interim Action at Operable Unit 2*

**August 1991**

Environmental Management Directorate

Ogden Air Logistics Center
Hill AFB, Utah

# RECORD OF DECISION FOR INTERIM ACTION AT OPERABLE UNIT 2

## Site WP07 - Chemical Disposal Pit 3
## Hill Air Force Base, Utah

August 1991

Prepared by:

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Environmental Restoration Division
Environmental Management Directorate
Hill AFB, Utah 84056

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# 1.0 DECLARATION FOR THE RECORD OF DECISION

## 1.1 Site Name and Location

Operable Unit 2
(Chemical Disposal Pit 3, Site WP07)
Hill Air Force Base (AFB), Davis and Weber Counties, Utah

## 1.2 Statement and Basis of Purpose

This decision document represents the selected interim remedial action for Operable Unit 2 (OU2), developed by Hill AFB (the Base) in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based upon the contents of the Administrative Record for OU2, Hill AFB.

The United States Environmental Protection Agency and the Utah Department of Environmental Quality concur with the selected interim remedy. References will be made in portions of this document to both The Utah Department of Health (UDOH) and the Utah Department of Environmental Quality (UDEQ). Both names refer to the same State agency responsible for CERCLA response actions. The name changed with agency reorganization during the period in which this document was developed.

## 1.3 Assessment of the Site

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

## 1.4 Description of Selected Remedy

This interim remedy addresses removal of a source of contamination in the subsurface soils and ground water and reduction of threat of contamination of aquifers currently used as a source of drinking water by eliminating or reducing the risks posed by the site through treatment. The contamination addressed by this interim action is dense, non-aqueous phase liquid (DNAPL). The DNAPL is a free-phase organic liquid composed mainly of solvent compounds and acts as a source for high concentrations of toxic or suspected

carcinogenic contaminants. High concentrations of contaminants have been detected in ground water samples from areas immediately adjacent to the DNAPL areas.

This interim action is consistent with any future actions to complete clean up of the entire operable unit, and is a logical first step in the clean up process. Future clean up actions addressing final remedies for all contaminated media (soil, ground water, surface water, air) will be detailed in a subsequent record of decision (ROD).

No changes have been made to the selected remedy originally presented in the proposed plan. The major components of the selected remedy include:

- Installation and maintenance of a source recovery system capable of removing DNAPL contamination from the subsurface.

- Installation and maintenance of an on-site ground water and DNAPL pretreatment facility to separate DNAPL from ground water and to treat contaminated ground water to levels which can be discharged to the Base industrial waste water treatment plant (IWTP).

- Disposal of DNAPL off-site by incineration in accordance with the Resource Conservation and Recovery Act (RCRA).

- Installation and maintenance of a double-walled pipeline from the site to the Base IWTP capable of transporting pretreated ground water.

- Treatment and discharge of the pretreated ground water with other Base industrial waste waters at the IWTP and discharge to the North Davis County Sewer District's Publicly Owned Treatment Plant in accordance with the Base's industrial pretreatment discharge permit.

- Monitoring the DNAPL collection and treatment system during remediation activities.

## 1.5 Statutory Determination

The interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute a final remedy for the operable unit, the statutory preference for remedies that employ

treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by the conditions at this operable unit. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as the Air Force continues to develop final remedial alternates for the operable unit.

### 1.6 Signature and Support Agency Acceptance of the Remedy

UNITED STATES AIR FORCE

BY: _____ 26 Sept 91
Major General Dale W. Thompson DATE
Commander, Ogden Air Logistics Center
Hill Air Force Base, Utah

UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY

BY: _____ 30 Sept 91
Kenneth L. Alkema DATE
Executive Director, Utah Department of
Environmental Quality

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

BY: _____ 9/30/91
Jack W. McGraw DATE
Acting Regional Administrator
Region VIII

## 2.0 DECISION SUMMARY

### 2.1 Site Name, Location and Description

Hill AFB is located in north-central Utah, covering portions of Davis and Weber Counties (Figure 1). The Base is topographically situated on a plateau formed by the ancient Weber Delta and is approximately 300 feet above the adjacent Great Salt Lake basin. Land surrounding the Base is generally level or slopes gently westward toward the basin.

Located on the northeastern boundary of Hill AFB (Figure 1), Operable Unit 2 (OU2) is described in earlier documents as Chemical Disposal Pit 3 and/or Site 7. For environmental response actions, OU2 consists of two disposal trenches used in the past, contaminated soils, surface water (seeps and springs) the DNAPL, and contaminated ground water in the vicinity of the disposal trenches. There are no buildings or facilities in the immediate area. The access route, Perimeter Road, carries little traffic.

Land adjacent to OU2 that is off the Base is in the town of South Weber (approximate population of 1500). Land use is mainly for agriculture. Natural resource use in the general area includes mining of gravel and sand. No mining has occurred in the contaminated area of OU2.

The town and the Base both obtain their drinking water from deep wells in the general vicinity of OU2. For the purpose of this document, "deep" wells are defined as those completed at depths greater than 150 feet in confined aquifers that are part of the Delta or Sunset aquifer systems. Based on established use and EPA's classification method, the water quality in these aquifers is IIA, currently used for drinking. The nearest municipal well, which supplies about 1500 people in the town of South Weber, is located about three-quarters of a mile from OU2. Approximately 20,000 people, whose drinking water is supplied by a separate and deeper well (approximately one mile away and hydrologically downgradient), work or live on the Base. No evidence of contamination has been detected to date in samples taken from these wells.

"Shallow" wells refer to those completed in the uppermost, unconfined aquifer materials, generally at depths of 50 feet or less. Generally this water is suitable for use as drinking water, and the water quality would be class IIA or IIB (potentially available) under EPA's classification method. The near surface ground water qualifies as potential drinking water under Utah's Ground Water Protection Rules. While the yield of the shallow aquifer is sufficient for domestic wells, it is probably too low to be a likely source for municipal water supply.

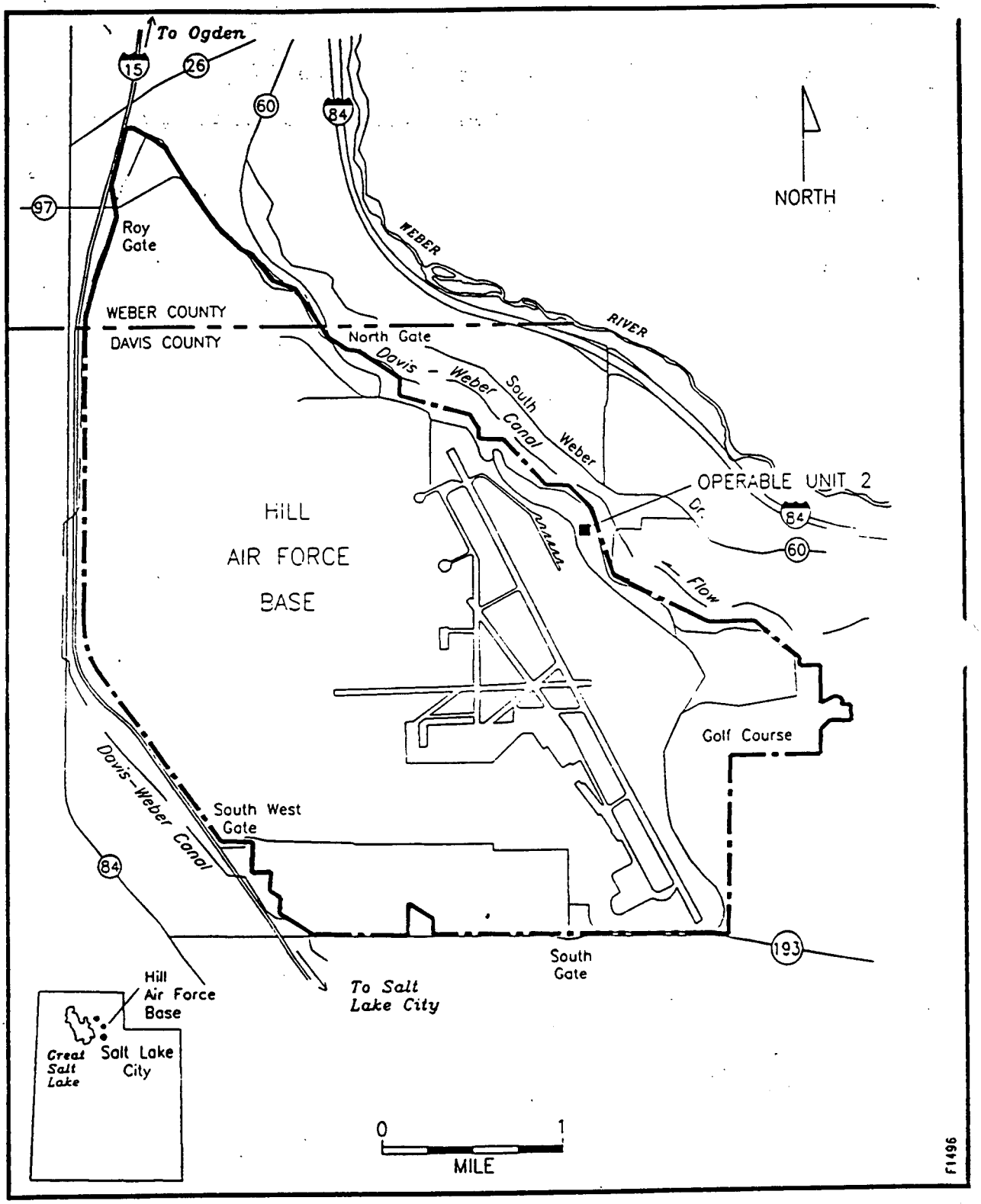


Figure 1. Location Map of Hill Air Force Base and Operable Unit 2

Between the deep and shallow aquifer materials is a sequence of clays and silty clays with interbedded sand units. The interbedded sand units are typically thin and discontinuous, but are locally as thick as 15 feet. While no evidence of contamination has been detected in deeper wells, a pathway may exist for migration and communication between these zones.

Approximately 20 residences are located within a one-half mile radius of OU2. Most are located northerly of OU2, in the down-gradient direction of shallow ground water flow. Some of these home-owners have chosen to use water from private shallow wells, although they are connected to a municipal water system supplied by deep wells. None of the shallow wells are immediately threatened by contamination from OU2.

A system of seeps and springs along the hillside north of the Base constitute the surface water of OU2. These have been used in the past as supplies for drinking and irrigation water. Present use is restricted mainly to irrigation. Contamination of this water, where used, has been addressed by the Air Force by interception and treatment or by providing alternate water supplies.

The Davis-Weber Canal runs along the perimeter of the Base and is about 500 feet from the Base boundary in the vicinity of OU2. Because the base of the canal is above the ground water level, no contamination from ground water affects the water in the canal. The canal is also a water source for irrigation.

## 2.2 Site History and Enforcement Activities

Chemical Disposal Pit 3 consisted of two unlined, north-northwest-trending trenches (Figure 2) that were used from 1967 to 1975 for disposal of waste solvents and sludges from degreasing operations on Base. Unknown quantities of trichloroethene (TCE) bottoms from the solvent recovery unit, sludge from vapor degreasers, and plating-tank sludge bottoms were disposed of in these trenches. The amount of waste solvents disposed at this site has been estimated to range from 100,000 to 1,000,000 gallons.

Reports identified in the bibliography provide detailed information on the investigative activities at OU2 that are summarized here. Investigative activities are currently under way to address all contaminated media at the site. All documents listed in the bibliography are part of the Administrative Record. These documents are available for public review at the Davis County Library, Central Branch, Layton, Utah.

Volatile organic compounds (VOCs) were first identified at OU2 in 1983. TCE is a relatively mobile and frequently detected VOC. The distribution of TCE approximately coincides with the distribution of other contaminants. For these reasons, TCE has been used as the

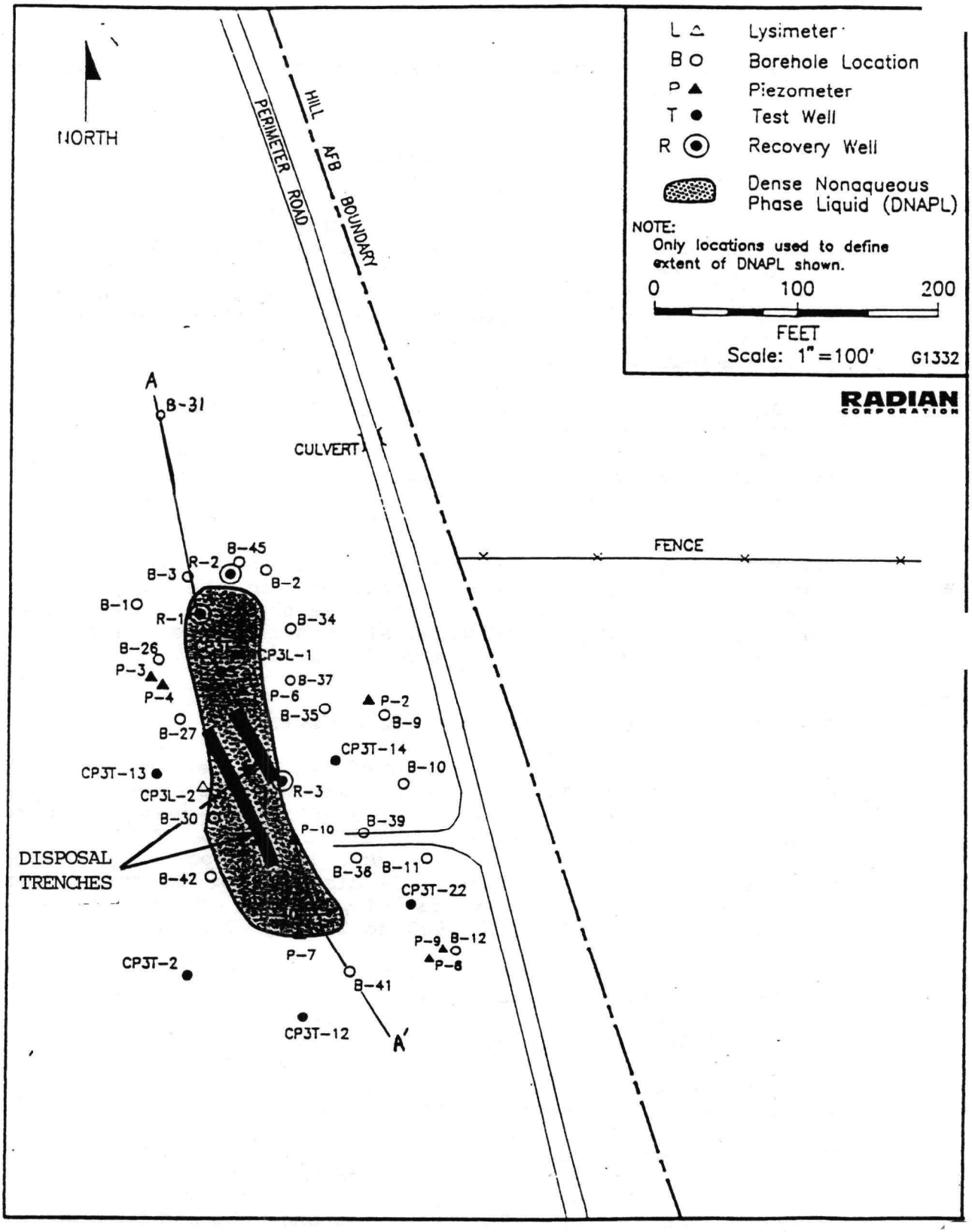


Figure 2. Approximate Lateral Extent of DNAPL Contamination in the Provo and Alpine Formations

primary indicator parameter for contamination from vapor degreasing wastes and sludges from the solvent recovery unit. Investigations have been inconclusive in identifying plating-tank sludge contaminants in the ground water.

High levels of VOCs dissolved in shallow ground water near the Base boundary were confirmed in 1986. A survey of off-Base water rights was conducted. Sampling of off-Base waters included wells, seeps and springs, and agricultural ponds in the area. Contaminants were found in several springs, some more than 1500 feet from the trenches. In general, the VOC concentrations are greatest near the trench area and decrease as distance increases away from the trenches. The maximum TCE concentration detected off-Base is 11,000 micrograms per liter (ug/l).

Hill AFB has collected and treated contaminated water from seeps and springs adjacent to OU2 since 1986. In addition, two homes below the site (which had used springs as a water supply) were connected to the municipal water supply, and three farms (which had used seeps and springs as sources of irrigation water) were supplied with alternate sources of irrigation water. These limited response actions have successfully prevented short-term exposure, but do not collect all of the potential contaminants migrating from the Base.

Subsurface conditions and delineation of the lateral and vertical extent of the DNAPL are based on:

- Information acquired from soil samples and field observations during drilling of one hundred and eight soil bore holes in the OU2 area;

- Thirty-six of the soil bore holes were converted to monitoring wells, recovery wells, or piezometers for ground water samples and water level information;

- Pumping tests of the aquifer were conducted in 1988 to determine properties of the shallow aquifer. An emulsion of water and approximately four percent DNAPL by volume was recovered. Samples were taken to determine the approximate composition of the DNAPL and VOC concentrations in the water phase; and

- Geophysical investigations that included seismic refraction, self potential, electro-magnetic conductivity, and resistivity methods to supplement and support the soil bore hole and analytical data.

All investigations and actions at this site have been conducted by the United States Air Force as the lead agency under the Installation Restoration Program (IRP). The IRP was established in 1980 as the program by which military facilities will conduct

environmental investigation and response actions to comply with CERCLA and the NCP. A Hazard Ranking System score for Hill AFB was developed that led to the inclusion of the Base on the Environmental Protection Agency's National Priorities List on 1 July 1987.

Hill AFB, the U.S. Environmental Protection Agency (EPA), and the Utah Department of Healthy (UDOH) signed a Federal Facilities Agreement (FFA) on 10 April 1991. The FFA is required pursuant to CERCLA Section 120, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Subject to a 45-day public comment period that ended 2 June 1991, the FFA became effective as written. The FFA sets forth the process for conducting CERCLA response actions at the Base. The Air Force is a responsible party with respect to present and past releases at the Base. Responsibility for oversight of activities performed under the FFA will be shared by EPA and the State.

## 2.3 Highlights of Community Participation

Community participation requirements in CERCLA Sections 117(k)(2)(B)(i-v) and 117 have been met for this interim action.

Community participation in actions at OU2 began in 1986, when contaminants were discovered to be migrating off-Base. Meetings with the South Weber City Council and the public were held on 13 May 1986 to report results of off-Base water sampling, and in November 1986 to report results of the off-Base soil gas investigation. The results of off-Base water sampling are reported to property owners by letter on an annual basis.

A Community Relations Plan for the Base hazardous waste sites was produced in December 1990 and is being reviewed by the EPA and the Utah Department of Environmental Quality. This document lists contacts and interested parties throughout government and the local community. It also identifies effective ways to disseminate pertinent information. The focused remedial investigation/ feasibility study (RI/FS) and the Proposed Plan for Interim Action were released to the public in February 1991. All of these documents were made available in both the administrative record and an information repository maintained at the Davis County Library-Central Branch. The proposed plan was mailed to property owners on the mailing list accompanied by a letter that encouraged their participation and comment.

A public comment period was held from 19 February 1991 through 20 March 1991. Advertisements announcing the public comment period and public meeting were published in the Ogden Standard Examiner and the Salt Lake Tribune on 19 February 1991. News releases announcing the public comment period and public meeting were sent to local newspapers and radio and television stations. The Ogden

Standard Examiner also published two articles indicating the public comment period (4 and 17 February 1991). A public meeting was held on 5 March 1991 to present the results of and solicit public comments on the RI/FS and the alternatives as presented in the Proposed Plan for the operable unit. Twenty-five people attended the 5 March public meeting which was held at South Weber Elementary School. Additional copies of the proposed plan and fact sheets describing the Installation Restoration Program (IRP), its history and the history of the Base were made available to the public at the public meeting. All comments which were received by Hill AFB prior to the end of the public comment period, including those expressed verbally at the public meeting, are addressed in the Responsiveness Summary which is Section 3.0 of this Record of Decision.

## 2.4 Scope and Role of Response Action

Hill AFB covers 6,700 acres, and has several areas where past disposal practices and spills have contaminated soil and ground water. Because the Base covers a large area, the Air Force decided to group geographically adjacent contaminated areas into operable units, each to be addressed under separate but concurrent investigations. Operable Unit 2, part of which is the subject of this Record of Decision for Interim Action, is one of seven operable units under investigation at Hill AFB.

Several response actions have already been taken at OU2 resulting from the discovery of off-Base ground water contamination in 1986. Five properties were provided alternate water sources to prevent them from using contaminated ground water supplied from seeps and springs. Residents at two of the properties had not been drinking contaminated water, but were at risk of having their drinking water source contaminated in the future. These residents were provided municipal drinking water. The other three properties were provided alternate sources of irrigation water. Water from several contaminated seeps and springs along the hillside has been diverted, treated with activated carbon, and then returned to the original channel. All of these actions have been in force since 1987 to prevent residents of off-Base properties from being exposed to contaminants in the shallow ground water.

In this ROD, the Air Force is selecting an interim action to prevent contaminants from reaching aquifers currently used as a source for drinking water. This interim action focuses on removal and off-site destruction of Dense, Non-Aqueous Phase Liquid (DNAPL) present in the subsurface at OU2.

The DNAPL is considered a principal threat waste and is a concentrated source of contaminants for soil and ground water. It is considered the major source of VOCs which are polluting the shallow ground water. The Air Force has elected to address this

contamination problem because the DNAPL is chemically altering and dissolving protective clay layers and will, if unabated or uncontrolled, eventually contaminate the deeper aquifers currently used as a primary source of drinking water for the communities of north Davis County. Addressing the problem now will help protect the water supplies of the deeper aquifer systems by reducing the volume and mobility of the DNAPL. The mobility and volume of the dissolved VOCs in the shallow aquifer will also be reduced.

A future ROD, scheduled for August 1993, will address all remaining media at OU2, including contamination of soil, ground water, surface water, and air. The remedy selected in this ROD for interim action is the first step in the process to clean up of all contaminated media at OU2, and will be consistent with planned future actions to the extent possible.

## 2.5 Site Characteristics

The contaminant media of concern for this ROD, the DNAPL, is composed mostly of volatile chlorinated solvents, primarily TCE, with lesser amounts of other volatile and non-volatile organics. Table 1 summarizes the analytical results of two samples taken from the DNAPL. Some of these VOCs are suspected carcinogens. Several VOCs in the shallow ground water exceed the national primary drinking water standards (maximum contaminant levels or MCLs) as established by the Safe Drinking Water Act. Other constituents are likely to be petroleum products, such as oil and grease.

The highest concentrations of VOCs dissolved in ground water are from samples adjacent to the DNAPL and in the water phase of the recovered emulsions. These data are presented in Table 2. Due to mixing during pumping, the VOC concentrations in the water phase of recovered emulsions are probably higher than concentrations would be in static equilibrium conditions. The data probably represent worst-case concentrations.

The site-specific subsurface geology has limited the migration and caused the DNAPL to accumulate. Further detail on the geological conditions summarized here are in "Hill Air Force Base, Utah; Draft Site Characterization Summary for Operable Unit 2 (4 volumes)," August 1990 and "Hill Air Force Base, Utah; Final Focused Feasibility Study for Operable Unit 2," February 1991.

DNAPLs move downward due to gravity through permeable materials, such as sands and gravels. Because the DNAPL is heavier than water, it continues to migrate downward through ground water contained in the permeable materials. Migration is slowed or halted when a less permeable material, such as a clay, is encountered. The DNAPL will then move "downhill" along the top surface of the less-permeable layer and accumulate in depressions in this surface.

TABLE 1. CONSTITUENT CHEMICALS OF DENSE, NON-AQUEOUS PHASE LIQUID (DNAPL) AT OPERABLE UNIT 2.

| Contaminant | Percent |
|---|---|
| Methylene Chloride | < 1 |
| Trichloroethene | 78 - 90 |
| Tetrachloroethene | 2 - 5 |
| 1,1,1-Trichloroethane | < 1 |
| 1,1,2-Trichloro 1,2,2-trifluoroethane | 1 - 4 |
| Toluene | < 0.1 |
| Xylene | < 0.1 |
| Other (non-volatile) | 7 - 12 |

TABLE 2. HIGHEST CONCENTRATION OF DISSOLVED VOLATILE ORGANIC COMPOUNDS IN THE WATER PHASE AT OPERABLE UNIT 2.

| Contaminant | Concentration (ug/L) | MCL (ug/L) |
|---|---|---|
| Methylene Chloride | 200,000 | |
| Chloroform | 16,000 | 100 |
| Trichloroethene | 1,700,000 | 5 |
| Tetrachloroethene | 130,000 | 5 |
| 1,1,1-Trichloroethane | 220,000 | 200 |
| 1,1,2-Trichloroethane | 13,000 | 3* |
| 1,1,2-Trichloro 1,2,2-trifluoroethane | 140,000 | |
| Toluene | 12,000 | 2000 |
| Acetone | 7,000 | |

*Non-zero MCLG (Maximum Contaminant Level Goal)

Such a situation exists at OU2 where the uppermost geologic materials, in which the disposal trenches were excavated, consist primarily of sands and gravels of the Provo Formation (Figures 2 and 3). Beneath the sands and gravels is the Alpine Formation, the uppermost part of which is primarily clays and silts with some localized sand units. The sand units in the Alpine Formation are typically thin and discontinuous, but vary in thickness and areal extent.

The subsurface contact between the Provo Formation sands and gravels, and the underlying Alpine Formation clays, is irregular. A curved trough in the top surface of the Alpine Formation clays has been defined beneath the disposal trenches from which the spent solvent materials comprising the DNAPL migrated. This trough appears to have slowed the vertical DNAPL migration and guided the DNAPL migration laterally. Some DNAPL has accumulated in the bottom of this trough and is in the lower, ground water-bearing Provo sands and gravels.

Most of the DNAPL has been found in the Alpine Formation, mainly in one of the localized, discontinuous sand units, which has been designated the "second sand". The second sand underlies the clay trough, follows its shape, and is estimated to range between 2 feet and 15 feet in thickness. The second sand seems to be approximately 75 feet wide in the area of the disposal trenches; the extent of the second sand to the west and south are undefined. Low areas of the second sand seem to be near wells CP3T-1 and R-1, and in the south branch near boring B-40. DNAPL should tend to accumulate in these low areas, and has been detected at these locations. If the second sand is saturated with DNAPL between well R-1 and boring B-40, over 250,000 gallons of DNAPL could be present in this part of the site.

Figure 2 illustrates the approximate areal extent, about one third of an acre, of the DNAPL in both the Provo and Alpine Formations. The DNAPL is all on-Base. The DNAPL is located at depth varying between 40 to 60 feet below the ground surface. Figure 3 illustrates the approximate vertical extent of DNAPL in both the Provo and Alpine Formations.

The fate and transport of contaminants associated with the DNAPL is governed by two mechanisms: (1) continued vertical migration of the DNAPL, and (2) dissolved VOCs that migrate within the shallow ground water.

Clay samples taken from the upper portions of the Alpine Formation in contact with the DNAPL appeared to be altered. The alteration is presumed to be a chemical degradation of the clay materials, suggesting the potential for the DNAPL to "eat" downward into the clay. Most of the alteration appears to be within the uppermost several feet of clays. In one soil boring (B-40), the depth of alteration was over 20 feet below the top of the Alpine Formation.

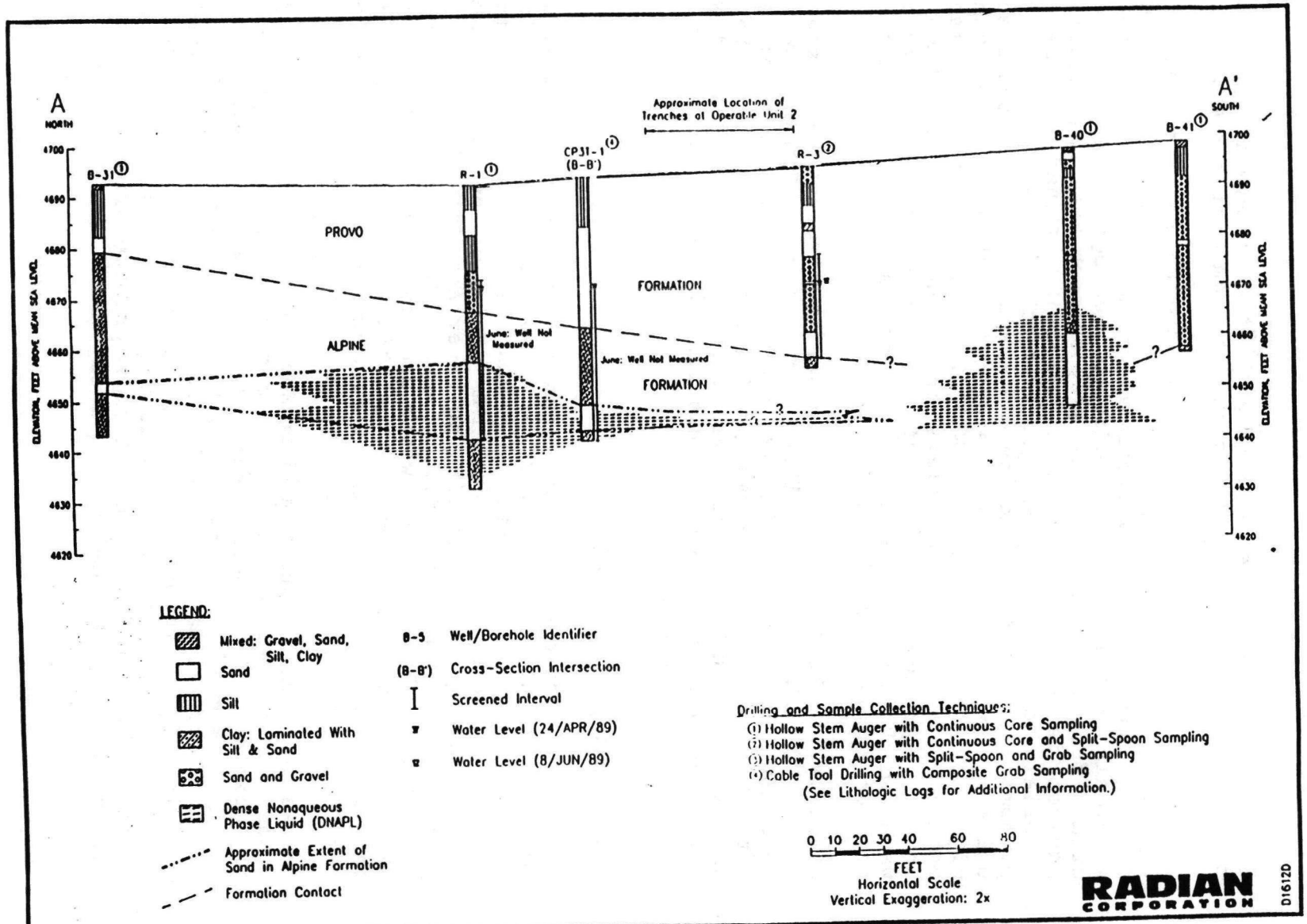


Figure 3. Hydrogeologic Cross-Section A-A'

Some uncertainty in the depth of alteration exists at this location due to poor recovery of well cuttings from boring B-40.

Some of the soil bore holes penetrated 85 feet into the Alpine Formation clay materials below the Provo sands and gravels, establishing this as an approximate minimum thickness for the clay materials at the site. In addition, geologic logs of subsurface strata from wells about a mile away suggest that the deeper Delta Aquifer is about 500 to 600 feet below ground surface. The materials between the investigation depth and the aquifer depth are predominantly Alpine Formation clays and silts, but localized sand units may exist and act as preferential pathways for contaminant migration. Migration of the DNAPL into the Alpine second sand may be due to alteration of clays or through thin, localized sand units. Continued migration offers a threat to the quality of the water in the aquifers currently used as a source of drinking water, such as the Delta Aquifer.

Not only is the DNAPL a contaminant, it also acts as a source of dissolved VOCs in the shallow ground water. Components of the DNAPL have limited solubilities in ground water. Unconfined ground water within the Provo Formation flows northeasterly. The seeps and springs are discharge areas for some of this ground water. VOCs have been detected in monitoring wells as far as 1400 feet from the disposal area.

## 2.6 Summary of Site Risks

The VOCs detected are suspected human carcinogens. The most common VOC is trichloroethene (TCE), a suspected human carcinogen. Several VOCs in the shallow ground water exceed the national primary drinking water standards (MCLs or non-zero MCLGs) as established by the Safe Drinking Water Act (see Table 2). Trans 1,2-dichloroethene, a product of anaerobic biodegradation of TCE, was recently found in seeps which are used to water stock animals. As the degradation process continues, chloroethene (vinyl chloride), a known human carcinogen, can be formed. Chloroethene has not been detected in samples to date.

Unless the DNAPL is extracted or separated from the shallow ground water, dissolved contaminant concentrations in ground water downgradient of OU2 are likely to increase to levels where they will pose a health risk at seeps, springs, and existing wells. The actions taken to date have served to collect migrating contaminants only locally at potential exposure points. The VOC contaminated water is subirrigating crops used as animal feed. Some of the homes in South Weber below OU2 have private drinking water wells completed in the shallow aquifer which could eventually be contaminated.

Children have played in some of the seep or spring areas with low-level contamination. The contaminant concentration is well below safe drinking water standards, so no access restrictions have been necessary. These areas are monitored by Hill AFB on a monthly to quarterly frequency.

The chemical degradation of the Alpine Formation uppermost clays, that slowed the contaminant movement between the shallow and deeper ground water, raises the concern that the DNAPL could reach the deeper Delta aquifer and subsequently contaminate drinking water wells. The nearest municipal well, which supplies about 1500 people in the town of South Weber, is located about three-quarters of a mile from OU2. Approximately 20,000 people, whose drinking water is supplied by a separate and deeper well (approximately one mile away and hydrologically downgradient), work or live on the Base.

At the rate of migration suggested by alteration of the Alpine Formation clays, an immediate threat to the quality of water in the deeper aquifer is not perceived. However, a longer-term risk is possible. The materials between the investigation depth and the aquifer depth are predominantly Alpine Formation clays and silts, but localized sand units may exist and act as conduits and increase the rate of migration.

No complete exposure route exists between the DNAPL and human receptors. Such a route can occur only in the situation that no action is taken and land use changes allow for water supply wells to use the shallow ground water for domestic purposes, or if future activities would include excavation in the area of OU2.

No environmental risks, such as adverse effects of contamination on critical habitats or endangered species, are apparent at this site. No critical habitats have been identified in the area. No endangered species inhabit the area, but the range of some endangered birds in the vicinity (bald eagles and peregrine falcons) may include portions of the Base.

A risk assessment to quantitatively evaluate current and potential future risks will be completed as part of the process for determining the final remedy(ies) at Operable Unit 2. The more specific findings of the baseline risk assessment, which will help establish the ultimate clean up objectives, will be included in the subsequent final action ROD for the operable unit. Shallow ground water contamination in concentrations exceeding health based limits (drinking water standards) and potential deep ground water contamination associated with the DNAPL are items of sufficient concern that USAF recommends initiating remedial actions as soon as practicable.

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.

## 2.7 Description of Alternatives

Media-specific actions consistent with the remedial action objectives include any combination of treatment, containment, excavation, extraction, disposal, institutional controls, and no action. A full range of alternatives will be considered for the final remedy(ies), but for an interim action for the DNAPL at OU2, only two will be discussed:

- No action.
- Extraction and treatment of the DNAPL and associated contaminated ground water (Pump and Treat).

Several alternatives, including physical containment, excavation, and in-situ treatment were briefly considered, but were judged to be inappropriate for this interim action. A brief discussion of these alternatives is contained in "Hill Air Force Base, Utah, Focused Feasibility Study for Operable Unit 2," February 1991. Alternatives that include these response actions will be addressed in the evaluation for final remedy selection.

2.7.1 No Action (Alternative 1): The no action alternative evaluated here refers only to taking no further action until the final remedy(ies) are selected and embodied in a Record of Decision (ROD) for OU2. This is expected to be in August 1993. Ongoing remedial investigation and feasibility study activities will provide information for the final selection. The present worth of this alternative is $163,000 assuming a 3 year life (same time frame as alternative 2).

2.7.2 Pump and Treat (Alternative 2): This alternative is schematically illustrated by Figure 4. This system will take approximately one year to build, and is expected to operate for approximately two years or until the final remedy is determined. Assuming a 2 year operating life until final remedy(ies) are enacted, the present worth is estimated to be $3.71 million.

This alternative includes recovering as much DNAPL as practicable with a series of pumping wells. Wells are the preferred extraction technology since they are generally less costly to install than subsurface drains and the subsurface materials containing the DNAPL appear to have adequate permeability(ies) on the basis of pump tests. In the event of fouling or scaling, wells can be reconditioned more easily than a subsurface drain system.

The pumped liquid, probably an emulsion, will be placed in batch settlers to separate DNAPL and the associated water into separate

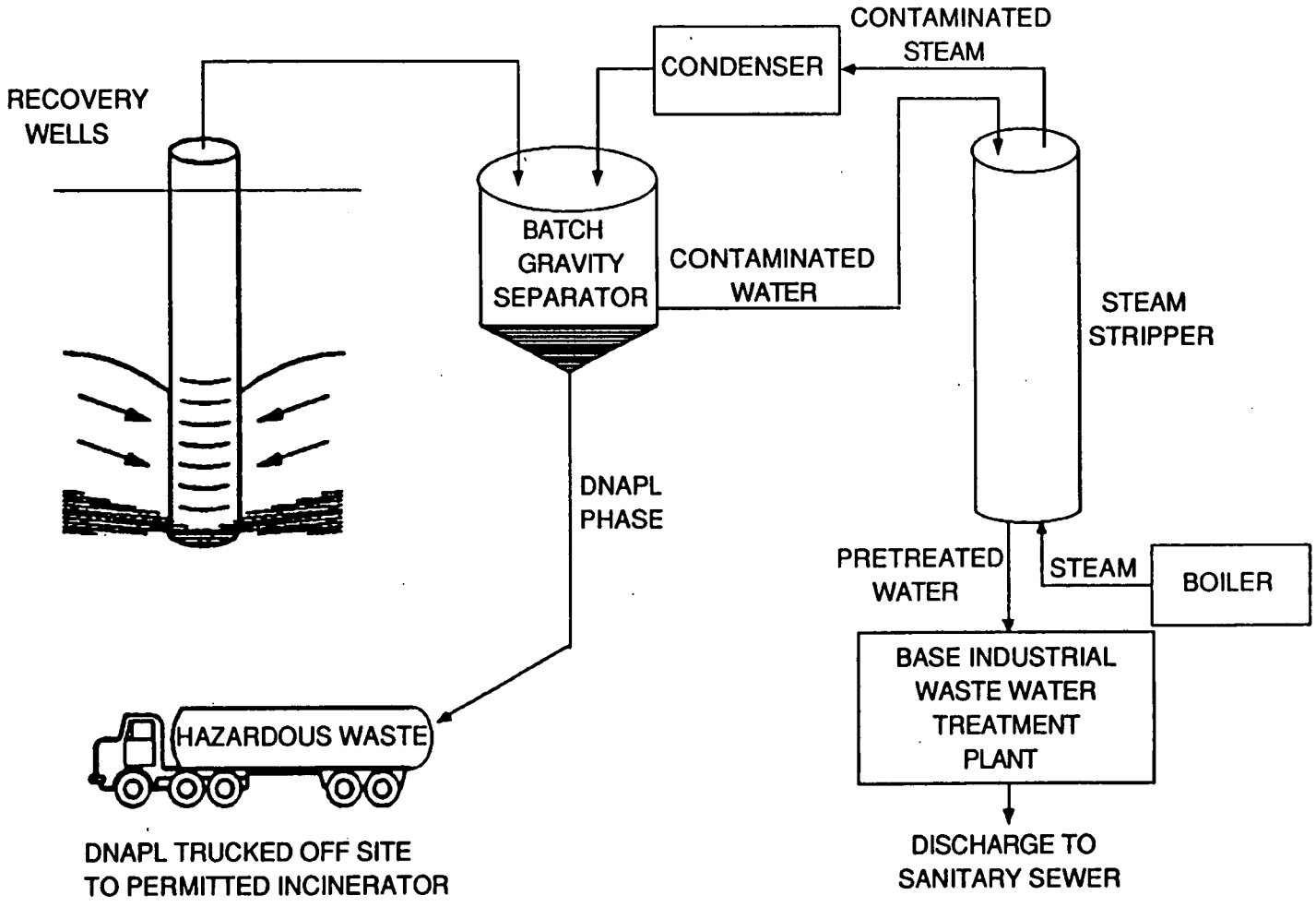


**Figure 4. Treatment Process for Alternative 2**

phases. The amount of DNAPL recovered can only be guessed at this time, but over 200,000,000 gallons of contaminated ground water and DNAPL may be recovered and treated during the expected two year life of this interim action. DNAPL recovered cannot exceed what was disposed at the site, estimated to range between 100,000 to 1,000,000 gallons. DNAPL will be temporarily stored on site in steel tanks with secondary containment until sufficient amounts (approximately 5,000 gallons) accumulate for off-site transport. Storage at any other location on Base will be in accordance with the conditions of Hill AFB's existing (or as modified) hazardous waste storage permit. The DNAPL will be transported in compliance with the Resource Conservation and Recovery Act (RCRA) and Department of Transportation (DOT) regulations to an incineration facility operating in compliance with RCRA.

The aqueous phase is expected to contain high concentrations of dissolved VOCs and will require pretreatment prior to disposal. An evaluation of the pretreatment alternatives is contained in the report "Hill Air Force Base, Utah; Final Conceptual Design Report; Source Recovery and Ground water Pre-Treatment System at Operable Unit 2; June, 1990." On-site pretreatment will be in two phases: (1) steam stripping in a unit at the site; then (2) final pretreatment in the Base Industrial Waste Treatment Plant (IWTP). The maximum pumping rate of pretreated water to the IWTP will be about 20 gallons per minute. The treatment process in the IWTP includes air stripping and carbon absorption to remove VOCs.

Treated effluent from the IWTP must be of low enough concentrations to meet pretreatment standards before being discharged to the North Davis County Sewer District treatment works. This discharge will be regulated under the conditions of a UPDES (Utah Pollution Discharge Elimination System) permit.

## 2.8 Summary of Comparative Analysis of Alternatives

Provisions of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that a limited number of alternatives that represent viable alternatives be evaluated against nine criteria in 40 CFR 300.430(e)(9). The alternatives are evaluated against each of these criteria and then against each other to determine the preferred alternative.

### 2.8.1 Criteria 1: Overall Protection of Human Health and the Environment

This criteria addresses whether or not a remedy provides adequate protection and describes how risks posed through exposure pathways are eliminated, reduced, or controlled.

Alternative 1 (no-action) does nothing to alleviate threats and potential threats to human health and the environment until the

final remedy(ies) are enacted. Unacceptable risks may occur if shallow ground water in the vicinity of the DNAPL is used as a water supply. If not removed, the DNAPL will potentially migrate through the upper aquifer system and contaminate deeper aquifers currently used as potable water supplies by the Base and by surrounding municipalities.

Alternative 2 (pump and treat) provides for removal of as much DNAPL from the subsurface as practicable, resulting in a permanent reduction in the volume of DNAPL that acts as a source of contaminants in shallow ground water used for irrigation and domestic use. Vertical and lateral migration of the DNAPL would be inhibited. Pumping should also slow the rate at which dissolved contaminants can migrate off-Base in the shallow ground water. For the final remedial action, attainment of exposure levels within the acceptable risk range for carcinogens in the shallow ground water is unlikely without extracting as much of the DNAPL as practicable.

### 2.8.2 Criteria 2: Compliance with ARARs

ARARs are applicable or relevant and appropriate requirements. Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site. Relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the environmental and technical factors at a particular site. ARARs are grouped into three categories:

- **Chemical-specific** ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of the amount or concentration of a chemical that may be found in, or discharged to the environment (soil, water, or air).

- **Location-specific** ARARs restrict the concentration of hazardous substances or the conduct of activities solely because they are in specific locations, such as flood plains, wetlands, historic places, and sensitive ecosystems or habitats.

- **Action-specific** ARARs are usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes. The largest number of action-specific requirements are generally provided by RCRA.

The analysis of ARARs has been limited to the scope of the interim action. Other ARARs may be invoked in enacting final remedy(ies).

Alternative 1 (no-action) delays meeting ARARs until the final remedy(ies) are implemented.

Alternative 2 (pump and treat) represents a only preliminary step in achieving chemical-specific ARARs for the shallow ground water. These ARARs will be addressed when the final remedy(ies) are selected.

No location-specific ARARs have been identified. The site and any treatment facilities that would be constructed are not located within a 100-year flood plain, wetland, historical site, or sensitive ecosystem or habitat.

Potential action-specific ARARs that will be met include:

- Design of the treatment plant equipment to meet the substantive requirements of RCRA (40 CFR Part 264) that may include secondary containment for tanks and pipelines, release detection, pressure controls, safety cutoffs and bypass systems. Operation of the treatment plant will meet RCRA waste handling requirements. RCRA is also an ARAR for storage of hazardous waste (40 CFR Parts 260, 264) awaiting transport to the disposal facility. RCRA is administered by the State of Utah. State provisions parallel to those federal provisions cited in this paragraph are found at U.A.C. R450-8.

- Design and operation of the treatment plant at OU2 to meet the applicable requirements of various air quality regulations, including National Ambient Air Quality Standards (U.A.C. R446-1-3, 40 CFR Parts 50 and 61), use of Best Available Control Technology (U.A.C. R446-1-3.1.8, 40 CFR Parts 50 and 61), and emergency closure (U.A.C. R446-1-5.1). Fugitive dust control requirements (U.A.C. R446-1-4.5) will be met during construction. No visible air emissions are expected. Any air emissions from the IWTP will be comply with existing Utah Bureau of Air Quality permits for that facility.

- Treatment of the effluent at the IWTP and discharge to the North Davis County Sewer District (NDSCD) treatment works must comply with the applicable laws, regulations, and permit requirements (U.A.C. R448-8-8, 40 CFR Part 403, local POTW regulations). A modification to the Base's pretreatment discharge permit with NDCSD will be necessary prior to discharge under this alternative. A corresponding modification to the NDCSD's UPDES permit is also likely to be required. EPA guidance documents on discharge to POTWs will be utilized as actions that are to be considered (TBC). Similar compounds are treated and discharged on a daily basis. Other alternatives will be evaluated if discharge to the NDCSD is not permitted.

- Compliance with federal (29 CFR 1910.120) and Utah (U.A.C. R500) regulations concerning occupational safety and health standards for workers at hazardous waste sites.

- Construction and abandonment of wells to meet applicable portions of Utah water well drilling regulations, including provisions to prevent further contamination of the environment (U.A.C. R625-4).

- Land disposal is not expected to occur, so the RCRA land disposal restrictions (40 CFR Part 268) are generally not applicable or relevant and appropriate. Any residual ash from incineration of the DNAPL will be disposed in accordance with the LDRs.

- Regulations for off-site disposal pertaining to manifesting, transport, destruction of the DNAPL and any residuals will be met. CERCLA Section 121(d)(3) requires that hazardous substances, pollutants, or contaminants may be transported off-Site only to facilities operating in compliance with RCRA Sections 3004 and 3005 and other applicable laws and regulations.

2.8.3 Criteria 3: Long-term Effectiveness and Permanence.

Long-term effectiveness and permanence refers to the ability of a remedy to provide reliable protection of human health and the environment over time.

Alternative 1 delays any action until final remedy(ies) are selected and is unlikely to provide long-term effectiveness and permanence.

Alternative 2 will permanently remove most of the DNAPL. Due to uncertainties in hydrogeological characteristics of the shallow aquifer, the physical and chemical nature of the DNAPL, and extraction system design parameters, complete extraction is not likely. The threat of contamination migrating to the deeper ground water currently used as a source of drinking water will be substantially reduced. Data collected and analyzed during the operation of the system will be used to evaluate long-term effectiveness and permanence of the final remedy(ies). No residuals are expected to be land disposed and all wastes will be treated to meet applicable or relevant and appropriate requirements of federal and state environmental and siting laws. If there is residual ash from incineration of the DNAPL, it will be disposed in accordance with the land disposal restrictions.

### 2.8.4 Criteria 4: Reduction of Toxicity, Mobility, and Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the preference for a remedy that reduces health hazards, the movement of contaminants, or the quantity of contaminants at the site.

Alternative 1 delays reduction of toxicity, mobility, and volume since no treatment would be taking place. Contaminants may migrate further into the environment, resulting in a greater volume of contaminated materials.

Alternative 2 utilizes established treatment technology to address the principal threats posed by the DNAPL. The volume of the DNAPL in the subsurface will be permanently reduced and mobility will be inhibited. On the basis of experience with similar recoveries and uncertainties discussed above, some residuals will probably remain in place unless recovery enhancement techniques can be feasibly used. A reduction of the amount of DNAPL results in less material available to contaminate shallow ground water. All of the recovered DNAPL will be destroyed by the incineration process. Any associated contaminated water effluent will be treated to meet discharge requirements from the IWTP. The steam stripping treatment system will have a performance specification of 99 percent removal of VOCs. No residuals from the treatment will remain on the site.

### 2.8.5 Criteria 5: Short-term Effectiveness

This criteria addresses the period of time needed to complete the remedy, and any adverse effects to human health and the environment that may be caused during the construction and implementation of the remedy.

Alternative 1 offers no immediate risks to the community. Potential immediate risks have been addressed with the actions already taken. If the final ROD for this operable unit involves clean up, Alternative 1 probably only delays any short-term risks.

Alternative 2 will involve some short-term risks to workers on the site during the construction phase of the system (one year estimated duration). No adverse impacts on the community are anticipated. Potential risks include exposure of site workers to contaminated water and soil, volatile organic vapors, or extracted DNAPL; and air emissions from any part of the operating facility. Dust control techniques will be employed to control exposure to chemicals from fugitive dust during construction. Alternative 2 will be designed to protect the community and workers during operation of remedial actions (two year estimated duration). Worker protection will be consistent with the OSHA requirements (U.A.C. R500, 29 CFR 1910.120), the site Health and Safety Plan,

and Contingency Plan during construction and operation. All tanks and pipelines installed will have secondary containment systems or double walls to collect accidental spills or leaks. All tanks will be fitted with emissions control devices to prevent contaminants from entering the air. The recovered DNAPL product will be hauled by a qualified contractor to a permitted incinerator for destruction. Transporting hazardous wastes off site will involve risks of accidental spills and traffic accidents, however, over 1,000 tons of hazardous waste are already trucked off of Hill AFB every year. Truck traffic is expected to be infrequent or sporadic and should not present any noise or traffic problems for the community. No adverse environmental impacts are expected from implementation of Alternative 2.

2.8.6 Criteria 6: Implementability

Implementability refers to the technical and administrative feasibility of a remedy. This includes the availability of materials and services needed to carry out a remedy. It also includes coordination of Federal, State, and Local government efforts to clean up the site.

Alternative 1 offers no implementability concerns since it is technically and administratively feasible and does not rely on the availability of services and materials.

Alternative 2 will utilize proven "off-the-shelf" technology, standard construction methods, and existing facilities. Adequate treatment, storage capacity, and disposal services are available. Off-site incineration services are readily available and can be implemented immediately. The equipment for on-site pretreatment is commercially available.

Access to the site is available through existing roadways and the site topography allows access for drilling equipment. Road construction will be necessary only to install treatment facilities and provide access for the trucks hauling the recovered product.

The action is administratively feasible. Discharge of the treated water effluent from the IWTP to the North Davis County Sewer District will require agreement and coordination with the district. Notification and possible permitting of air discharge may be required through the State of Utah (U.A.C. R446-1-3.1), depending on the final emissions control system. Off-site disposal of the product will require a manifesting system (U.A.C. R450-4) and possibly a modification of the existing State-issued permit for Hill AFB under the Resource Conservation and Recovery Act (RCRA) (U.A.C. R450-8) in terms of storage location and amounts of wastes to be disposed.

2.8.7 Criteria 7: Cost

Cost evaluates the estimated captial, operation, and maintenance costs of each alternative in comparison to other equally protective alternatives.

Alternative 1 does not involve any indirect or capital costs. Annual Operations and Maintenance (O&M) costs on the existing seep treatment system and water supplies provided to residences is estimated to be $60,000. The present worth of this alternative is $163,000 assuming a 3 year life (same time frame as alternative 2).

Alternative 2 is estimated to cost $2 million in capital costs to install the necessary facilities and to cost $1 million per year to operate. Assuming a 2 year operating life until final remedy(ies) are enacted, the present worth is estimated to be $3.71 million.

2.8.8 Criteria 8: State Acceptance

State acceptance describes whether the State agrees with, opposes, or has no comment on the preferred alternative.

The Utah Department of Environmental Quality (UDEQ) and the Environmental Protection Agency Region VIII concur with the Air Force's selected remedy for interim action at OU2. The UDEQ response to the alternatives is presented in the responsiveness summary (Section 3.0). While UDEQ supports this interim action, it does not necessarily agree with all descriptions of site hydrogeology found in this ROD, especially as they relate to aquifer systems at the site.

2.8.9 Criteria 9: Community Acceptance

Community acceptance includes determining which components of the alternatives which interested persons in the community support, have reservations about, or oppose.

The community response to the alternatives is presented in the responsiveness summary (Section 3.0) which addresses comments received during the public comment period. Community members were generally concerned about health effects of chemicals in ground water and seeps on private property. No comments opposing this interim action were received from the community.

## 2.9 Selected Remedy

Based on the comparative analysis of the nine criteria, alternative 2 (pump and treat) is preferable, and is the selected remedy for interim action. The selected remedy involves pumping wells to remove DNAPL and contaminated ground water from the subsurface. An on-site treatment plant will separate the DNAPL and aqueous phases,

then pretreat the recovered ground water by means of a steam stripper. All actions involved in this interim action will occur on Base at the actual dump site. Pretreated ground water will be discharged to the Base IWTP and then to the North Davis County Sewer District's sanitary sewer. DNAPL will be disposed of in an off-site, RCRA-permitted incinerator. The present worth of this remedy is estimated to be $3.71 million as discussed in section 2.8.7.

Alternative 1 (no-action) is more easily implemented and of lower cost (criteria 6 & 7) than alternative 2. In all of the other criteria, alternative 2 provides greater overall protection of human health and the environment with active progress towards clean up. Other benefits of alternative 2 are that it: provides for rapid response; will reduce contaminant loading on any future actions; and will inhibit contaminant migration.

This alternative calls for the design and implementation of an interim remedial action to protect human health and the environment. The goals of this remedial action are to:

- Remove as much of the DNAPL as practicable, permanently reducing the volume and mobility;

- Reduce the rate of dissolved contaminant migration and reduce contaminant loading for future response actions.

- Collect data on aquifer and contaminant response to remediation measures that will be useful in the selection and design of final response actions.

This remedial action will be monitored carefully to determine the feasibility of reducing contamination with this method and to ensure that control of the DNAPL is maintained. After the time necessary to arrive at a final decision for the site, a final ROD will be prepared. This ROD will address the final remedy and anticipated remediation time-frame. Upon completion of the RI/FS for operable unit 2, this interim system may be incorporated into the design of the site remedy specified in the final action ROD.

Specific points of compliance will not be defined for this interim action, but will be appropriately designated for the final response action. In general, the area of attainment is the general area of DNAPL accumulation with the primary objective of removing as much of the DNAPL as practicable.

The system will use the most cost-effective of equivalent treatment systems available and will meet best engineering practices and technology.

## 2.10 Statutory Determinations

The selected remedy meets the statutory requirements of Section 121 of CERCLA as amended by SARA. These statutory requirements include protection of human health and the environment, compliance with ARARs, cost effectiveness, utilization of permanent solutions and alternative treatment technologies to the maximum extent practicable, and preference for treatment as a principal element. The manner in which the selected remedy for this interim action meets each of these requirements is presented in the following discussion. The statutory determinations for the preferred remedy for soils, ground water, surface water, and air will be discussed in a separate Record of Decision that will be prepared following the initiation of this interim action and the collection and analysis of additional monitoring data.

### 2.10.1 Protection of Human Health and the Environment

This interim action is protective of human health and the environment from the threat being addressed and the waste being managed (DNAPL). The interim action will remove DNAPL from the environment and destroy it by incineration. The risks posed by the threat of DNAPL contaminating deeper drinking waters will be substantially reduced. Also, by removing DNAPL, a major source of shallow ground water contamination will be removed.

### 2.10.2 Attainment of Applicable or Relevant and Appropriate Requirements of Environmental Laws

No chemical-specific ARARs will be met with this interim action. However, without the removal of DNAPL, it is unlikely that any chemical-specific ARARs will be met as the result of any remedial action. Therefore this interim action is the first step in ultimately achieving chemical-specific ARARs for this site.

Potential action-specific ARARs that will be met include:

- Design of the treatment plant equipment to meet the substantive requirements of RCRA (40 CFR Part 264) that may include secondary containment for tanks and pipelines, release detection, pressure controls, safety cutoffs and bypass systems. Operation of the treatment plant will meet RCRA waste handling requirements. RCRA is also an ARAR for storage of hazardous waste (40 CFR Parts 260, 264) awaiting transport to the disposal facility. RCRA is administered by the State of Utah. State provisions parallel to those federal provisions cited in this paragraph are found at U.A.C. R450-8.

- Design and operation of the treatment plant at OU2 to meet the applicable requirements of various Utah air quality regulations, including National Ambient Air Quality Standards (U.A.C. R446-1-3, 40 CFR Parts 50 and 61), use of Best

Available Control Technology (U.A.C. R446-1-3.1.8, 40 CFR Parts 50 and 61), and emergency closure (U.A.C. R446-1-5.1). Fugitive dust control requirements (U.A.C. R446-1-4.5) will be met during construction. No visible air emissions are expected. Any air emissions from the IWTP will be comply with existing Utah Bureau of Air Quality permits for that facility.

- Treatment of the effluent at the IWTP and discharge to the North Davis County Sewer District (NDSCD) treatment works must comply with the applicable laws, regulations, and permit requirements (U.A.C. R448-8-8, 40 CFR Sec. 403, local POTW regulations). A modification to the Base's pretreatment discharge permit with NDCSD will be necessary prior to discharge under this alternative. A corresponding modification to the NDCSD's UPDES permit may also be required. EPA guidance documents on discharge to POTWs will be utilized as actions that are to be considered (TBC). Similar compounds are treated and discharged on a daily basis. Other alternatives will be evaluated if discharge to the NDCSD is not permitted.

- Compliance with federal (29 CFR 1910.120) and Utah (U.A.C. R500) regulations concerning occupational safety and health standards for workers at hazardous waste sites.

- Construction and abandonment of wells to meet applicable portions of Utah water well drilling regulations, including provisions to prevent further contamination of the environment (U.A.C. R625-4).

- Land disposal is not expected to occur, so the RCRA land disposal restrictions (40 CFR Part 268) are generally not applicable or relevant and appropriate. Any residual ash from incineration of the DNAPL will be disposed in accordance with the LDRs.

- Regulations for off-site disposal pertaining to manifesting, transport, destruction of the DNAPL and any residuals will be met. CERCLA Section 121(d)(3) requires that hazardous substances, pollutants, or contaminants may be transported off-Site only to facilities operating in compliance with RCRA Sections 3304 and 3005 and other applicable laws and regulations.

### 2.10.3 Cost Effectiveness

The no action alternative initially appears to be the most cost effective alternative. However, the alternative is defined as no further action until the final ROD. If the interim action is not taken now, contamination will migrate further into the environment, probably increasing ultimate clean up costs for OU2. Therefore the

selected remedy is cost effective in terms of reduction in threat to public health and the environment per dollars expended when remediation of the entire site is considered. The interim action makes use of existing facilities to the extent practicable.

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

As this is an interim action, it is not designed or expected to be final. However, the selected remedy represents the best balance of tradeoffs with respect to pertinent criteria given the limited scope of the action. The interim action involves removing and destroying DNAPL -- a permanent reduction in the volume of contamination. Once removed and destroyed, the DNAPL can no longer threaten the drinking water aquifers or contribute to the contamination of shallow ground water. As removal technology is not 100 percent effective, some residuals may remain in the subsurface. This residual DNAPL will represent a reduced threat to the drinking water and shallow aquifers because the amount of DNAPL will be permanently reduced and the mobility of the DNAPL will be inhibited. The interim action meets this statutory requirement.

2.10.5 Preference for Treatment as a Principal Element

This interim action does employ treatment as a principal element, and is therefore in furtherance of meeting this statutory requirement. The preference for treatment as a principal element will be addressed in the final ROD for this operable unit.