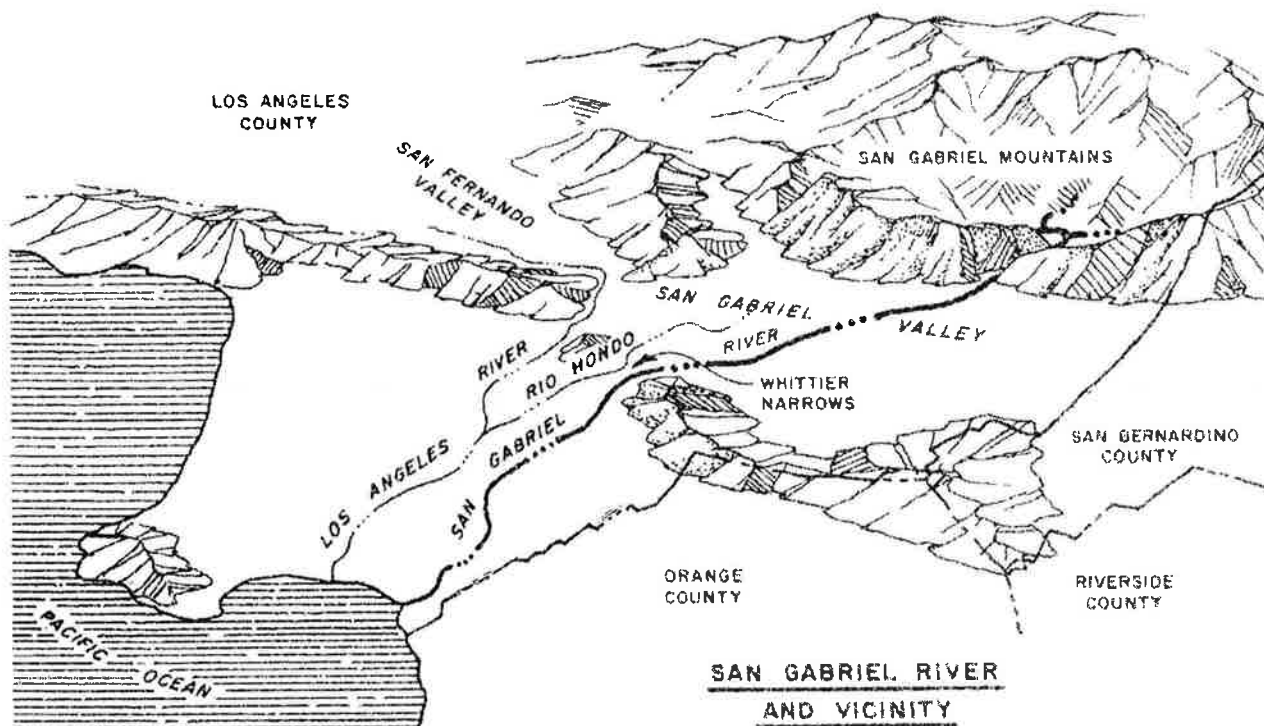


WATERMASTERS
HOWARD H. HAILE
RICHARD A. RHONE
THOMAS M. STETSON

MAILING ADDRESS:
225 W. BROADWAY
SUITE 400
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THIRTY-FIFTH ANNUAL REPORT
OF THE
SAN GABRIEL RIVER WATERMASTER
FOR
1997-98



City of Long Beach, et al., vs. San Gabriel Valley Water Co., et al.
Case No. 722647 — Los Angeles County

February 26, 1999

SAN GABRIEL RIVER WATERMASTER

FOR
CITY OF LONG BEACH ET AL VS SAN GABRIEL VALLEY WATER CO. ET AL
CASE NO. 722647-LOS ANGELES COUNTY

WATERMASTERS
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February 26, 1999

To: Clerk of Superior Court of Los Angeles
County and All Parties

Re: Watermaster Report for 1997-98 Water Year

Gentlemen:

We have the honor of submitting the Thirty-Fifth Annual Report of the San Gabriel River Watermaster for water year 1997-98, in accordance with the Judgment in Case No. 722647 entered September 24, 1965. A complete summary of Watermaster Findings is contained in this report.

The 1997-98 water year is the fourth year in the Third Long-term Accounting Period. The average precipitation at the four stations used to represent San Gabriel Valley rainfall for 1997-98 was 36.1 inches or 195 percent of the long-term average annual rainfall of 18.52 inches as defined in the Judgment. The ten-year average rainfall from 1988-89 through 1997-98 amounted to 20.9 inches, which, according to Table A of the Judgment, established the Lower Area Annual Entitlement at 113,100 acre-feet for 1997-98.

The principal findings of the Watermaster under annual accounting for the year 1997-98 are as follows:

	<u>Acre-Feet</u>
1. Lower Area Annual Entitlement	113,100
2. Usable water received by Lower Area	145,722
3. Upper Area Credit for Water Year 1997-98	32,622
4. Accrued Credit of Upper Area as of September 30, 1997	188,977

February 26, 1999

- | | | |
|----|--|---------|
| 5. | Amount of Make-up Water received by
Lower Area in 1997-98 | 0 |
| 6. | Accrued Credit of Upper Area as of
September 30, 1998 | 221,599 |
| 7. | Amount of Make-up Water required to
be delivered prior to October 1, 1999 | 0 |

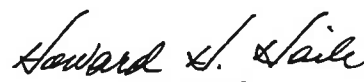
A complete summary of Watermaster findings is contained in Chapter IV of this report.

The majority of the data required by the Watermaster is furnished by the Los Angeles County Department of Public Works. The cooperation and assistance furnished by the County and other agencies is gratefully acknowledged.

Sincerely,

SAN GABRIEL RIVER WATERMASTER

By: 
Thomas M. Stetson


Howard H. Haile


Richard A. Rhone

Enclosure

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CHAPTER I. ACTIVITIES OF WATERMASTER

This report is for the thirty-fifth year of operations under the Judgment in Case No. 722647 (the Long Beach case). Parties to the Judgment are listed on page A-1 of the Appendix. The Judgment declared that the Lower Area of the San Gabriel River System, the area downstream of Whittier Narrows, is entitled to receive an annual average of 98,415 acre-feet of Usable Water from the Upper Area, the area upstream of Whittier Narrows. The history of the litigation, the Judgment and related activities were described in the first twelve annual reports and in the thirty-first annual report on the occasion of the Second Long-term Accounting. Therefore, they will not be restated in this report.

The activities of the Watermaster include administration of operations under the Judgment, performance of field inspections, collection of data and maintenance of records, analyses of data, preparation of the annual report presenting the required determinations and findings, and maintenance of records of transfers of defendants' water rights. All operations and reports are based on the "Water Year," which is from October 1 through September 30.

Administration

The official office and depository of records of the Watermaster is 225 W. Broadway, Suite 400, Glendale, California. Such records are available for inspection during regular office hours at that office upon the request of any Party.

An audit of income and expenditures of the Watermaster for the water year 1997-98 was performed by the firm of Christine L. Blazey, CPA. Table 1 is the Statement of Income and Expenditures for the water year 1997-98 based on the Blazey letter of December 1, 1998, which is in the Appendix of this Report.

TABLE 1
STATEMENT OF INCOME AND EXPENDITURES
FOR THE WATER YEAR 1997-98

Carried forward from year 1996-97	\$ 13,854.41
Income from 1997-98 assessments	72,000.00
Interest Income	<u>1,839.02</u>
	\$ 87,693.43
Expenditures:	
1. Administrative fees and general operating expenses	\$ 13,331.19
2. Collection of data, field inspections and maintenance of records	29,728.24
3. Calculations and preparation of Watermaster Report for water year 1996-97	41,528.99
4. Printing and reproduction costs	<u>2,281.56</u>
Total expenditures	86,869.98
Balance	<u><u>\$ 823.45</u></u>

The tentative budget for the current water year (1998-99) was mailed to all Parties on July 6, 1998. Following a period of 15 days after service of the tentative budget, there being no objections received, the tentative budget became the final budget. The 1998-99 annual budget and proration of costs for payment thereof are shown in Table 2.

Watermaster Personnel

The Judgment provided for the appointment of a three-member Watermaster, one to represent the Upper Area, one to represent the Lower Area, and the third to represent both areas. On November 12, 1965, the three-member Watermaster was appointed and certified by the Court, namely Thomas M. Stetson representing the Upper Area, Max Bookman representing the Lower Area, and M. E. Salsbury representing both areas. Mr. Salsbury elected to conclude his years of service in 1985 and upon nomination from Upper San Gabriel Valley Municipal Water District (Upper District) and Central Basin Municipal Water District (Central Municipal), the Court appointed Howard H. Haile as his replacement effective February 7, 1985. Mr. Bookman elected to conclude his years of service in 1986 and upon nomination by the Lower Area Parties, the Court on January 14, 1986, appointed Richard A. Rhone to replace Mr. Bookman. This appointment was effective in February 1986.

The staff work for this report was by Richard Anderson for Bookman-Edmonston Engineering, Inc. and Stephen B. Johnson, Kevin Smead and Sarah Tracy for Stetson Engineers Inc.

TABLE 2

WATERMASTER BUDGET
FOR
WATER YEAR 1998-99

1.	Administrative costs and general operating expenses	\$15,000.00
2.	Hydrologic analyses, collection of data and field inspection	27,000.00
3.	Additionally needed facilities	10,000.00
4.	Calculations and preparation of Watermaster Report for Water Year 1997-98	50,000.00
5.	Printing and reproduction costs	3,000.00
6.	Contingencies	<u>10,000.00</u>
	Total	\$115,000.00
	Surplus carried forward from 1997-98	2,000.00
	To be financed for 1998-99	\$113,000.00

Proration for Payment Purposes

Upper San Gabriel Valley Municipal Water District	50.0%	\$56,500.00
Central Basin Municipal Water District	41.2%	46,556.00
City of Long Beach	7.125%	8,051.25
City of Compton	<u>1.675%</u>	<u>1,892.75</u>
Total	100%	\$113,000.00

Data Collection

The Watermaster collects data on streamflow, rainfall, water quality, ground water levels, export of ground water through Whittier Narrows, reclaimed water, imported replenishment water and other information as required. The principal source of data is the Los Angeles County Department of Public Works (hereinafter County). Copies of appropriate records were obtained from the County and many conferences were held between County personnel and Watermaster personnel in order that the Watermaster would be fully informed on the facts necessary to make the determinations required by the Judgment. Other data were obtained from the Metropolitan Water District of Southern California, the County Sanitation Districts of Los Angeles County, the Water Replenishment District of Southern California, the Upper San Gabriel Valley Municipal Water District, the San Gabriel Valley Municipal Water District, the Central Basin Municipal Water District, the San Gabriel Valley Water Company, Main San Gabriel Basin Watermaster, the U. S. Army Corps of Engineers, and the U. S. Geological Survey (USGS). The Watermaster makes use of water level measurements collected by University of Southern California on behalf of the San Gabriel Valley Protective Association.

The collected surface flow data are summarized in a daily operation computer model. This model, developed by Watermaster personnel, aids in the efficiency and accuracy of the analyses.

Field Inspections

During the 1997-98 water year, Watermaster staff made quarterly field inspections of gaging stations and other facilities. Facilities inspected included some of the spreading grounds, stream gaging stations, imported water delivery points and river channels in the San Gabriel River system. Watermaster staff also measured the depth to water in a number of wells in the Whittier Narrows area to obtain data for the calculation of annual subsurface flow through Whittier Narrows. The quarterly inspections are coordinated with the water level measuring program conducted on behalf of San Gabriel Valley Protective Association.

Preparation of Report

One of the required functions of the Watermaster is the preparation of the annual report presenting the findings required by the Judgment. The Judgment provides that a report be prepared and submitted within five months after the end of each water year, and copies of the report are to be filed with the Court and furnished to each of the Parties. Copies are also furnished to others upon request.

Stream Gaging Stations

The County and the U. S. Geological Survey operate the stream gaging stations on the San Gabriel River System, data from which are essential for determinations required of the Watermaster.

Plate 1, entitled "Stream Gaging Stations, Rio Hondo - San Gabriel River System," shows the general vicinity of the Whittier Narrows area. Plate 2, entitled "Map

of Whittier Narrows," shows in greater detail certain features in Whittier Narrows including wells used for calculating subsurface flow.

The accuracy of measuring some of the higher surface water flows is at times questionable. Also, physical changes occur in the channel sections at several of the stream gaging stations. These problems and their resolutions are discussed in Chapter III.

Memorandum of Understanding (1982)

On May 13, 1982, a Memorandum of Understanding was executed by representatives of Upper and Lower Area Parties. That document recognizes the need for a continuing cooperative working relationship between the Upper and Lower Area Parties. The purpose of the agreement was to institute under present conditions certain practical accommodations which are not intended to constitute interpretations of or additions to the Judgment. That Memorandum of Understanding is still in effect and is included as an Appendix to the Thirty-first Annual Watermaster Report.

Transfer of Water Rights, Change of Address and Change of Name of Parties

During the 1997-98 water year there were no transfers of water rights, changes of address or changes of names of Parties reported to the Watermaster.

CHAPTER II. LOWER AREA ANNUAL ENTITLEMENT

The Lower Area Annual Entitlement for the water year 1997-98 is based on the average annual rainfall which occurred in the 10-year period ending September 30, 1998, and the corresponding entitlement shown in Table A of the Judgment. Four precipitation stations are utilized to determine the annual precipitation for San Gabriel Valley. The four stations are located at San Dimas, Walnut, El Monte and Pasadena.

Rainfall

Rainfall during the 1997-98 water year at the four stations was as follows:

<u>Station Number</u>	<u>Location</u>	<u>Depth of Rainfall in Inches</u>
95	114 East First Street, San Dimas	34.97
102D	700 Fairway Drive, Walnut	35.19
108D	3615 North Santa Anita Avenue, El Monte	35.33
610B	City Hall, Pasadena	<u>39.02</u>
	Four Station Average Rainfall	36.13

Table 3 presents the calculation of the 10-year average rainfall in the San Gabriel Valley for the water years 1988-89 through 1997-98.

TABLE 3
AVERAGE ANNUAL RAINFALL IN SAN GABRIEL VALLEY
1988-89 THROUGH 1997-98

Water Year	Annual Precipitation Rainfall
1988-89	11.2
1989-90	12.4
1990-91	15.1
1991-92	22.8
1992-93	35.9
1993-94	11.6
1994-95	30.4
1995-96	15.6
1996-97	17.5
1997-98	<u>36.1</u>
Total	208.6
10-Year Average	20.9

Lower Area Annual Entitlement

Based on the 10-year average rainfall of 20.9 inches, the Lower Area Annual Entitlement for the 1997-98 water year is 113,100 acre-feet, determined from Table A of the Judgment.

CHAPTER III. USABLE WATER RECEIVED BY LOWER AREA

Presented in this Chapter is the determination of the quantity of Usable Water received by the Lower Area during the water year 1997-98. Also included is a discussion of the quality of water received by the Lower Area.

Surface Flow

The items to be included in Surface Flow through Whittier Narrows are set forth in Section III.A of Exhibit B of the Judgment. The measured flows and estimated flows are described below. The Judgment provides for adjustments to the measured flows where applicable. Some measurements during water year 1997-98 were found to be unreliable, questionable, or in error and appropriate adjustments were made by Watermaster. These adjustments are discussed later in this chapter.

Rio Hondo Above Mission Bridge, Station F64

In August of 1978, the flow recorder at this station was removed due to high maintenance costs and very poor control caused by a shifting sand bottom at the station. Also, the use of Whittier Narrows Reservoir for storage of storm waters for conservation purposes causes frequent backwater at the station during storm operations. The County again removed the recorder at this station in 1995. The County Hydrographer schedules periodic current meter measurements at this station. Using these measurements and upstream measurements, a record of flow has been developed over the years which is considered to be more accurate than the recorder. This is due to the poor conditions of the channel section at the station and backwater from Whittier Narrows Dam.

During water year 1997-98, a total of 38 current meter measurements were performed by the County. The Watermaster has determined that a synthesized flow at Station F64 should be used for the entire year. Using data provided by the County and by the USGS, the Watermaster synthesized flow at the station as being equal to the sum of the flow at Garvey Avenue (E326-R), Alhambra Wash (F81D-R), imported water releases through CenB-36, plus an estimate of rising water. For some limited periods in 1997-98, the record at Garvey Avenue (E326-R) was inconsistent with measurements at other stations and County records. This occurred at times when large releases from San Gabriel Canyon reservoirs were made and flowed past the County station at Lower Azusa Road on the Rio Hondo during non-storm periods. For periods when flow at Garvey Avenue was inconsistent and questionable, flow at Lower Azusa Road (F192B-R), about 2 miles upstream of E326-R, was used for the synthesized flow calculations. This was done for the period of June 2-7, July 8-9, and July 14-19, 1998. The synthesized flow at F64 was utilized for the entire water year and it is considered that the record produced is reasonably accurate. This resulted in a total flow at Station F64 for the 1997-98 water year of 102,200 acre-feet.

Additional analyses balancing all inflow stations with the outflow stations and the amount of water spread indicated some inconsistencies during days of very high flow. In those cases, appropriate adjustments were made, which are described later under the heading "Adjustments to Surface Flow."

Mission Creek at San Gabriel Boulevard, Station F83

The recorder was removed from this station during water year 1977-78 because of construction work by the Los Angeles County Road Department and the designation of

the station was changed from "F83-R" to "F83", a non-recording station. The channel has also been realigned making reestablishment of the station less reliable. Historically, the majority of the water carried in Mission Creek was rising water.

In the past, weekly visits to this station were made by a County hydrographer and if there was surface water flow, a measurement was made. There was no record of Station F83 being measured or visited by a hydrographer during 1997-98. Observations were made by the Watermaster staff in October 1997 and January, April and July 1998 showing that Mission Creek was dry. As the spring is the time of maximum rising water and the Creek was dry in April, it is presumed to have been dry for the entire year.

Rio Hondo By-Pass Channel (Zone I Ditch), Station F313B-R

The measured flow at Station F313B-R for the 1997-98 water year was recorded by the County to be 22,860 acre-feet.

Whittier Narrows Flood Channel, Station G44B-R (formerly F337-R)

Station F337-R was located on the Rosemead Boulevard Bridge. Construction work in 1978-79 removed a levee which directed flow past this station and made the rating curve at this station questionable. Poor communication existed between the channel and the stilling well. In addition, the station was subject to backwater from the Rio Hondo side of Whittier Narrows Reservoir. However, water entering the Flood Channel crosses over a stabilizer weir. By using the Corps of Engineers' record of water surface elevations on the San Gabriel River side of Whittier Narrows Reservoir, the flow in the Flood Channel was estimated by Watermaster staff. Historically, these estimates were prepared by applying an appropriate weir formula. During 1981-82 a flow measurement was made at the weir by County personnel. This measurement confirmed the

calculations of flow by the weir formula.

The County in 1993 established a gaging station utilizing the stabilizing weir and a recorder and has designated the station G44B-R, Whittier Narrows Flood Channel. The Watermaster is utilizing records developed by the County and has verified them utilizing a weir formula and records of reservoir stage obtained from the Corps of Engineers, operators of Whittier Narrows Reservoir. In general, these comparisons provided reasonably accurate data. For water year 1997-98, the mean daily discharge measurements at station G44B-R were consistent with the flow estimates using the weir flow calculations and, thus, confirm the method used. The flow through the Flood Channel for 1997-98 water year was determined to be 77,630 acre-feet.

Sycamore Canyon

The determination of runoff from Sycamore Canyon, which flows through Whittier Narrows, is based on a correlation with rainfall at Potrero Heights (Station 170F). Sycamore Canyon is located in the La Merced Hills northwesterly of Whittier Narrows and enters the Rio Hondo below Station F64, Rio Hondo above Mission Bridge. During the 1997-98 water year, rainfall at Station 170F was 38.52 inches. Referring to Table 6 of Exhibit B of the Judgment, the runoff from Sycamore Canyon was determined to be 1,180 acre-feet.

San Gabriel River Below Parkway Bridge, Station F263C-R

The flow in the San Gabriel River below Parkway Bridge for the 1997-98 water year was recorded by the County to be 168,600 acre-feet. However, based on data from other stations and estimates of channel infiltration, an adjustment to the above quantity was made for the period of January 22-26, 1998. The value determined by the

Watermaster as flow at Station F263C-R for the 1997-98 water year is 168,356 acre-feet.

San Gabriel River at Florence Avenue, Station F262C-R

This recording station replaced F262B-R beginning with water year 1988-89. The former station was discontinued during the summer of 1988 because the County constructed a rubber dam in the channel. The recording gage is now located about one mile downstream at the beginning of the lined portion of the San Gabriel River. The County, with Watermaster concurrence, relocated this station to provide a more accurate measurement of flow to the ocean.

Flow in San Gabriel River at Florence Avenue for the 1997-98 water year was recorded by the County to be 121,400 acre-feet. However, based on data from other stations and estimates of channel infiltration, adjustment to the quantity was made for February 22-25 and 28, 1998; March 2, 5, 9 and 29, 1998; and May 5-31, 1998. The value determined by the Watermaster as flow at Station F262C-R for the 1997-98 water year is 116,500 acre-feet.

Rio Hondo Spreading Grounds Intake (Headworks)

The County constructed a low level intake to the Rio Hondo East Side Spreading Grounds in 1987. This intake supplements the original higher level intake and allows water to be diverted into the spreading grounds when the radial gates are raised. The spreading grounds inflow data were historically used to verify other records of inflow and to make adjustments.

Metering of the new low level intake was to be provided by means of an acoustical meter. When the low level installation was made a number of years ago, the County specified an Accusonic Meter located in the 102-inch diameter pipe downstream

from the undershot slide gate assembly. Because of turbulence and air entrainment, the meter did not work properly and was moved to the intake channel located between the Rio Hondo channel and the diversion structures. Metering of the low level intake has not yet been done successfully. There were periods of time during which the records of Spreading Grounds inflow did not exist or were not accurate. The County assured the Watermaster that it would take whatever steps were necessary to provide accurate measurements at this station.

Several letters were sent to the County during 1994-95 which resulted in some facilitation of measures to improve quality of data at this station and other stations of concern to the Watermaster. For the low level intake, the project consisted of the replacement of the control console in the headworks building with a new signal processor. The County installed a new control console, on loan from the manufacturer, in the middle of December 1995. The new console was tested for a period of several months through the storm period to determine if it will alleviate past operational problems with the system. Records for years following Water Year 1994-95 appear to be more consistent than for previous years. However, during Water Year 1997-98, the low level intake operated inconsistently. When the low level intake meter was inoperative, the mean daily flow was estimated by County personnel. Maintenance and recalibration occurred during the first few months of the 1998-99 water year. Other intakes to the Spreading Grounds are equipped with Parshall flumes and recorders.

Reclaimed Water Delivered to Rio Hondo Below Station F64

Water from the Whittier Narrows Water Reclamation Plant can be delivered to the San Gabriel River, the Rio Hondo below Station F64, or the Rio Hondo Bypass Channel

(Zone I Ditch). The total water production from this plant was 11,574 acre-feet during the 1997-98 water year, of which 57 acre-feet was used by a commercial nursery near the plant site resulting in net release for groundwater recharge of 11,517 acre-feet. Of this quantity, 9,790 acre-feet was delivered directly to the Rio Hondo below Station F64 and must, therefore, be added as Surface Flow.

The balance of the Reclaimed Water from the Whittier Narrows Plant, in the amount of 1,727 acre-feet, was delivered to the San Gabriel River and accounted for in the recorded flows at the Parkway Bridge Station, F263C-R.

As mentioned above, Reclaimed Water from the Whittier Narrows Plant can also be delivered to the Zone I Ditch. In 1984, the location of the gaging station on the Zone I Ditch was moved from upstream of the point of delivery to downstream of the point of delivery. Thus, Reclaimed Water now delivered to the Zone I Ditch is included with the water measured at Station F313B-R. During the 1997-98 water year, no flow was delivered to the Zone I Ditch.

Reclaimed Water Delivered to San Gabriel River Below Station F263C-R

The San Jose Creek Water Reclamation Plant is located near the intersection of San Gabriel River and San Jose Diversion Channel, as shown on Plate 1. Reclaimed Water from this plant is carried in an outfall pipeline which generally parallels the San Gabriel River to a point south of Florence Avenue, where the flow can be released to the lined channel of the San Gabriel River. At the San Gabriel River Spreading Grounds Headworks, there is a turnout from this outfall pipeline so that Reclaimed Water can be delivered to the San Gabriel River Spreading Grounds or the unlined portion of the San Gabriel River for ground water recharge. This outlet is located downstream of Station

F263C-R and this outlet facility is equipped with a propeller meter.

During the 1997-98 water year, no Reclaimed Water from the San Jose Creek Water Reclamation Plant was delivered via this outfall pipeline to the San Gabriel River Spreading Grounds Headworks for replenishment purposes.

The flow in the San Jose Creek outfall pipeline which is not diverted for replenishment use is delivered to the lined portion of the San Gabriel River and flows to the ocean. During the 1997-98 water year, such flow amounted to approximately 58,200 acre-feet, and is not included as Surface Flow under the Judgment.

A second turnout for replenishment purposes from the San Jose Plant was first used in December 1986 to provide the option of releasing Reclaimed Water directly to the San Jose Diversion Channel. For the 1997-98 water year, 31,730 acre-feet of Reclaimed Water was released through the San Jose Creek Reclamation Plant Stages I and II for replenishment by the Lower Area. San Jose Plant Reclaimed Water released through this second turnout may be diverted to the Rio Hondo via the Zone I Ditch or to the San Gabriel River. A third turnout for replenishment purposes from the San Jose Plant was installed with expansion of Stage III of the San Jose Creek Plant. Effluent from Stage III can be delivered to the aforementioned outfall pipeline or delivered directly to the San Gabriel River at the Plant. Phase III construction was completed during the 1992-93 water year and this connection was first used on January 18, 1993. Water released to the San Gabriel River at this location totaled 2,821 acre-feet for the 1997-98 water year. This flow will commingle with that delivered from Stages I and II delivered to the San Jose Wash and can be diverted to the Rio Hondo via the Zone I Ditch or to the San Gabriel River where it would be measured at Parkway Bridge. For the 1997-98

water year, a total of 34,551 acre-feet of Reclaimed Water was released from the San Jose Creek Reclamation Plant for groundwater recharge. A part of this flow was subsequently lost to the ocean and was accounted for as described in a later section.

Adjustments to Surface Flow

The quantity of Surface Flow is, for the most part, based upon streamflow measurements made by the County. In essence, the method set forth in the Judgment is to measure the surface inflow to the Lower Area through Whittier Narrows and deduct that portion of surface flow which leaves the Montebello Forebay at its lower end. The difference in these measurements represents a determination of the quantity of Surface Flow which infiltrates to the Montebello Forebay.

High runoff conditions occur during and following certain storms. Certain inconsistencies can result from the inflow minus outflow calculations. While the stream gaging measurements may be within the accuracy of normal stream gaging measurements during periods of high flow, the amount of Usable Surface Flow is only a small portion of the total flow. Inaccuracies in the gaging of total flow will affect the determination of Usable Surface Flow. It also should be noted that storm runoff through Whittier Narrows has increased as a result of urbanization which tends to produce higher peak flows of a shorter duration, making the measuring program less reliable.

Accordingly, the Watermaster, after evaluating the available data, determined that for certain periods of time adjustments should be made in the quantities of Surface Flow as derived from the measurements. An alternative method of determining Surface Flow for the Rio Hondo was outlined in the Fifth Annual Watermaster Report. In this method, an adjustment is made by first determining the amount delivered to Rio Hondo Spreading

Grounds and adding thereto the estimated amount of water infiltrated in the Rio Hondo portion of the Whittier Narrows Reservoir. This is compared to the measured inflow minus the outflow and a determination is made as to the most reliable quantities.

Changes in the method of determining Surface Flow can be made under the terms of the Judgment. Reference is made to Exhibit B of the Judgment, Article III, Section A entitled, "Surface Water Measurements and Calculations," which reads in part:

"In the event that any of the aforementioned gaging stations are inoperative for any reason and for any period of time the Watermaster shall estimate the quantity that would have been measured at the station had it been operative. The estimate shall be based on correlation to nearby operative measuring stations or on other reasonable engineering methods."

The Watermaster considers that stations are inoperative for the purposes of the Judgment when the measurements obtained are not of sufficient accuracy to produce reasonable results. For the 1997-98 water year, it was decided to apply the alternative method during certain periods of time to the Rio Hondo side of Whittier Narrows.

Presented in Table 4 is an adjustment to Rio Hondo inflow. This table presents a summary of the calculations utilizing the alternative method. Analysis of the daily inflow and outflow data indicated that the alternative method should be applied during 62 days of the 1997-98 water year. These days were November 10, 26-27, 30; December 6, 18-19; January 4, 9-11, 29-31; February 3-4, 14-15, 22-26; March 31; May 1-31; and June 2-8. The unadjusted inflow to the Lower Area in the Rio Hondo as set forth in Table 4 was 125,496 acre-feet during those 62 days. The outflow to the ocean during the same 62 days (calculated on a daily basis from stream gaging measurements as provided in the Judgment) was 80,672 acre-feet. (This latter value is Unusable Surface Flow from

the Upper Area.) In making the adjustment, the unusable outflow as measured at Stewart and Gray Road was accepted.

TABLE 4
LOWER AREA INFLOW AND OUTFLOW
ADJUSTMENT TO RIO HONDO INFLOW

Item	:	Amounts in Acre-Feet For 62 Days ^(a) of the Water Year 1997-98
A. UNADJUSTED INFLOW		
Rio Hondo Above Mission Bridge, F64		63,656
Mission Creek at San Gabriel Boulevard, F83		0
Rio Hondo By-Pass Channel (Zone 1 Ditch)		3,310
Whittier Narrows Flood Channel		56,008
Sycamore Canyon		723
Ungaged Reclaimed Water		<u>1,799</u>
Total Unadjusted Inflow		125,496
B. ADJUSTED INFLOW		
Infiltration		
Spreading grounds infiltration		25,710
Reservoir area infiltration		1,626
Total infiltration		27,336
Change in Reservoir Storage		+ 599
Outflow at Stewart and Gray Road		<u>80,672</u>
Total Adjusted Inflow		108,607
C. ADJUSTMENT		
Adjustment to Rio Hondo Inflow		<u>-16,889</u>

(a) Days adjusted were November 10, 26-27, 30; December 6, 18-19; January 4, 9-11, 29-31; February 3-4, 14-15, 22-26; March 31; May 1-31; and June 2-8.

The infiltration during the 62 days was calculated to be 27,336 acre-feet. This included the amount delivered to the spreading grounds and the water infiltrated in the Whittier Narrows Reservoir westerly of Rosemead Boulevard. In addition, the amount of water stored on the Rio Hondo side of the Reservoir increased by 599 acre-feet during those 62 days. The inflow is therefore adjusted by adding the quantity of infiltration (27,336 acre-feet) to the outflow (80,672 acre-feet) and adding the increase in storage (599 acre-feet) to determine the adjusted inflow in the amount of 108,607 acre-feet.

As shown on Table 4, the adjustment to the Rio Hondo inflow is minus -16,889 acre-feet. This adjustment relies on the spreading grounds inflow and estimated infiltration in Whittier Narrows Reservoir. These latter values provide a more accurate determination of Usable Water during high flows as opposed to taking the difference between inflows and outflows from stream gaging stations during periods of storm flows.

Summary of Surface Flow

A total of 365,127 acre-feet of surface water flowed through Whittier Narrows during the 1997-98 water year. Table 5 shows the components and the total Surface Flow.

TABLE 5
SUMMARY OF SURFACE FLOW THROUGH WHITTIER NARROWS
FOR WATER YEAR 1997-98

	<u>Amount in Acre-Feet</u>
Rio Hondo above Mission Bridge, Station F64	102,200
Mission Creek at San Gabriel Boulevard, Station F83	0
Rio Hondo By-Pass Channel, Station F313B-R	22,860
Whittier Narrows Flood Channel	77,630
Sycamore Canyon	1,180
San Gabriel River below Parkway Bridge, Station F263C-R	168,356
Reclaimed Water From Whittier Narrows Plant Delivered to Rio Hondo below Station F64	9,790
Reclaimed Water from San Jose Plant Delivered to San Gabriel River below Station F263C-R	0
Less Adjustment to Rio Hondo Inflow (Table 4)	<u>- 16,889</u>
Total Surface Flow	365,127

Subsurface Flow

The method utilized to determine Subsurface Flow through Whittier Narrows is set forth in Exhibit B of the Judgment. The data used for computing Subsurface Flow are the spring and fall ground water elevations in Whittier Narrows. The measurement well locations are shown on Plate 2.

The Subsurface Flow for any year is the average of the six spring and fall computations of Subsurface Flow for the three years ending with the year of calculation. Shown in the following tabulation is the result of the calculation of Subsurface Flow for the 1997-98 water year which amounted to 27,900 acre-feet.

Time	Subsurface Flow in Acre-Feet
Spring 1996	29,200
Fall 1996	33,700
Spring 1997	27,100
Fall 1997	29,100
Spring 1998	24,200
Fall 1998	<u>23,900</u>
Subsurface Flow 1997-98	27,900

Export to Lower Area

The Watermaster is required to determine the amount of water which is pumped from ground water or diverted from surface streams in the Upper Area and transported in conduits through Whittier Narrows.

During the 1997-98 water year, there were four entities which transported water by pipeline through Whittier Narrows. All of the water exported through the Narrows was ground water produced in the San Gabriel Valley. The annual export for each of the four exporters is shown below:

Exporter	Acre-feet
California Domestic Water Company	16,225
San Gabriel Valley Water Company	272
Suburban Water Systems	12,820
City of Whittier	<u>9,651</u>
Total	38,968

The Judgment provides that the maximum annual credit for export in the determination of Usable Water shall not exceed 23,395 acre-feet.

Lower Area Replenishment Water

The Lower Area purchases imported replenishment water from The Metropolitan Water District of Southern California. This imported water may be delivered at four Metropolitan connections: (1) Alhambra Wash (CenB-36); (2) San Gabriel River below Ramona Boulevard (CenB-37); (3) Foothill Feeder at San Dimas Wash (CenB-48); and (4) Upper Feeder at Thompson Creek (CenB-28). All connections are metered and delivered amounts are recorded by the Metropolitan Water District. These amounts are verified by personnel of the County.

During water year 1997-98 the total amount of imported water purchased from Metropolitan for replenishment was 1,026 acre-feet all of which was on behalf of the Lower Area.

MWD Connection	Imported Water (Acre-Feet)
Alhambra Wash (CenB-36)	1,026
San Gabriel River: Ramona Blvd. (CenB-37)	0
San Dimas Wash (CenB-48)	0
Thompson Creek (CenB-28)	0
Total	1,026

Provision is made in the Judgment for the deduction of evaporation losses upstream of Whittier Narrows occurring during conveyance of Lower Area Replenishment Water through San Gabriel Valley to Whittier Narrows. The total calculated amount of evaporation during the 1997-98 water year was 1 acre-foot.

Because of use of connection Cen B-36 during storm periods there were potential losses to the ocean of imported water during limited periods of time. Analysis of daily flows indicated that these losses totaled 75 acre-feet which occurred on one day. After losses, the net amount of Lower Area Replenishment Water amounted to 950 acre-feet.

Reclaimed Water

Reclaimed Water used for replenishment of the Montebello Forebay came from three separate plants, each of which is operated by the County Sanitation Districts.

Whittier Narrows Water Reclamation Plant

The total amount of Reclaimed Water produced at the Whittier Narrows Water Reclamation Plant during the 1997-98 water year, and delivered to stream channels, was 11,517 acre-feet. During 1997-98, Whittier Narrows effluent was bypassed during storm operations. The amount of water bypassed that was included as Surface Outflow totaled

3,139 acre-feet for water year 1997-98. Therefore, a total of 8,378 acre-feet of Reclaimed Water from the Whittier Narrows WRP was purchased by the Water Replenishment District of Southern California and spread in the Montebello Forebay.

Pomona Water Reclamation Plant

County Sanitation District No. 21 owns and operates a water reclamation plant near the City of Pomona. A portion of the reclaimed water is sold for industrial, agricultural, landscaping and other uses. During the 1997-98 water year a substantial quantity of Reclaimed Water from this plant reached Whittier Narrows. The plant facilities, discharge of effluent from the plant, and the method of determining the amount of discharge generated within the San Gabriel River system and reaching Whittier Narrows were described in the Fifth Annual Watermaster Report. Reclaimed Water is defined in the Judgment as water reclaimed from sewage generated in the watershed of the San Gabriel River System above Whittier Narrows. The area served by the Pomona Plant includes areas inside and outside of the San Gabriel River System. A study was conducted in 1995 to review the factors utilized in apportioning Pomona Plant effluent generated in the San Gabriel River System. As a result of the study, it was concluded that 76 percent of the effluent of the Pomona Plant originates from sewage generated within the San Gabriel River System. This reevaluation by the Watermaster staff is an increase from the 70 percent concluded by a similar study conducted in 1985. This apportionment will be reviewed periodically in the future.

The total production at the Pomona Water Reclamation Plant during the 1997-98 water year was 12,494 acre-feet. The majority of the effluent was delivered to the City of Pomona for resale. The undelivered portion, amounting to 2,649 acre-feet was delivered to

San Jose Creek. It was determined that 988 acre-feet was wasted to the ocean, 235 acre-feet percolated in the San Gabriel Valley, and 1,426 acre-feet percolated in the Montebello Forebay. The portion of this Reclaimed Water which was generated within the watershed of the San Gabriel River System was calculated to be 1,084 acre-feet.

San Jose Creek Water Reclamation Plant

The Water Replenishment District of Southern California purchases Reclaimed Water from the San Jose Creek Water Reclamation Plant. During the 1997-98 water year, 34,551 acre-feet of Reclaimed Water from the San Jose Creek Water Reclamation Plant was delivered to the Lower Area for replenishment. Reclaimed water was bypassed for several days during the 1997-98 water year. The amount of water bypassed that was included as surface outflow during 1997-98 totaled 8,067 acre-feet. Therefore, a total of 26,484 acre-feet of such Reclaimed Water was spread in the Montebello Forebay. Total plant effluent for the 1997-98 water year was about 95,000 acre-feet.

Summary of Reclaimed Water

The total amount of Reclaimed Water which should be deducted from the inflow is 35,946 acre-feet for the 1997-98 water year. This is comprised of 8,378 acre-feet from the Whittier Narrows Water Reclamation Plant, 1,084 acre-feet from the Pomona Water Reclamation Plant which originated within the San Gabriel River watershed, and 26,484 acre-feet from the San Jose Creek Water Reclamation Plant.

Make-Up Water by Surface Flow Delivery

During 1997-98, the Upper Area did not supply any Make-Up Water by surface flow delivery or otherwise since there was no Make-up Water requirement to be delivered for that year.

Recirculation of Measured Water

There was no recirculation of measured water as defined in Paragraph 3(1) (6) of the Judgment during the 1997-98 water year.

Unusable Surface Flow

The water from the San Gabriel Valley which leaves Montebello Forebay as surface flow is called Unusable Surface Flow and is determined in accordance with Exhibit B of the Judgment. Surface outflow from the Montebello Forebay is accounted for in the Rio Hondo at Stewart and Gray Road, Station F45B-R, and in the San Gabriel River at Florence Avenue, Station F262C-R. This surface outflow may be comprised of water from the San Gabriel Valley and local storm water which enters the channels downstream of Whittier Narrows.

During the 1997-98 water year, measured surface outflow from the Montebello Forebay in the Rio Hondo at Station F45B-R was 129,200 acre-feet. This included water from the San Gabriel Valley, Local Storm Inflow originating downstream of Whittier Narrows and in some cases Lower Area replenishment water. The Local Storm Outflow on days when the radial gates at the Rio Hondo headworks were open was estimated by correlating the drainage areas of the unmeasured storm drains with the Montebello Storm Drain, which is equipped with a stream flow recorder. By analysis of flows on days when the radial gates were open, it was possible to segregate the flow at Stewart and Gray Road into Local Storm Outflow, Unusable Surface Flow and replenishment water. The total loss to the ocean on such days was determined to be 127,498 acre-feet. It was determined

that the Local Storm Outflow was 6,856 acre-feet and the Unusable Surface Flow in the Rio Hondo was 120,642 acre-feet. Unusable Surface Flow includes 3,556 acre-feet of Reclaimed Water and 75 acre-feet of Imported Water which was previously deducted from Lower Area Replenishment Water. Local Inflow for water year 1997-98 was calculated to be 8,142 acre-feet.

The total flow of the San Gabriel River at Florence Ave., Station F262C-R was measured to be 116,500 acre-feet. This flow consisted of Local Storm Inflow through storm drains located in the Montebello Forebay and surface inflow from the San Gabriel Valley. Most of the storm water in the San Gabriel River entering the Whittier Narrows Reservoir in excess of the spreading capacity in the San Gabriel River below Whittier Narrows Dam was conveyed by the Flood Channel to the Rio Hondo. The Local Storm Inflow was calculated to be 5,167 acre-feet based on correlation with the Montebello Storm Drain. The Local Storm Outflow on the San Gabriel River was determined to be 3,338 acre-feet. Analyses of daily flows indicated a total Unusable Surface Flow from the Montebello Forebay in the San Gabriel River of 113,162 acre-feet during the 1997-98 water year. Unusable Surface Flow included 8,638 acre-feet of Reclaimed Water which was previously deducted from Lower Area Replenishment Water.

The total Unusable Surface Flow passing through the Montebello Forebay in the Rio Hondo and San Gabriel River in the 1997-98 water year was 233,804 acre-feet.

Determination of Usable Water

Usable Water under the terms of the Judgment is defined as the sum of Surface Flow, Subsurface Flow and Credited Export to Lower Area less the sum of Lower Area

Replenishment Water, Reclaimed Water, Make-up Water by Surface Flow Delivery and Unusable Surface Flow. Table 6 presents the determination of Usable Water for the 1997-98 water year.

TABLE 6
USABLE WATER FOR WATER YEAR 1997-98

	<u>Amount in Acre-Feet</u>	
Surface Flow	365,127	
Subsurface Flow	27,900	
Credit for Export to Lower Area	<u>23,395</u>	
Subtotal		416,422
Less:		
Lower Area Replenishment Water	950	
Reclaimed Water	35,946	
Make-Up Water by Surface Flow Delivery	0	
Recirculation of Measured Water	0	
Unusable Surface Flow	<u>233,804</u>	
Subtotal		<u>270,700</u>
Usable Water		<u>145,722</u>

Quality of Water

The Judgment (Exhibit B, Section IV.E) provides that the Watermaster gather readily available data from public and private agencies relating to the quality of water. During the water year, quality data were obtained from the State Department of Water Resources, the County Sanitation Districts, Los Angeles County Department of Public Works, and the Metropolitan Water District of Southern California. Ground water quality data were also obtained from programs of the Main San Gabriel Basin Watermaster, Central Basin Municipal Water District, Water Replenishment District of Southern California and the U.S. Environmental Protection Agency (EPA). In the last few years increasing concern has developed over the trace constituents found in drinking water. Table 7 includes these constituents for illustrating both the quality of different sources of water supply and the increasing number of regulated constituents. Shown in Figures 1, 2 and 3 are graphical trends of salinity, hardness and nitrogen of the sources of imported and Reclaimed Water for recharge in the San Gabriel River System.

TABLE 7

**WATER QUALITY ANALYSES REPRESENTATIVE OF SOURCES
OF WATER PASSING THROUGH WHITTIER NARROWS
WATER YEAR 1997-98(a)**

CATEGORY	DRINKING WATER STANDARDS	IMPORTED WATER		RECLAIMED WATER				RUNOFF WATER	
		UNTREATED STATE PROJECT WATER (b)	UNTREATED COLORADO RIVER WATER (c)	WHITTIER NARROWS PLANT (d)	SAN JOSE CREEK PLANT (E) (d)	SAN JOSE CREEK PLANT STAGE III (W) (d)	POMONA PLANT (d)	STORM FLOW (e)	SUBSURFACE FLOW (f)
		4/6/98	4/6/98	4/20/98	4/13/98	4/13/98	4/19/98	1/4/98	6/8/98
DATE		4/6/98	4/6/98	4/20/98	4/13/98	4/13/98	4/19/98	1/4/98	6/8/98
pH	6.5-8.5	8.13	8.03	7.2	7.2	7.0	7.1	7.4	7.6
EC x 106 (umho/cm)		381	966					295	665
CATIONS									
Calcium		20	73	36	60.4	59.5	62.3	26	78
Magnesium		9.5	26.5	11	18.5	19.5	13.5	8	14
Sodium		39	88	72.3	119	114	92.7	23	50
Potassium		2.6	4.1	7.9	13.3	13.1	10.6	4	3.9
ANIONS									
Carbonate		0	0	0	0	0	0	0	0.5
Bicarbonate		84	157	160	219	190	218	55	189
Sulfate	250	27	237	89	118	98	77	42.3	85
Chloride	250	54	80	98	119	91	115	25.6	51
Nitrate as NO3	45	1.8	1.1					4.0	
Fluoride	1.8	0.07	0.26	0.64	0.52	0.58	0.37	0	0.25
Total Dissolved Solids	500-1500	210	600	587	570	529	542	195	410
Total Hardness as CaCO3		89	291	135	227	229	211	1	155
Boron		<0.10	0.11	0.49	0.48	0.63	0.42	0.214	0.13
INORGANIC TRACE CONSTITUENTS									
Arsenic	0.05	0.0016	0.0024	0.001	0.002	0.001	0.002	ND	ND
Barium	1	0.028	0.11	0.03	0.03	0.03	0.03	ND	0.11
Cadmium	0.005	ND	0.0002	ND	ND	ND	ND	ND	ND
Chromium, Total	0.05	ND	ND	ND	ND	ND	ND	ND	0.014
Lead	0.05	ND	ND	0.002	ND	ND	ND	ND	ND
Mercury	0.002	ND	ND	ND	0.0003	ND	ND	ND	ND
Perchlorate	0.018								
Selenium	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Sivler	0.05	ND	ND	ND	ND	ND	ND	ND	ND
NUTRIENTS as N									
Ammonia				5.0	11.6	8.6	11.8	1.1	ND
Nitrate				5.52	1.39	5.69	2.4	0.9	1.1
Nitrite				1.28	0.91	0.97	1.46	0.15	ND
Organic Nitrogen				3.3	1.8	2.1	1.2		ND

(a) All constituents in mg/l unless noted. ND = None Detected

(b) Sampled at Lake Silverwood. Purgeable organics and trace inorganics were sampled in February and March 1998.

(c) Sampled at Lake Mathews. Purgeable organics and trace inorganics were sampled in February and March 1998.

(d) Trace inorganic samples taken in March 1997.

(e) At San Gabriel Spreading Grounds.

(f) From Well 2947LM.

(g) By Evaporation at 180° C.

TABLE 7 (CONT'D)

**WATER QUALITY ANALYSES REPRESENTATIVE OF SOURCES
OF WATER PASSING THROUGH WHITTIER NARROWS
WATER YEAR 1997-98(a)**

CATEGORY		IMPORTED WATER		RECLAIMED WATER				RUNOFF WATER		
		DRINKING WATER STANDARDS	UNTREATED STATE PROJECT WATER	UNTREATED COLORADO RIVER WATER	WHITTIER NARROWS PLANT	SAN JOSE CREEK PLANT (E)	SAN JOSE CREEK PLANT STAGE III (W)	POMONA PLANT	STORM FLOW	SUBSURFACE FLOW
			(b)	(c)				(d)	(e)	(f)
		DATE	4/6/98	4/6/98	4/21/98	4/21/98	4/21/98	4/29/97	1/4/98	6/8/98
<u>PURGEABLE ORGANICS, ug/l</u>										
Methylene Chloride	5	ND	ND	ND	ND	ND	ND		ND	
Chloroform	100 (h)			11.0	7.2	6.0	8.1		ND	
Bromodichloromethane	100 (h)			4.9	1.3	1.3	0.8		ND	
Dibromochloromethane	100 (h)			1.6	ND	ND	ND		ND	
Bromoform	100 (h)			ND	ND	ND	ND		ND	
Carbon Tetrachloride	0.5	ND	ND	ND	ND	ND	ND		ND	
1,1-Dichloroethane	5	ND	ND	ND	ND	ND	ND		ND	
1,2-Dichloroethane	0.5	ND	ND	ND	ND	ND	ND		ND	
1,1,1-Trichloroethane	200	ND	ND	ND	ND	ND	ND		ND	
1,1,2-Trichloroethane	5	ND	ND	ND	ND	ND	ND		ND	
1,1-Dichloroethylene	6	ND	ND	ND	ND	ND	ND		ND	
Trichloroethylene	5	ND	ND	ND	ND	ND	ND		ND	
Tetrachloroethylene	5	ND	ND	0.5	ND	0.7	0.6		ND	
Methyl Tertiary-Butyl Ether	35	ND	ND						ND	
Benzene	1	ND	ND	ND	ND	ND	ND		ND	
Toluene	100	ND	ND	ND	ND	ND	ND		ND	
Chlorobenzene	30	ND	ND	ND	ND	ND	ND		ND	
O-Dichlorobenzene	130 (i)	ND	ND	2.2	ND	ND	ND		ND	
M-Dichlorobenzene	130 (i)	ND	ND	ND	ND	ND	ND		ND	
P-Dichlorobenzene	5	ND	ND	0.6	0.7	0.7	ND		0.6	
Cis-1,2-Dichloroethylene	6	ND	ND		ND	ND	ND		ND	
Trans-1,2-Dichloroethylene	10	ND	ND	ND	ND	ND	ND		ND	
Bromomethane		ND	ND	ND	ND	ND	ND		ND	
Chloroethane		ND	ND	ND	ND	ND	ND		ND	
2-Chloroethylvinylether		ND	ND	ND	ND	ND	ND		ND	
Chloromethane		ND	ND	ND	ND	ND	ND		ND	
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND		ND	
Cis-1,3-Dichloropropene	0.5(j)	ND	ND	ND	ND	ND	ND		ND	
Trans-1,3-Dichloropropene	0.5(j)	ND	ND	ND	ND	ND	ND		ND	
1,1,2,2-Tetrachloroethane	1	ND	ND	ND	ND	ND	ND		ND	
Vinyl Chloride	0.5	ND	ND	ND	ND	ND	ND		ND	
<u>NON-PURGEABLE ORGANICS, ug/l</u>										
Bis(2-ethylhexyl)phthalate	4			4.5	4.4	ND	23.0	25.6	ND	
1,2,4-Trichlorobenzene				ND	ND	ND	ND	ND	ND	
2,4,6-Trichlorophenol				ND	ND	ND	ND	ND	ND	
2,4,5-Trichlorophenol				ND	ND	ND	ND	ND	ND	
2,3,4-Trichlorophenol				ND	ND	ND	ND	ND	ND	
2,3,6-Trichlorophenol				ND	ND	ND	ND	ND	ND	
3,4,5-Trichlorophenol				ND	ND	ND	ND	ND	ND	
Pentachlorophenol	30			ND	ND	ND	ND	ND	ND	
Phenanthrene				ND	ND	ND	ND	ND	ND	
Fluoranthene				ND	ND	ND	ND	ND	ND	
Atrazine	3			ND	ND	ND	ND	ND	0.08	
Simazine	10			ND	ND	ND	ND	ND	ND	
Phenylacetic Acid				ND	ND	ND	ND	ND	ND	
Phenol	1									
<u>CHLORINATED HYDROCARBONS, ug/l</u>										
DDT				ND	ND	ND	ND	ND	ND	
BHC	0.3-0.7			ND	ND	ND	ND	ND	ND	
Lindane	4			0.03	0.03	0.03	0.03	ND	ND	
Heptachlor	0.01			ND	ND	ND	ND	ND	ND	
Heptachlor Epoxide	0.01			ND	ND	ND	ND	ND	ND	
Aldrin	0.05			ND	ND	ND	ND	ND	ND	
Dieldrin	0.05			ND	ND	ND	ND	ND	ND	

(a) All constituents in mg/l unless noted. ND = None Detected.

(b) Sampled at Lake Silverwood. Purgeable organics and trace inorganics were sampled in February and March 1998.

(c) Sampled at Lake Mathews. Purgeable organics and trace inorganics were sampled in February and March 1998.

(d) Trace inorganic samples taken in May 1998.

(e) At San Gabriel Spreading Grounds.

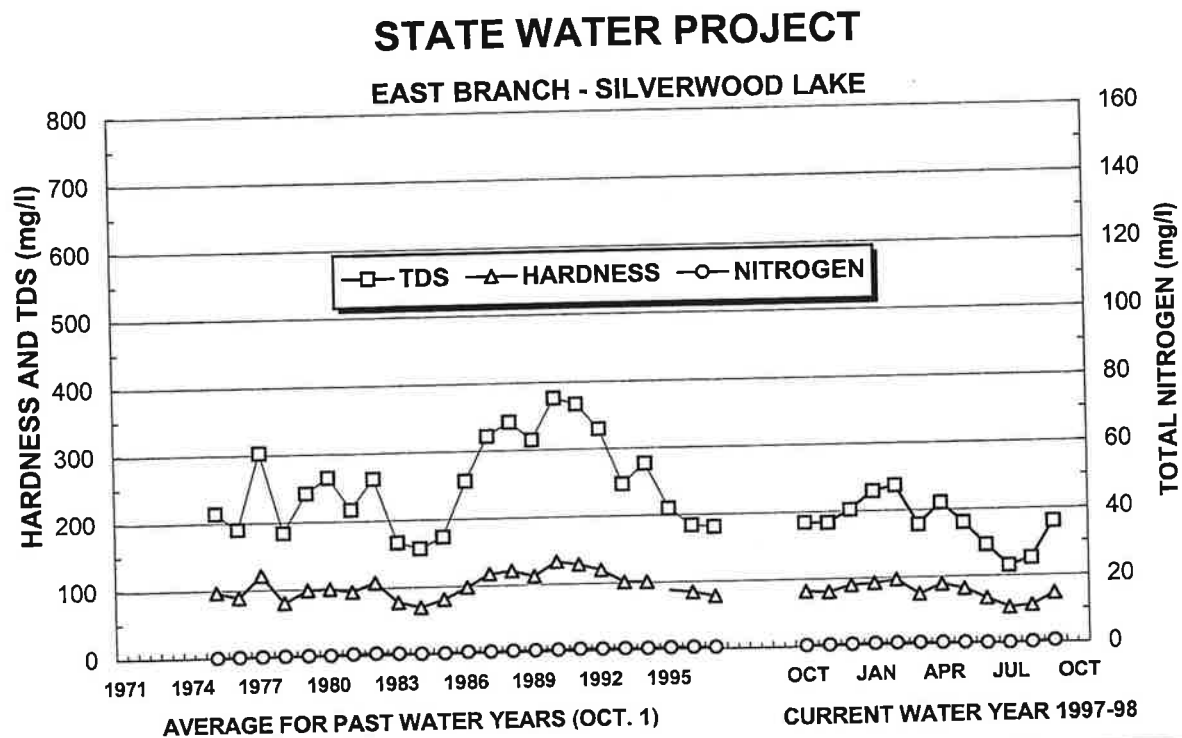
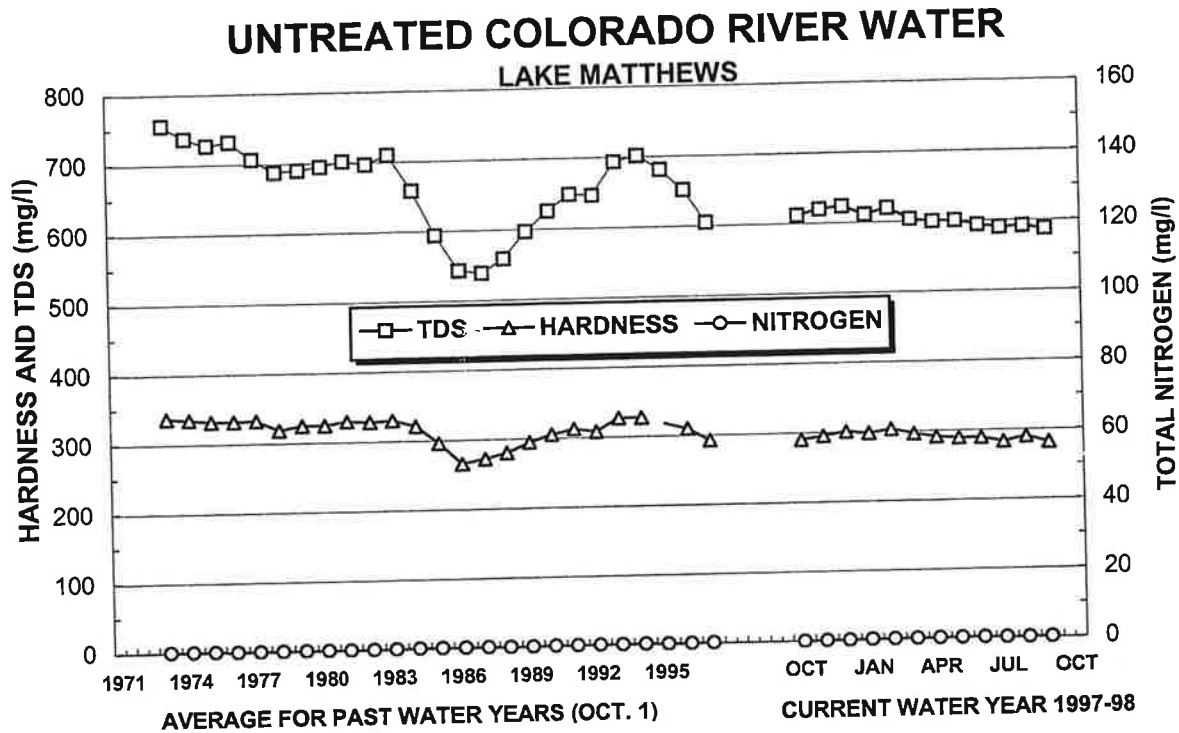
(f) From Well 2947LM.

(h) Total Trihalomethanes is not to exceed 100 ug/l.

(i) Action Level. Sum not to exceed 130.0 ug/l.

(j) Sum not to exceed 0.5 ug/l.

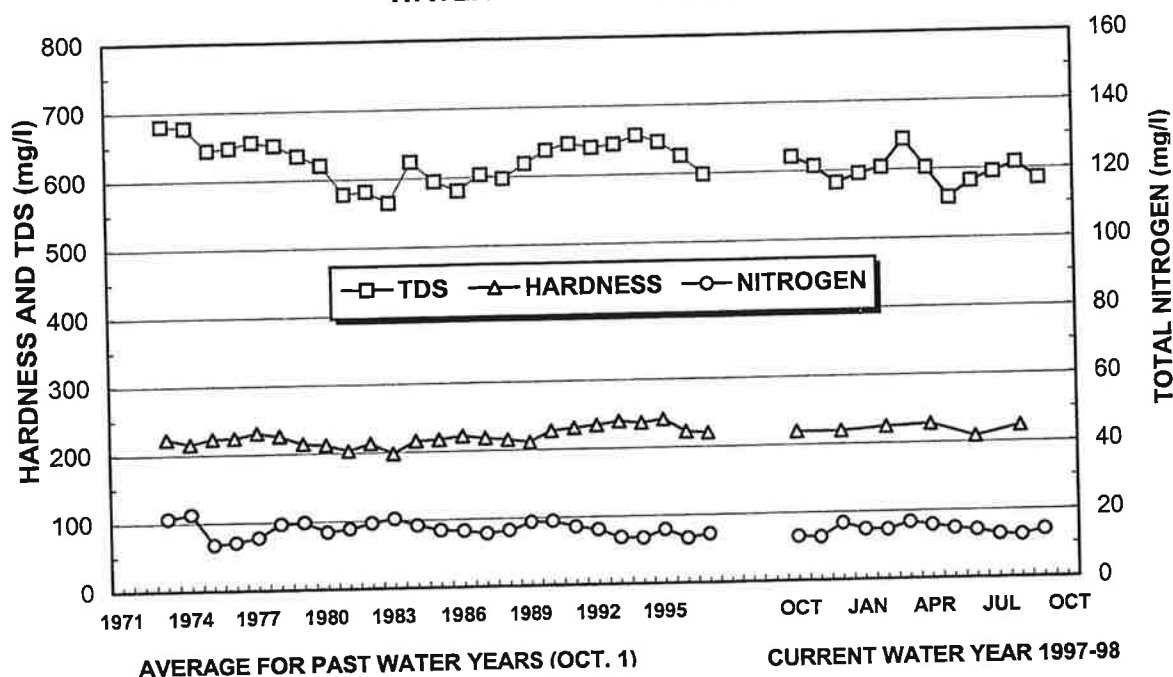
FIGURE 1



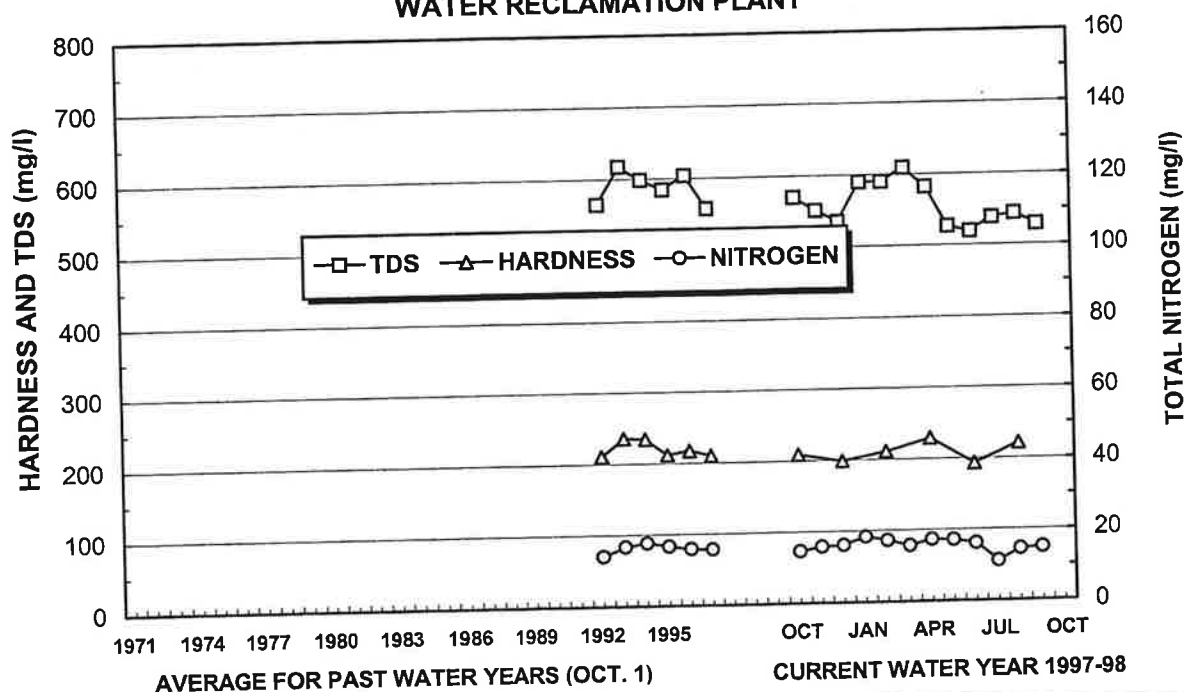
SELECTED WATER QUALITY PARAMETERS OF IMPORTED WATER

FIGURE 2

SAN JOSE CREEK WATER RECLAMATION PLANT



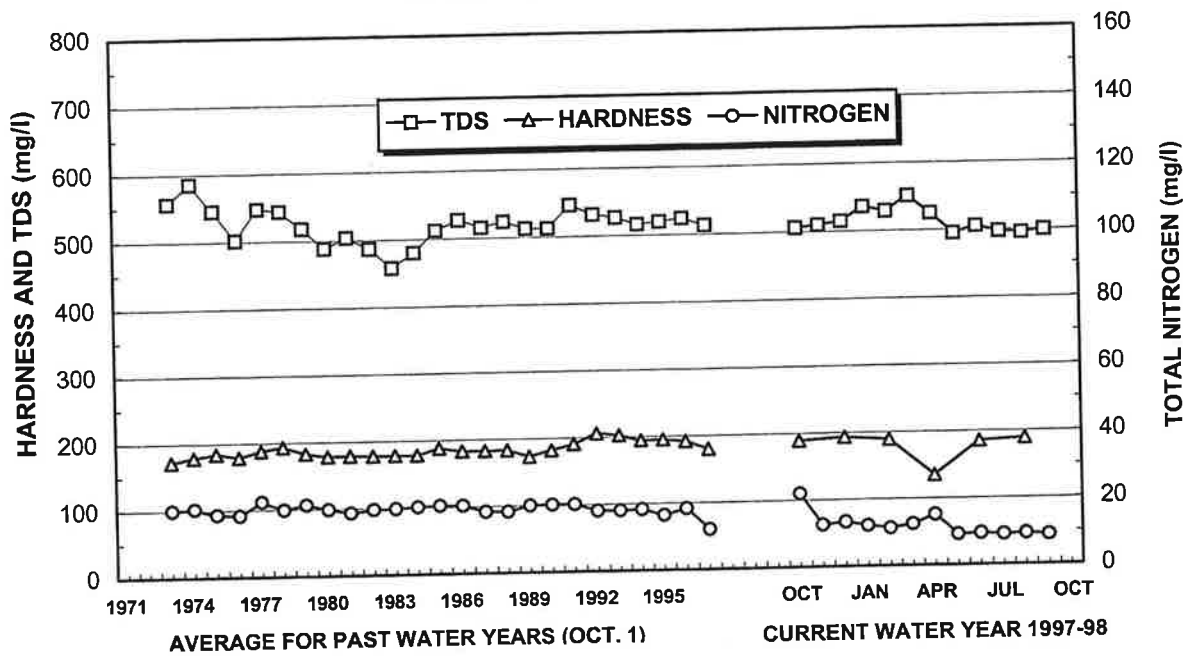
SAN JOSE CREEK III WATER RECLAMATION PLANT



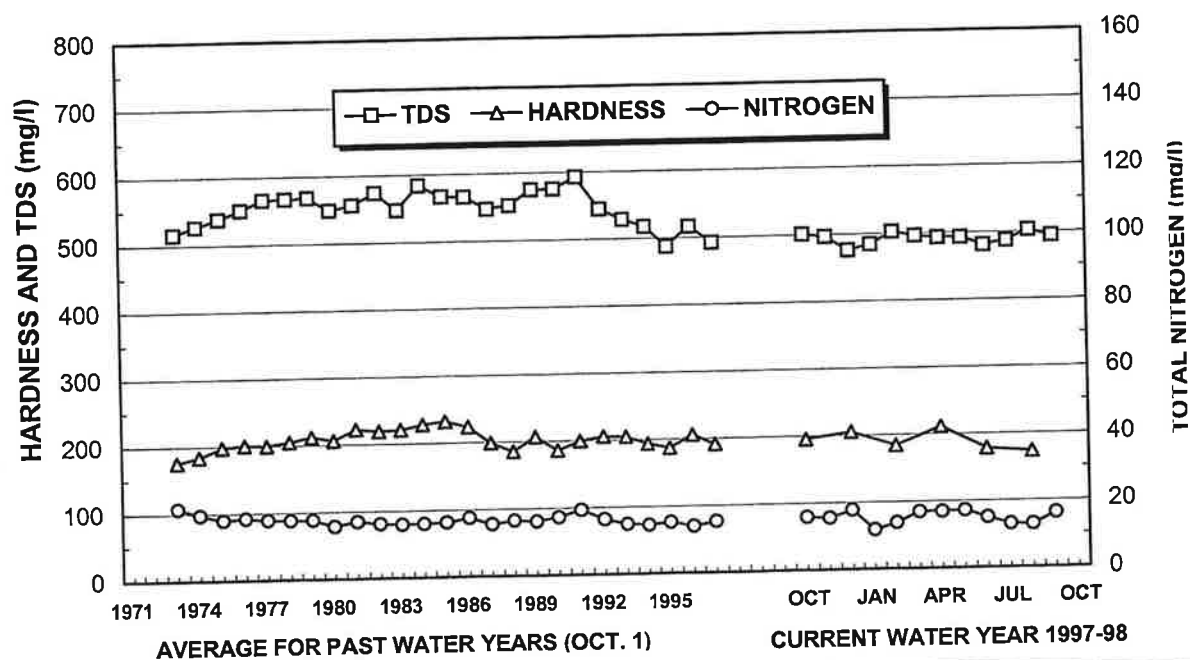
SELECTED WATER QUALITY PARAMETERS OF RECLAIMED WATER

FIGURE 3

WHITTIER NARROWS WATER RECLAMATION PLANT



POMONA WATER RECLAMATION PLANT



SELECTED WATER QUALITY PARAMETERS OF RECLAIMED WATER

CHAPTER IV. ANNUAL ACCOUNTING AND MAKE-UP WATER REQUIREMENTS

Under the terms of the Judgment, the Watermaster is required to annually determine the Accrued Debit or Credit of the Upper Area and the obligations, if any, of the Upper Area to deliver Make-up Water during the ensuing water year.

Delivery of Make-up Water During 1997-98

Because of the existence of an Accrued Credit at the end of 1996-97, the Upper Area made no Make-up Water delivery to the Lower Area during the 1997-98 water year.

Accrued Credit as of September 30, 1998

The Lower Area Annual Entitlement as heretofore determined for the 1997-98 water year was 113,100 acre-feet. The Usable Water received was 145,722 acre-feet, which resulted in a credit to the Upper Area for the water year of 32,622 acre-feet. The Upper Area had an Accrued Credit as of September 30, 1997, of 188,977 acre-feet. Thus the total Accrued Credit of the Upper Area as of September 30, 1998 is 221,599 acre-feet.

Requirement for Make-up Water Delivery in 1998-99

Because of the existence of an Accrued Credit on September 30, 1998, the Upper Area is under no obligation to deliver Make-up Water to the Lower Area during 1998-99.

Summary

Table 8 presents a summary of the findings of the Watermaster for the 1997-98 water year.

TABLE 8
SUMMARY OF FINDINGS FOR WATER YEAR 1997-98

	Quantities In Acre-Feet
1. Rainfall 1997-98, 36.1 inches	
2. Ten-year average rainfall, 20.9 inches	
3. Lower Area Annual Entitlement	113,100
4. Surface flow through Whittier Narrows	365,127
5. Subsurface Flow through Whittier Narrows	27,900
6. Credited export through Whittier Narrows	23,395
7. Total Flow through Whittier Narrows	416,422
8. Lower Area Replenishment Water	950
9. Reclaimed Water	35,946
10. Make-up Water (Surface Flow Delivery)	0
11. Recirculation of Measured Water	0
12. Unusable Surface Flow	233,804
13. Usable Water Received by Lower Area	145,722
14. Credit for Water Year 1997-98	32,622
15. Accrued Credit of Upper Area as of September 30, 1997	188,977
16. Amount of Make-up Water delivered during Water Year 1997-98	
a. Payment for Reclaimed Water	0
b. Surface Flow Delivery	0
Total	0
17. Adjusted Accrued Credit of Upper Area as of September 30, 1997	188,977
18. Accrued Credit of Upper Area as of September 30, 1998	221,599
19. Required Make-up Water to be delivered during Water Year 1998-99	0

CHAPTER V. LONG-TERM ACCOUNTING

Long-term Accounting is required by paragraph 5(h) of the Judgment. The first Long-term Accounting period under the Judgment included the 16 water years from 1963-64 through 1978-79. The second Long-term Accounting period included the 15 water years 1979-80 through 1993-94. The Third Long-term Accounting Period started with the 1994-95 water year. The Long-term Accounting periods are discussed in this Chapter.

The Watermaster is required from time to time, but not sooner than 15 years nor more than 25 years after September 30, 1963 and after the close of each Long-term Accounting period, to make a Long-term Accounting of the aggregate amount of Usable Water and Make-up Water received by the Lower Area. A Long-term Accounting is to be made sooner than 25 years if the average annual rainfall for a period of 15 or more years is at least 18 inches but not more than 19 inches.

The quantity of Usable Water and Make-up Water received during a Long-term Accounting period is compared to a quantity based upon the annual entitlement (98,415 acre-feet) multiplied by the number of years in the period and then adjusted by the ratio of the average annual rainfall for that period to the long-term average annual rainfall (18.52 inches). The difference in the amount of water received and the total annual entitlements is carried forward as either a credit or debit of the Upper Area.

First Long-term Accounting Period

As reported in the Sixteenth Annual Report, the First Long-term Accounting under the Judgment occurred as of September 30, 1979 for the period of 16 water years 1963-64 through 1978-79. The rainfall for the period averaged 18.16 inches resulting in a total entitlement of 1,544,031 acre-feet for the 16-year period. The amount of Usable Water and Make-up Water

received was 1,376,090 acre-feet resulting in a Long-term Accounting Debit of 167,941 acre-feet.

Make-up Water Deliveries

The Judgment provides that the debit under Long-term Accounting be made up over a three-year period. Representatives of the Upper Area and Lower Area agreed that Make-up Water for the first Long-term Accounting Period could be delivered over a five-year period, requiring not less than one-fifth be delivered each year. Use of annual credit for Reclaimed Water, however, was limited to the first three years of the repayment period.

During the five years 1979-80 through 1983-84, the Upper Area delivered 167,941 acre-feet of Make-up Water to the Lower Area to satisfy the First Long-term Accounting. Thus, the Make-up Water delivery for the First Long-term Accounting Period was fully satisfied. A detailed description of the deliveries is contained in the Twenty-Second Annual Report.

Second Long-term Accounting Period

Table 9 is a summary of operations under the Judgment showing Lower Area Annual Entitlement, Usable Water and Make-up Water received by the Lower Area and the Accrued Debit or Credit of Upper Area for each year of operation during the Second Long-term Accounting period from 1979-80 through 1993-94.

As previously mentioned, Long-term Accounting is to be made sooner than the 25th year if the average annual rainfall for a period of 15 or more years is at least 18 inches but not more than 19 inches. Shown in Table 10 are the data used for the Second Long-term Accounting period. As shown on Table 10, the annual rainfall for the first fifteen years of operation under the Second Long-term Accounting period averaged 18.89 inches. Because at least 15 years elapsed since the First Long-term Accounting Period and because the average

annual rainfall was between 18 and 19 inches, the Second Long-term Accounting was made. The rainfall for the period averaged 18.89 inches resulting in a long-term entitlement of 1,505,718 acre-feet. The amount of Usable Water received by the Lower Area was 1,631,156 acre-feet resulting in a credit of 125,438 acre-feet to be carried into the Third Long-term Accounting Period.

TABLE 9
SUMMARY OF ANNUAL OPERATIONS
UNDER JUDGMENT DURING
SECOND LONG-TERM ACCOUNTING PERIOD

(In Acre-Feet)					
Water Year	Entitlement	Water Received by Lower Area			Accrued Credit (+) or Debit (-)
		Usable	Make-Up ^(a)	Total	
1979-80	107,600	137,175	0	137,175	+29,575
1980-81	105,700	85,917	0	85,917	+ 9,792
1981-82	111,900	94,823	0	94,823	- 7,285
1982-83	122,200	185,014	7,285	192,299	+62,814
1983-84	118,600	99,725	0	99,725	+43,939
1984-85	118,100	90,965	0	90,965	+16,804
1985-86	123,900	119,457	0	119,457	+12,361
1986-87	121,000	63,192	0	63,192	- 45,447
1987-88	106,300	85,251	20,447	105,698	- 46,049
1988-89	98,800	70,280	21,190	91,470	- 53,379
1989-90	81,800	67,709	28,279	95,988	- 39,191
1990-91	85,600	75,572	14,835	90,407	- 34,384
1991-92	88,700	105,990	14,735	120,725	- 2,359
1992-93	86,400	156,594	2,359	158,953	+70,194
1993-94	---	84,362	0	84,362	---
Totals	1,505,718 ^(b)	1,522,026	109,130	1,631,156	125,438

(a) Does not include deliveries of Make-up Water for First Long-term Accounting.

(b) The figures shown for the first 14 years are for information purposes only. The Second Long-term Accounting was determined in accordance with paragraph 5(h) of the Judgment.

TABLE 10

**DATA FOR SECOND
LONG-TERM ACCOUNTING PERIOD**

Number of Years	Water Year	Rainfall in Inches		Water Received by Lower Area in Acre-Feet				Long-Term Accounting Formula ^(b) in Acre-Feet
		Amount	Average Annual Amount	Usable	Make-Up ^(a)	Total	Accumulated Total	
1	1979-80	34.85	34.85	137,175	0	137,175	137,175	185,192
2	1980-81	10.31	22.58	85,917	0	85,917	223,092	239,980
3	1981-82	18.88	21.35	94,823	0	94,823	317,915	340,361
4	1982-83	39.26	25.82	185,014	7,285	192,299	510,214	548,828
5	1983-84	10.56	22.77	99,725	0	99,725	609,939	604,997
6	1984-85	14.58	21.41	90,965	0	90,965	700,904	682,635
7	1985-86	21.96	21.48	119,457	0	119,457	820,361	799,011
8	1986-87	9.06	19.93	63,192	0	63,192	883,553	847,262
9	1987-88	14.88	19.37	85,251	20,447	105,698	989,251	926,387
10	1988-89	11.15	18.55	70,280	21,190	91,470	1,080,721	985,744
11	1989-90	12.35	17.99	67,709	28,279	95,988	1,176,709	1,051,585
12	1990-91	15.12	17.75	75,572	14,835	90,407	1,267,116	1,131,879
13	1991-92	22.80	18.14	105,990	14,735	120,725	1,387,841	1,253,144
14	1992-93	35.94	19.41	156,594	2,359	158,953	1,546,794	1,444,022
15	1993-94	11.64	18.89	84,362	0	84,362	1,631,156	1,505,718

(a) Excludes water delivered to Make-up for deficit in First Long-term Accounting Period.

(b) The figures shown for first 14 years are for informational purposes only. The Second Long-term Accounting was determined in accordance with paragraph 5(h) of the Judgment.

Third Long-term Accounting Period

Table 11 is a summary of operations under the Judgment showing Lower Area Annual Entitlement, Usable Water and Make-up Water received by the Lower Area and the Accrued Debit or Credit of Upper Area for each year of operation during the Third Long-term Accounting Period beginning with 1994-95. Included in the Accrued Credit of the Upper Area at the start of the period is the carryover from the Second Long-term Accounting Period of 125,438 acre-feet.

Water Year 1997-98 is the fourth year in the third Long-term Accounting Period which as explained above can occur between the 15th and 25th year. Table 12 is a summary of operations under the Judgment showing data to be used for the Third Long-term Accounting.

TABLE 11

**SUMMARY OF ANNUAL OPERATIONS
UNDER JUDGMENT DURING
THIRD LONG-TERM ACCOUNTING PERIOD**

(In Acre-Feet)

Water Year	Entitlement	Water Received by Lower Area			Annual Credit (+) or Debit (-)	Accrued Credit (+) or Debit (-)
		Usable	Make-Up ^(a)	Total		
1993-94	---					+ 125,438 ^(a)
1994-95	98,300	140,103	0	140,103	+ 41,803	+ 167,241
1995-96	94,000	108,201	0	108,201	+ 14,201	+ 181,442
1996-97	99,500	107,035	0	107,035	+ 7,535	+ 188,977
1997-98	113,100	145,722	0	145,722	+ 32,622	+ 221,599
Totals	404,900	501,061	0	501,061		

^(a) Carryover of credit from Second Long-term Accounting Period.

TABLE 12
DATA FOR THIRD
LONG-TERM ACCOUNTING PERIOD

Number of Years	Water Year	Rainfall in Inches		Water Received by Lower Area in Acre-Feet				Long-Term Accounting Formula ^(b) in Acre-Feet
		Amount	Accumulated Average Annual Amount	Usable	Make-Up	Total	Accumulated Total	
0 ^(a)	1993-94	---	---	---	---		125,438 ^(a)	----
1	1994-95	30.44	30.44	140,103	0	140,103	265,541	161,758
2	1995-96	15.60	23.02	108,201	0	108,201	373,742	244,656
3	1996-97	17.49	21.18	107,035	0	107,035	480,777	337,651
4	1997-98	36.13	24.92	145,722	0	145,722	626,499	529,698

(a) Carryover of credit from Second Long-term Accounting Period.

(b) The figures shown are for informational purposes only. The Third Long-term Accounting will be determined in accordance with paragraph 5(h) of the Judgment.

STREAM GAGING STATIONS

- F45B-R RIO HONDO ABOVE STEWART AND GRAY ROAD
- F64 RIO HONDO ABOVE MISSION BRIDGE
- F81D-R ALHAMBRA WASH NEAR KLINGERMANN STREET
- F83 MISSION CREEK AT SAN GABRIEL BOULEVARD
- F86-S SAN GABRIEL RIVER BELOW STANDEFER DITCH
- F181-R MONTEBELLO STORM DRAIN ABOVE RIO HONDO
- F261C-R SAN GABRIEL RIVER BELOW VALLEY BOULEVARD
- F262C-R SAN GABRIEL RIVER BELOW FLORENCE AVENUE
- F263B-R SAN GABRIEL RIVER AT BEVERLY BOULEVARD
- F263C-R SAN GABRIEL RIVER BELOW PARKWAY BRIDGE
- F312B-R SAN JOSE CHANNEL ABOVE WORKMAN MILL ROAD
- F313B-R RIO HONDO BY-PASS CHANNEL ABOVE WHITTIER NARROWS DAM

E322-R SAN GABRIEL RIVER AT PECK ROAD

E326-R RIO HONDO BELOW GARVEY AVENUE

E327-R RIO HONDO BELOW WHITTIER NARROWS DAM

F330-R MISSION CREEK BELOW LEGG LAKE

G44B-R WHITTIER NARROWS FLOOD CHANNEL

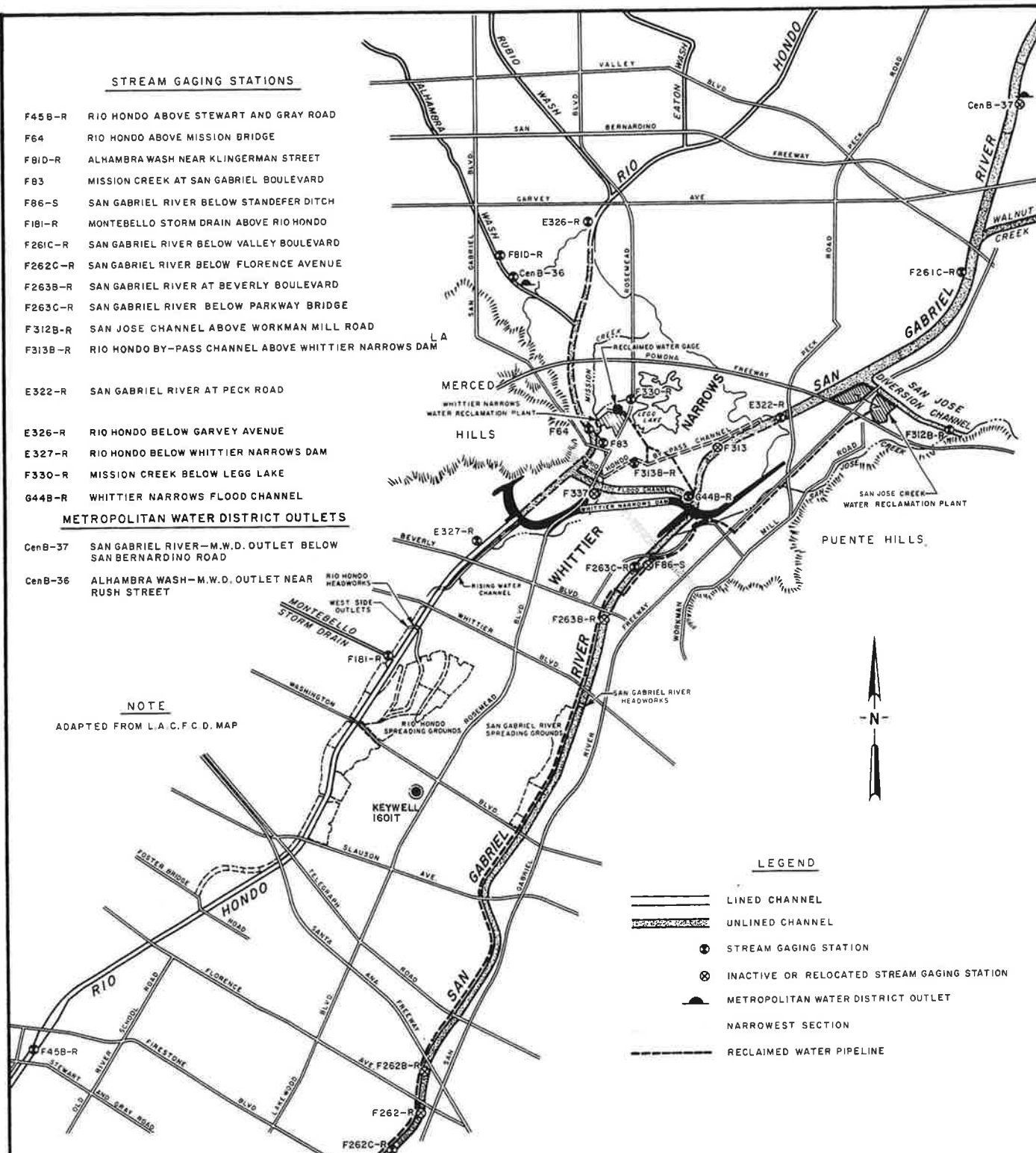
METROPOLITAN WATER DISTRICT OUTLETS

CenB-37 SAN GABRIEL RIVER—M.W.D. OUTLET BELOW SAN BERNARDINO ROAD

CenB-36 ALHAMBRA WASH—M.W.D. OUTLET NEAR RUSH STREET

NOTE

ADAPTED FROM L.A.C.F.C.D. MAP



SAN GABRIEL RIVER WATERMASTER

CITY OF LONG BEACH Vs. SAN GABRIEL VALLEY WATER CO.
CASE No. 722647

STREAM GAGING STATIONS
RIO HONDO — SAN GABRIEL RIVER SYSTEM

WATERMASTERS
HOWARD H. HAILE—RICHARD A. RHONE—THOMAS M. STETSON





APPENDIX

**PARTIES TO JUDGMENT
CITY OF LONG BEACH, ET AL, VS.
SAN GABRIEL VALLEY WATER CO., ET AL,
CASE NO. 722647 - LOS ANGELES COUNTY**

Court - Clerk of Superior Court (Case No. 722647)

Plaintiffs

Board of Water Commissioners of the City of Long Beach
Central Basin Municipal Water District
City of Compton

Defendants

San Gabriel Valley Water Company
(includes, by merger, Vallecito Water Company)
Azusa Agricultural Water Company
Azusa Valley Water Company
California-American Water Company
(successor to California Water and Telephone Company)
Covina Irrigating Company
East Pasadena Water Company, Ltd.
Glendora Irrigating Company (now City of Glendora)
Southern California Water Company
Suburban Water Systems
Sunny Slope Water Company
City of Alhambra
City of Arcadia
City of Azusa
City of Covina
City of El Monte
City of Glendora
City of Industry (successor to Cross Water Company)
City of Monrovia
City of Monterey Park
City of South Pasadena
San Gabriel County Water District
Valley County Water District
(formerly known as Baldwin Park County Water District)

Intervenors

Upper San Gabriel Valley Municipal Water District
California Domestic Water Company

Christine L. Blazey, CPA

An Accountancy Corporation

December 1, 1998

San Gabriel River Watermaster
225 W. Broadway, Suite 400
Glendale, California 91203

We have audited the accompanying statement of Income and Expenditures for the San Gabriel River Watermaster for the water year 1997-1998. This financial statement is the responsibility of management. Our responsibility is to express an opinion on this financial statement based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the statement of income is free of material misstatement. An audit includes examining on a test basis, evidence supporting the amounts and disclosures in the statement of income. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the statement of income. We believe that our audit of the statement of income provides a reasonable basis for our opinion.

In our opinion, the statement of income referred to above presents fairly, in all material respects, the results of operations of San Gabriel River Watermaster for the year ended, in conformity with generally accepted accounting principles.



Christine L. Blazey, CPA
An Accountancy Corporation

SAN GABRIEL RIVER WATERMASTER
Statement of Income and Expenditures
For the Water Year 1997-1998

Carried forward from year 1996-1997	\$ 13,854.41
Income	72,000.00
Interest Income	1,839.02

	\$ 87,693.43

Expenditures:

Administrative fees and general operating expenses	\$13,331.19	
Collection of data, field inspections and maintenance of records	29,728.24	
Calculations and preparation of Watermaster Reports for water years 1996-1997	41,528.99	
Printing and reproduction costs	2,281.56	

Total Expenditures	\$ 86,869.98	

Balance	\$ 823.45	=====