United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R09-89/033
June 1989

EPA

Superfund Record of Decision:

San Fernando Valley (Area 1), CA

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The San Fernando Valley Basin (SFVB) Area 1 site is one of four Superfund sites (including SFVB Areas 2, 3, and 4) being remediated as one large site. The SFVB lies within the approximately 328,500-acre Upper Los Angeles River area. This remedial action is for the Burbank Well Field operable unit of the SFVB Area 1 site, located within the city of Burbank, California, and addresses a portion of the overall ground water problem in the SFVB Areas 1, 2, 3, and 4 sites. The SFVB aquifers is an important source of drinking water for approximately 600,000 residents in nearby cities and is also used for commercial and industrial purposes. Contaminated ground water is difficult to replace in this area because water from the metropolitan water district, an alternate source of drinking water, may not always be available due to periodic drought conditions and State and Federal water rights issues. Contaminated ground water in the SFVB wells was first discovered in 1980. Results of a ground water monitoring program conducted from 1981 through 1987 revealed approximately 50 percent of the water supply wells in the eastern portion of the SFVB were contaminated with TCE and PCE at concentrations exceeding State and Federal drinking water standards. All of Burbank's production wells have been shut down due to this VOC contamination. In 1987 the primary contaminant TCE was found in concentrations exceeding State Action Levels (See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - San Fernando Valley (Area 1), CA
Second Remedial Action
Contaminated Medium: gw
Key Contaminants: VOCs (TCE, PCE)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 48
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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

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16. Abstract (continued)

(SALs) in 48 percent of the SFVB's 120 production wells, and PCE levels exceeded SALs in 18 percent of the SFVB wells. In 1987 EPA selected a remedy to address another operable unit in Area 1, specifically the threat of contaminated public water supply wells located in the city of North Hollywood. The selected remedy for the North Hollywood operable unit included the construction of an extraction and aeration facility to pump and treat contaminated ground water in the North Hollywood area. The facility has been operational since March 1989. The remedy selected for the Burbank operable unit will control the migration of contaminated ground water in the SFVB where additional downgradient public water supply wells are threatened by contamination and will aid in aquifer restoration in the immediate Burbank area. The primary contaminants of concern are VOCs including TCE and PCE.

The selected remedial action for this site includes pumping and treatment of ground water contaminated with TCE exceeding 100 ug/l or PCE exceeding 5 ug/l using air or stream stripping, with vapor phase GAC adsorption units if air stripping is used, and discharge to the municipal water supply distribution system; and ground water monitoring. The estimated present worth cost for this remedial action is $69,000,000, which includes an estimated present worth O&M of $43,900,000 (for a 20-year period).

San Fernando Valley Area 1

Superfund Site

Los Angeles County, California

RECORD OF DECISION

for the

BURBANK WELL FIELD

OPERABLE UNIT

United States Environmental Protection Agency
Region 9 - San Francisco, California
May, 1989

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

26 JUN 1989

MEMORANDUM

SUBJECT: San Fernando Area 1 Site
Burbank Operable Unit
Record of Decision

FROM: Jeff Zelikson, Director
Hazardous Waste Management Division

TO: John Wise
Deputy Regional Administrator

Please find enclosed for your concurrence the Final Record of Decision (ROD) for the San Fernando Area 1 site, Burbank Well Field Operable Unit in Los Angeles County, California. We would appreciate receiving your concurrence by COB Thursday, June 29, 1989 so the ROD can be transmitted to the RA for signature on June 30. Please have your secretary contact Alisa Greene at 4-9096 so that your concurrence sheet can be collected after you have signed it.

Please sign below if you are in agreement with the following statement:

The enclosed Record of Decision package for the San Fernando Area 1 site, Burbank Well Field Operable Unit in Los Angeles County, California has been reviewed and I concur with the contents.

6.26.89
Date

John Wise
John Wise
Deputy Regional Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

01 MAY 1989

MEMORANDUM

SUBJECT: San Fernando Area 1 Site,
Burbank Operable Unit Record of Decision

FROM: for Jeff Zelikson, Director
Hazardous Waste Management Division

TO: Harry Seraydarian, Director
Water Management Division

Please find enclosed for your concurrence the Final Record of Decision (ROD) for the San Fernando Area 1 Site, Burbank Operable Unit in Los Angeles County, California. This document was submitted for review by your staff and we know of no unresolved issues. If you have any questions about this ROD, please contact Alisa Greene at 4-8015 or Jon Wactor (ORC) at 4-8042. Alisa would appreciate receiving this concurrence sheet by COB Wednesday May 10, 1989 so the ROD can be transmitted to the RA for signature. Please contact Alisa at the above phone number so that your concurrence sheet can be collected after you have signed it.

Please sign below if you are in agreement with the following statement:

The enclosed Record of Decision package for the San Fernando Area 1 Site, Burbank Operable Unit in Los Angeles County, California has been reviewed and I concur with the contents.

May 1, 1989
Date

for Harry Seraydarian, Director
Water Management Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

01 MAY 1989

MEMORANDUM

SUBJECT: San Fernando Area 1 Site,
Burbank Operable Unit Record of Decision

FROM: Jeff Zelikson, Director
Hazardous Waste Management Division

TO: David Howekamp, Director
Air Management Division

Please find enclosed for your concurrence the Final Record of Decision (ROD) for the San Fernando Area 1 Site, Burbank Operable Unit in Los Angeles County, California. This document was submitted for review by your staff and we know of no unresolved issues. If you have any questions about this ROD, please contact Alisa Greene at 4-8015 or Jon Wactor (ORC) at 4-8042. Alisa would appreciate receiving this concurrence sheet by COB Wednesday May 10, 1989 so the ROD can be transmitted to the RA for signature. Please contact Alisa at the above phone number so that your concurrence sheet can be collected after you have signed it.

Please sign below if you are in agreement with the following statement:

The enclosed Record of Decision package for the San Fernando Area 1 Site, Burbank Operable Unit in Los Angeles County, California has been reviewed and I concur with the contents.

5/10/89
Date

David Howekamp, Director
Air Management Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

01 MAY 1989

MEMORANDUM

SUBJECT: San Fernando Areas 1 Site, Burbank Operable Unit Record of Decision

FROM: Jeff Zelikson, Director
Toxics & Waste Management Division

TO: Gail Cooper, Acting Regional Counsel
Office of Regional Counsel

Please find enclosed for your concurrence the Final Record of Decision (ROD) for the San Fernando Area 1, Burbank Well Field Operable Unit in Los Angeles County, California. This document was submitted for review by your staff and we know of no unresolved issues. If you have any questions about this ROD, please contact Jon Wactor (ORC) at 4-8042 or Alisa Greene (T-4-1) at 4-8015. Alisa would appreciate receiving this concurrence sheet by COB Monday April 24, 1989 so the ROD can be transmitted to the RA for signature immediately following. Please contact Alisa so that your concurrence sheet can be collected after you have signed it.

Please sign below if you are in agreement with the following statement:

> The enclosed Record of Decision package for the San Fernando Area 1, Burbank Well Field Operable Unit in Los Angeles County, California has been reviewed and I concur with the contents.

5/1/89
Date

Gail Cooper
Acting Regional Counsel
Office of Regional Counsel

RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

San Fernando Valley Basin Area 1
Burbank Operable Unit
Los Angeles County, California

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the San Fernando Valley Basin Area 1, Burbank Operable Unit, in Los Angeles County, California, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. Section 9601 et. seq.) and the National Contingency Plan (40 C.F.R. Section 300 et. seq.). This decision is based on the administrative record for these sites.

The State of California concurs on the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

The Burbank Operable Unit (OU) remedial action is the second to be taken at the San Fernando Valley Basin (SFVB) Area 1 site. In a September 1987 Record of Decision (ROD), EPA selected a remedy to address the public health threat posed by volatile organic compound (VOC) contamination of the Los Angeles Department of Water and Power (DWP) public supply wells located in the North Hollywood area. The North Hollywood OU remedial action has been constructed and became operational in March 1989. The remedial action selected in this decision document - - the Burbank Operable Unit - - is designed to achieve two objectives:

1) to partially control the movement and spread of groundwater contaminants in the Burbank OU area, while contributing to aquifer restoration at the SFVB Area 1 National Priority List (NPL) site; and

(2) to address the public health threat posed by contamination of the City of Burbank's public water supply wells by providing residents in the area with a water supply that meets State and Federal drinking water standards.

This remedial action for the Burbank Operable Unit addresses a portion of the overall groundwater contamination problem in the SFVB Area 1,2,3 and 4 sites. It will control the migration of contamination in the groundwater basin where additional downgradient public water supply wells are threatened by contamination. It will also aid in aquifer restoration in the immediate Burbank OU area. The basinwide Remedial Investigation (RI) is currently being conducted by DWP to define the vertical and areal extent of contamination in the four San Fernando Valley Superfund areas. EPA will conduct the basinwide Feasibility Study (FS) and write the corresponding Record of Decision. (EPA also has the lead on the enforcement activities and Community Relations.) The basinwide RI/FS is expected to be released for public comment in 1992. The remedial action selected in this Burbank OU decision document will be incorporated in the remedial action for all four SFVB NPL sites.

The remedial action selected in this decision document incorporates the following components:

- extraction of groundwater from the most highly contaminated zones of the underlying aquifer using wells that are strategically located to maximize the efficiency of the system;

- extraction to capture groundwater containing 100 ppb or greater of TCE and 5 ppb or greater of PCE (flow rate of the system is proposed to be 12,000 gpm);

- construction of stripping (either air or steam) units to treat contaminated groundwater;

- installation of vapor phase GAC adsorption units to control VOC air emissions if air stripping technology is used;

- installation of monitoring wells to be placed on the border of the contaminant plume to monitor the extraction reliability of the system;

- treatment of contaminated water, at the effluent discharge point, to contaminant concentrations below MCLs and SALs; and

- use of the treated groundwater as a water supply for Burbank's Public Service Department's customers by feeding the treated water directly into Burbank's water distribution system.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies which employ treatment that reduces toxicity, mobility, or volume as a permanent solution and alternative treatment (or resource recovery) technologies to the maximum extent practicable. As part of the remedy, groundwater monitoring will be conducted to track contaminant levels in the Burbank Well Field and to monitor the performance of the extraction and treatment system to ensure adequate protection of human health and the environment. Periodic reviews will be conducted to analyze the effectiveness of the system.

Daniel W. McGovern
Regional Administrator

June 30, 1989
Date

RECORD OF DECISION

DECISION SUMMARY

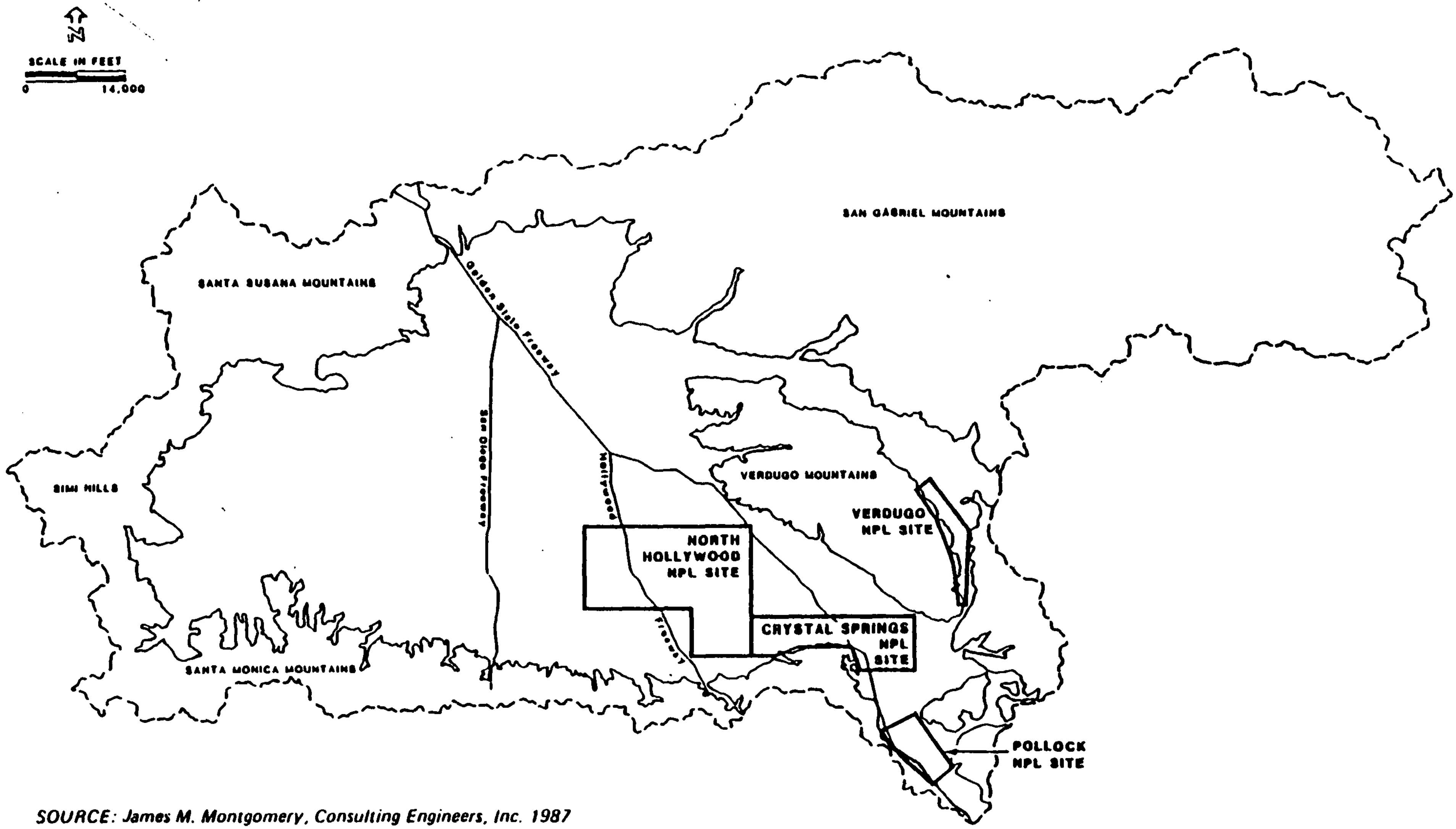
1.0 SITE LOCATION AND DESCRIPTION

The area around the Burbank Well Field, located in the San Fernando Area 1 (North Hollywood) NPL site within the San Fernando Valley Basin (SFVB), has been designated an Operable Unit (OU). Figure 1 shows the location of the North Hollywood NPL site within the SFVB. Figure 2 shows the boundary of the study area for the OU within the North Hollywood NPL site and the approximate location of the proposed extraction wells. The entire Burbank Well Field lies within the political boundaries of the City of Burbank, California.

The SFVB is located in the Upper Los Angeles River Area (ULARA), which consists of the entire watershed of the Los Angeles River and its tributaries. The ULARA encompasses approximately 328,500 acres, of which 122,800 acres are alluvial deposits which fill the SFVB. The SFVB is bounded on the north and northwest by the Santa Susana Mountains, on the northeast by the San Gabriel Mountains, on the west by the Simi Hills, and on the south by the Santa Monica Mountains. These mountain ranges are shown in Figure 1.

Four distinct groundwater basins are located within the ULARA: the San Fernando (with 91.2 percent of the total valley fill, the Verdugo (with 3.6 percent of the total valley fill), the Sylmar (with 4.6 percent of the total valley fill), and the Eagle Rock (with 0.6 percent of the total valley fill). Because the SFVB Area 1 NPL site is located within the San Fernando groundwater basin, the following discussion focuses on the San Fernando groundwater basin.

The geology of the SFVB generally consists of alluvial deposits composed of unconsolidated gravels and sand interbedded with lenses of silt and clay. The overlying alluvial deposits range in thickness from a few inches at the base of the mountains to as much as 1,500 feet in the center of the SFVB. The Burbank Well Field is located in the eastern portion of the San Fernando Valley Basin (SFVB), which contains coarser sediments that transmit water at higher rates than the western area of the SFVB. Most of the production wells in the SFVB are located in this eastern area. Results of aquifer testing in the SFVB have shown that groundwater velocities in the eastern portion of the basin are much greater than in the western portion. Within the eastern portion of the SFVB, the velocities are estimated to be between 300 to 500 feet per year with localized velocities of more than three feet per day near well fields.



SOURCE: James M. Montgomery, Consulting Engineers, Inc. 1987

WATERSHED BOUNDRY
EDGE OF VALLEY FILL
SITE AREA BOUNDRY

Base map of LADWP

FIGURE 1 LOCATION OF GROUNDWATER BASINS AND NPL SITES IN UPPER LOS ANGELES RIVER BASIN

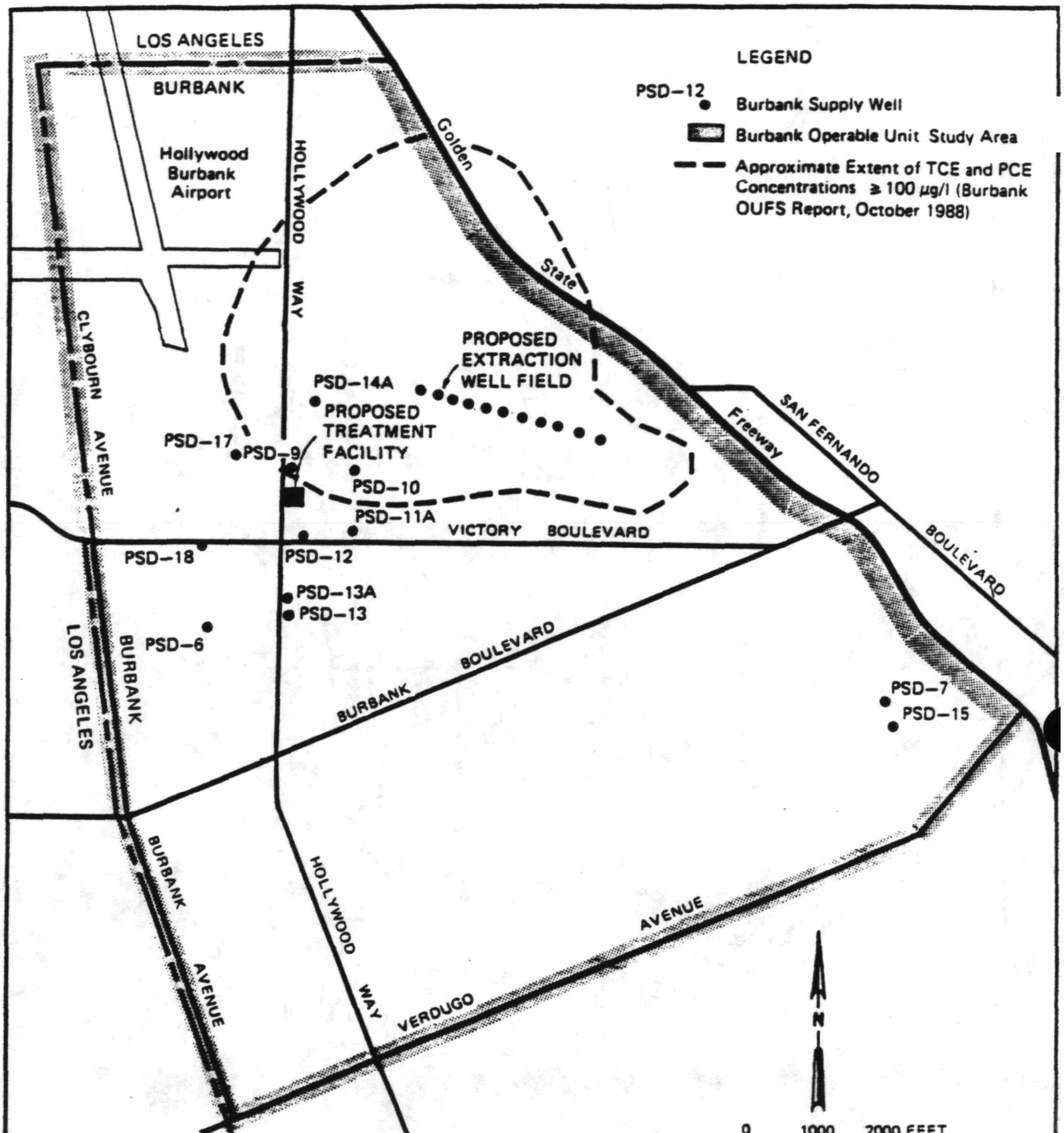


FIGURE 2 BURBANK OPERABLE UNIT STUDY AREA, LOCATION OF BURBANK SUPPLY WELLS, PROPOSED EXTRACTION WELLS AND TREATMENT FACILITY

Historically, groundwater recharge to the SFVB has occurred through both natural recharge from precipitation and artificial recharge from applied water and treated wastewater effluent. The total storage capacity of the SFVB is approximately 3 million acre-feet (acre-ft), two-thirds of which is located in the eastern portion of the basin. In 1979, the State Supreme Court granted the City of Burbank the right to extract 20 percent of the imported and reclaimed water for domestic use. Currently, this 20 percent amounts to an average of 4,700 acre-ft per year. The City of Burbank also has limited rights to physical solution water, that is, water normally supplied to other parties but which may be used by the City of Burbank upon payment of specified charges. In addition, the City of Burbank is entitled to store water in the SFVB and receives a credit for recharging treated wastewater effluent. As of March 1989, Burbank's water credits were approximately 38,000 acre-feet.

The City of Burbank's production wells have been shut down because the water they produce contains trichloroethylene (TCE) and perchloroethylene (PCE) in concentrations exceeding state and federal guidelines. Consequently, the City of Burbank now imports 100 percent of its water from the Metropolitan Water District of Southern California (MWD). In 1987, the City of Burbank imported approximately 23,100 acre-feet of water.

2.0 SITE HISTORY

In June 1986, at the request of the Los Angeles Department of Water and Power (DWP) and the California Department of Health Services (DHS), EPA designated four well fields within the San Fernando and Verdugo Groundwater Basins as National Priorities List (NPL) hazardous waste sites. Industrial chemicals have been detected in groundwater from these areas. Although each well field is listed separately on the NPL, EPA and DWP are managing the investigation of the four sites as if they are one single, large site.

The SFVB represents an important source of drinking water for the cities of Los Angeles, Burbank, Glendale, and La Crescenta, and provides these communities with enough water to serve approximately 600,000 residents.

Groundwater from the aquifers in the SFVB is used for commercial, industrial and residential purposes, and is especially important during years of drought. The groundwater that has become contaminated is difficult to replace. The current water supply from surface water via the Metropolitan Water District (MWD) may not always be available in the future because of periodic drought conditions and State and Federal water rights issues.

In late 1979, as a result of the passage of Assembly Bill 1803, DHS requested that all major water purveyors using groundwater conduct tests for the presence of certain industrial chemicals as part of a statewide groundwater quality surveillance effort. These initial tests, completed in spring 1980, indicated that hazardous substances such as trichloroethylene (TCE) and perchloroethylene (PCE), were present in concentrations above State Action Levels (SALs) and Maximum Contaminant Levels (MCLs) in a number of water production wells in the San Fernando Valley Basin. Concentration levels in the wells have been increasing since 1980.

In 1987, the primary contaminant, TCE, was found at concentrations exceeding the State Action Level (SAL) in 48% of the SFVB's 120 production wells. In addition, PCE levels above State Action Level were present in 18% of the SFVB wells.

At present, the City of Los Angeles addresses well contamination by either shutting down heavily contaminated wells and providing alternate sources of drinking water, or blending contaminated water with other sources to achieve TCE and PCE concentrations in the served water that are below State Action Levels and Federal MCLs. Other communities, like the City of Burbank, have turned to the Metropolitan Water District of Southern California for surface water to augment their supplies.

In September 1987, EPA signed the North Hollywood OU Record of Decision to construct an extraction and aeration facility, to pump and treat contaminated groundwater in the North Hollywood area within the SFVB Area 1 NPL site. EPA provided funds to DWP through a cooperative agreement to implement this project. Also, EPA has joined with DWP and DHS in a Three Party Agreement that defines specific agency responsibilities, cost sharing, and other applicable provisions for construction, operation, and maintenance of this treatment system. The plant became operational in March, 1989.

The Burbank Operable Unit (OU) will be the second OU in the SFVB Area 1.

3.0 ENFORCEMENT

The SFVB NPL sites were first listed because of contaminated public supply wells. At the time of listing, the sources of contamination were unknown. EPA and the Los Angeles Regional Water Quality Control Board (RWQCB) have and are continuing to conduct numerous activities to identify sources of groundwater contamination in the San Fernando Valley Basin. The two agencies are working cooperatively in source identification and enforcement activities.

The RWQCB began source investigation activities in 1987 under the AB 1803 program. Under this program, an area (typically one square mile) surrounding contaminated public water supply wells is established within which a door-to-door industrial survey is completed. Inspections are conducted at all facilities potentially using solvents. Facilities that may have had a release due to their handling or storage practices are requested to conduct a site assessment for their facility. If soil contamination is found, expanded soil and/or groundwater investigations are required. Later, a cleanup and abatement order may be issued requiring the site to be remediated.

In addition, the RWQCB conducts source identification and cleanup activities under the Underground Storage Tank, Solid Waste Assessment Testing (SWAT), and Waste Discharge Requirements programs.

Between August 1987 and 1988, EPA issued 145 RCRA Section 3007/CERCLA Section 104 information request letters to facilities suspected of being users of chlorinated solvents in the San Fernando Valley Basin. Based on the responses received and information in state agency files, EPA issued 34 General Notice letters informing companies of their potential liability for the cleanup of the SFVB Area 1 and 2 NPL sites. On September 13, 1988 EPA held an information meeting for facilities identified as PRP's for the Burbank Well Field. To begin negotiations for cleanup of the Burbank OU area, EPA sent Special Notice Letters pursuant to CERCLA Section 122 in May 1989. Negotiations with PRP's are expected to end in September 1989. EPA and the RWQCB will continue basinwide source identification and enforcement activities throughout the basinwide RI/FS process.

4.0 COMMUNITY RELATIONS

The comment period for the OUFS Report and the Proposed Plan opened on October 19, 1988 and closed December 2, 1988. A public meeting was held on November 9, 1988 at the Thomas Jefferson Elementary School in Burbank and was attended by approximately 65 people.

Prior to the beginning of the public comment period, EPA and the City of Burbank published a notice both in the Los Angeles Times and the Burbank Leader. The notice briefly described the Proposed Plan and announced the public comment period and the public meeting. The notice also announced the availability of the Proposed Plan and the Draft OUFS Report for review at the information repositories established at the Burbank Public Library, California State University - Northridge Library, Los Angeles Department of Water and Power Library and the University of California - Los Angeles (UCLA) Research Library. (See fact sheet #1 or #2 for the locations.)

A fact sheet describing the Proposed Plan was delivered to the information repositories. Copies of the fact sheet were also mailed to the EPA general mailing list for the San Fernando Valley Basin sites, which included about 800 members of the general public, elected officials, agency, and media representatives. Fact sheets were also hand-delivered to residents near the proposed treatment facility location. In addition, the Burbank Water System Manager made an announcement of the public meeting and presented the Proposed Plan on local cable television. He also had fact sheets available for distribution at the Burbank Public Service Department (PSD). Additionally, news stories appeared in the local newspaper, The Burbank Leader, and The Los Angeles Times and The Daily News.

From March 1987 to the present, EPA and DWP have met bimonthly or quarterly with members of the Community Workgroup (CWG). The members include elected officials, industry representatives, community-based public interest representatives, and residents from the San Fernando Valley/Los Angeles area. The purpose of the CWG meetings have been to discuss technical issues and management strategies involving the San Fernando Valley Basin Superfund project. CWG members have been updated on agency activities and have had the opportunity to express their concerns about the Burbank Operable Unit throughout the Remedial Investigation/Feasibility Study (RI/FS) process. EPA transmitted copies of the OUFS Report to CWG members for their review and comment.

The minutes of the community meeting were transcribed. The transcript and the attached response summary provide responses to the community comments submitted in writing during the public comment period, as well as oral comments made at the November 9, 1988 public meeting. The public transcript and response summary are part of the Administrative Record.

5.0 SCOPE AND ROLE OF THE OU WITHIN THE BASINWIDE SITE STRATEGY

As discussed in the Site History section, EPA is treating the SFVB Area 1 - 4 NPL sites as one large site. EPA and DWP are conducting one basinwide RI/FS for the 4 NPL sites. The RI/FS for the San Fernando sites was initiated in 1987. The major goal of the RI is to identify the sources, pathways and receptors of the contaminants and to characterize the nature and extent of the public health and environmental problems presented by the contamination. Major components of the RI include soil gas surveys, installation of monitoring wells, regional and site specific groundwater flow and solute transport modeling of the basin and sampling of the groundwater and soil. The FS will evaluate the necessity for and proposed extent of remedial actions. DWP has the lead for the RI and EPA has the lead for the FS.

EPA previously selected a remedy to address the public health threat posed by contamination of the public water supply wells located in the City of North Hollywood which lies within the SFVB Area 1 NPL site. The North Hollywood OU project was designed to control the migration of contaminants in the groundwater, while initiating aquifer restoration in the area. The contaminant plume has already affected numerous groundwater production wells in Area 1 of the SFVB and has precluded their use for public water supply. Construction and operation of the Burbank project is intended to further address the immediate problem in Area 1 while a more complete investigation of the Valley's overall groundwater problem is being done through the overall Remedial Investigation/Feasibility Study (RI/FS) process.

The Burbank response action is designed to achieve two objectives:

- To partially control the movement and spread of groundwater contaminants in the Burbank Operable Unit area, while contributing to aquifer restoration in the San Fernando Valley Basin Area 1 NPL site.

- To address the public health threat posed by contamination of the City of Burbank's public water supply wells by providing residents in the area with a water supply that meets State and Federal drinking water standards.

All of the City of Burbank's PSD wells are shut down due to the VOC contamination. Moreover, other downgradient public water supply wells are potentially threatened by contamination in the Burbank OU area. The response action selected in this decision document will be incorporated into the EPA response action for the entire San Fernando Superfund Areas 1-4.

As the operable units are addressing part of the overall problem, the RI/FS and subsequent ROD are intended to address the 4 SFVB NPL sites and the areas which impact these sites.

6.0 SUMMARY OF THE BURBANK OU SITE CHARACTERISTICS

Contamination of groundwater from the San Fernando Valley Basin wells was first discovered in 1980. Since then, various monitoring programs have been implemented. Results of LADWP's groundwater monitoring program conducted from 1981 through 1987 revealed that TCE and PCE had contaminated approximately 50 percent of the water supply wells in the eastern portion of the SFVGB at concentrations exceeding State and Federal drinking water standards. Figure 3 presents the approximate location of the TCE and PCE plumes in 1987.

The City of Burbank's wells are sampled routinely as part of the monitoring of 112 wells in the San Fernando Valley Basin. The concentration ranges of TCE and PCE found in the Burbank wells are presented in Tables 1 and 2. Several other VOCs have also been detected in the Burbank wells, including acetone, toluene, methylethylketone, carbon tetrachloride and trihalomethanes (THMs) which include chloroform, bromodichloromethane, dibromochloromethane, and bromoform. The concentrations of these other VOCs have not exceeded State Action Levels (SALs) or Federal MCLs. The Burbank wells have also been sampled for trace metals and other water quality parameters. Although groundwater

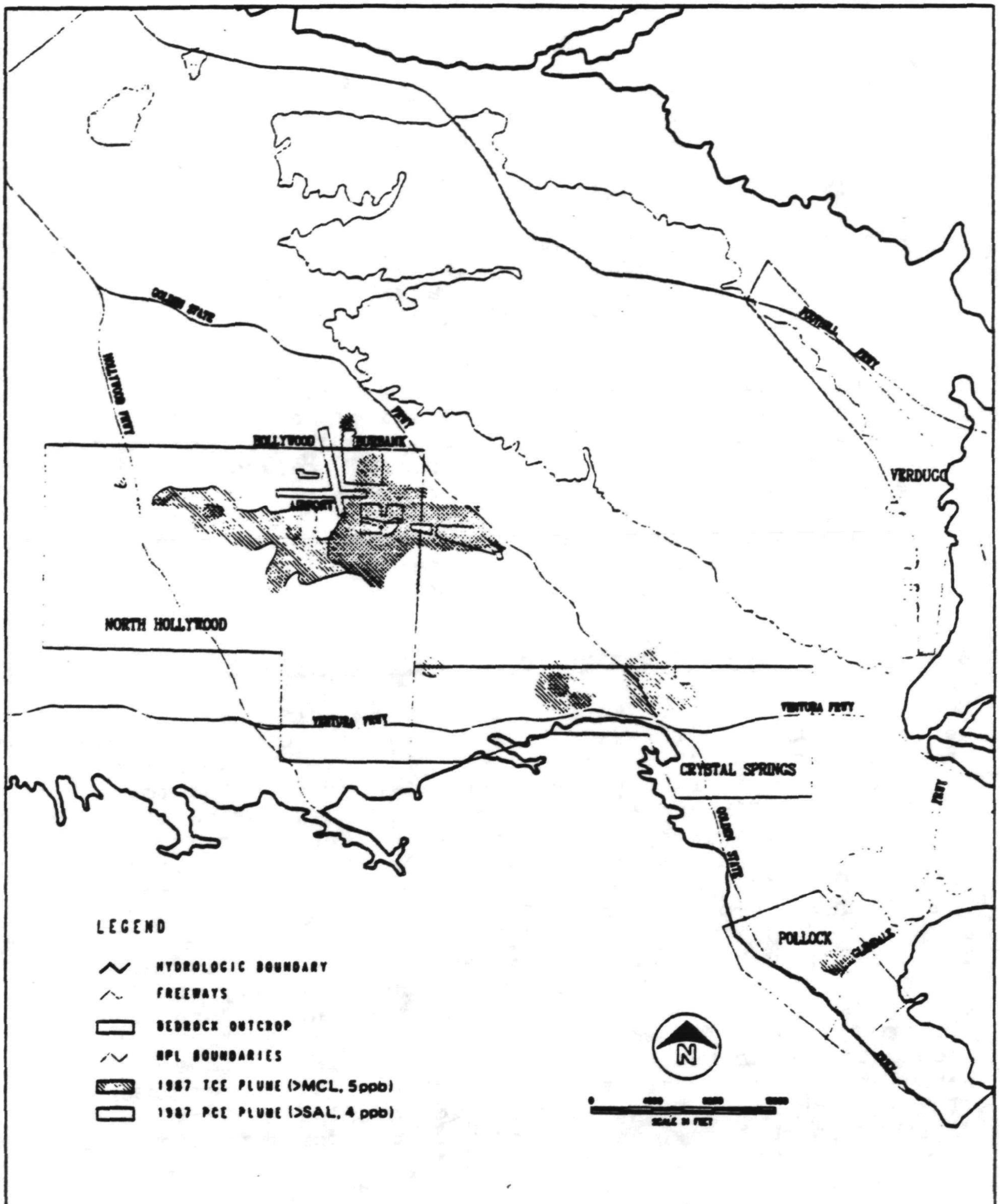


FIGURE 3 SAN FERNANDO VALLEY
1987 TCE AND PCE PLUMES

from one well had elevated concentrations of iron, the quality of the treated water from these wells is expected to meet Title 22 drinking water standards for metals.

The tables can be summarized as follows;

- o TCE and PCE are the principal contaminants of concern. TCE and PCE are industrial solvents commonly used in the metal degreasing and dry-cleaning industries. Both are animal carcinogens and are suspected of being carcinogenic to humans. The Federal MCL for TCE is 5.0 ug/L. The SAL for PCE is 4.0 ug/L and the proposed State MCL is 5 ug/L.

- o Other VOCs detected in trace quantities include methylene chloride, toluene, acetone, carbon tetrachloride, methylethylketone, and the THMs (chloroform, bromodichloromethane and dibromochloromethane). Methylene chloride is an industrial solvent commonly used in laboratories. It is carcinogenic in animals and is also a suspected human carcinogen. The SAL for methylene chloride is 40 ug/L. Toluene is an industrial solvent and a gasoline additive. It is carcinogenic in animals and is also a suspected human carcinogen. The SAL for toluene is 100 ug/L. Acetone is used as an industrial solvent and in the production of lubricating oils. A SAL for acetone has not been established. Carbon tetrachloride is an industrial solvent. It is carcinogenic in animals and is a suspected human carcinogen. The Federal MCL for carbon tetrachloride is 5.0 ug/L and the Federal MCLG is set at 0 ug/l. Methyethylketone is used as a solvent in nitrocellulose coatings and vinyl film manufacturing and in cements and adhesives. A SAL has not been established for methylethylketone. Most THMs found in finished drinking water are unwanted by-products caused by the chlorination process. THMs are formed by the chemical attack of hypochlorite on fulvic and humic acids. Chloroform also has a variety of industrial uses, including use as a solvent in lacquer manufacture. Chloroform is a suspected human carcinogen. The MCL for the sum of THMs is 100 ug/L.

- o The wells with the shallowest perforated intervals (PSD 10 and PSD 12) and the ones that are the furthest upgradient (PSD 9, PSD 10, PSD 11A, PSD 13, PSD 14A, PSD 17) have historically had the highest concentrations of TCE and PCE. In contrast, PSD 6, PSD 7 and PSD 15 have low or nondetected concentrations of VOCs. PSD 6 is likely at the edge of the lateral extent of the VOC plume, and PSD 7 and PSD 15 are likely at the leading edge of the plume. For relative location of wells see Figure 2.

TABLE 1

SUMMARY OF VOLATILE ORGANIC CHEMICALS DETECTED IN BURBANK PUBLIC SERVICES DEPARTMENT WELLS

Burbank PSD Well No.	TCE Range of Concentration (ug/L)	PCE Range of Concentration (ug/L)	Other (ug/L)	Notes
6A	ND-1.0	ND-1.0	---	---
7	ND--4.9	ND-1.0	---	---
9	15-61.6	144	---	Two data points (1981 & 1984) then well abandoned
10	110-1800	56-590	---	---
11A	10-21	18-35	---	---
12	0.7-38	1.0-33	Carbontetra-chloride 3.4	Trend toward increasing contamin-ation since 3/83
13	0.1-34	ND-52	Chloroform 2.0	Trend toward increasing contamin-ation since 4/85
14A	76	140	---	Average of 19 samples analyzed by Lockheed
15	ND-4.1	ND-1.0	---	---
17	5.8	5.3-8.3	---	---
18	ND-38	ND-63	Trace concentrations of Chloroform Dichlorobromomethane	---

TCE = Trichloroethene
PCE = Tetrachloroethene
ND = Below Detection Limit

Sources:
1. LADWP, Remedial Investigation of San Fernando Valley Groundwater Basin, Current Situation Report, January 29, 1988.
2. JMM. GC/MS Analysis of Volatile Organics for Selected Burbank Wells. 1987-1988.

TABLE 2

SUMMARY OF VOLATILE ORGANIC CHEMICALS DETECTED
DURING CONTINUOUS MONITORING
CITY OF BURBANK

Well No.	Sampling Date	TCE Concentration (ug/L)	PCE Concentration (ug/L)	Other	Detection Limits (ug/L)
6A	6/3/87	ND	ND	---	0.5
	7/2/87	ND	ND	---	0.1
	8/4/87	ND	ND	---	0.1
	9/3/87	ND	ND	---	0.5
	10/5/87	ND	ND	---	0.5
	10/28/87	ND	ND	---	0.1
	12/1/87	ND	ND	---	0.1
	1/5/88	ND	ND	---	0.1
	2/9/88	ND	ND	---	0.5
7	5/29/87	3.7	ND	---	0.1
	7/7/87	4.9	1.0	---	0.1
	8/4/87	1.0	ND	---	0.1
	9/3/87	1.0	ND	---	0.5
	10/5/87	0.5	ND	Methylethylketone (1.2)	0.5
	10/28/87	0.8	ND	---	0.1
	12/1/87	0.8	ND	---	0.1
	1/5/88	0.4	ND	Toluene (0.8)	0.1
	2/9/88	ND	ND	---	0.5
10	7/2/87	1800	590	---	10
12	10/28/87	31	29	---	1.0
	12/1/87	22	17	Carbon Tetrachloride (3.4)	0.5
	1/5/88	38	31	Chloroform (1.2)	1.0
	2/9/88	24	16	Carbon Tetrachloride (3.3)	2.5
13	6/3/87	1.3	1.3	---	0.5
	7/2/87	10	15	Carbon Tetrachloride Chloroform	0.1

1 No value reported means that the VOC was detectable, but not quantifiable.
2 Sampling difficulties on this date make results questionable. Use data with qualification.
TCE = Trichloroethene
PCE = Tetrachloroethene
ND = Below Detection Limit
Source = City of Burbank (Analyzed by Montgomery Laboratories)

TABLE 2 - Continued

SUMMARY OF VOLATILE ORGANIC CHEMICALS DETECTED
DURING CONTINUOUS MONITORING
CITY OF BURBANK

Well No.	Sampling Date	TCE Concentration (ug/L)	PCE Concentration (ug/L)	Other	Detection Limits (ug/L)
	8/4/87	21	25	Chloroform (2.0) Acetone (43)	1.0
	9/3/87	34	52	---	12.5
	10/5/87	24	43	Methylethylketone	2.5
	10/28/87	24	48	---	1.0
	12/1/87	20	38	---	0.5
	1/5/88	22	37	---	1.0
15	5/27/87	0.4	ND	---	0.1
	7/2/87	1.0	ND	---	0.1
	8/4/87	1.0	0.2	---	0.1
	9/3/87	1.0	ND	---	0.5
	10/5/87	0.9	ND	---	0.5
	10/28/87	1.0	0.2	---	0.1
	12/1/87	0.9	ND	---	0.1
	1/5/88	0.7	ND	---	0.1
	2/9/88	0.5	ND	---	0.5
18	6/3/87	ND	0.5	---	0.5
	7/2/87	0.9	0.4	---	0.1
	8/7/87	13	32	---	1.0
	9/3/87	37	58	---	12.5
	10/5/87	38	63	Methylethylketone	5.0
	10/28/87	33	10	Bromodichloromethane	1.0
	12/1/87	20	35	Bromodichloromethane Chloroform	0.5
	1/5/88[2]	6.0	13	Dibromochloromethane Chloroform Bromodichloromethane	1.0
	2/9/88	2.3	2.9	Toluene (0.5) Methylene Chloride (0.9)	0.5

1 No value reported means that the VOC was detectable, but not quantifiable
2 Sampling difficulties on this date make results questionable. Use data with qualification.
TCE = Trichloroethene
PCE = Tetrachloroethene
ND = Below Detection Limit
Source = City of Burbank (Analyzed by Montgomery Laboratories)

7.0 SUMMARY OF SITE RISKS

The purpose of the risk assessment is to evaluate the public health and environmental risks posed by the Burbank OU site. For the risk assessment evaluation, both a baseline risk assessment and a risk assessment for Alternative 5, phase 1 were conducted. This section describes the risk assessment process and results.

Baseline Risk Assessment: Analytical results from groundwater samples collected from City of Burbank production wells (PSD 6, 7, 10, 12, 15, and 18) between May 1987 and June 1988 form the groundwater database that were used in the Baseline Risk Assessment. In the Baseline Risk Assessments the current risks posed by domestic use of groundwater from the Burbank Well Field were estimated. The well field is currently not in use as a water supply. As a result, no receptors are currently being exposed.

A quantitative risk assessment was developed for two exposure source terms. One source term, "the potential average exposure," or the "most likely case" assumes that groundwater concentrations in the Burbank Well Field are at the geometric mean levels (averaged by well) and averaged across wells (arithmetic mean of geometric means). The other source term is a "plausible worse-case" and assumes that the receptor is exposed to the maximum contaminant level detected in any one well.

Assuming that groundwater from the well field is used for a lifetime, an individual receptor would be exposed to an excess cancer risk range (i.e., above the natural background risk) of approximately 2.0×10^{-4} to 1.7×10^{-3}. These risk values are at the highest range allowed by most regulatory agencies. For comparison, a lower excess risk range of 1.0×10^{-4} to 1.0×10^{-7}, with 10-6 departure, is used in CERCLA as a site remediation target.

The Baseline Risk Assessment concluded that, under the conditions postulated in the exposure assessment, the use of untreated groundwater from the Burbank Well Field as a domestic water supply for a lifetime would present an unacceptably high cancer risk. This conclusion assumes that the existing chemical analytical database sufficiently characterizes the groundwater contamination present.

It should be noted that the highest concentration levels found in the area were not used for the baseline risk assessment. In 1987, monitoring wells located near the Burbank well field showed concentrations as high as 18,000 ug/l for PCE and 3600 ug/l for TCE. Moreover, in February 1989, Lockheed Aeronautical Systems Company (LASC) was extracting groundwater with concentrations as high as 10,000 ppb for PCE and 2000 ppb for TCE at their treatment facility located within the Burbank OU area. If these concentrations observed at LASC had been used, the baseline risk assessment would have shown even higher risk.

<u>Alternative 5, phase 1 Risk Assessment</u>: A risk assessment was performed for Alternative 5, phase 1 (extracting and treating 12,000 gpm with dual stage air stripping and vapor phase GAC). Both LASC monitoring well data and Burbank production well data were used. (See the Burbank OUFS report for tables and more information.) The contaminant mass was calculated from estimates of the concentrations in the groundwater (ug/M^3) which would likely be extracted and treated by the system. The expected chemical mass discharged to the atmosphere (g/sec) was calculated with respect to the three different air pollution control options. The expected chemical mass discharge was input to an atmospheric dispersion model which calculated concentrations of the chemicals in the air (ug/M^3). The concentration in the air was modeled to be spatially distributed in a two-mile radius surrounding the proposed air stripper location (see Figure 2). The population estimated to reside within two miles of the site in 1990 is 94,195. The 2010 population is expected to be slightly lower at 93,765.

In the health risk assessment, three air stripping air emission control options for Phase I of Alternative 5 were examined:

- o No air pollution control;
- o air emission controls leading to 90 % removal of VOCs; and
- o air emissions control leading to 99 % removal of VOCs.

Two types of carcinogenic risk calculations were performed. The first type is independent of population and is termed the maximally exposed individual (MEI). The MEI is the site of highest estimated potential exposure calculated. The MEI is independent of whether the site is inhabited. The total cancer risk to the MEI is examined by the South Coast Air Quality Management District (SCAQMD) to ascertain if a proposed project is expected to exceed a total risk of 1×10^{-6}. The air modeling results conclude that the MEI occurs at a distance 0.1 to 0.2 miles from the site. The total excess estimated cancer risk (to the MEI) for the three different air emission control options are as follows:

- o no air pollution control: 5.98×10^{-6}
- o 90 % removal of VOCs: 4.07×10^{-7}
- o 99 % removal of VOCs: 4.07×10^{-8}.

The second type of risk calculation presented was for a population. For the population risk, the individual risk level is multiplied by the size of the potentially exposed population. The air concentrations generated by the air model, expressed as the associated risk, are superimposed on the 1990 and year 2010 population data for a two-mile radius. The predicted total excess population cancer burden in a two-mile zone under conditions of the various air emission control options estimated for the 1990 population data are as follows:

- o No air pollution control: 0.04 cancers/population;
- o 90% removal of VCCs: 0.003 cancers/population; and
- o 99% removal of VOCS: 0.0003 cancers/population.

Thus, less than one excess cancer would be expected to occur in the population due to the emissions from the project.

Non-carcinogenic risks or the "Hazard Index" (HI) were calculated by an approach similar to that used for carcinogens. The rule of thumb is that HI should not exceed one. The HIs calculated are several orders of magnitude less than one, for any of the three air emission control options examined. As a result, the predicted exposure to receptors due to the non-carcinogens emitted from the air stripping towers were concluded to be insignificant from a human health perspective. (See the Burbank OUFS report for more detail on the risk assessment analaysis.)

Although uncontrolled emissions are near EPA's acceptable excess cancer risk number of 1×10^{-6}, it is unacceptable to not control emissions because of the poor air quality in the Burbank area. Moreover, emission controls would be needed to comply with requirements of the SCAQMD Regulation 13. See Section 9, Compliance with ARARs for a more detailed explanation of the ARARs and other information To Be Considered (TBC).

8.0 DESCRIPTION OF ALTERNATIVES

Many technologies were evaluated based on these criteria during the Feasibility Study. Treatment technologies that may be applicable to groundwater contaminated with volatile organic compounds, primarily TCE and PCE, were screened based on two criteria: (1) their ability to meet the remedial response objectives; and, (2) the applicability and feasibility of the technology to the site conditions.

After the initial screening, six alternatives were evaluated using the following Superfund guidance criteria: technical and adminstrative feasibility, capital costs, operation and maintenance costs, environmental impacts, protection of public health and the environment, compliance with federal and state regulations, and community and state acceptance.

The following is a list of the alternatives analyzed and compared during the FS and found in the Burbank OUFS Report:

Alt 1 - No action
Alt 2 - Extract from existing wells/Treat/Reinject and Reuse
Alt 3 - Extract from new wells/Treat/Reinject and Reuse

Alt 4 - Extract from new and existing wells/Treat/ Spread and Reuse

Alt 5 - Extract from new and existing wells/ Treat/Reuse

Alt 6 - Extract from existing wells/Treat/Reuse.

The following descriptions give a summary of the alternative features. See the Burbank OUFS Report for more detail.

Alternative 1 - No Action Alternative

The No Action alternative served as a basis for comparing the other remedial alternatives. This alternative is evaluated to determine the risks that would be posed to public health and the environment if no action were taken to treat or contain the contamination. This alternative would include quarterly monitoring of the ten existing Burbank Public Service Department (PSD) wells. The monitoring program would help to ensure that groundwater would not be used when concentrations of VOCs exceed MCLs and SALs. It should be noted that currently all of the City of Burbank's wells have been shut down due to the VOC contamination and the City buys all its water from the Metropolitan Water District (MWD).

The Federal and State MCLs are relevant and appropriate in the aquifer.

Alternatives 2 - 6

Alternatives 2 through 6 include extraction of groundwater, treatment with air stripping with vapor phase GAC adsorption units, and discharge of the treated groundwater. The following is a description of the treatment system proposed in the Feasibility Study Report.

Air stripping (or aeration) is a method that removes VOCs from water by volatilization at the air-water interface. The pumped groundwater is run down through a vertical column which contains a packing medium. The medium provides surface area over which a countercurrent flow of air is introduced. The contaminant is transferred from the water to the air and thus removed from the water. The efficiency of the process is dependent on the nature of the contaminant, its influent concentration, the rate of air flow, and the available surface area afforded by the packing material. For TCE and PCE, removal efficiencies can exceed 99 percent. Aeration is a proven method and is commonly used to treat groundwater.

Dual stage air stripping uses two airstripping towers in series to remove contaminants from water. Treated water from the base of the first air stripping tower is pumped to the top of the second air stripping tower and aerated a second time. Dual stage air stripping is preferable to single stage air stripping because the contaminated water here is expected to have high levels of TCE and PCE.

Air stripping has two drawbacks with respect to public health and the environment. First, there is the possibility of low-level, longterm cancer risk to the local population due to the release of volatilized contaminants into the air. Secondly, this release of contaminants also contributes to air quality degradation which in turn affects human health and the environment.

Therefore if dual stage air strippers are used as the treatment technology, vapor phase GAC adsorption units will be installed to remove 90 - 99% of the VOCs discharged to the air. Air emission controls would minimize the negative impact on public health and the environment. (See Section 9, Compliance with ARARs, Community Acceptance and State Acceptance, for more detailed support documentation.)

It has been determined that pure product in the form of TCE and PCE (U210 and U228) are contained in the groundwater making RCRA Section 261.33 applicable for this action. The groundwater also contains spent TCE and PCE that was used in degreasing. The listing in 40 C.F.R. Subpart D Section 261.31 that pertains to spent halogenated solvents used in degreasing is F001. This listing requires knowledge of the percent solvent by volume before use. This information is unavailable for the Burbank OU making the RCRA F001 listing not applicable but relevant and appropriate for this action.

In Alternatives 2-6, the spent carbon is considered a RCRA waste or it is a mixture of the solid waste carbon and the RCRA listed wastes F001, U210, and U228 (40 C.F.R. Section 261.3(a)(2)(iv)). Therefore the carbon must satisfy the requirements of 40 C.F.R. Part 263 to be shipped off site for regeneration.

The Federal and State MCLs are relevant and appropriate in the aquifer. Moreover, the MCLs are the ARARs that will be met in the treated water. This water will be either reinjected, spread, or reused as a drinking water source.

Alternative 2 - Extract from Existing Wells, Treat, Reinject and Reuse

This alternative includes pumping 16,000 gpm of water from eight Burbank PSD wells (located west of the highest known TCE and PCE contamination) to an existing equalization basin, which would be retrofitted, to provide a uniform feed to the treatment facility. The water would be treated by eight sets of dual stage air strippers (AS) with vapor phase GAC adsorption units for the off-gas.

Treatment efficiency could produce effluent water of a quality that meets or exceeds all federal and state applicable or relevant and appropriate requirements (ARARs). Four thousand gallons per minute (4000 gpm) of the treated water would be introduced into Burbank's existing distribution system for reuse. The remainder of the treated water would be injected into the aquifer downgradient of the VOC plume to reduce VOC movement. The reinjection would help enhance plume containment and aquifer restoration. The treated water would be delivered to the injection field by a new pipeline to be constructed along Victory Boulevard.

After 20 years of extraction, concentrations of TCE and PCE in the groundwater would still exceed MCLs. Since the plume migration would be diverted from its current path towards Burbank's production wells, the PSD wells could produce groundwater with higher concentrations of PCE and TCE.

This alternative would be expected to reduce TCE concentrations in the aquifer from 3,200 ppb to 590 ppb in 20 years. This alternative would partially arrest the migration of the TCE and PCE plumes.

Six monitoring wells would be installed to monitor the performance of the system.

Since the groundwater has been determined to contain RCRA listed wastes, it must satisfy the requirements of RCRA Land Disposal Restrictions (LDR), 40 C.F.R. Section 268. The LDR defines the requirements for reinjection or land disposal. Therefore, the water must be treated to meet the Best Demonstrated Available Treatment Technology (BDAT) standards for spent PCE and TCE which are .079 ppm PCE and .062 ppm TCE (40 C.F.R. Part 268.42). Approval for reinjection would also be needed from the California Regional Water Quality Control Board - Los Angeles Region.

Approval for reuse would be required by California Department of Health Services (DHS) and the City of Burbank. EPA, DHS, and the City have already begun discussions over the possibiltiy of the City's reuse of the water.

There are some technical concerns over the operation of injection wells due to the uncertainities of the contamination plumes and operational effectiveness of injection wells.

Alternative 3 - Extract from New Wells, Treat, Reinject and Reuse

This alternative is similar to Alternative 2 except that ten new extraction wells would be constructed to extract the 16,000 gpm of contaminated groundwater. Although the cost of installing extraction wells would be greater than pumping the existing wells, the new wells would be optimally located to maximize the removal of contaminants from the groundwater. The treatment, disposal, and monitoring technologies would be the same as those employed in Alternative 2.

This alternative is estimated to reduce TCE concentrations from 3200 ppb to 81 ppb in the first 10 years, and more thereafter. It is estimated it would reduce PCE concentrations from over 4000 ppb to 30 ppb in 20 years. Alternative 3 would be successful in halting plume migration and in mitigating the VOC contamination (contributing to aquifer restoration).

Since the groundwater has been determined to contain RCRA listed wastes, it must satisfy the requirements of RCRA Land Disposal Restrictions (LDR), 40 C.F.R. Section 268. The LDR defines the requirements for reinjection or land disposal. Therefore, the water must be treated to meet the Best Demonstrated Available Treatment Technology (BDAT) standards for spent PCE and TCE which are .079 ppm PCE and .062 ppm TCE (40 C.F.R. Part 268.42). Approval for reinjection would also be needed from the California Regional Water Quality Control Board - Los Angeles Region.

Approval for reuse would be required by California Department of Health Services (DHS) and the City of Burbank. EPA, DHS, and the City have already begun discussions over the possibility of the City's reuse of the water.

There would be significant gains in aquifer restoration and control of the plume migration with this alternative.

Alternative 4 - Extract from New and Existing Wells/ Treat/Spread and Reuse

The major features of this alternative include extraction of 16,000 gpm from 10 new wells and 6,000 gpm from 5 existing wells, treatment with either dual stage or single stage AS with vapor phase GAC, reuse of 4000 gpm by the City of Burbank and discharge of 18,000 gpm to spreading grounds for recharge. Six monitoring wells would be installed to assess the effectiveness of the system.

Alternative 4 was developed to compare the option of groundwater recharge by spreading with groundwater recharge by injection. This comparison addresses uncertainties associated with the capacity, operation and maintenance of injection wells used in Alternatives 2 and 3, and the overall uncertainties associated with the characterization of plume contamination.

Because the treated water would not be reinjected into the aquifer downgradient of the VOC plume as in Alternatives 2 and 3, the extraction rate of contaminated groundwater would have to be higher to achieve a similar gradient reversal. In this alternative, the water from ten new extraction wells and five existing Burbank PSD wells would be pumped to an existing equalization basin, which would be retrofitted, to deliver two treatment streams to the treatment facility. The water would be treated by six sets of dual stage carbon air filtering units and five single-stage air strippers with carbon air filtering units, depending on the amount of water flowing into the system. Each treatment module would be designed to treat the water and air to meet the ARARS and TBCs (see Section 9, Compliance with ARARs).

Since the groundwater has been determined to contain the RCRA listed wastes F001, U210 and U228, it must be treated to "no longer contain" these listed wastes before being spread for recharge. (See Memorandum from Marcia E. Williams, Office of Solid Waste Director, to Patrick Tobin, Waste Management Division Director, regarding RCRA Regulatory Status of Contaminated Ground Water, November 13, 1986.)

Approval for reuse would be required by California Department of Health Services (DHS) and the City of Burbank. EPA, DHS, and the City have already begun discussions over the possibility of the City's reuse of the water.

This alternative is estimated to reduce TCE concentrations from 3,200 ppb to 122 ppb in 10 years and more thereafter. PCE concentrations are estimated to reduce from over 4000 ppb to 39 ppb in 20 years. There would be significant gains in aquifer restoration and control of the plume migration with this alternative.

The OUFS Report determined that spreading basins may be more reliable than injection wells.

Alternative 5 - Extract from New and Existing Wells/ Treat/Reuse

This alternative uses the same extraction, treatment, and monitoring technologies as those specified in Alternative 4. This alternative is unique in that all of the treated water would be used for potable water supply. The treated water would be at or below the federal and state MCLs and SALs (ARARs).

A portion of the treated water would be introduced into the Burbank PSD's existing distribution system for reuse, which would meet the City of Burbank's current average daily demand (12,000 gpm). The remainder of the treated water (10,000 gpm) could be introduced into the Metropolitan Water District (MWD) distribution lines.

Under this arrangement, the parties involved would have to enter into agreements for this exchange because the San Fernando Valley Groundwater Basin is an adjudicated basin and the net extraction of groundwater in this alternative would exceed the Burbank PSD's pumping rights. Also, MWD does not have any pumping rights. However, instutitional arrangements could be worked out between the LADWP and the other parties, since LADWP does have pumping rights. Preliminary discussions with the City of Burbank and

LADWP have been initiated and the parties are in agreement that adminstrative agreements could be arranged (for the reuse of 12,000 gpm).

Alternative 5 could be implemented in two phases. Phase 1 would consist of extracting 12,000 gpm from new wells, treating with dual stage AS with vapor phase GAC, and reusing the treated water by the City of Burbank. Phase 2 could consist of extracting the remainder 10,000 gpm (total 22,000 gpm) from new and existing wells, treating with AS with vapor phase GAC adsorption units and reusing by MWD customers.

It is estimated that Phase 1 would control most of the plume migration (100 ug/l TCE plume boundary and 5 ug/l PCE plume boundary) while aiding with aquifer restoration and the total project (phase 1 and phase 2) would reduce concentrations to the same levels as Alternative 4.

Due to the large size of the total project, and the uncertainities associated with the modeling and extent of contamination, EPA believed it was important to look at phasing Alternative 5; thereby, initiating the necessary remediation, while conducting further evaluations to refine technical features in order to maximize the effectiveness of the total project.

Alternative 6 - Extract from Existing Wells/Treat/Reuse

The technical features of this alternative include extracting 4000 gpm from two existing Burbank PSD wells, treating the water with dual stage AS with vapor phase GAC adsorption units, and reusing the treated water by the City of Burbank.

This alternative would not restrict the plume's migration, nor would it significantly aid in aquifer restoration.

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides a summary of the advantages and disadvatages of each of the alternatives' performance under the nine evaluation criteria.

Table 3 provides a summary of the analyses of alternatives. The alternatives were evaluated based on the following criteria for conducting feasibility studies:

(1) overall protection of human health and the environment,
(2) short term effectiveness in protecting human health and the environment,
(3) long-term effectiveness and permanence in protecting human health and the environment,
(4) compliance with ARARs,

Table 3
Summary and Costs of Alternatives ***

	1	2	3	4	5	6
Alternatives	No action includes the monitoring of 8 existing wells.	Extract 16,000 gpm from 8 existing wells. Treat with dual stage AS with vapor phase GAC. Dispose by injection in 10 new wells and reuse of 4,000 gpm. Injection wells placed to enhance containment.	Extract 16,000 gpm from 10 new wells. Treatment and disposal same as Alternative 2. Phased approach: Phase 1 75% capacity (12,000 gpm); and Phase 2, 25% additional capacity, (4,000 gpm)	Extract 16,000 gpm from 10 new wells and 6,000 gpm from 5 existing wells. Treatment same as Alternative 2 for Phases 1 and 2. Phase 2 treatment single stage AS. Disposal at spreading grounds and reuse of 4,000 gpm. Phased approach same as Alternative 3.	Extract and treat same as Alternative 4. Reuse of 22,000 gpm of treated water. Phased approach: Phase 1, 55% capacity (12,000 gpm) and Phase 2, 45% capacity (10,000 gpm)	Extract 4,000 gpm from 2 existing wells. Treat with dual stage AS with vapor phase GAC. Reuse 4,000 gpm of treated water.
Effectiveness & Permanence	Continued risk of groundwater contamination would be present. Reliance would be solely on institutional controls to prevent exposure.	After 20 years of extraction, concentrations of TCE in the groundwater would still exceed MCLs. Since plume migration would be diverted from its current path towards Burbank's production wells, wells could be contaminated to higher levels.	After 10 years of extraction, concentrations of TCE in the groundwater would still exceed MCLs. However, concentrations would be greatly reduced from those achieved in Alternative 2. Plume migration would be controlled as long as pumping continued or the aquifer was remediated.	Less effective than Alternative 3 but more effective than Alternative 2.	Same as Alternative 4.	Same as Alternative 2.
Reduction of Toxicity, Mobility, or Volume	No reduction toxicity, mobility, or volume since no treatment would be used.	Estimated to reduce TCE concentrations from 3,200 ug/l to 500 ug/l after 20 years. Continued contamination migration would occur but would be redirected towards the extraction wells.	Estimated to reduce TCE concentrations from 3,200 ug/l to 81 ug/l after 10 years. Plume migration would be effectively controlled and further aquifer contamination would not be expected.	Estimated to reduce TCE concentrations from 3,200 ug/l to 122 ug/l after 10 years. Plume migration would be less effectively controlled than in Alternative 3, but more more effectively controlled than in Alternative 2.	Same as Alternative 4.	Same as Alternative 1 except additional decrease of contaminant concentrations would be achieved by groundwater extractions.
Compliance With ARARS	Would not meet MCLs and state action levels.	Water discharged from the treatment system would meet MCLs and state action levels. Emissions from AS would be controlled by GAC.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Overall Protection of Human Health & Environment	Institutional controls would control risk of ingestion of contaminated groundwater. Environmental degradation would increase as groundwater contamination spread.	Institutional controls would control risk of ingestion of contaminated groundwater and monitor effectiveness of the treatment system. Environmental degradation could increase since a zone in the aquifer with apparently low contaminant concentrations could be contaminated to higher levels.	Institutional controls would be same as Alternative 2. Environmental degradation could be greatly reduced since the plume of groundwater contamination would be reduced in conentration and extent.	Institutional controls would be same as Alternative 2. Environmental degradation could be more effectively controlled than Alternative 2 but less effectively than Alternative 3.	Same as Alternative 4.	Same as Alternative 2.
Implementability	Monitoring wells would be easy to construct. Spread of the groundwater plume could make remediation more difficult in the future.	Monitoring would be needed to assess effectiveness of groundwater extraction. AS with vapor phase GAC is a proven technology. Approval for hookup would be needed from municipal authority. Operational effectiveness of injection wells may be questionable.	Same as Alternative 2.	Same as Alternative 2 except spreading basins could be more reliable than the injection wells.	Technical implementability would be the same as Alternative 2 for extraction and treatment. Administrative agreements would need to be developed between the City of Burbank, MWD, and LADWP to accomodate the exchange of water beyond the City of Burbank's water rights.	Same as Alternative 2 without injection wells
Cost ($1,000)					Phase 1 / Phase 2 / Total**	
Capital	0	38,600	43,400	42,300	25,100 / 7,000 / 32,100	Assumed to be 25% of the cost of Alternative 2, or $20,450.
O & M Total	60	46,200	44,700	52,900	43,900 / 10,300 / 54,200	
Total Present Worth*	500	81,900	88,100	95,200	68,000 / 17,300 / 88,300	

* Present worth evaluation assumes 10 percent annual interest rate and 20 years for the project life.
** Total cost of Phase 1 and Phase 2.
***As presented in the Final Draft Operable Unit Feasibility Study Report (October 1988)

(5) reduction of toxicity, mobility, and volume of contaminants,
(6) technical and administrative feasibility of implementation,
(7) state acceptance,
(8) community acceptance, and
(9) capital and operation and maintenance costs.

The nine criteria and the relative performance of the alternatives in relation to each criterion and each other is summarized below.

Overall Protection of Human Health and the Environment

Alternatives 3, 4, and 5 provide the best protection to human health and the environment. Environmental degradation would be reduced since the plume of groundwater contamination would be reduced in concentration and extent. Institutional controls would control the risk of ingestion of contaminated groundwater, since only treated water would be served. Drinking water would be provided via surface water from the MWD and/or treated groundwater from the stripping units.

Alternatives 1, 2 and 6 are not as protective of the environment because environmental degradation would increase over time. Alternative 1, the no action alternative, would allow the contamination to continue spreading. Although alternatives 2 and 6 extract and treat some of the contaminated groundwater, the extraction wells would not be strategically located to capture the higher groundwater contaminant concentrations. Institutional controls in Alternatives 1, 2, and 6 for the protection of drinking water would be the same as in Alternatives 3, 4, and 5.

Compliance with ARARS

This section will outline the Applicable or Relevant and Appropriate Requirements (ARARs) and other information that EPA considered for this site. Then it will compare the alternatives with one another regarding these ARARs and To Be Considereds (TBCs).

There are ARARs and TBCs that apply to both the water and air for this response action. These can be separated into chemical specific and primary action specific ARARs and TBCs.

Water ARARs and TBCs: There are chemical specific ARARs and TBCs for water which will be described here. First, the ARARs for the water are the Safe Drinking Water Act Maximum Contaminant Levels (MCLs). In accordance with the EPA "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements (OSWER Directive 9234.0-05)," the MCLs are considered the chemical-specific ARARs because they are the enforceable drinking water standards. They are required to be set as close to the Maximium Contaminant Level Goals (MCLGs) as is feasible, taking into consideration the best available technology, treatment techniques and other factors (including cost). They are also protective of public health to within EPA's acceptable carcinogen risk range of 10^{-4} to 10^{-7}. The MCL of particular importance for this response action is the MCL of 5 ppb for TCE.

MCLGs, which are based only upon health criteria, are not directly applicable as chemical-specific requirements because they are not enforceable standards.

EPA also considered the California DHS's action levels for VOCs, a few of which are more stringent than the MCLs or for which no MCL has been established. While the DHS action levels are not promulgated standards and are not, therefore, ARARs, they have been taken into consideration during development of remedial action alternatives as allowed for in the National Contigency Plan (NCP). In addition, DHS has recently proposed MCLs for a number of VOCs. Of particular significance, the proposed MCL for PCE is 5 ppb, which is just slightly higher than the current DHS action level of 4 ppb.

Table 4 lists the federal MCLs, MCLGs and SALs for the primary contaminants detected in the Burbank Operable Unit area. The remedial action selected will meet the federal MCL for TCE (< 5ppb) and the SAL for PCE (< 4 ppb).

It has been determined that pure product in the form of TCE and PCE (U210 and U228) are contained in the groundwater making RCRA Section 261.33 applicable for this action. The groundwater also contains spent TCE and PCE that was used in degreasing. The listing in 40 C.F.R. Subpart D Section 261.31 that pertains to spent halogenated solvents used in degreasing is F001. This listing requires knowledge of the percent solvent by volume before use. This information is unavailable for the Burbank OU making the RCRA F001 listing not applicable but relevant and appropriate for this action.

Air ARARs and TBCs: There are primary action-specific ARARs and TBCs for the air discharge which will affect this response action. In California, the authority to regulate stationary sources of emissions has been delegated to local air quality management districts. The Burbank OU is located in the South Coast Air Quality Management District (SCAQMD). Therefore, SCAQMD regulations constitute generally applicable, promulgated state requirements under state environmental law, as set forth in section 121(d) of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

EPA considered SCAQMD Regulation XIII (comprising Rules 1300 to 1313), which requires that stationary sources of air emissions meet best available control technology (BACT) standards. Regulation 13 states that new stationary sources of air contaminants in the air basin that emit reactive organic gases must employ BACT air pollution control devices. These BACT devices are defined as

Table 4
MCLs, MCLGs and State Action Levels for
Primary Organic Contaminants Detected in the
Groundwater Beneath the Burbank Operable Unit Area

	Federal Maximum Contaminant Level (MCL)[a] (ug/l)	Federal Maximum Contaminant Level Goal (MCLG)[a] (ug/l)	State Action Level (SAL)[b] (ug/l)
Trichloroethene (TCE)	5	zero	5
Perchloroethene (PCE)	-	-	4[c]
Carbon tetrachloride (CTC)	5	zero	5[c]
Chloroform	100[d]	-	-

Notes: '-' Indicates that there is not a set level.

[a]MCL and MCLG are set by the United States Environmental Protection Agency.

[b]SALs are set by the California Department of Health Services (DHS)

[c]DHS has recently proposed establishing State MCLs for PCE and CTC of 5 and 0.5 ug/l, respectively.

[d]Value reported is total trihalomethanes (chloroform, dibromochloromethane, bromodichloromethane, and bromoform).

"the most stringent emission...control technique which... is found... to be technologically feasible and cost effective...." (See the Administrative Record for the Burbank OU for a copy of Regulation XIII.) It is estimated that, if there are no emissions controls, the air strippers contemplated for the Burbank OU would emit over 168 pounds per day of reactive organic gases to the atmosphere. For air strippers, SCAQMD considers vapor phase GAC (with 90 to 99% removal efficiency) devices to be BACT.

EPA also considered SCAQMD Rules 1401 and 1167 as "other information to be considered," pursuant to the NCP.

Proposed Rule 1401 - New Source Review of Carcinogenic Air Contaminants - specifies limits for individual cancer risk and excess cancer cases from new stationary sources which emit carcinogenic air contaminants. The rule requires BACT for toxic air discharge for new stationary sources where a lifetime maximum individual cancer risk of one in one million or greater is estimated to occur. TCE is a listed carcinogenic air contaminant. Results from the public health assessment show that TCE emissions after treatment on the vapor phase would meet Rule 1401's requirements.

Rule 1167's purpose is to control VOCs as precursor emissions to ozone formation in the South Coast Air Basin. The South Coast Air Basin is currently in nonattainment status with respect to the National Ambient Air Quality Standards (NAAQS) for ozone, and VOCs are known precursors to ozone formation. Rule 1167 is designed to reduce VOC emissions from new and existing air stripping equipment used for treatment of contaminated water. The rule requires that all air stripping facilities treating contaminated groundwater that emit more than one pound per day of total VOC emissions install air emission controls capable of reducing air emissions by 90%.

Although Rule 1167 was stayed by the California Superior Court until an Environmental Impact Report is completed, it is considered in the remedy selection process as a TBC since SCAQMD fully intends to meet the requirements set by the court judgment and proceed toward adoption of this rule as a promulgated, legally enforceable, generally applicable requirement in the near future.

Installation of an air stripping system with air emission controls is more protective of the environment in that it will reduce ozone precursor emissions to the atmosphere by 90 to 99% and will support efforts by SCAQMD to reach attainment status for ozone in the South Coast Air Basin.

Comparision of Alternatives: Alternative 1, the no action alternative, would meet the drinking water ARARs because institutional controls would continue to assure that the public was provided

with drinking water that meets the federal and state MCLs and SALs. Also since no system would be in place, the SCAQMD's rules would not be violated.
Water treated and discharged from alternatives 2 - 6 would meet the federal and state MCLs and SALs before reuse, injection or spreading. Air stripping systems would have vapor phase GAC adsorption units to control air emissions to 90 - 99% removal efficiency to meet the South Coast Air Quality Management District's rules. Steam stripping would recover the VOCs for recycling so no air emission control system would be necessary.

However, Alternatives 1, 2, and 6 do not do as much as Alternatives 3, 4, and 5 to meet federal and state MCLs in the aquifer. Alternatives 3, 4, and 5 more effectively aid in restoring the aquifer (to VOC concentrations at or below the MCLs and SALs) and controlling the plume migration.

By meeting the federal and state MCLs and SALs before reinjection, Alternatives 2 and 3 will satisfy the RCRA Land Disposal Restrictions requirements. By meeting the federal MCLs and SALs, the groundwater will no longer contain the listed wastes when it is spread for recharge in Alternative 4.

For Alternatives 1 - 6, the MCLs are relevant and appropriate in the aquifer. Upon completion of the final remedial action for the site, this ARAR will be satisfied.

Long-term Effectiveness and Permanence

Alternatives 3,4, and 5 would have the greatest ability to maintain reliable protection of human health and the environment over time. After 20 years of extraction, concentrations of TCE and PCE in the groundwater are expected to still exceed the federal MCLs and SALs, however they would be greatly reduced as discussed in the previous section. Plume migration would be controlled and aquifer restoration would continue as long as the system kept operating.

Alternatives 1,2, and 6 do not offer long term effectiveness or permanence. In fact, these alternatives might allow contamination to spread to clean zones within the SFVB.

Alternative 1 relies solely on institutional controls to prevent exposure to the contaminanted groundwater. The current water supply from surface water via the MWD may not always be available in the future because of peiodic drought conditions and State and Federal water rights issues.

Reduction of Toxicity, Mobility, or Volume

Alternatives 3, 4, and 5 offer the most reduction of toxicity, mobility, and/or volume of the contamination. The most contaminated groundwater in the Burbank OU area would be extracted and treated to remove the VOCs from the groundwater, thus the VOC contamination in the groundwater would be greatly reduced in toxicity, volume and mobility. Moreover, the air emission control units would reduce the mobility of the VOCs to the air.

Alternative 1 would have no reduction in toxicity, mobility, or volume since no treatment is employed.

Alternative 2 would reduce the volume of contamination by extracting and treating 16,000 gpm. Alternative 6 would reduce the volume of contamination by extracting and treating 4000 gpm. However, the existing wells used for alternatives 2 and 6 would not be stratigically located to control migration or capture the contamination. Therefore, continued contaminant migration would occur and a lesser amount of contamination would be captured then for alternatives 3, 4, and 5.

Short Term Effectiveness

For alternatives 3, 4, and 5, no adverse impacts would be expected during the construction and implementation period or remediation. Drinking water supplies would be provided from treated groundwater and/or surface water from the MWD during the interim before construction complete and during remediation. Institutional controls would assure that all drinking water would meet drinking water standards. The plume migration would be effectively controlled with these alternatives and aquifer restoration would be initiated in this area.

Alternative 1, the no action alternative, would not be effective in controlling migration or aquifer restoration. It would allow the contaminanted groundwater to spread to uncontaminated downgradient wells. There would be sole reliance on institutional controls to prevent exposure via drinking water ingestion.

Alternative 2 and 6 would be more effective than alternative 1. There would be less reliance on institutional controls for drinking water, since treated groundwater that meets MCLs and SALs would be served, as a portion of the total drinking water supply for the affected areas. However, these alternatives would not be as effective in controlling plume migration and in aquifer restoration as alternatives 3, 4, and 5.

Implementability

Alternatives 1 - 6 would all be technically implementable. However, Alternative 5 appears the easiest to implement with the current information, due to the practical uncertainities associated with injection and spreading and the technical uncertainties associated with plume location and migration.

Construction of monitoring wells for all alternatives is straight forward, using well known technology. There are many monitoring wells in the SFVB.

Alternatives 2 - 6 would employ air stripping with vapor phase GAC adsorption units (or steam stripping*) which is a proven treatment technology and relatively easy to implement. Administrative agreements would be needed for the use of treated groundwater. Approval for hookup to the City of Burbank would also need to be arranged prior to distribution. Preliminary discussions have already taken place and no significant problems have been identified.

Alternative 5 would require agreements between the City of Burbank, LA DWP, and MWD to accomodate the exchange of water beyond the City of Burbank's extraction credits. However, preliminary discussions between EPA and the affected parties regarding the reuse of the water have shown that the agreements could be arranged.

The use of injection wells in alternatives 2 and 3 could be difficult to implement technically due to operational problems encountered with injection wells and the unknowns associated with extent of contamination. Further spread of contamination could occur if the injection wells were improperly placed.

Spreading in Alternative 4 could be more reliable than the injection wells. However, there are also uncertainities associated with possible contamination in the area of the spreading grounds. An additional load from discharging the water by spreading could cause further contamination of the area by enhancing movement of the contaminants in the soil and/or groundwater.

Alternatives 1 and 6 would allow the contamination to spread and thus make remediation more difficult in the future.

Cost

Alternative 1 would be the least expensive with an expected present worth value of $500,000. (Present worth evaluations assume 10% annual interest rate and 20 years for the project life.)

Alternative 2 has an estimated capital cost of $36.6 million and total O&M of $45.2 million. The expected present total worth value is $81.8 million.

Alternative 3 has an estimated capital cost of $43.4 million and total O&M of $44.7 million. The expected present total worth value is $88.1 million.

Alternative 4 has an estimated capital cost of $42.3 million and total O&M of $52.9 million. The expected present total worth value is $95.2 million.

* Steam stripping is discussed in Section 10, Documentation of Significant Changes.

Alternative 5 has an estimated capital cost of $32.1 million ($25.1 M for phase 1 and $7.0 M for phase 2) and total O&M of $54.2 million ($43.9 M for phase 1 and $10.3 M for phase 2). The expected present worth value is $86.3 million ($69.0 M for phase 1 and $17.3 M for phase 2).

Alternative 6 is assumed to be 25% of the cost of Alternative 2, or $20.5 million.

The cost summaries can be found in greater detail in the Burbank OUFS Report.

Community Acceptance

Alternatives 3, 4, and 5 received the most community acceptance. The community generally wants the aquifer restored for beneficial use and the plume migration halted as soon as possible.

Community Workgroup members expressed some concern over reinjection and spreading due to the uncertainties associated with the extent of contamination. Their concern was that reinjection or spreading could contribute to the spread of contamination if the wells or spreading areas were improperly located. Therefore Alternative 5, the water reuse option, was most attractive to the community workgroup.

The community feels strongly that air emission controls must be employed due to the poor air quality in the Burbank area. EPA addresses this concern with the requirement that vapor phase GAC adsorption units would be installed if air stripping is used.

The Response Summary (attached) addresses more specific concerns and comments raised during the public comment period.

State Acceptance

Like the community, the State (DHS and RWQCB) wants aquifer restoration and control of the plume migration initiated as soon as possible.

They prefer Alternative 5 because they (like the community) have concerns with regards to the reinjection and spreading options associated with Alternatives 3 and 4. (See previous discussion.)

They also believe it is important to have air emission controls on the air stippers. Moreover, the SCAQMD insists that if aeration is used to treat the water that vapor phase GAC adsorption units (or comparable BACT) be installed.

California DHS has concurred with the Burbank OU remedy selection.

10. Documentation of Significant Changes

The Proposed Plan was released for public comment in October 1988. The Proposed Plan identified Alternative 5, phase 1, extraction, treatment, and reuse, as the preferred alternative.

Dual stage air strippers with vapor phase GAC adsorption units were chosen as the preferred treatment technology. During the public comment period, a potentially responsible party, Lockheed Aeronautical Systems Company (LASC), presented EPA with a similar treatment technology - steam stripping, more specifically, the AquaDetox system.

In the Burbank OUFS Report, conventional steam stripping was screened out because TCE and PCE are highly volatile compounds which are easily removed from water without input of heat. Furthermore, the expected concentrations of TCE and PCE were not high enough to warrant the added energy input. Therefore, steam stripping was not considered cost effective and was not considered further in the OUFS.

Steam stripping with the AquaDetox system was also screened out during the Burbank OUFS on the basis that adequate experience did not exist either for AquaDetox systems without external steam supply or for the effluent to be used as drinking water.

The AquaDetox process is a proprietary and patented steam stripping technology developed by AWD Technologies, Inc., which uses steam stripping under moderate or deep vacuum pressure. While conventional steam stripping was considered not applicable because of its higher cost than air stripping, the AquaDetox system, may be cost-effective due to the lower energy requirements. Other claimed advantages of the system are : (1) the VOCs can be recovered for recycling instead of discharged to the air or carbon, and (2) it is a closed loop system and therefore there is minimal VOC discharge to the air (< 1 lb/day, given estimated groundwater VOC concentrations).

The AquaDetox system under moderate vacuum pressure was selected by LASC for groundwater treatment at a site within the Burbank OU area. This 1200 gpm extraction and treatment facility began operation in January 1989 and should provide performance data relative to the use of this technology in the removal of the VOCs.

Information on the influent from the LASC AquaDetox extraction and treatment system is showing higher concentration levels for TCE and PCE than estimated in the Burbank OUFS Report. LASC's treatment facility is extracting groundwater with concentrations up to 12,000 ppb PCE and TCE combined (as of February 1989). Therefore steam stripping may be more applicable (e.g. economical) than originally thought due to the higher concentrations and added stripping efficiency of steam stripping.

Since air and steam stripping fall under the same class of treatment - stripping - either technology can be employed to meet the performance standards, therefore achieving the stated Burbank Operable Unit objectives.

Air stripping was used during the discussion of the description of alternatives and comparision analysis. However, the selected remedy will be either air or steam stripping, as long as the steam stripping meets the performance standards and is as effective as the air stripping in meeting the evaluation criteria. This allows flexibility during the remedial design to procure the most cost-effective unit that also protects human health and the environment.

11.0 THE SELECTED REMEDY

Alternative 5, phase 1, using either steam or air stripping for treatment, is the selected remedy for the Burbank Operable Unit. The remedy includes extraction of contaminated groundwater, treatment by stripping, and reuse of the water by the City of Burbank for drinking water. If air stripping is chosen during the remedial design, vapor phase GAC adsorption units will be needed to comply with the ARARs and TBCs.

The extraction system will be designed to capture groundwater containing 100 ppb or greater of TCE and 5 ppb or greater of PCE. The extraction flow rate is currently projected to be 12,000 gpm.

The Federal and State MCLs are relevant and appropriate in the aquifer. Upon the completion of the final remedial action for the site, this ARAR will be satisfied.

Although it was estimated in the Burbank OUFS report that extraction at a rate of 16,000 gpm coupled with injection wells for a period of 20 years was necessary to fully remediate the Burbank OU area (i.e. removing groundwater until that left contained contaminants to concentration levels at or below MCLs and SALs), the decision to pump and treat 12,000 gpm was determined to be the most appropriate given the amount of technical information currently available. More information will be gathered during the basinwide RI, North Hollywood OU remedy operation, LASC's extraction and treatment system, Burbank OU remedial design, and the operation of the Burbank OU treatment system to determine whether more extraction is necessary to continue aquifer restoration and controlling the migration of the plume. If additional extraction is determined necessary, EPA would again go out for public comment with a Proposed Plan before signing another Record of Decision.

Extraction wells will be strategically placed (both laterally and vertically) to maximize the effectiveness of the system. The locations presented in the OU may be modified if warranted by new data. Stripping is the chosen treatment. LASC is conducting a treatability study with its AquaDetox system. This will help determine whether steam stripping will be used for the OU remedy. Air stripping with vapor phase GAC adsorption units will be used unless steam stripping is shown to meet or exceed the treatment advantages of air stripping with vapor phase GAC. EPA may also decide to use the two technologies together if that would maximize efficiency.

The VOCs - particularly the primary contaminants, TCE and PCE - in the groundwater must be removed from the groundwater such that treatment plant effluent concentrations are below the Federal MCLs and SALs (TCE - 5 ppb and PCE - 4 ppb). The water must also meet all drinking water standards. This may require further treatment like chloramination for disinfection purposes, or reverse osmosis or ion exchange for nitrates.

The treated water will be fed directly into Burbank's distribution system for reuse by the City's residents.

Monitoring wells will be installed downgradient to monitor the performance of the system.

The extraction of contaminated groundwater from the Burbank OU area, treatment of groundwater to drinking water standards, and distribution of the water to the Burbank residents is the most cost effective and technically sound means of meeting the OU objectives.

The selected remedy permanently and significantly reduces the toxicity, mobility, and volume of hazardous substances with respect to their presence in the groundwater -- the contaminants are removed from the groundwater, thereby reducing contaminant migration in the vicinity of the Burbank OU area.

Stripping will result in a small increase in the toxicity, mobility, and volume of hazardous substances with respect to their presence in the air. However, the use of steam stripping recovers most of the VOCs for recycling. If dual stage air stripping is used for treatment, vapor phase GAC adsorption units will be installed to minimize the amount of VOCs discharged to the air.

The air emissions are estimated to add a minimal risk to the project via airborne contaminants, because the air emission controls will remove 90 - 99% of the contaminants before they are discharged to the air. The addition of vapor phase GAC adsorption units meets the ARARs and TBCs discussed in Section 9, Compliance of ARARs.

The spent carbon from the vapor phase GAC adsorption system is considered a RCRA waste or it is a mixture of the solid waste carbon and the RCRA listed wastes F001, U210, and U228 (40 C.F.R.

Section 261.3(a)(2)(iv)). Therefore the carbon must satisfy the requirements of 40 C.F.R. Part 263 to be shipped off site for regeneration.

The pump and treat system will operate for an estimated 20 years. Groundwater monitoring and groundwater level measuring will be conducted as part of the remedy to track contaminant concentrations in the Burbank OU area, to monitor the performance of the treatment system and to determine the efficiency of the system in restoring the aquifer. The system will be evaluated periodically to determine the effeciency and necessity of the remediation in achieving the stated goals. The reviews will allow for modification in the system as required.

For reference, the estimated cost of the selected remedy with the use of dual stage air stripping with vapor phase GAC adsorption units is $69M (see Table 5). LASC's Remedial Action Alternative for the Burbank Well Field Operable Unit gives a cost estimate of $50.1 Million net present value for the Burbank OU remedy using the AquaDetox sytem instead of the AS with vapor phase GAC adsorption units. Although LASC's alternative is similar to Alternative 5, phase 1 in the Burbank OUFS Report, LASC's alternative does have some different features. (LASC's report can be found in the Administrative Record.)

12.0 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment -- as required by Section 121 of CERCLA -- in that it treats the extracted groundwater so that remaining contaminants are at or below the MCLs and SALs for the contaminants of concern.

Stripping has been shown to be the most cost effective technology for treating the concentrations of VOCs found in the groundwater from the Burbank OU area. Although the addition of air emission controls (GAC) to the dual stage air strippers (if steam stripping fails to pass the treatability studies) will increase the cost of the selected remedy, it is determined to be justified as a cost-effective measure for the following reasons:

(1) It meets the requirements of SCAQMD Regulation XIII, the ARAR for air discharge from the air stripping treatment; (2) It reduces ozone precursor emissions in a nonattainment area (the South Coast Air Basin) that has the worst air quality in the nation; and (3) It responds to public comments requesting air emission controls to minimize the increase in existing air quality problems regardless of legal requirements.

The selected remedy (either air or steam stripping) meets the ARARs and TBCs that apply to this response action. The selected remedy will meet the Safe Drinking Water Act MCLs and the CA DHS

Table 5
Cost Summary for Alternative 5, phase 1
(air stripping, with vapor
phase GAC)

Item/Description	Estimated Cost ($)
CAPITAL COSTS	
Extraction and Pipeline to Treatment System	5,125,000
Treatment (Dual-Stage as with Vapor Phase GAC)	6,740,000
Connection to Burbank PSD Distribution System	25,000
Monitoirng Well	2,220,000
CAPITAL COSTS	$14,100,000
Fees and Contingencies	4,510,000
Engineering, Legal, Administration	6,520,000
TOTAL CAPITAL REQUIREMENT	$25,100,000
OPERATION AND MAINTENANCE COSTS	
Extraction	793,000
Treatment	3,465,500
Monitoring	33,200
Contingencies	
TOTAL ANNUAL COSTS	$ 4,300,000
Present Worth of O&M Costs (Interest rate = 10%; Years = 20; Present Worth Factor = 8.51)	$43,900,000
TOTAL PRESENT WORTH COST	$69,000,000

State Action Levels in the extracted groundwater that is treated for reuse. Upon the completition of the final remedial action for the site, the MCLs will be met in the aquifer.

It will also meet the SCAQMD's Regulation XIII and Rules 1167 and 1401 by adding air emission controls to the air strippers or using steam stripping.

Finally, it will meet the RCRA requirements as specified in 40 C.F.R. Section 261 and 263. RCRA Subpart B, 40 C.F.R. 261 - Criteria for Identifying Listed Hazardous Waste - identifies the waste as relevant and appropriate to FOO1 and applicable for U210 and U228. RCRA Part 263 - Standards Applicable to Transporters of Hazardous Waste - specifies compliance with the manifest system for shipment of the spent carbon off-site for regeneration.

The solvent product generated from steam stripping is not considered a RCRA waste if in accordance with 40 C.F.R. Section 261.2(e)(i)(ii) materials are not solid wastes when they can be shown to be recycled by being used or reused as effective substitutes for commercial products.

The selected remedy permanently and significantly reduces the toxicity, mobility and volume of hazardous substances with respect to their presence in groundwater. The contaminants are removed from the groundwater, thereby reducing contaminant migration and restoring the aquifer in the vicinity of the Burbank OU area. The stripping technology will result in a very slight increase in the toxicity, mobility, and volume of hazardous substances with respect to their presence in the air.

Air stripping with vapor phase GAC increases the volume of contamination in the air by transferring that volume, which is not trapped into the carbon for regeneration, from the water to the air. Steam stripping slighty increases the volume of contamination in the air by transferring that volume, which is not recovered as product for recycling, from the water to the air. The VOC volumes released by either method will not exceed the SCAQMD's limits.

The inclusion of air emissions control (vapor phase GAC adsorption units) in the selected remedy (if air stripping is used) reduces the impact of the air emissions in a cost-effective manner to the maximum extent possible. The air emissions are estimated to add a minimal risk to the project via airborne contaminants. The minimal risk addition is due largely to the capabilities of the vapor phase GAC adsorption units to remove 90 to 99% of the contaminants in the air discharged to the atmosphere from the stripper. With the addition of air emission controls, the selected remedy reduces the potential for ozone formation.

Both air and steam stripping meet the statutory preference for remedies that use alternative treatment or resource recovery technologies to the maximum extent practicable. Steam stripping under vacuum pressure is an innovative technology that recovers the VOCs for reuse. If the dual stage air stripping with vapor phase GAC adsorption units is used, the spent carbon from the GAC off-gas treatment system will be regenerated, instead of being disposed of in a landfill. Therefore, the VOCs will be collected for reuse or destroyed.