SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

VS. CITY OF CHINO, et al

CASE NO. 117628-COUNTY OF ORANGE

THIRTEENTH

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

1982-83

APRIL 5, 1984

SANTA ANA RIVER WATERMASTER

FOR
ORANGE COUNTY WATER DISTRICT VS. CITY OF CHINO, ET AL
CASE NO. 117628 — COUNTY OF ORANGE

WATERMASTER
HARVEY O. BANKS
WILLIAM J. CARROLL
JAMES C. HANSON
DONALD L. HARRIGER
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April 5, 1983

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

Re: Watermaster Report for 1982-83

Gentlemen:

We have the honor of submitting herewith the Thirteenth Annual Report of the Santa Ana River Watermaster.

The principal findings of the Watermaster for the water year 1982-83 are as follows:

At Prado

(1)	Base Flow at Prado	111,692 acre-feet
(2)	Annual Weighted TDS of Base and Storm Flows	411 mg/l
(3)	Annual Adjusted Base Flow	138,591 acre-feet
(4)	One-half Lake Elsinore Discharge Reaching Prado Dam and Recharging Orange County Groundwater Basin	3,362 acre-feet
(5)	Cumulative Adjusted Base Flow	899,036 acre-feet
(6)	Cumulative Entitlement of OCWD	546,000 acre-feet
(7)	Cumulative Credit	353,036 acre-feet
(8)	One-third of Cumulative Debit	0 acre-feet
(9)	Minimum Required Base Flow in 1983-84	34,000 acre-feet

At Riverside Narrows

(1)	Base Flow at Riverside Narrows	57,128 acre-feet
(2)	Annual Weighted TDS of Base Flow	610 mg/l
(3)	Annual Adjusted Base Flow	57,128 acre-feet
(4)	Cumulative Adjusted Base Flow	300,102 acre-feet
(5)	Cumulative Entitlement of CBMWD and WMWD	198,250 acre-feet
(6)	Cumulative Credit	101,852 acre-feet
(7)	One-third of Cumulative Debit	0 acre-feet
(8)	Minimum Required Base Flow in 1983-84	12,420 acre-feet

The above findings show that at the end of the 1982-83 water year Chino Basin Municipal Water District and Western Municipal Water District have a cumulative credit of 353,036 acre-feet to their Base Flow obligation at Prado Dam. San Bernardino Valley Municipal Water District has a cumulative credit of 101,852 acre-feet to its Base Flow obligation at Riverside Narrows.

Because of above average rainfall and high water levels in Lake Elsinore, pumping from Lake Elsinore and discharge to Temescal Wash was again undertaken during this water year. The discharge of water from Lake Elsinore to the Santa Ana River is considered a rare event and was not contemplated under this Judgment. In view of this special case and since a portion of the water pumped from Lake Elsinore was determined by the Watermaster to have been recharged to the groundwater basin in Orange County, one-half of such amount has been considered a credit against the Upper Area Base Flow Obligation at Prado Dam.

Sincerely yours,

SANTA ANA RIVER WATERMASTER

BY: Harvey O. Banks

Harvey O. Banks

Donald L. Harriger

William J. Carroll

William J. Carroll

William R. Mills, Jr.

James C. Hanson

James C. Hanson

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CHAPTER I
WATERMASTER ACTIVITIES

This is the thirteenth annual report of the Santa Ana River Watermaster required by the stipulated Judgment in the case of Orange County Water District vs. City of Chino, et al, entered by the court on April 17, 1969. This stipulated Judgment became effective on October 1, 1970 and contains a declaration of rights of the entities in the lower area of the Santa Ana River Basin downstream of Prado Dam as against those in the upstream area, and provides a physical solution to implement the provisions of the Judgment. The physical solution accomplishes, in general, a regional intrabasin allocation of the surface flow of the Santa Ana River System. All defendants and cross-defendants were dismissed except the four major public water districts within the Santa Ana River Basin; namely, the San Bernardino Valley Municipal Water District (SBVMWD), Western Municipal Water District (WMWD), Chino Basin Municipal Water District (CBMWD) and Orange County Water District (OCWD). The boundaries of these districts are shown on Plate 1. This arrangement leaves to each of the major hydrologic units in the watershed the determination and regulation of individual rights therein and the development and implementation of its own basin management plan. The history of the litigation and the Summary of the Judgment were included in the annual report for the water year 1974-75.

In order to administer the provisions of the Judgment, the court appointed a Watermaster composed of five persons. During the 1982-83 water year, the Santa Ana River Watermaster Committee consisted of Harvey O. Banks, William J. Carroll, James C. Hanson, William R. Mills, Jr. and Donald L. Harriger. Mr. Banks was appointed by the Court by order dated 6 October 1983, effective 1 October 1983, as one of the two representatives of Orange County Water District, upon the resignation of Mr. Bookman. Mr. Banks now serves as Chairman, and Mr. Mills continues to serve as Secretary. The office of the Santa Ana River

Watermaster is located at 972 Town and Country Rd., P.O. Box 5367, Orange, California 92667.

The time for submission of the annual report is now seven months after the end of each water year. The items to be reported upon are listed in the letter of transmittal of this report.

Stream Flow and Water Quality Measurements

Stream flow measurements and water quality data required by the Watermaster are, for the most part, furnished by the U.S. Geological Survey (USGS). The financing of the cooperative monitoring program with the USGS is shared by the parties to the Judgment. These costs are set forth in Table 1.

The USGS measured and computed the mean daily discharge of the Santa Ana River at MWD Crossing and below Prado Dam as well as the daily discharge of the Riverside Water Quality Control Plant into the Santa Ana River. Runoff data have also been provided for several smaller streams tributary to Prado Reservoir; namely, Chino Creek at Schaefer Avenue, Cucamonga Creek near Mira Loma and Temescal Wash at Corona, and for the Santa Ana River near Mentone, at E Street in San BErnardino and at Mission Blvd.

Precipitation during 1982-83 was heavy; 32.36 inches at San Bernardino County Hospital. Storm runoff was continuous from late in December to the end of July at Riverside Narrows and from early in November to early in August at Prado.

The 1982-83 discharge record for the USGS gaging station, "Santa Ana River below Prado" is considered by the USGS to be a "good" record. Twenty-nine direct discharge measurements, which ranged from 13 to 5,560 cubic feet per second, were made during the year. Beginning on November 9, 1982, the discharge was regulated by Prado Reservoir with a maximum of 52,081 acre-feet in storage on March 3, 1983. The maximum average daily discharge after regulation by Prado Reservoir occurred on March 5, 1983 and amounted to 5,590 cubic feet per second. The mean annual discharge was approximately 589 cubic feet per second.

TABLE 1

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

October 1, 1982 to September 30, 1983

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT		
At Riverside Narrows (MWD Crossing)		
Water Quality Monitor/TDS Samples	$ 650	
Dozer	334	
At Mission Boulevard		
Surface Water Gage	398	$ 1,382
WESTERN MUNICIPAL WATER DISTRICT		
Same as SBVMWD	$ 1,381	
Cucamonga Creek Discharge	1,450	
Chino Creek Discharge	967	3,798
CHINO BASIN MUNICIPAL WATER DISTRICT		
Same as WMWD		3,798
ORANGE COUNTY WATER DISTRICT		
At Prado Dam		
Water Quality Monitor/TDS Samples, Water Quality Sampling and Conductivity Programs	$10,850	
At Mission Boulevard		
Surface Water Gage	796	
Chino Creek		
Surface Water Gage	967	12,613
TOTAL FOR PARTIES		$21,591
UNITED STATES GEOLOGICAL SURVEY		18,850
GRAND TOTAL		$40,441

Data related to the operation of Prado Reservoir were obtained from the Corps of Engineers. Water quality data were supplied to the Watermaster by the State Department of Water Resources, City of Riverside and City of Corona Sanitation Departments and Chino Basin Municipal Water District.

The overall 1982-83 discharge record for the USGS gaging station "Santa Ana River at MWD Crossing" is considered by the USGS to be a fair record at low flow stages and a poor record at high stages because of the shifting channel. Summer thunderstorms created especially severe problems. The water stage recorder was inoperative much of the time during low flow periods. Control of the channel by bulldozing was not attempted. The concrete low-flow control structure, submerged by 3 to 4 feet of sand during previous years, remained inoperative. The continuous downstream movement of sand deposits, however, continued to affect the stage discharge relationship for the station. Forty-four direct discharge measurements which ranged from 38 to 5,090 cfs were made during the year which helped to improve the overall quality of the record.

Water was pumped from Lake Elsinore and discharged into Temescal Wash starting June 22 and continued intermittantly through September 28. Data on the amount pumped and daily spill from Lee Lake were furnished by Riverside County Flood Control and Water Conservation District and Temescal Water Company, respectively. Quality data were provided by Riverside County Health Department and Temescal Water Quality.

Compilation and Analysis of Basic Data

The Watermaster has established procedures for compiling and analyzing the basic data necessary to carry out the provisions of the Judgment. The records maintained by the Watermaster have been listed in prior annual reports. Based on these data, determinations were made of the Base Flow, Storm Flow, Nontributary Flow, Lake Elsinore flow passing Prado, and relationships between electrical conductivity (EC) and total dissolved solids (TDS). These determinations are explained in detail in Chapters III and IV.

Administration Costs

In accordance with Paragraph 7(d) of the Judgment, the fees and expenses of each of the members of the Watermaster are to be borne by the district which nominated such member. All other Watermaster administrative costs and

expenses are borne by the parties, with OCWD paying 40 percent of the cost and WMWD, SBVMWD, and CBMWD each paying 20 percent of the cost. The Judgment further provides that the Watermaster may from time to time, at its discretion, require advances of operating capital from the parties.

At its meeting on May 4, 1982, the Watermaster adopted a budget for the fiscal year 1982-83 in the amount of $14,000. At its meeting on June 22, 1983 the Watermaster adopted a budget for the fiscal year 1983-84 in the amount of $14,000. Table 2 shows the items and amounts included in said budgets together with actual expenses for the fiscal year 1982-83.

TABLE 2

SANTA ANA RIVER WATERMASTER BUDGET AND EXPENSES

	July 1, 1982 to June 30, 1983 Budget	July 1, 1982 to June 30, 1983 Expenses	July 1,1983 to June 30, 1984 Budget
Administration	$ 3,000.00	$1,585.00	$ 3,000.00
Support Engineering Services	8,000.00	7,705.00	8,000.00
Reproduction of Annual Report	3,000.00	2,081.00	3,000.00
Total	$14,000.00	$11,371.00	$14,000.00

An audit prepared by Diehl, Evans and Company showing the details of income and expenses of the Santa Ana River Watermaster for the fiscal year 19082-83 is included herein as Appendix F.

Summary of Findings

A summary of findings by the Watermaster for the period 1970-71 through 1982-83 is presented in Table 3. The Base Flow obligations at both Riverside

Narrows and Prado Dam provided for in the Judgment have been met and cumulative credits have been established.

TABLE 3

SUMMARY OF FINDINGS

AT PRADO

Water Year	Rainfall (in)(1)	Total Flow (ac-ft)(2)	Base Flow (ac-ft)	Weighted TDS (ppm)(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	77,484	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 (4)	74,875 (5)	728	74,875 (5)	205,652 (6)
1981-82	18.34	143,702	81,548	584	89,431	253,083
1982-83	32.36	426,273 (4)	111,692 (5)	411	138,591 (5)	353.036 (6)

AT RIVERSIDE NARROWS

Water Year	Rainfall (in)(1)	Total Flow (ac-ft)(2)	Base Flow (ac-ft)	Weighted TDS (ppm)(3)	Adjusted Base Flow (ac-ft)	Cumulative Credit (ac-ft)
1970-71	11.97	24,112	17,061	704	17,012	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	254,077 (8)	25,549 (8)	676	25,549	38,146
1980-81	10.45	34,278	19,764	715	19,550	42,446
1981-82	18.34	83,050	32,778	678	32,778	59,974
1982-83	32.36	279,987	57,128	610	57,128	101,852

(1) Measured at San Bernardino County Hospital.
(2) Does not include Nontributary Flow.

(3) For Base and Storm Flow at Prado and Base Flow only at Riverside Narrows.
(4) Includes 16,090 acre-feet of water pumped from Lake Elsinore which passed Prado Dam in 1980-81 and 7,720 acre feet in 1982-83.
(5) Excludes water pumped from Lake Elsinore.
(6) Includes 8,045 acre feet in 1979-80 and 3,362 acre feet in 1982-83, of Lake Elsinore discharge.
(7) For these years, a correction has been made for different losses or State water than assumed in reports published prior to this Twelfth Annual Report. The values changed are base flow, weighted TDS, and adjusted base flow, and these changes in turn have changed the cumulative credit for all years subsequent to 1972-73.
(8) Includes Rubidoux Wastewater in 1979-80 and subsequent years.

CHAPTER II
WATER SUPPLY CONDITIONS

The precipitation in the Santa Ana River Watershed during 1982-83, as represented by rainfall measured at San Bernardino County Hospital, was about 80 percent above normal in terms of the Base Period average. Accordingly, the total flow of the Santa Ana River below Prado Dam during the 1982-83 water year increased to 426,273 acre-feet as compared to a total flow of 143,702 acre-feet which occurred in the previous year. The Base flow at Riverside Narrows reached an all time high of 57,128 acre-feet and 111,692 acre-feet at Prado.

Precipitation During 1982-83

During the 1982-83 water year, the precipitation at the San Bernardino County Hospital amounted to 32.36 inches, which is 180 percent of the Base Period average. Heavy precipitation started in November and continued through April, with a heavy storm in August. The maximum monthly precipitation of 7.46 inches occurred during March.

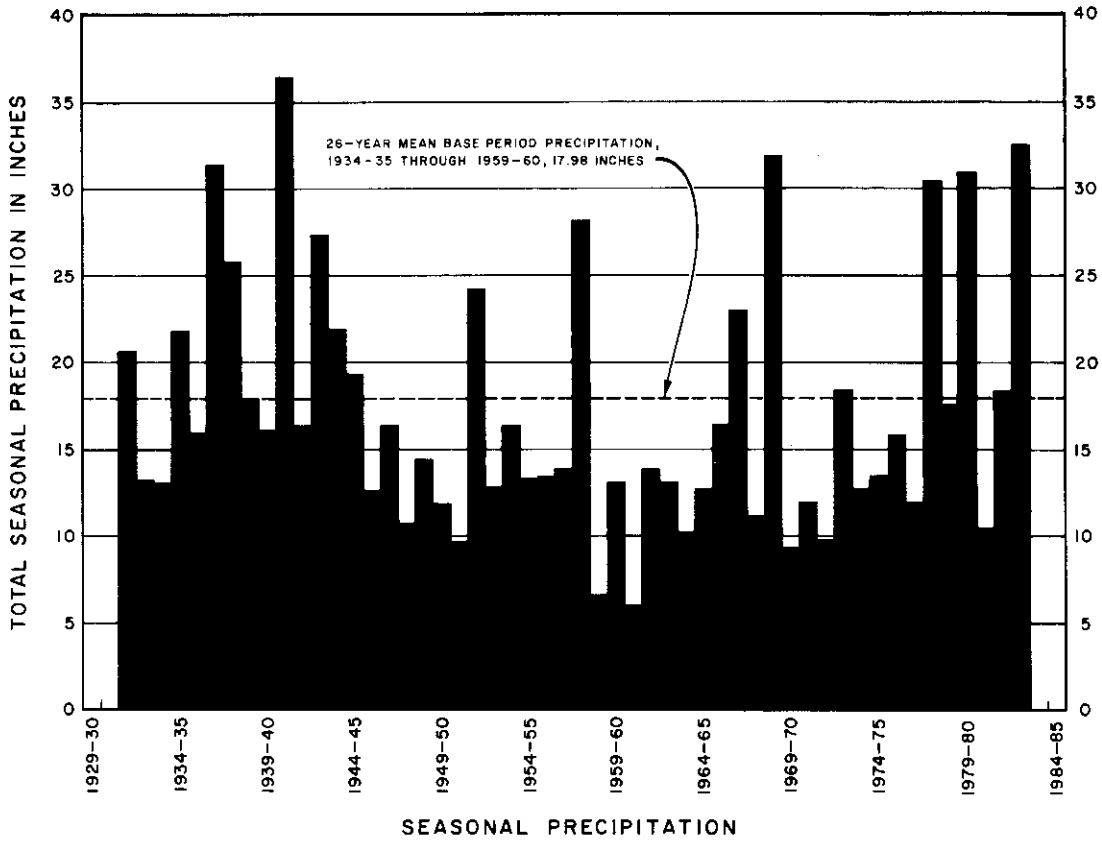
Figure 1 shows the seasonal precipitation from 1931-32 through 1982-83 and the accumulated departure from the 1934-35 through 1959-60 Base Period average.

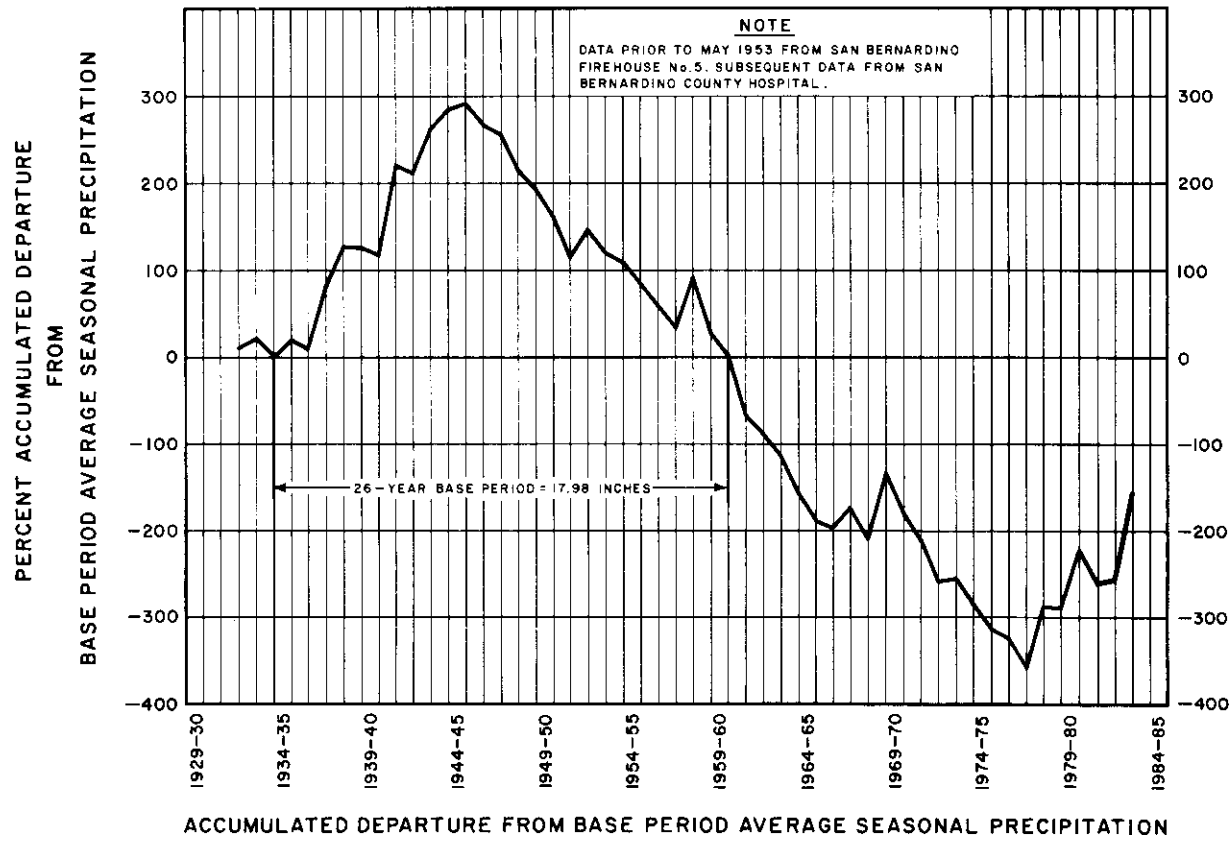
Runoff During 1982-83

Below Prado Dam

The total seasonal flow at Prado for the 1982-83 water year less Non-tributary Flow was 425,938 acre-feet which is well above the Base Period (1934-35 through 1959-60) average of 78,780 acre-feet per year.

After 1943-44, the Base Flow at Prado Dam progressively decreased and reached a low in 1960-61 of 26,190 acre-feet. Since that year, the Base Flow has substantially increased. During the thirteen-year period (1970-71 through 1982-83 since the Judgment went into effect, the Base Flow, unadjusted for quality, has averaged 61,239 acre-feet per year. This compares to the 26-year Base





VARIATION IN PRECIPITATION AT SAN BERNARDINO

FIGURE 1

Period average of 47,470 acre-feet and the Base Flow requirements under the Judgment of 42,000 acre-feet. The 1981-82 Base Flow amounted to 111,692 acre-feet, an increase of 50,453 acre-feet over the thirteen-year average.

The calculated inflow to Prado Reservoir during the month of March amounted to 124,900 acre-feet or 30 percent of the seasonal total. The maximum storage in Prado Reservoir occurred on March 3rd when 52,081 acre-feet (about 27 percent of the reservoir capacity at spillway level) was in storage. The maximum release of 5,590 cfs from Prado Reservoir occurred on March 5, 1982.

Figure 2 shows the Storm and Base Flow components of the Total Flow in the Santa Ana River below Prado Dam during the period 1934-35 through 1982-83.

At Riverside Narrows

The Total Flow less Nontributary Flow of the Santa Ana River at Riverside Narrows for the 1982-83 water year was 279,645 acre-feet.

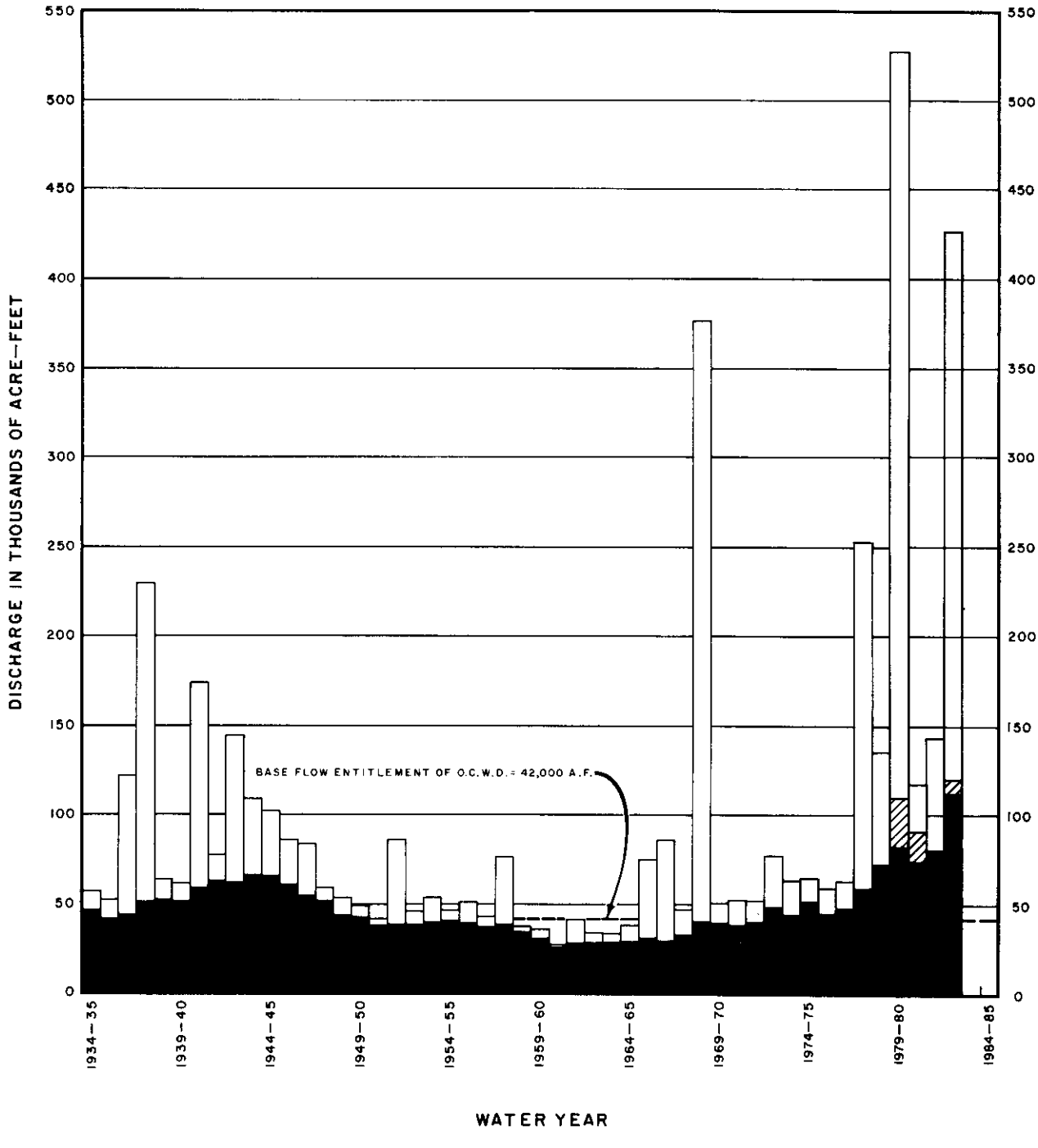
The Base Flow at Riverside Narrows decreased from 27,120 acre-feet in 1943-44 to an all-time low of 13,450 acre-feet in 1965-66. Since that time, the Base Flow at Riverside Narrows has gradually increased. During the thirteen-year period 1970-71 through 1982-83 the Base Flow has averaged 23,230 acre-feet per year. The 1982-83 Base Flow amounted to 57,128 acre-feet, an increase of 33,898 acre-feet over the thirteen-year average.

Figure 3 shows the components of Total Flow in the Santa Ana River at Riverside Narrows for the period from 1934-35 through 1982-83.

Wastewater Effluent Discharges

A portion of the Base Flow at Prado is made up of treated wastewater effluent discharged from the Riverside Water Quality Control Plant, the Chino Basin Municipal Water District's Regional Plants No. 1 and 2 and the City of Corona Treatment Plant.

Since the late 1940's, the wastewater effluent from the Riverside Water Quality Control Plant, which is discharged at the Riverside Narrows between Pedley Bridge and the MWD Crossing, has been increasing in amount. In 1949-50, the amount of treated effluent discharged was 3,960 acre-feet. By 1959-60, the discharge had increased to 9,900 acre-feet. By 1969-70, the discharge of effluent from the treatment plant was 18,657 acre-feet. The wastewater discharge of the Riverside Water Quality Control Plant during 1982-83 was 25,020 acre-feet.



NOTES

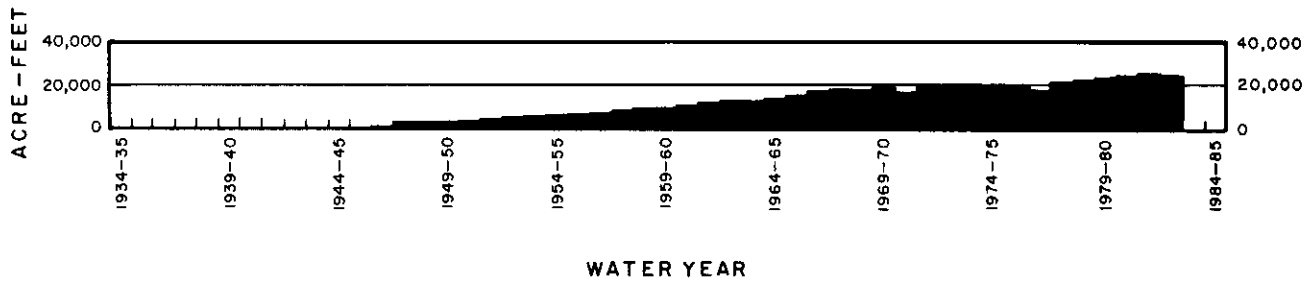
1. DISCHARGE EXCLUDES IMPORTED M.W.D. COLORADO RIVER OR STATE WATER PROJECT WATER BEING TRANSPORTED IN THE SANTA ANA RIVER.
2. DISCHARGE INCLUDES EMERGENCY LAKE ELSINORE WATER IN 1979-80 AND 1980-81.

LEGEND

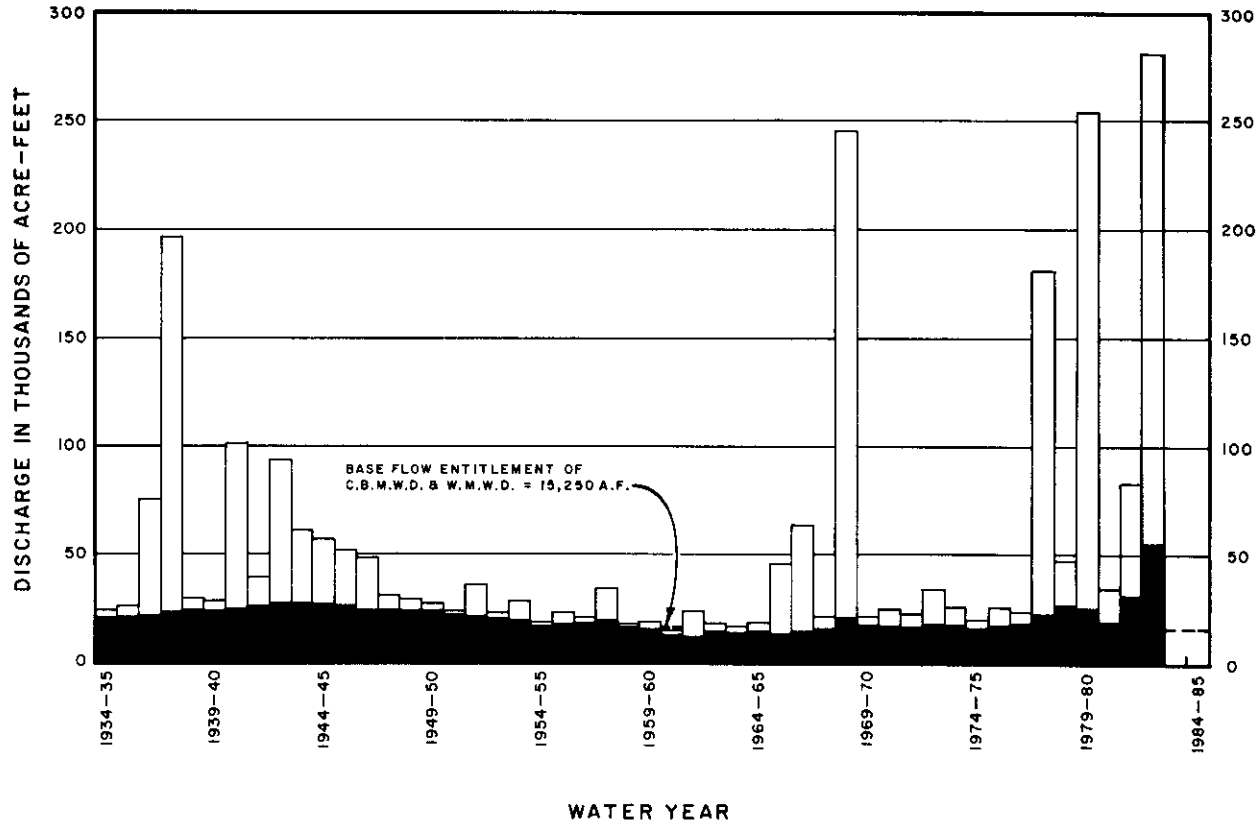
- STORM FLOW
- LAKE ELSINORE FLOW
- BASE FLOW

DISCHARGE OF SANTA ANA RIVER BELOW PRADO DAM

FIGURE 2



SEWAGE EFFLUENT FROM RIVERSIDE WATER QUALITY CONTROL PLANT



NOTES

1. DISCHARGE EXCLUDES SEWAGE EFFLUENT FROM THE RIVERSIDE WATER QUALITY CONTROL PLANT AND IMPORTED M.W.D. COLORADO RIVER OR STATE WATER PROJECT WATER BEING TRANSPORTED IN THE SANTA ANA RIVER.
2. DISCHARGE OF RUBIDOUX WASTEWATER PLANT INCLUDED IN BASE FLOW COMMENCING IN 1979-80.

LEGEND

STORM FLOW

BASE FLOW

DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS

FIGURE 3

CBMWD's Regional Plants No. 1 and 2 began discharging to the Santa Ana River in 1971-72 and 1973-74 respectively and in 1982-83 discharged 25,081 acre-feet of effluent to the Santa Ana River.

The City of Corona Sewage Treatment Plant discharged 3,192 acre-feet of treated wastewater effluent to the River in 1970-71. This discharge has increased to 5,862 acre-feet in 1982-83.

Table 4 sets forth the amount of treated wastewater effluent discharged to the Santa Ana River between Riverside Narrows and Prado Dam during the period 1970-71 through 1982-83. The values show that over the last thirteen years, the amount of treated wastewater discharged to the River between these two points has more than doubled.

TABLE 4

TREATED WASTEWATER EFFLUENT DISCHARGED TO THE SANTA ANA RIVER RIVERSIDE NARROWS TO PRADO DAM

(ACRE-FEET)

Year	Riverside	Corona	CBMWD #1	CBMWD #2	Total
1970-71	18,619	3,192	0	0	21,811
1971-72	19,006	3,227	6,742	0	28,975
1972-73	19,061	3,342	10,384	0	32,878
1973-74	19,561	3,507	11,435	2,322	36,825
1974-75	19,343	4,015	14,960	2,282	40,600
1975-76	19,579	4,699	15,448	2,947	42,673
1976-77	18,766	5,012	14,638	3,381	41,797
1977-78	20,314	5,201	14,651	4,061	44,227
1978-79	21,068	5,393	15,035	5,069	46,565
1979-80	22,910	5,364	14,413	5,523	48,210
1980-81	24,180	5,590	17,269	5,264	52,303
1981-82	25,643	5,409	19,575	5,364	55,991
1982-83	25,020	5,862	20,787	4,294	55,963

CHAPTER III
BASE FLOW AT PRADO

This chapter deals with determinations of: 1) the components of flow at Prado Dam, which include Nontributary Flow, discharge from Lake Elsinore, Storm Flow, and Base Flow; and 2) the adjusted Base Flow at Prado credited to CBMWD and WMWD.

Total Flow at Prado

The total flow of the Santa Ana River at Prado amounted to 426,273 acre-feet, measured at the USGS gaging station below Prado Dam. Separated into its components, Base Flow was 111,692 acre-feet, Storm Flow was 307,338 acre-feet, Nontributary Flow during 1982-83 due to the release of State water above Riverside Narrows during 1972-73 was 335 acre-feet, and discharge due to the pumpout program from Lake Elsinore that passed Prado Dam was 7,720 acre-feet. The components of flow of the Santa Ana River at Prado Dam for each month in the 1982-83 water year are listed in Table 5, and are shown graphically on Plate 2.

Nontributary Flow

Since May 1973, OCWD has from time to time purchased State water for the replenishment of the groundwater basins in Orange County. The water has been released at two locations: Santa Ana River above Riverside Narrows and San Antonio Creek near Upland.

Releases Above Riverside Narrows

As fully discussed in Appendix F of the Fifth Annual Report, the Watermaster Committee made a determination of a schedule of credits to OCWD for State Water released above Riverside Narrows during 1972-73. For 1982-83 the credit is 335 acre-feet, assumed to be distributed uniformly throughout the year, as shown in Table 5.

TABLE 5

COMPONENTS OF FLOW AT PRADO DAM
FOR WATER YEAR 1980-81
(acre-feet)

Month	USGS Measured Outflow	Change in Storage (1)	Computed Inflow	Discharge from Lake Elsinore	Storm Flow	Base Flow	Non-tributary Water from Riverside Narrows (2)
October	5,720	0	5,720	0	49	5,643	28
November	12,440	6,544	18,984	0	11,953	7,003	28
December	20,129	1,868	21,997	0	13,430	8,539	28
January	32,993	3,874	36,867	0	26,860	9,979	28
February	44,075	1,250	45,325	0	35,273	10,024	28
March	117,921	6,978	124,899	0	112,972	11,899	28
April	48,560	587	49,147	0	37,407	11,712	28
May	51,817	(1,960)	49,857	0	38,222	11,607	28
June	43,814	(19,135)	24,679	363	13,937	10,351	28
July	16,025	0	16,025	2,101	4,375	9,521	28
August	21,646	0	21,646	2,458	10,951	8,209	28
September	11,133	806	11,939	2,798	1,090	7,205	27

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

(2) That portion of State water released during 1972-73 upstream of Riverside Narrows, determined to have reached Prado Dam in 1982-83.

Releases to San Antonio Creek

During water year 1982-83, OCWD did not purchase State water to be released from the Rialto Reach of the Foothill Feeder at OC-59 into San Antonio Creek near Upland. Therefore there was no Nontributary Flow of State water through Prado Dam from this source during 1982-83.

Discharge from Lake Elsinore

As discussed in Chapter II, pumps at Lake Elsinore were first started on June 22, 1983 and brought on line in stages. Pumping was discontinued from July 8 to July 17 for flood control repairs along Temescal Wash. The pumps were placed back in operation beginning on July 18 until August 15. Pumping was again discontinued from August 16 to August 31 for flood control repairs along Temescal Wash. Pumping resumed on September 1 and continued through September 27 except for September 13, 14, and 20. A total volume of 10,778 acre-feet was discharged to Temescal Wash from the Lake by the program during water year 1982-83.

To determine the amount of Lake Elsinore discharge reaching Prado Dam, data for spill from Lee Lake were used. Due to the fact that Storm Flow occurred during the Lake Elsinore pumpout program, the scalping procedure could not be used to determine the amount of Lake Elsinore discharge reaching Prado Dam. Therefore, it was assumed that 5 percent of the spill from Lee Lake was lost before reaching Prado Dam. This appproximates the 6 percent loss determined by the Watermaster for the 1980-81 Lake Elsinore pumpout program for the Eleventh Annual Report. As there was no surface diversion between Lee Lake and Prado Dam, 95 percent of the spill from Lee Lake was assumed to have reached Prado Dam. The total aount of Lake Elsinore discharge passing Prado Dam in the water year 1982-83 was 7,720 acre-feet. This total and the monthly distribution are shown in Table 5.

Storm Flow

Generally during storms, the U.S. Army Corps of Engineers operates the Prado gates so that some of the storm runoff is temporarily held in storage behind the dam. As the storm ends, Prado Reservoir storage is generally reduced by the controlled releases to the downstream water conservation facilities operated by OCWD. Monthly and annual quantities of Storm Flow are shown in Table 5.

The U.S. Army Corps of Engineers has an established operations guideline schedule with respect to required reservoir releases for specific water surface elevations. With water elevations above 490 feet, the elevation of the top of the debris pool water is released at a progressive increase in flowrate to a maximum of 5,000 cfs. This flowrate is maintained until the water surface elevation reaches the spillway crest elevation at 543 feet. The original reservoir operation plan, although never officially changed, was modified during water year 1977-78 by an Executive Order from President Carter which requested all government agencies to make every effort to maximize water conservation.

During water-year 1979-80, the Corps of Engineers initiated a study to reevaluate its operations schedule to increase the water conservation potential of Prado Reservoir while maintaining flood control protection in downstream areas. When finalized, the selected plan will consist of a combination of one of six alternative flood control plans and one of four alternative water conservation plans under evaluation by the study. Each of the water conservation alternatives, including the current plan, requires an empty reservoir in August and September to allow for annual maintenance. The study has not been completed and Prado Dam was operated under the original guidelines during the water year 1982-83.

During the 1982-83 water year, more than 100 acre-feet of water was stored behind Prado Dam during the periods November 9 to November 25,1982; November 30, 1982 to June 12, 1983; August 17 to August 21, 1983; and September 30, 1983. During those periods, the water stored in Prado Reservoir varied up to a maximum of 52,081 acre-feet and the maximum mean daily flow released to the Santa Ana River was 5,590 cfs.

Base Flow

The determination of Base Flow was affected by Nontributary Flow which was released above Riverside Narrows and discharge from Lake Elsinore reaching Prado Dam via the Temescal Wash. The general procedure used by the members of the Watermaster to separate the 1982-83 flow components was the same as used for previous years and is fully described in the Fifth Annual Report. The monthly and annual amounts are shown in Table 5.

Water Quality

The weighted average total dissolved solids (TDS) for the total flow passing Prado Dam, including Nontributary Flow released above Riverside Narrows was found to be 419 ppm. This determination was based on continuous measurements of electrical conductivity (EC) by the USGS at the Santa Ana River below Prado, supplemented by grab samples of EC and TDS, and a statistical correlation of EC and TDS.

The EC of the outflow at Prado Dam was recorded hourly on a punched tape by the USGS. The USGS and DWR collected a total of 33 grab samples and performed laboratory analyses for TDS. A correlation between TDS and EC was developed using the TDS data from the grab samples and the EC recorded by the meter at the times when the samples were collected. Data used for the statistical analysis are listed in Table B-1; Appendix B. The statistical analysis yields the best fit equation shown below:

$$TDS = 0.65\ EC - 25.7$$

where: TDS = mg/l
EC = micromhos/cm

Application of the equation relating EC to TDS provided hourly TDS values. Using hourly data, flow weighted average daily values for TDS were computed and are listed in Table B-2, Appendix B.

The plot of TDS on Plate 3 shows the daily average TDS concentration of flow of the Santa Ana River passing Prado Dam. The daily average TDS concentration was calculated from the continuous EC measurements and the correlation of EC and TDS. As daily TDS concentration could not be determined during the period when continuous EC data was not available, TDS was assumed to be unchanged unless there was a change in the amount of storm flow reaching Prado Dam. The TDS concentration would decrease at the on-set of a storm and would increase with a decrease in storm flow; the extent of the increase or decrease in TDS concentration was determined by the TDS concentration of the next available grab sample. In the case when two samples were taken during a period of no change in the amount of storm flow, the average TDS of the two samples was considered as the TDS of the flow during the period.

Water Quality Adjustment for Nontributary Flow and Discharge from Lake Elsinore

The weighted average annual TDS value of 419 mg/l, shown in Table B-3, Appendix B, represents the quality of Total Flow which includes Nontributary Flow from release of State water to Santa Ana River above Riverside Narrows and discharge from Lake Elsinore due to the pumpout program. The Judgment requires that Base Flow shall be subject to adjustment based on the TDS of Base Flow and Storm Flow only. Hence, the following determination of Base Flow plus Storm Flow TDS has been made.

The flow weighted average TDS of State water released above Riverside Narrows during 1972-73 was 235 mg/l and was adjusted to 242 mg/l to reflect a 3 percent evapotranspiration loss of the water released.

The flow weighted average TDS of State water released above Riverside Narrows during 1972-73 was 235 mg/l and was adjusted to 242 mg/l to reflect a 3 percent evpotranspiration loss of the water released.

The flow weighted average TDS of Lake Elsinore water at the point of release to the Temescal Wash in 1982-83 was 612 mg/l as shown in TAble C-1, Appendix C. A total of 10,778 acre-feet was pumped from Lake Elsinore. It is assumed that the amount of salt transported down the Temescal Wash to Prado Dam was conserved. As there was no surface diversion of water between the discharge point at Lake Elsinore and Prado Dam, a total of 6,597,626 acre-feet-mg/l of salt reached Prado Dam due to the pumpout program.

		Annual Flow (acre-feet)	Average TDS (mg/l)	Annual Flow X Average TDS (acre-feet-mg/l)
1.	Total Flow	426,273	419	178,608,387
2.	Nontributary Flow Riverside Narrows	335	242	81,070
3.	Lake Elsinore Flow	7,720 (1)	855 (2)	6,597,626 (3)
4.	Total Base and Storm Flows	418,218		171,929,691
5.	Average TDS of Total Base and Storm Flows	171,929,691 + 418,218 = 411 mg/l		

(1) 95 percent of Lee Lake spillage was asssumed to have reached Prado Dam.

(2) Determined from total salts transported down Temescal Wash to Prado Dam and total flow reaching Prado Dam and Lake Elsinore.

(3) Determined from pumped out volume from Lake Elsinore and average TDS at the discharge outlet.

After adjusting for Nontributary Flows of State water from Riverside Narrows, the weighted average annual TDS of Storm Flow and Base Flow for 1982-83 was 411 mg/l.

Adjusted Base Flow

According to the Judgment, "The amount of Base Flow at Prado received during any year shall be subjected to adjustment based on weighted average annual TDS in 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 - 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 411 mg/l is less than 700 mg/l. Therefore, the Base Flow of acre-feet must be adjusted by the above equation for TDS less than 700 mg/l. Thus the Adjusted Base Flow is as follows

$$(111,692 \text{ A.F.}) + \frac{35}{42,000} (111,692 \text{ A.F.})(700-411) = 138,591 \text{ A.F.}$$

Entitlement and Credit or Debit

From pages 12 and 13 of the Judgment, the following obligation of the CBMWD and WMWD is given: "CBMWD and WMWD shall be responsible for an average annual Adjusted Base Flow of 42,000 acre-feet at Prado..... CBMWD 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 not 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 Lake Elsinore flows were not envisioned during the formulation of the Judgment and because of the occurrence of Lake Elsinore water at Prado, the Watermaster decided to credit one-half of the amount of Lake Elsinore flow recharging Prado Dam and recharging the groundwater basin in Orange County against the Base Flow obligation at Prado Dam.

Of the 7,720 acre-feet of Lake Elsinore discharge reaching Prado Dam, 428 acre-feet flowed past the gage in the Santa Ana River at Fifth Street and was considered as lost to the ocean. In addition, a portion of the Lake Elsinore pumpout water reaching Prado Dam was lost to Orange County via the San

Gabriel River System. For the purpose of water conservation, OCWD diverted flows in the Santa Ana River to off-channel recharge facilities during the period Lake Elsinore discharge passed Prado Dam. A portion of this diverted flow reached Anaheim Lake, overflowed to the Atwood Channel and eventually discharged to Coyote Creek, a tributary to the San Gabriel River. The Watermaster Committee has determined that 568 acre-feet of the Lake Elsinore discharge was lost to the San River. Therefore, a net amount of 6,724 acre-feet of Lake Elsinore discharge recharged the Orange County groundwater basin in 1982-83. One-half of such amount has been considered a credit against the Upper Area Base Flow obligation at Prado Dam. Thus, an additional 3,362 acre-feet were credited to the Cumulative Adjusted Base Flow.

The Watermaster's findings at Prado for 1982-83 required under the Judgment are as follows:

1.	Total Flow at Prado	426,273 acre-feet
2.	Base Flow at Prado	111,692 acre-feet
3.	Annual Weighted TDS of Base and Storm Flows	411 mg/l
4.	Annual Adjusted Base Flow	138,591 acre-feet
5.	One-half Lake Elsinore Discharge reaching Prado Dam and Recharging Orange County Groundwater Basin	3,362 acre-feet
6.	Cumulative Adjusted Base Flow	899,036 acre-feet
7.	Cumulative Entitlement of OCWD	546,000 acre-feet
8.	Cumulative Credit	353,036 acre-feet
9.	One-Third of Cumulative Debit	0 acre-feet
10.	Minimum Required Base Flow in 1983-84	34,000 acre-feet

CHAPTER IV
BASE FLOW AT RIVERSIDE NARROWS

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

Total Flow at Riverside Narrows

The total flow of the Santa Ana River at Riverside Narrows amounted to 279,987 acre-feet, measured at the USGS gaging station just upstream of the MWD Upper Feeder Crossing. Separated into its components, Base Flow was 57,128 acre-feet, Storm Flow was 224,103 acre-feet, and Nontributary Flow due to the release of State water above Riverside Narrows was 342 acre-feet. Included in Base Flow is 1,586 acre-feet of wastewater from Rubidoux Community Services District which now bypasses the USGS gaging station. This item is discussed on the following page. The components of flow of the Santa Ana River at Riverside Narrows for each month in the 1982-83 water year are listed in Table 6 and graphically shown on Plate 4.

Nontributary Flow

During the period May through September, 1973, 11,617 acre-feet of State water from the East Branch of the California Aqueduct was purchased by the Orange County Water District and released into the Santa Ana River in the vicinity of Colton.

The Watermaster's determination of the effect of these releases has been discussed in the Fifth Annual Report of the Watermaster. For the water year 1982-83 the amount of State water reaching Riverside Narrows has been agreed upon as 342 acre-feet.

TABLE 6

COMPONENTS OF FLOW AT RIVERSIDE NARROWS FOR WATER YEAR 1982-83

(acre-feet)

		Total Flow USGS Measurement	Storm Flow	Non-tributary Flow	Rubidoux Wastewater	Base[1] Flow
1982	October	2,784	359	29	124	2,520
	November	8,895	5,711	29	118	3,273
	December	10,923	6,848	29	128	4,174
1983	January	21,624	16,733	29	134	4,996
	February	36,304	31,375	29	120	5,020
	March	75,035	69,210	29	151	5,947
	April	36,238	30,444	28	139	5,905
	May	40,872	35,043	28	141	5,942
	June	19,619	14,325	28	132	5,398
	July	8,889	3,944	28	134	5,051
	August	13,329	8,894	28	131	4,538
	September	5,475	1,217	28	134	4,364
Total		279,987	224,103	342	1,586	57,128

(1) Base Flow includes Rubidoux wastewater.

Base Flow

Based on the hydrograph shown on Plate 4 and utilizing in general the same procedures reflected in the Work Papers of the engineers (as referenced in Paragraph 2 of the Engineering Appendix of the Judgment), a separation was made between Storm Flow and the sum of Base Flow and Nontributary Flow.

Nontributary Flow was assumed to be equally distributed throughout the year (342 acre-feet divided by 12 months) and subtracted from the sum of the Base Flow and Nontributary Flow as shown on Table 6.

In April 1980, Rubidoux Community Services District made the first delivery of wastewater to the regional waste 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 1982-83, in the

amount of 1,586 acre-feet as shown in Appendix E, has been added to the streamflow as measured at the gaging station. The Base Flow was determined to be 57,128 acre-feet, as shown on Table 6.

Water Quality

The determination of quality of water at the Riverside Narrows Gaging Station was made using periodic grab samples taken and analyzed for TDS by the USGS, the City of Riverside and the Department of Water Resources. The results are summarized in Appendix D, Table D-1. Table D-2 shows the flow weighted quality of the flow including the Nontributary Flow and excluding the Rubidoux wastewater. The Base Flow quality resulting from exclusion of the Nontributary Flow and inclusion of the Rubidoux wastewater is shown in the following table as 610 mg/l.

		Annual Flow (acre-feet)	Avg. TDS (mg/l)	(Annual Flow) x (Avg. TDS) (acre-feet - mg/l)
1.	Base Flow including Nontributary Flow and excluding Rubidoux Wastewater	55,884 A.F.	603 mg/l	33,706,797 A.F.-mg/l
2.	Less Nontributary Flow	342 A.F.	237 mg/l	81,054 A.F.-mg/l
3.	Plus Rubidoux Wastewater	1,586 A.F.	761 mg/l	1,207,297 A.F.-mg/l
4.	Base Flow	57,128 A.F.	610 mg/l	34,833,040 A.F.-mg/l

Adjusted Base Flow at Riverside Narrows

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

If the Weighted Average TDS in Base Flow at Riverside Narrow 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 - 700 mg/l	Q
Less than 600 mg/l	$Q + \frac{11}{15,250} Q\ (600-TDS)$

Where: Q = Base Flow actually received.

From the previous subsection, the weighted average annual TDS in the Base Flow at Riverside Narrows for the water year 1982-83 was 610 mg/l. Therefore, no adjustment is necessary, and the Adjusted Base Flow for 1982-83 is 57,128.

Entitlement and Credit or Debit

Paragraph 5(b) of the 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 at Riverside Narrows 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 at Riverside Narrows for 1982-83 required under the Judgment are as follows:

1.	Base Flow at Riverside Narrows	57,128	acre-feet
2.	Annual Weighted TDS of Base Flow	610	mg/l
3.	Annual Adjusted Base Flow	57,128	acre-feet
4.	Cumulative Adjusted Base Flow	300,102	acre-feet
5.	Cumulative Entitlement of CBMWD and WMWD	198,250	acre-feet
6.	Cumulative Credit	101,852	acre-feet
7.	One-Third of Cumulative Debit	0	acre-feet
8.	Minimum Required Base Flow in 1983-84	12,420	acre-feet

APPENDIX A

STATE WATER RELEASED BY MWD TO SAN ANTONIO CREEK NEAR UPLAND

CONNECTION OC-59

1982-83

PREPARED BY

DONALD L. HARRIGER

TABLE A-1

NONTRIBUTARY WATER FROM OC-59
MONTHLY TOTALS
(ACre-Feet)

WATER YEAR 1982-83

No Water was Released in 1982-83 from OC-59 for
Orange County Water District

APPENDIX B

WATER QUALITY-
SANTA ANA RIVER BELOW PRADO DAM

1982-83

PREPARED BY

WILLIAM R. MILLS, JR.

METHOD OF ANALYZING WATER QUALITY DATA

Utilizing the USGS water quality records, the following analyses were performed by the Watermaster to determine the annual weighted TDS:

1. Mean daily flow weighted specific conductivity (EC) was calculated using the punched tape from the Prado water quality recorder, processed by a newly developed computer program designed by USGS. Input to the program included hourly EC data from the recorder tape, which was flow weighted using hourly discharge measurements from the water stage recorder. However, due to recorder malfunction, hourly EC data were not available from October 1, 1982 through May 18, 1983.

2. Laboratory analyses of the 26 grab samples taken by the USGS and 9 grab samples taken by DWR below Prado Dam during the 1982-83 season were run to determine both EC and TDS. Data from the grab samples are given in Table B-1. Results of these analyses were used to prepare a correlation between EC recorded on punched tape of the USGS at the times when the grab samples were collected and the corresponding TDS. A detailed discussion of this statistical analysis is presented in the Fifth Annual Watermaster Report.

3. The equation from the curve fitting operation was then used to determine the mean daily TDS corresponding to the mean daily EC values for each day of the year except for the period when the recorder was not functioning.

4. The TDS for the period when EC data were not available was constructed from sample data from grab samples taken during that period. The TDS concentration was assumed to be unchanged unless there was a change in the

amount of storm flow. TDS concentration would increase when there was a decrease in storm flow and decrease with an increase in storm flow; the extent of the increase or decrease in TDS concentration was determined by the TDS concentration of the next available grab sample. In the case when the samples were taken during a period of no change in the amount of storm flow, the average TDS of the two samples was considered as the TDS of the flow during the period.

5. The mean daily TDS values were then multiplied by the mean daily flow as shown in Table B-2. These products were then summed and divided by the total flow for the year to determine the weighted average TDS value for the water year. This value for TDS for the total flow including nontributary water was 419 mg/l of TDS for the 1982-83 water year. The weighted TDS calculation for the water year 1982-83 is shown in Table B-3.

TABLE B-1

USGS WATER QUALITY ANALYSES

BELOW PRADO DAM DURING WATER YEAR 1982-83

Date			TDS(1) (mg/l)	EC(2) (micromhos/cm)	Source
1982	Oct	1	714	960	USGS
		6	721	1,210	USGS
		27	761	1,190	DWR
	Nov	2	770	1,110	USGS
		17	585	990	USGS
		26	792	1,240	DWR
	Dec	9	403	700	USGS
		25	515	783	DWR
		27	411	700	USGS
1983	Jan	7	476	800	USGS
		20	606	1,025	USGS
		26	501	816	DWR
	Feb	7	379	670	USGS
		22	448	750	USGS
		25	556	875	DWR
	Mar	8	293	470	USGS
		30	552	940	USGS
	Apr	6	400	680	USGS
		8	405	640	DWR
		28	424	720	DWR
		30	484	825	USGS
	May	5	363	595	USGS
		17	407	668	DWR
		25	386	630	USGS
	Jun	3	364	590	USGS
		9	391	631	DWR
		20	559	900	USGS
	Jul	5	609	935	USGS
		26	649	1,060	USGS
	Aug	5	697	1,120	USGS
		15	647	1,050	USGS
	Sep	9	699	1,160	USGS
		27	716	1,190	USGS

(1) Based on analysis of grab samples.
(2) Based on field EC recording at the time of sampling.

TABLE B-2

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
OCT	1	108.0	960	596	64368.
OCT	2	112.0	960	596	66752.
OCT	3	106.0	960	596	63176.
OCT	4	105.0	1210	758	79590.
OCT	5	108.0	1210	758	81864.
OCT	6	103.0	1210	758	78074.
OCT	7	105.0	1210	758	79590.
OCT	8	101.0	1210	758	76558.
OCT	9	87.0	1210	758	65946.
OCT	10	71.0	1210	758	53818.
OCT	11	68.0	1210	758	51544.
OCT	12	64.0	1210	758	48512.
OCT	13	63.0	1210	758	47754.
OCT	14	62.0	1210	758	46996.
OCT	15	72.0	1210	758	54576.
OCT	16	125.0	1210	758	94750.
OCT	17	99.0	1210	758	75042.
OCT	18	101.0	1210	758	76558.
OCT	19	99.0	1210	758	75042.
OCT	20	96.0	1210	758	72768.
OCT	21	74.0	1210	758	56092.
OCT	22	86.0	1210	758	65188.
OCT	23	77.0	1210	758	58366.
OCT	24	75.0	1210	758	56850.
OCT	25	81.0	1210	758	61398.
OCT	26	91.0	1190	745	67795.
OCT	27	111.0	1190	745	82695.
OCT	28	106.0	1190	745	78970.
OCT	29	107.0	1110	694	74258.
OCT	30	108.0	1110	694	74952.
OCT	31	113.0	1110	694	78422.
TOTAL		2884.			2108264.
MONTHLY WEIGHTED T.D.S.				731	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
NOV	1	117.0	1110	694	81198.
NOV	2	114.0	1110	694	79116.
NOV	3	110.0	1110	694	76340.
NOV	4	111.0	1110	694	77034.
NOV	5	112.0	1110	694	77728.
NOV	6	114.0	1110	694	79116.
NOV	7	121.0	1110	694	83974.
NOV	8	122.0	1110	694	84668.
NOV	9	75.0	990	616	46200.
NOV	10	114.0	990	616	70224.
NOV	11	227.0	990	616	139832.
NOV	12	246.0	990	616	151536.
NOV	13	262.0	990	616	161392.
NOV	14	259.0	990	616	159544.
NOV	15	308.0	990	616	189728.
NOV	16	333.0	990	616	205128.
NOV	17	325.0	990	616	200200.
NOV	18	318.0	990	616	195888.
NOV	19	313.0	990	616	192808.
NOV	20	315.0	990	616	194040.
NOV	21	307.0	990	616	189112.
NOV	22	207.0	1240	778	161046.
NOV	23	227.0	1240	778	176606.
NOV	24	303.0	1240	778	235734.
NOV	25	285.0	1240	778	221730.
NOV	26	254.0	1240	778	197612.
NOV	27	173.0	1240	778	134594.
NOV	28	154.0	1240	778	119812.
NOV	29	168.0	700	428	71904.
NOV	30	178.0	700	428	76184.
TOTAL		6272.			4130028.
MONTHLY WEIGHTED T.D.S.				658	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
DEC	1	303.0	700	428	129684.
DEC	2	339.0	700	428	145092.
DEC	3	337.0	700	428	144236.
DEC	4	335.0	700	428	143380.
DEC	5	334.0	700	428	142952.
DEC	6	332.0	700	428	142096.
DEC	7	333.0	700	428	142524.
DEC	8	198.0	700	428	84744.
DEC	9	333.0	700	428	142524.
DEC	10	331.0	700	428	141668.
DEC	11	328.0	700	428	140384.
DEC	12	326.0	700	428	139528.
DEC	13	323.0	700	428	138244.
DEC	14	336.0	700	428	143808.
DEC	15	347.0	700	428	148516.
DEC	16	344.0	700	428	147232.
DEC	17	341.0	783	482	164362.
DEC	18	339.0	783	482	163398.
DEC	19	336.0	783	482	161952.
DEC	20	332.0	783	482	160024.
DEC	21	336.0	783	482	161952.
DEC	22	235.0	783	482	113270.
DEC	23	219.0	783	482	105558.
DEC	24	364.0	783	482	175448.
DEC	25	361.0	783	482	174002.
DEC	26	361.0	700	428	154508.
DEC	27	359.0	700	428	153652.
DEC	28	354.0	700	428	151512.
DEC	29	349.0	700	428	149372.
DEC	30	344.0	700	428	147232.
DEC	31	342.0	700	428	146376.
TOTAL		10151.			4499230.
MONTHLY WEIGHTED T.D.S.				443	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
JAN	1	341.0	700	428	145948.
JAN	2	340.0	700	428	145520.
JAN	3	338.0	800	493	166634.
JAN	4	337.0	800	493	166141.
JAN	5	335.0	800	493	165155.
JAN	6	334.0	800	493	164662.
JAN	7	332.0	800	493	163676.
JAN	8	330.0	800	493	162690.
JAN	9	325.0	800	493	160225.
JAN	10	323.0	800	493	159239.
JAN	11	328.0	1025	638	209264.
JAN	12	335.0	1025	638	213730.
JAN	13	337.0	1025	638	215006.
JAN	14	334.0	1025	638	213092.
JAN	15	332.0	1025	638	211816.
JAN	16	330.0	1025	638	210540.
JAN	17	330.0	1025	638	210540.
JAN	18	272.0	1025	638	173536.
JAN	19	323.0	1025	638	206074.
JAN	20	436.0	1025	638	278168.
JAN	21	335.0	816	503	168505.
JAN	22	147.0	816	503	73941.
JAN	23	214.0	816	503	107642.
JAN	24	419.0	816	503	210757.
JAN	25	480.0	816	503	241440.
JAN	26	490.0	816	503	246470.
JAN	27	1060.0	816	503	533180.
JAN	28	2090.0	816	503	1051270.
JAN	29	2760.0	816	503	1388280.
JAN	30	1110.0	816	503	558330.
JAN	31	837.0	816	503	421011.
TOTAL		16634.			8742482.
MONTHLY WEIGHTED T.D.S.				526	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
FEB	1	632.0	670	408	257856.
FEB	2	749.0	670	408	305592.
FEB	3	908.0	670	408	370464.
FEB	4	434.0	670	408	177072.
FEB	5	277.0	670	408	113016.
FEB	6	274.0	670	408	111792.
FEB	7	387.0	670	408	157896.
FEB	8	1180.0	670	408	481440.
FEB	9	812.0	670	408	331296.
FEB	10	527.0	670	408	215016.
FEB	11	380.0	670	408	155040.
FEB	12	285.0	750	460	131100.
FEB	13	282.0	750	460	129720.
FEB	14	280.0	750	460	128800.
FEB	15	428.0	750	460	196880.
FEB	16	526.0	750	460	241960.
FEB	17	383.0	750	460	176180.
FEB	18	474.0	750	460	218040.
FEB	19	487.0	750	460	224020.
FEB	20	482.0	750	460	221720.
FEB	21	480.0	750	460	220800.
FEB	22	488.0	750	460	224480.
FEB	23	794.0	750	460	365240.
FEB	24	736.0	875	541	398176.
FEB	25	536.0	875	541	289976.
FEB	26	1440.0	470	279	401760.
FEB	27	3090.0	470	279	862110.
FEB	28	4470.0	470	279	1247130.
TOTAL		22221.			8354572.
MONTHLY WEIGHTED T.D.S.				376	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
MAR	1	3040.0	470	279	848160.
MAR	2	4520.0	470	279	1261080.
MAR	3	5050.0	470	279	1408950.
MAR	4	5510.0	470	279	1537290.
MAR	5	5590.0	470	279	1559610.
MAR	6	5560.0	470	279	1551240.
MAR	7	4580.0	470	279	1277820.
MAR	8	1510.0	470	279	421290.
MAR	9	656.0	470	279	183024.
MAR	10	1950.0	470	279	544050.
MAR	11	1580.0	470	279	440820.
MAR	12	869.0	470	279	242451.
MAR	13	862.0	470	279	240498.
MAR	14	1140.0	470	279	318060.
MAR	15	1570.0	470	279	438030.
MAR	16	2050.0	470	279	571950.
MAR	17	1030.0	470	279	287370.
MAR	18	242.0	470	279	67518.
MAR	19	797.0	470	279	222363.
MAR	20	1080.0	470	279	301320.
MAR	21	1060.0	470	279	295740.
MAR	22	860.0	470	279	239940.
MAR	23	728.0	470	279	203112.
MAR	24	1380.0	470	279	385020.
MAR	25	1470.0	470	279	410130.
MAR	26	1120.0	940	583	652960.
MAR	27	1110.0	940	583	647130.
MAR	28	1230.0	940	583	717090.
MAR	29	790.0	940	583	460570.
MAR	30	15.0	940	583	8745.
MAR	31	502.0	940	583	292666.
TOTAL		59451.			18035988.
MONTHLY WEIGHTED T.D.S.				303	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)† -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
APR	1	1420.0	940	583	827860.
APR	2	1620.0	940	583	944460.
APR	3	1590.0	680	415	659850.
APR	4	1270.0	680	415	527050.
APR	5	1140.0	680	415	473100.
APR	6	1130.0	680	415	468950.
APR	7	1110.0	680	415	460650.
APR	8	556.0	640	389	216284.
APR	9	247.0	640	389	96083.
APR	10	248.0	640	389	96472.
APR	11	247.0	640	389	96083.
APR	12	272.0	640	389	105808.
APR	13	291.0	640	389	113199.
APR	14	378.0	640	389	147042.
APR	15	452.0	640	389	175828.
APR	16	452.0	640	389	175828.
APR	17	456.0	640	389	177384.
APR	18	462.0	640	389	179718.
APR	19	467.0	720	441	205947.
APR	20	472.0	720	441	208152.
APR	21	1130.0	720	441	498330.
APR	22	1550.0	720	441	683550.
APR	23	1530.0	720	441	674730.
APR	24	1510.0	720	441	665910.
APR	25	783.0	720	441	345303.
APR	26	271.0	720	441	119511.
APR	27	297.0	720	441	130977.
APR	28	361.0	720	441	159201.
APR	29	1150.0	720	441	507150.
APR	30	1620.0	825	509	824580.
TOTAL		24482.			10964986.
DNTHLY WEIGHTED T.D.S.				448	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
MAY	1	1610.0	595	360	579600.
MAY	2	1600.0	595	360	576000.
MAY	3	1590.0	595	360	572400.
MAY	4	1570.0	595	360	565200.
MAY	5	1560.0	595	360	561600.
MAY	6	1540.0	595	360	554400.
MAY	7	1520.0	595	360	547200.
MAY	8	1500.0	595	360	540000.
MAY	9	1540.0	595	360	554400.
MAY	10	1550.0	595	360	558000.
MAY	11	714.0	595	360	257040.
MAY	12	122.0	646	393	47946.
MAY	13	192.0	646	393	75456.
MAY	14	255.0	646	393	100215.
MAY	15	259.0	646	393	101787.
MAY	16	299.0	646	393	117507.
MAY	17	347.0	646	393	136371.
MAY	18	370.0	646	393	145410.
MAY	19	414.0	646	393	162702.
MAY	20	446.0	620	376	167696.
MAY	21	463.0	638	388	179644.
MAY	22	465.0	635	386	179490.
MAY	23	437.0	641	390	170430.
MAY	24	413.0	630	383	158179.
MAY	25	475.0	630	383	181925.
MAY	26	551.0	613	372	204972.
MAY	27	719.0	590	357	256683.
MAY	28	910.0	593	359	326690.
MAY	29	908.0	582	351	318708.
MAY	30	894.0	566	341	304854.
MAY	31	891.0	572	345	307395.
TOTAL		26124.			9509898.
MONTHLY WEIGHTED T.D.S.				364	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
JUN	1	887.0	537	322	285614.
JUN	2	886.0	547	329	291494.
JUN	3	1180.0	541	325	383560.
JUN	4	1510.0	551	331	499810.
JUN	5	1490.0	559	337	502130.
JUN	6	1500.0	575	347	520500.
JUN	7	1510.0	593	359	542090.
JUN	8	1470.0	610	370	543900.
JUN	9	1430.0	630	383	547690.
JUN	10	1390.0	666	406	564340.
JUN	11	1320.0	710	434	572880.
JUN	12	1220.0	758	465	567300.
JUN	13	698.0	811	500	349000.
JUN	14	464.0	880	544	252416.
JUN	15	384.0	891	552	211968.
JUN	16	333.0	901	558	185814.
JUN	17	342.0	909	563	192546.
JUN	18	333.0	913	566	188478.
JUN	19	322.0	894	554	178388.
JUN	20	327.0	865	535	174945.
JUN	21	326.0	792	487	158762.
JUN	22	332.0	776	477	158364.
JUN	23	302.0	797	491	148282.
JUN	24	282.0	831	513	144666.
JUN	25	302.0	863	533	160966.
JUN	26	308.0	877	543	167244.
JUN	27	329.0	897	556	182924.
JUN	28	317.0	876	542	171814.
JUN	29	309.0	894	554	171186.
JUN	30	286.0	886	548	156728.
TOTAL		22089.			9175738.
MONTHLY WEIGHTED T.D.S.				415	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY	U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
JUL 1	327.0	809	550	179850.
JUL 2	385.0	901	558	214830.
JUL 3	390.0	900	557	217230.
JUL 4	380.0	915	567	215460.
JUL 5	346.0	919	570	197220.
JUL 6	309.0	918	569	175821.
JUL 7	288.0	929	576	165888.
JUL 8	270.0	938	582	157140.
JUL 9	285.0	942	585	166725.
JUL 10	292.0	939	583	170236.
JUL 11	253.0	946	587	148511.
JUL 12	236.0	936	581	137116.
JUL 13	232.0	928	576	133632.
JUL 14	228.0	930	577	131556.
JUL 15	220.0	945	587	129140.
JUL 16	213.0	946	587	125031.
JUL 17	207.0	934	579	119853.
JUL 18	206.0	932	578	119068.
JUL 19	237.0	938	582	137934.
JUL 20	230.0	951	590	135700.
JUL 21	218.0	963	598	130364.
JUL 22	225.0	972	604	135900.
JUL 23	225.0	981	610	137250.
JUL 24	221.0	986	613	135473.
JUL 25	231.0	994	612	141372.
JUL 26	240.0	1070	668	160320.
JUL 27	229.0	1000	622	142438.
JUL 28	238.0	1000	622	148036.
JUL 29	238.0	1000	622	148036.
JUL 30	241.0	1020	635	153035.
JUL 31	239.0	1030	642	153438.
TOTAL	8079.			4762367.
MONTHLY WEIGHTED T.D.S.			589	

TABLE B-2 (Continued)

SANTA ANA RIVER BELOW PRADO DAM — WEIGHTED T.D.S. CALCULATION SHEET — WATER YEAR 1982-83 — TDS= 0.6479(EC)+ -25.6568

MONTH-DAY		U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
AUG	1	228.0	1040	648	147744.
AUG	2	224.0	1060	661	148064.
AUG	3	223.0	1070	668	148964.
AUG	4	218.0	1070	668	145624.
AUG	5	195.0	1090	681	132795.
AUG	6	186.0	1100	687	127782.
AUG	7	207.0	1110	694	143658.
AUG	8	222.0	1080	674	149628.
AUG	9	250.0	1060	661	165250.
AUG	10	306.0	1010	629	192474.
AUG	11	295.0	1010	629	185555.
AUG	12	263.0	1040	648	170424.
AUG	13	247.0	1080	674	166478.
AUG	14	253.0	1060	661	167233.
AUG	15	256.0	1060	661	169216.
AUG	16	317.0	942	585	185445.
AUG	17	820.0	734	450	369000.
AUG	18	891.0	481	286	254826.
AUG	19	899.0	603	365	328135.
AUG	20	886.0	646	393	348198.
AUG	21	836.0	754	463	387068.
AUG	22	521.0	885	548	285508.
AUG	23	307.0	896	555	170385.
AUG	24	291.0	900	557	162087.
AUG	25	274.0	900	557	152618.
AUG	26	247.0	917	568	140296.
AUG	27	232.0	939	583	135256.
AUG	28	217.0	946	587	127379.
AUG	29	209.0	940	583	121847.
AUG	30	206.0	937	581	119686.
AUG	31	187.0	947	588	109956.
TOTAL		10913.			5758579.
MONTHLY WEIGHTED T.D.S.				528	

TABLE B-2 (Continued)

WEIGHTED T.D.S. CALCULATION SHEET

SANTA ANA RIVER BELOW PRADO DAM WATER YEAR 1982-83 TDS= 0.6479(EC)+ -25.6568

MONTH-DAY	U.S.G.S. MEAN DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.D.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.
SEP 1	192.0	1010	629	120768.
SEP 2	195.0	1060	661	128895.
SEP 3	180.0	1110	694	124920.
SEP 4	173.0	1120	700	121100.
SEP 5	164.0	1080	674	110536.
SEP 6	184.0	1090	681	125304.
SEP 7	189.0	1120	700	132300.
SEP 8	194.0	1150	719	139486.
SEP 9	203.0	1170	732	148596.
SEP 10	195.0	1160	726	141570.
SEP 11	196.0	1150	719	140924.
SEP 12	195.0	1150	719	140205.
SEP 13	193.0	1150	719	138767.
SEP 14	179.0	1150	719	128701.
SEP 15	158.0	1160	726	114708.
SEP 16	148.0	1160	726	107448.
SEP 17	166.0	1170	732	121512.
SEP 18	182.0	1170	732	133224.
SEP 19	196.0	1170	732	143472.
SEP 20	206.0	1170	732	150792.
SEP 21	185.0	1170	732	135420.
SEP 22	170.0	1160	726	123420.
SEP 23	168.0	1150	719	120792.
SEP 24	187.0	1140	713	133331.
SEP 25	200.0	1130	706	141200.
SEP 26	208.0	1120	700	145600.
SEP 27	206.0	1090	681	140286.
SEP 28	187.0	1080	674	126038.
SEP 29	217.0	1090	681	147777.
SEP 30	197.0	1090	681	134157.
TOTAL	5613.			3961249.
MONTHLY WEIGHTED T.D.S.			706	

TABLE B-3

SUMMARY OF WEIGHTED TDS

BELOW PRADO DAM WATER YEAR 1980-1981

	Monthly Flow (cfs-day)	Monthly Flow Times TDS	Monthly Weighted TDS (mg/l)
October	2,884	2,108,264	731
November	6,272	4,130,028	658
December	10,151	4,499,230	443
January	16,634	8,742,482	443
February	22,221	8,354,572	376
March	59,451	18,035,988	303
April	24,482	10,964,986	448
May	26,124	9,509,898	364
June	22,089	9,175,738	415
July	8,079	4,762,367	589
August	10,913	5,758,579	528
September	5,613	3,961,249	706
Total	214,913	90,003,381	
Yearly Weighted TDS			419

APPENDIX C

WATER QUALITY-
LAKE ELSINORE DISCHARGE

1982-83

PREPARED BY:

WILLIAM R. MILLS, JR.

TABLE C-1

SUMMARY OF WEIGHTED TDS

OF WATER PUMPED FROM LAKE ELSINORE

FOR WATER YEAR 1982-83

	Monthly Flow[1] (acre-feet)	Monthly Flow Times TDS	TDS[2] (mg/l)
October	0	0	0
November	0	0	0
December	0	0	0
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0
May	0	0	0
June	966	576,702	597
July	3,577	2,135,469	597
August	2,815	1,669,295	593
September	3,420	2,216,160	648
Total	10,778	6,597,626	
Yearly Weighted TDS			612

(1) Data supplied by the Riverside County Flood Control and Water Conservation District.

(2) Average water quality of water at the discharge of the pumps.

APPENDIX D

WATER QUALITY - SANTA ANA RIVER AT RIVERSIDE NARROWS

1982-83

PREPARED BY

DONALD L. HARRIGER

TABLE D-1

WATER QUALITY ANALYSIS
SANTA ANA RIVER AT RIVERSIDE NARROWS
WATER YEAR 1982-83

Date			EC	TDS	Agency
1982	Oct.	5	1010	648	USGS
		7	1000	620	C of R
		12	980	618	C of R
		21	980	628	C of R
		21	1030	656	USGS
		26	940	624	C of R
		27	1050	638	DWR
	Nov.	1	1000	638	USGS
		4	980	630	C of R
		9	980	647	C of R
		10	400	239	USGS
		17	1050	661	USGS
		18	1120	738	C of R
		23	1010	654	C of R
		26	1040	673	DWR
		30	338	194	USGS
	Dec.	2	820	521	C of R
		3	979	630	USGS
		7	1000	647	C of R
		14	980	650	C of R
		21	1000	715	C of R
		21	1060	574	DWR
		27	774	488	USGS
1983	Jan.	4	820	533	C of R
		7	824	516	USGS
		13	970	634	C of R
		18	970	670	C of R
		19	469	294	USGS
		21	1000	661	USGS
		23	431	269	USGS
		27	350	280	C of R
	Feb.	1	476	287	USGS
		1	450	363	C of R
		10	590	390	C of R
		15	800	515	C of R

TABLE D-1

WATER QUALITY ANALYSIS
SANTA ANA RIVER AT RIVERSIDE NARROWS
WATER YEAR 1982-83 (Continued)

Date			EC	TDS	Agency
1983 (Cont'd)	Feb	18	899	570	USGS
		24	860	558	C of R
		25	851	583	DWR
	Mar	1	275	227	C of R
		2	283	161	USGS
		7	399	245	USGS
		10	540	355	C of R
		14	395	243	USGS
		15	510	311	C of R
		24	290	269	C of R
		25	851	583	DWR
		29	400	277	C of R
	Apr.	6	504	295	USGS
		7	440	329	C of R
		8	544	344	DWR
		12	500	337	C of R
		21	250	223	C of R
		22	429	270	USGS
		26	460	326	C of R
		27	499	316	DWR
	May	4	413	268	USGS
		5	380	268	C of R
		10	400	282	C of R
		17	502	320	DWR
		18	432	256	USGS
		19	430	290	C of R
		24	352	273	C of R
	June	2	382	257	USGS
		2	362	261	C of R
		6	429	275	DWR
		7	400	306	C of R
		16	600	436	C of R
		20	615	396	USGS
		21	620	421	C of R
		30	680	460	C of R

TABLE D-1

WATER QUALITY ANALYSIS
SANTA ANA RIVER AT RIVERSIDE NARROWS
WATER YEAR 1982-83 (Continued)

Date			EC	TDS	Agency
1983 (Cont'd)	July	1	605	400	USGS
		5	690	447	C of R
		14	730	473	C of R
		19	690	481	DWR
		19	740	486	C of R
		20	730	489	USGS
		28	790	532	C of R
	Aug.	2	796	529	USGS
		2	840	547	C of R
		11	820	546	C of R
		15	781	511	USGS
		16	780	538	C of R
		25	690	489	C of R
		30	820	530	C of R
		30	780	560	DWR

TABLE D-2

FLOW WEIGHTED TDS OF FLOW AT RIVERSIDE NARROWS
(Including Nontributary Flow and Excluding Rubidoux Wastewater

WATER YEAR 1982-83

	Month	Acre Feet[1]	TDS[2] (mg/l)	Acre Feet Times TDS
1981	October	2,425	633	1,535,025
	November	3,184	663	2,110,992
	December	4,075	661	2,693,575
1982	January	4,891	645	3,154,695
	February	4,929	630	3,105,270
	March	5,825	615	3,582,375
	April	5,794	600	3,476,400
	May	5,829	585	3,409,965
	June	5,294	565	2,991,110
	July	4,945	545	2,695,025
	August	4,435	531	2,354,985
	September	4,258	610	2,597,380
Total		55,884		33,706,797
Flow Weighted TDS		$\frac{33,706,797}{55,884}$ = 603		

(1) Total Flow minus Storm Flow from Table 6.

(2) Estimated average TDS based on water quality data from Table D-1.

APPENDIX E

QUANTITY AND QUALITY OF WASTEWATER FROM RUBIDOUX COMMUNITY SERVICES DISTRICT

1982-83

PREPARED BY

DONALD L. HARRIGER

TABLE E-1

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

WATER YEAR 1982-83

Month		Flow A.F.	TDS (ppm)	Acre-Feet x TDS
1982	October	124	732*	90,768
	November	118	768	90,624
	December	128	751	96,128
1983	January	134	749	100,366
	February	120	788	94,560
	March	151	744	112,344
	April	139	792	110,088
	May	141	750	105,750
	June	132	796	105,072
	July	134	770	103,180
	August	131	727	95,237
	September	134	770	103,180
	Total	1,586	---	1,207,297

$$\frac{1,207,297}{1,586} = 761 \text{ mg/l}$$

Average Flow Weighted Quality of Wastewater = 761 mg/l.

* No data available. Therefore, TDS shown is the average of TDS for September and November 1982.

APPENDIX F

SANTA ANA RIVER WATERMASTER
FINANCIAL STATEMENTS WITH REPORT
ON
EXAMINATION BY CERTIFIED PUBLIC ACCOUNTANTS

SANTA ANA RIVER WATERMASTER

FINANCIAL STATEMENTS

WITH REPORT ON EXAMINATION BY CERTIFIED PUBLIC ACCOUNTANTS

JUNE 30, 1983

DIEHL, EVANS AND COMPANY
A PARTNERSHIP OF ACCOUNTANCY CORPORATIONS
CERTIFIED PUBLIC ACCOUNTANTS
1910 NORTH BUSH STREET
SANTA ANA, CALIFORNIA 92706

ELLIS C. DIEHL, C.P.A. (1925-1956)
BRYN B. EVANS, C.P.A.
WIN G. PETERS, C.P.A.
DONALD H. PETERSON, C.P.A.
DONALD E. CALLAHAN, C.P.A.
L. PETER SCHERER, C.P.A.
PHILIP H. HOLTKAMP, C.P.A.
RODNEY K. McDANIEL, C.P.A.
RALPH H. WEINTRAUB, C.P.A.

DIEHL, EVANS AND COMPANY
A PARTNERSHIP OF ACCOUNTANCY CORPORATIONS
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CARLSBAD, CALIFORNIA 92008
(714) 729-2343
120 WEST WOODWARD AVENUE
ESCONDIDO, CALIFORNIA 92025
(714) 741-3141

July 29, 1983

ACCOUNTANTS' REPORT

Santa Ana River Watermaster
Orange, California

We have examined the statement of assets and liabilities arising from cash transactions of the Santa Ana River Watermaster as of June 30, 1983 and the related statement of revenue collected, expenses paid and changes in fund balance for the year then ended. Our examination was made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

As described in Note 1, the Watermaster's policy is to prepare its financial statements on the basis of cash receipts and disbursements; consequently, certain revenue and the related assets are recognized when received rather than when earned and certain expenses are recognized when paid rather than when the obligation is incurred. Accordingly, the accompanying financial statements are not intended to present financial position and results of operations in conformity with generally accepted accounting principles.

In our opinion, the aforementioned financial statements present fairly the assets and liabilities arising from cash transactions of the Santa Ana River Watermaster at June 30, 1983, and the revenue collected and expenses paid for the year then ended, on the basis of accounting described in Note 1, which basis has been applied in a manner consistent with that of the preceding year.

Diehl, Evans and Company

SANTA ANA RIVER WATERMASTER

STATEMENT OF ASSETS AND LIABILITIES
ARISING FROM CASH TRANSACTIONS

June 30, 1983

ASSETS

Cash in checking account	$ 500
Cash in savings account	12,699
TOTAL ASSETS	$ 13,199

LIABILITIES AND FUND BALANCE

Liabilities	$ -
Fund balance	13,199
TOTAL LIABILITIES AND FUND BALANCE	$ 13,199

See accountants' report and notes to financial statements.

SANTA ANA RIVER WATERMASTER

STATEMENT OF REVENUE COLLECTED, EXPENSES
PAID AND CHANGES IN FUND BALANCE

For the year ended June 30, 1983

		Actual	Budget	Over (Under) Budget
REVENUE COLLECTED:				
Water district contributions:				
Orange County Water District		$ 5,600	$ 5,600	$ -
Chino Basin Municipal Water District		2,800	2,800	-
San Bernardino Valley Municipal Water District		2,800	2,800	-
Western Municipal Water District		2,800	2,800	-
Interest from savings account		560	-	560
TOTAL REVENUE COLLECTED		14,560	14,000	560
EXPENSES PAID:				
Professional engineering services		7,705	8,000	(295)
Administrative expenses:				
Office and secretarial expense	$ 1,005			
Auditing services	580	1,585	3,000	(1,415)
Annual reports		2,081	3,000	(919)
TOTAL EXPENSES PAID		11,371	14,000	(2,629)
EXCESS OF REVENUE COLLECTED OVER EXPENDITURES PAID		3,189	$ -	$ 3,189
FUND BALANCE AT JULY 1, 1982		10,010		
FUND BALANCE AT JUNE 30, 1983		$ 13,199		

See accountants' report and notes to financial statements.

SANTA ANA RIVER WATERMASTER

NOTES TO FINANCIAL STATEMENTS

June 30, 1983

1. ACCOUNTING METHOD:

The Watermaster uses the cash receipts and disbursements method of accounting for all of its financial activity.

2. ORGANIZATION AND HISTORY:

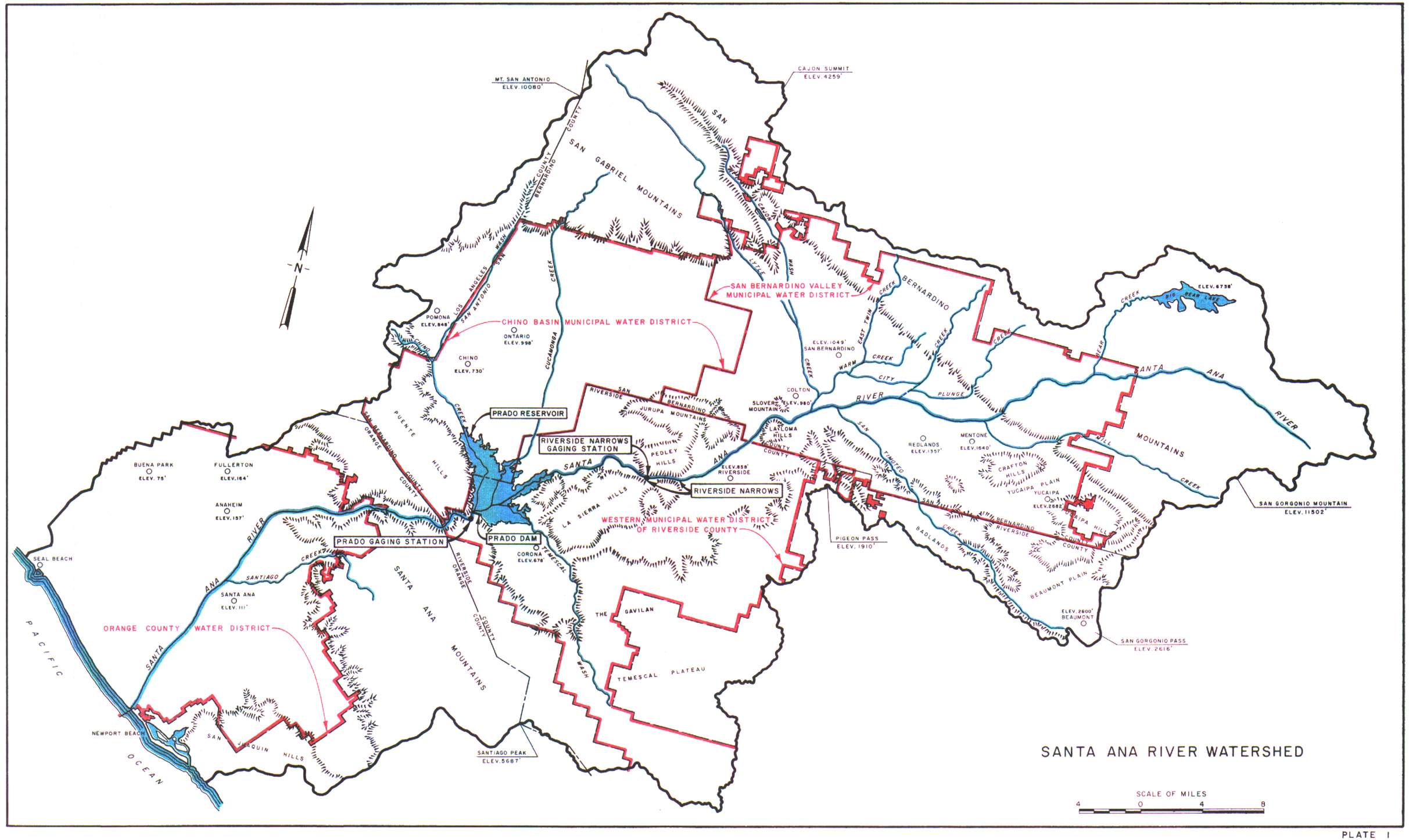
The Santa Ana River Watermaster is composed of a committee of five representatives of four water districts. Two representatives serve from Orange County Water District and one representative each serves from Chino Basin Municipal Water District, Western Municipal Water District and San Bernardino Valley 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 judgement resulting from a lawsuit by Orange County Water District as plaintiff vs. City of Chino, et al, as defendants.

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

Orange County Water District	40%
Chino Basin Municipal Water District	20
Western Municipal Water District	20
San Bernardino Valley Municipal Water District	20
Total	100%

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

See accountants' report.



SANTA ANA RIVER WATERSHED

PLATE I

OCTOBER 5 10 15 20 25 | NOVEMBER 5 10 15 20 25 | DECEMBER 5 10 15 20 25 | JANUARY 5 10 15 20 25 | FEBRUARY 5 10 15 20 25 | MARCH 5 10 15 20 25 | APRIL 5 10 15 20 25 | MAY 5 10 15 20 25 | JUNE 5 10 15 20 25 | JULY 5 10 15 20 25 | AUGUST 5 10 15 20 25 | SEPTEMBER 5 10 15 20 25

SAN BERNARDINO PRECIPITATION
(County Hospital)
Total - 32.36″

INCHES

2
1
0

0.24″ | 4.35″ | 2.31″ | 5.41″ | 4.90″ | 7.46″ | 3.22″ | 0.05″ | 0.02″ | 0.00″ | 3.72″ | 0.68″

CUBIC FEET PER SECOND

280
260
240
220
200
180
160
140
120
100
80
60

INFLOW TO PRADO DAM

DISCHARGE OF LAKE ELSINORE REACHING PRADO DAM (7,703 ac-ft)

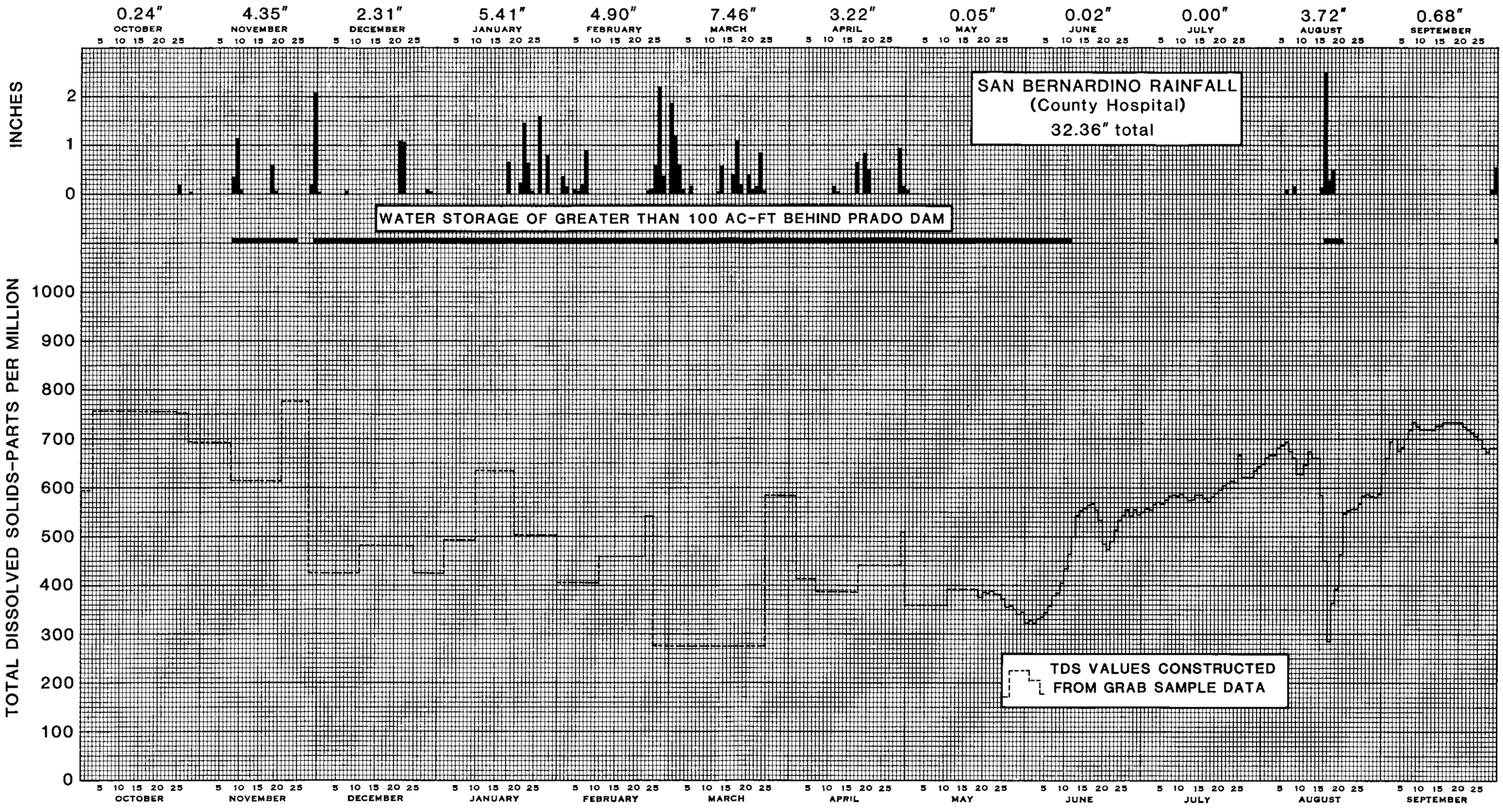
STORM FLOW

5 10 15 20 25 OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE | JULY | AUGUST | SEPTEMBER

DISCHARGE OF SANTA ANA RIVER BELOW PRADO DAM & SAN BERNARDINO PRECIPITATION

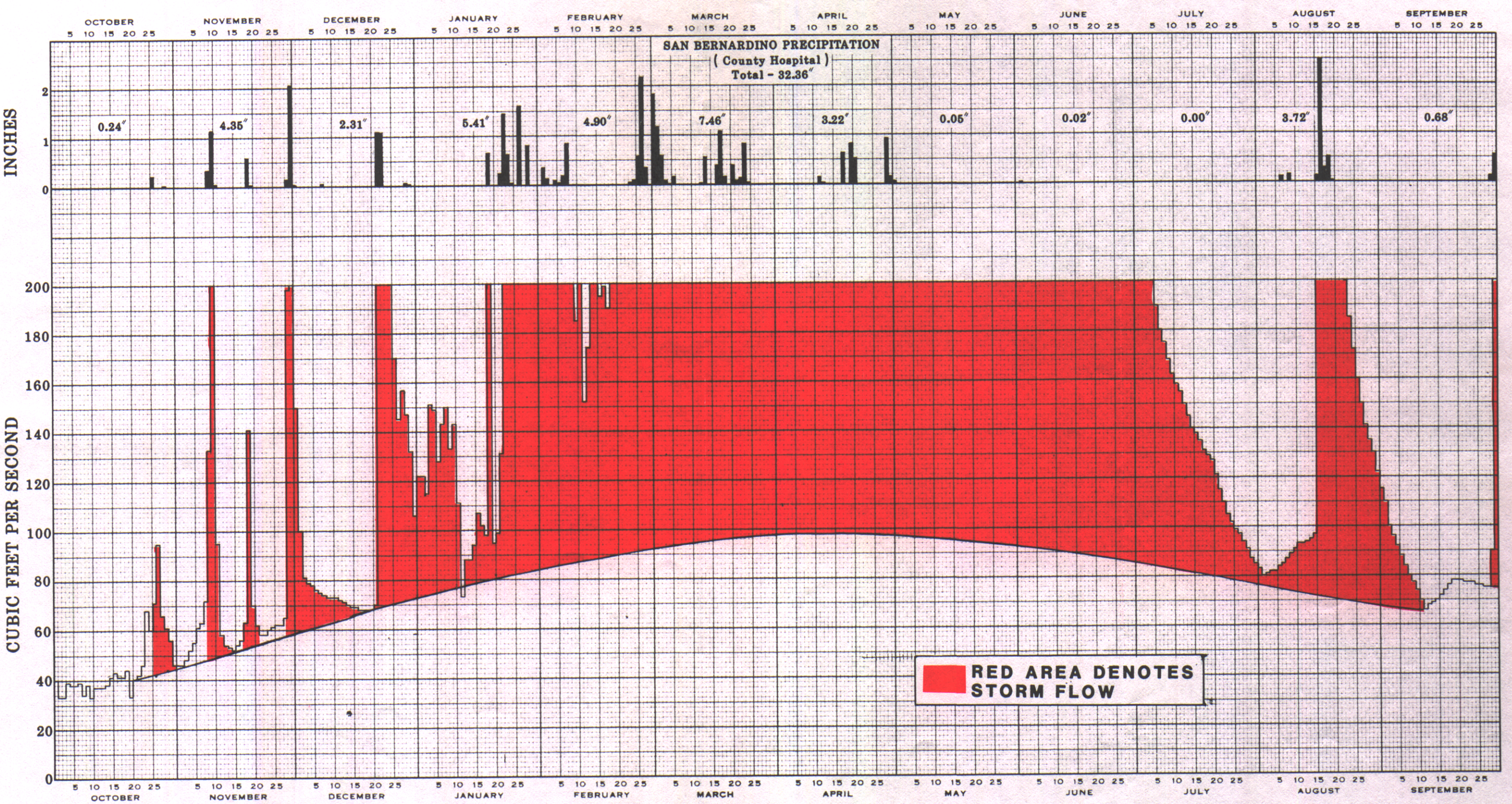
WATER YEAR 1982 - 83

PLATE 2



DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM
WATER YEAR 1982-83

PLATE 3



DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS & SAN BERNARDINO PRECIPITATION

WATER YEAR 1982 - 83

PLATE 4