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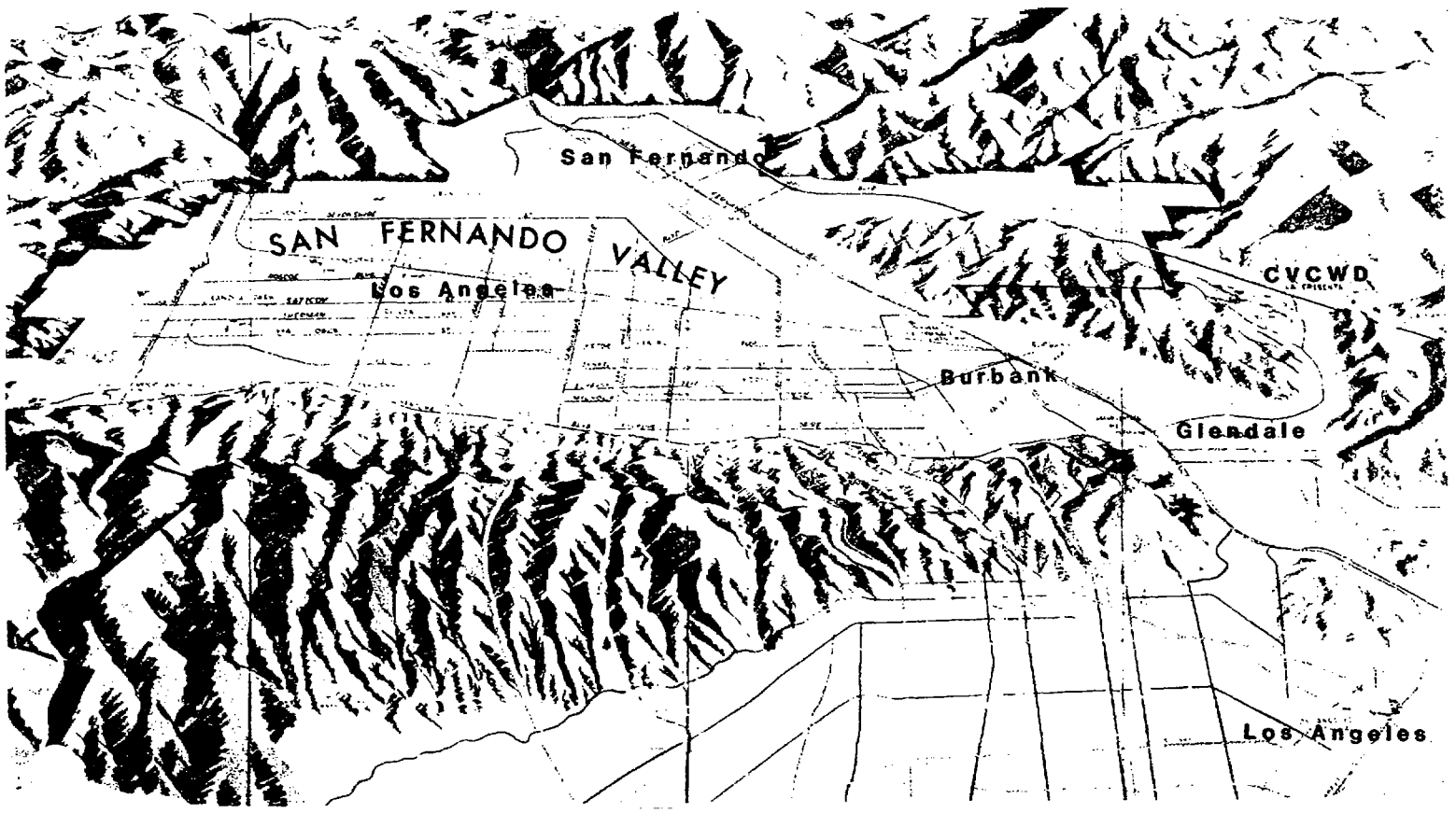
GROUNDWATER QUALITY MANAGEMENT PLAN

SAN FERNANDO VALLEY BASIN



JULY 1983

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GROUNDWATER QUALITY MANAGEMENT PLAN

SAN FERNANDO VALLEY BASIN

PREPARED FOR

SOUTHERN CALIFORNIA ASSOCIATION

OF GOVERNMENTS

PREPARED BY

DEPARTMENT OF WATER AND POWER

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JULY 1, 1983

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PREFACE

This report is a summary of a two-year study that resulted in eight (8) primary recommendations that constitute the Groundwater Quality Management Plan for the San Fernando Valley Basin (SFVB). These recommendations will impact municipal water supply agencies within the SFVB and city, county and state agencies responsible for the regulation and control of hazardous materials.

This report is divided into three major sections: Overview of the Study, Recommendations, and Summary of Subtask Investigations. The first section or the Overview of the Study describes the contamination problem and briefly summarizes the investigative phase of the study. The Recommendations section outlined in this report will provide direction in the development of strategies designed to protect the groundwater against continued contamination by hazardous chemicals in the basin and to ensure the safe use of this source of drinking water. The last major section is the Summary of Subtask Investigations. This section describes the individual subtask investigations, previously completed, as outlined in the Work Plan for this project.

The preparation of this report was a partial fulfillment of Cooperative Agreement No. 10590 between the Department of Water and Power (DWP) and the Southern California Association of Governments (SCAG). The study was initiated in July, 1981 and funded in part by a grant of $375,000 from the United States Environmental Protection Agency. The study was administered by SCAG. Engineering services were performed by the DWP pursuant to a detailed work plan. This report will be used to draft an amendment to the 208 Areawide Waste Treatment Plan for the South Coast Planning Area.

To incorporate the input and comments of private citizens, concerned interest groups and affected public agencies, a Citizens' Advisory Committee and a Technical Advisory Committee were formed. The Citizens' Advisory Committee was composed of representatives from local governments, public interest groups, economic interest groups and private citizens. The Technical Advisory Committee was composed primarily of engineering representatives from city, county and state agencies that have extensive technical and management experience in the water supply industry.

In addition, a public participation program was conducted that included a public meeting and numerous speaking engagements before service groups, private organizations, and local governments within the study area. The goal of the public participation program was to disseminate pertinent information and to obtain public support and input to the study.

ACKNOWLEDGMENTS

The formulation of the Groundwater Quality Management Plan for the San Fernando Valley Basin has required the intense effort of numerous individuals. A special expression of gratitude is extended to the following individuals and organizations that made contributions toward the formulation of portions of this plan.

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EXECUTIVE SUMMARY

In early 1980, the industrial chemicals trichloroethylene (TCE) and perchloroethylene (PCE), were discovered in the groundwater of the San Fernando Valley Basin (SFVB) which provides drinking water for the Cities of Los Angeles, Burbank, Glendale and San Fernando. TCE, the major contaminant found, was detected in approximately one-fourth of the groundwater wells tested in the SFVB, at concentrations in excess of the current level recommended for drinking water by the California State Department of Health Services (DOHS).

In response to these findings, the Los Angeles Department of Water and Power, and the Southern California Association of Governments (SCAG) received EPA funds to embark upon a two-year study which began in July, 1981. The scope of the study was to determine the extent and severity of the contamination and to develop strategies to control the groundwater contamination problem. The specific objective of the study was to develop a basin-wide groundwater quality management plan including recommendations for implementing strategies to ensure the future protection and safe use of the groundwater basin.

Efforts were focused primarily on defining the extent of the contamination, investigating current potential sources of contamination and developing this plan to protect the basin. Extensive investigations to determine past activities that might have caused the contamination problem were not made because many expensive groundwater monitoring wells would have been required to trace the contaminants to their origins and such information would have been of little help in the formulation of an overall plan to protect the basin. It is apparent from the contamination pattern that there were many sources that caused the contamination currently found in a number of the wells. The approach of the investigation, therefore, was to examine all potential sources of groundwater contamination and to evaluate current industrial practices for the handling, storage and disposal of hazardous materials.

The investigation of potential sources of groundwater contamination included: (1) commercial and industrial establishments; (2) accidental spills and unintentional releases of hazardous materials; (3) dry weather urban drainage; (4) landfills; and (5) other commercial waste sources which included private disposal systems, sewer exfiltration and permitted industrial waste discharges. Evidence of the presence or use of industrial contaminants was found for all of the sources investigated. Those sources within the sensitive groundwater areas surrounding the well fields where soil permeabilities and groundwater velocities are relatively high, were of particular concern because of the high potential for groundwater contamination.

Although no distinction could be made between past and current groundwater contamination, the findings of the study indicate that most of the contaminants currently reaching the wells probably resulted from past industrial practices before hazardous material classifications and regulations became established. A practical way to protect the groundwater is to improve the methods of use, handling, storage and disposal of hazardous materials by industry. Remedial action to protect the sensitive groundwater areas from additional contamination is the most immediate concern since the groundwater basin is a vital source of water supply for the Cities of Los Angeles, Burbank, Glendale and San Fernando.

The eight primary recommendations of the study, presented on the following page, are based on a twofold approach for the control of groundwater contamination in the SFVB. Recommendations 1 through 6 involve the prevention of future contamination of the groundwater basin. These recommendations provide for a comprehensive management plan for the handling, storage and disposal of hazardous materials. Recommendations 7 and 8 involve remedial actions for the current contamination problem and recommend engineering strategies to allow full use of the groundwater for drinking.

The degree of implementation for Recommendations 7 and 8 will depend upon water quality regulations adopted for the contaminants. These recommendations are based on the State DOHS interim action levels for TCE and PCE. Proposed EPA contaminant limits are expected to be published in late 1983 but will not be implemented until after an extensive public review process that will take about two years. The State DOHS must adopt contaminant limits for drinking water that are equal to or more stringent than those adopted by the EPA. Currently, the State DOHS interim action levels are at the lower limits of the EPA's Suggested No Adverse Response Levels (SNARL) and represent a conservative estimate of the eventual standard.

GROUNDWATER QUALITY MANAGEMENT PLAN

Recommendations	Proposed Implementing Agencies
1. Public Education Program	Water Agencies, Industrial Waste Control Sections, State and County DOHS
2. Regulation of Private Disposal Systems	Industrial Waste Control Sections, Engineering Departments, Building Departments
3. Augmented Enforcement Program	Regional Water Quality Control Board (RWQCB), State and County DOHS, Industrial Waste Control Sections
4. Regulation of Storage Tanks, Sumps and Pipelines	RWQCB, State and County DOHS, Fire Departments, Building Departments
5. Small-Quantity Generator Hazardous Waste Disposal Program	SCAG, Sanitation Departments
6. Regulation of Landfills	RWQCB, Water Agencies, Sanitation Departments
7. Groundwater Monitoring Program	Water Agencies
8. Aquifer Management and Groundwater Treatment Program	Water Agencies

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INTRODUCTION

SECTION 1

INTRODUCTION

1.1 Importance of Groundwater

The San Fernando Valley groundwater basin is a natural underground reservoir that represents an important source of drinking water for the Los Angeles metropolitan area. (Figure 1) In addition to supplying annual water needs, this groundwater basin holds large quantities of stored water which can be extracted during droughts and replenished during years of surplus water supply.

Groundwater extractions from the basin are important water supplies for the Cities of Los Angeles, Burbank, Glendale, San Fernando and the unincorporated La Crescenta area of the County of Los Angeles. (Figure 2) All the above agencies can draw upon groundwater stored in the basin for use during droughts or emergencies when sufficient water from the Metropolitan Water District of Southern California (MWD) may not be available. Groundwater extractions typically supply about 15 percent of Los Angeles' water, nearly all of San Fernando's and about half of La Crescenta's requirements. An estimate of the annual value of groundwater produced from the SFVB is $15 million based upon current MWD water rates and approximately $30 million based upon water replacement costs of new water supplies.

The use of groundwater resources will become more important in Southern California in the future because of the expected loss of imported surface water supplies. Upon the completion of the Central Arizona Project, Southern California will lose over half of the water now provided from the Colorado River Aqueduct. The California State Water Project, which imports water from Northern California, was expected to compensate for the loss of Colorado River water. However, since all of the State Water Project facilities have not been approved or constructed, the State project currently can deliver only half of the water for which it is obligated. The construction of additional facilities to allow the full delivery capacity of water is estimated to require about 10 years to complete after approval. Currently, approval of these facilities is not in the foreseeable future. In addition, litigation over Los Angeles' water rights in the Mono Basin and Owens Valley threatens the loss of part of the imported water supply.

The combined impact of these losses of water supply for Southern California would place an extreme burden on the MWD to compensate for this shortfall. The impact could be quite severe during an extended drought. Consequently, the management of the quality of groundwater in the San Fernando Valley Basin is a vital concern in ensuring the continued use

and protection of this valuable water resource for the affected cities.

1.2 Background of Groundwater Study

In late 1979, the California State Department of Health Services (DOHS) requested that all major water purveyors using groundwater conduct tests for the presence of certain industrial chemicals in groundwater as part of a nationwide groundwater quality surveillance effort. These initial tests, completed in the spring of 1980, showed that trichloroethylene (TCE), perchloroethylene (PCE), and to a lesser extent some other hazardous chemicals were present at low concentrations in a number of wells in the SFVB. As a result of these initial tests, some wells were taken out of service and others were blended with clean supplies from other sources to lower the contaminant levels. Close monitoring assured that only water in compliance with the recommended quality guidelines of the State DOHS was delivered to the customer for consumption.

In response to these findings, the Los Angeles Department of Water and Power (DWP), through a cooperative agreement with the Southern California Association of Governments (SCAG), applied to the California State Water Resources Control Board for EPA funding under the 208 Grant Program to develop a basin-wide Groundwater Quality Management Plan. Other participating Cities included Burbank, Glendale, and San Fernando.

Funds were received and work began in July of 1981. The major objectives of this two-year study were:

1. To define and describe the extent and severity of present groundwater contamination in the SFVB,

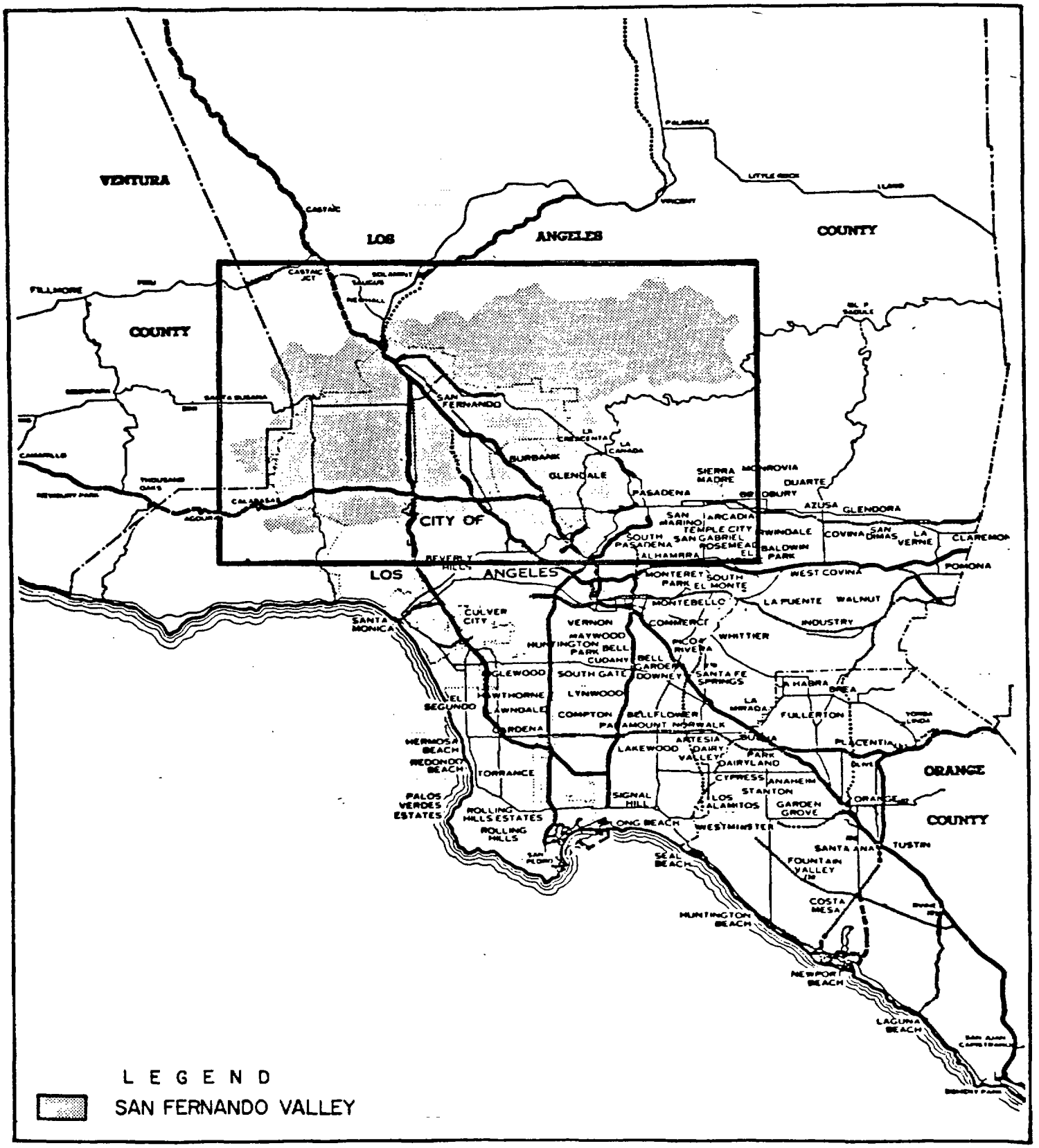
2. To investigate and examine information relative to potential sources of the contamination,

3. To develop and evaluate engineering and regulatory strategies for controlling the contamination problem, and

4. To recommend specific programs or actions deemed necessary for the protection and safe use of the basin, including proposed funding alternatives for the implementation of remedial action.

Activities of the study included field investigations, industrial site surveys, records and archives searches, literature reviews, and water quality analyses of more than 600 samples. In addition, two Advisory Committees were formed to assist with both public and technical input during the course of the study.

FIGURE



VICINITY MAP

SCALE

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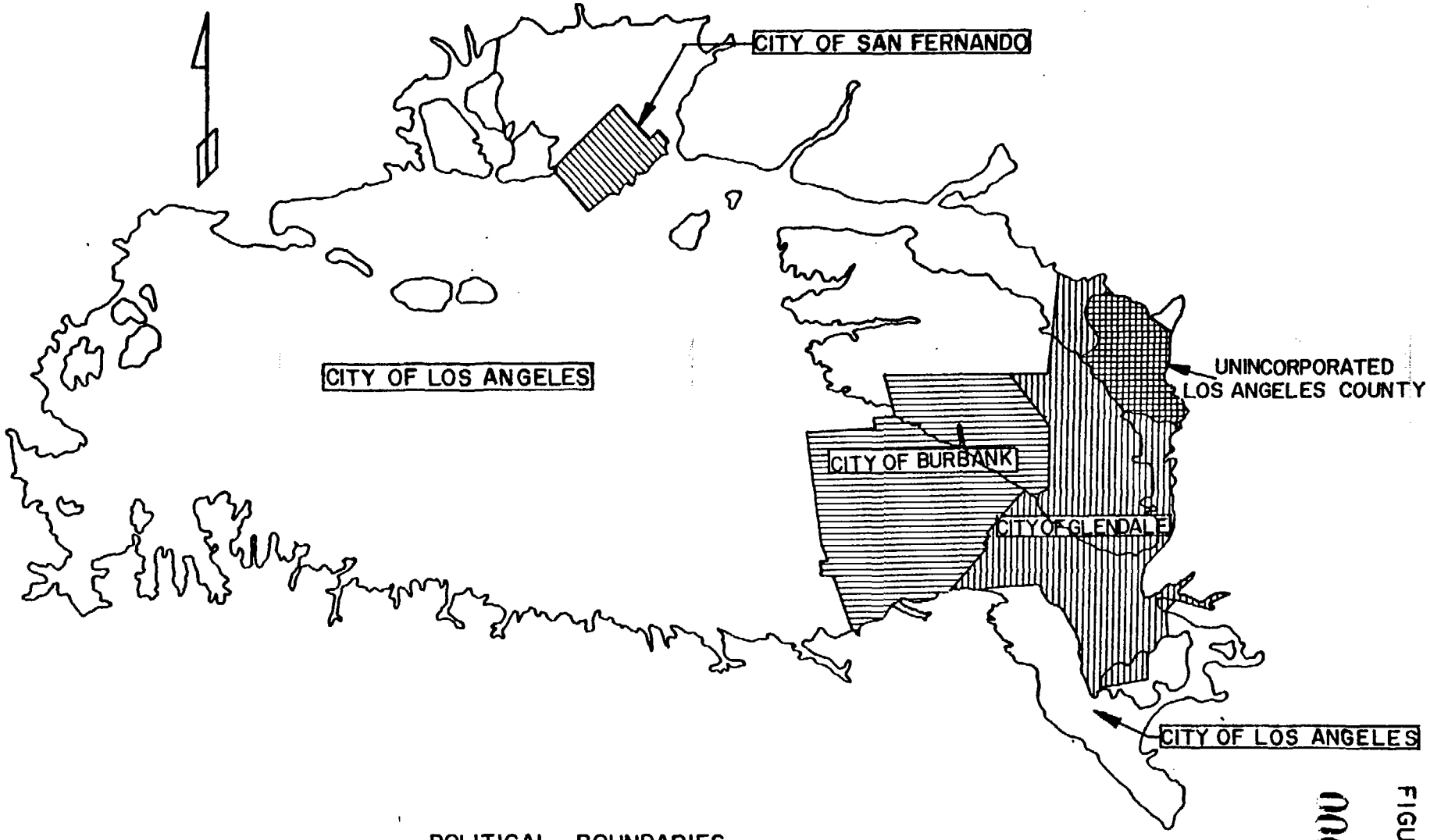

POLITICAL BOUNDARIES
San Fernando Valley Basin
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FIGURE 2

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OVERVIEW

SECTION 2

OVERVIEW OF THE STUDY

The following is an overview of the findings and conclusions of the investigation of existing groundwater contamination by hazardous industrial chemicals in the San Fernando Valley Basin. Detailed information describing the specific activities or subtasks of the study may be found in the Appendix, Summary of Subtask Investigations.

2.1 Description of the Study Area

2.1.1 San Fernando Valley Basin

The San Fernando Valley Basin (SFVB) is encompassed within a region known as the Upper Los Angeles River Area (ULARA), which consists of the entire watershed of the Los Angeles River (LAR) and its several tributaries above a point along the LAR near its junction with the Arroyo Seco Flood Control Channel. The ULARA is comprised of a total of 328,500 acres, of which 122,800 acres are alluvial valley fill deposits and 205,700 acres are hills and mountains. The area is bounded on the north and northwest by the Santa Susana Mountains, on the northeast by the San Gabriel Mountains, on the east by the San Rafael Hills, on the west by the Simi Hills, and on the south by the Santa Monica Mountains. (Figure 3)

The 122,800 acres of valley fill include four distinct groundwater basins which are separated by restrictions to groundwater flow. These basins are replenished by a combination of local and imported surface recharge waters and subsurface inflow. The four groundwater basins are the San Fernando, Sylmar, Verdugo and Eagle Rock Basins. (Figure 3)

The San Fernando Basin is by far the largest. It consists of 112,000 acres, or 91.2 percent of the total valley fill, and has an estimated total groundwater storage capacity of 3,200,000 acre-feet. The volume of usable stored groundwater in the San Fernando Basin is estimated to be approximately 1,000,000 acre-feet.

For the purpose of this report, any reference to the SFVB will include all four groundwater basins with particular emphasis on the San Fernando Basin.

2.1.2 Groundwater Conditions

Groundwater in the SFVB is stored in the alluvial deposits which comprise the valley fill. The distribution of these deposits has resulted in a characteristic difference in groundwater conditions between the eastern and western portions of the basin. This difference is illustrated by the Soil

Infiltration Map for the SFVB (Plate 1). This map shows the variation in relative infiltration rates from low in the western portion to high in eastern portion of the SFVB. These relative surface infiltration rates are also generally indicative of the relative rates of percolation and soil permeability in the SFVB.

The alluvial deposits in the eastern portion of the SFVB are comprised primarily of sands and gravels with some localized lenses of silts and clays interbedded. Conditions in the eastern portion of the SFVB are therefore characterized by high soil permeability and groundwater production. Groundwater in the eastern SFVB is generally unconfined with a depth to water table from 50 to 200 feet. The presence of clay lenses partially restricts the vertical movement of groundwater.

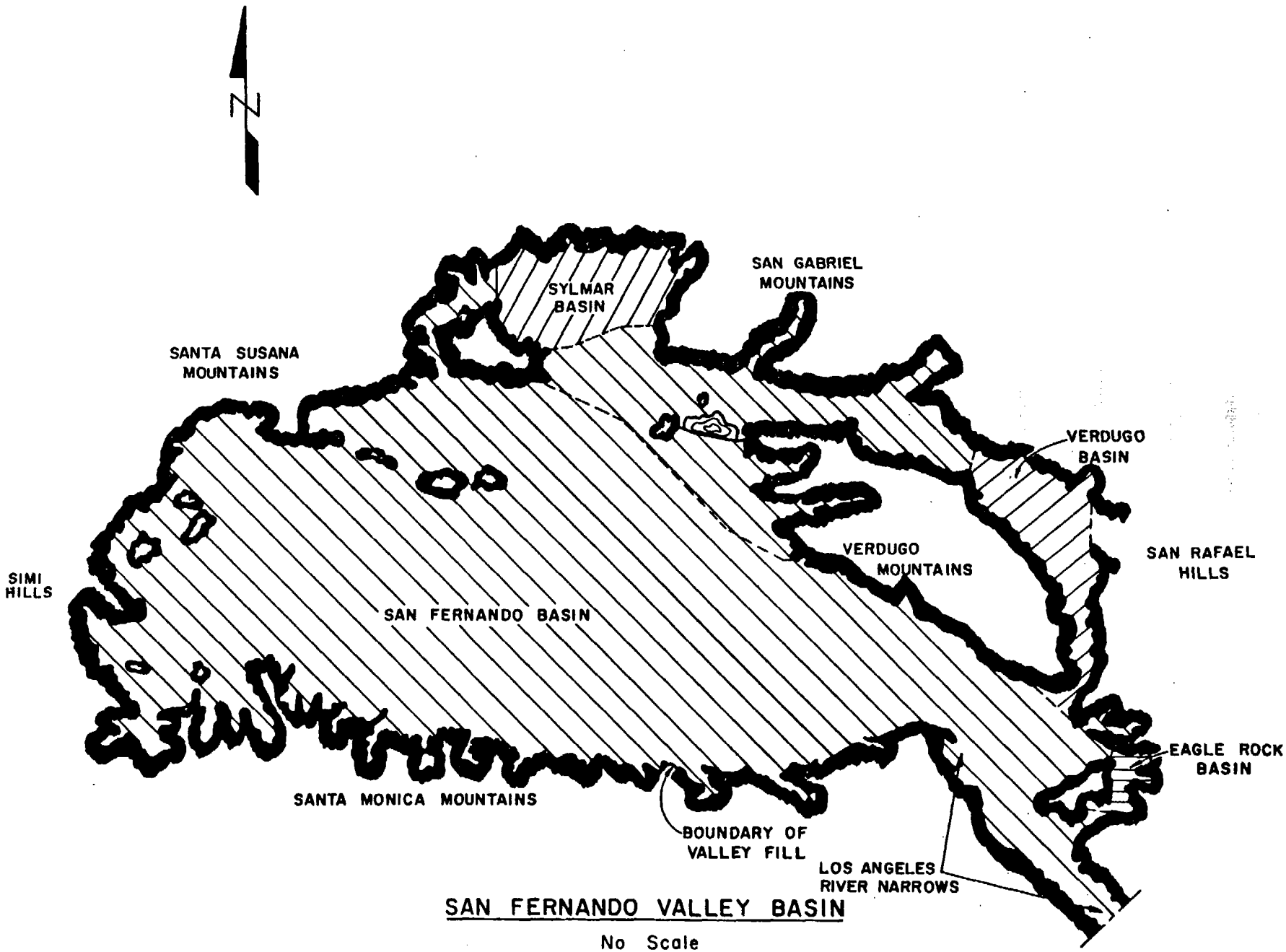
The western portion of the basin, on the other hand, consists of finer sediments and clays exhibiting low permeability and low water yields. In the western SFVB, groundwater generally is confined or partially confined; and rising water or artesian flow is common in this area. Groundwater in the western portion also contains higher total dissolved solids (TDS) concentrations than groundwater in the eastern portion.

The groundwater contours, shown on Plate 2, indicate that the general direction of groundwater flow in the SFVB is southeasterly from the recharge areas on the alluvial fans along the edges of the valley fill toward the basin outlet area at the Los Angeles River Narrows. Figure 4 shows groundwater flow directions and the variations in estimated groundwater flow velocities over the basin.

Because of the dense grouping of wells in certain areas and the extensive pumping of groundwater, several large cones of depression have formed in the water table. These cones of depression have caused significant changes in the natural groundwater flow patterns and generally persist throughout the year despite the highly seasonal variation in pumping activities. One such cone of depression exists in the North Hollywood well field and is illustrated by the groundwater contours shown on Plate 5. Similar cones of depression have also developed in the Crystal Springs and the Pollock well fields and are illustrated by the groundwater contours shown on Plates 6 and 7, respectively.

2.1.3 Groundwater Use

Because of the favorable geohydrologic conditions in the eastern portion of the SFVB, extensive development of groundwater wells has occurred there. Between the mid 1940's and the late 1960's, excessive groundwater extractions caused a significant lowering of the water table over the eastern portion of the basin. An effect of this lowered water table condition was the influx of higher TDS groundwaters from the



SAN FERNANDO VALLEY BASIN

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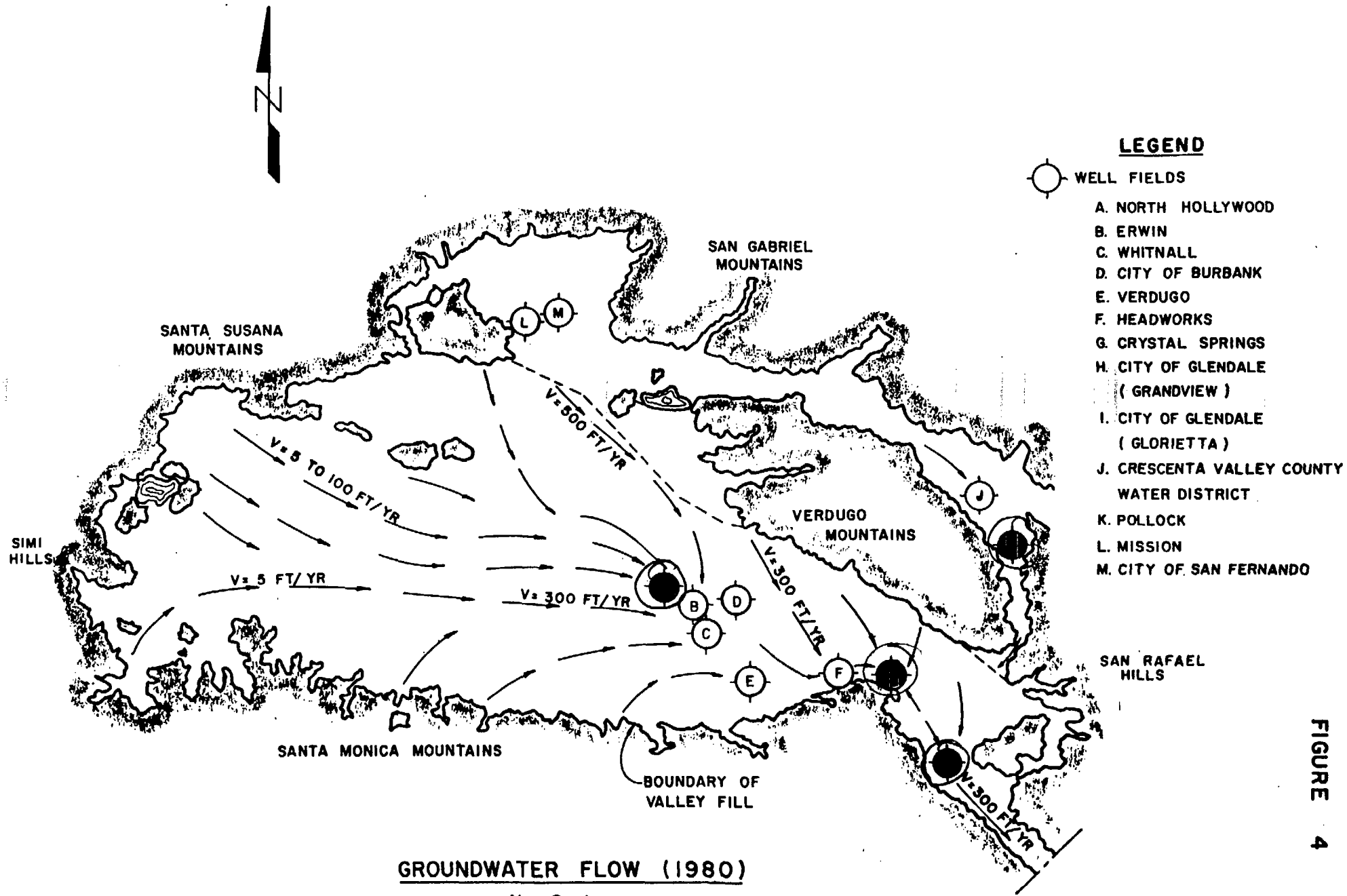
FIGURE 3



GROUNDWATER FLOW (1980)

No Scale

FIGURE 4

western portion.

The total allowable groundwater extraction rights for the SFVB were determined through a protracted court case involving the City of Los Angeles and other owners of wells in the SFVB. The litigation, which began in 1955, lasted over 20 years. In 1975, the City of Los Angeles' water rights in the San Fernando Basin were upheld by the California State Supreme Court. The City of Los Angeles retained rights to all of the native groundwaters of the San Fernando Basin. All cities within the SFVB were allowed to extract imported return waters, as well as to store water in the SFVB and to extract equivalent amounts.

As of October, 1982, the total annual extraction rights to groundwater in the SFVB amounted to more than 100,000 acre-feet, with accumulated water storage credits for all cities totaling more than 160,000 acre-feet for future use.

2.2 Groundwater Quality Testing Program

2.2.1 Background

The groundwater quality testing program was conducted to more accurately define both the extent and severity of contamination by Volatile Organic Compounds (VOC's) in the SFVB. Samples from 135 production and monitoring wells throughout the SFVB were analyzed for the presence of organic contaminants. Complete Gas Chromatograph-Mass Spectrometer (GC-MS) scans allowed detection of as many as 36 possible VOC's. GC-MS scans were performed on more than 60 groundwater samples taken from 45 selected wells.

Gas Chromatograph (GC) analysis was used to measure the concentrations of individual contaminants in the groundwater. GC analyses for TCE and PCE were performed on more than 600 groundwater samples. This information was used to better define the temporal and areal distribution of these hazardous chemicals in the SFVB.

2.2.2 Major Contaminants Present

Results of the GC-MS analyses indicated that the major contaminant in the groundwater was TCE. PCE was also present in many samples but to a much lesser extent than TCE. These two compounds were detected at higher concentrations than any other VOC. While other VOC's were present in some samples, most were detected at concentrations well below action levels recommended by the State DOHS for TCE and PCE.

2.2.3 Contaminant Concentrations

Follow-up investigations with GC analysis were conducted through January, 1983, to better define the concentration and distribution of both TCE and PCE in the groundwater. A significant finding was that the concentration of these

compounds varied considerably between well groups and among wells within a group. Contaminant concentrations were also found to vary widely in water samples from a single well over periods of months, weeks and even hours. For this reason, it was difficult to correlate the contaminant concentrations measured except as a relative or statistical indication of the overall level of contamination in the basin. Tables 1 and 2 summarize the maximum concentrations of TCE and PCE found in groundwater production wells throughout the SFVB.

TCE was found in 42 wells at concentrations exceeding the State DOHS recommended Action Level of 5 ppb. Average concentrations in most of these wells generally ranged from 5 to 50 ppb. However, maximum contaminant concentrations from 200 to 500 ppb were found in a few of the wells.

PCE was found at concentrations greater than the recommended Action Level of 4 ppb in 17 wells. Average concentrations generally ranged from 4 to 50 ppb with a maximum level of 130 ppb occurring in one of the wells.

2.2.4 Contaminant Distribution

The groundwater quality testing program showed that volatile organics contamination affected four water systems in the SFVB. These systems are operated by the Cities of Los Angeles, Burbank and Glendale, and the Crescenta Valley County Water District. Plate 8 shows the locations of wells exceeding the State DOHS recommended action levels.

Area 1

The groundwater in the North Hollywood area of the SFVB is the most heavily contaminated. Contamination in this area affects wells in the DWP's North Hollywood, Erwin and Whitnall well fields and the Burbank well field. Contamination is greatest from TCE. PCE is also present at significant levels in several wells.

Area 2

TCE contamination in the Crystal Springs area of the SFVB affects wells in the DWP's Crystal Springs and Headworks well fields and Glendale's Grandview well field. No significant contamination by PCE has been found to date in this area.

Area 4

Contamination by TCE and PCE in the Pollock well field was found in two of the DWP's wells. However, contrary to the contamination found in the North Hollywood and Crystal Springs areas, PCE is at higher levels than TCE in the Pollock well field.

Area 3

The La Crescenta area, within the Verdugo basin, includes wells in Glendale's Glorietta well field and wells owned by the Crescenta Valley County Water District. The groundwater from the Verdugo Basin is isolated from the groundwater of the San Fernando Basin. To date PCE is the only volatile organic contaminant found at significant levels in this area.

TABLE 1

STATUS OF TCE CONTAMINATION

SAN FERNANDO VALLEY BASIN

Well Group	No. of Wells	No. of Wells Containing TCE Under 5 ppb	No. of Wells Containing TCE Between 5 and 50 ppb	No. of Wells Containing TCE Greater Than 50 ppb
DWP Wells				
North Hollywood	35	17	9	8
Erwin	7	1	1	0
Whitnall	10	4	2	2
Verdugo	7	1	1	0
Headworks	6	6	2	4
Crystal Springs	3	3	3	0
Pollock	2	2	2	0
Mission	3	0	0	0
(Sub Total)	73	34	20	14
Glendale Wells				
Grandview	8	4	4	0
Glorietta	3	0	0	0
(Sub Total)	11	4	4	0
Burbank Wells	10	4	3	1
San Fernando Wells	5	0	0	0
Crescenta Valley County Water District	10	0	0	0
Total	109	42	27	15

Note: The ranking of wells in the above table indicates that at some time between January 1980 and January 1983, the individual well analysis has attained the indicated level.

TABLE 2

STATUS OF PCE CONTAMINATION

SAN FERNANDO VALLEY BASIN

Well Group	No. of Wells	No. of Wells Containing PCE Under 4 ppb	No. of Wells Containing PCE Between 4 and 50 ppb	No. of Wells Containing PCE Greater Than 50 ppb
DWP Wells				
North Hollywood	35	4	4	0
Erwin	7	1	1	0
Whitnall	10	2	2	0
Verdugo	7	0	0	0
Headworks	6	0	0	0
Crystal Springs	3	0	0	0
Pollock	2	2	2	0
Mission	3	0	0	0
(Sub Total)	73	9	9	0
Glendale Wells				
Grandview	8	0	0	0
Glorietta	3	1	1	0
(Sub Total)	11	1	1	0
Burbank Wells	10	3	2	1
San Fernando Wells	5	0	0	0
Crescenta Valley County Water District	10	4	4	0
Total	109	17	16	1

Note: The ranking of wells in the above table indicates that at some time between January 1980 and January 1983, the individual well analysis has attained the indicated level.

No groundwater contamination was found in the City of San Fernando wells or the DWP's Mission wells located in the Sylmar Basin. The Sylmar Basin is a confined aquifer with a substantial clay confining layer near the surface that may act as a barrier to restrict the infiltration of organic contaminants.

2.2.5 Summary of Results

The results of the groundwater testing program revealed that TCE and PCE are present, in approximately 45 percent of the water supply wells located in the eastern portion of the SFVB, at concentrations exceeding the action levels recommended by the State DOHS.

Contamination by TCE and PCE had severely restricted the use of 13 municipal water supply wells. Two wells each in the Cities of Burbank and Glendale were shut down as a result of groundwater contamination. In the City of Los Angeles, the use of 9 wells was restricted under the operating guidelines of the State DOHS. The State DOHS required that water from these wells could be used only after blending with water from clean sources to assure that water delivered to the consumer was below the recommended action levels for TCE and PCE.

An examination of Plates 5, 6 and 7 indicates an apparent correlation between TCE contamination and commercial and industrial developments for wells located in the vicinity of the North Hollywood, Crystal Springs and Pollock well fields, respectively. This relationship is particularly discernible on Plate 5 which shows the wells contaminated with TCE located within or adjacent to commercial and industrial zones. The higher concentrations of TCE were detected in wells within the commercial and industrial corridors. In general, wells located in residential zones, represented by the uncolored areas on Plate 5, were uncontaminated. The contaminants in the groundwater, however, could either migrate in the direction of groundwater flow or be drawn toward an operating well from as far away as 2000 feet depending upon the rate of pumping and transmissivity of the aquifer.

The levels of TCE and PCE observed in water supply wells over the two years of testing indicated the contaminants occurred in plume patterns. In general, the contaminants were observed only in certain groups of wells while other well groups appeared to be unaffected. Because of the lack of adequate groundwater sampling facilities, it was not possible to trace the paths or origins of the contaminants, or to accurately plot contaminant plume patterns.

A significant finding resulted from aquifer tests conducted with a special inflatable well packer installed in a contaminated well. The installation of the well packer, at the middle of a thick clay lense approximately 300 feet below the water table, allowed the isolation of the upper zone of the

aquifer from the discharge flow of the well. A comparison of TCE levels before and after installation of the well packer revealed a dramatic reduction in the order of about 50 to 1. The results of these tests not only indicate the substantial dilution factors involved in the results of water quality analyses but also reveal that, for the particular well tested, the concentration of TCE was much greater in the upper zone of the aquifer than in the lower zone.

The results of the groundwater testing program must be carefully evaluated in order to avoid erroneous conclusions in the interpretation of data. Although the movement of contaminants in groundwater is relatively slow, groundwater contamination is a dynamic condition. The results presented in this report are composites of data collected during two years of testing.

Additionally, several factors affect contaminant concentrations in the discharge from production wells used for monitoring. The most significant is the dilution factor which is directly proportional to the pumping rate. Another is the effect of adjacent operating wells. Depending on the path of the contaminant in the groundwater, this could either increase or decrease the contaminant concentration in a well. A final factor is sampling procedure. For representative results, samples should be collected after the well is initially purged and steady state conditions are attained.

While the results of the groundwater testing program were important from an operational standpoint, more information on contaminant distribution, paths and origins, is needed. This information would aid in the development and implementation of the most effective engineering solution to the problem.

2.3 Hazardous Waste Sources Investigation

2.3.1 Background

The objectives of this phase of the study were to identify and to investigate major potential sources of hazardous wastes in order to assess the overall impact of these potential sources on groundwater quality. Although it was not the goal of this study to search out illegal industrial waste dischargers or discharge sites, any available information relative to groundwater contamination was examined and analyzed. The investigation of these potential hazardous waste sources was as comprehensive and complete as possible under the scheduling and budgetary constraints of the study. Whenever warranted, laboratory analyses were conducted to aid in the detection of major organic contaminants which could have originated from these sources.

2.3.2 Industrial Survey

An industrial survey was conducted by Stearns, Conrad and

Schmidt Consulting Engineers (SCS) in a 1300-acre area that was primarily industrially zoned in the North Hollywood area of Los Angeles. The survey attempted to: (1) identify the types and quantities of hazardous materials and the industrial users within the survey area, (2) evaluate current industrial practices for the handling, storage and disposal of hazardous materials and (3) evaluate current industrial inspection and enforcement programs for the regulation of the use and disposal of hazardous materials. It was not possible to make an accurate assessment of the impact of past use, handling and disposal of these materials on current groundwater quality conditions.

Based on results of the survey, very little TCE is presently used in the North Hollywood area. This is primarily due to the strict control placed on the use of TCE by the Air Pollution Control District Board (now the South Coast Air Quality Management District) in 1966, because of TCE's photoreactivity and air pollution effects. Prior to this time, TCE was widely used as a degreasing solvent in aircraft and electronics manufacturing, metal plating, automotive, dry cleaning and other industries. At present, however, PCE and other solvents have replaced TCE in most industrial applications.

The survey also indicated that, in general, current hazardous materials management practices are adequate among most large commercial and industrial establishments (greater than 100 employees). However, the following deficiencies were noted in the survey, especially among commercial or industrial facilities that handle small quantities of hazardous materials:

1. There was little formal spill control planning or employee training.

2. There was no monitoring for leaks from underground or surface tanks storing hazardous materials.

3. There was practically no evidence of an operating program for the disposal of small quantities of hazardous wastes within the survey area. Improper disposal practices including on-site dumping, uncontrolled discharge to storm drains and sewer facilities and disposal to municipal refuse were suspected to be more prevalent than observed.

Since current industrial use of TCE is not significant, it is believed that existing contamination generally originated from disposal practices of 2 to 3 decades ago. Nevertheless, the potential for contamination by other hazardous materials currently in use still exists at many industrial plant sites.

Compliance and enforcement activities currently conducted by the regulatory agencies were sometimes inadequate where

groundwater protection is concerned. The following major shortcomings were identified in the combined effort of existing city, county and state programs:

1. The mechanisms for identifying commercial and industrial establishments requiring investigation and evaluation were inadequate.

2. Effective sampling and inspection coverage was difficult to implement due to staffing limitations and budgetary constraints.

3. Frequently, the enforcement response was impeded due to lengthy hearings and adjudicatory proceedings.

2.3.3 Accidential Spills and Unintentional Releases

The investigation of accidental spills and unintentional releases of hazardous materials involved an examination of records kept by the DWP, the Los Angeles City Bureau of Sanitation, the Los Angeles City Fire Department, the Los Angeles County Flood Control District, and the County Department of Health Services. Such spills and releases may result from transportation accidents, industrial storage and pipeline leaks, equipment failures and overflows, mishandling of materials, fire control runoff and removal by washdown.

In general, reported spill incidences do not appear to have resulted in a significant degree of contamination of the groundwater in the SFVB. During recent years, most of the harmful effects which could have resulted from major spill and release incidences were prevented through quick response and the implementation of proper containment and clean up procedures. Spill contingency planning is the most important factor for the successful prevention of groundwater contamination by accidental or unintentional releases of hazardous materials.

Studies in other communities, however, indicate that leak incidences from storage tanks and pipelines are common but are often undetected until groundwater contamination occurs. In the SFVB, current regulatory programs do not focus on all hazardous materials storage and pipeline facilities.

2.3.4 Dry Weather Urban Drainage

The term dry weather urban drainage denotes the flow patterns in the Los Angeles River (LAR) and storm drain systems during the annual dry season. Urban drainage water has many origins and was investigated and tested to determine if hazardous chemicals were present and transported by the drainage system and possibly input to the groundwater basin. Dry weather urban drainage flow tributary to the LAR could originate from any of the following sources:

1. runoff water from yards, driveways, sidewalks and streets that results from car washing, excess irrigation and washdown water, and subsequently enters the storm drain system,

2. wastewater discharges including effluents from the Los Angeles-Glendale and Burbank Water Reclamation Plants and other NPDES permitted discharges, and

3. rising groundwater occurring in the western portion of the SFVB.

Dry weather urban drainage may enter the groundwater basin either through water spreading activities or through deep percolation along the unlined reaches of the LAR and the storm drain systems. Contaminants in the LAR could conceivably migrate to nearby wells and impact groundwater quality.

A water quality survey of the LAR and tributary storm drains was conducted to determine the background levels of both TCE and PCE. While these chemicals were present at low concentrations in the LAR, they did not appear to significantly endanger groundwater quality. However, continued monitoring of the LAR and the storm drain system is necessary to evaluate the impact of both sporadic contaminant discharges and of scheduled effluent discharges from the Los Angeles-Glendale and Burbank Water Reclamation Plants and from the proposed Donald C. Tillman Water Reclamation Plant.

2.3.3 Landfills

The sanitary landfills investigation consisted primarily of a review of available information on the siting, design, classification and use of active and completed landfills as a source of groundwater contamination in the SFVB. Little or no information was available on privately operated, on-site disposal operations of the past. Plate 9 and the accompanying list show the locations and names of the sites identified in the San Fernando Valley. The waste classifications of old landfills and dumps were estimated and based upon observations noted in DWP files. For many of the older sites, however, there was no documentation on what was deposited.

The available information on landfill locations, areas of known groundwater contamination and samples from monitoring wells was not sufficient to establish the impact of landfills on the current groundwater contamination problem in the SFVB. Owners or operators of older landfills were not required to install monitoring equipment. Therefore, specific water quality data for older sites was not developed.

While most of the landfills investigated were not permitted to receive hazardous wastes, it is generally accepted that early regulatory controls on operation and design of landfills were not adequate to prevent the disposal of

hazardous wastes and the leaching of hazardous chemicals from landfills into the groundwater. However, current state of the art design, operating and monitoring requirements protect the basin from any potential adverse impact to groundwater quality which may result from new sites.

2.3.6 Other Commercial Waste Sources

This category involved an investigation of the disposal of industrial wastewaters as a source of contamination. Wastewater flows into the public sewer system and from private disposal systems (PDS) on commercial and industrial properties were analyzed for the presence of VOC's.

Analysis of samples from public sewer lines indicated that both TCE and PCE were present in wastewater collection systems at low concentrations. If significant exfiltration of wastewater occurs, these contaminants could infiltrate the groundwater basin. However, it appears the public sewer system is currently not a significant source of contamination because the contaminant levels found in sewers were much lower than the levels found in the wells.

A comprehensive search of public works records revealed that a number of commercial and industrial properties in the North Hollywood area still utilize private disposal systems, such as septic tanks, for their wastewater disposal. (See Plate 10) Effluents from these systems are discharged directly to the ground through leach lines, where they subsequently percolate to the groundwater table.

While these on-site systems were installed for the disposal of domestic wastes only, there was no monitoring requirement to ensure that hazardous industrial wastes were not also discharged. Quantitative analyses performed on grab samples taken from PDS's revealed that a range of VOC's were present at potentially harmful concentrations in the effluents sampled from commercial and industrial sites.

2.4 Conclusions

Study results indicated that TCE and, to a lesser extent, PCE were present at low concentrations in the groundwater at scattered locations throughout the eastern portion of the SFVB. The occurrence of TCE and PCE contamination in the SFVB clearly indicated that the contaminants originated from a number of different sources.

Although it was not possible to determine the specific origins of the contaminants or to accurately define contaminant plume patterns, there appeared to be a distinct relationship between groundwater contamination and commercial and industrial developments. Based on the present limited use and improved industrial waste practices for TCE and PCE, current groundwater contamination of the SFVB appears to be the result of past

disposal practices. It is suspected that the major sources of these contaminants may have been in operation about two to three decades ago before priority pollutant designations and adequate hazardous materials regulations became established.

The present contamination problem should be viewed as a long-term condition. Since data on TCE and PCE levels in groundwater in the SFVB was not available prior to 1980, long-term trends of contaminant levels cannot be determined from current limited information.

Research studies, however, indicate that TCE and PCE are not subject to significant biodegradation under conditions generally found in the SFVB. Therefore, the only apparent method of reducing the overall contaminant loading in the SFVB is by removal. A more intensive groundwater quality testing effort is needed to monitor contaminant trends and to determine sources of contamination.

The implementation of measures to eliminate or control any present or future sources of contamination is also of vital importance for the protection of the SFVB. The vulnerability of the SFVB to the threat of contamination from a large number of potential commercial and industrial sources is especially critical for the eastern portion of the SFVB. High infiltration rates and extensive groundwater pumping make the eastern portion of the basin the primary area of concern. Because of the extensive cost of corrective measures, a maximum effort to prevent further input of hazardous chemicals to the groundwater is essential to ensure the continued safe use of the basin in the future.

Although the existing regulatory structure is basically sound, current inspection and compliance programs have not yet been developed to the full extent needed for the protection of the groundwater. Under the present institutional arrangement, regulatory programs exist at each level of government. These programs, however, should be reevaluated since the original intent of regulatory activities typically has been for surface water rather than groundwater protection. Further interagency coordination is needed to assure the most efficient and effective arrangement and utilization of manpower. In many instances, the activities of these agencies are restricted by budgetary and manpower limitations.

RECOMMENDATIONS

SECTION 3

RECOMMENDATIONS

3.0 Introduction

3.0.1 Objectives

As a result of the investigations and conclusions of the study, eight (8) primary recommendations for the management of groundwater quality are proposed. The overall objectives of these recommendations are designed to address two major aspects of the contamination problem:

1. the control and regulation of hazardous materials to minimize future contamination of the basin (Sections 3.1 through 3.6), and

2. the control and management of contaminants currently in the basin to assure a quality of groundwater supply safe for drinking (Sections 3.7 and 3.8).

Table 3 shows the estimated costs, suggested funding and primary affected agencies for each of the recommendations. For Recommendations 7 and 8, the costs are based upon the current action levels of 5 ppb for TCE and 4 ppb for PCE, as recommended by the State DOHS.

The benefits to be derived from the implementation of preventive measures far outweigh the remedial costs for restoration of the basin. Although final standards for the concentrations of VOC's in drinking water have not yet been adopted, preliminary estimates indicate a significant increase in water operating costs for the cleanup and treatment of contaminated groundwater. Current levels of contamination must be controlled and managed through the application of various engineering strategies to assure the safest and highest attainable quality of drinking water. More important, however, are the future consequences of permanent or long-term damage to the groundwater basin and the diminished groundwater production capability during critical water shortages.

3.0.2 Groundwater Protection Priority Areas

Eventually, the recommendations should be implemented on a basin-wide scale. However, there are certain priority areas of the groundwater basin where initial implementation will provide the greatest and most immediate benefits to groundwater quality. In addition, current budgetary and staffing constraints on regulatory agencies may make it necessary to prioritize initial efforts. For these reasons a three-level groundwater protection priority system has been developed for the SFVB, as illustrated in Figure 5.

Priority Area One includes all of the areas that overlie and have the most immediate impact on the major wells and well fields in the southeastern and south-central portion of the SFVB. This area is generally characterized by high soil infiltration and permeability rates and a high density of commercial and industrial development.

Priority Area Two generally includes areas of the SFVB with high to medium soil infiltration and permeability rates but are separated from the major well fields by distance and/or restrictions to groundwater flow as provided by fault lines. These areas also have a lower density of commercial and industrial development.

Priority Area Three includes primarily the western portion of the SFVB where soil infiltration and permeability rates are low. Groundwater in these areas is generally confined by extensive clay deposits which also restrict the percolation of contaminants. To date, no contamination has been found in these areas.

3.0.3 *Interagency Advisory Committee*

Since the recommendations cross administrative, political and municipal boundaries, a concerted effort must be made to coordinate the activities of these agencies into a uniform implementation program. In order to ensure that the needs and concerns of all parties are met, it is recommended that representatives of these agencies form an interagency advisory committee to coordinate and to resolve the technical, administrative and political aspects of these recommendations and to assure orderly implementation. Such a committee could also play an important role in developing inter-city and interagency joint powers agreements or other applicable arrangements to facilitate the implementation of these recommendations.

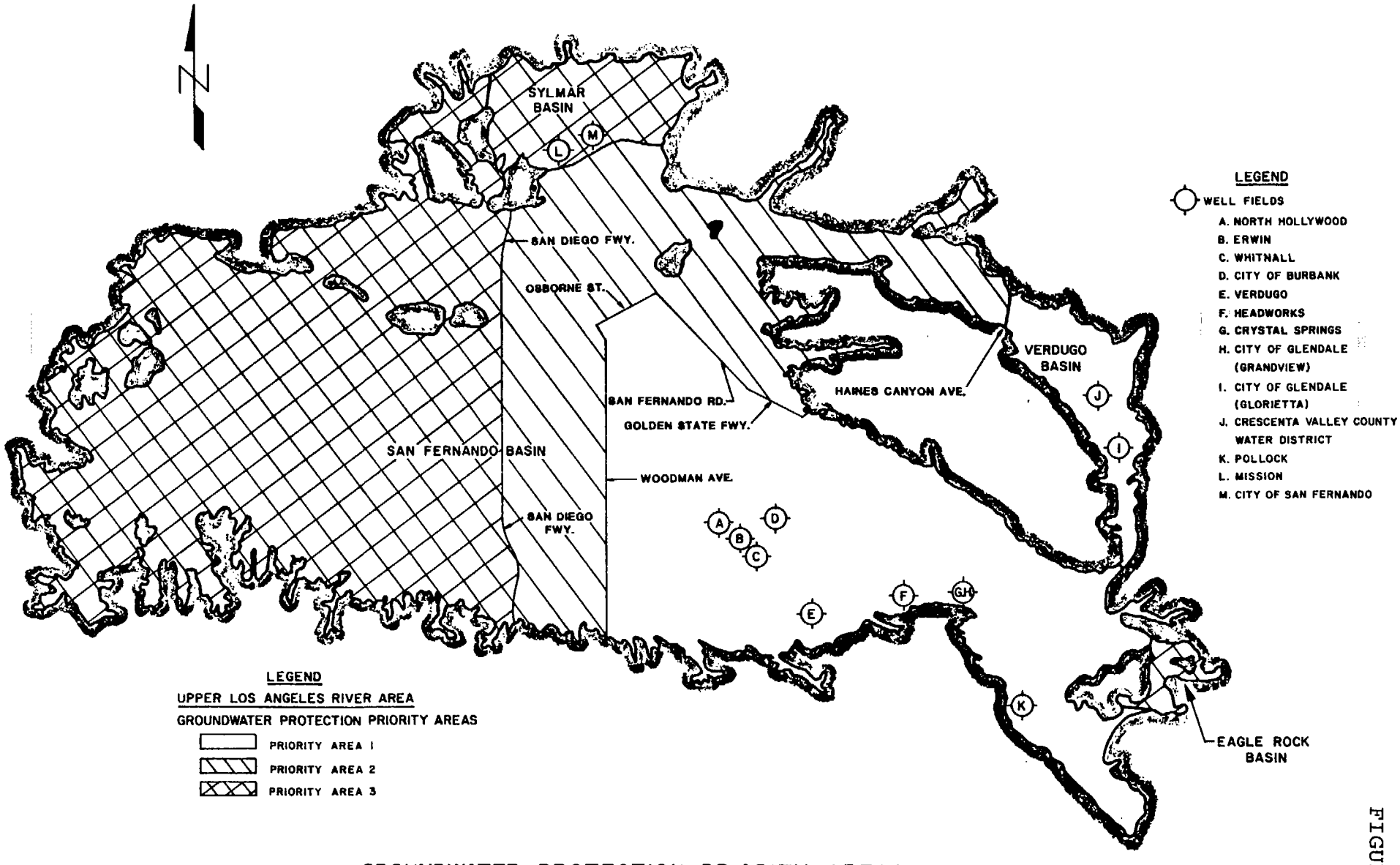
The following agencies should participate in this Interagency Advisory Committee.

1. Municipal water agencies within the SFVB
2. Cities of Los Angeles, Burbank, Glendale and San Fernando, and the County of Los Angeles
3. State and County DOHS
4. RWQCB
5. Watermaster, ULARA
6. Los Angeles County Engineer's Office
7. Los Angeles County Flood Control District

TABLE 3

SUMMARY OF ESTIMATED COSTS AND SUGGESTED FUNDING

RECOMMENDATION	Estimated Cost to City of Los Angeles	Burbank	Glendale	San Fernando	Primary Affected Agency(ies)/ Suggested Funding Sources
1. Public Education Program	Nominal	Nominal	Nominal	Nominal	Water Agency/General Operating Funds-Water Revenue
2. Regulation of Private Disposal Systems	$1,000,000/yr. for 10 yrs.	Nominal	Nominal	Nominal	Industrial Waste Control Section, Public Works Department/Property Assessment and Sewer Construction Funds, Wastewater Treatment Construction '201' Grant and Clean Water Grant Programs
3. Augmented Enforcement Program	$100,000/yr.	Nominal	Nominal	Nominal	RWQCB, State and County DOHS, Industrial Waste Control Section/ Permit and Inspection Fees
4. Regulation of Storage Tanks, Sumps and Pipelines	Indeterminate	Indeterminate	Indeterminate	Indeterminate	RWQCB, State and County DOHS, Fire Departments, Building Departments/ Permit and Inspection Fees
5. Small-Quantity Generator Hazardous Waste Disposal Program	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate - SCAG is proposing to conduct a study to be funded under the Water Quality Management Planning Program, Section 205(j) Grants
6. Regulation of Landfills	$15,000/yr.	Indeterminate	Indeterminate	Indeterminate	RWQCB, Water Agency, Sanitation Department/Inspection Fees
7. Groundwater Monitoring Program	$75,000 + $70,000/yr.	$30,000 + $2,000/yr.	$30,000 + $2,000/yr.	Nominal	Water Agency/General Operating Funds - Water Revenues, Water Quality Management Planning Program
8. Aquifer Management and Groundwater Treatment Program	$2,600,000 + $180,000/yr.	$625,000 + $40,000/yr.	$325,000 + $30,000/yr.	None	Water Agency/General Operating Funds - Water Revenue, Superfund, Hazardous Substance Account and Energy and Resources Fund, California Safe Drinking Water Grant Program



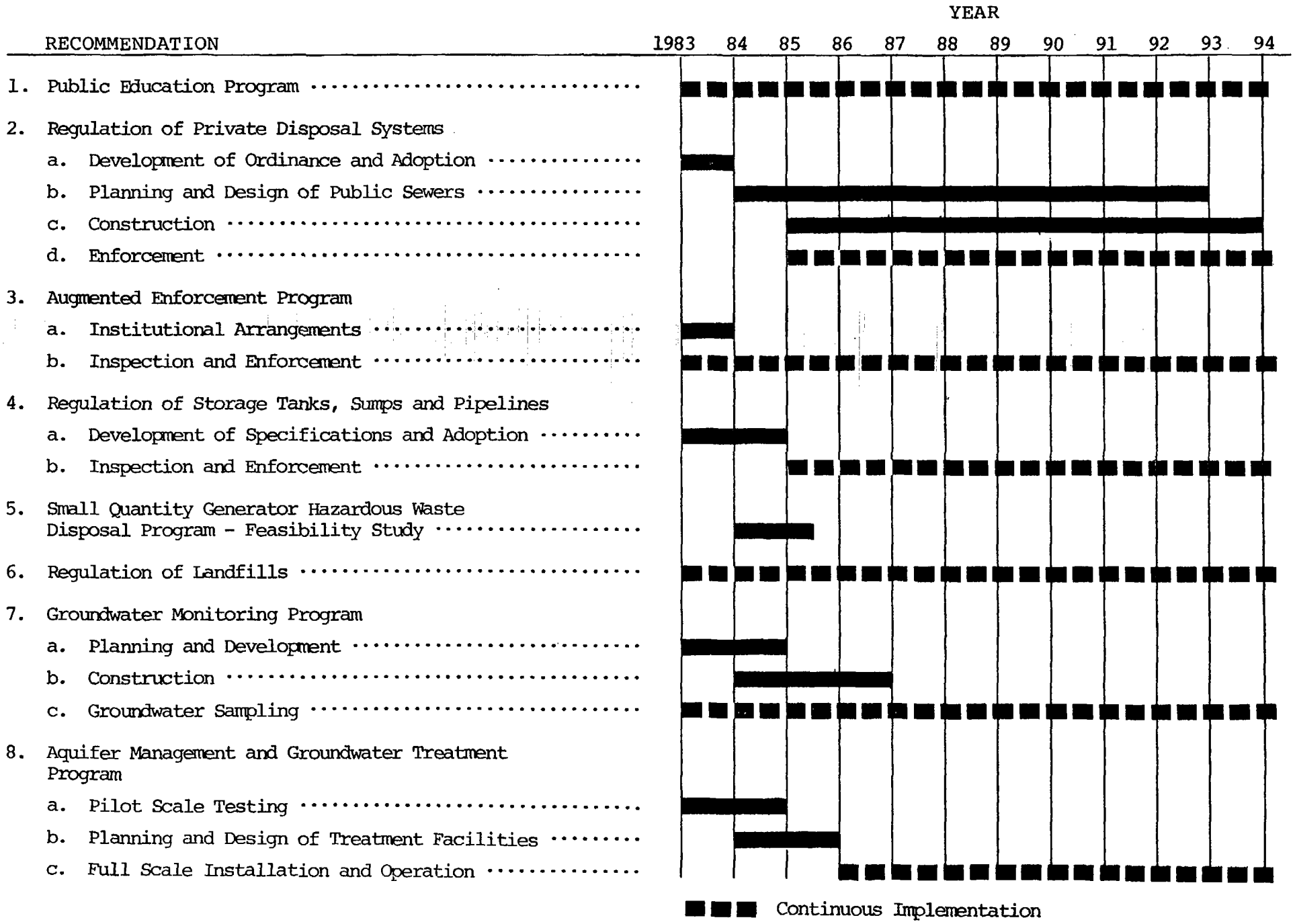
GROUNDWATER PROTECTION PRIORITY AREAS

FOR COMMERCIAL AND INDUSTRIAL DEVELOPMENT

FIGURE 5

TABLE 4

PLAN IMPLEMENTATION SCHEDULE



3.0.4 Transferability of the Plan

Although the study is site specific, the nature of the study and its findings are such that the methodology used and recommended approaches could be utilized by regions having similar groundwater quality problems. The transfer of this plan to other groundwater basins should first involve evaluations of the geology, hydrology, and institutional and legal conditions existing in those basins.

In general, the basic goals and primary objectives of the overall groundwater quality management plan are applicable to the protection of any groundwater basin. The development and implementation of each specific recommended action, however, will depend upon the conditions peculiar to each basin or region.

3.0.5 Plan Implementation

Implementation of the overall groundwater quality management plan will rely primarily on local governments and designated agencies to carry out provisions of the plan. An estimated schedule for the implementation of each recommendation is shown in Table 4. However, the implementation of the recommendations proposed in this plan will be contingent upon the availability of funds from federal, state and local sources.

The proposed recommendations will be incorporated in an amendment to the 208 Areawide Waste Treatment Plan for the South Coast Planning Area.

RECOMMENDATION NO. 1

3.1 Public Education Program

3.1.1 Introduction

3.1.1.1 Objective

The objective of the Public Education Program is to inform both the general public and industry of (a) the importance and value of groundwater as a drinking water supply and (b) the far reaching effects of improper handling or disposal of hazardous materials on the quality of the groundwater supply, and that (c) all water supplied to the public is safe to drink despite some localized groundwater contamination. By educating the public of the importance of groundwater quality protection, it may be possible to gain greater support for, and compliance with the recommended programs of this plan.

3.1.1.2 Required Actions

The following actions are required to implement the public education program:

A. General Public Education:

Conduct a continuing public education program to inform the general public of the impact of the current SFVB groundwater contamination problem, and how they can assist in preventing future contamination.

B. Industrial Education:

Carry out a long-term education program for commercial and industrial organizations of the San Fernando Valley to assist in the implemention of "Best Management Practices" for the storage, handling, and disposal of hazardous materials.

Definition: "Best Management Practices" (BMP's) are defined as those methods and procedures that protect employee and public health, and groundwater quality through the prevention of spills or leakages during the storage, handling, or disposal of hazardous materials.

3.1.2 Background

3.1.2.1 Need for a Public Education Program

There is a need for the general public to be educated to the proper methods of storing, handling, and disposing of hazardous materials in order to protect the quality of groundwater in the San Fernando Valley. Hazardous materials, such as

paints, paint thinners, oil and grease "spot" removers, spent crankcase oil, etc., are present in virtually every household in the SFVB. Although improper disposal of small quantities of these hazardous materials from an individual household may not pose a significant threat to groundwater quality, the collective impact of disposal from a large number of households over many years could cause significant contamination of underlying groundwaters. A properly conducted public education program will make residents of the San Fernando Valley aware of both the value of groundwater to the community and the harm that can result from the improper disposal of common household waste products that are hazardous to the environment.

Furthermore, since the general public and industry will ultimately share the costs and participate in the prevention and cleanup of contamination, they must be made aware of the cost and impact of these programs. A public education program should be an effective method of securing the required support.

Finally, the general public should be reassured of the fact that SFVB groundwater currently supplied to them meets all drinking water quality standards of the California Department of Health Services, and is safe for consumption.

3.1.2.2 Results of Industrial Surveys

Results of the industrial survey, conducted by SCS Engineers in the North Hollywood area, revealed that, among many employees, there was a general lack of knowledge and training relating to good management of hazardous materials and the importance of preventing groundwater contamination.

In addition, the County DOHS Hazardous Waste Control Program recently initiated an inspection survey of businesses generating hazardous wastes. Initial results showed that a substantial majority of businesses were not in compliance with existing hazardous waste disposal regulations.

These industrial site surveys indicated that there is a need to educate both management and employees of the potential adverse impact of hazardous chemicals on groundwater quality, and of the importance of utilizing BMP's for the storage, handling, and disposal of these chemicals.

3.1.3 Implementation

3.1.3.1 Recommended Actions

A. General Public Education Program

Various methods can be employed to communicate information to the general public. Informative literature can be distributed in the form of newsletters, brochures, pamphlets or informational flyers enclosed with water utility bills.

Other methods of communication that should be considered include film or slide presentations at open public meetings, public schools, and community and trade association meetings. Periodic press releases also can be used to inform the general public of the progress of the groundwater quality control program in the SFVB.

B. Industrial Education Program

Information on methods by which industry should develop and implement BMP's for hazardous materials can be conveyed to businesses in several different ways. Management representatives from large segments of commerce can be contacted through presentations to local chambers of commerce or trade associations. In addition, industry and trade newsletters and publications are often an effective means of contacting specific types of industry.

Existing on-site inspection programs conducted by local and regional agencies provide an ideal opportunity for effective personal contact with operating personnel. The inspection process could be expanded to assist businesses in the development and implementation of BMP's. Inspection programs that could be adapted to the implementation of these on-site education efforts include the programs of industrial waste sections, fire departments and health departments. Training literature for developing and implementing BMP's in industry could also be distributed during routine plant inspections conducted by these regulatory agencies.

3.1.3.2 Responsible Agencies

The division of responsibility for the preparation and implementation of the Public Education Program should be coordinated by the proposed Interagency Advisory Committee.

Suggested activities for responsible agencies are as follows:

Water Agency	1. Prepare literature 2. Mail out literature in water bills 3. Send out press releases 4. Conduct public meetings
Industrial Waste Section, Fire Department and County Department of Health Services	1. Train inspectors in methods and procedures to protect groundwater from contamination. 2. Distribute literature, assist in helping industry implement BMP's for handling, storage, and disposal of hazardous materials.

Regional Water Quality Control Board, County & State Departments of Health Services	Provide legal, regulatory support and guidelines for agencies implementing education program.

3.1.4 Costs and Funding

A. General Public Education

While the actual costs of the education program for the general public are dependent upon the educational method employed, these types of activities are, in general, relatively inexpensive to implement. For example, the cost to the City of Los Angeles for "bill stuffers" is estimated at approximately $10,000 while for all other cities of the SFVB, it is assumed to be nominal. Since many of the other recommendations of this study will require the support and participation of the public, the education program may be the most cost-effective element of the overall management plan. The affected agencies should work through the Interagency Advisory Committee to develop and coordinate an effective public education program.

Funding for the general public education program could come from the water agencies or general budgets of cities in the SFVB. The level of funding and participation by each city would be directly proportional to the number of customers and the severity of the groundwater contamination problem for that particular city.

B. Industrial Education

Detailed costs for on-site education efforts have not been developed at this time. The increased level of inspection required to implement and enforce BMP's cannot be accurately determined. Funding for these efforts, however, could be included as part of the inspection program of each agency. Since these inspection programs are generally designed to be self-supporting, these costs would in turn be transferred to industry through the permit and inspection fee process. Another alternative is to require industry to develop and conduct their own on-site education programs which would be subject to approval by the regulatory agencies.

RECOMMENDATION NO. 2

3.2 Regulation of Private Disposal Systems

3.2.1 Introduction

3.2.1.1 Objective

The objective of this recommendation is to prevent or to control contamination of groundwater in the San Fernando Valley by hazardous chemicals discharging from private disposal systems (PDS's) operated on commercial and industrial properties.

3.2.1.2 Required Actions

A program to fully regulate private disposal systems on commercial and industrial properties where hazardous wastes are generated or handled will require the following activities:

A. Identify, Investigate and Regulate Existing Private Disposal Systems:

Field investigations and a survey of public works records should be conducted to identify all PDS's operated on commercial and industrial properties in sensitive groundwater areas of the SFVB. Inspection and monitoring of the effluent discharging from these PDS's should be conducted to thoroughly assess the impact of each PDS site on groundwater quality during the phaseout of these systems.

B. Phase Out the Use of Private Disposal Systems

A priority schedule should be developed for the phaseout and elimination of PDS's operated on commercial and industrial properties in the sensitive groundwater areas of the SFVB. This phaseout will involve the following:

1. In areas where public sewers are currently available, commercial and industrial properties that generate hazardous wastes should be required to abandon their PDS's and connect to the public sewer.

2. In areas where no sewers are available, new public sewers should be constructed to eliminate the use of PDS's on these commercially and industrially zoned properties.

DEFINITION: Private disposal systems (PDS's) are on-site wastewater disposal systems that consist of septic tanks, cesspools or other wastewater retention units, and which discharge their effluent to the ground, usually through a

network of subsurface perforated pipes in an area referred to as a leach field.

3.2.2 Background

A study of PDS's was conducted in a two zip code study area in North Hollywood within the City of Los Angeles. The study revealed that 88 PDS's were operated on commercial and industrial premises which overlie well fields in this North Hollywood area. (See Plate 10) Similarly, a large number of PDS's may be operated on other commercial and industrial sites throughout the sensitive groundwater areas of the eastern SFVB.

While current regulations and permits specify that PDS's are to receive domestic type wastes only, these systems may in fact provide an unauthorized means for the disposal of hazardous liquid wastes. These hazardous wastes may then pass through the PDS and discharge with the effluent to the ground.

The reasons for the continued use of these private disposal systems are twofold:

1. Despite heavy development in the eastern SFVB, there are still many isolated areas in the City of Los Angeles which are not served by sewers. (Plate 10) These areas rely on PDS's as the only available means of wastewater disposal. Except for some fringe areas, all areas in the Cities of Burbank, Glendale and San Fernando have been sewered.

2. Current regulations in the City of Los Angeles do not provide a systematic method for requiring both the connection to public sewers and the abandonment of PDS's as new sewer facilities become available in an area. In addition, PDS's may not have been properly abandoned when businesses were connected to the public sewer system. The Cities of Glendale and Burbank do have provisions in their municipal codes that require properties with access to available public sewers to connect to those facilities within a 5-year period and to backfill abandoned PDS's.

The disposal of hazardous materials into an operating or improperly abandoned PDS is an attractive but unlawful alternative to proper waste disposal such as pickup by a licensed chemical waste hauler or recycler. The disposal of hazardous wastes to PDS's may become increasingly attractive as more stringent enforcement is focused on the disposal of these materials into sewers and sanitary landfills for domestic refuse, and the cost of disposal becomes increasingly expensive.

At present, there are no monitoring requirements for the

periodic testing or inspection of PDS's operated on commercial and industrial properties. Quantitative analyses of single grab samples from some of the PDS's in the North Hollywood area revealed that effluents from the systems contained potentially significant concentrations of volatile organic compounds (averaging 6 ppm and ranging from 0.3 ppm to 23 ppm). The effluents from each of these systems are discharged directly to the ground. These analyses indicate that the PDS is a more significant potential source of contamination than previously believed.

3.2.3 Implementation

3.2.3.1 Recommended Actions

The various city, county, and state agencies should coordinate their activities through the Interagency Advisory Committee to regulate and phase out PDS's in the San Fernando Valley. The Committee should oversee and direct the measures set forth in the following sections.

A. Identification, Investigation and Regulation of Existing Private Disposal Systems

The first phase of implementation involves the identification, investigation, and increased regulation of PDS's on commercial or industrial properties. Monitoring and testing of individual PDS's may be required to determine which sites have the greatest potential for adverse impact on groundwater quality. Where applicable, these facilities should be included in existing regulatory programs, such as the Industrial Waste Permit program or the County Hazardous Waste Control Program. Provisions should be made for regular testing of PDS effluents to ensure the proper utilization of the PDS.

B. Phaseout and Elimination of Private Disposal Systems

The second phase of implementation involves the phaseout and elimination of existing PDS's. This recommended action is in substantial conformance with the recommended management policies of the Water Quality Control Plan for the Los Angeles River Basin adopted by the Los Angeles Regional Water Quality Control Board and the State Water Resources Control Board.

Based on the information gathered from the first phase, a priority schedule for the elimination of PDS's from commercial and industrial properties should be established. This schedule should consider the following factors:

1. nature and quantity of hazardous wastes generated;

2. history of compliance with or violation of hazardous waste disposal regulations (e. g. presence of industrial wastes in PDS effluent);

3. availability of existing public sewer facilities; and

4. costs to construct new public sewer facilities.

Those sites that have access to existing public sewers should be required to abandon their PDS's and connect to the sewer system if hazardous wastes are generated on the premises. Currently, Burbank and Glendale have provisions in their municipal codes that require all properties within 200 feet of available sewers to connect to those facilities within a 5-year period. Similar provisions should be included in the Los Angeles and San Fernando Municipal Codes to allow for enforcement of this action for those commercial and industrial land uses where hazardous wastes may be generated.

Where no existing sewer facilities are available, new public sewers should be constructed to further eliminate the need for PDS's in those areas. The Cities of Burbank, Glendale and San Fernando have already instituted projects to sewer all areas within those cities. Except for some possible fringe areas, all properties appear to be connected to the public sewer system. Provisions for the abandonment and backfilling of the PDS upon connection to the sewer are also included in the plumbing codes for these cities.

There are several unsewered areas in heavily developed commercial and industrial zones in the City of Los Angeles. Although there are currently no provisions to require that these areas be sewered, the County DOHS, together with the RWQCB, can order that individual sites be sewered when it is believed that the continued use of a PDS represents either a threat to public health or a significant public nuisance.

3.2.3.2 Responsible Agencies

Water Agency	Assist in locating PDS's by conducting a search of utility files and provide the appropriate agency with a listing of all locations in the east San Fernando Valley that have been exempted from the sewer service charge.
Engineering Department	1. Review public sewer "WYE" maps, evaluate the areawide wastewater collection network, and identify areas not served by public sewers. 2. Plan, schedule and construct new public sewer facilities in those commercial and industrial areas within the sensitive groundwater areas of the SFVB.

Sanitation Department	1.	Conduct field investigations and coordinate records search to identify all PDS's operated by commercial and industrial firms in the eastern San Fernando Valley.
	2.	Conduct regular inspections and testing at commercial and industrial sites that generate industrial wastes where a private disposal system is used.
Department of Building and Safety, Cities of Los Angeles and San Fernando	1.	Review files to assist in locating existing and improperly abandoned PDS's.
	2.	Recommend and pursue a revision to the Municipal Code to require mandatory connection to the public sewer system and proper abandonment of the PDS for commercial and industrial properties in areas where sewers are available.
State and County Departments of Health Services, Regional Water Quality Control Board	1.	Assist in locating unauthorized PDS's during field inspections.
	2.	Assist in monitoring and testing of PDS's on sites that generate hazardous wastes.
	3.	Provide regulatory and legal support and guidelines for efforts to require construction of new sewers and abandonment of misused PDS's.

3.2.4 Costs and Funding

A. Investigation and Regulation of Private Disposal Systems

The costs associated with the investigative phase of this program are not known at this time. All efforts should be made to incorporate the regulation and monitoring of PDS's within the framework of existing inspection programs. Funding for inspection could then be provided through the permit fee process. Costs associated with testing of PDS effluents could be included as part of this fee and billed to the applicant.

B. Phaseout of Private Disposal Systems

The Cities of Burbank, Glendale and San Fernando have already instituted an overall plan to sewer all areas within these cities. As a result of their previous efforts, minimal additional costs appear to be required by these cities for the

construction of new public sewer facilities.

For the City of Los Angeles, the implementation of a sewer construction program in the eastern San Fernando Valley is expected to represent an ongoing project of approximately 10 years. The cost of this program, including planning, design and construction, is estimated at $1,000,000 annually. While a small portion of this program could be financed by the sewer construction fund, major funding would rely ultimately on the property owner through the sewer assessment proceedings or private developments. Portions of the cost of construction of sewer facilities may qualify for funding under the Wastewater Treatment Construction "201" Grants and Clean Water Grant Program. However, it is not known at this time whether funds from these sources will be available for plan implementation in the near future.

The cost of sewer installation to individual property owners will vary considerably. The best available estimate for an average assessment to each property is $50 per linear foot of property frontage. In addition, properties will then be subject to the sewer service charge and the one-time sewer facilities charge. Costs for on-site plumbing modifications and abandonment of the PDS are also borne by the property owner *and will vary for each case.*

RECOMMENDATION NO. 3

3.3 Augmented Enforcement Program

3.3.1 Introduction

3.3.1.1 Objective

The objective of an augmented enforcement program, relative to groundwater protection, is to ensure that commercial and industrial establishments involved in the production, handling, storage and disposal of hazardous materials comply with applicable regulations and best management practices to prevent degradation of groundwater quality.

3.3.1.2 Required Actions

The following activities are recommended to achieve the objective.

A. Improve and Develop Regulatory and Enforcement Procedures:

Existing regulatory guidelines and enforcement procedures should be strengthened and clarified to provide more effective and specific regulation of all hazardous materials and wastes. In some cases, new regulations will be necessary to fully implement the recommended programs of this study. Alternative enforcement techniques should also be studied and developed to provide more uniform and effective application of regulations.

B. Coordinate and Expand Inspection and Enforcement Efforts:

Inspection and enforcement efforts of the various agencies should be coordinated to provide for interagency referrals and the sharing of information to minimize the duplication of efforts and record keeping. Where necessary, operating budgets and manpower should be enlarged to enforce the timely application of permits and mandatory inspections of commercial and industrial sites involved in the production, handling, storage and disposal of all hazardous materials including hazardous wastes.

3.3.2 Background

3.3.2.1 Potential Impact on Groundwater Quality

Accidental and indiscriminate spills and improper methods

of disposal of hazardous materials can seriously endanger groundwater quality. When discharged to the ground, these materials may pass readily through the highly permeable strata near municipal water wells. Even small quantities of the hazardous materials used and generated by commercial and industrial establishments can cause significant contamination if these materials reach the groundwater. Accordingly, rigorous inspection of these establishments is necessary to protect groundwater quality from the threat of hazardous materials discharges.

Commercial and industrial establishments, which use or produce hazardous materials in sensitive groundwater areas near municipal water wells, are of immediate concern.

3.3.2.2 Industrial Site Survey

Hazardous materials management practices were observed among commercial and industrial establishments during a special survey made during the course of this investigation. The survey of commercial and industrial establishments within a 1300-acre North Hollywood area indicated that the application of best management practices (BMP's) was somewhat related to the size of the company. In general, hazardous materials were managed satisfactorily by the larger companies (greater than 100 employees) because these firms had adequately diversified staffs with the resources and expertise to properly perform this function. On the other hand, the handling of these materials amongst the medium-sized and smaller companies was often found to be deficient because of the lack of trained staff, proper equipment and the high cost of compliance.

The following observations, relating typical instances of improper disposal of hazardous materials, were noted during the survey:

1. Spilled hazardous chemicals were often washed into streets and storm drains or directly onto the soil;

2. Hazardous liquid wastes were discharged to storm drains or building sewers which were connected either to private disposal systems or the sewer system;

3. Small quantities of hazardous wastes are disposed with domestic refuse and subsequently deposited in Class II sanitary landfills for nonhazardous wastes.

3.3.2.3 Existing Regulatory Framework

There are many regulatory agencies with responsibilities

related to the permitting and inspection of commercial and industrial sites that use or generate hazardous materials. The specific goals and jurisdiction of each of these agencies vary. However, past and current on-site inspection efforts of these agencies have not adequately focused on the protection of groundwater quality.

There are several general conclusions that can be made concerning the overall effectiveness of the current regulatory framework and some of the areas that may need improvement. In general, surveillance efforts are devoted primarily to on-site inspections to ensure compliance with existing permits and to process new applications. However, most of these permit programs primarily focus on the regulation of hazardous wastes without due regard for the storage and use of process chemicals and other hazardous materials. For this reason, many potential sources of contamination may have been overlooked in the enforcement of existing regulations.

In most cases, regulatory agencies are under budgetary and manpower constraints that may restrict their ability to provide the most uniform and expedient enforcement of regulations.

In addition, traditional enforcement response alternatives based on legal and adjudicatory actions are generally time consuming, expensive and sometimes ineffective in eliminating or shutting down the source of contamination. These alternatives generally require extensive investigations and documentation before any mitigating response actions are taken. One of the primary enforcement tools available to these regulatory agencies is the State Hazardous Waste Manifest. However, application of the manifest program in the field has pointed out certain procedural and administrative shortcomings that need to be addressed and corrected.

The specific activities and jurisdiction of the major agencies involved in the regulation of hazardous materials and the protection of water quality are outlined as follows.

State Water Resources Control Board/Regional Water Quality Control Board

Pursuant to the Porter-Cologne Water Quality Control Act of 1969, the State Water Resources Control Board (SWRCB) has the primary authority and responsibility for water quality control policy in the State. The SWRCB is responsible for the administration of the National Pollutant Discharge Elimination System (NPDES) and is also responsible for developing regulations for the design and operation of all sanitary landfills in the state.

Monitoring, surveillance and enforcement activities in Los Angeles and Ventura Counties, Region 4, are delegated to the Los Angeles Regional Water Quality Control Board (RWQCB). The RWQCB has but a limited staff to survey this two-county

area. The RWQCB also recently directed a part of its staff to conduct a survey of all hazardous materials storage tanks, sumps and pipelines in Region 4.

State Department of Health Services

The California State Hazardous Waste Management Program was recently certified by the EPA. The program is administered by the State Department of Health Services which issues hazardous waste facility permits in accordance with the requirements of the Resource Conservation and Recovery Act of 1976 (RCRA) and Title 22 of the California Administrative Code. Under this program only hazardous wastes, and not hazardous process chemicals, are regulated.

The Los Angeles Regional Office of the State Department of Health Services is responsible for the eight southernmost counties and includes a four-member team to conduct compliance inspections over the entire region. Approximately 65, or 10 percent of the total number of hazardous waste facility permits for the region are expected to be issued by September, 1983. The remainder are expected to be completed by 1990.

The State DOHS also administers the manifest system for the transport and disposal of hazardous wastes and issues hazardous waste hauler's permits. Under the guidelines of this program, only hazardous wastes destined for disposal sites are subject to the State manifest requirements. Those wastes destined for recycling or resource recovery are not currently manifested.

The State offers a maximum $5000 reward for information "which materially contributes to the imposition of a civil penalty" or "to the conviction of a person for violating the provisions" of the State Hazardous Waste Control Law.

County Department of Health Services

The County DOHS Hazardous Waste Control Program is intended to complement the State program by permitting and inspecting all facilities that produce hazardous wastes and are exempted from the State program. Approximately 17,000 businesses that produce hazardous wastes in Los Angeles County have been identified. Due to limited staffing, the County DOHS has projected that initial inspections will be completed over a two-year period ending in 1984.

The County of Los Angeles offers a $2500 reward for information "relating to the dumping of toxic material into sewers, flood control channels and other areas of the County."

Local and City Programs

Existing industrial waste control programs, for the Cities

of Los Angeles, Burbank, and Glendale and in unincorporated areas of the County, regulate the disposal of industrial wastewaters into the sanitary sewer and storm drain systems. The purpose of the industrial waste control programs is to maintain the safest and best use of the sanitary sewer and storm drain systems and to prevent disruption of wastewater treatment processes. The City of San Fernando has not yet established an industrial waste program.

The City of Los Angeles revised its industrial waste code this year. The new regulations effectively expand the jurisdiction of the Bureau of Sanitation to include protection of all waters of the state, including groundwater.

City fire codes require permits and inspection for commercial and industrial sites where certain hazardous materials are stored or used. The purpose of this regulatory program is the safeguarding of life and property from fire, explosion or other hazardous occurrences. The storage and use of non-flammable industrial solvents and the production and disposal of industrial wastes are not normally regulated under this program.

3.3.3 Implementation

3.3.3.1 Recommended Actions

A. Improve and Develop Regulatory Guidelines

Existing regulations and enforcement laws and ordinances for the management of hazardous materials should be reviewed and improved to provide each agency with the proper authority to implement the recommendations described in this report.

Many of the regulatory programs currently in operation could be readily expanded to provide for regulation of all hazardous materials and facilities that could impact groundwater quality. Currently, most regulatory agencies focus primarily on hazardous wastes and have little authority over other hazardous materials.

Local and state laws should be coordinated and strengthened by requiring the application of a hazardous materials permit and inspection for all commercial and industrial establishments engaged in the production, handling, storage and disposal of both hazardous materials and wastes. A requirement of the permit should be the development and application of BMP's. Periodic compliance inspections should be conducted for every permit issued.

In some cases, new laws or municipal codes may be required to fully implement these actions. The agencies should then work together to recommend specific legislative changes to the appropriate governing bodies.

Finally, possible changes or alternatives to the present enforcement process should be examined to provide for more uniform compliance with environmental laws. For example, state and local agencies should work together to identify any functional shortcomings in the present hazardous waste manifest process. These agencies could then make specific recommendations and direct any necessary changes to the program that would increase its effectiveness as an enforcement tool.

Alternatives to traditional criminal and civil actions should also be pursued. Studies conducted under the Connecticut Enforcement Program* have shown that an economic enforcement approach based on recapture standards and graduated civil penalties is substantially more effective and less expensive to implement than traditional responses to noncompliance. Appropriate fines and penalties should be imposed to establish suitable economic disincentives for noncompliance and illegal practices.

B. Coordinate and Expand Inspection and Enforcement Efforts

City, County and State regulatory programs should be coordinated to avoid jurisdictional conflicts and to achieve an efficient and effectively integrated control plan for all hazardous materials. Whenever possible, the requirement for permits and inspections together with the payment of fees should not be duplicated.

These agencies should also establish an active interagency referral and enforcement network. By making each inspection agency more aware of groundwater contamination concerns, and providing for the referral of related violations, the available inspection manpower base can be effectively broadened. In addition, the jurisdictional alternatives available for enforcement are also broadened through the collective authority of all agencies. These cooperative efforts should be designed to provide for the concerns of all agencies.

Such interagency cooperation raises important issues concerning jurisdiction and information sharing that are not easily resolved. Existing City and County-wide Hazardous Materials Coordinating Committees provide an ideal forum for open discussion on these topics.

Finally, although no new regulatory bodies or agencies have been proposed, all local and regional agencies should assess their capability to provide the necessary inspection efforts to fully implement the programs outlined in this study. While these agencies do not have the direct authority to expand

*Drayton, William, "Economic Law Enforcement", Land Use and Environment Law Review, Fredric A. Strom, ed., New York, 1980, p.53-90.

their manpower or operating budget, they can make recommendations to the appropriate governing or legislative body for any necessary funding or fee increases.

Increased inspection efforts are likely to be needed for the investigation and regulation of landfills, private disposal systems and storage tanks and pipelines. The initial phase of these programs should involve an intensive preliminary survey of priority areas to identify these facilities and to assess the long-term needs of future permit and inspection programs. Increased efforts should also be directed towards employee training and on-site educational efforts to promote compliance with Best Management Practices.

3.3.3.2 Responsible Agencies

RWQCB and State DOHS	1. Assist in the development and coordination of a basin-wide policy for the regulation of the storage, use and disposal of all hazardous materials. 2. Increase manpower necessary to implement recommended programs.
County DOHS, Los Angeles, Burbank, Glendale and San Fernando	1. Review the procedures and local regulations governing the handling, storage and disposal of hazardous materials and wastes. 2. Assess the need for new ordinances and budgetary increases to conduct an effective inspection program.

3.3.4 Costs and Funding

Point source control programs are generally financed through local revenue sources. Permit fees, license fees or inspection fees should be established or expanded to provide a continuous financing mechanism. Fees should be based upon program administrative costs including permit processing and inspections.

The level of additional inspection effort and resultant cost should be determined cooperatively by all affected regulatory agencies.

The establishment of a successful economic enforcement system, such as the posting of rewards and the imposition of substantial fines, civil assessments or penalties, could serve as a deterrent to potential violators and thereby minimize the need for inspectors and program costs.

RECOMMENDATION NO. 4

3.4 Regulation of Storage Tanks, Sumps, and Pipelines

3.4.1 Introduction

3.4.1.1 Objectives

The objectives of this recommendation are to prevent and to detect contamination of the groundwaters of the San Fernando Valley by hazardous materials leaking from storage tanks, sumps, and pipelines. Underground or subsurface installations are of particular concern since leak detection may be extremely difficult and costly.

3.4.1.2 Required Actions

A program to implement this recommendation should incorporate the following actions:

A. Survey and Identify Existing Facilities:

A survey should be conducted to identify and to record the location of all storage tanks, sumps, pipelines and related facilities in the SFVB that contain hazardous materials. Information on the location, size, construction, age and materials contained in these facilities should be determined.

B. Develop and Implement Regulatory Program:

A comprehensive program for the regulation of storage tanks, sumps and pipelines should be developed. This program should include minimum design and construction requirements as well as permit, inspection and testing criteria that provide for the complete protection of groundwater quality especially in sensitive groundwater areas of the SFVB.

3.4.2 Background

3.4.2.1 Vulnerability of SFVB Groundwater to Contamination

Because of the high infiltration capacity of the soil in the eastern SFVB, groundwaters located in this region are highly vulnerable to contamination by hazardous materials leaking from tanks, sumps or pipelines. At present, there are thousands of these facilities located throughout the SFVB. The location, age and condition of many of these are not currently documented. The leakage of hazardous materials from deteriorated or corroded storage facilities and pipelines could be a major avenue of groundwater contamination.

Although there is no direct and conclusive evidence of contamination from these sources in the SFVB, many other communities in the United States, notably in Suffolk County, New York and Santa Clara County, California, have found that local groundwaters have been severely contaminated by hazardous liquid materials from leaking storage tanks.

In Suffolk County, approximately 1,000 tanks, or 20 percent of all tanks, initially inspected and tested were found to be leaking. As a result, stringent regulations have been adopted for the control of design and construction of new tanks and for the testing and replacement of old tanks. Under current Suffolk County regulations, all underground tanks for hazardous materials which are found to be leaking must be removed and replaced by a tank of acceptable design. All existing underground tanks which do not conform to current design requirements must be replaced within 15 years and leak tested annually prior to replacement.

Similarly, strict regulations are being proposed in the Santa Clara Model Ordinance as a result of groundwater contamination problems in that area.

3.4.2.3 Current Regulation of Storage Tanks and Pipelines

Storage Tanks

There are several inspection programs conducted by various agencies to regulate the on-site use and storage of hazardous materials. However, certain jurisdictional limitations and policy guidelines have historically limited the scope of these programs such that the protection of groundwater from leaking tanks and sumps has not been fully addressed.

Storage tanks which contain flammable or explosive liquids are currently subjected to some regulation by cities in the SFVB. Local fire departments are generally responsible for regulating these tanks in order to safeguard public health and safety from fires and explosions that could occur as a result of leaks. The regulatory programs of individual fire departments, however, may vary significantly from city to city. Tanks containing non-flammable materials, including many halogenated solvents, are generally not subject to regulation under the local fire codes.

In the City of Los Angeles, the Fire Department reviews plans for flammable liquid storage tank construction and inspects the tank installations. Each underground tank is pressure tested for leakage before being placed into service. However, there are currently no requirements for leak detection or regular leak testing during the life of the tank. Large leaks from storage tanks and associated piping are ordinarily detected only after gross losses of material are discovered during routine inventory checks, or after leakage enters

adjoining buildings or substructures. Small leaks may go undetected for long periods of time.

Once a leak has been reported, the RWQCB and the State and County DOHS have regulatory authority to order monitoring and cleanup actions.

Pipelines

Pipelines passing through a city are normally under the jurisdiction of the utility regulating authority of the city. Regulation and testing of pipelines within the City of Los Angeles is currently conducted by the City Department of Transportation. Current pipeline testing procedures should be reviewed to determine if they provide adequate protection of the groundwater from leakages.

3.4.3 Implementation

3.4.3.1 Recommended Actions

A. Survey of Current Storage Facilities and Pipelines

An office records and field survey should be undertaken to determine the location, use and characteristics of all storage tanks, sumps and pipelines including associated plumbing. A record of these facilities would be developed as a result of this phase of the program.

B. Development and Adoption of Regulatory Guidelines For Design, Construction, and Testing

Although there are currently some regulations for the design, construction and testing of storage tanks, sumps and pipelines, there is a need for a more uniform, basin-wide program that will better provide for the protection of groundwater quality. A combined and coordinated effort among all affected cities and agencies should result in the development of an effective and comprehensive program for the handling and storage of hazardous materials. Such a program should address each of the following concerns:

1. Collection and management of pertinent data;

2. Interagency referral and coordination guidelines;

3. Development of regulatory guidelines including:

   a. Minimum design, construction and installation standards,
   b. Testing and monitoring requirements,
   c. Permit, inspection and fee requirements, and
   d. Compliance schedule for existing facilities;

4. Designation of regulatory responsibilities including implementation of necessary legislation.

It may be possible to utilize portions of the Suffolk County or Santa Clara County model programs for developing these regulations. Efforts should be made to adopt guidelines for the entire basin in order to avoid regulatory variations from city to city.

3.4.3.2 Responsible Agencies

At the present time, there is no one agency with the authority, budget, or manpower to completely implement the specific actions of this recommendation. There is a need to clarify and coordinate the authority and responsiblity of individual local, county and state agencies for the regulation of hazardous materials storage facilities.

The following agencies have some authority relative to the protection of groundwater quality or the control of hazardous materials used in storage tanks, sumps, and pipelines and should therefore play a role in the development of a comprehensive regulatory and inspection program.

Regional Water Quality Control Board, Los Angeles Region (RWQCB)

On January 24, 1982, the RWQCB directed its staff to conduct a survey of tanks, sumps and pipelines to assess the impact of leaks on groundwater basins within Region 4 (Los Angeles and Ventura Counties). RWQCB staff was directed to implement a program for the collection of data on all storage tanks in the region. Sugsequent in-depth investigations may be conducted in the priority areas of the San Fernando Valley and the San Gabriel Valley. This investigation could include field surveys, leak detection and groundwater monitoring.

City of Los Angeles

The Los Angeles City Council is studying a motion directing the Bureau of Sanitation to work with the Los Angeles Fire Department to investigate and develop a tank testing program. The City is also cooperating with, and supporting the RWQCB in the development of a comprehensive program to identify and inspect hazardous materials storage facilities. The Building and Safety Department may also play a role in the formulation and adoption of new design and construction requirements.

State and County Departments of Health Services (DOHS)

The State and County DOHS may also undertake support roles for the RWQCB investigation. Their existing inspection programs could supply information on the current status of storage tanks at businesses they permit. In addition, the

State DOHS may assist in the development and adoption of regional or statewide guidelines for these facilities within the authority of the Hazardous Waste Program. Recent legislative proposals, if adopted, could designate the responsibility for implementing such actions to the State DOHS.

South Coast Air Quality Management District (SCAQMD)

The SCAQMD currently maintains a computerized listing of all tanks used for the storage of volatile organic compounds as part of its regulation of point discharges of air contaminants. The SCAQMD is assisting the RWQCB in the storage tank survey by supplying this information.

3.4.4 Costs and Funding

The cost of this program cannot be estimated at this time because guidelines and criteria have yet to be developed. Funds for the initial study and investigation are expected to be provided by the RWQCB. It is expected, however, that any long term program would have to be self-supported through permit and inspection fees.

RECOMMENDATION 5

3.5 Small-Quantity Generator Hazardous Waste Disposal Program

3.5.1 Introduction

3.5.1.1 Objective

The overall objective of a hazardous waste collection program is to provide an economical disposal alternative to small-quantity hazardous waste generators, including homeowners. The collection program should encourage proper hazardous waste disposal practices to minimize improper practices that could result in contamination of groundwater.

3.5.1.2 Required Actions

A. Feasibility Study:

An initial feasibility study of a selected high priority area is needed to assess the magnitude and nature of existing hazardous waste streams and to formulate plans for an overall hazardous waste management approach for small-quantity waste generators.

B. Pilot Program and Evaluation:

Based on information generated from the feasibility study, pilot operation of the recommended waste management program should be conducted and evaluated for its effectiveness.

C. Full-Scale Program:

The ultimate goal of the program is to establish a full-scale, area-wide hazardous waste management program for small-quantity hazardous waste generators.

3.5.2 Background

3.5.2.1 Existing Practices

Although storage, treatment and disposal practices for hazardous wastes have improved substantially over the last decade, uncontrolled discharge and illicit dumping are still prevalent. The industrial facilities survey conducted by Stearns, Conrad and Schmidt Consulting Engineers (SCS) pointed out several weaknesses in current hazardous waste management practices, especially among commercial and industrial establishments that generate relatively small quantities of hazardous wastes. The SCS survey found that, in general, most

large industrial facilities have instituted good hazardous waste management practices. However, many smaller facilities are not closely monitored and often do not have adequate waste disposal programs in operation.

Results of preliminary inspections by the Los Angeles County Department of Health Services (DOHS) Hazardous Waste Control Section support this conclusion. A high incidence of improper discharge and disposal has been documented. Hazardous wastes are often discharged to sewer or storm drains, added to regular domestic garbage, or poured onto the ground.

While individually these small quantities of wastes may not pose a serious environmental threat, the collective impact of literally thousands of small-quantity discharges could be quite significant in terms of groundwater quality.

3.5.2.2 Reasons for Existing Practices

Lack of knowledge and proper training is one of the reasons for existing hazardous waste disposal practices among small-quantity waste generators. The County DOHS Hazardous Waste Control Program has found that many individuals are unaware of existing waste disposal regulations and the waste management alternatives available to them. This educational problem is addressed in the public education program. (See Recommendation No. 1)

Another reason is that economic constraints tend to make it costly to dispose of small quantities of waste in an environmentally acceptable manner. There are several hazardous waste hauling and/or recycling companies operating in the Los Angeles area. Although recycling operations will often pay for certain oil and solvent wastes, they generally do not accept quantities of less than one barrel (55 gallons) of recyclable materials.

Additionally, sanitary landfill disposal and hauling costs may range from $75 to $250 per ton for hazardous wastes. While these fees may be acceptable on a unit cost basis, most haulers charge a minimum fee of from $100-$150 per load. This high cost is often prohibitive for many small companies that do not generate enough wastes to justify the cost of a separate pickup.

Finally, under existing regulatory guidelines it may be illegal for non-licensed individuals to transport their own wastes to the landfill. The BKK Class I sanitary landfill will accept small quantities of wastes from individuals and homeowners for a reasonable fee. However, in order to accept wastes at a Class I site, the landfill operator should manifest that the wastes were delivered by a registered, licensed hauler. As defined by Department of Transportation guidelines, the vehicles that carry less than 500 lbs of hazardous wastes are not required to be registered. The State DOHS program

does not recognize such an exemption but does provide for a variance to the hauler's permit requirement on a case by case basis.

3.5.3 Implementation

3.5.3.1 Recommended Actions

A. Feasibility Study

The initial phase of implementation will involve a preliminary feasibility study. This study would attempt to further define the scope and magnitude of the problem, and specific economic requirements and institutional arrangements necessary for the implementation of a successful and cost-effective program.

A study of this nature should include consideration of the roles of local sanitation and regulatory agencies as well as those of private industry and free market forces. Alternative technologies such as recycling and waste exchange should be emphasized whenever feasible. All pertinent legal and regulatory restrictions with respect to the transport and storage of hazardous wastes should also be considered.

B. Pilot Program

As a result of the recommendations of the feasibility study, a pilot program should be developed in the study area. Such a program could encompass a number of waste management alternatives.

One such possibility would involve a hazardous waste collection and transfer station where small-quantity waste generators could deposit wastes for a nominal fee. Currently, the only hazardous waste transfer station in operation is located in San Diego County approximately 150 miles away.

Another possibility involves the coordination of pickup routes for recycling and/or disposal of small quantities of hazardous wastes. These operations could be established either by local agencies or by the private sector. One such waste route program has been coordinated by South Coast Air Quality Management District (SCAQMD) for the collection of PCE wastes from local dry cleaning establishments.

A third possibility is a proposal that would make it incumbent on retailers and distributors of products containing hazardous materials to provide a depository for spent containers and residual products.

Whatever techniques are employed this pilot program should in turn be fully analyzed to determine its effectiveness in meeting the waste disposal needs of the community.

C. Full-Scale Program

Successful elements of the pilot program should be instituted on a regional basis. Such a program must consider the guidelines of the County Solid Waste Management Plan, as well as the requirements of all local and regional regulatory agencies.

The overall success of any hazardous waste management plan will ultimately rely on the support and participation from waste generators. For this reason education and enforcement efforts of local agencies will be vital to the program. These agencies can best assure that small business are aware of existing hazardous waste disposal alternatives.

3.5.3.2 Responsible Agencies

Southern California Association of Governments (SCAG)	Administer Feasibility Study for Small-Quantity Hazardous Waste Disposal.
RWQCB, County and State DOHS	Provide legal and regulatory guidelines for devlopment of pilot and full-scale program.
Other Inspection Agencies (Bureau of Sanitation, SCAQMD)	1. Assist in development of pilot and full-scale programs. 2. Educate industry and coordinate waste generators, haulers and recyclers.

3.5.4 Cost and Funding

A. Feasibility Study

The Southern California Association of Governments (SCAG) has recently applied to the State under the Water Quality Management Planning Program for a grant to fund a study for the development of a cost-effective hazardous waste management plan for small-quantity generators.

B. Pilot and Full-Scale Programs

It is not known at this time what costs and funding will be necessary for the pilot and full-scale programs. Ideally, these programs should be self-supported through user's fees and other 'free market' funding.

RECOMMENDATION NO. 6

3.6 Regulation of Landfills

3.6.1 Introduction

3.6.1.1 Objective

The overall objective of this recommendation is to minimize the potential adverse impact of sanitary landfills on groundwater quality in the San Fernando Valley Basin (SFVB) through specific design, siting and monitoring requirements.

3.6.1.2 Required Actions

The following activities are intended to prevent the contamination of groundwater through the release of hazardous chemicals from active, abandoned or future landfill sites.

A. Investigate Older Landfills:

The effects of older and recently completed landfill sites on groundwater quality should be closely monitored on a long-term basis. Most previously completed sites have little or no provisions for groundwater protection or monitoring. Where no monitoring facilities are available, observation wells should be provided to effectively assess the impact of those sites on groundwater quality in the SFVB.

B. Control the Siting of New Landfills:

In accordance with the general goals of the County Solid Waste Management Plan, future siting of landfills in the SFVB should be controlled to maintain sufficient facilities to satisfy solid waste management requirements. The Regional Water Quality Control Board (RWQCB) should assign low priority to the development of landfill sites in sensitive groundwater areas in the SFVB.

C. Design and Construction Requirements On New Landfills:

Whenever any landfill is to be sited in the SFVB, state-of-the-art groundwater protection measures should be employed that include provisions for leachate collection and gas migration control as well as for groundwater monitoring. Stringent inspection controls should also be required during the construction and landfilling operations to assure compliance with these design specifications.

3.6.2 Background

3.6.2.1 Past Landfill Developments

Sanitary landfills, dumps and other related waste disposal sites in the SFVB were identified in this investigation as either completed or currently in use (Plate 9). Although these landfills were permitted to accept only nonhazardous wastes, most of the older sites were designed and regulated without the benefit of current knowledge of state-of-the-art groundwater protection measures. Prior to 1949, the capability of hazardous materials to contaminate groundwater during landfill operations was generally not understood and safeguards against such contamination were limited.

The Sheldon-Arleta landfill, owned and operated by the City of Los Angeles, is a documented case of groundwater degradation occurring from the by-products of decomposing refuse. As a result of extensive water spreading activities nearby, portions of the fill became temporarily inundated. This resulted in a localized increase in carbon dioxide and dissolved solids concentrations in adjacent groundwaters. There was no evidence, however, of volatile organic compounds (VOC's) entering the groundwater from this site.

Limited sampling of landfill gases from two recently completed landfills in the SFVB indicated the presence of TCE and other VOC's. The presence of these chemicals indicates a potential for contamination of adjacent groundwater. However, since groundwater monitoring downgradient of landfills was not required in prior years, it is not known to what extent many active or abandoned sites may have contributed to current contamination problems. Comprehensive sampling and monitoring of these sites are necessary to fully evaluate their actual and potential impact on groundwater quality.

3.6.2.2 Landfill Siting

There are currently several proposed landfill sites in the SFVB that are in various phases of the design and permit approval process. These new sites are generally proposed for the reclamation of depleted sand and gravel mining pits in the Sun Valley area of Los Angeles located in the eastern SFVB. At present, landfilling is the most feasible alternative for the reclamation of these exhausted pits and complies with the City's General Plan for the area. As such, pressure to use these pits for landfilling is expected to continue for some time.

Currently, the RWQCB has restricted development of landfills in the SFVB to the disposal of nonhazardous wastes only. These landfills may, under certain conditions, affect adjacent groundwaters. The latest landfill design requirements are intended to prevent groundwater contamination from landfill gases and leachates. However, these design features have had

limited field application (5 years) in comparison to the period over which a sanitary landfill can act as a source of contamination to the surrounding environment (50-70 years). For this reason, many individuals have advocated a temporary moratorium on the development of sanitary landfills in the SFVB.

3.6.2.3 County Solid Waste Management Plan

The County Solid Waste Management Board is currently in the process of updating the Solid Waste Management Plan for Los Angeles County.

While the previous County Plan relied heavily on the continued development of sanitary landfill sites throughout the County, the new plan (scheduled for release in 1983) will place greater emphasis on alternative technologies such as waste recycling and energy recovery systems. At present, these technologies are in a developmental stage and must undergo further testing before accurate economic and operating comparisons can be made with traditional landfill operations.

The County Plan recognizes that available landfill space is a limited commodity that should be managed for both present and future needs. As such, the County Plan will attempt to guide the siting and development of sanitary landfills on a regional basis in order to stimulate the economic environment necessary for the development of alternative resource recovery technologies. Such control would consist of defining regional 'waste-sheds' of solid waste generation, handling and disposal self-sufficiency. Ideally a given region with a high availability of landfill space should not be 'over-developed' to accommodate the short-term needs of any adjacent waste-shed. Such controls would promote the development of landfill alternatives and thus extend the practical lifetime of all existing landfill space. Similar planning controls may be available in the SFVB to pace the development of future landfill sites to allow a period for the testing of current sanitary landfill design.

3.6.2.4 Landfill Design

Previous controls for landfills were inadequate to protect against groundwater contamination. As mentioned, the Sheldon-Arleta site is one known example of deleterious effects resulting from landfill operations in the SFVB. Prior to 1978, there were no formal design requirements for the containment and management of leachates and gas migration.

At present, the RWQCB is charged with the responsibility of establishing requirements for the design and operation of sanitary landfills. Each applicant for a landfill must comply with the design, operating and monitoring requirements imposed by the RWQCB. In addition, each site plan must meet the requirements of all concerned agencies including local

sanitation departments, health services agencies and others.

In the City of Los Angeles, each Class II sanitary landfill site must also meet the design and inspection requirements of the Department of Water and Power (DWP). The current DWP requirements are designed to both minimize the production of leachates and provide for the containment and removal of any leachates and landfill gases produced. In order to assure compliance with these design objectives, the DWP also conducts inspection and monitoring of the construction of these containment and removal systems.

The Bureau of Sanitation of the City of Los Angeles has the authority to inspect all Class II and III sanitary landfills in the city to ensure that only refuse which is allowed under a landfill's operating permit is placed in the landfill. This inspection authority is designed to prevent the illegal disposal of hazardous wastes into Class II sanitary landfills, and to ensure that household refuse or decomposable waste is not placed in Class III sanitary landfills, which have no groundwater protection controls.

3.6.3 Implementation

3.6.3.1 Recommended Actions

A. Site Investigation

A comprehensive survey of all landfills in the SFVB for the presence of hazardous wastes should be performed. Information from existing well data should be analyzed in conjunction with existing records on landfill depth, current and historical water levels, filling and closure dates, final cover requirements, etc. As indicated by this initial information, further investigation of individual sites may be necessary. Landfill gas sampling, exploratory soil borings, aerial surveys and construction of new monitoring wells may be required to fully evaluate the groundwater contamination potential of each site.

These investigative activities generally fall within the regulatory authority of the RWQCB and the State DOHS. The RWQCB is currently requiring such monitoring on all new landfills and has begun a program to upgrade closure and post closure monitoring requirements for all active Class II sites as well.

The State DOHS is currently conducting an abandoned waste disposal site identification program as part of the California administered equivalent of the federal Resource Conservation and Recovery Act (RCRA) program. The goal of this program is to identify all industrial sites that previously allowed on-site hazardous waste disposal and to investigate these abandoned operations for the presence of hazardous wastes. Those sites that could cause public health related problems are

referred to the Superfund program for further detailed investigations. Present funding for the abandoned site program is scheduled to end in July of 1983. New funding will be required at that time to continue this vital program.

B. Siting Controls

A general moratorium on sanitary landfill construction is not recommended at this time. However, planning guidelines of the Solid Waste Management Plan of Los Angeles County should be used by the City Planning Departments and other agencies to fully regulate the development of alternative landfill sites. The implementation of measures presented in the Solid Waste Management Plan would make it possible to control the development of landfills in the sensitive groundwater areas and thereby serve the best needs of the entire community.

The siting of landfills is initially reviewed under the land development planning process. Land use controls, such as general plans and zoning requirements, and conditional use applications, could be applied to proposed landfill siting. The submittal of environmental documents and the successful conclusion of a public hearing are prerequisites to the approval of any proposed landfill site.

C. Design Requirements

Current procedures for the review and approval of landfill design should be continued because they provide an opportunity for local agencies to influence groundwater protection features of the design. Current landfill design guidelines and the equivalent construction inspection provisions should be required for all new Class II sanitary landfills in the SFVB.

3.6.3.2 Responsible Agencies

Regional Water Quality Control Board	1. Maintain number of Class II Sanitary Landfills in SFVB sufficient to meet public needs in the region. 2. Develop design, construction and monitoring requirements for all Class II sanitary landfills in SFVB. 3. Update monitoring require ments on all operating Class II landfills.
Water Agencies, Sanitation and Planning Agencies	1. Assist RWQCB in developing landfill siting and design criteria. 2. Provide inspection and monitoring of construction and landfill operations.

State DOHS	Continue investigation of all abandoned landfill sites in SFVB and provide monitoring where necessary.

3.6.4 Costs and Funding

A. Site Investigation

The State DOHS provides funding for the Abandoned Site Investigation Project through implementation of the State Hazardous Waste Control Law. Follow-up investigations of individual sites can be funded through the State Hazardous Substances Account. Whenever possible, however, testing requirements and monitoring programs for landfills should be funded directly by the landfill owner/operator.

B. Landfill Siting

All fees associated with the planning, siting and permitting process are borne by the landfill developer through zoning and conditional use applications.

C. Design

The implementation of more stringent requirements for sanitary landfill development could be achieved through the existing regulatory process. The costs of regulatory changes are nominal and should be borne by regulatory agencies.

The DWP has incurred substantial costs for past inspections of landfill construction. The City of Los Angeles recently adopted an ordinance requiring that the developer of the landfill pay the cost of these inspections. The landfill inspection costs are currently estimated at approximately $1,500 per acre of landfill area.

RECOMMENDATION NO. 7

3.7 Groundwater Monitoring Program

3.7.1 Introduction

3.7.1.1 Objective

The objective of the groundwater monitoring program is to provide complete and comprehensive information on groundwater quality in the San Fernando Valley Basin. Information should be collected that will enable the continued and timely evaluation of the following:

1. the compliance of delivered water with drinking water quality guidelines recommended by the State Department of Health Services;

2. the effectiveness of treatment and aquifer management techniques in controlling contaminants;

3. the long-term variations and trends in the occurrence and movement of contaminants; and

4. the effects of potential sources of contamination on groundwater quality (e.g. recharge water, landfills, etc.).

3.7.1.2 Required Actions

The implementation of an expanded groundwater monitoring program will require the following actions.

A. Continue Current Monitoring:

Current monitoring of both operating production wells and the water distribution network must be continued to ensure that all water delivered to the consumer meets the water quality criteria recommended by the State Department of Health Services (DOHS).

B. Expand and Coordinate Aquifer Monitoring:

In addition to system monitoring, increased efforts should be directed toward expanded basin-wide aquifer monitoring. An expanded aquifer monitoring program will require increased coordination, planning and scheduling of sampling efforts to ensure that pertinent water quality data is gathered and evaluated. In addition, a series of new observation wells should be installed in key locations in the basin to provide more detailed

information on the movement and distribution of contaminants.

C. Monitor Potential Sources of Contamination:

Potential sources of contamination should be closely monitored to provide complete protection of groundwater quality in the basin. The following potential sources will require some level of increased monitoring:

1. Landfills, including landfill gases and monitoring wells;

2. Recharge water from the urban drainage system including effluents from local wastewater reclamation plants.

Compliance monitoring requirements for private disposal systems, storage tanks, sumps and pipelines were discussed in Recommendation Nos. 2 and 4 of this plan.

3.7.2 Background

3.7.2.1 Current Water Quality Monitoring

The purpose of current water quality monitoring is to determine the concentration of organic contaminants in groundwater extracted from the SFVB and delivered through the distribution system. Monitoring requirements were developed by the State DOHS to ensure that water delivered to the consumer meets all drinking water quality guidelines. The current sampling and analysis program also provides the data needed in blending operations to maintain the contaminant concentrations in product water below recommended action levels.

Water quality testing for the City of Los Angeles consists of daily sampling of water for TCE and PCE in the DWP distribution system. In addition, monthly water quality analyses are performed on production wells where contaminant levels have historically exceeded the State DOHS action levels. Other production wells are tested on an infrequent basis. These monitoring efforts amount to approximately 100-150 samples per month during peak groundwater production periods.

Water supply wells in Burbank and Glendale are currently maintained on a standby basis and are sampled and analyzed semiannually as required by the State DOHS. This system monitoring involves approximately 20 to 30 samples per year for each of these cities.

3.7.2.2 Need for Expanded Groundwater Monitoring

System monitoring efforts alone do not provide sufficient

data necessary to monitor basin-wide changes and trends in groundwater quality. Current monitoring of production wells depends primarily on previous contaminant concentrations and varies seasonally with changes in groundwater pumping schedules. The current monitoring effort, therefore, does not provide comprehensive groundwater quality information. Some areas of the eastern SFVB are not equipped with any monitoring capabilities to allow the early detection of contaminants in the groundwater basin. Finally, data gathered from production well monitoring does not provide complete information such as the vertical distribution of contaminants or contaminant movement. This information is necessary to assess the effectiveness of aquifer management techniques, such as well packers, in controlling the movement of contaminants.

3.7.2.3 Monitoring of Potential Contaminant Sources

At present, data concerning the quality of water that percolates into and recharges the SFVB is very limited. A significant portion of the water which recharges the SFVB is derived from sources which may be degraded by inadvertent or deliberate discharges of hazardous materials. Potential sources of groundwater recharge or contamination which may contribute hazardous materials to the groundwater basin are as follows:

1. Reclaimed wastewater used for irrigation or spreading;

2. Storm water runoff and dry weather urban drainage percolating into the unlined reaches of the Los Angeles River or recharged at spreading grounds;

3. Leachate and gas migration from sanitary landfills (see Recommendation No. 6);

4. Septic tank effluent discharged from private disposal systems on commercial and industrial sites (see Recommendation No. 2); and

5. Hazardous materials leaks from storage tanks, sumps and pipelines (see Recommendation No. 4).

Many of these potential sources of contamination are not presently subject to any monitoring requirements. Regular monitoring programs should be developed in order to fully assess the impact of each of these potential sources.

3.7.3 Implementation

3.7.3.1 Recommended Actions

A. Distribution System and Production Well Monitoring

System monitoring efforts should be continued at current levels to provide up-to-date information on the quality of drinking water delivered to the consumer.

B. Increased Aquifer Monitoring

An increased level of groundwater monitoring is prerequisite to the effective implementation of the proposed Groundwater Quality Management Plan for the San Fernando Valley Basin. A comprehensive aquifer monitoring program should consist of regularly scheduled sampling and analysis for TCE, PCE and other VOC's in production and observation wells throughout the SFVB. The information obtained from this monitoring program will also allow the evaluation of the effectiveness of the groundwater quality protection programs and aquifer management techniques implemented as part of this plan.

To supplement data from existing wells, 8-10 observation wells should be installed in key locations in the basin. These wells would provide more detailed information on the movement and distribution of contaminants. This information, correlated with data from existing observation and production wells, may also provide early detection of new contamination and aid in the identification of contaminant sources.

This increased aquifer monitoring is estimated to require the collection and analysis of approximately 75 additional samples per month, basin-wide. This would be roughly equivalent to a 50 percent increase over current system monitoring for each city.

C. Special Source Monitoring

Regular testing and monitoring requirements should be developed that will provide information on the impact of major potential sources of contamination on groundwater quality in the SFVB. This data may provide early detection of localized groundwater contamination and allow the implementation of measures to mitigate any adverse impact on groundwater quality. Special compliance monitoring programs could be developed as part of the regulatory requirements of various local, county and state agencies.

The following is recommended as a guideline for these requirements. Additional details on the implementation, responsible agencies, costs and funding for these monitoring programs should be developed through the proposed Interagency Advisory Committee.

1. Monitor effluents discharged into the urban drainage system from wastewater treatment plants.

2. Monitor spread water from the urban drainage systems at the spreading basins and along unlined channels where deep percolation occurs.

The monitoring of groundwater underlying active and completed sanitary landfills for leachate and gas migration should be coordinated with the RWQCB. (See Recommendation No. 6)

3.7.3.2 Responsible Agencies

Water Agencies	1. Continue system monitoring programs 2. Conduct expanded aquifer monitoring program 3. Monitor recharge water from the urban drainage system (DWP only)
Sanitation Agencies	Monitor quality of water reclamation plant effluents discharged to the urban drainage system
Watermaster, Interagency Advisory Committee	Coordinate monitoring activities and data collection of various agencies

3.7.4 Costs and Funding

A. System and Aquifer Monitoring

The total costs for sampling and analysis are estimated at $60,000 per year for the City of Los Angeles and $2,000 per year each for the Cities of Burbank and Glendale. Monitoring costs for San Fernando are expected to be nominal since no contamination has yet been detected in municipal wells there. Periodic monitoring should be performed to ensure that contaminants are not entering these wells.

The costs of installing observation wells are estimated at $75,000 for 5 wells for Los Angeles and $30,000 for two wells for each of the cities of Burbank and Glendale. No new observation wells are currently needed in San Fernando. The need for additional observation wells should be assessed as the program progresses.

The groundwater monitoring program would probably be funded by the operating budgets of each water department through water revenues. Funding for the initial installations of observation wells could also be supported by the cities or water departments as part of their water quality protection

efforts. An alternative funding source is the Water Quality Management Planning Program which is administered by the SWRCB. Funds equal to 75 percent of the project costs could be derived from this source.

B. Special Monitoring Programs

Costs for sampling and monitoring of the LAR and nearby water reclamation plants are expected to be less than $5,000 per year. Funding for this effort should be absorbed by the water agencies and/or local sanitation agencies.

Other observation wells may be constructed pursuant to requirements of the State DOHS or the RWQCB in conjunction with special investigations of individual spill or landfill sites. Funding for the cost of these wells would usually be provided by the site owners. (See Recommendation Nos. 4 and 6)

RECOMMENDATION NO. 8

3.8 Aquifer Management and Groundwater Treatment

3.8.1 Introduction

3.8.1.1 Objectives

The objectives of this recommendation are to reduce or minimize the effects of contamination on overall groundwater quality in the San Fernando Valley Basin and to reduce the levels of contaminants in drinking water.

3.8.1.2 Required Actions

The following actions are necessary to accomplish the objectives of this recommendation.

A. Aquifer Management:

Develop and implement programs for the in-situ management of groundwater quality in the SFVB including such techniques as preferential pumping of groundwater, groundwater level management, and removal-disposal.

B. Blending:

Develop and implement a blending plan for groundwater to assure a safe drinking water supply.

C. Treatment:

Develop treatment facilities to utilize degraded groundwater where blending is not feasible.

3.8.2 Background

3.8.2.1 Alternative Plans for the Control of Contaminants

Approximately 45 percent of a total of 109 municipal supply wells in the SFVB produce water containing TCE and/or PCE in excess of the recommended action levels of 5 ppb and 4 ppb, respectively, established by the California Department of Health Services (DOHS). While water from most of these wells can still be used when blended with clean sources, the use of approximately 13 wells has been severely restricted or discontinued due to excessive levels of TCE or PCE.

During this study, several engineering management alternatives were investigated for the control of existing contamination problems. These investigations attempted to

determine the cost-effectiveness and impact of each operating strategy to reduce or remove contaminants in drinking water, or to otherwise control the effects of in situ contaminants on groundwater quality in the SFVB. The following alternatives were considered in this analysis:

A. Preferential Pumping,
B. Groundwater Level Management,
C. Blending,
D. Treatment,
E. Removal/Disposal,
F. No Project.

Following is a brief description of each alternative. A more detailed discussion of each is contained in the Appendix, Summary of Subtask Investigations, Task III.

A. Preferential Pumping

Preferential pumping involves the controlled use of production wells to pump groundwater from selected zones of the aquifer. Preferential pumping is designed to (1) allow the continued use of high quality groundwater and (2) to control the migration of contaminated groundwaters.

First, by pumping wells located in less contaminated zones, these wells can continue to produce high quality groundwater from the SFVB. For example, new wells could be sited in uncontaminated areas of the basin. Special well packers could also be used in some contaminated wells to fully exploit the vertical distribution of contaminants and the confining effects of localized clay lenses. The well packer has been shown under certain conditions to be an effective way to isolate and partially contain the contaminants in the upper zone of a semiconfined aquifer. The packer can then be used to pump relatively uncontaminated waters from the remaining lower zone of the well. The packer could also be used to isolate zones of heavy contamination for removal and subsequent treatment or disposal.

A second technique involves the use of local groundwater flow patterns to control the migration of contaminants. Since contaminants move with the flow of groundwater, they tend to be drawn towards, and held within, cones of depression or pumping holes developed by operating wells. The migration of these contaminants can be controlled to some extent through the manipulation of pumping schedules. By maintaining localized pumping holes within contaminated areas around individual wells or well fields, it may be possible to contain contaminant plumes or to retard the migration of contaminants to nearby and downgradient wells. Contaminated groundwater pumped from these areas could then be blended or treated to safe drinking levels before delivery to the consumer.

B. Groundwater Level Management

Groundwater level management is a technique used to prevent the inundation of landfills and to minimize the infiltration of other potential contaminants that may be held in the vadose zone of the soil. Maintaining the water table levels below these potential sources may help to minimize the leaching of contaminants into the aquifer.

C. Blending

Blending is a technique used to reduce the concentration of contaminants in drinking water through dilution. By carefully diluting slightly contaminated groundwaters with clean water from uncontaminated sources, a safe, blended mixture of water that meets the recommended State DOHS requirements for drinking water, can be produced. Blending is limited only by the amount of clean water available in the distribution system to dilute the existing contaminant concentrations below the recommended action levels.

D. Treatment

Treatment is used to permanently remove contaminants from pumped groundwater in order to maintain a water supply that meets recommended water quality guidelines.

Packed tower air stripping is the most cost-effective treatment alternative available at this time. Air stripping involves the transfer of VOC's from water into air where they are vented to the atmosphere. However, air quality standards of the South Coast Air Quality Management District (SCAQMD) may place restrictions on contaminants discharged to the atmosphere. Standards for emissions from aeration towers are currently under development by the State Air Resources Board and the SCAQMD.

Treatment costs for air stripping are estimated at approximately $36 per acre-foot of groundwater treated. If pretreatment of the air is required before discharge, this cost could increase substantially.

A new treatment alternative under development that was not fully evaluated is the use of air-lift pumping with simultaneous removal of volatile organics. Further investigation of this new technique is recommended.

E. Removal/Disposal

Removal and Disposal is an aquifer rehabilitation technique designed to permanently remove highly contaminated groundwater from the aquifer for discharge to an approved disposal facility. To be effective, removal must result in substantial improvement to the overall quality of groundwater in the SFVB.

Initial estimates, however, indicate that relatively large volumes of groundwater must be removed in order to effect any significant decline in the present concentrations of contaminants in the SFVB. For this reason, full-scale implementation of the Removal and Disposal option is not justifiable in view of the high water replacement costs and the current need to store groundwater in anticipation of future water shortages.

However, the Removal and Disposal option should not be dismissed entirely. It may be the only practical method to control contaminant migration until treatment measures could be implemented. It also provides the safest means of monitoring a contaminated well prior to determining which engineering strategy to employ.

Presently, the only practical option for the disposal of contaminated groundwater is the storm drain system. This matter will therefore require the evaluation and approval by the Los Angeles Regional Water Quality Control Board prior to implementation. The South Coast Air Quality Management District will also evaluate the impact to air quality resulting from the release of contaminants to the atmosphere. Other regulatory considerations could include those of the public works departments and the Los Angeles County Flood Control District.

F. No Project

The No Project option is an arbitrary engineering scenario in which none of the previously discussed management actions are implemented for the control of existing contamination. Under the No Project option, highly contaminated wells would be abandoned and alternative MWD supplies would be used to replace the production capacity lost as a result of contamination.

The No Project option was considered an unacceptable strategy due to the higher cost of alternative MWD supply and the reduction in operating flexibility for the water systems. For the City of Los Angeles, MWD rates for water are currently estimated at $110 per acre-foot more than groundwater costs. Under the No Project scenario, contaminants would ultimately spread to other wells in the basin thus resulting in further abandonment of wells and loss of valuable water resources.

3.8.2.2 Proposed Actions: Aquifer Management and Groundwater Treatment Program

TCE, which is currently the major contaminant in the SFVB, is present at scattered locations throughout the eastern portion of the SFVB. Although exceeding concentrations recommended for drinking water in some wells, TCE concentrations are relative dilute. Since no distinct concentrated sources have yet been identified, it is not possible to effectively utilize some traditional aquifer rehabilitation

techniques designed to purge contaminants from the aquifer.

Preliminary estimates have indicated that at present rates of removal, it may take as long as from 20 to 100 years to cleanse the aquifer of TCE. For this reason, the present contamination problem should be viewed as a long-term condition that must be managed in order to facilitate the continued best possible use of this valuable water resource.

A coordinated program of Aquifer Management and Groundwater Treatment techniques should be implemented. This program would include the effective elements of preferential pumping, groundwater level management, blending, treatment and a very limited extent of removal/disposal.

The primary objectives of this program are as follows:

1. Provide for the continued delivery of water in compliance with the Action Levels recommended by the State DOHS;

2. Control the migration of contaminants;

3. Permanently remove contaminants from highly degraded areas;

4. Maintain groundwater storage at levels designed to minimize further leaching of contaminants.

3.8.3 Implementation

3.8.3.1 Recommended Actions

There are several factors which will influence the implementation of the specific recommended actions. One of the key factors is the establishment of EPA standards for VOC's in drinking water. It is possible that the establishment of a national standard may differ from the interim action levels currently recommended by the State DOHS. A revised State requirement will have a significant impact on the necessity and extent of the blending and treatment measures recommended.

Another factor is the requirements of other regulatory agencies. For example, air contaminant emissions must be considered for any proposed treatment facility. Any atmospheric discharge limitations imposed by the SCAQMD could substantially affect the costs and implementation of treatment processes. Additionally, building and zoning codes may restrict the installation of treatment facilities.

A third factor that must be considered is the water operating requirements for each water distribution system. The overall program must be compatible with the operational requirements of each respective system including consideration

of seasonal water demands and pumping schedules.

Finally, these aquifer management and treatment programs should be responsive to any changes or fluctuations in the groundwater quality trends in the SFVB. For example, extended preferential pumping in the western-most wells of the North Hollywood well field could result in an increased in-flow of higher TDS waters from the western portion of the basin. The use of well packers could also be effective in restricting the vertical spread of contaminants and could reduce the number of wells and the volume of water to be treated.

A. Aquifer Management

Aquifer management includes those measures designed to minimize the effects of localized contamination through the application of in-situ control techniques. These include the following specific activities.

1. Preferential Pumping

a. Design and Siting of New Wells

New wells are constructed periodically as replacements for wells with diminished capacities and to expand available groundwater pumping capacity. New wells such as these should be located in uncontaminated areas of the basin, preferably upgradient from identified contaminated areas. The potential for future intensive commercial and industrial development and existing potential sources of contamination adjacent to the proposed well site should also be considered. In addition, the design of all new wells should take advantage of existing clay lenses and the vertical distribution of contaminants. By perforating wells below clay lenses and isolating higher contaminated regions, it may be possible to further reduce the level of contaminants in pumped water. If warranted, the construction of observation wells to facilitate groundwater quality monitoring should precede final approval of the well site.

The DWP is currently planning to construct a new well field consisting of approximately 20 new wells and a main collection line. This new well field is intended to increase the available groundwater pumping capacity during peak use, drought, or other emergency conditions. One area under consideration for siting these wells is directly to the north of the North Hollywood well field.

b. Well Packers

Initial tests on the installation of a special inflatable well packer showed that the well packer can be an effective means of controlling the concentration of contaminants in pumped water. The use of well packers appears to be feasible in other wells.

c. Groundwater Pumping Controls

Preferential groundwater pumping controls will involve the coordinated application of monitoring and computer modeling of groundwater flow patterns and contaminant migration to direct the planning of both seasonal and long-term pumping activities in the SFVB. Computer modeling, when adequately correlated with groundwater quality and aquifer data, can be a useful tool for predicting the effectiveness of preferential pumping activities. This information could be used to develop specific pumping schedules designed to control the migration and spread of contaminants.

In general, the large, extensively developed groundwater pumping holes in the North Hollywood and Crystal Springs areas should be maintained through continued pumping of wells in those areas. This continuous pumping will minimize the migration of contaminants out of these areas into uncontaminated zones directly downgradient.

2. Groundwater Level Management

In order to minimize leaching and inundation of landfills in the San Fernando Basin, groundwater levels should not exceed 1955 levels. This level will maintain a safe distance between the water table and landfills, and also minimize the outflow of water from the basin through the LAR Narrows area. Groundwater level management is especially critical in areas where groundwater recharge and spreading activities are directly adjacent to existing sanitary landfills.

3. Removal and Disposal

Disposal is currently the only available method for sampling highly contaminated wells without impacting drinking water supplies. For this reason, operational and monitoring guidelines should be developed that will allow limited disposal of groundwater for testing purposes. Removal and Disposal also may be a desirable short-term alternative for certain wells where other management options may not be feasible. Removal would be most effective when used in regions of high contaminant concentration, such as may be isolated by well packers, to obtain the maximum result.

B. Blending

Based on present basin-wide TCE levels and available diluting sources, the DWP can effectively provide for the safe, long-term blending of all well waters with TCE at concentrations of less than 20 ppb. Above this level, blending becomes impractical because of limitations in the availability of blending water and sufficient hydraulic capacity of the system. Specific monitoring plans and operating schedules should be adopted to fully implement the recommended blending program.

At this time, the water systems of the Cities of Burbank and Glendale are not adaptable to any large scale blending program. Substantial changes to the distribution systems would be required to enable blending with MWD supplies. These cities should conduct a detailed study to determine the cost-effectiveness of implementing such large scale changes for blending purposes.

C. Treatment

Those wells that cannot be safely blended on a long-term basis should be treated to allow their continued use. Under present operating conditions, there is a need for approximately 11 treatment units. In some cases, a single treatment unit could serve two adjacent wells. Nine of these units are needed for DWP wells, one for Burbank and one for Glendale. No treatment is required for San Fernando wells. As mentioned previously, these numbers could change substantially with changes in water quality and regulatory conditions.

To allow the development of the most cost-effective design, the treatment system should be developed in three phases: (1) Pilot scale testing, (2) Demonstration testing on full-scale unit, and (3) Application to other wells in basin. SCAQMD approval of proposed emissions during each phase will be required in advance of actual testing.

3.8.3.2 Responsible Agencies

Water Agencies	1. Develop and implement blending and treatment to maintain safe drinking water quality. 2. Develop design and siting criteria for new wells.
ULARA Watermaster, Interagency Advisory Committee	1. Investigate and develop guidelines for the implementation of short-term removal and disposal applications. 2. Coordinate long-term preferential pumping activities and water level management strategy.

3.8.4 Costs and Funding

The following is a brief summary of projected capital and operational costs for the Aquifer Management and Treatment Program. More detailed descriptions of each of the elements of this program are contained in the Appendix, Subtasks III and IV-A.

A. Aquifer Management

In general, implementation of the recommended aquifer management techniques will not involve substantial costs since

these programs rely primarily on changes to, and coordination of, the existing operational and planning guidelines of the water agencies.

For example, groundwater level management and preferential pumping controls on contaminant migration are generally compatible with the current long-term operational guidelines of the water agencies within the basin.

Costs for the installation of well packers may vary from $1,000 to $7,000, depending upon whether the packer is installed during routine pump maintenance.

Water quality management considerations also could affect the cost of future groundwater pumping expansion projects. The major portion of the cost of this expansion is for the laying of new collector lines to transport the groundwater to the distribution system. This cost could increase as a result of water quality considerations if the distance to an uncontaminated zone is significant.

Any costs associated with these aquifer management programs are expected to be funded by the various water agencies that implement them.

B. Blending

The costs for implementing a blending program in Los Angeles are minimal since blending is currently being accomplished through existing operational controls and will not require any modifications to the distribution system. These operations are currently funded through the water operating budget.

Any estimated costs for system modifications for Burbank and Glendale are not known at this time. These cities should assess whether blending would be a cost-effective alternative to treatment despite the major systems modifications required.

C. Treatment

Several factors will significantly affect the costs of the groundwater treatment program. First, the concentration of contaminants in the groundwater at individual wells frequently exhibits broad variations with time. This dynamic condition makes it difficult to determine the exact level of treatment necessary to produce high quality drinking water. Second, possible changes in the regulatory guidelines developed by the EPA for volatile organic chemicals in drinking water could significantly alter the level of treatment required. Finally, the feasibility and effectiveness of alternative groundwater contaminant control techniques such as air-lift pumping and well packers must be fully evaluated so that the most cost-effective combination of management alternatives is employed.

Based upon current data, the estimated cost for packed tower aeration units is approximately $300,000 per unit for initial installation costs and $22,000 per unit for annual operating costs.

Water treatment costs could be funded by the individual water agencies through their operating budgets as derived from increased water rates. However, other possible funding sources including the Superfund, Hazardous Substance Account, Energy and Resources Fund, and the California Safe Drinking Water Grant Program should be investigated. Federal and/or state assistance in financing the water treatment program may require legislative approval before funding is allocated.

In the event that specific individual sources of contamination are located, it may be possible that individual spill or site clean-up and treatment costs could be funded privately by the responsible parties, or through State or Federal Superfund programs.

000049

PLATES

DESCRIPTION OF PLATES

Plate No.	Title

1 Soil Infiltration Map

This map shows the variation in relative water infiltration rates from low (green areas) in the western portion to high (orange areas) in eastern portion of the SFVB. These relative surface infiltration rates are also generally indicative of the relative rates of percolation and soil permeability in the SFVB.

2 Upper Los Angeles River Area Groundwater Contours Fall 1981

The groundwater contours indicate that the general direction of groundwater flow in the SFVB is southeasterly from the recharge areas on the alluvial fans along the edges of the valley fill toward the basin outlet area at the Los Angeles River Narrows.

3 Commercial-Industrial Development - San Fernando Valley Basin

This plate shows the extent of commercial and industrial development of the SFVB. The organge, yellow and pink areas indicate heavy industrial, manufacturing/industrial and commercial zoned land, respectively. The uncolored areas represent residential or recreational areas. The North Hollywood Industrial Survey Area is also outlined on the map.

4 Location Map San Fernando Valley Area

This map outlines the location of the North Hollywood (Plate 5), Crystal Springs (Plate 6), and Pollock Wells areas (Plate 7) in relationship to the SFVB.

5 Commercial and Industrial Development - North Hollywood and Vicinity

This map illustrates the presence of a cone of depression in the North Hollywood well field, and the relationship between Industrial and Commercial Zones and wells contaminated with TCE. The color and size of the dots indicates the level and range of TCE contamination in each well.

Plate No.	Title

6 Commercial and Industrial Development - Crystal Springs and Vicinity

This map illustrates the presence of a cone of depression in the Crystal Springs area, and the relationship between Industrial and Commercial Zones and wells contaminated with TCE. The color and size of the dots indicates the level and range of TCE contamination in each well.

7 Commercial and Industrial Development - Pollock Wells and Vicinity

This map illustrates the presence of a cone of depression in the Pollock well field, and the relationship between Industrial and Commercial Zones and wells contaminated with TCE. The color and size of the dots indicates the level and range of TCE contamination in each well.

8 Location of Wells Containing TCE and/or PCE in Excess of State DOHS Action Levels

This map shows the location of wells containing TCE and/or PCE in excess of State DOHS Action Levels, and the location of wells tested during the groundwater quality testing program.

9 Landfill Location - San Fernando Valley

This map depicts the location of all landfills located in the San Fernando Valley. The accompanying list of landfills contains the name and number (assigned by the Los Angeles County Engineer's Office) of each landfill or dump site on the map. The classification of each site is also given if available.

10 Locations of Private Disposal Systems and Areas Without Sewer Service

Plate 10 shows the location of private disposal systems (blue dots) and unsewered areas (crosshatched areas) found within a two zip code study area (outlined in blue) of the North Hollywood area of the City of Los Angeles. Manufacturing, commercial, commercial manufacturing, and heavy industrial zones (shaded in yellow, pink, green, and orange, respectively) are also shown on the map. The North Hollywood Industrial Survey Area is outlined on the map in black.

Plate No.	Title
A-1	Upper Los Angeles River Area Groundwater Contours Fall 1977

This plate shows the location of the three cones of depression (North Hollywood, Crystal Springs, and Pollock well field areas) in the SFVB.

A-2 Lines of Equal Change in Groundwater Elevation, Fall 1955 - Fall 1977

The effects of pumping the SFVB in excess of safe yield is illustrated on this plate by the decline in groundwater levels (bold black lines) from 1955 through 1977.

PLATE 1

0000049

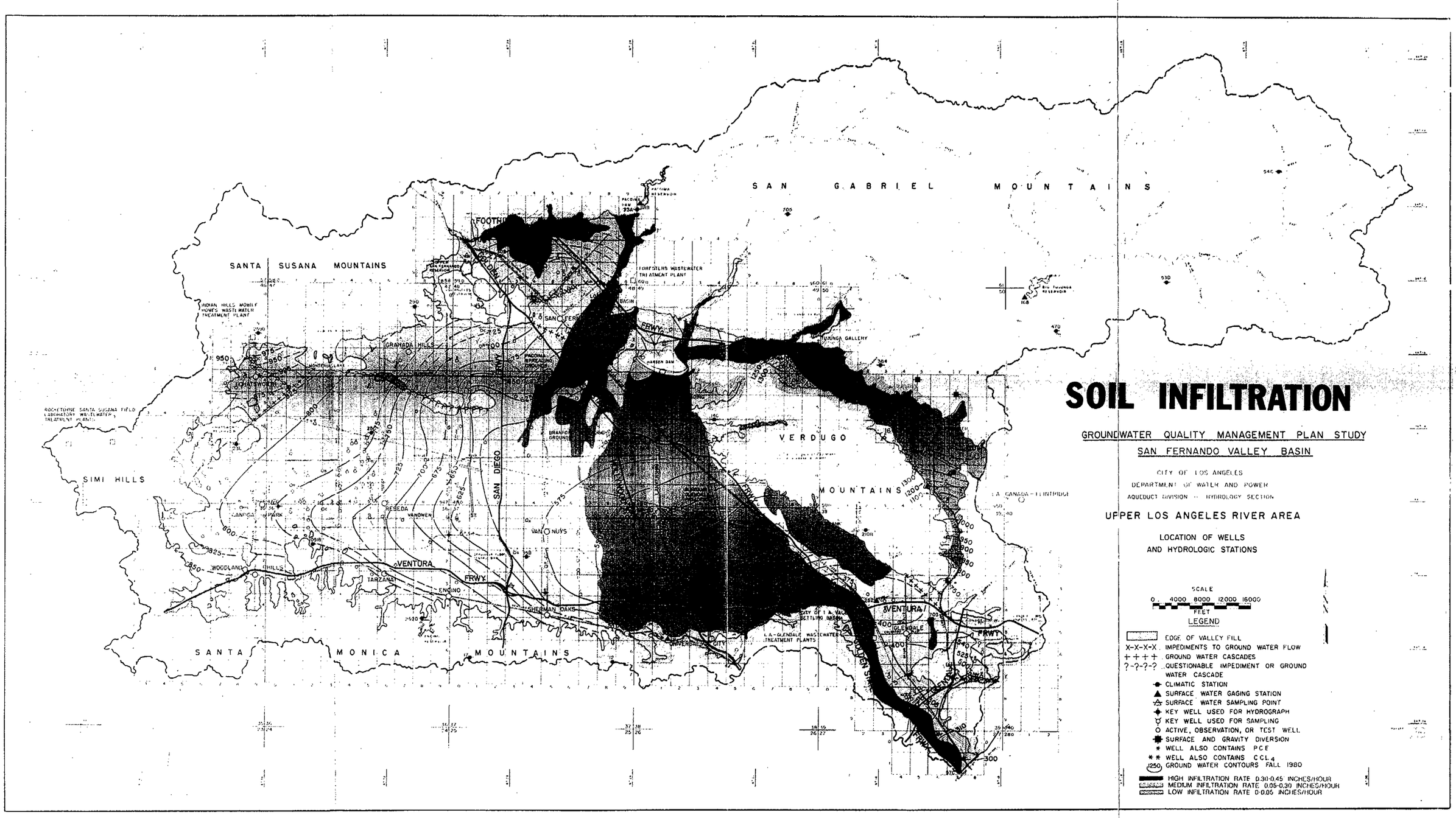


PLATE 2

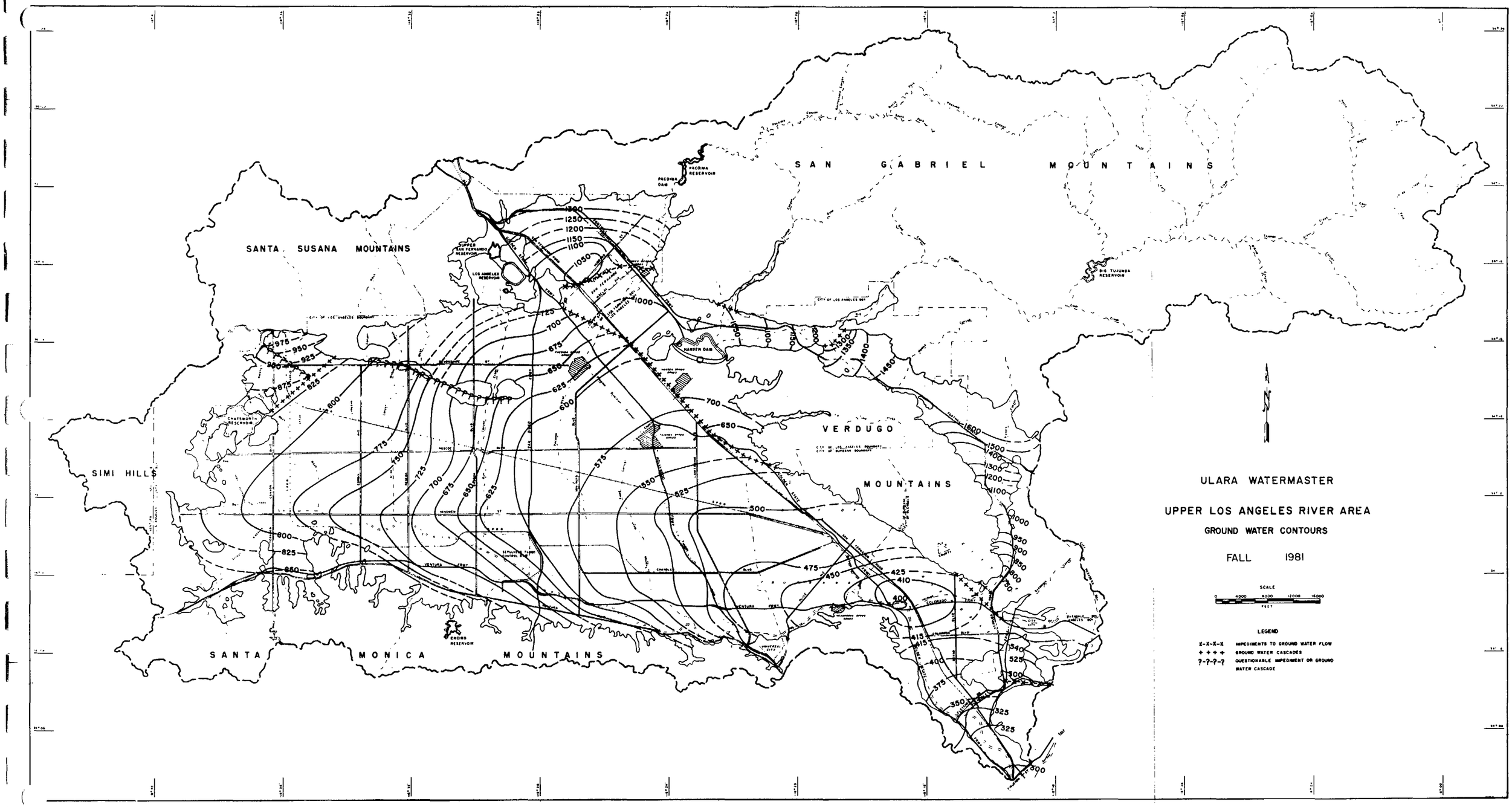
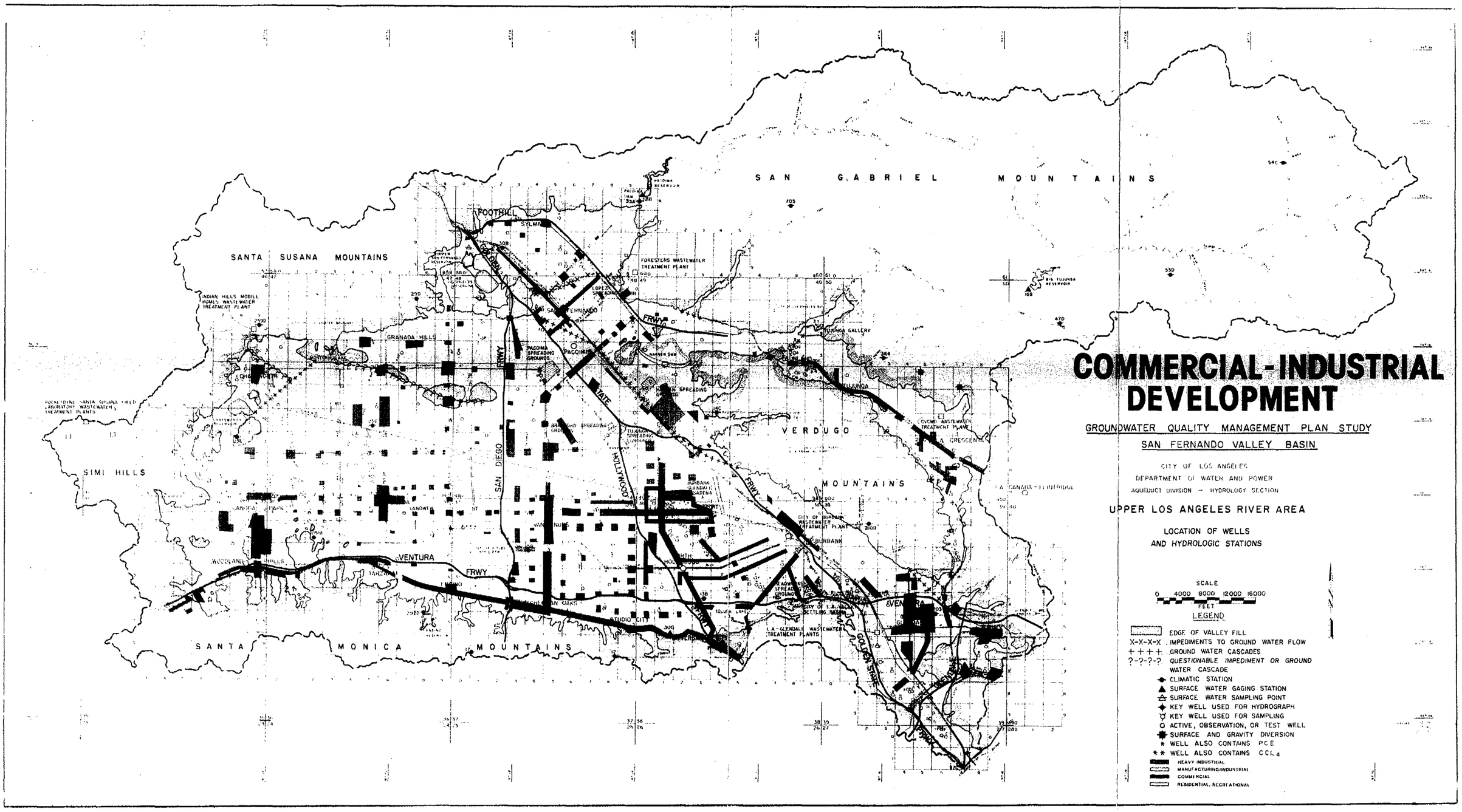

SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
SIMI HILLS
VERDUGO MOUNTAINS
SANTA MONICA MOUNTAINS
PACOIMA DAM
PACOIMA RESERVOIR
UPPER SAN FERNANDO RESERVOIR
LOS ANGELES RESERVOIR
HANSEN DAM
BIG TUJUNGA RESERVOIR
CHATSWORTH RESERVOIR
ENCINO RESERVOIR
N
ULARA WATERMASTER
UPPER LOS ANGELES RIVER AREA
GROUND WATER CONTOURS
FALL 1981
SCALE
0 4000 8000 12000 16000
FEET
LEGEND
X-X-X-X IMPEDIMENTS TO GROUND WATER FLOW
+ + + + GROUND WATER CASCADES
?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUND WATER CASCADE

PLATE 3



COMMERCIAL-INDUSTRIAL DEVELOPMENT

GROUNDWATER QUALITY MANAGEMENT PLAN STUDY

SAN FERNANDO VALLEY BASIN

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
AQUEDUCT DIVISION – HYDROLOGY SECTION

UPPER LOS ANGELES RIVER AREA

LOCATION OF WELLS
AND HYDROLOGIC STATIONS

SCALE
0 4000 8000 12000 16000
FEET

LEGEND

- EDGE OF VALLEY FILL
- X-X-X-X . IMPEDIMENTS TO GROUND WATER FLOW
- + + + + . GROUND WATER CASCADES
- ?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUND WATER CASCADE
- CLIMATIC STATION
- SURFACE WATER GAGING STATION
- SURFACE WATER SAMPLING POINT
- KEY WELL USED FOR HYDROGRAPH
- KEY WELL USED FOR SAMPLING
- ACTIVE, OBSERVATION, OR TEST WELL
- SURFACE AND GRAVITY DIVERSION
- * WELL ALSO CONTAINS PCE
- ** WELL ALSO CONTAINS CCl_4
- HEAVY INDUSTRIAL
- MANUFACTURING/INDUSTRIAL
- COMMERCIAL
- RESIDENTIAL, RECREATIONAL

PLATE 4

0000049

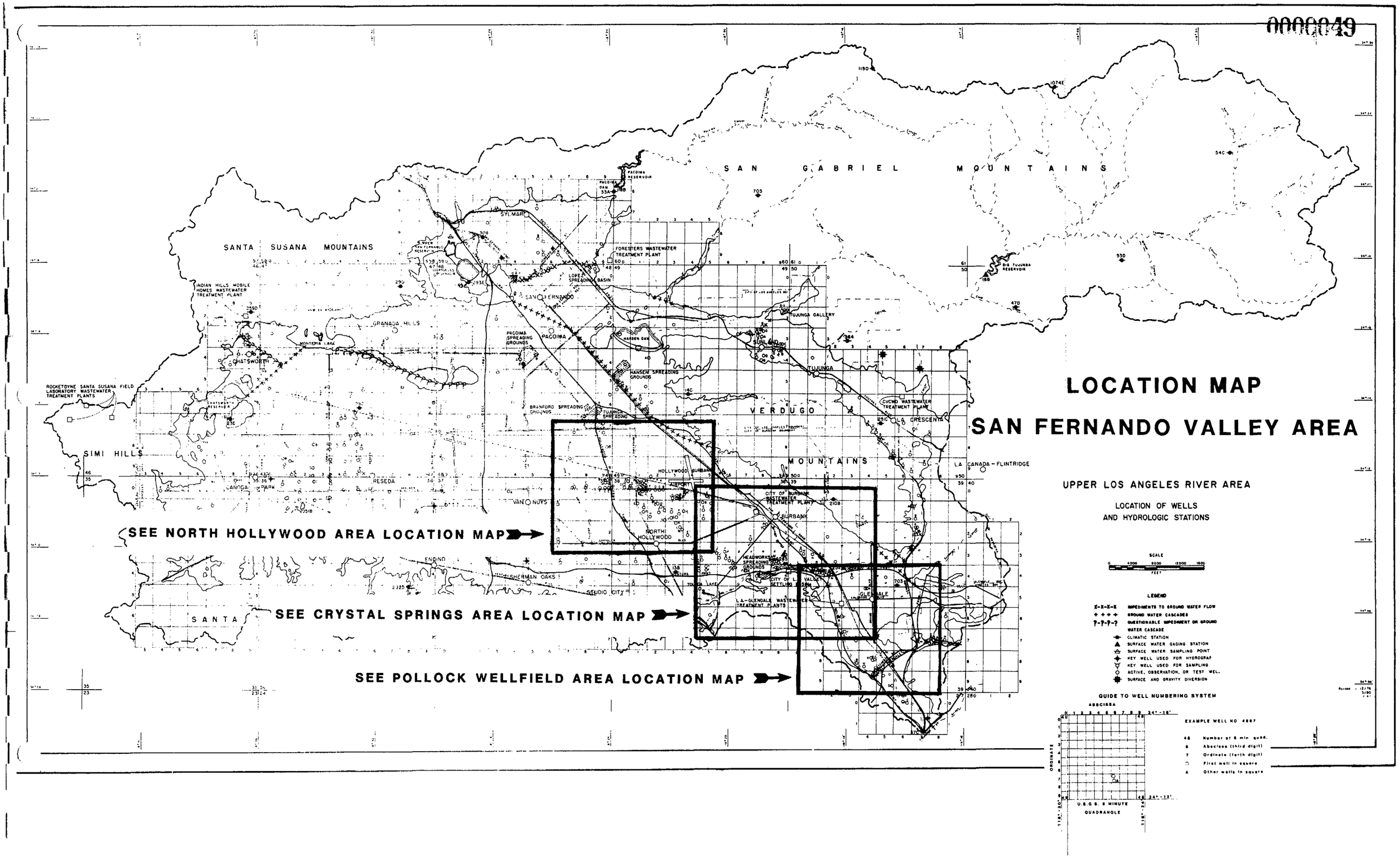
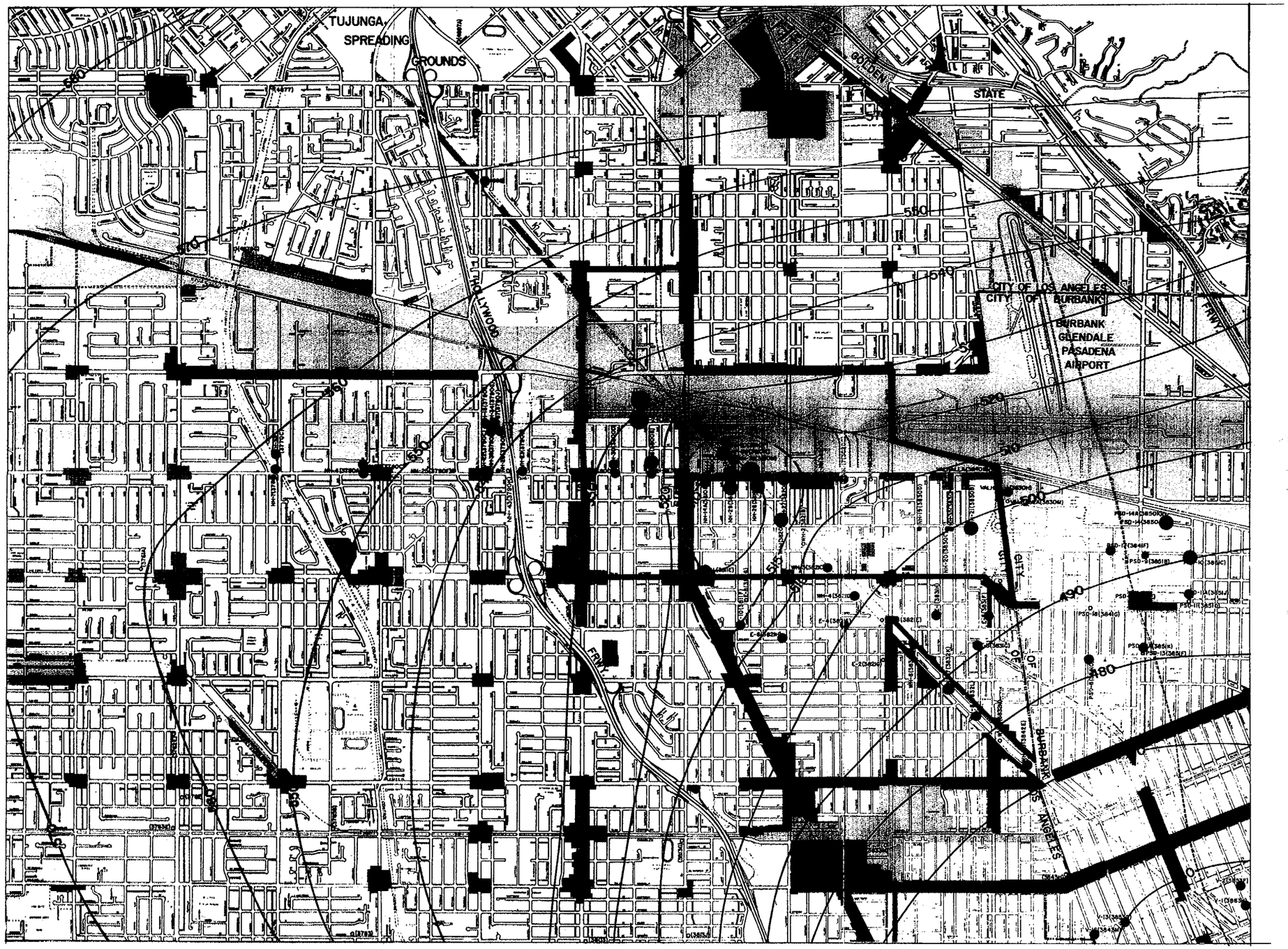


PLATE 5

COMMERCIAL AND INDUSTRIAL DEVELOPMENT



GROUNDWATER QUALITY MANAGEMENT PLAN

SAN FERNANDO VALLEY BASIN

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
SANITARY ENGINEERING DIVISION – SOURCE WATER QUALITY SECTION

NORTH HOLLYWOOD AND VICINITY

WELL AND STREET LOCATIONS

SCALE

1000 500 0 1000 2000 3000
FEET

LEGEND:

- WELL LOCATION
- CITY BOUNDARY
- PRIVATE STREET
- FUTURE STREET
- RAILROAD
- PARK AND RECREATION CENTER
- HEAVY INDUSTRIAL
- MANUFACTURING
- COMMERCIAL
- COMMERCIAL MANUFACTURING
- 480 GROUNDWATER CONTOURS FALL 1980
- <2 ppb TCE
- 2-5 ppb TCE
- 5-25 ppb TCE
- 25-100 ppb TCE
- >100 ppb TCE

DATE

PLATE 6

000049

COMMERCIAL AND INDUSTRIAL DEVELOPMENT

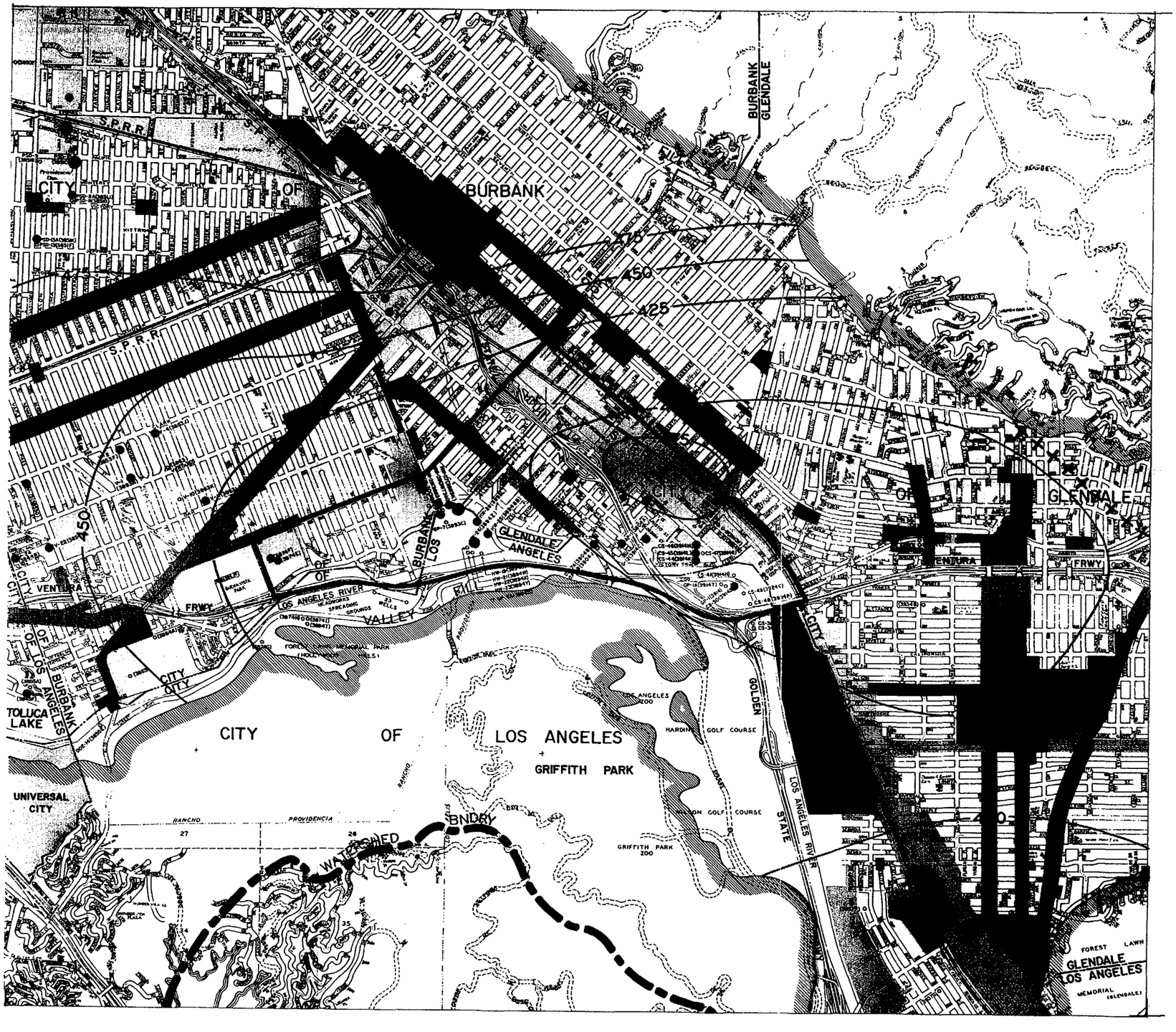
GROUNDWATER QUALITY MANAGEMENT PLAN

SAN FERNANDO VALLEY BASIN

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
SANITARY ENGINEERING DIVISION - SOURCE WATER QUALITY SECTION

CRYSTAL SPRINGS AND VICINITY

WELL AND STREET LOCATIONS



SCALE

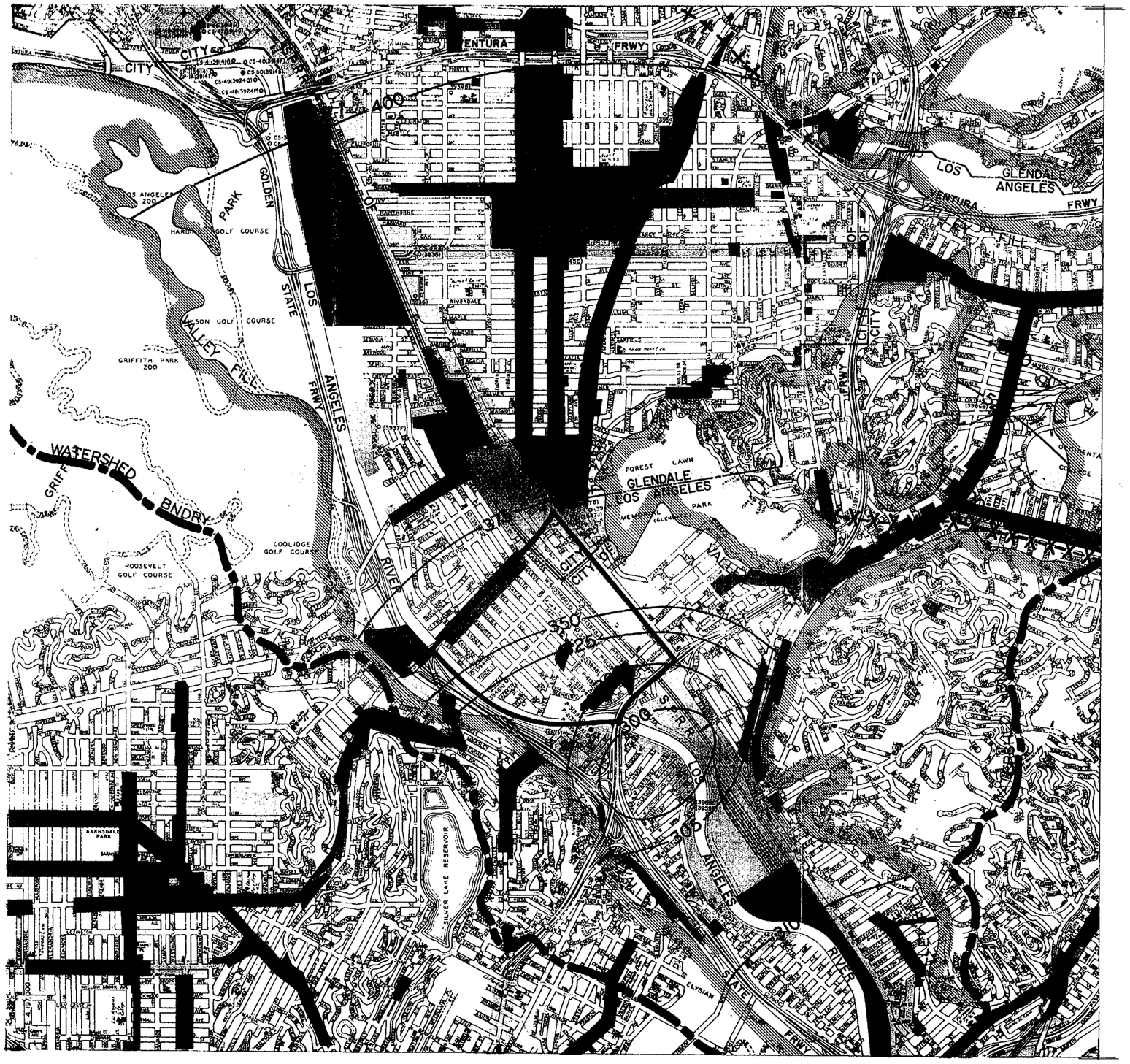
N

LEGEND:

- WELL LOCATION
- CITY BOUNDARY
- PRIVATE STREET
- RAILROAD
- GROUNDWATER CONTOURS FALL 1980
- VALLEY FILL BOUNDARY
- WATERSHED BOUNDARY
- GROUNDWATER CASCADE
- HEAVY INDUSTRIAL
- MANUFACTURING
- COMMERCIAL
- COMMERCIAL MANUFACTURING
- <2 ppb TCE
- 2-5 ppb TCE
- 6-20 ppb TCE
- 20-100 ppb TCE
- >100 ppb TCE

DATE _____

PLATE 7



COMMERCIAL AND INDUSTRIAL DEVELOPMENT

GROUNDWATER QUALITY MANAGEMENT PLAN

SAN FERNANDO VALLEY BASIN

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
SANITARY ENGINEERING DIVISION SOURCE WATER QUALITY SECTION

POLLOCK WELLS AND VICINITY

WELL AND STREET LOCATIONS

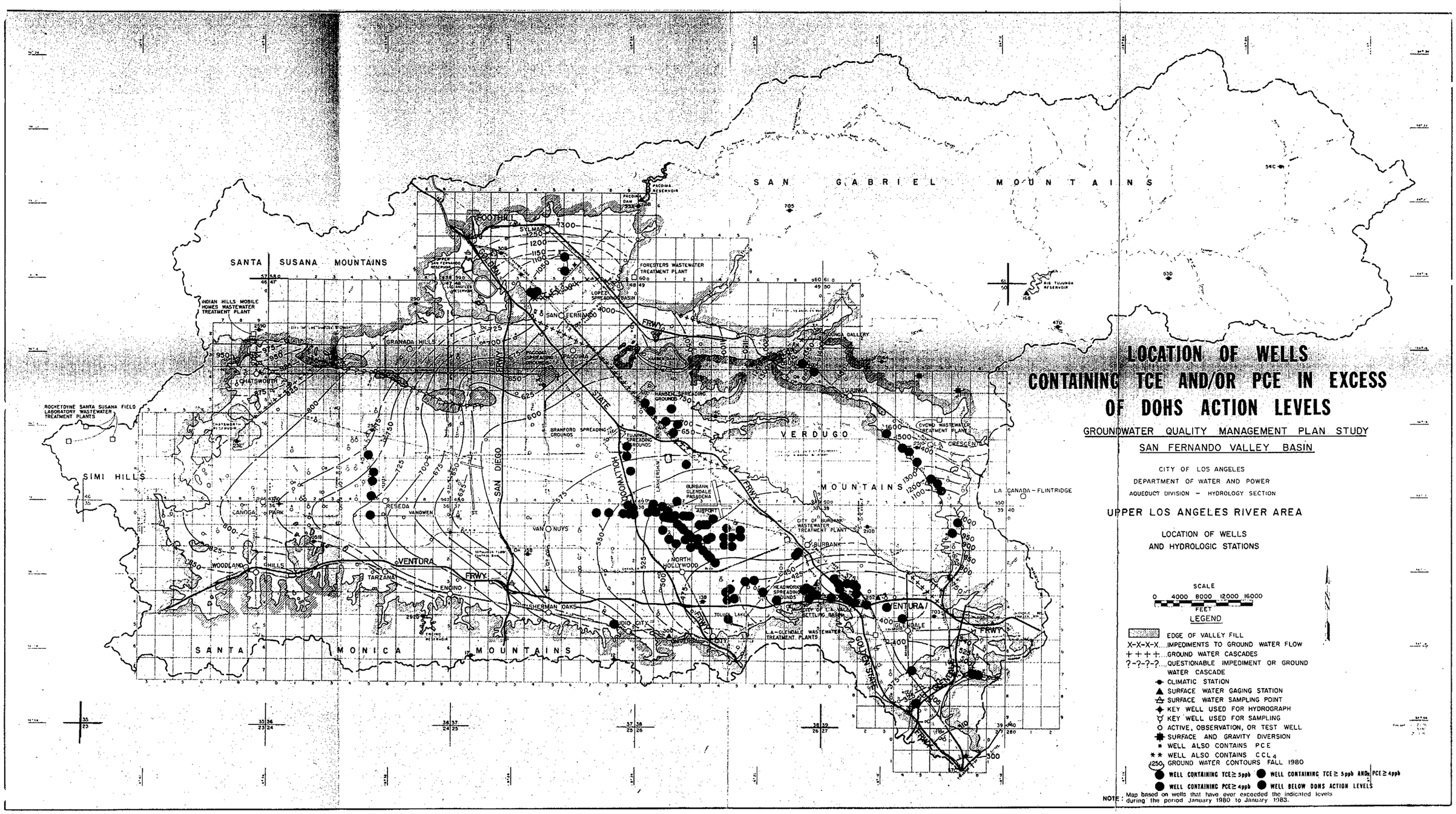
SCALE

LEGEND:

- WELL LOCATION
- CITY BOUNDARY
- PRIVATE STREET
- RAILROAD
- 350 GROUNDWATER CONTOURS FALL 1980
- VALLEY FILL BOUNDARY
- WATERSHED BOUNDARY
- GROUNDWATER CASCADE
- IMPEDIMENT TO GROUNDWATER FLOW
- HEAVY INDUSTRIAL
- MANUFACTURING
- COMMERCIAL
- COMMERCIAL MANUFACTURING
- < 2 ppb TCE
- 2-5 ppb TCE
- 5-25 ppb TCE
- 25-100 ppb TCE
- > 100 ppb TCE

DATE

PLATE 8


LOCATION OF WELLS
CONTAINING TCE AND/OR PCE IN EXCESS
OF DOHS ACTION LEVELS
GROUNDWATER QUALITY MANAGEMENT PLAN STUDY
SAN FERNANDO VALLEY BASIN
CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
AQUEDUCT DIVISION - HYDROLOGY SECTION
UPPER LOS ANGELES RIVER AREA
LOCATION OF WELLS
AND HYDROLOGIC STATIONS
SCALE
0 4000 8000 12000 16000
FEET
LEGEND
EDGE OF VALLEY FILL
X-X-X-X...IMPEDIMENTS TO GROUND WATER FLOW
+ + + +...GROUND WATER CASCADES
?-?-?-?...QUESTIONABLE IMPEDIMENT OR GROUND WATER CASCADE
CLIMATIC STATION
SURFACE WATER GAGING STATION
SURFACE WATER SAMPLING POINT
KEY WELL USED FOR HYDROGRAPH
KEY WELL USED FOR SAMPLING
ACTIVE, OBSERVATION, OR TEST WELL
SURFACE AND GRAVITY DIVERSION
* WELL ALSO CONTAINS PCE
** WELL ALSO CONTAINS CCL4
GROUND WATER CONTOURS FALL 1980
WELL CONTAINING TCE ≥ 5ppb
WELL CONTAINING TCE ≥ 5ppb AND PCE ≥ 4ppb
WELL CONTAINING PCE ≥ 4ppb
WELL BELOW DOHS ACTION LEVELS
NOTE: Map based on wells that have ever exceeded the indicated levels during the period January 1980 to January 1983.
SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
SIMI HILLS
SANTA MONICA MOUNTAINS
VERDUGO MOUNTAINS
SAN FERNANDO
GRANADA HILLS
CHATSWORTH
RESEDA
VANOWEN
CANOGA PARK
WOODLAND HILLS
TARZANA
ENCINO
SHERMAN OAKS
VAN NUYS
NORTH HOLLYWOOD
BURBANK
GLENDALE
LA CANADA-FLINTRIDGE
LA CRESCENTA
TUJUNGA
SYLMAR
FOOTHILL FRWY
VENTURA FRWY
SAN DIEGO FRWY
HOLLYWOOD FRWY
GOLDEN STATE FRWY
INDIAN HILLS MOBILE HOMES WASTEWATER TREATMENT PLANT
ROCKETDYNE SANTA SUSANA FIELD LABORATORY WASTEWATER TREATMENT PLANTS
FORESTERS WASTEWATER TREATMENT PLANT
LOPEZ SPREADING BASIN
PACOIMA SPREADING GROUNDS
HANSEN SPREADING GROUNDS
BRANFORD SPREADING GROUNDS
TUJUNGA SPREADING GROUNDS
LANKERSHIM
BURBANK GLENDALE PASADENA AIRPORT
CITY OF BURBANK WASTEWATER TREATMENT PLANT
HEADWORKS SPREADING GROUNDS
TOLUCA LAKE
L.A.-GLENDALE WASTEWATER TREATMENT PLANTS
SVCWD WASTEWATER TREATMENT PLANT
PACOIMA RESERVOIR
BIG TUJUNGA RESERVOIR
ENCINO RESERVOIR

LANDFILLS AND DUMP SITES IN THE SAN FERNANDO VALLEY

DESIGNATION*	SITE IDENTIFICATION	LOCATION	WASTE CLASSIFICATION	STATUS	OWNER/OPERATOR
006	Burbank Reclamation Project	1801 North Bell Aire Dr.	2	Active	City of Burbank
010	Lopez Canyon Landfill	North of Van Nuys Blvd.	2	Active	Los Angeles
011	Sheldon-Arleta	8700 Arleta Avenue	2	Inactive	Los Angeles
012	Toyon-Griffith Park	Griffith Park Drive	2	Active	Los Angeles
014	Griffith Park Landfill	--	U	Planned	Los Angeles
027	Scholl Canyon Landfill	7546 North Figueroa St.	2	Active	LACSD
063	Aqua Vista Debris Disposal	Acama Street	3	Active	LACFCD
066	Brown Debris Disposal	DeSoto Avenue	3	Active	LACFCD
068	Dunsmuir Debris Disposal	5100 Dunsmore Avenue	3	Active	LACFCD
069	Eagle Debris Disposal	Harmony Place	3	Active	LACFCD
075	LaTuna Debris Disposal	8900 LaTuna Canyon Road	3	Active	LACFCD
079	May Debris Disposal	Barner Avenue	3	Active	LACFCD
082	Shields Debris Disposal	LaCrescenta Avenue	3	Active	LACFCD
085	Wilbur Debris Disposal	Nordhoff Street	3	Active	LACFCD
087	Zachau Debris Disposal	Seven Hills Drive	3	Active	LACFCD
088	Ward Debris Disposal	Markridge Road	3	Active	LACFCD
093	Brand Canyon Debris Disposal	Brand Park Reservoir	3	Active	LACFCD
096	Deer Debris Disposal	Beudry Boulevard	3	Active	LACFCD
103	North Valley Refuse Center	14747 San Fernando Road	2	Active	North Valley Land Dev. Corp.
104	Bradley Pit Landfill	9351 Tujunga Avenue	2	Active	Conrock

LANDFILLS AND DUMP SITES (Continued)

DESIGNATION*	SITE IDENTIFICATION	LOCATION	WASTE CLASSIFICATION	STATUS	OWNER/OPERATOR
105	Livingston-Graham Landfill	11670 Wicks Street	2	Planned	Livingston-Graham Corp.
106	Hewitt Pit	7245 Laurel Canyon Blvd.	2	Inactive	Valley Reclamation
107	Penrose Pit	8251 Tujunga Avenue	2	Inactive	L.A. By-Products
133	Universal City Studios Landfill	100 Universal City Plaza	2	Active	Universal City Studios
134	Pendleton Street Dump	11251 Pendleton Street	2	Inactive	California Materials Co.
141	Kagel Canyon Landfill	--	2	Planned	--
147	Morman Canyon	Easterly of Brown Canyon and Morman Canyon	U	Planned	--
282	Pendleton Street Landfill	11000 Pendleton Street	3	Active	DWP
283	Valley Steam Plant Landfill	9430 San Fernando Road	3	Active	DWP
310	Brand Park Disposal Site L. F.	North of Childs Canyon Debris Basin	3	Active	Glendale
315	Lower Sunset Debris Disposal	Lower Sunset Debris Basin	3	Active	LACFCD
639	--	Bluffside Dr.-Willowcrest	3	Inactive	Los Angeles
643	Grand Central Airport Dump	1101 Airway	U	Inactive	Glendale
644	Kellogg Avenue Dump	630 Kellogg Avenue	U	Inactive	Glendale
645	E. L. Flemming Dump	W. of 5431 San Fernando Rd.	U	Inactive	Glendale
646	Colorado Boulevard Dump	500 Feet West of	2	Inactive	Glendale
695	Valley Brick Dump	6151 Kester Avenue	2	Inactive	Valley Brick & Supply Co.
696	L.A. City Department of Public Works	15145 Oxnard Avenue	2	Inactive	Los Angeles
698	Unknown	--	U	--	--

LANDFILLS AND DUMP SITES (Continued)

DESIGNATION*	SITE IDENTIFICATION	LOCATION	WASTE CLASSIFICATION	STATUS	OWNER/OPERATOR
700	Valley Transfer Station	9501 San Fernando Rd.	2	Inactive	
701	Branford Street Dump	Branford Street at San Fernando Road	2	Inactive	
703	Cal-Mat Dump	9228 Tujunga Avenue	2	Inactive	California Materials Co.
704	Akmadzich Dump	11201 Randall Street	3	Inactive	P. J. Akmadzich
705	Strathern Landfill	8001 Fair Avenue	2	Proposed	L.A. By-Products
706	Tuxford Pit	8501 Tujunga Avenue	2	Inactive	L.A. By-Products
707	L.A. By-Products	Victory Boulevard at Vineland Avenue	3	Inactive	L.A. By-Products
708	Lockheed Aircraft	1705 Victory Boulevard	U	Inactive	Lockheed Aircraft
709	Benz Dump	11666 Pendleton Street	3	Inactive	Valley Iron & Metal Co.
710	DeGarmo Pit	9135 DeGarmo Avenue	2	Active	L.A. By-Products
711	Wicks Place Dump	Wicks Street at Glenoaks	2	Inactive	(See #104)
712	Kittridge Dump	11400 Kittridge Street	U	Inactive	Unknown
713	Newberry Pit (Razarian Dump)	8250 Tujunga Avenue	2	Inactive	L.A. By-Products
714	Bradley Pit	9050 Bradley Avenue	U	Inactive	California Materials Co.
720	Morris Pit Dump	9116 Norris Avenue	2	Inactive	Valley Iron & Metal Co.
721	Valley Iron & Metal Dump	Pendleton Street (North of Glenoaks Blvd)	2	Inactive	Valley Iron & Metal Co.
722	--	12800 Oxnard Street	2	Inactive	Ludvig Grudt and
723	Bright Realty Dump	Laurel Canyon at Jerome	U	Inactive	Bright Realty Co.
724	Tujunga at Peoria Dump	--	2	Inactive	California Materials Co.

LANDFILLS AND DUMP SITES (Continued)

DESIGNATION*	SITE IDENTIFICATION	LOCATION	WASTE CLASSIFICATION	STATUS	OWNER/OPERATOR
745	L.A. City Department of Public Works	Zelzah Avenue at Lerdo Ave.	2	Inactive	Los Angeles
746	San Fernando City Dump	Sharp Avenue at Paxton St.	2	Inactive	City of San Fernando
747	Ledger Dump No. 2	Glenoaks Blvd at Montoque St.	2	Inactive	Robert Ledger
752	Russell Moe Dump	Lopez Canyon Road	2	Inactive	Russell Moe Inc.

*Corresponds with County Engineer's Office designation as shown on Plate 4.
WASTE CLASSIFICATION as defined in the California Administrative Code.

1 - Toxic substances and substances which could significantly impair the quality of usable waters.
2 - Chemically or biologically decomposable materials which do not include hazardous substances nor those capable of significantly impairing the quality of usable waters.
3 - Nonwater soluble, nondecomposable inert solids.
U - Unknown

PLATE 9

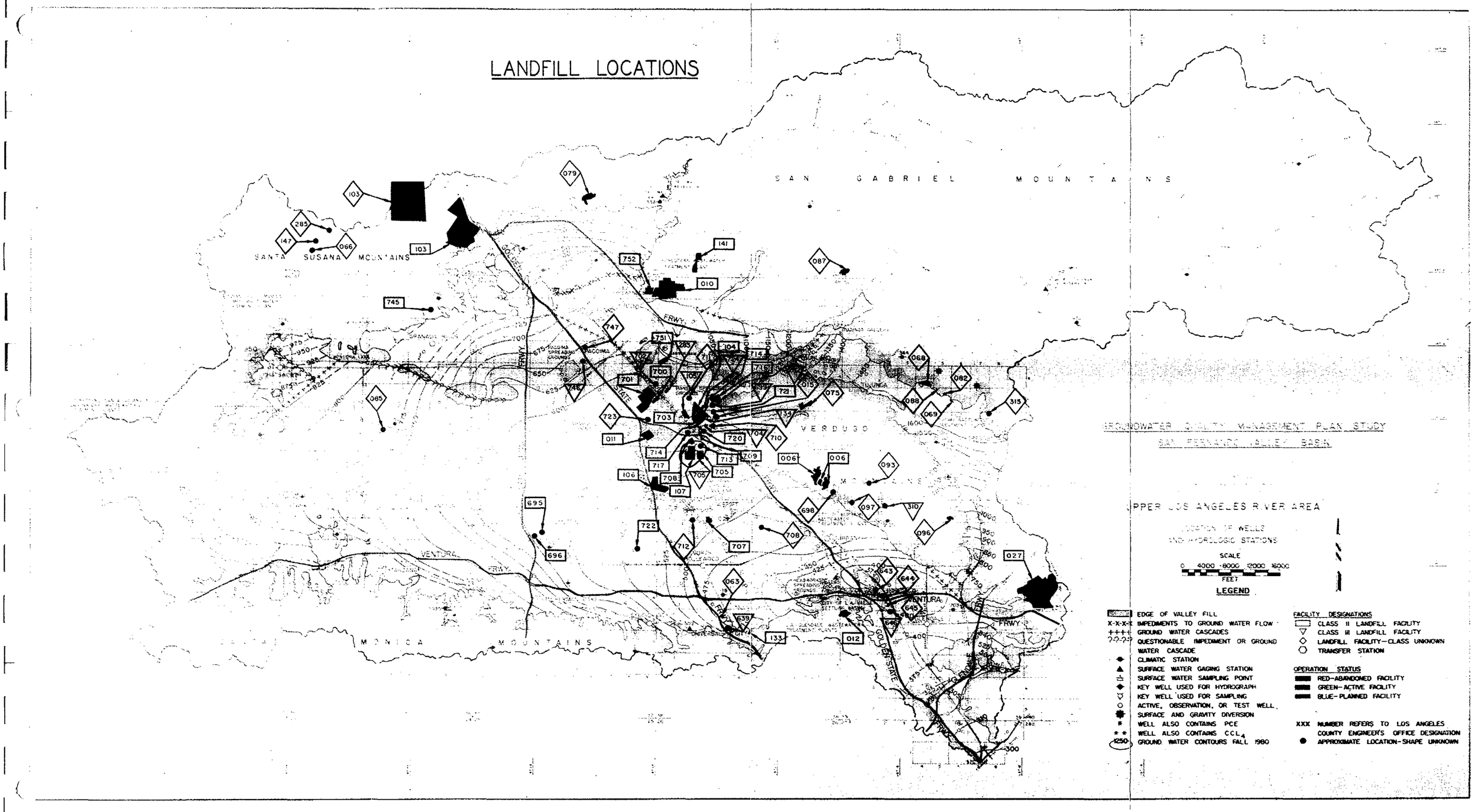
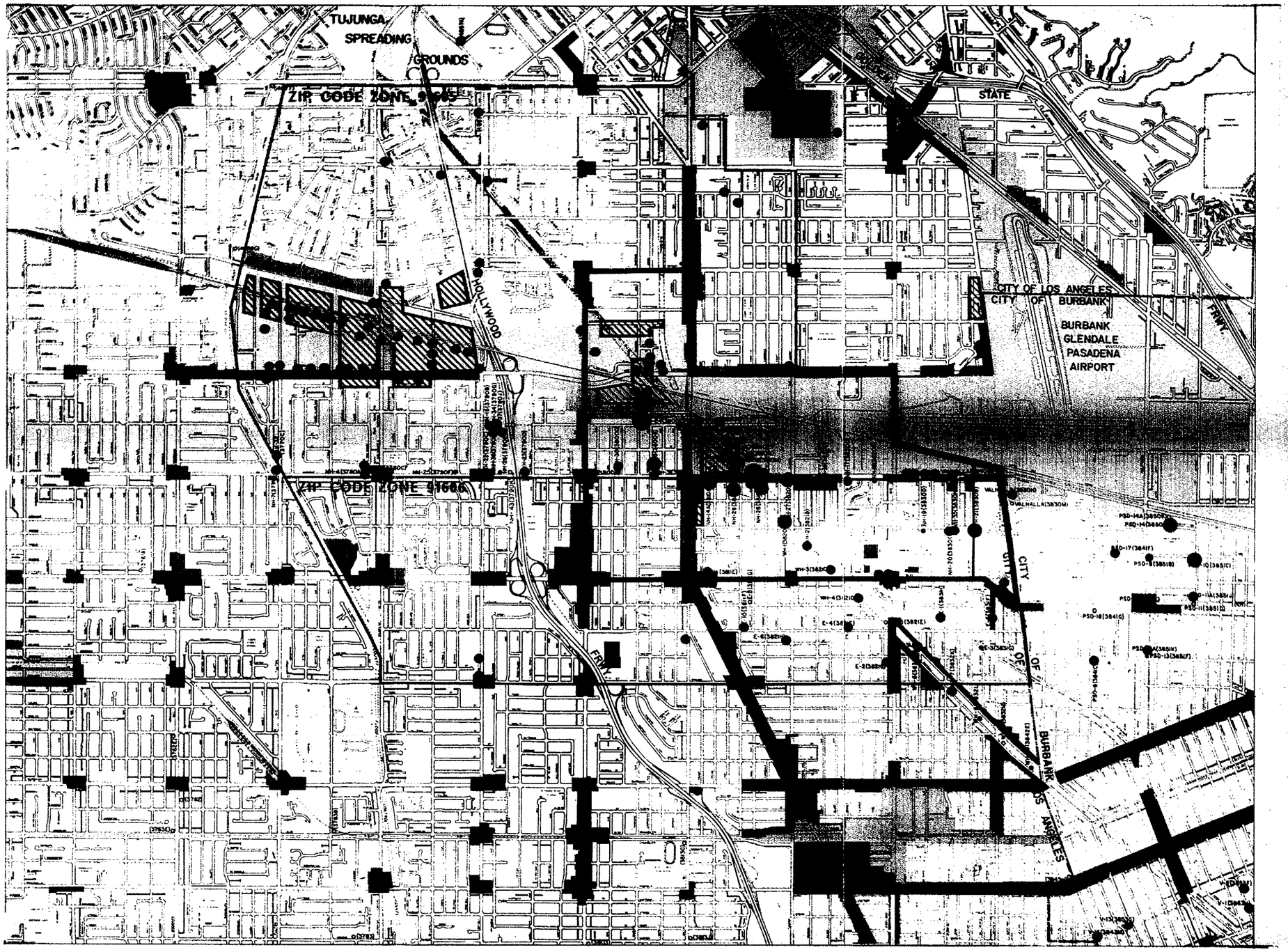

LANDFILL LOCATIONS
SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
MONICA MOUNTAINS
VERDUGO
VENTURA
GOLDEN STATE
FRWY
GROUNDWATER QUALITY MANAGEMENT PLAN STUDY
SAN FERNANDO VALLEY BASIN
UPPER LOS ANGELES RIVER AREA
LOCATION OF WELLS
AND HYDROLOGIC STATIONS
SCALE
0 4000 8000 12000 16000
FEET
LEGEND
EDGE OF VALLEY FILL
IMPEDIMENTS TO GROUND WATER FLOW
GROUND WATER CASCADES
QUESTIONABLE IMPEDIMENT OR GROUND WATER CASCADE
CLIMATIC STATION
SURFACE WATER GAGING STATION
SURFACE WATER SAMPLING POINT
KEY WELL USED FOR HYDROGRAPH
KEY WELL USED FOR SAMPLING
ACTIVE, OBSERVATION, OR TEST WELL
SURFACE AND GRAVITY DIVERSION
WELL ALSO CONTAINS PCE
WELL ALSO CONTAINS CCL4
GROUND WATER CONTOURS FALL 1980
FACILITY DESIGNATIONS
CLASS II LANDFILL FACILITY
CLASS III LANDFILL FACILITY
LANDFILL FACILITY—CLASS UNKNOWN
TRANSFER STATION
OPERATION STATUS
RED-ABANDONED FACILITY
GREEN-ACTIVE FACILITY
BLUE-PLANNED FACILITY
XXX NUMBER REFERS TO LOS ANGELES COUNTY ENGINEER'S OFFICE DESIGNATION
APPROXIMATE LOCATION-SHAPE UNKNOWN

PLATE 10

LOCATIONS OF PRIVATE DISPOSAL SYSTEMS AND AREAS WITHOUT SEWER SERVICE



GROUNDWATER QUALITY MANAGEMENT PLAN

SAN FERNANDO VALLEY BASIN

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
SANITARY ENGINEERING DIVISION - SOURCE WATER QUALITY SECTION

NORTH HOLLYWOOD AND VICINITY

WELL AND STREET LOCATIONS

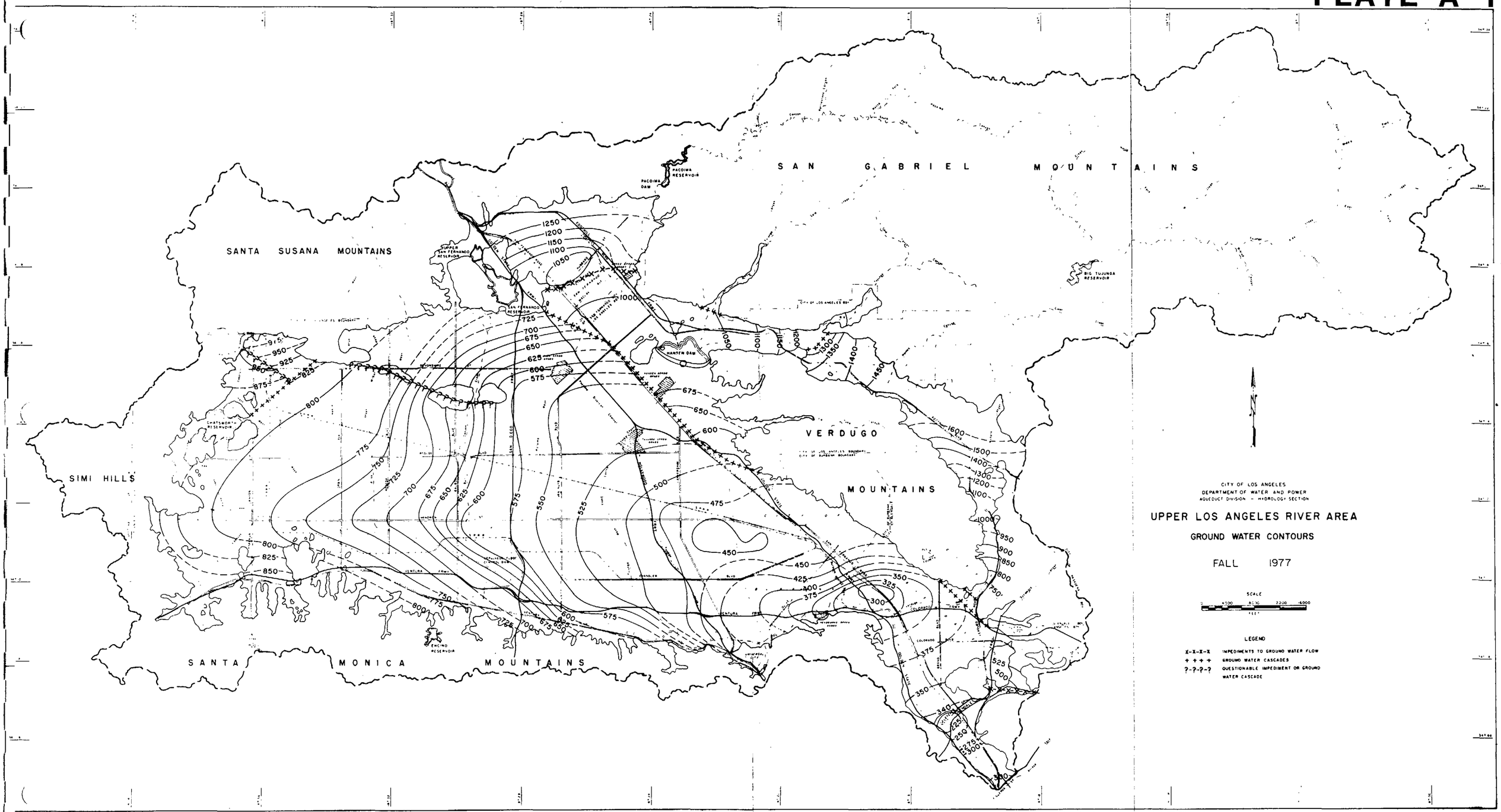
SCALE

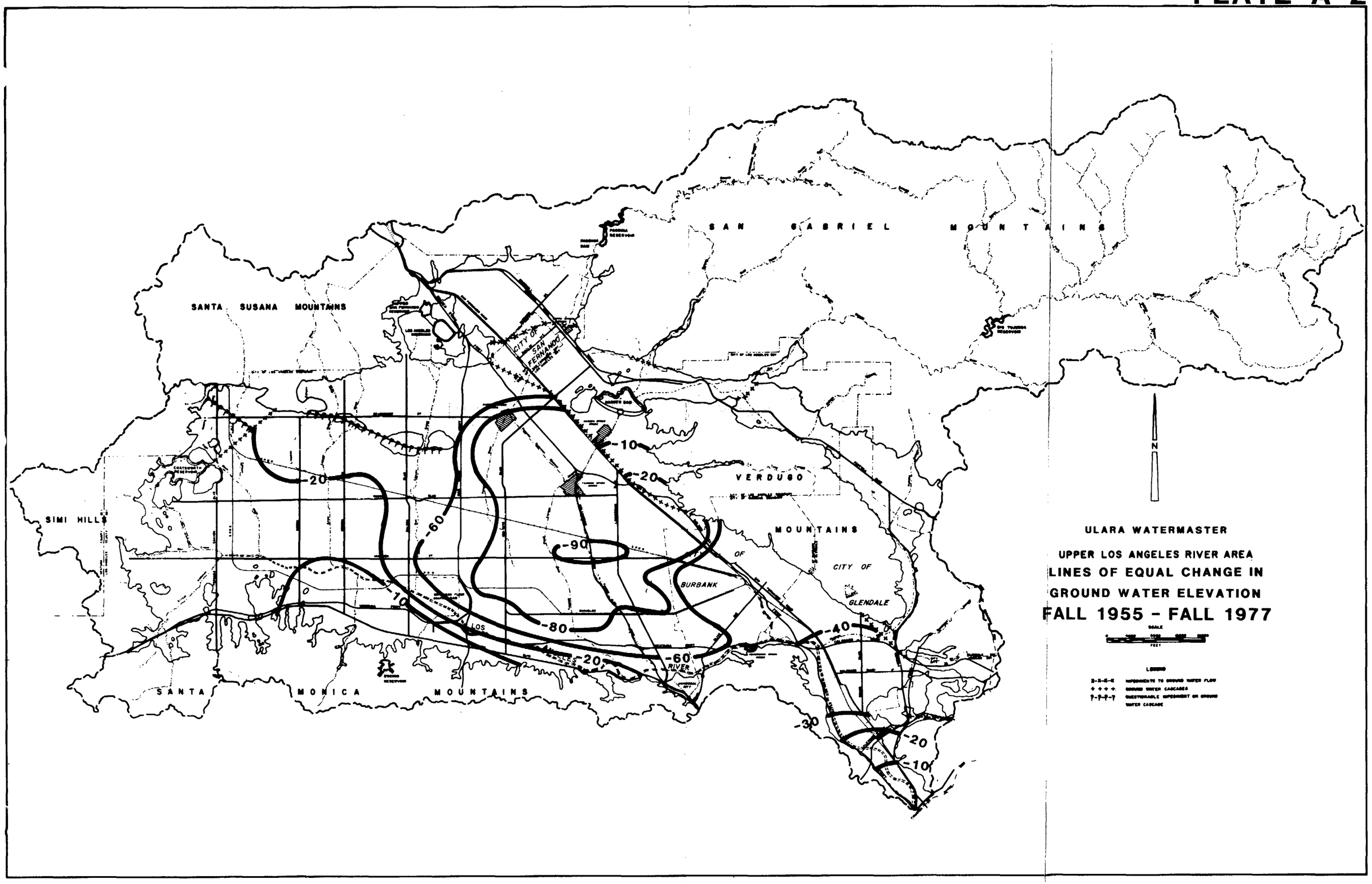
LEGEND

- WELL LOCATION
- CITY BOUNDARY
- PRIVATE STREET
- FUTURE STREET
- RAILROAD
- PARK AND RECREATION CENTER
- UNSEWERED AREAS
- MANUFACTURING
- COMMERCIAL
- COMMERCIAL MANUFACTURING
- HEAVY INDUSTRIAL
- < 2 ppb TCE
- 2-5 ppb TCE
- 5-20 ppb TCE
- 20-100 ppb TCE
- > 100 ppb TCE
- PRIVATE DISPOSAL SYSTEM

DATE

PLATE A-1


SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
SIMI HILLS
SANTA MONICA MOUNTAINS
VERDUGO MOUNTAINS
PACOIMA RESERVOIR
PACOIMA DAM
UPPER SAN FERNANDO RESERVOIR
SAN FERNANDO RESERVOIR
HANSEN DAM
BIG TUJUNGA RESERVOIR
CHATSWORTH RESERVOIR
ENCINO RESERVOIR
CITY OF LOS ANGELES BOUNDARY
CITY OF BURBANK BOUNDARY
VENTURA FWY
COLORADO
N
CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
AQUEDUCT DIVISION - HYDROLOGY SECTION
UPPER LOS ANGELES RIVER AREA
GROUND WATER CONTOURS
FALL 1977
SCALE
LEGEND
X-X-X-X IMPEDIMENTS TO GROUND WATER FLOW
+ + + + GROUND WATER CASCADES
?-?-?-? QUESTIONABLE IMPEDIMENT OR GROUND WATER CASCADE


SAN GABRIEL MOUNTAINS
SANTA SUSANA MOUNTAINS
SIMI HILLS
SANTA MONICA MOUNTAINS
VERDUGO MOUNTAINS
CITY OF SAN FERNANDO
CITY OF BURBANK
CITY OF GLENDALE
LOS ANGELES RIVER
-10
-20
-60
-90
-80
-40
-30
N
ULARA WATERMASTER
UPPER LOS ANGELES RIVER AREA
LINES OF EQUAL CHANGE IN
GROUND WATER ELEVATION
FALL 1955 - FALL 1977
SCALE
LEGEND
INFERENCE TO GROUND WATER FLOW
GROUND WATER CASCADES
QUESTIONABLE INFERENCE ON GROUND WATER CASCADE

APPENDIX

APPENDIX

SUMMARY OF SUBTASK INVESTIGATIONS

This section contains a brief summary of each of the subtasks completed in compliance with the provisions of the Final Work Plan of the Groundwater Quality Management Plan - San Fernando Valley Basin (GWQMP-SFVB).

A complete listing of the Task and Subtask titles is included in the Table of Contents, Page ix.

TASK I

INVENTORY AND ANALYSIS OF AVAILABLE INFORMATION

Introduction

The objective of Task I is to accumulate and evaluate all pertinent SFVB information on a) geohydrology, b) groundwater quality, c) organic chemical contaminant movement, and d) governmental regulations on all aspects of toxic waste handling. This information is designed to provide background for other task investigations and serve as the foundation for the final management plan of the GWQMP-SFVB project.

Task I is divided into four subtask investigations which include the following: Groundwater Geohydrology/Quality (I-A), Industrial Survey (I-B), Survey of Other Waste Sources (I-C) and Survey of Government Regulations (I-D). Completion of the specific elements in the task required extensive review of applicable industrial waste discharge regulations, industrial waste discharge locations, identification of landfills in the basin, review of historical toxic material spill reports, dry weather urban drainage, and the establishment of an extensive network of groundwater monitoring stations for subsequent analysis of toxic materials in SFVB groundwaters.

Each subtask is divided into several subordinate elements. For convenience in report preparation, some of these elements were combined together or with other task reports as follows: Groundwater Flow Patterns/Water Levels and Groundwater Usage (I-A-1 and I-A-2); Source Identification, On-site Industrial Waste Management Plans, Augmented Enforcement Programs, and Best Management Practices (I-B-1, I-B-3, II-B and IV-B); and Dry Weather Urban Drainage and Dry Weather Urban Drainage Controls (I-C-1 and II-C).

These reports are summarized individually on the following pages.

SUBTASK I-A GROUNDWATER GEOHYDROLOGY/QUALITY

SUBTASKS I-A-1 AND I-A-2

GROUNDWATER FLOW PATTERNS/WATER LEVELS AND WATER USAGE

1.0 Work Plan Objectives of Subtasks I-A-1 and I-A-2

1.1 Subtask I-A-1

To investigate groundwater flow patterns in the study area; to establish water levels in conjunction with present and projected groundwater use plans.

1.2 Subtask I-A-2

To gather pertinent information on all forms of groundwater usage in the study area, including normal and emergency water supply (pumping operations), conjunctive use of State Project and other imported waters, and industrial uses of groundwater.

2.0 Investigation

2.1 Background

In order to accomplish the objectives of Subtask I-A-1 and I-A-2, a broad study was made of those factors which influence and control groundwater flow patterns, water levels and groundwater usage in the San Fernando Valley Basin. Pertinent hydrologic data on the SFVB was utilized from the files of the Los Angeles Department of Water and Power (DWP).

2.2 Scope

Available information was evaluated in order to determine the following: velocity and direction of groundwater flow; areas of the SFVB most vulnerable to the infiltration of contaminants because of the permeability of the subsurface strata; the impact of faults and other geologic features on groundwater movement; aquifer characteristics; and testing needs.

Water uses which most significantly affect SFVB groundwater quality were also investigated. Particular attention was directed toward the effect of long-term groundwater extractions upon the contours of the groundwater table, both before 1955 and after the 1968 adjudication of the San Fernando Valley Basin. The role of the Watermaster in controlling groundwater usage in accordance with the provisions of the water rights judgment was also reviewed.

3.0 Conclusions

3.1 Groundwater Flow Patterns/Water Levels

3.1.1 Geohydrology of the San Fernando Valley Basin

An extensive and comprehensive investigation of the SFVB geohydrology was conducted in the 1950's by the State Water Rights Board during the protracted SFVB water rights litigation. This information has been updated to present day by DWP hydrologists during follow-up studies. Much information is known about groundwater flow patterns, water levels and groundwater usage as a result of these studies. The following section summarizes this geohydrological information. The actual tests by which aquifer characteristics were determined are discussed in Subtask III-A, Preferential Pumping.

3.1.1.1 Description of the San Fernando Valley Basin

The San Fernando Valley Basin is part of the hydrologic region known as the Upper Los Angeles River Area (ULARA). The ULARA encompasses all the watershed of the Los Angeles River and its tributaries above a point in the river designated by the Los Angeles County Flood Control District (LACFCD) Gaging Station F-57C-5, near the junction of the Los Angeles River and the Arroyo Seco Flood Control Channel (See Plate 2). The ULARA encompasses a total area of 328,500 acres, which is composed of 122,800 acres of valley fill and 205,700 acres of hills and mountains. The 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 Basin; and on the west by the Simi Hills.

The valley fill area of the ULARA is divided into four groundwater basins: San Fernando, Sylmar, Verdugo, and Eagle Rock. Each of these basins is defined on the basis of the existence of an apparent impairment of groundwater flow from one to the other caused by man-made, physiographic, or geologic features. The boundaries of the various basins are shown on Figure 3.

The San Fernando Basin is the largest of the four basins, comprising 91.2 percent of the total valley fill area. The western portion of the San Fernando Basin is generally composed of materials derived from the surrounding sedimentary rocks. The materials are generally fine-grained with high clay content which transmit water at a relatively slow rate. In addition, the presence of extensive clay layers make the western portion of the San Fernando Basin, for all practical purposes, a confined aquifer system.

By contrast, the eastern portion of the SFB is generally an unconfined aquifer and is composed of alluvial deposits of sand and gravel. The deposits have been eroded from the granitic rocks of the San Gabriel Mountains and transmit water at a relatively rapid rate. This eroded debris is generally very coarse. In places, boulders up to three feet in diameter are relatively common. In addition to these very permeable alluvial deposits, the basin is laced with clay lenses of varying extent and thickness. These layers have varying effects on water movement in the aquifer. Unexpected high water table conditions may be encountered due to perching of water above a clay lense. Localized semi-confined aquifer conditions may exist due to the confinement of water below a clay lense.

The sand and gravel deposits of the eastern San Fernando Basin constitute about one-third of the surface area of the Basin and contain approximately two-thirds of the total groundwater storage capacity of the basin. It is in this area that most of the SFVB groundwater extraction and collection systems are located. Some groundwater extraction wells are also located in the Verdugo, Sylmar and Eagle Rock Basins. The Verdugo Basin is similar to the San Fernando Basin in that it is an unconfined aquifer. The Sylmar and Eagle Rock Basins are confined aquifers except in the forebay areas where recharge occurs.

3.1.1.2 Sources of Groundwater Recharge

The sources of groundwater recharge in the SFVB are percolation of rainfall in the valley fill and surface runoff from hill and mountain areas, spread waters, return flows of imported waters, deep percolation of water from the LA River at the unlined reaches, and underground flow of water from the mountains to the alluvium.

3.1.2 Water Levels and Flow Patterns

3.1.2.1 Water Levels

A groundwater contour map of the SFVB, prepared for the ULARA Watermaster Report, is included in this report. This map depicts 1981 water levels throughout the basin (Plate 2). Contour lines are dashed where sufficient data was unavailable for accurate detail.

3.1.2.2 Groundwater Flow Direction and Velocity

The general direction of groundwater flow in the San Fernando Basin is from the recharge areas on the alluvial fans and along the edges of the valley fill, toward the basin discharge area located at the Los Angeles River Narrows (Figure 4). Well tests and observations have revealed that flow velocities in the eastern portion are much greater than in the western portion of the basin. Horizontal groundwater

velocities in the western portion of the San Fernando Basin have been estimated to be between 5 and 100 feet per year versus 300 to 500 feet per year in the eastern portion (Figure 4). This difference is attributed primarily to much higher permeability of deposits in the eastern San Fernando Basin area.

3.1.2.3 Groundwater Flow Changes Resulting from Pumping

Three major cones of depression are apparent on the 1977 water level map (Plate A-1). The extraction of large quantities of groundwater for municipal use has greatly modified hydrologic conditions in the eastern portion of the San Fernando Basin with respect to the depths to water, hydraulic gradients, and direction of groundwater movement. A comparison of the changes of the groundwater contours of the SFVB from 1955 to 1977 clearly illustrates the development of cones of depression in each of the well field areas. (Plate A-2) The largest and earliest to develop is located at the bend of the Los Angeles River where the river begins its southerly course through the narrows area (Plate A-1).

3.2 Groundwater Usage

3.2.1 Use of the Water Supply

There are six general types of water use in the SFVB.

1. Domestic - use for residences, including incidental irrigated gardens and orchards.

2. Industrial - use by a manufacturing or service industry that involves water being used directly in the manufacturing process or service.

3. Commercial - use by manufacturing and other commercial establishments whose primary water requirement is for the lavatory needs of employees and clients and may include incidental irrigation of ornamental plants.

4. Irrigation - use for irrigated agriculture including incidental stockwater and domestic use.

5. Recreation - use for swimming, boating, hunting, or fishing.

6. Municipal - use for domestic, industrial, commercial, irrigation, and recreation purposes; including fire protection and use for other municipal functions or services by a municipality, public utility or district.

3.2.2 Sources of Water Supply

Most of the water supply delivered to the communities within the Upper Los Angeles River Area is served by five agencies. They are the Cities of Burbank, Glendale, San Fernando and Los Angeles, and the Crescenta Valley County Water District. The water provided to residents is a combination of local groundwater and imported surface water from one or more of the three aqueducts supplying the SFVB. The Cities of Burbank and Glendale rely primarily upon imported water provided by the Metropolitan Water District (MWD). These Cities maintain their SFVB well fields on a standby basis at the present time.

The City of Los Angeles is served primarily by water from the Owens Valley/Mono Basin areas. Groundwater from the SFVB provides approximately 15 percent of Los Angeles' annual water needs.

The city of San Fernando relies solely on groundwater while the La Crescenta area derives about half of its supply from groundwater.

3.2.3 Present and Future Pumping Controls in the San Fernando Basin

Groundwater pumping in the San Fernando Basin was not subject to regulation by the courts until 1968. Approximately 37,000 acre-feet/year of groundwater was overdrafted from the basin for the period 1955 to 1968. This period of overdraft brought about a significant lowering of the water table in the eastern portion of the San Fernando basin. This change resulted in an increased movement of higher TDS groundwaters from the western to the eastern portions of the basin. The ULARA was placed under Watermaster control in accordance with the basin adjudication on January 26, 1979 by the California Superior Court.

4.0 Recommendations of Subtasks I-A-1 and I-A-2

The following work is recommended to obtain needed geohydrological data on the factors that influence and control the movement of groundwater in the SFVB.

4.1 Aquifer Testing

Additional aquifer tests will be needed to better understand the groundwater flow patterns in the study areas. Several individual and multiple well tests are planned.

4.2 Well Packers

It is also planned that some experiments will be conducted on deep wells in the contaminated areas using well packers. The purpose of these experiments would be to isolate various

water extraction zones between layers of impervious materials to determine the vertical distribution of contaminants.

4.3 Groundwater Modeling

More experimenting with groundwater models will be useful in analyzing the pumping schemes, and the effect of time on the development and collapse of pumping cones in the contaminated areas.

4.4 Additional Studies

Additional and more detailed studies may be required as the study proceeds and more information becomes available. Any additional studies undertaken or recommendations for extensive study will be included when the final report is completed.

SUBTASK I-A-3

GROUNDWATER QUALITY

1.0 Work Plan Objective of Subtask I-A-3

To determine or estimate the extent and severity of groundwater quality problems in the study area; to identify long-term groundwater monitoring needs.

2.0 Investigation

2.1 Background

All available data, as well as related studies and reports, on groundwater quality in the SFVB area was collected and analyzed. In addition, an area-wide groundwater monitoring program was developed and implemented to determine the present status of groundwater quality in the basin. Standard sampling procedures, sample preservation, and lab testing methods were developed as a part of the monitoring program.

2.2 Scope

The initial focus of this investigation involved a survey of the SFVB groundwater system for 36 volatile organic compounds. Particular emphasis was placed upon detecting trichloroethylene (TCE), tetrachloroethylene (PCE), and carbon tetrachloride (CTC), since these compounds were detected in the initial survey conducted by DWP in January of 1980 at levels above state DOHS action levels in some wells.

3.0 Conclusions

With the exception of the waters from certain identified quality problem areas, the groundwater produced from the SFVB is of good quality and should continue to serve as an important source of domestic water in the future. TCE and PCE are priority pollutants which were found at significant levels in the problem areas. Four localized areas in the SFVB were determined to contain TCE and/or PCE at levels above DOHS action levels. The identified water quality problem areas are in the vicinity of a) North Hollywood (Plate 5), b) Crystal Springs (Plate 6), c) Pollock Wells (Plate 7), and d) La Crescenta (not shown).

The extent and severity of groundwater contamination in the SFVB were determined from the results of analyses of more than 600 samples collected from 135 wells located throughout the basin. Many wells were sampled four or more times during the monitoring program. The level of contamination in individual wells has been found to vary with time, apparently due to the changing flow patterns in the basin caused by varying pumping demands. The overall range of TCE and PCE

contamination in production wells is presented in Section 2.2.3 of the overview section of this report.

3.1 Origin of Contamination

The random location of the contaminated wells, particularly in the highly industrialized North Hollywood area, tends to indicate that the contamination is due to many sources rather than a single source. It has not been possible to determine the exact origin of pollutants in individual wells for a number of reasons including: a) lack of records, b) proximity of many diverse businesses in the area, and c) the transient nature of businesses in the area over a long period.

3.2 Individual Well Contamination Levels for TCE, PCE and Other Volatile Organics

The range of TCE and PCE contamination levels in production wells during 1980-81 is presented in Tables A-1 and A-2.

Various other volatile organic compounds were detected at low concentrations in scattered water supply wells. Table A-3 identifies the compounds and concentrations found in each well tested.

4.0 Recommendations of Subtask I-A-3

Interpretation of the results of the groundwater quality investigation has indicated the need for long-term monitoring in the SFVB. Collection and analysis of water samples from original sampling sites, in addition to sites not previously sampled, would supply data which could be used in continued assessment of the nature of the groundwater quality problem. The following paragraphs summarize the recommendations for long-term monitoring.

4.1 Monitoring Existing Wells

A two-year basin-wide monitoring program of production and monitoring wells for TCE, PCE and other volatile organic chemicals is recommended to follow the present program. The frequency of sampling and analyses of these wells will be adjusted depending on the latest available monitoring information. A long-term basin monitoring program can be proposed at the end of this two-year period.

4.2 Construction and Monitoring of Additional Observation Wells

Construction of several new observation wells is recommended. These observation wells would be installed in areas where groundwater quality data is currently unavailable. Of special concern are areas upgradient from municipal water supply well fields and downgradient from landfills. Data from

these recommended observation wells would allow monitoring of the quality of groundwater which is moving toward a well field and assess the impacts of landfills on groundwater quality.

TABLE A-1

Analyses of
Domestic Water Supply Wells
That Have Exceeded the DOHS
Action Level for TCE (5.0ppb)

Los Angeles Department of Water and Power Wells

Well Identification Owner Designation	LACFCD No.	Highest Value (ppb)/Date	Latest Value (ppb)/Date
North Hollywood-5	3810S	53/7-22-81	18/11-5-81
North Hollywood-11	3810	192/5-11-81	36/10-21-81
North Hollywood-13	3810A	69/5-19-81	54/5-22-81
North Hollywood-14A	3810B	36/11-25-81	36/11-25-81
North Hollywood-19	3830D	5.1/7-23-81	5.1/7-23-81
North Hollywood-21	3830B	142/7-29-81	68/12-3-81
North Hollywood-24	3800C	528/3-20-81	34/1-14-82
North Hollywood-27	3820F	45/6-15-81	0.8/11-25-81
North Hollywood-28	3810K	194/7-14-81	194/7-14-81
North Hollywood-29	3810L	28/4-29-81	2.0/12-7-81
North Hollywood-31	3810T	48.6/7-14-81	2.1/12-2-81
North Hollywood-38	3810M	8.8/4-20-81	7.2/7-21-81
North Hollywood-39	3810N	59.4/6-15-81	15/7-21-81
North Hollywood-40	3810P	5.2/6-15-81	2.3/7-21-81
North Hollywood-41	3810Q	31/11-5-81	31/11-5-81
North Hollywood-42	3810R	9.5/8-7-80	1.5/11-5-81
Erwin-5	3831F	8.2/8-14-80	2.4/7-30-81
Whitnall-1	3820E	51/7-28-81	35/11-25-81
Whitnall-2	3821	5.0/9-16-81	5.0/9-16-81
Whitnall-3	3821C	15/7-22-81	3.3/12-7-81
Headworks-26	3893L	11/1-6-81	9.4/1-20-81
Headworks-27	3893K	27/6-12-81	7.2/8-12-81
Headworks-28	3893M	19/5-28-81	12.6/11-26-81
Crystal Springs-45	3914L	7.0/7-23-81	5.0/11-26-81
Crystal Srpings-46	3914M	12/8-6-80	9.0/11-26-81
Crystal Springs-50	3914S	9/1-24-80	5.6/11-26-81 (18)
Pollock-4	3959E	11/1-17-80	1.0/12-7-81
Pollock-6	3958H	10/1-17-80	3.2/12-7-81

Total No. LADWP Wells That Have Ever Exceeded Action Level = 27
Total No. LADWP Wells Currently Exceeding Action Level = 18

City of Glendale Wells

Grandview-12	3914C	7.8/2-5-80	3.2/10-14-81
Grandview-13	3903M	5.3/8-6-81	3.7/10-14-81
Grandview-14	3903N	5.7/8-6-81	2.5/10-14-81

TABLE A-1 (Continued)

Burbank Public Service Department Wells

PSD-7	3882P	16/1-24-80	16/1-24-80
PSD-9	3851B	15/8-5-81	15/8-5-81
PSD-10A	3851C	130/10-6-81	130/10-6-81
PSD-11A	3851J	12/9-2-81	10/10-6-81
PSD-12	3851E	6.5/4-14-80	2.2/10-6-81
PSD-14A	3850K	44/1-24-80	44/1-24-80
PSD-15	3822T	17/1-24-80	3.0/10-7-81

Total No. SFVB Wells That Have Ever Exceeded Action Level = 37
Total No. SFVB Wells Currently Exceeding Action Level = 23

TABLE A-2

Analyses of
Domestic Water Supply Wells
That Have Exceeded the DOHS
Action Level for PCE (4.0ppb)

Los Angeles Department of Water and Power Wells

Well Identification Owner Designation	LACFCD No.	Highest Value (ppb)/Date	Latest Value (ppb)/Date
North Hollywood-13	3810A	11/5-19-81	6.3/5-22-81
North Hollywood-24	3800C	4.1/3-20-81	3.7/3-25-81
North Hollywood-27	3820F	4.5/7-21-81	0.1/11-25-81
Erwin-2A	3821-J	15.6/8-6-81	1.5/11-30-81
Whitnall-3	3821C	9.0/6-21-81	2.7/12-7-81
Pollock-4	3859E	36/1-21-80	4.5/12-7-81
Pollock-6	3859H	18/1-21-80	8.8/12-7-81

Total No. LADWP Wells That Have Ever Exceeded Action Level = 7
Total No. LADWP Wells Currently Exceeding Action Level = 3

City of Glendale Wells

Glorietta-6	3970	6.0/9-19-81	6.0/9-19-81

Burbank Public Service Department Wells

PSD-10A	3851C	94/10-6-81	94/10-6-81
PSD-11A	3851J	35/10-6-81	35/10-6-81
PSD-17	3841J	6.6/10-6-81	6.6/10-6-81

Crescenta Valley County Water District Wells

CVCWD-6	5058	16.5/9-9-81	16.5/9-9-81
CVCWD-8	5069J	15/9-9-81	15/9-9-81
CVCWD-10	5058D	16.5/9-9-81	16.5/9-9-81
CVCWD-12	5058J	16.5/9-9-81	16.5/9-9-81
CVCWD-14	5069F	16/9-9-81	16/9-9-81

Total No. SFVB Wells That Have Ever Exceeded Action Level = 16
Total No. SFVB Wells Currently Exceeding Action Level = 12

TABLE NO. A-3
SUMMARY OF VOLATILE ORGANIC COMPOUNDS
OTHER THAN TCE OR PCE IDENTIFIED WITHIN THE SAN FERNANDO VALLEY BASIN
FOR DATA THROUGH JUNE 1982

	Compound	Well Where Compound Was Identified: Owner Designation	Well Where Compound Was Identified: LACFCD NO.	Average Concentration (ppb)	Times Well was Sampled
1.	Trichlorofluoromethane	North Hollywood - 24	3800C	4.1	1
		Whitnall - 1	3820E	15.4	2
		Whitnall - 3	3821C	1.0	1
2.	1,1-Dichloroethylene	North Hollywood - 21	3830B	3.1	3
		Pollock - 4	3949E	1.5	3
		Crystal Springs - 45	3914L	2.4	3
3.	Bromochloromethane	North Hollywood - 24	3800C	1.2	1
4.	Trichloromethane (Chloroform)	North Hollywood - 5	3810S	3.1	1
		North Hollywood - 14A	3810B	3.0	1
		North Hollywood - 21	3830B	3.5	3
		North Hollywood - 24	3800C	2.2	1
		North Hollywood - 26	3790E	1.9	1
		North Hollywood - 30	3800D	1.9	1
		North Hollywood - 31	3810T	1.4	1
		Reseda - 6	4757C	3.2	1
		Erwin - 2A	3821J	1.3	1
		CVCWD - 10	5058D	1.2	1
		Glendale Glorietta - 6	3970	2.0	1
		Burbank PSD - 15	3882T	10.0	2
		Whitnall - 1	3820E	11.4	2
		Whitnall - 3	3821C	1.8	1
		Glendale Glorietta - 3	3961	2.0	1
		Glendale Grandview - 14	3903N	1.0	1
		Deep Rock - 2	2958D	2.7	1

Table No. A-3 (Continued)

Compound	Well Where Compound Was Identified: Owner Designation	Well Where Compound Was Identified: LACFCD NO.	Average Concentration (ppb)	Times Well was Sampled
5. 1,1,-Dichloroethane	Pollock - 4	3959E	3.5	3
	Pollock - 6	3958H	1.7	3
6. 1,1,1-Trichloroethane	North Hollywood - 21	3830B	6.0	3
	Pollock - 4	3959E	3.0	3
	Pollock - 6	3958H	1.2	3
	Crystal Springs - 45	3914L	3.7	3
	Deep Rock - 2	3958D	1.2	1
	Burbank PSD - 15	3882T	1.7	2
7. 1,2-Dichloroethane	North Hollywood - 24	3800C	1.8	1
	Reseda - 6	4757C	1.0	1
	Strathern Landfill	4928	2.6	1
8. Carbon Tetrachloride	North Hollywood - 21	3830B	11.8	3
	Burbank PSD - 10	3851C	1.6	2
9. Benzene	North Hollywood - 24	3800C	1.0	1
	Burbank PSD - 15	3882T	2.6	2
	Deep Rock - 2	3958D	1.3	1
10. 1,1,2-Trichloroethane	North Hollywood - 24	3800C	1.7	1
11. Dibromochloromethane	North Hollywood - 24	3800C	1.2	1
12. 1,2-Dibromoethane	North Hollywood - 24	3800C	2.1	1
13. Tribromomethane	North Hollywood - 24	3800C	2.3	1
14. 1,1,2,2-Tetrachloroethane	North Hollywood - 24	3800C	2.0	1
15. 1,2-Dichlorobenzene	North Hollywood - 24	3800C	3.8	1
16. Methylbenzene (Toluene)	North Hollywood - 31	3810T	1.8	1

Table No. A-3 (Continued)

Compound	Well Where Compound Was Identified: Owner Designation	Well Where Compound Was Identified: LACFCD NO.	Average Concentration (ppb)	Times Well was Sampled
17. 1,4-Dichlorobenzene (Xylene)	North Hollywood - 24	3800C	1.3	1
18. 1,2,4-Trichlorobenzene	North Hollywood - 24	3800C	1.3	1
19. 1,2,3-Trichlorobenzene	North Hollywood - 24	3800C	1.9	1
20. Naphthalene	North Hollywood - 5	3800S	1.4	1
	North Hollywood - 24	3800C	3.2	1
	Whitnall - 1	3820E	2.2	1
	Strathern Landfill	4928	2.8	1

SUBTASK I-A-4

TOXIC MOVEMENT STUDY

1.0 Work Plan Objective for Subtask I-A-4

To determine the movement, dispersion and ultimate fate of selected in-ground priority pollutants, especially TCE and PCE.

2.0 Investigation

2.1 Background

The effects of movement, dispersion and ultimate fate of priority pollutants upon the quality of the groundwaters in the San Fernando Valley Basin (SFVB) were investigated. Natural groundwater basin processes that can affect the magnitude of these parameters were also investigated.

2.2 Scope

The study focused on developing criteria for engineering measurements and tools that can be used in the water quality management of the SFVB.

3.0 Conclusions

At the present time, a number of factors make direct evaluation of rate of movement, dispersion and ultimate fate of pollutants in the groundwater basin of the SFVB infeasible. An engineering approach is proposed to predict toxic movement.

3.1 Pollutant vs. Groundwater Movement

The rate of movement of pollutants through a groundwater basin is not only dependent upon the rate of flow of the groundwater that is physically transporting the pollutants but also depends upon the natural attenuation processes which remove or restrain the pollutants contained in the moving groundwater. The average rate of pollutant movement appears to be specific for each basin, and for each pollutant.

3.2 Retardation Factors

The rates of movement of the groundwater and the accompanying pollutants have been determined by investigators for other basins. From these measurements, it is possible to determine a very useful parameter which is designated as the Retardation Factor. This factor is calculated as the ratio of groundwater to pollutant velocities in a basin. The Retardation Factor provides an indication of the effectiveness of the various difficult-to-quantify natural attenuation processes in diminishing the rate of movement of

pollutants through a groundwater basin. These attenuation processes include adsorption of contaminants onto soil, advection and dispersion, and biological degradation of contaminants within the aquifer. This factor is ordinarily determined in laboratory soil columns because of the technical complications and cost of field measurements.

4.0 Recommendations of Subtask I-A-4

4.1 Determination of Retardation Factors in SFVB

In order to provide additional information for water quality management, it is recommended that the Retardation Factors for the four most prevalent priority pollutants detected in SFVB groundwater be investigated by a qualified technical organization, especially for locations around the well water production area of North Hollywood. This information will provide the water quality manager with the ability to predict pollutant movement more accurately and to make more effective corrective action decisions in cases where improper waste disposal practices are identified.

4.2 Measuring System North Hollywood Well Field

An independent investigation should be conducted by DWP on the technical and economic feasibility of developing a system that is capable of more precise and timely measurement of groundwater flow and direction for use in interpreting groundwater quality data. If the results of this investigation are favorable, the system can be developed and installed as a water quality control tool.

SUBTASK I-B INDUSTRIAL SURVEY

SUBTASKS I-B-1, I-B-3, II-B AND IV-B

INDUSTRIAL SURVEY

1.0 Work Plan Objectives for Each of the Subject Subtasks

1.1 Subtask I-B-1 Source Identification

Survey types of industrial chemical use in the survey area; itemize discharges according to type of industry, chemicals used, and wastes generated.

1.2 Subtask I-B-3 On-Site Industrial Waste Management Plans

Collect data on existing waste management practices by industry in the survey area, including Best Management Practices (BMPs); evaluate the effectiveness of these practices in view of groundwater quality protection.

1.3 Subtask II-B Augmented Enforcement Programs

Identify and explore waste control plans that utilize augmented on- and off-site inspection, surveillance, effluent monitoring, and reporting strategies on a cooperative basis with appropriate local, state, and federal agencies.

1.4 Subtask IV-B Best Management Practices

Determine the cost-effectiveness of existing or identified industrial Best Management Practices (BMPs) for toxic substances handling, storage, and disposal.

2.0 Investigation

2.1 Background

Stearns, Conrad and Schmidt Consulting Engineers (SCS) conducted a survey of all businesses generating or disposing of toxic materials in a two-square mile study area in North Hollywood (Plate 5). The survey area was limited in size due to budgetary and manpower constraints. A list of candidate businesses for the survey was prepared from utility user records and based upon SIC Codes.

2.2 Scope

Toxic chemical handling and/or toxic waste disposal practices were investigated at each business establishment surveyed. Current management practices in handling and disposing of toxic materials were assessed. An analysis of the handling and disposal of toxic materials was developed to

assist in the future regulations of these and other businesses. Current regulatory guidelines and the effectiveness of enforcement activity in regulating toxic material use and disposal were evaluated. The cost effectiveness of existing or proposed BMPs was considered.

3.0 Conclusions

Based on a survey of 301 companies identified as either toxic chemical users or toxic waste generators in the North Hollywood area, the information necessary to develop the following conclusions on the combined investigations for Subtasks I-B-1, I-B-3, II-B and IV-B was obtained:

3.1 Process Chemicals Usage (Table A-4)

Approximately 6.0 million gallons of liquid chemicals are used per year in the study area, while the use of solid chemicals equals 1.1 million pounds per year.

3.1.1 Liquid Chemical Usage

Over half of all toxic liquids used in the study area was categorized as gasolines. Chromium solutions and alcohols were the two next largest categories, with annual quantities totaling 31.4 and 9.2 percent, respectively. Other types of chemicals utilized in large quantities included liquid petroleum products (1.8 percent), aliphatic solvents (1.7 percent), and cutting oils (1.2 percent). All other categories contributed a combined total of 2.3 percent to annual liquid chemical usage. A detailed breakdown of the type of liquid chemicals used in the survey area is presented in Figure A-1.

Halogenated compounds were of particular concern in relation to groundwater quality. The categories of halogenated liquids found in the study area yielded a total combined usage of 24,000 gallons per year. PCE, which comprised 66 percent of this total, was utilized by seven companies in five industry groups. Seventy percent of the annual usage, totaling 16,000 gallons, was attributable to three aircraft and parts manufacturers, while a chemical manufacturer and a metal coating company each contributed 13 percent. Pentachlorophenol (PCP), with 6,000 gallons per year (26 percent of the total for halogens), was used by a furniture manufacturer (57 percent) and a chemical manufacturer (43 percent). Yearly halomethane usage totaled 900 gallons, while annual usage of various insecticides, herbicides, and fungicides totaled 700 gallons. The other two halogenated chemical categories used in the study area were TCE (300 gallons per year) and mixed or unspecified halogenated solvents (200 gallons per year).

Utilization of toxic liquid chemicals in the survey area was highest in the service station industry (SIC Code 554), which accounted for 49 percent of the total liquids used annually. Aircraft and parts manufacturing companies (SIC Code

TABLE A-4 Summary of Process Chemicals Used and Toxic Wastes Generated by Industrial Groups

Process Chemicals

INDUSTRY GROUP \ TOXIC MATERIAL	Alcohols	Aliphatic Ethers/Esters	Aliphatic Solvents	Amines	Antimony Compounds	Beryllium	Chlordane	Chromium Compounds	Chromium Solutions	Copper Compounds	Copper Solutions	Cutting Oils	Cutting Oils, Soluble	Cyanides	Cyanide Solutions	Fungicides	Gasoline	Halomethanes	Herbicides	Insecticides	Kerosene	Ketones	Lead Compounds	Nickel Compounds	Nickel Solutions	Paints/Lacquers	Pentachlorophenol	Petroleum Distillates	Petroleum Products	Phenols	Photographic Chemicals	Solvents, Halogenated	Solvents, Nonhalogenated	Tetrachloroethylene	Thiram	Toluene	1,1,1-Trichloroethane	Trichloroethylene	Xylene	Zinc Compounds
17 - Special Trade Contractors																										●		●												
25 - Furniture Mfg.																										●	●									●				
27 - Printing and Publishing	●								●		●											●						●	●		●		●							
28 - Chemicals Mfg.	●	●	●	●	●			●														●	●			●	●	●	●	●		●		●	●	●			●	●
307 - Misc. Plastics Products		●																				●																		
344 - Fabricated Structural Metal Products						●						●	●								●	●				●		●					●			●				
345 - Screw Machine Products												●	●															●												
346 - Metal Stamping												●									●								●											
347 - Metal Coating								●	●	●	●	●		●	●			●			●	●		●	●			●					●	●		●	●	●		
349 - Misc. Fabricated Metal Products								●													●					●			●					●		●				●
354 - Metalworking Machinery												●	●								●								●				●				●			
355 - Special Industrial Machinery												●										●						●					●			●				
359 - Misc. Machinery												●	●					●			●	●						●	●			●	●							
367 - Electronic Components	●																															●								
371 - Motor Vehicle Equip. Mfg.			●																									●					●							
372 - Aircraft and Parts Mfg.			●						●			●	●				●				●							●	●					●		●	●		●	
38 - Instruments, Photographic Equip.	●	●						●															●												●			●	
39 - Misc. Mfg.	●		●									●										●						●						●						
422 - Public Warehousing																													●											
446 - Services Incidental to Water Transp.																												●												
508 - Machinery (whlsle)																		●			●															●				
516 - Chemicals (whlsle)	●	●														●			●	●													●							●
518 - Alcoholic Beverages (whlsle)	●																●																							
554 - Service Stations			●														●												●											
733 - Reproduction, Commercial Art																										●		●	●		●		●			●				
734 - Services to Buildings							●			●										●							●											●		
753 - Automotive Services			●														●									●		●				●	●					●		
769 - Misc. Repair Services		●	●																			●															●			●
781 - Motion Picture Services			●																									●												

Wastes

INDUSTRY GROUP \ TOXIC MATERIAL	Aliphatic Solvents	Beryllium	Chlordane	Chromium Solutions	Copper Solutions	Cyanide Solutions	Halomethanes	Heavy Metal Wastes	Insecticides	Ketones	Nickel Solutions	Oils, Waste	Paints/Lacquers	Petroleum Distillates	Petroleum Products	Photographic Chemicals	Sludges, Toxic	Solvents, Halogenated	Solvents, Nonhalogenated	Tetrachloroethylene	Toluene	1,1,1-Trichloroethane	Zinc Solutions
17 - Special Trade Contractors													●										
25 - Furniture Mfg.																							
27 - Printing and Publishing																●	●						
28 - Chemicals Mfg.																	●		●				
307 - Misc. Plastics Products												●											
344 - Fabricated Structural Metal Products		●								●		●							●		●		
345 - Screw Machine Products																	●						
346 - Metal Stamping																							
347 - Metal Coating				●	●	●		●			●						●						
349 - Misc. Fabricated Metal Products				●																●	●		●
354 - Metalworking Machinery												●							●				
355 - Special Industrial Machinery												●											
359 - Misc. Machinery							●					●							●				
367 - Electronic Components																							
371 - Motor Vehicle Equip. Mfg.														●									
372 - Aircraft and Parts Mfg.				●								●						●	●	●	●		
38 - Instruments, Photographic Equip.																		●					
39 - Misc. Mfg.																							
422 - Public Warehousing																							
446 - Services Incidental to Water Transp.												●											
508 - Machinery (whlsle)												●											
516 - Chemicals (whlsle)																							
518 - Alcoholic Beverages (whlsle)																							
554 - Service Stations	●											●											
733 - Reproduction, Commercial Art																●							
734 - Services to Buildings			●						●												●		
753 - Automotive Services												●											
769 - Misc. Repair Services												●			●								●
781 - Motion Picture Services												●											

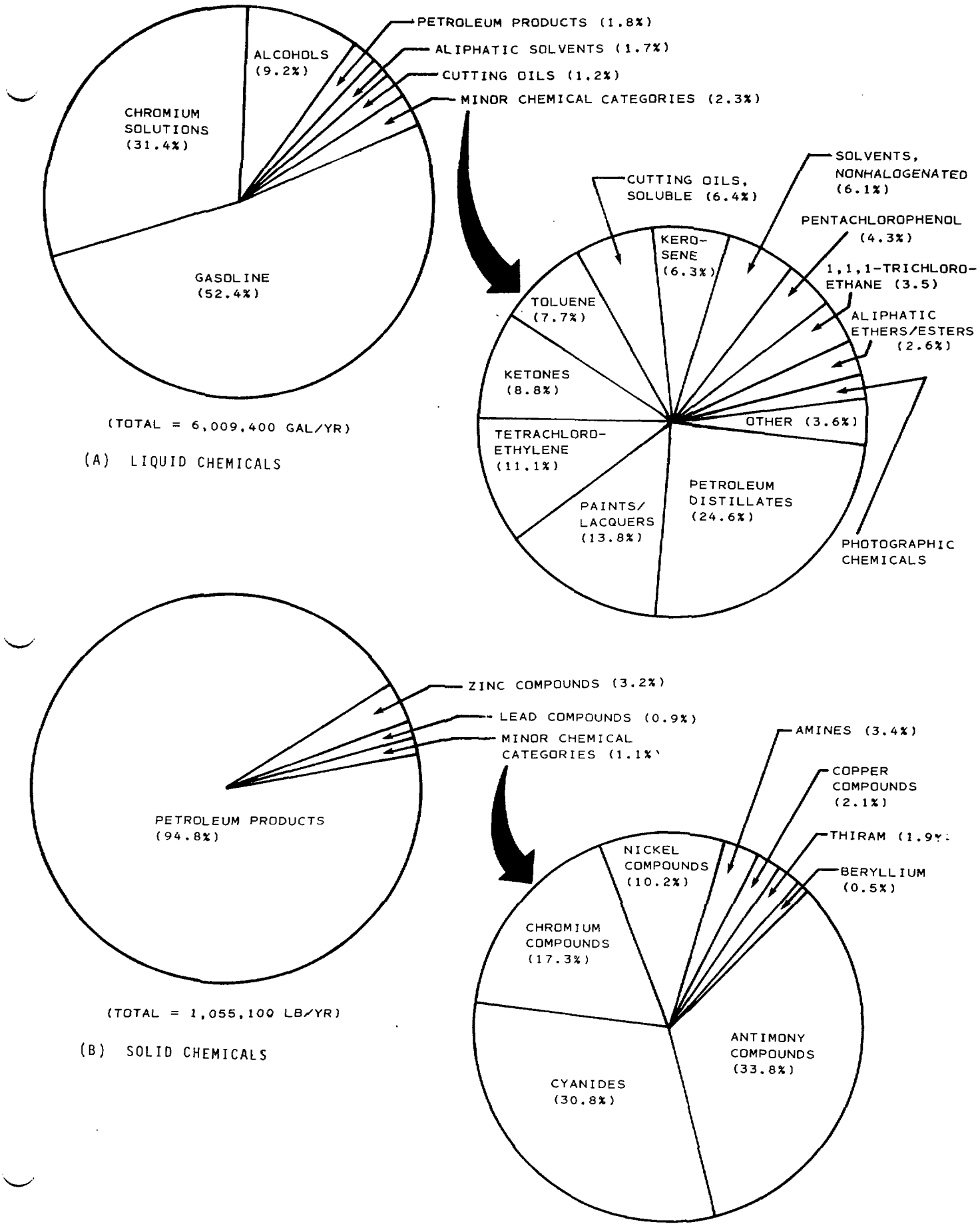


Figure A-1 Percent liquid and solid process chemicals used in study area, by chemical category.

372), utilized 33 percent of this total, surpassed the alcoholic beverage wholesalers (SIC Code 518), who utilized 12 percent, the chemical manufacturers (SIC Code 28), who utilized 3 percent, and public warehousing companies (SIC Code 422), who utilized 1.5 percent. All other industry groups combined contributed 1.5 percent annually to the total use of toxic liquids (Figure A-2).

3.1.2 Solid Chemical Usage

Solid petroleum products constituted 94.8 percent per year of all toxic solid process chemicals and products. Use of zinc compounds totaled 3.2 percent, while lead compounds totaled 0.9 percent. The eight other categories of toxic solids collectively contributed 1.1 percent to the annual usage of toxic solids (Figure A-1).

The chemical manufacturing industry (SIC Code 28) used almost 96 percent of all toxic solids inventoried. Chemical wholesalers (SIC Code 516) utilized 2.8 percent; manufacturers of instruments, photographic equipment, and optical goods (SIC Code 38) utilized 0.6 percent; and the metal coating industry (SIC Code 347) utilized 0.5 percent. The other industries collectively used 0.1 percent of the total (Figure A-2).

3.2 Process Chemical Management

3.2.1 Process Chemical Storage

Gasoline, the highest volume chemical used in the study area, was stored primarily in underground tanks at service stations. Six percent of the gasoline used in the area was stored in aboveground tanks either inside or outside of the facility.

All of the chromium solutions used in the study area were kept in tanks or other containers, located inside the facility on concrete floors. Most of the solution was supplied as liquid concentrate, and was stored in corrosion-resistant containers. Process solutions made from the concentrate or solid chemicals were maintained in process tanks. Spills from these tanks were caught by floor drains and directed to the wastewater discharge system.

Ninety-eight percent of the alcohols used or produced in the study area was stored by one company and kept in large stainless steel tanks inside the facility. The company representative indicated that there had never been a spill incident.

Approximately 13 percent of all of the cutting oils (soluble and insoluble) was stored outside, generally on asphalt or concrete; in 90 percent of the cases, they were stored uncovered. Corroded drums and spilled oils were common. Most companies maintain some type of absorbent (sand, sawdust,

kitty litter, etc.) for use on the spills. However, 93 percent of the insoluble cutting oils stored outside was stored on dirt.

Slightly over one quarter of the petroleum distillates used annually was stored outside uncovered. Again, corroded drums were in evidence, but most drums were stored on concrete or asphalt with no direct access to the soil.

Nearly 50 percent of the paints and lacquers (non-water-based) was stored outside on concrete or asphalt. All of the outside storage was uncovered. However, 75 percent of these paints was manufactured at a facility with a fairly quick turnaround time. Consequently, individual containers were seldom left outside long enough to weather significantly.

With the exception of PCP and halomethanes, all of the halogenated organic compounds were stored inside on concrete or asphalt. Fifty-seven percent of the pentachlorophenol and 88 percent of the halomethanes were stored outside on concrete or asphalt. The halomethanes were stored uncovered, and the drums were subject to corrosion.

About 16 percent of the ketones and toluene was stored outside of the facility. The majority was uncovered, and approximately 10 percent was stored on dirt.

Eighty-two percent of the kerosene was stored outside. Over 90 percent was uncovered, but virtually all of it was stored on concrete or asphalt.

Over 90 percent of all remaining toxic liquid process chemicals was stored inside on concrete or asphalt. All solid process chemicals were stored inside the facility.

Most of the companies involved in outside storage had 26 to 75, 151 to 500, or over 1,000 employees. Smaller companies seldom stored chemicals in such quantities that inside storage space became a problem. Overall, 80 percent of the companies surveyed utilized inside storage of process chemicals exclusively. These companies used approximately 99 percent of the chemicals in the study area.

Among the surveyed companies that used drummed chemicals, less than 10 percent utilized drum cradles or stands. However, most used spigots or pumps to remove liquids from drums. Only a few companies transferred liquids by tipping the drums and pouring.

3.2.2 Spill Contingency Planning

Most of the companies with 76 or more employees were aware of the need for spill control or contingency plans. Most indicated that they would call the fire department in the event

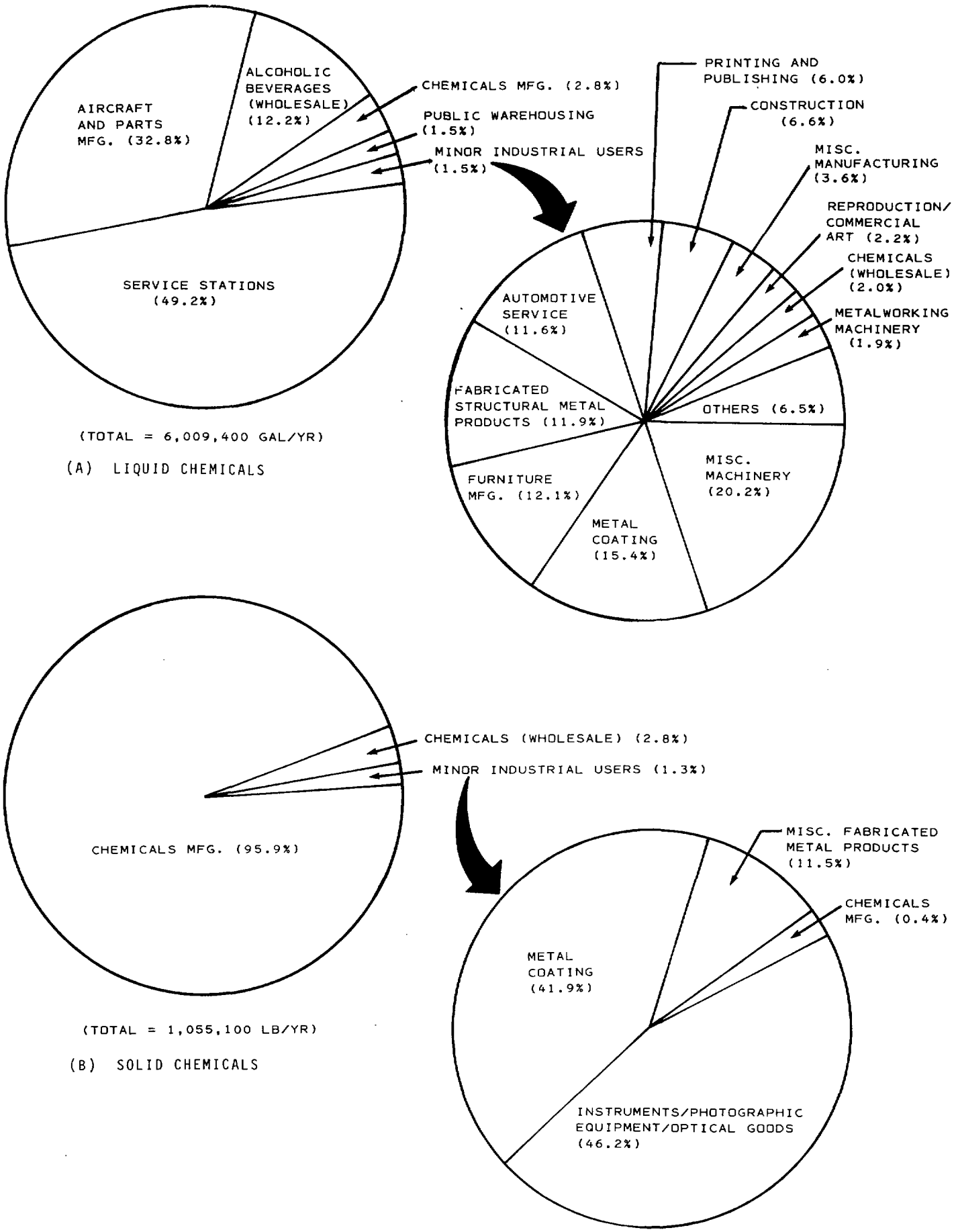
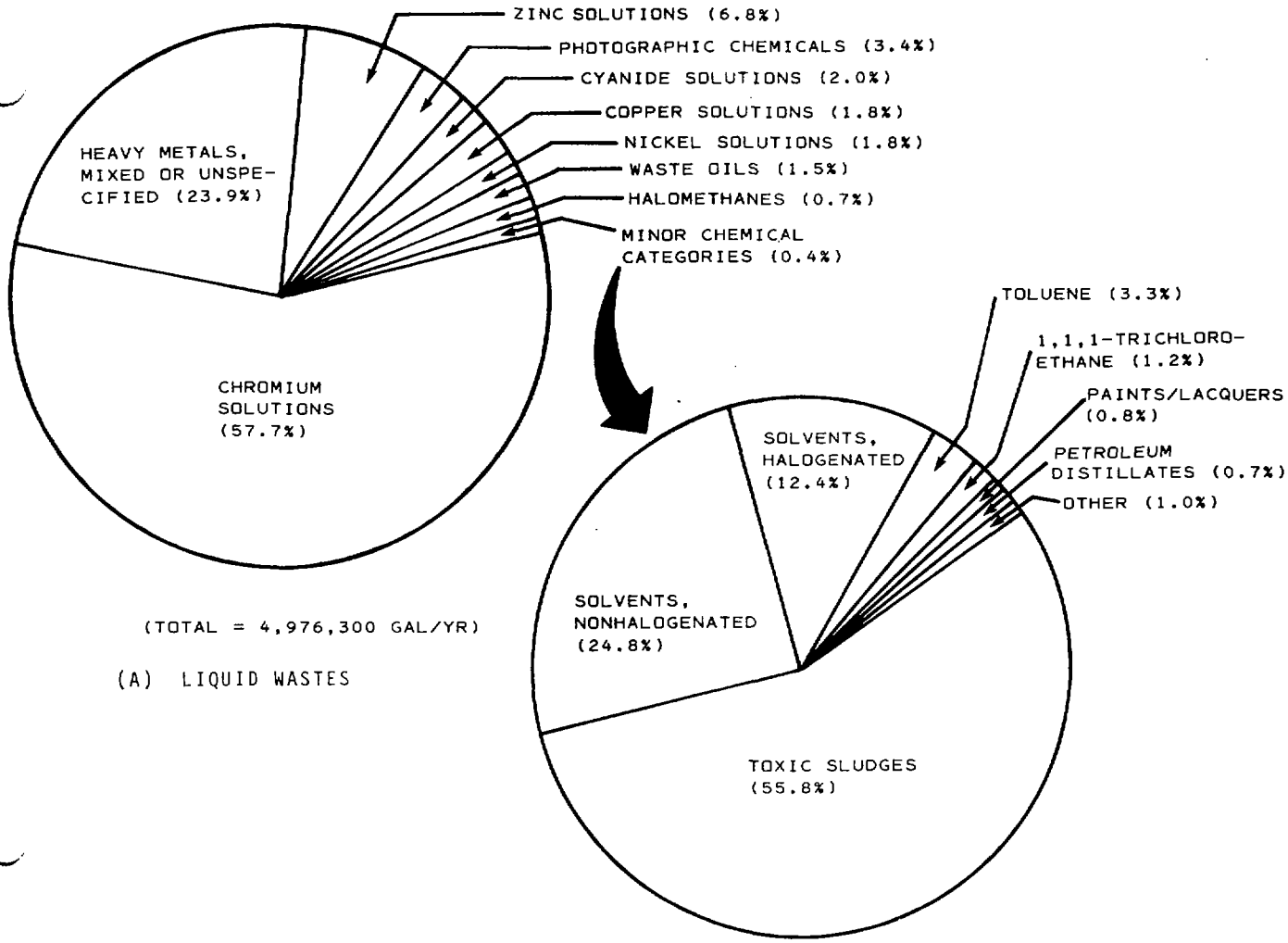
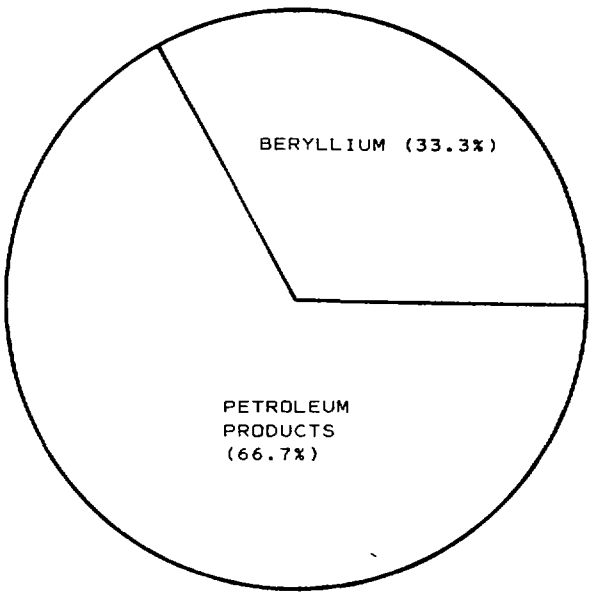


Figure A-2 Percent liquid and solid process chemical use in study area, by industry group.



(TOTAL = 4,976,300 GAL/YR)

(A) LIQUID WASTES



(TOTAL = 15 LBS/YR)

(B) SOLID WASTES

Figure A-3 Percent liquid and solid toxic wastes generated in study area, by chemical category.

of a serious spill. Only about 5 percent of the companies actually had formal written contingency plans. None of these plans was directed toward preventing groundwater contamination. Rather, they were either OSHA-related, or dealt only with fire/explosion hazards. Only one company had a formal system of moats and dikes around its chemical storage areas to contain spills.

3.3 Toxic Wastes

A total of almost 5.0 million gallons of toxic liquid wastes is generated annually, while only 15 pounds per year of toxic solid wastes are produced. Discrepencies between quantities of certain process chemicals (particularly cutting oils and certain solvents) and related wastes are indicative of use patterns in the study area. Cutting oils burn away in use, or adhere to parts and scaps. Solvents are allowed to evaporate during use. Table A-4 shows the types of industry that generate toxic wastes and the types of toxic waste each industry produces.

3.3.1 Toxic Liquid Wastes

Almost 58 percent of the total toxic liquid wastes generated in the study area was chromium solutions. Wastes solutions containing mixed or unspecified heavy metals constituted another substantial portion of this total (23.8 percent), while zinc solutions totaled only 6.8 percent. Other categories of wastes liquids included cyanide solutions (2.0 percent), copper solutions (1.8 percent), nickel solutions (1.8 percent), waste oils (1.5 percent), and halomethanes (0.7 percent) (Figure A-3).

Halogenated compounds were of special concern in relation to groundwater quality. A total of 56,000 gallons per year containing these toxic waste chemicals was generated in the study area. Halomethanes were the major category of halogenated compounds, with 52,000 gallons per year generated by a single miscellaneous machinery manufacturer (SIC Code 359), employing 11 to 25 workers. Two medium-sized companies (26 to 75 employees) generated mixed or unspecified halogenated solvent wastes, which totaled 3,700 gallons annually. Minor categories of halogenated compounds consisted of 1,1,1-trichloroethane (360 gallons per year), insecticides (120 gallons per year), and PCE (110 gallons per year).

3.3.2 Toxic Solid Wastes

Toxic solid wastes formed a very minor part of the overall waste generation in the study area. Of the two solid waste categories measured, petroleum product wastes totaled 10 pounds annually, while waste beryllium totaled only 5 pounds (Figure A-3).

3.4 Toxic Waste Management

3.4.1 Toxic Waste Management - Metal Coating

Wastewaters containing chromium, copper, cyanide, nickel, zinc, and other metals constituted the largest waste streams in the study area. These were generated by six companies involved with plating or other metal coating. All of these companies employed some type of on-site treatment (usually neutralization/ clarification) before discharge to the sanitary sewer system, and all had Bureau of Sanitation Industrial Waste Permits. Only two of these companies admitted that their treatment processes generated toxic sludges which required disposal. The remaining companies indicated that their operations produced some sludge, but in such small quantities that, even after several years of operation, sludge removal still had not become necessary (Figure A-4).

Four companies in other industry groups produced toxic sludges. All of the companies producing such sludges used commercial sludge pumpers and waste haulers to remove the wastes to appropriate disposal facilities.

3.4.2 Toxic Waste Management - Photographic Processing

Spent photographic processing wastewaters comprised the second major toxic wastewater discharged in the study area. Eleven companies generated spent processing chemicals, which were discharged directly to the sanitary sewer system without treatment. None of these companies had Industrial Waste Permits.

3.4.3 Toxic Waste Management - Paint Stripping

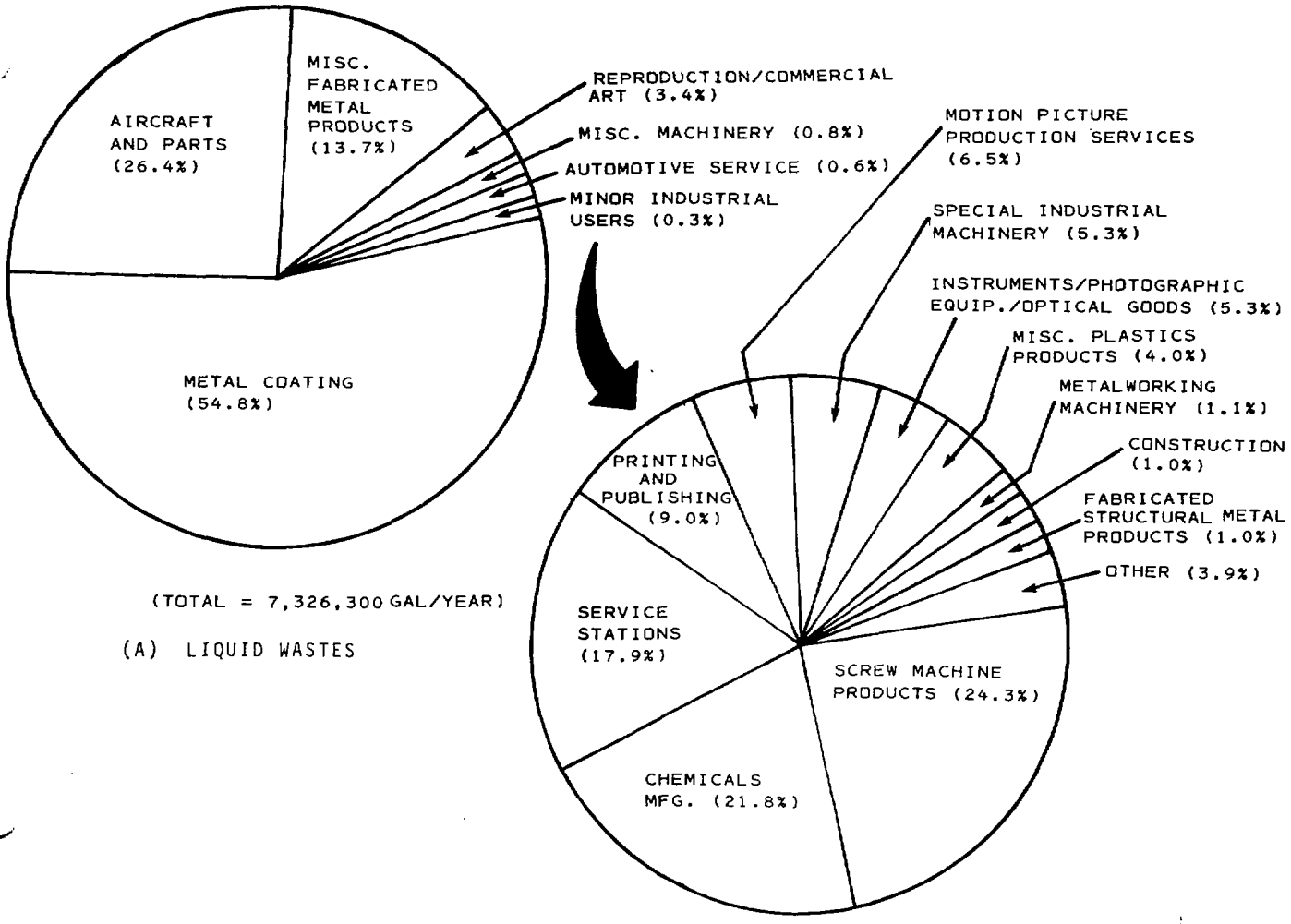
Other major wastewater sources included water contaminated with halomethanes discharged from paint stripping operations. One company produced over 50,000 gallons annually, all of which was washed directly into the sewer system without treatment.

3.4.4 Toxic Waste Management - Pest Control

Although pesticide-containing wastewaters were not generated in large volumes, approximately 180 gallons of unused pesticide mixtures and application equipment rinsate were generated annually. One-third of this volume was contaminated with chlordane. All of the pesticide wastes were discharged into gravel-filled pits, purportedly under direction of the US Department of Agriculture.

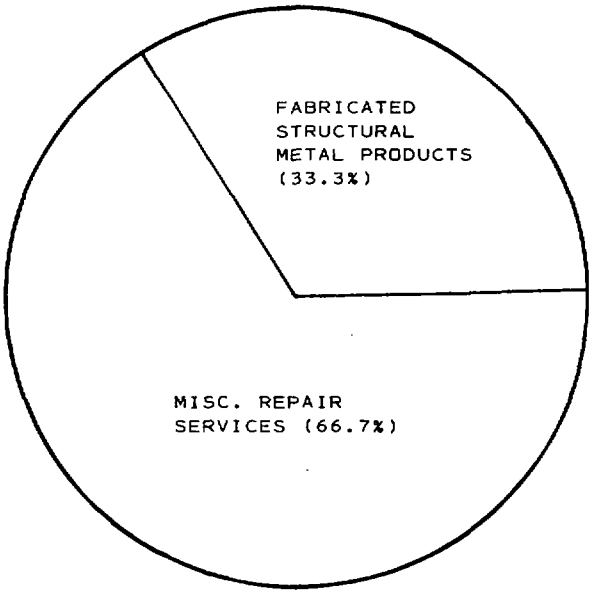
3.4.5 Toxic Waste Management - Cutting Oils

Waste oils comprised the largest volume of non-wastewater toxic waste in the survey area. Waste oils were produced primarily from auto service and machine shop operations. Waste oils from machine shops may be contaminated with solvents,



(TOTAL = 7,326,300 GAL/YEAR)

(A) LIQUID WASTES



(TOTAL = 15 LB/YR)

(B) SOLID WASTES

Figure A-4 Percent liquid and solid waste generation in study area, by industry group.

heavy metals, or TCE. One company produced 48 percent of the total waste oils generated. This waste was picked up by commercial hauler and transported to a disposal facility. Forty-nine percent of the waste oils, generated by 92 companies, was picked up by commercial waste oil recyclers. Eleven companies, producing 0.5 percent of the waste oils, either buried their wastes on site or disposed of it with the regular refuse.

3.4.6 Toxic Waste Management - Solvents

Solvent used in the study area did not produce large volumes of wastes. Most solvent was allowed to evaporate, leaving no wastes. Only about 9,000 gallons of solvent wastes were produced annually in the entire study area. Approximately 16 percent of the waste solvents was recycled. Some solvent suppliers collected contaminated solvents, re-refined them, and sold them back to the customer at a reduced price. A number of companies use a closed, recirculating solvent wash system for small parts (auto, aircraft, etc.). The system was provided and serviced periodically by Safety-Kleen. Contaminated solvents were removed, and fresh solvent added. Most of the remaining solvent wastes were collected by commercial haulers and transported to disposal facilities. A small fraction was either disposed of with the conventional refuse, poured in a sink, or poured on the soil.

3.4.7 Toxic Waste Management - Based on Company Size

With the possible exception of Miscellaneous Fabricated Metal Products (SIC Code 349), no industry group could be singled out for improperly treating or disposing of its wastes. Rather, improper management (e.g., uncontrolled discharge to sewer, dirt, etc.) seemed to be a function of company size. Small to medium size companies were more likely to improperly dispose of hazardous materials than larger size companies. Approximately 25 percent of the companies with 1 to 25 employees, and 33 percent of those with 75 to 150 employees, treated or disposed of their wastes improperly. Fewer than 11 percent of all other companies did so.

3.4.8 Toxic Waste Management - Unsuitable Practices

There was evidence, however, of more illicit dumping than was admitted by company representatives during the survey. Stained pavements in streets and parking lots, and spots of dead grass could indicate improper disposal. There was also some evidence that several companies wash grease, oil, solvents, etc., off of equipment or parts with a hose, and allow the water to run into the streets. (Figure A-5)

The potential for illicit dumping is very high. There are three major areas of open land in the survey area: the DWP powerline right-of-way, the railroad track right-of-way, and the fields under the airport landing pattern. Approximately

two-thirds of the companies generating wastes in the study area border on one of these open areas.

Uncontrolled septic tank discharge is another potential problem of uncertain magnitude. No company admitted to discharging to septic tanks, but at least six companies discharge to "sumps" that may actually be connected to leach fields.

3.4.9 Toxic Waste Management - Waste Storage

Less than 2 percent of the total waste volume generated in the study area was stored on site for more than 90 days. Most companies had wastes collected from 2 to 24 times per year. On-site toxic waste storage was carried out less carefully than process chemical storage. Overall, less than 25 percent of the companies surveyed utilized inside storage of wastes. Sixty percent of the wastes was stored in underground tanks or sumps. These were not monitored for leaks. The remaining toxic wastes were stored outside, uncovered, half on dirt, and half on concrete or asphalt.

3.5 BMP Enforcement (Figure A-5)

In general, standard handling practices necessary to comply with OSHA, fire department, or general safety guidelines are sufficient to prevent most groundwater contamination. However, comprehensive spill control measures and continency planning would eliminate much of the potential for contamination from process chemical storage and handling practices.

It is necessary to develop a method by which to identify companies that are subject to management guidelines. Mass mailings of instructions and voluntary responses are generally ineffective. Many companies will not read the mailer; others will either misunderstand it or choose to believe it does not apply to them.

Company management and all employees involved in toxic chemical or waste handling must be educated as to the true hazards of these materials, the importance of protecting the groundwater, and their role in this effort. Many people, including those who handle toxic substances, are unaware of the real hazards posed by these materials.

It is imperative that industry personnel be educated as to the potential hazards that toxic chemicals can create in groundwater supplies where poor management practices are employed. Many employees are unaware of what constitutes a toxic chemical; what good management is; or what their role is in preventing groundwater contamination.

Figure A-5 Evidence of Improper Waste Disposal (Ground Stains) and Poor Management Practices in the North Hollywood Area.

TABLE A-5

List of Reported Priority Pollutant Spills - SFVB

Type of Material Spilled	Date Spill Occurred	Quantity (Gal.)	Affected Drainage Facility
1) TCE	3/27/81	U*	Sewer
2) 1,1,1 Trichloroethane	10/19/77	55	Bull Creek (LAR)
3) Metal Contaminants	7/15/81	Min**	Ground
4) Heavy Metals, Acid	5/10/78	U	Ground
5) Cyanide Solution (14%)	3/22/74	3,000	Ground
6) TCE	5/27/75	100	Clarifier/Sewer
7) Plating Waste	1/6/81	U	Sewer
8) Plating Wastes (Green)	12/31/80	U	Storm Drain
9) TCE	9/29/80	0.5	Sewer
10) Methylene Chloride	9/12/79	U	Street, Storm Drain
11) Penetrant Solution (Hg,Pb,Zn)	1/25/79	U	Storm Drain
12) Cyanide Solution	5/27/75	200	Storm Drain
13) Plating Solution	8/20/79	U	Street
14) Plating Wastes	4/16/81	U	Street
15) Methyl Chloride	9/2/81	1	Street
16) Plating Wastes	1/13/77	40	Burbank Western Wash (LAR)
17) Cyanide	8/13/81	Min	Ground
18) TCE	7/17/80	30	Sewer
19) TCE, PCE	3/13/81	U	LAR
20) Acids, Metals	5/2/79	U	Ground
21) Solvent	1/6/77	U	Street
22) Solvents	1/26/78	U	Sewer
23) Grease Solvents	5/28/81	U	Ground
24) Cleaning Solutions	4/10/79	U	Sewer
25) Cleaning Compound	2/23/79	200	Storm Drain
26) Ink (60% Solvents, 1-20% Toluene)	4/17/79	55	Storm Drain
27) Cleaning Solvent	6/18/79	50	Storm Drain
28) Solvent	1/4/79	U	Storm Drain

* U = Unknown Quantity
** Min = Minimal Quantity

4.0 Recommendations of Subtasks I-B-1, I-B-3, II-B and IV-B

The following recommendations should be adopted to provide more information on toxic material management practices for use in future remedial programs.

1. Better spill/contingency planning and control practices need to be developed among the companies in the survey area.

2. Locate and document all septic tanks in use in the area.

3. Monitoring should be initiated at all underground storage tanks.

4. In the future, a different approach to this type of survey might prove more efficient. An initial walking tour of the survey area, while more labor-intensive, could save time and effort in the long term.

SUBTASK I-B-2

ACCIDENTAL/UNINTENDED RELEASES

1.0 Work Plan Objectives of Subtask I-B-2

To determine possible/probable effects of hazardous material spills, fire control runoff and related unintentional releases on groundwater quality within the study area.

2.0 Investigation

2.1 Background

The records of the Department of Water and Power, the Los Angeles City Bureau of Sanitation, the Los Angeles City Fire Department, the Los Angeles County Flood Control District and the Los Angeles County Department of Health Services were searched for information relating to past incidents that resulted in the release of hazardous materials to the environment. Such releases result from transportation accidents, industrial storage and pipeline leaks, equipment failures and overflows, mishandling of materials, fire control operations in commercial and industrial fires, and removal by washdown. An accidentally released hazardous material will go into the ground or the drainage system if it is not properly confined to the premises by planned containment.

2.2 Scope

The Subtask I-B-2 investigation required an examination of the groundwater system, including groundwater recharging facilities, well field operations and the entire urban drainage system, in order that the various means of access for contaminants to enter the groundwater basin could be determined.

3.0 Conclusions

3.1 Results of Investigation

A review of spill records disclosed that 76 spills of hazardous materials occurred from 1974 to 1981. The spills ranged in size from 0.5 gallons to 6,000 gallons, but a great many spills (35 out of the 76, or 46 percent) were of indeterminate quantity. Many different types of hazardous materials were involved in these spills, with most involving an acid, alkali, or solvent. A list of priority pollutant spills that occurred in the SFVB can be found in Table A-5.

3.2 Record Keeping

As documented by the case studies presented in this report, the most common incident of accidental release occurs

during the transport by truck. Where the public health or safety is threatened by major spills, information on the spill incident as well as any corrective action taken, is recorded. While it is believed that there are many instances in which small quantities of hazardous materials are accidentally released to the environment, the impact of these spills is not known since there is no requirement for the reporting of these incidents.

3.3 Vulnerable Areas

Spill incidents occurring over the eastern portion of the San Fernando Valley Basin are more likely to impact groundwater quality due to the proximity of the well fields and because of the greater permeability of the soil in that locale. The combination of greater soil permeability and the intense industrial activities within and adjacent to the well fields increases the probability of a significant effect on groundwater quality resulting from accidental and unintentional releases of hazardous materials.

3.4 Response to Accidental Releases

The impact of a hazardous material spill on groundwater quality depends upon whether the spilled material is discharged in sufficient quantities to cause harmful effects. Some of the harmful effects from a spill incident may be mitigated by the implementation of spill contingency plans. Quick response to a spill incident and the implementation of proper containment and removal procedures are usually sufficient to prevent the potential contaminant from entering the groundwater system.

4.0 Recommendations of Subtask I-B-2

4.1 Spill Contingency Planning

Since hazardous material spills are a common occurrence in the Los Angeles area, the preparedness of the responding agencies is the single most important factor to the successful conclusion of a spill incident. Spill contingency plans should be reviewed periodically to ensure the utilization of up-to-date procedures. All spill incidents should be documented by the use of a standard spill report form. This procedure would reduce difficulties in retrieving spill information and will assure that the necessary information is being documented.

4.2 Further Evaluation

Although the areal extent of the groundwater contamination problem in the San Fernando Valley Basin has been determined with respect to TCE and PCE, it has not been possible to trace the contaminants to individual point sources. Through an evaluation of well sampling data, zones of groundwater

contamination appear to be concentrated downgradient from industrial land uses. The results of the Industrial Survey of the North Hollywood study area as a part of Subtasks I-B-1 and I-B-3, should further aid in determining whether industrial spills and leaks of hazardous materials are a significant factor contributing to the groundwater contamination problems in the San Fernando Valley Basin.

SUBTASK I-C SURVEY OF OTHER WASTE SOURCES

SUBTASKS I-C-1 AND II-C

DRY WEATHER URBAN DRAINAGE

1.0 Work Plan Objective of Subtasks I-C-1 and II-C

1.1 Subtask I-C-1 Dry Weather Urban Drainage

To survey quantities and patterns of urban (dry weather) drainage in the study area.

1.2 Subtask II-C Dry Weather Drainage Controls

To recommend a program of action for the control of dry weather urban drainage flows having significant levels of priority pollutants.

2.0 Investigation

2.1 Background

A system of dry weather flow sampling points was established upstream of groundwater recharge areas. The location of the sampling points are shown in Figure A-6. The investigation of the quantity and quality of dry weather drainage was designed to determine the level of impact on groundwater quality of this flow.

2.2 Scope

This investigation focused upon whether a need exists for the control of dry weather flows. If the impact of dry weather drainage upon the quality of basin groundwater is deemed significant, various control measures would be investigated and recommended.

3.0 Conclusions

3.1 Characteristics of Dry Weather Flow in the Los Angeles River System

Dry weather drainage as used in this subtask refers to the flow pattern in the Los Angeles River (LAR) and its tributary channels during the annual dry season in the San Fernando Valley which generally begins in April and continues through November. The LAR waters reach the groundwater aquifers by percolation at the DWP Headworks Spreading Grounds and at three unlined reaches of the River in the Narrows area (Figure A-6). Dry weather flows in the Los Angeles River (LAR) during the months of April through October provide a portion of the recharge to the San Fernando Valley groundwater basin which becomes available for extraction at the nearby

well fields. A limited field survey of the LAR water quality with respect to priority pollutants was conducted as part of this subtask (Table A-6). As a result of this survey, it was determined that the concentration of TCE and PCE in the LAR east of the Tujunga Wash on the days sampled was lower than the State DOHS action level of 5 ppb for TCE and 4 ppb for PCE. Additional analyses of the LAR are necessary to verify this data and determine daily and seasonal trends, if any.

The introduction of volatile organic priority pollutants into the LAR is attributable in part to industrial and wastewater discharges authorized under the NPDES system, and partly to urban runoff, unauthorized discharges, and possibly to rising water that originates within the groundwater basin and enters the LAR along its lower valley reaches.

The effluents from Water Reclamation Plants (WRP) discharging into the LAR after completion of the Donald C. Tillman (Sepulveda) WRP could amount to over 80 percent of the dry weather flow in the LAR. These effluents could possibly contain TCE, PCE or other priority pollutants which could be deleterious if introduced into groundwater.

3.2 Well Fields Adjacent to the LAR

Examination of analytical records of the Los Angeles Department of Water and Power indicates that the volatile organic compounds, TCE and PCE, have been found in the water produced by the well fields adjacent to the LAR. See Tables A-1, A-2, A-3 and A-6 for analyses of these well fields.

The well fields adjacent to the unlined sections of the LAR are an important water resource for the Cities of Los Angeles and Glendale. Protection of the water quality of these well fields requires sufficient monitoring to assess the levels of pollutants in the LAR and in the well fields. The attenuation of the contaminants, if any, as they move from the River to the well fields may be quantified with adequate sampling and analysis. Future attention should also be addressed to the presence of volatile organic priority pollutants other than TCE and PCE in the LAR and the well fields adjacent to the LAR.

4.0 Recommendations of Subtasks I-C-1 and II-C

4.1 LAR and Water Reclamation Plant Effluent Quality Monitoring

The following recommendations relate to further investigations of the impact of dry weather urban drainage on groundwater quality in the SFVB.

A. The effluent from the Los Angeles - Glendale WRP (LAGWRP), the Burbank WRP and the LAR at locations shown in Figure A-6 should be sampled monthly for

TABLE A-6 Results of Water Quality Analysis

Organic Priority Pollutants in Los Angeles River and Nearby Well Fields

Sampling Location	Date and (No. of Analyses)	Priority Pollutant Name or Group	ppb	Mean Concentration (Standard Deviation)
Pollock Well Field	1980-82 (63)	TCE	2.8	(2.7)
	(59)	PCE	8.4	(6.9)
Crystal Springs Well Field	1980-82 (49)	TCE	7.3	(3.5)
	(45)	PCE	1.4	(0.9)
Headworks Well Field	1980-82 (57)	TCE	8.2	(5.7)
	(49)	PCE	1.1	(0.7)
Glendale-Grandview	1980-82 (17)	TCE	3.0	(2.5)
	(14)	PCE	1	(0.1)
Los Angeles below unlined reaches (#1) (a)	4-82 (2)	Total Volatiles (b)		9.10
		TCE	1.9	
		PCE	0.9	
		BN/AE (c)	BDL (d)	
Los Angeles @ Tujunga Ave (#3)	4-82 (2)	Total Volatiles		16.8
		TCE	0.1	
		PCE	0.7	
		MC (e)	8.4	
		Benzene	3.9	
		BN/AE	BDL	
Los Angeles @ Hazeltine (#4)	4-82 (2)	Total Volatiles		153.5
		TCE	8.3	
		PCE	3.2	
		MC	36.1	
		Benzene	34.9	
		BN/AE	BDL	
Verdugo Wash (#2)	4-82(2)	Total Volatiles		25.4
		TCE	2.3	
		PCE	1.1	
		MC	10.8	
		Benzene	4.6	
		BN/AE	BDL	

(a) No.'s correspond to sampling points see Figure A-6
(b) Total volatiles is the summation of the ppb concentrations of 37 volatile organic compounds
(c) Base neutral/acid extractable
(d) Below detection limits
(e) Methylene chloride

TABLE A-7

List of Priority Pollutants to be Monitored in Los Angeles River

I. These thirty volatile organic compounds can be determined by the Department of Water and Power Sanitary Engineering Division using a Gas Chromatograph and Mass Spectrometer utilizing the EPA Consent Decree Analytical Kit. The compounds are listed below:

1. Methylene chloride
2. 1,1-Dichloroethylene
3. 1,1-Dichloroethane
4. Chloroform
5. Carbon tetrachloride
6. 1,2-Dichloropropane
7. Trichloroethylene (TCE)
8. 1,1,2-Trichloroethane
9. Dibromochloromethane
10. Tetrachloroethylene (PCE)
11. Chlorobenzene
12. Trichlorofluoromethane
13. trans-1,2-Dichloroethylene
14. 1,2-Dichloroethane
15. 1,1,1-Trichloroethane
16. Bromodichloromethane
17. trans-1,3-Dichloropropene
18. cis-1,3-Dichloropropene
19. Benzene
20. Bromoform
21. 1,1,2,2-Tetrachloroethane
22. Toluene
23. Ethylbenzene
24. Chloromethane
25. Dichlorodifluoromethane
26. Bromomethane

TABLE A-7 (Continued)

27. Vinyl chloride
28. Chloroethane
29. Acrolein
30. Acrylonitrile

a two-year period and analyzed for TCE and PCE.

B. The LAGWRP and Burbank WRP effluent and the LAR should be sampled and analyzed quarterly for 30 volatile organic priority pollutants (Table A-7) for a two-year period.

C. At the end of each six months during the two-year period, a summary of the analytical data obtained in this sampling program will be evaluated by the proposed Interagency Advisory Committee.

4.2 Recommend Water Quality Standards for WRP Effluents

It is recommended that the Interagency Advisory Committee evaluate the above data, along with other pertinent information, and make recommendations as to specific numerical NPDES limits for WRP effluents for TCE and PCE. The formation and operation of an Interagency Advisory Committee to oversee the implementation of a long term groundwater protection program is proposed in the Introduction to the Recommendation Section of this plan (Section 3.0). The effluent water quality limits proposed by the Committee should reflect the consideration of volatilization of contaminants which may occur in surface flow. The need for limits for other priority pollutants should be considered and recommended by the Committee, if necessary.

SUBTASK I-C-2

OTHER COMMERCIAL WASTE SOURCES

1.0 Work Plan Objectives of Subtask I-C-2

To assess overall groundwater quality impacts due to infiltration of local commercial wastes.

2.0 Investigation

2.1 Background

In assessing the overall groundwater quality impacts due to the infiltration of local commercial and industrial liquid wastes, particular attention was addressed to identifying the wastewater disposal methods could cause organic chemical wastes to enter the SFV groundwater basin. Also, the identification of the "avenues" by which these commercial wastes may enter the groundwater system was investigated.

A limited area of the San Fernando Valley Basin was chosen for study because of project limitations of time, manpower and funding. The study area is shown on Plate 5.

2.2 Scope

The "avenues" investigated in this subtask by which commercial wastes may enter the groundwater basin and impact groundwater quality are as follows:

1. Percolation of wastewater from private disposal systems such as sumps, septic tanks, cesspools and seepage pits.

2. Exfiltration of wastewater from leaking sewer lines.

The following work was performed during the course of this investigation:

1. review of DWP water service accounts which are exempt from the sewer service charge;

2. review of sewer service maps;

3. review and inspection of underground discharge permit holders;

4. review of the City of Los Angeles plumbing code;

5. determination of TCE and PCE levels in North Hollywood sewers.

3.0 Conclusions

In the eastern San Fernando Valley, the discharge of organic chemical commercial wastes to the groundwater basin by way of private disposal systems or other sources has a high potential for contaminating the groundwater.

A summary of available data on the number of commercial waste sources in the study area that are capable of discharging to the groundwater basin is presented as follows. This data may only represent a partial listing of the total number of waste sources in the study area based upon current records. A door to door survey would be necessary to determine the complete status of ground discharges in the area. The following list indicates the types and numbers of commercial waste sources in the study area. (Plate 10)

1. Sewer Exempt Disposal Systems: 75.

2. Commercial Parcels without Sewer Service: 10.

3. Permitted Industrial Waste Discharges (for ground discharge): 4.

Based on the findings of this investigation, the Los Angeles City Bureau of Sanitation conducted a follow-up survey of business and commercial operators of private disposal systems (PDS's). A preliminary survey of the quality of the effluent of twelve PDS's was also conducted during the course of the survey. Test results showed significant levels of priority pollutants in these effluents, including TCE and PCE.

4.0 Recommendations of Subtask I-C-2

An Interagency Advisory Committee should be formed by representatives from the agencies listed in the Recommendations Section of this report. The committee should oversee and coordinate the following activities for private disposal system regulation.

1. Identify and prepare a list of all commercial and industrial businesses in the eastern San Fernando Valley that operate private disposal systems.

2. Develop and recommend methodology for corrective action to eliminate hazardous waste discharges from private disposal systems located in the eastern SFVB.

    a. Require semi-annual inspection for all commercial and industrial businesses located in the eastern San Fernando Valley that utilize private disposal systems.

b. Conduct a semi-annual monitoring program to determine volatile organic chemical concentrations at selected locations in the sewer system.

3. Propose rules, regulations, ordinances and procedural changes to implement an improved program of groundwater protection. For example, revise Section 94.2119 of the Los Angeles City Plumbing code to include abandonment procedures for septic tanks, dry wells and waste holding sumps.

SUBTASK I-C-3

LANDFILLS

1.0 Work Plan Objective of Subtask I-C-3

To assess the overall groundwater quality impacts of existing or abandoned landfills, rubbish dumps, trash pits and related sites of solid or liquid waste discharge; to determine the severity and extent of identified problem areas.

2.0 Investigation

2.1 Background

In assessing the impact of landfills and dumps on the quality of groundwater in the San Fernando Valley Basin, the following factors were evaluated:

1. the locations of all active and completed landfills and dump sites, in the San Fernando Valley Basin;

2. the areas where groundwater contamination is known to exist, based on collecting and testing groundwater samples from existing production and observation wells;

3. the impact upon the quality of water produced by production and observation wells that are located downgradient of landfill sites and areas of known groundwater contamination.

3.0 Conclusions

A search of records to determine the locations of waste disposal sites indicated that over 60 landfills are present in the valley fill of the SFVB. Of these, approximately 32 are Class II landfills (as defined below), 20 are Class III landfills, and 10 could not be classified based on available information. (Plate 9)

Landfill sites are categorized as Class I, II, or III depending upon their ability to protect the groundwater from contamination. Wastes are classified as either Group 1, 2, or 3 depending upon the ability of the waste to impair groundwater quality.

Class III landfills are permitted to accept only Group 3 wastes that includes nonbiodegradable materials such as fill dirt or demolition debris.

Class II landfills can accept Group 3 wastes as well as nonhazardous, biodegradable Group 2 wastes including traditional domestic refuse.

Class I landfills can accept both Group 2 and Group 3 waste materials as well as Group 1 hazardous wastes.

The design and operating requirements of Class I sites are most stringent and closely monitored. The requirements for Class III sites are least stringent. Class II site requirements are intermediate between Class I and Class III.

Past regulations of solid waste disposal practices did not emphasize the protection of groundwater quality and only limited provisions were made to facilitate monitoring. Recently developed concepts of sanitary landfill design incorporate improved groundwater quality protection provisions.

The analysis of a limited number of landfill gas samples taken from SFVB landfill sites during the course of the Subtask I-C-3 investigation revealed traces of TCE, PCE and other pollutants (Tables A-8 and A-9). Groundwater samples collected from several monitoring wells downgradient of a landfill site indicated groundwater contamination by carbon dioxide, possibly from the landfill.

An evaluation of available information on SFVB landfills including locations, areas of known groundwater contamination and sample analyses from monitoring wells, did not establish that landfills are sources of the present groundwater contamination problem. However, the future construction and testing of wells that will more effectively monitor landfill sites may result in different findings.

4.0 Recommendations of Subtask I-C-3

4.1 Observation Wells at Landfills

In concurrence with the recommendation contained in the Subtask I-A-3 report on SFVB Groundwater Quality, there is a definite need for the planning and construction of additional observation wells to more effectively monitor the impact of landfills and dump sites on groundwater quality. It is recommended that observation wells be provided downgradient of selected landfill and dump sites suspected of posing a significant threat to groundwater quality in SFVB.

It is important to be able to determine whether a landfill site is a contributing source to the groundwater quality problem. The effects of groundwater contamination resulting from landfill sources could be long-term and costly to remedy. The potential landfill problem sites identified in this subtask investigation could be used as a basis of establishing a network of observation wells to monitor these sites. The exact locations and specifications for the observation wells will be included in a future program.

TABLE A-8

TRACE ORGANIC COMPOUNDS DETECTED
IN LANDFILL GAS FROM THE HEWITT PIT

Compound	Manufacturing Source or Use
Benzene	Used for mfg. paints, plastics, rubber, organic chemicals, pesticides, pharmaceuticals, etc. Derived from petroleum refining and solvent recovery.
1-Bromo, 3-Chloropropane	
Dichloromethane (Methylene Chloride)	Paint stripper solvent, Trichloromethane mfg. by-product.
Decane	Paraffin products, rubber and paper processing
Dodecane	Paraffin products, rubber and paper processing
Naphthalene	Pesticides, dyes, syn. resins, motor fuel mfg.
1,1,2,2-Tetrafluoro 1,2-Dinitroethane	
2,2,3,4-Tetramethylpentane	
Trichloroethylene (TCE)	Dry cleaning, metal degreasing

TABLE A-9

TRACE ORGANIC COMPOUNDS DETECTED
IN LANDFILL GAS FROM THE SHELDON-ARLETA LANDFILL

Compound	Manufacturing Source or Use
1,4-Butanediol	
1,3-Dimethylbenzene	Asphalt and naphtha constituent; chem. mfg.; coatings mfg.; insecticides and pharm. mfg.
2,4-Dimethylhexane	
Ethylbenzene	Asphalt constituent; styrene mfg.
Ethylesterbutanoic	Artifical flavoring mfg. Acid
2,4-Pentanedione	Gasoline and lubricant additive mfg.; ink and varnish mfg.; insecticides
4-Methyldecane	

4.2 Further Evaluation of Privately Owned Landfills

It is also recommended that further efforts be expended to obtain additional information on privately operated waste disposal sites in the SFVB. Since information on some of these sites was not readily available, the effort of the subtask investigation was directed to compiling data on other sites. Nevertheless, information regarding the exact location, bottom elevation, types of wastes, and other operational data is needed for a complete assessment of the contamination potential of these sites.

SUBTASK I-D

SURVEY OF GOVERNMENT REGULATIONS

1.0 Work Plan Objectives of Subtask I-D

To survey and document regulations administered by local agencies regarding the handling, storage, treatment and disposal of toxic wastes; to evaluate the effectiveness of current regulations in preventing or controlling the contamination of surface waters and groundwaters in the study area.

2.0 Investigation

2.1 Background

Federal, State, and local laws and regulations pertaining to the storage, handling, and disposal of hazardous materials were evaluated for their effectiveness in preventing groundwater and surface water contamination.

2.2 Scope

The following sections discuss the existing enforcement alternatives available for the control and regulation of potential sources of contamination to the SFVB. Each major agency that has authority, or conducts activities, relative to the regulation or control of hazardous materials is discussed. The scope and effectiveness of these programs are discussed in relation to their application to the protection of groundwater resources.

3.0 Conclusions

3.1 Existing Regulatory Structure

3.1.1 Federal Agencies

3.1.1.1 Environmental Protection Agency

The US Environmental Protection Agency (EPA) administers water quality programs pursuant to the Clean Water Act, and hazardous waste control programs pursuant to the Resource Conservation and Recovery Act. Both of these laws provide for the delegation of enforcement authority to individual states when it is established that the state program is at least as stringent as the federal guidelines.

The Clean Water Act sets forth a national strategy for controlling water pollution. The National Pollutant Discharge Elimination System (NPDES) is the primary enforcement mechanism provided in the Clean Water Act. In California, authority for this program has been delegated to the state and is

administered by the State Water Resources Control Board.

The Resource Conservation and Recovery Act (RCRA) sets forth a national strategy for the cradle-to-grave regulation of Hazardous Wastes through permitting of the storage, transport and disposal of Hazardous Wastes. In California, Phase I interim authorization has been granted to the state, and the program is administered by the State Department of Health Services.

3.1.2 State Agencies

3.1.2.1 State Water Resources Control Board

The State Water Resources Control Board (SWRCB) is responsible, under California's Porter-Cologne Act, for the formulation and adoption of a state-wide policy for the control of water pollution.

In addition to administering the Federal NPDES permit program, the SWRCB is also the designated administrator of the financial assistance program for water pollution control projects.

The SWRCB is also responsible for developing minimum guidelines for the design and siting of sanitary landfills.

Enforcement of the SWRCB requirements is delegated to nine Regional Water Quality Control Boards (RWQCB) throughout the state. The SFVB falls within the jurisdiction of the Los Angeles RWQCB, Region 4.

3.1.2.2 State Department of Health Services

The State Department of Health Services (DOHS) has specific statutory authority for public health aspects of water supply, hazardous waste handling and disposal, and toxic substances control.

The Hazardous Materials Management Branch (HMMB) of the State DOHS currently issues hazardous waste facility permits under the California equivalent of the Federal RCRA program. The State DOHS (a) permits facilities that transport, treat, store or dispose of hazardous wastes as defined in Title 22 of the California Administrative Code and (b) administers the "cradle to grave" manifest system for hazardous wastes. The state does not require manifesting of wastes that go to recycling or reclamation operations.

The Los Angeles Regional Office of HMMB is currently processing Interim Status Documents for some 570 Hazardous Waste Facilities. Final permits for these facilities are scheduled for completion by 1990. The LA Regional office maintains a staff to process permits and conduct on-site inspections of these facilities.

Other activities of the State DOHS include the Abandoned Site Project and the 'Superfund' program. The goal of the Abandoned Site Project is to identify all abandoned landfills and on-site disposal facilities that may be contaminated by hazardous wastes. The Superfund office, in turn, conducts investigations of these sites and determines if any clean up actions are required based on public health considerations. When no financial responsibility for clean up can be established, the state may recommend that a site be added to the funding priority list for either Federal or State Superfunds.

3.1.3 Regional Agencies

3.1.3.1 Regional Water Quality Control Board

In addition to implementing the State policy for Water Quality Control, the Los Angeles Regional Water Quality Control Board (RWQCB) is responsible for the development of a regional water quality control plan that establishes the policies and goals necessary to ensure that the beneficial uses of the State's water resources are preserved.

The RWQCB administers over an area including most of Los Angeles and Ventura Counties. As part of its regulatory function, the RWQCB issues waste discharge requirements for NPDES permits. The RWQCB may issue cease and desist or clean-up orders for violations of any waste discharge requirement, and may seek issuance of court orders and/or fines for noncompliances.

The RWQCB has also recently initiated a study to assess the use and impact of underground storage tanks, sumps and pipelines on groundwater quality.

3.1.3.2 South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) is responsible for the development of a regional air quality management plan that establishes the policies and goals necessary to attain compliance with provisions of the Clean Air Act.

The SCAQMD regulates and permits all stationary emissions of air pollutants. The SCAQMD currently requires permits on all facilities for the storage of potential air pollutants including gasoline, solvents and other volatile organic compounds. SCAQMD controls on discharges may indirectly provide for the protection of groundwater quality.

3.1.4 City and County Agencies

City and County governments may provide groundwater quality control benefits through a variety of activities involving water works, public works, public safety and welfare,

industrial waste control, and land use controls. These activities are customarily performed by the following departments: health, water, public works, sanitation, building and safety, fire and planning. These services are also supplied by the County in both unincorporated areas or, by contract to smaller cities that do not have the resources to develop their own programs.

3.1.4.1 County Department of Health Services

The Los Angeles County Department of Health Services currently conducts a Hazardous Waste Control Program to regulate the handling, storage and disposal of hazardous wastes. This program is designed to complement the existing state program by providing inspection of those facilities that produce hazardous wastes but are not covered under the operating guidelines of the State DOHS program. The county also relies on the State manifest system to support its enforcement activities.

The County program, which was initated in May of 1982, is supported by a Hazardous Waste Generator's license fee levied on all industries within broad SIC codes. The County currently maintains a 23-man professional staff for the regulation of an estimated 17,000 businesses.

3.1.4.2 Water Agency

The water agency is responsible not only for the operation and maintenance of the water system, but also for the delivery of a safe water supply. The protection of the groundwater, therefore, is of utmost concern to the water agency. However, the water agency does not have regulatory authority in the hazardous waste area and acts only in an advisory and/or surveillance role in regard to pollution control measures.

3.1.4.3 Public Works Department

The public works department plans, constructs, operates and maintains public improvements such as sewers, storm drains, and streets. Although not intended for groundwater quality control, these facilities will sometimes restrict the input of hazardous materials to the underground.

3.1.4.4 Sanitation Department

The sanitation department is usually charged with the responsibility for industrial waste control. The purpose of the industrial waste control program usually includes the detection and prevention of the disposal of industrial wastes to waters of the state. The primary goal of the local industrial waste control programs is to promote the best use of the sewer and storm drain systems. However, this protection

could also be expanded to include the regulation of private disposal systems for the protection of the groundwater basin.

Another function of the sanitation department is to regulate the operation and use of sanitary landfills for the protection of underlying groundwater quality.

3.1.4.5 Building and Safety Department

Building and Safety departments are responsible for developing and enforcing minimum design, construction, and maintenance requirements that protect community property and safeguard the health and safety of the public. Many of these provisions can be directly or indirectly beneficial to the protection of groundwater resources.

3.1.4.6 Fire Department

Fire departments conduct on-site inspections of commercial facilities to acquire information and enforce regulations concerning the use and storage of certain hazardous chemicals. The purpose of these inspections is to assure compliance with health and safety codes related to hazards during fire fighting operations and the safety of occupants during normal use. Fire departments require some testing and inspection of storage tanks for the detection of leaks. These activities indirectly result in protection of groundwater quality by preventing conditions that could result in the release of contaminants to the groundwater basin.

3.1.4.7 Planning Department

Planning departments are responsible for developing general plans and the general guidelines used to regulate and direct development within a region. The planning department utilizes zoning and land use controls to promote the best possible use of existing resources and to protect the long-term interests of the entire community.

3.2 Effectiveness of Existing Regulatory Structure

While protection of groundwater quality is not the primary goal of existing laws and regulations controlling hazardous materials, adequate enforcement of these laws could provide the necessary level of protection to groundwater quality.

Current enforcement manpower is considered inadequate to insure compliance with existing hazardous material regulations based upon the current limited staffing of enforcement agencies and the very large number of possible contaminant sources, such as private disposal systems, that need investigation. Accordingly, additional manpower is needed for enforcement agencies to adequately protect groundwater.

4.0 Recommendations of Subtask I-D

4.1 Increased Enforcement Staff

An increased level of enforcement is needed in order to protect groundwater quality from future contamination. Any further tightening of hazardous material control regulations to prevent groundwater contamination will be ineffective considering current enforcement staff levels. State, regional and local hazardous material regulatory staffs should be increased to enforce current laws and regulations governing all phases of hazardous material management.

4.2 Interagency Coordination

The existing state, regional, and local regulatory agencies should coordinate their inspection and enforcement programs in order to avoid duplication of effort. This coordination will allow for a maximum utilization of enforcement manpower and budget.

TASK II

DEVELOPMENT AND EVALUATION OF ALTERNATIVE PLANS FOR EXISTING SOURCES OF WASTES

Introduction

The objective of this task series is to develop alternative plans for controlling hazardous materials in the identified groundwater quality problem area. This investigation focuses primarily on the development of alternative waste handling, storage and discharge regulations which will be effective in controlling or preventing groundwater contamination within the SFVB.

Task II is divided into three subtask investigations as follows:

a) Subtask II-A titled "Land Use Performance Standards and Local Enforcement" which is summarized in the following section.

b) Subtask II-B titled "Augmented Enforcement Programs" which is summarized in Task I as part of the Industrial Survey which combines Subtasks I-B-1, I-B-3, II-B and IV-A.

c) Subtask II-C titled "Dry Weather Urban Drainage Controls" which is summarized in Task I with Subtask I-C-1.

SUBTASK II-A

LOCAL GOVERNMENT LAND USE PERFORMANCE STANDARDS AND LOCAL ENFORCEMENT

1.0 Work Plan Objectives of Subtask II-A

To identify local land use standards and related regulations for potential use in implementing waste control enforcement plans.

2.0 Investigations

Local standards (zoning, building codes, etc.) were reviewed to determine which standards and regulations could be applied to enforcement plans.

3.0 Conclusions

3.1 Preserving Open Space

In the San Fernando Valley, the preservation of open space lands does not appear to be the most reasonable or effective means of protecting groundwater quality through land use restriction. This is because very little vacant land exists in the industrially zoned areas of the eastern SFVB, and open space does not necessarily insure protection as dumping of hazardous wastes on open space is actually encouraged by the existence of scattered and unattended vacant lots.

3.2 Down Zoning of Industrial Zoned Land

Down zoning industrially zoned land to the level of current use has some merit in reducing the potential for contamination of groundwater by precluding future industry from locating in the area. However, since this area is heavily developed by industry, significant economic disruption of the community could result from down zoning. Therefore, down zoning of industrially zoned land is not a practical alternative to protect groundwater quality in the SFVB.

3.3 Special Assessments

Special assessments can be utilized to fund activities directed at the enforcement and monitoring of best management practices. However, City, County and State regulatory programs should be coordinated to avoid jurisdictional conflicts and to achieve the implementation of an efficient and effective integrated control program for all hazardous materials in the SFVB. If possible, the requirement for permits and inspections together with the payment of fees should not be duplicated.

3.4 Economic Law Enforcement

Economic law enforcement appears to have good potential for aiding the implementation of programs involving the enforcement of environmental regulations. Economic law enforcement techniques such as recapture standards, economic civil assessments, surety devices and progression of steps make compliance with environmental regulation unprofitable for firms that do not comply. It is equitable and objective, thereby giving regulators ministerial authority to use it quickly without having to go to court.

3.5 Well Field Protection Ordinances

Land uses within the sensitive groundwater areas of the basin can be regulated through "well field protection" ordinances. Restrictions on types of development and activities involving the use of hazardous materials would be based on the computed groundwater travel time between the proposed development and the water supply well.

This type of ordinance is geared primarily towards developing areas. However, fully developed areas would also be helped through intensified enforcement and public information efforts which are concentrated on businesses located within the sensitive groundwater areas.

4.0 Recommendations of Subtask II-A

4.1 Establish Groundwater Protection Zones

Groundwater protection zones should be established to provide special provisions for land use development around well-fields. These provisions could include such measures as:

A. Banning development immediately adjacent to a well;

B. Restricing new development by:

   1. Limiting new development to those activities which would not present a threat to the groundwater supply through the use of hazardous materials, or

   2. Requiring such new development to meet certain building and performance standards to insure that the activity would not pose a threat to the groundwater supply.

C. Requiring existing development to meet similar performance standards within a specified time limit;

D. Restricting or banning landfills within the groundwater protection zone; and

E. Subjecting industries already located in such zones to a more rigorous monitoring and enforcement program. The lower portion of the Verdugo basin and the eastern portion of the San Fernando Valley basin are of critical concern because of unconfined aquifer conditions, high soil infiltration rates, rapid groundwater movement and the location of a large number of active public water supply wells.

4.2 Economic Recapture

The economic concept of recapture should be investigated further in order to ascertain its potential applicability as a mechanism for the implementation of hazardous materials control plans.

TASK III

DEVELOPMENT AND EVALUATION

OF ALTERNATIVE PLANS FOR IN SITU CONTAMINATION

Introduction

The objective of this task series is to formulate plans for the control, removal and/or treatment of contaminated groundwaters in the study area. The overall goal of the task is to facilitate the beneficial use of SFVB groundwaters while concurrently mitigating the water quality impacts of in situ contamination.

In situ contaminants are defined here as those toxic substances that have either reached the underlying groundwater reservoirs or are enroute in the unsaturated soil zone. These substances are dispersed throughout identified contamination zones in varying concentrations. Their presence may be the result of past or very recent disposal practices; in the case of a continuous point discharge, the materials may be present in the form of a plume or continuous slug moving in the direction of groundwater flow.

Alternative plans focused primarily on control strategies for the volatile organic compounds trichloroethylene (TCE) and tetrachloroethylene (PCE) because these compounds were found in excess of California Department of Health Services allowable action levels in drinking water.

Task III is divided into six subtasks as follows: Preferential Groundwater Pumping (Subtask III-A); Water Level Management (Subtask III-B); Groundwater Blending (Subtask III-C); Groundwater Extraction/Treatment (Subtask III-D); Groundwater Removal/Disposal (Subtask III-E); and No Project (Subtask III-F).

SUBTASK III-A

PREFERENTIAL GROUNDWATER PUMPING

1.0 Work Plan Objectives of Subtask III-A

To develop preferential groundwater pumping plans designed to contain or limit the spread of identified bodies of contaminated groundwater.

2.0 Investigations

2.1 Background

In order to accomplish the objective of this subtask a well packer and area of influence test were conducted. The purpose of the well packer test was to evaluate the effectiveness of clay layers in limiting the vertical movement of groundwater contaminants. The purpose of the area of influence test was to further evaluate and verify aquifer characteristics in the North Hollywood area, and to gain a more precise understanding of the response of horizontal groundwater movement to changing pumping patterns.

Prior to the initiation of the well packer and areal extent test, an engineering evaluation of existing information including the geohydrological setting, well logs, pumping patterns and groundwater quality data for the North Hollywood area was performed.

2.2 Scope

2.2.1 Well Packer Test

A well packer was installed at the midpoint of a 37-foot thick clay layer in DWP North Hollywood Well No. 24 in which the casing is perforated both above and below the clay lense. Various factors were observed before and after the packer was inflated including the concentration of TCE and PCE in the well discharge, water levels in the well, and pumping rates were observed before and after the packer was inflated. Comparison of the data before and after the packer was inflated allowed the following:

1. An evaluation of the packer's effectiveness in restricting water containing organic contaminants from entering the discharge flow from this well; and

2. An evaluation of well performance, aquifer transmissivity, storage coefficient and the changes in each of these parameters resulting from the elimination of well perforations above the clay layer when the packer is inflated.

2.2.2 Area of Influence Test

The area of influence test involved:

1. Controlled pumping of NH-24, with and without the well packer inflated while several other North Hollywood area wells were in normal operation;

2. Measurement of the corresponding change in water levels occurring in a network of surrounding observation wells; and

3. Measurement of TCE levels in the discharge from pumping wells.

This information was then correlated with known distances between the wells in order to:

1. Define the magnitude and areal extent of drawdown or cone of depression under the various pumping conditions; and

2. Evaluate the effect changing pumping patterns have on TCE levels.

3.0 Conclusions

From an examination of the measurements and data collected during the Packer and Area of Influence Test, the following conclusions and observations can be made:

3.1 Well Packer Test

1. The transmissivity of the North Hollywood area aquifer was found to be over 500,000 gpd/ft., based on values calculated from data collected during the Well Packer Test. This value is consistent with previous aquifer tests. Storage coefficients of ±0.0005 calculated from the Well Packer Test data indicate that the aquifer is locally confined in the North Hollwyood area around NH 24.

2. When the NH 24 well packer was inflated, theoretically the aquifer was separated into two zones, preventing contaminated water in the upper zone from entering the well casing and making its way to the lower zone. The effectiveness of the packer as a seal was demonstrated by the following observations:

   a. Comparing the two successive 24-hour pumping periods before and during well packer inflations, the drawdown in the pumping well increased by over 10 feet while pumping with the packer inflated.

b. The upper zone water level declined approximately one and a half feet while pumping with the packer inflated, whereas the lower zone water level had a piezometric head loss of approximately 25 feet.

c. Transmissivity values decreased significantly when the upper zone was sealed off, while the flow rate was virtually unchanged.

3. Comparing the results of Water Quality Division analyses of samples collected at NH 24 while pumping with the well packer deflated versus when inflated, it was concluded that organic contaminants appeared to be effectively prevented from reaching the lower zone. The following observations lead to this conclusions:

a. Prior to installation of the well packer in NH 24, the TCE contamination level averaged 500 ppb (3 samples in March 1981). During the 24 hour test pumping period with the packer deflated prior to the packer test, the TCE level was at least 100 ppb. During the 24-hour test pumping period with the packer inflated, the TCE level averaged only 7 ppb. PCE concentrations also appeared to decline when pumping with the packer inflated.

b. The well packer continued to be effective over several months of continuous pumping. The average TCE concentration declined over a 7-month period from February 1982 to September 1982 was 7 ppb. PCE averaged 0.6 ppb during this period.

c. Additional testing in November 1982 confirmed that the well packer contained the contaminants above the clay lense. While pumping with the packer deflated, the TCE levels increased from 0.1 to 136 ppb within 6 days and PCE increased from 0.2 to 5.4 ppb.

4. From the above testing, it could not be determined how the vertical distribution of TCE varied. It is not known whether the small amount of TCE and PCE detected while pumping with the packer inflated was present in the lower zone, or the lower zone was uncontaminated. The possibility exists that the contaminants were pulled through the clay lense or from elsewhere in the aquifer during the pumping. To answer these questions, another series of controlled pumping tests with special equipment is required.

3.2 Area of Influence Test

1. Based on the results of the Area of Influence Test, the cone of depression developed by each of the North Hollwyood test pumping wells extended approximately 4500 to 5500 feet from each pumping well after a few days pumping.

2. The combined effect of pumping these wells probably reached about 6500 feet from each pumping well, as indicated by the recovery effect due to the unplanned shut-off of the Erwin Wells and by the total drawdown in the observation wells.

3. Individual pumping cones appeared to be established after one day of pumping and continued to expand at a very slow rate. After the first day of pumping, drawdowns increased from zero to one and a half feet per day within each pumping well, and less than one tenth of a foot of drawdown per day at a distance of 2000 feet from each pumping well. At the fringes of the pumping cone, water levels were drawn down at an even slower rate.

4. The gradual increase in TCE levels while test pumping suggest that the contaminant distribution can be affected by the pumping. Greater concentrations of TCE may have been drawn towards the pumping wells as the pumping cones reached more highly contaminated portions of the aquifer. Therefore, controlled well field pumping practices, such as preferential well pumping, may be a practical tool for managing the groundwater contamination problem in the North Hollywood Area.

5. Based upon the water quality data collected from the North Hollywood Wells No. 24, 38, 39, 40, 41 and 42 during the recent testing , it was concluded that this group of wells is very favorably situated for experimenting with the movement of contaminated water from one location to another by pumping different wells and observing changes in TCE contamination.

4.0 Recommendations of Subtask III-A

As a means of controlling and reducing the amount of TCE and PCE contamination in the North Hollywood, Crystal Springs, and Pollock study areas, the following are recommended:

4.1 Pump Highly Contaminated Wells

Pump highly contaminated wells for long durations (minimum of several months) to attenuate the concentration by dilution and sorption, and pump the remaining contaminants out of the

aquifer.

4.2 Location of New Wells

Locate new wells several miles away outside of existing zones of contamination and alternate pumping of the new wells with the old, moving cone of depression back and forth. In the process, the contaminated water will be either attenuated or pumped out of the wells.

4.3 Packer Test

The packer test should be continued to determine:

A. Its long-term suitability as a possible solution to groundwater contamination problems.

B. The operation and maintenance cost associated with the use of inflatable well packers.

4.4 Placement and Perforation of Future Wells

Where practical, consideration should be given to locating new or replacement wells in areas where power and collection facilities are in close proximity and a sufficiently thick clay lense exists below which a new casing can be perforated so that it can act as a barrier for TCE and PCE.

TASK III-B

WATER LEVEL MANAGEMENT

1.0 Work Plan Objectives of Subtask III-B

To establish maximum desirable groundwater levels in the study area to prevent leaching or inundation of known or suspected areas of toxic waste containment in the non-saturated zone.

The goal of this subtask was to develop operating criteria for the SFVB based on water level fluctuations in relation to groundwater storage and extraction.

2.0 Investigation

2.1 Background

In order to accomplish the goals and objectives of Subtask III-B, the investigation focused upon an engineering review of the historical upper and lower water levels and pumping activities that most significantly affect groundwater quality in the SFVB.

2.2 Scope

The bottom elevations of individual landfills were compared to historic high water levels to determine the possibility of inundation by groundwater. The impact of low water levels upon the quality of extracted groundwater was also investigated. In addition, the implications of low water table level restrictions imposed by the SFVB groundwater judgment were reviewed.

3.0 Conclusions

From a review of data and information collected for Subtask III-B the following conclusions relative to upper and lower groundwater levels were made:

3.1 Upper Levels

There are four areas of concern in the San Fernando Valley that need to be carefully observed for groundwater innudation of a landfill.

3.1.1 Sun Valley-Hansen Dam Vicinity

This area has a high density of operating and completed landfills. Heavy spreading at the Hansen Spreading Grounds and existence of the Verdugo Fault can have a significant impact on water levels below landfills in this area.

3.1.2 Crystal Springs Vicinity

In periods of high runoff the water table should be monitored closely because the lower elevations of the E.L. Flemming and Colorado Boulevard Dump pits, located in this area, are below the 1969 high water levels.

3.1.3 Strathern Landfill

Based upon the 1981 groundwater table levels and the proposed recharge of 400,000 acre-feet of State Project Water into the SFVB over a six year period under the State Conjunctive Use Plan, a computer simulation has demonstrated that wet cycle fluctuations of the water table would cause inundation of the proposed Strathern landfill.

3.1.4 Los Angeles Narrows Area

It is important to continue pumping activities at the Pollock well field in order to keep water levels down and to intercept groundwaters that would otherwise flow out of the SFVB in the form of 3000 to 4000 acre-feet/year surface drainage originating as rising water along the lower reaches of the LAR and 500-1000 acre-feet/year groundwater underflow spilling out of the basin.

3.2 Lower Levels

1. Judgment restrictions on the SFVB on groundwater extractions set low water levels at the 1968 and 1977 storage levels.

2. Lower water levels promote an increase in the migration of higher TDS groundwaters from western portions of the basin into areas of groundwater extraction.

4.0 Recommendations of Subtask III-B

As a means of protecting the groundwater basin from additional water quality problems, the following water table limits are recommended:

1. The upper limit of the SFVB water table elevation should fluctuate at about the 1955 water levels since they a) allow for water level increases during wet cycles, b) keep rising water to a minimum, c) reduce pumping lifts, and d) provide protection against inundation of landfills, except in the Crystal Springs area.

2. Water levels in the Crystal Springs area should be maintained below the base of local landfills by localized pumping.

3. The lower limit is essentially restricted to the 1977 water levels by the San Fernando Basin Judgment.

4. If a conjunctive use program is implemented, caution should be exercised in regulating water levels so that groundwater does not inundate the proposed Strathern Landfill.

SUBTASK III-C

GROUNDWATER BLENDING

1.0 Work Plan Objectives of Subtask III-C

To formulate plans for the blending of pumped groundwater supplies having excessive or objectionable levels of priority pollutants with suitable supplies of pumped, surface and/or imported waters.

2.0 Investigation

2.1 Background

The focus of this subtask was to evaluate the blending capabilities and limitations of each municipal well water system in the SFVB. The blending of water from contaminated wells with noncontaminated water may be required in order to reduce the level of TCE or PCE below action levels as established by the State DOHS.

2.2 Scope

Background information on the physical layout and hydraulic limitations of each water system was obtained during a series of meetings held with water utility representatives for the Cities of Burbank, Glendale, San Fernando, and Los Angeles, and the Crescenta Valley County Water District. Information was obtained concerning well locations, production rates, entry points where well flows enter the distribution system, availability of imported water and seasonal water demand for each water system. TCE and PCE water quality data was compiled for each SFVB production well; including the calculation of the annual mean of monthly values.

This information was then combined to establish the capabilities and limitations on blending for each water system. Schematic diagrams were developed for groundwater collection systems affected by TCE and PCE contamination.

3.0 Conclusions

3.1 Blending Requirements

The requirements for blending for each water system follows.

A. The water systems serving the City of San Fernando and the Crescenta Valley County Water District do not have to employ blending in order to deliver acceptable quality water.

B. Water systems serving the Cities of Burbank, Glendale, and Los Angeles were determined to be candidates for utilizing blending.

3.2 Blending Capabilities

The capabilities and limitations on blending were based on normal operations during periods of high groundwater demand.

3.2.1 Cities of Los Angeles and Glendale

Facilities currently exist that allow for the blending of acceptable quality groundwater or imported surface water with groundwater containing excessive levels of TCE (Figures A-7 and A-8). Based on past operating experience, however, only wells with average (mean of monthly values) TCE or PCE levels no greater than 20 ppb can be successfully blended (Tables A-10 and A-11).

3.2.2 City of Burbank

Facilities currently exist that allow for the blending of higher quality groundwater with groundwater containing excessive levels of TCE; however, the blending of imported water is not possible at the present time (Figure A-9). Because of this limitation, only wells with average TCE or PCE levels equal to or less than 10 ppb can be successfully blended (Table A-11).

3.3 Limitations of Blending

During a drought situation, the unavailability of adequate quantities of imported water for blending will limit the number of contaminated wells that can be operated. Accordingly, the total quantity of suitable quality groundwater that can be extracted from the SFVB would be limited.

4.0 Recommendations of Subtask III-C

4.1 City of Los Angeles

As a means of putting contaminated SFVB groundwater supplies to beneficial use while concurrently meeting water quality standards established by the State DOHS, the recommendations on groundwater blending are presented as follows:

A. The current practice by the DWP of blending groundwater containing TCE with uncontaminated groundwater or imported water should be continued as the most cost-effective water quality control method for those wells containing 5 to 20 ppb TCE.

Figure A-6

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Los Angeles River and Tributary Channels (4-82)

Organics Sampling Points
NPDES Permits
Recharge Zones
Well Fields

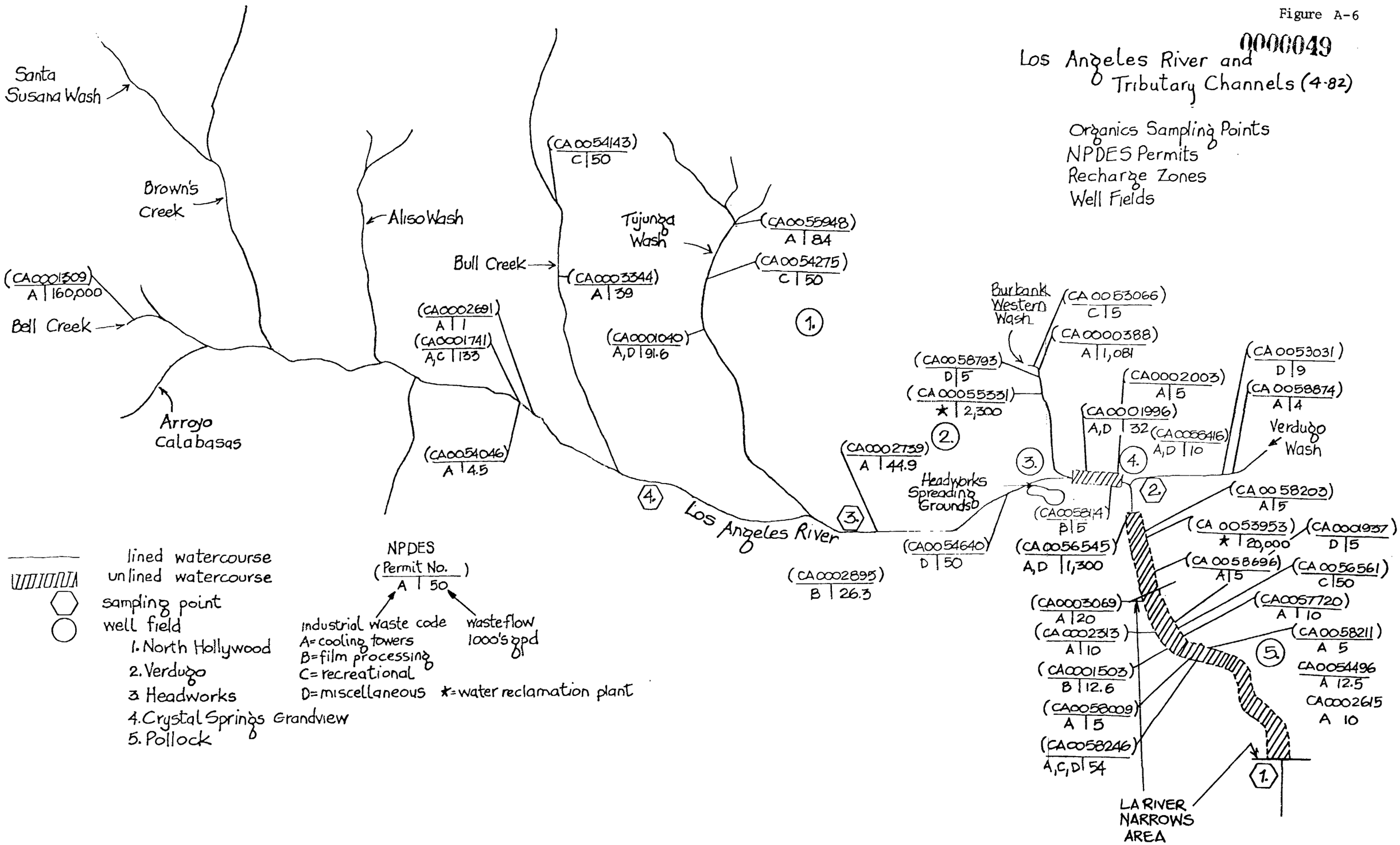
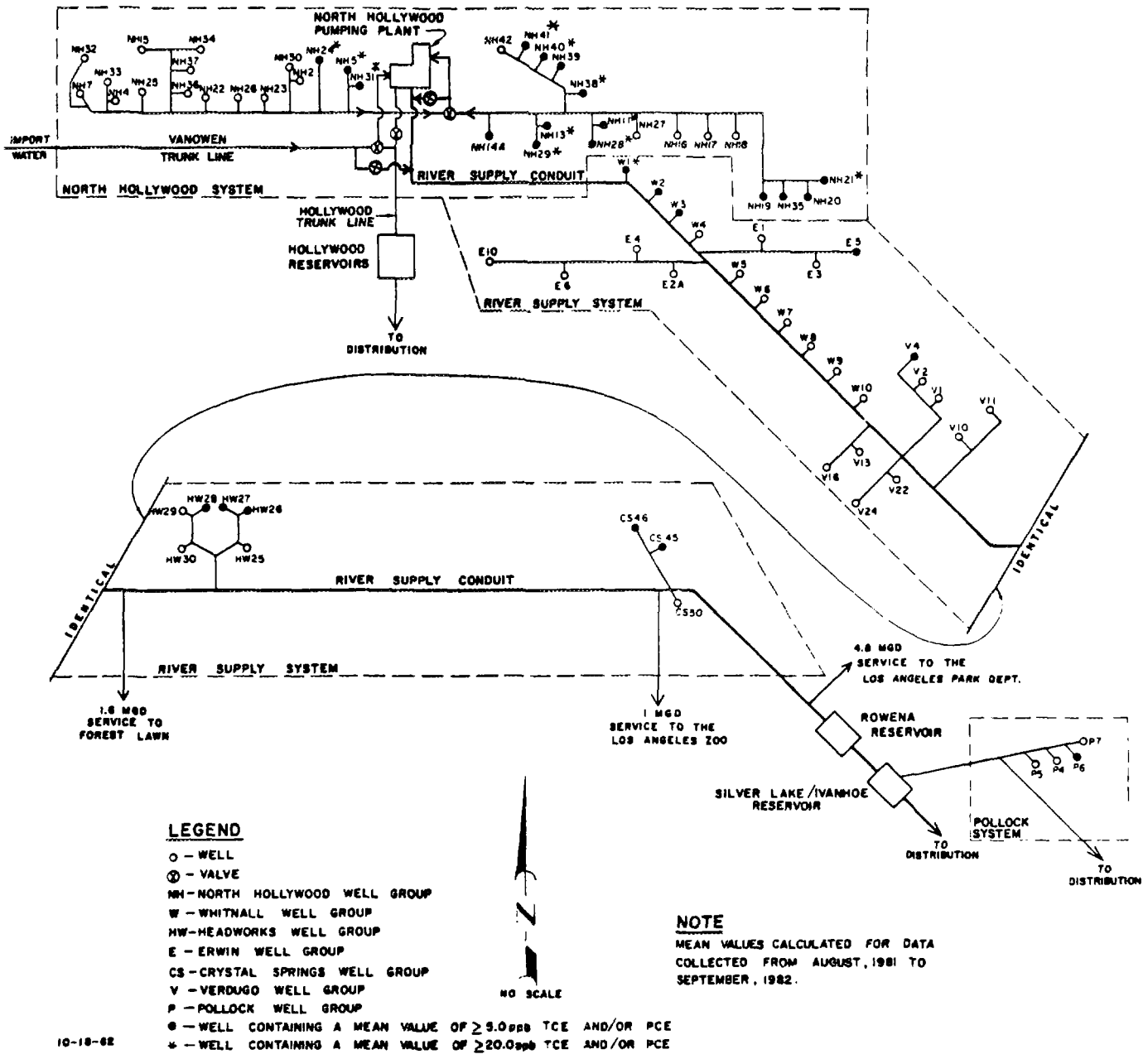
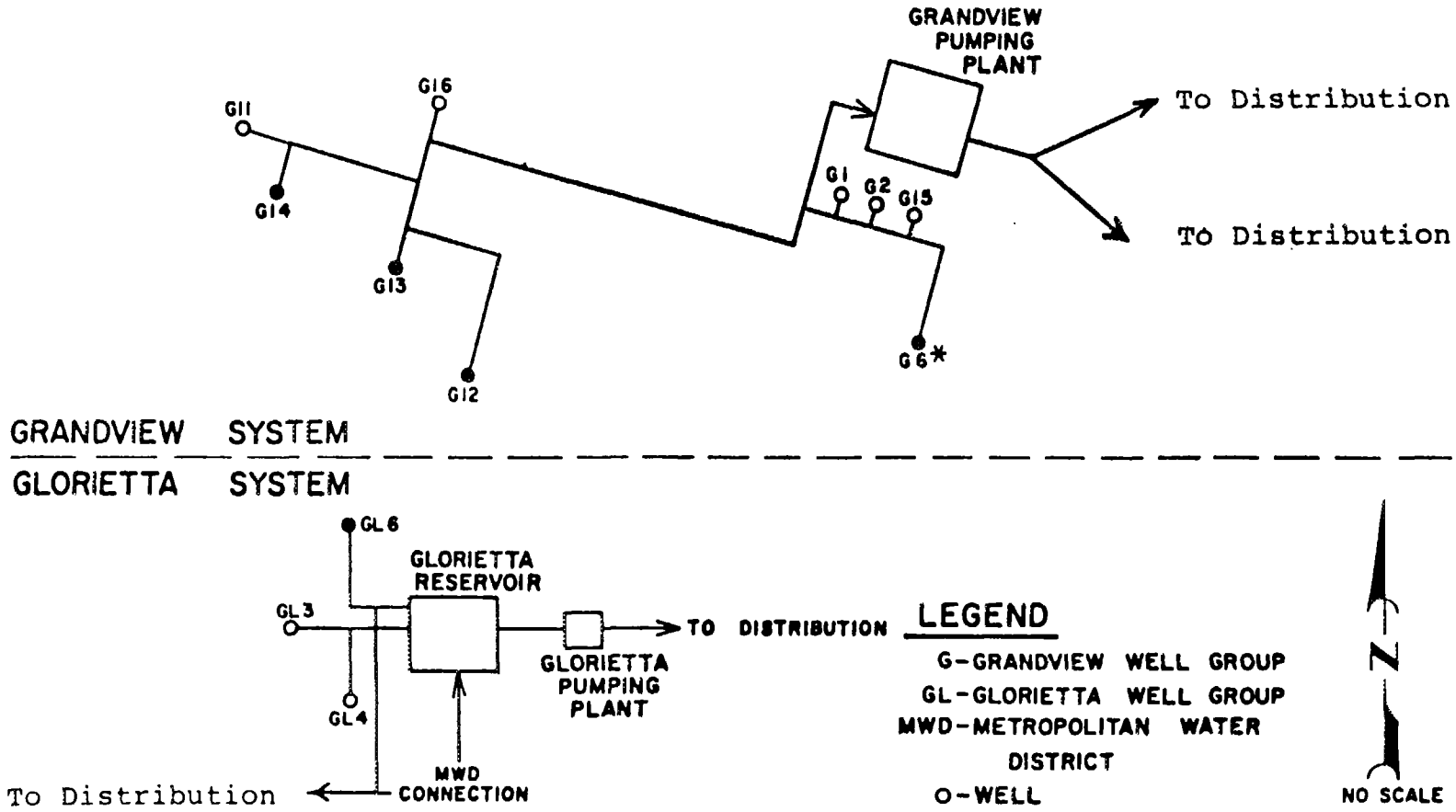


FIGURE A-7

CITY OF LOS ANGELES
GROUNDWATER COLLECTION AND DISTRIBUTION SYSTEMS
AFFECTED BY TCE AND PCE CONTAMINATION



CITY OF GLENDALE
GROUNDWATER COLLECTION SYSTEMS AFFECTED BY TCE AND PCE CONTAMINATION

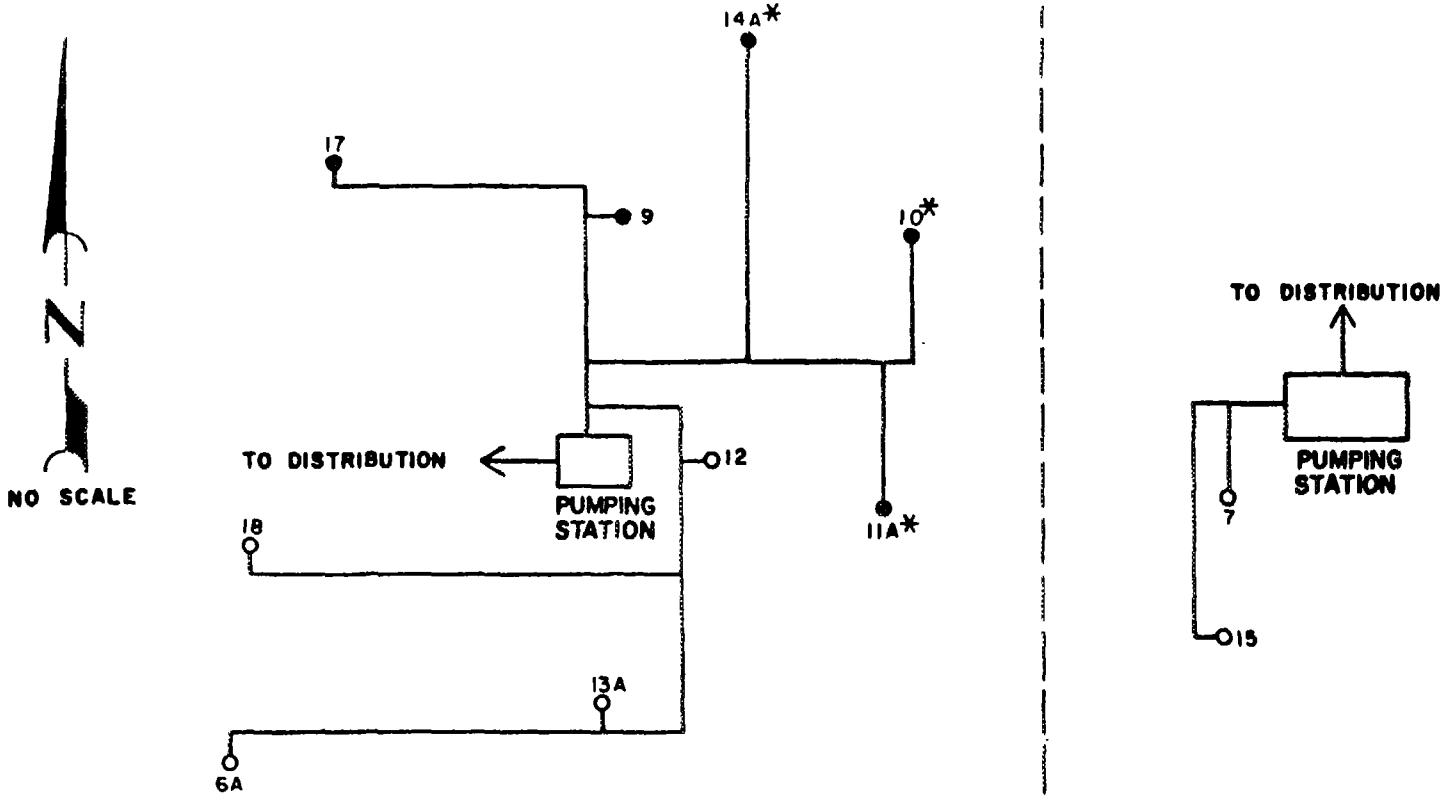


NOTE

MEAN VALUES CALCULATED FOR DATA COLLECTED FROM JANUARY, 1980 TO AUGUST, 1982.

FIGURE A-8

CITY OF BURBANK
GROUNDWATER COLLECTION AND DISTRIBUTION SYSTEMS AFFECTED BY TCE AND PCE CONTAMINATION



LEGEND

o – WELL

● – WELL CONTAINING A MEAN VALUE OF ≥ 5.0 ppb TCE AND/OR PCE

* – WELL CONTAINING A MEAN VALUE OF ≥ 20.0 ppb TCE AND/OR PCE

SYSTEM NO. 1 | SYSTEM NO. 2

NOTE

MEAN VALUES CALCULATED FOR DATA COLLECTED JANUARY, 1980 TO AUGUST, 1982.

10-18-82

FIGURE A-9

TABLE A-10

ESTIMATION OF TCE LEVEL

FULL DWP GROUNDWATER PRODUCTION

EXCLUDING WELLS OUT OF SERVICE AS OF 10-1-82

Well Field and No.	Rated Flow (cfs)	TCE* Level (ppb)	Cumulative Well Field Production (cfs)	Weighted Average of TCE in Cumulative Flow (ppb)
1) NH4	3.0	0	3.0	0
2) NH7	3.0	0	6.0	0
3) NH17	5.0	0	11.0	0
4) NH22	4.0	0	15.0	0
5) NH30	5.3	0	20.3	0
6) NH32	5.3	0	25.6	0
7) NH33	5.3	0	30.9	0
8) NH34	5.3	0	36.2	0
9) NH36	6.2	0	42.4	0
10) NH37	6.2	0	48.6	0
11) Erwin 1	4.0	0	52.6	0
12) Erwin 2A	2.7	0	55.3	0
13) Erwin 3	4.4	0	59.7	0
14) Erwin 4	4.0	0	63.7	0
15) Erwin 10	4.4	0	68.1	0
16) Whitnall 4	4.4	0	72.5	0
17) Whitnall 7	4.4	0	76.9	0
18) Whitnall 9	2.2	0	79.1	0
19) Verdugo 2	4.4	0	83.5	0
20) Verdugo 11	3.9	0	87.4	0
21) Verdugo 13	2.7	0	90.1	0
22) Verdugo 24	3.2	0	93.3	0
23) NH42	6.3	1.3	99.6	0.08
24) NH18	5.0	1.4	104.6	0.14
25) NH26	5.0	1.5	109.6	0.20
26) NH25	5.0	1.7	114.6	0.27
27) Whitnall 5	4.0	1.7	118.6	0.32
28) Whitnall 10	2.5	2.0	121.1	0.35
29) NH2	4.0	2.2	125.1	0.41
30) NH27	4.4	3.6	129.5	0.52
31) NH24**	5.4	5.0	134.9	0.70
32) Whitnall 3	4.0	5.2	138.9	0.83
33) Verdugo 4	3.2	6.3	142.1	0.95
34) NH35	3.2	6.4	145.3	1.1
35) Erwin 5	4.4	6.7	149.7	1.2

TABLE A-10 (Continued)

Well Field and No.	Rated Flow (cfs)	TCE* Level (ppb)	Cumulative Well Field Production (cfs)	Weighted Average of TCE in Cumulative Flow (ppb)
36) CS45	2.2	7.9	151.9	1.3
37) NH20	4.4	11.0	156.3	1.6
38) Headworks 25	4.0	11.0	160.3	1.8
39) CS46	4.4	13.1	164.7	2.1
40) Headworks 30	6.7	15.0	171.4	2.6
41) NH19	5.3	17.5	176.7	3.1
42) NH41	6.3	20.6	183.0	3.7
43) NH11	3.6	24.0	186.6	4.1
44) NH29	5.3	26.0	191.9	4.7
45) Whitnall 1	5.0	27.0	196.9	5.3
46) NH5	3.0	28.0	199.9	5.6
47) NH38	6.2	28.0	206.1	6.3
48) NH31	5.0	28.0	211.1	6.8
49) NH40	6.2	34.0	217.3	7.6
50) NH21	4.0	47.0	221.3	8.3
51) Headworks 26	4.0	55.0	225.3	9.1
52) Whitnall 2	5.0	55.0	230.3	10.1
53) NH13	3.2	62.0	233.5	10.8
54) Headworks 28	7.1	70.0	240.6	12.6
55) Headworks 27	4.0	130.0	244.6	14.5
56) NH28	5.3	185.0	249.9	18.1

Wells out of service for electrical or mechanical malfunction or other reasons as of 10-82: NH14A,15,16,23,39; Whitnall 6,8; Erwin 6; Verdugo 16,22; Crystal Springs 50, Headworks 29.

* Mean values calculated from data collected from August 1981 through August 1982. The analyses of 7 wells were adjusted to reflect recent higher TCE values through January 1983. The wells are: NH28, Whitnall 2, Headworks 25, 26, 27, 28, and 30.

** When packer is inflated.

TABLE A-11
ESTIMATION OF TCE LEVEL OF CUMULATIVE WELL FIELD FLOWS

CITY OF BURBANK
SYSTEM NO. 1

Well No.	Q (cfs)	TCE (ppb)	Mass of TCE in Well (cfs-ppb)	Cumulative Mass of TCE Entering System (cfs-ppb)	Cumulative Well Field Production (cfs)	Average TCE of Cumulative Flow (ppb)
18	3.1	0	0	0	0	0
6A	5.5	0	0	0	8.6	0
13A	4.6	2.5	11.5	11.5	13.2	0.87
17	3.5	3.3	11.6	23.1	16.7	1.4
12	4.2	4.3	18.1	41.1	20.9	2.0
11A	4.1	16.0	65.6	106.7	25.0	4.3
14A	5.8	44.0	99.8	156.5	30.8	5.1
10	3.4	184.0	625.6	782.1	34.2	22.9
CITY OF BURBANK SYSTEM NO. 2						
7	1.2	3.3	4.0	4.0	1.2	3.3
15	2.2	3.3	7.3	11.3	3.4	3.3
CITY OF GLENDALE GRANDVIEW WELL FIELD						
15	3.6	0	0	0	3.6	0
1	3.9	0	0	0	7.5	0
2	3.9	0	0	0	11.4	0
16	4.7	1.0	4.7	4.7	16.1	0.29
11	4.2	1.3	5.5	10.2	20.3	0.50
12	4.1	5.6	23.0	33.1	24.4	1.4
13	4.5	8.1	36.5	69.6	28.9	2.4
14	5.1	8.4	42.8	112.4	34.0	3.3
6	4.0	22.0	88.0	200.4	38.0	5.3
CITY OF GLENDALE GLORIETTA WELL FIELD						
		PCE				PCE
4	1.8	3.1	5.6	5.6	1.8	3.1
3	2.5	3.3	8.3	13.8	4.3	3.2
6	2.5	5.6	14.0	27.8	6.8	4.1

MASS BALANCE EQUATION FOR THE DETERMINATION
OF TCE CONTAMINATION LEVEL IN WELL FIELD FLOWS
FOR TABLES A-10 AND A-11

Governing Equation:

$$Q_1 C_1 + Q_2 C_2 = (Q_1 + Q_2) C_w$$

Where Q_1 = Rated Flow from Well 1

Q_2 = Rated Flow from Well 2

C_1 = TCE Level in Well 1

C_2 = TCE Level in Well 2

C_w = TCE Level in Well Field Output

Rearranging $$C_w = \frac{(Q_1 C_1 + Q_2 C_2)}{(Q_1 + Q_2)}$$

or

$$C_w = \frac{\Sigma(Q_i C_i)}{\Sigma Q_i}$$

Where Q_i = Rated Flow of an individual well adjusted for impact of system friction losses

C_i = TCE Level of an individual well

$(Q_i C_i)$ = Mass of TCE in an individual well flow

$\Sigma(Q_i C_i)$ = Mass of TCE in well field flow (Sump of mass of TCE from individual wells in a well field)

ΣQ_i = Well field flow (sum of rated flows from fields individual wells in a well field)

B. For groundwater with a long-term average analysis in excess of 20 ppb TCE, methods other than blending are recommended.

C. A groundwater quality monitoring program should be implemented in order to develop a more effective long-term program of groundwater blending.

4.2 Other Eastern SFVB Water Systems

Blending is not currently recommended for the other water systems for the following reasons.

A. Burbank and Glendale are currently utilizing imported water for supplying their customers and maintaining their well fields on a standby basis in case of a drought. Both Burbank and Glendale have limited capacity to blend their contaminated wells with uncontaminated wells under present system constraints. Substantial system modifications will be required to fully implement blending.

B. The Cresenta Valley County Water District reduces the volatile organic contaminant levels in their well water to acceptable levels during the course of present treatment for carbon dioxide removal.

C. San Fernando does not currently have a VOC contamination problem.

SUBTASK III-D

GROUNDWATER EXTRACTION/TREATMENT

1.0 Work Plan Objectives of Subtask III-D

To formulate plans involving the treatment of contaminated groundwaters.

2.0 Investigations

2.1 Background

The purpose of Subtask III-D was to evaluate processes that will allow contaminated groundwaters to be extracted from the SFVB, treated and then put to beneficial use.

Treatment methods studied for the removal of volatile organic contaminants from SFVB well water included packed tower aeration, spray aeration, diffused aeration, adsorption by Granular Activiated Carbon (GAC) and adsorption by synthetic resins.

Cost estimates and process evaluations were developed from information collected in an extensive review of technical literature. Based on this evaluation, the most cost-effective treatment method for removing TCE and PCE from contaminated groundwater was determined.

2.2 Scope

The formulation and evaluation of alternative plans for the treatment of contaminated groundwater involved the following:

1. An analysis of treatment technologies currently available for removing identified contaminants from source water in order to facilitate the selection of the most cost-effective process;

2. An analysis of the physical arrangement and operational flexibility of the groundwater collection systems affected by contamination and the identification of wells targeted to receive treatment;

3. An estimate of the unit treatment cost for each treatment technology; and

4. A determination of the important operational aspects of each alternative such as the required maintenance, treatment process stability,

efficiency and impact on existing water system operation.

3.0 Conclusions

From an evaluation of published data, technical reports and water quality evaluations for SFVB groundwater supplies, the following conclusions on treatment processes and costs were made.

3.1 Number of Wells Requiring Treatment

There are approximately 13 SFVB wells containing TCE at a long term average level of 20.0 ppb or greater which require some form of treatment in order to be operated without raising contaminant levels in delivered water above State DOHS action levels.

3.2 Results of Investigation

Under current State DOHS action levels of 5 ppb for TCE and 4 ppb for PCE in drinking water, it is necessary to provide treatment for wells containing high levels of TCE and/or PCE. Long duration extraction and treatment of groundwater from contaminated wells could accomplish the following:

A. Reclaim contaminated groundwater which is presently unusable.

B. Remove contaminants from the basin which could migrate and affect other wells.

C. Regain the use of well facilities which are not utilized when wells are taken out of service because of contamination.

D. Restore normal operational flexibility of the groundwater collection system.

3.3 Treatment Costs

The unit treatment costs of packed tower aeration, GAC adsorption, and diffused aeration are compared in Table A-12 and Figure A-10. Based on this subtask evaluation, packed tower aeration was determined to be the most cost-effective treatment method for removing VOC's from contaminated SFVB wells. Diffused aeration and GAC treatment processes involve higher treatment costs.

3.4 Other Emerging Treatment Techniques

Air-lift pumping, preferential pumping and the use of well packers are emerging groundwater contaminant control techniques which presently are in the developmental stages. While the reliability and effectiveness of these methods on a large scale

needs further study, results from a limited amount of pilot scale testing indicate that each has good potential to be a cost-effective contaminant control technique and should be investigated further.

3.5 Selection of Contaminant Control Techniques

Due to variability in the geologic conditions, the level of groundwater contamination, the locations of casing perforations, and the pumping rates for each well affected by groundwater contamination, the selection of the most suitable contaminant control techniques can vary throughout a well field. Optimum contaminant control methods can only be selected in local areas of a well field after a careful study of the interrelationship of many factors.

4.0 Recommendations of Subtask III-D

Based upon the findings of the Subtask III-D investigation, the recommendations on candidate wells and on the most cost-effective methods for treating these contaminated SFVB wells are as follows:

4.1 Candidate SFVB Wells

The following SFVB wells were selected as candidates to receive treatment on the basis of meeting well selection criteria outlined in the preceding Section 3.2.

CITY OF BURBANK
Public Service Department Well No. 14A

CITY OF GLENDALE
Grandview Well No. 6

CITY OF LOS ANGELES
North Hollywood Wells Nos. 5, 11, 13, 21, 28, 29, 31 and 40

4.2 Implementation Program

A three phase treatment program is recommended for consideration in the final recommendations of the plan. This program involves the employment of aeration treatment in the following phases.

Phase 1 Pilot test of packed tower aeration unit and an air-lift pumping unit at nearby wells.

Phase 2 Full-scale treatment unit using the selected process method from Phase 1 at a single SFVB production well.

TABLE A-12

SUMMARY OF PRELIMINARY TREATMENT COST ESTIMATES FOR

PACKED TOWER AERATION, DIFFUSED AERATION AND GAC ADSORPTION

(Based on August 1982 Dollars)

Cost Item	Cost Units	Treatment Process		
		Packed Tower Aeration[4]	Diffused Aeration[4]	GAC Adsorption
Capital[1]	(thousands of dollars)	360-625	800-1100	800
O & M[2]	(thousands of dollars)	29-40	120-205	112-145
Total Annual[3]	(thousands of dollars)	70-115	235-370	215-240
Unit Production	(dollars/1000 gallons)	.050-.080	.185-.295	.165-.195
Unit Production	(dollars/acre foot)	16-26	60-96	54-64

1. Capital cost based on 90 to 99 percent removal of TCE, influent level of 500 ppb, and a design flow of 5.4 cfs (3.5 MGD).

2. Operational and maintenance cost based on continuous operation at 100 percent design flow.

3. Total annual cost is a combination of the annual capital cost at 10 percent for 20 years and the annual O&M cost.

4. The evaluation of this treatment method did not include an estimate of the cost to remove TCE and other VOC's from the air used to purge the contaminated water. However, preliminary calculations by equipment manufacturers indicated that even with SCAQMD requirements for air pollution control equipment, the cost of packed tower aeration would still be significantly less than that of the other two treatment processes investigated.

TABLE A-12 (Continued)

5. Sources:

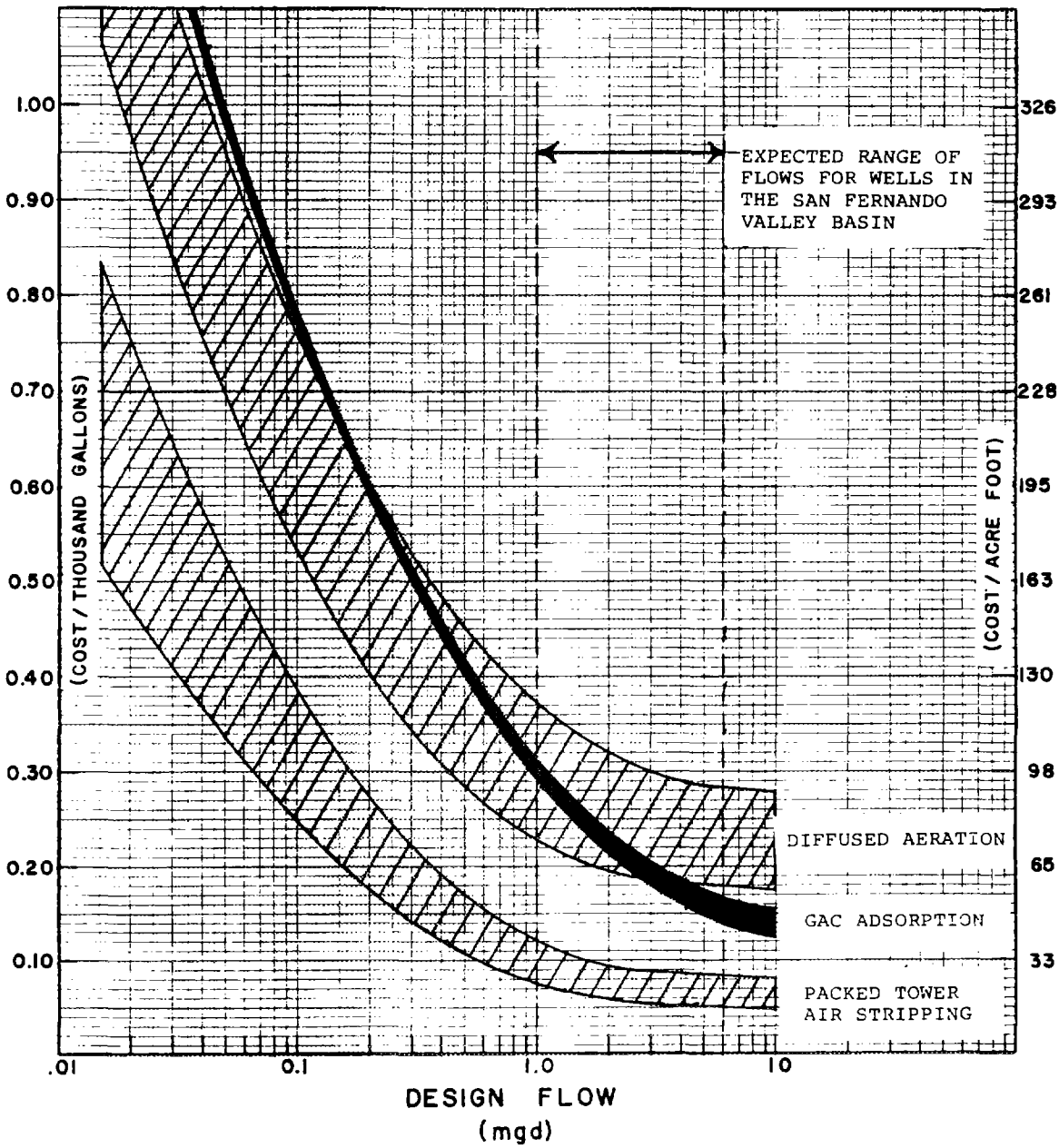
1) Ruggiero, Dominick D.; Ausubel, Robert, Nebolsine Kohlmann Ruggiero Engineers, P. C.; Removal of Organic Contaminants from Drinking Water Supply at Glen Cove, NY; Municipal Environmental Research Laboratory, Drinking Water Research Division, US Environmental Protection Agency Cincinnati, Ohio.

2) Malcolm Pirnie Incorporated; Preliminary Treatment Designs and Costs for Control of Volatile Organic Compounds; Prepared for the Office of Drinking Water - US Environmental Protection Agency, Washington, DC, April 1981.

FIGURE A-10

0000049

COMPARISON OF APPROXIMATE UNIT TREATMENT COST FOR
PACKED TOWER AIR STRIPPING, DIFFUSED AERATION,
AND GRANULAR ACTIVATED CARBON ADSORPTION
90 to 99 PERCENT TCE REMOVAL
(BASED ON AUGUST 1982 DOLLARS)



NOTE:

1. Cost calculated for the removal of trichloroethylene at an influent concentration of 500 ppb.
2. For each treatment process, upper and lower curves represent the approximate costs for 99 and 90 percent removal, respectively.
3. Unit treatment costs include the annualized capital costs for facilities and the annual operation and maintenance costs.
4. Capital costs are annualized at 10% for 20 years.
5. Operation and maintenance costs based on continuous year round operation.

Phase 3 Based upon Phase 1 and 2 findings, formulate and implement a long-term treatment program for the candidate wells listed in the preceding discussion.

SUBTASK III-E

REMOVAL/DISPOSAL OPTION

1.0 Work Plan Objectives for Subtask III-E

To formulate plans for the selective disposal of degraded groundwaters.

2.0 Investigation

2.1 Background

The Groundwater Removal and Disposal alternative is an engineering strategy designed to remove highly contaminated groundwaters from the aquifer. Consideration of the removal and disposal alternative is based on the assumption that removal is an aquifer treatment technique and will result in an improvement to the quality of the groundwater supply by purging the basin of contaminants. Under this assumption, pumping of highly contaminated wells will continue. However, the reuse of a contaminated well for groundwater production will not be allowed until contaminant concentrations fall below the action levels recommended by the State Department of Health Services.

2.2 Scope

This report is an engineering evaluation of the feasibility of removing and disposing of contaminated groundwaters from the groundwater basin of the SFVB as a management option for the control of groundwater contamination. The capacity of two systems within the SFVB were evaluated for the disposal of contaminated waters. They are:

1. The sanitary sewer system

2. The storm drain system including the Los Angeles River (LAR).

3.0 Conclusions

The Removal and Disposal Alternative involves the disposal of large quantities of groundwater in order to purge the basin of contaminants at harmful levels. For the Cities of Los Angeles, Burbank and Glendale, the combined disposal of groundwater from 13 contaminated wells over a six-month trial period is equivalent to a value of about $3 million based upon the current MWD water rate of $140 per acre-foot. Prolonged pumping requirements beyond this initial period will result in a proportional increase in the loss of valuable water resources and will not be justifiable under present conditions. The City of San Fernando was not involved in this

investigation since their groundwater supply is currently unaffected by contamination.

In addition to the monetary loss of this valuable resource, there are other considerations that currently make this alternative undesirable. The need to maintain sufficient groundwater reserves becomes even more vital after 1985 when the Metropolitan Water District of Southern California (MWD) will lose more than half of its legal entitlement to Colorado River water. The MWD is the major wholesaler of water for cities within the SFVB and the primary source of water supply for the Cities of Burbank and Glendale. To dispose of the large quantities of contaminated groundwater necessary to effect any long-term benefits to groundwater quality in the SFVB, may not be advisable under these circumstances.

Finally, the regulatory requirements relative to environmental considerations must be satisfied. The most feasible disposal option is the storm drain system. However, the discharge of contaminated groundwater to the storm drain system and the Los Angeles River must meet the requirements of the Los Angeles Regional Water Quality Control Board. The South Coast Air Quality Management District must also evaluate the air quality impact resulting from the release of the volatile contaminants to the atmosphere.

4.0 Recommendations of Subtask III-E

Although the benefits to be derived from the removal of contaminated groundwater are not readily quantifiable, it is desirable to intercept the contaminant before it disperses and migrates to other nearby wells. Since a high contaminant level generally is an indication that the well may be close to the source, removal of the contaminated groundwater is the most effective solution. When the implementation of blending or treatment measures cannot be accomplished in a timely manner, the disposal of the contaminanted groundwater to the storm drain system should be pursued as an interim measure. The disposal of contaminated groundwater also provides the safest means of monitoring a well before an appropriate engineering strategy could be developed and implemented. Therefore, the Los Angeles Regional Water Quality Control Board should be requested to develop specific criteria or conditions under which the disposal of contaminated groundwater to the storm drain system may be accomplished.

Further studies should be undertaken to: 1) determine the vertical distribution of contaminants in the aquifer, 2) define the contaminant plume patterns, and 3) locate the source or sources of the contaminants affecting the wells. Such information will result in the development of a more effective aquifer restoration program and minimize groundwater losses resulting from the migration of contaminants and from the possible implementation of Removal and Disposal on an interim basis.

SUBTASK III-F

NO PROJECT ALTERNATIVE

1.0 Work Plan Objectives of Subtask III-F

To determine the effects of the No-Project Alternative.

2.0 Investigation

2.1 Background

The objective of the No Project Report is to analyze the effects of not implementing a plan to remedy the current groundwater contamination problem in the SFVB. It is assumed "No Project" means that no capital expenditures will be incurred and no deviation from current operating procedures will result in handling the present contamination of the wells in the SFVB. Further, it is assumed that wells producing water contaminated beyond the blending capabilities of the water distribution system will be taken out of service.

Data on current contamination levels and current water system operations was compiled. Costs of replacement supplies of water for contaminated SFVB groundwater were determined.

2.2 Scope

An analysis of the impact of replacing SFVB groundwater with Metropolitan Water District (MWD) water was performed, and an examination of groundwater quality impacts within the SFVB aquifer was considered if No Project was adopted.

3.0 Conclusions

3.1 Impact on Groundwater Supply

Based upon an evaluation of available data and current water operations, the location and concentration levels of contaminants in the SFVB groundwater could have a significant future impact on the water systems for the Cities of Los Angeles, Burbank and Glendale depending upon well field operational patterns. Although current water operations are able to tolerate the loss of some groundwater production capability under normal operating conditions, the future impact on the capacity of these water systems will depend upon the total demand upon the groundwater basin. At the very least, these cities can anticipate higher water production costs as a direct result of the No Project Alternative due to the loss of additional wells because of contamination.

3.2 New Replacement Wells

The loss of productive wells may necessitate the construction of new replacement wells at alternate locations to restore groundwater production capability. The installation of a new well is estimated at approximately $210,000 per well not including the groundwater collection line between the well and the distribution system. Substantial additional costs may be incurred if a remote location is required.

3.3 Replacement Water Costs

The loss of groundwater production capability may necessitate additional purchases of water from the Metropolitan Water District of Southern California (MWD) The current DWP cost for groundwater pumping is approximately $30 per acre-foot. For the City of Los Angeles, the cost for MWD water as a replacement for groundwater is $140 per acre-foot under long-term contract provisions. The Cities of Burbank and Glendale currently store groundwater for use under emergency conditions. The cost for MWD water as a replacement under emergency conditions is $344 per acre-foot if the groundwater were unavailable. Based upon current projections, however, the MWD water rates could increase more than two times the present rates by 1990.

4.0 Recommendations of Subtask III-F

The No Project Alternative is not considered to be a remedy to the groundwater contamination problem in the SFVB. By failing to make provision for the removal of contaminants from the aquifer, the contaminants can be transported by basin currents to other locations and adversely affect groundwater in other portions of the basin. Further delays in resolving the current basin contamination problem could result in the need for more costly solutions.

It is recommended not only that a more positive solution to the groundwater contamination problem be pursued but also that future planning for water supply wells in the SFVB consider groundwater quality as one of the primary concerns. Since recent developments may significantly limit the ability of the MWD and the State Water Project to provide a sufficient supply of water, it is imperative that a reliable groundwater supply of uncompromisable quality should be developed.

TASK IV

COST-EFFECTIVENESS ANALYSIS OF ALTERNATIVE CONTROL PLANS

SUBTASK IV-A

FACILITIES

1.0 Work Plan Objectives of Subtask IV-A

To determine the cost-effectiveness of groundwater quality control measures including aeration, preferential pumping, blending and disposal.

2.0 Investigation

2.1 Background

The findings and recommendations of the various Task III reports on the different control/treatment techniques for managing in situ contaminants in the SFVB were examined to determine the costs and benefits that could be derived for each strategy.

2.2 Scope

Cost analyses were performed on the different toxic waste control/treatment strategies that were recommended for use by the Task III reports. The cost-effectiveness of each alternative was compared where costs and benefits were developed in the various Task III subtasks.

3.0 Conclusions

Some of the Task III recommendations that provide for the control and treatment of organic contaminants found in the groundwaters of the SFVB can be implemented concurrently in a cost-effective manner. The alternatives were combined into a corrective action plan.

The treatment alternatives relating to Removal and Disposal, and No Project (Subtasks III-E and III-F) were deemed not to be cost-effective because of the high cost of purchasing replacement water.

The cost to the Los Angeles Department of Water and Power (DWP) system for each recommended alternative, and the total cost of the recommended alternatives, is outlined in Table A-13.

4.0 Recommendations of Subtask IV-A

With the exception of the Removal/Disposal and No Project Alternatives, which were not recommended for adoption in Task

TABLE A-13

ESTIMATED COSTS OF RECOMMENDED ALTERNATIVES - DWP SYSTEM

Subtask	Alternative	Capital Cost (000's of $)	Annual O&M Cost (000's of $)	Increase in Unit Cost ($/A.F.)
IIIA	a) Pump highly contaminated wells	-	-	-
	b) Install well packers (Note 1)	40	-	-
	c) Perforate future wells below clay lenses	-	-	-
IIIB	Water Level Management	-	-	-
IIIC	Blend groundwater with groundwater for wells containing 5-20 ppb TCE	Minimal Cost Increase		
IIID	Aeration for wells containing more than 20 ppb TCE (Note 2)	2,600	180	+36
	TOTAL	2,640	180	+36

Note 1 - Based upon 7 DWP candidate wells - includes cost of installing packer.
Note 2 - Based upon 8 DWP candidate wells.

III, the remaining alternatives presented in the subtasks of Task III are considered to be desirable for upgrading the quality of groundwater of the SFVB. Recommendations are proposed in the following sections for those Task III alternatives for which adequate cost data is available or can be estimated.

4.1 Install Additional Well Packers

It is recommended that the use of well packers be included in the Task VI Final Plan as a Recommended Alternative Method for upgrading groundwaters of the SFVB.

4.2 Perforate Future Well Casings Below Clay Lenses

The perforation of future well casings in zones below clay lenses is recommended as a cost-effective procedure since it involves minimal additional cost, and provides added protection to the quality of the groundwater supply against contamination by the waters of the upper unconfined zone which can more easily contain contaminants resulting from surface spills.

4.3 Install Any New Wells in Uncontaminated Areas of the SFVB

When new wells are installed, they should be located in uncontaminated areas of the groundwater basin of the SFVB to make possible an effective program of preferential pumping and the attenuation of groundwater contaminants.

4.4 Implement Blending and Treatment

Adopt the proposed Blending and Treatment recommendations of Subtasks III-C and III-D respectively as described in the earlier sections on those subtasks.

TASK V

FINANCIAL, INSTITUTIONAL AND MANAGEMENT PLANNING SUMMARY

1.0 Work Plan Objectives of Task V

The overall objective of Task V of the GWQMP-SFVB study is to develop an organized framework for the successful implementaiton of the recommended plan. The final work plan for the GWQMP-SFVB study states the objectives of this task as follows:

1.1 Funding Alternatives

"To identify actual and potential sources of funding for continuous project implementation";

1.2 Institutional/Management Arrangement

"To identify and evaluate alternative institutional and management arrangements for project implementation";

1.3 Financial/Institutional Plans

"To develop candidate financial/institutional approaches for the continuous (or phased) implementation of project strategies".

2.0 Investigation

2.1 Background

The results of all subtask investigations prior to Task V were evaluated. Eight specific study recommendations were identified as a result of this review for inclusion in the final plans and for further evaluation in this subtask. These recommendations were designed to both increase source control of contaminants and to mitigate the effects of in-situ contamination.

2.2 Scope

The product of this task is a proposed implementation plan for use by the affected agencies. The proposed implementation plan is designed to identify primary agency responsibilities, and financial and institutional arrangements necessary to achieve the goals of the recommended plan. An evaluation of funding alternatives and of the existing institutional framework as it relates to overall planning, management, operating and regulatory functions was also presented in these subtask investigations.

3.0 Conclusions

Based on the findings of these Subtask V investigations, the conclusions relative to the implementation of the proposed recommendations are presented as follows.

3.1 Organizational Framework

The organizational framework proposed in this task assigns the major responsibility for the implementation of the recommended groundwater quality management plan to local agencies. The report acknowledges the existence of the local regulatory structure and attempts to complement and to reinforce existing roles and activities. Although no new agency is proposed, local institutional roles and responsibilities, primarily in terms of enforcement, permit issuance, inspection and funding should be reevaluated.

3.2 Institutional Framework

The institutional framework for the primary affected agencies is shown in Table A-14. Those agencies or departments within the local agencies that are assigned lead roles, have the major responsibility or authority. The agencies or departments assigned support roles conduct related activities which may require a coordinated effort. The agencies or departments assigned advisory roles provide technical assistance in program planning and development.

3.3 Financial Arrangements

Table 3 of the Overview of this Report presents a summary of the financial arrangements for each city. An estimate of the funds required for the implementation of each of the final recommendations is also included.

3.4 Proposed Plan Implementation

A proposed plan implementation schedule is presented in Table 4 of this Report. A time schedule for each of the final recommendations is shown. Successful implementation, however, is contingent upon the availability of funds.

4.0 Recommendations of Task V

In order to implement a successful groundwater quality protection program, the following recommendations are presented for consideration.

4.1 Interagency Coordination

Since the implementation of the recommended plan relies primarily on the activities of various local agencies, interagency coordination should be encouraged to consolidate

management arrangements, to avoid interagency conficts, and to assure continuous implementation through participation in the Interagency Advisory Committee proposed by this study.

4.2 Regional Implementation

State and County agencies should participate in the Interagency Committee to assure compliance with the objectives of the recommended plan on a regional basis. State and County agencies could also provide additional support in the adoption and enforcement of regulations for the prevention and control of groundwater contamination.

4.3 Funding Alternatives

Local agency commitment for the implementation of the recommended plan depends upon the availability of funds. Because of current economic conditions, the arrangement of funding will require special attention. Where applicable, service charges, user fees and permit fees are recommended as the primary funding sources. Federal and state funds should also be pursued to the maximum extent.

TABLE A-14

SUMMARY OF INSTITUTIONAL ARRANGEMENTS FOR PRIMARY AFFECTED AGENCIES

RECOMMENDATION	WATER DEPARTMENT	INDUSTRIAL WASTE SECTION	PUBLIC WORKS DEPARTMENT	BUILDING DEPARTMENT	FIRE DEPARTMENT	PLANNING DEPARTMENT	RWQCB	STATE AND COUNTY DOHS
1. PUBLIC EDUCATION PROGRAM	L	S			S		S	S
2. REGULATION OF PRIVATE DISPOSAL SYSTEM	A	S	L	S			S	S
3. AUGMENTED ENFORCEMENT PROGRAM	A	S			S		S	L
4. REGULATION OF STORAGE TANKS, SUMPS	A	S		S	S		L	S
5. SMALL QUANTITY HAZARDOUS WASTE DISPOSAL PROGRAM*	A	S					S	S
6. REGULATION OF LANDFILLS	S					S	L	
7. GROUNDWATER MONITORING PROGRAM	L						S	
8. AQUIFER MANAGEMENT AND GROUNDWATER TREATMENT PROGRAM	L						A	A

*LEAD AGENCY YET TO BE DETERMINED

L - LEAD ROLE
S - SUPPORT ROLE
A - ADVISORY ROLE

TASK VI

FORMULATION OF RECOMMENDED PLAN

Introduction

The formulation of a recommended plan involves the evaluation and analysis of previously identified waste control measures identified in the subtask investigations as to costs and overall effectiveness. Acceptable alternatives were also evaluated on the basis of ease of implementation and impact on the groundwater contamination problem.

Formulation of the recommended plan was carried out in the following three phases: a) Preliminary Draft Plan Development and Impact Assessment, b) Preliminary Draft Plan Review and c) Formulation of the Recommended Plan.

1.0 Work Plan Objectives of Task VI

The overall objective of Task VI is to develop a recommended plan of action for the protection of SFVB groundwater quality and for the correction of existing groundwater quality problems in the basin. The specific objective of Task VI as stated in the GWQMP-SFVB Final Work Plan are as follows:

1.1 Draft Plan Development

To evaluate control strategies detailed in Tasks II and III for feasibility ranking; to develop a preliminary draft plan consisting of candidate control measures; to evaluate the environmental, social and financial impacts of the draft plan.

1.2 Draft Plan Review

To distribute the draft plan to participating agencies for cooperative review and comment; to incorporate reviews into the plan for the development of a recommended plan.

1.3 Formulation of Recommended Plan

To prepare a final recommended plan utilizing revisions to the draft plan; to transmit recommended plan to participating agencies for conditional approvals.

2.0 Investigation

2.1 Background

Plans of action for the protection of SFVB groundwaters and for the control of existing contamination were developed

from information presented in previous Task investigtions. Based on an evaluation of alternative toxic material control plans, the draft plan was formulated and is recommended for adoption.

2.2 Scope

The formulation of the draft plan involved the following:

1. Assessment of alternative control plans and their effectiveness in providing solutions based upon a consideration of all pertinent factors including facility requirements, design and construction, operation and maintenance, inter-agency monitoring, enforcement capability and environmental impact;

2. Selection and further development of hazardous material control measures based on anticipated effectiveness of selected alternative systems, costs of treatment processes and facilities, and interagency cooperative procedures for plan implementation;

3. Distribution of the recommendations of the draft plan for review and comment to SCAG, the participating agencies and committees, and to the general public at a public meeting;

4. Preparation of a final recommended plan which documents and responds to each draft plan comment received; and

5. Transmittal to SCAG for formal 208 plan update and to the particpating agencies for their endorsement.

TASK VII

208 PLAN AMENDMENT AND ENVIRONMENTAL DOCUMENTATION

1.0 Work Plan Objective of Task VII

The overall objectives of Task VII are as follows:

1. To prepare a draft amendment to the 208 Areawide Waste Treatment Plan for the South Coast Planning Area, to incorporate the recommendations of the Groundwater Quality Management Plan for the San Fernando Valley Basin.

2. To prepare the necessary environmental documentation for the plan amendment.

2.0 Scope

The Southern California Association of Governments (SCAG) will prepare the draft 208 Plan Amendment and environmental document under a separate report.

SCAG will circulate the draft 208 Plan Amendment and environmental document to the participating agencies for review and comment. In addition, a public hearing will be held for public viewing of the plan. SCAG will prepare a responsiveness statement subsequent to the hearing. SCAG will review comments and recommendations by participating agencies and incorporate comments into a final recommended 208 Plan Amendment/Environmental Documentation.

SCAG will secure formal commitments from local jurisdictions and management agencies to implement the plan amendment and will prepare a report on implementation commitment. The SCAG Executive Committee will adopt the 208 Plan Amendment/Environmental Documentation and submit the plan and commitments report to the State Water Resources Control Board and EPA for formal certification and approval.

TASK VIII

PUBLIC PARTICIPATION

1.0 Work Plan Objective of Task VIII

The goal of the public participation program is to educate, inform and provide access for public and industry support, input and comment to the final plan.

Several specific activities and goals of the program, as defined in the final work plan, are described below.

1.1 Public Information

To provide readily understandable information on a periodic basis to the consumer population and the general public regarding project tasks, findings and plan recommendations; to collect and evaluate public input to the project.

1.2 Industry Information

To provide industry in the study area with increased awareness of the interrelationships of groundwater quality and toxic contaminants; to provide written information to industry in the form of project data, brochures and leaflets describing the need for proper toxic waste containment and disposal and urging industry to practice good on-site housekeeping.

1.3 Local Advisory Group

To provide representatives from the general public, industry, public interest groups and agencies in the Staff Advisory Committee for the purpose of assisting SCAG in specific phases of the public participation program.

1.4 Evaluation of Public Input and Integration into Plans

To evaluate the input from the public participation program and to incorporate public input and comments into the public participation program.

2.0 Investigation

2.1 Background

Participation by the following affected groups was solicited in forming the Citizens' Advisory Committee (CAC).

1. Private Citizens Group - This group includes people who will not incur a financial gain or loss greater than that of an average homeowner, taxpayer or consumer as a result of any action likely to be

recommended in the plan.

2. Public Interest Group - A public interest group is defined as an organization which reflects a general civic, social, recreational, environmental or public health perspective in the area, and which does not directly reflect the economic interests of its membership.

3. Public Officials Group - Persons holding an elected position or their designated appointees.

4. Economic Interest Group - Citizens or representatives of organizations with substantial economic interests in the plan or project.

2.2 Scope

The CAC members provided public input to the formulation of the GWQMP-SFVB final plan. CAC member comments were solicited on individual GWQMP-SFVB subtask reports. CAC members assisted in setting up the public participation and public meeting segments of this subtask.

3.0 Conclusions

3.1 Citizens Advisory Committee

The CAC was formed at the beginning of the GWQMP-SFVB study to provide the public with the opportunity to participate in the management planning process. (See the Acknowledgements for a complete listing of all CAC members and the organizations they represented.)

Members' comments about various aspects of the GWQMP-SFVB during meetings were recorded and addressed by DWP staff members in the minutes of the CAC meetings. Although this was not a decision making body, members' comments were also requested on the preliminary drafts of the various subtask reports prepared for the study, and included in the respective final subtask reports. The CAC was also given the opportunity to comment on various aspects of the formulation of the final groundwater quality management plan and to complement other mechanisms of the public participation process.

CAC members participated in numerous presentations of study findings and preliminary recommendations. The CAC members also served as liaisons for various concerned interest groups in the study area.

In addition, the formation of the CAC fulfilled a

requirement of the 208 Planning Grant under Title 40, Part 25 of the U.S. Code of Federal Regulations.

3.2 Public Presentations

Beginning in September 1982 approximately 30 presentations of the preliminary findings and recommendations of the GWQMP-SFVB were made to a wide variety of business, political and environmental groups. Public input and suggestions to improve the GWQMP-SFVB were solicited, and incorporated into the final plan.

3.3 Public Meeting

A public meeting was held to obtain public input and inform the community of the nature of the groundwater contamination problem and the proposed recommendations to deal with the problem. The meeting was held in the North Hollywood area because of its central location in the SFVB and the severity of the contaminated groundwater in that particular area of SFVB. Meeting announcements were distributed to over 300 commercial and industrial establishments in the area. Newspaper articles and notices of the meeting were published in local SFVB newspapers to inform residents of the meeting. Comments made by people attending the meeting were recorded and taken into consideration in the formulation of the final plan.

TASK IX

TECHNICAL ADVISORY COMMITTEE

1.0 Work Plan Objective for Task IX

To provide technical advisory assistance to DWP staff and provide coordination between participating agencies.

2.0 Investigation

2.1 Background

Due to the regional nature of the project, the many sources of information and the need for interagency cooperation, a Technical Advisory Committee (TAC) was established. This committee consisted of individuals representing the participating agencies. Agencies who participated in the TAC are:

- Los Angeles Department of Water and Power
- Southern California Association of Governments
- Bureau of Engineering, City of Los Angeles
- Bureau of Sanitation, City of Los Angeles
- Regional Water Quality Control Board, Los Angeles
- Los Angeles City Department of Planning
- City of Burbank
- City of Glendale
- Los Angeles County Flood Control District
- City of San Fernando
- Los Angeles County Department of Health Services
- State Department of Health Services
- Los Angeles City Fire Department
- ULARA Watermaster
- State Water Resources Control Board

2.2 Scope

TAC member participation was in the form of specified or donated project task work, report writing, data gathering and analysis, public participation, and other advisory functions. Each member had the opportunity to make comments on each GWQMP-SFVB subtask report. SCAG assisted in the coordination of overall project work. A written cooperative agreement was developed in order to facilitate this coordination.

3.0 Conclusions

The TAC provided technical assistance in the form of comments on matters brought before the committee during the regular bimonthly meetings and on each individual GWQMP-SFVB subtask report. The TAC also offered advice in formulating the final plan, and assisted in developing the roles that each agency could take in implementing the recommendations of

GWQMP-SFVB. A complete listing of all TAC members and the organizations/agencies they represented is included in the Acknowledgments to the final plan.

4.0 Recommendations

4.1 Continue TAC Function as an Interagency Committee to Ensure Uniform GWQMP-SFVB Implementation Basinwide

Since the implementation of the GWQMP-SFVB recommendations can affect many different agencies and cross administrative, political and municipal boundaries, a concerted effort must be made to fully coordinate their activities into a uniform implementation program. In order to ensure that the needs and concerns of all parties are met, it is recommended that representatives of these agencies continue to serve in a committee structure in order to coordinate and resolve the technical, administrative and political aspects of these recommendations and ascertain orderly implementation. Such a committee could also play an important role in developing inter-city joint powers agreements or other applicable arrangements to facilitate the uniform implementation of these recommendations over the entire basin.

4.2 Interagency Committee Membership

The current agencies represented on the TAC should continue to participate in and coordinate their activities through the Interagency Committee.

ABBREVIATIONS AND GLOSSARY

ABBREVIATIONS

The following is a list of abbreviations used in this report.

ac-ft	- acre feet
BMP	- best management practice
CAC	- Citizens' Advisory Committee
cfs	- cubic feet per second
CTC	- carbon tetrachloride
DOHS	- Department of Health Services
DWP	- Los Angeles Department of Water and Power
EPA	- United States Environmental Protection Agency
GAC	- granular activated carbon
GC-MS	- gas chromatograph - mass spectrometer
gpd	- gallons per day
GWQMP	- Groundwater Quality Management Plan
LAR	- Los Angeles River
LACFCD	- Los Angeles County Flood Control District
LACSD	- Los Angeles County Sanitation District
MWD	- Metropolitan Water District of Southern California
NPDES	- National Pollutant Discharge Elimination System
OSHA	- Occupational Safety and Health Administration
PCE	- perchloroethylene or tetrachloroethylene
PDS	- private disposal system
ppb	- parts per billion (ug/l)
ppm	- parts per million (mg/l)
RCRA	- Resource Conservation and Recovery Act
RWQCB	- Regional Water Quality Control Board, Los Angeles Region
SCAQMD	- South Coast Air Quality Management District
SCAG	- Southern California Association of Governments
SFV	- San Fernando Valley
SFVB	- San Fernando Valley Basin
SIC	- Standard Industrial Classification
SWRCB	- State Water Resources Control Board
TAC	- Technical Advisory Committee
TCE	- trichloroethylene
TDS	- total dissolved solids
ULARA	- Upper Los Angeles River Area
VOC	- volatile organic compound
WRP	- water reclamation plant

GLOSSARY

acre-foot - The volume of water that would cover an area of one acre to a depth of one foot. This volume is equivalent to 325,851 gallons. A typical family of five uses approximately one acre-foot of water each year.

action level - Recommended interim water quality criteria established by the California State Department of Health Services for organic contaminants in drinking water. The action levels of 5 ppb and 4 ppb for TCE and PCE, respectively, are based on the probability of an excess cancer risk of one in a million. These action levels are at the lower limits of EPA's Suggested No Adverse Response Levels and represent a conservative estimate of the eventual standard.

air stripping - A water treatment process whereby volatile organic compounds are removed from drinking water by contact with large volumes of air. These compounds are transferred out of solution and into the surrounding atmosphere.

aquifer - Any geologic formation of sufficient porosity and permeability to store, transmit and supply water to wells or springs. An aquifer which is overlain by impermeable material and exhibits a piezometric or pressure head is a confined aquifer. An aquifer which has a free water surface is an unconfined aquifer.

best management practice - Those methods and procedures that protect employee and public health, and groundwater quality through the prevention of spills or leakages during the storage, handling, or disposal of hazardous materials.

blending - The process of mixing waters of varying quality from two of more different sources in order to produce a homogeneous blend that is of good quality and meets all recommended quality standards.

capillary zone - The zone above the water table wherein water is held by capillary action. The capillary zone is an intermediate or transition zone between the saturated and unsaturated zones of the aquifer.

cone of depression (pumping hole) - The change in the slope of the piezometric or water table surface that results from pumping of groundwater from wells. This change causes water to flow towards the well from surrounding areas.

conjunctive use - The coordinated use and management of surface and groundwater supplies. In general, an aquifer is used to store recharge water during years of above average

rainfall, or "wet" years for withdrawal during years of extended dry or drought conditions.

groundwater - Water in the part of a basin or aquifer that is wholly saturated, or in the zone of saturation.

hazardous materials - There are several different functional definitions of hazardous materials relative to the regulations and activities of various agencies. However, a more appropriate definition of hazardous materials should be similar to the definition of hazardous wastes as defined in Chapter 6.5, Division 20 of the California State Health and Safety Code. Hazardous materials, including all hazardous wastes, means any liquid, solid, or gaseous material or combination of materials "which because of its quantity, concentration, or physical, chemical, or infectious characteristics may either:

(a) Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness.

(b) Pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of, or otherwise managed."

imported return water - Water supplied from a source outside of the SFVB that percolates into and recharges the basin.

native groundwater - That portion of the groundwater supply which occurs naturally as rainfall and percolates to the water table and recharges the basin.

perchloroethylene (or tetrachloroethylene) - A volatile organic solvent currently used in dry cleaning primarily, and in other manufacturing, plating and industrial applications. Perchloroethylene is less soluble and volatile than trichloroethylene (TCE). It was the major replacement used for TCE after restrictions were placed on the use of TCE due to air quality considerations.

percolation - The downward movement of water through the interstices and pores of the unsaturated zone of an aquifer. Percolation occurring just at the ground surface is termed infiltration. Deep percolation indicates that percolating water reaches the water table, or saturated zone, and recharges the aquifer.

permeability - The property of a soil or an aquifer which permits the movement of groundwater under a hydraulic gradient.

private disposal systems - On-site wastewater disposal systems that consist of septic tanks, cesspools or other wastewater retention units, and which discharge their effluent to the ground, usually through a network of

subsurface perforated pipes in an area referred to as a leach field.

recharge water - Water that enters an aquifer to replenish groundwater supply. Recharge can occur from the infiltration and deep percolation of rainfall and other applied surface waters or through subsurface inflow from an adjacent aquifer.

rising water - Groundwater under a hydraulic gradient that emerges at the ground surface through a spring or artesian well.

small-quantity waste generator - Any individual or business that generates hazardous wastes in such small quantities that they may not be regulated and may not have a cost effective method of disposal.

sensitive groundwater area - Any area over the groundwater basin where there is a relatively high natural susceptibility to contamination from hazardous materials that are discharged to the ground. This is primarily in areas nearest to well fields and where percolation rates and permeability are high.

trichloroethylene - A volatile organic solvent used in manufacturing, dry cleaning, plating and other industrial degreasing applications. The use of TCE has been severely restricted since 1966 due to air quality considerations. The solubility of TCE in water is 1,100 mg/l which is more than 200,000 times the action level of 5 ppb recommended by the State DOHS.

valley fill - The generally unconsolidated or loosely consolidated erosional debris (sands, silts, clays and gravels) that have been deposited within a valley over geologic time.

water table - The free standing surface of groundwater in an unconfined aquifer that is under atmospheric pressure.

zone of aeration (unsaturated zone) - The zone of an aquifer extending from the ground surface to just above the water table wherein the interparticle pore spaces of the soil are filled partially with air and partially with water.

zone of saturation - The zone in an aquifer wherein all pore spaces in the soil are filled with water. This generally consists of the zone beneath the water table and some of the capillary zone above the water table.

COMMENTS

The following comments were received from members of the TAC and CAC concerning the preliminary draft of the Groundwater Quality Management Plan. These comments have been consolidated into those which deal with major topics. Comments concerning editorial or organizational matters have received remedial staff action.

Topic		Comment by	Page
A. Reclaimed Water and Water Reuse	1.	William F. Garber Assistant Director Bureau of Sanitation City of Los Angeles	1
	2.	Max Bookman Engineering Consultant for Burbank and Glendale	1
B. Removal and Disposal of Contaminated Groundwater	3.	Max Bookman Engineering Consultant for Burbank and Glendale	2
C. Landfills	4.	Max Bookman Engineering Consultant for Burbank and Glendale	2
	5.	Mirian Gensemer Southern California Association of Governments	3
	6.	Hank Yacoub Los Angeles Regional Water Quality Control Board	3
D. Storage Tanks	7.	Hank Yacoub Los Angeles Regional Water Quality Control Board	3
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Topic		Comment by	Page
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F. Public Education Program	12.	John Mitchell Los Angeles County Flood Control District	5
	13.	Oscar Balaguer State Water Resources Control Board	5
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	15.	Mike Miller Bureau of Sanitation City of Los Angeles	5
H. "Action Levels"	16.	Carl Johnson Public Service Commission City of Glendale	6

A. Reclaimed Water and Water Reuse

Comment No. 1 by William F. Garber, Assistant Director Bureau of Sanitation, City of Los Angeles

I find the final plan to be comprehensive and well done. I would make only one general suggestion. That is that perhaps the possible inputs from reclaimed water and the present input from spread storm waters should be examined a little more closely. To illustrate, if the 40 MGD and 20 MGD inputs from the Donald C. Tillman (Sepulveda) and Los Angeles-Glendale WRP are percolated through spreading basins, approximately 66,000 acre feet per year would enter the groundwater basin or about 65% of the present amount extracted. This could have a substantial effect and should be mentioned. Work by the DWP showed that carbon contacting (using existing filters) could handle materials like TCE and PCE at a competitive price. Obviously carbon regeneration could present some problem.

Also the storm water that is spread could add significant contaminants. The study of Whittier Narrows water spread in the Montebello Forebay showed the storm waters (storm drain waters) to be more mutagenic (Ames Test) than the reclaimed waters. Similarly, tests conducted on flows in the Pico Avenue Storm Drain, as a result of a legal action by life guards who claimed its waters had resulted in their contracting cancer, showed many pollutants arising from street, garden and general land wash. This could have resulted in the TCE-PCE contamination found in wells along the river.

We do practice recharge now and, if reclaimed water is used, will do so on a much larger scale. Perhaps some note should be made of this, of the possible hazards and of the treatment possible, such as carbon contacting.

Comment No. 2 by Max Bookman, Engineering Consultant for Burbank and Glendale

There is a need to discuss the reuse of water in the final report. In particular, the soon-to-be-completed Donald C. Tillman (Sepulveda) Water Reclamation Plant, and the growing importance of reclaimed water as a significant resource in California should be addressed.

Staff Response to Comment Nos. 1 and 2

The reclamation and reuse of storm water and dry weather urban runoff and treated wastewaters has been considered in the plan. Specific recommendations have been made to monitor these sources of groundwater recharge for potential contaminants. The beneficial reuse of

reclaimed water is a major objective of the water agencies. However, the reuse of reclaimed water in the San Fernando Valley Basin must be applied judiciously in order to prevent the input of contaminants into the groundwater.

B. Removal and Disposal of Contaminated Groundwater

Comment No. 3 by Max Bookman, Engineering Consultant for Burbank and Glendale

The adjudication provisions do not specifically rule against disposal of extracted water to the storm drain. The Judgment adjudicates the rights to extract groundwater to meet reasonable beneficial needs of the inhabitants. If disposal to storm drains is necessary to meet the beneficial needs by protecting the quality of the source of supply, then I see no prohibition provision in the Judgment.

Staff Response to Comment No. 3

Additional judicial direction is needed to resolve this matter. It is the opinion of the Watermaster that the judgement would have to be modified before implementing this type of disposal activity. However, approval for such activities would still be required from the RWQCB, LACFCD and possibly the SCAQMD.

C. Landfills

Comment No. 4 by Max Bookman, Engineering Consultant for Glendale and Burbank

The design and siting criteria for new landfills are sufficiently regulated. Post-closure maintenance and closure operations need to be spelled out explicitly in the original landfill permit. Additionally, overseeing agencies must develop internal directives to assure that maintenance and closure activities are carried out in a proper manner.

Staff Response to Comment No. 4

Final closure and post-closure guidelines are still being developed by the RWQCB. In order to ensure compliance with these guidelines, all new permits require that the landfill owner open a trust fund for post-closure maintenance or monitoring costs. However, since closure does not occur until 10 to 20 years after initial issuance of the landfill operating permit, it is more practical practical to spell out closure requirements near the time of completion of the landfill.

Comment No. 5 by Miriam Gensemer, SCAG

In the Recommendation Section, (Section 3.6), "planning guidelines" and "measures presented in the guidelines" are suggested as a means of controlling landfill development in the Sun Valley gravel pits. Some examples of how this would work would be useful to the reader.

Staff Response to Comment No. 5

Such controls might consist of limiting the development of landfills to those necessary to meet "regional" demands only. Current and recently proposed Class II facilities should meet local needs in this 'waste-shed' for more than 10 years. This could provide a transition period for the development and implementation of alternative technology.

Comment No. 6 by Hank Yacoub, Los Angeles Regional Water Quality Control Board (RWQCB)

The RWQCB has the authority to require groundwater monitoring at operating landfills. However, requests by the Board to install observation or monitoring wells at closed sites where a responsible party cannot be identified may not be possible.

Staff Response to Comment No. 6

At this time, only the State DOHS through the Abandoned Site Project and Superfund program has any funds for the investigation or monitoring of closed sites. It is imperative that these programs continue in order to identify sites capable of causing groundwater quality problems.

D. Storage Tanks

Comment No. 7 by Hank Yacoub, Los Angeles Regional Water Quality Control Board

It is too early to tell if the RWQCB has the resources (financial and staff) to be the lead agency for this recommendation. Region 2 has not been reimbursed for funds spent on manpower, equipment and testing incurred during an investigation of leaking underground tanks in the Silicon Valley.

Comment No. 8 by S. Sugita, County of Los Angeles Department of Health Services

The development of tank testing or design procedures is not within the powers of the County Department of Health Services.

Comment No. 9 by Gary Yamamoto, District Sanitary Engineer, State Department of Health Services

The development of tank testing or design procedures is not within the powers of the State Department of Health Services. It would be desirable to have regional direction for this type of information but local municipal direction may be the only workable course of action under the existing situation.

Staff Response to Comment Nos. 7, 8 and 9

The plan recognizes that, at this time, no agency has the complete authority, manpower or funding necessary to implement a storage tank regulation program. However, consideration of this issue should not be delayed. A cooperative effort among all agencies will help to resolve this issue. Local and statewide legislative measures may help to clarify and coordinate a regional plan of action.

E. Small Quantity Hazardous Waste Generators

Comment No. 10 by O. Balaguer, State Water Resources Control Board

The Southern California Association of Governments has just received a 205 (j) grant to develop a model program using North Hollywood as a study area. The LADWP and the Los Angeles Bureau of Sanitation should provide input for the work plan development and all subsequent phases of this project.

Comment No. 11 by Carl Johnston, Public Service Commission City of Glendale

Investigate the feasibility of having large generators of hazardous waste accept small quantities of hazardous waste from small business and homeowners as a method of decreasing the cost of proper disposal to small quantity generators.

Staff Response to Comment Nos. 10 and 11

The Los Angeles Department of Water and Power and Bureau of Sanitation will provide technical input to this proposed study. All possible alternatives will be discussed with SCAG for consideration in this study.

F. Public Education Program

Comment No. 12 by John Mitchell, Los Angeles County Flood Control District

There is a need to emphasize the long term nature of the proposed public education program.

Comment No. 13 by Oscar Balaguer, State Water Resources Control Board

It is important to recognize the nature of a two-target audience: general public and industry. This consideration needs to be brought out more explicitly in the recommendation.

Staff Response to Comment Nos. 12 and 13

Consideration of these comments have been addressed in Recommendation No. 1.

G. Plan Implementation

Comment No. 14 by Oscar Balaguer, State Water Resources Control Board

Lay out within the final GWQMP-SFVB a plan of attack for the plan implementation.

Comment No. 15 by Mike Miller, Bureau of Sanitation, City of Los Angeles

The overseeing political body or governing board must direct an agency to take action on Recommendations that require commitments for increased responsibility by that agency. Furthermore, additional responsibilities must be accompanied with financial commitments and budget allocations commensurate with the scope of those responsibilities.

(For example,) There is a need to have Los Angeles City Council direct Bureau of Sanitation to have inspectors participate in an industrial sector education program.

Staff Response to Comment Nos. 14 and 15

Implementation guidelines and proposed actions have been discussed in the final report. However, implementation will be contingent on the level of commitment that the various governing bodies give to the recommendations of the plan. An attempt will be made to obtain resolutions endorsing the plan and its objectives. It is understood that implementation of the recommendations will be contingent ultimately on funding.

H. State DOHS "Action Levels"

Comment No. 16 by Carl B. Johnston, Public Service Commission, City of Glendale

Because only an intensely interested person will read beyond the Executive Summary. I think the Executive Summary should openly recognize that if the DOHS action limit were more realistic, the concern, as well as the funds needed to treat existing wells, would be greatly reduced.

I think well monitoring is justified, but I don't favor recommending costly well water aeration to achieve a contaminant limit that has what I consider inadequate technical support.

Staff Response to Comment No. 16

Forthcoming EPA standards for Maximum Contaminant Levels (MCLs) for TCE and PCE are expected to clarify this uncertaintuy in the near future. In the interim, the State Department of Health Services has promulgated water quality guidelines establishing action levels for certain organic contaminants. Water agencies will probably delay major commitments for water treatment until MCLs are established.

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COMMENTS