SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

VS. CITY OF CHINO et al.

CASE NO. 117628 - COUNTY OF ORANGE

TWENTY-NINTH

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 1998 - SEPTEMBER 30, 1999

APRIL 30, 2000

SANTA ANA RIVER WATERMASTER

ORANGE COUNTY WATER DISTRICT VS. CITY OF CHINO ET AL.
CASE NO. 117628--COUNTY OF ORANGE

WATERMASTER
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April 30, 2000

To: Clerk of Superior Court of Orange County and all Parties

Re: Watermaster Report for Water Year October 1, 1998 - September 30, 1999

Ladies and Gentlemen:

We have the honor of submitting herewith the Twenty-ninth Annual Report of the Santa Ana River Watermaster. We wish to point out that the supporting basic data heretofore presented as Appendices are bound separately.

The principal findings of the Watermaster for the water year 1998-99 are as follows:

<u>At Prado</u>

1	Base Flow at Prado	158,637 acre-feet
2	Annual Weighted TDS in Base and Storm Flows	581 mg/L
3	Annual Adjusted Base Flow	174,369 acre-feet
4	Cumulative Adjusted Base Flow	3,188,600 acre-feet
5	One-Half San Jacinto Watershed Discharge Reaching Prado Dam and Recharging Orange County Groundwater Basin	0 acre-feet
6	Cumulative Entitlement of OCWD	1,218,000 acre-feet
7	Cumulative Credit	1,970,600 acre-feet
8	One-Third of Cumulative Debit	0 acre-feet
9	Minimum Required Base Flow in 1999-00	34,000 acre-feet

At Riverside Narrows

1	Base Flow at Riverside Narrows	73,094 acre-feet
2	Annual Weighted TDS in Base Flow	603 mg/L
3	Annual Adjusted Base Flow	73,094 acre-feet
4	Cumulative Adjusted Base Flow	1,174,910 acre-feet
5	Cumulative Entitlement of IEUA and WMWD	442,250 acre-feet
6	Cumulative Credit	732,660 acre-feet
7	One-Third of Cumulative Debit	0 acre-feet
8	Minimum Required Base Flow in 1999-00	12,420 acre-feet

The above findings show that at the end of the 1998-99 water year, Inland Empire Utilities Agency (formerly Chino Basin Municipal Water District) and Western Municipal Water District have a cumulative credit of 1,970,600 acre-feet to their Base Flow obligation at Prado Dam. San Bernardino Valley Municipal Water District has a cumulative credit of 732,660 acre-feet to its Base Flow obligation at Riverside Narrows.

Based on these findings, the Watermaster concludes that there was full compliance with the provisions of the Stipulated Judgment in 1998-99.

The Watermaster continued to exercise surveillance over the many active and proposed projects within the watershed for their potential effect on Base Flow.

Sincerely yours,

Santa Ana River Watermaster

By: Richard W. Atwater

Richard W. Atwater

Bill B. Dendy

Donald L. Harriger

William R. Mills, Jr.

Robert L. Reiter

Robert L. Reiter

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B Daily Precipitation Data at San Bernardino County Hospital

C Santa Ana River Watermaster Financial Statements with Report on Examination by Orange County Water District Controller

D Water Quality and Flow of High Groundwater Mitigation Project Pumped Water Discharged to the Santa Ana River above Riverside Narrows

E Water Quality and Discharge of Water Released by MWDSC to San Antonio Creek Near Upland (Connection OC-59)

F Water Quality and Discharge from the Arlington Desalter to the Arlington Valley Drain

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CHAPTER I

WATERMASTER ACTIVITIES AND WATER CONDITIONS

Introduction

This Twenty-ninth Annual Report of the Santa Ana River Watermaster covers water year 1998-99. The annual report is required by the Stipulated Judgment (Judgment) in the case of Orange County Water District vs. City of Chino et al., entered by the court on April 17, 1969 (Case No. 117628-County of Orange). The Stipulated Judgment became effective on October 1, 1970. It contains a declaration of rights of the water users and other entities in the Lower Area of the Santa Ana River Basin downstream of Prado Dam as against those in the Upper Area tributary to Prado Dam, and provides a physical solution to satisfy those rights. Chapter IV presents a history of the litigation and a summary of the Judgment.

The physical solution accomplishes, in general, a regional intrabasin allocation of the surface flow of the Santa Ana River System. The Judgment leaves to each of the major hydrologic units within the basin the determination and regulation of individual rights therein and the development and implementation of its own water management plan subject only to compliance with the physical solution.

The Judgment designates four public agencies to represent the interests of the Upper and Lower Areas and gives them the responsibility to fulfill the obligations set forth in the Judgment, including the implementation of the physical solution. The Lower Area is represented by Orange County Water District (OCWD). The Upper Area is represented by San Bernardino Valley Municipal Water District (SBVMWD), Western Municipal Water District of Riverside County (WMWD) and Inland Empire Utilities Agency (IEUA), formerly the Chino Basin Municipal Water District (CBMWD).

The court appoints a five-member Watermaster Committee to administer the provisions of the Judgment. The Watermaster's duty is to maintain a continuous accounting of each of the items listed in the letter of transmittal hereof and to report thereon annually for each water year to the court and the parties. The time for submission of the annual report is April 30, seven months after the end of the water year.

For the 1998-99 water year the Watermaster Committee consisted of Donald L. Harriger, William R. Mills, Jr., Robert L. Reiter, Bill B. Dendy and Richard W. Atwater. Mr. Mills served as Chairman and Mr. Reiter served as Secretary/Treasurer. Mr. Atwater was appointed on September 1, 1999 to replace Robb D. Quincey. Chapter IV presents the history of Watermaster Committee membership.

Watermaster Service Expenses

In accordance with Paragraph 7(d) of the Stipulated Judgment, the fees and expenses of each of the members of the Watermaster are borne by the parties by whom they were nominated. All other Watermaster service expenses are shared by the parties, with OCWD paying 40% of the cost and WMWD, SBVMWD, and IEUA each paying 20% of the cost.

Stream flow measurements and water quality data required by the Watermaster are, for the most part, furnished by the U.S. Geological Survey (USGS) through a cooperative monitoring program. The costs of the cooperative monitoring program for the 1998-99 water year, and each party's share of the costs, are set forth in Table 1.

TABLE 1
COSTS TO THE PARTIES AND USGS FOR MEASUREMENTS WHICH PROVIDE DATA USED BY THE SANTA ANA RIVER WATERMASTER

October 1, 1998 to September 30, 1999

	Total Cost	USGS Share	Parties' Share
USGS GAGING STATION			
Santa Ana River at MWD Crossing (Riverside Narrows)			
Surface Water Gage	$20,500	$10,250	$10,250
Water Quality Monitoring/TDS Sampling	8,400	4,200	4,200
Chino Creek at Schaefer	14,600	7,300	7,300
Cucamonga Creek at Mira Loma	14,600	7,300	7,300
Santa Ana River below Prado Dam			
Surface Water Gage	14,600	7,300	7,300
Water Quality Monitoring/TDS Sampling	17,700	8,850	8,850
Water Quality Conductance Program	1,650	0	1,650
TOTAL COST AND SHARES	$92,050	$45,200	$46,850
COST DISTRIBUTION AMONG PARTIES			
Inland Empire Utilities Agency	20%		$9,370
Orange County Water District	40%		$18,740
San Bernardino Valley Municipal Water District	20%		$9,370
Western Municipal Water District	20%		$9,370

The Watermaster annually adopts an expense budget. Table 2 shows the budget and actual expenses incurred for the 1998-99 fiscal year as well as the budget adopted for the 1999-00 fiscal year. A financial review was performed by OCWD and is reported in Appendix C.

TABLE 2

WATERMASTER SERVICE BUDGET AND EXPENSES

Budget Item	July 1, 1998 to June 30, 1999 Budget	July 1, 1998 to June 30, 1999 Expenses[1]	July 1, 1999 to June 30, 2000 Budget
Support Services	$9,500.00	$0.00	$9,500.00
Reproduction of Annual Report	2,500.00	0.00	2,500.00
TOTAL	$12,000.00	$0.00	$12,000.00

(1) Expenses were low because they were paid after June 30, 1999 and will be expensed in 1999-00.

Compilation and Analysis of Basic Data

The Watermaster has established procedures for annually compiling and analyzing the basic data necessary to monitor compliance with the provisions of the Judgment. The procedures are used to make determinations, at Prado Dam and at Riverside Narrows, of the Base Flow, Storm Flow, Nontributary Flow, and the relationships between electrical conductivity (EC), [measured as specific conductance and expressed in microsiemens per centimeter (μs/cm)], and total dissolved solids (TDS) concentrations. The determinations for the 1998-99 water year are explained in detail for Prado Dam in Chapter II and for Riverside Narrows in Chapter III.

Hydrologic and Water Quality Data for the 1998-99 Water Year

The USGS provided flow and water quality data for the Santa Ana River at two gaging stations, "Santa Ana River Below Prado" (Prado) and "Santa Ana River at Metropolitan Water District (MWD) Crossing" (Riverside Narrows). The flow data consist of computed mean daily discharges based on continuous recordings. The water quality data at Prado consist of daily maximum and minimum values for EC based on a continuous recording and twice-monthly values for TDS. The water quality data at Riverside Narrows consist of twice-monthly values for both EC and TDS. The USGS also provided discharge data for other gaging stations that measure flows tributary to Prado, including the Santa Ana River at E Street in San Bernardino, Chino Creek at Schaefer Avenue, Cucamonga Creek near Mira Loma, and Temescal Creek in the City of Corona (see Appendix A).

The 1998-99 daily mean discharge record at Prado is considered by the USGS to be a "good" record. Daily mean discharges at the station are controlled at times by storage operations in the reservoir behind Prado Dam just upstream. The maximum and minimum daily mean discharge values during the water year were, respectively, 1,710 cubic feet per second (cfs) on January 28, 1999, and 146 cfs on June 8, 1999. The maximum and minimum daily mean EC values were, respectively, 1,080 µs/cm on December 19, 1998, and 558 µs/cm on January 27, 1999. The respective corresponding calculated TDS concentrations were 675 and 349 milligrams per liter (mg/L).

The 1998-99 daily mean discharge record at Riverside Narrows is considered by the USGS to be "fair" below 500 cfs and "poor" above. The maximum and minimum daily mean discharge values during the year were, respectively, 392 cfs on April 12, 1999, and 72 cfs on July 7, 1999. The maximum and minimum daily mean EC values were, respectively, 998 µs/cm on May 21, 1999, and 492 µs/cm on June 2, 1999. The respective corresponding measured TDS concentrations were 652 and 433 mg/L.

During the year there was one source of non-storm flow in the river that the Watermaster has not included in Base Flow. At its Arlington Desalter in Riverside the Santa Ana Watershed Project Authority (SAWPA) produced and delivered to a channel tributary to the Santa Ana River between Riverside Narrows and Prado 2,684 acre-feet of water having an average TDS concentration of 492 mg/L.

During the year, pursuant to the High Groundwater Mitigation Project Agreement between SBVMWD and OCWD, SBVMWD pumped 3,365 acre-feet of groundwater from the Bunker Hill Basin and conveyed it to the river. The Watermaster decided that the pumped groundwater, net of any losses, is to be deducted from Base Flow as it passes Riverside Narrows and Prado. Representatives of IEUA, WMWD, SBVMWD and OCWD determined from field observations that none of the pumped groundwater reached Riverside Narrows during the year and that, instead, it percolated to storage in the Colton and Riverside Basins.

After a thorough discussion, the Watermaster determined that the pumped groundwater is in storage in the Colton and Riverside Basins and is moving toward the Riverside Narrows where, minus any losses, it will appear as rising water in the future. The Watermaster also decided that it will be impossible to distinguish this pumped groundwater from Base Flow by means of the scalping procedures used by the Watermaster. Hence, the Watermaster decided to establish a schedule during the coming year by which the pumped groundwater, net of losses, will be deducted from Base Flow in the future, beginning in water year 1999-00. Further, the Watermaster decided that the methods to be used for estimating losses and for establishing the schedule for future deduction from Base Flow will be similar to the methods developed previously for Nontributary Flows and reported in the Fifth Annual Report.

The National Oceanic and Atmospheric Administration reported precipitation totaling 8.02 inches at the San Bernardino County Hospital during 1998-99 (see Appendix B). The rainfall total was 45% of the average of 17.98 inches per year that occurred during the 26-year base period (1934-35 through 1959-60) that was used in the formulation of the physical solution. Plate 2 shows annual precipitation from 1934-35 through 1998-99.

Summary of Findings

A summary of findings by the Watermaster for the period 1970-71 through 1998-99 is presented in Table 3. Note that the Base Flow obligations set forth in the Judgment at both Prado Dam and Riverside Narrows have been met and cumulative credits have accrued to the Upper Area.

TABLE 3

SUMMARY OF FINDINGS AT PRADO

Water Year	Rainfall (in)[1]	Total Flow (ac-ft)[2]	Base Flow (ac-ft)	Weighted TDS (mg/L)[3]	Adjusted Base Flow (ac-ft)	Cumulative Credit (ac-ft)
1970-71	11.97	51,864	38,402	727	38,402	-3,598
1971-72	9.62	51,743	40,416	707	40,416	-5,182
1972-73	18.46	76,375	48,999	638	51,531	4,349
1973-74	12.72	63,620	43,106	633	45,513	7,862
1974-75	13.49	61,855	50,176	694	51,263	17,125
1975-76	15.86	59,209	45,627	635	48,098	23,223
1976-77	11.95	62,953	48,387	660	50,000	31,223
1977-78	30.47	252,837	58,501	383	73,955	63,178
1978-79	17.51	134,486	71,863	580	79,049	100,227
1979-80	30.93	527,760	82,509	351	106,505	164,732
1980-81	10.45	117,888	74,875[5]	728	74,875[5]	205,652[6]
1981-82	18.34	143,367	81,548	584	89,431	253,083
1982-83	32.36	425,938	111,692[5]	411	138,591[5]	353,036[6]
1983-84	10.81	178,395[4]	109,231[5]	627	115,876[5]	431,514[6]
1984-85	12.86	162,912	125,023[8]	617	133,670	523,184
1985-86	17.86	196,565	127,215[8]	567	141,315	622,499
1986-87	8.08	140,538	119,848	622	127,638	708,137
1987-88	13.78	170,279[9]	124,104[9]	582	136,308	802,445
1988-89	12.64	152,743[9]	119,572[9]	583	131,230	891,675
1989-90	8.53	144,483	119,149[10]	611	127,986	977,611
1990-91	15.48	191,321	111,151[11]	514	128,379	1,064,040
1991-92	16.54	193,225	106,948[11]	499	124,869	1,146,909
1992-93	30.92	568,677	128,068[11]	368	163,499	1,268,408
1993-94	11.62	158,241	111,186[11]	611	119,432	1,345,840
1994-95	25.14	424,017[4]	123,468[11]	415	152,792[5]	1,458,394[6]
1995-96	11.92	194,797	131,861[11]	514	152,299	1,568,693
1996-97	18.64	204,610	136,676[11]	514	157,861	1,684,554
1997-98	33.41	462,633[4]	155,711[11]	392	195,677	1,838,231
1998-99	8.02	182,310	158,637	581	174,369	1,970,600

TABLE 3 (Continued)

SUMMARY OF FINDINGS AT RIVERSIDE NARROWS

Water Year	Rainfall (in)[1]	Total Flow (ac-ft)[2]	Base Flow (ac-ft)	Weighted TDS (mg/L)[3]	Adjusted Base Flow (ac-ft)	Cumulative Credit (ac-ft)
1970-71	11.97	24,112	17,061	704	17,021	1,762
1971-72	9.62	22,253	16,157	712	16,017	2,529
1972-73	18.46	32,571	17,105	700	17,105	4,384
1973-74	12.72	24,494	16,203	700	16,203	5,337
1974-75	13.49	19,644	15,445	731	15,100	5,187
1975-76	15.86	26,540	17,263	723	16,977	6,914
1976-77	11.95	23,978	18,581	722	18,286	9,950
1977-78	30.47	181,760	22,360	726	21,941	16,641
1978-79	17.51	47,298	26,590	707	26,456	27,847
1979-80	30.93	253,817	25,549[7]	676	25,549	38,146
1980-81	10.45	34,278	19,764	715	19,550	42,446
1981-82	18.34	82,708	32,778	678	32,778	59,974
1982-83	32.36	279,645	57,128	610	57,128	101,852
1983-84	10.81	82,745	56,948	647	56,948	143,550
1984-85	12.86	78,771	69,772[8]	633	69,772	198,072
1985-86	17.86	99,258	68,220[8]	624	68,220	251,042
1986-87	8.08	77,752	59,808	649	59,808	295,600
1987-88	13.78	79,706	55,324	620	55,324	335,674
1988-89	12.64	62,376	52,259	607	52,259	372,683
1989-90	8.53	58,159	53,199	590	53,583	411,016
1990-91	15.48	73,790	45,041[11]	616	45,041	440,807
1991-92	16.54	71,427	40,306	620	40,306	465,863
1992-93	30.92	267,043	41,434	634	41,434	492,047
1993-94	11.62	45,006	31,278[11]	677	31,278	508,075
1994-95	25.14	243,411	45,562[11]	646	45,562	538,387
1995-96	11.92	81,786	54,548[11]	625	54,548	577,685
1996-97	18.64	104,518	62,618[11]	624	62,618	625,053
1997-98	33.41	214,375	65,013[11]	601	65,013	674,816
1998-99	8.02	76,294	73,094	603	73,094	732,660

TABLE 3 (Continued)

(1) Measured at San Bernardino County Hospital.
(2) Excludes Nontributary Flow and Exchange Waters.
(3) For Base and Storm Flow at Prado and Base Flow only at Riverside Narrows.
(4) Includes San Jacinto Watershed discharges which passed Prado Dam totaling 16,090 acre-feet in 1980-81; 7,720 acre-feet in 1982-83; 12,550 acre-feet in 1983-84; 4,697 acre-feet in 1994-95; and 1,690 acre-feet in 1997-98.
(5) Excludes water discharged from the San Jacinto Watershed.
(6) Includes a credit for a portion of San Jacinto Watershed discharges totaling 8,045 acre-feet in 1980-81; 3,362 acre-feet in 1982-83; 4,602 acre-feet in 1983-84; and 1,762 acre-feet in 1994-95.
(7) Includes Rubidoux Wastewater in 1979-80 and subsequent years.
(8) Includes groundwater pumped from San Bernardino Basin and released to the river in accordance with Court Orders approving agreement and allowing temporary additional extractions of water from the San Bernardino Basin Area.
(9) Excludes Nontributary Flow released to San Antonio Creek by MWDSC under the Ontario/MWDSC Exchange Program.
(10) Excludes water discharged to Santa Ana River from Arlington Desalter in 1989-90 and subsequent years in accordance with an agreement between OCWD, WMWD, and Santa Ana Watershed Project Authority.
(11) Excludes groundwater pumped from San Bernardino, Colton, and Riverside Basins and discharged to the Santa Ana River to flow to OCWD under the Exchange Water agreements.

Note: For the years 1973-74 through 1979-80, a correction has been made for different losses of State Water than assumed in reports published for these years. The values changed are Base Flow, weighted TDS, and Adjusted Base Flow. These changes, in turn, have changed the cumulative credit for these years. See Appendix C in the Twelfth Annual Report (1981-82).

CHAPTER II

BASE FLOW AT PRADO

This chapter deals with determinations of 1) the components of flow at Prado, which include Nontributary Flow, Arlington Desalter discharge, Storm Flow and Base Flow and 2) the Adjusted Base Flow at Prado credited to IEUA and WMWD.

Flow at Prado

During the 1998-99 water year, the flow of the Santa Ana River as measured at the USGS gaging station below Prado Dam amounted to 184,998 acre-feet. There was four acre-feet of storage behind the dam at the beginning and no storage at the end of the water year. Inflow to the reservoir included 158,637 acre-feet of Base Flow and 23,673 acre-feet of Storm Flow, based on an adjusted Prado Reservoir storage-elevation curve described in the following section. Nontributary flows due to the Arlington Desalter totaled 2,684 acre-feet. The monthly components of flow of the Santa Ana River at Prado Dam for 1998-99 are listed in Table 4 and are shown graphically on Plate 3. Historical Base and Storm Flows of the Santa Ana River below Prado during the period 1934-35 through 1998-99 are presented on Plate 4.

Prado Reservoir Storage-Elevation Curve Adjustment

The Watermaster calculates inflow to Prado Reservoir by adjusting outflow data using change in reservoir storage. Reservoir storage is based on a storage-elevation curve last updated by the U.S. Army Corps of Engineers (ACOE) in 1988. The ACOE reports that sedimentation averaged about 200 acre-feet per year between 1969 and 1979. Such sedimentation affects the accuracy of the storage-elevation curve when the storage in the reservoir is low. This inaccuracy results in anomalies in the calculated inflow near the end of each period of reservoir storage.

In 1997, the Watermaster adjusted the Prado Reservoir storage-elevation curve to improve the calculated Santa Ana River inflow hydrograph from which Base Flow and Storm Flow are determined. Assuming an average sedimentation rate of 200 acre-feet per year from 1988 through 1996, the portion of the ACOE storage-elevation curve below elevation 520 feet was adjusted to include a 1,600 acre-feet reservoir storage loss. Elevation 520 feet represents the approximate maximum flood storage elevation attained behind Prado Dam in the last several years where most sedimentation would likely have occurred. The new storage-elevation curve was developed by distributing the 1,600 acre-feet storage loss until the curve produced inflow values without significant anomalies.

TABLE 4

COMPONENTS OF FLOW AT PRADO DAM

WATER YEAR 1998-99
(acre-feet)

Month	USGS Measured Outflow	+ Storage Change[1]	= Computed Inflow	- High Ground-water Mitigation Project [2]	- Arlington Desalter	- Storm Flow	= Base Flow
1998							
October	11,302	2,646	13,948	0	271	506	13,171
November	16,618	(938)	15,679	0	0	2,673	13,006
December	18,179	(1,712)	16,467	0	0	2,300	14,167
1999							
January	20,063	299	20,362	0	28	5,080	15,253
February	17,310	(295)	17,015	0	347	3,120	13,547
March	16,552	(2)	16,550	0	329	772	15,449
April	16,024	3,377	19,401	0	274	4,764	14,363
May	19,178	(3,379)	15,800	0	93	2,295	13,411
June	13,194	0	13,194	0	121	1,003	12,071
July	13,279	0	13,279	0	433	1,160	11,687
August	11,675	0	11,675	0	370	0	11,304
September	11,625	0	11,625	0	417	0	11,208
Total	184,998	(4)	184,994	0	2,684	23,673	158,637

(1) The monthly change in storage is included in the monthly components of flow.

(2) San Bernardino Valley Municipal Water District High Groundwater Mitigation Project pumped water discharged to the Santa Ana River.

Nontributary Flow

Since May 1973, OCWD has from time to time purchased State Water Project water for the replenishment of the groundwater basin in Orange County. The water has been released at two locations: Santa Ana River above Riverside Narrows (1972-73 only) and San Antonio Creek near the City of Upland.

Releases to San Antonio Creek

During the 1998-99 water year, no State Water Project water was released into San Antonio Creek from the Foothill Feeder at turnout OC-59 near Upland.

Arlington Desalter

The underflow from the Arlington groundwater sub-basin has historically been a component of the Santa Ana River flow. These groundwaters have increasingly been degraded through agricultural and other uses. Two parties to the Stipulated Judgment, WMWD and OCWD, as members of the Santa Ana Watershed Project Authority, constructed a groundwater cleanup project that is designed to reduce the poor quality underflow from the sub-basin. This project is known as the Arlington Desalter and consists of five extraction wells and a treatment facility that reduces salinity. The capacity of the facility is approximately 6 million gallons per day (mgd). The facility began operations in July 1990, with OCWD buying the product water delivered through the Santa Ana River. All parties to the Stipulated Judgment agreed that the product water from this facility would be excluded from the computation of Santa Ana River Base Flow and Base Flow quality. During the 1998-99 water year, 2,684 acre-feet of water discharged from the Arlington Desalter were determined to have reached Prado Dam. OCWD Operations provided daily discharge rates and electrical conductance of product water. A summary of Arlington Desalter discharges is contained in Appendix F.

High Groundwater Mitigation Project

As mentioned in Chapter 1, discharges of 3,365 acre-feet of High Groundwater Mitigation Project pumped groundwater from the Bunker Hill Basin, less any evaporative losses, were determined to have percolated to storage in Colton and Riverside Basins. None of the water discharged reached Prado during the 1998-99 water year. A summary of the High Groundwater Mitigation Project discharges is contained in Appendix D.

San Jacinto Watershed Discharge

There were no discharges from the San Jacinto Watershed reaching Prado Dam during the 1998-99 water year.

Storm Flow

Portions of storm flows are retained behind Prado Dam for regulation of downstream flows and for water conservation purposes. The ACOE owns Prado Dam and operates it according to a release schedule utilizing a buffer pool elevation of 494 feet until March 1 of each year. In 1994 an agreement was signed by OCWD, ACOE, and the U.S. Fish and Wildlife Service, which provides that between March 1 and August 30 the pool would be raised, given sufficient flows, to elevation 497 feet. This elevation would be increased year by year, as additional biological habitat mitigation by OCWD comes on line, to a maximum elevation of 505 feet. On April 12, 1995, the ACOE, the U.S. Fish and Wildlife Service, and OCWD reached an agreement to accelerate immediately the raising of the seasonal water conservation pool to elevation 505 feet, in exchange for a $1 million contribution by OCWD to the U.S. Fish and Wildlife Service to be used to develop Least Bell's vireo habitat by the removal of a non-native plant, *Arundo donax*. Storm flows captured within the reservoir are released following the storm to downstream groundwater recharge facilities. Monthly and annual quantities of Storm Flow are shown in Table 4.

During the 1998-99 water year, the maximum volume of water stored in Prado Reservoir reached 5,338 acre-feet on November 15, 1998. The maximum daily mean flow released from Prado Dam to the Santa Ana River was 1,723 cfs on January 28, 1999.

During the year, construction continued on elements of the Santa Ana River Mainstem flood control project. Construction of the Seven Oaks Dam, located on the Santa Ana River above the community of Mentone was completed. Construction on the Santa Ana River channel in Orange County neared completion. Work on the raising of Prado Dam and spillway is expected to begin during the summer of 2000.

Base Flow

The Base Flow is affected by Nontributary Flow releases to San Antonio Creek, discharges from the Arlington Desalter, discharges of the High Groundwater Mitigation Project pumped water, and discharges from the San Jacinto Watershed. Arlington Desalter discharges were the only component affecting the Base Flow during the 1998-99 water year. The general procedure used by the Watermaster to separate the 1998-99 flow components was the same as used for previous years and is fully described in the Fifth (1974-75) and the Twelfth (1981-82) Annual Reports. The monthly and annual quantities of Base Flow are shown in Table 4.

Wastewater Effluent Discharges

A portion of the Base Flow at Prado is made up of treated wastewater effluent discharged from a number of municipal wastewater treatment plants located above

Prado Dam. During the 1998-99 water year, about 175,284 acre-feet of effluent were discharged above Prado Dam by major agencies as shown in Table 5.

Water Quality Adjustments

The flow-weighted average TDS for the total flow passing Prado Dam, including Arlington Desalter discharge, was found to be 580 milligrams per liter (mg/L). This determination was based on records from a continuous monitoring device operated by the USGS for EC of the Santa Ana River flow below Prado Dam. This record was supplemented by twenty-four (24) grab samples for EC collected by the USGS and analyzed for TDS.

A correlation between TDS and EC yields the following best fit equation:

$$TDS = EC \times 0.624695$$

(where the units of TDS and EC are mg/L and microsiemens/centimeter, respectively)

Using the daily EC data, flow-weighted average daily values for TDS were calculated using the above equation. The plot of TDS on Plate 5 shows the daily average TDS concentration of the Santa Ana River flow passing Prado Dam. A summary of daily TDS and EC of the Santa Ana River below Prado Dam is contained in Appendix H.

At Prado Dam, the flow-weighted average annual TDS value of 580 mg/L represents the quality of the total flow including releases from the Arlington Desalter. The Stipulated Judgment requires that Base Flow shall be subject to adjustment based on the TDS of Base Flow and Storm Flow only. Hence, a determination of the TDS of Base Flow plus Storm Flow only, is detailed in the following paragraphs.

Adjustment for Flow to San Antonio Creek

No water was received during the 1998-99 water year. Therefore, no water quality adjustment was necessary.

Adjustment for Arlington Desalter Discharge

The amount of product water discharged to the Santa Ana River during the 1998-99 water year totaled 2,684 acre-feet. Using daily EC, a 0.64 conversion factor, and daily flow values, a flow-weighted average TDS of 492 mg/L was calculated. A summary of these calculations is contained in Appendix F.

Adjustment for High Groundwater Mitigation Project Discharge

Since none of the Mitigation Project pumped water discharged to the Santa Ana River reached Prado during the 1998-99 water year, no water quality adjustment is necessary

TABLE 5

MUNICIPAL WASTEWATER EFFLUENT DISCHARGED ABOVE PRADO (acre-feet)

Year	Redlands	Beaumont	Yucaipa	San Bernardino	Colton	Rialto	RIX[1]	Riverside	Corona	IEUA #1[2]	IEUA #2	CCWRF[3]	WRCR[4]	Total
1970-71	2,650	no record	--	17,860	2,520	2,270	--	18,620	3,190	--	--	--	--	47,110
1971-72	2,830	no record	--	16,020	2,230	2,400	--	19,010	3,230	6,740	--	--	--	52,460
1972-73	2,810	450	--	18,670	2,530	2,260	--	19,060	3,340	10,380	--	--	--	59,500
1973-74	2,770	600	--	17,680	2,530	2,320	--	19,560	3,510	11,440	2,320	--	--	62,730
1974-75	2,540	570	--	16,750	1,980	2,320	--	19,340	4,020	14,960	2,280	--	--	64,760
1975-76	2,450	620	--	17,250	2,540	2,240	--	19,580	4,700	15,450	2,950	--	--	67,780
1976-77	3,170	580	--	17,650	3,260	2,330	--	18,770	5,010	14,640	3,380	--	--	68,790
1977-78	3,280	620	--	18,590	3,810	2,380	--	20,310	5,200	14,650	4,060	--	--	72,900
1978-79	3,740	670	--	19,040	3,850	3,050	--	21,070	5,390	15,040	5,070	--	--	76,920
1979-80	4,190	690	--	20,360	4,190	2,990	--	22,910	5,360	14,410	5,520	--	--	80,620
1980-81	4,410	690	--	20,550	3,930	3,370	--	24,180	5,590	17,270	5,260	--	--	85,250
1981-82	4,420	700	--	23,340	3,780	3,470	--	25,640	5,410	19,580	5,360	--	--	91,700
1982-83	4,530	710	--	24,160	3,600	3,620	--	25,020	5,860	20,790	4,290	--	--	92,580
1983-84	5,150	800	--	22,080	3,700	3,830	--	26,090	6,200	20,950	3,950	--	--	92,750
1984-85	4,990	840	--	23,270	3,830	4,070	--	27,750	6,250	25,160	4,280	--	--	100,440
1985-86	5,200	820	--	24,720	4,010	4,720	--	28,820	5,900	28,240	2,660	--	--	105,090
1986-87	5,780	880	800	26,810	4,170	5,350	--	30,340	6,170	27,160	5,000	--	--	112,460

(continued on next page)

TABLE 5 (continued)

MUNICIPAL WASTEWATER EFFLUENT DISCHARGED ABOVE PRADO (acre-feet)

Year	Redlands	Beaumont	Yucaipa	San Bernardino	Colton	Rialto	RIX[1]	Riverside	Corona	IEUA #1[2]	IEUA #2	IEUA CCWRF[3]	WRCR[4]	Total
1987-88	6,060	940	1,850	27,880	5,240	6,040	--	34,660	6,050	31,290	5,500	--	--	125,510
1988-89	5,250	1,030	2,260	27,640	5,550	6,280	--	35,490	8,080	35,510	6,180	--	--	133,270
1989-90	6,360	1,100	2,370	28,350	5,810	6,260	--	33,210	9,140	34,760	5,730	--	--	133,090
1990-91	6,690	1,120	2,490	27,570	5,670	6,290	--	32,180	9,110	36,840	6,100	--	--	134,060
1991-92	6,230	1,150	2,580	25,060	5,660	6,360	--	32,660	9,010	40,360	5,780	1,550	--	136,400
1992-93	6,880	1,180	2,580	25,550	6,210	6,460	--	34,100	9,600	41,510	5,640	4,720	--	144,430
1993-94	6,440	1,150	2,710	23,800	5,830	6,540	--	32,640	7,790	37,310	5,430	7,010	--	136,650
1994-95	6,720	1,180	2,560	26,330	5,500	6,820	--	33,950	7,340	39,680	5,360	8,690	--	144,130
1995-96	6,550	1,260	2,640	13,240	2,770	6,890	20,760	33,960	7,850	39,590	4,810	9,060	--	149,380
1996-97	6,510	1,280	2,780	--	--	7,160	42,800	34,240	5,040	39,940	4,790	9,750	--	154,290
1997-98	7,022	1,356	3,116	--	--	7,063	49,683	35,422	8,718	44,940	4,969	9,264	1,461	173,014
1998-99	7,379	1,367	3,128	--	--	6,524	47,587	34,844	11,629	43,354	5,345	9,534	4,594	175,284

1. RIX = Rapid Infiltration and Extraction Facility for San Bernadino and Colton, including over-extraction of groundwater
2. Beginning in 1997-98, includes IEUA Plant #4 flows.
3. CCWRF = Carbon Canyon Water Reclamation Facility
4. WRCR = Western Riverside County Regional Wastewater Treatment Plant

The amounts shown in this table were determined from data provided by the agencies.

this year. A flow-weighted average TDS of 470 mg/L was calculated from well discharge data to be used at a future date when it is determined that the water has arrived at Prado. This data is contained in Appendix D.

Adjustment for San Jacinto Watershed Discharge

During the 1998-99 water year, no water discharged from the San Jacinto Watershed reached Prado Dam.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow x Average TDS (acre-feet x mg/L)
1. Measured Outflow	184,998	580	107,298,840
2. Less Arlington Desalter	2,684	492	1,320,528
3. Less High Groundwater Mitigation Project Pumped Water	0	--	---
4. Measured Outflow less lines 2 and 3	182,314		105,978,312
Average TDS in total Base and Storm Flow	105,978,312 ÷ 182,314 = 581 mg/L		

After adjusting for Arlington Desalter discharges the weighted average annual TDS of Storm Flow and Base Flow for 1998-99 is 581 mg/L, as shown above.

Adjusted Base Flow at Prado

The Stipulated Judgment provides that the amount of Base Flow at Prado received during any year shall be subjected to adjustment based on weighted average annual TDS of the Base Flow and Storm Flow at Prado as follows:

If the Weighted Average TDS in Base Flow and Storm Flow at Prado is:	Then the Adjusted Base Flow shall be determined by the formula:
Greater than 800 mg/L	$Q - \frac{35}{42{,}000} Q(TDS-800)$
700 mg/L to 800 mg/L	Q
Less than 700 mg/L	$Q + \frac{35}{42{,}000} Q(700-TDS)$

Where: Q = Base Flow actually received.

The weighted average annual TDS of 581 mg/L is less than 700 mg/L. Therefore, the Base Flow must be adjusted by the above equation for TDS less than 700 mg/L. Thus the Adjusted Base Flow is as follows:

$$(158{,}637 \text{ acre-feet}) + \frac{35}{42{,}000} (158{,}637 \text{ acre-feet}) (700 - 581) = 174{,}369 \text{ acre-feet}$$

Entitlement and Credit or Debit

Paragraph 5(c) of the Stipulated Judgment states that "CBMWD [now IEUA] and WMWD shall be responsible for an average annual Adjusted Base Flow of 42,000 acre-feet at Prado. CBMWD [IEUA] and WMWD each year shall be responsible for not less than 37,000 acre-feet of Base Flow at Prado, plus one-third of any cumulative debit; provided, however, that for any year commencing on or after October 1, 1986, when there is no cumulative debit, or for any year prior to 1986 whenever the cumulative credit exceeds 30,000 acre-feet, said minimum shall be 34,000 acre-feet."

The Watermaster's findings concerning flow at Prado for 1998-99 required under the Stipulated Judgment are as follows:

1.	Measured Outflow at Prado	184,998 acre-feet
2.	Base Flow at Prado	158,637 acre-feet
3.	Annual Weighted TDS of Base and Storm Flow	581 mg/L
4.	Annual Adjusted Base Flow	174,369 acre-feet
5.	Cumulative Adjusted Base Flow	3,188,600 acre-feet
6.	Cumulative Entitlement of OCWD	1,218,000 acre-feet
7.	Cumulative Credit	1,970,600 acre-feet
8.	One-Third of Cumulative Debit	0 acre-feet
9.	Minimum Required Base Flow in 1999-00	34,000 acre-feet

CHAPTER III

BASE FLOW AT RIVERSIDE NARROWS

This chapter deals with determinations of 1) the components of flow at Riverside Narrows, which include Storm Flow and Base Flow and 2) the Adjusted Base Flow at Riverside Narrows credited to SBVMWD.

Flow at Riverside Narrows

The flow of the Santa Ana River at Riverside Narrows amounted to 76,294 acre-feet, measured at the USGS gaging station near the MWDSC Upper Feeder Crossing. Separated into its components, Base Flow was 73,094 acre-feet and Storm Flow was 5,382 acre-feet. Included in Base Flow are 2,182 acre-feet of wastewater from Rubidoux Community Services District that now by-passes the USGS gaging station. The Storm and Base Flow components of the flow of the Santa Ana River at Riverside Narrows for each month in the 1998-99 water year are listed in Table 6 and graphically shown on Plate 6. The components of flow of the Santa Ana River at Riverside Narrows during the period 1934-35 through 1998-99 are presented on Plate 7.

High Groundwater Mitigation Project

During the 1998-99 water year, 3,365 acre-feet of High Groundwater Mitigation Project pumped groundwater from the Bunker Hill Basin were delivered to the Santa Ana River upstream of Riverside Narrows. All of the water, less any evaporative losses, was determined to have percolated to storage in Colton and Riverside Basins. A more complete explanation of the release and how it will be accounted for are described in Chapter 1.

Base Flow

Based on the hydrograph shown on Plate 6 and utilizing in general the procedures reflected in the Work Papers of the engineers (as referenced in Paragraph 2 of the Engineering Appendix of the Stipulated Judgment), a separation was made between Storm Flow and the sum of Base Flow and Nontributary Flow.

In April 1980, Rubidoux Community Services District made the first delivery of wastewater to the regional treatment plant at Riverside. Prior to that time, Rubidoux had discharged to the river upstream of the Riverside Narrows gaging station. Wastewater from Rubidoux during water year 1998-99, in the amount of 2,182 acre-feet, has been added to the stream flow as measured at the gaging station.

TABLE 6

COMPONENTS OF FLOW AT RIVERSIDE NARROWS

WATER YEAR 1998-99
(acre-feet)

Month	USGS Measured Flow	- Storm Flow	- High roundwater Mitigation [1]	+ Rubidoux Waste- water	= Base Flow
1998					
October	5,829	276	0	181	5,734
November	6,103	224	0	175	6,054
December	6,371	320	0	182	6,232
1999					
January	7,341	1,218	0	185	6,308
February	6,605	785	0	167	5,986
March	6,549	313	0	181	6,417
April	7,418	1,412	0	179	6,185
May	6,022	8	0	188	6,202
June	6,603	194	0	182	6,591
July	6,208	631	0	188	5,766
August	5,758	0	0	191	5,949
September	5,486	0	0	184	5,670
Total	76,294	5,382	0	2,182	73,094

(1) San Bernardino Valley Municipal Water District High Groundwater Mitigation Project pumped water discharged to the Santa Ana River and arriving at Riverside Narrows.

Water Quality

The determination of water quality at the Riverside Narrows Gaging Station was made using periodic grab samples taken and analyzed for TDS by the USGS and the City of Riverside. Water quality data based on samples taken during storm flow periods were not used in the calculations.

The flow-weighted quality of wastewater from Rubidoux was 691 mg/L. The Base Flow quality resulting from exclusion of the Nontributary Flow and inclusion of the Rubidoux wastewater is shown in the following table as 603 mg/L.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow x Average TDS (acre-feet x mg/L)
1. Base Flow plus Nontributary Flow	70,912	600	42,547,200
2. Less High Groundwater Mitigation Project Water	0	--	—
3. Plus Rubidoux Wastewater	2,182	691	1,507,762
4. Base Flow (line 1 less line 2 plus line 3)	73,094		44,054,962
Average TDS of Base Flow	44,054,962 ÷ 73,094 = 603 mg/L		

Adjusted Base Flow at Riverside Narrows

The Stipulated Judgment provides that the amount of Base Flow at Riverside Narrows received during any year shall be subjected to adjustment based on weighted average annual TDS in the Base Flow as follows:

If the Weighted Average TDS in Base Flow at Riverside Narrows is:	Then the Adjusted Base Flow shall be determined by the formula:
Greater than 700 mg/L	$Q - \frac{11}{15,250} Q(TDS-700)$
600 mg/L to 700 mg/L	Q
Less than 600 mg/L	$Q + \frac{11}{15,250} Q(600-TDS)$

Where: Q = Base Flow actually received.

From the previous subsection, the weighted average annual TDS in the Base Flow at Riverside Narrows for the water year 1998-99 was 603 mg/L. Therefore, no adjustment is necessary, and the Adjusted Base Flow for 1998-99 is 73,094 acre-feet.

Entitlement and Credit or Debit

Paragraph 5(b) of the Stipulated Judgment states that "SBVMWD shall be responsible for an average annual Adjusted Base Flow of 15,250 acre-feet at Riverside Narrows . . . SBVMWD each year shall be responsible for not less than 13,420 acre-feet of Base Flow plus one-third of any cumulative debit, provided, however, that for any year commencing on or after October 1, 1986, when there is no cumulative debit, or for any year prior to 1986 whenever the cumulative credit exceeds 10,000 acre-feet, said minimum shall be 12,420 acre-feet."

The Watermaster's findings concerning flow at Riverside Narrows for 1998-99 required under the Stipulated Judgment are as follows:

1.	Base Flow at Riverside Narrows	73,094 acre-feet
2.	Annual Weighted TDS of Base Flow	603 mg/L
3.	Annual Adjusted Base Flow	73,094 acre-feet
4.	Cumulative Adjusted Base Flow	1,174,910 acre-feet
5.	Cumulative Entitlement of CBMWD and WMWD	442,250 acre-feet
6.	Cumulative Credit	732,660 acre-feet
7.	One-Third of Cumulative Debit	0 acre-feet
8.	Minimum Required Base Flow in 1999-00	12,420 acre-feet

CHAPTER IV

HISTORY AND SUMMARY OF THE JUDGMENT

History of Litigation

The complaint in the case was filed by Orange County Water District on October 18, 1963, seeking an adjudication of water rights against substantially all water users in the area tributary to Prado Dam within the Santa Ana River Watershed, but excluding the area tributary to Lake Elsinore. Thirteen cross-complaints were filed in 1968, extending the adjudication to include substantially all water users in the area downstream from Prado Dam. With some 4,000 parties involved in the case (2,500 from the Upper Area and 1,500 from the Lower Area), it became obvious that every effort should be made to arrive at a settlement and physical solution in order to avoid enormous and unwieldy litigation.

Efforts to arrive at a settlement and physical solution were pursued by public officials, individuals, attorneys, and engineers. Attorneys for the parties organized in order to facilitate settlement discussions and, among other things, provided guidance for the formation and activities of an engineering committee to provide information on the physical facts.

An initial meeting of the engineers representing the parties was held on January 10, 1964. Agreement was reached that it would be beneficial to undertake jointly the compilation of basic data. Liaison was established with the Department of Water Resources, State of California, to expedite the acquisition of data. Engineers representing the parties were divided into subcommittees which were given the responsibility of investigating such things as the boundary of the Santa Ana River Watershed and its subareas, standardization of the terminology, the location and description of wells and diversion facilities, waste disposal and transfer of water between subareas.

In response to a request from the attorneys' committee at a meeting held April 17, 1964, on April 30, 1964, the joint engineering committee prepared a list of preliminary engineering studies directed toward settlement of the Santa Ana River water rights litigation. Special assignments were made to individual engineers on selected items requested by the attorneys' committee.

The attorneys and engineers for the defendants then commenced a series of meetings separate from the representatives of the plaintiffs in order to consolidate their positions and to determine a course of action. On October 7, 1964, engineers for the defendants presented the results of the studies made by the joint engineering committee. The defendants' attorneys requested that additional information be provided on the methods of measuring flow at Prado Dam, the historical supply and disposal of water passing Prado Dam, segregation of flow into components, and determination of the amount of

supply which was usable by the downstream area. On December 11, 1964, the supplemental information was presented to the defendants' attorneys.

During 1965, engineers and attorneys for the defendants held numerous conferences and conducted additional studies in an attempt to determine their respective positions in the case. Early in 1966, the plaintiff and defendants exchanged drafts of possible principles for settlement. Commencing March 22 and ending April 13, 1966, four meetings were held by the engineers to discuss the draft of principles for settlement.

On February 25, 1968, the defendants submitted a request to the Court that the Order of Reference be issued requesting the California Department of Water Resources to determine the physical facts. On May 9, 1968, the plaintiffs' attorney submitted motions opposing the Order of Reference and requested that a preliminary injunction be issued. In the meantime, every effort was being made to come to an agreement on the Stipulated Judgment. Commencing on February 28, 1968 and extending until May 14, 1968, six meetings were held to determine the scope of physical facts on which agreement could be reached so that if an Order of Reference were to be approved by the Court, the work under the proposed reference would not repeat the extensive basic data collection and compilation which had already been completed and on which engineers for both plaintiffs and defendants had reached substantial agreement. Such basic data were compiled and published in two volumes under date of May 14, 1968 entitled "Appendix A, Basic Data."

On May 21, 1968, an outline of a proposal for settlement of the case was prepared and a committee of attorneys and engineers for the parties commenced preparation of the settlement documents. On June 16, 1968, the Court held a hearing on the motions it had received requesting a preliminary injunction and an Order of Reference. The parties requested that the Court delay the preliminary hearings on these motions in view of the efforts toward settlement that were underway. The plaintiff, however, was concerned regarding the necessity of bringing the case to trial within the statutory limitation and, accordingly, on July 15, 1968, submitted a motion to set the complaint in the case for trial. On October 15, 1968, the trial was commenced and was adjourned after one-half day of testimony on behalf of the plaintiff. Thereafter, the parties filed with the Court the necessary Settlement Documents including a Stipulation for Judgment. The Court entered the Judgment on April 17, 1969, along with Stipulations and Orders dismissing all defendants and cross-defendants except for the four major public water districts overlying, in aggregate, substantially all of the major areas of water use in the watershed. The districts, the locations of which are shown on Plate 1, "Santa Ana River Watershed", are as follows:

(1) Orange County Water District (OCWD), representing all lower basin entities located within Orange County downstream of Prado Dam.

(2) Western Municipal Water District (WMWD), representing middle basin entities located within Riverside County on both sides of the Santa Ana River primarily upstream from Prado Dam.

(3) Inland Empire Utilities Agency (IEUA), formerly Chino Basin Municipal Water District (CBMWD), located in the San Bernardino County Chino Basin area, representing middle basin entities within its boundaries and located primarily upstream from Prado Dam.

(4) San Bernardino Valley Municipal Water District (SBVMWD), representing all entities within its boundaries, and embraced within the upper portion of the Riverside Basin area, the Colton Basin area (being an upstream portion of the middle basin) and the San Bernardino Basin area, being essentially the upper basin.

Summary of Judgment

Declaration of Rights. The Judgment sets forth a declaration of rights. Briefly stated, the Judgment provides that the water users in the Lower Area have rights, as against the water users in the Upper Area, to receive certain average and minimum annual amounts of non-storm flow ("base flow") at Prado Dam, together with the right to all storm flow reaching Prado Dam. The amount of the Lower Area entitlement is variable based on the quality of the water received by the Lower Area. Water users in the Upper Area have the right as against the water users in the Lower Area to divert, pump, extract, conserve, store and use all surface and groundwater supplies originating within the Upper Area, so long as the Lower Area receives the water to which it is entitled under the Judgment and there is compliance with all of its provisions.

Physical Solution. The Judgment also sets forth a comprehensive "physical solution" for satisfying the rights of the Lower Area. To understand the physical solution it is necessary to understand the following terms that are used in the Judgment:

Storm Flow – That portion of the total flow which originates from precipitation and runoff and which passes a point of measurement (either Riverside Narrows or Prado Dam) without having first percolated to groundwater storage in the zone of saturation, calculated in accordance with procedures referred to in the Judgment.

Base Flow - That portion of the total surface flow passing a point of measurement (either Riverside Narrows or Prado Dam) which remains after deduction of storm flow, nontributary flows, exchange water purchased by OCWD, and certain other flows as determined by the Watermaster.

Adjusted Base Flow - Actual base flow in each year adjusted for water quality pursuant to formulas specified in the Judgment. The adjustment of Base Flow for water quality is intended to provide an incentive to the Upper Area to maintain a better quality of water in the river. When the total dissolved solids (TDS) is lower than a specified value at one of the measuring points, the water quantity obligation is lower. When the TDS is higher than a specified value, the water quantity

obligation is higher. This is the first comprehensive adjudication in Southern California in which the quality of water is taken into consideration in the quantification of water rights.

Credits and Debits - Under the accounting procedures provided for in the Judgment, credits accrue to SBVMWD in any year when the Adjusted Base Flow exceeds 15,250 acre-feet at Riverside Narrows and jointly to IEUA and WMWD when the Adjusted Base Flow exceeds 42,000 acre-feet at Prado Dam. Debits accrue in any year when the Adjusted Base Flows falls below those levels. Credits or debits accumulate year to year.

Obligation at Riverside Narrows. SBVMWD has an obligation to assure an average annual Adjusted Base Flow of 15,250 acre-feet at Riverside Narrows, subject to the following:

(1) A minimum Base Flow of 13,420 acre-feet plus one-third of any cumulative debit.

(2) After October 1, 1986, if no cumulative debit exists, the minimum Base Flow shall be 12,420 acre-feet.

(3) Prior to 1986, if the cumulative credits exceed 10,000 acre-feet, the minimum Base Flow shall be 12,420 acre-feet.

(4) All cumulative debits shall be removed by the discharge of a sufficient Base Flow at Riverside Narrows at least once in any ten consecutive years following October 1, 1976. Any cumulative credits shall remain on the books of account until used to offset any subsequent debits or until otherwise disposed of by SBVMWD.

(5) The Base Flow at Riverside Narrows shall be adjusted using weighted average annual TDS in such Base Flow in accordance with the formula set forth in the Judgment.

Obligation at Prado Dam. IEUA and WMWD have a joint obligation to assure an average annual Adjusted Base Flow of 42,000 acre-feet at Prado Dam, subject to the following:

(1) Minimum Base Flow at Prado shall not be less than 37,000 acre-feet plus one-third of any cumulative debit.

(2) After October 1, 1986, if no cumulative debit exists, the minimum Base Flow quantity shall be 34,000 acre-feet.

(3) Prior to 1986, if the cumulative credit exceeds 30,000 acre-feet, the minimum Base Flow shall be 34,000 acre-feet.

(4) Sufficient quantities of Base Flow shall be provided at Prado to discharge completely any cumulative debits at least once in any ten consecutive years following October 1, 1976. Any cumulative credits shall remain on the books of account until used to offset any debits, or until otherwise disposed of by IEUA and WMWD.

(5) The Base Flow at Prado during any year shall be adjusted using the weighted average annual TDS in the total flow at Prado (Base Flow plus Storm Flow) in accordance with the formula set forth in the Judgment.

Other Provisions. SBVMWD, IEUA and WMWD are enjoined from exporting water from the Lower Area to the Upper Area. OCWD is enjoined from exporting or "causing water to flow" from the Upper Area to the Lower Area. Any inter-basin acquisition of water rights will have no effect on Lower Area entitlements. OCWD is prohibited from enforcing two prior judgments so long as the Upper Area Districts are in compliance with the physical solution. The composition of the Watermaster and the nomination and appointment process for members are described along with a definition of the Watermaster's duties and a formula for sharing its costs. The court retains continuing jurisdiction over the case. There are provisions for appointment of successor parties and rules for dealing with future actions that might conflict with the physical solution.

History of the Watermaster Committee Membership

The Santa Ana River Watermaster is a committee composed of five members nominated by the parties and appointed by the court. SBVMWD, IEUA (formerly CBMWD), and WMWD nominate one member each and OCWD nominates two. The Watermaster members annually elect two officers: chairman and secretary.

The original five members were appointed at the time of entry of the judgment. They prepared a *pro forma* annual report for the 1969-70 water year. The first annual report required by the judgment was prepared for the 1970-71 water year and reports have been prepared annually since then.

The membership of the Watermaster has changed over the years. The historical listing of members and officers shown in Table 7 reflects the signatories to each annual report prior to this year.

TABLE 7

HISTORY OF THE WATERMASTER COMMITTEE MEMBERSHIP

Water Year	SBVMWD	IEUA	WMWD	OCWD	OCWD
1969-70	Clinton O. Henning	William J. Carroll	Albert A. Webb, Secretary	Max Bookman, Chairman	John M. Toups
1970-71 through 1973-74	James C. Hanson	William J. Carroll	Albert A. Webb, Secretary	Max Bookman, Chairman	John M. Toups
1974-75 through 1977-78	James C. Hanson	William J. Carroll	Donald L. Harriger	Max Bookman, Chairman	John M. Toups, Secretary
1978-79 through 1981-82	James C. Hanson	William J. Carroll	Donald L. Harriger	Max Bookman, Chairman	William R. Mills, Jr., Secretary
1982-83 through 1983-84	James C. Hanson	William J. Carroll	Donald L. Harriger	Harvey O. Banks, Chairman	William R. Mills, Jr., Secretary
1984-85 through 1988-89	Robert L. Reiter	William J. Carroll	Donald L. Harriger	Harvey O. Banks, Chairman	William R. Mills, Jr., Secretary
1989-90 through 1994-95	Robert L. Reiter, Secretary/Treasurer	William J. Carroll	Donald L. Harriger	Harvey O. Banks, Chairman	William R. Mills, Jr.
1995-96	Robert L. Reiter, Secretary/Treasurer	William J. Carroll, Chairman	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr.
1996-97	Robert L. Reiter, Secretary/Treasurer	William J. Carroll	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr., Chairman
1997-98	Robert L. Reiter, Secretary/Treasurer	Robb D. Quincey	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr., Chairman

Santa Ana River Watershed

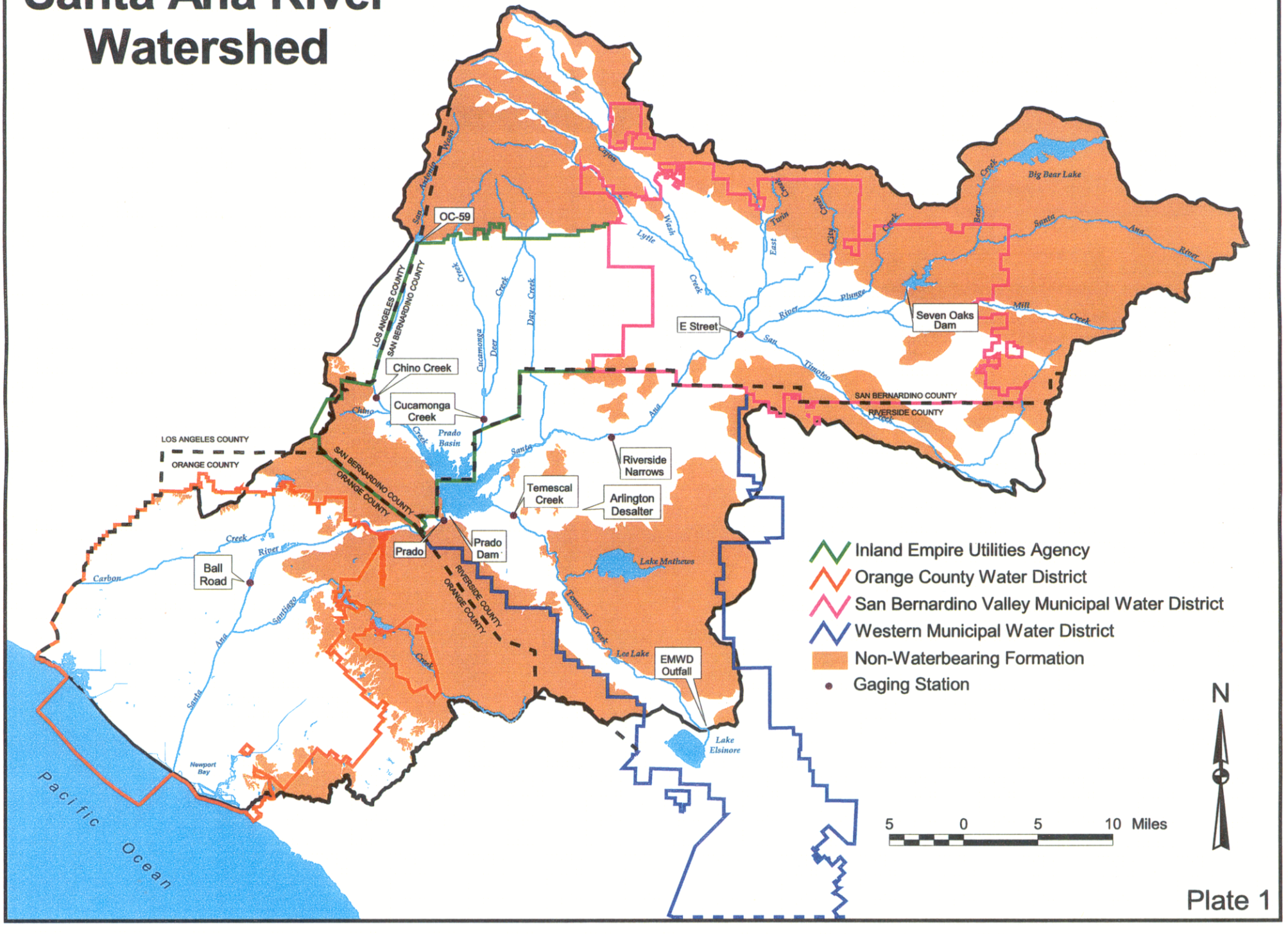


Plate 1

PRECIPITATION AT SAN BERNARDINO SINCE 1934-35

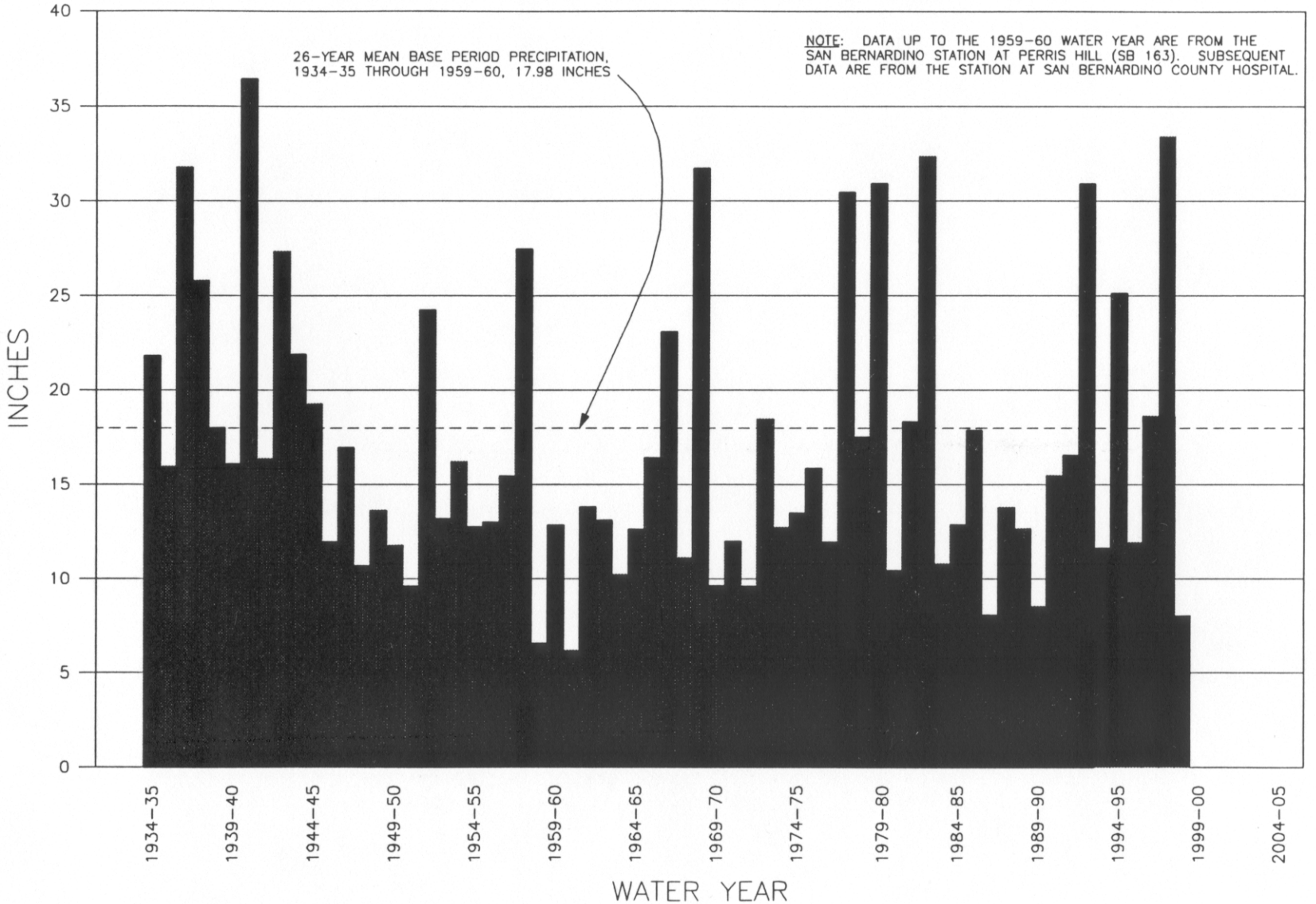
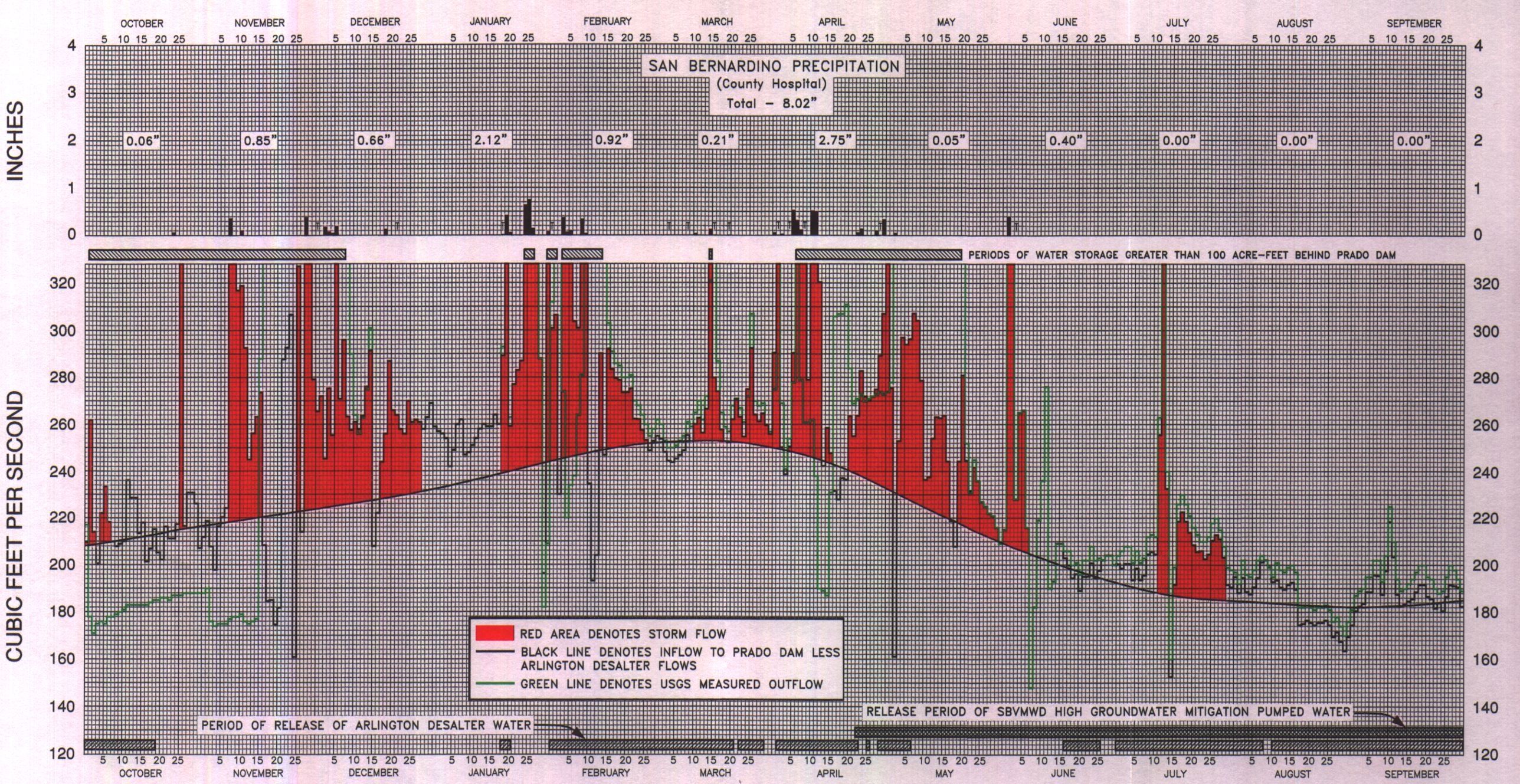


PLATE 2



DISCHARGE OF SANTA ANA RIVER AT PRADO DAM & SAN BERNARDINO PRECIPITATION
WATER YEAR 1998-99

Plate 3

DISCHARGE OF SANTA ANA RIVER AT PRADO SINCE 1934-35

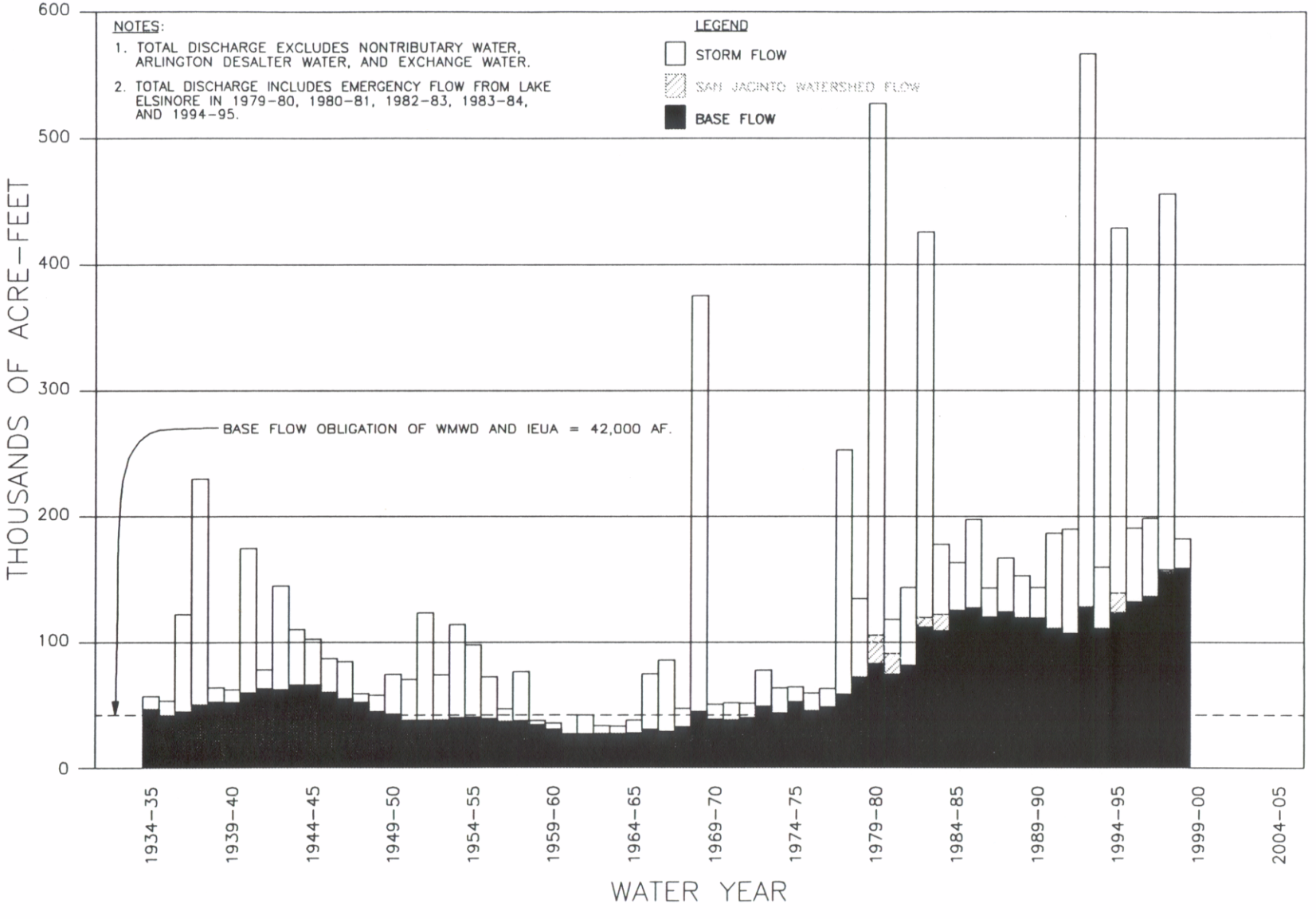
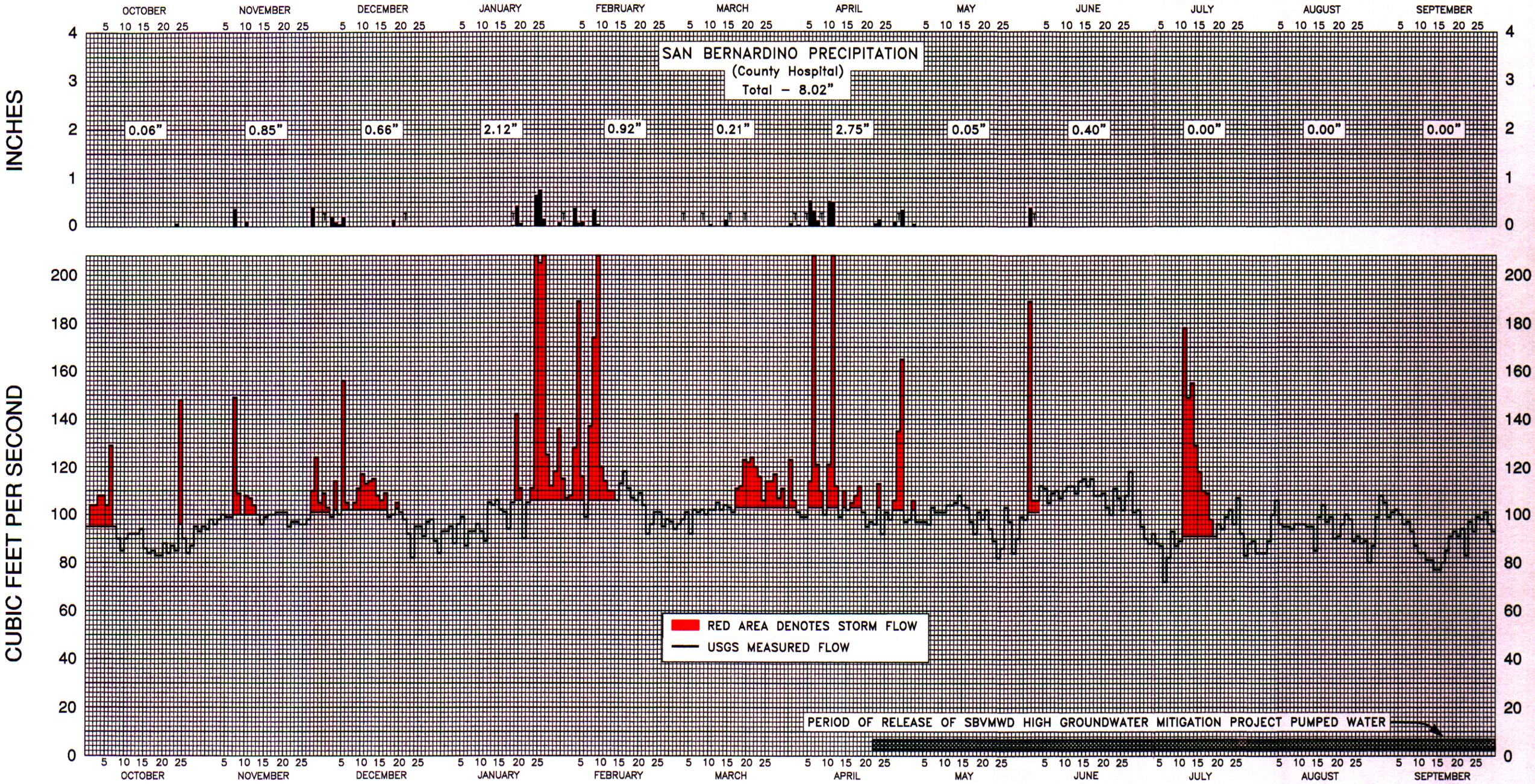


PLATE 4

DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM
WATER YEAR 1998-99

Plate 5



DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS & SAN BERNARDINO PRECIPITATION
WATER YEAR 1998-99

Plate 6

DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS SINCE 1934-35

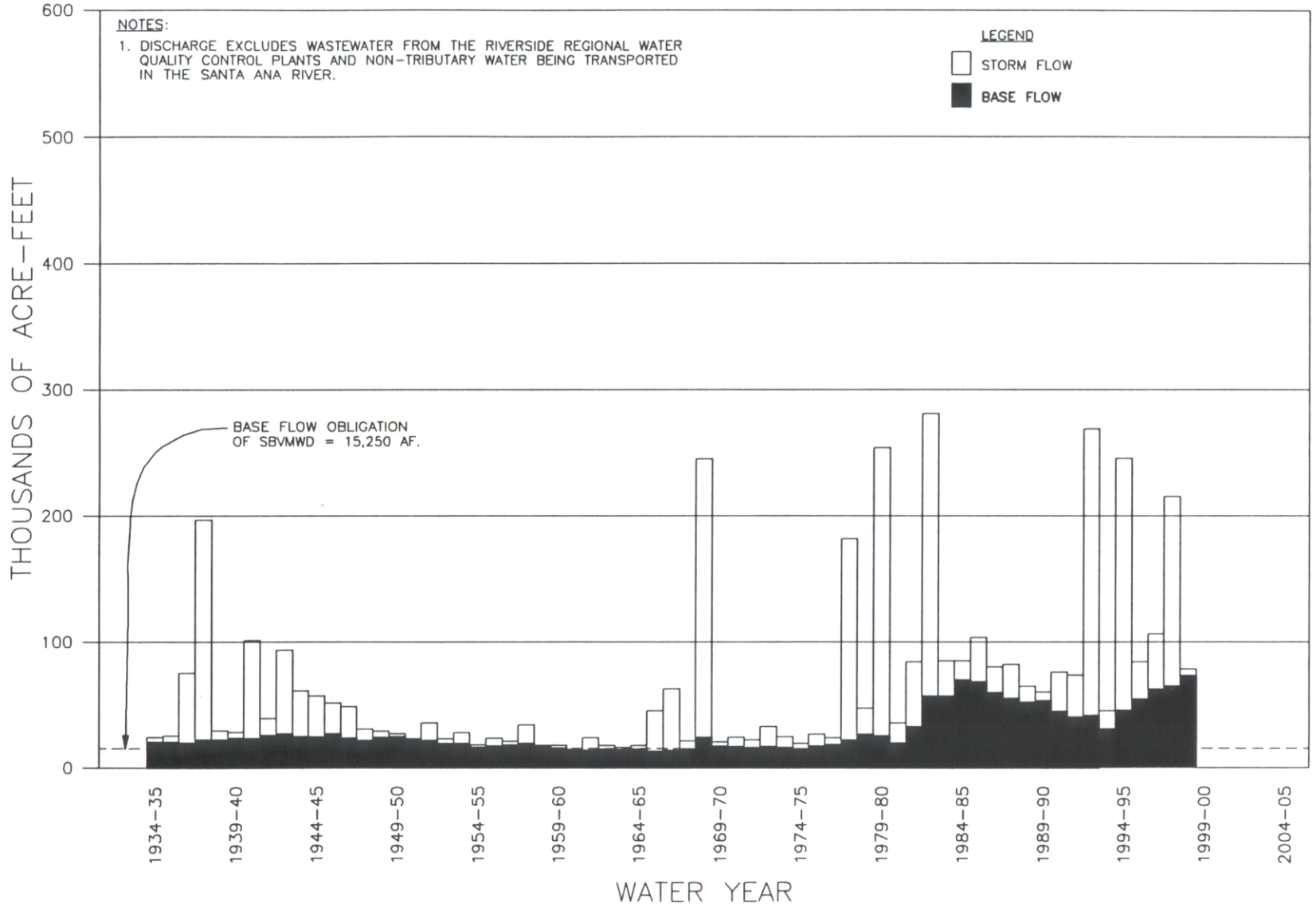


PLATE 7

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

VS. CITY OF CHINO et al.

CASE NO. 117628 - COUNTY OF ORANGE

BASIC DATA

FOR THE

TWENTY-NINTH ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 1998 - SEPTEMBER 30, 1999

APRIL 30, 2000

APPENDIX A

USGS FLOW MEASUREMENTS OF THE SANTA ANA RIVER FLOWS BELOW PRADO, AT MWD CROSSING, AND AT E STREET AND OF TEMESCAL CREEK ABOVE MAIN STREET (AT CORONA) AND CHINO CREEK AT SCHAEFER AVENUE (NEAR CHINO)

WATER YEAR 1998-99

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA

LOCATION.—Lat 33°53'00", long 117°38'40", in La Sierra Grant, Riverside County, Hydrologic Unit 18070203, on left bank of outlet channel, 2,500 ft downstream from axis of Prado Dam, and 4.5 mi west of Corona.

DRAINAGE AREA.—1,490 mi^2, excludes 768 mi^2 above Lake Elsinore.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.—May 1930 to November 1939 (irrigation seasons only), March 1940 to current year. Published as "at Santa Fe Railroad Bridge, near Prado" May 1930 to November 1931, as "at Atchison, Topeka, and Santa Fe Railroad Bridge, near Prado" May 1932 to November 1939, and as "below Prado Dam, near Prado" March 1940 to September 1950.

GAGE.—Water-stage recorder and concrete control since August 1944. Datum of gage is approximately 449 ft above sea level (levels by U.S. Army Corps of Engineers). Prior to Mar. 18, 1940, at about same site at various datums.

REMARKS.—Records good. Flow regulated since 1940 by Prado flood-control reservoir, capacity, 196,200 acre-ft. Natural streamflow affected by extensive ground-water withdrawals, diversion for irrigation, and return flow from irrigated areas. During the current year, no California Water Project releases were made. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 7,440 ft^3/s, Feb. 21, 1980, gage height, 6.88 ft; maximum gage height, 7.29 ft, Jan. 19, 1993; minimum daily, 2.4 ft^3/s, July 29 to Aug. 3, Sept. 20, 1978 (result of gate closure).

EXTREMES OUTSIDE PERIOD OF RECORD.—Flood of Mar. 2, 1938 reached a discharge of 100,000 ft^3/s, on basis of slope-area measurement of peak flow at site 2.5 mi downstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	216	189	389	262	309	261	273	276	214	207	202	188
2	177	191	395	259	344	259	370	278	395	209	197	194
3	170	177	386	258	332	251	268	343	364	210	206	197
4	175	176	377	256	273	250	240	366	226	211	200	199
5	175	176	370	244	219	248	253	361	263	206	199	204
6	175	176	366	251	234	249	276	360	264	211	203	204
7	177	176	382	262	236	252	327	358	214	206	207	211
8	177	178	380	264	264	255	278	354	146	208	209	209
9	178	179	362	255	282	258	262	351	181	217	207	202
10	179	179	291	260	411	257	261	369	217	218	204	204
11	180	180	266	268	474	263	261	373	234	217	200	205
12	182	177	257	264	469	268	237	364	273	266	206	201
13	183	177	265	258	454	260	188	363	188	336	203	204
14	184	177	278	260	430	269	187	359	191	243	203	197
15	184	178	303	259	370	319	185	350	207	164	206	199
16	185	284	209	259	301	358	231	340	207	205	207	200
17	184	390	223	265	289	285	304	354	205	231	204	202
18	184	399	246	262	285	264	304	362	204	235	187	205
19	186	394	258	292	285	260	307	359	198	231	187	209
20	186	390	289	345	278	256	309	350	199	226	189	209
21	187	387	268	267	278	267	284	324	195	221	187	204
22	186	384	266	282	280	270	269	251	200	218	186	204
23	186	391	260	287	268	265	270	230	201	215	188	202
24	187	394	259	291	266	261	272	244	208	215	188	200
25	187	388	273	410	262	272	269	235	202	218	188	201
26	189	383	263	400	258	304	270	226	203	224	187	207
27	189	379	265	554	253	269	271	224	203	226	181	212
28	189	376	263	1710	256	267	273	220	205	221	183	210
29	190	378	260	286	---	268	276	220	205	213	178	206
30	190	375	265	181	---	258	275	215	203	203	176	201
31	189	---	272	209	---	255	---	208	---	203	183	---
TOTAL	5706	8378	9206	10180	8660	8298	8050	9587	6615	6834	6051	6090
MEAN	184	279	297	328	309	268	268	309	220	220	195	203
MAX	216	399	395	1710	474	358	370	373	395	336	209	212
MIN	170	176	209	181	219	248	185	208	146	164	176	188
AC-FT	11320	16620	18260	20190	17180	16460	15970	19020	13120	13560	12000	12080

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 1999, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	103	133	201	318	402	392	244	176	144	118	94.4	90.0
MAX	344	322	709	3543	2733	2556	1101	915	736	446	352	372
(WY)	1984	1997	1967	1993	1998	1980	1980	1998	1983	1998	1983	1997
MIN	22.4	33.5	39.5	49.2	49.8	54.3	43.3	35.2	29.0	17.7	14.8	16.2
(WY)	1962	1963	1963	1963	1961	1961	1961	1961	1961	1960	1960	1960

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1941 - 1999	
ANNUAL TOTAL	226799		93655			
ANNUAL MEAN	621		257		200	
HIGHEST ANNUAL MEAN					789	1993
LOWEST ANNUAL MEAN					36.4	1961
HIGHEST DAILY MEAN	6170	Feb 24	1710	Jan 28	6440	Feb 23 1980
LOWEST DAILY MEAN	106	Sep 23	146	Jun 8	2.4	Jul 29 1978
ANNUAL SEVEN-DAY MINIMUM	175	Oct 2	175	Oct 2	3.0	Sep 24 1973
INSTANTANEOUS PEAK FLOW			2090	Jan 28	7440	Feb 21 1980
INSTANTANEOUS PEAK STAGE			5.28	Jan 28	7.29	Jan 19 1993
ANNUAL RUNOFF (AC-FT)	449900		185800		145100	
10 PERCENT EXCEEDS	817		366		344	
50 PERCENT EXCEEDS	421		244		116	
90 PERCENT EXCEEDS	186		184		38	

11066460 SANTA ANA RIVER AT MWD CROSSING, NEAR ARLINGTON, CA

LOCATION.—Lat 33°58'07", long 117°26'51", in NE 1/4 SW 1/4 sec.30, T.2 S., R.5 W., Riverside County, Hydrologic Unit 18070203, on left bank at MWD pipeline crossing, 0.8 mi downstream from Union Pacific Railroad Bridge, 1.1 mi upstream from bridge on Van Buren Boulevard, and 3.3 mi north of Arlington.

DRAINAGE AREA.—852 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.—March 1970 to current year.

REVISED RECORDS.—WDR CA-83-1: Drainage area.

GAGE.—Water-stage recorder and crest-stage gage. Elevation of gage is 685 ft above sea level, from topographic map. Prior to Apr. 15, 1985, water-stage recorder at site 300 ft upstream on left bank at different datum. From Apr. 15, 1985, to Sept. 30, 1985, water-stage recorder near right bank (atop pier 9 of MWD pipeline crossing), at same site and datum. From Oct. 1, 1985, to June 16, 1993, water-stage recorder and crest-stage gage on right bank at same site and datum.

REMARKS.—Records fair below 500 ft3/s and poor above. Flow partly regulated by Big Bear Lake (station 11049000). Natural streamflow affected by ground-water withdrawals, diversions for irrigation, and return flows from irrigated areas. The records at this station are equivalent to those collected at Santa Ana River at Riverside Narrows, near Arlington minus the flow at Riverside Water-Quality Control Plant at Riverside Narrows, near Arlington. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 31,300 ft^3/s, Feb. 24, 1998, gage height, 14.69 ft, on basis of area-velocity study; maximum gage height, 20.23 ft, site and datum then in use, Mar. 4, 1978; minimum daily, 15 ft^3/s, Sept. 7, 8, 1980.

EXTREMES OUTSIDE PERIOD OF RECORD.—Maximum discharge since at least 1927, 100,000 ft^3/s, Mar. 2, 1938, on basis of slope-area measurement at site 1.1 mi downstream. Flood of Jan. 22, 1862, 320,000 ft^3/s, on basis of slope-conveyance study at site 8.2 mi upstream. Stage at that site was 5 ft higher than that of Mar. 2, 1938.

EXTREMES FOR CURRENT YEAR.—Peak discharges greater than base discharge of 1,500 ft^3/s, or maximum:

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Oct. 25	2045	1,140	8.52				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	95	94	109	93	115	97	123	97	98	95	84	108
2	104	98	103	93	107	94	106	98	189	90	84	105
3	104	96	99	95	108	96	101	106	106	88	89	99
4	108	98	114	88	128	98	99	97	106	92	100	101
5	108	100	100	96	189	101	99	97	112	88	106	102
6	104	99	156	99	116	92	114	97	111	87	96	100
7	129	99	105	87	99	102	307	96	105	72	95	96
8	95	149	102	93	137	101	121	103	109	82	95	97
9	90	109	105	93	174	102	110	101	110	93	94	93
10	85	100	111	96	246	100	100	101	107	87	96	87
11	90	108	117	93	120	102	121	101	110	89	96	84
12	92	107	113	89	114	102	392	104	112	178	96	84
13	92	104	114	105	110	105	112	104	112	149	95	81
14	92	100	115	104	110	102	99	105	109	155	95	81
15	94	96	108	106	106	104	110	108	114	129	85	77
16	86	99	106	102	113	103	102	104	115	118	99	77
17	84	100	109	101	118	101	105	103	112	110	104	80
18	85	100	99	94	111	111	108	97	115	109	97	85
19	83	101	100	105	107	112	112	92	108	98	99	91
20	83	101	105	142	106	123	101	101	108	91	90	93
21	88	101	101	111	109	122	95	98	109	96	91	91
22	84	95	98	90	104	124	97	102	103	94	96	94
23	87	97	92	105	92	120	96	94	100	99	100	83
24	85	97	82	111	96	116	113	89	111	102	98	97
25	148	96	95	241	101	106	92	82	107	96	89	93
26	90	96	95	205	101	114	101	86	102	107	91	99
27	84	98	91	373	95	114	98	103	108	92	88	98
28	87	110	97	125	98	117	106	97	118	83	89	101
29	95	124	98	112	---	107	135	84	101	88	80	96
30	93	105	89	118	---	111	165	90	102	89	87	93
31	95	---	84	136	---	103	---	99	---	84	99	---
TOTAL	2939	3077	3212	3701	3330	3302	3740	3036	3329	3130	2903	2766
MEAN	94.8	103	104	119	119	107	125	97.9	111	101	93.6	92.2
MAX	148	149	156	373	246	124	392	108	189	178	106	108
MIN	83	94	82	87	92	92	92	82	98	72	80	77
AC-FT	5830	6100	6370	7340	6610	6550	7420	6020	6600	6210	5760	5490

11066460 SANTA ANA RIVER AT MWD CROSSING, NEAR ARLINGTON, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1999, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	59.5	78.3	103	238	293	326	148	121	79.2	52.9	52.5	53.8
MAX	194	259	292	1839	1411	1806	604	666	351	145	233	129
(WY)	1988	1984	1984	1993	1980	1995	1983	1983	1983	1983	1983	1976
MIN	20.5	21.2	23.3	24.7	23.1	23.7	23.1	22.3	20.2	16.8	17.9	18.0
(WY)	1974	1975	1974	1972	1972	1972	1971	1972	1981	1981	1981	1974

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1970 - 1999	
ANNUAL TOTAL	105228		38465			
ANNUAL MEAN	288		105		134	
HIGHEST ANNUAL MEAN					416	1983
LOWEST ANNUAL MEAN					29.0	1975
HIGHEST DAILY MEAN	10800	Feb 24	392	Apr 12	11500	Mar 2 1983
LOWEST DAILY MEAN	74	Jul 12	72	Jul 7	15	Sep 7 1980
ANNUAL SEVEN-DAY MINIMUM	79	Jul 8	81	Sep 11	16	Jul 1 1981
INSTANTANEOUS PEAK FLOW			1140	Oct 25	31300	Feb 24 1998
INSTANTANEOUS PEAK STAGE			8.52	Oct 25	20.23	Mar 4 1978
ANNUAL RUNOFF (AC-FT)	208700		76300		97140	
10 PERCENT EXCEEDS	416		118		202	
50 PERCENT EXCEEDS	117		100		62	
90 PERCENT EXCEEDS	87		87		22	

11059300 SANTA ANA RIVER AT E STREET, NEAR SAN BERNARDINO, CA

LOCATION.—Lat 34°03'54", long 117°17'58", in San Bernardino Grant, San Bernardino County, Hydrologic Unit 18070203, on left bank, 0.4 mi downstream from E Street Bridge, 0.4 mi upstream from Warm Creek, 1.2 mi downstream from San Timoteo Creek, 2.8 mi south of San Bernardino, and 26 mi downstream from Big Bear Lake.

DRAINAGE AREA.—541 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.—March 1939 to September 1954, October 1966 to current year.

GAGE.—Water-stage recorder and crest-stage gage. Elevation of gage is 940 ft above sea level, from topographic map. Prior to Nov. 10, 1950, water-stage recorder on right bank 0.4 mi upstream at datum 964.50 ft above sea level. Nov. 11, 1950, to Sept. 30, 1954, water-stage recorder on both banks 0.4 mi upstream at datum 964.50 ft above sea level. Oct. 1, 1966, to Sept. 30, 1976, water-stage recorder on right bank 0.4 mi upstream at datum 954.50 ft above sea level. Oct. 1, 1976, to Sept. 30, 1977, gage was removed for channel construction. Oct. 1, 1977, to Jan. 28, 1981, water-stage recorder on right bank 0.5 mi upstream at elevation 950 ft above sea level, from topographic map.

REMARKS.—Records poor. Flow partly regulated by Big Bear Lake (station 11049000). Natural flow of stream affected by ground-water withdrawals and diversion for domestic use and irrigation upstream from station. Effluent from sewage reclamation plant 1.0 mi upstream caused sustained flow past gage from 1967 to Mar. 21, 1996. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 28,000 ft^3/s, Feb. 25, 1969, gage height, 11.9 ft, site and datum then in use; no flow for many days many years prior to 1967 and since Mar. 21, 1996.

EXTREMES FOR CURRENT YEAR.—Peak discharges greater than base discharge of 1,000 ft^3/s, or maximum, from rating curve extended above 5,930 ft^3/s on basis of critical-depth computations:

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
July 11	2215	1,090	5.00				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	e13	e15	e12	e26	e8.8	6.0	42	.97	e3.9	11	10
2	38	e12	e17	e11	e23	e8.1	7.0	32	60	e4.0	9.3	8.6
3	33	e14	e16	e9.7	e20	e7.8	11	33	12	e3.7	7.6	11
4	31	e12	e28	e9.5	40	e7.5	14	19	14	e3.5	7.1	11
5	32	e11	e19	e8.5	36	e7.3	8.2	15	7.5	e3.2	6.6	12
6	e30	e16	e45	e8.3	26	e7.3	36	9.2	5.3	2.9	6.5	9.6
7	e22	e14	e20	e8.0	25	e7.2	154	6.7	1.7	1.7	6.7	8.0
8	e19	e75	e21	e8.0	e21	e7.1	25	7.0	e.55	2.1	7.0	6.5
9	e15	e45	e16	e8.5	e80	e7.1	22	8.1	e.58	1.7	6.9	4.5
10	e13	e19	e20	e8.4	68	e7.0	14	11	3.5	1.9	7.4	5.1
11	e13	e25	e15	e8.3	29	e7.1	23	9.1	7.8	53	6.8	6.3
12	e12	e16	e15	e8.5	21	e7.0	123	11	9.7	133	7.7	6.4
13	e12	e15	e13	e8.4	18	e6.9	40	13	10	83	7.7	6.6
14	e11	e13	e12	e8.5	e17	e6.9	41	10	8.2	66	8.7	6.5
15	e12	e12	e11	e8.3	e16	e28	27	10	6.9	23	8.9	7.7
16	e15	e11	e10	e8.3	e16	e13	22	9.6	8.0	23	7.4	8.7
17	e14	e11	e10	e8.2	e16	e10	15	6.6	8.1	23	7.1	6.8
18	e13	e11	e10	e8.1	e17	e7.0	12	2.8	7.3	19	8.2	6.9
19	e12	e10	e19	e8.4	e15	e6.0	7.6	2.6	8.2	17	8.1	7.0
20	e11	e10	e17	e22	e17	e4.7	6.6	1.7	11	18	e7.7	7.4
21	e10	e10	e19	e30	e15	e3.8	16	4.4	8.7	18	e7.5	7.5
22	e10	e10	e17	e18	e14	e3.0	22	3.2	9.7	19	e7.2	7.0
23	e9.8	e9.8	e14	e14	e17	e2.5	20	11	e7.0	17	e6.8	10
24	e9.4	e9.7	e13	e12	e16	e2.1	31	3.6	e6.6	21	e6.6	7.6
25	e70	e9.7	e18	e140	e15	e1.9	31	5.0	e6.5	21	e6.7	7.5
26	e19	e9.5	e17	70	e14	2.6	21	4.2	6.1	19	6.5	7.7
27	e15	e9.4	e16	137	e12	3.5	16	1.6	5.5	8.5	6.4	7.5
28	e14	e38	e13	27	e11	3.1	70	1.1	5.0	10	6.0	7.3
29	e12	e41	e12	e16	---	3.4	27	.82	3.9	10	5.3	6.5
30	e22	e22	e11	e14	---	3.8	65	.53	e4.0	8.5	5.8	6.3
31	e14	---	e13	e20	---	3.9	---	1.0	---	8.2	6.3	---
TOTAL	600.2	534.1	512	686.9	661	205.4	933.4	295.85	254.30	646.8	225.5	231.5
MEAN	19.4	17.8	16.5	22.2	23.6	6.63	31.1	9.54	8.48	20.9	7.27	7.72
MAX	70	75	45	140	80	28	154	42	60	133	11	12
MIN	9.4	9.4	10	8.0	11	1.9	6.0	.53	.55	1.7	5.3	4.5
AC-FT	1190	1060	1020	1360	1310	407	1850	587	504	1280	447	459

e Estimated.

11059300 SANTA ANA RIVER AT E STREET, NEAR SAN BERNARDINO, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1954, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	.88	3.47	20.9	23.7	20.6	37.4	27.2	11.3	2.39	.93	.87	.63
MAX	3.35	21.3	117	109	72.2	183	237	145	31.2	9.87	8.37	6.32
(WY)	1942	1945	1946	1943	1945	1943	1941	1941	1941	1940	1940	1939
MIN	.000	.007	.000	1.90	2.41	1.70	1.14	.14	.000	.000	.000	.000
(WY)	1951	1952	1951	1948	1942	1951	1951	1942	1950	1950	1942	1948

SUMMARY STATISTICS	WATER YEARS 1939 - 1954		
ANNUAL MEAN	12.7		
HIGHEST ANNUAL MEAN	56.6		1941
LOWEST ANNUAL MEAN	.78		1951
HIGHEST DAILY MEAN	2350	Jan 23	1943
LOWEST DAILY MEAN	.00	Jun 19	1940
ANNUAL SEVEN-DAY MINIMUM	.00	Sep 10	1940
ANNUAL RUNOFF (AC-FT)	9190		
10 PERCENT EXCEEDS	16		
50 PERCENT EXCEEDS	1.0		
90 PERCENT EXCEEDS	.00		

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1967 - 1995, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	33.9	43.3	77.4	158	232	253	132	103	63.9	40.8	36.8	34.6
MAX	117	191	469	1327	2096	1279	742	707	339	162	160	75.0
(WY)	1984	1984	1967	1993	1980	1980	1980	1983	1983	1969	1983	1983
MIN	12.4	13.2	14.8	13.2	11.6	10.6	12.5	9.35	13.0	9.08	9.97	9.93
(WY)	1968	1972	1970	1972	1968	1972	1972	1967	1971	1967	1967	1967

SUMMARY STATISTICS	WATER YEARS 1967 - 1995		
ANNUAL MEAN	100		
HIGHEST ANNUAL MEAN	441		1980
LOWEST ANNUAL MEAN	17.2		1968
HIGHEST DAILY MEAN	14800	Feb 25	1969
LOWEST DAILY MEAN	6.4	Jul 13	1967
ANNUAL SEVEN-DAY MINIMUM	8.1	Sep 16	1967
INSTANTANEOUS PEAK FLOW	28000	Feb 25	1969
INSTANTANEOUS PEAK STAGE	11.90	Feb 25	1969
ANNUAL RUNOFF (AC-FT)	72490		
10 PERCENT EXCEEDS	165		
50 PERCENT EXCEEDS	35		
90 PERCENT EXCEEDS	14		

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1996 - 1999, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	17.5	31.2	29.8	101	253	48.0	55.4	110	31.2	9.13	18.4	22.6
MAX	38.1	56.2	42.6	230	729	114	190	430	116	20.9	66.1	75.8
(WY)	1996	1997	1998	1997	1998	1998	1998	1998	1998	1999	1998	1998
MIN	4.97	11.0	16.5	22.2	7.57	.10	.000	.000	.000	.000	.000	.000
(WY)	1998	1998	1999	1999	1997	1997	1997	1996	1996	1996	1996	1996

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1996 - 1999	
ANNUAL TOTAL	55440.10		5786.95			
ANNUAL MEAN	152		15.9		59.4	
HIGHEST ANNUAL MEAN					152	1998
LOWEST ANNUAL MEAN					15.9	1999
HIGHEST DAILY MEAN	5050	Feb 24	154	Apr 7	5050	Feb 24 1998
LOWEST DAILY MEAN	.00	Jan 1	.53	May 30	.00	Mar 22 1996
ANNUAL SEVEN-DAY MINIMUM	.93	Jan 22	1.5	May 26	.00	Mar 22 1996
INSTANTANEOUS PEAK FLOW			1090	Jul 11	21100	Feb 23 1998
INSTANTANEOUS PEAK STAGE			5.00	Jul 11	7.70	Feb 23 1998
ANNUAL RUNOFF (AC-FT)	110000		11480		43010	
10 PERCENT EXCEEDS	283		30		138	
50 PERCENT EXCEEDS	38		10		7.5	
90 PERCENT EXCEEDS	6.8		4.0		.00	

11072100 TEMESCAL CREEK ABOVE MAIN STREET, AT CORONA, CA

LOCATION.—Lat 33°53'21", long 117°33'43", in La Sierra Grant, Riverside County, Hydrologic Unit 18070203, on right bank 500 ft upstream from Main Street Bridge in Corona and 1.5 mi upstream from topographic boundary of Prado Flood Control Basin.

DRAINAGE AREA.—224 mi^2, excludes 768 mi^2 above Lake Elsinore.

PERIOD OF RECORD.—October 1980 to July 1983, February 1984 to current year. December 1967 to September 1974, water-stage recorder at site 1.2 mi downstream at different datum (published as station 11072200, Temescal Creek at Corona).

GAGE.—Water-stage recorder and concrete-lined flood control channel. Elevation of gage is 600 ft above sea level, from topographic map. October 1980 to July 1983 at site 500 ft downstream at different datum.

REMARKS.—Records fair. Flow regulated by several small storage reservoirs. Many diversions upstream from station for irrigation. Water discharged to channel from Arlington Desalter at times since September 1990; records for water years 1981 to 1990 and 1991 to current year are not equivalent. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 4,720 ft^3/s, Mar. 1, 1983, gage height, 11.67 ft, site and datum then in use, on basis of slope-conveyance study; minimum daily, 0.27 ft^3/s, Sept. 25, 1981.

EXTREMES OUTSIDE PERIOD OF RECORD.—Maximum discharge, 8,850 ft^3/s, Feb. 25, 1969, gage height, 8.17 ft, from floodmark, at old site (station 11072200) 1.2 mi downstream on basis of slope-area measurement of peak flow.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.6	3.2	5.2	6.3	16	11	13	13	4.7	11	4.2	14
2	11	4.7	6.8	8.6	17	14	12	14	65	13	5.7	14
3	12	4.7	8.3	9.1	16	11	14	15	7.3	13	12	15
4	12	4.7	18	9.0	25	14	11	15	6.5	13	13	16
5	11	3.8	10	8.4	33	13	8.8	16	5.4	12	12	14
6	12	3.9	61	9.2	18	13	34	16	4.7	13	11	14
7	13	5.6	8.1	11	17	15	170	15	5.3	13	12	14
8	11	49	6.1	10	19	15	65	4.9	4.6	30	7.6	14
9	11	8.1	4.5	10	25	15	47	4.0	3.9	21	3.5	13
10	11	6.8	4.4	12	17	16	26	6.0	4.2	18	4.2	16
11	10	15	4.6	14	9.2	17	47	9.1	3.8	17	6.7	14
12	9.8	5.9	4.3	11	16	15	114	6.2	4.0	15	15	13
13	10	4.6	5.0	10	15	14	38	5.4	4.1	13	14	12
14	11	4.3	5.6	11	15	15	30	5.2	3.2	13	13	11
15	11	4.4	5.1	13	17	21	25	5.0	3.5	12	13	11
16	13	5.3	6.6	14	16	13	21	6.0	4.3	12	14	13
17	12	5.1	7.1	15	16	13	19	6.2	5.6	12	14	15
18	12	5.0	7.6	15	15	12	15	5.9	11	9.0	15	15
19	9.2	4.5	11	19	14	13	14	6.4	10	8.3	13	14
20	3.8	4.4	10	27	13	12	13	6.2	8.3	8.2	13	15
21	4.2	7.4	8.3	24	13	12	16	6.4	12	8.5	14	14
22	3.7	5.3	7.8	12	13	6.1	15	6.5	10	7.8	13	13
23	3.4	5.4	7.2	15	13	9.3	18	6.4	10	4.2	12	14
24	2.7	4.1	6.7	12	12	15	6.5	5.2	12	7.2	12	9.7
25	3.2	8.2	8.2	47	11	24	4.1	5.5	15	8.4	13	14
26	4.5	5.5	9.5	73	10	14	4.1	6.0	14	7.7	14	14
27	3.5	4.6	9.2	75	10	12	3.9	6.0	7.1	7.1	14	14
28	3.6	34	9.2	17	11	12	4.0	5.3	8.4	5.2	15	12
29	2.9	7.2	9.0	12	---	9.6	8.2	5.6	7.5	4.9	14	5.1
30	3.1	5.7	8.7	12	---	5.4	14	5.5	8.7	10	16	9.9
31	3.4	---	6.8	37	---	6.4	---	5.4	---	9.8	16	---
TOTAL	253.6	240.4	289.9	578.6	442.2	407.8	830.6	244.3	274.1	357.3	368.9	396.7
MEAN	8.18	8.01	9.35	18.7	15.8	13.2	27.7	7.88	9.14	11.5	11.9	13.2
MAX	13	49	61	75	33	24	170	16	65	30	16	16
MIN	2.7	3.2	4.3	6.3	9.2	5.4	3.9	4.0	3.2	4.2	3.5	5.1
AC-FT	503	477	575	1150	877	809	1650	485	544	709	732	787

11072100 TEMESCAL CREEK ABOVE MAIN STREET, AT CORONA, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1981 - 1990, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	7.62	15.1	23.8	23.0	14.5	40.9	13.1	12.0	9.35	7.15	6.45	6.99
MAX	16.1	55.9	126	116	25.5	237	39.3	43.7	30.0	10.9	13.4	11.3
(WY)	1986	1981	1981	1981	1981	1983	1983	1983	1983	1985	1990	1985
MIN	2.36	4.67	2.53	7.01	7.42	6.26	4.02	3.77	1.12	1.20	1.79	1.09
(WY)	1985	1987	1982	1989	1982	1990	1989	1982	1982	1982	1982	1981

SUMMARY STATISTICS	WATER YEARS 1981 - 1990	
ANNUAL MEAN	12.4	
HIGHEST ANNUAL MEAN	33.7	1981
LOWEST ANNUAL MEAN	6.10	1987
HIGHEST DAILY MEAN	1720	Mar 1 1983
LOWEST DAILY MEAN	.27	Sep 25 1981
ANNUAL SEVEN-DAY MINIMUM	.56	Sep 23 1981
INSTANTANEOUS PEAK FLOW	4720	Mar 1 1983
INSTANTANEOUS PEAK STAGE	11.67	Mar 1 1983
ANNUAL RUNOFF (AC-FT)	8990	
10 PERCENT EXCEEDS	27	
50 PERCENT EXCEEDS	6.1	
90 PERCENT EXCEEDS	2.7	

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1991 - 1999, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	12.1	14.4	17.0	50.5	107	80.6	42.6	25.9	15.9	13.5	12.1	12.3
MAX	16.3	24.3	26.4	161	351	349	190	100	34.3	24.9	20.1	15.1
(WY)	1997	1994	1993	1995	1993	1995	1995	1995	1995	1993	1993	1994
MIN	6.22	5.55	9.35	12.4	15.4	11.2	2.89	3.24	7.33	3.56	6.98	7.08
(WY)	1996	1996	1999	1998	1997	1997	1991	1992	1992	1994	1994	1995

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1991 - 1999	
ANNUAL TOTAL	16469.5		4684.4			
ANNUAL MEAN	45.1		12.8		33.3	
HIGHEST ANNUAL MEAN					81.8	1995
LOWEST ANNUAL MEAN					12.8	1999
HIGHEST DAILY MEAN	2090	Feb 24	170	Apr 7	2090	Feb 24 1998
LOWEST DAILY MEAN	1.3	Feb 2	2.7	Oct 24	.34	Jul 3 1992
ANNUAL SEVEN-DAY MINIMUM	1.6	Jan 22	3.4	Oct 24	.89	Jan 13 1992
INSTANTANEOUS PEAK FLOW			692	Jun 2	3660	Feb 24 1998
INSTANTANEOUS PEAK STAGE			4.28	Jun 2	6.54	Feb 24 1998
ANNUAL RUNOFF (AC-FT)	32670		9290		24100	
10 PERCENT EXCEEDS	77		17		56	
50 PERCENT EXCEEDS	15		11		13	
90 PERCENT EXCEEDS	3.7		4.4		4.3	

11073360 CHINO CREEK AT SCHAEFER AVENUE, NEAR CHINO, CA

LOCATION.—Lat 34°00'14", long 117°43'34", in Santa Ana del Chino Grant, San Bernardino County, Hydrologic Unit 18070203, on right bank 300 ft downstream from Schaefer Avenue, 0.8 mi downstream from San Antonio Creek, and 1.5 mi southwest of Chino.

DRAINAGE AREA.—48.9 mi^2.

PERIOD OF RECORD.—October 1969 to current year.

CHEMICAL DATA: Water year 1998.

SEDIMENT DATA: Water year 1998.

REVISED RECORDS.—WDR CA-84-1: 1983(M). WDR CA-95-1: 1992, 1993.

GAGE.—Water-stage recorder. Concrete dikes formed low-water control from October 1975 to Apr. 16, 1991. Elevation of gage is 685 ft above sea level, from topographic map.

REMARKS.—Records fair above 10 ft^3/s and poor below. Flow mostly regulated by San Antonio Flood-Control Reservoir, capacity, 7,700 acre-ft. Natural streamflow affected by extensive ground-water withdrawals, diversions for power, domestic use, irrigation, and return flow from irrigated areas. Releases of imported water are made to the basin by the California Water Project at times in some years, via San Antonio Creek from Rialto Pipeline below San Antonio Dam, at a site 10 mi upstream. During the current year, no California Water Project releases were made. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 12,700 ft^3/s, Feb. 27, 1983, gage height, 10.32 ft, from rating curve extended above 560 ft^3/s on basis of slope-conveyance study; no flow May 21, June 30, July 1, Oct. 30, Nov. 3, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.—Flood of Jan. 25, 1969, reached a stage of 9.23 ft, present datum, discharge, 9,200 ft^3/s, on basis of contracted-opening measurement at site 6.1 mi downstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	2.0	3.9	2.4	2.6	2.2	25	2.7	3.2	2.2	1.8	2.4
2	2.5	2.2	3.8	2.4	2.2	2.4	4.8	2.4	31	2.1	1.7	2.0
3	2.7	2.1	2.8	2.4	2.1	2.4	3.8	2.6	2.6	2.3	1.8	2.0
4	2.4	2.3	5.7	3.0	47	4.2	3.8	2.4	3.5	2.0	2.0	2.1
5	2.3	2.5	17	3.5	19	4.4	4.0	2.9	2.4	2.0	2.3	2.0
6	2.4	2.4	24	2.5	2.7	3.6	28	2.3	2.4	2.1	2.6	2.2
7	2.2	2.4	2.9	2.3	2.4	2.1	57	2.4	2.0	2.2	2.3	2.8
8	2.4	66	3.1	2.5	2.8	3.0	12	2.4	2.0	3.2	2.3	2.2
9	2.4	2.2	2.9	2.1	34	3.0	4.5	2.9	2.3	3.2	2.1	1.8
10	2.3	1.8	2.4	2.1	3.7	2.2	2.4	2.8	2.3	3.7	2.5	1.8
11	2.4	2.5	2.8	2.1	2.4	4.9	50	2.8	2.2	3.8	3.2	1.8
12	2.4	1.7	3.5	2.1	2.5	4.8	30	2.5	2.2	3.5	4.4	1.7
13	2.6	1.5	2.8	2.6	2.1	4.3	3.1	2.7	2.2	3.4	4.1	2.2
14	2.7	1.5	2.5	2.4	2.1	3.7	2.7	2.9	2.2	2.6	4.5	1.8
15	2.7	1.5	2.5	2.4	2.1	63	2.4	2.8	2.3	3.6	5.2	2.0
16	2.6	1.6	2.3	2.2	2.3	3.3	2.5	2.6	2.2	4.1	4.7	1.9
17	2.4	1.5	2.1	2.4	2.4	2.8	2.9	2.6	2.5	4.1	3.7	1.8
18	2.7	1.5	2.3	2.4	2.4	3.1	3.7	2.6	2.5	3.9	3.4	2.1
19	2.8	1.6	5.2	2.6	2.4	3.6	3.8	2.6	3.5	4.0	2.8	2.2
20	2.6	1.5	5.4	13	2.3	4.4	3.8	3.1	2.5	3.6	1.7	2.8
21	2.5	1.7	2.9	3.0	2.1	2.7	4.1	3.0	2.2	3.1	1.6	1.8
22	2.6	1.8	2.8	2.6	2.3	2.8	4.5	2.9	2.1	2.8	1.7	1.8
23	2.5	1.9	2.8	2.4	2.3	3.8	5.3	2.7	2.1	3.9	1.6	1.9
24	2.3	2.8	2.9	2.1	2.2	3.7	3.5	3.0	2.3	3.5	1.6	1.9
25	4.4	2.8	2.8	43	2.4	19	2.7	2.7	2.2	3.7	1.8	2.1
26	2.3	2.8	2.4	140	2.3	5.3	2.5	2.8	2.2	3.8	1.7	2.1
27	2.2	2.8	2.7	18	2.4	4.3	2.5	2.9	2.1	3.8	2.0	2.1
28	2.3	109	2.5	3.1	2.2	4.3	2.5	2.8	2.2	4.2	1.8	2.1
29	2.2	5.1	2.4	2.2	---	4.3	2.8	2.6	2.2	3.5	2.0	1.6
30	2.2	3.8	2.4	2.1	---	3.0	7.5	2.6	2.2	2.8	1.9	1.9
31	2.1	---	2.4	17	---	3.6	---	2.4	---	2.3	1.9	---
TOTAL	77.7	236.8	128.9	294.9	159.7	184.2	288.1	83.4	99.8	99.0	78.7	60.9
MEAN	2.51	7.89	4.16	9.51	5.70	5.94	9.60	2.69	3.33	3.19	2.54	2.03
MAX	4.4	109	24	140	47	63	57	3.1	31	4.2	5.2	2.8
MIN	2.1	1.5	2.1	2.1	2.1	2.1	2.4	2.3	2.0	2.0	1.6	1.6
AC-FT	154	470	256	585	317	365	571	165	198	196	156	121

11073360 CHINO CREEK AT SCHAEFER AVENUE, NEAR CHINO, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 1999, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	13.3	15.9	27.1	34.3	37.9	30.5	10.1	14.1	20.5	20.9	17.0	15.1
MAX	126	113	189	186	193	257	68.6	104	184	176	191	198
(WY)	1979	1976	1976	1976	1980	1978	1974	1997	1976	1974	1974	1997
MIN	.061	.23	.53	.55	.33	.30	.14	.22	.062	.069	.14	.13
(WY)	1978	1978	1970	1972	1972	1972	1977	1973	1977	1977	1976	1977

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1970 - 1999	
ANNUAL TOTAL	8541.2		1792.1			
ANNUAL MEAN	23.4		4.91		21.3	
HIGHEST ANNUAL MEAN					92.4	1974
LOWEST ANNUAL MEAN					3.24	1970
HIGHEST DAILY MEAN	700	Feb 7	140	Jan 26	2060	Mar 1 1978
LOWEST DAILY MEAN	1.5	Nov 13	1.5	Nov 13	.00	May 21 1977
ANNUAL SEVEN-DAY MINIMUM	1.5	Nov 13	1.5	Nov 13	.02	Oct 28 1977
INSTANTANEOUS PEAK FLOW			1080	Jan 26	12700	Feb 27 1983
INSTANTANEOUS PEAK STAGE			5.68	Jan 26	10.32	Feb 27 1983
ANNUAL RUNOFF (AC-FT)	16940		3550		15460	
10 PERCENT EXCEEDS	46		4.4		79	
50 PERCENT EXCEEDS	3.2		2.5		1.1	
90 PERCENT EXCEEDS	2.2		1.9		.32	

11073495 CUCAMONGA CREEK NEAR MIRA LOMA, CA

LOCATION.—Lat 33°58'58", long 117°35'55", in SW 1/4 NE 1/4 sec.22, T.2 S., R.7 W., San Bernardino County, Hydrologic Unit 18070203, on right bank 300 ft upstream from Merrill Avenue Bridge and 4.6 mi west of Mira Loma.

DRAINAGE AREA.—75.8 mi^2.

PERIOD OF RECORD.—January 1968 to July 1977, January 1979 to current year.

GAGE.—Water-stage recorder. Elevation of gage is 660 ft above sea level, from topographic map. Prior to July 1977 at site 100 ft downstream at different datum.

REMARKS.—Records fair except for discharges below 100 ft^3/s, which are poor. Channel is a trapezoidal concrete floodway; records for low and medium flows prior to July 31, 1977, are not equivalent (channel concrete lined since July 31, 1977). Inland Empire Utilities Agency Tertiary Plant No. 1 began discharging effluent 1.5 mi upstream from station on May 8, 1985. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 16,100 ft^3/s, Feb. 27, 1983, gage height, 7.85 ft, from floodmark, on basis of slope-conveyance study of peak flow; prior to operation of Plant No. 1, no flow for most of some years; minimum daily, since 1985, 2.5 ft^3/s, June 6, 1987.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	31	44	39	27	41	96	35	53	44	32	30
2	32	38	43	42	27	35	40	32	112	43	29	30
3	31	27	39	39	40	38	36	30	41	39	33	33
4	27	28	78	38	86	40	36	24	39	35	29	32
5	24	40	47	39	59	38	38	33	41	33	34	33
6	26	56	60	29	38	39	105	38	37	39	38	34
7	37	44	34	34	44	39	250	32	38	35	38	37
8	35	109	32	43	40	43	87	35	35	30	38	31
9	37	49	33	47	100	42	54	37	33	31	35	29
10	34	45	32	40	44	39	45	32	39	36	35	32
11	30	42	33	29	37	37	176	34	23	36	34	33
12	24	36	30	26	35	33	224	29	36	37	35	37
13	38	31	29	33	39	35	58	29	36	38	34	38
14	34	30	33	35	36	36	53	37	31	37	34	35
15	36	34	36	38	34	124	43	29	37	35	36	32
16	25	35	34	40	37	45	43	37	30	38	48	32
17	26	30	25	41	34	38	39	31	34	40	40	33
18	34	27	23	25	39	39	34	30	30	41	30	37
19	37	33	44	21	42	40	35	29	30	39	34	39
20	36	37	41	39	45	38	38	30	33	40	34	39
21	38	34	28	27	44	37	37	33	32	38	33	34
22	29	33	32	29	39	35	36	38	36	38	33	32
23	27	32	28	31	36	28	32	37	35	37	34	33
24	29	29	34	29	34	30	40	33	34	37	33	32
25	37	28	34	124	33	34	30	35	30	37	34	36
26	40	34	35	282	35	28	28	36	32	39	30	37
27	27	29	41	135	39	34	25	43	35	39	28	35
28	25	139	44	36	48	37	74	31	41	38	34	33
29	32	37	39	22	---	39	45	24	43	37	31	30
30	27	42	33	22	---	37	48	29	41	33	31	28
31	29	---	39	40	---	34	---	44	---	31	31	---
TOTAL	974	1239	1157	1494	1191	1232	1925	1026	1147	1150	1052	1006
MEAN	31.4	41.3	37.3	48.2	42.5	39.7	64.2	33.1	38.2	37.1	33.9	33.5
MAX	40	139	78	282	100	124	250	44	112	44	48	39
MIN	24	27	23	21	27	28	25	24	23	30	28	28
AC-FT	1930	2460	2290	2960	2360	2440	3820	2040	2280	2280	2090	2000

11073495 CUCAMONGA CREEK NEAR MIRA LOMA, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 1977, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	.021	1.15	1.55	18.2	4.65	1.91	1.35	.065	.001	.000	.000	.11
MAX	.19	6.07	7.91	149	30.7	7.94	13.1	.54	.007	.000	.000	1.03
(WY)	1972	1971	1972	1969	1969	1969	1969	1977	1969	1968	1968	1976
MIN	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
(WY)	1969	1969	1970	1975	1972	1972	1968	1968	1968	1968	1968	1968

SUMMARY STATISTICS — WATER YEARS 1968 - 1977

ANNUAL TOTAL			
ANNUAL MEAN	2.73		
HIGHEST ANNUAL MEAN	16.8		1969
LOWEST ANNUAL MEAN	.16		1976
HIGHEST DAILY MEAN	2600	Jan 25	1969
LOWEST DAILY MEAN	.00	Feb 1	1968
ANNUAL SEVEN-DAY MINIMUM	.00	Feb 1	1968
INSTANTANEOUS PEAK FLOW	9100	Jan 25	1969
INSTANTANEOUS PEAK STAGE	7.08	Jan 25	1969
ANNUAL RUNOFF (AC-FT)	1980		
10 PERCENT EXCEEDS	.10		
50 PERCENT EXCEEDS	.00		
90 PERCENT EXCEEDS	.00		

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1979 - 1984, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	3.49	11.3	7.69	34.1	65.0	46.3	12.1	3.43	.48	.37	1.47	1.08
MAX	11.1	27.9	24.7	149	216	205	63.4	19.8	2.30	1.22	6.99	3.45
(WY)	1984	1983	1984	1983	1980	1983	1983	1983	1983	1983	1983	1983
MIN	.091	.002	.006	1.67	1.29	2.44	.056	.063	.008	.019	.009	.011
(WY)	1981	1980	1980	1984	1984	1984	1981	1979	1979	1981	1979	1979

SUMMARY STATISTICS — WATER YEARS 1979 - 1984

ANNUAL TOTAL			
ANNUAL MEAN	17.5		
HIGHEST ANNUAL MEAN	53.4		1983
LOWEST ANNUAL MEAN	1.51		1981
HIGHEST DAILY MEAN	2530	Mar 1	1983
LOWEST DAILY MEAN	.00	Feb 6	1979
ANNUAL SEVEN-DAY MINIMUM	.00	Feb 6	1979
INSTANTANEOUS PEAK FLOW	16100	Feb 27	1983
INSTANTANEOUS PEAK STAGE	7.85	Feb 27	1983
ANNUAL RUNOFF (AC-FT)	12700		
10 PERCENT EXCEEDS	10		
50 PERCENT EXCEEDS	.13		
90 PERCENT EXCEEDS	.01		

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1986 - 1999, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	35.4	37.7	44.0	80.5	92.6	64.5	37.8	31.2	31.6	29.6	30.1	35.1
MAX	52.9	65.7	83.0	265	304	198	64.2	63.0	57.1	46.2	51.8	52.0
(WY)	1988	1997	1993	1993	1998	1995	1999	1998	1992	1992	1992	1986
MIN	20.4	23.4	21.0	26.1	34.9	25.3	20.5	18.5	18.1	19.3	18.5	16.4
(WY)	1987	1989	1987	1989	1989	1988	1987	1988	1988	1987	1987	1988

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1986 - 1999	
ANNUAL TOTAL	23832		14593			
ANNUAL MEAN	65.3		40.0		45.6	
HIGHEST ANNUAL MEAN					71.4	1993
LOWEST ANNUAL MEAN					26.6	1987
HIGHEST DAILY MEAN	2080	Feb 23	282	Jan 26	2490	Feb 20 1996
LOWEST DAILY MEAN	22	Sep 5	21	Jan 19	2.5	Jun 6 1987
ANNUAL SEVEN-DAY MINIMUM	25	Sep 5	29	Jan 18	12	Aug 25 1988
INSTANTANEOUS PEAK FLOW			1910	Jan 26	10400	Jan 7 1993
INSTANTANEOUS PEAK STAGE			3.25	Jan 26	5.40	Jan 7 1993
ANNUAL RUNOFF (AC-FT)	47270		28950		33040	
10 PERCENT EXCEEDS	74		44		54	
50 PERCENT EXCEEDS	33		35		31	
90 PERCENT EXCEEDS	27		29		19	

APPENDIX B

DAILY PRECIPITATION DATA
AT SAN BERNARDINO COUNTY HOSPITAL

WATER YEAR 1998-99

TABLE B-1

DAILY PRECIPITATION AT SAN BERNARDINO COUNTY HOSPITAL
(inches)

	1998			1999								
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0.02	0	0.01	0	0.06	0	0	0	0	0
2	0	0	0	0	0	0	0.01	0	0.39	0	0	0
3	0	0	0.18	0	0	0	0.03	0.05	0	0	0	0
4	0	0	0.08	0	0.37	0.01	0	0	0.01	0	0	0
5	0	0	0.05	0	0.07	0	0.01	0	0	0	0	0
6	0	0	0.19	0	0.09	0	0.53	0	0	0	0	0
7	0	0	0	0	0	0	0.32	0	0	0	0	0
8	0	0.36	0	0	0	0	0.12	0	0	0	0	0
9	0	0	0	0	0.34	0.01	0.01	0	0	0	0	0
10	0	0	0	0	0.04	0	0	0	0	0	0	0
11	0	0.11	0	0	0	0.04	0.52	0	0	0	0	0
12	0	0	0	0	0	0	0.49	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0.13	0	0	0	0	0	0
16	0	0	0	0	0	0.01	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0.13	0.02	0	0	0	0	0	0	0	0
20	0	0	0	0.42	0	0.01	0	0	0	0	0	0
21	0	0	0	0.06	0	0	0	0	0	0	0	0
22	0	0	0.01	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0.06	0	0	0	0	0
24	0.06	0	0	0	0	0	0.14	0	0	0	0	0
25	0	0	0	0.64	0	0	0	0	0	0	0	0
26	0	0	0	0.75	0	0	0	0	0	0	0	0
27	0	0	0	0.15	0	0	0	0	0	0	0	0
28	0	0.38	0	0	0	0	0.10	0	0	0	0	0
29	0	0	0	0		0	0.01	0	0	0	0	0
30	0	0	0	0		0	0.34	0	0	0	0	0
31	0		0	0.08		0		0		0	0	
Total	0.06	0.85	0.66	2.12	0.92	0.21	2.75	0.05	0.40	0.00	0.00	0.00

Total Rainfall = 8.02 Inches

Data Source: San Bernardino County Flood Control District Hydrology Department

APPENDIX C

SANTA ANA RIVER WATERMASTER
FINANCIAL STATEMENTS WITH REPORT
ON EXAMINATION BY
ORANGE COUNTY WATER DISTRICT CONTROLLER

WATER YEAR 1998-99

ORANGE COUNTY WATER DISTRICT

April 21, 2000

Santa Ana River Watermaster
c/o SBVMWD
P.O. Box 5906
San Bernardino, CA 92412-5906

Gentlemen:

I have reviewed the attached summary of transactions for the checking and savings accounts of the Santa Ana River Watermaster. As part of this review, I have compared the transactions on the attached summary with those shown on the original Bank of America Checking and Savings Account statements.

The transactions on the summary also match those found on original documents. The Checking and Savings Accounts balances as of June 30, 1999, are as shown.

Very truly yours,

ORANGE COUNTY WATER DISTRICT

Barbara Heatherly
Controller

P.O. Box 8300, Fountain Valley, CA 92728-8300 • 10500 Ellis Avenue, Fountain Valley, CA 92708
Telephone (714) 378-3200 Fax (714) 378-3373 Web Page www.ocwd.com

SANTA ANA RIVER WATERMASTER

FINANCIAL STATEMENTS

JUNE 30, 1999

SANTA ANA RIVER WATER MASTER

STATEMENT OF ASSETS AND LIABILITIES
ARISING FROM CASH TRANSACTIONS

June 30, 1999

ASSETS

Cash in checking account (Note 3)	$13,777.78
Cash in savings account (Note 3)	2,384.40
TOTAL ASSETS	$16,162.18

FUND BALANCE

Fund balance	$16,162.18

See independent reviewer's reports and notes to financial statements.

SANTA ANA RIVER WATERMASTER

STATEMENT OF ASSETS AND LIABILITIES
ARISING FROM CASH TRANSACTIONS

June 30, 1999

	Actual	Budget	Over (Under) Budget
REVENUE COLLECTED:			
Water district contributions (Note 2):			
Orange County Water District	$ 4,800	$ 4,800	$ -0-
Inland Empire Utilities Agency	2,400	2,400	-0-
San Bernardino Valley Municipal Water District	2,400	2,400	-0-
Western Municipal Water District			
Interest from Savings Account	2,400	2,400	-0-
	37	-	37
TOTAL REVENUE COLLECTED	12,037	12,000	37
EXPENSES PAID:			
Professional Engineering Service	$-0-	$ 9,500	$9,500
Administrative Expenses:			
Office and Bank Service Charges			
Auditing Services	100	0	(100)
Annual Reports	0	0	0
	0	2,500	2,500
TOTAL EXPENSES PAID	100	12,000	11,900
EXCESS OF REVENUE COLLECTED OVER EXPENSES PAID	11,937	0	11,937
FUND BALANCE AT JULY 1, 1998	4,225		
FUND BALANCE AT JUNE 30, 1999	$16,162		

See independent reviewer's report and notes to financial statements.

SANTA ANA RIVER WATERMASTER

NOTES TO FINANCIAL STATEMENTS

June 30, 1999

1. SIGNIFICANT ACCOUNTING POLICIES:

Basis of Accounting:

The Santa Ana River Watermaster's ("Watermaster") policy is to prepare its financial statements on the cash basis of accounting; consequently, certain revenues are recognized when received rather than when earned, and certain expenses are recognized when cash is disbursed rather than when the obligation is incurred.

2. ORGANIZATION AND HISTORY:

The Santa Ana River Watermaster is composed of committee of five representatives from four water districts. Two representatives serve from Orange County Water District and one representative each serves from Inland Empire Utilities Agency, Western Municipal Water District and San Bernardino Valley Municipal Water District. The committee was established on April 23, 1969, by order of the Superior Court of California in Orange County as part of a judgment resulting from a lawsuit by the Orange County Water District as plaintiff vs. City of Chino, et al, as defendants.

Costs and expenses incurred by the individual representatives are reimbursed directly from the water districts. Collective Watermaster costs and expenses are budgeted and paid for by the Watermaster after receiving contributions from the water districts. Water district contributions are made in the following ratios:

Orange County Water District	40%
Inland Empire Utilities Agency	20%
Western Municipal Water District	20%
San Bernardino Valley Municipal Water Districts	20%
Total	100%

The Watermaster issues a report each year to satisfy obligation to monitor and test water flows from the Upper Area to the Lower Area of the Santa Ana River.

See independent reviewer's report.

3. CASH IN BANK:

The following disclosures are made in accordance with Statement No. 3 of the Governmental Accounting Standards Board (GASB 3):

Cash at June 30, 1999 consisted of the following:

Bank of America:		
Checking account	$	13,778
Savings account		2,384
	$	16,162

All cash is fully insured by the FDIC.

See independent reviewer's report.

APPENDIX D

WATER QUALITY AND FLOW OF HIGH GROUNDWATER MITIGATION PROJECT PUMPED WATER DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS

WATER YEAR 1998-99

TABLE D-1

HIGH GROUNDWATER MITIGATION PROECT PUMPED WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE PRADO DAM

WATER YEAR 1998-99
(acre-feet)

Month	Discharged Above Riverside Narrows	Percolated In Colton and Riverside Basins [1]	Flow Arriving At Riverside Narrows	Flow Arriving At Prado Dam [2]
1998				
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
1999				
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	133	132	0	0
May	515	494	0	0
June	635	629	0	0
July	639	612	0	0
August	739	708	0	0
September	703	696	0	0
Total	3,365	3,271	0	0

(1) Adjusted for a 1% evapotranspiration losses.
(2) Adjusted for a 2% evapotranspiration loss between Riverside Narrows and Prado.

TABLE D-2

HIGH GROUNDWATER MITIGATION PROECT PUMPED WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE PRADO DAM

WATER YEAR 1998-99

Month	Discharge (acre-feet)	Discharge Percolated (acre-feet)	TDS [1] (mg/L)	Discharge Percolated x TDS
1997				
October	0	0	—	0
November	0	0	—	0
December	0	0	—	0
1998				
January	0	0	—	0
February	0	0	—	0
March	0	0	—	0
April	133	132	461	61,322
May	515	494	461	237,640
June	635	629	472	299,725
July	639	612	442	282,238
August	739	708	479	354,211
September	703	696	494	347,493
Total	3,365	3,271		1,582,629

$$\frac{1{,}582{,}629}{3{,}271} = 484 \text{ mg/L}$$

Flow-weighted TDS of pumped groundwater releases to the River = 484 mg/L.

(1) Average monthly TDS.

APPENDIX E

WATER QUALITY AND DISCHARGE OF WATER RELEASED BY MWDSC TO SAN ANTONIO CREEK NEAR UPLAND (CONNECTION OC-59)

WATER YEAR 1998-99

PREPARED BY

WILLIAM R. MILLS, JR.

There was no discharge of MWDSC water to San Antonio Creek near Upland (Connection OC-59) during the 1998-99 water year.

APPENDIX F

WATER QUALITY AND DISCHARGE FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN

WATER YEAR 1998-99

PREPARED BY

WILLIAM R. MILLS, JR.

TABLE F-1

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

October 1998

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	7	15	863	552	4,078
2	7	15	858	549	4,046
3	7	15	861	551	4,060
4	7	15	867	555	4,088
5	7	15	870	557	4,102
6	7	15	868	556	4,093
7	7	15	870	557	4,102
8	7	15	867	555	4,088
9	7	15	868	556	4,093
10	7	15	867	555	4,088
11	7	15	867	555	4,088
12	7	15	866	554	4,083
13	7	15	865	554	4,079
14	7	15	868	556	4,093
15	7	15	868	556	4,093
16	7	15	871	557	4,107
17	7	15	874	559	4,112
18	7	15	871	557	4,107
19	4	8	874	559	2,329
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
Total	137	271			75,928
Monthly Flow Weighted TDS				555	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

November 1998

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
Total	0	0			0
Monthly Flow Weighted TDS				0	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

December 1998

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
Total	0	0			0
Monthly Flow Weighted TDS				0	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

January 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	4	8	765	490	1,864
20	7	13	765	490	3,274
21	4	8	765	490	1,887
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
Total	14	28			7,025
Monthly Flow Weighted TDS				490	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

February 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	4	9	854	547	2,369
2	7	15	854	547	4,027
3	7	15	860	550	4,064
4	7	15	865	554	4,087
5	7	15	867	555	4,088
6	7	15	866	554	4,083
7	7	15	859	550	4,059
8	7	15	851	545	3,987
9	7	15	853	546	3,997
10	4	8	772	494	2,049
11	2	5	772	494	1,201
12	7	13	772	494	3,281
13	6	12	715	458	2,854
14	6	12	712	456	2,842
15	6	12	709	454	2,823
16	6	12	710	454	2,827
17	6	12	708	453	2,819
18	6	12	704	451	2,810
19	6	12	704	451	2,803
20	6	12	707	452	2,822
21	6	12	708	453	2,819
22	5	10	713	456	2,394
23	6	12	713	456	2,846
24	6	12	713	456	2,846
25	6	12	711	455	2,838
26	6	12	707	452	2,822
27	6	12	708	453	2,826
28	6	12	708	453	2,826
Total	175	347			86,114
Monthly Flow Weighted TDS				492	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

March 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	6	12	707	452	2,822
2	6	12	708	453	2,819
3	4	9	708	453	1,943
4	6	12	705	451	2,821
5	6	12	705	451	2,814
6	6	12	705	451	2,814
7	6	12	709	454	2,830
8	6	12	709	454	2,823
9	6	12	707	452	2,822
10	6	12	709	454	2,830
11	6	12	707	452	2,822
12	6	12	710	454	2,834
13	6	12	713	456	2,839
14	6	12	709	454	2,823
15	6	12	707	452	2,815
16	6	11	714	457	2,638
17	6	12	712	456	2,842
18	6	12	707	452	2,822
19	6	12	712	456	2,849
20	6	12	713	456	2,868
21	5	11	722	462	2,475
22	0	0	0	0	0
23	3	6	711	455	1,387
24	6	12	711	455	2,845
25	6	12	709	454	2,844
26	6	12	709	454	2,844
27	6	12	710	454	2,841
28	6	12	709	454	2,837
29	4	7	709	454	1,636
30	0	0	0	0	0
31	0	0	0	0	0
Total	166	329			75,207
Monthly Flow Weighted TDS				454	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

April 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	0	0	0	0	0
2	4	8	697	446	1,788
3	6	12	697	446	2,776
4	3	6	697	446	1,264
5	3	7	697	446	1,560
6	6	12	696	445	2,785
7	6	12	694	444	2,770
8	6	12	693	444	2,767
9	6	12	691	442	2,752
10	6	12	691	442	2,752
11	6	12	690	442	2,748
12	6	12	692	443	2,756
13	6	12	693	444	2,622
14	6	12	668	428	2,581
15	6	12	668	428	2,587
16	6	12	667	427	2,577
17	6	12	667	427	2,583
18	6	12	668	428	2,587
19	6	12	668	428	2,601
20	6	12	669	428	2,604
21	6	12	669	428	2,611
22	6	12	668	428	2,601
23	5	10	668	428	2,256
24	0	0	0	0	0
25	0	0	0	0	0
26	1	2	668	428	404
27	0	0	0	0	0
28	0	0	0	0	0
29	4	8	782	500	2,138
30	7	14	782	500	3,501
Total	138	274			60,971
Monthly Flow Weighted TDS				441	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

May 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	7	14	783	501	3,506
2	7	14	784	502	3,510
3	7	14	784	502	3,503
4	7	14	785	502	3,507
5	7	14	786	503	3,511
6	7	14	786	503	3,504
7	5	10	781	500	2,599
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	0
21	0	0	0	0	0
22	0	0	0	0	0
23	0	0	0	0	0
24	0	0	0	0	0
25	0	0	0	0	0
26	0	0	0	0	0
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
31	0	0	0	0	0
Total	47	93			23,640
Monthly Flow Weighted TDS				502	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

June 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0
17	3	6	676	433	1,333
18	6	12	676	433	2,719
19	6	11	542	347	1,970
20	5	10	288	184	899
21	7	14	778	498	3,476
22	7	14	774	495	3,443
23	7	14	772	494	3,418
24	7	14	812	520	3,748
25	7	15	843	540	4,017
26	5	11	843	540	2,923
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	0	0
30	0	0	0	0	0
Total	61	121			27,945
Monthly Flow Weighted TDS				459	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

July 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	4	7	860	550	1,985
2	8	15	856	548	4,121
3	8	15	855	547	4,116
4	8	15	855	547	4,116
5	8	15	855	547	4,108
6	8	15	856	548	4,121
7	8	15	857	548	4,126
8	8	15	857	548	4,126
9	8	15	858	549	4,131
10	8	15	859	550	4,135
11	8	15	859	550	4,127
12	8	15	859	550	4,127
13	7	15	859	550	4,110
14	7	15	861	551	4,128
15	7	15	866	554	4,152
16	8	15	861	551	4,137
17	8	15	861	551	4,137
18	7	15	855	547	4,082
19	8	15	860	550	4,132
20	7	14	883	565	4,032
21	7	15	862	552	4,133
22	7	15	861	551	4,128
23	4	8	861	551	2,200
24	8	15	871	557	4,185
25	7	15	868	556	4,162
26	7	15	864	553	4,142
27	7	14	825	528	3,792
28	4	8	825	528	2,068
29	5	9	865	554	2,631
30	7	15	865	554	4,147
31	7	15	864	553	4,142
Total	218	433			119,978
Monthly Flow Weighted TDS				550	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

August 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	2	4	864	553	1,155
2	4	8	864	553	2,157
3	7	15	871	557	4,176
4	7	15	866	554	4,152
5	7	15	866	554	4,152
6	7	15	866	554	4,152
7	7	15	866	554	4,152
8	3	6	866	554	1,561
9	0	0	0	0	0
10	0	0	0	0	0
11	2	5	871	557	1,286
12	8	15	871	557	4,202
13	8	15	870	557	4,197
14	8	15	869	556	4,175
15	8	15	868	556	4,170
16	8	15	868	556	4,170
17	8	15	867	555	4,165
18	8	15	867	555	4,174
19	7	14	800	512	3,582
20	7	13	747	478	3,145
21	7	13	745	477	3,136
22	7	13	745	477	3,136
23	7	13	743	476	3,121
24	7	13	742	475	3,109
25	7	13	741	474	3,105
26	7	13	741	474	3,105
27	7	13	741	474	3,105
28	7	13	741	474	3,098
29	7	13	740	474	3,093
30	7	13	739	473	3,082
31	7	13	738	472	3,078
Total	187	370			97,091
Monthly Flow Weighted TDS				520	

1. TDS = EC x 0.64

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

September 1999

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L) [1]	Outflow X TDS
1	7	13	737	472	3,081
2	7	13	737	472	3,081
3	7	13	737	472	3,081
4	7	13	736	471	3,069
5	7	13	736	471	3,069
6	7	13	736	471	3,069
7	6	13	769	492	3,116
8	7	13	740	474	3,130
9	6	11	755	483	2,722
10	7	13	746	477	3,148
11	7	13	745	477	3,144
12	7	13	745	477	3,144
13	7	13	739	473	3,097
14	7	13	742	475	3,131
15	7	13	743	476	3,135
16	7	15	680	435	3,253
17	8	17	606	388	3,290
18	8	17	604	387	3,279
19	8	17	604	387	3,273
20	8	17	604	387	3,267
21	8	17	605	387	3,272
22	8	17	604	387	3,261
23	8	17	604	387	3,249
24	4	8	710	454	1,878
25	8	17	599	383	3,246
26	8	17	598	383	3,240
27	8	17	598	383	3,234
28	7	14	664	425	2,940
29	3	7	768	492	1,719
30	7	13	741	474	3,098
Total	210	417			91,716
Monthly Flow Weighted TDS				436	

1. TDS = EC x 0.64

TABLE F-2

QUALITY OF WATER DISCHARGED
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 1998-99

Month	Discharge (acre-feet)	Weighted TDS (mg/L)	Discharge X TDS
1998			
October	271	555	150,602
November	0	---	0
December	0	---	0
1999			
January	28	490	13,933
February	347	492	170,805
March	329	454	149,171
April	274	441	120,933
May	93	502	46,890
June	121	459	55,428
July	433	550	237,972
August	370	520	192,578
September	417	436	181,916
Total	2,684		1,320,228

Yearly Flow Weighted TDS = $\frac{1,320,228}{2,684}$ = 492 mg/L

APPENDIX G

WATER QUALITY AND DISCHARGE FROM THE SAN JACINTO WATERSHED

WATER YEAR 1998-99

PREPARED BY

WILLIAM R. MILLS, JR.

No discharges into the Santa Ana River watershed from Lake Elsinore or Lee Lake occurred during the 1998-99 water year.

APPENDIX H

WATER QUALITY AND DISCHARGE OF THE SANTA ANA RIVER BELOW PRADO DAM

WATER YEAR 1998-99

PREPARED BY

WILLIAM R. MILLS, JR

TABLE H-1

WATER QUALITY SAMPLES BELOW PRADO DAM
WATER YEAR 1998-99

Date	EC (microsiemens/cm)	TDS (mg/L)	Source
10/01/98	955	588	USGS
10/23/98	981	610	USGS
11/06/98	961	603	USGS
11/24/98	943	584	USGS
12/08/98	1020	628	USGS
12/15/98	1010	626	USGS
01/08/99	1020	641	USGS
01/20/99	947	612	USGS
02/05/99	800	496	USGS
02/17/99	994	640	USGS
03/05/99	1030	636	USGS
03/17/99	973	625	USGS
04/06/99	992	624	USGS
04/16/99	738	465	USGS
05/07/99	935	577	USGS
05/24/99	987	638	USGS
06/07/99	972	620	USGS
06/21/99	966	606	USGS
07/07/99	998	600	USGS
07/21/99	960	607	USGS
08/06/99	972	595	USGS
08/19/99	972	595	USGS
09/07/99	968	597	USGS
09/20/99	948	582	USGS

TABLE H-2

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

October 1998

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	217	949	593	128,645
2	178	944	590	104,969
3	171	952	595	101,695
4	175	958	598	104,730
5	176	958	598	105,329
6	175	955	597	104,402
7	178	959	599	106,637
8	178	955	597	106,192
9	179	953	595	106,565
10	180	951	594	106,935
11	181	957	598	108,208
12	183	954	596	109,060
13	183	951	594	108,717
14	183	961	600	109,861
15	183	956	597	109,289
16	183	950	593	108,603
17	183	947	592	108,260
18	184	957	598	110,001
19	185	956	597	110,483
20	185	962	601	111,177
21	186	963	602	111,894
22	186	967	604	112,359
23	185	971	607	112,217
24	187	961	600	112,262
25	187	963	602	112,496
26	187	944	590	110,276
27	188	983	614	115,446
28	188	1,010	631	118,617
29	188	975	609	114,507
30	188	959	599	112,627
31	188	988	617	116,033
Total	5,698			3,418,493
Monthly Flow Weighted TDS			600	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

November 1998

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	188	973	608	114,272
2	190	959	599	113,826
3	176	946	591	104,009
4	174	949	593	103,153
5	175	954	596	104,293
6	175	956	597	104,511
7	175	957	598	104,621
8	177	958	598	105,927
9	178	960	600	106,748
10	178	960	600	106,748
11	179	969	605	108,354
12	176	990	618	108,847
13	175	994	621	108,666
14	176	975	609	107,198
15	177	968	605	107,001
16	288	960	600	172,793
17	393	953	595	234,001
18	399	946	591	235,758
19	394	939	586	231,010
20	389	931	582	226,308
21	387	924	577	223,383
22	386	919	574	221,600
23	391	906	566	221,296
24	394	952	595	234,315
25	389	965	603	234,501
26	384	974	608	233,646
27	380	991	619	235,248
28	378	1,000	625	236,135
29	379	968	605	229,183
30	378	896	560	211,577
Total	**8,378**			**4,988,926**
Monthly Flow Weighted TDS			**595**	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

December 1998

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	390	933	583	227,308
2	396	991	619	245,153
3	386	1,010	631	243,543
4	377	1,030	643	242,575
5	371	1,020	637	236,397
6	367	998	623	228,804
7	382	935	584	223,122
8	380	1,010	631	239,758
9	362	1,030	643	232,924
10	290	1,030	643	186,596
11	264	956	597	157,663
12	256	950	593	151,926
13	263	973	608	159,859
14	275	998	623	171,447
15	301	985	615	185,213
16	208	996	622	129,417
17	222	1,010	631	140,069
18	244	1,010	631	153,950
19	256	1,080	675	172,716
20	287	1,020	637	182,873
21	266	1,030	643	171,154
22	264	1,060	662	174,815
23	258	1,010	631	162,783
24	256	995	622	159,122
25	270	980	612	165,294
26	261	982	613	160,110
27	262	981	613	160,560
28	261	983	614	160,274
29	258	988	617	159,237
30	263	996	622	163,638
31	269	1,000	625	168,043
Total	9,165			5,716,342
Monthly Flow Weighted TDS			624	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

January 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	259	1,010	631	163,414
2	257	1,020	637	163,757
3	256	1,020	637	163,120
4	254	1,040	650	165,019
5	242	1,010	631	152,688
6	249	1,020	637	158,660
7	260	1,010	631	164,045
8	262	1,020	637	166,943
9	247	955	597	147,356
10	248	939	587	145,474
11	251	976	610	153,035
12	254	1,010	631	160,259
13	258	1,010	631	162,783
14	260	1,010	631	164,045
15	259	1,010	631	163,414
16	259	1,010	631	163,414
17	264	999	624	164,754
18	260	997	623	161,933
19	293	977	610	178,826
20	347	949	593	205,714
21	263	953	595	156,573
22	277	919	574	159,024
23	283	887	554	156,811
24	287	838	523	150,243
25	406	664	415	168,408
26	399	644	402	160,519
27	559	558	349	194,856
28	1,723	577	360	621,053
29	288	807	504	145,189
30	182	841	525	95,617
31	209	825	515	107,713
Total	10,115			5,384,661
Monthly Flow Weighted TDS			532	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

February 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	312	774	484	150,856
2	348	852	532	185,219
3	335	886	553	185,416
4	274	900	562	154,050
5	220	799	499	109,809
6	234	810	506	118,405
7	238	908	567	134,999
8	264	968	605	159,642
9	281	1,000	625	175,539
10	414	943	589	243,882
11	479	809	505	242,076
12	475	810	506	240,351
13	461	872	545	251,122
14	436	959	599	261,200
15	375	991	619	232,152
16	303	998	623	188,904
17	291	992	620	180,332
18	286	989	618	176,697
19	285	1,000	625	178,038
20	280	1,000	625	174,915
21	280	991	619	173,340
22	281	991	619	173,959
23	270	1,000	625	168,668
24	268	971	607	162,563
25	264	962	601	158,652
26	260	951	594	154,462
27	255	954	596	151,969
28	258	951	594	153,274
Total	8,727			5,040,492
Monthly Flow Weighted TDS			578	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

March 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	262	937	585	153,359
2	260	946	591	153,650
3	253	954	596	150,778
4	250	1,050	656	163,982
5	250	1,020	637	159,297
6	251	999	624	156,642
7	253	987	617	155,993
8	255	985	615	156,908
9	261	978	611	159,458
10	259	969	605	156,780
11	265	979	612	162,068
12	270	967	604	163,102
13	262	983	614	160,888
14	272	996	622	169,237
15	321	771	482	154,606
16	363	825	515	187,080
17	287	857	535	153,649
18	265	827	517	136,905
19	259	911	569	147,396
20	257	878	548	140,960
21	268	872	545	145,989
22	271	852	532	144,237
23	267	856	535	142,775
24	261	857	535	139,730
25	272	846	528	143,750
26	307	822	513	157,644
27	270	912	570	153,825
28	268	985	615	164,907
29	269	965	603	162,161
30	260	963	602	156,411
31	257	968	605	155,409
Total	8,345			4,809,575
Monthly Flow Weighted TDS			576	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

April 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	275	902	563	154,956
2	374	883	552	206,300
3	269	971	607	163,170
4	241	982	613	147,841
5	254	986	616	156,451
6	278	907	567	157,514
7	329	725	453	149,005
8	279	595	372	103,702
9	261	726	454	118,371
10	261	786	491	128,154
11	262	841	525	137,646
12	238	832	520	123,700
13	190	731	457	86,764
14	189	728	455	85,953
15	187	733	458	85,628
16	231	725	453	104,621
17	306	687	429	131,325
18	307	681	425	130,603
19	307	721	450	138,274
20	311	761	475	147,847
21	284	807	504	143,173
22	269	845	528	141,996
23	271	858	536	145,253
24	273	873	545	148,883
25	270	876	547	147,753
26	271	875	547	148,131
27	272	882	551	149,867
28	273	888	555	151,441
29	274	915	572	156,617
30	273	917	573	156,387
Total	8,079			4,147,324
Monthly Flow Weighted TDS			513	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

May 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	274	928	580	158,842
2	278	911	569	158,209
3	346	914	571	197,556
4	369	933	583	215,068
5	365	932	582	212,509
6	364	924	577	210,107
7	362	924	577	208,953
8	358	924	577	206,644
9	355	902	563	200,033
10	371	851	532	197,229
11	376	837	523	196,599
12	369	837	523	192,939
13	367	840	525	192,581
14	363	835	522	189,348
15	355	824	515	182,736
16	344	840	525	180,512
17	358	851	532	190,318
18	366	900	562	205,774
19	363	947	592	214,746
20	354	999	624	220,921
21	328	1,020	637	208,998
22	252	1,010	631	158,997
23	231	992	620	143,150
24	245	981	613	150,142
25	236	995	622	146,691
26	227	977	610	138,544
27	225	986	616	138,589
28	222	994	621	137,850
29	221	955	597	131,845
30	216	953	595	128,592
31	209	970	606	126,644
Total	9,669			5,541,666
Monthly Flow Weighted TDS			573	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

June 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	215	973	608	130,683
2	398	791	494	196,665
3	366	860	537	196,629
4	228	914	571	130,181
5	265	916	572	151,638
6	266	940	587	156,199
7	216	998	623	134,664
8	148	962	601	88,942
9	182	980	612	111,421
10	219	969	605	132,567
11	236	969	605	142,858
12	276	970	606	167,243
13	190	953	595	113,113
14	193	978	611	117,914
15	209	963	602	125,730
16	209	964	602	125,861
17	206	959	599	123,411
18	206	956	597	123,025
19	200	962	601	120,191
20	201	944	590	118,532
21	196	959	599	117,420
22	202	967	604	122,024
23	202	971	607	122,529
24	208	961	600	124,869
25	202	966	603	121,898
26	203	977	610	123,896
27	202	950	593	119,879
28	204	925	578	117,880
29	204	954	596	121,576
30	200	962	601	120,191
Total	6,652			3,919,629
Monthly Flow Weighted TDS			589	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

July 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	204	960	600	122,340
2	206	974	608	125,341
3	208	965	603	125,389
4	208	945	590	122,790
5	201	945	590	118,658
6	206	962	601	123,797
7	201	980	612	123,052
8	203	974	608	123,516
9	212	972	607	128,727
10	213	977	610	130,000
11	212	970	606	128,462
12	263	943	589	154,930
13	337	947	592	199,364
14	240	952	595	142,730
15	160	950	593	94,954
16	199	957	598	118,969
17	226	953	595	134,545
18	230	955	597	137,214
19	226	960	600	135,534
20	221	961	600	132,673
21	216	950	593	128,187
22	213	963	602	128,137
23	210	975	609	127,906
24	210	967	604	126,857
25	212	955	597	126,476
26	218	958	598	130,464
27	220	959	599	131,798
28	215	957	598	128,534
29	208	958	598	124,479
30	199	975	609	121,206
31	198	974	608	120,474
Total	6,695			4,017,503
Monthly Flow Weighted TDS			600	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

August 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	197	966	603	118,881
2	192	967	604	115,983
3	202	980	612	123,665
4	196	986	616	120,726
5	195	980	612	119,379
6	198	971	607	120,103
7	202	968	605	122,150
8	204	968	605	123,360
9	202	971	607	122,529
10	199	973	608	120,958
11	195	973	608	118,526
12	201	955	597	119,913
13	198	962	601	118,989
14	197	970	606	119,373
15	199	966	603	120,088
16	200	974	608	121,691
17	197	979	612	120,480
18	182	976	610	110,966
19	182	970	606	110,284
20	183	969	605	110,775
21	182	961	600	109,260
22	181	958	598	108,321
23	182	963	602	109,488
24	182	965	603	109,715
25	183	974	608	111,347
26	181	963	602	108,886
27	176	963	602	105,878
28	178	959	599	106,637
29	174	959	599	104,240
30	170	962	601	102,163
31	176	967	604	106,318
Total	5,886			3,561,071
Monthly Flow Weighted TDS			605	

1. TDS = EC x 0.624695

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

September 1999

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	181	972	607	109,904
2	187	972	607	113,547
3	189	975	609	115,116
4	190	975	609	115,725
5	195	970	606	118,161
6	195	973	608	118,526
7	202	969	605	122,276
8	202	960	600	121,141
9	193	965	603	116,346
10	204	953	595	121,448
11	225	954	596	134,091
12	210	972	607	127,513
13	194	966	603	117,070
14	189	964	602	113,817
15	190	965	603	114,538
16	192	965	603	115,743
17	194	972	607	117,797
18	197	962	601	118,388
19	200	951	594	118,817
20	200	941	588	117,568
21	195	946	591	115,237
22	194	964	602	116,828
23	190	959	599	113,826
24	188	955	597	112,158
25	189	951	594	112,282
26	195	955	597	116,334
27	200	951	594	118,817
28	198	961	600	118,866
29	194	961	600	116,464
30	189	959	599	113,227
Total	5,861			3,521,570
Monthly Flow Weighted TDS			601	

1. TDS = EC x 0.624695

TABLE H-3

ANNUAL SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1998-99

Month	Monthly Flow (cfs-days)	Monthly Weighted TDS (mg/L)	Monthly Flow x TDS
1998			
October	5,698	600	3,418,493
November	8,378	595	4,988,926
December	9,165	624	5,716,342
1999			
January	10,115	532	5,384,661
February	8,727	578	5,040,492
March	8,345	576	4,809,575
April	8,079	513	4,147,324
May	9,669	573	5,541,666
June	6,652	589	3,919,629
July	6,695	600	4,017,503
August	5,886	605	3,561,071
September	5,861	601	3,521,570
Total	93,270		54,067,253

Yearly Flow Weighted TDS = $\frac{54,067,253}{93,270}$ = 580 mg/L

APPENDIX I

WATER QUALITY AND FLOW OF WASTEWATER FROM RUBIDOUX COMMUNITY SERVICES DISTRICT DISCHARGED BELOW THE RIVERSIDE NARROWS GAGING STATION

WATER YEAR 1998-99

PREPARED BY

DONALD L. HARRIGER

TABLE I-1

QUANTITY AND QUALITY OF WASTEWATER FROM RUBIDOUX
DISCHARGED BELOW THE
RIVERSIDE NARROWS GAGING STATION

WATER YEAR 1998-99

MONTH	Discharge (acre -feet)	TDS (mg/L)	Discharge xTDS
1998			
October	181	760	137,377
November	175	651	113,878
December	182	666	121,019
1999			
January	185	681	125,688
February	167	706	117,692
March	181	691	124,904
April	179	690	123,241
May	188	695	130,917
June	182	687	125,235
July	188	685	129,033
August	191	688	131,562
September	184	687	126,500
Total	2,182		1,507,046

Flow weighted TDS = 691 mg/L

APPENDIX J

WATER QUALITY AND DISCHARGE OF THE SANTA ANA RIVER AT RIVERSIDE NARROWS

WATER YEAR 1998-99

PREPARED BY

DONALD L. HARRIGER

TABLE J-1

SANTA ANA RIVER AT RIVERSIDE NARROWS

WATER YEAR 1998-99

Sample Date	E.C. (microsiemens/cm)	TDS (mg/L)	Baseflow Monthly Average	Source of Data		*Ratio*
1998						
10/02/98	851	531		USGS		0.62
10/06/98	1025	600		C of R		0.59
10/15/98	1019	630		C of R		0.62
10/16/98	877	543		USGS		0.62
10/20/98	1022	616		C of R		0.60
10/29/98	970	656	596	C of R		0.68
11/03/98	908	596		USGS		0.66
11/03/98	958	456		C of R	*	0.48
11/12/98	937	532		C of R	*	0.57
11/17/98	955	542		C of R		0.57
11/24/98	925	563		USGS		0.61
11/26/98	1029	549	567	C of R	*	0.53
12/01/98	1017	590		C of R		0.58
12/07/98	869	550		USGS		0.63
12/10/98	1006	628		C of R		0.62
12/14/98	860	538		USGS		0.63
12/15/98	1020	584		C of R	*	0.57
12/24/98	1015	637		C of R		0.63
12/29/98	1016	523	578	C of R		0.51
1999						
01/05/99	875	554		USGS		0.63
01/07/99	994	574		C of R		0.58
01/12/99	988	564		C of R		0.57
01/20/99	668	420		USGS		0.63
01/21/99	927	586		C of R		0.63
01/26/99	838	440	540	C of R	*	0.53

* Data not used in determining monthly averages, storm flow.

C of R City of Riverside

USGS U.S. Geological Survey

DWR Dept. of Water Resources

TABLE J-1

SANTA ANA RIVER AT RIVERSIDE NARROWS

WATER YEAR 1998-99

Sample Date	E.C. (microsiemens/cm)	TDS (mg/L)	Baseflow Monthly Average	Source of Data		*Ratio*
02/04/99	881	557		USGS	*	0.63
02/04/99	998	540		C of R	*	0.54
02/08/99	849	544		C of R		0.64
02/09/99	936	548		C of R	*	0.59
02/17/99	875	554		USGS		0.63
02/18/99	988	626		C of R		0.63
02/23/99	986	628	588	C of R		0.64
03/02/99	886	553		USGS		0.62
03/04/99	1042	624		C of R		0.60
03/08/99	984	640		C of R		0.65
03/09/99	1004	700		C of R		0.70
03/10/99	867	557		USGS		0.64
03/18/99	961	614		C of R		0.64
03/22/99	976	620		C of R		0.64
03/31/99	863	547	607	USGS		0.63
04/01/99	1018	648		C of R		0.64
04/06/99	997	584		C of R		0.59
04/15/99	949	558		C of R		0.59
04/20/99	881	556		USGS		0.63
04/20/99	997	604		C of R		0.61
04/30/99	982	604	592	C of R		0.62
05/03/99	869	-		USGS	*	
05/04/99	979	620		C of R		0.63
05/14/99	976	608		C of R		0.62
05/18/99	1052	656		C of R		0.62
05/21/99	998	652		USGS		0.65
05/27/99	1007	638	635	C of R		0.63

* Data not used in determining monthly averages, storm flow.
C of R City of Riverside
USGS U.S. Geological Survey
DWR Dept. of Water Resources

TABLE J-1

SANTA ANA RIVER AT RIVERSIDE NARROWS

WATER YEAR 1998-99

Sample Date	E.C. (microsiemens/cm)	TDS (mg/L)	Baseflow Monthly Average	Source of Data		Ratio
06/01/99	1023	572		C of R	*	0.56
06/02/99	492	433		USGS	*	0.88
06/10/99	1038	644		C of R		0.62
06/15/99	1006	664		C of R		0.66
06/22/99	904	552		USGS		0.61
06/24/99	1049	626		C of R		0.60
06/29/99	1093	712	640	C of R		0.65
07/02/99	885	563		USGS		0.64
07/08/99	1045	676		C of R		0.65
07/12/99	743	440		USGS	*	0.59
07/13/99	808	555		C of R	*	0.69
07/22/99	974	502		C of R	*	0.52
07/27/99	998	620	620	C of R		0.62
08/03/99	897	561		USGS		0.63
08/05/99	1027	718		C of R		0.70
08/10/99	1038	-		C of R		-
08/19/99	897	550		USGS		0.61
08/19/99	1055	648		C of R		0.61
08/24/99	1065	660	627	C of R		0.62
09/02/99	1018	712		C of R		0.70
09/03/99	847	542		USGS		0.64
09/08/99	1030	604		C of R		0.59
09/16/99	866	540		USGS		0.62
09/16/99	1036	628		C of R		0.61
09/21/99	1026	708		C of R		0.69
09/30/99	1051	616	621	C of R		0.59

* Data not used in determining monthly averages, storm flow.

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DWR Dept. of Water Resources

TABLE J-2

FLOW WEIGHTED TDS OF BASE FLOW AT RIVERSIDE NARROWS
(Including Nontributary Flow
Discharged Above the Narrows)

WATER YEAR 1998-99

Month	Flow [1] (acre-feet)	TDS [2] (mg/L)	Flow x TDS
1998			
October	5,829	596	3,474,333
November	6,103	567	3,460,479
December	6,371	578	3,680,260
1999			
January	7,341	540	3,961,108
February	6,605	588	3,883,714
March	6,549	607	3,974,678
April	7,418	592	4,394,034
May	6,022	635	3,822,648
June	6,603	640	4,223,261
July	6,208	620	3,847,052
August	5,758	627	3,612,578
September	5,486	621	3,409,330
Total	76,294		45,743,474

$$\text{Flow weighted TDS} = \frac{45,743,474}{76,294} = 600 \text{ mg/L}$$

(1) Total Flow from Table 6

(2) TDS based on water quality data from Table J - 1