SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

VS. CITY OF CHINO, et al

CASE NO. 117628-COUNTY OF ORANGE

FIFTEENTH

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

1984-85

JUNE 30, 1986

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
    DONALD L. HARRIGER
    WILLIAM R. MILLS, JR.
    ROBERT L. REITER

MAILING ADDRESS
895 EAST YORBA LINDA BLVD.
SUITE J
PLACENTIA, CA 92670

June 30, 1986

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

Re: Watermaster Report for 1984-85

Gentlemen:

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

The principal findings of the Watermaster for the water year 1984-85 are as follows:

At Prado

(1)	Base Flow at Prado	125,023	acre-feet
(2)	Annual Weighted TDS of Base and Storm Flows	617	mg/l
(3)	Annual Adjusted Base Flow	133,670	acre-feet
(4)	Cumulative Adjusted Base Flow	1,153,184	acre-feet
(5)	Cumulative Entitlement of OCWD	630,000	acre-feet
(6)	Cumulative Credit	523,184	acre-feet
(7)	One-third of Cumulative Debit	0	acre-feet
(8)	Minimum Required Base Flow in 1985-86	34,000	acre-feet

At Riverside Narrows

(1)	Base Flow at Riverside Narrows	69,772	acre-feet
(2)	Annual Weighted TDS of Base Flow	633	mg/l
(3)	Annual Adjusted Base Flow	69,772	acre-feet
(4)	Cumulative Adjusted Base Flow	426,822	acre-feet
(5)	Cumulative Entitlement of CBMWD and WMWD	228,750	acre-feet
(6)	Cumulative Credit	198,072	acre-feet
(7)	One-third of Cumulative Debit	0	acre-feet
(8)	Minimum Required Base Flow in 1985-86	12,420	acre-feet

The above findings show that at the end of the 1984-85 water year Chino Basin Municipal Water District and Western Municipal Water District have a cumulative credit of 523,184 acre-feet to their Base Flow obligation at Prado Dam. San Bernardino Valley Municipal Water District has a cumulative credit of 198,072 acre-feet to its Base Flow obligation at Riverside Narrows.
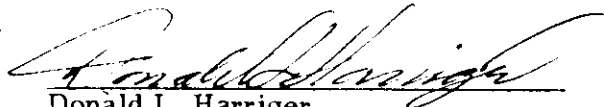
Two events of importance to the Watermaster that have occurred this past year are the MWD approval of the Chino Basin Groundwater Storage Program and the pumping of water from the Artesian Zone of the San Bernardino Basin Area to the Santa Ana River in an effort to lower the level of groundwater in the area underlying a portion of the City of San Bernardino. Both of these projects are discussed in Chapter II, Water Supply Conditions.
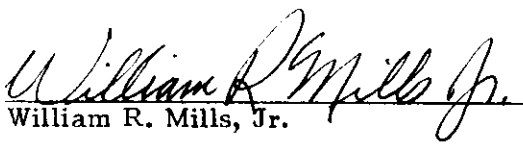
Sincerely yours,

SANTA ANA RIVER WATERMASTER
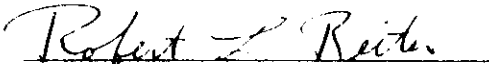
BY: _____   _____
    Harvey O. Banks   Donald L. Harriger

    _____   _____
    William J. Carroll   William R. Mills, Jr.

    _____
    Robert L. Reiter

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES
(Located at Back of Report)

APPENDICES
(Located at Back of Report)

CHAPTER I
WATERMASTER ACTIVITIES

This is the fifteenth 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 Litigation and the Summary of Judgment are included in this annual report as Appendices F and G.

In order to administer the provisions of the Judgment, the court appointed a Watermaster composed of five persons. After August 15, 1985, the Santa Ana River Watermaster Committee consisted of Harvey O. Banks, William J. Carroll, William R. Mills, Jr., Donald L. Harriger and Robert L. Reiter. Mr. Banks continued to serve as Chairman, and Mr. Mills continued to serve as Secretary. Mr. James C. Hanson had resigned from the Watermaster Committee on August 15, 1985. Mr. Hanson was appointed to the Watermaster Committee on February 11, 1971. His contributions to the Watermaster Committee have been innumerable. The Watermaster Committee adopted a resolution of commendation

for Mr. Hanson, which is included in this report as Appendix H. Mr. Robert L. Reiter was nominated by San Bernardino Valley Municipal Water District to replace Mr. Hanson on the Watermaster Committee. The Court appointed Mr. Reiter by order effective August 15, 1985. The office of the Santa Ana River Watermaster Committee has been moved to a new location at 895 East Yorba Linda Blvd., Suite J, Placentia, CA 92670.

The usual time for submission of the annual report is seven months after the end of each water year. The Court has approved the submittal of this Annual Report on or before June 30, 1986. 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. 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 at E Street in San Bernardino and at Mission Blvd. in Riverside.

Precipitation during 1984-85 was below normal and totaled 12.86 inches at San Bernardino County Hospital. Only 0.26 inches were recorded after March 29, 1985 in April, May and June. In September 0.42 inches were measured. Significant amounts of storm runoff were recorded during the first two weeks of November at both Riverside Narrows and Prado. Storm runoff continued from about November 20 through the end of March except for periods of one or two days at both stations.

The 1984-85 discharge record for the USGS gaging station, "Santa Ana River below Prado" is considered by the USGS to be a "good" record. Twenty direct discharge measurements, which ranged from 117 to 415 cubic feet per second, were made during the year. Beginning on November 14, 1984, the discharge was regulated by Prado Reservoir with a maximum of 4,783 acre-feet in storage on

TABLE 1

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

October 1, 1984 to September 30, 1985

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT		
At Riverside Narrows (MWD Crossing)		
Water Quality Monitor/TDS Samples	$ 609	
Dozer	333	
At Mission Boulevard		
Surface Water Gage	456	$ 1,398
WESTERN MUNICIPAL WATER DISTRICT		
Same as SBVMWD	$ 1,397	
Cucamonga Creek Discharge	1,675	
Chino Creek Discharge	1,117	4,189
CHINO BASIN MUNICIPAL WATER DISTRICT		
Same as WMWD		4,190
ORANGE COUNTY WATER DISTRICT		
At Prado Dam		
Water Quality Monitor/TDS Samples, Water Quality Sampling and Conductivity Programs	$11,815	
At Mission Boulevard		
Surface Water Gage	912	
Chino Creek		
Surface Water Gage	1,116	13,843
TOTAL FOR PARTIES		$23,620
UNITED STATES GEOLOGICAL SURVEY		20,500
GRAND TOTAL		$44,120

December 19, 1984. The maximum average daily discharge after regulation by Prado Reservoir occurred on December 20, 1984 and amounted to 1,930 cubic feet per second. The mean annual discharge was approximately 225 cubic feet per second.

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 City of Riverside, City of Corona, Chino Basin Municipal Water District, and the USGS.

The overall 1984-85 discharge record for the USGS gaging station "Santa Ana River at MWD Crossing" is considered by the USGS to be a "poor" record at both low and high stages because of the shifting channel. The station was moved downstream to the MWD pipeline trestle during the year. There was no gage height record from October 1, 1984 through April 15, 1985. The gage height record was complete from April 16, 1985 through September 26, 1985 after the installation of new instrumentation. 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. Thirty-one direct discharge measurements which ranged from 54 to 148 cfs were made during the year of which twelve, with a range of 54 to 102 cfs, were made on and after April 16 when a gage height record was available.

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, 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 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 10, 1984, the Watermaster adopted a budget for the fiscal year 1984-85 in the amount of $14,000. At its meeting on May 23, 1985 the Watermaster adopted a budget for the fiscal year 1985-86 in the amount of $16,000. Table 2 shows the items and amounts included in said budgets together with actual expenses for the fiscal year 1984-85.

TABLE 2
SANTA ANA RIVER WATERMASTER BUDGET AND EXPENSES

	July 1, 1984 to June 30, 1985 Budget	July 1, 1984 to June 30, 1985 Expenses	July 1,1985 to June 30, 1986 Budget
Administration	$ 3,000.00	$1,813.00	$ 5,000.00
Support Engineering Services	8,000.00	4,820.00	8,000.00
Reproduction of Annual Report	3,000.00	398.00	3,000.00
Total	$14,000.00	$7,031.00	$16,000.00

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 1984-85 is included herein as Appendix E.

Summary of Findings

A summary of findings by the Watermaster for the period 1970-71 through 1984-85 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 (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	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]
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	617	133,670	523,184

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	17,012	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	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	83,050	32,778	678	32,778	59,974
1982-83	32.36	279,987	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

(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; 7,720 acre-feet in 1982-83 and 12,550 acre-feet in 1983-84.

(5)   Excludes water pumped from Lake Elsinore.

(6)   Includes 8,045 acre-feet in 1979-80, 3,362 acre-feet in 1982-83, and 4,602 acre-feet in 1983-84 of Lake Elsinore discharge.

(7)   Includes Rubidoux Wastewater in 1979-80 and subsequent years.

(8)   Includes groundwater pumped by City of Riverside and released below Riverside Narrows in accordance with Court Orders approving agreement and allowing temporary additional extractions of water from the San Bernardino Basin Area.

Note: For the years 1973-74 through 1979-80, a correction has been made for different losses of State water than assumed in reports published for these years. The values changed are Base Flow, weighted TDS, and adjusted Base Flow, and these changes in turn have changed the cumulative credit for these years. See Appendix C in the Twelth Annual Report, 1981-1982.

CHAPTER II
WATER SUPPLY CONDITIONS

The precipitation in the Santa Ana River Watershed during 1984-85, as represented by rainfall measured at San Bernardino County Hospital, was about 72 percent of normal in terms of the Base Period average. Accordingly, the total flow of the Santa Ana River below Prado Dam during the 1984-85 water year decreased to 163,247 acre-feet as compared to a total flow of 178,730 acre-feet which occurred in the previous year. Despite below normal rainfall in the Santa Ana River Watershed during 1984-85 the effects of the heavy rainfall which occurred in 1977-78, 1979-80 and 1982-83 continue to be felt with the Base Flow amounts at Riverside Narrows and Prado of 69,772 acre-feet and 125,023 acre-feet, respectively. These Base Flows are the highest to date since 1970-71.

Chino Basin Groundwater Storage Program

Metropolitan Water District of Southern California (MWD) has approved the Chino Basin Groundwater Storage Program (Program) as an MWD project to augment the yield of the State Water Project (SWP) available to MWD and its member agencies during periods of SWP deficiency. MWD has initiated negotiations with the Chino Basin agencies involved for implementation of the Program. MWD proposes to store surplus State Water Project water when and as available underground in Chino Basin by artificial recharge for later extraction during subsequent periods of deficiency. It is anticipated that this will gradually affect significantly both the quantity and quality of the flow of the Santa Ana River at Prado, particularly the base flow. This situation was not anticipated in the stipulated judgment in Orange County Water District vs. City of Chino, et al. The Watermaster will need to modify the scalped base flow each year for the estimated effects of the Program to determine the amount of base flow within the meaning and intent of the stipulated judgment.

The Watermaster has requested that it be kept informed of the progress of negotiations and of MWD's plans for implementation of the Program and to

provide certain background information. MWD has been most cooperative in this regard.

MWD is now developing a groundwater monitoring program to provide the data necessary to refine the groundwater model of the Chino Basin, and then for use with the model each year to estimate the effects of the Program in Chino Basin and on the Santa Ana River. The Watermaster will be provided with the monitoring program data and the model formulation, and the results of its use.

The Watermaster will monitor the Chino Basin Groundwater Storage Program and report annually on the Program, its progress, results and effects on the River. The groundwater monitoring program and groundwater model formulation will be reviewed and suggestions submitted as deemed appropriate. MWD's estimates of the effects on the Santa Ana River once underground storage has begun, will be analyzed each year and appropriate modifications made to the scalped base flow.

Discharge of Groundwater From San Bernardino Basin Area
To Santa Ana River

During 1984-85, groundwater from the San Bernardino Basin Area was pumped directly to the Santa Ana River to lower groundwater levels in the area underlying portions of the City of San Bernardino. This pumping was done in accordance with Riverside County Superior Court Orders modifying the Western Judgment (Case No. 78426) by approving the Temporary Additional Extraction Agreements between San Bernardino Valley and Western.

These agreements indicate that recently, the groundwater levels in the Artesian Zone of San Bernardino Basin Area have risen to, or nearly to, the surface of the ground. The recurrence of the high groundwater table has caused basement flooding and damage to buildings, pavement, and sewer lines, and in the event of an earthquake may create a threat of ground liquefaction and constitutes and serves as a threat to public health, safety and welfare in the Artesian Zone.

San Bernardino Valley Municipal Water District and Western Municipal Water District initiated a program for additional extractions from San Bernardino Basin above the limits set in the judgment in Western Municipal Water District of Riverside County v. East San Bernardino County Water District et al. That judgment provides that additional extractions can be made under agreement

between San Bernardino Valley Municipal Water District and Western Municipal Water District approved by the Court under its continuing jurisdiction.

The previously listed agreement was entered into on February 25, 1985, among San Bernardino Valley Municipal Water District (SBVMWD), Western Municipal Water District (WMWD), Orange County Water District (OCWD), City of Riverside (Riverside), and City of San Bernardino (San Bernardino) providing for additional extractions from San Bernardino Basin to lower groundwater levels through June 30, 1985. The agreement was amended on August 21, 1985, extending the time limit through December 31, 1985. East Valley Water District (EVWD) has cooperated in the program.

The additional extractions by San Bernardino and EVWD were returned via storm channels to Santa Ana River above Riverside Narrows. Some of the additional extractions by City of Riverside were returned to the River below Riverside Narrows via the Riverside Canal.

Precipitation During 1984-85

During the 1984-85 water year, the precipitation at the San Bernardino County Hospital amounted to 12.86 inches, which is 72 percent of the Base Period average. Most of the precipitation, 93 percent, occurred during the months of November, December, January, February and March. The maximum monthly precipitation of 5.45 inches occurred during December.

Figure 1 shows the seasonal precipitation from 1931-32 through 1984-85 and the accumulated departure from the 1934-35 through 1959-60 Base Period average.

Runoff During 1984-85

Below Prado Dam

The total seasonal flow at Prado for the 1984-85 water year less Non-tributary Flow was 162,912 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 fifteen-year period (1970-71 through 1984-85) since the Judgment went into effect, the Base Flow, unadjusted for quality, has averaged 68,690 acre-feet per year. This compares to the 26-year
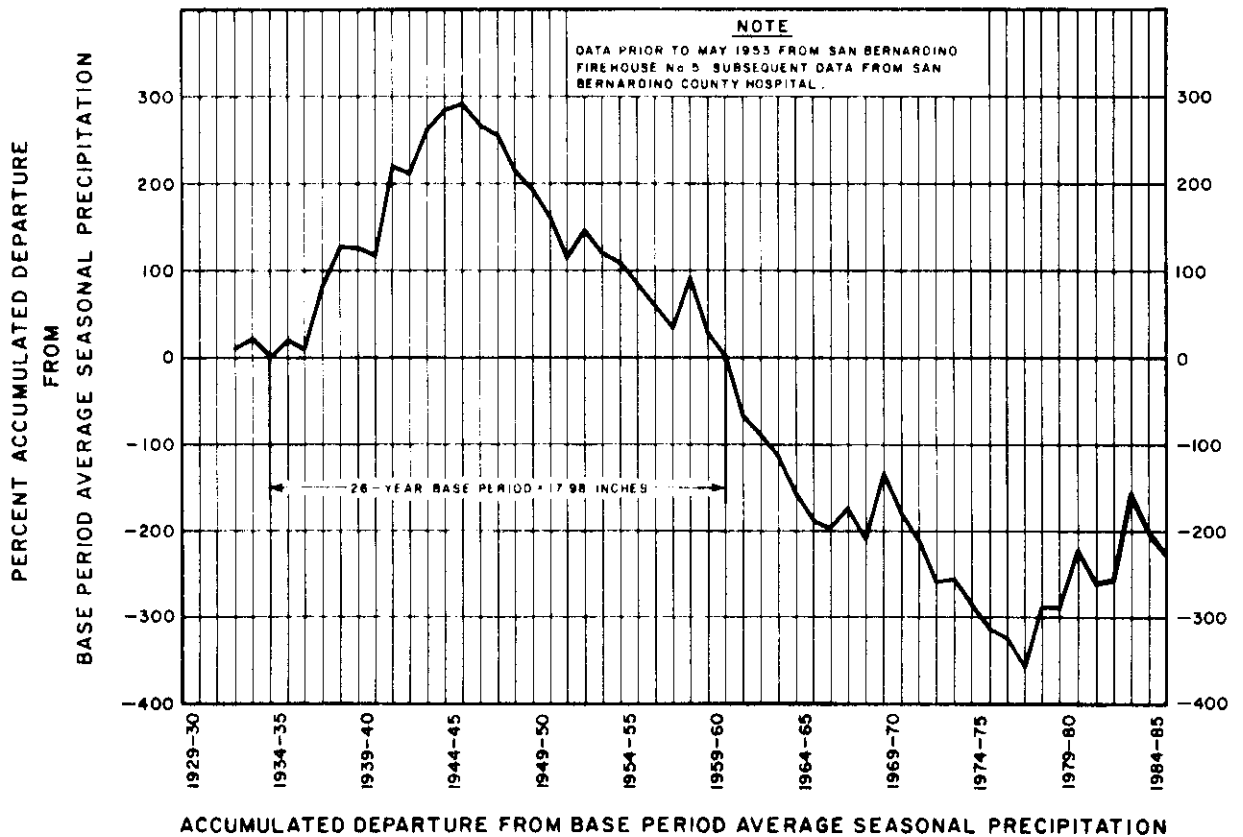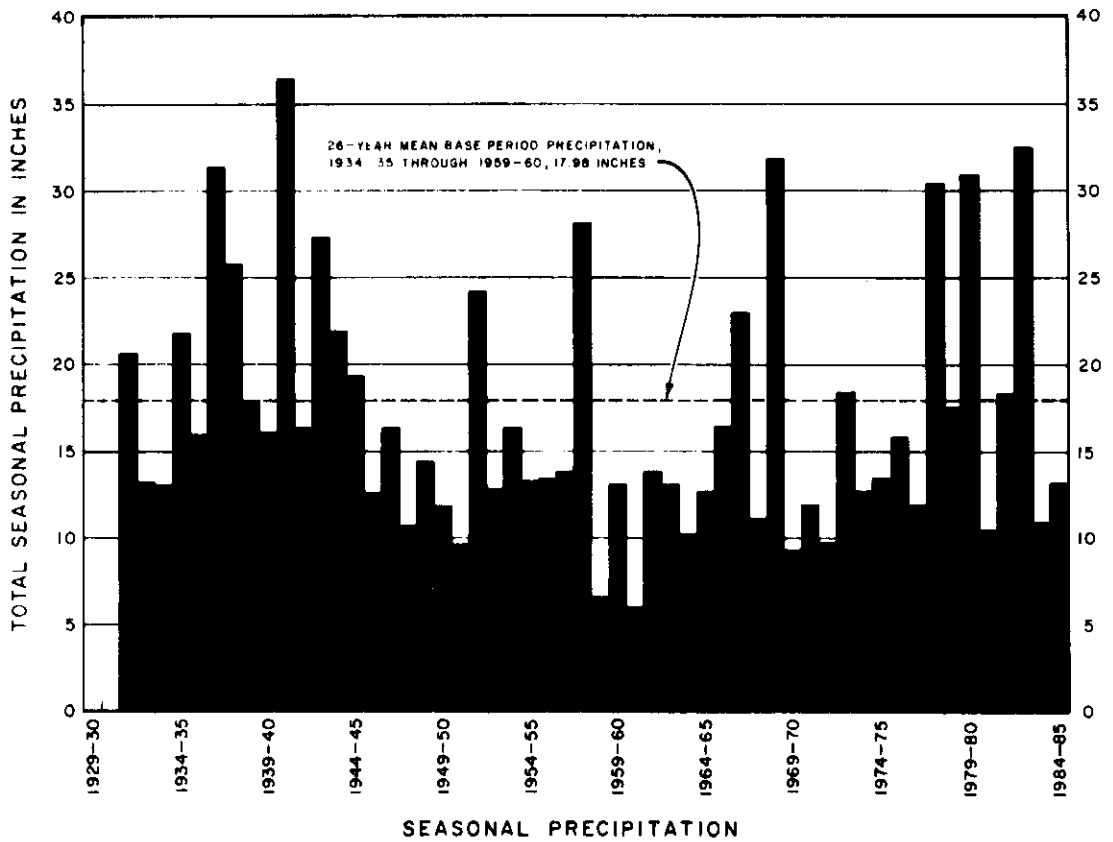
VARIATION IN PRECIPITATION AT SAN BERNARDINO
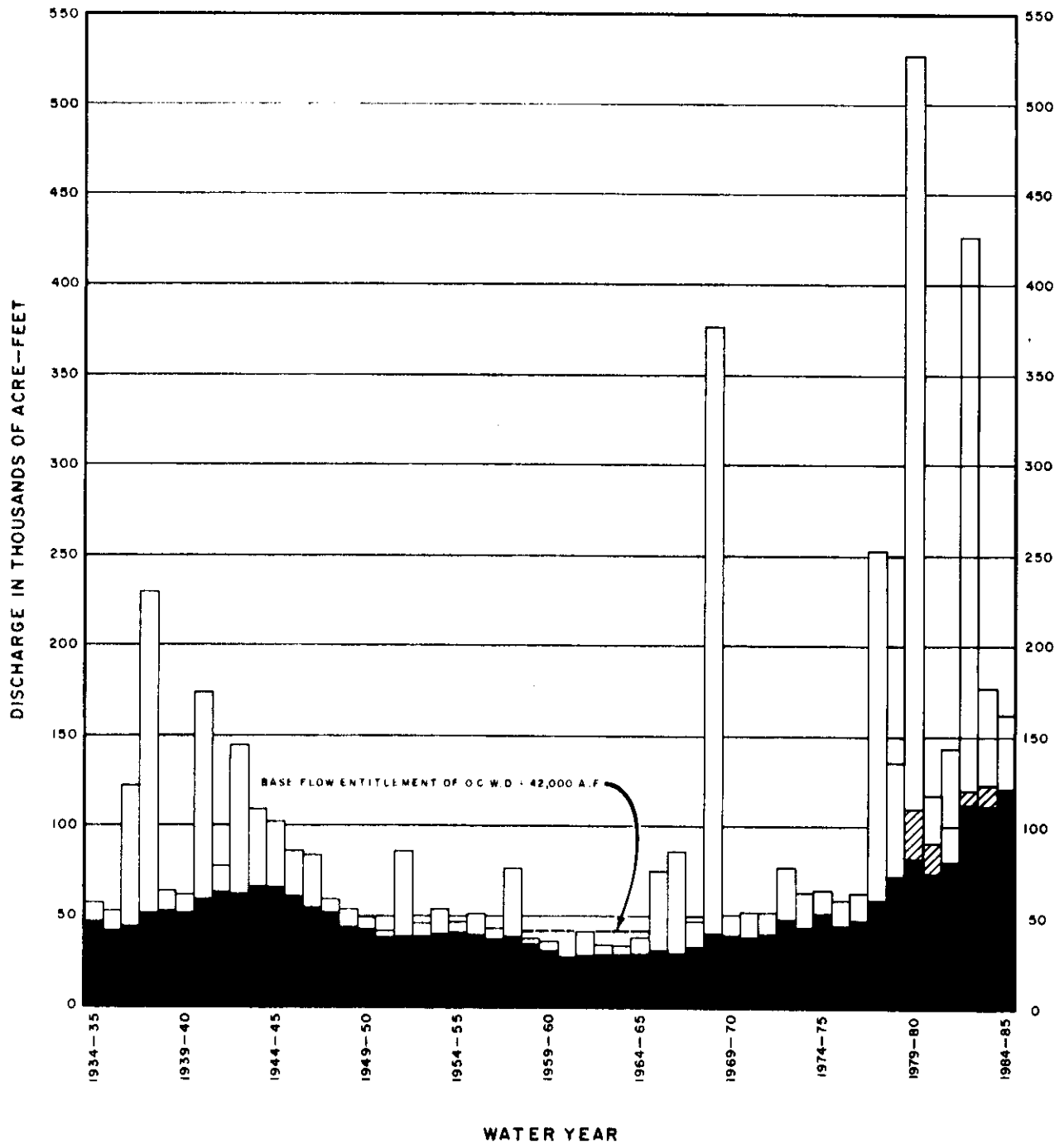
FIGURE 1

DISCHARGE OF SANTA ANA RIVER BELOW PRADO DAM

FIGURE 2

Base Period average of 47,470 acre-feet and the Base Flow requirements under the Judgment of 42,000 acre-feet. The 1984-85 Base Flow amounted to 125,023 acre-feet, an increase of 56,333 acre-feet over the fifteen-year average. The Base Flow in 1984-85 includes an increase due to the direct discharge to the River of groundwater pumped from San Bernardino Basin Area by City of San Bernardino, City of Riverside and East Valley Water District.

The calculated inflow to Prado Reservoir during the month of December amounted to 31,912 acre-feet or 20 percent of the seasonal total. The maximum storage in Prado Reservoir occurred on December 19, 1984 when 4,783 acre-feet (about 2 percent of the reservoir capacity at spillway level) was in storage. The maximum release of 1930 cfs from Prado Reservoir occurred on December 20, 1984.

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 1984-85.

At Riverside Narrows

The Total Flow less Nontributary Flow of the Santa Ana River at Riverside Narrows for the 1984-85 water year was 78,771 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 fifteen-year period 1970-71 through 1984-85, the Base Flow has averaged 28,580 acre-feet per year. The 1984-85 Base Flow amounted to 69,772 acre-feet, an increase of 41,192 acre-feet over the fifteen-year average. The Base Flow in 1984-85 includes an increase due to the direct discharge to the River of groundwater from San Bernardino Basin Area by City of San Bernardino, East Valley Water District and the City of Riverside.

Figure 3 shows the components of Total Flow in the Santa Ana River at Riverside Narrows for the period from 1934-35 through 1984-85.

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.
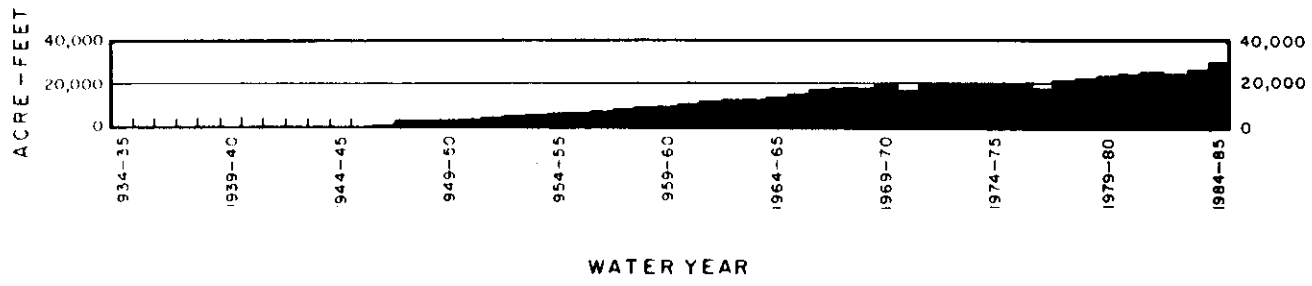
SEWAGE EFFLUENT FROM RIVERSIDE WATER QUALITY CONTROL PLANT
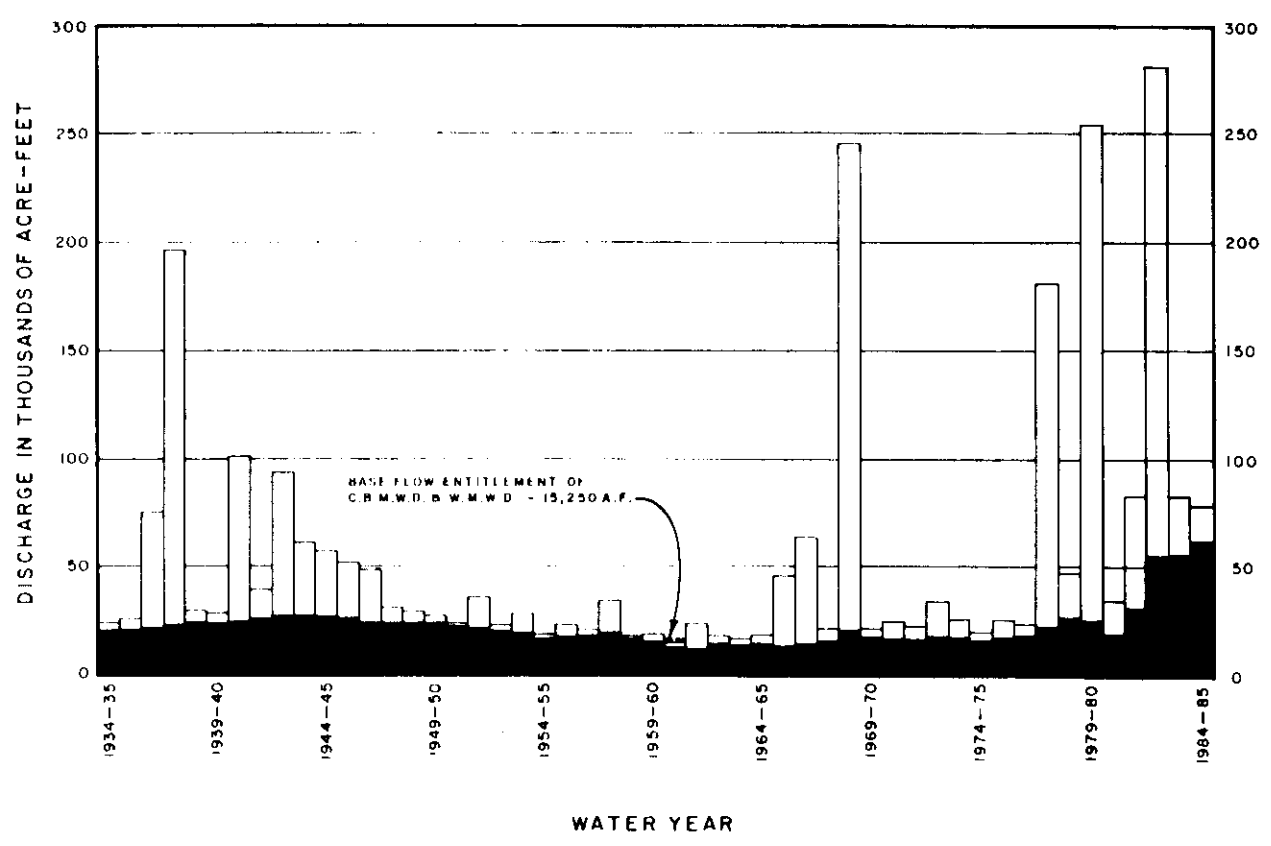
NOTES

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 TRANSPORTATION IN THE SANTA ANA RIVER.

2. DISCHARGE OF WASTEWATER FROM RUBIDOUX INCLUDED IN BASE FLOW COMMENCING IN 1979-80.

LEGEND

STORM FLOW

BASE FLOW

DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS

FIGURE 3
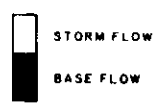
Since the late 1940's, the wastewater effluent from the Riverside Water Quality Control Plant, which is discharged at the Riverside Narrows between Pedley Bridge and the MWD Crossing, has been increasing in amount. In 1949-50, the amount of treated effluent discharged was 3,960 acre-feet. By 1959-60, 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 1984-85 was 27,751 acre-feet.

CBMWD's Regional Plants No. 1 and 2 began discharging to the Santa Ana River in 1971-72 and 1973-74, respectively, and in 1984-85 discharged 29,434 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 6,246 acre-feet in 1984-85.

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 1984-85. The values show that over the last fifteen years, the amount of treated wastewater discharged to the River between these two points has increased 191 percent.

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	32,877
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
1983-84	26,092	6,196	20,948	3,954	57,190
1984-85	27,751	6,246	25,155	4,279	63,431

CHAPTER III
BASE FLOW AT PRADO

This chapter deals with determinations of: 1) the components of flow at Prado Dam, which include Nontributary Flow, 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 163,247 acre-feet, measured at the USGS gaging station below Prado Dam. Separated into its components, Base Flow, including the groundwater pumped as described in Chapter II of this report, was 125,023 acre-feet and Storm Flow was 37,889 acre-feet. Nontributary Flow during 1984-85 due to the release of State water above Riverside Narrows during 1972-73 was 335 acre-feet. The components of flow of the Santa Ana River at Prado Dam for each month in the 1984-85 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 1984-85 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 1984-85

(acre-feet)

Month	Prado Outflow	Storage Change (1)	Computed Inflow	Storm Flow	Base Flow (2)	Nontrib. Flow (3)
October	8,345	0	8,345	264	8,053	28
November	11,804	12	11,816	2,505	9,283	28
December	31,482	430	31,912	20,598	11,286	28
January	17,933	589	18,522	4,590	13,904	28
February	20,341	-1,024	19,317	6,046	13,243	28
March	15,154	912	16,066	2,743	13,295	28
April	12,442	-919	11,523	423	11,072	28
May	11,601	0	11,601	0	11,573	28
June	9,481	0	9,481	0	9,453	28
July	8,333	0	8,333	0	8,305	28
August	7,976	0	7,976	0	7,948	28
September	8,355	0	8,355	720	7,608	27
Total	163,247	0	163,247	37,889	125,023	335

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

(2)   Includes groundwater pumped from San Bernardino Basin Area.

(3)   That portion of State water released during 1972-73 upstream of Riverside Narrows, determined to have reached Prado Dam in 1984-85.

Releases to San Antonio Creek

During water year 1984-85, 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 1984-85.

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.

During the water year, the Orange County Water District embarked on a program to formalize the operational schedule at Prado Dam to capture storm runoff for downstream water conservation. The program was initiated in response to activities within Prado Reservoir that interfere with conservation operations. OCWD entered into an agreement to provide flood protection, as affected by water conservation, for a municipal airport and to relocate a trap and skeet facility. OCWD also agreed to fund a study with the U.S. Army Corps of Engineers to evaluate alternative operational schedules at Prado Dam to accommodate water conservation.

In May, 1985, the U.S. Fish and Wildlife Service proposed to designate the least Bell vireo as an endangered species and a major portion of the lands within Prado Reservoir as a critical habitat for the species. The designation, if adopted, could restrict water conservation activities at Prado. No actions have as yet been taken by the Service.

During the 1984-85 water year, more than 100 acre-feet of water was stored behind Prado Dam during the periods November 14, 1984; November 25 to November 29, 1984; December 16, 1984; December 18 to December 22, 1984; December 26 to December 31, 1984; January 8 to January 10, 1985; January 28 to February 23, 1985; and March 27 to April 10, 1985. During those periods, the water stored in Prado Reservoir varied up to a maximum of 4,783 acre-feet and the maximum mean daily flow released to the Santa Ana River was 1,930 cfs.

Base Flow

The determination of Base Flow was affected by Nontributary Flow which had been released above Riverside Narrows. The general procedure used by the members of the Watermaster to separate the 1984-85 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 616 mg/l. 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 for EC and TDS determination, 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 collected a total of 28 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:

$$TDS = EC/(6.007 \times 10^{-7} \, EC + 1.5984)$$

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 hourly EC measurements and the correlation of EC and TDS. As daily TDS concentration could not be determined during the period when continuous EC data were not available, TDS was

approximated by linearly interpolating between values immediately before and after the malfunction.

Water Quality Adjustment for Nontributary Flow

The weighted average annual TDS value of 616 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. 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.

		Annual Flow (acre-feet)	Average TDS (mg/l)	Annual Flow X Average TDS (acre-feet-mg/l)
1.	Total Flow	163,247	616	100,560,152
2.	Nontributary Flow Riverside Narrows	335	242	81,070
3.	Total Base and Storm Flows	162,912		100,479,082
4.	Average TDS of Total Base and Storm Flows	100,479,082 $\div$ 162,912 = 617 mg/l		

After adjusting for Nontributary Flows of State water from above Riverside Narrows, the weighted average annual TDS of Storm Flow and Base Flow for 1984-85 was 617 mg/l, as shown above.

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	$Q - \dfrac{35}{42,000} \, Q \, (TDS-800)$
700 mg/l – 800 mg/l	Q
Less than 700 mg/l	$Q + \dfrac{35}{42,000} \, Q \, (700-TDS)$

Where: Q = Base Flow actually received."

The weighted average annual TDS of 617 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:

$$(125,023 \text{ A.F.}) + \frac{35}{42,000} \, (125,023 \text{ A.F.})(700-617) = 133,670 \text{ A.F.}$$

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 Watermaster's findings at Prado for 1984-85 required under the Judgment are as follows:

1.	Total Flow at Prado	163,247	acre-feet
2.	Base Flow at Prado	125,023	acre-feet
3.	Annual Weighted TDS of Base and Storm Flows	617	mg/l
4.	Annual Adjusted Base Flow	133,670	acre-feet
5.	Cumulative Adjusted Base Flow	1,153,184	acre-feet
6.	Cumulative Entitlement of OCWD	630,000	acre-feet
7.	Cumulative Credit	523,184	acre-feet
8.	One-Third of Cumulative Debit	0	acre-feet
9.	Minimum Required Base Flow in 1985-86	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 79,113 acre-feet, measured at the USGS gaging station near the MWD Upper Feeder Crossing. Separated into its components, Base Flow was 69,772 acre-feet, Storm Flow was 15,145 acre-feet, and Nontributary Flow due to a prior release of State water above Riverside Narrows was 342 acre-feet. Included in Base Flow are 5,425 acre-feet of groundwater pumped from the San Bernardino Basin Area which was discharged to the river above Riverside Narrows and 2,263 acre-feet of wastewater from Rubidoux Community Services District and 3,883 acre-feet of groundwater pumped from the San Bernardino Basin Area which was discharged below the Riverside Narrows. The components of flow of the Santa Ana River at Riverside Narrows for each month in the 1984-85 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 1984-85 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 1984-85

(acre-feet)

	Total Flow USGS Measurement	Storm Flow	Non-tributary Flow	Rubidoux Waste-water	Ground-water (2)	Base Flow (1)
October	4,322	157	29	170	0	4,306
November	5,837	1,390	29	193	0	4,611
December	13,969	8,485	29	214	0	5,669
January	8,904	1,743	29	211	0	7,343
February	8,934	1,845	29	192	0	7,252
March	7,845	1,289	29	213	0	6,740
April	5,520	79	28	204	0	5,617
May	5,135	0	28	171	1,174	6,452
June	5,217	0	28	164	713	6,066
July	4,750	0	28	170	614	5,506
August	3,866	0	28	182	630	4,650
September	4,814	157	28	179	752	5,560
Total	79,113	15,145	342	2,263	3,883	69,772

(1)   Base Flow includes Rubidoux wastewater and groundwater pumped from the San Bernardino Basin Area and discharged above and below Riverside Narrows.

(2)   Groundwater pumped from the San Bernardino Basin Area and discharged below Riverside Narrows.

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 1984-85, in the amount of 2,263 acre-feet as shown in Appendix D, has been added to the streamflow as measured at the gaging station.

During 1985 two orders were signed in Superior Court, County of Riverside, modifying the Western Judgment (Case No. 78426) by approving the Temporary Additional Extraction Agreements between Valley District and Western and allowing temporary additional extractions of water from the San Bernardino Basin Area. Some of the water pumped under these agreements was delivered to the river above the Riverside Narrows and some below. The amount pumped and delivered above Riverside Narrows during water year 1984-85 was 5,425 acre-feet. Flow resulting from this pumping is included in the total flow measurement shown on Table 6. Since pumped groundwater in the amount of 3,883 acre-feet was discharged below the point of measurement, this amount has been added to the streamflow in Table 6. The Base Flow was determined to be 69,772 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 and the City of Riverside. The results are summarized in Appendix C, Table C-1. Table C-2 shows the flow weighted quality of streamflow passing the gaging station which includes the nontributary flow and the pumped groundwater discharged above the Riverside Narrows.

The flow weighted quality of wastewater from Rubidoux is shown in Appendix D, Table D-1 as 754 g/l. The flow weighted quality of pumped ground water which was discharged below the Riverside Narrows was determined to be 316 mg/l. The Base Flow quality resulting from exclusion of the Nontributary Flow and inclusion of the Rubidoux wastewater and pumped groundwater is shown in the following table as 633 mg/l.

	Annual Flow (acre-feet)	Avg. TDS (mg/1)	(Annual Flow) x (Avg. TDS) (acre-feet - mg/1)
1. Base Flow including Nontributary Flow and groundwater discharged above Riverside Narrows	63,968	646	41,326,369
2. Less Nontributary Flow	342	237	81,054
3. Plus Rubidoux Wastewater	2,263	754	1,705,864
4. Plus pumped ground-water discharged below Riverside Narrows	3,883	316	1,227,028
5. Base Flow	69,772	633	44,178,207

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/1	$Q - \dfrac{11}{15,250} \, Q \,(TDS-700)$
600 mg/1 - 700 mg/1	Q
Less than 600 mg/1	$Q + \dfrac{11}{15,250} \, Q \,(600-TDS)$

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 1984-85 was 633 mg/1. Therefore, no adjustment is necessary, and the Adjusted Base Flow for 1984-85 is 69,772.

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 1984-85 required under the Judgment are as follows:

1.	Base Flow at Riverside Narrows	69,772	acre-feet
2.	Annual Weighted TDS of Base Flow	633	mg/l
3.	Annual Adjusted Base Flow	69,772	acre-feet
4.	Cumulative Adjusted Base Flow	426,822	acre-feet
5.	Cumulative Entitlement of CBMWD and WMWD	228,750	acre-feet
6.	Cumulative Credit	198,072	acre-feet
7.	One-Third of Cumulative Debit	0	acre-feet
8.	Minimum Required Base Flow in 1985-86	12,420	acre-feet

APPENDIX A

STATE WATER RELEASED BY MWD
TO SAN ANTONIO CREEK NEAR UPLAND

CONNECTION OC-59

1984-85

PREPARED BY

DONALD L. HARRIGER

TABLE A-1

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

WATER YEAR 1984-85

No Water was Released in 1984-85 from OC-59 for
Orange County Water District

APPENDIX B

WATER QUALITY-
SANTA ANA RIVER BELOW PRADO DAM

1984-85

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 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 July 4-7, 1984.

2. Laboratory analyses of the 28 grab samples taken by the USGS below Prado Dam during the 1984-85 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 estimated by linearly interpolating between TDS values immediately before and after the malfunction.

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 616 mg/l of TDS for the 1984-85 water year. The weighted TDS calculation for the water year 1984-85 is shown in Table B-3.

TABLE B-1

USGS WATER QUALITY SAMPLES BELOW PRADO DAM
FOR WATER YEAR 1984-85

DATE		EC (1) (micromhos)	TDS (2) (mg/l)
OCTOBER	5	1180	762
	26	1180	725
NOVEMBER	8	1160	731
	21	1140	720
	21	1140	705
DECEMBER	7	1180	719
JANUARY	9	738	462
	25	1070	684
	25	1110	677
FEBRUARY	7	995	614
	20	1080	644
MARCH	8	1110	698
	26	1090	697
APRIL	5	1070	683
	11	1100	690
	11	1120	701
MAY	9	1090	692
	23	1100	692
	23	1100	696
JUNE	7	1120	698
	25	1100	696
JULY	8	1130	704
	30	1110	694
	30	1110	689
AUGUST	5	1110	701
	29	1100	684
SEPTEMBER	3	1100	683
	20	1080	662

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

TABLE B-2

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

OCTOBER 1984

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
OCT 1	115	1110	694	79828
2	111	1130	707	78439
3	112	1130	707	79146
4	118	1140	713	84123
5	114	1180	738	84122
6	126	1140	713	89826
7	124	1130	707	87625
8	122	1120	700	85450
9	127	1110	694	88158
10	130	1110	694	90240
11	133	1100	688	91491
12	130	1110	694	90240
13	136	1100	688	93555
14	135	1110	694	93711
15	135	1110	694	93711
16	135	1120	700	94555
17	145	1120	700	101559
18	162	1110	694	112453
19	150	1120	700	105061
20	149	1130	707	105292
21	146	1140	713	104085
22	144	1150	719	103559
23	139	1160	725	100832
24	135	1180	738	99618
25	139	1180	738	102570
26	137	1170	732	100237
27	140	1160	725	101557
28	143	1150	719	102840
29	148	1150	719	106435
30	162	1120	700	113466
31	165	1120	700	115567

TOTAL	4207			2979350
MONTHLY FLOW WEIGHTED TDS			708	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

NOVEMBER 1984

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/1)	OUTFLOW x TDS
NOV 1	164	1110	694	113841
2	151	1120	700	105761
3	153	1130	707	108118
4	153	1130	707	108118
5	154	1140	713	109788
6	154	1140	713	109788
7	154	1150	719	110750
8	193	1080	675	130352
9	203	1160	725	147258
10	182	1180	738	134300
11	177	1180	738	130610
12	156	1170	732	114139
13	138	1130	707	97519
14	212	1060	663	140535
15	209	1120	700	146385
16	197	1150	719	141674
17	182	1150	719	130887
18	172	1140	713	122620
19	177	1130	707	125078
20	161	1160	725	116791
21	174	1120	700	121871
22	208	1090	682	141784
23	209	1120	700	146385
24	199	1140	713	141869
25	250	1090	682	170413
26	260	949	594	154312
27	290	1050	657	190428
28	284	1130	707	200691
29	347	1180	738	256055
30	288	1190	744	214319
TOTAL	5951			4182439
MONTHLY FLOW WEIGHTED TDS			703	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

DECEMBER 1984

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
DEC 1	218	1170	732	159502
2	206	1180	738	152010
3	218	1140	713	155414
4	241	1130	707	170304
5	220	1210	757	166466
6	205	1180	738	151272
7	203	1170	732	148527
8	333	914	572	190351
9	382	944	590	225526
10	255	1030	644	164257
11	252	953	596	150194
12	234	954	597	139612
13	221	947	592	130889
14	200	946	592	118326
15	183	941	589	107697
16	347	714	447	154962
17	403	754	472	190050
18	215	803	502	107979
19	905	644	403	364539
20	1930	493	308	595166
21	1410	461	288	406592
22	972	505	316	307036
23	684	624	390	266964
24	278	670	419	116500
25	257	689	431	110753
26	183	754	472	86301
27	551	697	436	240207
28	1090	656	410	447237
29	1070	624	390	417620
30	1040	605	378	393554
31	966	613	383	370384

TOTAL	15872			6906190
MONTHLY FLOW WEIGHTED TDS			435	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

JANUARY 1985

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
JAN 1	611	662	414	252991
2	283	669	418	118418
3	274	681	426	116708
4	254	691	432	109778
5	256	700	438	112083
6	256	712	445	114004
7	264	722	452	119217
8	378	711	445	168097
9	409	745	466	190578
10	438	959	600	262694
11	420	1060	663	278418
12	310	1080	675	209374
13	277	1060	663	183623
14	273	1060	663	180971
15	265	1060	663	175668
16	263	1070	669	175987
17	261	1070	669	174648
18	251	1080	675	169526
19	253	1080	675	170877
20	255	1080	675	172227
21	255	1070	669	170633
22	255	1070	669	170633
23	258	1080	675	174254
24	257	1060	663	170365
25	243	1070	669	162604
26	250	1070	669	167288
27	271	1050	657	177952
28	287	1020	638	183075
29	291	758	474	137960
30	186	780	488	90739
31	237	878	549	130141
TOTAL	9041			5191530
MONTHLY FLOW WEIGHTED TDS			574	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

FEBRUARY 1985

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
FEB 1	298	940	588	175188
2	318	978	612	194501
3	323	919	575	185645
4	382	881	551	210480
5	412	934	584	240661
6	405	966	604	244675
7	397	991	620	246046
8	375	1020	638	239210
9	354	1000	625	221388
10	431	673	421	181425
11	341	681	426	145246
12	298	733	458	136620
13	394	807	505	198862
14	440	905	566	249039
15	438	848	530	232298
16	434	928	580	251884
17	428	980	613	262316
18	421	1020	638	268553
19	413	1050	657	271196
20	354	1070	669	236879
21	309	1090	682	210631
22	385	1100	688	264843
23	405	1130	707	286196
24	370	1160	725	268402
25	297	1150	719	213590
26	281	1130	707	198571
27	283	1120	700	198215
28	269	1120	700	188409

TOTAL	10255			6220969
MONTHLY FLOW WEIGHTED TDS			607	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

MARCH 1985

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
MAR 1	253	1120	700	177203
2	252	1120	700	176502
3	266	1100	688	182982
4	253	1100	688	174040
5	253	1100	688	174040
6	253	1110	694	175621
7	243	1110	694	168680
8	248	1100	688	170600
9	243	1090	682	165642
10	240	1080	675	162096
11	234	1080	675	158044
12	236	1070	669	157919
13	234	1070	669	156581
14	238	1070	669	159258
15	233	1060	663	154455
16	229	1060	663	151804
17	234	1060	663	155118
18	255	1020	638	162663
19	361	967	605	218318
20	262	1030	644	168766
21	244	1060	663	161747
22	240	1080	675	162096
23	238	1090	682	162233
24	226	1100	688	155466
25	224	1100	688	154090
26	227	1090	682	154735
27	261	1040	650	169753
28	276	924	578	159494
29	228	876	548	124914
30	228	879	550	125341
31	228	930	582	132611
TOTAL	7640			5032816
MONTHLY FLOW WEIGHTED TDS			659	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

APRIL 1985

	DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
APR	1	227	982	614	139409
	2	228	1020	638	145440
	3	231	1050	657	151686
	4	261	1070	669	174648
	5	273	1080	675	184385
	6	270	1070	669	180671
	7	267	1070	669	178663
	8	264	1060	663	175005
	9	259	1060	663	171691
	10	251	1080	675	169526
	11	238	1100	688	163721
	12	225	1110	694	156185
	13	207	1110	694	143690
	14	191	1100	688	131390
	15	182	1090	682	124061
	16	191	1100	688	131390
	17	186	1110	694	129113
	18	184	1100	688	126574
	19	189	1100	688	130014
	20	186	1080	675	125625
	21	191	1070	669	127808
	22	185	1070	669	123793
	23	189	1080	675	127651
	24	184	1080	675	124274
	25	178	1080	675	120221
	26	166	1090	682	113154
	27	166	1090	682	113154
	28	167	1080	675	112792
	29	168	1080	675	113467
	30	169	1080	675	114143

TOTAL		6273			4223343
MONTHLY FLOW WEIGHTED TDS				673	

1. TDS = EC/(6.0070E-7*EC+1.5984)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

MAY 1985

	DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
MAY	1	169	1090	682	115199
	2	172	1100	688	118319
	3	181	1100	688	124511
	4	186	1090	682	126787
	5	190	1100	688	130702
	6	198	1090	682	134967
	7	201	1080	675	135756
	8	197	1090	682	134286
	9	196	1090	682	133604
	10	194	1100	688	133453
	11	200	1090	682	136331
	12	198	1100	688	136205
	13	196	1080	675	132379
	14	192	1090	682	130877
	15	181	1100	688	124511
	16	179	1110	694	124254
	17	180	1120	700	126073
	18	185	1120	700	129575
	19	193	1110	694	133972
	20	181	1130	707	127905
	21	188	1120	700	131676
	22	193	1120	700	135178
	23	189	1110	694	131195
	24	187	1100	688	128638
	25	190	1090	682	129514
	26	198	1090	682	134967
	27	190	1090	682	129514
	28	183	1090	682	124742
	29	183	1100	688	125886
	30	190	1100	688	130702
	31	189	1090	682	128832

TOTAL   5849   4020511
MONTHLY FLOW WEIGHTED TDS   687

1. TDS = EC/(6.0070E-7*EC+1.5984)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

JUNE 1985

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
JUNE 1	193	1080	675	130352
2	195	1080	675	131703
3	199	1070	669	133161
4	193	1080	675	130352
5	184	1080	675	124274
6	176	1090	682	119971
7	154	1130	707	108825
8	154	1140	713	109788
9	151	1140	713	107649
10	155	1120	700	108563
11	156	1100	688	107313
12	154	1120	700	107863
13	150	1120	700	105061
14	148	1130	707	104585
15	149	1130	707	105292
16	152	1120	700	106462
17	151	1120	700	105761
18	152	1120	700	106462
19	156	1120	700	109263
20	142	1120	700	99458
21	156	1120	700	109263
22	160	1110	694	111065
23	154	1110	694	106900
24	152	1110	694	105512
25	157	1110	694	108982
26	155	1120	700	108563
27	151	1130	707	106705
28	145	1120	700	101559
29	144	1120	700	100858
30	142	1120	700	99458

TOTAL	4780			3321023
MONTHLY FLOW WEIGHTED TDS			695	

1. TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

JULY 1985

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
JULY 1	139	1110	694	96488
2	132	1100	688	90803
3	131	1100	688	90115
4	131	(2)	693	90783
5	129	(2)	698	90042
6	133	(2)	703	93499
7	131	(2)	708	92748
8	132	1140	713	94104
9	134	1140	713	95530
10	136	1150	719	97806
11	127	1160	725	92127
12	127	1160	725	92127
13	127	1160	725	92127
14	136	1150	719	97806
15	138	1150	719	99244
16	148	1140	713	105510
17	141	1140	713	100520
18	137	1140	713	97668
19	140	1130	707	98932
20	137	1130	707	96812
21	146	1110	694	101347
22	139	1100	688	95619
23	137	1110	694	95099
24	141	1110	694	97876
25	142	1120	700	99458
26	147	1120	700	102960
27	146	1120	700	102259
28	131	1120	700	91753
29	126	1120	700	88251
30	128	1120	700	89652
31	132	1120	700	92454
TOTAL	4201			2961517
MONTHLY FLOW WEIGHTED TDS			705	

1. TDS = EC/(6.0070E-7*EC+1.5984)
2. RECORDER MALFUNCTION
3. TDS values for non-record days are approximated.

TABLE B-2 (continued)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

AUGUST 1985

	DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
AUG	1	135	1100	688	92867
	2	133	1100	688	91491
	3	134	1080	675	90504
	4	131	1080	675	88478
	5	131	1090	682	89297
	6	132	1110	694	91628
	7	130	1120	700	91053
	8	130	1130	707	91865
	9	127	1140	713	90539
	10	131	1130	707	92572
	11	129	1130	707	91159
	12	139	1130	707	98225
	13	141	1120	700	98757
	14	137	1130	707	96812
	15	128	1130	707	90452
	16	125	1130	707	88332
	17	130	1120	700	91053
	18	133	1110	694	92323
	19	138	1110	694	95793
	20	128	1120	700	89652
	21	135	1120	700	94555
	22	131	1120	700	91753
	23	129	1120	700	90352
	24	129	1120	700	90352
	25	126	1120	700	88251
	26	122	1120	700	85450
	27	118	1120	700	82648
	28	121	1120	700	84749
	29	124	1120	700	86850
	30	124	1120	700	86850
	31	120	1120	700	84049

TOTAL 4021 2808712
MONTHLY FLOW WEIGHTED TDS 699

1. TDS = EC/(6.0070E-7*EC+1.5984)

SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

SEPTEMBER 1985

DAY	PRADO OUTFLOW (cfs-day)	DAILY MEAN EC (micromhos)	COMPUTED TDS (1) (mg/l)	OUTFLOW x TDS
SEPT 1	113	1120	700	79146
2	109	1120	700	76344
3	119	1100	688	81861
4	134	1090	682	91341
5	156	1090	682	106338
6	163	1060	663	108053
7	145	1060	663	96120
8	141	1060	663	93469
9	142	1070	669	95019
10	139	1070	669	93012
11	148	1070	669	99034
12	158	1060	663	104738
13	151	1070	669	101042
14	144	1070	669	96358
15	141	1060	663	93469
16	145	1060	663	96120
17	145	1070	669	97027
18	147	1070	669	98365
19	157	1080	675	106038
20	152	1080	675	102661
21	143	1080	675	96582
22	138	1080	675	93205
23	135	1080	675	91179
24	136	1090	682	92705
25	129	1110	694	89546
26	98	1120	700	68640
27	152	1100	688	104561
28	149	1110	694	103429
29	142	1110	694	98570
30	141	1140	713	100520

TOTAL	4212			2854493
MONTHLY FLOW WEIGHTED TDS			678	

1.   TDS = EC/(6.0070E-7*EC+1.5984)

TABLE B-3

ANNUAL SUMMARY OF WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 1984-85

MONTH	MONTHLY FLOW (cfs-day)	MONTHLY WEIGHTED TDS (mg/l)	MONTHLY FLOW TIMES TDS
OCTOBER	4207	708	2979350
NOVEMBER	5951	703	4182439
DECEMBER	15872	435	6906190
JANUARY	9041	574	5191530
FEBRUARY	10255	607	6220969
MARCH	7640	659	5032816
APRIL	6273	673	4223343
MAY	5849	687	4020511
JUNE	4780	695	3321023
JULY	4201	705	2961517
AUGUST	4021	699	2808712
SEPTEMBER	4212	678	2854493
TOTAL	82302		50702893
YEARLY WEIGHTED TDS		616	

APPENDIX C

WATER QUALITY- SANTA ANA
RIVER AT RIVERSIDE NARROWS

1984-85

PREPARED BY

DONALD L. HARRIGER

TABLE C-1

WATER QUALITY ANALYSIS

SANTA ANA RIVER AT RIVERSIDE NARROWS

WATER YEAR 1984-85

Date	EC (micromhos/cm)	TDS (mg/l)	Source
10/02/84	980	654	C of R
10/05	960	679	USGS
10/11	990	632	C of R
10/16	940	634	C of R
10/16	1,020	674	USGS
10/25	1,020	672	C of R
10/30	1,080	677	C of R
11/07	1,040	697	USGS
11/08	1,000	674	C of R
11/13	1,040	633	C of R
11/20	1,020	681	USGS
11/22	950	596	C of R*
11/27	940	636	C of R
12/03	965	639	USGS
12/06	980	647	C of R
12/11	960	656	C of R
12/20	338	264	C of R*
12/25	934	641	C of R
1/02/85	903	593	USGS*
1/03	900	550	C of R*
1/08	420	320	C of R*
1/16	959	629	USGS
1/17	930	628	C of R
1/22	960	648	C of R
1/31	910	612	C of R

*   These TDS values not utilized in computing the averages shown in Table C-2. The reason not utilized is because they reflect storm flow values.

TABLE C-1

(CONTINUED)

Date	EC (micromhos/cm)	TDS (mg/l)	Source
2/05/85	923	605	USGS
2/05	910	609	C of R
2/14	890	589	C of R
2/15	926	601	USGS
2/19	930	613	C of R
2/28	950	641	C of R
3/01	973	648	USGS
3/05	975	666	C of R
3/14	990	658	C of R
3/18	969	642	USGS
3/19	860	571	C of R
3/28	640	432	C of R*
4/01	984	644	USGS
4/02	910	624	C of R
4/11	970	634	C of R
4/16	1,010	673	C of R
4/16	1,070	689	USGS
4/25	1,000	665	C of R
4/30	990	657	C of R
5/06	1,040	667	USGS
5/09	1,030	635	C of R
5/14	1,030	683	C of R
5/20	1,080	686	USGS
5/23	1,040	681	C of R
5/28	1,000	671	C of R
6/06	1,040	653	USGS
6/06	1,010	680	C of R
6/11	1,020	684	C of R
6/20	940	646	C of R
6/25	940	638	C of R
6/26	1,040	666	USGS

* These TDS values not utilized in computing the averages shown in Table C-2. The reason not utilized is because they reflect storm flow values.

TABLE C-1
(CONTINUED)

Date	EC (micromhos/cm)	TDS (mg/l)	Source
7/04	960	640	C of R
7/09	915	632	C of R
7/12	1,050	673	USGS
7/18	1,000	677	C of R
7/23	980	681	C of R
7/26	1,010	648	USGS
8/01	1,000	550	C of R*
8/06	1,000	664	C of R
8/15	820	558	C of R*
8/16	1,020	657	USGS
8/20	1,000	692	C of R
8/29	940	641	C of R
9/03	930	623	C of R
9/12	920	619	C of R
9/17	920	616	C of R
9/26	950	665	C of R

* These TDS values not utilized in computing the averages shown in Table C-2. The reason not utilized is because they reflect storm flow values.

TABLE C-2

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

WATER YEAR 1984-85

Month	Acre Feet (1)	TDS (2) (mg/l)	Acre Feet Times TDS
October – 1984	4,165	660	2,748,900
November	4,447	664	2,952,808
December	5,484	643	3,526,212
January – 1985	7,161	629	4,504,269
February	7,089	610	4,324,290
March	6,556	637	4,176,172
April	5,441	655	3,563,855
May	5,135	671	3,445,585
June	5,217	661	3,448,437
July	4,750	659	3,130,250
August	3,866	664	2,567,024
September	4,657	631	2,938,567
Total	63,968		41,326,369

Flow Weighted TDS $\dfrac{41,326,369}{63,968} = 646$

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

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

APPENDIX D

QUANTITY AND QUALITY OF
WASTEWATER FROM RUBIDOUX
COMMUNITY SERVICES DISTRICT

1984–85

PREPARED BY

DONALD L. HARRIGER

TABLE D-1

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

WATER YEAR 1984-85

Month	Acre-Feet	TDS (mg/l)	Acre-Feet Times TDS
October - 1984	170	736	125,120
November	193	767	148,031
December	214	760	162,640
January - 1985	211	776	163,736
February	192	767	147,264
March	213	758	161,454
April	204	743	151,572
May	171	726	124,146
June	164	751	123,164
July	170	738	125,460
August	182	757	137,774
September	179	757	135,503
Total	2,263	---	1,705,864

$$\frac{1,705,864}{2,263} = 754 \text{ mg/l}$$

Average Flow Weighted Quality of Wastewater = 754 mg/l.

APPENDIX E

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, 1985

July 30, 1985

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, 1985 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, 1985, 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

-1-

SANTA ANA RIVER WATERMASTER

STATEMENT OF ASSETS AND LIABILITIES
ARISING FROM CASH TRANSACTIONS

June 30, 1985

ASSETS

Cash in checking account		$ 500
Cash in savings account		7,693
TOTAL ASSETS		$ 8,193

LIABILITIES AND FUND BALANCE

Liabilities		$ -
Fund balance		8,193
TOTAL LIABILITIES AND FUND BALANCE		$ 8,193

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, 1985

		Actual	Budget	Over (Under) Budget
REVENUE COLLECTED:				
Water district contributions (Note 3):				
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		595	-	595
TOTAL REVENUE COLLECTED		14,595	14,000	595
EXPENSES PAID:				
Professional engineering services		4,820	8,000	(3,180)
Administrative expenses:				
Office and secretarial expense	$ 1,183			
Auditing services	630	1,813	3,000	(1,187)
Annual reports		398	3,000	(2,602)
TOTAL EXPENSES PAID		7,031	14,000	(6,969)
EXCESS OF REVENUES COLLECTED OVER EXPENDITURES PAID		7,564	$ -	$ 7,564
FUND BALANCE AT JULY 1, 1984		629		
FUND BALANCE AT JUNE 30, 1985		$ 8,193		

See accountants' report and notes to financial statements.

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.

3. WATER DISTRICT REVENUE CONTRIBUTIONS:

    Budgeted water district contributions for the year ended June 30, 1985 were
    not requested for payment until after June 30, 1985 since cash was
    available for payment of expenses incurred prior to year-end.

See accountants' report.

APPENDIX F

HISTORY OF LITIGATION

HISTORY OF LITIGATION

The complaint in this case was filed by the Orange County Water District on October 18, 1963 seeking an adjudication of water rights against more than 2,500 water users in the area tributary to Prado Dam within the Santa Ana River Watershed. Thirteen cross-complaints were filed in 1968 extending the adjudication to include an additional 1,500 water users in the area downstream from Prado Dam. Thus, there were involved in this case some 4,000 parties. It became obvious that every effort should be made to arrive at a settlement and a physical solution in order to avoid the enormous and unwieldy litigation that would be involved.

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 further this objective. Among other things, they provided guidance for the formation and activities of an engineering committee to provide them with 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 jointly undertake the compilation of basic data. Liaison was established with the Department of Water Resources, State of California, on requests for information to be obtained from the State's studies for use by the parties. Engineers representing the parties were divided into sub-committees 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 transfers of water between subareas.

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. This list of basic information was in response to a request from the attorney's committee at a meeting held April 17, 1964. Special assignments were made on selected items to individual engineers to provide information requested by the attorney's committee.

The attorneys and engineers for the defendants then commenced a series of meetings separate from the representatives of the plaintiff in order to consolidate their position and to determine their 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 and the historical supply and disposal of water passing Prado Dam segregated into the components of flow and designating the amount of supply which was usable by the downstream area. On December 11, 1964, this 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 of 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 an Order of Reference be issued requesting the State Department of Water Resources to determine the physical facts. On May 9, 1968 the plaintiff's attorney submitted motions opposing the Order of Reference and requesting that a preliminary injunction be issued. In the meantime, every effort was being made to come to an agreement on a 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 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 Settlements Documents including a Stipulation for Judgment. The Court entered the Judgment on April 17, 1969. This terminated the many years of controversy over water rights along the Santa Ana River involving the issues and parties embraced in Orange County Water District versus City of Chino, et al.

APPENDIX G

SUMMARY OF JUDGMENT

SUMMARY OF JUDGMENT

Provisions of the Judgment became effective on October 1, 1970. The Judgment does not define the water rights of the individual claimants. Instead, it provides for a regional allocation of water supply of the Santa Ana River system and establishes entitlements and obligations among the four existing major public water districts overlying the aggregate of substantially all of the major areas of water use in the watershed. Dismissals were entered as to all defendants and cross defendants other than these four major public districts. These districts, the locations of which are shown on Plate 1, "Santa Ana River Watershed," are the remaining parties to the Judgment and are as follows:

(1) Orange County Water District (OCWD), representing all lower basin entities which are located within Orange County downstream from 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) Chino Basin Municipal Water District (CBMWD), located in 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.

A physical solution under the stipulated Judgment provides, in general, that SBVMWD shall be responsible for the delivery of an average annual amount of Base Flow at Riverside Narrows and CBMWD and WMWD shall jointly be responsible for an average annual amount of Base Flow at Prado. Essential to the understanding of the provisions of the Judgment is the definition of certain important terms. The total surface flow passing a point of measurement is divided into components, which are defined in the Judgment as follows:

"(1) Storm Flow – That portion of the total surface flow passing a point of measurement, which originates from precipitation and runoff without having first percolated to groundwater storage in the zone of saturation, calculated in accordance with procedures referred to in Exhibit B.

(2) Base Flow – That portion of the total surface flow passing a point of measurement which remains after deduction of storm flow.

(3) Adjusted Base Flow – Actual base flow in each year adjusted for quality as provided . ."

The Judgment sets forth a declaration of rights. Briefly stated, the Judgment provides that the water users in the area downstream from Prado Dam have rights, as against the upstream users, to receive an average annual supply of 42,000 acre-feet of Base Flow at Prado Dam, together with the right to all Storm Flow reaching Prado Dam. Water users in the area upstream of Prado Dam, as against the downstream users, have the right 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.

The physical solution set forth in the Judgment requires that SBVMWD shall be responsible for an average annual Adjusted Base Flow of 15,250 acre-feet at Riverside Narrows subject each year to the following:

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

(2) After October 2, 1986, if no cumulated debit exists, the minimum quantity shall be 12,420 acre-feet.

(3) Prior to 1986, if the cumulated credit exceeds 10,000 acre-feet the minimum quantity shall be 12,420 acre-feet.

(4) All cumulated debits shall be removed by the discharge of a sufficient Base Flow at Riverside Narrows at least once in every ten consecutive years following October 1, 1976. Any accumulated 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.

The obligations under the physical solutions for meeting the Adjusted Base Flow of 42,000 acre-feet at Prado Dam for the benefit of the downstream water users as shared by CBMWD and WMWD are as follows:

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

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

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

(4) Sufficient quantities of Base Flow shall be provided at Prado to discharge completely any cumulated 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 subsequent debits, or until otherwise disposed of by CBMWD 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.

The accounting provided for under the Judgment allows credit to be earned when the average annual Adjusted Base Flow exceeds 15,250 acre-feet at Riverside Narrows and 42,000 acre-feet at Prado. Debits accrue when the average annual Adjusted Base Flow falls below the above quantities at the respective locations. The adjustment of Base Flow for water quality is to provide an incentive to maintain a better quality water as a result of implementation of the physical solution. That is, when the water quality is improved over a certain amount, the quantitative amount of the obligation is decreased; but when that water quality is impaired beyond a specified limit, the quantity of the obligation is increased. This is one of the first comprehensive adjudications in Southern California which includes provisions applicable to the quality of water in addition to the determination of quantitative rights.

APPENDIX H

RESOLUTION - JAMES C. HANSON

WHEREAS

JAMES C. HANSON

represented San Bernardino Valley Municipal Water District as a Santa Ana River Watermaster, and

WHEREAS

JAMES C. HANSON

served as Watermaster for more than fourteen years, and

WHEREAS

JAMES C. HANSON

assisted in formulating and developing procedures for the refinement of the "SCALPING" process;

NOW BE IT THEREFORE RESOLVED THAT

with great appreciation and respect, this Santa Ana River Watermaster committee recognizes his outstanding achievements and professional contributions.

Dated this 28th Day of January 1986.

SANTA ANA RIVER WATERSHED

PLATE 1
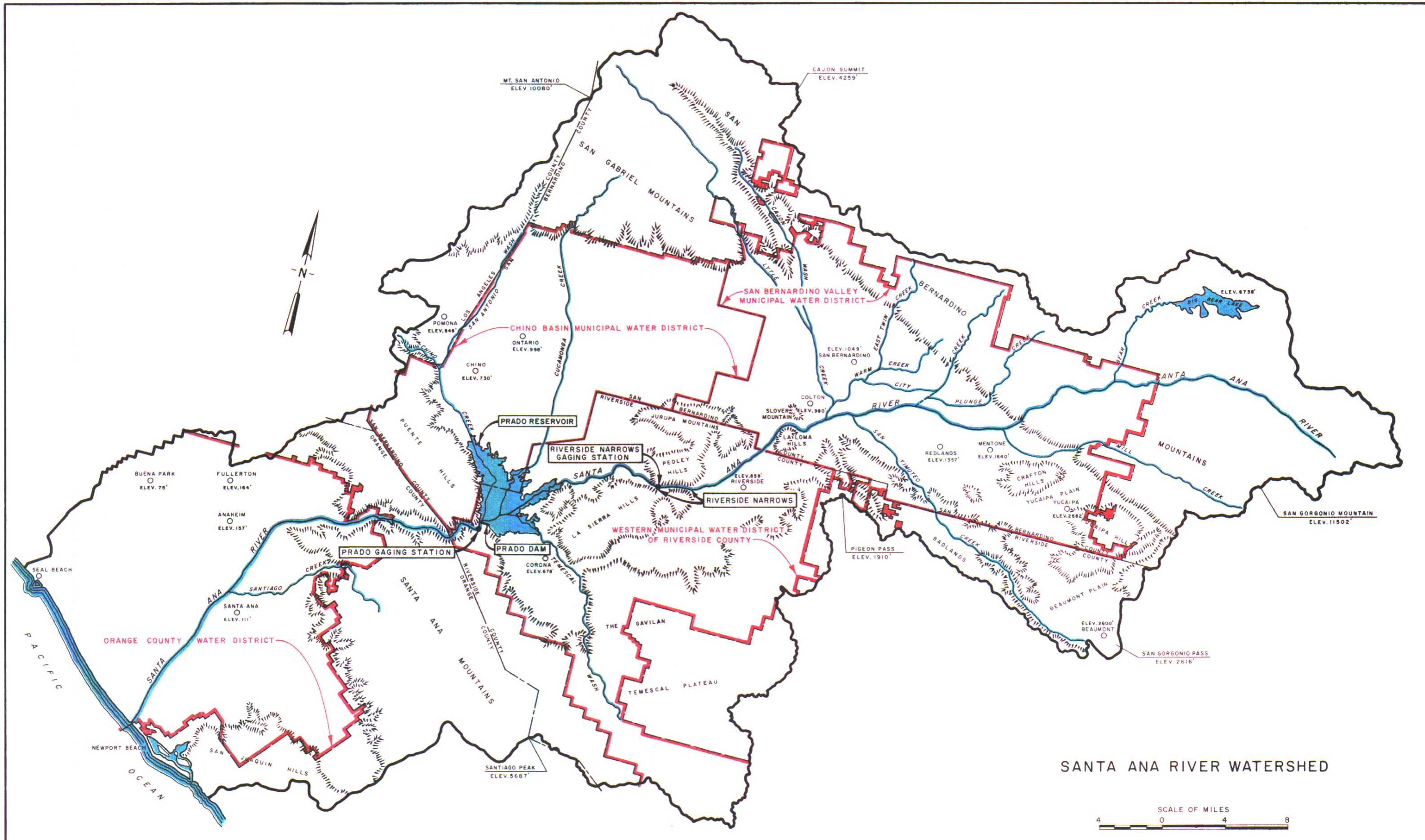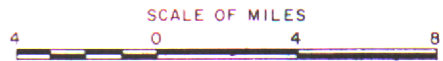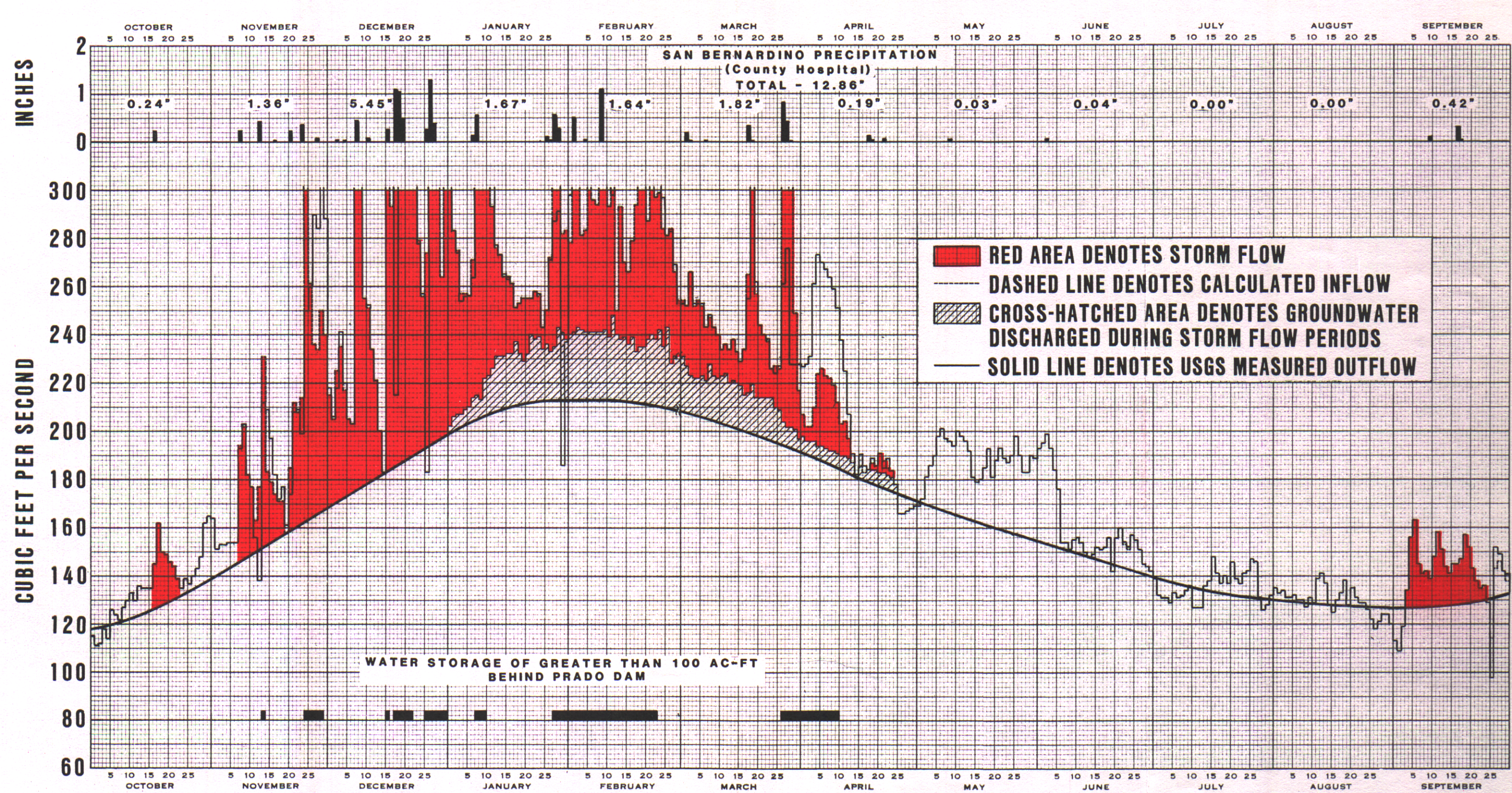
DISCHARGE OF SANTA ANA RIVER BELOW PRADO DAM & SAN BERNARDINO PRECIPITATION

WATER YEAR 1984-85
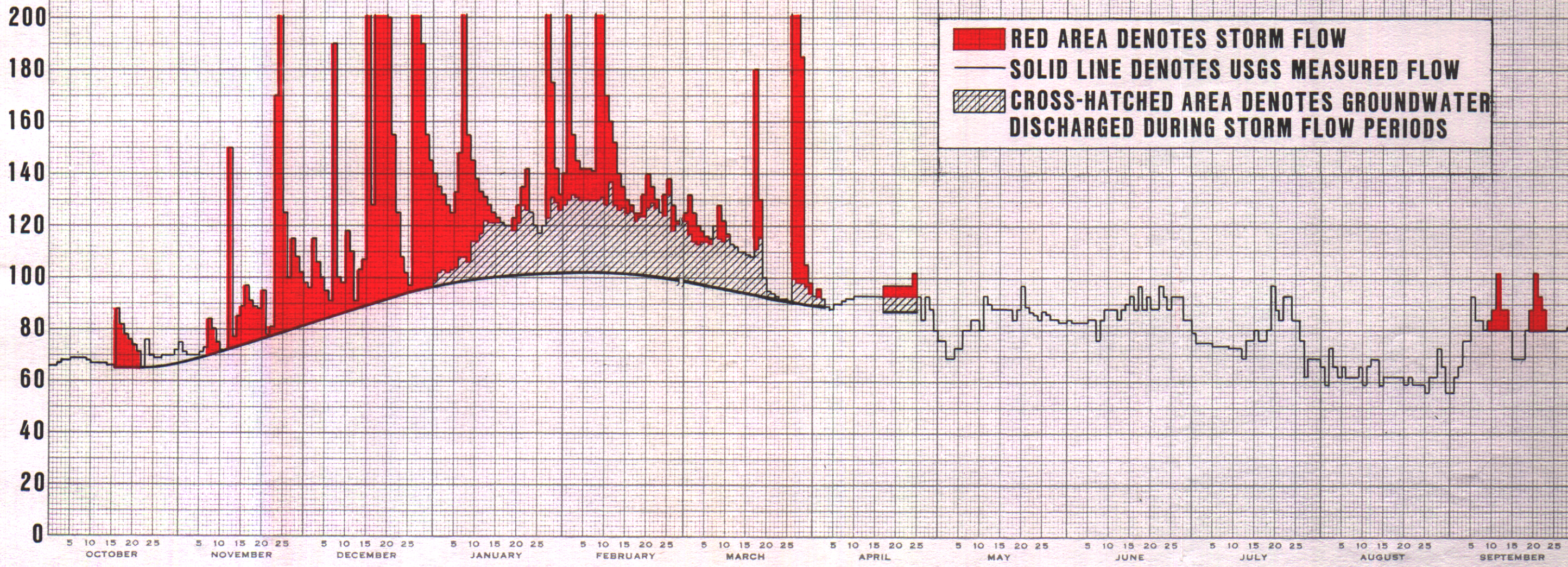
PLATE 2
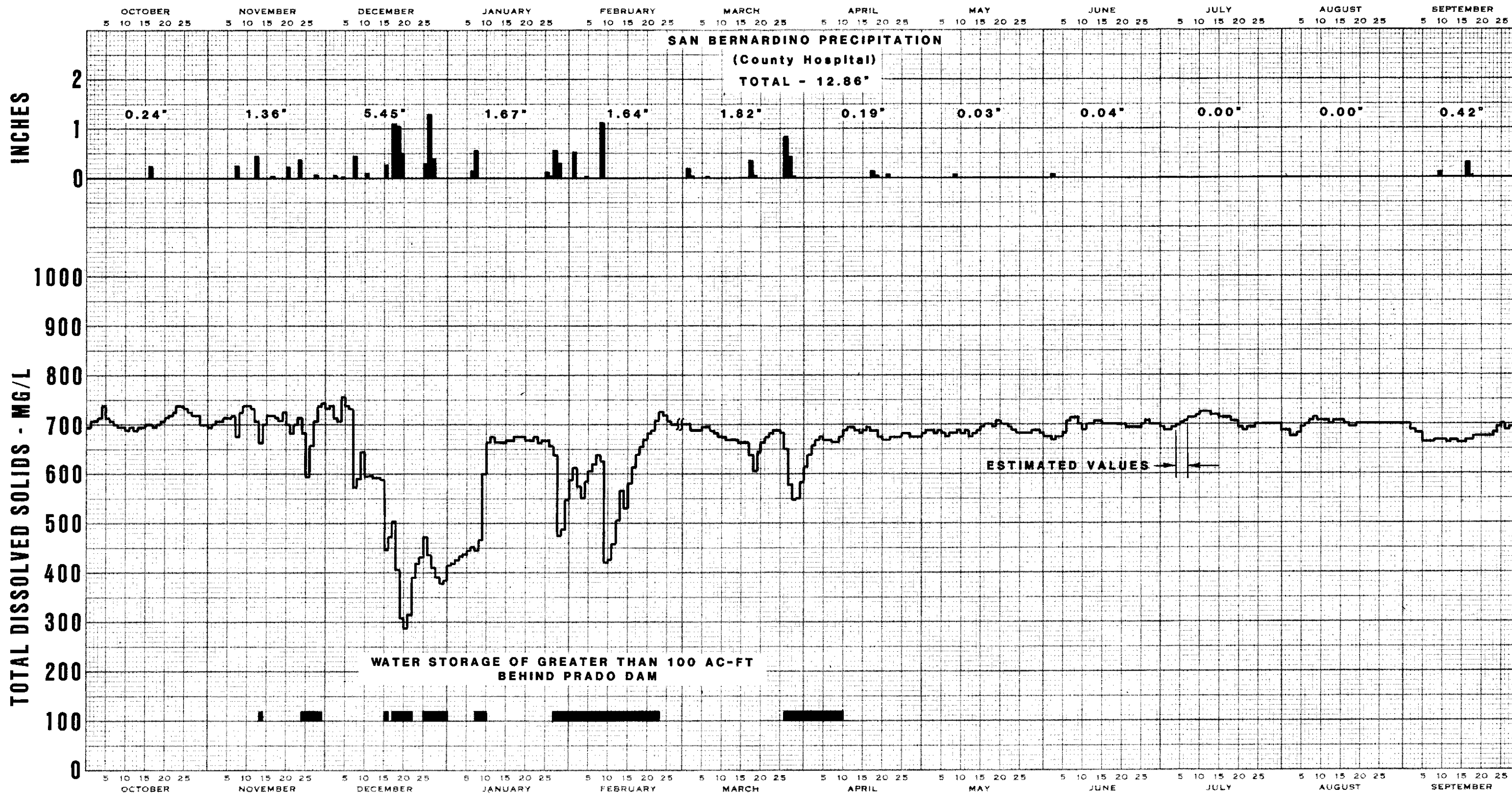
DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM

WATER YEAR 1984 - 85

PLATE 3

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

WATER YEAR 1984 - 85

PLATE 4