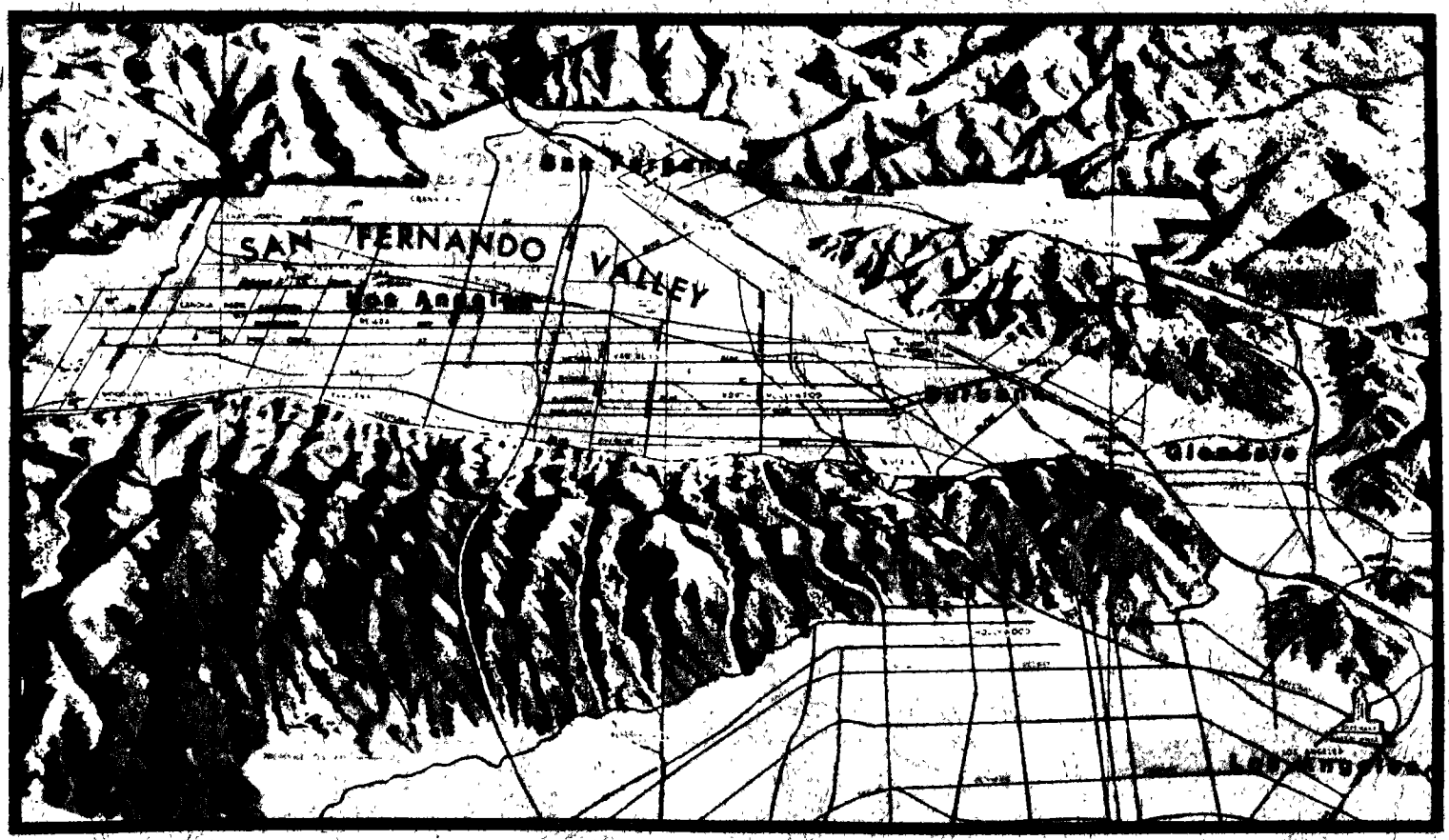
UPPER LOS ANGELES RIVER AREA WATERMASTER

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

OCTOBER 1, 1990 - SEPTEMBER 30, 1991



MAY 1992

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

OCTOBER 1, 1990 - SEPTEMBER 30, 1991

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CONVERSION FACTORS

English to Metric System of Measurement

Quantity	English unit	Multiply by	To get metric equivalent
Length	feet (ft)	.3048	metres (m)
	miles (mi)	1.6093	kilometres (km)
Area	square feet (ft^2)	.092903	square metres (m^2)
	acres	4046.9	square metres (m^2)
		.40469	hectares (ha)
		.40469	square hectometres (hm^2)
		.0040469	square kilometres (km^2)
	square miles (mi^2)	2.590	square kilometres (km^2)
Volume	gallons (gal)	3.7854	litres (l)
		.0037854	cubic metres (m^3)
	million gallons (10^6 gal)	3785.4	cubic metres (m^3)
	cubic feet (ft^3)	.028317	cubic metres (m^3)
	cubic yards (yd^3)	.76455	cubic metres (m^3)
	acre-feet (ac-ft)	1233.5	cubic metres (m^3)
		.0012335	cubic hectometres (hm^3)
		1.233×10^{-6}	cubic kilometres (km^3)
Volume/Time (Flow)	cubic feet per second (ft^3/s)	28.317	litres per second (l/s)
		.028317	cubic metres per second (m^3/s)
	gallons per minute (gal/min)	.06309	litres per second (l/s)
		6.309×10^{-5}	cubic metres per second (m^3/s)
	million gallons per day (mgd)	.043813	cubic metres per second (m^3/s)
	miners inch*	.70792 (.56634)	litres per second (l/s)
Temperature	Degrees Fahrenheit (°F)	$\frac{tF - 32}{1.8} = tC$	Degrees Celsius (°C)

* Section 24 of Water Code = 1/40 ft^3/s

( ) 1/50 ft^3/s commonly used in Southern California

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 Honorable Harry L. Hupp of the Los Angeles Superior Court on January 26, 1979. On April 30, 1985 Judge Vernon G. Foster replaced Judge Hupp as Judge of Record for the San Fernando Judgment. For the period January 16, 1990 to April 16, 1991, Judges Vogel and Disco were involved in the implementation of the San Fernando Judgment. On April 16, 1991, this case (City of Los Angeles vs. City of San Fernando et al - #650,079) was assigned to Judge Jerold Krieger. Subsequently, Judge Gary Klausner replaced Judge Krieger on December 9, 1991.

This report describes the water rights in each basin, lists the allowable pumping for the water year 1991-92 and indicates the water in storage to the credit of each party as of October 1, 1991. 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, groundwater extractions, groundwater levels, quantities of imported water use, recharge operations (including amounts thereof), water quality conditions, and other pertinent information occurring during the water year pursuant to the provisions of the Judgment.

During the 1986-87 water year significant revisions were made to the ULARA Policies and Procedures.* This document addresses and provides 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 groundwater 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 ULARA Policies and Procedures. Presently, several companies are involved in cleanup pumping and treatment or are drilling extraction wells and designing treatment facilities. These companies include the Lockheed Corporation, 3-M - Pharmaceuticals, Rockwell International, Philips Components, Mobil Oil, Thrifty Oil, Unocal Corporation, Allied-Signal, Malibu-Grand Prix and Wickes Company, Inc. Sections 2.5 to 2.7 of the Policies and Procedures were revised and approved on April 17, 1990 (Appendix E).

Also addressed in the Policies and Procedures (dated July 1987) is pumping for dewatering of construction projects. Arrangements have been made with the City of Los Angeles Department of Building and Safety to refer all such dewatering projects in ULARA to the 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 Watermaster's office (Appendix H).

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* The purpose and function of the ULARA Policies and Procedures is to provide guidelines regarding decreed rights of parties set forth in the Final Judgment.

A new section that was added to the Policies and Procedures provides for overextractions from the Verdugo Basin for the Crescenta Valley Country Water District (CVCWD) 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, accumulatively not to exceed 1,000 ac-ft 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 ceased. Appendix E has this new section of the Policies and Procedures (section 2.8) which was approved on April 20, 1992.

Under the Judgment, Walt Disney Pictures and Television (Disney) - (Defendant No. 105) operates under a separate stipulation (filed on May 11, 1961 and merged into the San Fernando Judgment filed January 26, 1979) whereby groundwater extracted for cooling water is discharged into the channel of the Los Angeles River (LAR) 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 groundwater storage. As the operation of the rubber dam was discontinued because of quality concerns by the California Department of Health Services, the water discharged by Disney is presently considered flowing to the ocean and being wasted. A number of meetings and letters between the Watermaster and parties have occurred in an attempt to resolve this matter. As a result of these meetings a solution to the problem has been obtained. In Disney's letters of December 13, 1990 and May 1, 1992 they have indicated that their present use of groundwater will be discontinued within the very near future. Also, the continued use of the 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 and Disney's water released to the LAR, to recharge the San Fernando Basin began June 17, 1991. Refer to Appendix J for the details of this project. This could eliminate the concern of Disney's pumped groundwater, which now flows to the ocean and is considered wasted water.

Under the Judgment, CalMat (Defendant No. 18) was assigned rights to pump, with the understanding that their use of 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 groundwater to a separate area for recharge. If done properly, on a continuous basis, such an approach is acceptable. This plan has now been implemented, with further confirmation reflected in CalMat's letter of July 31, 1991.

The Environmental Protection Agency (EPA) is overseeing a basin-wide remedial investigation being conducted by the Los Angeles Department of Water and Power (LADWP), to study the groundwater flow patterns and the nature and extent of groundwater contamination within the eastern half of the San Fernando Valley Basin. The work regarding this investigation has made considerable progress, as reflected in the water quality section of this report. The ULARA Watermaster, consultant and staff are very involved in the implementation of these studies.

The EPA signed a cooperative agreement with LADWP in July 1987 allowing Los Angeles to receive federal money to define the extent of groundwater contamination in four National Priority List (NPL) or Superfund sites. Fact Sheet No. 5 (Appendix I) provides background and the status of the Superfund cleanup studies for the San Fernando Valley.

As part of the San Fernando Valley Superfund Project, the EPA completed a report in March 1991 defining the water rights and water use options in the San Fernando Valley. The ULARA Watermaster and staff were involved in the preparation and approval of this report. In addition, two other reports dealing with the management of the San Fernando Valley were drafted for review (November 1991 and January 1992) and will be approved in the near future. The ULARA Watermaster and staff are working closely with EPA and LADWP on completion of these reports.

In April 1991, the ULARA Watermaster and parties were informed that the Burbank Operable Unit Consent Decree was signed by the EPA - Region IX, Regional Administrator, and representatives of Lockheed, Weber Aircraft and the City of Burbank. This will provide financial support for the on-going Superfund studies and cleanup. The final Consent Decree was approved on March 25, 1992.

LADWP proposes to construct and operate a project referred to as the East Valley Water Reclamation Project (EVWRP). The EVWRP will be located in the northeast portion of the San Fernando Valley. The purpose of the project is to use reclaimed municipal wastewater produced by the Tillman Water Reclamation Plant. Reclaimed water now being discharged into the LAR will be utilized for groundwater recharge, irrigation and industrial users. A Final Environmental Impact Report (EIR) on this project was completed in July 1991.

As described previously, a pilot project to investigate the feasibility of using LAR water to recharge the San Fernando Basin is in progress. The LAR water is planned to be spread at the HSG. All the necessary permits from the LARWQCB have been secured with spreading began on June 17, 1991. The pilot project plans to spread 1 cubic foot per second (cfs) with extractions to recover up to 1.5 cfs.

In dealing with the amount of stored groundwater, change in groundwater storage and the groundwater contours for the ULARA, a number of new monitoring wells will be required in the near future. These test wells will provide more control on the status of water levels and underflow conditions required by the Judgment. In the Superfund work a number of Vertical Profile Borings (VPB - test holes) have been installed at various depths. This may require a re-evaluation of the change in groundwater storage in the future, after a better knowledge of the true water table is available.

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
Senior Waterworks Engineer
and ULARA Watermaster
(Reg. C.E. No. 12863)

TABLE OF CONTENTS

APPENDICES

TABLES

FIGURES

PLATES

ULARA WATERMASTER REPORT

FOR WATER YEAR 1990-91

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I. INTRODUCTION

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 2). 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 (Plate 2).

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 in ULARA, 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.

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 on June 11, 1958 an "Order of Reference to State Water Rights Board to Investigate and Report upon the Physical Facts (Section 2001, Water Code)."

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 groundwater 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, or imported, etc. Said Report of Referee served as the principal basis for geological and hydrological facts for the original Trial Court Judgment in 1968 and Decision of the Supreme Court in 1975 (14 Cal 3d 199, 123 Cal Rept 1) and the Trial Court 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 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 MD 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, 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 a physical solution 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 letters 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 shall be limited in their pumping to bring the total pumping within the safe yield of the basin, less any rights exercised by the private parties.

On April 30, 1985, Judge Vernon G. Foster replaced Judge Hupp as Judge of Record for the San Fernando Judgment. On January 16, 1990, this case was assigned to Judge Miriam Vogel. On May 25, 1990, Judge Sally Disco replaced Judge Vogel, on April 16, 1991, Judge Jerold A. Krieger replaced Judge Disco, and on December, 1991 Judge Gary Klausner of Department 64 replaced Judge Krieger. Judge Klausner retains the authority to oversee and implement the Judgment.

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 water which, under the Judgment, is evaluated to be 43,660 acre-feet per year.

Imported Return Water. Los Angeles, Glendale, and Burbank each have a right to extract from the San Fernando Basin the following amounts:

Los Angeles:	20.8 percent of all delivered water (including reclaimed water) to valley fill lands of San Fernando Basin.
Burbank:	20.0 percent of all delivered water (including reclaimed water) to San Fernando Basin and its tributary hill and mountain areas.
Glendale:	20.0 percent of all delivered water (including reclaimed water) to San Fernando Basin and its tributary hill and mountain areas (i.e., total delivered water [including reclaimed water] less 105 percent of total sales by Glendale in 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 parties and their maximum physical solution quantities are as follows:

As to Los Angeles' Water:

Glendale	5,500 acre-feet per year
Burbank	4,200 acre-feet per year
Van de Kamp	120 acre-feet per year
Toluca Lake	100 acre-feet per year
Sportsmen's Lodge	25 acre-feet per year

As to Glendale's Water:

Forest Lawn	400 acre-feet per year
Environmentals Inc.	75 acre-feet per year

As to Burbank's Water:

Valhalla	300 acre-feet per year
Lockheed	25 acre-feet per year

Stored Water. Los Angeles, Glendale, and Burbank each have rights to store water in the San Fernando Basin and the right to extract equivalent amounts.

Sylmar Basin

Native and Imported Return Water. San Fernando and Los Angeles were assigned equal rights to pump the safe yield of the basin (6,210 acre-feet), after subtracting the overlying pumping of two private parties. Thus, Los Angeles and San Fernando are each allowed to pump approximately 3,105 acre-feet per year. 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 1992 are those of Meurer Engineering.

Stored Water. Los Angeles and San Fernando each have a right to store water in the Sylmar Basin and the right to extract equivalent amounts.

Verdugo Basin

Glendale and Crescenta Valley own water 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 has the right to extract or cause to be extracted the recharge to the basin.

Physical Solution Water. Sparkletts and Deep Rock have physical solution rights to extract water from Eagle Rock Basin.

Watermaster Service

In preparing the 1990-91 annual report, the Watermaster collected and reported all information affecting and relating to the water supply and disposal within ULARA. Such information includes the following items:

1. Water supply
    a. Precipitation and runoff
    b. Imports and exports

2. Water use and disposal

   a. Extractions

      (1) Used in valley fill area

      (2) Exported from each basin

   b. Water outflow

      (1) Surface

      (2) Subsurface

      (3) Sewers

3. Water levels

4. Water quality

5. Ownership and location of new wells

Administrative Committee

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 September 30, 1991, are:

City of Burbank

Fred Lantz (President)

Ross Burke (Alternate)

City of Glendale

Michael Hopkins (Vice-President)

Donald Froelich (Alternate)

City of Los Angeles

Dennis C. Williams

Donald G. McBride (Alternate)

City of San Fernando

Michael Drake

Harold Tighe (CO-Alternate)

Jerry Wedding (CO-Alternate)

Crescenta Valley County Water District

Robert K. Argenio

Ray Marsden (Alternate)

Private Parties

Charles Meurer

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 with the Watermaster the proposed annual report. During the 1990-91 water year, the Administrative Committee met on April 25, 1991. The following items were discussed at the April 25 meeting.

1. Amount of Groundwater Stored in San Fernando Basin.
2. Status of Groundwater Quality Studies in the San Fernando Valley.
   a) North Hollywood/Burbank Aeration Tower Facility
   b) Well Packer Project
   c) Superfund Study - Status
   d) Underground Tank Leakage Problems
   e) San Fernando Groundwater Quality Study - ICC Committee
   f) AB 1803 - Programs on Water Quality Monitoring - Status
   g) SWAT Reports - Status
3. Verdugo Basin / Groundwater Conditions and Future Pumping Amounts.
4. Pumping by Non-Parties for a Special Need..
5. Overall Problems and Concerns of ULARA Watermaster.
6. Approval of the 1989-90 Watermaster Report.

Summary of 1990-91 Operating Conditions

Table 1 compares statistics for this period of record and the prior water year.

Rainfall on the valley fill area was 86 percent of normal as compared to 49 percent of normal the year before. Surface runoff leaving the valley at Gage F-57C-R for 1990-91 was 196,629 acre-feet. The amount spread by the LACDPW in its spreading basins in 1990-91 was 18,666 acre-feet, an increase from 4,154 acre-feet spread in 1989-90. Total precipitation falling on the San Fernando Valley and its tributary hill and mountain areas was estimated to be 473,190 acre-feet for the 1990-91 water year. Of this total, approximately 117,581 acre-feet flowed from the valley as storm runoff and rising ground water, leaving 361,983 acre-feet which was consumed or recharged within the area (75 percent of the total).

Ground water extractions decreased in the Sylmar, Verdugo, and San Fernando Basins and increased in the Eagle Rock Basin during 1990-91. Total ULARA extractions amounted to 85,653 acre-feet. Of this total 3,477 acre-feet represents non-consumptive use pumping (see Table 13). Extractions used within ULARA increased by 4,129 acre-feet from last year.

For ULARA, gross imports decreased by 137,053 acre-feet, (Table 1, Item 6), while imports used within ULARA also decreased by 67,256 acre-feet. Pass-through of Owens River water increased by 24,586 acre-feet (Table 1, Item 7). The total amount delivered to water used within ULARA decreased by 61,931 acre-feet, or 17 percent mainly due to mandatory conservation efforts.

Sewage export was estimated at 160,000 acre-feet in 1990-91, a decrease of 9 percent. Total reclaimed water used in ULARA (cooling towers, irrigation, etc.) increased 4,999 acre-feet. The total water reclaimed decreased from 75,824 acre-feet to 73,185 acre-feet, a decrease of almost 3 percent. This slight decrease is due to the exclusion, from this year's report, of Las Virgenes Municipal Water District's treated reclaimed water since the treatment facility is outside ULARA boundries. For a more details see Table 7. Most of the reclaimed water is discharged to the Los Angeles River.

A total of 18,666 acre-feet of native water was spread during 1990-91 (no Owens River water spread).This represents an increase of 14,512 acre-feet from last year.

Ground water storage in the San Fernando, Sylmar, and Verdugo Basins decreased by an estimated 8,740 acre-feet , 124 acre-feet and 5,755 acre-feet respectively during 1990-91, as compared with 1989-90.

Summary of Allowable Pumping for 1991-92

Table 2 gives a summary of allowable pumping for the Cities of Los Angeles, Burbank, Glendale, and San Fernando, and Crescenta Valley County Water District. Stored water is also shown as a credit for these parties as of October 1, 1991.

TABLE 1

UPPER LOS ANGELES RIVER AREA
SUMMARY OF OPERATING CONDITIONS
1989-90 AND 1990-91

Item	Water Year 1989-90		Water Year 1990-91	
1. Active pumpers	25		28	(a)
2. Inactive pumpers (parties within valley fill)	2		2	
3. Valley rainfall, in inches	8.20		14.38	
4. Spreading operations, in acre-feet(b)				
a. LACDPW	4,154		18,666	
b. Los Angeles, City of	0		52	
5. Extractions, in acre-feet				
a. Used in ULARA	16,443		20,572	
b. Exported from ULARA	80,246		65,081	
Total	96,689		85,653	
6. Gross imports, in acre-feet				
a. MWD water	485,609		293,686	
b. Owens River water(c)	145,507		200,377	
Total	631,116		494,063	
7. Exports in acre-feet				
a. Owens River water	75,489		100,075	
b. MWD water (f)	210,706		116,323	
c. Groundwater by Los Angeles	80,041		64,595	
Total	366,236		280,993	
8. Imports used in ULARA, in acre-feet	344,921		277,665	
9. Reclaimed water, in acre-feet	75,824		73,185	
a. Used in ULARA	4,195		5,392	
b. Discharged in Los Angeles River	67,384		61,030	
10. Total delivered water used in ULARA in acre-feet	365,559		303,629	
11. Sewer export, in acre-feet (d)	175,000	(e)	160,000	(e)

(a) Active pumpers include party and non-party members. Increase is due to G. W. cleanup and dewatering activities.

(b) Breakdown of spreading operations as to sources of water is shown in Table 6. Values include native and imported water.

(c) This value represents the summation of the gross amount of water delivered to customers in the ULARA. It does not include operational releases, reservoir evaporation, and water spread during the year. A portion of the water (7a) is passed though ULARA and is considered an export.

(d) Total of sewage outflow from all four basins, including reclaimed water which is discharged into flood control channel and flows out of the basin.

(e) Estimated flow.

(f) MWD water now entering ULARA Basin through two new connections, LA 35-T and LA-25, that blends Aqueduct water with MWD water throughout the Basin.

TABLE 2

SUMMARY OF ALLOWABLE PUMPING FOR ENSUING YEAR 1991-92

(In Acre-Feet)

	Extractions			Stored Water Credit (a)
	Native	Import Credit	Total	
San Fernando Basin				
Los Angeles	43,660	37,581	81,241	185,239
Burbank	--	4,049	4,049	48,859
Glendale	--	4,488	4,488	32,569
Sylmar Basin				
Los Angeles	--	--	3105(b)	102
San Fernando	--	--	3105(b)	1,413
Verdugo Basin				
Crescenta	--	--	3294(c)	--
Glendale	--	--	3856(c)	--

Note: Calculation of these values shown in more detail in Tables 14, 15, and 16.

(a) As of October 1, 1991.

(b) Based on stipulation and order amending the judgment - filed on March 22, 1984 in the L. A. Superior Court.

(c) Based on Judgment entered on January 26, 1979 - Section 5.1.3.2.

II. WATER SUPPLY CONDITIONS

The present water supply of ULARA consists of ground water recharge from imported water, hill and mountain runoff, and direct precipitation on the valley floor area. This includes runoff from precipitation falling on portions of the San Gabriel, Verdugo, Santa Monica, and Santa Susana Mountains; imports from the Mono Basin-Owens River system; imports from the Metropolitan Water District (MWD) sources from the Colorado River; and Northern California imports made available by the State Water Project; and reclaimed water.

Precipitation

ULARA has the climate of an interior valley and is hotter in summer and wetter in the winter than the coastal areas.

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 1990-91 water year experienced below average rainfall. The valley floor received 14.38 inches of rain, whereas the mountains received approximately 19.02 inches. The weighted average of both valley and mountain areas was 17.24 inches, an increase of 7.69 inches from last year. The 100-year (1881-1981) average precipitation for the valley and mountains is 16.48 inches and 21.91 inches, respectively. Table 3 presents a record of rainfall at 17 key precipitation stations, the same as those which were used to develop the 100-year average rainfall as described in the Report of Referee, dated July 1962.

In the safe yield evaluation, precipitation on the valley was determined separately from that on the hills and mountains. The valley is made up of the four ground water basins, whereas the hills and mountains comprise the remaining areas in ULARA. Precipitation in the hills and mountains was evaluated to relate the runoff from the watersheds of Big Tujunga, Pacoima Creek, and Sycamore Canyon to the runoff records which are included in this report and also to calculate the ground water recharge. See Plate 5 for location of precipitation stations.

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, in turn, 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 is maintained throughout ULARA, either by 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.

TABLE 3

PRECIPITATION (a)
(INCHES)

LACDPW Number	Name	(1881-1981) 100-Year Mean	1989-90 Precipitation	1990-91 Precipitation	1990-91 Percent of 100-Year Mean
11D	Upper Franklin Canyon Reservoir	18.50	8.56	12.38	67
13C(b)	Hollywood-Blix	16.63	7.76	16.21	97
15A(b)	Van Nuys	15.30	8.49	8.49	55
17	Sepulveda Canyon-Mulholland Highway	19.82	11.20	19.10	96
21B(b)	Woodland Hills	14.60	7.36	14.81	101
23B-E(b)	Chatsworth Reservoir	15.19	6.13	11.61	76
25C(b)	Northridge-LADWP	15.16	7.60	11.90	78
33A-E	Pacoima Dam	19.64	9.80	14.19	72
47D	Clear Creek - City School	33.01	13.63 (i)	31.40	95
53D	Colby's Ranch	29.04	11.10	24.00	83
54C	Loomis Ranch-Alder Creek	18.62	9.05	18.90	102
251C(b)	La Crescenta	23.31	12.43	21.27	91
293E(b)	Los Angeles Reservoir	17.32	8.26	14.07	81
797	DeSoto Reservoir (c)	18.70 (f)	6.30 (j)	12.91	69
1081B	Glendale-Gregg (d)	18.13 (g)	11.50 (k)	19.09	105
1087(b)	Green Verdugo Pumping Plant (e)	14.98 (h)	7.28 (l)	13.92	93
1190	Pacoima Canyon-North Park Ranger Station	23.06	12.95	19.97	87

Weighted average for valley stations - 14.38 inches (1990-91)
Weighted average for mountain stations - 19.02 inches (1990-91)

(a) Data furnished by Los Angeles County Department of Public Works (LACDPW)
(b) Valley Stations
(c) Substituted for Station 259D due to incomplete rain data.
(d) Substituted for Station 210B due to incomplete rain data.
(e) Substituted for Station 14C due to incomplete rain data.

(f) 100-Year Mean for station 259D
(g) 100-Year Mean for station 210B
(h) 100-Year Mean for station 14C

(i) Precipitation data for station 46D
(j) Precipitation data for station 259D
(k) Precipitation data for station 210B
(l) Precipitation data for station 14C

Table 4 summarizes the monthly runoff for these gaging stations and compares the 1989-90 water year with the 1990-91 year. The larger runoff in 1990-91 reflects higher rainfall than 1989-90 in the valley and in the mountains.

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

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

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.

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 through) from Sepulveda Dam, which may include extractions from Reseda wells.

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.

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

The locations of these key gaging stations are shown on Plate 21. The mean daily discharge rates for these six gaging stations during 1990-91 are summarized in Appendix B.

The Watermaster has computed the surface flow of the Los Angeles River at Gaging Station F-57C-R as to the sources, i.e. storm runoff from precipitation, Owens River water, rising ground water, and industrial and reclaimed wastewater discharges. The Watermaster utilized the procedures outlined in the Report of Referee (Volume II, Appendix O) for estimating the approximate flow rates and sources of water passing Gaging Station F-57C-R. A similar calculation was made for Station F-252-R. A summary of the procedures used follows, and a tabulation of the computed flows is shown in Table 5.

The base low flows were separated from the surface runoff by the use of the hydrographs of Station F-57C-R. Base flows consist of rising ground water and industrial waste plus reclaimed water. Separation of base flow from surface runoff is based on the following assumptions:

TABLE 4

MONTHLY RUNOFF AT SELECTED GAGING STATIONS(a)
(In Acre-Feet)

Station	Water Year	Month												
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Total
F-57C-R	1989-90(b)	15811	16647	10584	22520	28501	9755	15306	13600	8085	7746	9618	9466	167,639
Los Angeles River	1990-91(b)	6545	12539	6217	12345	39193	77777	6535	6116	6192	6716	8074	8380	196,629
F-252-R	1989-90	197	390	156	1247	1284	90	203	315	47	71	48	72	4,120
Verdugo	1990-91(c)	82	503	90	497	2109	4311	136	87	65	64	39	39	8,022
E-285-R	1989-90	436	523	448	910	1334	679	633	589	497	452	451	306	7,258
Burbank Storm Drain	1990-91	405	1158	456	2057	1515	333	119	137	418	423	504	617	8,142
F-300-R	1989-90	4917	4975	4195	9331	11623	4460	4952	5402	4016	4441	5080	4297	67,689
L.A. River Tujunga Ave.	1990-91	3829	4473	3736	7306	14171	29549	4105	4105	3837	3182	1667	2424	82,384
F-168-R	1989-90	29	69	50	354	409	211	1960	35	27	0	0	0	3,144
Big Tujunga Dam	1990-91	0	311	0	336	502	6560	2800	761	582	241	69	1	12,163
118B-R	1989-90	4	0	0	60	0	0	0	611	0	0	0	0	675
Pacoima Dam	1990-91	0	0	0	0	0	4663	13167	8554	0	18	0	0	26,402

(a) See Plate 21 for gaging station locations.

(b) Corps of Engineers Data, County of Los Angeles Data not complete.

(c) Data not availible for the month of September. Since climatic conditions were the same as August, use August data for approximation.

TABLE 5

SEPARATION OF SURFACE FLOW AT STATIONS F-57C-R AND F-252-R

(In Acre-Feet)

Period	Base Low Flow: Rising Groundwater (a)	Base Low Flow: Waste Discharge	Storm Runoff	Total Measured Outflow
Station F57C-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 (d)	16,500 (d)	(b)	(b)
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 (d)	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	110 *	64,125	19,060	83,295
1987-88	210 *	81,920	74,074	156,204 (d)
1988-89	288 *	80,020	56,535	136,843 (d)
1989-90	6,335 *	76,789	55,811	167,639 (e)
1990-91	3,203	75,647	117,779	196,629 (e)
29-year average				
1929-57	6,810	770	30,790	39,950
Station F252 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	(b)	(b)
1979-80	5,150 (c)	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 (d)	0	(b)	(b)
1984-85	2,710	0	3,970	6,680
1985-86	2,470	0	6,270	8,740
1986-87	2,100 (d)	0	1,690 (d)	3,790 (d)
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

(a) Includes rising water past rubber dam at Headworks Spreading Grounds, Verdugo Channel, and the Los Angeles River Narrows.

(b) Data not available. .

(c) Verdugo Basin. Large increase in 1979-80 is probably due to a change in the method of measurement. which does not affect ULARA Basin outflow.

(d) Estimated.

(e) Used Corps of Engineers data, County of Los Angeles data not complete.

(*) These values are being re-evaluated.

TABLE 5a

1990 - 91
EVALUATION OF BASE FLOW @ GAGE F-57

	AC - FT												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1. TOTAL FLOW @ GAGE F-57 *	6545	12539	6217	12345	39193	77777	6535	6116	6192	6716	8074	8380	196629
2. STORM FLOW @ GAGE F-57	0	5571	0	4259	32174	70915	53	0	0	729	2010	2068	117779
3. BASE FLOW @ GAGE F-57 (1.-2.)	6545	6968	6217	8086	7019	6862	6482	6116	6192	5987	6064	6312	78850
4. WASTE DISCHARGE													
a. BURBANK WESTERN WASH @ F-285	405	1158	456	2057	1515	333	119	137	418	423	504	617	8142
b. LA - GLENDALE W. R. P.	1381	1252	1180	1494	1315	1570	1489	923	985	1085	1027	1059	14760
c. TILLMAN W. R. P.	3868	3710	3843	3330	2947	3596	3530	3910	3811	3663	3672	3821	43701
d. WASTE DISCHARGE ABOVE RUBBER DAM ASSUMED (1CFS)	61	59	61	61	57	61	59	61	59	61	61	59	720
e. DISNEY DISCHARGE	209	195	115	91	251	157	209	305	346	153	226	186	2443
f. ACCUMULATION OF ALL DEWATERING AND CLEANUP PUMPING	112	74	44	5	5	8	77	76	72	111	105	115	804
g. INDUSTRIAL WASTE R. D. TO F-57 ASSUMED (7CFS)	430	416	430	430	403	430	416	430	416	430	430	416	5077
h. TOTAL (a+b+c+d+e+f+g)	6466	6864	6129	7468	6493	6155	5899	5842	6107	5926	6025	6273	75647
5. BASE FLOW LESS WASTE DISCHARGE (3.-4h.)	79	104	88	618	526	707	583	274	85	61	39	39	3203
6. TOTAL RISING WATER @ GAGE F-57**													
a. BASE FLOW @ F-300	0	0	0	500	406	500	457	195	26	0	0	0	2084
b. DEWATERING AND CLEANUP PUMPING	0	0	0	5	5	8	7	7	6	0	0	0	38
c. BASE FLOW @ F-252	79	104	88	123	125	215	133	86	65	61	39	39	1157
d. PERCOLATION ***	0	0	0	0	0	0	0	0	0	0	0	0	0
e. TOTAL (a-b+c-d)	79	104	88	618	526	707	583	274	85	61	39	39	3203

ITEM (6a) REAL BASE FLOW IS TOTAL BASE FLOW - ITEM 4c.

* TOTAL MEASURED FLOW ADJUSTED TO REFLECT NON-STORM CONDITIONS

** TOTAL RISING WATER @ F-57 GAGE = F-300 BASE FLOW + GAGE F-252 BASE FLOW - NARROWS PERCOLATION

*** DUE TO HIGH GROUNDWATER, PERCOLATION IS CONSIDERED ZERO.

Rising ground water equals base low flow minus the sum of industrial discharge water and reclaimed water. Industrial discharge waters are estimated from City of Los Angeles waste permits, Los Angeles-Glendale and Tillman reclamation plant discharges, and low flows in the Burbank-Western storm drain which include wastewater from the Burbank reclamation plant.

Historically the City of Los Angeles diverts water at the Headworks spreading grounds. However, the operation of the diversion structure (rubber dam) was discontinued in 1982 because of quality concerns by the State Department of Health Services. A pilot program is underway to see if these diversions can be re-initiated.

Historically, the surface runoff obtained from the hydrographs of Station F-57C-R consisted primarily of storm runoff and Owens River water. The last releases of Owens River water into the Los Angeles River occurred in February 1971 due to the San Fernando earthquake. Releases in the future are expected to be minimal, but if they do occur, separation of surface runoff will be based on the following assumptions:

Net storm runoff equals surface runoff minus Owens River water.

If the Headworks diversion structure is used, all releases of Owens River waters are diverted to the Headworks spreading grounds. If the Headworks diversion structure does not divert water, all releases of Owens River waters are considered as passing Station F-57C-R.

Ground Water Recharge

Local precipitation can have a marked influence on the ground water supply and water in storage. However, there is a wide variation in the annual amount of runoff as a result of changes in both precipitation and increases in impermeable areas.

Urban development during the past years in ULARA has resulted in much of the rainfall being collected and routed into paved channels which discharge into the Los Angeles River and thence flows out of the basin and to the ocean.

To offset partially the increased runoff due to urbanization, Pacoima and Hansen Dams, originally built for flood protection, are utilized to regulate storm flows and allow recapture of the flow in downstream spreading basins operated by LACDPW, as well as the City of Los Angeles. Operation of Hansen Dam for the purpose of spreading water for recharge continues to be a problem because of the sediment that has accumulated upstream of the dam.

LACDPW operates the Branford, Hansen, Lopez, and Pacoima spreading grounds. LACDPW in cooperation with The City of Los Angeles, operates the Tujunga spreading grounds and The City of Los Angeles, operates Headworks spreading grounds. Plate 2 shows the locations of these spreading basins. The spreading grounds operated by LACDPW are utilized for spreading native water, and imported water under agreements. The Headworks spreading grounds are currently being used as a pilot project in spreading of Los Angeles River

water, which contains treated municipal wastewaters. Table 6 summarizes the spreading operations for the 1990-91 water year.

Ground Water Table Elevations

During the 1990-91 water year, the Watermaster collected and processed data to determine prevailing ground water conditions during the spring and fall of 1991. Plates 7 and 8 show ground water contours for these two seasons. Changes in water surface elevation from the fall of 1990 to the fall of 1991 are shown on Plate 9. The drop in water levels in the North Hollywood area is related to the increase in pumping in the North Hollywood production wells. The rise in water levels in the Rinaldi-Toluca area is related to the decrease in pumping in the Rinaldi-Toluca production wells. 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 1990-91 (11,489 acre-feet Table 6) as compared with 1989-90 (2,029 acre-feet). On Plate 10 is a diagrammatic sketch of flow directions and estimated ground water velocities in the San Fernando Basin. On Figures 1 and 2 are shown fluctuations of water levels in wells whose locations are shown in the inset map on Figure 2.

Water Reclamation

Water reclamation presently provides a source of water for irrigation, industrial and recreational uses, and ground water recharge in the unlined section of the Los Angeles River. Six wastewater reclamation plants are in operation in ULARA. Las Virgenes Municipal Water District (LVMWD) operates a water reclamation facility outside the ULARA Basin but releases part of the treated water into the ULARA Basin. A tabulation of operating water reclamation plants is shown on Table 7. Their locations are shown on Plate 2. Presently the East Valley Water Reclamation Project (EVWRP) is under study, which envisions the use of up to 50,000 AF/YR of reclaimed water from the Tillman Plant for landscaping and other non-potable uses, as well as for groundwater recharge

Water Quality

Water resources management must take into account water quality as well as water supply. The total dissolved solids (TDS) concentration in water is the quality indicator that is generally used. A comparison of the TDS content in the various water sources is shown in Figure 3. Representative mineral analyses of imported, surface, and ground waters are contained in Table 8. During the drought conditions the Regional Board expressed concern about increasing chlorides in effluent from the water reclamation plants. An investigation revealed two causes for this: (1) increasing chlorides in delivered water, especially from the State Water Project, and (2) decreasing dilution related to voluntary and mandatory water conservation.

TABLE 6

1990-91
SPREADING OPERATIONS
(In Acre-Feet)

Month	Native Water Spread by Los Angeles County Department of Public Works							Water Spread by City of Los Angeles Department of Water & Power		Total San Fernando Basin Spreading
	Spreading Basins							Spreading Basins		
	Branford	Hansen	Lopez	Native	Pacoima Owens River	MWD	Tujunga Native	Tujunga Owens River	Headworks	
Oct.	0	44	0	0	0	0	0	0	0	44
Nov.	27	166	0	0	0	0	0	0	0	193
Dec.	2	90	0	0	0	0	0	0	0	92
Jan.	82	141	0	260	0	504 (a)	0	0	0	987
Feb.	89	439	0	175	0	0	321	0	0	1024
Mar.	302	4,920	1	974	0	0	1,391	0	0	7588
Apr.	2	3,680	223	1,120	0	0	0	0	0	5025
May	1	1,010	17	907	0	0	0	0	0	1935
June	0	181	0	0	0	0	760	0	0	941
July	2	289	0	0	0	0	15	0	24	330
Aug.	2	253	0	0	0	0	0	0	14	269
Sept.	0	276	0	0	0	0	0	0	14	290
Totals	509	11,489	241	3,436	0	504	2,487	0	52	18,718

(a) City of Burbank spreading of MWD water in the Pacoima Spreading Grounds.

FIGURE 1

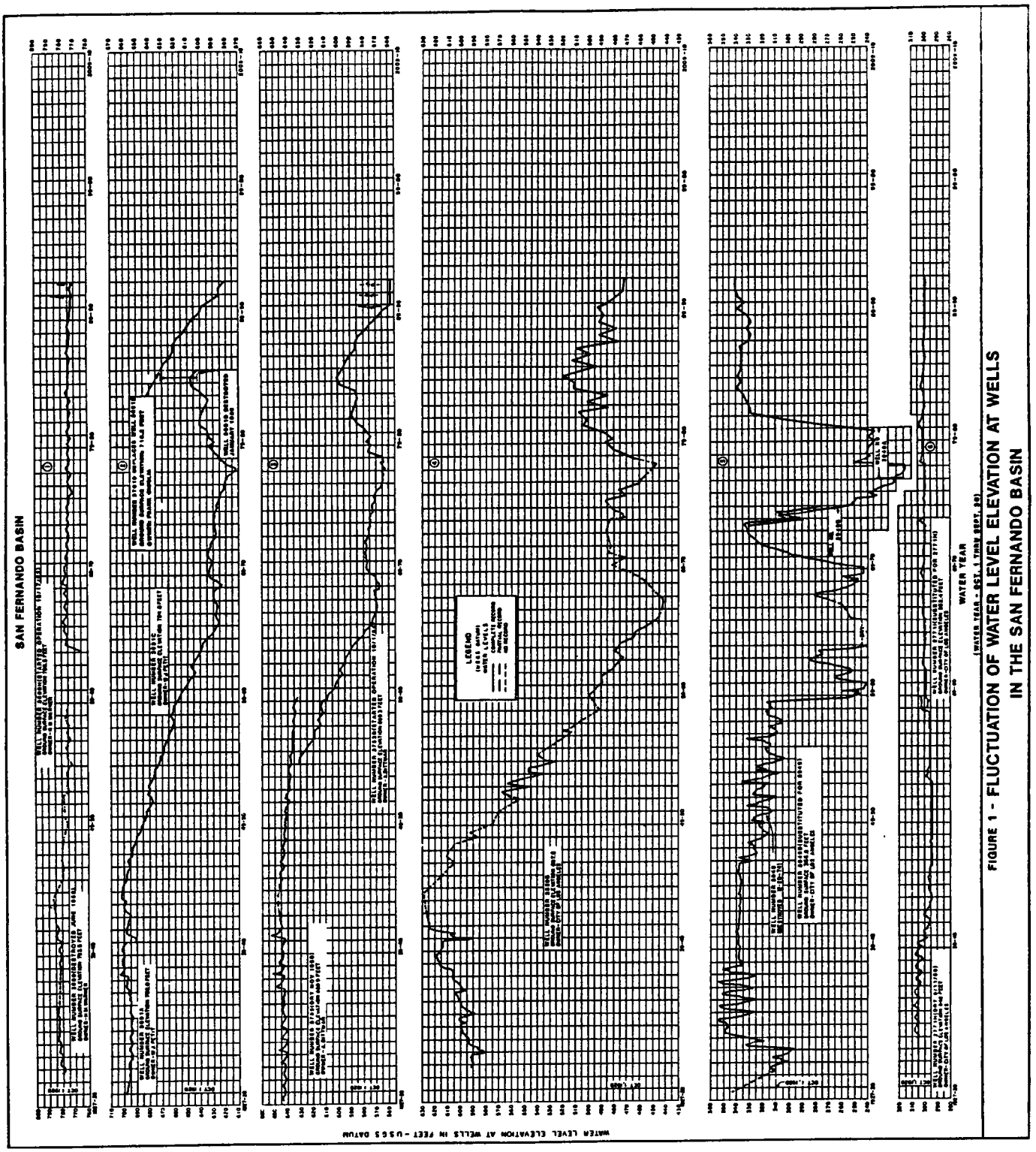


FIGURE 1 - FLUCTUATION OF WATER LEVEL ELEVATION AT WELLS IN THE SAN FERNANDO BASIN

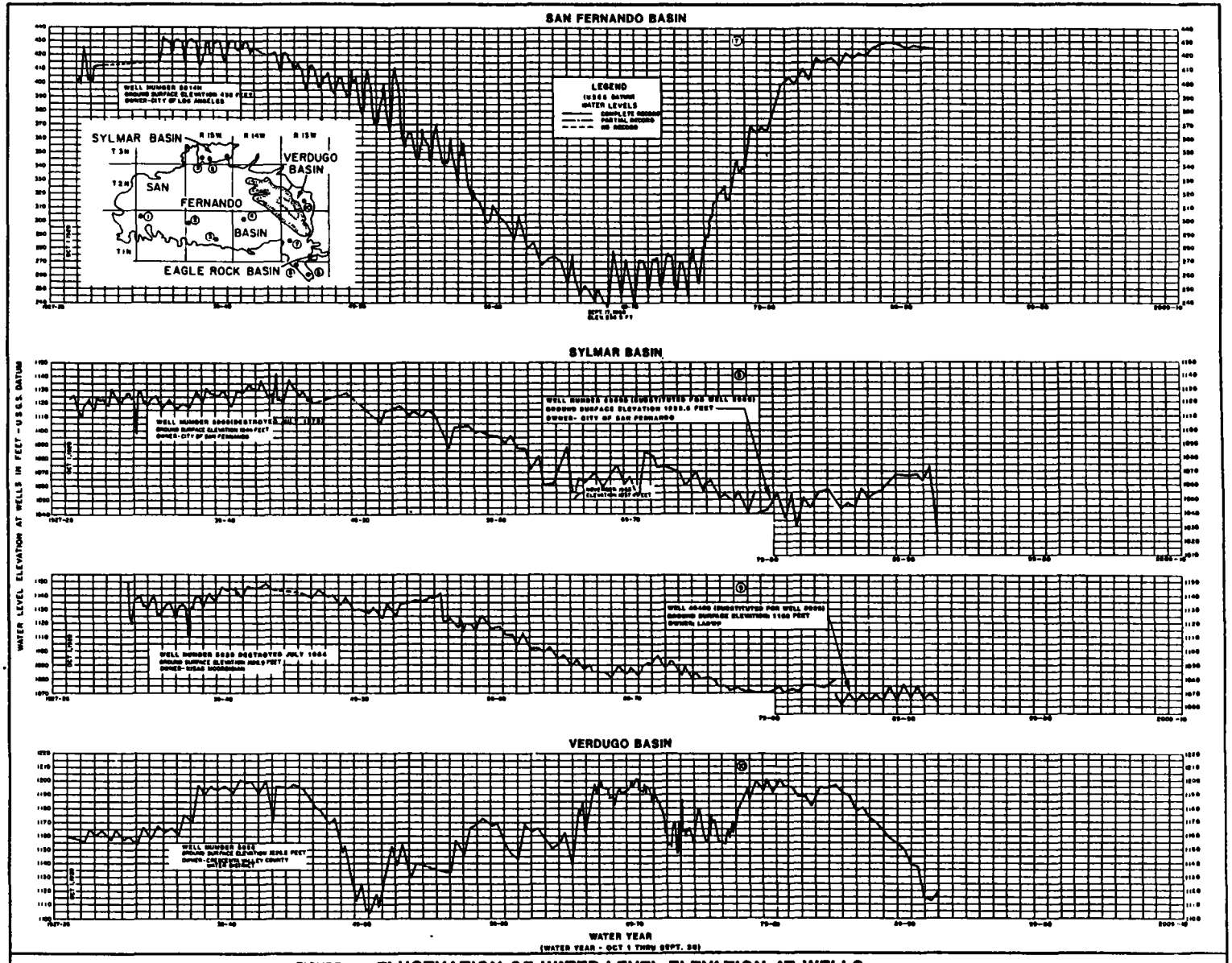


FIGURE 2 - FLUCTUATION OF WATER LEVEL ELEVATION AT WELLS IN THE SAN FERNANDO, SYLMAR AND VERDUGO BASINS

FIGURE 2

TABLE 7

WATER RECLAMATION PLANTS, 1990-91
(In Acre-Feet)

Plant	Treated	Used in ULARA		Discharged to Los Angeles River	Discharged to Hyperion Treatment Plant
San Fernando Basin					
City of Burbank	2,783	1,235	(a)	2,569	0
Los Angeles-Glendale	20,604	2,356	(b)	14,760	3,488
Donald C. Tillman	49,738	616	(c)	43,701	5,421
Indian Hills Mobile Homes(d)	20	20	(e)	0	0
Rocketdyne (Santa Susana Field Laboratory)	20	20		0	0
The Independent Order of Foresters(f)	20	20	(e)	0	0
Las Virgenes Municipal Water District	(g)	1,125		0	1,125
Total	73,185	5,392		61,030	10,034

(a) Total water delivered (1134 AF) to the power plant in Burbank for cooling water includes 50 percent evaporation and the rest is discharged to the Burbank western channel at the power plant; 101 AF used by Cal/Trans for freeway landscape irrigation.

(b) Total water delivered (320 AF) to the phosphate plant in Glendale for cooling water includes 50 percent evaporation and the rest to the Los Angeles River; 2,023 AF delivered to Griffith Park by City of Los Angeles for irrigation and to Los Angeles-Glendale plant for wash down, cooling, and irrigation; 12 AF used by Cal/Trans for freeway landscape irrigation.

(c) Water used for in plant use.

(d) Water supply from nearby well.

(e) Land irrigation

(f) Water supply from pipeline from LADWP.

(g) Reclamation plant outside of ULARA Basin treated a total of 7,638 AF of reclaimed water, part of which treated water used within ULARA drainage.

TABLE 8
REPRESENTATIVE MINERAL ANALYSIS OF WATER

Well Number or Source	Date Sampled	MINERAL CONSTITUENTS IN milligrams per liter (mg/l)														
		10^6 EC at 25 °C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B	(TDS) Total Dissolved Solids mg/l	(TH) Total Hardness as $CaCO_3$ mg/l
Imported Water																
Colorado River Water at Eagle Rock Reservoir	90-91	907	7.99	60	25.5	87	4.2	0	141	195	93	1.1	0.2	0.22	548	255
Los Angeles Aqueduct Filtration Plant Effluent	3/25/91	408	9.09	27.2	9.8	448	-	-	-	34	110	0.02	0.66	-	256	108
Los Angeles Aqueduct Filtration Plant Influent	3/25/91	399	8.4	24	9.8	32.8	-	-	-	35	110	<0.0	65	-	254	100
State Water Project at Joseph Jensen Filtration Plant (Influent)	90-91	623	7.81	25	16	71	3.7	0	98	50	107	2.4	0.14	0.27	339	127
Surface Water																
Donald C. Tillman Reclamation Plant Discharge to Los Angeles River	Aug-91	-	7	32	15	150	14	-	-	136	120	2.5	0.7	0.8	557	142
Burbank Western Wash at Los Angeles River	87-88	1163	7.9	46	21	152	13	3	162	171	146	20	-	0.54	757	202
Los Angeles-Glendale Reclamation Plant Discharge to Los Angeles River	90-91	-	7.2	42	17	152	15	-	-	164	179	2.83	-	0.8	694	176
Groundwater																
(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 (c) (No. Hollywood No. 11)	3/17/91	513	8.25	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	180
3913H (Grandview No. 16)	06/14/89	520	7.8	194	12.4	36.1	3.3	0.85	212	56	21	11.4	0.47	-	320	194
(San Fernando Basin - L.A. Narrows)																
3959E (Pollock No. 4) (a)	07/27/89	834	7.46	81	25	53	2.9	0	229	115	63	35	0.38	NA	529	302
(Sylmar Basin)																
4840J (Mission No. 5)	08/31/89	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)	06/14/89	870	6.8	91.8	31.7	38.8	3.0	0.1	226	101	70	52.8	0.20	-	520	362
5058 (CVCWD No. 12) (b)	11/25/91	720	7.9	65	27	30	3.3	1.03	193	71	55	62	0.25	-	430	275

(a) Substituted for Pollock No. 6
(b) Substituted for CVCWD No. 14
(c) Substituted for No. Hollywood No. 30

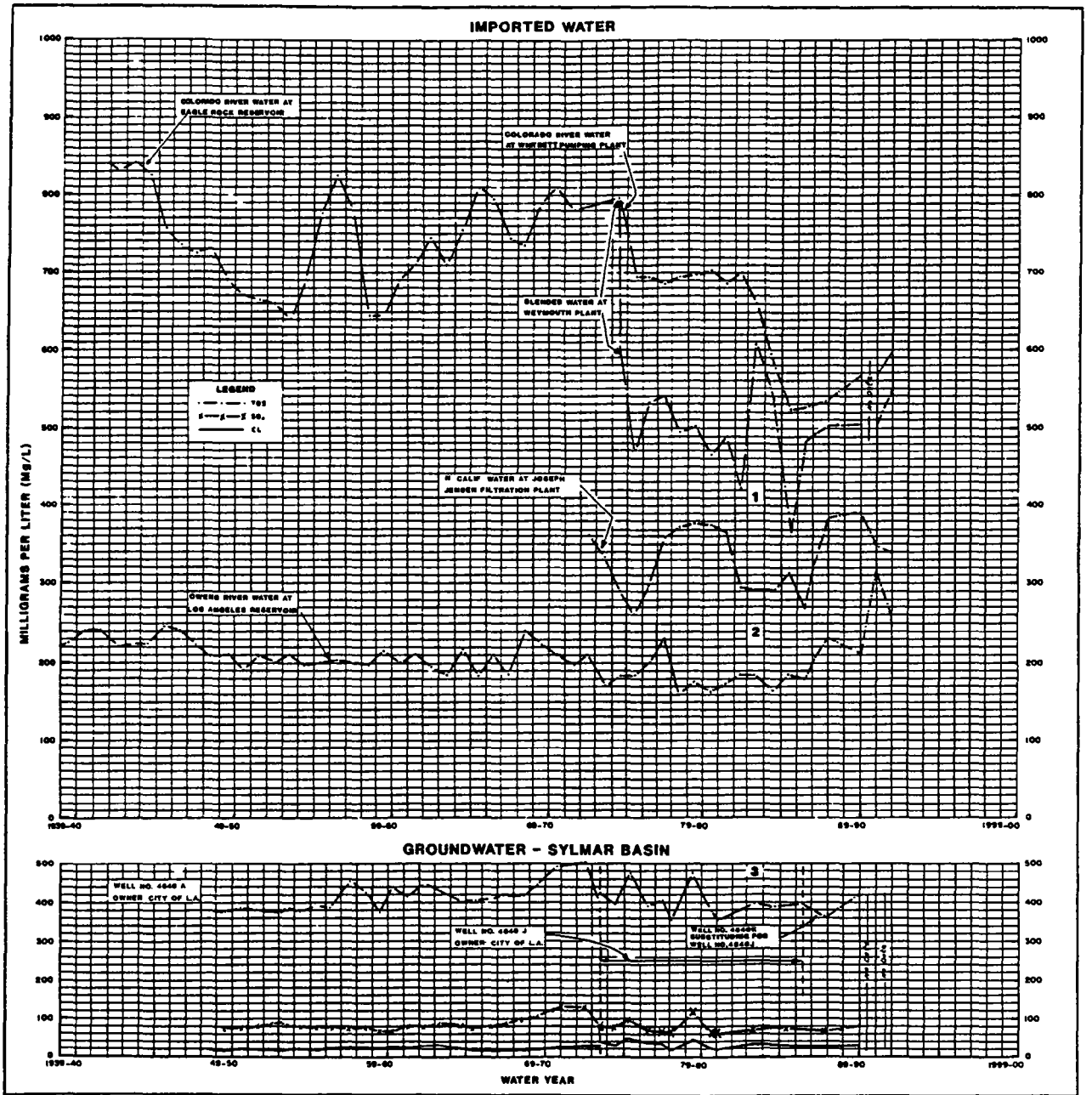


Figure 3 - MINERAL CONSTITUENTS OF WATER SOURCES IN THE ULARA

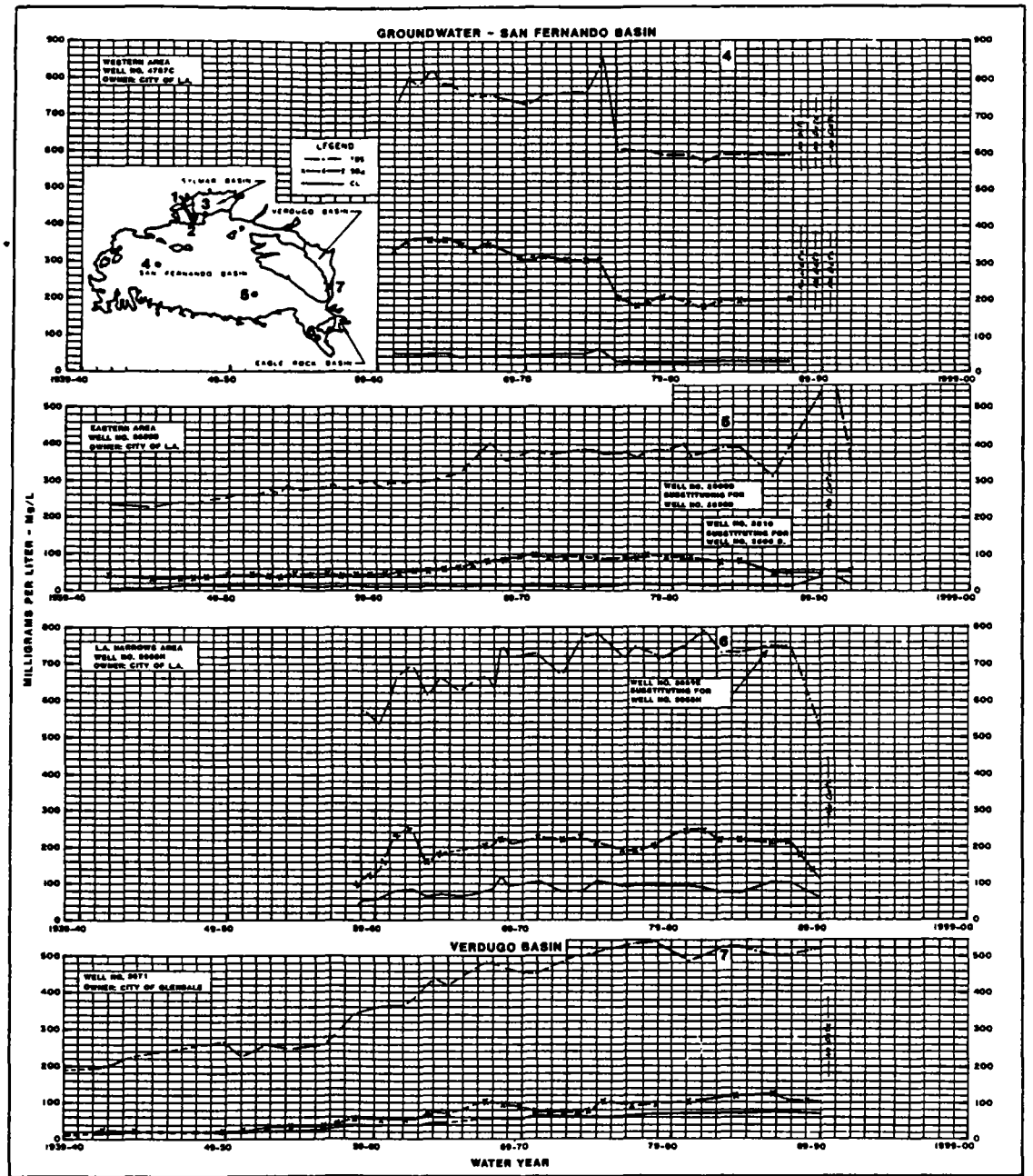


Figure 3(cont.) - MINERAL CONSTITUENTS OF WATER SOURES IN THE ULARA

Imported Water

A. Owens River-Mono Basin 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, and the lowest 150 mg/l on September 17, 1941. Average TDS concentration for 1990-91 was 256 mg/l, which was 20 percent less than the 321 mg/l for 1989-90. The decrease was due to the increase of Owens River-Mono Basin water blended with Northern California water.

B. 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 TDS concentration high of 875 mg/l in August 1955 and a low of 625 mg/l in April 1959. The average TDS over the 34-year period was approximately 740 mg/l. Tests conducted at Lake Matthews showed an average TDS of 626 mg/l for 1990-91, an increase of 5 percent from last year 1989-90.

C. 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 392 mg/l (1988-89) and a low of 247 mg/l. Tests of Northern California water are taken at the Joseph Jensen Filtration Plant. Average TDS concentration during 1990-91 was 345 mg/l, an increase of 1 percent over last year 1989-90 due to changes in the quality of MWD source waters. Drought conditions in northern California have appreciable increases in chlorides.

D. Colorado River and Northern California water were first blended at the Weymouth Plant location in May 1975. In the 1990-91 period, TDS had an average value of 570 mg/l which was a 8 percent increase from 1989-90. Blending ratios vary at the Weymouth Plant and tests are taken from the effluent.

Surface Water

Surface runoff contains salts dissolved from rocks in the tributary areas. Surface water is sodium-calcium, sulfate-bicarbonate in character. In 1990-91, low flows in the Los Angeles River at LACFCD Gage F-57 had an average TDS content of 740 mg/l and a total hardness of 276 mg/l.

Ground Water

Ground water in ULARA is moderately hard to very hard. The character of groundwater 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.

Groundwater 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) those throughout the Verdugo Basin and in various portions of the S.F. Basin, where there are abnormally high concentrations of nitrate. In each area the groundwater delivered is either being treated or blended in order to meet State Drinking Water Standards.

Groundwater Quality Management Plan -- During 1990-91, the Interagency Coordinating Committee (ICC) continued to implement the recommendations of the Groundwater Quality Management Plan (GWQMP) - San Fernando Valley Basin with the objective to protect the groundwater basins. Special emphasis was placed on monitoring the organic contaminants TCE and PCE found in the groundwater.

Underground Tanks, Sumps, and Pipelines - The City of Los Angeles Fire Department (LAFD) is the lead agency in the city to implement the State-mandated Underground Tank Program and is actively carrying on a program to bring the large number of underground tanks in the San Fernando Valley into compliance with current law. New fire permit application forms for Underground Storage Tanks (UST) and Atmospheric Above Ground Storage Tanks (AST) systems have been prepared. Captain Jonathan Hall of the LAFD who was reporting on Fire Department activities was reassigned to a new position in the Fire Suppression Division of the LAFD. Arrangements for periodic presentation during the year are planned by the LAFD.

Private Sewage Disposal System - In order to eliminate existing commercial and industrial Private Sewage Disposal Systems (PSDS) and their discharge of wastewater to the groundwater basin, a sewer construction program has been in progress for several years to install 20 designated Groundwater Improvement Districts (GID) in the San Fernando Valley (Plate 11). Up to, and including the year 1990-91, 7 sewer construction projects (i.e. GID-1, 2, 6, 7, 14, 18, and 20) have been completed. Construction of GID-15 sewer project is near completion, and the contract for the construction of the GID-13 has been awarded. Bids were invited for the construction of two additional (GID-9 and GID-10). The remaining seven projects are under design or are being processed.

The enforcement division of the Bureau of Sanitation has been pursuing a PSDS elimination program for commercial and industrial properties in order to prevent groundwater contamination from these sources. Additional sewer hookup notifications, as required by the ordinance, were issued to noncomplying owners. Monitoring of commercial and industrial PSDS for contaminants, where sewers are yet not available, is also being implemented. Property owner compliance during the year has been progressing at a satisfactory rate.

Landfills - Draft 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 Water System of LADWP has submitted the SWAT report for Pendleton Landfill and is awaiting final approval by the Regional Water Quality Control Board (RWQCB). The reports that have been completed or are near completion and under review by the RWQCB are listed in Table 9. A summary of the various SWAT Reports reviewed is included in Appendix F. The summaries include incomplete data on depth to trash and expectable groundwater elevations, as well as information on gas control systems.

Water Quality Monitoring - Water supply agencies in the ULARA continued to monitor for volatile organic contamination in their production wells during the water year 1990-91. Table 9a summarizes the number of ULARA wells that are contaminated at various levels above the Maximum Contaminant Levels (MCLs) of 5 ppb for TCE and 5 ppb for PCE.

Water Treatment

1. Advanced Oxidation Process

   The construction of the North Hollywood Advanced Oxidation Process (AOP) Plant by R. L. Hartley Company is completed. A seven-day start-up test to verify the proper mechanical operation of plant equipment was completed in May 1991. Corrective work and finalization of plant construction followed. Performance evaluation of the facility began on July 15, 1991 in accordance with the test plan approved by the Department of Health Services (DHS), and will continue for at least a one-year period. Monthly reports on water quality performance evaluation are being submitted to DHS. The AOP Plant was officially dedicated on October 17, 1991. The plant is designed to demonstrate that volatile organic compounds can be removed from groundwater by employing the ozone and hydrogen peroxide treatment method.

2. North Hollywood Aeration Facility of the Los Angeles Department of Water and Power

   The construction of the Aeration Facility, funded by the U.S. Environmental Protection Agency (EPA) and the State Department of Health Services (90% and 10%), respectively continued to operate satisfactory during the year 1990-91. The present drought has resulted in the shutdown of some of the supply wells for the Aeration Facility due to a declining water table. In order to increase the supply of well water for treatment, the use of smaller and variable-speed pumps will be investigated for use in those wells currently out of service due to the lower water table. Monthly reports on water quality performance are provided to the Department of Health Services.

TABLE 9

ULARA LANDFILLS UNDER SWAT INVESTIGATION

(reported to Interagency Coordinating Committee)

Name	Rank	Status	Current Owner	Location	SWAT Report Completed	Final SWAT Submitted	Phase II SWAT Required	Under Review (Reg. BD.)	Approved by Reg. BD.	Site Leak	Type of Leak	Further Groundwater Monitoring
Bradley West	1	Open	Valley Reclamation Co.	Sun Valley, Southeast of Sheldon Street	6/87	11/90		X				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		X				c
Bradley East	2	Closed	Valley Reclamation Co.	Southeast of Sheldon St.	6/87	11/90		X				c*
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	Pick-ur-Parts (Cal Mat Company)	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		X				c*
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		X				c
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 Cal Mat (old)	2	Closed	Cal Mat Properties	North Hollywood District Hollywood Fwy., Laurel Canyon Blvd.	6/88	7/89		X				c
Bradley Land-fill Complex	3	Closed	Valley Reclamation Co.	Sun Valley District Sheldon St., San Fernando	7/88	7/89		X				c
Pendleton St.	4	Open	Department of Water & Power	Sun Valley intersection Pendelton St., Glenoaks Blvd.	7/90	5/91						c
Stough Park	2	Open	City of Burbank	Bel Air Dr. & Cambridge Dr.	6/88	12/88			4/90	Y	NHA	a*

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

(b) Closed landfills with groundwater 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.

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

U - Undetermined due to dry wells.

Y - Yes

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

TABLE 9a

1990-91
ULARA WELL FIELDS(a)
WELLS EXCEEDING CALIFORNIA STATE MCL(b)
FOR TCE AND PCE

	Number of Wells											
	City of Los Angeles								Others			
	NH	CS	P	HW	E	W	V	Total	B	G	CVCWD	Total
TCE Levels (ppb)												
5-20	11	0	0	0	2	3	1	17	1	5	0	23
20-100	3	2	3	6	0	3	1	18	2	4	0	24
> 100	3	0	0	0	0	0	0	3	4	2	0	9
Total	17	2	3	6	2	6	2	38	7	11	0	56
PCE Levels (ppb)												
5-20	6	0	3	3	0	1	1	14	2	2	1	19
20-100	1	0	0	1	0	0	0	2	2	0	0	4
> 100	0	0	0	0	0	0	0	0	3	0	0	3
Total	7	0	3	4	0	1	1	16	7	2	1	26

Well Fields:
NH - North Hollywood
CS - Crystal Springs
P - Pollock
HW - Headworks
E - Erwin
W - Whitnall
V - Verdugo
B - City of Burbank
G - City of Glendale
CVCWD - Crescenta Valley County Water District

(a) Wells are categorized based upon annual averages of chemical results. Where data were not available for 1990-91, data from the most recent water year were used to compile this table.

(b) MCL Maximum Contaminant Level - 5 ppb of TCE and PCE.

3. Nitrate Removal

The Crescenta Valley County Water District's Glenwood Nitrate Water Treatment Plant using an anion-exchange process for nitrate removal from the District's well water continues in full-time operation.

Remedial Investigation (RI) of Groundwater Contamination in the San Fernando Valley

Extensive monitoring of the 87 RI wells took place during this water year. The 87 wells consist of 43 Vertical Profile Borings (VPBs) (water table monitoring wells) and 44 Cluster Wells (CWs) (groups of individual monitoring wells drilled to specific depths) (see Plates 17, 18, 19, and 20 for locations of all CWs and VPBs). Initial sampling of the CWs was completed early in the water year, and the VPBs and the CWs were all resampled later in the year. Based on their location in the basin and their contaminant levels, 14 VPBs were selected for quarterly sampling and equipped with dedicated sampling equipment. The newly equipped VPBs, along with 7 other VPBs, were sampled for a third time. In addition, 19 other existing San Fernando Valley wells were located and sampled. Water levels in all 87 of the RI wells were also measured monthly.

"Estimated Extent of TCE, PCE and NO_3 contamination in shallow and multi-level wells, January 1991" plume maps were completed. Copies of the figures are included as Plates 14, 15, and 16. The data used to compile the figures was based on the most recent contaminant concentration measured in wells between January 1987 and October 1990. The data was collected from production wells and monitoring wells. For water year 1991-92, plume maps will be updated based on a specific zone (depth) in the aquifer.

Data from the construction, installation and sampling of the North Hollywood, Crystal Springs, and Pollock VPBs and CWs and the Verdugo VPBs is available in separate Technical Memorandums (TMs) with the last of the TMs being completed in October 1991. The TMs are available for review at five information repositories. Also, work proceeds on the completion of the basin-wide RI report to be completed by July 1992.

EPA and its consultants are developing a sampling program for the RI monitoring wells. The program will include the installation of submersible pumps in all VPBs and CWs not currently equipped with dedicated pump systems.

The steady-state condition and the transient condition calibrations for the San Fernando Basin Groundwater Flow Model, based on existing data from the Report of the Referee and the ULARA Watermaster reports, have been completed. JMM will update the model to incorporate RI data from the Phase I - Field Investigation and also select a few key CWs to calibrate the model for vertical flow directions (vertical gradient).

Work is proceeding on the RI for the Glendale Operable Unit (OU). The Glendale OU RI characterizes two distinct areas of high groundwater contamination (plumes). One area is referred to as the North Plume Glendale's Grandview Well Field, and the second area is referred to as the South Plume, which is located upgradient of LADWP's Pollock Well Field. LADWP's Headworks Well Field area was not included as part of the Glendale OU. Separate Feasibility Studies will be developed for the North and South Plumes of the Glendale OU and are scheduled for completion by summer 1992.

Forty three vertical profile boreholes (VPB's) were installed, sampled, and analyzed as part of the Superfund program. Dedicated pumps have been installed in 14 VPB's in the North Hollywood area where higher concentrations of TCE/PCE exist.

To monitor vertical extent of volatile organics contamination at the National Priority List (NPL) sites, cluster wells were also installed. These cluster wells are constructed in close groups to different depths, sampling of groundwater at up to four water bearing zones. VPB's have been drilled at the Pollock and Verdugo NPL sites.There are also plans to drill VPB's in the Burbank and surrounding areas.

EPA Superfund Update

Work on the Burbank Operable Unit (BOU) is proceeding,including the completion of the Explanation of Significant Differences (ESD) Final Fact Sheet. The BOU is planned to treat 12,000 gallons per minute (gpm) of contaminated groundwater using air stripping technology. LADWP has prepared and processed California Environmental Quality Act (CEQA) documentation for the proposed treatment facility which resulted in a Negative Declaration for the project.

A Consent Decree between Lockheed, Weber, City of Burbank, and EPA Region IX was signed in March 1991.

The Consent Decree provides for:

1. Design, construction, operation, and maintenance expenses of the 12,000 gallon per minute (gpm) Burbank Operable Unit (BOU) for treating groundwater, (approximate project cost - $60 million).
2. Lockheed is to pay EPA 100 percent of BOU and 50 percent of the past groundwater cleanup program costs as of December 1989.

This Consent Decree was submitted to the Department of Justice and will be lodged in Federal Court. After the Judge signs the Decree, a work plan will be submitted.

3

Groundwater Quality Investigations

During the year 1990-91, groundwater contamination investigations were performed under the direction of the Regional Water Quality Control Board (RWQCB), including the following sites:

Philips Components (Centralab)

Philips Components is closing their manufacturing facility, but personnel will remain to conduct cleanup activities. Further site assessement work is required by RWQCB for groundwater protection purposes. An aquifer test could not be prerformed because of clogging within the extraction well, which was later abandonded with the approval of the RWQCB and DHS. A new extraction well was drilled for groundwater cleanup and control of the contamination at this site.

Lockheed Corporation

The Aqua Detox treatment facility with a design capacity of 1000 gpm for removal of TCE and PCE is being operated by Lockheed at a Burbank site. An application by Lockheed for a National Pollutant Discharge Elimination System (NPDES) waste discharge permit for reinjecting of treated groundwater was approved by RWQCB. Reinjection started in April 1991 with approximately 500 GPM being reinjected and the remainder discharged to the storm sewer system.

Rockwell-Rocketdyne

The groundwater extraction and pilot plant treatment using the ultraviolet/hydrogen peroxide method has been on line since mid-June 1991. Rocketdyne is exploring the possibility of delivering large quantities of pumped and treated water for irrigation purposes. Company representatives have met with Pierce College staff to discuss the feasibility of piping treated water to the college site.

Groundwater monitoring and further investigation in and around the Santa Susana facility of Rocketdyne is in progress.

3M-Pharmaceuticals (Riker Lab/3M)

A soil and groundwater cleanup plan was submitted to RWQCB for their review. An NPDES application has been filed with RWQCB for the discharge of the treated groundwater to a storm drain. The RWQCB is requiring additional information regarding nitrate levels in treated water before discharge of treated water at this site will be permitted.

Allied-Signal Aerospace Co. (Formerly Bendix Corporation, North Hollywood area)

A Remedial Program work plan was reviewed and approved by RWQCB, requiring additional groundwater monitoring. A second round of monitoring of the six recently installed wells was completed and the report was submitted to RWQCB. Allied-Signal Co. was named as a PRP by the EPA in the Burbank O. U.

Hughes Aircraft Co. (Canoga Park Area)

The RI report of the Hughes Co. area was reviewed by RWQCB. Additional groundwater monitoring and excavation in the contaminated underground tanks area was required.

Wickes (Van Luit) (Narrows Area)

The vapor extraction system at the Wickes Company (within the Pollocks Well field area) is reported to be operating satisfactorily. Two plumes of volatile organic contaminants - one on-site origin and another of off-site origin have been delineated. The groundwater remediation plan includes three extraction wells, treatment by chemical oxidation, and return to groundwater via a percolation trench.

Taylor Yard (Narrows Area)

The Taylor Yard soil and groundwater 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. An evaluation was made in Febuary 1992 to employ a soil vapor extraction system to remediate soils contamination with chlorinated solvents at the taylor Yard. A program to deal with VOCs in the groundwater has not been prepared to date.

Leaking Underground Tank Investigations - During 1990-91, major underground tank leak investigations with the potential for impacting ground water were active at various sites. The sites being investigated include Philips Components, Lockheed, 3M-Pharmaceuticals, Bendix, Rockwell-Rocketdyne, May Co. Northridge Fashion Plaza (N.R.F.P.), Unocal, and Mobil Oil. As part of these investigations, which are being conducted under the direction of the Regional Water Quality Control Board - Los Angeles Region, wells have been drilled and ground water has been extracted for the purpose of well development , testing or clean-up. Design work to implement remedial measures is in progress. For a complete listing of parties and non-parties during 1990-91 see Table 9B.

TABLE 9B

PUMPING FOR GROUNDWATER CLEAN-UP
(In Acre-Feet)

Party	Amount of Water Pumped			Method of Disposal
	Clean-up	Reinject./Recharg.	Devl./Test.	
Lockheed (a)	747.11	215.23	0.00	Storm Drain
Los Angeles, City of	1,438.47	0.00	0.00	Aeration Tower
	262.93	0.00	0.00	AOP Facility
Malibu Grand Prix	3.29	0.00	0.00	Storm Drain
May Co. N.R.F.P.	5.30	0.00	0.00	Storm Drain
Mobil Oil Co.	4.94	0.00	0.00	Storm Drain
Philips Components (b)	36.84	36.84	0.00	Recharge
Rockwell Corp.	0.00	0.00	0.49	Storm Drain
3M-Pharmaceuticals (c)	7.81	0.00	0.00	Storm Drain
TOTAL	2,506.69	252.07	0.49	

(a) Lockheed is a party to the Judgment on January 26,1979.

(b) Formerly known as Centralab.

(c) Formerly known as Riker Labs.

III. WATER USE AND DISPOSAL

Water delivered for use in ULARA is either imported water, local ground water, reclaimed, or a mixture of local and imported water, depending on the area and water system operation. During the 1990-91 water year, the total amount delivered to water users in ULARA was 303,628 acre-feet. Of this total, 20,572 acre-feet was ground water, 277,665 acre-feet was imported water, and 5,392 acre-feet was reclaimed water. Refer to Figure 5 for a monthly breakdown. The ULARA basins contain 765 wells, of which 122 are active and 643 are inactive, observation, test, capped, etc.

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 below 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. Refer to the previous section entitled "History of Adjudication" for details of allowed pumping.

Sparkletts Drinking Water Corporation and Deep Rock Water Company are the only parties that extract water from the Eagle Rock Basin.

Figure 4 illustrates the annual ground water extractions and total water imported in ULARA, beginning with the 1954-55 water year. Note the change from 1968-69 through the present.

It can also be noted that for 10 years before pumping was restricted, imports exceeded extractions by 50,000 to 90,000 acre-feet per year and that, for the water years 1968-69 to 1990-91, the difference between imports and extractions has increased to between 110,000 and 250,000 acre-feet.

Figure 5 provides an analysis of the monthly relationship between rainfall, ground water extractions used in ULARA, and imported supply. Data relates to all of ULARA. The precipitation values were obtained from stations on the valley floor (Table 3).

Ground Water Extractions

Appendix A is the record of groundwater extractions for the 1990-91 water year, and Plate 6 shows the approximate location of the well fields which pumped this water. A total of 76,093 acre-feet was pumped from the San Fernando Basin. Of this total, 99,777 acre-feet constitutes extraction rights by parties in the San Fernando Basin (see Table 15, 1990-91) and 3,477 acre-feet is pumping for nonconsumptive use (see Table 13).

A total of 5,547 AF was pumped from the Sylmar Basin and 3,845 AF from the Verdugo Basin. The respective safe yield values for the San Fernando Basin is 89,778 AF (native safe yield of 43,660 AF and an import return of 46,118 AF), Sylmar Basin 6,210 AF, and Verdugo Basin 7,150 AF. Pumping in the Verdugo Basin is less than safe yield due to water quality problems i.e.high nitrate . Construction of water blending facilities in the Verdugo Basin by the City of Glendale was completed in September 1981, which allows poorer quality Verdugo Basin ground water to be blended with MWD water. In addition, the completion of the Glenwood Nitrate Water Treatment Plant will enable Crescenta Valley County Water District to potentially pump its water rights. Also, Glendale is currently installing two pumping wells, a gravity pickup system, and treatment facilities for the purpose of pumping their full water rights in the Verdugo Basin.

Imports and Exports of Water

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

The imported supplies to ULARA are from the City of Los Angeles' Owens-Mono Basin aqueduct and through the MWD distribution system, which consists of California and Colorado River Aqueduct waters.

Exports from ULARA, exclusive of sewage, are solely by the City of Los Angeles, and include both imported (pass through) Owens River water and ground water. Table 10 summarizes the nontributary imports and exports from ULARA. Ground water imports and exports in and out of ULARA are listed in Tables 12A, 12B, 12C, and 12D.

Physical Data by Basins

The Watermaster has collected and summarized data in Tables 12A, 12B, 12C, and 12D, which show the water supply and disposal in each of the basins.

The information for Tables 12A, 12B, 12C, and 12D was submitted by the parties. Estimates made by the parties, for water delivered to hill and mountain areas, sewage exported, etc., were based upon methods consistent with previous estimates made by SWRCB for the San Fernando Valley reference (1962). The Watermaster also made computations of subsurface outflows based on similar computations made by SWRCB. Pumping by private parties is summarized in Table 13.

San Fernando Basin Allowable Extractions

Table 14 lists San Fernando Basin extraction rights for the Cities of Burbank, Glendale, Los Angeles, and San Fernando for the water year 1991-92. Table 15 shows San Fernando Basin stored water as of October 1, 1990 and October 1, 1991. All rights are based on the City of Los Angeles vs. City of San Fernando, et al., Judgment, dated January 26, 1979.

TABLE 10

ULARA - NONTRIBUTARY WATERS,
IMPORTS AND EXPORTS

(In Acre-Feet)

Souce and Agency	1989-90	1990-91
Imports		
MWD water(a)		
Burbank, City of	22,397	17,773
Crescenta Valley County Water District	1,809	1,354
Glendale, City of	28,620	22,408
Los Angeles, City of	423,440	244,758
La Canada Irrigation District	1,328	1,113
Las Virgenes Municipal Water District (nonparty)	7,008	5,158
San Fernando, City of	1,007	1,122
	485,609	293,686
Owens River water		
Los Angeles, City of	145,508 (b)	200,377 (b)
Total	631,117	494,063
Exports		
Owens River water		
Los Angeles, City of (c)	75,489	100,075
MWD water		
Los Angeles, City of (c)	210,706	116,323
Net Imports	344,922	277,665

(a) Colorado River and Northern California waters combined.

(b) This value represents the summation of the gross amount of water delivered to ULARA. It does not include operational releases, reservoir evaporation, and water spread during the year.

(c) This represents water passed through ULARA and is considered an export (see Table 1).

Sylmar Basin Allowable Extractions

Table 16 shows Sylmar Basin stored water as of October 1, 1990 and October 1, 1991. 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).

Facts Relevant to Ground Water Storage Capacity**

San Fernando Basin. The total ground water storage capacity of San Fernando Basin was estimated in the Report of Referee as about 3,200,000 acre-feet, of which a regulatory storage capacity of 360,000 acre-feet is required by the judgment. As of Fall 1954, the temporary surplus in the basin had been exhausted by the overextraction of approximately 520,000 acre-feet.

Sylmar Basin. Sylmar Basin consists of confined aquifers with stored ground water of approximately 310,000 acre-feet.

Verdugo Basin. The ground water storage capacity of Verdugo Basin is approximately 160,000 acre-feet.

Change in Ground Water Storage

San Fernando Basin. The change in storage for 1990-91 was estimated as -8,740 acre-feet, and the cumulative change in storage from 1953-54* through 1990-91 was -286,610 acre-feet. A comparison is made between the annual precipitation and the cumulative change in storage since the commencement of Watermaster activities for the San Fernando Basin. The average precipitation for the period 1968-69 through 1990-91 was 17.01 inches, compared to a long-term average of 16.48 inches of rainfall. From 1968-69 to 1990-91, the basin gained approximately 159,310 acre-feet of stored water. Through spreading and in-lieu replenishment*** activities, 266,667 acre-feet were stored. Thus, the net storage has decreased 107,357 acre-feet. Refer to Table 11 for the annual precipitation and change in storage.

Sylmar Basin. The change in storage for 1990-91 was -124 acre-feet, and the cumulative change in storage from 1953-54* through 1990-91 was -22,788 acre-feet.

Verdugo Basin. The change in storage for 1990-91 was -5,755 acre-feet, and the cumulative change in storage from 1953-54* through 1990-91 was +1,680 acre-feet.

* - Change in storage begins October 1 1954.

** Information obtained from the City of Los Angeles vs. City of San Fernando, et al., Findings of Fact and Conclusions of Law dated January 26, 1979.

** In-lieu recharge is a credit in stored ground water equal to an intentional reduction of pumping.

TABLE 11

SAN FERNANDO BASIN
PRECIPITATION COMPARED TO
CHANGE IN STORAGE

Water Year	Valley Floor Precipitation (Inches)	Change in Storage (AF)	Cumulative Change in Storage (AF)
1968-69 *	29.00	79240	79240
1969-70	10.50	-9740	69500
1970-71	15.57	15340	84840
1971-72	8.10	-17090	67750
1972-73	20.65	17020	84770
1973-74	15.75	-21820	62950
1974-75	14.74	-22580	40370
1975-76	9.90	-30090	10280
1976-77	14.19	-50490	-40210
1977-78	35.43	136150	95940
1978-79	21.76	78080	174020
1979-80	30.25	99970	273990
1980-81	11.04	-32560	241430
1981-82	17.18	-530	240900
1982-83	39.64	121090	361990
1983-84	9.97	-63180	298810
1984-85	11.00	-31690	267120
1985-86	20.27	-7980	259140
1986-87	5.99	-31940	227200
1987-88	18.62	-5000	222200
1988-89	9.12	-30550	191650
1989-90	8.20	-23600	168050
1990-91	14.38	-8740	159310
23-yr. average	17.01		

Notes:

(1) 100-year (1881-1981) mean precipitation = 16.48 inches.

(2) Stored water through spreading and in-lieu pumping = 266,667 AF.

(3) Change in storage = +159,310 AF - 266,667 AF = -107,357 AF.

(4) The change in storage is based on the methodology used in the Report of Referee (Volume II, Appendix Q) filed with the court in July 1962.

* - Change in storage begins October 1, 1968.

TABLE 12A

1990-91
SUMMARY OF WATER SUPPLY AND DISPOSAL
SAN FERNANDO BASIN
(In Acre-Feet)

Water Source and Use	City of Burbank	City of Glendale	City of Los Angeles	City of San Fernando	All Others	Total
Extractions						
Total quantity extracted	1,284 (a)	2,755	67,013	0	5,030 (b)	76,082
Extractions for Pilot Projects	--	--	71	--	--	71
Used on valley fill	0 (c)	(c)	2,155	2062	(c)	(c)
Imports						
MWD water	17,773	22,408	230,287 (d)	1,021	5,158 (e)	276,647
Owens River water	--	--	195,384 (d)	--	956 (e)	196,340
Ground water from Sylmar Basin	--	--	3,281	2,062	0	5,343
Ground water from Verdugo Basin	--	0	--	--	--	0
Reclaimed water	1,234 (f)	320 (g)	2,651 (h)	--	1,185	5,390
Exports						
Ground water: out of ULARA	--		64,595	--	0	64,595
Owens River water: out of ULARA (l)	--	--	100,075	--	0	100,075
MWD: to Verdugo Basin	--	3,043	--	--	--	3,043
MWD: out of ULARA (l)	--	--	116,323	--	--	116,323
Total net delivered water	20,246	22,440 (i)	217,623	3,083	12,329	275,721
Water delivered to hill and mountain area						
Ground water	(c)	(c)	0	0	0	(c)
Owens River water	--	--	16,676	--	0	16,676
MWD water	(c)	(c)	20,269	0	5,158 (e)	(c)
Water outflow						
Surface	--	--	--	--	--	136,843 (j)
Subsurface	--	--	--	--	--	421
Sewers	10,366	17,754	71,000 (k)	2,075	--	101,195
Reclaimed	2,569	7,380	51,082	--	--	61,031

(a) 45 AF of the 1284 AF of water was pumped for water quality testing only.

(b) See Table 13 for parties included.

(c) These values are no longer required to be calculated as per Judgment.

(d) Includes Owens River or MWD water exported to Eagle Rock and Sylmar Basins and exported out of ULARA.

(e) Las Virgenes Municipal Water District (see Table 10).

(f) This value no longer estimated. Actual amount of reclaimed water is being metered by the city of Burbank.

(g) Delivered to cooling towers of the phosphate plant in Glendale. Assumed 50 percent evaporation and 50 percent to Los Angeles River. Refer to Table 7 for all others.

(h) Used for irrigation at the Harding and Wilson Golf Courses, Crystal Springs picnic area, and freeway landscaping. Also used for wash down, cooling, and irrigation at the Los Angeles-Glendale plant and Tillman Water Reclamation Plant.

(i) Total delivered water to the City of Glendale was 26,712 AF. Verdugo Basin metered sales times 105 percent equaled 4,272 AF. Therfore, the San Fernando Basin delivered water was 22,440 AF (26,712 AF minus 4,272 AF). Refer to Section 5.2.1.3 of Judgment

(j) At Station F-57C-R where 29-year mean (1929-57) base low flow is 7580 acre-feet.

(k) Estimated, extrapolated from historic data.

(l) Represents pass through water (see Table 1).

Note: Colorado River and Northern California waters combined and listed as MWD water.

TABLE 12B

1990-91
SUMMARY OF WATER SUPPLY AND DISPOSAL
SYLMAR BASIN
(In Acre-Feet)

Water Source and Use	City of Los Angeles	City of San Fernando	All Others	Total
Extractions				
Total quantity extracted	3,281	2,266	1	5,548
Used on valley fill	0	204	0	204
Imports				
MWD water	4,553	101	--	4,654
Owens River water	3,744	0	--	3,744
Exports				
Ground water:				
to San Fernando Basin	3,281	2,062	0	5,343
Water delivered to hill and mountain area				
MWD water	325			325
Owens River water	78	--	--	78
Water outflow				
Subsurface:				
to San Fernando Basin	460 (a)	--	--	--
Sewers	830 (b)	205	0	1,035

(a) Base period average of 460 AF (Sylmar Notch & Pacoima Notch).

(b) Estimated, extrapolated from historic data.

TABLE 12C

1990-91
SUMMARY OF 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
Extractions					
Total quantity	2,615	1,230	0	0	3,845
Used on valley fill	2,547	(a)	0	0	(a)
Imports					
MWD water	1,354	3,043	1,113	351	5,861
Owens River water	--	--	--	293	293
Groundwater from:					
San Fernando Basin	--	--	--	--	--
Reclaimed water	--	--	--	--	--
Exports					
Groundwater to:					
San Fernando Basin	--	0	--	--	0
Water delivered to hill and mountain areas					
MWD water	35	(a)	0	66	101
Owens River water	--	--	--	16	16
Groundwater from:					
Verdugo Basin	68	(a)	--	0	68
San Fernando Basin	--	0	--	0	0
Water outflow					
Subsurface:					
to Monk Hill Basin	--	--	--	--	300 (b)
to San Fernando Basin	--	--	--	--	70
Sewage	1,435	1,098	0	190 (c)	2,723

(a) Not required.
(b) Based on 29-year average (1929-57).
(c) Estimated, extrapolated from historic data.

TABLE 12D

1990-91
SUMMARY OF WATER SUPPLY AND DISPOSAL
EAGLE ROCK BASIN
(In Acre-Feet)

Water Source and Use	City of Los Angeles	Deep Rock(a) Water Company	Sparkletts Drinking(a) Water Corporation	Total
Extractions				
Total quantity	0	0	169	169
Used on valley fill	0	0	0	0
Imports				
Owens river water	0	--	--	0
MWD water	3,386	--	--	3,386
Groundwater	0	0	0	0
Exports				
Groundwater	0	0	169	169
Water delivered to hill and mountain areas				
MWD water	1,771	--	--	1,771
Owens river water	0	--	--	0
Water outflow				
Surface(a)	--	--	--	0
Subsurface(b)	--	--	--	(b)
Sewers	1,940 (c)	0	0	1,940

(a) Deep Rock Water Company and Sparkletts Drinking Water Corporation are allowed to pump under a stipulated agrrement with the City of Los Angeles; extract limited to 500 AF/year, and export given amount.

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

(c) Estimated, 5 year trend.

TABLE 13

1990-91
PUMPING BY NONCONSUMPTIVE USE, PHYSICAL SOLUTION,
AND PARTIES WITHOUT RIGHTS
SAN FERNANDO BASIN

(In Acre-Feet)

I. Nonconsumptive Use Parties		
1. CalMat Co.	979	
2. Livingston-Graham Co.	7	
3. Philips Components	37	
4. Sears, Roebuck and Company	8	
5. Sportsmen's Lodge, Inc.	2	
6. Toluca Lake Property Owners Assn.	0	
7. Walt Disney Productions	2,444	
8. Total	3,477	
II. Physical Solution Parties		
1. Environmentals Inc.	86	
2. Forest Lawn Cemetery Assn.	398	
3. Sportsmen's Lodge, Inc.	2	
4. Toluca Lake Property Owners Assn.	23	
5. Valhalla Memorial Park	239	
6. Valley Reclamation Company	2	
7. Total	750	
III. GW Cleanup / Dewatering		
1. First Financial Plaza Site	21	
2. Lockheed	747	
3. Malibu Grand Prix	3	
4. MAY Co.-North Ridge Fashion Plaza	5	
5. Mobil Oil Corporation	5	
6. 3M-Pharmaceutical	8	
7. Trillium Corporation	35	
8. Total	824	
IV. Parties Without Rights		
1. Harper, Cecilia De Mille	15	(a)
2. Mena, John and Barbara	1	
3. Total	16	
V. Total Pumping	5,067	

Note: Sportsmen's Lodge and Toluca Lake pumping is part nonconsumptive and part physical solution.

(a) Presently under investigation.

TABLE 14

1991-92
SAN FERNANDO BASIN EXTRACTION RIGHTS
(In Acre-Feet)

Item	Cities of		
	Burbank (1)	Glendale (2)	Los Angeles (3)
1. Delivered water 1990-91	20,246	22,440	217,623
2. Delivered to hill & mountain 1990-91	(a)	(a)	36,945
3. Delivered to valley fill 1990-91	(a)	(a)	180,678
4. Percent Recharge	20.0%	20.0%	20.8%
5. Return water extraction right 1991-92	4,049	4,488	37,581
6. Native safe yield	0	0	43,660
7. Total exraction right 1991-92	4,049	4,488	81,241

Items 1	= Table 12A, Total net delivered water
Item 2	= Table 12A, Groundwater, Owens river, and MWD water delivered to hill & mountain area.
Item 3	= Item 1 minus Item 2
Item 4	= Section 5.2.1.3, page 17 of Judgment
Item 5, cols. (1) & (2)	= Item 1 x Item 4
cols. (3)	= Item 3 x Item 4
Item 6	= Section 4.2.4, page 11 of Judgment
Item 7	= Item 5 + Item 6

(a) Not required.

TABLE 15

STORED WATER
SAN FERNANDO BASIN
(In Acre-Feet)

	Cities of		
	Burbank (1)	Glendale (2)	Los Angeles (3)
1989-90			
1. Stored water as of Oct. 1, 1989	42,027	27,007	150,287
2. Delivered water 1988-89	23,863	27,169	233,768
3. Return water extraction right 1989-90	4,773	5,434	48,624
4. Native safe yield	0	0	43,660
5. Total extraction right for 1989-90	4,773	5,434	92,284
6. Extractions for year	16	1,500	79,929
7. Physical solution extractions	1,401	472	93
8. Spread water	378	0	0
9. Stored water as of Oct. 1, 1990	45,777	30,469	162,549 (b)
1990-91			
10. Delivered water 1989-90	23,053	26,696	221,955
11. Return water extraction right 1990-91	4,611	5,339	46,167
12. Native safe yield	0	0	43,660
13. Total extraction right for 1990-91	4,611	5,339	89,827
14. Extractions for year	1,262 (a)	2,755	67,013
15. Physical solution extractions	770	484	104
16. Spread water	504	0	52
17. Headworks Pilot Recharge Study	-----	-----	71
18. Stored water as of Oct. 1, 1991*	48,859	32,569	185,239

Item 3 & 11 = Items 2 & 10 x percent recharge
Item 5 & 13 = Items 3 + 4 & 11 + 12, respectively
Item 9 = Items 1 + 5 -6 -7 + 8
Item 7 & 15
col. (1) = Valhalla + Lockheed pumping
col. (2) = Forest Lawn + Environmentals Inc. pumping.
col. (3) = Toluca Lake + Sportsmen's Lodge + First Financial Plaza Site + Valley Reclamation + May Co. NRFP + 3M-Pharmaceutical + Trillium Corp. + Malibu Grand Prix + Mobil Oil Corporation pumping. Only consumptive use portion charged to Los Angeles.
Item 10
col. (1) = Table 14 Item 1 of previous year
col. (2) = Table 14 Item 1 of previous year
col. (3) = Table 14 Item 4 of previous year (Delivered to valley fill)
Item 18 = Items 9 + 13 - 14 -15 + 16 + 17
* Does not include return flow occuring during water year 1990-91. Credit given in 1991-92.

(a) Total water pumped was 1278.38 AF. 16.12 AF of water was pumped for water quality testing only.
(b) Error in last year's Stored water. Corrected number now used.

1990-1991 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
San Fernando Basin														
City of Burbank														
3841C	6A	0.00	0.37	0.25	9.37	155.85	218.69	165.13	275.54	137.21	0.00	141.02	135.12	1238.55
3882P	7	0.00	0.25	0.29	0.00	3.02	0.01	0.00	3.57	0.00	9.69	14.64	1.49	32.96
3851E	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.38
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	0.00	0.33	0.15	0.00	0.00	5.42	0.00	0.15	0.00	0.00	0.21	0.00	6.26
3841G	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23
Party Total		0.00	0.95	0.69	9.37	158.87	224.12	165.13	279.26	137.21	9.69	156.25	136.84	1278.38
Conrock Co.														
4916A	2	53.07	75.82	53.63	71.32	49.67	18.25	63.68	71.05	41.79	50.19	91.57	92.04	732.08
4916	3	17.31	24.72	17.54	22.07	17.82	6.95	28.56	17.37	9.76	1.17	37.65	46.22	247.14
Party Total		70.38	100.54	71.17	93.39	67.49	25.20	92.24	88.42	51.55	51.36	129.22	138.26	979.22
Enviromentals Inc.														
3934A	M050A	5.69	5.66	5.40	7.14	6.75	6.33	5.84	7.65	7.07	11.20	9.90	7.11	85.74
First Financial Plaza Site														
N/A	F.F.P.S.	1.49	1.41	1.29	1.40	1.32	2.73	2.89	2.62	1.61	1.64	1.47	1.11	20.98

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
San Fernando Basin														
Headwoks (H)														
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
H Total		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	7.81	10.97	18.96
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	3.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.35
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	3.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.42
3810	NH-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.05	88.05	49.23	225.33
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	2.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.82
3820D	NH-16	6.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.93
3820C	NH-17	7.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.85
3820B	NH-18	5.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.28
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

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
							San Fernando Basin							
North Hollywood (NH)														
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	3.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.44
3790C	NH-22	6.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.41
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	4.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.27
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.79	18.79	0.05	37.63
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	6.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.80
3780C	NH-33	3.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.81
3790G	NH-34	7.53	0.00	0.00	0.00	186.98	146.19	43.66	262.49	245.50	246.03	237.10	196.83	1572.31
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	85.17	104.68	30.56	181.29	178.58	181.77	179.06	85.93	1027.04
3790J	NH-37	9.18	0.00	0.00	0.00	281.91	170.98	50.41	311.71	302.89	312.56	312.56	262.58	2014.78

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
							San Fernando Basin							
North Hollywood (NH)														
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	9.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.62
3810Q	NH-41	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
3810R	NH-42	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
3790K	NH-43A	8.06	0.00	0.00	0.00	348.51	235.06	69.56	425.65	407.95	415.61	404.04	373.79	2688.23
3790L	NH-44	9.66	0.00	0.00	0.00	319.31	184.32	77.43	333.27	319.65	326.20	321.65	312.93	2204.42
3790M	NH-45	12.17	0.00	0.00	0.00	388.23	232.37	68.62	420.87	404.34	413.89	409.97	342.43	2692.89
NH Total		110.60	0.00	0.00	0.00	1610.11	1073.60	340.24	1935.28	1858.91	2002.90	1971.22	1623.77	12526.63
Crystal Springs (CS)														
3904J	CS-52(#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
3904J	CS-52(#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
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
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

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
						San Fernando Basin								
Rinaldi-Toluca (RT)														
4909E	RT-1	8.24	0.00	0.00	13.06	382.67	257.51	164.42	413.07	394.01	400.65	395.99	377.76	2807.38
4898A	RT-2	9.78	0.00	0.00	15.77	441.05	297.96	191.42	481.87	464.21	475.51	471.01	452.55	3301.13
4898B	RT-3	10.74	0.00	0.00	17.33	472.52	318.62	237.67	515.25	494.82	508.80	503.36	483.68	3562.79
4898C	RT-4	11.41	0.00	0.00	18.76	499.84	422.68	251.33	544.82	523.83	537.95	531.64	510.17	3852.43
4898D	RT-5	11.52	0.00	0.00	19.03	502.32	551.08	541.37	544.47	523.81	537.72	530.93	510.54	4272.79
4898E	RT-6	0.00	0.00	0.00	19.19	504.89	557.30	545.53	551.89	531.59	544.38	536.46	514.37	4305.60
4898F	RT-7	11.18	0.00	0.00	17.95	471.03	283.66	154.04	520.18	497.73	511.31	505.83	486.83	3459.74
4898G	RT-8	11.16	0.00	0.00	17.95	469.33	283.29	184.90	515.16	497.02	511.55	506.00	486.64	3483.00
4898H	RT-9	8.22	0.00	0.00	12.92	338.89	205.92	11.64	0.00	0.00	0.00	0.00	1.08	578.67
4909G	RT-10	11.07	0.00	0.00	17.59	491.26	295.25	159.83	536.34	480.79	473.33	466.85	446.38	3378.69
4909K	RT-11	9.48	0.00	0.00	14.95	428.63	294.10	208.04	479.66	464.33	465.13	457.62	438.07	3260.01
4909H	RT-12	9.64	0.00	0.00	15.36	436.85	300.81	212.05	493.00	509.81	515.41	508.84	479.14	3480.91
4909J	RT-13	9.73	0.00	0.00	15.01	431.57	297.87	207.55	485.36	476.15	487.33	480.74	460.43	3351.74
4909L	RT-14	10.06	0.00	0.00	16.21	471.79	283.84	153.77	515.89	494.84	501.13	493.02	473.07	3413.62
4909M	RT-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
RT Total		132.23	0.00	0.00	231.08	6342.64	4649.89	3223.56	6596.96	6352.94	6470.20	6388.29	6120.71	46508.50

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
							San Fernando Basin							
4992A	Tujung Gallery	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	4.29	81.84	0.00	0.00	61.66	82.83	29.52	158.15	48.07	49.52	49.45	47.48	612.81
3863P	V-2	0.00	0.00	0.00	0.00	59.60	126.03	37.56	86.96	0.00	0.00	0.00	0.00	310.15
3863J	V-4	0.00	61.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	221.40	226.51	188.78	698.56
3863L	V-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.60	28.60
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	3.49	64.85	0.00	0.00	49.72	11.20	31.01	182.51	175.94	180.19	176.03	167.86	1042.80
V Total		7.78	208.56	0.00	0.00	170.98	220.06	98.09	427.62	224.01	451.11	451.99	432.72	2692.92
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3821E	W-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
3831J	W-6A	6.59	115.15	0.00	0.00	0.00	0.00	0.00	168.16	316.42	323.72	297.73	297.52	1525.29

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW	Owners	Extractions (Ac-FT)												
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
San Fernando Basin														
Whitnall (W)														
3832K	W-7	0.00	59.30	0.00	0.00	0.00	0.00	6.24	0.00	0.00	0.00	0.00	23.60	89.14
3832L	W-8	2.92	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.79
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		9.51	175.32	0.00	0.00	0.00	0.00	6.24	168.16	316.42	323.72	297.73	321.12	1618.22
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
3810U	A-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
3810V	A-3	9.46	6.11	0.00	31.20	23.74	25.46	25.34	18.25	16.46	11.00	0.00	0.00	167.02
3810W	A-4	16.00	20.98	0.00	0.00	0.00	5.17	28.72	19.38	18.57	14.26	11.82	0.00	134.90
3820H	A-5	0.00	0.00	0.00	11.20	0.67	0.00	10.28	20.45	10.40	0.00	0.00	0.00	53.00
3821J	A-6	27.66	5.14	0.00	36.50	30.30	38.43	36.30	29.25	36.59	38.38	37.88	36.18	352.61
3830P	A-7	0.00	0.00	0.00	38.36	31.45	40.61	38.27	31.04	38.80	40.59	40.47	37.14	336.73
3831K	A-8	22.96	14.35	0.00	40.84	33.91	43.30	40.75	33.08	35.06	44.51	44.56	40.89	394.21
A Total		76.08	46.58	0.00	158.10	120.07	152.97	179.66	151.45	155.88	148.74	134.73	114.21	1438.47
City of Los Angeles Total		347.72	571.27	0.00	389.18	8243.80	6096.52	3847.79	9582.43	9344.43	9840.31	9685.01	9083.65	67032.11

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners	Extractions (Ac-FT)												
Well No. Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
San Fernando Basin													
Malibu Grand Prix													
--- MW--13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	3.08	3.29
May Co.-North Ridge Fashion Plaza													
--- ---	0.00	0.00	0.00	0.40	0.37	1.87	1.14	0.35	0.72	0.45	0.00	0.00	5.30
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 Corp.													
--- ---	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.39	1.68	0.87	4.94
Sears Roebuck & Co.													
3945 3945	0.85	0.33	0.12	0.07	0.69	0.69	0.69	0.69	0.69	0.70	0.35	1.96	7.83
Sportman's Lodge, Inc.													
3785A 1	0.05	0.05	0.12	0.29	0.08	0.40	0.11	0.11	0.11	0.11	0.11	0.11	1.65
3M-Pharmaceuticals													
--- ---	1.10	0.71	0.36	0.16	0.35	0.01	0.78	1.20	0.29	0.70	1.51	0.64	7.81
Toluca Lake Property Owners Assn.													
3845F 3845F	2.45	1.90	1.60	0.04	2.79	0.39	2.96	2.39	2.75	1.49	1.95	2.24	22.95
Trillium Corporation													
Well #1 ---	1.33	1.05	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	12.58
Well #2 ---	1.77	1.73	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	22.70
Party Total	3.10	2.78	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	35.28

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners	Extractions (Ac-FT)												
Well No. Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
San Fernando Basin													
Valhalla Memorial Park													
3840K 4	42.37	20.92	9.07	9.25	11.29	0.00	5.14	22.58	25.05	25.05	24.17	43.71	238.60
Valley Reclamation Co.													
4916D	0.00	0.00	0.00	0.00	0.00	0.51	0.49	0.04	0.00	0.00	0.00	0.89	1.93
Walt Disney Production													
3874E EAST	110.92	83.37	66.01	51.96	132.92	65.24	92.69	160.27	134.31	60.39	77.33	185.06	1220.47
3874F WEST	98.19	111.71	49.30	38.62	118.36	92.04	116.02	145.08	211.37	92.25	148.90	1.23	1223.07
Party Total	209.11	195.08	115.31	90.58	251.28	157.28	208.71	305.35	345.68	152.64	226.23	186.29	2443.54
Basin Total	933.43	1103.60	350.64	804.84	9231.83	6921.24	4553.76	10779.22	10398.58	10508.69	10613.75	9892.96	76092.54

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners	Extractions (Ac-FT)												
Well No. Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
Sylmar Basin													
City of Los Angeles													
Plant Mission	479.41	359.35	198.51	0.00	17.26	412.42	386.16	375.74	351.08	346.42	333.34	21.07	3280.76
Meurer Engineering Co.													
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
City of San Fernando													
5969D 2A	18.28	0.00	3.03	72.51	62.33	34.90	99.57	71.27	108.78	117.13	66.33	135.18	789.31
5959 3	14.61	0.00	0.00	52.80	75.25	97.86	87.38	124.63	97.43	116.43	131.99	149.87	948.25
5969 4	2.15	0.00	0.00	0.25	8.01	29.90	26.06	33.74	23.75	26.17	31.74	28.76	210.53
5968 7A	3.31	0.00	0.03	22.47	29.14	27.35	39.29	56.40	57.87	45.94	35.61	0.00	317.41
Party Total	38.35	0.00	3.06	148.03	174.73	190.01	252.30	286.04	287.83	305.67	265.67	313.81	2265.50
Basin Total	517.81	359.40	201.62	148.08	192.04	602.48	638.51	661.83	638.96	652.14	599.06	334.93	5546.86

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
						Verdugo Basin								
Crescenta Valley County														
5058B	1	1.63	12.90	25.81	11.21	16.56	2.35	19.30	19.21	31.63	26.73	5.05	3.82	176.20
5058H	5	53.83	32.52	7.13	13.82	27.50	13.25	34.64	48.10	30.55	26.12	74.31	76.17	437.94
5058	6	0.24	0.13	0.00	0.00	0.07	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.46
5047B	7	20.96	0.00	0.00	0.00	0.00	0.00	2.59	6.04	19.20	11.40	2.50	0.08	62.77
5069J	8	33.38	19.99	28.14	42.86	29.78	26.42	28.16	39.69	26.62	28.66	27.67	24.01	355.38
5047D	9	1.61	11.39	1.51	0.27	0.04	0.42	0.26	9.38	13.86	10.44	27.83	23.35	100.36
5058D	10	25.34	6.70	26.46	56.15	39.64	29.27	24.95	28.00	7.34	0.98	1.89	26.56	273.28
5058E	11	50.12	43.59	46.10	43.51	40.43	44.31	44.66	41.60	39.15	38.45	35.01	29.22	496.15
5058J	12	38.59	46.85	27.30	0.11	18.49	28.52	26.68	26.54	31.45	38.96	39.45	15.25	338.19
5069F	14	14.42	31.96	22.28	0.42	28.31	35.89	17.64	35.67	35.82	37.28	36.53	32.44	328.66
	PICK	3.81	3.63	3.73	3.73	3.35	3.69	3.56	3.70	3.72	4.45	4.57	4.03	45.97
Party Total		243.93	209.66	188.46	172.08	204.17	184.13	202.45	257.93	239.34	223.47	254.81	234.93	2615.36
City of Glendale														
3961-3971	GL3-4	49.87	76.79	105.42	73.16	40.76	45.70	43.24	71.66	43.70	43.64	53.98	29.74	677.66
3970	GL-6	47.51	42.23	50.15	44.87	47.51	50.15	39.59	47.51	44.87	39.59	44.87	50.15	549.00
-	MM-1	0.00	2.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.88
Party Total		97.38	121.90	155.57	118.03	88.27	95.85	82.83	119.17	88.57	83.23	98.85	79.89	1229.54
Basin Total		341.31	331.56	344.03	290.11	292.44	279.98	285.28	377.10	327.91	306.70	353.66	314.82	3844.90

1990-1991 WATER YEAR GROUNDWATER EXTRACTIONS

LACDPW Owners		Extractions (Ac-FT)												
Well No.	Designation	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	TOTAL
Eagle Rock Basin														
Sparkletts Drinking Water														
3987A	1	2.25	3.87	3.31	0.36	0.00	2.78	5.27	5.60	5.06	6.53	6.60	6.09	47.72
3987B	2	4.21	4.27	4.35	5.61	4.89	4.11	4.02	3.95	2.37	3.68	4.05	4.33	49.84
3987F	3	9.16	5.64	5.54	7.83	7.07	5.90	4.95	4.93	5.07	5.62	5.06	4.74	71.51
Party Total		15.62	13.78	13.20	13.80	11.96	12.79	14.24	14.48	12.50	15.83	15.71	15.16	169.07
Basin Total		15.62	13.78	13.20	13.80	11.96	12.79	14.24	14.48	12.50	15.83	15.71	15.16	169.07
ULARA Total		1808.17	1808.34	909.49	1256.83	9728.27	7816.49	5491.79	11832.63	11377.95	11483.36	11582.18	10557.87	85653.37

APPENDIX B

KEY GAGING STATIONS SURFACE RUNOFF

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F118B-R PACOIMA CREEK FLUME BELOW PACOIMA DAM

RUNOFF WATER

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1990 TO Sep 1991

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	34.8	244	228	0	0	0	0
2	0	0	0	0	0	45.1	156	228	0	0	0	0
3	0	0	0	0	0	45.4	320	227	0	0	0	0
4	0	0	0	0	0	34.9	324	226	0	0	0	0
5	0	0	0	0	0	27.5	296	226	0	0	0	0
6	0	0	0	0	0	11.9	295	225	0	0	0	0
7	0	0	0	0	0	2.1	295	224	0	0	0	0
8	0	0	0	0	0	.6	295	223	0	0	0	0
9	0	0	0	0	0	19.3	337	223	0	0	0	0
10	0	0	0	0	0	30.3	342	222	0	0	0	0
11	0	0	0	0	0	21.7	337	221	0	0	0	0
12	0	0	0	0	0	44.1	239	220	0	0	0	0
13	0	0	0	0	0	42.6	119	220	0	0	0	0
14	0	0	0	0	0	39.3	104	220	0	0	0	0
15	0	0	0	0	0	39.5	279	218	0	0	0	0
16	0	0	0	0	0	36.1	335	174	0	.2	0	0
17	0	0	0	0	0	27.5	242	96.3	0	8.9	0	0
18	0	0	0	0	0	15.3	111	94.8	0	0	0	0
19	0	0	0	0	0	29.5	92.1	92.2	0	0	0	0
20	0	0	0	0	0	12.4	91.0	89.7	0	0	0	0
21	0	0	0	0	0	0	88.7	88.6	0	0	0	0
22	0	0	0	0	0	0	240	87.5	0	0	0	0
23	0	0	0	0	0	0	315	82.0	0	0	0	0
24	0	0	0	0	0	0	314	67.8	0	0	0	0
25	0	0	0	0	0	0	160	49.0	0	0	0	0
26	0	0	0	0	0	62.8	90.8	29.1	0	0	0	0
27	0	0	0	0	0	355	90.3	10.1	0	0	0	0
28	0	0	0	0	0	350	87.5	.3	0	0	0	0
29	0	0	0	0	------	344	171	0	0	0	0	0
30	0	0	0	0	------	340	228	0	0	0	0	0
31	0	------	0	0	------	339	------	0	------	0	0	------
TOTAL	0	0	0	0	0	2,350.7	6,638.4	4,312.4	0	9.1	0	0
MEAN	0	0	0	0	0	75.8	221	139	0	.3	0	0
MAX	0	0	0	0	0	355	342	228	0	8.9	0	0
MIN	0	0	0	0	0	0	87.5	0	0	0	0	0
AC-FT	0	0	0	0	0	4,663	13,167	8,554	0	18.0	0	0
M3x1000	0	0	0	0	0	5,752	16,241	10,551	0	22.2	0	0

CAL YEAR 1990	TOTAL*	0.0	MEAN	0	MAX	0	MIN	0	AC-FT	0	M3x1000	0
WTR YEAR 1991	TOTAL	13,310.6	MEAN	36.5	MAX	355	MIN	0	AC-FT	26,402	M3x1000	32,566

* Incomplete Record

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F168-R BIG TUJUNGA CREEK BELOW BIG TUJUNGA DAM 19

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1990 TO Sep 1991

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	5.60	0	3.50	11.1	603	119	15.5	10.2	3.91	1.70	.19
2	0	4.13	0	3.50	11.1	342	79.8	13.3	10.2	3.95	0	.12
3	0	4.23	0	4.03	11.1	272	50.9	9.59	10.2	3.95	0	.04
4	0	4.04	0	4.25	11.1	96.4	122	9.59	13.6	3.95	.04	0
5	0	3.86	0	4.63	11.1	14.4	121	9.59	11.6	3.86	.18	0
6	0	3.79	0	4.50	11.1	14.0	119	9.59	11.4	3.86	.46	0
7	0	3.72	0	4.45	9.75	16.9	116	14.0	11.4	3.86	.91	0
8	0	3.64	0	4.45	4.29	18.4	111	14.0	11.4	3.94	1.99	0
9	0	3.59	0	4.41	4.22	18.4	95.8	14.0	11.4	3.88	2.50	0
10	0	3.50	0	4.45	4.01	18.7	13.0	14.3	11.4	3.84	1.00	0
11	0	2.86	0	4.45	3.93	10.7	4.65	14.4	11.4	3.90	.97	0
12	0	1.93	0	4.31	3.79	4.43	48.9	14.4	11.4	3.89	1.09	0
13	0	1.87	0	4.28	3.72	4.34	50.5	14.4	10.6	3.86	1.31	0
14	0	1.80	0	4.43	3.64	4.45	44.5	14.4	8.50	3.87	1.59	0
15	0	1.80	0	4.45	3.64	4.28	26.1	14.4	8.50	3.89	1.80	0
16	0	1.80	0	4.27	3.64	4.12	24.7	14.4	8.50	3.85	1.77	0
17	0	1.80	0	3.85	3.58	3.95	18.7	14.7	8.50	3.85	1.70	0
18	0	1.80	0	3.79	3.64	4.02	18.7	14.7	8.50	3.87	1.71	0
19	0	1.86	0	3.79	3.64	60.5	18.7	14.6	8.50	3.88	1.74	0
20	0	6.71	0	3.79	3.64	103	18.7	14.7	8.50	3.88	1.64	0
21	0	9.88	0	3.69	3.64	90.6	18.7	12.6	8.50	3.88	1.51	0
22	0	9.88	0	3.64	3.64	79.2	18.7	10.8	8.68	3.90	1.45	0
23	0	9.88	0	5.93	3.64	72.0	18.7	10.2	8.76	3.95	1.38	0
24	0	9.88	0	8.41	3.58	67.0	18.7	10.2	8.76	3.95	1.27	0
25	0	9.88	0	8.00	3.63	68.4	18.7	10.2	8.76	3.95	1.12	0
26	0	9.88	0	8.00	3.55	68.9	18.7	10.4	8.76	3.95	.98	0
27	0	9.88	0	8.00	4.44	249	18.8	10.4	8.76	3.95	.84	0
28	0	9.88	0	8.00	101	249	19.1	10.0	8.80	3.95	.67	0
29	0	9.14	0	9.82	------	249	19.1	10.1	9.03	4.03	.55	0
30	0	4.31	0	11.1	------	249	19.1	10.2	8.91	4.11	.42	0
31	0	------	0	11.1	------	247	------	10.2	------	4.11	.31	------
TOTAL	0	156.82	0	169.27	252.85	3,307.09	1,409.95	383.86	293.42	121.47	34.60	0.35
MEAN	0	5.23	0	5.46	9.03	107	47.0	12.4	9.78	3.92	1.12	.012
MAX	0	9.88	0	11.1	101	603	122	15.5	13.6	4.11	2.50	.19
MIN	0	1.80	0	3.50	3.55	3.95	4.65	9.59	8.50	3.84	0	0
AC-FT	0	311	0	336	502	6,560	2,800	761	582	241	69	.7

CAL YEAR 1990	TOTAL*	156.82	MEAN	1.70	MAX	9.88	MIN	0	AC-FT	311
WTR YEAR 1991	TOTAL	6,129.68	MEAN	16.8	MAX	603	MIN	0	AC-FT	12,160

* Incomplete Record

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1990 TO Sep 1991

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	1.3	1.2	1.7	3.0	2.0	544	6.8	1.2	1.2	1.7	.9	
2	.9	1.2	1.5	3.3	2.0	15.5	6.8	1.1	1.2	1.3	.7	
3	.7	1.5	1.5	51.8	2.0	4.2	5.1	1.1	1.2	1.2	.7	
4	.7	1.5	1.5	114	2.0	12.3	3.9	1.2	1.3	1.2	.7	
5	.7	1.5	1.5	9.8	2.0	12.2	2.7	1.0	1.2	1.2	.7	
6	1.8	1.5	1.2	1.9	2.3	3.4	4.3	1.1	1.0	1.5	.7	
7	1.7	1.5	1.2	1.8	2.3	2.8	2.8	1.4	1.0	1.6	.6	
8	1.2	1.5	1.2	1.8	2.3	3.0	2.7	1.2	1.0	2.8	.7	
9	1.2	1.7	1.3	22.3	2.5	2.9	2.2	1.1	1.0	.8	.7	
10	1.2	2.1	1.0	1.7	2.5	3.2	2.0	1.4	1.4	.6	.7	
11	1.2	2.1	1.1	1.5	2.3	4.2	1.6	1.5	1.1	.5	.8	
12	1.3	1.5	1.8	1.5	2.4	2.5	1.2	1.3	1.3	.8	.6	
13	1.2	1.1	1.2	1.5	2.3	21.2	1.0	1.2	1.0	.7	.7	
14	1.2	1.6	1.4	1.4	2.0	5.3	1.4	1.0	.8	.7	.6	
15	1.2	1.5	1.2	1.2	2.9	7.8	1.8	1.1	.9	.5	.5	
16	1.2	2.3	1.1	1.9	2.7	2.5	1.2	1.0	1.0	.5	.5	
17	1.2	1.8	1.2	2.3	2.8	2.3	1.4	1.1	1.1	1.0	.5	
18	1.2	1.7	2.5	2.0	4.5	93.2	1.7	.7	1.0	.9	.7	
19	1.9	3.9	2.3	2.0	1.4	339	1.5	.7	1.0	.7	.7	
20	2.0	140	2.0	2.0	2.1	228	2.1	1.8	1.0	.7	.4	
21	1.4	2.9	1.9	2.0	2.1	8.9	1.7	1.7	1.0	.8	.4	
22	1.2	2.0	2.0	2.0	2.6	4.3	1.7	1.7	1.0	.8	.2	
23	1.5	2.0	1.4	2.0	1.9	3.4	1.3	1.7	1.1	.5	.2	
24	1.5	2.0	.9	2.0	1.7	2.9	1.2	1.8	1.0	.9	.4	
25	1.5	2.0	.8	2.0	1.7	210	1.5	1.8	1.0	1.2	.5	
26	2.0	2.9	1.5	2.0	1.9	340	1.4	2.0	1.0	1.2	.5	
27	1.6	1.6	1.6	2.0	493	254	1.4	2.0	1.1	1.2	.5	
28	1.5	60.5	1.4	2.0	511	15.3	1.3	2.0	1.1	1.2	.9	
29	1.3	3.3	1.2	2.0	------	9.6	1.5	2.0	1.1	1.2	1.0	
30	1.4	1.7	1.1	2.0	------	8.3	1.2	2.0	1.5	1.2	.9	
31	1.2	------	2.0	2.0	------	7.2	------	2.0	------	1.2	.9	------
TOTAL	41.1	253.6	45.2	250.7	1,063.2	2,173.4	68.4	43.9	32.6	32.3	19.5	
MEAN	1.3	8.5	1.5	8.1	38.0	70.1	2.3	1.4	1.1	1.0	.6	
MAX	2.0	140	2.5	114	511	544	6.8	2.0	1.5	2.8	1.0	
MIN	.7	1.1	.8	1.2	1.4	2.3	1.0	.7	.8	.5	.2	
AC-FT	81.5	503	89.7	497	2,109	4,311	136	87.1	64.7	64.1	38.7	
M3x1000	101	620	111	613	2,601	5,318	168	107	79.8	79.1	47.7	

												*
CAL YEAR 1990	TOTAL*	339.9	MEAN	3.7	MAX	140	MIN	.7	AC-FT	674	M3x1000	831
WTR YEAR 1991	TOTAL*	4,023.9	MEAN	12.0	MAX	544	MIN	.2	AC-FT	7,982	M3x1000	9,846

* Incomplete Record

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1990 TO Sep 1991

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	6.7	7.6	9.4	3.4	5.3	37.7	2.0	1.9	15.9	3.9	7.9	9.0
2	6.7	6.5	9.0	3.4	5.3	2.2	2.0	2.2	15.4	3.5	7.9	9.0
3	6.7	7.0	9.0	6.8	5.3	B	2.2	1.7	14.3	3.4	7.9	9.0
4	6.7	6.8	9.0	60.3	5.3	2.4	2.2	2.2	14.1	3.4	7.9	9.0
5	6.7	6.4	9.0	112	5.3	B	2.2	1.7	14.1	1.9	7.9	9.0
6	6.7	8.5	9.0	83.9	4.6	B	2.2	2.2	9.5	1.5	7.9	9.0
7	6.7	7.7	9.0	57.4	4.6	2.2	2.2	2.2	4.7	6.1	7.9	9.0
8	6.7	7.8	9.0	38.9	4.6	2.2	2.2	2.2	5.0	7.9	7.9	9.0
9	6.7	6.7	9.0	114	4.6	2.2	2.2	2.2	4.6	7.9	7.9	9.0
10	6.7	6.7	9.0	128	4.6	2.2	2.2	2.2	5.1	7.9	7.9	9.0
11	6.5	6.2	9.0	95.3	4.6	2.2	2.2	2.2	5.3	7.9	7.9	9.0
12	5.7	6.6	10.2	71.1	4.6	2.2	2.2	2.3	5.3	7.9	7.9	9.0
13	6.3	6.7	10.2	50.1	5.2	2.2	B	2.8	5.3	7.9	7.9	9.0
14	6.3	7.9	10.2	33.2	5.3	B	2.2	2.7	5.3	7.9	7.9	9.0
15	5.7	7.9	8.4	26.7	5.3	B	2.2	2.6	5.3	7.9	7.9	9.0
16	5.5	9.0	9.0	20.9	5.3	B	2.2	2.8	5.3	7.9	7.9	9.0
17	5.2	9.0	8.7	16.7	5.3	2.2	2.2	2.8	5.3	7.9	7.9	9.0
18	5.3	9.0	7.9	14.4	5.3	30.6	2.2	2.8	5.1	7.9	7.9	9.0
19	5.0	10.7	7.9	12.2	5.3	37.9	2.2	2.8	5.3	7.9	7.9	9.0
20	7.5	147	7.4	10.8	6.0	B	2.2	2.6	5.3	7.9	7.9	9.0
21	7.9	82.4	6.6	10.2	6.0	2.6	2.2	2.2	5.8	7.9	7.9	9.0
22	7.9	52.2	6.0	9.2	6.0	B	2.2	2.2	6.0	7.9	7.9	9.0
23	6.9	37.6	5.3	8.2	6.0	B	2.2	2.2	6.0	7.9	7.9	9.0
24	6.7	28.2	5.2	7.9	6.0	B	2.0	2.2	5.8	7.9	7.9	22.4
25	6.7	21.4	4.6	6.9	6.3	13.8	B	2.2	6.0	7.9	7.9	22.9
26	6.7	18.2	4.5	6.7	6.7	B	2.2	B	5.6	7.9	9.3	12.5
27	6.7	15.5	3.9	6.7	376	11.1	1.9	2.2	5.3	7.9	10.2	11.8
28	6.7	13.4	3.9	6.0	249	4.8	1.7	2.2	5.3	7.9	10.2	11.3
29	6.7	11.3	3.7	5.4	------	4.2	2.2	2.2	4.7	7.9	9.0	11.8
30	7.3	12.0	3.4	5.3	------	3.0	2.2	2.2	4.6	7.9	9.0	11.5
31	7.9	------	3.4	5.3	------	B	------	2.2	------	7.9	9.0	------
TOTAL	204.1	583.9	229.8	1,037.3	763.7	167.9	60.2	69.1	210.6	213.3	254.2	311.2
MEAN	6.6	19.5	7.4	33.5	27.3	8.8	2.2	2.3	7.0	6.9	8.2	10.4
MAX	7.9	147	10.2	128	376	37.9	2.2	2.8	15.9	7.9	10.2	22.9
MIN	5.0	6.2	3.4	3.4	4.6	2.2	1.7	1.7	4.6	1.5	7.9	9.0
AC-FT	405	1,158	456	2,057	1,515	333	119	137	418	423	504	617
M3x1000	500	1,428	562	2,537	1,869	411	147	169	516	522	622	761
						*	*	*				

CAL YEAR 1990	TOTAL*	1,017.8	MEAN	11.1	MAX	147	MIN	3.4	AC-FT	2,019	M3x1000	2,[illegible]0
WTR YEAR 1991	TOTAL*	4,105.3	MEAN	11.7	MAX	376	MIN	1.5	AC-FT	8,142	M3x1000	10,043

* Incomplete Record

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F300-R LOS ANGELES RIVER AT TUJUNGA AVENUE 19

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1990 TO Sep 1991

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	65.4	64.0	57.3	66.7	59.6	2,540	80.2	67.0	67.2	61.9	44.3	23.4
2	65.1	64.8	62.0	62.2	58.9	150	79.4	66.6	67.9	50.8	44.8	21.2
3	66.5	62.7	58.6	530	58.9	91.8	76.6	68.9	68.6	49.9	36.6	19.1
4	65.5	61.7	56.9	950	58.9	208	77.7	70.2	67.5	63.7	35.7	17.2
5	63.1	62.9	58.5	164	57.7	126	74.7	69.5	67.3	49.4	26.6	15.4
6	67.2	64.8	61.2	66.1	56.8	87.1	75.6	72.2	68.4	49.2	25.5	14.0
7	64.0	63.2	62.4	65.0	49.6	123	74.2	69.8	56.4	58.8	28.9	12.3
8	62.6	61.7	62.8	63.9	57.9	69.5	71.9	68.5	61.5	79.7	35.5	10.6
9	61.9	49.5	61.7	342	58.1	67.4	70.2	66.9	61.7	56.9	33.3	9.1
10	59.9	59.3	62.5	72.8	57.8	66.5	69.5	67.6	62.6	36.8	31.8	7.6
11	55.2	63.3	61.4	62.6	61.0	72.1	64.0	67.4	70.0	51.8	32.2	6.4
12	64.8	59.3	50.5	64.9	61.5	64.7	65.7	62.8	69.1	51.3	29.1	5.2
13	64.2	59.5	43.5	63.8	58.4	251	73.1	67.4	65.4	59.8	28.0	4.0
14	62.4	48.4	47.7	64.0	45.5	77.6	71.5	66.5	67.4	55.5	32.1	2.9
15	63.8	61.3	60.9	69.3	59.3	62.2	70.1	65.2	68.3	44.1	29.0	1.9
16	63.5	50.5	59.9	47.4	59.9	61.7	65.4	65.8	64.5	45.3	27.0	31.7
17	59.0	63.0	60.0	63.4	61.1	62.9	57.9	62.8	65.3	42.1	19.5	47.0
18	63.8	58.3	61.5	62.4	59.3	860	55.2	63.7	62.9	44.8	16.2	43.2
19	61.2	169	61.5	59.6	62.5	1,870	61.1	64.1	59.5	44.7	16.5	39.5
20	58.4	385	58.1	63.9	63.6	1,640	59.4	64.8	68.1	44.5	17.0	48.8
21	61.6	57.8	63.1	64.2	65.0	103	71.0	67.6	67.3	44.9	17.2	44.9
22	61.0	57.3	62.1	62.5	62.9	76.9	70.4	68.1	67.2	41.3	18.9	51.9
23	59.7	59.5	66.4	62.9	62.7	77.2	53.9	67.4	68.7	47.5	17.4	56.2
24	58.0	61.1	67.4	62.3	63.7	69.4	54.7	71.3	67.7	53.0	14.4	61.6
25	50.1	57.8	65.2	60.9	66.3	1,420	69.3	69.0	66.6	56.5	22.6	62.8
26	63.7	106	68.3	60.3	67.5	2,300	77.7	65.4	65.4	54.2	25.6	66.0
27	64.2	53.8	65.3	60.7	3,130	1,640	68.8	65.2	59.3	51.2	26.5	61.6
28	63.2	56.1	65.1	59.9	2,460	355	72.8	66.8	43.5	49.3	28.8	60.5
29	63.6	55.8	64.4	60.4	------	138	68.7	66.1	57.7	53.0	26.1	60.3
30	63.9	57.7	64.0	62.8	------	87.8	69.0	58.1	61.3	59.4	27.9	62.5
31	64.1	------	63.2	62.4	------	79.0	------	67.1	------	52.8	25.5	------
TOTAL	1,930.6	2,255.1	1,883.4	3,683.3	7,144.4	14,897.8	2,069.7	2,069.8	1,934.3	1,604.1	840.5	968.8
MEAN	62.3	75.2	60.8	119	255	481	69.0	66.8	64.5	51.7	27.1	32.3
MAX	67.2	385	68.3	950	3,130	2,540	80.2	72.2	70.0	79.7	44.8	66.0
MIN	50.1	48.4	43.5	47.4	45.5	61.7	53.9	58.1	43.5	36.8	14.4	1.9
AC-FT	3,829	4,473	3,736	7,306	14,171	29,549	4,105	4,105	3,837	3,182	1,667	1,922
M3x1000	4,723	5,517	4,608	9,012	17,480	36,448	5,063	5,063	4,733	3,925	2,056	2,371

CAL YEAR 1990	TOTAL*	6,069.1	MEAN	66.0	MAX	385	MIN	43.5	AC-FT	12,038	M3x1000	14,849
WTR YEAR 1991	TOTAL	41,281.8	MEAN	113	MAX	3,130	MIN	1.9	AC-FT	81,882	M3x1000	101,000

* Incomplete Record

GAGING STATION SUMMARY

LOS ANGELES COUNTY
Department of Public Works
Hydraulic/Water Conservation Division

Station Location and Description L.A. River @ Tujunga Ave. for Water-Year 1989 1990 — Station No. F300-R

Drainage Area 401.0 Square Miles (R. Veler Observer) — Gage Read Every 15 Min. — Rating Table No. 62-01

DAY	OCTOBER			NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			DAY
	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	
1	2.06	-.03	64.9	2.05	+.03	67.8	1.95	-.08	64.3	2.01	+.07	67.7	2.00	+.11	70.0	1.92	+.04	61.8	1
2	2.08	-.02	66.4	2.01	+.04	65.8	2.03	(	69.9	2.73	↑	315	1.92	+.11	64.5	2.03	(	67.2	2
3	2.07	-.01	66.6	2.06	+.04	68.5	2.07		72.1	1.93		63.2	2.04	+.11	72.5	2.01		65.8	3
4	2.07	-.01	66.7	2.06	+.03	68.8	2.12		76.0	1.92		62.3	3.00	+.01	567	2.05		68.5	4
5	2.11	0	69.5	2.05	+.04	68.6	1.88		62.1	1.94		64.0	2.13	(	76.7	2.04		67.8	5
6	2.15	(	72.2	2.03	+.05	68.0	2.02		68.2	1.99		67.0	1.98		66.3	2.05		68.4	6
7	2.14		71.6	2.01	+.06	66.8	1.97	+.07	65.2	2.04		70.0	1.96		65.1	2.13	(	74.9	7
8	2.09	+.01	68.7	2.02	+.05	67.7	1.96	↑	65.1	2.02		68.9	1.94		63.5	2.08	+.04	70.4	8
9	2.11	(	70.1	1.99	+.06	66.3	1.99		66.6	2.00		67.4	1.96		65.1	2.05	+.05	69.0	9
10	2.09		69.3	2.04	(	68.4	2.00		67.4	1.96		64.7	1.98		65.9	2.02	(	67.5	10
11	2.08		68.8	2.02		68.1	2.07		71.9	1.86	↓	61.5	1.99		66.5	2.48		151	11
12	2.09	+.01	69.6	2.03	+.07	69.1	2.03		69.3	2.06	+.07	86.4	2.00		67.5	2.38		128	12
13	2.09	+.02	69.7	2.02	(	68.8	1.99		66.9	4.06	+.04	1,410	2.03		69.0	2.18		78.8	13
14	2.14	(	73.2	2.00		67.2	2.00		67.1	3.41	+.05	654	2.10		73.8	2.05		69.3	14
15	2.10		70.4	2.03	+.08	69.7	2.02		68.6	2.43	+.10	102.	2.07	+.07	72.0	1.99		65.6	15
16	2.07		68.5	1.96	(	65.6	2.04		69.8	2.61	+.09	236.0	2.42	+.06	328.	1.99		65.6	16
17	2.09		69.8	1.98		66.9	2.00		67.5	2.52	+.10	170.0	4.80	+.01	2910.	1.99		65.3	17
18	2.08		69.1	2.04		70.4	2.01		68.8	2.00	+.11	69.6	3.33	+.04	353.	2.00		65.8	18
19	2.08		69.5	2.02		69.1	2.05		70.3	1.95	↑	66.5	2.37	(	93.2	2.01		67.0	19
20	2.14		73.3	2.03		69.6	2.01		69.8	2.05		73.0	2.14		74.4	2.00		66.2	20
21	2.39		84.7	2.03		69.9	2.08		72.2	1.87		67.8	2.17		76.5	2.08		71.5	21
22	2.86		402	2.07		72.7	2.06		71.4	1.96		67.4	2.07		69.5	2.02		67.3	22
23	2.44		97.6	2.05		71.0	2.01		69.9	1.97		68.7	2.05		68.4	2.03	+.05	67.9	23
24	2.08		69.1	2.08		73.4	1.97		65.1	1.86		63.1	2.01		66.2	2.00	+.06	67.0	24
25	2.06		68.0	2.05		71.3	1.96		64.5	1.95		66.7	2.02		66.4	1.92	(	62.9	25
26	2.01		64.9	2.09		50.4	1.97		65.7	1.94		69.1	2.02		66.7	1.99		66.5	26
27	2.00		64.2	2.15		78.5	1.98		66.1	1.96		67.6	2.13		74.3	2.04		69.6	27
28	2.05		67.3	1.95		64.3	2.12		79.4	2.04		73.3	2.04	+.04	67.8	2.00		67.0	28
29	2.06		67.9	2.05		72.1	2.00		67.4	2.04		72.6				2.00		66.7	29
30	2.02		65.3	2.00	+.08	67.8	1.99	↓	64.0	2.30	↓	158.0				2.02		68.4	30
31	2.02	+.02	65.2				1.96	+.07	64.5	2.23	+.11	91.4				2.05	+.06	70.1	31
	2504.2			2508.2			2115.2			4,704.4			5839.8			2248.8			
	80.8			83.6			68.2			152			209.			72.5			
	4,967			4975			4195.0			9331.			11,683			4460			
	1.05			504			79.4			1,410.			2910			151			
	64.2			66.3			62.1			61.5			63.5			61.8			

DAY	APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER			DAY
	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj.	Discharge	Gage Height	Adj	Discharge	Gage Height	Adj	Discharge	
1	2.01	+.06	67.5	2.01	+.06	67.4	2.01	+.06	67.8	1.98	+.16	71.6	1.94	+.22	72.9	2.00	+.17	74.0	1
2	2.00	(	66.6	1.95	(	63.7	1.96	+.07	64.7	1.99	+.16	72.3	1.97	+.22	74.9	1.96	+.17	71.2	2
3	2.00		66.4	1.96		64.0	1.93	+.07	63.2	1.94	+.17	70.1	1.99	+.22	76.8	2.00	+.16	73.3	3
4	2.84		358.	1.97		64.6	1.96	+.07	64.7	1.95	(	70.6	2.00	+.22	77.5	2.00	+.16	73.6	4
5	2.14		75.9	2.00		66.3	1.96	+.08	65.6	1.99		73.2	2.01	+.21	77.4	2.01	+.16	73.6	5
6	2.13		74.8	1.97		64.8	1.95	+.08	64.8	1.98		72.4	2.16	+.21	179.	1.98	+.15	71.4	6
7	2.02		68.0	1.95		63.6	1.95	+.08	64.9	1.96		70.7	2.45		224.	2.00	+.15	72.6	7
8	1.98		65.6	1.99		66.2	1.96	+.09	66.0	1.95	+.17	70.6	2.01		77.5	1.95	+.15	69.4	8
9	2.02		68.0	1.99		66.1	1.91	+.09	63.0	1.98	+.18	73.3	1.98		75.3	1.96	+.14	69.3	9
10	2.08		71.8	1.98		65.7	1.94	+.10	65.4	2.03	(	76.6	1.97	+.21	74.7	2.03	(	73.5	10
11	2.07		71.5	2.02		67.9	1.98	+.10	67.8	1.97		72.7	2.02	+.20	77.4	1.99		71.0	11
12	2.03		68.8	1.99		66.0	1.95	+.10	65.8	1.97		72.5	2.00	(	75.5	1.96		69.1	12
13	1.98		65.2	1.97		65.0	1.95	+.11	67.0	1.97	+.18	72.6	1.95		72.6	1.93		67.3	13
14	1.98		65.3	1.98		65.3	1.96	+.11	67.3	1.92	+.19	70.0	1.95		72.5	2.00		71.6	14
15	1.99		66.1	1.98		65.7	1.97	+.11	68.2	1.93	(	70.3	1.98		75.0	1.97		70.2	15
16	2.51		149.	1.96		64.0	1.98	+.12	69.3	1.96		72.5	1.95		72.3	1.99		71.1	16
17	2.33		94.1	1.98		65.4	1.99	+.12	69.7	2.00		75.6	1.98	+.20	74.4	1.99		71.0	17
18	2.03		68.8	2.12		74.8	2.04	+.12	73.4	1.91	+.19	70.3	1.94	+.19	71.3	1.99		72.7	18
19	2.08		67.0	2.02		67.9	1.99	+.13	70.3	1.97	+.20	73.7	1.98		73.9	1.98		70.6	19
20	2.14		75.6	1.98		65.6	1.98	+.13	69.7	1.99	(	75.2	2.01		75.8	2.00		71.9	20
21	2.02		68.0	2.04		69.2	1.96	+.14	69.1	1.96		73.6	1.93		71.1	2.00		71.7	21
22	2.07		71.0	1.97		64.7	1.67	+.14	55.6	1.93		71.5	2.00		74.9	2.00		72.1	22
23	2.28		114.	1.96		64.5	1.95	+.14	68.8	1.97	+.20	73.9	2.04	+.19	78.0	1.99		71.5	23
24	2.13		75.7	1.92		62.3	1.92	+.15	67.6	1.96	+.21	73.6	2.00	+.18	74.3	1.99		71.3	24
25	1.98		65.4	1.93		62.6	1.98	+.13	71.5	1.99	(	75.9	1.98	(	73.2	2.02		73.3	25
26	1.96		64.4	1.94		63.3	1.97	+.15	70.2	1.62		60.5	1.98		72.9	2.25		90.0	26
27	1.98		65.4	1.95		64.9	1.94	+.15	68.6	1.95		72.9	1.97		72.9	2.07		76.4	27
28	1.98		65.5	3.49		750.	1.98	+.16	71.6	1.96		73.8	1.98		73.3	1.89		68.1	28
29	1.99		66.0	2.08		72.1	1.96	+.16	70.3	1.91	+.21	70.4	1.99	+.18	73.6	2.01		72.4	29
30	2.00		67.0	1.96		65.1	2.00	+.16	73.0	1.92	+.22	72.3	1.99	+.17	73.3	1.99	+.14	71.0	30
31				1.97	+.06	64.8				1.95	+.22	73.7	1.99	+.17	73.1				31
	2496.4			2723.5			2024.9			2238.9			2561.3			2166.2			
	83.2			87.9			67.5			72.2			82.6			72.2			
	4952			5402			4016			4441			5080			4297			
	358			750			234			96.6			224			90.0			
	64.4			62.3			55.6			60.5			71.1			67.3			

Maximum stage 6.68 +0 feet at 0800 on 2-17-90 Discharge 7296. Second-feet.
Minimum stage 0.34 +0.21 feet at 0845 on 7-26-90 Discharge 8.45 Second-feet.

REMARKS

1 - Total CFS
2 - Average Daily Flow in CFS
3 - Total Monthly Flow in A.F.
4 - Maximum Average Daily Flow in CFS
5 - Minimum Average Daily Flow in CFS

	YEARLY TOTALS	
1	34131.6	1
2	93.5	2
3	67699	3
4	2910	4
5	55.6	5

APPENDIX C

WELLS DRILLED AND DESTROYED

Wells Destroyed 1990-91

Party	Well No.	Owner No.	Purpose
Pilips Componemts	*	MW 2	Monitoring

WELLS DRILLED 1990-91**

Party	Well No.	Owner No.	Purpose
Philips Components	*	MW 16	Monitoring
Philips Components	*	MW 17	Monitoring
Philips Components	*	MW 18	Monitoring
Philips Components	*	MW 19	Monitoring
Philips Components	*	EW 2	Extraction
Lockheed Corp.	*	A-1-CW4	Monitoring
Lockheed Corp.	*	B-1-CW14	Monitoring
Lockheed Corp.	*	B-6-CW16	Monitoring
Lockheed Corp.	*	B-1-CW22	Monitoring
Lockheed Corp.	*	B-1-CW23	Monitoring
Lockheed Corp.	*	B-1-CW24	Monitoring
Lockheed Corp.	*	B-1-CW25	Monitoring
Lockheed Corp.	*	B-1-CW26	Monitoring
Lockheed Corp.	*	B-1-CW27	Monitoring
Lockheed Corp.	3850 N	----	Monitoring
Lockheed Corp.	3850 P	----	Monitoring
Lockheed Corp.	3851 M	----	Monitoring
Lockheed Corp.	3851 N	----	Monitoring
Lockheed Corp.	3851 P	----	Monitoring
Lockheed Corp.	3852 F	----	Monitoring
Lockheed Corp.	3852 G	----	Monitoring
Lockheed Corp.	3852 H	----	Monitoring
Lockheed Corp.	3860 J	----	Monitoring
Lockheed Corp.	3861 D	----	Monitoring
Lockheed Corp.	3861 E	----	Monitoring
Lockheed Corp.	3861 F	----	Monitoring
Lockheed Corp.	3861 F	----	Monitoring
Lockheed Corp.	3862 C	----	Monitoring
Lockheed Corp.	3862 D	----	Monitoring
Lockheed Corp.	3862 E	----	Monitoring
Lockheed Corp.	3870 D	----	Monitoring
Lockheed Corp.	3870 E	----	Monitoring
Lockheed Corp.	3871 G	----	Monitoring
Lockheed Corp.	3871 H	----	Monitoring
Lockheed Corp.	3871 J	----	Monitoring
Lockheed Corp.	3872 K	----	Monitoring
Lockheed Corp.	3872 L	----	Monitoring
Lockheed Corp.	3872 M	----	Monitoring
Lockheed Corp.	3880	----	Monitoring

* - Have not been assigned Los Angeles County Department of Public Works well nos.
** As of September 30, 1991

WELLS DRILLED 1990-91 FOR

MAJOR GROUNDWATER POLLUTION INVESTIGATIONS

Party

Allied - Signal Aerospace Co. (Formerly Bendix Corp.) - Installed six new monitoring wells (for a total of 7 monitoring wells).

Hughes Aircraft Company - Have 34 monitoring wells on and off site.

Philips Components - Installed 4 new monitoring wells and 1 new extraction well (for a total of 20 existing and 2 extraction wells) and abandoned 1 monitoring well.

Lockheed - Drilled 33 additional wells (for a total of 101 existing wells) for site evaluation, testing, and monitoring - one well is capable of being used as an extraction well. Ten existing multi screened wells were grouted in the lower zones so they can now be used as shallow monitoring wells.

3M-Pharmaceutical - No new wells drilled (for a total of 33 wells) for site evaluation, testing, and monitoring.

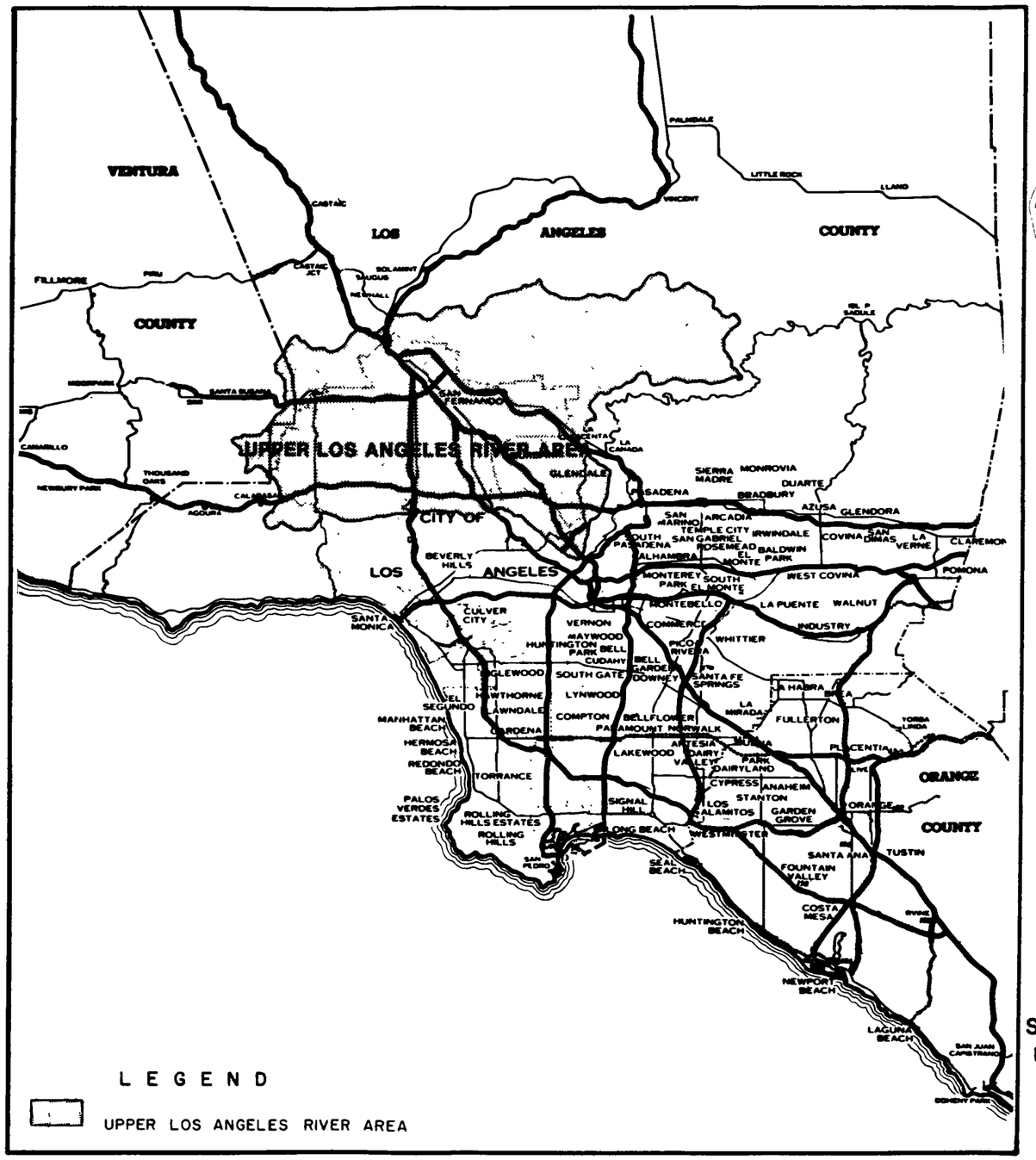
Rocketdyne - No additional wells (for a total of 105) for site evaluation, testing, and monitoring - 11 wells are capable of being used as extraction wells.

APPENDIX D

PLATES

PLATE 1

UPPER LOS ANGELES RIVER AREA WATERMASTER



VICINITY MAP

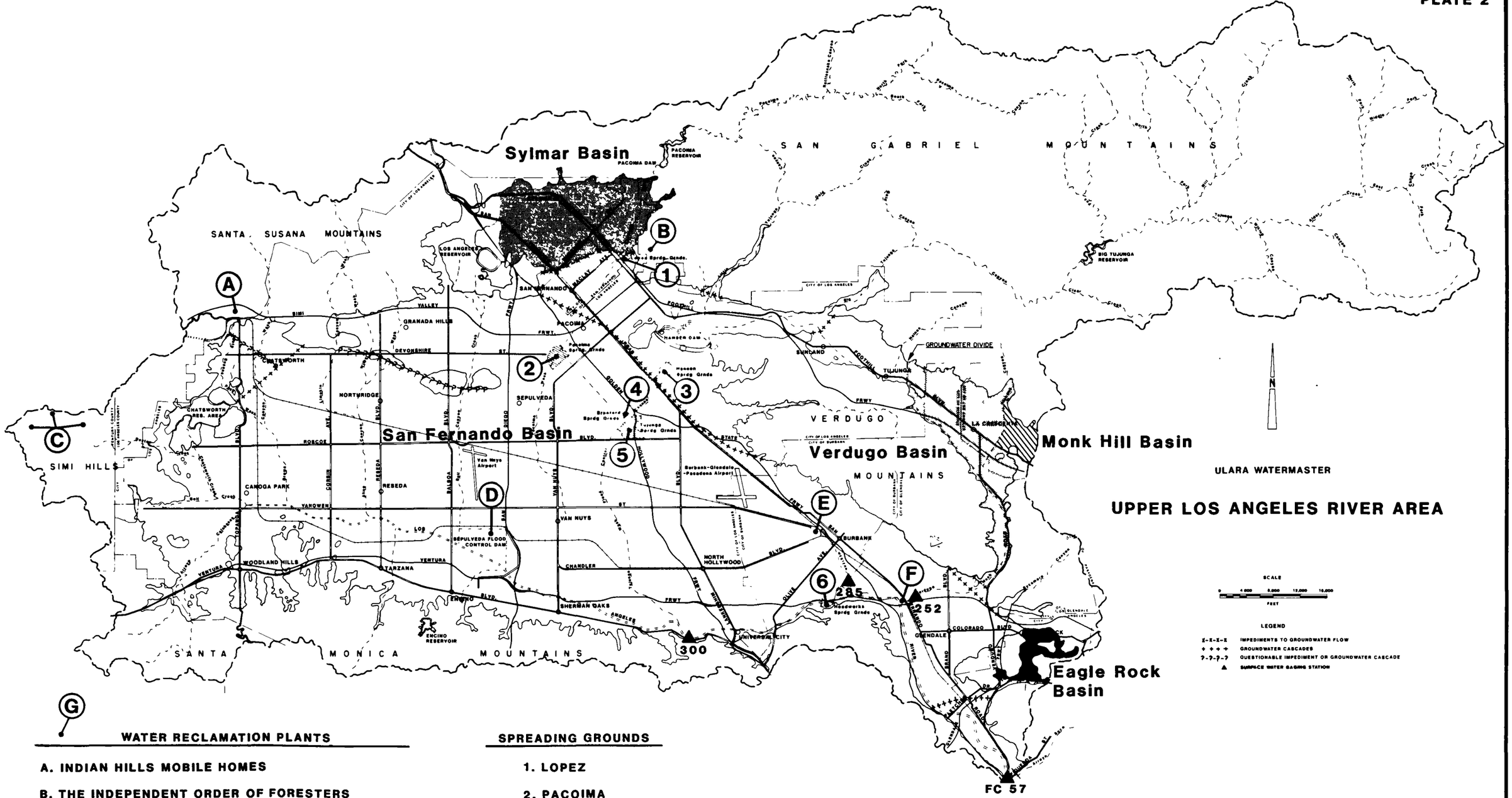
SCALE

0 5 10 15 Miles

SEE VICINITY MAP FOR UPPER LOS ANGELES RIVER AREA

LOCATION MAP

PLATE 2



WATER RECLAMATION PLANTS

A. INDIAN HILLS MOBILE HOMES

B. THE INDEPENDENT ORDER OF FORESTERS

C. ROCKETDYNE SANTA SUSANA FIELD LABORATORY

D. DONALD C. TILLMAN

E. CITY OF BURBANK

F. LOS ANGELES-GLENDALE

G. TAPIA WATER RECLAMATION PLANT

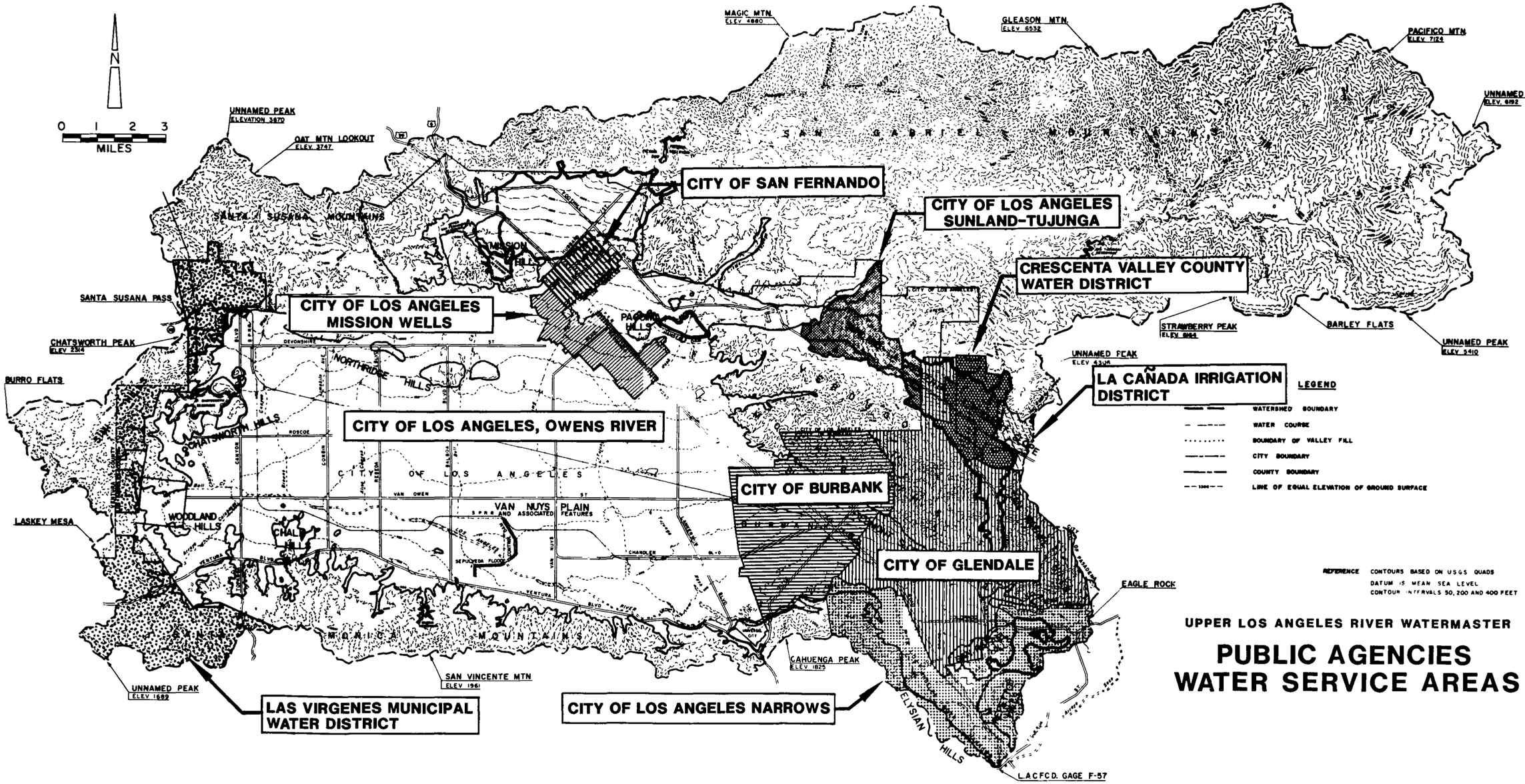
SPREADING GROUNDS

1. LOPEZ
2. PACOIMA
3. HANSEN
4. BRANFORD
5. TUJUNGA
6. HEADWORKS

UPPER LOS ANGELES RIVER AREA

MRG 3/89

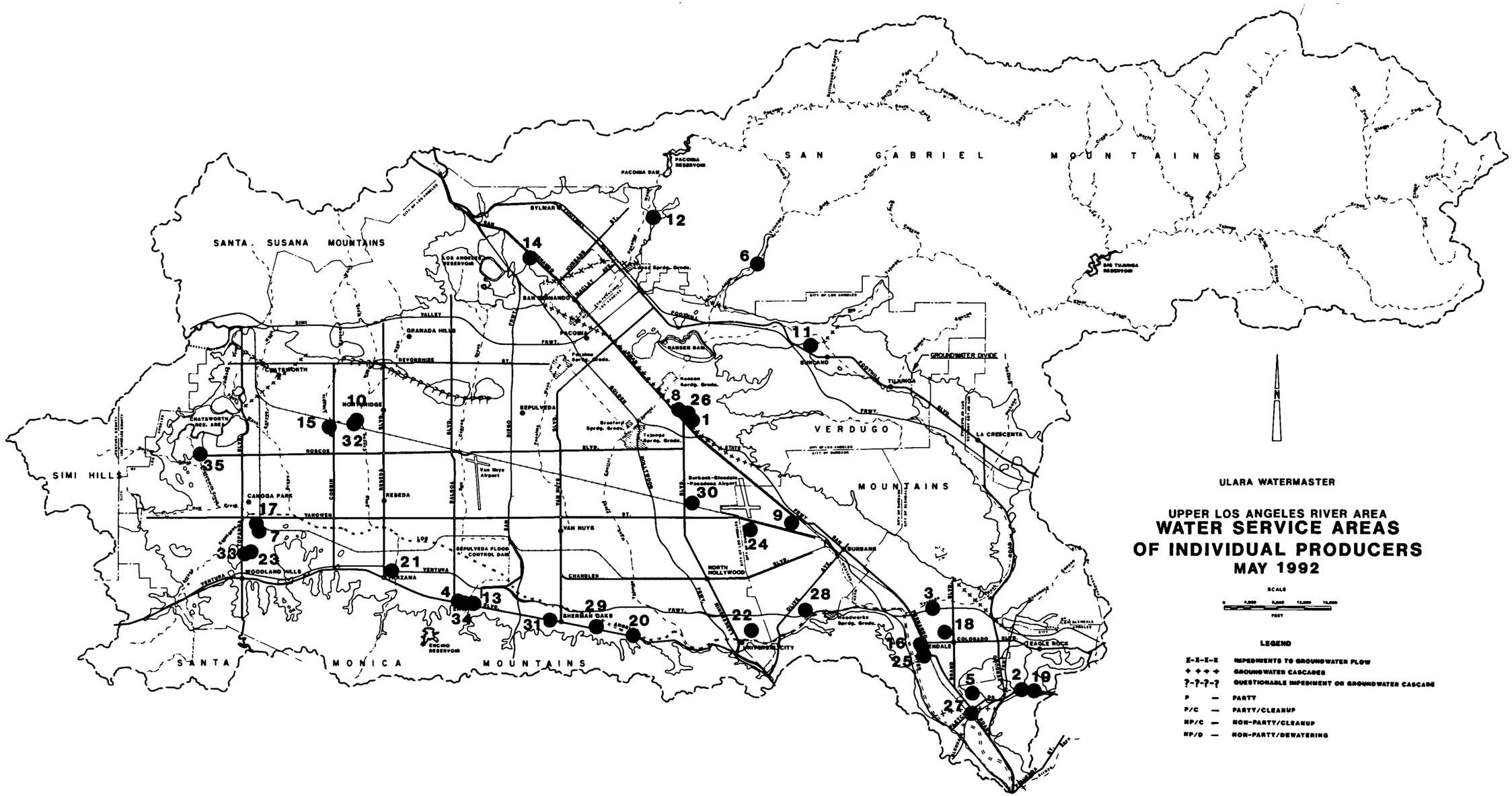
PLATE 3



UPPER LOS ANGELES RIVER WATERMASTER

PUBLIC AGENCIES WATER SERVICE AREAS

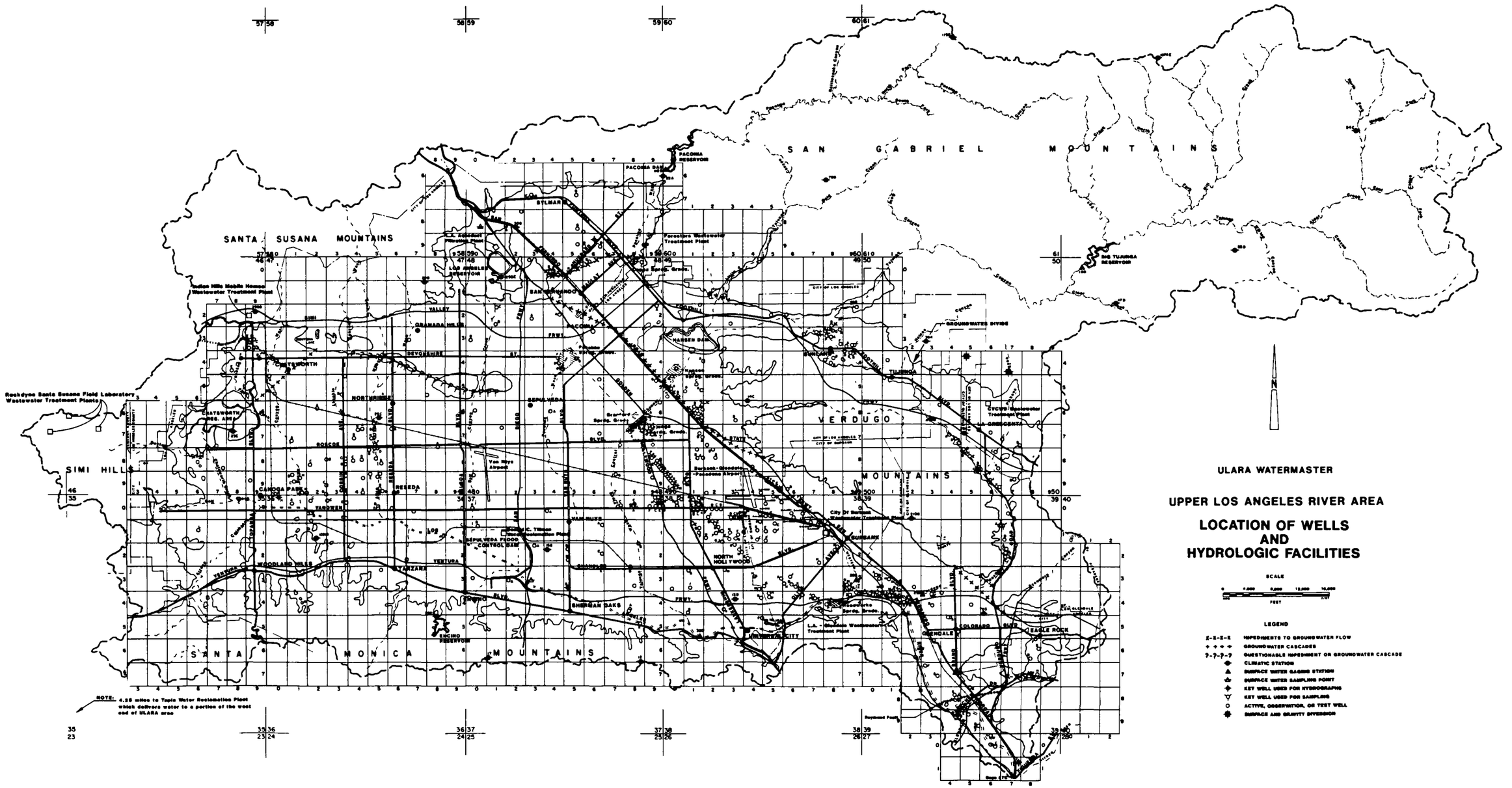
PLATE 4



1. **CONROCK CO. (CAL MAT)** (P)
2. **DEEP ROCK BOTTLED WATER** (P)
3. **ENVIRONMENTALS INC.** (P)
4. **FIRST FINANCIAL PLAZA SUITE** (NP/D)
5. **FOREST LAWN MEMORIAL PARK** (P)
6. **HARPER, CECELIA DE MILLE** (P)
7. **LAMCO** (NP/D)
8. **LIVINGSTON-GRAHAM, INC.** (P)
9. **LOCKHEED AIRCRAFT CORP.** (P/C)
10. **MAY CO. NORTHRIDGE FASHION PLAZA** (NP/D)
11. **MENA, JOHN & BARBARA** (P)
12. **MEURER ENGINEERING CO.** (P)
13. **MOBIL OIL** (NP/C)
14. **MOORDIGIAN, KISAG** (P)
15. **3M PHARMACEUTICAL** (NP/C)
16. **PHILIPS COMPONENTS** (NP/C)
17. **ROCKWELL INTERNATIONAL** (NP/C)
18. **SEARS, ROEBBUCK & CO.** (P)
19. **SPARKLETTS DRINKING WATER CORP.** (P)
20. **SPORTSMEN'S LODGE, INC.** (P)
21. **THRIFTY OIL** (NP/C)
22. **TOLUCA LAKE PROPERTY OWNERS ASSN.** (P)
23. **TRILLIUM CORP.** (NP/D)
24. **VALHALLA MEMORIAL PARK** (P)
25. **WICKES CO., INC.** (NP/C)
26. **VALLEY RECLAMATION CO.** (P)
27. **VAN DE KAMP'S DUTCH BAKERS, INC.** (P)
28. **WALT DISNEY PRODUCTIONS** (P)
29. **UNOCAL CORP.** (NP/C)
30. **ALLIED-SIGNAL AEROSPACE CO.** (NP/C)
31. **LA REINA FASHION PLAZA** (NP/D)
32. **MALIBU GRAND PRIX** (NP/C)
33. **WARNER CENTER** (NP/D)
34. **AUTO STIEGLER, INC.** (NP/D)
35. **HUGHES AIRCRAFT, CO.** (NP/C)

MRG 4/91

PLATE 5



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

LOCATION OF WELLS AND HYDROLOGIC FACILITIES

SCALE

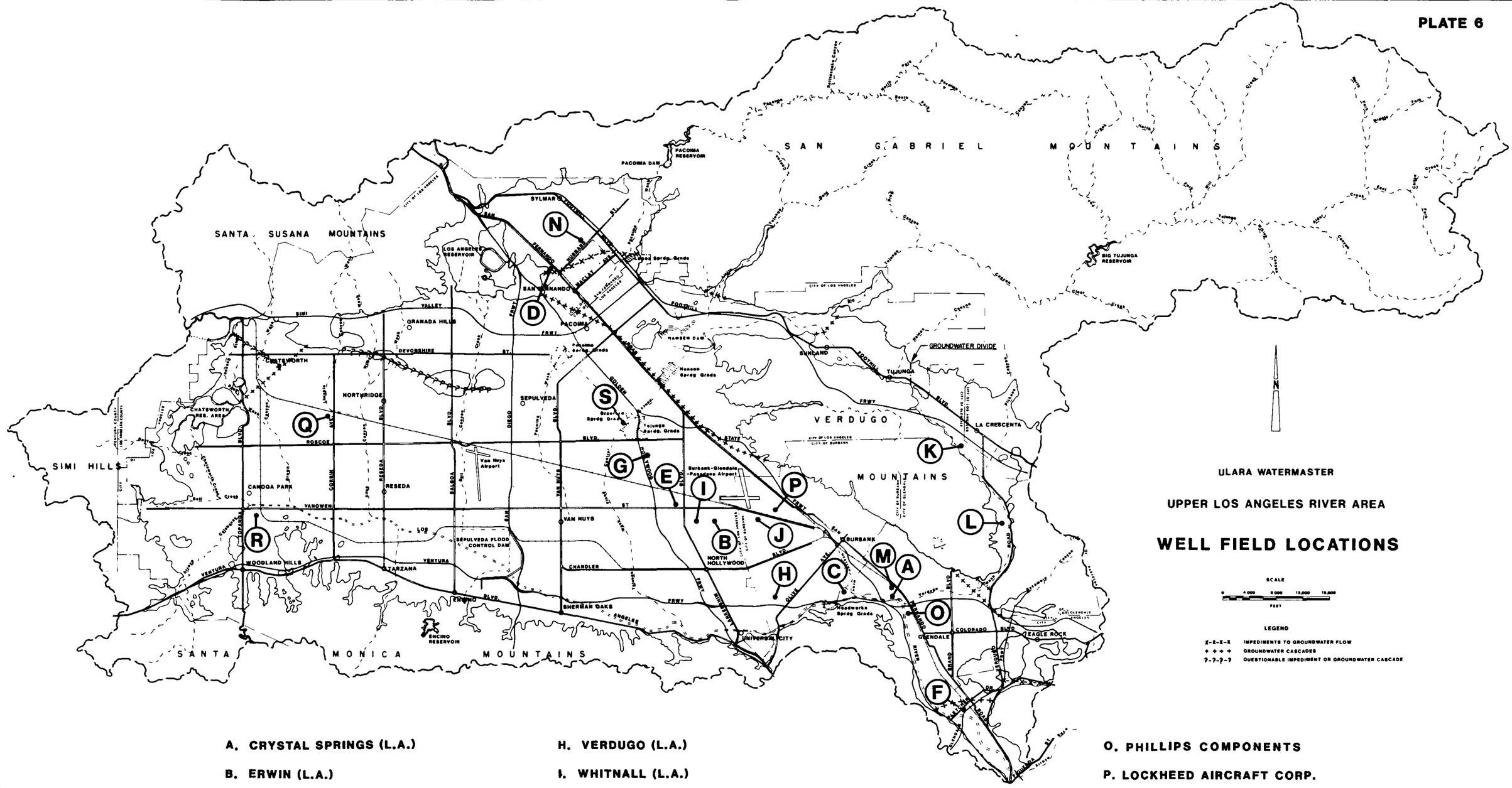
0 4,000 8,000 12,000 16,000

FEET 1:97

LEGEND

- E-E-E-E 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 DIVERSION

PLATE 6



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

WELL FIELD LOCATIONS

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

A. CRYSTAL SPRINGS (L.A.)

B. ERWIN (L.A.)

C. HEADWORKS (L.A.)

D. MISSION (L.A.)

E. NORTH HOLLYWOOD (L.A.)

F. POLLOCK (L.A.)

G. RINALDI-TOLUCA (L.A.)

H. VERDUGO (L.A.)

I. WHITNALL (L.A.)

J. CITY OF BURBANK

K. CRESCENTA VALLEY COUNTY WATER DISTRICT

L. CITY OF GLENDALE (GLORIETTA)

M. CITY OF GLENDALE (GRANDVIEW)

N. CITY OF SAN FERNANDO

O. PHILLIPS COMPONENTS

P. LOCKHEED AIRCRAFT CORP.

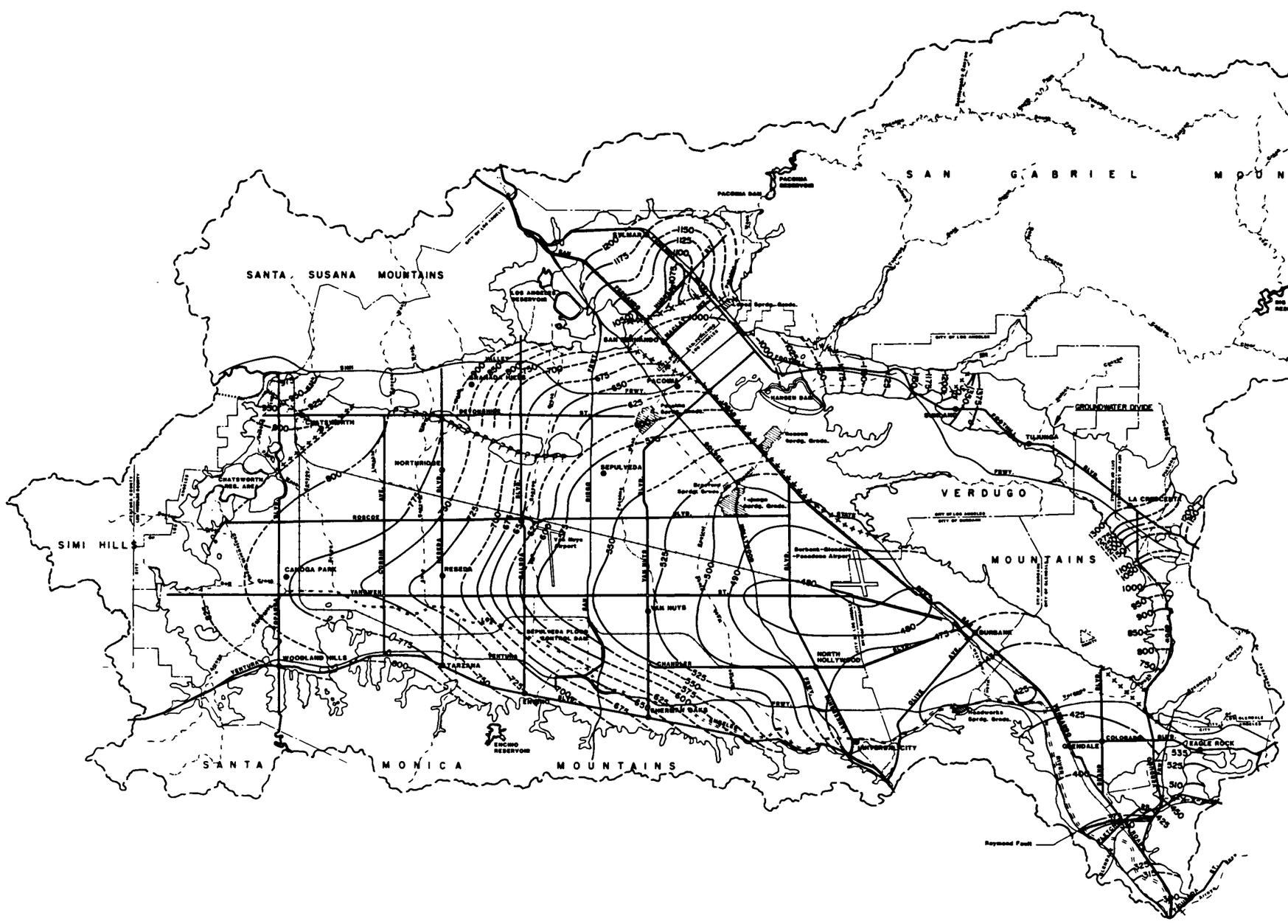
Q. 3M-PHARMACEUTICAL

R. ROCKWELL INTERNATIONAL

S. TUJUNGA (L.A.)

MRG 3/89

PLATE 7



N

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

GROUNDWATER CONTOURS

SPRING 1991

SCALE

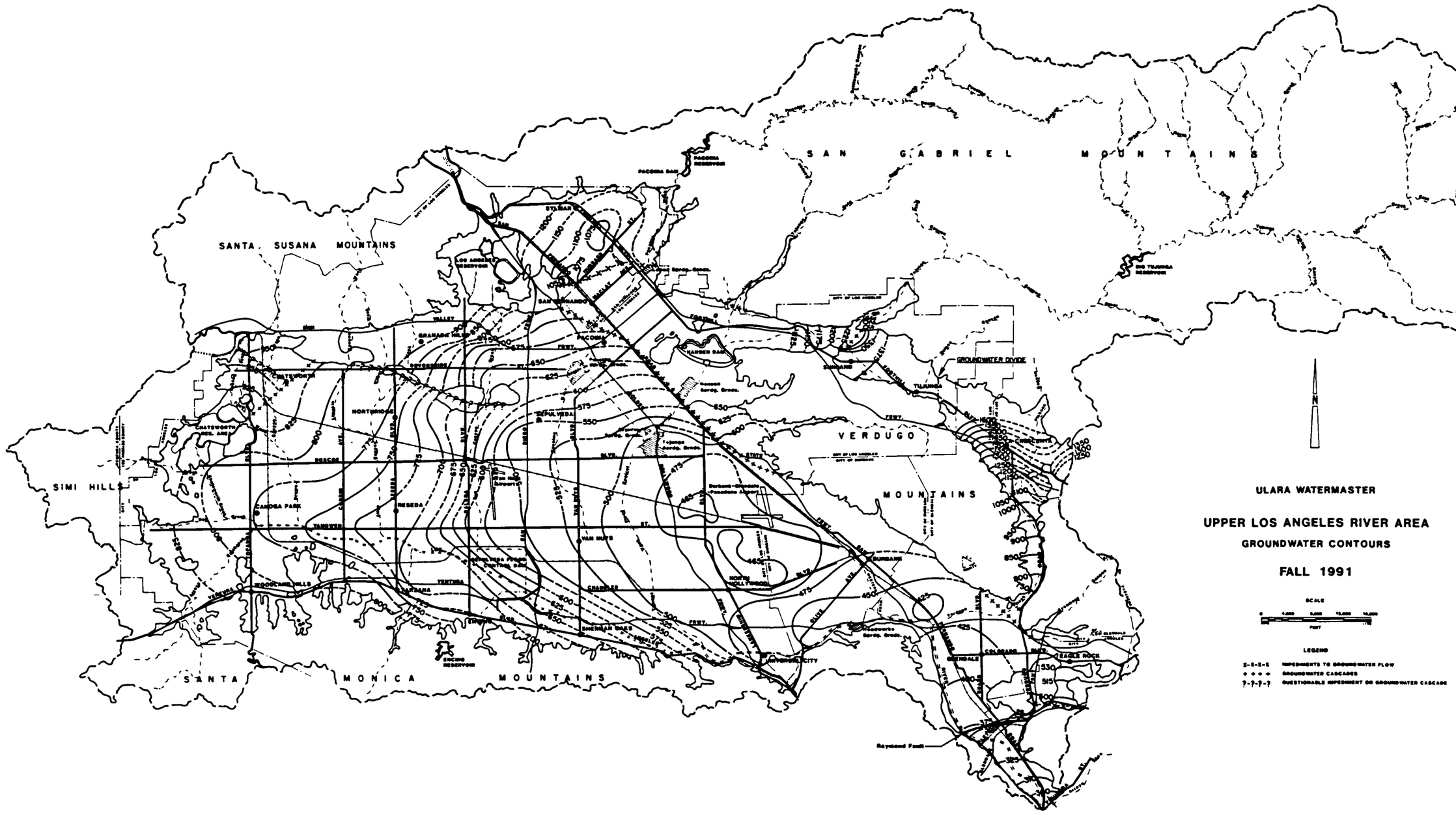
0 2,000 4,000 6,000 8,000

FEET

LEGEND

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

PLATE 8



N

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA
GROUNDWATER CONTOURS
FALL 1991

SCALE

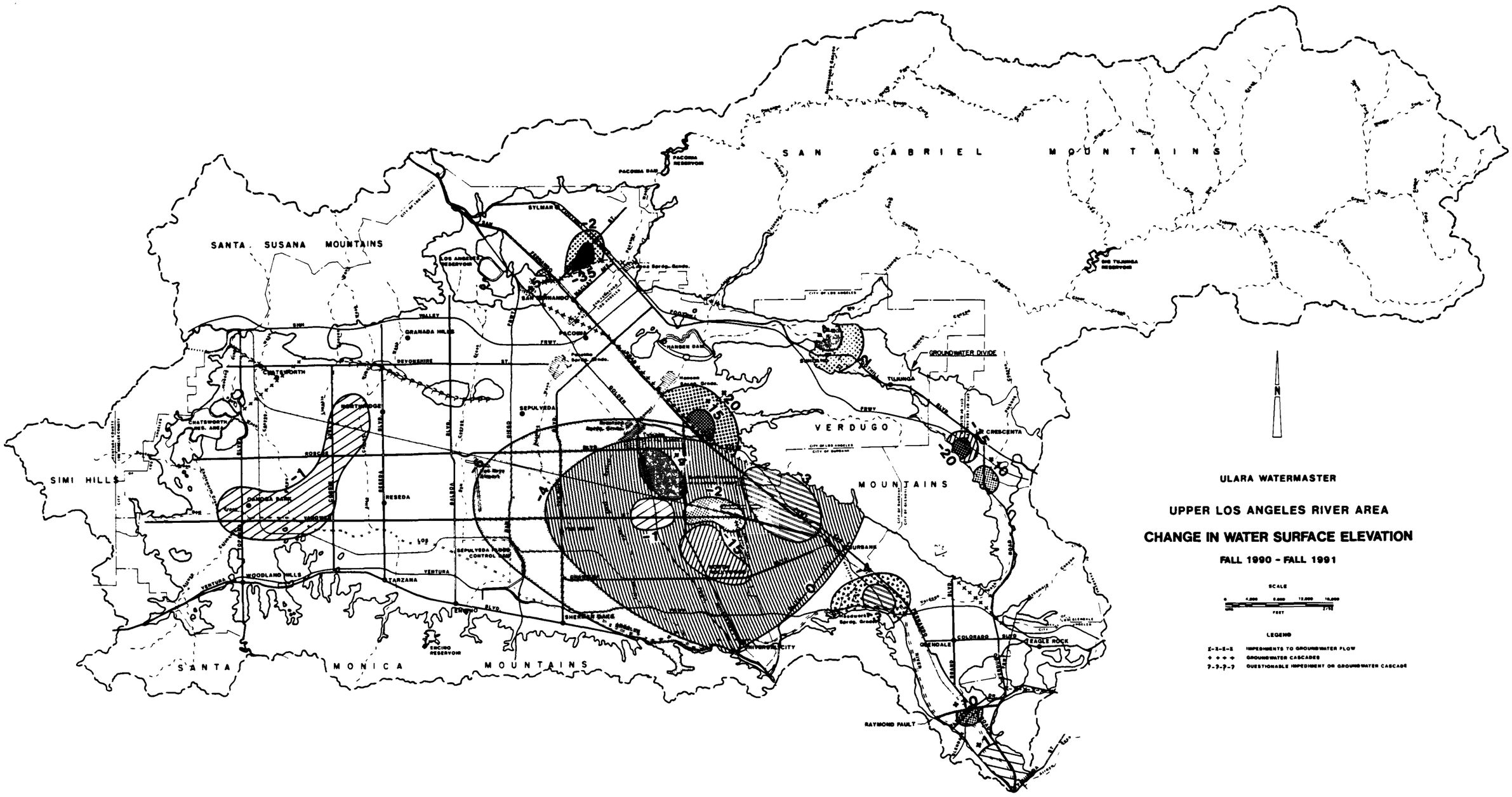
0 4,000 8,000 12,000 16,000

FEET

LEGEND

- E-I-E-I-E IMPEDIMENTS TO GROUNDWATER FLOW
- + + + + GROUNDWATER CASCADES
- ?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE

PLATE 9



N

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

CHANGE IN WATER SURFACE ELEVATION

FALL 1990 - FALL 1991

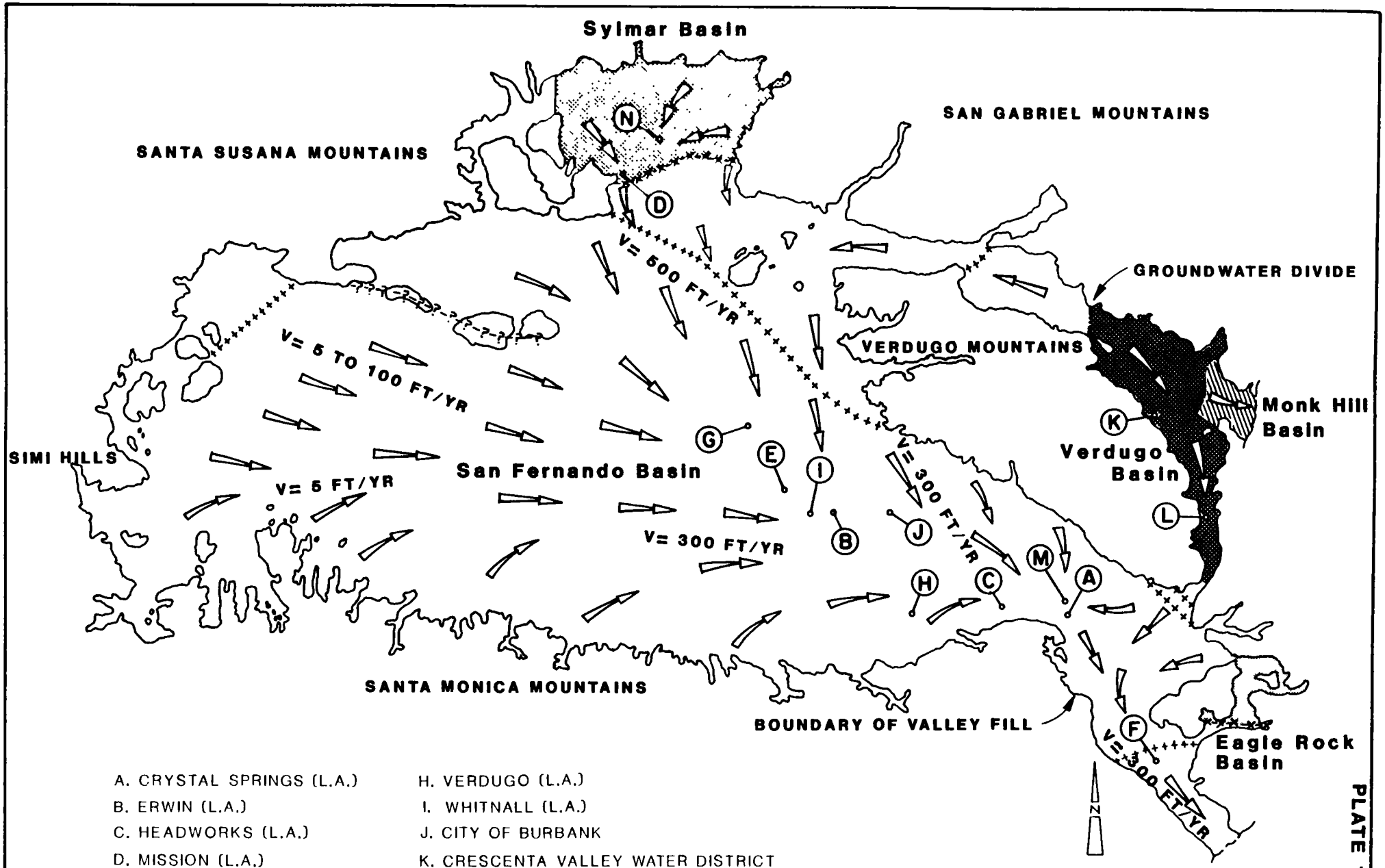
SCALE

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

FEET

LEGEND

Z-Z-Z-Z	IMPEDIMENTS TO GROUNDWATER FLOW
+ + + +	GROUNDWATER CASCADES
?-?-?-?	QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE



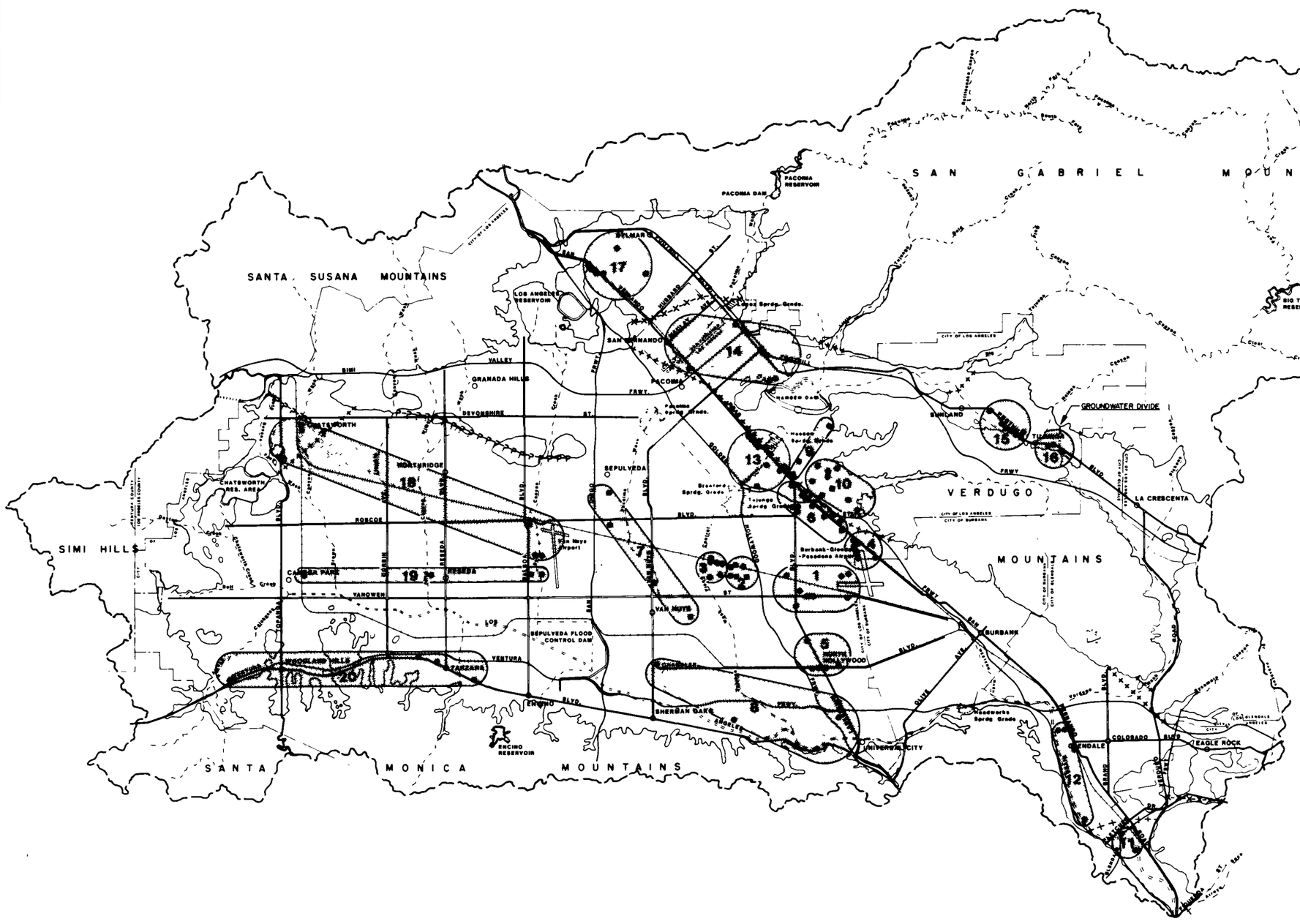
MRG 3/89

SAN FERNANDO BASIN

ESTIMATED DIRECTIONS AND VELOCITIES OF GROUNDWATER FLOW

PLATE 10

PLATE 11



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA
CITY OF LOS ANGELES - BUREAU OF ENGINEERING
SEWER CONSTRUCTION PROGRAM
1984 - 1995

SCALE

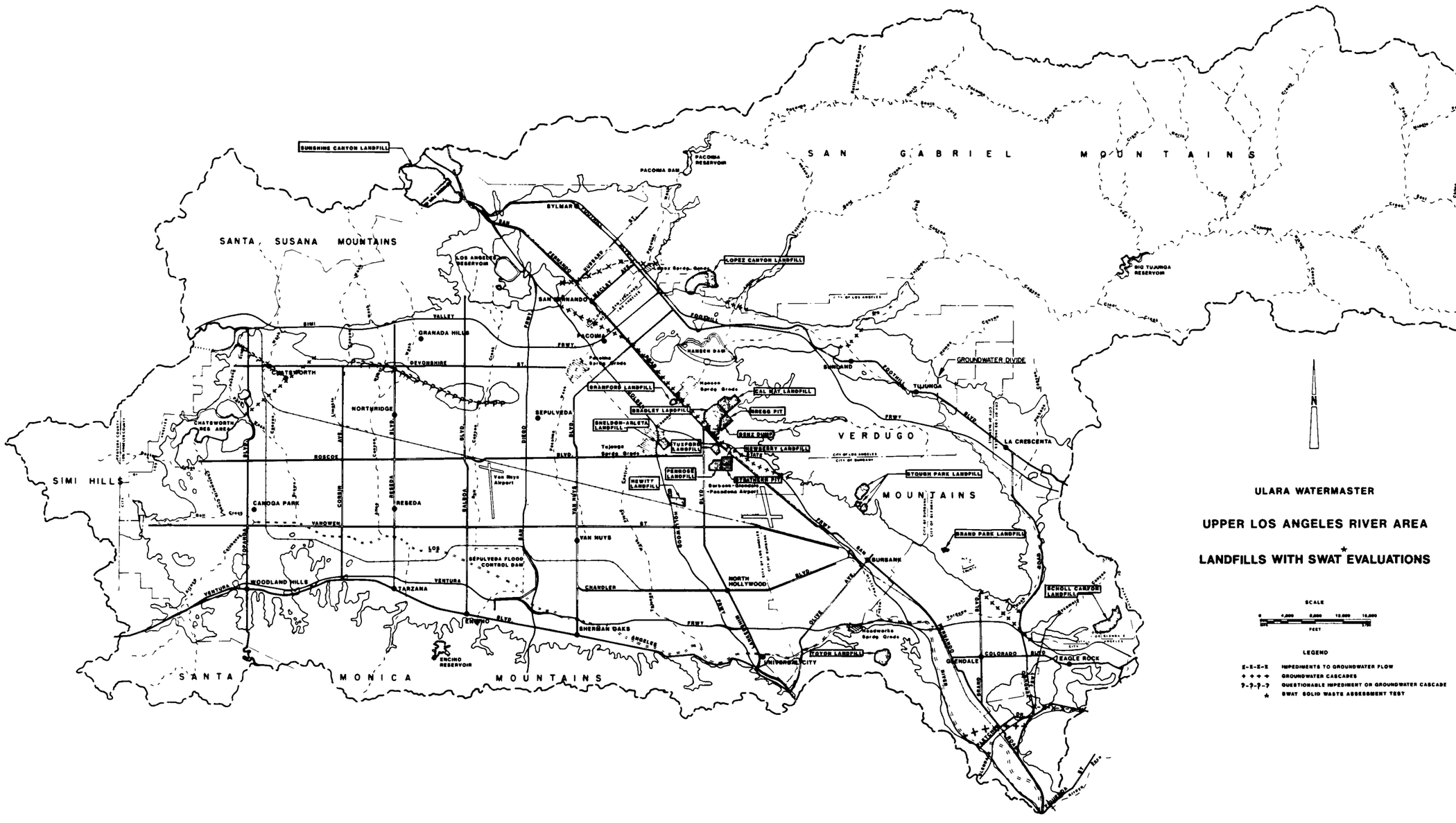
0 4,000 8,000 12,000 16,000
FEET

LEGEND

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

MRG 1/88

PLATE 12



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

★ LANDFILLS WITH SWAT EVALUATIONS

SCALE

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

FEET

LEGEND

- E-E-E-E IMPEDIMENTS TO GROUNDWATER FLOW
- ◆-◆-◆-◆ GROUNDWATER CASCADES
- ?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUNDWATER CASCADE
- ★ SWAT SOLID WASTE ASSESSMENT TEST

NOTE: For more details, see TABLE 9.

MRG 1/88

SAN FERNANDO BASIN

CUMULATIVE CHANGE IN GROUNDWATER STORAGE

OCTOBER 1, 1991 - STATUS OF GROUNDWATER STORAGE

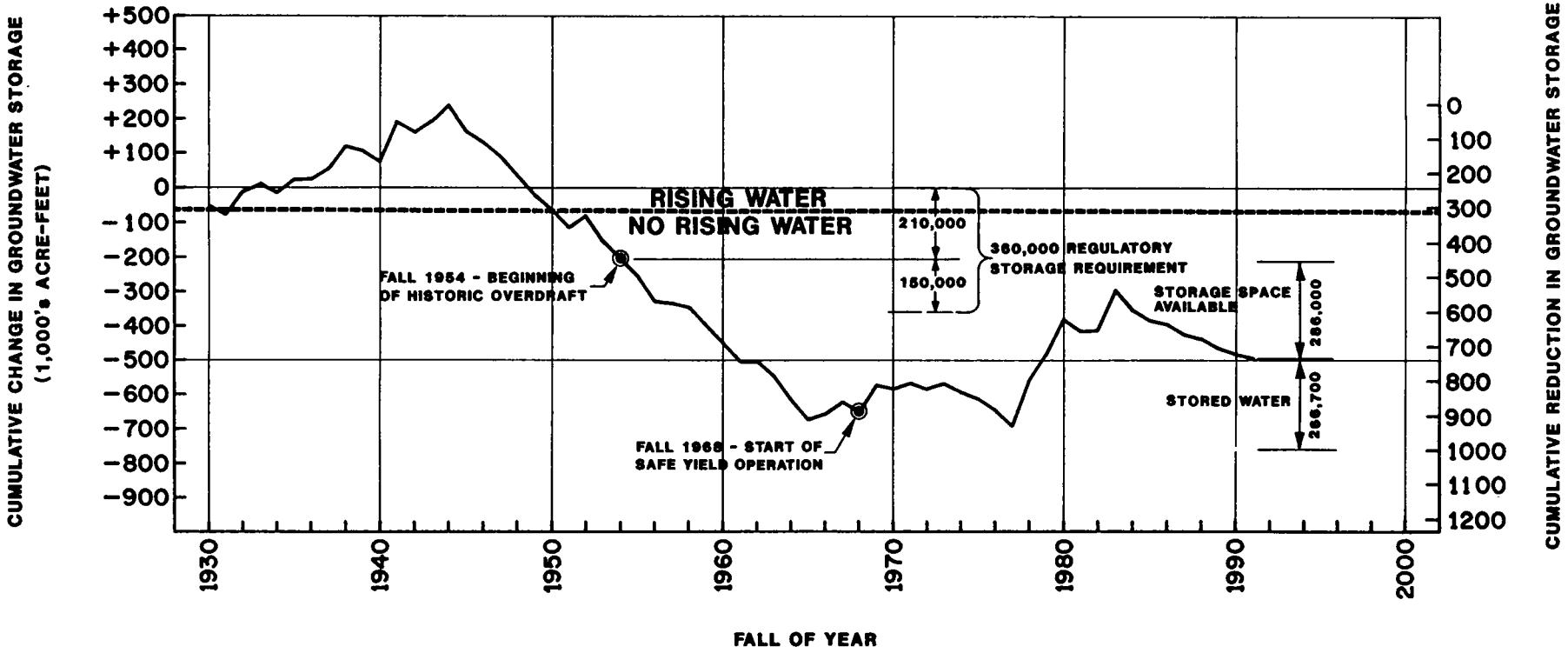
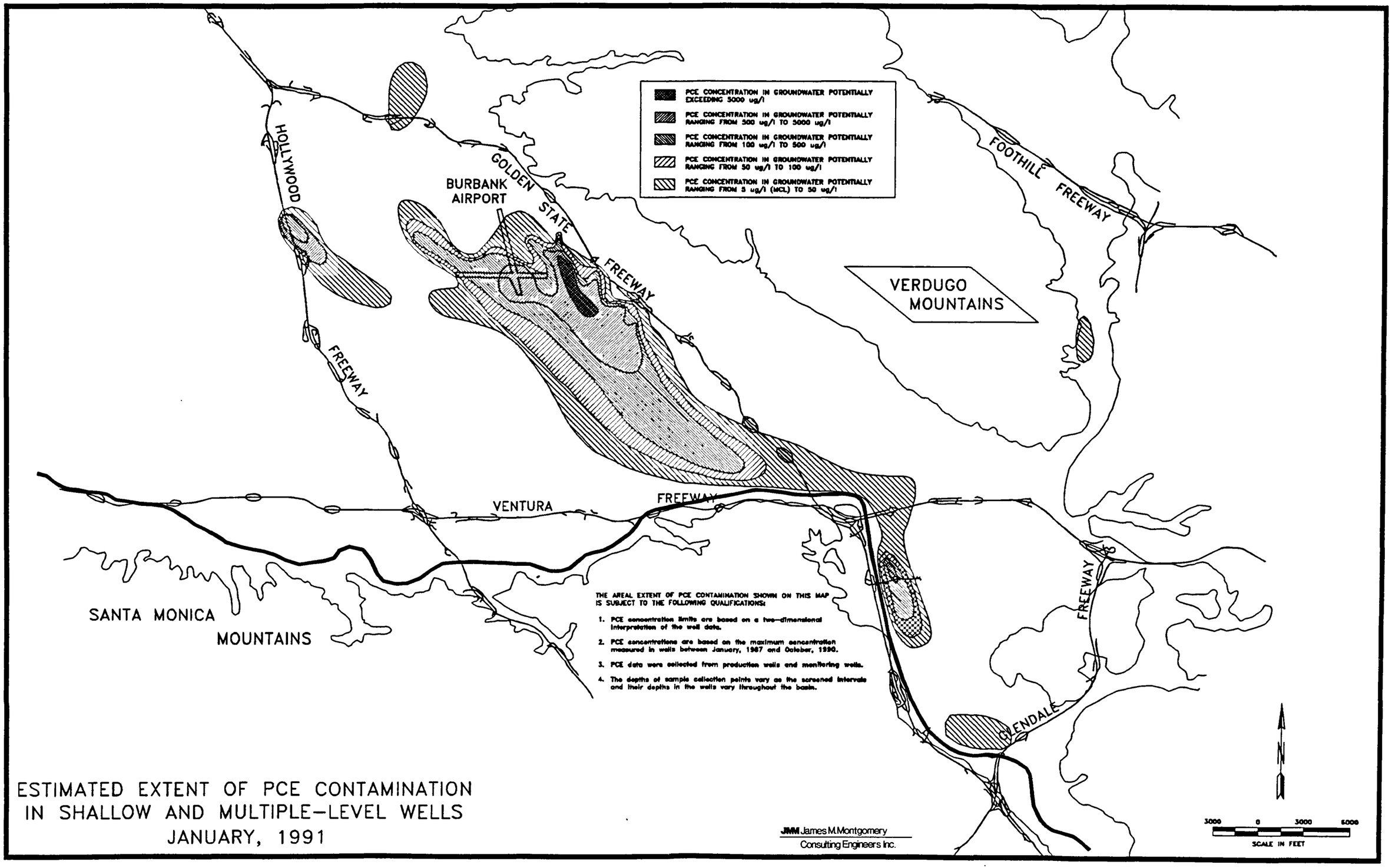
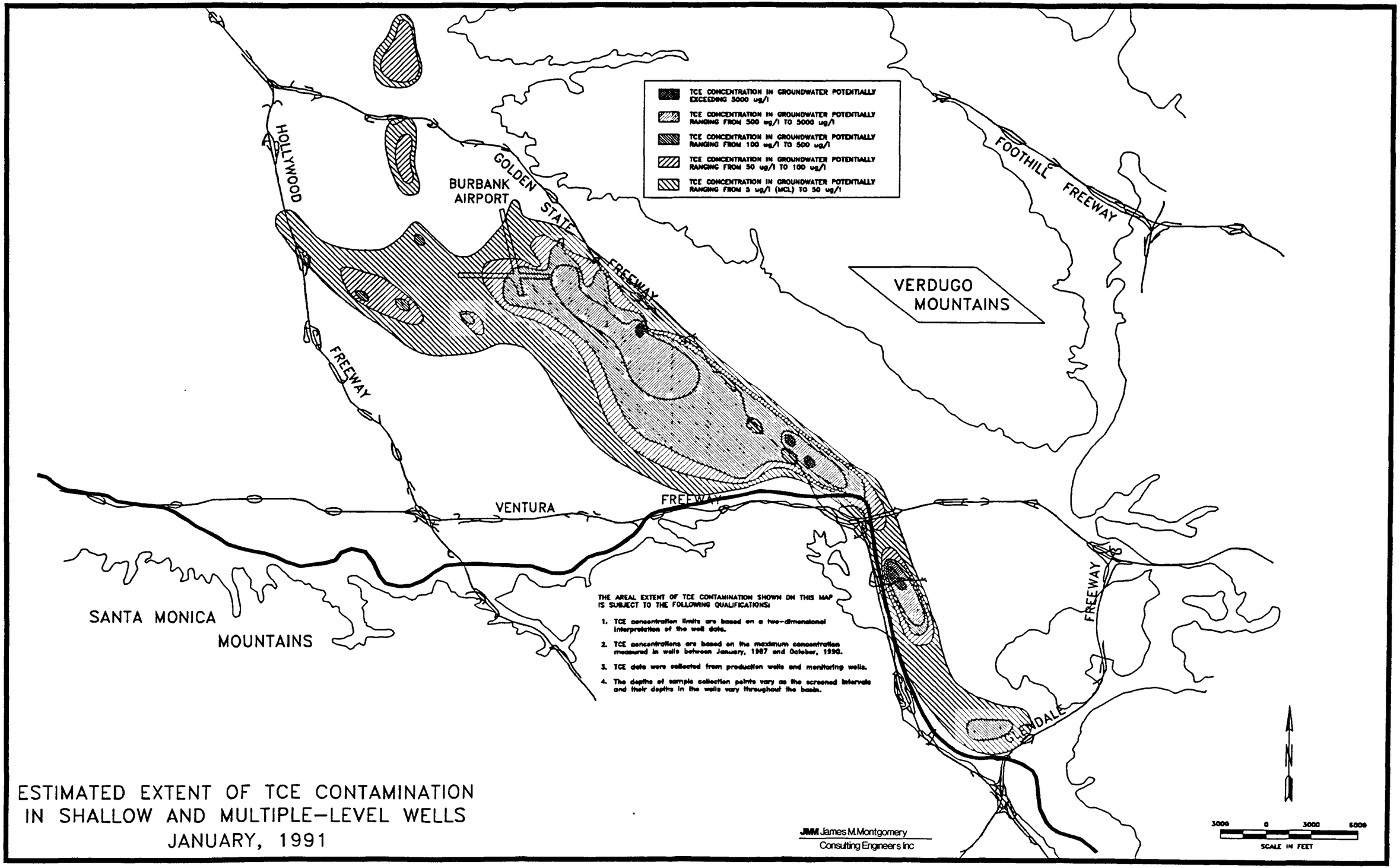


PLATE 13

MRG 2/92

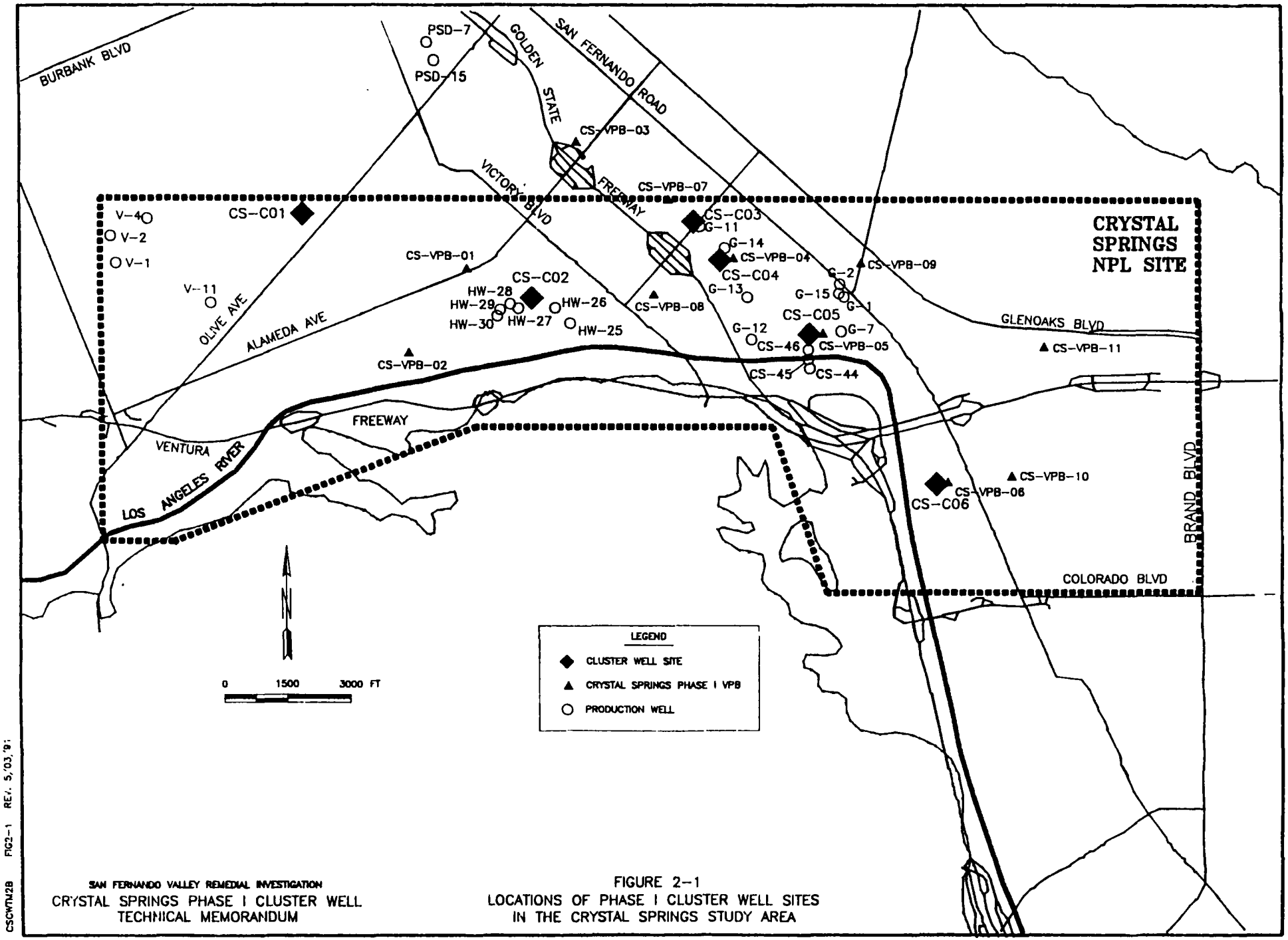


ESTIMATED EXTENT OF PCE CONTAMINATION IN SHALLOW AND MULTIPLE-LEVEL WELLS JANUARY, 1991



ESTIMATED EXTENT OF TCE CONTAMINATION IN SHALLOW AND MULTIPLE-LEVEL WELLS JANUARY, 1991

JMM James M. Montgomery Consulting Engineers Inc



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 18

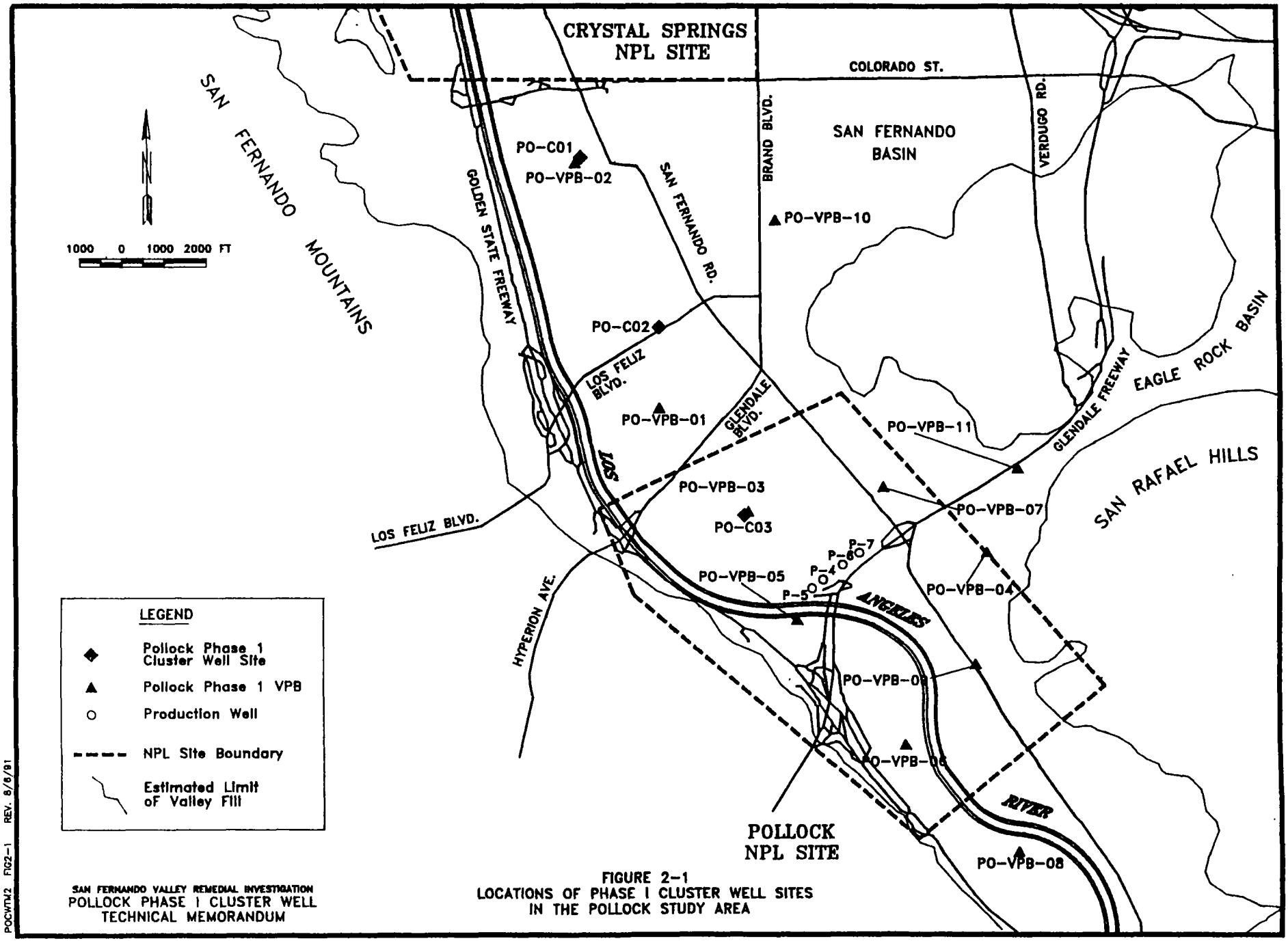
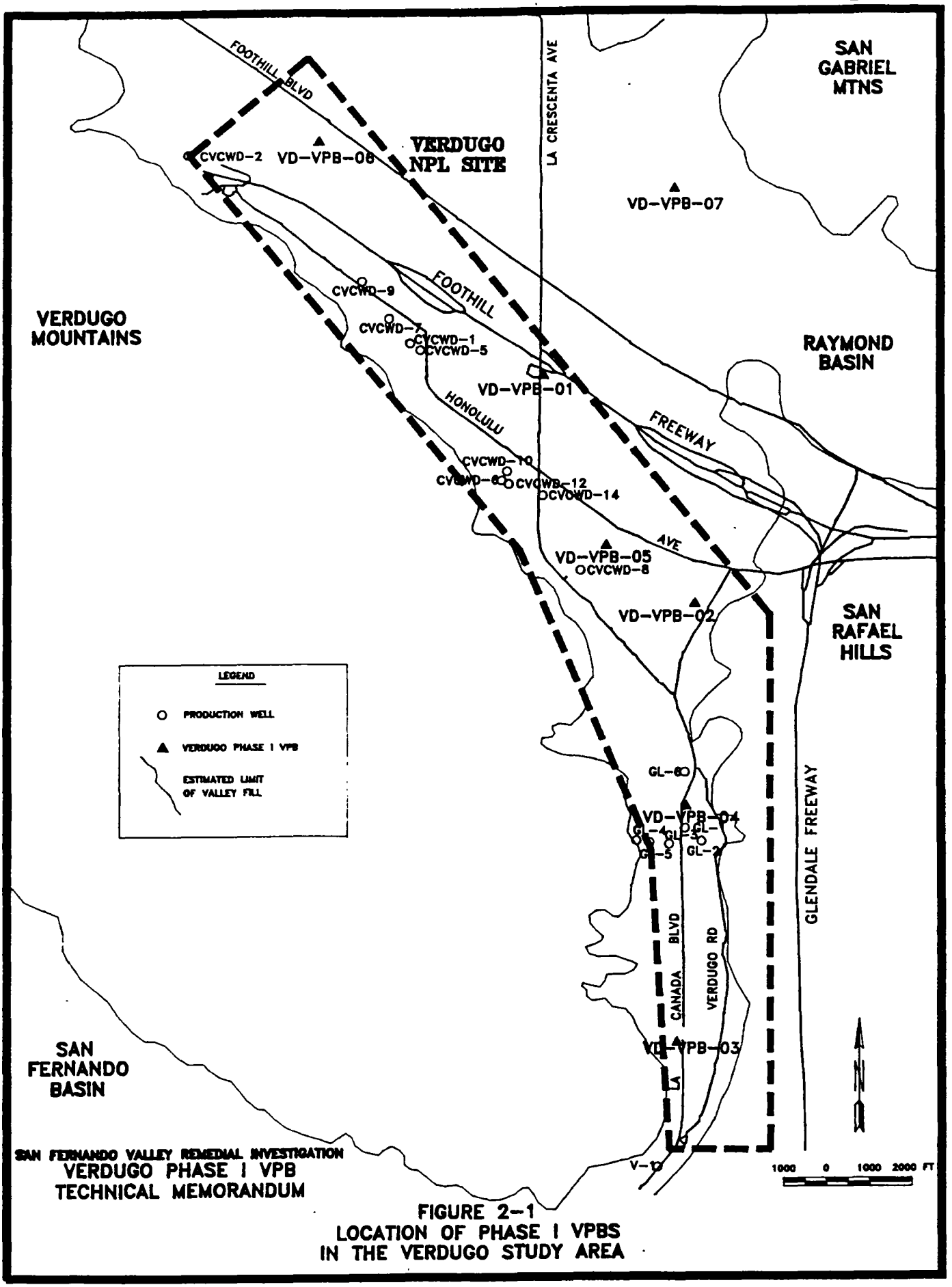


FIGURE 2-1
LOCATIONS OF PHASE I CLUSTER WELL SITES
IN THE POLLOCK STUDY AREA

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

POCWTM2 FIG2-1 REV. 8/8/91

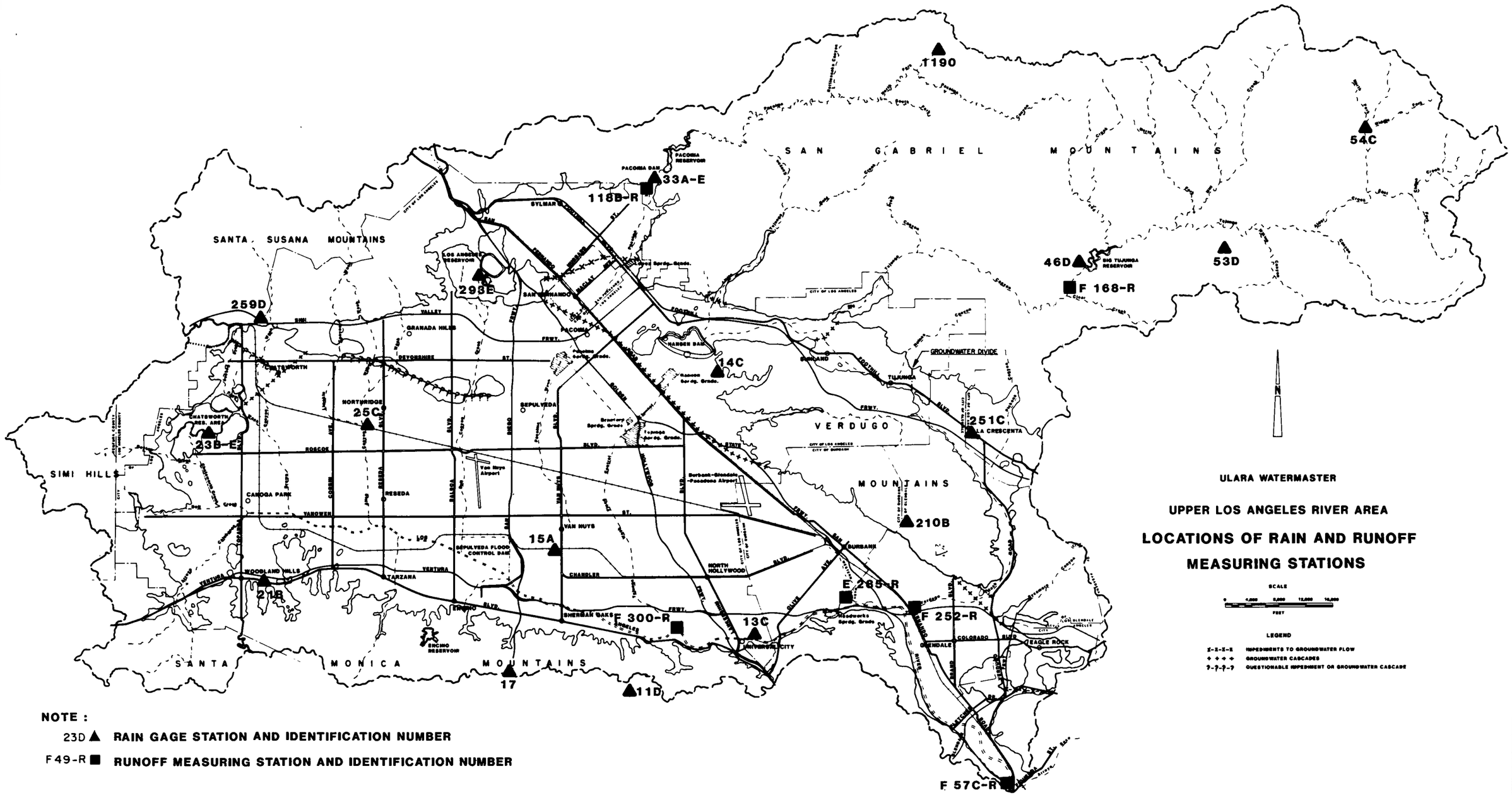
PLATE 19



SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
VERDUGO PHASE I VPB
TECHNICAL MEMORANDUM

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

PLATE 21



NOTE :

23D ▲ RAIN GAGE STATION AND IDENTIFICATION NUMBER

F49-R ■ RUNOFF MEASURING STATION AND IDENTIFICATION NUMBER

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

LOCATIONS OF RAIN AND RUNOFF MEASURING STATIONS

SCALE

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

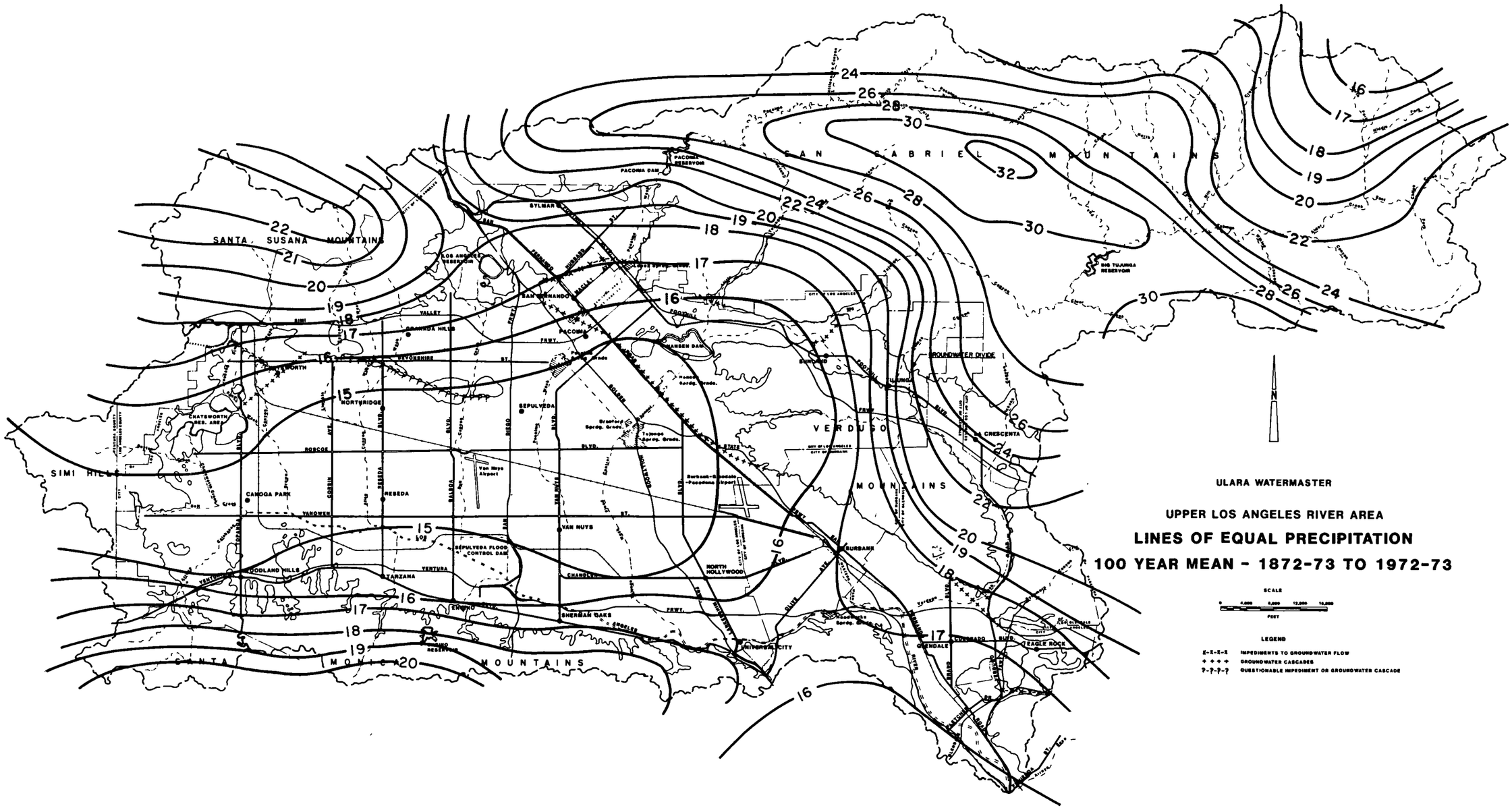
FEET

LEGEND

X-X-X-X IMPEDIMENTS TO GROUNDWATER FLOW

+ + + + GROUNDWATER CASCADES

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



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

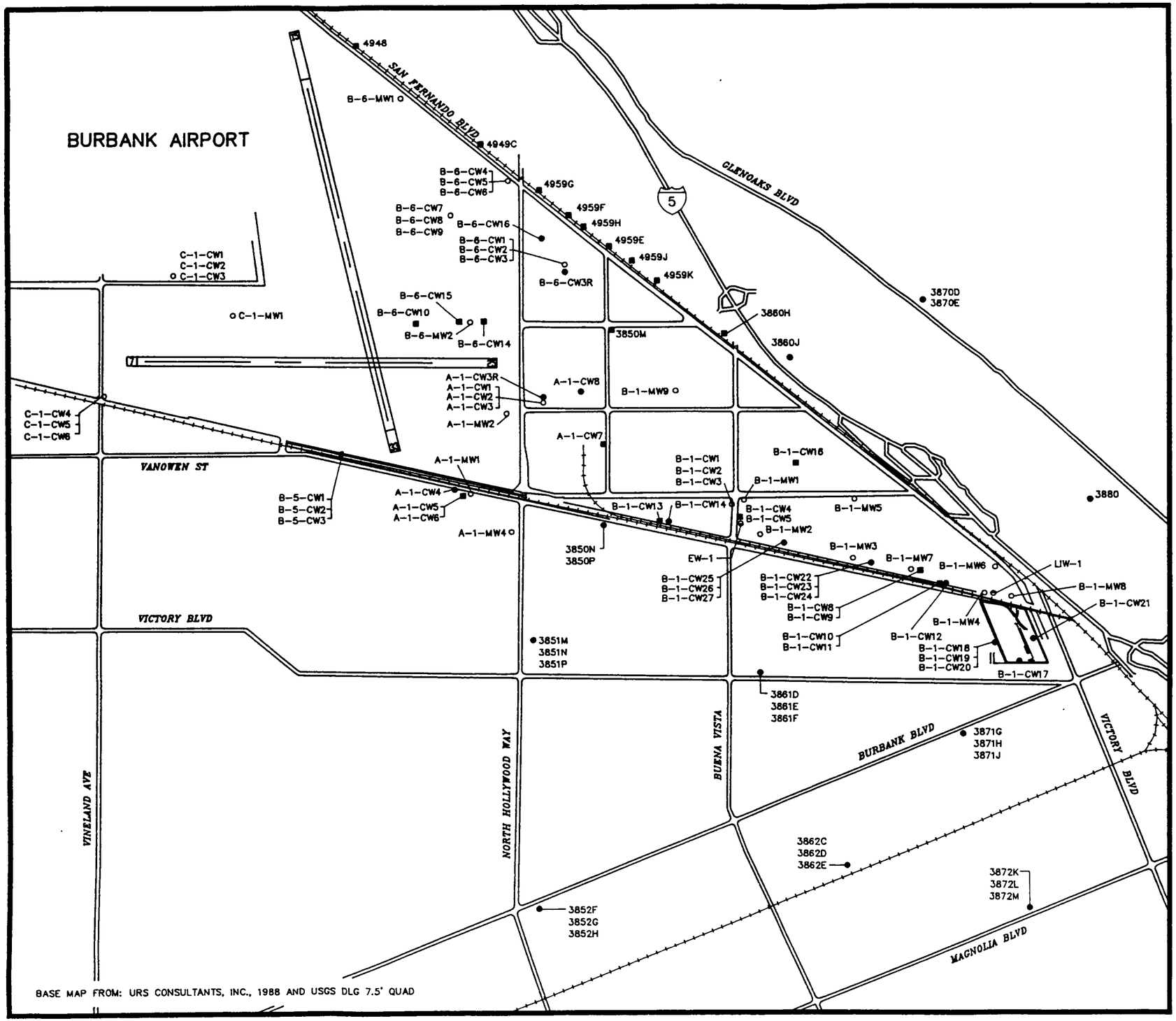
FEET

LEGEND

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

SOURCE : LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

MRG 4/92



BASE MAP FROM: URS CONSULTANTS, INC., 1988 AND USGS DLG 7.5' QUAD

EXPLANATION

PHASE 1–3 WELLS: MAY 1986 – JULY 1988

COMPLETED BY GREGG & ASSOCIATES, INC. AND URS CONSULTANTS, INC.

- ○ MONITOR WELL
- ⊖ EXTRACTION WELL

PHASE 4 WELLS: APRIL 1989 – SEPTEMBER 1989

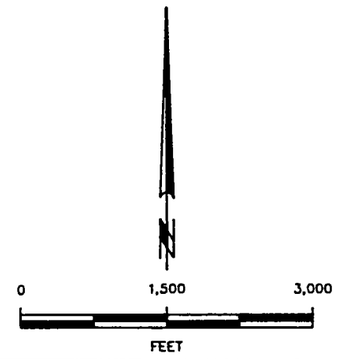
COMPLETED BY URS CONSULTANTS, INC.

- ■ MONITOR WELL

PHASE 4 WELLS AND EXPLORATORY BOREHOLES: FEBRUARY 1990 – AUGUST 1991

COMPLETED BY HARGIS + ASSOCIATES, INC.

- ● MONITOR WELL
- ⊙ PILOT INJECTION WELL



LOCKHEED ENGINEERING & SCIENCES COMPANY
BURBANK, CALIFORNIA

LOCKHEED MONITOR WELLS

HARGIS + ASSOCIATES, INC.

1/92

FIGURE 1

PREP BY RSD REV BY RCM RPT NO. 341.8 | 410–0021 | A

APPENDIX E

POLICIES AND PROCEDURES GUIDELINES

NON-PARTY PUMPING - PHYSICAL SOLUTION

APPENDIX E

ULARA WATERMASTER

POLICIES AND PROCEDURES GUIDELINES
Party And Non-Party Pumping - Physical Solution and Special Uses

I. Types of Physical Solution and Special Uses Pumping by Parties and Non-Parties

A. Dewatering for structure protection (Party & Non-Party)

B. Pumping for aquifer cleanup (Party & Non-Party)

C. Pumping of groundwater - special needs (Non-Party)

D. Pumping of groundwater - Verdugo Basin Flexibility

II. ULARA Policies and Procedures

A. Section 2.5 - Pumping for clean-up (Party and Non-Party).

B. Section 2.6 - Pumping for dewatering (Party & Non-Party).

C. Section 2.7 - Pumping for special needs (Non-Party).

D. Section 2.8 -- Pumping for flexibility -- Verdugo Basin

E. Guidelines for groundwater pumping

1. Application letter - (contact person; needs for pumping; location of wells; planned use and disposal) approval by Watermaster required.

2. Groundwater pumped must be metered and monthly report made to Watermaster.

3. Groundwater consumptively used - agreement needed with the city wherein the pumping

4. California Regional Water Quality Control Board (CRWQCB) - approval by CRWQCB as to the potential occurrence of groundwater contaminants.

III. Payment for Pumped Physical Solution Water -Dewatering for structure protection, pumping for aquifer clean-up, and special needs (non-party)

A. Non-consumptive use pumping: (spreading or re-injection); no payment is required.

B. Consumptive use pumping, discharged to the storm drain system: Cost for the water is the actual cost to Los Angeles for purchasing replacement water from MWD less the average power cost for extraction of groundwater from the San Fernando Basin.

C. Consumptive use pumping - used on site: Cost for the water is what would have been paid had the water been delivered from the Los Angeles distribution system, less the average energy cost for extraction of groundwater by Los Angeles from the San Fernando Basin.

VI. ULARA Watermaster Notification of Need to Pump for Clean-up

A. When a clean-up and abatement order has been issued to a party or a non-party by the California Regional Water Quality Control Board, Los Angeles Region, contacting the ULARA Watermaster is included as one of the requirements.

V. ULARA Watermaster Notification of Permanent Dewatering in the San Fernando Valley

A. Application for a Construction Permit from Los Angeles Department of Building and Safety

1. If a dewatering facility is part of the plans, the applicant must contact and receive clearance from the ULARA Watermaster's office before a construction permit is issued. The ULARA Watermaster's office can be contacted at (213) 481-6177 or (213) 481-6194.

2. ULARA Watermaster will provide the applicant (with copy to the Department of Building and Safety) with a written response saying that the project is not a water rights concern or an agreement with the City of Los Angeles Department of Water and Power (LADWP) for pumping is required.

3. The ULARA Watermaster will be sent a copy of the Department of Building and Safety's list of requirements for a permit.

B. Applicant of a project designed to discharge water to the storm drain system is required to apply to the California Regional Water Quality Control Board (CRWQCB) for an NPDES permit. The CRWQCB can be contacted at (213) 620-4460.

C. Issuance of Certificate of Occupancy (C of O)

If an agreement with the City of Los Angeles Deparment of Water and Power is required, a second letter from the LADWP or the Watermaster must provide to the applicant (with a copy to the Department of Building and Safety) saying that an agreement has been reached between the parties, or the water rights concern has been removed, and the C of O can released as it relates to water rights.

APPENDIX E

Revision of Policies And Procedures *
Sections 2.5 to 2.8 - Physical Solution and Special Uses
Pumping For Cleanup, Dewatering And Special Uses

2.5 PUMPING FOR CLEANUP BY PARTIES AND NONPARTIES

Under Section 8.2.4. of the judgment, the Watermaster is required to identify and report on any new or proposed new ground-water extractions by any party or nonparty. When a Cleanup and Abatement Order has been issued by the California Regional Water Quality Control Board - Los Angeles Region, or when a plan for cleanup at a Superfund site has been approved by the U. S. Environmental Protection Agency, the following guidelines are to be used:

2.5.1. Pumping for Plume Definition It is recognized that small amounts of water may need to be removed from underground storage for developing, sampling, and testing during the plume definition phase of a groundwater cleanup program. At this stage, the permanent treatment facilities would normally not have been installed. Most of the water which would be pumped for developing, sampling, and testing may require special handling, such as hauling to a treatment facility or to an acceptable waste disposal site. In order to expedite the investigation, up to five acre-feet per site will be deemed exempt from any water rights considerations. The plans for testing and the amounts to be pumped are to be reported to the Watermaster before beginning.

2.5.2 Permanent Pumping Program When the permanent cleanup and treatment facilities have been approved and installed, all pumping is to be conducted under the basic objectives of Safe Yield Operation -- to preserve a long-term balance of inflow and outflow and to preserve the ground water storage credits of the parties.

2.5.3 Quality of Treated Ground Water Although the primary responsibility of maintaining the quality of the ground water in the San Fernando Valley lies with the State Department of Health Services and the Regional Water Quality Control Board, the Watermaster has a substantial interest in the maintenance of water quality because of its potential impact upon water rights and distribution of pumping sites.

2.5.4 Use of Treated Ground Water Because of the large volumes of ground water which are expected to be required for cleanup in the San Fernando Valley Basin, it is desirable and expected that as much of the resultant treated water as reasonably possible be put to direct beneficial use. This requires that the quality of the cleaned-up or treated water must be adequate for the intended beneficial use. For example, if the treated water is reinjected; its quality must meet the water quality requirements of the Regional Board.

(*) - Revision to "Policies and Procedures" of July 1987.

2.5.5. Accounting for Cleanup Water As part of his responsibility for Safe Yield Operation, the Watermaster is required to account for all cleanup water -- the amount pumped and its use or disposition. Water consumptively used or discharged from the basin must be charged to a party's pumping entitlement. However, if the treated water is returned to ground water storage, the initial pumping of the water would be considered nonconsumptive, and no water rights arrangements would be necessary.

2.5.5.1 If the treated water is delivered for direct consumptive use, either on-site or off-site, the cleanup pumper must make arrangements with the party whose pumping rights may be affected and with the water purveyor responsible for supplying water to the area. This will ensure that all potentially impacted parties are made whole. The cleanup pumper if the water is used on site, would be required to financially compensate the party whose pumping right is affected. If the treated water is used off-site, arrangements would have to be made with the water purveyor responsible for supplying water to that area.

2.5.5.2 If the treated water is discharged to a storm drain, it is presumed to be wasted from the San Fernando Valley Basin as surface flow in the lined channel of the Los Angeles River. Before such a method of disposal will be considered, the cleanup pumper would have to make arrangements with a party with water rights similar to those in which the treated water is delivered for direct consumptive use.

2.5.5.3 Consistent with Section 4 of these Policies and Procedures, each cleanup pumper is required to report monthly to the Watermaster the metered amounts of: (1) ground water pumped; (2) treated water returned to ground water storage by reinjection; (3) treated water discharged to storm drains or elsewhere; (4) treated water delivered for direct consumptive use; and (5) the amounts of water spread or accumulated in ground water storage by in-lieu accounting through arrangements with a party.

2.6 PUMPING FOR DEWATERING

In the portions of the San Fernando Valley where high water tables exist, permanent dewatering facilities may be required for certain substructures. As such dewatering removes ground water from storage, the Watermaster is required to account for this.

2.6.1 City of Los Angeles If a dewatering facility is part of the building plans, or if there is some reason to believe that such a facility may be necessary, and the project is within the City of Los Angeles, the Department of Building and Safety refers the Application for a Construction Permit to the Watermaster, where a determination is made as to whether or not the pumping may impact water rights. If it is determined that water rights are affected, an agreement for dewatering pumping must be signed with the City of Los Angeles Department of Water and Power before a Certificate of Occupancy is granted.

2.6.1.1 If there is a request to discharge pumped ground water to a storm drain or to use the pumped groundwater consumptively, either on-site or off-site, the pumper would be required to pay Los Angeles for the right to pump its groundwater.

2.6.2 Other Jurisdictions Dewatering arrangements in other governmental jurisdictions in the San Fernando Valley have not yet been developed. As the Watermaster's primary charge is the accounting for and balancing of water volumes in the Safe Yield Operation, the financial arrangements between parties and non-parties which are used, in part, to accomplish this purpose, are left to the entities involved. However, the Watermaster must be kept informed of all matters bearing on ground water storage, such as pumping, recharge, and water rights arrangements.

2.7 PUMPING FOR SPECIAL NEEDS

If a nonparty has a special need to pump groundwater, an application to do so must be filed with the Watermaster. The application should explain the special need and indicate the amounts desired to be pumped, the location(s) of the well(s), and the method of disposal. Such request will be referred to the parties for consideration. To the extent that such water is consumptively used, or otherwise not returned to groundwater storage, financial arrangements must be made to exercise the right of a party in the same basin wherein the pumping will occur. All water pumped must be metered and reported to the Watermaster monthly and accounted for as in Section 2.5.5.

2.8 FLEXIBILITY PUMPING - VERDUGO BASIN

The Final Judgment did not provide for Safe Yield-Operations of the Verdugo Basin during unusual circumstances, such as dry years or water system problems. The parties recognize the importance of preserving the Verdugo Basin as a water production and groundwater storage resource. The City of Glendale and Crescenta Valley County Water District (CVCWD) seek to permit flexibility in the use of this resource without causing damage to the basin. To provide for water shortages due to unusual circumstances, such as weather conditions or water system operational problems, Glendale and CVCWD shall have the right in any year to overextract from the Verdugo Basin an amount not to exceed 10 percent of their allowed pumping, as provided in Section 5.1.3.2 of the 1979 Judgment. The 10 percent annual overextraction may continue from year to year, accumulatively not to exceed 1,000 ac-ft. for each agency, so long as the unusual circumstances persist. When the unusual circumstances cease, the accumulated overextractions shall be replaced by underpumping, and must be done within a 6 year period. The amount of such underpumping will not be required to exceed 10 percent of the annual allowed pumping of any party. The party desiring to overextract from the basin shall notify the Watermaster of the circumstances considered to be an unusual and shall justify the need for overextractions. The Watermaster shall review the existence and cessation of unusual circumstances and shall in his descretion approve the required overextraction and replacement operations.

APPENDIX F

LANDFILLS - SUMMARY OF SWAT REPORTS

APPENDIX F

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.

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

The following landfills are included in this report:

1. Bradley East
2. Bradley West
3. Branford Street
4. Cal Mat (Sun Valley #3)
5. Cal Mat (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

These are preliminary reports prepared by the ULARA Watermaster and staff. Additional reports will be available in the future as data become 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 groundwaterin 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.

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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.

GROUNDWATER FLOW DIRECTION - Southeasterly

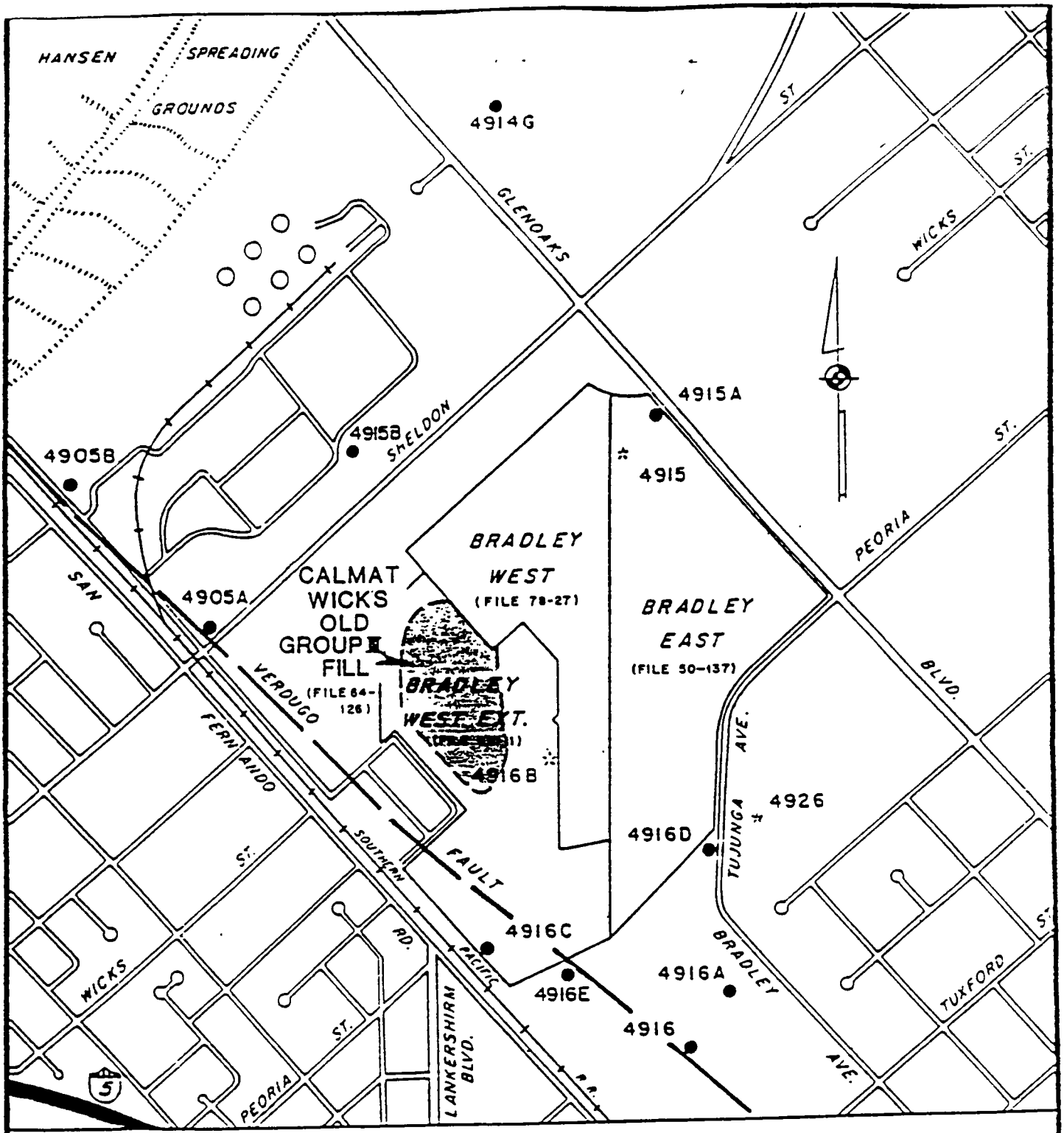
GENERAL OPERATIONS - Part of the 138-acre Bradley Landfill complex. Started accepting trash in 1960. Residential and commercial refuse with low moisture and no hazardous waste. Stopped accepting trash in the early 1980's. Contains about 7.5 million tons of trash.

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

GROUNDWATER QUALITY MONITORING -

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted November 1990. Report is under review.



EXPLANATION:

● 4905B EXISTING WELL

✲ 4926 ABANDONED WELL

REFERENCE: BASE MAP FROM U.S.G.S. 7.5' BURBANK (1973), SAN FERNANDO (1973), SUNLAND (1973) AND VAN NUYS (1973) QUADRANGLES.

0 1000 2000

SCALE IN FEET

LOCATION OF MONITORING WELLS

LeROY CRANDALL AND ASSOCIATES

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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.

GROUNDWATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Originally designed in 1975-77. Started accepting trash in 1981 -- relatively dry, inert ordecomposable, nonhazardous. Bradley West extension was designed according to 1984 Subchapter 15 requirements, and has a clay liner and leachate collection system.

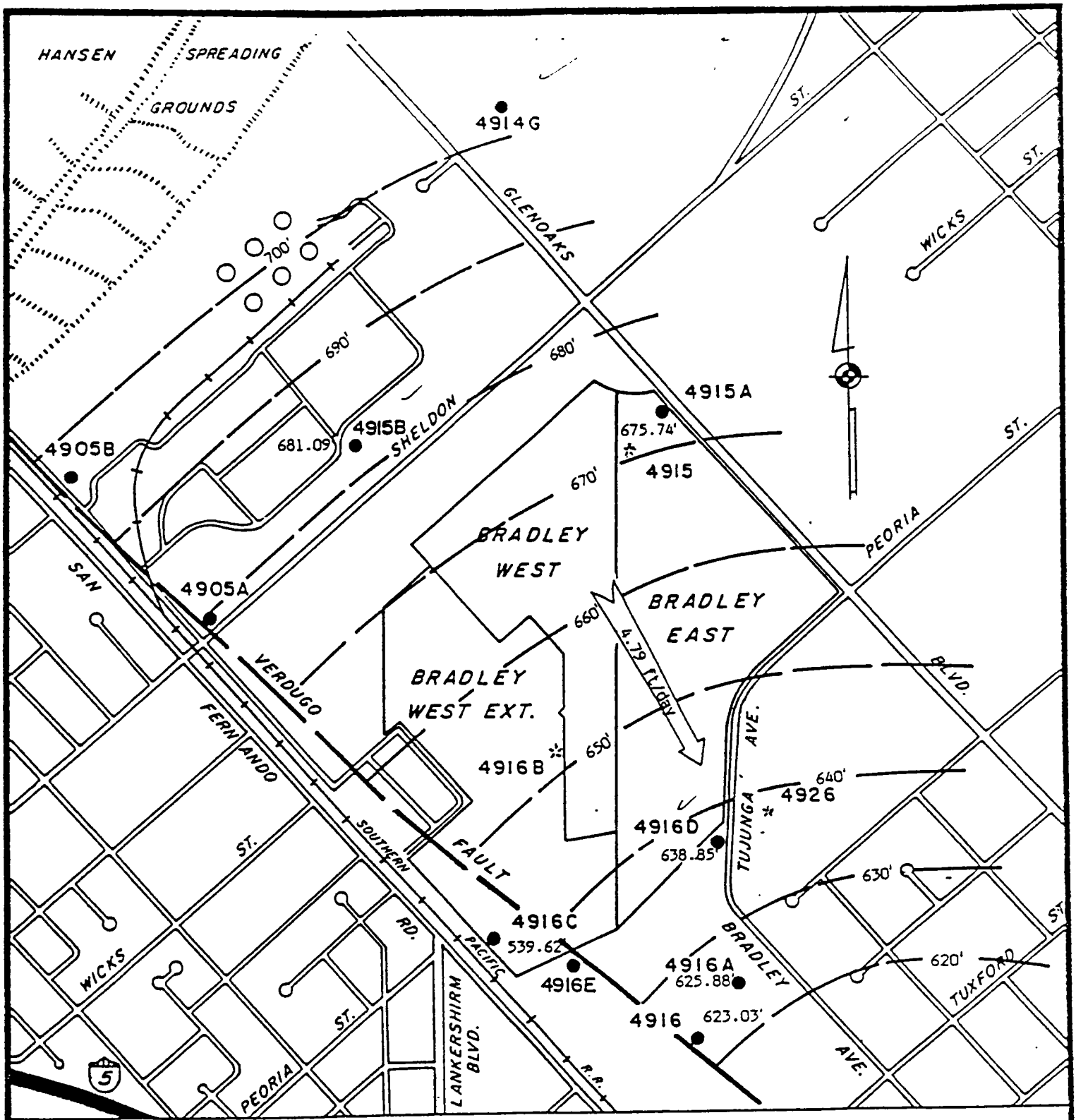
GAS CONTROL SYSTEM - Started ____. Now delivers 2 1/2 million cubic feet per day to the Valley Steam Plant.

LEACHATE CONTROL AND MONITORING - System in operation since____. As of June 26, 1987 no leachate was detected. There was ponding in 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-percent to 53-percent moisture.

GROUNDWATER QUALITY MONITORING - May be slight increase inchloride and total dissolved solids (TDS) 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 Supplement - March 21, 1988 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted November 1990. Report is under review.



EXPLANATION:

625.88' ● 4905B — EXISTING WELL, GROUND WATER ELEVATION

* 4926 — ABANDONED WELL

640' — GROUND WATER ELEVATION CONTOUR

4.79 ft/day — GROUND WATER VELOCITY & DIRECTION

REFERENCE: BASE MAP FROM U.S.G.S. 7.5' BURBANK (1973), SAN FERNANDO (1973), SUNLAND (1973) AND VAN NUYS (1973) QUADRANGLES.

0 1000 2000

SCALE IN FEET

12-19-87

WELL LOCATIONS, GROUND WATER LEVELS AND VELOCITY MAP

FIGURE 1

LAW ENVIRONMENTAL, INC.

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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 thepublic. 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 groundwater was 334 to 344 feet.

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

REPORTS -
SWAT Report (Rank 2) - June 1988 - IT Corporation

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted October 1990. Report is under review.

EXPLANATION

SURFACE WATER RETENTION AREA

SCALE

0 2000 4000 FEET

REFERENCE:

1958 7.5 MINUTE TOPOGRAPHIC MAPS OF VAN NUYS AND SAN FERNANDO, CALIFORNIA QUADRANGLES. DATED: 1966 AND PHOTOREVISED 1972 FOR BOTH SCALE: 1:24,000

"Do Not Scale This Drawing"

FIGURE 14

REGIONAL SURFACE WATERS
BRANFORD LANDFILL

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

INTERNATIONAL TECHNOLOGY CORPORATION

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Cal Mat Landfill (Sun Valley #3)

OWNER - Cal Mat 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.

GROUNDWATER 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 (non-decomposable). 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.

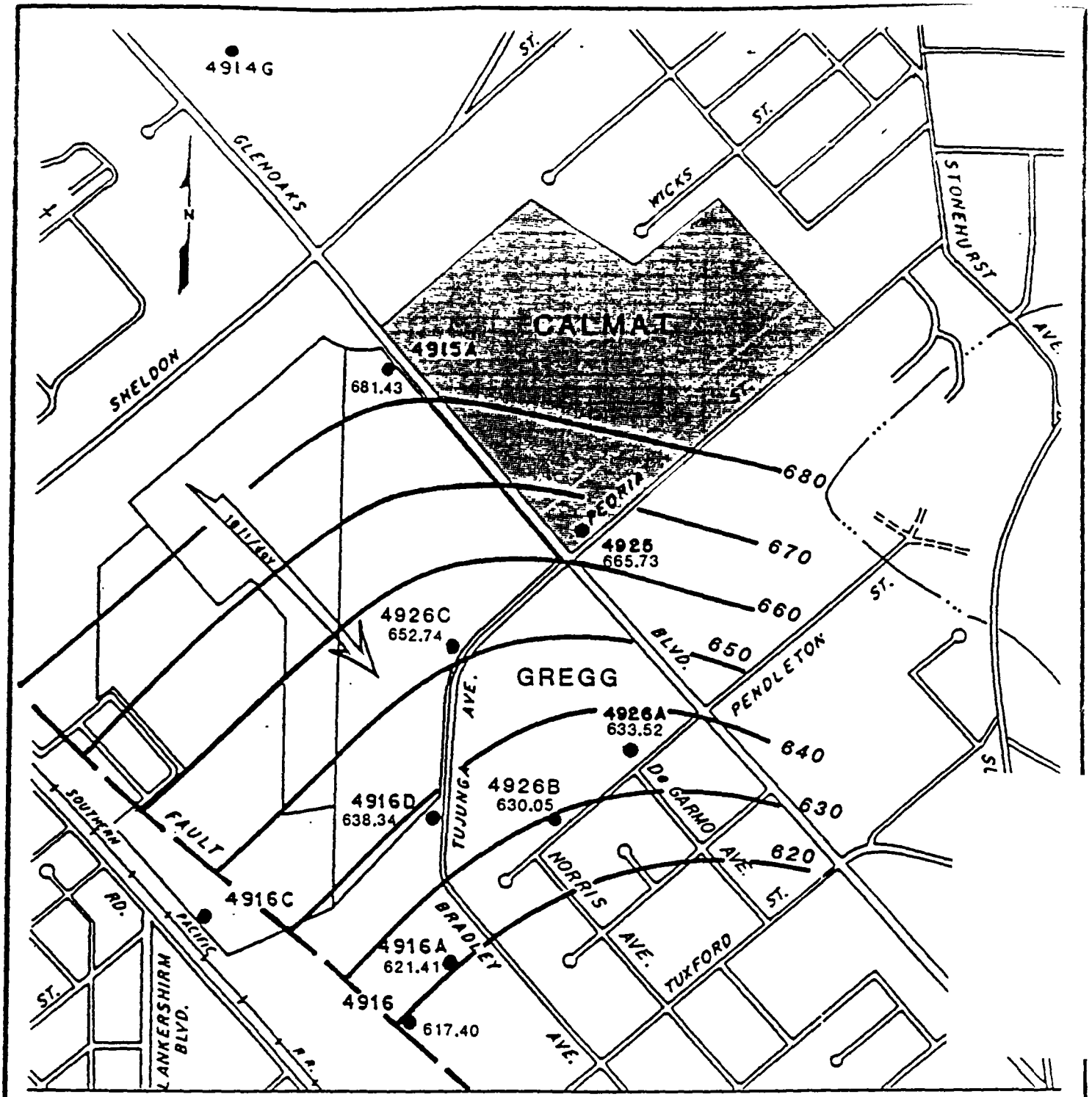
VADOSE ZONE MONITORING - One soil boring into the vadose zone. No contamination found.

LEACHATE CONTROL AND MONITORING - No evidence of leachate production.

GROUNDWATER QUALITY MONITORING - Background quality is obtained from the Bradley Landfill complex SWAT wells. Quarterly sampling started in April 1988. There are regional plumes of trichloroethene (TCE) 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
Supplement - July 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted November 1990. Report is under review.



4915A ● EXISTING WELL

617.40 WATER ELEVATION (feet above sea level)

630 GROUND WATER (elevation contour)

DIRECTION AND VELOCITY OF GROUND WATER FLOW (ft/day)

BASE MAP FROM U.S. GEOLOGICAL SURVEY 7½ MINUTE BURBANK, SAN FERNANDO, SUNLAND AND VAN NUYS QUADRANGLES (1973).

0 1000 2000

FEET

GROUND WATER ELEVATIONS

JUNE 1985

FIGURE 1

LAW ENVIRONMENTAL, INC.

PROJECT No. 88-4125 DATE 6/20/89 PROJ. MGR. A.C. DFTR. M.G.

DIETERICH POST REORDER NO. 126233

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Cal Mat (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.

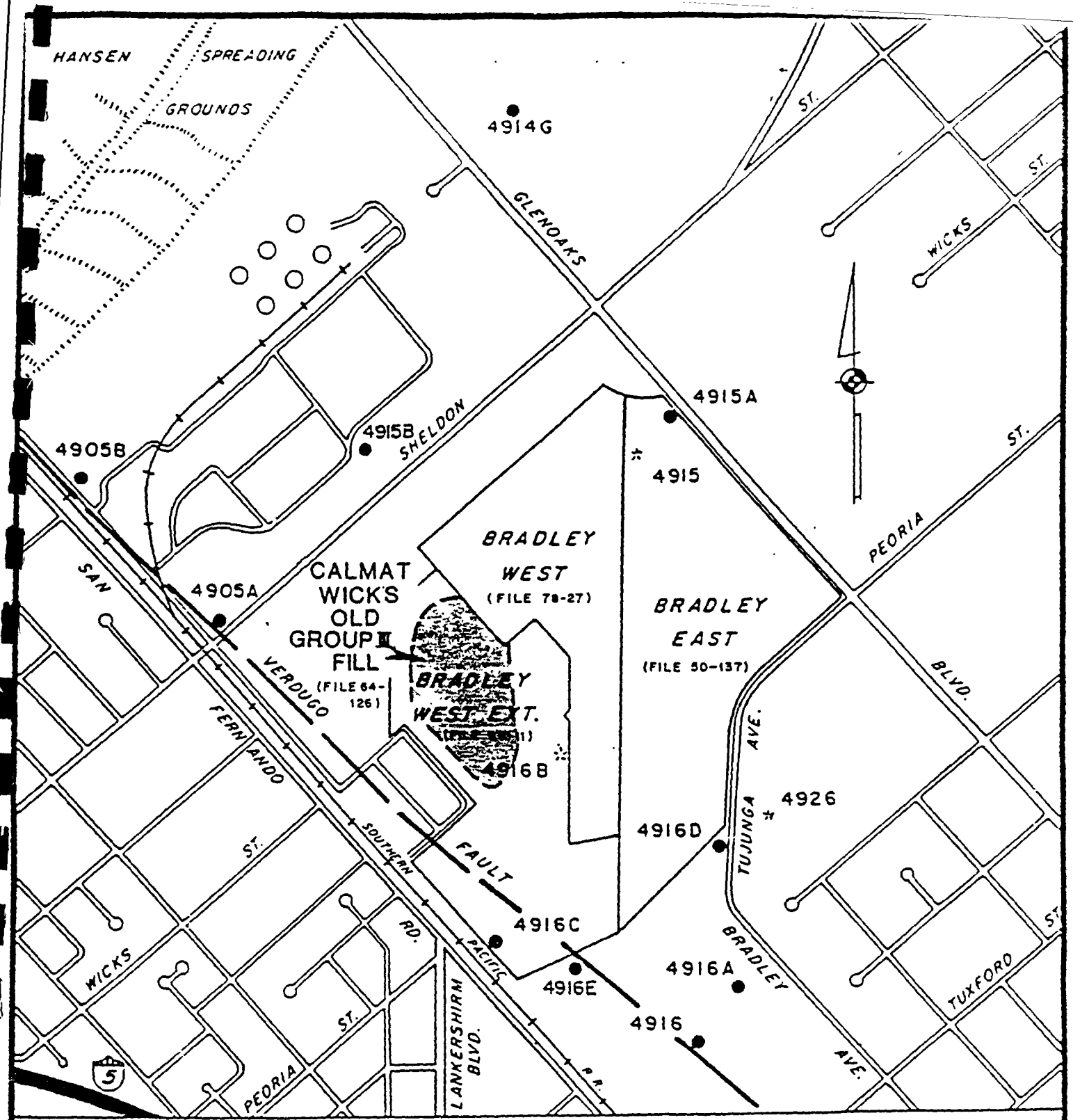
VADOSE ZONE MONITORING - Tried nine borings in 1986. Couldn't drill through concrete and steel.

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

GROUNDWATER QUALITY MONITORING - Started in this area in 1980. Higher total dissolved solids (TDS) 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 submittedNovember 1990. Report is under review.



EXPLANATION:

- ● 4905B EXISTING WELL
- ✲ 4926 ABANDONED WELL

REFERENCE: BASE MAP FROM U.S.G.S. 7.5' BURBANK (1973), SAN FERNANDO (1973), SUNLAND (1973) AND VAN NUYS (1973) QUADRANGLES.

0 1000 2000
SCALE IN FEET

LOCATION OF MONITORING WELLS

LeROY CRANDALL AND ASSOCIATES

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Gregg Pit/Bentz Disposal Sites

OWNER - Cal Mat 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. About 30 acres. Operated from 1955 to 1963. Accepted combustible and noncombustible wastes, but specified wet or hazardous wastes were prohibited. The eastern portion was re-activated after the main Gregg Fill closed in 1963. Bentz Dump. The re-activated 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". Estimate 3.5 million cubic yards in place in combined operation.

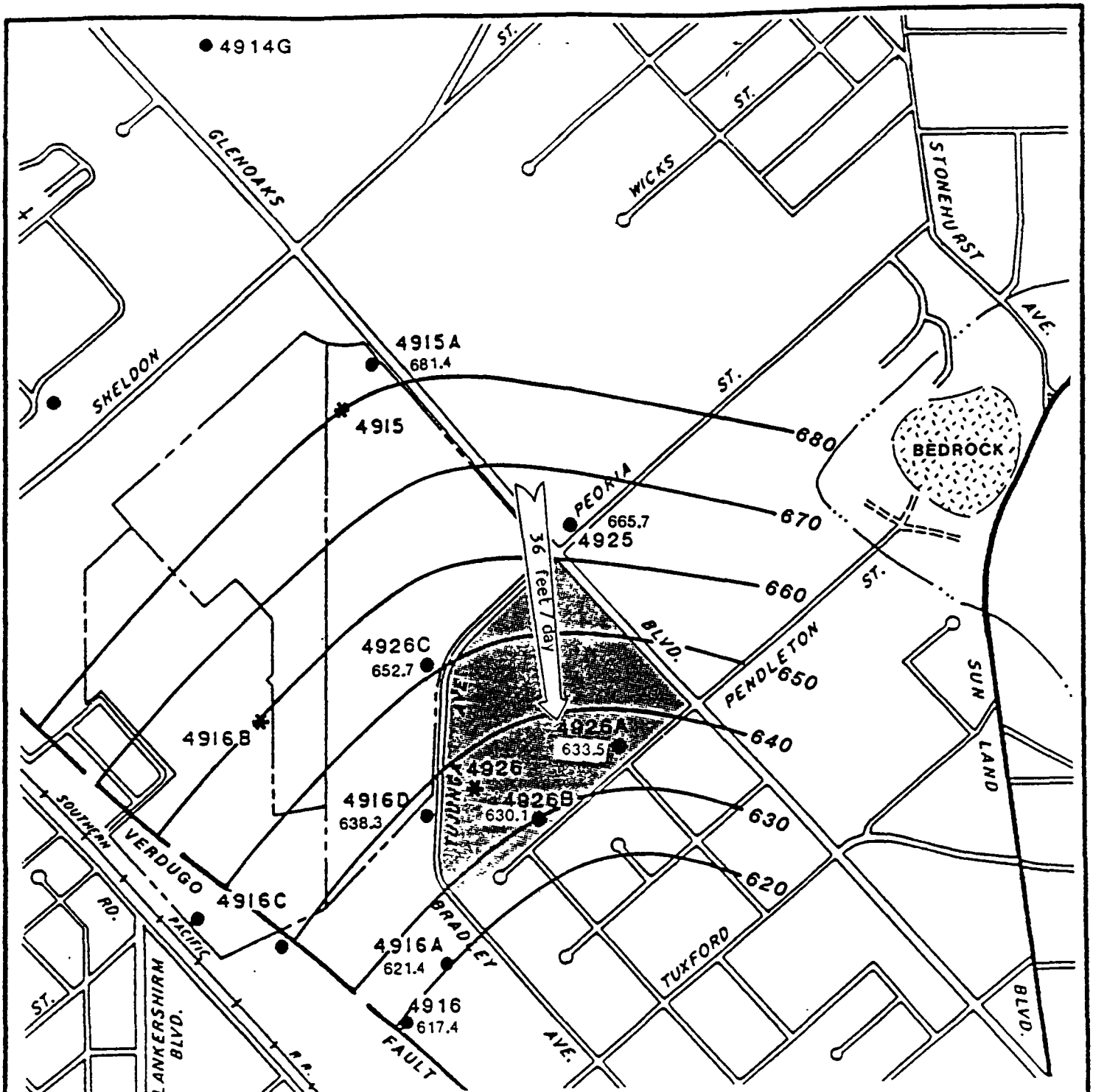
GAS CONTROL SYSTEM - Four wells and a gas flare were installed in 1987 (32 years after the first trash was placed). Produces about 310 cubic feet per minute of gas consisting of 30-percent methane, 30-percent carbon dioxide, water nitrogen and trace gases.

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

GROUNDWATER 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 tetrachloroethene (PCE), and the PCE found in upgradient wells is believed to be coming from an industrial area. Fill is not releasing hazardous wastes to groundwater.

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved report on February 8, 1990. Further groundwater monitoring is required under Chapter 15.



GREGG PIT / BENTZ DUMP
SUN VALLEY DISTRICT
LOS ANGELES, CALIFORNIA

GROUND WATER CONTOURS

JUNE 1989

FIGURE 1

LAW ENVIRONMENTAL, INC.

PROJECT No. SB-8628 DATE 8-16-89 PROJ. MGR. A.C. DFTR. M.N.

DIETERICH POST REORDER NO. 128233

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Hewitt Landfill (Closed)

OWNER - Cal Mat 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.

GROUNDWATER 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.

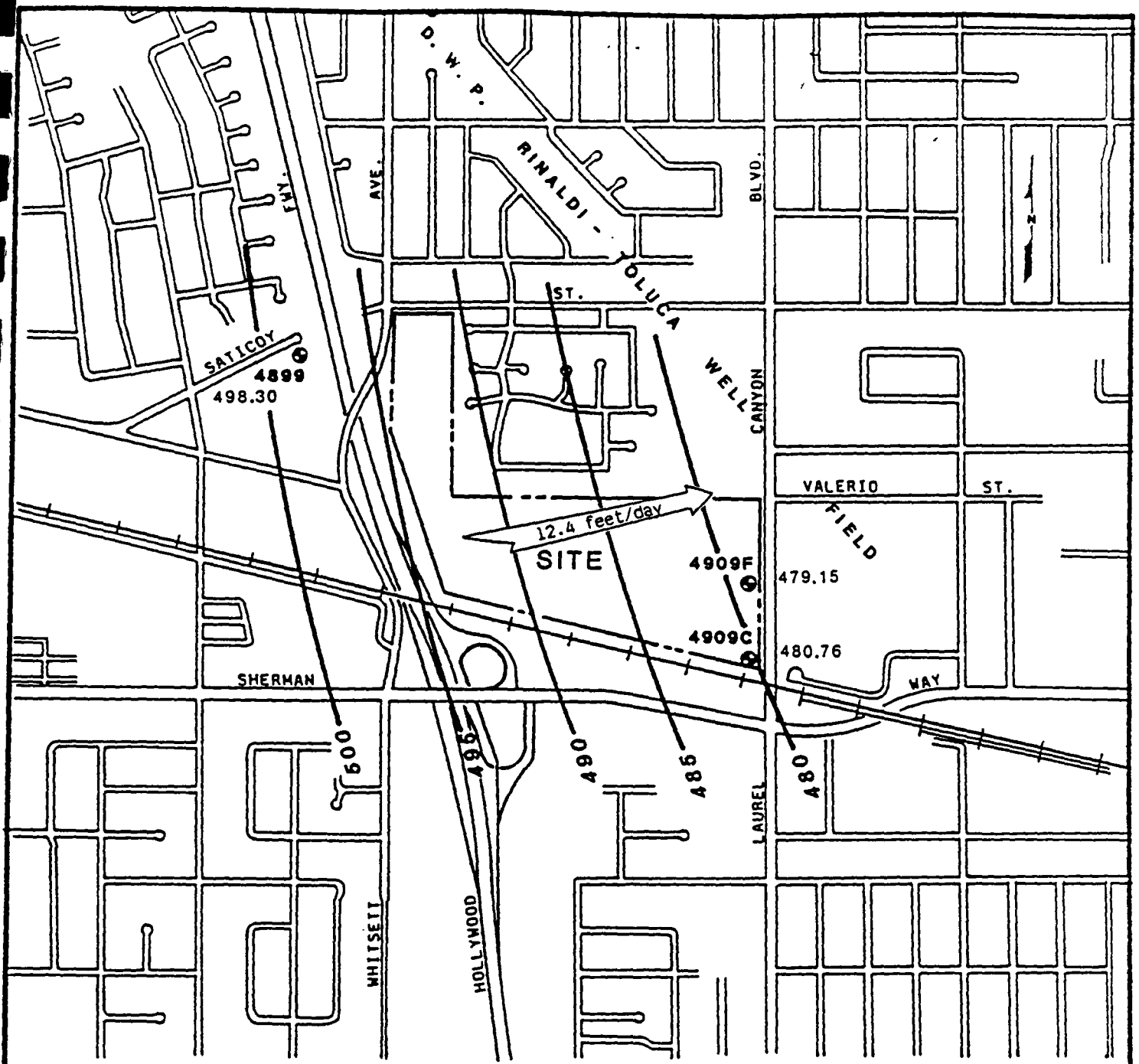
VADOSE ZONE MONITORING - Two Timco Teflon Lysimeters were installed to depths of 50 and 52 feet. Too little moisture to sample.

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

GROUNDWATER 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 trichloroethene (TCE) and tetrachloroethene (PCE) above action levels, and high nitrates (over 70 mg/1). 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 can not be an important contributor to groundwater.

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Report is under review. Further groundwater monitoring may be required under Chapter 15.



EXPLANATION

4909C — MONITORING WELL LOCATION AND NUMBER

500 — LINE OF EQUAL GROUND WATER ELEVATION IN FEET ASL

498.30 — GROUND WATER ELEVATION IN FEET ASL

GROUND WATER FLOW DIRECTION AND VELOCITY

BASE MAP MODIFIED FROM U. S. GEOLOGICAL SURVEY 7.5 MINUTE VAN NUYS TOPOGRAPHIC QUADRANGLE, 1972.

0 1000
FEET

GROUND WATER CONTOURS

FEBRUARY 1989

FIGURE 1

LAW ENVIRONMENTAL, INC.

PROJECT No. SB-2057 DATE PROJ. MGR.

DIETERICH POS" REORDER NO. 126233

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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 - Groundwater 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 groundwater decrease to the north, but no single groundwater 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 - Recommended, but not installed as of July 1, 1989.

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

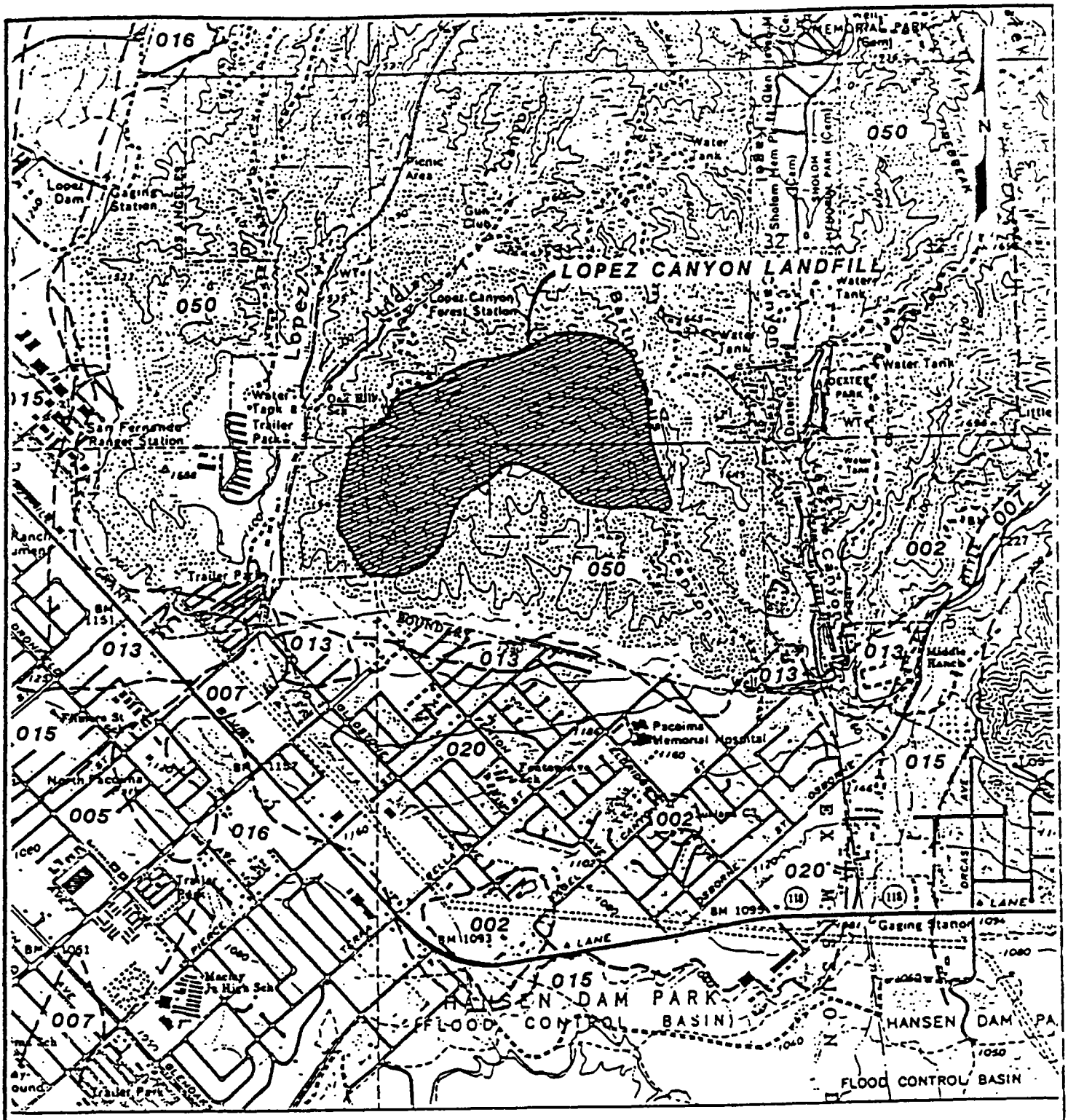
LEACHATE CONTROL AND MONITORING - A leachate well was drilled into the deepest part of the trash in Disposal Area B to a depth of 178 feet. No liquid was encountered during the drilling.

GROUNDWATER QUALITY MONITORING - Two upgradient and three downgradient monitoring wells. Only groundwater encountered was in a 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, 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 Supplement - July 1, 1989

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved report on February 8, 1990. A Phase II SWAT Report is being required.



EXPLANATION

002	ALTAMONT CLAY LOAM
005	HANFORD FINE SANDY LOAM
007	HANFORD GRAVELLY SANDY LOAM
013	RAMONA LOAM
015	TUJUNGA FINE SANDY LOAM
016	YOLO LOAM
020	YOLO SANDY LOAM
050	UPPER LOS ANGELES RIVER SOIL (MOUNTAIN SOIL)

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

SOIL TYPE MAP FROM LACFCD HYDROLOGY

SCALE: 1" = 2000'

SOIL TYPE MAP

Figure 10

Project No. 58-6425-11

LAW ENVIRONMENTAL INC.

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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.

GROUNDWATER 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.

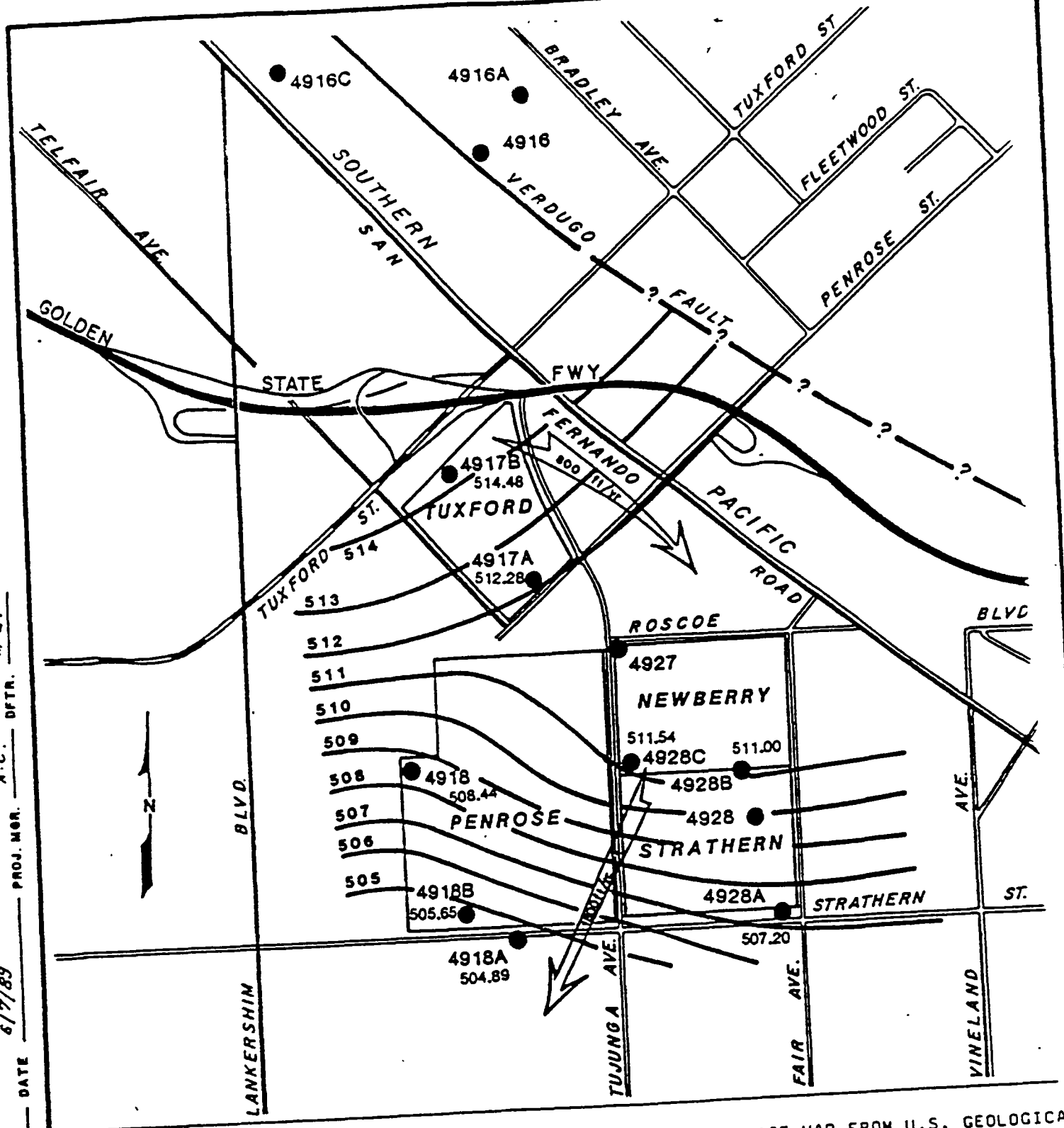
VADOSE ZONE MONITORING - Pressure-vacuum lysimeters wereinstalled in the Penrose and Newberry Landfills and in the bottom of the Strathern Pit. Couldn't get a sample from any of these.

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.

GROUNDWATER 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 trichloroethene (TCE) 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 groundwater quality.

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved on September 22, 1989. Further groundwater monitoring will be required under Chapter 15.



4918 ● WELL LOCATION AND NUMBER

508.44 WATER ELEVATION (feet above sea level)

508 LINE OF EQUAL GROUND WATER ELEVATION (feet above sea level)

GROUND WATER FLOW DIRECTION AND VELOCITY (feet per year)

BASE MAP FROM U.S. GEOLOGICAL SURVEY 7.5 MINUTE BURBANK AND VAN NUYS QUADRANGLES, 1972.

0 1000 2000
FEET

GROUND WATER ELEVATIONS
FEBRUARY 1989

FIGURE 1

LAW ENVIRONMENTAL, INC.

PROJECT No. 58-1420 DATE 6/7/89 PROJ. MGR. A.C. DFTR. M.G.

DIETERICH POST REORDER NO. 128233

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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.

GROUNDWATER FLOW DIRECTION -

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

GAS CONTROL SYSTEM - None required.

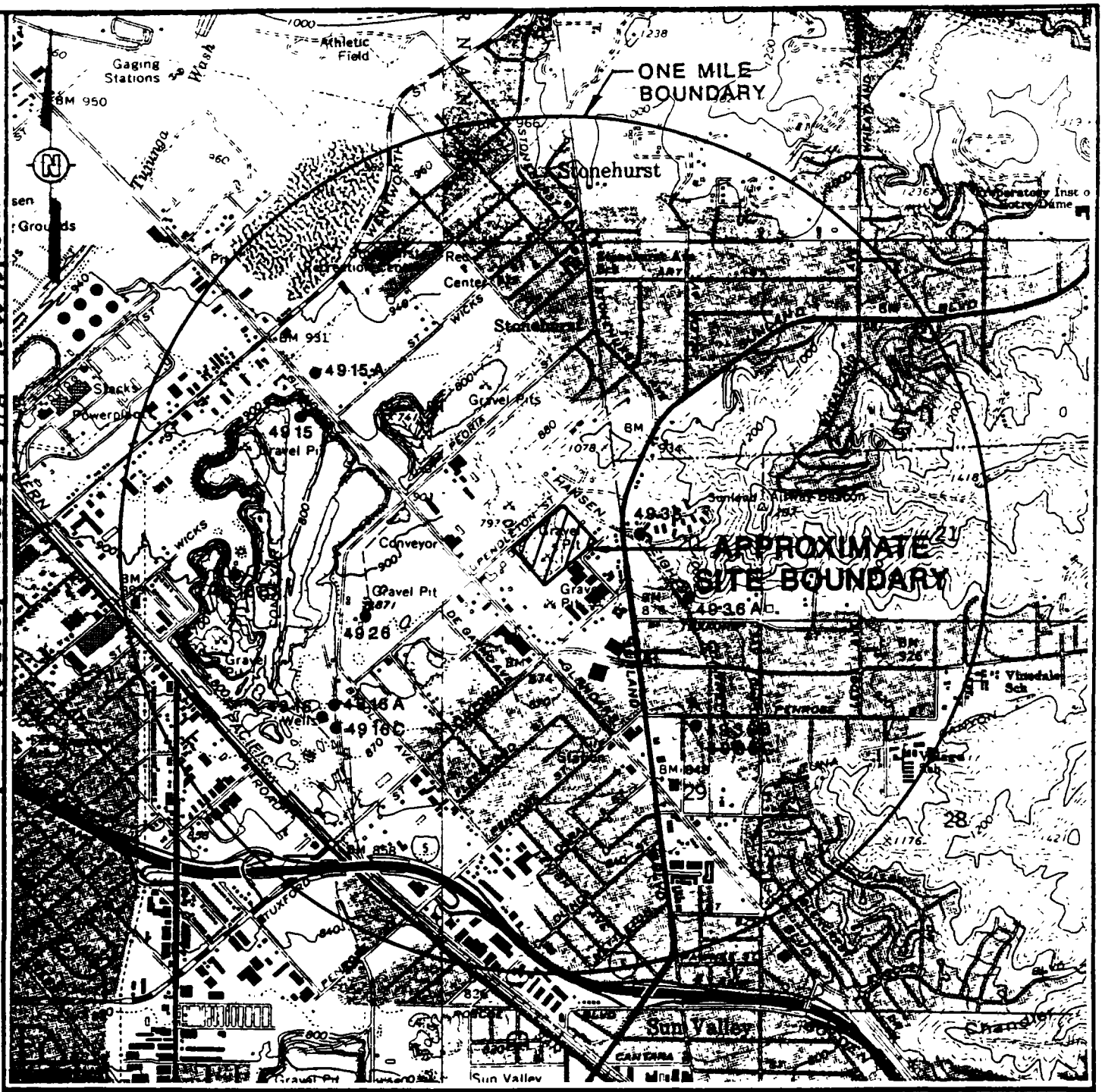
VADOSE ZONE MONITORING - None required.

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

GROUNDWATER QUALITY MONITORING - Three monitoring wells on periphery of property.

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted May 1991.



LEGEND:

4936● WELL LOCATION AND WELL NUMBER (WELL NUMBER ACCORDING TO LOS ANGELES COUNTY WELL NUMBERING SYSTEM)

SCALE

0 2000 4000 FEET

REFERENCE:

U.S.G.S. 7.5 MINUTE TOPOGRAPHIC MAP OF BURBANK, SAN FERNANDO, SUNLAND, AND VAN NUYS; CALIFORNIA QUADRANGLES; DATED: 1966, PHOTOREVISED: 1972

FIGURE 18

LOCATIONS OF WELLS WITHIN ONE MILE OF THE SITE PENDLETON STREET LANDFILL

PREPARED FOR

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
LOS ANGELES, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY 5-21-90 APPROVED BY HA 2-22-90 NUMBER 241343-A15

137773

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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 County Sanitation Districts of Los Angeles County. 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 - None.

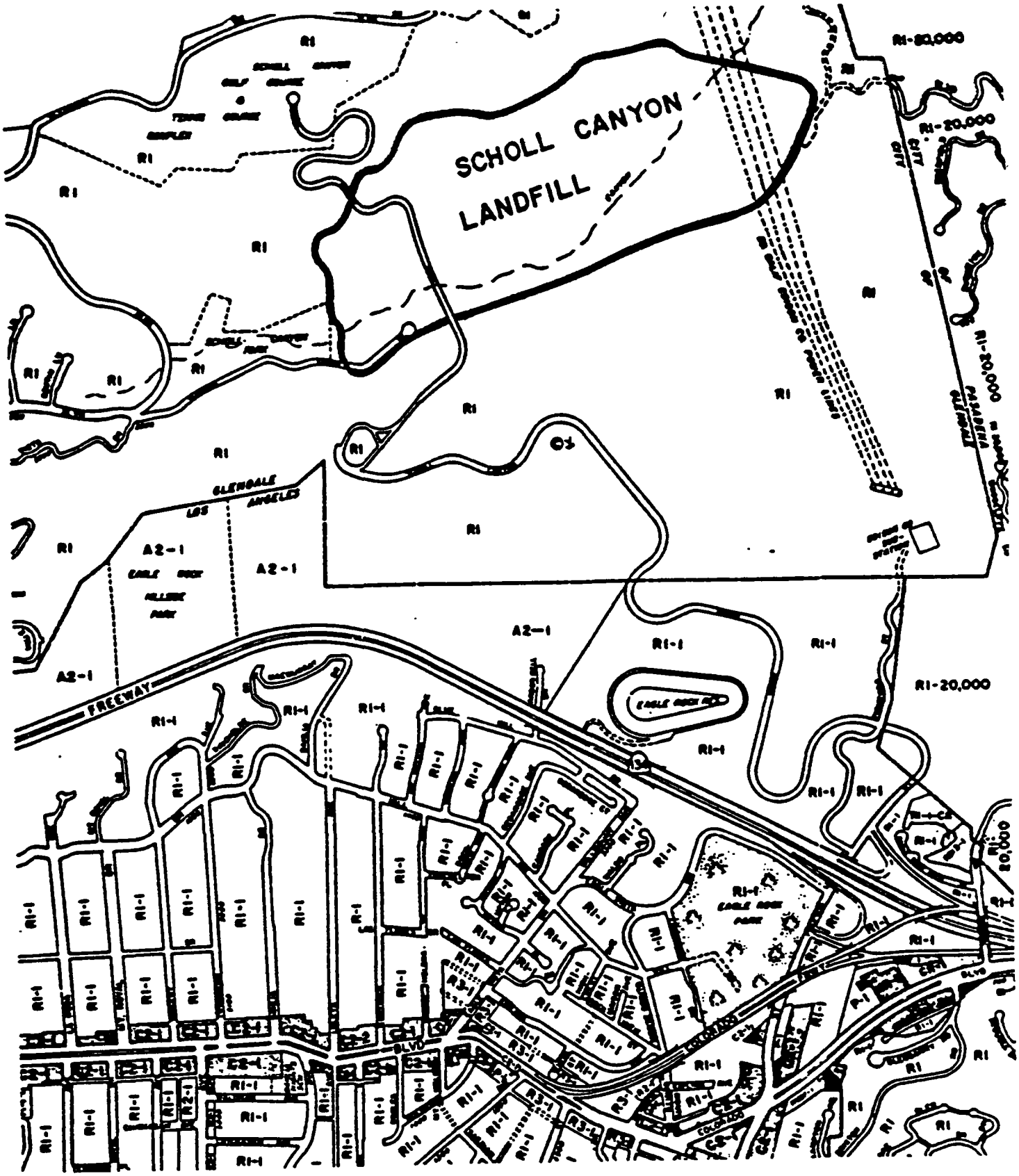
VADOSE ZONE MONITORING - Not required.

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, CoSan Districts

STATUS WITH LOS ANGELES REGIONALWATER QUALITY CONTROL BOARD -
Active - (Rank 1) SWAT Report completed July 1987. Final SWAT Report completed April 1988. SWAT Report approved August 1990. Further monitoring required under Chapter 15.

Inactive - (Rank 2) - SWAT Report completed July 1987. Final SWAT Report completed January 1991. Report is under review. Further monitoring may be required under Chapter 15.



SCHOLL CANYON LANDFILL
LOCAL ENVIRONMENT

FIGURE 4

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Sheldon-Arleta Landfill

OWNER - City of Los Angeles, Bureau of Sanitation

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

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

GROUNDWATER FLOW DIRECTION - Southeasterly to south-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 Elevation 700. 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 FT.

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. In 1974-76, the landfill gas was delivered to the Valley Steam Plant. In 1980 eighteen 100-foot wells were drilled to replace the earlier 25-foot holes.

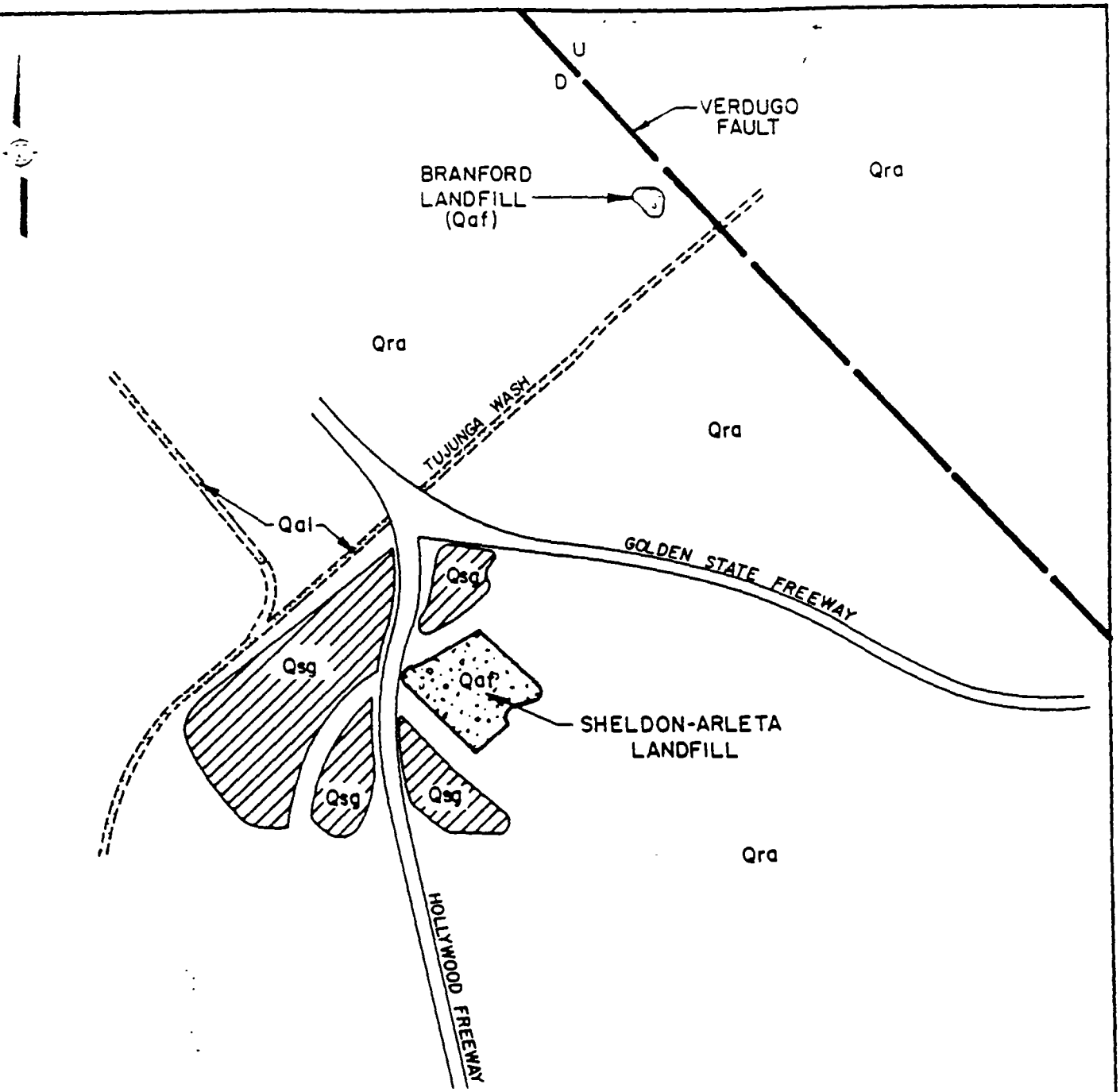
VADOSE ZONE MONITORING - Only two of 25 soil samples showed moisture above 25 percent. Additional sampling will be done after spreading.

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

GROUNDWATER QUALITY MONITORING - A well drilled downgradient (Wicks Well) showed a sharp increase in bicarbonate hardness and carbon dioxide between 1967-72, 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 - IT Corporation.

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved report on February 9, 1990. Further groundwater monitoring will be required under Chapter 15.



LEGEND

Qaf - ARTIFICIAL FILL

Qsg - TUJUNGA SPREADING GROUNDS

Qal - STREAM CHANNEL DEPOSITS

Qra - RECENT ALLUVIUM

U
D — INFERRED FAULT TRACE

REFENCE: SAN FERNANDO VALLEY REFERENCE REPORT OF REFEREE, STATE WATER RIGHTS BOARD, JULY 1962.

FIGURE 2A

GENERALIZED GEOLOGIC MAP
SHELDON-ARLETA LANDFILL AREA

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

IT ... Creating a Safer Tomorrow

Do Not Scale This Drawing

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Stough Park Landfill

OWNER - City of Burbank

LOCATION - west face of Verdugo Hills.

GEOLOGY -

HYDROGEOLOGY -

GROUNDWATER FLOW DIRECTION -

GENERAL OPERATIONS -

TIME OF OPERATION -

MINIMUM ELEVATION OF TRASH -

GAS CONTROL SYSTEM -

ELEVATION RANGE OF WATER TABLE -

VADOSE ZONE MONITORING -

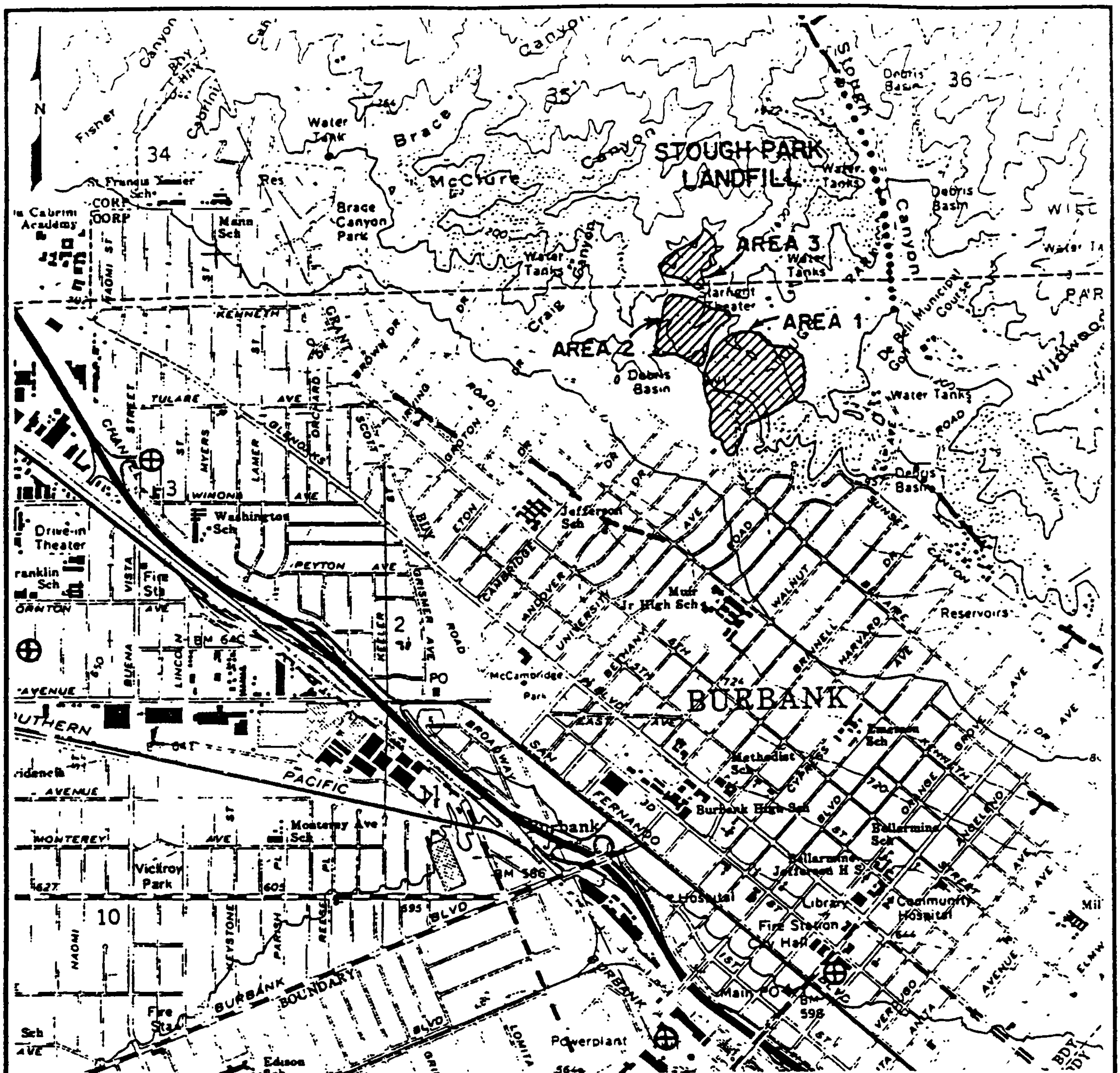
LEACHATE CONTROL AND MONITORING -

GROUNDWATER QUALITY MONITORING -

SURFACE WATER AND SUBDRAIN SAMPLING -

REPORTS -

STATUS WITH LOS ANGELES REGIONALWATER QUALITY CONTROL BOARD -



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

SCALE 1"=2000'

PLATE 1

LAW ENVIRONMENTAL, INC.

PROJECT No. DATE PROJ. MGR. DFTR.

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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 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 the Towsley formation. Groundwater was found in the alluvium and beneath the lower slopes in the Towsley. Groundwater flow follows the axes of the canyons.

GENERAL OPERATIONS - There is an existing 230-acre Class III landfill which has operated continuously since 1958. The present permit expires in September 1991. Accepts only nonhazardous wastes at 6400 tons per day or about 2.0 million tons per year. Expect an increase to 12,000-14,000 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).

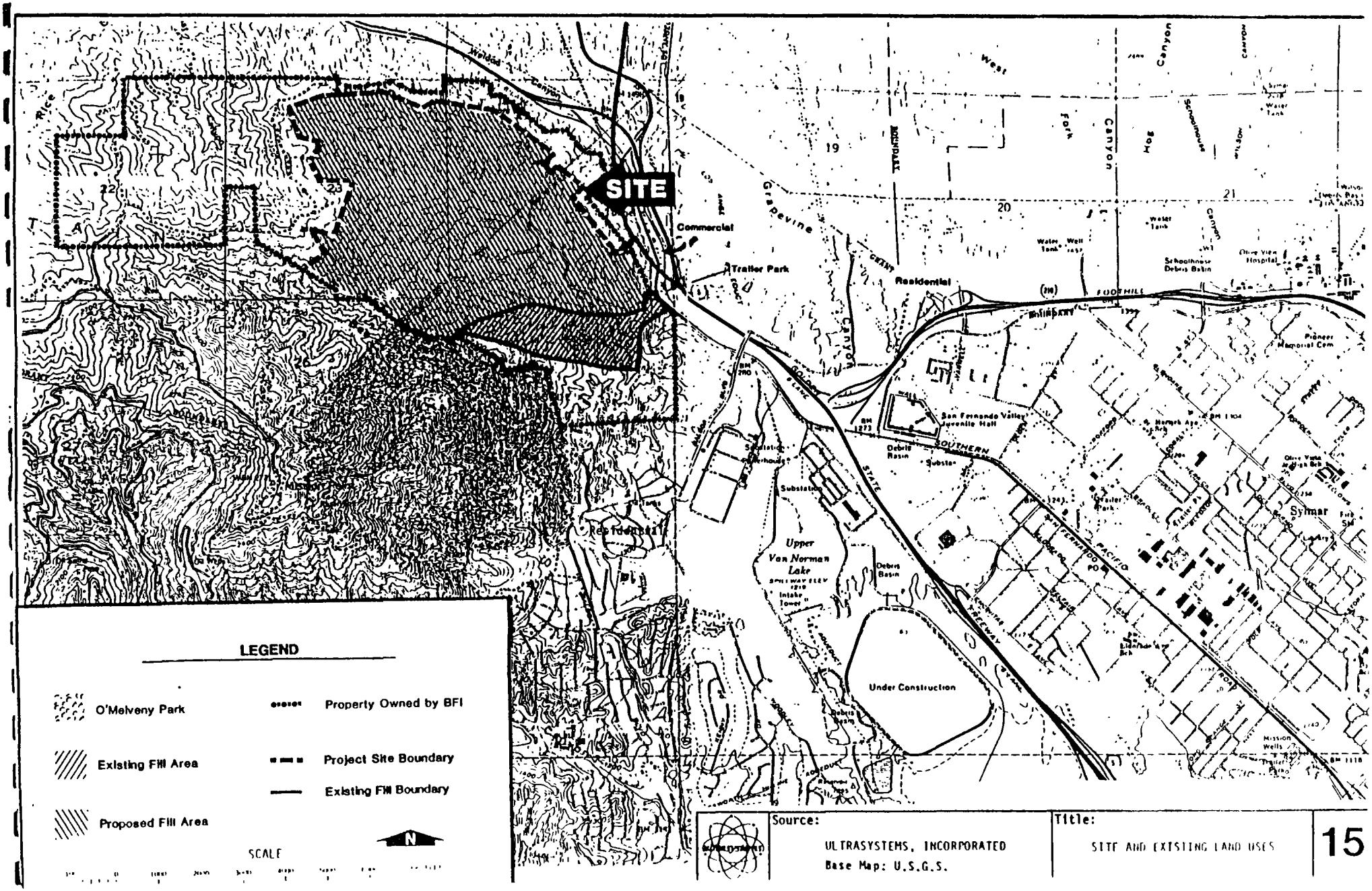
VADOSE ZONE MONITORING - No volatile organics detected in five lysimeter wells.

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

GROUNDWATER QUALITY MONITORING - The native waters of the Towsley formation are of poor quality because of excessive total dissolved solids (TDS), 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 sources(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 (DEIR) - Landfill, Extension - April 1989 - Ultrasystems

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Report is under review. Further groundwater monitoring will be required under Chapter 15.



Source: ULTRASYSTEMS, INCORPORATED
Base Map: U.S.G.S.

Title: SITE AND EXISTING LAND USES

15

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements 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 gravel-filled trenches which drain to sewer. Total leachate flow of 3-7 gpm. No liners or containment structures.

GROUNDWATER QUALITY MONITORING - Six monitoring wells around periphery. Direction of groundwater 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 - IT Corporation. Final SWAT Report - March 1989

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved Final SWAT Report April 1991. Further groundwater monitoring required under Chapter 15.

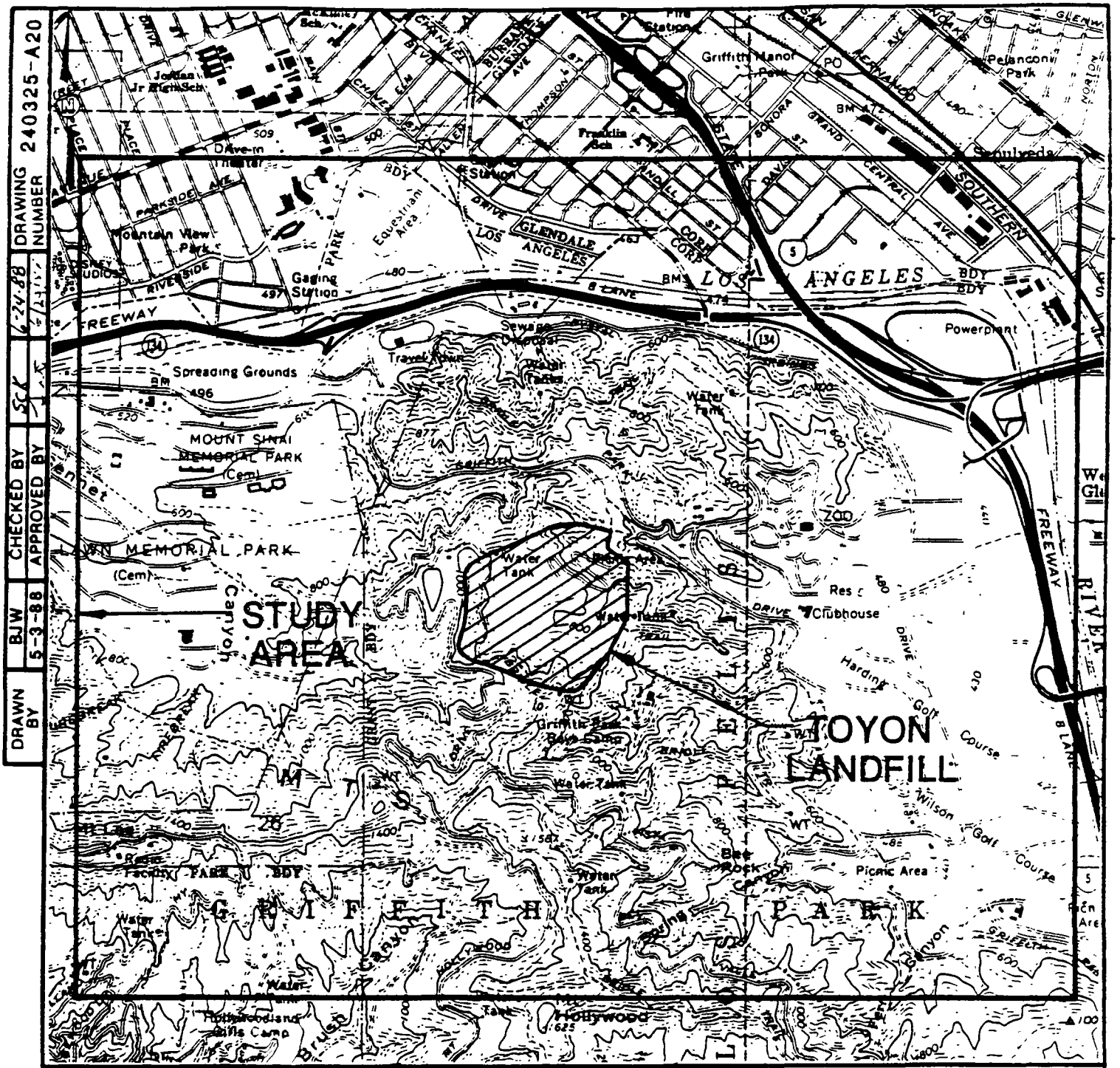


FIGURE 1

SITE LOCATION MAP
TOYON LANDFILL

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

INTERNATIONAL TECHNOLOGY CORPORATION

REFERENCE:

USGS TOPOGRAPHIC MAP OF
BURBANK, CALIFORNIA QUADRANGLE;
DATED: 1966; PHOTOREVISED: 1972;
SCALE 1:24000

"Do Not Scale This Drawing"

STATUS AS OF MAY 1992

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Tuxford Landfill (Closed)

OWNER - Los Angeles By-products Company

LOCATION - Sun Valley District. Just south of 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).

GROUNDWATER FLOW DIRECTION - Southeasterly

GENERAL OPERATIONS - Was open to public. Accepted only dry nonhazardous wastes.

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

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

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

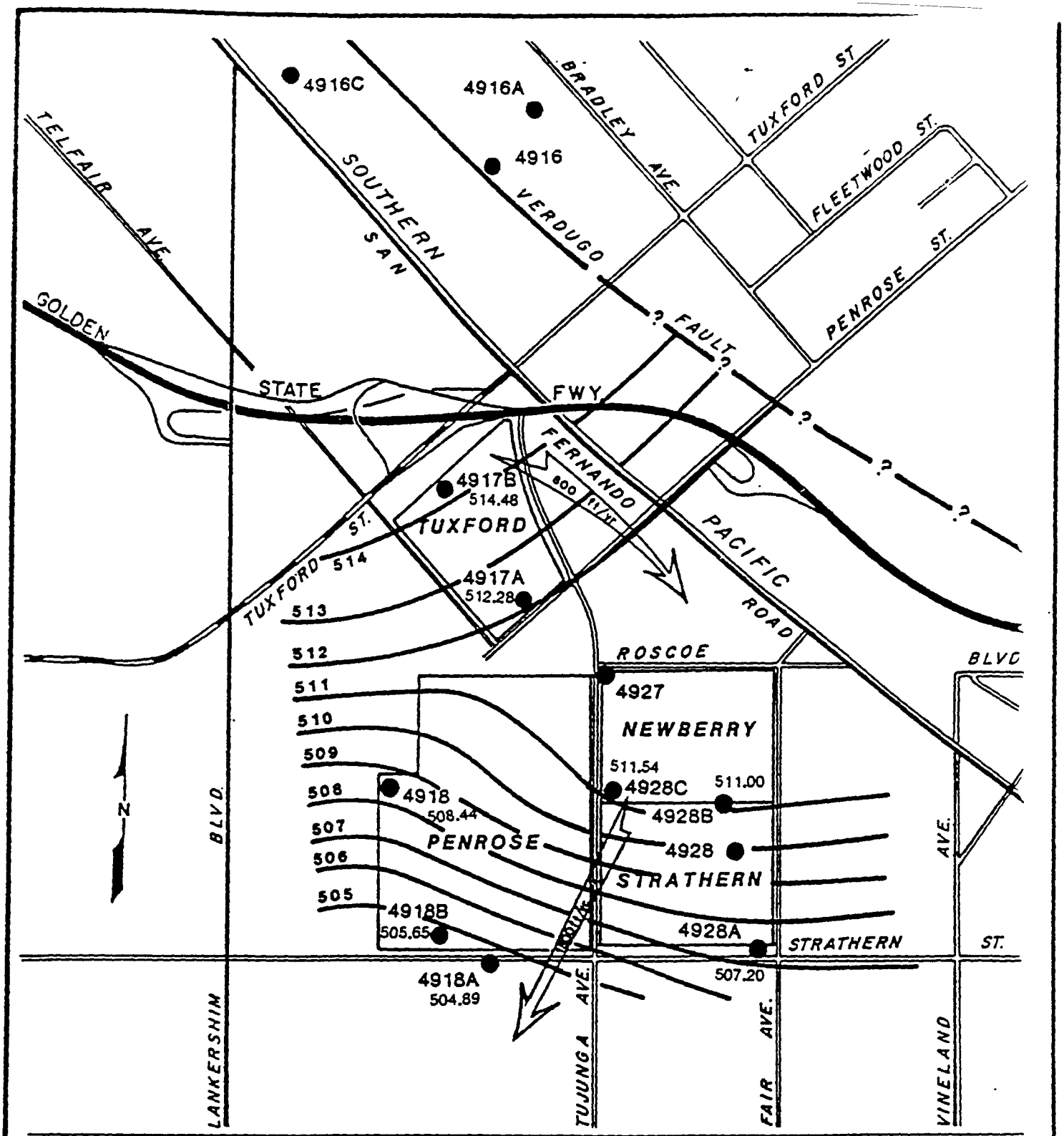
VADOSE ZONE MONITORING - Two wells drilled to 50 feet. Can't generate enough suction to get a liquid sample.

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

GROUNDWATER QUALITY MONITORING - Shares monitoring wells with Penrose/Newberry/Strathern. Sample by a pump with packer. Two wells upgradient and two wells downgradient. Volatile organic compounds (VOC) 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
Supplement - July 1, 1989 - Law Environmental

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted December 1990. Report is under review. Further groundwater monitoring may be required under Chapter 15.



4918 ● WELL LOCATION AND NUMBER

508.44 WATER ELEVATION (feet above sea level)

508 LINE OF EQUAL GROUND WATER ELEVATION (feet above sea level)

GROUND WATER FLOW DIRECTION AND VELOCITY (feet per year)

BASE MAP FROM U.S. GEOLOGICAL SURVEY 7.5 MINUTE BURBANK AND VAN NUYS QUADRANGLES, 1972.

0 1000 2000
FEET

GROUND WATER ELEVATIONS
FEBRUARY 1989

FIGURE 1

LAW ENVIRONMENTAL, INC.

PROJECT No. 58-7420 DATE 6/7/89 PROJ. MGR. A.C. DFTR. M.G.

DIETERICH POST REORDER NO. 126233

APPENDIX G

EVALUATION OF WATER RIGHTS AND WATER USE OPTION - SAN FERNANDO VALLEY BASIN

APPENDIX G

AN EVALUATION OF WATER RIGHTS AND WATER USE

OPTION - 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.

ARCS WEST

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

CH2M HILL

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.

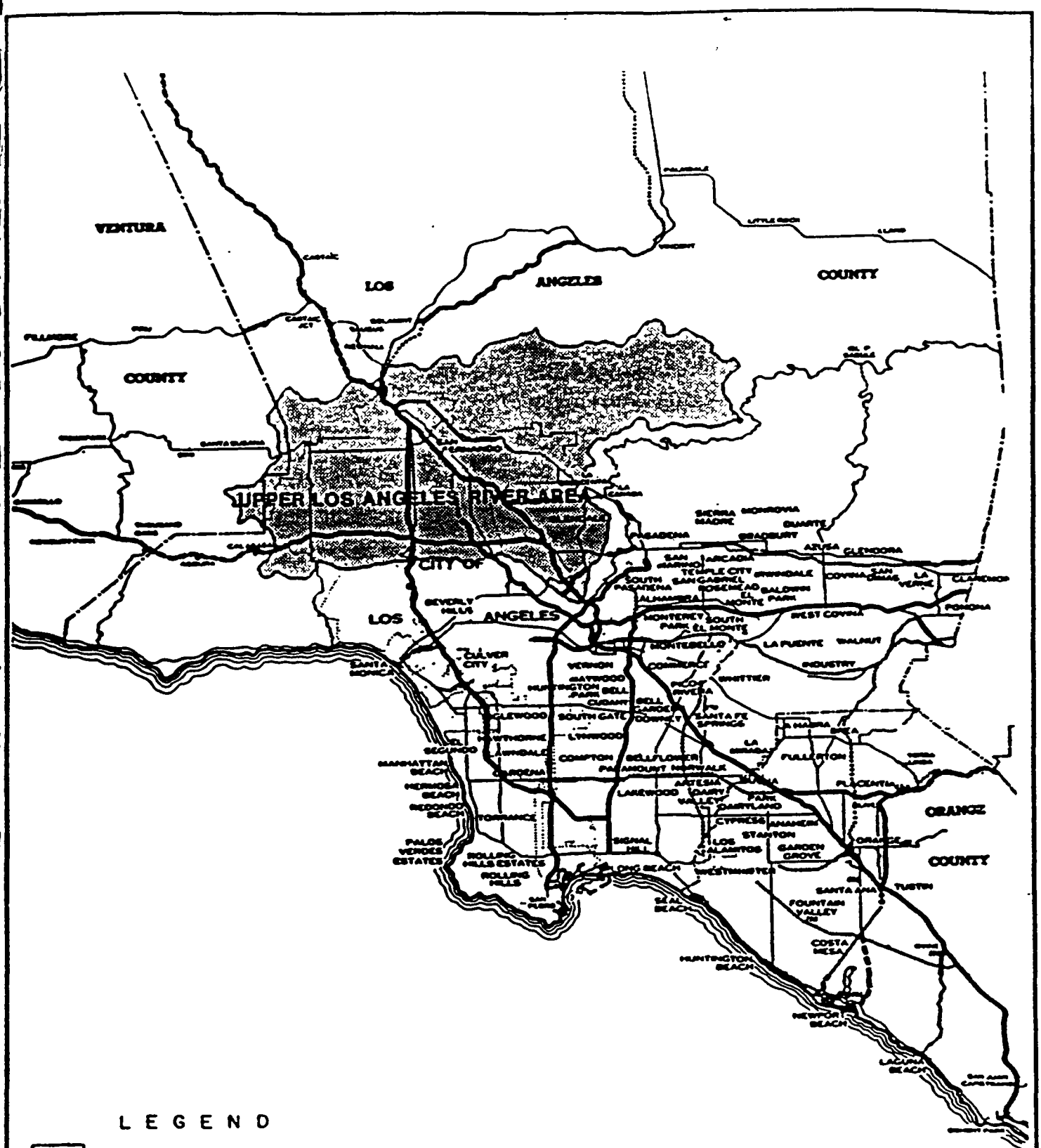
The SFVB is an adjudicated groundwater basin, and remediation efforts must be conducted within the constraints of the 1979 Judgment. The Judgment specifies who can extract groundwater and how much groundwater each party can extract. To address issues that were not included in the original text of the 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.



SOURCE: ULARA WATERMASTER, 1989

FIGURE 2-1
VICINITY MAP OF
UPPER LOS ANGELES RIVER AREA

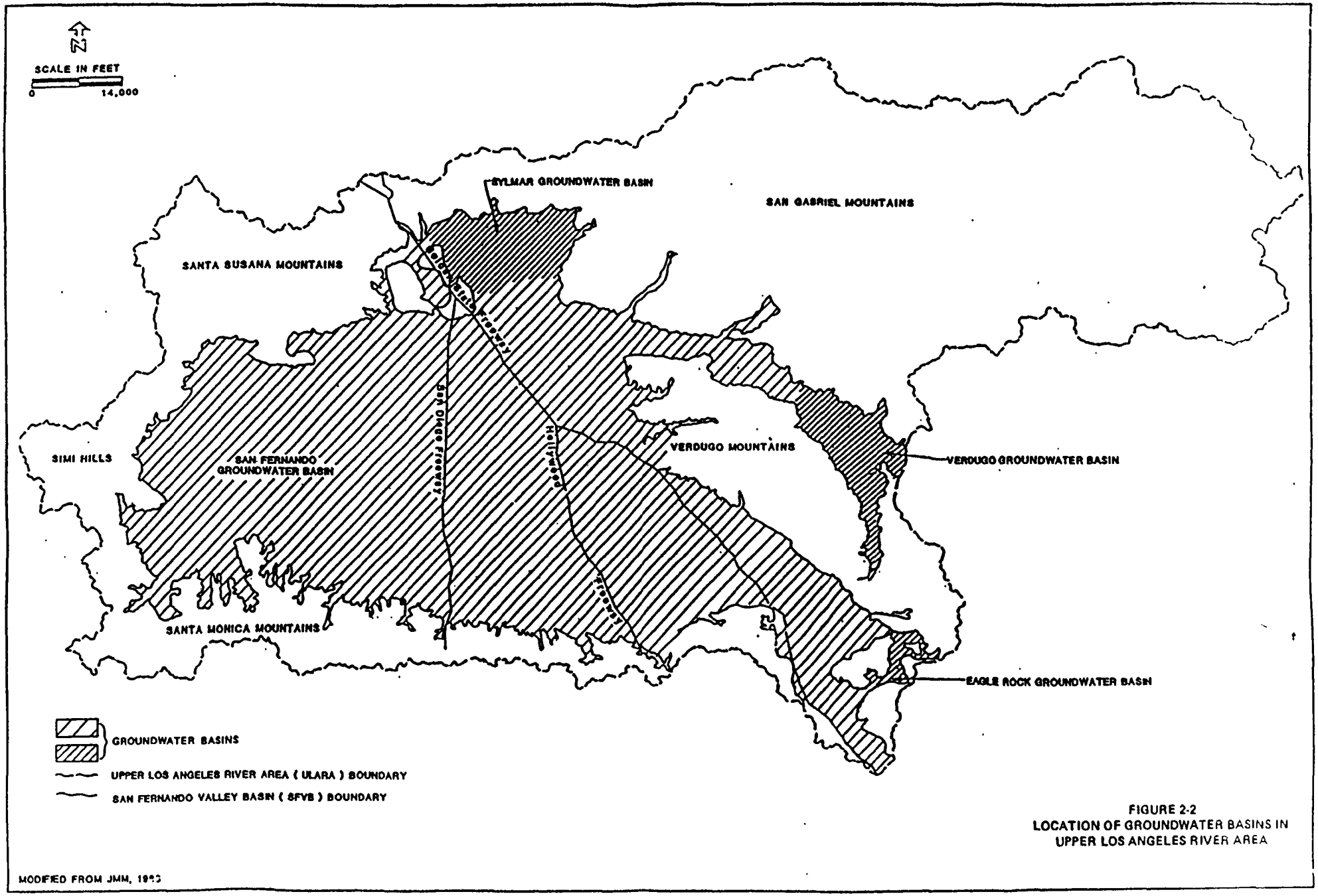
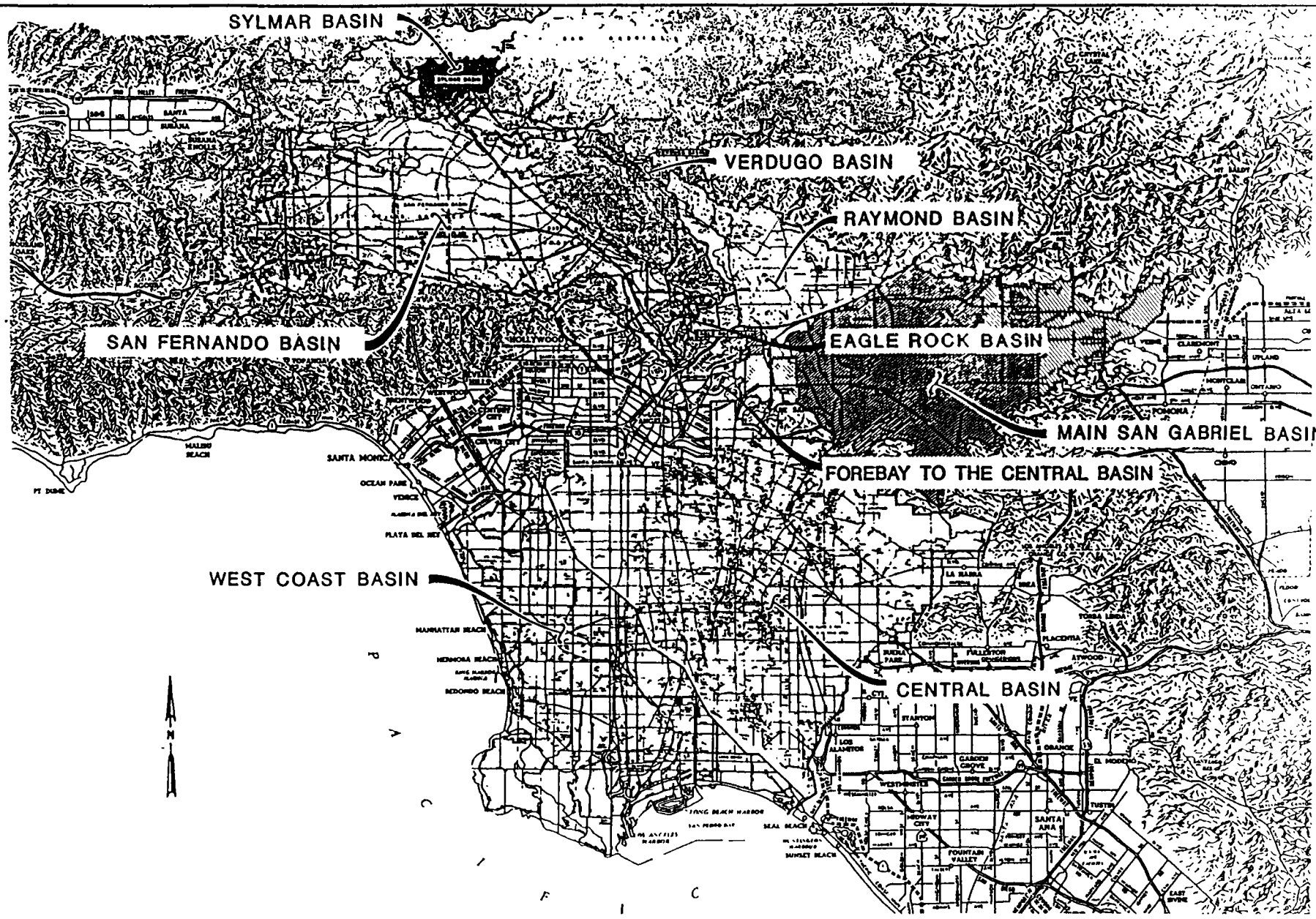


FIGURE 2-2
LOCATION OF GROUNDWATER BASINS IN
UPPER LOS ANGELES RIVER AREA

MODIFIED FROM JMM, 1993

SFO 69015.PP



Source: Bookman, 1972

FIGURE 2 – 3
LOCATION OF GROUNDWATER BASINS IN
THE LOS ANGELES AREA

APPENDIX H

ULARA DEWATERING

AND

REMEDIATION PROJECTS

ULARA DEWATERING AND REMEDIATION PROJECTS

NO.	COMPANY NAME	CONTACT NAME	ADDRESS	ID	START
1	DANALEX ENGINEERING CORPORATION	KRELL, ALEX	11239 VENTURA BLVD	P	
2		HENKIN, DOUG	8806 ETIWANDA AVE	P	
3	DELTA TECH ENGINEERING INC	ABBASI, Z A	12800 VENTURA BLVD	P	
4	HELFMAN/HOFFMAN & ASSOCIATES	VARADI, IVAN	5550 TOPANGA CYN	D	19-Jun-89
5	ENCINO SPECTRUM PROJECT	HELFMAN/HALOOSSIM & ASS	15503 VENTURA BLVD	D	14-Jun-89
6	HOME SAVINGS OF AMERICA	ELI SILON & ASSOCIATES	13949 VENTURA BLVD	D	14-Jun-89
7	WARNER CENTER ENTERTAINMENT CMPLX	TSUCHIYAMA AND KAINO	5955 OWENSMOUTH AVE	D	26-Jun-89
8	T VIOLES CONSTRUCTION COMPANY INC	VIOLE, TIM JR	15840 VENTURA BLVD	P	
9	MOBIL OIL	ALTON GEOSCIENCE INC	16461 VENTURA BLVD	R	11-May-89
10		ECCLESTON, C W	22020 CLARENDON ST	P	
11	THRIFTY OIL	DELTA TECH ENGR INC	18226 VENTURA BLVD	R	02-Feb-90
12		MARKS, RONALD	5348 TOPANGA CYN BLVD	P	
13		HALOOSIM, HALFMAN	21820 BURBANK BLVD	P	
14	PARK HILL MEDICAL PLAZA	ANJOMSHOAA, MAHMOUD	7303 MEDICAL CENTER DR	D	27-Dec-89
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 BLVD	P	
18	HELFMAN/HALOOSIM & ASSOCIATES	VARADI, IVAN	5350 WHITE OAK AVE	P	
19	CALIFORNIA ENVIRONMENTAL	BUCKLEY, CHARLIE	5455 VAN NUYS BLVD	R	04-Oct-89
20	FIRST FINANCIAL PLAZA	SLADE, RICHARD	16830 VENTURA BLVD	D	09-Oct-87
21	MORAN CONST/TRILLIUM	LEWIS, BILL	6310- CANOGA AVE	D	27-Apr-88
22	LAMCO	O'NEIL, JOHN	21300? VICTORY BLVD	D	27-Apr-88
23	LA REINA FASHION PLAZA	BLUMENFELD, DOLORES	14622 VENTURA BLVD	D	27-Apr-88
24	NORTHRIDGE FASHION CENTER-MAY CO	FRED FIEDLER & ASSCTS	9301 N TAMPA AVE	R	19-May-89
25	ROCKWELL INTERNATIONAL	LAFFLAM, S R	6633 CANOGA PARK AVE	R	10-Jun-90
26	LOCKHEED AERONAUTICAL SYSTEMS CO	HELGERSON, R N	E EMPIRE AVE	R	05-Jan-89
27	3M RIKER LAB	LEE, M E	19901 NORDHOFF ST	R	08-Feb-89
28	MEPCO/CENTRALAB, INC (PHILLIPS)	SMITH, WADE	4561 COLORADO ST	R	14-Jul-87
29	AUTO STIEGLER	STIEGLER, JOHN	16721 VENTURA BLVD	D	31-Oct-90
30	SHERWAY PROPERTIES	VASQUEZ, RODNEY	4477 WOODMAN AVE	P	
31	ELLIS PLUMBING CO	ELLIS, CHRIS	19951 ROSCO BLVD	P	

APPENDIX I

FACT SHEET NO. 5

GROUNDWATER CLEANUP STUDIES

CONTINUE IN THE SAN FERNANDO VALLEY BASIN

Groundwater Cleanup Studies Continue in the San Fernando Valley Basin

United States Environmental Protection Agency, Region IX, San Francisco

Fact Sheet Number 5 **July 1990**

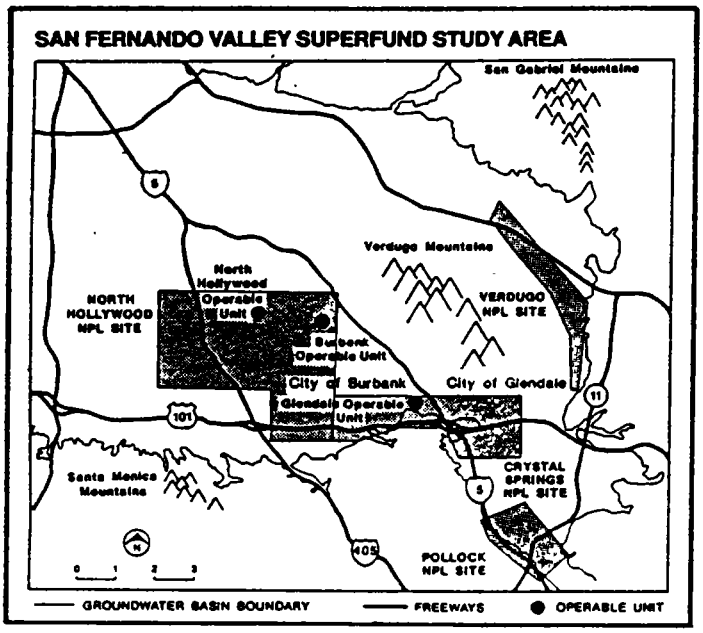


FIGURE 1

WHAT IS SUPERFUND?

Superfund is the common name used for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA). This federal law authorizes EPA to respond to releases or threatened releases of hazardous substances that may endanger public health and the environment.

INTRODUCTION

Federal, state and local agencies have been conducting investigations and cleanup of contaminated groundwater in the San Fernando Valley Basin since contamination was discovered in 1979.

This document discusses recent and future studies and activities under the Environmental Protection Agency (EPA) Superfund program. These activities include measuring the extent of contamination, developing and implementing cleanup remedies, and making polluters pay for cleanup.

SITE BACKGROUND

The San Fernando Valley is located between the San Gabriel Mountains and the Santa Monica Mountains. Several groundwater basins in the valley are collectively referred to as the San Fernando Valley Basin. The basin is an important source of drinking water for the Los Angeles metropolitan area, La Crescenta, and the Cities of Glendale, Burbank, and San Fernando (Figure 1).

In 1986, EPA placed four sites in the San Fernando Valley Basin on the Superfund National Priorities List (NPL). The NPL is a list of the most seriously contaminated hazardous waste sites eligible for federal cleanup funds under the Superfund program. As shown on Figure 1, the four sites are North Hollywood, Crystal Springs, Verdugo and Pollock. The sites are located in the cities of Los Angeles, Burbank, and Glendale. Although specific groundwater cleanup actions are taking place at each site, EPA manages the entire San Fernando Valley Basin cleanup as one large site, referred to as the San Fernando Valley Study Area.

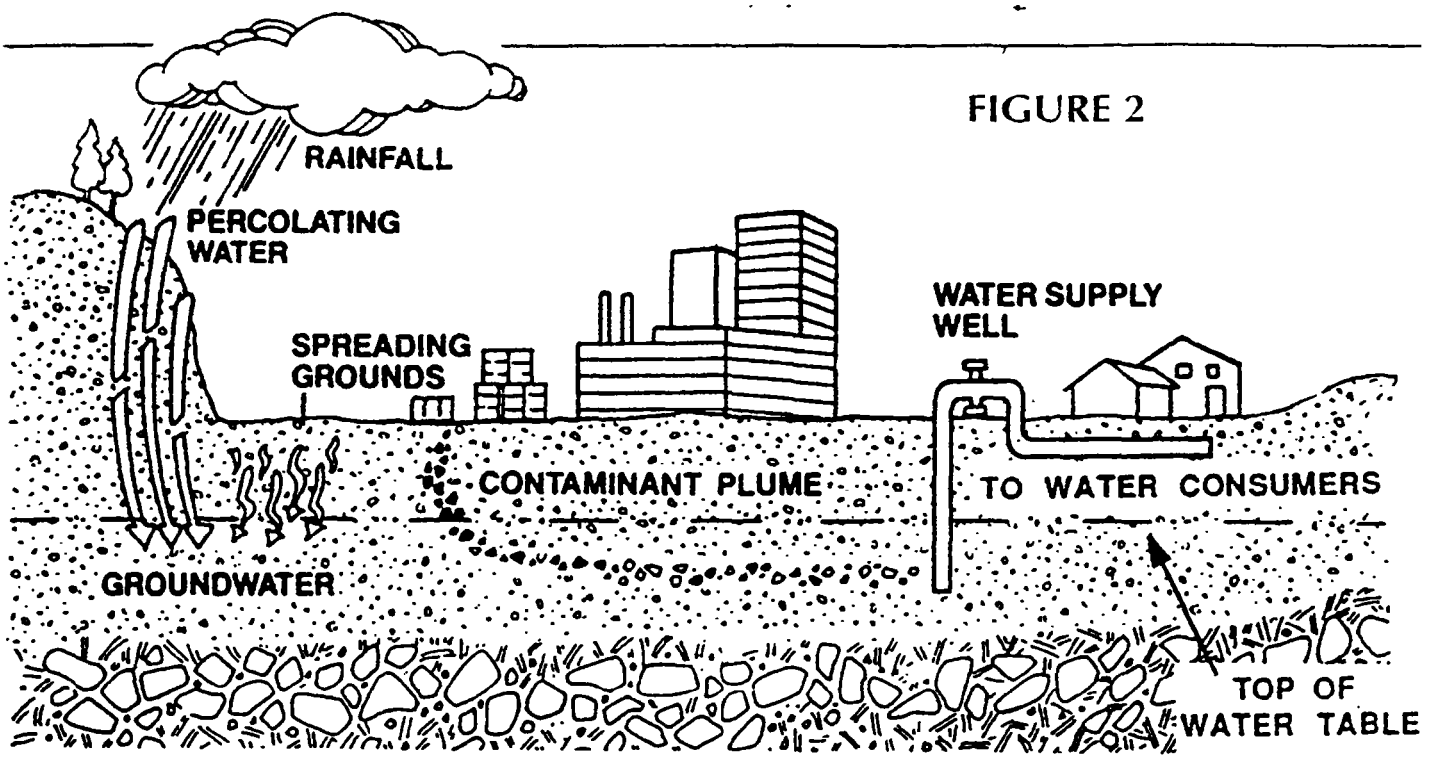


FIGURE 2

The primary contaminants found in the San Fernando Valley Groundwater Basin are industrial solvents. These solvents have found their way to the groundwater basin as a result of improper use, storage, and disposal practices.

CONTAMINANTS

The Superfund sites are areas where groundwater from wells has been found to contain volatile organic compounds (VOCs) above state and federal drinking water standards. Volatile organic compounds are chemicals that evaporate readily when exposed to air. Some VOCs have been shown to increase the rate of cancer in laboratory animals. Exposure to these chemicals may also increase the risk of cancer in humans. Volatile organic compounds have been and/or are being used in many San Fernando Valley industries, such as aeronautical, automotive, dry cleaning and metal plating. Figure 2 illustrates how groundwater becomes contaminated.

The Los Angeles Department of Water and Power (LADWP), California Department of Health Services (DHS), California Regional Water Quality Control Board (Regional Board), EPA, and local water agencies have taken steps to reduce human exposure to these chemicals. Many contaminated wells have been shut down and drinking water has been provided from alternate surface water sources such as the Owens River Aqueduct, the Colorado River Aqueduct, and the California Aqueduct. In some cases, groundwater is blended with surface water from other sources to meet drinking water standards.

Public drinking water in the San Fernando Valley Basin area is safe to drink. Drinking water is tested regularly before it is delivered to consumers.

BASINWIDE ACTIVITIES

Basinwide Investigations

EPA is overseeing the basinwide Remedial Investigation being conducted by LADWP, to study the groundwater flow patterns and the nature and extent of groundwater contamination within the eastern half of the San Fernando Valley Basin.

The Remedial Investigation has been divided into two phases. In phase one, LADWP has installed 43 shallow monitoring wells to obtain preliminary contamination information at the four NPL sites; 14 monitoring wells at the North Hollywood site; 11 wells at the Crystal Springs site; 11 wells at the Pollock site; and 7 wells at the Verdugo site. LADWP will also install 14 well clusters during 1990 to collect more detailed information by sampling groundwater at different depths. Based on the results of phase one, an additional 63 wells may be installed in phase two.

The data obtained from the remedial investigation and more than 60 private wells and existing

monitoring and production wells will be used to construct a computerized groundwater and contamination flow model. The data and model will help EPA select the most effective cleanup alternatives. Figure 3 shows the approximate location of VOC contamination above the maximum contaminant level (MCL) based on current data.

Basinwide Cleanup Plans

EPA is developing a Basinwide Plan to examine contamination cleanup methods, with the goal of minimizing public health risks and environmental impacts. The study uses available data from the Remedial Investigation to evaluate and compare cleanup alternatives. EPA is also evaluating the effectiveness of existing operable unit projects, such as the North Hollywood Treatment Facility (page 4) and considering whether or not other interim measures will be required. The Basinwide Plan will incorporate the basinwide technical needs, the operable units, and agency roles into a statement of long-range cleanup goals and methods.

Payment for Cleanup Activities

Enforcement is one of the most important Superfund activities. Enforcement efforts are underway in the basin to get polluters to pay for cleanup and to prevent further contamination.

EPA and the Regional Board are identifying potential sources of contamination and pursuing facility owners or operators that may be responsible for contaminating groundwater, regardless of when the contamination occurred. Potential sources include businesses, industries, or agencies that generate, transport, use, treat, store, or dispose of the hazardous substances. Hundreds of facilities in the Valley are possible sources.

The search for contamination sources includes, but is not limited to, site visits and review of historic aerial photographs and agency files. EPA requests information from industrial facilities about historic property use, industrial processes, and hazardous substance handling. EPA will also use groundwater data and modeling to help trace contamination to its source.

The Regional Board conducts investigations at individual facilities to determine if they have contamination. If contamination is found, the Regional Board will oversee cleanup activities at the site. EPA reviews the information gathered by the Regional Board and determines whether facility owners or operators are potentially responsible for the groundwater cleanup. If they are found to be a Potentially Responsible Party (PRP), EPA will negotiate an enforcement agreement with them. EPA encourages the PRPs to perform cleanups themselves whenever possible.

If a settlement is not reached, EPA has the authority to order PRPs to do the work with EPA oversight. If PRPs do not abide by the order, EPA may file suit against them. If EPA does the work, EPA can also file suit against the PRPs to recover the federal money spent on the site cleanup.

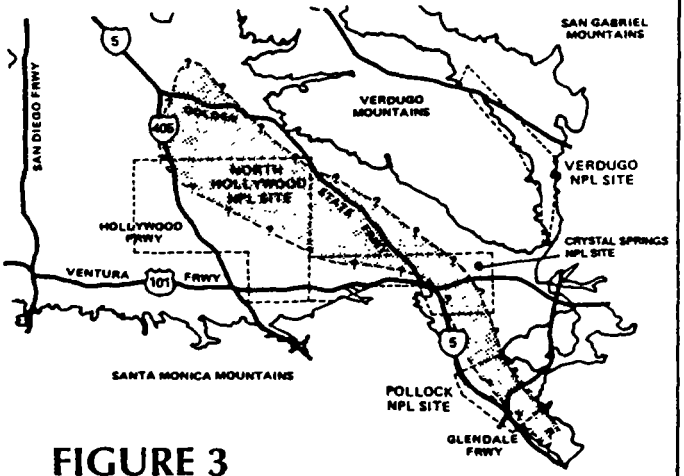


FIGURE 3

Shaded area shows approximate extent of VOC contamination above MCL based on current data.

We need your help identifying groundwater polluters

If you have information about groundwater contamination or potential sources of contamination that will be of value to the investigation, please call Chris Stubbs, EPA Remedial Project Manager, at (415) 744-1890.

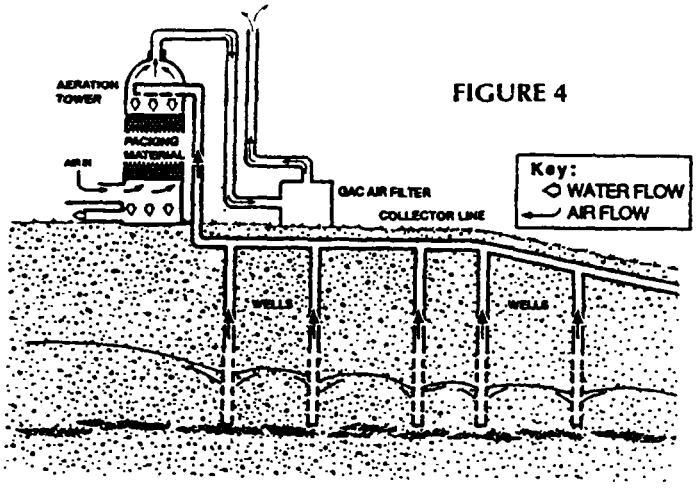


FIGURE 4

A typical aeration facility similar to the North Hollywood Extraction and Treatment Plant.

SITE SPECIFIC CLEANUP ACTIVITIES

EPA and LADWP are evaluating and constructing individual cleanup measures to address the most immediate contamination problems. These individual measures are called operable units. Operable units have been designated for North Hollywood and Burbank in the North Hollywood NPL site. An operable unit has been designated in Glendale in the Crystal Springs NPL site. The results of studies for each operable unit will be integrated into the long-term basinwide cleanup plan. The current status of each operable unit is described below.

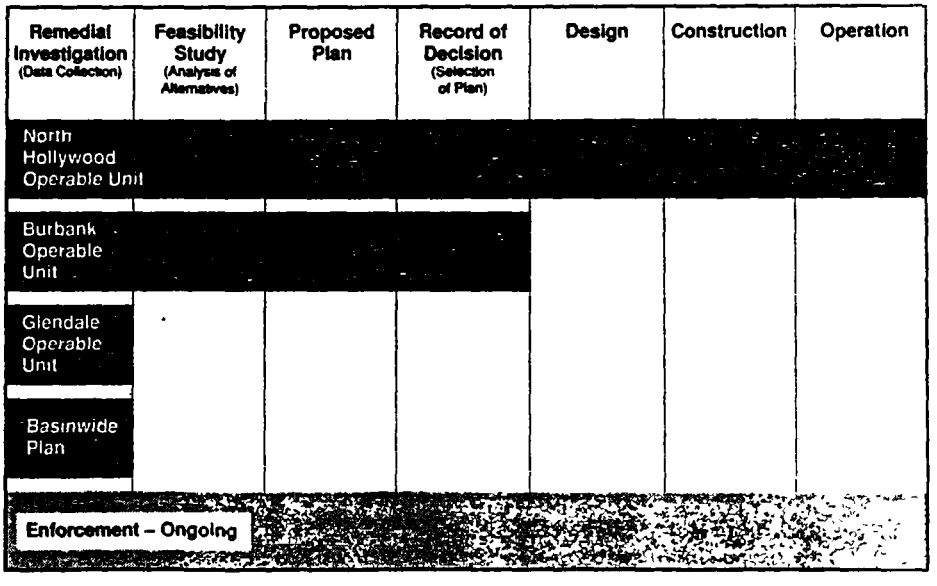
North Hollywood Cleanup Plan

In September 1987, EPA signed a Record of Decision for the North Hollywood Operable Unit. The Record of Decision documents the selection for the preferred remedy at the operable unit. EPA and the State of California constructed a groundwater extraction and treatment facility to remove the highest concentrations of VOCs within a portion of the North Hollywood NPL site. Construction was completed in early 1989 and the facility began extracting and treating water in March 1989. EPA has paid for 90% of the construction and operation of the facility. The California Department of Health Services (DHS) funded the remaining 10% of the construction costs, and LADWP pays the remaining 10% of the operation costs. EPA pays 90% of the operation and maintenance costs for 10 years.

The facility is located at 11845 Vose St., near Lankershim Boulevard in the North Hollywood section of Los Angeles. Eight extraction wells pump the groundwater to the top of a 45 foot tower. As the water cascades through packing material in the tower, air is forced up through the water. As the water comes into contact with the air, the volatile organic compounds (VOCs) transfer into the air stream. The air stream is filtered through two tanks containing granular activated carbon (GAC), a specially treated material that attracts the contaminants. The treated air meets all federal and state air quality standards. Figure 4 shows a typical aeration facility similar to the North Hollywood Extraction and Treatment Plant.

The treated water is disinfected and flows through a pipeline to LADWP's North Hollywood Pumping Station for distribution to the public. The water meets state and federal drinking water standards. EPA intends to recover the costs from PRPs that were incurred during the investigation, construction and operation of the North Hollywood operable unit.

Status of San Fernando Superfund Activities



Burbank Cleanup Plan

In June 1989, EPA signed the Record of Decision for the Burbank Operable Unit, selecting a remedy similar to the one chosen for the North Hollywood Operable Unit. EPA has proposed locating the facility on City of Burbank property near the intersection of Hollywood Way and Victory Boulevard. During treatment system design, the final location will be chosen. Monitoring wells will also be installed to monitor the system and effect on groundwater movement and quality. Treated water will be delivered to Burbank's water supply system for distribution to the public and/or put back into the basin.

EPA is negotiating with PRPs in the Burbank area to reach an agreement in which the PRPs will pay for design, construction, and operation of the treatment facility and will reimburse EPA for the earlier Burbank area study and enforcement costs.

Glendale Cleanup Plan

High concentrations of VOCs have been found in groundwater in the Glendale area of the Crystal Springs NPL site. Glendale has closed most of its wells and is now receiving the majority of its drinking water from imported surface water. A Feasibility Study will be conducted for the Glendale operable unit to determine what cleanup measures may be appropriate to protect human health and the environment.

Groundwater testing is underway in Glendale to define the nature and extent of the contamination. LADWP will begin the Operable Unit Feasibility Study in late 1990 when data from the Remedial Investigation will be available. When the Glendale OUFS has been completed, EPA will request public comment on the proposed cleanup alternatives.

EPA is identifying potential sources of contamination in the Glendale area. As with the Burbank Operable Unit, EPA will negotiate with PRPs in the Glendale area to get them to pay for design, construction, and operation of the selected remedy and reimburse EPA for study costs.

GLOSSARY

AERATION FACILITY: A treatment system that removes volatile organic compounds from contaminated water by forcing air through the water. The volatile chemicals evaporate when exposed to the air.

ARARs (Applicable or Relevant and Appropriate Requirements): Remedial actions must comply with relevant and appropriate or applicable federal and state laws at Superfund Sites.

CONTAMINANT PLUME: A three-dimensional zone within the groundwater aquifer containing contaminants that generally move in the direction of, and with, groundwater flow.

GAC (Granular Activated Carbon): An adsorptive material that attracts and holds contaminants. GAC has been demonstrated to be especially effective due to its large adsorption surface area.

HAZARDOUS SUBSTANCE: Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.

MCL (Maximum Contaminant Levels): Enforceable standards that apply to public drinking water supplies.

MONITORING WELL: Wells drilled at specific locations for the purpose of determining direction of groundwater flow, types and concentrations of contaminants present, or vertical or horizontal extent of contamination.

NPL (National Priorities List): A list of the top-priority hazardous substance sites in the country that are eligible for investigation and cleanup under the federal Superfund program.

OPERABLE UNIT: A discrete action taken that contributes to the permanent site cleanup. A number of operable units can be conducted during the course of a Superfund project.

PERCOLATING WATER: Surface water that filters through the soil and eventually reaches the groundwater.

PRP (Potentially Responsible Party): An individual or company potentially responsible and therefore potentially liable for the cost of cleaning up contamination at a Superfund site.

PRODUCTION WELL: A well that pumps water out of the ground to provide a municipal, agricultural, or industrial water supply.

ROD (Record of Decision): A public document that explains what cleanup alternative will be used at a specific NPL site. The ROD is based on information and technical analysis generated during the remedial investigation/feasibility study and consideration of public comments and community concerns.

VOC (Volatile Organic Compound): An organic (carbon containing) compound that evaporates readily at room temperature. VOCs are commonly used in dry cleaning, metal plating and machinery degreasing.

FOR MORE INFORMATION

Questions, comments, or concerns about the San Fernando Superfund Project can be addressed to:

Fraser Felter
Community Relations Coordinator
U.S. EPA
1235 Mission St. (H-1-1)
San Francisco, CA 94103

Alisa Greene
Remedial Project Manager
U.S. EPA
1235 Mission St. (H-6-4)
San Francisco, CA 94103

EPA's Superfund Toll-Free Message Line: 1-800 231-3075. Please leave your name and number for Fraser Felter and your call will be returned.

Copies of general introductory material, previous fact sheets, and Superfund documents are available at the following information repositories:

California State University Northridge Library
18111 Nordhoff St.
Northridge, CA 91330
(818) 885-2285
Contact: Mary Finley

The University Research Library/U.C.L.A.
Public Affairs Service
405 Hilgard Ave.
Los Angeles, CA 90024
(213) 825-3135
Contact: Barbara Silvernail

L.A.D.W.P. Library
111 North Hope St., Room 518
Los Angeles, CA 90012
(213) 481-4612
Contact: Joyce Purcell

City of Glendale Public Library
222 East Harvard St.
Glendale, CA 91205
(818) 956-2027
Contact: Lois Brown

City of Burbank Public Library
110 North Glenoaks Blvd.
Burbank, CA 91502
(818) 953-9741
Contact: Helen Wang

AGENCY COORDINATION

Due to the size and complexity of the San Fernando Superfund project, many agencies must work together to clean up the groundwater contamination and protect human health and the environment. These agencies are briefly described below:

EPA – The U.S. Environmental Protection Agency (EPA) has overall responsibility for cleanup and enforcement efforts at the San Fernando Valley Superfund sites. EPA provides review and oversight for the Remedial Investigation and Operable Unit Feasibility Studies. EPA also conducts cleanup, enforcement, and community relations activities and is the primary funding agency. EPA has delegated additional tasks to other agencies.

LADWP – The Los Angeles Department of Water and Power (LADWP) has overall responsibility for water supply in the City of Los Angeles. As part of this role, LADWP is required to provide water to its customers that meets state and federal drinking water standards.

In 1987, EPA signed a cooperative agreement with LADWP which provided LADWP with federal funds to conduct the basinwide Remedial Investigation, to construct the North Hollywood treatment facility, and to conduct the Burbank and Glendale Operable Unit Feasibility Studies. EPA has also signed a cooperative agreement with the Regional Board to assist in identifying sources of contamination and PRPs.

Regional Board – The Los Angeles Regional Water Quality Control Board is one of several agencies responsible for the protection of surface and groundwater for the State of California. The Regional Board investigates facilities which use, store, or handle chemicals and when contamination is found, requires site cleanup. Through a cooperative agreement with EPA, the Regional Board has been provided additional funds to investigate potential sources of groundwater contamination and when required, orders site specific source cleanup in the San Fernando Valley.

Department of Health Services (DHS) – The Department of Health Services (DHS) is the state agency responsible for protecting the health and welfare of California residents. DHS, through its Office of Drinking Water, requires regular testing of drinking water and has established state standards for more than 50 potential contaminants. Drinking water suppliers that service five or more connections (approximately 15 people) must meet the standards. Through its Toxic Substances Control Program, DHS also enforces state hazardous waste cleanup requirements.

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.

ULARA Watermaster – The Upper Los Angeles River Area Watermaster is appointed by the Los Angeles Superior Court and is responsible for ensuring compliance with the Superior Court Judgement of 1979, which defines water rights in the San Fernando Valley Basin. The Watermaster oversees and documents all actions that affect groundwater supply in the basin such as yearly rainfall, import and export of water to other areas, and pumping of groundwater for both water supply and cleanup purposes.

COMMUNITY WORK GROUP

The Community Work Group (CWG) was established in 1987 by EPA and LADWP to provide a forum for representatives from San Fernando Valley community groups, public interest organizations, local businesses, and government agencies to discuss the Superfund project. The CWG has been meeting regularly to hear presentations and progress reports from EPA and LADWP. Members have reviewed and commented on the investigations and cleanup alternatives. To improve distribution of project information, CWG members have provided Superfund status reports to their organizations.

EPA and LADWP would like to introduce six current and former Community Work Group members:

David Brooks lives in Glendale and works for the Crescenta Valley County Water District as Secretary to the Board and District Auditor. He has been interested in water quality for many years and sees the CWG as a way to keep informed about progress of the groundwater cleanup. He notes that most people are interested in health and need to receive more information about the water supply system and regulations that govern drinking water.

Barbara Fine is Vice President of the Federation of Hillside and Canyon Associations. She is a professional journalist and is currently a student at U.C.L.A. She is also a member of the City of Los Angeles Solid Waste Citizens Advisory Group. Barbara became interested in water quality when she learned that stormwater from overloaded drains carried pollutants which were seeping into the San Fernando Valley groundwater. She feels that too few people are aware of the source of their drinking water and that groundwater cleanup is important to everyone.

Ingrid Markul serves as the Air and Water Consultant to the League of Women Voters. Ingrid is a retired science teacher living in West Los Angeles. She has always had an interest in environmental issues and joined the CWG to learn more about groundwater contamination and cleanup. She enjoys relaying the technical information to the League and feels that awareness of the Superfund site has improved. She recently organized a successful symposium for community members on drinking water issues.

Mike Nolan is a Director of the Metropolitan Water District and represents the City of Burbank on the CWG. He participates in the CWG to keep current on groundwater cleanup and regularly presents information to the Burbank City Council. After getting involved in the CWG, Mike realized the group could encourage steady progress in the cleanup process. He feels that in spite of differing opinions on many issues, members of the CWG have learned from one another and have maintained a focus on the groundwater contamination problem and how it affects their communities.

Patty Prickett represents California Advocates for Pure Water. When asked why she was interested in the Community Work Group, Patty replied, "As a mother, it's hard not to be interested in drinking water!" Since learning about water quality as a researcher for a city councilperson, she has educated others and encouraged them to influence water quality policy. She feels it is important to monitor EPA and LADWP cleanup activities through the Community Work Group.

Jim Wilson is retired and lives in Los Angeles. He attends meetings as a representative of the Council of Community Clubs in Los Angeles, a community improvement organization. He sees the cleanup of contaminated groundwater as a way to improve the quality of life for people in his community, and he joined the CWG to find out what is being done to improve water quality.

OPPORTUNITIES FOR COMMUNITY INVOLVEMENT

EPA welcomes questions and comments from you. Comments can be directed to the EPA representatives listed on page 6. The public is encouraged to attend Community Work Group meetings. Contact Bob Haw, LADWP, at (213) 482-7295 (M-Th, 7:00-4:00) for additional information.

EPA also holds public meetings to receive comments before deciding on cleanup actions. Individuals returning the enclosed mailing list coupon will be sent notices of future public meetings and activities.

TECHNICAL ASSISTANCE GRANTS PROGRAM

Technical Assistance Grants (TAGs) are available for all federal Superfund and National Priority List (NPL) sites. The TAG program provides funds for community groups to hire a technical advisor to assist in interpreting technical information. Under this program, one eligible community group at each Superfund site may obtain one grant of up to $50,000. To be eligible, a group must: be legally incorporated; meet a 20% matching funds requirement; and prepare a plan for how the technical assistance grant will be used. For more information on the program, contact Jack Lockwood, EPA TAG Coordinator, at 1-800-231-3075.

MAILING LIST COUPON

If you did not receive this fact sheet in the 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:_____ **Telephone:**_____

Address:_____

Organization/Affiliation (if any): _____

Return to:
Office of Community Relations, U.S. EPA, 1235 Mission Street (H-1-1), San Francisco, CA 94103

United States Environmental Protection Agency-Region IX

Office of Community Relations
1235 Mission Street (H-1-1)
San Francisco, CA 94103
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APPENDIX J

EAST VALLEY WATER

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.

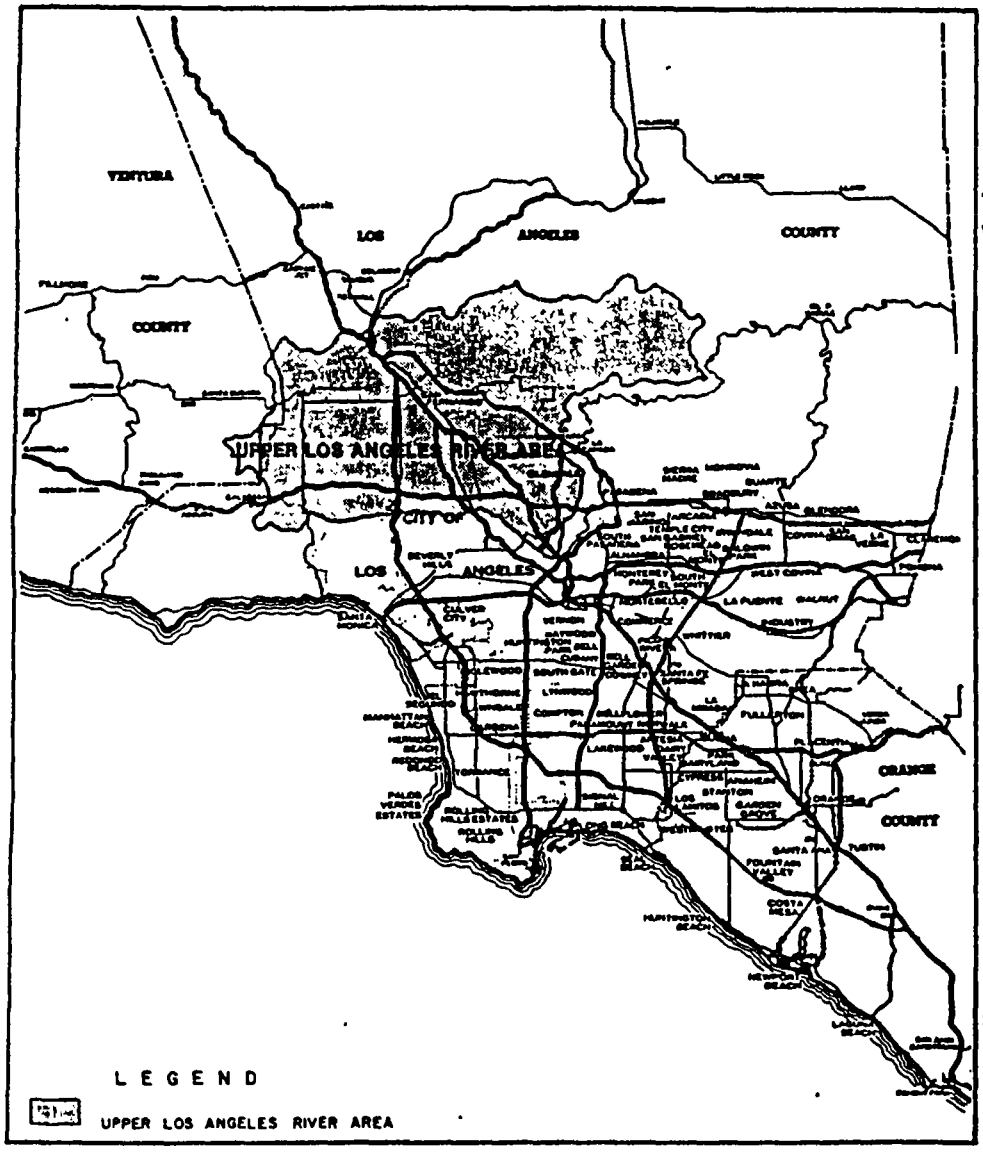
3.8 PROJECT FINANCING

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



VICINITY MAP
SCALE
0 5 10 15 Miles

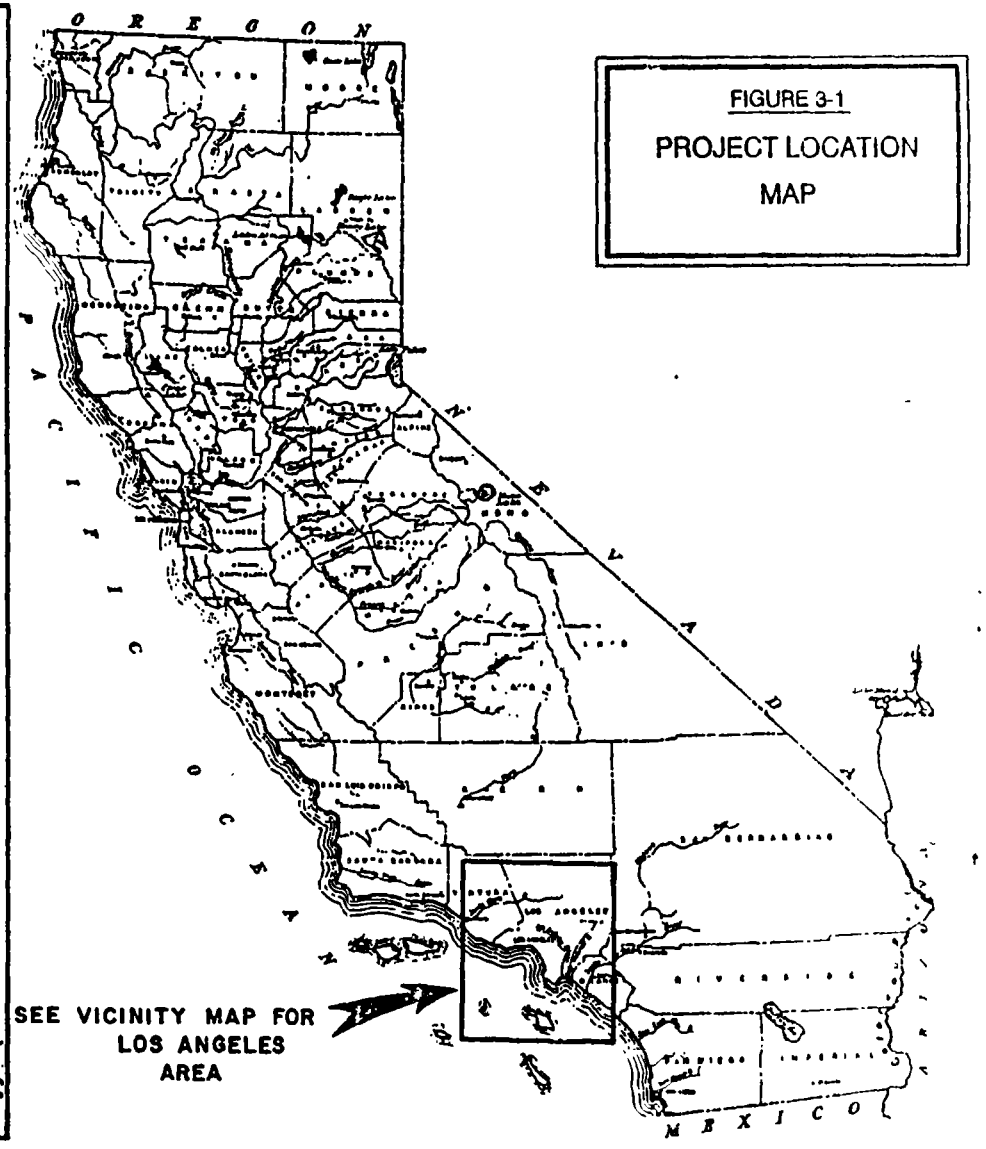


FIGURE 3-1
PROJECT LOCATION MAP

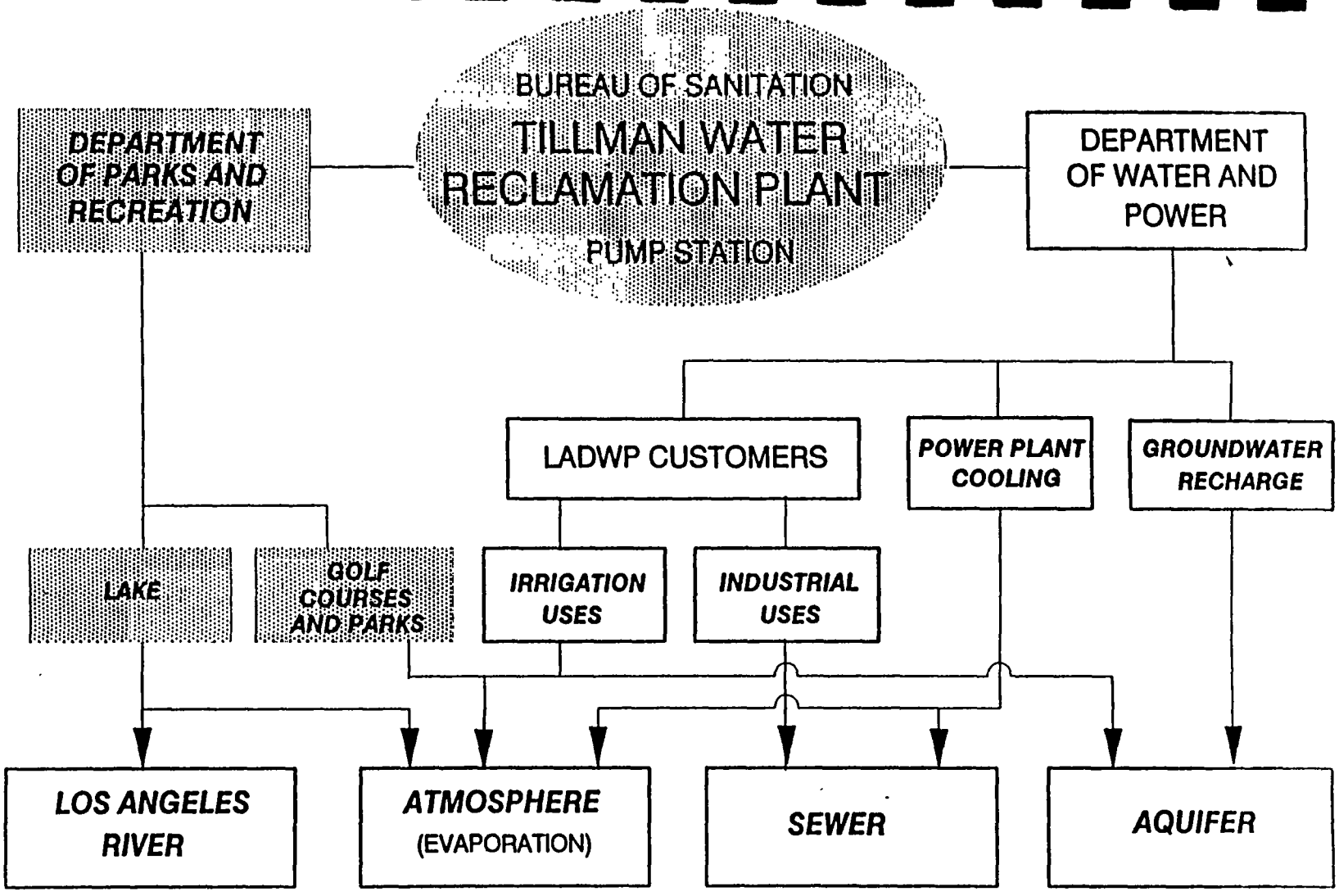


FIGURE 3-2
TILLMAN PLANT
RECLAIMED WATER
UTILIZATION

NOTE: Shaded areas are not part of the proposed project

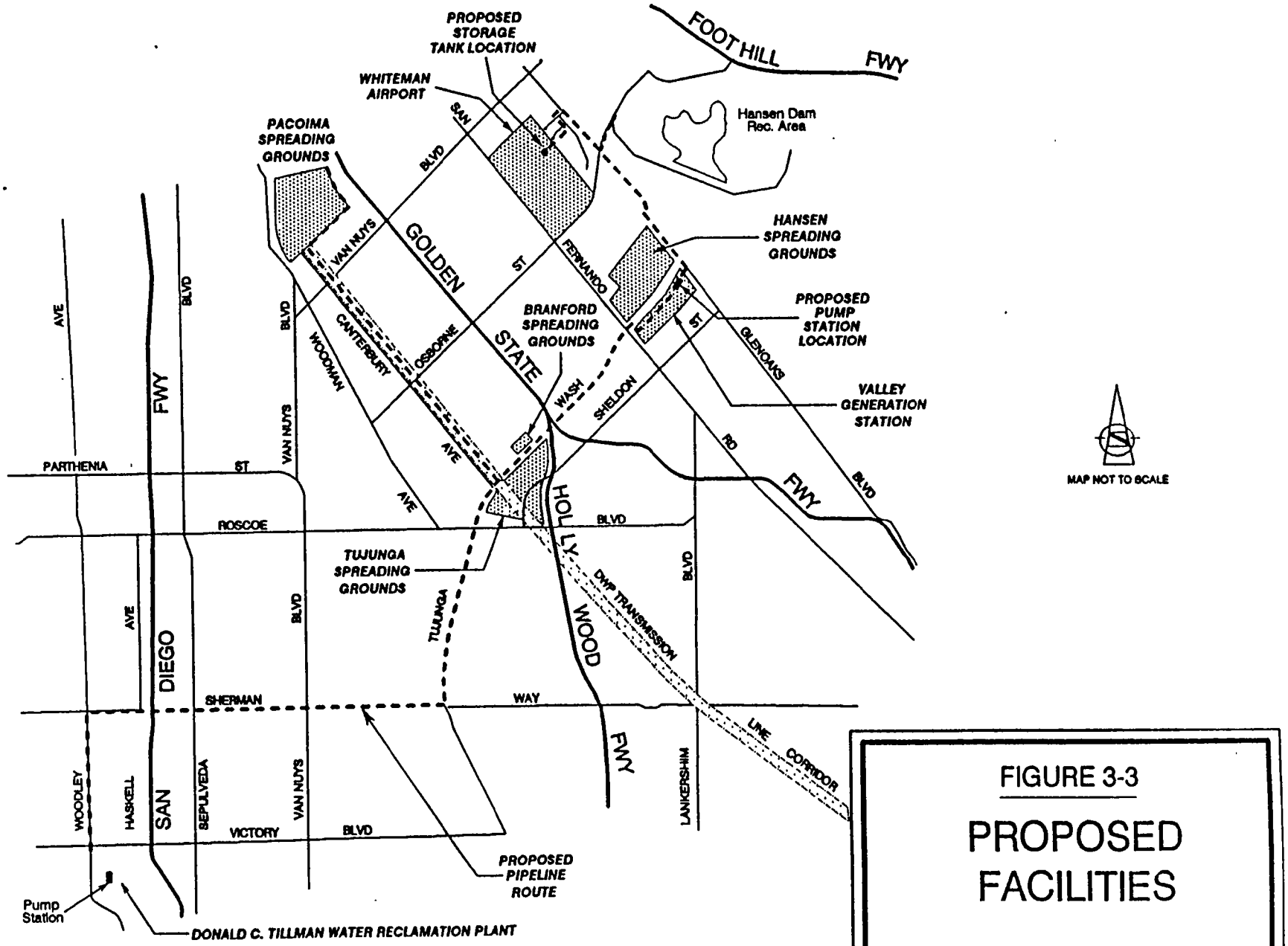


FIGURE 3-3

PROPOSED FACILITIES

APPENDIX K

HEADWORKS RECLAIMED

WATER PILOT RECHARGE STUDY

FACT SHEET
Headworks Reclaimed Water Pilot Recharge Study

Project Description

A pilot project to investigate the feasibility of using Los Angeles River (LAR) water, containing reclaimed water from the Tillman Reclamation Plant, to recharge the San Fernando Groundwater Basin (SFGWB).

Operation

A small amount of LAR water (1.0 cfs) will be spread at the Headworks Spreading Grounds and later extracted by pumping 1.5 cfs approximately 1000 ft down-gradient (north-east). Four monitoring wells will be placed down-gradient and up-gradient from an extraction well to monitor the groundwater and to insure that none of the reclaimed water escapes. The quality of the groundwater before spreading will also be monitored.

Objectives

- Compare water quality characteristics of LAR water prior to spreading and after extraction.
- Investigate the contaminant removal characteristics of the local soil formation.
- Investigate cost and effectiveness of using various treatment methods to bring the extracted water into compliance with federal and state drinking water standards should treatment become necessary.

Milestones

- June 1988: Completed Preliminary Project Description
- July 1988: Conducted Public Meeting on Proposal
- Feb. 1989: Submitted Engineering Report and application to Regional Water Quality Control Board (RWQCB)
- July 1989: Responded to RWQCB questions
- Dec. 1989: Obtained Water Discharge Requirement Permit for spreading

reclaimed water from RWQCB

- o May 1990: Obtained National Pollutant Discharge Elimination System (NPDES) permit for returning extracted water to the LAR
- o Oct. 1990: Award well drilling contract
- o Nov. 1990: Award monitoring contract and reach a joint funding and support agreement with Metropolitan Water District of Southern California.
- o Jan. 1991: Complete well construction and install a small granular activated carbon (GAC) unit at the extraction well to test feasibility of full-scale GAC treatment
- o Feb. 1991: Initiate spreading and extraction
- o Feb. 1993: Complete monitoring phase. Develop final report and recommendations.

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PRELIMINARY PROJECT DESCRIPTION

Headworks Reclaimed Water Pilot Recharge Study

Background

In 1976, the California Department of Health Services (DHS) placed 1) a moratorium on new groundwater recharge projects utilizing reclaimed water and 2) a freeze on existing projects. At the time the moratorium went into effect, only one planned recharge project was in operation; the Whittier Narrows Project operated by the County Sanitation Districts of Los Angeles County (CSD). The DHS action was taken because of surfacing concerns that insufficient data existed to ensure that human health would not be adversely affected by recharge of potable water aquifers with reclaimed water.

The CSD conducted a comprehensive study on health effects related to its use of reclaimed water to recharge the Montebello Forebay area of the Central Basin in Los Angeles County through spreading operations at Whittier Narrows. At the time the study was begun, the CSD had already spread over 400,000 acre-feet of reclaimed water at the Whittier Narrows site since the start-up of spreading operations in 1962. The Health Effects Study (HES), which the Department of Water and Power (DWP) participated in, was published in 1982 by the CSD and provided a wealth of information indicating that the use of reclaimed water for groundwater recharge at Whittier Narrows held little potential for adverse human health effects. These indications were strengthened by the recently convened California State Scientific Advisory Panel on Groundwater Recharge which issued a formal follow-up report on the subject in 1987.

Because conditions affecting groundwater recharge operations tend to be site specific, and because neither the HES nor the Scientific Advisory Panel report were completely conclusive regarding health effects, the long-term goal in California of developing uniform statewide criteria for groundwater recharge with reclaimed water has so far not been achieved. As a result, the DHS continues to take a conservative approach to the use of reclaimed water for groundwater recharge and considers requests for new reclaimed water spreading projects on a case-by-case basis only. In order to obtain approval for any new reclaimed water spreading project, it is necessary to effectively demonstrate to the DHS that the proposed project poses no potential health threat to the basin which will receive the water. In the absence of hard data obtained from actual spreading of reclaimed water in a particular geographic location, such as was already available to the CSD in the Whittier Narrows operation, the task of providing this type of demonstration becomes difficult.

The Headworks Reclaimed Water Pilot Recharge Study is intended to address this problem by spreading and retrieving a small amount of reclaimed water in an isolated portion of the San Fernando Groundwater Basin (SFGWB) for test purposes without impacting the basin.

Pilot Study Objectives

The object of the pilot study is to conduct a small-scale, two-phase recharge operation at the DWP's Headworks Spreading Grounds (HSG) near Griffith Park to evaluate all aspects of a potential full-scale reclaimed water spreading program to artificially recharge the SFGWB (see attached location map).

The DWP estimates that up to 35,000 acre-feet/year of reclaimed water could be spread in the San Fernando Groundwater Basin. This would be a valuable way to further conserve our existing water supplies, especially since reclaimed water would be available even during dry years. The benefits of this program would accrue to the entire Southern California area since the City would be able to reduce purchases from the Metropolitan Water District of Southern California.

The study must be conducted in such a manner that the water percolated for test purposes will be confined in an isolated portion of the basin and extracted downgradient from the point of application before it has had a chance to enter the main basin and blend with the native underground water. This is to ensure the separation of native groundwater from artificially recharged water until the results of the pilot study are known.

The specific objectives of Phase I of the pilot study are as follows:

1) Investigate the water quality characteristics of LAR water and groundwater containing percolated LAR water relative to federal and state drinking water standards.

2) Investigate the contaminant removal characteristics of the local soil formation.

The objectives of Phase II of the study are as follows:

1) Investigate the cost and effectiveness of using granular activated carbon, ozone peroxide, or other treatment processes to treat pumped groundwater, containing percolated LAR water, to meet state and federal drinking water standards if during Phase I it is determined that the water doesn't meet those standards.

3) Evaluate the overall benefit/cost of using LAR water containing tertiary treated effluent from the Tillman Water Reclamation Plant to recharge the SFGWB.

Preliminary Facilities Plan

The preliminary facilities plan for Phase I of the pilot study project involves the following:

1) Construction of two small test basins within the existing HSG.

2) Modification of the existing diversion ditch from the existing diversion works in the south wall of the LAR channel to deliver water to the test basins. (The ditch may have to be lined to prevent unplanned seepage.)

3) Installation of extraction well(s) downgradient from the test basin in position to recover the percolated LAR water.

5) Installation of monitoring wells to ensure confinement of the percolated water.

6) Installation of a collector line to deliver water from the extraction well(s) to a sampling point.

7) Construction of a disposal line from the sampling point to the LAR.

If it is determined that Phase II is necessary, the plan will be expanded to include construction of a pilot-scale treatment facility at HSG for testing alternative treatment methods.

Proposed Operating Plan

1) Divert a small amount of water from the LAR by way of the existing inflatable dam across the LAR at the HSG and the existing diversion works in the south wall of the concrete lined LAR channel just upstream of the inflatable dam.

   - Divert approximately 1 cubic foot per second (cfs).

   - Average LAR summer flow is about 50 cfs.

2) Spread diverted LAR water at one of the new test basins constructed for the pilot study. A tracer will be added to track the underground flow of the water. Basins will be rotated periodically for alternate spreading and drying cycles.

3) Extract groundwater downgradient from test basin.

   - Distance between test basin and new extraction well should be great enough to allow adequate lateral percolation and treatment by the local soil formation.

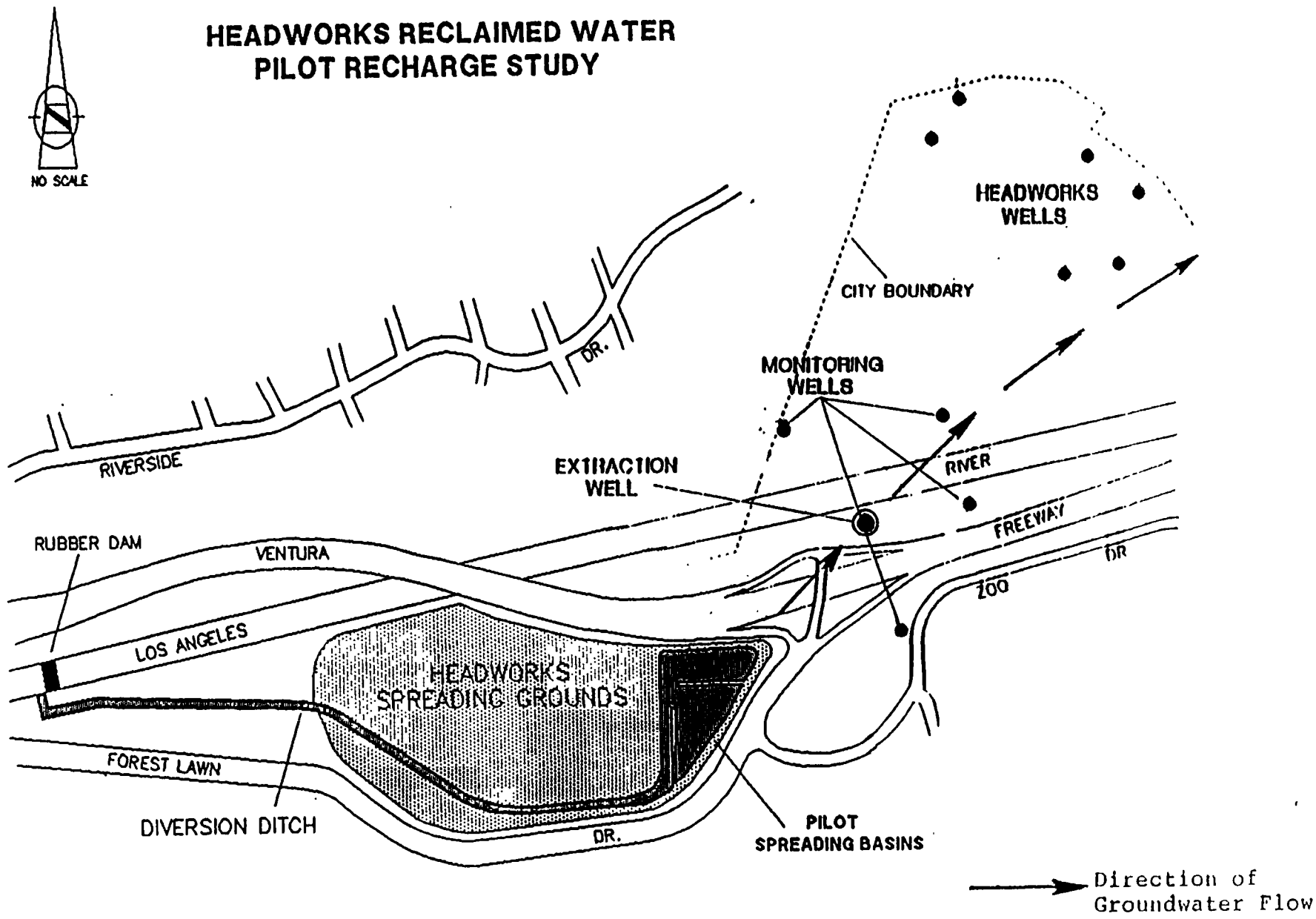
   - Extraction rate will be greater than spreading rate to provide adequate drawdown cone of depression (approximately 1.5 cfs).

4) Extracted groundwater will be tested and then discharged to the LAR.

5) Testing of the water will be performed on samples obtained from the diversion ditch and the pump discharge line.

Monitoring

Precautions will be taken to minimize commingling of percolated LAR water and native groundwater until the results of the study are completed. The use of a tracer injected into the diverted LAR water prior to spreading and installation of adequate monitoring wells are measures that will be taken to accomplish this. If, following start-up of test spreading operations, it is determined that the percolated LAR water is migrating from the site, spreading operations would be suspended and the pumping rate of the extraction well(s) will be increased and/or other extraction wells drilled to correct the situation and ensure proper confinement to test the area.


HEADWORKS RECLAIMED WATER
PILOT RECHARGE STUDY
NO SCALE
HEADWORKS
WELLS
CITY BOUNDARY
MONITORING
WELLS
DR.
RIVERSIDE
EXTRACTION
WELL
RIVER
FREEWAY
RUBBER DAM
VENTURA
LOS ANGELES
ZOO
DR
HEADWORKS
SPREADING GROUNDS
FOREST LAWN
DIVERSION DITCH
DR.
PILOT
SPREADING BASINS
Direction of
Groundwater Flow

HEADWORKS RECLAIMED WATER
PILOT RECHARGE STUDY