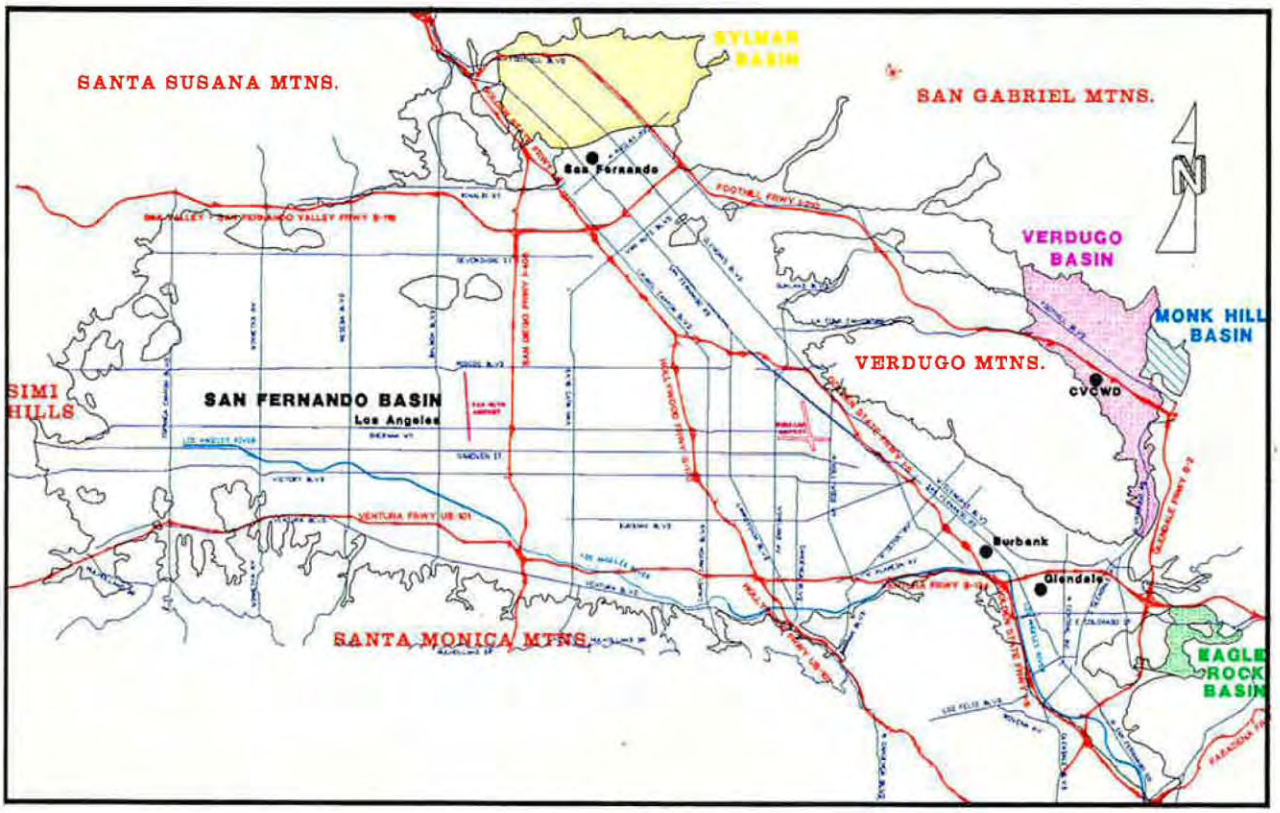
UPPER LOS ANGELES RIVER AREA WATERMASTER

CITY OF LOS ANGELES VS. CITY OF SAN FERNANDO, ET AL
CASE NO. 650079 - COUNTY OF LOS ANGELES

WATERMASTER SERVICE
IN THE
UPPER LOS ANGELES RIVER AREA
LOS ANGELES COUNTY

1992-93 WATER YEAR
OCTOBER 1, 1992 - SEPTEMBER 30, 1993



MAY 1994

FOREWORD

As Watermaster for the Upper Los Angeles River Area (ULARA), I am pleased to submit this report of the water supply in accordance with the provisions of the Final Judgment signed by the Los Angeles Superior Court on January 26, 1979.

This report describes the water rights in each basin, lists the allowable pumping for the 1993-94 Water Year and indicates the water in storage to the credit of each party as of October 1, 1993. In addition, this report includes background information on the history of the San Fernando Case, information as to each basin and the ULARA in total on water supply, ground water extractions, ground water levels, quantities of imported water use, recharge operations, water quality conditions, and other pertinent information occurring during the 1992-93 Water Year pursuant to the provisions of the Judgment.

Updates on the development of significant issues that took place through the printing of this report are discussed in Section 1.5: Significant Events. These include the changes in the ULARA Policies and Procedures, the conclusion of the Headworks Pilot Project, the progress of the EVWRP, the re-development of the Pollock Well Field, Burbank's reclaimed system expansion, the Burbank Consent Decree Project, the Glendale EPA Project, and the Glendale Water Treatment Plant in the Verdugo Basin. The progress of the San Fernando Valley Remedial Investigation/Feasibility Study is discussed in Section 3.6: San Fernando Valley Remedial Investigation (RI) and Related Activities.

In dealing with the amount of stored ground water, change in ground water storage and the ground water contours for the ULARA, eight additional monitoring wells are required at the general locations shown in Appendix L. These monitoring wells would provide more control on the status of ground water levels and underflow calculations required by the ULARA Judgment. I strongly recommend that these wells be installed to ensure adequate ground water management for the future.

I wish to acknowledge and express appreciation to all parties that have provided information and data which were essential to the completion of this report.

Sincerely,

MELVIN L. BLEVINS
ULARA Watermaster

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1992-93 WATER YEAR
OCTOBER 1, 1992 - SEPTEMBER 30, 1993

ULARA WATERMASTER

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MAY 1994

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1. INTRODUCTION

1. INTRODUCTION

1.1 Background

The Upper Los Angeles River Area (ULARA) encompasses all the watershed of the Los Angeles River and its tributaries above a point in the river designated as Los Angeles County Department of Public Works (LACDPW) Gaging Station F-57C-R, near the junction of the Los Angeles River and the Arroyo Seco (Plates 1 and 5). ULARA encompasses 328,500 acres, composed of 122,800 acres of valley fill, referred to as the ground water basins, and 205,700 acres of hills and mountains. ULARA is bounded on the north and northwest by the Santa Susana Mountains; on the north and northeast by the San Gabriel Mountains; on the east by the San Rafael Hills, which separate it from the San Gabriel Basin; on the south by the Santa Monica Mountains, which separate it from the Los Angeles Coastal Plain; and on the west by the Simi Hills.

ULARA has four distinct ground water basins. The water supplies of these basins are separate and are replenished by deep percolation from rainfall, surface runoff and from a portion of the water that is delivered for use within these basins. The four ground water basins in ULARA are the San Fernando, Sylmar, Verdugo, and Eagle Rock Basins.

The San Fernando Basin, the largest of the four basins, consists of 112,000 acres and comprises 91.2 percent of the total valley fill. It is bounded on the east and northeast by the San Rafael Hills, Verdugo Mountains, and San Gabriel Mountains; on the north by the San Gabriel Mountains and the eroded south limb of the Little Tujunga Syncline which separates it from the Sylmar Basin; on the northwest and west by the Santa Susana Mountains and Simi Hills; and on the south by the Santa Monica Mountains.

The Sylmar Basin, in the northerly part of ULARA, consists of 5,600 acres and comprises 4.6 percent of the total valley fill. It is bounded on the north and east by the San Gabriel Mountains; on the west by a topographic divide in the valley fill between the Mission Hills and the San Gabriel Mountains; on the southwest by the Mission Hills; on the east by the Saugus formation along the east bank of the Pacoima Wash; and on the south by the eroded south limb of the Little Tujunga syncline, which separates it from the San Fernando Basin.

The Verdugo Basin, north and east of the Verdugo Mountains, consists of 4,400 acres and comprises 3.6 percent of the total valley fill. It is bounded on the north by the San Gabriel Mountains; on the east by a ground water divide separating it from the Monk Hill Subarea of the

Raymond Basin; on the southeast by the San Rafael Hills; and on the south and southwest by the Verdugo Mountains.

The Eagle Rock Basin, the smallest of the four basins, is in the extreme southeast corner of ULARA. It comprises 800 acres and consists of 0.6 percent of the total valley fill.

1.2 History of Adjudication

The water rights in ULARA were established by the JUDGMENT AFTER TRIAL BY COURT in Superior Court Case No. 650079, entitled The City of Los Angeles, a Municipal Corporation, Plaintiff, vs. City of San Fernando, et al., Defendants, signed March 14, 1968, by the Honorable Edmund M. Moor, Judge of the Superior Court. Numerous pretrial conferences were held subsequent to the filing of the action by the City of Los Angeles in 1955 and before the trial commenced on March 1, 1966.

On March 19, 1958, an Interim Order of Reference was entered by the Court directing the State Water Rights Board, now known as the State Water Resources Control Board (SWRCB), to study the availability of all public and private records, documents, reports, and data relating to a proposed order of reference in the case. The Court subsequently entered an "Order of Reference to State Water Rights Board to Investigate and Report upon the Physical Facts (Section 2001, Water Code)" on June 11, 1958.

A final Report of Referee was approved on July 27, 1962 and filed with the Court. The Report of Referee made a complete study of the geology, insofar as it affects the occurrence and movement of ground water and the surface and ground water hydrology of the area. In addition, investigations were made of the history of channels of the Los Angeles River and its tributaries; the areas, limits, and directions of flow of all ground water within the area; the historic extractions of ground water in the basin and their quality; and all sources of water, whether they be diverted, extracted, imported, etc. The Report of Referee served as the principal basis for geological and hydrological facts for the original Trial Court Judgment in 1968, the Decision of the Supreme Court in 1975 (14 Cal 3d 199, 123 Cal Rept 1), and the Trial Court Final Judgment on remand on January 26, 1979.

The City of Los Angeles filed an appeal from the Judgment of the Trial Court with the Court of Appeal, which held a hearing on November 9, 1972, and issued its opinion on November 22,

1972. The opinion, prepared by Judge Compton and concurred in by Judges Roth and Fleming, reversed, with direction, the original judgment handed down by Judge Moor. In essence, the City of Los Angeles was given rights to all water in ULARA, including the use of the underground basins. The defendants, however, were given the right to capture "return water", which is water purchased from the Metropolitan Water District of Southern California (MWD) that percolates into the basin.

A petition for rehearing was filed on December 7, 1972, but was denied by the Court of Appeal. On January 2, 1973, the defendants filed a petition for hearing with the State Supreme Court. The Court on March 2, 1973 advised the parties it would hear the case. The hearing was held on January 14, 1975.

On May 12, 1975, the California Supreme Court filed its opinion on the 20-year San Fernando Valley water litigation. This opinion, which became final on August 1, 1975, upheld the Pueblo Water Rights of the City of Los Angeles to all ground water in the San Fernando Basin derived from precipitation within ULARA. The City of Los Angeles' Pueblo Water Rights were not allowed to extend to the ground waters of the Sylmar and Verdugo Basins.

The City of Los Angeles was also given rights to all San Fernando Basin ground water derived from water imported by it from outside ULARA and either spread or delivered within ULARA. The Cities of Glendale and Burbank each were also given rights to all San Fernando Basin ground water derived from water that each imports from outside ULARA and delivered within ULARA. San Fernando was not a member of MWD until the end of 1971, and had never prior thereto imported any water from outside ULARA.

The Supreme Court reversed the principal judgment of the Trial Court and remanded the case back to the Superior Court for further proceedings consistent with the Supreme Court's opinion. On remand the case was assigned to the Honorable Harry L. Hupp, Judge of the Superior Court of Los Angeles County.

The Final Judgment, signed by the Honorable Harry L. Hupp, was entered on January 26, 1979. Copies of the Final Judgment are available from the ULARA Watermaster's office at Post Office Box 111, Room 1455, Los Angeles, California 90051. The water rights set forth in the Judgment are consistent with the opinion of the Supreme Court described above. In addition, the Final Judgment includes provisions and stipulations regarding water rights, the calculation of imported

return water credit, storage of water, stored water credit, and arrangements for physical solution water for certain parties as suggested by the Supreme Court.

On August 26, 1983, the Watermaster reported to the Court pursuant to Section 10.2 of the Judgment that the Sylmar Basin was in a condition of overdraft. In response to the Watermaster's letter and a Minute Order of this Court, the Cities of Los Angeles and San Fernando responded by letter to the Court, agreeing with the Watermaster's report on overdraft. On March 22, 1984, Judge Harry L. Hupp signed a stipulation ordering, effective October 1, 1984, that the Cities of Los Angeles and San Fernando would be limited in their pumping to bring the total pumping within the safe yield of the basin, including any rights exercised by private parties.

The following table lists the judges who have succeeded Judge Hupp as Judge of Record for the San Fernando Judgment.

TABLE 1-1: JUDGES OF RECORD

Judge	Date Appointed
Vernon G. Foster	April 30, 1985
Miriam Vogel	January 16, 1990
Sally Disco	May 25, 1990
Jerold A. Krieger	April 16, 1991
Gary Klausner	December 9, 1991
Ricardo A. Torres	January 1, 1993

1.3 Extraction Rights

The extraction rights under the Judgment and Sylmar Basin Stipulation are as follows:

San Fernando Basin

Native Water: Los Angeles has an exclusive right to extract and utilize all the native safe yield water which is evaluated to be 43,660 acre-feet per year.

Import Return Water: Los Angeles, Glendale, and Burbank each has a right to extract the following amount:

Los Angeles: 20.8% of all delivered water (including reclaimed water) to valley fill lands of the San Fernando Basin.

Burbank: 20.0% of all delivered water (including reclaimed water) to the San Fernando Basin and its tributary hill and mountain areas.

Glendale: 20.0% of all delivered water (including reclaimed water) to the San Fernando Basin and its tributary hill and mountain areas (i.e., total delivered water [including reclaimed water] less 105% of total sales by Glendale in the Verdugo Basin and its tributary hills).

Physical Solution Water: Several parties are granted limited rights to extract water chargeable to the rights of others upon payment of specified charges. The following table lists the parties and their maximum physical solution quantities.

TABLE 1-2: PHYSICAL SOLUTION PARTIES

Chargeable Party	Pumping Party	Allowable Pumping (acre-feet)
City of Los Angeles	City of Glendale	5,500
	City of Burbank	4,200
	Van de Kamp	120
	Toluca Lake	100
	Sportsmen's Lodge	25
City of Glendale	Forest Lawn	400
	Angelica Healthcare	75
City of Burbank	Valhalla	300
	Lockheed	25

Under the Judgment, Walt Disney Pictures and Television (Defendant No. 105) operates under a separate stipulation (filed on May 11, 1961 and merged into the ULARA Judgment) whereby ground water extracted for cooling water is discharged into the channel of the Los Angeles River just upstream from the Headworks Spreading Grounds (HSG). The original stipulation between Los Angeles and Disney anticipated that the water so discharged would be diverted by the then-existing rubber dam into the HSG and returned to the San Fernando Basin as ground water storage. The operation of the rubber dam was discontinued in the 1982-83 Water Year due to water quality concerns by the California Department of Health Services. Thus, the water discharged by Disney, since it was not being spread at HSG, was considered flowing to the ocean and being wasted. As a result of meetings between the Parties and the ULARA Watermaster, a solution to the problem has been obtained. As of January 1993, Disney no longer pumps from its wells. It has installed a system for air conditioning and heating that does not require the use of ground water. Disney plans to destroy their three extraction wells in April or May of 1994.

Under the Judgment, Calmat (Defendant No. 18) was assigned physical solution rights to pump, with the understanding that its use of ground water for gravel washing would be non-consumptive. As the gravel pits became more extensive, permanent ponds were produced from which evaporation of perched water has occurred on a continuous basis. The Watermaster received from CalMat, a plan to take the pumped ground water to a separate area for recharge. If done properly, on a continuous basis, such an approach is acceptable. This plan has been implemented, and an additional investigation will be required to confirm how much evaporation, if any, may be occurring in the transfer of ground water to the recharge basins. Any pond evaporation loss of ground water would be charged to CalMat.

Stored Water: Los Angeles, Glendale, and Burbank each has a right to store water and the right to extract equivalent amounts.

Sylmar Basin

Native and Import Return Water: As of October 1, 1984, Los Angeles and San Fernando were assigned equal rights to pump the safe yield of the basin (6,210

acre-feet), less one half any pumping which occurs pursuant to the overlying rights of two private parties, Kisag Moordigian and Meurer Engineering. The private party Kisag Moordigian has sold and subdivided his property and there are no longer any overlying rights to extract and use water on his lands. The only active overlying rights as of 1993 are those of Meurer Engineering. Thus, Los Angeles and San Fernando are each allowed to pump approximately 3,105 acre-feet per year.

Stored Water: Los Angeles and San Fernando each has a right to store water and the right to extract equivalent amounts.

Verdugo Basin

Native and Import Return Water: Glendale and the Crescenta Valley County Water District own prescriptive rights to extract 3,856 acre-feet and 3,294 acre-feet per year, respectively.

Eagle Rock Basin

Native Water: The Eagle Rock Basin has no significant native safe yield.

Imported Return Water: Los Angeles delivers imported water to lands overlying the basin, and return flow from this delivered water constitutes the entire safe yield of the basin. Los Angeles has the right to extract or cause to be extracted the safe yield of the basin.

Physical Solution Water: McKesson Water Products and Deep Rock each have physical solution rights to extract water pursuant to a stipulation with the City of Los Angeles, and as provided in Section 9.2.1 of the Final Judgment.

1.4 Watermaster Service and Administrative Committee

In preparing the annual Watermaster Report, the Watermaster collected and reported all information affecting and relating to the water supply, water use and disposal, ground water levels, water quality, and ownership and location of new wells within ULARA. Ground water

pumpers report their extractions monthly to the Watermaster. This makes it possible to update the Watermaster Water Production Accounts monthly and keep track of the amount pumped during the water year, and the amount that can be legally pumped out the remainder of the year.

Section 8, Paragraph 8.3 of the ULARA Judgment established an Administrative Committee for the purpose of advising the Watermaster in the administration of his duties. The duly appointed members of the Committee, as of May 1, 1994, are:

Burbank, City of	Glendale, City of
Fred Lantz (President)	Donald Froelich (Vice-President)
Ross Burke (Alternate)	Wil Wilson (Alternate)
San Fernando, City of	Los Angeles, City of
Michael Drake	Henry R. Venegas
Ricardo Navarro (Alternate)	Donald G. McBride (Alternate)
Crescenta Valley County Water District	Private Parties
Michael Sovich	Charles Meurer
Phil McCleaf (Alternate)	Roger Meurer

The Administrative Committee may be convened by the Watermaster at any time in order to seek its advice. In addition, the Committee is responsible for reviewing and approving with the Watermaster the proposed annual report. A meeting was held February 16, 1994, to discuss the status of Watermaster activities, and the 1992-93 Watermaster Report was approved by the Committee on April 7, 1994.

1.5 Significant Events Through April 1994

ULARA Policies and Procedures (P&P)

The purpose and function of the P&P is to provide guidelines regarding decreed rights of parties set forth in the Final Judgment. During the 1986-87 Water Year, significant revisions were made to the P&P, with additional revisions occurring in April 1990. The revisions address and provide for test pumping and prolonged cleanup pumping by non-parties who have no right to pump but who are required to pump and treat contaminated ground water under a Cleanup and Abatement Order of the Los Angeles Regional Water Quality Control Board (LARWQCB). The

LARWQCB has included in all Cleanup and Abatement Orders for the ULARA a provision requiring the discharger to follow the P&P. Sections 2.5 to 2.7 of the P&P were revised and approved on April 17, 1990.

Also addressed in the P&P is pumping for dewatering of construction projects. Arrangements were made with the City of Los Angeles, Department of Building and Safety to refer all such dewatering projects in ULARA to the ULARA Watermaster's office. If the water pumped for dewatering must be discharged to the storm drains, replacement water must be purchased. At present, 23 companies are dewatering or potentially may be required to dewater and report to the ULARA Watermaster's office.

Section 2.8 was added to the P&P in April 1992 to provide for overextractions from the Verdugo Basin for the Crescenta Valley County Water District and the City of Glendale in any water year, an amount not exceeding 10 percent of their water rights. The 10 percent annual overextraction may continue from year to year cumulatively, not to exceed 1,000 acre-feet for each party, so long as the unusual circumstances persist. This overextraction will be made up within the next succeeding six years after the unusual circumstances cease.

In July 1993 the P&P were amended to reflect revisions requested by the ULARA Administrative Committee and the LARWQCB staff. Section 2.9 was added to deal with the control of contaminant movement within the ground water of the San Fernando Valley and overall ground water quality management through control of pumping patterns and Watermaster-recommended water production, along with ground water modeling and well monitoring procedures. These revisions are similar in scope and intent to the San Gabriel Valley Watermaster's Rules and Regulations that were adopted in September 1991.

Headworks Pilot Project

The continued use of the Headworks Spreading Grounds (HSG) is in the process of being implemented. A pilot project designed to investigate the feasibility of using Los Angeles River (LAR) water containing reclaimed water from the Tillman Reclamation Plant released to the LAR to recharge the SFB, began June 17, 1991 and was completed July 1993. An Engineering Report was published in December 1993. The indications of the pilot project are that spreading LAR water at the HSG reduces coliform, BOD, chloride, nitrite ammonia and turbidity levels to a point where extracted water meets all drinking water standards (Appendix E).

East Valley Water Reclamation Project

The LADWP is continuing its plans to construct and operate a project referred to as the East Valley Water Reclamation Project (EVWRP). This project proposes to utilize up to 35,000 acre-feet per year of reclaimed municipal waste water produced by the Tillman Water Reclamation Plant primarily for ground water recharge activities in the Sun Valley area of the San Fernando Valley. Reclaimed water now being discharged into the LAR will be utilized for ground water recharge, irrigation and industrial uses (Appendix D).

Approximately 13 miles of 54" diameter pipe, a 2 million gallon storage tank, and two pump stations will be built. Once fully implemented, this project will account for over 40% of the citywide goal to displace 80,000 acre-feet per year of potable water by the year 2010. This project is scheduled for completion and operation in May 1998.

Before recharging is allowed by the regulatory agencies, the LADWP will need to demonstrate that all criteria for recharging will be met. These include the following:

- Compliance with all drinking water quality standards for extracted water
- Minimum distances between wells and areas of recharge
- Minimum detention time of at least 6 months prior to extraction
- Maximum allowed blending of reclaimed water compared to other water entering the ground water basin

Furthermore, the basinwide water quality criteria for chloride will also have to be met. Because the LADWP has become more dependent upon State Water Project purchases from the Metropolitan Water District, higher levels of chlorides have been observed in the water supply, and subsequently the treated waste water as well, which will be the source of supply for this project. Compliance with the chloride basin objective will need to be investigated further.

Pollock Well Field Redevelopment

The LADWP is developing the Pollock Project to restore two of the existing Pollock wells to operation. The Pollock Well Field, which is located in the Los Angeles River Narrows Area, was removed from service in the late 1980s due to ground water contamination by trichloroethylene (TCE) and perchloroethylene (PCE). Other volatile organic compounds and nitrate have also been detected in the Pollock Well Field area.

The main purpose of the Pollock project is to address the concern by the ULARA Watermaster that rising ground water in the Los Angeles River Narrows area due to curtailed pumping is resulting in excessive discharges to the river. The Pollock project will also provide the LADWP with increased flexibility in using ground water supply from the San Fernando Basin.

Burbank Reclaimed System Expansion

Construction is under way on Burbank's project to bring reclaimed water to the DeBell Golf Course, Stough Landfill, McCambridge Park, Muir Middle School, Starlight Bowl, and Stough Park.. This will require installing 17,000 feet of pipe, two new pump stations, and two storage tanks. There will also be modifications to existing facilities.

The reclaimed water will come from Burbank's Water Reclamation Plant. This plant processes the City's wastewater to a high enough quality to allow it to be discharged into an open storm channel that feeds the Los Angeles River. While not suitable for potable applications, it is an ideal source for landscape irrigation. It is already being used by CalTrans and the Media City Center for landscape irrigation.

The total project cost is about $6 million, and construction is scheduled for completion in February 1995.

Burbank EPA Consent Decree Project

Phase I of the EPA Consent Decree project, which will extract and treat 6,000 gpm of contaminated ground water from the Burbank area, was expected to become operational on March 25, 1994. Due to delays by the Administrative Order Parties, construction is expected to be completed in Fall 1994. Phase II of the project is expected to be completed in 1996. The City of Burbank will use a portion of the treated ground water, and the City of Los Angeles is considering using a portion of the treated water upon completion of Phase II of the project.

Glendale EPA Project

The EPA is proceeding with the Consent Decree process for the Glendale North and Glendale South OUs. The Record of Decision for the Glendale North and South OUs was completed and signed in June 1993, and includes the decision to combine treatment facilities of both OUs and provide the treated ground water (5,000 gpm) to the City of Glendale.

Glendale-Verdugo Park Water Treatment Plant

The City of Glendale's Verdugo Park Water Treatment Plant is under construction near the southern boundary of the Verdugo Basin. This facility is scheduled for completion in August 1994, and is expected to pump and treat approximately 1,000 acre-feet/year of Verdugo Basin ground water. Presently, Glendale is under pumping its water right of 3,856 acre-feet/year in the Verdugo Basin. This facility will allow Glendale to pump more of its water right.

1.6 Summary of Water Supply, Operations, and Hydrologic Conditions

Highlights of operations for the 1991-92 and 1992-93 Water Years are summarized in Table 1-3. Details of the 1992-93 Water Year operations and hydrologic conditions are given in Section 2. Locations of the ground water basins, water service areas of the parties and individual producers, and other pertinent hydrologic facilities are shown on Plates 2 through 9.

Average Rainfall

Precipitation on the valley fill floor area was 36.62 inches, 222 percent of the calculated 100-year mean (16.48 inches), while precipitation in the mountain areas was 44.15 inches, 204 percent of the calculated 100-year mean (21.62 inches). Total precipitation falling on the San Fernando Valley and its tributary hill and mountain areas was estimated to be 1,131,549 acre-feet.

Spreading Operations

A total of 64,660 acre-feet of water was spread, an increase of 25,036 acre-feet from last year.

Extractions

Total ULARA extractions amounted to 48,283 acre-feet. Of this total, 390 acre-feet was for testing and 2,461 acre-feet was for non-consumptive use pumping. Total extractions decreased 42,762 acre-feet from the previous water year. This decrease is primarily due to increased surface water available statewide, resulting in reduced pumping activities by the City of Los Angeles in the San Fernando Basin. Appendix A contains a summary of ground water extractions for the 1992-93 Water Year.

Imports

Gross imports totaled 534,009 acre-feet, a decrease of less than one percent from last year, while net imports used within ULARA amounted to 302,375 acre-feet, a 12,550 acre-feet increase.

Exports

A total of 254,986 acre-feet of water was exported from ULARA, a decrease of 68,914 acre-feet from the previous year. Of the 254,986 acre-feet exported, 23,352 acre-feet was from ground water extractions, and 231,634 acre-feet was from imports. This decrease is due to increased surface water available statewide, resulting in less ground water extracted and exported from the basin by Los Angeles.

Treated Wastewater

A total of 105,306 acre-feet of wastewater was treated in ULARA. The majority of the treated water is discharged to the Los Angeles River or to the Hyperion Treatment Plant, with a small portion being used as reclaimed water.

Reclaimed Water

Total reclaimed water use in ULARA was 7,560 acre-feet, a 240 acre-feet increase from last year. The reclaimed water is used for in-plant use, power plant use (i.e cooling), irrigation and landscaping.

Sewage Export

Sewage export was estimated at 160,000 acre-feet, an increase of 5,000 acre-feet from last year. All sewage exported from ULARA is delivered to the Hyperion Treatment Plant.

Ground Water Storage

Ground water storage in the San Fernando Basin increased by 106,317 acre-feet, resulting in a total cumulative change in ground water storage of 254,315 acre-feet since October 1, 1968. This significant increase in due to a combination of reduced pumping by Los Angeles, increased spreading activities by the LACDPW, and an above average rainfall. The cumulative change in ground water storage for the Sylmar, Verdugo, and Eagle Rock Basins was 11,069, 12,601, and 184 acre-feet, respectively. The total change in ground water storage in ULARA was 130,171 acre-feet.

Wells

During the 1992-93 Water Year, a total of 40 wells were drilled for use in ground water investigations within ULARA (Appendix H). One well was destroyed.

TABLE 1-3: SUMMARY OF OPERATIONS IN ULARA

Item	Water Year 1991-92	Water Year 1992-93
Active Pumpers (party and nonparties)	29	29
Inactive Pumpers (parties within valley fill)*	2	2
Valley Rainfall, in inches		
Valley Floor	30.05	36.62
Mountain Area	33.86	44.15
Spreading Operations, in acre-feet	39,624	64,659
Extractions, in acre-feet		
Used in ULARA	12,478	22,080
Exported from ULARA	75,240	23,352
Non-consumptive Use	2,935	2,461
Testing	392	390
Total	91,045	48,283
Gross Imports, in acre-feet		
Los Angeles Aqueduct Water	224,347	271,825
MWD Water	314,514	262,184
Total	538,861	534,009
Exports, in acre-feet		
Los Angeles Aqueduct Water	117,903	138,692
MWD Water	131,133	92,942
Ground Water	75,240	23,352
Total	324,276	254,986
Net Imports Used in ULARA, in acre-feet	289,825	302,375
Reclaimed Water Use, in acre-feet	7,323	7,560
Total Water Use in ULARA, in acre-feet	309,626	332,015
Treated Wastewater, in acre-feet	100,295	105,306
Sewage Export to Hyperion, in acre-feet**	110,000	115,000
Change in Ground Water Storage, in acre-feet	2,884	130,171

* The two inactive pumpers are Deep Rock Bottled Water Company and Van de Kamp.

** Sewage outflow includes estimates of outflow from each of the four basins, and discharges to Hyperion from the Tillman and Los Angeles-Glendale Reclamation Plants. The 1991-92 sewage export volume estimate in last years annual report included reclaimed water and and consequently was revised in this report.

1.7 Allowable Pumping for the 1993-94 Water Year

Table 1-4 shows a summary of extraction rights for the 1993-94 Water Year and stored water credit as of October 1, 1993, for the Cities of Los Angeles, Burbank, Glendale, San Fernando, and the Crescenta Valley County Water District. The calculation of these values is shown in more detail in Section 2.

TABLE 1-4: ALLOWABLE PUMPING 1993-94 WATER YEAR
(acre-feet)

	Extraction Right			Stored Water Credit (as of Oct. 1, 1993)	Allowable Pumping 1993-94 Water Year
	Native Credit	Import Credit	Total		
San Fernando Basin					
City of Los Angeles	43,660	43,914	87,574	239,257	326,831
City of Burbank	—	4,368	4,368	54,981	59,349
City of Glendale	—	4,692	4,692	40,293	44,985
Total	43,660	52,974	96,634	334,531	431,165
Sylmar Basin					
City of Los Angeles	—	—	3,105	1,651	4,756
City of San Fernando	—	—	3,105	2,652	5,757
Total	—	—	6,210	4,303	10,513
Verdugo Basin					
CVCWD	—	—	3,294	—	3,294
City of Glendale	—	—	3,856	—	3,856
Total	—	—	7,150	—	7,150

2. WATER SUPPLY, OPERATIONS, AND HYDROLOGIC CONDITIONS

2. WATER SUPPLY, OPERATIONS, AND HYDROLOGIC CONDITIONS

2.1 Precipitation

Precipitation varies considerably throughout ULARA depending on topography and elevation. Mean seasonal precipitation ranges from about 14 inches at the western end of the San Fernando Valley to 35 inches in the San Gabriel Mountains. Approximately 80 percent of the annual rainfall occurs from December through March.

The 1992-93 Water Year experienced an above average rainfall. The valley floor received 36.62 inches of rain (222% of the 100-year mean), while the mountain areas received 44.15 inches (204% of the 100-year mean). Figure 2.1 shows monthly valley floor and mountain area rainfall in ULARA. The weighted average of both valley and mountain areas was 41.26 inches (210 % of the 100-year mean), and represents an increase of 8.87 inches from last year. Table 2-1 shows a record of rainfall at the valley and mountain precipitation stations, and Plate 5 shows their location.

FIGURE 2.1 - MONTHLY RAINFALL

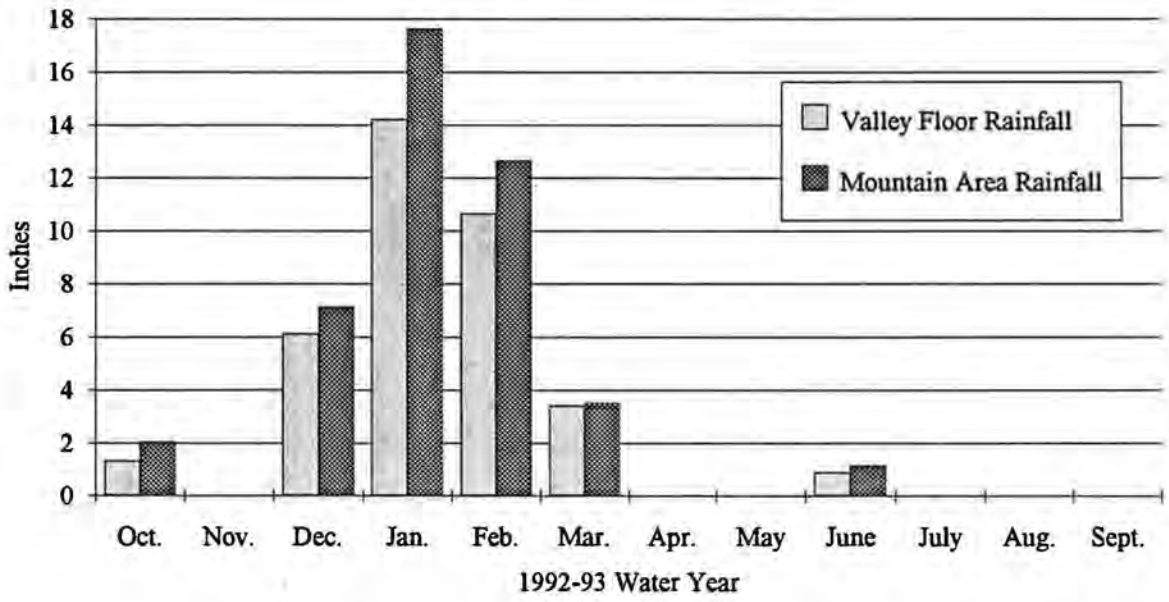


TABLE 2-1: 1992-93 PRECIPITATION
(inches)

LACDPW Rain Gage Stations No.	Name	1992-93 Precipitation	100-Year Mean (1881-1981)	Percent of 100-Year Mean
	Valley Stations			
13C	North Hollywood-Lakeside	40.22	16.63	242%
14C	Roscoe-Merrill	35.82	14.98	239%
15A	Van Nuys	36.92	15.30	241%
21B	Woodland Hills	32.56	14.60	223%
23B	Chatsworth Reservoir	29.12	15.19	192%
25C	Northridge-LADWP	32.12	15.16	212%
251C	La Crescenta	47.74	23.31	205%
293B	Los Angeles Reservoir	35.41	17.32	204%
	Weighted Average	36.62	16.48	222%
	Mountain Stations			
11D	Upper Franklin Canyon Reservoir	32.62	18.50	176%
292D*	Encino Reservoir	39.42	16.84	234%
33A	Pacoima Dam	37.77	19.64	192%
47D	Clear Creek - City School	65.80	33.01	199%
53D	Colby's	52.60	29.04	181%
54C	Loomis Ranch-Alder Creek	34.75	18.62	187%
1081B*	Glendale-Gregg	42.40	19.97	212%
797*	DeSoto Reservoir	32.20	17.52	184%
801B*	Magic Mountain	59.19	21.79	272%
	Weighted Average	44.15	21.62	204%
	Weighted Average of both Valley and Mountain Areas	41.26	19.64	210%

*Station 292D replaced Station 17 due to insufficient data.
Station 1081B replaced Station 210C due to insufficient data.
Station 801B replaced Station 1190 due to insufficient data.
Station 797 replaced Station 259 which has been discontinued.

2.2 Runoff and Outflow from ULARA

The drainage area of ULARA contains 328,500 acres, of which 205,700 acres are hills and mountains. The drainage system is made up of the Los Angeles River and its tributaries. Surface flow originates as storm runoff from the hills and mountains, storm runoff from the impervious areas of the valley, operational spills of imported water, industrial and sanitary waste discharges, and rising water.

A number of stream-gaging stations are maintained throughout ULARA, either by the LACDPW or the United States Geological Survey (USGS). The Watermaster has selected six key gaging stations which record runoff from the main hydrologic areas in ULARA (Plate 5 shows the location of the stations). The six gage stations are as follows:

1. Station F-57C-R registers all surface outflow from ULARA.

2. Station F-252-R registers flow from Verdugo Canyon which includes flows from Dunsmore and Pickens Canyons.

3. Station E-285-R registers flow from the westerly slopes of the Verdugo Mountains and some flow from east of Lankershim Boulevard. It also records any releases of reclaimed wastewater discharged by the City of Burbank.

4. Station F-300-R registers all flow east of Lankershim Boulevard plus the outflow from Hansen Dam which is not spread. These records also include flow from the Sepulveda Dam, which may include extractions from the Reseda wells.

5. Station F-168-R registers all releases from Big Tujunga Dam, which collects runoff from the watershed to the northeast. Runoff below this point flows to Hansen Dam.

6. Station F-118B-R registers all releases from Pacoima Dam. Runoff below this point flows to the Los Angeles River through lined channels, or can be diverted to the Lopez and Pacoima spreading grounds.

Table 2-2 summarizes the 1991-92 and 1992-93 monthly runoff for these stations. The larger runoff in 1992-93 is due to the greater rainfall in 1992-93 than in 1991-92. The mean daily discharge rates for these six stations during 1992-93 are summarized in Appendix B.

TABLE 2-2: MONTHLY RUNOFF AT SELECTED GAGING STATIONS
(acre-feet)

Station	Water Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
F-57C-R	1991-92	1,550	429	5,250	3,610	186,600	55,890	23,930	13,140	1,780	8,650	9,310	10,690	320,829
L.A. River	1992-93	14,290	7,563	34,810	253,200	132,000	48,000*	14,500*	10,120	12,810	10,420	11,320	10,990	560,023
Arroyo Seco														
F-252-R	1991-92	252	149	2,922	1,137	4,127	5,013	250	195	116	253	94	113	14,621
Verdugo Wash	1992-93	960	158	2,573	8,966	6,759	1,735	478	601	660	230	202	198	23,520
E-285-R	1991-92	802	688	2,522	3,449	10,616	4,470	829	453	324	487	479	693	25,812
Burbank	1992-93	1,068	532	3,725	5,802	6,357	3,028	772	555	909	711	588	520	24,567
Storm Drain														
F-300-R	1991-92	4,734	2,301	17,703	14,021	72,131	36,296	7,000	4,256	4,298	3,147	3,613	3,898	173,398
L.A. River	1992-93	5,389	3,722	22,250	93,270	115,300	31,970	7,861	4,664	5,768	3,904	3,593	3,580	301,271
Tujunga Ave.														
F-168-R	1991-92	12	92	958	1,384	13,561	8,757	3,937	1,130	1,328	549	81	0	31,789
Big Tujunga	1992-93	0	269	1,724	25,720	32,020	11,620	8,398	3,145	3,036	1,340	720	471	88,463
Dam														
118B-R	1991-92	4	0	129	716	7,844	3,154	42	2,111	2,059	218	0	0	16,277
Pacoima Dam	1992-93	0	4	821	15,970	18,620	10,290	1,802	1,846	1,781*	638*	343*	224	52,339

* Incomplete Record - Numbers Estimated.

2.3 Components of Surface Flow

The surface flow of the Los Angeles River at Gaging Station F-57C-R consists of:

1. Storm flows
2. Reclaimed wastewater from the Tillman, Burbank, and Los Angeles-Glendale Water Reclamation Plants
3. Industrial discharges
4. Rising ground water

In the Report of Referee (Volume II, Appendix O), procedures were developed for the calculation of rising ground water for the period 1928-1958. Some of the important factors of that study are no longer significant; releases of Owens River water, operation of the Chatsworth Reservoir, and (temporarily, at least) operation of the Headworks Spreading Grounds. As shown on Figure O-2 of the Report of Referee, rising water was considered to have fallen to zero by the late 1950s. Ground water levels along the course of the Los Angeles River were studied recently in the January 1993 report by Brown and Caldwell, "Potential Infiltration of Chlorides from the Los Angeles River into the Groundwater Aquifer". Figure 2-4 of that report is especially informative. As of the end of the drought period in 1977, ground water levels in the Los Angeles Narrows were very low, with very little potential for rising ground water. Heavy runoff occurred during the 1978-83 period, which, combined with reduced pumping in the Crystal Springs and Pollock Well Fields permitted large recoveries of ground water levels in the Los Angeles Narrows.

An even greater factor affecting hydrologic conditions in the Los Angeles Narrows has been the increasing releases of reclaimed waters; releases from the Los Angeles-Glendale Plant were started in 1976-77 and from the Tillman Plant in 1985-86. These large year-round releases tend to keep the alluvium of the Los Angeles River Narrows full, even in dry years. Conditions in the Spring of 1991, during an extended drought, are shown in Figure 2-4 of the Brown and Caldwell Report. There is opportunity for continuing percolation in the unlined reach, both upstream and downstream of the paved section near the confluence of the Verdugo Wash and the Los Angeles River. Water percolating in the reach is believed to circulate through shallow zones and re-appear as rising ground water downstream from Los Feliz Boulevard. Also, there is up to 3,000 acre-feet of recharge from delivered water within the Los Angeles Narrows-Pollock Well Field area that adds to the rising ground water conditions.

Under 1992-93 conditions, most of the rising ground water in the Los Angeles River is believed to originate within the Pollock Well Field area and above the Verdugo Narrows. Any rising ground water which percolates upstream from Los Feliz Boulevard is expected to re-appear as rising ground water upstream from Gaging Station F-57C-R. The estimate of rising water at Gaging Station F-57C-R for 1992-93 is based on the Tillman-impacted drought period estimates of 3,000 acre-feet/year, increased by the 1993 additional of 1,900 acre-feet recorded at Gaging Station F-252-R (Verdugo Basin), for a total of 4,900 acre-feet. Table 2-3 shows the computed flows, and Appendix C contains the components of Los Angeles River flow calculations.

TABLE 2-3: SEPARATION OF SURFACE FLOW AT STATIONS F-57C-R & F-252-R
(acre-feet)

Water Year	Base Flow		Storm Runoff	Total Measured Outflow
	Rising Ground Water	Waste Discharge		
		Station F-57C-R		
1971-72	3,602	8,219	35,049	46,870
1972-73	4,596	8,776	100,587	113,959
1973-74	2,694	6,366	79,587	88,878
1974-75	427	7,318	56,396	64,141
1975-76	261	6,741	32,723	39,725
1976-77	839	7,128	58,046	66,013
1977-78	1,331	7,449	357,883	366,663
1978-79	2,840	16,450	119,810	139,100
1979-80	5,500	16,500	n/a	n/a
1980-81	4,710	19,580	51,940	76,230
1981-82	1,280	18,180	80,000	99,460
1982-83	3,460	17,610	384,620	405,690
1983-84	3,000	17,780	49,090	69,870
1984-85	3,260	21,600	46,300	71,160
1985-86	3,880	48,370	102,840	155,090
1986-87	3,000	64,125	19,060	83,295
1987-88	3,000	81,920	74,074	156,204
1988-89	3,000	80,020	56,535	136,843
1989-90	3,000	76,789	55,811	167,639
1990-91	3,203	75,647	117,779	196,629
1991-92	3,000	120,789	197,040	320,829
1992-93	4,900	77,000	478,123	560,023
		Station F-252-R		
1971-72	2,050	0	2,513	4,563
1972-73	1,706	0	7,702	9,408
1973-74	1,772	0	5,613	7,385
1974-75	1,333	0	4,255	5,588
1975-76	2,170	0	2,380	4,550
1976-77	1,683	0	2,635	4,318
1977-78	1,168	0	23,571	24,739
1978-79	2,470	0	n/a	n/a
1979-80	5,150	0	7,752	12,902
1980-81	5,780	0	2,917	8,697
1981-82	3,710	0	5,367	9,077
1982-83	5,330	0	21,384	26,714
1983-84	4,000	0	n/a	n/a
1984-85	2,710	0	3,970	6,680
1985-86	2,470	0	6,270	8,740
1986-87	2,100	0	1,690	3,790
1987-88	3,548	0	10,493	14,041
1988-89	1,995	0	4,453	6,448
1989-90	1,182	0	2,938	4,120
1990-91	1,157	0	6,865	8,022
1991-92	1,412	0	13,209	14,621
1992-93	3,335	0	20,185	23,520

2.4 Ground Water Recharge

Precipitation has a marked influence on ground water recharge and ultimately ground water storage. Urban development during the past years in ULARA has resulted in approximately 20 percent of the rainfall being collected and routed into paved channels which discharge into the Los Angeles River. To partially offset the increased runoff due to urbanization, Pacoima and Hansen Dams, originally built for flood control, are utilized to regulate storm flows and allow recapture of the flow in downstream spreading basins operated by the LACDPW and the City of Los Angeles. Operation of Hansen Dam for the purpose of spreading water continues to be a problem due to the sediment that has accumulated upstream of the dam.

The LACDPW operates the Branford, Hansen, Lopez, and Pacoima spreading grounds, while the City of Los Angeles operates the Headworks spreading grounds. The LACDPW, in cooperation with the City of Los Angeles, operates the Tujunga spreading grounds. The spreading grounds operated by the LACDPW are utilized for spreading native water, and imported water under agreements. A pilot project for the spreading of Los Angeles River water, which contains over 65,000 acre-feet/year of treated municipal wastewaters, at the Headworks spreading grounds has been completed and is discussed in Appendix E. Table 2-4 summarizes the spreading operations for the 1992-93 Water Year, and Plate 6 shows the locations of the spreading basins.

TABLE 2-4: 1992-93 SPREADING OPERATIONS IN THE SAN FERNANDO BASIN
(acre-feet)

Agency	Spreading Facility	1992			1993								Total
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	
LACDPW														
	Branford	23	21	142	31	28	31	30	16	15	16	16	20	389
	Hansen	0	100	2,525	1,648	827	9,211	4,285	3,213	2,263	977	746	391	26,186
	Lopez	0	0	119	161	21	216	263	348	184	0	0	0	1,312
	Pacoima	0	142	969	2,936	3,320	4,007	1,861	2,031	1,202	33	0	0	16,501
	Tujunga	314	354	492	1,759	717	571	7,396	4,036	1,638	827	782	770	19,657
	Total	337	617	4,247	6,536	4,913	14,035	13,835	9,644	5,302	1,853	1,544	1,181	64,045
City of Los Angeles														
	Tujunga	0	0	0	0	0	0	0	0	0	0	0	0	0
	Headworks	23	17	12	10	8	39	5	0	0	0	0	0	114
	Total	23	17	12	10	8	39	5	0	0	0	0	0	114
City of Burbank														
	Pacoima	0	0	0	0	0	0	500	0	0	0	0	0	500
Basin Total		360	635	4,259	6,546	4,921	14,075	14,340	9,644	5,302	1,853	1,544	1,181	64,660

2.5 Ground Water Extractions

The original trial court adjudication of ground water rights in ULARA restricted all ground water extractions, effective October 1, 1968. On that date, extractions were restricted to approximately 104,000 acre-feet per water year. This amounted to a reduction of approximately 50,000 acre-feet from the previous six-year average. The State Supreme Court's opinion, as implemented on remand in the Final Judgment entered on January 26, 1979, provides a similar restriction in ground water pumping.

Sparkletts Drinking Water Corporation and Deep Rock Water Company are the only parties that extract water from the Eagle Rock Basin. These parties pay the City of Los Angeles for pumped ground water pursuant to the Judgment.

Figure 2.2 illustrates the annual ground water extractions and imported water in ULARA, beginning with the 1954-55 Water Year. It can be noted that for the 14 years prior to pumping restrictions (1954-55 to 1967-68), imports exceeded extractions by 50,000 to 90,000 acre-feet per year, in contrast to the past 25 years (1968-69 to 1992-93) where imports have exceeded extractions by 110,000 to 250,000 acre-feet per year (Refer to Figure 2.3 - Monthly Extractions and Imports).

A total of 48,283 acre-feet was pumped from ULARA during the 1992-93 Water Year; 41,042 acre-feet from the San Fernando Basin, 3,515 acre-feet from the Sylmar Basin, 3,547 acre-feet from the Verdugo Basin, and 180 acre-feet from the Eagle Rock Basin. The respective safe yield values for the 1992-93 Water Year are 92,700 acre-feet (Native Safe Yield of 43,660 and an import return of 49,040 acre-feet) for the San Fernando Basin, 6,210 acre-feet for the Sylmar Basin, and 7,150 acre-feet for the Verdugo Basin. Appendix A contains a summary of ground water extractions for the 1992-93 Water Year and Plate 9 shows the locations of the well fields.

Of the total amount pumped in the San Fernando Basin (41,042 acre-feet), 36,269 acre-feet constitutes extraction rights by Parties to the Judgment, 390 acre-feet was for testing, 2,461 acre-feet constitutes nonconsumptive use, and 1,922 acre-feet was by physical solution parties, ground water cleanup and dewatering parties, and parties without rights (Appendix G). Table 2-5 summarizes 1992-93 private party pumping in the San Fernando Basin, and Plate 3 shows the locations of the individual producers.

FIGURE 2.2 - YEARLY IMPORTS USED IN ULARA AND TOTAL EXTRACTIONS
UPPER LOS ANGELES RIVER AREA

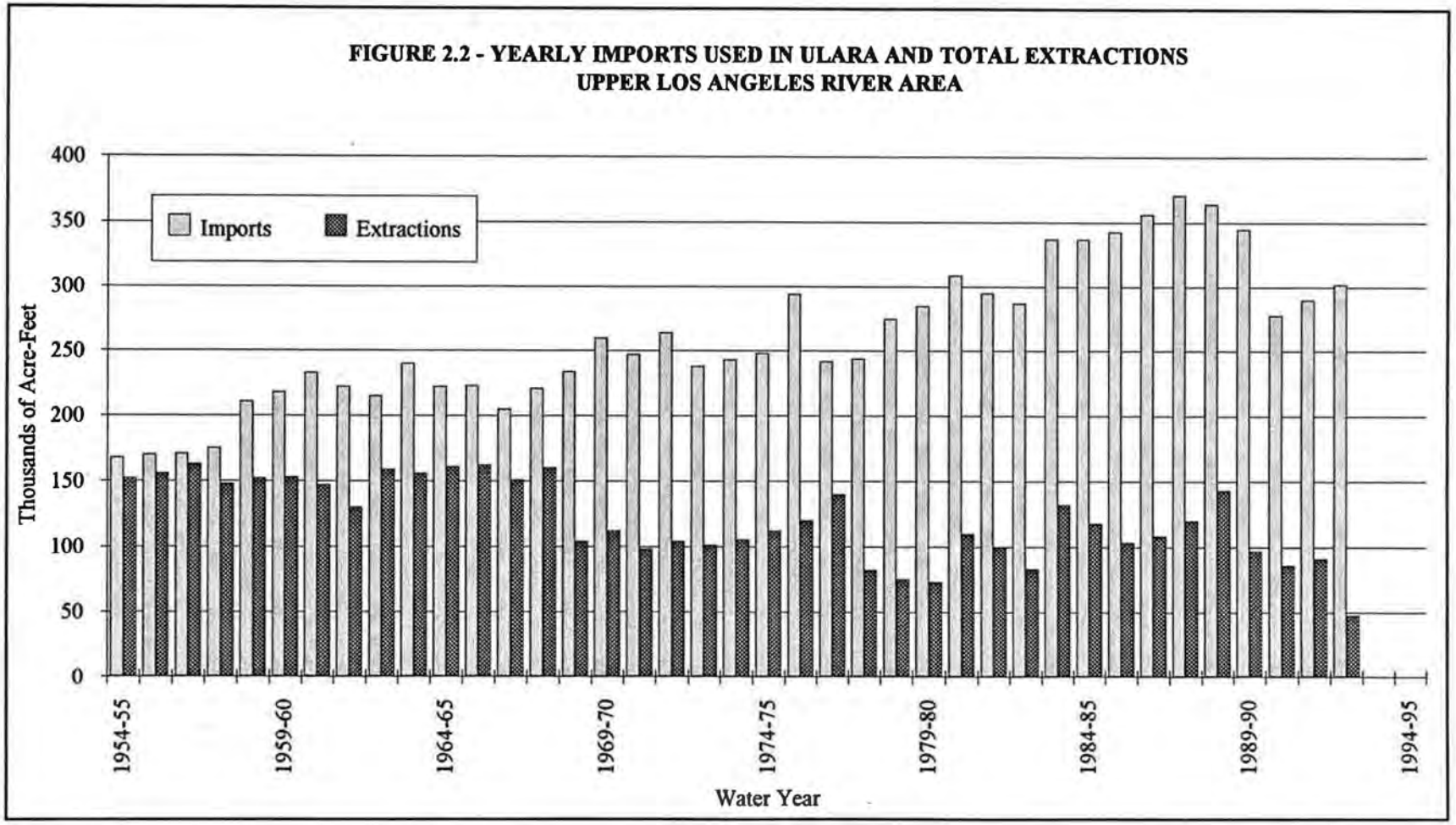


TABLE 2-5: 1992-93 PRIVATE PARTY PUMPING
SAN FERNANDO BASIN
(acre-feet)

Nonconsumptive Use			Physical Solution		
CalMat	1,654		Angelica Healthcare Services	65	*
Livingston-Graham Co.	2		Forest Lawn Cemetery Assn.	304	
Sears, Roebuck and Company	200		Sportsmen's Lodge	0	
Sportsmen's Lodge	0		Toluca Lake Property Owners	30	
Toluca Lake Property Owners Association	4		Valhalla Memorial Park	391	
Walt Disney Productions	600		Waste Management Disposal Services of California	0	
Total	2,461		Total	790	
Ground Water Cleanup			Ground Water Dewatering		
Lockheed	692	**	Auto Stiegler	17	
Malibu Grand Prix	11		First Financial Plaza Site	55	
Mobil Oil Corporation	11		Robinsons-May/Northridge Fashion Plaza	0	
Philips Components	85		Trillium Corporation	39	
Rockwell International	202		Total	111	
3M-Pharmaceutical	4				
Total	1,005				
Parties Without Rights					
Harper, Cecilia De Mille	15	***			
			Total Extractions	4,382	

* Not subtracted from Glendale's allowable pumping for the 1993-94 Water Year. Further evaluation is being made by the ULARA Watermaster.

** Of the total extractions, 103 acre-feet was reinjected; thus, net extractions totaled 589 acre-feet.

*** Party has been notified by letter that they have no pumping rights. An attempt will be made to resolve this problem.

2.6 Imports and Exports of Water

Residential, commercial, and industrial expansions in ULARA have required the importation of additional water supplies to supplement that provided by the ground water basins.

The imported supplies to ULARA are from the Los Angeles Aqueducts and the Metropolitan Water District (MWD). Los Angeles Aqueduct water consists of runoff from the Eastern Sierra Nevada and ground water from Owens Valley, while MWD supplies consists of California and Colorado River Aqueduct waters.

Exports from ULARA, exclusive of sewage, are solely by the City of Los Angeles, and include imported Los Angeles Aqueduct and MWD water, and ground water from the San Fernando Basin.

Table 2-6 summarizes the nontributary imports and exports from ULARA during the 1991-92 and 1992-93 Water Years, and Figure 2.3 shows the monthly extractions and imports.

FIGURE 2.3 - MONTHLY EXTRACTIONS AND IMPORTS

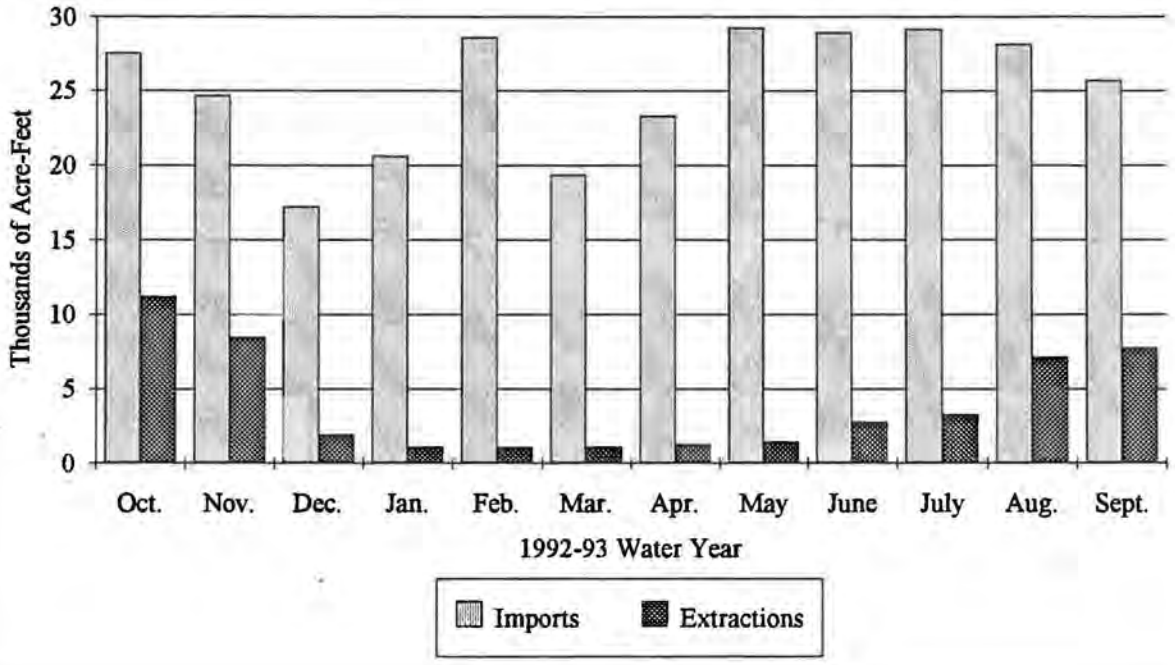


TABLE 2-6: ULARA NONTRIBUTARY WATERS IMPORTS AND EXPORTS
(acre-feet)

Source and Agency	Water Year 1991-92	Water Year 1992-93
Imported Water		
Los Angeles Aqueduct		
City of Los Angeles	224,347	271,825
MWD Water		
City of Burbank	18,830	18,005
Crescenta Valley County Water District	1,593	1,697
City of Glendale	24,638	25,970
City of Los Angeles	262,827	208,965
La Canada Irrigation District	846	886
Las Virgenes Municipal Water District	5,212	5,376
City of San Fernando	568	1,285
Total MWD Water	314,514	262,184
Total Imported Water	538,861	534,009
Exported Water		
Los Angeles Aqueduct		
City of Los Angeles	117,903	138,692
MWD water		
City of Los Angeles	131,133	92,942
Total Exported Water	249,036	231,634
Net Imported Water	289,825	302,375

2.7 Water Reclamation

Water reclamation presently provides a source of water for irrigation, industrial, and recreational uses. In the future, water reclamation could provide water for ground water recharge within the ULARA spreading basins and in the unlined portions of the Los Angeles River. Six wastewater reclamation plants are in operation in ULARA. The Las Virgenes Municipal Water District operates a water reclamation facility outside ULARA but releases part of the treated water in ULARA. The East Valley Water Reclamation Project which envisions the use of up to 35,000 acre-feet/year of reclaimed water from the Tillman Plant for ground water recharge. This is discussed in Appendix D. Table 2-7 summarizes the 1992-93 reclamation plant operations, and Plate 6 shows their location.

TABLE 2-7: 1992-93 WASTEWATER RECLAMATION PLANT OPERATIONS
(acre-feet)

Plant/Agency	Treated Water	Discharged to		Reclaimed Water	
		L.A. River	Hyperion		
City of Burbank	5,723	5,395	0	2,629	(a)
Los Angeles-Glendale	22,815	14,953	4,919	3,110	(b)
Donald C. Tillman	76,730	65,936	10,155	639	(c)
Indian Hills Mobile Homes	20	0	0	20	(d)
The Independent Order of Foresters	18	0	0	18	(d)
Rocketdyne	n/a	n/a	n/a	n/a	(e)
Las Virgenes MWD	---	0	0	1,144	(f)
Total	105,306	86,284	15,074	7,560	

(a) Of the total reclaimed water (2,629 AF), 2,557 AF was delivered to the Burbank power plant for cooling, and 72 AF was used by CalTrans, the Media City Center, and City water trucks.
(b) Of the total reclaimed water (3,110 AF), 726 AF was delivered to Glendale for use in Glendale's Phosphate Plant and for irrigation water for CalTrans and Forest Lawn; 777 AF was for in plant use; 1,347 AF was was delivered to Griffith Park by Los Angeles for irrigation; and 260 AF was used by CalTrans, Lake Side, Sinai Memorial Park, and Universal City MCA for irrigation.
(c) Of the total reclaimed water (639 AF), 616 AF was for in plant use and 23 AF was used offsite.
(d) Reclaimed water is used for irrigation.
(e) Rocketdyne does not meter treated water; all water is reused within the facility.
(f) Reclaimed water is used for irrigation.

2.8 Water Level Elevations

During the 1992-93 Water Year, water level data were collected and processed to determine prevailing ground water conditions during the Spring and Fall of 1993. Plates 10 and 11 show ground water elevation contours for these two seasons. Plate 12 shows the average change in water elevations from the Fall of 1992 to the Fall of 1993. The increase in water levels throughout the eastern half of the valley reflects reduced pumping by the City of Los Angeles throughout the 1992-93 Water Year. The increase in water levels northeast of the Verdugo Fault and southerly of the Hansen Spreading Grounds is related to the increase of spreading in 1992-93 (64,660 acre-feet, Table 2-4) as compared with 1991-92 (39,624 acre-feet). Plate 14 shows ground water flow directions and estimated ground water velocities in ULARA. Figure 2.4 shows historic hydrographs of wells throughout ULARA and their locations.

2.9 Ground Water Storage

San Fernando Basin

The total ground water storage capacity of the San Fernando Basin was estimated in the Report of Referee to be approximately 3,200,000 acre-feet, of which a regulatory storage capacity of 360,000 acre-feet is required by the Judgment.

The estimated increase in ground water storage for 1992-93 is 106,317 acre-feet (Table 2-8). From the start of safe yield operation in the Fall of 1968 through 1992-93, the amount of ground water in storage has increased by 254,315 acre-feet. However, during the 1968-93 period there has been an accumulation of 334,531 acre-feet of stored water credit through spreading and in-lieu activities of the parties. Such ground water can be extracted at any time by the credited parties in excess of normal pumping rights. If this water were to be removed, the remaining stored volume of ground water would show as minus 80,216 acre-feet on Table 2-8.

An annual comparison is made between the hydrologic conditions of the water year and change in storage. The 1992-93 Water Year experienced an above average rainfall of 41.26 inches (210% of the 100-year mean), and the total precipitation falling on the San Fernando Valley and its tributary hills and mountain areas was estimated to be 1,131,549 acre-feet. A total of 64,660 acre-feet of water was spread during the year and in-lieu replenishment activities totaled 55,329 acre-feet. Table 2-8 summarizes the annual precipitation and change in storage from 1968-69 through 1992-93. Plate 15 shows the cumulative change in storage from Fall 1928 to the present.

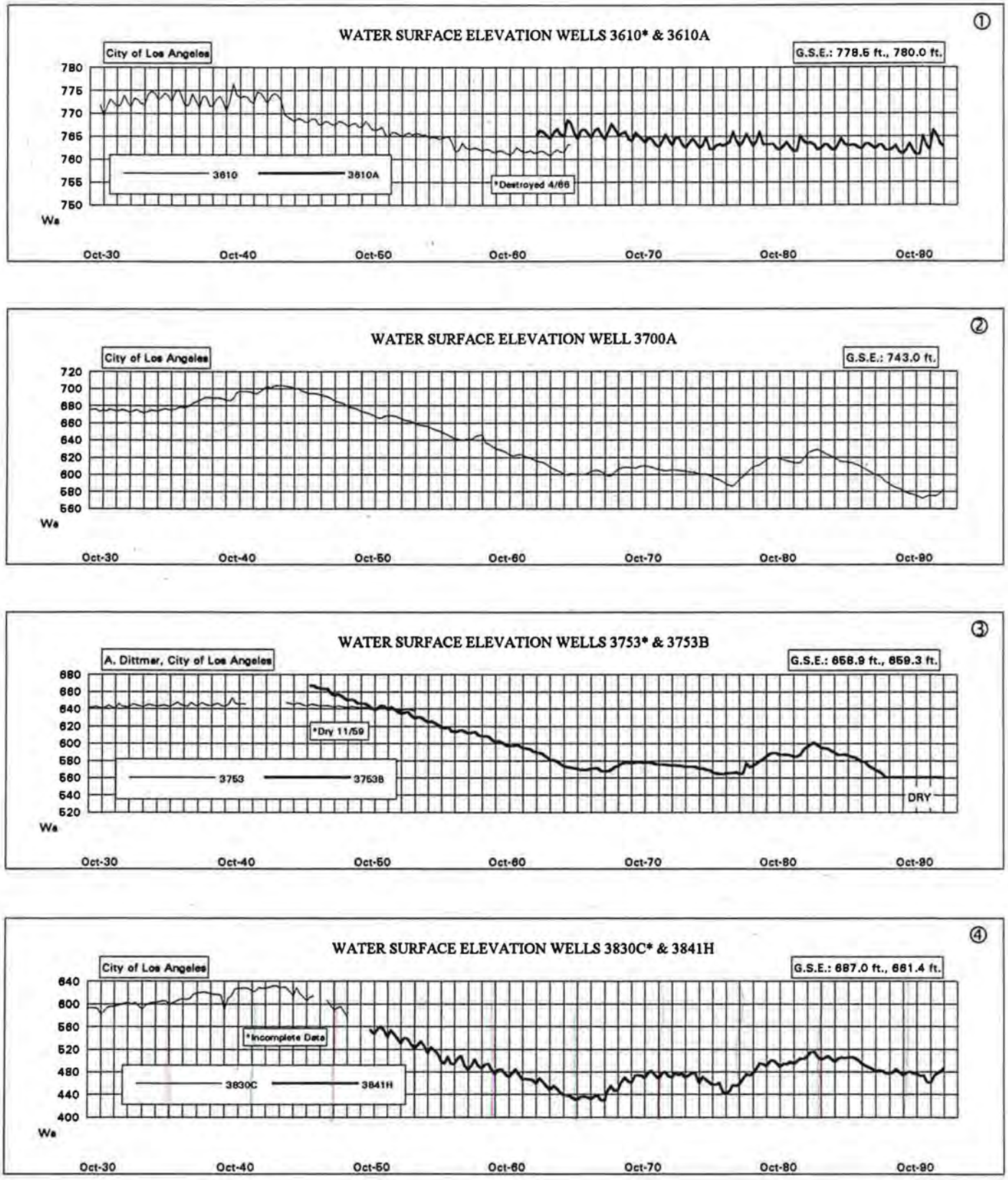
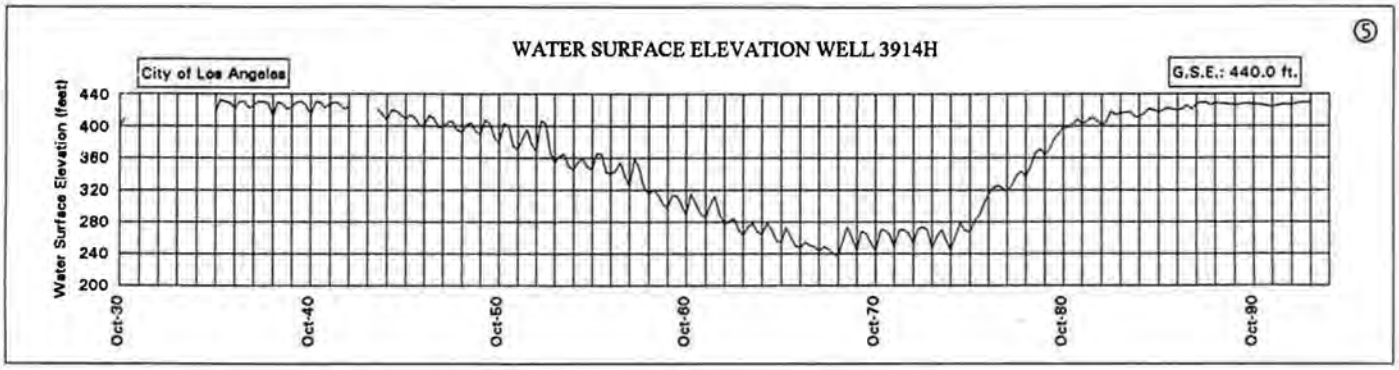
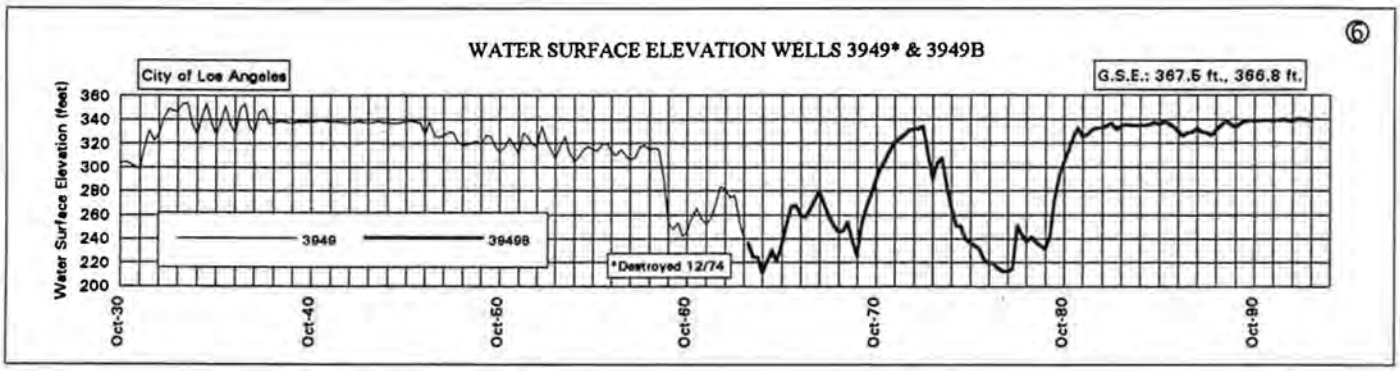
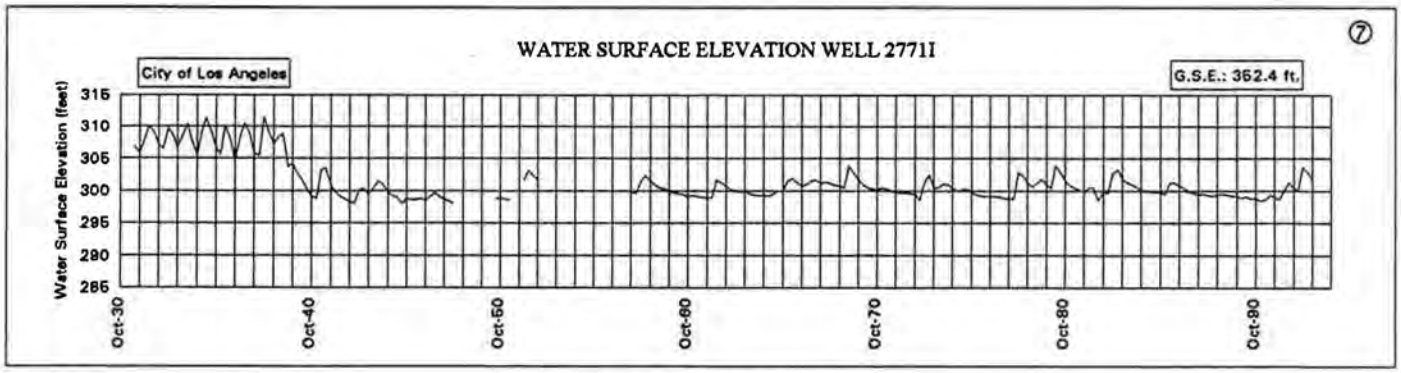


FIGURE 2.4 - HYDROGRAPHS OF WELLS THROUGHOUT ULARA AND WELL LOCATION MAP

SAN FERNANDO BASIN







SYLMAR BASIN

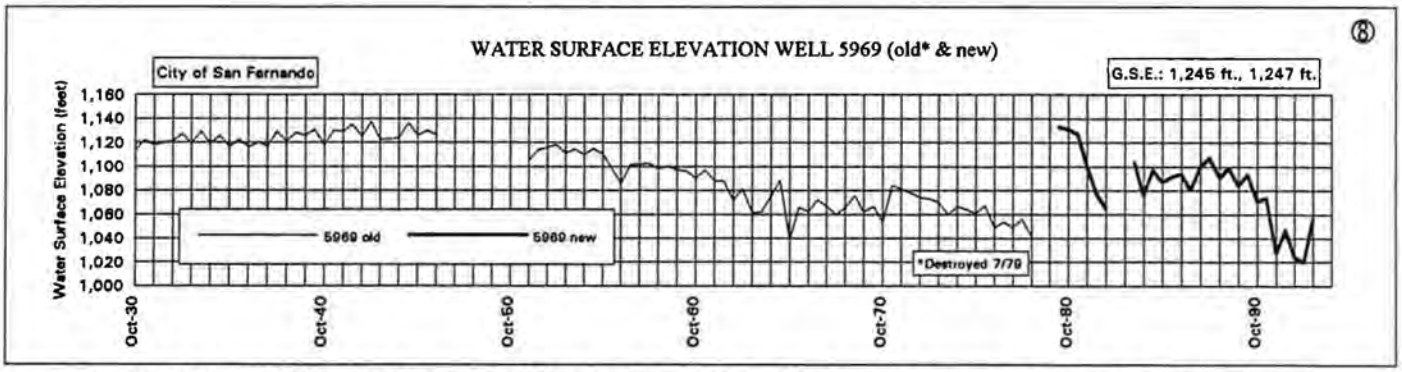
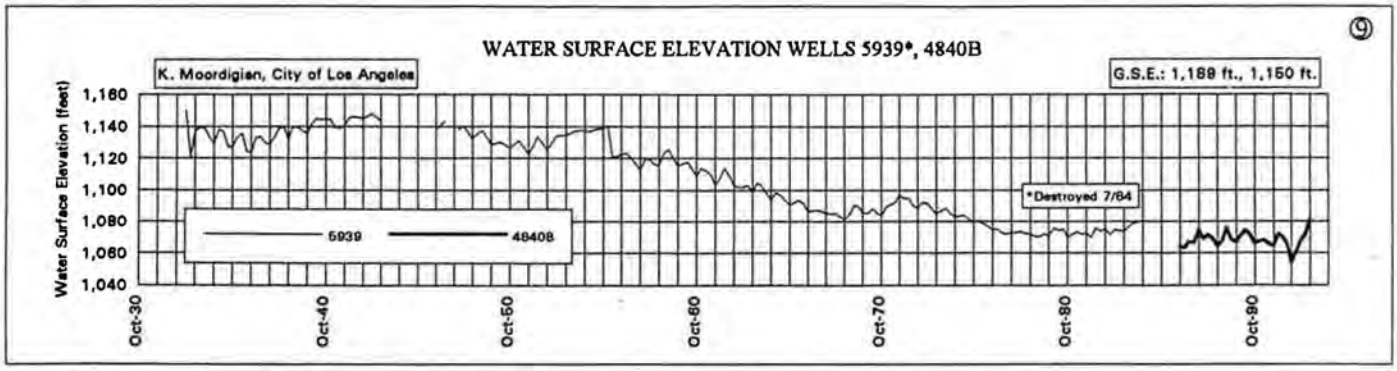
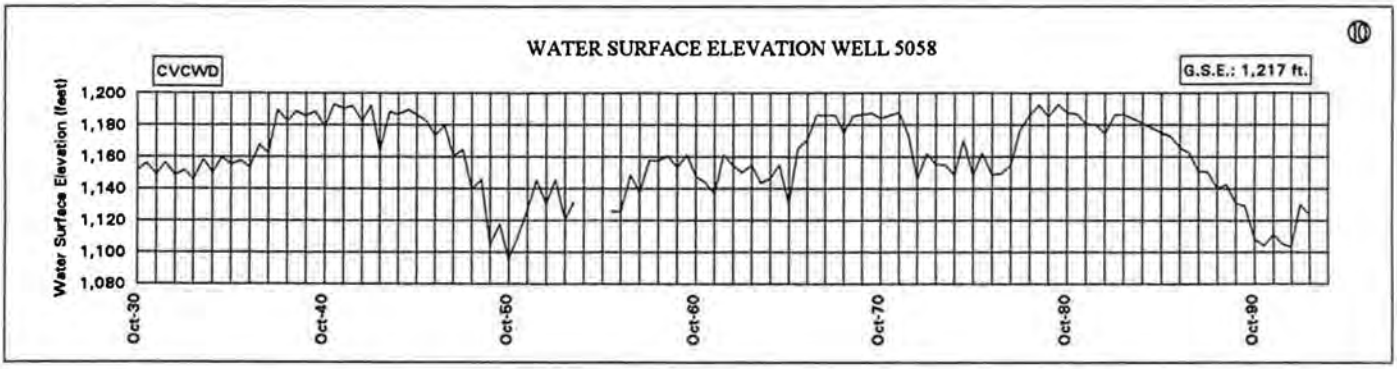


FIGURE 2.4 - HYDROGRAPHS OF WELLS THROUGHOUT ULARA AND WELL LOCATION MAP

SYLMAR BASIN



VERDUGO BASIN



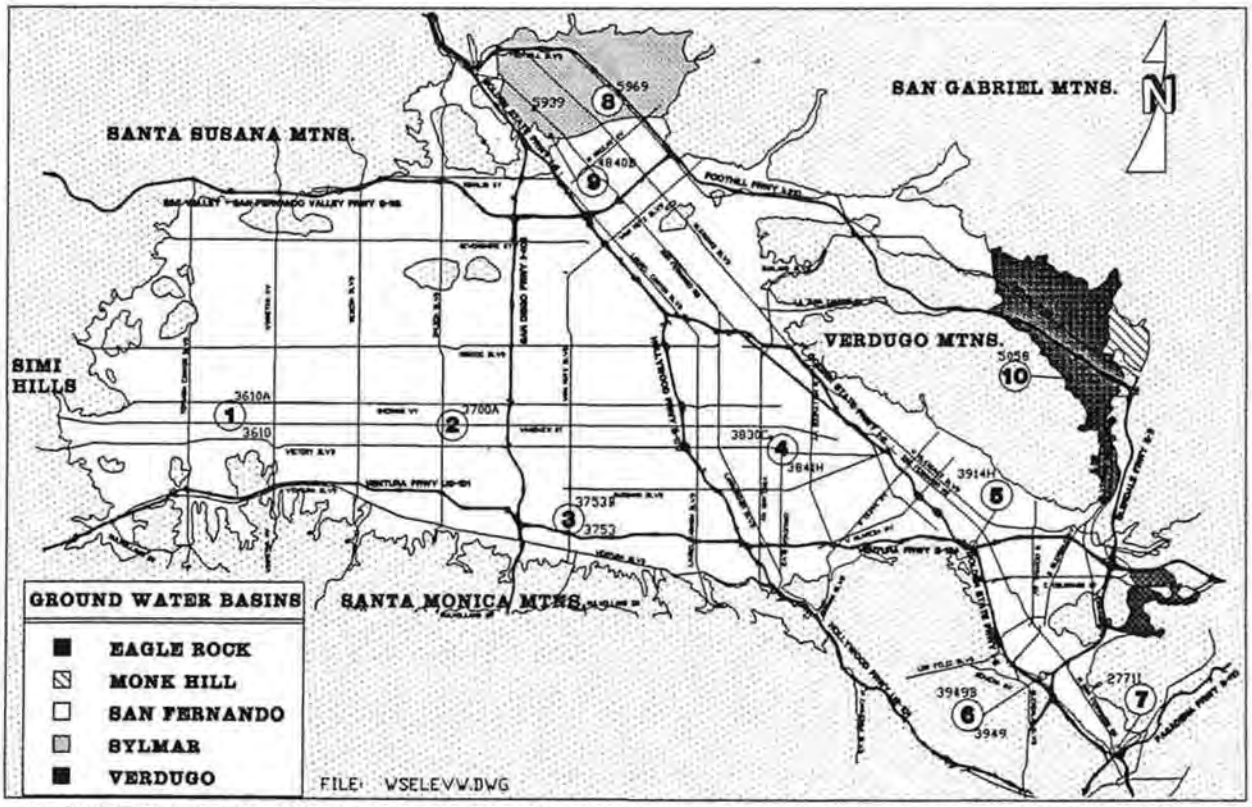


FIGURE 2.4 - HYDROGRAPHS OF WELLS THROUGHOUT ULARA AND WELL LOCATION MAP

Sylmar Basin

The ground water storage capacity of the Sylmar Basin is approximately 310,000 acre-feet. The estimated increase in storage for 1992-93 is 11,069 acre-feet, and the cumulative increase in storage from 1968-69 through 1992-93 is 5,759 acre-feet.

Verdugo Basin

The ground water storage capacity of the Verdugo Basin is approximately 160,000 acre-feet. The estimated increase storage for 1992-93 is 12,601 acre-feet, and the cumulative increase in storage from 1968-69 through 1992-93 is minus 5,348 acre-feet.

Eagle Rock Basin

The estimated increase in storage is 184 acre-feet.

2.10 Water Supply and Disposal - Basin Summaries

Tables 2-9A, 2-9B, 2-9C, and 2-9D summarize water supply and disposal in the San Fernando, Sylmar, Verdugo, and Eagle Rock Basin, respectively. The Watermaster made computations of subsurface outflows based on similar computations made by the State Water Resources Control Board (SWRCB).

2.11 Extraction Rights and Stored Water Credit - Basin Summaries

San Fernando Basin

Tables 2-10A and 2-11A show the calculation of San Fernando Basin extraction rights for the 1993-94 Water Year and stored water credit (as of October 1, 1993) for the Cities of Burbank, Glendale, and Los Angeles. All rights are based on the City of Los Angeles vs. City of San Fernando, et al., Judgment, dated January 26, 1979.

Sylmar Basin

Tables 2-10B and 2-11B show the calculation of Sylmar Basin extraction rights for the 1993-94 Water Year and stored water credit (as of October 1, 1993) for the Cities of Los Angeles and San Fernando. All rights are based on the March 22, 1984 stipulation between the City of San Fernando and the City of Los Angeles (filed with the Superior Court).

TABLE 2-8: CHANGE IN GROUND WATER STORAGE SAN FERNANDO BASIN

Water Year	Valley Floor Precipitation (Inches)	Change in Storage (AF)	Cumulative Change in Storage (AF)
1968-69	29.00	79,240	79,240 *
1969-70	10.50	(9,740)	69,500
1970-71	15.57	15,340	84,840
1971-72	8.10	(17,090)	67,750
1972-73	20.65	17,020	84,770
1973-74	15.75	(21,820)	62,950
1974-75	14.74	(22,580)	40,370
1975-76	9.90	(30,090)	10,280
1976-77	14.19	(50,490)	(40,210)
1977-78	35.43	136,150	95,940
1978-79	21.76	78,080	174,020
1979-80	30.25	99,970	273,990
1980-81	11.04	(32,560)	241,430
1981-82	17.18	(530)	240,900
1982-83	39.64	121,090	361,990
1983-84	9.97	(63,180)	298,810
1984-85	11.00	(31,690)	267,120
1985-86	20.27	(7,980)	259,140
1986-87	5.99	(31,940)	227,200
1987-88	18.62	(5,000)	222,200
1988-89	9.12	(30,550)	191,650
1989-90	8.20	(29,941)	161,709
1990-91	14.38	(14,122)	147,587
1991-92	30.05	411	147,998
1992-93	36.62	106,317	254,315
Average	18.32	10,173	

* Assumes storage as of October 1, 1968, to be zero.

TABLE 2-9A: SUMMARY OF 1992-93 WATER SUPPLY AND DISPOSAL SAN FERNANDO BASIN

(acre-feet)

Water Source and Use	City of Burbank	City of Glendale	City of Los Angeles	City of San Fernando	All Others	Total
Extractions						
Municipal Use	1,205	91	34,973	0	1,922	38,191
Testing	150	0	240	0	0	390
Non-consumptive Use	0	0	0	0	2,461	2,461
Total	1,354	91	35,213	0	4,383	41,042
Imports						
LA Aqueduct Water	---	---	266,203	---	---	266,203
MWD Water	18,005	25,970	201,505	1,169	5,376	252,025
Ground Water from Sylmar Basin	---	---	1,369	1,952	---	3,321
Total	18,005	25,970	469,077	3,121	5,376	521,549
Reclaimed Water Use	2,629	727	3,023	0	1,182	7,561
Exports						
LA Aqueduct Water	---	---	138,692	---	---	138,692
MWD Water						
out of ULARA	---	---	92,942	---	---	92,942
to Verdugo Basin	---	3,330	---	---	---	3,330
Ground Water	---	---	23,172	---	---	23,172
Total	0	3,330	254,806	0	0	258,136
Total Delivered Water	21,839	23,458	252,267	3,121	8,480	309,166
Water Delivered to Hill and Mountain Areas	---	---	41,142	---	---	41,142
Water Outflow						
Surface (Sta. F-57C-R)	---	---	---	---	---	560,023
Subsurface	---	---	---	---	---	421
Sewage	5,765	15,036	71,000 (a)	1,910	---	93,711
Reclaimed Water to the LA River	5,395	7,477	73,413	---	---	86,284
Total	11,160	22,512	144,413	1,910	0	740,439

(a) Estimated from historic data.

TABLE 2-9B: SUMMARY OF 1992-93 WATER SUPPLY AND DISPOSAL
SYLMAR BASIN
(acre-feet)

Water Source and Use	City of Los Angeles	City of San Fernando	All Others	Total
Total Extractions	1,369	2,145	1	3,515
Imports				
LA Aqueduct Water	5,188	--	--	5,188
MWD Water	3,472	116	--	3,588
Total	8,660	116	0	8,776
Exports				
Ground Water to the San Fern. Basin	1,369	1,952	0	3,321
Total Delivered Water	8,660	309	1	8,969
Water Outflow				
Subsurface	460 (a)	--	--	0
Sewage	830 (a)	189	--	1,019
Total	1,290	0	0	1,019

(a) Estimated.

TABLE 2-9C: SUMMARY OF 1992-93 WATER SUPPLY AND DISPOSAL
VERDUGO BASIN
(acre-feet)

Water Source and Use	Crescenta Valley County Water District	City of Glendale	La Canada Irrigation District	City of Los Angeles	Total
Total Extractions	2,557	990	0	---	3,547
Imports					
LA Aqueduct Water	---	---	---	434	434
MWD Water	1,697	3,330	886	283	6,195
Total	1,697	3,330	886	717	6,629
Exports	0	0	0	0	0
Total Delivered Water	4,253	4,320 (a)	886	717	10,176
Water Outflow					
Subsurface to:					
Monk Hill Basin	---	---	---	---	300 (b)
San Fern. Basin	---	---	---	---	70
Sewage	1,528	1,033	0	190 (b)	2,751
Total	1,528	1,033	0	190	3,121

(a) Verdugo Basin metered sales x 105%.
(b) Estimated.

TABLE 2-9D: SUMMARY OF 1992-93 WATER SUPPLY AND DISPOSAL EAGLE ROCK BASIN

(acre-feet)

Water Source and Use	City of Los Angeles	Deep Rock Water Company	McKesson Water Products Co.	Total
Total Extractions	0	0 (a)	180 (a)	180
Imports				
LA Aqueduct Water	0	--	--	0
MWD Water	3,705	--	--	3,705
Total	3,705	0	0	3,705
Exports				
Ground Water	0	0	180	180
Total Delivered Water	3,705	0	0	3,705
Water Outflow				
Surface	--	--	--	0
Subsurface	0 (b)	--	--	0
Sewage	1,940 (c)	0	0	1,940
Total	1,940	0	0	1,940

(a) Deep Rock Water Co. and McKesson Water Products Co. (formerly Sparkletts Drinking Water Co.) are allowed to pump under a stipulated agreement with The City of Los Angeles; extractions are limited to 500 AF/year, and they are allowed to export equivalent amounts.

(b) Estimated in Supplement No. 2 to Report of Referee for dry years 1960-61. Currently considered insignificant.

(c) Estimated 5 year trend.

TABLE 2-10A: CALCULATION OF 1993-94 EXTRACTION RIGHTS
SAN FERNANDO BASIN
(acre-feet)

	City of Burbank	City of Glendale	City of Los Angeles
Total Delivered Water, 1992-93	21,839	23,458	252,267
Water Delivered to Hill and Mountain Areas, 1992-93	---	---	41,142
Water Delivered to Valley Fill, 1992-93	21,839	23,458	211,125
Percent Recharge Credit	20.0%	20.0%	20.8%
Return Water Extraction Right	4,368	4,692	43,914
Native Safe Yield Credit	0	0	43,660
Total Extraction Right for the 1993-94 Water Year	**4,368**	**4,692**	**87,574**

TABLE 2-10B: CALCULATION OF 1993-94 EXTRACTION RIGHTS
SYLMAR BASIN
(acre-feet)

	City of Los Angeles	City of San Fernando	All Others
Extraction Right for the 1993-94 Water Year*	**3,105**	**3,105**	**

* The safe yield of the Sylmar Basin is 6,210 acre-feet. Effective October 1, 1984, the safe yield less pumping by two overlying parties, (which in 1992-93 was near zero), is equally shared by Los Angeles and San Fernando.

** Entitled to reasonable overlying pumping rights by Meurer Engineering only. Santiago Estates (Home Owners Group) are pumping for irrigation of their properties. This is being investigated further.

TABLE 2-11A: CALCULATION OF STORED WATER CREDIT
SAN FERNANDO BASIN
(acre-feet)

	City of Burbank	City of Glendale	City of Los Angeles
1. Stored Water Credit (as of October 1, 1992)	52,479	36,187	190,471
2. Extraction Right for the 1992-93 Water Year	4,186	4,500	84,014
3a. 1992-93 Extractions			
Party Extractions	1,354	91	35,213
Physical Solution Extractions	980	303 *	369
Total:	2,334	394	35,582
3b. Extractions for Testing	150 **	0	240 **
4. Total 1992-93 Spread Water	500	0	114
5. Stored Water Credit (as of October 1, 1993)	**54,981**	**40,293**	**239,257**

Note: Item 5 = 1 + 2 - 3a + 3b + 4

* Angelica Healthcare Services physical solution pumping (65 acre-feet) was not charged to Glendale (see Table 2-5).

** These values and purpose for pumping are under review by the ULARA Watermaster and may require approval by the Administrative Committee.

TABLE 2-11B: CALCULATION OF STORED WATER CREDIT
SYLMAR BASIN
(acre-feet)

	City of Los Angeles	City of San Fernando	All Others
1. Stored Water Credit (as of October 1, 1992)	(85)	1,692	---
2. Extraction Right for the 1992-93 Water Year	3,105	3,105	---
3. Total 1992-93 Extractions	1,369	2,145	1
4. Stored Water Credit (as of October 1, 1993)	**1,651**	**2,652**	—

Note: Item 4 = 1 + 2 - 3

3. WATER QUALITY, TREATMENT, AND REMEDIAL INVESTIGATION ACTIVITIES

3. WATER QUALITY, TREATMENT, AND REMEDIAL INVESTIGATION ACTIVITIES

3.1 Water Quality

Imported Water

1. Los Angeles Aqueduct water is sodium bicarbonate in character and is the highest quality water available to ULARA. Its TDS concentration averaged about 210 milligrams per liter (mg/l) for 30 years before 1969. The highest on record was 320 mg/l on April 1, 1946. TDS concentration On June 21, 1993 was 108 mg/l which is the lowest TDS concentration on record.

2. Colorado River water is predominantly sodium-calcium sulfate in character, changing to sodium sulfate after treatment to reduce total hardness. Samples taken at the Burbank turnout between 1941 and 1975 indicated a high TDS concentration of 875 mg/l in August 1955 and a low of 625 mg/l in April 1959. The average TDS concentration over the 34-year period was approximately 740 mg/l. Tests conducted at Lake Matthews showed an average TDS concentration of 635 mg/l for the 1992-93 Fiscal Year.

3. Northern California water (State Water Project water) is sodium bicarbonate-sulfate in character. It generally contains less TDS and is softer than local and Colorado River water. Since its arrival in Southern California in April 1972, the water has had a high TDS concentration of 410 mg/l and a low of 247 mg/l. Tests conducted at the Joseph Jensen Filtration Plant showed an average TDS concentration of 410 mg/l during the 1992-93 Fiscal Year.

4. Colorado River/Northern California water were first blended at Weymouth Plant in May, 1975. Blending ratios vary at the Weymouth Plant and tests are taken from the effluent. The average TDS concentration was 609 mg/l during the 1992-93 Fiscal Year.

Surface Water

Surface runoff contains salts dissolved from rocks in the tributary areas and is sodium-calcium, sulfate-bicarbonate in character. In December 1993, low flows in the Los Angeles River at the

Arroyo Seco showed a TDS concentration of 670 and a total hardness of 287 mg/l. These values also reflect the inclusion of rising ground water in the Los Angeles River reach between Los Feliz Blvd. and Gage F-57C-R.

Ground Water

Ground water in ULARA is moderately hard to very hard. The character of ground water from the major water-bearing formations is of two general types, each reflecting the composition of the surface runoff in the area. In the western part of ULARA, it is calcium sulfate-bicarbonate in character, while in the eastern part, including Sylmar and Verdugo Basins, it is calcium bicarbonate in character.

Ground water is generally within the recommended limits of the California Title 22 Drinking Water Standards, except for: 1) areas of the eastern San Fernando Valley where high concentrations of TCE, PCE, and nitrates are present; 2) wells in the western end of the San Fernando Basin having excess concentrations of sulfate; and 3) areas throughout the Verdugo Basin and in various portions of the San Fernando Basin, where there are abnormally high concentrations of nitrate. In each area the ground water delivered is either being treated or blended in order to meet State Drinking Water Standards.

A history of the TDS content in the various water sources and mineral analyses of imported, surface, and ground waters are contained in Appendix F.

3.2 Ground Water Quality Management Plan

During the 1992-93 Water Year, the Interagency Coordinating Committee continued to implement the recommendations of the "Groundwater Quality Management Plan - San Fernando Valley Basins" issued in July 1983. The objective of this effort is to protect and upgrade the quality of stored water held in San Fernando Valley ground water basin. Special emphasis is placed on monitoring and removing the organic contaminants Trichloroethylene (TCE) and Perchloroethylene (PCE) found in the ground water. Table 3-1 summarizes the number of wells in the ULARA well fields exceeding the Maximum Contaminant Levels of the California Drinking Water Standards of 5 ppb for TCE and 5 ppb for PCE.

TABLE 3.1 - 1992-93 NUMBER OF WELLS IN THE ULARA WELL FIELDS EXCEEDING CALIFORNIA STATE MCL FOR TCE AND PCE

	Number of Wells Exceeding Contaminant Level													
	City of Los Angeles									Sub-	Others			Grand
	NH	CS	P	HW	E	W	T	V	AE	Total	B	G	CVCWD	Total
TCE Levels (ppb)														
5-20	10	0	0	0	2	0	1	1	0	14	1	5	0	20
20-100	3	2	3	6	0	3	0	0	4	21	4	1	0	26
>100	2	0	0	0	0	0	0	0	2	4	4	2	0	10
Total	15	2	3	6	2	3	1	1	6	39	9	8	0	56
PCE Levels (ppb)														
5-20	4	0	0	3	0	0	0	1	0	8	2	1	1	11
20-100	1	0	3	1	0	0	0	0	1	6	3	0	0	9
>100	0	0	0	0	0	0	0	0	0	0	4	0	0	4
Total	5	0	3	4	0	0	0	1	1	14	9	1	1	24

Well Fields:
- NH - North Hollywood
- CS - Crystal Springs
- P - Pollock
- HW - Headworks
- E - Erwin
- W - Whitnall
- T - Tujunga (added this year)
- V - Verdugo
- AE - LADWP Aeration Tower Wells
- B - City of Burbank
- G - City of Glendale
- CVCWD - Crescenta Valley County Water District

Notes:

1) Wells are categorized based upon maximum TCE and PCE values attained during the 1992-93 Water Year, where data was not available, data from the most recent water year was used.

2) MCL: Maximum Contaminant Level

3.3 Underground Tanks, Sumps, and Pipelines

The Underground Storage Tank Program (UST) of the Los Angeles Fire Department (LAFD) will continue to operate beyond the original projected (1987) completion time frame of five years. Protracted remediation programs, reporting lags, and financial shortfalls are the primary causes of delay in the completion of the UST.

During the year 113 sites have been remediated under LAFD direction.

Since October 1, 1988 over 2,000 sites have been assigned to the UST Enforcement Unit of LAFD. Of these, 809 sites have been remediated. Another 599 sites have been forwarded to the Los Angeles Regional Water Quality Control Board (LARWQCB) for further action after LAFD initial site investigation indicated that ground water contamination was involved.

LAFD has presently 700 sites in various stages of corrective action.

The main focus of the LAFD UST program in ULARA has been the monitoring and removal of gasoline, diesel fuel, and their related constituents from the soils, in order to prevent contamination of the underlying ground water.

3.4 Private Sewage Disposal Systems (PSDS)

In order to eliminate existing commercial and industrial PSDS and their discharges of wastewater to the ground water basin, a sewer construction program has been in progress for several years to install new sewer projects in the San Fernando Valley which are designated as Ground Water Improvement Districts. Two Districts were eliminated from the 20 originally proposed. At the end of the 1992-1993 Water Year, twelve sewer construction projects had been completed. Additionally, five sewer construction projects had been designed and one project is being designed. Plate 8 shows the locations of the Districts.

The Industrial Waste Management Division (formerly the Enforcement Division) of the Bureau of Sanitation continued to pursue a PSDS elimination program for commercial and industrial properties in order to prevent ground water contamination from these sources. Additional "Notices to Connect" as required by Ordinance No. 160388 were issued to subject owners. Compliance with the notices issued under this program is rapidly approaching 100%.

3.5 Landfills

Solid Waste Assessment Test (SWAT) reports, prepared by consultants, were reviewed for accuracy as to the impact of solid waste disposal sites upon the air and water quality for many SWAT Ranks 1-4 landfills in the Los Angeles area. The SWAT Program has been discontinued, and replaced by Article 5 of Chapter 15.

The SWAT report of the Pendleton landfill, owned by the Water System of the Los Angeles Department of Water and Power was approved by the LARWQCB. To confirm the SWAT conclusions two additional semiannual monitorings were required. The report summarizing the first semiannual sampling procedures and analytical results was submitted to the LARWQCB.

The SWAT reports for other major landfills in the San Fernando Valley have been completed or are under review (Table 3-2). A summary of the contents of various SWAT reports previously reviewed is included in Appendix I.

3.6 San Fernando Valley Remedial Investigation (RI) and Related Activities

A remedial investigation (RI) of ground water contamination in the San Fernando Valley was initiated in July 1987 by the United States Environmental Protection Agency (EPA) to characterize the San Fernando Basin (SFB) and the Verdugo Basin and their contamination with TCE and PCE. The Los Angeles Department of Water and Power (LADWP) was selected by the EPA to serve as the its lead agency in conducting the RI and entered into a cooperative agreement that has provided over $19 million in federal funding to LADWP since July 1987. In August 1987, the LADWP selected James M. Montgomery, Consulting Engineers, Incorporated (JMM) to serve as its consultant to perform various RI tasks.

The report, "Remedial Investigation of Groundwater Contamination in the San Fernando Valley," was completed in December 1992 and is a comprehensive, five-volume report which presents the findings and characterizations of the SFB and the Verdugo Basin with regard to their geology, hydrogeology, and nature and extent of contamination. The RI report also provides a description and the documentation of the SFB Groundwater Flow Model, summarizes the RI field investigation activities, and evaluates potential risks to human health and the environment.

TABLE 3-2: LANDFILLS WITH SWAT INVESTIGATIONS

(reported to Interagency Coordinating Committee)

Name	Rank	Status	Current Owner	Location	SWAT Report Completed	Final SWAT Submitted	Phase II SWAT Required	Under Review by Reg. BD.	Approved by Reg. BD.	Site Leak	Type of Leak	Further Ground Water Monitoring
Bradley West	1	Open	WMDSC	Sun Valley, Southeast of Sheldon Street	6/87	11/90			4/92	Y	NHA	a*
Sheldon-Arleta	1	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District Near Hollywood & Golden State Freeways.	5/87	5/87			2/90	U		b
Scholl Canyon	1	Open	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl.	7/87	4/88			8/90	Y	NHA	a*
Scholl Canyon	2	Closed	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl.	7/87	1/91			12/93	P		c
Bradley East	2	Closed	WMDSC	Southeast of Sheldon St.	6/87	11/90			4/92	Y	NHA	b*
Sunshine Cyn.	2	Open	Browning - Ferris Industries	Southeast Santa Susana Mtns. West of Golden State Fwy.	7/88	7/89		X				a
Gregg Pit/Bentz	2	Closed	Cal Mat Properties	Between Pendleton Street and Tujunga Ave.	7/89	7/89			2/90	Y	NHA	b
Branford	2	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District Northwest of Tujunga Wash	7/88	10/90	X					c
Cal Mat (Sun Valley #3)	2	Open	Cal Mat Properties	Sun Valley District Northeast of Glenoaks Blvd.	7/88	11/90			6/92	N		
Lopez Canyon	2	Open	City of Los Angeles Bureau of Sanitation	North of Hansen Dam Between Lopez and Kagel Cyn.	6/88	6/88	X					a
Toyon Canyon	2	Closed	City of Los Angeles Bureau of Sanitation	Griffith Park	6/88	3/89			4/91	Y	NHA	b*
Tuxford Pit	2	Closed	Aadlin Bros. (Los Angeles By-Products Co.)	Sun Valley District Southwest of Golden State Freeway and Tujunga Ave.	6/88	12/90			6/92	P		b*
Penrose	2	Closed	Los Angeles By-Products Co.	N. of Strathern St., Tujunga Ave.	6/88	7/89			9/89	Y	NHB	b
Newberry	3	Closed	Los Angeles By-Products Co.	N. of Strathern St., Tujunga Ave.	6/88	7/89			9/89	Y	NHB	b
Hewitt Pit	2	Closed	Cal Mat Properties	North Hollywood District Hollywood Fwy., Laurel	6/88	7/89			5/91	Y	NHB	
CalMat (old) Bradley Land-fill Complex	3	Closed	WMDSC	Canyon Blvd. Sun Valley District Sheldon St., San Fernando	7/88	7/89			4/92	Y	NHA	b*
Pendleton St.	4	Open	Department of Water & Power	Sun Valley intersection Pendelton St., Glenoaks Blvd.	7/90	5/91			6/92	N		c
Stough Park	2	Open	City of Burbank	Bel Air Dr. & Cambridge Dr.	6/88	12/88			4/90	Y	NHA	a*

* Ground water contamination Evaluation Monitoring Program (EMP) required under chapter 15.

(a) All open landfills are required to have ground water monitoring under Chapter 15. Monitoring results are submitted to the Regional Board quarterly.

(b) Closed landfills with ground water monitoring required under Chapter 15. Monitoring results are submitted to the Regional Board periodically.

(c) Subject to SWAT requirements. Further monitoring may be required under Chapter 15.

U - Undetermined due to dry wells.

Y - Yes

N - no

P - Pending leakage determination.

NHA - Non-Hazardous but above state drinking water regulatory levels., H - Hazardous waste based on Title 22, CCR.

NHB - Non-Hazardous but below state drinking water regulatory levels., H - Hazardous waste based on Title 22, CCR.

The SFB Ground Water Flow Model was developed as a part of the San Fernando Valley Remedial Investigation and is a comprehensive, three-dimensional, regional-scale model. A three-dimensional mass transport model is being developed for the SFB. The model has been utilized to analyze the storage, characteristics, and quality of ground water in the SFB from the proposed East Valley Water Reclamation Project and ground water extraction scenarios.

EPA's consultant, CH2M HILL, continues to periodically sample the 87 ground water monitoring wells that were installed as part of the RI. CH2M HILL also obtains ground water quality and ground water elevation data from the LADWP, other municipalities, and various agencies and facilities in the San Fernando Valley to update the SFB database. CH2M HILL utilizes the data to produce contaminant plume maps, perform simulations with the SFB flow model, and proceed with the Feasibility Study to provide a remedial action plan for the SFB.

The RI Report and semi-annual sampling reports are available for public use at the Superfund Primary Information Repositories, which are located in the following agencies' libraries: City of Glendale, City of Burbank, LADWP, California State University-Northridge, and the University of California - Los Angeles.

The LADWP also maintains a current SFB database for use with the SFB flow model and generation of ground water contour maps and contaminant plume maps. CH2M HILL forwards current ground water quality and ground water elevation data to the LADWP for the database.

3.7 Water Treatment

EPA Operable Units

The EPA is proceeding with enforcement actions against potentially responsible parties (PRPs) for the North Hollywood, Burbank, Glendale North, and Glendale South Operable Units (OUs), which are part of the EPA's overall, long-term ground water remediation activities in the San Fernando Valley. The OUs are described below.

1. North Hollywood OU - The North Hollywood OU was completed and placed into full-time service in December 1989, and consists of a 2,000 gpm pump-and-treat system to contain and remove ground water contamination from the North Hollywood Well Field (east) area. The facility, which delivers the

treated ground water to the LADWP's water distribution system, is operated by the LADWP.

The Aeration Facility continued to operate satisfactorily during the 1992-93 Water Year, treating a total of 399 million gallons. North Hollywood Aeration Well No. 5 was repaired and put in operation, so that the average flow of water treated during the months of July and August 1993, reached 1,500-1,600 gpm. Due to ongoing construction work at the North Hollywood Sump, the Aeration Facility will be shut down effective October 1993 until April 1994.

The quality of air discharged to the atmosphere from the Aeration Facility was monitored on a regular basis to verify its conformance to permit requirements of the South Coast Air Quality Management District. The granular activated carbon in the off-gas adsorber was replaced in September/October 1992.

2. Burbank OU - The consent decree on the Burbank OU was entered by the court on March 25, 1992. Construction of Phase I of the Burbank OU facility, which will extract and treat 6,000 gpm of contaminated ground water from the Burbank area, is expected to be completed in Fall 1994. Once the blending facility has been completed to reduce nitrate levels, Phase I will be put into operation. The City of Burbank will use a portion of the treated ground water, and the City of Los Angeles is considering using a portion of the treated ground water upon completion of Phase II of the project in 1996.

3. Glendale North and Glendale South OUs - The Glendale North and Glendale South OUs are being planned to extract and treat a total of 5,000 gpm. The Records of Decision (RODs) were signed by the EPA in June 1993. The Glendale North OU is located in the Glendale Grandview Well Field area and will extract and treat 3,000 gpm of contaminated ground water. The Glendale South OU is located in the northern portion of the Los Angeles River Narrows Area and will extract 2,000 gpm of contaminated ground water for transmission to the Glendale South OU for treatment (the RODs specify a single treatment facility for both OUs). The combined 5,000-gpm flow of treated ground water will be delivered to the City of Glendale.

4. Pollock OU - The EPA is completing a site assessment of contaminated ground water in the Pollock Well Field area. LADWP has made use of all data and reports from the EPA for its Pollock Well Field Remediation Project on a cooperative basis.

Other Treatment Facilities

1. Advanced Oxidation Process (AOP) Plant - Performance evaluation of the facility continued throughout the year, in accordance with the test plan approved by the Department of Health Services (DHS). The plant was shut down intermittently for about one-and-a-half months, due to reconstruction of the North Hollywood Pumping Station and AOP system repair work.

   The plant is being run on four days per week basis with continuous daytime operator coverage. During routine operation some electrical and mechanical problems have been encountered. Equipment testing and improvement, refinement of operation and maintenance procedures, and data collection and reporting methods are being developed.

   The level of TCE in supply well water continues to be below original design estimates. Evaluation of water quality in the supply wells is still in progress.

2. Glendale Nitrate Water Treatment Plant - The Crescenta Valley County Water District's Glenwood Nitrate Water Treatment Plant which uses an anion-exchange process for nitrate removal, was back in full service in July 1993, and continued to operate satisfactorily during the remainder of the year.

3. Pollock Well Field Remediation Project - While the Pollock Project is compatible with the EPA's goal of basinwide ground water cleanup and protection, it is not directly related to the EPA's ground water cleanup efforts and will not be funded by the EPA. The Pollock Project's main focus is to reduce rising ground water flowing past gaging station F-57C-R, thus maintaining water rights for the City of Los Angeles.

The Pollock Project will entail the following:

- pumping approximately 3,000 gallons per minute of ground water from the existing Pollock Well No. 4 and Pollock Well No. 6 for a six-month period followed by a non-pumping period of six months
- treating the ground water with liquid-phase granular activated carbon (GAC) for VOC removal and disinfecting the treated ground water with liquid sodium hypochlorite
- blending the treated and chlorinated ground water to reduce nitrate levels
- delivering the blended water to LADWP's distribution system

The Pollock Project Alternative Study and recommendations were completed in November 1993 and were reviewed and approved by the ULARA Watermaster and LADWP engineering staff. The Initial Study and Negative Declaration were approved by the Board of Water and Power Commissioners in February 1994 and the Notice of Determination was filed with the Los Angeles County Clerk in March 1994. The Pollock Project will enter design phase in mid-1994 and is scheduled for completion in 1996.

4. Burbank GAC Treatment Plant - The City of Burbank placed a Granular Activated Carbon (GAC) Treatment Plant in operation in November 1992. The treatment facility underwent a carbon change out beginning in April 1993, and was placed back on line in September 1993. The GAC Treatment Plant uses ground water produced by Burbank Wells No. 7 and 15. Burbank continued to detect DCA and DCE in shallow Well No. 15. The origin of the DCA and DCE is suspected to be the plating operations in the vicinity of the facility.. The GAC Treatment Plant was out of operation from January 15, 1994 until March 3, 1994 for a carbon change out. Burbank expects to change carbon again in July 1994. Carbon efficiency is proving to be significantly less than expected. Burbank is considering switching contactors from parallel to series if the Department of Health Services allows it.

3.8 Ground Water Quality Investigations

During the 1992-93 Water Year, several ground water contamination investigations were performed at various sites. As part of these investigations ground water monitoring wells have been drilled and ground water has been extracted for the purpose of well development, testing or cleanup. Some of the major sites and their activities through March 1994 are summarized below:

Tujunga Well Field Area

The LADWP installed four ground water monitoring wells with dedicated pump systems upgradient of the Tujunga Well Field. In addition, two existing Valley Steam Plant Wells have been equipped with dedicated pump systems. The six wells will be sampled periodically to monitor the ground water quality in the Tujunga Well Field area.

Philips Components

Philips Components pumped and treated a total of 85 acre-feet of water during the 1992-93 Water Year. The approval for the installation of a soil vapor extraction system was received from the LARWQCB. An air permit to construct/operate was filed with the SCAQMD and the approval is expected in March 1994. The construction of the system will commence upon receipt of all appropriate permits.

Rockwell-Rocketdyne (Canoga Park)

Rocketdyne pumped and treated a total of 202 acre-feet of water during the 1992-93 Water Year. Rocketdyne is exploring the use of an air stripping system to replace the existing interim water phase granular activated carbon treatment system. The LARWQCB approved an air stripping tower pilot testing program, which commenced on January 10, 1994. After three consecutive weeks of analytical results of the testing, the air stripping system showed its effectiveness. The LARWQCB gave verbal approval to remove the water phase carbon after review of the analytical results.

3M (Formerly Riker Lab)

The interim pump and treat system treated 4 acre-feet during the 1992-93 Water Year. Installation of the vapor extraction system wells and piping was completed. The system is undergoing a Hazard and Operability Study (HAZOP) review. System startup in expected to be in the 2nd or 3rd quarter of 1994. Nitrate evaluation was submitted to the LARWQCB in October 1993. 3M expects to meet with the LARWQCB during the early part of 1994 to address nitrate and any other NPDES discharge issues.

Allied-Signal (Formerly Bendix Corp.)

Four offsite ground water monitoring wells were installed and sampled in July and August of 1993. Allied-Signal was named a Potentially Responsible Party (PRP) by the EPA in the Burbank OU. Allied Signal is currently investigating the possibility of Los Angeles' pumping in the North Hollywood Well Field drawing additional contamination under their site.

Hughes

Full-scale design specifications and drawings for the remediation system are being finalized for plan check and submission to the RWQCB as part of the Corrective Action Plan Addendum. The system integrates soil vapor extraction, a ground water pump and treat system for contaminant containment, and an air sparging system for remediation of the volatile organic compounds within the ground water. System construction is scheduled for completion in 1994.

A waste Discharge Permit Application has been submitted to the Regional Water Quality Control Board for discharge of the treated water stream from the ground water remediation system. Since the shallow ground water under the Hughes facility contains TDS concentrations in excess of NPDES discharge limitations, an alternative method of water handling has been designed and will include the construction of an irrigation water makeup system. Three 20,000 gallon holding tanks will store the treated water for use in the facility irrigation system. The treated water will supply approximately 50% of the required landscape maintenance water.

Greeff Fabrics (Formerly Wickes)

The vapor extraction system at the Wickes Company (within the Pollock Well Field area) is reported to be operating satisfactorily. Two plumes of volatile organic contaminants, one of onsite origin and the other of offsite origin, have been delineated. The ground water remediation plan includes three extraction wells, treatment by chemical oxidation, and return to ground water via a percolation trench. Preliminary data indicates high concentrations of chloro-toluene contamination in the ground water. Twenty test holes have been proposed to evaluate plume migration.

Taylor Yard (Narrows Area)

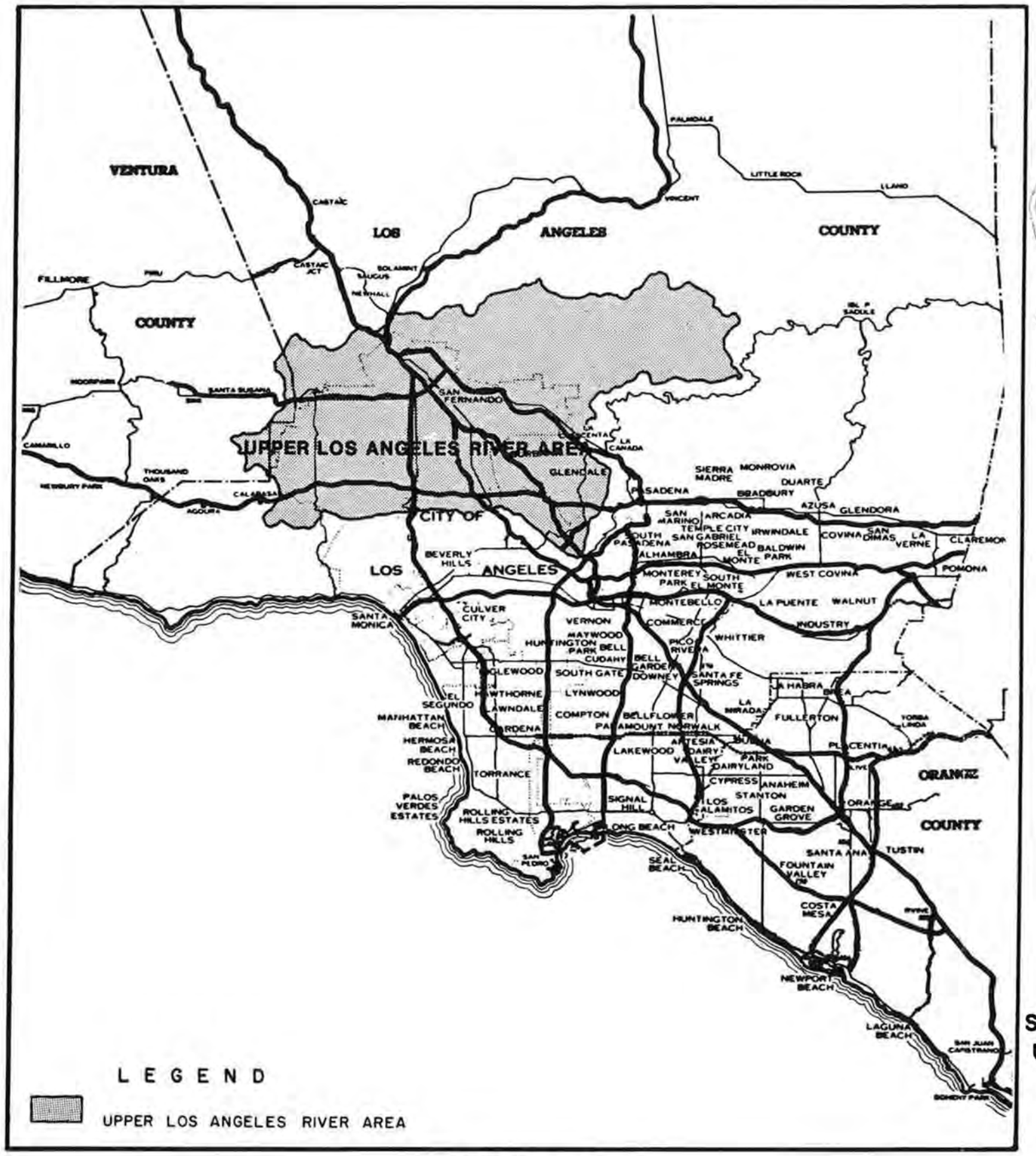
The Taylor Yard soil and ground water investigation is being handled by the Toxic Substances Control Program (TSCP) of the DHS. The TSCP will oversee the investigation and report to RWQCB of their findings. As of July 17, 1991, the TSCP became part of the newly formed California Environmental Protection Agency (CAL-EPA) and was renamed the Department of Toxic Substances Control (DTSC) in CAL-EPA. On September 30, 1991, DTSC approved the

Remedial Action Plan for the Southern Pacific Transportation Company, Taylor Yard-Sale Parcel. Diesel fuel was found in the ground water at the Taylor Yard sand trap excavation. VOCs have also been found along the northeast boundary of the Taylor Yard site. The VOCs are believed to be related to the operations of a series of small industries between the northeast boundary of the property and San Fernando Road.

PLATES

PLATE 1

UPPER LOS ANGELES RIVER AREA WATERMASTER



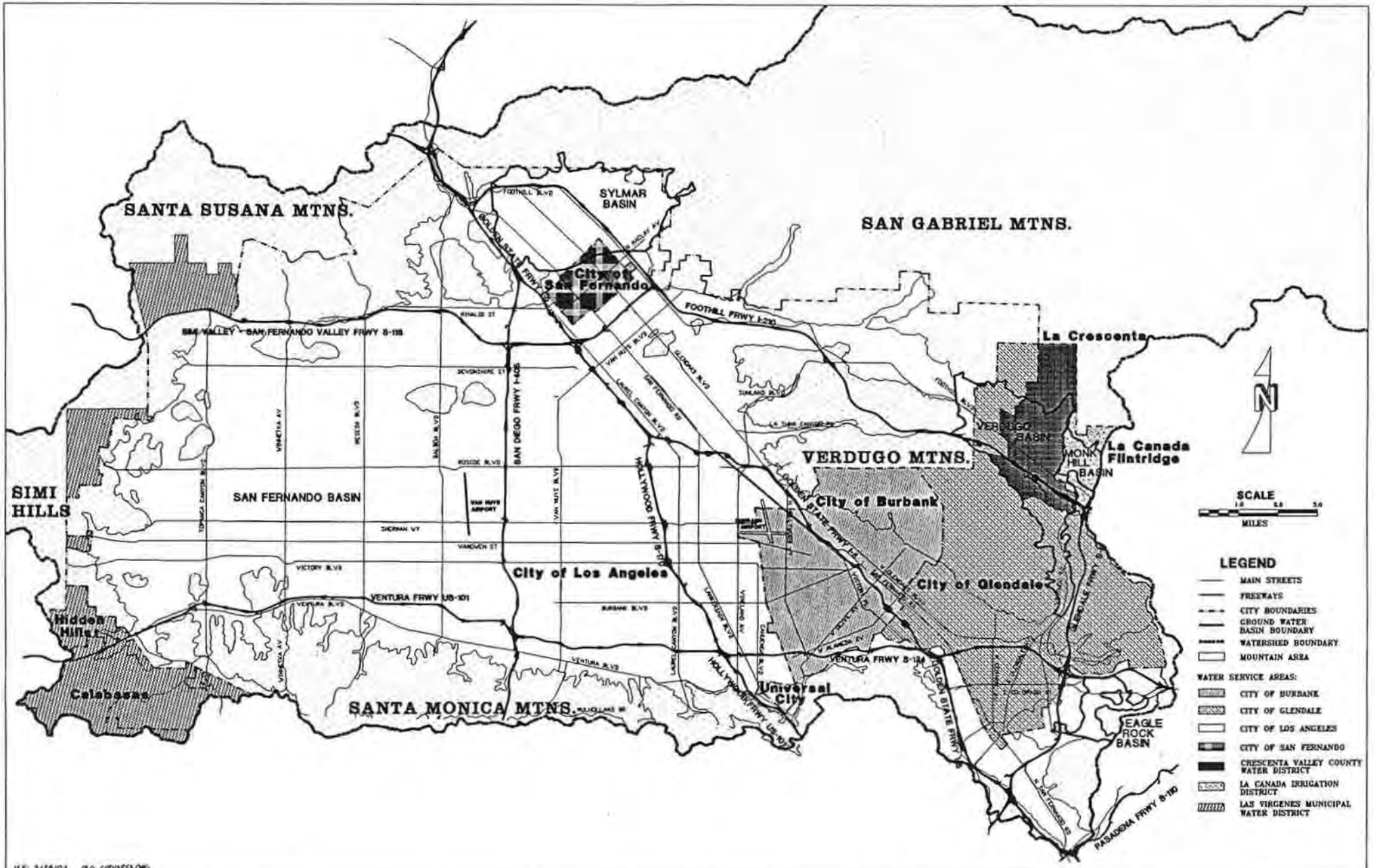
VICINITY MAP

SCALE

0 5 10 15 Miles

SEE VICINITY MAP FOR UPPER LOS ANGELES RIVER AREA

LOCATION MAP

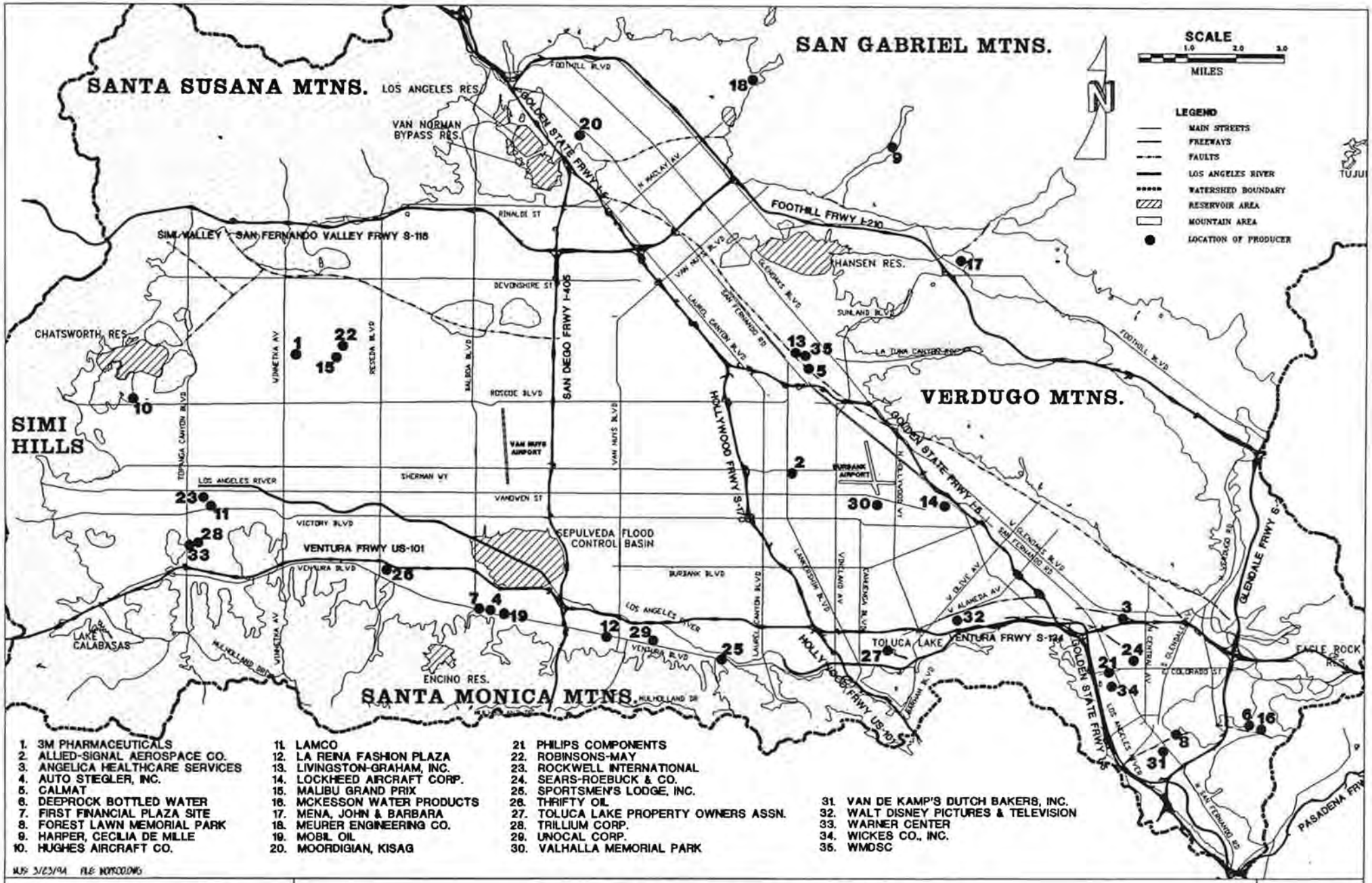


MJS 5/20/94 FILE SERVAREADMD

1992-93 Water Year
ULARA Watermaster Report

Upper Los Angeles River Area: Water Service Areas of Public Agencies

PLATE 2



1. 3M PHARMACEUTICALS
2. ALLIED-SIGNAL AEROSPACE CO.
3. ANGELICA HEALTHCARE SERVICES
4. AUTO STIEGLER, INC.
5. CALMAT
6. DEEPROCK BOTTLED WATER
7. FIRST FINANCIAL PLAZA SITE
8. FOREST LAWN MEMORIAL PARK
9. HARPER, CECILIA DE MILLE
10. HUGHES AIRCRAFT CO.
11. LAMCO
12. LA REINA FASHION PLAZA
13. LIVINGSTON-GRAHAM, INC.
14. LOCKHEED AIRCRAFT CORP.
15. MALIBU GRAND PRIX
16. MCKESSON WATER PRODUCTS
17. MENA, JOHN & BARBARA
18. MEURER ENGINEERING CO.
19. MOBIL OIL
20. MOORDIGIAN, KISAG
21. PHILIPS COMPONENTS
22. ROBINSONS-MAY
23. ROCKWELL INTERNATIONAL
24. SEARS-ROEBUCK & CO.
25. SPORTSMEN'S LODGE, INC.
26. THRIFTY OIL
27. TOLUCA LAKE PROPERTY OWNERS ASSN.
28. TRILLIUM CORP.
29. UNOCAL CORP.
30. VALHALLA MEMORIAL PARK
31. VAN DE KAMP'S DUTCH BAKERS, INC.
32. WALT DISNEY PICTURES & TELEVISION
33. WARNER CENTER
34. WICKES CO., INC.
35. WMDSC

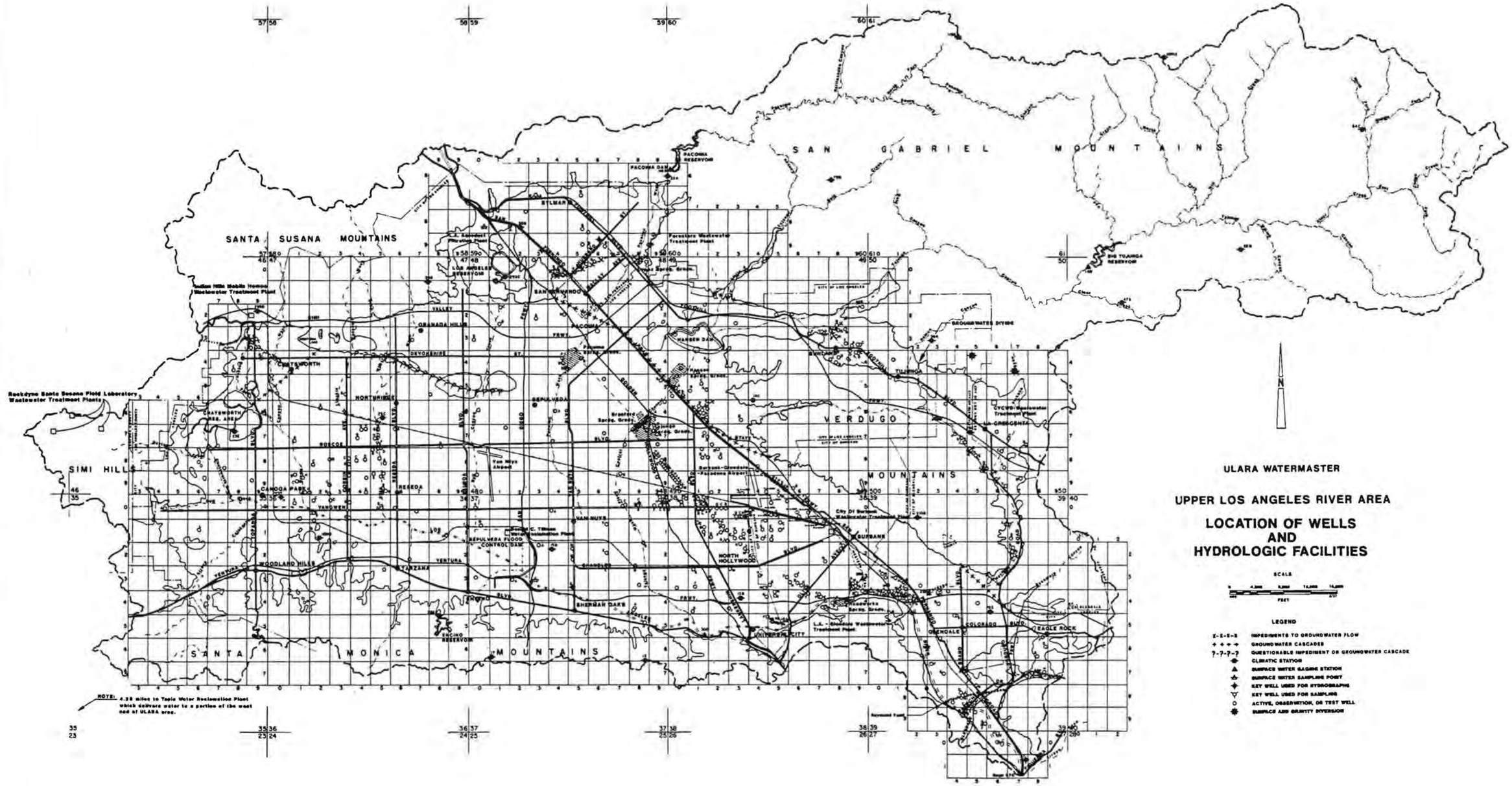
MJS 3/23/94 FILE: NOTCOLOR6

1992-93 Water Year
ULARA Watermaster Report

Upper Los Angeles River Area: Locations of Individual Producers

PLATE 3

PLATE 4



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

LOCATION OF WELLS AND HYDROLOGIC FACILITIES

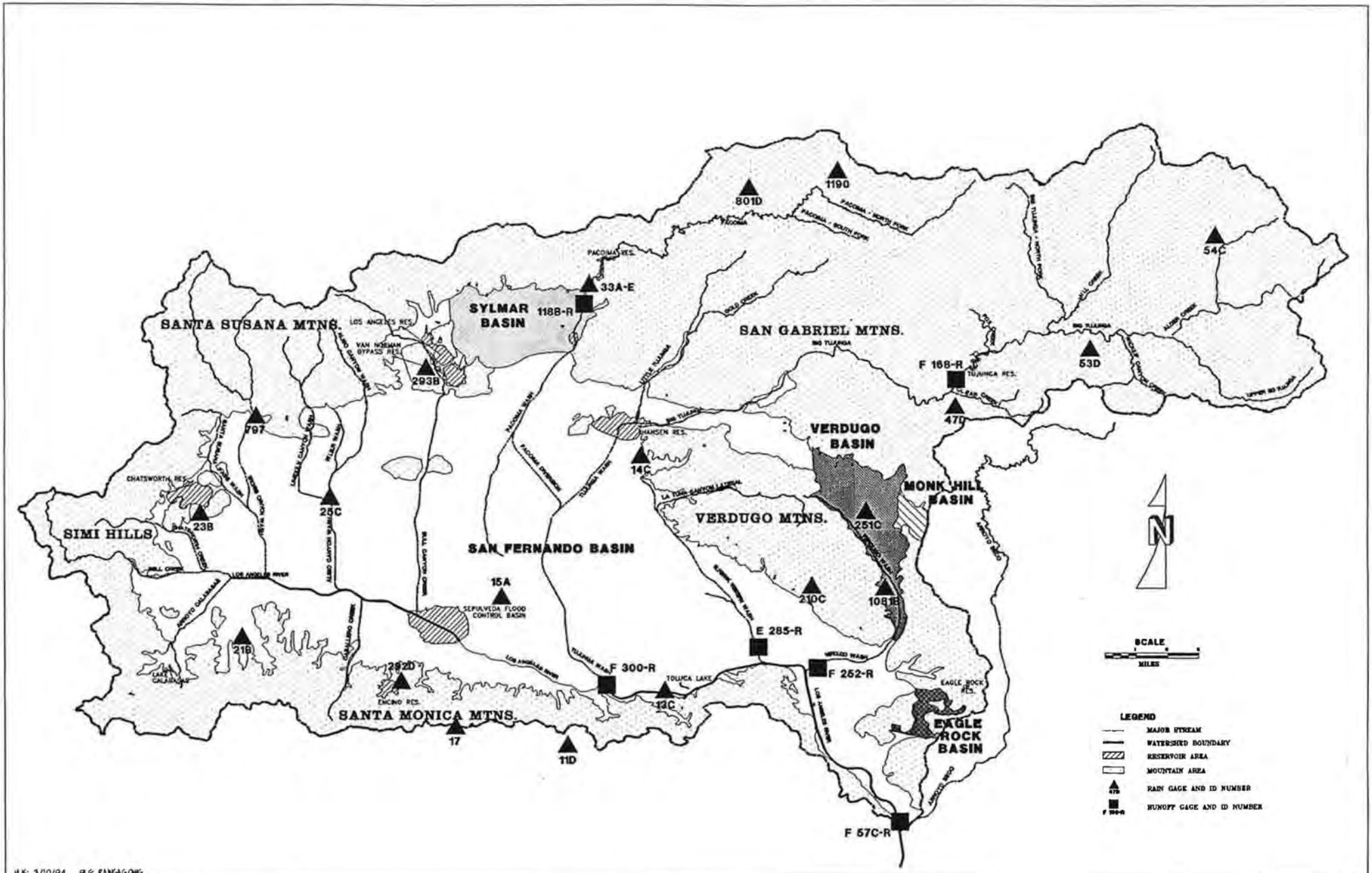
SCALE

0 4,000 8,000 12,000 16,000

FEET

LEGEND

- X-X-X-X IMPEDIMENTS TO GROUNDWATER FLOW
- + + + + GROUNDWATER CASCADES
- ?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE
- CLIMATIC STATION
- SURFACE WATER GAGING STATION
- SURFACE WATER SAMPLING POINT
- KEY WELL USED FOR HYDROGRAPHS
- KEY WELL USED FOR SAMPLING
- ACTIVE, OBSERVATION, OR TEST WELL
- SURFACE AND GRAVITY INVERSION

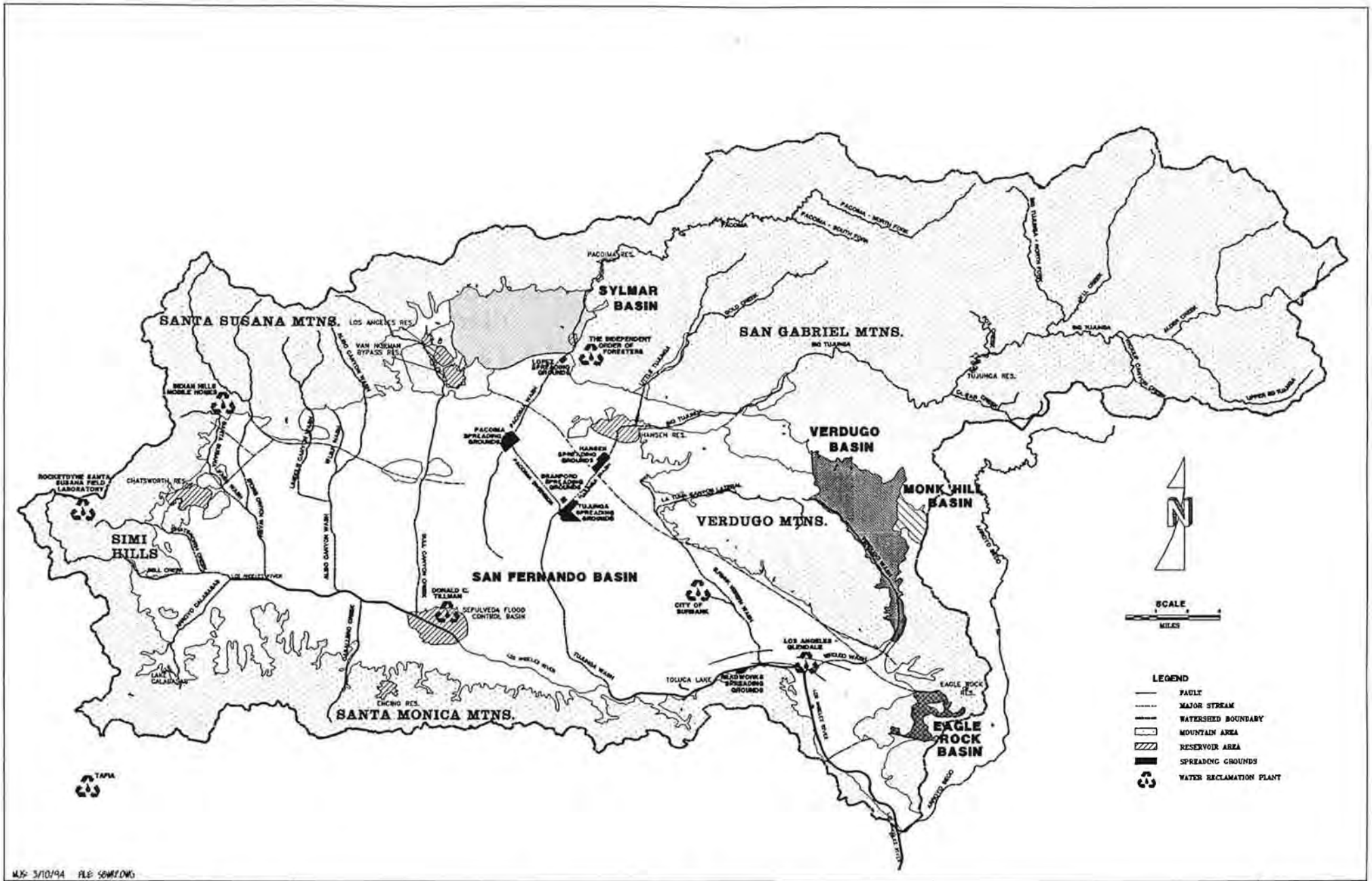


WLS: 3/10/94 FILE: RANGAGONG

1992-93 Water Year ULARA Watermaster Report

Upper Los Angeles River Area: Locations of Rain and Runoff Measuring Stations

PLATE 5

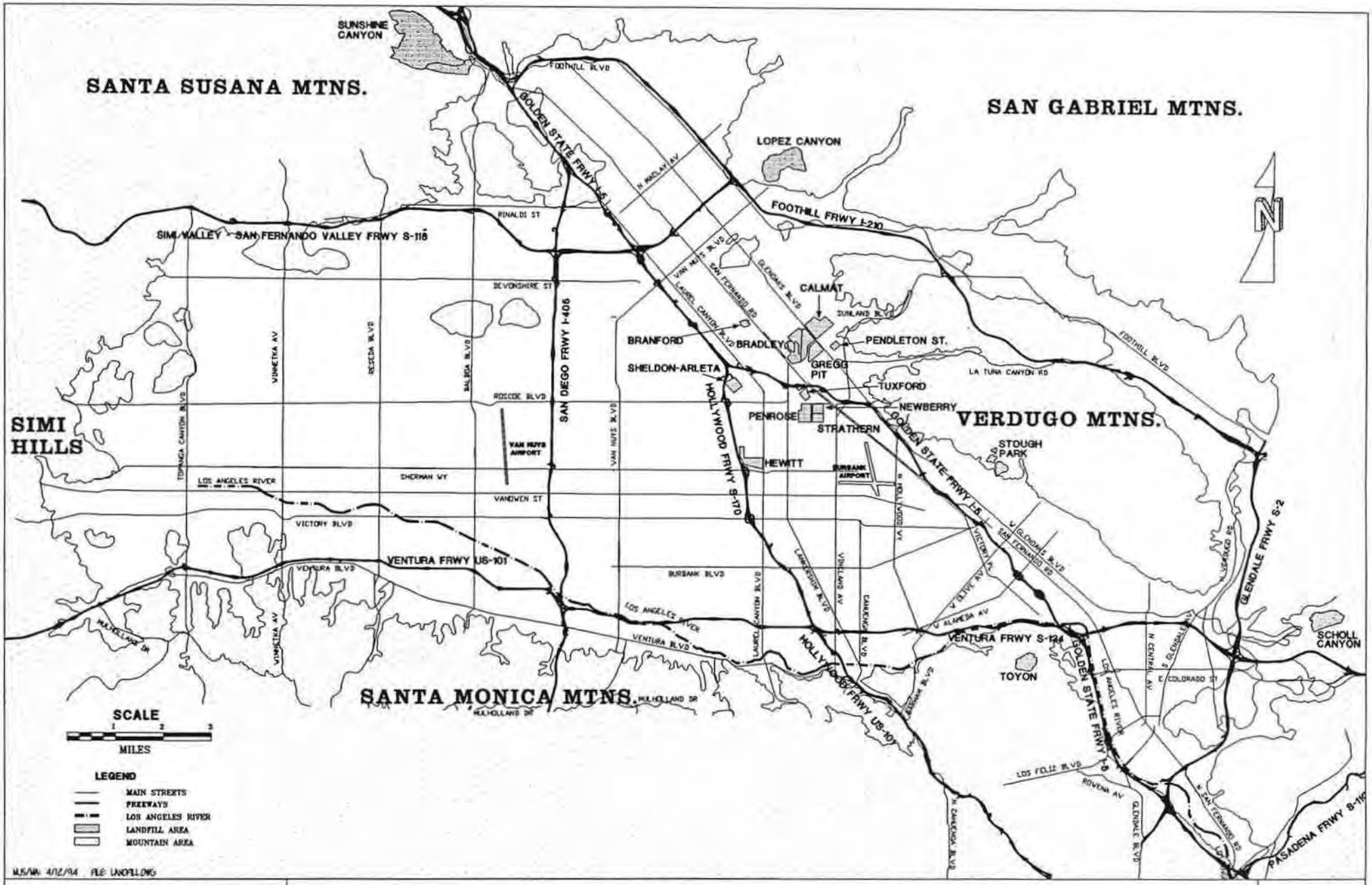


MJS 3/10/94 FILE SDWFLOWS

1992-93 Water Year
ULARA Watermaster Report

Upper Los Angeles River Area:
Spreading Basins and Water Reclamation Plants

PLATE 6



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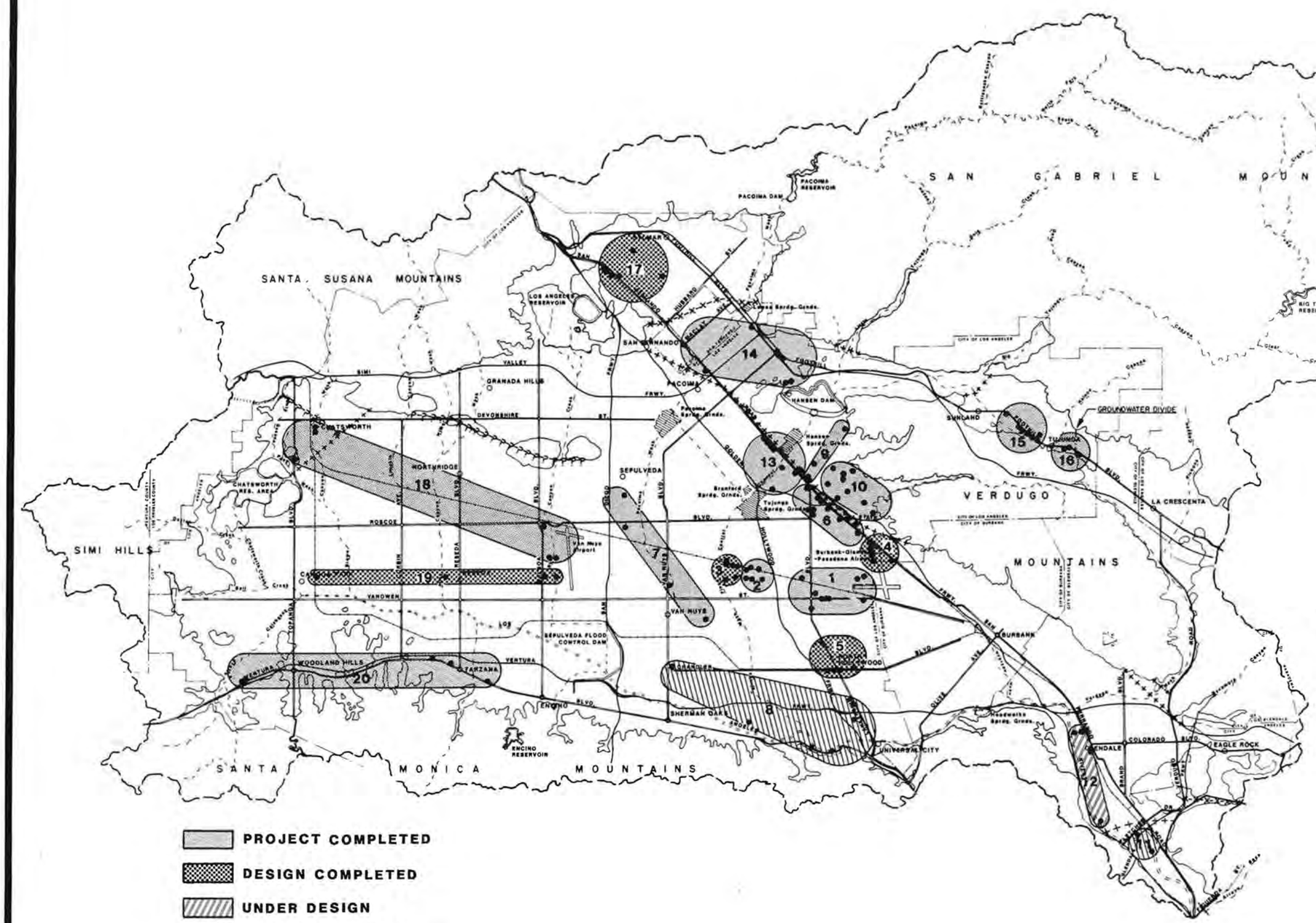
1992-93 Water Year ULARA Watermaster Report

Upper Los Angeles River Area: Landfills with Solid Waste Assessment Test (SWAT) Evaluations

PLATE 7

PLATE 8



PROJECT COMPLETED

DESIGN COMPLETED

UNDER DESIGN

DESIGN ELIMINATED

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

CITY OF LOS ANGELES - BUREAU OF ENGINEERING

SEWER CONSTRUCTION PROGRAM

1984 - 1995

SCALE

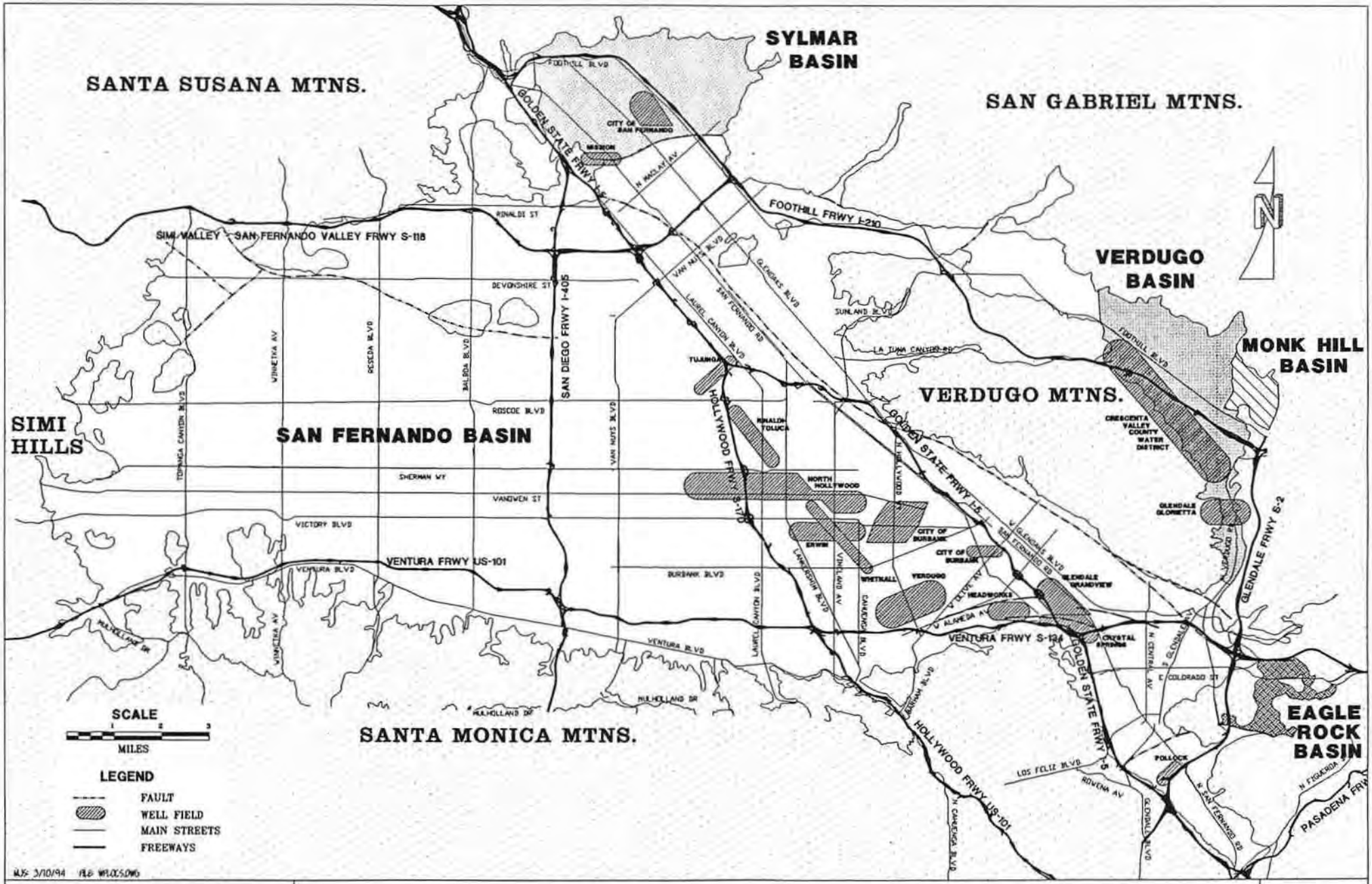
0 4,000 8,000 12,000 16,000

FEET

LEGEND

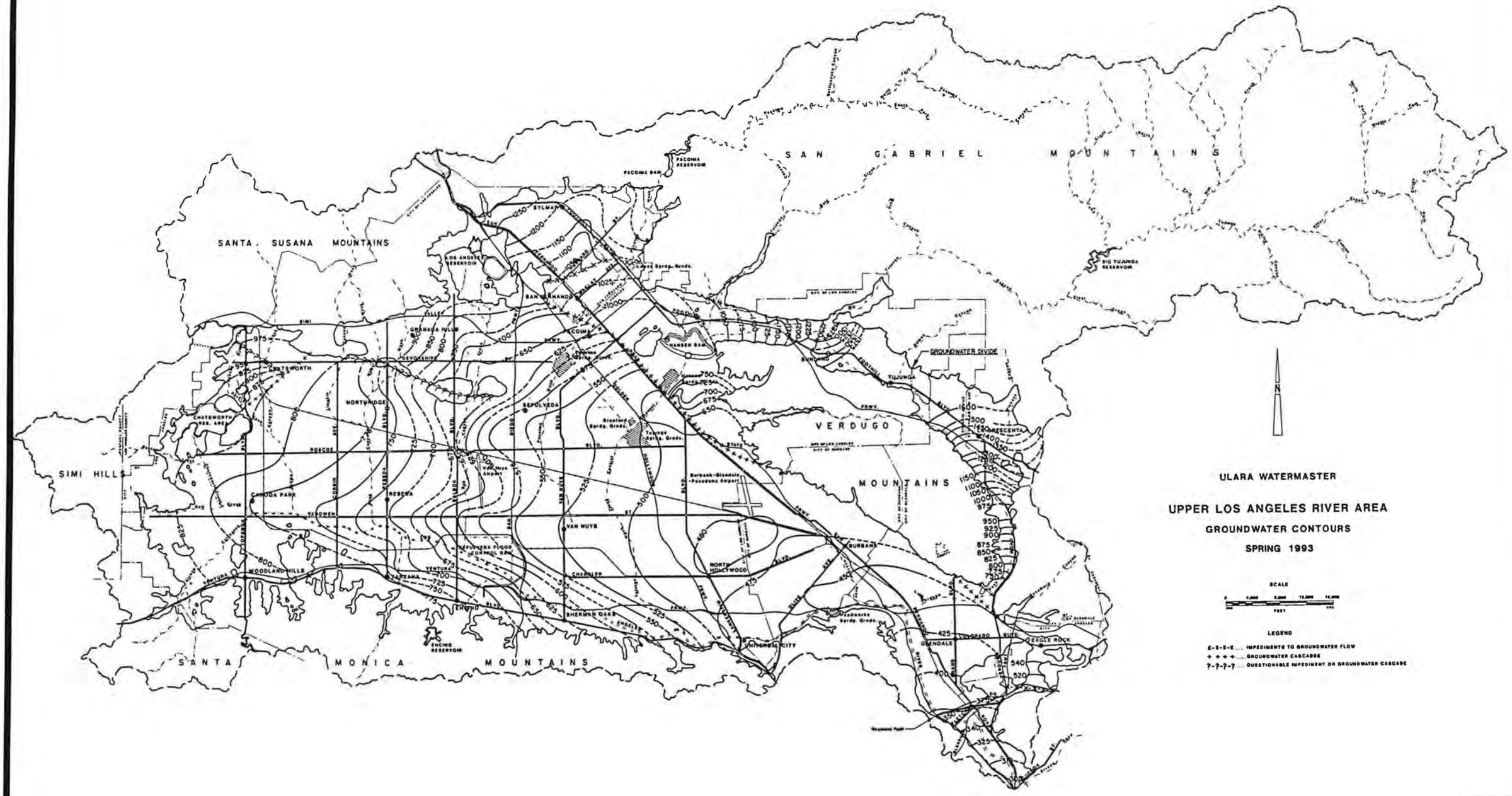
- IMPEDIMENTS TO GROUNDWATER FLOW
- GROUNDWATER CASCADES
- QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE
- PROPOSED SEWER CONSTRUCTION AND PROJECT NUMBER

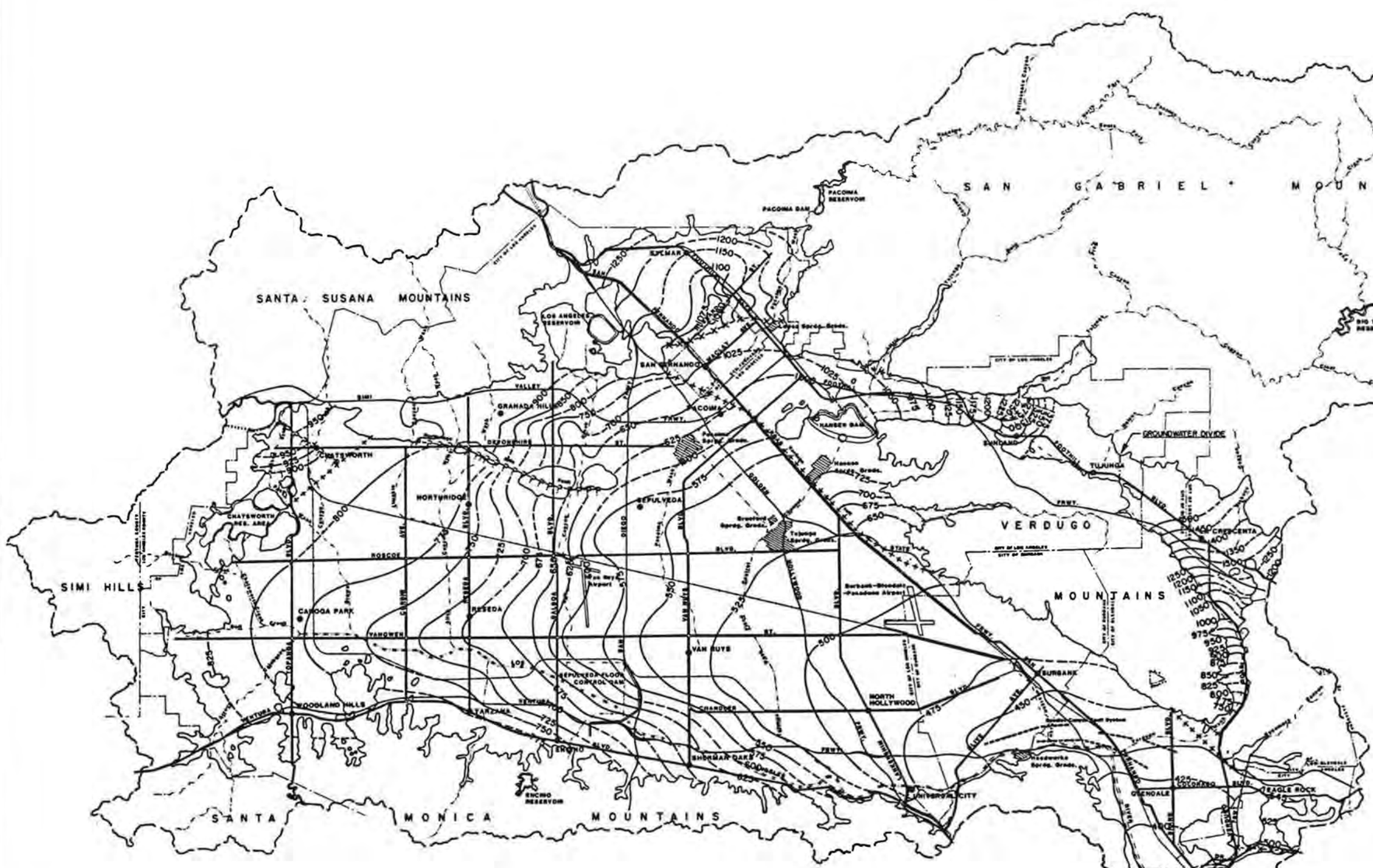
MRG 1/88



1992-93 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area: Well Field Locations**	PLATE 9

PLATE 10


SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
SIMI HILLS
SANTA MONICA MOUNTAINS
VERDUGO MOUNTAINS
PACOIMA RESERVOIR
PACOIMA DAM
LOS ANGELES RESERVOIR
BIG TUJUNGA RESERVOIR
HANSEN DAM
GROUNDWATER DIVIDE
TUJUNGA
SYLMAR
GRANADA HILLS
CHATSWORTH
NORTHRIDGE
SEPULVEDA
RESEDA
CANOGA PARK
VAN NUYS
WOODLAND HILLS
TARZANA
ENCINO
SHERMAN OAKS
CHANDLER
NORTH HOLLYWOOD
BURBANK
GLENDALE
EAGLE ROCK
MONTROSE
LA CRESCENTA
ULARA WATERMASTER
UPPER LOS ANGELES RIVER AREA
GROUNDWATER CONTOURS
SPRING 1993
SCALE
FEET
LEGEND
E-E-E-E.... IMPEDIMENTS TO GROUNDWATER FLOW
+ + + +.... GROUNDWATER CASCADES
?-?-?-? .... QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

GROUNDWATER CONTOURS

FALL 1993

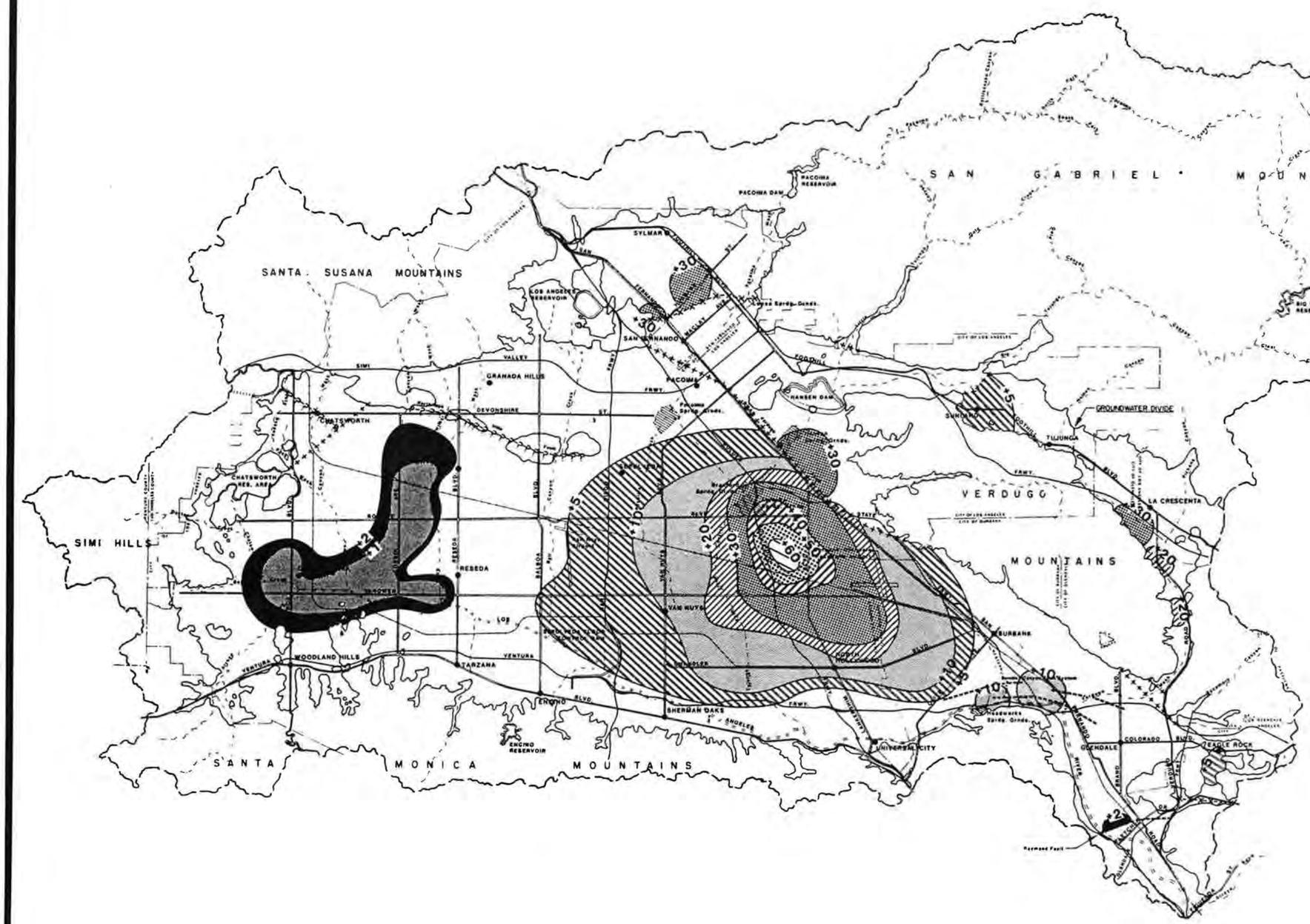
SCALE

0 4,000 8,000 12,000 16,000 FEET

LEGEND

- S-E-E-E IMPEDIMENTS TO GROUNDWATER FLOW
- + + + + GROUNDWATER CASCADES
- ?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE
- FAULT LINE

PLATE 12



N

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

CHANGE IN GROUNDWATER ELEVATIONS

FALL 1992 - FALL 1993

SCALE

0 4,000 8,000 12,000 16,000

FEET

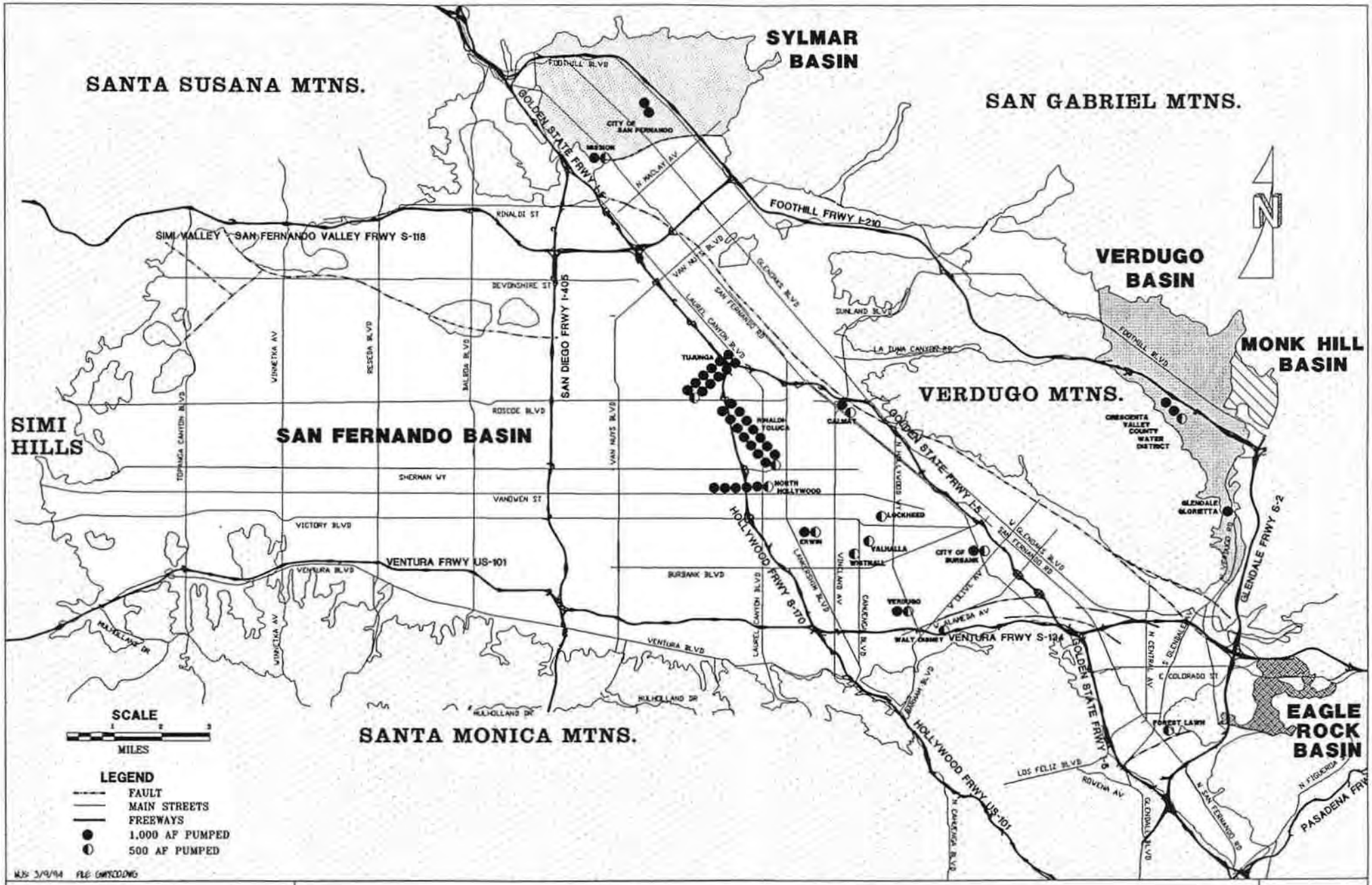
LEGEND

X-X-X-X IMPEDIMENTS TO GROUNDWATER FLOW

+ + + + GROUNDWATER CASCADES

?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE

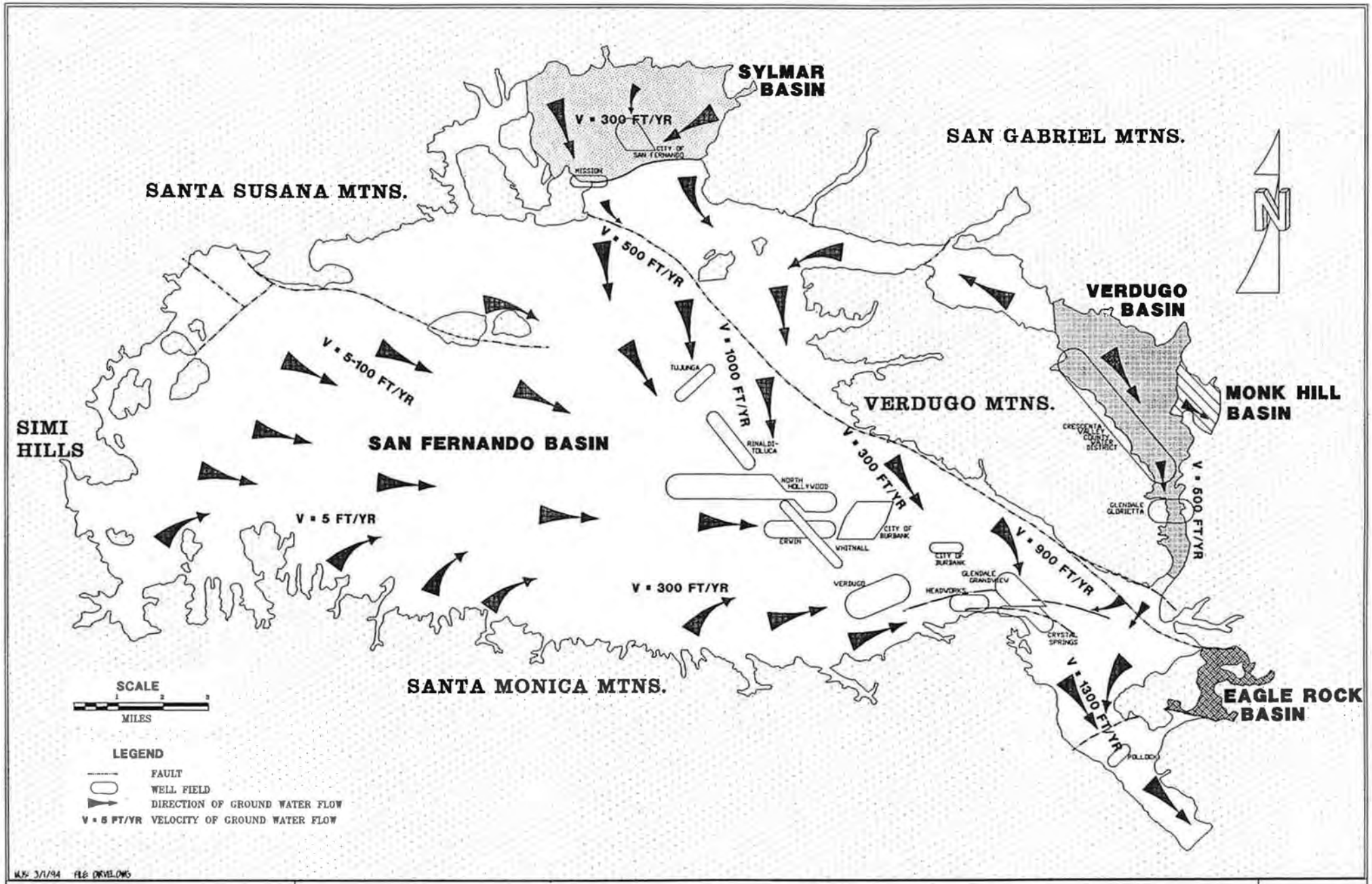
FAULT LINE



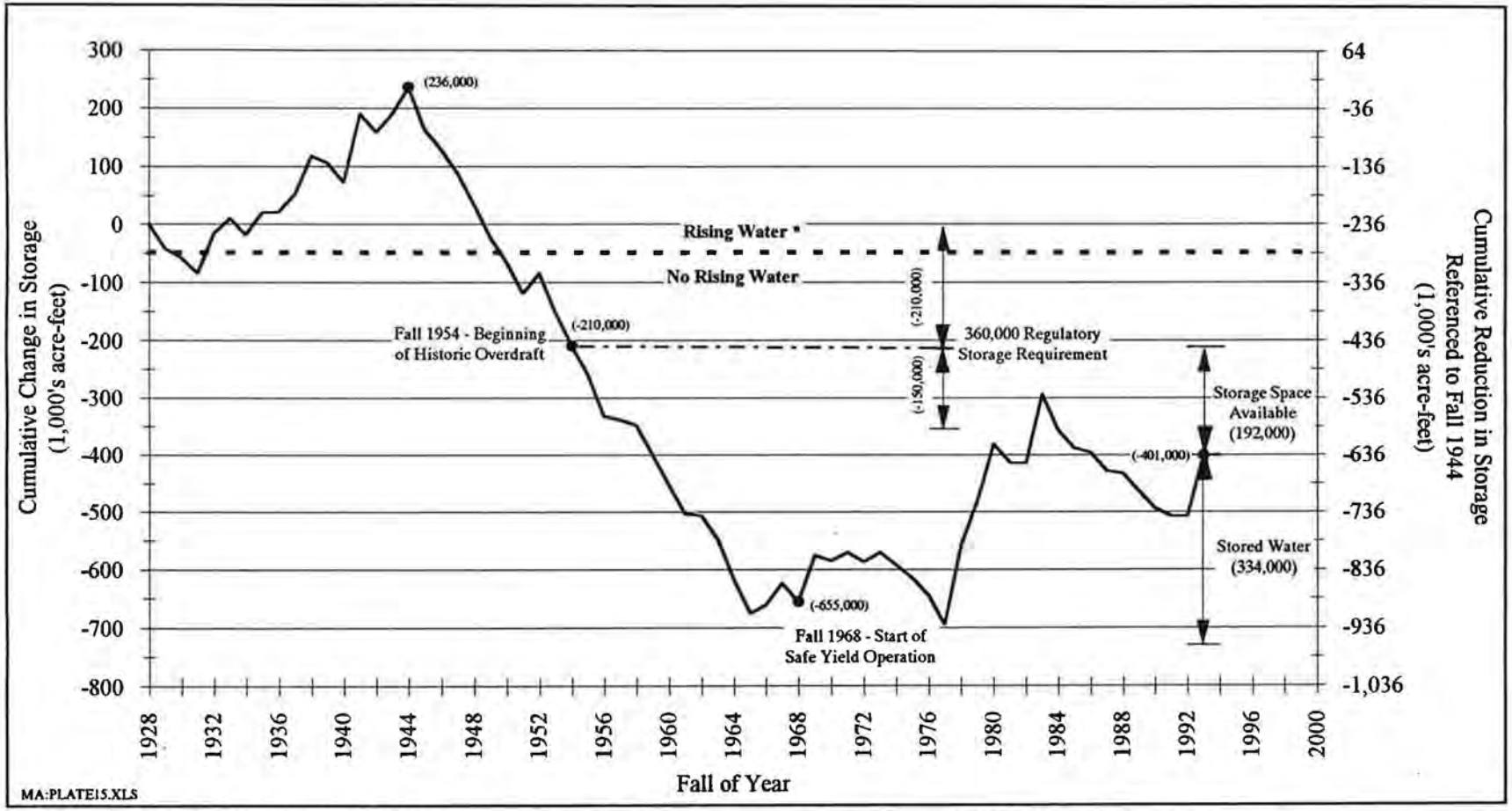
1992-93 Water Year
ULARA Watermaster
Report

Upper Los Angeles River Area:
Pattern of Ground Water Production

PLATE 13



1992-93 Water Year ULARA Watermaster Report	**Upper Los Angeles River Area:** **Estimated Directions and Velocities of Ground Water Flow**	PLATE 14

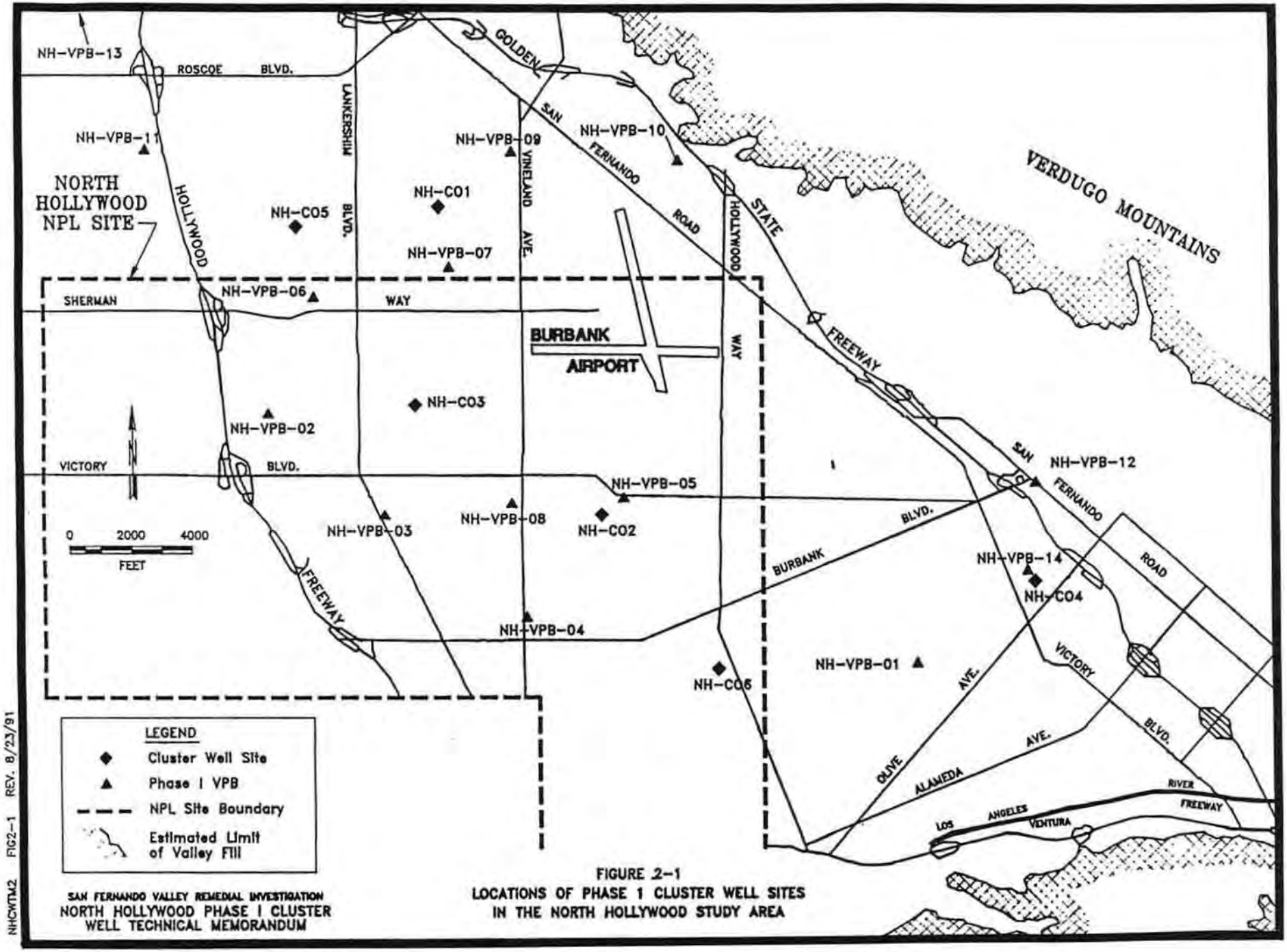


* This line indicates levels at which excess rising ground water occurs and can be controlled by reduction of storage. Rising ground water can also occur naturally at lower levels.

1992-93 Water Year
ULARA Watermaster Report

San Fernando Basin:
Cumulative Change in Ground Water Storage

PLATE 15

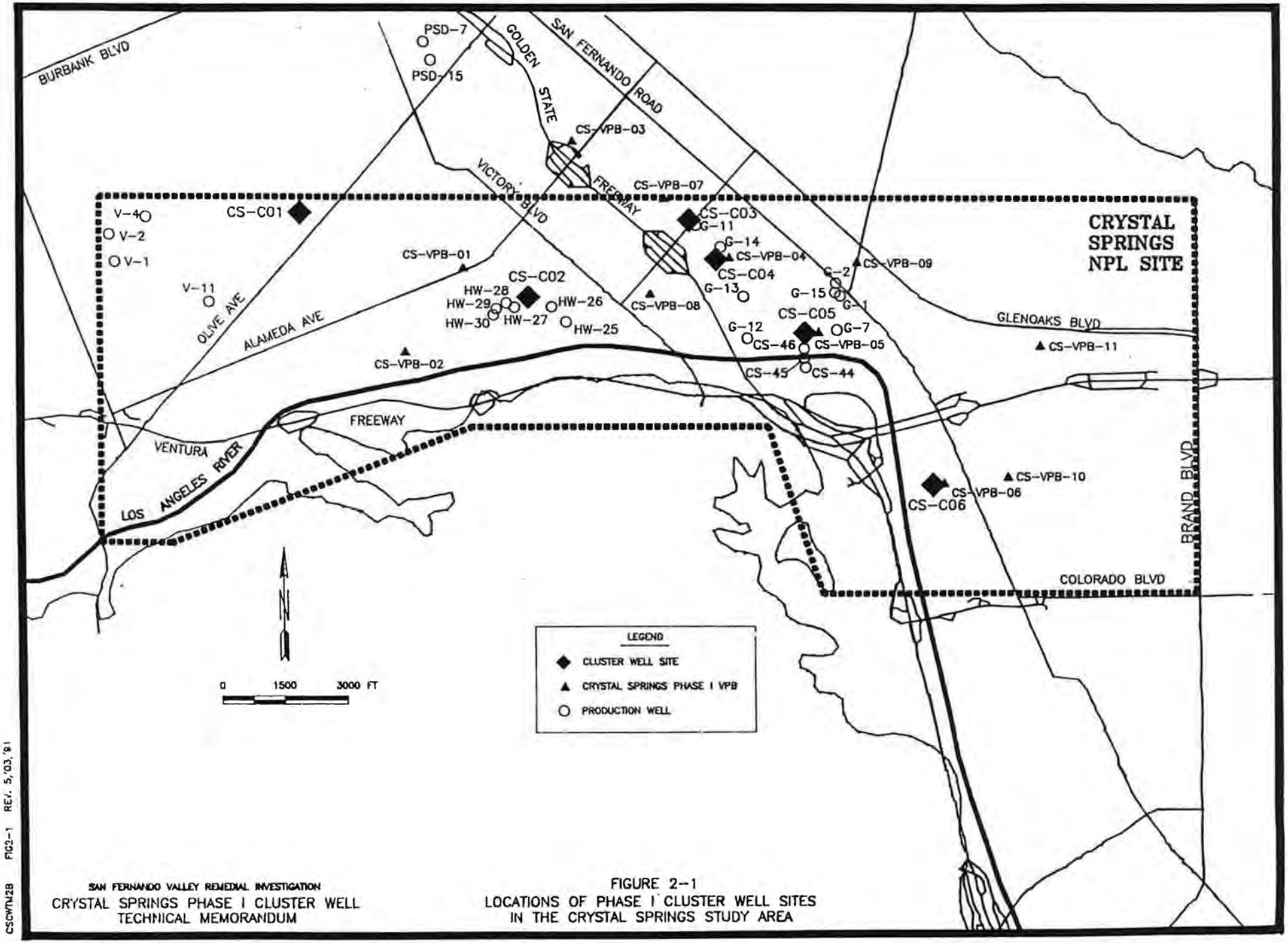


NHCWTM2 FIG2-1 REV. 8/23/91

SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
NORTH HOLLYWOOD PHASE I CLUSTER WELL TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATIONS OF PHASE 1 CLUSTER WELL SITES IN THE NORTH HOLLYWOOD STUDY AREA

PLATE 16

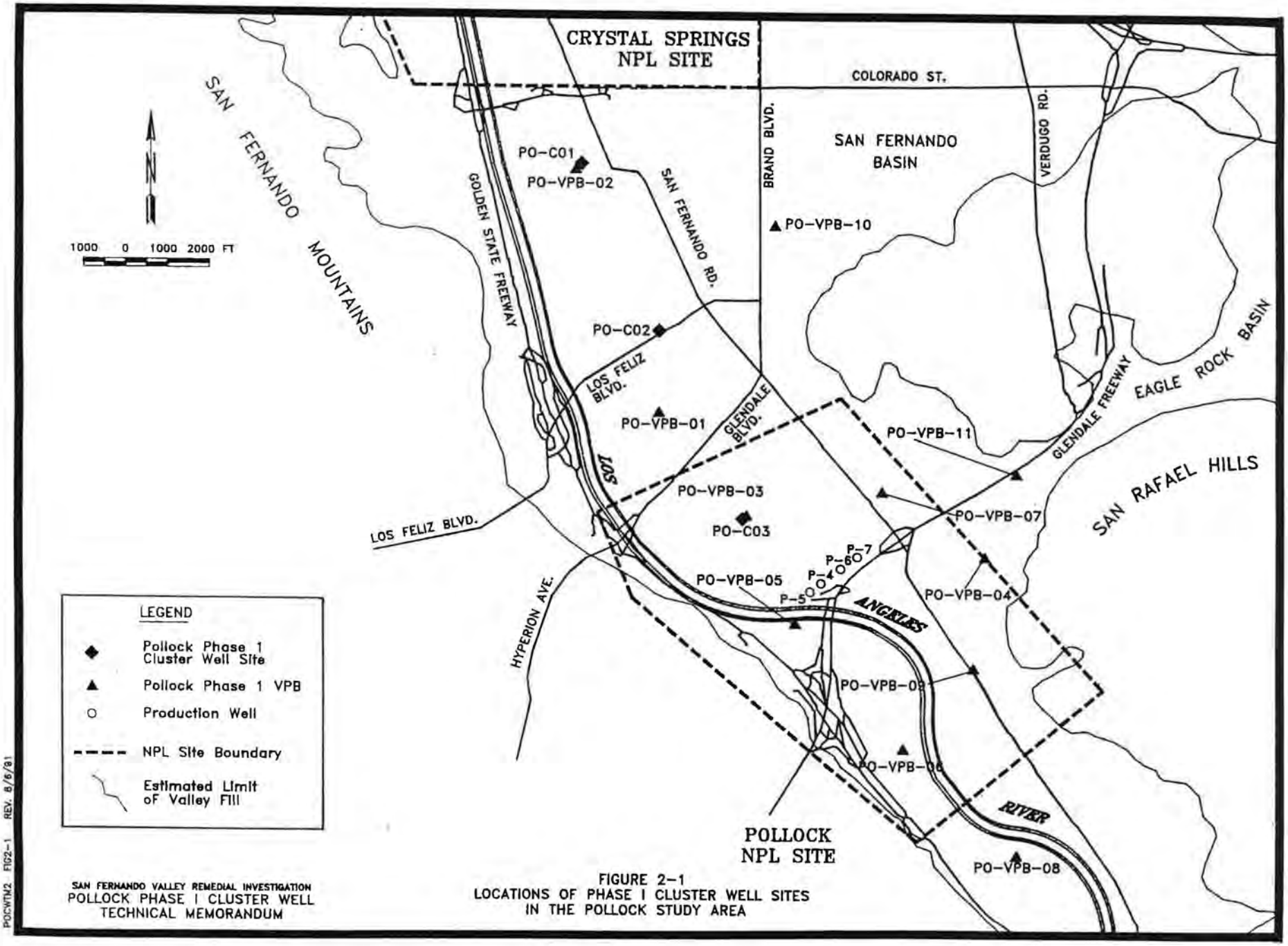


SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
CRYSTAL SPRINGS PHASE I CLUSTER WELL
TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATIONS OF PHASE I CLUSTER WELL SITES
IN THE CRYSTAL SPRINGS STUDY AREA

CSCWTM2B FIG2-1 REV. 5/03/91

PLATE 17

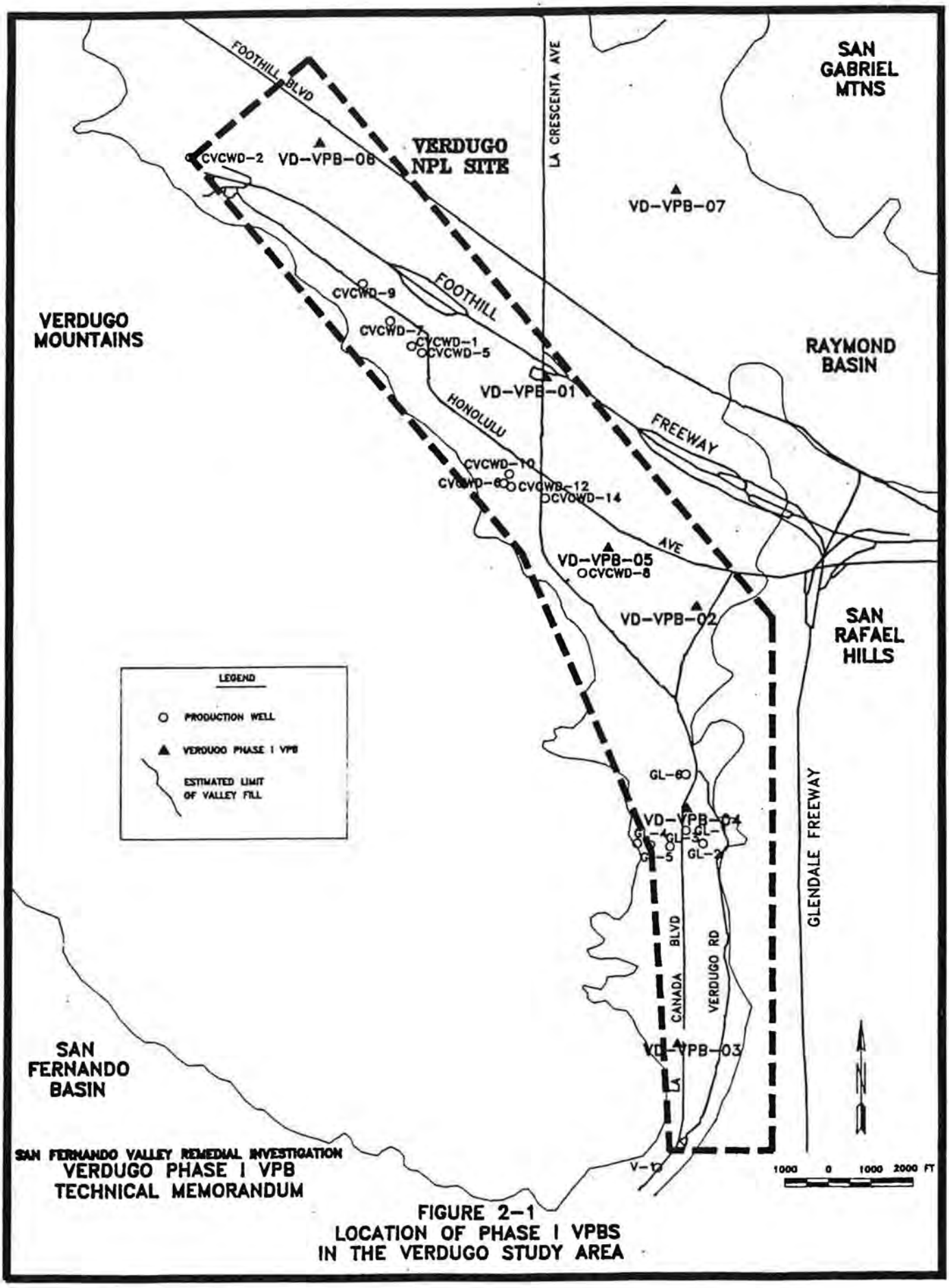


SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
POLLOCK PHASE I CLUSTER WELL TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATIONS OF PHASE I CLUSTER WELL SITES IN THE POLLOCK STUDY AREA

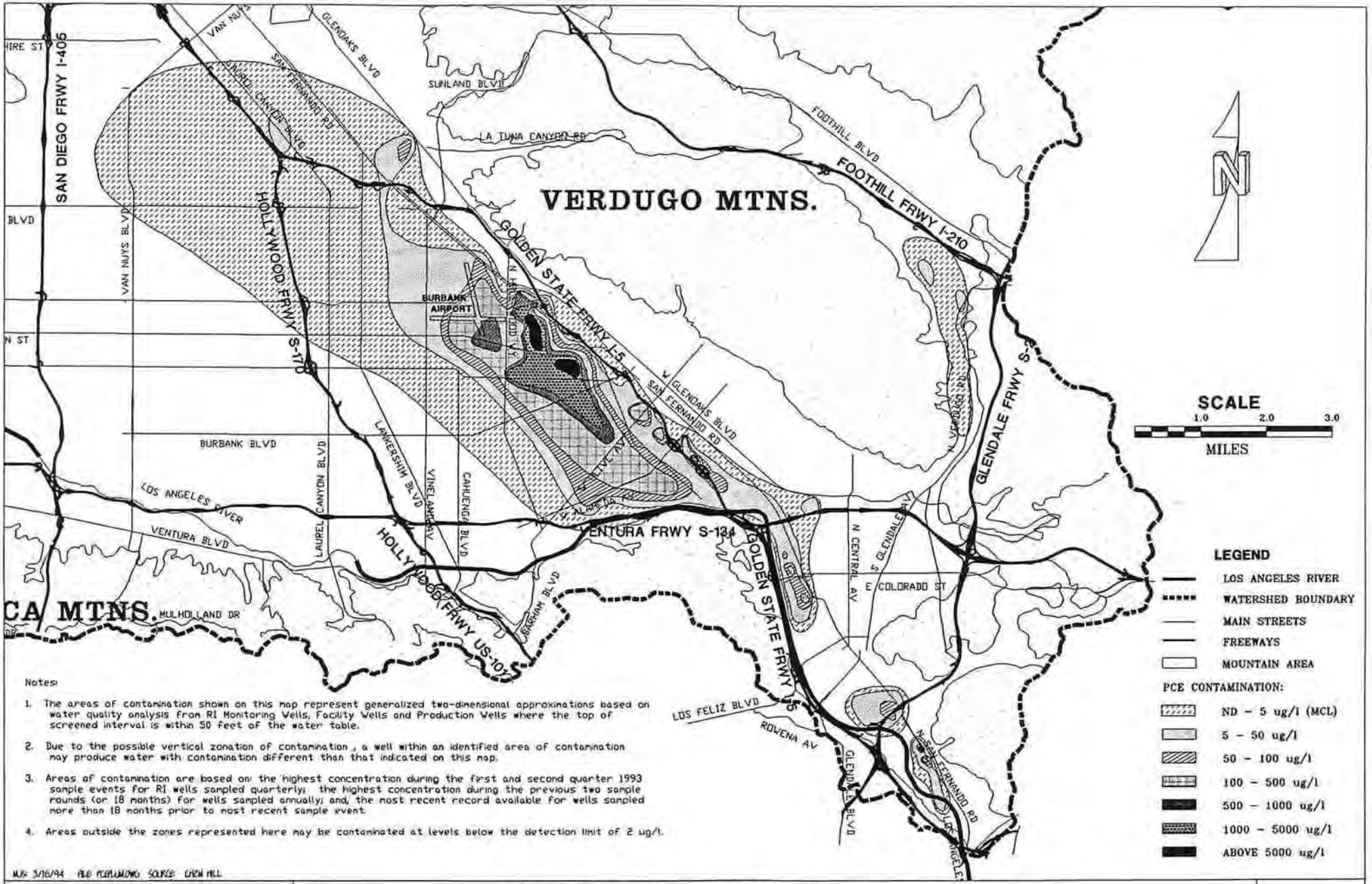
PLATE 18

POCWTM2 FIG2-1 REV. 8/6/81



SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
VERDUGO PHASE I VPB
TECHNICAL MEMORANDUM

FIGURE 2-1
LOCATION OF PHASE I VPBS
IN THE VERDUGO STUDY AREA



Notes:

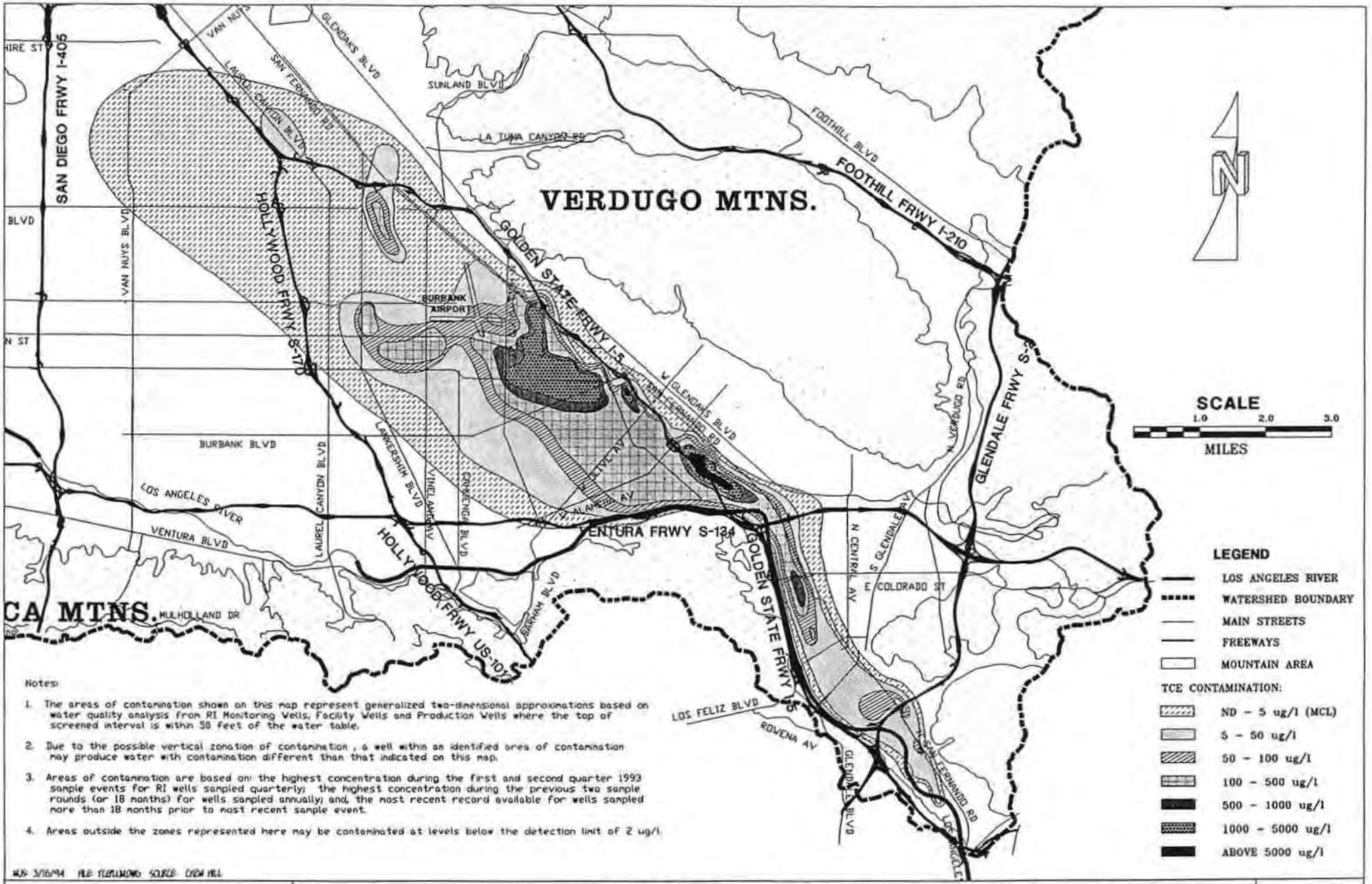
1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI Monitoring Wells, Facility Wells and Production Wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination , a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Areas of contamination are based on the highest concentration during the first and second quarter 1993 sample events for RI wells sampled quarterly; the highest concentration during the previous two sample rounds (or 18 months) for wells sampled annually; and, the most recent record available for wells sampled more than 18 months prior to most recent sample event.
4. Areas outside the zones represented here may be contaminated at levels below the detection limit of 2 ug/l.

MAP: 3/16/94 FILE: FCEMAP.DWG SOURCE: CHEN HILL

1992-93 Water Year
ULARA Watermaster Report

San Fernando and Verdugo Basins: PCE Contamination (ug/l) in the Upper Zone (Spring 1993)

PLATE 20



Notes:

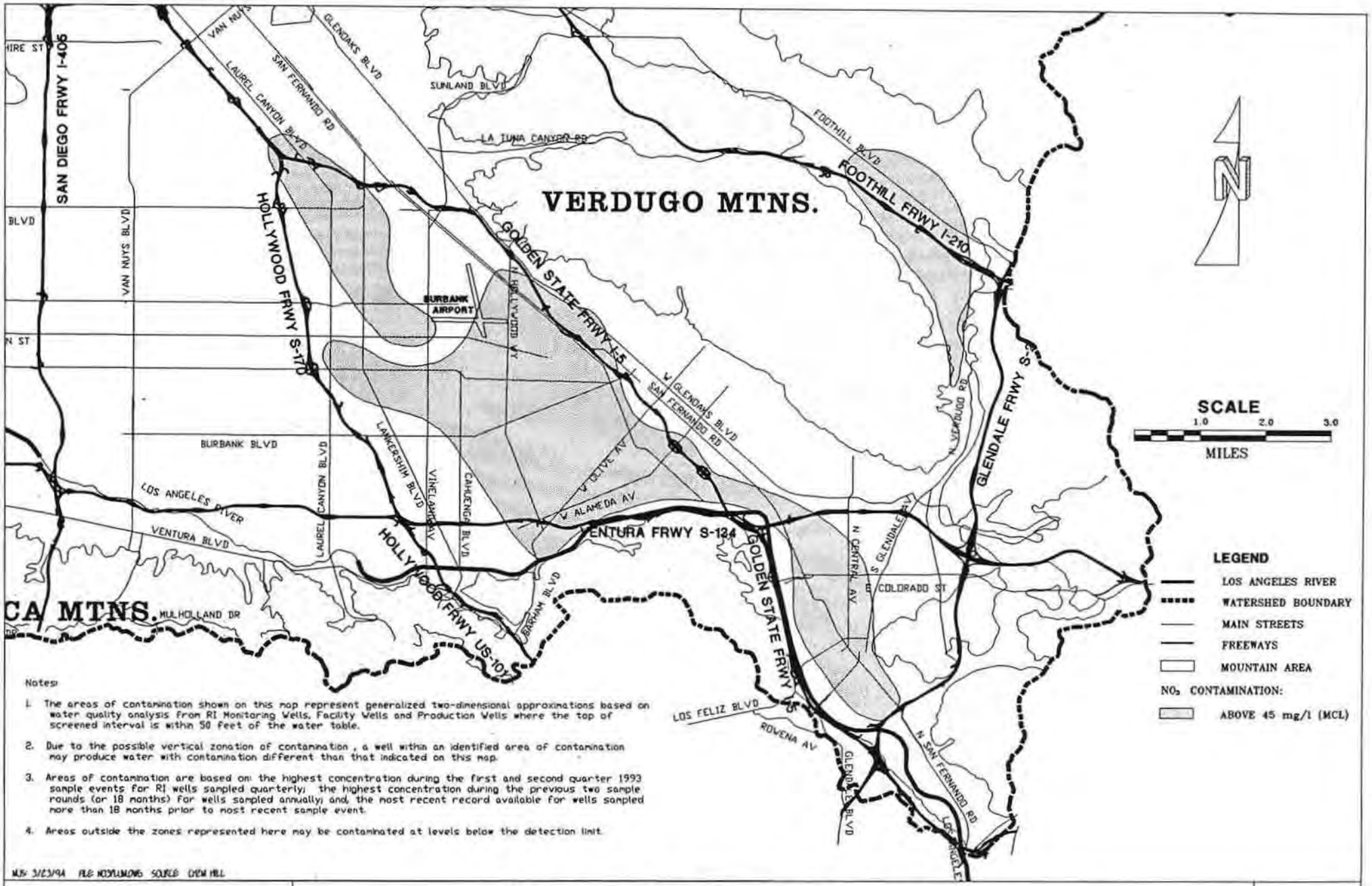
1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI Monitoring Wells, Facility Wells and Production Wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination , a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Areas of contamination are based on: the highest concentration during the first and second quarter 1993 sample events for RI wells sampled quarterly; the highest concentration during the previous two sample rounds (or 18 months) for wells sampled annually; and, the most recent record available for wells sampled more than 18 months prior to most recent sample event.
4. Areas outside the zones represented here may be contaminated at levels below the detection limit of 2 ug/l.

MJS 5/16/94 FILE: TCEPLMMG SOURCE: CHEM HILL

1992-93 Water Year
ULARA Watermaster Report

San Fernando Basin: TCE Contamination (ug/l) in the Upper Zone (Spring 1993)

PLATE 21



Notes:

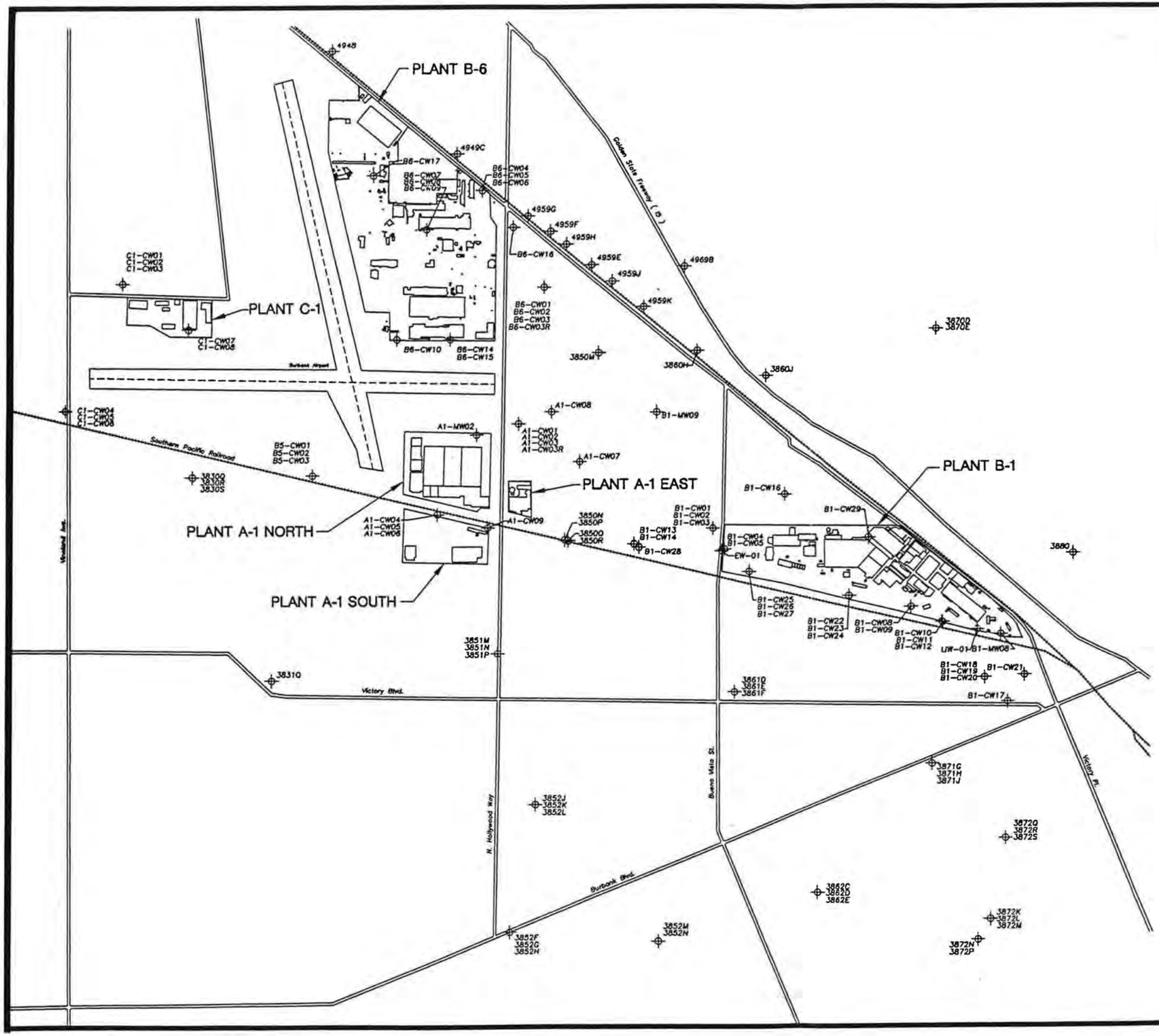
1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI Monitoring Wells, Facility Wells and Production Wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination, a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Areas of contamination are based on: the highest concentration during the first and second quarter 1993 sample events for RI wells sampled quarterly; the highest concentration during the previous two sample rounds (or 18 months) for wells sampled annually; and, the most recent record available for wells sampled more than 18 months prior to most recent sample event.
4. Areas outside the zones represented here may be contaminated at levels below the detection limit.

MJS 3/23/94 FILE: HOSTILMONG SOURCE: CHEM HILL

1992-93 Water Year
ULARA Watermaster Report

San Fernando and Verdugo Basins: NO_3 Contamination (mg/l) in the Upper Zone (Spring 1993)

PLATE 22



LEGEND

⌖ Monitoring Well Location

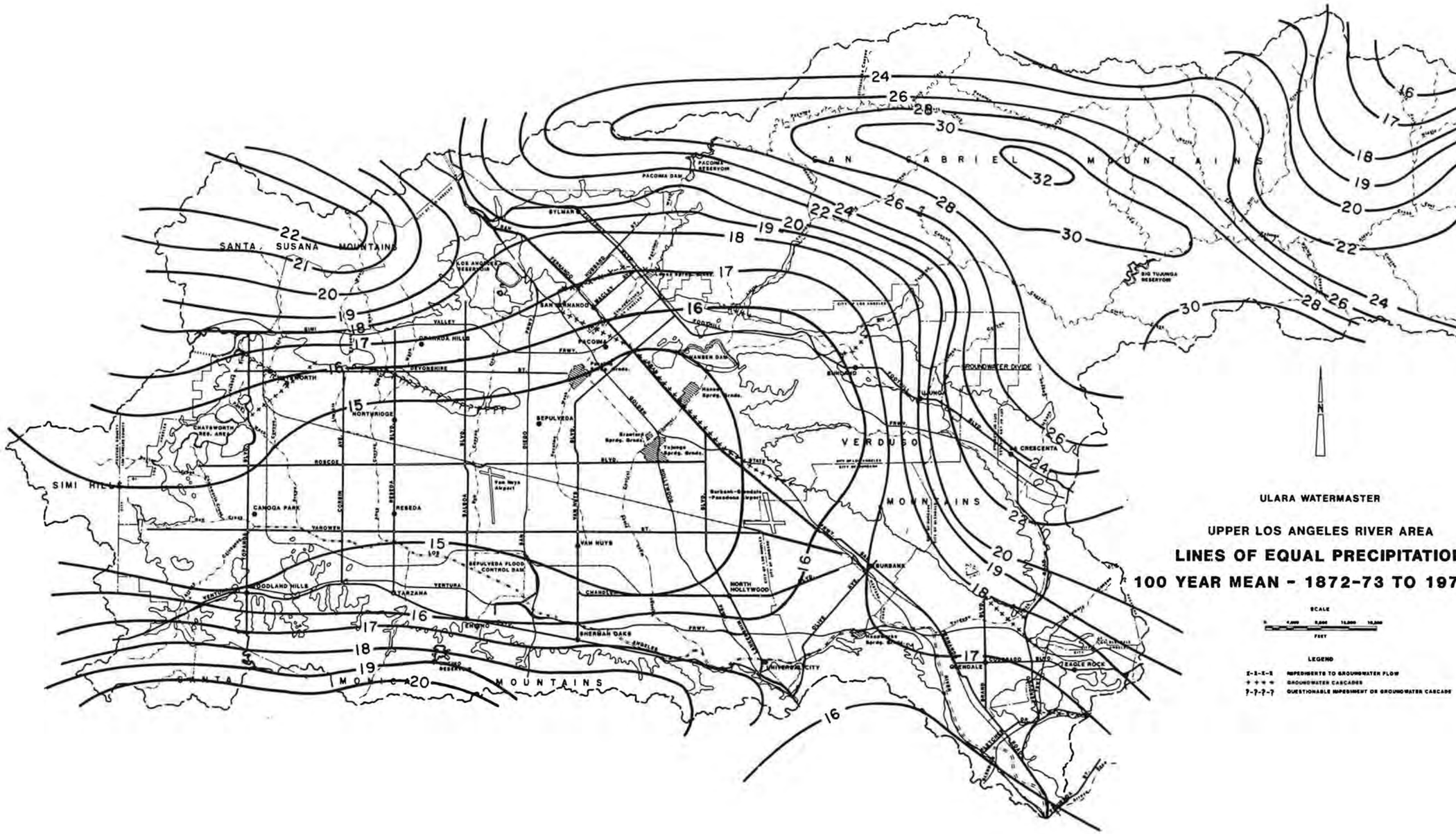
0' 1000' 2000' 3000'

TETRA TECH, INC.
PASADENA, CALIFORNIA

LOCKHEED ENVIRONMENTAL SYSTEMS & TECHNOLOGIES COMPANY

PLANT B-1 BURBANK

FIGURE 2-1 STUDY AREA AND PLANT LOCATIONS



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

LINES OF EQUAL PRECIPITATION

100 YEAR MEAN - 1872-73 TO 1972-73

SCALE

0 4,000 8,000 12,000 16,000

FEET

LEGEND

X-X-X-X IMPEDIMENTS TO GROUNDWATER FLOW

+ + + + GROUNDWATER CASCADES

?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE

SOURCE : LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

MRG 4/92

APPENDICES

APPENDIX A

GROUND WATER EXTRACTIONS

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	Nov.	Dec.	1993 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin							
Angelica Healthcare Services														
3934A	M050A	0.07	1.55	5.73	5.73	5.73	5.73	5.73	5.73	6.77	6.65	7.18	7.98	64.55
Auto Stiegler														
—	—	0.73	1.06	1.67	2.46	1.86	2.38	1.04	0.89	0.09	1.19	1.81	1.43	16.61
Burbank, City of														
3841C	6A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3882P	7	39.09	72.63	110.08	158.89	149.49	163.57	98.76	0.00	0.00	0.00	0.00	69.39	861.90
3851E	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3851K	13A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3882T	15	110.78	80.80	75.61	42.51	33.98	39.89	25.04	0.00	0.00	0.00	0.00	83.87	492.48
3841G	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	149.87	153.43	185.69	201.40	183.47	203.46	123.80	0.00	0.00	0.00	0.00	153.26	1,354.38
CalMat														
4916A	2	102.02	99.88	43.01	41.56	58.78	73.55	91.56	179.36	123.44	163.20	111.66	212.64	1,300.66
4916	3	50.39	58.49	61.97	3.06	2.82	78.50	0.00	20.51	40.81	36.63	0.00	0.00	353.18
	Total:	152.41	158.37	104.98	44.62	61.60	152.05	91.56	199.87	164.25	199.83	111.66	212.64	1,653.84
First Financial Plaza Site														
N/A	F.F.P.S.	1.60	1.52	1.63	6.94	10.46	11.18	7.04	5.12	3.52	3.29	1.48	1.60	55.38
Forest Lawn Memorial Park														
3947A	2	11.32	5.40	1.15	2.22	1.78	5.04	7.37	10.20	12.22	29.18	26.60	21.82	134.30
3947B	3	13.30	5.40	1.49	2.16	1.73	4.76	1.34	10.12	1.36	0.00	0.00	20.61	62.27
3947C	4	10.12	0.87	0.58	1.61	1.25	3.93	9.86	7.27	9.48	23.65	21.39	17.34	107.35
3858K	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	34.74	11.67	3.22	5.99	4.76	13.73	18.57	27.59	23.06	52.83	47.99	59.77	303.92
Glendale, City of														
3924N	STPT 1	6.23	4.36	5.15	5.50	4.17	3.24	2.34	3.66	3.14	5.52	27.45	11.54	82.30
3924R	STPT 2	1.11	0.74	0.00	0.00	0.08	0.37	0.44	0.00	0.53	0.62	4.92	0.00	8.81
GVENT	GVENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	7.34	5.10	5.15	5.50	4.25	3.61	2.78	3.66	3.67	6.14	32.37	11.54	91.11
Harper, Cecelia DeMille														
4940A	NORTH	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	15.00
Livingston-Graham, Inc.														
4916B	SnVal	0.31	0.27	0.02	0.02	0.02	0.06	0.18	0.44	0.03	0.17	0.40	0.21	2.13
Lockheed														
3861C	B175-E1	84.35	49.38	67.35	91.91	109.00	87.96	6.05	0.00	43.22	61.13	87.67	3.78	691.80
Malibu Grand Prix														
—	—	0.64	5.93	4.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.49

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	Nov.	Dec.	1993 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin (cont'd)														
Mena, John & Barbara														
4973J		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.96
Mobil Oil Corporation														
—	—	1.09	1.26	0.91	1.09	0.72	1.38	0.71	0.71	0.71	0.23	0.91	0.78	10.50
Philips Components														
—	—	9.09	9.09	9.09	9.49	9.49	9.49	5.21	5.21	5.21	4.64	4.64	4.64	85.29
Robinsons-May/Northridge Fashion Plaza														
—	—	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rockwell International														
—	E-1 to E-9	14.10	0.00	0.00	0.00	0.00	0.00	0.00	21.74	46.08	45.72	38.98	34.91	201.53
Sears Roebuck & Co.														
3945	3945	15.28	16.07	16.06	16.96	15.15	16.34	17.19	17.04	17.38	17.63	17.65	17.72	200.47
Sportmen's Lodge														
3785A	1	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.014	0.011	0.011	0.072
3M-Pharmaceuticals														
—	—	0.41	0.17	0.41	0.39	0.23	0.53	1.53	0.35	0.14	0.09	0.01	0.15	4.41
Toluca Lake Property Owners Association														
3845F	3845F	3.21	2.60	0.32	0.00	0.71	1.83	2.36	4.39	2.95	6.46	3.84	5.67	34.34
Trillium Corporation														
Well #1	—	1.35	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.12	1.12	1.12	16.71
Well #2	—	1.69	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.79	1.79	1.79	22.66
	Total:	3.04	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	2.91	2.91	2.91	39.37
Valhalla Memorial Park and Mortuary														
3840K	4	52.70	26.43	0.86	0.00	0.00	14.31	24.59	61.91	48.01	58.98	57.79	45.50	391.08
Waste Management Disposal Services of Calif.														
4916D		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Walt Disney Pictures and Television														
3874E	EAST	230.72	213.12	140.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	583.87
3874F	WEST	6.26	7.14	2.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.35
3874G	NORTH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	236.98	220.26	142.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.22

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	Nov.	Dec.	1993 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin (cont'd)							
Los Angeles, City of														
Aeration (A)														
3800E	A-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810U	A-2	2.78	0.00	13.20	19.49	21.33	13.75	4.80	5.17	10.72	24.38	20.29	0.00	135.91
3810V	A-3	1.38	0.00	15.38	23.37	27.36	19.17	7.51	18.37	22.82	38.68	32.28	3.49	209.81
3810W	A-4	0.00	3.88	0.00	10.88	20.57	15.61	0.00	4.34	18.16	35.28	7.05	1.12	116.89
3820H	A-5	0.00	0.00	0.00	0.00	0.00	2.32	0.05	0.00	0.00	7.76	4.64	1.81	16.58
3821J	A-6	15.15	23.92	26.31	33.65	33.70	22.45	7.78	19.10	23.00	39.12	32.64	3.67	280.49
3830P	A-7	14.12	15.56	26.06	33.08	35.26	22.84	7.92	19.47	23.53	40.40	33.93	3.67	275.84
3831K	A-8	11.91	27.00	29.66	37.88	12.47	0.00	0.00	12.33	26.10	44.81	37.56	4.02	243.74
	A Total:	45.34	70.36	110.61	158.35	150.69	96.14	28.06	78.78	124.33	230.43	168.39	17.78	1,279.26
Crystal Springs (CS)														
3914L	CS-45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3914M	CS-46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CS Total:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Erwin (E)														
3831H	E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821I	E-2A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.61	134.76	0.00	153.24	176.42	487.03
3831G	E-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821F	E-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3831F	E-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821H	E-6	117.03	0.00	0.00	0.00	0.00	0.11	0.00	21.30	124.95	0.00	141.51	162.56	567.46
3811F	E-10	115.08	0.00	0.00	0.00	0.00	0.00	0.00	23.90	145.71	0.00	161.76	184.00	630.45
	E Total:	232.11	0.00	0.00	0.00	0.00	0.11	0.00	67.81	405.42	0.00	456.51	522.98	1,684.94
Headworks (H)														
3893L	H-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893K	H-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893M	H-28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893N	H-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893P	H-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
—	—	29.22	20.59	22.50	25.40	24.49	30.15	22.11	24.79	25.08	15.57	0.00	0.00	239.90
	H Total:	29.22	20.59	22.50	25.40	24.49	30.15	22.11	24.79	25.08	15.57	0.00	0.00	239.90
North Hollywood (NH)														
3800	NH-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3780A	NH-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810S	NH-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3770	NH-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810	NH-11	0.00	30.71	66.03	23.55	0.00	0.00	0.03	19.12	0.18	0.00	79.81	53.87	273.30
3810A	NH-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810B	NH-14A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790B	NH-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820D	NH-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	Nov.	Dec.	1993 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
						San Fernando Basin (cont'd)								
North Hollywood (NH), cont'd														
3820C	NH-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820B	NH-18	312.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	312.56
3830D	NH-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3830C	NH-20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3830B	NH-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790C	NH-22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790D	NH-23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3800C	NH-24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790F	NH-25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790E	NH-26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820F	NH-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810K	NH-28	71.70	60.84	37.65	42.88	36.78	0.00	15.51	43.29	65.13	77.93	107.17	55.57	614.45
3810L	NH-29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3800D	NH-30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810T	NH-31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3770C	NH-32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3780C	NH-33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790G	NH-34	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	32.30	0.00	0.00	0.00	32.90
3830N	NH-35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790H	NH-36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790J	NH-37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810M	NH-38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810N	NH-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810P	NH-40	352.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	352.32
3810Q	NH-41	294.56	0.00	0.00	0.00	2.64	0.00	0.00	0.21	239.92	0.00	42.95	0.00	580.28
3810R	NH-42	221.74	0.00	0.00	0.00	2.16	0.00	0.00	0.11	198.97	0.00	46.44	122.75	592.17
3790K	NH-43A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790L	NH-44	316.60	0.00	0.00	0.00	0.00	0.00	0.00	50.39	279.75	0.00	197.61	170.00	1,014.35
3790M	NH-45	383.93	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.00	0.00	384.78
	NH Total:	1,953.41	91.55	103.68	66.43	41.58	0.60	15.54	113.97	816.25	77.93	473.98	402.19	4,157.11
Pollock (P)														
3959E	P-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3958H	P-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3958J	P-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	P Total:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rinaldi-Toluca (RT)														
4909E	RT-1	386.92	373.33	36.16	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.02	796.52
4898A	RT-2	469.36	450.51	0.00	0.00	0.00	1.12	0.00	0.25	0.00	0.00	0.00	0.11	921.35
4898B	RT-3	499.31	480.10	101.01	0.00	0.00	0.25	0.00	0.28	0.00	0.00	0.00	0.09	1,081.04
4898C	RT-4	514.28	492.84	50.90	0.00	0.00	0.21	0.00	0.39	0.00	0.00	0.00	0.07	1,058.69
4898D	RT-5	534.76	511.85	107.23	0.00	0.00	0.18	0.00	0.37	0.00	0.00	0.00	0.11	1,154.50
4898E	RT-6	536.07	514.65	53.38	0.00	0.00	0.11	0.00	0.34	0.00	0.00	0.00	0.05	1,104.60

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	1992 Nov.	1992 Dec.	1993 Jan.	1993 Feb.	1993 Mar.	1993 Apr.	1993 May	1993 June	1993 July	1993 Aug.	1993 Sept.	TOTAL
San Fernando Basin (cont'd)														
Rinaldi-Toluca (RT), cont'd														
4898F	RT-7	508.89	494.15	102.85	0.00	0.00	0.16	0.00	0.53	0.00	0.00	0.00	0.23	1,106.81
4898G	RT-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4898H	RT-9	485.27	465.22	97.04	0.00	0.00	2.09	0.00	0.55	0.00	0.00	0.00	0.09	1,050.26
4909G	RT-10	546.08	523.56	0.44	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	1,070.15
4909K	RT-11	468.44	453.63	0.00	0.00	0.00	1.22	0.00	0.18	0.00	0.00	0.00	0.09	923.56
4909H	RT-12	517.24	496.63	0.00	0.00	0.00	1.49	0.00	0.21	0.00	0.00	0.00	0.09	1,015.66
4909J	RT-13	491.81	469.63	0.00	0.00	0.00	1.24	0.00	0.28	0.00	0.00	0.00	0.07	963.03
4909L	RT-14	488.27	474.91	45.87	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	1,009.21
4909M	RT-15	496.40	471.63	46.86	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	1,015.12
	RT Total:	6,943.10	6,672.64	641.74	0.00	0.00	8.55	0.00	3.45	0.00	0.00	0.00	1.02	14,270.50
Tujunga (T)														
4887C	T-1	---	---	---	---	---	---	---	---	---	0.00	440.77	564.03	1,004.80
4887D	T-2	---	---	---	---	---	---	---	---	---	0.00	513.00	517.06	1,030.06
4887E	T-3	---	---	---	---	---	---	---	---	---	0.00	489.17	514.24	1,003.41
4887F	T-4	---	---	---	---	---	---	---	---	---	0.00	500.62	503.22	1,003.84
4887G	T-5	---	---	---	---	---	---	---	---	---	448.83	155.26	231.80	835.89
4887H	T-6	---	---	---	---	---	---	---	---	---	478.70	165.47	321.12	965.29
4887J	T-7	---	---	---	---	---	---	---	---	---	483.06	161.66	313.39	958.11
4887K	T-8	---	---	---	---	---	---	---	---	---	481.78	162.28	313.59	957.65
4886B	T-9	---	---	---	---	---	---	---	---	---	0.00	505.28	507.53	1,012.81
4886C	T-10	---	---	---	---	---	---	---	---	---	0.00	477.90	482.23	960.13
4886D	T-11	---	---	---	---	---	---	---	---	---	0.00	464.65	498.53	963.18
4886E	T-12	---	---	---	---	---	---	---	---	---	0.00	485.79	492.29	978.08
	T Total:	---	---	---	---	---	---	---	---	---	1,892.37	4,521.85	5,259.03	11,673.25
Tujunga Gallery														
4992A		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Verdugo (V)														
3863H	V-1	55.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.45	88.38	202.48
3863P	V-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3863J	V-4	0.00	0.00	0.00	0.00	5.62	0.00	0.00	0.21	0.00	0.00	0.00	0.00	5.83
3863L	V-11	0.00	0.00	0.00	0.00	7.16	0.00	0.00	27.53	11.75	0.00	183.79	210.65	440.88
3853G	V-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3854F	V-22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3844R	V-24	154.73	0.00	0.00	0.00	5.67	0.00	0.00	22.91	134.71	0.00	119.12	182.92	620.06
	V Total:	210.38	0.00	0.00	0.00	18.45	0.00	0.00	50.65	146.46	0.00	361.36	481.95	1,269.25
Whitnall (W)														
3820E	W-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821B	W-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821C	W-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821D	W-4	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69	1.38

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	Nov.	Dec.	1993 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							San Fernando Basin (cont'd)							
Whitnall (W), cont'd														
3821E	W-5	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.30	1.13
3831J	W-6A	43.11	0.00	0.00	0.00	0.00	0.18	0.00	38.54	164.40	0.00	128.47	0.55	375.25
3832K	W-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.28	137.58	0.00	100.55	0.00	261.41
3832L	W-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3832M	W-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3842E	W-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	W Total:	43.11	0.00	0.00	0.00	0.00	1.70	0.00	61.82	301.98	0.00	229.02	1.54	639.17
Los Angeles, City of	Total:	9,456.67	6,855.14	878.53	250.18	235.21	137.25	65.71	401.27	1,819.52	2,216.30	6,211.11	6,686.49	35,213.38
San Fernando Basin Total:		10,225.96	7,524.08	1,434.30	647.46	647.44	666.07	378.83	760.70	2,189.39	2,685.53	6,629.74	7,252.32	41,041.84
							Sylmar Basin							
Los Angeles, City of														
Plant	Mission	401.10	375.30	8.91	0.00	0.00	0.00	374.66	209.07	0.00	0.00	0.00	0.00	1,369.04
Meurer Engineering														
5998	3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.60
San Fernando, City of														
5969D	2A	126.36	133.31	36.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	295.81
5959	3	96.81	86.22	129.15	144.45	138.30	124.61	154.75	160.08	146.54	137.47	41.71	66.24	1,426.33
5969	4	28.79	30.94	32.68	33.18	30.49	35.61	33.26	35.07	34.37	35.10	13.34	24.95	367.78
5968	7A	45.72	9.29	0.00	0.00	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	55.08
	Total:	297.68	259.76	197.97	177.63	168.84	160.24	188.01	195.15	180.91	172.57	55.05	91.19	2,145.00
Sylmar Basin Total:		698.83	635.11	206.93	177.68	168.89	160.29	562.72	404.27	180.96	172.62	55.10	91.24	3,514.64
							Verdugo Basin							
Crescenta Valley County Water District														
5058B	1	0.00	0.00	0.00	0.00	0.00	0.00	13.08	4.19	12.01	16.34	9.97	7.90	63.49
5036A	2	0.00	0.59	0.00	1.17	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.01	1.81
5058H	5	25.46	18.33	3.09	0.00	0.00	2.67	3.27	35.87	65.66	52.70	103.27	80.61	390.93
5058	6	0.00	0.00	0.00	0.00	0.01	0.00	6.79	21.57	7.52	17.67	25.66	5.57	84.79
5047B	7	8.01	7.62	0.88	0.27	0.00	6.98	11.98	26.92	8.54	17.57	0.69	4.60	94.06
5069J	8	33.87	21.75	15.74	9.54	8.38	6.30	36.50	64.88	61.66	55.03	64.61	22.37	400.63

GROUND WATER EXTRACTIONS
1992-93 WATER YEAR
(acre-feet)

LACDPW Well No.	Owner Well No.	1992 Oct.	Nov.	Dec.	1993 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
							Verdugo Basin (cont'd)							
Crescenta Valley County Water District, cont'd														
5047D	9	14.64	13.45	1.96	0.36	0.00	8.81	1.68	0.00	0.00	2.34	0.00	4.12	47.36
5058D	10	30.56	28.78	28.84	28.62	28.96	40.03	15.85	3.85	2.17	66.28	71.51	52.32	397.77
5058E	11	32.93	31.35	34.25	35.88	39.37	24.81	49.70	53.45	51.02	50.44	48.55	45.94	497.69
5058J	12	22.00	20.57	20.70	21.13	21.57	24.11	25.79	19.58	49.32	7.59	0.44	17.12	249.92
5069F	14	33.35	31.96	32.15	29.30	30.16	37.14	9.83	5.56	10.65	8.47	8.76	30.74	268.07
	PICK	4.20	4.02	4.11	4.12	4.07	5.81	6.16	5.88	5.48	5.58	5.57	5.31	60.31
	Total:	205.02	178.42	141.72	130.39	132.52	156.67	180.63	241.76	274.03	300.01	339.05	276.61	2,556.83
Glendale, City of														
3961-3971	GL3-5	40.33	58.16	48.55	60.55	47.08	47.82	62.42	0.00	67.21	58.07	53.06	66.54	609.79
3970	GL-6	31.67	39.59	31.67	39.59	31.67	31.67	39.59	0.00	31.67	39.59	31.67	31.67	380.05
—	MM-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total:	72.00	97.75	80.22	100.14	78.75	79.49	102.01	0.00	98.88	97.66	84.73	98.21	989.84
Verdugo Basin Total:		277.02	276.17	221.94	230.53	211.27	236.16	282.64	241.76	372.91	397.67	423.78	374.82	3,546.67
							Eagle Rock Basin							
McKesson Water Products														
3987A	1	5.92	5.02	6.00	5.02	5.05	4.46	2.53	0.61	3.35	6.26	6.65	6.42	57.29
3987B	2	3.61	3.13	3.79	3.58	3.60	5.35	4.62	4.37	4.39	4.36	4.66	4.81	50.27
3987F	3	7.72	5.88	6.81	5.96	5.07	6.40	5.87	5.69	5.62	5.73	6.11	5.74	72.60
	Total:	17.25	14.03	16.60	14.56	13.72	16.21	13.02	10.67	13.36	16.35	17.42	16.97	180.16
Eagle Rock Basin Total:		17.25	14.03	16.60	14.56	13.72	16.21	13.02	10.67	13.36	16.35	17.42	16.97	180.16
ULARA Total:		11,219.06	8,449.39	1,879.77	1,070.23	1,041.32	1,078.73	1,237.21	1,417.40	2,756.62	3,272.17	7,126.04	7,735.35	48,283.31

APPENDIX B

KEY GAGING STATIONS SURFACE RUNOFF

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F57C-R LOS ANGELES RIVER ABOVE ARROYO SECO

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1992 TO SEP 1993

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	165	125	144	114	163			163	148	171	197	195
2	174	116	158	819	170			155	158	168	213	201
3	182	112	154	115	157			159	154	161	211	191
4	180	133	208	107	162			165	155	155	205	194
5	182	123	152	129	186			166	1,770	147	204	186
6	197	117	197	2,620	223			165	146	150	204	187
7	188	110	8,710	6,860	3,970			175	133	157	189	194
8	196	113	243	1,720	8,610			162	137	155	183	198
9	175	112	137	1,300	2,560			163	142	149	185	193
10	174	115	127	818	1,630			166	143	149	198	195
11	171	136	323	197	1,120			171	150	143	195	190
12	166	128	125	2,410	859			177	162	157	182	187
13	179	127	115	6,930	846			182	166	165	176	199
14	199	128	122	3,970	1,070			187	175	169	182	189
15	171	130	121	6,560	888			182	183	180	172	197
16	175	132	127	3,550	806	MALFUNCTION	MALFUNCTION	174	185	174	166	180
17	171	145	322	5,810	963			177	173	164	171	204
18	173	153	296	9,850	9,440			182	169	155	166	257
19	182	130	110	15,200	7,630			187	171	164	169	160
20	187	125	105	17,600	4,410			182	164	177	172	164
21	242	127	105	17,700	2,180			173	165	184	169	168
22	184	128	114	18,100	2,310			162	163	180	160	174
23	280	128	128	1,880	6,070			155	160	180	170	170
24	290	119	127	843	2,720			155	140	177	184	173
25	142	136	126	660	2,270			154	159	174	189	162
26	139	136	126	425	1,990			151	184	185	182	160
27	159	138	214	332	1,720			145	177	206	179	179
28	150	129	765	256	1,450			154	183	203	179	168
29	158	130	3,200	216	------			147	172	187	177	165
30	1,660	132	525	188	------		164	132	169	187	188	162
31	216	------	123	376	------		------	134	------	179	188	------
TOTAL	7,207	3,813	17,549	127,655	66,573		164	5,102	6,456	5,252	5,705	5,542
MEAN	232	127	566	4,118	2,378		164	165	215	169	184	185
MAX	1,660	153	8,710	18,100	9,440		164	187	1,770	206	213	257
MIN	139	110	105	107	157		164	132	133	143	160	160
AC-FT	14,290	7,563	34,810	253,200	132,000	48,000**	~~315~~ 14,500**	10,120	12,810	10,420	11,320	10,990

CAL YEAR 1992 TOTAL 186,649 MEAN 510 MAX 20,200 MIN 19.8 AC-FT 370,200

WTR YEAR 1993 TOTAL* 251,018 MEAN 823 MAX 18,100 MIN 105 AC-FT ~~497,900~~ 560,023**

* Incomplete Record

MAXIMUM INSTANTANEOUS PEAK IS 45,300 CFS AT 23:40 ON 02/07/93.

** Estimated by ULARA Watermaster STAFF.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F252-R VERDUGO WASH AT ESTELLE AVENUE

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1992 TO SEP 1993

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.4	4.1	3.9	6.0	8.4	38.5	8.3	11.3	9.7	5.0	2.8	2.3
2	2.3	2.9	4.6	103	8.3	32.4	8.4	11.7	11.2	4.9	2.8	2.5
3	2.5	2.8	5.8	6.4	7.2	30.6	8.4	11.1	12.5	5.0	2.8	2.5
4	2.3	2.8	10.3	4.7	7.7	27.1	8.0	10.5	13.4	5.6	2.6	2.5
5	2.5	2.8	6.2	3.2	7.0	25.3	7.2	10.6	216	5.0	2.0	2.3
6	2.6	2.8	12.3	345	6.2	21.3	7.2	10.3	4.8	5.0	1.9	2.3
7	2.5	2.9	548	733	242	20.0	7.2	9.4	2.7	4.9	1.8	2.3
8	2.6	4.3	10.7	105	583	19.4	7.2	9.5	2.5	5.0	1.7	2.4
9	2.6	2.6	2.3	16.3	82.3	14.0	7.2	10.2	2.5	5.0	1.7	2.5
10	2.7	2.5	2.3	7.5	29.9	12.9	7.2	10.4	2.5	3.9	1.8	2.3
11	2.5	2.5	2.8	7.2	15.0	12.9	7.2	10.3	2.5	3.9	2.2	2.3
12	2.5	2.3	2.3	192	11.4	12.0	7.2	10.0	2.5	3.4	2.3	2.5
13	2.5	2.3	2.3	634	10.2	10.8	7.2	10.2	2.5	2.8	2.3	2.5
14	2.5	2.3	2.3	274	14.9	9.2	8.1	10.5	2.5	2.8	2.3	2.5
15	2.5	2.3	2.1	363	19.0	8.4	8.4	10.7	2.5	2.6	2.3	2.5
16	2.6	2.3	2.0	257	8.9	8.4	8.4	10.8	2.5	2.5	2.3	2.5
17	2.5	2.5	10.6	519	8.4	7.2	8.2	11.1	2.5	2.4	2.5	2.5
18	2.6	2.5	28.8	528	675	7.2	7.2	10.2	2.5	2.3	2.8	2.5
19	2.8	2.5	1.8	136	448	7.2	8.7	6.3	2.5	2.4	3.5	2.7
20	2.8	2.5	1.7	72.2	224	7.9	7.3	6.7	2.5	2.4	4.5	2.8
21	3.7	2.5	1.9	51.2	78.4	9.0	7.2	7.8	2.5	2.5	3.9	3.4
22	2.8	2.5	2.0	36.8	68.9	9.4	7.2	8.6	2.5	3.0	3.9	3.9
23	17.8	2.5	1.7	28.4	484	9.4	7.2	8.9	2.5	5.0	3.9	4.9
24	9.9	2.5	1.7	19.0	103	9.4	8.0	10.0	2.5	4.0	4.7	6.2
25	2.5	2.7	1.7	15.4	70.5	333	9.0	10.8	2.5	2.8	5.0	6.2
26	2.5	2.5	1.7	11.9	81.1	95.3	9.5	10.5	2.7	3.5	5.0	6.2
27	2.4	2.5	5.1	10.4	59.2	8.4	9.4	9.5	2.8	3.9	5.0	6.2
28	2.5	2.5	50.1	8.4	45.6	42.7	9.4	8.9	3.6	4.8	5.8	6.1
29	4.8	2.5	433	8.4	------	8.4	9.5	8.3	3.9	4.1	6.2	4.3
30	363	2.6	124	8.4	------	8.4	10.5	8.4	4.7	2.9	5.8	2.7
31	21.2	------	11.2	9.7	------	8.4	------	9.4	------	2.7	3.6	------
TOTAL	484.2	79.8	1,297.2	4,520.5	3,407.5	874.5	241.1	302.9	333.0	116.0	101.7	99.9
MEAN	15.6	2.7	41.8	146	122	28.2	8.0	9.8	11.1	3.7	3.3	3.3
MAX	363	4.3	548	733	675	333	10.5	11.7	216	5.6	6.2	6.2
MIN	2.3	2.3	1.7	3.2	6.2	7.2	7.2	6.3	2.5	2.3	1.7	2.3
AC-FT	960	158	2,573	8,966	6,759	1,735	478	601	660	230	202	198

CAL YEAR 1992	TOTAL	7,559.0	MEAN	20.7	MAX	636	MIN	0	AC-FT	14,990
WTR YEAR 1993	TOTAL	11,858.3	MEAN	32.5	MAX	733	MIN	1.7	AC-FT	23,520

MAXIMUM INSTANTANEOUS PEAK IS 4,320 CFS AT 06:30 ON 06/05/93.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

E285-R BURBANK-WESTERN STORM DRAIN

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1992 TO SEP 1993

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12.5	7.5	13.6	33.9	13.5	16.1	15.8	12.3	9.3	10.5	9.0	9.7
2	12.3	7.1	13.4	82.3	13.9	15.4	15.6	11.4	13.8	10.3	10.4	8.8
3	12.5	6.7	12.9	42.7	13.2	15.1	15.3	11.4	16.9	12.5	9.2	9.3
4	11.8	7.6	14.4	37.1	13.7	14.5	15.5	10.1	13.3	13.4	9.9	9.7
5	12.2	7.1	14.0	30.7	13.0	14.3	15.3	8.5	146	13.5	11.5	8.6
6	12.7	7.3	15.0	140	13.4	14.2	14.7	7.9	9.5	13.0	9.9	8.8
7	12.7	7.9	523	229	476	13.6	14.5	7.9	9.0	12.8	9.4	10.1
8	12.2	7.9	65.3	71.2	501	13.3	13.9	6.7	9.2	12.1	10.3	9.9
9	12.3	7.9	41.4	66.5	171	13.2	14.1	6.4	10.1	12.2	9.3	8.4
10	13.3	7.9	32.3	59.0	141	12.3	14.2	6.6	9.9	10.6	9.6	8.6
11	12.4	8.8	27.0	52.9	102	12.4	14.2	6.6	9.7	10.4	10.5	8.2
12	12.9	8.1	22.9	214	76.1	12.4	14.4	6.0	9.9	11.5	11.7	9.3
13	12.6	8.8	19.7	284	58.4	12.1	13.8	6.7	10.4	11.5	9.7	9.9
14	12.4	9.0	17.1	233	44.9	12.8	13.6	6.7	9.7	11.5	9.3	10.5
15	10.2	8.6	16.8	264	34.3	12.7	12.7	7.1	9.8	11.5	8.9	10.1
16	11.6	7.9	15.7	212	25.5	13.0	12.5	8.5	10.2	11.5	10.3	8.0
17	10.0	8.8	24.6	403	18.7	14.1	12.1	9.0	11.7	11.5	10.2	7.4
18	9.0	9.0	47.3	232	564	13.9	11.6	9.0	15.8	11.5	9.9	7.9
19	9.6	9.0	30.2	26.3	237	14.3	11.0	9.1	13.0	11.5	9.5	7.9
20	8.8	9.0	30.1	25.0	84.8	15.2	10.9	10.7	11.3	11.5	9.4	7.9
21	11.8	9.0	30.1	22.8	50.5	15.0	11.1	11.5	9.9	11.5	8.8	7.9
22	9.9	9.0	30.1	20.0	28.2	15.6	11.0	10.2	10.2	11.5	8.9	7.9
23	21.9	9.0	31.9	18.6	195	15.4	10.7	10.9	10.0	11.5	9.1	9.0
24	10.3	9.0	30.1	17.5	111	16.4	10.7	11.5	9.5	11.5	8.6	9.0
25	8.8	9.0	30.2	16.6	82.5	437	10.4	11.5	10.3	11.5	8.9	9.0
26	8.9	10.5	28.6	16.7	59.3	218	11.6	10.0	10.4	11.5	8.7	9.0
27	10.5	12.8	60.9	15.6	40.1	180	11.4	8.7	10.3	11.5	8.6	9.0
28	11.6	11.5	159	15.4	22.9	197	11.7	9.0	10.3	12.5	9.0	6.7
29	12.3	12.5	293	14.8	------	126	12.3	8.7	8.9	11.9	9.3	8.2
30	150	14.1	149	14.2	------	15.4	12.6	9.8	10.0	9.9	9.7	7.4
31	48.6	------	38.4	14.4	------	15.9	------	9.2	------	9.1	9.0	------
TOTAL	538.6	268.3	1,878.0	2,925.2	3,204.9	1,526.6	389.2	279.6	458.3	358.7	296.5	262.1
MEAN	17.4	8.9	60.6	94.4	114	49.2	13.0	9.0	15.3	11.6	9.6	8.7
MAX	150	14.1	523	403	564	437	15.8	12.3	146	13.5	11.7	10.5
MIN	8.8	6.7	12.9	14.2	13.0	12.1	10.4	6.0	8.9	9.1	8.6	6.7
AC-FT	1,068	532	3,725	5,802	6,357	3,028	772	555	909	711	588	520

CAL YEAR 1992 TOTAL 13,674.3 MEAN 37.4 MAX 778 MIN 3.0 AC-FT 27,120

WTR YEAR 1993 TOTAL 12,386.0 MEAN 33.9 MAX 564 MIN 6.0 AC-FT 24,570

MAXIMUM INSTANTANEOUS PEAK IS 8,080 CFS AT 23:30 ON 02/07/93

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F300-R LOS ANGELES RIVER AT TUJUNGA AVENUE

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1992 TO SEP 1993

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	64.3	119	63.8	110	218	1,230	221	91.8	65.2	67.1	59.7	59.8
2	64.1	110	64.8	482	198	1,070	202	90.5	66.3	67.5	59.2	60.5
3	65.1	62.8	65.4	153	156	724	188	88.4	67.1	67.6	59.4	60.9
4	65.1	64.3	69.0	112	143	568	178	87.2	67.5	66.9	59.6	60.5
5	64.1	64.5	71.6	96.2	134	506	168	86.5	615	65.2	60.1	59.9
6	64.3	63.1	103	1,300	139	336	161	85.4	172	65.0	61.1	58.9
7	62.2	61.4	5,730	4,360	10,600	458	157	84.2	133	65.1	60.9	58.4
8	62.6	60.3	239	1,040	5,530	457	153	82.9	112	65.1	59.4	58.4
9	61.6	60.3	148	785	2,200	292	148	81.0	101	65.1	58.2	58.6
10	60.7	57.4	117	490	1,200	273	143	79.2	94.1	65.1	59.2	58.6
11	60.1	56.9	259	247	893	261	138	77.9	89.4	64.2	60.0	58.2
12	59.2	56.9	164	1,630	709	254	136	76.9	85.4	63.3	60.3	57.6
13	58.7	56.9	115	4,820	764	246	132	75.7	81.3	63.3	60.2	57.0
14	58.3	56.9	94.5	3,230	1,040	240	128	75.0	76.6	63.3	60.5	55.2
15	59.6	56.9	86.9	5,080	805	235	125	74.0	74.4	63.3	59.8	56.0
16	62.1	61.7	81.8	2,740	553	231	122	73.0	73.6	63.9	58.0	55.0
17	60.5	65.5	148	3,980	572	229	120	72.2	72.2	65.1	57.6	55.9
18	59.1	64.6	220	7,190	6,520	223	119	71.8	71.4	65.1	56.8	67.3
19	61.8	59.1	129	2,550	5,530	218	116	71.0	70.6	63.6	56.1	70.6
20	64.8	56.5	97.5	1,320	3,550	213	113	70.8	68.9	62.3	56.3	66.8
21	79.1	56.0	82.0	1,240	1,640	210	110	70.0	68.2	62.3	56.5	64.4
22	106	54.2	73.8	1,070	1,780	205	107	69.1	67.4	61.7	55.5	62.9
23	96.4	51.9	69.0	777	4,790	184	104	68.5	66.2	61.5	54.8	62.2
24	96.4	54.5	69.0	489	2,570	168	102	67.9	62.8	60.7	55.6	62.6
25	96.4	57.9	67.9	359	1,510	2,840	99.4	68.3	61.1	59.6	56.7	61.2
26	96.4	59.6	65.4	276	1,830	2,180	97.4	69.7	62.3	59.2	57.9	58.4
27	95.9	57.4	165	247	1,320	290	95.2	70.0	64.0	60.6	58.4	57.6
28	95.6	56.5	389	220	1,240	840	94.2	70.0	64.8	61.4	58.6	58.5
29	95.6	56.0	1,740	185	------	292	93.4	69.7	66.6	61.8	58.1	58.8
30	502	57.4	278	158	------	369	92.6	67.6	67.5	61.5	58.2	64.3
31	119	------	149	287	------	275	------	65.2	------	60.7	59.0	------
TOTAL	2,717.1	1,876.4	11,215.4	47,023.2	58,134	16,117	3,963.2	2,351.4	2,907.9	1,968.1	1,811.7	1,805.1
MEAN	87.6	62.5	362	1,517	2,076	520	132	75.9	96.9	63.5	58.4	60.2
MAX	502	119	5,730	7,190	10,600	2,840	221	91.8	615	67.6	61.1	70.6
MIN	58.3	51.9	63.8	96.2	134	168	92.6	65.2	61.1	59.2	54.8	55.0
AC-FT	5,389	3,722	22,250	93,270	115,300	31,970	7,861	4,664	5,768	3,904	3,593	3,580

CAL YEAR 1992	TOTAL	90,732.0	MEAN	248	MAX	10,800	MIN	34.2	AC-FT	180,000
WTR YEAR 1993	TOTAL	151,890.5	MEAN	416	MAX	10,600	MIN	51.9	AC-FT	301,300

MAXIMUM INSTANTANEOUS PEAK IS 25,700 CFS AT 23:45AM ON 02/07/93.
DATA PRODUCED FROM ALERT FOR 2/2-2/15.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F168-R BIG TUJUNGA CREEK BELOW BIG TUJUNGA DAM

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1992 TO SEP 1993

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	5.0	26.1	46.0	6.5	546	172	115	54.8	29.7	17.6	10.8
2	0	4.9	26.1	44.7	6.5	534	166	149	54.8	11.4	17.4	10.8
3	0	18.5	26.1	44.7	6.5	396	168	126	54.8	3.3	17.6	10.8
4	0	21.4	21.1	23.0	36.8	361	170	112	54.8	3.0	13.5	10.8
5	0	12.6	5.5	5.6	96.3	277	172	106	54.8	3.0	11.4	10.8
6	0	10.7	4.9	20.8	128	175	160	67.8	54.8	27.1	11.7	10.8
7	0	1.0	9.6	506	530	344	142	11.8	54.8	44.7	12.0	8.7
8	0	.6	33.9	741	1,010	240	137	13.4	54.5	44.7	12.3	6.0
9	0	.6	61.1	634	933	135	125	15.2	54.0	44.7	11.5	5.9
10	0	1.7	52.5	194	570	215	118	17.2	54.0	44.7	10.8	5.9
11	0	1.1	35.1	103	331	250	106	19.2	54.0	44.7	10.8	5.9
12	0	.9	35.1	105	377	240	192	21.2	54.0	31.8	10.8	5.9
13	0	.9	35.1	525	370	225	203	23.7	54.0	21.2	10.8	5.9
14	0	1.0	35.1	846	362	218	161	26.7	54.0	17.1	10.8	5.9
15	0	1.1	51.1	959	353	204	134	29.6	54.0	17.1	10.8	5.9
16	0	1.2	35.7	1,160	370	177	133	32.6	54.0	17.3	10.8	6.1
17	0	1.4	21.7	1,140	451	135	133	41.4	52.3	17.6	10.8	6.2
18	0	1.8	29.4	1,750	493	147	134	45.6	49.9	17.6	10.8	6.2
19	0	2.0	32.7	1,310	2,040	158	165	46.4	49.9	17.6	10.8	6.4
20	0	2.1	32.7	786	1,410	161	182	47.2	49.9	17.6	11.0	6.5
21	0	2.3	26.0	517	1,040	164	122	48.1	49.9	17.6	10.8	6.5
22	0	2.4	5.6	447	947	40.9	99.8	48.2	49.9	18.0	10.8	8.1
23	0	2.5	4.9	372	1,160	9.0	107	46.8	49.9	17.2	10.8	8.8
24	0	2.9	4.4	325	896	9.6	108	25.7	49.9	16.7	10.8	8.8
25	0	3.1	4.4	202	654	13.5	108	26.4	49.9	16.7	10.8	8.8
26	0	3.4	4.4	77.2	435	12.6	85.7	33.7	49.9	16.7	10.8	8.8
27	0	3.6	4.5	55.4	573	12.6	75.6	58.9	49.9	16.7	10.8	8.8
28	0	3.8	5.0	7.0	556	13.3	138	59.7	49.9	19.2	10.8	8.8
29	0	4.1	13.2	6.5	------	95.3	155	58.7	29.7	20.5	10.8	9.0
30	0	17.2	86.4	6.5	------	181	162	57.6	29.7	20.3	10.8	9.0
31	0	------	100	6.5	------	171	------	55.0	------	20.3	10.8	------
TOTAL	0	135.8	869.4	12,965.9	16,141.6	5,860.8	4,234.1	1,585.8	1,530.7	675.8	362.8	237.6
MEAN	0	4.5	28.0	418	576	189	141	51.2	51.0	21.8	11.7	7.9
MAX	0	21.4	100	1,750	2,040	546	203	149	54.8	44.7	17.6	10.8
MIN	0	.6	4.4	5.6	6.5	9.0	75.6	11.8	29.7	3.0	10.8	5.9
AC-FT	0	269	1,724	25,720	32,020	11,620	8,398	3,145	3,036	1,340	720	471

CAL YEAR 1992	TOTAL	16,498.2	MEAN	45.1	MAX	1,280	MIN	0	AC-FT	32,720
WTR YEAR 1993	TOTAL	44,600.3	MEAN	122	MAX	2,040	MIN	0	AC-FT	88,460

MAXIMUM INSTANTANEOUS PEAK IS 3,620 CFS AT 08:15AM ON 02/19/93.

F118B-R PACOIMA CREEK FLUME BELOW PACOIMA DAM

RUNOFF WATER

DAILY DISCHARGE IN CUBIC FEET PER SECOND WATER YEAR OCT 1992 TO SEP 1993

Day	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	0	36.0	194	331	39.5	31.3				
2	0	0	0	39.3	205	328	29.9	31.8				
3	0	0	0	36.2	204	268	28.4	32.1				
4	0	1.8	0	36.1	203	228	18.5	31.2				
5	0	0	0	42.1	202	220	2.0	30.2				
6	0	0	0	45.4	206	218	36.0	29.7				
7	0	0	0	133	236	219	31.1	30.5				
8	0	0	0	393	317	144	30.9	30.5				
9	0	0	0	369	303	145	30.8	29.9				
10	0	0	0	68.3	254	208	31.5	29.7				
11	0	0	0	117	214	201	31.1	30.7				
12	0	0	0	77.8	212	190	30.6	30.5				
13	0	0	0	425	212	189	30.5	30.5				
14	0	0	0	476	214	189	30.0	30.8				
15	0	0	0	539	214	190	30.4	30.6				
16	0	0	0	493	277	181	30.8	30.5				
17	0	0	0	529	265	187	30.5	31.1				
18	0	0	0	427	284	121	30.9	31.5				
19	0	0	0	531	458	83.6	31.8	30.9				
20	0	0	0	634	619	87.9	31.4	31.6				
21	0	0	36.0	499	478	90.4	32.1	30.8				
22	0	0	36.0	384	603	94.2	32.2	30.8				
23	0	0	36.0	255	688	97.2	31.7	30.2				
24	0	0	36.0	197	586	99.8	32.4	29.0				
25	0	0	36.0	162	448	104	32.8	27.5				
26	0	0	36.0	191	496	136	32.6	28.5				
27	0	0	36.0	214	440	116	32.6	28.9				
28	0	0	36.0	194	357	118	32.2	27.4				
29	0	0	47.6	168	------	129	31.8	27.4				
30	0	0	41.6	170	------	135	31.7	27.1				
31	0	------	36.8	170	------	138	------	27.3	------			------
TOTAL	0	1.8	414.0	8,051.2	9,389	5,186.1	908.7	930.5				
MEAN	0	.1	13.4	260	335	167	30.3	30.0				
MAX	0	1.8	47.6	634	688	331	39.5	32.1				
MIN	0	0	0	36.0	194	83.6	2.0	27.1				
AC-FT	0	4	821	15,970	18,620	10,290	1,802	1,846	*	*	*	*

CAL YEAR 1992	TOTAL	8,583.8	MEAN	23.5	MAX	704	MIN	0	AC-FT	17,030
WTR YEAR 1993	TOTAL*	24,881.3	MEAN	102	MAX	688	MIN	0	AC-FT	49,350

* Incomplete Record

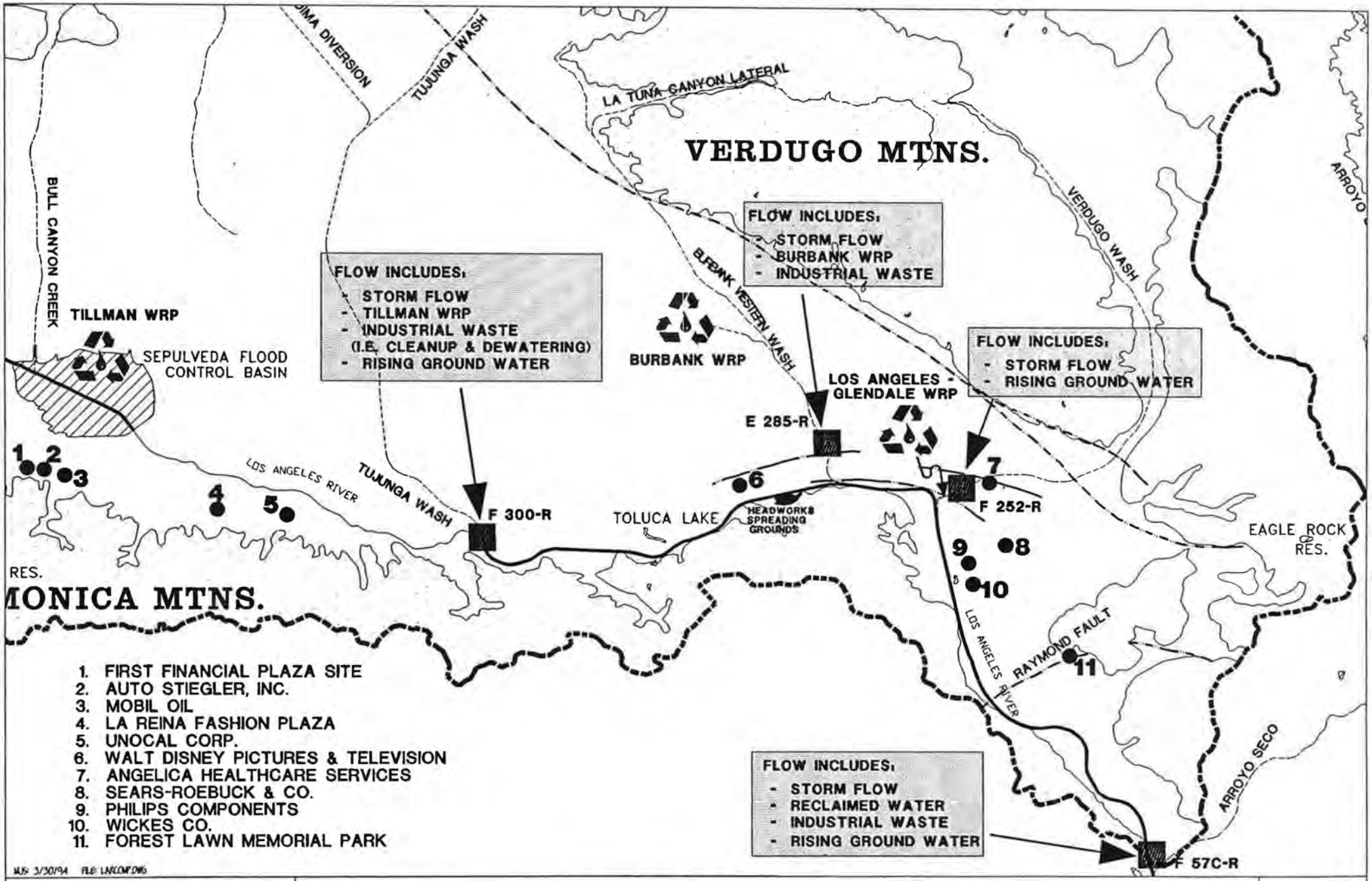
MAXIMUM INSTANTANEOUS PEAK IS 745 CFS AT 12:25PM ON 01/13/93.

APPENDIX C

COMPONENTS OF LOS ANGELES RIVER FLOW

UPPER LOS ANGELES RIVER AREA: COMPONENTS OF LOS ANGELES RIVER FLOW; 1992-93 WATER YEAR

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
TOTAL FLOW AT GAGE F-57C-R														F-57C-R: Storm, Reclaimed, Industrial, Rising Ground Water
Total:	14290	7563	34810	253200	132000	48000	14500	10120	12810	10420	11320	10990	560023	F300-R: storm, Tillman, industrial waste, and rising water
														E285-R :storm, Burbank WRP, industrial waste
														F252-R: storm, rising water
I. RECLAIMED WATER DISCHARGED TO L.A. RIVER IN ULARA														
Tillman:	2972	2780	3035	3501	3394	3482	3347	3273	3176	3387	3273	3462		: Record
L.A.-Glendale:	1388	1225	1457	1472	1257	1395	1321	1219	1007	1107	1010	1094		: Record
Burbank WRP:	459	444	459	459	414	459	444	459	444	459	459	444		: Record
Total:	4819	4449	4951	5432	5065	5336	5112	4951	4627	4953	4742	5000	59437	
II. INDUSTRIAL WATER DISCHARGED TO L.A. RIVER IN ULARA														
Upstream of F300-R	856	738	1046	591	302	610	613	819	750	517	320	118		: From F300-R separation of flow
Between F300-R and Rubber Dam														
Disney	237	220	143	0	0	0	0	0	0	0	0	0		
Other:	171	148	209	118	60	122	123	164	150	103	64	24		:20% of discharges 'Upstream of F300-R'; approximately 2cfs
Between Rubber Dam and F57C-R														
Headworks:	29	21	23	25	24	30	22	25	25	16	0	0		:pilot project record
Industrial waste:	430	417	430	430	389	430	417	430	417	430	430	417		:7 cfs assumed
Western Drain:	198	115	457	471	426	473	328	96	97	99	129	76		: From E285-R separation of flow
Total:	1922	1658	2309	1636	1201	1665	1502	1534	1439	1166	943	634	17609	
III. RISING WATER IN L.A. RIVER IN ULARA														
Total:	408	408	408	408	408	408	408	408	408	408	408	408	4896	: See Section 2.3 of the Watermaster's Report



1992-93 Water Year ULARA Watermaster Report

Upper Los Angeles River Area: Components of Los Angeles River Flow

FIGURE C.1

APPENDIX D

EAST VALLEY WATER RECLAMATION PROJECT

FINAL

ENVIRONMENTAL IMPACT REPORT
(SCH NO. 90010909)

EAST VALLEY WATER RECLAMATION PROJECT

JULY 1, 1991

PREPARED BY

CITY OF LOS ANGELES DEPARTMENT OF WATER AND POWER

111 North Hope Street, Room 1348

Los Angeles, California 90012

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

The proposed East Valley Water Reclamation Project (EVWRP) is to be constructed in the San Fernando Valley, approximately 10 miles north of downtown Los Angeles, California (Figure 3-1). The EVWRP will include a distribution system capable of transporting up to 40 million gallons per day of reclaimed water from the Donald C. Tillman Water Reclamation Plant (Tillman Plant) to users at higher elevations in the northeast portion of the San Fernando Valley.

The Tillman Plant, located in the Sepulveda Basin near the intersection of the San Diego and Ventura Freeways, presently treats 42 million gallons per day of municipal wastewater. It is now undergoing an expansion program that will increase its capacity to 80 million gallons per day. Reclaimed water from the Tillman Plant will be supplied to various users in the northeast portion of the San Fernando Valley by the Los Angeles Department of Water and Power (LADWP) as part of the proposed project, and by the Los Angeles Department of Public Works (Public Works) as part of separate projects. A chart showing the proposed distribution of reclaimed water from the Tillman Plant is presented in Figure 3-2. In the future, the LADWP will propose one or more additional projects to supply Tillman Plant effluent to users in the western portion of the San Fernando Valley.

The proposed EVWRP facilities required to distribute reclaimed water in the northeast San Fernando Valley will be contained in three systems, consisting of several pump stations, water

tanks and approximately 13 miles of large diameter pipeline. Table 3-1 outlines the major features of the three proposed distribution systems, while Figure 3-3 shows the location of the proposed facilities for Systems 1 and 2. Systems 1 and 2 will serve low and medium elevation users, and System 3 will be required to supply reclaimed water to industrial and irrigation users at higher elevations in the San Fernando Valley. The exact type and location of the facilities for System 3 will depend on future customer demand.

Many factors were considered in choosing pipe routes and in siting the pump station and storage tank for Systems 1 and 2. These considerations included:

- Size and location of existing utilities in City streets;
- Existence of street construction moratoriums due to the presence of recently laid pavement;
- Availability of public right-of-ways, (ie. rail corridors, power line corridors, flood control channels);
- Location of potential customers;
- Hydraulic requirements of proposed system;
- Aesthetics of completed project; and
- Potential disturbances to residences and businesses during construction.

A study was conducted to determine which of several possible configurations of pipe routes and appurtenant facilities would best meet the objectives of the project. The project design which best meets the needs of the City is described below. Those alternatives which were deemed less satisfactory are described in Chapter 16.

3.2 PROPOSED FACILITIES

To deliver reclaimed water from the Tillman Plant to the Hansen and Pacoima Spreading Grounds, approximately 64,000 feet of 48 54-inch diameter pipe must be installed. The pipeline will tie into an existing 54-inch diameter pipeline near the intersection of Woodley Avenue and Victory Boulevard. It will then continue ~~in the easterly direction on Victory Boulevard towards~~

~~Haskell Avenue, where it will turn left (north)~~ north on Woodley Avenue. At the intersection of ~~Haskell Avenue~~ Woodley Avenue and Sherman Way, the pipeline will turn right (east), and continue on Sherman Way to the Tujunga Wash. Between Allott Avenue and Varna Avenue, the pipeline will turn left (north) onto the Tujunga Wash right-of-way. The pipeline will continue on the Tujunga Wash right-of-way to Glenoaks Boulevard, where it will turn left (northwest). Near where the pipeline passes the northern end of the Hansen Spreading Grounds, an outlet structure will be constructed to deliver reclaimed water for groundwater recharge.

From Glenoaks Boulevard, the pipeline will turn right (north) on Osborne Street, and continue past the west abutment of Hansen Dam, where the pipeline will end. At a later date, the appropriate connections will be made to bring the reclaimed water pipeline onto the Hansen Dam Recreation Area property.

A second pipeline, approximately 36 inches in diameter, will branch off the main pipeline at the intersection of Osborne Street and Glenoaks Boulevard. This smaller line will continue on Glenoaks Boulevard in a northwesterly direction to Terra Bella Street, where it will turn left (south). Next, the pipeline will turn left on Dehaven Avenue, and then right on Garber Street. At the end of Garber Street, the pipeline will continue up a hill onto Los Angeles County property. The pipeline will terminate in a 2 million gallon tank which will be constructed as part of the project on a hilltop on the grounds of the Whiteman Airport, in Pacoima.

At the intersection of the Tujunga Wash and the LADWP Rinaldi-Toluca transmission line corridor (which parallels Canterbury Avenue), the main 48 54-inch reclaimed water pipeline will branch off in a northwesterly direction towards Pacoima Spreading Grounds. The 48 54-inch diameter pipeline will be installed in the Rinaldi-Toluca transmission line corridor between Tonapah and Filmore Streets. An outlet structure will be constructed at the northern end of the spreading grounds to discharge the reclaimed water into the Pacoima Spreading Grounds.

The rise in elevation from the Tillman Plant to Hansen and Pacoima Spreading Grounds is 250 feet and 240 feet respectively. To attain this uphill flow of water, an existing pump station at the Tillman Plant will be modified to pump the additional flows required by the EVWRP.

A booster pump station will also be required at the LADWP's Valley Generating Station to deliver the reclaimed water to the Hansen Dam Recreation Area and the proposed storage tank at the Whiteman Airport. This pump station will be located on LADWP property adjacent to existing power generation facilities. The Valley Generating Station will require water treatment facilities on site in order to use reclaimed water.

3.3 DISCRETIONARY ACTIONS

Completion of the proposed project will require approval of thirteen separate discretionary actions on the part of eight agencies. The actions to be completed are identified below:

City of Los Angeles Department of Water and Power Board of Commissioners

- Certification of the Final EIR.
- Approval of the proposed project.
- Completion of a Notice of Determination.

City of Los Angeles Planning Commission

- Approval of a Conditional Use Permit to allow construction of the pump stations and reclaimed water storage tank.

City of Los Angeles Cultural Affairs Commission

- Pump station and tank architectural design approval.

City of Los Angeles Department of Building and Safety

- Issuance of Permit to Construct for pump station and tank.

City of Los Angeles Bureau of Engineering

- Issuance of an Excavation Permit to construct the pipeline.

State of California Department of Health Services

- Engineering Report Recommendation

- Issuance of Operation Permit

Los Angeles Regional Water Quality Control Board

- Approval of Report of Waste Discharge
- Issuance of ~~Waste Discharge~~ Water Reclamation Requirements
- Engineering Report Recommendation

Los Angeles County Department of Public Works

- Issuance of Flood Control Permit

3.4 PROJECT SCHEDULE

Construction activities on the EVWRP are scheduled to begin in 1993 following a 12 to 18 month design phase. The construction process for System 1 is expected to continue for approximately two years. According to this schedule, the spreading of reclaimed water would begin in mid 1995. Use of reclaimed water by industrial and irrigation customers may be implemented in phases beginning in 1994, as portions of the 48 54 inch diameter pipeline are completed. System 2 facilities may be designed and constructed concurrent with System 1 or may proceed somewhat later. System 3 facilities will be constructed after completion of System 1 and 2 facilities.

3.5 CONSTRUCTION ACTIVITIES

After the plans and specifications are finalized, a construction contract for the EVWRP will be advertised for bidding. The contract will be awarded to the lowest responsible bidder.

Construction methods and scheduling will be determined to a large extent by the contractor. Therefore, it is impossible at this time to precisely describe these activities. However, a brief discussion of pipe laying, pump station and tank construction follows.

Installation of the pipeline will take place in public streets and in electrical transmission line and

flood control channel right-of-ways. Pipeline construction typically involves the following steps:

1. Set-up of traffic signs, barriers and flagmen (on roadways);
2. Delivery of pipe to curbside;
3. Cutting and removal of pavement (on roadways);
4. Trenching;
5. Installation of pipe in trench;
6. Backfill of trench; and
7. Restoration of pavement/cleanup.

Construction of the pump station and storage tank will involve earth work, foundation work, structural work, painting, and other construction disciplines.

Personnel for the construction project will be provided by the contractor. It is expected that a crew of approximately 20 workers will be required for each major portion of the project.

Some of the workers on the project will be providing labor, while others will be operating heavy equipment. Typical heavy equipment used for a project of this type includes cranes, dozers, loaders, trucks, graders, excavators, backhoes, pavement breakers, compactors, vibratory rollers, and compressors. Although these pieces of equipment may be used at some time on the project, it is not likely that they all would be running at the same time.

3.6 REGULATION AND INSPECTION OF CONSTRUCTION ACTIVITY

Construction activities in Los Angeles are regulated by several government agencies, including the Los Angeles Department of Building and Safety (LADBS), the Los Angeles Department of Transportation (LADOT), the Federal Occupational Safety and Health Administration (OSHA), and the Los Angeles Bureau of Engineering (LABOE).

Full time inspection will be provided at the job site by LADWP personnel. The contractor will be required to follow all applicable rules and regulations concerning noise, work hours, traffic

control, safety of persons and property, and use of premises and highways.

3.7 PROJECT OPERATIONS

Once construction of needed facilities is completed, reclaimed water will become available for groundwater recharge, industrial, and irrigation use.

Reclaimed water will be available for groundwater recharge at the Hansen and Pacoima Spreading Grounds. As required by the Department of Health Services' Proposed Guidelines for Groundwater Recharge with Reclaimed Water, the reclaimed water will be diluted with water from other sources. In addition to Hansen and Pacoima Spreading Grounds, dilution water may be spread at Tujunga and Branford Spreading Grounds. Dilution water may include the following:

- Imported aqueduct waters spread at spreading grounds;
- Native runoff (i.e. local rainwater, storm water);
- Imported aqueduct waters which reach the groundwater basin from infiltration of irrigation water; and
- Existing groundwater.

Several industrial and irrigation water users in the northeast San Fernando Valley have expressed interest in replacing some or all of their potable water purchases with reclaimed water. Reclaimed water will be sold to customers near the pipeline route at a substantially discounted rate after the completion of construction. A marketing plan for reclaimed water in the project area can be found in Appendix E.

Responsibility for the operation of the EVWRP will be shared by several parties. A brief outline of responsibilities is given below.

The City of Los Angles Department of Public Works, Bureau of Sanitation will be responsible for operating the Tillman Plant such that it provides a reliable source of reclaimed water. Bureau of Sanitation personnel will monitor the treatment process and periodically test the reclaimed water to ensure a high quality product. Bureau of

Sanitation Personnel will also operate pumping facilities at the Tillman Plant.

The Los Angeles Department of Water and Power will maintain and operate the reclaimed water pipeline, storage tank, booster pump station at the Valley Generating Station, and the associated water system valves and meters. The LADWP will test water quality on a periodic basis.

The Los Angeles County Department of Public Works will be responsible for the spreading reclaimed and/or dilution waters at the Hansen, Tujunga, Branford and Pacoima Spreading Grounds.

Industrial and Irrigation Customers who choose to use reclaimed water will be responsible for providing and/or installing the necessary facilities to distribute the reclaimed water throughout their premises. Each user will be required to install safety features at their facilities to ensure the proper use of reclaimed water.

3.8 PROJECT FINANCING

The estimated construction costs for the proposed project range between 29 and 38 million dollars. This total does not include land acquisition, project engineering, and management costs. The project will be financed through the normal capital improvement program of the Los Angeles Department of Water and Power. ~~All funds will be derived from city wide water sales.~~ Water system projects (potable and reclaimed) are financed from the Water Revenue Fund (WRF). The WRF is funded through the sale of potable and reclaimed water and the sale of Water Revenue Bonds which provide long term funding of capital projects. Other sources of funding are being investigated to reduce the need for WRF financing. The project is expected to qualify for assistance under the Metropolitan Water District of Southern California's (MWD) Local Projects Program. Currently that program provides $154 per acre-foot for projects that displace the use of MWD water. Assembly Bill 444 funds may also be available for this project. The availability of alternative financing is subject to project eligibility criteria and requirements as determined by the appropriate agencies.

TABLE 3-1

RECLAIMED WATER DISTRIBUTION SYSTEMS

	SYSTEM 1	SYSTEM 2	SYSTEM 3
PROPOSED FACILITIES	1. Pump station at Tillman plant 2. 64,000 feet of 54 inch diameter pipe	1. 4,000 feet of 36 inch diameter pipe 2. One 2 million gallon storage tank 3. Booster pump station at Valley Generating Station	1. Small booster pump station(s) 2. Hydropnuematic tank(s) 3. Small diameter distribution pipelines
SERVICE TO:	1. Pacoima Spreading Grounds 2. Hansen Spreading Grounds	1. Valley Generating Station 2. Irrigation and industrial users at lower and middle elevations	1. Irrigation and industrial users at higher elevations

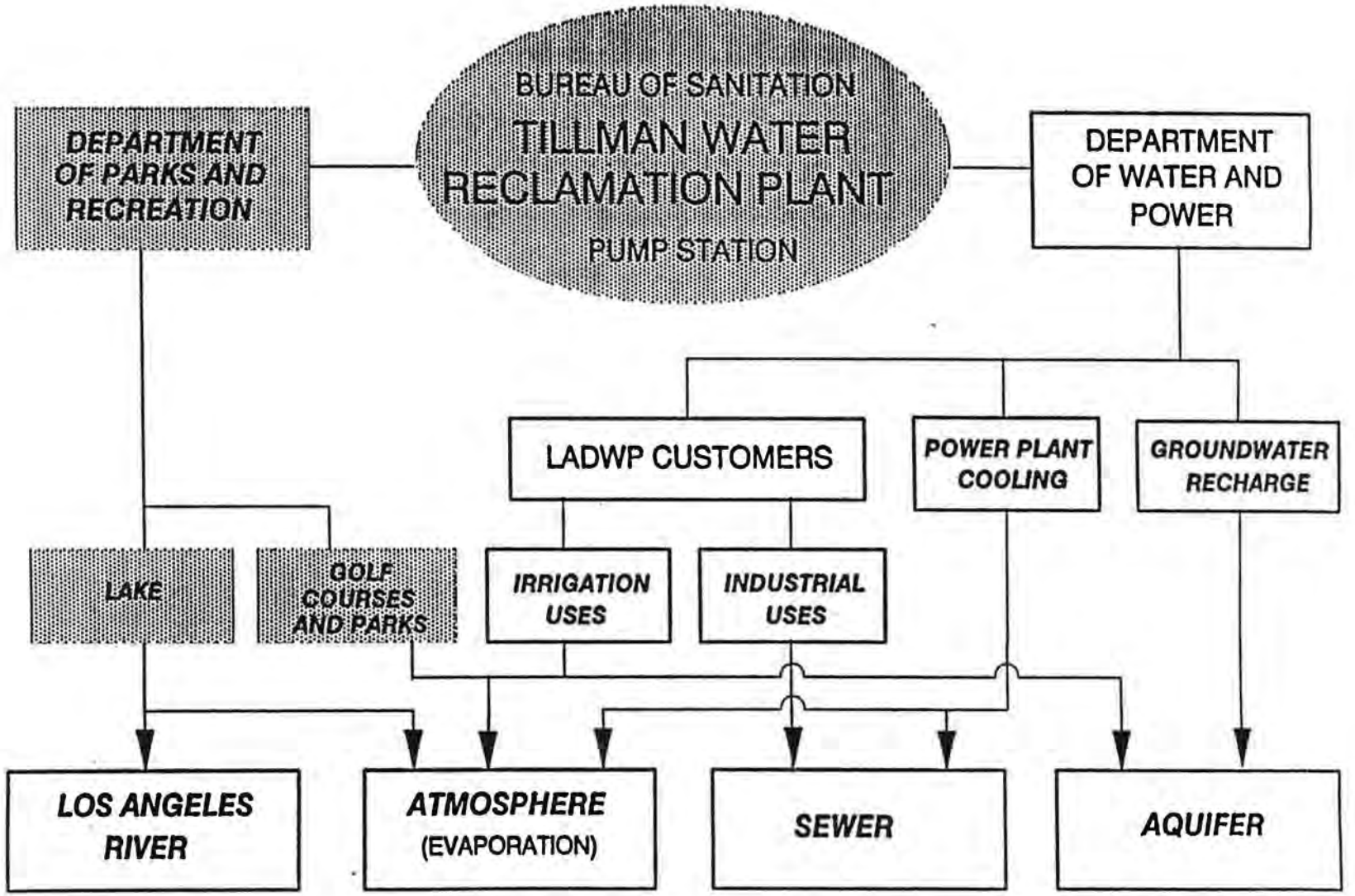


FIGURE 3-2
TILLMAN PLANT
RECLAIMED WATER
UTILIZATION

NOTE: Shaded areas are not part of the proposed project

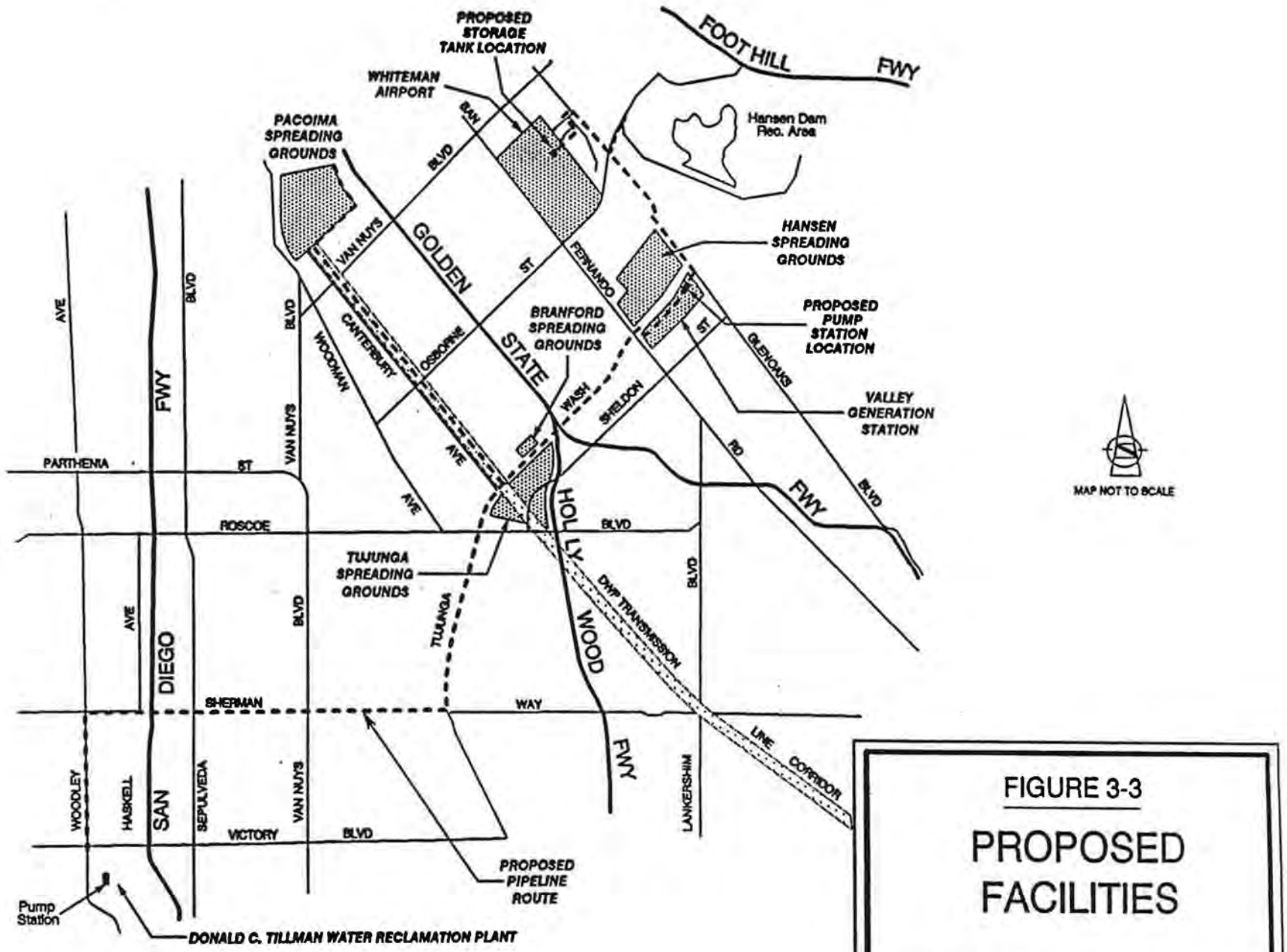


FIGURE 3-3

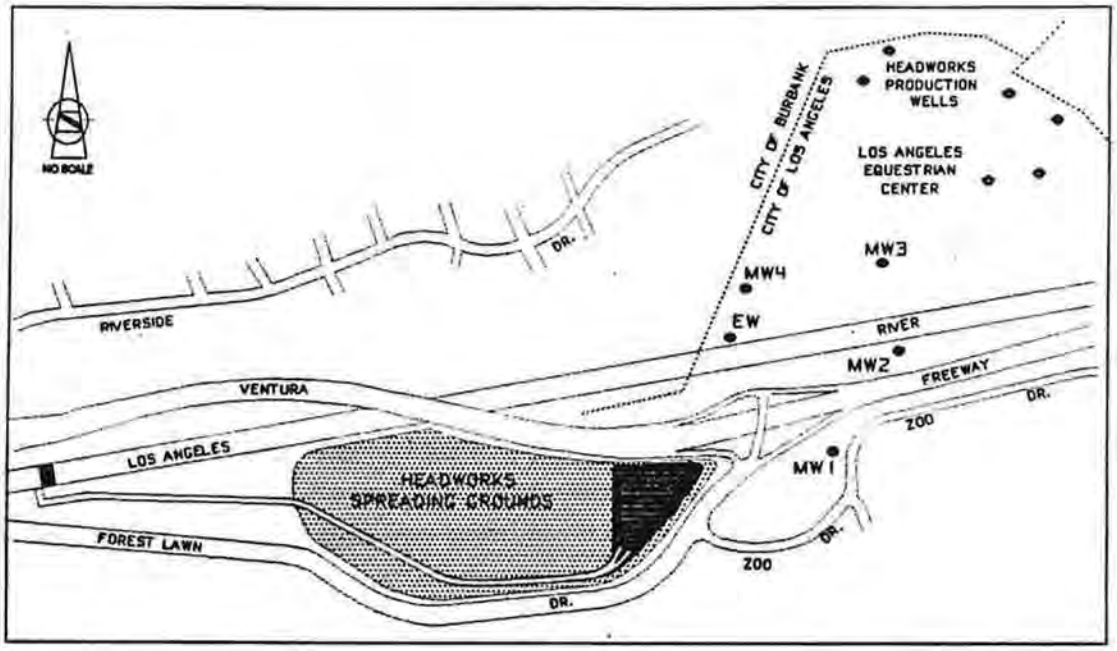
PROPOSED FACILITIES

APPENDIX E

HEADWORKS RECLAIMED WATER PILOT RECHARGE STUDY

Headworks Pilot Recharge Project

Water Quality Investigation



City of Los Angeles
Los Angeles Department of Water and Power
Water Engineering Design Division
In Cooperation with Metropolitan
Water District of Southern California

December 1993

Abstract

The objective of the Headworks Pilot Recharge Project was to demonstrate that Los Angeles River (LAR) water can be used to recharge the San Fernando Groundwater Basin (SFGB), thereby augmenting the City of Los Angeles' potable water supply. During the spreading season (April to November), the LAR contains approximately 71 percent tertiary treated reclaimed water from the Donald C. Tillman Water Reclamation Plant (Tillman).

A pilot spreading project and a comprehensive water quality monitoring program was implemented at the Headworks Spreading Grounds in June 1991 and was completed in July 1993. The project was jointly funded by the Los Angeles Department of Water and Power and The Metropolitan Water District of Southern California.

Approximately 1 cubic foot per second (cfs) of the LAR water was diverted by a rubber dam and was spread on a 2-day wet and 5-day dry cycle. An extraction well, located approximately 1,000 feet downgradient from the spreading area was used to recover the spread water. The extraction well was pumped at a constant rate of 200 gallons per minute (0.45 cfs). Due to dilution with natural groundwater, the extracted water contained about 45 percent reclaimed water .

A portion of the extracted water was diverted through a granular activated carbon (GAC) filter to evaluate its effect on improving extracted water quality.

Groundwater flow analysis indicated the spread water was recovered by the extraction well.

This 2-year pilot project indicates that:

- The extracted water complied with all drinking water standards.
- No adverse impact on water quality in the basin occurred.
- Complete removal of coliform bacteria was noticed. Compliance with the drinking water standards was achieved without disinfection.
- Giardia, and Cryptosporidium which were present in the LAR water, were removed by the filtering action of the soil and were not detected in the extracted water even though the water was not chlorinated.
- Viruses were neither detected in the LAR water nor in the extracted water.

- The groundwater recharge operation reduced the trihalomethane (THM) formation potential of the spread water by about 93 percent at the extraction well.

- The concentration of total organic carbon (TOC) and biochemical oxygen demand (BOD) in the extracted water were reduced by 92 percent and 87 percent, respectively, as compared to LAR water.

- GAC filtration improved the organic content (i.e., TOC) of the product water by an additional 46 percent (about 95 percent when compared to LAR water); however, due to high quality of the extracted water, the addition of GAC is not necessary.

- The recharge water (i.e., LAR blend) complied with the basin water quality objectives (non-degradation), except for chloride. The chloride level in the spread water averaged 122 mg/L during the course of the project. The basin water quality objective for chloride is 100 mg/L. The recharge operation resulted in a chloride increase of 8 mg/L in the extraction well, from 59 mg/L to 67 mg/L. This level is lower than the basin water quality objective and also lower than the maximum recommended level of 250 mg/L for drinking water.

Based on the results of this pilot project, an Engineering Report and an operational plan will be developed for a full-scale groundwater recharge project at the Headworks Spreading Grounds. This project is expected to result in the diversion of up to 10,000 acre-feet of LAR, which now flows to the Pacific Ocean, to the SFGB, where it will augment the City's groundwater supply.

Goal

The goal of this pilot project was to investigate the feasibility of using LAR water, containing 71 percent reclaimed water from Tillman, to recharge the SFGB. In order to demonstrate this, the Los Angeles Department of Water and Power conducted a pilot spreading project at the Headworks Spreading Grounds from June 1991 to July 1993. The specific goal was to determine the changes in the water quality as it moved through the soil, mixed with existing groundwater and was then extracted. Various physical, chemical, and microbiological water quality parameters were investigated throughout the course of the project.

This report summarizes the findings of the project as required by the California Regional Water Quality Control Board (RWQCB), Los Angeles Region and the Department of Health Services. The findings will also be included in an Engineering Report which is being prepared for the approval of a full-scale project.

Operation

Sampling and analysis of the background water quality of the basin began on June 6, 1991. The spreading operation started on July 2, 1991 and was continued until April 14, 1993. Extraction of the spread water, however, continued until July 15, 1993.

Approximately 1 cfs of the LAR water was diverted on a 2-day wet and 5-day dry cycle into a highly permeable spreading area known as the Headworks Spreading Grounds. The intermittent 1 cfs flow rate equates to a 0.29 cfs flow rate on a continuous basis. During the spreading season (April to November), reclaimed water averaged approximately 71 percent of the LAR, ranging from 53 percent to 79 percent. During the course of the pilot project, Tillman, which is located approximately 7 miles upstream

of the spreading area, was producing about 60 million gallons per day (MGD). Most of the tertiary treated effluent is discharged into the LAR. The process flow diagram of the Tillman is depicted in Figure 1. The treatment rate will be increased to 80 MGD in the near future. However, it is expected that up to 34 MGD (approximately 38,000 acre-feet per year) of the Tillman effluent in the future will be used for irrigation (approximately 3,000 acre-feet per year) in the Sepulveda Basin and for groundwater recharge (approximately 35,000 acre-feet per year) in the northeastern San Fernando Valley.

Figure 2 shows the proportion of the Tillman effluent and the LAR under the present and future flow conditions. As can be seen from this figure, during the spreading season (April to November), approximately 71 percent of the LAR flow consists of Tillman effluent.

The spreading operation was ceased during heavy rains due to the high turbidity of the LAR water and to avoid spreading of the storm water. Urban storm runoff may contain significant quantities of oils, greases, and pesticides which may adversely affect the quality of the LAR water. Also, the turbid water can leave a sediment deposit of fine particles on the bottom of the spreading basin thus lowering the permeability of the spreading basin. The diverted LAR water was conveyed by gravity through a corrugated metal pipe to the eastern portion of the Headworks Spreading Grounds, to an area of about 1 acre. The hydraulic load on the spreading ground during the course of the spreading operation was approximately 2 ft/day.

The spreading grounds occupy an area of approximately 30 acres, consisting of fine sand and gravel in the first 20 feet of depth, coarse gravel and boulder from 20 feet to 45 feet, and bedrock (decomposed granite and granite) below 45 feet of depth. The plan view of the spreading grounds is shown in Figure 3. The cross section of the pilot project area

is depicted in Figure 4. The spread water was then extracted at a constant flow rate of 0.45 cfs through an extraction well. This well is located approximately 1000 feet downgradient from the spreading grounds. Continuous pumping of the extraction well at a flow rate of 0.45 cfs resulted in a 1.5 to 1 ratio of water extracted to water spread. Figure 5 shows the capture of the spread water by the extraction well as evident from the groundwater stream lines.

In addition to the extraction well, four monitoring wells were used to track the movement of the spread water (Figure 3) and to obtain samples of the groundwater for water quality analysis. Information on the geological formation and the groundwater depth in the project area is contained on the well logs depicted in Figures 6 through 10.

Throughout the course of the project operation, approximately 368 acre-feet of the LAR water was spread at the Headworks Spreading Grounds (Table 1). Approximately 547 acre-feet of water was pumped from the extraction well, 1.5 times the spread water volume, between July 1991 to April 1993. The spreading operation was ceased in March 1993 while pumping continued until July 1993 to ensure total extraction of the spread water.

The LAR monthly flow data were collected for a period of 20 years from 1969 to 1989. The Tillman flow rates were then subtracted from the LAR total flow for the period from 1984 to 1989 in order to determine the LAR base flow rates. Tillman began discharging into the LAR in 1984. During the spreading period, the LAR on average contained 71 percent of Tillman reclaimed water. The percentage of reclaimed water in the extracted water was about 45 percent.

Conclusion

- Spreading of LAR water at Headworks Spreading Grounds effectively reduced coliform, TOC, BOD, chloride, nitrite, ammonia, and turbidity levels to the point where the extracted water met all drinking water standards. This was demonstrated through a comprehensive water quality monitoring program performed over a period of two years.

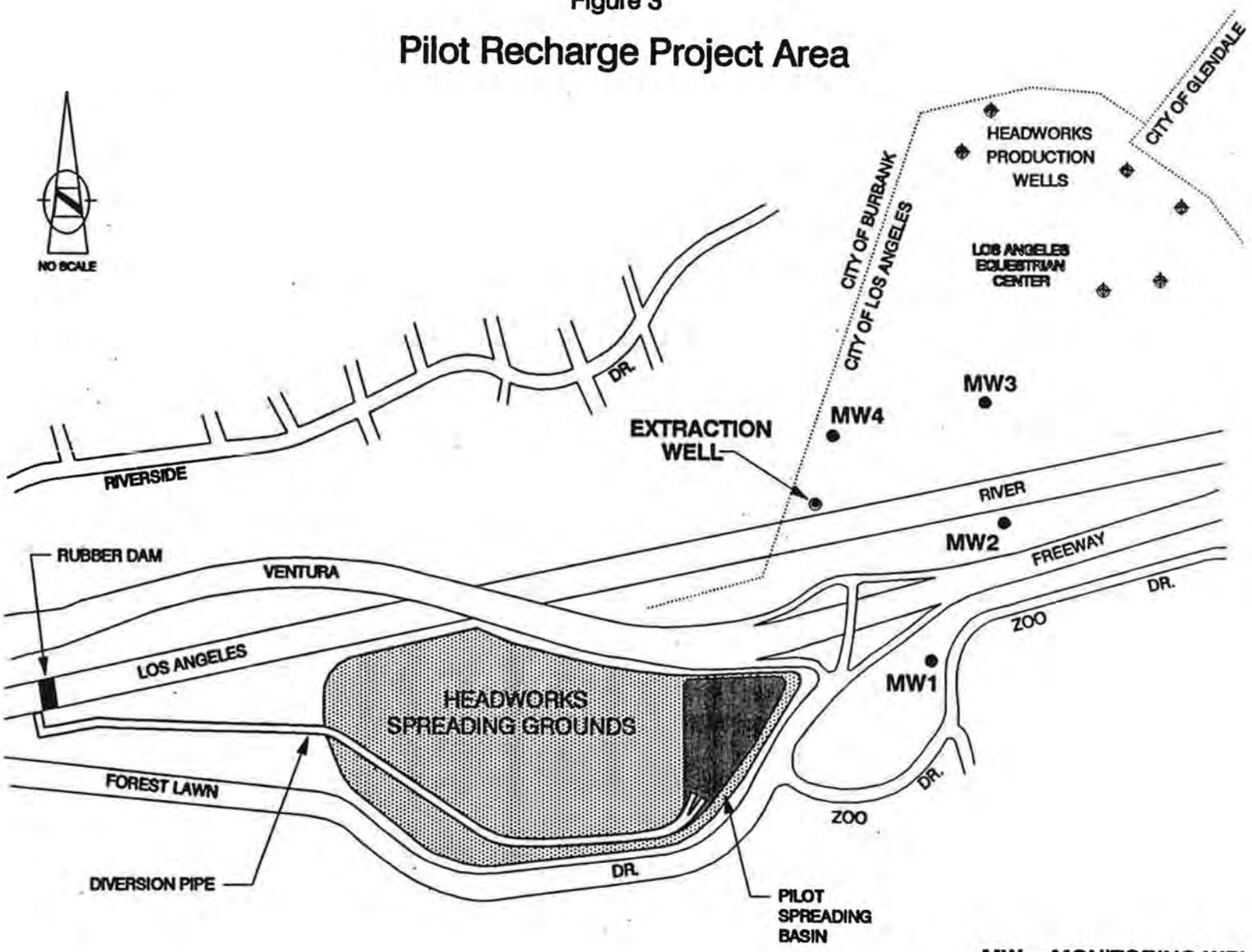
- The water quality basin objectives established for the spread water by the RWQCB were met except for chloride (122 mg/L vs. 100 mg/L). During the spreading operation an average increase of 8 mg/L was noticed in the background concentration of chloride from 59 mg/L to 67 mg/L. This level is less than one-third of the maximum recommended level of 250 mg/L for drinking water.

- The extracted water met the basin water quality objective except for TDS. The background concentration of TDS was 853 mg/L. The TDS level of 738 mg/L in the extracted water was approximately 5 percent higher than the objective level of 700 mg/L. This higher level of TDS did not result from the spreading operation since the TDS level in the spread water averaged 658 mg/L during the course of the pilot project.

- A full-scale project can be implemented at the Headworks Spreading Grounds and should be developed as soon as practical to make use of water which presently flows to the Pacific Ocean. Such a project would result in an increased supply of groundwater for the City of Los Angeles.

Figure 3

Pilot Recharge Project Area



APPENDIX F

WATER QUALITY DATA

REPRESENTATIVE MINERAL ANALYSES OF WATER

Well Number or Source	Date Sampled	Spec. Cond. umho/c	Mineral Constituents in milligrams per liter (mg/l) pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	TDS mg/l	Hardness as $CaCO_3$ mg/l
Imported Water																
Colorado River Water at Eagle Rock Reservoir	1992	1008	8.0	69	29	96	4.4	0	146	240	91	1	0.2	0.2	614	289
LA Aqueduct Influent	6/21/93	310	8.0	18	5	30	-	0	124	21	16	0.3	0.8	0.6	108	66
LA Aqueduct/MWD Filtration Plant Influent	12/11/93	536	8.0	36	13	55	-	0	145	83	45	1.5	0.6	0.6	341	159
State Water Project at Joseph Jensen Filtration Plant (Influent)	92/93 FY	726	7.8	38	19	76	3.7	0	117	105	91	2.3	0.3	0.3	410	172
Surface Water																
Tillman Rec. Plant Discharge to LA River	1992 CY	-	7.0	55	18	129	14	-	-	195	137	0.5	0.9	1	665	211
Los Angeles River at Arroyo Seco	12/93	981	7.3	71	27	117	17	<2	181	204	118	3.7	0.3	0.6	670	287
LA/Glendale Rec. Plant Discharge to LA River	1993 CY	-	7.4	51	19	149	16	-	-	207	164	2.8	0.9	0.7	736	188
Ground Water																
(San Fernando Basin - Western Portion)																
4757C (Reseda No. 6)	10/13/83	944	7.8	115	31	43	2.1	-	301	200	33	2.6	0.31	0.24	595	416
(San Fernando Basin - Eastern Portion)																
3810 (a) (No. Hollywood No. 11)	3/17/91	513	8.3	56	15.9	29.6	-	0	170	57	18.6	7.7	0.31	0.1	308	170
3841C (Burbank No. 6)	5/1/91	500	7.9	52	9.7	30	4.1	<0.6	220	44	19	2.2	0.28	-	290	170
3913H (Grandview No. 16)	12/93	540	7.9	56	13	33	3.6	1.2	225	56	24	13	0.5	-	330	193
(San Fernando Basin - L.A. Narrows)																
3959E (Pollock No. 4) (b)	3/8/93	794	7.5	77	24	49	NA	0	242	103	58	37.3	0.33	0.38	559	284
(Sylmar Basin)																
4840J (Mission No. 5)	8/31/89	652	7.7	76	18	32	4.1	-	208	80	31	1.1	0.34	-	420	267
5959 (San Fernando No. 3)	2/13/91	630	7.5	61	21	30	2.8	<0.6	210	75	28	27	-	-	380	170
(Verdugo Basin)																
3971 (Glorietta No. 3)	6/23/92	840	7.0	86	32	39	3.3	0.1	226	115	75	52.8	0.21	-	500	346
5058 (CVCWD No. 14)	2/9/93	705	7.2	68	27	30	2.5	0.21	201	76	56	54	0.33	-	410	281

(a) Substituted for No. Hollywood No. 30
(b) Substituted for Pollock No. 6

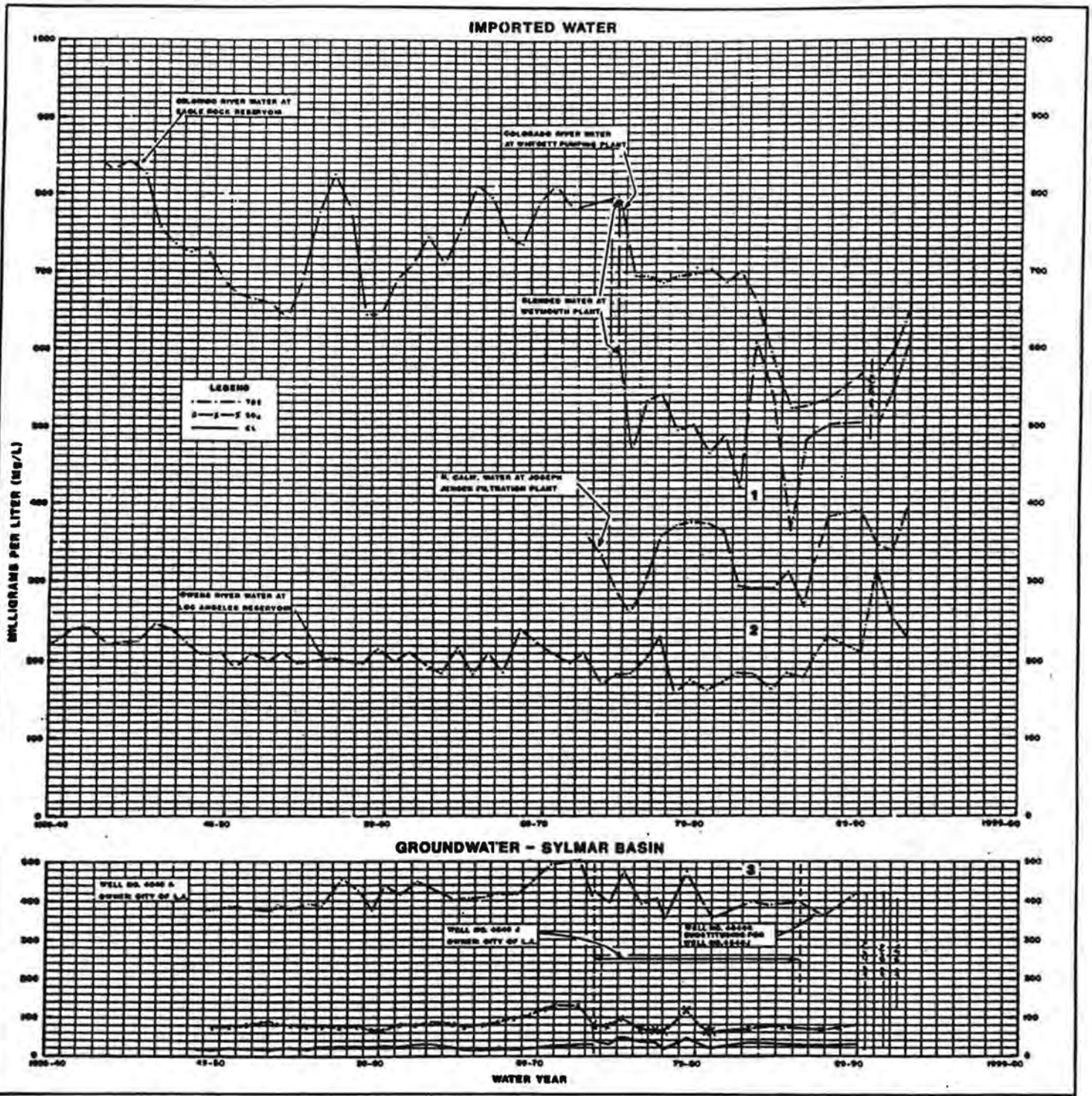


Figure 3 - MINERAL CONSTITUENTS OF WATER SOURCES IN THE ULARA

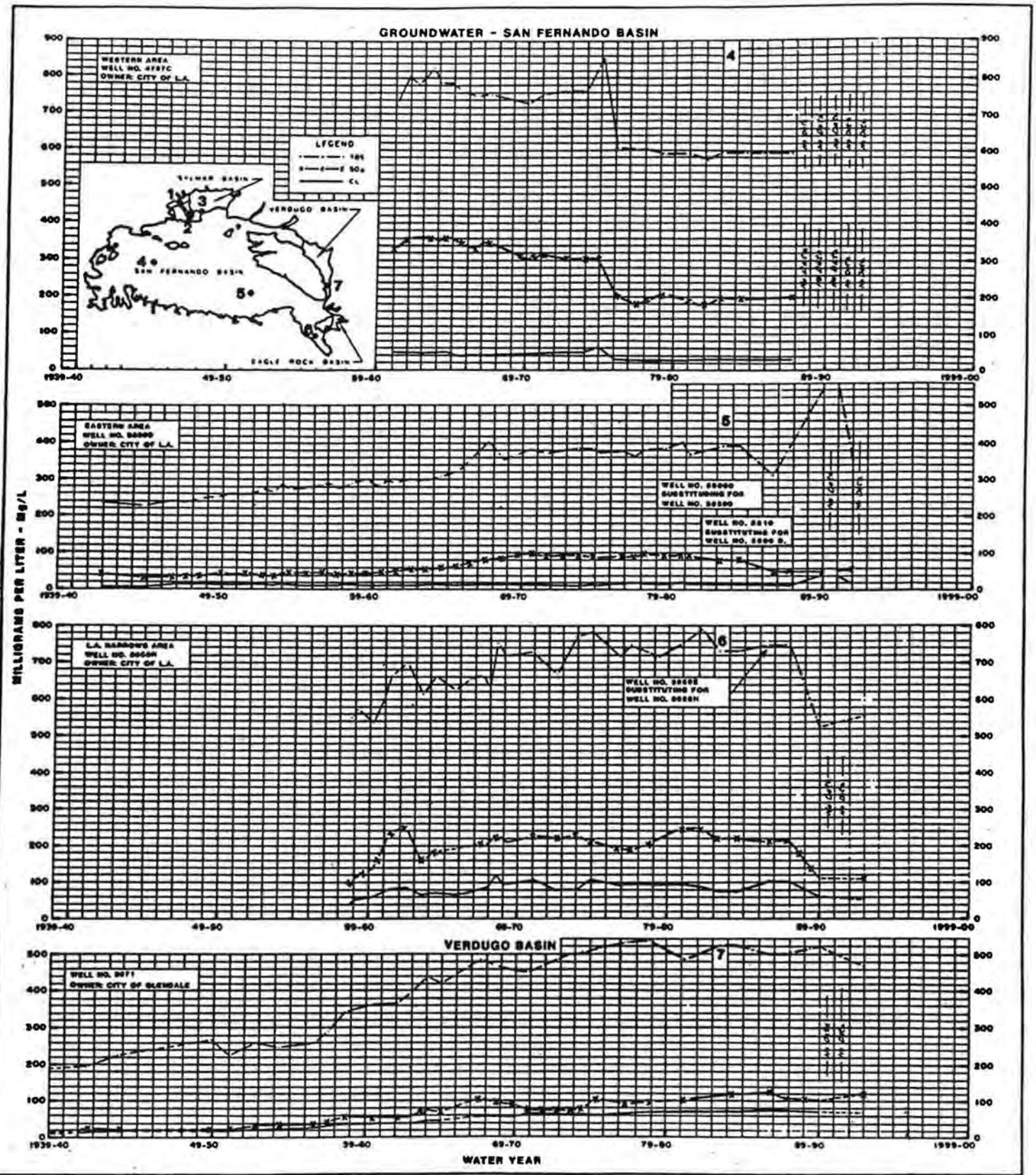


Figure 3(cont.) - MINERAL CONSTITUENTS OF WATER SOURES IN THE ULARA

APPENDIX G

DEWATERING AND REMEDIATION PROJECTS

DEWATERING AND REMEDIATION PROJECTS

No.	Company	Contact	Address	ID	Start Date
1	Danalax Engineering Corp.	Krell, Alex	11239 Ventura Blvd.	P	
2		Henkin, Doug	8806 Etiwanda Ave.	P	
3	Delta Tech. Engineering	Abbasi, Z. A.	12800 Ventura Blvd.	P	
4	Helfman, Hoffman & Associates	Varadi, Ivan	5550 Topanga Canyon	D	Jun 19, 1989
5	Encino Spectrum Project	Helfman, Haloosim & Ass.	15503 Ventura Blvd.	D	Jun 14, 1989
6	Home Savings of America	Eli Silon & Associates	13949 Ventura Blvd.	D	Jun 14, 1989
7	Warner Center Ent. Complex	Tsuchiyama and Kaino	5955 Owensmouth Ave.	D	Jun 26, 1989
8	T Violes Construction Company	Viole, Tim, Jr.	15840 Ventura Blvd.	P	
9	Mobil Oil	Alton Geoscience	16461 Ventura Blvd.	R	May 11, 1989
10		Eccleston, C. W.	22020 Clarendon St.	P	
11	Thrifty Oil	Delta Tech. Eng.	18226 Ventura Blvd.	R	Feb 2, 1990
12		Marks, Ronald	5348 Topanga Canyon	P	
13		Helfman, Haloosim & Ass.	21820 Burbank Blvd.	P	
14	Park Hill Medical Plaza	Anjomshoaa, Mahmoud	7303 Medical Center Dr.	D	Dec 27, 1989
15	Danalex Engineering		12050 Ventura Blvd.	P	
16	Ellis Plumbing Co.	Ellis, Chris	4235 Mary Ellen Ave.	P	
17	Tarzana Office Plaza	Varadi Engineering	18701 Burbank Ave.	P	
18	Helfman, Haloosim & Associates	Varadi, Ivan	5350 White Oak Ave.	P	
19	California Environmental	Buckley, Charlie	5455 Van Nuys Blvd.	R	Oct 4, 1989
20	First Financial Plaza Site	Slade, Richard	16830 Ventura Blvd.	D	Oct 9, 1987
21	Trillium	Lewis, Bill	6310 Canoga Ave.	D	Apr 27, 1988
22	LAMCO	O'Neil, John	21300 Victory Blvd?	D	Apr 27, 1988
23	La Reina Fashion Plaza	Blumenfeld, Dolores	14622 Ventura Blvd.	D	Apr 27, 1988
24	Robinsons-May/Northridge	Fred Fielder & Ass.	9301 N. Tampa Ave.	R	May 19, 1989
25	Rockwell International	Lafflam, S. R.	6633 Canoga Park Ave.	R	Jun 10, 1990
26	Lockheed	Helgerson, Ron	E. Empire Ave.	R	Jan 5, 1989
27	3M Pharmaceutical	Lee, M. E.	19901 Nordhoff St.	R	Feb 8, 1989
28	Philips Components	Smith, Wade	4561 Colorado St.	R	Jul 14, 1987
29	Auto Stiegler	Stiegler, John	16721 Ventura Blvd.	D	Oct 31, 1987
30	Sherway Properties	Vasquez, Rodney	4477 Woodman Ave.	P	
31	Ellis Plumbing Co.	Ellis, Chris	19951 Roscoe Blvd.	P	
32	Malibu Grand Prix	RESNA	19550 Nordhoff Place	R	Aug 1, 1991

Notes:

1) ID - Refers to the type of project;

D: Permanent dewatering required.

P: No dewatering required presently, however there is potential for dewatering in the future.

R: Ground water remediation site.

2) Start Date - Date project was brought to the attention of the ULARA Watermaster.

APPENDIX H

WELLS DRILLED FOR GROUND WATER INVESTIGATIONS

WELLS DRILLED FOR GROUND WATER INVESTIGATIONS

1992-93 WATER YEAR

1. Allied Signal

   Four new monitoring wells have been drilled There are now 9 active monitoring wells. One well has been abandoned.

2. Hughes Missile Systems Company

   Five ground water containment wells and 7 additional monitoring wells were drilled. There are now a total of 42 onsite and offsite wells.

3. Lockheed Aircraft Corp.

   Seven extraction wells and 7 additional observation wells were drilled. Lockheed has a total of 60 onsite and 80 offsite wells. The breakdown of the onsite and offsite wells is as follows: Onsite wells - 47 monitoring wells, 5 extraction wells, 4 observation wells, 2 piezometers, 1 injection well, and 1 pilot extraction well; Offsite wells - 73 monitoring wells, 3 extraction wells, 3 observation wells, and 1 piezometer.

4. City of Los Angeles

   Four wells were drilled to monitor the Tujunga Well Field.

5. Philips Components

   No new wells were drilled. There is a total of 22 onsite and offsite wells. Two of the 22 wells are extraction wells, however, only 1 is active.

6. Rocketdyne (Canoga Park Facility)

   No new wells were drilled. There is a total of 86 onsite monitoring wells (66 in the Shallow Zone, 14 in the Upper Zone, and 6 in the Lower Zone), and 30 offsite monitoring wells. There are 11 wells which are capable of being used as extraction wells.

7. 3M

   No new wells were drilled. There are 25 onsite monitoring wells, 8 offsite monitoring wells, and 11 onsite extraction wells. Of the 11 extraction wells, 2 are active.

8. Walt Disney

   One offsite and 5 onsite monitoring wells were drilled. There is a total of 9 wells. Disney has 3 extraction wells which they expect to destroy in April or May of 1994.

APPENDIX I

LANDFILLS - SWAT REPORT SUMMARY

STATUS OF LANDFILLS
SOLID WASTE ASSESSMENT TEST REPORTS

Attached are sixteen summary reports on the status of various landfills that exist within the Upper Los Angeles River Area (ULARA). For each of these landfills a Solid Waste Assessment Test (SWAT) Report was prepared and submitted to the Los Angeles Regional Water Quality Control Board.

These are reports prepared by the ULARA Watermaster and staff. Updated status reports will be available in the future as data becomes available. The date that gas control systems are installed and the depth-to-water at the landfill site are significant parameters as to the potential impact on groundwater in the alluvial area. Additional work is required in obtaining these data. A better understanding of the San Fernando Basin's increased hardness and total dissolved solids levels will be provided when these data are available.

Included in the summary sheets provided are the name and owner of the various landfills, along with location maps and general hydrogeologic information at the landfill site.

The following landfills are included in this report:

1. Bradley East
2. Bradley West
3. Branford Street
4. CalMat (Sun Valley #3)
5. CalMat (Old) Class 3 Site
6. Gregg Pit/Bentz
7. Hewitt
8. Lopez Canyon
9. Penrose/Newberry
10. Pendleton Street
11. Sheldon-Arleta
12. Scholl Canyon
13. Stough Park
14. Sunshine Canyon
15. Toyon
16. Tuxford

The SWAT program has been discontinued after completion of only 4 ranks of landfills in an original group that included 15 ranks. SWAT activities now include only a study of previously submitted reports. The controlling program now is Article 5 of Chapter 15, which became effective on July 1, 1991. However, this program was deemed unsuitable by the USEPA for RCRA authorization and had to be revised. The DHS and SWRCB agreed to jointly draft a suitable replacement. Among the changes are the requirements to analyze for many more VOCs, and to subject the results to more sophisticated statistical techniques. If a leak is detected, an Evaluation Monitoring Program (EMP) is required, followed by a Corrective Action Program (CAP).

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Bradley East Disposal Site (Bradley Landfill complex)

OWNER - Valley Reclamation Company

LOCATION - Sun Valley District. Southeast of Sheldon Street and San Fernando Road.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of San Fernando Road.

GROUND WATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Part of the 138-acre Bradley Landfill complex. Started accepting trash in 1960. Residential and commercial refuse with low moisture and nonhazardous waste. Stopped accepting trash in the early 1980s. Contains about 7.5 million tons of trash.

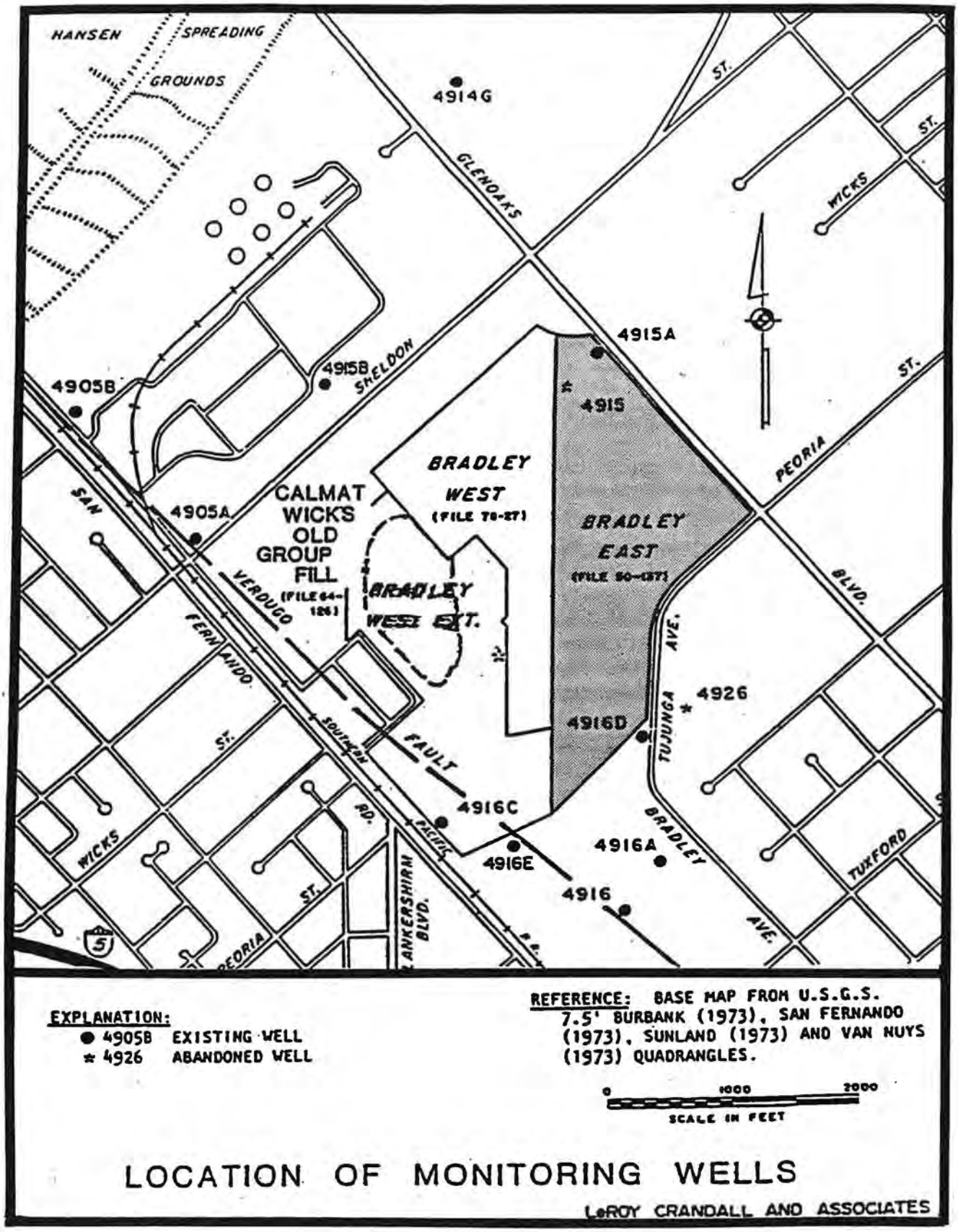
GAS CONTROL SYSTEM - Yes

LEACHATE CONTROL AND MONITORING - Has no liner. No visible seeps on western slope. No leachate in monitoring wells. No formal leachate collection system.

GROUND WATER QUALITY MONITORING - The SWAT reports completed in June 1987 and November 1990 provide the background ground water quality data upgradient and downgradient of the Bradley East Landfill.

REPORTS -
SWAT Report (Rank 2) - June 26, 1987 - LeRoy Crandall and Associates

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report (Rank 2) was approved by the RWQCB in April 1992. Non-hazardous substances were detected in monitoring wells above State drinking water regulatory levels. Although this landfill has been closed, an EMP will be required. A CAP will be required upon completion of the EMP.



1. BRADLEY EAST DISPOSAL SITE

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Bradley West Disposal Site (Part of Bradley Landfill complex)

OWNER - Valley Reclamation Company

LOCATION - Sun Valley District. Southeast of Sheldon Street and northeast of San Fernando Road.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of the Verdugo Fault.

GROUND WATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Originally designed during the period 1975 to 1977. Started accepting trash in 1981 -- relatively dry, inert or decomposable, nonhazardous. Bradley West extension was designed according to 1984 Subchapter 15 requirements, and has a clay liner and leachate collection system.

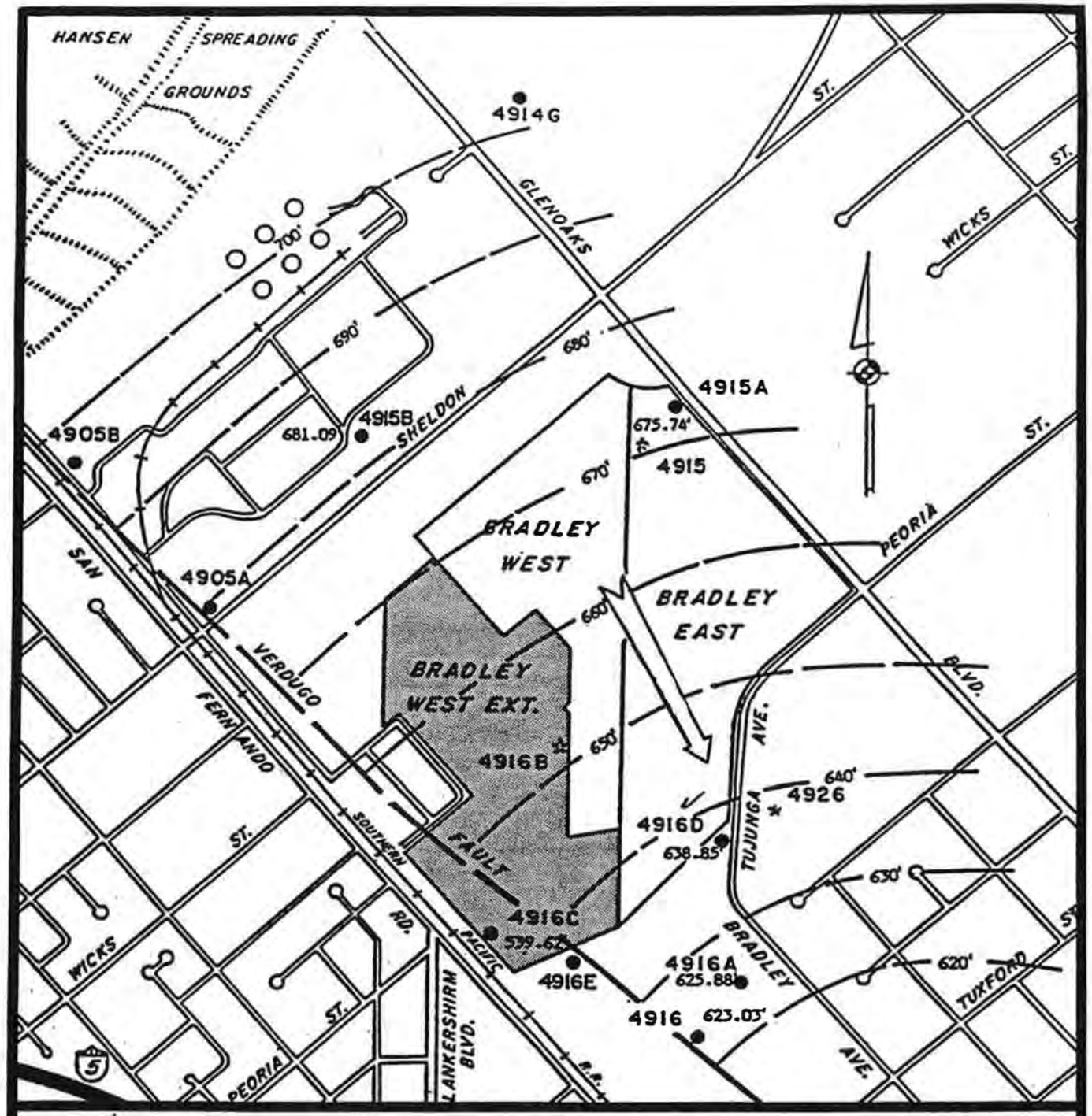
GAS CONTROL SYSTEM - Date started is unknown.

LEACHATE CONTROL AND MONITORING - First system in operation since 1980. Other systems have been installed as operations have expanded. As of June 26, 1987, no leachate was detected. There was ponding during the water year 1981-82 and about 1/2 million gallons of water percolated into the trash prism. As placed, trash has about 25-percent moisture. Holding capacity is 40- to 53-percent moisture.

GROUND WATER QUALITY MONITORING - May be slight increase in chloride and total dissolved solids with lower water levels. No evidence of chloride increase due to landfill; no evidence of increase in bicarbonate due to the landfill. Liner and gas control system seem to be effective in preventing gas from reaching the water table.

REPORTS -
SWAT Report (Rank 1) - June 25, 1987 - LeRoy Crandall and Associates
SWAT Report Supplement - March 21, 1988 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report (Rank 1) was approved by the RWQCB in April 1992. Non-hazardous substances were detected in monitoring wells above State drinking water regulatory levels. An EMP is required.



12-19-87
WELL LOCATIONS, GROUND WATER LEVELS AND VELOCITY MAP

2. BRADLEY WEST DISPOSAL SITE

STATUS AS OF MAY 1994

SWAT Not Completed

NAME OF LANDFILL - Branford Sanitary Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - Sun Valley District. Southwest of San Fernando Road, northwest of Tujunga Wash.

GEOLOGY - Holocene and Late Pleistocene alluvium just southwest of the Verdugo Fault. Old gravel pit.

GENERAL OPERATIONS - Class III landfill operated by the City of Los Angeles, Department of Sanitation. Not open to the public. Accepted only solid, nonhazardous waste.

TIME OF OPERATION - Landfilling began on August 5, 1957 and continued through January 25, 1961. About 435,000 tons of trash were deposited.

MINIMUM ELEVATION OF TRASH - 70 feet below ground surface.

ELEVATION RANGE OF WATER TABLE - In early 1988, depth to ground water was 334 to 344 feet.

GROUND WATER QUALITY MONITORING - Two SWAT wells drilled - one upgradient (ITB-1) and one downgradient (ITB-2). Later, two additional wells were drilled downgradient on CalMat property.

REPORTS -
SWAT Report (Rank 2) - June 1988 - International Technology Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted October 1990. Rejected SWAT Report April 1992 due to inadequate monitoring procedures which are under review. Although this landfill has been closed it is still subject to SWAT requirements. Further monitoring may be required under Chapter 15.

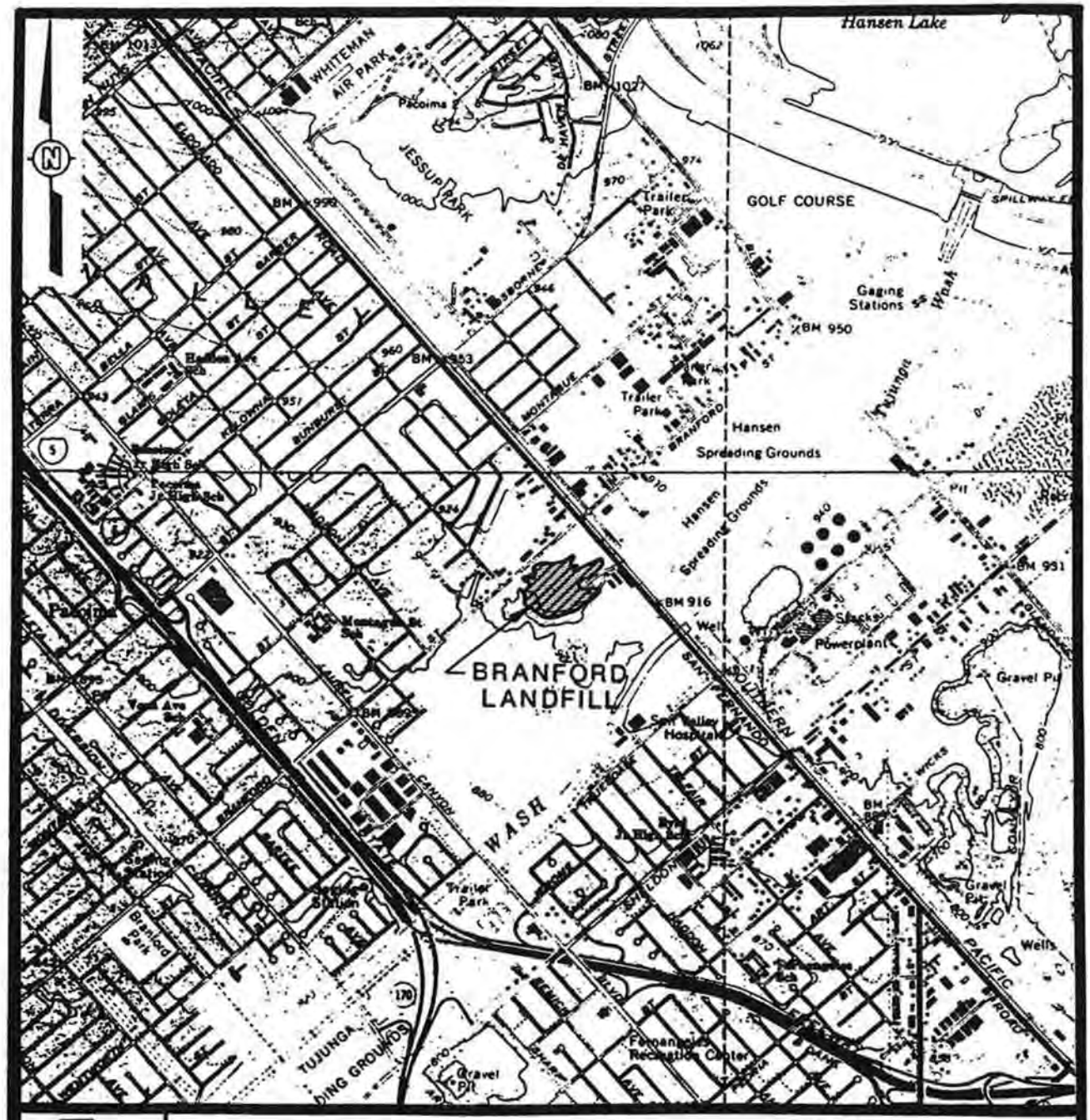


FIGURE 1

SITE LOCATION MAP
BRANFORD LANDFILL

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

INTERNATIONAL TECHNOLOGY CORPORATION

REFERENCE:

USGS 7.5 MINUTE TOPOGRAPHIC MAPS OF VAN NUYS AND SAN FERNANDO, CALIFORNIA QUADRANGLES
DATED: 1966 AND PHOTOREVISED 1972 FOR BOTH
SCALE: 1:24,000

3. BRANFORD SANITARY LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - CalMat Landfill (Sun Valley #3)

OWNER - CalMat Properties

LOCATION - Sun Valley District. Northeast of Glenoaks Boulevard and northwest of Peoria Street.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of the Verdugo Fault.

GROUND WATER FLOW DIRECTION - Mostly southeasterly along the Verdugo Fault.

GENERAL OPERATIONS - Covers 125 acres in an active gravel quarry. Open to the public since 1983 for general rubble and demolition debris (nondecomposable). No metal other than embedded rebar. As of July 1, 1988, contained about 1 million tons of trash. Receives about 75,000 tons per month. Has 15-year permit (to 1998). Total capacity, 75 million tons.

GAS CONTROL SYSTEM - Not needed because the trash is inert.

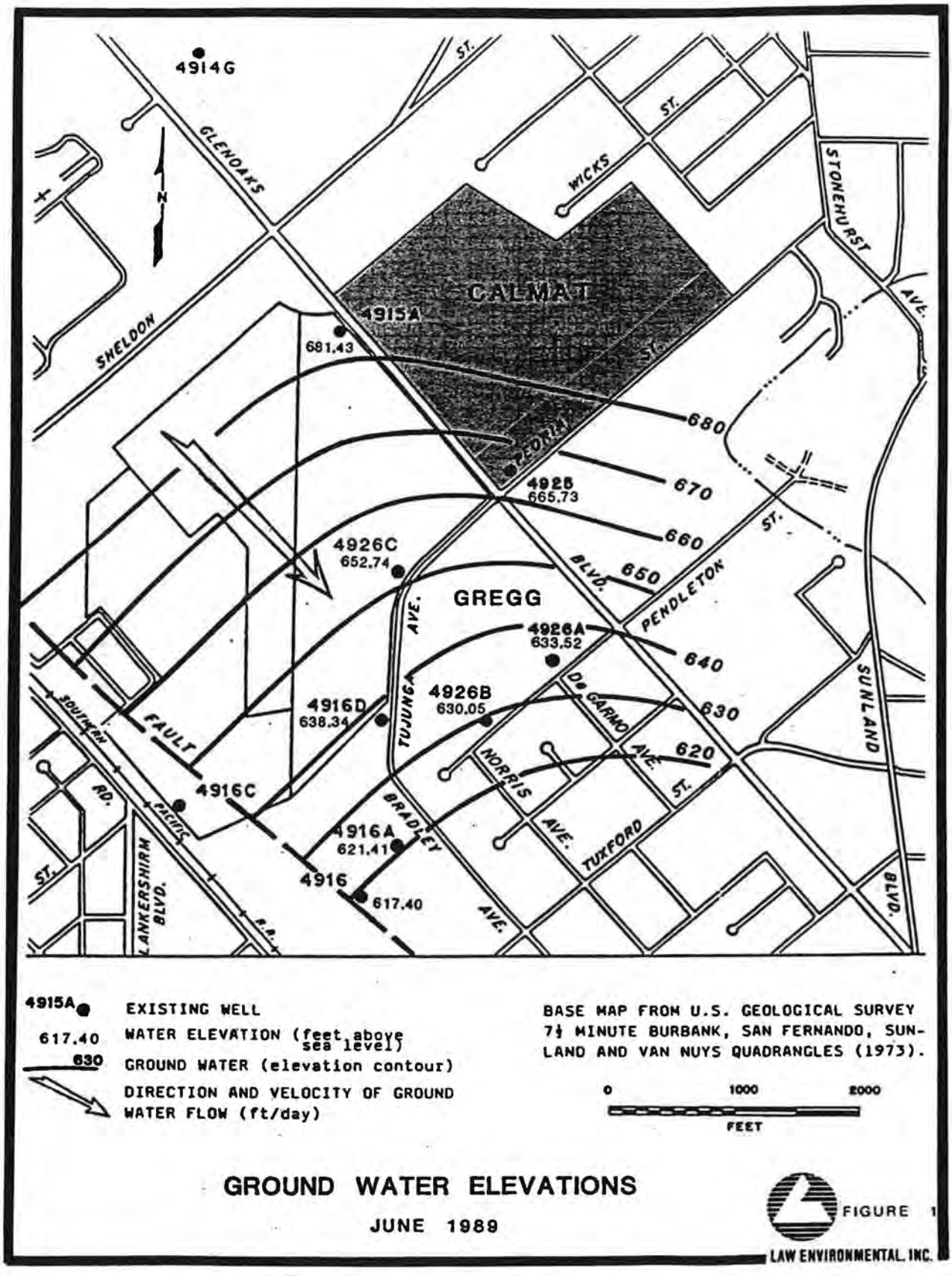
VADOSE ZONE MONITORING - One soil boring into the vadose zone. No contamination found.

LEACHATE CONTROL AND MONITORING - No evidence of leachate production.

GROUND WATER QUALITY MONITORING - Background quality is obtained from the Bradley Landfill complex SWAT wells. Quarterly sampling started in April 1988. There are regional plumes of trichloroethylene which are unrelated to the landfill. There are two different water types under the landfill which appear to be related to two different alluvial channels.

REPORTS -
SWAT Report (Rank 2) - July 1, 1988 - Law Environmental
SWAT Report Supplement - July 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report (Rank 2) approved in June 1992. No evidence of leakage. No further monitoring will be required.



4. CALMAT LANDFILL(SUN VALLEY #3)

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - CalMat (Old) Class 3 Site

OWNER - Valley Reclamation Company

LOCATION - Sun Valley District. Southeast of Sheldon Street and northeast of San Fernando Road.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea northeast of the Verdugo Fault.

GENERAL OPERATIONS - Part of the 138-acre Bradley Landfill complex. Formerly a concrete wash-out area. Now accepts only inert fill.

GAS CONTROL SYSTEM - Not needed.

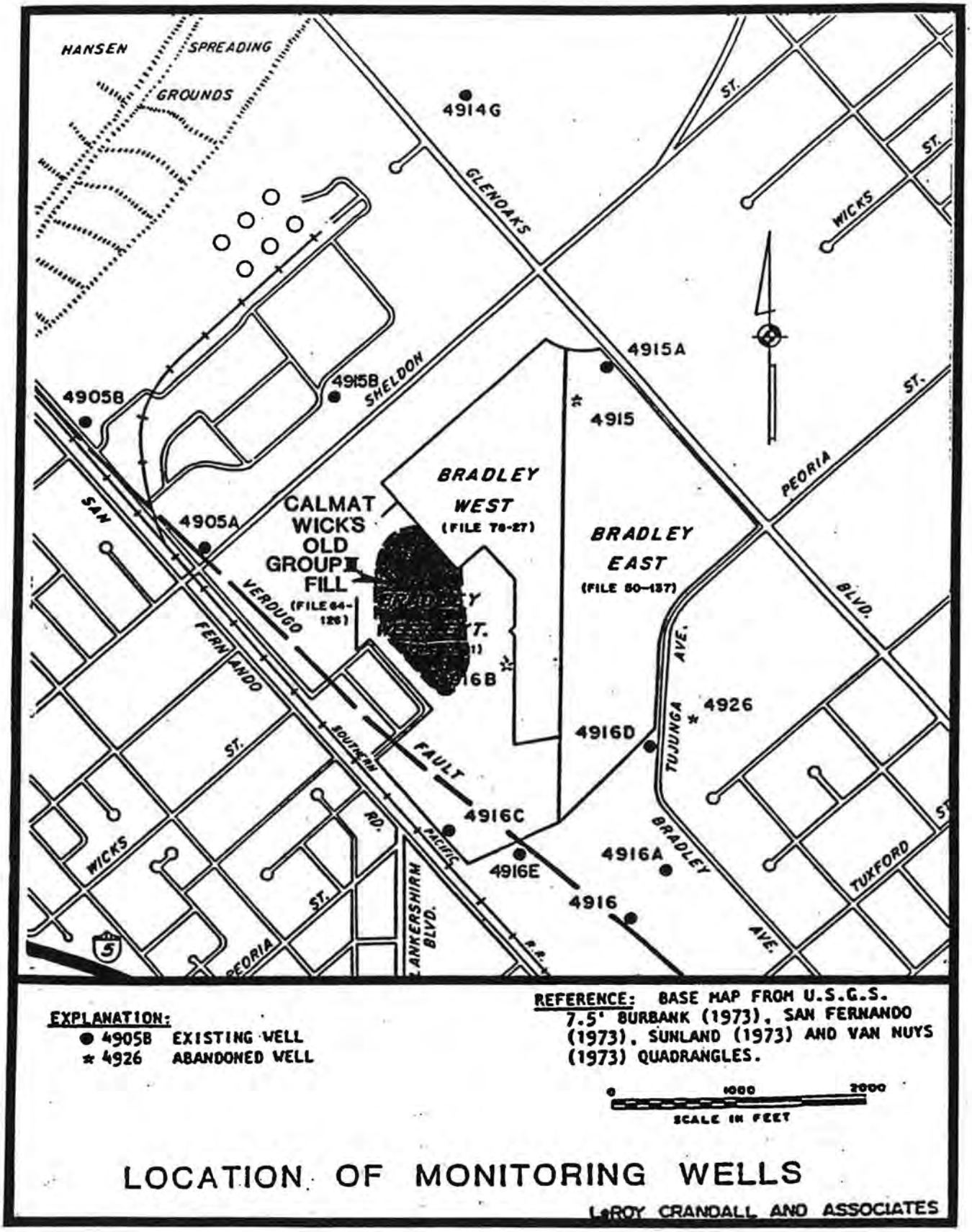
VADOSE ZONE MONITORING - Tried nine borings in 1986. Could not drill through concrete and steel.

LEACHATE CONTROL AND MONITORING - No liquid in any of the borings.

GROUND WATER QUALITY MONITORING - Started in this area in 1980. Higher total dissolved solids at lower levels is attributed to naturally higher salinities with depth. Increasing hardness could be related to landfill gas in one of the other landfills in the complex. High hardness is considered reversible.

REPORTS -
SWAT Report - June 26, 1987 - LeRoy Crandall and Associates

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted November 1990. Revised Water Monitoring Plan, required by Article 5 of Chapter 15, is under review. The Evaluation Monitoring Program required is under review. SWAT Report approved April 1992.



5. CALMAT (OLD) CLASS 3 SITE

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Gregg Pit/Bentz Disposal Sites

OWNER - CalMat Company

LOCATION - Southwest side of Glenoaks Boulevard between Pendleton Street and Tujunga Avenue.

GEOLOGY - Holocene and Late Pleistocene alluvium northeast of the Verdugo Fault. In the Hansen subarea.

GROUNDWATER FLOW DIRECTION - Mostly southerly, changing to southeasterly along the Verdugo Fault.

GENERAL OPERATIONS - Gregg Pit Approximately 30 acres in size. Operated from 1955 to 1963. Accepted combustible and noncombustible wastes, but specified wet or hazardous wastes were prohibited. The eastern portion was reactivated after the main Gregg Fill closed in 1963. Bentz Dump The reactivated area, which closed in 1963 to 1966, accepted only demolition debris. It was filled to street level but is still settling. Sign notes "clean fill dirt wanted". An estimated 3.5 million cubic yards of "debris and dirt" has been deposited with this combined operation.

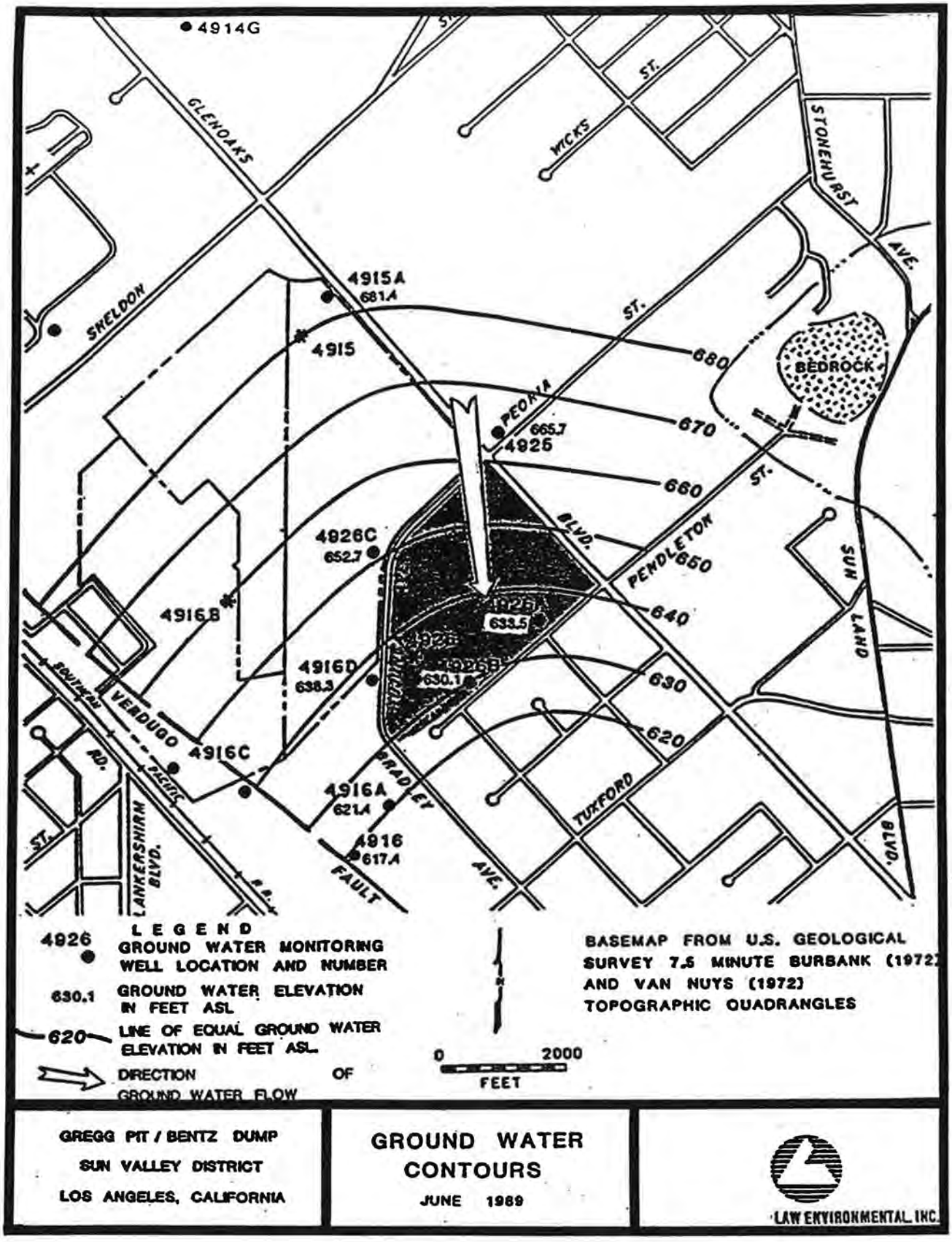
GAS CONTROL SYSTEM - Four wells and a gas flare were installed in 1987 (32 years after the first trash was placed). The system produces about 310 cubic feet per minute of gas consisting of 30-percent methane, 30-percent carbon dioxide, nitrogen and trace gases.

LEACHATE CONTROL AND MONITORING - A leachate test hole was drilled into the deepest part of the trash. No leachate was found.

GROUND WATER QUALITY MONITORING - Share monitoring wells with the program for the Bradley Landfill complex. Two monitoring wells drilled along Pendleton Street. Pumps with packers used to sample the uppermost 20 feet of saturation. Landfill gas contains no tetrachloroethylene (PCE), and the PCE found in upgradient wells is believed to be coming from an industrial area. Fill is not releasing hazardous wastes to ground water.

REPORTS -
SWAT Report (Rank 2) - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - SWAT Report (Rank 2) approved in February, 1990. There is evidence of possible leakage of non-hazardous substances in monitoring wells above State drinking water regulatory levels. Although this landfill has been closed further monitoring will be required under Chapter 15.



GREGG PIT / BENTZ DUMP SUN VALLEY DISTRICT LOS ANGELES, CALIFORNIA	GROUND WATER CONTOURS JUNE 1989	LAW ENVIRONMENTAL, INC.

6. GREGG PIT / BENTZ

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Hewitt Landfill (Closed)

OWNER - CalMat Properties

LOCATION - North Hollywood District, between the Hollywood Freeway and Laurel Canyon Boulevard, and north of Sherman Way. Just southwest of the Rinaldi-Toluca Well Field.

GEOLOGY - Holocene and Late Pleistocene alluvium of the San Fernando Basin.

GROUND WATER FLOW DIRECTION - A little north of east.

GENERAL OPERATIONS - Operated by Los Angeles By-Products Company. Opened to the public from 1962 to November 12, 1975. Below elevations 555 to 560 feet waste was limited to solid inert materials. Above those elevations, accepted solid commercial and residential waste.

GAS CONTROL SYSTEM - Installed during the mid-70s, and about 12 years after landfilling started.

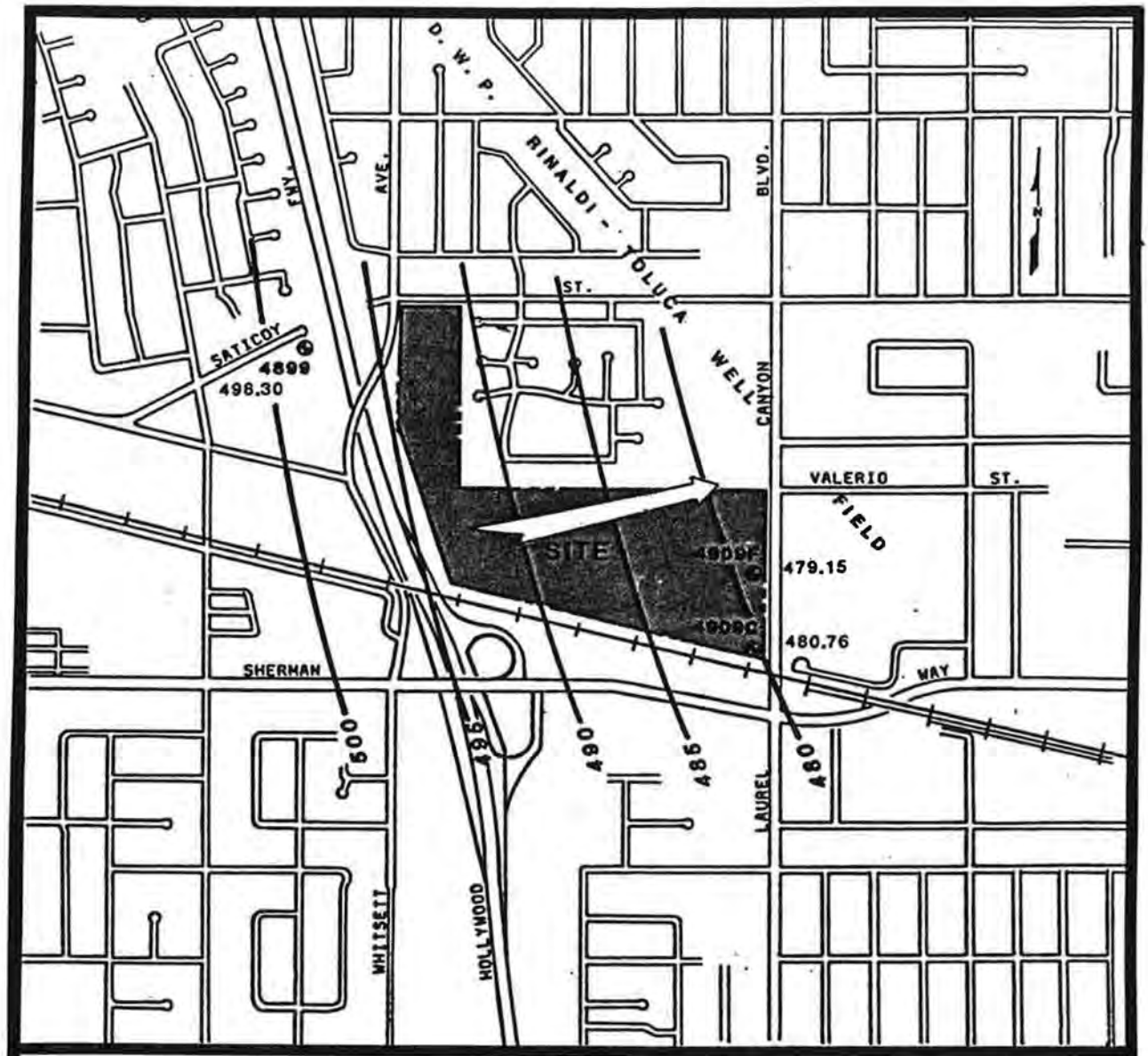
VADOSE ZONE MONITORING - Two Timco Teflon Lysimeters were installed to depths of 50 and 52 feet. Too little moisture to sample.

LEACHATE CONTROL AND MONITORING - A leachate well drilled in the trash showed moist conditions but no free leachate.

GROUND WATER QUALITY MONITORING - Has one upgradient and two downgradient wells. Use pump with inflatable packer to sample the top 20 feet of the saturated zone. One downgradient well has four perforated zones with grout seals. Upgradient samples show trichloroethylene and tetrachloroethylene above action levels, and high nitrates (over 70 mg/l). These are believed to be derived from upgradient sources, the plumes from which are passing under the landfill. High bicarbonates in downgradient wells may be related to gas production before the gas control system was in operation. Low chlorides indicate leachate cannot be an important contributor to ground water.

REPORTS -
SWAT Report (Rank 2) - June 6, 1988 - Law Environmental
Final SWAT Report - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - SWAT Report approved in May 1991. Non-hazardous substances were detected but were below State drinking water regulatory levels. No further monitoring will be required.



7. HEWITT LANDFILL

STATUS AS OF MAY 1994

SWAT Not Completed

NAME OF LANDFILL - Lopez Canyon Sanitary Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - In the foothills north of Hansen Dam, between Lopez Canyon and Kagel Canyon.

GEOLOGY - Underlain by Modelo, Towsley and/or Pico formations on the south limb of Merrick (or Little Tujunga) syncline. Quaternary terrace deposits near southeastern boundary of the property. Thin Holocene alluvium tributary to San Fernando Valley. Also, the San Fernando Fault (a reverse fault) lies between the landfill and the San Fernando Valley alluvium.

HYDROGEOLOGY - Ground water is found in the thin Holocene alluvium and in fractures in the underlying bedrock. It is seasonal and may not be found in summer. Elevations of the ground water decrease to the north but no single ground water surface occurs beneath the landfill.

GENERAL OPERATIONS - Began accepting refuse in 1975. Closed to the public. Accepts only nonhazardous solid waste fill of municipal origin on 392-acre site. Canyons A and B (presently active) are not lined. Disposal Area C (not yet significantly active) will be lined and equipped with subdrains as well as leachate collection and removal systems.

GAS CONTROL SYSTEM - Yes.

VADOSE ZONE MONITORING - Two lysimeters installed in the canyon below Disposal Area A.

LEACHATE CONTROL AND MONITORING - A leachate well was drilled into the deepest part of the trash in Disposal Area B to a depth of 178 feet. No liquid was encountered during the drilling.

GROUND WATER QUALITY MONITORING - Two upgradient and three downgradient monitoring wells. Only ground water encountered was in shallow silty sand near the lower-debris basin in Disposal Area B. Native water is highly mineralized. The landfill is dry with no evidence of leakage.

SURFACE WATER AND SUBDRAIN SAMPLING - Site runoff is collected and then routed into storm drains. Acetone and toluene in runoff are believed due to a reaction between landfill gas and the runoff water. The gas control system is expected to reduce the formation of these substances.

REPORTS -
SWAT Report (Rank 2) - June 22, 1988 - Law Environmental
SWAT Report Supplement - July 1, 1989

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - There is ongoing monitoring under Chapter 15. Construction for the required SWAT wells was delayed due to landfill expansion but is now complete.

BASEMAP FROM U.S. GEOLOGICAL SURVEY
7½ MINUTE SAN FERNANDO (1972) AND
SUNLAND (1972) QUADRANGLES.

SITE LOCATION MAP

Figure 4

Project No. 58-6425-11

LAW ENVIRONMENTAL, INC.

8. LOPEZ CANYON LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Penrose and Newberry Landfills (closed); Strathern Pit

OWNER - Los Angeles By-Products Company

LOCATION - Sun Valley District. North of Strathern Street on both sides of Tujunga Avenue.

GEOLOGY - Holocene and Late Pleistocene alluvium of the Tujunga alluvial cone. Southwest side of the Verdugo Fault.

GROUND WATER FLOW DIRECTION - Formerly to the south but now to the southwest because of pumping in the Rinaldi-Toluca Well Field.

GENERAL OPERATIONS - Penrose started accepting trash in 1960. Open to the public until March 1985. Dry nonhazardous waste (15 million cubic yards). Filled to 45 feet above grade. Settles two or more feet per year. Site is vacant except for an extraction/power generating plant. Newberry was open to the public from about 1948 to May 1955. Filled to level of surrounding streets with dry nonhazardous trash. Still settling. Low spots refilled with dirt. Two auto dismantlers and a ready-mix plant on site.

GAS CONTROL SYSTEM - Newberry has none. Penrose started operation in early 1980s.

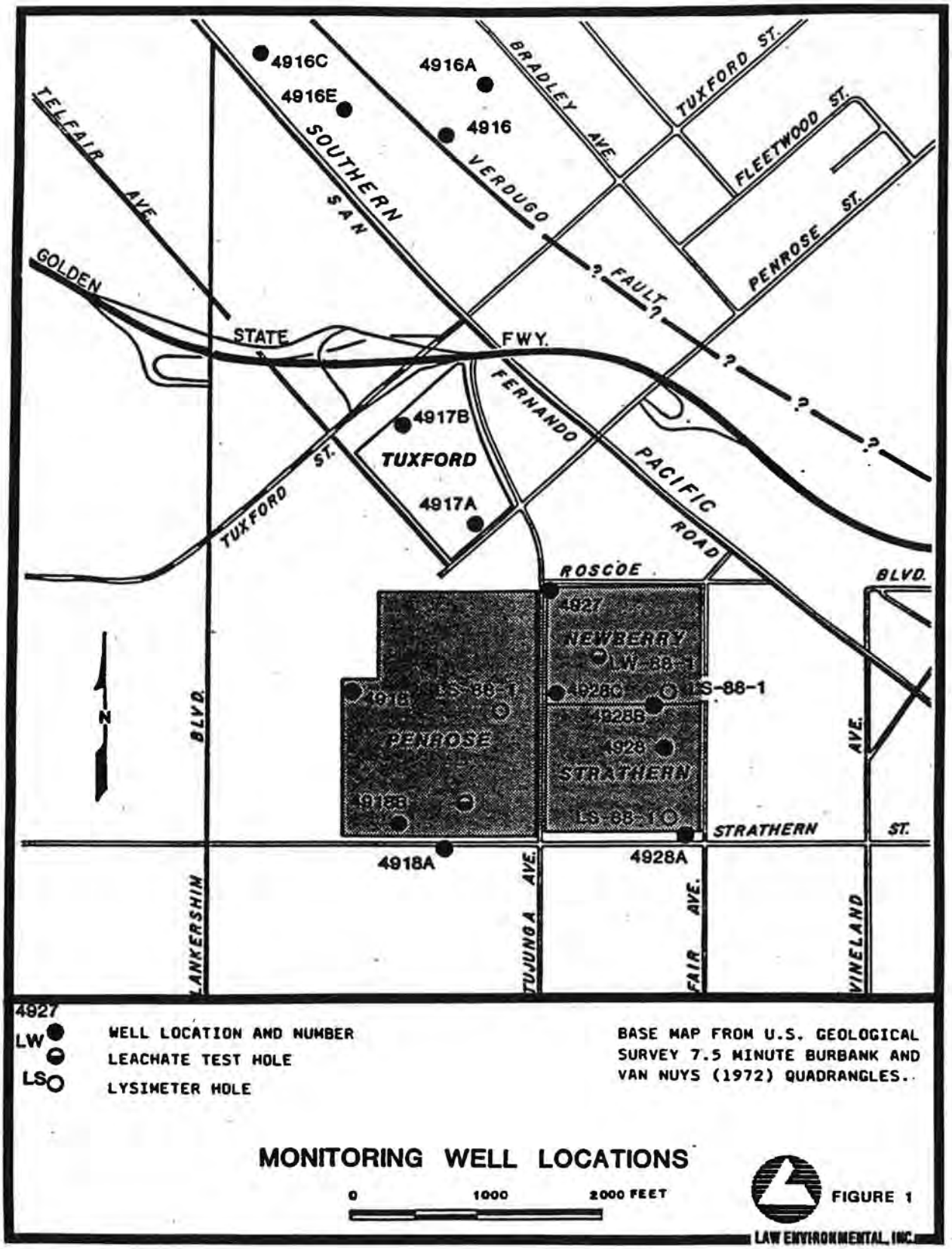
VADOSE ZONE MONITORING - Pressure-vacuum lysimeters were installed in the Penrose and Newberry Landfills and in the bottom of the Strathern Pit. Could not get a sample from any of these.

LEACHATE CONTROL AND MONITORING - Penrose - Replacement gas well showed 8- to 30-percent (25-percent average) moisture in trash samples. No leachate was found. Newberry - In leachate test hold, moisture was 9.8 to 20.8 percent. No liquid leachate was found.

GROUND WATER QUALITY MONITORING - Five wells have been monitored since 1985. Two new SWAT wells were drilled. Pump with packer samples uppermost 20 feet of saturated zone. SWAT monitoring started in April 1988. Rise and fall of trichloroethylene concentrations seems to be related to regional plumes moving through the area. High nitrates in upgradient wells. High levels of carbon dioxide in wells may be related to the period of time when the Penrose gas collection system was undergoing improvements. Generally speaking, these landfills are not affecting ground water quality.

REPORTS -
SWAT Report - June 29, 1988 - Law Environmental
SWAT Report Supplement - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved SWAT Reports in September 1989. There is evidence of leakage of non-hazardous substances, but below State drinking water regulatory levels. Detection monitoring will continue, but no EMP required at this time.



9. PENROSE / NEWBERRY LANDFILLS (CLOSED)

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Pendleton Street Landfill

OWNER - City of Los Angeles, Department of Water and Power

LOCATION - Southeast side of Pendleton Street, about 700-1600 feet northeast of Glenoaks Boulevard.

GEOLOGY - Holocene and Late Pleistocene alluvium in the Hansen subarea which lies to the northeast of the Verdugo Fault. North of La Tuna Canyon Fault.

GROUND WATER FLOW DIRECTION - Mostly southerly, changing to southeasterly toward the Verdugo Fault.

GENERAL OPERATIONS - Area of 15 acres, of which 10 acres have already been filled. Not open to the public. Accepts only water-soluble, nondecomposable, inert solids, mainly construction debris from Los Angeles Department of Water and Power sources.

GAS CONTROL SYSTEM - None required.

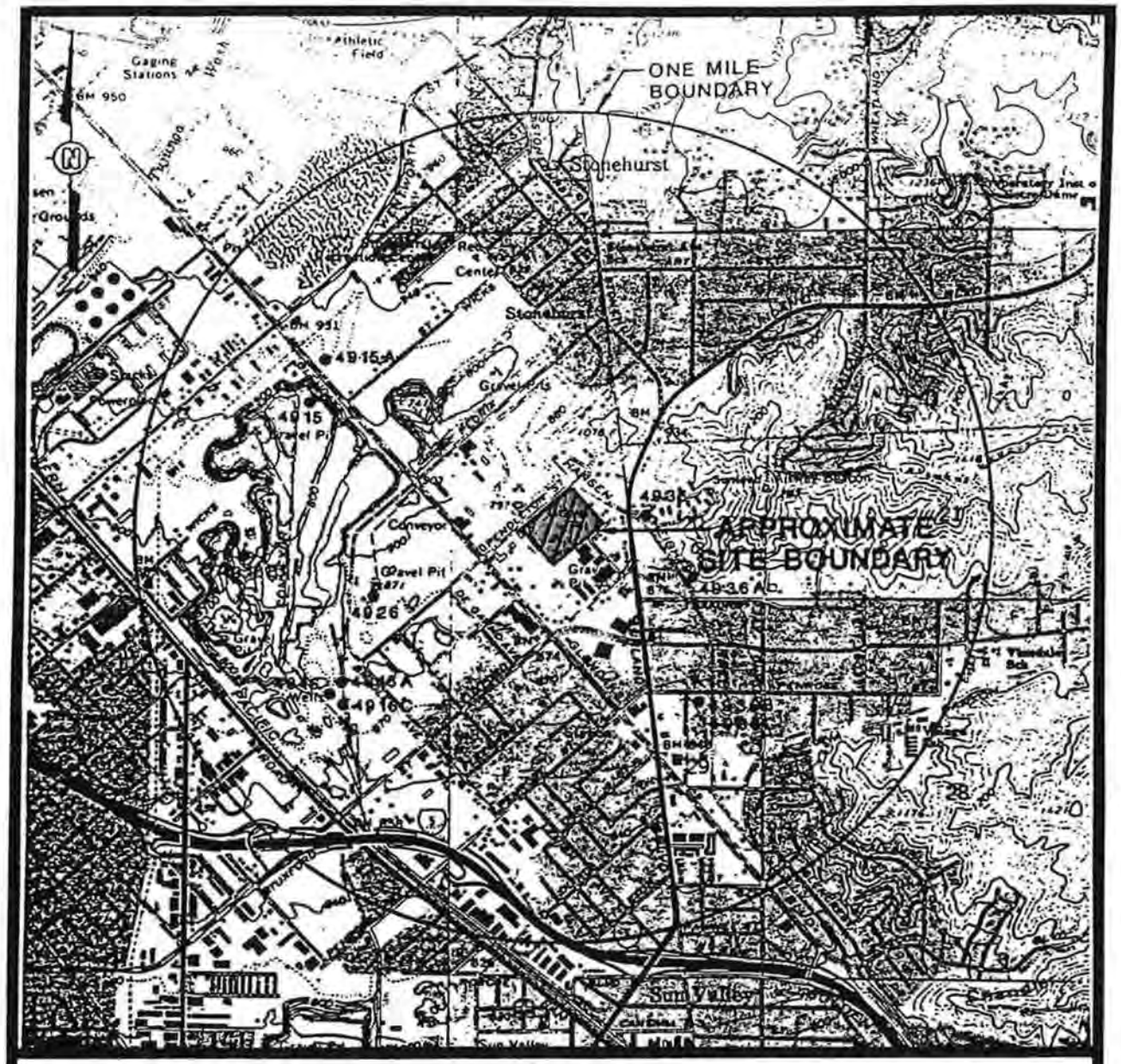
VADOSE ZONE MONITORING - None required.

LEACHATE CONTROL AND MONITORING - No containment structures, drainage control, covers, liners, leachate collection, or leak detection systems.

GROUND WATER QUALITY MONITORING - Three monitoring wells on periphery of property.

REPORTS -
SWAT Report (Rank 4) - June 1990 - International Technology Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted May 1991. Approved SWAT Report conditionally June 1992. Two semi-annual samplings were required, which are under review. Further monitoring may be required under Chapter 15.



10. PENDLETON STREET LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Sheldon-Arleta Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - Sun Valley District. Near the Hollywood and Golden State Freeways. Just to the east and southeast of the Tujunga Spreading Grounds.

GEOLOGY - Holocene and Late Pleistocene alluvium southwest of the Verdugo Fault. Old gravel pit.

GROUND WATER FLOW DIRECTION - Southerly to southeasterly, depending on spreading in the Tujunga Spreading Grounds.

GENERAL OPERATIONS - Started accepting trash (low moisture, nonhazardous) as of February 1962. Only inert materials allowed below 700-foot elevation. Filled by July 1974, at which time about 6 million tons of trash had been deposited. Partial clay barriers to prevent inundation of trash by water spread at the Tujunga Spreading Grounds.

MINIMUM ELEVATION OF TRASH - 700 feet.

GAS CONTROL SYSTEM - In 1967, about five years after the start of operation, methane was detected in an adjoining residential area and raised the concern about explosions. In mid-1969, the first gas extraction system was installed consisting of three wells in native soil. In 1971, eighteen 25-foot wells were installed, with the collected gas burned and discharged to the atmosphere. In 1973, a 100-foot well was installed. From 1974 through 1976, landfill gas was delivered to the Valley Steam Plant. In 1980, eighteen 100-foot wells were drilled to replace the earlier 25-foot holes.

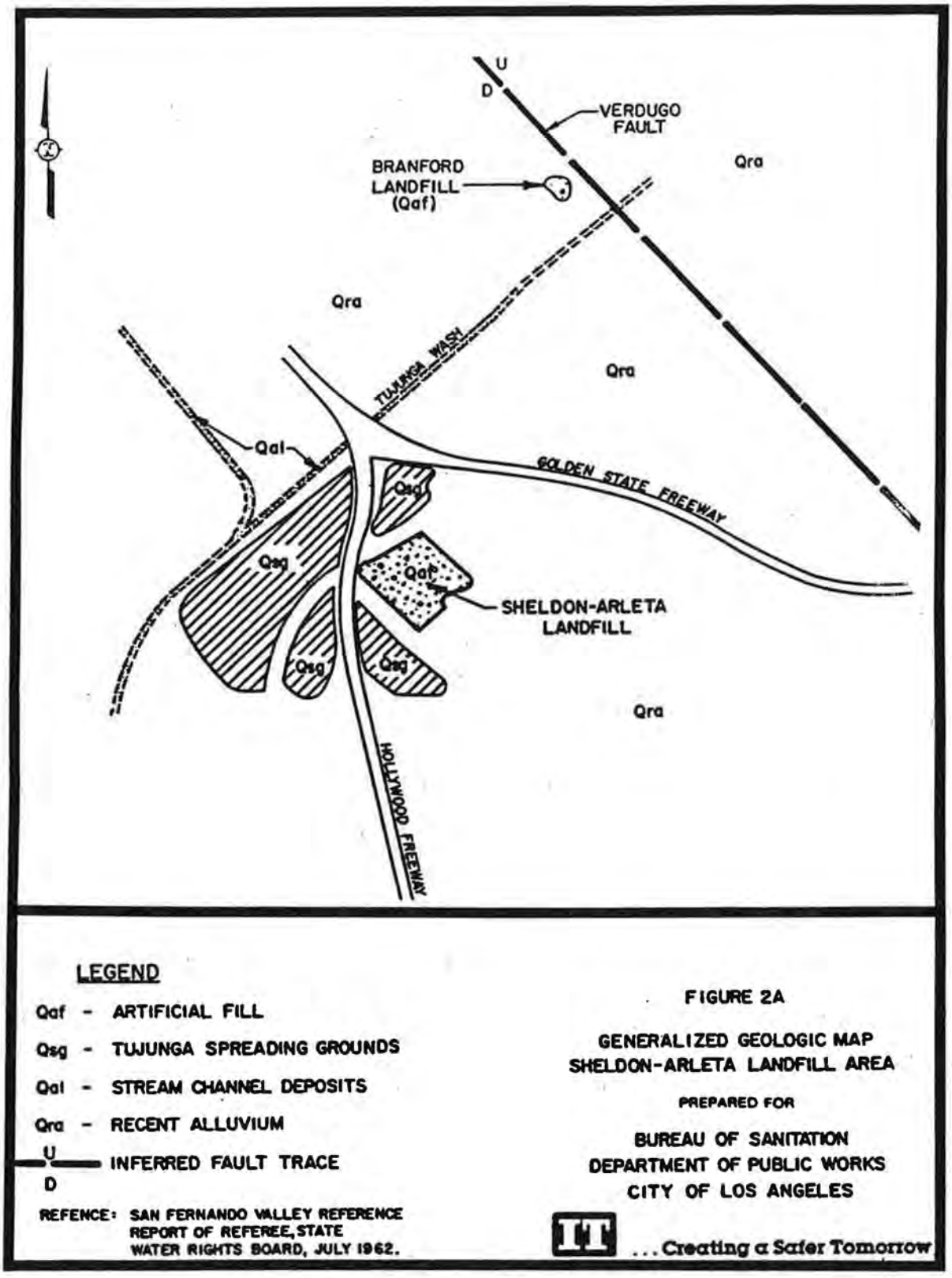
VADOSE ZONE MONITORING - Only two of 25 soil samples showed moisture above 25 percent. Additional sampling will be done after spreading.

LEACHATE CONTROL AND MONITORING - No evidence of leachate buildup within the landfill. Will be sampled again after spreading at the Tujunga Spreading Grounds.

GROUND WATER QUALITY MONITORING - A well drilled downgradient (Wickes Well) showed a sharp increase in bicarbonate hardness and carbon dioxide between 1967 and 1972, then a sharp decrease in 1972 after the gas control system began operating effectively. This same "temporary wave" of hardness may have later affected some of the Rinaldi-Toluca production wells.

REPORTS -
SWAT Report (Rank 1) - May 7, 1987 - International Technology Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final Swat Report (Rank 1) approved by the RWQCB in February 1990. The water table has dropped to more than 100 ft below the bottom of the trash and the monitoring wells are dry. These are being checked quarterly to see if water levels rise. If so monitoring will continue under Chapter 15.



11. SHELDON-ARLETA LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Scholl Canyon Landfill - (Active and Inactive)

OWNER - Los Angeles County - 85 acres; City of Glendale - 200 acres; Southern California Edison Company - 25 acres. Operated by Los Angeles County Sanitation Districts. Upon completion of fill, entire property will go to City of Glendale.

LOCATION - In the City of Glendale, on the southwestern flank of the San Rafael Hills, about one mile west of the Rose Bowl.

GEOLOGY - Canyon cut in quartz diorite gneiss. Thin alluvium is tributary to San Fernando Valley.

GENERAL OPERATIONS - Class III site open to the public. Operations began March 22, 1961. Accepts residential, commercial, and some industrial wastes, but no liquid or hazardous wastes. Weathered rock and colluvium is used for cover.

GAS CONTROL SYSTEM - Yes in both active and inactive areas. Inactive-original system replaced in 1987-89. Building pipeline to use gas in Glendale Power Plant. Active-since 1971-73.

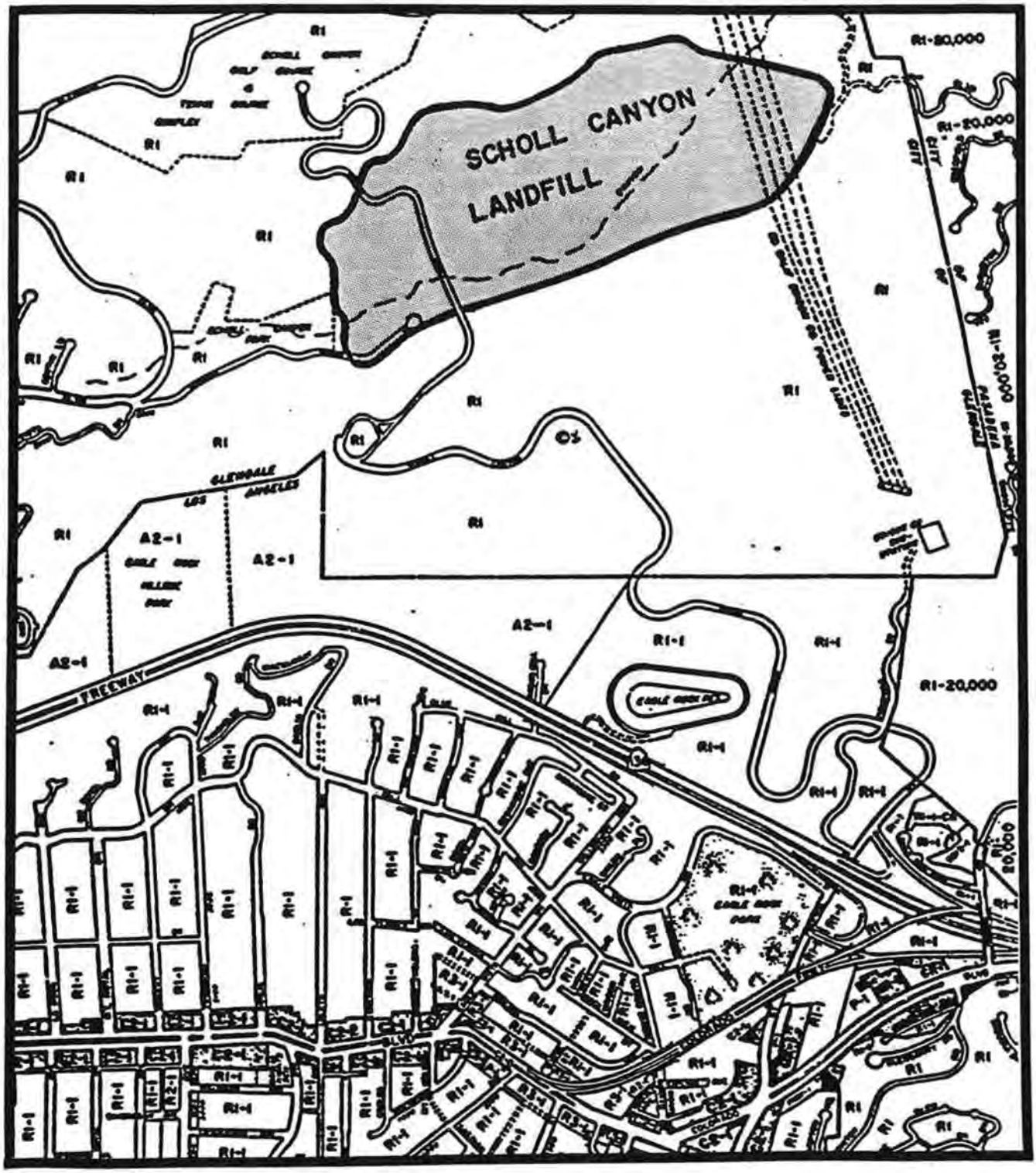
VADOSE ZONE MONITORING - Not required.

LEACHATE CONTROL AND MONITORING - Two subsurface barriers to cut off alluvial underflow. Extraction wells upgradient from barriers. Alluvial monitoring wells downgradient from barriers.

REPORTS -
Stone Geological Service - 1967
Converse Consultants - 1984
Woodward-Clyde - 1986
Earth Technology - 1987
SWAT Report - July 1, 1987 - Dale Hinkel
SWAT Progress Report - April 15, 1988, County Sanitation Districts

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD -
Active - (Rank 1) SWAT Report completed July 1987. Final SWAT Report completed April 1988. SWAT Report approved August 1990. Revised monitoring program required by Article 5, Chapter 15 is under review. EMP has been completed. CAP will be submitted soon.

Inactive - (Rank 2) - SWAT Report completed July 1987. Final SWAT Report approved in December 1993. Revised monitoring plan has been submitted and is under review.



12. SCHOLL CANYON LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Stough Park Landfill

OWNER - City of Burbank

LOCATION - Southwest flank of the Verdugo Mountains.

GEOLOGY - Landfill is underlain by metamorphic and igneous basement rocks of lower-Cretaceous to pre-Cambrian age that form the Verdugo Mountains.

HYDROGEOLOGY - Ground water is present in some fractures as evidenced by groundwater discharge at on-site ephemeral springs.

GROUND WATER FLOW DIRECTION - Ground water is present in both the alluvium and bedrock in one of the landfills (#2). Groundwater flow direction would be southerly.

GENERAL OPERATIONS - In operation since 1949. Consists of three fill areas (#1 - 31 acres up to 130 feet thick; #2 - 15 acres up to 70 feet thick; #3 - 24 acres up to 110 feet thick). Accepts nonhazardous waste and inert waste.

MINIMUM ELEVATION OF TRASH - Elevation data not available. Landfills have up to 110 feet of material deposited within canyons to bedrock.

GAS CONTROL SYSTEM - LFG gas collection/recovery system installed mid-summer 1988. Other gas migration control/monitoring systems installed in 1981.

ELEVATION RANGE OF WATER TABLE - Landfill in mountains and canyons. Ground water occurs mainly in fractured rock. No water table.

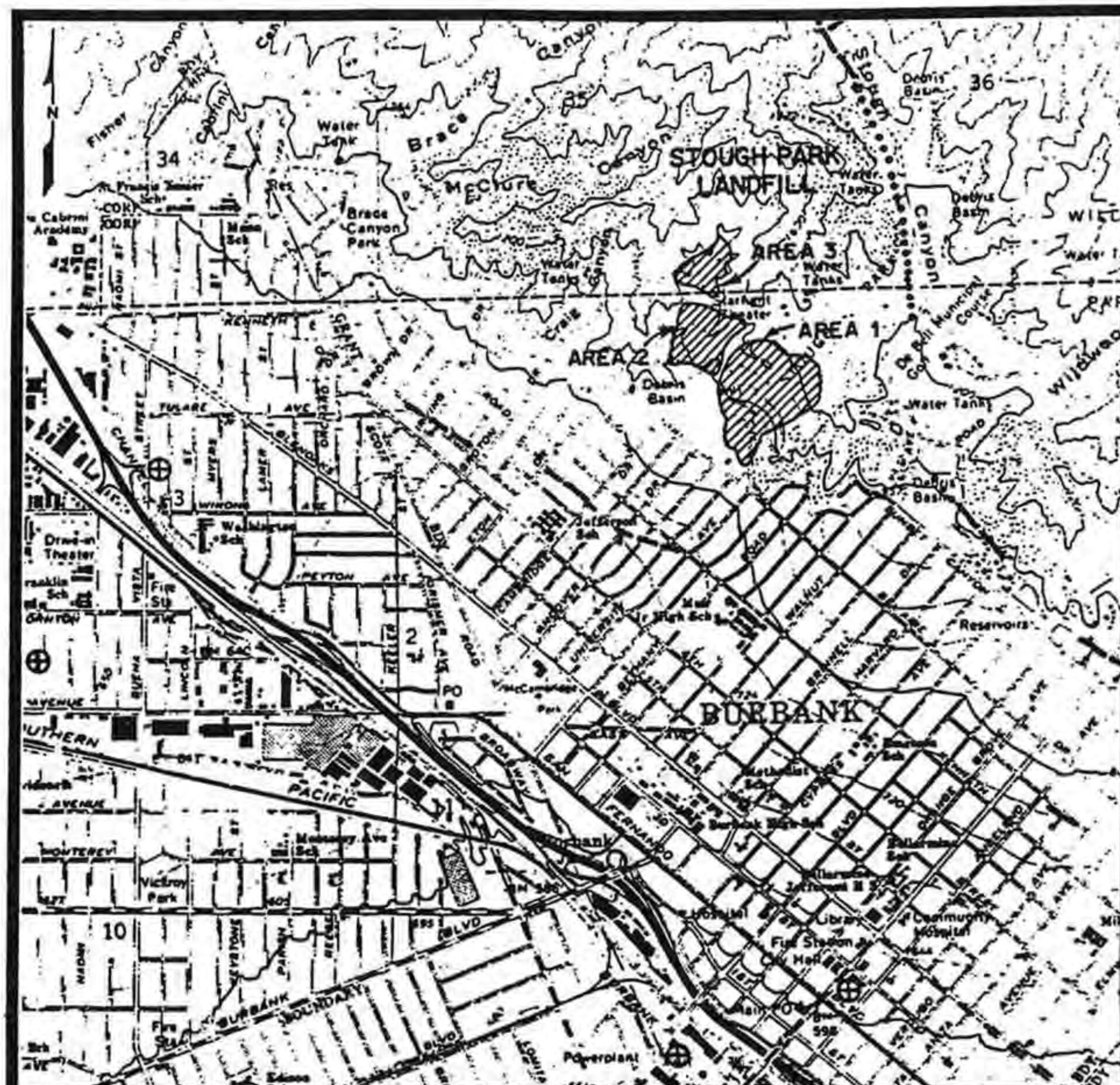
VADOSE ZONE MONITORING - None required.

LEACHATE CONTROL AND MONITORING - No appreciable amount of water has infiltrated the landfill to generate lechate. Drainage of runoff controlled.

GROUND WATER QUALITY MONITORING - Seven monitoring wells drilled to depths between 60 and 510 feet to monitor the shallow alluvium and deep bedrock.

REPORTS -
SWAT Report - June 1988
Final SWAT Report - December 1988 - Approved by LARWQCB - April 1990.

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. An EMP is required and is under review.



EXPLANATION

⊕ WATER WELL WITH GROUND WATER LEVEL MEASUREMENTS (1974-1975)

TRACE OF FAULT AND/OR FAULT SCARP dotted where concealed)
Indicates direction of scarp slope

LANDFILL AREA

REFERENCE :
BASE MAP : U.S.G.S. 7.5' QUADRANGLE MAP, BURBANK, CALIF. 1966-PHOTOREVISED 1972.
GEOLOGY ADAPTED FROM: C.D.M.G. OPEN FILE REPORT 79 - 16 .

LOCAL GEOLOGY MAP

LAW ENVIRONMENTAL, INC.

13. STOUGH PARK LANDFILL

STATUS AS OF MAY 1994

SWAT Not Completed

NAME OF LANDFILL - Sunshine Canyon Sanitary Landfill

OWNER - Browning-Ferris Industries

LOCATION - Southeast margin of the Santa Susana Mountains, west of the Golden State Freeway.

GEOLOGY - Underlain by the Towsley formation which has been folded along east-west axes into the Pico anticline and Oat Mountain syncline. Unnamed fault ("A") trends southeasterly across the site. Towsley formation is mainly sandstone with lesser amounts of siltstone, mudstone and conglomerate. The interstitial permeability of the Towsley formation is low, as is the secondary hydraulic conductivity of the fracture systems. Surficial deposits consist of alluvium, colluvium and landslides as much as 50-feet thick.

HYDROGEOLOGY - Sunshine Canyon is separated from the San Fernando Valley by a narrow, rock-walled canyon with thin alluvium. Upstream from this constriction the alluvium is recharged by slope runoff and direct penetration of rainfall. 24 piezometers were drilled into the alluvium and Towsley formation. Ground water was found in the alluvium and beneath the lower slopes in the Towsley formation. Ground water flow follows the axes of the canyons.

GENERAL OPERATIONS - There is an existing 230-acre Class III landfill which has operated continuously since 1958. This permit expired in September 1991. Accepts only nonhazardous wastes at 6,400 tons per day or about 2.0 million tons per year. Expect an increase from12,000 to 14,000 tons per day.

GAS CONTROL SYSTEM - In operation since November 1981. Extracts (nine wells), processes, sells or flares the landfill gas (up to 3.0 million cubic feet per day).

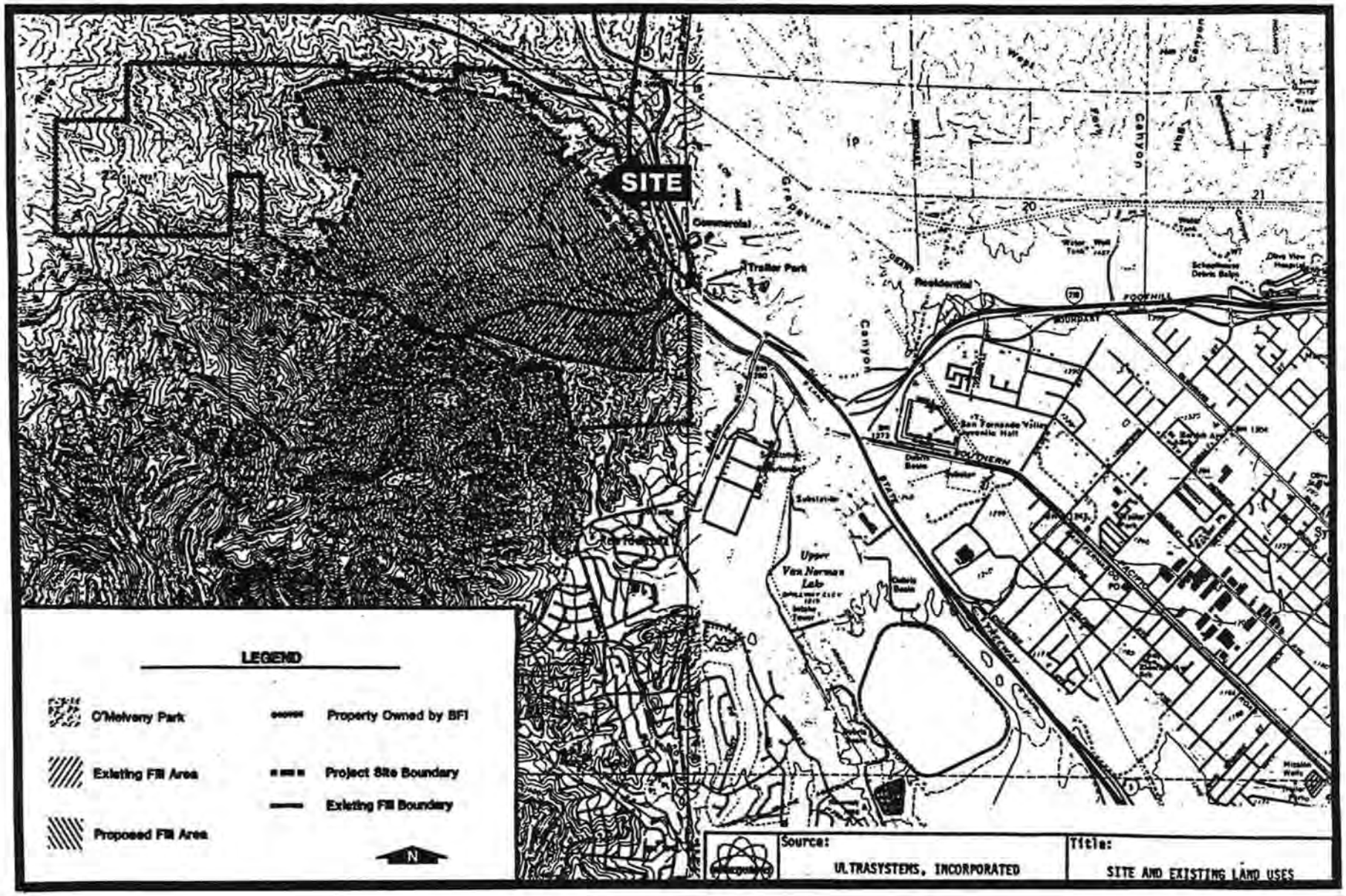
VADOSE ZONE MONITORING - No volatile organics detected in five lysimeter wells.

LEACHATE CONTROL AND MONITORING - The main concern is the potential for leachate leaving Sunshine Canyon and joining the ground water of the San Fernando Valley.

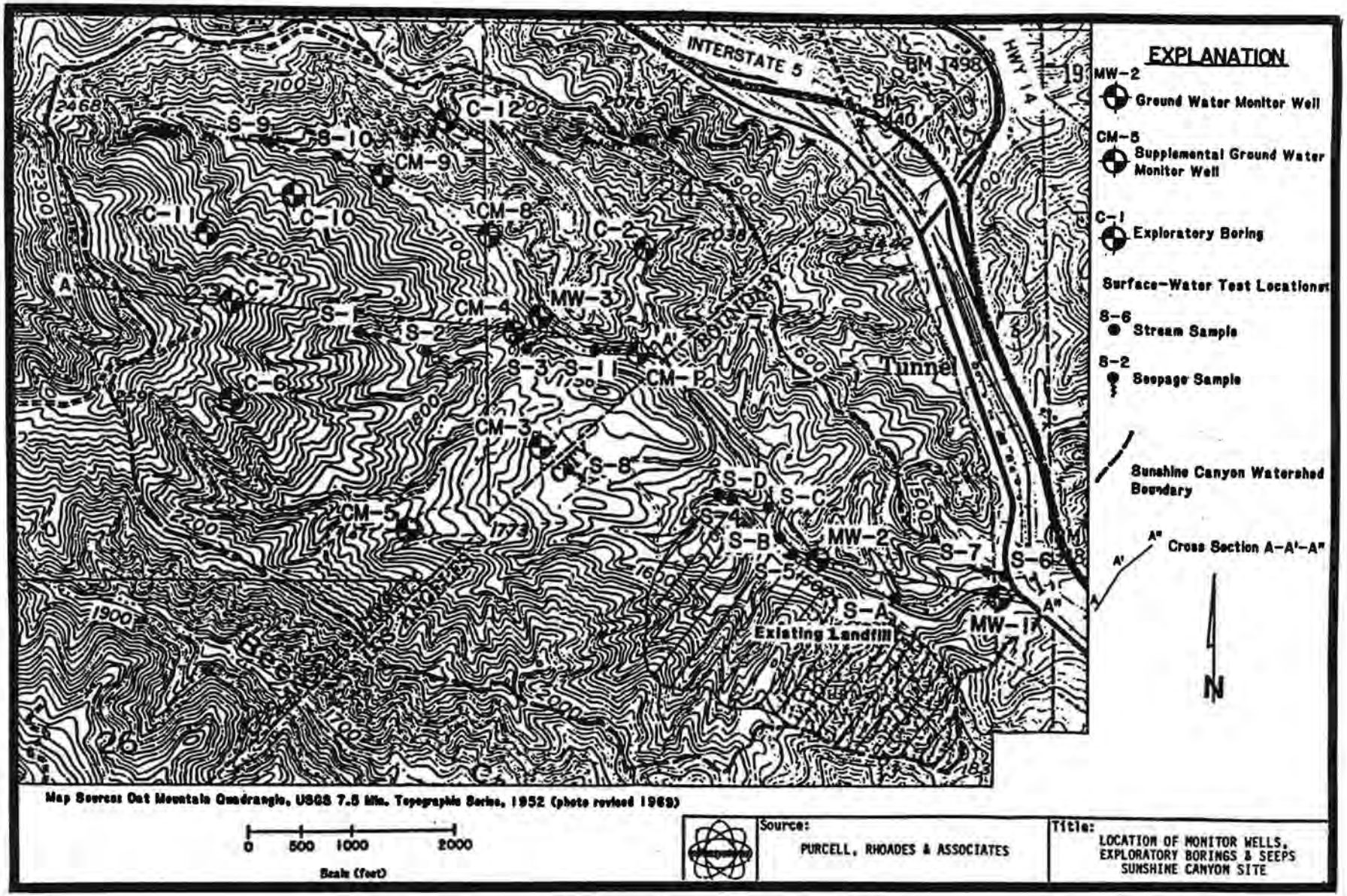
GROUND WATER QUALITY MONITORING - The native waters of the Towsley formation are of poor quality because of excessive total dissolved solids, but rather low in chloride. The appearance of much higher chlorides in downgradient monitoring well MW-1 raises the suspicion of leachate contribution from the landfill, but there are other possible explanations. The source(s) of these chlorides have yet to be defined.

REPORTS -
SWAT Report (Rank 2) - July 1, 1988 - Purcell, Rhoades and Associates
SWAT Addendum - July 26, 1989 - Purcell, Rhoades and Associates
Draft Environmental Impact Report Landfill Extension - April 1989 - Ultrasystems

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. One additional alluvial background and three alluvial downgradient wells were required to determine possible sources for elevated chloride levels. An eMP will be required under Chapter 15.



14a. SUNSHINE CANYON LANDFILL



14b. SUNSHINE CANYON LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Toyon Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

LOCATION - Griffith Park

GEOLOGY - In old rocks away from alluvium of San Fernando Valley and the Los Angeles Narrows. Arkosic sandstones and conglomerates of the Miocene Hollycrest formation along a northwest-trending overturned anticline and displaced along a northeast-trending fault.

GENERAL OPERATIONS - 90 acres. Operated from 1957 to February 1986 for the placement of a total of 16 million tons of household trash. Fills a former northeast-facing canyon with 140 to 290 feet of trash. Never open to the public.

GAS CONTROL SYSTEM - Gas samples from 16 perimeter probes are analyzed monthly for toxic constituents. Gas is collected from 30 duplex- and 41 single-pipe wells 40 to 100 feet deep. Power plant operated by Pacific Lighting Systems consists of six 150-HP generators which deliver 9.4 megawatts to the Southern California Edison Company.

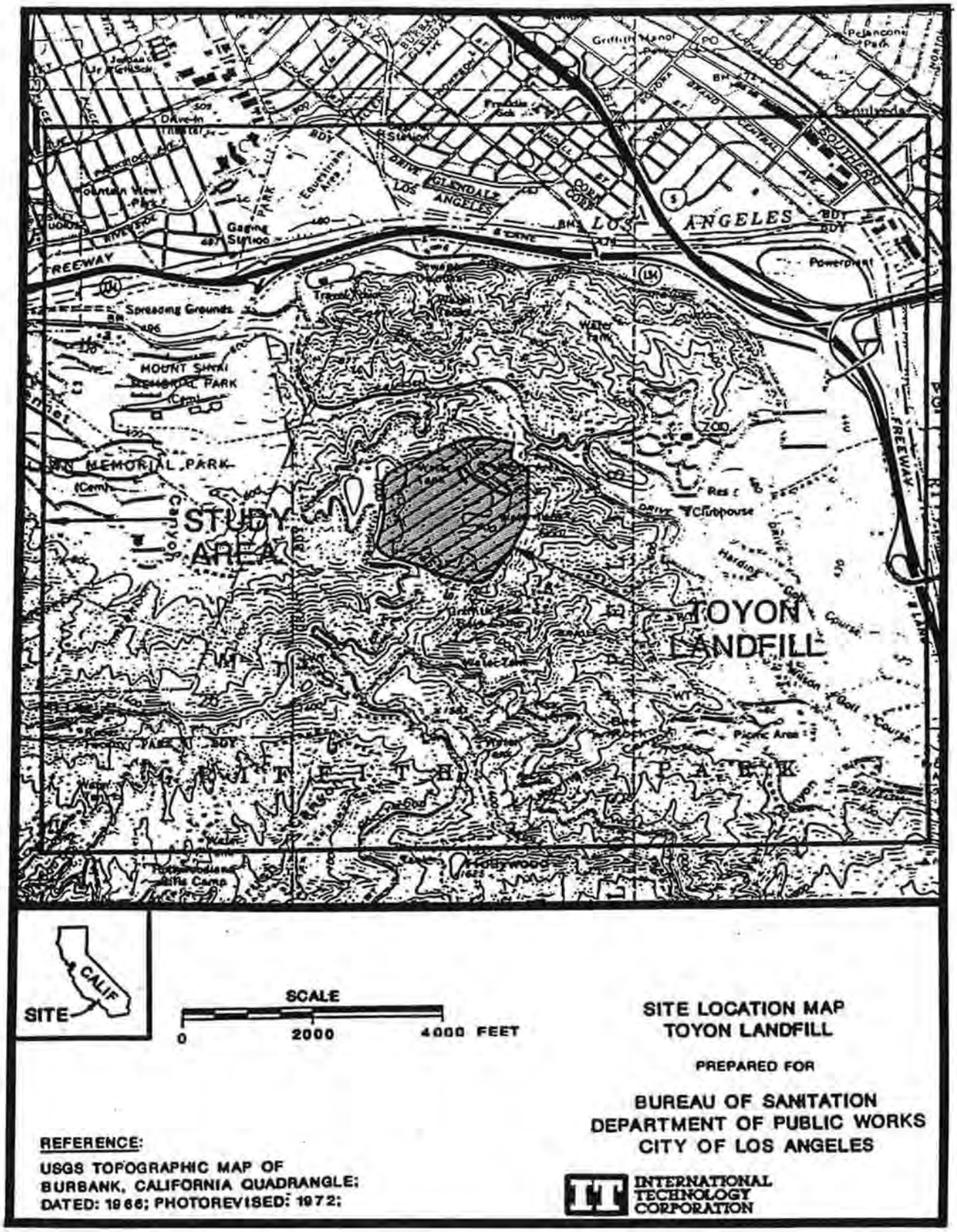
VADOSE ZONE MONITORING - None

LEACHATE CONTROL AND MONITORING - Three systems of perforated pipes in the gravel-filled trenches, which drain to sewer. Total leachate flow of 3 to 7 gpm. No liners or containment structures.

GROUND WATER QUALITY MONITORING - Six monitoring wells around periphery. Direction of ground water flow in old fractured rocks is poorly known. Some evidence of leachate in the monitoring wells, with chlorides, bicarbonates and sodium above background levels. However, significant concentrations of toxic pollutants are not believed to be migrating away from the landfill.

REPORTS -
SWAT Report (Rank 2) - June 1988 - International Technology Corporation
Final SWAT Report - March 1989

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved Final SWAT Report April 1991. Evidence of leakage of non-hazardous substances above State drinking water regulatory levels.. Closure Plan is under review. Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. EMP has been received and is under review. Waste discharge requirements (WDR) have been changed. Now under Monitoring and Reporting Program (MRP). Closure will require an MRP.



15. TOYON LANDFILL

STATUS AS OF MAY 1994

SWAT Completed

NAME OF LANDFILL - Tuxford Landfill (Closed)

OWNER - Los Angeles By-Products Company

LOCATION - Sun Valley District. Just south of the Golden State Freeway, on the west side of Tujunga Avenue.

GEOLOGY - On alluvial cone of Tujunga Wash southwest of the Verdugo Fault. Former gravel pit (20 acres).

GROUND WATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Was open to the public. Closed before 1984. Accepted only dry nonhazardous wastes.

MINIMUM ELEVATION OF TRASH - Original bottom of the gravel pit was about Elevation 710 feet.

GAS CONTROL SYSTEM - Started operation between June 1988 and June 1989. Fill has an impermeable cover (paving).

ELEVATION RANGE OF WATER TABLE - 514 feet in February 1989. Possibly as high as 697 feet in 1948.

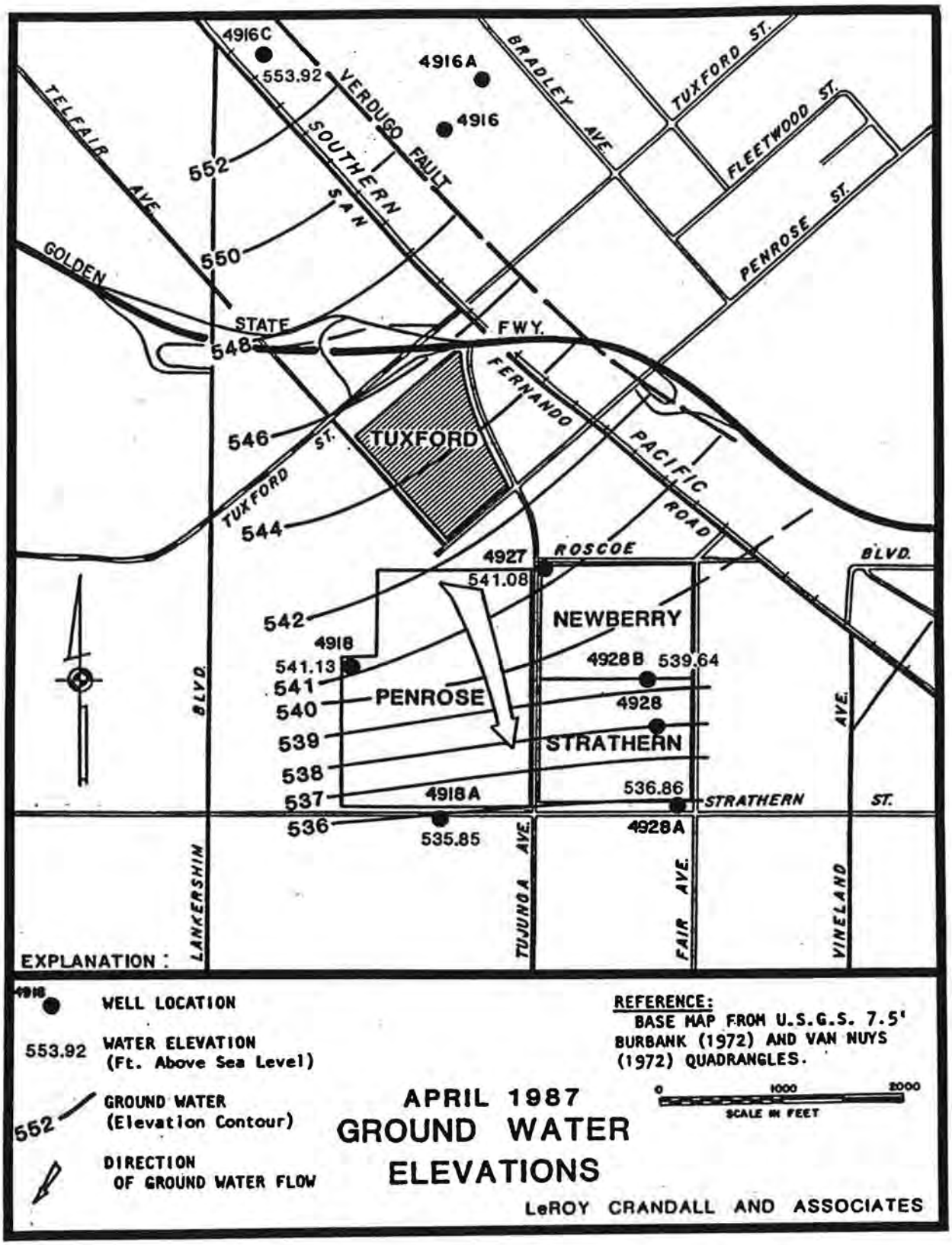
VADOSE ZONE MONITORING - Two wells drilled to 50 feet. Cannot generate enough suction to get a liquid sample.

LEACHATE CONTROL AND MONITORING - Five wells drilled to 100 feet. No leachate encountered.

GROUND WATER QUALITY MONITORING - Shares monitoring wells with Penrose/Newberry/ Strathern. Sampled by a pump with packer. Two wells upgradient and two wells downgradient. Volatile organic compounds are above action levels -- appear to be coming from upgradient. High nitrates in two upgradient wells (84 and 88 mg/l) are probably related to earlier dairy operations. Landfill does not appear to be generating any hazardous pollutants.

REPORTS -
SWAT Report (Rank 2) - June 29, 1989 - Law Environmental
SWAT Report Supplement - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted December 1990. Approved SWAT Report June 1992. Leakage determination not yet made; awaiting study of background ground water contamination. EMP required under Chapter 15 is underway.



16. TUXFORD LANDFILL

APPENDIX J

FACT SHEET NUMBER 12
SAN FERNANDO VALLEY SUPERFUND SITES

EPA San Fernando Valley Superfund Sites

Region IX, San Francisco | August 1993 | Fact Sheet Number 12

STATUS UPDATE FACT SHEET

Federal, state, and local agencies have been investigating and cleaning up groundwater contamination in the San Fernando Valley since the problem was first discovered in 1979. This fact sheet provides an update of recent and future activities conducted under the U.S. Environmental Protection Agency (EPA) Superfund program.

Site Specific Cleanup Activities

EPA has been evaluating and constructing individual cleanup plans to address the most immediate contamination problems. These individual cleanup actions are called operable units (OUs). Operable units have been designated for North Hollywood, Burbank, Glendale North and South, and Pollock areas. The results of studies for each operable unit will be integrated into the long-term basinwide cleanup plan. The following is a description of the status of each of the OUs. Figure 3 on page 5 shows the status of each of the OUs within the Superfund process.

NORTH HOLLYWOOD OPERABLE UNIT

In early 1989, EPA and the State of California, in cooperation with LADWP, completed construction of a groundwater extraction and treatment facility to inhibit migration of contamination and begin to remove VOCs within a portion of the North Hollywood site. The facility began extracting and treating water on a 24-hour basis in December 1989. The treated water, which meets state and federal drinking water standards, flows through a pipeline to LADWP's North Hollywood Pumping Station for distribution to the public.

EPA paid 90% and the California Department of Health Services (DHS) the remaining 10% of the construction costs of the facility. EPA is now paying 90% and LADWP is paying 10% of the operation and maintenance costs. EPA intends to recover the costs incurred during the investigation, construction, and operation of the North Hollywood operable unit from potentially responsible parties (PRPs) in the North Hollywood area.

BURBANK OPERABLE UNIT

In June 1989, EPA signed the Record of Decision for the Burbank Operable Unit, selecting a cleanup remedy involving the extraction and treatment of 12,000 gallons per

(Continued on page 4)

BACKGROUND

The San Fernando Valley Superfund site is located in the eastern portion of the San Fernando Valley, between the San Gabriel and Santa Monica Mountains. The San Fernando Valley is an important source of drinking water for the Los Angeles metropolitan area, the Cities of Glendale, Burbank, and San Fernando, La Cañada- Flintridge, and the unincorporated area of La Crescenta.

In 1980, after finding organic chemical contamination in the groundwater of the San Gabriel Valley, the California Department of Health Services (DHS) requested all major groundwater users to conduct tests for the presence of certain industrial chemicals in the water they were serving. The results of testing revealed volatile organic compound (VOC) contamination in the groundwater beneath large areas of the San Fernando Valley. The primary contaminants of concern are the solvents trichloroethylene (TCE) and perchloroethylene (PCE), widely used in a variety of industries including metal plating, machinery degreasing, and dry cleaning.

TCE and PCE have been detected in a large number of production wells at levels that are above the Federal Maximum Contaminant Level (MCL), which is 5 parts per billion (ppb) for

(Continued on page 2)

BACKGROUND

each of these VOCs. The State of California MCL is also 5 ppb for TCE and PCE. MCLs are drinking water standards. Other VOC contaminants in the San Fernando Valley have also been detected above Federal and/or State MCLs. As a result of the groundwater contamination, many production wells have been taken out of service. The water agencies of the San Fernando Valley closely monitor the quality of drinking water delivered to residents. **The water meets all federal and state requirements and is safe to drink.** Due to groundwater contamination, much of the drinking water delivered to residents is purchased from the Metropolitan Water District (MWD) of Southern California.

Nitrate, an inorganic contaminant, has also been detected in the groundwater in the San Fernando Valley, consistently at levels in excess of the MCL of 45 ppm. Nitrate contamination may be the result of past agricultural practices and/or septic system or ammonia releases.

State and local agencies acted to provide alternative water supplies and to investigate and clean up potential sources. EPA and other agencies became involved in coordinating efforts to address the large-scale contamination. In 1984, EPA proposed four sites for inclusion on the National Priorities List (NPL): North Hollywood, Crystal Springs, Pollock, and Verdugo. The original boundaries of these sites were based on drinking water wellfields that

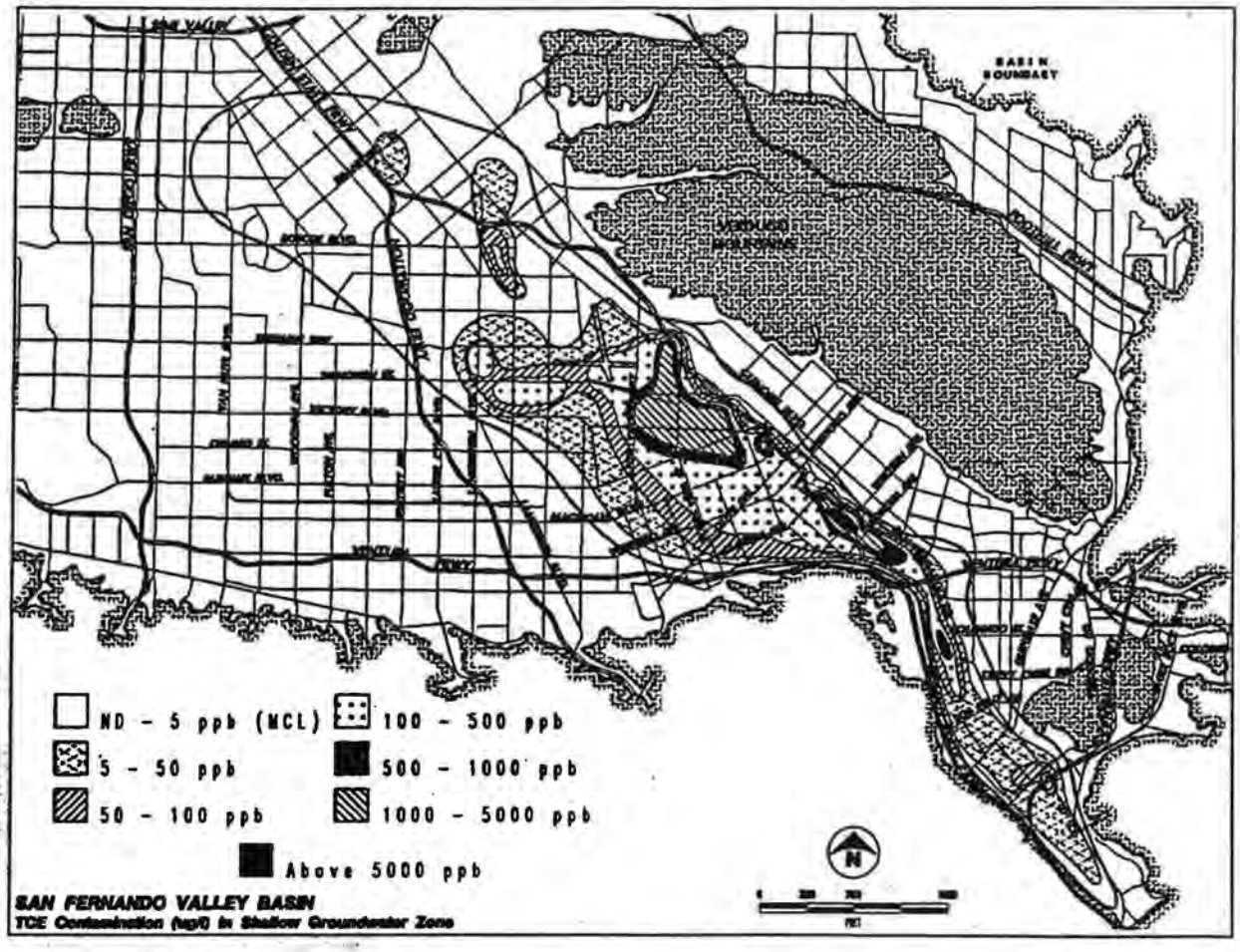


Figure 1. TCE Contamination Plume

BACKGROUND

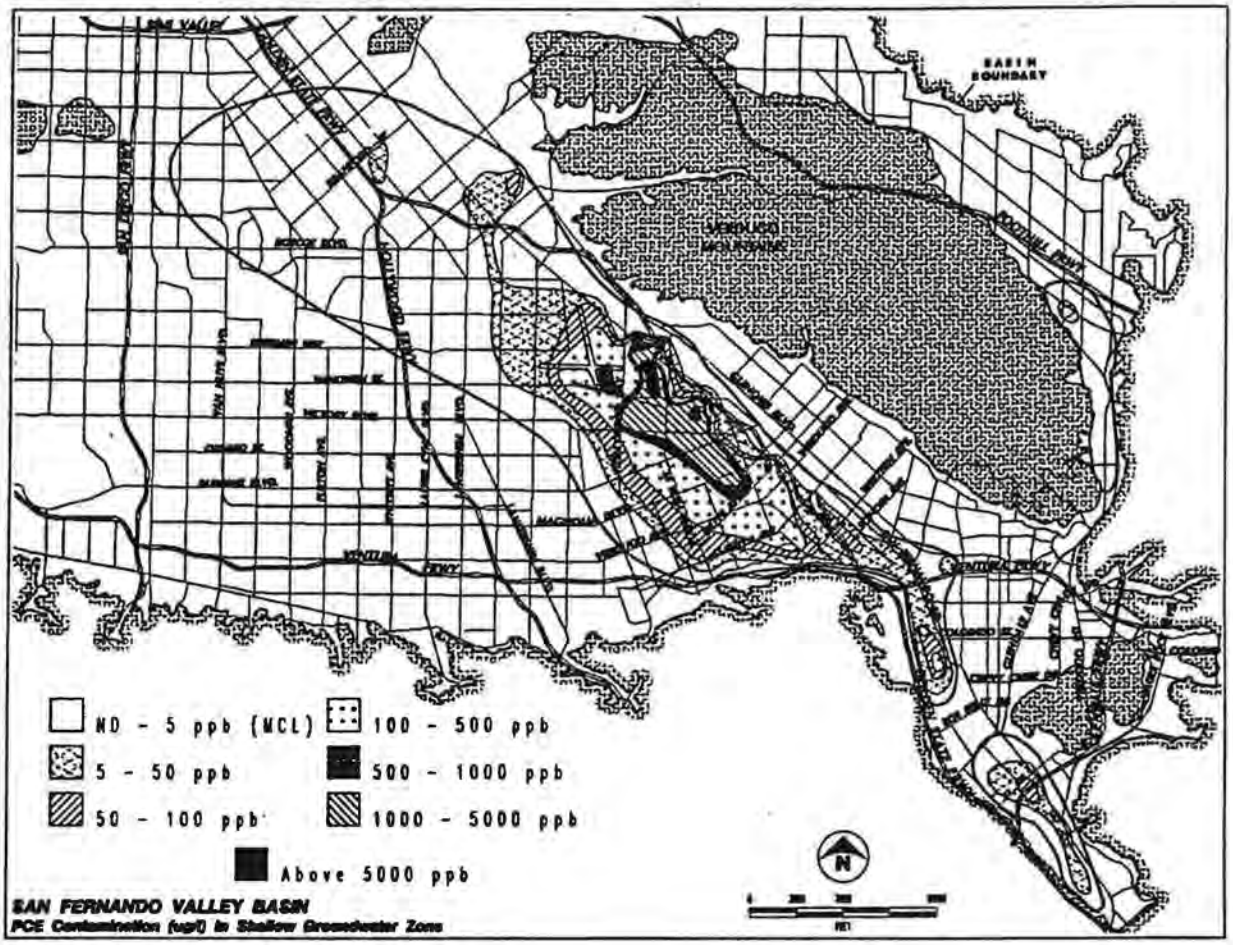


Figure 2. PCE Contamination Plume

were known to be contaminated by VOCs in 1984. In 1986, the four sites were included on the NPL. EPA manages the four sites and adjacent areas where contamination has (or may have) migrated as one large site called the San Fernando Valley Superfund Site. EPA uses the perimeter of the groundwater contamination plume as the boundary for the San Fernando Valley Superfund site. This has allowed the agency to pursue a more comprehensive approach for the investigation and cleanup of the contamination. Figures 1 and 2 show the TCE and PCE groundwater contamination plumes in the San Fernando Valley.

In 1987, EPA and the Los Angeles Department of Water and Power (LADWP) signed a Cooperative Agreement providing federal funds to perform a remedial investigation (RI) of groundwater contamination in the San Fernando Valley. EPA is coordinating the large-scale effort for subsequent groundwater monitoring and the basinwide groundwater Feasibility Study (FS).

EPA has divided the San Fernando Valley Superfund Site into five operable units (OUs) to accelerate the investigation and cleanup of the study area. Each OU represents a discrete, interim containment remedy currently in progress throughout the eastern portion of the San Fernando Valley. EPA has signed Record of Decision (ROD) documents for four OUs in the San Fernando Valley: North Hollywood OU (1987), Burbank OU (1989), and Glendale North and South OUs (1993). The North Hollywood OU Interim Remedy is

BACKGROUND

(Continued from page 3)

currently operating. The Burbank OU is in the remedial design phase. The RODs for the Glendale North and South OUs were recently signed and these OUs will be entering the remedial design phase in the near future. A remedial investigation to determine the need for a possible fifth OU in the Pollock area is currently underway. All remedial actions established by EPA in the Records of Decision issued to date are interim measures but are intended to be consistent with the overall long-term remediation of the San Fernando Valley. EPA has not yet selected a final remedy for the entire San Fernando Valley.

Local water suppliers and state agencies are ensuring that drinking water meets all state and federal standards. Due to the use of alternative water supplies and regular testing by local water suppliers, public drinking water in the San Fernando Valley is safe to drink.

Site Specific Cleanup Activities

(Continued from page 1)

minute (gpm) of VOC-contaminated groundwater. The treated water will meet all MCLs and secondary drinking water standards, except for nitrate. The treated water will be disinfected and then blended with water which does not contain nitrate in excess of the MCL to reduce nitrate levels and meet the MCL. The treated water will be delivered to the City of Burbank for distribution. Excess treated water will be reinjected back into the groundwater.

A Consent Decree became effective on March 25, 1992 between EPA, Lockheed Corporation, Weber Aircraft and the City of Burbank to design and construct the extraction and disinfection facilities. An Administrative Order was issued to six additional responsible parties to design and construct the blending facilities.

The extraction and treatment facilities will be designed and constructed in three phases. Phase I will extract and treat 6,000 gpm and is estimated to be operational in April 1994. Phase 2 will extract and treat an additional 3,000 gpm and is estimate to be operational in April 1996, and Phase 3 will treat another 3,000 gpm and will be operational by April 1998. The Consent Decree and Administrative Order also include operation and maintenance of the facilities for two years after Phase 3 is operational.

EPA is still conducting source investigations and developing technical cases and intends to begin negotiations with PRPs for the long-term operation and maintenance of these treatment facilities (for an additional 18 years) in 1994.

GLENDALE OPERABLE UNIT

In late 1989, during the basinwide groundwater remedial investigation (RI), EPA found elevated concentrations of VOCs in the groundwater of the Glendale area of the San Fernando Valley. In the Spring of 1990, EPA commenced an RI of the Glendale area and by early 1991 when the RI was complete, it was clear that there were two distinct plumes of VOC contamination in the Glendale area. These two plumes were referred to as the Glendale North Plume and the Glendale South Plume. EPA then determined that these two VOC plumes should be addressed as distinct operable unit remedies and thus separate feasibility studies were conducted to evaluate cleanup alternatives for each contamination plume.

A final remedial investigation report for both Glendale North and South OUs was completed in January 1992. The Glendale North OU Feasibility Study was complet[illegible] April 1992 and a Proposed Plan was presented to the public in June 1992. For Glendale South OU, the Feasibility Study was completed in August 1992 and a Proposed Plan was released in September 1992. Public meeting and comment periods were held for both OUs.

On June 18, 1993, EPA signed both the Glendale North and South OU Records of Decision. These RODs describe EPA's selected remedies for the groundwater contamination in the Glendale Study Area. As a result of comments by the City of Glendale on the Proposed Plans for the two OUs, indicating that the City had sufficient water credits to accept the water from both OUs, EPA determined that the treatment plants for the two OUs would be combined. This determination is documented in both RODs.

The selected remedies consist of groundwater extraction and treatment for the shallow aquifer system.

(Continued on page 6)

<table>
<tr><th>OU or Study Area</th><th>Site Discovery</th><th>NPL Ranking and Listing</th><th>Remedial Investigation (RI)</th><th>Feasibility Study (FS)</th><th>Public Comment Period</th><th>Record of Decision (ROD)</th><th>Remedial Design</th><th>Remedial Action</th></tr>
<tr><td>North Hollywood OU</td><td rowspan="6">In 1980, contaminated groundwater was discovered by San Fernando Valley Water Purveyors through testing mandated by the State of California Department of Health Services.</td><td rowspan="6">In 1984, four sites within the San Fernando groundwater basin were proposed for inclusion on the National Priorities List (NPL), because of contamination in municipal wellfields. In June 1986, the four sites were added to the NPL.</td><td colspan="3">LADWP investigated contamination in the North Hollywood OU. LADWP recommended that a groundwater extraction and treatment system be constructed.</td><td>EPA signed the Record of Decision in September 1987.</td><td>Construction of the extraction and treatment facility was completed in early 1989.</td><td>The facility began extracting and treating water on a 24-hour basis in December 1989.</td></tr>
<tr><td>Burbank OU</td><td>EPA issued this RI report as part of the October 1988 OU Feasibility Study.</td><td>EPA released the FS for the Burbank OU in October 1988. The cleanup remedy involved extracting and treating the contaminated groundwater.</td><td>EPA had a public comment period from October to December 1988 for its Proposed Plan for the Burbank OU.</td><td>EPA signed the ROD in June 1989. An Explanation of Significant Differences was issued in November 1990. Twelve-thousand gpm of contaminated water will be extracted and treated.</td><td>EPA signed a Consent Decree with three responsible parties in March 1991 to design and construct the extraction and disinfection facility. The consent decree became effective in March 1992.</td><td>The extraction and treatment facility is expected to begin operation by April 1994.</td></tr>
<tr><td>Glendale North OU</td><td rowspan="2">EPA issued the RI report for the Glendale Study Area in January 1992.</td><td>EPA issued this Feasibility Study in April 1992. The selected remedy involves treating groundwater in the shallow aquifer in the Glendale North OU.</td><td>A public comment period on EPA's preferred alternative was held from July to September 1992. A public hearing was held on July 23, 1992.</td><td rowspan="2">EPA signed Records of Decision for both Glendale North and South OUs on June 18, 1993. The treatment facilities for both OUs will be combined at a single location in the Glendale North OU area. Extraction rates will be 3,000 gpm for Glendale North and 2,000 for Glendale South.</td><td colspan="2" rowspan="2">EPA intends to conduct negotiations with potentially responsible parties to pay for the design, construction, and operation of the selected remedy.</td></tr>
<tr><td>Glendale South OU</td><td>EPA issued this Feasibility Study in August 1992. The selected remedy involves groundwater extraction and treatment.</td><td>EPA held a public comment period from October 1992 to January 1993 on the preferred alternative for this OU. A public hearing was held on October 21, 1992.</td></tr>
<tr><td>Pollock Study Area</td><td colspan="6">EPA is currently conducting a site assessment of the Pollock Study Area to determine if RI/FS activities are appropriate for this study area.</td></tr>
<tr><td>Basinwide Study Area</td><td>EPA issued the Basinwide Groundwater RI in December 1992.</td><td>EPA is currently conducting the Basinwide Groundwater and Vadose Zone Feasibility Studies.</td><td></td><td></td><td></td><td></td></tr>
</table>

Completed Current or To Be Done

Figure 3. Where the OUs Are Within the Superfund Process

Site Specific Cleanup Activities

(Continued from page 4)

The treatment facilities for both OUs will be combined at a single location in the Glendale North OU area. Combining the treatment facilities will save resources, accelerate the start of remedial action, and allow EPA to conduct one negotiation with a combined pool of PRPs.

Under the selected remedy, groundwater will be extracted at a rate of 3,000 gpm for Glendale North and 2,000 gpm for Glendale South for 12 years. New extraction wells will be installed at locations that most effectively inhibit the migration of the contamination plumes. The extracted water will be treated for VOCs using either air stripping or liquid-phase granular activated carbon (GAC). If air stripping is chosen, then vapor-phase GAC adsorption will be used to control air emissions.

The extracted water will be treated to meet all MCLs and secondary drinking water standards, with the exception of nitrate. The MCL for nitrate will be met by blending with water which does not contain nitrate in excess of the MCL. The treated and blended water will then be conveyed to the City of Glendale for distribution through its public water supply system. If Glendale does not accept all or part of the treated water, the water will be offered to another municipality and/or reinjected into the basin or recharged at the Headworks Spreading Ground. EPA anticipates the two OUs to be operational by 1996.

EPA is currently in the process of negotiating with PRPs to pay for the design, construction, and operation of the selected remedy, EPA's past costs associated with the RI/FS and EPA's future oversight costs.

POLLOCK STUDY AREA

The Pollock Study Area is located at the southern portion of the San Fernando Valley Basin in the vicinity of the Pollock Wellfield. EPA recently initiated a site assessment of the Pollock area because the basinwide VOC plumes extend into this area of the basin and concentrations of TCE are in the range of 50 - 100 ppb in the shallow groundwater. This is of particular concern because another groundwater basin, the Central Basin, is located directly downgradient of the Pollock Wellfield area and further downgradient migration could impact that basin.

EPA is currently conducting a site assessment of the Pollock Study Area based on existing data. The site assessment is expected to be completed in the Fall of 1993. Based upon the results of the Site Assessment, EPA will determine what additional RI/FS activities would be appropriate for the Pollock Study Area and whether or not an Operable Unit will be initiated. If an OU is initiated, the primary objective of such an interim remedy would likely be to contain the southern portion of the basinwide contamination plume and prevent it from migrating into and contaminating the Central Basin.

In addition, LADWP has recently announced its intention to initiate a

(Continued on page 8)

HOW DOES EPA'S ENFORCEMENT PROCESS WORK?

EPA uses a variety of resources to build enforcement cases, including facility specific information, groundwater and vadose zone modeling results, and results from investigations by state agencies. EPA also requests information from industrial facilities about historic property use, industrial processes, and hazardous substance handling. The goal of the enforcement program is to compel responsible parties to design, construct and operate treatment facilities and reimburse EPA for prior and any future expenditures at the site.

The enforcement process involves several components, all of which may be underway concurrently. Figure 4 is a schematic of the enforcement process.

- **INFORMATION GATHERING**

  Based on information obtained from the Regional Water Quality Control Board and Cal-EPA/DTSC site investigations, as well as information request letters sent by EPA to individuals and/or companies regarding the use and handling of hazardous substances at the facility, EPA gathers and compiles information on facilities throughout the San Fernando Valley.

- **INFORMATION EVALUATION**

  EPA evaluates the information gathered to determine which parties may be held responsible for the groundwater contamination and the cost of groundwater cleanup remedies. EPA notifies parties that they are investigating activities at their site through General Notice letters. A General Notice letter notifies a party that it may be potentially liable for the investigation and cleanup of contamination. Potential sources include businesses, industries, or agencies that generate, transport, use, treat, store, or dispose of hazardous substances.

- **LIABILITY IDENTIFICATION AND NOTIFICATION**

  After reviewing the information obtained from site investigations at the facility and from the information requests, EPA determines which parties should receive Special Notice letters. Parties that receive Special Notice letters are referred to as potentially responsible parties (PRPs). Special Notice letters are sent to notify the parties of their liability for the groundwater contamination. Unlike General Notice letters, which indicate that parties may be potentially liable, Special Notice letters are sent to parties that EPA has determined are potentially liable. These letters initiate a negotiation process and require a "good faith offer" by the company within 60 days of receiving the letter. In a cost recovery case, EPA sends Demand for Payment letters rather than Special Notice letters.

- **BEGIN NEGOTIATIONS**

  EPA then attempts to negotiate an agreement with the parties to implement the remedy and/or pay past and /or future costs.

- **IF NEGOTIATIONS ARE UNSUCCESSFUL**

  If a settlement is not reached, EPA has the authority to issue a Unilateral Administrative Order or file a lawsuit against the responsible party.

What Enforcement Activities Has EPA Conducted?

Enforcement is a crucial component of Superfund activities and EPA has been actively working to get responsible parties to contribute to remedial actions in the San Fernando Valley. In September 1989, EPA signed a cooperative agreement with the State Water Resources Control Board providing funds for the Regional Water Quality Control Board, Los Angeles Region (Regional Board) to oversee soil and groundwater investigations at individual facilities in the San Fernando Valley. The cooperative agreement has been renewed annually since 1989. If Regional Board investigations confirm soil or groundwater contamination, the facility is then referred to EPA. In addition, the Regional Board uses State funds to require and oversee individual facility cleanups. Using its enforcement authority under Superfund, EPA makes determinations regarding individuals and companies who are responsible for the groundwater contamination in the San Fernando Valley. Most of the source-specific investigation and source elimination will be conducted by the facilities (including PRPs) under the oversight of the Regional Board.

In 1989-90, EPA sent Special Notice letters to 32 parties for the Burbank OU. EPA settled (through a Consent Decree) with three parties and issued an Administrative Order to six of the remaining parties for partial implementation of the remedy. EPA intends to issue Special Notice letters in 1994 for negotiations of the remaining operation and maintenance of the remedy. In 1992 and 1993, EPA sent General Notice letters to 46 PRPs for 27 facilities in the Glendale North area and 19 PRPs for 12 facilities in the Glendale South area. EPA intends to pursue an Administrative Order on Consent for Remedial Design for a combined Glendale North and South project.

In July 1993, EPA sent 16 Demand for Payment letters to PRPs in the North Hollywood area, for cost recovery action. EPA and the Department of Justice held a meeting with the PRPs on July 22, 1993 to discuss the strategy for negotiations of past and future costs related to the North Hollywood OU and Basinwide activities.

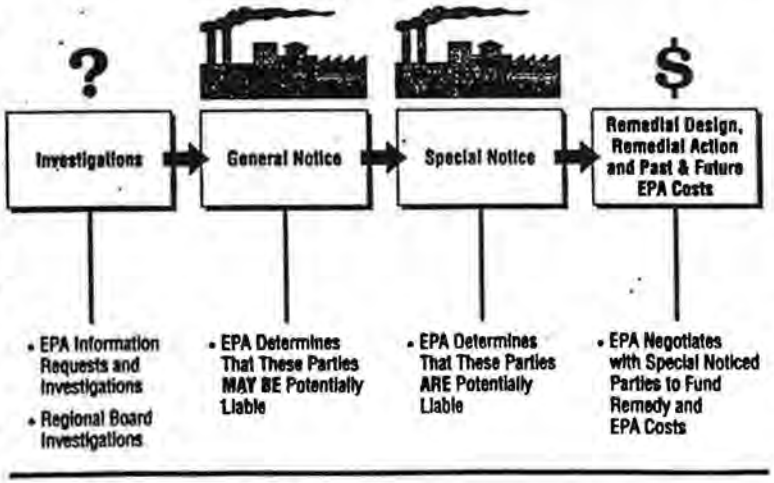


Figure 4. EPA's Enforcement Process

Site Specific Cleanup Activities

(Continued from page 6)

pump and treat project in the Pollock Wellfield. Under their proposal, a total of 3,000 gpm will be extracted from two Pollock production wells. The water will be treated and conveyed to LADWP's public water supply. While the primary objectives of this project are to protect LADWP's water rights and to supply clean drinking water to its public water distribution system, EPA will be working with LADWP to determine and evaluate the potential cleanup benefits associated with this project.

VERDUGO STUDY AREA

The Verdugo NPL site includes the contaminated groundwater in and around several wellfields located in the Verdugo Basin. The investigation of the nature and extent of contamination in the Verdugo Basin was included in the Basinwide Groundwater RI. In recent years, only the VOC perchloroethylene (PCE) has been consistently detected at concentrations at or slightly above its MCL of 5 ppb, and in only a small number of the total wells sampled. However, nitrate contamination has been found to be extensive throughout the Verdugo Basin.

EPA recently completed a site assessment for the Verdugo Basin. The site assessment, entitled *Site Assessment and Monitoring Plan for the Verdugo Basin (April 1993)*, defines the hydrogeologic framework of the Verdugo Basin and characterizes the current and historic patterns of groundwater contamination. This site assessment is available for review at the five information repositories listed on page 11.

Due to the repeated detection of only very low levels of PCE in the Verdugo Basin, EPA has determined that remedial action in that Basin is not necessary at this time. However, EPA continues to sample its groundwater monitoring wells in the Verdugo Basin on a quarterly basis to monitor the quality of the groundwater and to observe any changes in the extent of contamination.

Basinwide Activities

EPA is preparing a Basinwide Feasibility Study (FS) to analyze contamination cleanup methods that will minimize public health risks and environmental impacts. The results of the Basinwide FS will unite basinwide technical needs, the operable units, and agency roles into a statement of long-range cleanup goals and methods. The Basinwide FS includes both groundwater and vadose zone (the zone of soil above the water table) studies.

GROUNDWATER INVESTIGATION

A complete investigation of groundwater contamination in the San Fernando Valley was conducted through a Basinwide Groundwater Remedial Investigation (RI). The Basinwide RI Report was completed in December 1992 and describes the results of more than five years of investigation of groundwater contamination in the San Fernando and Verdugo Basins through 1991. This investigation is one of the largest projects of its kind in size and complexity in the United States. This report has provided EPA a better understanding of the nature and extent of VOC contamination in the groundwater of the San Fernando Valley. The Basinwide Groundwater RI was completed by LADWP with funding and technical oversight provided by EPA.

As part of the Basinwide Groundwater RI, EPA installed 87 groundwater wells. Forty-one of these wells are sampled quarterly to monitor the nature and extent of the groundwater contamination in the San Fernando Valley. All 87 wells are sampled annually. EPA is using the results of the Basinwide Groundwater RI to conduct a Basinwide Groundwater Feasibility Study to address VOC contamination in the groundwater of the eastern portion of the San Fernando Valley.

EPA has completed some initial activities related to the Basinwide Groundwater Feasibility Study, including technical memoranda on water rights and water management in the San Fernando Valley and recalibration and verification of the basinwide groundwater flow model incorporating the most recent data. The updated version of the model was completed in June 1993. EPA is now reviewing and evaluating various groundwater remediation options for the basin including regional pump and treat, well-head treatment, innovative technologies and no-further-action alternatives.

(Continued on page 10)

WHO'S INVOLVED?

The San Fernando Superfund project is large and complex, requiring many agencies to work together. EPA is coordinating efforts to address groundwater contamination in the San Fernando Valley Basin with water supply management activities. The agencies include the Los Angeles Department of Water and Power (LADWP), the Cities of Burbank and Glendale, the Crescenta Valley County Water District, the ULARA Watermaster, the Metropolitan Water District (MWD), the California Environmental Protection Agency (Cal-EPA), the Regional Board, and the State Water Resources Control Board. Representatives of these agencies meet quarterly at Management Committee Meetings to discuss issues pertaining to the San Fernando Valley Basin. Technical issues, related to RI/FS efforts, are also addressed at the quarterly meetings of the Interagency Coordinating Committee, a committee founded to implement the San Fernando Valley Basin Groundwater Quality Management Plan. The roles of some of these agencies are briefly described below.

EPA The U.S. Environmental Protection Agency has overall responsibility for cleanup and enforcement efforts at the San Fernando Valley Superfund Site. EPA is responsible for groundwater and vadose zone feasibility studies, community relations activities, and enforcement efforts. EPA is also responsible for the quarterly water quality monitoring program.

Cal-EPA The California EPA (formerly called the Department of Health Services) is the state agency responsible for protecting the health and welfare of California residents. It requires regular testing of drinking water and has established state standards for more than 50 potential contaminants. Through its Department of Toxic Substances Control, Cal-EPA also enforces state hazardous waste cleanup requirements and oversees potential source sites. Cal-EPA also reviews EPA documents and provides input to ensure compliance with state regulations. Cal-EPA is the coordinating agency for the state and is also involved in cleanup of sites around and within the San Fernando Valley.

Regional Board The Regional Water Quality Control Board, Los Angeles Region, is responsible for the protection of surface and groundwater for the State of California. The Regional Board investigates facilities which use, store, or handle chemicals. When contamination is found, the Regional Board requires and oversees site clean-up. Through a cooperative agreement with EPA, the Regional Board has been provided funds to investigate potential sources of groundwater contamination in the San Fernando Valley.

LADWP The Los Angeles Department of Water and Power has overall responsibility for water supply in the City of Los Angeles. It is required to provide water to its customers which meet state and federal drinking water standards. LADWP was responsible for a number of tasks under a cooperative agreement with EPA originally signed in 1987. LADWP completed the Phase 1 Basinwide Groundwater RI (December 1992) and feasibility studies for the North Hollywood OU (1986), Burbank OU (1989), Glendale North OU (April 1992) and Glendale South OU (August 1992).

Now that the basinwide groundwater RI report is final, LADWP's direct role in the overall project has decreased significantly. LADWP's continuing involvement includes preparation of cost documentation to support EPA enforcement/cost recovery actions, and coordination and consultation with EPA about the Pollock Study Area, and basinwide water management issues pertinent to remedial actions. In addition, LADWP continues to operate and maintain the North Hollywood OU treatment facility.

Burbank and Glendale The Cities of Burbank and Glendale each provide drinking water to their residents through local municipal utilities. As water providers, each city must test water regularly and ensure that water supplies meet federal and state standards. Both cities have been closely involved in the Superfund studies. The City of Burbank is a signatory to the Consent Decree for the Burbank OU and it is likely that the City of Glendale will be a signatory to an Administrative Order on Consent for the Glendale OUs.

ULARA Watermaster The Upper Los Angeles River Area (ULARA) Watermaster is appointed by the Los Angeles Superior Court and oversees and documents all actions that affect groundwater supply in the basin such as annual rainfall, import and export of water to other areas, and pumping of groundwater for both water supply and remediation purposes. The Watermaster is working with EPA and the Regional Board to address groundwater management issues in the San Fernando Valley.

Site Specific Cleanup Activities

(Continued from page 8)

EPA's interim actions to remove contaminants and inhibit migration from the most contaminated areas in North Hollywood, Burbank, Glendale North, and Glendale South will be major components of the basinwide cleanup plan. The Basinwide Groundwater FS will examine the need for additional actions to address the contaminants that have already reached the groundwater. EPA has been working with the San Fernando Valley water purveyors and the Upper Los Angeles River Area (ULARA) Watermaster to summarize past and future groundwater management in the San Fernando Valley.

SOILS INVESTIGATION

During 1993, EPA also initiated work on a vadose zone FS to examine ways to protect the groundwater from contaminants in the soil that could reach the groundwater in the future. As part of this FS, EPA will review and evaluate options for cleanup of VOC contamination in the vadose zone of the San Fernando Valley. EPA intends to develop a methodology for use at sites with known VOC soil contamination.

Public Involvement

EPA is committed to informing community members and other interested parties about the federal process for addressing contamination in the San Fernando Valley.

EPA encourages open communication between the public, EPA, and state and local agencies.

The Community Relations Plan for the San Fernando Valley Superfund sites was updated in August 1993. The plan was revised to reflect community relations activities conducted since its previous revision in 1990.

EPA's Proposed Plan for the Glendale North OU was prepared in the form of a fact sheet and was distributed in July 1992 to approximately 1800 individuals on EPA's mailing list for the San Fernando Valley Superfund Sites. A public meeting was held in the City of Glendale on July 23, 1992 to discuss EPA's preferred alternative for groundwater cleanup and other alternatives. EPA gave a brief presentation regarding the Proposed Plan, answered questions, and accepted comments from members of the public. A 60-day public comment period was held between July and September 1992.

In September 1992, EPA presented its Proposed Plan for addressing the south plume of groundwater contamination in the Glendale Study Area. A public meeting was conducted by EPA on October 21, 1992 to present the proposed cleanup plan for the Glendale South OU. Comments from the public were accepted through January 19, 1993.

EPA has distributed several other fact sheets, including one in March 1993 presenting results and findings from the Basinwide Remedial Investigation, and a June 1993 fact sheet announcing the selection of a cleanup remedy for the Glendale North and South Operable Units.

All of the documentation and material produced regarding the above activities is available at the five information repositories listed on page 11. In May 1992, an audit of these repositories was conducted to determine the availability and condition of the documents. Documents that were missing or in poor condition were replaced with new copies and the information repositories are now up-to-date. The administrative records for each of the OUs is at all five information repositories, although some of the administrative records are only on microfilm and some are only in hard-copy format. To view the microfilm, please see the reference desk librarian at the repositories.

The Community Work Group (CWG) that had met quarterly from March 1987 through December 1991 was discontinued in early 1992, due to lack of attendance. EPA and LADWP participated in the meetings to discuss technical issues and management strategies with interested San Fernando Valley community residents, elected officials, agency representatives, and environmental and business leaders. The group was designed to review Superfund work and provide input and feedback to EPA and other agencies involved in the San Fernando Valley cleanup. EPA also used the group as a means of information exchange with key representatives of the San Fernando Valley community.

EPA has been involved in a variety of other community relations activities, including briefings to community groups such as the League of Women Voters and area Rotary Clubs.

SAN FERNANDO VALLEY INFORMATION REPOSITORIES

EPA maintains information repositories containing fact sheets, technical documents, the Remedial Investigation/Feasibility Study, the Community Relations Plan, the ROD, and other reference materials. If documents are not available, contact Fraser Felter, Community Relations Coordinator, at (415) 744-2181.

City of Burbank Public Library
110 North Glenoaks Boulevard
Burbank, CA 91502
(818) 953-9741
Contact: Andrea Anzalone
Hours: M–Th 9:30 am–9:00 pm
F 9:30 am–6:00 pm
Sat 10:00 am–6:00 pm

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205
(818) 548-2021
Contact: Lois Brown
Hours: M–Th 10:00 am–8:55 pm
F–Sat 10:00 am–5:55 pm

California State University Northridge Library
18111 Nordhoff Street
Northridge, CA 91330
(818) 885-2285
Contact: Mary Finley
Hours: M–Th 8:00 am–10:00 pm
F 8:00 am–5:00 pm
Sat 9:00 am–5:00 pm

Los Angeles Department of Water and Power (LADWP) Library
111 North Hope Street, Room 518
Los Angeles, CA 90012
(213) 481-4612
Contact: Joyce Purcell
Hours: M–F 7:30 am–5:30 pm

The University Research Library/U.C.L.A.
Public Affairs Service
405 Hilgard Avenue
Los Angeles, CA 90024
(310) 825-3135
Contact: Barbara Silvernail
Hours: M–F 10:00 am–7:00 pm
Sat 1:00 pm–5:00 pm

For further information about the Basinwide investigation and cleanup, contact:

Colette Kostelec/Project Manager
U.S. EPA, Region IX
75 Hawthorne Street (H-6-4)
San Francisco, CA 94105
(415) 744-2253, FAX: (415) 744-2180

Fraser Felter/Community Relations Coordinator
U.S. EPA, Region IX
75 Hawthorne Street (H-1-1)
San Francisco, CA 94105
(415) 744-2181 or (800) 231-3075

MAILING LIST COUPON

If you did not receive this fact sheet by mail and would like to be included on the mailing list for the San Fernando Valley Superfund project, please fill out this coupon and return it to the EPA Office of Community Relations.

Name:

Address:

Telephone:

Affiliation (If any):

Return to: Office of Community Relations, U.S. EPA, 75 Hawthorne Street (H-1-1), San Francisco, CA 94105

WHAT IS SUPERFUND?

Superfund is the commonly-used name for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a federal law enacted in 1980 and amended in 1986. CERCLA enables EPA to respond to hazardous sites that threaten public health and the environment where owners or operators are either unwilling or unable to address the contamination themselves.

Two major steps in the Superfund process are to conduct an in-depth investigation of a site (called a Remedial Investigation) and evaluate possible cleanup alternatives (the Feasibility Study). During the Remedial Investigation, information is gathered to determine the general nature, extent, and sources of contamination at a site. Using the alternatives developed during the Feasibility Study, EPA selects a preferred cleanup alternative considering the following criteria: (1) overall protection of human health and the environment; (2) compliance with state and federal laws; (3) long-term effectiveness; (4) reduction of potency of the contamination (toxicity), ability of the contaminants to move through the environment (mobility), and the amount of contamination (volume); (5) cost; (6) short-term effectiveness; (7) how easily an alternative can be applied (implementability); (8) state acceptance; and (9) community acceptance.

Once the final cleanup plan has been selected, EPA formalizes this decision by signing a Record of Decision (ROD). The ROD also contains a Responsiveness Summary, EPA's response to public comments. Design and actual cleanup activities (Remedial Design and Remedial Action) can then proceed.

United States Environmental Protection Agency
Region 9
75 Hawthorne Street (H-1-1)
San Francisco, CA 94105
Attn: Fraser Felter

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INSIDE: STATUS OF ACTIVITIES AT THE SAN FERNANDO VALLEY SUPERFUND SITES

APPENDIX K

AN EVALUATION OF WATER RIGHTS AND WATER USE OPTIONS IN THE SAN FERNANDO VALLEY BASIN

AN EVALUATION OF WATER RIGHTS AND WATER USE OPTIONS IN THE SAN FERNANDO VALLEY BASIN

As part of the San Fernando Basin Superfund Project, the Environmental Protection Agency (EPA) completed a report in March of 1991 entitled - "Evaluation of Water Rights and Water Use Options in the San Fernando Valley Basin".

This report was reviewed by the ULARA Watermaster and staff. EPA has indicated that any implied conflict in interpretations are not intentional and should be resolved in consultations with the ULARA Watermaster.

The "Executive Summary" (pages iv to vi) and conclusion (Section 7) are enclosed to provide some insight as to the nature of this report. Basically, this report describes both the adjudicated water rights in the four basins - San Fernando, Sylmar, Verdugo, and Eagle Rock, and possible uses for the water that EPA expects will be extracted from the valley and treated to remove the volatile organic compounds. Also described are implications for basin-wide remedial planning that result from water rights and water use options in the San Fernando Valley.

ARCSWEST

Remedial Activities at Selected Uncontrolled Hazardous Waste Sites in the Zone of Regions IX and X

AN EVALUATION OF WATER RIGHTS AND WATER USE OPTIONS IN THE SAN FERNANDO VALLEY BASIN LOS ANGELES, CALIFORNIA

Environmental Protection Agency
Contract No. 68-W9-0031

CH2MHILL

EXECUTIVE SUMMARY

The purpose of this document, An Evaluation of Water Rights and Water Use Options in the San Fernando Valley Basin (SFVB), is to describe how some of the institutional and physical constraints associated with water supply management will affect remedial action planning as the SFVB Remedial Investigation/Feasibility Study (RI/FS) progresses. Preliminary estimates indicate that it might be necessary to extract, treat, and use as much as three-quarters of the safe yield of the SFVB (about 80,000 acre-feet per year) in the process of remediating the SFVB groundwater contamination. Extraction of such a large amount of water will require close coordination among EPA, the Upper Los Angeles River Area (ULARA) Watermaster, and the local water purveyors and a shared understanding of both objectives and constraints.

The SFVB is located in Los Angeles County, California, within the ULARA. The ULARA contains the watershed of the Los Angeles River and its tributaries above the confluence of the Los Angeles River and the Arroyo Seco Flood Control Channel. Four separate groundwater basins form the SFVB: the San Fernando Basin, Sylmar Basin, Verdugo Basin, and Eagle Rock Basin. Five water purveyors pump groundwater from the SFVB: the Los Angeles Department of Water and Power (LADWP); the Burbank Public Services Department; the Glendale Public Services Department; the San Fernando Department of Public Works--Water Division; and the Crescenta Valley County Water District. Each of these purveyors uses both local groundwater and imported surface water as sources of supply. Both supplies are now facing possible future limitations due to contamination, litigation over Owens Valley/Mono Lake supplies, debate over exports from the San Francisco Bay-Delta, and startup of the Central Arizona Project.

Four sites in the SFVB were listed on the EPA National Priorities List in 1986 due to contamination of production wells by trichloroethylene (TCE) and perchloroethylene (PCE). Since then, EPA has entered into cooperative agreements and provided funding to LADWP to conduct the basinwide Remedial Investigation and to the Regional Water Quality Control Board (RWQCB) to conduct source identification and investigation activities. Two Records of Decisions (RODs) have been signed: one for the North Hollywood Operable Unit in 1987 and one for the Burbank Operable Unit in 1989. LADWP is currently conducting an OUFS in the Glendale area; a ROD is expected in 1991. EPA is also conducting a basinwide Feasibility Study, of which this water rights and water use evaluation is a part.

Because the SFVB is an adjudicated groundwater basin, court-defined water rights affect who can extract groundwater, how much they can extract, and how the extracted groundwater can be used. The 1979 ULARA Judgment assigned specific water rights to each of the five purveyors and to some additional private parties. The Judgment mandated safe yield operation of the four groundwater basins and designated a Watermaster and an Administrative Committee, who now operate the basin under

Court supervision. A variety of different types of water rights are incorporated into the Judgment, including the right of some parties to store imported water in the SFVB and to accumulate import return flow. In addition, non-parties (those not assigned water rights as part of the Judgment) can extract groundwater from the SFVB under specified physical solution arrangements.

The ULARA Watermaster has also developed specific policies on non-party extraction for groundwater remediation purposes. These policies require compliance with safe yield operation, prior approval by the Watermaster, and compensation to parties to the Judgment who may be adversely affected by the extraction. These policies have already been applied to extractions at several facilities that are extracting groundwater as part of preliminary investigations required by the RWQCB. It is expected that the Burbank Operable Unit will be the first Superfund remedial action in the SFVB affected by the Watermaster policy.

Water use options in the SFVB fall into two categories: consumptive uses and non-consumptive uses. Consumptive uses are those that do not directly return the water to the groundwater basin; these uses include (1) use as drinking water, industrial, or irrigation supplies, or (2) discharge of the extracted water into a sanitary sewer or storm drain. Non-consumptive uses are those that do return the water to the SFVB and include recharge using either spreading grounds or injection wells.

Before choosing any one of these options as part of a remedial alternative for a future operable unit, specific information would need to be collected and various different design elements would need to be considered. In addition, each option would be limited by either technical or institutional constraints. Examples of constraints that would need to be evaluated include: the water quality requirements associated with specific industrial uses and the limited capacity of spreading ground facilities. Compatibility with existing water distribution systems and seasonal demand fluctuations would also be important considerations.

Two local water management programs and two agency policy directives on using treated water for potable supply have been identified as important considerations during development of future remedial alternatives. The City of Los Angeles Water Reclamation Program is increasing the amount of reclaimed water used for irrigation and industrial uses, which will limit the usefulness of treated groundwater for those purposes. MWD's Seasonal Storage Service Program will most likely increase seasonal fluctuations in groundwater pumping by the purveyors and will also increase the use of local spreading grounds. Increased recharge could cause changes in the migration of contaminants, which must be considered during remedial planning for specific operable units. DHS' guidelines on domestic use of treated water and MWD's policy on acceptance of treated water into their distribution lines are also discussed as they apply to use of the treated water as a potable supply.

In conclusion, this report describes some of the local institutional and system operation constraints in the SFVB. As the amount of water extracted and treated for remedial purposes increases, these constraints will become increasingly apparent. Integrating remedial action planning and water supply planning will be necessary to achieve both remedial and water supply goals. Mechanisms are already in place to allow for extractions to meet short-term goals. In the long term, the cumulative effects of the constraints posed by both water rights and water use options will need to be carefully considered and mechanisms to overcome them will need to be built into operable-unit design and basinwide remedial planning.

Section 7
CONCLUSIONS

Remediation efforts have begun in the SFVB and are expected to increase steadily in magnitude. During the 1986-1987 Water Year, a total of 1.88 acre-feet of groundwater was extracted by non-parties for groundwater remediation purposes (ULARA, 1988) compared to 14.42 acre-feet extracted during the 1987-1988 Water Year (ULARA, 1989). In March 1989, the North Hollywood extraction and treatment facility began operation which, when fully operational, is intended to extract 2,000 gpm or 3,200 AFY. This represents a significant increase over time in extraction for remediation purposes. When the planned Burbank facility begins operation, the total amount of groundwater extracted for remediation purposes (North Hollywood and Burbank) will increase to more than 22,400 AFY. Eventually, extractions for remedial purposes could approach three-quarters of the safe yield of the SFVB (EPA, 1988). The discussion presented in the previous sections of this report is intended to illustrate some of the ways water rights and water use issues will affect future remediation efforts in the SFVB.

The SFVB is an adjudicated groundwater basin, and remediation efforts must be conducted within the constraints of the 1979 Judgment. The Judgment specifies who can extract groundwater and how much groundwater each party can extract. To address issues that were not included in the original text of the Judgment, the ULARA Watermaster has developed new policies to implement the intent of the Judgment; additional policies could be developed in the future, as necessary. In response to the groundwater contamination problem in the SFVB, the ULARA Watermaster has developed a policy for groundwater extractions for remediation purposes by parties or non-parties (non-parties are those who do not hold water rights under the Judgment). According to this policy, groundwater extractions for remediation purposes that are then used consumptively require approval from the ULARA Watermaster and may require an agreement with a party to the Judgment and payment to the local purveyor.

As the amount of groundwater extracted for remediation purposes increases over time, the cumulative impact of these extractions will become more apparent. Integration of remedial action planning and water supply planning will be necessary if both remedial goals and water supply goals are to be achieved. Existing water supply conditions influence the feasibility of water use options that might be included as part of a remedial action. For example, low winter water demand could be a limiting factor when evaluating potable water use options. Current knowledge of the lateral and vertical extent of contamination could also be a limiting factor when evaluating the feasibility of water use options involving groundwater recharge.

Existing water supply conditions could also change as the population in Southern California increases and if the availability of imported water supplies decreases. The imported water supply from the Central Arizona Project will decrease, and the Bay Delta Hearings could result in less water being exported to the South. In partial

response to this situation of increasing water demand and potentially decreasing water supply, MWD has developed the SSSP to reduce the summer peak demand for MWD import water. This program is intended to increase groundwater recharge during the winter and groundwater extraction during the summer. This program may alter water management planning in the SFVB and, as a result, could influence remedial action planning. The potential effect of increasing recharge on groundwater flow and on the direction and velocity of contaminant migration will be especially important considerations.

In the short term, mechanisms are already in place to allow for the extraction of groundwater for remedial purposes. In the long term, however, the cumulative effect of extracting more and more water will present constraints. The technical, political, and economic considerations described in this report must be evaluated in more depth and addressed as basinwide remedial planning continues.

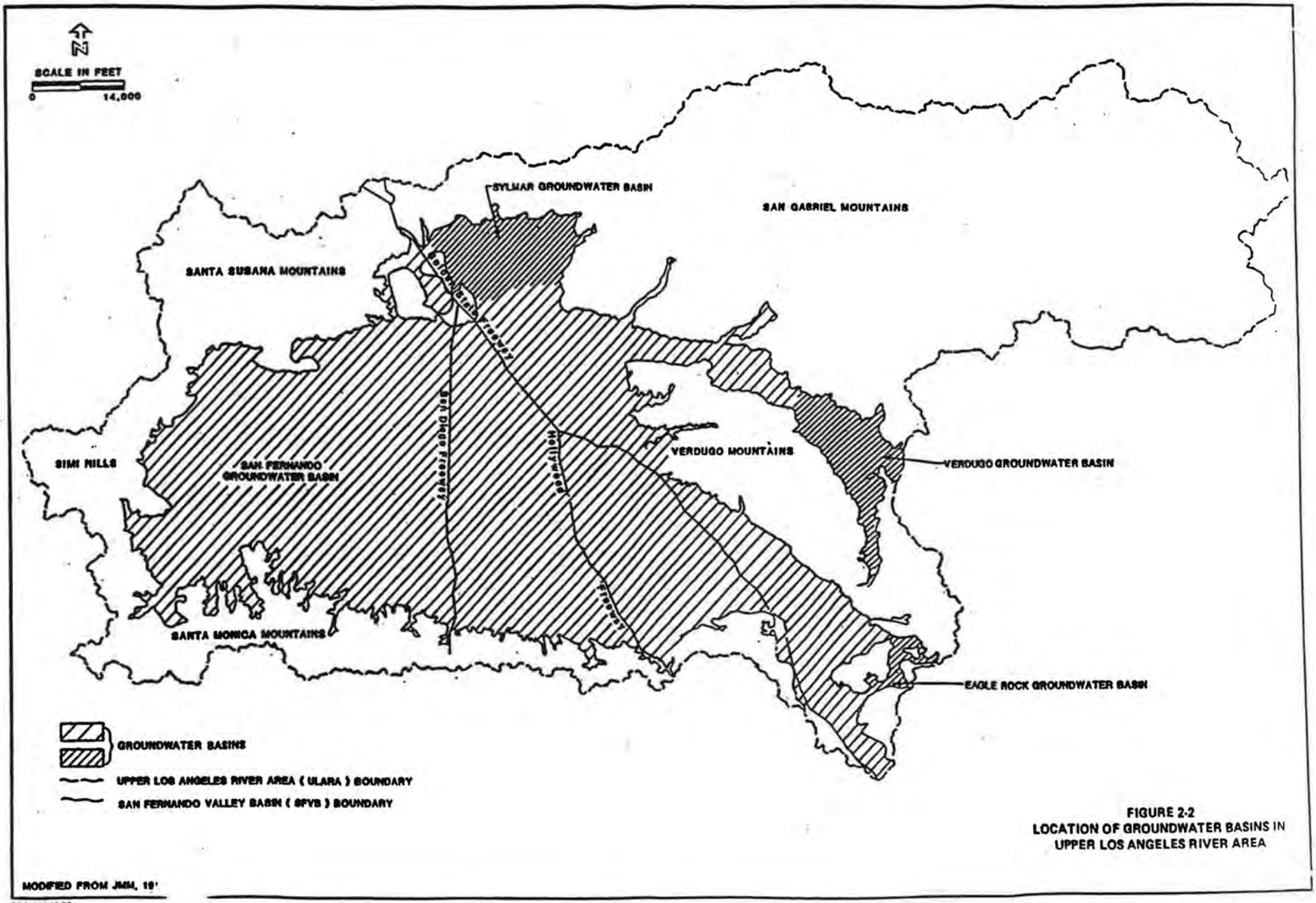
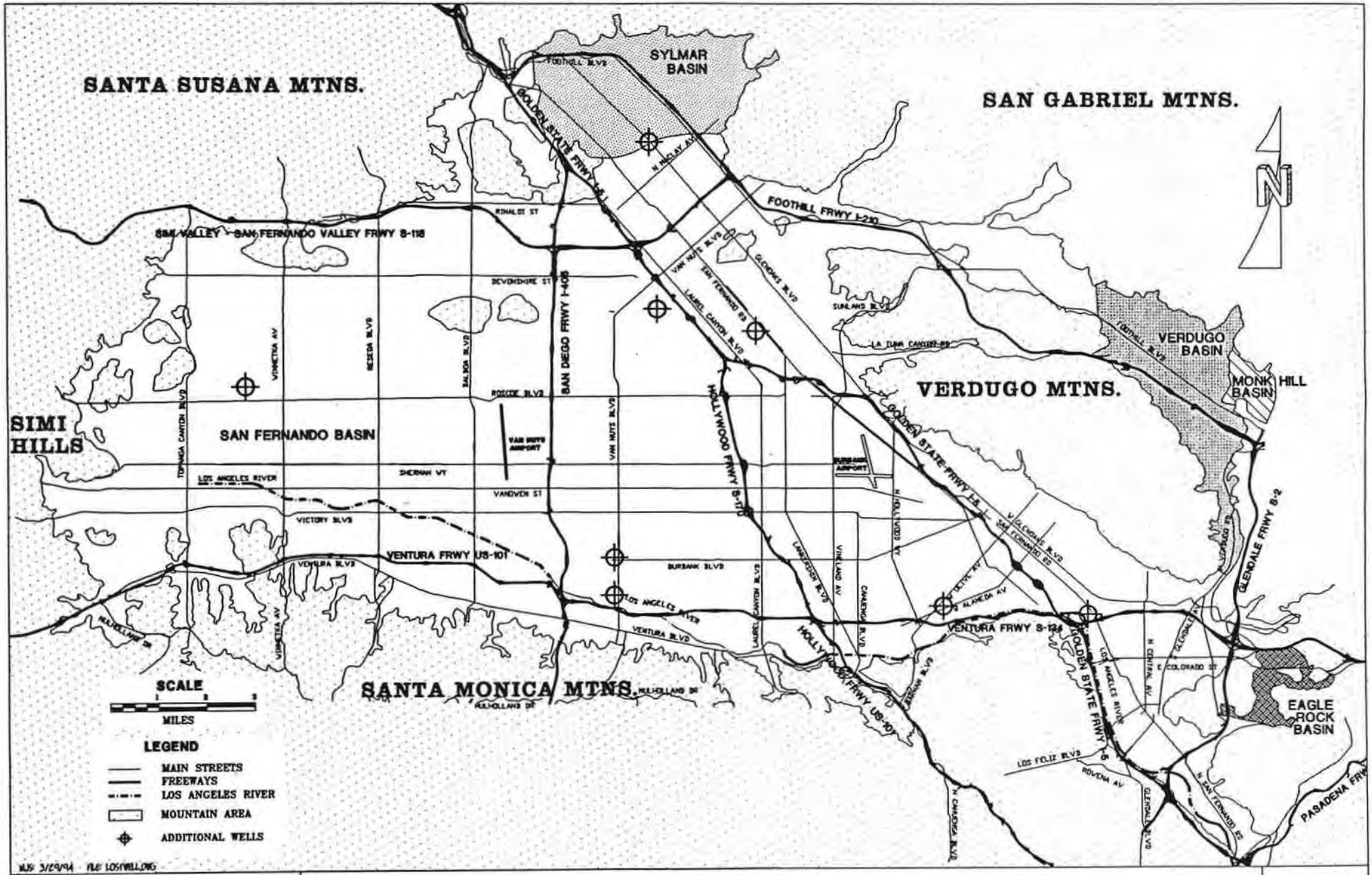


FIGURE 2-2
LOCATION OF GROUNDWATER BASINS IN
UPPER LOS ANGELES RIVER AREA

APPENDIX L

REQUIRED ADDITIONAL MONITORING WELLS



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Upper Los Angeles River Area: Locations of Eight Required Additional Monitoring Wells

FIGURE L.1

APPENDIX M

CONVERSION FACTORS

CONVERSION FACTORS

Quantity	Metric Unit	Customary Unit	To Convert to Customary Unit Multiply Metric Unit By	To Convert to Metric Unit Multiply Customary Unit By
Length	millimeters (mm)	inches (in)	0.03937	25.4
	centimeters (cm)	inches (in)	0.3937	2.54
	meters (m)	feet (ft)	3.2808	0.3048
	kilometers (km)	miles (mi)	0.62139	1.6093
Area	square millimeters (mm^2)	square inches (in^2)	0.00155	645.16
	square meters (m^2)	square feet (ft^2)	10.764	0.092903
	square meters (m^2)	acres (ac)	0.00025	4046.9
	hectares (ha)	acres (ac)	2.4710	0.40469
	square kilometers (km^2)	square miles (mi^2)	0.3861	2.590
Volume	liters (L)	gallons (gal)	0.26417	3.7854
	megaliters	million gallons (10^6 gal)	0.26417	3.7854
	cubic meters (m^3)	gallons (gal)	264.17	0.003785
	cubic meters (m^3)	cubic feet (ft^3)	35.315	0.028317
	cubic meters (m^3)	cubic yards (yd^3)	1.308	0.76455
	cubic meters (m^3)	acre-feet (ac-ft)	0.00081	1233.5
	cubic decameters (dam^3)	acre-feet (ac-ft)	0.8107	1.2335
Flow	cubic meters per second (m^3/s)	cubic feet per second (ft^3/s)	35.315	0.028327
	liters per second (L/s)	cubic feet per second (ft^3/s)	0.035325	28.317
	liters per second (L/s)	gallons per minute (gal/min)	15.850	0.06309
	liters per minute (L/min)	gallons per minute (gal/min)	0.26417	3.7854
	liters per day (L/day)	gallons per day (gal/day)	0.26417	3.7854
	megaliters per day (ML/day)	million gallons per day (mgd)	0.26417	3.7854
	cubic decameters per day (dam^3/day)	acre-feet per day (ac-ft/day)	0.8107	1.2335
Mass	kilograms (kg)	pounds (lb)	2.2046	0.45359
	megagrams (Mg)	tons	1.1.023	0.90718
Velocity	meters per second (m/s)	feet per second (ft/s)	3.2808	0.3048
Concentration	milligrams per liter (mg/L)	parts per million (ppm)	1.0	1.0
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)	(1.8 x °C)+32	(°F - 32)/1.8