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The Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Operations and Maintenance

STATE WATER PROJECT ANNUAL REPORT OF OPERATIONS

1981

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FOREWORD

This is the eighth in a series of annual reports summarizing the water and power operation of the California State Water Project.[1]

Since January 1965, a "State Water Project Report of Operations" has been published monthly. In October 1984, the publication name was changed to "State Water Project, Operations Data". These reports are limited to tabulations of daily and monthly data on reservoirs, pumping and generation plant operation, plus data on water quality and water deliveries. The monthly report will continue to provide daily and monthly information to State Water Service Contractors, public agencies, and others.

This annual report summarizes Project facilities in operation during 1981, operational constraints and outages, and significant operations and maintenance events within the five field divisions. Operational data are shown in the form of summaries for the year. Where relevant for comparison, the current and past years' data are shown in charts and tables. Revisions to the data published in the monthly "State Water Project, Report of Operations" are included.

The history, planning, and description of the State Water Project Facilities are detailed in "California State Water Project, Bulletin No. 200, Volumes I-VI," published by the Department of Water Resources.

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[1] Annual publications of the Department of Water Resources on the State Water Project activities include: (1) State Water Project, Annual Report of Operations, 1981; (2) The California State Water Project - Current Activities and Future Management Plans (1981), Bulletin 132-82.

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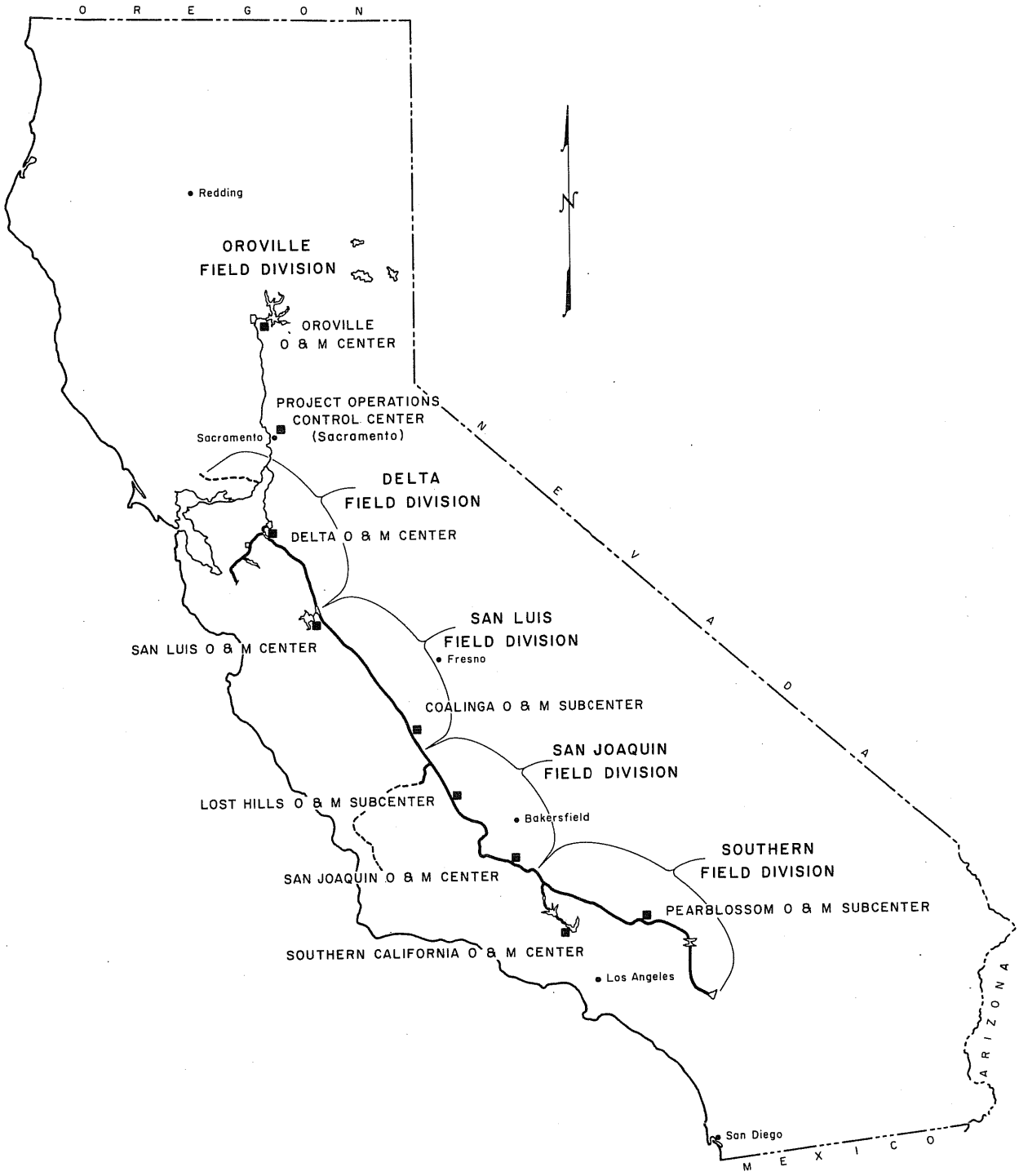
MAP 1
FIELD DIVISION BOUNDARIES



MAP 2
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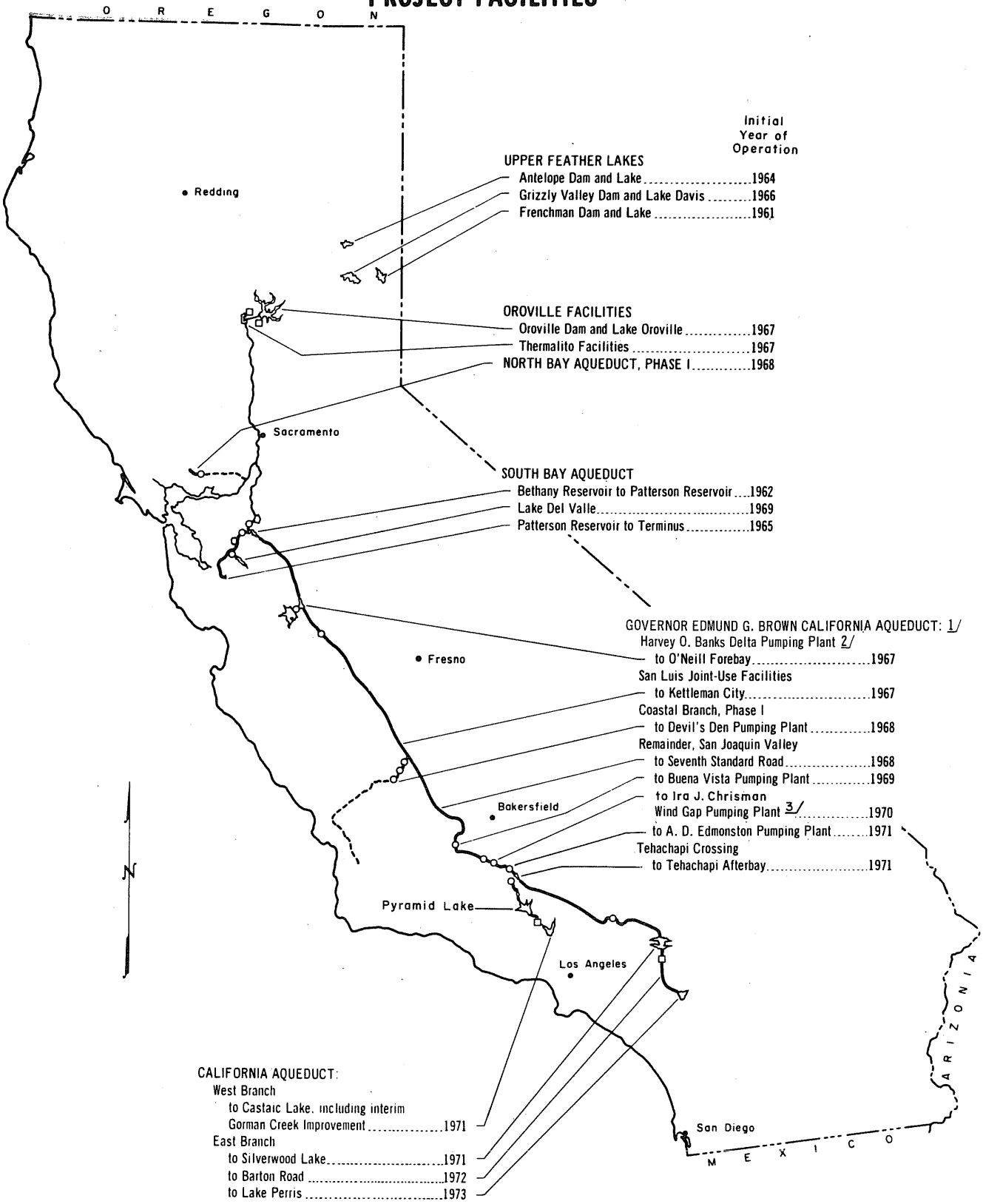

1/ This title became effective on Nov. 19, 1982.
2/ This title became effective on June 3, 1981.
3/ This title became effective on Jan. 9, 1986

INTRODUCTION

The 1981 Annual Report of Operations for the State Water Project is divided into four parts. The first two parts, "Highlights of 1981 Operation" and "Project Status in 1981", cover conditions and events of statewide significance, in detail where appropriate and in summary when the item is discussed in more detail in the following sections. The third part, "Sacramento-San Joaquin Delta Operations", gives special emphasis to a key aspect of State Water Project operations. The last part, "Project Operations", provides further detail on operational conditions and activities by field division.

Also, the report includes seven additional sections, tabulating and depicting Project operations. Section I covers water deliveries. Sections II through V cover operations of the Governor Edmund G. Brown California Aqueduct, Project pumping plants, San Luis Joint-Use Facilities, and Project reservoirs. Section VI covers Project power supply and use. Section VII covers various types of water quality measurement analyses for selected stations throughout the Project.

HIGHLIGHTS OF 1981 OPERATION

During 1981, two events were of major statewide significance, affecting not only State Water Project (SWP) operations, but also Central Valley Project (CVP) operations.

On May 18, about 1,000 feet of canal lining south of Bethany Reservoir, in the Delta Field Division, cracked and slumped into the California Aqueduct. Pumping at the Harvey O. Banks Delta

Pumping Plant was cut back to meet South Bay Aqueduct deliveries only, and an emergency diversion permit was obtained from the State Water Resources Control Board which allowed pumping at the U. S. Bureau of Reclamation's Tracy Pumping Plant for the State Water Project while Aqueduct repairs were being made. During May and June, 44,770 acre-feet of SWP water was pumped by the Bureau at Tracy Pumping Plant. Repairs were completed by July 12.

Before the May 18 California Aqueduct outage, pumping had been suspended at Banks Pumping Plant from May 4 through May 14 to allow modifications at the John E. Skinner Delta Fish Protective Facility. The net result of these two outages was that for a two-month period about 45,000 ac-ft of SWP water was pumped south from the Delta (excluding South Bay Aqueduct deliveries) when normally over 300,000 ac-ft is exported in that period.

In September, maintenance crews discovered a rock and earth slide on the upstream face of San Luis Dam of major proportions with an estimated total volume of 1.5 million cubic yards. Withdrawal of water in preparation for the repair work began in late November. By the end of December, the water level had been lowered to the minimum operating storage level in preparation for the main repair contract. Contracts to produce rock and construct a slide access road began in December. San Luis Reservoir is a key facility for storage of excess winter flows for both the Department and the USBR. The slide halted the filling of San Luis Reservoir and required much greater than normal releases and a reevaluation of 1981-82 operations for the Project as a whole. The reevaluation resulted in releases from Thermalito Afterbay and Diversion Dam to

the Feather River being minimized in October and November. In addition, the Department concentrated on early filling of the southern reservoirs and made daily determinations of unscheduled water availability, in order to use excess Delta flows more efficiently. The filling of the southern reservoirs resulted in water pumped over the Tehachapis reaching an all-time high of 30,000 ac-ft per week in early December. Nine pumps in operation at A. D. Edmonston Pumping Plant during off-peak hours and five pumps during on-peak hours were required.

Additional information on these major outages is presented in the Project Operations section.

Water Quality Standards

From 1976 through 1978, operation of the State Water Project was governed successively by at least seven different sets of water quality standards for the Sacramento-San Joaquin Delta. This was due mostly to the pronounced changes in hydrologic conditions leading into and out of California's record drought of 1977 and led, finally, to the adoption by the State Water Resources Control Board in August 1978 of Water Right Decision 1485 (D-1485), setting water quality standards for the Delta and Suisun Marsh. As described in more detail under Sacramento-San Joaquin Delta Operations, all Delta water quality standards were met with the exception noted on page 15 and shown graphically on page 20.

Water Conditions [1]

Based on criteria in D-1485, the 1980-81 water year was classified as a "dry" year. The final determination of year classification is made in May, based on current water year forecasts of the Sacramento Valley unimpaired runoff for the sum of the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River at Smartville; American River, total inflow to Folsom Reservoir. The forecasted (and actual, in parentheses) combined runoff for these basins was 11,540,000 (11,112,000) ac-ft for the water year, 65 (63) percent of average for the four basins.

In the Feather River Basin, the primary source of supply for the State Water Project, 1980-81 water year precipitation was 70 percent of average,[2] maximum snowpack water content was 63 percent of average, and unimpaired runoff was 60 percent of average.

Statewide precipitation during the 1980-81 water year was about 75 percent of average, compared to 135 percent of average for the corresponding 1979-80 period. Precipitation in all hydrographic areas was below average. Hydrographic areas representative of these conditions are:

- North Coastal - 75% of average
- San Joaquin Valley - 70% of average
- South Coastal - 65% of average

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[1] Taken from Bulletin 120-81, "Water Conditions in California", Report No. 4, May 1, 1981.

[2] Averages are based on the period, 1931 - 1975 (45 years).

Statewide snowpack accumulation reached maximum values during the first week of April. Snowpack water content measurements in Central Valley watersheds were about 60 percent of average from the American River Basin northward. San Joaquin Valley Basin watersheds were higher at about 80 percent of average.[1]

Runoff for the 1980-81 water year was below average throughout California. Variation in runoff in the major water supply areas ranged from about 57 percent of average in the North Coastal hydrographic area to 64 percent of average in the San Joaquin River portion of the Central Valley. Statewide runoff for the water year was 65 percent of average.

Reservoir Storage

At the beginning of 1981, storage in SWP reservoirs was well above average, partly because of the high precipitation and unimpaired runoff conditions in the 1980-81 water year. Local water supplies in Southern California were below normal, with runoff at 70 percent or less of average. Overall, total combined storage in the Project's seven major reservoirs decreased 849,509 ac-ft (20 percent) during 1981. These seven reservoirs are Lake Oroville, Lake Del Valle, San Luis Reservoir, Silverwood Lake, Lake Perris, Pyramid Lake, and Castaic Lake. This decrease in total storage was primarily because of the drawdown of San Luis Reservoir in preparation for repair of the San Luis Dam slide.

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[1] Comparisons are based on April 1 snow data which are major indexes of precipitation and historically reflect near maximum seasonal accumulation which is representative of the entire water year.

Lake Oroville reached a maximum storage of 3,411,206 ac-ft on May 3 and a minimum storage of 2,345,874 ac-ft on September 19. Total inflow to the reservoir in 1981 was 4,175,690 ac-ft. Additional information is given in Project Operations, Oroville Field Division.

State Water Project storage share in San Luis Reservoir ranged from 1,063,941 ac-ft on January 29, down to 39,710 ac-ft on December 31. The low storage in San Luis Reservoir was a result of preparations to repair the slide that occurred in September. See pages 2 and 37 for details.

Maximum and minimum storage values for the southern reservoirs in 1981 were:

	Maximum (ac-ft)	Date	Minimum (ac-ft)	Date
West Branch				
Castaic Lake	291,249	5/4	151,936	9/21
Pyramid Lake	168,421	4/20	141,124	1/8
East Branch				
Silverwood Lake	73,253	3/19	58,021	12/31
Lake Perris	125,537	4/11	66,314	8/4

Two ground water recharge demonstration programs initiated in 1978 were continued in 1981. During 1978, 23,684 ac-ft of SWP water had been released to the Mojave River for storage in the Mojave Ground Water Basin. A total of 22,500 ac-ft of this water was considered available for extraction from the basin for future use by the Mojave Water Agency. During 1979 and 1980, 8,000 ac-ft of this water was withdrawn and delivered for the agency's use in lieu of its

receiving SWP water then from the California Aqueduct. In 1981, an additional 4,000 ac-ft was withdrawn, leaving 10,500 ac-ft in storage. In the second program, 565 ac-ft of SWP water was stored during 1981 by the San Bernardino Valley Municipal Water District (SBVMWD). This supplemented the 13,425 ac-ft that had been previously received by SBVMWD for ground water storage. Thus, total water stored at the end of 1981 amounted to 13,990 ac-ft. Under the conservation project, up to 50,000 ac-ft of SWP water may be stored by SBVMWD for later withdrawal, in lieu of surface deliveries.

Water Deliveries

Project water supplies in 1981 were sufficient to meet all water service contractor requests for SWP water deliveries.

Water deliveries from SWP facilities in 1981 totaled 2,927,837 ac-ft, including local water deliveries and excluding deliveries to satisfy prior water rights and federal customers. This total, an increase of 48 percent over the water deliveries made during 1980, is tabulated by type on page 24.

Besides State water service contractors' entitlement water and local water, the 1981 deliveries included the following other types of water:

- Water delivered under wet weather contract provisions.
- Repayment water for preconsolidation water used during construction.
- Ground water demonstration.
- Surplus water.
- Unscheduled water.[1]
- Recreation and mitigation water.

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[1] Previously called extra-surplus water.

Also, as a carryover from the 1977 drought conditions, the 1981 water delivery total included:

- Makeup water.
- Emergency relief water.
- Empire West Side I. D. carryover water.

Federal water delivered to federal customers from the joint-use facilities and the SWP totaled 1,556,229 ac-ft for the year, 24 percent higher than deliveries made in 1980. This amount excludes 593 ac-ft of recreation and mitigation water and includes 137,190 ac-ft of Central Valley Project water wheeled for the USBR by the Department. For a more detailed description of federal deliveries, see page 35, and for SWP wheeling of CVP water, see pages 31, 35, and 40.

Water delivered from SWP facilities to satisfy prior water rights within the Feather River Service Area totaled 868,168[1] ac-ft, or less than a one percent increase over the previous year. In addition, 24,735 ac-ft of natural flow was released through the Project's southern reservoirs. This was an 82 percent decrease from the releases in 1980, which were much larger due to above-average precipitation in that year.

In 1981, 275,045 ac-ft of unscheduled water was delivered in January, February, March, April, November, and December. Unscheduled water was previously known as extra surplus water. It is in excess of that required to meet Delta water quality

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[1] This amount is from Lake Davis (1,263 ac-ft), Frenchman Lake (183 ac-ft), Palermo Canal (6,736 ac-ft), and Thermalito Afterbay deliveries (859,986 ac-ft).

requirements and all SWP needs. It can be delivered to contractors when delivery capability is available. The water must be used primarily for groundwater replenishment or for agricultural use in lieu of ground water pumping. Under the unscheduled water agreements, it can also be delivered for pre-irrigation, if more is available than needed for the previous purposes.

The unscheduled water program was developed as a result of contractor requests, to utilize excess water on an as-available basis before it is known if surplus water requests can be met. In 1981, six contractors received unscheduled water.

A summary of water deliveries from SWP facilities by years to individual agencies is shown on page I-2.

Project Energy Generation and Use

Energy generation from the SWP's five power plants during 1981 grossed 3,358,173 megawatthours (MWh) (see Figure M, page VI-1). This includes the Hyatt-Thermalito power complex and the SWP's other power recovery plants (San Luis, Castaic, and Devil Canyon) for a 12 percent increase over that generated in 1980. Monthly generation totals for each plant are shown in Section VI.

The SWP's use of energy in 1981 was 5,263,610 MWh (including energy use at Devil Canyon and Tracy Pumping Plant). This was about 57 percent greater than the amount used in 1980. SWP energy uses by field divisions and sources of energy are shown on Figure N, page VI-2. Monthly summaries of Project power supply and use are in Section VI.

PROJECT STATUS IN 1981

Project Facilities

The State Water Project conserves water for distribution to much of California's population and to irrigated agriculture. It also provides flood control, water quality control, electrical power generation, new recreational opportunities, and enhancement of sport fisheries and wildlife habitat.

The first SWP facilities to become operational were Frenchman Dam and Lake in the Upper Feather River Division and the South Bay Aqueduct in the San Francisco Bay Area in 1962. By 1973, construction of the initial facilities of the SWP was complete. This provided for operation of the entire SWP from Plumas County in the north to Riverside County in the south.

SWP facilities in operation during 1981 included: 22 reservoirs with a gross capacity of 6,797,171 ac-ft; 5 power plants with a total output capacity of 1,556 megawatts;[1] 16 pumping plants housing 109 units with a total motor rating of 2,487 MW;[2] and 537 miles of aqueduct.

During 1981, water was delivered from SWP facilities to:

- o 23 State long-term water service contractors.
- o 5 short-term contractors.
- o 7 local agencies receiving water to satisfy prior water rights.

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[1] Includes 202 MW of federal power generation output at San Luis Pumping-Generating Plant.

[2] Includes 261 MW of federal pumping capacity at San Luis Pumping-Generating Plant and Dos Amigos Pumping Plant.

In addition SWP facilities were used to deliver federal water to 5 USBR customers along the San Luis Division joint-use facilities.

Outages and Operating Limitations

Major outages and operating limitations of SWP facilities during 1981, in addition to those discussed previously under Highlights of 1981 Operation, follow:

- Sacramento Valley in-basin use of released water reached a record level of 8,560 cubic feet per second during late June 1981, surpassing the levels of the critical drought year 1977. Record depletions, increased demands, higher than expected Delta outflow requirements, generation limits on Keswick Reservoir releases, and the desire to minimize recreation disruption at Folsom Lake put the USBR in need of a water loan from the State at San Luis Reservoir. On August 13, the State loaned the Bureau 100,000 ac-ft of the State's share of water in San Luis Reservoir, with the provision that this loan be repaid by December 1, 1981. The loan could not be repaid in 1981, however, because of the slide at San Luis Dam discussed previously.

- During mid-November, two major storm systems filled Lake Oroville beyond the flood reservation parameters, causing over 190,000 ac-ft to spill. Additional storms in December caused close to 400,000 ac-ft of spillage. These storm systems, along with the unavailability of San Luis Reservoir for storage, contributed to a substantial amount of unscheduled water becoming available. Storage increases in southern reservoirs during this period were limited by the water flow capacity of the Gorman Creek Channel

Improvements on the California Aqueduct West Branch. Also, Lake Perris boat ramp construction and the flow capacity of Aqueduct pools upstream of Pearblossom Pumping Plant contributed to limitations on the East Branch.

- Dredging of asbestos-laden sediment from the California Aqueduct between Check 19 in the San Luis Field Division and A. D. Edmonston Pumping Plant in the San Joaquin Field Division began on August 26. Most of this sediment originated from periodic flood inflows from Arroyo Pasajero into the Aqueduct. Concern over potential health hazards led to the decision that it should be removed. The operation was still going on at the end of the year.

SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS

The Delta outflow index for 1981 reflects the dry conditions that prevailed until November. During 1981, all Delta water quality standards established by D-1485 were met except at Emmaton and Jersey Point in May (refer to Figure A, page 18). The Emmaton 14-day mean electrical conductivity standard of 0.45 millisiemen per centimeter (mS/cm) was exceeded to a small degree, less than 0.10 mS/cm, from May 7 through May 19 and the same Jersey Point standard was exceeded by only 0.01 mS/cm on May 16. The average at Emmaton was 0.51 mS/cm during this period.

Noncompliance with the standard was caused by unusually high tides combined with a declining Delta outflow index and increased use of water in the Delta. During this period, diversions from the Delta were reduced and releases from Keswick Reservoir, Lake Oroville, and Lake Natoma were increased in a cooperative effort by the USBR and the Department. As mitigation for the noncompliance, the State Water Resources Control Board extended by one day, to June 16, the 0.45 mS/cm salinity standard at Emmaton and Jersey Point.

The average Delta outflow index was about 16,157 cfs from January through April and about 4,757 cfs from May through October. The Delta outflow index was augmented with Yolo Bypass water received via the Fremont Weir during the last two months of the year. The combined outflow index averaged 31,000 cfs in November and 89,000 cfs in December. Figure A, page 18, "Water Quality Conditions at Selected Delta Stations and Other Pertinent Data, 1981", shows plots of some of the controlling Delta water quality

standards and corresponding recorded daily values. Additional information on water quality can be found in Section VII.

Coordinated operations between the CVP and SWP took place during four different periods in 1981. During these periods, USBR and DWR mutually agreed that "balanced water conditions"[1] existed and that flows in the Delta were to be controlled by releases from the upstream reservoirs of the two agencies. Balanced water conditions were in effect from April 17 through 19, May 1 through September 28, October 3 through October 12, and October 20 through October 27.

The determination for apportioning each agency's share of responsibility for reservoir releases was based on the draft agreement "Supplemental Agreement Between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project", dated May 13, 1971. Until November 24, 1986,[2] both agencies had agreed each year to operate as if the draft coordination agreement had been executed, except for agreed-upon specific modifications. The letter of agreement dated January 8, 1981 between DWR and USBR extended the interim coordinated operation of the CVP and SWP through calendar

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[1] "Balanced water conditions" occur when it is agreed by USBR and DWR that the releases of water from upstream CVP and SWP reservoirs, plus other inflows, approximately equal the water supply needed to meet Sacramento Valley in-basin uses, including water quality objectives, plus exports.

[2] On November 24, 1986, the "Agreement Between the United States of America and the Department of Water Resources of the State of California for Coordinated Operation of the Central Valley Project and the State Water Project" was signed.

year 1981. Figures B-1, B-2, and B-3 on pages 19, 20, and 21 show CVP-SWP coordinated operations for 1981. These figures show "lagged storage withdrawals". This term means that the storage withdrawals have been adjusted for the travel time, or "lag", (to the nearest whole day) for reservoir releases to reach the Delta; water data at the Delta will then be on the same time basis. For data comparisons and calculations at the Delta, storage withdrawals from Whiskeytown and Shasta Lakes are time lagged by five days, those from Lake Oroville are lagged by two days, and those from Folsom Lake are not lagged.

During most of the time when balanced water conditions were in effect, the State provided more than its share of storage releases to meet the in-basin use and D-1485 water quality requirements of the 1981 federal-State interim coordinated operation agreement. The resulting coordination-account-water obligation of the USBR peaked at about 54,542 cfs-days on August 5, and this obligation was met by August 30.

Table 1, page 22, tabulates, by months, the routing of water released to the Sacramento, Feather, and American Rivers from CVP-SWP upstream reservoirs. The water flowing to the ocean, represented by the Delta outflow index, provides a fresh water barrier to the more-saline water of Suisun Bay, and thus maintains required levels of Delta water quality. During the periods of balanced water conditions, any water in excess of that needed for in-basin use (including Delta consumptive use and the Delta outflow index) is available for export from the Delta in accordance with the terms of the coordination agreement.

In 1981, the dry year and SWP operational problems caused an irregular pumping schedule at Banks Pumping Plant. The lowest total exports of the year at Banks Pumping Plant occurred during May and June, followed by a slight increase in July. Exports were highest in August and fluctuated slightly through the rest of the year with December as the second highest month for exports. There was some export of additional water from the Delta by the SWP for USBR customers, in exchange for CVP water not pumped at Tracy Pumping Plant during January and February. This was related to the failure of the Lower Jones Tract levee during September and October of 1980.

Several events contributed to the reduced export rates at Banks Pumping Plant during May and June of 1981. On May 4, SWP exports were suspended until May 14 for repairs to the John E. Skinner Delta Fish Protective Facility. On May 18, about 1,000 ft of canal lining slumped into the California Aqueduct near Bethany Reservoir. During this time, water deliveries were made through increased pumping at the USBR's Tracy Pumping Plant for the SWP and through withdrawals from San Luis Reservoir.

To protect the striped bass fishery in the Sacramento River during the critical spawning period, D-1485 limits exports from the Delta to 3,000 cfs average monthly flow per project from both the CVP and the SWP during May and June, plus a limit of 4,600 cfs average monthly flow for the SWP for July. These limits were not exceeded in 1981. Total exports for the year from the Delta by SWP facilities were about 2.3 million ac-ft, which included 172,670 ac-ft of CVP water pumped for the USBR. For a more detailed

explanation of federal pumping at Banks Pumping Plant, see page 31. In addition, there was pumping at Tracy Pumping Plant for the SWP in May and June totaling 44,770 ac-ft.

Operation of the SWP in 1981 reduced the mean Delta outflow index (i.e., Delta exports exceeded the augmentation of Delta inflows by upstream reservoir releases) every month except May, June, July, and August. The months with the highest reductions in Delta outflow were February, April, and November. Despite these reductions, the Delta outflow index remained above the level required by D-1485 throughout the year. Table 2 on page 23 provides a tabulation of the daily computed Delta outflow index, reflecting flows in the Sacramento River at "I" St. Bridge and in the San Joaquin River at Vernalis, plus Yolo Bypass flows from Fremont Weir in November and December.

On October 15, 1981, installation of a rock barrier at the head of Old River was completed to enhance the fall salmon spawning run in the San Joaquin River in areas upstream of Stockton. The barrier effectively increased flows in the river and also raised dissolved oxygen levels in the water. The barrier remained in operation until November 25. If low San Joaquin River flows indicate it is needed, the barrier is installed in the fall to coincide with the salmon migration, and removed in early winter when river flows increase.

For further information and data on 1981 Delta operations, see DWR Bulletin 132-82, "The California State Water Project, Appendix E, Water Operations in the Sacramento-San Joaquin Delta During 1981".

FIGURE A: WATER QUALITY CONDITIONS AT SELECTED DELTA STATIONS AND OTHER PERTINENT DATA

1981

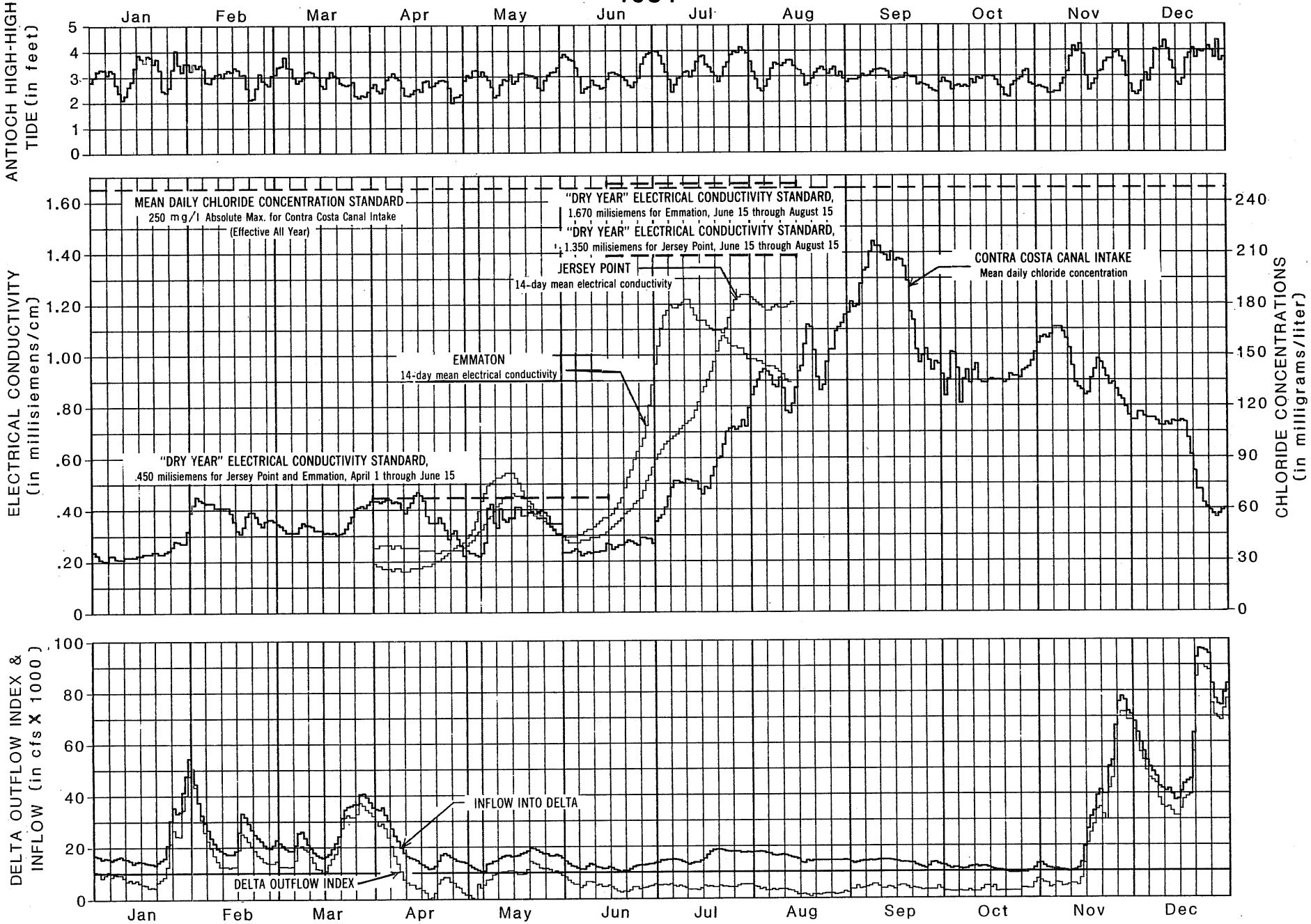


FIGURE B-1: CVP-SWP COORDINATED OPERATION

1981

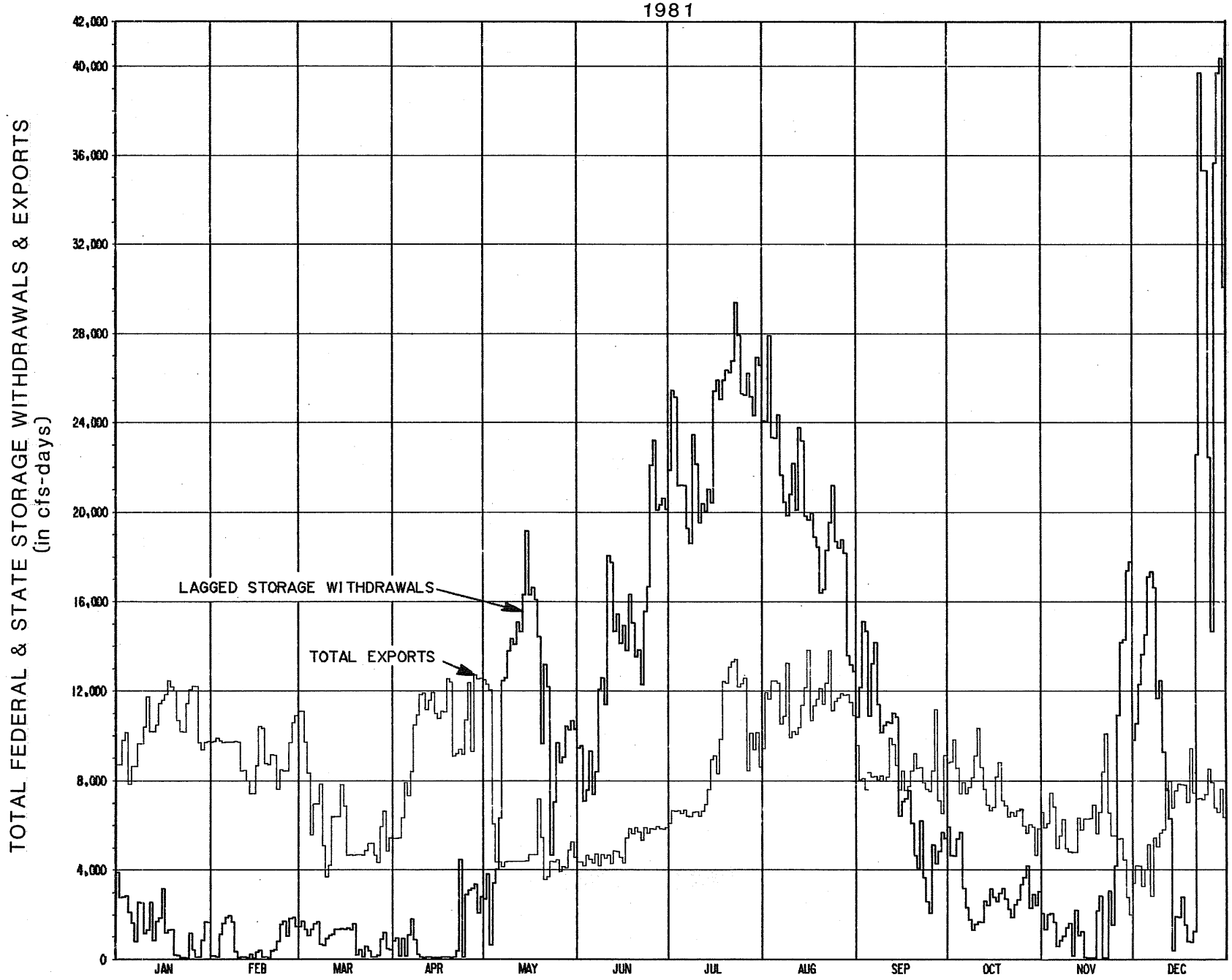


FIGURE B-2: CVP-SWP COORDINATED OPERATION
LAGGED STORAGE WITHDRAWALS
During Balanced Water Conditions

1981

(in thousands of cfs-days)

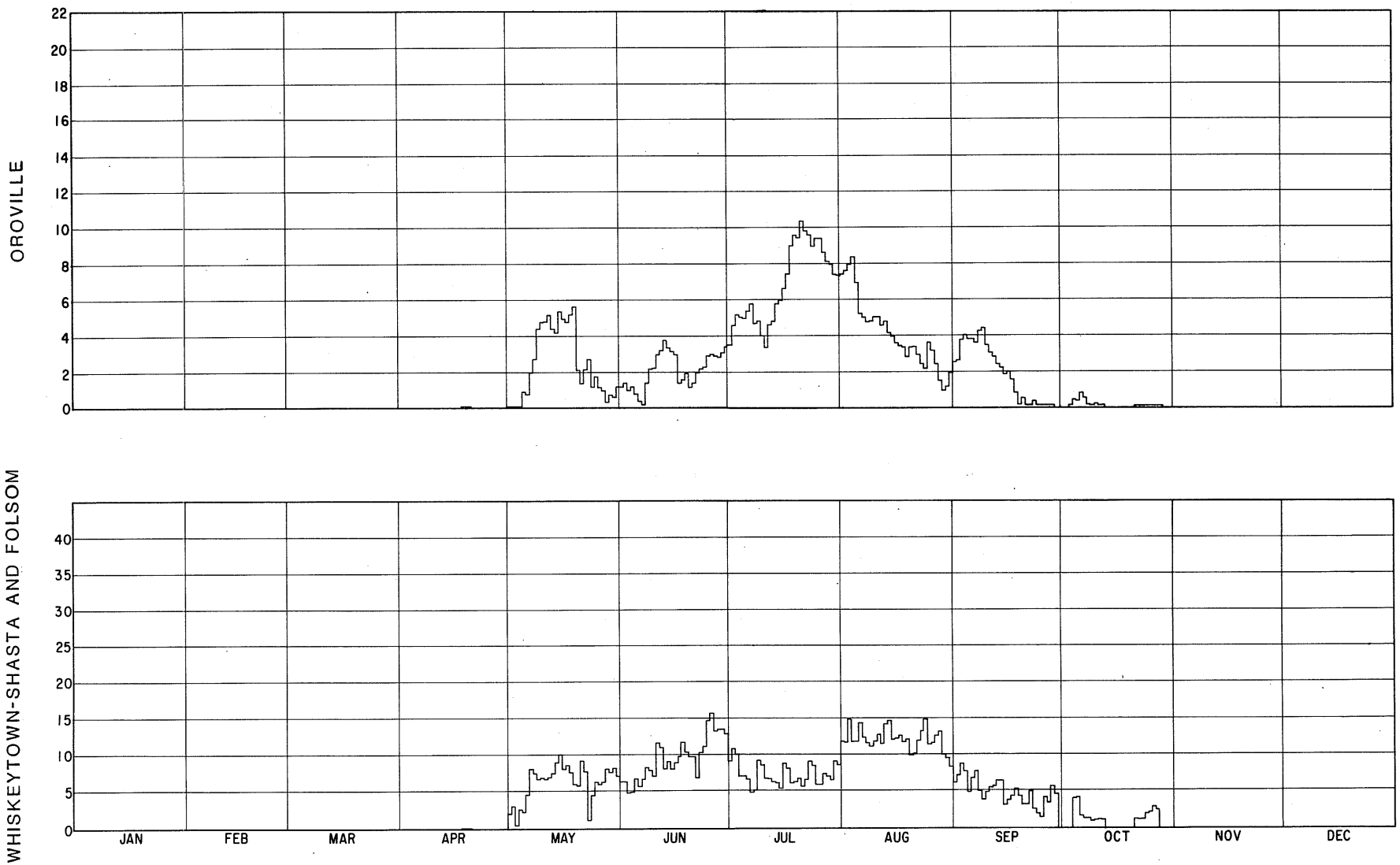


FIGURE B-3
CVP-SWP COORDINATED OPERATION
1981
(in thousands of cfs-days)

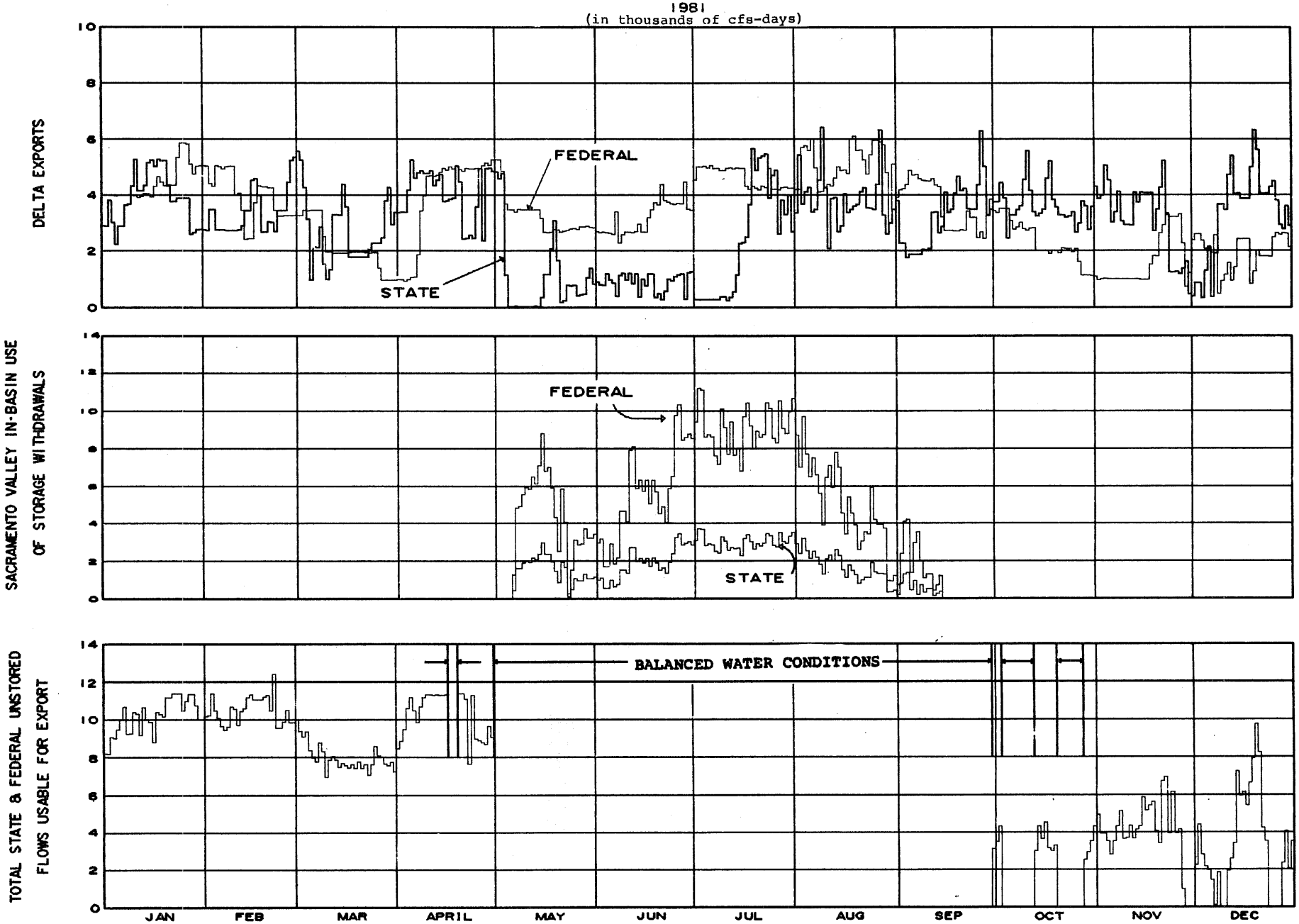


TABLE 1: SACRAMENTO BASIN AND SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS

1981

(in thousands of acre-feet except as noted)

MONTH	UPSTREAM RESERVOIR RELEASE			SACRAMENTO RIVER IN-BASIN USE 2/	DELTA INFLOW			DELTA USES			DELTA EXPORTS		
	KESWICK * 1/	OROVILLE * 1/	NIMBUS 1/		SACRAMENTO RIVER AT 3/ SACRAMENTO	SAN JOAQUIN RIVER AT 3/ VERNALIS	TOTAL DELTA INFLOW	DELTA CONSUMPTIVE USE 4/	DELTA OUTFLOW INDEX TOTAL	DELTA OUTFLOW INDEX AVERAGE CFS	TOTAL EXPORTS	EXPORTED BY STATE-DWR 5/	EXPORTED BY FEDERAL-USBR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
JANUARY	289	104	102	575	1,070	197	1,267	-56	815	13,259	509	236	273
FEBRUARY	223	115	84	905	1,327	161	1,488	-37	1,124	20,232	403	180	223
MARCH	331	181	94	798	1,404	184	1,588	-10	1,302	21,169	298	166	132
APRIL	498	158	92	244	992	141	1,133	63	593	9,967	477	242	235
MAY	653	191	177	-178	842	117	959	121	569	9,250	262	63	199
JUNE	672	102	195	-332	637	87	724	191	294	4,945	241	51	190
JULY	890	316	109	-410	906	77	983	268	290	4,716	427	143	284
AUGUST	877	167	83	-234	893	76	970	252	152	2,469	568	258	310
SEPTEMBER	441	135	71	96	743	69	812	174	238	4,000	397	187	210
OCTOBER	239	92	96	166	592	83	676	118	194	3,161	363	221	142
NOVEMBER	253	430	306	845	1,834	88	1,922	55	1,587	26,664	279	186	93
DECEMBER	1,279	1,148	656	597	3,680	104	3,784	2	3,465	56,350	317	199	118
TOTAL	6,645	3,139	2,065	3,072	14,920	1,384	16,306	1,141	10,623	——	4,541	2,132	2,409

* Time-lagged values.

1/ Releases to river

2/ Positive values show accretions; negative values show depletions.

3/ Column 5 and 6 are based on daily 6 a.m. readings. Columns 1, 2, 3, 12 and 13 are based on measured total daily flow.

4/ From Consumptive Use Table dated April 9, 1979.

5/ Includes State's pumping at Banks Pumping Plant and 44,770 ac-ft of pumping for State at Tracy Pumping Plant during May and June.

TABLE 2: DELTA OUTFLOW INDEX WITH BYPASS
1981

(in cfs-days except as noted)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	10,548	49,923	12,483	30,052	1,312	8,679	5,100	4,556	3,341	2,445	6,448	70,475
2	10,242	43,301	12,301	28,688	677	7,244	5,144	4,043	3,496	2,585	5,725	60,187
3	8,304	37,326	12,326	29,181	54	6,488	5,400	3,652	4,460	2,449	5,511	56,107
4	9,762	30,190	12,144	27,275	5,900	5,638	5,240	3,940	3,973	2,542	4,039	53,515
5	10,426	25,702	12,396	23,677	4,782	5,767	5,431	3,151	4,050	2,554	4,209	49,062
6	8,891	22,489	14,821	20,178	5,286	4,481	5,052	3,037	4,174	2,519	5,737	46,284
7	9,762	19,686	20,076	16,748	8,307	5,126	4,707	3,379	4,731	2,648	5,549	45,006
8	9,325	16,933	20,130	13,359	8,675	6,698	4,921	3,171	5,176	2,533	4,761	44,292
9	9,408	14,374	19,134	10,534	9,326	6,848	4,525	3,430	5,163	3,057	4,562	38,563
10	8,326	12,337	18,344	7,766	9,858	6,444	4,035	3,534	4,512	2,615	5,036	35,585
11	6,974	12,397	16,555	6,248	10,001	5,271	3,734	3,526	3,982	2,528	5,219	34,507
12	7,723	12,292	14,047	5,588	10,593	5,349	3,632	3,045	3,971	2,603	5,127	34,958
13	6,965	12,043	11,654	5,504	10,712	4,838	3,668	2,981	4,240	3,332	4,954	33,288
14	7,353	12,226	11,241	4,253	10,926	4,899	3,552	2,234	4,057	4,181	7,359	31,687
15	6,388	12,359	10,145	4,469	10,925	5,172	4,004	1,569	3,628	4,273	13,462	31,518
16	5,894	19,010	10,942	3,547	10,594	4,769	4,973	1,609	4,611	3,727	21,564	34,512
17	5,640	25,124	13,193	2,433	9,571	3,613	4,803	1,655	5,075	4,106	25,267	37,908
18	4,898	24,091	15,295	150	9,718	3,072	4,893	1,040	4,945	2,539	28,171	38,743
19	4,811	22,211	17,442	649	9,910	2,429	4,420	970	4,474	2,517	34,269	39,454
20	4,554	20,353	20,376	2,266	11,104	2,809	4,542	1,524	3,525	2,520	35,452	56,570
21	6,657	18,633	27,401	5,957	14,441	2,905	4,871	1,658	3,846	2,642	32,407	201,425
22	7,752	16,867	31,230	7,528	13,903	3,579	4,403	1,534	3,519	2,523	30,417	221,642
23	8,505	15,995	32,137	8,398	13,331	4,466	4,529	1,271	3,224	2,641	42,258	210,857
24	12,451	14,191	31,839	8,249	12,005	4,348	4,426	1,533	3,130	2,533	46,862	200,152
25	21,387	14,048	31,769	6,586	11,618	3,868	4,660	1,908	3,119	2,630	61,300	183,905
26	26,720	13,829	32,994	6,163	11,849	4,118	4,522	1,940	3,266	3,491	99,492	155,696
27	24,297	13,873	37,434	5,089	11,362	4,130	4,923	1,708	3,113	3,558	109,388	133,803
28	24,032	14,697	36,275	4,407	10,291	4,917	5,535	1,538	3,303	3,576	101,013	121,361
29	34,653		34,454	2,171	10,736	5,029	5,477	1,949	4,596	3,507	95,274	110,182
30	40,803		33,696	1,892	10,039	5,348	5,532	2,909	3,300	5,490	84,502	119,684
31	47,582		31,979		8,941		5,531	2,540		7,117		140,511
TOTAL	411,033	566,500	656,253	299,005	286,747	148,342	146,185	76,534	120,000	97,981	935,334	2,671,439
AVE	13,259	20,232	21,169	9,967	9,250	4,945	4,716	2,469	4,000	3,161	31,178	86,175
MAX	47,582	49,923	37,434	30,052	14,441	8,679	5,535	4,556	5,176	7,117	109,388	221,642
MIN	4,554	12,043	10,145	150	54	2,429	3,552	970	3,113	2,445	4,039	31,518
TOTAL IN AF	815,284	1,123,653	1,301,678	593,076	568,763	294,236	289,958	151,805	238,020	194,345	1,855,235	5,298,799

Average 16,885 cfs-days
Maximum 221,642 cfs-days
Minimum 54 cfs-days

Annual Total: 6,163,273 cfs-days
12,224,852 acre-feet

PROJECT OPERATIONS

SWP water delivered in 1981 totaled 2,892,233 ac-ft, a 49 percent increase over Project water delivered in 1980. In addition, local water delivered from SWP facilities totaled 35,604 ac-ft, down 13 percent from the amount delivered in 1980. Project and local water deliveries to each of the field divisions during 1981 and as compared to 1980 deliveries were:

Field Division	1981 Deliveries Amount (in ac-ft)	Percent Change from 1980 Deliveries
Oroville	14,022	2
Delta	177,794	8
San Luis	741	0
San Joaquin	1,793,830	54
Southern	941,450	47
Total	2,927,837	48

A tabulation of 1981 water deliveries by type follows:

Type	Amount (in ac-ft)
Entitlement	1,892,066[1]
Surplus	633,383
Unscheduled[2]	275,045
Makeup and Wet Weather	16,437
Stored Carryover	1,059
Emergency Relief	24,600
Repayment	46,060
Ground Water Demonstration	565
Recreation	3,018
Subtotal	2,892,233
Local Supply (non-Project water)	35,604
Total	2,927,837

[1] Includes 4,000 ac-ft stored by the State in the Mojave Ground Water Basin in 1978 and pumped from that basin for use in 1981 by the Mojave Water Agency.

[2] Prior to 1981 this was named Extra Surplus.

A table showing water deliveries by year for individual agencies is presented on page I-2; however, not shown are natural flow releases through the Project's southern reservoirs. These releases are summarized on page 8.

Following is a tabulation of 1981 regulated deliveries of local water supplies:

Agency	Amount (in ac-ft)
Last Chance Creek W.D.	12,145
Thermalito I.D.	1,301
Napa Co. F.C. & W.C.D.	9,001
Alameda Co. W.D.	10,448
Alameda Co. F.C. & W.C.D., Zone 7	2,709
	35,604

Federal water deliveries to federal customers from the USBR share of the joint-use facilities totaled 1,419,039 ac-ft, not including CVP water wheeled by the Department, up 13 percent over the 1980 delivery amount. CVP water wheeled by the State for the USBR in 1981 totaled 137,190 ac-ft. See pages 31, 35, and 40 for more details.

Oroville Field Division

Upper Feather River Reservoirs

Of the three upper Feather River reservoirs, only Antelope Lake filled and spilled in 1981. Spill took place during November and December. Antelope Lake has spilled every year except 1977 since its original filling in 1965. The following table shows the 1981 range of storages of the three upper Feather River reservoirs:

Upper Feather River Reservoir Storage

Reservoir	Maximum (in ac-ft)	Date	% of Capacity	Minimum (in ac-ft)	Date	% of Capacity
Antelope Lake	24,505	12/20	109	15,630	2/11-12	69
Frenchman Lake	31,225	4/23	56	16,971	10/6	31
Lake Davis	80,832	12/21	96	61,755	10/6, 26	73

Monthly operation tables for the upper Feather River reservoirs are on page V-1.

Lake Oroville

A summary of Lake Oroville 1981 operations data is given in the following table. More detailed information on operations can be found in Section V.

Lake Oroville Operations Summary

Parameter	Amount	Date
Storage		
Maximum	3,411,206 ac-ft	May 3
Minimum	2,345,874 ac-ft	Sept. 19
Daily Inflow		
Maximum	177,302 ac-ft	Dec. 20
Oroville Complex Total Release to Feather River		
Maximum Daily	115,483 ac-ft	Dec. 20
Surface Water Temperature		
Maximum	79°F	July 29 - Aug. 19

The computed inflow to Lake Oroville during 1981 was 4,175,690 ac-ft. Included in this computed inflow amount are releases from Ponderosa Dam (131,554 ac-ft) and Lake Wilenor (5,536 ac-ft).

Water Deliveries

Diversions and releases from the Oroville-Thermalito complex during 1981 are shown in the following table. Other Project deliveries in the Oroville Field Division are shown on page I-2.

Oroville-Thermalito Complex Diversions and Releases
(in ac-ft)

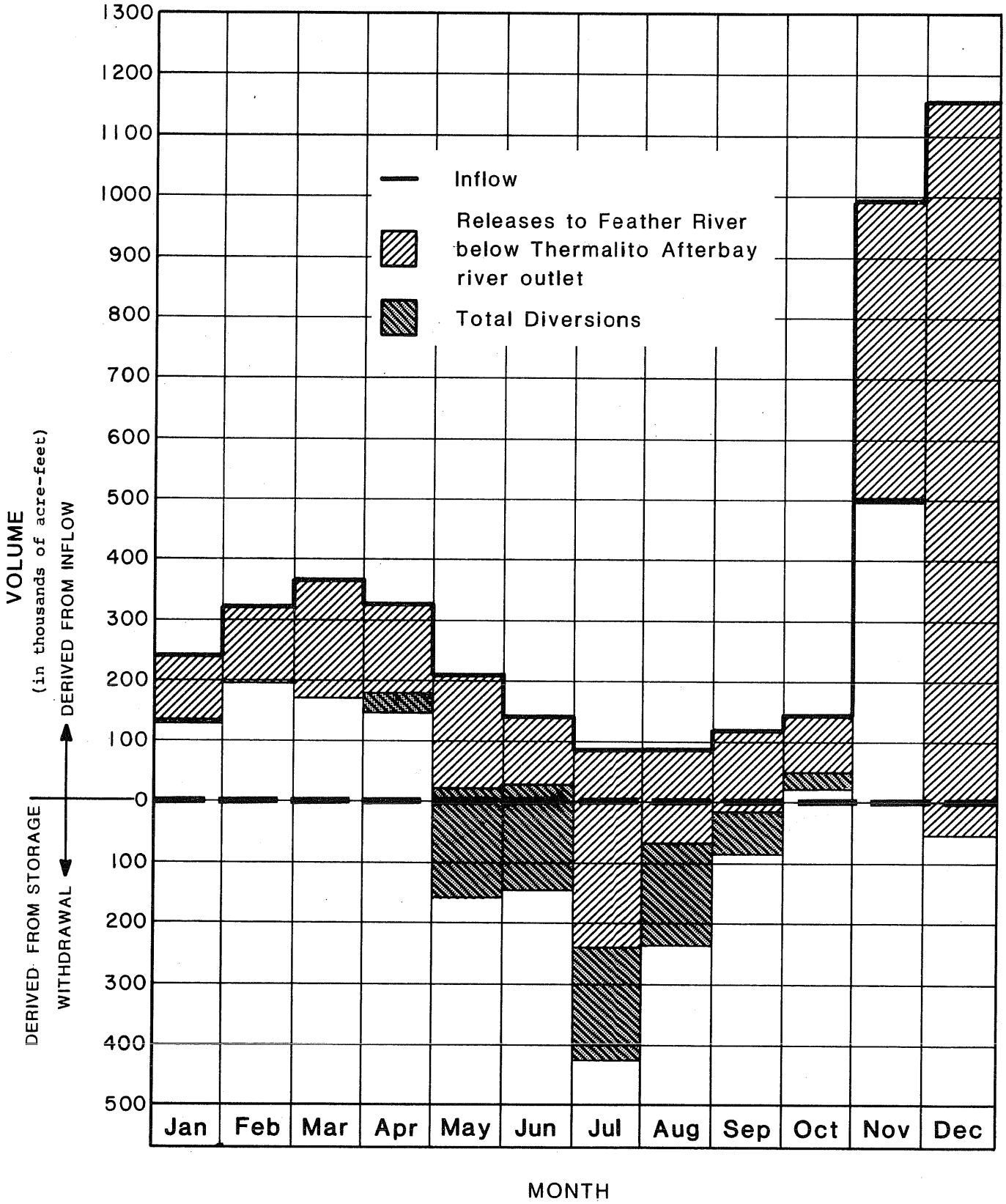
Diversions:			
	Palermo Canal	6,736	
	Thermalito Irrigation District	1,301	
	County of Butte	221	
	Subtotal		8,258
	Thermalito Afterbay deliveries		
	Sutter-Butte Canal	494,104	
	PGandE Lateral	4,282	
	Richvale Canal	88,637	
	Western Canal	272,963	
	Subtotal		859,986
Releases:	Thermalito Afterbay river outlet, Fish Hatchery, and Fish Barrier Dam		3,270,158
	Total		4,138,402

Figure C, page 28, presents a graph of the 1981 inflow, releases, and diversions for the Oroville-Thermalito complex. The inflow used for the graph is the computed inflow to Lake Oroville.

Hyatt-Thermalito Powerplants

Gross generation at the Hyatt-Thermalito power complex during the year totaled over 2,241 GWh. Energy consumed for pumpback requirements and station service totaled nearly 198 GWh. A graph showing the Edward Hyatt and Thermalito Powerplants' monthly gross generation is presented on page VI-3. Tables of monthly power operations are tabulated in Section VI.

FIGURE C: OROVILLE-THERMALITO COMPLEX OPERATIONS
1981
INFLOW, RELEASES,& DIVERSIONS



Annual Critique

Following the annual inspection, the annual critique for the Oroville Field Division was conducted on June 19 by representatives of the Field Division, O&M Headquarters, and the California Water Commission.

Activities, Outages, and Limitations

Other activities, outages, and limitations affecting or influencing operations of the Oroville Field Division in 1981 were:

- Because of less than normal snowpack, Lake Oroville storage was held into the flood control reservation space from February 15 through April 26. Maximum encroachment into the flood control reservation was 262,007 ac-ft on March 28, when the total storage was 3,249,414 ac-ft. During this period, all incoming storms were closely watched. As a result of these conditions, Lake Oroville reached maximum storage on May 3, about one month earlier than usual, with a storage of 3.4 million ac-ft.

- The 37.5 kilovoltampere (kVA) elevated neutral transformer at Thermalito Powerplant was changed in conjunction with the annual maintenance of Unit 4 (September 11 through 24). This was the first of the 10 poly-chlorinated-biphenyl (PCB) filled transformers in the Oroville Field Division to be replaced.

The following units at the two power plants in the Oroville Field Division were out of service for the times and reasons noted.

Unit	Outage Beginning	Outage Ending	Reason
Edward Hyatt Powerplant			
1	1/29/81	2/24/81	Annual maintenance and installation of a nose cone.
	11/17/81	11/23/81	Annual maintenance.
2	4/24/81	5/7/81	Annual maintenance.
3	3/21/81	4/23/81	Annual maintenance and thrust bearing repair.
4	5/14/81	6/3/81	Annual maintenance.
5	1/6/81	1/19/81	Annual maintenance.
6	2/26/81	3/26/81	Annual maintenance.
	12/7/81	12/18/81	Annual maintenance.
Thermalito Powerplant			
1	10/30/81	11/12/81	Annual maintenance.
2	10/13/81	10/23/81	Annual maintenance.
3	9/25/81	10/8/81	Annual maintenance.
4	9/11/81	9/24/81	Annual maintenance.

Delta Field Division

Water Deliveries

Comparisons of the 1981 water deliveries to the three areas the Division serves and their percent differences from 1980 deliveries are shown in the following table. Annual water deliveries to each contractor are presented on page I-2.

Delta Field Division Water Deliveries

Area	Water Deliveries (in ac-ft)	Difference from 1980 (in percent)
California Aqueduct	7,088	2
North Bay Aqueduct	9,001	34
South Bay Aqueduct	148,427	14

In addition to the SWP deliveries, a total of 351 ac-ft of federal CVP water was wheeled by the Department through SWP facilities in the Delta Field Division to Tracy Golf and Country Club, a federal customer.

Harvey O. Banks Delta Pumping Plant

Pumping at the Banks Pumping Plant for the year totaled 2,260,077 ac-ft, 5 percent more than that pumped during 1980.

Of the 1981 total pumping at the Banks Pumping Plant, 172,671 ac-ft was pumped for the USBR and was conveyed through the California Aqueduct to O'Neill Forebay. Pumping for the USBR at Banks Pumping Plant consisted of 35,707 ac-ft of D-1485 replacement water, 103,813 ac-ft of Cross Valley Canal water, 32,800 ac-ft of Jones Tract water, and 351 ac-ft of water for Tracy Golf and Country Club. Water wheeled for the CVP totaled 137,190 ac-ft during 1981.[1]

In complying with D-1485 limitations on Delta diversions, described on page 16, the USBR forgoes up to 193,590 ac-ft of its May-June diversion capacity at its Tracy Pumping Plant. This forgone

[1] Amounts of water pumped at Banks Pumping Plant for federal contractors may not reflect amounts wheeled for the same time frame, since wheeling and pumping do not necessarily take place concurrently.

capacity is then replaced by pumping CVP water at Banks Pumping Plant to the extent needed. In 1981, 35,707 ac-ft of D-1485 replacement water was pumped at Banks Pumping Plant during December. However, because of the outages, some D-1485 replacement water for 1981 remained to be pumped at the end of the year. Therefore, an additional 34,605 ac-ft of D-1485 replacement water for 1981 was pumped during 1982.

DWR pumped 32,800 ac-ft of CVP water at Banks Pumping Plant during January and February to replace water not pumped at Tracy Pumping Plant during September and October of 1980 during the Lower and Upper Jones Tract flooding.

South Bay Aqueduct

Pumping at the South Bay Pumping Plant totaled 164,917 ac-ft for the year, a 22 percent increase over the 1980 amount.

Maximum storage in Lake Del Valle was 39,491 ac-ft, about 51 percent of absolute maximum operating storage capacity on April 28 through 30. Minimum storage was 24,503 ac-ft, from January 11 through 16.

A monthly reservoir operation table for Lake Del Valle is shown on Table 11, page V-8.

Annual Critique

Following the annual inspection, the annual critique for the Delta Field Division was conducted on May 22 by representatives of the Field Division, O&M Headquarters, and the California Water Commission.

Activities, Outages, and Limitations

Other activities, outages, and limitations affecting or influencing operations of the Delta Field Division in 1981 were:

- On May 18, about 1,000 ft of canal lining near mile 10, south of Bethany Reservoir, cracked and slumped into the California Aqueduct. Pumping at Banks Pumping Plant was cut back on May 21 to meet South Bay Aqueduct deliveries only and remained low through July 12. An emergency diversion permit was obtained from the State Water Resources Control Board which allowed pumping for the State at USBR's Tracy Pumping Plant while Aqueduct repairs were being made. A total of 44,770 ac-ft of SWP entitlement water was pumped at Tracy Pumping Plant between May 22 and June 30, after which time USBR no longer had capacity available to pump SWP water. Repairs to the damaged lining were completed by July 12.

- Modifications to the John E. Skinner Delta Fish Protective Facility suspended pumping at Banks Pumping Plant from May 4 to May 15. Additional modifications were worked into the period of reduced pumping at Banks Pumping Plant during repair of the canal lining discussed previously.

- On August 27, the State cancelled work scheduled at the John E. Skinner Delta Fish Protective Facility enabling Banks Pumping Plant to pump for the USBR. The USBR concurrently decreased pumping at its Tracy Pumping Plant to permit repair of a customer turnout on the Delta-Mendota Canal.

- From November 10 to December 4, Patterson Reservoir was out of service for cleaning, inspection, and minor lining repairs.

The following units at the four pumping plants in the Delta Field Division were out of service for the times and reasons noted. If no date is given in the "Outage Ending" column, the unit remained out of service at the end of the report year.

Unit	Outage Beginning	Outage Ending	Reason
Cordelia Pumping Plant			
1	1/27/81	7/16/81	Replace motor bearing.
2	2/6/81	2/25/81	Replace pump bearing.
	11/17/81	--	Replace pump packing sleeve and repair reverse overspeed device.
Harvey O. Banks Delta Pumping Plant			
1	4/7/81	4/15/81	Replacement of lower guide bearing.
	6/1/81	6/12/81	Repair oil leak.
4	3/2/81	6/5/81	Annual maintenance.
5	1/8/81	2/20/81	Annual maintenance.
6	1/3/81	1/7/81	Repair of breaker racking gear.
	6/9/81	7/15/81	Annual maintenance.
	11/9/81	11/20/81	Discharge valve work.
7	6/8/81	6/17/81	Motor cooler cleaning.
	7/1/81	7/15/81	Replace "o" ring on upstream discharge valve.
	11/9/81	11/20/81	Discharge valve work.
	11/21/81	12/11/81	Annual maintenance.

Unit	Outage Beginning	Outage Ending	Reason
South Bay Pumping Plant			
2	11/12/81	11/19/81	Annual maintenance.
3	11/20/81	11/24/81	Annual maintenance.
6	4/15/81	6/25/81	Repair grounded stator winding.
Del Valle Pumping Plant			
Plant	1/3/81	1/7/81	Blown fuse on transformer.
4	3/31/81	4/7/81	Renewal of mechanical seals.

San Luis Field Division

Water Deliveries

Federal CVP water deliveries during the year totaled 1,556,822 ac-ft (includes 593 ac-ft of recreation and mitigation water), 24 percent more than the 1980 total. The following tabulation details the components of these deliveries.

Delivered from joint-use facilities	1,419,039 ac-ft
Wheeled by DWR for USBR	137,190 ac-ft[1]
Delivered from San Luis Reservoir and O'Neill Forebay to Department of Parks and Recreation	57 ac-ft
Delivered to O'Neill Forebay to Department of Fish and Game; mitigation water	345 ac-ft
Delivered to Mendota Waterfowl Habitat Area; recreation water	191 ac-ft

[1] Includes 351 ac-ft delivered in the Delta Field Division, 1,059 ac-ft delivered in the San Luis Field Division to Pleasant Valley Water District, a federal customer, and 135,780 ac-ft delivered in the San Joaquin Field Division.

In addition 741 ac-ft of State water was delivered to the Departments of Parks and Recreation and Fish and Game.

Mitigation Water

The SWP's share of mitigation water for 1981 totaled 4,245 ac-ft. This water was conveyed to the California Department of Fish and Game, Grasslands Water District, and Los Banos Gravel Company [1] through the Delta-Mendota Canal, Mendota Pool, and O'Neill Forebay. In 1982, the SWP paid back a total of 1,220.6 MWh of electrical energy for pumping the SWP share of the 1981 mitigation water at the USBR's Tracy and O'Neill Pumping Plants.

San Luis Reservoir

San Luis Reservoir storage reached its maximum of the year, 2,027,454 ac-ft, during March 22-24. Absolute maximum storage capacity is 2,027,835 ac-ft. The minimum storage for the year, 79,267 ac-ft, was reached on December 31. The reservoir was drawn down in preparation for repair of the slide discussed in the next section. A graph showing the fluctuations of San Luis Reservoir for 1981 is presented on page V-11.

The 1981 total pumping at San Luis Pumping-Generating Plant was 303,620 ac-ft, which is less than one-third the amount pumped in 1980. Total water released from San Luis Reservoir to O'Neill Forebay for generation was 2,001,459 ac-ft, about three times as much as in 1980. These large changes in pumping and

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[1] Water previously delivered to William Affonso under Contract No. 14-06-200-3599A is now delivered to Los Banos Gravel Company under Contract No. 8-07-20-W0151.

generation were attributable to the San Luis Dam slide. Monthly operation tables for San Luis Reservoir and O'Neill Forebay are presented in Section V.

San Luis Dam Slide

An earth and rock slide along the face of San Luis Dam was discovered on September 14. About 450,000 cubic yards of the dam's zoned earth and rockfill material slipped about 20 ft down the upstream face of the dam for a length of 1,100 ft. The embankment material continued to slide slowly (8 to 12 inches per day) and a second vertical scarp opened up about 20 ft above the first.

A three-member consulting board was formed by the USBR and the Department to review the damage and proposed repairs. The board members were James Duncan, an engineer from U. C. Berkeley, consulting engineer Thomas Lepps, and geologist Lloyd Underwood. According to a report issued by the board, the primary cause of the slide was a weak clay underlying the dam embankment, commonly referred to as slopewash. The reservoir drawdown, greater than previous years, as a result of increased Project deliveries, was a significant factor contributing to the slide. The drawdown was, however, within normal design expectations.

The consulting board reviewed and agreed with the USBR plans and engineering analysis for the dam repair in early December. Subsequently, three contracts were let for the repair work, with the first stages of the work beginning in mid-December. In preparation for the repair work, the level of the reservoir was drawn down to its minimum operating storage level at elevation 326 by December 30.

The effects on overall SWP operation are discussed in the Project Status in 1981 section starting on page 10.

Annual Critique

Following the annual inspection, the annual critique for the San Luis Field Division was conducted on September 25 by representatives of the Field Division, O&M Headquarters, and the California Water Commission.

Activities, Outages, and Limitations

Other activities, outages, and limitations affecting or influencing operations of the San Luis Field Division in 1981 were:

- On December 11, Dos Amigos Pumping Plant passed the four million ac-ft mark for the first time in one year's pumping.

The following units at the two pumping plants in the San Luis Field Division were out of service for the times and reasons noted.

Unit	Outage Beginning	Outage Ending	Reason
San Luis Pumping-Generating Plant			
1	2/20/81	4/3/81	Annual maintenance.
2	2/20/81	4/3/81	Annual maintenance.
7	10/25/81	12/4/81	Annual maintenance.
8	10/25/81	12/4/81	Annual maintenance.
Dos Amigos Pumping Plant			
3	1/9/81	1/30/81	Annual maintenance.
4	3/24/81	4/15/81	Repair of amortisseur winding straps.
	6/16/81	6/24/81	Penstock inspection and repair.
	10/5/81	11/23/81	Penstock inspection and repair.

Unit	Outage Beginning	Outage Ending	Reason
Dos Amigos Pumping Plant (Continued)			
6	12/29/80	1/9/81	Repair of discharge valve leaks.
	1/30/81	3/24/81	Annual maintenance and repair of discharge valve leaks.
	11/23/81	12/4/81	Repair of discharge valve leaks.

San Joaquin Field Division

Water Deliveries

Of the 1,793,830 ac-ft total SWP water delivered to State water service contractors in the San Joaquin Field Division during 1981, about 46 percent was entitlement water, 34 percent was surplus water, 15 percent was unscheduled water, and the remaining percentage was divided among makeup, wet weather, emergency relief, carryover, and repayment water. The largest delivery (1,340,581 ac-ft) was to the Kern County Water Agency. This represented 75 percent of the total water delivered within the Division.

Preconsolidation repayment water delivered in 1981 to Belridge Oil Company totaled 6,060 ac-ft and to J. G. Boswell Company totaled 40,000 ac-ft. At the end of 1981, the preconsolidation repayment account to be delivered before 1985 was as follows:

Preconsolidation Repayment Water
(in ac-ft)

Contract Holder	Total Contract Amount	1980 Balance	1981 Deliveries	Remaining Balance
J. G. Boswell Co.	131,600	84,895	40,000	44,895
Belridge Oil Co.	108,000	49,723	6,060	43,663

In addition to the SWP deliveries, a total of 135,780 ac-ft of federal CVP water was delivered by the Department through SWP facilities in the San Joaquin Field Division; 125,780 ac-ft to the Kern County Water Agency's Cross Valley Canal and 10,000 ac-ft to Kings County Water District.

Table 3 on page I-2 shows water deliveries by year with totals to date for individual agencies.

Annual Critique

Following the annual inspection, the annual critique for the San Joaquin Field Division was conducted on October 22 by representatives of the Field Division, O&M Headquarters, and the California Water Commission.

Activities, Outages, and Limitations

The following units at the six pumping plants in the San Joaquin Field Division were out of service for the times and reasons noted. If no date is given in the "Outage Ending" column, the unit remained out of service at the end of the report year.

Unit	Outage Beginning	Outage Ending	Reason
COASTAL BRANCH			
Las Perillas Pumping Plant			
2	10/19/81	12/14/81	Mechanical maintenance.
3	12/15/81	--	Annual maintenance.
5	10/8/81	10/16/81	Cathodic protection work.
6	10/8/81	10/16/81	Cathodic protection work.

Unit	Outage Beginning	Outage Ending	Reason
COASTAL BRANCH (Continued)			
Badger Hill Pumping Plant			
1	12/4/81	--	Annual maintenance.
4	11/27/81	12/7/81	Annual maintenance.
5	11/9/81	11/17/81	Discharge line outage.
	11/17/81	11/23/81	Installation of a sluice gate.
6	12/16/80	1/26/81	Mechanical maintenance.
	11/9/81	11/17/81	Discharge line outage.
CALIFORNIA AQUEDUCT			
Buena Vista Pumping Plant			
3	1/3/81	10/15/81	Annual maintenance and impeller repair.
8	6/29/81	7/14/81	Repair cavitation damage.
9	8/8/81	8/27/81	Impeller inspection and repack pump.
10	12/30/81	3/19/81	Install backfill valve.
Wheeler Ridge Pumping Plant			
1	7/7/81	7/16/81	Excessive packing leak-off.
2	3/4/81	5/18/81	Annual maintenance.
4	3/26/81	4/21/81	Repair backfill valve.
5	4/30/80	3/4/81	Impeller repair.
	11/19/81	--	Blown gasket on bypass line valve.
6	11/17/80	2/24/81	Install backfill valve.
7	6/9/81	--	Annual maintenance.

Unit	Outage Beginning	Outage Ending	Reason
CALIFORNIA AQUEDUCT (Continued)			
Wind Gap Pumping Plant			
1	10/21/81	10/29/81	Replace backfill valve.
2	4/30/81	8/27/81	Annual maintenance and impeller repair.
3	10/15/80	--	Impeller repair.
6	2/20/81	--	Repair water leak in pump casing.
7	2/22/81	7/30/81	Repair water leak in the pump casing.
A. D. Edmonston Pumping Plant			
1	7/10/78	--	Excessive downthrust on bearings.
2-4-6-8	4/24/81	7/27/81	West discharge line out to install discharge valves for Units 10, 12 and 14.
3	8/14/80	--	Replace lower wear ring.
4	8/10/81	8/21/81	Repair lower guide bearing.
6	7/28/81	8/6/81	Repair bypass line leak.
8	7/28/81	8/13/81	Repair bypass line leak.
9	5/26/81	6/9/81	Repair thrust bearing.
13	5/26/81	6/19/81	Repair thrust bearing.
	8/11/81	11/25/81	Repair thrust bearing and rewedge motor.

Southern Field Division

Water Deliveries

Water deliveries from the SWP to State water service contractors in the Southern Field Division totaled 934,729 ac-ft, a 47 percent increase over the amount delivered in 1980. Not included in this total is SWP water applied in the ground water demonstration areas (4,565 ac-ft) and recreation water (2,156 ac-ft).

As part of the continuation of a ground water demonstration program started in 1978 in Southern California, 4,000 ac-ft of SWP conservation water was withdrawn from the Mojave Ground Water Basin by the Mojave Water Agency and 565 ac-ft was withdrawn by the San Bernardino Valley Water District in 1981. These amounts are in lieu of receiving SWP water conveyed by surface facilities.

All of the 2,156[1] ac-ft of recreation water delivered in 1981 went to the California Department of Parks and Recreation, at Silverwood Lake and Lake Perris recreation areas.

A table showing water deliveries by year with totals to date for individual agencies is presented on page I-2.

Reservoir Storage

At the start of the year, total combined reservoir storage in the Southern Field Division's five reservoirs (Pyramid Lake, Elderberry Forebay, Castaic Lake, Silverwood Lake, and Lake Perris) was 547,364 ac-ft, or 75 percent of the combined capacity. Combined storage at the end of the year was 570,931 ac-ft, or 80 percent of the combined capacity.

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[1] Includes 126 ac-ft from Silverwood Lake, 807 ac-ft from Lake Perris, and 1,223 ac-ft from Castaic Lake.

A table of reservoir storages for Southern Field Division reservoirs follows, and summaries of operations for those reservoirs are in Section V.

Reservoir Storages
(in ac-ft)

Reservoir (Normal max. operating storage)	Start of 1981	End of 1981	Date	Maximum	Date	Minimum
Pyramid Lake (169,901)	142,230	153,836	4/20	168,421	1/8	141,124
Elderberry Forebay (28,230)	21,532	30,764	12/24	32,856	11/22-23	7,699
Castaic Lake (319,247)	214,626	252,171	5/4	291,249	9/21	151,936
Silverwood Lake (73,032)	68,753	57,996	3/19	73,253	12/31	57,996
Lake Perris (126,841)	100,212	76,199	4/11	125,537	8/4	66,314

Annual Critique

After the annual inspection, the annual critique for the Southern Field Division was conducted on November 19 by representatives of the Field Division, O&M Headquarters, and the California Water Commission.

Activities, Outages, and Limitations

Other activities, outages, and limitations affecting or influencing operations of the Southern Field Division in 1981 were:

- The Los Angeles Department of Water and Power (LADWP) took the Elderberry Forebay outlet tower out of service during

the latter part of November, for removal, measurement, and reinstallation of the Numbers 4 and 8 lower slide gates. To make space for Department inflow to Pyramid Lake at that time, Pyramid Lake was lowered by LADWP.

- The Gorman Creek Channel Improvements were out of service from December 15, 1980 through the end of that year, when about 100 ft of canal failed. Releases down the Channel were resumed on January 12, 1981. During this period, West Branch water deliveries were met from Castaic Lake storage. Because of the repair of Gorman Creek Channel Improvements and construction work at William E. Warne Powerplant, Castaic Lake was not filled during the 1980-81 filling season.

- Water delivery through the East Branch was hampered in mid-June by a heavy buildup of weeds in the Aqueduct that severely reduced pumping at Pearblossom Pumping Plant by clogging the pump intakes.

- Devil Canyon Powerplant was out of service from February 16 through 20 and from March 2 through 15 due to work on the San Bernardino Tunnel Intake Tower. During these times, East Branch deliveries were met from Lake Perris storage.

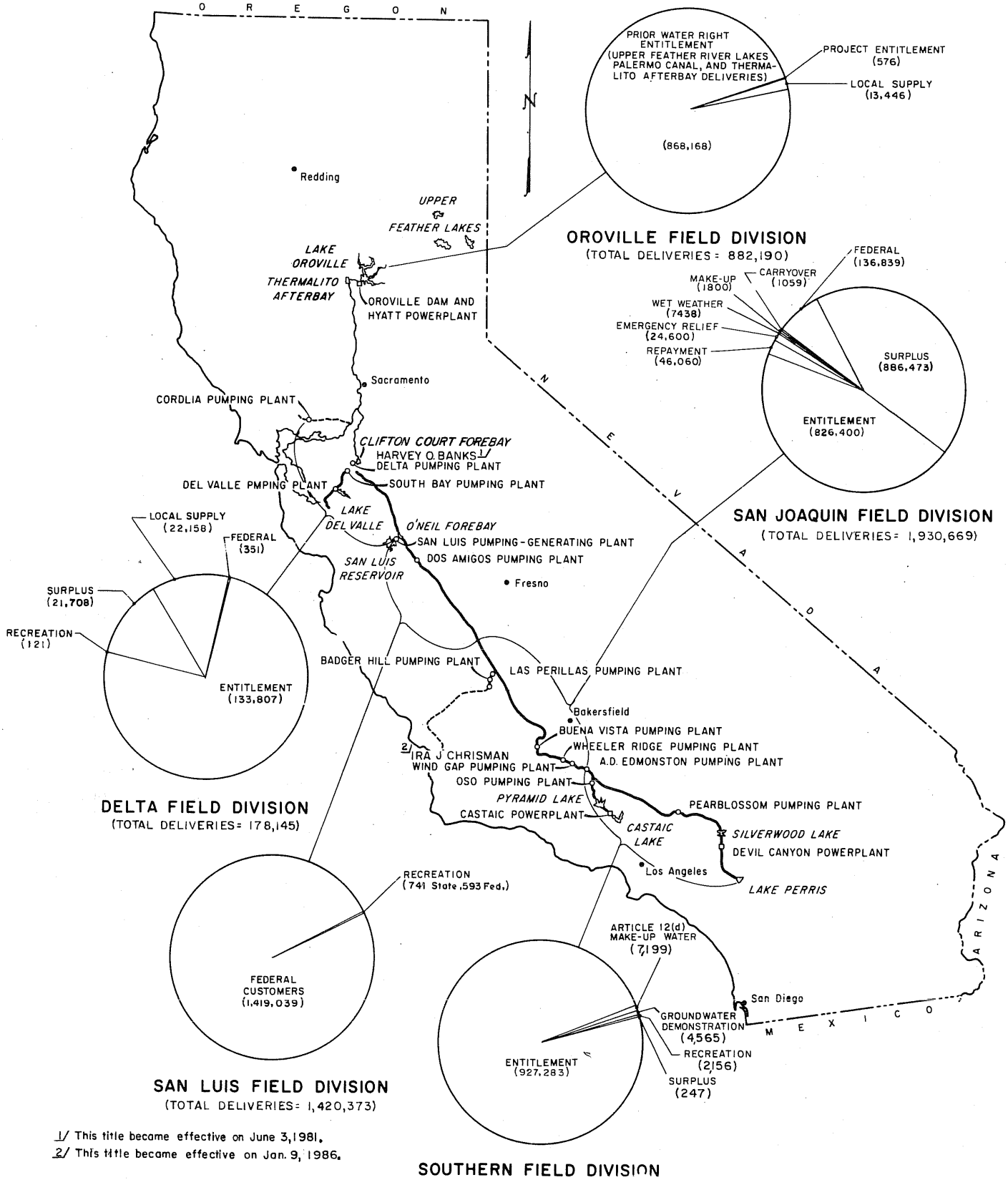
- Water was transferred from Silverwood Lake to Lake Perris in August, holding the water surface at Lake Perris at 1,560 ft for boat ramp access.

The following units in the Southern Field Division were out of service for the times and reasons noted. If no date is given in the "Outage Ending" column, the unit remained out of service at the end of the report year.

Unit	Outage Beginning	Outage Ending	Reason
WEST BRANCH			
Oso Pumping Plant			
1	11/30/81	--	Annual maintenance.
2	8/10/81	--	Bearing inspection.
3	12/22/80	1/14/81	Electrical maintenance.
4	11/2/81	11/16/81	Annual maintenance.
5	2/9/81	3/2/81	Annual maintenance.
6	1/14/80	2/18/81	Annual maintenance and installation of stub shaft.
7	12/2/80	7/24/81	Repair broken wear ring.
8	9/21/81	10/8/81	Annual maintenance.
EAST BRANCH			
Pearblossom Pumping Plant			
3	9/23/81	10/16/81	Discharge valve hydraulic system malfunction.
4	5/22/81	10/29/81	Repair wear ring.
5	2/2/81	8/13/81	Annual maintenance and impeller repair.
Devil Canyon Powerplant			
1	2/2/81	2/14/81	Annual maintenance.

PROJECT WATER DELIVERIES

MAP 3
PROJECT WATER DELIVERIES
1981
(in acre-feet)



1/ This title became effective on June 3, 1981.
2/ This title became effective on Jan. 9, 1986.

TABLE 3
WATER DELIVERIES 1962-1981

(in acre-feet)

AGENCY	1962-1976	1977 6/	1978	1979	1980	1981	TOTAL
OROVILLE FIELD DIVISION							
Last Chance Creek W.D. 1/	45,470	6,372	11,512	8,492	11,800	12,145	95,791
Plumas Co. F.C. & W.C.D.	2,753	303	278	329	295	355	4,313
Palermo Canal*	71,839	8,049	7,992	6,540	8,166	6,736	109,322
County of Butte	1,338	706	579	302	267	221	3,413
Thermalito I.D. 1/	1,040	418	1,121	1,183	1,327	1,301	6,390
Thermalito Afterbay*	7,125,283	552,470	779,901	857,763	851,578	859,986	11,026,981
Upper Feather River Lakes*	97,238	3,427	1,293	1,483	923	1,446	105,810
DELTA FIELD DIVISION							
Napa Co. F.C. & W.C.D. 1/	36,351	8,226	6,034	6,561	6,707	9,001	72,880
Alameda Co. W.D. 1/	219,098	20,644	14,963	18,006	26,968	32,365	332,044
Alameda Co. F.C. & W.C.D., Zone 7 1/	132,489	12,940	18,781	23,409	21,122	22,299	231,040
Pleasanton Township W.D.	674	0	0	0	0	0	674
Santa Clara Valley W.D.	190,395	76,220	95,727	107,989	102,278	106,920	679,529
Marin W.D.	0	4,594	0	0	0	0	4,594
San Francisco W.D.	0	3,372	973	0	0	0	4,345
Skylonda M.W.D.	0	10	0	0	0	0	10
Oak Flat W.D. 1/	53,662	3,370	3,912	6,847	6,418	7,088	81,297
Mustang W.D.	4,256	0	0	0	0	0	4,256
Tracy Golf & Country Club	11	0	0	330 12/	425	351 2/	1,117
Granite Construction	0	0	0	0	120	0	120
East Bay Regional Park District (Lake Del Valle)	141	112	116	89	123	121	702
Orestimba Creek (Spec. Rec. Rel.)	0	0	0	100	0	0	100
SAN LUIS FIELD DIVISION							
Dept. of Parks & Recreation (State's share)	82	61	54	72	56	72	397
Dept. of Fish and Game (State's share)	72	298	323	636	688	669	2,686
Federal Customers (includes fed. rec. water plus joint-use facilities)	7,092,392	323,638	910,860	1,239,980	1,253,956	1,419,632 2/	12,240,458
Federal Customers (Misc. Agreements)	0	0	0	0	0	1,059 2/	1,059
SAN JOAQUIN FIELD DIVISION							
Tulare Lake Basin W.S.D.	977,502	44,522	9,533	212,963	84,061	299,364	1,627,945
Empire West Side I.D.	41,019	2,355	454	1,739	894	8,851	55,312
County of Kings	12,300	1,530	2,070	2,000	2,200	2,300	22,400
Hacienda W.D. 3/	53,839	3,836	2,520	9,500	6,200	0	75,895
Kern Co. W.A.	4,178,931	432,837	675,970	1,290,293	964,933	1,340,581	8,883,545
Dudley Ridge W.D.	437,121	28,918 9/	59,333	77,089	80,079	73,327	755,867
Devil's Den W.D.	118,458	11,911	11,362	19,138	19,974	23,347	204,190
J. G. Boswell Co. 8/	46,225	0	480	0	0	40,000	86,705
Belridge Oil Co. (formerly Buena Vista W.S.D.) 8/	48,073	0	1,950	5,095	3,159	6,060	64,337
Green Valley W.D.	3,958	0	1,299	1,279	1,795	0	8,331
Federal USBR (U. S. Fish & Wildlife Service)	11,700	0	0	0	0	0	11,700
Federal USBR (Cross Valley Canal) 2/	88,300	31,060	8,387	51,733	0	135,780 4/	315,260
Wheeler Ridge W.S.D.	0	0	91	0	0	0	91
SOUTHERN FIELD DIVISION							
Antelope Valley-East Kern W.A.	37,182	33,354	44,137	60,493	72,407	79,375	326,948
The Metropolitan Water District of So. Cal.	1,655,035	189,755	550,161	507,074 13/	531,727	795,846	4,229,598
Littlerock Creek I.D.	2,640	111	208	133	191	1,517	4,800
Mojave W.A.	69	80	584 10/	4,000 11/	4,000	4,000	12,733
Desert W.A.	42,000	0	15,300	15,000	17,000	19,000	108,300
Coachella Valley W.D.	26,800	0	10,084	10,063	10,884	12,105	69,936
Crestline-Lake Arrowhead W.A.	3,379	1,109	1,209	1,260	1,239	1,485	9,681
San Gorgonio Pass W.A.	0	0	0	0	0	0	0
San Gabriel Valley M.W.D.	12,133	8,996	7,771	290	1,085	3,619	33,894
San Bernardino Valley M.W.D.	76,444	24,833	4,055	18	150 7/	16,586 5/	122,086
Parks & Recreation (Federal, State & County)	727	937	674	502	781	2,156	5,777
Piru Creek Fish Enhancement	2,915	0	0	0	0	0	2,915
Castaic Lake W.A.	0	0	0	7	1,210	5,761	6,978

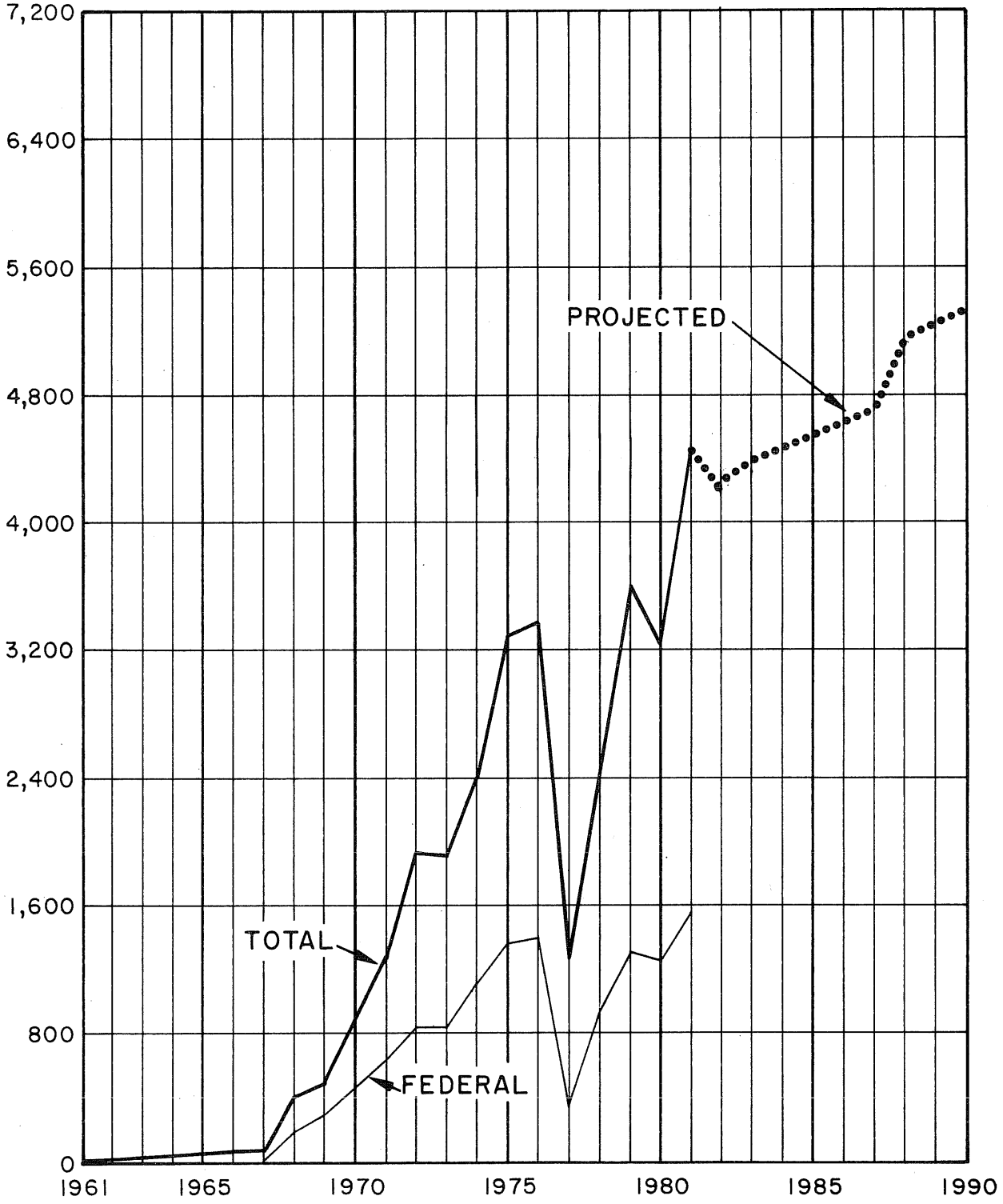
* Prior water right entitlement.
1/ Includes regulated delivery of local supply.
2/ Conveyance of C.V.P. water.
3/ Hacienda Water District was annexed by Tulare Lake Basin in 1981.
4/ Includes Kings County W.D.
5/ Includes San Bernardino Valley M.W.D. Ground Water Demonstration of 565 A.F.
6/ Includes Exchange and 1976 Carryover Water.
7/ Ground water demonstration.
8/ Repayment of preconsolidation water.
9/ Includes 200 acre-feet of local supply from Kaweah River.
10/ Water borrowed during construction.
11/ Pumped from ground water basin by the agency for its use.
12/ Includes 50 acre-feet acquired in 1977 for emergency relief purposes and later sold when drought ended.
13/ Includes 30,000 acre-feet conveyed to Metropolitan for storage in local ground water basins.

FIGURE D

CALIFORNIA AQUEDUCT WATER DELIVERIES

YEARLY TOTALS

(in thousands of acre-feet)



Total includes federal deliveries from San Luis joint-use facilities.

SUMMARY OF CALIFORNIA AQUEDUCT OPERATION

SECTION II

Table begins on next page.

TABLE 4: SUMMARY OF CALIFORNIA

1981

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
DELTA FIELD DIVISION						
North Bay Aqueduct						
Pumped at Cordelia Pumping Plant	453	535	522	664	754	900
Storage Change	-4	11	-2	-8	3	6
Operational Losses (-), Gains (+)	0	0	0	0	0	0
Delivered to Contracting Agency	457	524	524	672	751	894
California Aqueduct						
Pumped at Harvey O. Banks Delta Pumping Plant	252,515	196,006	174,677	250,206	56,935	15,772
South Bay Diversions (So. bay P.P.)	10,182	10,132	14,646	11,857	14,155	15,391
Storage Change	-5,284	5,139	-259	2,361	-1,118	-2,493
Operational Losses (-), Gains (+)	-331	1,089	-758	-873	-806	-1,826
Delivered to Contracting Agencies	248	108	364	1,073	1,020	1,243
Outflow at Check 12	247,038	181,716	159,168	234,042	42,072	-195
South Bay Aqueduct						
Pumped at South Bay P.P.	10,182	10,132	14,646	11,857	14,155	15,391
Inflow from Lake Del Valle	0	0	0	0	341	758
Outflow at Del Valle P.P.	0	2,737	6,859	0	0	0
Operational Losses (-), Gains (+)	-10	-10	-10	-10	-10	-10
Delivered to Contracting Agencies: Project Water	8,173	6,753	6,107	11,408	13,800	15,454
Del Valle Inflow Exchanged and Released from Aqueduct	1,999	632	1,670	436	138	68
Del Valle Inflow Released from Aqueduct	0	0	0	0	0	0
Storage Change	0	0	0	0	0	0
Del Valle Stored Exchange and Released from Aqueduct	0	0	0	3	548	617
Lake Del Valle Operation: End-of-Month Storage	26,485	29,781	39,267	39,484	38,953	37,779
Storage Change	1,962	3,296	9,486	217	-531	-1,174
SAN LUIS FIELD DIVISION						
O'Neill Forebay Operation						
End-of-Month Storage	52,437	40,305	44,557	47,309	43,515	51,260
Storage Change	4,996	-12,132	4,252	2,752	-3,794	7,745
Inflow, California Aqueduct	247,038	181,716	159,168	234,042	42,072	-195
Inflow, O'Neill P-G Plant	198,666	146,064	73,941	69,493	4,514	0
Inflow, San Luis P-G Plant	0	0	0	18,699	328,420	618,173
Delivered to Federal Customers	837	330	871	1,853	3,357	5,506
Outflow, O'Neill P-G Plant	0	0	1,515	2,850	35,257	44,419
Outflow, San Luis P-G Plant	132,332	113,264	21,043	10,553	0	0
Operational Losses (-), Gains (+)	-8,922	272	4,499	-4,505	-10,649	-7,375
Outflow, Dos Amigos P.P.	298,617	226,590	200,929	299,721	329,537	552,933
San Luis Reservoir Operation						
End-of-Month Storage	1,900,048	2,005,641	2,026,692	2,014,635	1,687,728	1,078,310
Storage Change	132,630	105,593	21,051	-12,057	-326,907	-609,418
Inflow, San Luis P-G Plant	132,332	113,264	21,043	10,553	0	0
Operational Losses (-), Gains (+)	298	-7,671	8	-3,911	1,513	8,755
Outflow, San Luis P-G Plant	0	0	0	18,699	328,420	618,173

AQUEDUCT OPERATION

1981

(in acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							DELTA FIELD DIVISION
							North Bay Aqueduct
1,091	1,131	1,140	831	626	380	9,027	Pumped at Cordelia Pumping Plant
3	-12	11	-1	-7	8	8	Storage Change
6	-24	0	0	0	0	-18	Operational Losses (-), Gains (+)
1,094	1,119	1,129	832	633	372	9,001	Delivered to Contracting Agency
							California Aqueduct
144,181	302,171	188,801	224,822	187,893	266,098	2,260,077	Pumped at Harvey O. Banks Delta Pumping Plant
17,400	17,396	15,173	14,692	10,972	12,921	164,917	South Bay Diversions (So. Bay P.P.)
2,393	-64	923	747	-1,107	335	1,593	Storage Change
-2,816	-3,518	-2,433	1,542	324	1,475	-8,911	Operational Losses (-), Gains (+)
1,601	940	546	257	34	5	7,439	Delivered to Contracting Agencies
119,971	280,381	169,726	210,668	178,318	254,312	2,077,217	Outflow at Check 12
							South Bay Aqueduct
17,400	17,396	15,173	14,692	10,972	12,921	164,917	Pumped at South Bay P.P.
1,812	1,585	1,886	0	0	0	6,382	Inflow from Lake Del Valle
0	0	0	0	0	0	9,596	Outflow at Del Valle P.P.
-10	-10	-10	-9	-10	-10	-119	Operational Losses (-), Gains (+)
17,199	16,893	17,033	14,605	10,347	10,655	148,427	Delivered to Contracting Agencies: Project Water
76	105	16	78	615	2,256	8,089	Del Valle Inflow Exchanged and Released from Aqueduct
0	0	0	0	0	0	0	Del Valle Inflow Released from Aqueduct
0	0	0	0	0	0	0	Storage Change
1,927	1,973	0	0	0	0	5,068	Del Valle Stored Exchange and Released from Aqueduct
35,564	33,640	31,430	31,303	31,818	34,022	--	Lake Del Valle Operation: End-of-Month Storage
-2,215	-1,924	-2,210	-127	515	2,204	9,499	Storage Change
							SAN LUIS FIELD DIVISION
							O'Neill Forebay Operation
50,326	51,821	48,176	50,006	49,474	51,153	--	End-of-Month Storage
-934	1,495	-3,645	1,830	-532	1,679	3,712	Storage Change
119,971	280,381	169,726	210,668	178,318	254,312	2,077,217	Inflow, California Aqueduct
2,717	33,043	73,873	41,694	76,925	42,648	763,578	Inflow, O'Neill P-G Plant
574,302	262,931	11,016	0	48,594	139,324	2,001,459	Inflow, San Luis P-G Plant
7,475	6,955	3,545	1,118	388	471	32,706	Delivered to Federal Customers
30,906	9,715	2,060	951	815	4,950	133,438	Outflow, O'Neill P-G Plant
0	6,488	19,940	0	0	0	303,620	Outflow, San Luis P-G Plant
-15,626	-7,775	-3,647	-3,940	-5,266	-9,709	-81,641	Operational Losses (-), Gains (+)
643,917	543,927	229,068	244,523	297,900	419,475	4,287,137	Outflow, Dos Amigos P.P.
							San Luis Reservoir Operation
514,265	258,742	263,381	261,485	214,454	79,267	--	End-of-Month Storage
-564,045	-255,523	4,639	-1,896	-47,031	-135,187	-1,688,151	Storage Change
0	6,488	19,940	0	0	0	303,620	Inflow, San Luis P-G Plant
10,257	920	-4,285	-1,896	1,563	4,137	9,688	Operational Losses (-), Gains (+)
547,302	262,931	11,016	0	48,594	139,324	2,001,459	Outflow, San Luis P-G Plant

TABLE 4: SUMMARY OF CALIFORNIA

1981

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
SAN LUIS FIELD DIVISION (Contd)						
California Aqueduct (Pools 14 thru 21)						
Inflow, Dos Amigos P.P. (State)	190,013	168,873	157,954	212,176	211,585	313,804
Inflow, Dos Amigos P.P. (Federal)	108,604	57,717	42,975	87,545	117,952	239,129
Storage Change	-376	688	-1,374	873	-498	2,204
Delivered to Federal Customers	109,962	59,126	38,891	78,297	101,405	215,057
Operational Losses (-), Gains (+)	3,017	3,132	6,784	3,369	10,714	206
Outflow, Check 21 (State)	192,048	169,908	163,059	213,156	218,031	311,713
Outflow, Check 21 (Federal)	0	0	7,137	10,764	21,313	24,165
SAN JOAQUIN FIELD DIVISION						
California Aqueduct, Check 21 to Buena Vista Pumping Plant						
Inflow, Check 21 (State)	192,048	169,908	163,059	213,156	218,031	311,713
Inflow, Check 21 (Federal)	0	0	7,137	10,764	21,313	24,165
Inflow, Kern River Intertie (State)	0	0	0	0	0	0
Delivered to State Contracting Agencies	89,478	62,445	73,172	98,415	108,167	173,684
Delivered for Repayment of Preconsolidation Water	584	2,749	4,594	3,464	4,485	4,892
Delivered to Federal Customers	0	0	7,137	10,764	21,422	24,165
Coastal Br. Diversion (Las Per. P.P.)	6,022	6,467	7,971	15,191	22,985	25,142
Storage Change	621	403	-228	-95	38	-35
Operational Losses (-), Gains (+)	-1,940	-2,532	-1,124	-229	-852	-2,387
Outflow, Buena Vista P.P.	93,403	95,312	76,426	95,952	81,395	105,643
California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.						
Inflow, Buena Vista P.P.	93,403	95,312	76,426	95,952	81,395	105,643
Delivered to Contracting Agencies	9,284	14,938	7,511	5,452	13,272	30,382
Storage Change	-659	782	-216	199	-130	100
Operational Losses (-), Gains (+)	-670	1,293	569	1,261	506	-1,379
Outflow, Wheeler Ridge P.P.	84,108	80,885	69,700	91,562	68,759	73,782
California Aqueduct, Wheeler Ridge P.P. to Ira J. Chrisman Wind Gap P. P.						
Inflow, Wheeler Ridge P.P.	84,108	80,885	69,700	91,562	68,759	73,782
Delivered to Contracting Agencies	1,495	1,169	1,288	3,422	5,679	9,208
Storage Change	57	65	-61	3	31	-75
Operational Losses (-), Gains (+)	1,114	1,750	1,315	736	-415	290
Outflow, Ira J. Chrisman Wind Gap P. P.	83,670	81,401	69,788	88,873	62,634	64,939
California Aqueduct, Ira J. Chrisman Wind Gap P. P. to A. D. Edmonston P. P.						
Inflow, Ira J. Chrisman Wind Gap P. P.	83,670	81,401	69,788	88,873	62,634	64,939
Delivered to Contracting Agencies	479	2,019	2,178	1,032	2,387	6,740
Storage Change	-157	-46	70	4	29	-44
Operational Losses (-), Gains (+)	-1,341	-2,232	1,113	-2,615	-117	-455
Outflow, A. D. Edmonston P.P.	82,007	77,196	66,427	85,222	60,101	57,788
Coastal Branch, California Aqueduct						
Inflow, Las Perillas P.P.	6,022	6,467	7,971	15,191	22,985	25,142
Delivered to Contracting Agencies	5,864	6,269	7,761	14,518	20,863	22,664
Storage Change	11	2	-30	8	9	2
Operational Losses (-), Gains (+)	-147	-200	-240	-665	-2,113	-2,476

AQUEDUCT OPERATION

1981
(in acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							SAN LUIS FIELD DIVISION (Contd)
							California Aqueduct (Pools 14 thru 21)
360,699	337,894	178,117	208,563	218,035	243,723	2,801,436	Inflow, Dos Amigos P.P. (State)
283,218	206,033	50,951	35,960	79,865	175,752	1,485,701	Inflow, Dos Amigos P.P. (Federal)
-1,131	93	-1,392	0	593	832	512	Storage Change
257,452	186,173	45,891	31,971	82,796	180,517	1,387,538	Delivered to Federal Customers
7,954	10,414	8,891	2,134	6,515	10,588	73,718	Operational Losses (-), Gains (+)
369,505	345,729	184,399	209,737	221,026	248,714	2,847,025	Outflow, Check 21 (State)
26,045	22,346	9,061	4,949	0	0	125,780	Outflow, Check 21 (Federal)
							SAN JOAQUIN FIELD DIVISION
							California Aqueduct, Check 21 to Buena Vista Pumping Plant
369,505	345,729	184,399	209,737	221,026	248,714	2,847,025	Inflow, Check 21 (State)
26,045	22,346	9,061	4,949	0	0	125,780	Inflow, Check 21 (Federal)
0	0	0	0	0	0	0	Inflow, Kern River Intertie (State)
201,489	180,727	76,564	88,951	91,923	93,275	1,338,290	Delivered to State Contracting Agencies
6,015	4,540	1,146	528	2,715	10,348	46,060	Delivered for Repayment of Preconsolidation Water
32,045	26,346	9,061	4,949	0	0	135,889	Delivered to Federal Customers
28,343	21,460	5,742	10,391	8,367	6,466	164,547	Coastal Br. Diversion (Las Per. P.P.)
-275	805	-404	-280	508	-301	757	Storage Change
-564	303	-1,697	-3,261	-3,631	-5,850	-23,764	Operational Losses (-), Gains (+)
127,369	134,500	99,654	106,886	113,882	133,076	1,263,498	Outflow, Buena Vista P.P.
							California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.
127,369	134,500	99,654	106,886	113,882	133,076	1,263,498	Inflow, Buena Vista P.P.
37,120	31,177	5,904	3,001	1,770	7,116	166,927	Delivered to Contracting Agencies
-110	487	-314	91	-16	-8	206	Storage Change
901	1,991	909	1,757	2,559	2,959	12,656	Operational Losses (-), Gains (+)
91,260	104,827	94,973	105,551	114,687	128,927	1,109,021	Outflow, Wheeler Ridge P.P.
							California Aqueduct, Wheeler Ridge P.P. to Ira J. Chrisman Wind Gap P.P.
91,260	104,827	94,973	105,551	114,687	128,927	1,109,021	Inflow, Wheeler Ridge P.P.
10,163	7,934	4,261	2,061	3,602	4,489	54,771	Delivered to Contracting Agencies
16	-27	-24	56	-34	38	45	Storage Change
-889	-1,446	-868	-1,968	-1,032	-1,390	-2,803	Operational Losses (-), Gains (+)
80,192	95,474	89,868	101,466	110,087	123,010	1,051,402	Outflow, Ira J. Chrisman Wind Gap P.P.
							California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmonston P.P.
80,192	95,474	89,868	101,466	110,087	123,010	1,051,402	Inflow, Ira J. Chrisman Wind Gap P.P.
9,103	8,557	1,951	245	385	1,282	36,358	Delivered to Contracting Agencies
7	-64	158	-77	-26	80	-66	Storage Change
-364	188	158	-478	-413	667	-8,115	Operational Losses (-), Gains (+)
70,718	87,169	87,917	100,820	109,315	122,315	1,006,995	Outflow, A. D. Edmonston P.P.
							Coastal Branch, California Aqueduct
28,343	21,460	5,742	10,391	8,367	6,466	164,547	Inflow, Las Perillas P.P.
25,168	19,433	5,512	9,497	7,613	6,153	151,315	Delivered to Contracting Agencies
-13	9	10	4	-4	-11	-7	Storage Change
-3,188	-2,018	-220	-890	-758	-324	-13,239	Operational Losses (-), Gains (+)

TABLE 4: SUMMARY OF CALIFORNIA

1981

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
SOUTHERN FIELD DIVISION						
California Aqueduct, A. D. Edmonston P. P. to Junction of West Branch						
Inflow, A. D. Edmonston P.P.	82,007	77,196	66,427	85,222	60,101	57,788
Storage Change	4	-7	5	-2	0	1
Operationsl Losses (-), Gains (+)	-12	-8	-17	-12	-21	-22
Outflow, West Branch	30,264	40,398	46,551	33,379	10,560	3,367
Outflow, East Branch	51,727	36,797	19,854	51,833	49,520	54,398
California Aqueduct, Junction of West Branch to Pearblossom P.P.						
Inflow	51,727	36,797	19,854	51,833	49,520	54,398
Delivered to Contracting Agencies	1,111	1,421	2,676	9,242	10,344	11,571
Storage Change	358	-50	188	-237	248	-140
Operational Losses (-), Gains (+)	-897	-604	-1,272	-907	-1,580	-1,595
Outflow, Pearblossom P.P.	49,361	34,822	15,718	41,921	37,348	41,372
California Aqueduct, Pearblossom P.P. to Silverwood Lake						
Inflow, Pearblossom P.P.	49,361	34,822	15,718	41,921	37,348	41,372
Deliveries (Exchange of natural inflow)	962	724	848	834	774	489
Storage Change	-33	20	-25	8	6	1
Operational Losses (-), Gains (+)	226	1,325	-210	-1,696	-1,566	-2,210
Outflow to Silverwood Lake	48,658	35,403	14,685	39,383	35,002	38,672
Silverwood Lake Operation						
End-of-Month Storage	64,632	71,691	70,875	71,749	69,744	70,233
Storage Change	-4,121	7,059	-816	874	-2,005	489
Inflow, Project	48,658	35,403	14,685	39,383	35,002	38,672
Inflow, Natural	740	526	1,623	602	307	57
Delivered to Contracting Agencies	105	83	91	85	146	171
Outflow, Natural Inflow Released	285	15	319	17	18	17
Outflow, Project Water at San Bernardino Tunnel	53,620	27,975	17,227	40,001	38,818	39,860
Operational Losses (-), Gains (+)	491	-797	513	992	1,668	1,808
California Aqueduct, Silverwood Lake to Lake Perris						
Inflow, San Bernardino Tunnel	53,620	27,975	17,227	40,001	38,818	39,860
Delivered to Contracting Agencies	24,566	16,698	10,270	34,454	38,735	39,708
Storage Change	2	-1	5	-4	2	4
Operational Losses (-), Gains (+)	2	-1	5	-2	2	-3
Outflow to Lake Perris	29,054	11,277	6,957	5,549	83	145
Lake Perris Operation						
End-of-Month Storage	119,184	123,828	124,442	118,580	100,928	82,570
Storage Change	18,972	4,644	614	-5,862	-17,652	-18,358
Inflow	29,054	11,277	6,957	5,549	83	145
Delivered to Contracting Agencies	9,025	5,375	6,057	10,516	17,231	17,529
Operational Losses (-), Gains (+)	-1,057	-1,258	-286	-895	-504	-974
Outflow	0	0	0	0	0	0

AQUEDUCT OPERATION

1981

(In acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION
							California Aqueduct, A. D. Edmonston P.P. to Junction of West Branch
70,718	87,169	87,917	100,820	109,315	122,422	1,007,102	Inflow, A. D. Edmonston P.P.
4	3	-5	7	1	-1	10	Storage Change
-29	-28	-26	-21	-29	-40	-265	Operational Losses (-), Gains (+)
7,253	9,872	21,948	49,367	53,871	55,337	362,167	Outflow, West Branch
63,432	77,266	65,948	51,425	55,414	67,046	644,660	Outflow, East Branch
							California Aqueduct, Junction of West Branch to Pearblossom P.P.
63,432	77,266	65,948	51,425	55,414	67,046	644,555	Inflow
14,775	13,780	10,580	3,558	1,344	490	80,892	Delivered to Contracting Agencies
-725	806	-314	-72	587	-683	-34	Storage Change
-2,108	-2,041	-1,946	-1,564	-2,127	-2,941	-19,477	Operational Losses (-), Gains (+)
47,274	60,639	53,736	46,375	51,356	64,298	544,220	Outflow, Pearblossom P.P.
							California Aqueduct, Pearblossom P.P. to Silverwood Lake
47,274	60,639	53,736	46,375	51,356	64,298	544,220	Inflow, Pearblossom P.P.
217	236	1	0	20	72	5,177	Deliveries (Exchange of natural inflow)
43	4	-122	2	26	55	-15	Storage Change
-1,842	-1,318	-770	-236	-1,081	-1,852	-11,230	Operational Losses (-), Gains (+)
45,172	59,081	53,087	46,137	50,229	62,319	527,828	Outflow to Silverwood Lake
							Silverwood Lake Operation
- 67,567	60,647	66,082	68,215	60,769	57,996	--	End-of-Month Storage
-2,666	-6,920	5,435	2,133	-7,446	-2,773	-10,757	Storage Change
45,172	59,081	53,087	46,137	50,229	62,319	527,828	Inflow, Project
1	0	0	7	70	78	4,011	Inflow, Natural
194	222	184	115	107	108	1,611	Delivered to Contracting Agencies
17	15	13	15	15	14	760	Outflow, Natural Inflow Released
49,142	67,211	48,970	44,896	59,314	67,814	554,848	Outflow, Project Water at San Bernardino Tunnel
1,514	1,447	1,515	1,015	1,691	2,766	14,623	Operational Losses (-), Gains (+)
							California Aqueduct, Silverwood Lake to Lake Perris
49,142	67,211	48,970	44,896	59,314	67,814	554,848	Inflow, San Bernardino Tunnel
41,513	42,188	39,613	45,154	42,884	44,465	420,248	Delivered to Contracting Agencies
4	-5	5	1	6	-2	17	Storage Change
-3	-2	-2	259	-2	-1	252	Operational Losses (-), Gains (+)
7,622	25,026	9,350	0	16,422	23,350	134,835	Outflow to Lake Perris
							Lake Perris Operation
67,676	68,651	71,846	68,961	70,774	76,199	--	End-of-Month Storage
-14,894	975	3,195	-2,885	1,813	5,425	-24,013	Storage Change
7,622	25,026	9,350	0	16,422	23,350	134,835	Inflow
21,993	23,360	5,634	2,138	13,765	17,589	150,212	Delivered to Contracting Agencies
-523	-691	-521	-747	-844	-336	-8,636	Operational Losses (-), Gains (+)
0	0	0	0	0	0	0	Outflow

TABLE 4: SUMMARY OF CALIFORNIA

1981

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
SOUTHERN FIELD DIVISION (Contd)						
West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.						
Inflow	30,264	40,398	46,551	33,379	10,560	3,367
Storage Change	12	-22	15	-7	0	1
Delivered to Contracting Agencies	0	0	0	0	0	0
Operational Losses (-), Gains (+)	-37	-25	-52	-37	-65	-66
Outflow, Oso Pumping Plant	30,215	40,395	46,484	33,349	10,495	3,300
West Branch California Aqueduct Oso P.P. to Pyramid Lake						
Inflow, Oso P.P.	30,215	40,395	46,484	33,349	10,495	3,300
Storage Change	659	-431	545	-86	-236	236
Delivered to Contracting Agencies	0	0	0	0	0	0
Operational Losses (-), Gains (+)	256	73	1	-1	-164	-143
Outflow to Pyramid Lake	29,812	40,899	45,940	33,434	10,567	2,921
Pyramid Lake Operation						
End-of-Month Storage	165,650	160,660	165,612	163,086	163,551	162,433
Storage Change	23,420	-4,990	4,952	-2,526	465	-1,118
Inflow, Project (Gorman Creek)	29,812	40,899	45,940	33,434	10,567	2,921
Inflow, Natural (from local runoff)	1,218	1,684	7,169	2,495	1,227	469
Inflow, Pumpback from Elderb. Forebay	21,228	12,408	3,048	6,787	46,350	118,052
Operational Losses (-), Gains (+)	-2,591	-1,810	-602	-3,721	-4,523	-10,954
Outflow, Angeles Tunnel	25,017	57,102	46,836	38,404	49,950	110,397
Outflow, Natural Inflow Released to Piru Creek	1,230	1,069	3,767	3,117	3,206	1,209
Elderberry Forebay Operation						
End-of-Month Storage	20,113	24,467	20,659	24,467	23,496	22,422
Storage Change	-1,419	4,354	-3,808	3,808	-971	-1,074
Inflow, Project thru Castaic P-G Plant	25,017	57,102	46,836	38,404	49,950	110,397
Inflow, Natural	410	303	1,106	296	128	4
Operational Losses (-), Gains (+)	1,435	-329	-614	792	2,895	8,344
Outflow, Pumpback to Pyramid Lake	21,228	12,408	3,048	6,787	46,350	118,052
Outflow, Project Water Released to Castaic Lake	6,643	40,011	46,982	28,601	7,466	1,763
Outflow, Nautral Inflow Released to Castaic Lake	410	303	1,106	296	128	4
Castaic Lake Operation						
End-of-Month Storage	210,989	238,705	268,801	287,525	278,725	248,984
Storage Change	-3,637	27,716	30,096	18,724	-8,800	-29,741
Inflow, Project	6,643	40,011	46,982	28,601	7,466	1,763
Inflow, Natural	604	657	1,340	506	183	71
Inflow, Natural Release from Elderberry Forebay	410	303	1,106	296	128	4
Delivered to Contracting Agencies	11,451	12,707	18,573	11,020	16,449	32,082
Operational Losses (-), Gains (+)	626	1,205	2,143	1,000	251	925
Outflow, Castaic Afterbay	469	1,753	2,902	659	379	422
Castaic Lagoon Operation						
Inflow	469	1,753	2,902	659	379	422
Change in Storage	330	608	-12	-100	-88	-64
Operational Losses (-), Gains (+)	-21	-43	-45	-69	-92	-114
Outflow, Subsurface	118	167	167	178	185	218
Outflow, Surface	0	935	2,702	512	190	154

AQUEDUCT OPERATION

1981

(in acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION (Contd)
							West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.
7,253	9,872	21,948	49,367	53,871	55,337	362,167	Inflow
12	10	-15	22	5	-3	30	Storage Change
0	0	0	0	0	0	0	Delivered to Contracting Agencies
-87	-84	-80	-65	-88	-117	-803	Operational Losses (-), Gains (+)
7,154	9,778	21,883	49,280	53,778	55,223	361,334	Outflow, Oso Pumping Plant
							West Branch California Aqueduct Oso P.P. to Pyramid Lake
7,154	9,778	21,883	49,280	53,778	55,223	361,334	Inflow, Oso P.P.
-151	349	270	-292	67	89	1,019	Storage Change
0	0	0	0	0	0	0	Delivered to Contracting Agencies
-22	0	-72	0	1,896	0	1,824	Operational Losses (-), Gains (+)
7,283	9,429	21,541	49,572	55,607	55,134	362,139	Outflow to Pyramid Lake
							Pyramid Lake Operation
157,212	165,879	160,859	164,169	165,930	153,836	--	End-of-Month Storage
-5,221	8,667	-5,020	3,310	1,761	-12,094	11,606	Storage Change
7,283	9,429	21,541	49,572	55,607	55,134	362,139	Inflow, Project (Gorman Creek)
245	253	286	400	617	696	16,759	Inflow, Natural (from local runoff)
100,107	105,186	49,504	57,646	25,637	38,105	584,058	Inflow, Pumpback from Elderb. Forebay
-8,123	-8,129	-2,708	-6,368	-5,263	5,683	-60,475	Operational Losses (-), Gains (+)
103,734	96,899	72,925	97,256	74,375	99,959	872,854	Outflow, Angeles Tunnel
999	1,173	718	684	462	387	18,021	Outflow, Natural Inflow Released to Piru Creek
							Elderberry Forebay Operation
30,193	24,852	31,875	25,024	23,496	30,764	--	End-of-Month Storage
7,771	-5,341	7,023	-6,851	-1,528	7,268	9,232	Storage Change
103,734	96,899	72,925	97,256	74,375	99,959	872,854	Inflow, Project thru Castaic P-G Plant
0	0	0	12	24	32	2,315	Inflow, Natural
6,274	7,869	1,740	1,093	-2,765	1,810	28,544	Operational Losses (-), Gains (+)
100,107	105,186	49,504	57,646	25,637	38,105	584,058	Outflow, Pumpback to Pyramid Lake
2,130	4,923	18,138	47,554	47,501	56,396	308,108	Outflow, Project Water Released to Castaic Lake
0	0	0	12	24	32	2,315	Outflow, Natural Inflow Released to Castaic Lake
							Castaic Lake Operation
212,369	171,171	155,361	180,964	211,873	252,171	--	End-of-Month Storage
-36,615	-41,198	-15,810	25,603	30,909	40,298	37,545	Storage Change
2,130	4,923	18,138	47,554	47,501	56,396	308,108	Inflow, Project
18	10	13	74	104	121	3,737	Inflow, Natural
0	0	0	12	24	32	2,315	Inflow, Natural Release from Elderberry Forebay
38,591	44,805	34,901	24,217	20,932	18,389	284,741	Delivered to Contracting Agencies
41	-692	1,209	2,180	4,326	2,288	16,126	Operational Losses (-), Gains (+)
213	634	269	0	150	150	8,000	Outflow, Castaic Afterbay
							Castaic Lagoon Operation
213	634	269	0	150	150	8,000	Inflow
-10	-15	-47	-283	19	-52	286	Change in Storage
-138	-129	-122	-79	-93	-48	-993	Operational Losses (-), Gains (+)
37	520	194	204	38	154	2,180	Outflow, Subsurfaces
48	0	0	0	0	0	4,339	

PUMPING PLANTS

SECTION III

TABLE 5: PROJECT PUMPING PLANTS

1981

(in acre-feet)

PUMPING PLANTS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
Hyatt	10,843	5,681	4,564	2,645	9,841	40,868	1,660	10,420	38,464	56,766	12,052	0	193,804
Thermalito	9,570	5,982	5,286	4,537	12,712	36,736	1,431	11,163	40,338	57,807	11,237	0	196,799
Cordelia	398	489	478	680	798	969	1,189	1,204	1,240	849	637	383	9,314
Harvey O. Banks Delta: State	235,535	180,186	166,277	241,429	54,409	15,772	142,717	257,720	186,939	221,906	185,704	198,813	2,087,407
Federal	16,980	15,820	8,400	8,777	2,526	0	1,464	44,451	1,862	2,916	2,189	67,285	172,670
South Bay	10,182	10,132	14,646	11,857	14,155	15,391	17,400	17,396	15,173	14,692	10,972	12,921	164,917
Del Valle	0	2,737	6,859	0	0	0	0	0	0	0	0	0	9,596
1/ San Luis: State	25,032	2,539	939	14	0	0	0	3,746	313	0	0	0	32,583
Federal	107,300	110,725	20,104	10,539	0	0	0	2,742	19,627	0	0	0	271,037
2/ O'Neill: Federal	198,666	146,064	73,941	69,493	4,514	0	2,717	33,043	73,873	41,694	76,925	42,648	763,578
State	0	0	0	0	0	0	0	0	0	0	0	0	0
1/ Dos Amigos: State	190,013	168,873	157,954	212,176	211,585	313,804	360,699	337,894	178,117	208,563	218,035	243,723	2,801,436
Federal	108,604	57,717	42,975	87,545	117,952	239,129	283,218	206,033	50,951	35,960	79,865	175,752	1,485,701
Las Perillas	6,022	6,467	7,971	15,191	22,985	25,142	28,343	21,460	5,742	10,391	8,367	6,466	164,547
Badger Hill	6,204	6,559	8,091	15,449	23,651	25,717	28,382	21,408	5,648	10,427	8,297	6,657	166,490
Buena Vista	93,403	95,312	76,426	95,952	81,395	105,143	127,369	134,500	99,654	106,886	113,882	133,276	1,263,198
Wheeler Ridge	84,108	80,885	69,700	91,562	68,759	73,782	91,260	104,735	94,973	105,551	114,687	128,927	1,108,929
Ira J. Chrisman Wind Gap	83,670	81,401	69,788	88,873	62,634	64,939	80,192	95,474	89,868	101,466	110,087	123,010	1,051,402
A. D. Edmonston	82,007	77,196	66,427	85,222	60,101	57,788	70,718	86,869	87,917	100,820	109,315	122,422	1,006,802
Oso	30,215	40,395	46,484	33,349	10,495	3,300	7,154	9,778	21,883	49,280	53,778	55,223	361,334
Castaic	25,017	57,102	46,836	38,404	49,950	110,397	103,734	96,899	72,925	97,256	74,375	99,959	872,854
Pearblossom	21,228	12,408	3,048	6,787	46,350	118,052	100,107	105,186	49,504	57,646	25,637	38,105	584,058

1/ Joint State-federal facility

2/ O'Neill Pumping Plant is a federal USBR facility

SAN LUIS
JOINT - USE FACILITIES

SECTION IV

TABLE 6: MONTHLY OPERATIONS SUMMARY, STATE-FEDERAL SAN LUIS JOINT-USE FACILITIES

19 81

(in acre-feet except as noted)

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Check 12	State	230,058	165,896	150,768	225,265	39,546	-195	118,507	235,930	167,864	207,752	176,129	187,027	1,904,547
	Federal	16,980	15,820	8,400	8,777	2,526	0	1,464	44,451	1,862	2,916	2,189	67,285	172,670
	Total	247,038	181,716	159,168	234,042	42,072	-195	119,971	280,381	169,726	210,668	178,318	254,312	2,077,217
O'Neill Pumping and Generating Plant Amount Pumped	State	0	0	0	0	0	0	0	0	0	0	0	0	0
	Federal	198,666	146,064	73,941	69,493	4,514	0	2,717	33,043	73,873	41,694	76,925	42,648	763,578
	Total	198,666	146,864	73,941	69,493	4,514	0	2,717	33,043	73,873	41,694	76,925	42,648	763,578
Released for Generation	Federal	0	0	1,515	2,850	35,257	44,419	30,906	9,715	2,060	951	815	4,950	133,438
O'Neill Forebay End-of-Month Storage	State	26,193	20,827	10,228	20,825	17,222*	25,349	27,600	14,555	22,999	20,021	23,813	23,696	XXXX
	Federal	26,244	19,478	34,329	26,484	26,293	25,911	22,726	37,266	25,177	29,985	25,661	27,457	XXXX
	Total	52,437	40,305	44,557	47,309	43,515	51,260	50,326	51,821	48,176	50,006	49,474	51,153	XXXX
San Luis Reservoir End-of-Month Storage	State	1,063,147	1,061,467	1,062,410	1,060,273	895,693	610,160	362,764	170,075 1/	147,778	146,735	99,001	39,708	XXXX
	Federal	836,901	944,174	964,282	954,362	792,035	468,150	151,501	88,667 1/	115,603	114,750	115,453	39,559	XXXX
	Total	1,900,048	2,005,641	2,026,692	2,014,635	1,687,728	1,078,310	514,265	258,742	263,381	261,485	214,454	79,267	XXXX
San Luis Pumping and Generating Plant Amount Pumped	State	25,032	2,539	939	14	0	0	0	3,746	313	0	0	0	32,583
	Federal	107,300	110,725	20,104	10,539	0	0	0	2,742	19,627	0	0	0	271,037
	Total	132,332	113,264	21,043	10,553	0	0	0	6,488	19,940	0	0	0	303,620
Released for Generation	State	0	0	0	0	165,412	290,348	253,037	96,941	11,016	0	48,594	61,568	926,916
	Federal	0	0	0	18,699	163,008	327,825	321,265	165,990	0	0	0	77,765	1,074,543
	Total	0	0	0	18,699	328,420	618,173	574,302	262,931	11,016	0	48,594	139,324	2,001,459
Dos Amigos Pumping Plant Amount Pumped	State	190,013	168,873	157,954	212,176	211,585	313,804	360,699	337,894	178,117	208,563	218,035	243,723	2,801,436
	Federal	108,604	57,717	42,975	87,545	117,952	239,129	283,218	206,033	50,951	35,960	79,865	175,752	1,485,701
	Total	298,617	226,590	200,929	299,721	329,537	552,933	643,917	543,927	229,068	244,523	297,900	419,475	4,287,137

*Includes 8881 ac-ft pumped at Tracy for State.

1/ 8/14/81 loaned USBR 100,000 ac-ft in San Luis Reservoir.

OPERATION OF RESERVOIRS

SECTION V

TABLE 7: UPPER FEATHER AREA LAKES, MONTHLY OPERATION

1981
(in acre-feet except as noted)

Month	Lake Storage			Outflow							Inflow
	Water Surface* Elevation (in feet)	Storage*	Storage Change	Regulated Release				Spill	Estimated Evaporation and Seepage	Total Outflow	Computed or Estimated
				Streamflow Maint.	Water Supply Contract	Water Right Entitlement	Total Regulated Release				
	1	2	3	4	5	6	7	8	9	10	11
ANTELOPE LAKE				*Capacity* 22,566							
Jan	4993.99E	15,810	-388	1,230	0	0	1,230	0	53	1,283	895
Feb	4995.09	16,654	844	744	0	0	744	0	61	805	1,649
Mar	4996.64	17,888	1,234	615	0	0	615	0	95	710	1,944
Apr	4999.74E	20,515	2,627	619	0	0	619	0	270	889	3,516
May	5000.29	21,010	495	617	0	0	617	0	566	1,183	1,678
June	4999.33E	20,155	-855	619	0	0	619	0	599	1,218	363
July	4997.93E	18,955	-1,200	627	0	0	627	0	665	1,292	92
Aug	4996.48	17,758	-1,197	615	0	0	615	0	644	1,259	62
Sept	4995.35	16,857	-901	581	0	0	581	0	422	1,003	102
Oct	4995.07	16,638	-219	615	0	0	615	0	187	802	583
Nov	5002.65	23,172	6,534	611	0	0	611	1,197	138	1,946	8,480
Dec	5002.95	23,456	284	676	0	0	676	8,416	104	9,196	9,480
Tot	--	--	7,258	8,169	0	0	8,169	9,613	3,804	21,586	28,844
FRENCHMAN LAKE				*Capacity* 55,477							
Jan	5567.38	28,559	496	123	0	0	123	0	72	195	691
Feb	5568.38	29,613	1,054	109	0	0	109	0	73	182	1,236
Mar	5569.21	30,504	891	123	0	0	123	0	129	252	1,143
Apr	5569.39	30,700	196	89	696	183	968	0	361	1,329	1,525
May	5566.71	27,868	-2,832	0	2,922	0	2,922	0	486	3,408	576
June	5562.89	24,108	-3,760	0	3,170	0	3,170	0	690	3,860	100
July	5557.97	19,728	-4,380	0	3,596	0	3,596	0	814	4,410	30E
Aug	5555.31	17,579	-2,149	0	1,615	0	1,615	0	590E	2,205	56E
Sept	5554.65	17,070	-509	84	146	0	230	0	339E	569	60E
Oct	5554.64	17,063	-7	139	0	0	139	0	183	322	315
Nov	5561.78	23,074	6,011	125	0	0	125	0	129	254	6,265
Dec	5569.79	31,137	8,063	138	0	0	138	0	109	247	8,310
Tot	--	--	3,074	930	12,145	183	13,258	0	3,975	17,233	20,307
LAKE DAVIS				*Capacity* 84,371							
Jan	5770.85	68,547	1,823	314	1	0	315	0	250	565	2,388
Feb	5771.43	70,654	2,107	280	1	0	281	0	254	535	2,642
Mar	5771.95	72,572	1,918	574	1	0	575	0	441	1,016	2,934
Apr	5772.22	73,579	1,007	893	8	70	971	0	727	1,698	2,705
May	5771.91	72,424	-1,155	684	34	246	964	0	1,727	2,691	1,536
June	5771.12	69,524	-2,900	476	77	238	791	0	2,209	3,000	100E
July	5770.30	66,582	-2,942	307	89	246	642	0	2,340	2,982	40E
Aug	5769.49	63,744	-2,838	307	94	246	647	0	2,216	2,863	25E
Sept	5769.01	62,095	-1,649	295	38	217	550	0	1,440	1,990	341E
Oct	5769.27	62,986	891	321	11	0	332	0	818	1,150	2,041
Nov	5772.82	75,843	12,857	298	1	0	299	0	572	871	13,728
Dec	5773.90	80,009	4,166	6,632	0	0	6,632	0	425	7,057	11,223
Tot	--	--	13,285	11,381	355	1,263	12,999	0	13,419	26,418	39,703

E = estimated value

*At end of month.

TABLE 8: LAKE OROVILLE, MONTHLY OPERATION

(in acre-feet except as noted)

Capacity 3,537,577 acre-feet

MONTH	YEAR	WATER SURFACE ELEVATION* (in feet)	STORAGE*	STORAGE CHANGE	OUTFLOW						TOTAL INFLOW	
					POWER	PALERMO CANAL	SPILLWAY LEAKAGE	EVAPORATION	SPILL	TOTAL OUTFLOW	PUMPBACK	INFLOW 1/
JAN	1981	855.37	2,881,027	148,670	100,378	186	192	857	0	101,613	10,843	239,440
	1980	844.52	2,735,516	-78,469	620,744	71	2/	1,118	726,257	1,348,190	12,533	1,257,188
FEB	1981	870.06	3,086,606	205,579	118,022	11	246	1,731	0	120,010	5,681	319,908
	1980	854.40	2,867,802	132,286	517,799	82	2/	1,299	352,976	872,156	0	1,004,442
MAR	1981	881.90	3,259,687	173,081	192,232	35	448	2,228	0	194,943	4,564	363,460
	1980	856.26	2,893,199	25,397	527,457	169	284	2,870	0	530,780	1,581	554,596
APR	1981	891.45	3,404,282	144,595	176,665	245	813	4,708	0	182,431	2,645	324,381
	1980	876.14	3,174,648	281,449	169,201	460	383	4,191	0	174,235	12,309	443,375
MAY	1981	881.44	3,252,836	-151,446	361,311	856	928	7,070	0	370,165	9,841	208,878
	1980	887.52	3,344,234	169,586	262,727	1,029	823	6,294	0	270,873	28,392	412,067
JUN	1981	871.80	3,111,623	-141,213	309,240	1,066	780	10,827	0	321,913	40,868	139,832
	1980	872.23	3,117,827	-226,407	414,995	1,115	867	8,114	0	425,091	0	198,684
JUL	1981	839.73	2,672,943	-438,680	511,031	1,163	434	11,117	0	523,745	1,660	83,405
	1980	855.67	2,885,126	-232,701	383,436	1,291	524	10,250	0	395,501	3,517	159,283
AUG	1981	821.74	2,446,716	-226,227	311,049	1,159	4	9,201	0	321,413	10,420	84,766
	1980	838.77	2,660,516	-224,610	328,796	1,288	218	9,336	0	339,638	1,136	113,892
SEP	1981	814.06	2,354,401	-92,315	240,077	1,233	0	6,944	0	248,254	38,464	117,475
	1980	834.93	2,611,211	-49,305	159,470	1,166	63	7,115	0	167,814	3,469	115,040
OCT	1981	817.20	2,391,842	37,441	158,502	575	0	3,684	0	162,761	56,766	143,436
	1980	833.94	2,598,604	-12,607	168,644	839	61	5,713	0	175,257	34,212	128,438
NOV	1981	856.12	2,891,282	499,440	310,770	207	2/	1,368	193,143	505,488	12,052	992,876
	1980	835.55	2,619,128	20,524	102,737	451	60	2,804	0	106,052	0	126,576
DEC	1981	853.93	2,861,409	-29,873	801,324	0	2/	712	385,670	1,187,706	0	1,157,833
	1980	844.28	2,732,357	113,229	114,745	205	139	1,261	0	116,350	10,493	219,086
TOTAL	1981	--	--	129,052	3,590,601	6,736	3,845	60,447	578,813	4,240,442	193,804	4,175,690
	1980	--	--	81,628	3,770,751	8,166	3,422	60,365	1,079,233	4,921,937	107,642	4,732,667

* At end of month.

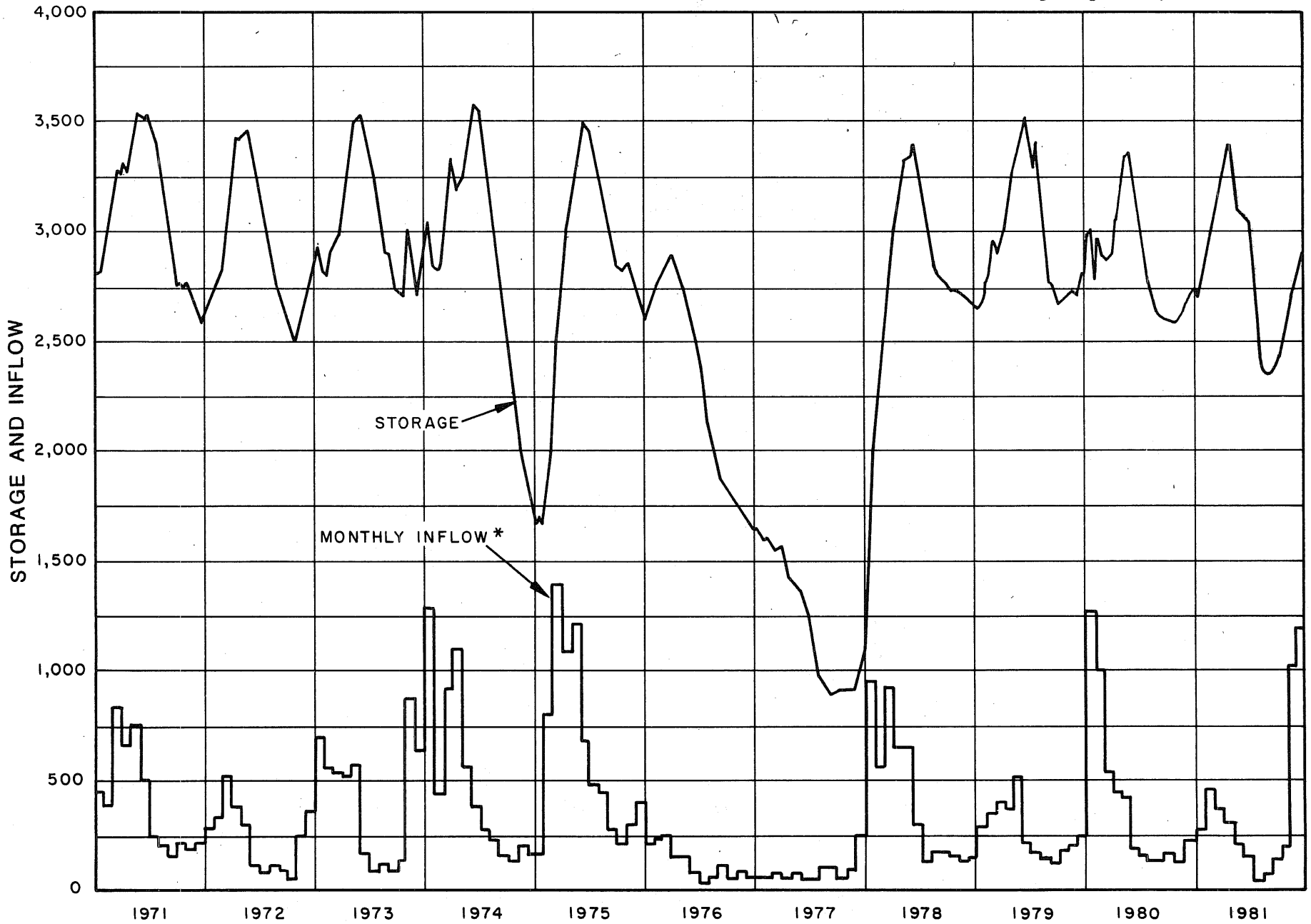
1/ Computed inflow excluding pumpback.

2/ Included in spill amount.

FIGURE E: LAKE OROVILLE OPERATION

(in thousands of acre-feet)

Capacity 3,537,577 acre-feet



*Includes pumpback.

FIGURE F: OPERATION OF LAKE OROVILLE FOR FLOOD CONTROL

1980-1981

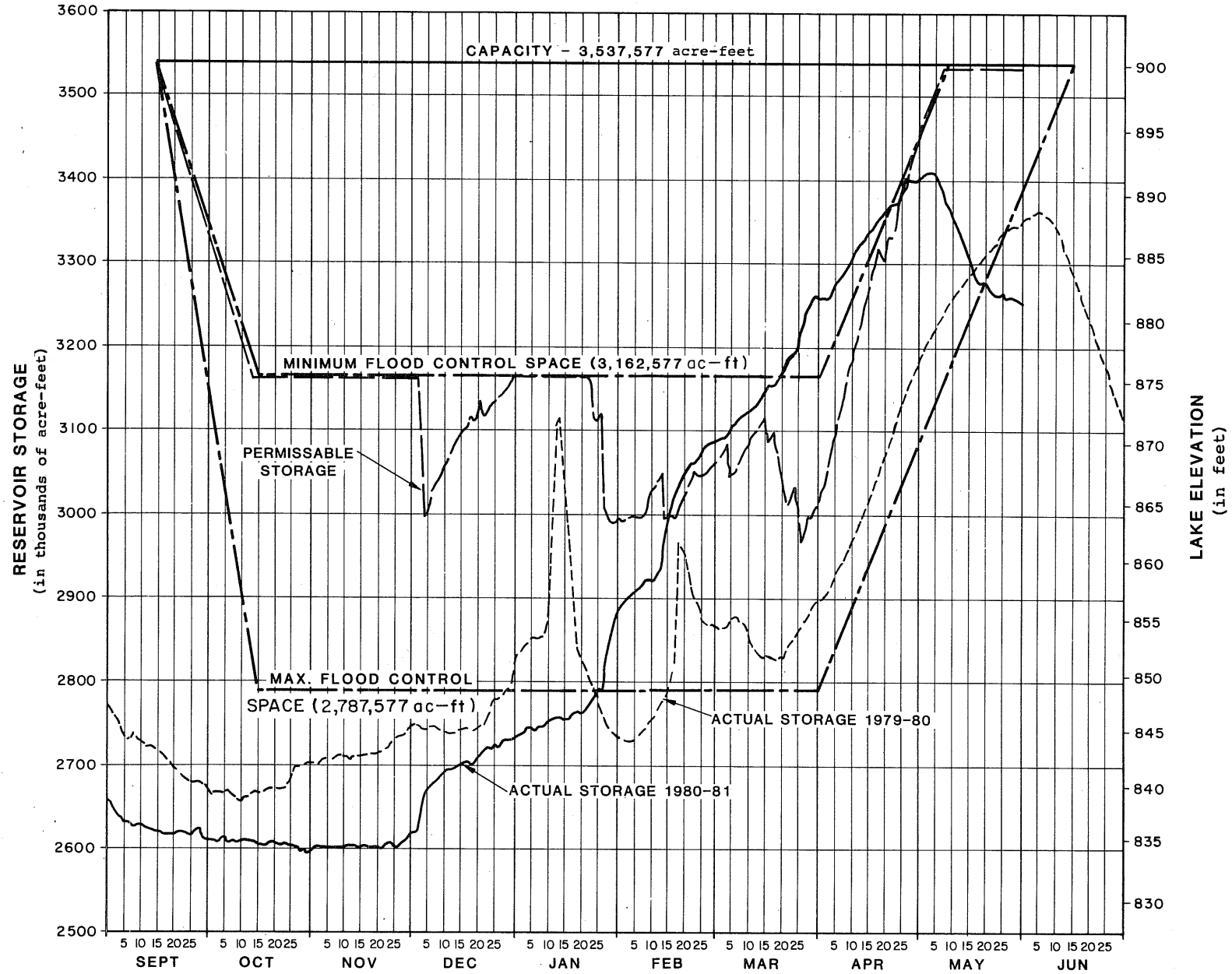


FIGURE G: LAKE OROVILLE ISOTHERMS

1981

(temperature in degrees fahrenheit)

DRAFT ELEVATION OF INTAKE STRUCTURES SHOW SHUTTER PLACEMENT AND TEMPERATURE OF WATER RELEASED AT DIFFERENT ELEVATIONS

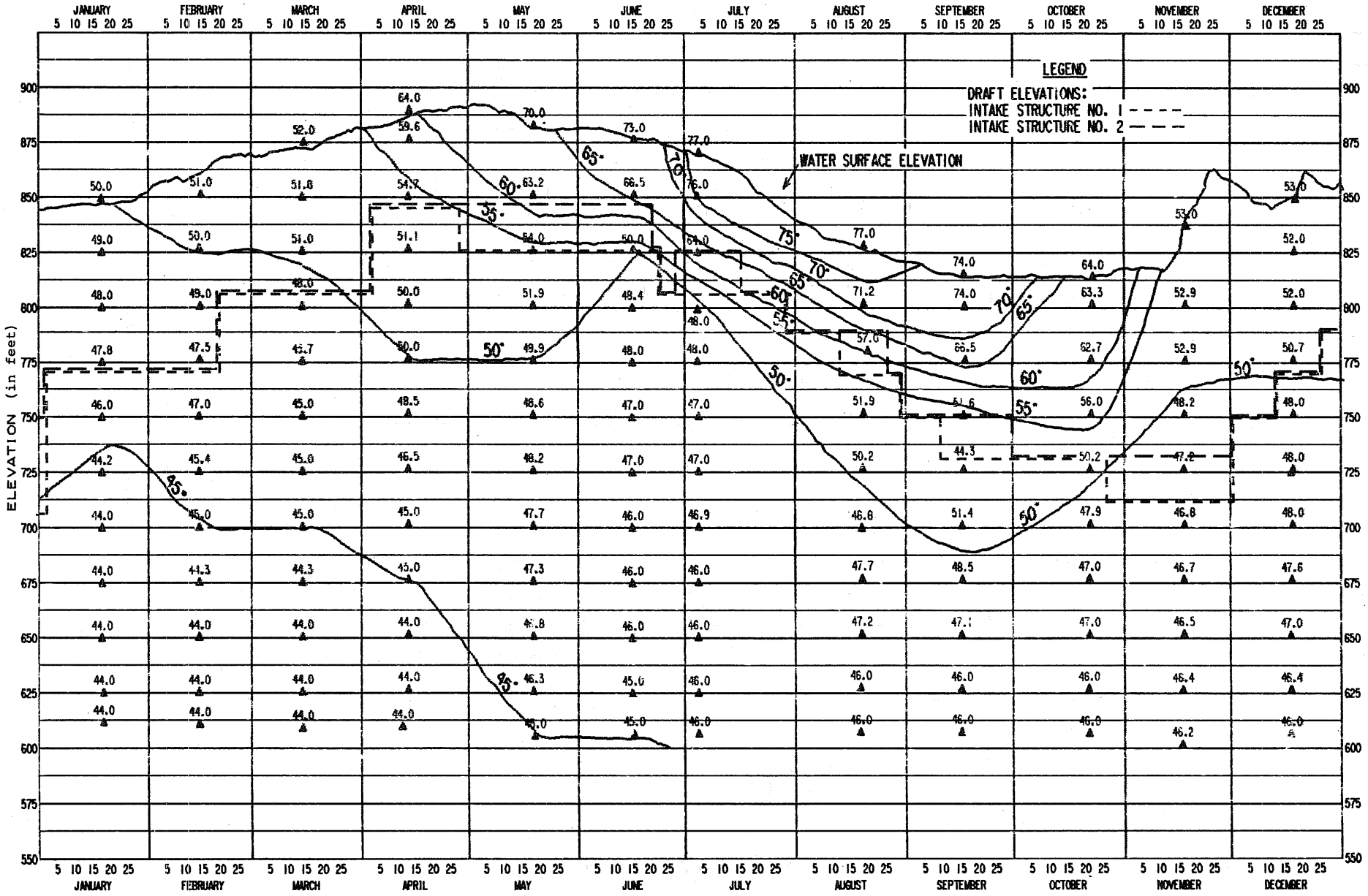


TABLE 9: OROVILLE-THERMALITO COMPLEX

MONTHLY STORAGE*

(elevation in feet, storage in acre-feet)

MONTH	YEAR	THERMALITO DIVERSION DAM POOL		THERMALITO FOREBAY		THERMALITO AFTERBAY	
		ELEVATION	STORAGE	ELEVATION	STORAGE	ELEVATION	STORAGE
JANUARY	1981	223.44	12,853	223.54	10,862	124.55	16,469
	1980	223.11	12,749	223.12	10,607	126.33	21,060
FEBRUARY	1981	223.80	12,967	223.60	10,899	124.60	16,591
	1980	224.83	13,298	222.74	10,377	127.68	24,881
MARCH	1981	223.04	12,727	223.60	10,899	126.00	20,172
	1980	223.26	12,796	223.66	10,935	124.87	17,257
APRIL	1981	223.22	12,783	223.20	10,655	127.12	23,259
	1980	223.85	12,983	224.12	11,219	125.40	18,598
MAY	1981	224.39	13,156	224.16	11,243	125.73	19,456
	1980	223.60	12,904	223.55	10,868	126.90	22,636
JUNE	1981	224.03	13,041	224.02	11,157	126.08	20,386
	1980	224.10	13,063	223.90	11,083	125.50	18,856
JULY	1981	224.28	13,121	223.36	10,752	127.26	23,659
	1980	223.62	12,910	223.42	10,789	126.98	22,861
AUGUST	1981	223.48	12,866	224.14	11,231	125.87	19,826
	1980	223.84	12,980	223.46	10,813	125.40	18,598
SEPTEMBER	1981	222.93	12,692	223.18	10,643	127.07	23,116
	1980	223.37	12,831	223.69	10,954	127.07	23,116
OCTOBER	1981	223.00	12,714	223.06	10,570	123.64	14,323
	1980	223.15	12,761	223.12	10,607	125.34	18,443
NOVEMBER	1981	224.17	13,086	221.68	9,747	128.16	26,312
	1980	223.33	12,818	223.20	10,655	123.41	13,801
DECEMBER	1981	224.43	13,169	221.76	9,794	127.89	25,502
	1980	223.88	12,993	223.66	10,935	126.01	20,199

*At end of month.

TABLE 10: CLIFTON COURT FOREBAY MONTHLY OPERATION

(elevation in feet, storage in acre-feet)

MONTH	YEAR	WATER SURFACE ELEVATION *	STORAGE *	STORAGE CHANGE	INFLOW
JANUARY	1981	-0.03	18,199	-710	251,805
	1980	1.42	21,325	1,900	387,967
FEBRUARY	1981	-0.55	17,079	-1,120	194,886
	1980	4.14	27,214	5,889	194,187
MARCH	1981	-0.35	15,360	-1,719	172,993
	1980	2.27	23,162	-4,052	65,750
APRIL	1981	-0.98	16,155	795	255,861
	1980	1.40	21,282	-1,880	88,757
MAY	1981	1.81	22,168	6,013	69,516
	1980	2.14	22,881	1,599	103,792
JUNE	1981	0.30	18,909	-3,259	19,973
	1980	-0.15	17,165	-5,716	179,224
JULY	1981	-0.16	17,919	-990	151,090
	1980	-0.37	17,467	302	138,495
AUGUST	1981	-0.89	16,520	-1,399	296,683
	1980	0.20	18,694	1,227	274,637
SEPTEMBER	1981	0.96	20,332	3,812	197,008
	1980	1.22	20,893	2,199	244,562
OCTOBER	1981	1.23	20,915	583	226,031
	1980	0.92	20,246	-647	185,265
NOVEMBER	1981	2.30	23,227	2,312	190,205
	1980	1.25	20,958	712	148,015
DECEMBER	1981	2.72	24,136	909	267,007
	1980	0.30	18,909	-2,049	178,375
TOTAL	1981	--	--	5,277	2,293,058
	1980	--	--	-516	3,621,835

*At end of month.

TABLE 11: LAKE DEL VALLE
MONTHLY OPERATION
1981
(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet) *	STORAGE *	STORAGE CHANGE	INFLOW		OUTFLOW				EVAPORATION (in feet)	PRECIPITATION (in inches)
				NATURAL	SOUTH BAY AQUEDUCT	SOUTH BAY AQUEDUCT	RECREATION 1/	ARROYO VALLE	TOTAL		
JANUARY	681.35	26,485	1,962	1,999	0	0	0	0	0	0.09	4.09
FEBRUARY	687.30	29,781	3,296	629	2,737	0	6	0	6	0.17	1.30
MARCH	702.08	39,267	9,486	2,725	6,859	0	0	0	0	0.24	3.21
APRIL	702.39	39,484	217	436	0	0	2	0	2	0.48	0.74
MAY	701.63	38,953	-531	138	0	341	0	0	341	0.67	0.28
JUNE	699.93	37,779	-1,174	68	0	758	16	0	774	0.98	0.00
JULY	696.63	35,564	-2,215	76	0	1,812	16	0	1,828	0.94	0.00
AUGUST	693.65	33,640	-1,924	105	0	1,585	21	0	1,606	0.85	0.00
SEPTEMBER	690.08	31,430	-2,210	16	0	1,886	17	0	1,903	0.64	0.08
OCTOBER	689.87	31,303	-127	78	0	0	14	0	14	0.37	2.24
NOVEMBER	690.72	31,818	515	615	0	0	6	0	6	0.17	4.44
DECEMBER	694.25	34,022	2,204	2,256	0	0	3	0	3	0.09	2.09
TOTAL	--	--	9,499	9,141	9,596	6,382	101	0	6,483	5.69	18.47

* At end of month.

1/ To East Bay Regional Park District.

TABLE 12: O'NEILL FOREBAY
MONTHLY OPERATION
(in acre-feet except as noted)

MONTH	YEAR	RESERVOIR STORAGE			INFLOW			OUTFLOW				COMPUTED GAIN (+) LOSS (-)
		WATER SURFACE ELEVATION (in feet) *	STORAGE *	STORAGE CHANGE	O'NEILL P-G PLANT PUMPING	SAN LUIS P-G PLANT GENERATION	CALIFORNIA AQUEDUCT CHECK 12	O'NEILL P-G PLANT GENERATION	SAN LUIS P-G PLANT PUMPING	DOS AMIGOS PUMPING	DELIVERIES	
JANUARY	1981	223.52	52,437	4,996	198,666	0	247,038	0	132,332	298,617	837	-8,922
	1980	223.42	52,172	6,779	0	0	380,139	5,186	192,404	182,915	745	7,890
FEBRUARY	1981	218.89	40,305	-12,132	146,064	0	181,716	0	113,264	226,590	330	272
	1980	219.75	42,508	-9,664	138,042	0	184,591	2,492	227,789	109,276	670	7,930
MARCH	1981	220.54	44,557	4,252	73,941	0	159,168	1,515	21,043	200,929	871	-4,499
	1980	219.23	41,171	-1,337	190,874	0	68,809	0	159,181	102,436	1,158	1,755
APRIL	1981	221.59	47,309	2,752	69,493	18,699	234,042	2,850	10,553	229,721	1,853	-4,505
	1980	223.48	52,333	11,162	182,436	0	73,908	0	46,783	185,795	2,717	-9,887
MAY	1981	220.14	43,515	-3,794	4,514	328,420	42,072	35,257	0	329,537	3,357	-10,649
	1980	221.42	46,862	-5,471	103,867	0	77,575	0	27,046	155,377	2,383	-2,107
JUNE	1981	223.08	51,260	7,745	0	618,173	-195	44,419	0	552,933	5,506	-7,375
	1980	220.64	44,819	-2,043	4,550	229,382	160,154	38,967	0	342,114	3,474	-11,574
JULY	1981	222.73	50,326	-934	2,717	574,302	119,971	30,906	0	643,917	7,475	-15,626
	1980	221.42	46,862	2,043	94,899	235,703	110,792	3,589	2,279	414,558	5,238	-13,687
AUGUST	1981	223.29	51,821	1,495	33,043	262,931	280,381	9,715	6,488	543,927	6,955	-7,775
	1980	222.51	49,742	2,880	37,927	165,973	256,620	6,544	0	435,825	6,276	-8,995
SEPTEMBER	1981	221.92	48,176	-3,645	73,873	11,016	169,726	2,060	19,940	299,068	3,545	-3,647
	1980	221.61	47,362	-2,380	85,282	18,351	226,554	9,438	166,491	161,151	4,020	8,533
OCTOBER	1981	221.61	50,006	1,830	41,694	0	210,668	951	0	244,523	1,118	-3,940
	1980	222.25	49,049	1,687	118,082	4,518	173,620	89	155,236	139,072	2,287	2,151
NOVEMBER	1981	222.41	49,474	-532	76,925	48,594	174,318	815	0	297,900	388	-5,266
	1980	222.67	50,116	1,117	193,976	0	134,128	0	129,739	186,464	861	-9,923
DECEMBER	1981	223.04	51,153	1,679	42,648	139,324	254,312	4,950	0	419,475	471	-9,709
	1980	222.64	47,441	-2,725	222,003	0	169,266	0	32,548	344,217	735	-16,494
TOTAL	1981	--	--	3,712	763,578	2,001,459	2,073,217	133,438	303,620	4,287,137	32,706	-81,641
	1980	--	--	2,048	1,371,938	653,927	2,016,156	66,305	1,139,496	2,759,200	30,564	-44,408

*At end of month.

TABLE 13: SAN LUIS RESERVOIR MONTHLY OPERATION

(in acre-feet except as noted)

MONTH	YEAR	RESERVOIR STORAGE			INFLOW	OUTFLOW			COMPUTED GAIN (+) LOSS (-)	EVAPORATION (in acre-feet)	PRECIPITATION (in inches)
		WATER SURFACE ELEVATION * (in feet)	TOTAL STORAGE *	STORAGE CHANGE	SAN LUIS P-G PLANT PUMPING	SAN LUIS P-G PLANT GENERATION	PACHECO TUNNEL (FUTURE FACILITY)				
JANUARY	1981	532.83	1,900,048	132,630	132,332	0			298	1,222	2.61
	1980	504.25	1,556,705	181,321	192,404	0			11,080	1,027	3.52
FEBRUARY	1981	541.25	2,005,641	105,593	113,264	0			-7,671	1,898	1.35
	1980	522.64	1,774,931	218,226	227,789	0			-9,563	1,702	3.16
MARCH	1981	542.91	2,026,692	21,051	21,043	0			8	3,116	2.17
	1980	534.70	1,923,308	148,377	159,181	0			-10,804	4,443	1.24
APRIL	1981	541.96	2,014,635	-12,057	10,553	18,699			-3,911	6,655	0.66
	1980	538.08	1,965,646	42,338	46,783	0			-4,445	6,241	0.38
MAY	1981	515.39	1,687,728	-326,907	0	328,420			1,513	10,798	0.01
	1980	539.78	1,987,061	21,415	27,046	0			-5,631	9,549	0.73
JUNE	1981	460.51	1,078,310	-609,418	0	618,173			8,755	12,952	0
	1980	521.13	1,756,653	-230,408	0	229,382			-1,026	11,016	0
JULY	1981	398.91	514,265	-564,045	0	574,302			10,257	11,169	0
	1980	501.33	1,522,951	-233,702	2,279	235,703			-278	12,355	0.27
AUGUST	1981	362.56	258,742	-255,523	6,488	262,931			920	7,107	0
	1980	486.18	1,351,986	-170,965	0	165,973			-4,992	11,246	0
SEPTEMBER	1981	363.32	263,381	4,639	19,940	11,016			-4,285	5,155	0
	1980	497.86	1,483,179	131,193	166,491	18,351			-16,947	7,825	0.03
OCTOBER	1981	363.01	261,485	-1,896	0	0			-1,896	2,608	0.84
	1980	509.38	1,616,591	133,412	155,236	4,518			-17,306	5,631	0
NOVEMBER	1981	355.01	214,454	-47,031	0	48,594			1,563	952	3.22
	1980	519.60	1,738,134	121,593	129,739	0			-8,146	2,951	0.12
DECEMBER	1981	326.01	79,267	-135,187	0	139,324			4,137	313	0.75
	1980	522.02	1,767,418	29,234	32,548	0			-3,314	1,180	0.48
TOTAL	1981	--	--	-1,688,151	303,620	2,001,459			9,688	63,945	11.61
	1980	--	--	392,037	1,139,496	653,927			-93,532	75,166	9.99

*At end of month.

FIGURE H: SAN LUIS RESERVOIR OPERATION

(in thousands of acre-feet)

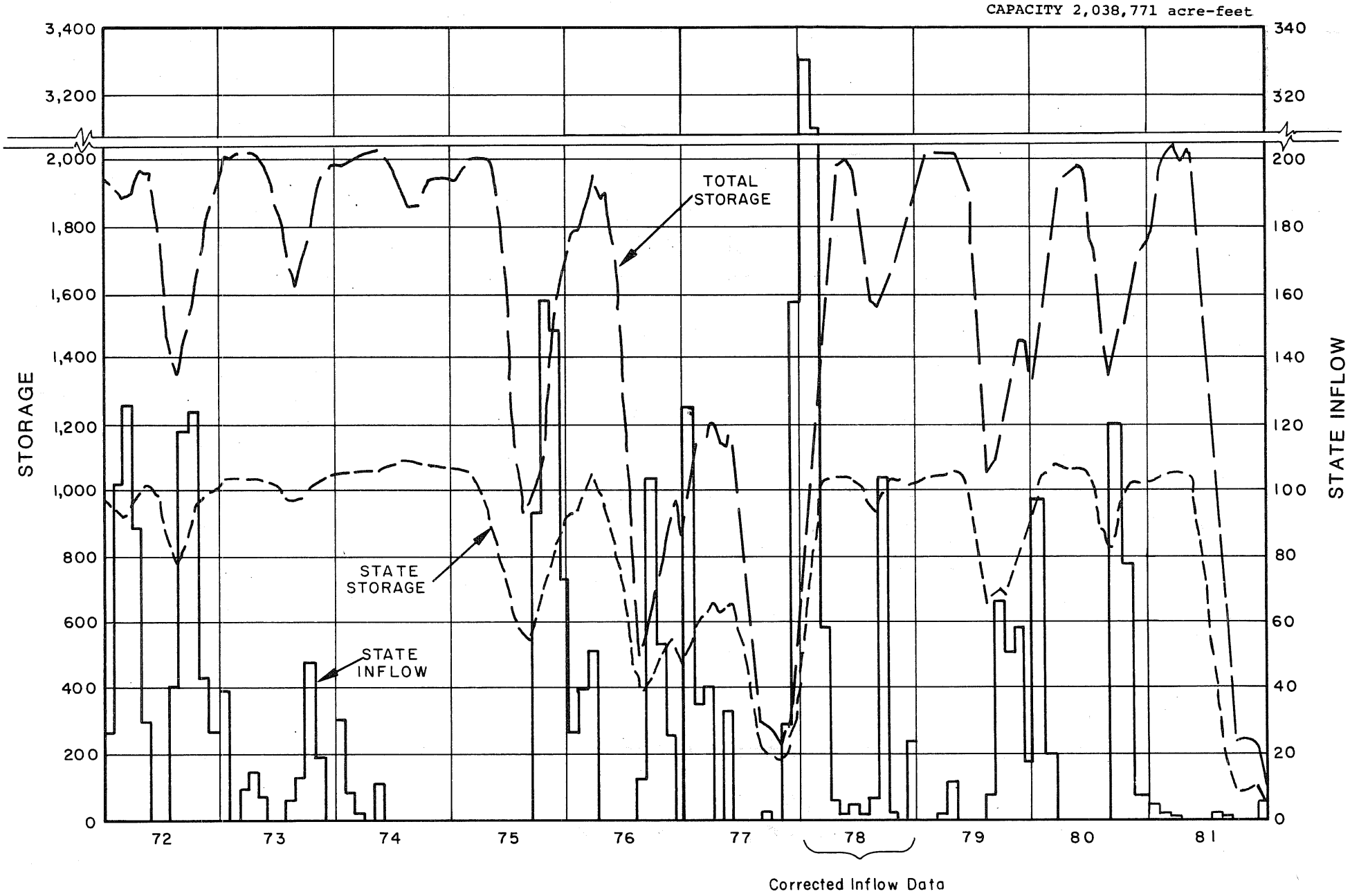


TABLE 14: PYRAMID LAKE
MONTHLY OPERATION
1981

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet) *	TOTAL STORAGE 1/ *	STORAGE CHANGE	INFLOW			OUTFLOW					COMPUTED LOSSES (-) GAINS (+)
				NATURAL	PROJECT		ANGELES TUNNEL	TO PIRU CREEK				
					GORMAN CREEK	PUMPBACK 2/		NATURAL INFLOW RELEASE 3/	PROJECT WATER FOR FISH ENHANCEMENT			
JAN	2,574.68	(1,239) 165,650	23,420	1,218	29,812	21,228	25,017	1,230				-2,591
FEB	2,570.71	(1,854) 160,660	-4,990	1,684	40,899	12,408	57,102	1,069				-1,810
MAR	2,574.65	(5,256) 165,612	4,952	7,169	45,940	3,048	46,836	3,767				-602
APR	2,572.65	(4,634) 163,086	-2,526	2,495	33,434	6,787	38,404	3,117				-3,721
MAY	2,573.02	(2,655) 163,551	465	1,227	10,567	46,350	49,950	3,206				-4,523
JUN	2,572.13	(1,915) 162,433	-1,118	469	2,921	118,052	110,397	1,209				-10,954
JUL	2,567.92	(1,161) 157,212	-5,221	245	7,283	100,107	103,734	999				-8,123
AUG	2,574.86	(241) 165,879	8,667	253	9,429	105,186	96,899	1,173				-8,129
SEP	2,570.87	(0) 160,859	-5,020	286	21,541	49,504	72,925	527			191	-2,708
OCT	2,573.51	(0) 164,169	3,310	400	49,572	57,646	97,256	400			284	-6,368
NOV	2,574.90	(155) 165,930	1,761	617	55,607	25,637	74,375	462				-5,263
DEC	2,565.15	(464) 153,836	-12,094	696	55,134	38,105	99,959	387				5,683
TOTAL			11,606	16,759	362,139	584,058	872,854	17,546	--	--	475	-60,475

* At end of month.

1/ Natural inflow storage shares shown in brackets.

2/ Pumpback by Los Angeles Department of Water and Power (LADWP) from Elderberry Forebay thru Castaic Powerplant.

3/ Portion of these amounts used to satisfy fishery enhancement agreement.

FIGURE I: PYRAMID LAKE OPERATION

(in thousands of acre-feet)

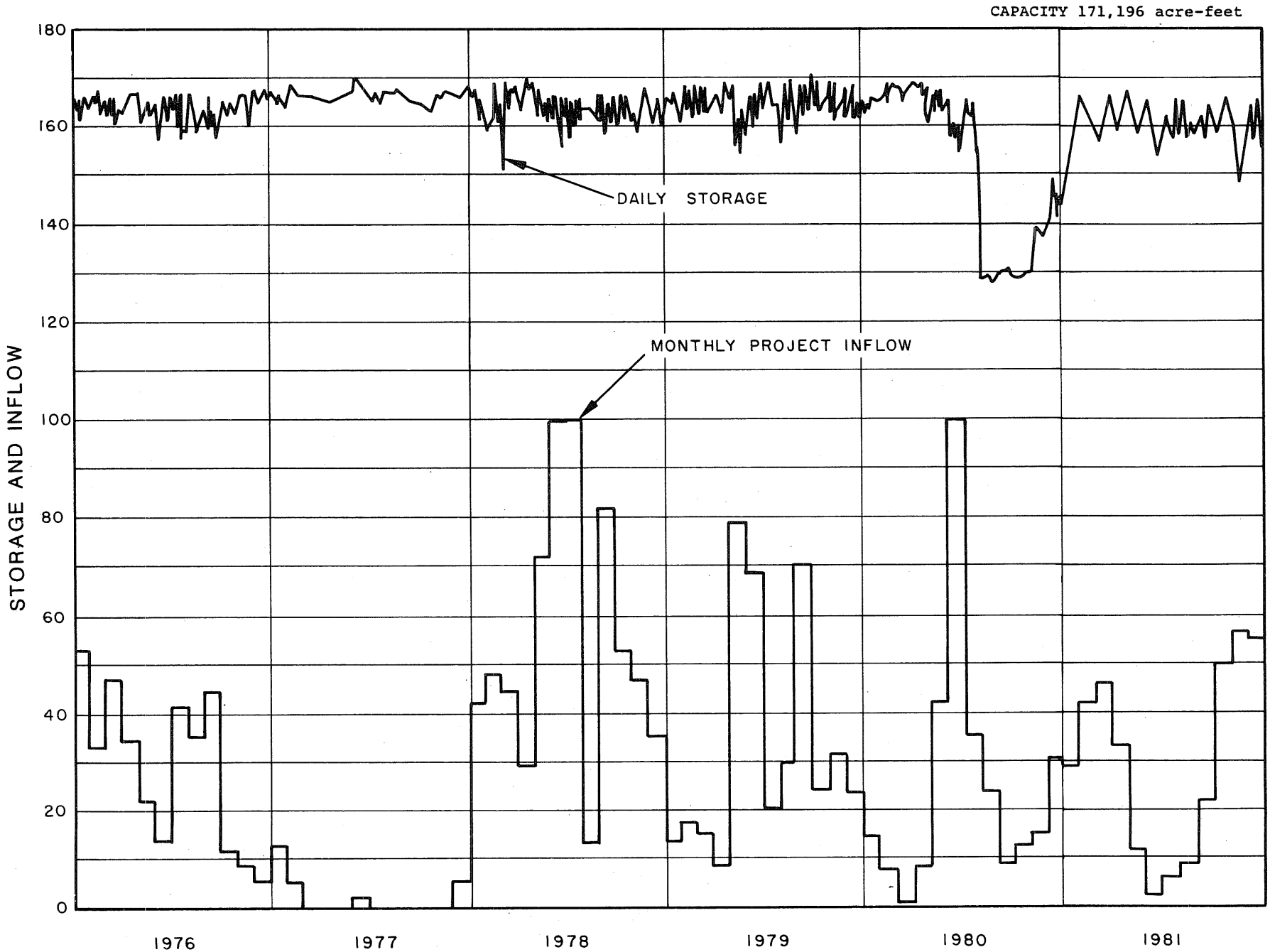


TABLE 15: ELDERBERRY FOREBAY
MONTHLY OPERATION
1981
(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION * (in feet)	TOTAL STORAGE *	STORAGE CHANGE	INFLOW		OUTFLOW			COMPUTED LOSSES (−) GAINS (+)
				CASTAIC P.P. GENERATION	NATURAL	TO CASTAIC LAKE		PUMP-BACK TO PYRAMID LAKE 1/	
						NATURAL	PROJECT		
JAN	1,510.8	20,113	-1,419	25,017	410	410	6,643	21,228	1,435
FEB	1,521.5	24,467	4,354	57,102	303	303	40,011	12,408	-329
MAR	1,512.2	20,659	-3,808	46,836	1,106	1,106	46,982	3,048	-614
APR	1,521.5	24,467	3,808	38,404	296	296	28,601	6,787	792
MAY	1,519.2	23,496	-971	49,950	128	128	7,466	46,350	2,895
JUN	1,516.6	22,422	-1,074	110,397	4	4	1,763	118,052	8,344
JUL	1,534.2	30,193	7,771	103,734	0	0	2,130	100,107	6,274
AUG	1,522.4	24,852	-5,341	96,899	0	0	4,923	105,186	7,869
SEP	1,537.8	31,875	7,023	72,925	0	0	18,138	49,504	1,740
OCT	1,522.8	25,024	-6,851	97,256	12	12	47,554	57,646	1,093
NOV	1,519.2	23,496	-1,528	74,375	24	24	47,501	25,637	-2,765
DEC	1,535.4	30,764	7,268	99,959	32	32	56,396	38,105	1,810
TOTAL			9,232	872,854	2,315	2,315	308,108	584,058	28,544

* At end of month.

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) through Castaic Powerplant.

TABLE 16: CASTAIC LAKE
MONTHLY OPERATION
1981

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION * (in feet)	TOTAL STORAGE * 1/	STORAGE CHANGE	INFLOW			OUTFLOW		DISPOSITION OF NATURAL INFLOW		COMPUTED LOSSES (−) GAINS (+)
				NATURAL	FROM ELDERBERRY FOREBAY		DELIVERIES	RELEASED TO CASTAIC AFTERBAY	RELEASED FROM CASTAIC AFTERBAY		
					NATURAL	PROJECT			SURFACE	SUB-SURFACE	
JAN	1,458.41	(679) 210,989	-3,637	604	410	6,643	11,451	469	0	118	626
FEB	1,473.61	(537) 238,705	27,716	657	303	40,011	12,707	1,753	935	167	1,205
MAR	1,489.09	(114) 268,801	30,096	1,340	1,106	46,982	18,573	2,902	2,702	167	2,143
APR	1,498.25	(226) 287,525	18,724	506	296	28,601	11,020	659	512	178	1,000
MAY	1,493.99	(162) 278,725	-8,800	183	128	7,466	16,449	379	190	185	251
JUN	1,479.01	(19) 248,984	-29,741	71	4	1,763	31,745	422	0	218	588
JUL	1,459.19	(0) 212,369	-36,615	18	0	2,130	38,767	213	0	37	217
AUG	1,434.51	(-510) 171,171	-41,198	10	0	4,923	45,429	634	0	520	-68
SEP	1,424.34	(-691) 155,361	-15,810	13	0	18,138	34,914	269	0	194	1,222
OCT	1,440.70	(-809) 180,964	25,603	74	12	47,554	24,217	0	0	204	2,180
NOV	1,458.91	(-683) 211,873	30,909	140	24	47,501	20,875	150	0	38	4,269
DEC	1,480.66	(-684) 252,171	40,298	121	32	56,396	18,340	150	0	154	2,239
TOTAL			37,545	3,737	2,315	308,108	284,487	8,000	4,339	2,180	15,872

* At end of month.

1/ Natural inflow storage shares shown in brackets.

FIGURE J: CASTAIC LAKE OPERATION

(in thousands of acre-feet)

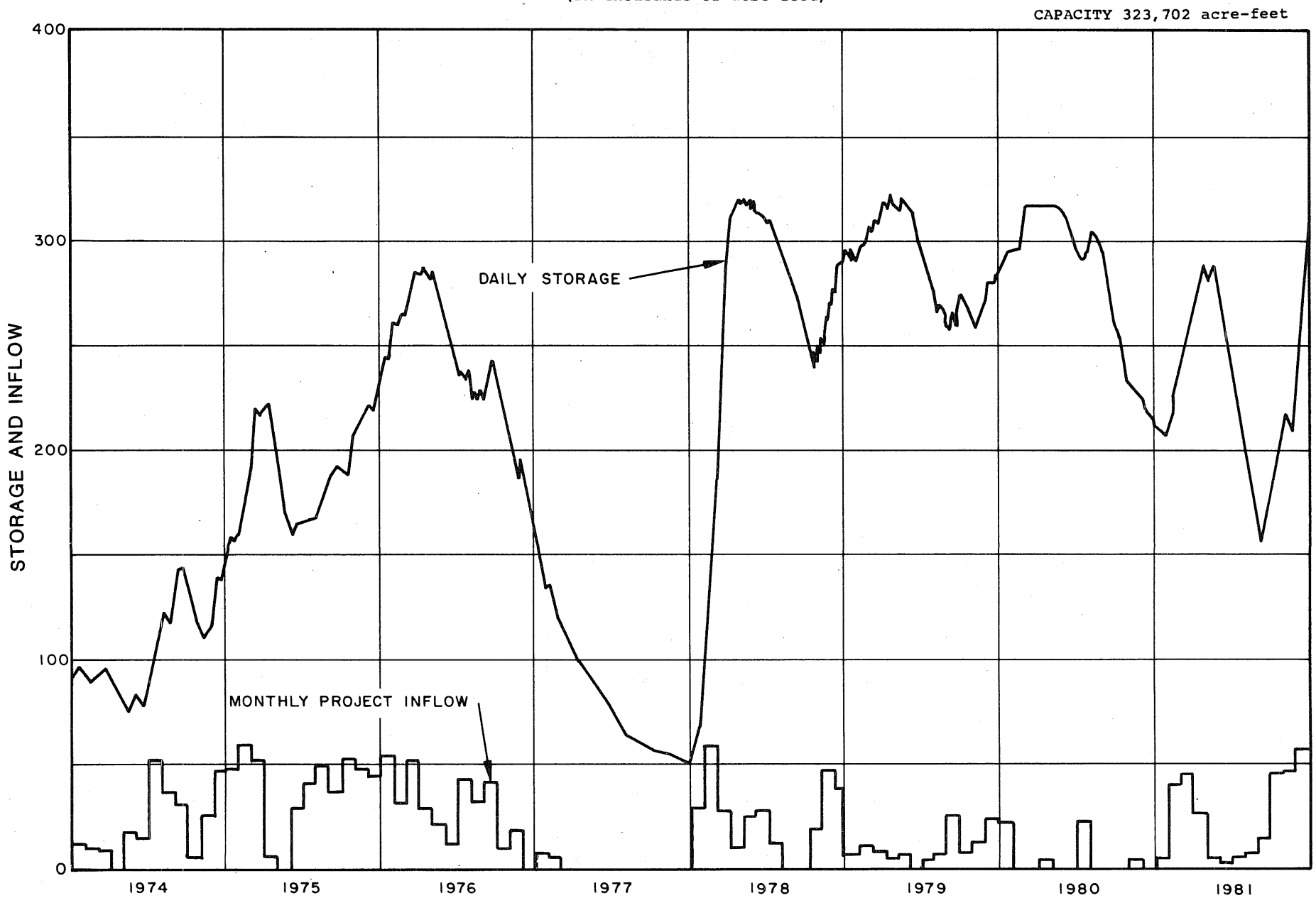


TABLE 17: SILVERWOOD LAKE MONTHLY OPERATION

1981

(in acre-feet except as noted)

MONTH	WATER * SURFACE ELEVATION (in feet)	STORAGE * 1/	STORAGE CHANGE	INFLOW		OUTFLOW			COMPUTED LOSSES (−) GAINS (+)	TOTAL NATURAL INFLOW RELEASED 2/
				NATURAL	PROJECT	SAN BERNARDINO TUNNEL	AT TURNOUT (CLAWA)	NATURAL INFLOW TO MOJAVE RIVER		
JAN	3,343.98	(1,458) 64,632	-4,121	740	48,658	53,620	105	285	491	1,247
FEB	3,351.60	(1,245) 71,691	7,059	526	35,403	27,975	83	15	-797	739
MAR	3,350.74	(1,700) 70,875	-816	1,623	14,685	17,227	91	319	513	1,168
APR	3,351.66	(1,451) 71,749	874	602	39,383	40,001	85	17	992	851
MAY	3,349.54	(966) 69,744	-2,005	307	35,002	38,818	146	18	1,668	792
JUN	3,350.06	(517) 70,233	489	57	38,672	39,860	171	17	1,808	506
JUL	3,347.20	(284) 67,567	-2,666	1	45,172	49,142	194	17	1,514	234
AUG	3,339.48	(33) 60,647	-6,920	0	59,081	67,211	222	15	1,447	251
SEP	3,345.58	(19) 66,082	5,435	0	53,087	48,970	184	13	1,515	14
OCT	3,347.90	(11) 68,215	2,133	7	46,137	44,896	115	15	1,015	15
NOV	3,339.62	(46) 60,769	-7,446	70	50,229	59,314	107	15	1,691	35
DEC	3,336.40	(38) 57,996	-2,773	78	62,319	67,814	108	14	2,766	86
TOTAL			-10,757	4,011	527,828	554,848	1,611	760	14,623	5,938

* At end of month.

1/ Natural inflow storage shares are shown in brackets.

2/ Releases made from Mojave Siphon to Los Flores Ranch Co. and to Mojave River from outlet to Mojave W.A. in exchange for natural inflow stored in lake.

FIGURE K: SILVERWOOD LAKE OPERATION

(in thousands of acre-feet)

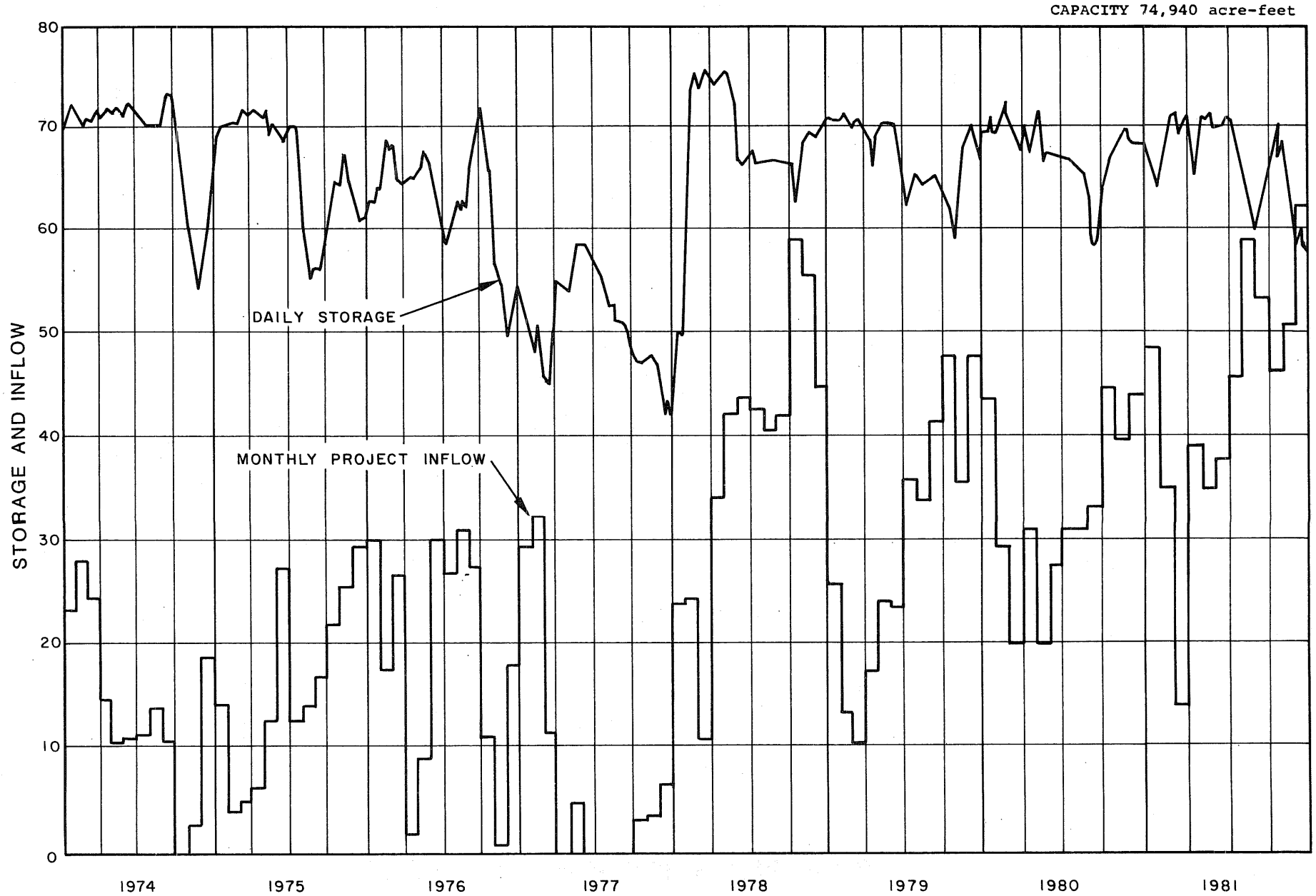


TABLE 18: LAKE PERRIS MONTHLY OPERATION

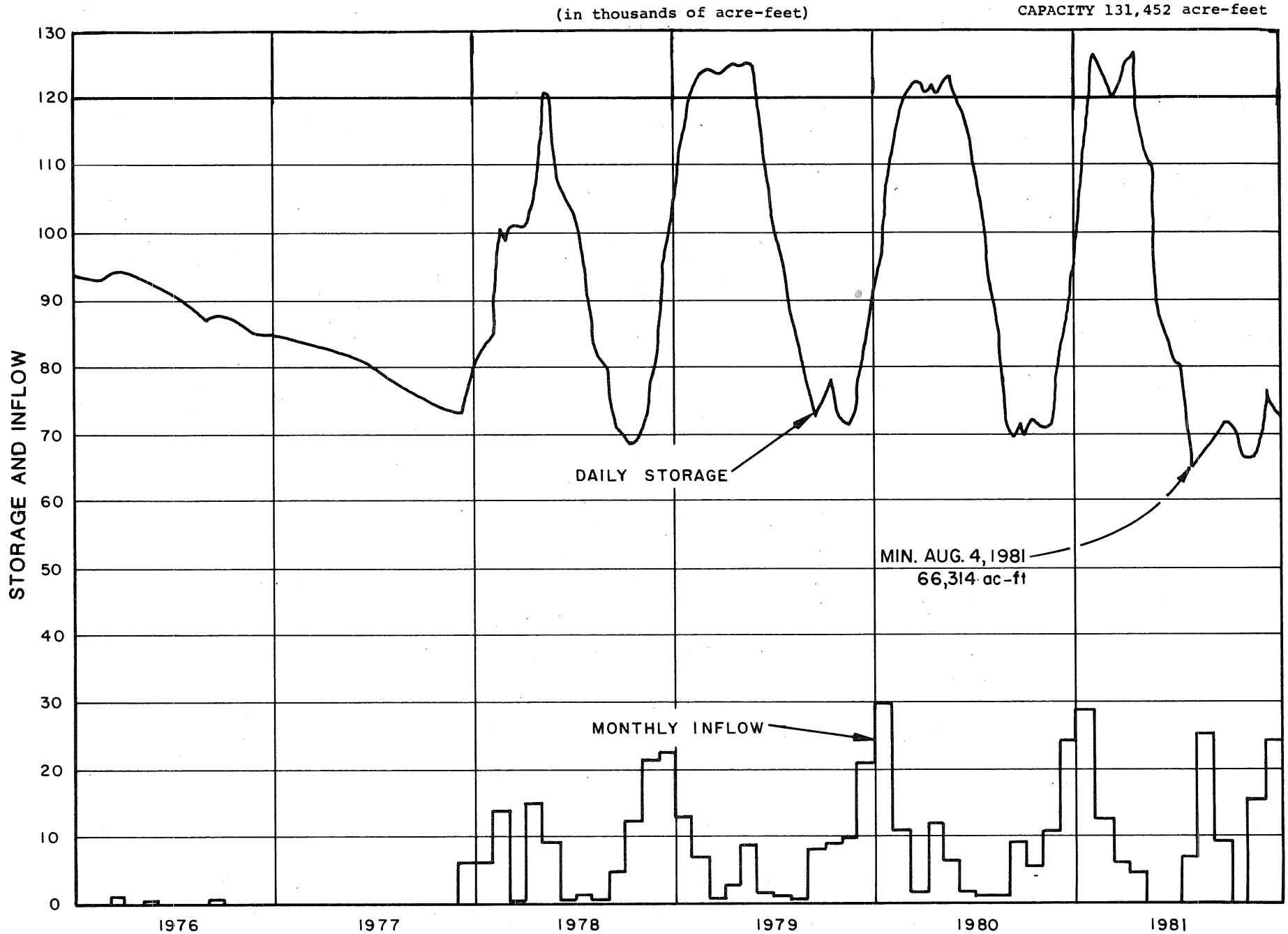
1981

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION * (in feet)	STORAGE *	STORAGE CHANGE	INFLOW	OUTFLOW	COMPUTED LOSSES (−) GAINS (+)
JAN	1,584.62	119,184	18,972	29,054	9,025	-1,057
FEB	1,586.68	123,828	4,644	11,277	5,375	-1,258
MAR	1,586.95	124,442	614	6,957	6,057	-286
APR	1,584.35	118,580	-5,862	5,549	10,516	-895
MAY	1,576.22	100,928	-17,652	83	17,231	-504
JUN	1,567.21	82,570	-18,358	145	17,529	-974
JUL	1,559.31	67,676	-14,894	7,622	21,993	-523
AUG	1,559.85	68,651	975	25,026	23,360	-691
SEP	1,561.59	71,846	3,195	9,350	5,634	-521
OCT	1,560.02	68,961	-2,885	0	2,138	-747
NOV	1,561.01	70,774	1,813	16,422	13,765	-844
DEC	1,563.91	76,199	5,425	23,350	17,589	-336
TOTAL			-24,013	134,835	150,212	-8,636

*At end of month.

FIGURE L: LAKE PERRIS OPERATION



POWER SUPPLY & USE

SECTION VI

FIGURE M: PROJECT GROSS POWER GENERATION

1981

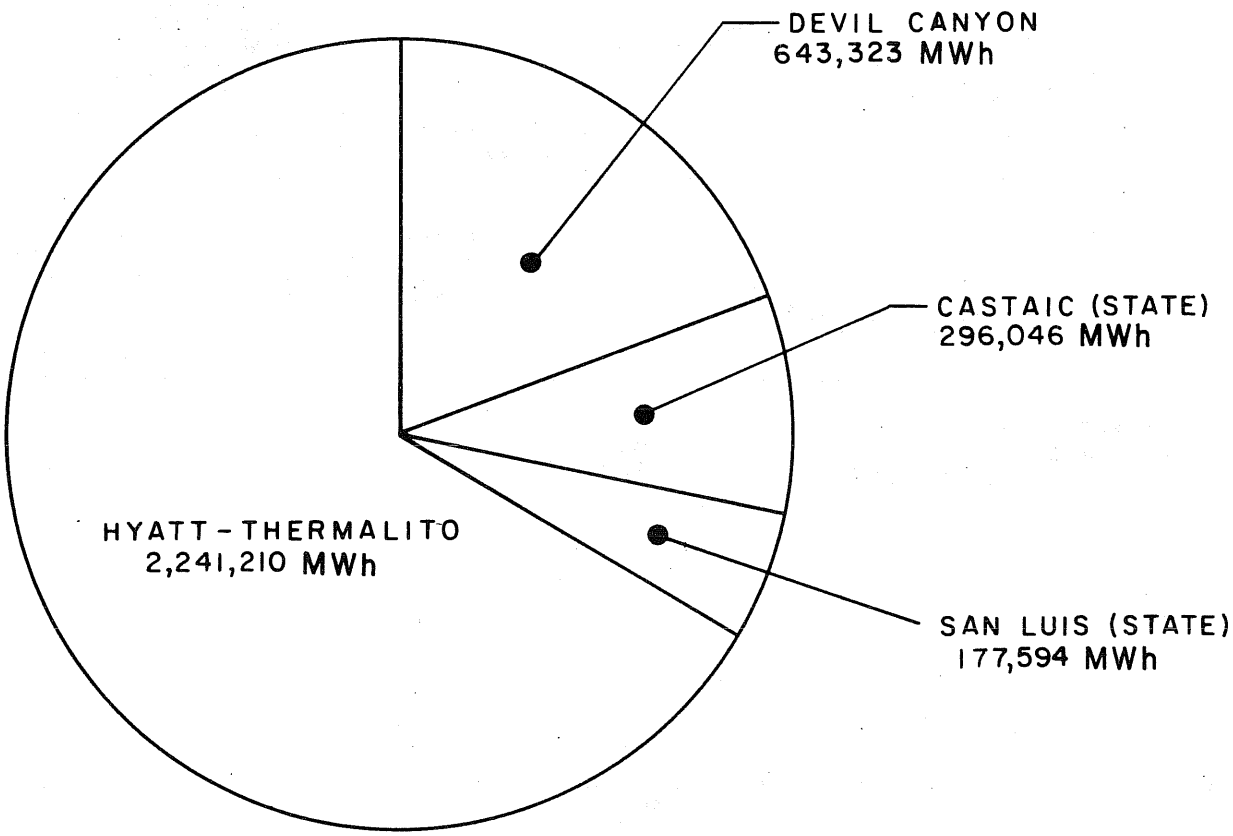
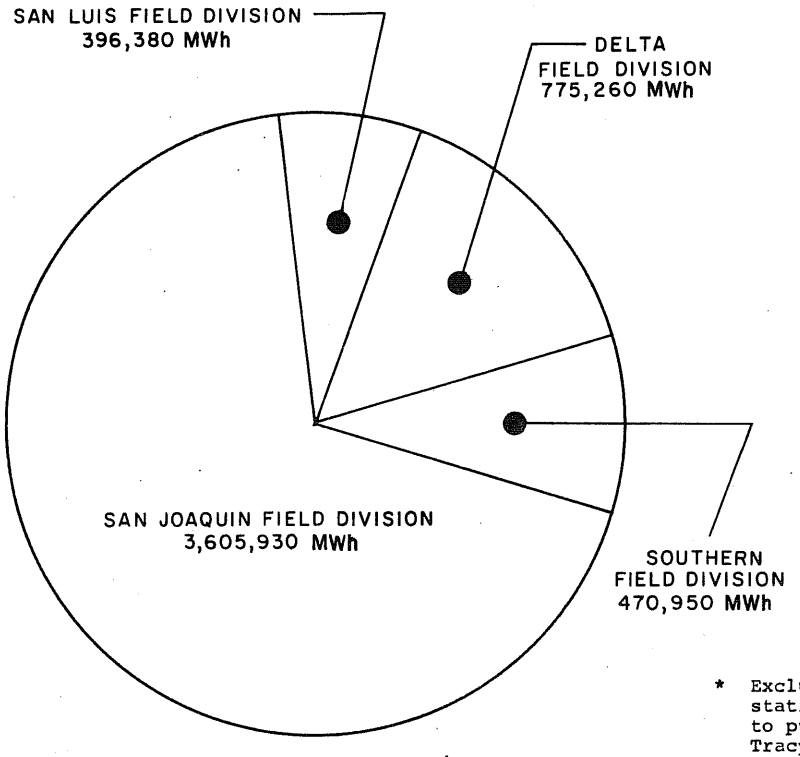


FIGURE N: PROJECT POWER OPERATIONS

(HYATT - THERMALITO NOT INCLUDED)

(STATE ONLY)

1981



ENERGY USED *

PUMPING PLANTS

DELTA FIELD DIVISION

1. CORDELIA
2. HARVEY O. BANKS DELTA
3. SOUTH BAY
4. DEL VALLE

SAN LUIS FIELD DIVISION

1. SAN LUIS
2. DOS AMIGOS

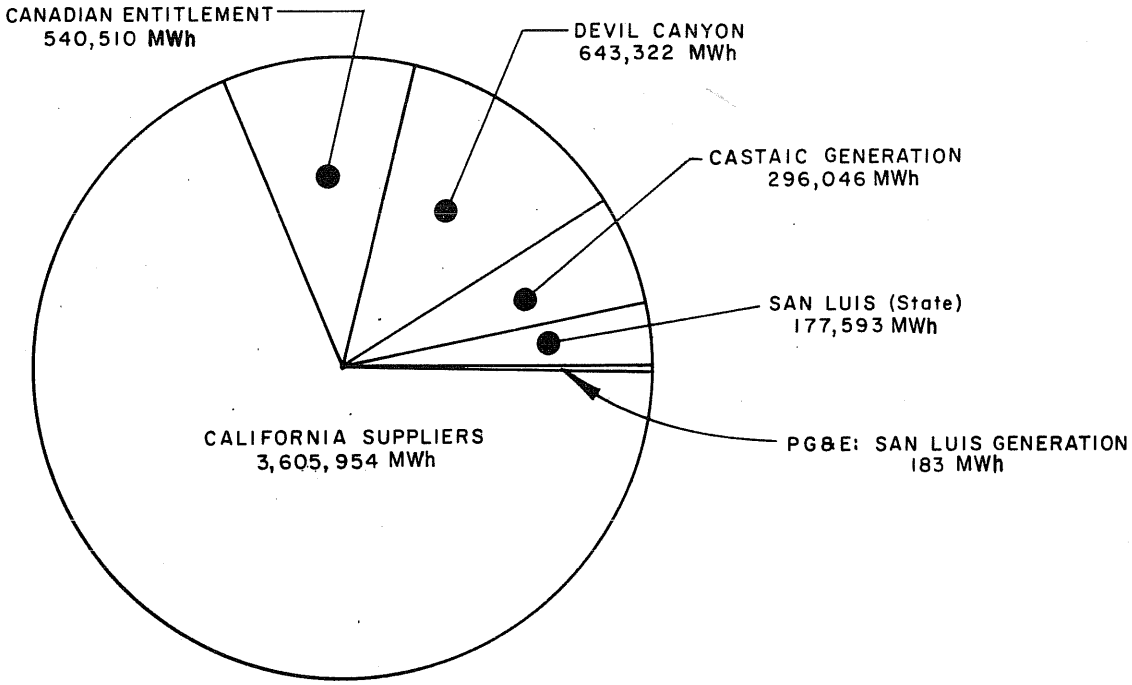
SAN JOAQUIN FIELD DIVISION

1. LAS PERILLAS
2. BADGER HILL
3. BUENA VISTA
4. WHEELER RIDGE
5. IRA J. CHRISMAN WIND GAP
6. A. D. EDMONSTON

SOUTHERN FIELD DIVISION

1. OSO
2. PEARBLOSSOM

* Excluding Devil Canyon Powerplant station service and State's share of power to pump waterfowl mitigation water at Tracy Pumping Plant.



ENERGY SOURCES

FIGURE 0: GROSS GENERATION AT EDWARD HYATT AND THERMALITO POWER PLANTS

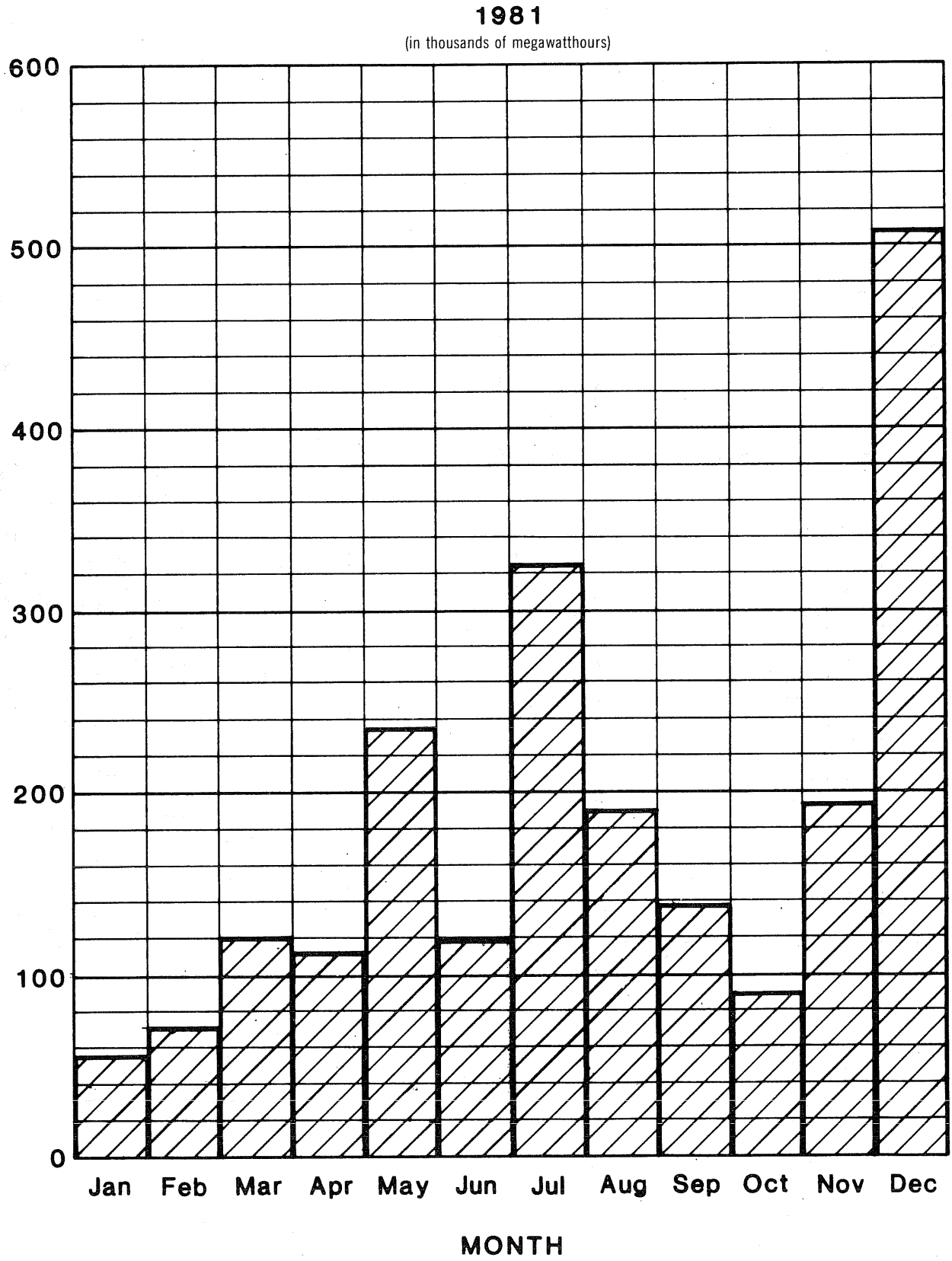


FIGURE P: OPERATION OF EDWARD HYATT AND THERMALITO POWERPLANTS

OPERATIONS	1981 ENERGY (in thousands of megawatthours)												
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
ENERGY GENERATED BY EDWARD HYATT AND THERMALITO POWER PLANTS GROSS GENERATION	57.00	71.14	120.40	111.71	237.25	199.19	326.22	188.18	139.52	87.98	193.08	509.54	2,241.21
POWER PLANT USE AND PUMPBACK REQUIREMENTS	12.96	7.65	6.30	4.28	10.97	40.62	2.65	11.58	36.16	50.96	12.78	0.99	197.90
DELIVERED TO CALIFORNIA POWER POOL COMPANIES	44.04	63.49	114.10	107.43	226.28	158.57	323.57	176.60	103.36	37.02	180.30	508.55	2,043.31

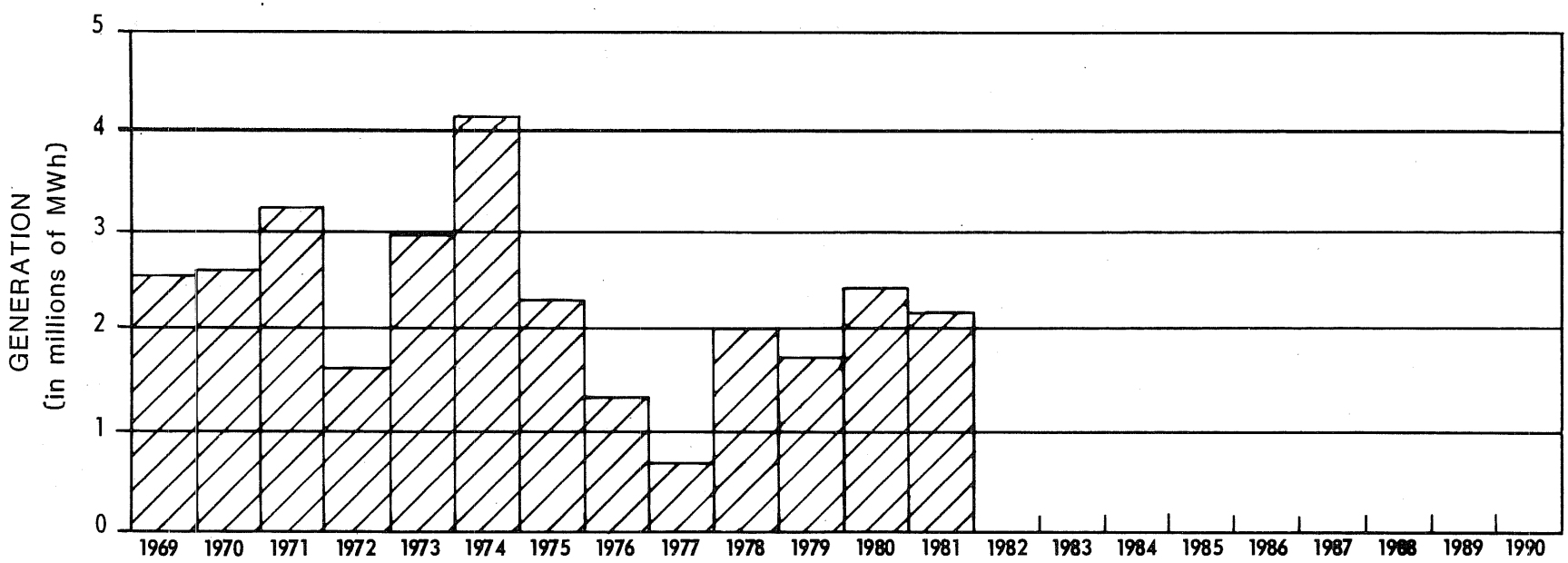


TABLE 19: PROJECT POWER SUPPLY

1981
(in megawatthours) 1/

SOURCE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
San Luis Generation:													
State	0	0	0	0	43,922	65,958	45,830	12,305	1,210	0	4,845	3,523	177,593
Federal	0	0	0	5,186	43,346	74,063	56,421	22,000	0	0	0	2,472	203,488
Total	0	0	0	5,186	87,268	140,021	102,251	34,305	1,210	0	4,845	5,995	381,081
Castaic: State	10,008	39,456	44,640	31,852	7,776	2,592	6,624	8,928	16,440	24,290	50,616	52,824	296,046
Devil Canyon	61,760	33,268	19,866	47,615	46,778	47,794	57,589	75,149	56,857	53,803	67,811	75,031	643,321
Bonneville Power Administration	0	0	0	0	0	0	0	0	0	0	0	0	0
Canadian Entitlement	47,977	43,335	47,743	43,800	45,148	43,976	45,361	45,069	44,043	45,333	43,737	44,986	540,508
Suppliers	324,761	281,413	230,626	328,253	166,372	166,795	262,672	365,931	327,275	382,677	358,332	410,846	3,605,953
PGandE, SDG&E and SCE	0	0	0	0	0	0	0	0	0	0	0	0	0
PGandE: San Luis Generation	183	0	0	0	0	0	0	0	0	0	0	0	183

1/ Values rounded to the nearest megawatthour.

TABLE 20: PROJECT POWER USE

1981

(in megawatthours) 1/

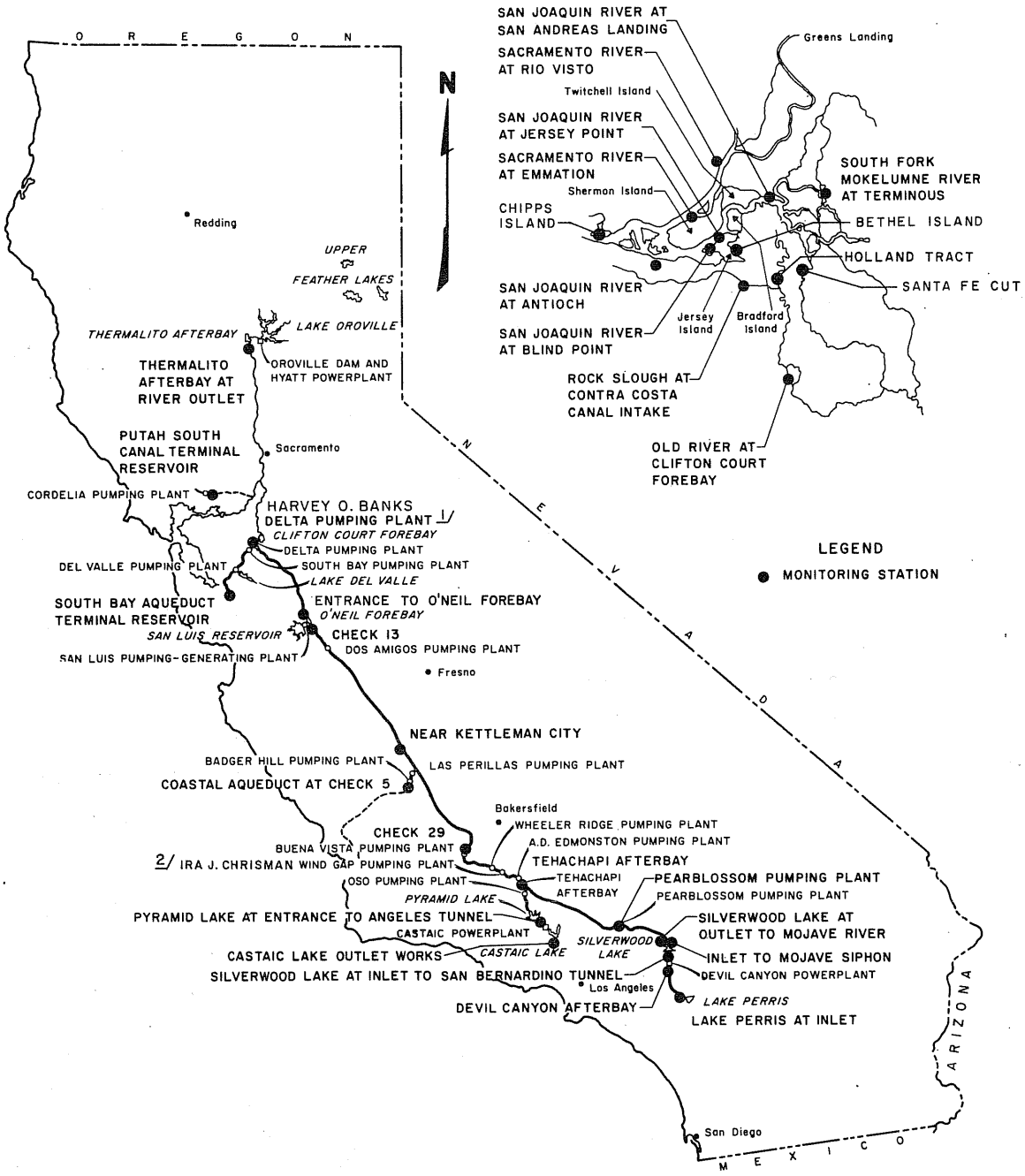
PUMPING PLANTS	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL
Cordelia	213	256	242	359	394	480	586	597	616	434	331	200	4,707
Tracy: State	0	1,137	0	0	2,735	11,054	0	0	0	0	0	0	14,926 2/
Delta: State	69,880	53,146	49,401	71,949	16,691	5,029	42,518	76,382	55,701	66,375	55,450	58,876	621,398
Federal	5,264	4,904	2,520	2,607	750	0	435	13,202	553	866	672	20,653	52,426
South Bay	8,603	8,937	12,963	10,328	12,994	14,127	16,312	16,107	13,671	13,079	9,773	11,346	148,240
Del Valle	12	219	576	12	11	14	12	10	10	12	12	11	911
San Luis: State	10,900	1,476	803	250	151	64	53	127	282	312	242	269	14,929
Federal	45,737	56,824	10,959	5,683	137	58	48	580	3,517	282	220	245	124,290
Dos Amigos: State	25,611	23,582	20,998	29,455	28,474	42,793	49,838	45,289	24,200	28,076	30,163	32,974	381,453
Federal	14,811	7,392	6,216	11,284	16,947	32,500	38,280	29,121	6,744	4,627	10,530	24,660	203,112
Las Perillas	449	474	596	1,113	1,658	1,821	2,056	1,594	435	764	620	487	12,067
Badger Hill	1,182	1,222	1,550	2,974	4,630	4,995	5,530	4,284	1,144	2,006	1,658	1,307	32,482
Buena Vista	22,838	23,244	18,659	23,233	19,849	25,637	31,063	32,651	24,244	26,020	27,810	32,600	307,848
Wheeler Ridge	24,349	23,158	19,843	25,538	19,356	21,037	25,685	29,439	26,887	29,425	32,154	36,245	313,116
Wind Gap	53,438	51,309	44,245	56,080	40,559	42,127	52,186	62,251	58,419	65,320	70,429	78,796	675,159
A. D. Edmonston	185,078	174,384	149,084	192,712	134,011	128,681	158,061	194,810	197,501	228,984	246,927	275,022	2,265,255
Oso	8,483	11,206	12,889	9,316	3,147	1,159	2,202	2,936	6,120	13,426	14,855	15,355	101,094
Pearblossom	33,652	23,686	10,904	28,198	25,336	28,097	31,972	40,904	36,593	31,867	34,916	43,721	369,846
Devil Canyon (Station Service)	2	35	121	0	0	0	0	0	0	3	0	0	161

1/ Values rounded to the nearest megawatt hour.
2/ Payback for mitigation water.

WATER QUALITY

SECTION VII

MAP 4
WATER QUALITY MONITORING STATIONS

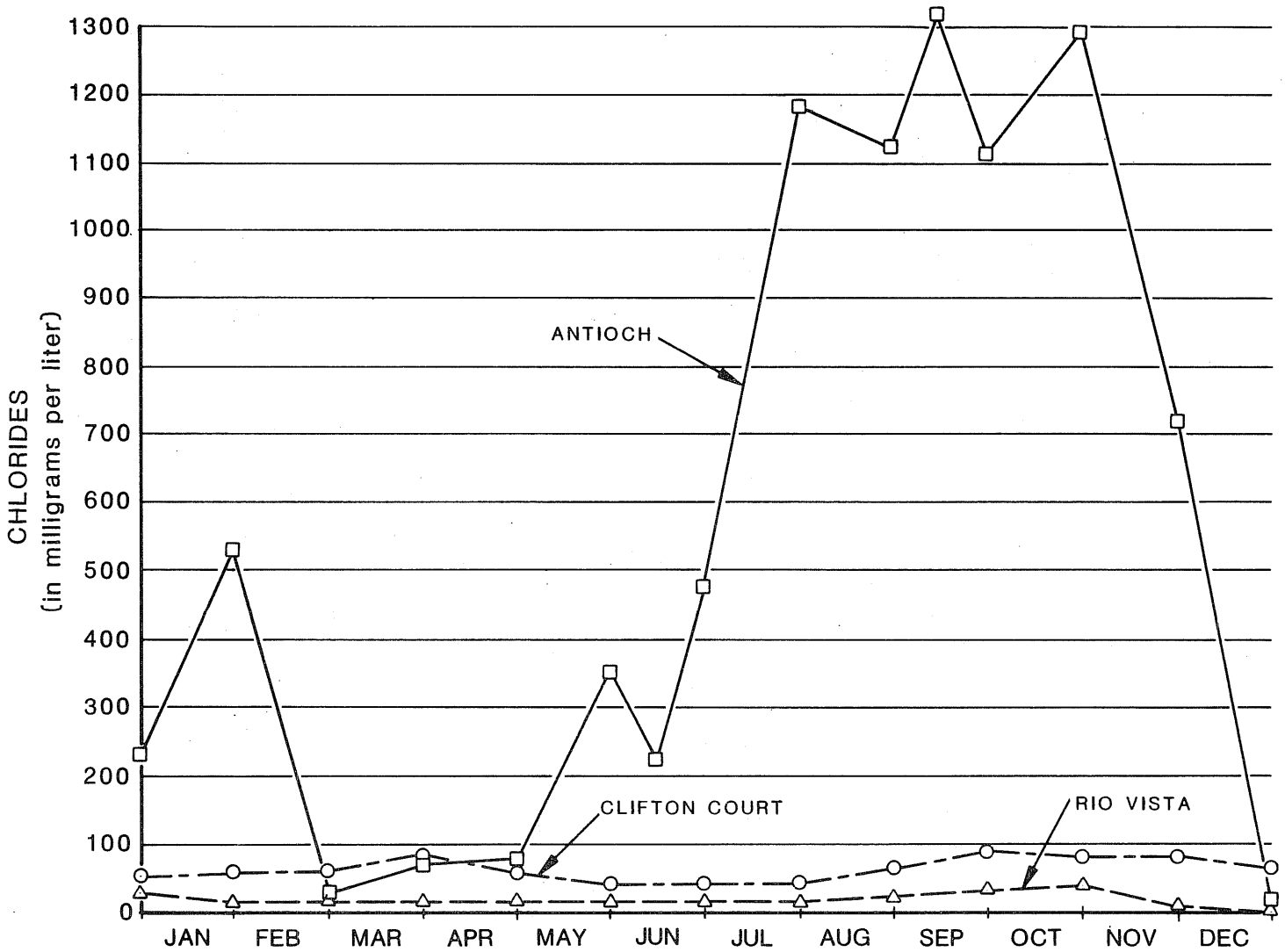


1/ This title became effective on June 3, 1981

2/ This title became effective on Jan. 9, 1986

FIGURE Q: MONTHLY 28-DAY MEAN CHLORIDE LEVELS 1/ AT DELTA STATIONS

1981



1/ Calculated from correlations using the 28-day mean value of electrical conductivity for the last day of each month, except that two significant mid-month values are also shown.

FIGURE R: MONTHLY ELECTRICAL CONDUCTIVITY AT SWP LOCATIONS

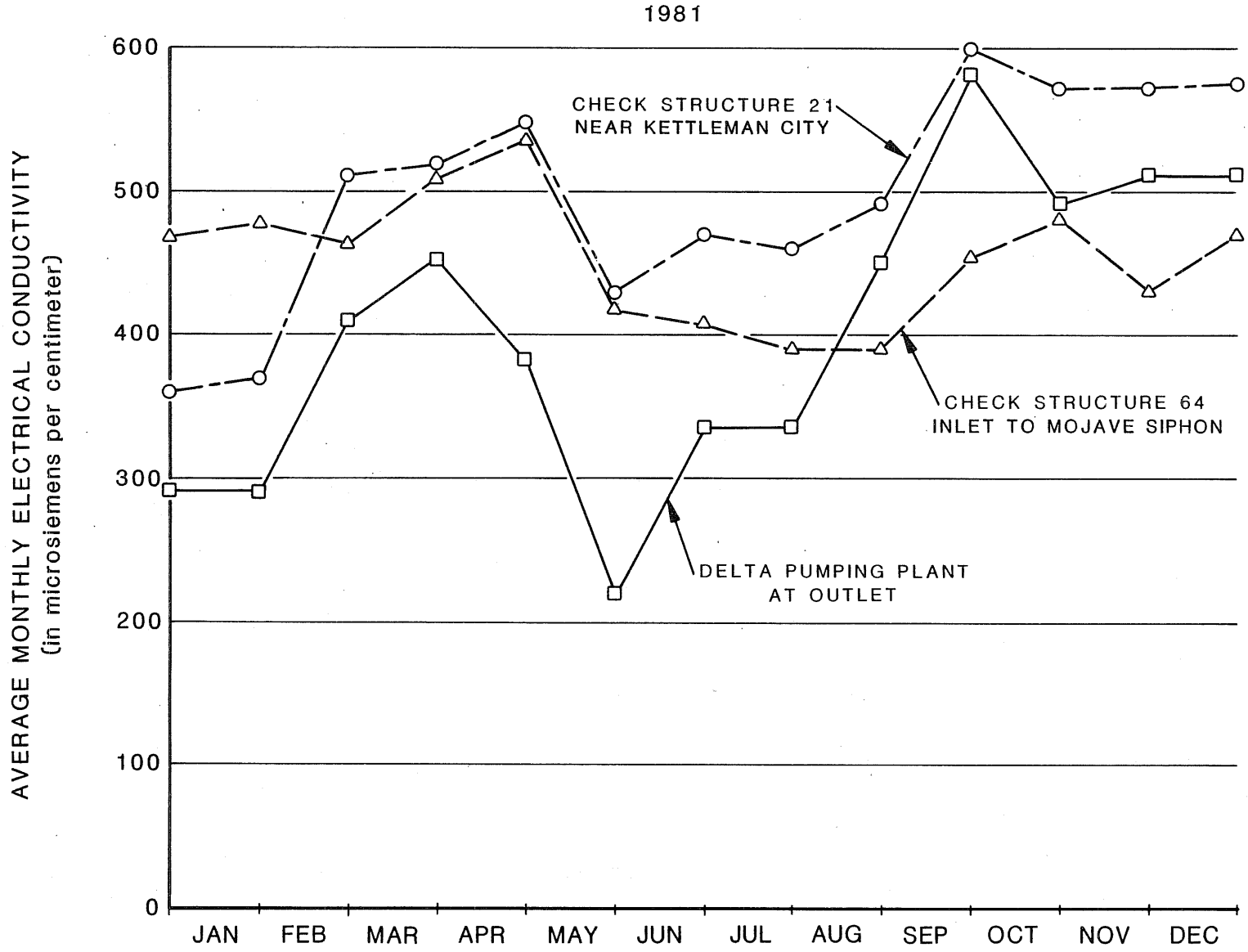


TABLE 21: THERMALITO AFTERBAY AT FEATHER RIVER OUTLET

1981

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	60	58		64	52	61	61	50	62	37	58	57	56
Total Hardness	32	32		32	32	32	36	39	39	39	36	32	35
Chlorides	1	1		1	1	1	1	2	1	1	2	2	1
Sulfates	1	1		2	1	1	1	3	2	2	0	17	3
Sodium	4	4		4	3	3	3	4	4	4	4	3	4
% Sodium	20	20		20	16	16	15	18	18	18	18	16	18
Electrical Conductivity	85	84		86	85	85	88	92	92	95	87	80	87
pH	7.6	7.6	7.4	7.2	7.2	7.2	7.2	7.3	7.3	7.2	7.2	7.4	7.3
Boron	0.0	0.0		0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0
Fluoride													
Lead													
Selenium													
Hexavalent Chromium													
Arsenic													
Iron													
Manganese													
Magnesium	3	3		3	3	3	4	4	4	4	4	3	3
Copper													
Calcium	8	8		8	8	8	8	9	9	9	8	8	8
Zinc													
Phenol													
Color (units)													
Sampling Date	01/21	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/21	11/18	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 22: PUTAH SOUTH CANAL FACILITY

(INFLOW TO NORTH BAY AQUEDUCT)

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	202	212	192	203	186	193	201	185	187	176	174	195	192
Total Hardness	159	161	155	155	152	152	152	156	154	156	146	165	155
Chlorides	8	10	8	8	7	7	7	7	6	7	7	8	8
Sulfates	18	24	22	24	17	20	20	22	22	21	18	22	21
Sodium	11	14	12	12	10	10	10	10	10	11	10	12	11
% Sodium	13	16	14	14	13	13	13	12	12	13	13	13	13
Electrical Conductivity	345	361	334	345	326	323	325	327	328	323	313	343	333
pH	8.5	7.6	7.3	8.4	8.2	8.3	8.8	8.2	8.1	9.0	7.9	8.4	8.4
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride													
Lead													
Selenium													
Hexavalent Chromium													
Arsenic													
Iron													
Manganese													
Magnesium	27	27	26	26	26	26	26	27	27	27	25	28	27
Copper													
Calcium	19	20	19	19	18	18	18	18	17	18	17	20	18
Zinc													
Phenol													
Color (units)													
Sampling Date	01/20	02/17	03/17	04/14	05/19	06/16	07/14	08/18	09/15	10/20	11/17	12/15	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 23: CALIFORNIA AQUEDUCT AT DELTA PUMPING PLANT

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	171	240	265	226	133	199	203	266	344	285	309	297	245
Total Hardness**	73	94	101	90	61	82	83	101	122	106	113	109	95
Chlorides**	33	54	63	50	22	41	42	64	93	70	80	75	57
Sulfates**	27	40	46	38	20	32	33	46	63	50	55	53	42
Sodium**	28	42	48	39	20	33	34	48	66	52	58	55	44
% Sodium**	45	49	51	49	42	47	47	51	54	52	53	52	49
Electrical Conductivity***	290	409	453	385	225	339	346	455	589	487	529	508	418
Electrical Conductivity	280	430	485	344	325	346	338	510	659	488	527	551	440
pH	7.4	7.3	7.5	7.5	7.7	7.7	7.6	7.4	6.6	7.8	7.1	7.5	7.5
Boron	0.1	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.03	0.01
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Iron	0.07	0.05	0.02	0.01	0.01	0.00	0.01	0.00	0.01	0.12	0.01	0.02	0.03
Manganese	0.06	0.06	0.03	0.03	0.02	0.01	0.01	0.01	0.03	0.03	0.02	0.04	0.03
Magnesium	9	12	13	10	10	10	10	13	17	14	14	14	2
Copper	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.00	0.01	0.02	0.01	0.01	0.01
Calcium	17	23	25	20	17	17	14	15	17	18	20	26	19
Zinc	0.05	0.02	0.04	0.02	0.03	0.02	0.04	0.00	0.03	0.02	0.01	0.02	0.03
Phenol		0.000							0.001				0.001
Color (units)	5	30	25	25	10	5	10	8	8	8	10	18	14
Sampling Date	01/21	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/20	11/18	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 24: SOUTH BAY AQUEDUCT TERMINAL RESERVOIR

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	176	244	281	234	185	203	209	275	340	292	316	298	254
Total Hardness**	86	120	138	115	91	100	103	135	167	143	155	146	125
Chlorides**	29	47	57	45	.31	.36	.38	56	73	60	67	62	50
Sulfates**	29	42	49	40	.30	.34	35	48	61	51	56	52	44
Sodium**	25	.37	44	35	27	.30	.31	43	54	46	50	47	.39
% Sodium**	.38	40	41	40	39	.39	.39	41	41	41	41	41	40
Electrical Conductivity***	.305	427	494	414	321	.353	.363	480	594	509	552	520	444
Electrical Conductivity	290	472	501	.364	322	346	345	476	651	477	523	563	444
pH	7.6	7.6	7.8	7.7	7.4	8.2	7.4	8.1	7.6	8.1	6.9	7.8	7.8
Boron	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Selenium	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.01
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.01	0.03	0.02	0.01	0.01	0.00	0.01	0.01	0.02	0.14	0.01	0.17	0.04
Manganese	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.02	0.01	0.02	0.01
Magnesium	9	13	14	11	10	11	10	13	17	14	14	14	12
Copper	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Calcium	18	24	26	20	18	17	15	15	18	18	19	24	19
Zinc	0.02	0.04	0.02	0.02	0.03	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Phenol		0.001							0.001				0.001
Color (units)	5	30	13	25	10	5	5	8	5	8	8	20	12
Sampling Date	01/20	02/17	03/17	04/14	05/19	06/16	07/14	08/18	09/15	10/20	11/17	12/15	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 25: CALIFORNIA AQUEDUCT ENTRANCE TO O'NEILL FOREBAY

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	169	246	254	241	172	191	204	256	333	286	304	274	244
Total Hardness**	73	93	95	92	74	79	83	96	113	103	107	100	92
Chlorides**	32	56	59	54	33	38	42	59	88	70	76	66	56
Sulfates**	27	42	44	41	27	31	34	44	61	50	54	48	42
Sodium**	27	43	45	42	28	32	34	45	63	52	56	50	43
% Sodium**	45	50	51	50	45	46	47	51	55	52	53	52	50
Electrical Conductivity***	291	422	437	414	297	328	351	439	571	491	521	471	419
Electrical Conductivity	290	468	456	377	284	331	373	471	662	475	525	507	435
pH	7.3	7.4	7.7	7.7	8.2	9.0	9.4	7.4	8.0	7.3	7.1	7.9	8.5
Boron	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.02	0.01
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.04	0.02	0.02	0.02	0.00	0.00	0.01	0.01	0.01	0.10	0.01	0.01	0.02
Manganese	0.03	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.02	0.01
Magnesium	9	12	13	11	10	11	12	12	17	14	14	14	12
Copper	0.02	0.00	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.02	0.02	0.02	0.02
Calcium	18	24	24	21	17	20	21	14	16	17	19	25	20
Zinc	0.03	0.01	0.04	0.04	0.01	0.01	0.01	0.01	0.02	0.02	0.04	0.02	0.02
Phenol		0.000							0.001				0.001
Color (units)	5	30	20	25	8	5	5	8	5	8	8	20	12
Sampling Date	01/21	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/20	11/18	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 26: CALIFORNIA AQUEDUCT AT CHECK 13

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	201	300	302	281	247	265	260	275	351	308	321	304	285
Total Hardness**	85	114	114	108	99	104	102	107	128	116	120	115	109
Chlorides**	43	78	79	70	58	65	63	68	98	81	86	79	72
Sulfates**	35	50	50	47	42	45	44	46	58	52	54	51	48
Sodium**	35	57	57	53	45	49	48	51	69	59	62	58	54
% Sodium**	47	52	52	51	50	51	50	51	54	52	53	52	51
Electrical Conductivity***	352	527	529	492	433	464	455	481	615	541	563	533	499
Electrical Conductivity	323	511	480	474	463	469	474	473	613	496	562	546	490
pH	7.3	7.4	7.5	7.6	7.6	7.8	8.0	7.6	7.6	8.1	7.9	7.7	7.7
Boron	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.00	0.02	0.01
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.07	0.09	0.05	0.06	0.00	0.00	0.00	0.05	0.01	0.00	0.02	0.05	0.03
Manganese	0.02	0.05	0.03	0.02	0.01	0.01	0.02	0.03	0.02	0.01	0.01	0.02	0.02
Magnesium	9	13	13	13	12	12	12	12	16	15	15	14	13
Copper	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01
Calcium	19	26	25	24	22	22	22	19	20	18	20	26	22
Zinc	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.01
Phenol		0.000							0.001				0.001
Color (units)	5	30	20	18	2	2	2	5	8	8	8	10	10
Sampling Date	01/21	02/18	03/18	04/15	05/20	06/17	07/15	08/19	09/16	10/21	11/18	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 27: CALIFORNIA AQUEDUCT NEAR KETTLEMAN CITY

1981

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	207	305	319	335	256	289	279	297	367	341	338	338	306
Total Hardness**	86	117	121	126	102	112	109	115	135	128	127	127	117
Chlorides**	42	58	60	63	50	55	54	57	67	63	63	63	58
Sulfates**	35	60	63	68	47	55	53	58	77	70	69	69	60
Sodium**	35	53	56	59	44	50	48	52	65	60	59	59	53
% Sodium**	47	50	50	50	48	49	49	49	51	50	50	50	50
Electrical Conductivity***	356	507	528	552	431	483	467	495	600	562	557	557	508
Electrical Conductivity	333	554	514	642	469	470	472	468	578	515	583	613	518
pH	7.6	7.6	7.7	7.9	7.7	8.1	7.9	8.4	7.8	8.2	7.7	8.2	8.0
Boron	0.2	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.02	0.01
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.11	0.06	0.04	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.02	0.02
Manganese	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Magnesium	9	14	14	16	12	12	12	12	15	15	16	16	14
Copper	0.01	0.00	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.02	0.02	0.02	0.01
Calcium	19	27	26	32	22	22	22	20	19	20	21	28	23
Zinc	0.02	0.00	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.03	0.01	0.02	0.01
Phenol		0.001							0.005				0.003
Color (units)	5	15	18	20	2	2	5	5	8	8	8	10	9
Sampling Date	01/20	02/18	03/18	04/15	05/19	06/17	07/15	08/19	09/16	10/21	11/18	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 28: COASTAL BRANCH AT CHECK 5

1981

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	204	275	294		243	280	269	278	318	316	303	310	281
Total Hardness**	83	104	109		95	105	102	105	115	115	111	113	105
Chlorides**	43	74	82		60	76	71	75	92	92	86	89	76
Sulfates**	34	44	46		40	45	43	44	49	49	48	48	45
Sodium**	34	53	57		44	54	51	53	64	63	60	61	54
% Sodium**	47	53	53		50	53	52	53	55	54	54	54	53
Electrical Conductivity***	345	478	513		419	487	466	483	558	554	529	542	489
Electrical Conductivity	348	551	488	628	475	474	476	468	570	533	564	575	513
pH	7.1	7.8	7.3	7.4	7.7	7.8	7.2	7.3	8.9	7.7	8.1	8.1	8.1
Boron	0.2	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
Fluoride	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.2
Lead	0.00	0.05	0.02	0.03	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.01
Selenium	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.07	0.02	0.03	0.01	0.00		0.01	0.02	0.01	0.02	0.01	0.02	0.02
Manganese	0.00	0.02	0.01	0.01	0.01		0.00	0.00	0.00	0.00	0.01	0.01	0.01
Magnesium	9	14	13	17	13	12	13	13	16	16	17	17	14
Copper	0.02	0.03	0.02	0.04	0.02		0.01	0.01	0.00	0.02	0.01	0.01	0.02
Calcium	20	27	26	31	21	24	22	18	18	21	19	23	23
Zinc	0.04	0.02	0.02	0.01	0.00		0.03	0.03	0.02	0.08	0.08	0.04	0.03
Phenol		0.003							0.001				0.002
Color (units)													
Sampling Date	01/20	02/17	03/17	04/14	05/19	06/16	07/14	08/18	09/15	10/20	11/17	12/15	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 29: CALIFORNIA AQUEDUCT AT CHECK 29

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	214	272	305		241	278	268	276	321	330	311	322	285
Total Hardness**	86	104	114		95	106	103	106	119	122	116	119	108
Chlorides**	48	68	80		57	70	67	70	85	89	82	86	73
Sulfates**	34	46	53		40	47	45	47	56	58	54	56	49
Sodium**	36	49	57		42	50	48	50	60	62	58	61	52
% Sodium**	48	50	52		49	51	50	51	52	53	52	52	51
Electrical Conductivity***	361	465	524		410	476	458	473	553	569	535	555	489
Electrical Conductivity	359	498	461	611	465	476	476	475	562	541	547	594	505
pH	7.1	7.7	7.1	7.9	7.9	7.7	7.4	7.7	8.7	8.0	8.0	7.8	8.0
Boron	0.1	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2
Fluoride	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2
Lead	0.01	0.02	0.03	0.04	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.01
Selenium	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.05	0.04	0.07	0.03	0.00		0.03	0.06	0.01	0.02	0.01	0.03	0.03
Manganese	0.01	0.02	0.01	0.01	0.02		0.01	0.04	0.00	0.00	0.01	0.01	0.01
Magnesium	10	13	13	16	12	12	12	14	16	16	16	17	14
Copper	0.02	0.02	0.02	0.01	0.01		0.01	0.02	0.00	0.02	0.01	0.00	0.01
Calcium	20	26	24	29	21	24	23	19	17	21	18	25	22
Zinc	0.04	0.02	0.02	0.01	0.00		0.01	0.01	0.02	0.02	0.02	0.02	0.02
Phenol		0.008							0.018				0.013
Color (units)	18	28	23	23	8	13	8	4	7	4	3	6	12
Sampling Date	01/20	02/17	03/17	04/14	05/19	06/16	07/14	08/18	09/15	10/20	11/17	12/15	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 30: CALIFORNIA AQUEDUCT AT TEHACHAPI AFTERBAY

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	198	245	284	305	222	256	249	246	263	263	265	271	256
Total Hardness**	84	99	110	116	92	102	100	99	104	104	105	106	102
Chlorides**	43	60	75	83	52	64	62	61	67	67	68	70	64
Sulfates**	35	43	50	53	39	45	44	43	46	46	47	48	45
Sodium**	35	46	56	61	41	49	47	46	50	50	51	52	49
% Sodium**	48	50	52	53	49	49	51	50	51	51	51	52	51
Electrical Conductivity***	351	436	507	544	395	456	443	438	469	468	471	483	455
Electrical Conductivity	371	468	520	580	445	471	486	470	541	547	529	548	498
pH							8.5						8.5
Boron	0.2	0.2	0.3	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Fluoride	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.2
Lead	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.06	0.04		0.03	0.00	0.00	0.01	0.01	0.03	0.01	0.01	0.01	0.02
Manganese	0.00	0.26		0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Magnesium	10	13	13	14	11	13	13	13	14	15	15	15	13
Copper	0.00	0.00		0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.01
Calcium	20	23	27	29	21	22	22	18	18	21	20	25	22
Zinc	0.00	0.01		0.00	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01
Phenol													
Color (units)	18	18	18	23	10	8	8	5	4	5	5	10	11
Sampling Date	01/21	02/18	03/18	04/15	05/20	06/17	07/17	08/22	09/16	10/21	11/18	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 31: PYRAMID LAKE AT ENTRANCE TO ANGELES TUNNEL

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	331	285	355	348	320	330	375	325	336	362	309	319	333
Total Hardness	170	142	142	134	144	148	144	144	144	146	141	135	145
Chlorides	40	41	57	59	63	57	57	60	63	70	75	79	60
Sulfates	111	84	86	82	88	91	90	86	84	83	69	64	85
Sodium	44	42	54	57	61	56	54	55	56	57	57	60	54
% Sodium	35	39	45	47	47	45	44	45	45	45	46	48	44
Electrical Conductivity	547	481	535	530	557	544	551	532	542	572	510	576	540
pH	8.1	8.3	8.4	9.9	8.9	8.3	8.8	9.4	9.1	8.4	8.3	8.0	8.7
Boron	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.3
Fluoride	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.3
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.01	0.01	0.02	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Manganese	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	17	15	15	15	15	16	18	16	16	16	16	17	16
Copper	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	40	32	32	29	33	33	28	31	31	32	30	26	31
Zinc	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Phenol													
Color (units)	8	8	18	18	18	13	8	10	10	3	3	8	10
Sampling Date	01/27	02/19	03/17	04/17	05/20	06/19	07/14	08/18	09/14	10/19	11/17	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 32: CASTAIC LAKE AT OUTLET WORKS

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	370	406	392	361	352	387	370	383	435	393	370	369	382
Total Hardness	217	210	203	196	190	194	194	201	218	198	172	176	197
Chlorides	46	44	43	43	42	44	45	48	50	51	63	61	48
Sulfates	138	136	129	128	127	127	136	143	153	129	100	106	129
Sodium	47	46	46	47	48	47	48	52	52	51	56	54	50
% Sodium	32	32	33	34	35	34	34	35	34	35	41	39	35
Electrical Conductivity	660	630	610	597	591	596	613	628	650	624	645	613	621
pH	8.4	8.4	7.9	9.1	10.3	7.5	8.6	7.8	7.9	8.2	8.2	8.2	9.3
Boron	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.4
Fluoride	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.4	0.4	0.4	0.5
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Manganese	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	20	19	19	18	19	20	20	21	22	19	18	19	20
Copper	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Calcium	54	53	50	49	45	45	45	46	51	48	39	39	47
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Phenol													
Color (units)	8	8	8	8	8	8	5	8	5	4	8	8	7
Sampling Date	01/19	02/16	03/16	04/16	05/18	06/16	07/13	08/17	09/14	10/19	11/16	12/16	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 33: CALIFORNIA AQUEDUCT AT CHECK 59

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	210	302	300	346	230	258	287	284	291	299	284	300	283
Total Hardness**	94	112	120	141	98	108	108	106	102	118	112	121	112
Chlorides**	43	61	68	78	53	70	72	77	102	89	92	83	74
Sulfates**	43	67	74	91	41	48	44	41	31	32	36	48	50
Sodium**	37	56	60	71	43	52	53	56	66	61	62	58	56
% Sodium**	45	51	51	52	48	50	51	52	57	52	54	50	51
Electrical Conductivity***													
Electrical Conductivity	379	505	535	621	405	478	518	485	541	538	535	538	507
pH							8.6						8.6
Boron	0.2	0.3	0.3	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Fluoride	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.07	0.02	0.01	0.02	0.01	0.00	0.01	0.01	0.03	0.02	0.01	0.01	0.02
Manganese	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	10	12	12	16	11	13	13	13	14	16	15	16	13
Copper	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.01
Calcium	21	25	28	30	21	22	22	21	18	21	20	22	23
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Phenol													
Color (units)	13	18	18	13	10	8	5	8	3	3	5	10	10
Sampling Date	01/21	02/20	03/19	04/15	05/20	06/17	07/16	08/21	09/17	10/21	11/20	12/17	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 34: CALIFORNIA AQUEDUCT AT INLET TO MOJAVE SIPHON

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	264	257	294	306	239	232	223	219	255	278	246	262	256
Total Hardness**	104	102	113	117	96	94	91	90	101	108	98	104	102
Chlorides**	68	65	79	83	59	56	53	52	65	73	62	68	65
Sulfates**	46	44	52	54	41	40	38	37	44	49	42	45	44
Sodium**	51	49	58	61	45	43	41	40	48	54	46	50	49
% Sodium**	51	51	53	53	50	50	50	49	51	52	51	51	51
Electrical Conductivity***	470	457	525	547	425	412	396	390	454	496	437	467	456
Electrical Conductivity	377	447	548	624	332	475	509	485	544	575	521	546	499
pH							8.6						8.6
Boron	0.2	0.2	0.4	0.4	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Fluoride	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.05	0.02	0.01	0.02	0.02	0.00	0.01	0.01	0.02	0.01	0.01	0.01	0.02
Manganese	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	10	12	13	17	11	13	12	13	14	16	15	16	14
Copper	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01
Calcium	20	23	27	30	18	22	24	19	18	21	20	22	22
Zinc	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenol													
Color (units)	18	18	18	13	13	8	8	8	5	5	5	10	11
Sampling Date	01/21	02/20	03/19	04/15	05/20	06/17	07/16	08/20	09/18	10/22	11/20	12/17	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 35: SILVERWOOD LAKE AT OUTLET TO MOJAVE RIVER

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	200	200	225	246	265	266	262	283	280	311	303	312	263
Total Hardness	84	84	92	102	104	108	108	104	102	112	112	118	103
Chlorides	41	40	43	49	53	62	68	72	82	100	93	92	66
Sulfates	35	36	40	51	55	51	47	42	36	36	33	42	42
Sodium	37	36	38	44	48	49	52	53	57	66	62	64	51
% Sodium	48	48	47	48	49	49	50	52	54	55	53	53	51
Electrical Conductivity	358	349	375	420	441	451	475	470	494	566	534	566	458
pH		7.6	8.0	8.4	8.0	8.4	8.2		8.9	7.6	6.8	8.1	8.3
Boron	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2
Fluoride	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.04	0.02	0.03	0.01	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Magnesium	9	10	10	12	12	13	14	13	14	15	17	17	13
Copper	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	19	17	20	21	22	22	20	20	18	20	17	19	20
Zinc	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phenol													
Color (units)	8	8	8	13	13	8	8	8	8	4	8	8	9
Sampling Date	01/23	02/18	03/17	04/13	05/21	06/18	07/16	08/18	09/15	10/19	11/16	12/15	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 36: SILVERWOOD LAKE AT INLET TO SAN BERNARDINO TUNNEL

1981

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	211	200	227	295	260	257	262	290	279	315	297	310	267
Total Hardness	84	84	88	98	108	104	108	104	105	112	111	115	102
Chlorides	41	40	42	48	56	61	68	72	82	99	93	93	66
Sulfates	35	37	38	52	59	48	48	41	36	36	34	40	42
Sodium	37	36	38	44	48	48	52	53	57	66	62	64	50
% Sodium	48	48	47	49	48	49	50	52	53	55	54	54	51
Electrical Conductivity	356	352	369	418	457	451	475	466	491	555	534	562	457
pH		7.6	8.5	8.2	8.0	7.9	8.1		8.2	7.7	8.0	7.8	8.1
Boron	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2
Fluoride	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.03	0.01	0.03	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Magnesium	9	10	10	11	13	12	14	13	14	15	16	17	13
Copper	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	19	17	19	21	22	22	20	20	19	20	18	18	20
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
Phenol													
Color (units)	8	8	8	13	10	8	8	8	8	3	10	8	8
Sampling Date	01/23	02/18	03/17	04/13	05/21	06/18	07/16	08/18	09/15	10/19	11/16	12/15	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 37: DEVIL CANYON AFTERBAY

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids**	335	264	262	299	195		256	247	259	288	291	289	271
Total Hardness**	129	106	105	118	81		103	100	104	114	115	114	108
Chlorides**	109	71	70	89	40		67	62	68	83	85	84	75
Sulfates**	53	42	42	48	31		41	40	42	46	47	46	44
Sodium**	73	52	52	62	34		50	48	51	59	60	59	55
% Sodium**	55	52	52	53	48		51	51	52	53	53	53	52
Electrical Conductivity***	632	484	479	556	338		466	447	472	534	541	536	499
Electrical Conductivity	355	357	367	426	458	456	499	462	493	566	526	562	461
pH							8.2						8.2
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2
Fluoride	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.04	0.02	0.03	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Manganese	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	9	10	9	12	13	12	13	13	13	15	15	16	13
Copper	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	19	21	20	21	22	21	21	20	20	20	20	21	21
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00
Phenol													
Color (units)	13	8	8	15	10	8	8	8	3	5	4	8	8
Sampling Date	01/22	02/20	03/19	04/16	05/20	06/18	07/16	08/20	09/18	10/22	11/20	12/17	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. The second Electrical Conductivity shown is from a once-monthly sample, as are all constituents following.

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 38: LAKE PERRIS AT INLET

1981

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	205	205	220	218	224	207	218	238	249	275	246	271	231
Total Hardness	76	76	80	80	80	82	84	87	91	90	88	98	84
Chlorides	53	51	50	50	52	52	55	58	63	66	66	75	58
Sulfates	36	36	35	36	35	38	36	39	34	41	42	40	37
Sodium	43	42	40	41	43	43	43	46	46	50	49	54	45
% Sodium	54	54	51	52	53	52	52	52	51	54	54	54	53
Electrical Conductivity	376	372	368	368	372	373	390	404	424	442	425	476	399
pH		8.5	9.0		8.6	8.9	8.5		9.0	7.7	6.7	7.7	8.6
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													0.00
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Manganese	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	10	10	11	11	11	11	12	12	13	12	13	14	12
Copper	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	14	14	14	14	14	15	14	15	15	16	14	16	15
Zinc	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Phenol													
Color (units)	8	8	8	8	8	8	5	5	8	3	8	8	7
Sampling Date	01/22	02/17	03/16	04/14	05/20	06/19	07/15	08/17	09/14	10/20	11/16	12/14	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, % Sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 39

WATER QUALITY
MINIMUM DETECTION CONCENTRATIONS
FOR TESTED SUBSTANCES*

	Detection Limits (ppm or mg/1)
CHLORINATED HYDROCARBON PESTICIDES & PCB's	
Alachlor	.00001
Aldrin	.00001
Atrazine and/or Simazine	.00001
BHC	.00001
Captan	.00001
Chlordane	.00001
Chlorothalonil	.00001
Chlorpropham	.00001
Dacthal	.00001
DDD	.00001
DDE	.00001
DDT	.00001
Dicofol	.00001
Dieldrin	.00001
Difolatan	.00001
Diuron	.00001
Endosulfan	.00001
Endrin	.00001
Heptachlor	.00001
Heptachlor Epoxide	.00001
Lindane	.00001
Methoxychlor	.00002
Nitrofen	.00001
PCB 1016	.00025
PCB 1242	.00025
PCB 1254	.00025
PCB 1260	.00025
Perthane	.00001
Pronamide	.00001
Propanil	.00001
Toxaphene	.00025

	Detection Limits (ppm or mg/1)
ORGANIC PHOSPHORUS PESTICIDES	
Bidrin	.00001
Carbophenthion	.00001
Crufomate	.00001
Demeton	.00010
Diazinon	.00001
Dioxathion	.00001
Dursban	.00001
Ethion	.00001
Ethyl Parathion	.00001
Fenthion	.00002
Malathion	.00001
Methidathon	.00001
Methyl Parathion	.00001
Paraoxon	.00001
Phorate	.00003
Phorate Sulfone	.00001
Phosmet	.00001
HERBICIDES & FUNGICIDES	
2,4-D + esters & salts	.00001
2,4,5-T + esters and salts	.00001
2,4,5-TP/Silvex + esters and salts	.00001
MCPA	.00001
Pentachlorophenol	.00001
Tetrachlorophenol	.00001
MISCELLANEOUS COMBINATIONS	
CDEC	.00001
Thiobencarb	.00001

* Listed are those pesticides that would be detected by laboratory scans currently used for pesticide analysis, and the minimum concentration at which these substances can be detected is shown. Detected amounts from a quarterly sampling program are shown in Table 40.

TABLE 40: PESTICIDES IN CALIFORNIA AQUEDUCT

(in parts per million)

STATION	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
DELTA PUMPING PLANT												
Chlorinated Hydrocarbons		0.00000			0.00096			0.00001				
Organic Phosphorous					0.00000			0.000024			0.00002	
Herbicides		0.00013			0.00001			0.00000				
Combinations of C,P, and N types					0.00025			0.00001				
DISCHARGE FROM O'NEILL P.P.												
Chlorinated Hydrocarbons		0.00000			0.00001						0.00000	
Organic Phosphorous												
Herbicides		0.00000			0.00000							
Combinations of C,P, and N types												
NEAR KETTLEMAN CITY (Check 21)												
Chlorinated Hydrocarbons		0.00000			0.00000						0.00000	
Organic Phosphorous					0.00001			0.00008				
Herbicides		0.00000			0.00007			0.00000			0.00026	
Combinations of C,P, and N types												
TEHACHAPI AFTERBAY												
Chlorinated Hydrocarbons				0.00000								
Organic Phosphorous				0.00000								
Herbicides				0.00026								
Combinations of C,P, and N types												

C – Chlorinated Hydrocarbons

P – Organic Phosphorous

N – Organic Nitrogen