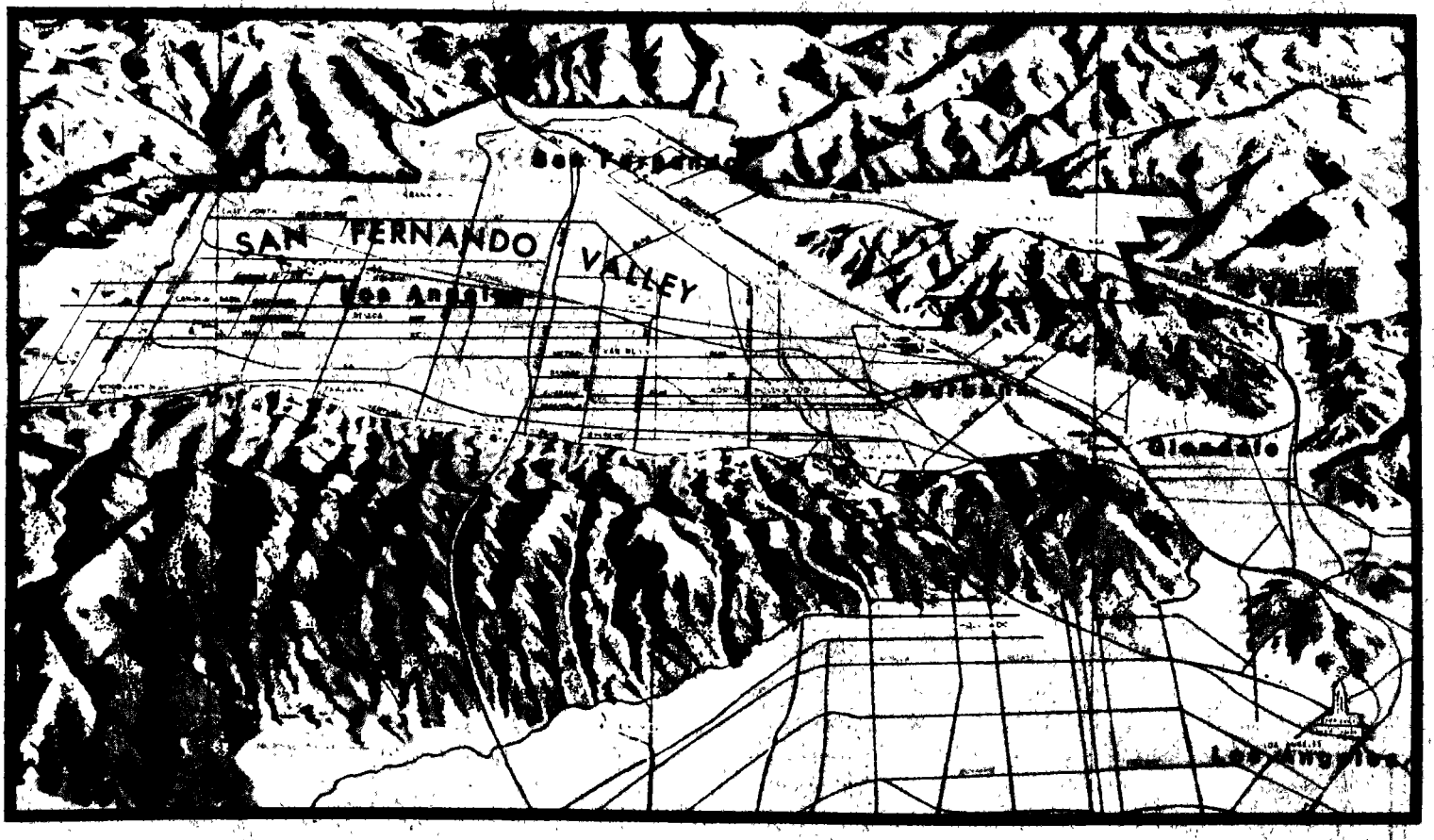
UPPER LOS ANGELES RIVER AREA WATERMASTER

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, 1991 - SEPTEMBER 30, 1992



MAY 1993

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

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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 ULARA Judgment. For the period January 16, 1990, to April 16, 1991, Judges Vogel and Disco were involved in the implementation of the ULARA Judgment. On April 16, 1991, the San Fernando Case was assigned to Judge Krieger. Subsequently, Judge Gary Klausner replaced Judge Krieger on December 9, 1991. On January 1, 1993, Judge Ricardo A. Torres was assigned to Department 64 of the Los Angeles Superior Court to continue the retained jurisdiction of the Court for the San Fernando Valley (Section 7.1 of the ULARA Judgment).

This report describes the water rights in each basin, lists the allowable pumping for the 1991-92 water year and indicates the water in storage to the credit of each party as of October 1, 1992. In addition, this report includes background information on the history of the San Fernando Case, information as to each basin and the ULARA in total on water supply, ground water extractions, ground water levels, quantities of imported water use, recharge operations (including amounts thereof), water quality conditions, and other pertinent information occurring during the 1991-92 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, with additional revisions occurring in April 1990. 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. The revisions address and provide for test pumping and prolonged cleanup pumping by non-parties who have no right to pump but who are required to pump and treat contaminated ground water under a Cleanup and Abatement Order of the Los Angeles Regional Water Quality Control Board (LARWQCB). The LARWQCB has included in all Cleanup and Abatement Orders for the ULARA a provision requiring the discharger to follow the ULARA Policies and Procedures. Presently, ten companies are involved in cleanup pumping and treatment or are drilling extraction wells and designing treatment facilities. These companies include 3-M - Pharmaceuticals, Allied Signal, California Environmental, Greeff Fabrics, Inc. (formerly Wickes Company, Inc.), the Lockheed Corporation, Malibu-Grand Prix, Mobil Oil, Philips Components, Thrifty Oil, and Rockwell International. Sections 2.5 to 2.7 of the ULARA Policies and Procedures were revised and approved on April 17, 1990 (Appendix E).

Also addressed in the ULARA Policies and Procedures (dated July 1987) is pumping for dewatering of construction projects. Arrangements were made with the City of Los Angeles, Department of Building and Safety to refer all such dewatering projects in the ULARA to the ULARA Watermaster's office. If the water pumped for dewatering must be discharged to the storm drains, replacement water must be purchased. At present, 23 companies are dewatering or potentially may be required to dewater and report to the ULARA Watermaster's office (Appendix H).

Section 2.8 was added to the ULARA Policies and Procedures in April 1992 to provide for overextractions from the Verdugo Basin for the Crescenta Valley County Water District and the City of Glendale in any water year, an amount not exceeding 10 percent of their water rights. The 10-percent annual overextraction may continue from year to year cumulatively, not to exceed 1,000 acre feet for each party, so long as the unusual circumstances persist. This overextraction will be made up within the next succeeding six years after the unusual circumstances cease. Appendix E has this new section of the ULARA 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 ULARA Judgment filed January 26, 1979) whereby ground water 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 (SFB) as ground water storage. The operation of the rubber dam was discontinued in the water year 1982-83 due to the quality concerns by the California Department of Health Services. Thus, the water discharged by Disney, since it was not being spread at HSG, was considered flowing to the ocean and being wasted. As a result of the meetings between the Parties and the ULARA Watermaster, a solution to the problem has been obtained. In Disney's letters of December 3, 1990, and May 1, 1992, they indicated that their present use of ground water would be discontinued. As of February 1993, Disney no longer pumps from its wells. It has installed a system for air conditioning and heating that does not require the use of ground water.

The continued use of the HSG is in the process of being implemented. A pilot project designed to investigate the feasibility of using LAR water containing reclaimed water from the Tillman Reclamation Plant released to the LAR to recharge the SFB, began June 17, 1991. Refer to Appendix J for the details of this project. If Disney were to resume pumping in the future, consistent with the ULARA Judgment, such water could be diverted and spread at HSG.

Under the Judgment, CalMat (Defendant No. 18) was assigned physical solution rights to pump, with the understanding that its 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 ground water 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. An additional investigation will be required to confirm how much evaporation, if any, may be occurring in the transfer of ground water to the recharge basins. Any pond evaporation loss of ground water would be charged to CalMat.

A remedial investigation (RI) of ground water contamination in the San Fernando Valley was initiated in July 1987 by the U.S. Environmental Protection Agency (EPA) to characterize the SFB and the Verdugo Basin and their contamination with trichloroethylene and

tetrachloroethylene. The Los Angeles Department of Water and Power (LADWP) was selected by the EPA to serve as its lead agency in conducting the RI and entered into a cooperative agreement that has provided over $19 million in federal funding to the LADWP since July 1987. In August 1987, the LADWP selected James M. Montgomery, Consulting Engineers, Incorporated (JMM) to serve as its consultant to perform various RI tasks.

The report, Remedial Investigation of Groundwater Contamination in the San Fernando Valley, dated December 1992, is a comprehensive, five-volume report that was completed by JMM and submitted to the LADWP and the EPA. The RI report presents the findings and characterizations of the SFB and the Verdugo Basin with regard to their geology, hydrogeology, and nature and extent of contamination. The RI report also provides a description and the documentation of the SFB Ground Water Flow Model, summarizes the RI field-investigation activities, and evaluates potential risks to human health and the environment. (Refer to the Water Quality Section of this report and Appendix I.)

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 (see Appendix G). 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). The January 1992 draft report was completed in October 1992. The ULARA Watermaster and staff are working closely with the EPA and LADWP on the completion of the November 1991 draft report and any future reports dealing with the management of the ground water within the ULARA.

In addition to the basin-wide RI/FS (Feasibility Study), the EPA requested the LADWP to prepare a number of Operable Unit (OU) FSs to provide a more prompt response to areas of contamination that were determined to be significant and requiring containment. The EPA has identified a number of OUs that require an interim remedial action as determined in the OUFSs, and the OUs are described as follows: (Refer to Appendix I for areas of OUs)

North Hollywood OU - The North Hollywood OU was completed and placed into full-time service in December 1989 and consists of a 2000-gallons-per-minute (gpm) pump-and-treat system to contain and remove ground water contamination from the Upper Zone in the North Hollywood Well Field (east) area.

Burbank OU - The Burbank OU, Phase I, is currently being designed under the direction of the EPA. The Burbank OU will ultimately consist of a 12,000-gpm pump-and-treat system to contain and remove ground water contamination from the Upper Zone in the Burbank Well Field area.

Glendale OU - North Plume Area - The LADWP completed the Glendale OUFS - North Plume Area in April 1992. The EPA is preparing a Record of Decision based on the OUFS to provide a pump-and-treat system with a 3000-gpm capacity to contain and remove contamination in the Upper Zone of the Grandview Well Field area.

Glendale OU - South Plume Area - The LADWP completed the Glendale OUFS - South Plume Area in July 1992. The EPA is preparing a Record of Decision based on the OUFS to provide a pump-and-treat system with a 2000-gpm capacity to contain and remove contamination on the Upper Zone in the northern portion of the Los Angeles River Narrows area.

Pollock OU - The EPA is planning to prepare an OUFS for the Pollock area in the near future.

The LADWP is continuing its plans 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 waste water produced by the Tillman Water Reclamation Plant. Reclaimed water now being discharged into the LAR will be utilized for ground water recharge, irrigation and industrial uses. The Final Environmental Impact Report (EIR) on the project was completed in July 1991. This project is scheduled for completion and operation in December 1996. (Appendix J.)

As described previously, a pilot project to investigate the feasibility of using LAR water to recharge the SFB is in progress. LAR water is being spread at the HSG. All the necessary permits from the LARWQCB were secured prior to the start of spreading, which began on June 17, 1991. The pilot project is spreading approximately 1 cubic foot per second (cfs). Extractions are recovering more than 1.5 cfs. (Appendix K.)

In dealing with the amount of stored ground water, change in ground water storage and the ground water contours for the ULARA, some additional monitoring wells may be required in the future. These monitoring wells would provide more control on the status of ground water levels and underflow elevations required by the ULARA Judgment. In the Superfund work, a number of Vertical Profile Borings have been installed at various depths. These wells along with the cluster wells have provided additional information for construction of ground water maps (fall and spring 1992). The change in storage evaluation is also facilitated by the use of these data.

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

Sincerely,

MELVIN L. BLEVINS
ULARA Watermaster

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ULARA WATERMASTER STAFF

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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 ground water within the area; the historic extractions of ground water in the basin and their quality; and all sources of water, whether they be diverted, extracted, or imported, etc. The 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 Final Judgment on remand on January 26, 1979.

The City of Los Angeles filed an appeal from the Judgment of the Trial Court with the Court of Appeal, which held a hearing on November 9, 1972, and issued its opinion on November 22, 1972. The opinion, prepared by Judge Compton and concurred in by Judges Roth and Fleming, reversed, with direction, the original judgment handed down by Judge Moor. In essence, the City of Los Angeles was given rights to all water in ULARA, including the use of the underground

basins. The defendants, however, were given the right to capture "return water", which is water purchased from the Metropolitan Water District of Southern California (MWD) that percolates into the basin.

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

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

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

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

The Final Judgment, signed by the Honorable Harry L. Hupp, was entered on January 26, 1979. Copies of the Final Judgment are available from the ULARA Watermaster, 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 letter to the Court, agreeing with the Watermaster's report on overdraft. On March 22, 1984, Judge Harry L. Hupp signed a stipulation ordering, effective October 1, 1984, that the Cities of Los Angeles and San Fernando would be limited in their pumping to bring the total pumping within the safe yield of the basin, including any rights exercised by private parties.

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 9, 1991, Judge Gary Klausner replaced Judge Krieger. On January 1, 1993, Judge Ricardo A. Torres was assigned to Department 64 of the Los Angeles Superior Court to continue the retained jurisdiction of the Court for the San Fernando Valley (Section 7.1 of the ULARA Judgement).

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: As of October 1, 1984, 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 1993 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 each have physical solution rights to extract water from the Eagle Rock Basin, pursuant to a stipulation with the City of Los Angeles and as provided in Section 9.2.1 of the Final Judgement.

Watermaster Service

In preparing the 1991-92 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 May 1, 1993, are:

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

The Administrative Committee may be convened by the Watermaster at any time in order to seek its advice. In addition, the Committee is responsible for reviewing with the Watermaster the proposed annual report.

During the 1991-92 water year, the Administrative Committee met seven times, with six meeting dealing with the Los Angeles Regional Water Quality Control Board's "Proposed Amendment To The Water Quality Control Plan Concerning The Extraction Of Groundwater In The San Fernando Valley" (BPA), and one meeting dealing with the annual ULARA report. The meeting

dealing with the 1991-92 ULARA report was held April 20, 1992. The following items were discussed at the April 20 meeting:

1. Amount of Ground Water Stored in San Fernando Basin.
2. Status of Ground Water Quality Studies in the San Fernando Valley.
   a) North Hollywood/Burbank Aeration Tower Facility
   b) Superfund Study - Ground Water Models - Status
   c) Underground Tank Leakage Problems
   d) San Fernando Ground Water Quality Study - ICC Committee
   e) Programs on Water Quality Monitoring - Status
   f) SWAT Reports - Status
3. Verdugo Basin / Ground Water Conditions and Future Pumping Amounts.
4. Pumping by Non-Parties for Special Needs.
5. Overall Problems and Concerns of ULARA Watermaster.
6. Approval of the 1990-91 Watermaster Report.

Summary of 1991-92 Operating Conditions

Table 1 compares the 1990-91 and 1991-92 operating conditions.

Rainfall on the valley fill area for 1991-92 was 30.05 inches, or 182 percent of normal, as compared to 14.38 inches, or 87 percent of normal, the year before. Surface runoff leaving the valley at Gage F-57C-R for 1991-92 was 320,829 acre-feet. Total precipitation falling on the San Fernando Valley and its tributary hill and mountain areas was estimated to be 887,929 acre-feet for the 1991-92 water year.

Ground water extractions decreased in the Verdugo Basin and increased in the San Fernando, Sylmar, and Eagle Rock Basin during 1991-92. Total ULARA extractions amounted to 91,045 acre-feet. Of this total 2,935 acre-feet represents non-consumptive use pumping (Table 13). Extractions used within ULARA decreased by 5,445 acre-feet from last year.

For ULARA, gross imports increased by 17,878 acre-feet, (Table 1, Item 6), while imports decreased by 14,760 acre-feet. Pass-through of Owens River water increased by 17,828 acre-feet (Table 1, Item 7a). The total amount of delivered water used within ULARA decreased by 18,274 acre-feet, or 6 percent, mainly due to mandatory conservation.

Sewage export was estimated at 155,000 acre-feet in 1991-92, a decrease of 3 percent. Total reclaimed water used in ULARA (cooling towers, irrigation, etc.) increased 1,931 acre-feet. The total water reclaimed increased from 73,185 acre-feet to 100,295 acre-feet, an increase of nearly 37 percent. This increase is due to the expansion of the Tillman Water Reclamation Plant coming on line. Table 7 gives a detailed description of reclaimed water processing in ULARA. Most of the reclaimed water is discharged to the Los Angeles River.

A total of 39,624 acre-feet of native water was spread during 1991-92 (no Owens River water was spread). This represents an increase of 20,958 acre-feet from last year.

Ground water storage in the San Fernando Basin increased by 411 acre-feet in 1991-92, resulting in a total cumulative change in groundwater storage of 147,998 acre-feet since October 1, 1968. However, the cumulative change in storage would have been -131,134 acre-feet if the parties had not stored water in the San Fernando Basin (amounting to 279,132 acre-feet). This negative change in storage was due to the five below-normal precipitation years from 1986-87 thru 1990-91 (Table 11).

Summary of Allowable Pumping for 1992-93

Table 2 gives a summary of allowable pumping for 1992-93, and stored water credit (as of October 1, 1992) for the Cities of Los Angeles, Burbank, Glendale, and San Fernando, and Crescenta Valley County Water District.

TABLE 1

UPPER LOS ANGELES RIVER AREA
SUMMARY OF 1990-91 & 1991-92
OPERATING CONDITIONS

	Water Year	
	1990-91	1991-92
1. Active pumpers (a)	28	28
2. Inactive pumpers (parties within valley fill)	2	2
3. Valley rainfall (inches)	14.38	30.05
4. Spreading operations (acre-feet) (b)		
a. LACDPW	18,666	39,624
b. City of Los Angeles	52	230
5. Extractions (acre-feet)		
a. Used in ULARA	20,572	15,127
b. Exported from ULARA	65,081	75,918
Total	85,653	91,045
6. Gross imports (acre-feet)		
a. MWD water	293,686	287,594
b. Owens River water (c)	200,377	224,347
Total	494,063	511,941
7. Exports (acre-feet)		
a. Owens River water	100,075	117,903
b. MWD water (d)	116,323	131,133
c. Ground water by Los Angeles	64,595	75,240
Total	280,993	324,276
8. Imports used in ULARA (acre-feet)	277,665	262,905
9. Reclaimed water (acre-feet)	73,185	100,295
a. Used in ULARA	5,392	7,323
b. Discharged into Los Angeles River	61,030	84,151
10. Total delivered water used in ULARA (acre-feet)	303,629	285,355
11. Sewer export (acre-feet) (e)	160,000	155,000

(a) Active pumpers include party and non-party entities.

(b) Table 6 shows breakdown of spreading operations as to sources of water. Values include native and imported water.

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

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

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

TABLE 2

SUMMARY OF 1992-93 ALLOWABLE PUMPING
(Acre-Feet)

	Allowable Pumping			Stored Water Credit (as of October 1, 1992)
	Native	Import Credit	Total	
San Fernando Basin				
Los Angeles	43,660	40,354	84,014	190,471
Burbank	--	4,186	4,186	52,479
Glendale	--	4,500	4,500	36,187
Sylmar Basin (a)				
Los Angeles	--	--	3,105	(85)
San Fernando	--	--	3,105	1,692
Verdugo Basin (b)				
CVCWD	--	--	3,294	--
Glendale	--	--	3,856	--

Notes:

1) Calculation of these values is shown in more detail in Tables 14, 15, and 16.
2) Numbers in parenthesis mean a negative stored water credit.

(a) Based on stipulation and order amending the judgment - filed on March 22, 1984 in the L. A. Superior Court.
(b) 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 Los Angeles Aqueduct; imports from the Metropolitan Water District (MWD); 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 1991-92 water year experienced an above average rainfall. The valley floor received 30.05 inches of rain, whereas the mountains received approximately 33.86 inches. The weighted average of both valley and mountain areas was 32.39 inches, an increase of 15.15 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. 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. Plate 21 shows the location of the precipitation stations.

TABLE 3

PRECIPITATION
(Inches)

LACDPW Number	Name	(1881-1981) 100-Year Mean	1990-91 Precipitation	1991-92 Precipitation	1991-92 Percent of 100-Year Mean
11D	Upper Franklin Canyon Reservoir	18.50	12.38	25.72	139
13C*	Hollywood-Blix	16.63	16.21	31.51	189
15A*	Van Nuys	15.30	8.49	28.27	185
17	Sepulveda Canyon-Mulholland Highway	19.82	19.10	37.10	187
21B*	Woodland Hills	14.60	14.81	28.11	193
23B-E*	Chatsworth Reservoir	15.19	11.61	26.35	173
25C*	Northridge-LADWP	15.16	11.90	27.97	184
33A-E	Pacoima Dam	19.64	14.19	31.66	161
47D	Clear Creek - City School	33.01	31.40	41.90	127
53D	Colby's Ranch	29.04	24.00	38.20	132
54C	Loomis Ranch-Alder Creek	18.62	18.90	24.62	132
251C*	La Crescenta	23.31	21.27	36.76	158
293E*	Los Angeles Reservoir	17.32	14.07	31.15	180
797 (a)	DeSoto Reservoir	18.70	12.91	30.20	161
1081B (b)	Glendale-Gregg	18.13	19.09	35.52	196
1107D* (c)	Green Verdugo Pumping Plant	14.98	13.92	29.80	199
801D (d)	Pacoima Canyon-North Park Ranger Station	23.06	19.97	36.65	159

Notes:

1) Weighted average for valley stations - 30.05 inches (1991-92)
2) Weighted average for mountain stations - 33.86 inches (1991-92)
3) Data furnished by Los Angeles County Department of Public Works

* Valley Stations

(a) Substituted for Station 259D due to incomplete rain data.
(b) Substituted for Station 210B due to incomplete rain data.
(c) Substituted for Station 14C due to incomplete rain data.
(d) Substituted for Station 1190 due to incomplete rain data.

Runoff and Outflow from ULARA

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

A number of stream-gaging stations 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 (Plate 21 shows the location of the stations). The six gage stations are as follows:

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

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

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

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

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

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

Table 4 summarizes the monthly runoff for these gaging stations and compares the 1990-91 and 1991-92 water years. The larger runoff in 1991-92 is due to the greater rainfall in the hills and mountains in 1991-92 than in 1990-91. The mean daily discharge rates for these six gaging stations during 1991-92 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 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:

1. 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.

2. Historically the City of Los Angeles diverts water at the Headworks spreading grounds. However, the operation of the diversion structure (rubber dam) was discontinued during the 1982-83 water year because of water quality concerns by the State Department of Health Services. A pilot program is underway to see if these diversions can be resumed.

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 of Owens River water in the future are expected to be minimal, but if they do occur, separation of surface runoff will be based on the following assumptions:

TABLE 4

MONTHLY RUNOFF AT SELECTED GAGING STATIONS
(Acre-Feet)

Station	Water Year	Month												Total
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	
F-57C-R	1990-91 (a)	6,545	12,539	6,217	12,345	39,193	77,777	6,535	6,116	6,192	6,716	8,074	8,380	196,629
Los Angeles River	1991-92	1,550	429	5,250	3,610	186,600	55,890	23,930	13,140	1,780	8,650	9,310	10,690	320,829
F-252-R	1990-91 (b)	82	503	90	497	2,109	4,311	136	87	65	64	39	39	8,022
Verdugo	1991-92	252	149	2,922	1,137	4,127	5,013	250	195	116	253	94	113	14,621
E-285-R	1990-91	405	1,158	456	2,057	1,515	333	119	137	418	423	504	617	8,142
Burbank Storm Drain	1991-92	802	688	2,522	3,449	10,616	4,470	829	453	324	487	479	693	25,812
F-300-R	1990-91	3,829	4,473	3,736	7,306	14,171	29,549	4,105	4,105	3,837	3,182	1,667	2,424	82,384
L.A. River Tujunga Ave.	1991-92	4,734	2,301	17,703	14,021	72,131	36,296	7,000	4,256	4,298	3,147	3,613	3,898	173,398
F-168-R	1990-91	0	311	0	336	502	6,560	2,800	761	582	241	69	1	12,163
Big Tujunga Dam	1991-92	12	92	958	1,384	13,561	8,757	3,937	1,130	1,328	549	81	0	31,789
118B-R	1990-91	0	0	0	0	0	4,663	13,167	8,554	0	18	0	0	26,402
Pacoima Dam	1991-92	4	0	129	716	7,844	3,154	42	2,111	2,059	218	0	0	16,277

Note: Plate 21 shows gaging station locations.

(a) Data taken from Army Corps of Engineers.

(b) Data not available for September. Due to similiar climatic conditions, August data was used for an approximation.

TABLE 5

SEPARATION OF SURFACE FLOW AT STATIONS F-57C-R AND F-252-R
(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 *	16,500 *	— **	— **
1980-81	4,710	19,580	51,940	76,230
1981-82	1,280	18,180	80,000	99,460
1982-83	3,460	17,610	384,620	405,690
1983-84	3,000 *	17,780	49,090	69,870
1984-85	3,260	21,600	46,300	71,160
1985-86	3,880	48,370	102,840	155,090
1986-87	3,000 *	64,125	19,060	83,295
1987-88	3,000 *	81,920	74,074	156,204 *
1988-89	3,000 *	80,020	56,535	136,843 *
1989-90	3,000 *	76,789	55,811	167,639 (b)
1990-91	3,203	75,647	117,779	196,629 (b)
1991-92	3,000 *	120,789	197,040	320,829
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	— **	— **
1979-80	5,150	0	7,752	12,902
1980-81	5,780	0	2,917	8,697
1981-82	3,710	0	5,367	9,077
1982-83	5,330	0	21,384	26,714
1983-84	4,000 *	0	— **	— **
1984-85	2,710	0	3,970	6,680
1985-86	2,470	0	6,270	8,740
1986-87	2,100 *	0	1,690 *	3,790 *
1987-88	3,548	0	10,493	14,041
1988-89	1,995	0	4,453	6,448
1989-90	1,182	0	2,938	4,120
1990-91	1,157	0	6,865	8,022
1991-92	1,412	0	13,209	14,621

* Estimated.

** Data not available.

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

(b) Data taken from Army Corps of Engineers.

1. Net storm runoff equals surface runoff minus Owens River water.

2. 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 recharge and ultimately ground 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 a significant amount (approximately 20 percent) 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 partially offset 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 and 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, while The City of Los Angeles operates the Headworks spreading grounds. LACDPW, in cooperation with The City of Los Angeles, operates the Tujunga 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 over 60,000 acre-feet/year of treated municipal wastewaters from the Tillman Plant (Table 7). Table 6 summarizes the spreading operations for the 1991-92 water year.

Water Table Elevations

During the 1991-92 water year, the Watermaster collected and processed data to determine prevailing ground water conditions during the spring and fall of 1992. Plates 7 and 8 show ground water contours for these two seasons. Plate 9 shows changes in water table elevations from the fall of 1991 to the fall of 1992. The drop in water levels in the North Hollywood area is related to the pumping in the North Hollywood Erwin and Whitnall production wells. The drop in water levels in the Rinaldi-Toluca area is related to the 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 1991-92 (15,461 acre-feet, Table 6) as compared with 1990-91 (11,489 acre-feet). Plate 10 is a diagrammatic sketch of flow directions and estimated ground water velocities in the San Fernando Basin. Figures 1 and 2 show fluctuations of water levels in wells shown in the inset map on Figure 2.

Water Reclamation

Water reclamation presently provides a source of water for irrigation, industrial and recreational uses. In the future, water reclamation could provide water for ground water recharge within the ULARA basins and in the unlined portions of the LA River. Six wastewater reclamation plants are in operation in ULARA. Las Virgenes Municipal Water District (LVMWD) operates a water reclamation facility outside ULARA but releases part of the treated water into ULARA. Table 7 gives a tabulation of the operating water reclamation plants 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 ground water 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 the effluent from the water reclamation plants. An investigation revealed two causes for this:

TABLE 6

1991-92 SPREADING OPERATIONS IN THE
SAN FERNANDO BASIN
(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 Basin Spreading
	Spreading Basins						Spreading Basins			
	Branford	Hansen	Lopez	Pacoima Native	MWD	Tujunga Native	Pacoima Owens River	Tujunga Owens River	Headworks	
Oct.	32	209	0	28	0	0	0	0	18	287
Nov.	0	177	0	484	0	0	0	0	15	676
Dec.	104	399	83	444	503 *	179	0	0	12	1,724
Jan.	48	1,111	168	376	0	368	0	0	16	2,087
Feb.	140	3,220	156	2,578	0	2,700	0	0	13	8,807
Mar.	300	2,804	109	3,570	0	2,677	0	0	32	9,492
Apr.	12	2,733	233	2,233	0	1,222	0	0	19	6,452
May	11	1,121	126	1,775	0	1,038	0	0	32	4,103
June	0	1,709	219	767	0	610	0	0	23	3,328
July	6	1,218	0	150	0	0	0	0	13	1,387
Aug.	0	732	0	6	0	90	0	0	20	848
Sept.	0	28	0	0	0	388	0	0	17	433
Totals:	653	15,461	1,094	12,411	503	9,272	0	0	230	39,624

* City of Burbank spreading of MWD water in the Pacoima Spreading Grounds.

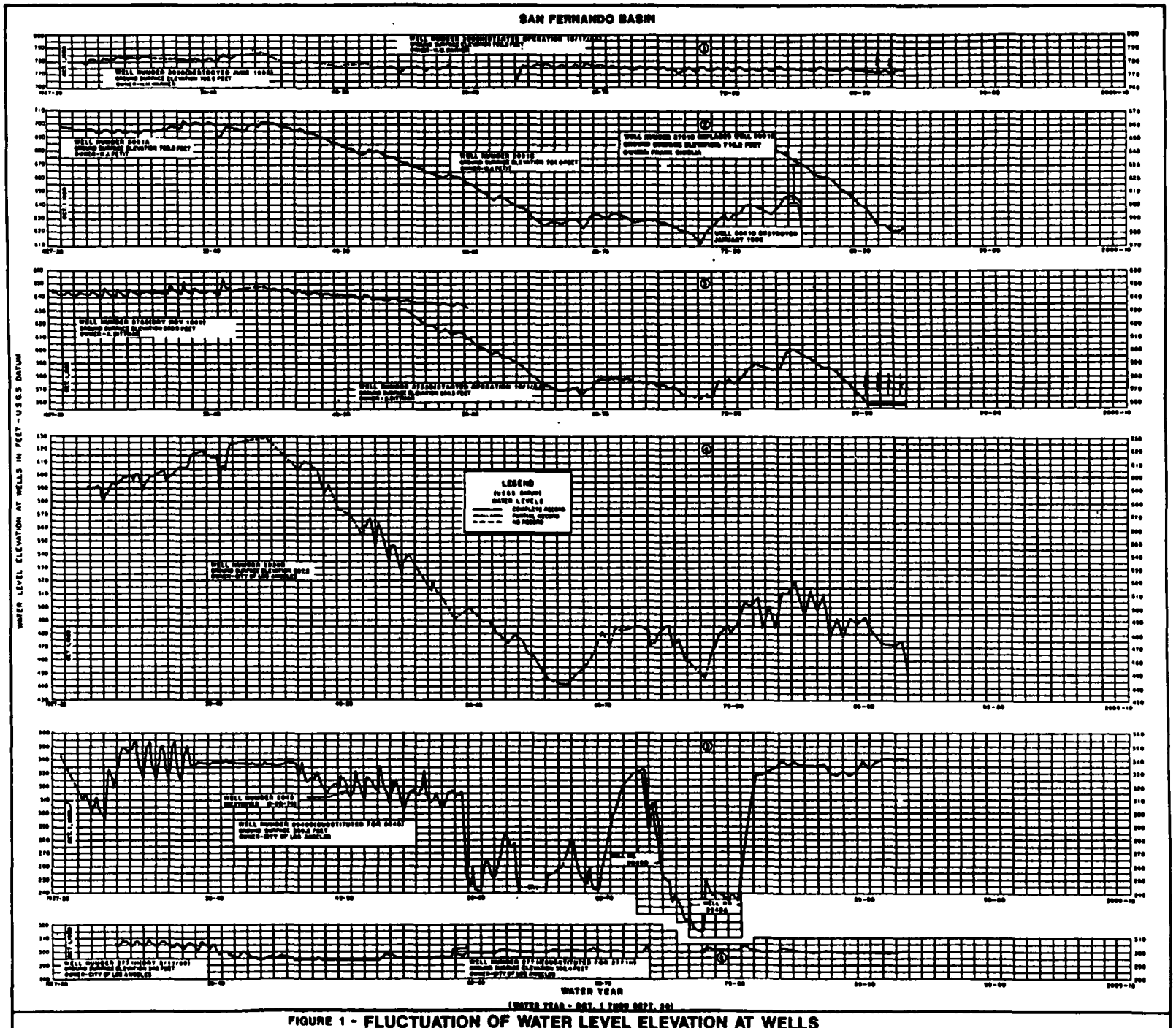


FIGURE 1 - FLUCTUATION OF WATER LEVEL ELEVATION AT WELLS IN THE SAN FERNANDO BASIN

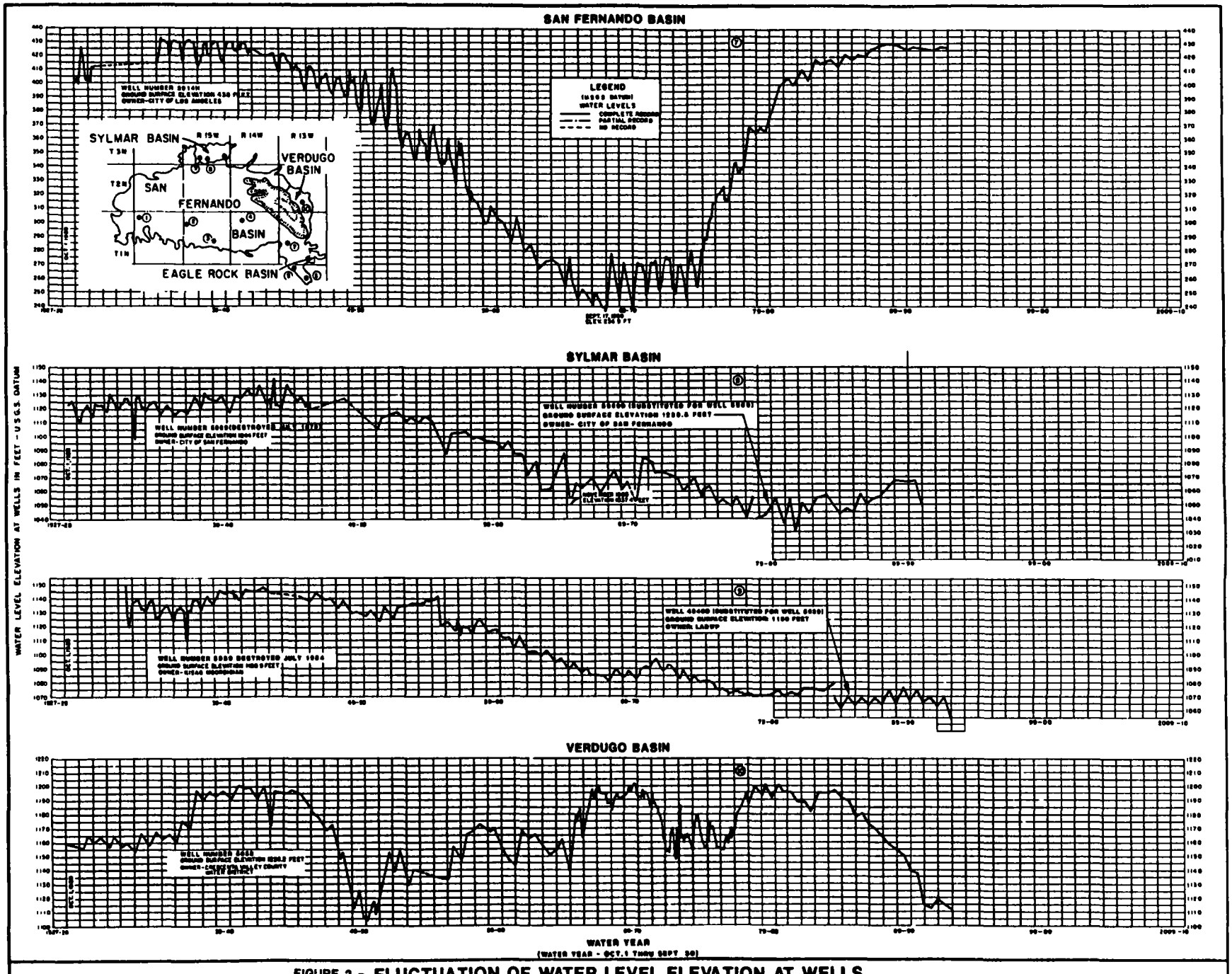


FIGURE 2 - FLUCTUATION OF WATER LEVEL ELEVATION AT WELLS IN THE SAN FERNANDO, SYLMAR AND VERDUGO BASINS

TABLE 7

1991-92 WATER RECLAMATION PLANTS
(Acre-Feet)

Plant	Treated	Used in ULARA	Discharged to Los Angeles River	Discharged to Hyperion Treatment Plant
San Fernando Basin				
City of Burbank	7,012	2,100 (a)	6,761	0
Los Angeles-Glendale	22,160	3,423 (b)	16,439	2,298
Donald C. Tillman	71,063	625 (c)	60,951	9,487
Indian Hills Mobile Homes (d)	20	20 (e)	0	0
Rocketdyne (Santa Susana Field Lab.)	22	22	0	0
The Independent Order of Foresters (f)	18	18 (e)	0	0
Las Virgenes Municipal Water District	— (g)	1,115 (e)	0	0
Totals:	100,295	7,323	84,151	11,785

(a) Of the total water treated (7,012 AF) in Burbank, 2054 AF was delivered to the power plant in Burbank for cooling water; 46 AF was used by Caltrans for freeway landscape irrigation and by City water trucks (1.71 of the 46 AF), and the remainder was discharged to the Burbank western channel at the power plant and the water reclamation plant.

(b) The total water delivered to the Glendale Power Plant for cooling water was 758 AF and included irrigation water for Forest Lawn Memorial Park. A total of 2,661 AF was delivered to Griffith Park by the City of Los Angeles for irrigation and to the Los Angeles-Glendale plant for wash down, cooling, and irrigation; 4 AF was used by Caltrans for freeway landscape irrigation. The remainder of the treated water (16,439 AF) was discharged to the LA River.

(c) Water for in plant use only.

(d) Water supplied from nearby well.

(e) Land irrigation

(f) Water supplied from LADWP pipeline.

(g) Reclamation plant outside of ULARA, part of which is 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)													(TDS) Total Dissolved Solids mg/l	(TH) Total Hardness as $CaCO_3$ mg/l
		$ECx10^6$ at 25 °C	pH	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	NO_3	F	B		
Imported Water																
Colorado River Water at Eagle Rock Reservoir	1992	1008	7.95	69	28.5	96	4.4	0	146	240	91	1	0.24	0.15	614	289
Los Angeles Aqueduct	12/9/92	396	8.47	26.7	8.8	44.6	-	0	176	26.7	22	0.1	0.8	0.68	231	108
Los Angeles Aqueduct Filtration Plant Influent	12/9/92	632	8	33.9	16.1	69.3	-	0	133	83.9	77.8	1.38	0.4	0.5	374	109
State Water Project at Joseph Jensen Filtration Plant (Influent)	1992	718	7.8	36	17.5	78	3.7	0	112	93	98	2.5	0.23	0.36	400	162
Surface Water																
Donald C. Tillman Reclamation Plant Discharge to Los Angeles River	Feb-92	-	7.1	45	17	134	15	-	-	140	135	2.1	0.8	0.9	665	182
Los Angeles River at Gage F-57	5/27/92	1130	7.86	91.2	16.8	108	16.1	<2	198	229	153	2.36	0.31	0.58	708	297
Los Angeles-Glendale Reclamation Plant Discharge to Los Angeles River	1990-91	-	7.2	42	17	152	15	-	-	164	179	2.83	-	0.8	694	176
Ground Water																
(San Fernando Basin - Western Portion)																
4757C (Reseda No. 6)	10/13/83	944	7.8	115	31	43	2.1	-	301	200	33	2.6	0.31	0.24	595	416
(San Fernando Basin - Eastern Portion)																
3810 (a) (No. Hollywood No. 11)	3/17/91	513	8.25	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	170
3913H (Grandview No. 16)	11/24/92	525	8	57	13	34	3.4	1.46	225	54	23	14	0.51	-	320	185
(San Fernando Basin - L.A. Narrows)																
3959E (Pollock No. 4) (b)	03/08/93	794	7.47	77	24	49	NA	0	242	103	58	37.3	0.33	0.38	559	284
(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)	06/23/92	840	7	86	32	39	3.3	0.1	226	115	75	52.8	0.21	-	500	346
5058 (CVCWD No. 14)	2/9/93	705	7.2	68	27	30	2.5	0.21	201	76	56	54	0.33	-	410	281

(a) Substituted for No. Hollywood No. 30

(b) Substituted for Pollock No. 6

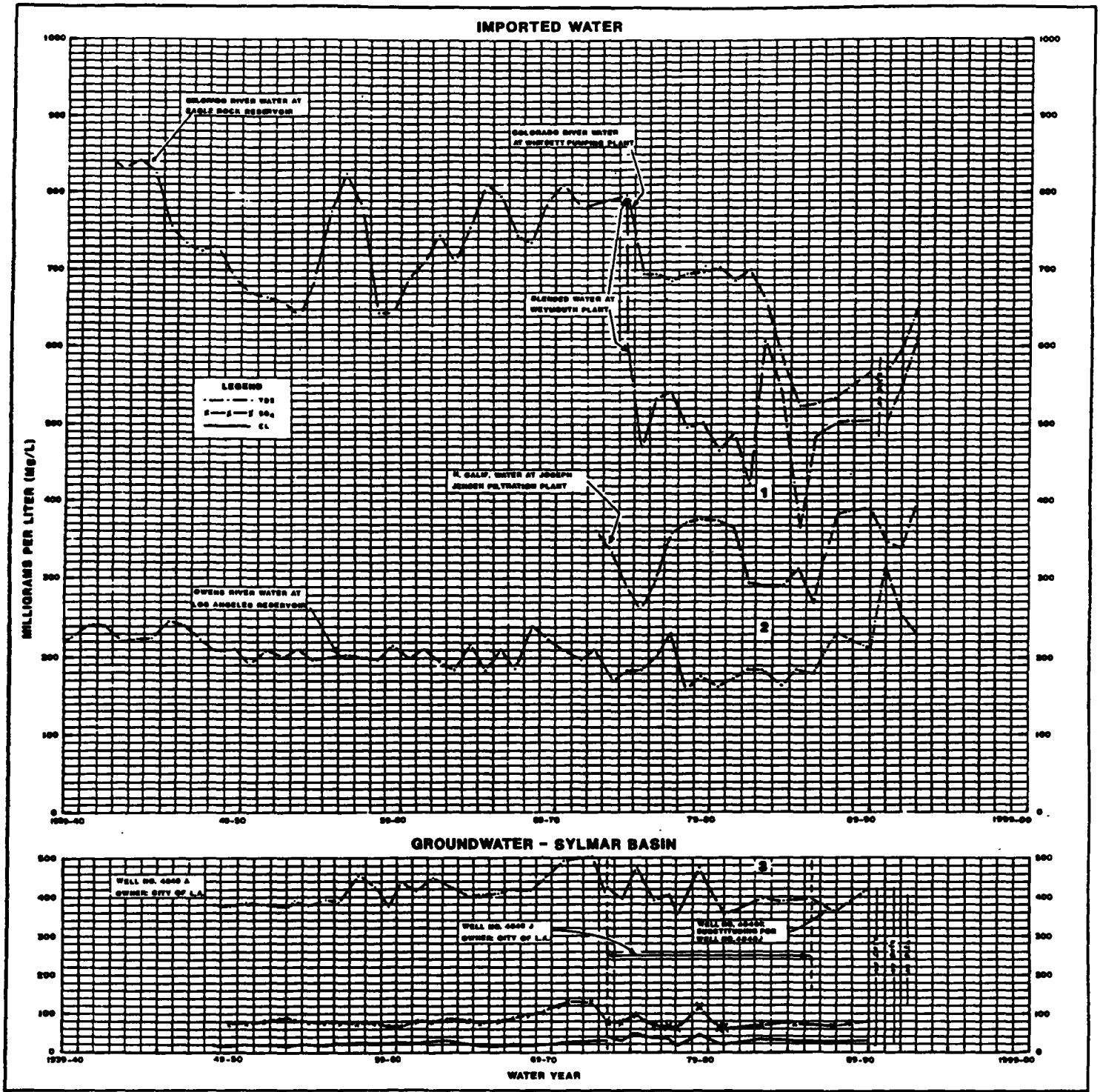


Figure 3 - MINERAL CONSTITUENTS OF WATER SOURCES IN THE ULARA

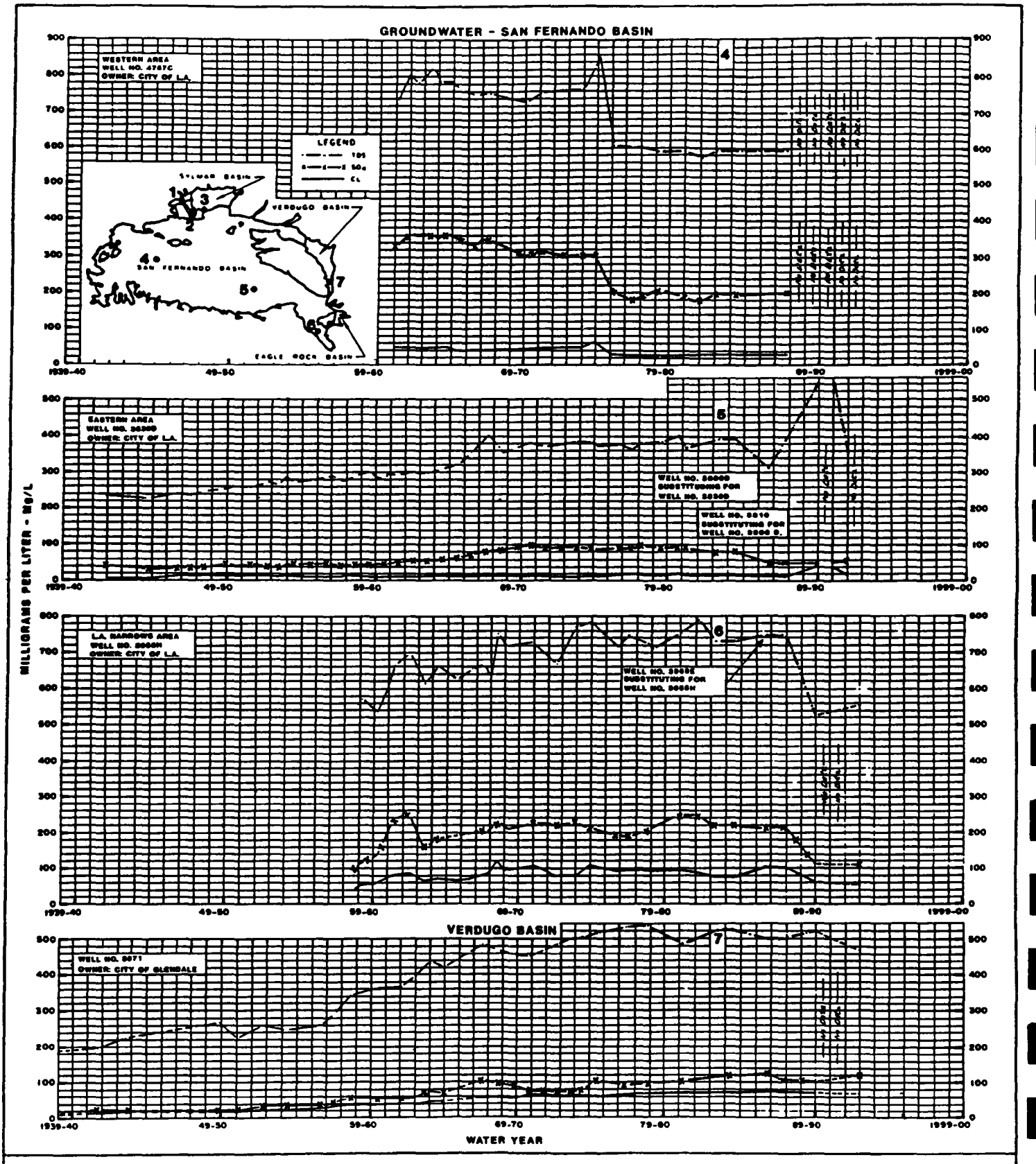


Figure 3(cont.) - MINERAL CONSTITUENTS OF WATER SOURES IN THE ULARA

1) increasing chlorides in delivered water, especially from the State Water Project, and; 2) decreasing dilution related to voluntary and mandatory water conservation.

Imported Water

A. Los Angeles Aqueduct water is sodium bicarbonate in character and is the highest quality water available to ULARA. Its TDS concentration averaged about 210 milligrams per liter (mg/l) for 30 years before 1969. The highest on record was 320 mg/l on April 1, 1946, and the lowest 150 mg/l on September 17, 1941. TDS concentration in December 1992 was 231 mg/l, which was 10 percent less than the 256 mg/l for 1990-91.

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 high TDS concentration 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 653 mg/l for 1991-92, a 4 percent increase from last year.

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 and a low of 247 mg/l. Tests of Northern California water are taken at the Joseph Jensen Filtration Plant. Average TDS concentration during 1991-92 was 409 mg/l, a 19 percent increase from last year. This is due to changes in the qulaity of MWD source waters. Drought conditions in Northern California have resulted in appreciable increase in chlorides from water diversions from the Delta. These have caused problems in meeting clorine limits under the San Fernando Valley Basin Plan.

D. Colorado River and Northern California water were first blended at the Weymouth Plant location in May 1975. During 1991-92, the average TDS concentration was 614 mg/l, an 8 percent increase from last year. 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 1991-92, low flows in the Los Angeles River at LACFCD Gage F-57 had an average TDS content of 708 mg/l and a total hardness of 297 mg/l. These values also reflect the inclusion of rising ground water in the LA River reach between Los Feliz Blvd. and Gage F-57.

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.

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

Ground Water Quality Management Plan

During 1991-92, the Interagency Coordinating Committee (ICC) continued to implement the recommendations of the "Groundwater Quality Management Plan (GWQMP) - San Fernando Valley Basins" issued in July 1983. The objective of this effort is to protect and upgrade the quality of stored water held in the San Fernando Valley 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 Storage Tank Program (UST) 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. The activities of the UST Enforcement Unit of LAFD include site assessments, monitoring proposals, site abandonments, and preparing preliminary soils reports. Presently, the UST Enforcement Unit forms have been updated to facilitate program effectiveness. If a LAFD

site investigation indicates that ground water contamination is involved, that site is referred for further action to the LARWQCB. Inspector Joseph Gould of the LAFD is reporting on Fire Department activities.

Private Sewage Disposal Systems

In order to eliminate existing commercial and industrial Private Sewage Disposal Systems (PSDS) and their discharge of wastewater to the ground water basin, a sewer construction program has been in progress for several years to install 18 designated Ground Water Improvement Districts (GID) in the San Fernando Valley (Plate 11). Up to, and including the 1991-92 water year, 12 sewer construction projects (i.e. GID-1, 2, 6, 7, 9, 10, 13, 14, 15, 16, 18, and 20) have been completed. The remaining four 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 ground water 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 SWAT report of the Pendleton Landfill, owned by LADWP Water System was approved by the Regional Water Quality Control Board (RWQCB). Table 9 lists the reports that have been completed or are near completion and under review by the RWQCB. A summary of the various SWAT Reports reviewed is included in Appendix F. The summaries include incomplete data on depth to trash and expected ground water elevations and 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 1991-92 water year. 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.

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			4/92	Y	NHA	a*
Sheldon-Arleta	1	Closed	City of Los Angeles Bureau of Sanitation	Sun Valley District Near Hollywood & Golden State Freeways.	5/87	5/87			2/90	U		b
Scholl Canyon	1	Open	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl.	7/87	4/88			8/90	Y	NHA	a*
Scholl Canyon	2	Closed	City of Glendale	San Rafael Hills, 1 mile West of Rose Bowl.	7/87	1/91		X				c
Bradley East	2	Closed	Valley Reclamation Co.	Southeast of Sheldon St.	6/87	11/90			4/92	Y	NHA	b*
Sunshine Cyn.	2	Open	Browning - Ferris Industries	Southeast Santa Susana Mtns. West of Golden State Fwy.	7/88	7/89		X				a
Gregg Pit/Bentz	2	Closed	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			6/92	N		
Lopez Canyon	2	Open	City of Los Angeles Bureau of Sanitation	North of Hansen Dam Between Lopez and Kagel Cyn.	6/88	6/88	X					a
Toyon Canyon	2	Closed	City of Los Angeles Bureau of Sanitation	Griffith Park	6/88	3/89			4/91	Y	NHA	b*
Tuxford Pit	2	Closed	Aadlin Bros. (Los Angeles By-Products Co.)	Sun Valley District Southwest of Golden State Freeway and Tujunga Ave.	6/88	12/90			6/92	P		b*
Penrose	2	Closed	Los Angeles By-Products Co.	N. of Strathern St., Tujunga Ave.	6/88	7/89			9/89	Y	NHB	b
Newberry	3	Closed	Los Angeles By-Products Co.	N. of Strathern St., Tujunga Ave.	6/88	7/89			9/89	Y	NHB	b
Hewitt Pit	2	Closed	Cal Mat Properties	North Hollywood District Hollywood Fwy., Laurel Canyon Blvd.	6/88	7/89			5/91	Y	NHB	
Cal Mat (old) Bradley Land-fill Complex	3	Closed	Valley Reclamation Co.	Sun Valley District Sheldon St., San Fernando	7/88	7/89			4/92	Y	NHA	b*
Pendleton St.	4	Open	Department of Water & Power	Sun Valley intersection Pendelton St., Glenoaks Blvd.	7/90	5/91			6/92	N		c
Stough Park	2	Open	City of Burbank	Bel Air Dr. & Cambridge Dr.	6/88	12/88			4/90	Y	NHA	a*

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

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

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

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

U - Undetermined due to dry wells.

Y - Yes

N - no

P - Pending leakage determination due to background ground water contamination.

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

1991-1992 NUMBER OF WELLS IN THE ULARA WELLFIELDS
EXCEEDING CALIFORNIA STATE MCL
FOR TCE AND PCE

	Number of Wells Exceeding Contaminant Level												
	City of Los Angeles									Others			Grand
	NH	CS	P	HW	E	W	V	AE	Sub-Total	B	G	CVCWD	Total
TCE Levels													
5-20	13	0	0	0	2	2	1	0	18	0	6	0	24
20-100	2	2	3	6	0	4	0	2	19	4	1	0	24
>100	3	0	0	0	0	0	0	4	7	3	2	0	12
Total:	18	2	3	6	2	6	1	6	44	7	9	0	60
PCE Levels													
5-20	4	0	2	3	0	1	1	1	12	0	2	1	15
20-100	1	0	1	1	0	0	0	1	4	3	0	0	7
>100	0	0	0	0	0	0	0	0	0	4	0	0	4
Total:	5	0	3	4	0	1	1	2	16	7	2	1	26

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

Notes:

1) Wells are categorized based upon maximum TCE and PCE values attained during the 1991-92 water year; where data was not available for 1991-92, data from the most recent water year was used.
2) MCL - Maximum Contaminant Level

Water Treatment

1. Advanced Oxidation Process: The construction of the North Hollywood Advanced Oxidation Process (AOP) Plant by R. L. Hartley Company has been completed. A seven-day start-up test to verify the proper mechanical operation of plant equipment was completed in May 1991. Performance evaluation of the facility continued throughout the year, in accordance with the test plan approved by the Department of Health Services (DHS). 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. The plant is being run on four days per week basis with continuous daytime operator coverage.

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 satisfactorily during the 1991-92 water year. The present drought has resulted in the shutdown of some of the supply wells for the Aeration Facility due to the 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 (one well has already been modified with a variable-speed pump). The average flow of treated water produced during operation has been 1000 - 1200 gpm. Monthly reports on water quality performance are provided to the Department of Health Services.

3. Nitrate Removal: The Crescenta Valley County Water District's Glenwood Nitrate Water Treatment Plant, which uses an anion-exchange process for nitrate removal, will be back in full service by July 1, 1993. The plant had been out of service since August 1992.

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

The RI was initiated in July 1987 by the U.S. Environmental Protection Agency (EPA) to characterize the San Fernando Basin (SFB) and the Verdugo Basin and their contamination with trichloroethylene (TCE) and perchloroethylene (PCE).

The Los Angeles Department of Water and Power (DWP) was selected by the EPA to serve as its lead agency in conducting the RI and entered into a cooperative agreement that has provided over $19 million in federal funding to the DWP since July 1987. In August 1987, the DWP selected James M. Montgomery, Consulting Engineers, Inc. (JMM) to serve as its consultant to perform various RI tasks.

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

The RI findings and characterizations were based on data collected under the field investigations with particular emphasis given toward the data collected from the 87 monitoring wells that were installed for the RI by the EPA. Forty-three of the RI monitoring wells are water table monitoring wells that are referred to as Vertical Profile Borings, and forty-four are in groups perforated at different depths (cluster well). Each cluster consists of two to four monitoring wells installed in close proximity, and each well monitors a different aquifer to provide depth-specific water quality data. Electric logs were taken for the deep well of each cluster. In addition, lithologic and water quality data from existing production wells, data from selected existing monitoring wells, and data from other investigations were also considered in developing the ground water basin characteristics.

Some of the key findings of the RI are summarized as follows:

1. The SFB shows extensive stratification and consists of four zones that are identified as the Upper Zone, Middle Zone, Lower Zone and the Deep Zone. The zones are briefly described as follows:

Upper Zone: The Upper Zone extends from the water table, which ranges from 200 to 250 feet below ground surface (bgs), and has a saturated thickness that can be as much as 210 feet. The Upper Zone consists of gravels, sands and clays and typically contains the highest levels of TCE, PCE and nitrate contamination.

Middle Zone: The Middle Zone underlies the Upper Zone and averages about 50 feet in thickness. The Middle Zone consists primarily of fine-grained materials such as sands, silts and clays and is heterogeneous in nature. Wherever the fine-grained nature of the Middle Zone is extensive, it has been found to be a significant impediment to vertical flow between the Upper and Lower Zones of the aquifer.

Lower Zone: The Lower Zone underlies the Middle Zone and averages about 200 to 250 feet in thickness. Its top lies at a depth of 250 to 300 feet bgs. The Lower Zone has the highest permeability of the four zones and consists of coarse sands, gravels and some cobble layers. The majority of ground water in the SFB is produced from the upper portions of the Lower Zone where the aquifer is the most transmissive.

Deep Zone: The Deep Zone underlies the Lower Zone and extends to bedrock or a minimum depth of 1200 feet bgs. Little data is available regarding the Deep Zone, which has minimal interaction with the other zones in the aquifer.

2. A number of faults within the SFB have a significant influence on ground water flow including the Raymond, the Verdugo and the Benedict Canyon faults.

3. Both horizontal and vertical gradients are influenced by pumping activities in the SFB.

4. The extent and the concentrations of TCE, PCE and nitrate vary significantly as a function of depth in the SFB. TCE, PCE and nitrate plume maps for the Upper Zone and the Lower Zone are included in the RI report.

5. TCE and PCE migration in ground water in the SFB is governed primarily by advection-dispersion with ground water flow but may also be retarded by

chemical or physical interactions such as sorption or desorption with the soil matrix.

6. Ground water from the contaminated areas of the Upper Zone, if it were to be used as a drinking water source without treatment to remove volatile organic compounds, would exceed the acceptable federal carcinogenic risk levels.

The SFB Ground Water Flow Model was developed as a part of the RI and is a comprehensive, three-dimensional, regional-scale model. The model was calibrated by simulating historic SFB operations and hydrologic conditions and comparing the computed water levels against the actual monitored water levels, which are used to develop groundwater gradients and flow directions.

The EPA is continuing its ground water monitoring activities in the SFB and is proceeding with its Feasibility Study (FS) activities which will provide a remedial action plan for the SFB. The RI report and the SFB Ground Water Flow Model will provide the basis and the tools to proceed with the FS.

EPA Operable Units

In addition to the RI/FS activities, the EPA requested the DWP to prepare a number of Operable Unit Feasibility Studies (OUFSs) to provide a more prompt response to those areas of contamination that were determined to be significant to require containment. The EPA has identified a number of Operable Units (OUs) that require an interim remedial action as determined in the OUFSs, and the OUs are described as follows:

1. North Hollywood OU - The North Hollywood OU was completed and placed into full-time service in December 1989 and consists of a 2000-gpm, pump-and-treat system to contain and remove ground water contamination from the Upper Zone in the North Hollywood Well Field (east) area. The system is operated by the DWP and financed, in part, by the EPA.

2. Burbank OU - The Burbank OU, Phase I, is currently being designed under the direction of the EPA. The Burbank OU will ultimately consist of a 12,000-gpm, pump-and-treat system to contain and remove ground water contamination from the Upper Zone in the Burbank Well Field area.

3. Glendale OU - North Plume Area - The DWP completed the Glendale OUFS - North Plume Area in April 1992. The EPA is preparing a Record of Decision based on the OUFS to provide a pump-and-treat system with a 3000-gpm capacity to contain and remove contamination in the Upper Zone of Glendale's Grandview Well Field area.

4. Glendale OU - South Plume Area - The DWP completed the Glendale OUFS - South Plume Area in July 1992. The EPA is preparing a Record of Decision based on the OUFS to provide a pump-and-treat system with a 2000-gpm capacity to contain and remove contamination on the Upper Zone in northern portion of the Los Angeles River Narrows area.

5. Pollock OU - The EPA is planning to prepare an OUFS for the Pollock area in the near future.

The EPA has also initiated cost recovery activities against potentially responsible parties (PRPs) for the Burbank OU and is preparing for cost recovery for the North Hollywood OU, the Glendale OU - North Plume Area, and the Glendale OU - South Plume Area.

Ground Water Quality Investigations

During the year 1991-92, ground water contamination investigations were performed under the direction of the Regional Water Quality Control Board (RWQCB), including the following sites:

Philips Components (Centralab)

Philips Components closed their manufacturing facility, but personnel remained to conduct cleanup activities. The aquifer test on a new extraction well was completed. The existing ground water extraction and treatment system operated at low flow rates before modification. Changes in the air stripping tower, transfer pumps, and ancillary equipment have enabled the facility to increase the hydraulic capacity of the ground water extraction and treatment to about 70 gpm.

Lockheed Corporation

The consent decree on the Burbank Operable Unit (OU) was entered by the court on March 25, 1992. 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. The "Ground Water Assessment, Lockheed Plant B-1 Report" and

the "Ground Water Assessment, South of Vanowen Alignment Report" were submitted to USEPA. USEPA approved Lockheed's amended monitoring Well Installation Plan which includes provisions for three additional monitoring wells. Reinjection started in April 1991 with approximately 500 GPM; the remainder was discharged to the storm sewer system.

Rockwell-Rocketdyne (Canoga Park)

Rocketdyne is exploring a new treatment system to replace the existing ultraviolet/hydrogen peroxide treatment system which is not performing as needed. The possibility of delivering large quantities of pumped and treated water for irrigation purposes is being looked into. Company representatives have met with Pierce College staff to discuss the feasibility of piping treated water to the college site. Negotiations are in progress with J. C. Penney Co. for sharing costs associated of the construction, operation, and maintenance of the treatment system.

3M-Pharmaceuticals (Riker Lab/3M)

RWQCB has requested additional information on the nitrate levels in the treatment effluent. The South Coast Air Quality Management District has issued a permit for a vapor extraction system equipped with a thermal oxidizer to treat the exhaust gas. CAL-EPA granted 3M a permit variance for an In-Situ Vacuum Extraction Demonstration Project.

Allied-Signal Aerospace Co. (Formerly Bendix Corp., North Hollywood Area)

The February 1992 monitoring report by the owner for this site reflects a significant change in ground water flow direction. The Revised Site Evaluation Plan was not accepted by RWQCB. Ground Water Technology Inc. was selected by the owners for the preparation of the site Assessment Evaluation Plan for the property. Allied-Signal Co. was named a PRP by EPA in the Burbank OU.

Hughes Aircraft Co. (Canoga Park Area)

The initial soil redemption of a diesel oil impacted site has been completed. The use of a carbon absorption system for treating extracted ground water is being considered. Hughes has selected a consulting firm to prepare the ground water Remedial Action Plan (RAP).

Greeff Fabrics (Formerly Wickes) (Pollock Well Field Area)

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

Taylor Yard (Narrows Area)

The Taylor Yard soil and ground water investigation is being handled by the Toxic Substances Control Program (TSCP) of the DHS. The TSCP will oversee the investigation and report to RWQCB of their findings. As of July 17, 1991 the TSCP became part of the newly formed California Environmental Protection Agency (CAL-EPA) and was renamed the Department of Toxic Substances Control (DTSC) in CAL-EPA. On September 30, 1991 DTSC approved the Remedial Action Plan for the Southern Pacific Transportation Company, Taylor Yard-Sale Parcel. Diesel fuel was found in the ground water at the Taylor Yard sand trap excavation.

Leaking Underground Tank Investigations

During 1991-92, 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. Table 9B gives a complete listing of parties and non-parties during 1991-92.

TABLE 9B

PUMPING FOR GROUND WATER CLEAN-UP
(Acre-Feet)

Party	Amount of Water Pumped			Method of Disposal
	Clean-up	Reinjection/ Recharge	Development/ Testing	
Lockheed (a)	917	356	0	Storm Drain
City of Los Angeles	786	0	0	eration Tower (b)
	766	0	0	AOP Facility (b)
Malibu Grand Prix	36	0	0	Storm Drain
May Co. N.R.F.P.	0	0	0	Storm Drain
Mobil Oil Co.	14	0	0	Storm Drain
Philips Components (c)	69	69	0	Recharge
Rockwell Corp.	211	0	0	Storm Drain
3M-Pharmaceuticals (d)	16	0	0	Storm Drain
Total:	2817	425	0	

(a) Lockheed became a party to the Judgment on January 26, 1979.
(b) Water from these projects is delivered to LA's water system.
(c) Formerly known as Centralab.
(d) 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 1991-92 water year, the total amount delivered to water users in ULARA was 285,355 acre-feet. Of this total, 15,127 acre-feet was ground water, 262,905 acre-feet was imported water, and 7,323 acre-feet was reclaimed water (Figure 5 gives a monthly breakdown). ULARA contains 781 wells, of which 122 are active and 659 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.

Sparkletts Drinking Water Corporation and Deep Rock Water Company are the only parties that extract water from the Eagle Rock Basin. These parties pay LADWP for pumped ground water pursuant to the ULARA Judgement.

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, in contrast to the 1968-69 to 1991-92 water years where imports exceeded extractions by 110,000 to 250,000 acre-feet.

Figure 5 provides an analysis of the monthly relationship between rainfall, ground water extractions and imported supply within ULARA. Precipitation values were obtained from stations on the valley floor (Table 3).

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.

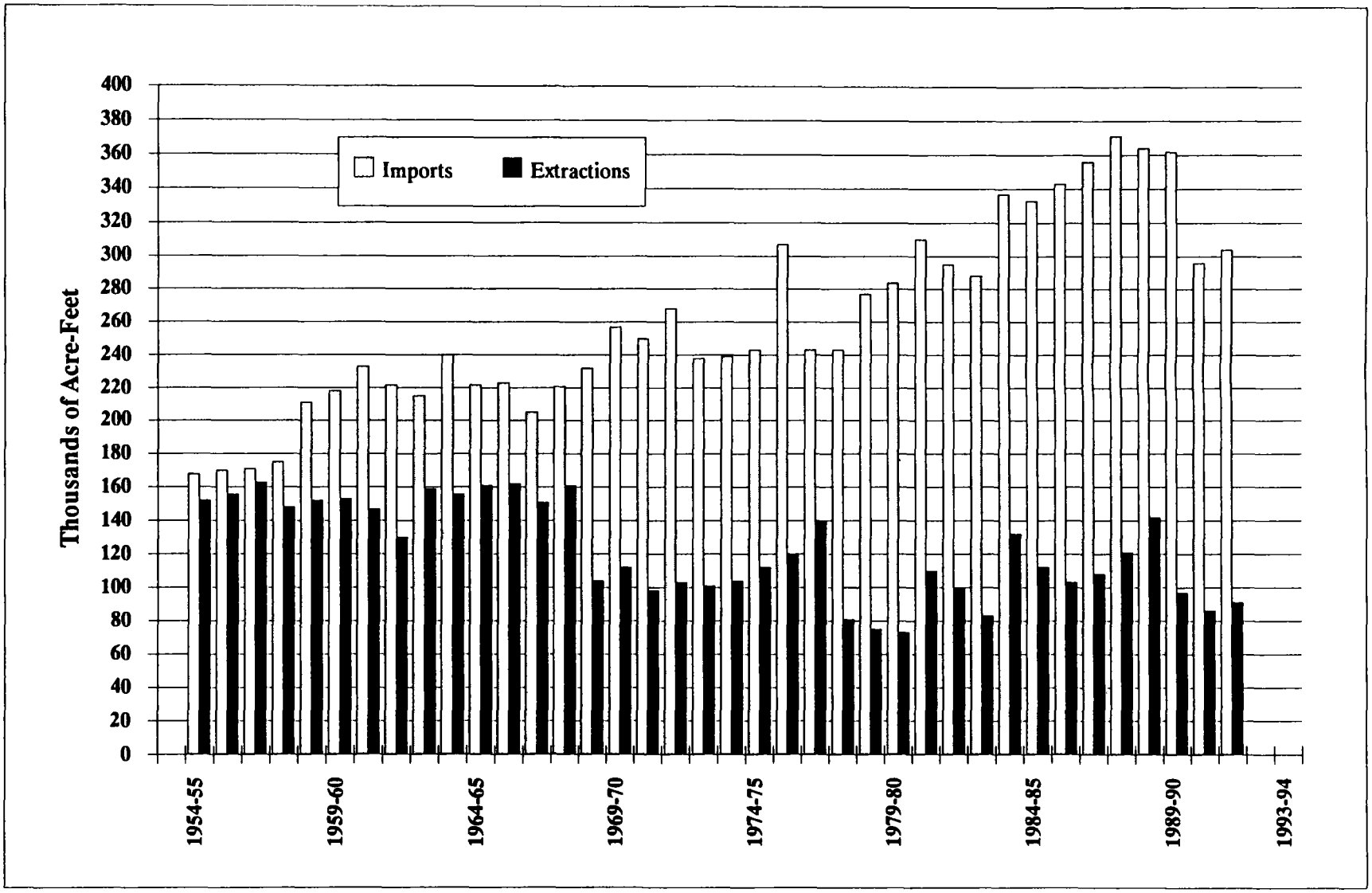


FIGURE 4

GROUND WATER EXTRACTIONS AND USE OF
IMPORTED WATER IN THE UPPER LOS ANGELES RIVER AREA

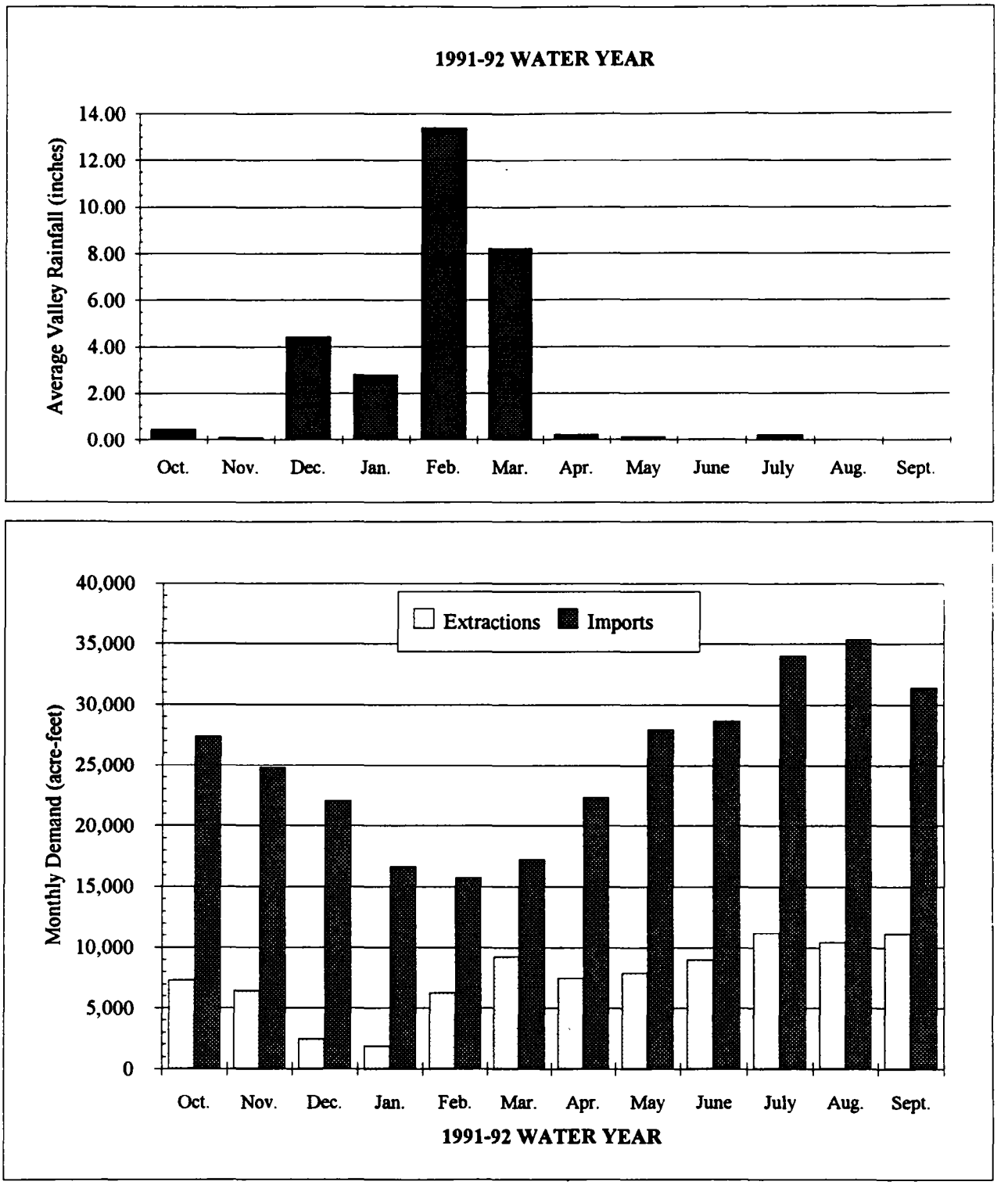


FIGURE 5

MONTHLY WATER DEMAND AND AVERAGE RAINFALL
IN THE UPPER LOS ANGELES RIVER AREA

The imported supplies to ULARA are from the Los Angeles 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 Owens River water and San Fernando and native ground water. Table 10 summarizes the nontributary imports and exports from ULARA. Tables 12A, 12B, 12C, and 12D list ground water imports and exports in and out of ULARA.

Ground Water Extractions

Appendix A contains a summary of ground water extractions for the 1991-92 water year, and Plate 6 shows the approximate locations of the well fields. A total of 81,023 acre-feet was pumped from the San Fernando Basin. Of this total, 76,212 acre-feet constitutes extraction rights by parties in the San Fernando Basin (Table 12A) with 2,935 acre-feet for nonconsumptive use and 1,876 acre-feet for physical solution parties and ground water clean-up and dewatering (Table 13).

A total of 81,023 acre-feet was pumped from the San Fernando Basin, 6,119 acre-feet from the Sylmar Basin, and 3,264 acre-feet from the Verdugo Basin. The respective safe yield values are 92,700 acre-feet (Native Safe Yield of 43,660 and an import return of 49,040 acre-feet) for the San Fernando Basin, 6,210 acre-feet for the Sylmar basin, and 7,150 acre-feet for the Verdugo Basin. Pumping in the Verdugo Basin is less than safe yield due to high nitrates. Construction of water blending facilities in the Verdugo Basin by the City of Glendale was completed in September 1981, and allows high nitrate Verdugo Basin ground water to be blended with MWD water. In addition, the completion of the Glenwood Nitrate Water Treatment Plant has enabled Crescenta Valley County Water District to pump more of its water rights. Glendale is currently installing two pumping wells, reactivating a gravity pickup system in Verdugo Park, and has proposed building a Verdugo Park Water Plant for the purpose of pumping additional water rights in the Verdugo Basin.

Physical Data by Basins

Tables 12A, 12B, 12C, and 12D summarize water supply and disposal in each of the basins as submitted by the parties. Estimates made by the parties, for water delivered to hill and mountain

TABLE 10

ULARA - NONTRIBUTARY WATERS
IMPORTS AND EXPORTS
(Acre-Feet)

Source and Agency	1990-91	1991-92
Imports		
MWD water (a)		
City of Burbank	17,773	18,830
Crescenta Valley County Water District	1,354	1,593
City of Glendale	22,408	24,638
City of Los Angeles	244,758	262,827
La Canada Irrigation District	1,113	846
Las Virgenes Municipal Water District*	5,158	5,212
City of San Fernando	1,122	568
Sub-Total:	293,686	314,514
Owens River water		
City of Los Angeles (b)	200,377	224,347
Total Imported Water:	494,063	538,861
Exports		
Owens River water		
City of Los Angeles (c)	100,075	117,903
MWD water		
City of Los Angeles (c)	116,323	131,133
Total Exported Water:	216,398	249,036
Net Imported Water:	277,665	289,825

* Nonparty

(a) Colorado River and Northern California waters combined.
(b) 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) Represents water passed through ULARA and is considered an export (Table 1).

areas, sewage exported, etc., were based upon methods consistent with previous estimates made by the SWRCB for the San Fernando Valley reference (1962). The Watermaster made computations of subsurface outflows based on similar computations made by SWRCB. Table 13 summarizes pumping by private parties.

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 1992-93 water year. Table 15 shows San Fernando Basin stored water credit as of October 1, 1991 and October 1, 1992. All rights are based on the City of Los Angeles vs. City of San Fernando, et al., Judgment, dated January 26, 1979.

Sylmar Basin Allowable Extractions

Table 16 shows Sylmar Basin stored water credit as of October 1, 1991 and October 1, 1992. 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[1]

San Fernando Basin

The total ground water storage capacity of the San Fernando Basin was estimated in the Report of Referee to be approximately 3,200,000 acre-feet, of which a regulatory storage capacity of 360,000 acre-feet is required by the judgment. 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 ground water storage of approximately 310,000 acre-feet.

Verdugo Basin

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

1 City of Los Angeles vs. City of San Fernando, et al., Findings of Fact and Conclusions of Law, January 26, 1979.

Change in Ground Water Storage

San Fernando Basin

The change in storage for 1991-92 was estimated as +411 acre-feet, and the cumulative change in storage from 1968-69 through 1991-92 was 147,998 acre-feet. A comparison has been made between the annual precipitation and the cumulative change in storage each year since the commencement of Watermaster activities for the San Fernando Basin. The average precipitation for the period 1968-69 through 1991-92 was 17.55 inches, compared to a long-term average of 16.48 inches of rainfall. From 1968-69 to 1991-92, there was an increase of ground water storage of approximately 147,998 acre-feet. Of this amount, 279,132 acre-feet was stored through spreading and in-lieu replenishment (a credit equal to an intentional reduction in pumping) activities. Thus, the net ground water storage has decreased 131,134 acre-feet. This is the result of a below normal period of rainfall between the 1986-87 to 1990-91 water years. Table 11 gives the annual precipitation and change in storage from 1968-69 to 1991-92.

Sylmar Basin

The change in storage for 1991-92 was +2,188 acre-feet, and the cumulative change in storage from 1968-69 through 1991-92 was -5,310 acre-feet.

Verdugo Basin

The change in storage for 1991-92 was +285 acre-feet, and the cumulative change in storage from 1968-69 through 1991-92 was -17,949 acre-feet.

TABLE 11

CHANGE IN GROUND WATER STORAGE
SAN FERNANDO BASIN

Water Year	Valley Floor Precipitation (Inches)	Change in Storage (AF)	Cumulative Change in Storage (AF)
1968-69	29.00	79,240	79,240
1969-70	10.50	-9,740	69,500
1970-71	15.57	15,340	84,840
1971-72	8.10	-17,090	67,750
1972-73	20.65	17,020	84,770
1973-74	15.75	-21,820	62,950
1974-75	14.74	-22,580	40,370
1975-76	9.90	-30,090	10,280
1976-77	14.19	-50,490	-40,210
1977-78	35.43	136,150	95,940
1978-79	21.76	78,080	174,020
1979-80	30.25	99,970	273,990
1980-81	11.04	-32,560	241,430
1981-82	17.18	-530	240,900
1982-83	39.64	121,090	361,990
1983-84	9.97	-63,180	298,810
1984-85	11.00	-31,690	267,120
1985-86	20.27	-7,980	259,140
1986-87	5.99	-31,940	227,200
1987-88	18.62	-5,000	222,200
1988-89	9.12	-30,550	191,650
1989-90	8.20	-29,941 *	161,709
1990-91	14.38	-14,122 *	147,587
1991-92	30.05	411	147,998
24 year average:	17.55		

* Change in storage was re-evaluated. These numbers were modified from those in earlier Watermaster Reports.

Notes:

1) 100-year (1881-1981) mean precipitation = 16.48 inches.
2) Stored ground water through spreading and in-lieu pumping = 279,132 AF. (Plate 13)
3) Change in ground water storage without stored water credit = (+147,998 AF) - (279,132 AF) = -131,134 AF.

TABLE 12A

SUMMARY OF 1991-92 WATER SUPPLY AND DISPOSAL
SAN FERNANDO BASIN
(Acre-Feet)

Water Source and Use	City of Burbank	City of Glendale	City of Los Angeles	City of San Fernando	All Other Cities	Total
Extractions						
Total quantity extracted	39 (a)	489	75,684	0	4,811	81,023
Extractions for Pilot Projects	—	—	353	—	—	353
Used on valley fill	*	*	3,737	2,572	*	*
Imports						
MWD water	18,830	24,638	254,371 (b)	517	5,212 (c)	303,568
Owens River water	—	—	219,900 (b)	—	32 (c)	219,932
Ground water from Sylmar Basin	—	—	3,292	2,572	0	5,864
Ground water from Verdugo Basin	—	0	—	—	—	0
Reclaimed water	2,100 (d)	758 (e)	3,290 (f)	—	1,175	7,323
Exports						
Ground water: out of ULARA	—		75,240	—	0	75,240
Owens River water: out of ULARA (g)	—	—	117,903	—	0	117,903
MWD: to Verdugo Basin	—	3,387	—	—	—	3,387
MWD: out of ULARA (g)	—	—	131,133	—	—	131,133
Total net delivered water	20,930	22,498 (h)	232,261	3,089	11,230	290,008
Water delivered to hill and mountain area						
Ground water	*	*	0	0	0	*
Owens River water	—	—	18,121	—	0	18,121
MWD water	*	*	20,129	0	5,212 (c)	*
Water outflow						
Surface	—	—	—	—	—	136,843 (i)
Subsurface	—	—	—	—	—	421
Sewers	4,981	14,163	71,000 (j)	1,980	—	92,124
Reclaimed	6,761	8,220	69,171	—	—	84,152

* These values are no longer required to be calculated as per Judgment.

Notes:

1) Colorado River and Northern California waters are combined and listed as MWD water.
2) See Table 13 for parties included in "All Other Cities" category.

(a) 39 AF was pumped for water quality testing only.
(b) Includes Owens River or MWD water exported out of ULARA.
(c) Las Virgenes Municipal Water District (Table 10).
(d) This value is no longer estimated. Actual amount of reclaimed water is being metered by the City of Burbank.
(e) 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.
(f) 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.
(g) Represents pass through water (see Table 1).
(h) Total delivered water to the City of Glendale was 26,518 AF. Verdugo Basin metered sales times 105 percent equalled 4,020 AF. Therfore, the San Fernando Basin delivered water was 22,498 AF (26,518 AF minus 4,020 AF). Refer to Section 5.2.1.3 of Judgment
(i) At Station F-57C-R where the 29-year mean (1929-57) base low flow is 7,580 acre-feet.
(j) Estimated from historic data.

TABLE 12B

SUMMARY OF 1991-92 WATER SUPPLY AND DISPOSAL
SYLMAR BASIN
(Acre-Feet)

Water Source and Use	City of Los Angeles	City of San Fernando	All Others	Total
Extractions				
Total quantity extracted	3,292	2,826	1	6,119
Used on valley fill	0	254	0	254
Imports				
MWD water	4,518	51	---	4,569
Owens River water	4,097	0	---	4,097
Exports				
Ground water to San Fernando Basin	3,292	2,572	0	5,864
Water delivered to hill and mountain area				
MWD water	280			280
Owens River water	123	---	---	123
Water outflow				
Subsurface: to San Fernando Basin	460 (a)	---	---	---
Sewers	830 (b)	196	0	1,026

(a) Base period average of 460 AF (Sylmar & Pacoima Notch).
(b) Estimated from historic data.

TABLE 12C

SUMMARY OF 1991-92 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	2,631	633	0	0	3,264
Used on valley fill	2,566	*	0	0	*
Imports					
MWD water	1,593	3,387	846	354	6,180
Owens River water	---	---	---	318	318
Ground water from					
San Fernando Basin	---	---	---	---	---
Reclaimed water	---	---	---	---	---
Exports					
Ground water to					
San Fernando Basin	---	0	---	---	0
Water delivered to hill and mountain areas					
MWD water	39	*	0	59	98
Owens River water	---	---	---	26	26
Ground water from					
Verdugo Basin	65	*	---	0	65
San Fernando Basin	---	0	---	0	0
Water outflow					
Subsurface					
to Monk Hill Basin	---	---	---	---	300 (a)
to San Fernando Basin	---	---	---	---	70
Sewage	1,514	972	0	190 (b)	2,676

* Not required.

(a) Estimated from 29-year average (1929-57).
(b) Estimated from historic data.

TABLE 12D

SUMMARY OF 1991-92 WATER SUPPLY AND DISPOSAL
EAGLE ROCK BASIN
(Acre-Feet)

Water Source and Use	City of Los Angeles	Deep Rock Water Company	Sparkletts Drinking Water Corp.	Total
Extractions (a)				
Total quantity	0	0	184	184
Used on valley fill	0	0	0	0
Imports				
Owens river water	0	--	--	0
MWD water	3,585	--	--	3,585
Ground water	0	0	0	0
Exports (a)				
Ground water	0	0	184	184
Water delivered to hill and mountain areas				
MWD water	1,726	--	--	1,726
Owens river water	0	--	--	0
Water outflow				
Surface	--	--	--	0
Subsurface (b)	--	--	--	0
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 agreement with The City of Los Angeles; extractions are limited to 500 AF/year, and they are allowed to export a 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

1991-92 PUMPING BY NONCONSUMPTIVE USE,
PHYSICAL SOLUTION, AND PARTIES WITHOUT RIGHTS
SAN FERNANDO BASIN
(Acre-Feet)

I. Nonconsumptive Use Parties	
1. CalMat Co.	1,485
2. Livingston-Graham Co.	5
3. Philips Components	69
4. Sears, Roebuck and Company	26
5. Sportsmen's Lodge, Inc.	0
6. Toluca Lake Property Owners Assn.	9
7. Walt Disney Productions	1,341
Sub-Total:	2,935
II. Physical Solution Parties	
1. Environmentals Inc.	52
2. Forest Lawn Cemetery Assn.	331
3. Sportsmen's Lodge, Inc.	2
4. Toluca Lake Property Owners Assn.	30
5. Valhalla Memorial Park	376
6. Valley Reclamation Company	0
Sub-Total:	791
III. GW Cleanup / Dewatering	
1. Auto Steigler	7
2. First Financial Plaza Site	39
3. Lockheed	917
4. Malibu Grand Prix	37
5. MAY Co.-Northridge Fashion Plaza	0
6. Mobil Oil Corporation	14
7. 3M-Pharmaceutical	16
8. Trillium Corporation	39
Sub-Total:	1,069
IV. Parties Without Rights	
1. Harper, Cecilia De Mille (a)	15
2. Mena, John and Barbara	1
Sub-Total:	16
Total Pumping:	4,811

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

(a) Presently being re-evaluated as a potential physical solution pumper.

TABLE 14

1992-93 EXTRACTION RIGHTS
SAN FERNANDO BASIN
(Acre-Feet)

	City of Burbank	City of Glendale	City of Los Angeles
1. Delivered water 1991-92	20,930	22,498	232,261
2. Delivered to hill & mountain 1991-92	*	*	38,250
3. Delivered to valley fill 1991-92	*	*	194,011
4. Percent Recharge	20.0%	20.0%	20.8%
5. Return water extraction right 1992-93	4,186	4,500	40,354
6. Native safe yield	0	0	43,660
7. Total extraction right 1992-93	4,186	4,500	84,014

* Not required.

Item 1 = Table 12A, Total net delivered water
Item 2 = Table 12A, Ground water, 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
Burbank = Item 1 x Item 4
Glendale = Item 1 x Item 4
LA = Item 3 x Item 4
Item 6 = Section 4.2.4, page 11 of Judgment
Item 7 = Item 5 + Item 6

TABLE 15

STORED WATER CREDIT
SAN FERNANDO BASIN
(Acre-Feet)

	City of Burbank	City of Glendale	City of Los Angeles
1990-91			
1. Stored water credit as of Oct. 1, 1990	45,777	30,469	162,549
2. Delivered water 1989-90	23,053	26,696	221,955
3. Return water extraction right 1990-91	4,611	5,339	46,167
4. Native safe yield	0	0	43,660
5. Total extraction right for 1990-91	4,611	5,339	89,827
6. Extractions for year	1,262	2,755	67,032
7. Physical solution extractions	770	484	104
8. Spread water	504	0	52
9. Headworks Pilot Recharge Study	-----	-----	71
10. Stored water credit as of Oct. 1, 1991	48,860	32,569	185,221
1991-92			
11. Delivered water 1990-91	20,270	22,440	180,678
12. Return water extraction right 1991-92	4,054	4,488	37,581
13. Native safe yield	0	0	43,660
14. Total extraction right for 1991-92	4,054	4,488	81,241
15. Extractions for year	0 *	489	75,684
16. Physical solution extractions	938	381	184
17. Spread water	503	0	230
18. Headworks Pilot Recharge Study	-----	-----	353
19. Stored water credit as of Oct. 1, 1992 (a)	52,479	36,187	190,471

* 39.28 AF of water was pumped for water quality testing only.
(a) Does not include return flow occuring during 1991-92 water year. Credit given in 1992-93.

Items 3 & 12 = Items 2 & 11 x percent recharge
Items 5 & 14 = Items 3 + 4 & 12 + 13, respectively
Item 10 = Items 1 + 5 -6 -7 + 8 -9
Items 7 & 16
Burbank = Valhalla + Lockheed pumping
Glendale = Forest Lawn + Environmentals Inc. pumping.
LA = 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.
Item 11
Burbank = Table 14 Item 1 of previous year
Glendale = Table 14 Item 1 of previous year
LA = Table 14 Item 3 of previous year (Delivered to valley fill)
Item 19 = Items 10 + 14 - 15 -16 + 17 - 18

TABLE 16

1992-93 EXTRACTION RIGHTS AND STORED WATER CREDIT
SYLMAR BASIN
(Acre-Feet)

	City of San Fernando	City of Los Angeles	All Other Cities
1990-91			
1. Stored water credit as of Oct. 1, 1990	575	278	---
2. Safe yield share	3,105	3,105	---
3. Total extraction right 1990-91	3,680	3,383	*
4. Extraction for year	2,266	3,281	0.6
5. Stored water as of Oct. 1, 1991	1,414	102	---
1991-92			
6. Stored water as of Oct. 1, 1991	1,414	102	---
7. Safe yield share	3,105	3,105	---
8. Total extraction right 1991-92	4,518	3,207	*
9. Extraction for year	2,826	3,292	0.6
10. Stored water as of Oct. 1, 1992	1,692	(85)	---
1992-93			
11. Stored water as of Oct. 1, 1992	1,692	(85)	---
12. Safe yield share	3,105	3,105	---
13. Total extraction right 1992-93	4,797	3,020	*

* Entitled to reasonable overlying pumping by Meurer Engineering only.

Notes:
1) The safe yield of the Sylmar Basin is 6,210 acre-feet. Effective October 1, 1984, the safe yield less pumping by two overlying parties, (which in 1988-89 was near zero), is equally shared by Los Angeles and San Fernando. The extraction right also takes into account deficit stored water.
2) Numbers in parenthesis indicate a deficit of stored water.

Item 3 = Items 1 + 2
Item 5 = Items 3 - 4 - (1/2 pumping by Meurer Engineering)
Item 8 = Items 6 + 7
Item 10 = Items 8 - 9 - (1/2 pumping by Meurer Engineering)
Item 13 = Items 11 + 12

APPENDIX A

GROUND WATER EXTRACTIONS

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Auto Steigler														
---	---	0.00	0.00	0.00	0.00	0.00	0.00	0.57	1.68	1.04	1.02	1.57	1.43	7.31
City of Burbank														
3841C	6A	1.79	0.37	0.00	0.00	0.00	0.28	0.00	0.00	0.51	0.00	0.00	13.48	16.43
3882P	7	0.10	0.00	21.95	0.28	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	22.52
3851E	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3851K	13A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3882T	15	0.20	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.33
3841G	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Party Total:		2.09	0.37	21.95	0.28	0.00	0.60	0.00	0.00	0.51	0.00	0.00	13.48	39.28
Conrock Co.														
4916A	2	81.08	71.05	80.18	52.46	38.72	59.36	92.03	139.64	47.23	142.22	107.54	137.33	1,048.84
4916	3	15.09	21.13	32.89	26.72	20.08	30.42	46.47	61.27	20.99	60.74	46.54	53.48	435.82
Party Total:		96.17	92.18	113.07	79.18	58.80	89.78	138.50	200.91	68.22	202.96	154.08	190.81	1,484.66
Environmentals Inc.														
3934A	M050A	4.89	7.00	6.00	6.71	4.90	5.67	5.68	4.37	4.15	1.05	0.00	0.00	50.42

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
First Financial Plaza Site														
N/A	F.F.P.S.	1.19	1.08	1.20	1.83	5.82	7.01	6.76	4.24	3.17	2.62	1.95	1.64	38.51
Forest Lawn Cemetery Assn.														
3947A	2	20.04	13.79	5.57	0.08	1.42	1.57	1.75	6.79	0.08	1.42	11.62	27.88	92.01
3947B	3	16.47	11.74	4.57	0.57	1.41	1.51	3.73	4.38	12.42	17.28	19.14	30.97	124.19
3947C	4	16.25	11.61	3.53	0.25	0.19	0.00	2.86	14.14	12.77	12.92	15.21	24.92	114.65
3858K	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Party Total:		52.76	37.14	13.67	0.90	3.02	3.08	8.34	25.31	25.27	31.62	45.97	83.77	330.85
City of Glendale														
3924N	STPT 2	19.87	24.52	10.64	8.19	19.18	5.07	7.46	3.36	4.65	12.70	9.42	10.62	135.68
3924R	STPT 3	0.92	0.66	0.00	0.00	0.00	0.00	0.00	0.02	0.12	0.04	1.78	2.02	5.56
GVENT	GVENT	170.02	0.00	72.74	0.00	13.81	91.67	0.00	0.00	0.00	0.00	0.00	0.00	348.24
Party Total:		190.81	25.18	83.38	8.19	32.99	96.74	7.46	3.38	4.77	12.74	11.20	12.64	489.48
Harper, Cecelia DeMille														
4940A	NORTH	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	15.00
Livingston-Graham, Inc.														
4916B	SnVal	0.35	0.36	0.33	0.36	0.12	0.33	0.59	0.66	0.63	0.48	0.48	0.49	5.18

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Lockheed														
3861C	B175-E2	94.28	106.42	101.45	86.64	87.56	87.14	74.72	89.16	85.46	0.00	18.98	85.60	917.41
City of Los Angeles														
Crystal Springs (CS)														
3914L	CS-46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3914M	CS-47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CS Total:		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Erwin (E)														
3831H	E-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
3821I	E-2A	272.96	205.69	226.49	189.03	206.91	191.14	112.93	144.35	213.09	137.47	3.24	0.00	1,903.30
3831G	E-4	227.78	166.21	30.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	424.11
3821F	E-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3831F	E-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
3821H	E-7	187.65	144.42	159.80	37.44	144.65	136.96	78.88	163.68	151.42	176.01	131.98	136.16	1,649.05
3811F	E-11	233.73	173.33	185.93	150.41	160.42	146.10	84.80	110.03	167.22	188.34	135.42	138.55	1,874.28
E Total:		922.12	689.65	602.34	376.88	511.98	474.20	276.61	418.06	531.73	501.82	270.64	274.71	5,850.74
Headworks (H)														
3893L	H-27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893K	H-28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3893M	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

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Headworks (H)														
3893N	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
3893P	H-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
H 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
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-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
3810S	NH-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
3770	NH-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810	NH-11	98.60	25.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.00
3810A	NH-14	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-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820D	NH-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820C	NH-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3820B	NH-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61.57	320.16	381.73
3830D	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

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
North Hollywood (NH)														
3830C	NH-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3830B	NH-22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790C	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
3790D	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
3800C	NH-25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790F	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
3790E	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
3820F	NH-28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3810K	NH-29	90.31	139.81	0.00	0.00	0.00	0.00	77.84	76.81	34.51	35.15	96.27	91.58	642.28
3810L	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
3800D	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
3810T	NH-32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3770C	NH-33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3780C	NH-34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790G	NH-35	18.66	0.00	0.00	0.00	0.00	0.00	0.00	19.63	0.00	0.00	0.00	0.00	38.29
3830N	NH-36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790H	NH-37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3790J	NH-38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.10	0.00	0.00	0.00	0.00	3.10

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
North Hollywood (NH)														
3810M	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
3810N	NH-40	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-41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	137.95	370.16	508.11
3810Q	NH-42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70.18	307.10	377.28
3810R	NH-43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.58	245.41	334.99
3790K	NH-43A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.03	0.00	152.99	204.75	0.00	360.77
3790L	NH-45	83.88	194.47	63.98	0.00	62.28	380.88	108.86	0.00	0.00	133.31	320.59	356.57	1,704.82
3790M	NH-46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.10	0.00	158.70	385.56	431.73	979.09
NH Total:		291.45	359.68	63.98	0.00	62.28	380.88	186.70	105.67	34.51	480.15	1,366.45	2,122.71	5,454.46
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-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
3958H	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
3958J	P-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Rinaldi-Toluca (RT)														
4909E	RT-2	144.79	208.52	0.00	0.00	66.69	410.63	299.54	400.62	377.28	167.70	341.53	371.42	2,788.72
4898A	RT-3	197.48	243.60	0.00	0.00	368.00	485.10	359.07	487.06	464.93	233.11	408.91	452.87	3,700.13
4898B	RT-4	379.53	276.59	0.00	0.00	390.75	519.72	418.78	315.18	357.23	560.50	437.10	486.44	4,141.82
4898C	RT-5	400.12	291.74	0.00	0.00	412.77	550.62	444.36	353.72	367.54	572.34	448.10	497.13	4,338.44
4898D	RT-6	401.91	292.91	0.00	0.00	413.94	111.23	264.01	350.76	388.13	595.87	465.89	517.66	3,802.31
4898E	RT-7	403.97	296.28	0.00	0.00	408.73	110.74	248.14	351.98	391.42	594.10	460.86	517.04	3,783.26
4898F	RT-8	214.40	264.19	0.00	0.00	391.94	522.77	421.42	335.13	372.13	566.69	442.75	499.22	4,030.64
4898G	RT-9	176.65	258.95	0.00	0.00	382.65	511.83	412.84	329.80	365.02	538.30	272.96	0.00	3,249.00
4898H	RT-10	170.16	250.44	0.00	0.00	365.31	489.97	395.46	300.53	350.05	535.66	421.35	469.52	3,748.45
4909G	RT-11	322.84	239.21	0.00	0.00	365.20	67.15	0.00	0.30	378.74	569.54	476.75	528.22	2,947.95
4909K	RT-12	198.56	243.00	0.00	0.00	77.71	483.80	356.55	291.99	334.37	502.41	413.52	451.59	3,353.50
4909H	RT-13	212.15	260.40	0.00	0.00	83.54	527.30	428.77	322.96	353.33	537.91	450.07	499.68	3,676.11
4909J	RT-14	204.57	251.10	0.00	0.00	81.70	509.05	411.41	510.86	470.04	516.00	431.50	477.48	3,863.71
4909L	RT-15	348.44	258.89	0.00	0.00	0.00	381.52	181.06	0.00	110.81	530.38	430.25	472.00	2,713.35
4909M	RT-16	0.00	0.00	0.00	0.00	0.00	421.86	403.19	518.81	470.87	215.18	440.75	484.23	2,954.89
RT Total:		3,775.57	3,635.82	0.00	0.00	3,808.93	6,103.29	5,044.60	4,869.70	5,551.89	7,235.69	6,342.29	6,724.50	53,092.28

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
4992A	Tujunga 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-2	155.86	99.52	90.70	18.34	69.54	74.11	49.52	50.80	73.35	79.25	60.97	64.19	886.15
3863P	V-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
3863J	V-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.72	167.75	111.07	2.04	0.00	349.58
3863L	V-12	240.61	198.97	225.30	190.66	205.81	230.92	152.30	140.52	212.15	159.90	11.50	0.00	1,968.64
3853G	V-14	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-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
3844R	V-25	197.25	150.83	170.16	145.23	157.46	175.90	113.27	104.80	167.43	200.00	152.07	168.60	1,903.00
V Total:		593.72	449.32	486.16	354.23	432.81	480.93	315.09	364.84	620.68	550.22	226.58	232.79	5,107.37
Whitnall (W)														
3820E	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
3821B	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
3821C	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
3821D	W-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	151.17	367.29	255.14	0.00	0.00	773.60
3821E	W-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.11
3831J	W-6A	250.92	268.28	294.55	243.07	261.20	297.09	196.88	289.63	271.76	308.22	121.10	0.00	2,802.70

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Whitnall (W)														
3832K	W-8	205.95	153.81	171.95	143.85	158.47	178.33	119.19	177.62	166.58	190.29	144.84	5.67	1,816.55
3832L	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
3832M	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
3842E	W-11	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:		456.87	422.09	466.50	386.92	419.67	475.42	316.07	618.53	805.63	753.65	265.94	5.67	5,392.96
Aeration (A)														
3800E	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
3810U	A-3	0.00	0.00	0.00	0.00	0.00	10.70	7.74	15.15	12.47	27.36	16.71	6.73	96.86
3810V	A-4	0.00	0.00	0.00	0.00	0.00	9.50	7.53	14.78	9.18	21.88	10.97	1.93	75.77
3810W	A-5	0.00	0.00	0.00	0.00	0.00	10.31	7.16	10.77	11.64	22.61	7.62	5.28	75.39
3820H	A-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
3821J	A-7	29.75	15.08	0.00	0.00	0.00	0.16	0.00	24.56	20.09	14.51	3.88	15.17	123.20
3830P	A-8	35.12	11.82	0.00	0.00	0.00	17.61	10.38	10.81	0.00	44.72	28.77	15.24	174.47
3831K	A-9	41.83	15.11	0.00	0.00	0.00	18.82	14.49	28.12	23.00	50.55	31.41	17.42	240.75
A Total:		106.70	42.01	0.00	0.00	0.00	67.10	47.30	104.19	76.38	181.63	99.36	61.77	786.44
City of Los Angeles Total:		6,146.43	5,598.57	1,618.98	1,118.03	5,235.67	7,981.82	6,186.37	6,480.99	7,620.82	9,703.16	8,571.26	9,422.15	75,684.25

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Malibu Grand Prix														
---	MW--14	3.96	1.88	3.97	2.62	2.02	2.76	3.75	2.81	3.06	3.16	3.71	2.79	36.49
May Co.-North Ridge Fashion Plaza														
---	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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.														
---	---	1.18	0.87	0.58	1.03	1.01	1.46	1.23	1.37	0.99	1.19	2.00	1.19	14.10
Philips Components														
---	---	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.77	5.77	5.77	5.77	69.32
Rockwell														
---	E-1 thru E-9	8.90	21.33	15.17	9.79	19.73	26.43	15.92	23.45	14.04	28.15	16.42	11.69	211.02
Sears Roebuck & Co.														
3945	3945	1.96	1.96	0.06	0.04	7.30	7.29	0.07	0.06	0.56	1.96	2.03	3.07	26.36
Sportmen's Lodge, Inc.														
3785A	1	0.11	0.11	0.11	0.03	0.08	0.40	0.11	0.11	0.11	0.11	0.11	0.11	1.50
3M-Pharmaceuticals														
---	---	2.62	1.59	1.08	0.68	1.49	1.05	1.41	1.37	0.79	1.39	1.28	1.36	16.11
Toluca Lake Property Owners Assn.														
3845F	3845F	2.77	2.83	2.56	1.22	0.53	1.09	1.74	3.57	6.66	7.51	1.83	6.62	38.93

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
San Fernando Basin														
Trillium Corporation														
Well #1	---	2.25	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	17.10
Well #2	---	3.42	1.69	1.69	1.69	1.69	1.69	1.70	1.69	1.69	1.69	1.70	1.67	22.01
Party Total:		5.67	3.04	3.04	3.04	3.04	3.04	3.05	3.04	3.04	3.04	3.05	3.02	39.11
Valhalla Memorial Park														
3840K	4	40.71	23.52	0.00	7.37	3.41	3.41	48.73	48.55	50.00	50.00	50.00	50.00	375.70
Valley Reclamation Co.														
4916D		0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05
Walt Disney Production														
3874E	EAST	185.45	75.86	176.07	91.67	0.00	0.00	0.00	0.00	2.68	45.28	87.21	73.63	737.85
3874F	WEST	54.58	89.43	5.91	0.00	0.00	22.82	16.82	6.98	4.47	3.74	305.99	92.39	603.13
3874G	NORTH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Party Total:		240.03	165.29	181.98	91.67	0.00	22.82	16.82	6.98	7.15	49.02	393.21	166.02	1,340.99
Basin Total:		6,897.03	6,090.98	2,168.72	1,419.11	5,463.00	8,336.24	6,516.39	6,899.10	7,898.60	10,099.89	9,278.51	10,057.59	81,125.16

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
Sylmar Basin														
City of Los Angeles														
Plant	Mission	0.00	0.00	0.00	59.57	381.87	385.56	334.62	427.96	411.14	461.25	427.55	402.53	3,292.05
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	61.28	47.99	29.66	69.61	122.93	105.33	165.56	167.02	173.27	183.67	169.10	160.08	1,455.50
5959	3	54.18	60.95	7.72	82.69	78.05	81.33	63.19	79.20	120.24	120.98	123.80	106.47	978.80
5969	4	11.00	15.37	7.25	27.48	8.31	32.72	30.99	33.22	30.25	36.94	35.08	28.39	297.00
5968	7A	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.05	48.11	46.18	95.08
	Party Total:	126.56	124.31	44.63	179.78	209.29	219.38	259.74	279.44	324.40	341.64	376.09	341.12	2,826.38
	Basin Total:	126.61	124.36	44.68	239.40	591.21	604.99	594.41	707.45	735.59	802.94	803.69	743.70	6,119.03

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
Verdugo Basin														
Crescenta Valley County														
5058B	1	17.27	25.15	26.20	19.80	4.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	92.78
5058H	5	35.06	32.99	37.48	9.76	0.00	34.00	36.53	64.95	78.64	78.71	90.76	83.03	581.91
5058	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
5047B	7	6.43	11.09	0.00	0.03	22.83	8.07	14.27	8.91	4.22	1.73	1.02	1.08	79.68
5069J	8	34.16	17.05	28.53	14.23	22.10	19.98	16.32	32.34	33.44	44.84	45.67	45.24	353.90
5047D	9	15.45	0.87	13.72	14.79	18.80	14.96	22.56	24.70	23.04	20.54	23.96	22.78	216.17
5058D	10	19.59	28.50	26.95	24.70	21.82	20.42	27.70	30.04	30.21	31.31	30.75	29.68	321.67
5058E	11	26.19	25.04	23.57	24.30	26.64	36.36	37.79	37.03	30.06	15.96	0.00	0.00	282.94
5058J	12	30.73	22.51	23.05	21.29	19.68	22.38	22.27	24.38	23.81	23.89	23.08	21.81	278.88
5069F	14	32.02	26.48	13.29	36.12	30.49	27.18	35.87	36.64	34.55	35.52	34.14	31.87	374.17
	PICK	4.04	3.90	3.98	3.95	3.67	3.94	3.94	4.27	4.21	4.52	4.33	4.08	48.83
	Party Total:	220.94	193.58	196.77	168.97	170.39	187.29	217.25	263.26	262.18	257.02	253.71	239.57	2,630.93
City of Glendale														
3961-3971	GL3-5	19.92	0.00	17.06	0.00	7.67	58.80	63.04	34.00	30.94	22.10	36.46	41.74	331.73
3970	GL-6	40.48	0.00	21.11	0.00	5.28	47.51	50.15	23.75	34.31	15.84	31.67	31.58	301.68
---	MM-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Party Total:	60.40	0.00	38.17	0.00	12.95	106.31	113.19	57.75	65.25	37.94	68.13	73.32	633.41
	Basin Total:	281.34	193.58	234.94	168.97	183.34	293.60	330.44	321.01	327.43	294.96	321.84	312.89	3,264.34

1991-1992 WATER YEAR GROUND WATER EXTRACTIONS

LACDPW Well No.	Owners Designation	Extractions (acre-feet) Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
Eagle Rock Basin														
Sparkletts Drinking Water														
3987A	1	7.00	5.80	6.29	5.61	4.33	4.48	3.62	5.02	5.07	6.38	6.38	6.11	66.09
3987B	2	4.74	1.89	1.56	0.80	3.44	3.68	4.68	4.57	4.46	6.15	6.20	4.62	46.79
3987F	3	5.57	5.63	5.43	5.79	4.16	4.71	5.71	5.45	5.84	7.56	7.88	7.20	70.93
Party Total:		17.31	13.32	13.28	12.20	11.93	12.87	14.01	15.04	15.37	20.09	20.46	17.93	183.81
Basin Total:		17.31	13.32	13.28	12.20	11.93	12.87	14.01	15.04	15.37	20.09	20.46	17.93	183.81
ULARA Total:		7,322.29	6,422.24	2,461.62	1,839.68	6,249.48	9,247.70	7,455.25	7,942.60	8,976.99	11,217.88	10,424.50	11,132.11	90,692.34

APPENDIX B

KEY GAGING STATIONS SURFACE RUNOFF

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F300-R LOS ANGELES RIVER AT TUJUNGA AVENUE 1992

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1991 TO Sep 1992

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	60.9	36.1	42.2	458	90.9	94.8	337	86.1	60.3	72.5	52.9	77.8
2	62.1	36.3	42.3	424	90.5	2,270	162	85.1	58.9	69.5	53.0	70.6
3	62.6	36.7	42.3	723	90.2	2,290	160	84.7	132	67.4	52.8	70.2
4	61.9	37.3	42.3	201	90.2	94.8	160	84.0	112	64.5	53.1	69.6
5	64.4	37.8	42.3	2,070	90.0	94.8	160	83.3	112	58.0	50.5	66.9
6	63.2	38.2	42.6	219	1,260	1,400	160	82.8	102	55.8	60.6	61.9
7	66.3	38.3	43.3	839	1,620	94.0	160	82.6	87.1	59.1	69.1	58.9
8	60.7	38.3	488	154	159	94.0	160	82.6	88.0	59.1	63.0	64.0
9	66.9	38.3	109	73.7	128	94.0	117	81.9	77.9	57.1	56.3	69.1
10	62.5	38.3	50.6	67.2	10,800	94.0	99.8	81.9	70.8	55.1	55.4	68.4
11	65.6	38.7	48.7	69.1	9,450	94.0	99.3	81.7	68.4	55.1	57.3	69.3
12	70.0	38.7	52.0	60.8	6,270	94.0	98.9	79.2	64.0	74.1	60.7	67.8
13	62.5	38.7	61.3	61.9	402	94.0	98.0	66.9	67.8	64.5	62.0	62.1
14	65.1	39.0	54.6	72.8	2,690	94.0	97.5	63.7	58.3	53.6	62.3	62.1
15	66.3	38.7	58.5	90.4	1,600	94.0	96.9	70.1	58.6	50.9	63.4	61.8
16	66.9	38.7	49.8	93.4	293	94.0	95.9	68.1	60.4	49.2	62.9	59.3
17	68.8	38.7	44.1	94.6	102	94.0	95.0	69.8	61.6	48.5	61.3	61.5
18	68.1	38.7	62.8	94.5	101	94.0	94.3	65.5	63.4	46.9	60.2	65.2
19	67.4	38.4	67.7	94.4	100	94.0	93.5	56.9	62.9	44.2	61.6	67.2
20	61.1	38.3	63.1	94.2	99.4	2,690	92.7	56.6	61.1	43.6	57.7	65.3
21	45.4	38.3	64.8	94.8	98.5	737	91.9	57.1	58.5	46.0	47.7	62.0
22	55.7	38.3	62.1	94.2	97.4	1,580	91.6	58.8	57.8	46.2	49.4	61.8
23	58.9	38.3	41.7	93.5	95.6	2,690	90.8	54.5	60.0	37.9	57.0	65.0
24	67.5	38.7	35.1	92.7	94.4	253	90.2	46.7	60.5	37.9	58.6	67.5
25	66.4	39.1	36.2	92.4	93.3	168	89.5	56.3	57.0	40.9	58.6	67.6
26	543	39.8	37.1	92.1	92.1	193	88.8	63.6	62.9	40.3	68.3	67.4
27	113	40.4	42.7	91.9	90.9	1,900	88.0	61.3	67.1	37.7	62.2	66.4
28	39.6	41.3	1,640	91.8	89.5	223	87.4	58.4	70.5	38.0	63.5	61.8
29	33.7	41.4	4,440	90.5	88.1	157	86.9	54.8	72.2	37.3	60.3	62.2
30	34.7	42.3	537	90.2	------	135	86.3	61.3	72.7	34.2	59.4	64.4
31	35.4	------	481	89.7	------	107	------	59.6	------	41.7	60.7	------
TOTAL	2,386.6	1,160.1	8,925.2	7,068.8	36,366.0	18,299.4	3,529.2	2,145.9	2,166.7	1,586.8	1,821.8	1,965.1
MEAN	77.0	38.7	288	228	1,250	590	118	69.2	72.2	51.2	58.8	65.5
MAX	543	42.3	4,440	2,070	10,800	2,690	337	86.1	132	74.1	69.1	77.8
MIN	33.7	36.1	35.1	60.8	88.1	94.0	86.3	46.7	57.0	34.2	47.7	58.9
AC-FT	4,734	2,301	17,703	14,021	72,131	36,296	7,000	4,256	4,298	3,147	3,613	3,898
M3x1000	5,839	2,838	21,836	17,295	88,972	44,770	8,634	5,250	5,301	3,882	4,457	4,808

CAL YEAR 1991	TOTAL*	12,471.9	MEAN	136	MAX	4,440	MIN	33.7	AC-FT	24,738	M3x1000	30,514
WTR YEAR 1992	TOTAL	87,421.6	MEAN	239	MAX	10,800	MIN	33.7	AC-FT	173,398	M3x1000	213,883

* Incomplete Record

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

E285-R BURBANK-WESTERN STORM DRAIN 1992

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1991 TO Sep 1992

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	13.4	10.1	10.5	95.1	11.5	106	33.6	3.9	5.3	4.6	7.6	10.2
2	15.6	10.7	10.4	72.8	11.5	212	32.2	3.6	5.3	4.7	7.2	10.5
3	13.6	11.2	10.3	147	11.5	198	28.8	3.4	6.0	5.1	7.1	7.2
4	14.5	10.8	11.0	130	9.8	134	25.9	3.4	5.6	5.3	6.8	9.4
5	13.1	13.6	11.2	305	6.9	115	23.5	8.7	5.3	5.6	6.4	8.5
6	11.1	14.9	10.9	146	87.9	171	21.1	17.5	5.3	6.0	7.0	11.4
7	11.5	9.7	12.2	149	248	169	19.7	16.8	5.3	6.3	6.5	13.3
8	11.9	12.1	41.6	126	158	88.3	18.5	15.7	5.3	6.7	6.5	13.9
9	11.6	14.0	16.6	93.6	202	69.4	18.2	14.4	4.8	7.2	6.2	12.0
10	10.5	13.7	16.6	63.9	778	58.1	17.0	13.0	5.3	7.9	6.4	11.8
11	13.7	13.8	16.8	47.0	507	45.6	16.8	11.7	5.3	9.0	8.6	13.1
12	10.5	14.3	15.0	36.2	641	37.3	15.7	11.5	5.4	9.0	9.8	11.0
13	11.4	13.2	14.2	29.3	239	29.5	14.6	10.2	6.0	10.2	7.6	12.4
14	9.6	14.7	13.4	24.2	193	21.9	13.7	9.2	5.5	11.4	8.9	12.4
15	13.0	12.3	12.6	21.7	287	17.5	12.2	8.2	6.0	10.2	10.2	11.9
16	11.0	8.1	11.0	20.1	186	14.0	11.5	7.3	5.6	9.6	10.3	11.8
17	15.5	6.8	9.3	19.7	176	10.2	10.5	6.7	5.3	8.8	8.8	12.4
18	15.3	6.6	9.0	18.2	164	7.1	10.0	6.3	6.0	9.0	9.4	12.2
19	15.1	10.1	9.0	17.3	154	6.7	9.0	6.0	5.3	8.0	9.7	9.7
20	15.9	10.2	9.0	16.8	147	132	8.4	5.3	6.0	7.7	9.1	9.4
21	15.2	10.3	9.1	16.8	141	45.6	7.9	5.3	5.5	5.4	9.0	9.4
22	15.1	11.0	10.2	15.9	139	87.1	6.9	4.9	6.0	7.8	7.7	10.3
23	15.3	11.7	10.2	15.4	134	112	6.6	4.6	5.6	7.3	6.9	12.4
24	15.5	12.3	10.2	15.4	129	44.6	6.0	4.6	5.3	9.0	8.5	13.4
25	15.8	12.1	10.2	14.6	125	43.8	5.9	4.6	5.6	10.0	8.4	14.1
26	19.5	12.0	10.7	13.4	120	53.3	5.3	4.0	5.3	9.7	7.3	14.0
27	10.3	12.4	89.1	14.1	118	79.9	5.1	3.9	5.6	9.9	6.6	11.8
28	10.1	11.6	221	14.1	114	39.3	4.6	3.9	5.2	8.9	6.4	13.9
29	10.2	11.6	354	14.1	113	37.6	4.6	3.4	4.6	8.1	6.7	13.4
30	9.8	10.9	152	13.3	------	34.9	4.1	3.4	4.9	8.9	6.8	12.0
31	9.6	------	124	12.8	------	32.8	------	3.0	------	8.4	7.0	------
TOTAL	404.2	346.8	1,271.3	1,738.8	5,352.1	2,253.5	417.9	228.4	163.5	245.7	241.4	349.2
MEAN	13.0	11.6	41.0	56.1	185	72.7	13.9	7.4	5.5	7.9	7.8	11.6
MAX	19.5	14.9	354	305	778	212	33.6	17.5	6.0	11.4	10.3	14.1
MIN	9.6	6.6	9.0	12.8	6.9	6.7	4.1	3.0	4.6	4.6	6.2	7.2
AC-FT	802	688	2,522	3,449	10,616	4,470	829	453	324	487	479	693
M3x1000	989	849	3,111	4,254	13,095	5,514	1,023	559	400	601	591	855

CAL YEAR 1991	TOTAL*	2,022.3	MEAN	22.0	MAX	354	MIN	6.6	AC-FT	4,012	M3x1000	4,949
WTR YEAR 1992	TOTAL	13,012.8	MEAN	35.6	MAX	778	MIN	3.0	AC-FT	25,812	M3x1000	31,839

* Incomplete Record

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

F252-R VERDUGO WASH AT ESTELLE AVENUE 1992

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1991 TO Sep 1992

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	2.3	3.9	2.0	1.2	.7	3.3	18.6	1.7	1.7	2.5	1.9	1.5
2	2.6	3.9	.7	1.4	.7	405	13.4	1.6	1.8	2.5	2.0	1.5
3	2.7	2.9	1.0	107	.7	253	9.1	1.3	1.2	1.4	2.6	1.5
4	2.7	2.8	1.2	2.4	.7	16.5	7.1	1.5	1.0	1.6	2.5	1.4
5	1.9	2.8	1.2	316	1.4	7.7	6.2	5.0	1.1	1.8	2.2	1.2
6	1.0	2.7	1.1	27.4	76.7	161	5.5	7.2	1.6	2.0	2.1	1.2
7	1.3	2.4	1.8	83.1	273	15.9	5.0	5.1	1.7	2.5	2.2	1.4
8	1.4	2.0	13.8	5.7	5.2	14.3	5.0	3.9	2.2	2.9	2.3	1.6
9	1.3	2.2	8.8	1.8	52.1	5.6	5.0	2.6	1.9	2.6	2.3	1.2
10	1.7	2.0	11.1	1.7	636	4.5	4.8	4.6	1.9	2.7	1.6	1.4
11	1.5	2.0	15.1	1.7	376	2.8	3.5	6.7	2.0	4.6	1.4	1.4
12	1.5	2.1	16.4	1.8	398	69.1	2.6	2.7	2.2	69.2	1.2	1.4
13	1.5	2.6	23.5	1.8	30.5	2.8	2.5	2.5	2.3	1.5	1.2	1.6
14	1.5	2.3	30.6	1.8	0	2.8	2.5	3.8	2.3	1.2	1.0	1.6
15	1.5	2.5	38.0	1.5	73.2	2.5	2.4	2.1	2.3	1.1	.9	1.7
16	1.8	2.8	46.0	1.2	0	2.5	2.3	2.1	2.3	1.2	.9	2.0
17	1.8	2.9	61.8	1.2	0	2.6	2.3	2.4	2.3	1.2	.9	2.0
18	2.0	3.7	74.0	1.2	0	2.8	2.3	2.1	2.3	1.3	.9	2.3
19	2.3	2.7	102	1.2	0	2.6	2.3	2.1	2.3	1.4	1.0	2.3
20	1.9	2.1	91.5	1.2	2.0	284	2.3	2.1	2.5	1.5	1.1	2.2
21	2.0	2.0	1.0	1.2	3.9	227	2.3	2.2	2.8	1.6	1.1	2.4
22	2.7	2.1	1.0	1.2	2.8	192	2.3	2.2	2.5	1.7	1.2	2.3
23	2.8	2.0	71.8	1.1	2.8	354	2.3	2.4	2.5	2.2	1.1	2.1
24	2.7	2.0	114	1.0	2.8	43.1	2.3	2.8	2.0	1.8	1.4	2.0
25	2.4	1.8	74.4	1.0	2.8	22.4	2.3	3.7	1.9	2.0	1.8	2.3
26	43.9	1.7	42.0	1.0	69.1	53.6	2.3	4.9	1.4	1.9	1.8	2.5
27	15.1	2.2	182	1.0	2.8	299	2.3	6.5	1.4	1.8	1.7	2.5
28	6.7	2.5	99.5	1.0	64.2	39.3	2.0	5.4	1.5	1.7	1.5	2.5
29	4.6	2.8	314	.9	2.5	14.4	1.8	1.9	1.4	2.0	1.2	2.9
30	3.9	2.7	0	.7	------	10.6	1.5	1.5	2.0	2.1	1.2	3.0
31	3.9	------	31.7	.7	------	10.8	------	1.7	------	2.0	1.2	------
TOTAL	126.9	75.1	1,473.0	573.1	2,080.6	2,527.5	126.1	98.3	58.3	127.5	47.4	56.9
MEAN	4.1	2.5	47.5	18.5	71.7	81.5	4.2	3.2	1.9	4.1	1.5	1.9
MAX	43.9	3.9	314	316	636	405	18.6	7.2	2.8	69.2	2.6	3.0
MIN	1.0	1.7	0	.7	0	2.5	1.5	1.3	1.0	1.1	.9	1.2
AC-FT	252	149	2,922	1,137	4,127	5,013	250	195	116	253	94.0	113
M3x1000	311	184	3,604	1,402	5,091	6,183	308	241	143	312	116	139

CAL YEAR 1991	TOTAL*	1,675.0	MEAN	18.2	MAX	314	MIN	0	AC-FT	3,323	M3x1000	4,099
WTR YEAR 1992	TOTAL	7,370.7	MEAN	20.1	MAX	636	MIN	0	AC-FT	14,621	M3x1000	18,035

* Incomplete Record

DISCHARGE. IN CUBIC FEET PER SECOND, WATER YEAR Oct 1991 TO Sep 1992

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	.18	5.00	1.68	7.04	104	155	21.6	19.5	8.00	1.59	
2	0	.10	5.00	1.16	7.04	104	155	21.6	33.4	8.75	1.59	
3	0	.10	5.00	1.11	7.04	104	154	21.9	49.2	10.5	.29	
4	0	.10	5.00	1.16	7.04	124	151	21.6	61.7	10.5	.19	
5	0	.10	4.32	105	7.04	150	147	22.3	61.4	10.5	.27	
6	0	.10	1.33	237	7.04	140	128	22.9	59.6	10.5	.36	
7	0	.10	.99	25.6	33.8	119	88.4	54.3	58.2	10.5	.59	
8	0	.10	.88	11.5	89.8	120	72.6	53.6	55.8	10.5	.65	
9	0	.10	.84	14.4	89.8	119	70.1	52.6	40.4	10.5	.84	
10	0	.10	.84	14.4	141	92.8	67.4	46.8	17.6	10.5	1.09	
11	0	.10	.94	14.4	716	67.1	67.0	20.3	17.2	10.5	1.40	
12	0	.10	.84	12.2	1,230	62.1	65.6	12.6	16.3	10.5	7.22	
13	0	.10	.84	12.6	1,280	61.8	65.1	13.4	15.9	10.5	3.21	
14	0	.10	.84	13.0	951	60.2	64.4	13.7	15.5	10.5	2.16	
15	0	.10	.84	13.0	533	60.2	45.8	13.6	14.9	10.5	1.49	
16	0	.10	.84	13.0	248	59.5	32.1	13.6	14.4	10.5	.90	
17	0	.10	.78	13.0	167	58.9	32.1	13.6	13.1	10.5	12.6	
18	0	.10	.74	13.0	142	57.9	32.4	13.6	9.68	10.5	1.65	
19	0	2.07	.78	13.0	98.5	57.2	32.9	13.6	8.00	10.5	.54	
20	0	4.63	.74	13.0	98.7	56.7	33.4	13.6	8.00	10.5	.39	
21	0	3.79	.74	15.1	99.8	94.3	33.4	13.8	8.00	9.08	.29	
22	0	3.79	.82	19.9	110	209	33.5	14.0	8.00	6.19	.27	
23	0	3.79	.84	15.7	110	548	34.0	14.0	8.00	6.19	.25	
24	0	3.79	.84	12.3	110	462	34.1	14.0	8.00	6.19	.19	
25	0	3.79	.84	12.3	110	245	34.6	14.0	7.90	6.19	.18	
26	0	3.79	.84	12.3	110	145	34.6	19.1	8.00	6.19	.15	
27	0	3.79	.89	12.6	107	198	34.6	0	8.00	6.19	.14	
28	0	3.79	1.29	13.3	99.8	203	34.7	0	8.00	6.19	.11	
29	1.66	3.79	2.95	13.6	99.8	193	30.4	0	8.00	6.19	.11	
30	2.10	3.79	204	13.6	------	182	21.6	0	8.00	6.19	.11	
31	1.96	------	232	13.6	------	159	------	0	------	6.19	.10	------
TOTAL	5.72	46.48	483.33	697.71	6,837.24	4,414.7	1,984.8	569.7	669.68	276.73	40.83	
MEAN	.18	1.55	15.6	22.5	236	142	66.2	18.4	22.3	8.93	1.32	
MAX	2.10	4.63	232	237	1,280	548	155	54.3	61.7	10.5	12.6	
MIN	0	.10	.74	1.11	7.04	56.7	21.6	0	7.90	6.19	.10	
AC-FT	11	92	959	1.380	13.560	8.760	3.940	1.130	1.330	549	81	

CAL YEAR 1991	TOTAL*	535.53	MEAN	5.82	MAX	232	MIN	0	AC-FT	1,060
WTR YEAR 1992	TOTAL*	16,026.92	MEAN	47.7	MAX	1,280	MIN	0	AC-FT	31,790

* Incomplete Record

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 1991 TO Sep 1992

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	72.6	0	49.5	3.0	0	40.4	0	0	0
2	0	0	9.0	48.3	0	49.0	3.0	0	40.3	0	0	0
3	0	0	13.8	23.0	0	46.5	3.0	0	40.3	0	0	0
4	0	0	12.6	31.8	0	46.0	3.0	11.4	39.7	0	0	0
5	0	0	11.8	27.8	0	46.0	3.0	34.4	39.9	0	0	0
6	0	0	11.0	22.1	0	46.4	3.0	33.6	40.2	0	0	0
7	0	0	6.8	12.1	0	44.9	3.0	35.0	39.5	0	0	0
8	0	0	0	2.6	0	45.4	0	35.1	39.4	0	0	0
9	0	0	0	0	0	75.1	0	36.3	38.9	0	0	0
10	0	0	0	0	391	75.4	0	36.7	38.5	0	0	0
11	0	0	0	0	686	74.4	0	39.8	38.2	0	0	0
12	0	0	0	0	704	74.8	0	41.9	37.7	0	0	0
13	0	0	0	16.2	639	74.4	0	41.1	37.6	18.1	0	0
14	0	0	0	25.7	635	74.6	0	41.1	36.0	26.6	0	0
15	0	0	0	25.9	0	74.8	0	40.8	36.0	39.3	0	0
16	0	0	0	8.6	0	75.2	0	40.2	35.3	26.0	0	0
17	0	0	0	0	0	58.3	0	40.5	34.7	0	0	0
18	0	0	0	0	0	50.3	0	40.1	33.6	0	0	0
19	0	0	0	0	0	27.3	0	39.4	33.1	0	0	0
20	0	0	0	0	0	9.8	0	39.4	32.5	0	0	0
21	0	0	0	0	92.8	9.2	0	38.9	32.0	0	0	0
22	0	0	0	0	105	8.5	0	38.5	31.2	0	0	0
23	0	0	0	0	177	111	0	38.5	30.7	0	0	0
24	0	0	0	0	179	179	0	38.8	30.2	0	0	0
25	0	0	0	0	88.9	61.2	0	39.2	34.3	0	0	0
26	0	0	0	0	88.3	57.4	0	40.2	37.2	0	0	0
27	0	0	0	13.3	70.0	32.0	0	40.7	36.6	0	0	0
28	0	0	0	23.4	48.8	3.6	0	40.5	27.7	0	0	0
29	0	0	0	7.8	49.7	3.6	0	40.9	24.8	0	0	0
30	2.2	0	0	0	------	3.5	0	40.9	31.4	0	0	0
31	0	------	0	0	------	3.0	------	40.2	------	0	0	------
TOTAL	2.2	0	65.0	361.2	3,954.5	1,590.1	21.0	1,064.1	1,067.9	110.0	0	0
MEAN	.1	0	2.1	11.7	136	51.3	.7	34.3	35.6	3.5	0	0
MAX	2.2	0	13.8	72.6	704	179	3.0	41.9	40.4	39.3	0	0
MIN	0	0	0	0	0	3.0	0	0	24.8	0	0	0
AC-FT	4.4	0	129	716	7,844	3,154	41.7	2,111	2,118	218	0	0
M3x1000	5.4	0	159	883	9,675	3,890	51.4	2,604	2,613	269	0	0

CAL YEAR 1991	TOTAL*	67.2	MEAN	.7	MAX	13.8	MIN	0	AC-FT	133	M3x1000	1
WTR YEAR 1992	TOTAL	8,236.0	MEAN	22.5	MAX	704	MIN	0	AC-FT	16,336	M3x1000	20,1

* Incomplete Record

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR Oct 1991 TO Sep 1992

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1		15	4.7	43	25	154		416	32	33	148	182
2		13	5.5	44	25	2,880	416	416	33		141	192
3		11	4.6	25	24	8,920	416	416	34	146	134	167
4		10	3.7	30	24	410	416	416	31	138	146	164
5		8.5	18	369	24	392	416	416	32	132	133	163
6		8.2	31	21	951	1,370	416	416	31	139	158	156
7		8.1	32	699	1,740	424	416	423	30	156	169	149
8		8.2	13	46	33	441	416	428	29	168	144	179
9		8.4	33	25	497	440	416	428	31	159	131	203
10	38	7.8	36	22	11,100	429	416	428	31	159	131	178
11	33	8.4	33	21	9,360	428	416	422	32	161	145	182
12	33	8.1	35	20	16,400	428	416	416	35	336	159	178
13	35	6.8	34	21	14,500	428	416	416	29	146	143	177
14	32	7.0	33	21	20,200	419	416	416	27	148	148	187
15	30	7.5	33	20	16,700	416	416	245	28	161	153	197
16	34	7.4	32	22	244	416	416	34	31	149	149	200
17	34	7.3	30	24	205	416	416	34	33	154	147	172
18	31	7.1	27	22	195	410	416	34	30	147	162	185
19	31	7.1	26	21	186	404	416	31	30	144	171	187
20	30	6.7	27	23	177	2,800	416	33	29	142	148	179
21	29	5.7	27	26	172	1,140	416	31	28	159	145	176
22	29	4.8	26	27	174	1,450	416	32	27	165	144	182
23	28	4.7	26	26	166	2,470	416	30	29	129	158	198
24	26	4.7	24	25	166	280	416	28	28	149	154	163
25	31	4.7	24	26	163	174	416	29	28	149	164	181
26	31	3.9	23	25	163	236	416	32	24	139	172	189
27	111	3.7	23	27	159		416	33	28	133	158	175
28	68	4.2	285	23	158		416	32	29	141	162	166
29	23	4.0	1,450	22	157		416	32	28	150	158	187
30	23	4.4	214	27	------		416	31	30	129	156	197
31	19	------	35	28	------		-----	31	------		164	------
TOTAL	779	216.4	2,648.5	1,821	94,088	28,175	12,064	6,625	897	4,361	4,695	5,391
MEAN	35.4	7.21	85.4	58.7	3,244	1,084	416	214	29.9	150	151	180
MAX	111	15	1,450	699	20,200	8,920	416	428	35	336	172	203
MIN	19	3.7	3.7	20	24	154	416	28	24	33	131	149
AC-FT	1,550	429	5,250	3,610	186,600	55,890	23,930	13,140	1,780	8,650	9,310	10,690
	*					*	*			*		

CAL YEAR 1991	TOTAL*	3,643.9	MEAN	43.9	MAX	1,450	MIN	3.7	AC-FT	7,230
WTR YEAR 1992	TOTAL*	161,760.9	MEAN	463	MAX	20,200	MIN	3.7	AC-FT	320,800

* Incomplete Record

APPENDIX C

WELLS DRILLED AND DESTROYED

WELLS DESTROYED 1991-92

Party	Well No.	Owner No.	Purpose
Lockheed Corp.	*	A-1-MW4	Monitoring
Lockheed Corp.	*	B-1-MW1	Monitoring
Lockheed Corp.	*	B-1-MW2	Monitoring
Lockheed Corp.	*	B-1-MW3	Monitoring
Lockheed Corp.	*	B-1-MW4	Monitoring
Lockheed Corp.	*	B-1-MW5	Monitoring
Lockheed Corp.	*	B-1-MW6	Monitoring
Lockheed Corp.	*	B-1-MW7	Monitoring
Lockheed Corp.	*	B-6-MW1	Monitoring
Lockheed Corp.	*	B-6-MW2	Monitoring
Hughes Aircraft Co.	*	----	Monitoring

WELLS DRILLED 1991-92**

Party	Well No.	Owner No.	Purpose
3M-Pharmaceuticals	*	----*	Monitoring
3M-Pharmaceuticals	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Monitoring
Lockheed Corp.	*	----	Observation
Lockheed Corp.	*	----	Pilot Extraction
Lockheed Corp.	*	----	Piezometer
Lockheed Corp.	*	----	Piezometer

* - Have not been assigned Los Angeles County Department of Public Works well numberts.

** As of September 30, 1992

WELLS DRILLED DURIN 1991-92 FOR MAJOR GROUND WATER POLLUTION INVESTIGATIONS

Party

Allied - Signal Aerospace Co. (Formerly Bendix Corp.) - No new wells (for a total of 7 monitoring wells).

Hughes Aircraft Company - Abandoned one well for a total of 33 monitoring wells on and off site.

Philips Components - No new wells (for a total of 20 existing and 2 extraction wells).

Lockheed - Drilled 26 additional wells and abandoned 11 monitoring wells (for a total of 116 existing wells) for site evaluation, testing, and monitoring - one well is capable of being used as an extraction well.

3M-Pharmaceutical - Two new wells drilled (for a total of 35 wells) for site evaluation, testing, and monitoring.

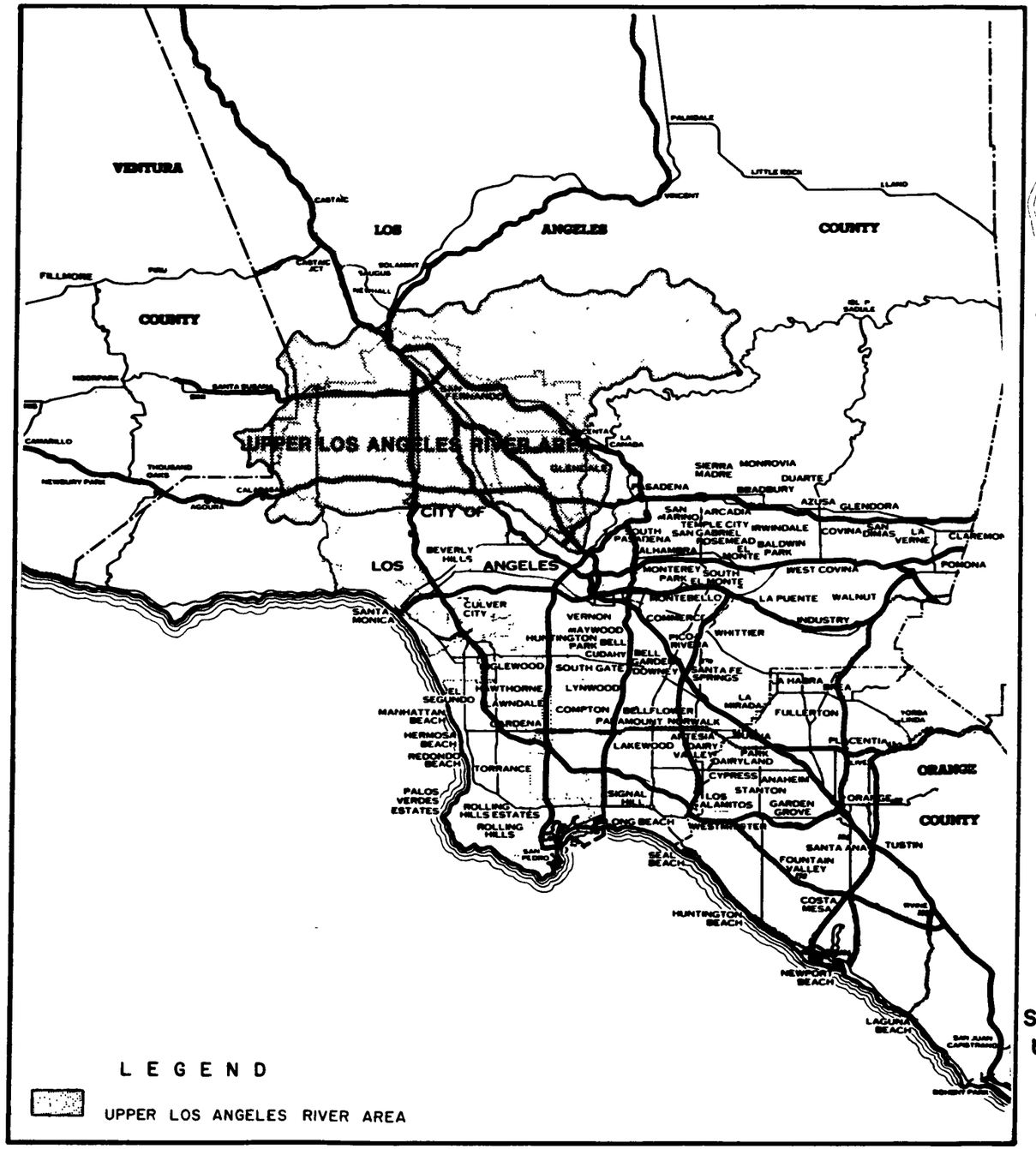
Rocketdyne - No additional wells (for a total of 105) for site evaluation, testing, and monitoring - 11 wells are capable of being used as extraction wells.

APPENDIX D

PLATES

PLATE 1

UPPER LOS ANGELES RIVER AREA WATERMASTER

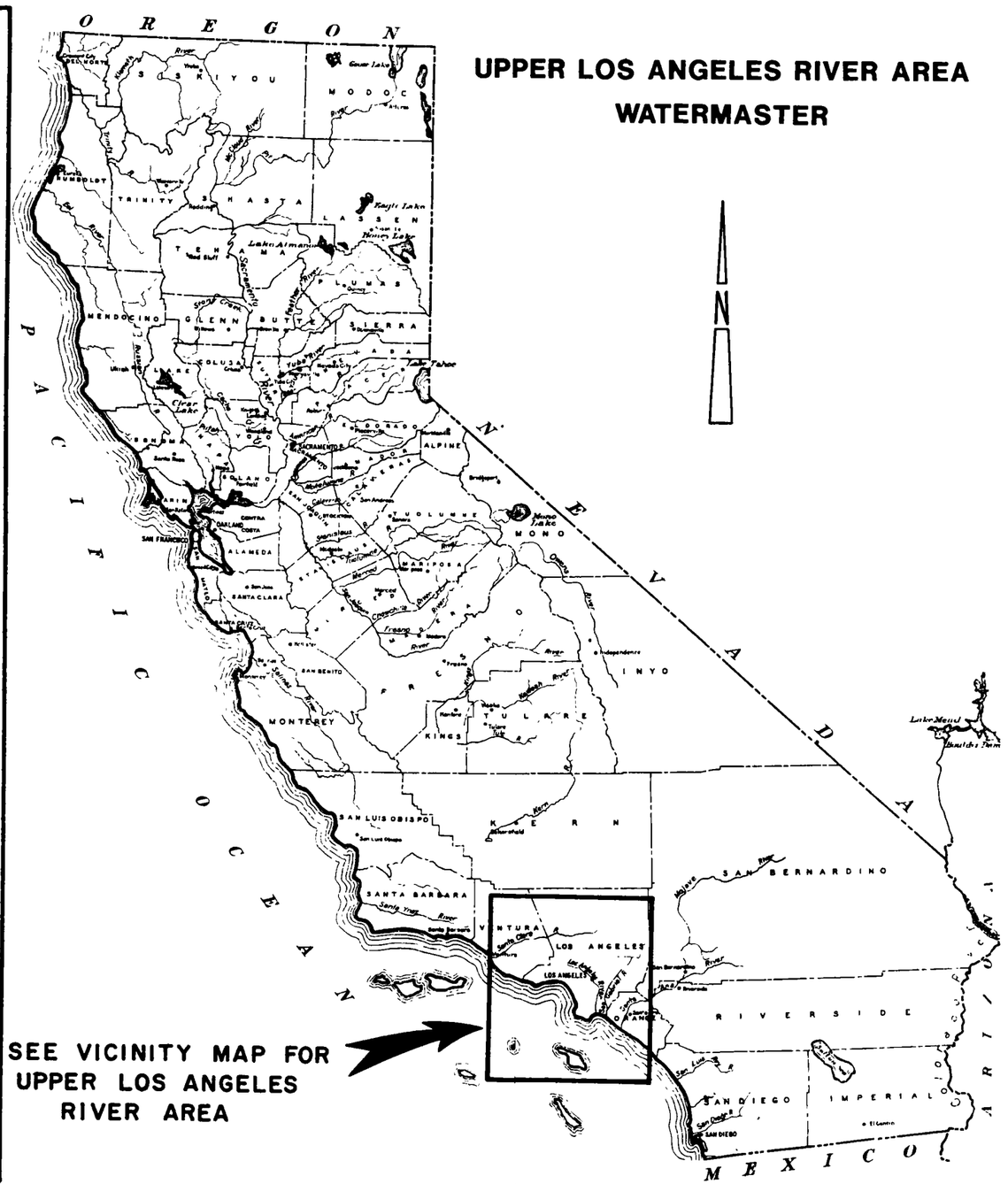


VICINITY MAP

SCALE

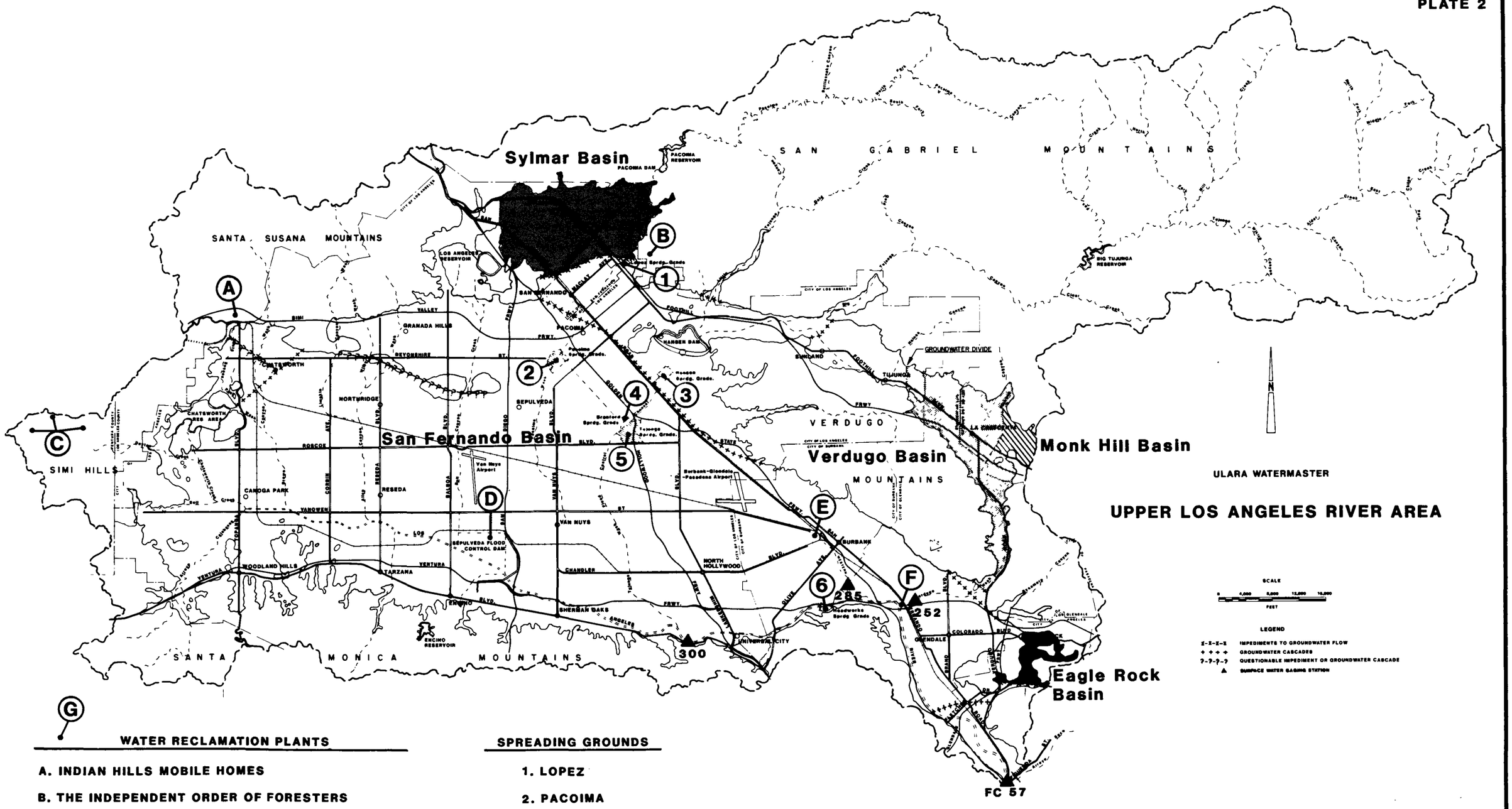
0 5 10 15 Miles

SEE VICINITY MAP FOR UPPER LOS ANGELES RIVER AREA



LOCATION MAP

PLATE 2



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

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
- ▲ SURFACE WATER GAGING STATION

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

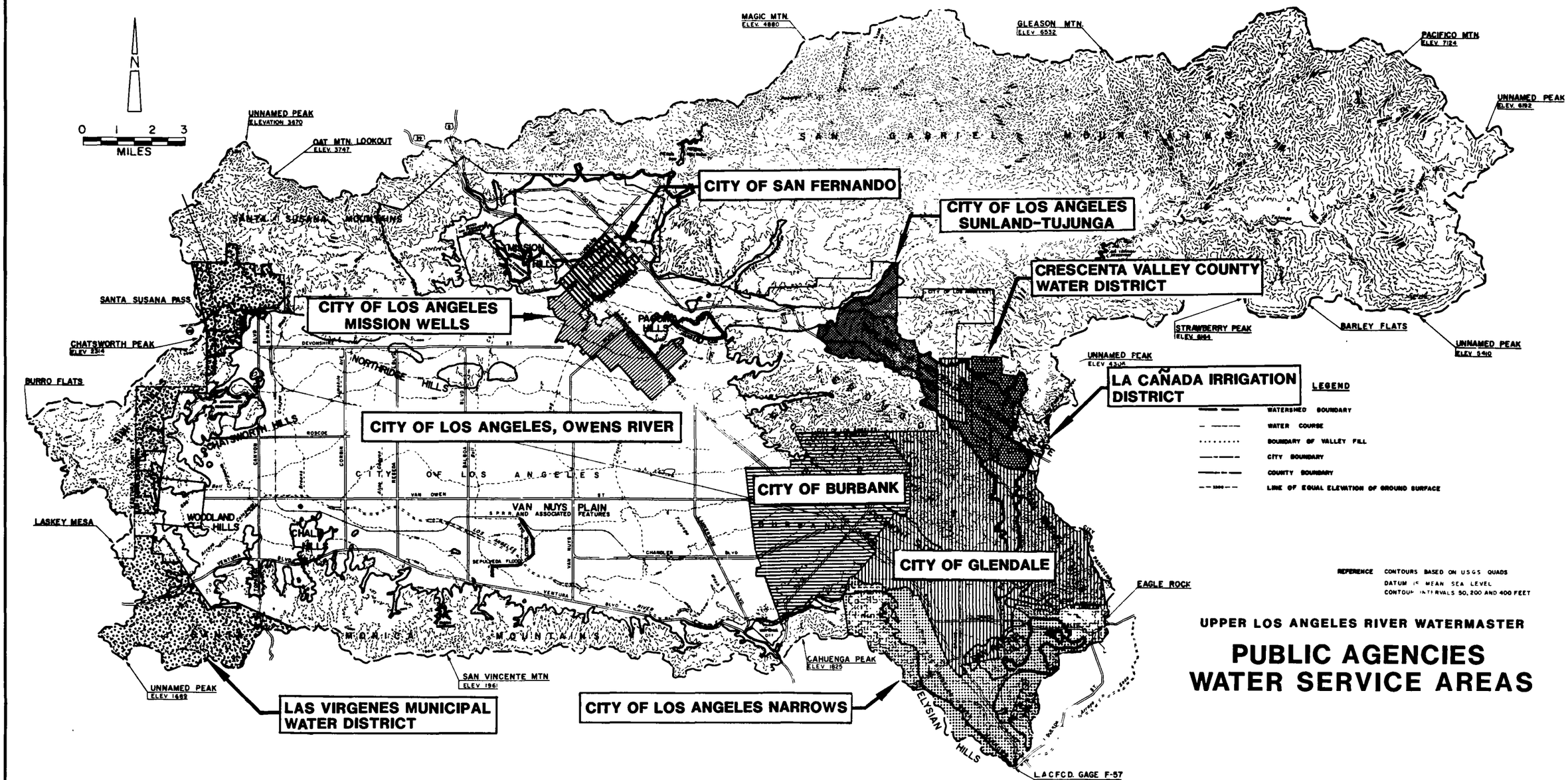
G. TAPIA WATER RECLAMATION PLANT

SPREADING GROUNDS

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

MRG 3/89

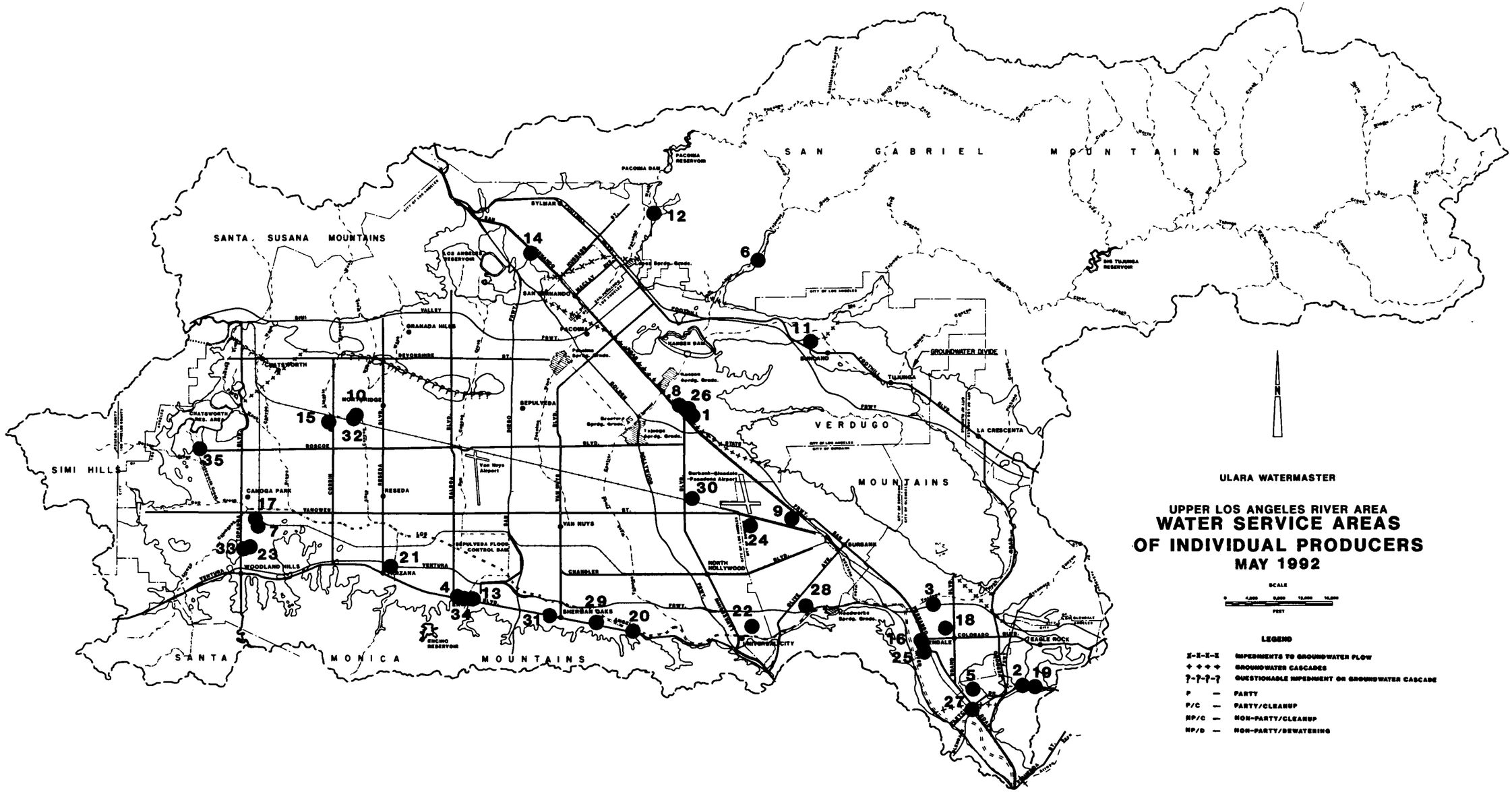
PLATE 3



UPPER LOS ANGELES RIVER WATERMASTER

PUBLIC AGENCIES WATER SERVICE AREAS

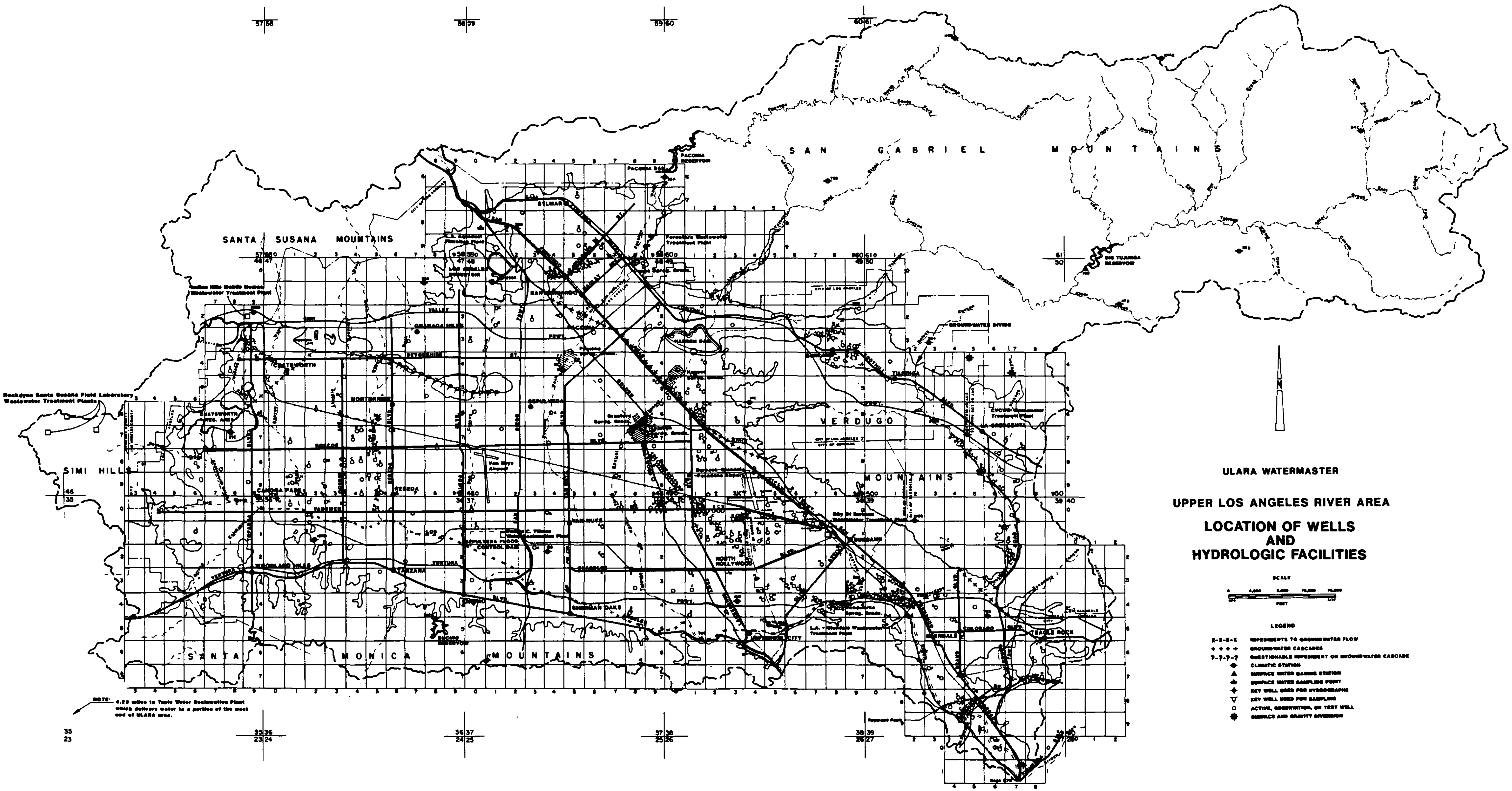
PLATE 4



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

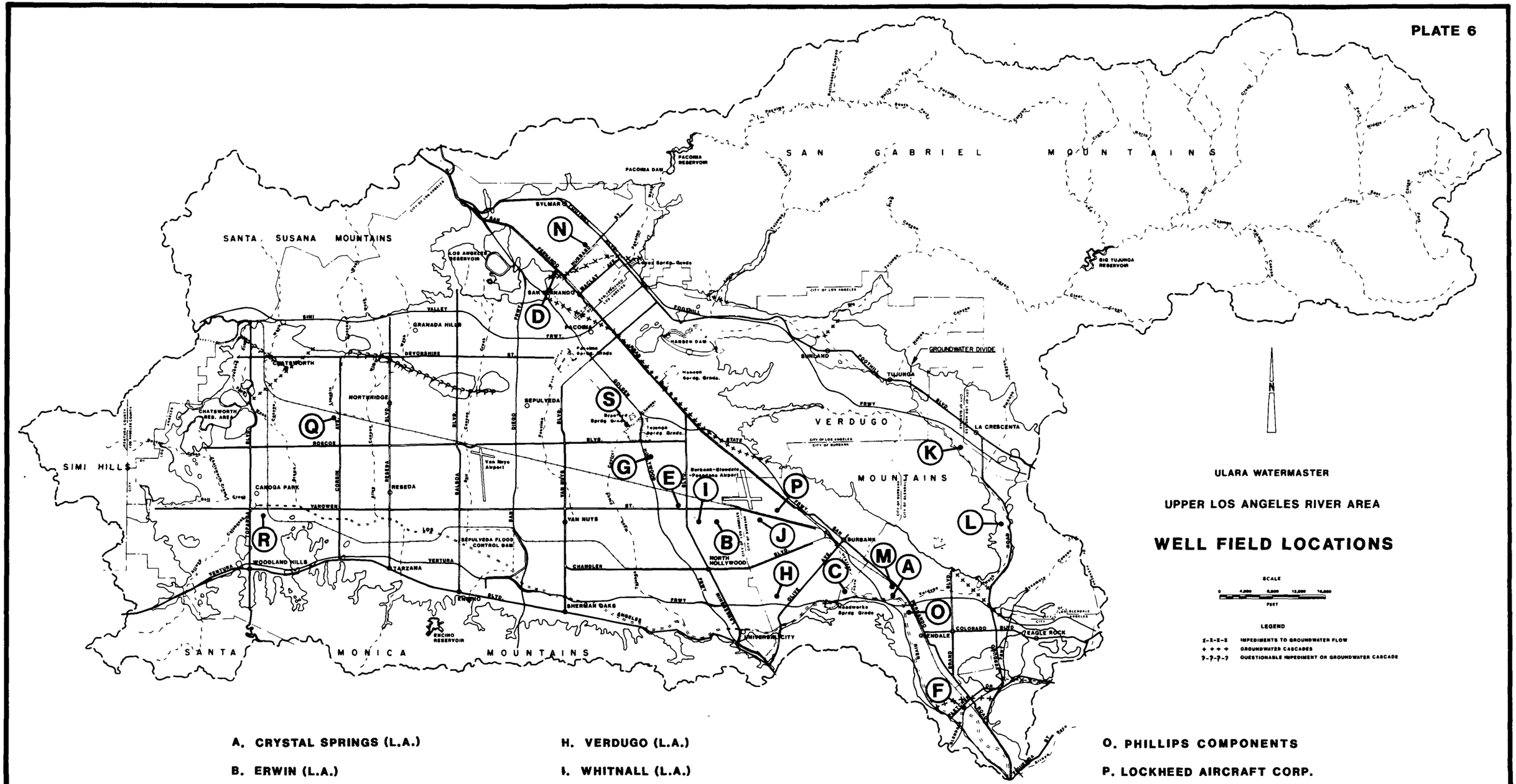
0 4,000 8,000 12,000 16,000

FEET

LEGEND

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

PLATE 6



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.

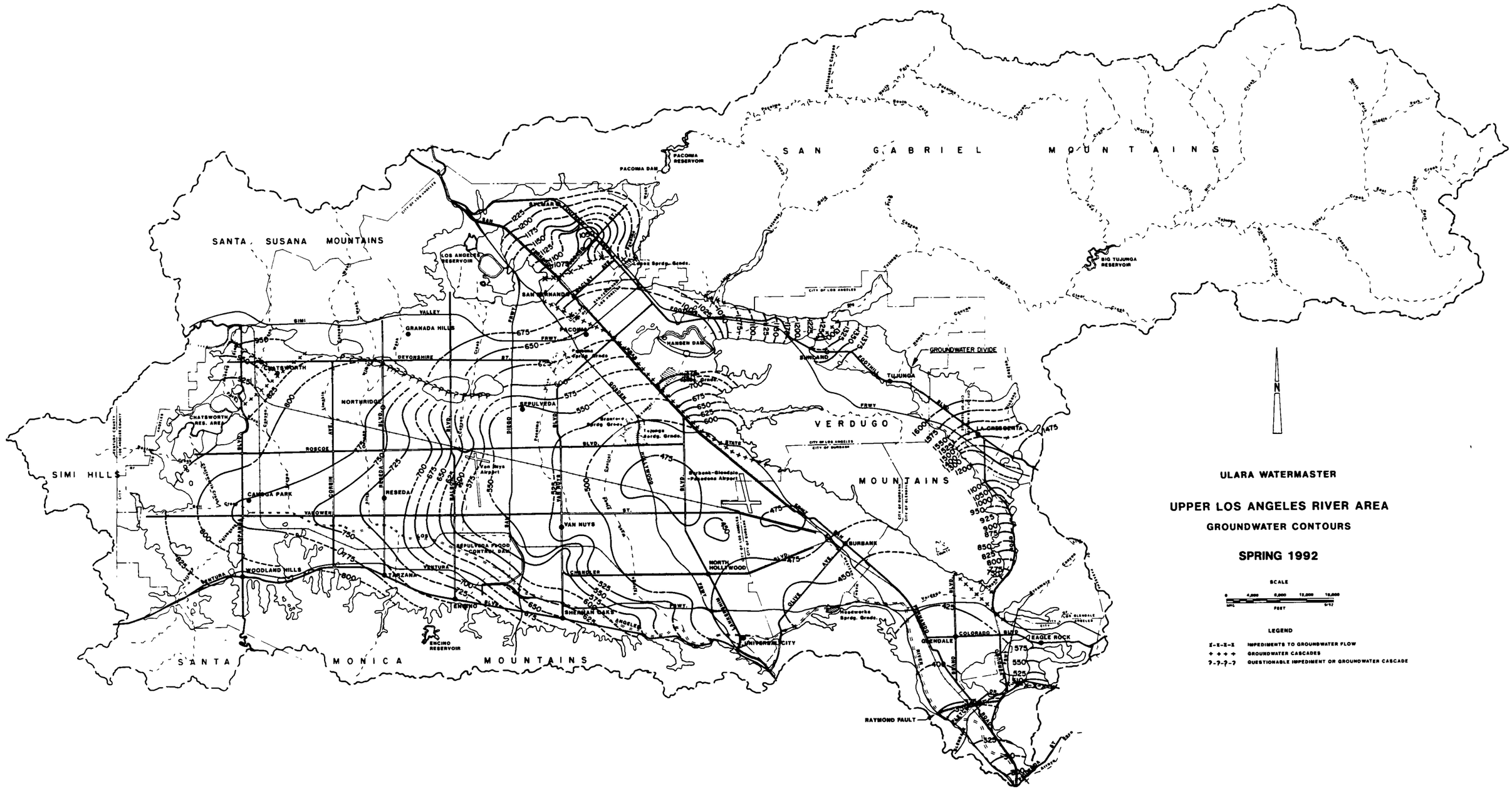
Q. 3M-PHARMACEUTICAL

R. ROCKWELL INTERNATIONAL

S. TUJUNGA (L.A.)

MRG 3/89

PLATE 7



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA
GROUNDWATER CONTOURS

SPRING 1992

SCALE

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

FEET

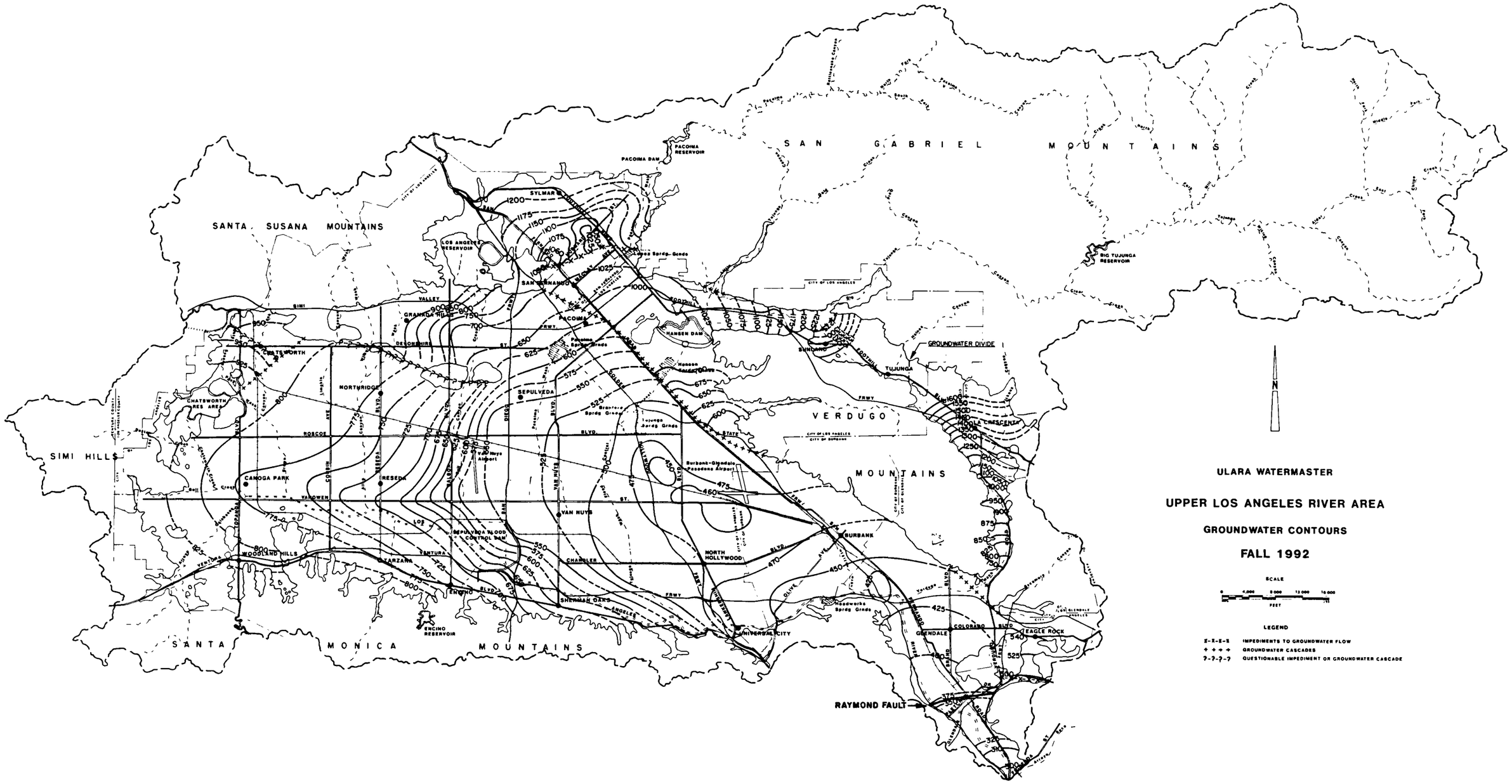
LEGEND

X-X-X-X IMPEDIMENTS TO GROUNDWATER FLOW

+ + + + GROUNDWATER CASCADES

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

PLATE 8



N

ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

GROUNDWATER CONTOURS

FALL 1992

SCALE

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

FEET

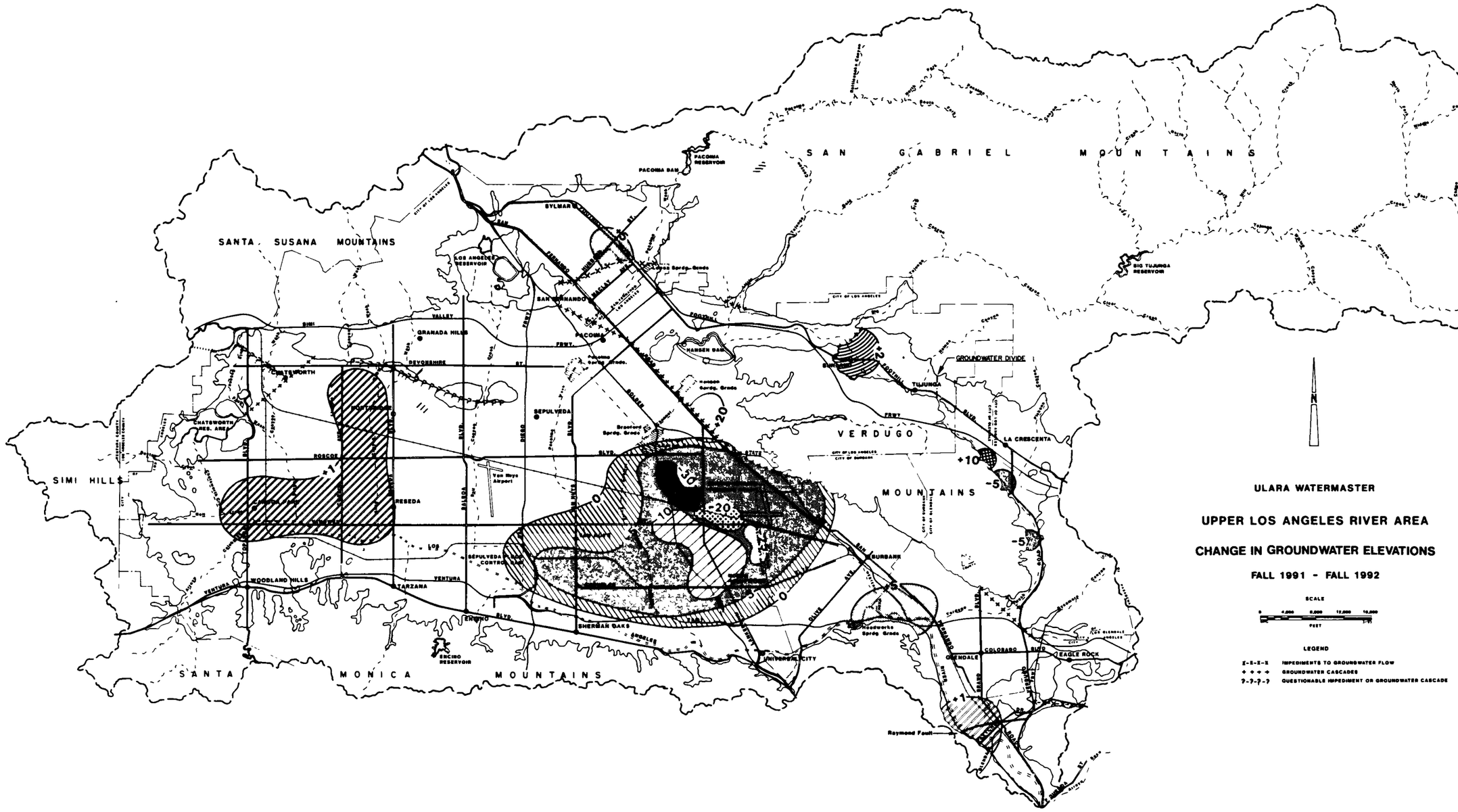
LEGEND

E-E-E-E IMPEDIMENTS TO GROUNDWATER FLOW

+ + + + GROUNDWATER CASCADES

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

PLATE 9



ULARA WATERMASTER

UPPER LOS ANGELES RIVER AREA

CHANGE IN GROUNDWATER ELEVATIONS

FALL 1991 - FALL 1992

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

REVISED MR MARCH 93

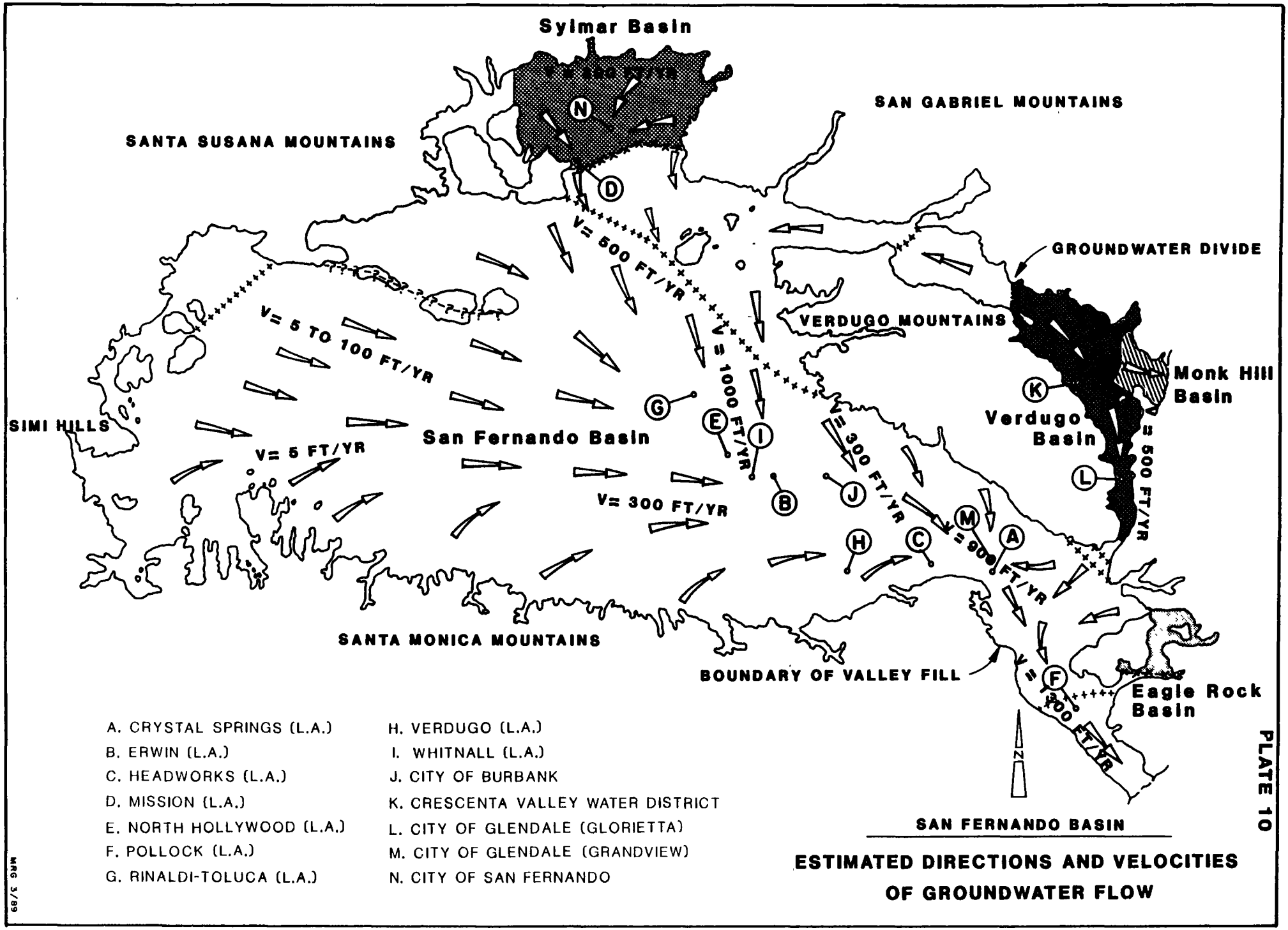
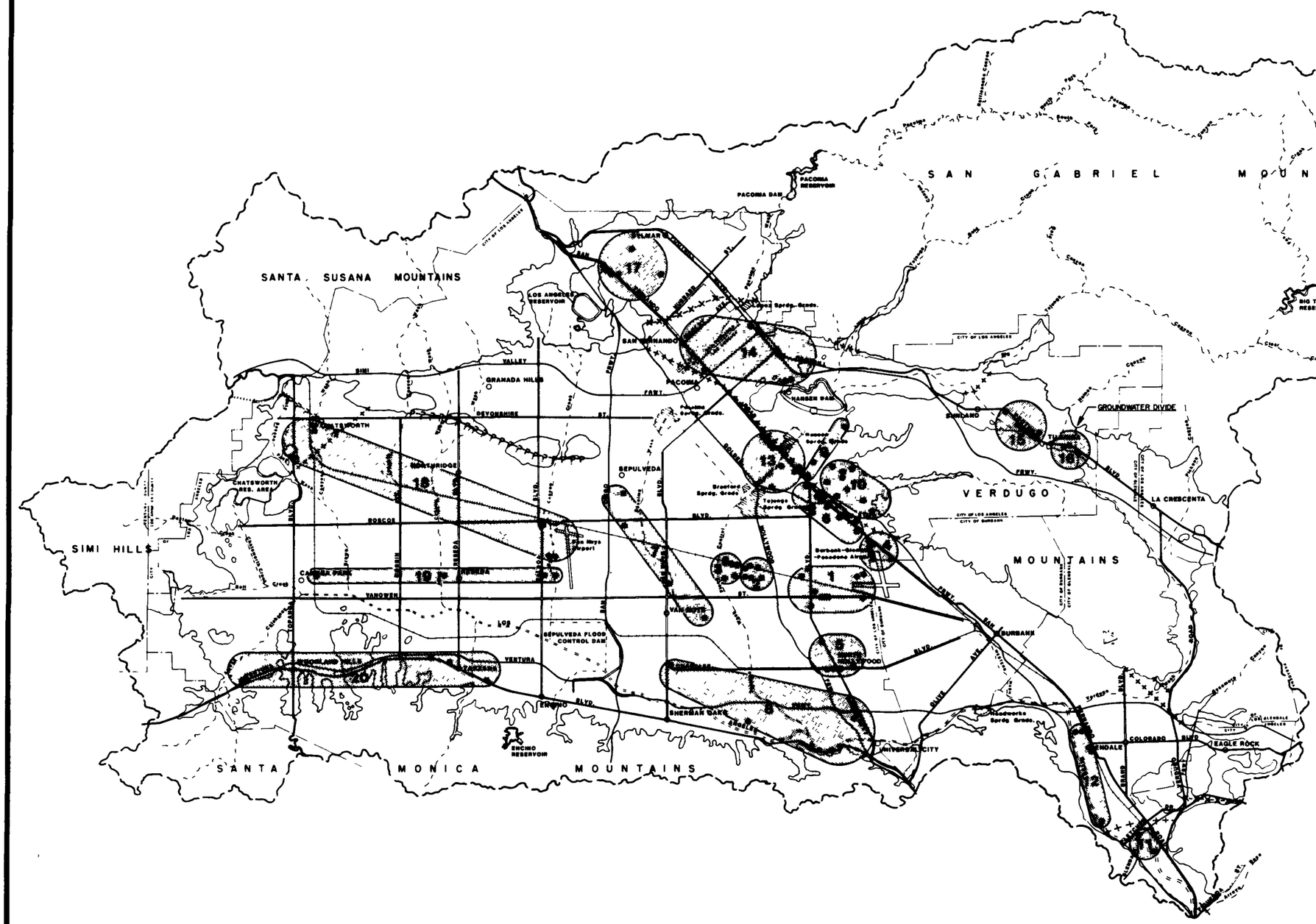

Sylmar Basin
SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
GROUNDWATER DIVIDE
V= 500 FT/YR
V= 5 TO 100 FT/YR
VERDUGO MOUNTAINS
Monk Hill Basin
Verdugo Basin
V= 1000 FT/YR
V= 300 FT/YR
V= 500 FT/YR
SIMI HILLS
San Fernando Basin
V= 5 FT/YR
V= 300 FT/YR
V= 900 FT/YR
SANTA MONICA MOUNTAINS
BOUNDARY OF VALLEY FILL
Eagle Rock Basin
V= 300 FT/YR
N
D
G
E
I
B
J
K
L
M
A
H
C
F
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 WATER DISTRICT
L. CITY OF GLENDALE (GLORIETTA)
M. CITY OF GLENDALE (GRANDVIEW)
N. CITY OF SAN FERNANDO
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

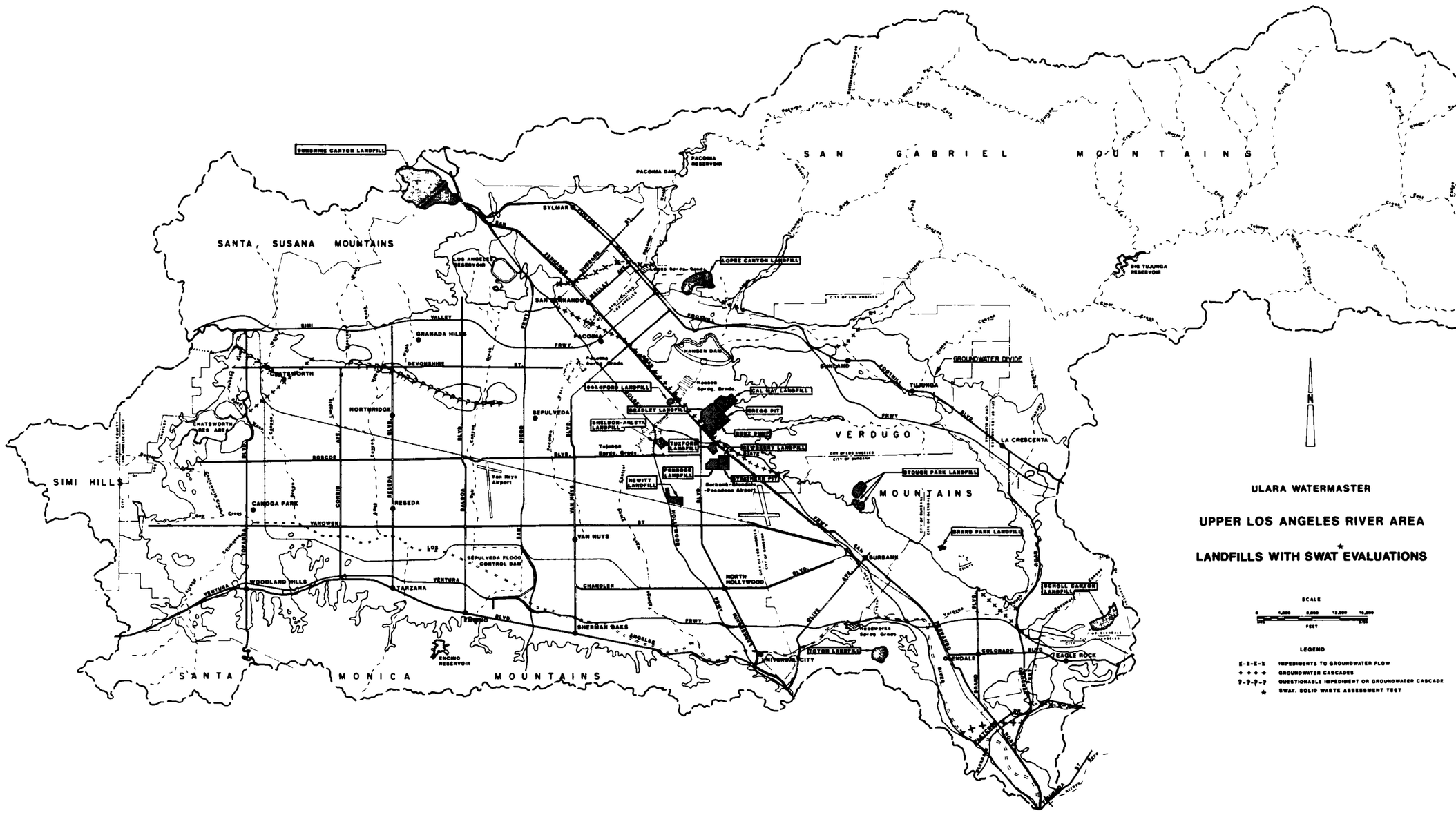
FEET

LEGEND

- E-E-E-E 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, 1992 - STATUS OF GROUNDWATER STORAGE

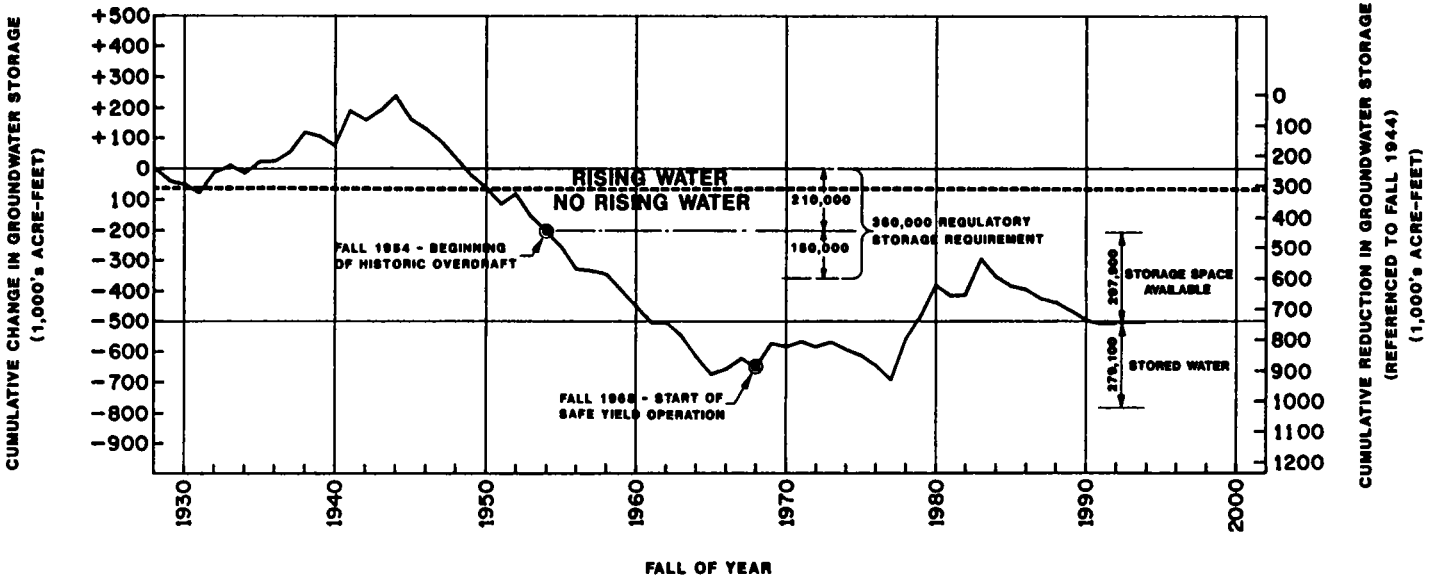


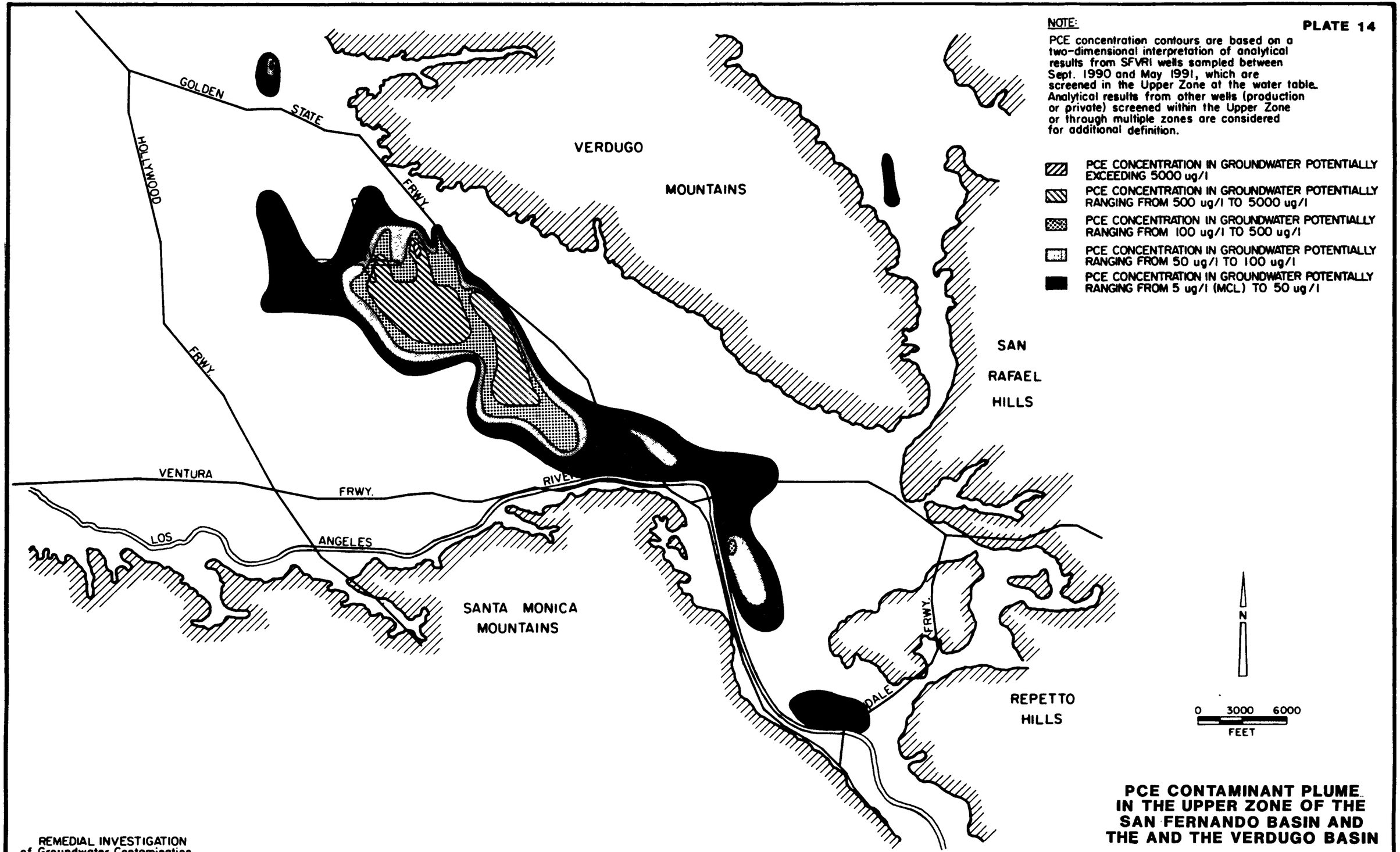
PLATE 13

PLATE 14

NOTE:

PCE concentration contours are based on a two-dimensional interpretation of analytical results from SFVRI wells sampled between Sept. 1990 and May 1991, which are screened in the Upper Zone at the water table. Analytical results from other wells (production or private) screened within the Upper Zone or through multiple zones are considered for additional definition.

- PCE CONCENTRATION IN GROUNDWATER POTENTIALLY EXCEEDING 5000 ug/l
- PCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 500 ug/l TO 5000 ug/l
- PCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 100 ug/l TO 500 ug/l
- PCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 50 ug/l TO 100 ug/l
- PCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 5 ug/l (MCL) TO 50 ug/l



PCE CONTAMINANT PLUME IN THE UPPER ZONE OF THE SAN FERNANDO BASIN AND THE AND THE VERDUGO BASIN

REMEDIAL INVESTIGATION
of Groundwater Contamination
in the San Fernando Valley

BY: MONTGOMERY-WATSON (Adapted from)

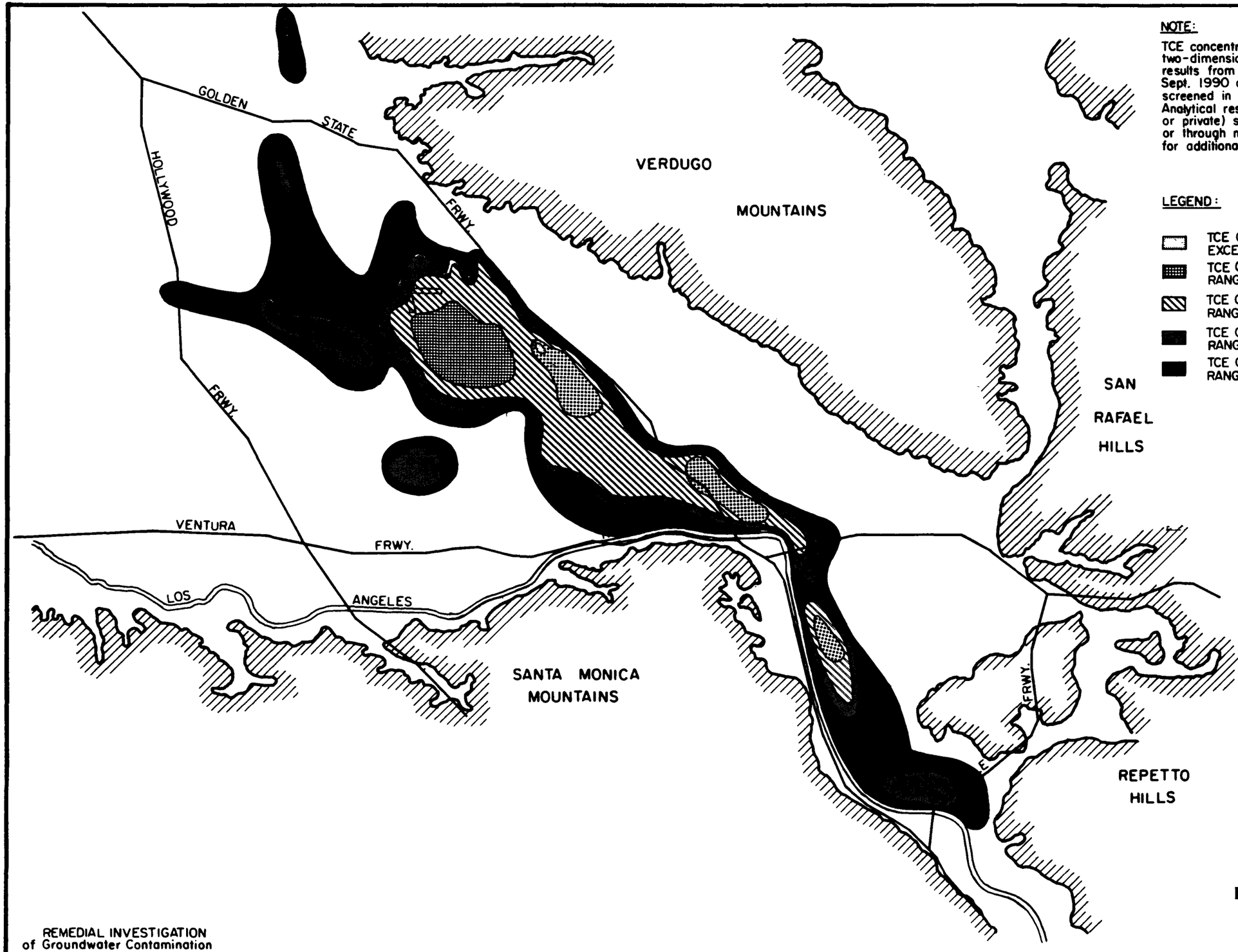
PLATE 15

NOTE:

TCE concentration contours are based on a two-dimensional interpretation of analytical results from SFVRI wells sampled between Sept. 1990 and May 1991, which are screened in the Upper Zone at the water table. Analytical results from other wells (production or private) screened within the Upper Zone or through multiple zones are considered for additional definition.

LEGEND:

- TCE CONCENTRATION IN GROUNDWATEP POTENTIALLY EXCEEDING 5000 ug/l
- TCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 500 ug/l TO 5000 ug/l
- TCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 100 ug/l TO 500 ug/l
- TCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 50 ug/l TO 100 ug/l
- TCE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 5 ug/l (MCL) TO 50 ug/l



TCE CONTAMINANT PLUME IN THE UPPER ZONE OF THE SAN FERNANDO BASIN AND THE VERDUGO BASIN

REMEDIAL INVESTIGATION of Groundwater Contamination in the San Fernando Valley

BY: MONTGOMERY-WATSON (Adapted from)

PLATE 16

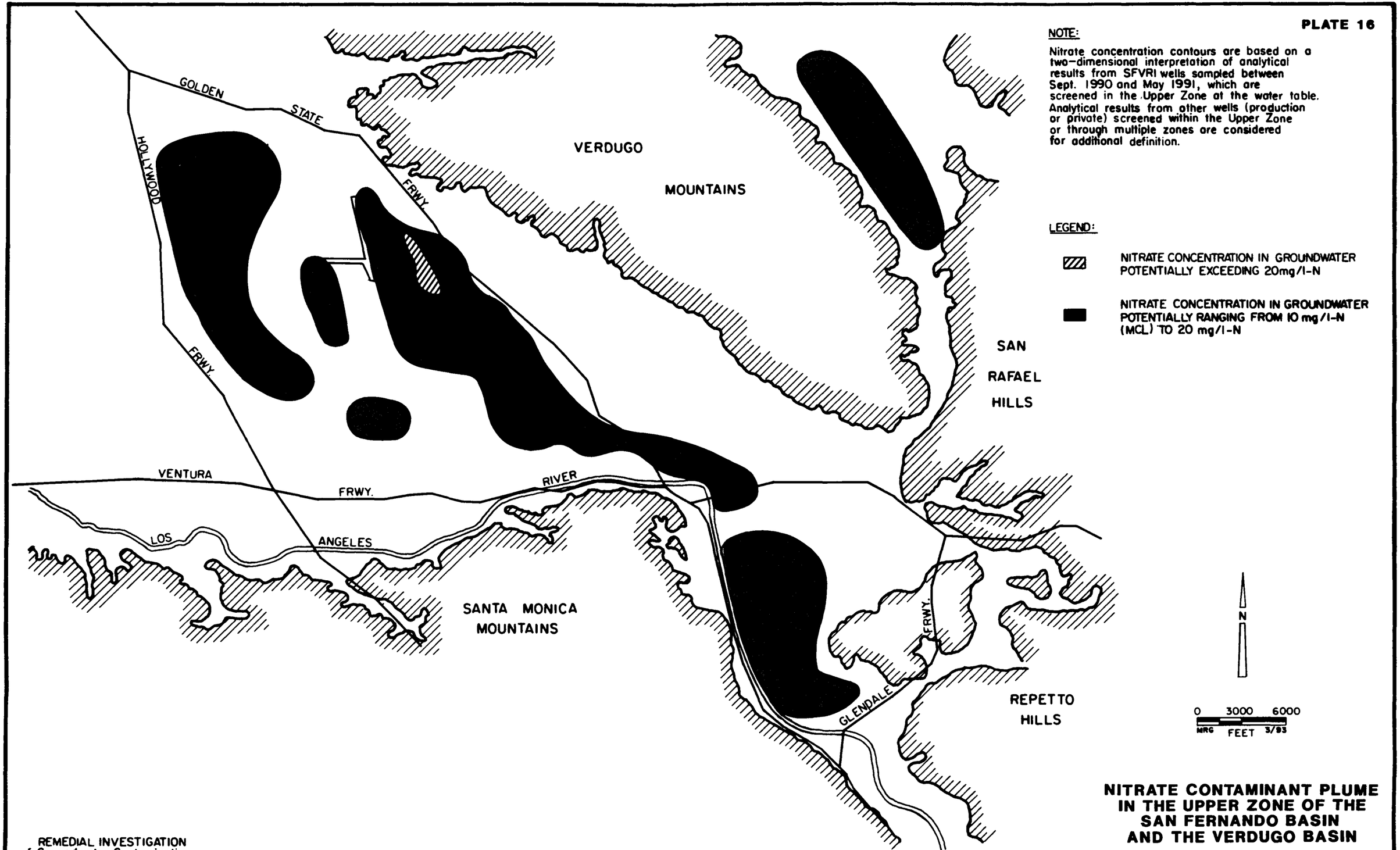
NOTE:

Nitrate concentration contours are based on a two-dimensional interpretation of analytical results from SFVRI wells sampled between Sept. 1990 and May 1991, which are screened in the Upper Zone at the water table. Analytical results from other wells (production or private) screened within the Upper Zone or through multiple zones are considered for additional definition.

LEGEND:

NITRATE CONCENTRATION IN GROUNDWATER POTENTIALLY EXCEEDING 20mg/l-N

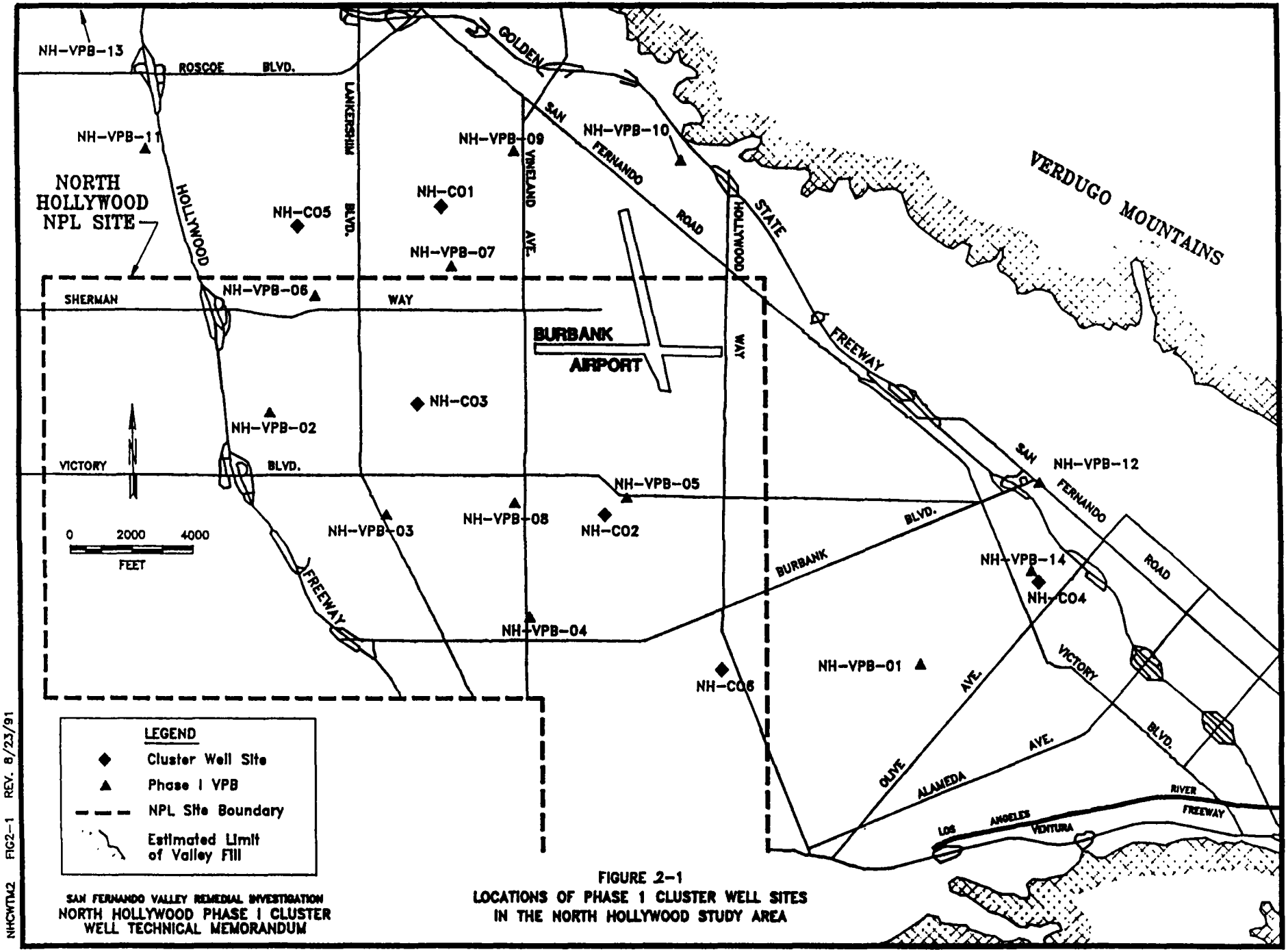
NITRATE CONCENTRATION IN GROUNDWATER POTENTIALLY RANGING FROM 10 mg/l-N (MCL) TO 20 mg/l-N



NITRATE CONTAMINANT PLUME IN THE UPPER ZONE OF THE SAN FERNANDO BASIN AND THE VERDUGO BASIN

REMEDIAL INVESTIGATION of Groundwater Contamination in the San Fernando Valley

BY: MONTGOMERY-WATSON (Adapted from)

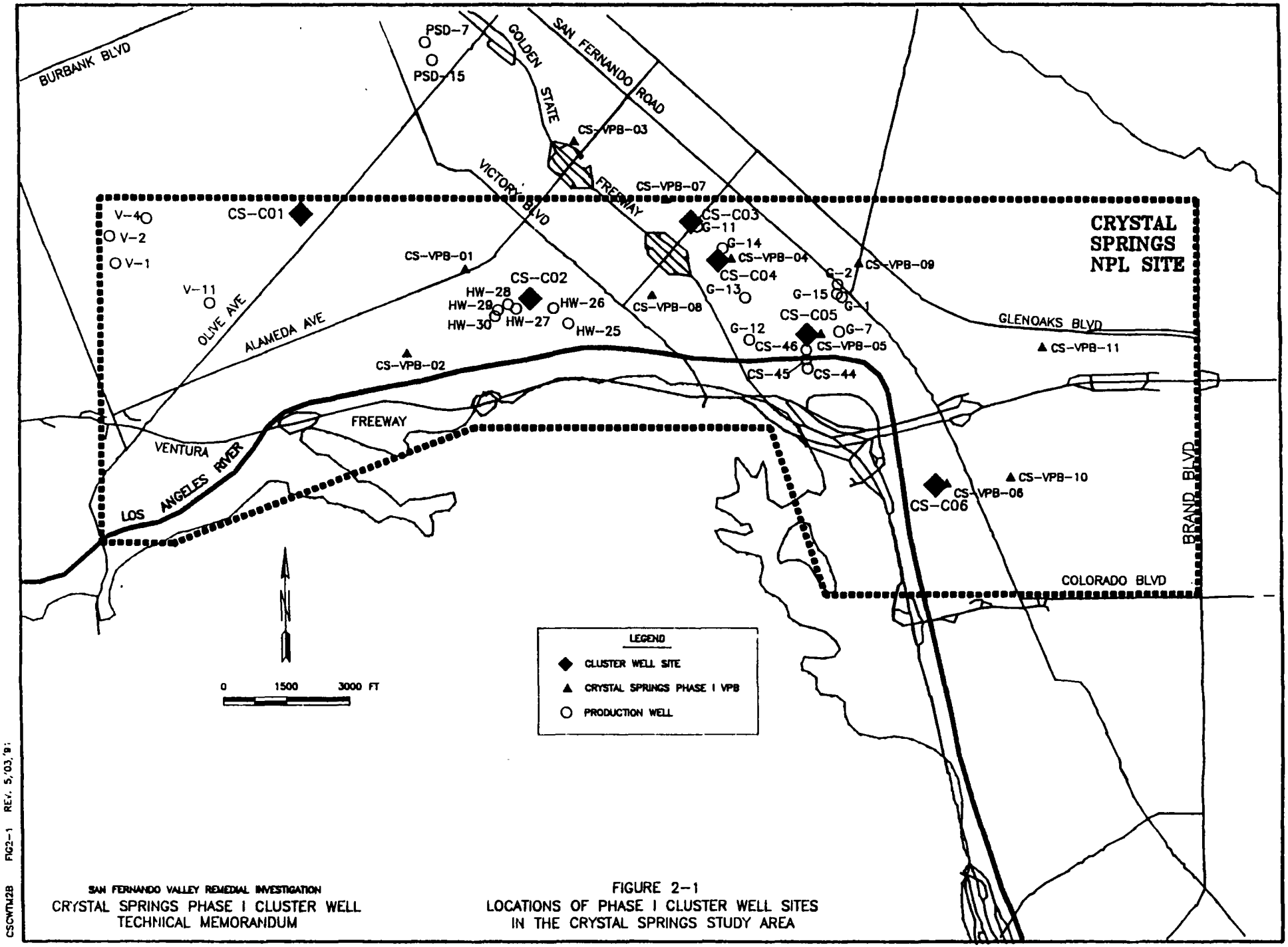


SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
NORTH HOLLYWOOD PHASE I CLUSTER WELL TECHNICAL MEMORANDUM

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

NHCWTM2 FIG2-1 REV. 8/23/91

PLATE 17

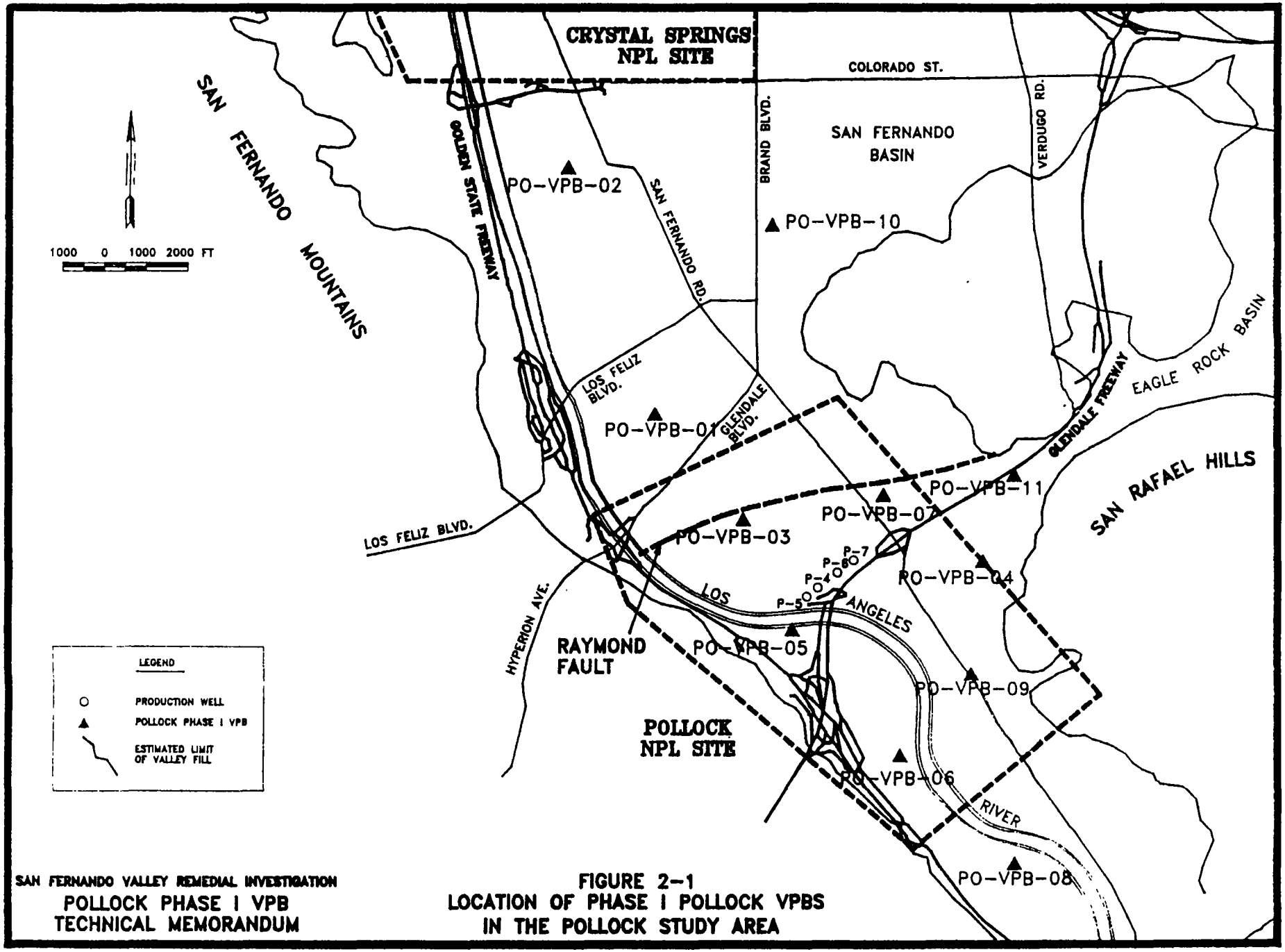


SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
CRYSTAL SPRINGS PHASE I CLUSTER WELL
TECHNICAL MEMORANDUM

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

PLATE 18

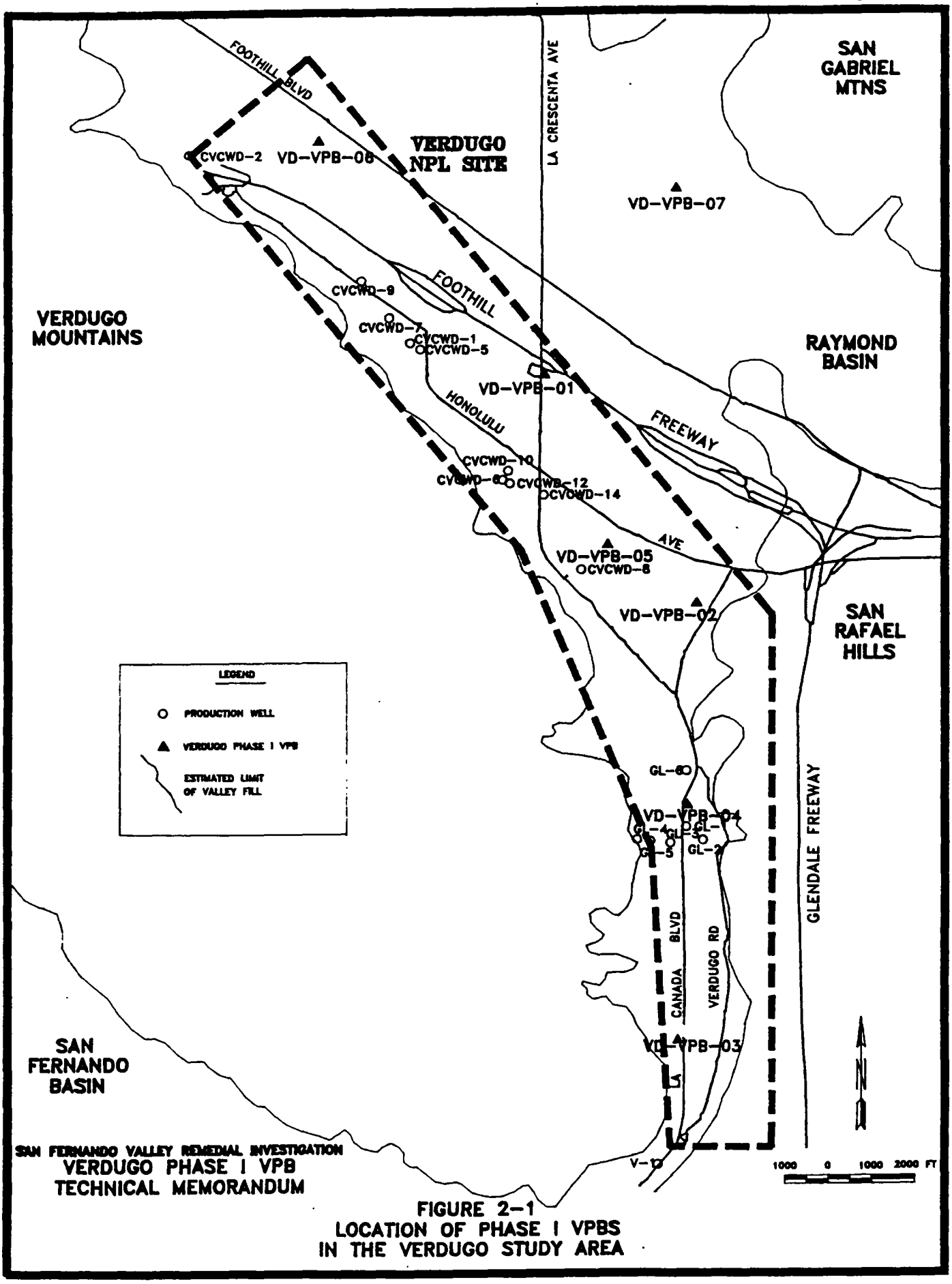
CSCWTM2B FIG2-1 REV. 5/03/91



SAN FERNANDO VALLEY REMEDIAL INVESTIGATION
POLLOCK PHASE I VPB
TECHNICAL MEMORANDUM

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

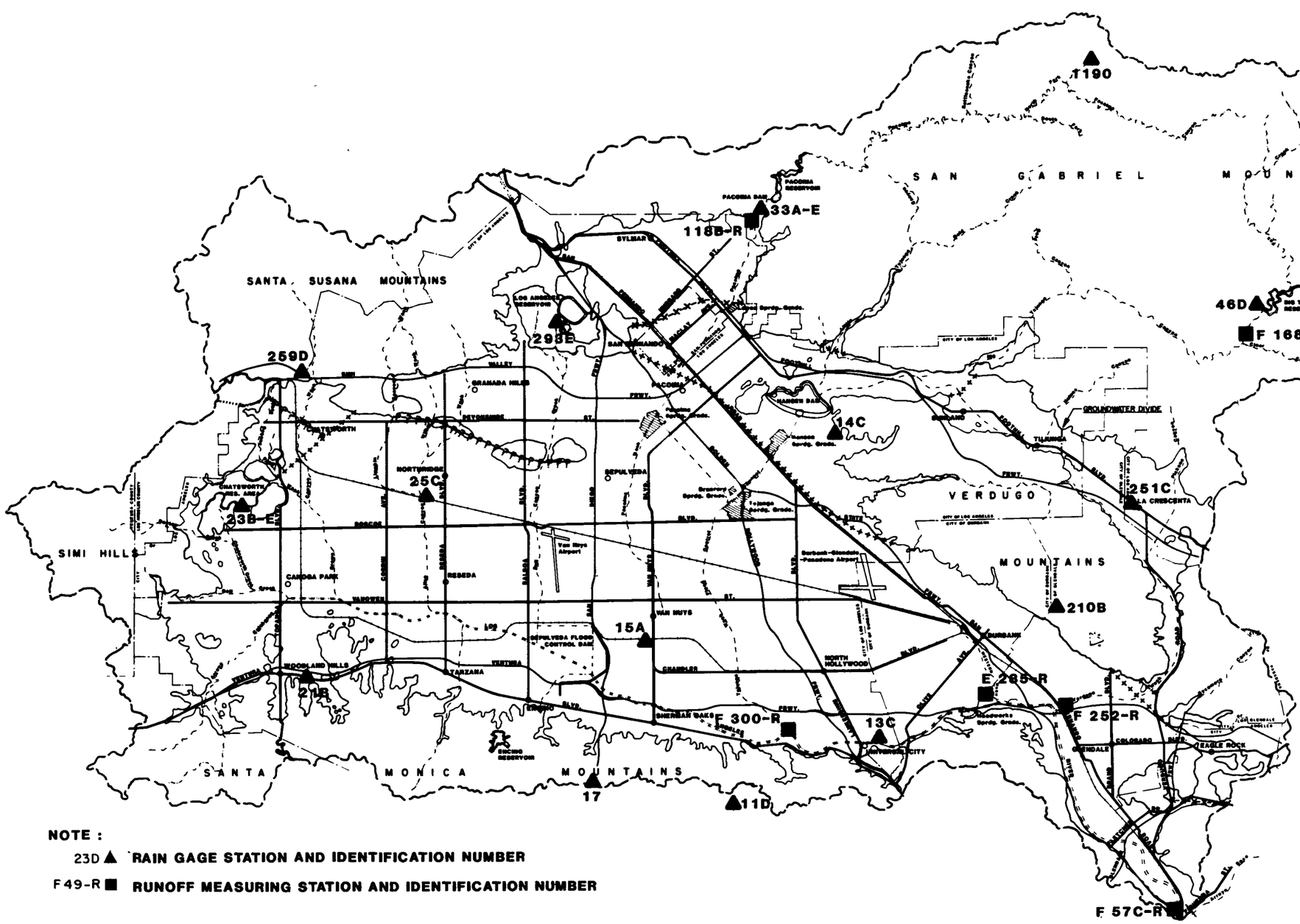
PLATE 19



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

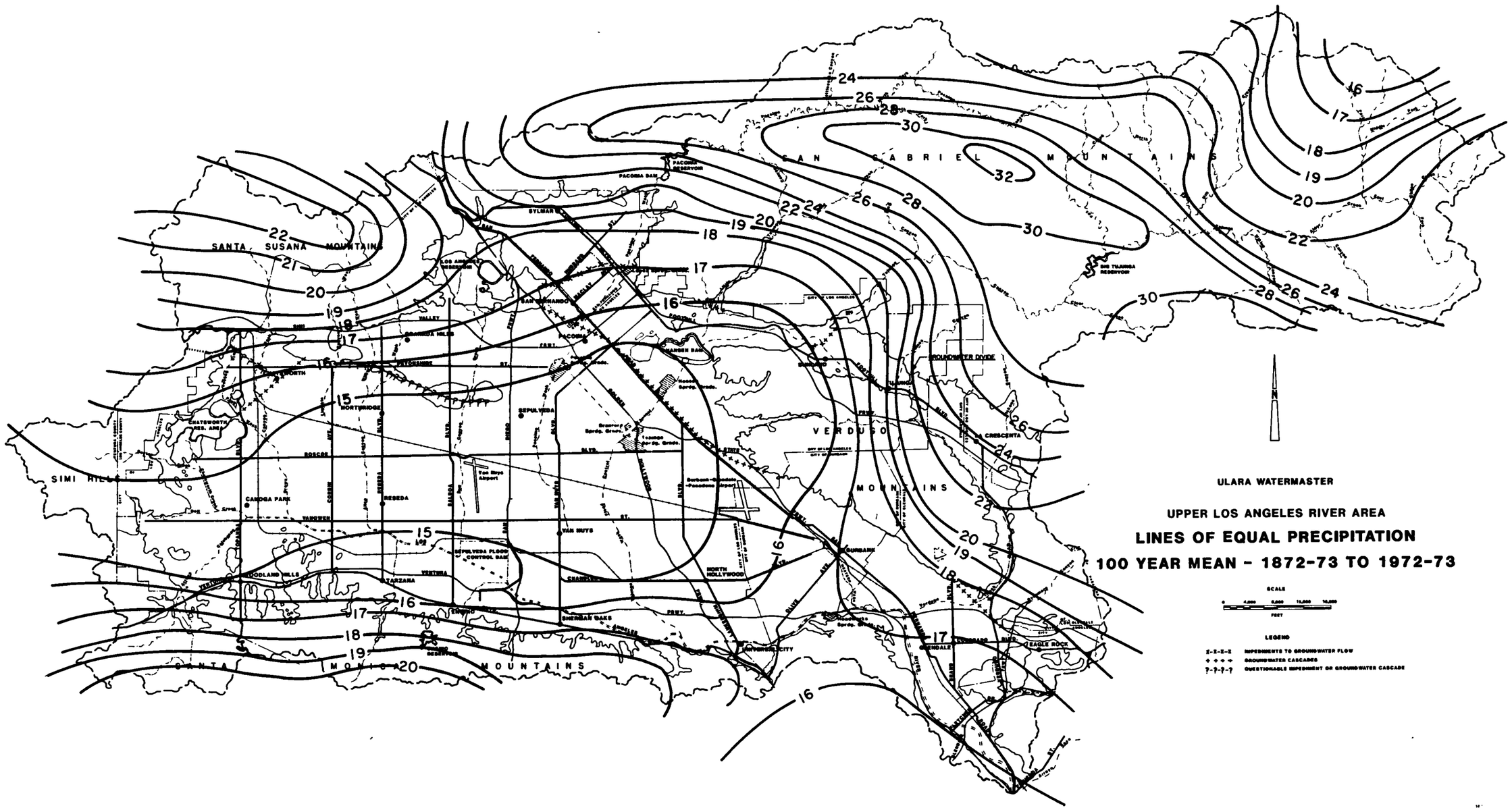
0 4,000 8,000 12,000 16,000 FEET

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

X-X-X-X IMPEDIMENTS TO GROUNDWATER FLOW

→ → → → GROUNDWATER CASCADES

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

SOURCE : LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

MRG 4/92

PLATE 23

PLANT B-6

PLANT C-1

PLANT A-1 EAST

PLANT A-1 NORTH

PLANT A-1 SOUTH

PLANT B-1

Golden State Freeway (5)

Southern Pacific Railroad

Victory Blvd.

Burbank Blvd.

N. Hollywood Way

Buena Vista St.

Victory Pl.

Valerio Ave.

Burbank Airport

LEGEND

⌖ Monitoring Well Location

N

0' 1000' 2000' 3000'

TETRA TECH, INC.
PASADENA, CALIFORNIA

LOCKHEED ENVIRONMENTAL SYSTEMS & TECHNOLOGIES COMPANY

PLANT B-1 BURBANK

FIGURE 2-1 STUDY AREA AND PLANT LOCATIONS

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 ground water - special needs (Non-Party)

D. Pumping of ground water - 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 ground water pumping

1. Application letter - (contact person; needs for pumping; location of wells; planned use and disposal) approval by Watermaster required.
2. Ground water pumped must be metered and monthly report made to Watermaster.
3. Ground water consumptively used - agreement needed with the city wherein the pumping occurs.
4. California Regional Water Quality Control Board (CRWQCB) - approval by CRWQCB as to the potential occurrence of ground water 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 ground water 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 ground water 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) 482-7412.
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 Department 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 ground water 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 ground water.

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 ground water, 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 ground water 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 ground water 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 unusual and shall justify the need for overextractions. The Watermaster shall review the existence and cessation of unusual circumstances and shall in his discretion 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. CalMat (Sun Valley #3)
5. CalMat (Old) Class 3 Site
6. Gregg Pit/Bentz
7. Hewitt
8. Lopez Canyon
9. Penrose/Newberry
10. Pendleton Street
11. Sheldon-Arleta
12. Scholl Canyon
13. Stough Park
14. Sunshine Canyon
15. Toyon
16. Tuxford

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

STATUS AS OF MAY 1993

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.

GROUND WATER FLOW DIRECTION - Southeasterly

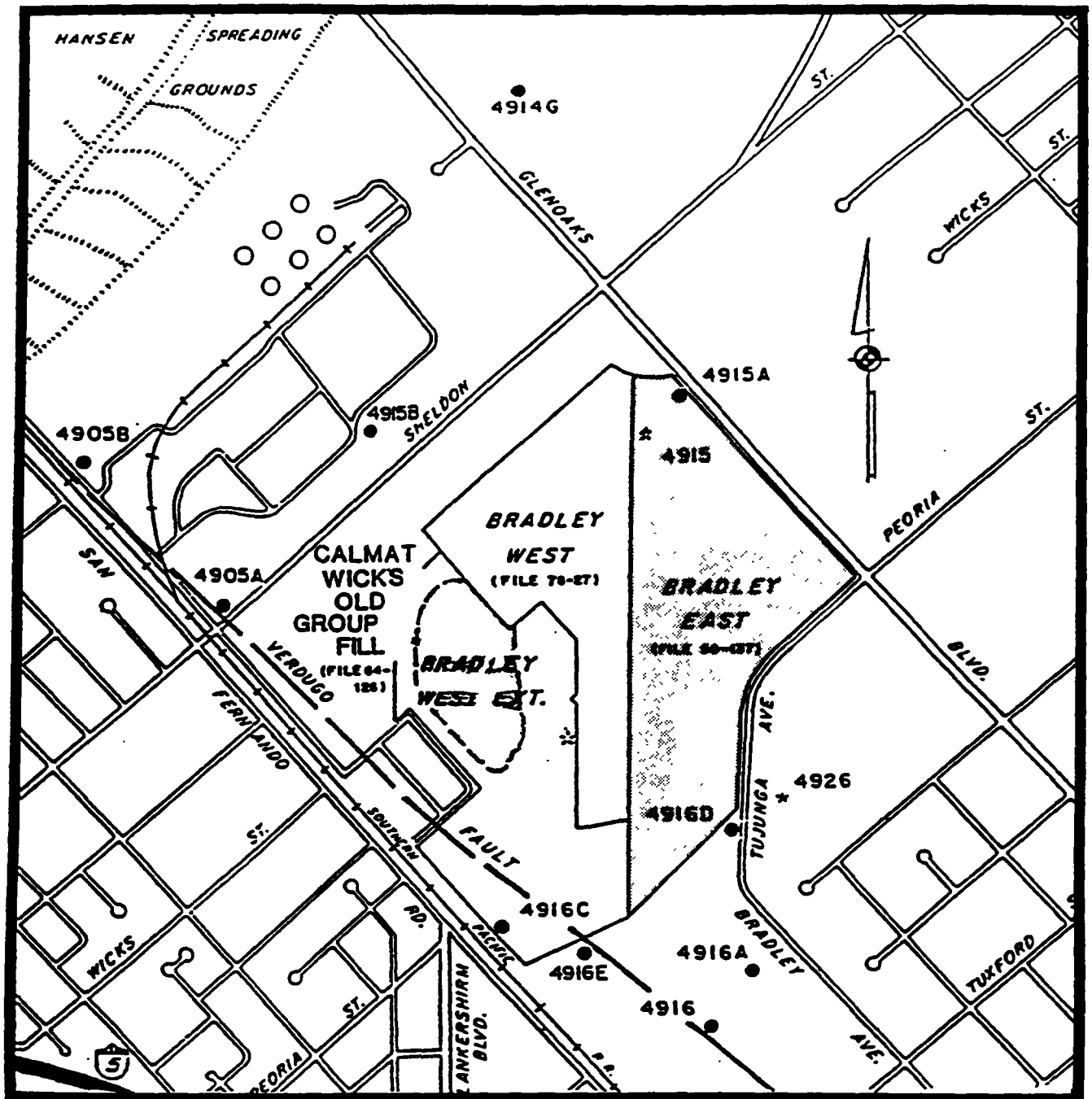
GENERAL OPERATIONS - Part of the 138-acre Bradley Landfill complex. Started accepting trash in 1960. Residential and commercial refuse with low moisture and nonhazardous waste. Stopped accepting trash in the early 1980s. Contains about 7.5 million tons of trash.

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

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

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

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



LOCATION OF MONITORING WELLS

LeROY CRANDALL AND ASSOCIATES

1. BRADLEY EAST DISPOSAL SITE

STATUS AS OF MAY 1993

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.

GROUND WATER FLOW DIRECTION - Southeasterly

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

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

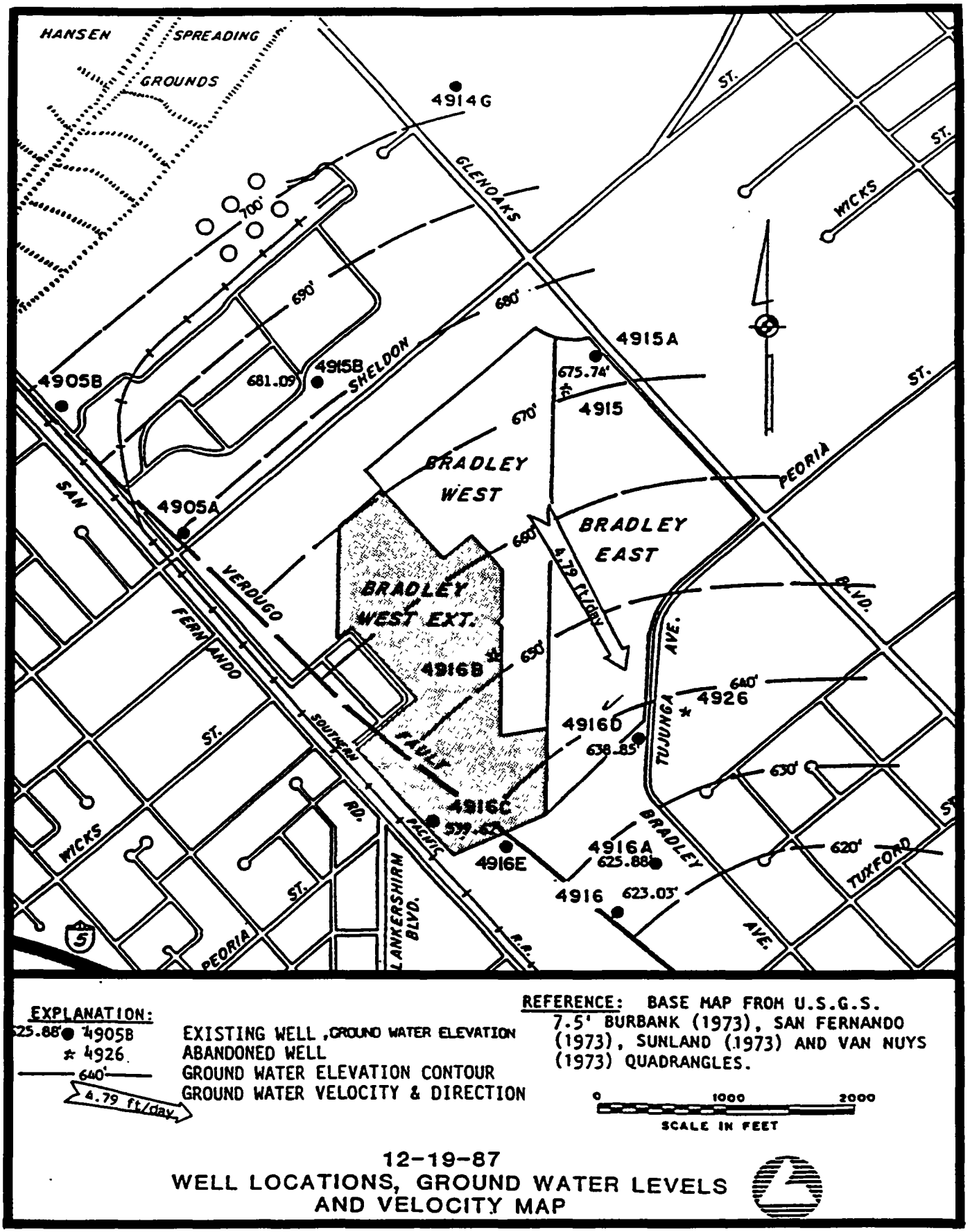
LEACHATE CONTROL AND MONITORING - System in operation since *. As of June 26, 1987, no leachate was detected. There was ponding during the water year 1981-82 and about 1/2 million gallons of water percolated into the trash prism. As placed, trash has about 25-percent moisture. Holding capacity is 40- to 53-percent moisture.

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

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

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

(*) - Dates unknown.



2. BRADLEY WEST DISPOSAL SITE

STATUS AS OF MAY 1993

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 the public. Accepted only solid, nonhazardous waste.

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

MINIMUM ELEVATION OF TRASH - 70 feet below ground surface.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted October 1990. Rejected SWAT Report April 1992 due to inadequate monitoring procedures. No further action required at this time.

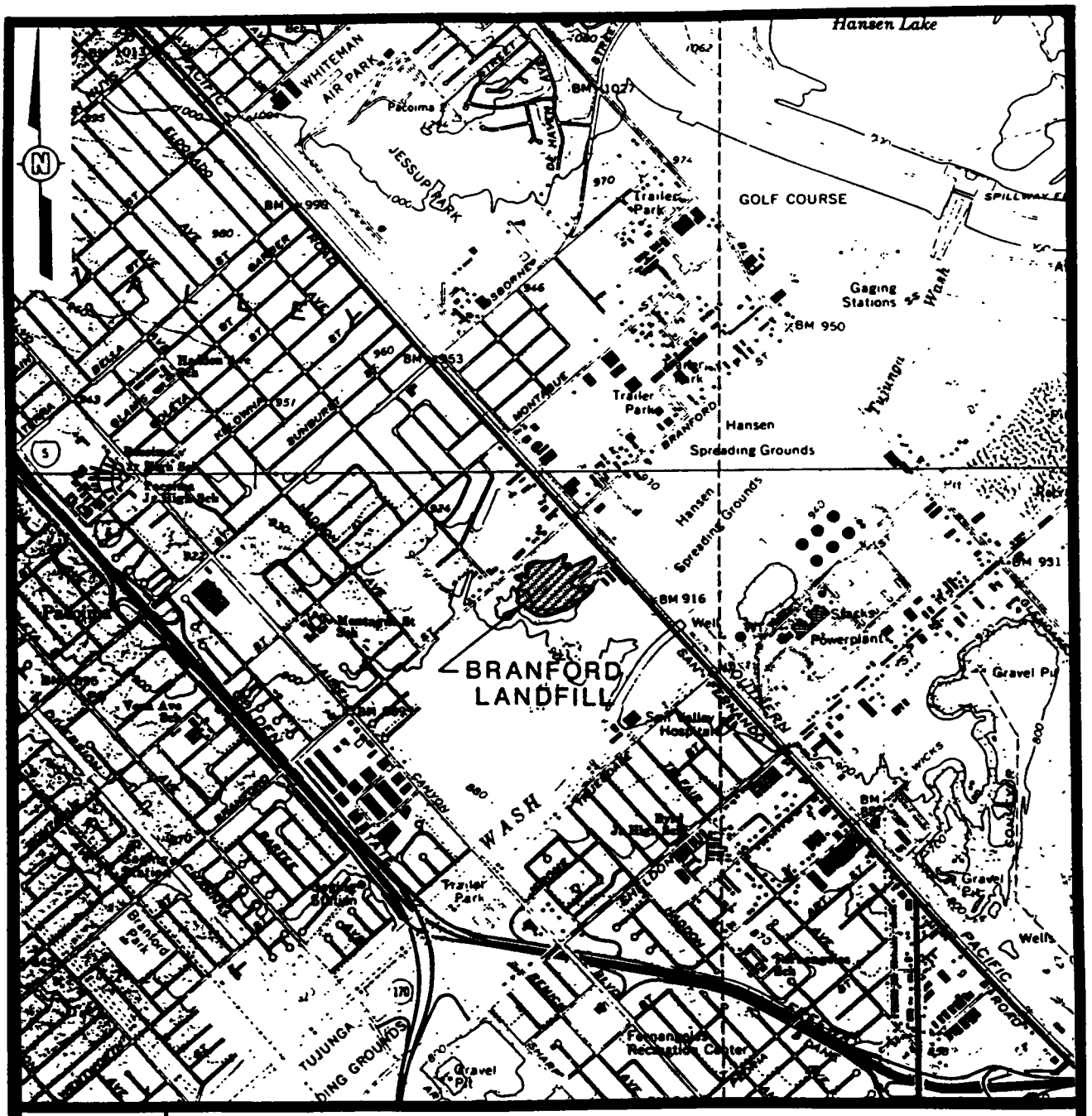


FIGURE 1

SITE LOCATION MAP
BRANFORD LANDFILL

PREPARED FOR

BUREAU OF SANITATION
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

INTERNATIONAL TECHNOLOGY CORPORATION

REFERENCE:

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

3. BRANFORD SANITARY LANDFILL

STATUS AS OF MAY 1993

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

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

OWNER - CalMat Properties

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

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

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

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

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

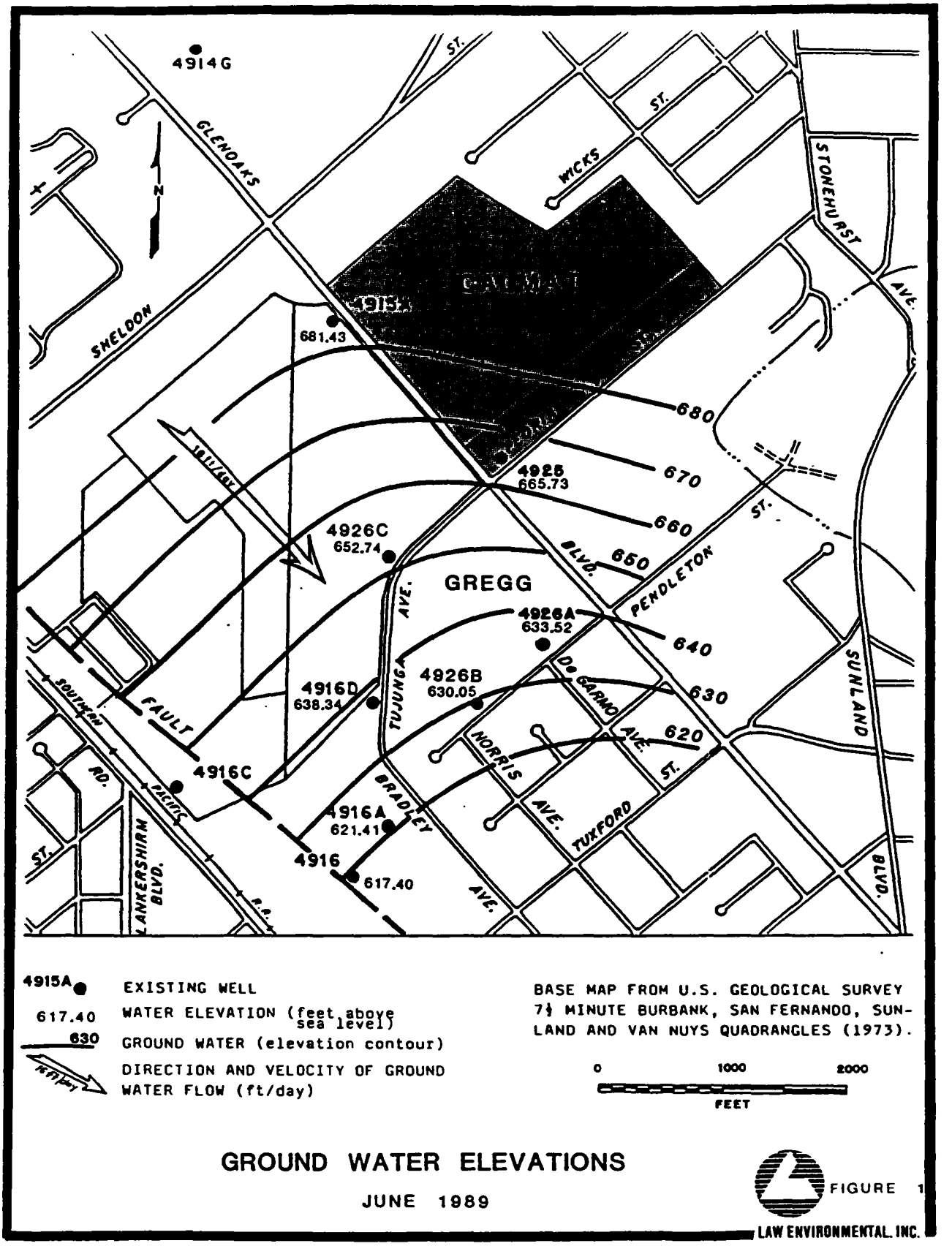
VADOSE ZONE MONITORING - One soil boring into the vadose zone. No contamination found.

LEACHATE CONTROL AND MONITORING - No evidence of leachate production.

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted November 1990. Approved SWAT Report June 1992. No further action required at this time.



GROUND WATER ELEVATIONS

JUNE 1989

FIGURE 1

LAW ENVIRONMENTAL, INC.

4. CALMAT LANDFILL(SUN VALLEY #3)

STATUS AS OF MAY 1993

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - CalMat (Old) Class 3 Site

OWNER - Valley Reclamation Company

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

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

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

GAS CONTROL SYSTEM - Not needed.

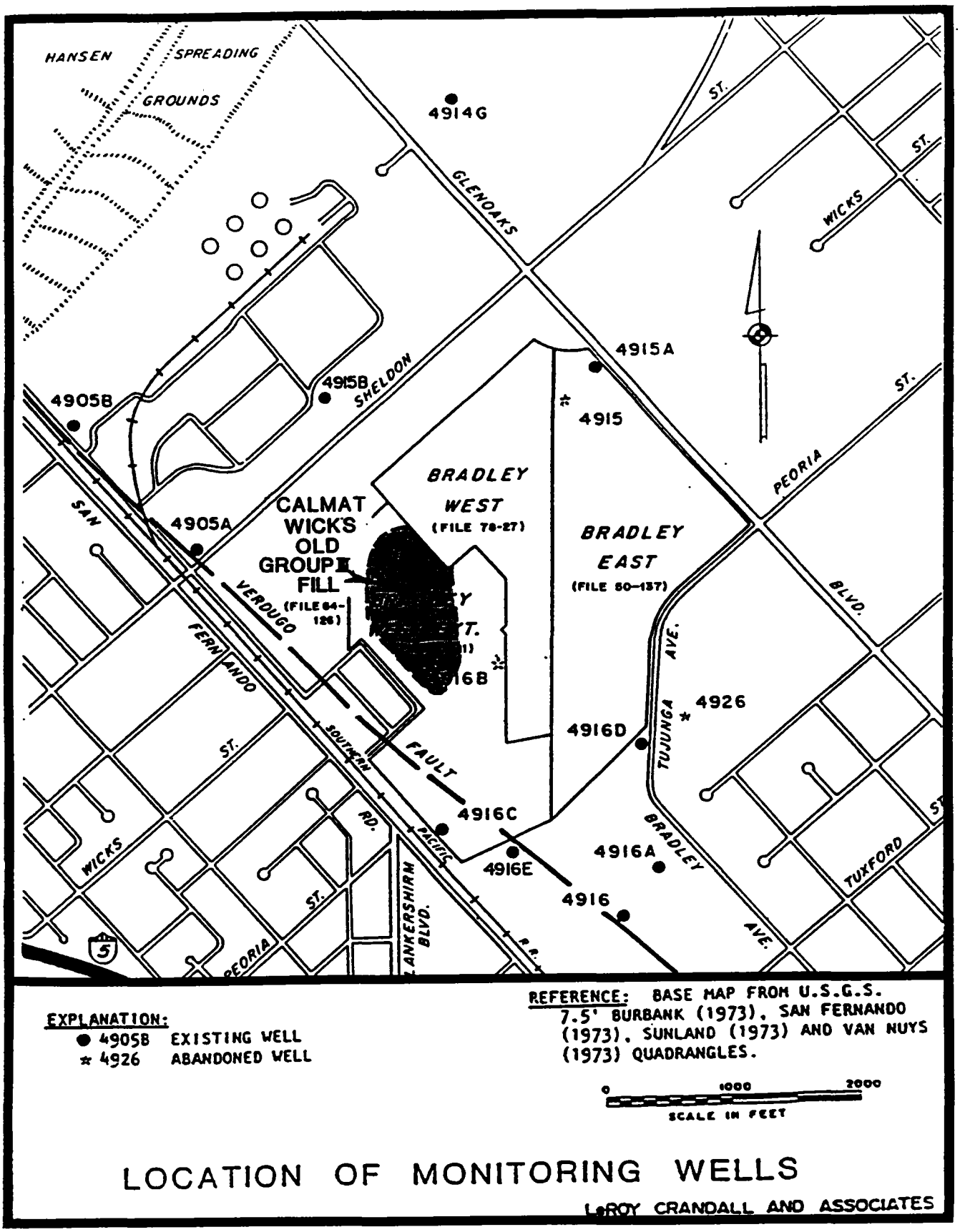
VADOSE ZONE MONITORING - Tried nine borings in 1986. Could not drill through concrete and steel.

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

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

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

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



5. CALMAT (OLD) CLASS 3 SITE

STATUS AS OF MAY 1993

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Gregg Pit/Bentz Disposal Sites

OWNER - CalMat Company

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

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

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

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

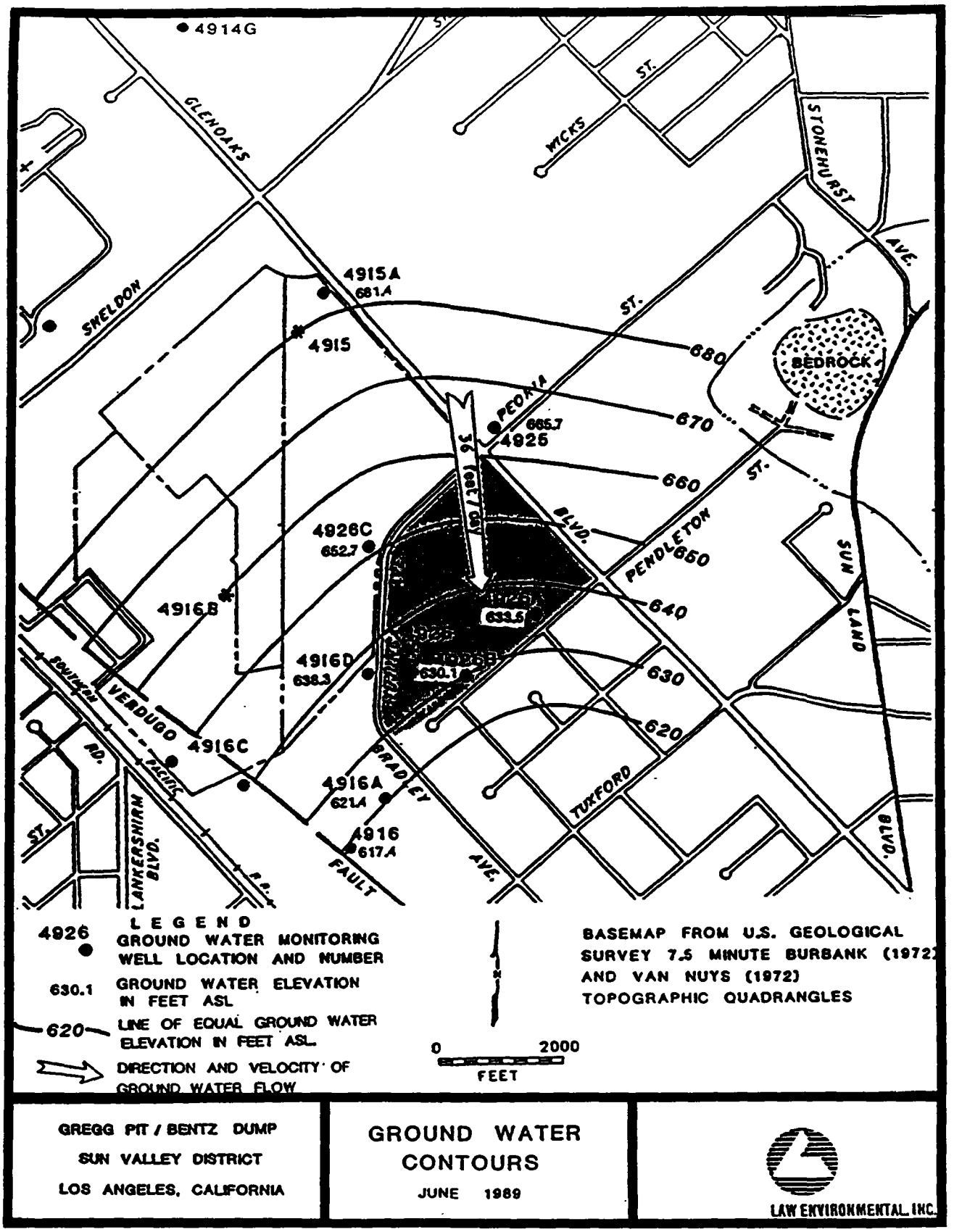
GAS CONTROL SYSTEM - Four wells and a gas flare were installed in 1987 (32 years after the first trash was placed). The system produces about 310 cubic feet per minute of gas consisting of 30-percent methane, 30-percent carbon dioxide, nitrogen and trace gases.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved SWAT Report on February 8, 1990. No further action required at this time.



6. GREGG PIT / BENTZ

STATUS AS OF MAY 1993

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Hewitt Landfill (Closed)

OWNER - CalMat Properties

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

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

GROUND WATER FLOW DIRECTION - A little north of east.

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

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

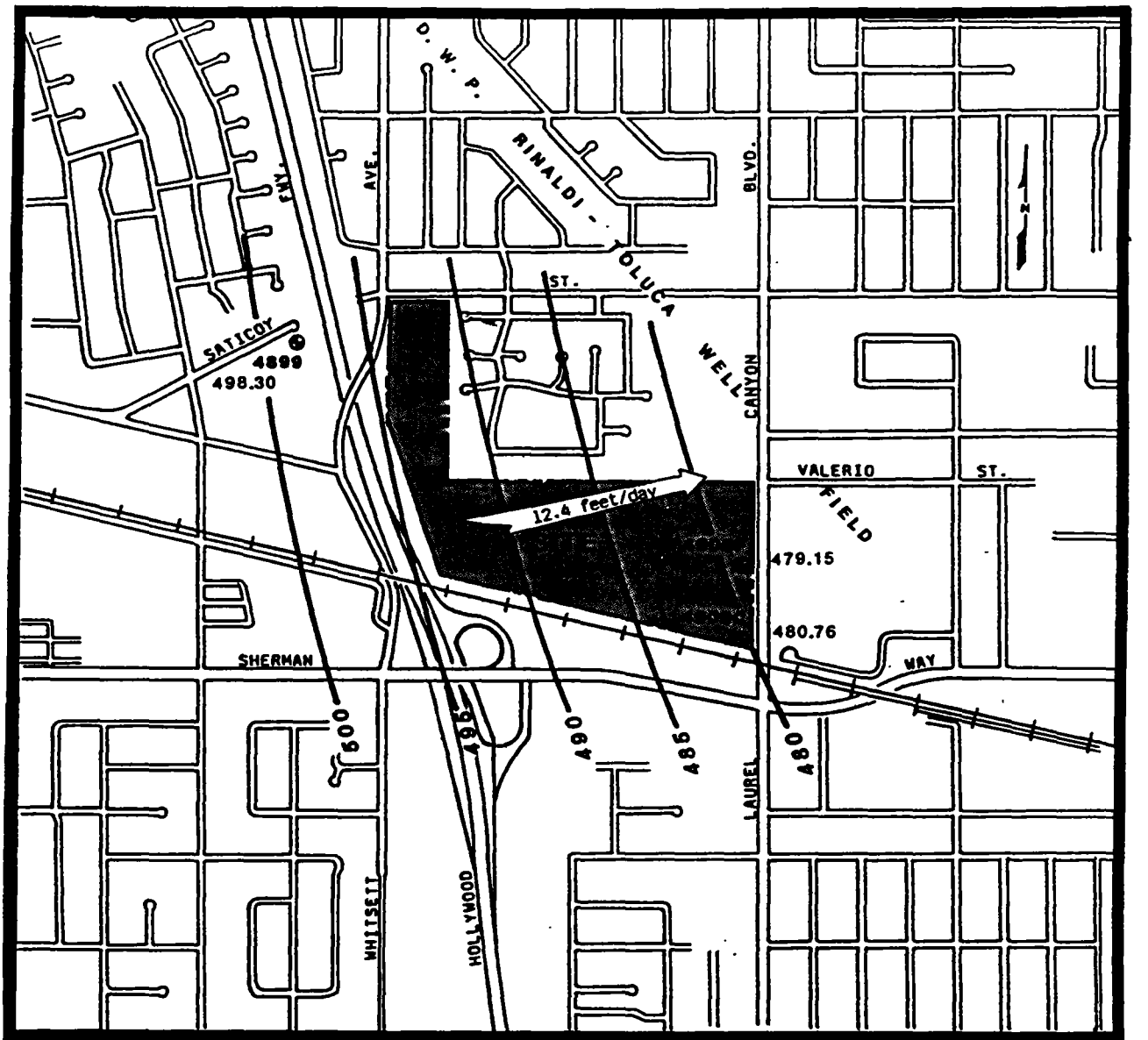
VADOSE ZONE MONITORING - Two Timco Teflon Lysimeters were installed to depths of 50 and 52 feet. Too little moisture to sample.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved SWAT Report May 1991. No further action required at this time.



7. HEWITT LANDFILL

STATUS AS OF MAY 1993

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

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

GAS CONTROL SYSTEM - Recommended but not installed as of July 1, 1989.

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

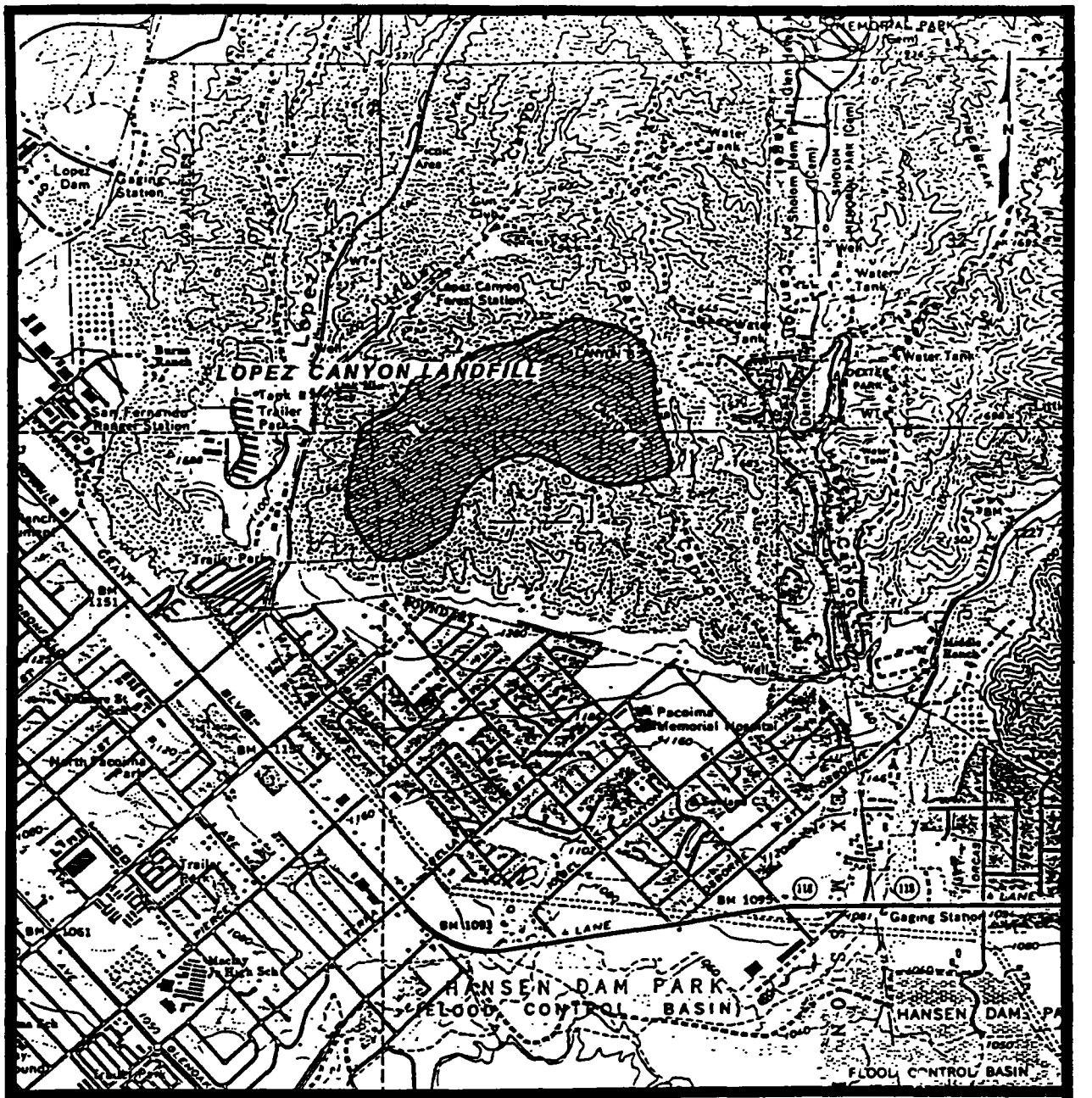
LEACHATE CONTROL AND MONITORING - A leachate well was drilled into the deepest part of the trash in Disposal Area B to a depth of 178 feet. No liquid was encountered during the drilling.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. Awaiting Phase II SWAT Report. Construction for the required SWAT wells was delayed due to landfill expansion.



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

SITE LOCATION MAP

Figure 4

Project No. 58-6425-11

LAW ENVIRONMENTAL, INC.

8. LOPEZ CANYON LANDFILL

STATUS AS OF MAY 1993

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.

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

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

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

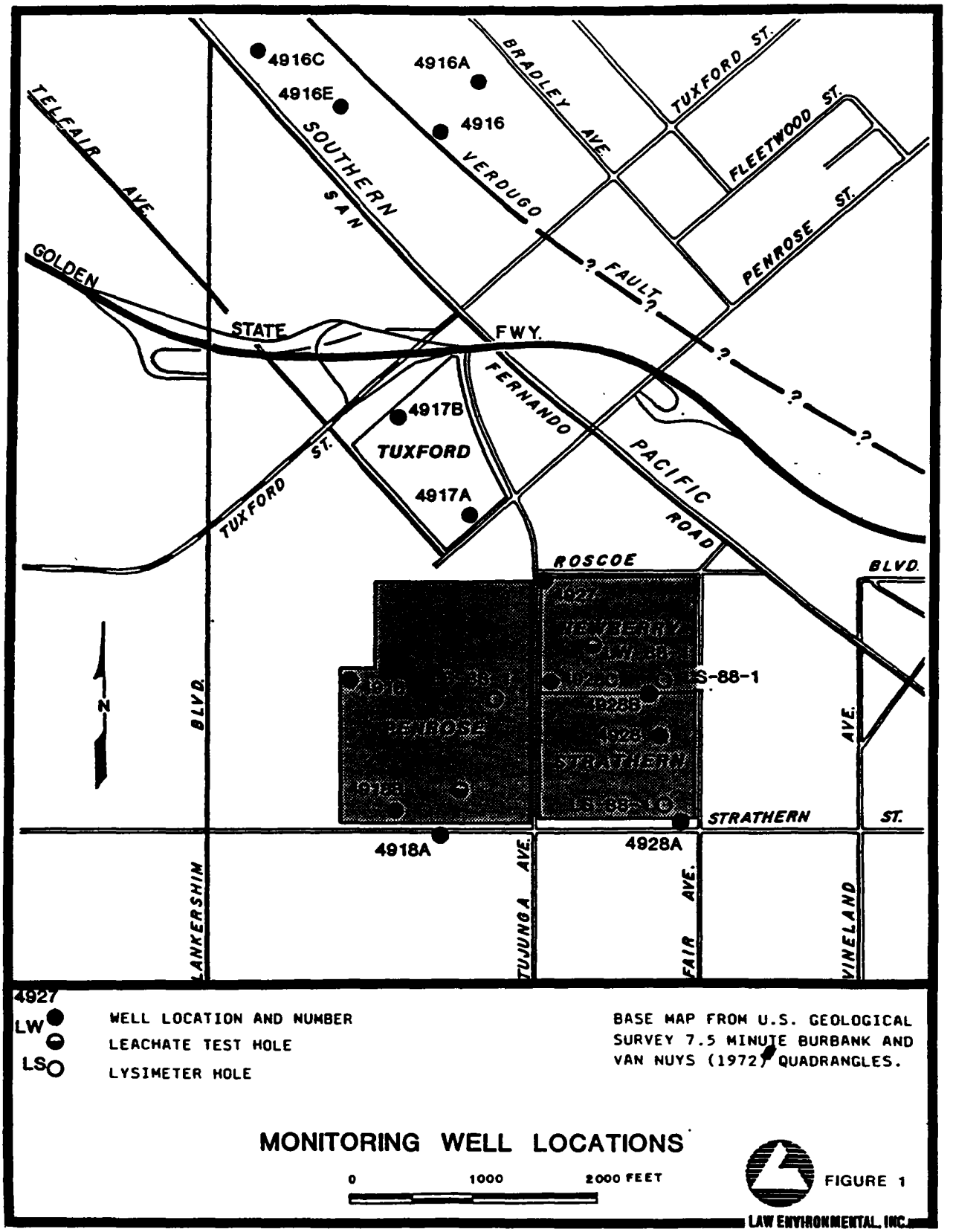
VADOSE ZONE MONITORING - Pressure-vacuum lysimeters were installed in the Penrose and Newberry Landfills and in the bottom of the Strathern Pit. Could not get a sample from any of these.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved on September 22, 1989. No further action required at this time.



9. PENROSE / NEWBERRY LANDFILLS (CLOSED)

STATUS AS OF MAY 1993

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.

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

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

GAS CONTROL SYSTEM - None required.

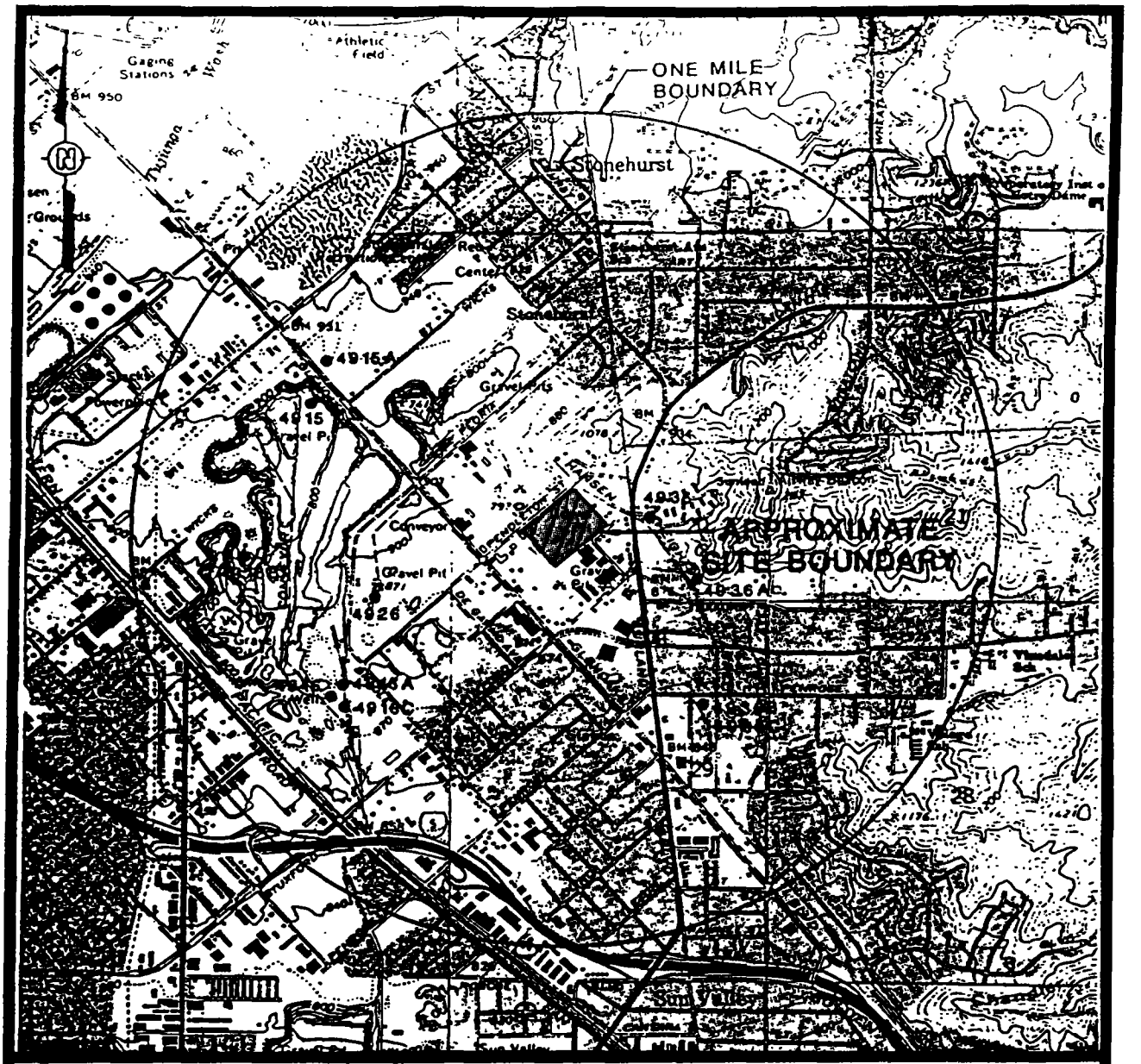
VADOSE ZONE MONITORING - None required.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted May 1991. Approved SWAT Report conditionally June 1992. Required two semiannual monitorings to confirm SWAT Report conclusion.



10. PENDLETON STREET LANDFILL

STATUS AS OF MAY 1993

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 the Hollywood and Golden State Freeways. Just to the east and southeast of the Tujunga Spreading Grounds.

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

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

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

MINIMUM ELEVATION OF TRASH - 700 feet.

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

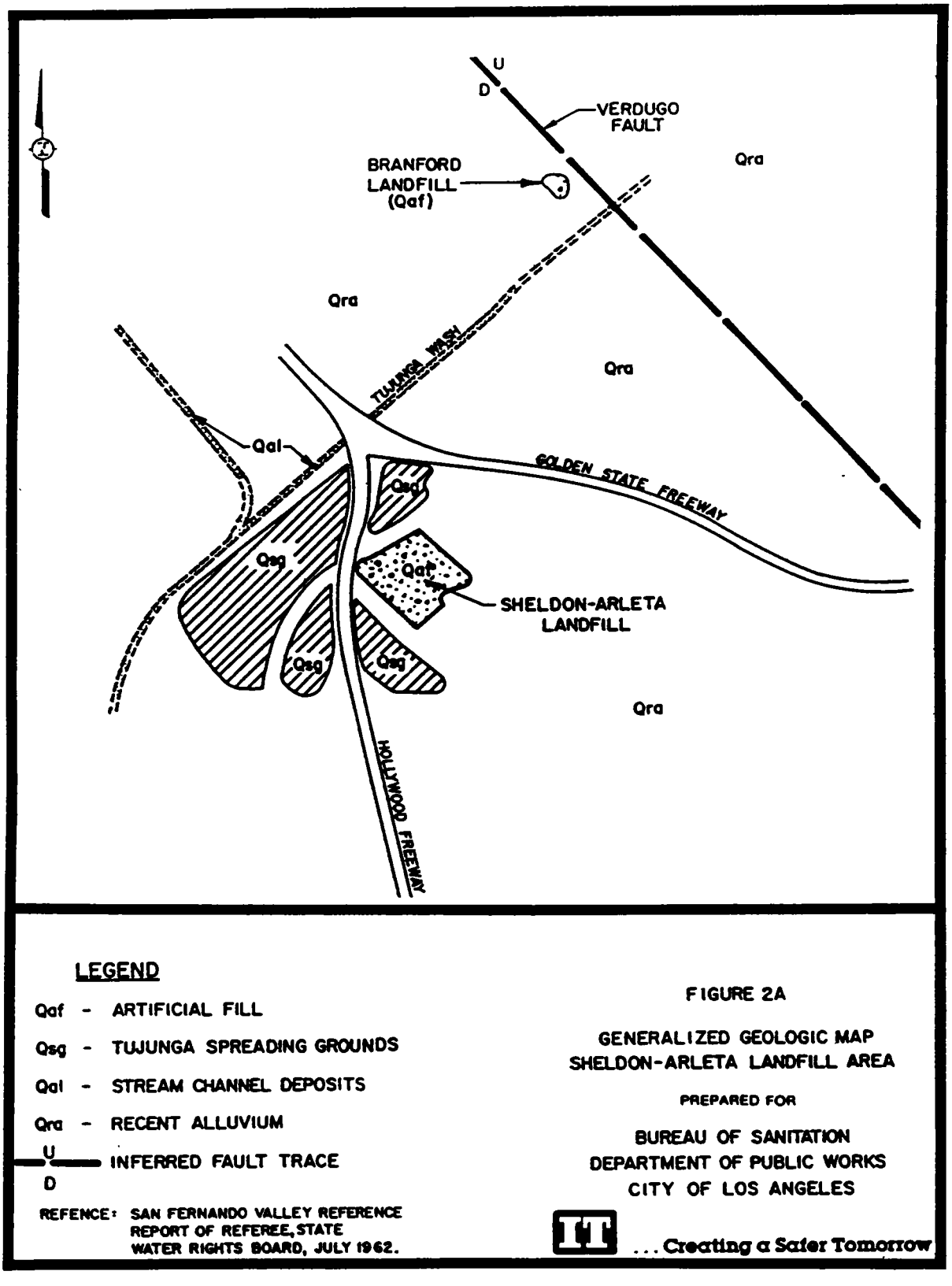
VADOSE ZONE MONITORING - Only two of 25 soil samples showed moisture above 25 percent. Additional sampling will be done after spreading.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved Swat Report on February 9, 1990. No further action required at this time.



11. SHELDON-ARLETA LANDFILL

STATUS AS OF MAY 1993

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 Los Angeles County Sanitation Districts. Upon completion of fill, entire property will go to City of Glendale.

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

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

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

GAS CONTROL SYSTEM - None.

VADOSE ZONE MONITORING - Not required.

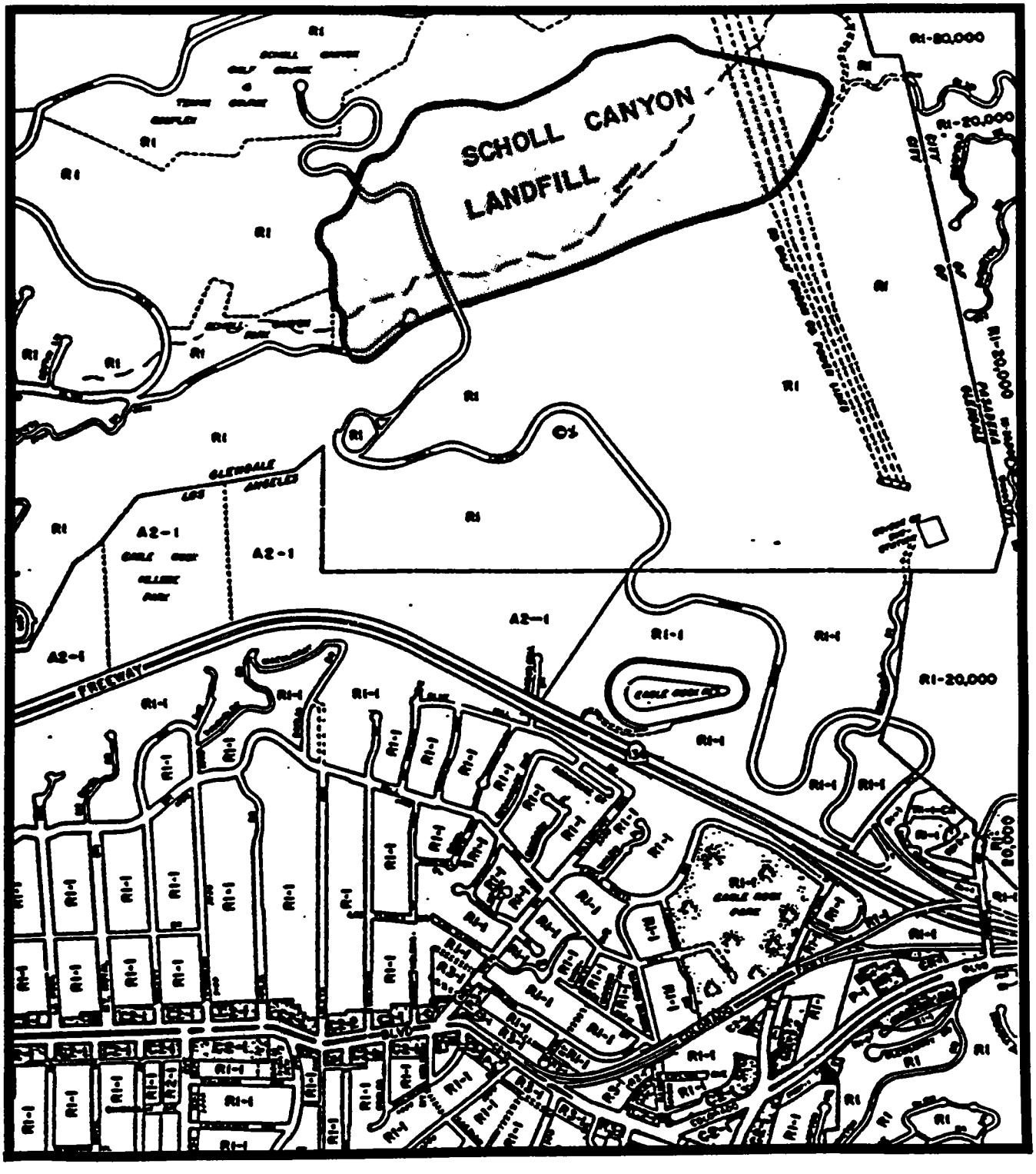
LEACHATE CONTROL AND MONITORING - Two subsurface barriers to cut off alluvial underflow. Extraction wells upgradient from barriers. Alluvial monitoring wells downgradient from barriers.

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, County Sanitation Districts

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD -
Active - (Rank 1) SWAT Report completed July 1987. Final SWAT Report completed April 1988. SWAT Report approved August 1990.

Inactive - (Rank 2) - SWAT Report completed July 1987. Final SWAT Report completed January 1991.

Active and Inactive
Under Evaluation Monitoring Program (EMP). Corrective Action Program will be required after completion of EMP in March 1993. Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. Revised Monitoring Plan is required for both active and inactive portions. SWAT Report under review for inactive portion.



12. SCHOLL CANYON LANDFILL

STATUS AS OF MAY 1993

Solid Waste Assessment Test (SWAT)
Data Requirements Completed

NAME OF LANDFILL - Stough Park Landfill

OWNER - City of Burbank

LOCATION - Southwest flank of the Verdugo Mountains.

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

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

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

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

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

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

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

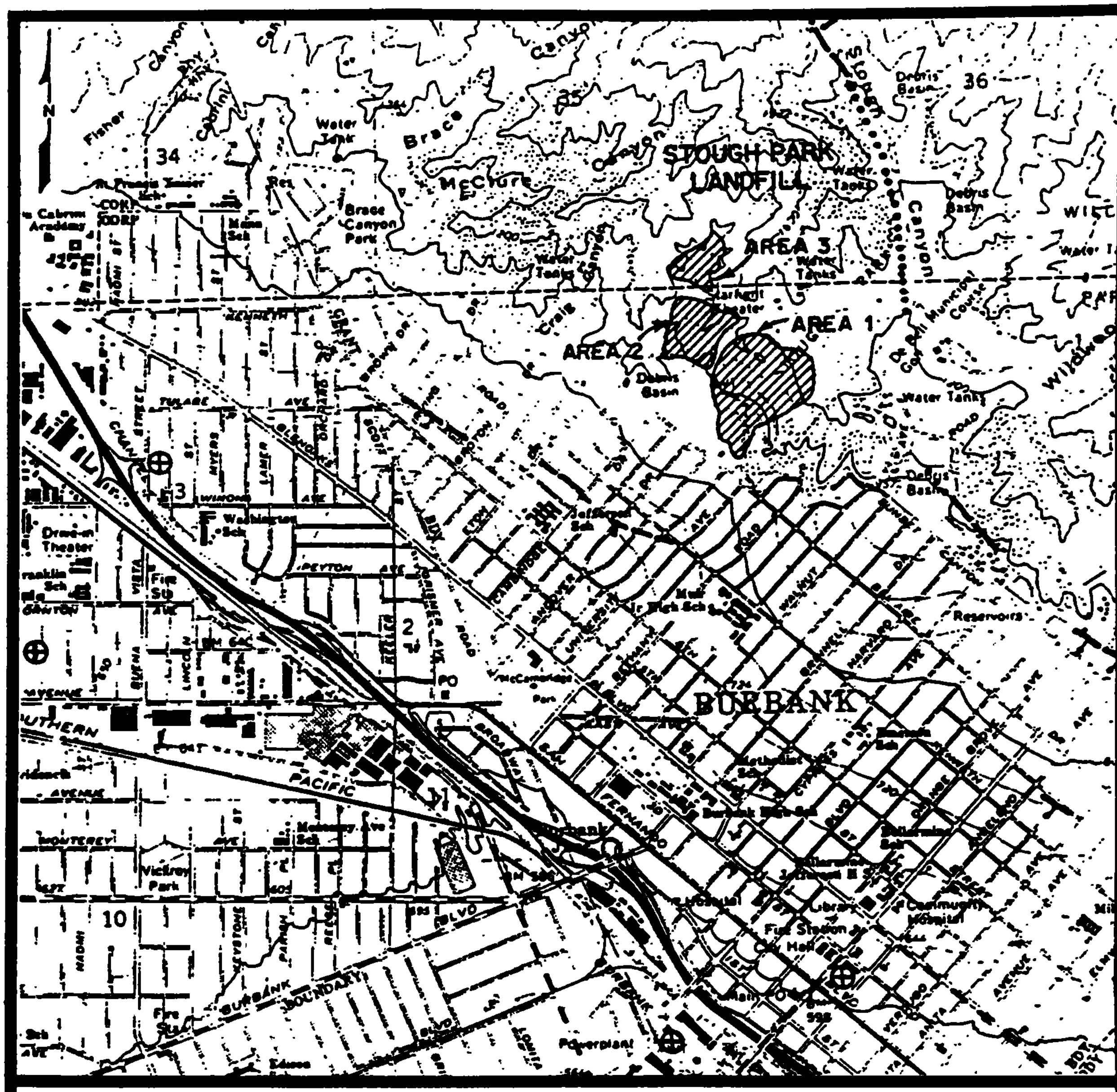
VADOSE ZONE MONITORING - None required.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. Evaluation Monitoring Program (EMP) is required. Plan for EMP is under review.



EXPLANATION

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

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

LANDFILL AREA

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

LOCAL GEOLOGY MAP

LAW ENVIRONMENTAL, INC.

13. STOUGH PARK LANDFILL

STATUS AS OF MAY 1993

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 formation is low, as is the secondary hydraulic conductivity of the fracture systems. Surficial deposits consist of alluvium, colluvium and landslides as much as 50-feet thick.

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

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

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

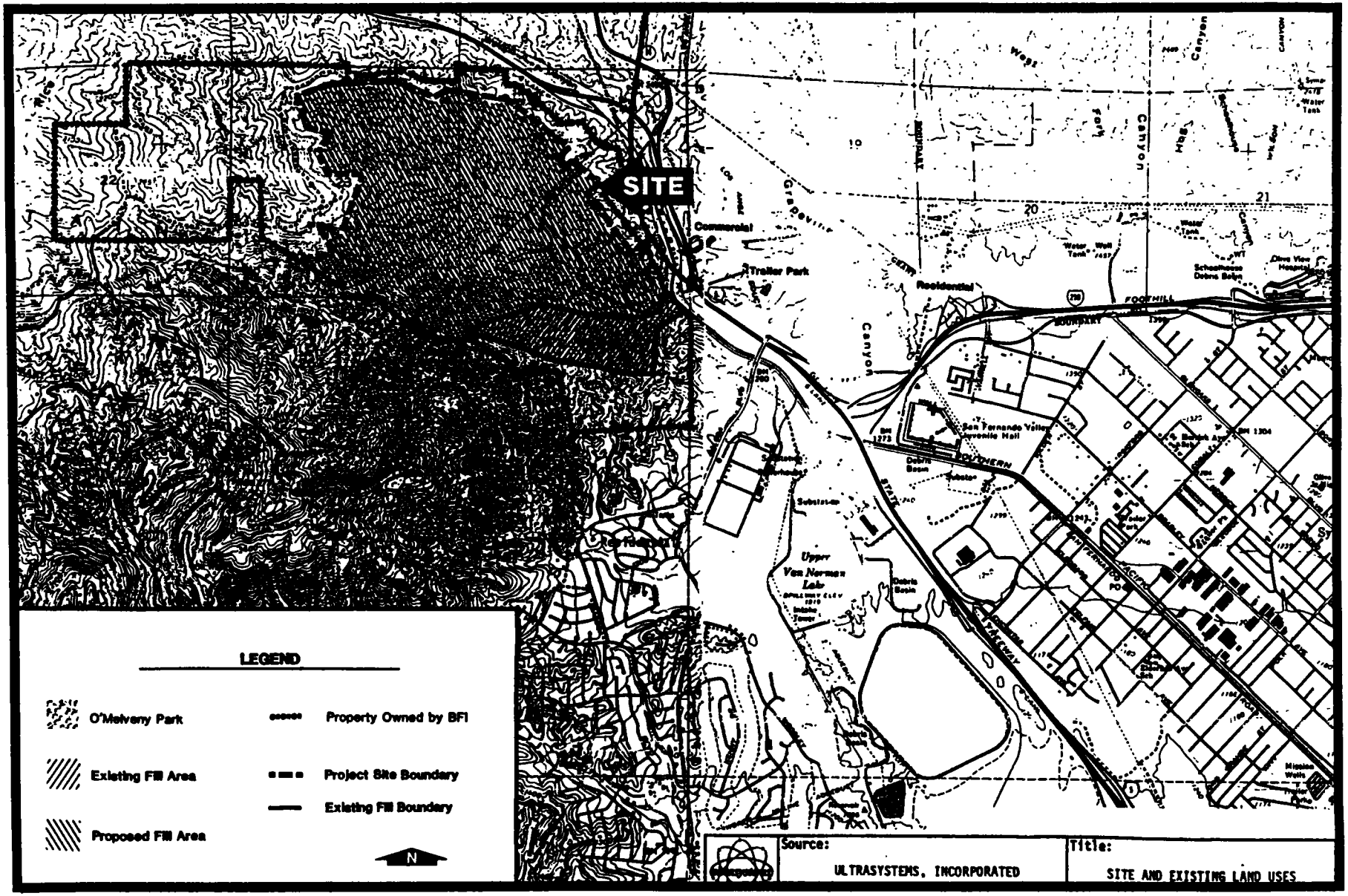
VADOSE ZONE MONITORING - No volatile organics detected in five lysimeter wells.

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

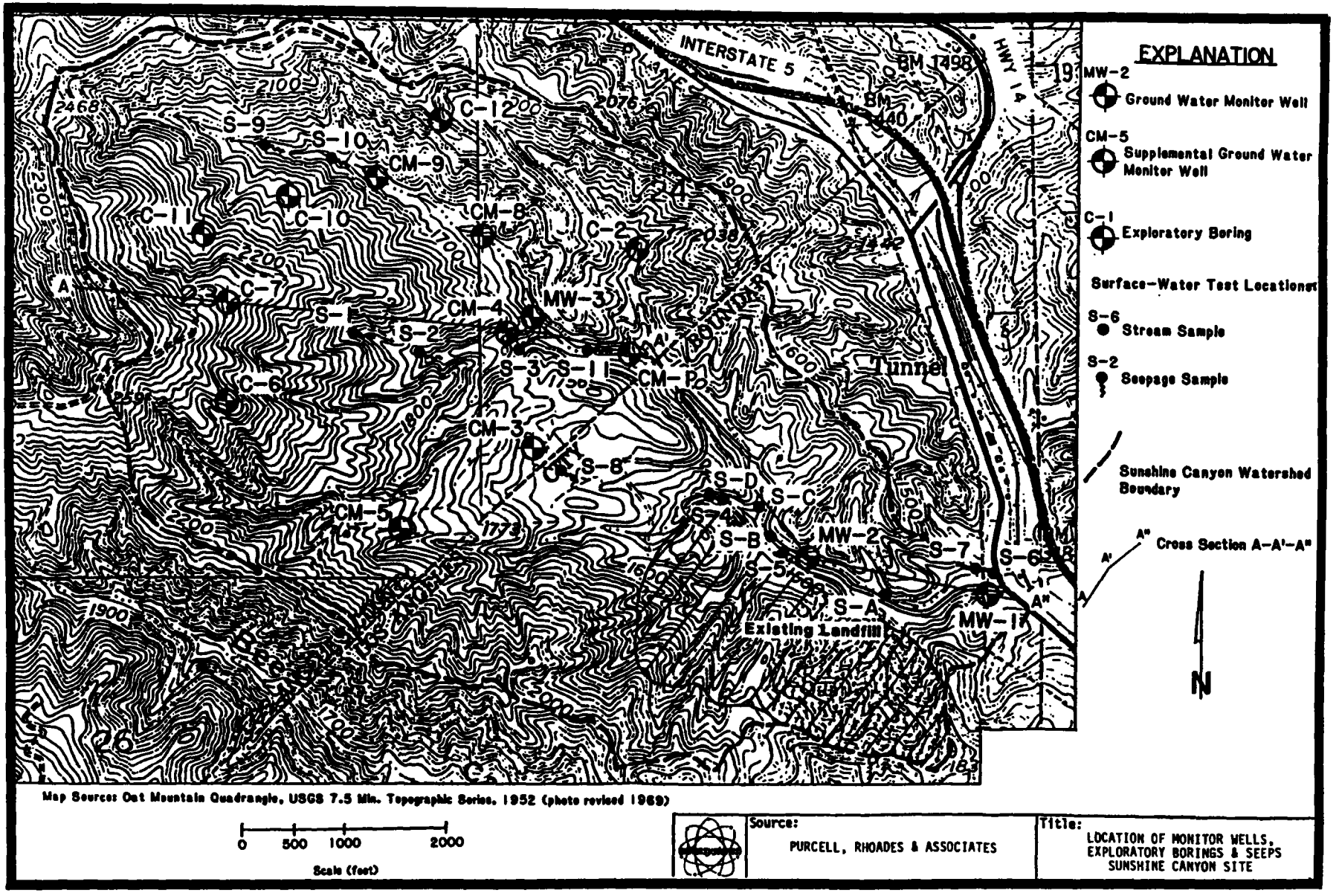
GROUND WATER QUALITY MONITORING - The native waters of the Towsley formation are of poor quality because of excessive total dissolved solids, but rather low in chloride. The appearance of much higher chlorides in downgradient monitoring well MW-1 raises the suspicion of leachate contribution from the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

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

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



14a. SUNSHINE CANYON LANDFILL



14b. SUNSHINE CANYON LANDFILL

STATUS AS OF MAY 1993

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.

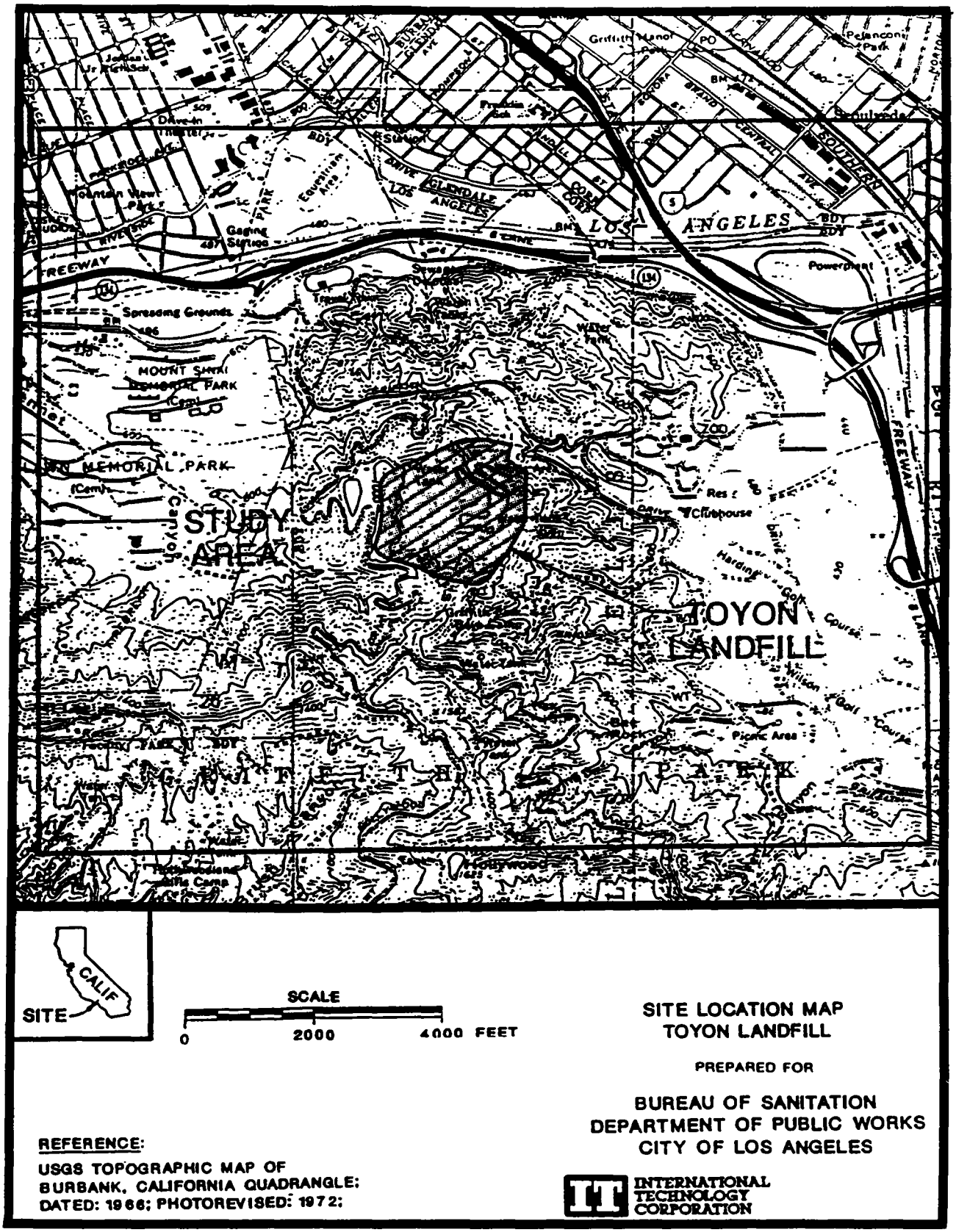
VADOSE ZONE MONITORING - None

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Approved Final SWAT Report April 1991. Closure Plan is under review. Revised Monitoring Plan, required by Article 5 of Chapter 15, is under review. Evaluation Monitoring Program is required.



15. TOYON LANDFILL

STATUS AS OF MAY 1993

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 the Golden State Freeway, on the west side of Tujunga Avenue.

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

GROUND WATER FLOW DIRECTION - Southeasterly

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

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

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

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

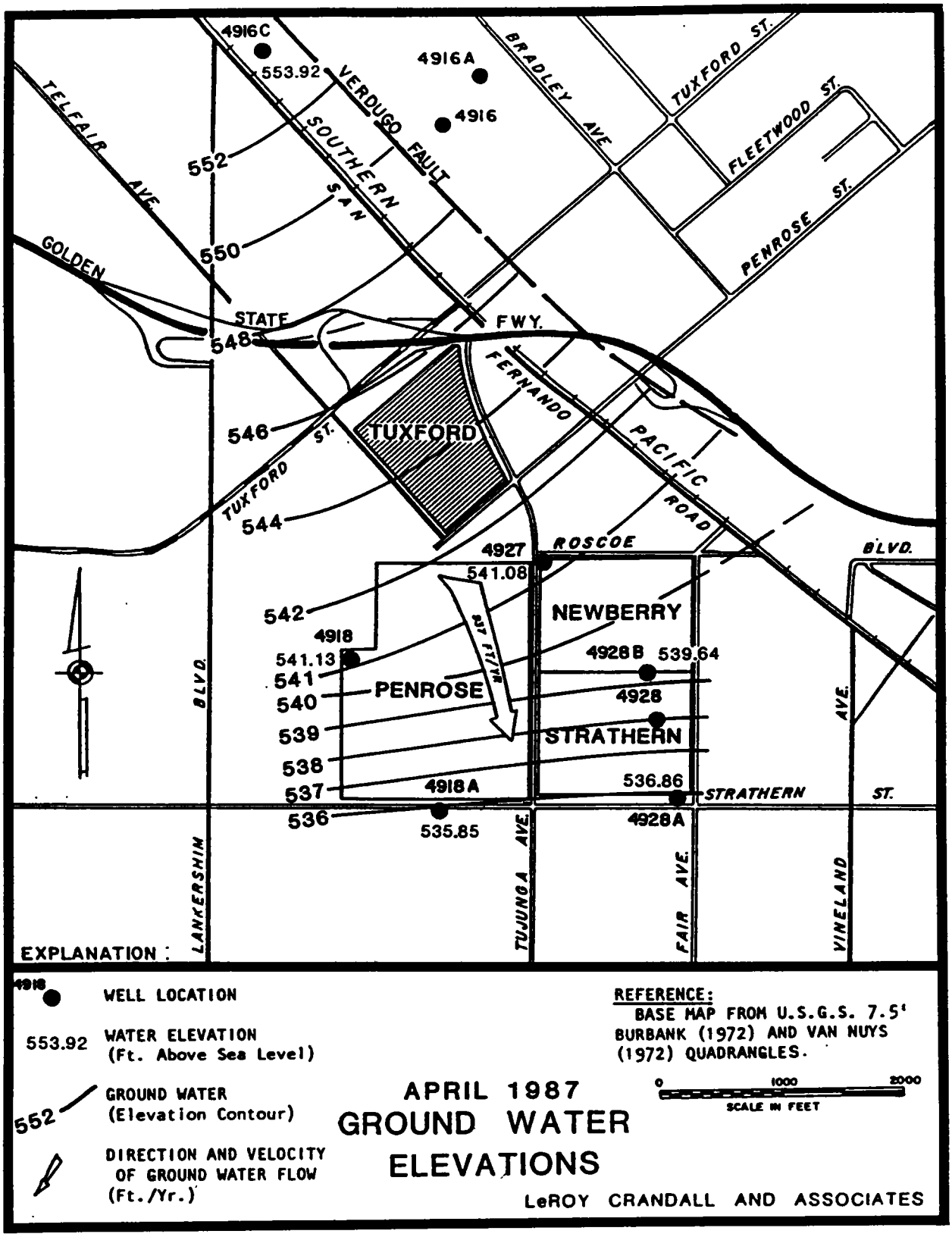
VADOSE ZONE MONITORING - Two wells drilled to 50 feet. Cannot generate enough suction to get a liquid sample.

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

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

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

STATUS WITH LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD - Final SWAT Report submitted December 1990. Approved SWAT Report June 1992. Evaluation Monitoring Program is required.



16. TUXFORD LANDFILL

APPENDIX G

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

APPENDIX G

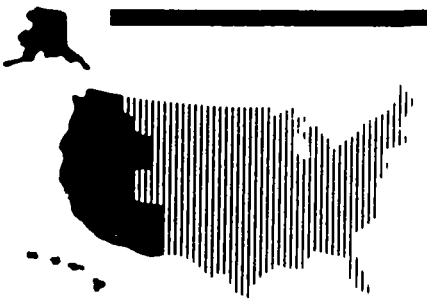
AN EVALUATION OF WATER RIGHTS AND WATER USE OPTION - SAN FERNANDO VALLEY BASIN

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.

ARCSWEST



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

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

Environmental Protection Agency
Contract No. 68-W9-0031

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.

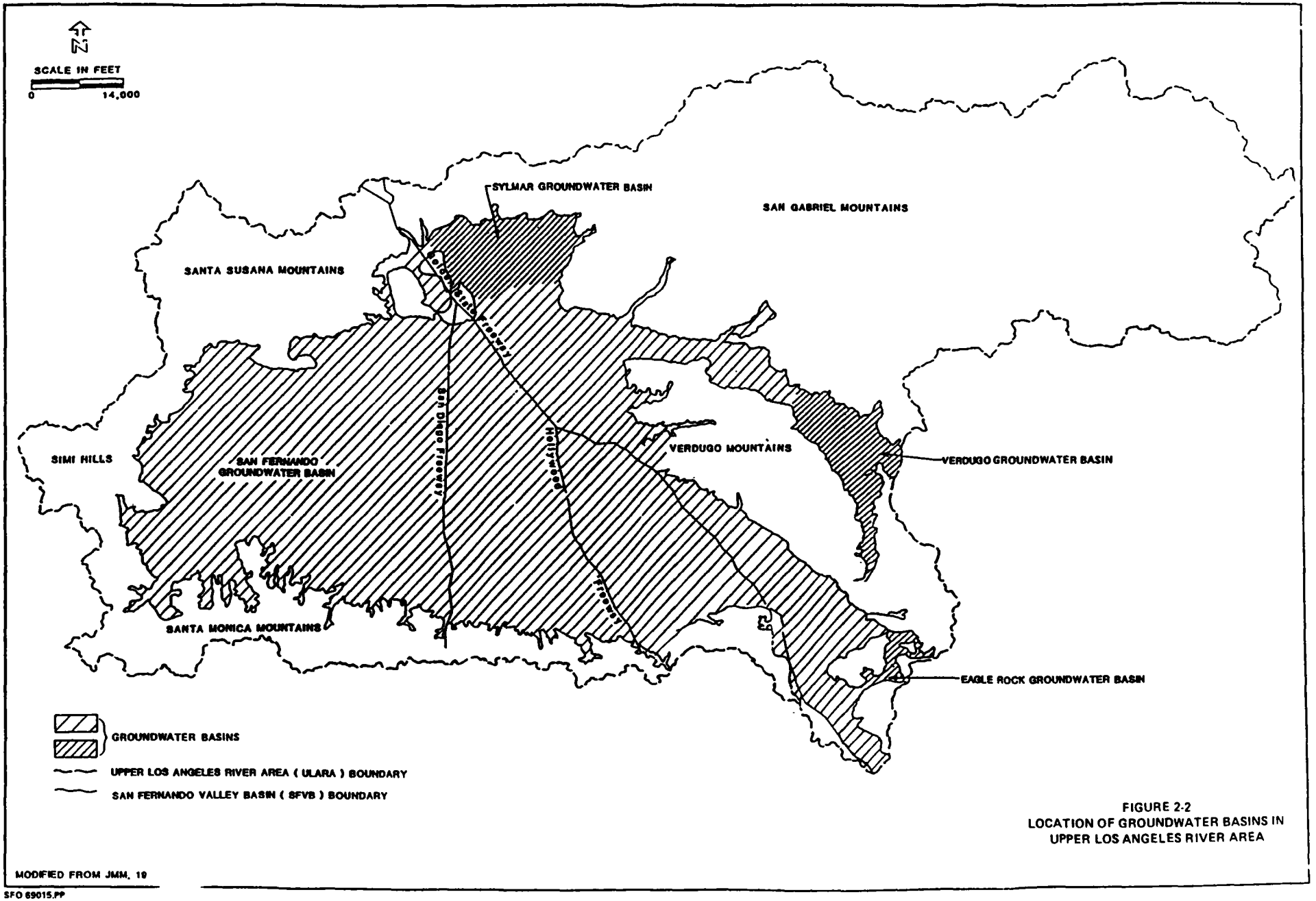


FIGURE 2-2
LOCATION OF GROUNDWATER BASINS IN
UPPER LOS ANGELES RIVER AREA

MODIFIED FROM JMM, 19

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APPENDIX H

ULARA DEWATERING
&
REMEDIATION PROJECTS

APPENDIX H

ULARA Dewatering and Remediation Projects Table Description

No. - Refers to the number in the ULARA Watermaster notebooks that the project is filed under.

Company Name - Name of the company that is involved in cleanup or dewatering.

Contact Name - Name of either the company or the individual that submitted the required report to the ULARA Watermaster.

Address - Street address of project site.

ID - Refers to the type of project:

D = Permanent dewatering required

P = No dewatering required now, but there is potential for dewatering in the future due to higher water levels.

R = Ground water remediation site.

Start - Date at which project was brought to the attention of the ULARA Watermaster.

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 NUMBER 10
SAN FERNANDO VALLEY SUPERFUND SITES

EPA ANNOUNCES RESULTS OF BASINWIDE GROUNDWATER REMEDIAL INVESTIGATION

EPA

San Fernando Valley Superfund Sites

Region IX, San Francisco | March 1993 | Fact Sheet Number 10

EPA ANNOUNCES RESULTS OF BASINWIDE GROUNDWATER REMEDIAL INVESTIGATION

Introduction

The U.S. Environmental Protection Agency (EPA) announces the availability of two reports on the groundwater contamination in the San Fernando Valley: 1) Remedial Investigation Report of Groundwater Contamination in the San Fernando Valley and 2) the Report for First and Second Quarter Sampling, 1992, of the San Fernando Groundwater Monitoring Program. This fact sheet describes the important findings of the two reports. The reports are available for review at the information repositories listed on page 11 of this fact sheet.

The Remedial Investigation (RI) report presents the results of investigations to identify and characterize **groundwater** contamination throughout the eastern San Fernando Valley. The comprehensive five-volume report, a product of EPA's **Remedial Investigation/Feasibility Study (RI/FS)** to investigate and clean up contamination for the San Fernando Valley **Superfund** project, includes data from groundwater investigations through 1991.

EPA is continuing to monitor the groundwater in the San Fernando Valley. The Report for First and Second Quarter Sampling, 1992 of the San Fernando Groundwater Monitoring Program report provides an updated information supplement to the Remedial Investigation Report.

Background

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

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

State and local agencies provided alternative water supplies while beginning the investigation and cleanup of potential sources of con-

Continued on page 2

IF YOU WOULD LIKE YOUR OWN COPY OF THE BASINWIDE REMEDIAL INVESTIGATION REPORT

The Basinwide Remedial Investigation Report can be purchased at DCS Reprographics in Irvine, California. Volume 1 consists of the findings and the analysis characterizing the groundwater of the San Fernando Valley, while Volumes 2 through 5 are data appendices. You can purchase Volume 1 only or all five volumes at a cost of $374.50 or $878.50, respectively. There is a discounted rate for 21 or more copies. Please call or visit DCS Reprographics to order your copy of the report.

DCS Reprographics
17721 Mitchell North
Irvine, CA 92714
(714) 660-1150
Contact: Brant Kiger

Terms in **bold** are defined in the glossary on page 9

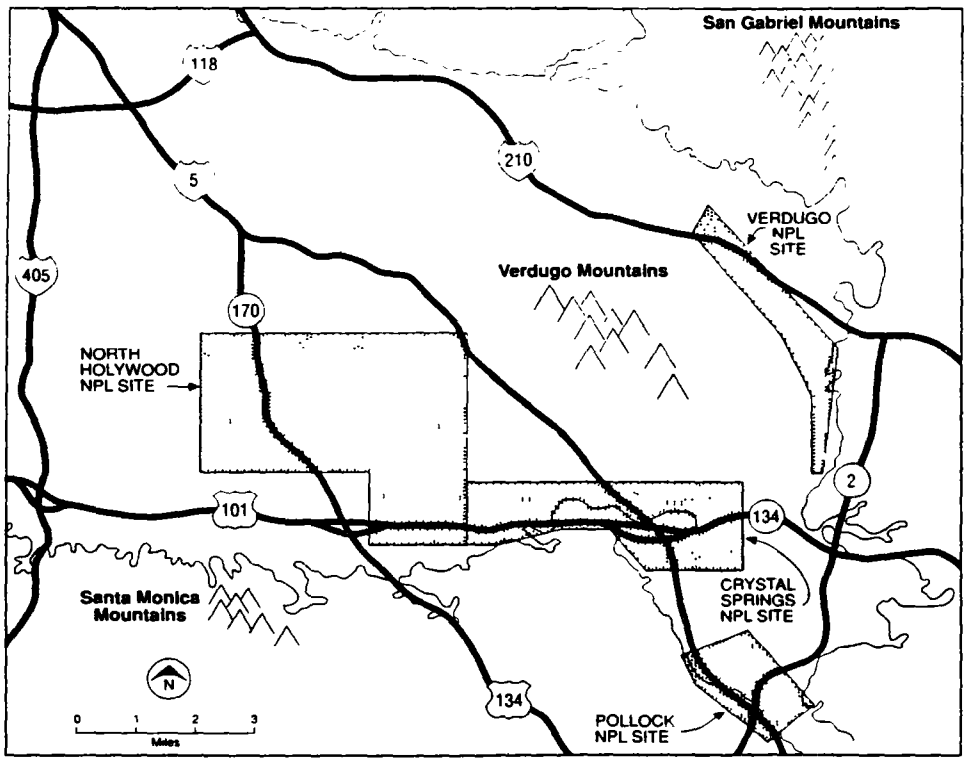
Background Continued from page 1

tamination. EPA and other agencies became involved in coordinating efforts to address the large-scale contamination. In 1984, EPA proposed four sites for inclusion on the **National Priorities List (NPL)**: North Hollywood, Crystal Springs, Pollock and Verdugo. In 1986, the four sites were included on the NPL. EPA manages the four sites and adjacent areas where contamination has or may have migrated as one large site called the **San Fernando Valley Superfund Site** (Figure 1). In 1987, EPA and the Los Angeles Department of Water and Power (LADWP) signed a Cooperative Agreement providing federal funds to perform an RI of groundwater contamination in the San Fernando Valley. EPA is coordinating the large-scale effort for groundwater monitoring and the basinwide groundwater Feasibility Study (FS).

EPA has identified five operable units (OUs) within the San Fernando Valley Superfund Site to address specific areas of contamination that require prompt remedial actions. Each OU represents a discrete, interim cleanup currently in progress throughout the eastern portion of the San Fernando Basin. EPA has signed **Record of Decision (ROD)** documents for two OUs in the San Fernando Valley: North Hollywood OU (1987) and Burbank OU (1989). The North Hollywood OU Interim Remedy is currently operating and the Burbank OU is in the remedial design phase. In the Glendale area, EPA has issued two Proposed Plans: one for Glendale North OU and one for Glendale South OU. A Remedial Investigation for a fifth OU has been initiated in the Pollock area. All **remedial actions** established by EPA in the RODs or proposed plans issued to date are interim measures but are intended to be consistent with the overall long-term remediation of the San Fernando Valley.

Through a cooperative agreement, EPA provides partial funding to the Los Angeles Regional Water Quality Control Board (RWQCB) for the State's Well Investigation Program. Through this program, the RWQCB identifies industries and facilities that may have caused or contributed to groundwater contamination and oversees facility-specific cleanup efforts.

Local water suppliers and state agencies assure that drinking water meets all state and federal standards. Drinking water is tested regularly before it is delivered to consumers. **Public drinking water in the San Fernando Valley Basin area is safe to drink.**



How Was The Remedial Investigation Data Obtained?

Understanding the geology, groundwater and extent of contamination in the San Fernando Valley is a complex task. An initial conceptual model was developed for the San Fernando and Verdugo basins of the San Fernando Valley, using existing water quality data and information such as reports from well drillers, to guide the field investigation and computer modeling of the groundwater. The field investigation for the RI began with a soil gas survey to initially locate the existing VOC groundwater contamination. The field investigation

Figure 1. San Fernando Valley Superfund Site.

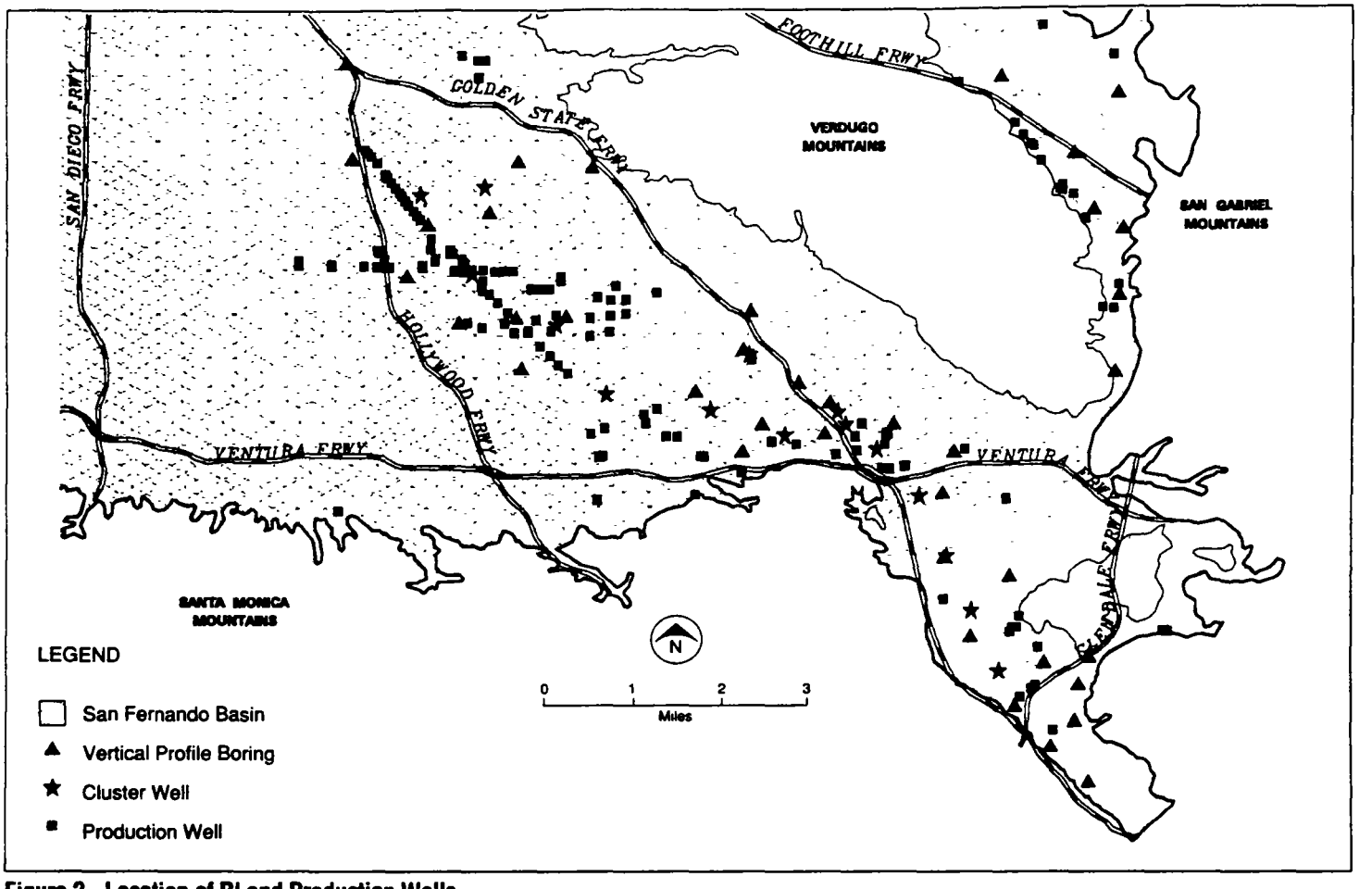


Figure 2. Location of RI and Production Wells

continued with extensive groundwater monitoring well installation, sampling and laboratory analysis to provide more focused data. This information was used by EPA and LADWP to determine the extent of contamination and refine our understanding of the geology and hydrogeology of the San Fernando Valley. Soils were also collected and analyzed during the drilling of the monitoring wells for additional information on contaminants in the soil and the geology of the contaminated areas.

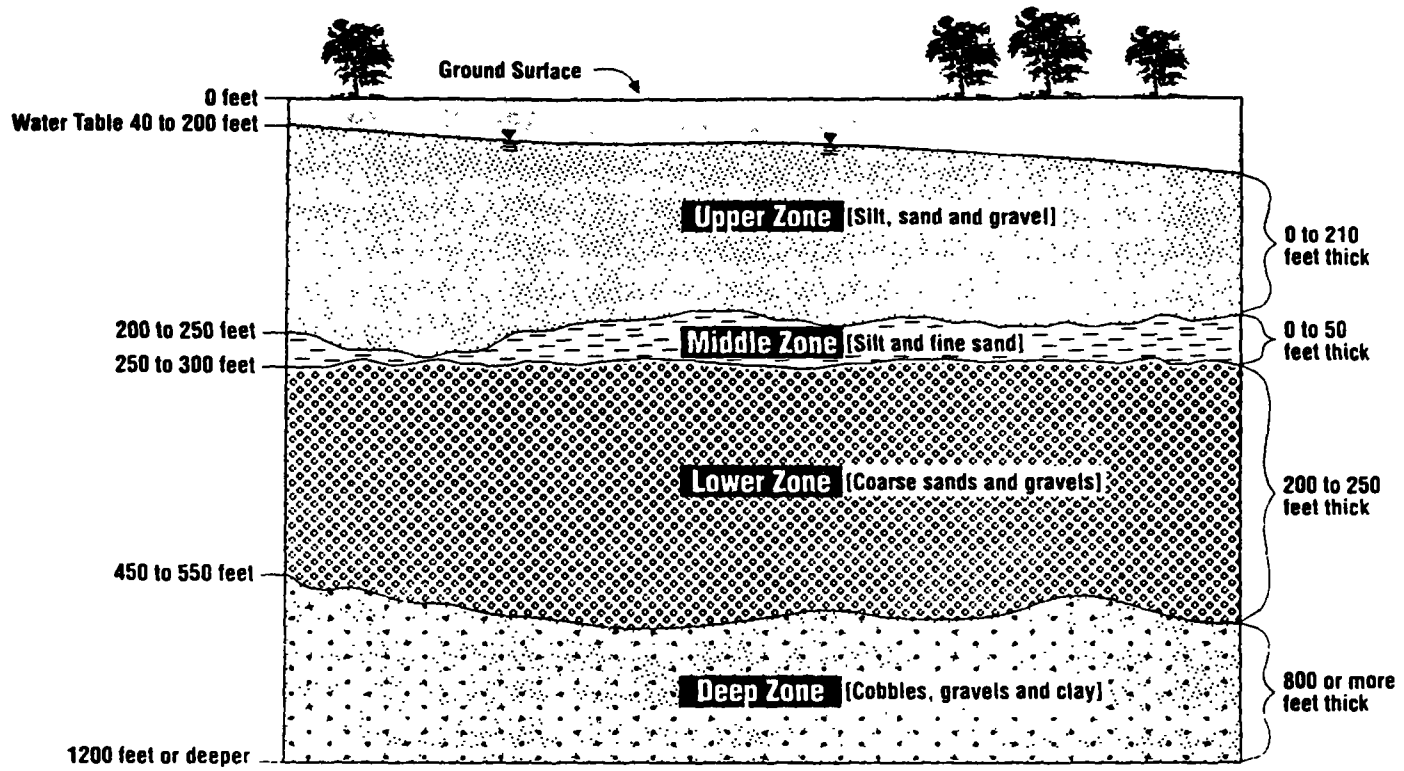
Locations of wells used to collect data for the RI are shown on Figure 2. Three types of groundwater wells were used in the RI: drinking water supply wells, vertical profile borings (shallow wells), and cluster wells.

Drinking Water Supply Wells ■ Existing drinking water wells (**production wells**) are sampled regularly to ensure that drinking water meets federal and state standards. Information from well drillers' reports was used to assess the geologic and hydrogeologic features of the San Fernando Valley. Data from existing water supply wells were included in the RI to provide current and historical water quality information. EPA continues to receive water supply well information to supplement its groundwater monitoring program. Because each production well typically draws water from a range of depths (45 feet to 1000 feet below the surface), the contaminant concentrations in these wells represent a composite or mixture of the concentrations at the different depths.

Vertical Profile Borings (VPBs) ■ Monitoring wells, called **vertical profile borings**, were constructed to sample and analyze groundwater in the shallow aquifer where the highest contaminant concentrations are generally found. Groundwater samples are obtained from a specific depth interval (10 to 20 feet thick) to estimate the areal extent of contamination in the upper aquifer zone. Between May 1989 and January 1990, 43 VPBs were completed near the water table at depths ranging from 45 to 376 feet below ground surface.

Cluster Wells ■ After the VPB installation and sampling, **cluster wells** were installed in areas of high contamination to better define the vertical extent of contamination. Each cluster well is

Figure 3. Geologic Zones in the San Fernando Basin



Four geologic zones are located in the San Fernando Valley Groundwater Basin. The zones are believed to be present over much of the eastern San Fernando Basin, but may not necessarily occur at any specific location.

typically composed of two to four monitoring wells installed closely together, with each well perforated (screened) to sample at a different specific depth. Fifteen sets of cluster wells, totalling 44 wells, were constructed between March 1990 and September 1990 at depths ranging from 52 to 800 feet below ground surface to collect data for the RI. Detailed geologic and hydrogeologic information was collected during construction of the deepest well in each cluster.

Most of the 87 monitoring wells and 19 previously existing monitoring or production wells were sampled again during 1991 to augment the earlier data. These RI monitoring wells have now been incorporated into EPA's quarterly sampling program to monitor changes of contaminant concentrations in the basin. EPA's groundwater monitoring program is ongoing. The wells most critical to tracking the contamination (currently 41 wells) are sampled every quarter (January, April, July and October) and analyzed for VOCs and nitrate. Each year, all EPA wells are sampled and analyzed for a full range of possible contaminants. EPA also performs specialized sampling and analyses as the need arises. Water quality information from local water suppliers and private facility monitoring wells, completed under the jurisdiction of state agencies, is collected to supplement EPA's monitoring data. The analytical results and the associated **plume** maps are compiled in a report twice a year. EPA estimates that the next monitoring report will be issued in April 1993.

Remedial Investigation Results

The Basinwide Remedial Investigation Report describes the results of more than five years of investigation of groundwater contamination in the San Fernando and Verdugo Basins through 1991. This is one of the largest projects of its kind in size and complexity in the United States. Objectives of the investigation were to: (1) characterize the geology and hydrogeology of the groundwater basins, (2) develop a groundwater flow model of the basin, (3) determine the nature and extent of groundwater contamination, (4) identify the fate and transport of compounds in the environment, (5) evaluate potential health risks, and (6) identify preliminary **applicable or relevant and**

appropriate requirements (ARARs), which are federal or more stringent state laws that would need to be met or waived for the final basinwide groundwater cleanup.

GEOLOGY AND HYDROGEOLOGY

Understanding the geology (how the soils and rocks are arranged) and hydrogeology (how water moves through the ground) is important to understanding how the contamination is moving in the San Fernando Basin and how it can be contained or cleaned up. The information from soil borings, monitoring wells, and other studies used to develop the RI indicate there are generally four geologic zones or layers (Deep, Lower, Middle, and Upper) in the basin. The depth and thickness of these zones depends on the location within the basin. The zones are believed to be present over much of the eastern San Fernando Basin, but the composition and characteristics of each zone may vary at any specific location. The relative depth and thickness of the zones are shown in Figure 3.

The Deep Zone extends to the bedrock at a depth of at least 1,200 feet below ground surface within the deepest portions of the eastern San Fernando Basin. The Deep Zone is not presently an important source for water supply. Evidence suggests that there is little interaction between the Deep Zone and contaminated portions of the aquifer. The Lower Zone, which lies above the Deep Zone, is composed of coarse sands, gravels, and cobbles. The top of the Lower Zone occurs approximately 250 feet below ground surface and the Lower Zone is approximately 200 to 250 feet thick. Most of the production wells in the eastern San Fernando Basin are perforated in the upper portions of the Lower Zone. The Middle Zone overlies the Lower Zone and is characterized by a sequence of fine-grained sands, silts and clays. The thickness of the Middle Zone is 0 to 50 feet. The Upper Zone is composed of silt, sand, and gravel and reaches from the surface to 200 to 250 feet below the ground surface. Because the groundwater varies from less than 40 feet below the ground surface (in the southeast) to greater than 200 feet below the ground surface in North Hollywood, only a portion of the Upper Zone may contain groundwater. Relatively little water supply is produced from the Upper and Middle Zones.

Under natural conditions, groundwater flows east across the valley in the western portion of the basin and to the southeast in the east portion toward the Los Angeles River Narrows. However, groundwater flow patterns are influenced by groundwater pumping for water supply. The direction of flow near these wells can change seasonally because the supply wells typically are pumped most heavily during the summer months. When water is being pumped from the Lower Zone, groundwater can be drawn downward through the Upper and Middle Zones. When the wells are not pumping from the Lower Zone and water levels recover, groundwater generally flows horizontally.

NATURE AND EXTENT OF CONTAMINATION

Groundwater samples have been collected from production (drinking supply) and monitoring wells throughout the San Fernando Valley. Sufficient data exist to identify contaminant distributions in the Upper and Lower

TABLE 1
VOCs DETECTED ABOVE MAXIMUM CONTAMINANT LEVELS (MCLs)

	Federal MCL (in parts per billion)	State MCL (in parts per billion)
Volatile Organic Compounds		
Benzene	5	1
1,1-Dichloroethane	—	5
1,2-Dichloroethane	5	0.5
1,1-Dichloroethene	7	6
1,2-Dichloroethene (total)	5	0.5
1,2-Dichloropropane	5	5
Carbon Tetrachloride	5	0.5
1,1,2,2-Tetrachloroethane	—	1
Tetrachloroethene (PCE)	5	5
1,1,1-Trichloroethane	200	200
Trichloroethene (TCE)	5	5

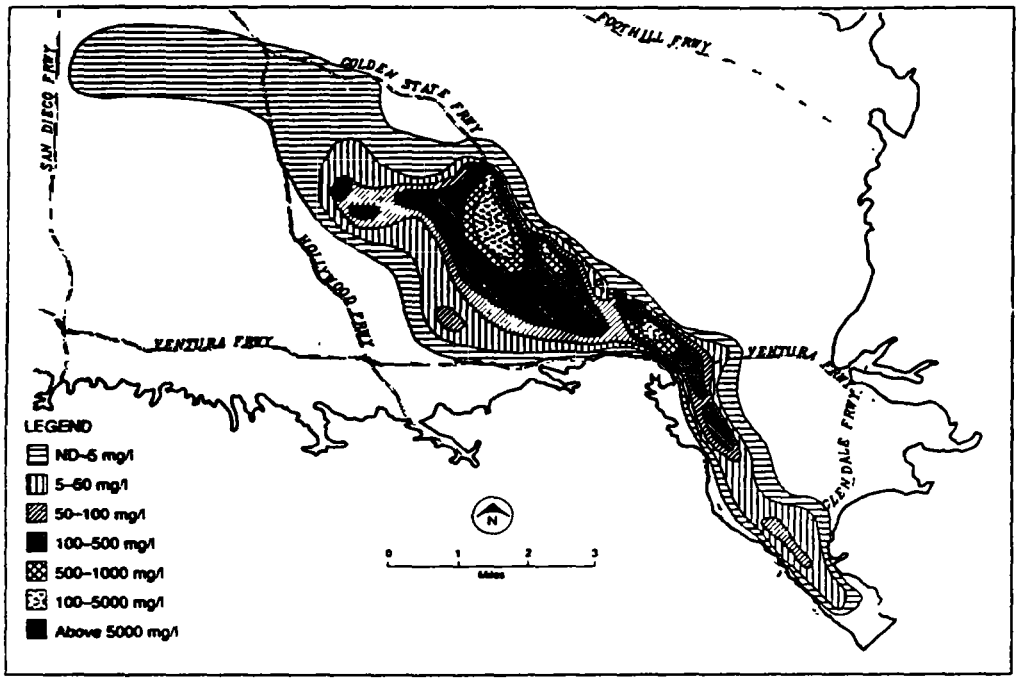


Figure 4A. Areas of TCE contamination in Upper Zone in 1992

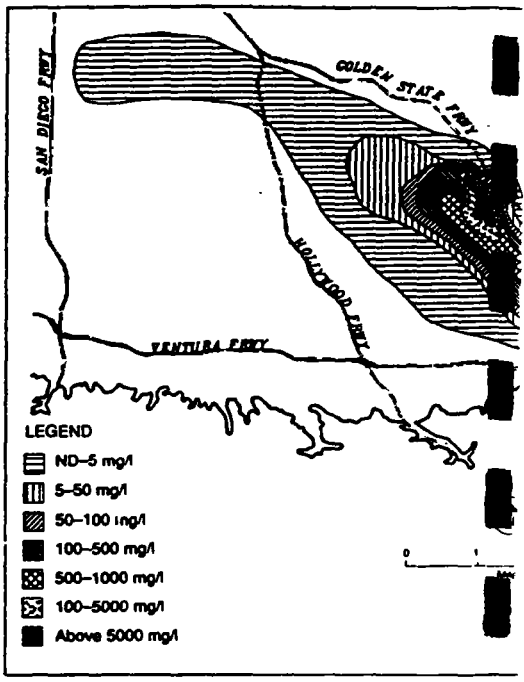


Figure 4B. Areas of PCE contamination in Up

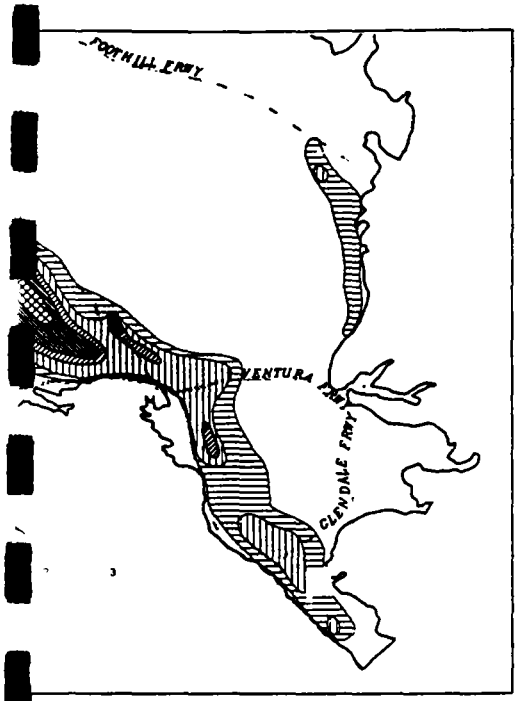
Zones. No monitoring wells were screened exclusively in the Middle Zone, and therefore, the distribution of contamination in this zone was not evaluated. EPA samples and analyzes the groundwater for volatile organic compounds (VOCs), semi-volatile organic compounds, metals, radionuclides, nitrate, and other chemicals. The predominant contaminants in the groundwater of the San Fernando Basin are VOCs, particularly trichloroethylene (TCE) and perchloroethylene (PCE), and nitrate. Table 1 on Page 5 shows the chemicals detected at least once in the San Fernando Valley above drinking water standards.

The majority and highest concentration of contamination in the groundwater was found in the Upper Zone, where 11 of the 34 VOCs analyzed were detected above their respective **maximum contaminant levels (MCLs)** during the 1991 sampling event. Only four of the 11 VOCs detected above their respective MCLs in the Upper Zone were also detected in the Lower Zone, and no VOCs were detected in the Lower Zone that were not also detected in the Upper Zone. In the Lower Zone, groundwater contamination appeared to be present in smaller, more isolated areas. No VOC contamination was detected in wells screened in the Deep Zone.

TCE, PCE and nitrate are the most widespread contaminants. Other contaminants, particularly other VOCs, have generally been found in areas of high PCE and TCE contamination. Concentrations are generally higher in the Upper Zone than in the Lower Zone. The highest concentration of TCE detected in EPA wells in 1992 was 7,100 **parts per billion (ppb)** or 1,420 times the drinking water standard. PCE in the EPA wells in 1992 was detected as high as 160 ppb, or 32 times the standard. Groundwater samples from wells installed at industry facilities in the San Fernando Valley near potential sources of contamination, have shown concentrations greater than 30,000 ppb for TCE and over 15,000 ppb for PCE.

In addition to VOCs, two priority pollutant metals, chromium and lead, were detected above their respective MCLs at some locations within the Upper Zone during the 1991 RI sampling. However, EPA is currently investigating the possibility that the metals are a result of drilling and sampling techniques, not actual groundwater contamination. No metals were detected above their MCLs within the Lower and Deep Zones. Nitrate was detected above its MCL in the Upper Zone and in isolated areas in the Lower and Deep Zones.

As part of the RI, plume maps showing the extent of PCE, TCE, and nitrate contamination in the Upper and Lower Zones were developed using RI well and depth-specific industry well data. Figures 4-A, 4-B, and 4-C above show TCE, PCE, and nitrate plumes for the Upper Zone based on 1992 data. Groundwater in the Upper Zone with



r Zone in 1992

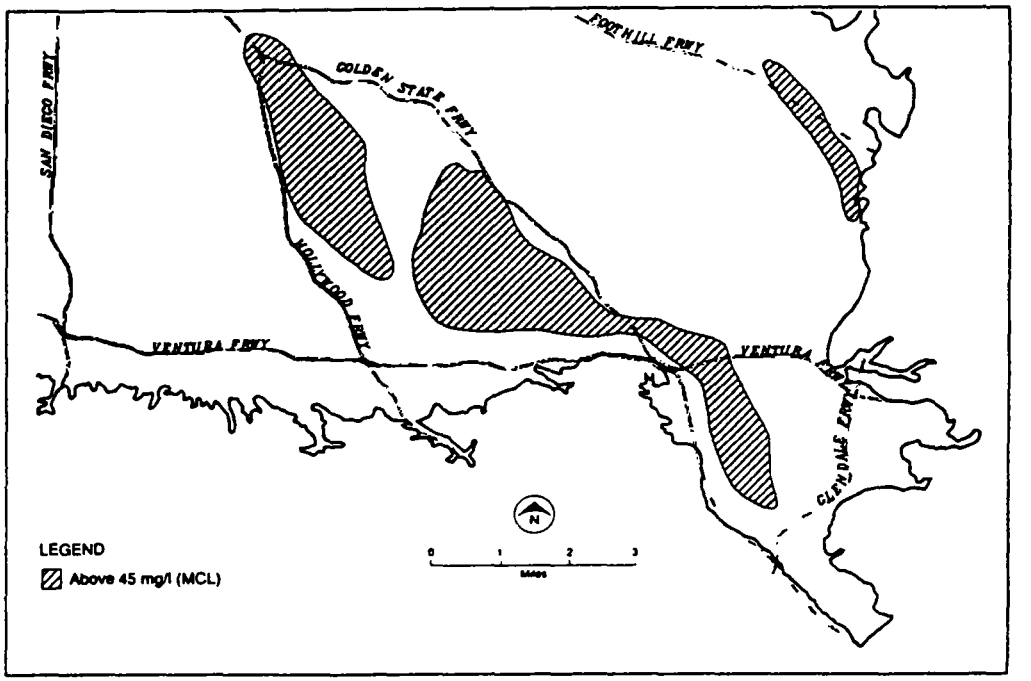


Figure 4C. Areas of Nitrate contamination in Upper Zone in 1992

TCE concentrations exceeding the drinking water standard underlies approximately 13 square miles of the basin and is interspersed with "hot spots," areas of higher contamination. The PCE plume is similar in shape to the TCE plume, but is smaller in extent (about nine square miles).

SAN FERNANDO BASIN GROUNDWATER FLOW MODEL

As part of the Basinwide Remedial Investigation, LADWP developed a three-dimensional groundwater flow model of the San Fernando Basin. The groundwater model of the San Fernando Basin was developed to meet these goals:

- Assess and confirm the groundwater conditions of the San Fernando Basin
- Evaluate past and future contaminant migration
- Predict and evaluate the basin-wide effects of potential remedial actions.

The computerized model represents the known and estimated components of the basin such as the hydrogeologic zones, groundwater flow directions, and the balance of groundwater inflows and outflows. By combining information about conditions in the basin with mathematical formulas to describe changes in those conditions, the model can help identify areas to target for field investigations, and predict future movement of contamination. This groundwater flow model will be continually updated, refined and improved by EPA as new information becomes available.

The model was calibrated by comparing results from computer simulations against actual water levels measured in the basin. The parameters of the model were adjusted until the differences between the model's results and the measured values met specified tolerances. Generally, the water levels and flow patterns generated by the model compare favorably with those derived from actual well data. The model simulates observed, regional flow directions and simulates both the steep cones of depression caused by pumping and the relatively flat gradients produced by recovering water levels in most areas in the eastern portion of the basin.

As the model was developed, it was used to guide RI work and OU feasibility studies. The model will help EPA evaluate past and future contaminant migration and remediation efforts in the groundwater basin.

FATE AND TRANSPORT

Once contaminants have reached the groundwater, their migration throughout the San Fernando Basin is controlled primarily by groundwater flow. Groundwater flows in complex patterns around the solid particles underground, although the overall flow may be in a single direction. The flow patterns can result in the spreading (dispersion) of contaminants carried with the groundwater. Physical and chemical reactions between some contaminant compounds

and the soil particles can slow down (retard) the average flow of contaminants, and may trap the compounds temporarily or permanently.

Neither chemical nor biological destruction are expected to have an important effect on the ultimate fate of the major contaminants in the San Fernando Valley. Most compounds will remain in the groundwater until they are pumped from wells or migrate with the groundwater through the Los Angeles River Narrows.

The RI estimated the average rates of TCE, PCE, and nitrate migration from the estimated velocity of groundwater flow and the estimated effects of physical retardation (entrapment on soil particles). Retardation has the effect of slowing the average TCE and PCE migration to velocities approximately one half to one third the velocity of the groundwater. Nitrate migration does not appear to be affected by physical retardation.

The average groundwater velocity is estimated to vary from about 300 feet per year in the North Hollywood area to over 1,300 feet per year in the Los Angeles River Narrows. Local pumping conditions may have a strong effect on the horizontal and vertical movement of groundwater and the transport of contaminants.

Existing wells in the basin that are perforated across several zones (such as the Upper and Lower Zones) may provide potential pathways for vertical contaminant migration, especially in areas where groundwater extraction in the Lower Zone occurs.

HEALTH RISK ASSESSMENT

As part of the Basinwide Remedial Investigation, LADWP prepared a "Baseline Risk Assessment" for the compounds detected in the San Fernando Basin that exceeded MCLs. The purpose of the risk assessment was to evaluate potential health effects from exposure to contaminated groundwater. The results of the risk assessment help EPA determine if any remedial actions are necessary to protect human health or the environment. The risk assessment examined the potential health effects if individuals were exposed to contaminated groundwater from the Upper and Lower Zones of the eastern San Fernando Basin (i.e., if it were to be used as a source of drinking water without treatment). In preparing risk assessments, EPA uses very conservative assumptions that weigh in favor of protecting public health.

The results of the risk assessment indicated contaminant levels in the Upper Zone of the aquifer would pose an unacceptable cancer risk (potentially greater than 1 in 1,000) to human health if this water were delivered directly to local residents *without* treatment. However, it should be reiterated that ***no one is drinking contaminated water.*** The RI presents the details of the risk assessment analysis.

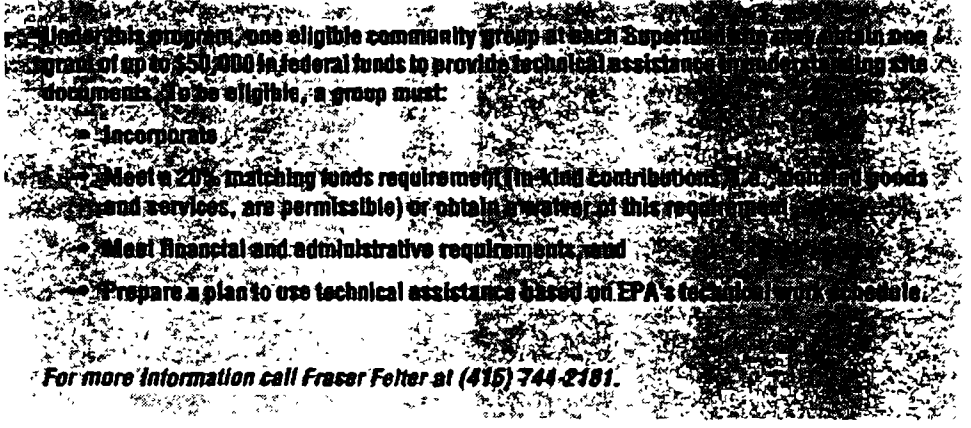
What Happens Next?

EPA is currently using the results of the remedial investigation to perform basinwide feasibility studies to address VOC contamination in both the groundwater and soil above the groundwater (**vadose zone**) of the eastern portion of the San Fernando Valley.

As part of the basinwide groundwater feasibility study, EPA is revising and recalibrating the basinwide groundwater flow model to incorporate the most recent data. The updated version of the model will be complete in early 1993. EPA will use the revised model to conduct a no-further-action analysis to determine what would occur if no basinwide groundwater cleanup action were undertaken. EPA will also evaluate the effectiveness of currently operating and planned OUs in facilitating the cleanup of the regional groundwater plume and limiting further spread of the most contaminated areas.

EPA will then review and evaluate various groundwater remediation options including: regional pump and treat, well-head treatment, and use of innovative technologies.

TECHNICAL ASSISTANCE GRANTS (TAGs) PROGRAM



For more information call Fraser Felter at (415) 744-2181.

During 1993, EPA will initiate work on a vadose zone FS to examine ways to protect the groundwater from contaminants that could reach the groundwater in the future. This FS will review and evaluate options for cleanup of VOC contamination in the vadose zone of the San Fernando Valley.

EPA will continue to gather and analyze information important to the project. EPA will also continue to work with the San Fernando Valley water purveyors and the Upper Los Angeles River Area (ULARA) Watermaster to summarize past and future groundwater management in the San Fernando Valley, including an overall water balance for the San Fernando Valley. EPA's interim actions to remove contaminants and inhibit migration from the most contaminated areas in North Hollywood, Burbank, Glendale North, Glendale South and Pollock OUs will also provide information useful for the basinwide FS. The quarterly groundwater monitoring program results, which include updated groundwater plume maps, will be available semi-annually at the five information repositories listed on page 11.

EPA will also continue to hold quarterly management committee meetings. These meetings, typically conducted in the Los Angeles area, are held among EPA, state and local agencies, the San Fernando Valley water purveyors, and the ULARA Watermaster to discuss the current status and future plans regarding EPA's Superfund activities in the San Fernando Valley.

As a result of repeated detection of only very low levels of PCE in the Verdugo Basin, EPA intends to continue to monitor the groundwater quality of that basin for at least the next five years.

Does EPA Consider Other Environmental Requirements?

Remedial actions must comply with all substantive elements of federal laws and more stringent state laws that apply or are determined to be relevant and appropriate to the remedy. EPA refers to these requirements as Applicable or Relevant and Appropriate Requirements (ARARs). Although several interim remedies (i.e., OUs) are currently operating or planned, a final cleanup remedy for the San Fernando Valley Superfund Site has not yet been selected. The ARARs identified in the RI are preliminary. When specific cleanup options are developed, EPA will consult with other federal and state agencies to identify the specific requirements. A final determination of requirements will be made by EPA and will be included in the Feasibility Study.

Glossary

ADMINISTRATIVE RECORD
The collection of documents which form the basis for an agency's decision on the selection of a response action at a Superfund site. CERCLA requires the EPA to establish an administrative record for every Superfund response action and to make a copy of the administrative record available at or near the site.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)
Remedial actions must comply with all substantive elements of Federal laws and more stringent state laws that apply or are determined to be relevant and appropriate to the remedy.

CERCLA
see Superfund.

CLUSTER WELLS
A group of two to four wells installed in close proximity to one another to sample groundwater at different depths.

GROUNDWATER
Underground water that fills pores between particles of soil, sand, and gravel or openings in rocks to the point of saturation. Where groundwater occurs in significant quantity, it can be used as a source of water supply.

NATIONAL PRIORITIES LIST (NPL)
A list of the top-priority hazardous waste sites in the country that are eligible for investigation and cleanup under the Superfund program.

OPERABLE UNIT (OU)
A distinct action taken at a Superfund site that contributes to the permanent

Continued on page 11

Glossary Continued from page 9

site cleanup. A number of operable units can be taken in the course of a Superfund project.

PARTS PER BILLION (PPB)
Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 billion ounces of water is 1 ppb.

PERCHLOROETHYLENE (PCE)
Also called tetrachloroethylene. A nonflammable solvent used commonly in dry cleaning operations and to remove grease from equipment. It is a suspected carcinogen.

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

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

RECORD OF DECISION (ROD)
A public document that explains the cleanup alternatives to be used at National Priorities List sites. The Record of Decision is based on information and technical analysis included in the administrative record including data generated during the remedial investigation/feasibility study and consideration of public comments and community concerns.

REMEDIAL ACTION
The construction or implementation of the selected cleanup remedy for a Superfund site.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
A two-part study of a hazardous waste site that must be completed before the site remedy is chosen and implemented. The first part, the Remedial Investigation, examines the nature and extent of contamination. The second part, the Feasibility Study, identifies and evaluates alternatives for addressing site contamination.

RISK ASSESSMENT
An evaluation performed as part of the remedial investigation to assess conditions at a Superfund site and determine the risk posed to public health and/or the environment.

SAN FERNANDO VALLEY
Geographic area composed of the valley floor and four groundwater basins: the San Fernando Basin, the Verdugo Basin, the Sylmar Basin, and the Eagle Rock Basin.

SAN FERNANDO VALLEY STUDY AREA
The eastern portion of the San Fernando Valley that includes the eastern portion of the San Fernando Basin and the entire Verdugo Basin.

SUPERFUND
The common name used for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), which defined a cleanup process and authorized money for investigating and cleaning up the nation's worst hazardous waste sites.

TETRACHLOROETHYLENE
see Perchloroethylene.

TRICHLOROETHYLENE (TCE)
A nonflammable liquid used commonly as a solvent to remove grease from metal. It is a suspected carcinogen.

VADOSE ZONE
The area between the ground surface and the water table. Also called the unsaturated zone.

VERTICAL PROFILE BORINGS (VPBs)
Wells drilled into the shallow groundwater to define the extent of groundwater contamination.

VOLATILE ORGANIC COMPOUND (VOC)
An organic compound (carbon containing) that evaporates (volatilizes) readily at room temperature.

SAN FERNANDO VALLEY INFORMATION REPOSITORIES

EPA encourages you to review the Basinwide Remedial Investigation Report (December 1992). The report and other San Fernando Superfund documents are available for public review at the following five locations. If the [illegible] are not available, contact Fraser Felter, Community Relations Coordinator, at (415) 744-2181.

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

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

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

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

The University Research Library/U.C.L.A.
Public Affairs Service
405 Hilgard Avenue
Los Angeles, CA 90024
(310) 825-4003
Contact: Barbara Silvernail
Hours: M–F 10:00 am–7:00 pm
Sat 1:00 pm–5:00 pm

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

Kevin Mayer/Project Manager
U.S. EPA, Region IX
75 Hawthorne Street (H-6-4)
San Francisco, CA 94105
(415) 744-2260

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

MAILING LIST COUPON

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

Name: _____

Address: _____

_____

Telephone: _____

Affiliation (if any): _____

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

What is Superfund?

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

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

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

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

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INSIDE: RESULTS OF BASINWIDE GROUNDWATER INVESTIGATION

APPENDIX J

EAST VALLEY WATER RECLAMATION PROJECT

FINAL

ENVIRONMENTAL IMPACT REPORT
(SCH NO. 90010909)

EAST VALLEY WATER RECLAMATION PROJECT

JULY 1, 1991

PREPARED BY

CITY OF LOS ANGELES DEPARTMENT OF WATER AND POWER

111 North Hope Street, Room 1348

Los Angeles, California 90012

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

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

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

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

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

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

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

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

3.2 PROPOSED FACILITIES

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

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

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

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

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

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

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

3.3 DISCRETIONARY ACTIONS

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

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

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

City of Los Angeles Planning Commission

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

City of Los Angeles Cultural Affairs Commission

- Pump station and tank architectural design approval.

City of Los Angeles Department of Building and Safety

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

City of Los Angeles Bureau of Engineering

- Issuance of an Excavation Permit to construct the pipeline.

State of California Department of Health Services

- Engineering Report Recommendation

- Issuance of Operation Permit

Los Angeles Regional Water Quality Control Board

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

Los Angeles County Department of Public Works

- Issuance of Flood Control Permit

3.4 PROJECT SCHEDULE

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

3.5 CONSTRUCTION ACTIVITIES

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

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

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

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

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

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

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

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

3.6 REGULATION AND INSPECTION OF CONSTRUCTION ACTIVITY

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

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

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

3.7 PROJECT OPERATIONS

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

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

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

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

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

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

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

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

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

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

3.8 PROJECT FINANCING

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

TABLE 3-1

RECLAIMED WATER DISTRIBUTION SYSTEMS

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

VICINITY MAP
SCALE
0 5 10 15 Miles

FIGURE 3-1
PROJECT LOCATION MAP

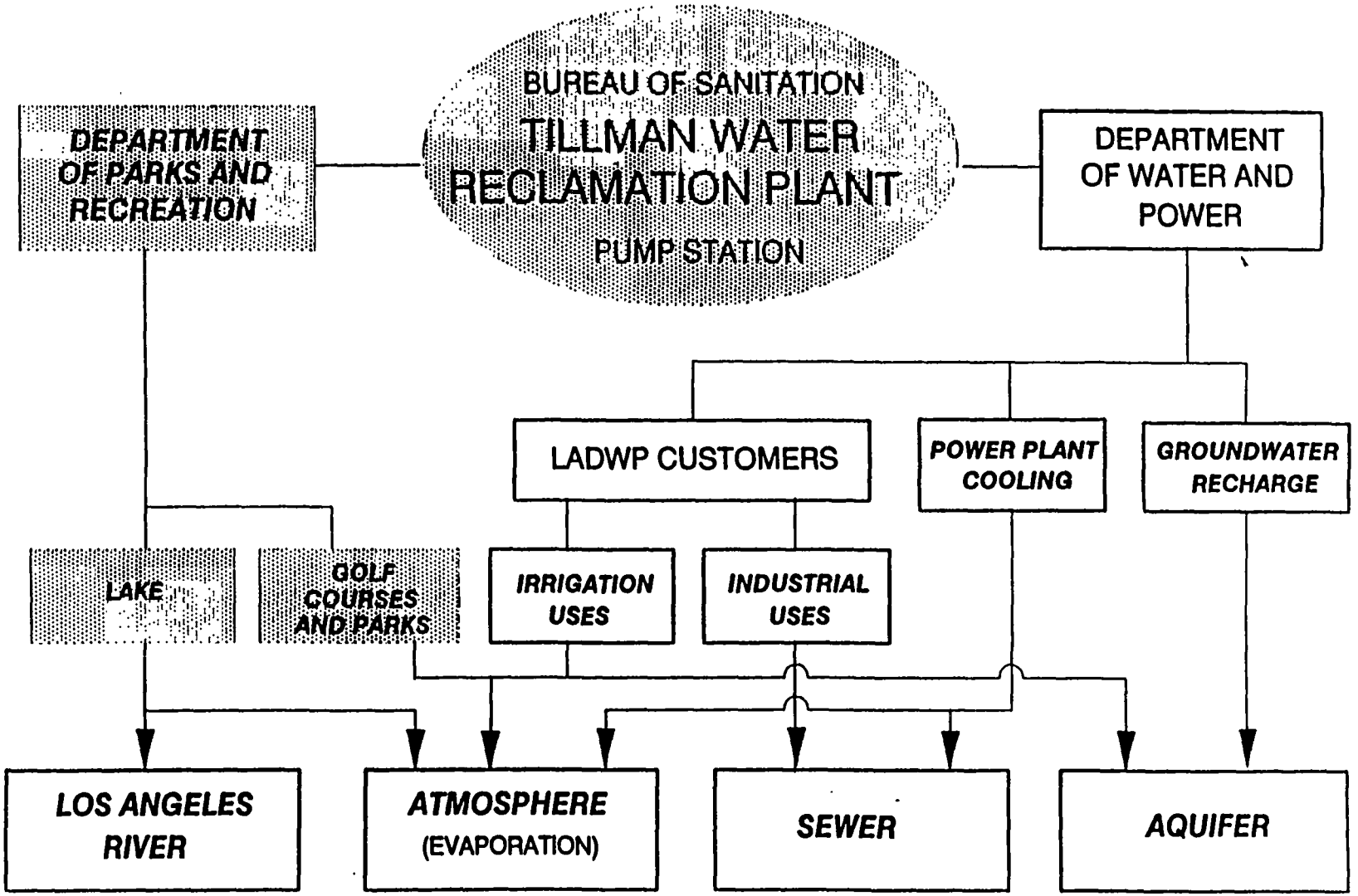


FIGURE 3-2
TILLMAN PLANT
RECLAIMED WATER
UTILIZATION

NOTE: Shaded areas are not part of the proposed project

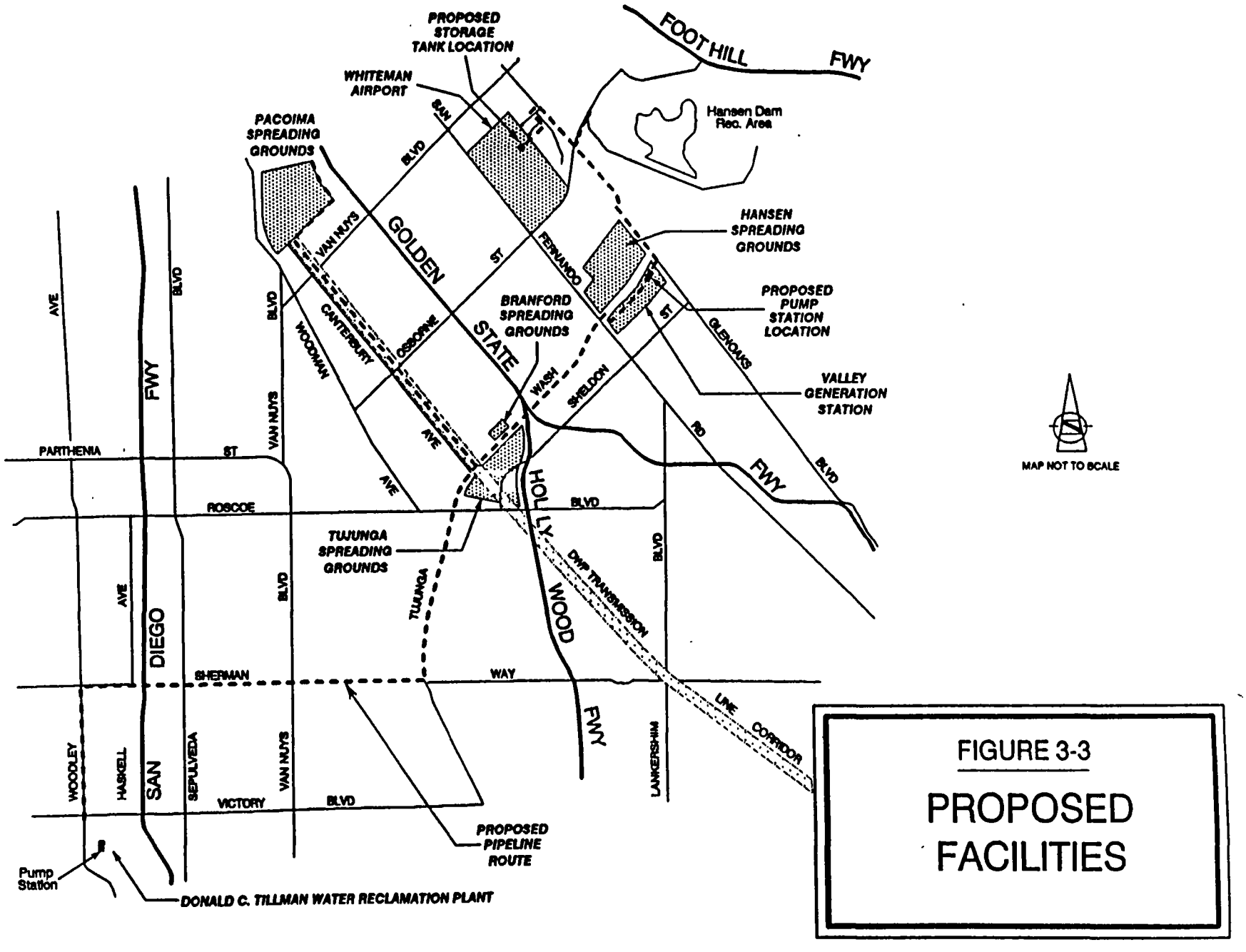


FIGURE 3-3

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 Ground Water 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 ground water and to insure that none of the reclaimed water escapes. The quality of the ground water 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.
- ◊ To propose a full-scale operation following the completion of the pilot study and the preparation of engineering report.

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

- ◊ May 1990: Obtained National Pollutant Discharge Elimination System (NPDES) permit for returning extracted water to the LAR

- ◊ Oct. 1990: Award well drilling contract

- ◊ Nov. 1990: Award monitoring contract and reach a joint funding and support agreement with Metropolitan Water District of Southern California.

- ◊ 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

- ◊ Feb. 1991: Initiate spreading and extraction

- ◊ Aug. 1992: Preparation of the First Progress Report

- ◊ Feb. 1993: Complete monitoring phase. Develop final report and recommendations.

Water Quality Monitoring Results

Results of comprehensive water quality analysis showed the extracted water from the ground water basin compiled with all drinking water standards.

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 ground water 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 ground water 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 Ground Water Recharge which issued a formal follow-up report on the subject in 1987.

Because conditions affecting ground water 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 ground water 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 ground water 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 Ground Water 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 Ground Water 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 form the point of application before it has had a chance to enter the main basin and blend with the native ground water 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 ground water 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 ground water, containing percolated LAR water, to meet state and federal drinking water standards if during Phase I it is determined that the water does not meet those standards.

2) Evaluate the overall benefit/cost of using LAR water containing tertiary treated effluent form 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.

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

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

6) 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 to the water. Basins will be rotated periodically for alternate spreading and drying cycles.

3) Extract ground water 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.

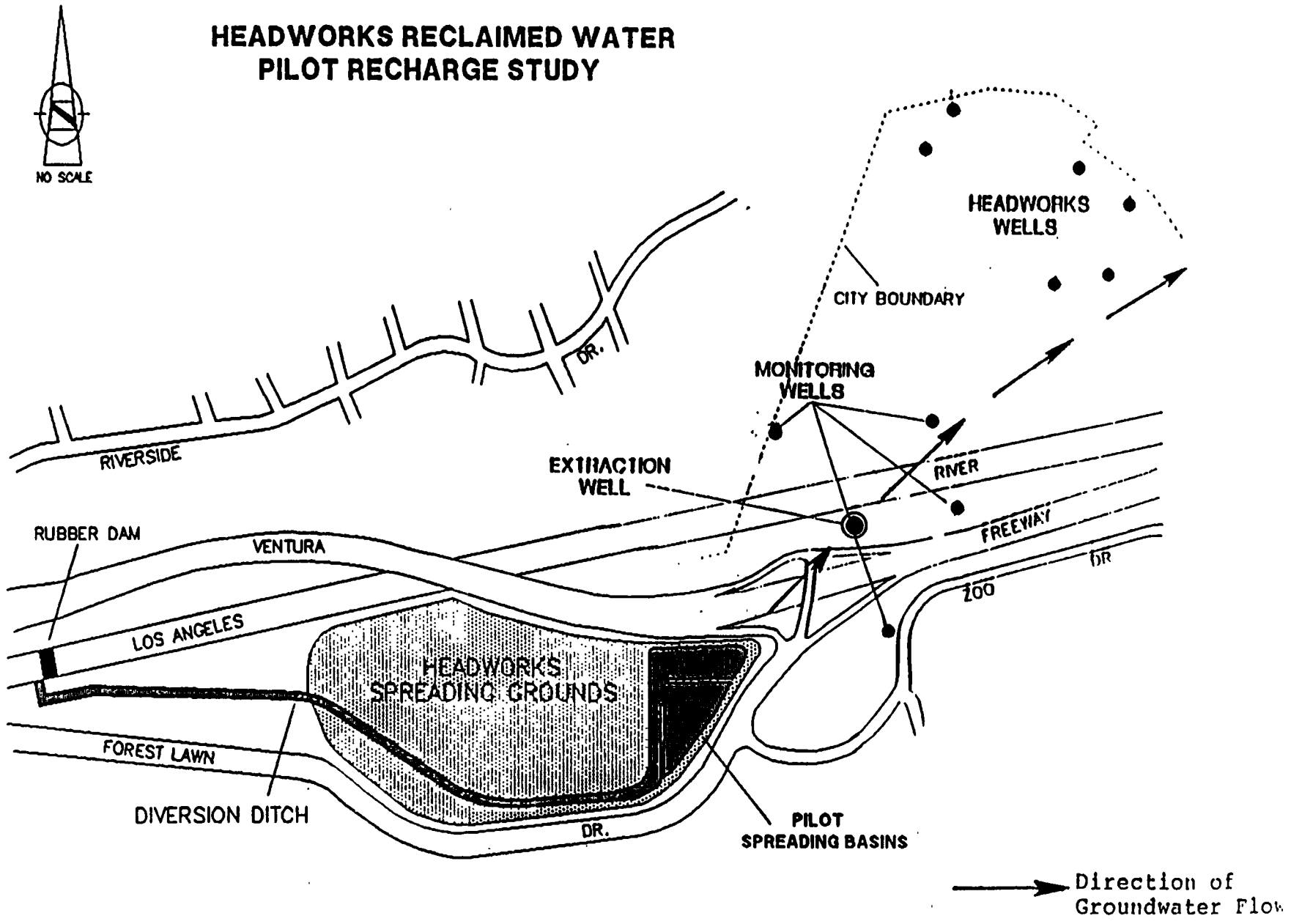
   ◊ Extraction rate will be greater than spreading rate to provide adequate drawdown cone of depression (approximately 1.5 cfs).

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

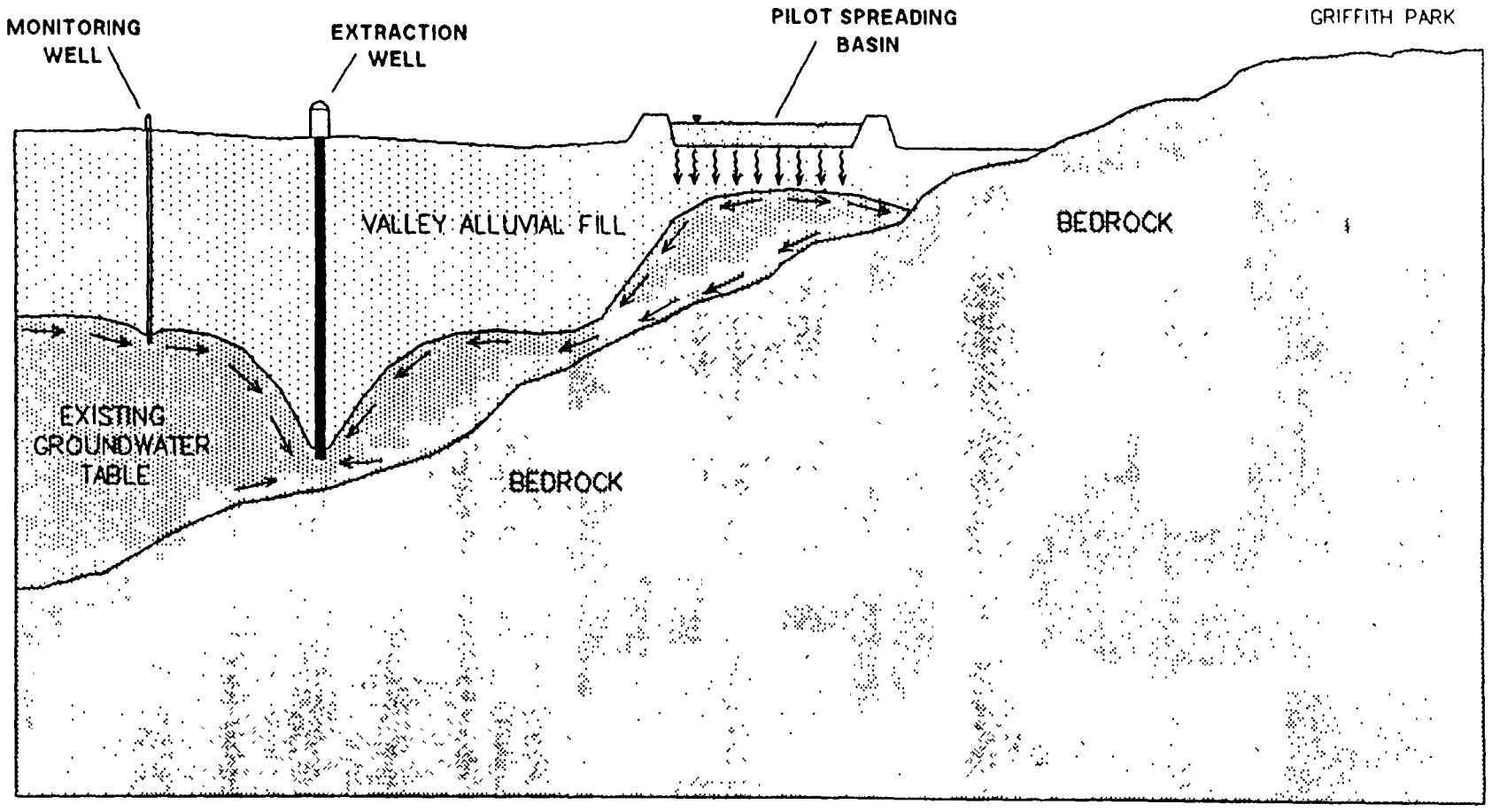
5) Testing of the water will be performed on samples obtained from the diversion ditch and the pump discharge line.

Monitoring

Precautions will be taken to minimize commingling of percolated LAR water and native ground water 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 the 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
RUBBER DAM
VENTURA
FREEWAY
DR
ZOO
LOS ANGELES
HEADWORKS
SPREADING GROUNDS
FOREST LAWN
DIVERSION DITCH
DR.
PILOT
SPREADING BASINS
Direction of
Groundwater Flow

HEADWORKS RECLAIMED WATER
PILOT RECHARGE STUDY



APPENDIX L

CONVERSION FACTORS

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