December 1995

Plan for Beneficial Reuse of Reclaimed Water

SANITATION DISTRICTS OF LOS ANGELES COUNTY

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SECTION 1.1: EXECUTIVE SUMMARY

1.1.1 Introduction

The County Sanitation Districts of Los Angeles County (Districts) are a confederation of 26 independent special districts that serve the water pollution control and solid waste management needs of approximately five million people in Los Angeles County. Fifteen of the districts have collectively constructed an extensive regional sewerage system known as the Joint Outfall System (JOS), which conveys and treats approximately 450 million gallons per day (MGD) of wastewater from 72 cities and unincorporated county areas. The JOS consists of seven treatment plants (the Joint Water Pollution Control Plant, or JWPCP, and six inland water reclamation plants) and 1,200 miles of truck sewers that form a network connecting the treatment plants and ocean outfalls off Whites Point on the Palos Verdes Peninsula. The Districts also operate four water reclamation plants in northern Los Angeles County serving the communities in and around the cities of Santa Clarita, Lancaster and Palmdale.

During Fiscal Year 1994-95, Districts' facilities produced 519.3 MGD of effluent, of which 189.9 MGD was reclaimed water suitable for reuse. Just over 35% of the reclaimed water produced was reused for direct nonpotable or indirect potable applications at some 322 sites.

1.1.2 Consent Decree

In May 1994, the Districts entered into a Consent Decree with the U.S. Environmental Protection Agency (EPA), the Los Angeles Regional Water Quality Control Board (RWQCB), the Natural Resources Defense Council (NRDC) and Heal the Bay. The objective of the 1994 Consent Decree is to ensure that the JWPCP complies with the Clean Water Act (CWA) and National Pollutant Discharge Elimination System (NPDES) Permit Number CA0053813. Included in the Consent Decree is a requirement for the Districts to prepare a plan for the beneficial reuse of its reclaimed water. Specifically, the plan is to:

- Identify and evaluate the potential for reuse of reclaimed water produced, including a review and update of the relevant sections of the 1982 Orange and Los Angeles Counties Water Reuse Study and other appropriate subsequent studies prepared by the Districts or by water supply agencies.

- Delineate and examine the impediments to the use of reclaimed water, including technical, regulatory and institutional barriers.

- Propose a strategy for avoiding or overcoming the identified impediments.

Other elements of the Consent Decree include a goal for the Districts to use their best efforts to maximize the beneficial reuse of reclaimed water and a commitment to establish and fund a full-time position to promote the beneficial reuse of reclaimed water during the term of the Consent Decree.

1.1.3 Report Organization

This report is intended to satisfy the terms and conditions of the Consent Decree as outlined above. The report is divided into seven Chapters beginning with this executive summary. The remaining chapters are organized as follows:

- Chapter II provides background information on the water supply institutions, the role of water reuse and sources of reclaimed water. All of the entities involved in delivering reclaimed water for use, from the producer to the wholesale and retail purveyors to the customers, must make the committment to ensure the continued success and expansion of water recycling

- Chapter III discusses the different kinds of water reuse applications and applicable regulations governing reuse.

- Chapter IV presents information on existing uses and potential demands, including reviews and updates of previous studies and identification of other potential users. The combination of existing users, planned projects and potential use sites yields a future demand of 220 MGD (246,420 AFY).

- Chapter V addresses impediments to the use of reclaimed water including technical obstacles, regulatory constraints, institutional barriers, economic deterrents and public opposition. These impediments, either individually or in combination, can be responsible for delaying implementation, reducing quantities of recycled water or cancelling projects outright.

- Chapter VI presents various strategies for overcoming these impediments, which must be undertaken by not only the Districts, but by the purveyors, users, regulators and funding sources.

- Chapter VII identifies recommended action items.

SECTION 1.2: ABBREVIATED TERMS USED IN THE REPORT

AF	Acre-feet
AFY	Acre-feet per year
AVTTP	Antelope Valley Tertiary Treatment Plant
CBMWD	Central Basin Municipal Water District
CDM	Camp, Dresser & McKee
CLWA	Castaic Lake Water Agency
COD	Chemical oxygen demand
CRTC	Clarifier Research Technical Committee
CWA	Clean Water Act
DFG	Department of Fish and Game
DHS	Department of Health Services
DOA	Department of Airports
DPW	Department of Public Works
DWP	Department of Water and Power
DWR	Department of Water Resources
EPA	Environmental Protection Agency
FY	Fiscal year
GAC	Granular activated carbon
gpm	Gallons per minute
HP	Horse power
ISWP	Inland Surface Waters Plan
JAO	Joint Administration Office
JOS	Joint Outfall System
JWPCP	Joint Water Pollution Control Plant
kWh	Kilowatt-hours
LBWD	Long Beach Water Department
MAF	Million acre-feet
MG	Million gallons
MGD	Million gallons per day
MWD	Metropolitan Water District of Southern California
NPDES	National Pollutant Discharge Elimination System

NRC	National Research Council
NRDC	National Resources Defence Council
NSF	National Science Foundation
OCWD	Orange County Water District
OLAC	Orange and Los Angeles Counties (Water Reuse Study)
O & M	Operations and maintenance
PERG	Puente Hills Energy Recovery From Landfill Gas facility
POTW	Publicly owned treatment works
SAR	Sodium adsorption ratio
SRF	State Revolving Loan Fund
RO	Reverse osmosis
RWQCB	Regional Water Quality Control Board
SDA	Service Duplication Act
SDCWA	San Diego County Water Authority
SGVMWD	San Gabriel Valley Municipal Water District
SGVWC	San Gabriel Valley Water Company
SOR	Surface overflow rate
SWRCB	State Water Resources Control Board
TDS	Total dissolved solids
TOC	Total organic carbon
UCI	University of California at Irvine
USGS	United States Geological Survey
USGVMWD	Upper San Gabriel Valley Municipal Water District
UV	Ultraviolet
VLP	Virus like particle
WBMWD	West Basin Municipal Water District
WRD	Water Replenishment District of Southern California
WRPs	Water reclamation plants
WRRs	Water reclamation requirements
WVWD	Walnut Valley Water District

SECTION 2.1: WATER SUPPLY INSTITUTIONS

Potable water supplies in the Districts' service area come from two main sources: local groundwater pumped from the Central, West or Main San Gabriel basins, and imported water from the Colorado River, Owens Valley/Mono Basin, and Sacramento Delta. In its simplest form, the water supply hierarchy can be divided into two main groups: agencies or other entities that deliver water directly and groundwater managers. The responsibilities of many agencies to supply imported water, groundwater or both tend to parallel or overlap each other. The complex and diverse relationships between the various parties involved in raw, potable or reclaimed water deliveries are shown in Figure 2-1. This illustration does not include every single entity; rather, only representative examples of the different types of water transfers and interactions are included.

2.1.1 Direct Delivery

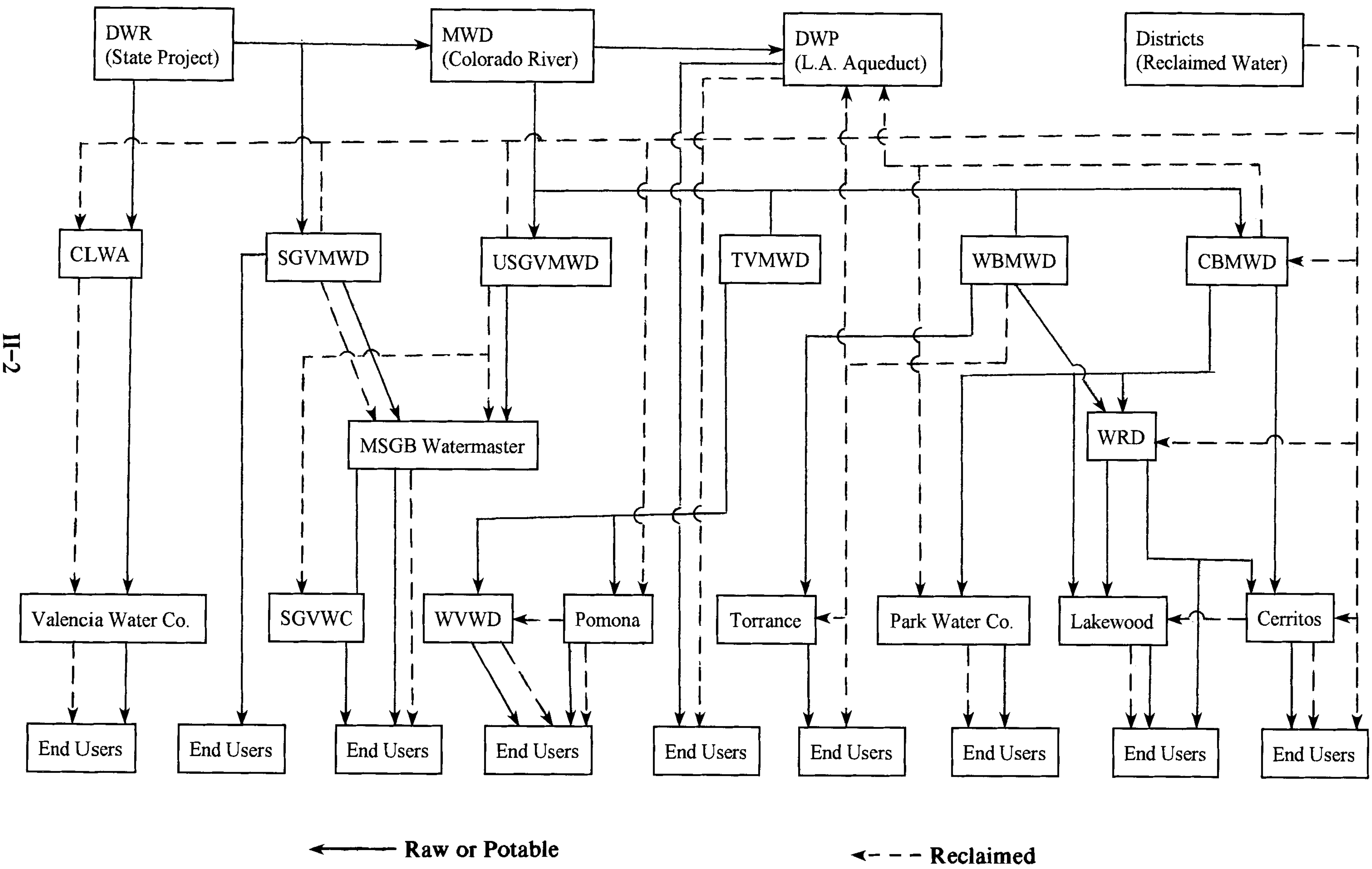
Two-thirds of the potable water used in southern California is imported through the three major aqueduct systems. The State Water Project is operated by the State Department of Water Resources (DWR), and contracts for the sale of water to numerous agencies throughout the state. The Metropolitan Water District of Southern California (MWD), a regional importer of water, purchases State Project water to augment the 1.2 million acre-feet (MAF) of Colorado River water it imports through its own aqueduct, which it sells to its 27 member agencies. The City of Los Angeles' Department of Water and Power (DWP) operates the aqueduct from the Owens Valley and Mono Lake area, augmenting its supply with local groundwater and imported water purchased from MWD.

Regional wholesalers occupy the next tier of potable water distribution. They are either member agencies of MWD, such as the Central Basin, West Basin, Upper San Gabriel Valley and Three Valleys municipal water districts, or local State Project contractors, such as the San Gabriel Valley Municipal Water District (SGVMWD) and the Castaic Lake Water Agency (CLWA). These agencies sell the imported water to retail purveyors such as city water departments, municipal water districts, investor-owned water companies or mutual water companies. Some local water retailers, such as the cities of Long Beach, Pasadena, Compton and Torrance, are also MWD member agencies. Not all retailers rely exclusively on imported water, as some may have rights to local groundwater that constitutes varying percentages (up to 100%) of their domestic water supply. Some water purveyors also have rights to reclaimed water produced by the Districts, which is used to replace domestic water in certain applications (discussed further in Chapter III). The retailers then deliver water to the end user. The wholesalers and major retail purveyors in the Districts' service area are listed in Table 2-1. The retail purveyors in the Central Basin, West Basin, Upper San Gabriel Valley, San Gabriel Valley and Three Valleys municipal water districts are listed in Tables 2-2 through 2-6, respectively. The current direct nonpotable uses of reclaimed water and planned projects are discussed in detail in Chapter IV.

2.1.2 Groundwater Managers

In contrast to other urban areas of the state, the Los Angeles Basin has significant storage in its groundwater basins. This groundwater supply provides about one-third of the area's water needs. There are two main groundwater basins in the Districts' metropolitan Los Angeles service area: the Central and West Basins, which are separated by the Newport/Inglewood fault but operated and managed together, and the Main San Gabriel Basin. To address the problem of overdrafting of the groundwater, pumping rights in both basins

FIGURE 2-1
EXAMPLE OF WATER SUPPLY INSTITUTIONAL FRAMEWORK



have been legally adjudicated with special entities created to actively manage them. Management of these basins is discussed in the following sections. The other main groundwater basin in Los Angeles County, underlying the San Fernando Valley, is managed by the City of Los Angeles and will not be discussed further.

2.1.2.1 Central and West Basins

The Central and West groundwater basins underlie 420 square miles of the main metropolitan area of Los Angeles County, which has a population of 3.5 million. Excessive and unregulated pumping through the 1950's resulted in a cumulative 900,000 acre-foot (AF) overdraft, which lowered the water table below sea level and led to sea water intrusion of the aquifer. The Central and West Basin Water Replenishment District (later renamed the Water Replenishment District (WRD) of Southern California) was formed in 1959 by the State Legislature to manage these basins. By regulating pumping, which averages approximately 230,000 acre-feet per year (AFY), conserving local rainfall runoff, purchasing imported water from MWD (through its member agencies, Central Basin and West Basin municipal water districts) and utilizing reclaimed water from the Districts, the WRD has been able to reduce the cumulative overdraft in the basins to an estimated 396,000 AF (as of September 1994). To address the issue of seawater intrusion, the WRD purchases imported water, and sometimes reclaimed water, for injection into three barriers (West Coast, Dominguez Gap and Alamitos Gap) constructed and operated by the Los Angeles County Department of Public Works (DPW) to hold back the ocean and provide additional replenishment of the aquifer. The WRD currently charges pumpers in both basins $127/AF for these replenishment activities. The current indirect potable use of reclaimed water and planned projects in the Central Basin are discussed in detail in Chapter IV.

2.1.2.2 Main San Gabriel Basin

The Main San Gabriel Basin underlies 115 square miles of the San Gabriel Valley, which has a population of approximately one million. When the basin was fully adjudicated in 1973, the Main San Gabriel Basin Watermaster was created as an arm of the court to annually set the safe operating yield (historically between 140,000 and 230,000 AFY) and to purchase replacement water (50,000 to 60,000 AFY) for pumping that exceeds this goal. Replacement water from the State Water Project is supplied to the Watermaster by the Upper San Gabriel Valley Municipal Water District (USGVMWD) as a member agency of MWD and by the SGVMWD as a State Project contractor. Pumpers who exceed their annual entitlement currently pay $229/AF to the Watermaster for replacement water. A planned project to begin the indirect potable use of reclaimed water in this basin is discussed in detail in Chapter IV.

2.1.3 Urban Water Management Plans

Water Code §10610 through §10656 constitute the California Urban Water Management Planning Act, which was passed in 1983 and subsequently amended six times. The purpose of the Act is to require the larger urban water suppliers (>3,000 customers or >3,000 AFY in water sales) in the state to file plans with the State DWR every five years describing and evaluating *"reasonable and practical efficient uses and reclamation and conservation activities."* The items to be covered in the plan are specifically delineated in the Act to provide for a high level of uniformity across the state and increase the utilities' ability to update the plans readily. Such plans in the current cycle are required to be filed by December 31, 1995.

The history of the Act indicates a high level of interest on the part of the State Legislature to encourage advance planning with a strong "demand management perspective" and to promote overall efficiency of water use. Recent amendments to the Act have strengthened these features, adding substantial requirements for planning for water recycling and provision of incentives for the use of reclaimed water. Proposed amendments would put in place additional enforcement and tracking mechanisms to increase compliance and, ultimately, to maximize reliability of water supply in the State.

These plans have been produced during the past year, with the large, regional wholesaler (MWD) completing its Integrated Resource Program first. Next came the MWD member agencies, followed by the smaller, retail purveyors. Each successive level used the preceding plans as a basis for developing and customizing their own plans. Although the Act requires planning for water reclamation, the number and types of issues discussed varied from agency to agency depending on their actual involvement with water recycling. Thus, MWD's discussion is limited to its Local Projects Program that provides financial assistance to its member agencies to enhance the economics of planned water recycling projects. No plans for actual construction of reclaimed water distribution facilities are discussed, since MWD does not participate in such activities and the Act prohibits inclusion of such elements in the water management plan if these elements are applicable to agencies that provide water directly.

Conversely, the combined water management plan of the Central Basin and West Basin municipal water districts is very detailed in the planned development of reclaimed water distribution systems beyond what is now in existence. This plan not only includes the water recycling efforts of these two agencies, which operate with a common staff, but also the efforts of other entities within their service area that have their own water recycling projects (e.g., cities of Long Beach, Cerritos and Lakewood and the WRD). The combined efforts of all these entities within the geographic boundaries of the Central and West Basins, most of which are in the Districts' service area, are expected to result in a total reclaimed water usage of 200,000 AFY (178.5 MGD) by the year 2020. (Note: This quantity includes the use of reclaimed water produced by the newly constructed West Basin reclamation plant that provides additional treatment to secondary effluent originating at the City of Los Angeles' Hyperion Treatment Plant.)

The water management plans of other regional wholesalers within the Districts' service area, like USGVMWD, contain water recycling elements in varying degrees of development between the extremes of the two described above. Because of the sequential development of these water management plans, those of the retail purveyors were not available to be reviewed for inclusion in this document.

TABLE 2-1
LIST OF WHOLESALERS AND MAJOR RETAIL PURVEYORS

Organization	Address	City	State	Zip Code
Metropolitan Water District	350 S. Grand Ave.	Los Angeles	CA	90071
Central Basin Municipal Water District	17140 S. Avalon Blvd. Ste 210	Carson	CA	90746
West Basin Municipal Water District	17140 S. Avalon Blvd. Ste 210	Carson	CA	90746
Upper San Gabriel Valley MWD	11310 E. Valley Blvd.	El Monte	CA	91731
San Gabriel Valley Municipal Water Dist.	549 E. Sierra Madre Ave.	Azusa	CA	91702
Three Valleys Municipal Water District	1021 Miramar Ave.	Claremont	CA	91711
Castaic Lake Water Agency	27234 Bouquet Canyon Rd.	Saugus	CA	91350
Water Replenishment Dist. of So. Calif.	12621 E.166th St.	Cerritos	CA	90702
Main San Gabriel Basin Watermaster	725 N Azusa Ave.	Azusa	CA	91702
City of Long Beach Water Department	1800 E. Wardlow Rd.	Long Beach	CA	90807
City of Pasadena Water Department	150 S. Los Robles Ave.	Pasadena	CA	91101
City of Compton Municipal Water Dept.	205 S Willowbrook Ave.	Compton	CA	90220
City of Torrance Municipal Water Dept.	3031 Torrance Blvd	Torrance	CA	90503
Los Angeles Dept. of Water and Power	111 N. Hope St.	Los Angeles	CA	90051

TABLE 2-2
CENTRAL BASIN MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS
(two pages)

Organization	Address	City	State	Zip Code
Los Angeles County Waterworks Districts	900 Fremont Ave.	Alhambra	CA	91803
City of Bell Gardens	7100 Garfield Ave.	Bell Gardens	CA	90201
Bellflower Home Garden Water Company	17447 Lakewood Blvd.	Bellflower	CA	90706
Bellflower-Somerset Mutual Water Co.	P.O. Box 1697	Bellflower	CA	90706
Peerless Water Company	P.O. Box 117	Bellflower	CA	90706
City of Bellflower	16600 Civic Center Dr.	Bellflower	CA	90706
Southern California Water Company	595-C Tamarack Ave.	Brea	CA	92621
City of Cerritos	P.O. Box 3130	Cerritos	CA	90703
City of Commerce	2535 Commerce Way	Commerce	CA	90040
Midland Park Water Trust	P.O. 4417	Compton	CA	90224
Lynwood Park Mutual Water Company	2644 E. 1245 St.	Compton	CA	90222
Sativa Los Angeles County Water District	2015 E. Hatchway St.	Compton	CA	90222
Suburban Water Systems	1211 E. Center Court Dr.	Covina	CA	91724
Tract 180 Mutual Water Company	4544 E. Florence	Cudahy	CA	90201
Tract 349 Mutual Water Company	4630 Santa Ana St.	Cudahy	CA	90201
City of Downey	P.O. Box 7016	Downey	CA	90241
Park Water Company	P.O. Box 7002	Downey	CA	90241
El Segundo Water Department	400 Lomita St.	El Segundo	CA	90245
San Gabriel Valley Water Company	11142 Garvey Ave.	El Monte	CA	91733
City of Manhattan Beach	1400 Highland Ave.	Hawthorne	CA	90250
Walnut Park Mutual Water Company	2460 E. Florence Ave.	Huntington Park	CA	90255
City of Huntington Park	6500 Miles Ave.	Huntington Park	CA	90255
Maywood Mutual Water Company #1	5953 Gifford	Huntington Park	CA	90255
City of Inglewood	One Manchester Blvd.	Inglewood	CA	90301
La Habra Heights County Water District	P.O. Box 628	La Habra Heights	CA	90631
City of Lakewood	5050 Clark Ave.	Lakewood	CA	90712
City of Lomita	24300 Narbonne Ave.	Lomita	CA	90717

TABLE 2-2
CENTRAL BASIN MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS
(two pages)

Organization	Address	City	State	Zip Code
Dominguez Water Corporation	21718 S. Alameda St.	Long Beach	CA	90810
Mutual Water Owners Assc. of Los Nietos	11509 Walnut St.	Los Nietos	CA	90606
Los Angeles Dept. of Water & Power	111 N. Hope St.	Los Angeles	CA	90051
City of Lynwood	11330 Bullis Rd.	Lynwood	CA	90262
Maywood Mutual Water Company #2	3521 E. Slauson	Maywood	CA	90270
Maywood Mutual Water Company #3	P.O. Box 669	Maywood	CA	90270
California Water Service	3316 W. Beverly Blvd.	Montebello	CA	90640
South Montebello Irrigation District	864 W. Washington Blvd.	Montebello	CA	90640
Montebello Land & Water Company	P.O. Box 279	Montebello	CA	90640
City of Norwalk	12700 Norwalk Blvd.	Norwalk	CA	90651
County Water Company	11829 E. 163 St.	Norwalk	CA	90650
City of Paramount	16400 Colorado Ave.	Paramount	CA	90723
Pico Water District	P.O. Box 758	Pico Rivera	CA	90660
City of Pico Rivera	P.O. Box 1016	Pico Rivera	CA	90660
California Water Service - Palos Verdes	5936 Crest Road West	Rancho Palos Verdes	CA	90274
California Water Service - H/R	1211 S. Pacific Coast Hwy.	Redondo Beach	CA	90277
California American Water Company	P.O. 80338	San Marino	CA	91118
California American Water Company	2020 Huntington Dr.	San Marino	CA	91108
City of Santa Fe Springs	11710 Telegraph Rd.	Santa Fe Springs	CA	90670
City of Signal Hill	2175 Cherry Ave.	Signal Hill	CA	90806
City of South Gate	8650 California Ave.	South Gate	CA	90280
City of Torrance	3031 Torrance Blvd.	Torrance	CA	90503
City of Vernon	4305 Santa Fe Ave.	Vernon	CA	90058
Orchard Dale Water District	13819 E. Telegraph Rd.	Whittier	CA	90604
California Domestic Water Company	15505 E. Whittier Blvd.	Whittier	CA	90605
City of Whittier	13230 E. Penn St.	Whittier	CA	90602

TABLE 2-3
WEST BASIN MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS

Organization	Address	City	State	Zip Code
California Water Service, Palos Verdes	5936 Crest Road West	Rancho Palos Verdes	CA	90274
California American Water Company	2020 Huntington Dr.	San Marino	CA	91108
Southern California Water Company	595-C Tamarack Ave.	Brea	CA	92621
City of Los Angeles DWP	111 N. Hope St.	Los Angeles	CA	90051
City of Lomita	24300 Narbonne Ave.	Lomita	CA	90717
City of Inglewood	One Manchester Blvd.	Inglewood	CA	90301
City of Manhattan Beach	1400 Highland Ave.	Manhattan Beach	CA	90266
City of Hawthorne	4455 W. 126th St.	Hawthorne	CA	90250
City of Torrance	3031 Torrance Blvd.	Torrance	CA	90503
Los Angeles Co. Waterworks Districts	900 Fremont Ave.	Alhambra	CA	91803
El Segundo Water Department	400 Lomita St.	El Segundo	CA	90245
California Water Service	1311 S. Pacific Coast Hwy.	Redondo Beach	CA	90277
Dominguez Water Corporation	21718 S. Alameda St.	Long Beach	CA	90810
Water Replenishment District	12621 166th st.	Cerritos	CA	90702

TABLE 2-4
UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS
(two pages)

Organization	Address	City	State	Zip Code
City of Arcadia, Water Division	P.O. Box 60021	Arcadia	CA	91066
City of Azusa	P.O. Box 9500	Azusa	CA	91702
City of Azusa Light & Water Department	725 N. Azusa Ave.	Azusa	CA	91702
Azusa Valley Water Company	P.O. Box 9500	Azusa	CA	91702
Azusa Agricultural Water Company	P.O. Box 9500	Azusa	CA	91702
Valley County Water District	14521 E. Ramona Blvd.	Baldwin Park	CA	91706
Valley View Mutual Water Company	13730 E. Los Angeles St.	Baldwin Park	CA	91706
Maple Water Company, Inc.	P.O. Box 3758	City of Industry	CA	97144
City of Industry Waterworks	P.O. Box 3165	City of Industry	CA	91744
Covina Irrigating Company	146 E. College St.	Covina	CA	91723
City of Covina	125 E. College St.	Covina	CA	91723
Suburban Water Systems	1211 E. Center Court Dr.	Covina	CA	91724
San Gabriel Valley Water Company	11142 Garvey Ave.	El Monte	CA	91733
Rurban Homes Mutual Water Company	5044 N. Cogswell	El Monte	CA	91732
Hemlock Mutual Water Company	P.O. Box 6280	El Monte	CA	91734
Champion Mutual Water Company	P.O. Box 4093	El Monte	CA	91734
Richwood Mutual Water Company	11723 Bryant	El Monte	CA	91732
Del Rio Mutual Water Company	2223 Burkett Rd.	El Monte	CA	91733
Sterling Mutual Water Company	11922 Lambert Ave.	El Monte	CA	91732
City of El Monte	11333 E. Valley Blvd.	El Monte	CA	91734
City of Glendora	116 E. Foothill Blvd.	Glendora	CA	91741
City of Irwindale	5050 N. Irwindale Ave.	Irwindale	CA	91706
La Puente Valley County Water District	P.O. Box 3136	La Puente	CA	91744
City of Monrovia	415 S. Ivy St.	Monrovia	CA	91016
Sunny Slope Water Company	1040 El Campo Dr.	Pasadena	CA	91107
East Pasadena Water Company, Ltd.	3725 E. Mountainview Ave.	Pasadena	CA	91107
San Gabriel County Water District	P.O. Box 475	Rosemead	CA	91770

TABLE 2-4
UPPER SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS
(two pages)

Organization	Address	City	State	Zip Code
Adams Ranch Mutual Water Company	9343 Pitkin St.	Rosemead	CA	91770
Amarillo Mutual Water Company	3404 N. Burton Ave.	Rosemead	CA	91770
San Gabriel County Water District	P.O. Box 2227	San Gabriel	CA	91778
Southern California Water Company	630 E. Foothill Blvd.	San Dimas	CA	91773
Southern California Water Company	401 San Dimas Canyon Rd.	San Dimas	CA	91773
California-American Water Company	2020 Huntington Dr.	San Marino	CA	91108
City of South Pasadena	825 Mission St.	South Pasadena	CA	91030
City of West Covina	1444 W. Garvey Ave.	West Covina	CA	91790
Valencia Heights Water Company	3009 Virginia Ave.	West Covina	CA	91791
Beverly Acres Mutual Water Users' Assoc.	10361 Cliota St.	Whittier	CA	90601
California Domestic Water Company	P.O. Box 1338, Perry Annex	Whittier	CA	90609

TABLE 2-5
SAN GABRIEL VALLEY MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS

Organization	Address	City	State	Zip Code
City of Alhambra	111 S. First St.	Alhambra	CA	91802
New Owl Rock Products	P.O. Box 330	Arcadia	CA	91066
Monrovia Nursery	P.O. Box Q	Azusa	CA	91702
City of Azusa	213 E. Foothill Blvd.	Azusa	CA	91702
City of Monterey Park	320 W. Newmark Ave.	Monterey Park	CA	91754
City of Sierra Madre	232 W. Sierra Madre Blvd.	Sierra Madre	CA	91024

TABLE 2-6
THREE VALLEYS MUNICIPAL WATER DISTRICT
LIST OF RETAIL PURVEYORS

Organization	Address	City	State	Zip Code
Mt. San Antonio College	1100 N. Grand Ave.	Walnut	CA	91789
California Polytechnic University, Pomona	3801 W. Temple Ave.	Pomona	CA	91768
Southern California Water Company	401 S. San Dimas Canyon Rd.	San Dimas	CA	91733
Walnut Valley Water District	271 S. Brea Canyon Rd.	Walnut	CA	91789
City of La Verne	City Hall, 3669 D St.	La Verne	CA	91750
City of Covina Water Department	125 E. College	Covina	CA	91722
City of Industry	15651 E Stafford St.	Industry	CA	91744
City of Glendora	116 E. Foothill Blvd.	Glendora	CA	91740
Covina Irrigation	P.O. Box 306	Covina	CA	91723
Rowland Water District	3021 S Fullerton Rd.	Rowland Heights	CA	91748
City of Pomona Water Department	505 S. Garey Ave.	Pomona	CA	91766
Suburban Water Systems	1211 E. Center Court Dr.	Covina	CA	91724
Valencia Heights Water Company	3009 Virginia Ave.	West Covina	CA	91791
City of West Covina	P.O. Box 1444	West Covina	CA	91790
Boy Scouts of America	2333 Scout Way	Los Angeles	CA	90

SECTION 2.2: THE ROLE OF WATER REUSE

2.2.1 The Need for Reclaimed Water

Perhaps the greatest motivation to use reclaimed water is the fact that the Los Angeles area is essentially a desert, with a long-term average rainfall of only 15 inches per year and with no major flowing rivers within 100 miles. Approximately two-thirds of the area's annual water supply is imported through three aqueducts that extend between 200 and 500 miles from the Los Angeles Basin. The delivery capability of each aqueduct is subject to legal, political, operational and climatological limitations.

- The City of Los Angeles DWP's groundwater pumping in the Owens Valley has been halted due to the adverse environmental effects resulting from the lowered water table. Also, DWP's diversions from streams feeding Mono Lake have been voluntarily curtailed to allow water levels in that lake to rise so the ecosystem can recover.

- MWD's annual diversion of approximately 1.2 MAF from the Colorado River is expected to be cut by more than half as the Central Arizona Project continues to increase diversions to agricultural and urban areas of Arizona through the 1990's and into the next century.

- The State Water Project currently only has facilities sufficient to supply half of its ultimate capacity of water from the state's main watershed, the Sacramento Delta. The defeat of the Peripheral Canal initiative in 1982 blocked construction of the remaining necessary facilities that would have brought this system to full capacity. Lack of precipitation and the resulting reduced runoff in 1987-92 prompted reductions in water deliveries to southern California by up to 80%. Environmental concerns over effects of water diversions on the delta's wildlife may eventually make such reductions in water diversions permanent.

Existing local groundwater supplies are also limited by the lack of local precipitation, recharge capacities of spreading grounds, basin overdrafting, sea water intrusion in coastal areas and industrial contamination. Compounding these threats to the southern California water supply is the fact that every year the population in the MWD service area increases by another 400,000 people, equivalent to a city the size of Portland, Oregon. In the State Department of Finance's "Population Projections by Race/Ethnicity for California and Its Counties, 1990-2040," Report 93 P-1, estimates that the population of the State of California will increase 42%, from 30 million in 1990 to 42.5 million, by the year 2010, prompting increased competition for the State's dwindling water resources. This rate of growth is reflected in southern California, as the Southern California Association of Governments' "1994 Regional Comprehensive Plan" estimated population growth in the six county area (Los Angeles, Orange, Riverside, San Bernardino, Ventura and Imperial) to be 40%, from 14.6 million in 1990 to 20.5 million in 2010.

Within the last 20 years, the State of California has been hit by two serious droughts, in 1976-77 and more recently in 1987-92. Mandatory water rationing of at least 20% was instituted by water purveyors throughout the state, and, at one point, the State DWR anticipated going to a mandatory 50% rationing. Only the extremely wet winters of 1993 and 1995 brought the water supply situation in the state out of crisis. The DWR, in its Bulletin 163-94, predicted that the growing population in the State of California will result in annual water shortages of up to 4.1 MAF by the year 2020.

The State Legislature has long known of the value of water reclamation. The Water Reclamation Law, Chapter 7 of the California Porter-Cologne Water Quality Act, states that *"the people of the State have a primary interest in the development of facilities to reclaim water containing waste to supplement existing surface and underground water supplies and to assist in meeting the future requirements of the State."* Furthermore, the State Legislature in 1991 officially adopted the goal of reaching 1 MAF per year of reuse by the year 2010.

Following the severe 1976-77 drought, several public water purveyors decided to pursue reclaimed water as a supplementary supply to lessen the effects of future water shortages in their service areas. An additional boost for water reclamation came from the most recent drought, which has prompted even more public and private water purveyors to invest in a reclaimed water distribution infrastructure.

2.2.2 The Role of the Reclaimer

The powers and authorities of county sanitation districts are defined under §4700 *et seq.* of the California Health and Safety Code. Accordingly, such districts have the authority to sell reclaimed water, but other statutes have been interpreted to limit their power to provide distribution systems in areas served by other water suppliers. Thus, the Districts have established their role to include producing the reclaimed water, promoting its use, and cooperating with other entities who distribute the water to retail customers, or to use it themselves for purposes such as groundwater replenishment or maintaining wildlife areas. A few irrigation sites adjacent to Districts' water reclamation plants (WRPs) are directly served, but the vast majority of irrigation sites are served via an intermediary such as a city water department or municipal water district. In practice, the water supply entity must build and operate the transmission and distribution systems, while the Districts contract to produce, sell and, sometimes, pump the reclaimed water to the retailer. Thus, the Districts' role limits its ability to assure that a given level of water reuse will occur.

The Districts have a long history of activity in pioneering the field of water recycling, culminating in one of the most advanced and widespread programs for the treatment, distribution and reuse of reclaimed water. A chronology of significant events in the Districts' reuse program is presented in Exhibit 2-1.

Water reclamation's potential in Los Angeles was recognized as early as 1949 when a Districts' study detailed most of the features incorporated in today's reclamation program, highlights listed below:

- The construction of WRPs, incorporating existing, proven treatment technology, along the Districts' sewer system would be a preferable alternative to increasing treatment at the Districts' ocean disposal facility, JWPCP. Economy of scale would be achieved by operating these facilities under one agency, and using the solids handling facilities of the JWPCP instead of constructing and operating such facilities at each WRP.

- Locating the WRPs upstream of the more heavily industrialized areas to treat mostly residential sewage, producing a higher quality effluent. To further improve effluent quality from the reclamation plants, industrial waste would be bypassed around the plants, and an industrial waste pretreatment program would be implemented to prevent toxic wastes from entering the WRPs.

- The reclaimed water produced at the WRPs would be of such high quality to allow its use for agricultural and landscape irrigation, manufacturing, construction and industrial cooling, environmental enhancement, recreational activities, and groundwater replenishment.

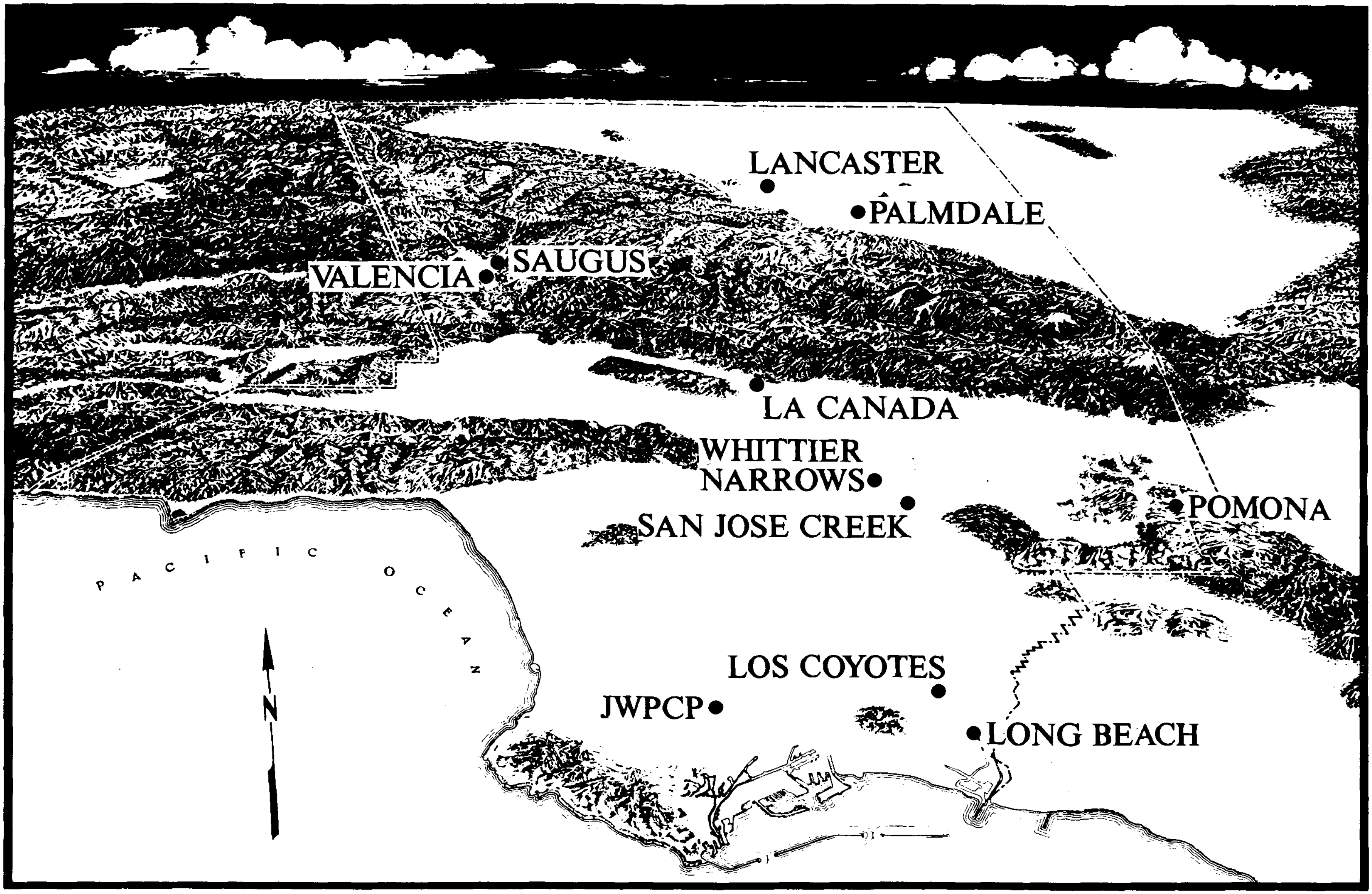
Using these principles, the Districts constructed the prototype Whittier Narrows WRP in 1962. The effectiveness of this facility led to the decision to construct four more WRPs in the Los Angeles basin area, Long Beach, Los Coyotes, San Jose Creek and Pomona. A small, secondary treatment plant in the La Cañada area was taken over by the Districts and added to the Joint Outfall System (JOS) in 1995. Four other WRPs serve the outlying communities of Lancaster, Palmdale and Santa Clarita (Figure 2-2). Not only would the valuable resource of water be produced in large quantities from these plants, but it was also determined that this would be more cost effective than increasing treatment capacity at the JWPCP and constructing more and larger sewers to transport the wastewater to that facility. The five WRPs in the Los Angeles Basin area were constructed in the early 1970's, with treatment consisting of primary sedimentation (with optional chemical coagulation added later), secondary biological oxidation by means of activated sludge, and disinfection with gaseous chlorine. All five were subsequently upgraded several years later to tertiary treatment with the addition of coagulation dosing and inert media filters. The result of this upgrade was the production of an effluent that meets federal and state drinking water standards for heavy metals, pesticides, trace organics, major minerals, radionuclides and microorganisms.

The severe, statewide droughts in 1976-77 and 1986-92 motivated many water purveyors in the Districts' service area to take advantage of reclaimed water as a supplement to their dwindling potable water supplies. Several city water departments and regional municipal water districts constructed extensive distribution systems consisting of pump stations, pipelines and storage reservoirs to transport the reclaimed water to a variety of users. As of the end of Fiscal Year (FY) 1994-95, approximately 35% of the effluent produced at the Districts' ten WRPs is actively being reused at 322 individual sites, which include 80 parks, 71 schools, 63 roadway greenbelts, 50 miscellaneous landscaped sites (e.g., office buildings, auto dealerships, churches, etc.), 17 golf courses, 15 nurseries, eight industrial users (e.g., paper manufacturing, carpet dyeing, concrete mixing, toilet flushing, construction), five cemeteries, nine agricultural sites, a wildlife habitat and two sets of groundwater recharge spreading basins. To put the quantity of reclaimed water used into perspective, this amount of effluent reused is equivalent to the water supply for a population of 372,775, roughly the population of a city the size of Oakland, California (the 39th largest city in the U.S.).

Typically, the Districts do not participate in the construction of offsite distribution systems for reclaimed water. This is the responsibility of the municipalities or water purveyors who are sponsoring the projects. However, the Districts will sometimes use their expertise to design, construct and/or operate and maintain the pumping plants, which are located at the treatment plant site for convenient access to the reclaimed water needed to supply the distribution system. The costs of these activities undertaken by the Districts are borne by the water purveyor purchasing and distributing the reclaimed water.

The use of locally produced reclaimed water precludes the need to pump State Project water over the Tehachapi Mountains at a net energy cost of 3,000 kilowatt-hours (kWh) per acre-foot. Thus, the use of Districts' reclaimed water over the course of a year conserves approximately 223.7 million kWh of electricity, which is equivalent to the annual output of a 25.5 megawatt power plant consuming 121,205 barrels of oil. At $0.08/kWh, this equates to an annual savings of nearly $17.9 million. The conservation of fossil fuels and energy also results in significant reductions in potential air pollutants. Due to the use of Districts' reclaimed water, 128.6 tons of nitrogen oxide, 22.4 tons of carbon monoxide, 13.4 tons of sulfur oxides, 4.5 tons of

FIGURE 2-2
LOCATION OF DISTRICTS' WASTEWATER TREATMENT FACILITIES



particulates and 1.1 tons of reactive organic gases are kept out of the atmosphere annually (emission factors based on Power Plant Fuel Use and Emissions, South Coast Air Quality Management District, 1986). Perhaps more important, the use of the local reclaimed water supply indirectly avoids the production of 167,750 tons of carbon dioxide, a greenhouse gas that contributes to global warming.

SECTION 2.3: SOURCES OF RECLAIMED WATER

2.3.1 Overview of the Districts

The Districts operate 11 wastewater treatment facilities, ten of which are classified as WRPs, previously shown in Figure 2-2. Effluent quality from the WRPs ranges from undisinfected secondary to coagulated, filtered, chlorinated tertiary. During FY 1994-95, Districts' facilities produced 519.3 MGD of effluent, which is 3.1% decrease from the historic peak of FY 1989-90, but a 3.7% increase from the preceding fiscal year. The decrease in flow was due mainly to widespread water conservation beginning in January 1991 in response to the drought-induced, statewide water crisis. The nationwide economic slowdown, which was particularly acute in California, may also have been a contributing factor in the decrease in sewage flows. The recent increase in flow is due in part to population growth, an increase in economic activity and an easing of conservation measures in response to the improved statewide water supply situation following heavy rains during the winters of 1993 and 1995.

Of the total effluent produced during FY 1994-95, 189.9 MGD (212,781 AFY) was reclaimed water suitable for reuse, a 5.1% increase over the preceding fiscal year. This was due mainly to the diversion of more wastewater flow to the expanded San Jose Creek WRP (completed on January 6, 1993) and to the Long Beach WRP. Water reclamation capacity at the Districts' ten facilities is now 226.7 MGD (254,029 AFY). The remainder was effluent from the Districts' JWPCP, which was disposed of by ocean discharge. It has been the Districts' policy over the past 33 years to divert new wastewater flows in the JOS away from ocean disposal to the upstream WRPs, which provide additional reclaimed water supplies for eventual reuse. Figure 2-3 shows that while flows in the JOS have been increasing, effluent flow to the ocean has held steady (or declined during the drought) while reclaimed flows have been increasing.

FIGURE 2-3
JOINT OUTFALL SYSTEM FLOW DIVERSION TO RECLAMATION
1928-94

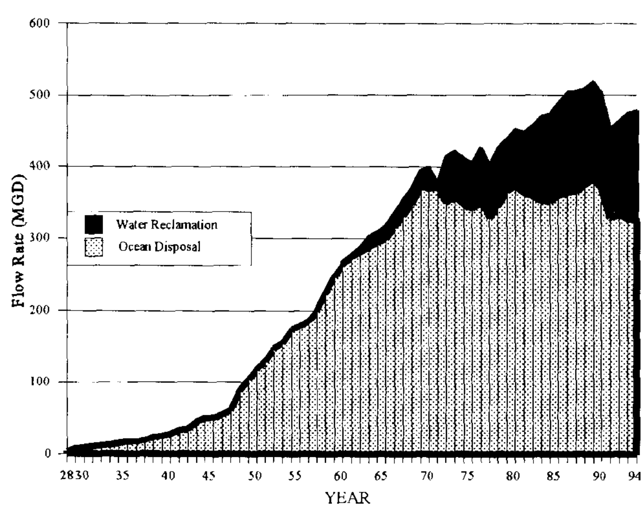
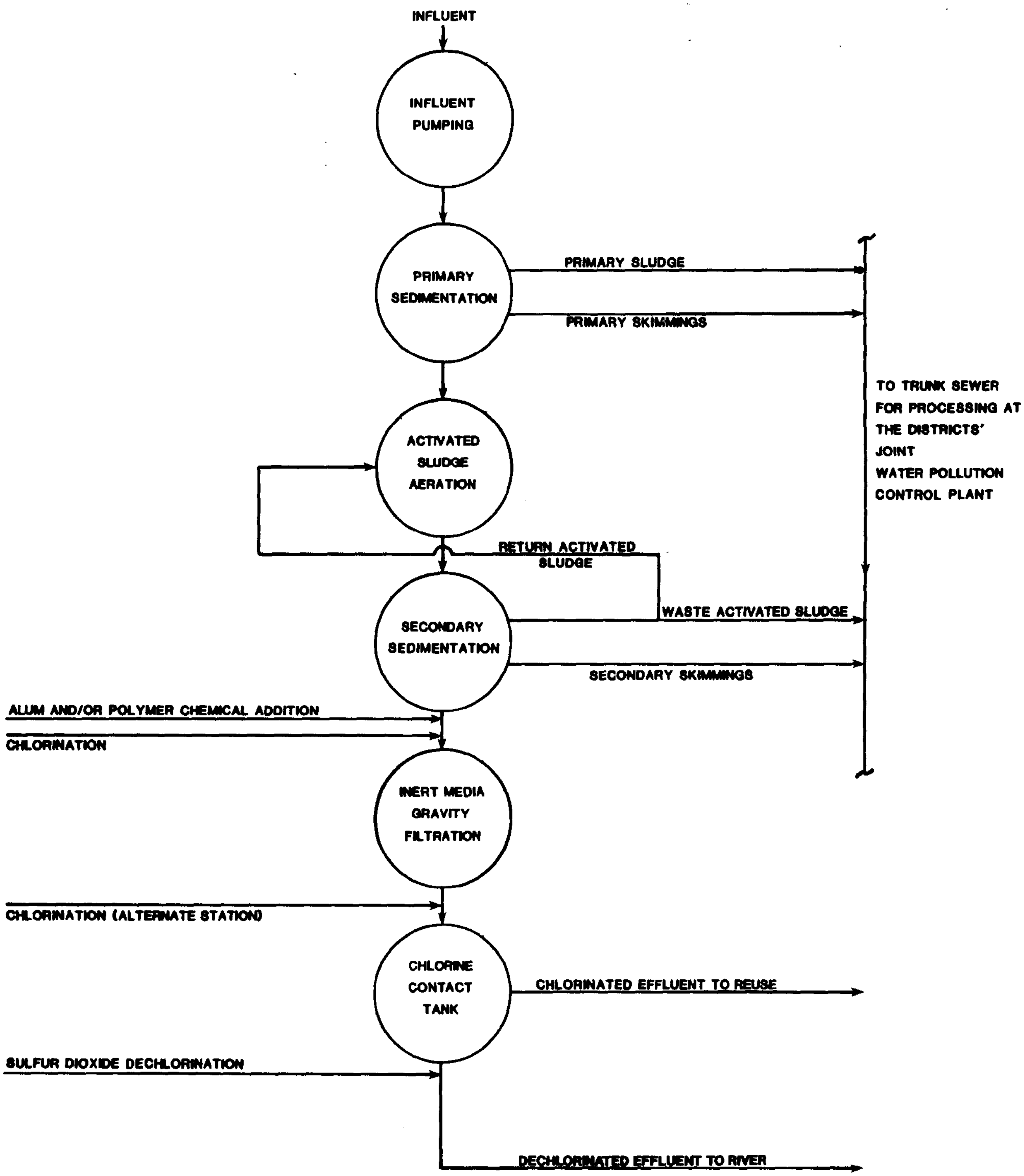


FIGURE 2-4
TERTIARY TREATMENT PROCESS FLOW SCHEMATIC



2.3.2 The Water Reclamation Process

The treatment process employed by the Districts is essentially the same for the five largest WRPs in the Los Angeles Basin (Figure 2-4). The two WRPs in the Santa Clarita area are also similar, except for the fact that all waste solids from the treatment process are handled at the Valencia WRP, not at the JWPCP.

Wastewater entering the plant must first pass through the primary sedimentation tanks, which, over the course of two hours, use gravity and flotation to remove two-thirds of the wastewater solids. An influent pH meter measures changes in acidity or alkalinity, allowing the plant operators to take corrective actions before a problem arises in the downstream treatment processes. A chemical polymer is available for dosing the raw wastewater if conditions warrant.

The secondary treatment process is biological in nature, as bacteria aid in the removal of the remaining suspended solids and soluble matter in the primary effluent, converting it to biomass that is subsequently settled out in the final clarifiers. Again, the process is simple in nature. The bacteria are given wastewater as food and air is diffused into the aeration tanks to provide oxygen (the plants are equipped with backup air compressors to maintain the flow of air to the tanks). A chemical polymer can also be added to the influent end of the final sedimentation tanks to increase solids removal by settling in these tanks. Solids removal by the end of this process is over 95%.

The tertiary treatment process begins when secondary effluent leaving the final clarifiers is dosed with alum (as a coagulant) and chlorine before entering the inert media (either dual-media sand/anthracite coal or mono-media anthracite) gravity filters (pressure filters at the Saugus and Valencia WRPs). These filters are automated so that they go into a backwash cycle when they begin to plug with particulate material removed from the wastewater. Filtered effluent is pumped out of the filter underdrain system, then chlorinated a second time before traveling through the chlorine contact tanks for at least 90 minutes. Several residual chlorine analyzers are used throughout the process to ensure that the proper dosage of chlorine is maintained. Following chlorination, the effluent is considered fully treated and ready for reuse or discharge to the river. (NOTE: When excess effluent is discharged to an unlined, natural-state waterway, it must be dechlorinated first.) Final effluent that has passed through all three stages of treatment has had more than 99% of the solids removed.

The treatment processes for the remaining three WRPs are somewhat different from the seven tertiary treatment facilities described above. The La Cañada WRP uses extended aeration as its secondary treatment process, precluding the need for separate primary sedimentation tanks. This plant does not have filtration facilities. The secondary treatment process at the Lancaster and Palmdale WRPs consists of oxidation ponds, into which primary effluent is introduced for several hundred days of retention. These plants do not have filtration facilities for all the effluent, and only the Lancaster effluent is chlorinated. Limited tertiary facilities, known as the Antelope Valley Tertiary Treatment Plant (AVTTP), were constructed by the County of Los Angeles at the Lancaster WRP to provide a small amount of high quality effluent to its Apollo Lakes Regional Park.

2.3.3 Water Reclamation Plants

The Districts' WRPs are scattered geographically throughout their service area to better handle locally produced wastewater. Reclaimed water can, therefore, be supplied to a greater number of communities. In order to make additional reclaimed water supplies available for reuse, it continues to be the Districts' intent to construct additional treatment capacity at the WRPs instead of treatment and ocean disposal capacity at the JWPCP. The following sections give brief descriptions of the Districts' ten WRPs that are the focus of this plan. The operation and maintenance (O&M) costs for treating the wastewater that are presented are for FY 1994-95 and do not include solids handling, except where noted.

2.3.3.1 La Cañada WRP

The La Cañada WRP, completed in 1962, is the smallest facility operated by the Districts and is located on the grounds of the La Cañada-Flintridge Country Club. The plant has a capacity of 0.2 MGD, and, in FY 1994-95, it treated an average of 0.117 MGD (132 AFY) of wastewater generated by the 425 homes surrounding the country club. The average O&M cost to produce this water is approximately $1,280/AF. The FY 1994-95 flow rate represents an 8.3% increase in average daily flows over the preceding fiscal year; the result of the heavy winter rainfall runoff entering the plant in January-March 1995. All of the disinfected, secondary effluent from the plant is disposed of by discharge into the four lakes on the 105 acre golf course. The developers of the country club and neighboring homes financed the construction of the treatment plant, which was later sold to the Districts. The operators of the country club are required to take all of the effluent produced at this facility for use in their irrigation system.

2.3.3.2 Long Beach WRP

The Long Beach WRP was completed in 1973 and was expanded in 1986 to its current design capacity of 25 MGD (28,014 AFY). However, it produced only 19.27 MGD (21,598 AFY) of coagulated, filtered, disinfected tertiary effluent in FY 1994-95. This was due to its location in the JOS and the lack of sufficient tributary sewage flows. Even so, this was a 13.7% increase over what was produced during the preceding fiscal year. The average O&M cost to produce this water is approximately $129/AF. As part of the purchase price of $362,000 for the land on which to construct the plant, the Districts also conveyed the right to all of the reclaimed water produced at that facility to the City of Long Beach Water Department (LBWD) at no cost for the water. During FY 1994-95, the LBWD delivered 2.67 MGD (2,992 AFY), or 13.9% of the reclaimed water produced at this plant.

2.3.3.3 Los Coyotes WRP

The Los Coyotes WRP was completed in 1970 and currently has a design capacity of 37.5 MGD (42,021 AFY), although actual daily effluent flows during FY 1994-95 averaged only 33.87 MGD (37,949 AFY) of coagulated, filtered, disinfected tertiary effluent. This was a slight decrease of 1.1% over the preceding fiscal year. The average O&M cost to produce this water is approximately $125/AF. Through three contracts, an average of 4.01 MGD (4,493 AFY), or 11.9% of the reclaimed water produced at this plant was delivered during FY 1994-95 for use at 172 sites in the cities of Bellflower, Cerritos, Compton, Downey, Lakewood, Lynwood, Norwalk, Paramount, South Gate and Santa Fe Springs. This represents a 20.4% increase in reuse flows from the preceding fiscal year.

2.3.3.4 Pomona WRP

The Pomona WRP at its current site was completed in 1966 and expanded in June 1991, allowing the plant to treat up to 13.5 MGD (15,127 AFY). In FY 1994-95, the plant produced 12.75 MGD (14,291 AFY) of coagulated, filtered, disinfected tertiary effluent, a 6.1% increase from the preceding fiscal year. The average O&M cost to produce this water is approximately $124/AF. Two agencies, the Pomona Water Department and the Walnut Valley Water District (WVWD), together delivered 7.17 MGD (8,030 AFY), or 56.2% of the plant's total production, for use at 83 sites. The remaining effluent is discharged to the San Jose Creek channel where it makes its way to the unlined San Gabriel River. Therefore, nearly 100% of the plant's effluent is reused, since most of the river discharge percolates into the groundwater, and is included in the reclaimed water allotment for the Montebello Forebay Groundwater Recharge Project.

2.3.3.5 San Jose Creek WRP

The San Jose Creek WRP was completed in 1973 (Stage I) with a design capacity of 37.5 MGD. It was expanded by 25 MGD to 62.5 MGD in 1983 (Stage II) and to 100 MGD (112,055 AFY) in 1993 (Stage III). During FY 1994-95, Stages I & II produced 54.71 MGD (61,307 AFY) and Stage III produced 25.96 MGD (29,093 AFY). The entire facility produced a total of 80.67 MGD (90,400 AFY) of coagulated, filtered, disinfected tertiary effluent, a 5.6% increase over the preceding fiscal year. Of the total amount of effluent produced, 37.3% is actively reused: 1.5% for direct nonpotable landscape irrigation and 35.8% (averaged over the preceding three fiscal years) for indirect potable groundwater recharge, with the remainder discharged to the concrete-lined portion of the San Gabriel River below Firestone Boulevard for ultimate disposal to the ocean. The average O&M cost to produce this water is approximately $109/AF for Stages I & II, and $87/AF for Stage III.

2.3.3.6 Whittier Narrows WRP

The Whittier Narrows WRP was the first activated sludge plant built by the Districts and was completed in 1962 with a design capacity of 15 MGD (16,808 AFY). Of the 11.74 MGD (13,150 AFY) of coagulated, filtered, disinfected tertiary effluent produced during FY 1994-95, most was actively reused. However, 1.43 MGD (1,600 AFY) was bypassed to the concrete-lined portion of the Rio Hondo below the Rio Hondo Spreading Grounds in Montebello and lost to the ocean during storm flow periods in October 1994, January, February, March and June 1995. The average O&M cost to produce this water is approximately $136/AF. Reclaimed water from this WRP is used at two sites: for groundwater recharge and for landscape irrigation.

2.3.3.7 Valencia WRP

The Valencia WRP was completed in 1967, and with its two subsequent expansions and construction of a 4.4 MG flow equalization tank in February 1995, it now has a design capacity of 11 MGD (12,326 AFY). In FY 1994-95 the plant produced an average effluent flow of 8.71 MGD (9,755 AFY). Final earthquake repair construction is currently underway and will give the plant a capacity of 12.6 MGD when it is completed in early 1996. The average O&M cost to produce this water is approximately $330/AF, which includes solids processing for both the Saugus and Valencia WRPs. The City of Santa Clarita hauls small amounts of reclaimed water by tanker truck for irrigation of city-owned parkway trees.

2.3.3.8 Saugus WRP

The Saugus WRP was completed in 1962. Two subsequent expansions and flow equalization facilities have brought its current design capacity to 6.5 MGD (7,284 AFY), with an average effluent flow in FY 1994-95 of 7.01 MGD (7,858 AFY). Dual-media pressure filters were added in 1987 to bring the treatment process up to a tertiary level. No future expansions are possible due to space limitations at the site. The average O&M cost to produce this water is approximately $246/AF. The City of Santa Clarita hauls small amounts of reclaimed water by tanker truck for irrigation of city-owned parkway trees.

2.3.3.9 Lancaster WRP

The existing Lancaster WRP began operation in 1959, replacing an earlier treatment plant that had begun operation in 1941. The plant's capacity was expanded in 1988-89 to 6.5 MGD, with 500 million gallons of storage ponds to capture excess winter flows. The Stage III expansion, which was completed in June 1992, increased the plant capacity to 10 MGD. The Stage IV expansion, which consists of a flow equalization basin, two sedimentation tanks and additional aeration equipment in the oxidation ponds, is currently underway and will give the plant a capacity of 16 MGD (17,929 AFY) when it is completed in mid to late 1996. This WRP treated an average of 9.3 MGD in FY 1994-95, utilizing oxidation ponds to produce 8.76 MGD (9,817 AFY) of disinfected secondary effluent. A significant amount of the wastewater entering the plant is lost due to evaporation from the oxidation and storage ponds. The average O&M cost to produce this water is approximately $141/AF. This includes the cost of sludge disposal, which only occurs every few years due to the stockpiling of sludge onsite. All of the effluent leaving the plant was actively reused at three sites.

2.3.3.10 Palmdale WRP

The Palmdale WRP began operation in 1953 and was expanded in 1989 to a capacity of 6.5 MGD. The Stage III expansion increased its capacity to 8.0 MGD in June 1992. The Stage IV expansion, which consists of two grit channels, five sedimentation tanks and additional aeration equipment in the oxidation ponds, is currently underway and will give the plant a capacity of 15 MGD (16,808 AFY) when it is completed in mid to late 1996. This WRP treated an average of 7.88 MGD in FY 1994-95, utilizing oxidation ponds to produce 6.99 MGD (7,826 AFY) of secondary effluent. A significant amount of the wastewater entering the plant is lost due to evaporation and percolation from the oxidation ponds. The average O&M cost to produce this water is approximately $146/AF. This includes the cost of sludge disposal, which only occurs every few years due to the stockpiling of sludge onsite. Only 0.8% of the effluent leaving the plant, or 0.054 MGD (61 AFY), was actively reused at three sites on property owned by the City of Los Angeles Department of Airports (DOA). However, this represents a 61% increase in reuse from the preceding fiscal year. The remainder of the effluent was disposed of by spreading on adjacent DOA property.

2.3.4 Summary

A summary of treatment plant capacities, reclaimed water production and reuse for FY 1994-95 is presented in Table 2-7. During 1994-95, 66.53 MGD of reclaimed water, or 35% of the total reclaimed water produced, was reused. (Note: Actual fiscal year flows are used for direct nonpotable deliveries, while indirect potable, or groundwater recharge, deliveries are an average of FY 1992-93 through FY 1994-95 flows).

TABLE 2-7
RECLAIMED WATER SUMMARY
Fiscal Year 1994-95

Water Reclamation Plant	Existing Design Capacity MGD	1994-95 Reclaimed Water Production MGD	Percent Reclaimed Water Reused
La Cañada	0.2	0.117	100.0%
Long Beach	25.0	19.27	13.9%
Los Coyotes	37.5	33.87	11.9%
Pomona	13.5	12.75	100.0%
San Jose Creek	100.0	80.67	37.3%
Whittier Narrows	15.0	11.74	88.0%
Valencia	11.0	8.71	0.7%
Saugus	6.5	7.01	1.8%
Lancaster	10.0	8.76	100.0%
Palmdale	8.0	6.99	0.8%
TOTAL	226.7	189.89	35.0%

EXHIBIT 2-1

CHRONOLOGY OF CSD REUSE ACTIVITIES

July 1927	The Tri-City Plant serving Pomona, Claremont and La Verne is placed into service and the effluent is used for irrigation of crop and pasture land by the Diamond Bar Ranch Company and the Northside Water Company.
December 1941	The 0.36 million gallon per day (MGD) Lancaster Treatment Plant is placed into service.
April 1949	Sanitation Districts' "Report upon the Reclamation of Water from Sewage and Industrial Wastes in Los Angeles County, California" is published, demonstrating the feasibility of water reclamation and eventual reuse.
January 1952	The Lancaster Treatment Plant is expanded from 0.36 to 1.35 MGD.
September 1953	The 0.75 MGD Palmdale Treatment Plant is placed into service.
September 1954	Sanitation Districts assumes operation of Tri-City Plant.
November 1958	The Palmdale Treatment Plant is expanded from 0.75 to 2.5 MGD.
1959	Report outlining the financing and construction of the Whittier Narrows Water Reclamation Plant (WRP) is published.
May 1959	Deliveries of effluent from the Palmdale WRP for alfalfa irrigation begin.
October 1959	A new Lancaster WRP is constructed and put into full service, with a capacity of 6.5 MGD. The original plant ceased operation two months later.
1960	Edwards Air Force Base constructs "C" dike on Rosamond Dry Lake to impound effluent from the Lancaster WRP, forming Paiute Pond.
July 1962	The 15 MGD Whittier Narrows WRP goes into operation, becoming first of the "upstream" treatment plants in the Joint Outfall System.
July 1962	The Saugus WRP in what is now the City of Santa Clarita is put into service, with effluent being discharged into the Santa Clara River.
August 1962	The Whittier Narrows WRP begins delivering reclaimed water for groundwater replenishment in the Montebello Forebay of the Central groundwater basin.
November 1962	The Angeles Crest Development Company completes the La Cañada WRP on the site of the La Cañada-Flintridge Country Club to treat wastewater produced by the homes surrounding the golf course. Reclaimed water produced by this facility is used as a source of supply for the lakes and the irrigation system on the golf course.
August 1964	The Saugus WRP is expanded to 0.75 MGD.
October 1965	The Saugus WRP is expanded from 0.75 to 1.5 MGD.
June 1966	Pomona WRP is constructed to replace Tri-City Plant.

September 1966	The La Cañada WRP is purchased by the Districts.
July 1967	The Valencia WRP in what is now the City of Santa Clarita is put into service with the capacity of 1.5 MGD. Effluent is discharged into the Santa Clara River.
February 1968	The Saugus WRP is expanded from 1.5 to 5 MGD.
May 1968	The Central and West Basin Water Replenishment District (now the Water Replenishment District of Southern California) contracts for the purchase of reclaimed water from the proposed San Jose Creek WRP.
September 1969	The County of Los Angeles constructs the Antelope Valley Tertiary Treatment Plant to further treat Lancaster WRP effluent for use at Apollo Lakes County Park, which opened in November 1972.
March 1970	The Pomona WRP is expanded to 10 MGD.
October 1970	The 12.5 MGD Los Coyotes WRP in Cerritos is completed and placed in operation.
May 1971	The La Cañada WRP is expanded to 0.2 MGD.
June 1971	The 37.5 MGD San Jose Creek WRP in Whittier is completed.
September 1972	The Palmdale WRP is expanded from 2.5 to 3.1 MGD.
May 1973	The 12.5 MGD Long Beach WRP is completed and placed in operation.
December 1973	Deliveries of reclaimed water from the Pomona WRP through the Pomona Water Department to Cal Poly Pomona begin. As of 1995, nine reuse sites are served by this system.
June 1975	The Los Coyotes WRP is expanded from 12.5 to 37.5 MGD.
April 1976	The Valencia WRP is expanded from 1.5 to 4.5 MGD.
February 1977	The Districts' "Pomona Virus Study" final report is published, which demonstrated that direct filtration (adding coagulant just prior to inert media filters) was just as effective at removing virus from secondary effluent as coagulation followed by a separate flocculation basin and then filtration. This led to the construction of effluent filters at the upstream water reclamation plants in the late 1970's. The WRPs were then classified as tertiary treatment facilities.
June 1978	Deliveries of reclaimed water from the San Jose Creek WRP to the adjacent California Country Club begin.
October 1978	The Legislature of the State of California adopts revised wastewater reclamation regulations which are contained in Title 22 of the California Administrative Code. The effluent from the Districts' tertiary treatment plants can be used for all of the approved applications contained in these regulations.

November 1978	Reclaimed water deliveries from the Los Coyotes WRP to Ironwood 9 Golf Course and Caruthers Park begin.
October 1979	The first industrial use of reclaimed water occurs as Garden State Paper (now Smurfit Newsprint) begins to use over 3 MGD of Pomona WRP effluent for recycling old newspapers.
August 1980	Deliveries of reclaimed water from the Long Beach WRP through the City of Long Beach Water Department begin. The first reuse site is El Dorado Park West and Golf Course.
January 1981	Contract signed with City of Los Angeles Department of Airports for the use of reclaimed water from the Palmdale WRP for tree irrigation and effluent disposal.
May 1981	Agreement is signed requiring the maintenance of 200 acres of wetlands at Paiute Pond for use by waterfowl migrating along the Pacific Flyway.
April 1982	The "Orange and Los Angeles Counties (OLAC) Water Reuse Study" is published. Numerous potential reclaimed water distribution system projects are detailed, several of which were subsequently constructed in the Districts service area and elsewhere.
September 1982	The City of Industry completes its 7,100 gallon per minute (gpm) reclaimed water pump station located at the San Jose Creek WRP and begins deliveries of reclaimed water to the Industry Hills Recreation Area through a 36-inch transmission line.
October 1982	The San Jose Creek WRP is expanded from 37.5 to 62.5 MGD.
January 1984	The Long Beach Water Department's North Long Beach reclaimed water distribution system is completed, with 11 sites connected by September of the following year.
March 1984	The Districts publishes the "Health Effects Study". This study determined that the recharge of reclaimed water into the groundwater drinking supply of the Central Basin did not adversely affect in a statistically significant way the health of people ingesting up to 15% reclaimed water in regards to gastrointestinal disease and cancers or birth defects. It also determined that recharge with reclaimed water was not adversely affecting the groundwater quality of the Central Basin.
May 1984	During this month, daily average reuse flows in the Districts' service area exceed 70 MGD for the first time.
June 1984	The Long Beach WRP is expanded from 12.5 to 25 MGD.
March 1986	The Long Beach Water Department's South Long Beach reclaimed water distribution system is completed, with five sites connected.
May 1986	The Walnut Valley Water District completes its 27-mile reclaimed water distribution system and begins delivery of reclaimed water from the Pomona WRP (purchased from the Pomona Water Department). This system served 74 reuse sites as of June 1995.

March 1987	The Los Angeles Regional Water Quality Control Board adopts Board Order No. 87-40, which permits the increase in the use of reclaimed water for groundwater recharge in the Montebello Forebay from 32,700 to 50,000 acre-feet per year.
December 1987	The City of Cerritos completes its 14,500 gpm pump station at the Los Coyotes WRP and expands delivery of reclaimed water to dozens of landscape irrigation sites throughout the city.
May 1988	During this month, daily average reuse flows in the Districts' service area exceed 80 MGD for the first time.
June 1988	Deliveries of reclaimed water from the Lancaster WRP to Nebeker Ranch for alfalfa irrigation begin.
September 1988	The Valencia WRP is expanded from 4.5 to 7.5 MGD.
December 1988	Norman's Nursery moves from the site of the Stage III expansion of the San Jose Creek WRP to a site next to the Whittier Narrows WRP, using reclaimed water from the latter facility.
February 1989	The Palmdale WRP is expanded from 3.1 to 6.5 MGD.
March 1989	The Long Beach Water Department's North Long Beach reclaimed water distribution system is extended, with six more sites being connected.
June 1989	During this month, daily average reuse flows in the Districts' service area exceed 90 MGD for the first time, and the running 12-month average daily reuse flows exceed 60 MGD.
August 1989	The City of Lakewood connects to the City of Cerritos' reclaimed water distribution system originating at the Los Coyotes WRP, and begins delivery of reclaimed water to eight sites. Nine additional reuse sites have been connected by May 1993.
November 1989	The Lancaster WRP is expanded from 6.5 to 8 MGD.
June 1991	The Pomona WRP is expanded from 10 to 15 MGD.
October 1991	Flow equalization facilities are completed at the Saugus WRP, increasing its treatment capacity from 5 to 5.6 MGD.
January 1992	The Long Beach Water Department's North Long Beach reclaimed water distribution system is extended again, with seven more sites being connected.
February 1992	The Central Basin Municipal Water District completes its 26-mile reclaimed water distribution system, delivering effluent from the Los Coyotes WRP via the City of Cerritos' reclaimed water pump station to 86 reuse sites by June 1995.
December 1992	The Lancaster WRP is expanded from 8 to 10 MGD.

January 1993	The San Jose Creek WRP is expanded from 62.5 to 100 MGD, as Stage III begins discharging effluent.
August 1993	Daily average reuse flows in the Districts' service area exceed 100 MGD for this month, setting a record at 113 MGD.
December 1993	The Palmdale WRP is expanded from 6.5 to 8 MGD.
February 1994	The running 12-month daily average reuse flows exceed 70 MGD for the first time.
April 1994	The running 12-month daily average reuse flows exceed 75 MGD for the first time.
May 1994	The running 12-month daily average reuse flows exceed 80 MGD for the first time.
June 1994	The Saugus WRP is expanded from 5.6 to 6.5 MGD.
July 1994	The Central Basin Municipal Water District begins operating the Rio Hondo reclaimed water pump station and distribution system, which was interconnected to that agency's Century reclaimed water distribution system. For the first time, two different water reclamation plants (Los Coyotes and San Jose Creek) are used to supply reclaimed water to the same regional distribution system.
November 1994	The City of Santa Clarita begins hauling reclaimed water from the Valencia WRP via water truck for irrigation of city-owned trees and parkways. This activity is extended to the Saugus WRP in March 1995.
February 1995	The Valencia WRP is expanded from 7.5 to 11 MGD.
April 1995	The Walnut Valley Water District extends its reclaimed water distribution system to the Fairway Business Park. By June 1995, the landscaping around 15 commercial buildings had been connected.

SECTION 3.1: WATER REUSE APPLICATIONS

The use for which reclaimed water may be applied is dependent on the level of treatment it has received. As the degree of human contact with the reclaimed water increases, so does the requirement for higher levels of treatment. These requirements are contained in Title 22 of the California Code of Regulations (Exhibit 3-1), which will be discussed in greater detail in Section 3.2. Most of the Districts' WRPs produce tertiary treated effluent, which is the highest quality regulated for reuse by the California Department of Health Services (DHS). For all practical purposes, this water can be used for literally any application short of direct drinking water supply or for the production of food and drink products. A summary of the various categories of reuse in the Districts' service area is presented in Table 3-1. The potential uses of tertiary treated reclaimed water are described below. The last section describes some precautions that need to be taken at direct nonpotable reuse sites.

TABLE 3-1
CATEGORIES OF RECLAIMED WATER USAGE
Fiscal Year 1994-95

Reuse Application	Number of Sites	Area Applied (acres)	Usage (MGD)
Parks	80	2,314.8	2.825
Golf Courses	17	2,094.5	3.225
Schools	71	767.4	1.359
Roadway Greenbelts	65	675.3	1.319
Nurseries	15	117.3	0.273
Cemeteries	5	128.4	0.287
Miscellaneous Landscaping	50	174.1	0.417
Industrial	7	21	4.351
Agriculture	9	1,331.8	4.098
Environmental Enhancement	1	200	5.879
SUBTOTAL	320	7,824.7	24.033
Groundwater Recharge[1]	2	646	42.5
TOTAL	322	8,470.7	66.533

[1]Annual average of fiscal years 1992-93 through 1994-95

3.1.1 Landscape Irrigation

The vast majority of sites in the Districts' service area are using reclaimed water for the irrigation of turf and decorative plantings. In fact, water recycling is best known for its use in the watering of greenbelt areas and is uniquely suited for this application. The high level of treatment provided by the Districts' WRPs allows their reclaimed water to be used for both low public contact sites, such as freeway slopes, cemeteries, nurseries and golf courses, and high public contact sites, such as parks, playgrounds and schoolyards. Besides these obvious greenbelt uses, reclaimed water is also used for landscape irrigation around churches, hotels, commercial buildings, police stations, post offices, restaurants, landfills, shopping centers, libraries, auto dealerships and common areas in housing developments.

Since nutrients such as nitrogen and phosphorous are not removed from the wastewater during treatment, landscape users of reclaimed water can reduce or eliminate fertilizer applications. For example, the operators of the California County Club in Whittier report that they have not fertilized the fairways on that golf course since it began receiving effluent from the San Jose Creek WRP in 1978, at an estimated annual savings of approximately $10,000. Based on 1993 water quality data, reclaimed water produced at the five tertiary treatment plants in the Los Angeles Basin contains approximately 41 pounds per acre-foot of nitrogen as N, 20 pounds per acre-foot of phosphorous as PO_4, and 26 pounds per acre-foot of potassium as K_2O. The constant application of small amounts of nutrients through the use of reclaimed water promotes a balanced growth in the vegetation that results in healthier plants, while avoiding the creation of "fertilizer dependence." This also reduces the risk of groundwater contamination from the standard application of large amounts of fertilizer over a short period.

As for the effect of reclaimed water on vegetation, according to Irrigation with Reclaimed Municipal Wastewater - A Guidance Manual, issued by the State Water Resources Control Board (SWRCB) in 1984, the chemical constituents (e.g., boron, chloride, total dissolved solids, heavy metals, sodium absorption ratio, etc.) in the effluent produced by the Districts' WRPs would have a slight or no effect on most plants. Experience has borne this out as several commercial nurseries growing very sensitive bedding plants have reported no problems in using reclaimed water. On the contrary, they have had great success regarding plant growth and quality.

3.1.2 Agricultural Irrigation

The high quality of tertiary treated effluent allows it to be used for all types of crops. This includes food crops that are not processed any further, even though the edible portions came into contact with the reclaimed water via spray irrigation. Despite the urban nature of Los Angeles County, there are examples of effluent from Districts' WRPs being applied in this fashion. The most notable example is California Polytechnic University, Pomona (commonly called Cal Poly Pomona). This facility has several hundred acres set aside for cultivation of literally any crop that can be grown in the area, such as field crops, truck crops, vineyards, orchards, etc. The produce is then sold on the open market to subsidize university operations. Less highly treated reclaimed water, such as that produced by the Districts' Lancaster and Palmdale WRPs in the Antelope Valley, can be used for limited agricultural irrigation. Undisinfected secondary treated effluent can be used for surface irrigation of orchards and vineyards (with no fruit in contact with ground) and for surface or spray irrigation of fodder, fiber or seed crops that are not meant for human consumption. Such effluent is used in Lancaster to irrigate alfalfa for livestock feed and in Palmdale to irrigate chestnut, pistachio and Christmas trees.

3.1.3 Recreational and Landscape Impoundments

High quality, tertiary treated effluent can be used in a variety of onsite impoundments. Landscape impoundments are bodies of water located on parks or golf courses, which are for aesthetic enjoyment only and not for any public recreational activities. The lakes on golf courses can also act as water hazards or irrigation water storage reservoirs. Restricted recreational impoundments are not only aesthetic, but also offer non-body contact recreational opportunities, such as boating and fishing. Many parks and golf courses receiving reclaimed water from the Districts have one or the other or both of these types of impoundments. Unrestricted recreational impoundments place no limitations on human contact, which means that swimming is allowed. Although there are no unrestricted impoundments using reclaimed water in the Districts' service area, there are several areas where excess reclaimed water from Districts' WRPs is discharged into local, natural-state waterways for disposal. The resulting aquatic environment has attracted nearby residents during the hot summer months.

3.1.4 Industrial Processes

Several nonpotable applications are collectively referred to as "industrial use," although not all are what would normally be considered industry, per se.

- Smurfit Newsprint uses approximately 3.3 MGD (3,658 AFY) of reclaimed water at its Pomona recycling plant to process 400 tons per day of old newspapers. Simpson Paper, also in Pomona, uses 0.56 MGD (623 AFY) of reclaimed water for the production of high quality office paper.

- Tuftex Industries in Santa Fe Springs uses approximately 0.5 MGD (553 AFY) of reclaimed water for dyeing carpet. Reclaimed water can also be used in dyeing of other fabrics as well.

- Robertson Ready-Mix in Santa Fe Springs uses approximately 0.13 MGD (146 AFY) to batch mix concrete for all types of construction uses.

- Reclaimed water can be used for a variety of construction applications such as soil compaction and jetting, dust control, equipment washdown, consolidation of backfill and sewer line flushing. These are short-term applications that make use of water trucks and blow-off valves on distribution systems to deliver the reclaimed water. Several contractors in the City of Cerritos over the years have used reclaimed water on city redevelopment projects. This form of "hauled use" can be extended to street sweeping operations.

- Cooling towers can make use of reclaimed water for the cycling of cooling water. The cities of Glendale and Burbank have supplied their municipal power plants with reclaimed water from their WRPs, and the West Basin Municipal Water District (WBMWD) has begun supplying reclaimed water to a number of cooling towers at the Chevron and Mobil oil refineries. Several refineries in the Districts' service area are expected to use reclaimed water in the near future, and a Districts' facility which converts landfill gas to energy will use reclaimed water in its cooling tower by the middle of 1996.

- Metal finishing operations and chemical manufacturers can make use of reclaimed water for their process water.

- The THUMS (Texaco, Humboldt, Union, Mobil, Shell) project operated by ARCO in Long Beach Harbor is a pilot study using 0.4 MGD (450 AFY) of reclaimed water for oil-zone repressurization. If this six-month study favorably determines the effectiveness and applicability of injecting reclaimed water to replace pumped oil (preventing land subsidence), then the project will expand to 3.6 MGD (4,000 AFY).

- Commercial buildings, such as high-rise office towers, can be dual plumbed to provide reclaimed water for toilet and urinal flushing, and for priming floor drain traps. This can result in estimated water savings of 75-90%. The Irvine Ranch Water District in Orange County has several office buildings that have already been dual plumbed. All of the new restrooms in the Districts' recent Joint Administration Office (JAO) building expansion are supplied with reclaimed water from the adjacent San Jose Creek WRP.

- Reclaimed water is available for firefighting at all of the Districts' WRPs and at some reuse sites, such as Bonelli Regional County Park in San Dimas and at William Fox Airfield, next to Apollo Lakes County Park in Lancaster.

3.1.5 Environmental Enhancement

Reclaimed water can be used for the creation or augmentation of wetland habitats. Discharge of chlorinated secondary effluent from the Districts' Lancaster WRP created 200 acres of wetlands known as Paiute Ponds. This area has become an important migratory stopover for waterfowl along the Pacific Flyway. Approximately 5.9 MGD (6,588 AFY) of effluent are used to maintain this habitat.

3.1.6 Groundwater Recharge

The use of reclaimed water for replenishing the underground drinking water supply has been occurring in southern California for decades, and projects are approved on a case-by-case basis by State DHS. Groundwater recharge can occur by either surface percolation or by well injection. The advantage to groundwater recharge is that it avoids the significant construction costs of a dual distribution system for delivering reclaimed water to direct nonpotable users, and much greater quantities of reclaimed water can be conserved by utilizing the substantial underground storage capacities of the local aquifers.

SECTION 3.2: REGULATIONS AFFECTING WATER REUSE

Key factors in the establishment of water reclamation and reuse criteria include health protection, public policy, past reuse experience and economics. There are no federal regulations governing water reuse in the U.S. Therefore, the regulatory burden rests with the individual states. California, with its long history of reuse, developed the first reuse regulations in 1918. These have been modified and expanded through the years. The state's current Wastewater Reclamation Criteria were adopted in 1978 (see Exhibit 3-1) and have served as the basis for reuse standards in other states and countries. The reclamation criteria include water quality standards, treatment process requirements, operational requirements and treatment reliability requirements. Treatment process and effluent quality criteria are shown in Table 3-2.

TABLE 3-2
CALIFORNIA TREATMENT & QUALITY CRITERIA FOR REUSE

Type of Use	Total Coliform Limits	Treatment Required
Fodder, Fiber & Seed Crops Surface Irrigation of Orchards and Vineyards	---	Primary
Pasture for Milking Animals Landscape Impoundments Landscape Irrigation (Golf Courses, Cemeteries, etc.)	23/100 mL	Oxidation & Disinfection
Surface Irrigation of Food Crops Restricted Landscape Impoundments	2.2/100 mL	Oxidation & Disinfection
Spray Irrigation of Food Crops Landscape Irrigation (Parks, Schools, etc.) Nonrestricted Recreational Impoundments	2.2/100 mL	Oxidation, Clarification, Filtration[1] and Disinfection
Groundwater Recharge	Case-by-Case Evaluation	Case-by-Case Evaluation

[1] The turbidity of the filtered effluent cannot exceed an average of 2 turbidity units during any 24-hour period, or 5 turbidity units more than 5% of the time during any 24-hour period.

It is important to point out that the level of treatment specified in the Water Reclamation Criteria to produce an essentially pathogen-free effluent (e.g., oxidation, coagulation, clarification, filtration and disinfection) can be substituted for a commensurate level of treatment. Studies conducted by the Districts in the 1970s demonstrated that equivalent virus removal could be achieved by direct filtration of high quality secondary effluent. This alternate treatment train (oxidation, clarification, filtration and disinfection) has been judged equivalent by State DHS to the treatment train specified in the regulations.

For groundwater recharge projects, requirements are established on a case-by-case basis, considering such factors as treatment provided, effluent quality and quantity, spreading area operations, soil characteristics, hydrogeology, residence time and distance to withdrawal. The Wastewater Reclamation Criteria also include requirements for treatment reliability such as providing for standby power, alarm systems, multiple or standby treatment processes, emergency storage or disposal of inadequately treated wastewater, monitoring devices and automatic controls systems, and flexibility in design.

Although the reclamation criteria do not address use area controls for sites that receive reclaimed water, DHS has established guidelines that describe safety precautions and operational procedures. These address cross-connections controls, confinement of reclaimed water at use areas, color-coded reclaimed water lines and equipment, separation and construction criteria for potable and reclaimed water lines, key-operated valves and outlets, fencing, signs, control of wind blown sprays, and provisions for worker protection.

California's reclamation criteria are in the process of being revised. For nonpotable uses, changes may include criteria for additional types of applications such as toilet flushing in commercial buildings, industrial cooling and process water, and residential irrigation. Other potential revisions include the allowance of ultraviolet (UV) radiation as an alternative to chlorine disinfection and virus monitoring requirements for nonrestricted recreational impoundments.

For indirect potable reuse, the revisions are intended to establish specific criteria that will facilitate the development and approval of projects. However, as discussed in Chapter V, these may in fact adversely impact the current or future level of groundwater recharge. Many proposed requirements are based on concerns over unregulated organics, disinfection by-products and pathogens, and thus are intended to provide additional barriers for the protection of the replenished groundwater and improve overall project reliability. The proposed regulations currently being used as guidelines include:

- For projects using more than 20% reclaimed water, removal of organics is required to achieve a goal of 1 mg/L of total organic carbon (TOC) of reclaimed wastewater origin at the drinking water wells.
- A reclaimed water total nitrogen limit $\leq$ 10 mg/L as N unless the project sponsor can demonstrate that the standard can be met before reaching the groundwater level.
- A maximum reclaimed water contribution of 50%.
- Minimum depths to groundwater for surface spreading projects.
- Minimum reclaimed water retention times of six months.
- A minimum horizontal separation distances from the spreading grounds to production wells of 500 feet.

The draft regulations do allow for some requirements to be met using alternate requirements provided that the proposed alternative reliably achieves an equal degree of public health protection.

EXHIBIT 3-1

Barclays Official

CALIFORNIA CODE OF REGULATIONS

Title 22. Social Security

Division 4. Environmental Health

Division 4.5. Environmental Health Standards for the Management of Hazardous Waste

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Division 4. Environmental Health

Chapter 1. Introduction

Article 1. Definitions

§ 60001. Department.

Whenever the term "department" is used in this division, it means the State Department of Health Services, unless otherwise specified.

NOTE: Authority cited: Section 208, Health and Safety Code. Reference: Section 20, Health and Safety Code.

HISTORY

1. New Division 4 (Sections 60001–60180, not consecutive) filed 7–2–74 as an emergency; effective upon filing. Certificate of Compliance included (Register 74, No. 27).
2. Amendment filed 6–30–78 as an emergency; designated effective at 11:59 p.m. on 6–30–78 (Register 78, No. 26).
3. Certificate of Compliance transmitted to OAH 10–27–78; filed 10–31–78 (Register 78, No. 44).
4. Editorial correction of NOTE filed 7–2–84 (Register 84, No. 27).

§ 60003. Director.

Whenever the term "director" is used in this division, it means the Director, State Department of Health Services, unless otherwise specified.

NOTE: Authority cited: Section 208, Health and Safety Code. Reference: Section 21, Health and Safety Code.

HISTORY

1. Amendment filed 6–30–78 as an emergency; designated effective at 11:59 p.m. on 6–30–78 (Register 78, No. 26).
2. Certificate of Compliance transmitted to OAH 10–27–78; filed 10–31–78 (Register 78, No. 44).
3. Editorial correction of NOTE filed 7–2–84 (Register 84, No. 27).

§ 60091. Chemical Toilet.

NOTE: Authority cited: Section 25210, Health and Safety Code. Reference: Section 25210, Health and Safety Code.

HISTORY

1. Renumbering from Section 60091 to 66016 filed 5–10–79; effective thirtieth day thereafter (Register 79, No. 19). For former history, see Register 78, No. 51.

§ 60093. Chemical Toilet Additive.

NOTE: Authority cited: Section 25210, Health and Safety Code. Reference: Section 25210, Health and Safety Code.

HISTORY

1. Renumbering from Section 60093 to 66020 filed 5–10–79; effective thirtieth day thereafter (Register 79, No. 19). For former history see Register 78, No. 51.

§ 60095. Chemical Toilet Waste.

NOTE: Authority cited: Section 25210, Health and Safety Code. Reference: Section 25210, Health and Safety Code.

HISTORY

1. Renumbering from Section 60095 to 66024 filed 5–1–79; effective thirtieth day thereafter (Register 79, No. 18). For former history, see Register 78, No. 51.

Chapter 2. Regulations for the Implementation of the California Environmental Quality Act

Article 1. General Requirements and Categorical Exemptions

§ 60100. General Requirements.

The Department of Health Services incorporates by reference the objectives, criteria, and procedures as delineated in Chapters 1, 2, 2.5, 2.6, 3, 4, 5, and 6, Division 13, Public Resources Code, Sections 21000 et seq., and the Guidelines for the Implementation of the California Environmental Quality Act, Title 14, Division 6, Chapter 3, California Administrative Code, Sections 15000 et seq.

NOTE: Authority cited: Title 14, Section 15022(d), California Administrative Code; Section 208, Health and Safety Code; and Section 21082, Public Resources Code. Reference: Sections 21000 et seq., Public Resources Code.

HISTORY

1. New Chapter 2 (Sections 60100 and 60101) filed 1–2–86; effective thirtieth day thereafter (Register 86, No. 1). For history of former Chapter 2, see Registers 79, No. 19 and 77, No. 42.

§ 60101. Specific Activities Within Categorical Exempt Classes.

The following specific activities are determined by the Department to fall within the classes of categorical exemptions set forth in Sections 15300 et seq. of Title 14 of the California Administrative Code:

(a) Class 1: Existing Facilities.

(1) Any interior or exterior alteration of water treatment units, water supply systems, and pump station buildings where the alteration involves the addition, deletion, or modification of mechanical, electrical, or hydraulic controls.

(2) Maintenance, repair, replacement, or reconstruction to any water treatment process units, including structures, filters, pumps, and chlorinators.

(b) Class 2: Replacement or Reconstruction.

(1) Repair or replacement of any water service connections, meters, and valves for backflow prevention, air release, pressure regulating, shut–off and blow–off or flushing.

(2) Replacement or reconstruction of any existing water supply distribution lines, storage tanks and reservoirs of substantially the same size.

(3) Replacement or reconstruction of any water wells, pump stations and related appurtenances.

(c) Class 3: New Construction of Small Structures.

(1) Construction of any water supply and distribution lines of less than sixteen inches in diameter, and related appurtenances.

(2) Construction of any water storage tanks and reservoirs of less than 100,000 gallon capacity.

(d) Class 4: Minor Alterations to Land.

(1) Minor alterations to land, water, or vegetation on any officially existing designated wildlife management areas or fish production facilities for the purpose of reducing the environmental potential for nuisances or vector production.

(2) Any minor alterations to highway crossings for water supply and distribution lines.

NOTE: Authority cited: Section 208, Health and Safety Code; Section 21082, Public Resources Code; and Sections 15022(a) and 15300.4, Title 14, Division 6, California Administrative Code. Reference: Sections 15301, 15302, 15303, 15304 and 15308, Public Resources Code.

CROSS–REFERENCE TABLE

NOTE: Sections in Chapters 1 and 2 of Division 4 were renumbered by an order filed 5–1–79 which created a new Chapter 30. The following cross–reference table showing old and new section numbers is provided for research purposes.

*Those sections which were amended by the 5–1–79 order are asterisked.

OLD SECTION	NEW SECTION
60091	66016
60093	66020
60095	66024
60102	66028
60103	66032
60104	66036
60105	66040
60106	66048
60107	66052
60108	66056
60109	66060
60110	66064
60111	66068
60112	66072
60113	66076
60114	66080
60115	66084
60116	66088
60117	66092
60118	66096
60119	66100
60120	66104
60121	66108
60122	66120*
60123	66124
60124	66128
60125	66132
60127	66136
60127	66136
60128	66140
60129	66144
60130	66148
60131	66160
60133	66164
60135	66176
60137	66180
60139	66184
60141	66188
60143	66196
60145	66200
60147	66204
60149	66208
60151	66212
60153	66216
60155	66220
60157	66224
60159	66228
60161	66232
60163	66236
60165	66240
60167	66300
60169	66305
60171	66310
60173	66315
60175	66320
60177	66328
60179	66336
60181	66344
60185	66352
60187	66360
60189	66370
60191	66084*
60193	66376*
60195	66379*
60197	66391
60199	66384
60201	66387*
60203	66390*
60205	66393*
60207	66396*
60209	66399
60211	66402
60213	66405
60215	66408
60217	66420
60219	66428
60221	66436*
60223	66444*
60225	66452*
60227	66460
60229	66470
60231	66475
60233	66480
60235	66485*
60237	66490*
60239	66495
60241	66500
60243	66505
60245	66510*
60247	66520
60249	66525
60251	66530
60253	66535*
60255	66540*
60257	66545
60259	66550
60261	66555
60263	66560
60265	66570
60267	66595
60269	66620
60271	66645
60273	66670*
60275	66672
60277	66674
60279	66676
60281	66680
60283	66685
60285	66880
60287	66683
60289	66886
60291*	66889*
60293	66892
60295	66895
60297	66898*

Chapter 3. Reclamation Criteria

Article 1. Definitions

§ 60301. Definitions.

(a) Reclaimed Water. Reclaimed water means water which, as a result of treatment of domestic wastewater, is suitable for a direct beneficial use or a controlled use that would not otherwise occur.

(b) Reclamation Plant. Reclamation plant means an arrangement of devices, structures, equipment, processes and controls which produce a reclaimed water suitable for the intended reuse.

(c) Regulatory Agency. Regulatory agency means the California Regional Water Quality Control Board in whose jurisdictions the reclamation plan is located.

(d) Direct Beneficial Use. Direct beneficial use means the use of reclaimed water which has been transported from the point of production to the point of use without an intervening discharge to waters of the State.

(e) Food Crops. Food crops mean any crops intended for human consumption.

(f) Spray Irrigation. Spray irrigation means application of reclaimed water to crops by spraying it from orifices in piping.

(g) Surface Irrigation. Spray irrigation means application of reclaimed water by means other than spraying such that contact between the edible portion of any food crop and reclaimed water is prevented.

(h) Restricted Recreational Impoundment. A restricted recreational impoundment is a body of reclaimed water in which recreation is limited to fishing, boating, and other non–body–contact water recreational activities.

(i) Nonrestricted Recreational Impoundment. A nonrestricted recreational impoundment is a body of reclaimed water in which no limitations are imposed on body–contact water sport activities.

(j) Landscape Impoundment. A landscape impoundment is a body of reclaimed water which is used for aesthetic enjoyment or which otherwise serves a function not intended to include public contact.

(k) Approved Laboratory Methods. Approved laboratory methods are those specified in the latest edition of "Standard Methods for the Examination of Water and Wastewater," prepared and published jointly by the the American Public Health Association, the American Water Works Association, and the Water Pollution Control Federation and which are conducted in laboratories approved by the State Department of Health.

(*l*) Unit Process. Unit process means an individual stage in the wastewater treatment sequence which performs a major single treatment operation.

(m) Primary Effluent. Primary effluent is the effluent from a wastewater treatment process which provides removal of sewage solids so that it contains not more than 0.5 milliliter per liter per hour of settleable solids as determined by an approved laboratory method.

(n) Oxidized Wastewater. Oxidized wastewater means wastewater in which the organic matter has been stabilized, is nonputrescible, and contains dissolved oxygen.

(o) Biological Treatment. Biological treatment means methods of wastewater treatment in which bacterial or biochemical action is intensified as a means of producing an oxidized wastewater.

(p) Secondary Sedimentation. Secondary sedimentation means the removal by gravity of settleable solids remaining in the effluent after the biological treatment process.

(q) Coagulated Wastewater. Coagulated wastewater means oxidized wastewater in which colloidal and finely divided suspended matter have been destabilized and agglomerated by the addition of suitable floc–forming chemicals or by an equally effective method.

(r) Filtered Wastewater. Filtered wastewater means an oxidized, coagulated, clarified wastewater which has been passed through natural undisturbed soils or filter media, such as sand or diatomaceous earth, so that the turbidity as determined by an approved laboratory method does not exceed an average operating turbidity of 2 turbidity units and does not exceed 5 turbidity units more than 5 percent of the time during any 24–hour period.

(s) Disinfected Wastewater. Disinfected wastewater means wastewater in which the pathogenic organisms have been destroyed by chemical, physical or biological means.

(t) Multiple Units. Multiple units means two or more units of a treatment process which operate in parallel and serve the same function.

(u) Standby Unit Process. A standby unit process is an alternate unit process or an equivalent alternative process which is maintained in operable condition and which is capable of providing comparable treatment of the entire design flow of the unit for which it is a substitute.

(v) Power Source. Power source means a source of supplying energy to operate unit processes.

(w) Standby Power Source. Standby power source means an automatically actuated self–starting alternate energy source maintained in immediately operable condition and of sufficient capacity to provide necessary service during failure of the normal power supply.

(x) Standby Replacement Equipment. Standby replacement equipment means reserve parts and equipment to replace broken–down or worn–out units which can be placed in operation within a 24–hour period.

(y) Standby Chlorinator. A standby chlorinator means a duplicate chlorinator for reclamation plants having one chlorinator and a duplicate of the largest unit for plants having multiple chlorinator units.

(z) Multiple Point Chlorination. Multiple point chlorination means that chlorine will be applied simultaneously at the reclamation plant and at subsequent chlorination stations located at the use area and/or some intermediate point. It does not include chlorine application for odor control purposes.

(aa) Alarm. Alarm means an instrument or device which continuously monitors a specific function of a treatment process and automatically gives warning of an unsafe or undesirable condition by means of visual and audible signals.

(bb) Person. Person also includes any private entity, city, county, district, the State or any department or agency thereof.

NOTE: Authority cited: Section 208, Health and Safety Code and Section 13521, Water Code. Reference: Section 13521, Water Code.

HISTORY

1. New Chapter 4 (§§ 60301–60357, not consecutive) filed 4–2–75; effective thirtieth day thereafter (Register 75, No. 14).
2. Renumbering of Chapter 4 (Sections 60301–60357, not consecutive) to Chapter 3 (Sections 60301–60357, not consecutive), filed 10–14–77; effective thirtieth day thereafter (Register 77, No. 42).

Article 2. Irrigation of Food Crops

§ 60303. Spray Irrigation.

Reclaimed water used for the spray irrigation of food crops shall be at all times an adequately disinfected, oxidized, coagulated, clarified, filtered wastewater. The wastewater shall be considered adequately disinfected if at some location in the treatment process the median number of coliform organisims does not exceed 2.2 per 100 milliliters and the number of coliform organisms does not exceed 23 per 100 milliliters in more than one sample within an 30–day period. The median value shall be determined from the bacteriological results of the last 7 days for which analyses have been completed.

§ 60305. Surface Irrigation.

(a) Reclaimed water used for surface irrigation of food crops shall be at all times an adequately disinfected, oxidized wastewater. The wastewater shall be considered adequately disinfected if at some location in the treatment process the median number of coliform organisms does not exceed 2.2 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed.

(b) Orchards and vineyards may be surface irrigated with reclaimed water that has the quality at least equivalent to that of primary effluent provided that no fruit is harvested that has come in contact with the irrigating water or the ground.

§ 60307. Exceptions.

Exceptions to the quality requirements for reclaimed water used for irrigation of food crops may be considered by the State Department of Health on an individual case basis where the reclaimed water is to be used to irrigate a food crop which must undergo extensive commercial, physical or chemical processing sufficient to destroy pathogenic agents before it is suitable for human consumption.

Article 3. Irrigation of Fodder, Fiber, and Seed Crops

§ 60309. Fodder, Fiber, and Seed Crops.

Reclaimed water used for the surface or spray irrigation of fodder, fiber, and seed crops shall have a level of quality no less than that of primary effluent.

§ 60311. Pasture for Milking Animals.

Reclaimed water used for the irrigation of pasture to which milking cows or goats have access shall be at all times an adequately disinfected, oxidized wastewater. The wastewater shall be considered adequately disinfected if at some location in the treatment process the median number of coliform organisms does not exceed 23 per 100 milliliters, as determined from the bacteriological results of he last 7 days for which analyses have been completed.

Article 4. Landscape Irrigation

§ 60313. Landscape Irrigation.

(a) Reclaimed water used for the irrigation of golf courses, cemeteries, freeway landscapes, and landscapes in other areas where the public has similar access or exposure shall be at all times an adequately disinfected, oxidized wastewater. The wastewater shall be considered adequately disinfected if the median number of coliform organisms in the effluent does not exceed 23 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed, and the number of coliform organisms does not exceed 240 per 100 milliliters in any two consecutive samples.

(b) Reclaimed water used for the irrigation of parks, playgrounds, schoolyards, and other areas where the public has similar access or exposure shall be at all times an adequately disinfected, oxidized, coagulated, clarified, filtered wastewater or a wastewater treated by a sequence of unit processes that will assure an equivalent degree of treatment and reliability. The wastewater shall be considered adequately disinfected if the median number of coliform organisms in the effluent does not exceed 2.2 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed, and the number of coliform organisms does not exceed 23 per 100 milliliters in any sample.

NOTE: Authority cited: Section 208, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

HISTORY

1. Amendment filed 9–22–78; effective thirtieth day thereafter (Register 78, No. 38).

Article 5. Recreational Impoundments

§ 60315. Nonrestricted Recreational Impoundment.

Reclaimed water used as a source of supply in a nonrestricted recreational impoundment shall be at all times an adequately disinfected, oxidized, coagulated, clarified, filtered wastewater. The wastewater shall be considered adequately disinfected if at some location in the treatment process the median number of coliform organisms does not exceed 2.2 per 100 milliliters and the number of coliform organisms does not exceed 23 per 100 milliliters in more than one sample within any 30–day period. The median value shall be determined from the bacteriological results of the last 7 days for which analyses have been completed.

§ 60317. Restricted Recreational Impoundment.

Reclaimed water used as a source of supply in a restricted recreational impoundment shall be at all times an adequately disinfected, oxidized wastewater. The wastewater shall be considered adequately disinfected if at some location in the treatment process the median number of coliform organisms does not exceed 2.2 per 100 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed.

§ 60319. Landscape Impoundment.

Reclaimed water used as a source of supply in a landscape impoundment shall be at all times an adequately disinfected, oxidized wastewater. The wastewater shall be considered adequately disinfected if at some location in the treatment process the median number of coliform organisms does not exceed 23 per 00 milliliters, as determined from the bacteriological results of the last 7 days for which analyses have been completed.

Article 5.1. Groundwater Recharge

§ 60320. Groundwater Recharge.

(a) Reclaimed water used for groundwater recharge of domestic water supply aquifers by surface spreading shall be at all times of a quality that fully protects public health. The State Department of Health Services' recommendations to the Regional Water Quality Control Boards for proposed groundwater recharge projects and for expansion of existing projects will be made on an individual case basis where the use of reclaimed water involves a potential risk to public health.

(b) The State Department of Health Services' recommendations will be based on all relevant aspects of each project, including the following factors: treatment provided; effluent quality and quantity; spreading area operations; soil characteristics; hydrogeology; residence time; and distance to withdrawal.

(c) The State Department of Health Services will hold a public hearing prior to making the final determination regarding the public health aspects of each groundwater recharge project. Final recommendations will be submitted to the Regional Water Quality Control Board in an expeditious manner.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.

HISTORY

1. New Article 5.1 (Section 60320) filed 9–22–78; effective thirtieth day thereafter (Register 78, No. 38).
2. Editorial correction of NOTE filed 12–3–84 (Register 84, No. 49).

Article 5.5. Other Methods of Treatment

§ 60320.5. Other Methods of Treatment.

Methods of treatment other than those included in this chapter and their reliability features may be accepted if the applicant demonstrates to the satisfaction of the State Department of Health that the methods of treatment and reliability features will assure an equal degree of treatment and reliability.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Section 13520, Water Code.

HISTORY

1. Renumbering of Article 11 (Section 60357) to Article 5.5 (Section 60320.5) filed 9–22–78; effective thirtieth day thereafter (Register 78, No. 38).

Article 6. Sampling and Analysis

§ 60321. Sampling and Analysis.

(a) Samples for settleable solids and coliform bacteria, where required, shall be collected at least daily and at a time when wastewater characteristics are most demanding on the treatment facilities and disinfection procedures. Turbidity analysis, where required, shall be performed by a continuous recording turbidimeter.

(b) For uses requiring a level of quality no greater than that of primary effluent, samples shall be analyzed by an approved laboratory method of settleable solids.

(c) For uses requiring an adequately disinfected, oxidized wastewater, samples shall be analyzed by an approved laboratory method for coliform bacteria content.

(d) For uses requiring an adequately disinfected, oxidized, coagulated, clarified, filtered wastewater, samples shall be analyzed by approved laboratory methods for turbidity and coliform bacteria content.

Article 7. Engineering Report and Operational Requirements

§ 60323. Engineering Report.

(a) No person shall produce or supply reclaimed water for direct reuse from a proposed water reclamation plant unless he files an engineering report.

(b) The report shall be prepared by a properly qualified engineer registered in California and experienced in the field of wastewater treatment, and shall contain a description of the design of the proposed reclamation system. The report shall clearly indicate the means for compliance with these regulations and any other features specified by the regulatory agency.

(c) The report shall contain a contingency plan which will assure that no untreated or inadequately–treated wastewater will be delivered to the use area.

§ 60325. Personnel.

(a) Each reclamation plant shall be provided with a sufficient number of qualified personnel to operate the facility effectively so as to achieve the required level of treatment at all times.

(b) Qualified personnel shall be those meeting requirements established pursuant to Chapter 9 (commencing with Section 13625) of the Water Code.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.

HISTORY

1. New NOTE filed 12–3–84 (Register 84, No. 49).

§ 60327. Maintenance.

A preventive maintenance program shall be provided at each reclamation plant to ensure that all equipment is kept in a reliable operating condition.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.

HISTORY

1. New NOTE filed 12–3–84 (Register 84, No. 49).

§ 60329. Operating Records and Reports.

(a) Operating records shall be maintained at the reclamation plant or a central depository within the operating agency. These shall include: all analyses specified in the reclamation criteria; records of operational problems, plant and equipment breakdowns, and diversions to emergency storage or disposal; all corrective or preventive action taken.

(b) Process or equipment failures triggering an alarm shall be recorded and maintained as a separate record file. The recorded information shall include the time and cause of failure and corrective action taken.

(c) A monthly summary of operating records as specified under (a) of this section shall be filed monthly with the regulatory agency.

(d) Any discharge of untreated or partially treated wastewater to the use area, and the cessation of same, shall be reported immediately by telephone to the regulatory agency, the State Department of Health, and the local health officer.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.

HISTORY

1. New NOTE filed 12–3–84 (Register 84, No. 49).

§ 60331. Bypass.

There shall be no bypassing of untreated or partially treated wastewater from the reclamation plant or any intermediate unit processes to the point of use.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.

HISTORY

1. New NOTE filed 12–3–84 (Register 84, No. 49).

Article 8. General Requirements of Design

§ 60333. Flexibility of Design.

The design of process piping, equipment arrangement, and unit structures in the reclamation plant must allow for efficiency and convenience in operation and maintenance and provide flexibility of operation to permit the highest possible degree of treatment to be obtained under varying circumstances.

§ 60335. Alarms.

(a) Alarm devices required for various unit processes as specified in other sections of these regulations shall be installed to provide warning of:

(1) Loss of power from the normal power supply.

(2) Failure of a biological treatment process.

(3) Failure of a disinfection process.

(4) Failure of a coagulation process.

(5) Failure of a filtration process.

(6) Any other specific process failure for which warning is required by the regulatory agency.

(b) All required alarm devices shall be independent of the normal power supply of the reclamation plant.

(c) The person to be warned shall be the plant operator, superintendent, or any other responsible person designated by the management of the reclamation plant and capable of taking prompt corrective action.

(d) Individual alarm devices may be connected to a master alarm to sound at a location where it can be conveniently observed by the attendant. In case the reclamation plant is not attended full time, the alarm(s) shall be connected to sound at a police station, fire station or other full–time service unit with which arrangements have been made to alert the person in charge at times that the reclamation plant is unattended.

§ 60337. Power Supply.

The power supply shall be provided with one of the following reliability features:

(a) Alarm and standby power source.

(b) Alarm and automatically actuated short–term retention or disposal provisions as specified in Section 60341.

(c) Automatically actuated long–term storage or disposal provisions as specified in Section 60341.

Article 9. Alternative Reliability Requirements for Uses Permitting Primary Effluent

§ 60339. Primary Treatment.

Reclamation plants producing reclaimed water exclusively for uses for which primary effluent is permitted shall be provided with one of the following reliability features:

(a) Multiple primary treatment units capable of producing primary effluent with one unit not in operation.

(b) Long–term storage or disposal provisions as specified in Section 60341.

Article 10. Alternative Reliability Requirements for Uses Requiring Oxidized, Disinfected Wastewater or Oxidized, Coagulated, Clarified, Filtered, Disinfected Wastewater

§ 60341. Emergency Storage or Disposal.

(a) Where short–term retention or disposal provisions are used as a reliability feature, these shall consist of facilities reserved for the purpose of storing or disposing of untreated or partially treated wastewater for at least a 24-hour period. The facilities shall include all the necessary diversion devices, provisions for odor control, conduits, and pumping and pump back equipment. All of the equipment other than the pump back equipment shall be either independent of the normal power supply or provided with a standby power source.

(b) Where long-term storage or disposal provisions are used as a reliability feature, these shall consist of ponds, reservoirs, percolation areas, downstream sewers leading to other treatment or disposal facilities or any other facilities reserved for the purpose of emergency storage or disposal of untreated or partially treated wastewater. These facilities shall be of sufficient capacity to provide disposal or storage of wastewater for at least 20 days, and shall include all the necessary diversion works, provisions for odor and nuisance control, conduits, and pumping and pump back equipment. All of the equipment other than the pump back equipment shall be either independent of the normal power supply or provided with a standby power source.

(c) Diversion to a less demanding reuse is an acceptable alternative to emergency disposal of partially treated wastewater provided that the quality of the partially treated wastewater is suitable for the less demanding reuse.

(d) Subject to prior approval by the regulatory agency, diversion to a discharge point which requires lesser quality of wastewater is an acceptable alternative to emergency disposal of partially treated wastewater.

(e) Automatically actuated short-term retention or disposal provisions and automatically actuated long-term storage or disposal provisions shall include, in addition to provisions of (a), (b), (c), or (d) of this section, all the necessary sensors, instruments, valves and other devices to enable fully automatic diversion of untreated or partially treated wastewater to approved emergency storage or disposal in the event of failure of a treatment process and a manual reset to prevent automatic restart until the failure is corrected.

§ 60343. Primary Treatment.

All primary treatment unit processes shall be provided with one of the following reliability features:

(a) Multiple primary treatment units capable of producing primary effluent with one unit not in operation.

(b) Standby primary treatment unit process.

(c) Long-term storage or disposal provisions.

§ 60345. Biological Treatment.

All biological treatment unit processes shall be provided with one of the following reliability features:

(a) Alarm and multiple biological treatment units capable of producing oxidized wastewater with one unit not in operation.

(b) Alarm, short-term retention or disposal provisions, and standby replacement equipment.

(c) Alarm and long-term storage or disposal provisions.

(d) Automatically actuated long-term storage or disposal provisions.

§ 60347. Secondary Sedimentation.

All secondary sedimentation unit processes shall be provided with one of the following reliability features:

(a) Multiple sedimentation units capable of treating the entire flow with one unit not in operation.

(b) Standby sedimentation unit process.

(c) Long-term storage or disposal provisions.

§ 60349. Coagulation.

(a) All coagulation unit processes shall be provided with the following mandatory features for uninterrupted coagulant feed:

(1) Standby feeders,

(2) Adequate chemical stowage and conveyance facilities,

(3) Adequate reserve chemical supply, and

(4) Automatic dosage control.

(b) All coagulation unit processes shall be provided with one of the following reliability features:

(1) Alarm and multiple coagulation units capable of treating the entire flow with one unit not in operation;

(2) Alarm, short-term retention or disposal provisions, and standby replacement equipment;

(3) Alarm and long-term storage or disposal provisions;

(4) Automatically actuated long-term storage or disposal provisions, or

(5) Alarm and standby coagulation process.

§ 60351. Filtration.

All filtration unit processes shall be provided with one of the following reliability features:

(a) Alarm and multiple filter units capable of treating the entire flow with one unit not in operation.

(b) Alarm, short-term retention or disposal provisions and standby replacement equipment.

(c) Alarm and long-term storage or disposal provisions.

(d) Automatically actuated long-term storage or disposal provisions.

(e) Alarm and standby filtration unit process.

§ 60353. Disinfection.

(a) All disinfection unit processes where chlorine is used as the disinfectant shall be provided with the following features for uninterrupted chlorine feed:

(1) Standby chlorine supply,

(2) Manifold systems to connect chlorine cylinders,

(3) Chlorine scales, and

(4) Automatic devices for switching to full chlorine cylinders.

Automatic residual control of chlorine dosage, automatic measuring and recording of chlorine residual, and hydraulic performance studies may also be required.

(b) All disinfection unit processes where chlorine is used as the disinfectant shall be provided with one of the following reliability features:

(1) Alarm and standby chlorinator;

(2) Alarm, short-term retention or disposal provisions, and standby replacement equipment;

(3) Alarm and long-term storage or disposal provisions;

(4) Automatically actuated long-term storage or disposal provisions; or

(5) Alarm and multiple point chlorination, each with independent power source, separate chlorinator, and separate chlorine supply.

§ 60355. Other Alternatives to Reliability Requirements.

Other alternatives to reliability requirements set forth in Articles 8 to 10 may be accepted if the applicant demonstrates to the satisfaction of the State Department of Health that the proposed alternative will assure an equal degree of reliability.

NOTE: Authority cited: Section 208, Health and Safety Code; and Section 13521, Water Code. Reference: Sections 13520 and 13521, Water Code.

HISTORY

1. New NOTE filed 12-3-84 (Register 84, No. 49).

Article 11. Other Methods of Treatment

§ 60357. Other Methods of Treatment.

NOTE: Authority cited: Section 208, Health and Safety Code and Section 13521, Water Code. Reference: Section 13520, Water Code.

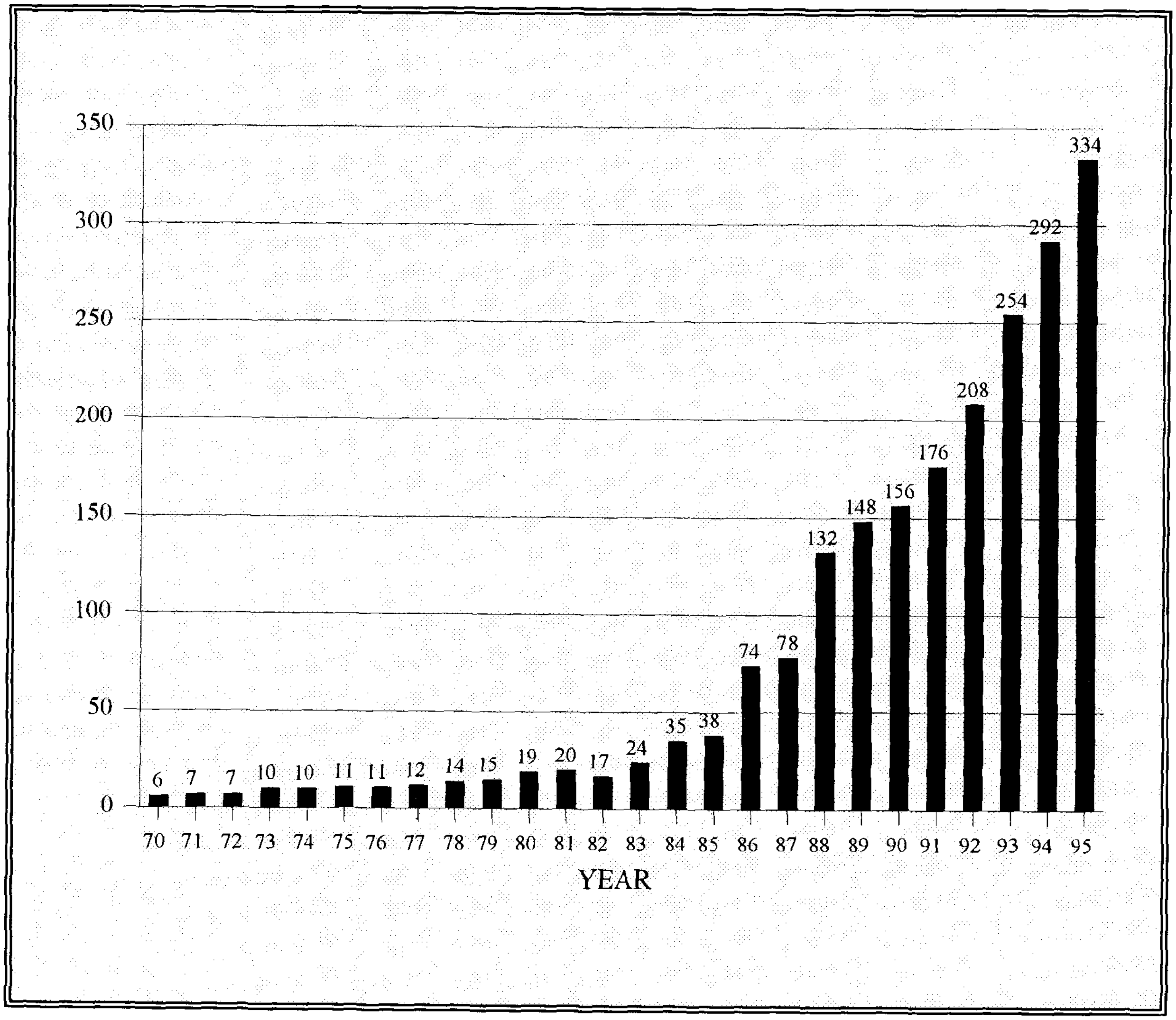
HISTORY

1. Renumbering of Article 11 (Section 60357) to Article 5.5 (Section 60320.5) filed 9-22-78; effective thirtieth day thereafter (Register 78, No. 38.) For history of former Article 11, see Registers 75, No. 14 and 77, No. 42.

SECTION 4.1: EXISTING WATER REUSE IN THE DISTRICTS' SERVICE AREA

Prior to the drought of 1976-77, there were eleven reuse customers (both direct nonpotable and indirect potable) using reclaimed water on 940 acres (direct use only). By the end of September 1995, there were 334 reuse sites on approximately 8,023 acres (direct use only). This includes three cities employing water trucks to haul reclaimed water to various greenbelt areas and several private water trucks hauling reclaimed water to construction sites. Figure 4-1 shows the increase in the number of reuse sites receiving reclaimed water from the Districts from 1970 through the end of the third quarter of 1995. All of the reuse sites and their acreages, the start-up dates, and the applications and quantities of reclaimed water used are presented in Exhibit 4-1.

FIGURE 4-1
INCREASE IN NUMBER OF REUSE SITES
1970-95



Of the total amount of water reused, an annual average of 44.6 MGD (50,000 AFY) or 65.0% is used from the San Jose Creek, Whittier Narrows and Pomona WRPs for groundwater replenishment. Through the end of FY 1994-95, nearly 1,000,000 AF of reclaimed water from these plants have recharged the Central Basin aquifer. More reclaimed water is used for groundwater recharge than for all other applications combined. This is because the WRPs are located along existing rivers or creeks (i.e., flood control channels) that convey the effluent by gravity to existing offstream recharge basins where large quantities of reclaimed water can be percolated by gravity into the groundwater basin. Reclaimed water used in this manner incurs no additional capital improvements or O&M costs.

The remainder of the reclaimed water usage is divided between four broad categories of direct nonpotable usage. During FY 1994-95, a total of 300 of the individual reuse sites used reclaimed water for some form of landscape irrigation, and approximately 9.706 MGD (10,876 AFY) or 14.1% of the total amount reused went toward this application. These sites included 80 parks, 71 schools, 63 roadway greenbelt areas, 17 golf courses, 15 nurseries, five cemeteries and 50 miscellaneous landscaped sites, such as churches, commercial buildings, auto dealerships, landfills, etc. Agricultural usage was approximately 4.097 MGD (4,591 AFY) or 6.0% of the total amount reused. Industrial applications of reclaimed water (which include carpet dyeing, paper manufacturing and construction applications such as dust control and concrete mixing) totaled 4.351 MGD (4,875 AFY) or 6.3% of the total amount reused. And finally, 5.879 MGD (6,588 AFY) or 8.6% of the total amount reused went to maintaining a wildlife habitat in the Mojave Desert. Figure 4-2 shows the growth in direct nonpotable usage (calendar year 1995 value estimated). Figure 4-3 shows the distribution of reuse flows among these various reuse applications.

FIGURE 4-2
INCREASE IN DIRECT NONPOTABLE REUSE
(MGD)

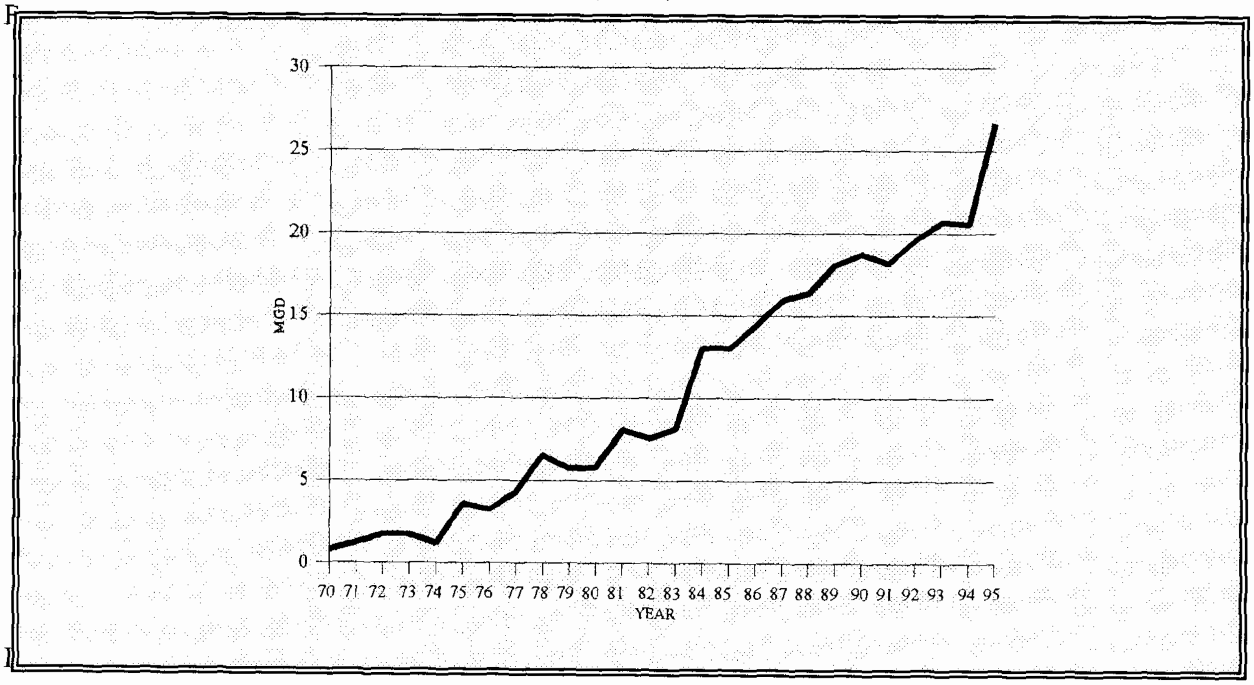
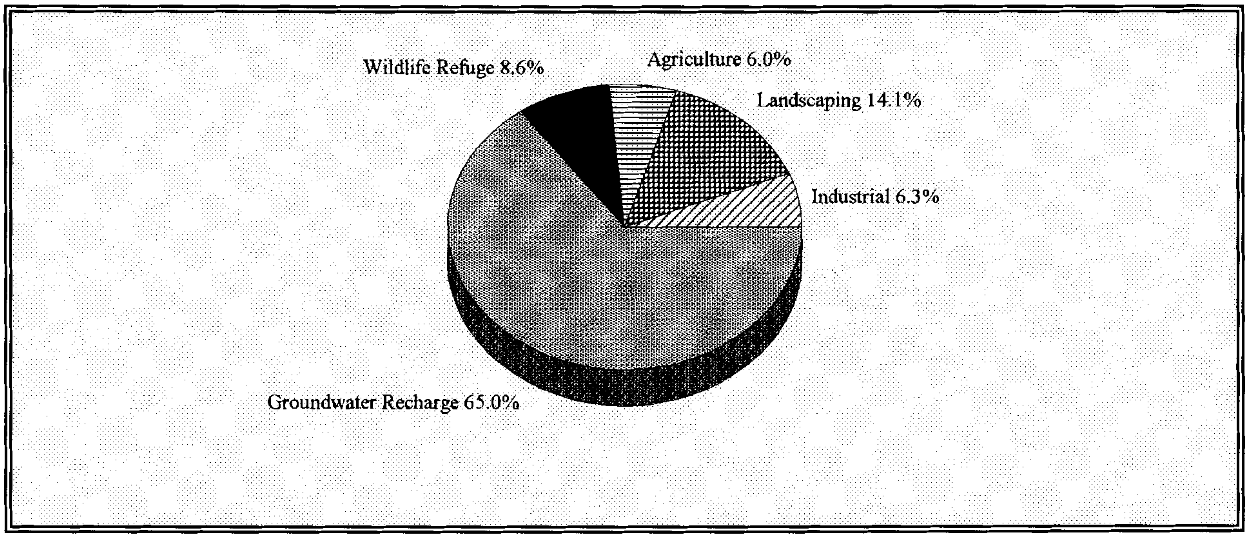


FIGURE 4-3
AVERAGE DISTRIBUTION OF RECLAIMED WATER USAGE
Fiscal Year 1994-95



The following sections detail the various reclaimed water distribution systems in the Districts' service area.

4.1.1 La Cañada-Flintridge Country Club

All of the disinfected, secondary effluent from the La Cañada WRP is disposed of by discharge into the four lakes on the 105 acre golf course that makes up the La Cañada-Flintridge Country Club (Figure 4-4). Lake water (augmented by potable water during the summer) is used for landscape irrigation of the golf course. During FY 1994-95, 0.117 MGD (131 AFY) was used.

4.1.2 Long Beach Water Department

Beginning in 1980, the LBWD embarked on a multi-phase program to distribute reclaimed water from the Long Beach WRP throughout the city (Figure 4-5). During FY 1994-95, the LBWD served 2.671 MGD (2,992 AFY), or 13.9% of the reclaimed water produced at this plant, through approximately 103,000 feet of pipeline (6- to 24-inches in diameter) to 41 sites encompassing 1,774 acres. The total capital cost of the system was approximately $8.6 million. The LBWD sells the reclaimed water at a rate of $319.73/AF, or approximately 50% of its potable water rate of $643.38/AF.

In addition to landscape irrigation, reclaimed water service for use in repressurization of the oil-bearing strata, initially constructed in 1971, was restored to the THUMS project on Island White in June 1995. This is beginning as a six month, 300 gpm trial project to determine the suitability of tertiary treated reclaimed water for this application. Once the reclaimed water is delivered to the island, it is treated similarly to the potable water supplies used for repressurization: oxygen removal, polymer coagulation and 5 and 10 micron filtration.

FIGURE 4-4
LA CANADA-FLINTRIDGE COUNTRY CLUB

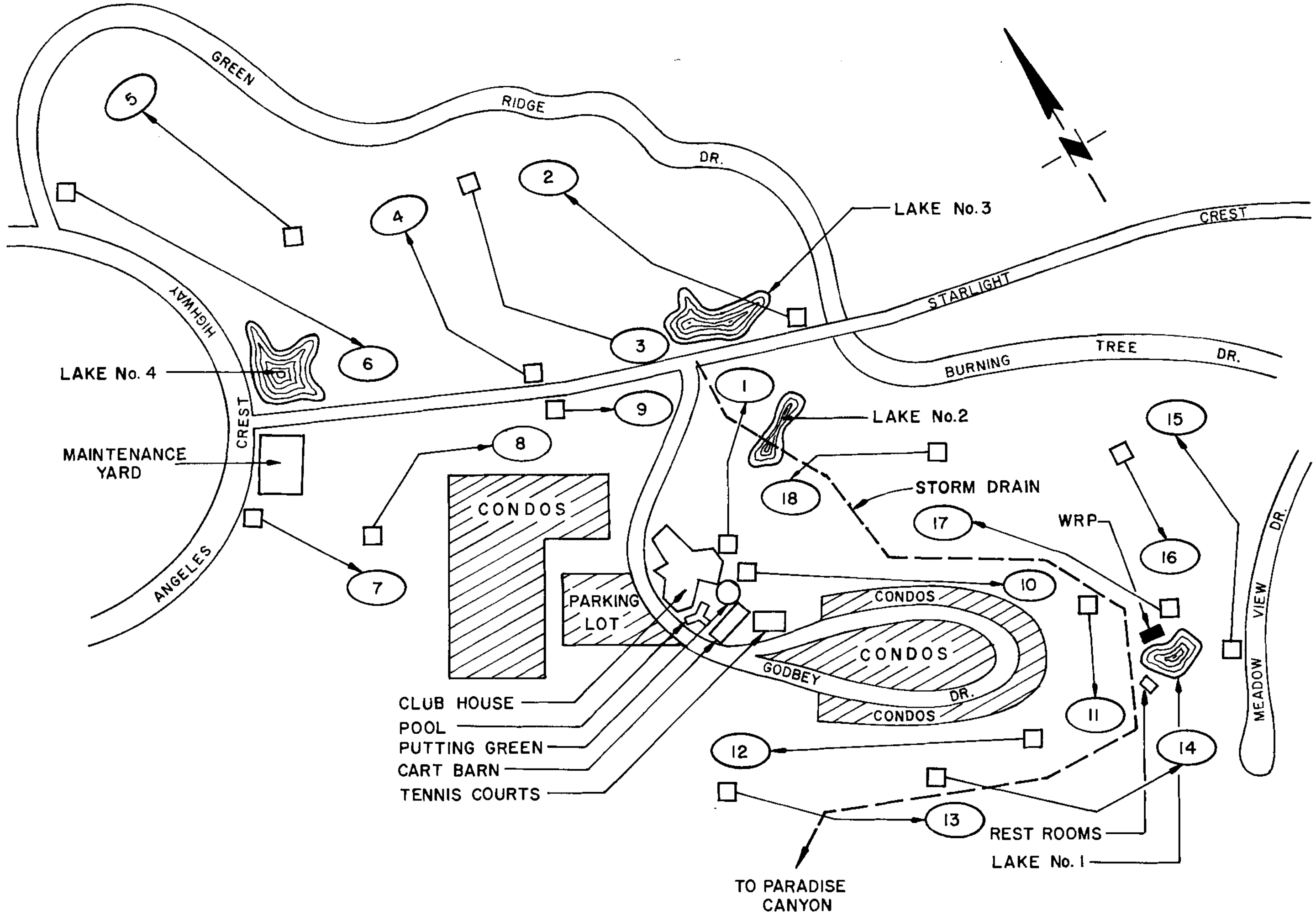
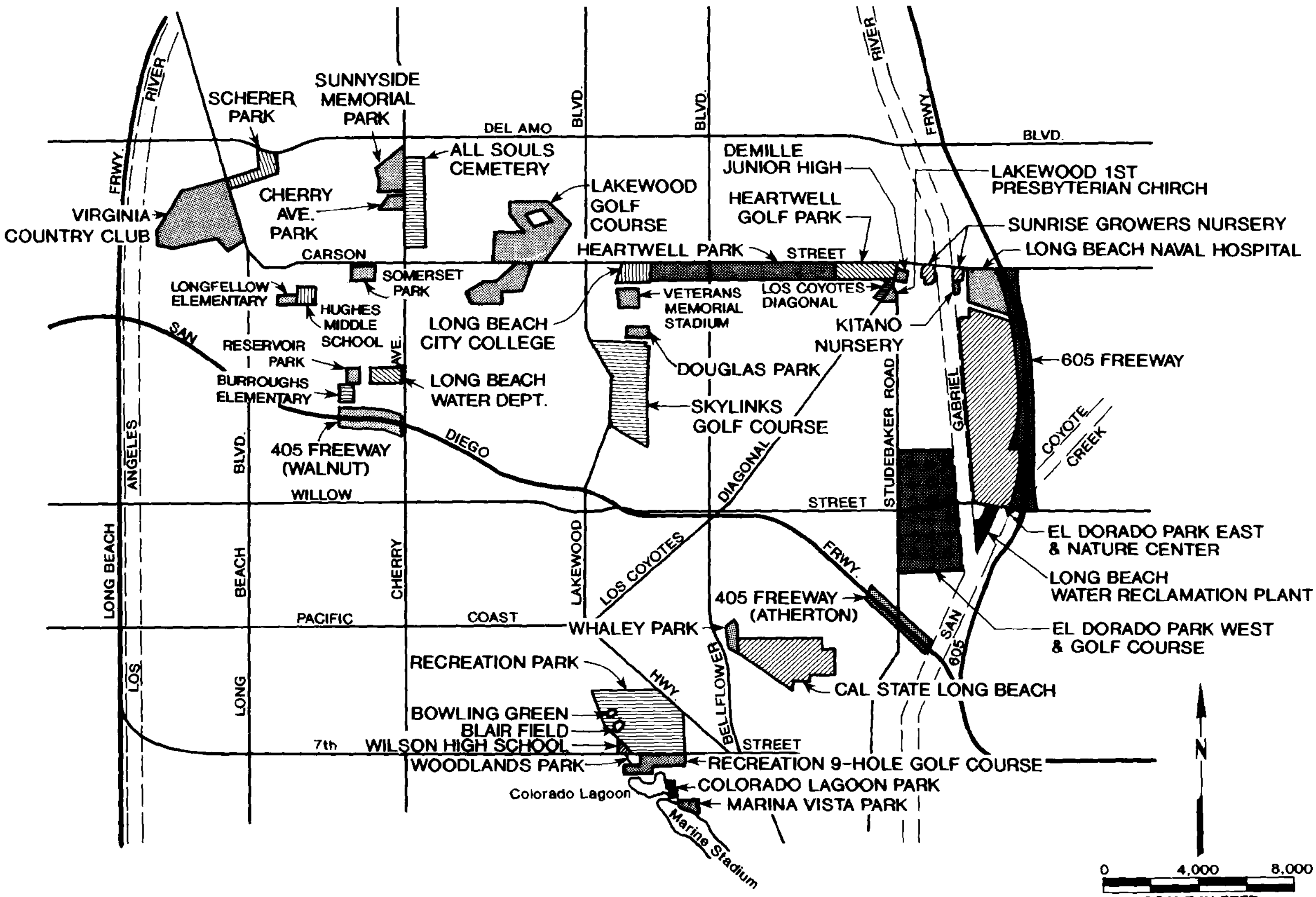


FIGURE 4-5
LONG BEACH WATER DEPARTMENT REUSE SITES



Preliminary results indicate that the reclaimed water can be treated to achieve desirable injection qualities and that no negative effects from reclaimed water use have been detected.

4.1.3 City of Bellflower

Reclaimed water deliveries from the Los Coyotes WRP to a single, 5 acre site (Caruthers Park) in Bellflower began in November 1978. Currently, an average of 0.046 MGD (51 AFY), or 0.1% of the reclaimed water produced at this plant, is used for landscape irrigation. A 30 horsepower (HP) pump at the end of the WRP's effluent forebay supplies reclaimed water to the park through 1,900 feet of 4-inch pipe which crosses the San Gabriel River. The cost of the reclaimed water to the City of Bellflower for FY 1994-95 was $82.10/AF, which included the cost of purchasing the reclaimed water from the Districts, O&M on the pump station and power costs for pumping. This cost does not include any amortized capital costs for the distribution facilities. It is possible that this site could be connected to the Century Reclamation Program (see Section 4.1.6).

4.1.4 City of Cerritos

Initial deliveries to Cerritos also began in November 1978 and consisted of landscape irrigation and ornamental lake supply at the 25 acre Ironwood 9 Golf Course next to the Los Coyotes WRP. Reclaimed water was supplied to this site by means of a 50 HP pump at the plant's effluent forebay (next to the Bellflower pump) and 75 feet of 6-inch pipe. This system was abandoned in May 1988 when the City of Cerritos completed its citywide distribution system (Figure 4-6). A 14,800 gpm pump station next to the north side of the effluent forebay delivered water to 47 initial reuse sites through 130,000 feet (24.6 miles) of pipe that loops through the city. Provisions were made so that neighboring cities could connect to this distribution system in the future and make use of the projected system capacity of 4,000 AFY.

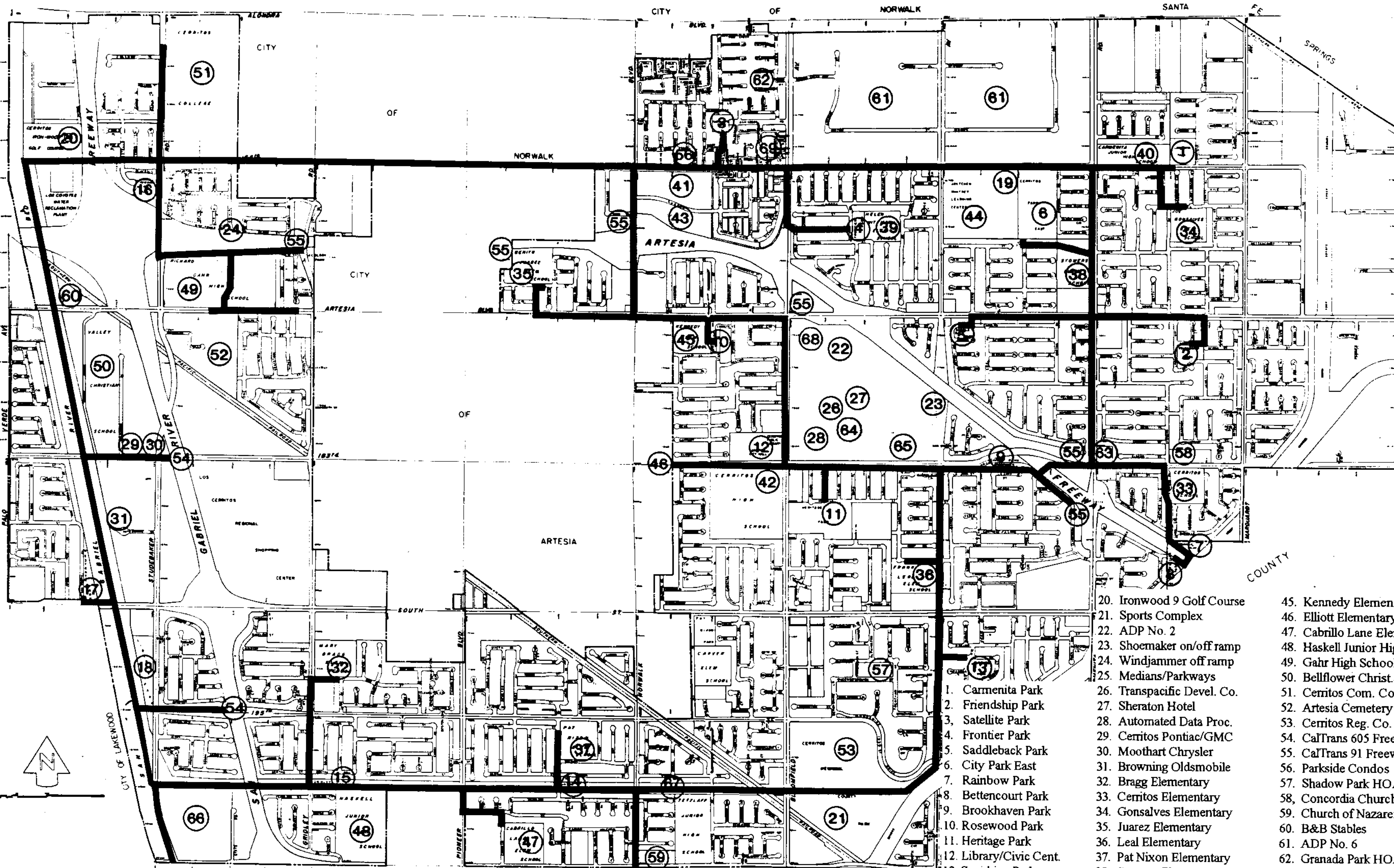
During FY 1994-95, Cerritos used 1.588 MGD (1,779 AFY), or 4.7% of the reclaimed water produced at the Los Coyotes WRP, for landscape irrigation and impoundments on 742.5 acres at 69 individual sites. Effluent was also hauled by private and city water trucks for construction and landscape irrigation, respectively. Reclaimed water users are charged $217.80/AF, or 53% of the potable water rate of $413.82/AF.

4.1.5 City of Lakewood

In August 1989, the City of Lakewood connected to two of the stub-outs provided in the City of Cerritos reclaimed water distribution system to supply Lakewood's own distribution system. This system consisted of 28,300 feet (5.4 miles) of pipeline. All of the users of reclaimed water from the Lakewood distribution system, as of the end of FY 1994-95, are shown in Figure 4-7.

During FY 1994-95, the City of Lakewood used 0.393 MGD (441 AFY), or 1.2% of the reclaimed water produced at the Los Coyotes WRP, for irrigation of landscaping, athletic fields and a vegetable farm on 190.5 acres at 16 individual sites. A small amount of reclaimed water is hauled by a city water truck for spot irrigation of parkways and trees in the city. The City of Lakewood is charged $171.51/AF by the City of Cerritos for the reclaimed water. The City of Lakewood, in turn, retails the reclaimed water to its customers for $370.26/AF, or 89% of its potable rate of $413.82/AF. However, Lakewood reimburses its reclaimed water customers for their capital expenditures to convert their onsite facilities to accept reclaimed water.

FIGURE 4-6
CITY OF CERRITOS RECLAIMED WATER DISTRIBUTION SYSTEM



1. Carmenita Park
2. Friendship Park
3. Satellite Park
4. Frontier Park
5. Saddleback Park
6. City Park East
7. Rainbow Park
8. Bettencourt Park
9. Brookhaven Park
10. Rosewood Park
11. Heritage Park
12. Library/Civic Cent.
13. Sunshine Park
14. Jacob Park
15. Gridley Park
16. Reservoir Hill Park
17. Westgate Park
18. Liberty Park
19. Olympic Natatorium
20. Ironwood 9 Golf Course
21. Sports Complex
22. ADP No. 2
23. Shoemaker on/off ramp
24. Windjammer off ramp
25. Medians/Parkways
26. Transpacific Devel. Co.
27. Sheraton Hotel
28. Automated Data Proc.
29. Cerritos Pontiac/GMC
30. Moothart Chrysler
31. Browning Oldsmobile
32. Bragg Elementary
33. Cerritos Elementary
34. Gonsalves Elementary
35. Juarez Elementary
36. Leal Elementary
37. Pat Nixon Elementary
38. Stowers Elementary
39. Whittman Elementary
40. Carmenita Junior High
41. ABC Adult School/Office
42. Cerritos High School
43. Tracy Education Center
44. Whitney Learning Center
45. Kennedy Elementary
46. Elliott Elementary
47. Cabrillo Lane Elem.
48. Haskell Junior High
49. Gahr High School
50. Bellflower Christ. Sch.
51. Cerritos Com. Coll.
52. Artesia Cemetery Dist.
53. Cerritos Reg. Co. Park
54. CalTrans 605 Freeway
55. CalTrans 91 Freeway
56. Parkside Condos
57. Shadow Park HOA
58. Concordia Church
59. Church of Nazarene
60. B&B Stables
61. ADP No. 6
62. Granada Park HOA
63. Cerritos Post Office
64. Performing Arts Center
65. Delta Dental
66. Orange County Nursery
67. SCE Nursery
68. Vestar Development
69. Sundance Condos

FIGURE 4-7
CITY OF LAKEWOOD REUSE SITES

1. River Park	9. Woodruff Avenue greenbelt
2. Monte Verde Park	10. South Street greenbelt
3. Mae Boyer Park	11. St. Joseph's Parish School
4. Del Valle Park	12. Steven Foster Elementary
5. San Martin Park	13. Mayfair High School
6. Mayfair Park	14. Lindstrom Elementary
7. Civic Center Way	15. Lakewood High School
8. City Water Yard	16. My Hoa Farm

4.1.6 Central Basin Municipal Water District (E. Thornton Ibbetson Century Program)

The Central Basin Municipal Water District (CBMWD), a regional water purveyor and member agency of the MWD, is the lead agency in developing the regional Century reclaimed water distribution system which serves the cities of Bellflower, Compton, Downey, Lynwood, Norwalk, Paramount, Santa Fe Springs and South Gate. The $15 million project consists of 26 miles of pipelines connected to one of the 24-inch distribution lines coming from the City of Cerritos pump station, located at the Los Coyotes WRP. At some future date, a separate pump station is expected to be constructed to serve this system. In September 1993, a 4 MG potable storage reservoir in the City of Santa Fe Springs was converted for daily operational storage of reclaimed water. The backbone of the distribution system is a 30-inch pipeline paralleling the San Gabriel River. Construction was completed in 1993, and up to 8,000 AFY of reclaimed water will eventually be delivered to over 100 sites for applications such as landscape irrigation of parks, schools and freeway slopes, nursery stock irrigation and various industrial applications. This system has also been connected to the completed portions of the Rio Hondo reclaimed water distribution system, as detailed later in Section 4.2.13. Both the Century and Rio Hondo distribution systems can be supplied with reclaimed water from either the Los Coyotes or San Jose Creek WRPs, individually or in combination. Figure 4-8 shows the location of the current and planned reclaimed water use sites.

The CBMWD has constructed the delivery facilities right up to the end user; however, the retail water purveyor is the entity actually supplying the reclaimed water. During FY 1994-95, the CBMWD delivered 1.982 MGD (2,221 AFY) of reclaimed water through 10 retail water purveyors for landscape and athletic field irrigation on 916.7 acres at 86 individual sites. The CBMWD wholesales the reclaimed water to its customers, the retail water purveyors, on a monthly use, tiered rate schedule ($260 for the first 25 AF, $240 for the next 25 AF, $220 for the next 50 AF and $200 for anything above 100 AF). This is between 47% and 61% of the rate of $429/AF charged by CBMWD for potable water supplied by MWD.

4.1.7 Pomona Water Department

Documented use of treated wastewater in the Pomona area goes as far back as 1904 when effluents treated to various levels were used on the many farms and ranches in the area. The City of Pomona Water Department began using reclaimed water from the Districts' current Pomona WRP in December 1973 when agricultural irrigation at Cal Poly Pomona and its satellite farming operation at Lanterman State Hospital, along with landscape irrigation along South Campus Drive Parkway, were connected to a reclaimed water distribution system. In later years, two freeway interchanges, two paper mills, a county regional park and the Districts' Spadra Landfill were added. The distribution system consists of a 490 HP, 9,000 gpm pump station that feeds two, 21-inch transmission lines. A 21-inch unreinforced concrete gravity line from the WRP serves the Landfill, Lanterman Hospital and the WVWD system.

During FY 1994-95, the Pomona Water Department delivered 6.082 MGD (6,815 AFY), or 47.7% of the reclaimed water from the Pomona WRP, to its nine retail customers shown in Figure 4-9. Reclaimed water is sold at approximately 28% of its potable water rate of $276.17/AF, or $76.21/AF.

4.1.8 Walnut Valley Water District

In March 1986, the WVWD completed its reclaimed water distribution system that includes a 3,500 gpm pump station and an 8,000 gallon wet well at the end of the 21-inch concrete gravity line from the Pomona

FIGURE 4-8
CENTRAL BASIN MUNICIPAL WATER DISTRICT
CENTURY RECLAIMED WATER DISTRIBUTION SYSTEM

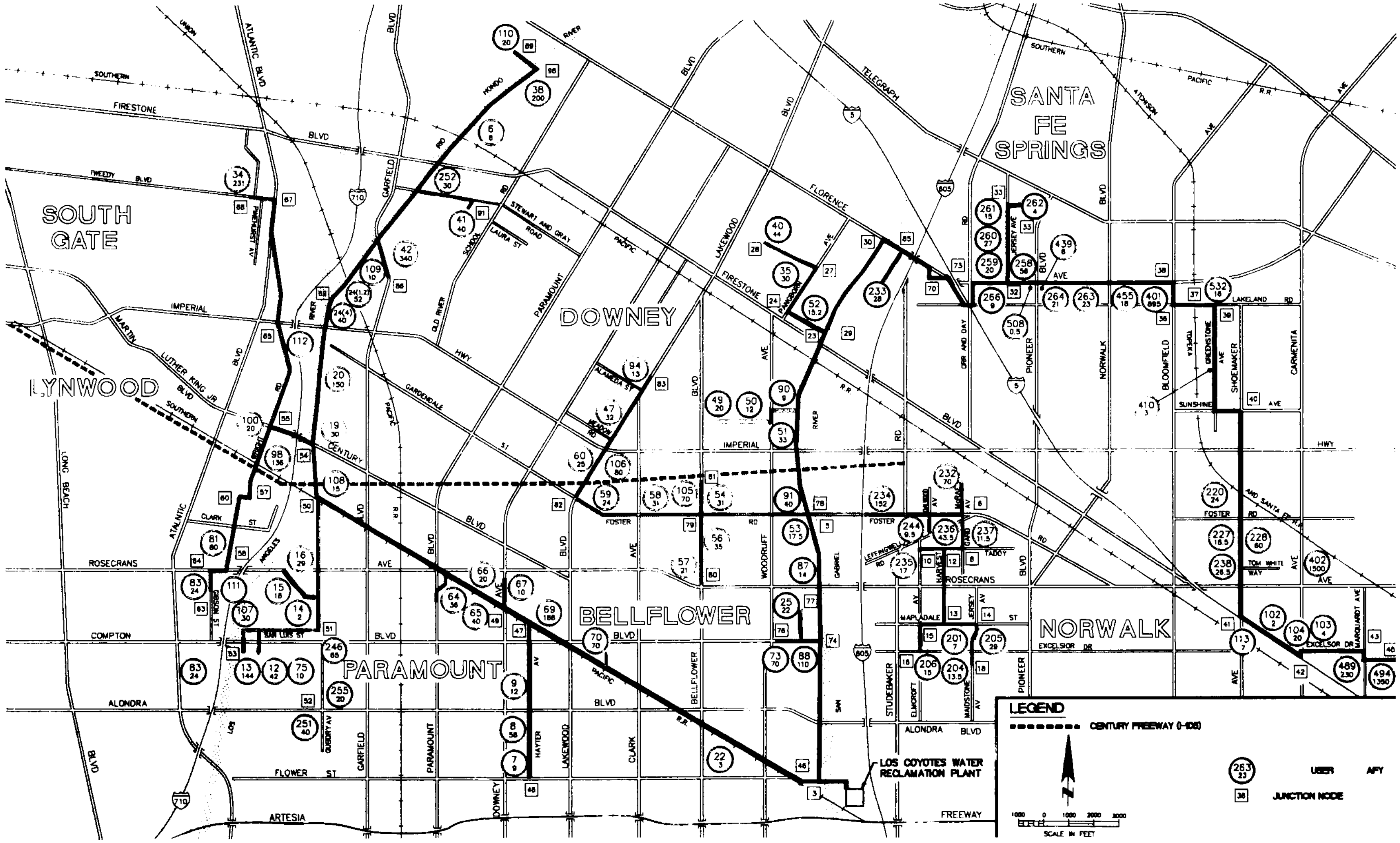
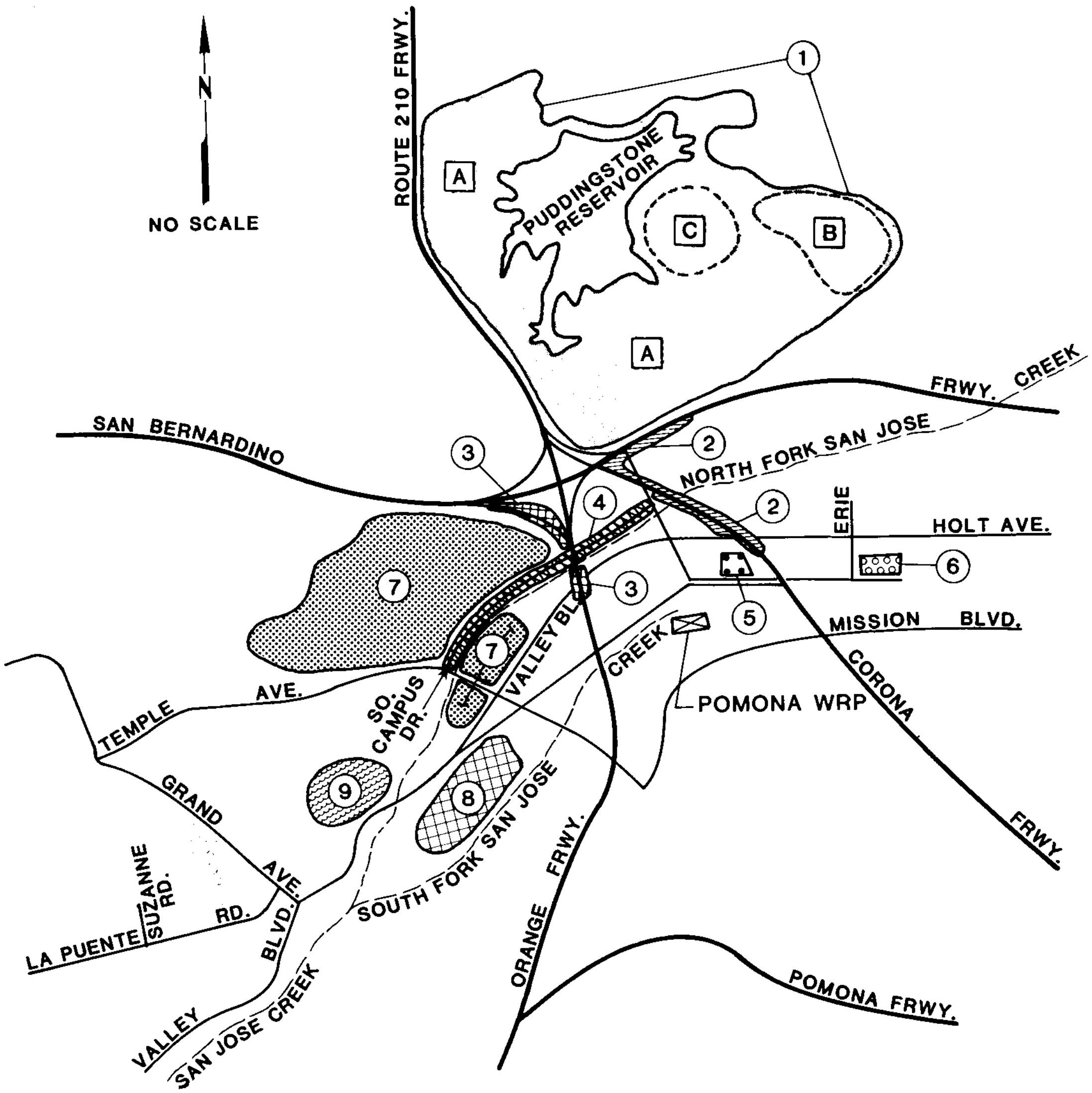


FIGURE 4-9
POMONA WATER DEPARTMENT REUSE SITES



Reuse Sites

- (1) FRANK G. BONELLI REGINOAL COUNTY PARK
  - [A] BONELLI PARK
  - [B] MOUNTAIN MEADOWS GOLF COURSE
  - [C] EAST SHORE R.V. PARK
- (2) ROUTE 71 FREEWAY
- (3) ROUTE 57 FREEWAY
- (4) SOUTH CAMPUS DRIVE PARKWAY
- (5) SMURFIT NEWSPRINT COMPANY
- (6) SIMPSON PAPER COMPANY
- (7) CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA - KELLOGG CAMPUS
- (8) CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA - LANTERMAN STATE HOSPITAL
- (9) SPADRA LANDFILL

WRP, 27 miles of pipeline and a 2 MG reservoir. Construction of a second, 2 MG reservoir was completed in mid-1992 to provide more storage to satisfy the late night/early morning peak demands. The distribution system is supplemented during the peak summer demand periods with nonpotable water from a well located next to the reclaimed water line on Fairway Avenue. Initially, 26 individual sites were served following completion of the distribution system, with another 49 added since then. Figure 4-10 shows the users of the WVWD system as of the end of FY 1994-95.

During FY 1994-95, the WVWD delivered 1.085 MGD (1,215 AFY), or 8.5% of the reclaimed water produced at the Pomona WRP. The WVWD purchased the reclaimed water from the Pomona Water Department at $76.21/AF, and retailed to its 74 customers (which irrigate 830 acres) at 85% of its potable water rate of $596.77/AF, or $507.26/AF.

4.1.9 Montebello Forebay Groundwater Recharge Project

The Central Basin groundwater aquifer is naturally replenished by a long-term average of 46,600 AFY of infiltration from surface flows and 28,400 AFY of subsurface inflow from the Main San Gabriel Basin to the north. Over the past 10 years, an average of 38,500 AFY of imported water from MWD has been purchased by the WRD for groundwater replenishment. The WRD has also contracted with the Districts for the purchase of reclaimed water from the Whittier Narrows and San Jose Creek WRPs for the replenishment of the Central Basin aquifer. River discharge of reclaimed water from the Districts' Pomona WRP is also recovered for this purpose. The groundwater recharge operation with reclaimed water is limited to a three-year running total of 150,000 AFY and a maximum of 60,000 AFY in any one year. The locations of the groundwater recharge facilities are shown in Figure 4-11 (Whittier Narrows WRP Reuse Sites).

The majority (76.3%) of reclaimed water discharged from the Whittier Narrows WRP is used to recharge the Central Basin. In FY 1994-95, 8.96 MGD (10,038 AFY) was directed mainly to the Rio Hondo Spreading Grounds via the plant's discharge point to the Rio Hondo (99%), with a small amount going to the San Gabriel Coastal Spreading Grounds via the plant's 45-inch outfall pipe (1%). A third discharge point, the Zone 1 Ditch leading to the Rio Hondo Spreading Grounds, was not used during FY 1994-95.

The great majority (91%) of reclaimed water actively used from the San Jose Creek WRP goes to recharge the Central Basin aquifer, which in FY 1994-95 was 12.51 MGD (14,019 AFY). In FY 1994-95, 16.72 MGD (18,740 AFY) was directed either to the San Gabriel Coastal Spreading Grounds from both the east and west side of the WRP via the plant's 66-inch outfall pipe (1.3%), or to the Rio Hondo Spreading Grounds via the plant's discharge point from the east side to the San Jose Creek channel (97%). The Stage III expansion also has the capability of discharging into the San Gabriel River upstream of the Zone 1 Ditch for transport to the Rio Hondo Spreading Grounds. However, this was only done on 14 days during the past fiscal year (1.7% of total recharged flow). Due to heavy rainfall in January to March 1995, the Los Angeles County DPW, which operates the recharge facilities, estimated that 2.26 MGD (2,532 AFY) bypassed the spreading grounds and was lost to the ocean.

After the diversions to Pomona Water Department and WVWD, 2.71 MGD (3,037 AFY) of effluent from the Pomona WRP were discharged to the river and credited toward groundwater recharge in FY 1994-95.

The cost of the reclaimed water for FY 1994-95 was $11.77/AF, which included the cost of purchasing the reclaimed water from the Districts and the cost of the additional chemicals required for discharge into an

FIGURE 4-10

WALNUT VALLEY WATER DISTRICT RECLAIMED WATER DISTRIBUTION SYSTEM

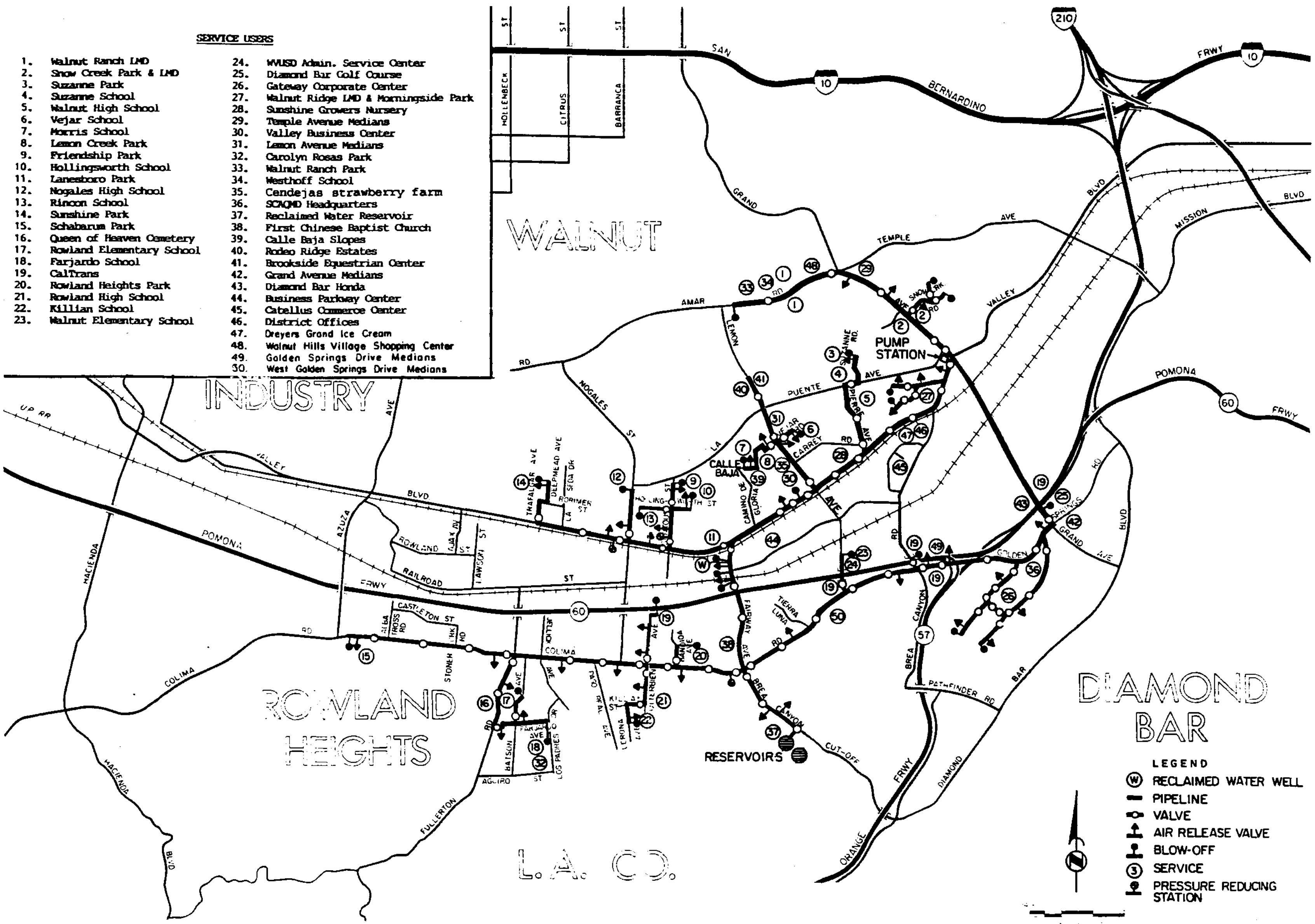
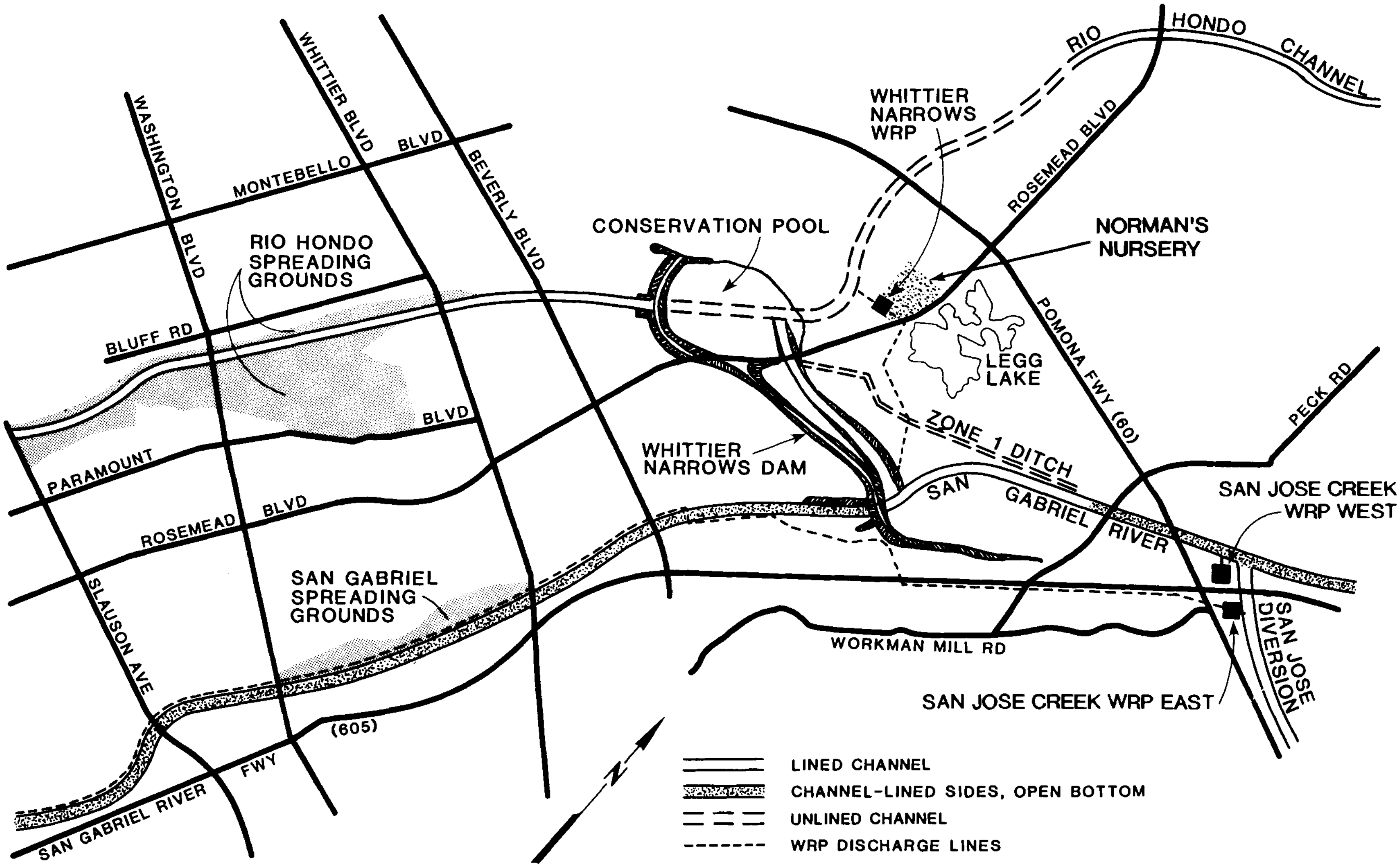


FIGURE 4-11

WHITTIER NARROW WRP REUSE SITES



unlined channel. This particular reuse application does not have any amortized capital costs for the distribution facilities, facility O&M costs or associated power costs for pumping.

4.1.10 City of Industry

In August 1983, the City of Industry completed a reclaimed water distribution system to serve the Industry Hills Recreation and Conservation Area (Figure 4-12). This system included a 7,100 gpm pump station at the San Jose Creek WRP, seven miles of 36-inch pipe following the San Jose Creek Channel and a 2 MG reservoir with a 3,400 gpm booster pump station at Anaheim-Puente Road. From this point, a 16-inch pipe with a second 3,300 gpm booster pump station brings reclaimed water into the 600 acre reuse site for landscape irrigation of two 18-hole golf courses and an equestrian area and as a source of supply for eight ornamental lakes and storage impoundments. During FY 1994-95, 0.814 MGD (912 AFY) of reclaimed water was delivered and used at this site. The cost of the reclaimed water for FY 1994-95 was $89.40/AF, which included the cost of purchasing the reclaimed water from the Districts, O&M on the pump station and power costs for pumping. This cost does not include any amortized capital costs for the distribution facilities.

4.1.11 California Country Club

In June 1978, deliveries of reclaimed water began to this 120 acre golf course located directly across the San Jose Creek Channel from the San Jose Creek WRP (Figure 4-12). An 8-inch polypropylene line inside a 24-inch reinforced concrete pipe siphon under the channel delivers chlorinated reclaimed water to the golf course's 0.75 acre lake No. 2. The golf course irrigation system is supplied by two pumps that can deliver a maximum of 1,800 gpm of reclaimed water from the lake. During FY 1994-95, 0.325 MGD (365 AFY) of reclaimed water was delivered to this site. The cost of the reclaimed water for FY 1994-95 was $28.67/AF, which included the cost of purchasing the reclaimed water from the Districts, O&M on the pump station (which was zero for this year) and power costs for pumping. This cost does not include any amortized capital costs for the distribution facilities.

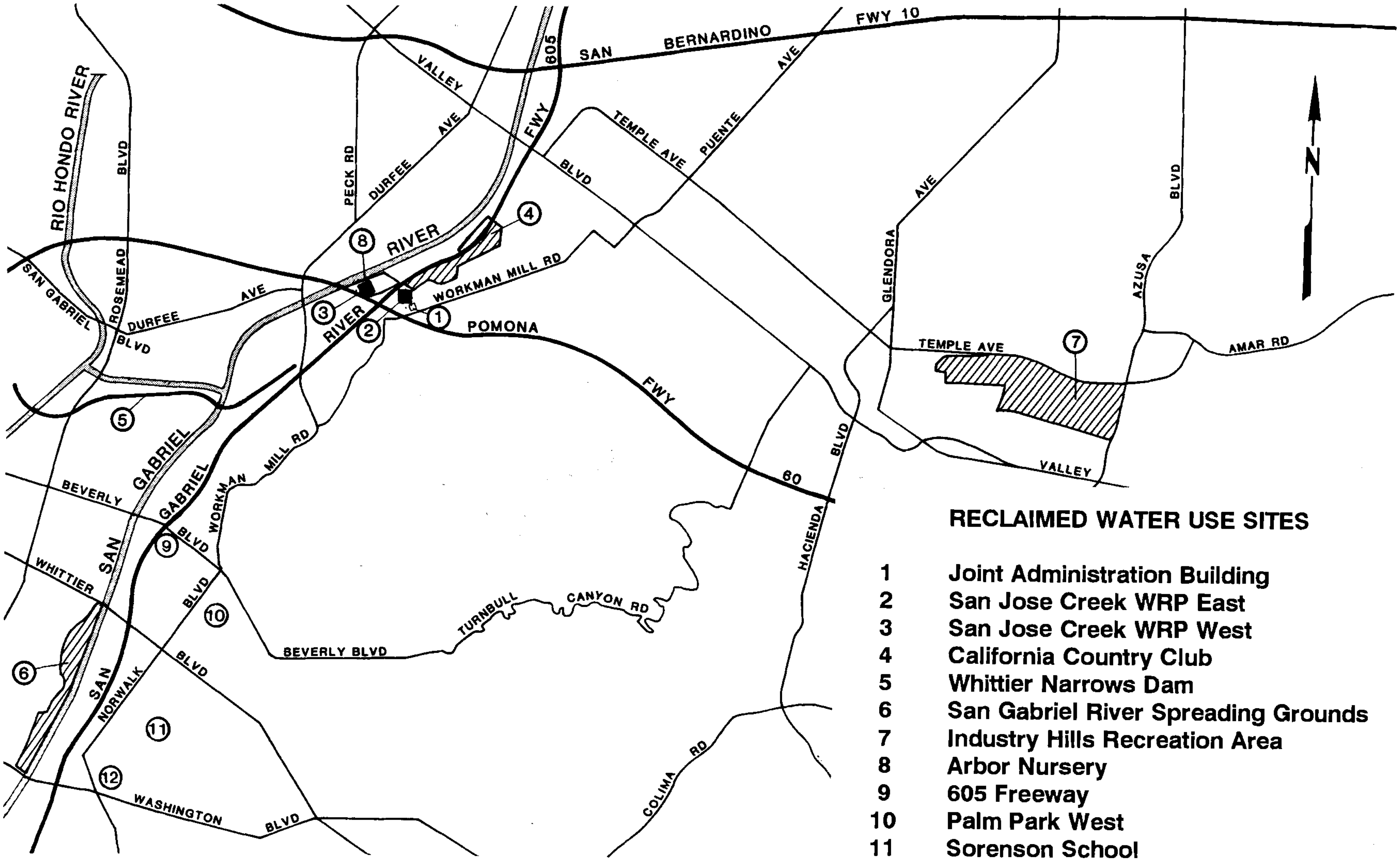
4.1.12 Arbor Nursery

In April 1986, this 5 acre nursery began operations under a DWP right-of-way next to Districts' property that is now the site of San Jose Creek WRP Stage III (Figure 4-12). Reclaimed water is transported from Stages I & II by means of a 6-inch steel pipe connected to the plant's washwater pump system. A 3-inch PVC pipe connects to the steel pipe in the northeast corner of the Stage III site to serve the nursery. During FY 1994-95, 0.007 MGD (7 AFY) of reclaimed water was delivered to this site for the irrigation of ornamental plants for commercial resale. Reclaimed water is actually purchased from the Districts by the San Gabriel Valley Water Company and then resold to the nursery for $126.65/AF.

4.1.13 Central Basin Municipal Water District (Esteban E Torres Rio Hondo Program)

The CBMWD is proceeding with a second regional distribution system to deliver an estimated 10.71 MGD (12,000 AFY) of reclaimed water from the San Jose Creek WRP to sites in the upper portion of its service area in the cities of Montebello, Pico Rivera, Commerce, Bell Gardens, Vernon, Santa Fe Springs and Whittier. This project is patterned after the regional concept of the "Century Project" described previously in Section 4.1.6. Connections to the Century system, originating from the Los Coyotes WRP, will allow for a looped system served by two independent treatment plants and will provide additional reliability and

FIGURE 4-12
SAN JOSE CREEK WRP REUSE SITES



RECLAIMED WATER USE SITES

1 Joint Administration Building
2 San Jose Creek WRP East
3 San Jose Creek WRP West
4 California Country Club
5 Whittier Narrows Dam
6 San Gabriel River Spreading Grounds
7 Industry Hills Recreation Area
8 Arbor Nursery
9 605 Freeway
10 Palm Park West
11 Sorenson School
12 Washington Elementary School

constant water pressure. Both distribution systems can be supplied solely by one WRP or the other. However, for the sake of consistent reporting, reclaimed water usage along the Rio Hondo facilities is reported as coming from the San Jose Creek WRP, and along the Century facilities as coming from the Los Coyotes WRP.

Construction began in April 1993 on a 22,000 gpm pump station, located adjacent to the 66-inch San Jose Creek Outfall on the east side of San Gabriel River Parkway, approximately 900 feet north of Beverly Boulevard. The pump station was completed in March 1994 and went on-line delivering reclaimed water in July 1994. Pipeline construction in the Whittier and Santa Fe Springs areas began in April 1993 and was completed in February 1994, with the Whittier Connector Unit crossing of the 605 Freeway/San Gabriel River being completed in May 1994. Construction on the Vernon unit began in June 1993 and was completed in September 1994, while construction on the Pico Rivera, Montebello, Montebello/Vernon and Vernon 2B units has not yet begun.

The CBMWD has constructed the delivery facilities right up to the end user; however, the retail water purveyor is the entity actually supplying the reclaimed water. During FY 1994-95, the CBMWD delivered 0.093 MGD (105 AFY) of reclaimed water to three water purveyors (the San Gabriel Valley Water Company and the cities of Whittier and Santa Fe Springs) for landscape and athletic field irrigation on 54.8 acres at the six sites (Figure 4-12). The CBMWD wholesales the reclaimed water to its customers, the retail water purveyors, on a monthly use, tiered rate schedule (as described previously in Section 4.1.6). This is between 47% and 61% of the rate of $429/AF it charges for potable water supplied by MWD. The retail purveyors then set their own rates for the reclaimed water.

4.1.14 F.L. Norman's Nursery

In March 1983, Flora Nursery leased from the Districts the 17 acre parcel known as the arboretum site northwest of the junction of the 60 and 605 Freeways, and contracted for the purchase of reclaimed water for the irrigation of nursery stock. F.L. Norman's Nursery purchased this operation in March 1986. The Stage III expansion of the San Jose Creek WRP required the relocation of the nursery operations from the arboretum site to land owned by the Districts and the Army Corps of Engineers next to the Whittier Narrows WRP (Figure 4-11). This relocation began in December 1988 and was completed in May 1989. Reclaimed water is supplied to the nursery operation from the final effluent forebay through the nursery's own pump. During FY 1994-95, 0.037 MGD (42 AFY) of reclaimed water was delivered to this 20.2 acre site for the irrigation of ornamental plants for commercial resale. Reclaimed water is actually purchased from the Districts by the San Gabriel Valley Water Company and then resold to the nursery for $126.65/AF.

4.1.15 City of Santa Clarita

The Parks and Recreation Department of the City of Santa Clarita began using reclaimed water from the Valencia WRP for landscape irrigation of various greenbelt areas in November 1994. City-owned tanker trucks pick up the reclaimed water via a drop structure located outside the fence-line of the WRP. The City has the contractual right to 500,000 gallons of reclaimed water per year (1.5 AFY), with a maximum of 10,000 gallons per day (five truckloads). However, additional amounts may be provided at the discretion of the Districts. During FY 1994-95, a total of 0.062 MG (0.2 AFY) was hauled from the Valencia WRP Because some greenbelt areas in the City of Santa Clarita were located closer to the Saugus WRP, 0.124 MG (0.4 AFY) was hauled by the city water truck from this site from March to June 1995.

4.1.16 Paiute Ponds

The historic discharge point for disposal of effluent from the Lancaster WRP has been Amargosa Creek that flows onto Rosamond Dry Lake. The subsequent flooding of the dry lake bed (located on Edwards Air Force Base) prompted the Air Force to construct a 1¼ mile long dike to impound the effluent. Approximately 200 acres of wetlands formed and became an important migratory stopover for ducks along the Pacific Flyway (Figure 4-13). In a letter of understanding signed in 1981 with the State of California Department of Fish and Game (DFG), the Districts agreed to maintain at least 200 acres of wetlands to preserve Paiute Ponds as a wildlife refuge. Chlorination of the secondary effluent is done to protect the health of the Air Force officers who use this area as a duck hunting club. In FY 1994-95, 5.879 MGD (6,588 AFY) was discharged into Paiute Ponds, equivalent to 67.1% of the effluent produced at this plant.

4.1.17 Nebeker Ranch

The dike constructed by the Air Force (previously described) did not eliminate the flow of Lancaster WRP effluent onto the dry lake bed during winter when evaporation was at a minimum and additional rainfall runoff was added to Paiute Ponds. The 500 MG of storage capacity added in 1988 at the Lancaster WRP is used to collect excess effluent flow during the winter for delivery to the 640 acre Nebeker Ranch alfalfa farm located approximately 6 miles west of the treatment plant (Figure 4-13). The Districts constructed the pump station and 24-inch force main at its expense since it was the only available disposal option. However, the O&M costs of this delivery system, which were approximately $5/AF in FY 1994-95, are paid for by the farm operator. During FY 1994-95, 2.791 MGD (3,127 AFY) of secondary effluent were used for agricultural irrigation at this site, equivalent to 31.9% of the effluent produced at this plant.

4.1.18 Apollo Lakes County Park

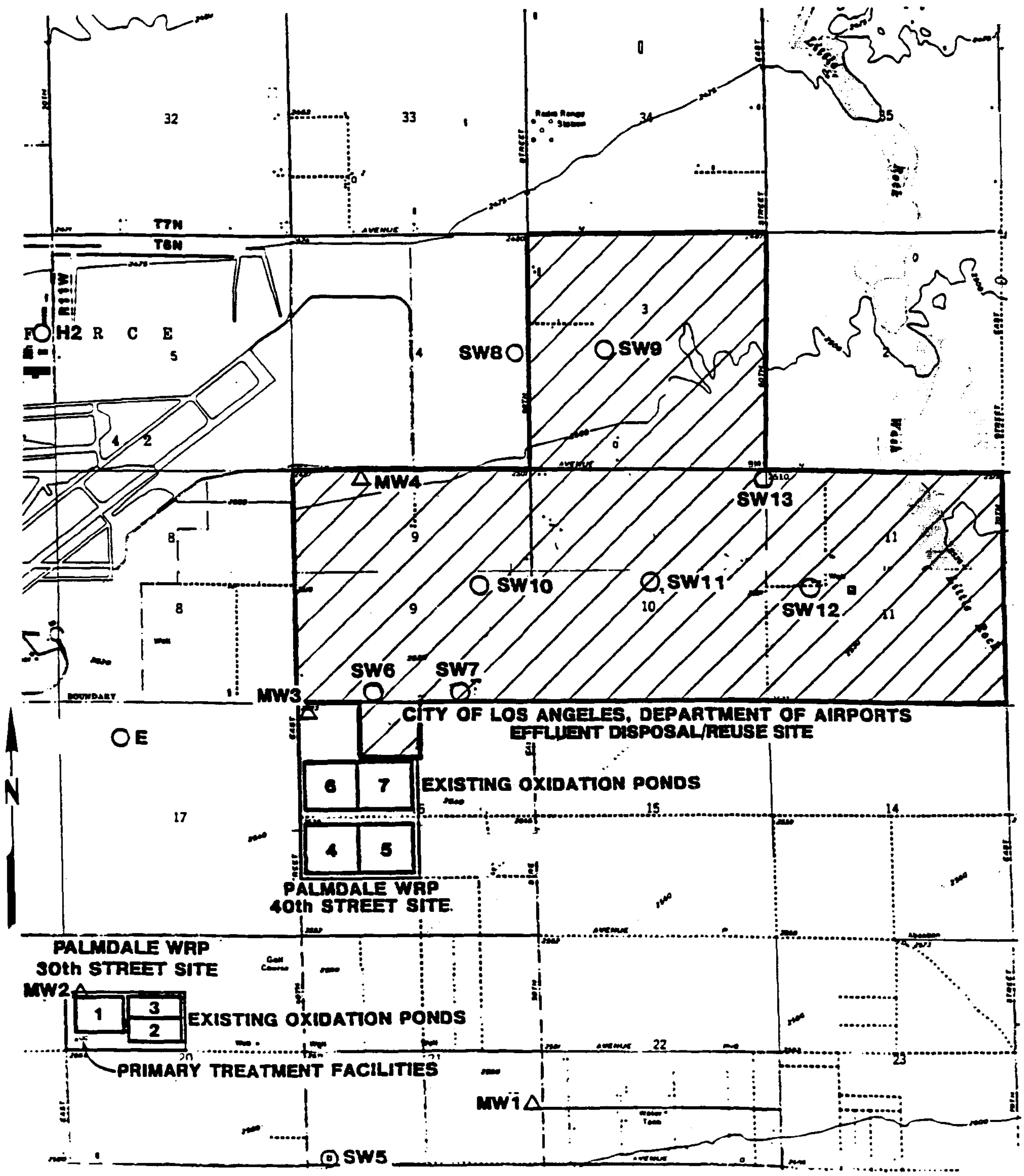
In 1962, the Los Angeles County Engineer devised a project to develop an aquatic park next to the General William J. Fox Airfield in Lancaster. The source of water was to be an advanced treatment plant, known as the Antelope Valley Tertiary Treatment Plant (AVTTP), located at the Districts' Lancaster WRP that would consist of chemical coagulation (for the reduction of phosphate to inhibit algal growth), sedimentation, dual-media filtration and chlorination. The AVTTP was placed in operation in June 1969 with a capacity of 0.6 MGD. Reclaimed water from the AVTTP was delivered by means of a 12-inch force main for construction of the 56 acre Apollo Lakes County Park (Figure 4-13) and then for filling of the lakes. The park was opened to the public in November 1972. In FY 1994-95, approximately 0.091 MGD (102 AFY) of reclaimed water was delivered to the 26 acre (80 MG) lakes at the park to make up for evaporative losses and for irrigation water withdrawn from the lakes for use on the park. This was equal to 1.0% of the effluent produced at the Lancaster WRP. The three lakes in the park (Armstrong, Aldrin and Collins) are stocked with trout and catfish for public fishing, although no swimming is allowed. The County of Los Angeles reimburses the Districts for the O&M costs incurred in operating this facility, which were $321.16/AF in FY 1994-95.

4.1.19 Los Angeles City Department of Airports

Reclaimed water from the Palmdale WRP has been sold to a series of local farmers since 1960. However, since the effluent from the Palmdale WRP is undisinfected secondary, its applications are limited. In January 1981, the Districts entered into a contract for the delivery of all the plant's effluent to the DOA, which had

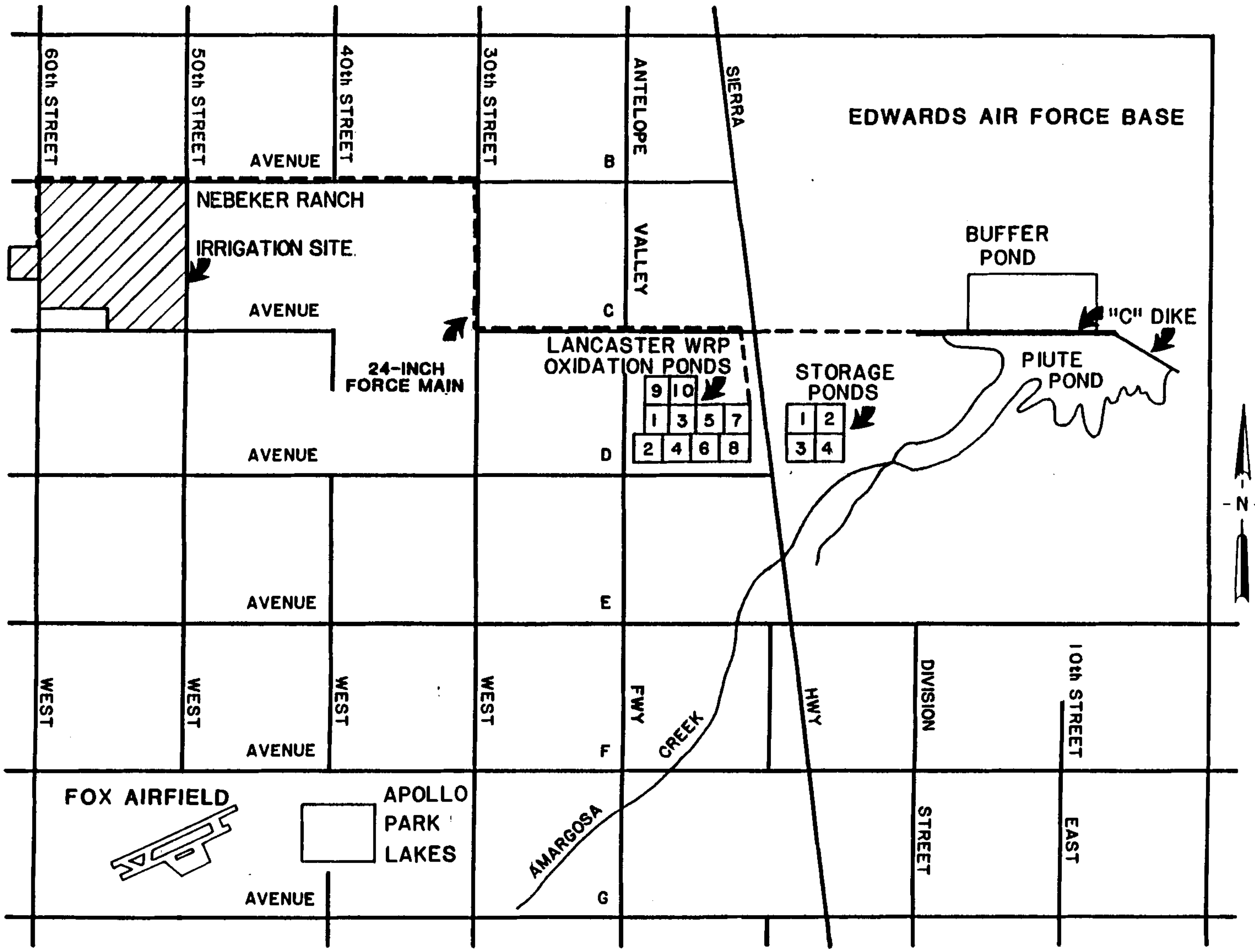
FIGURE 4-14

PALMDALE WRP FACILITIES LOCATION



purchased much of the land in the area in anticipation of the construction of the proposed Palmdale International Airport. The DOA had planned to lease out the land that they owned to farmers until the airport could be built, and would resell the reclaimed water to these farmers. However, the DOA was unable to find tenants for their land who would also buy the reclaimed water; therefore, a second contract was signed in 1989 that allowed the Districts to dispose of all the effluent from the Palmdale WRP on DOA uncultivated land (Figure 4-14) at no charge to either party. Reclaimed water is delivered to DOA property via a 12-inch concrete line and a 21-inch concrete-coated steel gravity line. In FY 1994-95, an average of 0.055 MGD (60 AFY) was used to irrigate 105 acres of pistacio, chestnut and Christmas trees and landscape plants, which receive reclaimed water at no cost.

FIGURE 4-13
LANCASTER WRP FACILITIES LOCATION



SECTION 4.2: POTENTIAL DEMAND FOR WATER REUSE

Within the Districts' service area, there are a number of water recycling projects in various stages of development, as well as several studies that have identified a number of potential reuse sites not covered in the projects under development. Together, these projects and studies represent a total potential reclaimed water demand of 153.38 MGD (170,757 AFY). Figure 4-15 shows the geographic distribution of the potential demand in the general areas of Three Valleys (Pomona, Claremont, Diamond Bar, etc.), San Gabriel Valley (El Monte, West Covina, Irwindale, Azusa, etc.), Whittier Narrows (Pico Rivera, Whittier, Commerce, Montebello, etc.), Mid-Cities (Downey, Paramount, Santa Fe Springs, Compton, etc.), Long Beach, Carson, South Bay (El Segundo, Inglewood, Gardena, Hawthorne, etc.) and Santa Clarita.

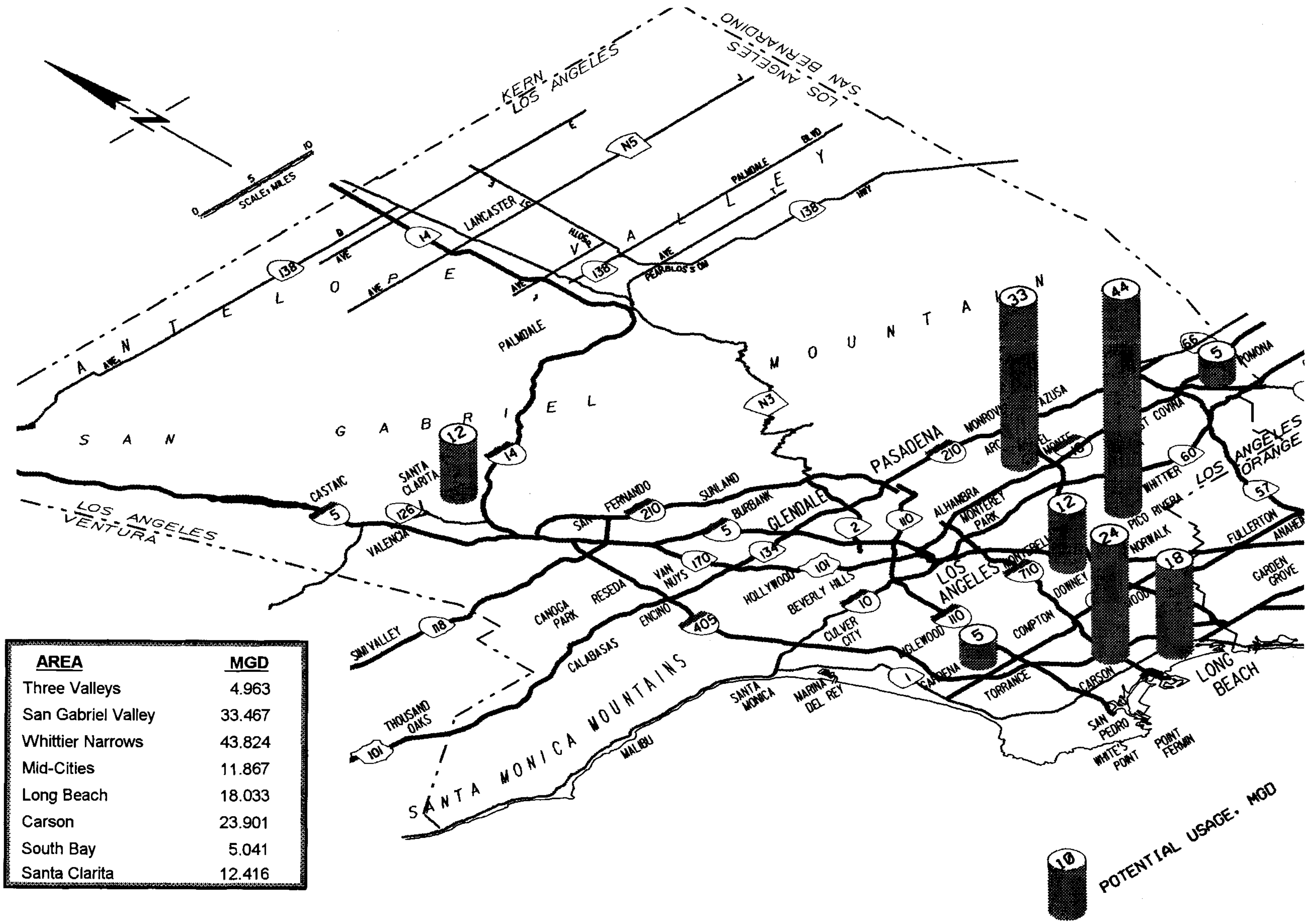
It must be stressed, however, that the mere identification of distribution systems and potential users does not guarantee that these systems will be constructed or the users connected. Any of the impediments discussed in Chapter V may cause indeterminate delays in implementing the proposed projects, may prevent individual reuse sites from receiving reclaimed water or may even totally preclude some projects from being implemented at all.

Expansion of existing reuse projects will be discussed in Section 4.2.1. New reuse projects currently under development will be discussed in Section 4.2.2. Table 4-1 lists these projects, which could potentially yield an additional 96.05 MGD (107,630 AFY) by the beginning of the 21st Century. In Section 4.2.3, other studies of potential demand (up to 56.33 MGD or 63,127 AFY), both past and present, will be discussed.

TABLE 4-1
SUMMARY OF PROPOSED RECLAIMED WATER PROJECTS

Project Name	Reclaimed Water Source	Quantity (AFY)
Alamitos Intrusion Barrier	Long Beach WRP	5,000-10,000
Long Beach Master Plan	Long Beach WRP	2,710
THUMS Project	Long Beach WRP	4,000
Century Project	Los Coyotes WRP	5,700
Rio Hondo Project	San Jose Creek WRP	12,000
Puente Hills/Rose Hills	San Jose Creek WRP	3,000
San Gabriel Valley Project	San Jose Creek WRP	23,900
City of Industry	San Jose Creek WRP	1,200
City of West Covina	San Jose Creek WRP	2,800
Montebello Forebay Recharge Expansion	San Jose Creek WRP	10,000-25,000
Whittier Narrows Recreation Area	Whittier Narrows WRP	3,200
Castaic Lake Water Agency	Valencia & Saugus WRPs	8,600
NorthLake Project	Valencia WRP	5,200
TOTAL		87,310-107,360

FIGURE 4-15
GEOGRAPHICAL DISTRIBUTION OF POTENTIAL RECLAIMED WATER DEMAND



AREA	MGD
Three Valleys	4.963
San Gabriel Valley	33.467
Whittier Narrows	43.824
Mid-Cities	11.867
Long Beach	18.033
Carson	23.901
South Bay	5.041
Santa Clarita	12.416

4.2.1 Expansion of Existing Projects

4.2.1.1 City of Long Beach Master Plan

In exchange for the land on which the Districts' Long Beach WRP was constructed, the LBWD obtained the rights to all of the effluent produced at this facility. Beginning in 1980, the LBWD embarked on a multi-phase program to distribute reclaimed water throughout the city. Approximately 103,000 linear feet of pipeline delivers an average of 2.7 MGD (3,025 AFY), or about 17% of the WRP's production.

The LBWD, in conjunction with Black and Veatch consulting engineers, has developed the preliminary engineering for a master plan to extend reclaimed water service throughout the city, supplying up to an additional 4.3 MGD (4,780 AFY) at approximately 120 new reuse sites, to be built in four phases. The plan calls for 133,300 feet of 6- to 36-inch pipelines for a "looped" distribution network with an additional 19,800 gpm pump station, chlorination facilities, 2.2 MG of equalization storage at the Long Beach WRP and a possible 20,800 foot, 16-inch inter-tie with the adjacent CBMWD's Century reclamation program to the north. Included in this plan is the abandonment of open lake storage and the establishment of 13 MG of closed storage at the LBWD's water tank farm on Alamitos Reservoir Hill, through the conversion of four of the 3.3 MG potable tanks to reclaimed water storage. This plan will be undertaken together with the Alamitos Seawater Intrusion Barrier reclaimed water project detailed in Section 4.2.2.1. This plan was expected to be implemented over four years, at an estimated cost of $33.2 million.

Since the development of the Master Plan, an opportunity has arisen to serve approximately 3.6 MGD (4,000 AFY) of reclaimed water to the THUMS project in Long Beach Harbor for oil field injection make-up water to prevent land subsidence. The facilities to deliver the reclaimed water to the THUMS White Island site had been in place since 1971 and only needed to be reconnected to the LBWD's reclaimed water distribution system. Reclaimed water was not used when the delivery facilities were originally constructed because bench-scale tests of the secondary effluent produced at that time indicated that the injection wells would become clogged. The reclaimed water line to the island was reconnected in May 1995, and a six month, 300 gpm trial project began in June 1995 to determine the suitability of tertiary-treated reclaimed water for this application. Once the reclaimed water is delivered to the island, it is treated similarly to the potable water used for repressurization: oxygen removal, polymer coagulation and 5 and 10 micron filtration. Preliminary results suggest that the reclaimed water can be treated to achieve desirable injection qualities and that, so far, there are no detectable negative effects from the use of reclaimed water.

The Master Plan final design will be modified both in scope and implementation based on the successful outcome of the trial project. Only the first phase of the Master Plan will be implemented, since nearly the entire production of reclaimed water from the Long Beach WRP will have been committed to the oil field injection project and the Alamitos Barrier project. The modified plan will invest $13 million in facilities which will serve 2.4 MGD (2,710 AFY) to over 40 sites consisting of parks, schools, housing developments and industrial processes (aircraft manufacturing, power plants, oil refining, commercial laundry). Design of Phase 1 by HYA Consulting Engineers began in October 1995.

4.2.1.2 Central Basin Municipal Water District's Rio Hondo (Torres) and Century (Ibbetson) Projects

A pump station and a large portion of the distribution network for the Rio Hondo project have been completed, although additional pipelines need to be constructed to finish the interconnection with this agency's Century reclaimed water distribution system. By the end of June 1995, only six sites using 100 AFY have been connected to the Rio Hondo system. In an ongoing effort, the CBMWD will connect nearly 200 sites to this system and will result in the use of up to 10.7 MGD (12,000 AFY). The completed Century system has the potential to add another 5.1 MGD (5,700 AFY) of use. Additional pipelines and customers can be added to both systems as conditions allow.

4.2.1.3 Montebello Forebay Groundwater Recharge Project Expansion

The WRD is currently reusing the largest proportion of reclaimed water produced by the Districts. An average of 44.6 MGD (50,000 AFY) is currently being recharged into the Central groundwater basin. The WRD has contracted with Black and Veatch to study the feasibility of constructing advanced treatment for TOC removal, which will be required by DHS to allow for an additional 10,000 AFY of reclaimed water to be recharged. A January 1992 draft report recommended the construction of separate granular activated carbon (GAC) contactors next to the Whittier Narrows WRP to treat 10 MGD of reclaimed water currently being recharged, with an equal amount of effluent for recharge being diverted to the Montebello Forebay spreading grounds from the San Jose Creek WRP. The results of pilot GAC column studies at the Whittier Narrows WRP showed that separate GAC contactors could be built and operated for approximately $222/AF (1992 dollars), which compares favorably with the costs of purchasing untreated water from MWD. The next steps for implementation of this project consist of renegotiating the reclaimed water contract with the WRD, completing the necessary CEQA documents and obtaining regulatory approval. Construction will cost an estimated $9.9 million (1992 dollars) and is expected to take three to four years.

In order to support the use of additional quantities of reclaimed water for groundwater replenishment, two studies were initiated by the WRD. The U.S. Geologic Survey (USGS) constructed a test basin with sampling wells at the inlet to the San Gabriel Coastal Spreading Grounds. This four-year study, begun in 1992, is attempting to determine the fate of nitrates and TOC during percolation, and to further categorize the components of TOC. The second study was a revisitation of the epidemiological survey done for the Districts' 1984 Health Effects Study. Researchers from the Rand Corporation are studying a control area (about 700,000 people) that receives groundwater not influenced by reclaimed water and three areas (about 900,000 people) that have varying exposures to reclaimed water (low, medium and high). The relative rates of infectious diseases (e.g., Shigellosis, Giardiasis, Hepatitis A, etc.), cancer incidence (e.g., colon, bladder, kidney, etc.) and mortality will be statistically compared between the control and exposed areas, to determine if long-term ingestion of groundwater containing reclaimed water has significantly affected the health of residents in the exposed areas. The final report is expected to be completed in early 1996.

The WRD's long-term goal is to increase groundwater replenishment with reclaimed water to 66.9 MGD (75,000 AFY), although no plans have been made on how to proceed with the final 13.4 MGD (15,000 AFY) incremental increase.

4.2.1.4 City of Industry

In August 1983, the City of Industry completed a reclaimed water distribution system to serve the Industry Hills Recreation and Conservation Area. This system included a 7,100 gpm pump station at the San Jose Creek WRP and 7 miles of 36-inch pipe following the San Jose Creek Channel to a 2 MG reservoir with a 3,400 gpm booster pump station at Anaheim-Puente Road. From this point, a 16-inch pipeline with a second

3,300 gpm booster pump station brings reclaimed water into the 600 acre reuse site for landscape irrigation and storage impoundments.

The city is extending its reclaimed water distribution system originating at the Districts' San Jose Creek WRP. It will initially deliver an additional 1,200 AFY within its service area, as well as additional quantities into West Covina and Diamond Bar (discussed in following sections). It will also extend into the WVWD's reclaimed water system emanating from the Districts' Pomona WRP, with an ultimate demand of 8,600 AFY for all phases. The project, as detailed in a March 1992 report by Stetson Engineers, requires the construction of 45,000 feet of a 36-inch "backbone" line, four mainline booster stations and four zone reservoirs at a reconnaissance level cost estimate of $26 million. The first phase of construction will consist of a second 2.1 MG reservoir located adjacent to the existing reservoir at Azusa Boulevard and Anaheim/Puente Road, two pump stations, and 36-inch transmission lines running east to Fairway Drive, where it will connect with the WVWD system. ASL Engineers is currently designing this project, with bid advertisement expected in August 1996. Construction is expected to be completed by August 1997. The City of Industry is also investigating the feasibility of locating a 10,000 AF open reservoir in the Tres Hermanos area of Diamond Bar for seasonal storage of reclaimed water, which could also serve as a recreational area. If approved, construction of this reservoir is several years away.

4.2.2 Projects Under Development

4.2.2.1 Alamitos Seawater Intrusion Barrier Project

The Central Basin aquifer, which underlies and supplies water to the Metropolitan Los Angeles area, is a major source of local water. Due to an expanding population and economy that severely overdrafted the basin by the early 1950's, the groundwater level dropped below sea level, allowing saltwater to move inland into the aquifer at various points along the coastline. The Los Angeles County DPW, in an effort to stem the landward movement of the ocean, constructed freshwater injection barriers in front of the advancing seawater at three locations in Los Angeles County. One of these barrier projects is located within 2 miles of the Districts' Long Beach WRP. The Alamitos Barrier straddles the San Gabriel River and the Los Angeles/Orange county line, creating a pressure ridge in five aquifers. Historically, between 4,000 and 7,000 AFY of noninterruptible imported water jointly purchased from MWD by the WRD and the Orange County Water District (OCWD) have been injected into the Alamitos Barrier. In 1993, additional injection wells were installed to increase the freshwater injection capacity to 10,000 AFY.

A consortium consisting of WRD, OCWD, DPW and MWD, along with the Districts and the City of Long Beach, was formed in October 1989 to examine the feasibility of using Long Beach WRP effluent instead of the imported water in the injection barrier. Camp/Dresser/McKee (CDM) completed a feasibility study in April 1991 that identified a range of alternatives that would provide additional treatment for nitrogen, total dissolved solids and trace organics removal. This level of treatment would ensure that the reclaimed water could be injected without clogging the wells, would meet regulatory criteria required by DHS and the two Regional Water Quality Control Boards (RWQCBs) involved (Los Angeles and Santa Ana), and would be cost effective.

A draft Engineering Report that detailed the construction of operational storage (to dampen diurnal flow variations) followed by an advanced treatment process was completed in February 1992 and updated in April 1994. This treatment train consisted of a pretreatment process using single stage lime clarification, recarbonation and dual-media filtration in series, followed by parallel treatment with reverse osmosis (RO) and GAC adsorption. Initially, the project will produce 5,000 AFY of advanced treated reclaimed water that will be blended with an equal amount of MWD water in a 9 MGD pump station that will use the existing 27-inch MWD supply line to the Barrier. The purpose of blending is to demonstrate reliability of water quality and nondegradation of groundwater, with the eventual construction of the remainder of the treatment processes to enable 100% reclaimed water to be injected. In June 1993, CDM completed a Site Investigation and Predesign Study that provided a layout for the treatment train described in the Engineering Report on four acres of land directly north of the Long Beach WRP. This study also provided information on the potential use of microfiltration as the pretreatment process, thus saving $2.4 million in capital costs and reducing the unit cost of water by $90-100/AF.

In June 1992, a permit application for the 50% blend project was filed with both the Los Angeles and Santa Ana RWQCBs; however, these agencies and DHS have not yet fully completed their review. In response to concerns from the Los Angeles RWQCB, Montgomery-Watson has been contracted to perform a $300,000 Hydrogeological Study; it began in August 1995. The WRD and the OCWD will provide funding for construction, and the project is on the list for federal funds as well. CH2M Hill has been awarded a contract for the predesign of the project, and has done some site work to determine the geologic suitability for construction. A design/build contract is expected to be awarded in early 1996. The cost of constructing the first phase is estimated at $19.6 million, with completion of construction expected by 1997-98.

4.2.2.2 Puente Hills Landfill/Rose Hills Memorial Park

The Districts are developing a distribution system that will deliver approximately 2.7 MGD (3,000 AFY) from the San Jose Creek WRP. The effluent will be used for landscape irrigation and dust control at the Districts' nearby Puente Hills Landfill, for cooling tower supply at the Districts' Puente Hills Energy Recovery from Landfill Gas (PERG) Facility, and for landscape irrigation at the adjacent Rose Hills Memorial Park. This project was originally conceived in 1978. However, various impediments have stalled the project over the years, including litigation involving the local water company that served the landfill based on the claim of "duplication of services." (State law prohibits a public agency from competing with a private water company within its certificated service area, unless compensation is paid.) To resolve this, Assembly Bill 778 was passed by the State Legislature, and became law on January 1, 1995. This bill allowed the Districts to deliver its own reclaimed water to its landfill, without having to pay the water company for lost revenues. The Districts must pay appropriate compensation to the purveyor for water service facilities that are being replaced by the reclaimed water service.

The distribution system now under construction consists of a 36-inch gravity line that will tie into the 66-inch San Jose Creek Outfall on Workman Mill Road and run east to the original entrance to the landfill. The first of two pump stations will lift 12,000 gpm of reclaimed water 500 feet through a 36-inch force main to an existing 0.65 MG reservoir located close to the PERG Facility. The second pump station will lift the reclaimed water another 300 feet through a 30-inch force main to a 1.2 MG reservoir constructed by Rose Hills on the border between the landfill and cemetery. Construction of the 1,800 foot gravity line was completed in June 1993, with construction of its connection to the San Jose Creek Outfall expected to be completed in January 1996. The last of the pre-purchased pumps and electrical components was delivered in November 1993. The contract for the pump stations and force mains was awarded in May 1995, with an expected completion date of June 1996 when reclaimed water will begin to be delivered. The estimated cost of the total project is approximately $6 million and is being funded in part by a low-interest State water reclamation loan.

4.2.2.3 San Gabriel Valley Groundwater Recharge Project

In a legal decision rendered by the Los Angeles Superior Court in February 1991, the Upper San Gabriel Basin adjudication was amended to allow the use of reclaimed water for groundwater replenishment. The USGVMWD, a member agency of MWD, is planning a 9 mile long, 54-inch transmission line running north along the San Gabriel River to the Santa Fe Spreading Grounds. This pipeline will be used to deliver a long-term average of 16,000 AFY (with a potential maximum of 25,000 AFY) of reclaimed water from the Districts' San Jose Creek WRP for groundwater replenishment of the Main San Gabriel Basin. This project would replace a like amount of imported water currently purchased from MWD to prevent long-term groundwater overdraft of the basin. The result would be a diversified water supply for the region which will cost less than the imported water supply and will insure the area against drought-induced water supply shortages or the loss of imported water to other regions of the state, to other states or to environmental concerns. Since the groundwater recharge with reclaimed water can and will take place during the winter months, the extra capacity of the transmission line could potentially be used during the summer months to deliver another 5.5 MGD (6,205 AFY) of reclaimed water in a future Phase II to water purveyors for landscape irrigation and industrial processes.

A draft Environmental Impact Report was released in October 1993 and certified by the USGVMWD Board of Directors in August 1994. Preliminary design by Boyle Engineering has been completed and final design was scheduled to begin in the summer of 1995, with an estimated completion date of early 1998 for Phase I. The project is expected to cost approximately $29 million.

This project has faced serious opposition from the Miller Brewing Company (Miller), which has a brewery about 1 mile east of the spreading grounds. Miller petitioned the adjudication to revoke the approval of reclaimed water from the Basin Judgment. The judge upheld her earlier decision and denied Miller's petition in May 1995. Miller has also challenged the adequacy of the Environmental Impact Report for the project. This issue is currently being litigated.

In response to Miller's opposition, the Basin Watermaster has proposed a "demonstration" recharge project that will use a smaller quantity of reclaimed water (10,000 AFY) for recharge downstream of the Santa Fe Dam. Stetson Engineers is performing a groundwater model to determine the potential impact on nearby potable water wells in the context of the proposed DHS groundwater recharge regulations.

4.2.2.4 City of West Covina

The West Covina reclaimed water distribution system will deliver up to 2,800 AFY of reclaimed water by 1998 to the BKK Landfill, South Hills Country Club, Galastar Park, Woodgrove Park, Gingrich Park, Shadow Oak Park and other greenbelt areas. A 24-inch line will continue into West Covina from the City of Industry's new 24-inch line that was constructed along Azusa Avenue to Temple Avenue during previously scheduled roadway work, and run through the BKK Landfill, serving several storage reservoirs. Design has been completed by Engineering Science and the project was approved for a low-interest State water reclamation loan. However, due to unresolved issues between the city and the landfill regarding closure of the latter, and uncertainty over the price of the reclaimed water, the City Council has decided not to proceed with the project at this time and has released the loan funds earmarked for this project. There has been no indication as to when or if this project may proceed.

4.2.2.5 Whittier Narrows Recreation Area

The Districts have been working with the Los Angeles County Department of Parks and Recreation to ultimately supply approximately 2.9 MGD (3,200 AFY) of reclaimed water from the Districts' Whittier Narrows WRP to the adjacent Whittier Narrows Recreation Area, Golf Course and Legg Lake. Parks and Recreation retained Boyle Engineers to examine the feasibility of implementing this project, and a Market Assessment and Survey Facilities Plan/Project Report was issued in March 1992. In April 1993, the Chambers Group prepared a Biological Constraints Analysis for a Water Reclamation Project in the Whittier Narrows Dam County Recreation Area. This analysis was used in preparing a draft Negative Declaration for this project that is required before applying for a State Revolving Fund (SRF) loan. Project design and construction of a booster pump station, a storage reservoir and a distribution pipeline were expected to begin after loan approval was received. However, the 1995 County of Los Angeles budgetary crisis resulted in widespread layoffs, including the staff of Parks and Recreation responsible for implementing this project. There is no timetable for completion of this project or when work on this project can be renewed.

4.2.2.6 Castaic Lake Water Agency

The CLWA, the regional importer and wholesaler of State Project water in the Santa Clarita Valley, has completed a master plan for a $33 million reclaimed water distribution system. This project will be built in nine phases over 20 years, and will deliver up to 7.7 MGD (8,600 AFY) of water for reuse in their service area using effluent from both the Saugus and Valencia WRPs. Design was completed on part of the first phase which will use approximately 1.5 MGD (1,675 AFY) from the Valencia WRP at the Magic Mountain Theme Park and the planned Westridge Golf Course. This part of the first phase, now called Phase 1B, has an expected construction completion date in 1997, depending on the progress of the Westridge development. An extension of Phase 1B, known as Phase 1A, will serve 0.7 MGD (750 AFY) to Newhall Land and Farm's North River development. In December 1995, the Districts executed a contract for the sale of 1,600 AFY of reclaimed water to CLWA for Phase 1 of their program. Design of Phase 1 began in fall 1995, with an expected completion date for construction in late 1996. Before proceeding beyond Phase 1, an Environmental Impact Report will be required to document the effect of diverting reclaimed water out of the Santa Clara River, which is the home of an endangered species of fish. This is currently being prepared by Woodward/Clyde.

4.2.2.7 NorthLake Development

A private developer in the Santa Clarita Valley area has proposed a dual-use reclaimed water system that will provide more water in this area, allowing for his residential development to proceed. The project consists of a pump station at the Valencia WRP, approximately 5.2 miles of a minimum 14-inch pipe paralleling Castaic Creek to the Castaic Lake Afterbay. Approximately 2.5 MGD (2,800 AFY) of reclaimed water will be discharged into the Afterbay for both groundwater recharge and maintenance of that recreational area. Along the pipeline route, 1.5 MGD (1,680 AFY) of reclaimed water will be delivered for landscape irrigation of 842 acres at Peter Pitchess Honor Rancho Golf Course, Golden State Business Park, Valencia Commerce Center, NorthLake development and golf course, Castaic Lake Park, CalTrans medians along the Golden State Freeway and others. According to the final Conceptual Design Report of November 1991, the groundwater recharge portion of this project will meet the proposed DHS regulations for recharge with reclaimed water. Review of this report by the RWQCB and DHS resulted in a qualified, preliminary approval. Final approval will be required following completion of contract negotiations between the developer and the Districts over the sale of reclaimed water. Once approval is received, final design of the pipeline will begin, with construction commencing in early 1996 and finishing by the summer of 1996. The local water purveyor, Newhall County Water District, has agreed to take over operation and maintenance of the reclaimed water line and will supply enough potable water to serve the NorthLake development.

4.2.3 Past and Present Studies of Reuse Potential

In addition to the reclaimed water distribution projects previously described, several studies have been done over the years that have identified numerous potential reclaimed water use sites within the Districts' service area. Table 4-2 summarizes the studies and the potential demand for reclaimed water, which results in an additional demand of 56.33 MGD (63,127 AFY). This cumulative total represents a demand above that previously listed in Table 4-1.

TABLE 4-2
STUDIES OF POTENTIAL RECLAIMED WATER DEMAND

Water Reclamation Study	MGD	AFY
OLAC Study - Cerritos Greenbelt Project	0.428	479
OLAC Study - Walnut Valley Greenbelt Project	1.146	1,285
OLAC Study - Long Beach & Seal Beach Greenbelt Projects	3.059	3,428
OLAC Study - Central Basin Greenbelt/Industrial Project	7.817	8,760
OLAC Study - Carson Industrial Project	20.909	23,436
So. Calif. Comprehensive Water Reclamation/Reuse Study	8.686	9,735
San Gabriel Valley Potential Reuse Site Study	7.503	8,443
City of Diamond Bar Water Reuse Feasibility Study	1.96	2,196
Sanitation Districts Staff Review of Thomas Guide	4.82	5,401
TOTAL	56.328	63,127

The following sections summarize these studies, and Tables 4-3 through 4-7 (at the end of this section) list the identified potential users. The identification of these individual sites can be used to either add new customers to existing distribution systems, or to provide "nexus" points (sites with a very large demand for reclaimed water) that can assist in developing a new distribution system to a previously unserved area. There may be some redundancy of sites from table to table, due to the fact that these studies were performed at different times, independent of one another. However, every effort has been made to eliminate any duplication.

4.2.3.1 Orange and Los Angeles Counties Water Reuse Study

The OLAC Study was completed in 1982, and identified 45 potential water reuse distribution systems in Orange and Los Angeles counties. Five of these systems were located within the Districts' service area, with construction of the projects in Cerritos, Walnut Valley, Long Beach and Central Basin being completed, although not exactly as envisioned in the OLAC Study. The potential reuse sites in the Districts' service area, excluding those already using reclaimed water, are listed in Tables 4-3a through 4-3d. Table 4-3e lists users for the Carson Industrial Project, which has not been constructed. Since this study is well over a decade old, a number of the industrial sites have ceased operations. The original OLAC lists have been cross-checked against the Districts' list of industrial waste dischargers, with those industries that have ceased operations being deleted from the list. If and when reclaimed water is to be delivered in a given area, the site list would be refined, based on the service areas of the purveyors involved in any proposed project. The following items discuss in further detail the five OLAC distribution systems within the Districts' service area.

- The Cerritos Greenbelt Project in the OLAC Study is essentially the same as the system that was constructed by the City of Cerritos in the mid-1980's. Of the original 67 sites identified in the OLAC Study, 52 have been connected (some via the City of Lakewood and CBMWD Century reclaimed water distribution systems), while an additional 17 sites were subsequently identified and are now receiving reclaimed water. The remaining 15 sites (Table 4-3a), which could potentially use an additional 0.428 MGD (479 AFY), were not connected because the rerouting of pipelines was cost-prohibitive or they were located within the City of Artesia, which did not want to purchase reclaimed water from Cerritos.

- The Walnut Valley Greenbelt Project originally identified only 33 reuse sites, of which 28 were connected and another 46 were subsequently identified and connected. Of the five remaining, unconnected sites (Table 4-3b), the largest (BKK Landfill) is planned to be connected to the City of West Covina's proposed reclaimed water distribution system, as detailed in Section 4.2.2.4. The remaining four sites, which could potentially use an additional 1.146 MGD (1,285 AFY), are outside the WVWD's service area, and there are no plans to extend reclaimed water service to them in the near future.

- The Long Beach & Seal Beach Greenbelt Projects were considered together in the OLAC Study, which also envisioned the construction of another water reclamation plant in the Seal Beach area. Of the 31 identified users, only the five sites in Orange County, which could potentially use an additional 3.059 MGD (3,428 AFY), were not connected to the LBWD's distribution system (Table 4-3c). A number of additional reuse sites in Long Beach were subsequently identified and connected, with more being expected with the city's Master Plan implementation, as described in Section 4.2.1.1.

- The Central Basin Greenbelt/Industrial Project (Table 4-3d) is roughly the equivalent of the CBMWD's completed Century and nearly completed Rio Hondo distribution systems. A number of the potential landscape irrigation customers have been connected (e.g., Rio Hondo Country Club, John Anson Ford Golf Course, Little Lake and Wilderness parks) or are expected to be connected in the near future (Los Amigos, Norwalk, Montebello and Pico Rivera golf courses), as time and resources permit. In addition, some industrial sites have been connected (e.g., Tuftex Carpet) or are expected to be connected (e.g., RHS Carpets, Lever Brothers, Philadelphia Quartz, U.S. Gypsum). Other potential use sites are included in other projects. For example, the Legg Lake, Whittier Narrows Golf Course and Recreation Area are a part of the Whittier Narrows Recreation Area project (Section 4.2.2.5), and Rose Hills Memorial Park is part of the Puente Hills project (Section 4.2.2.2). Some of the industrial users identified in the OLAC Study, such as General Motors in the City of South Gate and Gulf Oil in the City of Santa Fe Springs, have ceased operations. All of the aforementioned sites have been deleted from the listing of potential reuse sites contained in this portion of the OLAC Study. The remaining could potentially use an estimated 7.817 MGD (8,760 AFY). The extension of reclaimed water service to industrial sites in the City of Vernon via the Rio Hondo Project has been indefinitely delayed due to a dispute between the city and the CBMWD.

- The Carson Industrial Project is the only one of the five proposed projects included in the OLAC Study that was not constructed. This project proposed a long transmission line originating at the Districts' Los Coyotes WRP and extending to the industrial areas of the City of Carson. The reuse sites in this project (Table 4-3e) are in close proximity to the already constructed Long Beach and Century distribution systems. Also, the largest proposed user of reclaimed water, Mobil Oil, is already receiving reclaimed water from the West Basin Water Recycling Project originating in El Segundo. Users in this proposed project may eventually receive an estimated 20.909 MGD (23,436 AFY) of reclaimed water via possible future interconnections between the Long Beach, Century and WBMWD distribution systems.

4.2.3.2 Southern California Comprehensive Water Reclamation and Reuse Study

The Southern California Comprehensive Water Reclamation and Reuse Study was performed by HYA Consulting Engineers in 1994 under the direction of the MWD. The purpose of the study was to develop a long-range water supply and reclaimed water management program for southern California coastal and inland valley areas, and to identify the feasibility of various regional water reclamation programs. HYA was selected because it has been involved in many of the recently developed water recycling programs in the Los Angeles area. Table 4-4 lists reuse sites within the Districts' service area that could potentially use reclaimed water, excluding all those sites expected to be connected in the near future to either the Century or Rio Hondo distribution systems.

4.2.3.3 San Gabriel Valley Potential Reuse Site Study

One obvious area where there is little reclaimed water service is the San Gabriel Valley. Assuming a backbone distribution line could run along the San Gabriel River, a study area of one mile on either side of the river was delineated from the San Jose Creek WRP to Pasadena. The one mile distance was chosen as a approximate estimate of the possible extent of distribution system lateral lines that would deliver reclaimed water to direct nonpotable use sites. In 1991, Districts' staff, using Brewster Aerial maps, identified a number of potential reuse sites (Table 4-5) in the study area that have a demand of 7.503 MGD (8,443 AFY). This list was used by HYA when performing the marketing study for the San Gabriel Valley reclamation project, described previously in Section 4.2.2.3. Table 4-5 lists those sites that were not included in the marketing analysis because a much smaller study area was reviewed.

4.2.3.4 City of Diamond Bar Water Reuse Feasibility Study

In 1990, Boyle Engineering Corporation identified 50 existing and future sites (Table 4-6) where approximately 3 MGD (3,360 AFY) of reclaimed water could be utilized for irrigation and other applications. A computer model of the proposed distribution system was developed, and the study concluded that this project would be technically viable and cost effective when compared with developing new potable water sources. However, implementation of this $17.3 million project would require a cooperative effort with the City of Industry and the WVWD in order to obtain the reclaimed water supplies.

4.2.3.6 1995 Districts' Staff Review of Thomas Guide

Table 4-7 lists a number of potential reuse sites that were identified by Districts' staff in the spring of 1995 using a Thomas Guide. Located in cities within the boundaries of the Districts' JOS, these sites are mainly large, landscape irrigation sites, such as parks, schools and golf courses that are readily identifiable using the "Points of Interest" guide at the back of the Thomas Guide. Acreages were determined either by contacting the site operator or by using a grid and conversion factor to measure directly from the map. Estimated usage was calculated by multiplying the acreage by 2.5 to get acre-feet per year. An effort was made to avoid duplication of reuse sites identified in any of the previous studies. These sites have an additional demand of 4.82 MGD (5,401 AFY).

TABLE 4-3a
POTENTIAL SITES
IDENTIFIED BY 1982 OLAC STUDY
(Cerritos Greenbelt Project)

Site Name	Location	MGD	AFY
Artesia Park	Artesia	0.036	40
Bloomfield Park	Hawaiian Gardens	0.032	36
Burbank School	Artesia	0.018	20
Carver School	Cerritos	0.009	10
Ecology Park	Cerritos	0.004	5
Faye Ross Jr. High School	Artesia	0.017	19
Kennedy Park	Artesia	0.018	20
Loma Park	Cerritos	0.003	3
Nienes School	Artesia	0.015	17
Orange Co. Nursery Site 2	Cerritos	0.046	52
Our Lady of Fatima Church	Artesia	0.006	7
Pat Nixon Park	Cerritos	0.012	14
SCE Row	Cerritos	0.196	219
Tetzlaff Jr. High School	Cerritos	0.016	18

TABLE 4-3b
POTENTIAL SITES
IDENTIFIED BY 1982 OLAC STUDY
(Walnut Valley Greenbelt Project)

Site Name	Location	MGD	AFY
Ajax Hardware	Industry	0.259	289
Hacienda Golf Club	La Habra Heights	0.179	199
Mount San Antonio College	Walnut	0.198	221
Northrop Architectural	Industry	0.143	159

TABLE 4-3c
POTENTIAL SITES
IDENTIFIED BY 1982 OLAC STUDY
(Long Beach & Seal Beach Greenbelt Project)

Site Name	Location	MGD	AFY
Leisure World Golf Course Club	Seal Beach	0.021	23
Los Alamitos Country Club	Seal Beach	0.446	498
Naval Base Golf Course	Seal Beach	0.156	174
Old Ranch Country Club	Seal Beach	0.204	228
Seal Beach Naval Weapons Station	Seal Beach	2.232	2490

TABLE 4-3d
POTENTIAL SITES
IDENTIFIED BY 1982 OLAC STUDY
(Central Basin Greenbelt/Industrial Project)

Site Name	Location	MGD	AFY
Airco Welding Products	Vernon	0.036	40
All American Mfg. Co.	Downey	0.036	40
Anchor Hocking	South Gate	0.016	18
Armstrong Cork	Huntington Park	0.082	92
Ashland Oil	Commerce	0.015	17
Automotive Battery Products	Vernon	0.018	20
Azusa Western, Inc.	Norwalk	0.045	50
Bechtel Power Corp.	Los Angeles Co.	0.045	50
Bell Gardens Park	Bell Gardens	0.033	37
Bicknell Park	Montebello	0.037	41
Bohn Heat Transfer	Commerce	0.009	10
Bowers Manufacturing	South Gate	0.054	60
Bristow Park	Commerce	0.024	27
Bronze Way Plating Corporation 1	Los Angeles	0.022	25
Bronze Way Plating Corporation 2	Los Angeles	0.022	25
California Metal Enameling	Commerce	0.035	39
Calvary Cemetery	East Los Angeles	0.296	331
Candlewood Country Club	Los Angeles Co.	0.231	258
Cargill	Lynwood	0.004	5
Champion Power Wash	Vernon	0.018	20
Chemplate Corporation	Commerce	0.089	100
Crown Zellerbach	Commerce	0.371	414
Davis Walker	Commerce	0.312	349
Downey Car Wash	Commerce	0.031	35
Downey Glass	Commerce	0.026	29
Fero Corporation	Vernon	0.089	100
Furman Park	Downey	0.034	38
General Felt	Commerce	0.031	35
Glass Container	Los Angeles	0.263	294
Golden Wool	Vernon	0.268	299
Grandview Park (George E. Elder Park)	Monterey Park	0.029	32
Gravure West	Vernon	0.021	24
Greer Hydraulic	Commerce	0.021	24
I.T.E. Imperial	Downey	0.027	30
Inland Container Corporation	Commerce	0.012	14
International Paper	Commerce	0.013	15
Johns-Manville Company	Vernon	0.018	20
Jorgensen Steel	Lynwood	0.020	22
Kaiser Aluminum	Commerce	0.057	64
King Metal Company	Vernon	0.036	40

TABLE 4-3d
POTENTIAL SITES
IDENTIFIED BY 1982 OLAC STUDY
(Central Basin Greenbelt/Industrial Project)

Site Name	Location	MGD	AFY
L.A. Chemicals	Cudahy	0.016	18
L.A. Paper Box	Commerce	0.219	244
Lincoln Foundry	Huntington Park	0.036	40
Lynwood City Park	Lynwood	0.072	81
Mand Carpet	Cudahy	0.245	273
Maryatt Industries (Cotton Club)	Vernon	0.036	40
Matchmaster	Los Angeles	0.312	349
Monogram Aerospace	Commerce	0.036	40
Mt. Zion Beth Israel Cemetery	Los Angeles	0.029	32
National Can Company	Vernon	0.187	209
National Seal	Downey	0.062	70
Neff Park	La Mirada	0.018	20
Norwalk Park	Norwalk	0.032	36
Operating Industries Landfill	Monterey Park	0.089	100
Owens - Illinois Glass	Vernon	0.442	493
Pacific Coast Packing Corporation	South Gate	0.732	817
Pacific Kraft	Commerce	0.030	34
Pacific Tube	Commerce	0.016	18
Paramount Plating & Polishing	Huntington Park	0.036	40
Park Lawn Cemetery	Commerce	0.027	30
Phelps - Dodge Brass	Commerce	0.116	129
Pico Rivera Campgrounds	Pico Rivera	0.098	110
Punch Press Products	Los Angeles	0.027	30
Purex Corporation (Dial Corp.)	South Gate	0.045	50
Reisner Metals	Downey	0.075	84
Resurrection Cemetery	Montebello	0.134	149
Richards Rack	Lynwood	0.179	199
Rio Hondo College	Los Angeles Co.	0.179	199
Rockwell International	Downey	0.161	179
Ross Snyder Recreation Center	Los Angeles	0.018	20
Southwest Foam	Downey	0.045	50
Standard Precision	Santa Fe Springs	0.062	70
Super Temp Corporation	Santa Fe Springs	0.027	30
Terry Oil Co.	Commerce	0.156	174
Trend Mills	Commerce	0.357	398
Union Pacific	Commerce	0.245	274
Vernon Leather	Los Angeles	0.184	205
Vernon Uniform Supply Company	Vernon	0.036	40
W.R. Grace	Cudahy	0.125	139
Western Gillette Company	Los Angeles	0.018	20
Westside Park	Norwalk	0.012	13

TABLE 4-3e
POTENTIAL SITES
IDENTIFIED BY 1982 OLAC STUDY
(Carson Industrial Project)

Site Name	Location	MGD	AFY
Airco Industrial Gases	Torrance	0.049	55
Atlantic Richfield (ARCO) refinery	Carson	5.802	6473
Carson Park	Carson	0.022	25
Champlin Petroleum (Ultramar)	Wilmington	0.493	550
Charles Wilson Community Park	Torrance	0.048	54
Columbia Park	Torrance	0.040	45
Del Amo Park	Carson	0.020	22
Delthorne Park	Torrance	0.011	12
Dominguez Golf Course	Carson	0.096	108
Golden Eagle Refinery (G.E. Services)	Carson	0.893	996
Great Lakes Carbon (G.L. Paper Co.)	Wilmington	0.304	339
Guenser Park	Torrance	0.016	18
Harbor Regional Park & Golf Course	Wilmington	0.439	490
Huck Manufacturing (Huck International)	Carson	0.064	72
Linair Engineering (Teledyne)	Los Angeles Co.	0.022	25
Los Angeles Plating	Los Angeles	0.076	85
Martin Marietta	Los Angeles	0.437	488
Metal Box - Standun, Inc	Carson	0.103	115
National Supply	Torrance	0.085	95
Pittsburgh Plate	Torrance	0.019	21
Roosevelt Memorial Park Cemetery	Los Angeles	0.056	63
Shell Oil	Carson	4.642	5179
Soule Steel	Carson	0.067	75
Sun Oil	Wilmington	0.420	468
Texaco, Inc	Wilmington	3.303	3685
U.S. Borax	Wilmington	0.335	373
U.S. Gypsum	Torrance	0.022	25
Union Carbide - Plastic	Torrance	0.268	299
Union Oil	Wilmington	2.376	2651
Victoria Golf Course	Carson	0.312	349
Victoria Park	Carson	0.069	77

TABLE 4-4
POTENTIAL USERS
IDENTIFIED BY HYA CONSULTING ENGINEERS

Site Name	Location	MGD	AFY
ABC Nursery	Bell Gardens	0.013	15
Alexander Haagen	Montebello	0.043	48
Allied Signal	El Segundo	0.134	149
Anderson Park	San Pedro	0.019	21
Angeles Sanitary Can Co.	Los Angeles	0.009	10
Anza School	Hawthorne	0.014	16
Armenian School	Pico Rivera	0.004	5
Aurora Clayton	Bell Gardens	0.021	23
Begg School	Manhattan Beach	0.004	5
Bell Garden Association	Bell Gardens	0.012	13
Bell Gardens Convention Center	Bell Gardens	0.017	19
Bell Gardens Manor	Bell Gardens	0.029	33
Bell Gardens School	Montebello	0.005	6
Birney School	Pico Rivera	0.013	15
Buford School	Lennox	0.006	7
Burke Jr. High	Pico Rivera	0.027	30
Cabrillo School	Hawthorne	0.015	17
Cal State University Dominguez Hills	Carson	0.495	553
Calas Park	Carson	0.021	24
CalTrans 105 Prairie	Hawthorne	0.004	5
CalTrans 105/Crenshaw	Inglewood	0.005	6
CalTrans 105/Hawthorne Blvd.	Hawthorne	0.027	30
CalTrans 105/La Cienega Blvd.	LA County	0.012	13
CalTrans 105/Van Ness	Hawthorne	0.006	7
CalTrans 105/Western Avenue	Hawthorne	0.009	10
CalTrans 110/405	Long Beach	0.062	69
CalTrans 405/117th Street	Hawthorne	0.013	15
CalTrans 405/120th Street	Hawthorne	0.009	10
CalTrans 405/166th Street	Lawndale	0.005	6
CalTrans 405/Artesia Blvd.	Torrance	0.007	8
CalTrans 405/Century Blvd.	Inglewood	0.004	5
CalTrans 405/Crenshaw Blvd.	Torrance	0.009	10
CalTrans 405/El Segundo Blvd.	Hawthorne	0.014	16
CalTrans 405/Imperial Hwy.	Hawthorne	0.024	27
CalTrans 405/Inglewood Avenue	Redondo Beach	0.013	15
CalTrans 405/La Cienega Blvd.	LA County	0.014	16
CalTrans 405/Redondo Beach Blvd.	Lawndale	0.007	8
CalTrans 405/Rosecrans Avenue	Hawthorne	0.014	16
CalTrans 405/Van Ness	Torrance	0.009	10
CalTrans 405/Yukon	Torrance	0.004	4

TABLE 4-4
POTENTIAL USERS
IDENTIFIED BY HYA CONSULTING ENGINEERS

Site Name	Location	MGD	AFY
CalTrans 91/110	Los Angeles	0.062	69
Carson Park	Carson	0.024	27
Cintas Corp. (Laundry)	Pico Rivera	0.071	79
Centennial Field Park	Inglewood	0.021	24
Center Elementary School	El Segundo	0.027	30
Clark Stadium	Hermosa Beach	0.015	17
Clorox Company	Vernon	0.057	64
Clyde Woodworth Elementary School	Inglewood	0.007	8
Columbia Regional Park	Torrance	0.089	100
Container Corporation of America	Commerce	0.028	31
Community Center	Hermosa Beach	0.012	14
Continental Park	El Segundo	0.058	65
County of Los Angeles Women's Jail	Los Angeles	0.005	6
Cure, Inc.	Montebello	0.062	69
Dana-Burnett Playground	Hawthorne	0.036	40
Dominguez Golf Course	Carson	0.187	209
E&J Dye House	Compton (Rancho Dominguez)	0.379	423
Edison School	Torrance	0.004	5
El Segundo Generating Station (SCE)	El Segundo	0.268	299
El Segundo High School	El Segundo	0.009	10
El Segundo Library Park	El Segundo	0.009	10
Emery Industry	Commerce	0.233	260
Eucalyptus Park	Hawthorne	0.011	12
Eucalyptus Avenue School	Hawthorne	0.015	17
Felton School	Lennox	0.015	17
Galletti Brothers Foods	Vernon	0.035	39
Gardena High School	Gardena	0.027	30
General Felt	Pico Rivera	0.011	12
Goodyear Airship Field	Carson	0.080	90
Green Acres Nursery	Pico Rivera	0.011	12
Grevillea	Inglewood	0.012	14
Gruma Corporation	Commerce	0.065	73
Hawthorne High School	Hawthorne	0.059	66
Hawthorne Junior High School	Hawthorne	0.009	10
Hawthorne Municipal Airport	Hawthorne	0.013	15
Hermosa Valley Park	Hermosa Beach	0.017	19
Hermosa Valley School	Hermosa Beach	0.016	18
Hughes Aircraft Company	El Segundo	0.304	339
Inglewood City Hall & Library	Inglewood	0.029	32
Inglewood City Service Center	Inglewood	0.007	8

TABLE 4-4
POTENTIAL USERS
IDENTIFIED BY HYA CONSULTING ENGINEERS

Site Name	Location	MGD	AFY
Inglewood High School	Inglewood	0.021	23
Jackson, Byron Property	Vernon	0.010	11
James P. Berg	Bell Gardens	0.009	10
Jefferson School	Lennox	0.004	5
Jefferson School	Hawthorne	0.005	6
John Kelly Stumpus	Los Angeles	0.030	34
Kelso School	Inglewood	0.003	3
Kaiser Aluminum	Commerce	0.179	199
La Marina Field	Manhattan Beach	0.018	20
Lawndale High School	Lawndale	0.022	25
Lennox High School	Lennox	0.027	30
Leuzinger High School	Lawndale	0.013	15
Los Angeles Air Force Base	El Segundo	0.054	60
Los Angeles Co. Dept. of Parks & Recreation	Los Angeles	0.250	279
Los Angeles Dye and Wash	Commerce	0.044	49
M.L. Winters Co.	Pico Rivera	0.005	6
Magruder School	Torrance	0.007	8
Manhattan Village Mall	Manhattan Beach	0.057	64
Marriot Textile Service	Compton	0.098	110
Meadows School	Manhattan Beach	0.005	6
Metal Plating	Bell Gardens	0.009	10
MGF Industries	Commerce	0.027	30
Mira Costa High School	Manhattan Beach	0.024	27
Monroe Jr. High School	Inglewood	0.010	11
Morningside High School	Inglewood	0.054	61
Montebello Container Co.	Pico Rivera	0.007	8
North Torrance High School	Torrance	0.018	20
New Crow	Commerce	0.073	82
New Crow II	Commerce	0.026	29
Nursery	Pico Rivera	0.009	10
Pacific Continental Textile	Compton (Rancho Dominguez)	0.527	588
Pacific Tube Company	Commerce	0.047	53
Pennecamp Camp	Manhattan Beach	0.004	5
Pico Plating	Pico Rivera	0.044	49
Polliwog Park	Manhattan Beach	0.062	69
Prudential Overall	Commerce	0.037	41
Public Library/ City Hall	Hermosa Beach	0.004	5
Radisson Hotel	Manhattan Beach	0.004	5
Railroad R/W Park	Hermosa Beach	0.044	49
Redondo Beach Generating Station (SCE)	Redondo Beach	0.268	299

TABLE 4-4
POTENTIAL USERS
IDENTIFIED BY HYA CONSULTING ENGINEERS

Site Name	Location	MGD	AFY
Richmond Park	El Segundo	0.010	11
Rio Hondo Hospital	Pico Rivera	0.005	6
Rio Vista Estates	Pico Rivera	0.005	6
Rivera Nursing Home	Pico Rivera	0.018	20
Robinson School	Manhattan Beach	0.004	5
Rodriguez Park	Montebello	0.018	20
Rohne-Poulenc	Carson	0.241	269
Roosevelt Memorial Park	L.A. County (Walnut Park)	0.126	140
Sepulveda School (Canyon Verde Ctr)	Hawthorne	0.014	16
Shell Station & Car Wash	Pico Rivera	0.005	6
Smithway Associates	Commerce	0.095	106
South Ranchito Estates	Pico Rivera	0.013	15
South Montebello Irrigation	Commerce	0.112	124
Southern California Gas Co.	Pico Rivera	0.036	40
Street Medians (Marine Ave.)	Manhattan Beach	0.009	10
St. Mariannes School	Pico Rivera	0.004	5
Sungdo International	Compton (Rancho Dominguez)	0.339	378
Super A Investment	Montebello	0.045	50
Toyoshima Dyeing and Finishing	Rancho Dominguez	0.076	85
Trammel Crow Company	Commerce	0.045	50
Thorpe Park	Hawthorne	0.024	27
TRW-Manhattan Beach	Manhattan Beach	0.223	249
TRW-Redondo Beach	Redondo Beach	0.107	120
Union Ice & Storage	Commerce	0.021	24
Valley/Ardmore Greenbelt	Manhattan Beach	0.061	68
Victoria Golf Course	Carson	0.536	598
Victoria Park	Arcadia	0.096	108
Washington Avenue School	Hawthorne	0.008	9
Welch's Uniform Rental	Vernon	0.069	77
Westco Products	Pico Rivera	0.013	15
West Coast Rendering	Vernon	0.029	33
Western Dye & Finishing	Compton (Rancho Dominguez)	0.415	463
Westerntex Industries Inc.	Commerce	0.099	111
Whittier Fertilizer	Pico Rivera	0.014	16
Windsor Art Products	Pico Rivera	0.004	5
York Avenue School	Hawthorne	0.010	11
Yukon School	Torrance	0.007	8

TABLE 4-5
POTENTIAL SITES IN SAN GABRIEL VALLEY
IDENTIFIED BY 1991 LACSD STUDY

Site Name	Location	MGD	AFY
Alhambra City High School	Alhambra	0.020	22
Almansor Golf Course	South Pasadena	0.454	507
Amar School	Brewster Map 510	0.065	72
Annandale Golf Course	Pasadena	0.204	228
Arroyo Seco Golf Course	South Pasadena	0.261	291
Arroyo Seco Park	Pasadena	0.172	192
Arroyo Vista School	South Pasadena	0.006	6
Avocado Heights Park	Bassett	0.047	53
Baldwin School	Alhambra	0.018	20
Basset Park	Bassett	0.036	40
Bella Vista Park	Monterey Park	0.007	8
Belvedere Jr. High School & Park	East Los Angeles	0.024	27
Blair High School	Pasadena	0.027	31
California School	La Puente	0.031	35
California State University, Los Angeles	East Los Angeles	0.052	58
CalTrans 10/ 8 intersections	Brewster Map 497	0.045	50
CalTrans 60 & Valley, area between	Industry	0.738	823
CalTrans 60/Valley, area between	Industry	0.259	288
CalTrans 605/Valley Greenbelt	Bassett	0.038	43
CalTrans 710/10 interchange	Monterey Park	0.039	44
CalTrans 710/60 interchange	East Los Angeles	0.059	66
Carver, K.L. Elementary	San Marino	0.003	3
Clemmenson School	Brewster Map 464	0.004	5
Cloverly Elementary School	Temple City	0.012	14
Codlidge School	Brewster Map 465	0.004	5
Cogswell Elementary School	El Monte	0.006	7
Cortida Elementary School	Brewster Map 598	0.007	8
Don Bosco Technical	Rosemead	0.065	72
Don Julian School	La Puente	0.016	18
Duff School	Rosemead	0.031	35
East Los Angeles Junior College	East Los Angeles	0.074	82
Edison Right-of-Way	Brewster Map 497	0.055	62
Edison Right-of-Way	Brewster Map 465	0.202	226
Edison Right-of-Way	Brewster Map 513	0.485	542
Edison Substation	Brewster Map 513	0.052	58
Emerson Elementary School	Rosemead	0.005	5
Edgewood Middle School	La Puente	0.106	118
Erwin, Thomas E. Elementary School	La Puente	0.015	16
Fairgrove Continuation High School	Brewster Map 510	0.033	37
Fern Elementary School	Brewster Map 513	0.031	35
Flanner School	Brewster Map 599	0.015	16

TABLE 4-5
POTENTIAL SITES IN SAN GABRIEL VALLEY
IDENTIFIED BY 1991 LACSD STUDY

Site Name	Location	MGD	AFY
Fletcher Park	El Monte	0.054	60
Fremont Elementary School	Montebello	0.002	3
Garfield Jr. High School	Alhambra	0.007	8
Garfield Park	South Pasadena	0.020	22
Garvey Elementary School	Rosemead	0.010	11
Garvey Reservoir & Garvey Ranch Park	Monterey Park	0.366	408
George E. Elder Park & High School	Monterey Park	0.038	42
Giano Jr. High School & Park	West Covina	0.030	33
Gidley School	Brewster Map 598	0.033	37
Granada Elementary School	Alhambra	0.009	10
Grand View School	Brewster Map 510	0.054	60
Hammel Elementary School	Brewster Map 514	0.004	5
Highland Park	Highland Park	0.012	13
Hudson School	Brewster Map 543	0.010	11
Huntington School	Brewster Map 465	0.027	30
Jefferson Jr. High School	San Gabriel	0.014	15
La Puente High School & Elementary School	La Puente	0.118	132
La Seda School	La Puente	0.015	16
Lacy Park	San Marino	0.048	54
Lassalette School	La Puente	0.041	46
Le Gore High School	Brewster Map 598	0.010	11
Live Oak Park	Temple City	0.028	31
Longden School	Temple City	0.009	11
Marguerita Elementary School	Alhambra	0.050	56
Marianna Elementary School	Brewster Map 514	0.018	20
Mark Kepple High School	Alhambra	0.052	58
Marshall School	San Gabriel	0.010	12
Mayfield High School	Pasadena	0.004	4
McKinley School	San Gabriel	0.049	55
Mission High School	Brewster Map 465	0.042	46
Monterey Park Golf Course	Monterey Park	0.076	85
Moor Field	Brewster Map 496	0.059	66
Muscatel Jr. High School	Rosemead	0.009	11
Nativity School	El Monte	0.020	22
Nelson Elementary School	La Puente	0.029	32
New Temple Elementary School & Park	South El Monte	0.053	59
Northham School	La Puente	0.015	16
Northrup Elementary School	Alhambra	0.059	66
Oak Ave Jr. High School	Temple City	0.012	13
Oneonta Elementary School	Alhambra	0.006	6
Park Elementary School	Alhambra	0.036	40

TABLE 4-5
POTENTIAL SITES IN SAN GABRIEL VALLEY
IDENTIFIED BY 1991 LACSD STUDY

Site Name	Location	MGD	AFY
Potrero Heights Elementary School & Park	San Gabriel	0.024	26
Potrero School	Montebello	0.012	13
Radio Towers KGRB	Montebello	0.086	96
Repath School	Brewster Map 513	0.007	8
Riggin Ave School	Brewster Map 514	0.061	68
Rimgrove Dr. Park	Valinda	0.054	60
Rio Vista School	Brewster Map 598	0.030	33
Roosevelt Elementary School	San Gabriel	0.007	8
Rorimer School	La Puente	0.017	19
Rosemead High School	Rosemead	0.098	110
South Pasadena High School	South Pasadena	0.023	25
San Gabriel Academy	San Gabriel	0.020	22
San Gabriel Cemetery	San Gabriel	0.042	47
San Gabriel Country Club	San Gabriel	0.301	336
San Gabriel High School	Alhambra	0.454	507
Savannah Elementary School	Rosemead	0.007	8
Shirpeer School	Brewster Map 598	0.015	16
Shively Park	South El Monte	0.024	26
Sierra Park Elementary School	Covina	0.004	4
Sierra Vista Park	Monterey Park	0.006	7
South Pasadena Jr. High School	South Pasadena	0.014	15
Southwestern Academy	San Marino	0.006	7
Sparks Schools Intermediate & Elementary	La Puente	0.045	50
St. Joseph Elementary School	La Puente	0.268	299
St. Martin Academy	Brewster Map 544	0.003	4
Story Park	Alhambra	0.005	5
Sunkist School & Park	La Puente	0.020	22
Sybil Brand Institute	Monterey Park	0.055	61
Temple School	Rosemead	0.030	33
Truman Continuation High School	Brewster Map 510	0.043	49
Valinda School	Valinda	0.010	11
Valle Lindo School	El Monte	0.024	26
Van Wig School	La Puente	0.010	11
Villa Corta School	La Puente	0.005	6
Wells Elementary School	Brewster Map 497	0.016	18
Wescove School	West Covina	0.022	24
Western Pilgrim Elementary School	Brewster Map 512	0.007	8
Westridge Girls School	Pasadena	0.005	6
Willard School	Rosemead	0.004	4
Wilkerson Elementary School	Brewster Map 512	0.007	8
Williams School & Park	Rosemead	0.063	70

TABLE 4-5
POTENTIAL SITES IN SAN GABRIEL VALLEY
IDENTIFIED BY 1991 LACSD STUDY

Site Name	Location	MGD	AFY
Willow Elementary School	Glendora	0.032	36
Willoweed Jr. High School	Brewster Map 510	0.024	27
Wilson Jr. High School	Brewster Map 465	0.002	2
Wing Lane School	La Puente	0.016	18
Workman Elementary School & Hospital	West Covina	0.069	77
Wright School	Brewster Map 599	0.023	26
Yorbita School & Park	La Puente	0.040	45

TABLE 4-6
POTENTIAL REUSE SITES IN DIAMOND BAR
IDENTIFIED BY BOYLE ENGINEERING

Site Name	Location	MGD	AFY
Carlton Peterson Park	Diamond Bar	0.014	16
Heritage Park (I)	Diamond Bar	0.006	7
Maple Hill Park	Diamond Bar	0.01	11
Paul C Grow Park	Diamond Bar	0.01	11
Reagan Park	Diamond Bar	0.009	10
Starshine Park	Diamond Bar	0.004	4
Summit Ridge Park	Diamond Bar	0.013	15
Sycamore Canyon Park (II)	Diamond Bar	0.011	12
Landscape Maintenance District No. 38	Diamond Bar	0.074	83
Landscape Maintenance District No. 39	Diamond Bar	0.071	80
Landscape Maintenance District No. 41	Diamond Bar	0.043	48
57 Freeway	Diamond Bar	0.04	45
60 Freeway	Diamond Bar	0.013	15
Other CalTrans Landscaping	Diamond Bar	0.008	9
Little League Field	Diamond Bar	0.013	15
Diamond Bar Country Estates	Diamond Bar	0.053	59
Castle Rock Elementary School	Diamond Bar	0.007	8
Maple Hill Elementary School	Diamond Bar	0.017	19
Evergreen Elementary School	Diamond Bar	0.016	18
Quail Summit Elementary School	Diamond Bar	0.009	10
Chaparral Junior High School	Diamond Bar	0.032	36
Diamond Bar High School	Diamond Bar	0.015	17
South Point Middle School	Diamond Bar	0.007	8
Golden Springs Elementary School	Diamond Bar	0.003	3
Diamond Point Elementary School	Diamond Bar	0.002	2
Armstrong Elementary School	Diamond Bar	0.001	1
Lorbeer Junior High School	Diamond Bar	0.026	29
Tres Hermanos High School (future)	Diamond Bar	0.038	43
Elementary Schools (future)	Diamond Bar	0.026	29
The Country residential development	Diamond Bar	0.052	58
Industrial Park on Grand	Diamond Bar	0.149	167
Larkstone Park (future)	Diamond Bar	0.004	4
Pantera Park (future)	Diamond Bar	0.021	24
Additional parks (future)	Diamond Bar	0.08	90
Tres Hermanos Park (future)	Diamond Bar	0.096	108
Firestone Golf Course	Los Angeles County	0.625	700
South Country residential development	Diamond Bar	0.285	319
Brea Canyon residential development	Rowland Heights	0.057	64

TABLE 4-7
POTENTIAL USERS IDENTIFIED BY THOMAS GUIDE

Site Name	Location	MGD	AFY
Almendra Park	Valencia	0.010	11
Alondra County Golf Course	Lawndale	0.375	418
Alondra Park	Lawndale	0.190	212
Aviation Park	Redondo Beach	0.036	40
Baldwin Stocker Park	Arcadia	0.010	11
Barranca Park	Covina	0.016	17
Begonias Lane Park	Santa Clarita	0.008	9
Blaisdell Park	Claremont	0.023	26
Bouquet Canyon Park	Saugus	0.022	25
Cahuilla Park	Claremont	0.042	47
Canyon Country Park	Canyon Country	0.039	43
Capstone Park	Azusa	0.009	10
Center Park	Inglewood	0.004	4
Centinela Park	Inglewood	0.134	149
Central Park	Pomona	0.007	7
Central Park West	Baldwin Park	0.016	18
Chaparral Park	Claremont	0.008	9
Charter Oak Park	Charter Oaks	0.025	28
Chester L. Washington Golf Course	Los Angeles County	0.257	287
Civic Center Park	San Dimas	0.002	2
Claremont Golf Course	Claremont	0.067	74
College Park	Claremont	0.022	25
Country Crossing Park	Pomona	0.026	28
Covina Park	Covina	0.026	29
Del Aire Park	Los Angeles County	0.012	14
Del Norte Park	West Covina	0.019	22
Dominguez Park	Redondo Beach	0.045	50
Dr. Martin Luther King Jr. Memorial Park	Pomona	0.013	14
East Los Angeles Community College	Monterey Park	0.076	85
Edna Park	Covina	0.004	5
El Barrio Park	Claremont	0.015	17
El Camino College	Torrance	0.067	75
El Nido Park	Torrance	0.018	20
Garfield Park	Pomona	0.008	9
Garvey Ranch Park	Monterey Park	0.054	61
Gladstone Park	Glendora	0.022	24
Glendora Sports Park	Glendora	0.063	70
Griffith Park	Claremont	0.025	27
Hamilton Park	Pasadena	0.007	8
Hamilton Park	Pomona	0.007	8
Happy Town Park	Pomona	0.005	5
Harrison Park	Pomona	0.014	16

TABLE 4-7
POTENTIAL USERS IDENTIFIED BY THOMAS GUIDE

Site Name	Location	MGD	AFY
Higgin Botham Park	Claremont	0.012	13
Highland Park	Highland Park	0.010	11
Hilltop Park	El Segundo	0.004	5
Holifield Park	Norwalk	0.005	6
Hollenbeck Park	Covina	0.025	27
Holly Glen Park	Hawthorne	0.004	4
Holly Park	Hawthorne	0.012	13
Inglewood Park Cemetery	Los Angeles	0.402	448
Irwindale Community Park	Irwindale	0.040	45
J. N. Mallows Park	Claremont	0.002	2
Jaeger Park	Claremont	0.011	12
Jane Addams Park	Lawndale	0.009	10
Kelby Park	Covina	0.020	22
Kennedy Park	Pomona	0.014	15
Kuns Park	La Verne	0.008	9
La Puerta Sports Park	Claremont	0.020	22
La Verne Cemetery	La Verne	0.036	40
Lambert Park	El Monte	0.025	28
Larkin Park	Claremont	0.020	22
Lennox Park	Lennox	0.014	16
Lewis Park	Claremont	0.007	8
Lincoln Mini Park	LaVerne	0.001	1
Lincoln Park	Pomona	0.011	12
Live Oak Park	Manhattan Beach	0.008	9
Live Oak Park	Temple City	0.035	39
Lone Hill Park	San Dimas	0.031	34
Los Angeles County Fairplex	La Verne	0.045	50
Los Flores Park	LaVerne	0.028	31
Madison Park	Pomona	0.022	24
Manhattan Village Park	Manhattan Beach	0.006	7
Marine Avenue Park	Manhattan Beach	0.012	14
McMaster Park	Torrance	0.013	15
Memorial Park	Claremont	0.019	21
Merchant Park	San Dimas	0.025	28
Montvue Park	Pomona	0.010	11
Morgan Park	Baldwin Park	0.024	26
North Oaks Park	Canyon Country	0.005	6
Oak Park Cemetery	Claremont	0.020	22
Oakdale Memorial Park	Glendora	0.245	274
Palm Lake Golf Club	Pomona	0.036	40
Palmview Park	West Covina	0.029	32
Palomares Park	Pomona	0.049	54

TABLE 4-7
POTENTIAL USERS IDENTIFIED BY THOMAS GUIDE

Site Name	Location	MGD	AFY
Park	Pomona	0.002	2
Pelota Park	LaVerne	0.012	14
Phil Park	Pomona	0.018	20
Phillips Ranch Park	Pomona	0.012	13
Pioneer Park	El Monte	0.012	14
Pioneer Park	San Dimas	0.014	15
Pitzer College	Claremont	0.004	5
Pomona & Holy Cross Cemetery	Pomona	0.205	229
Pomona College	Claremont	0.179	199
Pomona J.C. Community Park	Pomona	0.015	17
Progress Park	Paramount	0.011	12
Queen Park	Inglewood	0.003	3
Radisson Plaza Golf Course	Manhattan Beach	0.089	100
Ralph Welch Park	Pomona	0.023	26
Rancho Santa Ana Botanic Garden	Claremont	0.178	199
Recreation Park	LaVerne	0.010	11
Recreation Park	El Segundo	0.054	60
Rhoads Park	San Dimas	0.006	6
Rio Vista Park	El Monte	0.004	5
Rogers Park	Inglewood	0.037	42
Rogers-Anderson Park	Lawndale	0.018	20
Sand Dune Park	Manhattan Beach	0.024	27
Santa Anita Park	Arcadia	0.004	4
Santa Clarita Park	Saugus	0.017	19
Smith Park	San Gabriel	0.021	23
Spadra Cemetery	Pomona	0.017	19
Streamland Park	Pico Rivera	0.031	35
Stuart Wheeler Park	Claremont	0.028	31
Sycamore Canyon Park	Claremont	0.052	58
Ted Greene Park	Pomona	0.013	14
Temple Park	Temple City	0.016	18
Tierra Verde Park	Arcadia	0.003	3
Vail Park	Claremont	0.011	12
Valleydale Park	Azusa	0.024	27
Via Verde Country Club	San Dimas	0.268	299
Via Verde Park	San Dimas	0.026	29
Washington Park	Pomona	0.066	74
Weber Street Park	Pomona	0.016	18
Westmont Park	Pomona	0.014	15
Wingate Park	Covina	0.041	46

EXHIBIT 4-1

SUMMARY OF RECLAIMED WATER USAGE

REUSE SITE (City)	START-UP DATE	ACREAGE	TYPE OF USE	USAGE (MGD)
Water Replenishment District (WNWRP)	Aug 62	--	R	10.10
La Cañada-Flintridge C.C. (La Canada)	Oct 62	105	L,P	0.117
Water Replenishment District (PomWRP)	Jun 66	--	R	4.16
Apollo Lakes County Park (Lancaster)	Jun 69	56	L,P	0.091
Water Replenishment District (SJCWRP)	Jun 71	--	R	28.84
Cal Poly, Pomona-Kellogg (Pomona)	Dec 73	500	AG,L,O,P,AF	1.210
Lanterman Hospital (Pomona)	Dec 73	100	AG	0.026
South Campus Drive Parkway (Pomona)	Dec 73	8	L	0.019
Route 57 and 10 Freeways (Pomona)	May 75	18	L	0.055
Bonelli Regional County Park (Pomona)	Apr 77	789	L	0.754
California Country Club (Industry)	Jun 78	120	L,P	0.325
Ironwood 9 Golf Course (Cerritos)	Nov 78	25	L,P	0.075
Caruthers Park (Bellflower)	Nov 78	5	L	0.046
Smurfit Newsprint (Pomona)	Oct 79	--	I	3.265
El Dorado Park West (Long Beach)	Aug 80	135	L	0.098
El Dorado Golf Course (Long Beach)	Aug 80	150	L	0.215
Suzanne Park (Walnut)	Oct 80	12	L	0.016
Route 71 and 10 Freeways (Pomona)	Apr 81	12	L	0.016
Paiute Pond (Lancaster)	May 81	200	WR	5.879
Recreation Park and G.C. (Long Beach)	Oct 82	175	L	0.280
Norman's Nursery (El Monte)	Mar 83	20.2	O	0.037
Whaley Park (Long Beach)	Jun 83	9	L	0.021
Simpson Paper Company (Pomona)	Aug 83	--	I	0.556
Industry Hills Recreation Area (Industry)	Aug 83	600	L,P	0.814
El Dorado Park East (Long Beach)	Jan 84	300	L	0.278
Nature Center (Long Beach)	Jan 84	60	L	0.054
605 Freeway (Long Beach)	Feb 84	50	L	0.030
Heartwell Park (Long Beach)	Feb 84	120	L	0.160
Skylinks Golf Course (Long Beach)	Apr 84	155	L,P	0.259
Douglas Park (Long Beach)	Apr 84	3	L	0.003
Kitano Nursery (Long Beach)	Apr 84	3	O	0.007
405 Freeway at Atherton (Long Beach)	May 84	5	L	0.006
DeMille Junior High School (Long Beach)	Jun 84	5	AF	0.009
Heartwell Golf Park (Long Beach)	Jun 84	30	L	0.070
Spadra Landfill (Pomona)	Jul 84	53	L	0.181
Veteran's Memorial Stadium (Long Beach)	Jan 85	6	AF	0.022
DOA's Eastgrove Pistachio Orchard (Palmdale)	Apr 85	140	AG	0.013
Recreation Park Bowling Green (Long Beach)	Aug 85	3	L	0.008
Sunrise Growers Nursery, east and west (Long Beach)	Sep 85	11	O	0.083
California State University (Long Beach)	Dec 85	52	AF	0.127
Long Beach City College (Long Beach)	Feb 86	15	AF	0.031
Recreation 9-Hole G.C. (Long Beach)	Mar 86	37	L	0.086
Blair Field (Long Beach)	Apr 86	5	AF	0.010
Woodlands Park (Long Beach)	Apr 86	7	L	0.013
Colorado Lagoon Park (Long Beach)	Apr 86	4	L	0.005
Marina Vista Park (Long Beach)	Apr 86	30	L	0.009
Arbor Nursery (Whittier)	Apr 86	5	O	0.007
Suzanne Middle School (Walnut)	May 86	4	AF,L	0.018
Walnut High School (Walnut)	May 86	15	AF,L	0.035
Vejar School (Walnut)	May 86	3	AF,L	0.012
Morris School (Walnut)	May 86	9	AF,L	0.013
Snow Creek Park (Walnut)	May 86	7	L	0.020
Snow Creek Landscape Maintenance Dist. (Walnut)	May 86	13.5	L	0.080
Lemon Creek Park (Walnut)	May 86	5	L	0.005
Friendship Park (West Covina)	May 86	6	L	0.007
Hollingworth School (West Covina)	May 86	3	AF,L	0.012

NOTES: L = Landscape irrigation, P = Impoundment, WR = Wildlife refuge, AG = Agricultural irrigation, AF = Athletic field irrigation
O = Ornamental plant irrigation, I = Industrial, R = Groundwater replenishment (value is average of three fiscal years).

SUMMARY OF RECLAIMED WATER USAGE

REUSE SITE (City)	START-UP DATE	ACREAGE	TYPE OF USE	USAGE (MGD)
Lanesboro Park (West Covina)	May 86	2	L	0.003
Rincon Middle School (West Covina)	May 86	3	AF,L	0.016
Sunshine Park (L.A. County)	May 86	4	L	0.009
Rowland School (Rowland Heights)	May 86	3	AF,L	0.006
Farjardo School (Rowland Heights)	May 86	4	AF,L	0.004
Farjardo Park (Rowland Heights)	May 86	4	L	0.008
Route 57 and 60 Freeways (Rowland Heights)	May 86	15	L	0.007
Rowland Regional County Park (Rowland Heights)	May 86	11	L	0.012
Rowland High School (Rowland Heights)	May 86	9	AF,L	0.028
Killian School (Rowland Heights)	May 86	3	AF,L	0.009
Walnut Elementary School (Walnut)	May 86	4	AF,L	0.004
WUSD Administrative Service Center (Walnut)	May 86	4	L	0.007
Walnut Ranch Park (Walnut)	Jun 86	26	L	0.036
Walnut Ranch Landscape Maintenance Dist. (Walnut)	Jun 86	16	L	0.027
Nogales High School (L.A. Co.)	Jun 86	11	AF,L	0.031
Queen of Heaven Cemetery (Rowland Heights)	Jun 86	35	L	0.072
Diamond Bar Golf Course (Diamond Bar)	Jul 86	174	L,P	0.175
Walnut Valley Water Dist. pump station (Walnut)	Jul 86	1	L	0.0002
Schabarum Regional County Park (L.A. Co.)	Sep 86	250	L	0.090
Walnut Ridge Landscape Maintenance District (Walnut)	Mar 87	25.5	L	0.081
Morningside Park (Walnut)	Mar 87	4	L	0.008
Gateway Corporate Center (Diamond Bar)	Jun 87	45	L	0.080
Library/Civic Center (Cerritos)	Dec 87	4	L	0.020
Olympic Natatorium (Cerritos)	Dec 87	6	L	0.017
Reservoir Hill Park (Cerritos)	Dec 87	4	L	0.011
Whitney Learning Center (Cerritos)	Dec 87	10	AF,L	0.032
Gonsalves Elementary School (Cerritos)	Dec 87	5	AF,L	0.015
Wittman Elementary School (Cerritos)	Dec 87	5	AF,L	0.015
Gahr High School (Cerritos)	Dec 87	28	AF,L	0.029
Area Development Project No. 2 (Cerritos)	Jan 88	11.5	L,P	0.069
Medians/Parkways (Cerritos)	Jan 88	33.7	L	0.159
605 Freeway (Cerritos)	Jan 88	58.6	L	0.057
91 Freeway (Cerritos)	Jan 88	70	L	0.067
Frontier Park (Cerritos)	Jan 88	2.5	L	0.011
Carmenita Junior High School (Cerritos)	Jan 88	5	AF,L	0.009
Cerritos Elementary School (Cerritos)	Jan 88	6	AF,L	0.013
Stowers Elementary School (Cerritos)	Jan 88	6	AF,L	0.014
Kennedy Elementary School (Cerritos)	Jan 88	7	AF,L	0.017
City Park East (Cerritos)	Jan 88	18	L	0.031
Satellite Park (Cerritos)	Jan 88	2	L	0.005
Leal Elementary School (Cerritos)	Jan 88	6	AF,L	0.008
Cerritos High School (Cerritos)	Jan 88	20	AF,L	0.044
Elliott Elementary School (Cerritos)	Jan 88	7	AF,L	0.008
Carmenita Park (Cerritos)	Jan 88	4.5	L	0.013
Juarez Elementary School (Cerritos)	Jan 88	7	AF,L	0.022
ABC Adult School & Office (Cerritos)	Jan 88	3	L	0.018
Tracy Education Center (Cerritos)	Jan 88	6	AF,L	0.002
Liberty Park (Cerritos)	Jan 88	20	L	0.067
Gridley Park (Cerritos)	Jan 88	9	L	0.021
Jacob Park (Cerritos)	Jan 88	5	L	0.009
Heritage Park (Cerritos)	Feb 88	12	L	0.031
Bragg Elementary School (Cerritos)	Feb 88	7	AF,L	0.022
Haskell Junior High School (Cerritos)	Feb 88	18	AF,L	0.022
Pat Nixon Elementary School (Cerritos)	Feb 88	5	AF,L	0.012
Cabrillo Lane Elementary School (Cerritos)	Feb 88	9	AF,L	0.007
Sunshine Park (Cerritos)	Feb 88	3.5	L	0.008
Friendship Park (Cerritos)	Feb 88	4	L	0.009

NOTES: L = Landscape irrigation, P = Impoundment, WR = Wildlife refuge, AG = Agricultural irrigation, AF = Athletic field irrigation
O = Ornamental plant irrigation, I = Industrial.

SUMMARY OF RECLAIMED WATER USAGE

REUSE SITE (City)	START-UP DATE	ACREAGE	TYPE OF USE	USAGE (MGD)
Bettencourt Park (Cerritos)	Feb 88	2	L	0.006
Brookhaven Park (Cerritos)	Feb 88	2	L	0.005
Saddleback Park (Cerritos)	Feb 88	2	L	0.003
Westgate Park (Cerritos)	Feb 88	4	L	0.018
Rainbow Park (Cerritos)	Mar 88	2.5	L	0.005
Bellflower Christian School (Cerritos)	Mar 88	30	AF,L	0.033
Cerritos Community College (Cerritos)	Mar 88	55	AF,L	0.092
Cerritos Regional County Park (Cerritos)	Apr 88	59	L	0.068
Artesia Cemetery District (Cerritos)	Apr 88	10	L	0.021
Rosewood Park (Cerritos)	Apr 88	1.5	L	0.011
Sunshine Growers (Walnut)	May 88	7	O	0.005
Nebeker Alfalfa Farm (Lancaster)	Jun 88	600	AG	2.791
Lakewood 1st Presbyterian Church (Long Beach)	Sep 88	1	L	0.002
Westhoff Elementary School (Walnut)	Sep 88	8	L	0.013
Anthony P. Baal Tree Farm (Palmdale)	Feb 89	20	O	0.010
Virginia Country Club (Long Beach)	Mar 89	135	L,P	0.301
Lakewood Golf Course (Long Beach)	Mar 89	128	L,P	0.152
Scherer Park (Long Beach)	Mar 89	24	L	0.025
Sports Complex (Cerritos)	Mar 89	25	AF,L	0.049
Sunnyside Memorial Park (Long Beach)	Apr 89	35	L	0.069
All Soul's Cemetery (Long Beach)	Apr 89	40	L	0.117
Cherry Avenue Park (Long Beach)	May 89	10	L	0.007
Rynerson Park (Lakewood)	Aug 89	40	L	0.100
Monte Verde Park (Lakewood)	Aug 89	4	L	0.008
Mae Boyer Park (Lakewood)	Aug 89	8	L	0.031
Jose Del Valle Park (Lakewood)	Aug 89	12	L	0.026
Jose San Martin Park (Lakewood)	Aug 89	9.3	L	0.018
City Water Yard (Lakewood)	Aug 89	1	L	0.007
Woodruff Avenue greenbelt (Lakewood)	Aug 89	4.1	L	0.010
South Street greenbelt (Lakewood)	Aug 89	3.3	L	0.006
Mayfair Park (Lakewood)	Dec 89	18	L	0.032
Shoemaker On/Off Ramp - 91 Freeway (Cerritos)	Dec 89	1.8	L	0.018
Temple Avenue greenbelt (Walnut)	Jan 90	1	L	0.001
Transpacific Development Co. (Cerritos)	Feb 90	6.9	L	0.019
Automated Data Processing (Cerritos)	Feb 90	0.7	L	0.006
Sheraton Hotel (Cerritos)	Mar 90	0.6	L	0.003
Paseo del Prado Parkway (Walnut)	Apr 90	1	L	0.003
Cerritos Pontiac/GMC Truck (Cerritos)	May 90	0.5	L	0.006
Moothart Chrysler (Cerritos)	May 90	0.4	L	0.008
St. Joseph Parish School (Lakewood)	Aug 90	3.5	AF,L	0.005
Foster Elementary School (Lakewood)	Sep 90	6	AF,L	0.019
Windjammer Off Ramp - 91 Freeway (Cerritos)	Sep 90	0.8	L	0.005
Browning Oldsmobile (Cerritos)	Sep 90	0.1	L	0.001
Civic Center Way and City Hall (Lakewood)	Nov 90	2.8	L	0.028
Los Coyotes Diagonal (Long Beach)	Mar 91	1	L	0.001
City Water Truck (Cerritos)	May 91	--	L	0.0002
Private Haulers (Cerritos)	May 91	--	I	0.0003
Parkside Condominiums (Cerritos)	May 91	1.8	L	0.008
Mayfair High School (Lakewood)	May 91	36.5	AF,L	0.052
Wilson High School (Long Beach)	Jun 91	5	AF,L	0.022
Concordia Church (Cerritos)	Jun 91	4	L	0.005
City Water Truck (Lakewood)	Jun 91	--	L	0.002
Church of the Nazarene (Cerritos)	Aug 91	1	L	0.004
B&B Stables (Cerritos)	Aug 91	18	I	0.004
Lemon Avenue greenbelt (Walnut)	Sep 91	3.5	L	0.008
Lindstrom Elementary School (Lakewood)	Sep 91	12	AF,L	0.017

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SUMMARY OF RECLAIMED WATER USAGE

REUSE SITE (City)	START-UP DATE	ACREAGE	TYPE OF USE	USAGE (MGD)
Lakewood High School (Lakewood)	Sep 91	25	AF,L	0.016
Shadow Park Homeowner's Association (Cerritos)	Nov 91	6	L	0.024
South Coast AQMD Headquarters (Diamond Bar)	Nov 91	2	L	0.011
Long Beach Water Dept. office (Long Beach)	Jan 92	2	L	0.005
Reservoir Park (Signal Hill)	Feb 92	2	L	0.008
Burroughs Elementary School (Signal Hill)	Feb 92	4	AF,L	0.005
Andy's Nursery (Bellflower)	Feb 92	23	O	0.036
Lake Center Park (Santa Fe Springs)	Mar 92	13.3	L	0.020
Clarkman Walkway (Santa Fe Springs)	Mar 92	0.3	L	0.001
Hughes Middle School (Long Beach)	Apr 92	3	AF,L	0.015
405 Freeway at Walnut (Long Beach)	Apr 92	9	L	0.026
Area Development Project No. 6 (Cerritos)	Apr 92	9	L	0.065
Towne Center Walkway (Santa Fe Springs)	Apr 92	0.3	L	0.001
Lakeview Child Care (Santa Fe Springs)	May 92	0.2	L	0.002
Orr & Day Road medians (Santa Fe Springs)	May 92	0.1	L	0.0003
Somerset Park (Long Beach)	May 92	3	L	0.006
Longfellow Elementary School (Long Beach)	May 92	1	AF,L	0.002
Granada Park Homeowners Association (Cerritos)	May 92	3.8	L	0.014
Walnut Valley Water Dist. reservoir (Diamond Bar)	May 92	1	L	0.001
Florence Avenue medians (Santa Fe Springs)	Jun 92	3	L	0.031
Gauldin School (Downey)	Jun 92	8.4	AF,L	0.008
Rio San Gabriel School (Downey)	Jun 92	14.8	AF,L	0.017
Bellflower High School (Bellflower)	Jul 92	28.4	AF,L	0.071
Ernie Pyle High School (Bellflower)	Aug 92	4.9	AF,L	0.013
Higo Nursery (Bellflower)	Aug 92	5	O	0.004
Telegraph Road medians (Santa Fe Springs)	Aug 92	0.4	L	0.005
Lakeview Park (Santa Fe Springs)	Aug 92	6.7	L	0.011
Clark Estate (Santa Fe Springs)	Aug 92	4.3	L	0.005
Towne Center Green (Santa Fe Springs)	Aug 92	2.3	L	0.007
Pioneer Road medians (Santa Fe Springs)	Sep 92	0.4	L	0.003
Police Station (Santa Fe Springs)	Sep 92	0.2	L	0.001
Aqua Center (Santa Fe Springs)	Sep 92	0.5	L	0.004
Lewis School (Downey)	Nov 92	4.6	AF,L	0.012
Wilderness Park (Downey)	Nov 92	24	L	0.060
First Chinese Baptist Church (Walnut)	Dec 92	0.3	L	0.004
605 Freeway at Foster (Bellflower)	Jan 93	12	L	0.011
Promenade Walkway (Santa Fe Springs)	Jan 93	0.3	L	0.004
Rio San Gabriel Park (Downey)	Jan 93	6.4	L	0.025
East Middle School (Downey)	Jan 93	26	AF,L	0.016
Zinn Park (Bellflower)	Jan 93	1.7	L	0.011
Cerritos Post Office (Cerritos)	Feb 93	1	L	0.006
605/105 Interchange (Bellflower)	Feb 93	22	L	0.017
Bellflower Golf Course (Bellflower)	Feb 93	22.5	L	0.039
Center for the Performing Arts (Cerritos)	Mar 93	1	L	0.004
Old Downey Cemetery (Downey)	Apr 93	7.8	L	0.008
Thompson Park (Bellflower)	Apr 93	15	L	0.022
My Hoa Farm (Lakewood)	May 93	5	AG	0.014
105 Freeway at Bellflower (Downey)	May 93	17.9	L	0.031
Palms Park (Lakewood)	May 93	20	L	0.027
Crawford Park (Downey)	Jul 93	2.1	L	0.005
Calle Baja slopes (Walnut)	Aug 93	0.5	L	0.004
Grand Ave/60 Freeway on-ramp (Diamond Bar)	Aug 93	4.7	L	0.001
Avila Nursery (Downey)	Aug 93	11	O	0.004
105 Freeway at Lakewood (Downey)	Sep 93	25	L	0.028
Tuftex Carpet Mill (Santa Fe Springs)	Sep 93	--	I	0.493
Palms Elementary School (Lakewood)	Sep 93	3.5	AF,L	0.009

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SUMMARY OF RECLAIMED WATER USAGE

REUSE SITE (City)	START-UP DATE	ACREAGE	TYPE OF USE	USAGE (MGD)
Artesia High School (Lakewood)	Sep 93	20.9	AF,L	0.044
West Middle School (Downey)	Oct 93	19.5	AF,L	0.019
Circle Park (South Gate)	Oct 93	4	L	0.008
Burger King restaurant (Diamond Bar)	Oct 93	0.2	L	0.002
GTE Building (Walnut)	Nov 93	7.2	L	0.009
Hollydale Park (South Gate)	Nov 93	46	L	0.113
Delta Dental (Cerritos)	Nov 93	1.8	L	0.007
Orange County Nursery (Cerritos)	Dec 93	13	O	0.043
Rodeo Ridge Landscape Maintenance Dist. (Walnut)	Dec 93	6.3	L	0.013
Robertson's Ready-Mix (Santa Fe Springs)	Dec 93	--	I	0.013
710/105 Interchange (Paramount)	Dec 93	18.5	L	0.019
Downey/Contreras greenbelt (Paramount)	Dec 93	0.1	L	0.001
Compton Golf Course (Paramount)	Dec 93	13	L	0.031
Alondra Junior High School (Paramount)	Dec 93	14	AF,L	0.022
Mokler Elementary School (Paramount)	Dec 93	10	AF,L	0.009
Los Cerritos Elementary School (Paramount)	Dec 93	8	AF,L	0.008
Wirtz Elementary School (Paramount)	Dec 93	9	AF,L	0.008
Keppel Elementary School (Paramount)	Dec 93	4	AF,L	0.006
Senh Hau Liu Nursery (Paramount)	Dec 93	3.3	O	0.011
Menh Hau Liu Nursery (Paramount)	Dec 93	2	O	0.008
Kathy Thach Nursery (Paramount)	Dec 93	5.8	O	0.014
Billy Lee Nursery (Paramount)	Dec 93	2.5	O	0.008
Lan Vong Nursery (Paramount)	Dec 93	2	O	0.002
DOA's Eastgrove Chestnut Orchard (Palmdale)	Dec 93	35	AG	0.028
Golden Springs Drive median (Diamond Bar)	Jan 94	0.5	L	0.014
105 Freeway at Wright (Lynwood)	Jan 94	19.6	L	0.012
710 Freeway at M.L. King (Lynwood)	Jan 94	15.5	L	0.013
710 Freeway at San Rafael (Compton)	Jan 94	24.2	L	0.033
Independence Park (Downey)	Feb 94	10.4	L	0.018
Paramount Park (Paramount)	Feb 94	9	L	0.027
Paramount High School (Paramount)	Feb 94	19	AF,L	0.042
Varela's Nursery (Cerritos)	Mar 94	3.5	O	0.004
Rosecrans/Paramount medians (Paramount)	Mar 94	0.2	L	0.002
Isidro Cendejas strawberry farm (Walnut)	Mar 94	1.8	AG	0.002
Walnut Hills Village Shopping Center (Walnut)	Mar 94	2.4	L	0.007
Somerset medians (Paramount)	Apr 94	0.4	L	0.002
Rio Hondo Golf Course (Downey)	Apr 94	92.4	L	0.199
Zimmerman Park (Norwalk)	Apr 94	9.5	L	0.014
Vista Verde Park (Norwalk)	Apr 94	6.5	L	0.011
Gerdes Park (Norwalk)	Apr 94	8.6	L	0.016
Clearwater Junior High School (Paramount)	Apr 94	4	AF,L	0.044
Park N' Ride Lot at 605 Freeway/Foster (Norwalk)	May 94	2	L	0.003
Vestar Development (Cerritos)	Jun 94	7.5	L	0.029
Steam Engine Park (Paramount)	Jun 94	0.6	L	0.004
Shoemaker/Firestone medians (Norwalk)	Jul 94	1.6	L	0.003
Lakewood/Adoree medians (Downey)	Jul 94	0.1	L	0.0004
Spane Park (Paramount)	Jul 94	5	L	0.008
Orange/Cortland Parkway (Paramount)	Jul 94	1.3	L	0.007
Carpenter School (Downey)	Aug 94	7.4	AF,L	0.007
Brookside Equestrian Center (Walnut)	Aug 94	13.6	L	0.001
Field, S/W corner Norwalk/Telegraph (S.F. Springs)	Aug 94	5.2	L	0.011
Washington Elementary School (Whittier)	Sep 94	5	AF,L	0.008
605 Freeway at Beverly (Whittier)	Sep 94	30	L	0.055
John Anson Ford Park (Bell Gardens)	Sep 94	45	L	0.031
Ramona Park (Norwalk)	Oct 94	4.8	L	0.004
Alondra median (Paramount)	Oct 94	0.6	L	0.002
WVWD Office (Walnut)	Oct 94	0.2	L	0.0005

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O = Ornamental plant irrigation, I = Industrial.

SUMMARY OF RECLAIMED WATER USAGE

REUSE SITE (City)	START-UP DATE	ACREAGE	TYPE OF USE	USAGE (MGD)
Cattelus Development (Walnut)	Oct 94	18.4	L	0.010
Circuit City (Walnut)	Oct 94	1	L	0.007
Dreyer's Grand Ice Cream (Walnut)	Oct 94	0.6	L	0.002
Sorenson Elementary School (Whittier)	Oct 94	4	AF,L	0.005
Palm Park West (Whittier)	Nov 94	4	L	0.003
Metrolink Station (Industry)	Nov 94	0.6	L	0.001
James Harris Chestnut Orcharge (Palmdale)	Nov 94	20	AG	0.004
City Water Truck (Santa Clarita)	Nov 94	--	L	0.001
Little Lake Park (Santa Fe Springs)	Dec 94	18	L	0.008
Sundance Condominiums (Cerritos)	Jan 95	9	L	0.012
Del Paso High School (Walnut)	Jan 95	3	AF,L	0.002
Dow Corning (Walnut)	Jan 95	0.1	L	0.0001
North Golden Springs Drive (Industry)	Jan 95	0.5	L	0.001
John Anson Ford Golf Course (Bell Gardens)	Feb 95	13.6	L	0.018
Sysco Food Service (Walnut)	Apr 95	2.3	L	0.006
F. D. Titus (Walnut)	Apr 95	0.8	L	0.002
Viewsonic Corporation (Walnut)	Apr 95	0.8	L	0.004
Christian Salvesen, Inc. (Walnut)	Apr 95	1	L	0.001
John Sanfillipo &Sons, Inc. (Walnut)	Apr 95	0.5	L	0.001
S/W Corner Lemon/Bus. Parkway (Walnut)	Apr 95	0.1	L	0.002
GATX Logistics, 20275 Bus. Parkway (Walnut)	Apr 95	1.3	L	0.002
GATX Logistics, 20300 Bus. Parkway (Walnut)	Apr 95	3.1	L	0.003
Dura Freight Lines (Walnut)	Apr 95	0.8	L	0.002
Ingram Industries (Walnut)	Apr 95	0.7	L	0.001
Orange Grove School (Whittier)	Apr 95	6.6	AF,L	0.002
South Middle School (Downey)	May 95	15.8	AF,L	0.005
Nuffer Elementary School (Norwalk)	Jun 95	10.4	AF,L	0.001
Lampton Middle School (Norwalk)	Jun 95	9.5	AF,L	0.001
THUMS (Long Beach)	Jun 95	8	I	0.020
Fairway Drive medians (Industry)	Jun 95	0.1	L	0.0002
S/E Corner Fairway/Bus. Parkway (Walnut)	Jun 95	0.1	L	0.0001
Strouds Linen Warehouse (Walnut)	Jun 95	0.5	L	0.002
Servicecraft Corporation (Walnut)	Jun 95	3.1	L	0.002
Thompson (Walnut)	Jun 95	4	L	0.001
Aiwa (Walnut)	Jun 95	1.3	L	0.002
General Electric (Walnut)	Jun 95	9	L	0.001
Hargitt Middle School (Norwalk)	Aug 95	9.5	AF,L	0.004
Norwalk Adult School (Norwalk)	Aug 95	17.2	AF,L	0.008
John Glenn High School (Norwalk)	Aug 95	38.8	AF,L	0.020
Ramona Elementary School (Norwalk)	Aug 95	6.8	AF,L	0.001
New River Elementary School (Norwalk)	Aug 95	10.3	AF,L	0.003
Grand Avenue medians (Diamond Bar)	Aug 95	0.3	L	0.0002
Morrison Elementary School (Norwalk)	Sep 95	7.7	AF,L	0.003
Johnston Elementary School (Norwalk)	Sep 95	8.9	AF,L	0.003
Corvallis Middle School (Norwalk)	Sep 95	16.9	AF,L	0.010
Edwards School (Whittier)	Sep 95	19	AF,L	0.002
Longfellow School (Whittier)	Sep 95	4.5	AF,L	0.001
Dexter School (Whittier)	Sep 95	15.5	AF,L	0.003

NOTES: L = Landscape irrigation, P = Impoundment, WR = Wildlife refuge, AG = Agricultural irrigation, AF = Athletic field irrigation
O = Ornamental plant irrigation, I = Industrial.

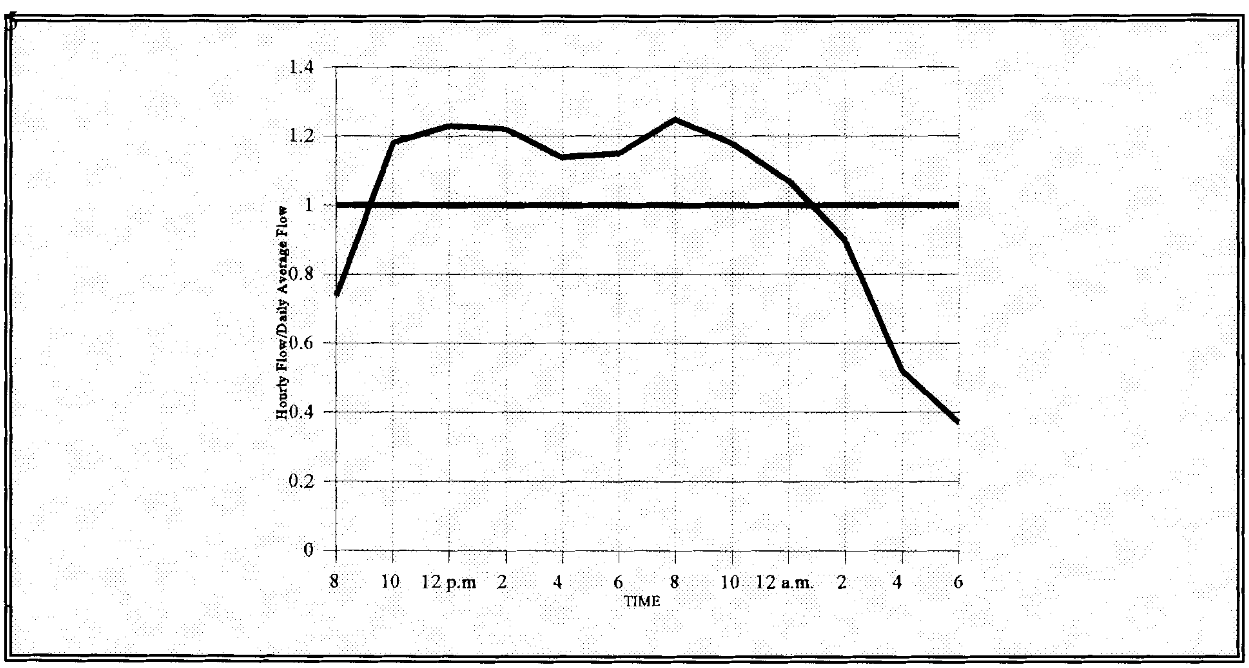
SECTION 5.1: TECHNICAL IMPEDIMENTS

5.1.1 Storage

5.1.1.1 Diurnal Flow Variations

In earlier times, when fewer customers were receiving reclaimed water, there was never a question of whether water would be readily available on demand. However, as large scale distribution systems were constructed over the past decade and more landscape irrigation customers were connected, the reclaimed water supply/demand paradox was revealed. The WRPs were developed to treat mainly residential and commercial wastewater. Therefore, from a supply standpoint, most of wastewater entering these plants would be during the period of greatest human activity, from 8:00 a.m. to 10:00 p.m. Much less wastewater would enter the plants while people were asleep. This diurnal variation in flows is illustrated in Figure 5-1, which plots the ratio of hourly flow versus daily average flow for the San Jose Creek WRP. As for landscape irrigation demand, the exact opposite situation exists. Human activity at parks, golf courses, schools and other public areas is the greatest during the daytime, so irrigation is scheduled during the night when no one is present and irrigation efficiency is at its greatest (lowest evaporation). In short, peak demand for reclaimed water coincides with low flow at the WRP, while peak flows in the treatment plant occur when there is little or no landscape irrigation. Unless means are developed to transfer peak effluent production to the times of greatest landscape irrigation demand, the use or reclaimed water will eventually be limited to the level of instantaneous production during low flow periods.

FIGURE 5-1
RATIO OF HOURLY FLOW TO DAILY AVERAGE FLOW
San Jose Creek WRP



5.1.1.2 Supply Interruptions

Compounding the asynchronous supply/demand curves are several other factors that can result in short-term interruptions in the reclaimed water supply.

- The inert-media effluent filters must be periodically backwashed (every 24 to 48 hours) to flush out the suspended solids removed from the secondary effluent. Since this requires taking the filter out of service and, thus, temporarily reducing plant capacity, it is often done at night when plant flows are at their lowest. This activity further reduces effluent flow and the availability of reclaimed water during the half-hour duration of the backwash cycle.

- Scheduled maintenance of the treatment plants may also temporarily restrict the availability of reclaimed water. For example, the Whittier Narrows WRP is occasionally shut down completely during the late night, low flow periods for maintenance of the electrical circuitry, pumps, etc. WRPs that employ fine-bubble air diffusers in their secondary aeration tanks must have them cleaned over several days semiannually, resulting in a temporary reduction in treatment capacity.

- Construction activities, whether expansion of treatment capacity or improvements in the treatment process, may require a reduction in plant flows. For example, flow through the Whittier Narrows WRP was recently reduced so the secondary aeration system could be modified to allow for either parallel or serpentine operation, which will enhance treatment reliability. Flow through the Long Beach WRP was also reduced so that corrosion protection in and around the primary sedimentation tanks could be done.

- Acts of nature can also cause an interruption in reclaimed water flows. For example, the 1994 Northridge earthquake caused enough damage at the Districts' Valencia WRP that reclaimed water of a quality adequate for reuse was not available for several days. Episodes of extremely heavy rainfall may lead to effluent filter overloads with a bypass of secondary effluent occurring. In these instances, reuse deliveries are interrupted by plant operators, until effluent water quality has returned to normal. Fortunately, these latter instances occur during the wet season when landscape irrigation with reclaimed water is not critical. However, this may affect nonseasonal industrial processes that use reclaimed water continually.

- The WRPs have a reputation for consistently and reliably producing reclaimed water that meets the highest standards for reuse. However, in the rare instances when effluent quality is degraded below these standards, it is the treatment plant operators' priority to shut down the pumps delivering reclaimed water for reuse. Such incidents are generally short, but can result in a reduction in reclaimed water availability.

5.1.1.3 Seasonal Demand

Compounding the daily need for reclaimed water storage is the seasonal fluctuation of reclaimed water demand. Obviously, the need for water, reclaimed or otherwise, is greatest during the hot, dry summer months and is least during the cool, wet winter months. In southern California, that means water demands normally peak during the month of August, while the production of reclaimed water can actually be slightly higher during the winter due to rainfall runoff entering the sewer system.

The increase in reclaimed water demand for direct nonpotable applications during the summer is mainly the result of landscape irrigation, which has peaking factors (peak month to annual average) from 2:1 for freeway landscaping to 3:1 or greater for golf courses. Reclaimed water use for other applications can also contribute to summer peaking. The current Montebello Forebay Groundwater Recharge Project makes use of local storm runoff and MWD seasonal storage water during the winter. If the amount of precipitation is relatively high and the duration of the rainy season long, then nearly all the permitted amounts of reclaimed water will have to be recharged during the summer. Furthermore, since the Montebello Forebay recharge permit allows for essentially a 10,000 AFY carry-over (when excess local surface water prevents the entire 50,000 AFY of recharge to occur), a very dry year following a very wet year can result in an even greater demand for reclaimed water for recharge. This also holds true for landscape irrigation.

Industrial processes, such as paper manufacturing and carpet dyeing, are generally nonseasonal in their demand for water. However, cooling tower use is a notable exception, as roughly 10-20% more water is required during the summer when ambient air temperature increases and relative humidity decreases. The use of reclaimed water for construction applications, such as dust control and soil compaction, is transient by nature (as construction projects are completed and construction activities move elsewhere) and requires more water during the dry season than the rainy season.

5.1.2 Water Quality Limitations

Although the reclaimed water produced by the Districts' tertiary treatment plants is of such a high quality that it meets state and federal drinking water standards, it is different from the domestic water supply that is currently used by potential reuse customers. As potable water is used in homes and businesses, it picks up additional constituents. The wastewater treatment process removes most of these; however, some constituents, like salts, pass through and exist in higher concentrations in the reclaimed water than in the potable supply. For many reuse applications, such as turf irrigation, construction and newspaper recycling, the different quality of the reclaimed water does not pose any real problems. However, as the number and variety of reuse applications expand, so do the concerns about certain aspects of the reclaimed water quality.

5.1.2.1 Irrigation Use

Concerns about reclaimed water quality for irrigation are almost exclusively limited to mineral content, such as TDS, chloride, sulfate, boron and sodium adsorption ratio (SAR). The TDS concentrations at most of the Districts' WRPs are between 500 and 700 mg/L, which is actually lower than water imported from the Colorado River. Because of the domestic water supply tributary to some of the WRPs, TDS levels can go as high as 900 mg/L (Valencia and Los Coyotes WRPs). Most turf landscaping can handle even the higher levels of TDS, as salts are concentrated in the leaf tips of the grass removed during mowing. Many other types of landscape plants (trees and shrubs) can handle these levels of TDS in the reclaimed water.

The most common problem associated with irrigation occurs on the greens of some golf courses, which are planted with very sensitive bentgrass. While the rest of the golf course shows no adverse effects from irrigation with reclaimed water, the quality of the bentgrass is often adversely affected. Golf course operators have claimed that salt buildup in the root zone is responsible for this. The TDS levels in the reclaimed water may play a factor in this phenomenon, as can the sensitive nature of the bentgrass itself, construction of the greens with poor drainage and frequent, short irrigation periods. The latter two factors are primarily responsible for preventing salts leaching from the root zone, as properly constructed and irrigated greens show no such problem. The absence of sufficient winter rainfall further exacerbates the lack of salt leaching. An expensive solution adopted by some golf courses is the construction of a potable water line to every green.

Other landscape plants are susceptible to higher TDS levels in the reclaimed water. The City of Cerritos had damage occur to azaleas planted in an area receiving reclaimed water from the Districts' Los Coyotes WRP. In late 1995, the City of Santa Clarita reported adverse effects on city trees receiving reclaimed water from the Districts' Valencia and Saugus WRPs via a city water truck. The circumstances surrounding the latter episode are not completely known. Most nonfruit bearing trees are not sensitive to elevated TDS levels. Avocado and citrus trees are affected by TDS, chloride and boron in the water, but these types of trees are not nearly as common in the Los Angeles area as in the past.

The several hundred million gallons per day of secondary effluent produced at the Districts' JWPCP would not be useful for landscape irrigation in its current form, even if filtration facilities were added to that plant. The TDS concentration in that plant's effluent averages 1,500 mg/L, a level that would cause serious damage to even salt-tolerant plants, according to the SWRCB's 1984 publication, Irrigation with Reclaimed Municipal Wastewater - A Guidance Manual.

The level of treatment, more than effluent quality itself, limits the uses of reclaimed water from the Lancaster and Palmdale WRPs. Those facilities use oxidation ponds as the secondary treatment process, with no filtration. Water reuse regulations prohibit reclaimed water of this quality from most urban irrigation applications. Furthermore, this effluent is not suitable from a practical standpoint because of algae growth in the ponds. Without filtration, the solids content could cause serious clogging of meters and irrigation spray nozzles. Surface or flood irrigation of urban uses, such as parks and golf courses, is not appropriate because of its inefficiency and inconvenience, nor is it permitted because of the increased runoff from the site. Uses of reclaimed water from these WRPs have included low-grade agricultural irrigation, maintenance of a wildlife habitat and, for effluent provided with additional treatment, supply to recreational lakes.

5.1.2.2 Industrial Use

Unlike the direct use of reclaimed water for landscape irrigation, the water quality considerations that might limit the industrial use of reclaimed water go beyond salinity. Desirable water quality will vary from industry to industry, although most will want reclaimed water quality to be consistent and equivalent to the potable water they have become accustomed to using. The following are examples of potential problems with using reclaimed water for different industrial applications.

- Cooling towers represent the greatest opportunity for using large quantities of reclaimed water for industrial applications. The mineral content of the reclaimed water, in terms of TDS, chloride, sulfate, hardness, alkalinity, silica, etc., may limit its use in the cooling tower. These facilities continuously recycle their cooling water and experience evaporative losses. Thus, the levels of these constituents can be concentrated to a point where staining, scaling and corrosion can occur, thereby limiting the number of cycles the cooling tower can operate. Fewer cooling tower cycles impacts cost by increasing water use, requiring the use of chemicals to treat the water and incurring higher sewage charges for the greater quantity of water being discharged.

- Ammonia, which is the most prevalent form of nitrogen in Districts' effluent, can also cause corrosion of the "yellow metals" used in some cooling towers. Before delivering reclaimed water to the cooling towers at the Chevron and Mobil oil refineries, the CBMWD had to build special nitrifying treatment plants (at approximately $12 million each) to eliminate ammonia.

- Nutrients, such as nitrogen and phosphorous, can promote biological growth and scaling in cooling towers, adversely affecting the efficiency of the system. Biocides and other chemicals are required to prevent this from happening.

- The mineral content of the reclaimed water may also affect carpet and textile dyeing, depending on the type of dye being used. In the case of Tuftex Carpets, the higher level of TDS in the Los Coyotes WRP effluent actually aids in the dyeing process. However, increased levels of iron can cause problems for this process.

- Color in reclaimed water is not discernible to the human eye, but can affect some manufacturing processes, such as Simpson Paper's white office paper production. The color levels in the Pomona WRP effluent, which supplies this user, are higher than other Districts' facilities due to the industrial discharge of a cosmetics manufacturer that is tributary to this plant. Even this small amount of color can affect the quality of the product, which needs to be pure white. Thus, Simpson must occasionally interrupt the flow of reclaimed water to its storage reservoir and augment its process water supply with domestic water.

5.1.2.3 Groundwater Recharge

The use of reclaimed water for groundwater recharge has been historically limited more by the "macro" constituents (minerals), measured in parts per million, than by "micro" constituents (metals, organics), measured in parts per billion. The following are the three constituents that are most likely to limit the use of reclaimed water for this application.

- Nitrogen, because of its potential to form nitrates that can lead to methemoglobinemia in infants, is the primary limitation on the amount of reclaimed water that can be used to replenish the Central Basin through the Montebello Forebay Groundwater Recharge Project. When the permitted amount of reclaimed water for recharge was increased from 32,700 to 50,000 AFY in 1987, it had to be demonstrated to the regulatory agencies that this quantity would not result in unacceptable levels of nitrates in the groundwater. Currently, all replenishment water sources (local, imported, subsurface and reclaimed) maintain an average total nitrogen concentration of approximately 5.5 mg/L as nitrogen, well below the nitrate plus nitrite drinking water standard fof 10 mg/L. Before additional quantities of reclaimed water could be recharged, it would have to be demonstrated that nitrates in the groundwater would not be increased to undesirable levels.

- TOC, which is discussed in greater detail in Section 5.2, is expected to be regulated by the DHS groundwater recharge regulations, now in proposed form. Increases in the amount of reclaimed water for groundwater recharge above the permitted average of 50,000 AFY, may be required to have some form of organics removal, such as activated carbon.

- Numeric Basin Plan Objectives are set by the RWQCB for TDS, chloride, sulfate and boron, and vary between groundwater bodies within its jurisdiction. In the case of the Montebello Forebay Groundwater Recharge Project, which serves to replenish the Central Basin aquifer, the reclaimed water produced by the San Jose Creek, Whittier Narrows and Pomona WRPs meets all these criteria. However, for the proposed groundwater recharge project in the Main San Gabriel Basin, the reclaimed water from the San Jose Creek WRP meets none of these criteria, which are set significantly lower than those for the Central Basin. It is interesting that the criterion for boron was set to protect citrus crop irrigation which no longer exists in the San Gabriel Valley in any appreciable quantity other than backyard trees.

5.1.2.4 Intrusion Barrier Injection

Injection of reclaimed water into an intrusion barrier to prevent the landward migration of salt water into the underground drinking water supply was pioneered in Orange County 25 years ago with Water Factory 21. The WBMWD has recently begun supplying reclaimed water to the West Coast Barrier and a similar project is planned using effluent from the Districts' Long Beach WRP at the Alamitos Gap Barrier (previously described in Chapter IV). A common link between all these projects is the need for treatment of the reclaimed water beyond tertiary filtration. For the Alamitos Barrier Project, additional treatment as reverse osmosis (RO) will be required to remove TOC, TDS and nitrogen.

- TOC removal will be required pursuant to the proposed DHS regulations for groundwater recharge. The reason for this is that approximately 80% of the injected water will migrate back into the aquifer and the groundwater supply, without the benefit of percolation through the vadose zone and the soil aquifer treatment that occurs. GAC can be used; however, it is only about half as effective as RO in removing TOC, and the proposed regulations limit TOC of wastewater origin to 1 mg/L at the point of withdrawal.

- TDS is effectively removed from reclaimed water by RO. Removal of this constituent is also a regulatory imperative, this time from the Santa Ana RWQCB. Reclaimed water from the Long Beach WRP meets the Basin Plan Objective for TDS of 700 mg/L in the Central Basin. However, the barrier facilities straddle the boundary between this basin and the Coastal Basin in Orange County, which has a Basin Plan Objective of 450 mg/L for TDS.

- Nitrogen, a nutrient that can stimulate biological growth, must be removed before injection. If it is not, the resulting biogrowth will clog the aquifer material and effectively shut down the injection activities. Again, RO is a very effective treatment process for nitrogen removal, although nitrification/denitrification at the WRP or at a separate facility could be employed.

The additional treatment processes employed for injecting reclaimed water into the aquifer can also be extended to a future reclaimed water application, known as "repurification." The process is being pioneered by the San Diego County Water Authority (SDCWA), and entails introducing reclaimed water into the domestic water system without first passing it through the underground aquifer. Various treatment processes beyond tertiary treatment are being investigated by SDCWA, such as RO, GAC, and ultraviolet (UV) and ozone disinfection, to further treat reclaimed water before discharging it into a raw water reservoir. These additional treatment processes essentially are barriers to the transmission of virus and other microorganisms. The mix of water in the reservoir would be retained there for at least a year, with the mixture then going through a conventional potable water treatment plant. These processes will be closely scrutinized and strictly regulated by DHS and the RWQCB.

SECTION 5.2: REGULATORY CONSTRAINTS

Reclaimed water can be used for both direct nonpotable applications, such as landscape irrigation or industrial process water, and indirect potable use for groundwater recharge or seawater intrusion barrier injection. In either case, the RWQCBs and the state and local DHS treat reclaimed water more strictly than domestic, local or imported water supplies used for the same applications. This results in additional burdens that purveyors and users must incur to switch from their normal source of water to reclaimed water.

Another factor that must be considered is the continuing expansion of technical information on possible water quality and health issues, and public concerns stemming from this information. Thus, a project that has been approved by regulatory agencies and implemented at one point in time may not meet regulations adopted at a later date. This can be problematic should it become necessary to abandon or significantly modify a project that has been operating for years without impacts on public health or the environment.

Examples of the protective mechanisms applied to water reclamation projects are discussed in the following sections along with examples of impediments that may arise as a result of their application.

5.2.1 Direct Nonpotable Use

Even though the quality of tertiary treated reclaimed water produced is safe for full-body contact and for the irrigation of food crops, precautions are still required to protect the public health, mainly to prevent the accidental ingestion of the reclaimed water.

- The reclaimed water distribution system must be completely separate from the domestic water supply. Ironically, construction guidelines require that reclaimed water lines be treated like sewers when constructed near potable water lines, but treated like potable water lines when constructed near sewers. This can be difficult as streets are becoming more crowded with underground utilities.

- The color purple as the identifier of reclaimed water facilities was selected by the California-Nevada Section of the American Water Works Association and adopted by the California DHS and the WateReuse Association of California. To prevent an accidental cross-connection to a domestic water supply or outlet, new reclaimed water transmission lines must be colored purple and marked "reclaimed water" or wrapped with a purple notification tape. Fortunately, existing underground piping for landscape use sites does not have to be rebuilt or dug up and labeled. However, exposed onsite process piping at industrial sites must be labeled or painted purple, although the regulatory agencies have not required that every inch of pipe be so identified.

- Aboveground sprinkler heads and valves must be tagged to discourage the public from drinking from them, and hose bibs accessible to the general public are prohibited.

- Care must be exercised so irrigation systems do not spray drinking water fountains and neighboring homes, and to limit irrigation to times with the least potential for public contact. For many facilities, this can require the relocation of drinking water fountains and/or the installation of fencing or other mitigation measures.

- Irrigation water must be applied in sufficient quantities to prevent the buildup of salt in the plant root zones, yet, simultaneously, ponding of effluent or runoff from the reuse site must be avoided.

- Signs must be posted at the entrances to the reuse sites to notify the public of the use of reclaimed water; however, these signs do not have to be worded threateningly. Many communities are promoting the use of reclaimed water through public relations campaigns, calling it what it truly is: "Conservation of Natural Resources."

- Above all else, the item of most concern is that potable water supplies not be directly connected to the reclaimed water systems, even through reduced pressure, back-flow prevention devices. When reclaimed water is provided to a site, such as a park, the existing potable water supply is disconnected from the onsite irrigation system and capped. A reduced pressure back-flow device is then installed downstream of the potable water meter to protect the drinking water supply from inadvertent cross-connections. Double check valves are not approved by the Los Angeles County DHS. Such conversions are relatively simple for sites such as parks and golf courses that do not contain many facilities (such as buildings) requiring a potable water supply. Often, a small potable pipeline can be constructed to serve water fountains, restrooms, etc. at a reasonable cost. The situation is much more complicated for reuse sites such as schools, which have buildings interspersed with athletic fields. Often there are several potable water supplies that must be isolated from the incoming reclaimed water service. Older reuse sites are even more problematic since adequate as-built drawings of the piping system may not exist.

- Before receiving reclaimed water, each new reuse site must have a cross-connection inspection performed by the local health authorities. This can consist of alternately charging the separate potable and reclaimed water systems while turning off the other, and observing if there is any flow in the inactive system. If a backup supply to the reclaimed water is needed, the potable water can be air-gapped (no physical connection) into the pumping plant, storage reservoir or other reclaimed water distribution facility.

Regulatory constraints, such as those described above, may simply add to the cost balance of reclaimed water versus other supplies. They may also create situations where the use of reclaimed water is infeasible. The impact of these constraints is site-specific since the requirements may be easy to meet in some situations and harder in others.

5.2.2 Indirect Potable Use

Groundwater recharge with reclaimed water involves replenishing the underground drinking water supply by either percolation or injection using a mixture of the reclaimed water and other waters such as local runoff, imported water or native groundwater. Because the extracted groundwater is used for human consumption, DHS has strictly regulated this application, more so than any of the other direct use. In the past, this has been done on a case-by-case basis, as set forth in the Title 22 regulations. As discussed in Chapter III, DHS has prepared draft regulations that establish specific operational and water quality requirements for existing and planned groundwater recharge projects. The results of the Districts' Health Effects Study and research conducted for the OCWD's Water Factory 21 Direct Injection Project were used by DHS in formulating the draft regulations. The intention was to assist with the planning and implementation of new groundwater recharge projects using reclaimed water, while providing a combination of controls to maintain microbiologically and chemically safe groundwater recharge operations. It is of interest to note that the draft regulations are currently being used by DHS and the Los Angeles RWQCB as guidelines in reviewing and approving projects.

As currently drafted, there are several requirements that could constrain or limit the use of reclaimed water for groundwater recharge within the Districts' service area. These are discussed in the following sections.

5.2.2.1 Organics Removal

To control the level of unregulated organics in wastewater used for groundwater recharge, DHS has proposed an organics removal requirement for projects that use more than 20% reclaimed water as a source of replenishment. The requirement sets removal efficiency based on final effluent TOC concentrations as shown in Table 5-1. TOC is a gross measurement of the amount of carbon from organic sources contained in reclaimed water. The vast majority (90%) of the individual constituents that make up TOC are not determined and thus there is insufficient basis to establish a gross organic standard to protect public health. However, TOC is considered a good collective parameter for the purposes of determining overall organics removal efficiency.

TABLE 5-1
DRAFT DEPARTMENT OF HEALTH SERVICES
GROUNDWATER RECHARGE REGULATIONS

Reclaimed Water Contribution	Maximum TOC after Organics Removal	
	Category I[1]	Category IV[2]
0 - 20%	20	5
21 - 25%	16	4
26 - 30%	12	3
31 - 35%	10	3
36 - 45%	8	2
46 - 50%	6	2

[1] Surface spreading project that utilizes oxidized, filtered, disinfected reclaimed water that has been subjected to organics removal.

[2] Injection project that utilizes oxidized, filtered, disinfected reclaimed water that has been subjected to organics removal.

For new projects that will rely on using filtered tertiary effluent, this requirement could limit groundwater replenishment with reclaimed water to 20% of all the water recharging the groundwater basin unless additional treatment is required. This will then become a cost and feasibility issue for project implementation.

For the existing Montebello Forebay Groundwater Recharge Project, the potential impact of this draft requirement is not known, but could be significant. This project, which began in 1962, has been extensively studied and evaluated, beginning with the Health Effects Study, initiated by the Districts in 1978 and completed in 1984. Based on the results of the Health Effects Study and recommendations of the Scientific Advisory Panel convened by DHS and jointly sponsored by the SWRCB, authorization was given by the Los Angeles RWQCB in 1987 to increase the annual quantity of reclaimed water used for replenishment from 32,700 AFY to 50,000 AFY. In 1991, the water reclamation requirements for the project were revised to allow for recharge up to 60,000 AFY and 50% reclaimed water in any one year as long as the running 3-year total did not exceed 150,000 AFY or 35% reclaimed water. For the Districts' tertiary treated effluent, TOC concentrations range from 9-13 mg/L.

Continued evaluation of the project is being provided by an extensive sampling and monitoring program, and by supplemental research projects concerning percolation effects, epidemiology and microbiology. Table 5-2 lists many of the individual trace organic compounds required to be monitored in the Montebello Forebay recharge permit and compares the annual average concentrations in the four effluent streams contributing to groundwater replenishment to this limits. The compounds of health significance are, with rare exceptions, always well below drinking water standards, with the concentration often below the detection limit.

It is important to note that the proposed regulations were predicated on a lower proportion of reclaimed water than that presently approved for the Montebello Forebay Groundwater Recharge Project. The data and information that continue to be collected for this project will enable further refinement of the proposed regulations during their ultimate development and application upon final approval.

5.2.2.2 Nitrogen

Nitrates in groundwater have the potential to cause methemoglobinemia ("blue-baby syndrome") and, therefore, a primary drinking water standard of 10 mg/L as nitrogen for nitrate has been established. The draft groundwater recharge regulations require that the total nitrogen of the reclaimed water not exceed 10 mg/L as nitrogen unless the project sponsor demonstrates that the standard can be met before reaching the groundwater level. The Districts' WRPs produce an effluent containing 15-18 mg/L of nitrogen (mostly in the ammonium ion form). During percolation and transport, the ammonia nitrogen is converted to nitrate nitrogen by soil bacteria and a portion of it is ultimately denitrified. Further reductions in nitrogen levels occur via dilution with native groundwater. Data provided by the Montebello Forebay monitoring program have shown that there have been no detrimental water quality impacts from using reclaimed water with nitrogen concentrations above 10 mg/L. It is not known if the proposed nitrogen limit can be met before reaching the groundwater level. Consequently, the proposed nitrogen standard may limit the amount of reclaimed water used for groundwater recharge unless alternate requirements are allowed or additional treatment via nitrification/denitrification is provided. Again, this becomes a cost issue that impacts project feasibility on a case-by-case basis.

TABLE 5-2
COMPARISON OF MAXIMUM CONTAMINANT LEVELS AND
TERTIARY EFFLUENT TRACE ORGANIC LEVELS
(October 1994 to August 1995)

Constituent	Unit	Limit	San Jose Creek East	San Jose Creek West	Whittier Narrows	Pomona
Atrazine	μg/L	3	< 2.7	< 2.7	< 2.7	< 2.7
Simazine	μg/L	10	< 2.7	< 2.7	< 2.7	< 2.7
Methylene Chloride	μg/L	40	< 5.4	< 1.5	4.8	< 1.0
Chloroform	μg/L	100	5.8	7.0	13.9	7.1
Bromodichloroform	μg/L		1.3	< 0.9	< 0.8	1.5
Dibromochloroform	μg/L		< 0.5	< 0.5	< 0.5	< 0.7
Bromoform	μg/L		< 0.5	< 0.5	< 0.5	< 0.5
1,1,1-Trichloroethane	μg/L	200	< 0.5	< 0.5	< 0.5	< 0.5
Carbon Tetrachloride	μg/L	0.5	< 0.3	< 0.3	< 0.3	< 0.3
1,1-Dichloroethene	μg/L	6	< 0.3	< 0.3	< 0.3	< 0.3
Trichloroethylene	μg/L	5	< 0.3	< 0.3	< 0.3	< 0.3
Tetrachloroethylene	μg/L	5	< 0.9	< 0.3	< 0.6	< 0.3
Chlorobenzene	μg/L	30	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl Chloride	μg/L	0.5	< 0.5	< 0.5	< 0.5	< 0.5
o-Dichlorobenzene	μg/L	130	< 0.5	< 0.5	< 0.5	< 0.5
m-Dichlorobenzene	μg/L	130	< 0.5	< 0.5	< 0.5	< 0.5
p-Dichlorobenzene	μg/L	5	< 0.5	< 0.5	< 0.8	< 0.6
1,1-Dichloroethane	μg/L	5	< 0.3	< 0.3	< 0.3	< 0.3
1,1,2-Trichloroethane	μg/L	32	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dichloroethane	μg/L	0.5	< 0.3	< 0.3	< 0.3	< 0.3
Benzene	μg/L	1	< 0.3	< 0.3	< 0.3	< 0.3
Toluene	μg/L	100	< 0.3	< 0.3	< 0.3	< 0.3
Ethyl Benzene	μg/L	680	< 0.3	< 0.3	< 0.3	< 0.3
o-Xylene	μg/L	1750	< 0.5	< 0.5	< 0.5	< 0.5
p-Xylene	μg/L	1750	< 0.5	< 0.5	< 0.5	< 0.5
Trans-1,2-Dichloroethylene	μg/L	10	< 0.3	< 0.3	< 0.3	< 0.3
1,2-Dichloropropane	μg/L	5	< 0.5	< 0.5	< 0.5	< 0.5
Cis-1,3-Dichloropropene	μg/L	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trans-1,3-Dichloropropene	μg/L		< 0.5	< 0.5	< 0.5	< 0.5
1,1,2,2-Tetrachloroethane	μg/L	1	< 0.5	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	μg/L	150	< 1.0	< 0.9	< 1.0	< 1.0
Diethylhexyl phthalate	μg/L	4	< 2.7	< 2.4	< 2.4	< 2.6
Pentachlorophenol	μg/L	30	< 16.0	< 16.0	< 16.0	< 16.0
Phenol	μg/L	5	< 2.2	< 2.2	< 2.2	< 2.2

5.2.2.3 Operational Requirements

The proposed DHS regulations for groundwater recharge include several criteria related to the characteristics of the spreading grounds. These include minimum underground retention time requirements for reclaimed water before withdrawal and minimum horizontal separation between the area where reclaimed water is applied for percolation and the nearest domestic water well. The intent of these requirements is to ensure inactivation of pathogens. As presently drafted, the regulations do not allow for alternatives to reduce the retention time below six months or the horizontal separation below 500 feet. Unless these criteria can be modified to allow for tradeoffs (e.g., greater depth to groundwater for less horizontal distance) or other mitigating actions, existing, expanded and proposed groundwater recharge projects may be limited as to the quantity of reclaimed water allowed. In the case of the Montebello Forebay Project, over 20 wells might have to be taken out of service to meet the proposed requirements.

5.2.3 Scope of Regulations

As time passes, regulations are generally tightened or broadened in scope, but rarely lessened. For example, when a new drinking water standard is adopted, it is automatically incorporated into permit limits where recharge can take place without a determination of whether an impact would occur. Limiting all sources of water to drinking water limits (or Basin Plan objectives) without considering the net effect of all recharge waters or soil aquifer treatment, can result in restrictions on recharge quantities for reclaimed water.

There have also been situations where regulators have attempted to apply potable water limits to situations where minor percolation might occur, such as from irrigation or small impoundments. In other cases, there have been attempts to prevent even the slightest contact by the public with reclaimed water, despite the precautions and restrictions provided for in the nonpotable water reclamation criteria. When regulations are applied to extremes or inconsistently, reuse is discouraged.

5.2.4 Regulatory Project Approval

Regulatory agencies, such as the SWRCB, the RWQCBs, DHS and county health departments, are all decisive players in the planning and implementation of water reclamation projects. One constraint faced by all reuse project proponents is that these key agencies have limited resources to devote to water reclamation programs. This significantly impacts their ability to review and approve new or expanded projects, provide low interest loans, issue water reclamation permits or develop/revise water reuse criteria.

5.2.5 Water Rights

A recent SWRCB decision regarding §1211 of the Water Code may have a significant impact on future reclaimed water use. The SWRCB has already determined that an agency seeking a change in its point of discharge or place of use must seek Board approval before altering its discharge. This section of the law has been interpreted to require a publicly owned treatment works (POTW) discharging into a stream to petition the SWRCB for a water rights decision before reclaiming the water for other beneficial reuse. In this recent decision, the SWRCB concluded that fish and wildlife are legal users of water that cannot be injured by any change in use. As reported in the October 1995 issue of the "California Water Law and Policy Reporter," some water rights attorneys believe that this decision could impair the ability of public agencies to reclaim all of their available wastewater in situations where fish and other aquatic life depend on some of the discharge of effluent to maintain their habitat.

5.2.6 Water Quality Plans and Basin Plans

5.2.6.1 Reclamation Policies

The California Legislature has recognized for some time the importance of water reclamation as a water source for the state, and, in 1991, set statewide goals to reclaim 700,000 AFY by the year 2000 and 1,000,000 AFY by the year 2010. In 1977, the SWRCB adopted the Policy With Respect to Water Reclamation in California (Resolution No. 77-1), which carries out the Legislature's directive contained in the California Water Code (§13512) that *"the State shall undertake all possible steps to encourage the development of water reclamation facilities so that reclaimed water may be made available to help meet the growing water requirements of the State."* This policy also directs the RWQCBs *"to encourage reclamation of wastewaters and to promote water reclamation projects that preserve, restore, or enhance instream beneficial uses"* (1994 Los Angeles Basin Plan).

The SWRCB is responsible for several programs concerning water reclamation. First, the SWRCB administers the grant and loan programs that provide financing for water reclamation projects (e.g., the State Revolving Loan Fund, or SRF). The California Water Code (§13527) directs the SWRCB to give "added consideration" to funding for water quality control facilities that promote water reclamation. Second, the SWRCB is responsible for determining whether the use of potable water for nonpotable uses constitutes a waste or unreasonable use of water under the California Constitution (California Water Code §13550, *et seq.*). If the use in question is found to be a waste or unreasonable use of water, the SWRCB may order the person or entity to use reclaimed water or to cease using potable water.

The Los Angeles RWQCB supports water reclamation primarily through two mechanisms: review and recommendations to the SWRCB regarding funding for water reclamation projects and implementation of the Water Reclamation Requirements (WRRs) program, under which water reclamation projects are issued permits. As an incentive to promote water reclamation, the RWQCB waives permit fees for WRRs (1994 Los Angeles Basin Plan). In addition, the RWQCB may issue master reclamation permits to a supplier or distributor of reclaimed water in lieu of site-specific waste discharge or water reclamation requirements. This has helped to encourage reclamation by making the permitting process more efficient for reclamation projects.

5.2.6.2 Basin Plans

The State and Regional Boards also influence water reclamation indirectly through the regulatory programs that influence the activities of entities that produce reclaimed water. In particular, Statewide Water Quality Plans and Regional Water Quality Control Plans (or Basin Plans), which are implemented on a site-specific basis through issuance of NPDES permits or waste discharge requirements, directly affect the level of treatment at and operation of WRPs by specifying the requirements that must be met when reclaimed water is discharged instead of reused. Although these regulatory requirements influence both the quality of the reclaimed water produced and the cost of treatment, it is important to note that they are intended to protect the beneficial uses of the waters into which the reclaimed water may be discharged, not to promote the offstream use of the reclaimed water.

The Water Quality Control Plan for the Los Angeles Region (known as the Basin Plan) was updated in 1994. The Basin Plan designates beneficial uses for specific waterbodies throughout the region, and sets regional water quality objectives for a variety of constituents. The Basin Plan also contains a Plan of Implementation, an explanation of policies and State Plans applicable to the Region and a description of the SWRCB's and RWQCB's monitoring programs. The RWQCB renewed the NPDES permits for seven of the Districts' WRPs in mid-1995, and included requirements based on the 1994 Basin Plan Update in these 5-year permits.

The Districts' NPDES permits include several water quality objectives that may prove difficult for some Districts' WRPs to meet under the Districts' existing source control program and with existing treatment processes. The most significant of these are ammonia and chloride. Other objectives such as boron and MBAS can be exceeded from time to time.

As of mid-1995, none of the seven WRPs could meet the ammonia objective. The Districts have until 2003 to make either the necessary facility improvements or adjustments to meet the new ammonia objective, or to conduct studies leading to an approved site specific objective for ammonia. The Districts are currently exploring alternate methods of compliance with this requirement. Under a "new facilities" scenario, nitrification and, in some cases, denitrification, would have to be added to the treatment train. Although the cost of these potential modifications has yet to be determined, additional capital and O&M costs would be incurred.

Effluent limits for chloride vary in the permits for different plants, with those plants discharging into the Santa Clara River limited to 100 mg/L and those discharging into the unlined portion of the San Gabriel River or the Rio Hondo Spreading Grounds restricted to 150 mg/l. These levels apparently were established to maintain historic levels of chloride in the groundwater aquifers underlying these waters. However, the RWQCB has provided a temporary variance for dischargers from these requirements since 1990, when a resolution was enacted to provide relief to dischargers who were unable to meet chloride limitations due to the drought and/or water conservation measures (Resolution 90-04). For the discharges covered by this resolution, which is in effect through February 1997, the chloride limitation shall not be considered violated unless the effluent concentrations of chlorides exceed 250 mg/L or water supply concentrations plus 85 mg/L, whichever is less. The Districts' San Jose Creek, Pomona, La Cañada, Saugus, and Valencia plants are all covered under this resolution. As discussed in Section 5.1.2, high chloride levels can be an impediment to some uses of reclaimed water because of the adverse effects of high salt levels have on plant growth. However, for many reuse applications such as turf irrigation, the quality of the Districts' reclaimed water does not pose any real problems. Nonetheless, the Districts have participated with the RWQCB to seek ways to reduce chloride discharge levels and will continue to seek cost-effective means to control chloride levels to the extent necessary.

5.2.6.3 Inland Surface Waters Plan

The SWRCB adopted an Inland Surface Waters Plan (ISWP) in 1991, which contained narrative, numeric and toxicity water quality objectives for toxic pollutants in fulfillment of the requirements of Section 303(c)(2)(B) of the Clean Water Act (CWA) to adopt water quality objectives for priority pollutants. Pursuant to the CWA, the SWRCB submitted the ISWP to the EPA for review and approval. In November 1991, the U.S. EPA took action on the ISWP, which included, among other things, disapproval of performance goals for categorical water bodies (e.g., effluent-dependent waterbodies). The EPA subsequently promulgated the National Toxics Rule that included the promulgation of standards for the priority pollutants not included in the 1991 plans and for the categorical waterbodies for California.

In addition, litigation was filed against the SWRCB regarding ISWP compliance with three state laws. This litigation was resolved by the issuance of a March 1994 decision by the Sacramento County Superior Court, which invalidated the ISWP. Because of this decision, California does not currently have statewide water quality objectives for toxic pollutants for inland surface waters, except those promulgated under the National Toxics Rule.

The SWRCB is currently developing a new ISWP. As part of the process, the Board convened several task forces to discuss issues of concern. One task force focused solely on "effluent dependent waterbodies," which include those waters that flow year-round because of the discharge of reclaimed water. (NOTE: The Task Force was unable to reach agreement on the definition that should be used by the SWRCB in the ISWP; the definition provided here is intended to be a general explanation, rather than a reference to any of the specific options included in the Task Force's report.) The Task Force recognized that the application of more stringent regulations to wastewater discharges, including those of unused reclaimed water, could result in increased treatment costs which could pose a disincentive to reclamation. This would depend on the specific circumstances of the discharge and reclamation program, such as the feasibility of 100% reclamation with no discharge, the costs of the treatment deemed necessary to meet water quality objectives and the cost of potable water compared with reclaimed water. Most reclamation projects require some discharge to a local waterbody during the "build-out" phase, seasonally or in other times of low demand ("Report of the Effluent-Dependent Waters Task Force for Consideration of Issues Related to the Inland Surface Waters Plan," October 1995). The Task Force recommended that the SWRCB develop definitions for effluent dependent waterbodies, determine appropriate beneficial uses for such waterbodies and develop water quality objectives to protect those uses.

SECTION 5.3: INSTITUTIONAL BARRIERS

Literally every potential reclaimed water use site is already served with domestic water. As a result, the biggest incentive to use reclaimed water, which is the absence of any kind of water supply, is missing. During times of water surplus, as is currently the case, the potential for future interruptions in the domestic water system is simply ignored, a case of "out of site, out of mind." Even during the recent droughts, although rationing and increased water costs had very severe consequences, the domestic water connections were physically still there. Therefore, the marketing of reclaimed water has to overcome an obstacle that never confronted the domestic water system: competition from another source with infrastructure already in place. The concept of water recycling, by necessity, must rely on the voluntary commitment from all of the parties involved. These parties include the agencies who produce the commodity, the various layers of purveyors and the end user who must ultimately accept the reclaimed water and apply it. Any break in this chain results in reclaimed water not being used. There are many reasons why these institutional barriers occur as discussed in the following sections.

5.3.1 Public vs. Private Purveyors

Public water supply entities, such as municipal water districts, city water departments and the like, have been at the forefront of promoting water recycling within their service areas. This has not necessarily been the case for investor-owned water utilities or private water companies. When these latter entities have participated in water recycling projects, it has been part of a regional agency's effort, requiring no financial or other contribution from them. The reason for this dichotomy lies in the fundamental makeup of these two types of purveyors.

The public purveyors are nonprofit entities that are answerable to the ratepayers to whom water is delivered. Their concerns are directed at providing an adequate supply at the lowest rates possible. It is natural for such entities to embrace reclaimed water as it diversifies their water supply, drought-proofs their service area and allows for the replacement of expensive imported water with less expensive reclaimed water. Because their ratepayers are essentially the entire population of their service area, other consequences of water supply and rates should be considered, although not all public purveyors realize this. With the added reliability and availability of reclaimed water, the industrial and commercial base within a municipality can be preserved during periods of drought by reducing or eliminating rationing and avoiding big increases in water rates. If businesses have sufficient water at a reasonable cost, they are more likely to keep their operations at normal levels and less likely to move their business out of the area. This results in the preservation of jobs and the tax base for the municipality, which, in turn, provides revenue for municipal services. Quality of life for the residents is also enhanced, as quality of greenbelt areas, such as parks, golf courses, schools and street medians, can be adequately maintained. Municipal government is much more popular with the ratepayers (who are also voters) if their city is attractively landscaped and their children can play on grass instead of dirt. The use of reclaimed water, especially during drought periods, can provide these benefits.

Investor-owned water companies, on the other hand, answer mainly to shareholders, not to ratepayers. The California Public Utilities Commission allows for a certain rate-of-return on the investment made by the shareholders, and rates for the water are set to provide that return. A drought-induced reduction in water deliveries can result in an increase in rates so that investors are made whole. Spending money to construct reclaimed water delivery facilities might cut into the rate-of-return to the investors, so the private water company simply does not do this. Issues such as quality of life or preservation of jobs are not usually considered by the private water companies because they are not necessarily shareholders' concerns or part of the business.

5.3.2 Service Duplication

Another potential barrier to reclaimed water use is the application of the state Service Duplication Act (SDA) (Public Utilities Code §1501 *et seq.*). This law requires the payment of damages to public and private water purveyors for the duplication of water service by a public entity within their certificated service area. Thus the SDA gives water agencies a monopoly over water service, or alternatively requires "just compensation" if another agency wants to provide duplicate service, thereby creating a barrier to the expanded use of reclaimed water. While the SDA does not outright prohibit agencies from entering the marketplace, it does give the existing water purveyor a definite advantage and increases the cost of providing reclaimed water.

An example of this law being used to obstruct a water recycling project occurred in 1992, when the investor-owned San Gabriel Valley Water Company (SGVWC) successfully sued the Districts over using reclaimed water in the SGVWC's service area. This lawsuit affected several reuse applications including two commercial nurseries who had purchased reclaimed water directly from the Districts and who had never received domestic water. One nursery leased its property from the Districts. The lawsuit also affected the Districts plan to use reclaimed water from its San Jose Creek WRP at its own Puente Hills Landfill. Prior to the litigation, the water company's solution was for the Districts, at its expense, to produce the reclaimed water, construct, operate and maintain the distribution facilities (while deeding ownership over to the water company at no cost) and use the water at its own facility. The water company would only take paper control of the water, adding a markup for profit before reselling it to the Districts.

Besides delaying the Puente Hills project (which was planned for as far back as 1978) and adding hundreds of thousands of dollars of additional costs, this application of the SDA is undoubtedly a barrier for other agencies as well. However, it is impossible to document the projects that have not been built or which have been delayed because of the mere threat of litigation over damages.

5.3.3 Easements

Because city streets are already crowded with other utilities and the cost of cutting through and replacing pavement while disrupting traffic is high, alternate routes for reclaimed water lines have become very attractive. Such routes include freeway slopes, river channel embankments and the rights-of-way for railroads and overhead power transmission lines. The desirability of these routes is further enhanced by the presence of large potential reclaimed water users, such as freeway landscaping and the commercial nurseries that often lease the land under the power lines. While easements that laterally cross these rights-of-way are relatively easy to obtain, longitudinal encroachments, which would allow the reclaimed water line to parallel the other utility, are often prohibited. For example, during development of the Century Project, it was discovered that the California Department of Transportation, as a matter of policy, could not allow a longitudinal encroachment for a main reclaimed water transmission line, even though they would be a beneficiary of its use. Similar restrictions have been encountered with the other rights-of-way as well. Without such alternate routes, reclaimed water projects can encounter significantly increased costs and possibly restricted access to potential users.

5.3.4 Interagency Coordination

Many reclamation projects involve two or more cities, counties or other agencies, and political considerations far removed from water recycling can sometimes create barriers preventing project implementation. One example of this type of institutional barrier is the reclaimed water distribution system that was being developed from the City of Industry into the City of West Covina. This project has been indefinitely postponed because of a dispute between West Covina and a large, privately-owned landfill, which would have been the city's biggest reclaimed water customer. Another example is the City of Cerritos project, which was developed in the mid-1980's. One aspect of this project was the construction of a main transmission line through the City of Artesia. A conflict arose between the two cities and permission to construct the transmission line was denied, forcing a realignment of the pipeline. A similar conflict between the CBMWD and the City of Vernon is causing a delay in completion of the Rio Hondo distribution system while pipelines are being redesigned. A final example lies with the highly successful Century Program, which, despite its success, had difficulties in its initial organization. This was due to political conflicts between a number of retail purveyors and the CBMWD. It was not until well into the planning process that all of the involved parties totally embraced the concept and worked toward its eventual implementation.

Smaller purveyors may have the desire to use reclaimed water, but they either lack the resources to build distribution facilities, have insufficient demand or are located too far from the WRP to develop a project on their own. This was the case in the mid-1980's, when cities such as Paramount, Downey and others found themselves in just such a position. Without the benefits of economy of scale, small markets for reclaimed water cannot participate in water recycling unless they do so as part of a larger project or with the assistance of a third party having a regional interest in implementation of water reclamation.

5.3.5 Budgetary Crises

Budgetary crises have become commonplace in California, with entities from local cities to state governments experiencing difficulties in meeting expenses. These fiscal problems have affected the direct funding of capital improvement projects including water reclamation projects. Since the Water Reclamation Bond Act of 1988 was passed, the voters of the state have overwhelmingly defeated every bond measure for water supply improvements, including reclaimed water, because of their concern over the extent of the state's bonded indebtedness. Thus, low interest loans for water recycling projects are extremely difficult to obtain since sufficient funds earmarked for reclamation are no longer available.

Local budgetary problems have curtailed water recycling projects in other ways. For example, in 1995 when the County of Los Angeles discovered that it had an extreme budgetary shortfall, staffing for nonessential activities was reduced. One such activity was the Department of Parks and Recreation, which was developing a project to deliver 3,200 AFY of reclaimed water to its Whittier Narrows Recreation Area. Unfortunately, most of the employees of this department were laid off or reassigned, including all of the staff involved with this project. The long-term financial benefits of the project were overshadowed and obscured by the imminent short-term fiscal emergency that loomed ahead. Similar budgetary predicaments often occur with school districts, which are generally supportive of using reclaimed water, but are faced with the lack of funds to do the necessary, but often complicated and expensive, onsite retrofits.

SECTION 5.4: COST

5.4.1 Potable Water Pricing

In marketing reclaimed water, one fact is plainly obvious. Reclaimed water will not be used if the cost of its conveyance, storage and treatment is more than the wholesale cost of a water purveyor's alternative supplies. The competitiveness of reclaimed water rates with potable rates depends on the source of the domestic water and the calculated per acre-foot cost of the reclaimed water. To encourage purveyors to participate and users to connect, the user will need an incentive to use the water and the purveyor will want to remain financially whole. The most common incentive for users is for the reclaimed water to be offered at a discount. Reclaimed water currently sold in the Districts' service area is discounted between 15% and 72%. The actual amount required to make a project feasible is market-driven and depends on the availability of alternative supplies and the types of use.

Landscape and agricultural users may require minimal discounts because of the nutrient value in reclaimed water. Industrial users, on the other hand, will likely require deeper discounts because reclaimed water typically contains higher mineral content than alternative supplies. Many industries pretreat their water supplies before using it as process or cooling water. The use of reclaimed water usually requires additional treatment and could result in higher wasting rates (blowdown) which results in increases in chemical costs, water usage and disposal costs.

Water purveyors are unlikely to subsidize the cost purveying reclaimed water by raising potable water rates. In fact, because water purveyors have already incurred infrastructure expenses to purvey potable water to their customers (not true for new users) and have a potable rate structure (or mark up) for potable water to cover those existing expenses, they will want to continue to cover these costs when existing users are converted to reclaimed water. In this way, the use of reclaimed water actually subsidizes the sunk or fixed cost of the potable system.

The wholesale cost of water can vary from basin to basin, and within each basin can vary from purveyor to purveyor. The cost of wholesale water from basin to basin is dependent on the cost and availability of groundwater and the source and availability of imported water. The cost from one purveyor to another can vary depending upon their respective ratios of groundwater to imported water use. Groundwater is usually significantly cheaper and more reliable than imported water. For example, treated imported water supplies from MWD are relatively expensive at $426/AF, while groundwater in the Main San Gabriel Basin can be pumped for as little as $60/AF. Therefore, water purveyors who are heavily dependent on imported water are more likely to develop an interest in reclaimed water and are more likely to make its use economically feasible in their service area. However, purveyors who have access to more groundwater are less likely to use reclaimed water and face a greater challenge in justifying the added expense of a reclaimed water project.

Pricing of potable water is complicated by the fact that different purveyors use water from the different sources in different ratios and have different treatment requirements and distribution costs, resulting in a wide range of rates. For example, the rate for potable water from the Pomona Water Department in Fiscal Year 1994-95 was $276/AF, while in Long Beach it was $643/AF. Thus, determining if reclaimed water is competitive with potable water has to be done on a case-by-case basis. In areas such as Long Beach that has high potable water rates, it is relatively easy to market reclaimed water. However, in the San Gabriel Valley, where purveyors and even users can obtain groundwater for under $100/AF, reclaimed water cannot be priced to recover amortized capital, debt service, energy and O&M costs, and still be competitive. The alternative wholesale costs of imported and groundwater supplies within the Districts' boundaries are listed in Table 5-3.

5.4.2 Distribution Costs

Irrespective of the cost of producing reclaimed water, the costs of distribution can be significant. The cost of distribution is directly dependent on two variables: the quantity of reclaimed water that can be sold and the proximity of the users to the source of the reclaimed water. The more reclaimed water that can be sold within a given area, the better the economics of scale becomes. Similarly, the shorter the distance to the users from a given reclaimed water source, the lower the capital and operational costs will be. As an example, the Pomona Water Department operates a reclaimed water system consisting of 6 miles of pipeline to serve 6,800 AFY of reclaimed water to nine users. Their cost of service is under $100/AF. In contrast, the neighboring WVWD requires 27 miles of pipeline to convey 1,200 AFY of reclaimed water to 74 users. Even though WVWD purveys reclaimed water to more customers than Pomona, their customers are spread over a wider area and use significantly less water. As a result, WVWD's cost of service is $500/AF.

Since most of the large water users close to the WRPs are already using or are planning to use reclaimed water, any significant expanded use of reclaimed water for direct use will depend on the development of larger regional systems. These systems would need to cover large service areas through several cities and would require many miles of pipeline. An existing model for such a system would be that of the Century and Rio Hondo Water Recycling Programs, which are under development by the CBMWD. At present, the combined systems consist of 47 miles of pipeline, one storage reservoir, four pump stations (two of them leased) and a rechlorination station. Although the CBMWD plans to expand the system and add customers, the current system provides 2.075 MGD (2,325 AFY) of reclaimed water to 92 users in 10 cities, as of the end of FY 1994-95. The capital cost involved in constructing the distribution system is approximately $44 million. Without the commitment of CBMWD to utilize reclaimed water and the financial incentives provided by the MWD and the U.S. Bureau of Reclamation, which will be discussed further in Chapter VI, a system like this would not be feasible. Whether such a system is feasible in other areas remains to be seen, and will depend on the future cost and availability of conventional water supplies.

5.4.3 Daily Operational Storage Costs

Daily operational storage of reclaimed water generally consists of the construction of either steel or reinforced concrete tanks, with capacities ranging from tens of thousands to several million gallons. Besides the obvious construction costs, which can run in the hundreds of thousands of dollars, there are additional costs related to storage that must be considered. Siting of the storage reservoir can be difficult as available sites in the urban area are limited to begin with and sites within a reasonable distance of the reclaimed water distribution system are even more limited. Furthermore, proposals for aboveground storage tanks will most likely encounter opposition from local residents, who may have aesthetic and/or safety concerns. Unless the storage reservoir is at a sufficient elevation, such as the WVWD's reclaimed water tanks, repumping of the stored water and its attendant cost may be required. Finally, storage of reclaimed water requires dosing with additional chlorine to prevent the slime growth that occurs in water lines of all types. This slime can clog up meters, sprinkler heads and other appurtenances or interfere with industrial processes.

TABLE 5-3
ALTERNATIVE WATER SUPPLY COSTS

Purveyor/Water Supply		Sources	Cost ($/AF)
Three Valleys MWD Service Area			
District Use	Imported	MWD	$426
	Groundwater	Watermaster	$252
Recharge Use	Imported	MWD	$229
USGVMWD Service Area			
District Use	Imported	MWD	$426
	Groundwater	Watermaster	$252
Recharge	Imported	MWD	$229
SGVMWD Service Area			
Recharge	Imported	SWP	$130
CBMWD Service Area			
District Use	Imported	MWD	$426
	Groundwater	WRD	$162
Recharge Spreading	Imported	MWD	$229
Recharge Injection	Imported	MWD	$426
WBMWD Service Area			
District use	Imported	MWD	$426
		WRD	$162
Recharge Injection	Imported	MWD	$426
Santa Clarita Valley			
District Use	Imported	CLWA	$145
	Groundwater	No groundwater management agency exists	$0
Recharge		No purchased water is used for groundwater replenishment	$0
Antelope Valley			
District Use	Imported	AVEK	$170
	Groundwater	No groundwater management agency exists	$0
Recharge Use		No purchased water is used for groundwater replenishment	$0

5.4.4 Seasonal Storage Costs

The kinds of costs associated with developing seasonal storage are similar to those with daily operational storage, only to a much greater degree due to the larger volume to be stored. However, the feasibility of providing seasonal storage for tens of thousands of acre-feet is much more problematic than a relatively small storage tank and unlikely in most of southern California based on the significant land requirements to construct a reservoir of sufficient size. Most likely a local canyon would have to be dammed to form the reservoir, inviting a host of environmental concerns ranging from habitat loss to archeological sites to dam safety. Because such a reservoir would be located outside the developed urban area where the reclaimed water would be produced and used, a lengthy, large diameter pipeline (delivering large quantities of reclaimed water to the reservoir in the winter and reversing flow in the summer) would have to be constructed. In order to match pressure in the reclaimed water delivery system, repumping from the reservoir would be required if the reservoir outlet was not located at a sufficient elevation for gravity flow. Because the long-term storage of the reclaimed water would lead to algae growth and water quality degradation, additional filtration and chlorination facilities would need to be constructed, operated and maintained, resulting in significant labor, chemical and energy costs. Irvine Ranch Water District must do precisely this for its seasonal storage reservoir.

5.4.5 Supplemental Treatment Costs

Supplemental treatment, when required, can also affect the economic viability of a reuse project. The type of supplemental treatment required depends on the type of use and the quality of reclaimed water available. When using reclaimed water for groundwater recharge by direct injection, State DHS requires organics removal. DHS defines organics removal as treatment by GAC or RO, which can cost $250 to $600/AF for that level of treatment alone. The RWQCBs can also require additional treatment for groundwater recharge projects to meet local Basin Plan objectives. Should the project specifically require RO or another membrane technology, disposal of the brine produced during treatment can become a cost issue if it must be returned to the sewer. This cost can be the result of a connection fee and/or construction of a connecting sewer should it be necessary to route the high TDS wastewater to a sewer line tributary to the JWPCP. In addition, since this wastewater stream must be treated again, an industrial waste surcharge may be applied.

Industrial use, which represents a substantial potential market for reclaimed water, may require additional treatment for cooling and process water. Although many industries already pretreat their existing supplies before using as process or cooling water, their treatment costs are sensitive to the mineral and nutrient content of their water supply. Reclaimed water is likely to be higher for both minerals and nutrients. Therefore, significant industrial use of reclaimed water will depend on added treatment from the supplier and/or deeper discounts on the reclaimed water to pay for their own added treatment costs. As an example, the WBMWD sells reclaimed water at a substantial discount through local purveyors to two oil refineries. In addition, they provide onsite nitrification treatment at a significant capital and operational cost of approximately $500/AF. Because the oil refineries are large water users, the added cost can be justified and eventually recovered in the rate structure. For the many smaller industrial users, additional treatment would not be economically feasible.

Even the direct use of reclaimed water for irrigation users can require provisions for supplemental chlorination. Extensive distribution systems have potentially long detention times that will often require the addition of chlorine throughout the system to prevent bacterial and algal growth. This is not commonplace for most of the smaller distribution systems in operation today, which rely on the chlorine residual remaining in the effluent as it leaves the WRP. However, as large systems are developed, the practice likely will become more routine.

5.4.6 Financial Analysis

The preceding topics in this section deal with the "economic analysis" (should it be done) for proposed reclaimed water projects, or will it be cost-effective versus continuing domestic water use. A "financial analysis" answers the question of whether it can be done, by looking at issues that are unrelated to the actual reclaimed water project. These issues revolve around whether the purveyor has the resources, financial or otherwise, to assume the initial costs associated with designing and constructing a reclaimed water distribution system. As detailed in Section 5.3.5, the immediacy of the County of Los Angeles' 1995 budgetary crisis precluded investing in a reclaimed water distribution system, despite the long-term cost benefits. Other factors, such as lack of bonding ability and insufficient reserve funds, can also negatively impact the financial analysis of a reclaimed water project, without any direct relation to it.

5.4.7 Retrofit Costs

Even if the economic and financial issues involved in developing a water recycling program can be successfully addressed by the purveyor, there remains the issue of the costs that will be incurred by the customer in retrofitting the use site targeted to accept reclaimed water. Many reclaimed water purveyors have reported that this is a growing concern in their efforts to market reclaimed water. The main concern in retrofitting a site for reclaimed water, either for irrigation or industrial process water, is the separation of the reclaimed and potable water services so that there is no potential for cross-connection. In many landscape irrigation sites (e.g., golf courses, parks, freeway slopes) and some industrial sites, there are limited potable water services onsite, such as restroom facilities, and the irrigation and/or industrial process water is already segregated. In such cases, retrofit costs are minimal, requiring only a new reclaimed water meter and a reduced-pressure backflow prevention device (which, incidentally, are not inexpensive). On the other hand, more complicated sites, such as schools that have buildings intermixed with landscaping, may require much more repiping to achieve separation. The problem is further compounded by the finances of school districts, which are chronically short of funds for educational purposes, much less additional infrastructure costs.

SECTION 5.5: PUBLIC OPPOSITION

5.5.1 Public Opinion and Health Risk Perception

The success or failure of a water reclamation project will be determined somewhat by the public's acceptance or rejection of the project. Various studies have been conducted to evaluate the key issues and factors that influence public acceptance of the use of reclaimed water. These kinds of studies are difficult because the public is generally uninformed about water reclamation, and because acquiring useful information is dependent on the wording and framework of questions used to gather the information and the socio-demographic composition of the population being questioned.

Several public opinion studies were conducted in the 1970's and 1980's. The results generally suggested that people's attitudes were dependent on the intended use. Reuse options involving low to medium contact were considered the most likely to be successful, although projects involving no or very low contact could still face the risk of public opposition.

A more recent public opinion study was conducted by the City of San Diego and the SDCWA concerning a water repurification project that could add up to 22,000 AFY to the region's potable water supply. Information was gathered through public opinion research, focus groups and individual interviews with community leaders and policy makers. Overall, those people surveyed supported the proposed repurification project, with the majority saying they would be willing to use repurified water for drinking and other purposes.

Risk perception, or how people judge and react to risk, is value-laden, and affected by such attributes as personal inability to exercise control, fear, perceived involuntary nature of exposure, past experiences and personal beliefs. In cases where lay and expert values differ, the potential for misunderstanding and conflict is great, and can foster public opposition of projects. Examples include the resistance to the siting of facilities or or other element of the program perceived have a direct impact on nearby residential or commercial communities and resistance to projects due to perceived health risks.

5.5.2 Special Interest Opposition

Although water reuse projects have been successfully implemented in the past without any adverse impacts, occasionally a special interest group, an individual or a company will attempt to escalate opposition to a proposed project by launching a negative public relations campaign. Such campaigns are often based on half-truths or on a one-sided interpretation of facts. One early example occurred about 30 years ago in the Central Valley, where opponents of a proposed orchard irrigation project attempted to stop the project by calling the reclaimed water "sewer water" and by discouraging consumers from eating the effected fruit. In 1975, farmers in the Salinas Valley were frightened by the initial proposals to use reclaimed water for irrigation of artichokes and vegetables. These fears were based on their previous experience with competitors who tried to ruin their markets by planting pictures in major newspapers of a rodent on an artichoke.

Special interest opposition is currently a major impediment to water reuse facing southern California, not only in terms of implementing new projects, but also curtailing the existing level of reuse being achieved by other projects. One conflict began in 1993 and was directed at the proposed San Gabriel Valley groundwater recharge project. As conceived by the USGVMWD and its partner, the SGVMWD, the project would use 16,000 AFY of reclaimed water from the Districts' San Jose Creek WRP to replenish the Main San Gabriel groundwater basin. Significant opposition was launched by the Miller Brewing Company (Miller) and its affiliated citizen's groups during the project's Environmental Impact Report process in 1993. Early tactics included newspaper advertisements and mailers designed to stir up public fears regarding potentially carcinogenic chemicals and pathogens.

The battle over this project is continuing in the courts and has spread to three other fronts. In their quest to kill the San Gabriel Valley project, Miller has now directed their opposition toward the Los Angeles DWP's proposed East Valley Water Recycling Project Phase I-A, the Districts' Montebello Forebay Groundwater Recharge Project, and State DHS proposed water reclamation regulations and groundwater recharge regulations. The focus of their expanded attack is that "new" scientific information (a virus study commissioned by the Las Virgenes Municipal Water District) suggests that projects like the San Gabriel Valley Groundwater Recharge Project pose public health and environmental risks, thereby justifying new Environmental Impact Reports for the East Valley Project and the Montebello Forebay Project. Exhibit 5-1 includes a letter from Miller's attorneys to State DHS that presents the so-called "new" scientific information and a response by the Districts on the distortions and fallacies asserted in the Miller letter. The most recent foray in the battle is a petition filed by Miller to the SWRCB seeking to overturn the water reclamation requirements issued by the Los Angeles RWQCB in September 1995 for the East Valley Project.

Beyond the potentially ominous impacts on these projects, the misrepresentation of scientific information by Miller is being used by other special interest groups to halt projects in other areas. One example is the Irvine Ranch Water District's plan to discharge reclaimed water into Newport Bay. Opponents of the project are using the Miller information as the basis to stop the project and to aggravate public fears about the consequences of the discharge.

5.5.3 Growth Inducement Concerns

There is a distinct possibility that the discussion about the feasibility of implementing a proposed water recycling project may include a debate over the growth-inducing effects of expanding a particular region's water supply. No-growth advocates may oppose a water recycling project on the grounds that the additional water supply will allow for additional development. It is interesting to note that such advocates of no-growth also support water conservation, which also increases the area's water supply.

EXHIBIT 5-1

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To Pamela Olton	From Carol Mix
Co./Dept.	Co. LVMWD
Phone # 310	Phone # 818
Fax # 695-6139	Fax # 880-9077

2094-23

S. Kimberly Belshé
Director
Department of Health Services
714 "P" Street, Room 1253
Sacramento, California 95814

BY FEDERAL EXPRESS

Re: The San Gabriel Wastewater Recharge Project and The Proposed State Regulations

Dear Ms. Belshé:

We recently received important additional scientific information confirming that water reclamation projects which use minimally-treated effluents from sewage treatment plants pose serious public health risks. For your convenience, this new information is summarized below.

New Virus Testing

In April of this year, the Las Virgenes Municipal Water District ("LVMWD") released a report documenting, in pertinent part, the results of virus testing done on the chlorinated, tertiary treated effluents of the Tapia Water Reclamation Facility.[1] The PCR tests indicated the presence of viruses (including hepatitis A and rotavirus) in three consecutive months, and the more primitive tissue culture virus test yielded a positive

[1] A copy of the chart summarizing the results of the virus testing is attached as Exhibit "A" hereto. We understand that the full report was publicly released in conjunction with a press conference held on April 18, 1995.

From Steve Bui Coast — 4-7-7 7 7 n r — Mary result in one of those months.[2] Tissue culture virus tests are considered primitive because they are not capable of detecting the vast majority of the 120 types of enteric viruses that have been found in wastewater tests and because, even for the few types of viruses they can detect, the tests are unlikely to find most of the viruses in a given sample due to the low recovery rates in the concentration process.

The Tapia virus tests confirm that mere tertiary treatment (even if coupled with chlorination) cannot reliably eliminate viruses. Accordingly, sound public policy requires that your agency presume that tertiary effluents do contain pathogenic viruses for purposes of regulations and wastewater permits.[3]

Cryptosporidium and Giardia Testing

We also recently learned that the County Sanitation Districts of Los Angeles County ("CSDLAC") has been conducting tests for the presence of Cryptosporidium and Giardia in the effluents of the San Jose Creek water reclamation plant ("SJC plant"). The tests conducted thus far by CSDLAC indicate Giardia was consistently present in the SJC plant's final effluents and that Cryptosporidium was present in three of seven final effluent samples.[4] For example, in the last two tests for which we have received data, CSDLAC found 0.2 and 0.6 Cryptosporidium oocysts per liter, respectively.[5] The relatively high numbers (equivalent to 20 or 60 oocysts/100L) found by CSDLAC present a serious public health risk. Moreover, the CSDLAC tests should be assumed to substantially underestimate the presence of the parasites due to the low recovery rate of the ICR tests for Giardia and Cryptosporidium.

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[2] The testing was done on a total of eleven months of samples.

[3] Virtually all viruses, even those which are highly resistant to conventional chlorine treatment, can be readily removed through advanced water treatment and disinfection techniques, such as reverse osmosis followed by ozonation.

[4] The term "indicate" is used advisedly because the CSDLAC personnel involved in the testing were not able to definitively confirm the identity of the cysts which looked like Giardia and Cryptosporidium.

[5] A copy of the May 11, 1995 memorandum summarizing the results of the two tests is attached as Exhibit "B" hereto.

Legionella Testing

As part of the ongoing litigation concerning the proposed San Gabriel wastewater recharge project, our consultants recently arranged for direct fluorescence assay testing of the SJC plant's final effluents. The two tests found $4.7x10^5$ and $2.6x10^5$ fluorescent cells per liter.[6] When taken together with the County Sanitation District of Orange County ("CSDOC") Legionella study conducted last year, these new test results confirm that reclaimed water projects present significant Legionella risks.

New Toxicity Testing

Also as part of the ongoing litigation concerning the proposed San Gabriel wastewater recharge project, our consultants recently arranged for chronic toxicity bioassays to be conducted on the SJC plant's effluents. These bioassay tests found significant adverse impacts on test animals at effluent concentration levels as low as 12.5 percent.[7] The fact that the tertiary treated effluents can have toxic effects at concentrations as low as 12.5 percent demonstrates that your agency's proposal (which is set forth in the draft proposed groundwater recharge regulations) to allow human consumption of water containing up to 20 percent sewage plant effluents will not adequately protect public health. Accordingly, these new bioassay test results confirm the obvious fact that the 20 percent concentration standard must be revised significantly downward.[8]

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6 Copies of the test results are attached as Exhibits "C" and "D" hereto.

7 A copy of the chart summarizing the bioassay results is attached as Exhibit "E" hereto.

8 Miller believes that the scientific evidence strongly supports the adoption of a "health conservative" standard of 5 percent or less. In any event, we know of no scientific data which supports a standard anywhere near as high as 20 percent and, despite an exhaustive review of the scientific literature and the files of your agency, we have been unable to find any scientific rationale for permitting such an extraordinarily high level of sewer plant wastewater to be added to underground drinking water supplies. The agency documents we have reviewed suggest that the 20 percent figure is a somewhat arbitrary one apparently chosen at least in part due to pressure from the wastewater industry to avoid case-by-case regulatory analysis and for the adoption of regulations which would permit the easy (and profitable) disposal of large quantities of sewage plant wastewaters without the use (or

(continued...)

In sum, the enclosed materials further confirm, *inter alia*, that: (1) the proposed San Gabriel project constitutes an unacceptable public health threat; (2) that the proposed Wastewater Reclamation Criteria and the unofficial proposed recharge regulations are both inadequate to protect the public health and without any scientific basis; and (3) both environmental impact reports and detailed health risk assessments are necessary before your agency can properly go forward with the formal proposal or adoption of any wastewater recharge regulations.

Please place this letter and the attached documents in the rulemaking records for both the proposed Wastewater Reclamation Criteria and any groundwater recharge regulations proposed in the future.

Thank you for your attention to this matter.

Very truly yours,

ROGERS & WELLS

By Terry O. Kelly

TOK/AJY/vd

Enclosures
i:\\50142

'(...continued)
cost) of any advanced water treatment or disinfection processes. Indeed, the only scientific rationale even mentioned in the agency files we reviewed was the widely-criticized 1984 CSDLAC Whittier Narrows Health Effects Study which was, at best, inconclusive with respect to long-term carcinogenic effects of the human consumption of drinking water contaminated with minimally-treated sewer plant effluents.

WASTEWATER RECLAMATION
SOLID WASTE MANAGEMENT

COUNTY SANITATION DISTRICTS OF LOS ANGELES COUNTY

1955 Workman Mill Road / Whittier, California
Mailing Address: / P. O. Box 4998, Whittier, California 90607-4998
Telephone: (213) 699-7411 / From Los Angeles (213) 685-5217

CHARLES W. CARRY
Chief Engineer and General Manager

July 6, 1995

S. Kimberly Belshe
Director
Department of Health Services
714 P Street, Room 1253
Sacramento, CA 95814

Dear Ms. Belshe:

We recently received a copy of a letter from the law firm of Rodgers & Wells to you, dated May 23, 1995, commenting on Department of Health Services (DOHS) proposed groundwater recharge regulations. That letter cites research conducted by the Las Virgenes Municipal Water District (LVMWD) and the County Sanitation Districts of Los Angeles County (CSDLAC) and data related to tests performed on CSDLAC reclaimed water. The CSDLAC data was mischaracterized and presented out of context. We have not reviewed the LVMWD studies and cannot comment directly on those data, although some general observations are appropriate.

First, the letter cites new virus testing conducted at LVMWD. As stated, we are not familiar with the specifics of that study, details of disinfection parameters and water quality, or other pertinent information necessary to properly interpret specific test results. However, Rodgers & Wells made misleading and erroneous comments on PCR testing and derisive comments concerning tissue culture testing which warrant response. For example, Rodgers & Wells said "PCR tests indicated the presence of viruses" but failed to state that these tests cannot measure viability. The PCR technique is a powerful analytical tool when used in appropriate applications or in an experimental design planned to utilize genetic based data. The greatest limitation of the PCR technique for detecting the presence of microorganisms is the inability of the test to distinguish between live (infective) vs dead (noninfective) organisms. There is now an extensive body of literature documenting this fact (citations available on request). For that reason it is specifically inappropriate to use PCR to monitor the effectiveness of a disinfection process. PCR tests have a useful purpose, but Rodgers & Wells either misunderstood or misstated that purpose.

The letter goes on to indicate that viruses, specifically noting rotavirus and hepatitis A (HAV), were detected by PCR. Obviously, no responsible scientist would deny that viruses are present in raw sewage. It would be equally surprising if the genetic fragments, which may be detected by PCR testing, were not present following disinfection. With specific regard to rotavirus, there is experimental documentation in the literature that rotavirus would be inactivated by the chlorine residuals and contact times typically required to meet Title 22 disinfection criteria. Although rotavirus is not detected by routine tissue culture cytopathic effect assays, these tests appear to be a reasonable indicator for the inactivation of rotavirus by chlorine. Due to the difficulties of assaying for the presence of HAV, data for this virus is less definitive. Available literature suggests HAV is readily inactivated by reasonably low doses of <u>free</u> chlorine. Combined chlorine (chloramine) was found much less effective for inactivating HAV than free chlorine, however, <u>preformed</u> chloramine was utilized in the experimental protocols so that only the effect of chloramine was measured. The same was true for the previously mentioned rotavirus experiments. When disinfecting effluents in actual practice, a chloramine residual is formed due to the presence of ammonia in the water, however, the chlorine is added as hypochlorous acid or hypochlorite with subsequent *in situ* formation of the chloramine. It has been our hypothesis that the resulting disinfecting power lies somewhere between that experimentally found effective for free chlorine vs preformed chloramine. Recently, the CSDLAC laboratory has been conducting HAV disinfection experiments designed to model the actual disinfection process used in the water reclamation plants. This is work in progress and no formal reports are yet available. Preliminary experimental results indicate HAV is inactivated at chlorine residuals and contact times representative of the water reclamation plants when the chlorine is dosed as hypochlorite. It must be emphasized, these are preliminary data. Confirmation studies are planned. Rodgers and Wells had access to all of this information in addition to the data they cite in their letter. They chose to cite PCR test results even though they have a list of references documenting that PCR detects inactivated (dead) microorganisms and were aware of the preliminary results from our HAV disinfection experiments.

One last note regarding virus testing. We would take exception to the use of the term "primitive" to describe tissue culture based infectivity testing. Very few laboratories test water samples for viruses due to the cost and sophistication necessary to successfully operate a tissue culture lab. This is just one of many examples of the equivocation used throughout the Rodgers & Wells letter. It is accurate that only a portion of the entire enteric virus group is detectable in tissue culture. The appropriate issue is whether the subgroup of viruses detected is a reasonable indicator for the broader group of viruses which may be present. When all available data is considered, including the epidemiology, we see no evidence suggesting that virus infectivity assays have not been an adequate indicator system of treatment reliability. It is also true that there is a relatively low recovery efficiency associated with any given virus sample. Low efficiency of a single sample can be statistically compensated for by increasing the number of samples. CSDLAC has been conducting virus testing of tertiary effluents for 15 years and has tested over 800 samples. The reliability of this data base was discussed in a 1993 peer reviewed journal article and was acknowledged in a subsequent letter to the journal.

The next section of the Rodgers & Wells letter cites current CSDLAC research on the removal of *Giardia* and *Cryptosporidium* by Districts' water reclamation plants. As DOHS is aware, the fate of protozoan parasites in water treatment plants and the associated risks is a concern of the entire water supply community. Reflecting that concern, CSDLAC initiated studies to determine the removal of protozoan cysts by our water reclamation plants. Removal of *Giardia* cysts at each stage of the treatment process at San Jose Creek was 61 percent by primary treatment, 98 percent by activated sludge secondary treatment and 79 percent by filtration. Overall removal was 99.8 percent. The experimental design compensated for analytical inefficiency; these figures represent actual removal rates. Detectable *Giardia* cysts were present in final effluent when large volumes of sample (300 gal) were concentrated. No removal rate was determined for *Cryptosporidium* because oocysts were only detected sporadically at each stage of treatment. These experiments were conducted to determine the removal rate of cysts by the treatment process. The cyst test, like PCR, does not determine if the cysts are viable and, in some cases, the identification of cysts is only presumptive. Therefore, these data cannot specifically assess risk. Protozoan cysts are more resistant to chlorine than indicator bacteria and available data suggests some cysts can survive chlorination at potable water treatment plants, but the extent of survival is unknown. Treated wastewater is disinfected more aggressively than potable water supply. Little is known about the viability of protozoan cysts in treated, disinfected wastewater meeting California Title 22 treatment criteria.

The above is a brief summary of the factual data concerning the CSDLAC *Giardia* and *Cryptosporidium* work conducted to date. Obviously, it would have been preferable to not detect any cysts in the effluent. In reality, water reclamation plants appear to be no more immune to the presence of cysts than the rest of the water supply in this country. These data need to be evaluated in context. The Rodgers & Wells letter correctly cites levels of presumptive *Cryptosporidium* oocysts found in three of seven final effluent samples *ie.* 0.2 to 0.6 oocysts per liter. Oocysts were not detected in four of seven samples. The letter suggests this finding presents a "serious public health risk". This opinion was offered with full knowledge by Rodgers & Wells that the viability of the cysts was unknown. Further, studies of the presence of *Cryptosporidium* oocysts in river water found cyst concentrations ranging from 2 to 28 cysts per liter in samples from the American and Sacramento rivers in California. Following the Rodgers and Wells logic, use of water from the American and Sacramento rivers represents a one to two order of magnitude greater "serious public health risk", yet Rodgers and Wells has indicated they support the use of surface water for recharge. Viewing these data another way, risks would be reduced by one to two orders of magnitude by using reclaimed water instead of state project water. Given Rodgers and Wells professed concern about public health, it would appear they should be advocates of using reclaimed water in lieu of surface water sources to minimize potential concerns associated with cysts. This argument simply points out the inconsistency of the Rodgers & Wells comments.

As stated earlier, there is legitimate concern about the presence of cysts in water supplies. This was amply demonstrated by the outbreak in Milwaukee. It has been estimated that fifty percent or more of the potable water supply in the U.S. contains detectable *Cryptosporidium* oocysts but there is not a countrywide epidemic. Most major outbreaks have been traced to a combination of environmental factors and identifiable treatment problems. Federal and state agencies and universities around the U.S. are conducting research to address these issues in a responsible manner. CSDLAC is continuing its' efforts to contribute to this process. The CSDLAC testing has been expanded to include wells in the Montebello forebay where groundwater recharge with reclaimed water has been occurring for over thirty years. These types of data, in conjunction with national research efforts to determine cyst viability and infective dose, will allow us to assess what constitutes unacceptable risks for water supplies, including reclaimed water. Epidemiological studies to date have not found any increased risks associated with the Montebello Forebay groundwater recharge program and, in general, groundwater is much less likely to be impacted by cysts compared to raw surface waters. Potential recreational exposures to cysts also appear to be greater in surface waters. The presence of cysts in effluent clearly warrants continuing efforts to assess the significance, if any, of their presence. These data, when considered in context of what is now known about the presence of cysts in water supplies and available epidemiological data, do not indicate a "serious public health risk" associated with water reuse as stated in the Rodgers & Wells letter. If cyst concentrations were the only issue, the data suggest reclaimed water may be preferable to untreated surface water sources for groundwater recharge.

Rodgers & Wells next cites the presence of *Legionella* bacteria, determined by direct fluorescent antibody microscopic count (DFA), as further evidence of health risk. They indicate DFA counts of 10^5 cells per liter in SJC final effluent. They do not mention that *Legionella* are ubiquitous in water or that DFA counts in the 10^5 cells/L range are typical in water. An extensive survey of lakes and rivers in the U.S. reported DFA *Legionella* counts ranging from 10^4 to 10^7 cells/L. The letter also neglects to mention that DFA methods do not discriminate between live and dead bacteria nor does the letter mention any possibility of cross reactivity using fluorescent antibodies. Studies conducted at Orange County Sanitation Districts were cited as further evidence of a problem but the letter conveniently ignores the fact that *Legionella* were detected by PCR and DFA, but could not be detected using culture based methods which detect live bacteria. Similar results have been reported by Metropolitan Water District for treated potable water. It is now known that *Legionella* bacteria proliferate under specific conditions and if those environments are properly controlled, this bacteria presents minimal health risk. One group of researchers examining the occurrence of *Legionella* in water distribution systems concluded "it may be a misnomer to refer to water systems as being contaminated with *L. pneumophila* when this organism merely represents one of the hundreds of microorganisms which occupy an ecological niche in this environment". Public health data on the occurrence of legionellosis supports that observation.

The final allegation in the letter indicates significant toxicity was detected in SJC final effluent in chronic bioassay tests conducted by a Rodgers & Wells consultant. CSDLAC collected samples during the same time as the Rodgers & Wells consultant laboratory. Chronic bioassay test results reported by the CSDLAC contract laboratory and in-house acute bioassay tests are not consistent with the "significant adverse impacts" reported in the letter. CSDLAC has not seen any details of the tests conducted by the Rodgers & Wells consultant so further comment on the bioassay results is not possible beyond noting the apparent marked difference between data from the respective laboratories. Of greater concern is the basic misuse of aquatic toxicity data. The purpose of aquatic toxicity testing is to determine effects on communities of aquatic organisms. There is not any specific relationship between aquatic toxicity testing and risk to human health. For example, a common multivitamin used as a nutritional supplement, dissolved in ten liters of water, contains enough copper to produce an aquatic toxicity response. That same copper is necessary for human nutrition. To use a more colorful analogy, fish cannot live in orange juice, or beer, and daphnia cannot reproduce in chocolate ice cream. Drawing human health conclusions solely on the basis of aquatic toxicity tests is disingenuous, at best.

The information presented in the Rodgers & Wells letter does not warrant sweeping generalizations such as an "unacceptable public health threat" or that proposed regulations are "inadequate" and "without any scientific basis". The letter does demonstrate that Rodgers & Wells is under no restraint to present an objective view of information they obtain. DOHS is well aware of the legitimate concerns associated with insuring safe and adequate water supplies. CSDLAC shares those concerns and remains committed to addressing pertinent issues. It is worthy to note that Rodgers and Wells obtained other data under subpena from CSDLAC studies in progress. A preliminary study was conducted using naturally occurring bacteriophage as a tracer for virus transport in Montebello Forebay soils. Bacteriophage in the recharge water were not detected at production wells. Preliminary work has been done on a followup to the 1984 Health Effects study. Initial results suggest that Ames test mutagenicity is much lower in effluents today compared to the early 1980's. These are works in progress and require additional confirmation. They are only mentioned here to document that Rodgers & Wells ignores any evidence not consistent with their agenda.

We hope this information helps provide perspective to the data cited in the Rodgers & Wells letter. We can provide additional information or discuss any of these issues in greater detail if that would be helpful. Thank you for your time.

Very truly yours,

William A. Yanko

William A. Yanko
Laboratory Supervisor,
Microbiology

LAS VIRGENES MUNICIPAL WATER DISTRICT
EST 1958
Dedicated to Quality Service.

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MEMBER AGENCY OF THE
METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

August 30, 1995

Robert Ghirelli, D.Env.
Executive Officer, Region 4
State Regional Water Quality Control Board
101 Centre Plaza Drive
Monterey Park, CA 91754

Subject: **Miller Brewing's Use of Las Virgenes' Test Results**

Dear Dr. Ghirelli,

We are writing to respond to recent events concerning Miller Brewing Company's opposition to the San Gabriel Valley Groundwater Recharge Project and related projects in the East Valley and Montebello Forebay, where reclaimed water is used or proposed to be surface spread to augment groundwater supplies. It is our opinion that attorneys for Miller Brewing have seriously misrepresented the results of a study sponsored by our district and our joint venture partner Triunfo Sanitation District. We wish to clarify the record.

Last April our district was contacted by Rodgers and Wells, a legal firm, on behalf of their client the Miller Brewing Company. They requested permission to go through our files to gather information about our reclamation facilities and any studies associated with our reclaimed water operations. At that time they were provided with a copy of a report entitled, "Enhanced Environmental Monitoring Program at Malibu Lagoon and Malibu Creek." One chapter of this report (Chapter 10) described an attempt to apply "state-of-the-art" technologies to detect viruses in our reclaimed water effluent. This was exploratory research, and the authors of the report carefully detailed what questions their methods could and could not answer.

Included in this chapter was the underlined warning that,

> "Results of PCR analyses cannot be used to estimate possible public health outcomes or risks because PCR does not determine virulence, infectivity or physiological state of the detected organism"

Neither this warning nor any reference to this warning appeared in a letter Miller's attorneys subsequently submitted to Ms. S. Kimberly

Belshé of the State Department of Health Services, dated May 23, 1995 (copy enclosed). The author of that letter, Mr. Terry O. Kerry, stated that,

> "We recently received important additional scientific information *confirming* that water reclamation projects which use minimally-treated effluents from sewage treatment plants *pose serious public health risks.*" [Emphases added]

Immediately following this statement was Mr. Kelly's description of our virus testing effort ("New Virus Testing"), wherein he refers to the study's PCR results as "indicating the presence of viruses." He concluded his description of our research by reiterating that, "The Tapia virus tests *confirm* that mere tertiary treatment (even if coupled with chlorination) cannot reliably eliminate viruses." [Emphasis added]

Before getting into the details underlying these claims, we wish to state at the outset that the methods referred to (PCR, or Polymerase Chain Reaction) are incapable of confirming the presence of live, infectious virus. This point was made repeatedly in the report and the report's executive summary by the researchers themselves, and its absence in Rodgers and Wells' letter of May 23 seems to us to be a clear example of selective omission.

Shortly after Mr. Kelly's letter was sent, Mr. William Yanko (Laboratory Supervisor of the Los Angeles County Sanitation District's Microbiology Lab) responded in writing to the DOHS with a thoughtful analysis and refutation of the claims contained in Rodgers and Wells' letter of May 23 (a copy of Mr. Yanko's letter is enclosed). Although Mr. Yanko admitted not knowing the details of our study, his explanation of the limitations of the methods used in our study virtually duplicated the text of our own report, stating that,

> "The greatest limitation of the PCR technique for detecting the presence of microorganisms is the inability of the test to distinguish between live (infective) vs dead (noninfective) organisms . . . *For that reason it is specifically inappropriate to use PCR to monitor the effectiveness of a disinfection process.* PCR tests have a useful purpose, but Rodgers & Wells either misunderstood or misstated that purpose." [emphasis added]

Mr. Yanko's letter was direct and thorough, and we saw no need for further action. However, on August 8 we were dismayed to learn that Miller's attorneys had obtained a ruling from Superior Court Judge Florence Pickard that relied almost entirely on the same claims that Miller's attorneys made in their letter of May 23[1].

Before we could respond to this event, we received a copy of another letter from

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[1] We subsequently learned that this hearing was limited to the submission of written briefs, and provided little opportunity to rebut Miller's claims or cross-examine their attorneys.

Rodgers and Wells, dated August 8, 1995, addressed to yourself in your capacity of Executive Officer of the Los Angeles Regional Water Quality Control Board. In this letter, they attempt to extrapolate Judge Pickard's decision to other water reclamation projects, specifically the East Valley and Montebello Forebay projects, stating that, "the LVMWD virus study conclusively establishes that the study, by itself, constitutes new and significant information requiring the preparation of new EIRs for both the East Valley and Montebello Forebay projects."

In summary, in three short months Miller's legal counsel has managed to parlay eight pages of preliminary and, from a public health perspective, fundamentally uninformative research into a moderately favorable court decision. They are now attempting to repeat this success before your board, with potentially severe consequences for three projects with tangible and important public benefits.

As leaders in the beneficial reuse of reclaimed water, we are greatly disturbed by the actions of Miller's attorneys, and we are very concerned by their representations before the Regional Board. We are disturbed because they have misrepresented the results of a study sponsored and paid-for by our district and our joint venture partner, Triunfo Sanitation District. We are disturbed because the authors of this study clearly stated that these results should not be used as a basis for any regulatory decision. We are disturbed because, if it were used in a regulatory decision it would in fact support a conclusion exactly opposite of Miller's claims[2]. Finally, and perhaps most importantly, we are concerned that Miller's success will have a chilling effect on the willingness of water agencies to undertake research that, ***regardless of the results***, can be used by a third party to block projects that are vital to meeting the region's need for water.

In closing, we would like to offer our understanding of the position Miller Brewing finds itself in. The water industry can offer its assurances, but in the final analysis, all the scientific proof in the world cannot guarantee that their competitors will not exploit this issue to gain a larger share of their market. It is a difficult problem, and we ask only that they not try to resolve this particular issue via the Regional Board or any other regulatory agency whose responsibilities are limited to matters of water quality, water supply, or public health[3].

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[2]This study found no conclusive evidence for live, infectious virus in our reclaimed water effluent. Even the one positive tissue culture result was ultimately found to be unconfirmed (see abstract, enclosed).

[3]There is precedence for cooperative efforts between breweries and their regulators. For example, by mutual agreement these parties have agreed to forego labelling of the alcoholic content of their brands. This solution prevents a "bidding war," wherein each manufacturer tries to ensure their product is slightly higher in ethanol than their competitors'.

Sincerely,

James E. Colbaugh
General Manager

Enclosures (2)

c: Mr. Gerry Gewe, LADWP
Mr. Terry O. Kelly, Rogers & Wells
Ms. S. Kimberly Belshe, DOHS
Upper San Gabriel Valley Municipal Water District
Mr. William Yanko, LACSD

SECTION 6.1: TECHNICAL SOLUTIONS

6.1.1 Storage Options and Flow Management

As the reuse demands on a particular WRP's reclaimed water production increase, the need for daily operational storage may be required to bridge the 12-hour offset between the peak production of the reclaimed water (during daytime hours) and the greatest demand for its use (during nighttime hours). Besides daily storage, management of reuse demands can spread the delivery of reclaimed water throughout the day.

6.1.1.1 Onsite and Offsite Storage

There are several strategies available to provide operational storage, both on the site of the WRP and offsite.

- The existing chlorine contact tanks can provide for several million gallons of storage, with no modification. Pump stations serving nonpotable distribution systems (e.g., Long Beach, Industry) pull reclaimed water directly out of the chlorine contact tanks.

- Modifications have been made to the chlorine contact tanks where direct connections to the tanks did not previously exist. For example, the CBMWD, which contracts for a portion of the City of Cerritos' reclaimed water pump station, funded a modification of the chlorine contact tanks at the Los Coyotes WRP. Previously, these tanks overflowed a weir into the effluent forebay and then into the pumping bay. During low flow, effluent availability was restricted. Butterfly valves were installed near the bottoms of the chlorine contact tanks leading to the effluent forebay, allowing for the entire three million gallons of storage in these tanks to be available for reuse during the night.

- Many Districts' WRPs have land set aside for possible future expansions. Rather than attempting to squeeze in additional reclaimed water storage that may interfere with future treatment process construction, it would serve both the purchaser of reclaimed water and the Districts if the planned, future chlorine contact tanks were constructed to act as storage tanks until needed for treatment. Funding for this construction would have to be negotiated between the two parties.

- The savings in potable water usage may allow for the conversion of potable water storage tanks to reclaimed water storage. For example, the City of Santa Fe Springs has realized such a great reduction in domestic water demand that a 4 MG storage tank was converted to reclaimed water storage and leased to the CBMWD, the regional distributor of reclaimed water. The City of Long Beach, in its Master Plan for expansion of its reclaimed water distribution system, is planning to convert four, 3.3 MG domestic reservoirs to reclaimed water storage to meet diurnal demands. These storage tank conversions result in significant construction cost savings that enhance the economic attractiveness of reclaimed water. The original potable water supply lines to these tanks can remain as an air-gapped emergency water supply in the extremely rare instance when reclaimed water may not be available.

- Offsite storage facilities have been constructed by reclaimed water purveyors to serve their entire reclaimed water distribution systems, as has been done by the cities of Industry and Pomona, and the WVWD. The CBMWD is planning for a storage tank to be constructed next to its Rio Hondo Pump Station, as the increase in demand for reclaimed water dictates.

- In some cases, industrial reuse sites, such as Smurfit Newsprint and Simpson Paper, and large landscape irrigation reuse sites, such as Rose Hills Memorial Park, maintain their own covered storage reservoirs or tanks. These tanks originally held domestic or nonpotable well water, but now are used or will be used for reclaimed water storage. These storage tanks allow the users to continue normal operation for a short time despite interruptions in the water service, whether it is reclaimed, domestic or well water. As a further guarantee of uninterrupted water supply, the original domestic or well water supply lines air-gap into the storage reservoir to provide emergency water supplies.

- Many golf courses, such as the California Country Club, Industry Hills, Virginia Country Club and La Cañada-Flintridge Country Club, have landscape impoundments that double as reclaimed water storage reservoirs. Onsite pumps draw reclaimed water from the lakes to supply their irrigation systems during the late night hours, and the lakes are refilled in the early morning. These golf courses have had varying degrees of success in maintaining these lakes, as algal growth is accelerated in standing reclaimed water. The LBWD attempted to use open storage of reclaimed water to augment flows in its distribution system. However, operational problems have beset this operation, which has been abandoned in favor of future covered storage. This appears to be the trend elsewhere as well.

- The longer term problem of seasonal demands on reclaimed water can be addressed by the construction of seasonal storage reservoirs. For example, the City of Industry is proposing to pump unused reclaimed water produced during the cooler, wetter winter months to a large capacity (10,000 AF) dammed reservoir, and drawing off the stored water during the hotter, drier summer months to augment reclaimed water production. This reservoir could also serve the dual purpose of being a recreational facility. Seasonal storage reservoirs may also be useful in preserving native habitat in streams that are dependent on effluent flow during the summer months. Offstream storage of reclaimed water could occur during the winter when there is enough storm runoff to maintain flows through the stream bed. The stored water could be slowly discharged into the stream during the summer to maintain base flows for habitat, allowing for reclaimed water production from the WRP to be delivered for reuse. However, impoundments of this kind are more problematic than daily storage reservoirs as the land demands are much greater and the reclaimed water is held for a much longer time (potential algal growth).

- The most efficient, cost-effective means of reclaimed water storage continues to be the replenishment of the groundwater basin. The Montebello Forebay Groundwater Recharge Project has stored approximately 1 MAF of reclaimed water in the Central Basin groundwater aquifer since 1962. There has been no degradation of groundwater quality or discernible adverse health impacts on the population ingesting up to 30% reclaimed water. The recharge facilities for this project, the San Gabriel Coastal and Rio Hondo spreading grounds, were located along local rivers and sized to conserve storm flows. The WRPs that supply the effluent to this project were located upstream of these facilities and use gravity and the existing flood control infrastructure to transport the reclaimed water at literally no cost. Because there is no temporal demand for the reclaimed water used for groundwater recharge, the entire daytime peak flow production that is generally unused by landscape irrigation demands can be conserved. The proposed groundwater recharge project in the Main San Gabriel Basin can address seasonal demands for the reclaimed water. Since the spreading facilities for this project can be isolated from storm runoff, reclaimed water can be used for groundwater replenishment during the winter rainy season, when irrigation demands are minimal and the recharge facilities in the Central Basin are used for conserving rainfall runoff.

6.1.1.2 Demand Side Management

Adjusting the time in which the reclaimed water is delivered to the customer can be used as an alternative or as a complement to daily operational storage. The object of this strategy is to avoid having all of the end users, mainly landscape irrigators, applying the reclaimed water simultaneously when the WRP is at low flow. There are some options available to accomplish this goal.

- The retail reclaimed water purveyor can work with large irrigation customers, such as golf courses, in adjusting their irrigation schedules for different days of the week or different hours at night, to avoid overlapping and overtaxing the reclaimed water distribution system.

- Some landscape irrigation customers can be transferred to daytime usage. These customers would be restricted to sites where public contact is limited, such as commercial nurseries and landscaping along freeways. School athletic fields, which are not always in use during the peak summer seasonal demand, may also be amenable to such rescheduling.

- The customer base for the reclaimed water distribution system can be expanded to include industrial users who are not restricted to nighttime usage. Either the industrial facility operates on a single or double shift, which would only require reclaimed water outside the period of irrigation usage, or on a continuous, 24-hour a day schedule, which would establish a consistent, baseline flow throughout the day. Dual-plumbing of the lavatory facilities in new high-rise office buildings, which are generally occupied only during the day, can further offset peak demands on the reclaimed water supply. The addition of industrial and commercial customers also makes use of the underutilized winter flows when landscape irrigation is curtailed.

6.1.2 Water Quality

The Districts' WRPs employ a tertiary treatment process to produce an effluent that meets water quality based discharge standards and state and federal Drinking Water Standards for heavy metals, pesticides, trace organics, minerals, microorganisms and radionuclides. Such effluent quality allows it to be used for a variety of applications, short of direct drinking water. Beyond the treatment process, the Districts take certain steps to prevent contaminants that might adversely impact the quality of the reclaimed water being produced from getting into the sewer system in the first place. As the use of reclaimed water advances beyond the traditional landscape irrigation, new applications may require further "custom" treatment of the tertiary effluent to meet the particular conditions of that use. Further source control or treatment measures may be needed to enable continued or expanded reuse, as health or water quality requirements are modified or new requirements are promulgated. These measures are discussed in the following sections.

6.1.2.1 Source Control

Following state law and federal regulations, the Districts administer an industrial waste pretreatment program designed to prevent pass-through and interference at the Districts' treatment plants, to protect worker health and safety and to protect the environment. Since its implementation in the 1970s, the program preserves the high quality of the Districts' reclaimed water by requiring the pretreatment of industrial wastes at their point of generation, thereby preventing toxic substances from entering the sewer system. The program's success is attributed to rigorous permitting and pretreatment requirements, extensive field inspections and monitoring, aggressive enforcement actions, and public outreach and educational activities. Because of the large number of industrial users (more than 3,900) and the diversity of the industrial base, the pretreatment program uses computer-automated permitting, inspection and compliance programs. A key feature of the Districts' public outreach program is the Industry Advisory Council, a government and industry partnership in the development of policies and regulations for industry that are acceptable to all involved parties. Other outreach efforts involve preparation of newsletters, guidelines, technical policies and other publications. In recognition of these accomplishments, the Districts' program was the recipient of the EPA's 1995 National Pretreatment Excellence Award.

Should the Districts' water reclamation requirements or NPDES requirements change to accommodate water reuse, it would be necessary to reevaluate and possibly revise the Districts' industrial discharge limits. These include prohibitions, uniform limits that apply to all dischargers, category-specific limits and treatment plant specific limits to ensure that incompatible constituents are either treated to acceptable levels before discharge or are not discharged at all. The first step in a reevaluation is an assessment of the industrial and commercial sources tributary to the Districts' treatment plants, and their relative contributions of pollutants of concern. Using this information, a control strategy would then be developed to reduce the influent loadings of pollutants to levels necessary to meet water reuse discharge standards based on a headworks loading assessment. The results of this assessment would indicate the mass of pollutant reductions needed to comply with standards, and would form the basis for establishing local industrial discharge limits that would be applied to individual discharge permits, or other control measures such as the implementation of best management practices. The strategy selected would be based on such factors as feasibility and cost effectiveness. For example, if the pollutant of concern was mainly attributed to many, small commercial sources, a best-management practice approach might be selected rather than establishing uniform limits for all dischargers and issuing permits to all likely contributors. In other cases it might be more appropriate to revise the uniform industrial limits or establish additional category-specific limits, and require industries to provide additional pretreatment before discharge to meet those limits.

In some cases, further industrial source control may not be the solution, particularly if the primary source of the pollutant of concern is drinking water, as with chlorides or TDS. The Districts are continuing to work with the RWQCB to seek alternatives for cost-effective solutions to control chlorides and salts to the extent necessary.

6.1.2.2 Sewage Collection/Bypass

Despite the success of the Districts' industrial waste pretreatment program, the inclusion of industrial waste in the influent to the WRPs can still potentially degrade the quality of the effluent produced, particularly regarding TDS concentrations. To further protect the effluent quality of the WRPs, industries have been diverted to "nonreclaimable waste lines" wherever possible. These particular sewers completely bypass all of the WRPs, delivering wastewater to the Districts' JWPCP for ocean disposal. Thus, the WRPs treat mainly residential and commercial waste, with less than 10% of the influent coming from industrial sources. The success of this activity can be seen in the comparative TDS levels, which range from 500 to 900 mg/L in reclaimed water, but are 1,500 mg/L in JWPCP effluent. The limitation of industrial waste discharges and the pretreatment program reduces the potential for industrial waste upsets of the WRPs' activated sludge process, which provides a further guarantee to end users of high quality water and uninterrupted reclaimed water deliveries.

6.1.2.3 Supplemental Treatment Options

Despite the high quality of the Districts' tertiary treated effluent, conditions may arise that require additional treatment, either to meet a certain user's specific water quality needs, or to meet RWQCB requirements or DHS regulations. As discussed in Chapter V, future requirements might require the addition of nitrification/denitrification, organics removal or other technologies.

For a few of the existing reuse projects, additional treatment has been provided beyond the tertiary level by the purchasers of the reclaimed water. Examples include the stand-alone nitrification plants for treatment of reclaimed water used for cooling towers at oil refineries in the South Bay. These plants were constructed by the WBMWD to remove ammonia. Similar facilities may be constructed in the CBMWD's service area to further treat effluent from Districts' WRPs. To allow for reclaimed water to be used in the Alamitos Seawater Intrusion Barrier, the WRD and the OCWD are designing an RO plant. This level of treatment will be provided to satisfy DHS's organics removal requirement, to remove nitrogen that can cause biofouling of the well field and to remove TDS to meet the Orange County Coastal Plain groundwater basin plan objectives. The Districts will provide easements on the sites of the WRPs for both points-of-connection and for construction of additional facilities, wherever possible.

SECTION 6.2: REGULATORY SOLUTIONS

All water recycling projects, either direct nonpotable or indirect potable, are subject to regulatory agency approval and oversight. Many constraints to reclamation are derived from policies, procedures and other activities of these agencies. Some suggestions for overcoming these constraints are presented in the following sections.

6.2.1 Consolidated Reuse Permits

One solution to alleviating resource demands and ensuring consistency in requirements is through consolidated reuse permits. The Los Angeles RWQCB currently issues consolidated reuse permits with water reclamation requirements to the Districts as the "Reclaimer" for each of the eight WRPs, and in some cases for specific projects (e.g., the Montebello Forebay Groundwater Recharge Project). In contrast, the Lahontan RWQCB, which regulates the Lancaster and Palmdale WRPs, issues permits for individual sites. Table 6-1 lists the reuse permits issued to the Districts that are currently in force and regulate over 14 existing water recycling projects. Table 6-2 list the permits issued by the Lahontan RWQCB for the three projects using reclaimed water from the Districts' Lancaster and Palmdale WRPs.

TABLE 6-1
LOS ANGELES RWQCB REUSE PERMITS

Reclamation Facility	RWQCB Order No.	Monitoring and Reporting Program No.
La Cañada WRP	88-37	3139
Long Beach WRP	87-47	6184
Los Coyotes WRP	87-51	6182
Pomona WRP	81-34	6241
San Jose Creek WRP	87-50	6372
Whittier Narrows WRP	88-107	6844
Saugus WRP	87-49	6188
Valencia WRP	87-48	6186
Montebello Forebay Recharge	91-100	5728

TABLE 6-2
LAHONTON RWQCB REUSE PERMITS

User	RWQCB Order No.
County of Los Angeles (Apollo Lakes County Park)	6-85-35
City of Los Angeles Department of Airports	6-85-34
Nebeker Ranch	6-86-58

The consolidated permits for direct nonpotable reuse in the Los Angeles Region provide considerable cost savings to the individual purveyors or users. Effluent water quality sampling and analysis are already provided for through the Districts' NPDES monitoring program and do not have to be duplicated by either the purchasers of reclaimed water or by the Districts. The required quarterly monitoring reports are also produced by only one entity, the Districts.

The Montebello Forebay Groundwater Recharge Project, which is operated by three agencies and supplied by three WRPs, also benefits from having a consolidated permit, although somewhat differently. Unlike the direct reuse permits issued to individual WRPs, this permit includes all three facilities that contribute reclaimed water for recharge. This permit also differs from the direct use permits as all three agencies involved in the recharge effort are parties to the permit and participate in a cooperative effort, with each agency assuming different responsibilities:

- The Districts, which produce the reclaimed water, are responsible for sampling and analyzing the various effluent streams that contribute to groundwater recharge. The Districts are also responsible for collecting data from the other two agencies and submitting all the information in a monthly report to the RWQCB.

- The Los Angeles County DPW maintains the local waterways, transports the reclaimed water through these facilities to the instream and offstream spreading grounds, and operates and maintains the spreading facilities. This agency provides monthly total amounts of reclaimed water spread and takes samples of water entering the spreading grounds.

- The WRD and its consulting engineer conducts sampling of shallow monitoring wells and production wells that, along with the recharged water samples, are analyzed by a contract laboratory. This agency also provides a narrative report describing the analytical results of these and other groundwater monitoring efforts.

This model of cooperation and delegation of responsibilities is expected to be extended to other planned groundwater recharge projects in the Districts' service area, such as the San Gabriel Valley recharge project and the Alamitos Seawater Intrusion Barrier project.

6.2.2 General Water Reuse Permits

Another solution to overcoming resource restrictions and ensuring consistency in permitting, might be through general water reuse permits. The goal of this approach would be to streamline the permitting process and delegate the responsibility, to the fullest extent possible, of administering water reuse programs to local agencies. This concept is currently being used by some RWQCBs for biosolids applications.

6.2.3 Engineering Reports

All of the direct nonpotable reuse permits issued to the Districts include a statement that reads *"For any extension of the reclaimed water system, the Reclaimer shall submit a report detailing the extension for the approval of the Executive Officer . . . prior to use of reclaimed water."* Rather than requiring its purveyors to produce this document as a contractual obligation for purchasing reclaimed water, the Districts have elected to provide this service for many projects both as a courtesy and as an incentive for promoting reuse projects. Examples include projects developed by the WVWD, the cities of Cerritos, Lakewood and Industry, the CBMWD and several for the City of Long Beach. The contents of such an Engineering Report are specified by DHS and include descriptions of the treatment process, the delivery system facilities, the end uses of the reclaimed water and any mitigating measures that are being taken to protect public health, among other topics.

6.2.4 Water Rights Appropriations

New reclaimed water projects generally entail the diversion of reclaimed water that previously had been discharged into a waterway for disposal. In the Los Angeles Basin, there are no downstream diverters of water in the San Gabriel, Rio Hondo and San Jose Creek channels that receive Districts' effluent. However, California Water Code §1210 and §1212 require that this reclaimed water be appropriated by the reclaimed agency, and that a Petition for Change be filed with the SWRCB's Division of Water Rights. This submittal requires detailed descriptions of the changes that are involved and the proposed facilities to be constructed, legal descriptions of the land parcels involved, identification of any downstream users, identification of any additional permits required, assessments of any effects the proposed project may have on the local environment and a consultation with local staff of the State DFG. A copy of the required form is included as Exhibit 6-1. The Districts have experience in completing this documentation, and will offer this service to future reclaimed water purchasers. However, the nominal filing fees to the SWRCB and the DFG will be the responsibility of the purveyor.

As noted in Section 5.2.5, the recent SWRCB decision regarding §1211 of the Water Code may have a significant impact on future reclaimed water use, and it is not known how this ruling will affect the ability of public agencies to reclaim wastewater in situations where fish and other aquatic life depend on the discharge of reclaimed water to maintain their habitat.

6.2.5 Research

To keep pace with the rapid advancement of scientific knowledge and regulatory requirements, the Districts actively engage in research dealing with effluent water quality issues and treatment processes. The following sections detail several recently completed, ongoing or planned research projects designed to address concerns over the quality of the reclaimed water produced by Districts' facilities, or to improve the wastewater treatment processes so that an even higher quality reclaimed water can be produced. The data and information that continue to be collected through these and other research projects will enable the continuation and expansion of water recycling by addressing public and regulatory concerns.

6.2.5.1 Epidemiological Studies

One element of the Districts' 1984 Health Effects Study focussed on the health of individuals who had received groundwater containing reclaimed water since the 1960s. An epidemiological study performed by the University of California at Los Angeles School of Public Health concluded that *"Evaluation of health and vital statistics data for the period of 1969-80 showed that residents of the area that received reclaimed water experienced no increased rates of infectious diseases, congenital malformations, infant and neonatal mortality, low birth weight, cancer incidence, or deaths due to heart disease, stroke, stomach cancer, rectal cancer, bladder cancer, colon cancer, or all cancers combined, when compared to residents of two control areas that did not receive reclaimed water."*

Researchers from the Rand Corporation, under contract with the WRD, are revisiting this study by examining a control area (about 700,000 people) having groundwater that is not influenced by reclaimed water and three areas (about 900,000 people) that have varying exposures to reclaimed water. The study is based on more recent health statistics and longer periods of exposure. Districts' staff is serving on this project's review board. Statistical comparisons will be made between the relative rates of mortality and morbidity, including deaths due to cancer, cancer incidence and infectious disease incidence, to learn if long-term ingestion of groundwater containing reclaimed water has significantly affected these health outcomes. The final report is scheduled to be completed by early 1996.

6.2.5.2 Microbiological Monitoring

Microbiological testing and research studies have been an integral part of the Districts' efforts to assure the safety of water reclamation practices. These efforts have predominantly focused on the reliability of the treatment systems and quality of the reclaimed water. The Districts' 1977 Pomona Virus Study determined, using seeded virus, that direct filtration of coagulated, secondary effluent achieved the same level of virus inactivation as did coagulation followed by a separate flocculation basin. Monitoring of indigenous enteric viruses in reclaimed water, which was conducted as part of the Health Effects Study, was continued and made into a permanent monthly monitoring program for the Districts' tertiary treatment plants. As of the end of October 1995, analyses had been completed on a total of 890 samples of tertiary effluent from seven WRPs consisting of approximately 915,000 liters of sample, with only one confirmed positive for virus. These data have demonstrated the continued reliability of the treatment processes, but it is recognized that available testing methodology cannot detect every virus potentially present in reclaimed water, or any other water source.

During the past year, the Districts' efforts have expanded to examine the efficacy of soil systems in the Montebello Forebay to inhibit the transport of microorganisms. This expansion of focus was intended to provide additional data on the overall effectiveness of the multiple barrier concept and provide additional supportive evidence for models estimating groundwater travel times. Hydrogeological based travel time estimates may provide an alternative to the DHS proposed 500 foot setback guideline and provide for cost-effective utilization of existing resources. Within this general framework, two areas are currently being studied: virus transport in soil and the fate of *Giardia* and *Cryptosporidium* cysts.

A preliminary virus soil transport study using native bacteriophage as tracers was conducted in the fall of 1994 with the WRD and the USGS. Results of that study were previously reported to the RWQCB and provided the basis for expanding the preliminary testing program. A six-month monitoring program of purveyor wells located within 500 feet of recharge basins was started in spring of 1995. That sampling program is currently underway and includes testing 27 wells monthly for bacteriophage and coliform bacteria. Heterotrophic plate count populations were incorporated during the last two sampling cycles. The primary goal of this monitoring program is to provide additional documentation for the finding from the preliminary study that native bacteriophage present in recharge and surface water do not impact purveyor wells.

The 1994 preliminary bacteriophage study also included an experiment, conducted at the USGS research basin, to determine if virus removal rate data could be developed using native male specific coliphage as a model. The design of the research basin is ideal to develop these data. Removal rate data would complement the monitoring results and improve our understanding of virus transport dynamics and the adsorptive capacity of the soil. Although results were derived from the initial experiments, native bacteriophage concentrations were not high enough to develop reliable removal rate data.

Seeding studies, using MS2 bacteriophage, have been conducted at other groundwater recharge sites in the U.S. to address the potential for aquifer contamination. The male specific coliphage, MS2, is not pathogenic to animals or humans but is considered a potentially good transport model for human viruses. The technical feasibility of conducting coliphage seeding studies at the USGS research basin was discussed with USGS staff and it was concluded that these experiments were practical and of interest and value to both local water reclamation efforts and USGS water quality research programs.

As a result of these preliminary discussions, it was decided that a formal proposal would be prepared for review and submitted for approval by concerned agencies, including the RWQCB and DHS. The proposal will detail both the rationale and design of the experiments, and will also document the safety of conducting small scale bacteriophage tracer studies. The proposal will be submitted in early 1996 with experiments starting after the end of the 1995-96 winter rainy season, contingent upon DHS and RWQCB approval. These proposed studies will be conducted jointly by USGS and Districts' scientists.

Besides the Districts' ongoing virus research, the Districts are a cooperator in a joint University of California, Irvine (UCI) and Baylor University project that was jointly funded by EPA and the National Science Foundation (NSF). This innovative three-year study will evaluate the potential of using Norwalk virus-like particles (VLPs) for soil transport tracers. VLPs are the protein portion of the virus without the genetic material. The ability to synthesize VLPs is based on very new technology developed by researchers at Baylor University to produce a new generation of vaccines. Since VLPs do not contain genetic material, they cannot, by definition, be pathogenic. The VLP protein, however, is structurally identical to the parent virus and it is the protein interactions in soil that mediate virus transport behavior. A VLP has the potential to be a completely noninfective but exact tracer for human virus behavior. The first two years of this study will consist of laboratory studies evaluating the potential of using Norwalk virus VLPs as environmental tracers and comparing their transport and adsorptive properties to selected bacteriophages. If successful, the first two years' effort will lead to a proposed field demonstration. UCI will be responsible for obtaining all federal, state and local approvals for conducting the field demonstration. This research has the potential to add significantly to our knowledge of human virus behavior in soil.

The second area of current research is examining the fate of *Giardia* and *Cryptosporidium* cysts. Initial studies examined the removal of cysts during the treatment process. Testing has been conducted for raw sewage, secondary effluent and final effluent. Intact soil systems are generally thought to remove cysts during percolation. Given the potential presence of cysts in all recharge water sources, a testing program was begun at the Rio Hondo recharge basin monitoring wells to verify the integrity of the soil filtration process. Sampling at the monitoring wells is ongoing and will continue until enough samples have been collected to assess the results in context of the EPA guidelines for potable water (<1 cyst/10,000 L).

6.2.5.3 Soil Column Study

The nitrification-denitrification process occurring underground was demonstrated experimentally by the Districts as part of a study conducted in 1993 in which filtered, disinfected effluent from the San Jose Creek WRP was percolated through a 10-foot column of soil collected from the San Gabriel spreading grounds. By mimicking the flooding-drying cycle employed by the DPW in the spreading grounds, it was shown that the positively charged ammonium ion was adsorbed by the negatively charged soil particles in the vadose zone during the flooding cycle, where nitrifying bacteria then converted it to negatively charged nitrate ions during the following drying cycle. In micro-environments of anaerobic activity around soil particles in the vadose zone, denitrifying bacteria convert at least one-third of the nitrate to nitrogen gas. The next flooding cycle flushes out the remaining remobilized nitrate ions into the anaerobic zone where denitrifying bacteria can continue the denitrification process. Experimental results also indicate that the rate of denitrification is limited by the availability of organic carbon. The same study also demonstrated up to 50% removal of total organic carbon by the soil column. Similar results were found as part of the test basin studies conducted by USGS and funded by the WRD. These results may provide an alternative to the proposed total nitrogen limit of 10 mg/L as recommended by the draft DHS groundwater recharge regulations.

6.2.5.4 Primary Treatment Optimization Study

This project attempted to identify improvements in the current design and operation of the primary chemical treatment system. An effective methodology using chemical oxygen demand (COD) data was developed to measure settling velocity distributions.

6.2.5.5 Ultraviolet Inactivation of Bacteria and Viruses

The objectives of this project were to investigate the feasibility of ultraviolet (UV) disinfection of reclaimed water to meet the bacterial reuse standard, to determine the dose-response relationships for bacteria, coliphages and viruses, to investigate the potential for photoreactivation of bacteria in UV-disinfected water, to study the effects of UV on reclaimed water characteristics and to evaluate the microbial growth in transport lines.

As part of this study, UV-dose/survival response curves for total coliform, coliphages and polio viruses were developed. For the tertiary filter effluent from the Pomona WRP, UV doses of 100 mW-sec/cm^2 reduced the total coliform concentrations to 2.2 MPN/100 mL or lower, while 140 mW-sec/cm^2 provided a four-log inactivation of seeded polio viruses and coliphages (F2 and MS2). In addition, seeded polio viruses and natural enteric viruses were found more sensitive to UV irradiation than the coliphages. The required disinfection level of UV doses had no significant effects on wastewater characteristics such as TOC, COD and chlorine demand. Photoreactivation of bacteria in UV-disinfected water was observed, but no reactivation of bacteria was observed in a dark environment. Increases of total plate counts in a pipeline transporting UV-disinfected filter effluent were observed; however, they could be effectively controlled by the addition of 4.5 mg/L of chlorine.

6.2.5.6 Evaluation of Tertiary Filtration

Studies were performed to evaluate the performance of the various filtration systems at the Districts, which include mono-medium gravity (anthracite or GAC), dual-media (sand and anthracite) gravity and dual-media pressure filters. The results of the study indicated that the ratios of suspended solids to turbidity were found comparable at all seven of the Districts' tertiary treatment plants. This ratio was 2.3 to 3.0 for secondary effluents and 1.5 for final effluents. The removal efficiencies of suspended solids were always greater than the corresponding turbidity removal. As secondary effluent turbidity decreases, so does the removal efficiency of suspended solids and turbidity.

The GAC filters can serve a dual-role as a tertiary filter and adsorber of organics. Although all four types of filters at the Districts could effectively remove the turbidity to meet the effluent limit of 2 NTU, the GAC filters consistently yielded the lowest effluent turbidity and suspended solids in addition to the removal of organics. More frequent carbon regeneration led to better removal of organic compounds; however, the impacts of regeneration frequency on suspended solids and turbidity removals were insignificant. If the removals of TOC and color are not required, then regeneration once a year is sufficient to control the turbidity.

After 20 regenerations with an average of 10% carbon makeup, the GAC filter still exerted a TOC removal from above 80% initially to 20%. The accumulated removal capacity of this regenerated carbon was 0.062 pound TOC removed/pound carbon, compared to 0.080 for virgin carbon under similar operational conditions. The removal of true color by the regenerated carbon decreased from 90% initially to 30%. On the other hand, anthracite filters, with similar filter configuration and surface loading, showed insignificant removals of TOC and true color.

The GAC filter performed best in the removal of particles, although effluent from all of the filters, except the dual-media gravity filters, were essentially free of particles larger than 50 microns in diameter.

6.2.5.7 Performance Evaluation of Secondary Clarifiers

Districts' research staff participated in the Clarifier Research Technical Committee (CRTC), a group associated with the American Society of Civil Engineers that evaluated secondary clarifier performance at the Districts' San Jose Creek WRP. The CRTC developed a protocol that provides a detailed and rigorous methodology for performing the evaluation so that performance of different secondary clarifier designs can be compared.

The study demonstrated that process sludge settleability was very favorable during the stress tests when surface overflow rates (SOR) were increased above design parameters, although significant sludge blankets resulted because of inadequate withdrawal capacity. The rectangular clarifiers at the San Jose Creek WRP may been able to handle higher SORs with increased sludge pumping. The deterioration in effluent quality, as measured by effluent turbidity, was attributable to either a hydraulic phenomenon or high sludge blankets and not to the settling and flocculation characteristics of the sludge.

The flow pattern/solids distribution tests performed to quantify the hydraulic characteristics indicated a favorable distribution of the influent flow as it passed through the test clarifier's inlet diffusers, and that an end-wall effect was not present. A combination of favorable sludge settling and flocculation characteristics and tank hydraulic characteristics resulted in good test clarifier performance under a wide range of sustained flow rates.

6.2.5.8 Soil Aquifer Treatment

Preliminary discussions are underway for a regional research project to evaluate the impacts of soil aquifer treatment on reclaimed water quality. This project would involve a consortium of municipalities and universities from Arizona and southern California. The objectives of the study would be to conduct bench scale experiments and field tests to characterize organics and virus removal mechanisms/efficiencies during transport through the vadose zone and subsequent long-term aquifer storage.

6.2.5.9 National Research Council Evaluation

The Districts are a sponsor of the National Research Council's (NRC's) project entitled "Evaluation of the Viability of Augmenting Potable Water Supplies With Reclaimed Water." The purpose of this project is to review current technologies and approaches for using reclaimed water as a contributing source to drinking water supplies and to develop general statements regarding human health effects. The study will take 14 months and will use a multidisciplinary committee of experts from fields such as environmental engineering, toxicology, microbiology, risk assessment, public health, environmental law, public policy and resource economics to review results of recent and significant studies.

6.2.6 Workshops with Regulatory Agencies

An important aspect of bridging the gap between the regulatory agencies and the producers and users of reclaimed water, is the establishment of personal dialogue between staff members. The Districts have and will continue to participate in face-to-face meetings and workshops with staff of the RWQCB and DHS. In the summer of 1995, RWQCB and Districts' staff met several times to discuss and resolve issues surrounding the reissuance of NPDES permits for the Districts' seven tertiary treatment plants. In the fall of 1995, staff of the Districts, RWQCB, DHS, WRD and DPW began meeting to identify the issues to be addressed in an Engineering Report for the Montebello Forebay Groundwater Recharge Project. The permittees for this project are in the process of compiling comprehensive technical data for a reissuance of this reuse permit, which will include water quality impacts (nitrogen, TOC, total trihalomethanes, iron and manganese, etc.), microbiological studies (virus, protozoan cysts, coliforms, etc.), a hydrologic assessment (depth of saturated zone, horizontal separation, subsurface retention time, percent reclaimed water at wellhead), industrial waste source controls, wastewater treatment processes and monitoring requirements.

The Districts have also actively participated in the multiyear development of revisions to the Title 22 regulations governing direct nonpotable and indirect potable reuse.

The Los Angeles County Reclaimed Water Advisory Committee, made up of all the producers and most of the major purveyors of reclaimed water within the county, has formed an ad hoc committee to develop reasonable, standardized monitoring requirements for groundwater recharge projects. The Districts are a member of this committee, along with the WRD, WBMWD and the Los Angeles DWP.

SECTION 6.3: INSTITUTIONAL/INTERAGENCY COOPERATION

6.3.1 Water Recycling at Districts' Facilities

Before attempting to convince other entities to use reclaimed water, the Districts must make every effort to maximize reclaimed water use at its own facilities. The following are steps that have been or will be taken to accomplish this goal.

- All of the Districts' tertiary treatment plants use reclaimed water for all of the landscape irrigation around the plant (and around the JAO in the case of the San Jose Creek WRP).

- The tertiary treatment plants also use product water instead of domestic water for assorted other applications such as filter backwashes, washdown water, chemical mixing, foam suppression, pump lubrication and fire flows.

- The JAO uses reclaimed water for both the air chillers, and for toilet and urinal flushing and for floor drain trap priming in the restrooms of the recent building expansion. Unfortunately, existing lavatory facilities at the JAO and other Districts' facilities are prohibited by DHS from being retrofitted for reclaimed water use.

- The Central Plant, which will use methane gas produced by the Districts' Puente Hills Landfill to provide heating and air-conditioning for the JAO/San Jose Creek WRP complex, will be supplied with reclaimed water.

- The Districts' JWPCP uses secondary effluent for making the hypochlorite solution used in the chlorination process.

- The Districts' solid waste management facilities also make use of reclaimed water, produced by either the Districts or by a neighboring reclamation agency. Two of the Districts' four active sanitary landfills use reclaimed water for landscape irrigation and dust control: the Spadra Landfill in Walnut uses effluent from the Districts' Pomona WRP and the Calabasas Landfill in Agoura uses effluent from the Las Virgenes Municipal Water District's Tapia WRP. Reclaimed water service will soon be extended to the other two landfills: the Puente Hills Landfill near the City of Industry will begin receiving effluent from the Districts' San Jose Creek WRP in summer 1996 and the Scholl Canyon Landfill in Glendale will begin receiving L.A./Glendale WRP effluent through the City of Glendale Public Services Department in spring 1996. The Districts' two refuse-to-energy plants in Commerce and Long Beach can use reclaimed water when and if it is made available by the CBMWD and the LBWD, respectively.

6.3.2 Support Studies of Future Reuse

The Districts has a long history of involvement with planning studies for water reuse, from the regionwide OLAC Study in 1982 to the more area-specific Resource Allocation Study in 1992. The Districts also provide water recycling expertise for planning for specific projects by wholesale or retail purveyors, such as the USGVMWD. In some cases, the Districts can actively promote expanding water recycling. For example, in 1985-86, Districts and MWD staff recruited and organized several water agencies and companies to form a cooperative effort that eventually became the highly successful Century Reclamation Program. The Districts have provided and will continue to provide these kinds of services within the limitations placed upon its ability to sell and distribute reclaimed water.

6.3.3 Cooperative Interface with Purveyors and Users

The Districts' involvement with water recycling does not end after the planning process, after delivery system construction or even after signing the contract for the sale of reclaimed water. The Districts remain active and involved throughout the life of the projects. Districts' staff, both engineering and operations, maintain personal contact with the managers and operations staff of the reclaimed water purveyors, and they are accessible to the end users. In this way, any questions regarding water quality, billing, interruptions in reclaimed water supply or other issues dealing with the use of reclaimed water, can be answered quickly, completely and satisfactorily. It is very important that contact between the plant operators and delivery system maintenance staff be established so that both routine and emergency situations can be immediately resolved or even avoided altogether.

Despite the Districts' efforts in the past, this system of personal contacts and communication can be improved to make it more responsive to the needs of the purveyors and users. For example, a standardized protocol for notifying delivery system personnel of WRP emergency situations or planned shutdowns can be developed and implemented.

6.3.4 Regional Distribution Systems

As the cost of potable water has increased, the cost-effectiveness of reclaimed water has allowed distribution systems to extend further from the WRP source. The first generation of reclaimed water users consisted of individual sites (e.g., California Country Club, Ironwood 9 Golf Course) which were located next to a WRP. The second generation was a more extensive system serving many sites within a city that surrounded a WRP (e.g., Pomona, Cerritos). The third generation is the regional distribution system (Century, Rio Hondo). As stated in the previous chapter, smaller purveyors such as Paramount, Downey and others cities had the desire to use reclaimed water, although it was impossible for them to proceed alone. It was only after the CBMWD assumed the role of lead agency did the Century Program become a reality. The larger, regional agency could fund and construct a cost-effective system to serve many retail purveyors.

Water recycling is now embarking on the fourth generation of distribution systems, in which the regional systems originating from a single WRP have extended so far that they are merging and interconnecting with regional systems coming from other WRPs. The resulting mega-system provides for a closed loop system that enhances flows, pressure, flexibility and reliability, as there is more than one source of water. The Century and Rio Hondo projects are becoming this kind of mega-system, allowing for reclaimed water from either the Districts' San Jose Creek or Los Coyotes WRPs or both to supply both systems. CBMWD is planning for future interties with the LBWD system, which uses effluent from the Districts' Long Beach WRP, and the West Basin Project, which uses effluent that originally came from the City of Los Angeles' Hyperion Plant in El Segundo.

6.3.5 Service Duplication

The California SDA, previously described in Chapter V, acts to inhibit the use of reclaimed water by increasing the cost of providing this service. One solution to this problem has been the inclusion of private water companies in the regional distribution systems. In this way, the distribution system is financed and constructed by the larger public agency, which physically delivers the reclaimed water to the end user. However, the actual chain of ownership of the reclaimed water is from the Districts to the wholesaler and then to the retailer, who continues to be the water purveyor to the end user. Thus, the private water companies maintain their customer base and rate-of-return for investors. Unfortunately, situations may arise in which there is no regional public entity developing a distribution system, and the private water retailer is unable or unwilling to serve reclaimed water in its service area. In these cases, it may be technically and economically feasible for the reclaimer to directly serve the end user, if not for the SDA. A possible legislative solution would be to exempt reclaimed water service from the SDA, thereby opening the market to allow competition between potable and reclaimed water. Because reclaimed water requires separate distribution systems, it does not provide an exact duplication of existing potable water service.

6.3.6 Legislative Actions

In the past, the Districts have been supportive of, and will continue to encourage legislative efforts to promote water reclamation and recycling. In recent years, several bills have been enacted demonstrating the State's intent that reclaimed water be developed as a supplemental source of water, and that remove barriers to the use of reclaimed water. For instance, in 1991, the Legislature set a statewide goal of using 1,000,000 AFY of reclaimed water by the year 2010. The Legislature has also specified conditions under which the use of reclaimed water for nonpotable uses constitutes a waste or unreasonable use of that water. Expanding this list would greatly assist in marketing reclaimed water to new categories of users.

6.3.7 Dispute Resolution

As reclaimed water distribution lines extend into new areas, as the amount of water used and number and types of reuse sites increase and as the number of layers of reclaimed water purveyors grows, the opportunity for disputes between the involved parties increases. Such disputes can be related to reclaimed water pricing, service area jurisdiction, reclaimed water quality, contractual matters, obtaining easements, etc. The possibility of establishing a third party arbitrator to mediate and settle such disputes can be investigated, so that disagreements that currently delay water recycling projects, increase their cost or end up in litigation can be identified and resolved to the mutual satisfaction of the involved parties.

SECTION 6.4: ECONOMIC INCENTIVES

Although other elements are important, the primary factor driving the use of reclaimed water as a water supply is its cost compared with other water sources. The major elements influencing the choice of whether to develop reclaimed water supplies are the cost of potable water, the cost of reclaimed water and the availability of financing. Most other influences on the choice of supply translate into one of these factors.

6.4.1 Economic Advantages of Using Reclaimed Water

The Districts' sewerage system is funded primarily through residential service charges and industrial waste surcharges for operation and maintenance costs and capital expenditures for replacement or upgrading of existing facilities, and through connection and annexation fees for capital expenditures related to expansion of sewer and treatment plant capacities. Therefore, the sale of reclaimed water represents a cost recovery for the Districts, partially offsetting the costs of sewage treatment and disposal. Historically, the price of reclaimed water has been based on approximately one-fifth of the operations and maintenance costs for the WRPs. This results in a unit commodity price for the reclaimed water of approximately $20-25/AF. However, since the costs of alternate sources of potable water are increasing rapidly (MWD's rate for treated water is expected to increase to over $800/AF by the year 2010), a new pricing policy for reclaimed water sales has been adopted. This new policy is based on "shared savings," by which the price of the water as a commodity is set as one-half the savings realized by the water purveyor from using reclaimed water to replace a higher priced domestic water supply. To calculate this, the unit cost per acre-foot to build, operate and maintain the reclaimed water system is subtracted from the unit cost of the alternate potable water supply, and half of this amount is set as the price of the reclaimed water.

In FY 1994-95, the price for MWD's treated supply was $426/AF. The cost of pumping groundwater (energy plus replenishment fees) was approximately $307/AF in the Central Basin. (NOTE: These costs are for the water alone and do not take into the consideration the distribution facilities.) The final price of water from local purveyors to the end user can easily exceed $600/AF.

The final price of reclaimed water to the end user will range from 85% to as low as 28% of the domestic water rate (Table 6-3). This table shows the cost of reclaimed water established by the various purveyors; it is not the price of the water charged by the Districts. The low cost of the reclaimed water supply helps offset the high capital costs of constructing a separate reclaimed water distribution system to deliver the water from the WRP to the point of use. Other capital costs can include operational storage facilities that might be required to offset diurnal flow variations at the WRP. Since the Districts' WRPs are situated along rivers for effluent discharge, construction costs can be reduced by utilizing the rights-of-way along the banks of these waterways for locating the distribution pipelines.

Golf courses operators and water-intensive industries, such as those using cooling towers, should be well aware of the dire consequences if stricter conservation measures are ever imposed again. Businesses may curtail operations or even shut down, and golf courses may lose their expensive investments in landscaping. Many heavy water users have since come to the realization that reclaimed water is still a drought-proof supply, despite the fact that sewage flows decreased by 10% during the 1987-92 drought.

TABLE 6-3
POTABLE vs. RECLAIMED WATER RATES[1]
Fiscal Year 1994-95
($/AF)

Purveyor	Potable Water	Reclaimed Water
Long Beach Water Department	643.38	319.73
City of Cerritos	413.82	217.80
City of Lakewood	413.82	370.26
Central Basin MWD	429.00	200.00-260.00
Pomona Water Department	276.17	76.21
Walnut Valley Water District	596.77	507.26
[1]This price includes distribution system costs.		

6.4.2 Funding Mechanisms

In California, funding for reuse projects is available as low-interest loans from the SWRCB. The voters in 1984 and 1988 approved bonds to provide a total of $55 million for such loans, while State Revolving Funds have recently been made available for water reclamation projects. The interest rate for these loans is set at one-half the rate of the State's general obligation bonds, which can result in a loan rate of below 3%. Continued financial support via passage of new water reclamation bonds would help alleviate funding as a barrier to water recycling.

In the southern California area, MWD has established a program to provide funds for local conservation projects, including reclamation. By developing alternate local water supplies, MWD will save not only energy costs by not importing State Project water from the Sacramento Delta area and pumping it over the Tehachapi Mountains, but also the capital costs involved in expanding conveyance, treatment and distribution facilities. The savings are used to provide rebates for reclaimed water projects that would not be economically feasible without this assistance. In 1990, MWD increased its rebate from $84 to $154/AF, and in 1995 to $256/AF to further stimulate reuse.

The WateReuse Association of California created the California WateReuse Finance Corporation in 1992 to assist its members in their efforts to enhance revenues while reducing costs. This program allows members to pool their capital project financing needs together, giving them access to both the lower rates in the tax-exempt bond market and the experienced financial and legal firms associated with the Corporation.

6.4.3 Contracting for Services

Instead of hiring additional staff to maintain and operate reclaimed water pump stations and pipelines, many purveyors have contracted for these services. For example, Districts' staff has the knowledge and experience to maintain and operate the Cerritos, Bellflower and Industry pump stations for those cities, who reimburse the Districts for these costs. The CBMWD has no field maintenance staff, so O&M on the Century and Rio Hondo pipelines and pump stations is contracted out to Park Water Company, California Water Service Company, ECO Resources and the City of Santa Fe Springs, all of which already have an adequate, experienced field staff.

SECTION 6.5: PUBLIC ACCEPTANCE

Generally there is widespread public acceptance of the use of reclaimed water because of its long track record of safety. Previous surveys have shown that public acceptance is inversely proportional to the level of contact with the reclaimed water (i.e., more people are comfortable with the use of reclaimed water for golf course irrigation versus drinking it). Despite this, developers of any reclaimed water project can be caught off guard when unexpected, strong and, sometimes, vitriolic opposition arises. In denouncing the proposed recycling project, opponents may attempt to play on the fears of the general public by pushing the "hot buttons" they feel will result in the desired response. By using buzzwords such as "toxics," "taxes," "cancer" and "job loss," they hope for an automatic, emotional response against the project, which they might receive to a certain degree. A relatively small number of vocal opponents to a water recycling project may exert enough political pressure to force a city council or water district board of directors to cancel the project. It is no longer sufficient to satisfy the concerns of the regulatory community, which had been the case in the past when new water recycling projects were proposed. The objective must be to involve the public early and to a greater extent than would normally occur, and address their concerns before they even have a chance to express them. A proactive campaign to inform the public and garner their support can serve as inexpensive insurance early in project development.

Retail and wholesale purveyors planning water recycling projects can rely on the Districts' extensive body of scientific research, water quality monitoring data, health effects studies and decades of experience with direct nonpotable and indirect potable use of reclaimed water. There are several activities that the Districts are currently engaged in which enhance the public's general knowledge and acceptance of reclaimed water use that should be continued and even expanded. Tours, presentations, news articles and advertisements, mailers and public hearings reach different segments of the public. These activities can be increased and customized to assist in the development of individual reuse projects as the situation warrants.

However, all of this will not necessarily prevent opposition from individuals or groups who have hidden agendas other than valid health and safety concerns, as described in Chapter V. Efforts described in the following sections can prove to be of great help in attempting to mitigate the negative impacts of such opposition.

6.5.1 Technical Information

From the San Gabriel Valley experience, it was seen that public concerns regarding water recycling consisted of an incredibly broad range of subjects including: microorganisms, trace organics, job loss, economic feasibility and treatment process effectiveness and reliability, among others. The Districts have a wealth of information in all these areas, making it available to not only its recycling partners within its service area, but to other reclamation entities, local, national and international. Most important, the thoroughness of the responses presents an image of openness and candor to the public. By not allowing any concern or allegation to go unchallenged, it demonstrates to the public that the project sponsors are diligent in their research, that they are not obscuring any relevant facts and that opposition to the project (if it exists) is scientifically unfounded. However, it must be kept in mind that complete and accurate scientific and technical responses to the public's concerns necessarily involve a great deal of information that cannot be delivered in the sound-bite format enjoyed by the project opponents. On the other hand, answers to public concerns should be delivered in a way that is comprehensible to the nontechnical layperson. This avoids giving the impression that the technical experts are speaking down to the public or, even worse, are attempting to obscure the issues with "techno-babble."

6.5.2 Qualified Supporters

An unfortunate aspect of many public works projects is that often certain segments of the public distrust the bureaucracy involved, no matter how honest, efficient and competent they may be. The recruitment of outside supporters is important in reestablishing public trust. Using the Districts' distinguished history in reclamation and its wealth of technical data, supporters have been found in academia, environmental groups such as the Sierra Club and the Mono Lake Committee, regulatory agencies, the Los Angeles County Medical Association and civic groups such as the League of Women Voters. The depth and breadth of official, technical support for water recycling projects can be overwhelming, leaving any potential opponents with little or no support of a reputable nature. While the sheer number of supporters may not convince the more diehard opponents, it can nonetheless impress many people who are looking for a comfort level that this kind of expertise can supply. Furthermore, if a water recycling project is challenged in court, these supporters can be translated into a considerable expert witness list.

6.5.3 News Media

The battle for the hearts and minds of the public can be won or lost in the press. Contacts with local environmental reporters need to be established as early as possible in the development of a water recycling project. These reporters will then have responsible sources of information during the project. Thus, any claims made by project opponents can be addressed and refuted within the same news article, rather than days later when the damage has already been done. Contacts should also be extended to the editorial staffs of the local newspapers. In the case of the San Gabriel Valley project, representatives from several Los Angeles County reclamation agencies met with the local editorial board to provide information on the quality of the reclaimed water, the reliability of the treatment process, the historical uses of reclaimed water for groundwater recharge and the critical water supply situation the State of California will be facing in the near future. These endeavors paid off as subsequent editorials published in this newspaper not only voiced support for this project, but also criticized the opponents for both their lack of credible evidence and their questionable tactics.

The Districts have also acted in cooperation with other local agencies and the WateReuse Association of California in producing a full-page advertisement on water recycling timed to coincide with the 25th anniversary of Earth Day in April 1994. This ad described the treatment process, summarized the historic use of reclaimed water, provided quotes from highly regarded experts in water supply, public health and the environment and offered tours of the treatment plant to the public. Advertisements and news articles promoting a reuse project should ideally begin early in planning process to preempt opposition.

6.5.4 Facility Tours

The single, most successful tactic for increasing public support for water recycling has been shown to be a walking tour of an actual WRP. The Districts have a regular program of plant tours for the public including local colleges and universities, associations and foreign visitors. Facility tours are scheduled on an as-needed basis with managers and employees, such as maintenance staff, of direct nonpotable reuse sites, with local politicians or with groups of interested individuals. The vast majority of tour attendees at Districts' facilities are impressed with what had previously been a great mystery to them, namely where all the sewage went when they flushed their toilets. The cleanliness of the facilities, the various treatment process backup systems, and, most important, the quality of the water as it leaves the plant (compared to its appearance as it entered the plant) are generally enough to assuage any of the residual concerns harbored by the attendees. It is stressed that literally *all* water is reclaimed water, and that the water that comes out their taps has been used by thousands upon thousands of other organisms since life began, some more recently than they think. For example, State Project water contains secondary treated effluent from many northern California cities. Before leaving the tour, the attendees are asked to pass along the information they received on the tour to friends and family who may also have expressed concerns regarding water reclamation.

As a gauge of the effectiveness of these tours, evaluation sheets were distributed at the end of six tours given to the general public in 1994. Every completed evaluation indicated that the responder now supported the use of reclaimed water for groundwater recharge, and that viewing the treatment facilities did the most in convincing them of the safety and usefulness of water recycling.

6.5.5 Speakers Bureau

The Districts' public education efforts are designed to reach other segments of the populace with its Speakers Bureau program. Program presentations are made upon request at the weekly meetings of the various community service clubs, such as Rotary, Lions and Kiwanis. This program has been and will continue to be extended to city councils, local commissions, school boards and other political entity meetings if a special effort is needed to support a particular project. The people that attend these meetings are influential community and business leaders, and having the support of this demographic group is considered essential. While no formal evaluation sheets are used, comments following these presentations are always complimentary and supportive of the concept of water recycling.

6.5.6 Public Hearings

Public hearings on water recycling projects are generally not held, unless an Environmental Impact Report is required, a permit is needed from the local regulatory agency, bonds are to be sold to finance the project, additional taxes or fees are to be implemented, significant construction will occur or the particular reuse application is unique. Such public hearings not only follow the letter of the law, they can demonstrate to the public that the sponsoring agency is being candid and open in informing the public of its intentions.

An unfortunate characteristic of these kinds of hearings is that people who believe a particular proposed project is a good idea or who are not concerned about the project or the issues involved stay at home, while vocal opponents will show up. For such public hearings the Districts' generally provide staff members and/or outside experts who are experienced with similar water recycling projects and who can directly and accurately answer questions regarding any of the various aspects of the projects.

6.5.7 Water Reuse Videos

In 1989, the Districts produced a 10 minute video entitled "Water for a Dry Land." It described, in an easily understood manner, the various aspects of the Districts' reuse program, including the treatment process, the diverse uses of reclaimed water and the advantages of using reclaimed water. This video won top honors in two categories (Best Professional and Best Public Education) at that year's California Water Pollution Control

Association's annual film festival. This video is made available at no cost to public agencies and nonprofit organizations. The Districts' have also assisted other agencies, independent producers, schools and the WateReuse Association in producing other videos on water recycling.

6.5.8 Water Reuse Brochures

The Districts have produced two brochures on water recycling with a third currently in production. The two existing brochures are smaller versions of two entries on water recycling that had been submitted to the American Academy of Environmental Engineers annual competition, one of which was the Grand Prize winner in 1990. All of the brochures present easy-to-read information on various aspects of the Districts' water recycling program.

6.5.9 Water Recycling Newsletter

Several other reclamation agencies in the Los Angeles area have newsletters devoted to the water recycling efforts of their agency. The Districts have a growing library of information on its water recycling program, which could be disseminated in a reuse newsletter. Such a newsletter could be started as early as 1996. The goal of this newsletter would be to provide updates on reuse projects currently under development or start-up and to highlight state-of-the-art research on wastewater treatment and water reclamation being undertaken by Districts' staff.

6.5.10 Interactive Computer Information

In an effort to reach more people with information about water recycling, the Districts is developing a multimedia computer presentation that will include photographic, textual and graphic material in an interactive and readily updatable format. This can be provided to users by means of a CD, with the possibility of establishing a page on the World Wide Web that can reach an almost unlimited audience.

EXHIBIT 6-1

STATE OF CALIFORNIA - CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
P. O. BOX 2000, Sacramento, CA 95812-2000
901 P Street, Sacramento, CA 95814
(916) 657-1364

MAY 1993
RECEIVED

PETITION FOR CHANGE

For owners of waste water treatment plants
(Water Code 1210)

☐ Point of Discharge ☐ Place of Use ☐ Purpose of Use

I (we) hereby petition for change(s) noted above and shown on the accompanying map and described as follows:

Point of Discharge (Give coordinate distances from section corner or other ties as allowed by Cal CR 715, and the 40 - acre subdivision in which the present & proposed points lie.)

Present ______________________

Proposed ______________________

Place of Use (If irrigation, then state number of acres to be irrigated within each 40 - acre tract.)

Present ______________________

Proposed ______________________

Purpose of Use

Present ______________________

Proposed ______________________

• GIVE REASON FOR PROPOSED CHANGE: ______________________

____

I have access to the proposed point of discharge or control the proposed place of use by virtue of ______________________
(ownership, lease, verbal or written agreement)

If by lease or agreement, state name and address of party(s) from whom access has been obtain.

______________________ ______________________
______________________ ______________________
______________________ ______________________

Give name and address of any person(s) taking water from the stream between the present point of discharge and the proposed point of discharge, as well as any other person(s) known to you who may be affected by the proposed change.

______________________ ______________________
______________________ ______________________
______________________ ______________________

Will this change involve water provided by a water service contract which prohibits your exclusive right to this treated water? ________
(yes/no)

Will any legal user of the discharge treated waste water be affected ? ________
(yes/no)

I (we) declare under penalty of perjury that the above is true and correct to the best of my (our) knowledge and belief.

Dated: ______________, 19 ____ at ______________________, California

______________________ ( ) ______________________
Signature(s) Telephone No.

NOTE: A $100 filing fee made payable to the State Water Resources Control Board and an $850 fee made payable to the Department of Fish and Game must accompany a petition for change.

WR 22-WW (1-92)

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
901 P Street, Sacramento
P. O. Box 2000, Sacramento, CA 95812-2000

PETITION FOR CHANGE
ENVIRONMENTAL INFORMATION

(THIS IS NOT A CEQA DOCUMENT)

APPLICATION NO.____________PERMIT NO.____________LICENSE NO.____________

The following information will aid in the environmental review of your petition as required by the California Environmental Quality Act (CEQA). IN ORDER FOR YOUR PETITION TO BE ACCEPTED AS COMPLETE, ANSWERS TO THE QUESTIONS LISTED BELOW MUST BE COMPLETED TO THE BEST OF YOUR ABILITY. Failure to answer all questions may result in your petition being returned to you, causing delays in processing. If you need more space, attach additional sheets. Additional information may be required from you to amplify further or clarify the information requested in this form. If form WR 1-2 was completed during the application process describe the differences between those conditions and the present conditions.

DESCRIPTION OF CHANGES TO PROJECT

1. Provide a brief description of the proposed changes to your project (**CHANGES**), including but not limited to type of construction activity, structures existing or to be built, area to be graded or excavated and operational changes.

WR 1-4 (10/90)

GOVERNMENTAL REQUIREMENTS

Before a final decision can be made on your petition for change, we must consider the information contained in an environmental document prepared in compliance with the requirements of CEQA. If an environmental document has been prepared for your CHANGES by another agency, we must consider it. If one has not been prepared, a determination must be made as to who is responsible for the preparation of the environmental document for your CHANGES. The following questions are to aid us in that determination.

2. Contact your county planning or public works department for the following information:
   (a) Assessor's Parcel No. ________________
   (b) County Zoning Designation ________________
   (c) Will the county have to issue any permits or approvals for your CHANGES? ________ If yes, check appropriate spaces below: ______ Grading Permit, ________ Use Permit, ________ Watercourse Obstruction Permit, _____ Change of Zoning, _____ General Plan Change, _____ Other: ________________
   (d) If any permits have been obtained list permit type and permit number: ________________
   (e) Person contacted ________________ Date of contact __________ Department ________________ Telephone (   )______________

3. Are any additional state or federal permits required for your CHANGES? (i.e., Federal Energy Regulatory Commission, U.S. Forest Service, Bureau of Land Management, Soil Conservation Service, Department of Water Resources, Division of Dam Safety, Reclamation Board, Coastal Commission, State Land Commission,etc.) For each agency from which a permit is required provide the following information:
   Permit type ________________

   Person(s) contacted ________________ Agency ________________

   Date of contact ________________ Telephone (   ) ________________

4. Have you (if you are a public agency) or any permitting agency prepared any environmental documents for your CHANGES? ________________
   If so, you must submit a copy of the latest environmental document with this application, including a copy of the notice of determination.
   If not, will any environmental documents be prepared by any permitting agency, or will you be preparing environmental documents for your CHANGES?

   ________________If so, explain:________________

   ____

   ____

   Note: When completed, the final environmental document or notice of exemption must be submitted to the Board. Processing of your petition to change cannot proceed until such documents are submitted.

5. Will your CHANGES, during construction or operation, generate waste or wastewater containing such things as sewage, industrial chemicals, metals,or agricultural chemicals, or cause erosion, turbidity or sedimentation? ___

   If so, explain: ________________

   ____

   ____

   If you answered yes or you are unsure of your answer, contact your local Regional Water Quality Control Board for the following information (See attachment for address and telephone number):

   Will a waste discharge permit be required for your CHANGES? ____________

   Person contacted ________________ Date of contact _________

   What method of treatment and disposal will be used? ________________

   ____

   ____

6. Have any archeological reports been prepared on this project, or will you be preparing an archeological report to satisfy another public agency because of the CHANGES?____________________

Do you know of any archeological or historic sites located within the general project area? ________ If so, explain: ____________________

ENVIRONMENTAL SETTING

7(a). Describe the current land use of the area at the point of water diversion, immediately downstream of the diversion, and at the place where the water is to be used. **Attach two sets of photographs of these areas. Date and label photos.**

Point of diversion: ____________________

Downstream of diversion: ____________________

Place of use: ____________________

(b) Describe the types of existing vegetation at the point of diversion, immediately downstream of the point of diversion, and at the place where the water is to be used. These vegetation types should be shown in the photographs submitted.

Point of diversion: ____________________

Downstream of diversion: ____________________

Place of Use: ____________________

8. What changes in the project site and surrounding area will occur or are likely to occur because of the CHANGES and operation of your project? Include in your answer such things as approximate number and size/age of trees to be removed or areas of vegetation/brush removal; area or extent of streambed alteration, trenching, grading, excavation, plowing, or road, dam or building construction; etc. Consider all aspects of your project, including diversion structure, pipelines or ditches, water use,and changes at the place of use.

FISH AND WILDLIFE CONCERNS

Contact your regional office of the State Department of Fish and Game (DFG) to obtain the information requested in questions 9 through 17 (see page 6 for address and telephone number):

9. Person contacted ______________________________

Date of contact ______________ Telephone (   ) ______________

10. According to the DFG representative, when did or when will a DFG representative visit the project site area? ______________________________

____

What is the name of the DFG representative who made or will make the inspection of the project site area? ______________________________

11. According to the DFG representative, will your CHANGES require a Streambed Alteration Agreement? ______________________________

12. According to the DFG representative, do any resident or migratory game or non-game fish species occur in the affected stream? ______________

If so, what species? ______________________________

____

What season of the year do they occur in the stream? ______________

____

____

13. According to the DFG representative, do any plants or animals which are (1) federally identified as candidate, threatened, or endangered; (2) state listed as rare, threatened, or endangered; or (3) listed by the DFG Natural Diversity Data Base, occur in the project area? ______________

Will they be impacted by the CHANGES? ______________________________

If so, identify the species and explain how they will be impacted:

____

____

____

____

____

14. Does the DFG representative expect that your CHANGES will have an adverse effect on any resident or migratory fish populations, any wildlife populations, or any rare or endangered plant or animal species? ________

If so, explain: ______________________________

____

____

____

____

____

15. What measures relating to your CHANGES have been proposed by the DFG representative to protect fish, wildlife or endangered or rare species:

____

____

____

____

____

____

____

16. Will you make changes in your project as recommended by DFG? __________

If not, explain: ______________________________

____

17. If your petition lists wildlife enhancement as a proposed use, describe your wildlife enhancement plans under question one above (attach additional pages as necessary).
According to the DFG representative, do your proposed CHANGES utilize a sound technique for the purpose of wildlife enhancement? __________

EXISTING STORAGE OR DIVERSIONS

18. If you currently have an interest in any other appropriative water projects in the same watershed as this project, answer the following additional questions for each project:
Does the project have fish and wildlife protection requirements? __________
If so, list the permit number and specific protection requirements for each project: ______________________________

____

CERTIFICATION

I hereby certify that the statements I have furnished above and in the attached exhibits are complete to the best of my ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge.

Date ______________ Signature ______________________

STATE OF CALIFORNIA

DEPARTMENT OF FISH AND GAME

● **REGIONAL OFFICES**

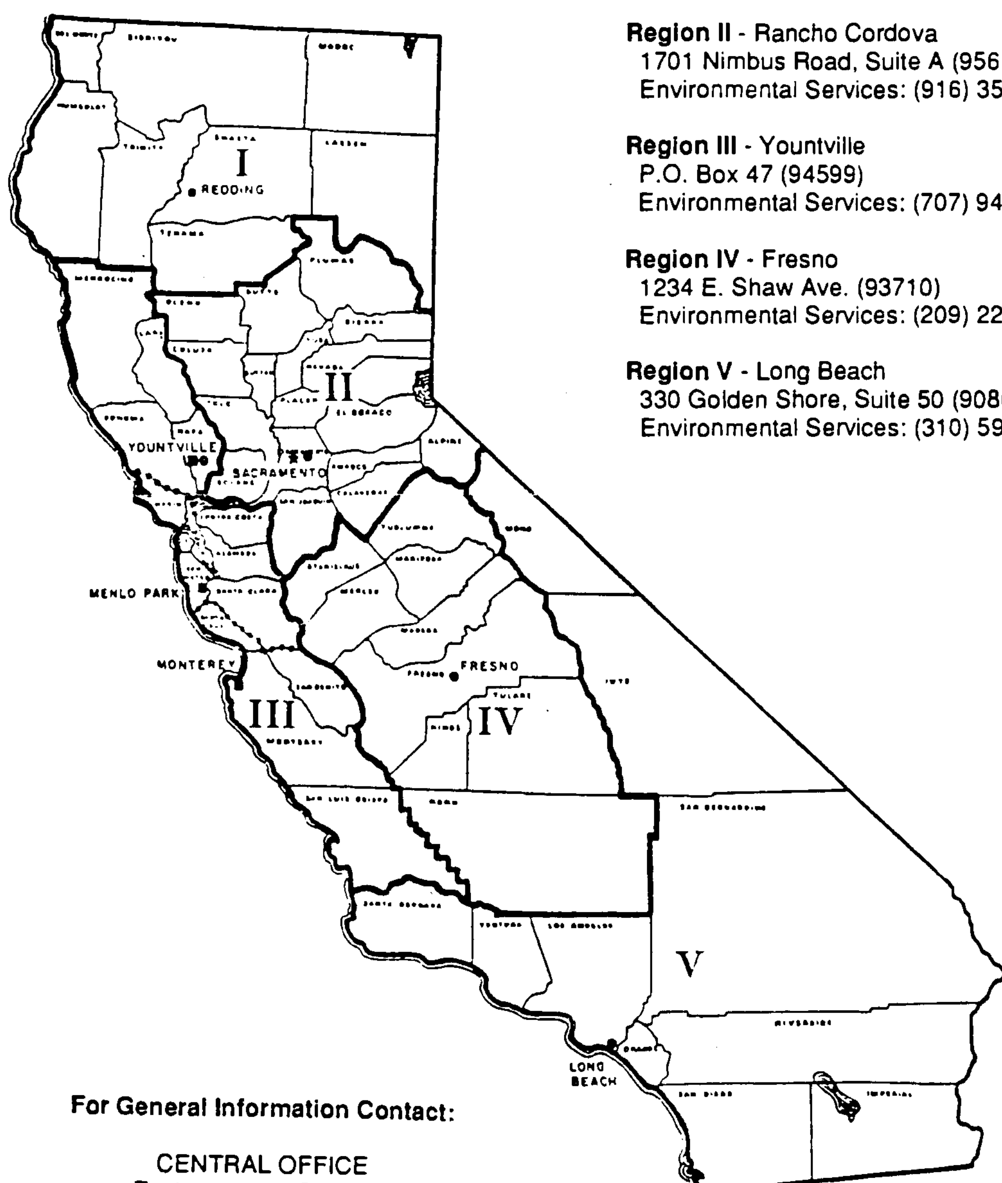
Region I - Redding
601 Locust Street (96001)
Environmental Services: (916) 225-2373

Region II - Rancho Cordova
1701 Nimbus Road, Suite A (95670)
Environmental Services: (916) 355-7030

Region III - Yountville
P.O. Box 47 (94599)
Environmental Services: (707) 944-5500

Region IV - Fresno
1234 E. Shaw Ave. (93710)
Environmental Services: (209) 222-3761

Region V - Long Beach
330 Golden Shore, Suite 50 (90802)
Environmental Services: (310) 590-5132



For General Information Contact:

CENTRAL OFFICE
Environmental Services
1416 - 9th Street, Room 1236-8
Sacramento, CA 95814

Water Rights Coordinator
(916) 653-9719

SECTION 7.1: RECOMMENDED ACTION ITEMS

The Districts have a long history in the field of water recycling, resulting in one of the most advanced and widespread programs for the treatment, distribution and reuse of reclaimed wastewater. Based on the powers and authorities of county sanitation districts as defined under §4700, *et seq.* of the California Health and Safety Code, the Districts have established their role to include producing the reclaimed water, promoting its use, conducting necessary research, and cooperating with other entities who either distribute the water to retail customers or use it themselves for purposes such as groundwater replenishment. This report has identified and evaluated the potential for reuse of reclaimed water produced, the technical, regulatory, institutional, economic and public acceptance impediments to the use of reclaimed water, and possible solutions for avoiding or overcoming the identified impediments. Based on this evaluation, presented below are a number of activities that the Districts must continue to engage in and/or initiate to promote the expanded use of this resource.

- Provide high quality, cost-effective reclaimed water through treatment and source control.
- Manage reclaimed water production/distribution to optimize its availability to customers.
- Implement the JOS 2010 Master Facilities Plan to build additional treatment capacity, as needed, at the water reclamation plants to increase the available reclaimed water supply.
- Actively participate in planning processes for new water recycling projects and provide technical assistance, when applicable.
- Work with water suppliers during preparation of their Urban Water Management Plans to identify water recycling projects that can be considered as additional water supplies.
- Where appropriate, allow construction of reclaimed water pump stations on WRP property, with contracted operation and maintenance by District's forces.
- Work with regulatory agencies to develop mechanisms to streamline approval of water reclamation projects, and to develop/revise water reuse regulations that are protective of public health and the environment and are conducive to maintaining and expanding water recycling opportunities.
- Encourage and promote relations with water reuse customers by maintaining personal contacts to address water recycling issues and by providing technical assistance.
- Undertake research and monitoring activities designed to assure the safety of water reclamation.
- Work with the SWRCB and RWQCB to balance the independent, and sometimes conflicting, mandates of protecting instream beneficial uses and promoting new sources of water supply, such as water reclamation.
- Participate in legislative efforts to promote water reclamation.

- Work to resolve conflicts between the fair and reasonable distribution of reclaimed water and the SDA.
- Advance public outreach efforts through the distribution of water recycling information and through tours and public presentations about water recycling.
- Set rates for reclaimed water that encourage reuse via savings over domestic water supply, including consideration of reduced introductory rates that will allow distribution systems to be completed, sufficient number of users to be connected and revenues from the sale of reclaimed water to be firmly established.
- Work with the Los Angeles County Reclaimed Water Advisory Committee to identify and address technical and regulatory issues affecting the local use of reclaimed water.