SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

VS. CITY OF CHINO et al.

CASE NO. 117628 - COUNTY OF ORANGE

THIRTY-THIRD

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2002 - SEPTEMBER 30, 2003

APRIL 30, 2004

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

VS. CITY OF CHINO et al.

CASE NO. 117628 - COUNTY OF ORANGE

THIRTY-THIRD

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2002 - SEPTEMBER 30, 2003

APRIL 30, 2004

SANTA ANA RIVER WATERMASTER

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

WATERMASTER
Richard W. Atwater
Bill B. Dendy
Virginia Grebbien
Donald L. Harriger
Robert L. Reiter

MAILING ADDRESS
c/o SBVMWD
Post Office Box 5906
San Bernardino CA 92412-5906
Telephone 909/387-9200
FAX 909/387-9247

April 30, 2004

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

Re: Watermaster Report for Water Year October 1, 2002 - September 30, 2003

Ladies and Gentlemen:

We have the honor of submitting herewith the Thirty-third 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 2002-03 are as follows:

		At Prado	
1	Measured Outflow at Prado	256,157	acre-feet
2	Base Flow at Prado	146,113	acre-feet
3	Annual Weighted TDS in Base and Storm Flows	463	mg/L
4	Annual Adjusted Base Flow	174,970	acre-feet
5	Cumulative Adjusted Base Flow	3,851,531	acre-feet
6	Other Credits (Debits)	887	acre-feet
7	Cumulative Entitlement of OCWD	1,386,000	acre-feet
8	Cumulative Credit	2,484,189	acre-feet
9	One-Third of Cumulative Debit	0	acre-feet
10	Minimum Required Base Flow in 2003-04	34,000	acre-feet

At Riverside Narrows

1	Base Flow at Riverside Narrows	57,747 acre-feet
2	Annual Weighted TDS in Base Flow	626 mg/L
3	Annual Adjusted Base Flow	57,747 acre-feet
4	Cumulative Adjusted Base Flow	1,416,733 acre-feet
5	Cumulative Entitlement of IEUA and WMWD	503,250 acre-feet
6	Cumulative Credit	913,483 acre-feet
7	One-Third of Cumulative Debit	0 acre-feet
8	Minimum Required Base Flow in 2003-04	12,420 acre-feet

The above findings show that at the end of the 2002-03 water year, Inland Empire Utilities Agency (formerly Chino Basin Municipal Water District) and Western Municipal Water District have a cumulative credit of 2,484,189 acre-feet to their Base Flow obligation at Prado Dam. San Bernardino Valley Municipal Water District has a cumulative credit of 913,483 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 2002-03.

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
Bill B. Dendy

Virginia Grebbien
Virginia Grebbien

Donald L. Harriger
Donald L. Harriger

Robert L. Reiter
Robert L. Reiter

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF PLATES

(Located at back of report)

TABLE OF CONTENTS (Continued)

APPENDICES

The following appendices are bound separately and available for review at the office of the Secretary of the Santa Ana River Watermaster.

CHAPTER I

WATERMASTER ACTIVITIES AND WATER CONDITIONS

Introduction

This Thirty-third Annual Report of the Santa Ana River Watermaster covers Water Year 2002-03. 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 locations of the districts are shown on Plate 1, "Santa Ana River Watershed".

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 water year begins October 1 and ends the following September 30. The time for submission of the annual report is April 30, seven months after the end of the water year.

For the 2002-03 Water Year the Watermaster Committee consisted of Donald L. Harriger, Robert L. Reiter, Bill B. Dendy, Richard W. Atwater, and Virginia L. Grebbien. Mr. Harriger served as Chairman and Mr. Reiter served as Secretary/Treasurer. Chapter IV presents the history of Watermaster Committee membership.

Compilation of Basic Data

The Watermaster annually compiles the basic hydrologic and water quality data necessary to determine compliance with the provisions of the Judgment. The data include records of stream flow and quality for the Santa Ana River (River) at Prado Dam and at Riverside Narrows as well as stream flows for most tributaries; flow and quality of nontributary water entering the River; rainfall records at locations in or adjacent to the Watershed; and other data that may be used to support the Watermaster's determinations.

For Water Year 2002-03 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 at both stations consist of computed mean daily discharges, expressed in cubic feet per second (cfs), based on continuous recordings. The water quality data at Prado consist of daily maximum and minimum values for electrical conductivity (EC), measured as specific conductance and expressed in microsiemens per centimeter (μs/cm) based on a continuous recording, and twice-monthly measured values for total dissolved solids (TDS), expressed in milligrams per liter (mg/L). 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 for streams tributary to Prado, including, among others, 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 2002-03 daily mean discharge record at Prado is considered by the USGS to be "excellent" for flows below 550 cfs and "fair" above. 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, 3,850 cfs on February 13, 2003, and 90 cfs on May 18, 2003. The maximum and minimum daily mean EC values reported by the USGS at Prado were 1070 μs/cm on January 30, 2003, and 302 μs/cm on February 14, 2003. The respective corresponding calculated TDS concentrations were 669 and 189 mg/L.

The 2002-03 daily mean discharge record at Riverside Narrows was rated by the USGS to be "poor" due to a continuing trend of river scour, lateral movement away from the sensor and deposition of sediments near the sensor. The maximum and minimum daily mean discharge values during the year were 2,460 cfs on March 16, 2003 and 65 cfs on October 5, 2002. The maximum and minimum daily mean EC values reported by the USGS were 992 μs/cm on both May 2 and May 9, 2003 and 693 μs/cm on March 18, 2003. The respective corresponding measured TDS concentrations were 635, 626, and 429 mg/L.

To assist in making its determinations each year the Watermaster refers to the rainfall records of many National Weather Service precipitation stations located in or near the Santa Ana River watershed. The record for Station 2146, located at the

San Bernardino County Hospital, was used to define the hydrologic base period upon which the physical solution in the Judgment was based, and annual reports of the Watermaster have always presented the daily and total annual rainfall record at the station in order to provide a comparison with historical conditions.

In 2000-01 Station 2146 was destroyed when the hospital buildings were demolished. For many days of that year precipitation data were missing entirely, and for many other days the reported data were clearly inconsistent with data from other nearby stations. The Watermaster decided that the record for Station 2146 for that entire year might be unreliable and decided to replace it with estimated data. Beginning with Water Year 2001-02 OCWD hydrogeologists Roy Herndon and Gwen Sharp have obtained the records for three nearby stations (2357 at San Bernardino CDF, 2015 at Del Rosa Ranger Station, and 2001B2 or 2001B3 at San Bernardino County Flood Control District) and, using the method recommended by the U.S. Weather Service, have annually estimated the precipitation at the location of the former Station 2146. For Water Year 2002-03 their estimate was 16.22 inches. The Watermaster accepted their estimate.

The estimated 2002-03 rainfall total was 90% 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 3 shows annual precipitation from 1934-35 through 2002-03.

Watermaster Determinations

Each year the Watermaster uses its long-established procedures to analyze the basic hydrologic and water quality data to determine, at Riverside Narrows and at Prado, Base Flow, Base Flow TDS, Adjusted Base Flow, Cumulative Credits or Debits to Upper Area parties, and the Minimum Required Base Flow for the following water year. The procedures include determining, for both locations, the amounts of Nontributary Flow or other flow to be excluded from Base Flow, the relative amounts of Base Flow and Storm Flow and the relationships between EC and TDS concentrations.

During 2002-03 there were three sources of non-storm flow in the river at Prado that the Watermaster has not included in Base Flow: imported water, Arlington Desalter product water, and WMWD-EVMWD Transfer Program water. A fourth source, from the San Jacinto River Watershed, was also excluded from Base Flow but was partially added to the Cumulative Credit at Prado.

A total of 1,664 acre-feet of Nontributary Flow attributable to imported State Water Project water, purchased by OCWD and released at the OC-59 turnout from MWDSC's Foothill Feeder into San Antonio Creek, was calculated to have reached Prado with an estimated average TDS concentration of 224 mg/L.

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 4,882 acre-feet of water having an average TDS concentration of 362 mg/L.

Under agreements with Elsinore Valley Municipal Water District (EVMWD) and OCWD, WMWD obtained and delivered to the Santa Ana River above Prado Dam 3,664 acre-feet of water for OCWD. The estimated flow-weighted average TDS of the water was 504 mg/L.

Eastern Municipal Water District (EMWD) discharged to Temescal Creek 2,312 acre-feet of municipal wastewater, with a flow-weighted average TDS of 671 mg/L, that originated in the San Jacinto River Watershed. Discharges from the San Jacinto Watershed were not taken into account in the settlement discussions and calculations that led to the flow obligations in the Judgment. In the past the Watermaster decided that fifty percent of any portion of such discharges that reach Prado Reservoir and that are subsequently captured by OCWD should be added to the Cumulative Credit at Prado (after the usual water quality adjustment). Watermasters Harriger and Dendy and OCWD Hydrogeologist Gwen Sharp jointly estimated that 2,024 of the EMWD wastewater, with a TDS concentration of 707 mg/L, reached Prado Reservoir, that 1,774 acre-feet was captured by OCWD, and recommended that the Cumulative Credit at Prado be increased accordingly, using the prior fifty percent rule. The Watermaster accepted the estimate and the recommendation.

The Watermaster's determinations for the 2002-03 Water Year are explained in detail for Prado in Chapter II and for Riverside Narrows in Chapter III. A summary of annual determinations by the Watermaster for the period 1970-71 through 2002-03 is presented in Table 1. Note that the Base Flow obligations set forth in the Judgment at both Prado and Riverside Narrows have been met and cumulative credits have accrued to the Upper Area.

TABLE 1

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[6]
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
1999-00	11.09	187,905	148,269[11]	527	169,644	2,098,244
2000-01	16.13	209,168	153,914[11]	525	176,360	2,232,604
2001-02	5.08	156,596	145,981[11]	587	159,728	2,350,332
2002-03	16.22	256,157	146,113[11]	463	174,970[5]	2,484,189[6]

TABLE 1 (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
1999-00	11.09	75,572	63,499	602	63,499	780,909
2000-01	16.13	75,331	61,872[11]	603	61,872	827,531
2001-02	5.08	59,434	58,705[11]	606	58,705	870,986
2002-03	16.22	92,166	57,747[11]	617	57,747	913,483

TABLE 1 (Continued)

(1) Measured at San Bernardino County Hospital, except was estimated for San Bernardino in 2000-01 and 2002-03.
(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; 1,690 acre-feet in 1997-98; and 2,024 acre-feet in 2002-03.
(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; 1,762 acre-feet in 1994-95; 0 acre-feet in 1997-98; and 887 acre-feet in 2002-03.
(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, High Groundwater Mitigation Project, and WMWD Transfer Program.

Note: For the years 1973-74 through 1979-80, a correction has been made for different losses of State Water Project 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).

Upper Area Wastewater Discharges and Salt Exports

Although not used directly in the Watermaster's analyses and determinations, data on municipal wastewater discharged in the Upper Area are compiled annually because it is a major contributor to Base Flow in the River. The historical data on wastewater discharged are summarized in Table 2.

Similarly, while data on the amounts of high salinity water exported from the Upper Area to the ocean through SAWPA's Santa Ana Regional Interceptor (SARI) and IEUA's Non-Reclaimable Wastewater System (NRWS) are not used directly by the Watermaster, salt export helps to protect River water quality and, therefore, helps the Upper Area parties comply with the Judgment. The available historical data on salt export are summarized in Table 3. The SARI first went into service in 1985-86. The NRWS has been in service since prior to 1970, but records of flow data prior to 1981-82 are missing.

Plate 2 is a map showing the locations of wastewater treatment plants and the SARI and NRWS pipelines.

TABLE 2
MUNICIPAL WASTEWATER EFFLUENT DISCHARGED ABOVE PRADO
(acre-feet)

Water Year	Wastewater discharges upstream from Colton that generally do not flow continuously to Santa Ana River above E Street				Wastewater discharges to Santa Ana River and its tributaries that have hydraulic continuity to the Santa Ana River above Riverside Narrows					Wastewater discharges to Santa Ana River between Riverside Narrows and Prado Dam							Total Discharge to Surface Flow of the Santa Ana River (B + C)	Total Wastewater Discharged in Watershed (A + B + C)
										Inland Empire Utilities Agency								
	Redlands	Beaumont	Yucaipa	Subtotal (A)	San Bernardino	Colton	Rialto	RIX[1]	Subtotal (B)	Riverside	Corona	IEUA #1[2]	IEUA #2	CCWRF[3]	WRCR[4]	Subtotal (C)		
1970-71	2,650	no record	--	2,650	17,860	2,520	2,270	--	22,650	18,620	3,190	--	--	--	--	21,810	44,460	47,110
1971-72	2,830	no record	--	2,830	16,020	2,230	2,400	--	20,650	19,010	3,230	6,740	--	--	--	28,980	49,630	52,460
1972-73	2,810	450	--	3,260	18,670	2,530	2,260	--	23,460	19,060	3,340	10,380	--	--	--	32,780	56,240	59,500
1973-74	2,770	600	--	3,370	17,680	2,530	2,320	--	22,530	19,560	3,510	11,440	2,320	--	--	36,830	59,360	62,730
1974-75	2,540	570	--	3,110	16,750	1,980	2,320	--	21,050	19,340	4,020	14,960	2,280	--	--	40,600	61,650	64,760
1975-76	2,450	620	--	3,070	17,250	2,540	2,240	--	22,030	19,580	4,700	15,450	2,950	--	--	42,680	64,710	67,780
1976-77	3,170	580	--	3,750	17,650	3,260	2,330	--	23,240	18,770	5,010	14,640	3,380	--	--	41,800	65,040	68,790
1977-78	3,280	620	--	3,900	18,590	3,810	2,380	--	24,780	20,310	5,200	14,650	4,060	--	--	44,220	69,000	72,900
1978-79	3,740	670	--	4,410	19,040	3,850	3,050	--	25,940	21,070	5,390	15,040	5,070	--	--	46,570	72,510	76,920
1979-80	4,190	690	--	4,880	20,360	4,190	2,990	--	27,540	22,910	5,360	14,410	5,520	--	--	48,200	75,740	80,620
1980-81	4,410	690	--	5,100	20,550	3,930	3,370	--	27,850	24,180	5,590	17,270	5,260	--	--	52,300	80,150	85,250
1981-82	4,420	700	--	5,120	23,340	3,780	3,470	--	30,590	25,640	5,410	19,580	5,360	--	--	55,990	86,580	91,700
1982-83	4,530	710	--	5,240	24,160	3,600	3,620	--	31,380	25,020	5,860	20,790	4,290	--	--	55,960	87,340	92,580
1983-84	5,150	800	--	5,950	22,080	3,700	3,830	--	29,610	26,090	6,200	20,950	3,950	--	--	57,190	86,800	92,750
1984-85	4,990	840	--	5,830	23,270	3,830	4,070	--	31,170	27,750	6,250	25,160	4,280	--	--	63,440	94,610	100,440
1985-86	5,200	820	--	6,020	24,720	4,010	4,720	--	33,450	28,820	5,900	28,240	2,660	--	--	65,620	99,070	105,090
1986-87	5,780	880	800	7,460	26,810	4,170	5,350	--	36,330	30,340	6,170	27,160	5,000	--	--	68,670	105,000	112,460
1987-88	6,060	940	1,850	8,850	27,880	5,240	6,040	--	39,160	34,660	6,050	31,290	5,500	--	--	77,500	116,660	125,510
1988-89	5,250	1,030	2,260	8,540	27,640	5,550	6,280	--	39,470	35,490	8,080	35,510	6,180	--	--	85,260	124,730	133,270
1989-90	6,360	1,100	2,370	9,830	28,350	5,810	6,260	--	40,420	33,210	9,140	34,760	5,730	--	--	82,840	123,260	133,090
1990-91	6,690	1,120	2,490	10,300	27,570	5,670	6,290	--	39,530	32,180	9,110	36,840	6,100	--	--	84,230	123,760	134,060
1991-92	6,230	1,150	2,580	9,960	25,060	5,660	6,360	--	37,080	32,660	9,010	40,360	5,780	1,550	--	89,360	126,440	136,400
1992-93	6,880	1,180	2,580	10,640	25,550	6,210	6,460	--	38,220	34,100	9,600	41,510	5,640	4,720	--	95,570	133,790	144,430
1993-94	6,440	1,150	2,710	10,300	23,800	5,830	6,540	--	36,170	32,640	7,790	37,310	5,430	7,010	--	90,180	126,350	136,650
1994-95	6,720	1,180	2,560	10,460	26,330	5,500	6,820	--	38,650	33,950	7,340	39,680	5,360	8,690	--	95,020	133,670	144,130
1995-96	6,550	1,260	2,640	10,450	13,240	2,770	6,890	20,760	43,660	33,960	7,850	39,590	4,810	9,060	--	95,270	138,930	149,380
1996-97	6,510	1,280	2,780	10,570	--	--	7,160	42,800	49,960	34,240	5,040	39,940	4,790	9,750	--	93,760	143,720	154,290
1997-98	7,022	1,356	3,116	11,494	--	--	7,063	49,683	56,746	35,422	8,718	44,940	4,969	9,264	1,461	104,774	161,520	173,014
1998-99	7,379	1,367	3,128	11,874	--	--	6,524	47,587	54,111	34,844	11,629	43,354	5,345	9,534	4,594	109,299	163,410	175,284
1999-00	7,670	1,373	3,284	12,327	--	--	7,392	45,012	52,404	35,399	13,152	42,967	4,378	9,954	2,371	108,221	160,625	172,952
2000-01	7,379	1,377	3,345	12,101	--	--	8,346	49,407	57,753	35,663	13,100	43,863	4,401	11,615	2,210	110,852	168,605	180,706
2001-02	7,395	1,434	3,285	12,114	--	--	7,952	44,513	52,465	35,586	12,378	40,377	4,056	10,677	2,380	105,454	157,919	170,033
2002-03	7,499	1,593	3,480	12,572	--	--	8,042	45,570	53,612	36,298	12,027	45,838	4,343	10,837	2,409	111,752	165,364	177,936

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.

TABLE 3

HIGH SALINITY WATER EXPORTED
FROM THE SANTA ANA RIVER WATERSHED

Water Year	Inland Empire Utility Agency Non-Reclaimable Wastewater	Santa Ana Watershed Project Authority Santa Ana Regional Interceptor (SARI)[1]		
	North System (acre-feet)	SARI Flow[2] (acre-feet)	Average TDS (mg/L)	Total Flow (acre-feet)
1970-71	NA	---	---	---
1971-72	NA	---	---	---
1972-73	NA	---	---	---
1973-74	NA	---	---	---
1974-75	NA	---	---	---
1975-76	NA	---	---	---
1976-77	NA	---	---	---
1977-78	NA	---	---	---
1978-79	NA	---	---	---
1979-80	NA	---	---	---
1980-81	NA	---	---	---
1981-82	4,236	NA	---	---
1982-83	4,651	NA	---	---
1983-84	4,142	NA	---	---
1984-85	2,346	NA	---	---
1985-86	2,995	2,791 [3]	---	---
1986-87	4,943	2,869 [3]	---	---
1987-88	5,177	2,948 [3]	---	---
1988-89	5,949	3,622 [3]	---	---
1989-90	5,240	7,393	1,649	12,633
1990-91	2,847	7,340	1,906	10,187
1991-92	3,421	6,457	2,346	9,878
1992-93	3,774	5,277	2,516	9,051
1993-94	3,764	7,860	2,302	11,624
1994-95	4,131	8,656	1,903	12,787
1995-96	3,863	9,597	2,175	13,460
1996-97	4,191	10,225	2,292	14,417
1997-98	4,575	8,210	2,456	12,785
1998-99	3,666	4,305	2,611	7,971
1999-00	4,272	7,711	2,154	11,983
2000-01	5,075	8,205	2,504	13,280
2001-02	4,297	8,385	3,289	12,682
2002-03	3,926	9,331	3,482	13,257

1. Santa Ana Regional Interceptor began operation in 1985-86.
2. IEUA Non-Reclaimable Wastewater from the South System goes into the SARI and is included in SARI Flow.
3. SARI flow for 1985-86 through 1988-89 is partial flow.

NA = Data Not Available

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 2002-03 Water Year, and each party's share of the costs, are set forth in Table 4. Each agency received a one-time credit to individual agency contribution due to distribution of Federal Matching Funds

TABLE 4
COSTS TO THE PARTIES AND USGS FOR MEASUREMENTS WHICH PROVIDE DATA USED BY THE SANTA ANA RIVER WATERMASTER

October 1, 2002 to September 30, 2003

	Total Cost	USGS Share	Parties' Share
USGS GAGING STATION			
Santa Ana River at MWD Crossing (Riverside Narrows)			
Surface Water Gage	$23,330	$11,650	$11,650
Water Quality Monitoring/TDS Sampling	9,600	4,800	4,800
Chino Creek at Schaefer	16,600	8,300	8,300
Cucamonga Creek at Mira Loma	16,600	8,300	8,300
Santa Ana River below Prado Dam			
Surface Water Gage	16,600	8,300	8,300
Water Quality Monitoring/TDS Sampling	18,400	9,200	9,200
Water Quality Conductance Program	1,850	0	1,850
One-time Credit	(9,000)	---	(9,000)
TOTAL COST AND SHARES	$93,950	$50,550	$43,400
COST DISTRIBUTION AMONG PARTIES			
Inland Empire Utilities Agency	20%		$8,680
Orange County Water District	40%		$17,360
San Bernardino Valley Municipal Water District	20%		$8,680
Western Municipal Water District	20%		$8,680

The Watermaster annually adopts a budget for the costs of services other than those provided by the USGS. Table 5 shows the budget and actual expenses incurred for such services during the 2002-03 fiscal year as well as the budget adopted for the 2003-04 fiscal year. A financial review was performed by OCWD and is reported in Appendix C.

TABLE 5

WATERMASTER SERVICE BUDGET AND EXPENSES

Budget Item	July 1, 2002 to June 30, 2003 Budget	July 1, 2002 to June 30, 2003 Expenses[1]	July 1, 2003 to June 30, 2004 Budget
Support Services	$9,500.00	$8,040.53	$9,500.00
Reproduction of Annual Report	2,500.00	443.71	2,500.00
TOTAL	$12,000.00	$8,484.24	$12,000.00

(1) Expenses for 2001-02 were paid in 2002-03.

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 2002-03 Water Year, the flow of the Santa Ana River as measured at the USGS gaging station below Prado Dam amounted to 256,157 acre-feet. There was no water in storage behind the dam at the beginning or at the end of the water year. Inflow to the reservoir included 146,113 acre-feet of Base Flow and 97,810 acre-feet of Storm Flow, based on an adjusted Prado Reservoir storage-elevation curve described in the following section. Nontributary flows consisted of State Water Project water, Arlington Desalter discharge, and WMWD Transfer Program water. Water discharged from San Jacinto Watershed was also excluded from Base Flow but was partially credited to Cumulative Credit at Prado. Of the nontributary flow due to State Water Project water released to San Antonio Creek at turnout OC-59, 1,664 acre-feet was calculated to have reached Prado Reservoir during 2002-03. Arlington Desalter flows totaled 4,882 acre-feet. The WMWD Transfer Program contributed 3,664 acre-feet. Flows from the San Jacinto Watershed calculated to have reached Prado Reservoir were 2,024 acre-feet. The monthly components of flow of the Santa Ana River at Prado Dam for 2002-03 are listed in Table 6 and are shown graphically on Plate 4. Historical Base and Storm Flows of the Santa Ana River below Prado during the period 1934-35 through 2002-03 are presented on Plate 5.

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-foot 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

TABLE 6

COMPONENTS OF FLOW AT PRADO DAM
WATER YEAR 2002-03
(acre-feet)

	USGS Measured Outflow	Storage Change (1)	Computed Inflow	San Jacinto Watershed Flow at Prado (2)	WMWD Transfer Water (3)	SBVMWD HGMP Water (4)	San Antonio Creek (5)	Arlington Desalter	Storm Flow	Base Flow
2002										
October	11,669	779	12,448	0	578	0	0	542	0	11,328
November	15,294	4,910	20,204	0	269	0	0	522	8,438	10,975
December	25,815	1,120	26,935	0	94	0	0	482	13,480	12,879
2003										
January	20,684	(6,797)	13,887	0	0	0	0	435	59	13,393
February	38,539	7,617	46,156	0	229	0	0	455	32,689	12,783
March	36,407	10,907	47,314	5	61	0	0	456	32,203	14,589
April	29,020	(6,648)	22,372	1,165	0	0	0	468	8,399	12,340
May	23,113	(6,512)	16,601	854	0	0	0	82	2,404	13,261
June	18,188	(5,376)	12,812	0	354	0	0	0	0	12,458
July	12,871	0	12,871	0	654	0	0	156	138	11,923
August	12,109	0	12,109	0	611	0	667	632	0	10,199
September	12,448	0	12,448	0	814	0	997	652	0	9,985
Total	256,157	0	256,157	2,024	3,664	0	1,664	4,882	97,810	146,113

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

(2) Discharge due to overflow of Lake Elsinore and/or discharge of wastewater by EMWD from the San Jacinto Watershed.

(3) WMWD Transfer Program water pumped from the Bunker Hill, Riverside, and Colton basins and discharged to the Santa Ana River above the Riverside Narrows.

(4) HGMP water pumped from the Bunker Hill groundwater basin and discharged into the Santa Ana River, less 1% for evapotranspiration above Riverside Narrows and 2% evapotranspiration between Riverside Narrows and Prado Dam.

(5) State Water Project water released into San Antonio Creek from turnout OC-59 during 2002-03 and calculated to have reached Prado Dam in the 2002-03 Water Year.

likely have occurred. The new storage-elevation curve was developed by distributing the 1,600 acre-foot storage loss until the curve produced inflow values without significant anomalies.

Nontributary Flow

Nontributary Flow includes water that originated outside the watershed, as well as other water that the Watermaster has determined should be excluded from Base Flow. During the 2002-03 Water Year it included State Water Project water imported by OCWD and released to San Antonio Creek, water discharged to the river from the Arlington Desalter, and WMWD Transfer Program water. Flows from the San Jacinto Watershed were also calculated to have reached Prado Reservoir. In the past it has included, and in the future may include, other water discharged to the river pursuant to the water exchanges or other such programs.

High Groundwater Mitigation Project

No HGMP water was discharged to the Santa Ana River during the 2002-03 water year.

Releases to San Antonio Creek

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.

During the 2002-03 Water Year, 1,766 acre-feet of State Water Project water was released into San Antonio Creek from the Foothill Feeder at turnout OC-59 near Upland. Total monthly deliveries and daily flow rates were provided by the MWDSC. Water loss between OC-59 and Prado Dam was calculated per the procedures set forth in the Twelfth Annual Report (1981-82), Appendix C. It was determined that of the OC-59 water released, a total of 1,664 acre-feet reached Prado Dam, 76 acre-feet (4.3%) was lost to evapotranspiration, and 26 acre-feet was in transit at the end of the water year due to the 12-hour delay from the time of release until the water reaches Prado Dam. A monthly summary of Nontributary Flow released from OC-59 into San Antonio Creek is contained in Appendix E.

Arlington Desalter

Groundwater flowing from the Arlington Basin has historically been a component of the Santa Ana River flow. This groundwater has 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 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. The Watermaster determined that the flow and TDS of the water from this facility would be excluded from the computation of Base Flow and Adjusted Base at Prado. During the 2002-03 Water Year, 4,882 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 water discharged. A summary of Arlington Desalter discharges is contained in Appendix F.

WMWD Transfer Program

In 2001, OCWD and WMWD entered into an agreement that provides for delivery of groundwater pumped primarily from the Bunker Hill Basin to OCWD via the Riverside Canal and Santa Ana River. During the 2002-03 Water Year, WMWD delivered 3,664 acre-feet to the Santa Ana River upstream of Riverside Narrows and Prado Dam. A summary of the WMWD Transfer Program discharges is contained in Appendix K.

San Jacinto Watershed Discharge

Prior to the 1997-98 water year, discharges from the San Jacinto Watershed reaching Prado Reservoir were due to discharges from Lake Elsinore, and had been accounted for as "Lake Elsinore Discharge." In 1998 Eastern Municipal Water District (EMWD) completed its Reach 4 discharge pipeline to Wasson Canyon, which is tributary to Temescal Wash. The pipeline discharges tertiary-treated wastewater to Temescal Wash above Lee Lake when flows exceed EMWD's storage facility capacity. The collective discharges from Lake Elsinore and EMWD to Temescal Wash are referred to herein as San Jacinto Watershed discharges.

During the 2002-03 water year, EMWD discharged 2,312 acre-feet of wastewater to Temescal Wash, and 2,024 acre-feet of that discharge reached Prado Reservoir. The Watermaster previously determined that to the extent such discharges occur and are captured by OCWD, fifty percent of such captured water will be added as Cumulative Credit at Prado. OCWD captured 1,774 acre-feet of the San Jacinto Watershed discharge.

Storm Flow

Portions of storm flows are retained behind Prado Dam for flow regulation and for water conservation purposes. The ACOE owns the Dam, which has a spillway elevation of 543 feet above mean sea level, and operates it according to a flow release schedule with 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 for conservation are released following the storm to downstream groundwater recharge facilities. Monthly and annual quantities of Storm Flow are shown in Table 6.

During the 2002-03 Water Year, the maximum volume of water stored in Prado Reservoir reached 23,580 acre-feet on March 18, 2003. The maximum daily mean flow released from Prado Dam to the Santa Ana River was 3,850 cfs on February 13, 2003.

Base Flow

The Base Flow is affected by Nontributary Flow releases to San Antonio Creek, discharges from the Arlington Desalter, discharges of the HGMP and WMWD Transfer Program water, and discharges from the San Jacinto Watershed. Nontributary Flow releases to San Antonio Creek, Arlington Desalter discharges, WMWD Transfer water, and discharges from the San Jacinto Watershed affected the Base Flow during the 2002-03 Water Year. The general procedure used by the Watermaster to separate the 2002-03 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 6.

Water Quality Adjustments

The flow-weighted average TDS for the total flow passing Prado Dam, including Nontributary Flow released to San Antonio Creek, Arlington Desalter discharge, WMWD Transfer Program water, and San Jacinto Watershed discharge, was found to be 462 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:

$$TDS = EC \times 0.625347$$

(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 6 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 462 mg/L represents the quality of the total flow including releases to San Antonio Creek, discharge from the Arlington Desalter, WMWD Transfer Program water, and discharges from the San Jacinto Watershed. 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 High Groundwater Mitigation Project Discharge

During the 2002-03 Water Year SBVMWD discharged no HGMP water. Therefore, no water quality adjustment was necessary.

Adjustment for Flow to San Antonio Creek

During the 2002-03 Water Year, 1,664 acre-feet of water released from OC-59 to San Antonio Creek were calculated to have reached Prado Dam. A flow-weighted average TDS of 224 mg/L was calculated for State Water Project water reaching Prado Dam. A summary of these calculations is contained in Appendix E.

Adjustment for Arlington Desalter Discharge

The amount of product water discharged to the Santa Ana River during the 2002-03 Water Year totaled 4,882 acre-feet. A conversion factor of 0.6069 was determined by regression analysis based on seven (7) grab samples collected by WMWD and analyzed for EC and TDS by an independent laboratory, and one (1) sample collected by the OCWD and analyzed for EC and TDS. Using daily EC and daily flow values, a flow-weighted average TDS of 362 mg/L was calculated. A summary of these calculations is contained in Appendix F.

Adjustment for WMWD Transfer Program Discharge

During the 2002-03 Water Year, WMWD delivered 3,664 acre-feet to the Santa Ana River upstream of Riverside Narrows and Prado. A TDS of 504 mg/L was calculated for that water. A summary of the WMWD Transfer Program discharges is contained in Appendix K.

Adjustment for San Jacinto Watershed Discharge

Discharge from the San Jacinto Watershed during the 2002-03 Water Year reaching Prado Reservoir totaled 2,024 acre-feet. Using EMWD TDS data for the period of discharge and monthly volume of discharge reaching Prado reservoir, a flow-weighted average TDS of 707 mg/L was calculated. A summary of these calculations is contained in Appendix G.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow x Average TDS (acre-feet x mg/L)
1. Measured Outflow	256,157	462	118,344,534
2. Less High Groundwater Mitigation Project	0	---	---
3. Less Nontributary Flow San Antonio Creek	(1,664)	224	(372,736)
4. Less Arlington Desalter	(4,882)	362	(1,767,284)
5. Less WMWD Transfer Program	(3,664)	504	(1,846,656)
6. Less San Jacinto Watershed Discharge	(2,024)	707	(1,430,968)
7 Measured Outflow less lines 2 through 6	243,923		112,926,890
Average TDS in total Base and Storm Flow	112,926,890 ÷ 243,923 = 463 mg/L		

After adjusting for Nontributary Flow of OC-59 water to San Antonio Creek, Arlington Desalter discharges, WMWD Transfer Program water, and San Jacinto Watershed discharge, the weighted average annual TDS of Storm Flow and Base Flow for 2002-03 is 463 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 subject 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 463 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:

$$(146{,}113 \text{ acre-feet}) + \frac{35}{42{,}000} (146{,}113 \text{ acre-feet}) (700 - 463) = 174{,}970 \text{ acre-feet}$$

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 Watermasters agreed that San Jacinto Watershed outflows were not envisioned during the flrmulation of the Judgment and because of the occurrence of San Jacinto Watershed flows at Prado, the Watermaster decided, as in previous years, to credit one-half of the amount of any such outflows recharging the groundwater basin in Orange County to CBMWD [IEUA] and WMWD.

Of the 2,024 acre-feet of San Jacinto Watershed outflows reaching Prado Reservoir in 2002-03, 250 acre-feet flowed past OCWD's groundwater recharge facilities and was considered as lost to the ocean. Therefore, a net amount of 1,774 acre-feet of San Jacinto Watershed outflow recharged the Orange County groundwater basin in 2002-03. One-half of that amount has been considered a credit against the Upper Area Base Flow obligation at Prado Dam. Thus, an additional 887 acre-feet was added to the Cumulative Credit at Prado Dam.

It has come to the attention of the Watermaster that in previous reports one-half the San Jacinto Watershed discharge reaching Prado and recharging Orange County groundwater basin has been included in the Cumulative Adjusted Base Flow as well as the Cumulative Credit. In 2002-03 the Watermaster determined that the San Jacinto Watershed discharge should be included only in the Cumulative Credit and not in the Cumulative Adjusted Base Flow. Therefore, the Watermaster revised the Cumulative Adjusted Base Flow and has included a table of historical Watermaster findings concerning flow at Prado that reflect this revision in this report following the Watermaster's findings.

The Watermaster's findings concerning flow at Prado for 2002-03 required under the Stipulated Judgment are as follows:

1.	Measured Outflow at Prado	256,157 acre-feet
2.	Base Flow at Prado	146,113 acre-feet
3.	Annual Weighted TDS of Base and Storm Flow	463 mg/L
4.	Annual Adjusted Base Flow	174,970 acre-feet
5.	Cumulative Adjusted Base Flow	3,851,531 acre-feet
6.	Other Credits (Debits) [1]	887 acre-feet
7.	Cumulative Entitlement of OCWD	1,386,000 acre-feet
8.	Cumulative Credit [2]	2,484,189 acre-feet
9.	One-Third of Cumulative Debit	0 acre-feet
10.	Minimum Required Base Flow in 2003-04	34,000 acre-feet

1. Other Credits (Debits) are comprised of San Jacinto Watershed outflow.
2. Cumulative Credit includes 17,771 acre-feet of San Jacinto Watershed outflow from previous years.

Historical Watermaster Findings at Prado Dam
(acre-feet)

Water Year	Base Flow	Annual Adjusted Base Flow	Cumulative Adjusted Base Flow	Other Credits (Debits)[1]	Cumulative Entitlement of OCWD	Cumulative Credit[2]
1970-71	38,402	38,402	38,402	0	42,000	(3,598)
1971-72	40,416	40,416	78,818	0	84,000	(5,182)
1972-73	48,999	51,531	130,349	0	126,000	4,349
1973-74	43,106	45,513	175,862	0	168,000	7,862
1974-75	50,176	51,263	227,125	0	210,000	17,125
1975-76	45,627	48,098	275,223	0	252,000	23,223
1976-77	48,387	50,000	325,223	0	294,000	31,223
1977-78	58,501	73,955	399,178	0	336,000	63,178
1978-79	71,863	79,049	478,227	0	378,000	100,227
1979-80	82,509	106,505	584,732	0	420,000	164,732
1980-81	74,875	74,875	659,607	8,045	462,000	205,652
1981-82	81,548	89,431	749,038	0	504,000	253,083
1982-83	111,692	138,591	887,629	3,362	546,000	353,036
1983-84	109,231	115,876	1,003,505	4,602	588,000	431,514
1984-85	125,023	133,670	1,137,175	0	630,000	523,184
1985-86	127,215	141,315	1,278,490	0	672,000	622,499
1986-87	119,848	127,638	1,406,128	0	714,000	708,137
1987-88	124,104	136,308	1,542,436	0	756,000	802,445
1988-89	119,572	131,230	1,673,666	0	798,000	891,675
1989-90	119,149	127,986	1,801,652	0	840,000	977,661
1990-91	111,515	128,379	1,930,031	0	882,000	1,064,040
1991-92	106,948	124,869	2,054,900	0	924,000	1,146,909
1992-93	128,067	163,499	2,218,399	0	966,000	1,268,408
1993-94	111,186	119,432	2,337,831	0	1,008,000	1,345,840
1994-95	123,468	152,792	2,490,623	1,762	1,050,000	1,458,394
1995-96	131,861	152,299	2,642,922	0	1,092,000	1,568,693
1996-97	136,676	157,861	2,800,783	0	1,134,000	1,684,554
1997-98	155,711	195,677	2,996,460	0	1,176,000	1,838,231
1998-99	158,637	174,369	3,170,829	0	1,218,000	1,970,600
1999-00	148,269	169,644	3,340,473	0	1,260,000	2,098,244
2000-01	153,914	176,360	3,516,833	0	1,302,000	2,232,604
2001-02	145,981	159,728	3,676,561	0	1,344,000	2,350,332
2002-03	146,113	174,970	3,851,531	887	1,386,000	2,484,189

1. Other Credits (Debits) are comprised of San Jacinto Watershed outflow.
2. Cumulative Credit includes 17,771 acre-feet of San Jacinto Watershed outflow from previous years.

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 92,166 acre-feet, measured at the USGS gaging station near the MWD Crossing. Separated into its components, Base Flow was 57,747 acre-feet and Storm Flow was 33,077 acre-feet. Excluded from the Base Flow was 3,664 acre-feet of WMWD Transfer Program water. Included in Base Flow are 2,322 acre-feet of wastewater from Rubidoux Community Services District that now bypasses 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 2002-03 Water Year are listed in Table 7 and shown graphically on Plate 7. The components of flow of the Santa Ana River at Riverside Narrows during the period 1934-35 through 2002-03 are presented on Plate 8.

Nontributary Flow

Nontributary Flow includes water that originated outside the watershed, as well as other water that the Watermaster has determined should be excluded from Base Flow. During the 2002-03 Water Year it included WMWD Transfer Program Water. In the past it has included High Groundwater Mitigation Project Water.

High Groundwater Mitigation Project

No HGMP water was discharged to the Santa Ana River during the 2002-03 water year.

WMWD Transfer Program

In 2001, OCWD and WMWD entered into an agreement that provides for delivery of groundwater pumped primarily from the Bunker Hill Basin to OCWD via the Riverside Canal and Santa Ana River. During the 2002-03 Water Year, WMWD delivered 3,644 acre-feet to the Santa Ana River upstream of Riverside Narrows and Prado Dam. A summary of the WMWD Transfer Program discharges is contained in Appendix K.

TABLE 7

COMPONENTS OF FLOW AT RIVERSIDE NARROWS
WATER YEAR 2002-03
(acre-feet)

	Month	USGS Measured Flow	Storm Flow	SBVMWD HGMP Water[1]	WMWD Transfer Program[2]	Rubidoux Waste-water	Base Flow[3]
2002	October	4,485	0	0	578	195	4,102
	November	8,406	3,682	0	269	192	4,647
	December	9,055	4,168	0	94	196	4,989
2003	January	5,046	52	0	0	193	5,187
	February	16,703	11,974	0	229	178	4,678
	March	15,568	10,264	0	61	199	5,442
	April	7,688	2,646	0	0	190	5,232
	May	5,290	291	0	0	192	5,191
	June	5,018	0	0	354	190	4,854
	July	5,008	0	0	654	200	4,554
	August	5,119	0	0	611	200	4,708
	September	4,780	0	0	814	197	4,163
Total		92,166	33,077	0	3,664	2,322	57,747

(1) HGMP water pumped from the Bunker Hill groundwater basin and discharged into the Santa Ana River less 1% for evapotranspiration above Riverside Narrows.

(2) WMWD Transfer Program water pumped from the Bunker Hill, Riverside, and Colton basins and discharged to the Santa Ana River above the Riverside Narrows.

(3) Base Flow equals USGS measured flow, minus storm flow, minus HGMP, and minus WMWD water, plus Rubidoux Wastewater.

Base Flow

Based on the hydrograph shown on Plate 7 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 2002-03, in the amount of 2,322 acre-feet, has been added to the Base Flow as measured at the gaging station. A summary of Rubidoux discharges is contained in Appendix I.

Water Quality Adjustments

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. A summary of TDS and EC data of the Santa Ana River at Riverside Narrows is contained in Appendix J.

Adjustment for High Groundwater Mitigation Project Discharge

Since there was no discharge of High Groundwater Mitigation Project water during Water Year 2002-03, no water quality adjustment was required.

Adjustment for WMWD Transfer Program Discharge

During the 2002-03 Water Year, WMWD delivered 3,664 acre-feet to the Santa Ana River upstream of Riverside Narrows and Prado. A TDS of 504 mg/L was calculated for that water. A summary of the WMWD Transfer Program discharges is contained in Appendix K.

Adjustment for Wastewater Discharges from the Rubidoux Community Services District

The flow-weighted quality of wastewater from Rubidoux was 657 mg/L. A monthly summary of discharges and quality is contained in Appendix I.

The Base Flow quality resulting from exclusion of the Nontributary Flow and inclusion of the Rubidoux wastewater is shown in the following table as 626 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	59,089	617	36,457,913
2. Less Nontributary Flow HGMP Pumped Water	0	---	---
3. Less WMWD Transfer Flow	(3,664)	504	(1,846,656)
4. Plus Rubidoux Wastewater	2,322	657	1,525,554
5. Base Flow (line 1 less lines 2 and 3 plus line 4)	57,747		36,136,811
Average TDS of Base Flow		36,136,811 ÷ 57,747 = 626 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 subject 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 Water Year 2002-03 was 626 mg/L. Therefore, no adjustment is necessary, and the Adjusted Base Flow for 2002-03 is 57,747 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 2002-03 required under the Stipulated Judgment are as follows:

1.	Base Flow at Riverside Narrows	57,747 acre-feet
2.	Annual Weighted TDS of Base Flow	626 mg/L
3.	Annual Adjusted Base Flow	57,747 acre-feet
4.	Cumulative Adjusted Base Flow	1,416,733 acre-feet
5.	Cumulative Entitlement of CBMWD and WMWD	503,250 acre-feet
6.	Cumulative Credit	913,483 acre-feet
7.	One-Third of Cumulative Debit	0 acre-feet
8.	Minimum Required Base Flow in 2003-04	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/Treasurer.

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.

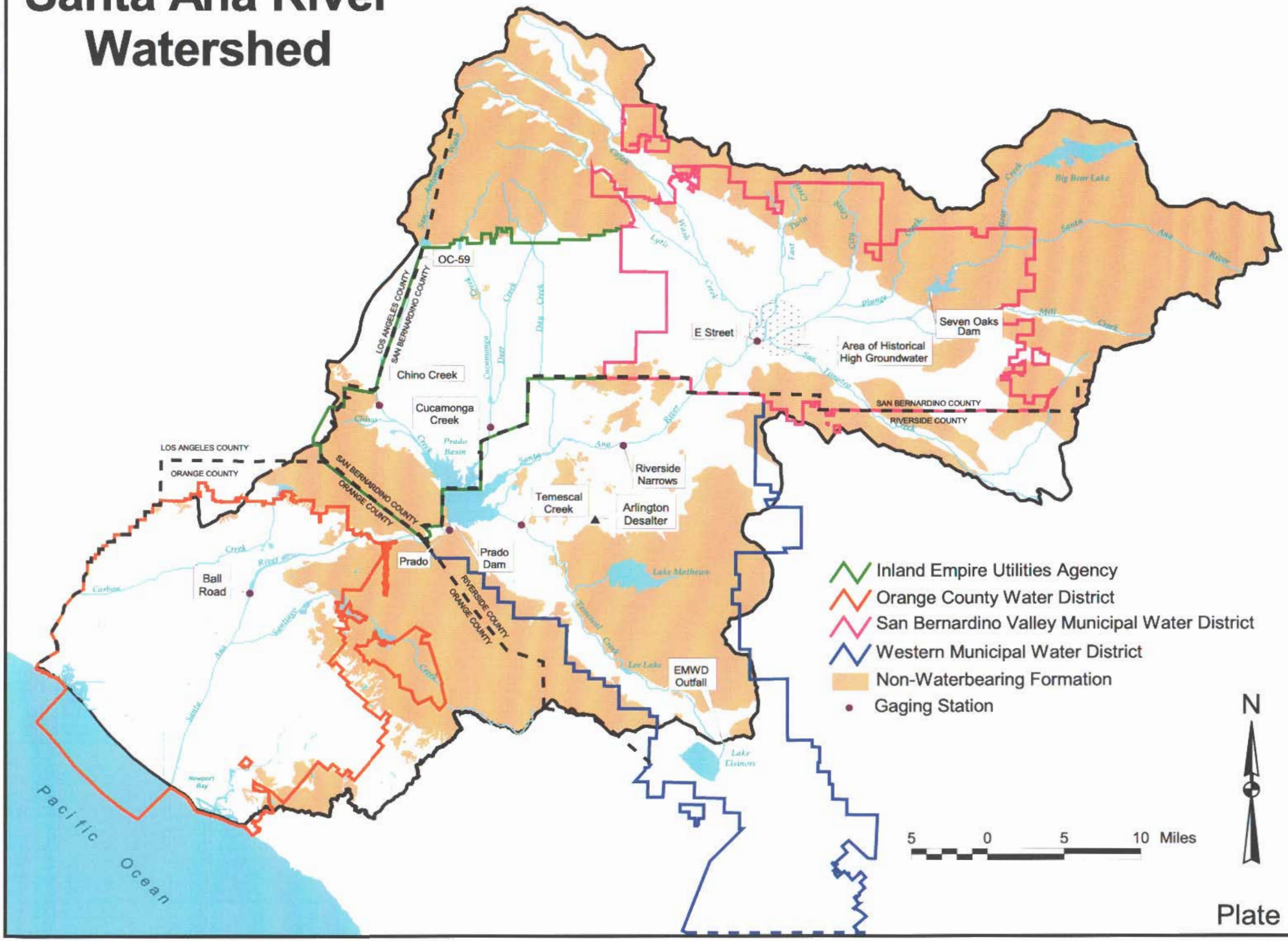
The membership of the Watermaster has changed over the years. The historical listing of members and officers shown in Table 8 reflects the signatories to each annual report.

TABLE 8

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
1998-99 through 2000-01	Robert L. Reiter, Secretary/Treasurer	Richard W. Atwater	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr., Chairman
2001-02 through 2002-03	Robert L. Reiter, Secretary/Treasurer	Richard W. Atwater	Donald L. Harriger, Chairman	Bill B. Dendy	Virginia L. Grebbien

Santa Ana River Watershed



Santa Ana River Watershed Wastewater Treatment Plants and Salt Export Pipelines

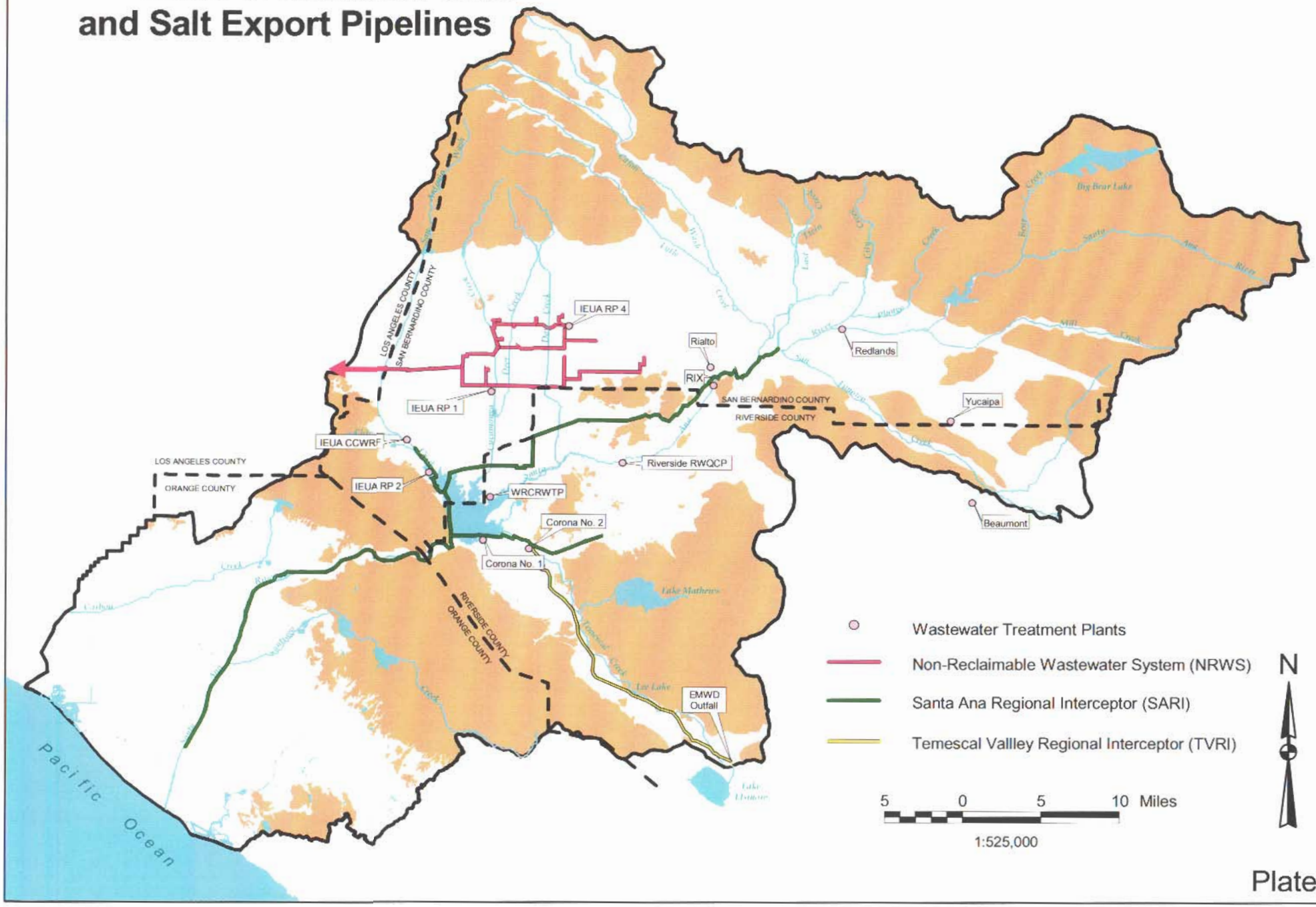


Plate 2

PRECIPITATION AT SAN BERNARDINO STARTING WITH 1934-35

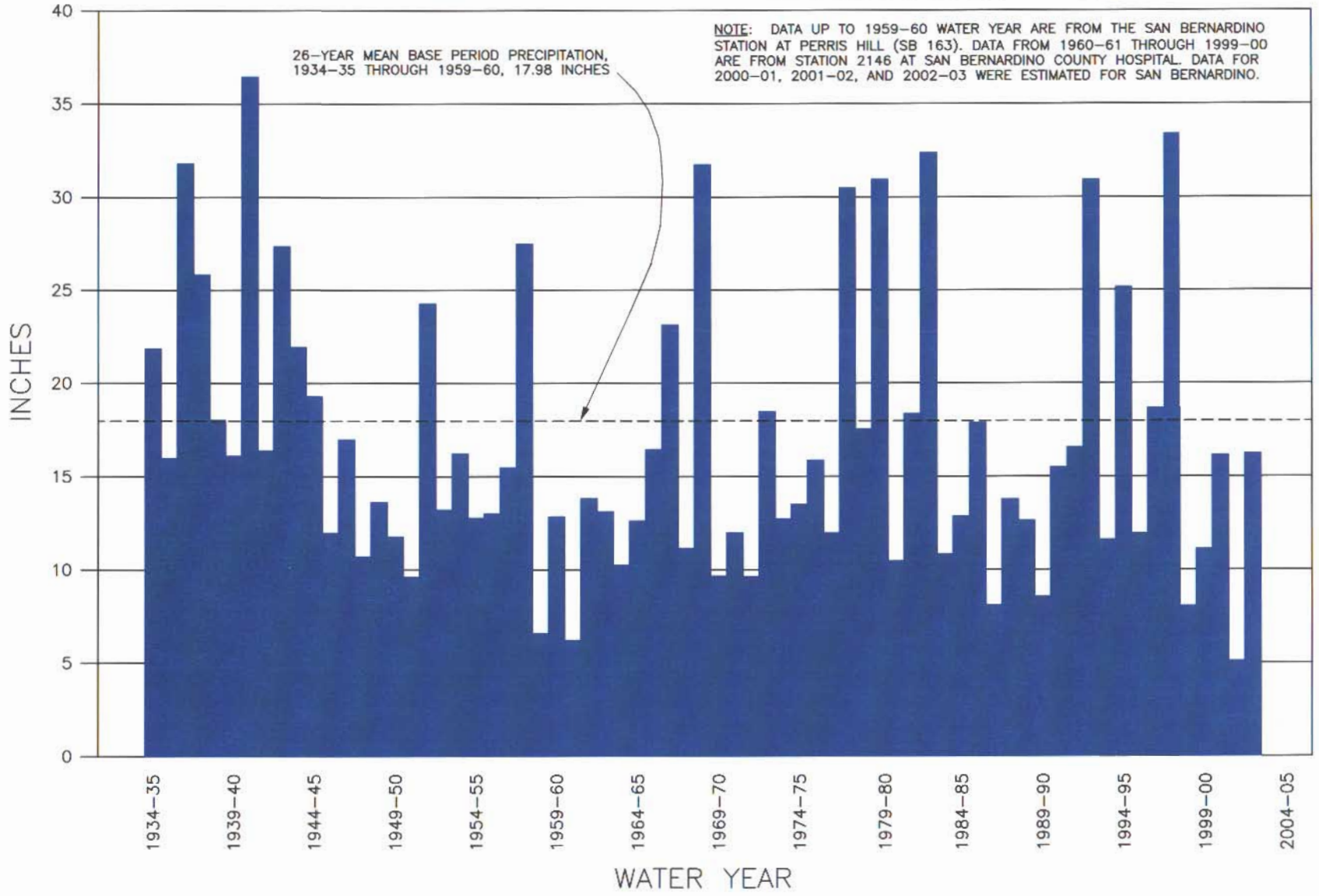
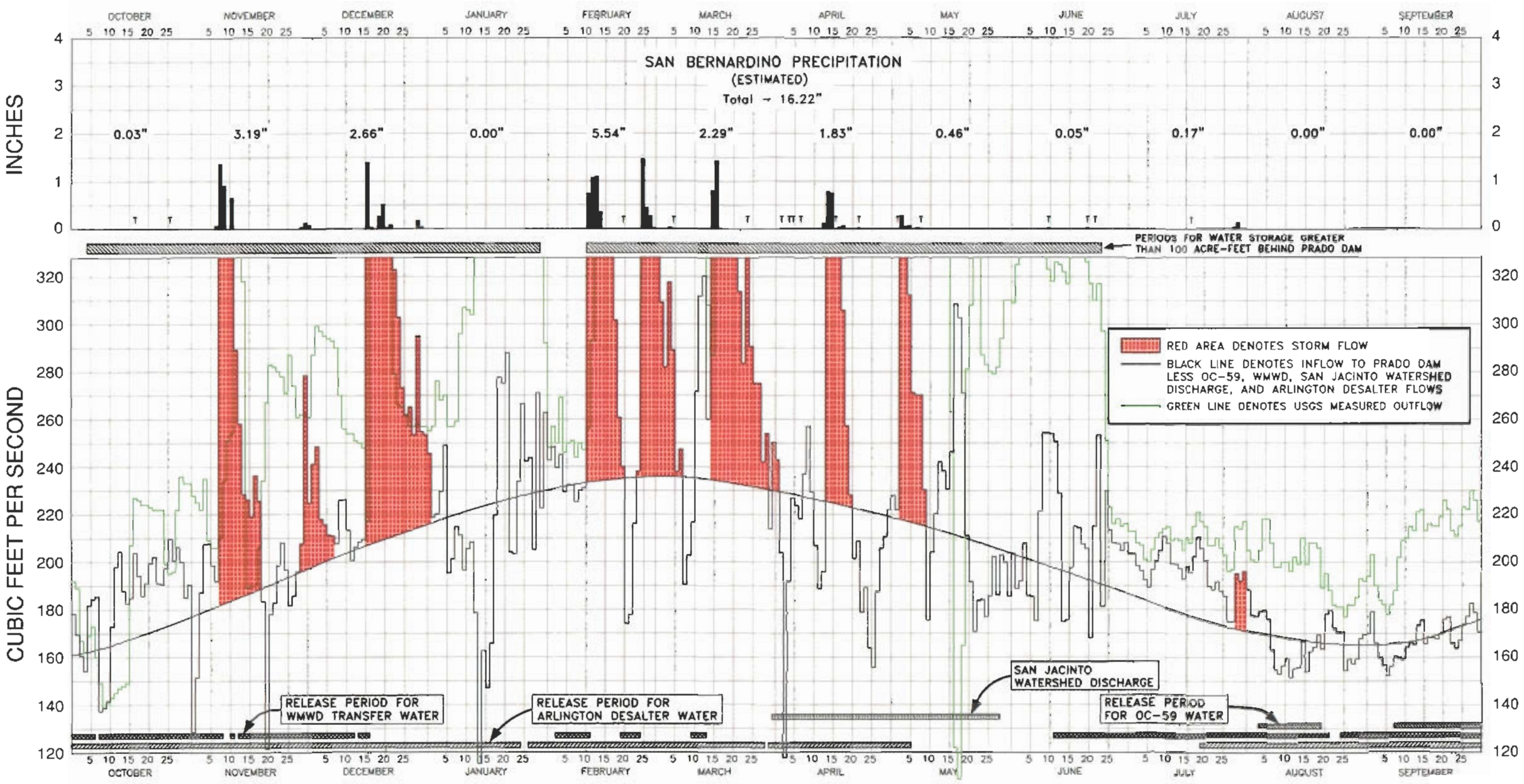


PLATE 3



DISCHARGE OF SANTA ANA RIVER AT PRADO DAM & SAN BERNARDINO PRECIPITATION
WATER YEAR 2002-03

Plate 4

DISCHARGE OF SANTA ANA RIVER AT PRADO STARTING WITH 1934-35

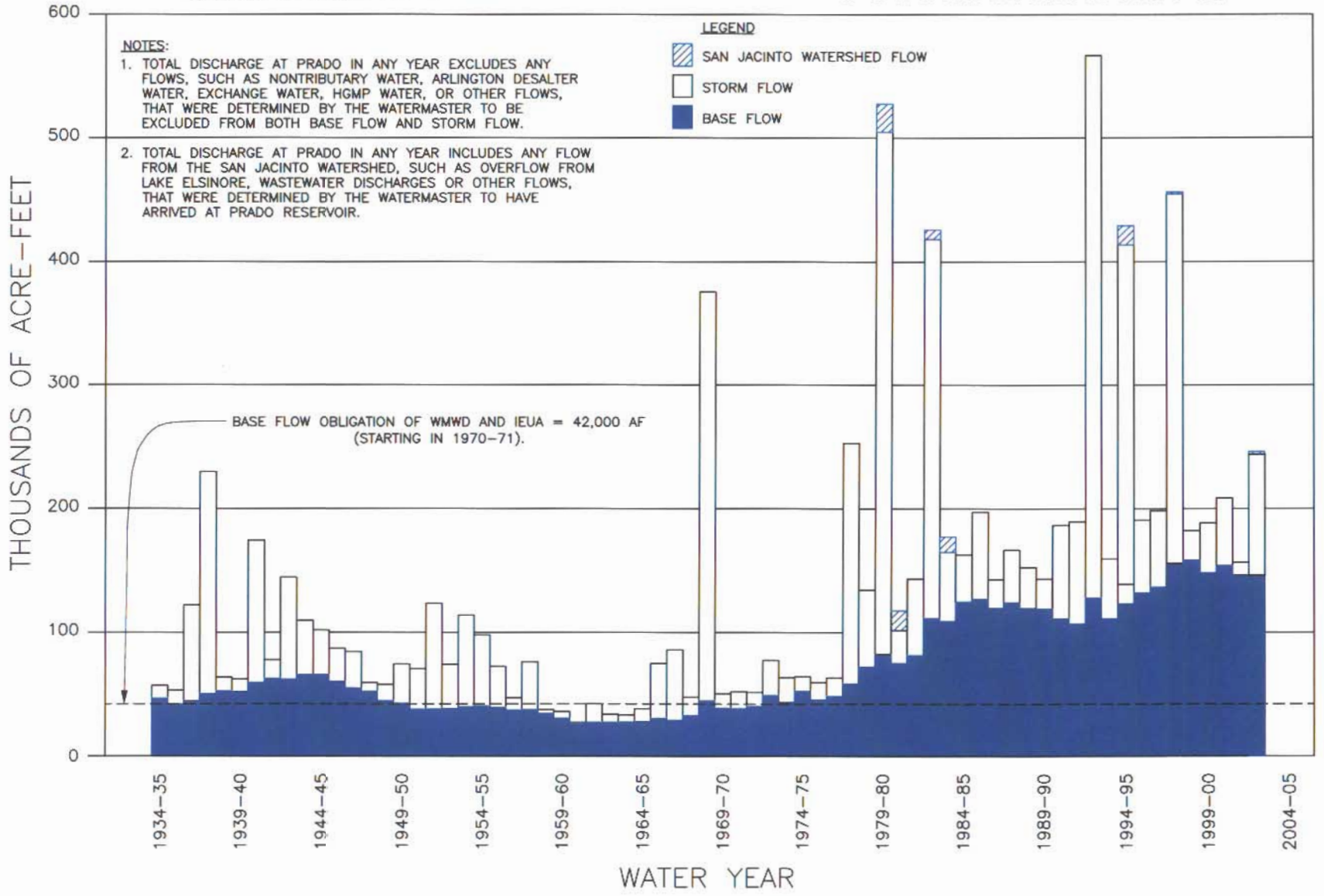
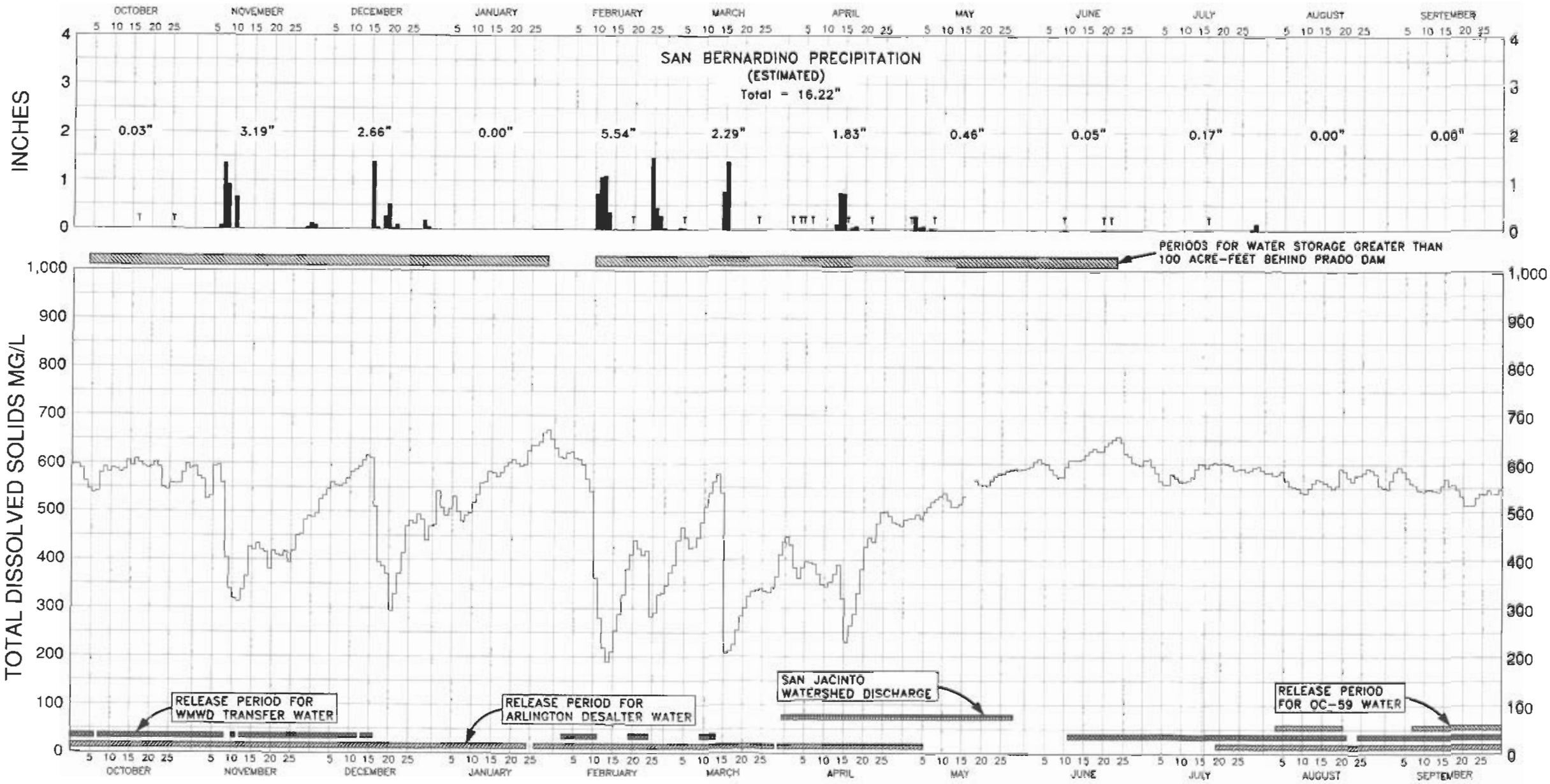
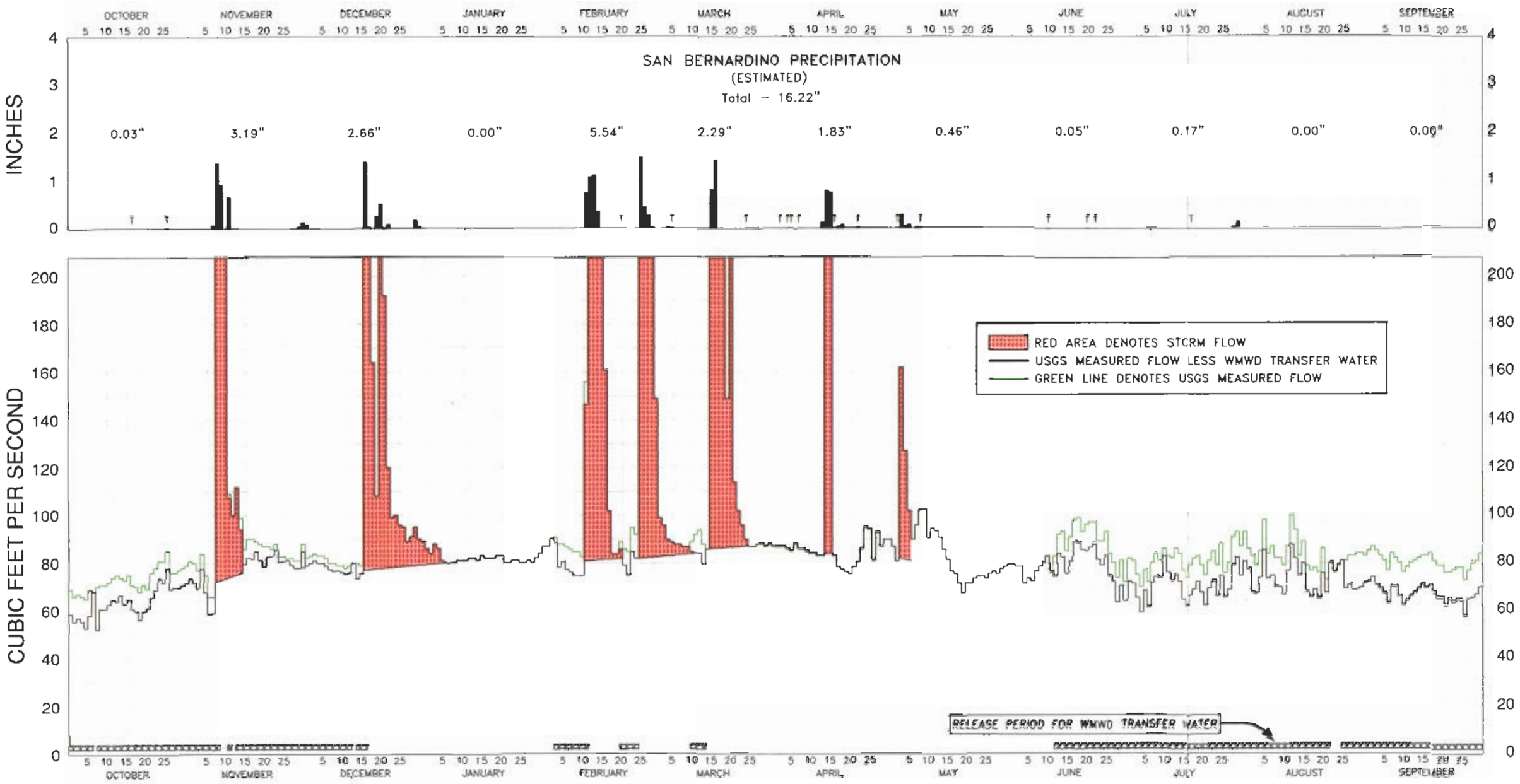


PLATE 5



DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM
WATER YEAR 2002-03

Plate 6



DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS & SAN BERNARDINO PRECIPITATION
WATER YEAR 2002-03

Plate 7

DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS STARTING WITH 1934-35

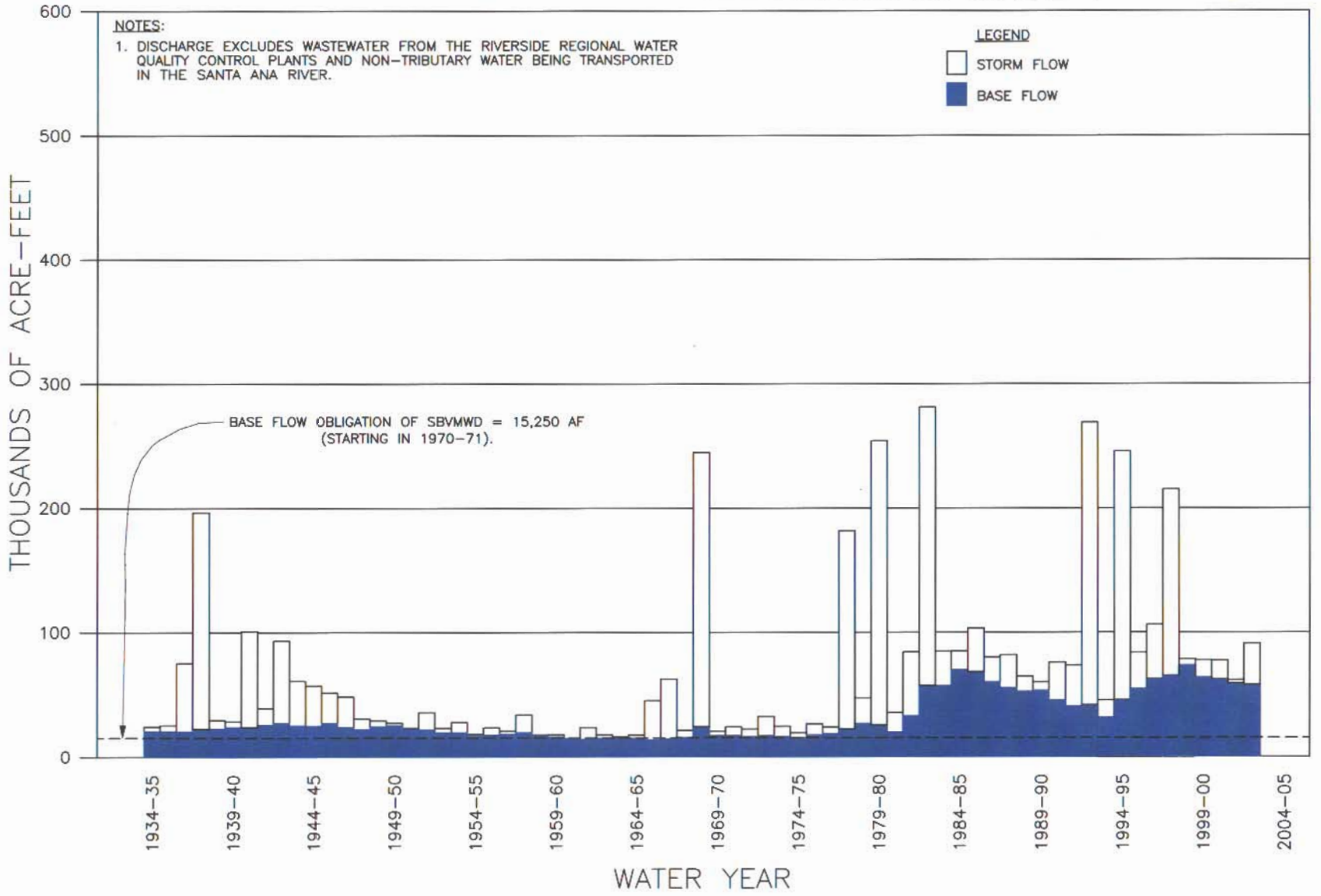


PLATE 8

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

THIRTY-THIRD ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2002 - SEPTEMBER 30, 2003

APRIL 30, 2004

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), CUCAMONGA CREEK (NEAR MIRA LOMA) AND CHINO CREEK AT SCHAEFER AVENUE (NEAR CHINO); AND WATER QUALITY RECORDS FOR THE SANTA ANA RIVER AT PRADO DAM AND AT MWD CROSSING

WATER YEAR 2002-03

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 NGVD of 1929 (levels by U.S. Army Corps of Engineers). Prior to Mar. 18, 1940, at about same site at various datums.

REMARKS.—Records excellent below 550 ft^3/s and fair above, except for estimated daily discharges, which are poor. 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, discharges of treated effluent, 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. During the current year, the California Water Project released 1,770 acre-ft to the basin. 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 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	228	261	255	248	503	503	506	309	213	205	194
2	189	225	288	257	257	475	486	509	325	213	201	203
3	167	222	299	276	250	474	482	494	346	208	200	190
4	163	235	297	267	269	372	478	476	343	207	205	184
5	169	209	295	270	246	471	475	487	338	201	217	182
6	173	206	294	257	250	520	474	513	336	200	218	178
7	160	206	293	257	251	514	472	513	334	205	208	182
8	149	210	290	259	244	508	499	511	331	210	198	188
9	139	234	270	296	249	503	509	509	329	212	198	202
10	141	250	256	308	247	498	502	506	323	214	200	209
11	143	254	254	306	256	494	497	501	318	215	200	210
12	145	426	254	304	293	488	492	501	326	209	196	215
13	147	472	251	355	3850	431	488	499	325	210	202	213
14	148	318	250	374	2530	308	489	495	322	209	199	221
15	149	189	248	369	536	287	506	345	317	205	210	222
16	207	190	217	385	526	2820	484	e262	333	210	199	213
17	227	190	1790	392	526	1270	479	e92	335	208	208	216
18	226	205	864	388	409	670	489	e90	335	215	208	215
19	224	234	732	383	356	600	488	e158	339	221	206	215
20	224	267	1710	381	356	567	485	281	326	217	189	219
21	223	283	806	395	357	532	485	308	317	215	195	226
22	222	282	439	396	350	512	483	435	310	207	188	222
23	222	280	279	392	350	512	482	337	317	207	182	213
24	222	278	266	386	348	511	480	287	297	210	181	211
25	199	271	265	380	1170	508	479	283	251	206	181	215
26	195	287	262	374	3190	507	478	280	223	203	177	223
27	196	274	257	381	984	507	480	279	216	196	182	222
28	222	261	257	376	532	497	486	282	218	197	182	230
29	236	263	258	363	---	494	499	294	215	215	185	226
30	232	262	257	354	---	492	502	310	216	214	193	217
31	232	---	256	292	---	510	---	310	---	217	192	---
TOTAL	5883	7711	13015	10428	19430	18355	14631	11653	9170	6489	6105	6276
MEAN	190	257	420	336	694	592	488	376	306	209	197	209
MAX	236	472	1790	396	3850	2820	509	513	346	221	218	230
MIN	139	189	217	255	244	287	472	90	215	196	177	178
AC-FT	11670	15290	25820	20680	38540	36410	29020	23110	18190	12870	12110	12450

e Estimated.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2003, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	112	141	208	319	414	395	251	182	149	123	101	96.4
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 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1941 - 2003	
ANNUAL TOTAL	91392		129146			
ANNUAL MEAN	250		354		206	
HIGHEST ANNUAL MEAN					789	1993
LOWEST ANNUAL MEAN					36.4	1961
HIGHEST DAILY MEAN	1790	Dec 17	3850	Feb 13	6440	Feb 23 1980
LOWEST DAILY MEAN	139	Oct 9	90	May 18	2.4	Jul 29 1978
ANNUAL SEVEN-DAY MINIMUM	145	Oct 8	145	Oct 8	3.0	Sep 24 1973
MAXIMUM PEAK FLOW			6120	Mar 16	7440	Feb 21 1980
MAXIMUM PEAK STAGE			7.06	Mar 16	7.29	Jan 19 1993
ANNUAL RUNOFF (AC-FT)	181300		256200		149600	
10 PERCENT EXCEEDS	300		506		357	
50 PERCENT EXCEEDS	233		266		127	
90 PERCENT EXCEEDS	177		192		39	

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 NGVD of 1929, 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 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 poor. Flow partly regulated by Big Bear Lake (station 11049000) and, since November 1999, by Seven Oaks Flood-Control Reservoir, capacity, 145,600 acre-ft. Natural streamflow affected by ground-water withdrawals, diversions for irrigation, return flows from irrigated areas, and discharges of treated effluent. 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)
Nov. 10	0430	2,160	8.71	Feb. 25	1300	5,360	10.09
Dec. 16	2245	5,540	10.15	Mar. 16	0700	8,900	11.11
Dec. 20	1230	1,580	8.34	Apr. 14	2245	3,420	9.34
Feb. 12	2315	4,500	9.78				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	81	e82	e86	e87	149	e87	87	e79	82	86	e85
2	66	80	e83	e84	e90	e99	e87	81	e78	81	83	e87
3	67	77	e84	e88	e91	e96	e87	162	78	75	79	e85
4	66	84	e83	e86	e88	e90	e86	127	71	70	85	e83
5	65	75	e83	e81	e88	e89	e85	102	73	77	98	81
6	69	66	e82	e80	e87	e88	e88	90	72	72	84	77
7	68	e66	e80	e80	e86	e88	e86	96	76	80	87	84
8	e70	285	e80	e80	e85	e87	e86	102	e78	84	82	e82
9	e71	718	e79	e81	e85	e87	e85	102	e80	81	82	e80
10	e71	915	e79	e81	e83	e89	84	90	83	86	79	e76
11	e72	109	e78	e81	156	92	84	94	76	83	87	e78
12	e74	100	e79	e82	918	94	e83	93	83	82	100	e80
13	e75	112	e80	e82	1810	88	e83	e90	92	86	94	e81
14	e74	99	e80	e81	828	e86	916	e85	93	84	83	e82
15	e73	86	e79	e83	268	1910	586	e81	85	77	89	e83
16	e75	90	669	e82	161	2460	e83	e76	91	74	79	e83
17	71	e90	575	e82	102	538	e78	e75	98	79	77	e84
18	70	e89	164	e82	e84	232	e77	e71	99	82	78	e81
19	68	e88	108	e83	e84	149	e76	e67	93	83	76	e79
20	71	e87	682	e83	e89	224	e75	e71	96	79	86	e79
21	69	e87	192	e80	86	e114	e78	e71	97	75	73	e76
22	76	e86	120	e80	85	e102	e80	e73	97	81	e80	e76
23	78	88	99	e81	95	e96	e86	e74	89	85	76	e77
24	81	83	100	e81	92	e90	95	e74	89	79	79	78
25	81	83	e96	e80	1510	e87	94	e73	93	88	81	78
26	e85	e82	e95	e80	459	e87	81	e75	84	76	e81	73
27	e76	e82	e89	e81	474	e88	93	e76	80	80	e83	77
28	e76	e81	e91	e80	250	e88	87	e75	74	91	e83	80
29	e77	e81	e95	e82	---	e87	90	e77	81	93	e84	81
30	e78	e88	e90	e84	---	e88	90	e78	72	87	e84	84
31	79	---	e89	e87	---	e87	---	e79	---	93	e83	---
TOTAL	2261	4238	4565	2544	8421	7849	3876	2667	2530	2525	2581	2410
MEAN	72.9	141	147	82.1	301	253	129	86.0	84.3	81.5	83.3	80.3
MAX	85	915	682	88	1810	2460	916	162	99	93	100	87
MIN	65	66	78	80	83	86	75	67	71	70	73	73
AC-FT	4480	8410	9050	5050	16700	15570	7690	5290	5020	5010	5120	4780

e Estimated.

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 2003, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	62.3	82.4	104	223	282	306	145	117	79.7	55.8	55.2	56.4
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 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1970 - 2003	
ANNUAL TOTAL	36292		46467			
ANNUAL MEAN	99.4		127		131	
HIGHEST ANNUAL MEAN					416	1983
LOWEST ANNUAL MEAN					29.0	1975
HIGHEST DAILY MEAN	915	Nov 10	2460	Mar 16	11500	Mar 2 1983
LOWEST DAILY MEAN	59	Aug 17	65	Oct 5	15	Sep 7 1980
ANNUAL SEVEN-DAY MINIMUM	67	Oct 1	67	Oct 1	16	Jul 1 1981
MAXIMUM PEAK FLOW			8900	Mar 16	31300	Feb 24 1998
MAXIMUM PEAK STAGE			11.11	Mar 16	20.23	Mar 4 1978
ANNUAL RUNOFF (AC-FT)	71990		92170		94900	
10 PERCENT EXCEEDS	112		102		185	
50 PERCENT EXCEEDS	86		83		70	
90 PERCENT EXCEEDS	71		74		24	

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, 26 mi downstream from Big Bear Lake, and 2.8 mi south of San Bernardino.

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 NGVD of 1929, from topographic map. Prior to Nov. 10, 1950, water-stage recorder on right bank 0.4 mi upstream at datum 24.50 ft higher. Nov. 11, 1950, to September 1954, water-stage recorder on both banks 0.4 mi upstream at datum 24.50 ft higher. October 1966 to September 1976, water-stage recorder on right bank 0.4 mi upstream at datum 14.50 ft higher. October 1976 to September 1977, gage was removed for channel construction. October 1977 to Jan. 28, 1981, water-stage recorder on right bank, 0.5 mi upstream at elevation 10 ft higher, from topographic map.

REMARKS.—Records poor. Flow partly regulated by Big Bear Lake (station 11049000) and, since November 1999, by Seven Oaks Flood-Control Reservoir, capacity, 145,600 acre-ft. 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, from rating curve extended above 5,930 ft^3/s, on basis of critical-depth computations, or maximum:

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Nov. 9	1930	2,210	5.07	Feb. 25	0915	3,570	5.44
Dec. 16	1830	4,240	5.58	Mar. 15	1815	3,400	5.40
Dec. 20	0830	1,870	4.95	Apr. 14	2045	3,940	5.52
Feb. 12	1945	3,570	5.44	May 3	1345	1,510	4.80

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.22	0.00	0.00	17	0.00	1.8	e0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	3.6	0.00	1.1	e0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	40	0.00	68	e0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	11	0.00	e4.0	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	3.7	1.6	e1.1	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.08	0.00	e0.30	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.15	0.00	0.00	0.00	0.00
8	0.00	188	0.00	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
9	0.00	653	0.00	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
10	0.00	332	0.00	0.00	0.00	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
11	0.00	0.78	0.00	0.00	248	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	579	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
13	0.00	15	0.00	0.00	1000	0.21	0.47	e0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	275	0.12	985	e0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	86	770	373	e0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	536	0.00	e51	732	49	e0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	e133	0.00	e68	155	26	e0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	e2.7	0.00	e30	46	72	e0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	e0.00	0.00	e0.00	52	22	e0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	e285	0.00	e30	88	0.00	e0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	e2.6	0.00	e31	18	1.0	e0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	e0.00	0.00	e29	8.8	0.81	e0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	e0.00	0.00	e43	4.3	0.00	e0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	e48	2.1	0.00	e0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	788	2.3	0.00	e0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	168	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	162	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	46	0.00	0.00	e0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.56	e0.00	0.00	1.1	0.00	0.00
30	0.00	1.2	0.00	0.00	---	0.00	2.1	e0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	e0.00	---	0.00	0.00	---
TOTAL	0.00	1189.98	959.52	0.00	3682.00	1954.21	1533.54	76.45	0.00	1.10	0.00	0.00
MEAN	0.000	39.7	31.0	0.000	132	63.0	51.1	2.47	0.000	0.035	0.000	0.000
MAX	0.00	653	536	0.00	1000	770	985	68	0.00	1.1	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AC-FT	0.00	2360	1900	0.00	7300	3880	3040	152	0.00	2.2	0.00	0.00

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
MAXIMUM PEAK FLOW	28000	Feb 25	1969
MAXIMUM 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 - 2003, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	9.98	23.0	21.1	56.4	161	41.0	38.4	55.6	15.8	4.72	9.37	11.4
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	0.000	0.67	1.16	0.000	0.82	0.10	0.000	0.000	0.000	0.000	0.000	0.000
(WY)	2003	2001	2001	2003	2002	1997	1997	1996	1996	1996	1996	1996

SUMMARY STATISTICS	FOR 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1996 - 2003	
ANNUAL TOTAL	2369.81		9396.80			
ANNUAL MEAN	6.49		25.7		36.6	
HIGHEST ANNUAL MEAN					152	1998
LOWEST ANNUAL MEAN					1.70	2002
HIGHEST DAILY MEAN	653	Nov 9	1000	Feb 13	5050	Feb 24 1998
LOWEST DAILY MEAN	0.00	Jan 10	0.00	Oct 1	0.00	Mar 22 1996
ANNUAL SEVEN-DAY MINIMUM	0.00	Feb 6	0.00	Oct 1	0.00	Mar 22 1996
MAXIMUM PEAK FLOW			4240	Dec 16	21100	Feb 23 1998
MAXIMUM PEAK STAGE			5.58	Dec 16	7.70	Feb 23 1998
ANNUAL RUNOFF (AC-FT)	4700		18640		26480	
10 PERCENT EXCEEDS	1.6		24		50	
50 PERCENT EXCEEDS	0.00		0.00		0.65	
90 PERCENT EXCEEDS	0.00		0.00		0.00	

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 old Schaefer Avenue Bridge, 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 and concrete-lined flood-control channel. Concrete dikes formed low-water control from October 1975 to Apr. 16, 1991. Elevation of gage is 685 ft above NGVD of 1929, from topographic map.

REMARKS.—Records fair above 10 ft^3/s and poor below. Since 1997, due to construction in area of gage, Schaefer Avenue no longer extends to the Chino Creek crossing. The Schaefer Avenue Bridge, however, remains. 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 approximately 11 mi upstream. During the current year, 1,770 acre-ft was released. 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 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	1.8	2.8	1.4	1.9	4.4	1.9	1.9	2.3	1.5	1.0	3.5
2	1.6	1.8	8.1	1.5	1.7	5.1	1.5	7.0	2.3	1.5	0.95	2.1
3	1.6	1.9	2.5	1.6	3.1	4.8	1.6	174	2.3	1.4	0.87	1.3
4	1.6	3.3	2.4	1.6	1.7	4.3	1.6	3.4	2.3	1.4	6.9	1.3
5	1.6	2.4	2.4	1.6	1.7	2.2	2.1	2.3	2.4	1.3	22	1.3
6	1.5	2.3	2.2	1.9	1.9	1.6	1.6	2.1	2.4	1.4	23	1.3
7	1.6	2.6	1.7	2.1	1.8	1.4	1.7	1.9	2.2	1.5	24	1.3
8	1.5	205	1.6	1.8	1.6	1.3	1.7	2.0	2.3	1.8	24	7.3
9	1.6	265	5.3	3.3	1.6	1.4	1.8	2.0	2.6	1.7	26	26
10	1.6	7.0	7.3	2.0	1.8	1.4	1.7	1.9	2.3	1.8	26	25
11	2.7	4.2	2.2	1.4	89	1.5	1.7	2.0	2.3	1.9	27	25
12	3.2	3.6	2.6	1.5	374	1.5	1.7	2.1	2.5	1.7	28	24
13	4.4	3.4	2.2	1.8	197	1.6	1.7	2.0	2.4	1.7	30	24
14	2.5	2.5	2.0	3.1	4.1	1.5	197	2.1	2.3	1.8	30	24
15	2.3	2.0	1.8	2.8	2.0	780	21	2.4	2.2	1.8	29	24
16	2.2	1.9	341	1.8	3.7	311	1.8	2.2	2.3	2.4	30	23
17	1.9	2.3	31	1.6	2.9	9.3	1.9	2.3	2.3	1.8	32	23
18	1.8	1.9	2.5	1.5	2.1	2.5	1.7	2.2	2.6	1.9	32	23
19	1.8	2.0	2.2	1.6	3.2	2.1	1.6	2.3	2.2	1.9	15	23
20	3.4	2.0	148	2.2	3.1	2.0	1.6	2.3	2.0	1.8	3.8	26
21	3.6	2.1	5.1	3.2	1.7	1.9	1.7	2.4	2.3	1.9	1.6	27
22	2.7	2.1	2.4	2.1	1.7	1.9	1.7	2.4	2.2	1.9	1.3	25
23	2.3	2.0	1.8	1.9	1.6	1.9	1.7	2.3	2.1	1.8	1.3	25
24	1.6	2.0	2.1	1.5	2.4	1.9	1.8	2.3	1.9	1.7	1.2	24
25	4.1	2.1	2.0	1.5	132	2.1	1.8	2.2	2.0	1.7	1.2	24
26	3.2	2.0	2.5	1.4	64	1.6	1.8	2.2	2.5	1.7	1.3	24
27	2.8	2.2	1.6	3.0	29	1.7	1.7	2.4	1.5	1.7	1.4	24
28	2.2	2.5	2.3	1.9	2.9	1.6	1.8	2.4	1.5	1.9	1.4	24
29	2.0	19	9.6	1.6	---	1.6	1.8	2.7	1.4	3.3	1.3	24
30	2.1	3.9	2.1	1.7	---	1.6	1.8	2.3	1.7	1.0	1.3	27
31	1.9	---	1.5	1.6	---	1.7	---	2.3	---	1.0	1.2	---
TOTAL	70.8	558.8	604.8	59.5	935.2	1160.4	266.5	246.3	65.6	53.6	426.02	557.4
MEAN	2.28	18.6	19.5	1.92	33.4	37.4	8.88	7.95	2.19	1.73	13.7	18.6
MAX	4.4	265	341	3.3	374	780	197	174	2.6	3.3	32	27
MIN	1.5	1.8	1.5	1.4	1.6	1.3	1.5	1.9	1.4	1.0	0.87	1.3
AC-FT	140	1110	1200	118	1850	2300	529	489	130	106	845	1110

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 2003, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	16.0	16.9	26.2	33.0	38.0	28.7	9.93	12.9	18.3	18.9	16.8	14.0
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	0.061	0.23	0.53	0.55	0.33	0.30	0.14	0.22	0.062	0.069	0.14	0.13
(WY)	1978	1978	1970	1972	1972	1972	1977	1973	1977	1977	1976	1977

SUMMARY STATISTICS	FOR 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1970 - 2003	
ANNUAL TOTAL	3487.2		5004.92			
ANNUAL MEAN	9.55		13.7		20.7	
HIGHEST ANNUAL MEAN					92.4	1974
LOWEST ANNUAL MEAN					3.24	1970
HIGHEST DAILY MEAN	341	Dec 16	780	Mar 15	2060	Mar 1 1978
LOWEST DAILY MEAN	1.2	Jul 21	0.87	Aug 3	0.00	May 21 1977
ANNUAL SEVEN-DAY MINIMUM	1.4	Jul 18	1.3	Aug 22	0.02	Oct 28 1977
MAXIMUM PEAK FLOW			4310	Mar 15	12700	Feb 27 1983
MAXIMUM PEAK STAGE			7.45	Mar 15	10.32	Feb 27 1983
ANNUAL RUNOFF (AC-FT)	6920		9930		15030	
10 PERCENT EXCEEDS	30		24		75	
50 PERCENT EXCEEDS	2.1		2.1		1.3	
90 PERCENT EXCEEDS	1.6		1.5		0.36	

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.
CHEMICAL DATA: Water years 1999–2000.
SPECIFIC CONDUCTANCE: Water years 1999–2000.
WATER TEMPERATURE: Water years 1999–2000.
SEDIMENT DATA: Water years 1999–2000.

GAGE.—Water-stage recorder, crest-stage gage, and concrete-lined flood-control channel. Elevation of gage is 660 ft above NGVD of 1929, from topographic map. Prior to July 1977 at site 100 ft downstream at different datum.

REMARKS.—Records fair above 200 ft^3/s and poor below. 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 3.3 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 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	52	48	59	64	57	44	59	57	51	47	43
2	41	56	49	57	56	59	50	60	55	49	50	50
3	41	59	53	53	51	55	49	447	57	51	49	44
4	41	59	46	54	50	114	60	126	61	58	50	40
5	49	51	47	54	42	68	68	64	56	56	46	41
6	51	51	43	50	41	76	72	56	54	60	45	39
7	48	46	45	45	36	76	63	58	51	57	42	44
8	47	587	46	44	40	85	55	56	55	54	42	46
9	52	857	58	47	44	85	67	53	55	51	44	51
10	50	88	48	46	40	72	67	56	55	49	44	46
11	45	63	50	48	346	71	51	58	49	49	45	47
12	48	59	50	52	903	60	54	53	59	49	45	45
13	48	52	56	49	657	59	76	48	60	55	43	47
14	57	50	59	47	86	55	1040	47	55	44	42	47
15	58	52	61	55	60	e1690	196	48	49	44	44	52
16	52	69	749	51	51	800	57	48	47	45	42	45
17	50	65	106	48	49	153	68	52	42	44	42	46
18	48	61	59	55	49	62	59	64	45	47	45	47
19	47	51	61	59	47	56	61	56	51	50	46	47
20	52	54	369	48	41	59	57	52	41	50	41	47
21	56	70	49	49	43	62	52	51	47	54	44	49
22	58	53	49	55	47	68	57	57	49	53	42	50
23	50	49	53	50	56	72	62	58	49	54	42	49
24	49	55	57	46	73	71	72	60	46	58	44	49
25	49	52	51	47	747	69	74	54	44	56	45	47
26	56	45	53	56	219	62	69	54	42	56	43	51
27	55	52	59	54	115	59	57	51	43	55	48	47
28	55	64	62	58	64	57	48	49	45	54	46	50
29	52	59	74	54	---	57	46	51	46	55	46	51
30	52	67	54	59	---	51	51	51	47	54	47	50
31	59	---	58	53	---	44	---	54	---	50	45	---
TOTAL	1558	3048	2722	1602	4117	4484	2902	2151	1512	1612	1386	1407
MEAN	50.3	102	87.8	51.7	147	145	96.7	69.4	50.4	52.0	44.7	46.9
MAX	59	857	749	59	903	1690	1040	447	61	60	50	52
MIN	41	45	43	44	36	44	44	47	41	44	41	39
AC-FT	3090	6050	5400	3180	8170	8890	5760	4270	3000	3200	2750	2790

e Estimated.

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
MAXIMUM PEAK FLOW	9100	Jan 25 1969
MAXIMUM 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)

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
MAXIMUM PEAK FLOW	16100	Feb 27 1983
MAXIMUM 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 - 2003, BY WATER YEAR (WY)

MEAN	36.6	42.6	46.4	75.8	96.4	66.8	43.9	35.3	34.4	32.9	32.9	36.9
MAX	52.9	102	87.8	265	304	198	96.7	69.4	57.1	52.0	51.8	52.0
(WY)	1988	2003	2003	1993	1998	1995	2003	2003	1992	2003	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 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1986 - 2003	
ANNUAL TOTAL	20065		28501			
ANNUAL MEAN	55.0		78.1		48.1	
HIGHEST ANNUAL MEAN					78.1	2003
LOWEST ANNUAL MEAN					26.6	1987
HIGHEST DAILY MEAN	857	Nov 9	1690	Mar 15	2490	Feb 20 1996
LOWEST DAILY MEAN	34	Jan 23	36	Feb 7	2.5	Jun 6 1987
ANNUAL SEVEN-DAY MINIMUM	37	Jul 17	42	Feb 4	12	Aug 25 1988
MAXIMUM PEAK FLOW			6720	Mar 16	10400	Jan 7 1993
MAXIMUM PEAK STAGE			4.62	Mar 16	5.40	Jan 7 1993
ANNUAL RUNOFF (AC-FT)	39800		56530		34880	
10 PERCENT EXCEEDS	58		69		57	
50 PERCENT EXCEEDS	46		52		34	
90 PERCENT EXCEEDS	39		44		20	

11073300 SAN ANTONIO CREEK AT RIVERSIDE DRIVE, NEAR CHINO, CA

LOCATION.—Lat 34°01'07", long 117°43'47", in Santa Ana del Chino Grant, San Bernardino County, Hydrologic Unit 18070203, on right bank, at south end of Riverside Drive Bridge, 0.4 mi upstream from confluence with Chino Creek, 10.2 mi downstream from San Antonio Dam, and 2.4 mi northwest of Chino.

DRAINAGE AREA.—36.6 mi^2.

PERIOD OF RECORD.—December 1998 to current year.

GAGE.—Water-stage recorder and concrete-lined flood-control channel. Elevation of gage is 735 ft above NGVD of 1929, from topographic map.

REMARKS.—Records fair above 20 ft^3/s and poor below. Flow mostly regulated by San Antonio Flood-Control Reservoir, capacity, 7,700 acre-ft. Natural streamflow affected by ground-water withdrawals, diversions for power, domestic use, irrigation, and return flow from irrigated areas. Flow at gage is primarily urban runoff, except when releases are made from San Antonio Dam. Releases of imported water are made to San Antonio Creek by the California Water Project at times in some years, from Rialto Pipeline below San Antonio Dam, at a site 10 mi upstream. During the current year, the California Water Project reported releases of 1,770 acre-ft. See schematic diagram of Santa Ana River Basin.

EXTREMES FOR PERIOD OF RECORD.—Maximum discharge, 2,750 ft^3/s, Nov. 24, 2001, gage height, 4.84 ft, from rating curve extended above 576 ft^3/s, on basis of step-backwater analysis; no flow at times in most years.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.48	0.33	0.79	0.05	0.55	2.0	0.80	0.23	0.57	0.71	0.66	1.00
2	0.36	0.25	2.6	0.25	0.32	1.5	0.39	4.0	0.56	0.65	0.63	0.35
3	0.37	0.34	0.06	0.31	1.1	1.8	0.38	75	0.71	0.75	0.57	0.38
4	0.34	0.78	0.01	0.19	0.52	1.3	0.44	1.2	0.70	0.56	5.0	0.39
5	0.35	0.31	0.11	0.20	0.56	0.70	0.81	0.77	0.76	0.39	17	0.41
6	0.35	0.20	0.14	0.17	0.84	0.47	0.37	0.54	0.71	0.43	20	0.38
7	0.44	0.28	0.10	0.31	0.70	0.27	0.55	0.44	0.56	0.66	19	0.41
8	0.33	93	0.11	0.44	0.54	0.16	0.55	0.53	0.84	0.78	18	5.0
9	0.35	132	0.31	1.3	0.50	0.19	0.60	0.53	0.88	0.81	22	21
10	0.39	3.3	0.23	0.69	0.65	0.29	0.56	0.39	0.83	0.86	20	20
11	0.89	1.9	0.14	0.26	66	0.27	0.54	0.40	0.77	0.82	25	25
12	1.1	1.5	0.10	0.32	159	0.22	0.54	0.42	0.95	0.64	24	24
13	1.9	1.5	0.18	0.55	113	0.30	0.44	0.45	0.86	0.72	26	24
14	0.83	0.82	0.06	1.2	1.5	0.31	112	0.51	0.71	0.79	27	23
15	0.50	0.29	0.06	1.1	0.67	346	17	0.79	0.70	0.82	25	21
16	0.40	0.21	173	0.57	1.6	141	0.59	0.64	0.64	0.82	30	20
17	0.54	0.49	20	0.45	1.2	6.6	0.81	0.53	0.57	0.92	32	21
18	0.43	0.23	0.62	0.31	0.52	0.58	0.51	0.52	0.86	0.93	30	22
19	0.43	0.34	0.74	0.38	1.7	0.46	0.38	0.66	0.66	0.82	14	22
20	1.4	0.23	84	0.71	1.6	0.45	0.25	0.64	0.77	0.81	1.7	27
21	1.4	0.24	2.0	1.3	0.47	0.38	0.42	0.73	0.98	0.89	1.0	28
22	1.0	0.29	0.52	0.71	0.39	0.22	0.33	0.60	0.77	1.1	0.81	19
23	0.82	0.20	0.23	0.58	0.26	0.36	0.32	0.57	0.79	0.95	0.70	23
24	0.46	0.31	0.62	0.41	1.00	0.38	0.44	0.62	0.74	0.81	0.52	23
25	0.97	0.24	0.54	0.27	78	0.35	0.36	0.52	0.78	0.82	0.54	24
26	1.4	0.08	0.96	0.26	43	0.32	0.31	0.55	1.00	0.83	0.58	23
27	1.1	0.15	0.33	1.2	18	0.40	0.25	0.66	0.68	0.81	0.33	20
28	0.63	0.40	1.1	0.53	0.81	0.32	0.24	0.71	0.71	0.96	0.26	23
29	0.45	9.3	5.8	0.37	---	0.24	0.22	0.71	0.61	1.1	0.34	25
30	0.47	1.0	0.32	0.48	---	0.48	0.17	0.54	0.67	0.69	0.36	26
31	0.31	---	0.19	0.45	---	0.73	---	0.50	---	0.69	0.44	---
TOTAL	21.19	250.51	295.97	16.32	495.00	509.05	141.57	95.90	22.34	24.34	363.44	512.32
MEAN	0.68	8.35	9.55	0.53	17.7	16.4	4.72	3.09	0.74	0.79	11.7	17.1
MAX	1.9	132	173	1.3	159	346	112	75	1.0	1.1	32	28
MIN	0.31	0.08	0.01	0.05	0.26	0.16	0.17	0.23	0.56	0.39	0.26	0.35
AC-FT	42	497	587	32	982	1010	281	190	44	48	721	1020

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1999 - 2003, BY WATER YEAR (WY)

MEAN	34.0	19.6	14.9	14.4	19.4	6.08	4.19	0.90	0.59	2.38	10.8	3.69
MAX	98.1	63.2	46.9	53.9	55.3	16.4	7.15	3.09	0.99	8.38	40.9	17.1
(WY)	2000	2001	2000	2000	2000	2003	2000	2003	2002	2002	2002	2003
MIN	0.32	0.59	0.19	0.53	1.70	1.47	1.02	0.006	0.11	0.43	0.20	0.040
(WY)	2002	2000	2001	2003	2002	2001	2002	1999	2001	2000	2000	1999

SUMMARY STATISTICS	FOR 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1999 - 2003	
ANNUAL TOTAL	2409.83		2747.95			
ANNUAL MEAN	6.60		7.53		11.8	
HIGHEST ANNUAL MEAN					22.6	2000
LOWEST ANNUAL MEAN					5.82	2002
HIGHEST DAILY MEAN	173	Dec 16	346	Mar 15	346	Mar 15 2003
LOWEST DAILY MEAN	0.01	Dec 4	0.01	Dec 4	0.00	Dec 21 1998
ANNUAL SEVEN-DAY MINIMUM	0.12	Dec 3	0.12	Dec 3	0.00	Dec 26 1998
MAXIMUM PEAK FLOW			2170	Mar 15	2750	Nov 24 2001
MAXIMUM PEAK STAGE			4.29	Mar 15	4.84	Nov 24 2001
ANNUAL RUNOFF (AC-FT)	4780		5450		8530	
10 PERCENT EXCEEDS	23		22		48	
50 PERCENT EXCEEDS	0.83		0.63		0.54	
90 PERCENT EXCEEDS	0.34		0.25		0.04	

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 NGVD of 1929, 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 2002 TO SEPTEMBER 2003

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	12	15	11	11	12	24	46	3.5	2.8	8.9	13
2	13	12	15	11	11	11	29	42	3.8	3.5	13	13
3	13	10	14	11	11	10	34	63	3.6	3.2	13	13
4	13	11	13	11	11	21	33	42	4.5	3.1	14	14
5	14	12	13	11	12	12	31	41	4.1	4.5	12	15
6	15	9.2	12	11	13	11	25	36	4.5	3.1	13	15
7	14	12	13	10	15	12	15	37	5.1	3.2	12	15
8	13	68	13	12	12	12	21	35	3.6	2.9	13	15
9	13	64	13	11	12	12	18	27	3.4	4.9	12	15
10	13	9.9	14	12	12	13	18	20	2.7	3.0	11	11
11	14	14	11	14	167	13	19	19	2.6	2.9	14	14
12	13	13	5.6	13	276	13	18	18	2.2	2.2	16	14
13	6.3	13	12	12	282	13	20	17	2.0	2.9	16	15
14	5.1	13	11	13	18	12	285	16	3.2	2.9	16	14
15	13	12	11	10	5.7	456	88	14	2.8	3.0	19	14
16	13	14	230	13	3.4	626	35	14	2.9	2.8	19	13
17	12	14	35	15	8.1	109	32	15	2.8	2.7	19	11
18	12	13	11	15	13	41	30	13	2.5	4.4	21	13
19	12	13	6.2	15	13	23	40	13	3.1	5.7	21	12
20	11	15	124	17	20	19	48	13	4.6	4.5	19	12
21	12	13	12	16	13	17	48	15	4.2	9.4	13	10
22	13	15	9.6	12	13	15	50	13	3.1	9.2	15	12
23	14	14	10	10	14	14	54	7.6	3.7	7.8	16	12
24	12	13	13	4.5	14	15	61	8.1	2.4	8.2	15	13
25	13	11	12	1.8	417	17	67	5.7	2.2	9.1	14	13
26	11	10	7.6	2.0	25	16	61	5.4	2.6	14	13	14
27	10	12	11	1.9	30	16	53	5.3	2.7	14	12	14
28	9.7	13	11	4.6	12	14	53	4.3	2.9	12	12	15
29	9.5	48	13	11	---	3.2	53	3.8	3.1	18	12	11
30	11	24	9.2	10	---	5.8	49	3.7	3.1	11	12	11
31	11	---	11	11	---	15	---	4.5	---	8.8	13	---
TOTAL	371.6	527.1	711.2	332.8	1464.2	1599.0	1412	617.4	97.5	189.7	448.9	396
MEAN	12.0	17.6	22.9	10.7	52.3	51.6	47.1	19.9	3.25	6.12	14.5	13.2
MAX	15	68	230	17	417	626	285	63	5.1	18	21	15
MIN	5.1	9.2	5.6	1.8	3.4	3.2	15	3.7	2.0	2.2	8.9	10
AC-FT	737	1050	1410	660	2900	3170	2800	1220	193	376	890	785

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
MAXIMUM PEAK FLOW	4720	Mar 1 1983
MAXIMUM 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 - 2003, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	12.2	14.7	16.9	39.7	84.0	62.2	36.8	22.3	14.5	12.9	12.4	12.7
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	10.7	10.5	5.19	2.89	3.24	3.25	3.56	6.98	7.08
(WY)	1996	1996	1999	2003	2002	2001	1991	1992	2003	1994	1994	1995

SUMMARY STATISTICS	FOR 2002 CALENDAR YEAR		FOR 2003 WATER YEAR		WATER YEARS 1991 - 2003	
ANNUAL TOTAL	5150.4		8167.4			
ANNUAL MEAN	14.1		22.4		28.1	
HIGHEST ANNUAL MEAN					81.8	1995
LOWEST ANNUAL MEAN					12.8	1999
HIGHEST DAILY MEAN	230	Dec 16	626	Mar 16	2090	Feb 24 1998
LOWEST DAILY MEAN	1.1	Feb 3	1.8	Jan 25	0.34	Jul 3 1992
ANNUAL SEVEN-DAY MINIMUM	1.7	Jan 31	2.6	Jun 10	0.89	Jan 13 1992
MAXIMUM PEAK FLOW			2380	Dec 16	3660	Feb 24 1998
MAXIMUM PEAK STAGE			5.82	Dec 16	6.54	Feb 24 1998
ANNUAL RUNOFF (AC-FT)	10220		16200		20380	
10 PERCENT EXCEEDS	16		35		40	
50 PERCENT EXCEEDS	13		13		13	
90 PERCENT EXCEEDS	9.5		3.3		4.4	

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.—Water years 1967 to current year.
CHEMICAL DATA: Water years 1967 to current year.
SPECIFIC CONDUCTANCE: Water years 1970 to current year.
WATER TEMPERATURE: Water years 1970 to current year.
BIOLOGICAL DATA: Water years 1975–81.
SEDIMENT DATA: Water years 1974–94, 1999 to current year.
CHLORIDE: October 1970 to September 1971.

PERIOD OF DAILY RECORD.—Water years 1970 to current year.
SPECIFIC CONDUCTANCE: October 1969 to current year.
WATER TEMPERATURE: October 1969 to current year.
CHLORIDE: October 1970 to September 1971.
SUSPENDED-SEDIMENT DISCHARGE: October 1973 to June 1982.

INSTRUMENTATION.—Water-quality monitor recording specific conductance and water temperature since October 1969.

REMARKS.—Specific conductance records rated fair, except for Oct. 3-12, Dec. 19 to Jan. 5, Apr. 4 to June 5, Aug. 7 to Sept. 10, and Sept. 18-30, which are rated good, and Oct. 25-30, Nov. 8-15, Dec. 15-19, Mar. 13-20, June 6-19, and July 31 to Aug. 6, which are rated poor. Temperature records rated fair, except for Dec. 2 to Feb. 24 and Apr. 23 to June 11, which are rated good. Specific conductance and water temperature values are affected by releases from Prado Dam. Interruptions in record at times due to malfunction of recording or sensing equipment. Sediment data and a portion of chemical data collected for the National Water-Quality Assessment (NAWQA) Program.

EXTREMES FOR PERIOD OF DAILY RECORD.—
SPECIFIC CONDUCTANCE: Maximum recorded, 1,830 microsiemens, Apr. 30, 1971; minimum recorded, 220 microsiemens, Feb. 20, 1978.
WATER TEMPERATURE: Maximum recorded, 36.0°C, Sept. 4, 1972, Sept. 8, 1984; minimum recorded, 2.5°C, Dec. 30, 1969.
SEDIMENT CONCENTRATION: Maximum daily mean, 2,870 mg/L, Mar. 5, 1978; minimum daily mean, 3 mg/L, Apr. 2, 1980, and several days during 1982.
SEDIMENT LOAD: Maximum daily, 18,900 tons, Mar. 5, 1978; minimum daily, 0.58 ton, Sept. 20, 1978.

EXTREMES FOR CURRENT YEAR.—
SPECIFIC CONDUCTANCE: Maximum recorded, 1,080 microsiemens, Jan. 29, 30; minimum recorded, 280 microsiemens, Mar. 16.
WATER TEMPERATURE: Maximum recorded, 30.0°C, July 29; minimum recorded, 11.5°C, Feb. 6.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Instantaneous discharge, cfs (00061)	Barometric pressure, mm Hg (00025)	Dissolved oxygen, mg/L (00300)	Dissolved oxygen, percent of saturation (00301)	pH, water, unfltrd field, std units (00400)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, air, deg C (00020)	Temperature, water, deg C (00010)
OCT									
02...	1215	180	--	--	--	--	968	19.5	19.0
17...	1000	226	747	7.5	82	8.0	961	17.5	18.5
17...	1200	224	--	--	--	--	974	18.5	19.0
NOV									
01...	1200	226	--	--	--	--	948	--	18.0
15...	1245	187	--	--	--	--	654	26.0	17.0
DEC									
06...	1200	289	--	--	--	--	887	14.5	15.0
11...	1530	248	750	8.7	85	7.8	924	21.5	13.5
19...	1100	379	--	--	--	--	615	11.0	14.0
JAN									
03...	1145	277	--	--	--	--	792	18.0	13.0
15...	1600	366	752	9.1	91	8.2	1010	26.0	14.5
17...	1245	390	--	--	--	--	912	25.5	14.5
31...	1200	283	--	--	--	--	1040	30.0	17.0
FEB									
13...	1500	5730	745	10.0	98	8.0	363	17.0	13.5
19...	1230	356	--	--	--	--	614	15.5	16.0
MAR									
07...	1140	508	--	--	--	--	685	19.0	15.0
12...	1430	485	746	9.4	99	8.2	855	24.5	16.5
21...	1240	508	--	--	--	--	492	22.0	15.5
APR									
03...	1350	481	--	--	--	--	632	17.0	16.5
16...	1400	471	--	--	--	--	354	20.5	16.0
16...	1600	466	748	9.1	92	7.8	375	20.0	15.0
MAY									
02...	1000	512	--	--	--	--	764	19.0	19.0
16...	1000	280	--	--	--	--	834	20.5	19.5
JUN									
06...	1000	336	--	--	--	--	967	19.0	22.0
11...	1600	317	748	8.0	92	8.0	1020	26.0	21.0
19...	1050	339	--	--	--	--	998	20.0	23.0
JUL									
03...	1130	208	--	--	--	--	1000	28.0	24.0
18...	1015	218	--	--	--	--	964	22.5	24.0
23...	0900	204	749	8.6	102	7.9	974	--	23.0
AUG									
01...	1000	200	--	--	--	--	950	26.0	24.0
13...	1700	202	746	7.9	102	8.4	890	35.5	27.0
15...	1000	205	--	--	--	--	900	27.0	24.0
SEP									
05...	1030	185	--	--	--	--	942	32.0	24.5
19...	0920	216	--	--	--	--	873	27.0	22.0

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Alka-linity, wat flt inc tit field, mg/L as CaCO3 (39086)	Bicar-bonate, wat flt incrm. titr., field, mg/L (00453)	Carbon-ate, wat flt incrm. titr., field, mg/L (00452)	Chlor-ide, water, fltrd, mg/L (00940)	Sulfate water, fltrd, mg/L (00945)	Residue on evap. at 180degC wat flt mg/L (70300)	Ammonia + org-N, water, unfltrd mg/L as N (00625)	Ammonia water, fltrd, mg/L as N (00608)	Nitrite + nitrate water fltrd, mg/L as N (00631)
OCT									
02...	--	--	--	--	--	591	--	--	--
17...	203	247	--	112	100	--	.92	<.04	4.35
17...	--	--	--	--	--	609	--	--	--
NOV									
01...	--	--	--	--	--	586	--	--	--
15...	--	--	--	--	--	427	--	--	--
DEC									
06...	--	--	--	--	--	555	--	--	--
11...	213	260	--	104	94.6	--	1.1	.34	2.87
19...	--	--	--	--	--	386	--	--	--
JAN									
03...	--	--	--	--	--	490	--	--	--
15...	220	269	--	112	115	--	.77	.05	5.44
17...	--	--	--	--	--	564	--	--	--
31...	--	--	--	--	--	657	--	--	--
FEB									
13...	82	100	--	28.9	35.9	--	2.0	.19	2.35
19...	--	--	--	--	--	389	--	--	--
MAR									
07...	--	--	--	--	--	429	--	--	--
12...	183	224	--	96.7	85.7	--	.96	<.04	4.93
21...	--	--	--	--	--	301	--	--	--
APR									
03...	--	--	--	--	--	381	--	--	--
16...	--	--	--	--	--	218	--	--	--
16...	96	117	--	29.4	33.6	--	1.2	<.04	1.51
MAY									
02...	--	--	--	--	--	467	--	--	--
16...	--	--	--	--	--	514	--	--	--
JUN									
06...	--	--	--	--	--	616	--	--	--
11...	235	286	--	113	99.8	--	1.0	e.03	3.15
19...	--	--	--	--	--	639	--	--	--
JUL									
03...	--	--	--	--	--	619	--	--	--
18...	--	--	--	--	--	605	--	--	--
23...	--	--	--	--	--	--	--	--	--
AUG									
01...	--	--	--	--	--	604	--	--	--
13...	185	225	N	101	88.8	--	1.4	<.04	4.07
15...	--	--	--	--	--	559	--	--	--
SEP									
05...	--	--	--	--	--	596	--	--	--
19...	--	--	--	--	--	547	--	--	--

< Actual value is known to be less than the value shown.
e Estimated.
N Presumptive evidence of presence of material.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Nitrite water, fltrd, mg/L as N (00613)	Ortho-phos-phate, water, fltrd, mg/L as P (00671)	Phos-phorus, water, unfltrd mg/L (00665)	2,6-Di-ethyl-aniline water fltrd 0.7u GF ug/L (82660)	CIAT, water, fltrd, ug/L (04040)	Aceto-chlor, water, fltrd, ug/L (49260)	Ala-chlor, water, fltrd, ug/L (46342)	alpha-HCH, water, fltrd, ug/L (34253)	Atra-zine, water, fltrd, ug/L (39632)
OCT									
02...	--	--	--	--	--	--	--	--	--
17...	.158	1.08	1.14	<.006	<.006	<.006	<.004	<.005	.008
17...	--	--	--	--	--	--	--	--	--
NOV									
01...	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--
DEC									
06...	--	--	--	--	--	--	--	--	--
11...	.113	.95	1.02	<.006	e.006	<.006	<.004	<.005	.007
19...	--	--	--	--	--	--	--	--	--
JAN									
03...	--	--	--	--	--	--	--	--	--
15...	.079	.75	.75	<.006	e.006	<.006	<.004	<.005	e.007
17...	--	--	--	--	--	--	--	--	--
31...	--	--	--	--	--	--	--	--	--
FEB									
13...	.068	.26	1.17	<.006	<.006	.010	<.030	<.005	<.007
19...	--	--	--	--	--	--	--	--	--
MAR									
07...	--	--	--	--	--	--	--	--	--
12...	.071	.56	.66	<.006	<.006	<.006	<.004	<.005	<.007
21...	--	--	--	--	--	--	--	--	--
APR									
03...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
16...	.084	.30	.81	<.006	<.006	<.006	<.004	<.005	<.007
MAY									
02...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
JUN									
06...	--	--	--	--	--	--	--	--	--
11...	.077	.72	.93	<.006	e.005	<.006	<.004	<.005	e.005
19...	--	--	--	--	--	--	--	--	--
JUL									
03...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--
AUG									
01...	--	--	--	--	--	--	--	--	--
13...	.043	.55	.82	<.006	<.006	<.006	<.004	<.005	e.006
15...	--	--	--	--	--	--	--	--	--
SEP									
05...	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--

< Actual value is known to be less than the value shown.
e Estimated.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Azinphos-methyl, water, fltrd 0.7u GF ug/L (82686)	Benfluralin, water, fltrd 0.7u GF ug/L (82673)	Butylate, water, fltrd, ug/L (04028)	Carbaryl, water, fltrd 0.7u GF ug/L (82680)	Carbofuran, water, fltrd 0.7u GF ug/L (82674)	Chlorpyrifos water, fltrd, ug/L (38933)	cis-Permethrin water fltrd 0.7u GF ug/L (82687)	Cyanazine, water, fltrd, ug/L (04041)	DCPA, water fltrd 0.7u GF ug/L (82682)
OCT									
02...	--	--	--	--	--	--	--	--	--
17...	<.050	<.010	<.002	e.005	<.020	<.005	<.006	<.018	<.003
17...	--	--	--	--	--	--	--	--	--
NOV									
01...	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--
DEC									
06...	--	--	--	--	--	--	--	--	--
11...	<.050	<.010	<.002	e.007	<.020	<.005	<.006	<.018	<.003
19...	--	--	--	--	--	--	--	--	--
JAN									
03...	--	--	--	--	--	--	--	--	--
15...	<.050	<.010	<.002	e.015	<.020	<.005	<.006	<.018	.004
17...	--	--	--	--	--	--	--	--	--
31...	--	--	--	--	--	--	--	--	--
FEB									
13...	<.050	<.010	<.002	e.036	<.020	<.005	<.006	<.018	<.003
19...	--	--	--	--	--	--	--	--	--
MAR									
07...	--	--	--	--	--	--	--	--	--
12...	<.050	<.010	<.002	<.041	<.020	<.005	<.006	<.018	<.003
21...	--	--	--	--	--	--	--	--	--
APR									
03...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
16...	<.050	<.010	<.002	e.084	<.020	<.005	<.006	<.018	.068
MAY									
02...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
JUN									
06...	--	--	--	--	--	--	--	--	--
11...	<.050	<.010	<.002	<.041	<.020	<.005	<.006	<.018	<.003
19...	--	--	--	--	--	--	--	--	--
JUL									
03...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--
AUG									
01...	--	--	--	--	--	--	--	--	--
13...	<.050	<.010	<.002	<.041	<.020	<.005	<.006	<.018	e.002
15...	--	--	--	--	--	--	--	--	--
SEP									
05...	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--

< Actual value is known to be less than the value shown.
e Estimated.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Desulfinyl fipronil, water, fltrd, ug/L (62170)	Diazinon, water, fltrd, ug/L (39572)	Dieldrin, water, fltrd, ug/L (39381)	Disulfoton, water, fltrd 0.7u GF ug/L (82677)	EPTC, water, fltrd 0.7u GF ug/L (82668)	Ethalfluralin, water, fltrd 0.7u GF ug/L (82663)	Ethoprop, water, fltrd 0.7u GF ug/L (82672)	Desulfinyl-fipronil amide, wat flt ug/L (62169)	Fipronil sulfide water, fltrd, ug/L (62167)
OCT									
02...	--	--	--	--	--	--	--	--	--
17...	<.004	.019	<.005	<.02	<.002	<.009	<.005	<.009	<.005
17...	--	--	--	--	--	--	--	--	--
NOV									
01...	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--
DEC									
06...	--	--	--	--	--	--	--	--	--
11...	<.004	.019	<.005	<.02	<.002	<.009	<.005	<.009	<.005
19...	--	--	--	--	--	--	--	--	--
JAN									
03...	--	--	--	--	--	--	--	--	--
15...	<.004	<.020	<.005	<.02	<.002	<.009	<.005	<.009	<.005
17...	--	--	--	--	--	--	--	--	--
31...	--	--	--	--	--	--	--	--	--
FEB									
13...	<.004	.088	<.005	<.02	<.002	<.009	<.005	<.009	<.005
19...	--	--	--	--	--	--	--	--	--
MAR									
07...	--	--	--	--	--	--	--	--	--
12...	<.004	.037	<.005	<.02	<.002	<.009	<.005	<.009	<.005
21...	--	--	--	--	--	--	--	--	--
APR									
03...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
16...	<.004	.109	<.005	<.02	<.002	<.009	<.005	<.009	<.005
MAY									
02...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
JUN									
06...	--	--	--	--	--	--	--	--	--
11...	<.004	.015	<.005	<.02	<.002	<.009	<.005	<.009	<.005
19...	--	--	--	--	--	--	--	--	--
JUL									
03...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--
AUG									
01...	--	--	--	--	--	--	--	--	--
13...	<.004	.014	<.005	<.02	<.002	<.009	<.005	<.009	<.005
15...	--	--	--	--	--	--	--	--	--
SEP									
05...	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--

< Actual value is known to be less than the value shown.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Fipronil sulfone water, fltrd, ug/L (62168)	Fipronil, water, fltrd, ug/L (62166)	Fonofos water, fltrd, ug/L (04095)	Lindane water, fltrd, ug/L (39341)	Linuron water fltrd 0.7u GF ug/L (82666)	Malathion, water, fltrd, ug/L (39532)	Methyl parathion, water, fltrd 0.7u GF ug/L (82667)	Metolachlor, water, fltrd, ug/L (39415)	Metribuzin, water, fltrd, ug/L (82630)
OCT									
02...	--	--	--	--	--	--	--	--	--
17...	<.005	<.007	<.003	<.004	<.035	<.027	<.006	<.013	<.006
17...	--	--	--	--	--	--	--	--	--
NOV									
01...	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--
DEC									
06...	--	--	--	--	--	--	--	--	--
11...	<.005	<.007	<.003	<.004	<.035	<.027	<.006	e.007	<.006
19...	--	--	--	--	--	--	--	--	--
JAN									
03...	--	--	--	--	--	--	--	--	--
15...	<.005	<.007	<.003	<.004	<.035	<.027	<.006	<.013	<.006
17...	--	--	--	--	--	--	--	--	--
31...	--	--	--	--	--	--	--	--	--
FEB									
13...	<.005	<.007	<.003	<.004	<.035	.060	<.006	<.013	<.006
19...	--	--	--	--	--	--	--	--	--
MAR									
07...	--	--	--	--	--	--	--	--	--
12...	<.005	<.007	<.003	<.004	<.035	<.027	<.006	<.013	<.006
21...	--	--	--	--	--	--	--	--	--
APR									
03...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
16...	<.005	e.004	<.003	<.004	<.035	.051	<.006	e.008	<.006
MAY									
02...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
JUN									
06...	--	--	--	--	--	--	--	--	--
11...	<.005	<.007	<.003	<.004	<.035	<.027	<.006	<.013	<.006
19...	--	--	--	--	--	--	--	--	--
JUL									
03...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--
AUG									
01...	--	--	--	--	--	--	--	--	--
13...	<.005	<.007	<.003	<.004	<.035	<.027	<.006	e.003	<.006
15...	--	--	--	--	--	--	--	--	--
SEP									
05...	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--

< Actual value is known to be less than the value shown.
e Estimated.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Molinate, water, fltrd 0.7u GF ug/L (82671)	Napropamide, water, fltrd 0.7u GF ug/L (82684)	p,p'-DDE, water, fltrd, ug/L (34653)	Parathion, water, fltrd, ug/L (39542)	Pebulate, water, fltrd 0.7u GF ug/L (82669)	Pendimethalin, water, fltrd 0.7u GF ug/L (82683)	Phorate water fltrd 0.7u GF ug/L (82664)	Prometon, water, fltrd, ug/L (04037)	Pronamide, water, fltrd 0.7u GF ug/L (82676)
OCT									
02...	--	--	--	--	--	--	--	--	--
17...	<.002	<.007	<.003	<.010	<.004	<.022	<.011	.02	<.004
17...	--	--	--	--	--	--	--	--	--
NOV									
01...	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--
DEC									
06...	--	--	--	--	--	--	--	--	--
11...	<.010	<.007	<.003	<.010	<.004	<.022	<.011	e.01	<.004
19...	--	--	--	--	--	--	--	--	--
JAN									
03...	--	--	--	--	--	--	--	--	--
15...	<.002	<.007	<.003	<.010	<.004	<.022	<.011	e.01	<.004
17...	--	--	--	--	--	--	--	--	--
31...	--	--	--	--	--	--	--	--	--
FEB									
13...	<.002	<.007	<.003	<.010	<.004	<.022	<.011	.04	<.004
19...	--	--	--	--	--	--	--	--	--
MAR									
07...	--	--	--	--	--	--	--	--	--
12...	<.010	<.007	<.003	<.010	<.004	<.022	<.011	.02	<.004
21...	--	--	--	--	--	--	--	--	--
APR									
03...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
16...	<.002	<.007	<.003	<.010	<.004	<.022	<.011	.05	<.004
MAY									
02...	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--
JUN									
06...	--	--	--	--	--	--	--	--	--
11...	<.002	<.007	<.003	<.010	<.004	<.022	<.011	.02	<.004
19...	--	--	--	--	--	--	--	--	--
JUL									
03...	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--
AUG									
01...	--	--	--	--	--	--	--	--	--
13...	<.002	<.007	<.003	<.010	<.004	<.022	<.011	e.01	<.004
15...	--	--	--	--	--	--	--	--	--
SEP									
05...	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--

< Actual value is known to be less than the value shown.
e Estimated.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Propachlor, water, fltrd, ug/L (04024)	Propanil, water, fltrd 0.7u GF ug/L (82679)	Propargite, water, fltrd 0.7u GF ug/L (82685)	Simazine, water, fltrd, ug/L (04035)	Tebuthiuron water fltrd 0.7u GF ug/L (82670)	Terbacil, water, fltrd 0.7u GF ug/L (82665)	Terbufos, water, fltrd 0.7u GF ug/L (82675)	Thiobencarb water fltrd 0.7u GF ug/L (82681)	Triallate, water, fltrd 0.7u GF ug/L (82678)	Trifluralin, water, fltrd 0.7u GF ug/L (82661)
OCT										
02...	--	--	--	--	--	--	--	--	--	--
17...	<.010	<.011	<.02	.039	<.02	<.034	<.02	<.005	<.002	<.009
17...	--	--	--	--	--	--	--	--	--	--
NOV										
01...	--	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--	--
DEC										
06...	--	--	--	--	--	--	--	--	--	--
11...	<.010	<.011	<.02	.196	<.02	<.034	<.02	<.005	<.002	<.009
19...	--	--	--	--	--	--	--	--	--	--
JAN										
03...	--	--	--	--	--	--	--	--	--	--
15...	<.010	<.011	<.02	.128	<.02	<.034	<.02	<.005	<.002	<.009
17...	--	--	--	--	--	--	--	--	--	--
31...	--	--	--	--	--	--	--	--	--	--
FEB										
13...	<.010	<.011	<.02	.362	<.02	<.034	<.02	<.005	<.002	<.009
19...	--	--	--	--	--	--	--	--	--	--
MAR										
07...	--	--	--	--	--	--	--	--	--	--
12...	<.010	<.011	<.02	.053	<.02	<.034	<.02	<.005	<.002	<.009
21...	--	--	--	--	--	--	--	--	--	--
APR										
03...	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--
16...	<.010	<.011	<.02	.396	<.02	<.034	<.02	<.005	<.002	<.009
MAY										
02...	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--
JUN										
06...	--	--	--	--	--	--	--	--	--	--
11...	<.010	<.011	<.02	.028	<.02	<.034	<.02	<.005	<.002	<.009
19...	--	--	--	--	--	--	--	--	--	--
JUL										
03...	--	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--	--
23...	--	--	--	--	--	--	--	--	--	--
AUG										
01...	--	--	--	--	--	--	--	--	--	--
13...	<.010	<.011	<.02	.024	<.02	<.034	<.02	<.005	<.002	<.009
15...	--	--	--	--	--	--	--	--	--	--
SEP										
05...	--	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--	--

< Actual value is known to be less than the value shown.

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

SPECIFIC CONDUCTANCE (MICROSIEMENS/CENTIMETER AT 25 DEG. C), WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	971	935	972	925	816	728	857	702	1030	946	572	539
2	981	922	944	894	816	765	909	805	1000	941	659	556
3	962	917	916	893	879	816	866	780	989	965	687	589
4	917	888	900	795	864	845	820	754	1010	963	769	652
5	888	866	946	811	889	856	861	776	1020	976	812	705
6	878	839	1010	923	933	882	936	779	987	968	742	666
7	903	850	994	931	895	878	843	766	980	964	708	665
8	950	903	964	689	897	874	782	760	977	926	702	665
9	959	925	763	545	913	876	825	763	927	879	730	686
10	941	902	569	491	933	885	825	763	886	846	793	726
11	964	867	522	486	951	912	857	802	860	327	852	778
12	959	919	521	482	960	924	880	829	458	432	890	827
13	952	913	578	513	974	926	936	864	456	299	929	866
14	962	920	639	559	996	943	918	875	325	292	949	903
15	1020	923	744	637	1010	970	991	894	355	307	950	485
16	965	931	704	653	999	907	961	895	455	350	496	280
17	993	916	707	679	983	678	946	895	498	431	364	308
18	983	948	689	649	802	594	952	919	612	464	381	348
19	964	935	679	646	696	594	968	933	680	554	443	381
20	967	925	648	567	636	524	979	953	729	585	473	434
21	971	932	680	617	525	437	983	963	788	672	497	460
22	999	942	672	644	603	478	980	914	737	640	537	484
23	966	891	682	624	625	557	980	932	682	640	550	513
24	891	855	725	634	733	606	997	930	728	636	554	512
25	892	846	674	577	793	726	1030	980	768	369	561	525
26	901	882	706	628	792	757	1040	997	556	375	556	507
27	906	874	761	684	775	740	1050	1010	548	497	554	509
28	902	881	739	706	825	757	1050	1020	561	516	610	489
29	970	872	810	727	836	707	1080	1040	---	---	658	546
30	973	930	826	755	745	685	1080	1050	---	---	732	589
31	961	918	---	---	803	691	1060	1030	---	---	726	675
MONTH	1020	839	1010	482	1010	437	1080	702	1030	292	950	280

	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	739	673	816	757	968	931	978	958	965	901	899	848
2	720	661	795	764	971	939	998	946	951	909	923	886
3	662	550	805	758	986	951	975	915	942	898	959	911
4	643	531	810	778	983	961	963	894	942	910	967	922
5	672	580	790	765	973	955	926	867	955	908	968	853
6	661	614	821	783	962	950	917	863	934	861	942	870
7	650	608	832	799	951	928	900	877	906	868	920	868
8	652	600	863	812	947	911	957	894	906	865	907	873
9	611	559	879	825	927	908	943	883	907	848	920	823
10	568	542	887	831	928	905	916	887	885	827	895	839
11	562	541	876	845	992	895	915	882	885	831	908	848
12	579	547	857	816	998	954	920	887	903	856	906	851
13	619	563	832	805	989	953	926	903	921	867	893	842
14	654	602	837	802	1000	951	956	924	932	887	897	842
15	653	349	861	807	1010	959	972	947	924	884	924	857
16	406	348	---	---	1020	968	987	923	917	869	936	876
17	447	402	---	---	1020	982	957	937	910	853	911	854
18	497	445	---	---	1030	989	972	948	899	845	919	858
19	571	495	---	---	1020	985	977	944	911	856	900	841
20	663	571	901	876	1020	996	973	940	974	909	878	809
21	733	651	897	884	1040	1000	981	924	958	899	845	790
22	726	696	901	878	1050	1020	979	951	942	887	837	801
23	728	680	945	888	1040	1030	980	933	920	859	845	788
24	805	727	937	907	1060	1030	957	921	955	881	885	819
25	827	769	936	918	1050	1020	960	923	950	898	877	830
26	819	792	940	919	1030	972	980	911	958	899	875	829
27	807	768	960	928	999	968	964	909	974	911	920	832
28	779	755	952	935	980	939	966	910	956	914	890	837
29	784	749	954	932	980	933	995	911	955	890	877	832
30	769	744	958	927	968	936	992	925	909	857	898	849
31	---	---	960	932	---	---	951	924	906	849	---	---
MONTH	827	348	960	757	1060	895	998	863	974	827	968	788

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	21.0	19.5	18.0	17.5	15.5	15.0	13.0	12.0	20.0	16.5	14.5	13.5
2	21.0	17.5	18.0	17.5	15.5	15.0	13.5	13.0	19.0	17.0	15.5	14.0
3	21.0	17.5	17.5	17.0	15.5	15.0	13.5	13.0	18.0	14.5	14.5	14.0
4	21.0	18.0	17.0	16.5	15.5	14.5	13.0	12.5	17.0	13.0	14.5	14.0
5	21.5	19.0	17.0	16.0	15.0	14.5	14.0	13.0	16.0	13.0	14.5	14.0
6	21.5	19.5	17.0	16.0	15.0	14.5	14.5	14.0	15.5	11.5	14.5	14.0
7	21.5	20.0	17.0	16.0	15.0	14.5	14.5	13.5	15.5	12.0	14.5	14.0
8	21.5	20.0	16.5	16.0	15.0	14.5	13.5	13.5	17.0	13.5	15.0	14.5
9	21.5	20.0	17.0	16.5	15.0	14.5	14.0	13.0	17.0	13.0	15.5	14.5
10	21.5	20.5	17.5	17.0	15.0	14.5	14.0	13.0	16.0	13.0	16.0	15.5
11	21.0	20.0	18.0	17.0	15.0	14.0	14.0	13.5	16.0	13.5	16.5	16.0
12	20.5	19.5	17.0	16.5	14.5	14.0	14.5	14.0	14.0	14.0	17.0	16.5
13	19.5	19.0	17.0	16.5	14.5	14.0	15.0	14.0	14.5	14.0	17.5	17.0
14	20.0	19.5	17.0	16.5	14.0	14.0	14.5	14.0	15.0	14.5	18.0	17.5
15	20.0	19.5	17.0	16.5	14.0	14.0	15.5	14.5	15.5	15.0	18.0	16.5
16	19.5	19.5	17.0	16.5	14.5	14.0	15.0	14.0	15.5	15.0	16.5	15.0
17	19.5	19.0	16.5	16.0	14.5	14.0	14.5	14.0	15.5	15.5	15.5	15.0
18	19.0	19.0	16.5	16.0	14.0	14.0	14.5	14.0	16.0	15.5	15.5	15.0
19	19.0	18.5	16.5	15.5	14.0	13.5	14.5	14.5	16.0	15.5	15.5	15.0
20	19.0	18.5	16.0	15.5	13.5	13.0	15.0	14.5	16.0	15.5	15.5	15.0
21	19.0	18.5	16.5	16.0	13.0	12.5	15.5	15.0	16.0	15.5	15.5	15.0
22	18.5	18.5	16.0	16.0	13.0	12.5	15.5	15.0	16.0	15.5	15.5	15.5
23	18.5	18.5	16.5	16.0	13.0	13.0	15.5	15.5	15.5	15.5	15.5	15.5
24	18.5	18.5	16.5	16.0	13.0	12.5	16.0	15.5	15.5	15.5	15.5	15.5
25	18.5	18.0	16.0	16.0	13.0	12.5	16.5	15.5	16.0	13.0	16.0	15.5
26	18.0	17.5	16.0	15.5	13.0	12.5	17.0	16.0	14.5	13.0	16.0	15.5
27	18.0	17.5	15.5	15.0	13.0	12.0	17.5	16.5	14.0	13.5	16.0	15.5
28	18.0	17.5	15.5	15.0	13.0	12.5	17.5	16.5	14.5	14.0	17.0	16.0
29	18.0	17.5	15.5	15.5	12.5	12.0	17.0	16.5	---	---	17.0	16.0
30	18.5	18.0	15.5	15.0	12.5	12.0	18.5	16.5	---	---	17.0	16.0
31	18.0	17.5	---	---	13.0	12.0	20.0	16.0	---	---	16.5	16.0
MONTH	21.5	17.5	18.0	15.0	15.5	12.0	20.0	12.0	20.0	11.5	18.0	13.5

	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	17.0	16.5	19.0	18.5	22.5	22.0	28.5	23.0	28.5	24.0	27.5	23.5
2	16.5	16.5	19.0	18.5	22.5	22.0	28.5	23.0	28.5	23.5	28.0	24.0
3	16.5	16.0	19.0	19.0	22.5	22.0	28.0	22.5	28.0	23.0	27.5	24.0
4	16.5	16.5	19.0	19.0	22.5	22.0	28.5	22.5	28.0	22.5	28.0	23.5
5	17.0	16.5	19.5	19.0	22.0	22.0	28.5	23.0	27.0	22.5	28.0	23.5
6	17.0	16.5	19.5	19.0	22.0	21.5	28.0	23.0	27.0	22.0	27.0	23.0
7	17.5	16.5	19.5	19.0	21.5	21.0	27.0	23.0	27.0	22.5	27.0	23.0
8	17.0	17.0	19.5	19.0	21.5	21.0	27.5	22.5	27.5	23.0	26.0	22.0
9	17.0	17.0	19.5	19.0	21.0	21.0	28.0	22.5	27.5	23.5	24.5	22.0
10	17.5	17.0	19.5	19.0	21.0	20.5	29.0	23.5	28.5	23.5	24.5	21.5
11	17.5	17.0	19.5	19.0	21.5	20.5	29.0	24.5	26.5	23.5	25.5	21.5
12	18.0	17.5	19.5	19.0	21.0	20.5	28.5	23.5	28.0	23.0	25.5	22.5
13	18.5	18.0	19.5	19.0	21.5	21.0	29.0	23.5	27.5	23.5	25.5	22.0
14	18.5	18.0	19.5	19.0	21.5	21.0	29.0	24.0	27.5	23.0	26.0	22.5
15	18.5	16.0	19.5	19.0	22.0	21.0	29.5	24.0	27.5	24.0	25.5	22.5
16	16.5	16.0	---	---	23.0	22.0	29.0	24.5	28.0	23.5	25.0	22.0
17	16.5	16.5	---	---	23.5	23.0	27.5	24.5	28.0	24.0	24.5	21.5
18	17.0	16.5	---	---	23.5	23.0	27.0	24.0	28.0	24.0	24.5	21.5
19	17.5	17.0	---	---	23.5	22.5	28.0	24.0	27.5	24.0	25.0	21.5
20	18.0	17.5	20.5	19.5	22.5	21.5	29.5	24.0	28.0	23.5	25.0	21.5
21	18.0	17.5	20.5	20.0	21.5	20.5	28.5	24.0	27.5	24.5	25.5	21.5
22	18.0	18.0	21.0	20.0	20.5	20.0	26.5	23.5	27.0	23.5	25.5	22.0
23	18.5	18.0	21.5	21.0	22.0	20.5	28.5	23.0	27.0	22.5	25.0	22.0
24	18.5	18.0	21.5	21.0	24.5	20.5	28.5	23.5	28.0	23.0	24.0	22.0
25	18.5	18.0	21.5	21.0	26.5	20.5	28.5	23.5	28.0	24.0	24.5	21.5
26	18.5	18.5	21.5	21.0	27.5	21.0	28.0	23.0	27.5	24.0	24.5	21.5
27	19.0	18.5	21.5	21.0	27.5	22.0	28.5	23.5	27.5	23.0	25.0	21.5
28	19.0	18.5	22.0	21.0	27.5	22.0	28.5	23.5	27.5	23.5	25.0	22.0
29	19.0	18.5	22.0	21.0	28.0	22.0	30.0	24.0	27.0	22.5	25.0	22.0
30	19.0	18.5	22.0	21.5	28.5	22.5	29.0	24.5	27.0	22.5	25.0	22.5
31	---	---	22.5	21.5	---	---	29.0	24.0	27.5	23.0	---	---
MONTH	19.0	16.0	22.5	18.5	28.5	20.0	30.0	22.5	28.5	22.0	28.0	21.5

11074000 SANTA ANA RIVER BELOW PRADO DAM, CA—Continued

PARTICLE-SIZE DISTRIBUTION OF SUSPENDED SEDIMENT, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Instantaneous discharge, cfs (00061)	Temperature, water, deg C (00010)	Suspnd. sediment, sieve diametr percent <.063mm (70331)	Suspended sediment concentration mg/L (80154)	Suspended sediment load, tons/d (80155)
OCT						
17...SS	1000	226	18.5	23	22	13
DEC						
11...SS	1530	248	13.5	52	6	4.0
JAN						
15...SS	1600	366	14.5	75	<.5	<.49
FEB						
13...SS	1500	5730	13.5	93	653	10100
MAR						
12...SS	1430	485	16.5	88	5	6.5
APR						
16...SS	1600	466	15.0	98	227	286
JUN						
11...SS	1600	317	21.0	98	37	32
AUG						
13...SS	1700	202	27.0	90	124	68

SS Suspended-sediment data determined from a sample collected and processed according to National Water-Quality Assessment (NAWQA) Program protocol.

CROSS SECTION ANALYSES, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Barometric pressure, mm Hg (00025)	Dissolved oxygen, mg/L (00300)	Dissolved oxygen, percent of saturation (00301)	pH, water, unfltrd field, std units (00400)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, water, deg C (00010)	Location in X-sect. looking dwnstrm ft from l bank (00009)
AUG								
13...*	1721	746	7.9	102	8.4	889	27.0	6.00
13...*	1722	746	7.9	102	8.4	886	27.0	12.0
13...*	1723	746	7.9	102	8.4	888	27.0	18.0
13...*	1724	746	7.9	102	8.4	890	27.0	24.0
13...*	1725	746	7.9	102	8.4	892	27.0	30.0
SEP								
05...*	1120	--	--	--	--	958	24.5	30.0
05...*	1125	--	--	--	--	961	24.5	24.0
05...*	1130	--	--	--	--	962	24.5	18.0
05...*	1135	--	--	--	--	962	24.5	12.0
05...*	1140	--	--	--	--	960	24.5	6.00

* Instantaneous discharge at the time of cross-sectional measurements: Aug. 13, 198 ft^3/s; Sept. 5, 180 ft^3/s.

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.—Water years 1970 to current year.
CHEMICAL DATA: Water years 1970 to current year.
SPECIFIC CONDUCTANCE: Water years 1970–78, 1999–2000.
WATER TEMPERATURE: Water years 1999–2000.
SEDIMENT DATA: Water years 1999–2000.

WATER-QUALITY DATA, WATER YEAR OCTOBER 2002 TO SEPTEMBER 2003

Date	Time	Instantaneous discharge, cfs (00061)	Specif. conductance, wat unf uS/cm 25 degC (00095)	Temperature, water, deg C (00010)	Residue on evap. at 180degC wat flt mg/L (70300)
OCT					
01...	1300	73	920	24.0	567
16...	1420	76	930	21.5	586
30...	1630	79	896	20.0	567
NOV					
15...	1100	97	888	24.5	556
DEC					
03...	1230	84	957	19.0	604
17...	1100	300	585	15.0	368
JAN					
07...	1400	80	934	21.0	580
16...	1145	82	940	18.0	588
FEB					
04...	1145	88	916	18.0	585
20...	1330	93	957	18.0	608
MAR					
03...	1500	98	956	17.5	602
18...	1330	225	693	18.0	429
APR					
03...	1230	88	970	20.0	614
16...	1345	81	724	20.5	431
MAY					
02...	1030	73	992	21.0	635
19...	1330	69	992	27.0	626
JUN					
03...	1115	76	983	21.0	613
16...	1320	90	934	28.0	581
JUL					
08...	1510	86	925	29.0	577
22...	1315	81	938	26.0	593
AUG					
01...	1030	81	926	24.0	582
18...	1145	83	958	26.0	609
SEP					
03...	1315	85	942	27.0	571
17...	1220	84	934	24.0	580

APPENDIX B

DAILY PRECIPITATION DATA
ESTIMATED FOR SAN BERNARDINO

WATER YEAR 2002-03

TABLE B-1

DAILY PRECIPITATION ESTIMATED FOR MISSING/QUESTIONABLE DATA
FOR STATION 2146-A AT SAN BERNARDINO
(inches)

	2002			2003								
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0.08	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0.01	0.01	0	0	0	0
3	0	0	0	0	0	0	0	0.28	0	0	0	0
4	0	0	0	0	0	0.04	0.01	0.05	0	0	0	0
5	0	0	0	0	0	0.02	0.01	0.07	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0.07	0	0	0	0	0.01	0.03	0	0	0	0
8	0	1.37	0	0	0	0	0	0.02	0	0	0	0
9	0	0.92	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0.02	0	0	0
11	0	0.66	0	0	0.74	0	0	0	0	0	0	0
12	0	0	0	0	1.08	0	0	0	0	0	0	0
13	0	0	0	0	1.11	0	0.12	0	0	0	0	0
14	0	0	0	0	0.36	0	0.78	0	0	0	0	0
15	0	0	0	0	0	0.80	0.75	0	0	0	0	0
16	0	0	1.40	0	0	1.42	0.01	0	0	0	0	0
17	0.01	0	0.04	0	0	0	0.04	0	0	0.01	0	0
18	0	0	0	0	0	0	0.07	0	0	0	0	0
19	0	0	0.27	0	0	0	0	0	0	0	0	0
20	0	0	0.52	0	0.01	0	0	0	0.02	0	0	0
21	0	0	0.03	0	0	0	0	0	0	0	0	0
22	0	0	0.09	0	0	0	0.02	0	0.01	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0.01	0	0	0	0	0	0
25	0	0	0	0	1.48	0	0	0	0	0	0	0
26	0.02	0	0	0	0.45	0	0	0	0	0	0	0
27	0	0	0	0	0.28	0	0	0	0	0	0	0
28	0	0	0	0	0.03	0	0	0	0	0.03	0	0
29	0	0.04	0.18	0		0	0	0	0	0.13	0	0
30	0.00	0.13	0.05	0		0	0	0	0	0	0	0
31	0		0	0		0		0		0	0	
Total	0.03	3.19	2.66	0.00	5.54	2.29	1.83	0.46	0.05	0.17	0.00	0.00

Total Rainfall = 16.22 Inches

Data Source:

Calculated from San Bernardino Flood Control District Precipitation Stations 2001B2, 2015, and 2357 using the method described in the following memo dated April 26, 2004.

MEMORANDUM

DATE: April 26, 2004
TO: SAR Watermaster
FROM: Gwen Sharp, Roy Herndon

SUBJECT: CALCULATION OF 2002-03 PRECIPITATION FOR MISSING/QUESTIONABLE DATA FOR STATION 2146-A AT SAN BERNARDINO

The Santa Ana River Watermaster has historically used precipitation recorded at the San Bernardino County Hospital Station 2146 to assist in determining when storm flow occurs in the Santa Ana River. Data from a standard, or manually measured, station was used until that station was abandoned after 1998. Thereafter, data from the automatic station, 2146-A, which was established in 1984, has been used. As review of the data for the 2002-03 Watermaster Report began, it was noted that precipitation was not recorded at Station 2146-A for October 1st through October 29th 2002 and from July 21st through September 30th 2003.

A similar problem with missing and inconsistent precipitation data for Station 2146-A had occurred the last two years. At that time staff obtained and reviewed a copy of the USGS paper, "Double-Mass Curves," by James K. Searcy and Clayton H. Hardison, (1960), from Manual of Hydrology: Part 1. General Surface-Water Techniques, Geological Survey Water-Supply Paper 1541-B. A copy of that paper was included in the 2000-01 Basic Data. Staff review found that the primary purpose of the double-mass method was for data quality or trend analysis of a flow or precipitation station rather than to replace a missing year of record. Searcy and Hardison suggested the method used by the U.S. Weather Bureau as a simpler and more suitable method to use in a case where one year of data was missing or poor. The authors state that "The double-mass curve can also be used to estimate missing precipitation data, but the method is generally more laborious and no more accurate than the U.S. Weather Bureau method."

The paper described the Weather Bureau method (page 39) of using data from three adjacent stations to calculate missing data. If the three adjacent stations have precipitation ratios within 10% of the missing station, an average of the three stations is used. If the ratios are not all within 10% of the missing station, the normal-ratio method is used. "In this method, the precipitation at each of the three stations is multiplied by the ratio of the normal annual precipitation at the interpolation [missing or poor-quality]

station to the normal annual precipitation at each station. The weighted precipitation of the three stations is averaged to obtain the estimate for the interpolation station." Based on this information, staff proceeded to follow the U.S. Weather Bureau method.

Nearby precipitation stations were reviewed for proximity to Station 2146-A and completeness of records. Station 2001B2 located approximately one and one-half miles south of 2146, Station 2015 located three miles north and one mile east of 2146, and Station 2357 located two and one-quarter miles north and one mile west of 2146 were determined to be the best stations for this purpose due to their proximity to 2146-A (see location map attached) and for having from 22 to over 40 years of continuous data.

The cumulative annual precipitation from 1984-85 through 2000-01 for each of the adjacent stations was graphed against like data for the same time period from Station 2146-A. A trend line through the points on the graph gave the ratio of each station's precipitation to that of Station 2146-A. The R^2 values for all of the trend lines were greater than 0.996, showing excellent correlation. The ratios did, however, vary between 0.896 and 1.1156 (greater than 10%), so it was necessary to apply the normal-ratio method.

The historical annual precipitation ratio of each station to 2146-A was applied to the 2002-03 daily precipitation for each of the three adjacent stations and then averaged to estimate the daily precipitation for Station 2146-A, using the following equation:

$$P_{2146\text{-}A} = (R_1P_1 + R_2P_2 + R_3P_3)/3$$

where:
- $P_{2146\text{-}A}$ = calculated daily precipitation for Station 2146-A
- R_x = historical annual precipitation ratio of Station X to Station 2146-A
- P_x = daily precipitation for Station X

As seen in Table B-3, the calculated total 2002-03 precipitation for Station 2146-A was 16.22 inches.

Table B-2
2002-03 DATA FOR 2146-A CALCULATED FROM
ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
10/1/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/2/02	[ ]M	0.00	0.00	0.01	0	0	0.01	0	
10/3/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/4/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/5/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/6/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/7/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/8/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/9/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/10/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/11/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/12/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/13/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/14/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/15/02	[ ]M	0.00	0.00	0.01	0	0	0.01	0	
10/16/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/17/02	[ ]M	0.00	0.01	0.01	0	0.01	0.01	0.01	
10/18/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/19/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/20/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/21/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/22/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/23/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/24/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/25/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/26/02	[ ]M	0.05	0.00	0.00	0.06	0	0	0.02	
10/27/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/28/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/29/02	[ ]M	0.00	0.00	0.00	0	0	0	0	
10/30/02	0.00	0.00	0.00	0.00	0	0	0	0	
10/31/02	0.00	0.00	0.00	0.00	0	0	0	0	0.03
11/1/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/2/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/3/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/4/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/5/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/6/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/7/02	0.00	0.19	0.00	0.00	0.21	0	0	0.07	
11/8/02	1.56	0.00	2.32	2.12	0	2.08	2.02	1.37	
11/9/02	0.99	0.00	1.78	1.22	0	1.59	1.16	0.92	
11/10/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/11/02	0.00	1.77	0.00	0.00	1.97	0	0	0.66	
11/12/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/13/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/14/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/15/02	0.00	0.00	0.00	0.00	0	0	0	0	

Table B-2
2002-03 DATA FOR 2146-A CALCULATED FROM
ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
11/16/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/17/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/18/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/19/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/20/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/21/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/22/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/23/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/24/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/25/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/26/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/27/02	0.00	0.00	0.00	0.00	0	0	0	0	
11/28/02	0.00	0.00	0.00	0.01	0	0	0.01	0	
11/29/02	0.05	0.00	0.11	0.01	0	0.10	0.01	0.04	
11/30/02	0.21	0.00	0.09	0.32	0	0.08	0.30	0.13	3.19
12/1/02	0.00	0.21	0.00	0.00	0.23	0	0	0.08	
12/2/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/3/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/4/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/5/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/6/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/7/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/8/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/9/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/10/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/11/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/12/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/13/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/14/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/15/02	0.00	0.00	0.00	0.00	0	0	0	0	
12/16/02	0.16	1.31	1.52	1.44	1.46	1.36	1.37	1.40	
12/17/02	0.21	0.01	0.07	0.04	0.01	0.06	0.04	0.04	
12/18/02	0.06	0.00	0.00	0.00	0	0	0	0	
12/19/02	0.17	0.73	0.00	0.00	0.81	0	0	0.27	
12/20/02	0.13	0.00	0.96	0.74	0	0.86	0.70	0.52	
12/21/02	0.05	0.00	0.09	0.00	0	0.08	0	0.03	
12/22/02	0.03	0.23	0.00	0.00	0.26	0	0	0.09	
12/23/02	0.03	0.00	0.00	0.00	0	0	0	0	
12/24/02	0.33	0.00	0.00	0.00	0	0	0	0	
12/25/02	0.13	0.00	0.00	0.00	0	0	0	0	
12/26/02	0.03	0.00	0.00	0.00	0	0	0	0	
12/27/02	0.02	0.00	0.00	0.00	0	0	0	0	
12/28/02	0.01	0.00	0.00	0.00	0	0	0	0	
12/29/02	0.03	0.00	0.38	0.22	0	0.34	0.21	0.18	
12/30/02	[ ]M	0.13		0.00	0.15	0	0	0.05	
12/31/02	0.00	0.00	0.00	0.00	0	0	0	0	2.66

Table B-2

2002-03 DATA FOR 2146-A CALCULATED FROM ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
1/1/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/2/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/3/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/4/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/5/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/6/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/7/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/8/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/10/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/11/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/12/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/13/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/14/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/15/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/16/03	0.02	0.00	0.00	0.00	0	0	0	0	
1/17/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/18/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/19/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/20/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/22/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/23/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/24/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/25/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/26/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/27/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/28/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/29/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/30/03	0.00	0.00	0.00	0.00	0	0	0	0	
1/31/03	0.00	0.00	0.00	0.00	0	0	0	0	0.00
2/1/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/2/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/3/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/4/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/5/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/6/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/7/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/8/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/10/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/11/03	1.11	0.31	1.12	0.91	0.35	1.00	0.87	0.74	
2/12/03	1.00	1.05	1.26	0.99	1.17	1.13	0.94	1.08	
2/13/03	1.42	1.12	2.00	0.29	1.25	1.79	0.28	1.11	
2/14/03	0.00	0.96	0.00	0.01	1.07	0	0.01	0.36	
2/15/03	0.00	0.00	0.00	0.00	0	0	0	0	

Table B-2
2002-03 DATA FOR 2146-A CALCULATED FROM
ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
2/16/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/17/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/18/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/19/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/20/03	0.00	0.00	0.03	0.01	0	0.03	0.01	0.01	
2/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/22/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/23/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/24/03	0.00	0.00	0.00	0.00	0	0	0	0	
2/25/03	1.93	1.12	1.79	1.67	1.25	1.60	1.59	1.48	
2/26/03	0.64	0.97	0.22	0.07	1.08	0.20	0.07	0.45	
2/27/03	0.27	0.30	0.26	0.29	0.33	0.23	0.28	0.28	
2/28/03	0.06	0.09	0.00	0.00	0.10	0	0	0.03	5.54
3/1/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/2/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/3/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/4/03	0.02	0.00	0.06	0.08	0	0.05	0.08	0.04	
3/5/03	0.01	0.00	0.08	0.00	0	0.07	0	0.02	
3/6/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/7/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/8/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/10/03	0.02	0.00	0.00	0.00	0	0	0	0	
3/11/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/12/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/13/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/14/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/15/03	2.61	0.00	0.97	1.62	0	0.87	1.54	0.80	
3/16/03	0.98	3.43	0.48	0.00	3.83	0.43	0	1.42	
3/17/03	0.30	0.01	0.00	0.00	0.01	0	0	0	
3/18/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/19/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/20/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/22/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/23/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/24/03	0.00	0.00	0.02	0.00	0	0.02	0	0.01	
3/25/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/26/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/27/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/28/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/29/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/30/03	0.00	0.00	0.00	0.00	0	0	0	0	
3/31/03	0.00	0.00	0.00	0.00	0	0	0	0	2.29
4/1/03	[ ]M	0.00	0.00	0.00	0	0	0	0	
4/2/03	0.00	0.00	0.02	0.01	0	0.02	0.01	0.01	

Table B-2
2002-03 DATA FOR 2146-A CALCULATED FROM
ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
4/3/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/4/03	0.00	0.00	0.00	0.02	0	0	0.02	0.01	
4/5/03	0.04	0.00	0.05	0.00	0	0.04	0	0.01	
4/6/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/7/03	0.00	0.02	0.00	0.00	0.02	0	0	0.01	
4/8/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/10/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/11/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/12/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/13/03	0.11	0.00	0.32	0.09	0	0.29	0.09	0.12	
4/14/03	1.76	0.10	2.21	0.26	0.11	1.98	0.25	0.78	
4/15/03	0.08	1.88	0.09	0.06	2.10	0.08	0.06	0.75	
4/16/03	0.00	0.00	0.00	0.02	0	0	0.02	0.01	
4/17/03	0.06	0.00	0.15	0.00	0	0.13	0	0.04	
4/18/03	0.04	0.07	0.14	0.01	0.08	0.13	0.01	0.07	
4/19/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
4/20/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
4/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/22/03	0.01	0.04	0.00	0.01	0.04	0	0.01	0.02	
4/23/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/24/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
4/25/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
4/26/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/27/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/28/03	0.00	0.00	0.00	0.00	0	0	0	0	
4/29/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
4/30/03	0.00	0.00	0.00	0.00	0	0	0	0	1.83
5/1/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/2/03	0.01	0.00	0.02	0.00	0	0.02	0	0.01	
5/3/03	0.28	0.46	0.37	0.00	0.51	0.33	0	0.28	
5/4/03	0.04	0.00	0.15	0.01	0	0.13	0.01	0.05	
5/5/03	0.00	0.00	0.00	0.23	0	0	0.22	0.07	
5/6/03	0.01	0.00	0.01	0.00	0	0.01	0	0	
5/7/03	0.01	0.00	0.10	0.01	0	0.09	0.01	0.03	
5/8/03	0.00	0.00	0.03	0.02	0	0.03	0.02	0.02	
5/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/10/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/11/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/12/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/13/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/14/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/15/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
5/16/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/17/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/18/03	0.00	0.00	0.00	0.00	0	0	0	0	

Table B-2
2002-03 DATA FOR 2146-A CALCULATED FROM
ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
5/19/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/20/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/22/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/23/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/24/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/25/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/26/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/27/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/28/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/29/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/30/03	0.00	0.00	0.00	0.00	0	0	0	0	
5/31/03	0.00	0.00	0.00	0.00	0	0	0	0	0.46
6/1/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/2/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/3/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/4/03	0.00	0.00	0.01	0.00	0	0.01	0	0	
6/5/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/6/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/7/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/8/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/10/03	0.01	0.00	0.07	0.01	0	0.06	0.01	0.02	
6/11/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/12/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/13/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/14/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/15/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/16/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/17/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/18/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/19/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/20/03	0.01	0.00	0.06	0.02	0	0.05	0.02	0.02	
6/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/22/03	0.00	0.00	0.02	0.01	0	0.02	0.01	0.01	
6/23/03	0.00	0.00	0.00	0.01	0	0	0.01	0	
6/24/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/25/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/26/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/27/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/28/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/29/03	0.00	0.00	0.00	0.00	0	0	0	0	
6/30/03	0.00	0.00	0.00	0.00	0	0	0	0	0.05
7/1/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/2/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/3/03	0.00	0.00	0.00	0.00	0	0	0	0	

Table B-2

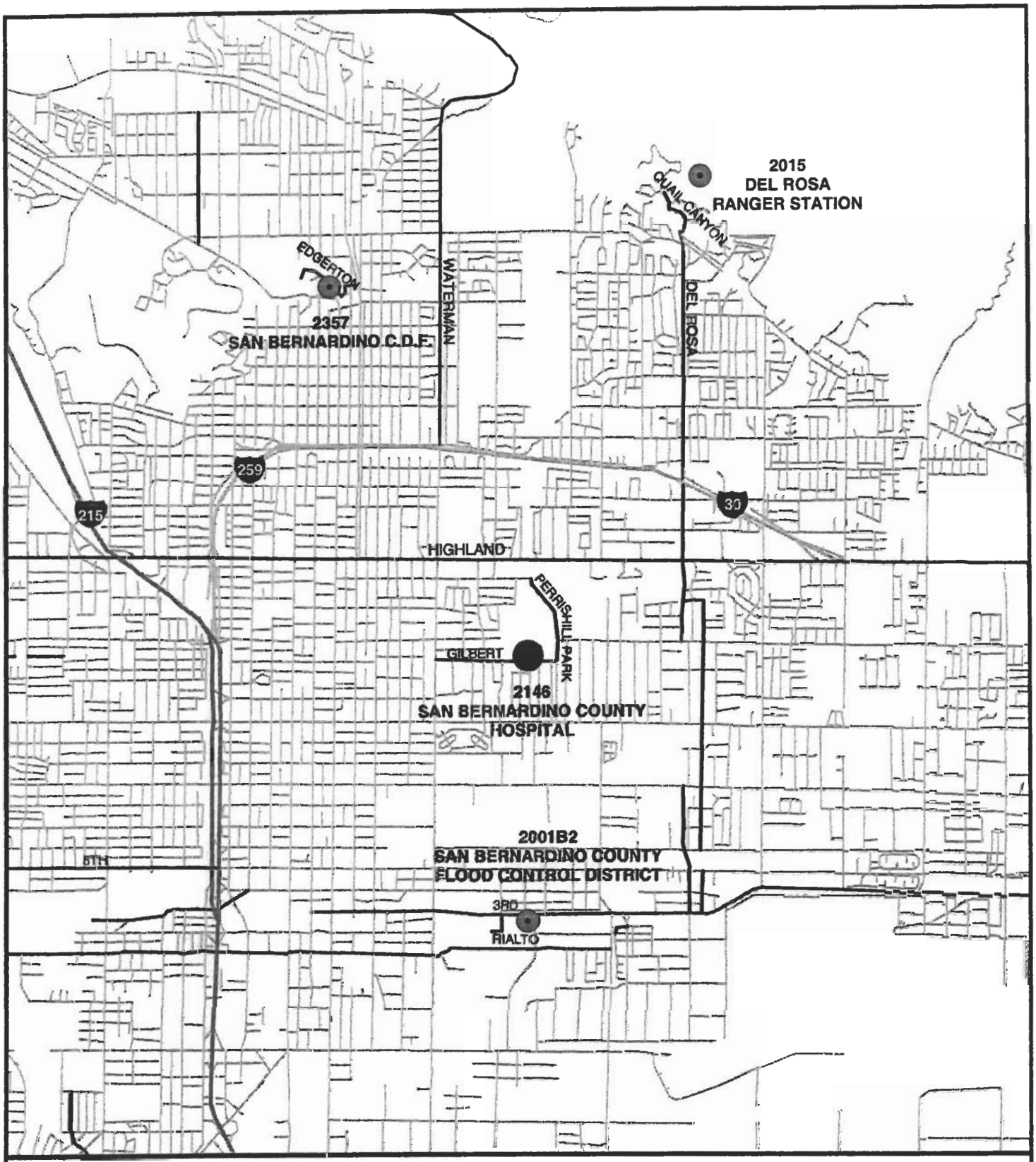
2002-03 DATA FOR 2146-A CALCULATED FROM ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn.	Adjacent Stations[1]							
	2146-A	2001B2	2015	2357	(2001B2 X	(2015 X	(2357 X		Monthly
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526	1.1156)	0.9076)	0.9958)	Average	Total
7/4/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/5/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/6/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/7/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/8/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/9/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/10/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/11/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/12/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/13/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/14/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/15/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/16/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/17/03	0.00	0.02	0.00	0.00	0.02	0	0	0.01	
7/18/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/19/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/20/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/21/03	0.00	0.00	0.00	0.00	0	0	0	0	
7/22/03	[ ]	0.00	[ ]M	0.00	0	0	0	0	
7/23/03	[ ]	0.00	0.00	0.00	0	0	0	0	
7/24/03	[ ]	0.00	0.00	0.00	0	0	0	0	
7/25/03	[ ]	0.00	0.00	0.00	0	0	0	0	
7/26/03	[ ]	0.00	0.00	0.00	0	0	0	0	
7/27/03	[ ]	0.00	0.00	0.00	0	0	0	0	
7/28/03	[ ]	0.08	0.00	0.01	0.09	0	0.01	0.03	
7/29/03	[ ]	0.00	0.25	0.18	0	0.22	0.17	0.13	
7/30/03	[ ]	0.00	0.00	0.00	0	0	0	0	
7/31/03	[ ]	0.00	0.00	0.00	0	0	0	0	0.17
8/1/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/2/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/3/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/4/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/5/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/6/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/7/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/8/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/9/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/10/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/11/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/12/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/13/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/14/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/15/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/16/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/17/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/18/03	[ ]	0.00	0.00	0.00	0	0	0	0	

Table B-2

2002-03 DATA FOR 2146-A CALCULATED FROM ADJACENT STATIONS 2001B2, 2015, AND 2357 (Inches)

	Recorded Daily Precipitation				Calculated Precipitation For Stn. 2146-A =			Calculated Data	
	Interpolation Stn. 2146-A	Adjacent Stations[1] 2001B2	2015	2357	(2001B2 X 1.1156)	(2015 X 0.9076)	(2357 X 0.9958)	Average	Monthly Total
Ratio Adjacent Stn. to 2146-A =		1.1156	0.896	0.9526					
8/19/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/20/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/21/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/22/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/23/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/24/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/25/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/26/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/27/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/28/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/29/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/30/03	[ ]	0.00	0.00	0.00	0	0	0	0	
8/31/03	[ ]	0.00	0.00	0.00	0	0	0	0	0
9/1/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/2/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/3/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/4/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/5/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/6/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/7/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/8/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/9/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/10/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/11/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/12/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/13/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/14/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/15/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/16/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/17/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/18/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/19/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/20/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/21/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/22/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/23/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/24/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/25/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/26/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/27/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/28/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/29/03	[ ]	0.00	0.00	0.00	0	0	0	0	
9/30/03	[ ]	0.00	0.00	0.00	0	0	0	0	0.00
ANNUAL	17.06	16.66	19.69	13.14	18.59	17.64	12.52	16.22	16.22



Precipitation Station 2146, San Bernardino County Hospital and Adjacent Rain Stations 2001B2, 2015, and 2357

- Precipitation Station 2146
  San Bernardino County Hospital
- Rain Station
- Freeway
- Highway
- Streets

N, W, E, S

0 0.25 0.5 1 1.5 Miles

SINCE 1933 ORANGE COUNTY WATER DISTRICT A TRADITION OF INNOVATION

\\drive\maps\projects\sawpa\precip_stations_012502.mxd 04/03/2003

APPENDIX C

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

WATER YEAR 2002-03

ORANGE COUNTY WATER DISTRICT

Orange County's Groundwater Authority

April 22, 2004

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

Subject: Review of Fiscal Year 2002-03 Financial Transactions

Gentlemen:

I have reviewed and prepared the attached statement of assets and liabilities comprised of cash transactions for Santa Ana River Watermaster, and the related statement of revenue, expenses, and changes in fund balance of year ended June 30, 2003. This review includes examining evidence that supports the amounts and disclosures in the financial statements. I have reviewed minutes of meetings as well as Bank of America Checking and Savings Accounts' transactions and statements, and have concluded that all transactions were properly recorded.

Very truly yours,

ORANGE COUNTY WATER DISTRICT

Laura L. Li

Laura Li
Controller

cc: John Kennedy, Assistant General Manager, OCWD

SANTA ANA RIVER WATERMASTER

FINANCIAL STATEMENTS

JUNE 30, 2003

SANTA ANA RIVER WATER MASTER

STATEMENT OF ASSETS AND LIABILITIES ARISING FROM CASH TRANSACTIONS

June 30, 2003

ASSETS

Cash in checking account (Notes 3)	$ 6,543
Cash in savings account (Notes 3)	2,459
	$9,002

FUND BALANCE

Fund balance	$9,002

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

SANTA ANA RIVER WATER MASTER

STATEMENT OF ASSETS AND LIABILITIES ARISING FROM CASH TRANSACTIONS

June 30, 2003

	Actual	Budget	Variance-Favorable (Unfavorable)
REVENUE COLLECTED:			
Water district contributions (Note 2):			
Orange County Water District	$ 3,500	$ 4,800	$ 1,300
Chino Basin Municipal Water District	1,750	2,400	650
San Bernardino Valley Municipal Water District	1,750	2,400	650
Western Municipal Water District	1,750	2,400	650
Interest from Savings Account	12	0	12
TOTAL REVENUE COLLECTED	$ 8,762	$ 12,000	$ 3,238
EXPENSES PAID:			
Professional Engineering Service	$ 8,484	$ 9,500	$ (1,016)
Administrative Expenses:			
Auditing Services	0	0	0
Annual Reports	0	2,500	(2,500)
TOTAL EXPENSES PAID	$ 8,484	$ 12,000	$ (3,516)
EXCESS OF REVENUE COLLECTED OVER(UNDER) EXPENSES PAID	278	0	
FUND BALANCE AT JUNE 30, 2002	8,724		
FUND BALANCE AT JUNE 30, 2003	$ 9,002		

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

SANTA ANA RIVER WATERMASTER

NOTES TO FINANCIAL STATEMENTS

June 30, 2003

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 Chino Basin Municipal Water District, 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 districts contributions are made in the following ratios:

Orange County Water District	40%
Chino Basin Municipal Water District	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.

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, 2003 consisted of the following:

Bank of America:	
Checking account	$6,543
Savings account	$2,459
	$9,002

All cash is fully insured by the FDIC.

Bank of America

Your Bank of America Business Savings Statement

Statement Period:
April 1 through June 30, 2003
Account Number: 05958-50340

SANTA ANA RIVER WATERMASTER
C-O SBVMWD
P O BOX 5906
SAN BERNARDINO CA 92412-5906

At Your Service
Call: 909-686-2590
Online: www.bankofamerica.com

Written Inquiries
Bank of America
Magnolia Center Branch
P.O. Box 37176
San Francisco, CA 94137-5176

Customer since 1976
Bank of America appreciates your business and we enjoy serving you.

Our free Online Banking service allows you to check account balances, transfer funds and more. Enroll at www.bankofamerica.com.

❑ Summary of Your Business Savings Account

Beginning Balance on 04/01/03	$2,455.87
Interest Paid	+ 2.99
Ending Balance	$2,458.86

Annual Percentage Yield earned this period	0.49%
Interest paid year-to-date	$6.01

❑ Important Information About Your Account

Your savings account earned $3.00 in interest this statement period. The Interest Paid shown above reflects interest earned since your last payment date.

❑ Bank of America News

We're celebrating small businesses with BIG savings. Now through July 31, 2003. Call or visit a banking center for details.

❑ Savings Activity

Date	Description	Reference Number	Amount
	Interest Paid		
04/30	Interest Paid from 04/01/03 Through 04/30/03		$1.01
05/30	Interest Paid from 05/01/03 Through 05/31/03		1.04
06/30	Interest Paid from 06/01/03 Through 06/30/03		.94
	Total Interest Paid		*$2.99*

Bank of America.

Your Bank of America Business Checking Statement

0595
E 0-1

SANTA ANA RIVER WATERMASTER
C-O SBVMWD
P O BOX 5906
SN BERNARDINO CA 92412-5906

Statement Period:
May 22 through June 20, 2003

Account Number: 05957-11534

At Your Service
Call: 909.686.2590
Online: www.bankofamerica.com

Written Inquiries
Bank of America
Magnolia Center Branch
PO Box 37176
San Francisco, CA 94137-0001

Our free Online Banking service allows you to check account balances, transfer funds, pay bills and more. Enroll at www.bankofamerica.com.

Customer since 1969
Bank of America appreciates your business and we enjoy serving you.

❑ Summary of Your Business Checking Account

Beginning Balance on 05/22/03	$6,543.06
Ending Balance	$6,543.06

Number of 24 Hour Customer Service Calls	
Self-Service	0
Assisted	0

❑ Important Information About Your Account

Based on the minimum balance you've maintained in this account, your monthly service charge has been waived.

APPENDIX D

SAN BERNARDINO
HIGH GROUNDWATER MITIGATION PROJECT WATER
DISCHARGED TO THE SANTA ANA RIVER
ABOVE RIVERSIDE NARROWS

WATER YEAR 2002-03

There was no discharge of SBVMWD HGMP water to the Santa Ana River during the 2002-03 water year.

APPENDIX E

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

WATER YEAR 2002-03

TABLE E-1

NONTRIBUTARY WATER FROM OC-59
MONTHLY TOTALS
WATER YEAR 2002-03
(acre-feet)

Month	Released at OC-59	12-Hour Delay [1]	Evaporation Losses [2]	Calculated Flow at Prado
2002				
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
2003				
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	715	715	48	667
September	1,051	1,025	28	997
Total	1,766	1,740	76	1,664

(1) Released nontributary water is delayed 12 hours to reflect the estimated travel time between OC-59 and Prado Dam.

(2) Monthly evapotranspiration losses calculated per the procedures referenced in the Twelfth Annual Watermaster Report, Appendix C and shown in Table E-3.

TABLE E-2

NONTRIBUTARY WATER FROM OC-59
AUGUST 2003
(cfs)

Day	Released at OC-59	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	8.7	4.4	4.1
5	22.1	15.4	14.4
6	24.3	23.2	21.7
7	23.1	23.7	22.1
8	22.9	23.0	21.5
9	24.8	23.9	22.3
10	25.4	25.1	23.4
11	23.7	24.6	22.9
12	25.6	24.7	23.0
13	26.5	26.1	24.3
14	26.1	26.3	24.5
15	24.5	25.3	23.6
16	25.0	24.8	23.1
17	25.5	25.3	23.6
18	24.5	25.0	23.3
19	7.8	16.2	15.1
20	0.0	3.9	3.6
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
31	0.0	0.0	0.0
Total (cfs-days)	360.5	360.5	336.5
(AF)	715.0	715.0	667.3

(1) Includes the monthly evapotranspiration loss listed in Table E-3.

TABLE E-2

NONTRIBUTARY WATER FROM OC-59
September 2003
(cfs)

Day	Released at OC-59	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	8.6	4.3	4.2
9	25.8	17.2	16.7
10	25.3	25.6	24.9
11	24.8	25.1	24.4
12	23.9	24.4	23.7
13	23.7	23.8	23.2
14	23.9	23.8	23.2
15	23.3	23.6	23.0
16	21.8	22.6	21.9
17	23.4	22.6	22.0
18	22.7	23.1	22.4
19	22.4	22.6	21.9
20	26.2	24.3	23.6
21	26.8	26.5	25.8
22	23.7	25.3	24.6
23	23.5	23.6	23.0
24	22.9	23.2	22.6
25	22.9	22.9	22.3
26	22.0	22.5	21.8
27	21.8	21.9	21.3
28	22.0	21.9	21.3
29	22.5	22.3	21.6
30	25.8	24.2	23.5
Total (cfs-days)	529.7	516.8	502.7
(AF)	1,050.6	1,025.1	997.1

(1) Includes the monthly evapotranspiration loss listed in Table E-3.

TABLE E-3

EVAPOTRANSPIRATION LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2002-03
SUM OF ALL CHANNEL REACHES
(acre-feet)

Month	State Water Released with 12-hour delay	Rialto Pipeline to Los Serranos Road	Los Serranos to Prado Dam w/o vegetation	Los Serranos to Prado Dam w/ vegetation	Total Evapo-transpiration	Percent of Monthly Release
2002						
October	0	0	0	0	0	0%
November	0	0	0	0	0	0%
December	0	0	0	0	0	0%
2003						
January	0	0	0	0	0	0%
February	0	0	0	0	0	0%
March	0	0	0	0	0	0%
April	0	0	0	0	0	0%
May	0	0	0	0	0	0%
June	0	0	0	0	0	0%
July	0	0	0	0	0	0%
August	715	19	24	5	48	6.7%
September	1,025	20	7	1	28	2.7%
Total	1,740	39	31	6	76	

Percent of Annual Releases : 4.3%

TABLE E-3.1

EVAPOTRANSPIRATION LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2002-03
RIALTO PIPELINE TO LOS SERRANOS ROAD

Month	State Water Released with 12-hour delay (AF)	Days of Evaporation	Evapo-transpiration (in) [a]	Computed Evaporation Losses[b]	
				(AF)	(% of release)
[1]	[2]	[3]	[4]	[5]	[6]
2002					
October	0	0	---	0	0%
November	0	0	---	0	0%
December	0	0	---	0	0%
2003					
January	0	0	---	0	0%
February	0	0	---	0	0%
March	0	0	---	0	0%
April	0	0	---	0	0%
May	0	0	---	0	0%
June	0	0	---	0	0%
July	0	0	---	0	0%
August	715	16	7.50	18.7	2.6%
September	1,025	23	5.53	19.8	1.9%

(a) At UCR Evapotranspiration Station #44
(b) Evaporation losses=[4]/(days/month)x[3]x(Pan Factor of 1.0)x(area of 56.1 acres)x(1 foot/12 inches)

TABLE E-3.2

EVAPOTRANSPIRATION LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2002-03
LOS SERRANOS ROAD TO PRADO DAM (WITHOUT VEGETATION COVER)

Month	State Water Released with 12-hour delay (AF)	Days of Evaporation (+7 days)[a]	Evapo-transpiration (in)[b]	Average Wetted Area (AF)[c]	Computed Evaporation Losses[d]	
					(AF)	(% of release)
[1]	[2]	[3]	[4]	[5]	[6]	[7]
2002						
October	0	0	---	0	0	0%
November	0	0	---	0	0	0%
December	0	0	---	0	0	0%
2003						
January	0	0	---	0	0	0%
February	0	0	---	0	0	0%
March	0	0	---	0	0	0%
April	0	0	---	0	0	0%
May	0	0	---	0	0	0%
June	0	0	---	0	0	0%
July	0	0	---	0	0	0%
August	715	16	7.50	72	24.0	3.4%
September	1,025	23	5.53	20	7.0	0.7%

(a) Period of delivery plus 7 days after stoppage of delivery.
(b) At UCR Evapotranspiration Station #44.
(c) Equals 1/2 of 144 acres if the maximum flow rate of the month is less than 200 cfs and 1/2 of 369 acres if the maximum flow rate is greater or equal to 200 cfs.
(d) Evaporation losses=[3]x[4]/(days/month)x[5]x(1 foot/12 inches)

TABLE E-3.3

EVAPOTRANSPIRATION LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2002-03
LOS SERRANOS ROAD TO PRADO DAM (WITH VEGETATION COVER)

Month	State Water Released with 12-hour delay (AF)	Days of Evaporation[a]	Evapo-transpiration (in)[b]	Normal Evaporation (in)[c]	Average Wetted Area (AF)[d]	Computed Evaporation Losses[e]	
						(AF)	(% of release)
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
2002							
October	0	0	---	---	0	0	0%
November	0	0	---	---	0	0	0%
December	0	0	---	---	0	0	0%
2003							
January	0	0	---	---	0	0	0%
February	0	0	---	---	0	0	0%
March	0	0	---	---	0	0	0%
April	0	0	---	---	0	0	0%
May	0	0	---	---	0	0	0%
June	0	0	---	---	0	0	0%
July	0	0	---	---	0	0	0%
August	715	16	7.50	6.20	72	5.0	0.7%
September	1,025	23	5.53	4.80	20	1.1	0.1%

(a) Period of delivery plus 7 days after stoppage of delivery.
(b) At UCR Evapotranspiration Station #44.
(c) Referenced in the 1983 report "Nontributary Losses of State Water Released at OC-59 and Final Adjustments to Base Flows".
(d) Equals 1/2 of 144 acres if the maximum flow rate of the month is less than 200 cfs and 1/2 of 369 acres if the maximum flow rate is greater or equal to 200 cfs.
(e) Evaporation losses=[3]x([4]-[5])/(days/month)x[6]x(1 foot/12 inches)

TABLE E-4

CALCULATION OF WEIGHTED TDS OF
OC-59 RELEASES

WATER YEAR 2002-03

Month	OC-59 Discharge (acre-feet)	TDS at Release[1] (mg/L)	Discharge X TDS at Release	Calculated OC-59 Flow at Prado (acre-feet)	TDS at Prado[2] (mg/L)	Flow at Prado X TDS at Prado
2002						
October	0	-	0	0	-	0
November	0	-	0	0	-	0
December	0	-	0	0	-	0
2003						
January	0	-	0	0	-	0
February	0	-	0	0	-	0
March	0	-	0	0	-	0
April	0	-	0	0	-	0
May	0	-	0	0	-	0
June	0	-	0	0	-	0
July	0	-	0	0	-	0
August	715	195	139,433	667	224	149,408
September	1051	181	190,167	997	224	223,328
Total	1,766		329,600	1,664		372,736

At Discharge:
Flow-weighted TDS = $\frac{329,600}{1,766}$ = 187 mg/L

At Prado:
Flow-weighted TDS = $\frac{372,736}{1,664}$ = 224 mg/L

(1) Monthly average TDS values for State Water Project water at Devil Canyon Power Plant.
(2) TDS values for OC-59 releases arriving at Prado were adjusted based on mass balance using known flow and quality components, as described in Table E-5.

TABLE E-5

TDS ADJUSTMENT OF OC-59 DISCHARGE
WATER YEAR 2002-03

This section describes the methodology used to adjust TDS concentrations in flows of OC-59 water as it arrived at Prado Dam. Because no direct TDS measurements were available as the water arrived at Prado, the adjusted TDS concentrations of OC-59 water were estimated from mass balance calculations using flows and TDS values of the Prado flow components for the period of delivery.

The TDS of the OC-59 water reaching Prado Dam is estimated using the two methods described below. Method 1 is essentially the same as that described in Appendix C of the Twelfth Annual Report. It uses the following equation that depends on assumed *annual average* TDS concentrations of Base Flow and Storm Flow at Prado, which are not measured values:

Method 1:

$$Q_p q_p = Q_{bf} q_{bf} + Q_{sf} q_{sf} + Q_{ad} q_{ad} + Q_{sjw} q_{sjw} + Q_{wmwd} q_{wmwd} + Q_{59} q_{59}$$

where:					
Q_p = total inflow at Prado	=	256,157	256,157	256,157	af
q_p = total flow TDS at Prado	=	462	462	462	mg/L
Q_{bf} = base flow at Prado	=	146,113	146,113	146,113	af
q_{bf} = base flow TDS at Prado	=	600	600	600	mg/L*
Q_{sf} = storm flow at Prado	=	97,810	97,809	97,809	af
q_{sf} = storm flow TDS at Prado	=	**350**	**300**	**255**	mg/L*
Q_{ad} = Arlington Desalter flow	=	4,882	4,882	4,882	af
q_{ad} = Arlington Desalter flow TDS	=	362	362	362	mg/L
Q_{sjw} = San Jacinto Watershed outflow	=	2,024	2,024	2,024	af
q_{sjw} = San Jacinto Watershed outflow TDS	=	707	707	707	mg/L
Q_{wmwd} = WMWD Transfer flow	=	3,664	3,664	3,664	af
q_{wmwd} = WMWD Transfer flow TDS	=	504	504	504	mg/L
Q_{59} = OC-59 flow reaching Prado	=	1,664	1,664	1,664	af
q_{59} = OC-59 flow TDS reaching Prado	=				

Note: All values are annualized.

* Assumed Value

Solving for q_{59}:

$$q_{59} = \frac{(Q_p q_p - Q_{bf} q_{bf} - Q_s f q_{sf} - Q_{ad} q_{ad} - Q_{sjw} q_{sjw} - Q_{wmwd} q_{wmwd})}{Q_{59}}$$

q_{59} =	**-5,122**	**-2,230**	**415**	**mg/L**

TABLE E-5

TDS ADJUSTMENT OF OC-59 DISCHARGE
WATER YEAR 2002-03

Note the extreme sensitivity of q_{59} to the assumed values of Prado storm flow TDS. As show above, the fairly low TDS of the total flow resulted in the calculated q_{59} being negative in two of the three calculations above. Therefore, this method of calculation was ineffectual this year. Since very small changes in assumed or calculated figures cause significant differences in estimated q_{59} values, the following method was developed to reduce this uncertainty.

Method 2

The TDS of Base Flow water reaching Prado Dam is a key element for the second method of calculating q_{59} TDS. This year there was no month without water purchases or storm flow included in the total flow at Prado. Therefore, q_{bf} must be calculated before calculating q_{59}.

The months of October and June were chosen to calculate q_{bf} because they had the least amount of interference of the months during which there were no OC-59 deliveries. The following equation was used to calculate the TDS of base flow water reaching Prado Dam:

$$Q_p q_p = Q_{bf} q_{bf} + Q_{ad} q_{ad} + Q_{wmwd} q_{wmwd}$$

where:	Q_p = total inflow at Prado [1]	=	25,260	af
	q_p = total flow TDS at Prado [2]	=	595	mg/L
	Q_{ad} = Arlington Desalter flow [1]	=	542	af
	q_{ad} = Arlington Desalter flow TDS [2]	=	397	mg/L
	Q_{wmwd} = WMWD Transfer flow [1]	=	932	af
	q_{wmwd} = WMWD Transfer flow TDS [2]	=	496	mg/L
	Q_{bf} = base flow at Prado [1]	=	23,786	af
	q_{bf} = base flow TDS at Prado	=		

[1]For October 2002 and June 2003.

[2]Flow-weighted average TDS for October 2002 and June 2003.

Solving for q_{bf}:

$$q_{bf} = \frac{(Q_p q_p + Q_{ad} q_{ad} + Q_{wmwd} q_{wmwd})}{Q_{bf}}$$

$$q_{bf} = 604 \text{ mg/L}$$

TABLE E-5

TDS ADJUSTMENT OF OC-59 DISCHARGE
WATER YEAR 2002-03

Method 2 uses essentially the same equation as Method 1, except the time period of flow measurements is based on the period during which OC-59 deliveries were made, August and September 2003. The following equation was used to estimate the TDS of OC-59 water reaching Prado Dam:

$$Q_p q_p = Q_{bf} q_{bf} + Q_{ad} q_{ad} + Q_{wmwd} q_{wmwd} + Q_{59} q_{59}$$

where:	Q_p = total inflow at Prado [1]	=	16,334	af
	q_p = total flow TDS at Prado [2]	=	549	mg/L
	Q_{bf} = base flow at Prado [1]	=	12,879	af
	q_{bf} = base flow TDS at Prado [3]	=	604	mg/L
	Q_{ad} = Arlington Desalter flow [1]	=	824	af
	q_{ad} = Arlington Desalter flow TDS [2]	=	382	mg/L
	Q_{wmwd} = WMWD Transfer flow	=	974	af
	q_{wmwd} = WMWD Transfer flow TDS	=	491	mg/L
	Q_{59} = OC-59 flow reaching Prado [1]	=	1,766	af
	q_{59} = OC-59 flow TDS reaching Prado	=		

[1] For August and September 2003.
[2] Flow-weighted average TDS for August and September 2003.
[3] As calculated above for the months of October 2002 and June 2003.

$$q_{59} = \frac{(Q_p q_p - Q_{bf} q_{bf} + Q_{ad} q_{ad} + Q_{wmwd} q_{wmwd})}{Q_{59}}$$

$$\mathbf{q_{59} = 224\ mg/L}$$

By using the calculated base flow TDS concentration, this method more accurately reflects the TDS concentration of the OC-59 water reaching Prado Dam. *Therefore, the above values were used to calculate annual base and storm flow TDS at Prado in the report.*

APPENDIX F

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

WATER YEAR 2002-03

TABLE F-1

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

OCTOBER 2002

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	3.41	6.8	698	424	1,443
2	9.74	19.3	666	404	3,936
3	9.40	18.6	669	406	3,814
4	9.18	18.2	672	408	3,744
5	9.43	18.7	668	406	3,823
6	9.43	18.7	666	404	3,808
7	9.43	18.7	657	399	3,759
8	9.41	18.7	657	399	3,751
9	9.41	18.7	657	399	3,753
10	9.43	18.7	657	399	3,757
11	9.43	18.7	657	399	3,759
12	9.41	18.7	657	399	3,754
13	2.40	4.8	656	398	955
14	4.81	9.5	660	400	1,927
15	9.43	18.7	656	398	3,750
16	9.41	18.7	657	399	3,752
17	9.41	18.7	656	398	3,747
18	9.41	18.7	658	399	3,756
19	9.41	18.7	656	398	3,749
20	9.41	18.7	657	399	3,752
21	9.41	18.7	656	398	3,749
22	9.41	18.7	654	397	3,735
23	9.40	18.6	652	396	3,717
24	9.41	18.7	650	395	3,713
25	9.18	18.2	669	406	3,729
26	9.41	18.7	651	395	3,719
27	9.80	19.4	652	396	3,876
28	9.35	18.5	646	392	3,666
29	9.27	18.4	637	387	3,585
30	9.27	18.4	636	386	3,578
31	8.81	17.5	576	349	3,077
Total	273.48	542.4			108,634
	Monthly Flow Weighted TDS			397	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

NOVEMBER 2002

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	8.67	17.2	615	373	3,235
2	9.40	18.6	654	397	3,729
3	9.40	18.6	654	397	3,729
4	9.40	18.6	652	396	3,717
5	9.40	18.6	654	397	3,730
6	6.36	12.6	645	391	2,490
7	8.23	16.3	636	386	3,179
8	8.50	16.9	699	424	3,607
9	7.03	13.9	633	384	2,699
10	5.49	10.9	630	382	2,101
11	9.24	18.3	632	383	3,542
12	9.24	18.3	632	383	3,544
13	9.24	18.3	631	383	3,538
14	9.29	18.4	643	390	3,625
15	8.59	17.0	649	394	3,383
16	9.38	18.6	654	397	3,723
17	9.38	18.6	655	397	3,727
18	9.36	18.6	651	395	3,701
19	9.36	18.6	651	395	3,700
20	9.36	18.6	653	396	3,709
21	7.83	15.5	667	405	3,168
22	9.35	18.5	648	393	3,678
23	9.35	18.5	650	394	3,685
24	9.35	18.5	650	394	3,686
25	8.39	16.6	710	431	3,613
26	8.02	15.9	683	414	3,322
27	8.76	17.4	635	385	3,374
28	9.36	18.6	653	396	3,709
29	9.35	18.5	653	396	3,705
30	9.33	18.5	654	397	3,703
Total	263.40	522.5			104,048
	Monthly Flow Weighted TDS			395	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

DECEMBER 2002

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	9.33	18.5	652	395	3,690
2	9.33	18.5	651	395	3,690
3	9.32	18.5	650	395	3,678
4	9.12	18.1	651	395	3,602
5	9.32	18.5	652	396	3,688
6	7.58	15.0	646	392	2,971
7	9.32	18.5	654	397	3,700
8	8.90	17.7	652	396	3,520
9	9.33	18.5	650	395	3,683
10	8.25	16.4	651	395	3,258
11	5.31	10.5	666	404	2,145
12	3.61	7.2	838	508	1,834
13	7.41	14.7	830	504	3,734
14	7.06	14.0	822	499	3,522
15	7.44	14.8	820	498	3,707
16	7.44	14.8	821	498	3,709
17	7.32	14.5	821	498	3,648
18	7.41	14.7	823	499	3,702
19	2.43	4.8	831	505	1,226
20	4.19	8.3	794	482	2,022
21	7.44	14.8	826	501	3,731
22	7.43	14.7	826	501	3,724
23	8.33	16.5	741	450	3,744
24	9.41	18.7	645	391	3,684
25	9.12	18.1	643	391	3,560
26	6.27	12.4	664	403	2,527
27	9.33	18.5	661	401	3,745
28	9.40	18.6	647	393	3,688
29	9.40	18.6	646	392	3,684
30	8.11	16.1	660	401	3,249
31	9.38	18.6	656	398	3,735
Total	243.05	482.0			103,799
	Monthly Flow Weighted TDS			427	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

JANUARY 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	9.42	18.7	655	398	3,745
2	9.38	18.6	632	383	3,595
3	9.40	18.6	630	382	3,594
4	9.40	18.6	632	384	3,607
5	9.40	18.6	632	384	3,606
6	9.40	18.6	632	384	3,604
7	9.38	18.6	629	382	3,582
8	9.39	18.6	629	382	3,585
9	9.39	18.6	632	383	3,600
10	9.39	18.6	632	384	3,602
11	9.38	18.6	631	383	3,591
12	9.39	18.6	632	383	3,598
13	8.81	17.5	612	372	3,273
14	9.10	18.1	662	401	3,654
15	5.76	11.4	717	435	2,504
16	7.45	14.8	798	485	3,609
17	7.21	14.3	776	471	3,395
18	7.07	14.0	756	459	3,243
19	7.07	14.0	755	458	3,239
20	7.01	13.9	755	458	3,212
21	7.00	13.9	755	458	3,207
22	6.98	13.8	756	459	3,203
23	6.92	13.7	755	458	3,170
24	1.55	3.1	754	458	709
25	0.00	0.0	0	0	0
26	0.00	0.0	0	0	0
27	0.20	0.4	951	577	116
28	3.84	7.6	838	508	1,951
29	7.49	14.9	798	485	3,630
30	5.84	11.6	767	466	2,717
31	7.17	14.2	747	453	3,249
Total	219.16	434.7			91,389
	Monthly Flow Weighted TDS			417	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

FEBRUARY 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	7.64	15.1	817	496	3,788
2	7.63	15.1	817	496	3,783
3	7.57	15.0	803	487	3,686
4	7.92	15.7	631	383	3,033
5	8.78	17.4	557	338	2,968
6	8.65	17.2	575	349	3,017
7	8.82	17.5	566	344	3,030
8	8.82	17.5	566	343	3,026
9	8.82	17.5	568	345	3,042
10	7.82	15.5	644	391	3,055
11	6.41	12.7	703	426	2,732
12	7.63	15.1	672	408	3,113
13	8.72	17.3	535	325	2,831
14	8.77	17.4	543	329	2,887
15	8.82	17.5	566	344	3,030
16	8.82	17.5	566	344	3,030
17	5.08	10.1	568	344	1,749
18	8.85	17.6	548	333	2,942
19	8.30	16.5	581	353	2,928
20	8.70	17.3	556	337	2,933
21	8.89	17.6	556	337	2,998
22	8.89	17.6	557	338	3,004
23	8.89	17.6	555	337	2,993
24	8.85	17.5	545	331	2,928
25	6.83	13.5	551	334	2,283
26	8.15	16.2	437	265	2,159
27	8.14	16.2	435	264	2,151
28	8.03	15.9	413	250	2,011
Total	229.21	454.6			81,129
	Monthly Flow Weighted TDS			354	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

MARCH 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	8.06	16.0	416	253	2,035
2	8.06	16.0	416	253	2,036
3	6.50	12.9	445	270	1,756
4	8.07	16.0	419	255	2,055
5	8.07	16.0	420	255	2,054
6	8.07	16.0	420	255	2,058
7	8.07	16.0	420	255	2,056
8	8.07	16.0	421	256	2,061
9	8.07	16.0	420	255	2,057
10	8.00	15.9	421	255	2,043
11	8.07	16.0	422	256	2,064
12	8.07	16.0	421	256	2,062
13	8.10	16.1	428	260	2,101
14	8.28	16.4	461	280	2,315
15	8.00	15.9	410	249	1,992
16	6.44	12.8	125	76	490
17	7.48	14.8	561	340	2,544
18	8.22	16.3	445	270	2,222
19	8.03	15.9	333	202	1,623
20	7.08	14.0	220	134	946
21	6.59	13.1	126	77	505
22	6.59	13.1	126	76	503
23	6.59	13.1	126	76	504
24	7.68	15.2	324	197	1,510
25	8.68	17.2	514	312	2,707
26	9.00	17.9	567	344	3,095
27	9.00	17.9	568	345	3,104
28	6.36	12.6	569	345	2,197
29	0.00	0.0	0	0	0
30	3.88	7.7	504	306	1,189
31	8.53	16.9	495	300	2,559
Total	229.71	455.6			56,445
	Monthly Flow Weighted TDS			246	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

APRIL 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	8.21	16.3	437	265	2,175
2	8.33	16.5	460	279	2,325
3	8.33	16.5	460	279	2,326
4	7.80	15.5	472	287	2,236
5	8.40	16.7	470	285	2,394
6	8.05	16.0	471	286	2,303
7	3.53	7.0	444	269	951
8	7.90	15.7	390	237	1,871
9	6.49	12.9	118	72	466
10	7.17	14.2	243	148	1,059
11	8.19	16.2	436	265	2,168
12	8.19	16.2	439	266	2,180
13	8.20	16.3	440	267	2,189
14	8.20	16.3	439	266	2,182
15	8.20	16.3	440	267	2,190
16	8.20	16.3	452	274	2,246
17	8.20	16.3	456	277	2,268
18	8.19	16.2	456	277	2,269
19	8.19	16.2	455	276	2,262
20	8.19	16.2	454	276	2,258
21	7.72	15.3	347	211	1,627
22	8.01	15.9	417	253	2,027
23	8.16	16.2	447	271	2,212
24	8.23	16.3	466	283	2,329
25	7.43	14.7	445	270	2,007
26	7.90	15.7	402	244	1,928
27	7.90	15.7	401	243	1,921
28	7.89	15.7	400	243	1,916
29	7.92	15.7	405	246	1,947
30	8.71	17.3	534	324	2,825
Total	236.03	468.2			61,057
	Monthly Flow Weighted TDS			259	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

MAY 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	9.19	18.2	600	364	3,346
2	9.19	18.2	599	364	3,342
3	8.86	17.6	538	326	2,891
4	9.11	18.1	584	354	3,226
5	5.15	10.2	616	374	1,926
6	0.00	0.0	0	0	0
7	0.00	0.0	0	0	0
8	0.00	0.0	0	0	0
9	0.00	0.0	0	0	0
10	0.00	0.0	0	0	0
11	0.00	0.0	0	0	0
12	0.00	0.0	0	0	0
13	0.00	0.0	0	0	0
14	0.00	0.0	0	0	0
15	0.00	0.0	0	0	0
16	0.00	0.0	0	0	0
17	0.00	0.0	0	0	0
18	0.00	0.0	0	0	0
19	0.00	0.0	0	0	0
20	0.00	0.0	0	0	0
21	0.00	0.0	0	0	0
22	0.00	0.0	0	0	0
23	0.00	0.0	0	0	0
24	0.00	0.0	0	0	0
25	0.00	0.0	0	0	0
26	0.00	0.0	0	0	0
27	0.00	0.0	0	0	0
28	0.00	0.0	0	0	0
29	0.00	0.0	0	0	0
30	0.00	0.0	0	0	0
31	0.00	0.0	0	0	0
Total	41.50	82.3			14,731
	Monthly Flow Weighted TDS			355	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

JUNE 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	0.00	0.0	0	0	0
2	0.00	0.0	0	0	0
3	0.00	0.0	0	0	0
4	0.00	0.0	0	0	0
5	0.00	0.0	0	0	0
6	0.00	0.0	0	0	0
7	0.00	0.0	0	0	0
8	0.00	0.0	0	0	0
9	0.00	0.0	0	0	0
10	0.00	0.0	0	0	0
11	0.00	0.0	0	0	0
12	0.00	0.0	0	0	0
13	0.00	0.0	0	0	0
14	0.00	0.0	0	0	0
15	0.00	0.0	0	0	0
16	0.00	0.0	0	0	0
17	0.00	0.0	0	0	0
18	0.00	0.0	0	0	0
19	0.00	0.0	0	0	0
20	0.00	0.0	0	0	0
21	0.00	0.0	0	0	0
22	0.00	0.0	0	0	0
23	0.00	0.0	0	0	0
24	0.00	0.0	0	0	0
25	0.00	0.0	0	0	0
26	0.00	0.0	0	0	0
27	0.00	0.0	0	0	0
28	0.00	0.0	0	0	0
29	0.00	0.0	0	0	0
30	0.00	0.0	0	0	0
Total	0.00	0.0			0
	Monthly Flow Weighted TDS			#DIV/0!	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

JULY 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	0.00	0.0	0	0	0
2	0.00	0.0	0	0	0
3	0.00	0.0	0	0	0
4	0.00	0.0	0	0	0
5	0.00	0.0	0	0	0
6	0.00	0.0	0	0	0
7	0.00	0.0	0	0	0
8	0.00	0.0	0	0	0
9	0.00	0.0	0	0	0
10	0.00	0.0	0	0	0
11	0.00	0.0	0	0	0
12	0.00	0.0	0	0	0
13	0.00	0.0	0	0	0
14	0.00	0.0	0	0	0
15	0.00	0.0	0	0	0
16	0.00	0.0	0	0	0
17	0.00	0.0	0	0	0
18	0.00	0.0	0	0	0
19	0.00	0.0	0	0	0
20	0.00	0.0	0	0	0
21	1.90	3.8	751	455	867
22	5.84	11.6	525	319	1,861
23	5.78	11.5	515	312	1,806
24	5.39	10.7	556	337	1,817
25	4.72	9.4	556	337	1,593
26	6.90	13.7	597	362	2,499
27	9.93	19.7	608	369	3,664
28	9.94	19.7	607	368	3,661
29	9.43	18.7	607	369	3,474
30	9.86	19.6	611	371	3,653
31	8.78	17.4	601	365	3,201
Total	78.46	155.6			28,096
	Monthly Flow Weighted TDS			358	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

AUGUST 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	7.94	15.7	601	365	2,896
2	8.17	16.2	590	358	2,927
3	10.96	21.7	566	343	3,764
4	10.95	21.7	567	344	3,767
5	10.96	21.7	567	344	3,769
6	10.06	20.0	565	343	3,448
7	11.00	21.8	557	338	3,713
8	9.87	19.6	570	346	3,416
9	10.62	21.1	583	354	3,757
10	7.94	15.7	618	375	2,978
11	7.63	15.1	663	402	3,069
12	9.38	18.6	592	359	3,368
13	10.43	20.7	548	332	3,467
14	10.67	21.2	563	342	3,647
15	10.74	21.3	581	352	3,784
16	10.74	21.3	618	375	4,030
17	10.62	21.1	603	366	3,885
18	11.46	22.7	654	397	4,550
19	10.73	21.3	662	402	4,307
20	11.62	23.1	670	407	4,726
21	11.56	22.9	678	411	4,755
22	8.17	16.2	678	411	3,362
23	10.22	20.3	600	364	3,721
24	10.84	21.5	536	325	3,526
25	10.84	21.5	536	325	3,528
26	10.85	21.5	535	325	3,523
27	10.71	21.2	536	325	3,484
28	10.49	20.8	536	325	3,414
29	10.84	21.5	536	325	3,525
30	10.84	21.5	539	327	3,547
31	10.84	21.5	537	326	3,534
Total	318.71	632.1			113,187
	Monthly Flow Weighted TDS			355	

1. TDS = EC x 0.6069

TABLE F-1 (continued)

SUMMARY OF DISCHARGE AND WEIGHTED TDS
FROM THE ARLINGTON DESALTER TO THE ARLINGTON VALLEY DRAIN
WATER YEAR 2002-03

SEPTEMBER 2003

Day	Arlington Discharge (cfs)	Arlington Discharge (acre-feet)	Daily Mean EC (microsiemens/cm)	Computed TDS (mg/L)[1]	Outflow X TDS
1	10.84	21.5	536	325	3,527
2	10.84	21.5	534	324	3,514
3	9.92	19.7	605	367	3,643
4	10.51	20.8	605	367	3,859
5	11.65	23.1	676	410	4,782
6	11.64	23.1	671	407	4,740
7	11.62	23.1	670	407	4,727
8	11.63	23.1	670	407	4,732
9	11.64	23.1	677	411	4,781
10	11.35	22.5	683	414	4,702
11	7.74	15.4	571	347	2,682
12	11.42	22.7	458	278	3,173
13	11.02	21.9	684	415	4,575
14	11.63	23.1	678	412	4,787
15	11.64	23.1	678	412	4,789
16	11.64	23.1	681	413	4,809
17	11.64	23.1	681	413	4,812
18	10.52	20.9	681	413	4,350
19	11.33	22.5	681	414	4,688
20	11.35	22.5	649	394	4,469
21	9.98	19.8	624	378	3,778
22	8.82	17.5	570	346	3,051
23	10.68	21.2	597	363	3,872
24	11.10	22.0	668	405	4,500
25	11.57	22.9	684	415	4,806
26	11.56	22.9	681	413	4,779
27	11.55	22.9	679	412	4,755
28	11.59	23.0	681	414	4,793
29	11.59	23.0	682	414	4,795
30	8.81	17.5	651	395	3,477
Total	328.82	652.2			128,746
	Monthly Flow Weighted TDS			392	

1. TDS = EC x 0.6069

TABLE F-2

QUALITY OF WATER DISCHARGED
FROM THE ARLINGTON DESALTER
TO THE ARLINGTON VALLEY DRAIN

WATER YEAR 2002-03

Month	Discharge (acre-feet)	Weighted TDS (mg/L)	Discharge X TDS
2002			
October	542	397	215,473
November	522	395	206,377
December	482	427	205,847
2003			
January	435	417	181,267
February	455	354	160,917
March	456	246	111,956
April	468	259	121,105
May	82	355	29,219
June	0	---	---
July	156	358	55,727
August	632	355	224,502
September	652	392	255,364
Total	4,882		1,767,753
	Yearly Flow-weighted TDS =	362	

APPENDIX G

WATER QUALITY AND DISCHARGE FROM THE SAN JACINTO WATERSHED

WATER YEAR 2002-03

TABLE G-1

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2002-03
MARCH 2003

Day	[1] Temescal Creek Flow (cfs)	[2] Arlington Desalter Flow (cfs)	[3]=[1]-[2] Temescal Creek Flow - Arlington Desalter (cfs)	[4] Temescal Creek Base Flow (cfs)	[5] EMWD Wastewater Discharge (cfs)	[6] Scalped Storm Flow (cfs)	[7]=[3]-[4]-[6] San Jacinto Water Reaching Prado (cfs)
1	12.0	8.1	3.9	3.9	0.0	0.0	0.0
2	11.0	8.1	2.9	2.9	0.0	0.0	0.0
3	10.0	6.5	3.5	3.5	0.0	0.0	0.0
4	21.0	8.1	12.9	4.0	0.0	8.9	0.0
5	12.0	8.1	3.9	3.9	0.0	0.0	0.0
6	11.0	8.1	2.9	2.9	0.0	0.0	0.0
7	12.0	8.1	3.9	3.9	0.0	0.0	0.0
8	12.0	8.1	3.9	3.9	0.0	0.0	0.0
9	12.0	8.1	3.9	3.9	0.0	0.0	0.0
10	13.0	8.0	5.0	5.0	0.0	0.0	0.0
11	13.0	8.1	4.9	4.9	0.0	0.0	0.0
12	13.0	8.1	4.9	4.9	0.0	0.0	0.0
13	13.0	8.1	4.9	4.9	0.0	0.0	0.0
14	12.0	8.3	3.7	3.7	0.0	0.0	0.0
15	456.0	8.0	448.0	4.0	0.0	444.0	0.0
16	626.0	6.4	619.6	4.0	0.0	615.6	0.0
17	109.0	7.5	101.5	4.0	0.0	97.5	0.0
18	41.0	8.2	32.8	4.0	0.0	28.8	0.0
19	23.0	8.0	15.0	4.0	0.0	11.0	0.0
20	19.0	7.1	11.9	4.0	0.0	7.9	0.0
21	17.0	6.6	10.4	4.0	0.0	6.4	0.0
22	15.0	6.6	8.4	4.0	0.0	4.4	0.0
23	14.0	6.6	7.4	4.0	0.0	3.4	0.0
24	15.0	7.7	7.3	4.0	0.0	3.3	0.0
25	17.0	8.7	8.3	4.0	0.0	4.3	0.0
26	16.0	9.0	7.0	4.0	40.5	3.0	0.0
27	16.0	9.0	7.0	4.0	42.3	3.0	0.0
28	14.0	6.4	7.6	4.0	42.3	3.6	0.0
29	3.2	0.0	3.2	3.2	42.3	0.0	0.0
30	5.8	3.9	1.9	1.9	42.3	0.0	0.0
31	15.0	8.5	6.5	4.0	42.3	0.0	2.5
Total (cfs)	1,599	230	1,369	122	252	1,245	2
(acre-feet)	3,172	456	2,716	241	500	2,470	5

1. USGS measured flow of Temescal Creek above Main St. at Corona.
2. Discharge of the Arlington Desalter to the Arlington Valley Channel.
3. Temescal Creek flow minus the Arlington Desalter contribution.
4. When other flow was present, Temescal base flow was assumed to be 4 cfs based on flowrates during non-storm periods.
5. Eastern Municipal Water District wasterwater discharge to Temescal Creek at Wasson Canyon.
6. Temescal Creek flow attributed to storm events.
7. Flow in Temescal Creek at Corona attributed to EMWD discharge of wastewater to Temescal Creek.

TABLE G-1

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2002-03
APRIL 2003

Day	[1] Temescal Creek Flow (cfs)	[2] Arlington Desalter Flow (cfs)	[3]=[1]-[2] Temescal Creek Flow - Arlington Desalter (cfs)	[4] Temescal Creek Base Flow (cfs)	[5] EMWD Wastewater Discharge (cfs)	[6] Scalped Storm Flow (cfs)	[7]=[3]-[4]-[6] San Jacinto Water Reaching Prado (cfs)
1	24.0	8.2	15.8	4.0	42.3	0.0	11.8
2	29.0	8.3	20.7	4.0	0.0	0.0	16.7
3	34.0	8.3	25.7	4.0	0.0	0.0	21.7
4	33.0	7.8	25.2	4.0	0.0	0.0	21.2
5	31.0	8.4	22.6	4.0	0.0	0.0	18.6
6	25.0	8.0	17.0	4.0	0.0	0.0	13.0
7	15.0	3.5	11.5	4.0	0.0	0.0	7.5
8	21.0	7.9	13.1	4.0	0.0	0.0	9.1
9	18.0	6.5	11.5	4.0	0.0	0.0	7.5
10	18.0	7.2	10.8	4.0	0.0	0.0	6.8
11	19.0	8.2	10.8	4.0	0.0	0.0	6.8
12	18.0	8.2	9.8	4.0	0.0	0.0	5.8
13	20.0	8.2	11.8	4.0	0.0	0.0	7.8
14	285.0	8.2	276.8	4.0	25.6	266.3	6.5
15	88.0	8.2	79.8	4.0	41.6	70.0	5.8
16	35.0	8.2	26.8	4.0	42.3	17.8	5.0
17	32.0	8.2	23.8	4.0	39.6	15.6	4.3
18	30.0	8.2	21.8	4.0	40.1	14.3	3.5
19	40.0	8.2	31.8	4.0	40.1	12.0	15.8
20	48.0	8.2	39.8	4.0	39.6	10.0	25.8
21	48.0	7.7	40.3	4.0	39.6	9.0	27.3
22	50.0	8.0	42.0	4.0	39.6	9.0	29.0
23	54.0	8.2	45.8	4.0	40.1	9.0	32.8
24	61.0	8.2	52.8	4.0	40.1	8.7	40.1
25	67.0	7.4	59.6	4.0	40.1	15.5	40.1
26	61.0	7.9	53.1	4.0	40.1	9.0	40.1
27	53.0	7.9	45.1	4.0	40.1	1.0	40.1
28	53.0	7.9	45.1	4.0	40.5	0.6	40.5
29	53.0	7.9	45.1	4.0	40.5	0.6	40.5
30	49.0	8.7	40.3	4.0	40.5	0.0	36.3
Total (cfs)	1,412	236	1,176	120	712	468	588
Total (AF)	2,801	468	2,332	238	1,413	929	1,165

1. USGS measured flow of Temescal Creek above Main St. at Corona.
2. Discharge of the Arlington Desalter to the Arlington Valley Channel.
3. Temescal Creek flow minus the Arlington Desalter contribution.
4. When other flow was present, Temescal base flow was assumed to be 4 cfs based on flowrates during non-storm periods.
5. Eastern Municipal Water District wasterwater discharge to Temescal Creek at Wasson Canyon.
6. Temescal Creek flow attributed to storm events.
7. Flow in Temescal Creek at Corona attributed to EMWD discharge of wastewater to Temescal Creek.

TABLE G-1

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2002-03
MAY 2003

Day	[1] Temescal Creek Flow (cfs)	[2] Arlington Desalter Flow (cfs)	[3]=[1]-[2] Temescal Creek Flow - Arlington Desalter (cfs)	[4] Temescal Creek Base Flow (cfs)	[5] EMWD Wastewater Discharge (cfs)	[6] Scalped Storm Flow (cfs)	[7]=[3]-[4]-[6] San Jacinto Water Reaching Prado (cfs)
1	46.0	9.2	36.8	4.0	40.3	0.0	32.8
2	42.0	9.2	32.8	4.0	40.1	0.0	28.8
3	63.0	8.9	54.1	4.0	40.5	21.3	28.8
4	42.0	9.1	32.9	4.0	40.3	0.0	28.9
5	41.0	5.2	35.8	4.0	40.1	0.0	31.8
6	36.0	0.0	36.0	4.0	0.0	0.0	32.0
7	37.0	0.0	37.0	4.0	0.0	0.0	33.0
8	35.0	0.0	35.0	4.0	0.0	0.0	31.0
9	27.0	0.0	27.0	4.0	0.0	0.0	23.0
10	20.0	0.0	20.0	4.0	0.0	0.0	16.0
11	19.0	0.0	19.0	4.0	0.0	0.0	15.0
12	18.0	0.0	18.0	4.0	0.0	0.0	14.0
13	17.0	0.0	17.0	4.0	0.0	0.0	13.0
14	16.0	0.0	16.0	4.0	0.0	0.0	12.0
15	14.0	0.0	14.0	4.0	0.0	0.0	10.0
16	14.0	0.0	14.0	4.0	0.0	0.0	10.0
17	15.0	0.0	15.0	4.0	0.0	0.0	11.0
18	13.0	0.0	13.0	4.0	0.0	0.0	9.0
19	13.0	0.0	13.0	4.0	0.0	0.0	9.0
20	13.0	0.0	13.0	4.0	0.0	0.0	9.0
21	15.0	0.0	15.0	4.0	0.0	0.0	11.0
22	13.0	0.0	13.0	4.0	0.0	0.0	9.0
23	7.6	0.0	7.6	4.0	0.0	0.0	3.6
24	8.1	0.0	8.1	4.0	0.0	0.0	4.1
25	5.7	0.0	5.7	4.0	0.0	0.0	1.7
26	5.4	0.0	5.4	4.0	0.0	0.0	1.4
27	5.3	0.0	5.3	4.0	0.0	0.0	1.3
28	4.3	0.0	4.3	4.0	0.0	0.0	0.3
29	3.8	0.0	3.8	3.8	0.0	0.0	0.0
30	3.7	0.0	3.7	3.7	0.0	0.0	0.0
31	4.5	0.0	4.5	4.5	0.0	0.0	0.0
Total (cfs)	617	42	576	124	201	21	431
Total (AF)	1,225	82	1,142	246	399	42	854

1. USGS measured flow of Temescal Creek above Main St. at Corona.
2. Discharge of the Arlington Desalter to the Arlington Valley Channel.
3. Temescal Creek flow minus the Arlington Desalter contribution.
4. When other flow was present, Temescal base flow was assumed to be 4 cfs based on flowrates during non-storm periods.
5. Eastern Municipal Water District wasterwater discharge to Temescal Creek at Wasson Canyon.
6. Temescal Creek flow attributed to storm events.
7. Flow in Temescal Creek at Corona attributed to EMWD discharge of wastewater to Temescal Creek.

TABLE G-2
SUMMARY OF SAN JACINTO WATERSHED DISCHARGE
WATER YEAR 2002-03
MARCH 2003

Day	EMWD Discharge to Temescal Creek (cfs)[1]	San Jacinto Watershed Outflow Reaching Prado (cfs)[2]	Santa Ana River Flow Lost to the Ocean (cfs)[3]	San Jacinto Outflow Recharged by OCWD (cfs)[4]
1	0	0	20	0
2	0	0	0	0
3	0	0	94	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	929	0
16	0	0	3,155	0
17	0	0	1,355	0
18	0	0	382	0
19	0	0	104	0
20	0	0	35	0
21	0	0	27	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	41	0	0	0
27	42	0	0	0
28	42	0	0	0
29	42	0	0	0
30	42	0	0	0
31	42	2	0	2
Total	252	2	6,101	2

(1) Eastern Municipal Water District (EMWD) effluent discharge to Temescal Creek at Wasson Canyon.
(2) The amount of EMWD discharge determined to have reached Prado reservoir by scalping the flow of Temescal Creek at the Main St. gauging station in Corona.
(3) Flow of the Santa Ana River at Ball Road has historically been lost to the ocean. OCWD Forebay Operations currently sink 20-25 cfs between Ball Road and Orangewood Avenue. Therefore, the Ball Road figure minus 25 cfs was used for "Santa Ana River Flow Lost to the Ocean".
(4) When the Santa Ana River flow lost to the ocean is greater than the San Jacinto watershed outflow reaching Prado Dam, it is assumed that no San Jacinto watershed outflow could be recharged by OCWD. When San Jacinto watershed outflow reaching Prado Dam was greater than the Santa Ana River flow lost to the ocean, San Jacinto watershed outflow recharged by OCWD was calculated as the difference between the two.

TABLE G-2
SUMMARY OF SAN JACINTO WATERSHED DISCHARGE
WATER YEAR 2002-03
APRIL 2003

Day	EMWD Discharge to Temescal Creek (cfs)[1]	San Jacinto Watershed Outflow Reaching Prado (cfs)[2]	Santa Ana River Flow Lost to the Ocean (cfs)[3]	San Jacinto Outflow Recharged by OCWD (cfs)[4]
1	42	12	0	12
2	0	17	0	17
3	0	22	0	22
4	0	21	0	21
5	0	19	0	19
6	0	13	0	13
7	0	7	0	7
8	0	9	0	9
9	0	8	0	8
10	0	7	0	7
11	0	7	0	7
12	0	6	0	6
13	0	8	0	8
14	26	7	687	0
15	42	6	161	0
16	42	5	11	0
17	40	4	0	4
18	40	4	11	0
19	40	16	10	6
20	40	26	9	17
21	40	27	0	27
22	40	29	2	27
23	40	33	0	33
24	40	40	0	40
25	40	40	0	40
26	40	40	0	40
27	40	40	0	40
28	41	41	0	41
29	41	41	3	38
30	41	36	0	36
Total	712	588	894	543

(1) Eastern Municipal Water District (EMWD) effluent discharge to Temescal Creek at Wasson Canyon.
(2) The amount of EMWD discharge determined to have reached Prado reservoir by scalping the flow of Temescal Creek at the Main St. gauging station in Corona.
(3) Flow of the Santa Ana River at Ball Road has historically been lost to the ocean. OCWD Forebay Operations currently sink 20-25 cfs between Ball Road and Orangewood Avenue. Therefore, the Ball Road figure minus 25 cfs was used for "Santa Ana River Flow Lost to the Ocean".
(4) When the Santa Ana River flow lost to the ocean is greater than the San Jacinto watershed outflow reaching Prado Dam, it is assumed that no San Jacinto watershed outflow could be recharged by OCWD. When San Jacinto watershed outflow reaching Prado Dam was greater than the Santa Ana River flow lost to the ocean, San Jacinto watershed outflow recharged by OCWD was calculated as the difference between the two.

TABLE G-2
SUMMARY OF SAN JACINTO WATERSHED DISCHARGE
WATER YEAR 2002-03
MAY 2003

Day	EMWD Discharge to Temescal Creek (cfs)[1]	San Jacinto Watershed Outflow Reaching Prado (cfs)[2]	Santa Ana River Flow Lost to the Ocean (cfs)[3]	San Jacinto Outflow Recharged by OCWD (cfs)[4]
1	40	33	0	33
2	40	29	1	28
3	41	29	225	0
4	40	29	10	19
5	40	32	0	32
6	0	32	0	32
7	0	33	3	30
8	0	31	6	25
9	0	23	12	11
10	0	16	9	7
11	0	15	8	7
12	0	14	0	14
13	0	13	0	13
14	0	12	0	12
15	0	10	0	10
16	0	10	0	10
17	0	11	0	11
18	0	9	0	9
19	0	9	0	9
20	0	9	0	9
21	0	11	0	11
22	0	9	0	9
23	0	4	4	0
24	0	4	0	4
25	0	2	0	2
26	0	1	0	1
27	0	1	0	1
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
31	0	0	0	0
Total	201	431	278	349

(1) Eastern Municipal Water District (EMWD) effluent discharge to Temescal Creek at Wasson Canyon.
(2) The amount of EMWD discharge determined to have reached Prado reservoir by scalping the flow of Temescal Creek at the Main St. gauging station in Corona.
(3) Flow of the Santa Ana River at Ball Road has historically been lost to the ocean. OCWD Forebay Operations currently sink 20-25 cfs between Ball Road and Orangewood Avenue. Therefore, the Ball Road figure minus 25 cfs was used for "Santa Ana River Flow Lost to the Ocean".
(4) When the Santa Ana River flow lost to the ocean is greater than the San Jacinto watershed outflow reaching Prado Dam, it is assumed that no San Jacinto watershed outflow could be recharged by OCWD. When San Jacinto watershed outflow reaching Prado Dam was greater than the Santa Ana River flow lost to the ocean, San Jacinto watershed outflow recharged by OCWD was calculated as the difference between the two.

TABLE G-3
SUMMARY OF SAN JACINTO WATERSHED DISCHARGE
WATER YEAR 2002-03

MONTHLY TOTALS

Month	EMWD Discharge to Temescal Creek (cfs)[1]	San Jacinto Watershed Outflow Reaching Prado (cfs)[2]	Santa Ana River Flow Lost to the Ocean (cfs)[3]	San Jacinto Outflow Recharged By OCWD (cfs)[4]
2002				
October	0	0	0	0
November	0	0	727	0
December	0	0	6,269	0
2003				
January	0	0	0	0
February	0	0	11,494	0
March	252	2	6,101	2
April	712	588	894	543
May	201	431	278	349
June	0	0	14	0
July	0	0	15	0
August	0	0	0	0
September	0	0	0	0
Total (cfs)	1,166	1,021	25,792	894
(acre-feet)	2,312	2,024	51,158	1,774

(1) Eastern Municipal Water District (EMWD) effluent discharge to Temescal Creek at Wasson Canyon.

(2) The amount of EMWD discharge determined to have reached Prado reservoir by scalping the flow of Temescal Creek at the Main St. gauging station in Corona.

(3) Flow of the Santa Ana River at Ball Road has historically been lost to the ocean. OCWD Forebay Operations currently sink 20-25 cfs between Ball Road and Orangewood Avenue. Therefore, the Ball Road figure minus 25 cfs was used for "Santa Ana River Flow Lost to the Ocean".

(4) When the Santa Ana River flow lost to the ocean is greater than the San Jacinto watershed outflow reaching Prado Dam, it is assumed that no San Jacinto watershed outflow could be recharged by OCWD. When San Jacinto watershed outflow reaching Prado Dam was greater than the Santa Ana River flow lost to the ocean, San Jacinto watershed outflow recharged by OCWD was calculated as the difference between the two.

TABLE G-4
SUMMARY OF FLOW-WEIGHTED AVERAGE TDS
OF SAN JACINTO WATERSHED DISCHARGE
CALCULATED TO REACH PRADO RESERVOIR
WATER YEAR 2002-03

Month	EMWD Discharge to Temescal Creek[1] (acre-feet)	EMWD Disharge TDS[2] (mg/L)	95% of EMWD Discharge[3] (acre-feet)	Flow at Prado x TDS
2002				
October	0	---	0	0
November	0	---	0	0
December	0	---	0	0
2003				
January	0	---	0	0
February	0	---	0	0
March	500	640	475	319,894
April	1,413	680	1,342	960,856
May	399	680	379	271,505
June	0	---	0	0
July	0	---	0	0
August	0	---	0	0
September	0	---	0	0
Total	2,312		2,197	1,552,256

Flow-weighted TDS at Discharge [4] = 671 mg/L

Flow-weighted TDS of Discharge with 5% Evaporation [5] = 707 mg/L

(1) Actual EMWD discharge to Temescal Creek at Wasson Canyon.
(2) Water quality data for EMWD Surface Water Discharge at Wasson Canyon.
(3) EMWD discharge with 5% evaporation prior to arriving at Prado reservoir.
(4) Water quality for EMWD discharge at Wasson Canyon =
(Sum of Monthly Discharge Volume X Discharge TDS)/Total Discharge Volume.
(5) Water quality for EMWD discharge arriving at Prado reservoir =
(Sum of Monthly Discharge Volume X Discharge TDS)/95% of Total Discharge Volume.

APPENDIX H

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

WATER YEAR 2002-03

TABLE H-1

WATER QUALITY SAMPLES BELOW PRADO DAM
WATER YEAR 2002-03

Date	EC (microsiemens/cm)	TDS (mg/L)	Source
10/2/2002	591	968	USGS
10/7/2002	540	969	OCWD
10/17/2002	609	974	USGS
11/1/2002	586	948	USGS
11/7/2002	484	991	OCWD
11/15/2002	427	654	USGS
12/6/2002	555	887	USGS
12/9/2002	696	929	OCWD
12/19/2002	386	615	USGS
1/3/2003	490	792	USGS
1/17/2003	564	912	USGS
1/27/2003	636	1030	OCWD
1/31/2003	657	1040	USGS
2/6/2003	590	1030	OCWD
2/19/2003	389	614	USGS
3/7/2003	429	685	USGS
3/17/2003	210	286	OCWD
3/21/2003	301	492	USGS
4/3/2003	381	632	USGS
4/7/2003	404	671	OCWD
4/16/2003	218	354	USGS
5/2/2003	467	764	USGS
5/8/2003	494	837	OCWD
5/16/2003	514	834	USGS
6/6/2003	616	967	USGS
6/16/2003	628	1040	OCWD
6/19/2003	639	998	USGS
7/3/2003	619	1000	USGS
7/14/2003	582	995	OCWD
7/18/2003	605	964	USGS
8/1/2003	604	950	USGS
8/5/2003	568	970	OCWD
8/12/2003	572	930	OCWD
8/14/2003	562	927	OCWD
8/15/2003	559	900	USGS
8/19/2003	546	939	OCWD
8/26/2003	598	989	OCWD
9/5/2003	596	942	USGS
9/15/2003	496	904	OCWD
9/19/2003	547	873	USGS

TABLE H-2

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

OCTOBER 2002

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	192	952	595	114,303
2	189	953	596	112,636
3	167	940	588	98,167
4	163	898	562	91,535
5	169	872	545	92,156
6	173	862	539	93,256
7	160	866	542	86,648
8	149	926	579	86,282
9	139	944	590	82,056
10	141	929	581	81,914
11	143	941	588	84,149
12	145	939	587	85,144
13	147	929	581	85,399
14	148	936	585	86,628
15	149	967	605	90,102
16	207	949	593	122,845
17	227	972	608	137,979
18	226	961	601	135,817
19	224	949	593	132,934
20	224	944	590	132,233
21	223	949	593	132,340
22	222	963	602	133,690
23	222	945	591	131,192
24	222	877	548	121,751
25	199	872	545	108,515
26	195	893	558	108,895
27	196	890	557	109,086
28	222	891	557	123,695
29	236	927	580	136,808
30	232	955	597	138,552
31	232	941	588	136,521
Total	5,883			3,413,227

Monthly Flow Weighted TDS = 580 mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

NOVEMBER 2002

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	228	946	592	134,880
2	225	915	572	128,743
3	222	904	565	125,500
4	235	840	525	123,444
5	209	851	532	111,224
6	206	950	594	122,380
7	206	952	595	122,638
8	210	895	560	117,534
9	234	646	404	94,530
10	250	541	338	84,578
11	254	510	319	81,007
12	426	502	314	133,732
13	472	540	338	159,388
14	318	584	365	116,134
15	189	682	426	80,606
16	190	673	421	79,963
17	190	693	433	82,339
18	205	673	421	86,276
19	234	665	416	97,310
20	267	609	381	101,683
21	283	668	418	118,218
22	282	656	410	115,684
23	280	649	406	113,638
24	278	666	416	115,782
25	271	631	395	106,935
26	287	669	418	120,069
27	274	718	449	123,026
28	261	725	453	118,331
29	263	771	482	126,804
30	262	784	490	128,451
Total	7,711			3,370,829
		Monthly Flow Weighted TDS =	437	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

DECEMBER 2002

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	261	780	488	127,308
2	287	792	495	142,144
3	299	839	525	156,875
4	297	853	533	158,426
5	295	872	545	160,864
6	294	896	560	164,731
7	293	886	554	162,339
8	290	884	553	160,314
9	270	890	557	150,271
10	256	907	567	145,201
11	254	930	582	147,720
12	254	937	586	148,831
13	251	949	593	148,957
14	250	968	605	151,334
15	248	984	615	152,605
16	217	976	610	132,444
17	1,791	815	510	912,797
18	863	630	394	339,995
19	731	617	386	282,048
20	1,711	592	370	633,422
21	806	470	294	236,894
22	439	527	330	144,676
23	279	594	371	103,636
24	266	661	413	109,952
25	265	750	469	124,288
26	262	769	481	125,994
27	257	760	475	122,143
28	257	789	493	126,804
29	258	772	483	124,554
30	257	703	440	112,982
31	257	750	469	120,536
Total	13,015			6,031,084
		Monthly Flow Weighted TDS =	463	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

JANUARY 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	255	756	473	120,554
2	257	869	543	139,661
3	276	812	508	140,148
4	268	787	492	131,896
5	270	810	507	136,763
6	257	849	531	136,446
7	257	801	501	128,732
8	259	769	481	124,551
9	296	788	493	145,861
10	307	797	498	153,009
11	306	829	518	158,634
12	304	857	536	162,920
13	355	895	560	198,688
14	374	899	562	210,258
15	369	933	583	215,293
16	385	928	580	223,424
17	392	914	572	224,054
18	388	930	582	225,650
19	383	949	593	227,293
20	381	962	602	229,203
21	395	972	608	240,096
22	396	960	600	237,732
23	392	949	593	232,634
24	386	956	598	230,763
25	380	1000	625	237,632
26	374	1020	638	238,557
27	381	1020	638	243,022
28	376	1030	644	242,184
29	363	1060	663	240,621
30	354	1070	669	236,869
31	292	1040	650	189,905
Total	10,428			6,003,058
		Monthly Flow Weighted TDS =	576	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

FEBRUARY 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	248	1010	632	156,637
2	257	983	615	157,982
3	250	978	612	152,897
4	269	996	623	167,546
5	246	998	624	153,528
6	250	978	612	152,897
7	251	973	608	152,724
8	244	956	598	145,871
9	249	907	567	141,230
10	247	868	543	134,072
11	256	579	362	92,691
12	293	447	280	81,902
13	3,850	348	218	837,840
14	2,530	302	189	477,803
15	536	335	209	112,287
16	526	406	254	133,547
17	526	460	288	151,309
18	409	524	328	134,022
19	356	609	381	135,578
20	356	659	412	146,709
21	357	705	441	157,390
22	350	677	423	148,176
23	350	656	410	143,580
24	348	670	419	145,806
25	1,170	453	283	331,440
26	3,190	465	291	927,609
27	984	524	328	322,439
28	532	532	333	176,988
Total	19,430			6,172,501
		Monthly Flow Weighted TDS =	318	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

MARCH 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	503	557	348	175,204
2	475	600	375	178,224
3	474	625	391	185,259
4	372	704	440	163,771
5	471	748	468	220,315
6	520	714	446	232,179
7	514	679	425	218,250
8	508	684	428	217,291
9	503	714	446	224,588
10	498	766	479	238,550
11	494	819	512	253,007
12	488	858	537	261,835
13	431	896	560	241,494
14	308	923	577	177,776
15	287	861	538	154,528
16	2,820	333	208	587,238
17	1,270	339	212	269,231
18	670	358	224	149,996
19	600	407	255	152,710
20	567	453	283	160,621
21	532	481	301	160,021
22	512	519	325	166,172
23	512	534	334	170,975
24	511	540	338	172,558
25	508	545	341	173,134
26	507	536	335	169,939
27	507	533	333	168,988
28	497	548	343	170,317
29	494	585	366	180,719
30	492	658	411	202,447
31	510	700	438	223,249
Total	18,355			6,420,587

Monthly Flow Weighted TDS = 350 mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

APRIL 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	503	717	448	225,532
2	486	688	430	209,096
3	482	613	383	184,769
4	479	579	362	173,434
5	475	615	385	182,680
6	474	634	396	187,927
7	471	631	395	185,854
8	499	625	391	195,030
9	509	593	371	188,753
10	502	557	348	174,856
11	497	551	345	171,249
12	492	566	354	174,142
13	488	591	370	180,355
14	489	623	390	190,510
15	506	512	320	162,010
16	483	368	230	111,152
17	479	421	263	126,107
18	489	459	287	140,360
19	487	529	331	161,104
20	485	608	380	184,402
21	485	683	427	207,149
22	483	713	446	215,356
23	482	698	436	210,389
24	480	761	476	228,427
25	479	796	498	238,435
26	479	800	500	239,633
27	480	784	490	235,331
28	487	765	478	232,976
29	499	759	475	236,845
30	502	753	471	236,385
Total	14,631			5,790,248
		Monthly Flow Weighted TDS =	396	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

MAY 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	506	773	483	244,597
2	509	777	486	247,320
3	494	778	487	240,341
4	476	791	495	235,453
5	487	776	485	236,326
6	513	800	500	256,642
7	513	814	509	261,134
8	511	831	520	265,548
9	509	842	527	268,010
10	506	852	533	269,595
11	501	861	538	269,750
12	501	839	525	262,858
13	499	816	510	254,631
14	495	815	510	252,281
15	345	825	516	177,989
16	262	849	531	139,101
17	92	*877* [2]	548	50,427
18	90	*877* [2]	548	49,331
19	158	904	565	89,320
20	281	891	557	156,569
21	308	890	557	171,420
22	435	887	555	241,287
23	337	906	567	190,932
24	287	920	575	165,117
25	283	927	580	164,054
26	280	929	581	162,665
27	279	938	587	163,655
28	282	941	588	165,943
29	294	943	590	173,372
30	310	939	587	182,032
31	310	942	589	182,614
Total	11,653			6,190,315

Monthly Flow Weighted TDS = 531 mg/L

1. TDS = EC x 0.625347 2. Missing data; value is average of previous and following values.

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

JUNE 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	309	944	590	182,411
2	325	951	595	193,279
3	346	966	604	209,014
4	343	974	609	208,917
5	338	961	601	203,124
6	336	957	598	201,082
7	335	941	588	197,131
8	331	924	578	191,259
9	329	916	573	188,457
10	323	914	572	184,616
11	318	949	593	188,719
12	326	972	608	198,155
13	325	970	607	197,141
14	322	970	607	195,321
15	317	974	609	193,081
16	333	990	619	206,158
17	335	1000	625	209,491
18	334	1010	632	210,955
19	339	1000	625	211,993
20	326	1000	625	203,863
21	317	1020	638	202,200
22	310	1030	644	199,673
23	317	1040	650	206,164
24	297	1050	657	195,015
25	251	1030	644	161,671
26	223	995	622	138,755
27	216	986	617	133,184
28	218	964	603	131,418
29	215	959	600	128,937
30	216	954	597	128,862
Total	9,170			5,600,045
		Monthly Flow Weighted TDS =	611	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

JULY 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	213	971	607	129,336
2	213	975	610	129,869
3	208	951	595	123,699
4	207	930	582	120,386
5	201	902	564	113,377
6	200	893	558	111,687
7	205	891	557	114,223
8	210	925	578	121,474
9	212	916	573	121,437
10	214	904	565	120,977
11	215	901	563	121,139
12	209	906	567	118,412
13	210	917	573	120,423
14	209	944	590	123,378
15	205	962	602	123,325
16	210	958	599	125,807
17	208	946	592	123,048
18	215	959	600	128,937
19	221	965	603	133,365
20	217	960	600	130,272
21	215	964	603	129,609
22	207	963	602	124,657
23	207	956	598	123,751
24	210	940	588	123,444
25	206	942	589	121,350
26	203	945	591	119,963
27	196	934	584	114,479
28	197	939	587	115,679
29	215	949	593	127,593
30	214	951	595	127,267
31	217	939	587	127,423
Total	6,489			3,809,786
		Monthly Flow Weighted TDS =	587	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

AUGUST 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	205	931	582	119,351
2	201	933	583	117,273
3	200	922	577	115,314
4	205	926	579	118,710
5	217	937	586	127,151
6	218	907	567	123,647
7	208	887	555	115,374
8	198	885	553	109,580
9	198	882	552	109,208
10	200	866	542	108,310
11	200	863	540	107,935
12	196	880	550	107,860
13	202	897	561	113,309
14	199	910	569	113,244
15	210	904	565	118,716
16	199	898	562	111,751
17	208	888	555	115,504
18	208	878	549	114,203
19	206	887	555	114,265
20	189	943	590	111,454
21	195	936	585	114,138
22	188	916	573	107,690
23	182	902	564	102,659
24	181	921	576	104,246
25	181	923	577	104,472
26	177	930	582	102,938
27	182	945	591	107,553
28	182	938	587	106,757
29	185	926	579	107,128
30	193	888	555	107,174
31	192	883	552	106,019
Total	6,105			3,462,935
		Monthly Flow Weighted TDS =	567	mg/L

1. TDS = EC x 0.625347

TABLE H-2 (continued)

SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2002-03

SEPTEMBER 2003

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS[1]	Outflow X TDS
1	194	878	549	106,517
2	203	907	567	115,140
3	190	935	585	111,093
4	184	950	594	109,311
5	182	936	585	106,529
6	178	914	572	101,739
7	182	897	561	102,090
8	188	891	557	104,751
9	202	874	547	110,404
10	209	870	544	113,707
11	210	875	547	114,908
12	215	877	548	117,912
13	213	871	545	116,016
14	221	870	544	120,235
15	222	888	555	123,278
16	213	911	570	121,344
17	216	888	555	119,947
18	215	890	557	119,660
19	215	874	547	117,509
20	219	853	533	116,819
21	226	822	514	116,172
22	222	822	514	114,116
23	213	823	515	109,623
24	211	848	530	111,892
25	215	861	538	115,761
26	223	858	537	119,650
27	222	871	545	120,918
28	230	860	538	123,694
29	226	859	537	121,401
30	217	873	546	118,466
Total	6,276			3,440,603
		Monthly Flow Weighted TDS =	548	mg/L

1. TDS = EC x 0.625347

TABLE H-3

ANNUAL SUMMARY OF FLOW WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 2002-03

Month	Monthly Flow (cfs-days)	Monthly Weighted TDS (mg/L)	Monthly Flow x TDS
2002			
October	5,883	580	3,413,227
November	7,711	437	3,370,829
December	13,015	463	6,031,084
2003			
January	10,428	576	6,003,058
February	19,430	318	6,172,501
March	18,355	350	6,420,587
April	14,631	396	5,790,248
May	11,653	531	6,190,315
June	9,170	611	5,600,045
July	6,489	587	3,809,786
August	6,105	567	3,462,935
September	6,276	548	3,440,603
Total	129,146		59,705,216
Yearly Flow-weighted TDS =		462	

APPENDIX I

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

WATER YEAR 2002-03

PREPARED BY

DONALD L. HARRIGER

TABLE I-1

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

WATER YEAR 2002-03

MONTH	Discharge (acre -feet)	TDS (mg/L)	Discharge xTDS
2002			
October	195	648	126,379
November	192	652	125,458
December	196	652	127,779
2003			
January	193	696	134,418
February	178	672	119,529
March	199	620	123,275
April	191	644	122,734
May	192	668	128,370
June	190	672	127,452
July	200	624	124,669
August	200	696	139,054
September	197	640	126,093
Total	2,322		1,525,208

Flow weighted TDS = $\frac{1,525,208}{2,322}$ = 657 mg/L

APPENDIX J

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

WATER YEAR 2002-03

PREPARED BY

DONALD L. HARRIGER

TABLE J-1

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2002-03

Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data		Ratio	Average
2002						
10/1/02	920	567	USGS		0.62	
10/2/02	924	528	C of R		0.57	
10/11/02	935	548	C of R		0.59	
10/16/02	930	586	USGS		0.63	
10/16/02	922	564	C of R		0.61	
10/25/02	918	576	C of R		0.63	
10/30/02	896	567	USGS		0.63	
10/30/02	916	600	C of R		0.66	567
11/8/02	932	584	C of R		0.63	
11/15/02	888	556	USGS	*	0.63	
11/15/02	934	576	C of R	*	0.62	
11/22/02	981	628	C of R		0.64	
11/27/02	977	640	C of R		0.66	617
12/3/02	957	604	USGS		0.63	
12/6/02	1033	632	C of R		0.61	
12/11/02	1018	636	C of R		0.62	
12/17/02	585	368	USGS	*	0.63	
12/20/02	267	212	C of R	*	0.79	
12/25/02	992	664	C of R	*	0.67	624
2003						
1/3/03	966	608	C of R	*	0.63	
1/7/03	934	580	USGS		0.62	
1/8/03	961	584	C of R		0.61	
1/16/03	940	588	USGS		0.63	
1/17/03	995	544	C of R		0.55	
1/22/03	987	624	C of R		0.63	
1/31/03	1007	632	C of R		0.63	592

*Data not used in determining monthly averages; storm flow.
C of R City of Riverside
USGS U.S. Geological Survey

TABLE J-1

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2002-03

Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data		Ratio	Average
2/4/03	916	585	USGS		0.64	
2/5/03	951	536	C of R		0.56	
2/14/03	430	380	C of R	*	0.88	
2/19/03	989	616	C of R	*	0.62	
2/20/03	957	608	USGS	*	0.64	
2/28/03	784	524	C of R	*	0.67	561
3/3/03	956	602	USGS	*	0.63	
3/5/03	981	560	C of R	*	0.57	
3/14/03	951	584	C of R		0.61	
3/18/03	693	429	USGS	*	0.62	
3/19/03	798	520	C of R	*	0.65	
3/28/03	1027	604	C of R		0.59	594
4/2/03	1037	644	C of R		0.62	
4/3/03	970	614	USGS		0.63	
4/11/03	1065	732	C of R		0.69	
4/16/03	724	431	USGS	*	0.60	
4/16/03	717	424	C of R	*	0.59	
4/25/03	995	608	C of R		0.61	
4/30/03	1018	608	C of R		0.60	641
5/2/03	992	635	USGS		0.64	
5/7/03	972	612	C of R		0.63	
5/16/03	1064	676	C of R		0.64	
5/19/03	992	626	USGS		0.63	
5/21/03	1035	612	C of R		0.59	
5/30/03	1039	716	C of R		0.69	646

*Data not used in determining monthly averages; storm flow.
C of R City of Riverside
USGS U.S. Geological Survey

TABLE J-1

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2002-03

Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data	Ratio	Average
6/3/03	983	613	USGS	0.62	
6/6/03	1064	740	C of R	0.70	
6/11/03	985	676	C of R	0.69	
6/16/03	934	581	USGS	0.62	
6/20/03	1024	740	C of R	0.72	
6/25/03	957	688	C of R	0.72	673
7/4/03	974	600	C of R	0.62	
7/8/03	925	577	USGS	0.62	
7/9/03	990	692	C of R	0.70	
7/18/03	978	652	C of R	0.67	
7/22/03	938	593	USGS	0.63	
7/23/03	962	712	C of R	0.74	638
8/1/03	926	582	USGS	0.63	
8/1/03	963	684	C of R	0.71	
8/6/03	973	560	C of R	0.58	
8/15/03	981	644	C of R	0.66	
8/18/03	958	609	USGS	0.64	
8/20/03	991	644	C of R	0.65	
8/29/03	893	680	C of R	0.76	629
9/3/03	942	571	USGS	0.61	
9/3/03	964	640	C of R	0.66	
9/12/03	983	592	C of R	0.60	
9/17/03	934	580	USGS	0.62	
9/17/03	961	656	C of R	0.68	
9/26/03	975	664	C of R	0.68	617

*Data not used in determining monthly averages; storm flow.
C of R City of Riverside
USGS U.S. Geological Survey

TABLE J-2

ANNUAL SUMMARY OF FLOW WEIGHTED TDS AT RIVERSIDE NARROWS
WATER YEAR 2002-03

	Month	Stream Flow [1] (acre-feet)	Monthly Average TDS (mg/L)	Monthly Flow x TDS
2002	October	4,102	567	2,325,994
	November	4,647	617	2,868,641
	December	4,989	624	3,112,904
2003	January	5,187	592	3,070,704
	February	4,678	561	2,622,241
	March	5,442	594	3,232,716
	April	5,232	641	3,354,758
	May	5,191	646	3,354,251
	June	4,854	673	3,266,792
	July	4,554	638	2,903,724
	August	4,708	629	2,961,026
	September	4,163	617	2,569,408
	Total	57,747		35,643,159

$$\text{Flow-weighted TDS} = \frac{35,643,159}{57,747} = 617 \text{ mg/L}$$

(1) USGS measured flow minus storm flow.
(2) TDS based on water quality data from Table J-1.

APPENDIX K

WMWD TRANSFER PROGRAM WATER DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS

WATER YEAR 2002-03

TABLE K-1

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
(acre-feet)

Month	Discharged Above Riverside Narrows[1]	Flow Arriving At Riverside Narrows[1]	Flow Arriving At Prado Dam [1]
2002			
October	578	578	578
November	269	269	269
December	94	94	94
2003			
January	0	0	0
February	229	229	229
March	61	61	61
April	0	0	0
May	0	0	0
June	354	354	354
July	654	654	654
August	611	611	611
September	814	814	814
Total	3,664	3,664	3,664

(1) Unadjusted for evapotranspiration loss per agreement between WMWD and OCWD.

TABLE K-2

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
OCTOBER 2002

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	10.3	10.3	10.3
2	10.5	10.5	10.5
3	10.0	10.0	10.0
4	10.4	10.4	10.4
5	12.1	12.1	12.1
6	11.0	11.0	11.0
7	0.0	0.0	0.0
8	17.8	17.8	17.8
9	10.0	10.0	10.0
10	10.2	10.2	10.2
11	9.4	9.4	9.4
12	9.4	9.4	9.4
13	11.0	11.0	11.0
14	7.4	7.4	7.4
15	10.2	10.2	10.2
16	10.3	10.3	10.3
17	10.2	10.2	10.2
18	10.4	10.4	10.4
19	11.8	11.8	11.8
20	11.3	11.3	11.3
21	8.0	8.0	8.0
22	10.5	10.5	10.5
23	9.4	9.4	9.4
24	7.4	7.4	7.4
25	9.1	9.1	9.1
26	7.3	7.3	7.3
27	7.3	7.3	7.3
28	6.3	6.3	6.3
29	7.4	7.4	7.4
30	7.4	7.4	7.4
31	7.4	7.4	7.4
Total in cfs-days	291.3	291.3	291.3
Total in AF	578	578	578

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
NOVEMBER 2002

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	7.5	7.5	7.5
2	8.2	8.2	8.2
3	7.7	7.7	7.7
4	6.3	6.3	6.3
5	7.3	7.3	7.3
6	7.4	7.4	7.4
7	7.0	7.0	7.0
8	8.1	8.1	8.1
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	1.4	1.4	1.4
12	0.0	0.0	0.0
13	0.2	0.2	0.2
14	4.8	4.8	4.8
15	6.4	6.4	6.4
16	7.9	7.9	7.9
17	8.1	8.1	8.1
18	4.4	4.4	4.4
19	6.9	6.9	6.9
20	8.5	8.5	8.5
21	4.5	4.5	4.5
22	2.9	2.9	2.9
23	2.4	2.4	2.4
24	2.6	2.6	2.6
25	2.2	2.2	2.2
26	0.9	0.9	0.9
27	2.9	2.9	2.9
28	3.0	3.0	3.0
29	3.0	3.0	3.0
30	3.0	3.0	3.0
Total in cfs-days	135.7	135.7	135.7
Total in AF	269	269	269

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
DECEMBER 2002

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	2.9	2.9	2.9
2	3.0	3.0	3.0
3	3.0	3.0	3.0
4	3.0	3.0	3.0
5	3.0	3.0	3.0
6	3.4	3.4	3.4
7	2.8	2.8	2.8
8	3.5	3.5	3.5
9	2.1	2.1	2.1
10	3.0	3.0	3.0
11	2.7	2.7	2.7
12	3.1	3.1	3.1
13	0.0	0.0	0.0
14	6.6	6.6	6.6
15	3.3	3.3	3.3
16	2.4	2.4	2.4
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
31	0.0	0.0	0.0
Total in cfs-days	47.6	47.6	47.6
Total in AF	94	94	94

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
JANUARY 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
31	0.0	0.0	0.0
Total in cfs-days	0.0	0.0	0.0
Total in AF	0	0	0

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
FEBRUARY 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	2.1	2.1	2.1
4	9.7	9.7	9.7
5	7.2	7.2	7.2
6	9.4	9.4	9.4
7	9.5	9.5	9.5
8	10.1	10.1	10.1
9	10.1	10.1	10.1
10	8.0	8.0	8.0
11	9.4	9.4	9.4
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	2.9	2.9	2.9
21	6.8	6.8	6.8
22	10.1	10.1	10.1
23	10.1	10.1	10.1
24	10.1	10.1	10.1
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
Total in cfs-days	115.3	115.3	115.3
Total in AF	229	229	229

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
MARCH 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	4.1	4.1	4.1
11	7.8	7.8	7.8
12	9.8	9.8	9.8
13	8.9	8.9	8.9
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
31	0.0	0.0	0.0
Total in cfs-days	30.6	30.6	30.6
Total in AF	61	61	61

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
APRIL 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
Total in cfs-days	0.0	0.0	0.0
Total in AF	0	0	0

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
MAY 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
31	0.0	0.0	0.0
Total in cfs-days	0.0	0.0	0.0
Total in AF	0	0	0

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
JUNE 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	8.7	8.7	8.7
13	8.1	8.1	8.1
14	10.5	10.5	10.5
15	9.4	9.4	9.4
16	10.4	10.4	10.4
17	9.2	9.2	9.2
18	10.8	10.8	10.8
19	7.4	7.4	7.4
20	10.8	10.8	10.8
21	10.6	10.6	10.6
22	9.1	9.1	9.1
23	7.5	7.5	7.5
24	9.8	9.8	9.8
25	9.8	9.8	9.8
26	9.7	9.7	9.7
27	8.0	8.0	8.0
28	10.4	10.4	10.4
29	10.3	10.3	10.3
30	7.8	7.8	7.8
Total in cfs-days	178.4	178.4	178.4
Total in AF	354	354	354

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
JULY 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	9.6	9.6	9.6
2	9.7	9.7	9.7
3	9.6	9.6	9.6
4	10.7	10.7	10.7
5	8.6	8.6	8.6
6	10.7	10.7	10.7
7	8.4	8.4	8.4
8	9.7	9.7	9.7
9	7.4	7.4	7.4
10	3.1	3.1	3.1
11	6.9	6.9	6.9
12	9.7	9.7	9.7
13	10.9	10.9	10.9
14	11.8	11.8	11.8
15	12.1	12.1	12.1
16	12.2	12.2	12.2
17	12.4	12.4	12.4
18	12.9	12.9	12.9
19	10.8	10.8	10.8
20	11.4	11.4	11.4
21	12.7	12.7	12.7
22	11.5	11.5	11.5
23	12.7	12.7	12.7
24	12.8	12.8	12.8
25	13.4	13.4	13.4
26	10.4	10.4	10.4
27	11.2	11.2	11.2
28	12.0	12.0	12.0
29	10.5	10.5	10.5
30	12.2	12.2	12.2
31	12.2	12.2	12.2
Total in cfs-days	329.9	329.9	329.9
Total in AF	654	654	654

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
AUGUST 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	8.6	8.6	8.6
2	15.6	15.6	15.6
3	12.1	12.1	12.1
4	11.0	11.0	11.0
5	12.3	12.3	12.3
6	10.6	10.6	10.6
7	12.2	12.2	12.2
8	12.2	12.2	12.2
9	12.2	12.2	12.2
10	12.2	12.2	12.2
11	10.3	10.3	10.3
12	12.1	12.1	12.1
13	12.0	12.0	12.0
14	8.2	8.2	8.2
15	9.1	9.1	9.1
16	11.3	11.3	11.3
17	11.5	11.5	11.5
18	9.0	9.0	9.0
19	10.9	10.9	10.9
20	10.5	10.5	10.5
21	5.6	5.6	5.6
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	11.8	11.8	11.8
27	12.1	12.1	12.1
28	14.2	14.2	14.2
29	15.0	15.0	15.0
30	14.3	14.3	14.3
31	11.6	11.6	11.6
Total in cfs-days	308.3	308.3	308.3
Total in AF	611	611	611

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-2 (continued)

WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03
SEPTEMBER 2003

Day	Discharged Above Riverside Narrows (cfs)	Flow Arriving At Riverside Narrows[1] (cfs)	Flow Arriving At Prado Dam[1] (cfs)
1	13.1	13.1	13.1
2	13.0	13.0	13.0
3	14.1	14.1	14.1
4	14.0	14.0	14.0
5	14.0	14.0	14.0
6	14.1	14.1	14.1
7	14.2	14.2	14.2
8	12.1	12.1	12.1
9	14.1	14.1	14.1
10	13.9	13.9	13.9
11	14.0	14.0	14.0
12	14.0	14.0	14.0
13	13.6	13.6	13.6
14	13.0	13.0	13.0
15	12.2	12.2	12.2
16	13.8	13.8	13.8
17	13.8	13.8	13.8
18	13.7	13.7	13.7
19	13.9	13.9	13.9
20	14.1	14.1	14.1
21	14.1	14.1	14.1
22	11.5	11.5	11.5
23	13.8	13.8	13.8
24	13.8	13.8	13.8
25	14.0	14.0	14.0
26	15.6	15.6	15.6
27	12.0	12.0	12.0
28	14.4	14.4	14.4
29	14.1	14.1	14.1
30	14.0	14.0	14.0
Total in cfs-days	410.3	410.3	410.3
Total in AF	814	814	814

(1) Unadjusted for evapotranspiration loss per agreement between WMWD

TABLE K-3

SUMMARY OF TDS OF WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03

Month	Discharged (acre-feet)	TDS[1] (mg/L)	Discharge x TDS	Flow At Riverside Narrows[2] (acre-feet)	Flow At Prado[2] (acre-feet)
2002					
October	578	*458*	264,724	578	578
November	269	*494*	132,972	269	269
December	94	*530*	50,007	94	94
2003					
January	0	---	0	0	0
February	229	*534*	121,960	229	229
March	61	*534*	32,370	61	61
April	0	---	0	0	0
May	0	---	0	0	0
June	354	*534*	188,819	354	354
July	654	541	353,992	654	654
August	611	500	305,744	611	611
September	814	*486*	395,501	814	814
Total	3,664		1,846,089	3,664	3,664

Flow-weighted TDS of pumped groundwater releases to the Santa Ana River :

At Riverside Narrows: $\frac{1,846,089}{3,664} = 504$ mg/L

At Prado: $\frac{1,846,089}{3,664} = 504$ mg/L

(1) Estimated average monthly TDS is italicized; see page Table K-4. Data is from the Riverside Canal.

(2) Unadjusted for evaporation loss per agreement between WMWD and OCWD.

TABLE K-4

SUMMARY OF TDS OF WMWD TRANSFER PROGRAM WATER
DISCHARGED TO THE SANTA ANA RIVER ABOVE RIVERSIDE NARROWS
WATER YEAR 2002-03

CALCULATION OF WMWD TRANSFER PROGRAM FLOW TDS

Water quality samples collected from the wells were unavailable. The flow is delivered via the Riverside Canal. Three samples were collected from the new gauging station on the Riverside Canal in July and August 2003 and analyzed for TDS and EC. The gauge is located just east of the 91 freeway, 0.5 miles north of Ivy St. in Riverside. A ratio was developed from the TDS vs. the lab EC and field EC from those samples. That ratio was applied to field EC data of a samples from October and December 2002 and from July 2003 to obtain TDS for those months. No data was available between December 2002 and July 2003. The average of the December and July data was used for those months.

Water Quality Samples from the Riverside Canal

Date	TDS[1] (mg/L)	EC (um/cm)	Field-EC (um/cm)	TDS/EC Ratio	TDS/F-EC Ratio
10/15/02	*458*		750		
12/05/02	*530*		869		
07/10/03	*592*		970		
07/15/03	490	803	803	0.6102	0.6102
08/12/03	478	788	784	0.6066	0.6097
08/19/03	522	870	854	0.6000	0.6112
09/16/03	*486*		796		
			Average	**0.6056**	**0.6104**

1. TDS in italics estimated from the ratio of lab calculated TDS from 3 sampling events to field-EC for 4 other samples.