

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT Vs. CITY OF CHINO, et al

CASE No. 117628 – COUNTY OF ORANGE

EIGHTH

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

1977-78

MARCH 30, 1979

# SANTA ANA RIVER WATERMASTER

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

WATERMASTER  
MAX BOOKMAN  
WILLIAM J. CARROLL  
JAMES C. HANSON  
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March 30, 1979

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

Re: Watermaster Report for 1977-78

Gentlemen:

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

The principal findings of the Watermaster for the water year 1977-78 are as follows:

## At Prado

(1) Base Flow at Prado	58,516 acre-feet
(2) Annual Weighted TDS of Total Flow	384 ppm
(3) Annual Adjusted Base Flow	73,925 acre-feet
(4) Cumulative Adjusted Base Flow	396,802 acre-feet
(5) Cumulative Entitlement of OCWD	336,000 acre-feet
(6) Cumulative Credit	60,802 acre-feet
(7) One-third of Cumulative Debit	0 acre-feet
(8) Minimum Required Base Flow in 1978-79	37,000 acre-feet

## At Riverside Narrows

(1) Base Flow at Riverside Narrows	22,360 acre-feet
(2) Annual Weighted TDS of Base Flow	726 ppm
(3) Annual Adjusted Base Flow	21,941 acre-feet
(4) Cumulative Adjusted Base Flow	138,641 acre-feet
(5) Cumulative Entitlement of CBMWD and WMWD	122,000 acre-feet
(6) Cumulative Credit	16,641 acre-feet
(7) One-third of Cumulative Debit	0 acre-feet
(8) Minimum Required Base Flow in 1978-79	13,420 acre-feet

SANTA ANA RIVER WATERMASTER

Clerk of Superior Court of Orange County  
and All Parties

March 30, 1979  
Page Two

The above findings show that at the end of the water year 1977-78 there was a credit of 60,802 acre-feet in the obligations of Chino Basin Municipal Water District and Western Municipal Water District in the discharge of Base Flow downstream from Prado Dam. During the water year 1978-79 the minimum required Base Flow is 37,000 acre-feet. At Riverside Narrows, there was a credit of 16,641 acre-feet. The obligation of San Bernardino Valley Municipal Water District during the water year 1978-79 is a minimum Base Flow of 13,420 acre-feet.

During September of the 1977-78 water year, a small amount of State water (Nontributary Flow) was purchased by Orange County Water District and released from the Rialto Reach of the Foothill Feeder at OC-59 into San Antonio Creek near Upland. The Committee found this small amount of water did not permit the completion of its study of methods of determining the quantity and quality of released Nontributary Flow that actually passed Prado. Therefore, the Committee did not make a final determination but intends to continue investigation of this matter and to make a final determination and adjustment at some subsequent time.

Sincerely yours,

SANTA ANA RIVER WATERMASTER

By: Max Bookman  
Max Bookman

Donald L. Harriger  
Donald L. Harriger

William J. Carroll  
William J. Carroll

William R. Mills, Jr.  
William R. Mills, Jr.

James C. Hanson  
James C. Hanson

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## CHAPTER I

### WATERMASTER ACTIVITIES

This is the eighth annual report of the Santa Ana River Watermaster required by the stipulated Judgement in the case of Orange County Water District vs City of Chino, et al was entered by the court on April 17, 1969. This stipulated Judgement became effective on October 1, 1970 and contains a declaration of rights of the entities in the lower area downstream of Prado Dam as against those in the upstream area, and provides a physical solution to implement the Judgement. The physical solution accomplishes, in general, a regional interbasin 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 Watershed; namely, the San Bernardino Valley Municipal Water District, Western Municipal Water District of Riverside County, Chino Basin Municipal Water District and Orange County Water District (See 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 Judgement were included in the annual report for the water year 1974-75.

In order to administer the provisions of the Judgement, the court appointed a Watermaster composed of five persons. During the 1977-78 water year the Santa Ana River Watermaster Committee consisted of Max Bookman, William J. Carroll, James C. Hanson, John M. Toups and Donald L. Harriger. Mr. Bookman served as Chairman during the 1977-78 water year, and John M. Toups served as Secretary. John M. Toups submitted his resignation as one of the representatives of Orange County Water District effective February 1, 1979. At the request of the District the Court appointed William R. Mills Jr. to replace Mr. Toups. The office of the Santa Ana River Watermaster is located at 972 Town and Country Rd., P.O. Box 5367, Orange, California 92667.

Section 7(c) of the Judgement requires the Watermaster to report to the Court and to each party not more than five months after the end of each water year starting with 1970-71. 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 was shared by the parties to the Judgement. Such costs are set forth in Table 1. The USGS measured and computed the mean daily discharge of Santa Ana River at

**TABLE 1**  
**COSTS TO THE PARTIES AND USGS**  
**FOR MEASUREMENTS WHICH PROVIDE DATA**  
**USED BY THE SANTA ANA RIVER WATERMASTER**  
**July 1, 1977 to June 30, 1978**

**SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT**

At Riverside Water Quality Control Plant		
Surface Water Gage	\$ 459.00	
Water Quality Monitor/TDS Samples	958.00	
At Riverside Narrows (MWD Crossing)		
Water Quality Monitor/TDS Samples	991.00	
Dozer	250.00	
At Prado Park		
Surface Water Gage	460.00	
Place Rip-Rap and Stabilize Orifice	(125.00) <sup>1</sup>	
At Mission Boulevard		
Surface Water Gage	360.00	
Dozer	50.00	
	<u>          </u>	\$ 3,403.00

**WESTERN MUNICIPAL WATER DISTRICT**

Same as SBVMWD	\$3,403.00	
Cucamonga Creek Discharge	800.00	4,203.00

**CHINO BASIN MUNICIPAL WATER DISTRICT**

Same as WMWD		4,204.00
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**ORANGE COUNTY WATER DISTRICT**

At Prado Dam		
Water Quality Monitor/TDS Samples, Water		
Quality Sampling and Conductivity Programs	\$8,925.00	
At Prado Park		
Surface Water Gage	920.00	
Place Rip-Rap and Stabilize Orifice	(250.00) <sup>1</sup>	
At Mission Boulevard		
Surface Water Gage	720.00	
Dozer	100.00	
San Antonio Creek Water Quality Program	1,550.00	
Chino Creek		
Surface Water Gage	1,600.00	
Cleaning Control Area	1,000.00	
	<u>          </u>	14,565.00

**TOTAL FOR PARTIES** \$26,375.00

**UNITED STATES GEOLOGICAL SURVEY** 26,375.00

**GRAND TOTAL** \$52,750.00

<sup>1</sup>Credit for work not performed under 1976-77 Contract.

Mission Boulevard, MWD Crossing, Prado Park, and Below Prado Dam as well as the daily discharge of the Riverside Water Quality Control Plant into the Santa Ana River. Discharge measurements were also provided for two smaller streams tributary to Prado Reservoir; Chino Creek at Schaefer Avenue and Cucamonga Creek near Mira Loma.

The 1977-78 discharge record for the U.S.G.S. gaging station Santa Ana River Below Prado Dam is considered by the U.S.G.S. to be a good record. Due to the high flow rates commencing during the latter part of December 1977, the U.S.G.S. made several additional direct discharge measurements in order to extend the rating curve for the station. On March 1, 1978 the dike which confines the flow to the concrete channel below Prado Dam washed out allowing the flow to spread out. However, as a result of the additional flow measurements, the record of daily discharge was maintained. On August 4, 1979, the dike was reconstructed again confining the flow below Prado Dam to the concrete channel. During the 1977-78 the outlet control gates at Prado Dam were closed on two occasions. The gates were first closed on July 28, at 9:00 a.m. and then reopened on August 4 at 9:05 a.m. On September 18, at 9:15 a.m. the gates were again closed and then reopened on September 21 at 8:40 a.m. While the gates were closed, the mean daily discharge at the station was reported to be 2.4 cubic feet per second.

During 1977-78 collection or reliable discharge data at the gaging station Santa Ana River at MWD Crossing (Riverside Narrows) presented more than the usual number of problems. On December 11, vandals destroyed the stage recorder orifice line and the electrical conductivity probe. These were repaired on December 16. During the period January 15 to 18, the equipment was again inoperative due to failure of the power supply batteries resulting from the previous damage. During the February storms there was considerable movement of streambed materials and erosion towards the right bank of the channel allowing the stream to widen 100 to 300 feet. The concrete control structure which had been constructed to improve the accuracy of the normal low flow measurements was submerged by sand and remained inoperative until the latter part of March. Sand deposits also blocked the orifice line to the gage. The U.S.G.S. made direct discharge measurements on a weekly basis starting on February 8 and with these additional measurements was able to prepare a complete record for the water year 1977-78.

Maintenance of an adequate section for reasonably accurate discharge measurements at this station has been a continuous problem. The Watermaster is however studying alternatives for improving the reliability and accuracy of the discharge data.

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

Municipal Water District. Data regarding the discharge of State water into the Santa Ana River were provided by the Metropolitan Water District and the State Department of Water Resources.

### 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 Judgement. 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 Judgement, 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 CBMWD, SBVMWD and WMWD each paying 20 percent of the cost. The Judgement 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 31, 1977 the Watermaster adopted a budget for the fiscal year 1977-78 in the amount of \$15,000. At its meeting on May 26, 1978 the Watermaster adopted a budget for the fiscal year 1978-79 in the amount of \$10,000. Table 2 shows the items and amounts included in said budgets together with actual expenses for the fiscal year 1977-78.

TABLE 2

### SANTA ANA RIVER WATERMASTER BUDGET AND EXPENSES

	July 1, 1977 to June 30, 1978 <u>Budget</u>	July 1, 1977 to June 30, 1978 <u>Expenses</u>	July 1, 1978 to June 30, 1979 <u>Budget</u>
Administration	\$ 5,000.00	\$1,545.00	\$ 2,500.00
Support Engineering Services	8,000.00	4,593.00	6,000.00
Reproduction of Annual Report	<u>2,000.00</u>	<u>2,268.00*</u>	<u>1,500.00</u>
Total	\$15,000.00	\$8,406.00	\$10,000.00

Publication of the 1976-77 and 1977-78 reports (\$1,061.49 and \$1,206.26, respectively).

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 1977-78 is included herein as Appendix E.

## CHAPTER II WATER SUPPLY CONDITIONS

After experiencing four years of below normal precipitation the 1977-78 precipitation in the Santa Ana River watershed, as represented by rainfall measured at San Bernardino, was well above the Base Period average. Accordingly, the total flow in the Santa Ana River during the water year 1977-78 also increased. In addition to the increase in storm flow, the Base Flow at both Riverside Narrows and Prado also increased.

### Precipitation During 1977-78

During the 1977-78 water year, the precipitation at the San Bernardino County Hospital amounted to 30.47 inches, which is 169 percent of the Base Period average. Only three other years experienced precipitation amounts exceeding the 1977-78 rainfall, namely, 1936-37, 1940-41, and 1968-69 with 31.45, 36.44, and 31.79 inches respectively. Unseasonal precipitation occurred during the months of December through April and totaled 29.50 inches. The maximum monthly rainfall of 9.65 inches occurred in March. The maximum daily rainfall amounting to 2.65 inches occurred on February 9.

Figure 1 shows the seasonal precipitation from 1931-32 through 1977-78 and the accumulated departure from the 1934-35 through 1959-60 Base Period average.

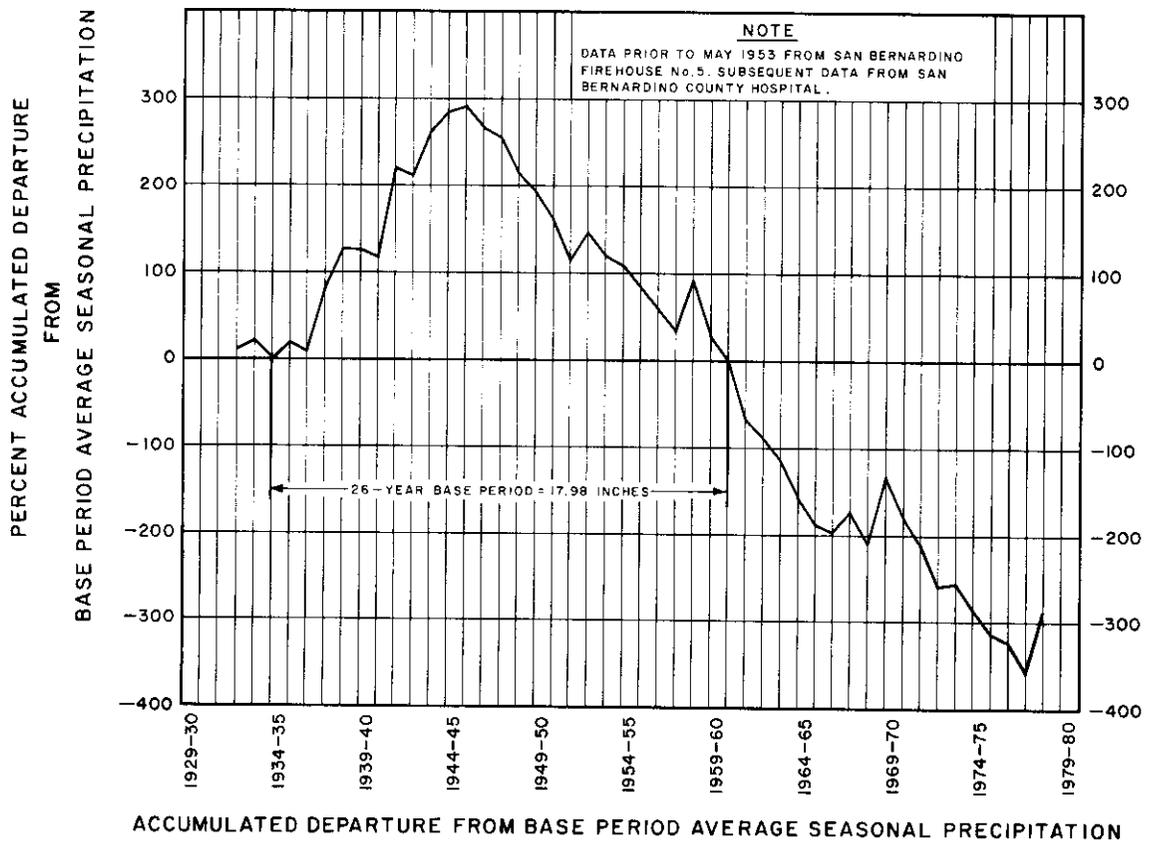
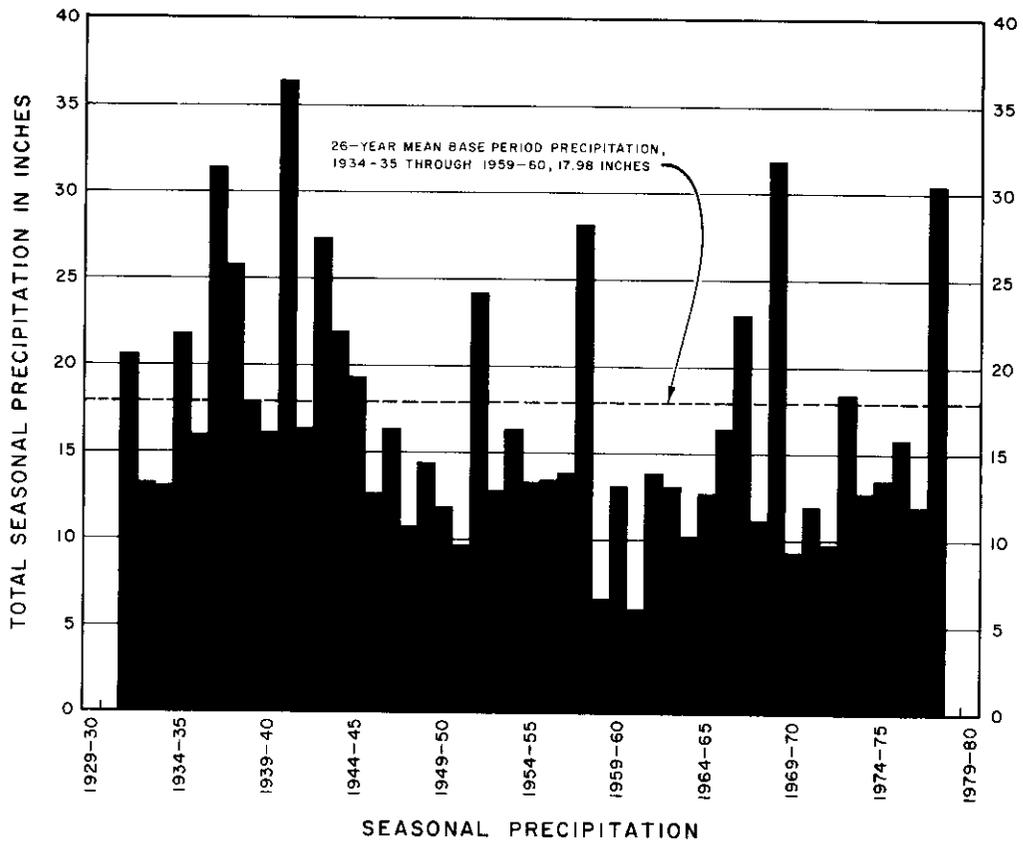
### Runoff During 1977-78

#### Below Prado Dam

During 1977-78, the Total Flow of the Santa Ana River at Prado Dam, less Nontributary Flow, was 252,853 acre-feet, which is well above the 16-year Base Period (1934-35 through 1959-60) average of 78,780 acre-feet per year. Since 1934-35 the discharge in 1977-78 is exceeded only by the 1968-69 discharge of 375,000 acre-feet.

Since 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 generally increased. During the eight-year period (1970-71 through 1977-78) since the Judgement went into effect, the Base Flow has averaged 47,068 acre-feet per year. This compares to the 26-year Base Period average of 47,470 acre-feet, and the Base Flow requirement under the Judgement of 42,000 acre-feet. The 1977-78 Base Flow amounted to 58,516 acre-feet, an increase of about 11,448 acre-feet over the eight-year average.

Figure 2 shows the Storm and Base Flow components of the Total Flow in the Santa Ana River below Prado Dam.

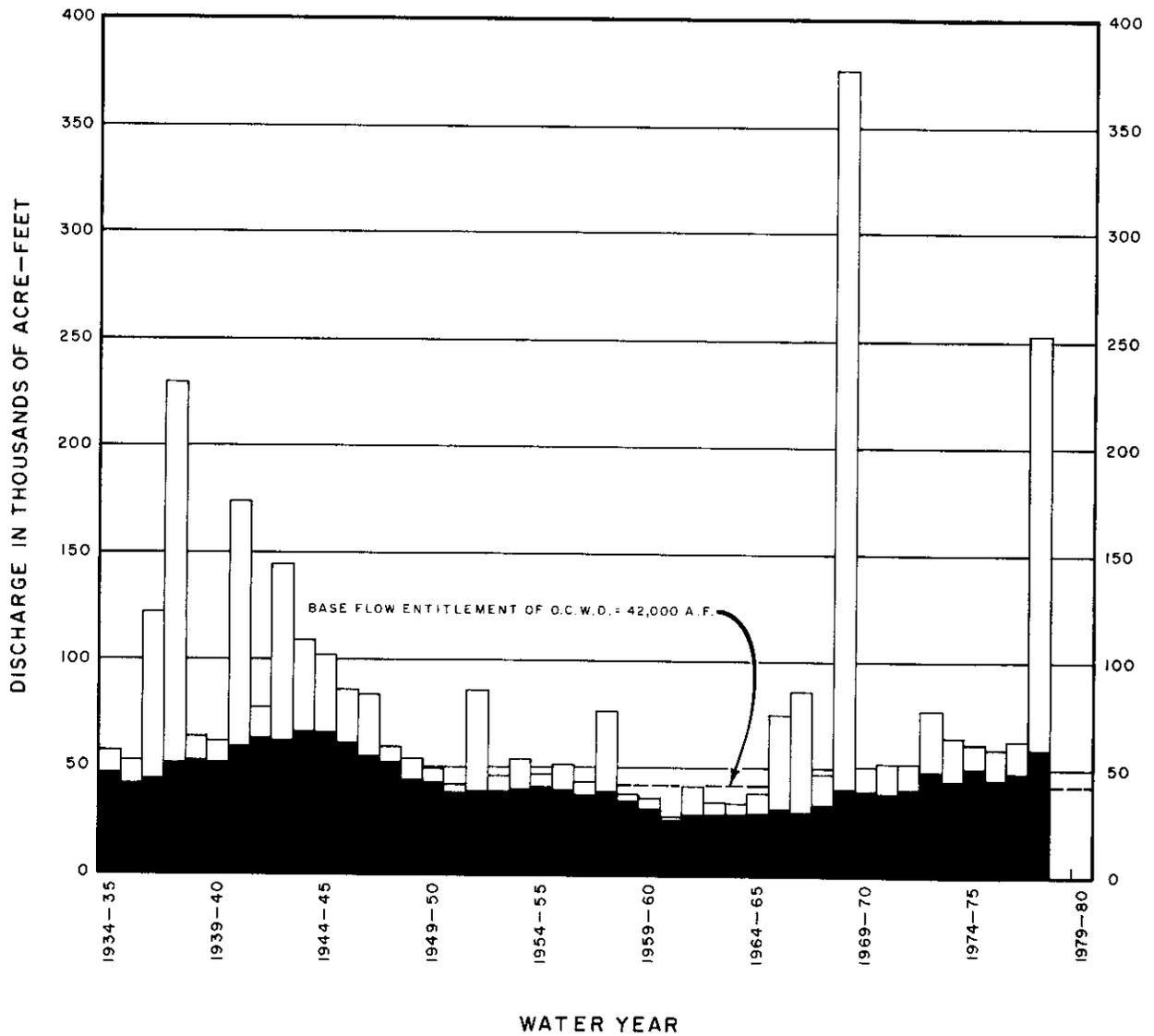


VARIATION IN PRECIPITATION AT SAN BERNARDINO

NOTE

DISCHARGE EXCLUDES IMPORTED M.W.D. COLORADO RIVER OR STATE WATER PROJECT WATER BEING TRANSPORTED IN THE SANTA ANA RIVER.

LEGEND



DISCHARGE OF SANTA ANA RIVER BELOW PRADO DAM

### **At Riverside Narrows**

The Total Flow less Nontributary Flow at Riverside Narrows for the 1977-78 water year was 181,760 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 eight-year period 1970-71 through 1977-78, the Base Flow has averaged 17,430 acre-feet per year. The 1977-78 Base Flow amount to 22,360 acre-feet, an increase of 4,930 acre-feet over the eight-year average.

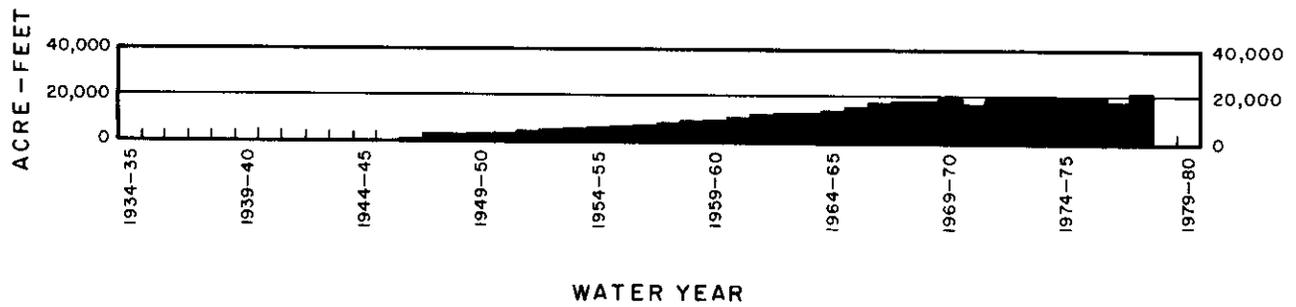
Figure 3 shows the components of Total Flow in the Santa Ana River at Riverside Narrows and the sewage effluent from the Riverside Water Quality Control Plant for the period from 1934-35 through 1977-78.

### **Sewage Effluent From Riverside Water Quality Control Plant**

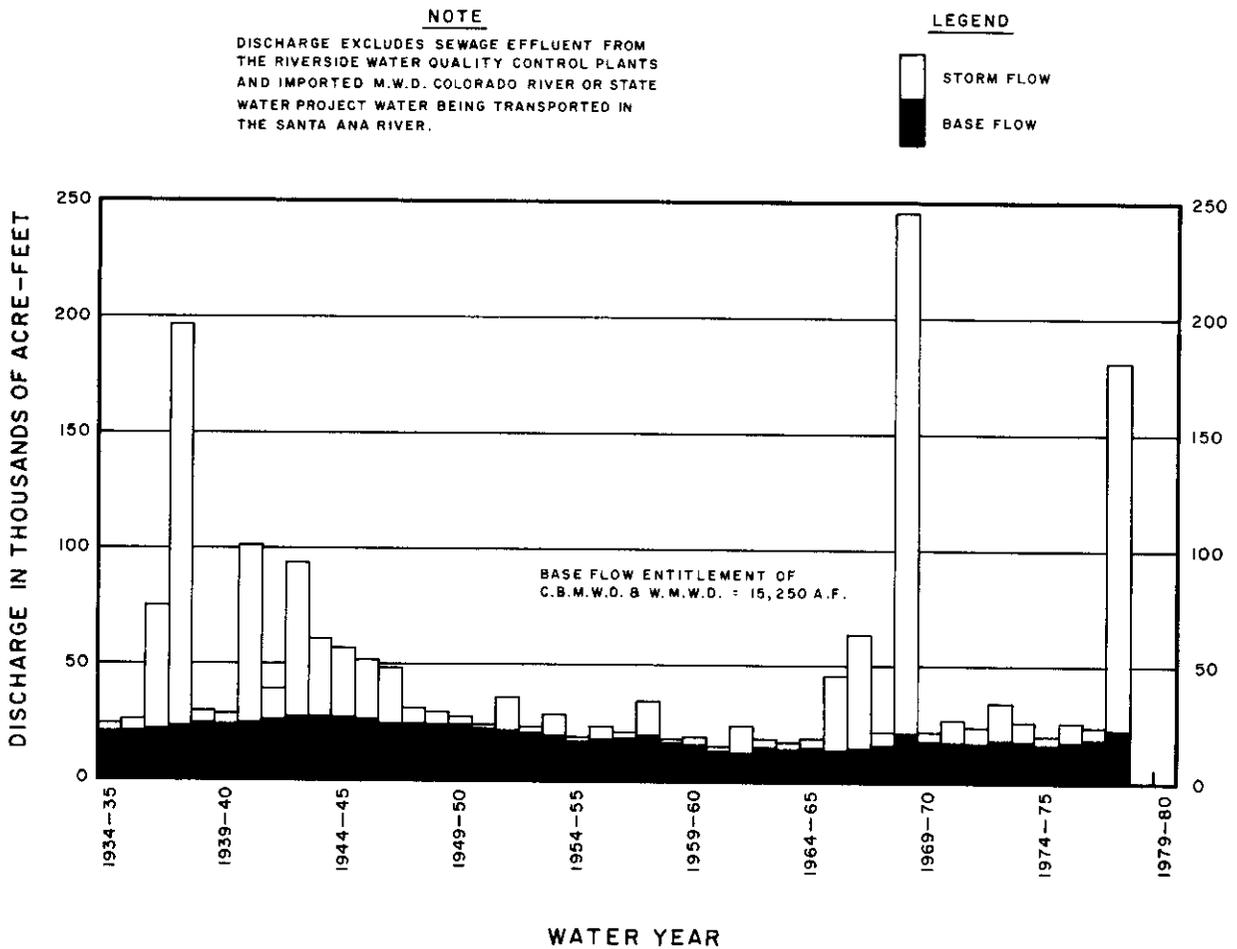
Since the late 1940's, the sewage effluent from the Riverside Water Quality Control Plant, which is discharged at the Riverside Narrows between Pedley Bridge and the MWD Crossing, has been increasing in amount. In 1949-50, the amount of treated effluent discharged was 3,960 acre-feet. By 1959-60, the discharge had increased to 9,900 acre-feet. By 1969-70, the discharge of sewage effluent from the treatment plant was 18,657 acre-feet. During this period, wastewater effluent discharged by the City of Riverside increased at a rate of about 800 acre-feet per year. Since 1969-70, the wastewater effluent discharge has not varied significantly. This trend is illustrated on Figure 3. The wastewater discharge of the Riverside Water Quality Control Plant during 1977-78 was 20,310 acre-feet.

### **Effluent From CMBWD Regional Wastewater Treatment Plants**

During the 1977-78 water year, CBMWD's Regional Plants No. 1 and 2 discharged 18,712 acre-feet of effluent to the Santa Ana River.



### SEWAGE EFFLUENT FROM RIVERSIDE WATER QUALITY CONTROL PLANTS



### DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS

## **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 255,043 acre-feet, measured at the USGS gaging station below Prado Dam. Separated into its components, Base Flow was 58,516 acre-feet, Storm Flow was 194,349 acre-feet, Nontributary Flow during 1977-78 due to the release of State water above Riverside Narrows during 1972-73 was 725 acre-feet, and Nontributary Flow due to State water that passed Prado Dam was assumed to be 1,466 acre-feet. The above determination of Nontributary Flow resulting from releases at San Antonio Creek is based on two adjustments for losses: 1) turnout gate leakage of 1.3 cfs at the Montclair spreading basin; 2) the assumption that 98 percent of the State water released at OC-59 has passed the Montclair Spreading Basin, and through Prado. The assumption is subject to review and the above amounts are subject to revision in subsequent years. The components of flow of the Santa Ana River at Prado Dam for each month in the 1977-78 water year are listed in Table 3, and are shown graphically on Plate 2.

### **Nontributary Flow**

Since May 1973, OCWD has 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, 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 1977-78, the credit is 725 acre-feet, assumed to be distributed uniformly throughout the year, as shown in Table 3.

#### **Releases to San Antonio Creek**

During water year 1977-78, 1,658 acre-feet of State water were purchased by OCWD and released from the Rialto Reach of the Foothill Feeder at OC-59 into San Antonio Creek near

**TABLE 3**  
**COMPONENTS OF FLOW AT PRADO DAM FOR WATER YEAR 1977/78 (acre-feet)**

Month	USGS Measured Outflow	Change in Storage <sup>1</sup>	Computed Inflow	Storm Flow	Base Flow	Nontributary Water	
						San Antonio Creek <sup>2</sup>	Riverside Narrows <sup>3</sup>
October	3,566	-0-	3,566	-0-	3,505	-0-	61
November	4,117	-0-	4,117	75	3,981	-0-	61
December	8,132	1,519	9,651	5,048	4,542	-0-	61
January	26,779	2,868	29,647	24,238	5,348	-0-	61
February	23,635	9,868	33,503	28,140	5,302	-0-	61
March	75,458	38,071	113,529	107,188	6,281	-0-	60
April	49,643	(25,442)	24,201	18,121	6,020	-0-	60
May	15,428	(5,042)	10,386	4,195	6,131	-0-	60
June	20,442	(11,959)	8,483	3,157	5,266	-0-	60
July	16,979	(9,495)	7,484	2,830	4,594	-0-	60
August	4,481	(383)	4,098	0	4,038	-0-	60
September	6,383	8	6,391	1,357	3,508	1,466	60
<b>Total</b>	<b>255,043</b>	<b>13</b>	<b>255,056</b>	<b>194,349</b>	<b>58,516</b>	<b>1,466</b>	<b>725</b>

1. The monthly change in storage included in the monthly components of flow.
2. State water released into San Antonio Creek during 1977-78 assumed to have reached Prado Dam in 1977-78.
3. That portion of State water released during 1972-73 upstream of Riverside Narrows, determined to have reached Prado Dam in 1977-78.

Upland. The measured flows at OC-59 are set forth in Appendix A. The Watermaster determined that additional testing and sampling programs should be made to quantify the extent of losses between OC-59 and the Prado Dam gage, however, due to the very limited releases, this program could not be continued in water year 1977-78. The Committee did not make a final determination and intends to continue investigation of the disposition of State water released into San Antonio Creek since the water year 1973-74, and to make a final determination and adjustment for each of these years at some subsequent time.

For the purpose of arriving at findings in this report, the Committee assumed after deducting leakage at Montclair Spreading Basin, that 98 percent of the State water released passed Prado and assumed a 12-hour delay for travel time. Based on the above assumptions, 1,466 acre-feet of the

State water released to San Antonio Creek passed Prado Dam during 1977-78. The monthly and annual amounts are shown in Table 3.

#### **Storm Flow**

Generally during storms, the 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 gradually reduced by the controlled releases to the downstream water conservation facilities operated by Orange County Water District. Monthly and annual quantities of Storm Flow are shown in Table 3.

During the 1977-78 water year, water was stored behind Prado Dam during the periods December 26 to July 22; July 28 to September 10; September 18 to September 21; and September 26 through September 30. During these periods, the water stored in Prado Reservoir varied up to a maximum of 79,730 acre-feet and the maximum mean daily flow released to the Santa Ana River was 2,470 cfs.

#### **Base Flow**

The determination of Base Flow was affected, as in the previous four years, by the State water which was released upstream of Prado Dam.

The general procedure used by the members of the Watermaster to separate the 1977-78 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 3.

#### **Water Quality**

The weighted average total dissolved solids (TDS) for the total flow passing Prado, including Nontributary Flow, was found to be 383 ppm. This determination was based on continuous measurements of electrical conductivity (EC) by the USGS at the Santa Ana River below Prado and a statistical correlation of EC and TDS.

The EC of the river was recorded hourly on a punched tape by USGS. The USGS also collected 30 samples and performed laboratory analyses for EC and TDS. Results of these analyses, listed in Table B-1, Appendix B, were used to develop the correlation between EC and TDS as shown on Figure 4.

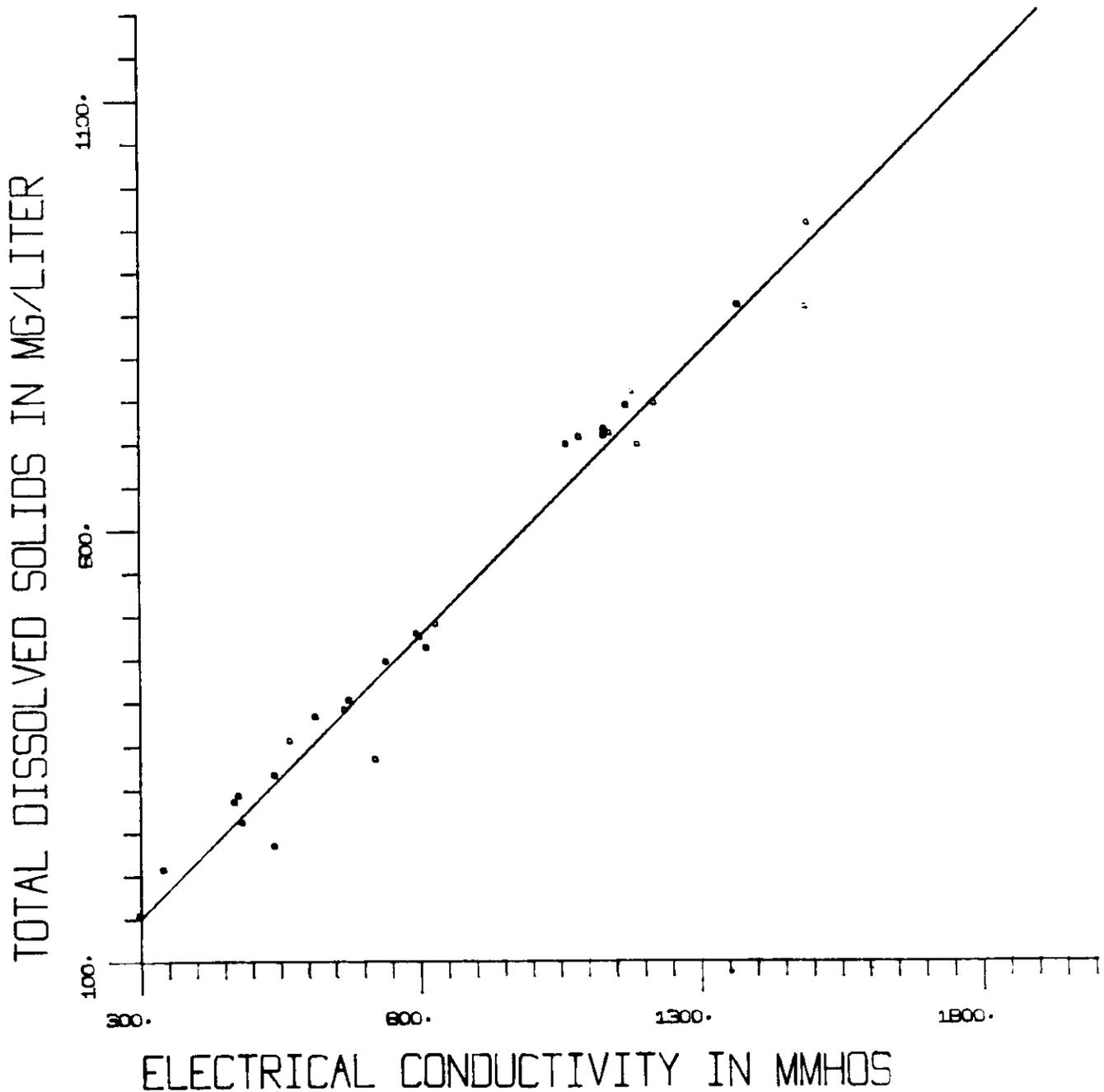
Application of the equation relating EC to TDS provided hourly TDS values. Using hourly data, flow weighted average daily values for TDS were computed and are listed in Table B-2, Appendix B.

# TDS AS A FUNCTION OF E.C. BELOW PRADO DAM

$$Y=A+B \cdot X$$

$$A=-0.4436698E 02$$

$$B= 0.6515928E 00$$



The plot of TDS on Plate 3 shows the effects of the State water. In general, the TDS fluctuated in the 425 to 676 ppm range when State water was being released during the last 6 days of the water year. Prior to the releases of State water the TDS ranged from 109 to 998 ppm.

#### Water Quality Adjustment for Nontributary Flow

The weighted average annual TDS value of 383 ppm, shown in Table B-3, Appendix B, represents the quality of Total Flow which includes Nontributary Flow from release of State water to San Antonio Creek and Santa Ana River above Riverside Narrows. The Judgement 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.

	<u>Annual Flow</u>	<u>Avg. TDS</u>	<u>(Annual Flow) x (Avg. TDS)</u>
1. Total Flow	255,042 A.F.	383 ppm	97,681,469 A.F.-ppm
2. Nontributary Flow Riverside Narrows	725 A.F.	242 ppm	175,450 A.F.-ppm
3. Nontributary Flow San Antonio Creek	1,466 A.F.	296 ppm	433,940 A.F.-ppm
4. Total Flow Less Nontributary Flow	252,852 A.F.		97,072,079 A.F.-ppm
5. Av. TDS of Total Flow Less Nontributary Flow	97,072,079 divided by 252,852 - 384 ppm		

The flow weighted average TDS of the State water released to San Antonio Creek in 1977-78 was 290 ppm as shown in Table C-1, Appendix C. This was adjusted to 296 ppm for use in the above calculation to reflect the evapotranspiration associated with assumption that 2 percent of the water released was lost. The flow weighted average TDS of State water released above Riverside Narrows during 1972-73 was 235 ppm and was similarly adjusted to 242 ppm to reflect a 3 percent evapotranspiration loss.

After adjusting for releases of State water, the weighted average annual TDS of Storm Flow and Base Flow for 1977-78 was 384 ppm. It is understood that the water quality adjustment will be changed for years subsequent to 1973-74 at the same time the final determination of the disposition of State water released into San Antonio Creek is made.

### Adjusted Base Flow

According to the Judgement, "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:

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

Where: Q = Base Flow actually received."

The weighted average annual TDS of 384 ppm is less than 700 ppm. Therefore, the Base Flow of 58,516 acre-feet must be adjusted by the equation above for TDS less than 700 ppm. Thus the Adjusted Base Flow is as follows:

$$(58,516 \text{ A.F.}) + \frac{35}{42,000} (58,516 \text{ A.F.}) (700-384) = 73,925 \text{ A.F.}$$

### Entitlement and Credit or Debit

From pages 12 and 13 of the Judgement, 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..."

The Watermaster's findings at Prado for 1976-77 required under the Judgement are as follows:

1. Base Flow at Prado	58,516 acre-feet
2. Annual Weighted TDS of Total Flow	384 ppm
3. Annual Adjusted Base Flow	73,925 acre-feet
4. Cumulative Adjusted Base Flow	396,802 acre-feet
5. Cumulative entitlement of OCWD	336,000 acre-feet
6. Cumulative Credit	60,802 acre-feet
7. One-third of Cumulative Debit	0 acre-feet
8. Minimum Required Base Flow in 1978-79	37,000 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 182,500 acre-feet, measured at the U.S.G.S. gaging station just upstream of the MWD Upper Feeder Crossing. Separated into its components, Base Flow was 22,360 acre-feet, Storm Flow was 159,400 acre-feet, and Nontributary Flow due to the release of State water above Riverside Narrows was 740 acre-feet. The components of flow of the Santa Ana River at Riverside Narrows for each month in the 1977-78 water year are listed in Table 4 and graphically shown on Plate 4.

**TABLE 4**  
**COMPONENTS OF FLOW AT RIVERSIDE NARROWS FOR**  
**WATER YEAR 1977-78**  
**(Quantities in Acre-Feet)**

		<u>Total Flow USGS Measurement</u>	<u>Storm Flow</u>	<u>Base Flow</u>	<u>Nontributary Flow</u>
1977	October	1,591	0	1,529	62
	November	1,569	0	1,507	62
	December	5,135	3,550	1,523	62
1978	January	17,061	15,316	1,683	62
	February	37,579	35,782	1,735	62
	March	80,062	77,870	2,130	62
	April	21,092	18,753	2,277	62
	May	7,069	4,647	2,360	62
	June	5,379	3,279	2,039	61
	July	2,013	20	1,932	61
	August	1,974	0	1,913	61
	September	1,976	183	1,732	61
Total-Acre-Feet		182,500	159,400	22,360	740

### **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 previous reports. For the water year 1977-78 the amount of State water reaching Riverside Narrows has been agreed upon as 740 acre-feet.

### **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 Judgement), 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 (740 acre-feet divided by 12 months) and subtracted from the sum of the Base Flow and Nontributary Flow to arrive at Base Flow. The Base Flow was determined to be 22,360 acre-feet, as shown on Table 4.

### **Water Quality**

The weighted average total dissolved solids (TDS) for the Base Flow plus Nontributary Flow at Riverside Narrows was found to be 710 ppm and for Base Flow only was found to be 726 ppm. This determination of the water quality was made using periodic grab samples taken and analyzed for TDS by the U.S.G.S.. The data for this analysis are listed in Tables D-1 and D-2, Appendix D.

A plot of the TDS of the total flow, including Nontributary Flow, at Riverside Narrows for the year 1977-78, is shown on Plate 5.

### **Adjusted Base Flow at Riverside Narrows**

The Judgement 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 and  
Riverside Narrows is:

Then the Adjusted Base  
Flow shall be determined  
by the formula:

Greater than 700 ppm

$$Q - \frac{11}{15,250} Q (\text{TDS}-700)$$

600 ppm - 700 ppm

$$Q$$

Less than 600 ppm

$$Q + \frac{11}{15,250} Q (600-\text{TDS})$$

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 1977-78 was 726 ppm. Therefore, a downward adjustment to the Base Flow of 419 acre-feet is necessary, and the Adjusted Base Flow for 1977-78 is 21,941 acre-feet.

#### **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..."

The Watermaster's findings at Riverside Narrows for 1977-78 required under the Judgment are as follows:

(1) Base Flow at Riverside Narrows	22,360 acre-feet
(2) Annual Weighted TDS of Base Flow	726 ppm
(3) Annual Adjusted Base Flow	21,941 acre-feet
(4) Cumulative Adjusted Base	138,641 acre-feet
(5) Cumulative Entitlement of CBMWD and WMWD	122,000 acre-feet
(6) Cumulative Credit	16,641 acre-feet
(7) One-Third Cumulative Debit	0 acre-feet
(8) Minimum Required Base Flow in 1978-79	13,420 acre-feet

**APPENDIX A**

**STATE WATER RELEASED BY MWD  
TO SAN ANTONIO CREEK NEAR UPLAND**

**CONNECTION OC-59**

**1977-78**

**PREPARED BY  
DONALD L. HARRIGER**

Table A-1

SUMMARY

OC-59 RELEASED AND DELAYED

MONTH TOTALS

(in Acre Feet)

Water Year 1977-78

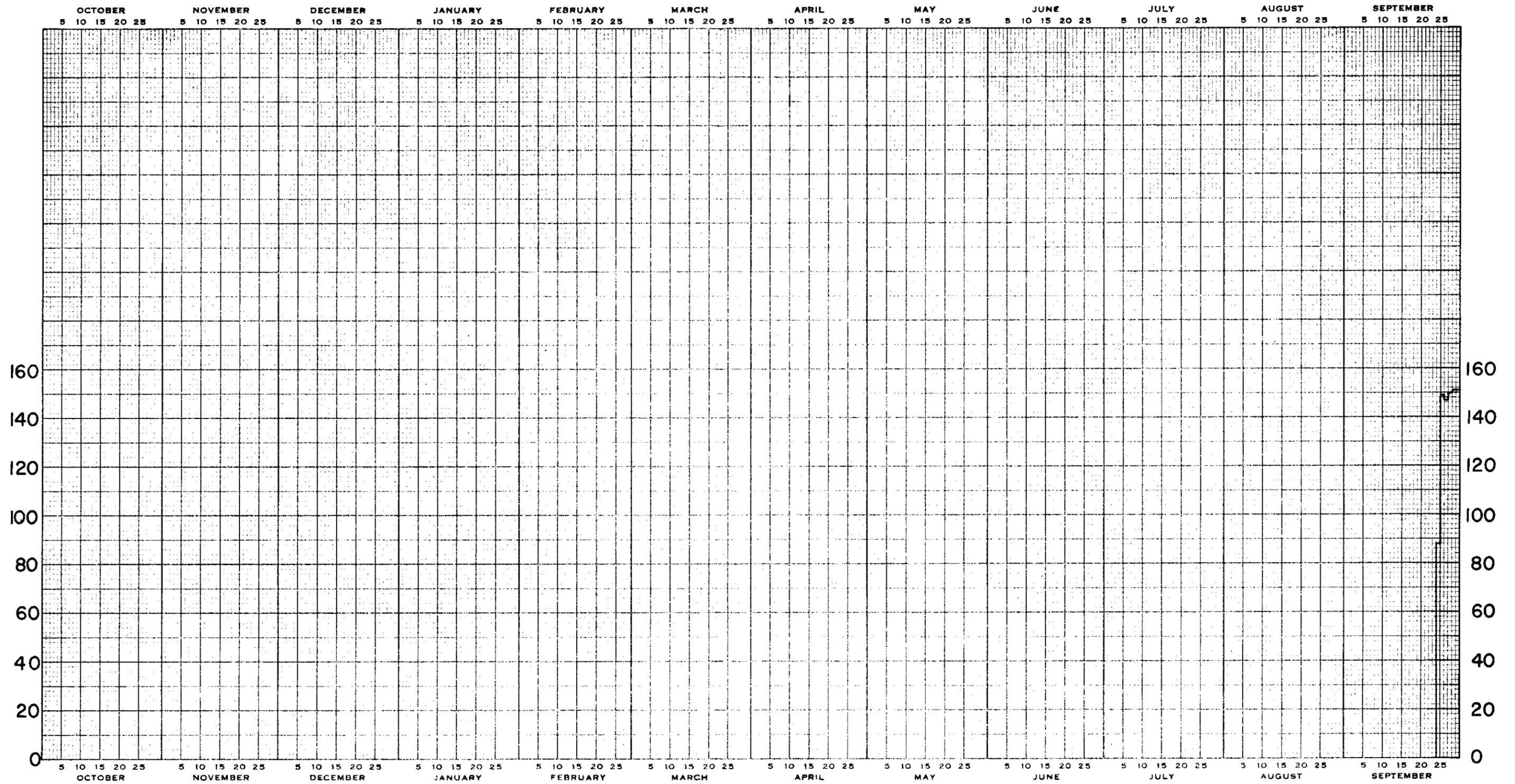
<u>Month</u>	<u>Released</u>	<u>Delayed</u>
October	0	0
November	0	0
December	0	0
January	0	0
February	0	0
March	0	0
April	0	0
May	0	0
June	0	0
July	0	0
August	0	0
September	<u>1658</u>	<u>1508</u>
Total	1658	1508

## NONTRIBUTARY WATER FROM OC-59

in cfs days

September 1978

Day	Released	12 hour delay
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	88	10
26	149	153
27	147	147
28	150	149
29	151	150
30	<u>151</u>	<u>151</u>
	836 cfs days	760 cfs days
	1658 A.F.	1508 A.F.



NONTRIBUTARY WATER RELEASED  
AT OC-59

PLATE A-1  
WATER YEAR 1977-78

APPENDIX B

WATER QUALITY-  
SANTA ANA RIVER BELOW PRADO DAM

1977-78

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 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 specific conductivity data from the recorder tape, which was flow weighted using hourly discharge measurements from the water stage recorder.
2. Laboratory analyses of the 30 grab samples taken by the USGS below Prado Dam during the 1977-78 season were run to determine both specific conductance and TDS. Data from the grab samples are given in Table B-2. Results of these analyses were used to prepare a correlation between specific conductance and the corresponding TDS. A detailed discussion of this statistical analysis is presented in the Fifth Annual Watermaster Report. The resulting graph of plotted data points and equation of the best fit line are shown in Chapter III of this report.
3. The equation from the curve fitting operation was then used to determine the mean daily TDS corresponding to the mean daily specific conductance values for each day of the year. These data are given in Table B-2.

4. 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 383 ppm of total dissolved solids for the 1977-78 water year. The weighted TDS calculation for the water year 1977-78 is shown in Table B-3.

TABLE B-1  
 U.S.G.S WATER QUALITY SAMPLES  
 BELOW PRADO DAM  
 WATER YEAR 1977-78

Date	E.C.	T.D.S.	Date	E.C.	T.D.S.
Oct. 1977	1140	716	April 1978	549 577	236 358
Nov. 1977	1140 1180 1150	709 744 713	May 1978	683 809	404 477
Dec. 1977	1180 1200 1230	744 700 747	June 1978	822 804	465 482
Jan. 1978	1380 549 491	861 319 264	July 1978	1073	699
Feb. 1978	838 478 750	492 288 449	Aug. 1978	1500 1190	858 762
Mar. 1978	675 308 350 485 730 623	394 156 209 295 336 385	Sept. 1978	1096 1505	709 956

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TABLE B-2  
 TOUPS CORPORATION  
 WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM

WATER YEAR 1977-1978

TDS= 0.651592(EC)+-44.3669A003

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 01	50.0	1140 *	698	34900.
OCT 02	48.0	1140 ***	698	33504.
OCT 03	51.0	1130 ***	692	35292.
OCT 04	53.0	1110 ***	679	35987.
OCT 05	49.0	1130 *	692	33908.
OCT 06	48.0	1130	692	33216.
OCT 07	51.0	1123	687	35037.
OCT 08	51.0	1119	685	34935.
OCT 09	50.0	1125	689	34450.
OCT 10	52.0	1111	680	35360.
OCT 11	54.0	1126	689	37206.
OCT 12	60.0	1111	680	40800.
OCT 13	60.0	1107	677	40620.
OCT 14	56.0	1118	684	38304.
OCT 15	54.0	1149	704	38016.
OCT 16	56.0	1137	696	38976.
OCT 17	59.0	1118	684	40356.
OCT 18	62.0	1118	684	42408.
OCT 19	63.0	1131	693	43659.
OCT 20	62.0	1142	700	43400.
OCT 21	62.0	1141	699	43338.
OCT 22	62.0	1142	700	43400.
OCT 23	62.0	1135	695	43090.
OCT 24	63.0	1118	684	43092.
OCT 25	61.0	1132	693	42273.
OCT 26	61.0	1148	704	42944.
OCT 27	64.0	1152	706	45184.
OCT 28	66.0	1153	707	46662.
OCT 29	68.0	1153	715	48620.
OCT 30	70.0	1165	715	50050.
OCT 31	70.0	1166	715	49420.
		1151	706	
TOTAL	1798.		694	1248407.
MONTHLY WEIGHTED T.D.S.				

\* Mean Daily E.C. Estimated

TABLE B-2 (Continued)

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 01		68.0	1154	708	48144.
NOV 02		66.0	1172	719	47454.
NOV 03		67.0	1180	725	48575.
NOV 04		68.0	1177	723	49164.
NOV 05		71.0	1184	727	51617.
NOV 06		74.0	1187	729	53946.
NOV 07		72.0	1167	716	51552.
NOV 08		71.0	1161	712	50552.
NOV 09		67.0	1180	725	48575.
NOV 10		62.0	1172	719	44578.
NOV 11		62.0	1185	728	45136.
NOV 12		66.0	1194	734	48444.
NOV 13		68.0	1215	747	50796.
NOV 14		70.0	1206	741	51870.
NOV 15		66.0	1197	736	48576.
NOV 16		64.0	1213	746	47744.
NOV 17		66.0	1228	756	49896.
NOV 18		68.0	1216	748	50864.
NOV 19		69.0	1224	753	51957.
NOV 20		70.0	1238	762	53340.
NOV 21		72.0	1222	752	54144.
NOV 22		71.0	1250	757	53747.
NOV 23		75.0	1240	764	57300.
NOV 24		76.0	1279	789	59964.
NOV 25		74.0	1254	773	57202.
NOV 26		71.0	1244	766	54386.
NOV 27		71.0	1257	775	55025.
NOV 28		72.0	1227	755	54360.
NOV 29		68.0	1217	749	50932.
NOV 30		71.0	1228	756	53676.
TOTAL		2076.		744	1543516.
MONTHLY WEIGHTED T.D.S.					

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TABLE B-2 (Continued)

TOUPS CORPORATION  
WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM

WATER YEAR 1977-1978

TDS= 0.651592(EC)+-44.36698003

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 01	73.0	1225	754	55042.
DEC 02	71.0	1243	766	54386.
DEC 03	68.0	1272	784	53312.
DEC 04	66.0	1288	795	52470.
DEC 05	68.0	1264	779	52972.
DEC 06	67.0	1255	773	51791.
DEC 07	70.0	1282	791	55370.
DEC 08	69.0	1266	781	53889.
DEC 09	68.0	1259	776	52768.
DEC 10	69.0	1258	775	53475.
DEC 11	68.0	1262	778	52904.
DEC 12	72.0	1238	762	54864.
DEC 13	73.0	1233	759	55407.
DEC 14	71.0	1259	776	55096.
DEC 15	71.0	1249	769	54599.
DEC 16	71.0	1238	762	54102.
DEC 17	69.0	1261	777	53613.
DEC 18	143.0	1255	773	115177.
DEC 19	112.0	1293	798	89376.
DEC 20	79.0	1263	779	61541.
DEC 21	76.0	1249	769	58444.
DEC 22	85.0	1255	773	65705.
DEC 23	86.0	1274	786	67596.
DEC 24	92.0	1316	813	74796.
DEC 25	86.0	1298	801	68806.
DEC 26	180.0	1312	811	145980.
DEC 27	245.0	991	601	147245.
DEC 28	302.0	831	497	150094.
DEC 29	428.0	568	326	139528.
DEC 30	504.0	508	287	144648.
DEC 31	492.0	547	345	169740.
TOTAL	4100.		589	2414816.
MONTHLY WEIGHTED T.D.S.				

B-6

TABLE B-2 (Continued)

TOUPS CORPORATION

WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM

WATER YEAR 1977-1978

TDS= 0.651592(EC)+-44.36698003

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 01	462.0	793	472	218064.
JAN 02	428.0	1018	619	264932.
JAN 03	268.0	1236	761	203948.
JAN 04	285.0	791	471	134235.
JAN 05	421.0	597	345	145245.
JAN 06	357.0	618	358	127806.
JAN 07	293.0	673	394	115442.
JAN 08	287.0	785	467	134029.
JAN 09	282.0	966	585	164970.
JAN 10	302.0	856	513	154926.
JAN 11	503.0	559	320	160960.
JAN 12	571.0	492	276	157596.
JAN 13	550.0	502	283	155650.
JAN 14	454.0	635	369	167526.
JAN 15	429.0	751	445	190905.
JAN 16	551.0	713	420	231420.
JAN 17	962.0	534	304	292448.
JAN 18	1210.0	494	278	336380.
JAN 19	598.0	489	274	163852.
JAN 20	553.0	486	272	150416.
JAN 21	453.0	503	283	128159.
JAN 22	445.0	531	302	134390.
JAN 23	394.0	553	316	124188.
JAN 24	344.0	515	291	100104.
JAN 25	339.0	842	504	170856.
JAN 26	336.0	1238	762	256032.
JAN 27	333.0	1429	887	295371.
JAN 28	291.0	1201	738	214758.
JAN 29	269.0	1251	771	207399.
JAN 30	267.0	1264	779	207943.
JAN 31	265.0	1475	917	243085.
TOTAL	13501.		426	5753045.
MONTHLY WEIGHTED T.D.S.				

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TABLE B-2 (Continued)

TOUPS CORPORATION

WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM

WATER YEAR 1977-1978

TDS= 0.651592(FC)+-44.3669A003

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 01	261.0	1090	666	173826.
FEB 02	231.0	973	590	136290.
FEB 03	207.0	1300	803	166221.
FEB 04	204.0	1470	913	186252.
FEB 05	203.0	1600*	998	202594.
FEB 06	150.0	1600*	998	149700.
FEB 07	165.0	480*	268	44220.
FEB 08	229.0	680*	399	90972.
FEB 09	539.0	884	532	286748.
FEB 10	1070.0	441	243	260010.
FEB 11	1120.0	314	160	180800.
FEB 12	590.0	302	152	89680.
FEB 13	744.0	263	127	94488.
FEB 14	858.0	294	147	126126.
FEB 15	814.0	309	157	127758.
FEB 16	596.0	332	172	102512.
FEB 17	458.0	331	171	78318.
FEB 18	630.0	285	141	88830.
FEB 19	612.0	241	113	69156.
FEB 20	587.0	235	109	63983.
FEB 21	317.0	245	115	36455.
FEB 22	197.0	274	134	26348.
FEB 23	196.0	301	152	29792.
FEB 24	204.0	325	167	34068.
FEB 25	196.0	361	191	37436.
FEB 26	195.0	372	198	38610.
FEB 27	195.0	368	195	38025.
FEB 28	139.0	350*	184	25576.
TOTAL	11916.		250	2984884.
MONTHLY WEIGHTED T.D.S.				

B-8

\*Mean Daily E.C. Estimated

B-9

TABLE B-2 (Continued)

TOUPS CORPORATION

WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM		WATER YEAR 1977-1978	TDS=	0.651592(EC)+-44.36698003	
MONTH-DAY	U.S.G.S. MEAN DAILY FLOW	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.)	MEAN DAILY ADJUSTED T.D.S.	MEAN DAILY FLOW TIMES ADJUSTED T.D.S.	
	(CFS-DAY)	(MICROMHOS)	(PPM)		
MAR 01	358.0	370*	197	70526.	
MAR 02	1890.0	675*	395	746550.	
MAR 03	2230.0	575*	330	735900.	
MAR 04	2180.0	500*	281	612580.	
MAR 05	2420.0	350*	144	445280.	
MAR 06	2470.0	350*	184	454480.	
MAR 07	2400.0	350*	184	441600.	
MAR 08	1690.0	400*	216	365040.	
MAR 09	2380.0	350*	184	437920.	
MAR 10	2440.0	350**	184	448960.	
MAR 11	2270.0	350**	184	417680.	
MAR 12	2230.0	375**	200	446000.	
MAR 13	1380.0	460**	255	351900.	
MAR 14	930.0	571**	328	385040.	
MAR 15	2200.0	612**	354	778800.	
MAR 16	1400.0	653*	381	525780.	
MAR 17	62.0	693	407	25234.	
MAR 18	54.0	762	452	24408.	
MAR 19	47.0	820	490	23030.	
MAR 20	157.0	804	480	75360.	
MAR 21	373.0	703	414	154422.	
MAR 22	690.0	574	330	227700.	
MAR 23	242.0	690	405	98010.	
MAR 24	448.0	562	322	144256.	
MAR 25	644.0	531	302	194488.	
MAR 26	633.0	522	296	187368.	
MAR 27	239.0	488	280	262640.	
MAR 28	429.0	485	272	252416.	
MAR 29	656.0	482	276	181056.	
MAR 30	656.0	486	272	178432.	
MAR 31	667.0	489	274	182758.	
TOTAL		58943.	257	9795614.	
MONTHLY WEIGHTED T.D.S.					

\*Mean Daily E.C. Estimated

TABLE B-2 (Continued)

TOUPS CORPORATION  
WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM      WATER Y EAR 1977-1978      TDS= 0.651592(EC)+-44.36698003

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 01	667.0	449	248	165416.
APR 02	678.0	502	283	191874.
APR 03	667.0	499	281	187427.
APR 04	518.0	515	291	150738.
APR 05	235.0	552	315	74025.
APR 06	504.0	554	317	159768.
APR 07	690.0	576	331	228390.
APR 08	690.0	596	344	237360.
APR 09	690.0	549	313	215970.
APR 10	690.0	547	312	215280.
APR 11	790.0	541	308	243320.
APR 12	887.0	575	330	292710.
APR 13	887.0	587	338	299806.
APR 14	887.0	584	336	298032.
APR 15	887.0	578	332	294484.
APR 16	880.0	577	332	292160.
APR 17	1010.0	595	343	346430.
APR 18	1180.0	564	323	381140.
APR 19	1170.0	534	304	355680.
APR 20	1170.0	528	300	351000.
APR 21	1160.0	533	303	351480.
APR 22	1150.0	546	311	357650.
APR 23	1150.0	554	317	364550.
APR 24	1140.0	563	322	367080.
APR 25	1130.0	566	324	366120.
APR 26	1130.0	571	328	370640.
APR 27	1120.0	538 *	306	342720.
APR 28	857.0	568 **	326	279382.
APR 29	207.0	653 **	381	78867.
APR 30	207.0	691 *	406	84042.
TOTAL	25328.		317	7943541.
MONTHLY WEIGHTED T.D.S.				

\*Mean Daily E.C. Estimated

TABLE B-2 (Continued)

RELOW PRADO DAM		TOUPS CORPORATION WEIGHTED T.O.S. CALCULATION SHEET		WATER YEAR 1977-1978		TDS= 0.651592(FC)+-44.3669R003	
MONTH-DAY		U.S.G.S. YEAR DAILY FLOW (CFS-DAY)	U.S.G.S. MEAN DAILY SPECIFIC CONDUCTANCE (E.C.) (MICROMHOS)	MEAN DAILY ADJUSTED T.O.S. (PPM)	MEAN DAILY FLOW TIMES ADJUSTED T.O.S.		
MAY	01	207.0	692	407	84249.		
MAY	02	207.0	714	421	87147.		
MAY	03	202.0	735	435	87870.		
MAY	04	202.0	762	452	91304.		
MAY	05	202.0	747	475	95950.		
MAY	06	202.0	749	470	94940.		
MAY	07	202.0	741	465	93930.		
MAY	08	200.0	774	460	92000.		
MAY	09	197.0	774	460	90670.		
MAY	10	197.0	786	464	92196.		
MAY	11	197.0	797	475	93575.		
MAY	12	219.0	796	474	103806.		
MAY	13	234.0	789	470	109980.		
MAY	14	234.0	793	472	110448.		
MAY	15	237.0	797	475	112575.		
MAY	16	238.0	792	472	112336.		
MAY	17	240.0	754	447	110856.		
MAY	18	254.0	769	457	116078.		
MAY	19	254.0	770	457	116078.		
MAY	20	254.0	768	456	115824.		
MAY	21	254.0	770	457	116078.		
MAY	22	278.0	775	461	124158.		
MAY	23	298.0	785	467	139166.		
MAY	24	315.0	789	470	148050.		
MAY	25	326.0	787	468	152568.		
MAY	26	325.0	791	471	153075.		
MAY	27	324.0	796	474	153576.		
MAY	28	321.0	812	485	155645.		
MAY	29	319.0	794	473	150487.		
MAY	30	316.0	803	479	151364.		
MAY	31	315.0	798	476	149940.		
TOTAL		7778.		464	3610309.		
MONTHLY WEIGHTED T.O.S.				464			

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TABLE B-2 (Continued)

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	01	315.0	793	472	148680.
JUN	02	315.0	784	466	146790.
JUN	03	315.0	778	463	145845.
JUN	04	315.0	782	465	146475.
JUN	05	315.0	787	468	147420.
JUN	06	355.0	808	482	171110.
JUN	07	380.0	793	472	179360.
JUN	08	380.0	793	472	179360.
JUN	09	398.0	792	472	187856.
JUN	10	409.0	795	474	193866.
JUN	11	405.0	787	468	189540.
JUN	12	402.0	781	465	186930.
JUN	13	350.0	794	473	165550.
JUN	14	287.0	813	485	139195.
JUN	15	319.0	807	481	153439.
JUN	16	339.0	808	482	163398.
JUN	17	331.0	823	492	162852.
JUN	18	324.0	843	505	163620.
JUN	19	325.0	859	522	169650.
JUN	20	325.0	868	521	169325.
JUN	21	326.0	856	513	167238.
JUN	22	325.0	869	522	169650.
JUN	23	325.0	885	532	172900.
JUN	24	325.0	895	539	175175.
JUN	25	326.0	896	539	175714.
JUN	26	327.0	902	543	177561.
JUN	27	327.0	906	546	178542.
JUN	28	361.0	906	546	197106.
JUN	29	380.0	911	549	208620.
JUN	30	380.0	930	562	213560.
TOTAL		10306.		499	5146327.
MONTHLY WEIGHTED T.D.S.					

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TABLE B-2 (Continued)

TOUPS CORPORATION

WEIGHTED T.D.S. CALCULATION SHEET

BELOW PRADO DAM

WATER YEAR 1977-1978

TDS= 0.651592(EC)+-44.36698003

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 01	380.0	933	564	214320.
JUL 02	384.0	920	555	213120.
JUL 03	387.0	913	551	213237.
JUL 04	387.0	927	560	216720.
JUL 05	387.0	939	567	219429.
JUL 06	398.0	946	572	227656.
JUL 07	406.0	940	568	230608.
JUL 08	402.0	940	568	228336.
JUL 09	404.0	936	566	228664.
JUL 10	401.0	941	569	228169.
JUL 11	396.0	953	577	228492.
JUL 12	394.0	965	584	230096.
JUL 13	387.0	973	590	228330.
JUL 14	373.0	968	586	218578.
JUL 15	375.0	978	593	222375.
JUL 16	371.0	1011	614	227794.
JUL 17	356.0	1028	625	222500.
JUL 18	342.0	1054	642	219564.
JUL 19	319.0	1067	651	207669.
JUL 20	302.0	1077	657	198414.
JUL 21	280.0	1076	657	183960.
JUL 22	245.0	1133	694	170030.
JUL 23	127.0	1331	823	104521.
JUL 24	75.0	1439	893	66975.
JUL 25	69.0	1383	857	59133.
JUL 26	88.0	1177	723	63624.
JUL 27	76.0	1102	726	55176.
JUL 28	43.0	967	586	25198.
JUL 29	2.0	1200*	738	1476.
JUL 30	2.0	1400*	868	1736.
JUL 31	2.0	1430*	887	1774.
TOTAL	8560.		603	5157674.
MONTHLY WEIGHTED T.D.S.				

\*Mean Daily E.C. Estimated

TABLE B-2 (Continued)

TOUPS CORPORATION				
WEIGHTED T.D.S. CALCULATION SHEET				
BELOW PRADO DAM		WATER YEAR 1977-1978	TDS=	0.651592(EC)+44.36698003
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 01	2.0	1430*	887	1774.
AUG 02	2.0	1435	891	1782.
AUG 03	2.0	1442	895	1790.
AUG 04	67.0	1397	866	58022.
AUG 05	105.0	1244	766	80430.
AUG 06	104.0	1184	727	75608.
AUG 07	103.0	1163	713	73439.
AUG 08	101.0	1143	700	70700.
AUG 09	99.0	1139	698	69102.
AUG 10	98.0	1121	686	67228.
AUG 11	97.0	1130	692	67124.
AUG 12	97.0	1139	698	67706.
AUG 13	93.0	1131	693	64449.
AUG 14	91.0	1133	694	63154.
AUG 15	89.0	1144	701	62349.
AUG 16	86.0	1163	713	61310.
AUG 17	81.0	1180	725	58725.
AUG 18	79.0	1184	727	57433.
AUG 19	76.0	1184	727	55252.
AUG 20	74.0	1166	715	52910.
AUG 21	69.0	1192	732	50508.
AUG 22	65.0	1184	727	47255.
AUG 23	66.0	1179	724	47784.
AUG 24	65.0	1175	721	46865.
AUG 25	63.0	1188	730	45990.
AUG 26	63.0	1177	723	45549.
AUG 27	64.0	1163	713	45632.
AUG 28	64.0	1151	706	45184.
AUG 29	63.0	1171	719	45297.
AUG 30	64.0	1194	734	46976.
AUG 31	67.0	1182	726	48642.
TOTAL	2259.			
MONTHLY WEIGHTED T.D.S.			720	1626017.

\*Mean Daily E.C. Estimated

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TABLE B-2 (Continued)

MONTH-DAY		TOUPS CORPORATION WEIGHTED T.D.S. CALCULATION SHEET			
		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.
BELOW PRADO DAM		WATER YEAR 1977-1978		TDS= 0.651592(EC)+-44.36698003	
SEP	01	68.0	1168	717	48756.
SEP	02	68.0	1153	707	48076.
SEP	03	68.0	1136	696	47328.
SEP	04	67.0	1133	694	46498.
SEP	05	66.0	1155	708	46728.
SEP	06	78.0	1087	664	58432.
SEP	07	170.0	1042	635	107950.
SEP	08	211.0	1019	620	130820.
SEP	09	201.0	999	607	122007.
SEP	10	184.0	1061	647	119048.
SEP	11	111.0	1148	704	78144.
SEP	12	85.0	1157	710	60350.
SEP	13	83.0	1226	754	62582.
SEP	14	82.0	1286	794	65108.
SEP	15	86.0	1280	790	67940.
SEP	16	75.0	1239	763	57225.
SEP	17	75.0	1166	715	53625.
SEP	18	35.0	1127	690	24150.
SEP	19	3.0	1234	760	2280.
SEP	20	2.0	1287	794	1588.
SEP	21	150.0	1384	857	128550.
SEP	22	133.0	1129	691	91903.
SEP	23	60.0	1161	712	42720.
SEP	24	55.0	1132	693	38808.
SEP	25	56.0	1106	676	37856.
SEP	26	162.0	858	515	83430.
SEP	27	188.0	769	457	85916.
SEP	28	193.0	740	438	84534.
SEP	29	194.0	726	429	83226.
SEP	30	198.0	721	425	84150.
TOTAL		3218.		625	2009728.
MONTHLY WEIGHTED T.D.S.					

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TABLE B-3

SUMMARY OF WEIGHTED TDS  
BELOW PRADO DAM  
WATER YEAR 1977-1978

	Monthly Flow cfs-day	Monthly Flow Times TDS	Monthly Weighted TDS
October	1,798	1,248,407	694
November	2,076	1,543,516	744
December	4,100	2,414,816	589
January	13,501	5,753,045	426
February	11,916	2,984,884	250
March	38,043	9,795,614	257
April	25,028	7,943,541	317
May	7,778	3,610,309	464
June	10,306	5,146,327	499
July	8,560	5,157,674	603
August	2,259	1,626,017	720
September	3,218	2,009,728	625
Total	128,583	49,233,878	
Yearly Weighted TDS			383

APPENDIX C

WATER QUALITY—  
STATE WATER RELEASED  
AT OC-59

1977-78

PREPARED BY  
WILLIAM R. MILLS, JR.

TABLE C-1

SUMMARY OF WEIGHTED TDS  
OF NONTRIBUTARY WATER RELEASED  
FROM OC-59 FOR  
WATER YEAR 1976-1977

	Monthly Flow cfs-days	Monthly Flow Times TDS	Monthly Weighted TDS
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	-0-	-0-	-0-
July	-0-	-0-	-0-
August	-0-	-0-	-0-
September	1,658*	480,820	290
Total	1,658	480,820	
Yearly Weighted TDS			290

\* Based on USGS measurements, it was estimated that 162 cfs-days of this flow entered the Montclair Spreading Basin through gate leakage.

APPENDIX D

WATER QUALITY – SANTA ANA  
RIVER AT RIVERSIDE NARROWS

1977-78

PREPARED BY  
DONALD L. HARRIGER

TABLE D-1  
U.S.G.S. WATER QUALITY SAMPLES  
SANTA ANA RIVER AT RIVERSIDE NARROWS  
WATER YEAR 1977-78

<u>Date</u>	<u>E.C. @25° C</u>	<u>T.D.S. mg/l</u>
1977 October 4	1105	750
13	1090	728
November 1	1080	716
17	1050	725
December 5	1100	740
15	1120	743
1978 January 4	766	386
18	717	343
24	838	424
February 8	773	440
March 6	273	158
22	377	191
28	723	416
April 4	360	192
15	397	193
25	580	352
May 2	660	399
19	620	363
June 2	626	360
July 6	626	360
August 3	953	687
September 6	1000	645

Source: U.S.G.S.

TABLE D-2  
FLOW WEIGHTED TDS OF COMBINED  
BASE FLOW AND NONTRIBUTARY WATER  
AT RIVERSIDE NARROWS  
WATER YEAR 1977-78

	Combined Base Flow and Nontributary Water Acre Feet <sup>(1)</sup>	TDS <sup>(2)</sup>	Acre Feet Times TDS
1977 October	1591	730	1,161,430
November	1569	725	1,137,525
December	1585	735	1,164,975
1978 January	1745	735	1,282,575
February	1797	730	1,311,810
March	2192	720	1,578,240
April	2339	715	1,672,385
May	2422	705	1,707,510
June	2100	700	1,470,000
July	1993	695	1,385,135
August	1974	670	1,322,580
September	1793	675	1,210,275
TOTAL	<u>23,100</u>		<u>16,404,440</u>

$$\text{Combined Flow Weighted TDS} = \frac{16,404,440}{23,100} = 710 \text{ mg/l}$$

- (1) Combined Flow from Table 4 (Base Flow and Nontributary Flow)  
(2) TDS of Combined Flow from Plate 5

**APPENDIX E**

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

DIEHL, EVANS AND COMPANY  
CERTIFIED PUBLIC ACCOUNTANTS  
1910 NORTH BUSH STREET  
SANTA ANA, CALIFORNIA 92706  
(714) 542-4453

EDUARD DIEHL, C.P.A. 925-956  
BRYN E. EVANS, C.P.A.  
WALTER PETERS, C.P.A.  
DONALD H. PETERSON, C.P.A.  
DONALD E. DALLAHAN, C.P.A.  
L. PETER ECHERER, C.P.A.  
PAUL R. HOLTkamp, C.P.A.

OTHER OFFICES AT:  
2965 ROOSEVELT STREET  
CARLSBAD, CALIFORNIA 92008  
(714) 744-4411  
448 SOUTH ESCONDIDO BOULEVARD  
ESCONDIDO, CALIFORNIA 92025  
(714) 741-3141

October 17, 1978

ACCOUNTANTS' REPORT

Santa Ana River Watermaster  
Santa Ana, California

We have examined the statement of assets and liabilities arising from cash transactions of the Santa Ana River Watermaster as of June 30, 1978 and the related statement of revenue collected and 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 Company's policy is to prepare its financial statements on the basis of cash receipts and disbursements; consequently, revenue and the related assets are recognized when received 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, 1978, 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, 1978

ASSETS

Cash in checking account	\$ 500
Cash in savings account	<u>4,427</u>
TOTAL ASSETS	<u>\$ 4,927</u>

LIABILITIES AND FUND BALANCE

Liabilities	\$ -
Fund balance	<u>4,927</u>
TOTAL LIABILITIES AND FUND BALANCE	<u>\$ 4,927</u>

See accompanying 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, 1978

	<u>Actual</u>	<u>Budget</u>	<u>Over (Under) Budget</u>
REVENUE COLLECTED:			
Water district contributions:			
Orange County Water District	\$ 4,000	\$ 4,000	\$ -
Chino Basin Municipal Water District	2,000	2,000	-
San Bernardino Valley Municipal Water District	2,000	2,000	-
Western Municipal Water District	2,000	2,000	-
Interest from savings account	<u>279</u>	<u>-</u>	<u>279</u>
TOTAL REVENUE COLLECTED	<u>10,279</u>	<u>10,000</u>	<u>279</u>
EXPENSES PAID:			
Professional engineering services	4,593	8,000	(3,407)
Administrative expenses:			
Office and secretarial expense	\$ 1,205		
Auditing services	<u>340</u>	5,000	(3,455)
Annual reports	<u>2,268</u>	<u>2,000</u>	<u>268</u>
TOTAL EXPENSES PAID	<u>8,406</u>	<u>15,000</u>	<u>(6,594)</u>
EXCESS OF REVENUE COLLECTED OVER EXPENSES PAID	1,873	<u>\$ (5,000)</u>	<u>\$ (6,873)</u>
FUND BALANCE AT JULY 1, 1977	<u>3,054</u>		
FUND BALANCE AT JUNE 30, 1978	<u>\$ 4,927</u>		

See accompanying accountants' report and notes to financial statements.

SANTA ANA RIVER WATERMASTER  
NOTES TO FINANCIAL STATEMENTS

June 30, 1978

1. SIGNIFICANT ACCOUNTING POLICIES:

The Watermaster uses the cash receipts and disbursed 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 judgment 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	<u>20</u>
Total	<u>100%</u>

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 accompanying accountants' report.

APPENDIX F

ORDER OF THE SUPERIOR COURT  
APPOINTING  
WILLIAM R. MILLS, JR.  
ONE OF THE REPRESENTATIVES OF ORANGE  
COUNTY WATER DISTRICT ON WATERMASTER COMMITTEE

1 RUTAN & TUCKER  
MILFORD W. DAHL, SR.  
2 Attorneys at Law  
401 Civic Center Drive West  
3 Santa Ana, California 92702

4 (714) 835-2200

5 Attorneys for Plaintiff  
Orange County Water District  
6  
7

8 SUPERIOR COURT OF THE STATE OF CALIFORNIA

9 FOR THE COUNTY OF ORANGE

10	ORANGE COUNTY WATER DISTRICT,	)	NO. 117 628
		)	
11	Plaintiff,	)	
		)	
12	v.	)	ORDER APPOINTING WILLIAM R.
		)	MILLS, JR. ONE OF THE REPRESENTATIVES OF ORANGE COUNTY
13	CITY OF CHINO, et al,	)	WATER DISTRICT ON WATERMASTER
		)	COMMITTEE
14	Defendants.	)	
		)	

15  
16 John M. Toups having submitted his resignation as one  
17 of the Representatives of Orange County Water District on the  
18 Watermaster Committee provided for in the Judgment herein effective  
19 February 1, 1979,; and Orange County Water District having filed  
20 herein its Nomination of William R. Mills, Jr. as one of the  
21 Representatives of Orange County Water District on said Watermaster  
22 Committee to take the place of John M. Toups effective upon the  
23 effective date of the resignation of said John M. Toups;

24 IT IS HEREBY ORDERED that William R. Mills, Jr., 972 Town  
25 and Country Road, Orange, California 92668, Telephone (714) 835-4447,  
26 be and and he is hereby appointed as one of the Representatives of  
27 the Orange County Water District on the Watermaster Committee to  
28 serve in accordance with the terms of the Judgment and for the

1 purpose of exercising the powers and duties of the Watermaster  
2 provided for in the Judgment herein in the place of and as successor  
3 to John M. Toups.

4 DATED: 1-31-77

*W. H. Egan*

\_\_\_\_\_  
Judge of the Superior Court

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(VERIFICATION — 446, 2015.5 C. C. P.)

STATE OF CALIFORNIA }  
COUNTY OF } ss.

I am the \_\_\_\_\_

in the above entitled action; I have read the foregoing \_\_\_\_\_

and know the contents thereof; and I certify that the same is true of my own knowledge, except as to those matters which are therein stated upon my information or belief, and as to those matters, I believe it to be true.

I certify (or declare), under penalty of perjury,\* that the foregoing is true and correct.

Executed on \_\_\_\_\_ at \_\_\_\_\_, California  
(date) (place)

(Signature)

(PROOF OF SERVICE BY MAIL — 1013a, 2015.5, C. C. P.)

STATE OF CALIFORNIA }  
COUNTY OF ORANGE } ss.

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years and not a party to the within above entitled action; my business address is: 401 Civic Center Drive West, Santa Ana, California 92702.

On the January 31 19 79 I served the within ORDER APPOINTING WILLIAM R. MILLS,  
JR. ONE OF THE REPRESENTATIVES OF ORANGE COUNTY WATER DISTRICT  
ON WATERMASTER COMMITTEE

on the interested parties in said action, by placing a true copy thereof enclosed in a sealed envelope with postage

thereon fully prepaid, in the United States post office mail box at Santa Ana, California  
addressed as follows:

SEE ATTACHED LIST

I certify (or declare), under penalty of perjury,\* that the foregoing is true and correct.

Executed on January 31 1979 at Santa Ana, California  
(date) (place)

Lorraine Schacht  
(Signature)

Lorraine Schacht

\*Both the verification and proof of service by mail forms, being signed under penalty of perjury, do not require notarization.

JAMES MICHAEL  
PILLSBURY, MADISON & SUTRO  
225 Bush Street  
San Francisco, California 94104

DONALD D. STARK, ESQ.  
2061 Business Center Drive  
Irvine, California 92715

MARTIN McDONOUGH  
McDONOUGH, HOLLAND, SCHWARTZ & ALLEN  
555 Capitol Mall, Suite 950  
Sacramento, California 95814

ARTHUR L. LITTLEWORTH  
BEST, BEST & KRIEGER  
4200 Orange Street  
Riverside, California 92501

JAMES C. HANSON  
926 J Building  
Sacramento, California 95814

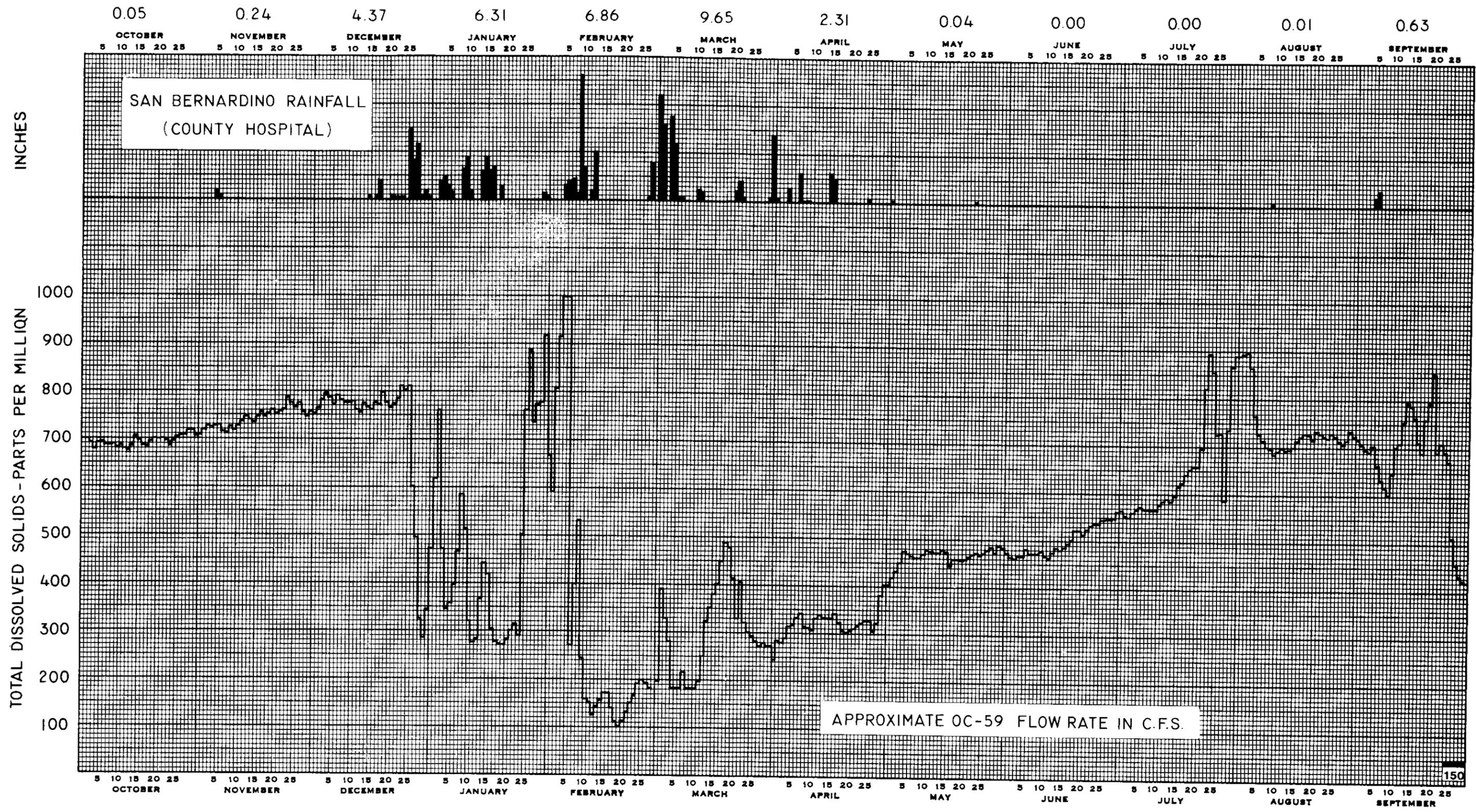
WILLIAM J. CARROL  
555 East Walnut Street  
Pasadena, California 91101

MAX BOOKMAN  
102 Brand Boulevard  
Glendale, California 91203

DONALD L. HARRIGER  
P. O. Box 2038  
Riverside, California 92506



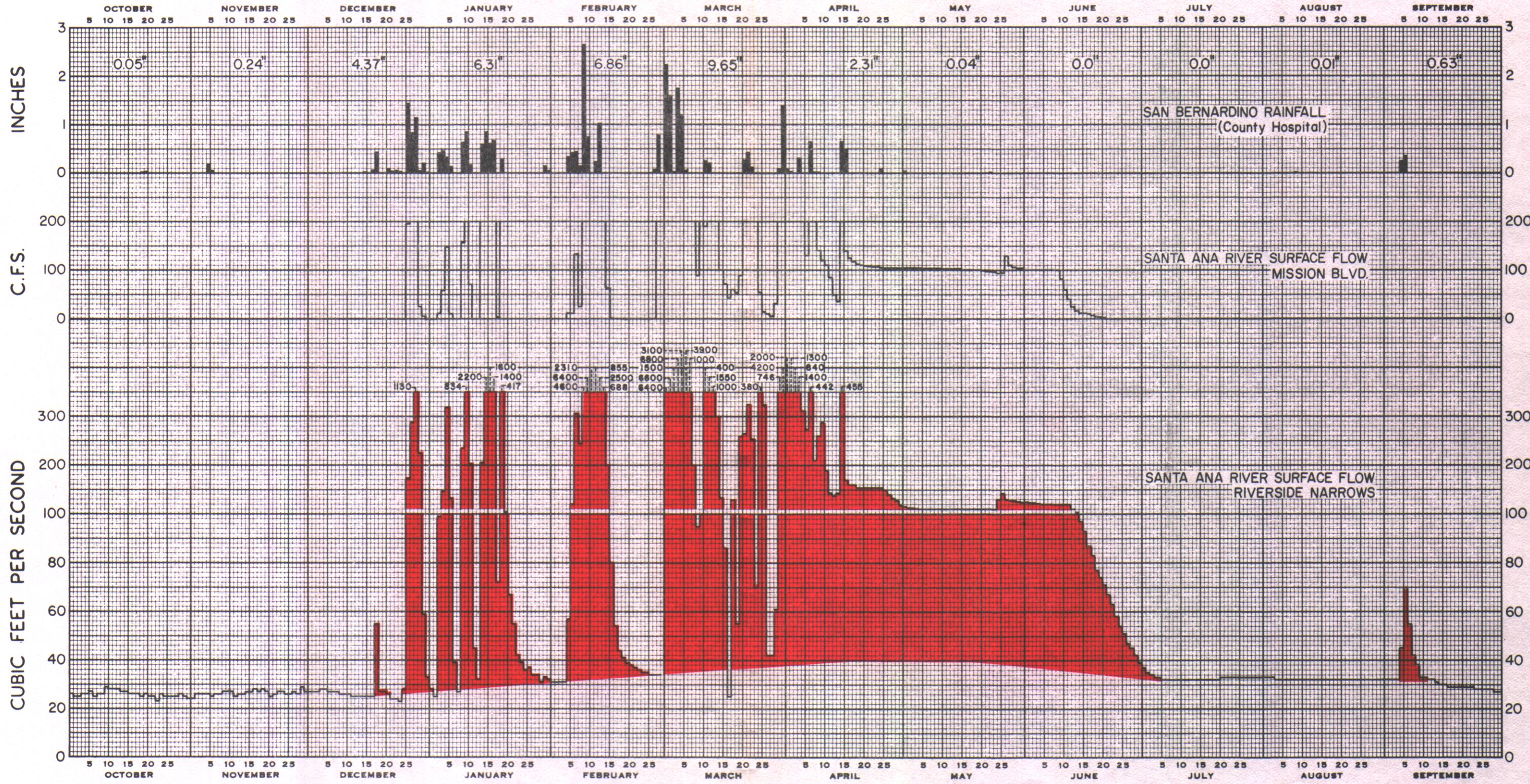




DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM

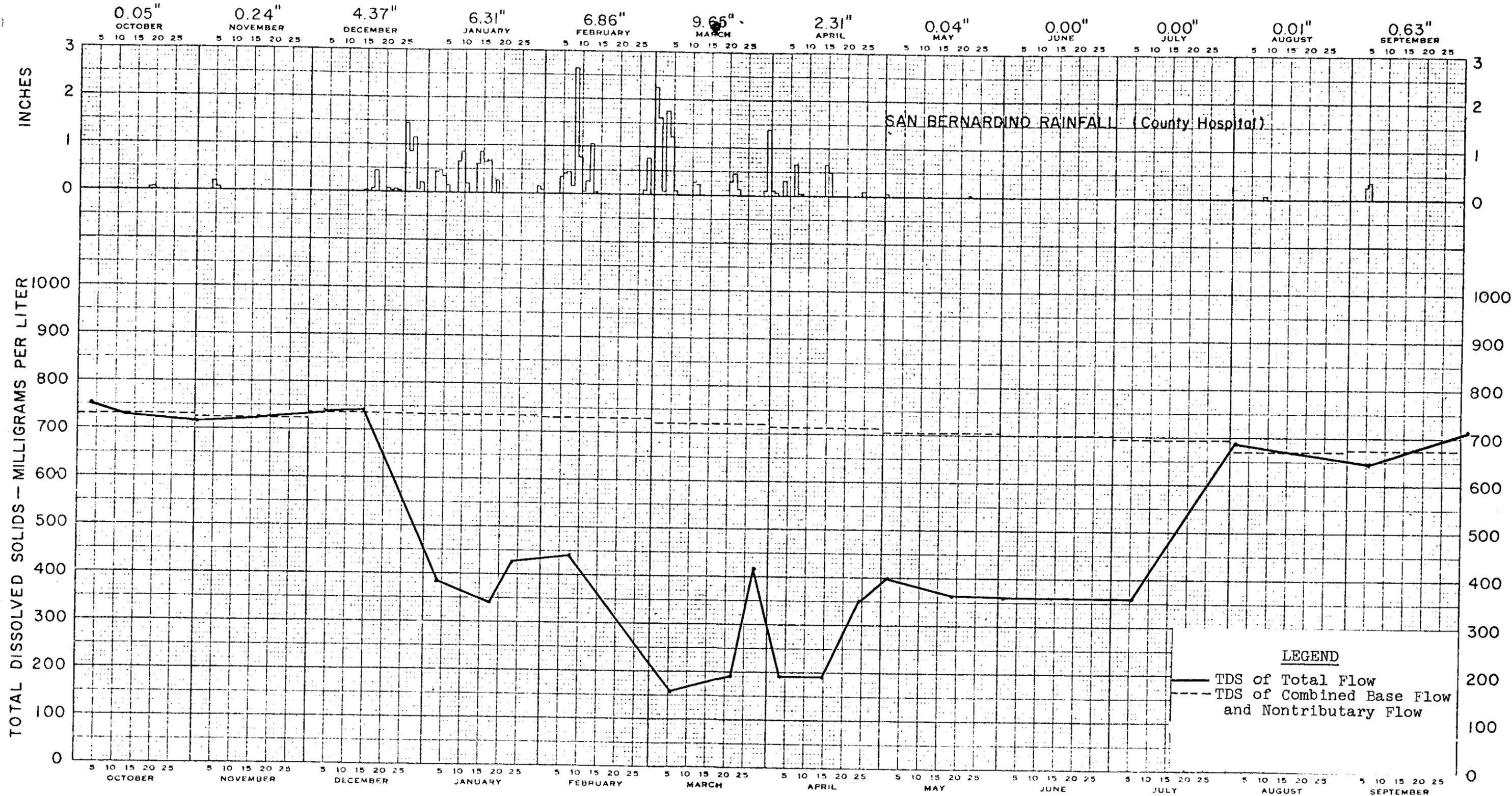
PLATE 3

WATER YEAR 1977-78



DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS

30.47" total



1977

1978

DISSOLVED SOLIDS IN THE SANTA ANA RIVER AT THE RIVERSIDE NARROWS

PLATE 5

WATER YEAR 1977-78

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