State of California
The Resources Agency

DEPARTMENT OF WATER RESOURCES
Division of Operations and Maintenance

STATE WATER PROJECT ANNUAL REPORT OF OPERATIONS 1984

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FOREWORD

This is the eleventh in a series of annual reports summarizing the water and energy operation of the California State Water Project. This report summarizes the operation of Project facilities during 1984, and includes revisions to the data published in the monthly "State Water Project, Report of Operations".

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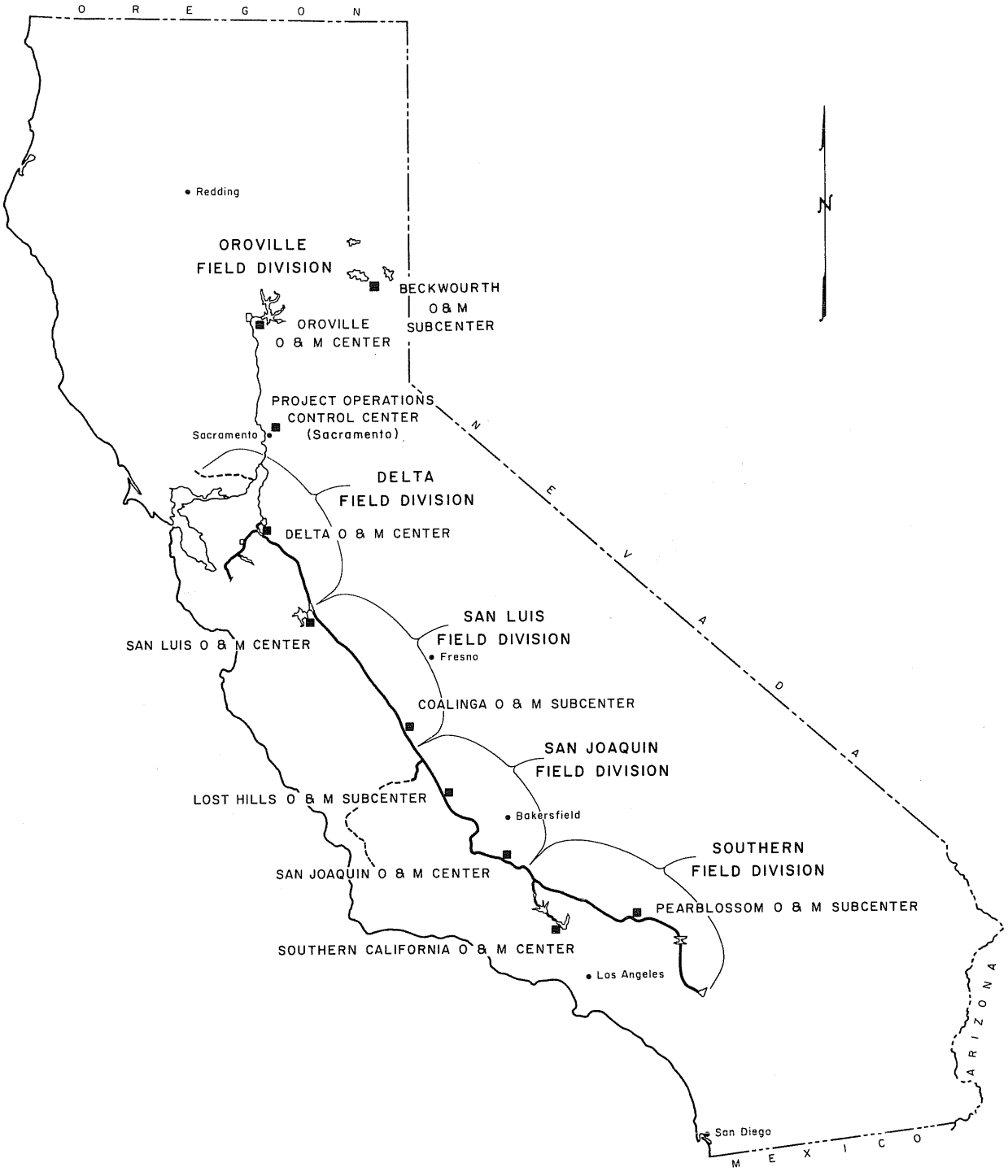
MAP 1
FIELD DIVISION BOUNDARIES



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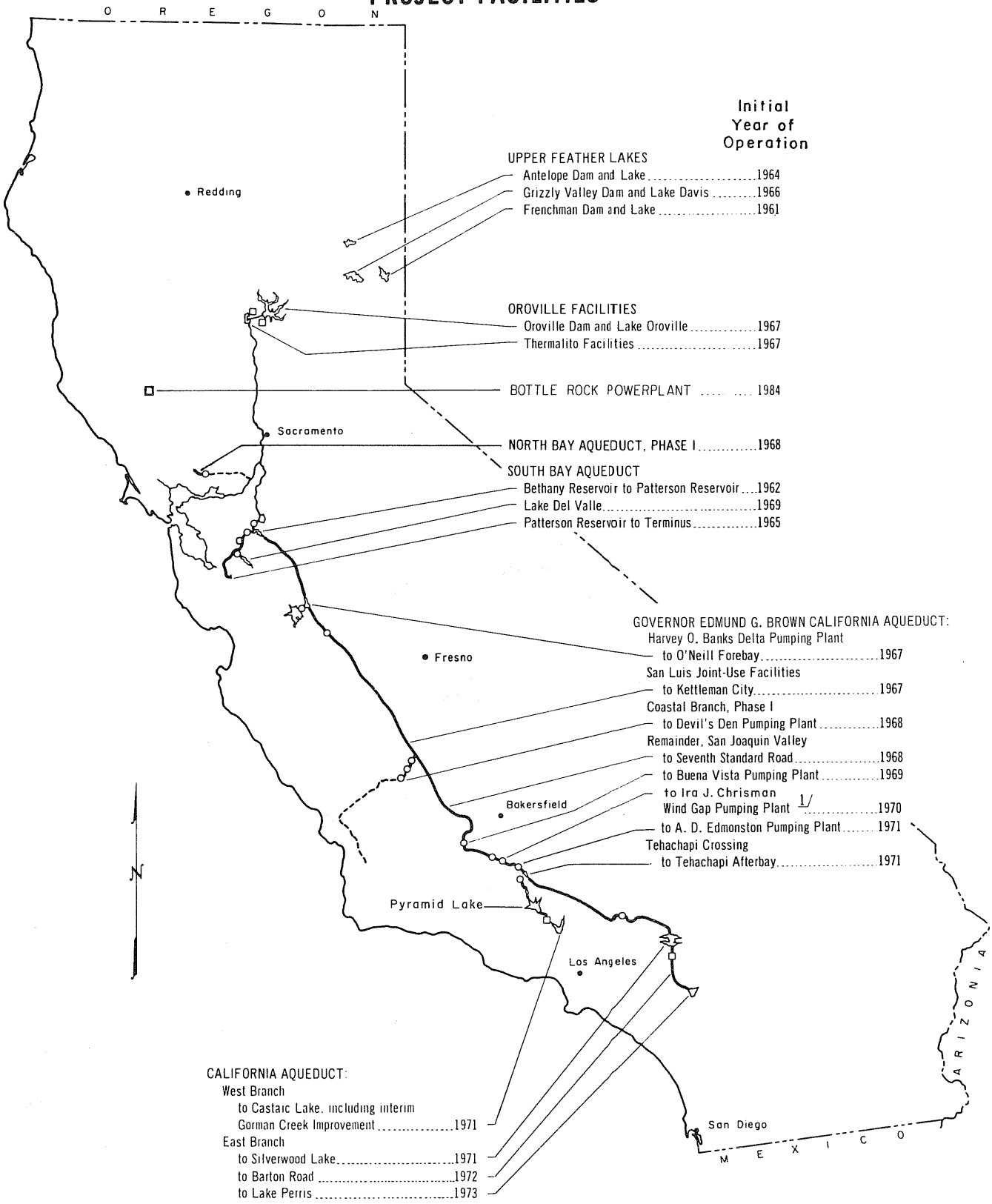


1/ This title became effective on Jan. 9, 1986.

INTRODUCTION

The 1984 Annual Report of Operations for the State Water Project (SWP) is divided into eight parts. The first two parts, "Introduction and Highlights of 1984 Operation" and "Project Status in 1984", cover conditions and events of state-wide significance, in detail where appropriate and in summary when the item is discussed in more detail in the following sections. The next four sections cover water quality, water conditions, water operations, and energy operations in 1984. The seventh part, "Sacramento-San Joaquin Delta Operations", gives special emphasis to Delta operations, a key aspect of the SWP. The last part, "Project Operations By Field Division", provides further detail on operational conditions and activities by field division.

The report also includes three additional sections in the appendix, tabulating and depicting Project operations. Section I covers operations of the Governor Edmund G. Brown California Aqueduct (California Aqueduct). Section II covers Project pumping plants. Section III covers various types of water quality measurement analyses for selected stations throughout the Project.

HIGHLIGHTS OF 1984 OPERATION

The 1983-84 water year (October 1, 1983 through September 30, 1984) began with heavy precipitation in November and December that threatened to be a repeat of the previous record year. The weather pattern then changed, and the above normal first quarter of the year was followed by well below normal precipitation for the remaining three quarters. Despite the dramatic drop in precipitation after January, total water year runoff was above normal for most river basins, and reservoir storages were just above average for the State as a whole. As a result, demand for SWP water returned to more normal levels in 1984 after the extremely wet year of 1983. Deliveries of entitlement water to long-term contractors dramatically increased over 1983, and was sufficient for meeting the 1984 deliveries requested in the fall of 1983.

After a drawdown of about 100 feet at San Luis Reservoir, a small crack appeared in the roadway on the crest of San Luis Dam on July 30, in the same place as the 1981 slide. By August 22, the crack was 0.75 inch wide and 100 ft long. A review by a board of consultants declared that the dam was in no danger of failing. Normal reservoir operation resumed in the fall of 1984.

A turn-in structure was constructed in August by the Los Angeles Department of Water and Power (LADWP) in Pool 44 of the California Aqueduct, where the First Los Angeles Aqueduct crosses the California Aqueduct. This structure was constructed to provide for water deliveries to the Antelope Valley-

East Kern Water Agency (AVEKWA) during the East Branch outage from September 24 through February 5, 1985, for construction work at Alamo Powerplant and Pearblossom Pumping Plant, which is discussed in detail on page 4. The turn-in was constructed to provide not only the 30 cubic feet per second (cfs) of flow capacity needed for that period, but also for possible future water exchanges up to 480 cfs.

Design of the three-Megawatt (MW) Thermalito Diversion Dam Powerplant was nearing completion at the end of 1984. The largest two contracts were awarded in August of 1984 for constructing the powerplant and furnishing the turbine, generator, and governor. The facility is scheduled to become operational in 1987.

Construction of the valve vault for the future Mojave Siphon Powerplant continued in 1984, and the plant's tunnel through the left abutment of Cedar Springs Dam was nearing completion at the end of 1984. Construction of the plant itself remained deferred pending decisions on the enlargement of the East Branch of the California Aqueduct.

Construction of Bottle Rock Powerplant, a 55-MW geothermal development, was essentially complete in the fall of 1984. The plant will begin generating power in 1985.

Installation of the final three pumps at A. D. Edmonston Pumping Plant was completed, and the units became operational in December 1984. Full plant capacity was then 14 units for a total of 4,410 cfs.

PROJECT STATUS IN 1984

PROJECT FACILITIES

The SWP 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. An additional facility, William E. Warne Powerplant, began generation on November 17, 1982.

SWP facilities in operation during 1984 included: 22 reservoirs with a gross capacity of 6,797,171 acre-feet (ac-ft); six power plants with a total output capacity of 1,631 MW [1/]; 16 pumping plants housing 112 units with a total motor rating of 2768 MW [2/]; and 537 miles of aqueduct.

During 1984, water was delivered from SWP facilities to:

* 25 State long-term water service contractors.
* 3 Agencies receiving recreation water (Department of Parks and Recreation, Department of Fish and Game, and the Los Angeles County Recreation Department).
* Several local agencies and farmers receiving water to satisfy prior water rights.
* 2 Local agencies receiving other water.

In addition, SWP facilities were used to wheel federal water to seven USBR customers.

MAJOR OUTAGES AND OPERATING LIMITATIONS

Major outages and operating limitations of SWP facilities during 1984 were:

* The South Bay Aqueduct was taken out of service from November 4 to 16, to install trash rakes at the Lupin and Del Valle checks, and to make lining repairs at several locations along the Aqueduct's pipeline. During this same outage, Santa Clara Valley Water District (SCVWD) completed installation of the new 54-inch butterfly valve below the terminal tank of the South Bay Aqueduct.
* After a normal drawdown at San Luis Reservoir to meet increased demands, elevation at the reservoir

1 Includes 202 MW of federal power generation at San Luis Pumping-Generating Plant, and excludes 1,036 MW from Castaic Powerplant for LADWP.

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

was held to 433 ft (808,721 ac-ft) from August 22 to September 28, to install instrumentation on the upstream face of the dam in order to define the earth movement problem at the Dam which resulted from the 1981 slide. On October 11, the operations crew received clearance to fill San Luis Reservoir to elevation 448 ft (952,506 ac-ft). Pumping into the reservoir resumed by the U.S. Bureau of Reclamation (USBR) and the Department of Water Resources (DWR) on October 10 and 11, respectively.

East Branch

* Pearblossom Pumping Plant was shut down on September 24 for work related to the installation of a concrete wing wall to allow for future enlargement. This work began with an earth dike in Pool 58, at a point 600 ft upstream of Pearblossom Pumping Plant. In addition, the East Branch was shut down on October 2 to install an earth dike at 1,000 ft upstream of Check 42 to tie in the Alamo Powerplant intake and tailrace channels, and another earth dike in pool 43 to isolate the whole tailrace area. The recently-built turn-in connection to the California Aqueduct from the LADWP's First Los Angeles Aqueduct became operational on September 28. Thirty cfs were released through this connection to help meet AVEKWA's water demands during this period. Deliveries to the Metropolitan Water District of Southern California (MWDSC) from the East Branch were met from storage in Silverwood Lake during this period. The East Branch remained out of service at the end of 1984.

West Branch

* On January 16, a break occurred at Station 283 in the Lower Quail Canal, about one mile downstream from the outlet of Quail Lake. The break expanded to about 50 ft in width in the embankment, and extended down to about elevation 3,302 ft, about 14 ft above the bottom of the canal. All of the damage was on the west side of the canal. About 1,000 ft along the canal was affected by movement of the embankment and concrete lining. Approximately 300 ac-ft of water escaped through the break. The escaped water was controlled by a recently completed detention embankment, and flowed safely to the Gorman Creek improvement channel and thence to Pyramid Lake. Another 600 ac-ft was released through the Peace Valley Pipeline to bring water remaining in the canal down to a holding level.

  The canal was operated to a maximum elevation of 3,300 ft (canal maximum elevation is 3324.5 ft) to facilitate the repair work on the damaged canal section. Reduced flows of 800 cfs from Quail

Lake to Pyramid Lake resumed on April 10, and the water level was maintained below the damaged area by throttling the Quail Lake outlet gates. The canal was made operational to elevation 3,309 ft on November 2, then to elevation 3,311 ft on November 8, until installation of the embankment drainage system was completed.

* Castaic Lake was drawn down to elevation 1,380 ft (96,040 ac-ft) starting in April to allow for work on the intake tower. The work entailed repair of hydraulic operators on the 72-inch butterfly tower port valves and associated piping. In October, the Lake was further drawn down to elevation 1,367 ft (81,489 ac-ft) to allow for repairs to the valves in tiers 8 and 9. Refilling of the Lake commenced on November 4.
* The Angeles Tunnel was out of service from November 22 through December 13 for inspection and maintenance work. About 20,000 ac-ft was withdrawn from Pyramid Lake in preparation for this outage to provide space for pumping at A. D. Edmonston Pumping Plant, since the East Branch was out of service.

WATER QUALITY STANDARDS

From 1976 through 1978, the SWP was governed successively by several 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 (SWRCB) in August 1978 of Water Right Decision 1485 (D-1485). That decision established water quality standards for the Delta and Suisun Marsh. As described in more detail under Sacramento-San Joaquin Delta Operations Section, all Delta water quality standards were met in 1984.

Figure A on page 7 shows the mean daily chloride levels at three Delta stations: Cache Slough, Contra Costa Canal Intake, and Tracy Pumping Plant. Figure B on page 8 shows the mean daily electrical conductivity at three SWP locations. Also, Section III of the appendix presents various types of water quality data for selected stations throughout the SWP in tables 21 through 38. Table 39 tabulates the minimum detection concentrations for tested substances, and table 40 tabulates the different types of pesticides detected in the California Aqueduct.

FIGURE A: MEAN DAILY CHLORIDE LEVELS AT DELTA STATIONS
1984

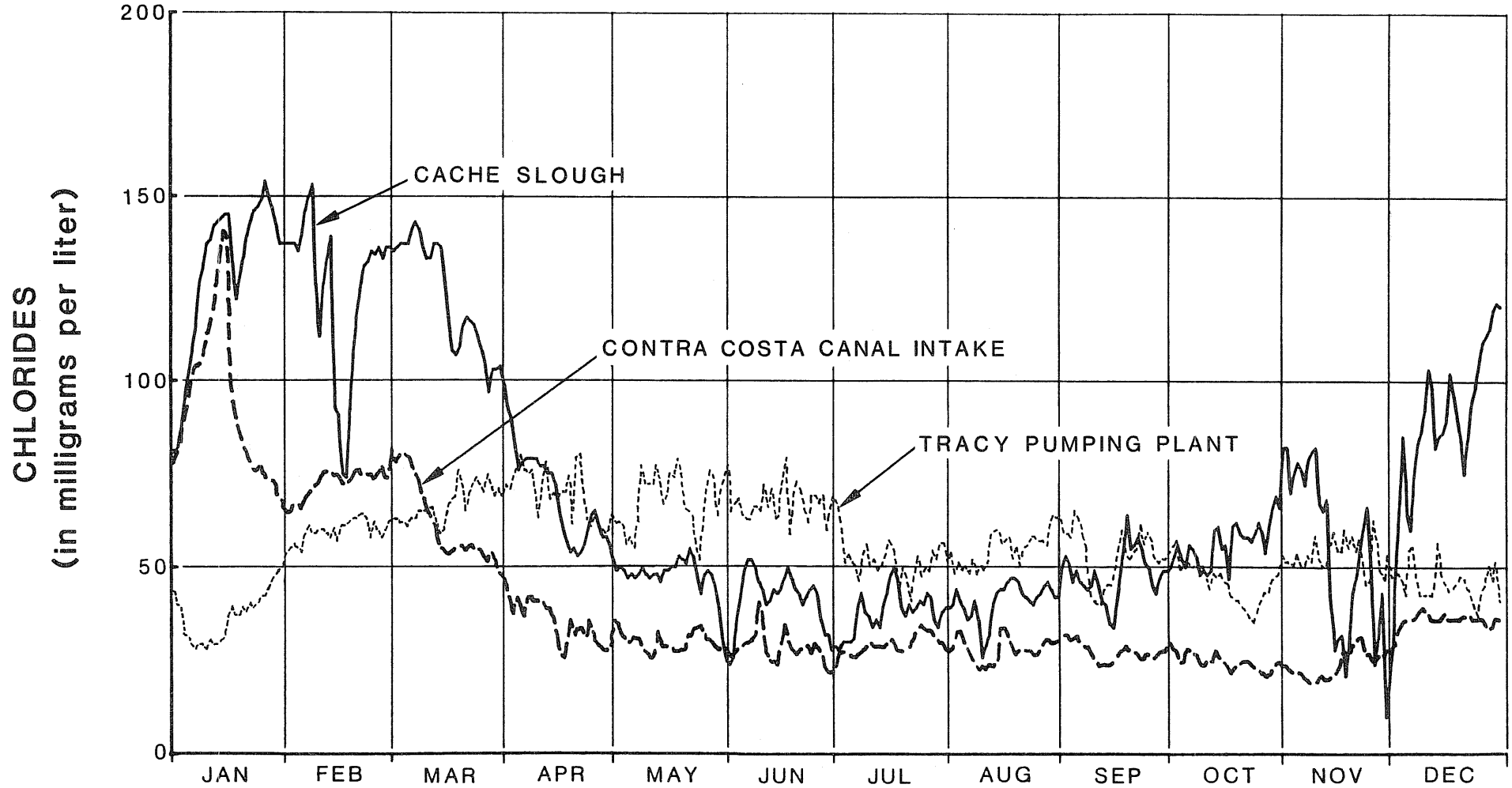
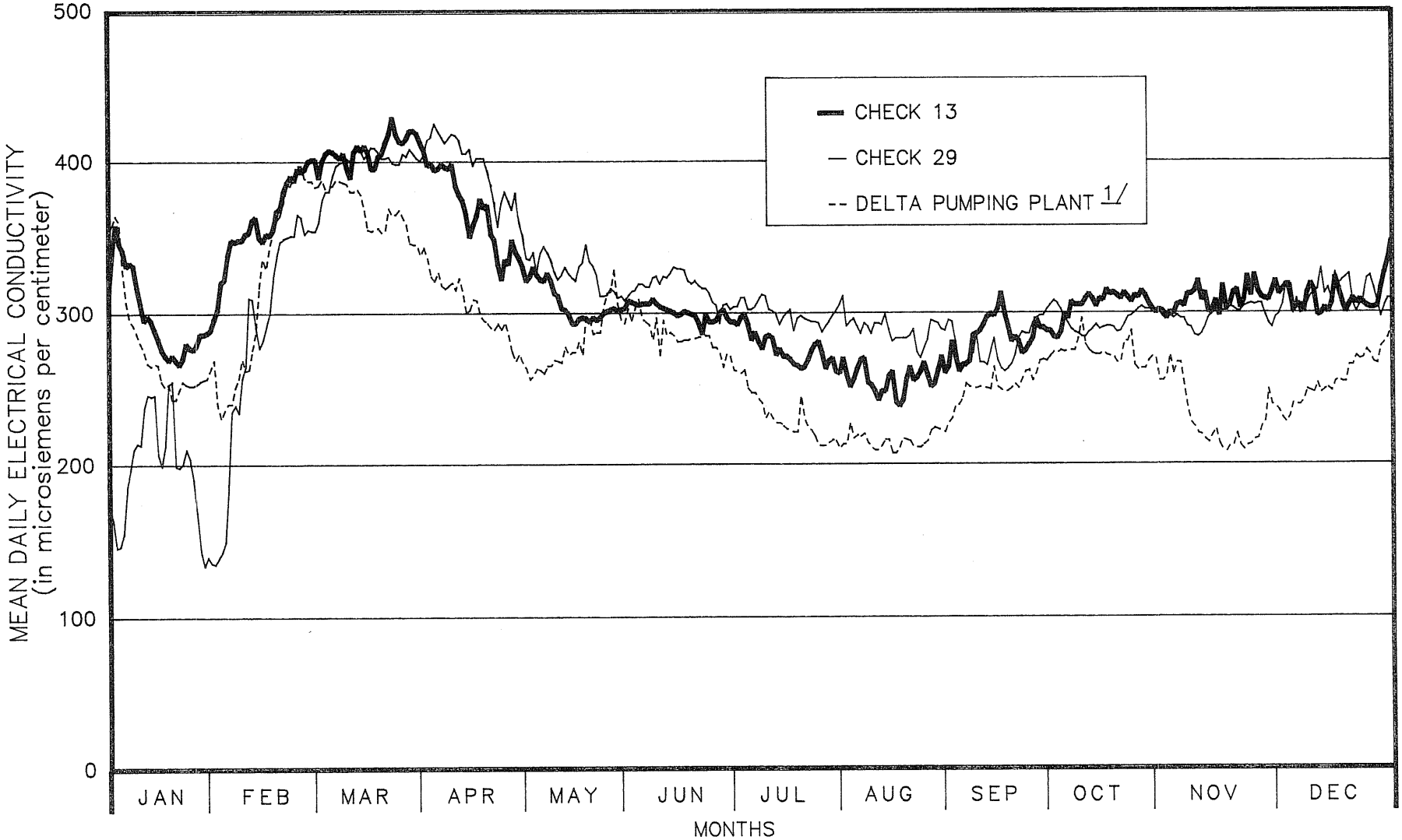


FIGURE B: MEAN DAILY ELECTRICAL CONDUCTIVITY AT SWP LOCATIONS
1984



1/ Estimated values are shown for days when no data was available. (June 11 through June 19 for Delta P.P.)

WATER CONDITIONS

Based on criteria in D-1485, the 1983-84 water year was classified as a "wet" year. The final determination of year classification is made in May, based on current water year forecasts of the "Sacramento River Index" (known as the "Four Basin Index"), which is the sum of the Sacramento Valley's unimpaired runoff at the following four locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Lake Oroville; Yuba River at Smartville; and the American River, total inflow to Folsom Lake. The May 1 forecast (and actual, in parentheses) of unimpaired runoff for these basins was 22,620,000 (22,351,000) ac-ft for the 1983-84 water year, which was 128 (127) percent of average for the four basins [3/]. Because the April through July forecast of unimpaired runoff was 5.52 million ac-ft, which is less than the 5.90 million ac-ft specified in D-1485, the year was further designated a subnormal snowmelt year.

Actual unimpaired runoff for the 1983-84 water year was above average throughout California, except the Central and South Coastal areas which showed below average amounts. Unimpaired runoff statewide for the water year was 138 percent of average, ranging from 60 percent of average in the South Coastal hydrographic area to 189 percent of average in the Colorado Desert area. Total volume of runoff for the water year in the Central Valley was 34.6 million ac-ft.

In the Feather River basin, the primary source of water supply for the SWP, water year total precipitation was 126 percent of average, and the total unimpaired runoff for 1984 was 130 percent of average. Maximum snowpack water equivalent [4/] was 60 percent of average.

State-wide precipitation to May 1, during the 1983-84 water year, was 105 percent of average, compared to 190 percent of average for the corresponding 1982-83 period. The hydrographic areas representative of these conditions are:

Sacramento Valley	115 % of average
San Joaquin Valley	100 % of average
South Coastal	60 % of average

May 1 snow surveys showed snow-stored water amounts that were below average on the majority of snow courses measured. Snowpack water equivalent measurements in Sacramento Valley watersheds were 80 percent of average. San Joaquin Valley watersheds were lower at 55 percent of average.

3 Unimpaired runoff and precipitation averages are based on the 50-year period 1931-1980. Snowpack averages are based on the 45-year period 1931-1975.

4 Snowpack water equivalent is the amount of water contained in a snow sample using selected snow courses and sensors.

WATER OPERATIONS

RESERVOIR OPERATIONS

On January 1, storage in the principal SWP reservoirs (Lake Oroville, Lake Del Valle, San Luis Reservoir, Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris) was above average. The combined storage of these reservoirs on January 1 was about 800 thousand ac-ft below their combined operational capacity. At the end of 1984, this combined storage was about 284 thousand ac-ft (six percent) less than the combined storage at the end of 1983. The following tabulation compares 1983 and 1984 year-end storage in the principal SWP reservoirs:

Reservoir & Operational Capacity (ac-ft)	Storage (ac-ft) 12/31/83	12/31/84
Lake Oroville 3,520,000	2,830,810	2,672,684
Lake Del Valle 40,000	36,253	26,464
San Luis Reservoir* 1,062,000	1,064,254	1,061,150
Pyramid Lake 170,000	153,425	153,727
Castaic Lake 319,000	270,730	133,369
Silverwood Lake 73,000	37,117	62,190
Lake Perris 127,000	125,149	124,305
Total 5,311,000	4,517,738	4,233,889
Total difference	-283,849	
* SWP share.		

A detailed description of the individual reservoirs is presented in the Project Operations section under their respective field divisions, beginning on page 37.

AQUEDUCT OPERATIONS

In 1984, a total of 1,540,707 ac-ft of Central Valley Project (CVP) water was delivered from the San Luis Joint-Use Facilities to the federal San Luis service area. DWR operates and maintains the joint-use facilities, including the 102 miles of aqueduct between O'Neill Forebay and Kettleman City.

The DWR provided 64,621 ac-ft of water from San Luis Reservoir to the USBR in O'Neill Forebay in May, June, and July. The USBR then pumped this water to the Cross Valley Canal for delivery to federal customers. The USBR returned this water to the State's share of San Luis Reservoir in November and December by pumping an equivalent amount of CVP water through Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant).

The flows of excess San Joaquin Valley flood water into the California Aqueduct through the Kern River Intertie, which began in 1983, were terminated on February 10, 1984. A total of 27,846 ac-ft was diverted into the California Aqueduct through the Intertie in 1984.

The Los Angeles Department of Water and Power (LADWP) supplied water from the First Los Angeles Aqueduct to the California Aqueduct using the newly-constructed connection facilities at its crossing over Pool 44 to help meet the needs of the Antelope Valley-East Kern Water Agency (AVEKWA), while the East Branch was shut down for construction work at Alamo Powerplant and Pearblossom Pumping Plant between September 24 and the end of the year. The connection became operational on September 28, and provided 3,111 ac-ft of water between that date and November 27, when use was stopped for the year.

In 1984, DWR pumped a total of 192,144 ac-ft of Decision 1485 replacement water at Banks Pumping Plant for the USBR.

WATER DELIVERIES

Water conditions in 1984 helped restore demands for SWP water to more normal levels after the extremely wet year of 1983. Project water supplies in 1984 were sufficient to meet all water service contractors' requests for SWP water deliveries.

The total amount of water delivered by the SWP in 1984 was 4,420,534 ac-ft. SWP deliveries, prior water rights deliveries, local supply deliveries, and federal deliveries are included in this total.

SWP water delivered in 1984 totaled 1,906,617 ac-ft, a 50 percent increase over project water delivered in 1983. Deliveries made to satisfy prior water rights (listed on page 38) totaled 832,197 ac-ft. Local supply water delivered from SWP facilities totaled 42,515 ac-ft, up 30 percent from the amount delivered in 1983. Federal deliveries made by the SWP totaled 1,639,205 ac-ft in 1984.

In addition to entitlement water, which was 1,590,663 ac-ft (includes 3,111 ac-ft of LADWP water supplied from the First Los Angeles Aqueduct through the connection over pool 44 of the California Aqueduct and delivered to AVEKWA through reach 30) in 1984, SWP deliveries were made for various

other purposes in 1984. The following table shows these various water deliveries by water type, and a discussion of these different types follows the table.

1984 water deliveries by type:

Type	Amount (ac-ft)
Entitlement	1,590,663
Wet Weather Water	900
Carry-over Water	41
Surplus Water	262,917
Recreation Water	4,190
Mitigation Water	472
1977 Emergency Relief Water	8,100
1982 Exchange Water	685
Repayment Water	38,649
Subtotal	1,906,617
Local Supply Water (non-project)	42,515
Total	1,949,132

Under water supply contract Article 7 (South Bay contractors) or Article 45 (San Joaquin contractors), SWP contractors can acquire credits for future deliveries if above-normal supplies of local water reduces their needs for SWP water. The delivery of these credits in any one year is permitted, provided that the sum of the current annual entitlement plus "wet-weather" water do not exceed a contractor's maximum annual entitlement. As of January 1, 1984, five contractors had acquired credits totaling 225,002 ac-ft for future delivery of entitlement water. Of this total, 221,961 ac-ft was acquired under the wet-weather provisions of their contracts, and 3,041 ac-ft was carry-over water (see next paragraph). During 1984, Oak Flat Water District took delivery of 900 ac-ft of Article 45 water for which it had acquired credit in 1982 and 1983.

Both Empire West Side Irrigation District (EWSID) and Devil's Den Water District (DDWD) reached their maximum annual entitlement in 1983. Therefore, EWSID was no longer able to exercise the delivery provisions of Article 45 of its contract. DDWD had not amended the wet-weather provisions into its contract prior to reaching maximum annual entitlement. EWSID and DDWD did, however, have temporary "carry-over" storage rights in either Lake Oroville or San Luis Reservoir under letter agreements executed on October 1, 1979. Both EWSID and DDWD requested that their undelivered 1983 entitlement water be stored in Lake Oroville. A total of 3,041 ac-ft of undelivered 1983 entitlement water was stored. On January 1, 1984, Lake Oroville exceeded its flood control reservation, and EWSID's carry-over water (3,000 ac-ft) was released from storage. Accordingly, EWSID received a monetary credit for 3,000 ac-ft as provided in the October 1, 1979, storage agreement which was later stored in Lake Oroville contingent on space

availability. As requested by the DDWD, its 1983 carry-over water (41 ac-ft) was delivered to the District on January 1, 1984.

In September 1983, six contractors submitted estimates indicating that they could use a total of 245,858 ac-ft of surplus water during 1984. In December 1983, DWR announced that all 1984 surplus water requests could be satisfied. The total surplus water delivered during 1984 was 262,917 ac-ft to only five contractors.

During 1984, a total of 4,190 ac-ft of recreation water was delivered for use at public recreation facilities at Lake Del Valle, San Luis Reservoir, O'Neill Forebay, Silverwood Lake, Pyramid Lake, Castaic Lake, and Lake Perris. Also, during 1984, a total of 472 ac-ft was conveyed to about 830 acres of wildlife mitigation lands located below O'Neill Forebay at the Pilibos Wildlife Area as fish and wildlife mitigation water.

The 1977 emergency relief water program resulted in 95,176 ac-ft of undelivered exchange water being held in SWP reservoirs for emergency relief of future drought conditions. Two non-SWP contractors (Green Valley Water District and Tracy Golf and Country Club) purchased a total of 650 ac-ft of this stored water and took delivery in 1978 and 1979. Also in 1978, Kern County Water Agency (KCWA) purchased the remaining 94,526 ac-ft for delivery before December 31, 1983. At KCWA's request, an agreement was made to extend the delivery deadline to December 31, 1986. In 1984, 8,100 ac-ft of water was delivered to KCWA, leaving a balance of 13,421 ac-ft undelivered.

The MWDSC was able to increase imports of water from the Colorado River During 1982, which resulted in decreased SWP demands. In return, an equal amount of MWDSC's 1982 entitlement water was made available to San Joaquin Valley agencies. This arrangement was made to alleviate agricultural water shortages resulting from the repair of San Luis Dam and consequent unavailability of San Luis Reservoir for full use during 1982. Of the 120,000 ac-ft of water eventually exchanged, 60,000 ac-ft was purchased by the USBR for delivery to the Westlands Water District, and 306 ac-ft was delivered to Oak Flat Water District in 1982. Dudly Ridge Water District (DRWD), DDWD, and KCWA obtained rights under a 1982 agreement to the remaining water, which was stored in MWDSC ground water basins and in Lake Oroville as follows:

Agency	MWDSC Basins (ac-ft)	Lake Oroville (ac-ft)	Total (ac-ft)
DDWD	126	559	685
DRWD	1,301	1,821	3,122
KCWA	9,494	46,393	55,887
Totals	10,921	48,773	59,694

Only one delivery from the stored 1982 exchange water was made in 1984, when DDWD received all of its water (685 ac-ft).

Preconsolidation repayment water deliveries in 1984 were 7,924 ac-ft to Shell California Production, Inc. (formerly Belridge Oil Company), and 30,725 ac-ft to J. G. Boswell Company. At the end of 1984, the preconsolidation repayment account to be delivered before 1995 was as follows:

Pre-consolidation Repayment Water

(ac-ft)

Contract Holder	Total Contract Amount	1983 Balance	1984 Deliveries	Remaining Balance
J. G. Boswell Co.	131,600	44,895	30,725	14,170
Shell California Production, Inc.	108,000	31,613	7,924	23,689

SWP facilities are also used to transport non-project water for both long-term SWP contractors and for other agencies under various agreements to honor local water rights. Some of this water simply passes through SWP facilities, and some is stored in SWP reservoirs to be released later in the year, under agreements by which water-right holders pay storage fees. The SWP reservoirs used for storing this type of water are Lake Del Valle and Castaic Lake. In 1984, a total of 42,515 ac-ft was delivered in this manner.

The total amount of water delivered to federal customers from the joint-use facilities was 1,639,205 ac-ft in 1984. This amount includes 433 ac-ft of federal recreation water and 98,498 ac-ft of CVP water wheeled for the USBR by DWR. This is about 29 percent higher than deliveries made in 1983.

Table 1 on page 15, shows deliveries from SWP facilities by years, with totals to date, for individual agencies. Figure C on page 16, shows annual totals for California Aqueduct water deliveries. Water deliveries by field division are presented in map 3 on page 17.

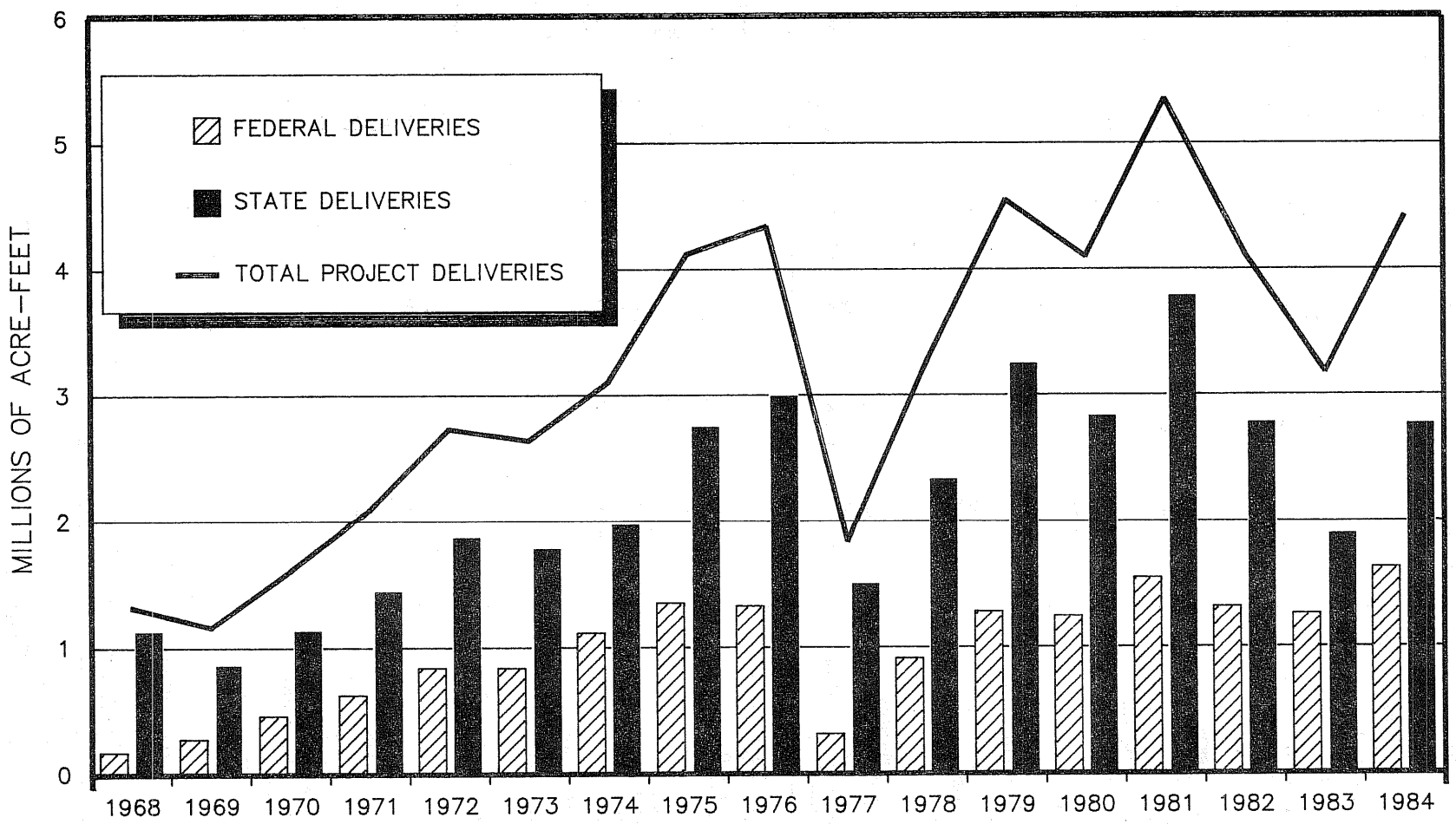
TABLE 1: WATER DELIVERIES 1962-1984
(in acre-feet)

AGENCY	1962-1979	1980	1981	1982	1983	1984	TOTALS
OROVILLE FIELD DIVISION							
LAST CHANCE CREEK W.D. 1/	71,846	11,800	12,145	10,499	9,073	13,782	129,145
PLUMAS CO. F.C. & W.C.D.	3,663	295	355	305	262	272	5,152
PALERMO CANAL 2/	94,420	8,166	6,736	6,493	6,761	6,850	129,426
COUNTY OF BUTTE	2,925	267	221	334	325	177	4,249
THERMALITO I.D. 1/	3,762	1,327	1,301	763	1,459	1,869	10,481
THERMALITO AFTERBAY 2/	9,315,417	851,578	859,986	754,260	594,409	822,721	13,198,371
UPPER FEATHER RIVER LAKES 2/	103,441	923	1,446	484	797	2,626	109,717
YUBA CITY	-	-	-	-	-	108	108
DELTA FIELD DIVISION							
NAPA CO. F.C. & W.C.D.	57,172	6,707	9,001	1,213	2,287	2,923	79,303
ALAMEDA CO. W.D. 1/	272,216	26,968	32,365	15,383	12,470	13,723	373,125
ALAMEDA CO. F.C. & W.C.D., ZONE 7 1/	187,619	21,122	22,299	19,055	15,460	20,340	285,895
PLEASANTON TOWNSHIP W.D.	674	0	0	0	0	0	674
SANTA CLARA VALLEY W.D.	470,331	102,278	106,920	88,564	86,733	91,663	946,489
MARIN W.D.	4,594	0	0	0	0	0	4,594
SAN FRANCISCO W.D.	4,345	0	0	0	0	0	4,345
SKYLONDA M.W.D.	10	0	0	0	0	0	10
OAK FLAT W.D.	67,791	6,418	7,088	4,865	3,822	7,344	97,328
MUSTANG W.D.	4,256	0	0	0	0	0	4,256
TRACY GOLF & COUNTRY CLUB 3/	341	425	351	319	364	525	2,325
GRANITE CONSTRUCTION	0	120	0	0	0	0	120
LAKE DEL VALLE (E.B.R.P.D.)	458	123	121	129	132	158	1,121
ORESTIMBA CREEK	100	0	0	0	0	0	100
MUSCO OLIVE	-	-	-	-	-	10	10
SAN LUIS FIELD DIVISION							
DEPT. PARKS & REC. (STATE)	269	56	72	49	45	55	546
DEPT. FISH & GAME (STATE)	1,329	688	669	418	381	472	3,957
FED. CUSTOMERS (REC.+ JOINT-USE)	9,566,870	1,253,956	1,419,632	1,264,735	1,269,901	1,540,707 13/	16,315,801
FED. CUSTOMERS (MISC.)	0	0	1,059	60,000	0	0	61,059
SAN JOAQUIN FIELD DIVISION							
TULARE LAKE BASIN W.S.D.	1,244,520	84,061	299,364	85,916	1,006	5,743	1,720,610
EMPIRE WEST SIDE I.D.	45,667	894	8,851	1,287	0	0	56,699
COUNTY OF KINGS	17,900	2,200	2,300	1,750	3,550	3,100	30,800
HACIENDA W.D. 4/	69,695	6,200	0	0	0	0	75,895
KERN CO. W.A.	6,578,031	964,933	1,340,581	895,193 12/	595,112	1,099,391	11,473,241
DUDLEY RIDGE W.D.	602,461	80,079	73,327	55,463	55,919	64,600	931,849
DEVILS DEN W.D.	160,869	19,974	23,347	19,059	12,659	20,845 14/	256,753
J.G. BOSWELL	46,705	0	40,000	0	0	30,725	117,430
SHELL CAL PROD. 8/	55,118	3,159	6,060	5,979	6,071	7,924	84,311
GREEN VALLEY W.D.	6,536	1,795	0	0	0	2,557	10,888
U.S.B.R. (FISH & WILDLIFE)	11,700	0	0	0	0	0	11,700
U.S.B.R.	179,480	0	135,780	1,046 5/	0	95,406	411,712
WHEELER RIDGE W.S.D.	92	0	0	0	0	0	92
SOUTHERN FIELD DIVISION							
A.V.E.K. W.A.	175,156	72,407	79,375	50,291	32,961	32,662 15/	442,852
M.W.D. OF S.C.	2,902,025	531,727	795,846	691,749	371,985	460,693	5,754,025
LITTLEROCK CREEK I.D.	3,092	191	1,517	0	38	1	4,839
MOJAVE W.A.	4,733	4,000	4,000	10,500 10/	34,356	0	57,589
DESERT W.A.	72,300	17,000	19,000	21,000	23,000	25,000	177,300
COACHELLA VALLEY W.D.	46,947	10,884	12,105	13,326	14,547	15,768	113,577
CRESTLINE-LAKE ARROWHEAD W.A.	6,957	1,239	1,485	1,238	911	1,128	12,958
SAN GABRIEL VALLEY M.W.D.	29,190	1,085 7/	3,619 6/	12,599 11/	734 9/	7,656	54,883
SAN BERNARDINO VALLEY M.W.D.	105,350	150	16,586	14,137	6,675	5,556	148,454
DEPT. PARKS & REC., L.A. CO. REC. DEPT.	2,840	781	2,156	2,119	3,098	3,977	14,971
PIRU CREEK FISH ENHANCEMENT	2,915	0	0	0	0	0	2,915
CASTAIC LAKE W.A.	7	1,210	5,761	9,516	9,476	11,477	37,447
TOTALS	32,604,135	4,097,188	5,352,827	4,120,036	3,176,779	4,420,534	53,771,497

1/ Includes regulated delivery of local supply.
2/ Prior water right entitlement.
3/ Conveyance of C.V.P. water as of 1981.
4/ Hacienda Water District was annexed by Tulare Lake Basin W.S.D. in 1981.
5/ Includes Green Valley W.D.
6/ Includes San Bernardino Valley M.W.D. Ground Water Demonstration of 565 A.F.
7/ Ground Water Demonstration.
8/ Repayment of preconsolidation water.
9/ Includes 681 acre-feet delivered and stored at state expense, charge to be made upon withdrawal.
10/ Ground water withdrawn as an entitlement delivery.
11/ Includes 1,650 acre-feet of ground water withdrawn as entitlement and 5,728 acre-feet stored at state expense.
12/ Includes 199 acre-feet delivered to Pleasant Valley W.D. in San Luis Field Division.
13/ Includes 433 acre-feet Federal recreation water.
14/ Includes 559 acre-feet of 1982 Exchange water stored in Lake Oroville and 126 acre-feet stored in a MWDSC ground water basin.
15/ Billed for 126 acre-feet of 1982 Exchange Water, but not included here. Includes 3,111 acre-feet of local-out through reach 30.

FIGURE C: TOTAL PROJECT DELIVERIES

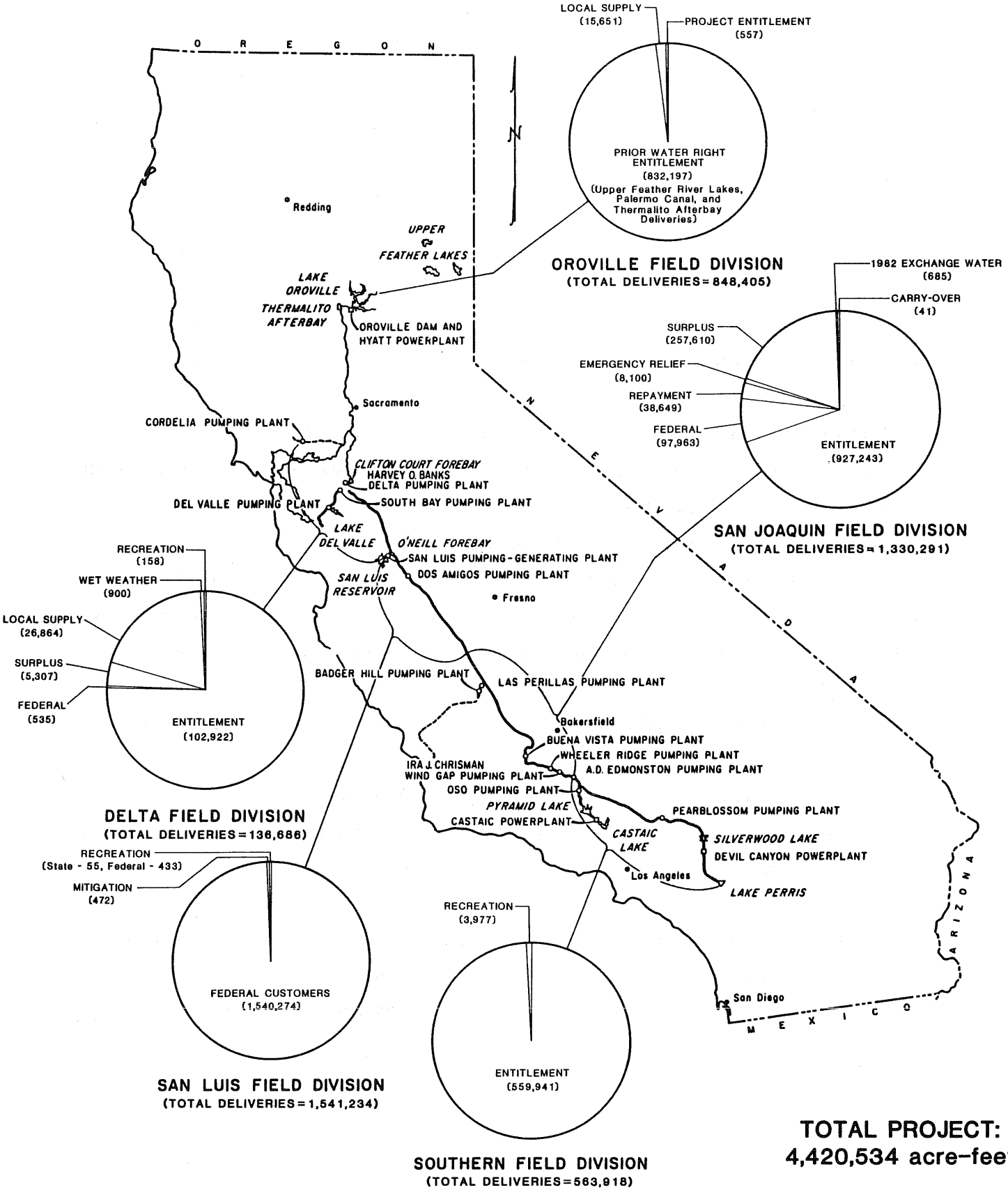
ANNUAL TOTALS



MAP 3

PROJECT WATER DELIVERIES 1984

(in acre-feet)



TOTAL PROJECT: 4,420,534 acre-feet

ENERGY OPERATIONS

DWR began operation as a bulk power agency following the termination of several key power supply and power sale contracts on March 31, 1983. The year 1984 was the first full year of operation as a bulk power agency.

ENERGY SOURCES

Energy generation from the SWP's six hydroelectric plants (Hyatt, Thermalito, San Luis, William E. Warne, Castaic, and Devil Canyon) during 1984, grossed 3,332,981 megawatthours (MWh), as illustrated in figure D on page 20. This is a 39 percent decrease from that generated in 1983, but was sufficient to meet over 92 percent of SWP energy requirements in 1984. Monthly generation totals for each plant are shown in table 2 on page 21.

Edward Hyatt and Thermalito Powerplants constituted the largest single source of SWP energy in 1984, with 2,609,613 MWh generated, far below the record amount generated in the extremely wet year of 1983, but still above the estimated average production at these plants. Operation of Edward Hyatt and Thermalito Powerplants is shown in figure E on page 22.

The combined energy generation at the SWP energy recovery plants (San Luis, William E. Warne, Castaic, and Devil Canyon) totaled 723,368 MWh in 1984. This is a 40 percent increase over the amount generated in 1983, and reflects the increased amount of water conveyed through the California Aqueduct.

The last of the three units at Pine Flat Powerplant was declared commercially operable on April 1, 1984. DWR receives all of the output of this 165-MW plant under a 50-year contract with the Kings River Conservation District. The plant furnished 552,337 MWh to the SWP in 1984.

Reid Gardner Unit No. 4 supplied 1,327,379 MWh to the SWP in 1984, which was its first year of full operation. This amount included 19,000 MWh that was banked with Nevada Power Company during start-up of the unit in 1983. The balance of banked energy due to DWR was 41,000 MWh as of December 31, 1984.

DWR has a contract with TERA Corporation for purchase of the energy from two hundred 50-KW wind turbines to be constructed at Bethany Wind Park near the South Bay Pumping Plant. One hundred wind turbines were operational at the end of 1984, and delivered 5,706 MWh to the SWP during the year.

Energy generation as a part of all SWP energy sources in 1984 is illustrated in figure F, on page 23.

In April 1983, the SWP began receiving energy under contract from five small hydroelectric facilities (total capacity of 30 MW) owned and operated by MWDSC. In 1984, these plants furnished 146,140 MWh

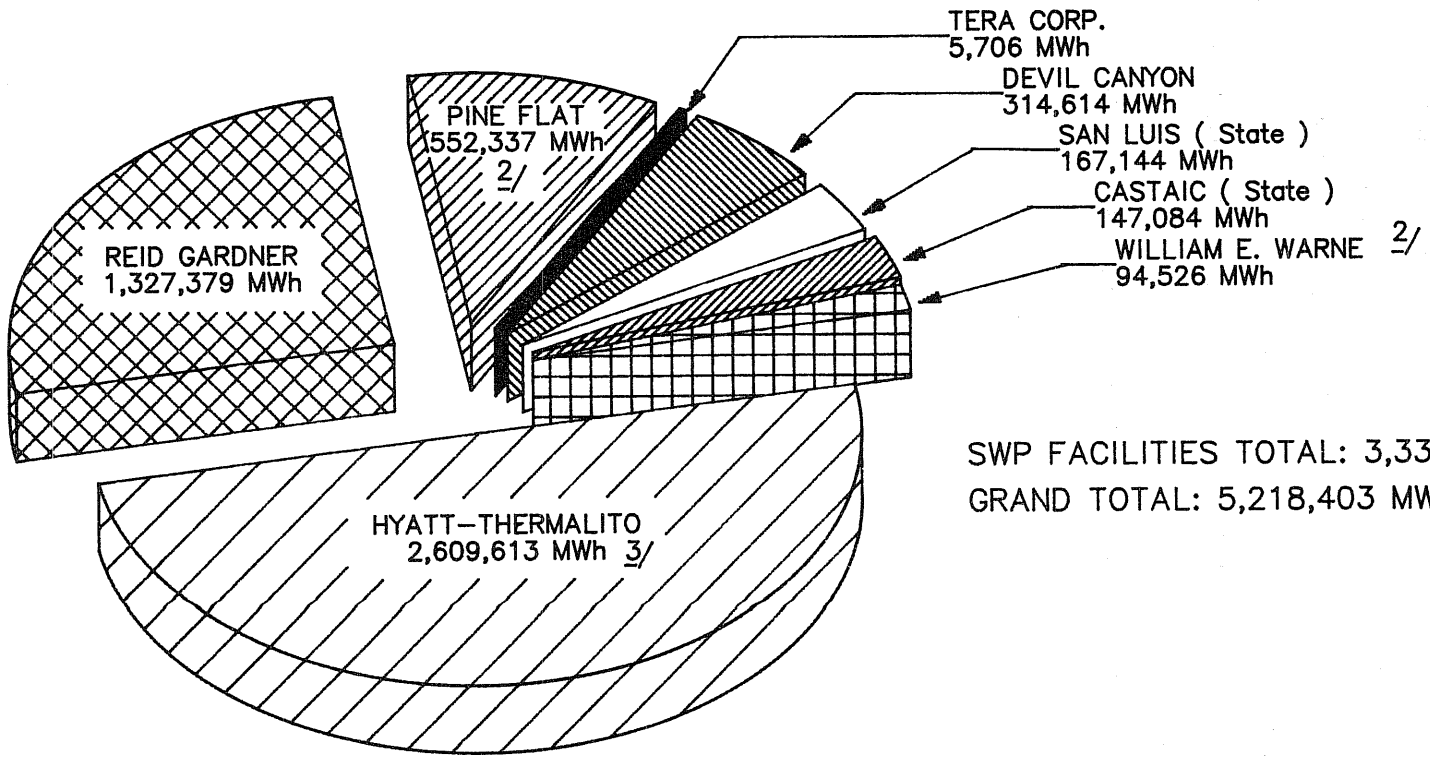
of energy to the SWP. DWR has exchange arrangements with Southern California Edison (SCE) and LADWP to facilitate transmission of this energy.

The DWR-SCE Power Contract has been in effect since April 1983. Under this contract, part of the Hyatt-Thermalito Powerplants' generation and all of the output of Devil Canyon Powerplant are delivered to SCE. The energy is generally delivered during on-peak periods and a greater amount of energy is returned during off-peak periods. The net gain to the SWP during 1984 was 1,346,481 MWh.

DWR purchased 2,421,483 MWh from various utilities in 1984. Most of the energy purchased came from the Pacific Northwest via DWR's contracted 300 MW of transmission capacity in the extra high voltage (EHV) Pacific Northwest Intertie.

SWP energy sources are shown in figure F on page 23, and also in table 2 on page 21.

FIGURE D: ENERGY GENERATION 1/
1984



SWP FACILITIES TOTAL: 3,332,981 MWh

GRAND TOTAL: 5,218,403 MWh

1/ Values are metered readings at plants and are not adjusted for transmission losses.

2/ Includes station-service energy.

3/ Excludes 31,827 MWh of losses. Includes 177,816 MWh of station-service and pump-back energy.

TABLE 2: PROJECT POWER SOURCES
1984

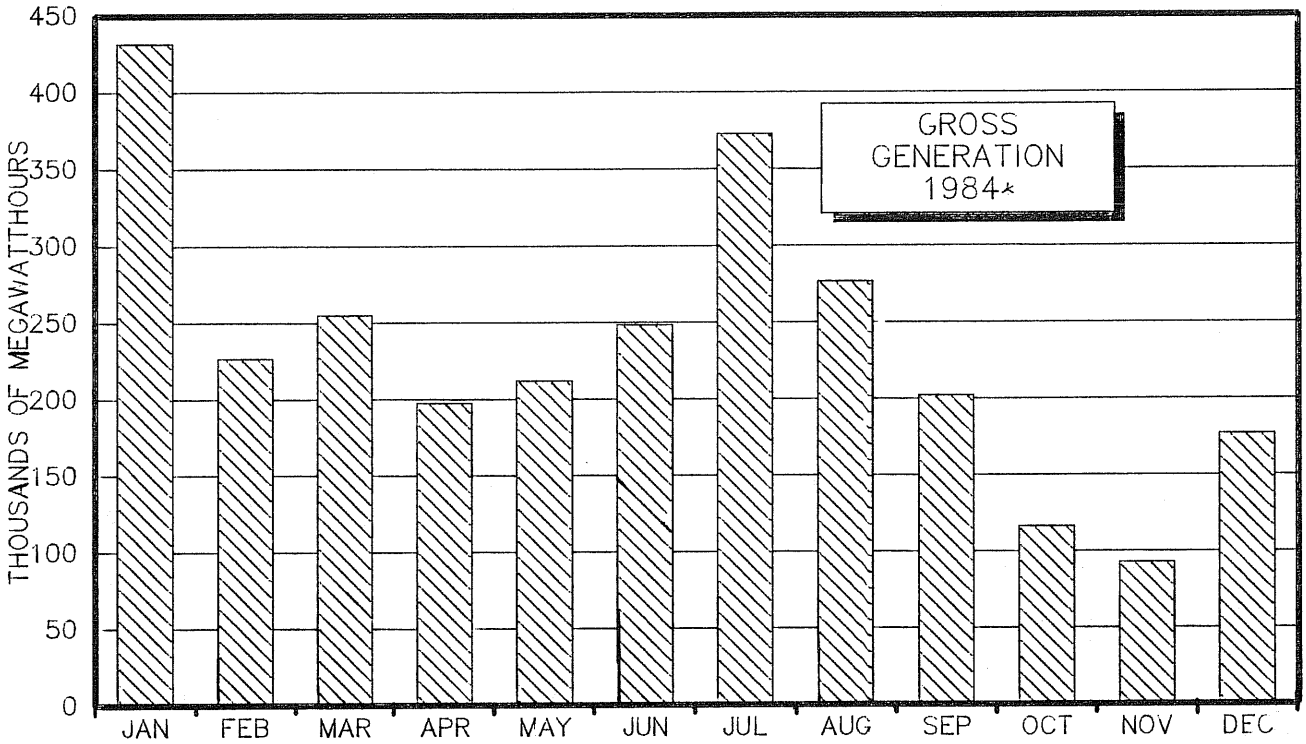
(in megawatthours)

SOURCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt-Thermalito Powerplant 1/	424,271	212,858	243,067	152,246	210,121	240,974	355,041	245,820	169,706	97,762	86,117	171,631	2,609,613
San Luis Generation													
State	457	2,352	2,152	2,102	38,537	50,572	39,497	18,089	8,920	719	2,080	1,667	167,144
Federal	0	468	0	11,234	48,382	56,612	51,390	21,320	0	0	0	0	189,406
Total	457	2,820	2,152	13,336	86,919	107,184	90,887	39,409	8,920	719	2,080	1,667	356,550
William E. Warne Powerplant 2/	239	0	0	13,745	9,179	7,687	11,637	1,822	1,284	1,089	20,748	27,096	94,526
Castaic Powerplant State	672	672	0	18,600	13,944	10,140	17,064	2,760	1,848	1,848	40,320	39,216	147,084
Devil Canyon Powerplant	4,258	6,667	23,318	51,151	31,524	51,482	38,813	44,168	47,277	7,074	5,971	2,911	314,614
Tera Corp.	54	132	422	627	711	709	808	994	484	608	3	154	5,706
Purchases 3/	157,200	160,393	213,800	205,066	209,741	179,886	206,387	181,815	182,740	200,370	290,937	233,148	2,421,483
Other Sources 4/	2,702	3,115	9,355	12,800	2,201	2,543	2,136	2,257	2,549	2,355	3,570	5,050	50,633
Net Gain, SCE Power Exchange 5/	29,710	35,971	41,809	87,071	72,622	121,463	224,653	165,992	217,356	78,231	72,286	199,317	1,346,481
Reid Gardner Powerplant	90,743	68,608	75,484	90,146	142,737	124,467	144,326	149,797	162,269	161,952	69,851	46,999	1,327,379
Pine Flat	48,004	5,632	38,503	48,550	86,246	106,687	121,519	67,484	21,606	8,106	0	0	552,337

1/ Excludes 31,827 MWh of losses and includes 177,816 MWh of station-service and pump-back energy.
2/ Includes station-service energy.
3/ Includes Bonneville Power Authority, Portland General Electric, Pacific Power & Light Co., Salt River Project, LADWP, and San Diego Gas & Electric Co.
4/ Includes Emergency Service, PG&E, SCE, Western Area Mid-Pacific, and LADWP.
5/ Includes 5 plants under MWDSC contract.

Total State: 9,037,000
Total Federal: 189,406
Total Project: 9,226,406

FIGURE E: OPERATION OF EDWARD HYATT AND THERMALITO POWERPLANTS



* Includes 177,800 MWh of plant use and pumpback requirements.

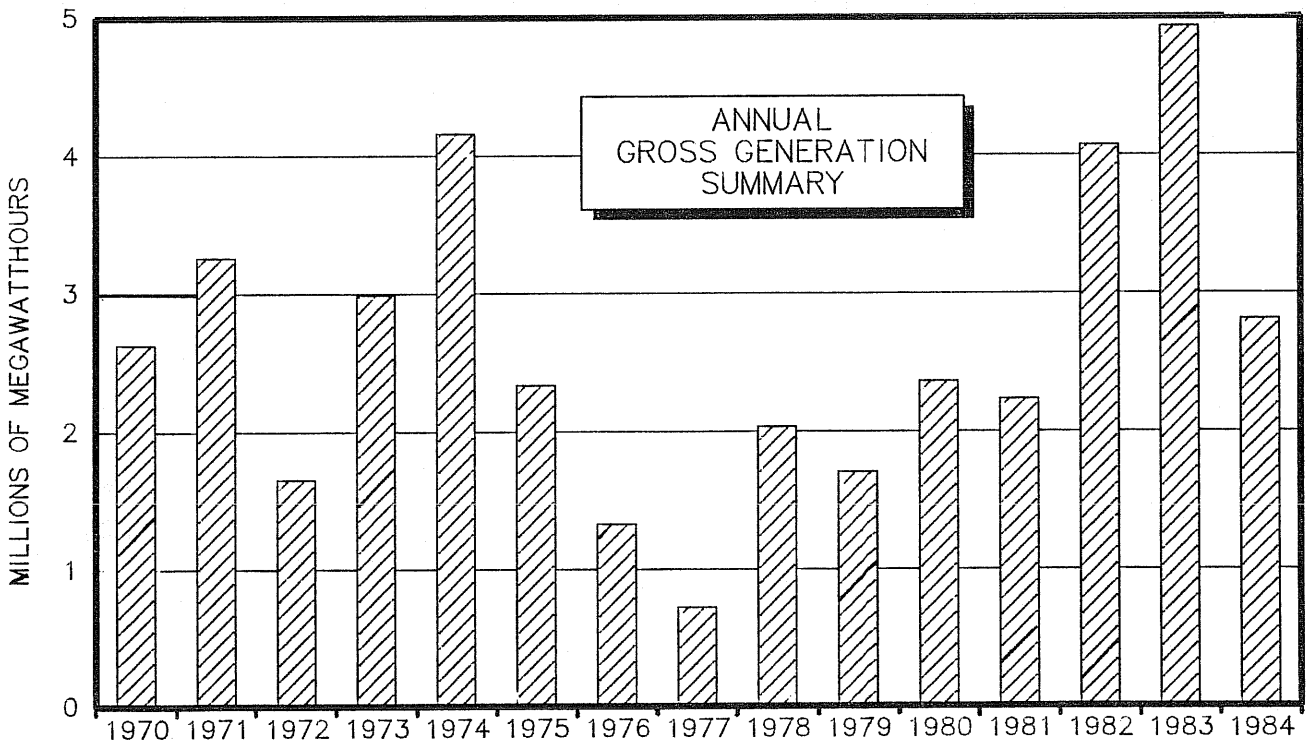
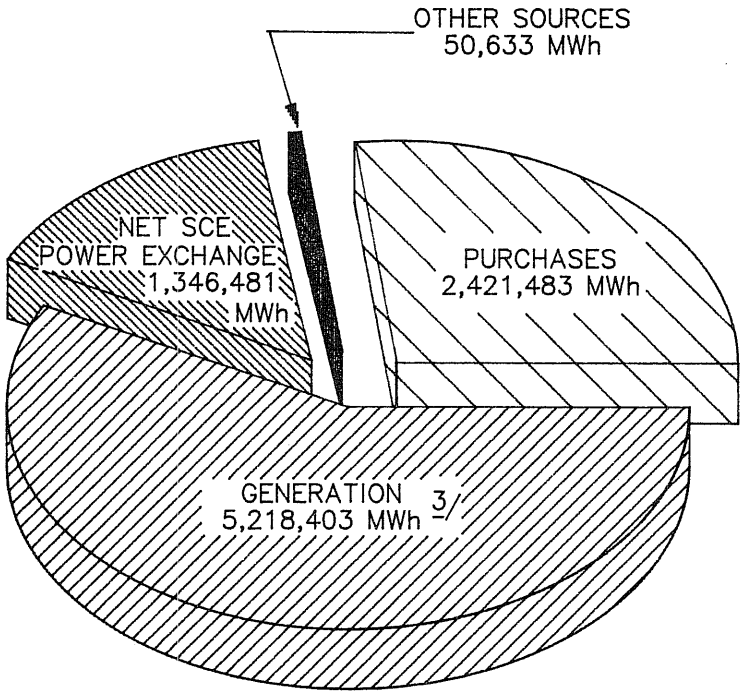


FIGURE F: ENERGY SOURCES
(STATE ONLY)
1984



TOTAL: 9,037,000 MWh

PURCHASES

1. Bonneville Power Authority	351,292 MWh
2. Portland General Elec. Co.	872,490 MWh
3. Pacific Power and Light Co.	1,161,994 MWh
4. Salt River Project	35,099 MWh
5. Los Angeles Dept. of Water and Power	576 MWh
6. San Diego Gas and Elec. Co.	32 MWh

OTHER SOURCES 1/

1. Emergency Service Return	1,131 MWh
2. Pacific Gas and Electric Co.	185 MWh
3. Southern California Edison	42,260 MWh
4. Western Area Mid–Pacific	2,751 MWh
5. Los Angeles Dept. of Water and Power	4,306 MWh

SCE POWER EXCHANGE 2/

1. Total received from SCE	2,704,449 MWh
2. SCE Hyatt–Thermalito Entitlement	–1,025,908 MWh
3. SCE Hyatt–Thermalito pump credit	–17,446 MWh
4. SCE Devil Canyon Entitlement	–314,614 MWh

1/ Items 2,3,4 & 5 are intertie accounts.

2/ Includes 5 small powerplants under a MWDSC exchange contract.

3/ See Figure D for a breakdown of this source.

ENERGY LOADS

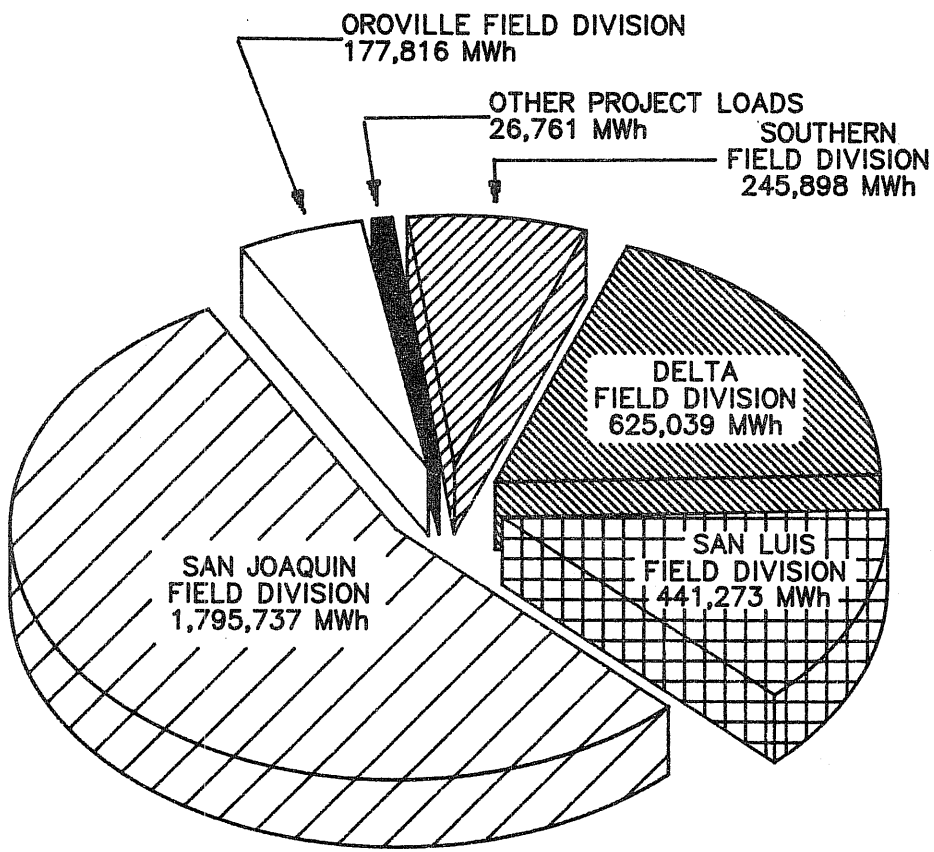
Total energy used by the SWP during 1984 was 3,312,524 MWh, not including 299,034 MWh for system losses. This amount was a 20 percent increase over that used in 1983. The principal reason for the increased energy requirements in 1984 was an increase of about 50 percent in water deliveries over 1983. About 60 percent of the total energy used in 1984 occurred within the Pacific Gas & Electric Company service area, and 40 percent within the SCE service area. SWP energy loads by field division are shown in figure G on page 25, and also are listed in table 3 on page 26.

During 1984, SWP energy supplies (including substantial purchases under contractual obligations) exceeded SWP needs, and DWR sold the excess energy under power sale contracts to 13 utilities at current market rates. The total sale of energy during 1984 was 5,425,444 MWh. The revenue from these energy sales during 1984 exceeded expenditures for purchases and transmission services by 10 percent. This reflects only the cash transactions during 1984, and is not directly indicative of the true net cost of SWP energy, which includes such other costs as:

* debt service and operation, maintenance, and replacement (OM&R) costs associated with SWP-owned hydroelectric facilities.
* debt service, OM&R, and fuel costs associated with Reid Gardner Unit No. 4.

Energy loads in 1984 are illustrated in figure H, on page 27. Table 20 in Section II of the appendix presents totals for monthly pumping throughout the SWP.

FIGURE G: PROJECT LOADS
1984



TOTAL: 3,312,524 MWh

1/ Includes 5,706 MWh from TERA Corporation.

OROVILLE FIELD DIVISION

1. Hyatt Thermalito Complex (Pump–back and Station Service)	177,816 MWh

DELTA FIELD DIVISION

1. Cordelia (North Bay Interim)	1/ 1,492 MWh
2. South Bay	92,262 MWh
3. Del Valle	191 MWh
4. Harvey O. Banks Delta	530,942 MWh
5. Bottle Rock S.S.	152 MWh

SAN LUIS FIELD DIVISION

1. San Luis	225,236 MWh
2. Dos Amigos	215,647 MWh
3. Pine Flat S.S.	390 MWh

SAN JOAQUIN FIELD DIVISION

1. Las Perillas	10,585 MWh
2. Badger Hill	29,103 MWh
3. Buena Vista	173,492 MWh
4. Wheeler Ridge	159,674 MWh
5. Wind Gap	327,065 MWh
6. A.D. Edmonston	1,095,818 MWh

SOUTHERN FIELD DIVISION

1. Oso	44,392 MWh
2. Pearblossom	200,315 MWh
3. William E. Warne S.S.	1,191 MWh

OTHER PROJECT LOADS

1. Reid Gardner Unit No. 4 (S.S.)	7,241 MWh
2. " " (Peaking Interuptions)	15,770 MWh
3. " " (Outages)	3,141 MWh
4. Emergency Service	609 MWh

TABLE 3: PROJECT POWER USES
1984

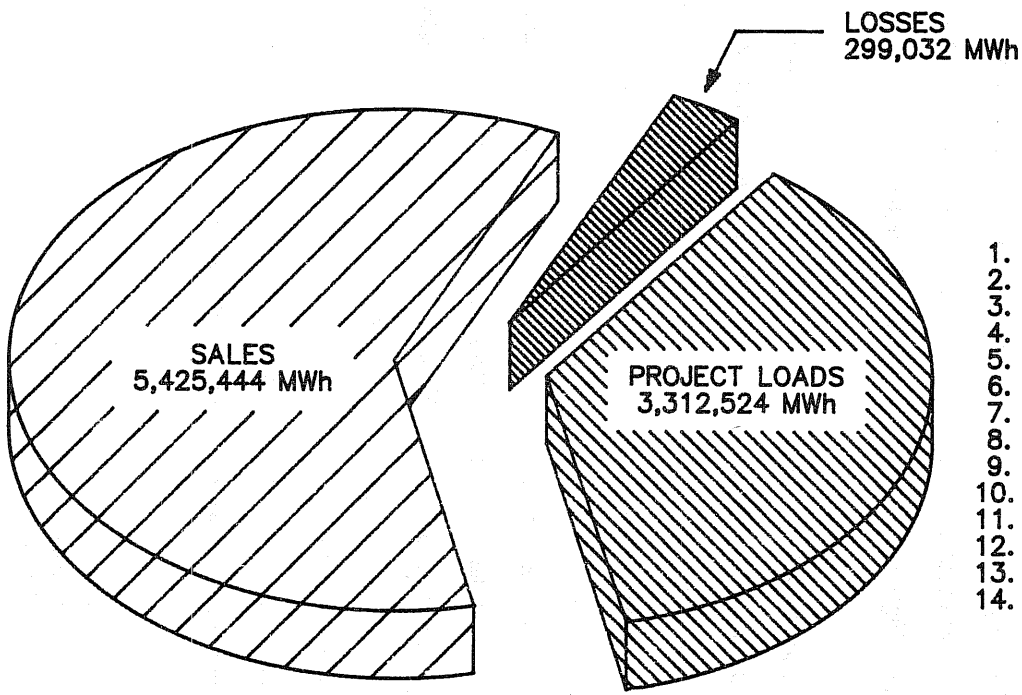
(in megawatthours)

SOURCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt-Thermalito Pumpback and Station Service	142	11,257	9,542	44,885	357	5,159	13,830	28,863	32,165	19,566	7,427	4,623	177,816
Cordelia	32	28	33	41	60	126	110	135	106	211	270	340	1,492
South Bay 1/	943	6,039	7,944	8,379	12,149	11,407	11,867	12,151	6,179	7,431	1,368	6,405	92,262
Del Valle	6	7	5	35	95	10	6	5	5	5	6	6	191
Banks													
State	6,637	34,317	45,941	55,521	48,446	53,107	59,209	51,090	37,004	34,484	53,117	52,069	530,942
Federal	0	96	1,302	9,039	784	0	23,754	37,971	2,079	0	18,057	30,218	123,300
Bottlerock 2/	0	0	0	0	0	0	0	0	0	4	57	91	152
San Luis													
State	690	986	5,909	14,232	14,187	15,436	27,751	17,102	14,668	18,672	42,419	53,185	225,236
Federal	0	38,702	24,868	0	0	0	0	0	3,716	25,615	59,062	48,171	200,134
Dos Amigos													
State	3,390	15,520	19,002	19,163	26,037	39,005	37,062	25,680	14,758	5,519	4,787	5,724	215,647
Federal	10,680	10,608	14,568	20,811	26,199	28,903	43,851	35,511	6,744	4,523	11,529	22,538	236,465
Pine Flat 2/	1	64	0	0	0	0	0	0	1	104	195	25	390
Las Perillas	501	526	1,154	906	1,415	1,630	2,017	1,036	518	460	139	283	10,585
Badger Hill	1,411	1,365	3,165	2,470	3,870	4,594	5,476	3,058	1,415	1,248	335	696	29,103
Buena Vista	7,708	10,680	10,670	18,513	16,858	25,246	24,493	20,950	14,112	2,827	9,335	12,100	173,492
Wheeler Ridge	6,879	8,181	8,533	19,801	15,368	22,235	19,635	17,112	15,057	2,612	10,549	13,712	159,674
Wind Gap	14,450	16,675	15,400	42,385	29,613	45,567	39,508	36,555	32,620	3,233	22,267	28,792	327,065
A.D. Edmonston	49,138	56,588	48,066	144,067	97,491	152,991	130,504	120,455	110,377	7,746	77,433	100,963	1,095,818
Oso	906	280	354	5,054	4,279	3,752	5,487	1,095	805	968	9,257	12,155	44,392
Pearblossom	12,604	16,345	12,366	28,140	15,648	33,692	21,862	30,003	28,696	201	284	474	200,315
William E. Warne 2/	148	139	125	59	59	102	88	122	125	139	43	42	1,191
Other Project Loads 3/	40	1,713	1,436	362	6,993	1,622	9,907	1,131	1,110	162	1,261	1,024	26,761

1/ Includes 5,706 MWh from, TERA Corp.
2/ Station Service only.
3/ Includes Nevada Power Company and Project Emergency Service.

Total State:	3,312,524
Total Federal:	959,899
Total Project:	3,872,423

FIGURE H: ENERGY LOADS
1984



SALES	
1. Southern California Edison	2,844,020 MWh
2. Pacific Gas and Electric	1,225,640 MWh
3. City of Pasadena	274,225 MWh
4. San Diego Gas and Electric	199,880 MWh
5. Nevada Power Company	194,665 MWh
6. City of Anaheim	166,858 MWh
7. Los Angeles Dept. of Water and Power	166,844 MWh
8. City of Glendale	124,101 MWh
9. City of Riverside	96,867 MWh
10. City of Burbank	93,135 MWh
11. City of Vernon	18,616 MWh
12. Portland General Electric	13,230 MWh
13. Northern California Power Agency	6,220 MWh
14. City of Santa Clara	1,145 MWh

TOTAL: 9,037,000 MWh

Note: See Figure G for breakdown of Project Loads

SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS

SWP operations in the Sacramento-San Joaquin Delta are greatly influenced by the classification of year type as prescribed by the SWRCB's D-1485. Earlier forecasts of the Sacramento Valley unimpaired runoff for the four river basins, as well as the May 1 forecast, classified the 1983-84 water year as a "wet year". Water quality conditions were good throughout 1984, and all D-1485 standards were met, most by a comfortable margin.

The Delta outflow index is a calculated value that is a relative measure of the net westerly flow of fresh water at Chipps Island near Pittsburgh. The index, including flows through the Yolo Bypass via the Fremont and Sacramento Weirs, averaged over 36,000 cfs from January through May, and over 9,000 cfs from June through October, remaining above the minimum required by D-1485 for years with subnormal snowmelt. The index, with bypass flows included, peaked at over 200,000 cfs on January 1, and stayed above 100,000 cfs from January 2 through 9. Sacramento River flow standards at Rio Vista were met by wide margins in 1984, and the May through July Delta export limits of D-1485 were also met, although by small margins in June and July as discussed later in this section. Figure I on page 30, shows 1984 water quality data compared to their respective standards at three Delta stations: Emmaton, Jersey Point, and Contra Costa Canal Intake. Figure J on page 31, shows 1984 high-high tide at Antioch, the Delta outflow index, and Delta inflow.

"Balanced water conditions" [5/] in the Sacramento-San Joaquin Delta were declared by DWR and the USBR from June 14 through August 20, and flows in the Delta were controlled by coordinating releases from upstream reservoirs of the two agencies. The determination for apportioning each agency's share of responsibility for reservoir releases was based on the draft "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. Both agencies agreed by letter agreement dated December 7, 1983, to operate during calendar year 1984 as if the draft coordinated agreement had been executed, except for agreed-upon specific modifications. Figures K-1, K-2, and K-3 on pages 32, 33, and 34 show CVP-SWP coordinated operations for 1984. These figures show "lagged storage withdrawals". This term means that the storage withdrawals had been adjusted for the travel time, or "lag", (to the nearest whole day) for reservoir releases to reach the Delta, and 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

5 "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.

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 1984 Federal-State interim coordinated operation agreement.

Table 4 on page 35, 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 from the west, and thus maintains desired levels of Delta water quality. During the period 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 D-1485.

To protect the striped bass fishery and avoid pumping very small fish from the Delta, D-1485 limits exports from the Delta to 3,000 cfs average monthly flow for both the CVP and the SWP during May and June, plus a limit of 4,600 cfs average monthly flow for each project in July. In 1984, these limits were met with comfortable margins by the SWP. Total exports (state and federal) for the year from the Delta by SWP facilities were about 2.2 million ac-ft. For a detailed description of federal pumping at Banks Pumping Plant, see page 47.

Operation of the SWP in 1984 reduced the mean Delta outflow index (i.e., Delta exports exceeded the augmentation of Delta inflows by upstream reservoir storage withdrawals) for 277 days and increased it for 89 days. The Delta Outflow Index remained well above the level required by D-1485 throughout the year. Table 5 on page 36, provides a tabulation of the daily computed total Delta outflow which includes flows in the Sacramento River at Sacramento and in the San Joaquin River at Vernalis, plus Yolo Bypass flows from Fremont Weir and from Sacramento Weir. Starting on July 1, 1982, the flow measurements in the Sacramento River at Sacramento were shifted from the "I" Street Bridge to a more accurate measurement at Freeport.

As in most years, a rock barrier was installed in Old River on September 7, 1984, to encourage the upstream migration of salmon and steelhead by increasing fall flows in the lower San Joaquin River. However, large releases from upstream reservoirs washed out the north portion of the rock barrier in early October, which also significantly eroded a portion of the downstream levee. Sustained high flows forced a complete removal of the barrier in late October to prevent further damage to the eroded levee.

For further information and data on 1984 Delta operations, see DWR Bulletin 132-85, "The California State Water Project, Appendix E, Water Operations in the Sacramento-San Joaquin Delta During 1984".

FIGURE I: WATER QUALITY CONDITIONS AT SELECTED DELTA STATIONS 1984

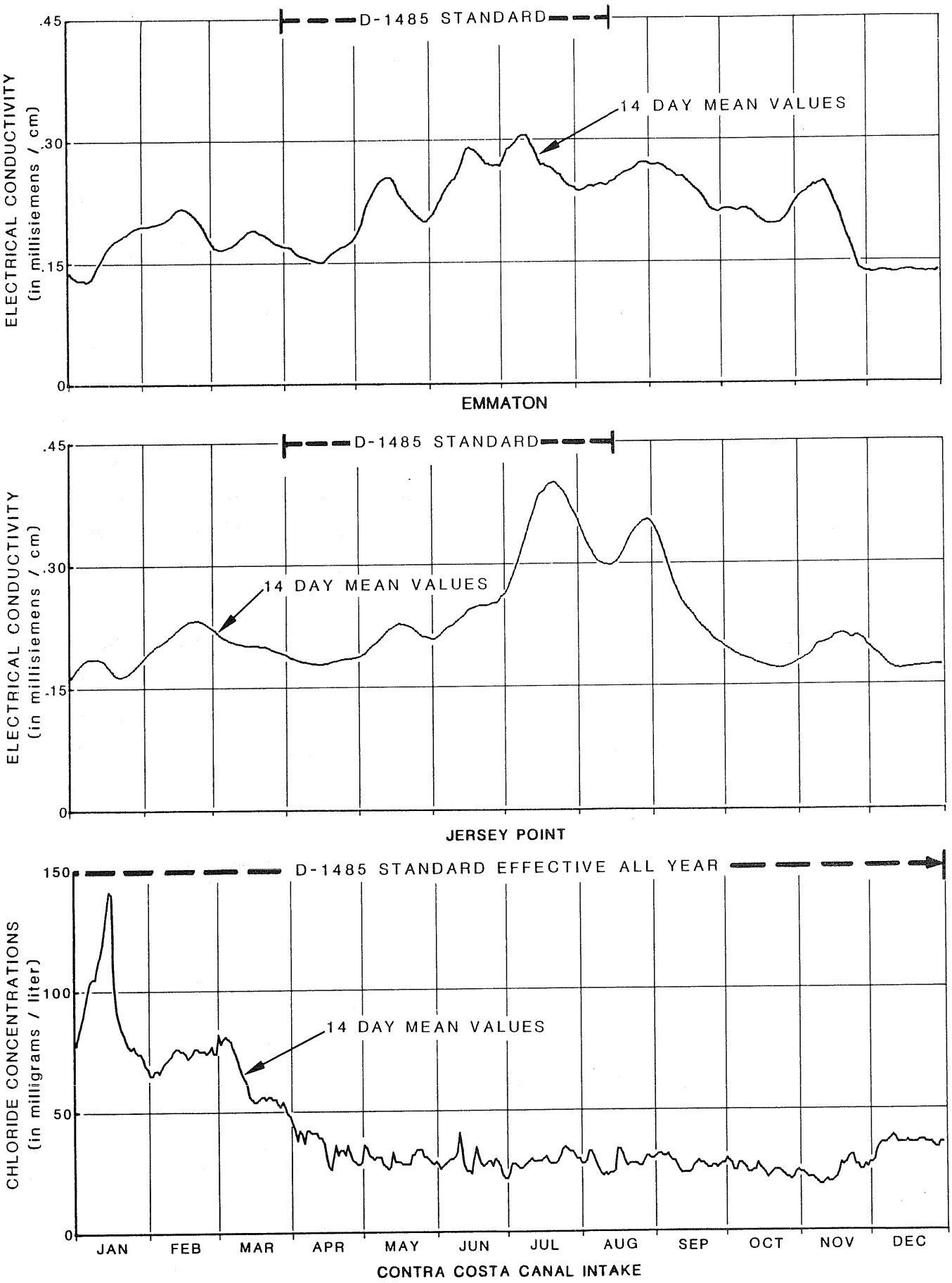


FIGURE J: DELTA TIDE, INFLOW, AND OUTFLOW INDEX
1984

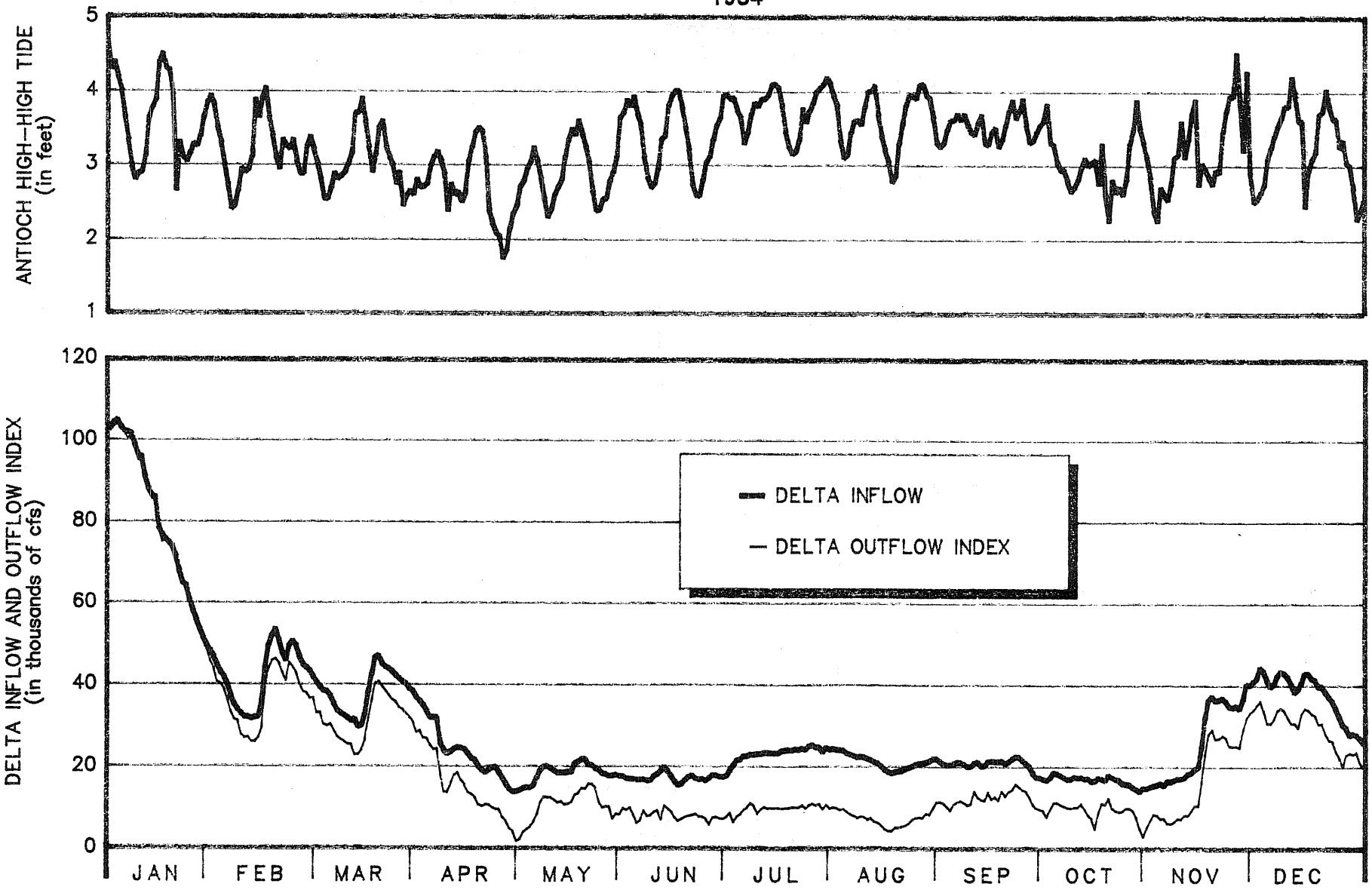
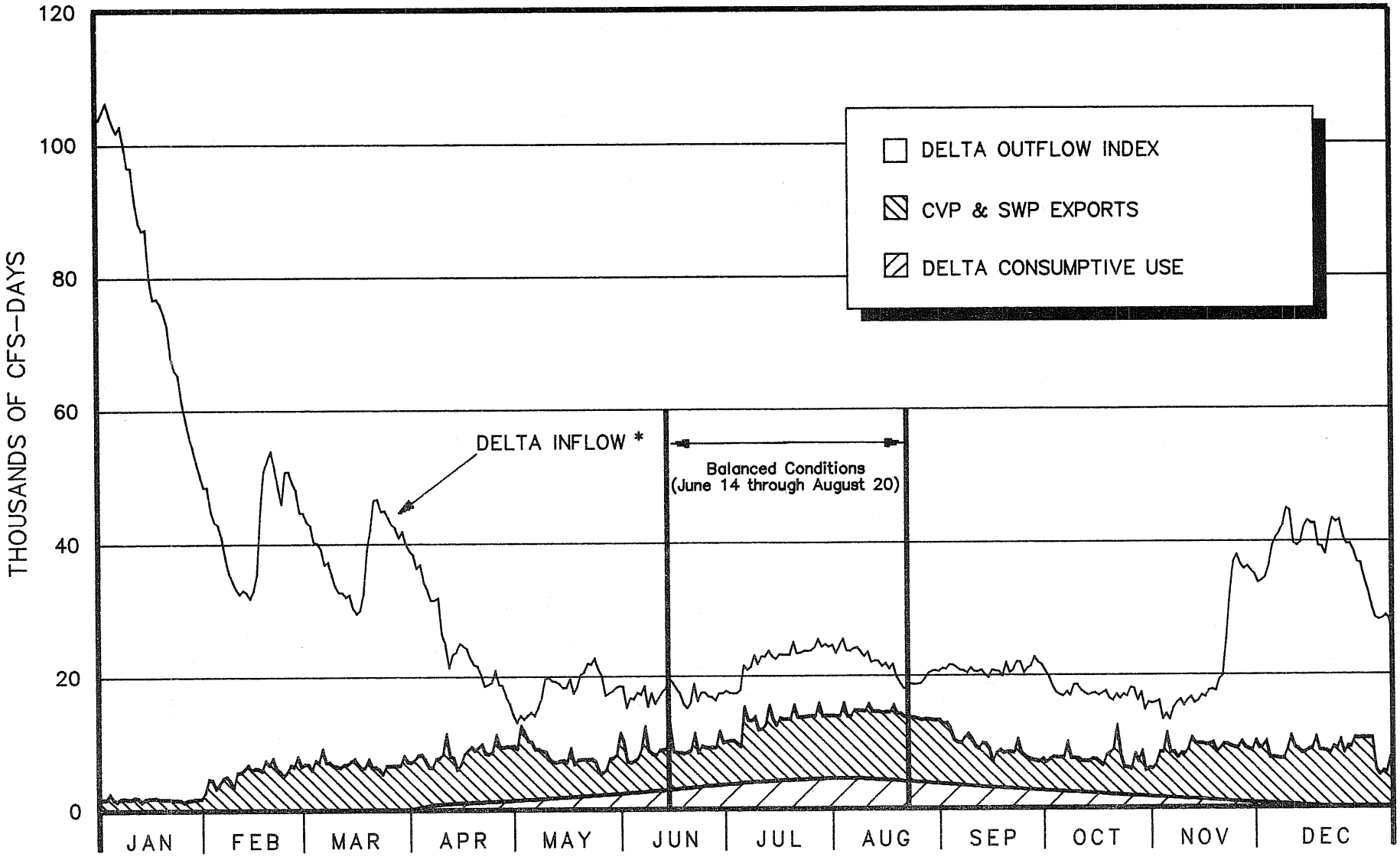


FIGURE K-1: COORDINATED DELTA OPERATIONS
1984



* Delta inflow = Exports + Outflow + Consumptive use.

FIGURE K-2: COORDINATED DELTA OPERATIONS
LAGGED STORAGE WITHDRAWALS
1984

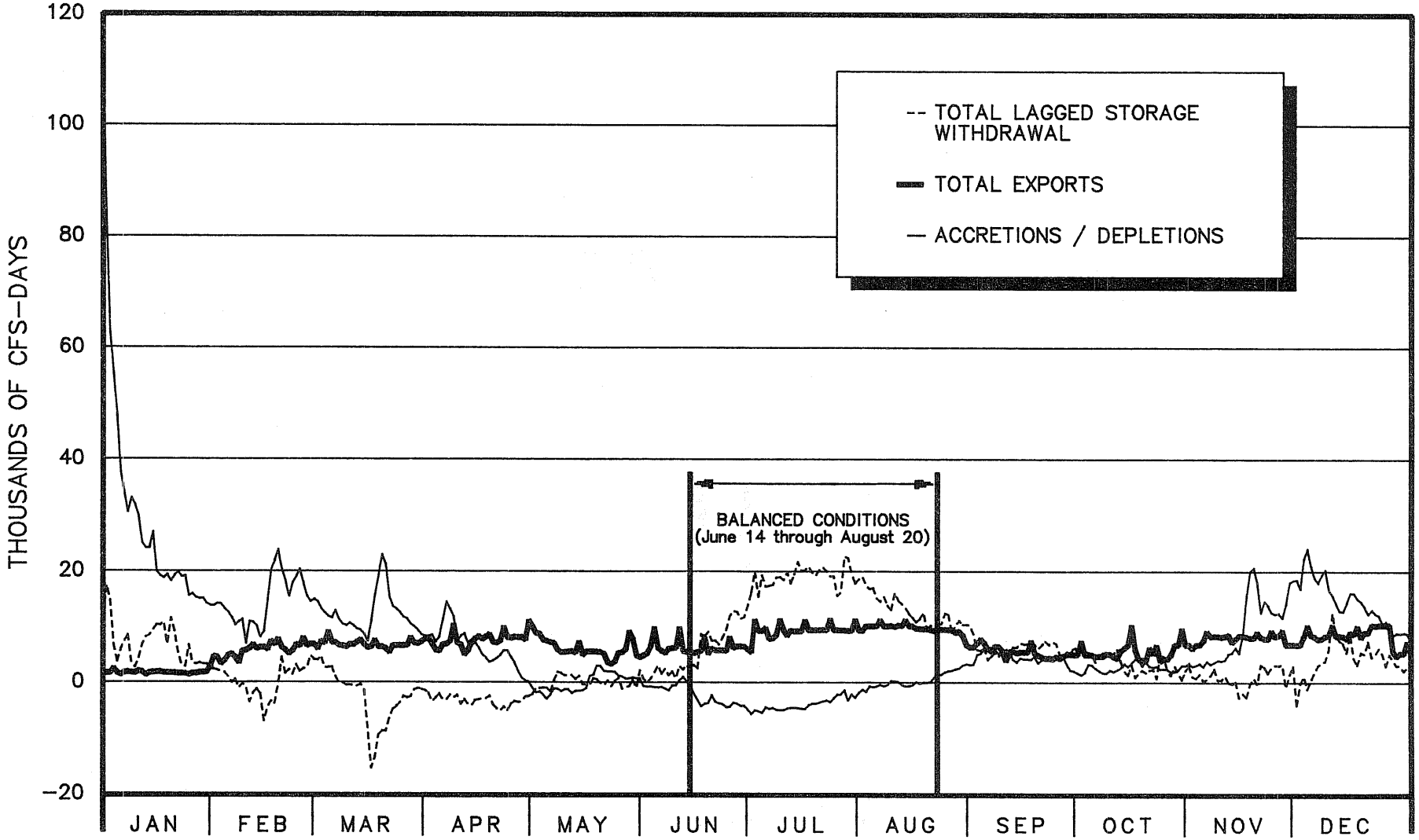
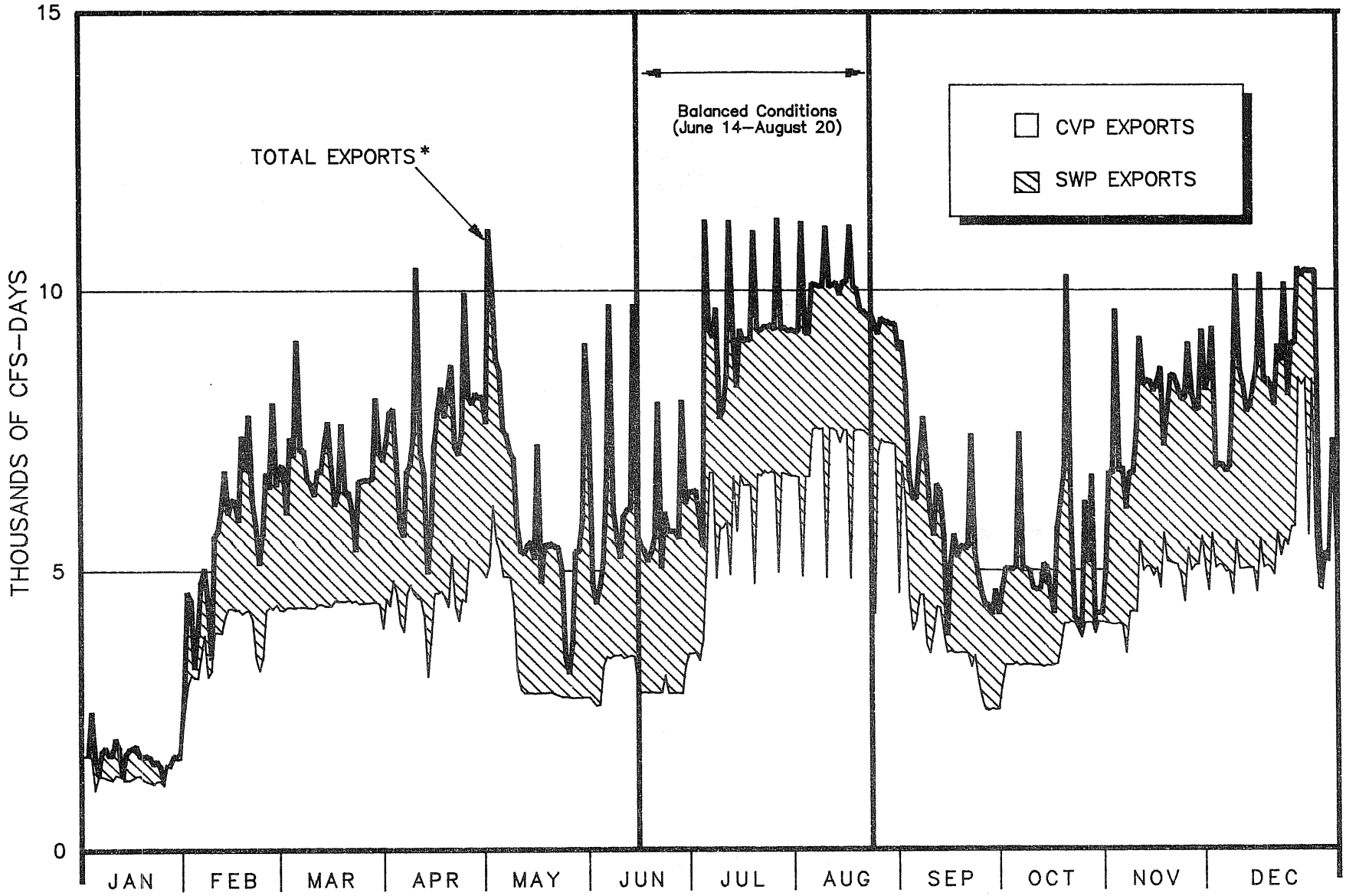


FIGURE K-3: COORDINATED DELTA OPERATIONS
DELTA EXPORTS
1984



* Total Exports = CVP Exports + SWP Exports

TABLE 4: SACRAMENTO BASIN AND SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS 1984

(in thousands of acre-feet except as noted)

MONTH	UPSTREAM RESERVOIR RELEASES TO RIVER			SACRAMENTO RIVER IN-BASIN USE	DELTA INFLOW			DELTA USES			DELTA EXPORTS		
	KESWICK 1/	OROVILLE 1/	NIMBUS	2/	SACRAMENTO RIVER AT SACRAMENTO 3/	SAN JOAQUIN RIVER AT VERNALIS 4/	TOTAL 5/	DELTA CONSUMPTIVE USE	DELTA OUTFLOW INDEX TOTAL	DELTA OUTFLOW INDEX AVERAGE CFS	TOTAL EXPORTS	EXPORTED BY DWR	EXPORTED BY USBR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
JAN	1,034	884	498	1,855	3,515	1,317	4,944	-56	4,894	79,594	107	20	87
FEB	382	345	302	838	1,861	552	2,427	-37	2,133	37,075	336	113	223
MAR	488	398	306	754	1,930	407	2,353	-10	1,938	31,518	424	153	271
APR	432	152	194	363	1,081	226	1,357	63	838	14,084	459	183	276
MAY	552	173	232	-7	947	188	1,139	121	653	10,619	360	162	198
JUN	589	206	243	-142	891	137	1,033	191	475	7,979	368	178	190
JUL	855	385	321	-231	1,327	122	1,452	268	603	9,804	582	199	383
AUG	752	252	129	42	1,155	123	1,298	252	461	7,504	583	171	412
SEP	477	218	114	262	1,054	143	1,215	174	714	11,998	328	124	204
OCT	416	117	126	169	815	190	1,020	118	557	9,051	346	115	231
NOV	582	137	176	622	1,564	146	1,666	55	1,135	19,077	476	177	299
DEC	712	283	192	873	2,002	253	2,308	2	1,786	29,038	519	171	348
TOTAL	7,271	3,550	2,833	5,398	18,142	3,804	22,212	1,141	16,187	267,341	4,888	1,766	3,122

1/ Time lagged values (Keswick: 5 days; Oroville: 2 days).
2/ Positive values show accretions; negative values show depletions.
3/ These values are a measured daily average taken from the Sacramento River at Freeport.
4/ These values are based on daily 6 a.m. readings. Columns 1, 2, 3, 12, and 13 are based on measured total daily flow.
5/ Includes Sacramento County Regional Waste Treatment Plant.

TABLE 5:CALCULATED TOTAL DELTA OUTFLOW INCLUDING YOLO BYPASS FLOWS
1984
(in cfs-days except as noted)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	213,491	43,968	36,733	28,776	3,918	9,986	6,453	9,494	10,303	9,508	8,238	36,240
2	183,156	40,632	33,030	26,960	4,592	8,245	7,734	9,675	9,290	11,165	7,365	33,977
3	155,283	40,142	33,143	26,868	5,142	6,237	8,284	9,013	10,860	11,288	7,481	30,824
4	136,680	38,949	30,245	25,288	6,350	6,711	9,440	8,435	11,315	10,798	6,274	30,725
5	124,196	36,382	29,928	24,130	8,154	9,263	10,010	8,070	11,701	10,415	6,171	31,784
6	113,805	33,283	30,306	24,344	11,129	7,862	11,097	7,527	11,177	10,045	6,557	33,971
7	109,149	31,496	28,889	18,239	12,432	8,084	10,392	7,869	10,587	9,953	7,433	34,536
8	105,077	31,159	27,294	13,667	12,357	8,840	8,437	7,716	10,895	10,128	7,291	33,867
9	101,443	27,825	26,549	13,473	12,315	9,269	9,602	7,142	13,917	10,169	8,268	32,175
10	96,734	26,952	26,097	15,728	11,730	7,067	10,152	7,503	12,505	10,964	8,164	30,784
11	95,060	27,170	25,408	17,850	11,062	10,473	9,737	6,647	11,913	9,823	9,313	30,762
12	89,953	26,077	25,305	18,426	11,392	9,790	9,855	6,381	11,682	8,281	10,590	29,736
13	87,163	25,972	22,831	16,552	10,599	8,998	9,861	5,735	13,642	7,407	10,524	33,058
14	85,441	26,959	22,857	15,478	10,791	7,586	9,834	4,843	12,046	4,926	16,011	34,471
15	85,559	29,429	23,967	13,558	11,200	6,713	9,750	4,429	12,618	8,655	22,933	34,139
16	78,230	38,978	26,319	13,050	12,919	7,222	9,743	4,345	11,815	11,109	28,005	33,183
17	74,952	43,606	31,419	12,353	13,305	7,653	9,861	5,199	13,835	10,817	29,202	32,688
18	75,299	45,766	35,842	10,613	14,618	7,904	10,071	5,152	12,724	12,370	26,913	30,567
19	74,497	46,231	40,243	10,213	14,384	8,184	9,998	5,406	13,754	9,977	27,024	30,694
20	72,912	45,226	40,722	10,597	15,733	8,416	10,000	5,673	14,287	9,250	27,721	28,159
21	71,080	42,881	39,581	10,562	15,639	7,799	10,539	6,177	15,798	8,979	27,219	26,682
22	66,583	40,934	38,470	9,927	14,753	7,730	9,857	7,108	15,077	9,217	25,201	26,408
22	66,583	40,934	38,470	9,927	14,753	7,730	9,857	7,108	15,077	9,217	25,201	26,408
23	64,586	45,285	37,388	9,476	11,251	7,235	10,604	7,529	14,291	9,953	25,039	24,027
24	63,879	44,229	36,299	9,462	9,975	5,860	10,953	7,657	13,895	9,917	25,154	22,294
25	60,330	42,797	35,727	7,571	10,191	7,526	10,564	7,493	12,602	9,361	24,783	20,067
26	57,386	40,181	34,382	6,574	10,203	7,762	10,891	8,545	10,855	7,836	29,044	22,999
27	54,801	38,255	33,861	4,825	7,261	7,318	9,625	8,251	9,929	5,059	31,908	23,514
28	52,750	37,859	32,909	4,136	8,390	7,240	10,696	9,768	9,597	3,009	33,278	23,183
29	50,695	36,572	31,987	1,711	8,196	7,735	9,886	11,353	9,315	5,068	34,049	23,717
30	48,682		30,979	2,120	9,857	8,663	10,068	11,401	7,732	6,728	35,166	21,039
31	45,829		28,362		9,381		9,939	11,112		8,418		19,923
TOTAL	2,794,681	1,075,195	977,072	422,527	329,219	239,371	303,933	232,648	359,957	280,593	572,319	900,193
AVE	90,151	37,076	31,518	14,084	10,620	7,979	9,804	7,505	11,999	9,051	19,077	29,038
MAX	213,491	46,231	40,722	28,776	15,733	10,473	11,097	11,401	15,798	12,370	35,166	36,240
MIN	45,829	25,972	22,831	1,711	3,918	5,860	6,453	4,345	7,732	3,009	6,171	19,923
TOTAL IN AF	5,543,250	2,132,649	1,938,022	838,082	653,006	474,792	602,851	461,457	713,975	556,556	1,135,195	1,785,533

Annual Total: 8,487,708 cfs-days
16,835,369 acre-feet

Average for year = 23,254 cfs-days
Maximum for year = 213,491 cfs-days on January 1, 1984
Minimum for year = 1,711 cfs-days on April 29, 1984

PROJECT OPERATIONS BY FIELD DIVISION

OROVILLE FIELD DIVISION

Water Storage

Antelope and Frenchman Lakes of the upper Feather River reservoirs filled and spilled in 1984. Antelope Lake spilled every day from January 1 through June 30. Frenchman Lake spilled from January 1 through January 16, and from April 23 through May 31. Antelope Lake has spilled every year since its original filling in 1965 with the exception of 1977. Monthly operations for the upper Feather River reservoirs are presented in table 6 on page 40.

Lake Oroville was operated for flood control during the first part of 1984, but spilled only 33,894 ac-ft during January.

The following table presents the 1984 range of storages in the Oroville Field Division reservoirs:

Reservoir & Operational Capacity (ac-ft)	Maximum (ac-ft)	Date	Minimum (ac-ft)	Date
Antelope Lake 22,566	23,742	5/12	15,110	11/1
Frenchman Lake 55,477	56,893	1/1	40,853	11/1
Lake Davis 84,371	83,289	5/20	70,581	11/1
Lake Oroville 3,537,577	3,377,907	6/10	2,520,614	10/10

The computed inflow to Lake Oroville during 1984 was 3,911,016 ac-ft (includes 213,400 ac-ft released from Ponderosa Dam, and 3,690 ac-ft released from Lake Wilenor). The maximum daily inflow to Lake Oroville in 1984 was 47,137 ac-ft on January 1, and the maximum daily release to the Feather River from the lake in 1984 was 33,128 ac-ft on January 2.

Detailed information on Lake Oroville operations and the Oroville-Thermalito complex water operations is presented on pages 41 through 46.

Water Deliveries

Deliveries during 1984 in the Oroville Field Division are shown in the following table:

Agency	Amount (ac-ft)
SWP Contractors:	
County of Butte	177
Plumas County	272
Yuba City	108
Local Supply (under special contracts):	
Last Chance Water District	13,782
Thermalito Irrigation District	1,869
Prior Water Rights Entitlement:	
Upper Feather Lakes	2,626
Palermo Canal	6,850
Thermalito Afterbay Deliveries:	
Sutter-Butte Canal	483,577
PGandE Lateral	3,441
Richvale Canal	80,049
Western Canal	255,654
Total	848,405

All of the water delivered to SWP contractors in the Oroville Field Division was for municipal and industrial purposes. Table 1 on page 15, presents water deliveries by year with totals to date for individual agencies.

Outages and Limitations

Major outages affecting or influencing operations in the Oroville Field Division in 1984 were:

* The No. 1 intake gate at Edward Hyatt Powerplant was out of service from April 30 through May 2 for annual maintenance. The No. 2 intake gate was also out of service April 23-26 to repair the return oil filters.
* The following individual 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	2/26/84	4/30/84	Annual maintenance.
	9/16/84	11/12/84	Modify head-cover & repair wear rings.
2	4/19/84	5/07/84	Replace "O" rings & annual maintenance.
3	1/25/84	2/16/84	Replace "O" rings & annual maintenance.
4	1/09/84	1/19/84	Replace turbine shut-off valve seats & annual maintenance.
5	11/26/84	12/17/84	Replace turbine shut-off valve seats & annual maintenance.
Thermalito Powerplant:			
1	1/06/84	1/20/84	Annual Maintenance.
2	5/18/84	5/31/84	Annual maintenance.
3	11/09/84	11/21/84	Annual maintenance.
4	5/06/84	5/16/84	Annual maintenance.

TABLE 6: UPPER FEATHER AREA LAKES
MONTHLY OPERATION
1984

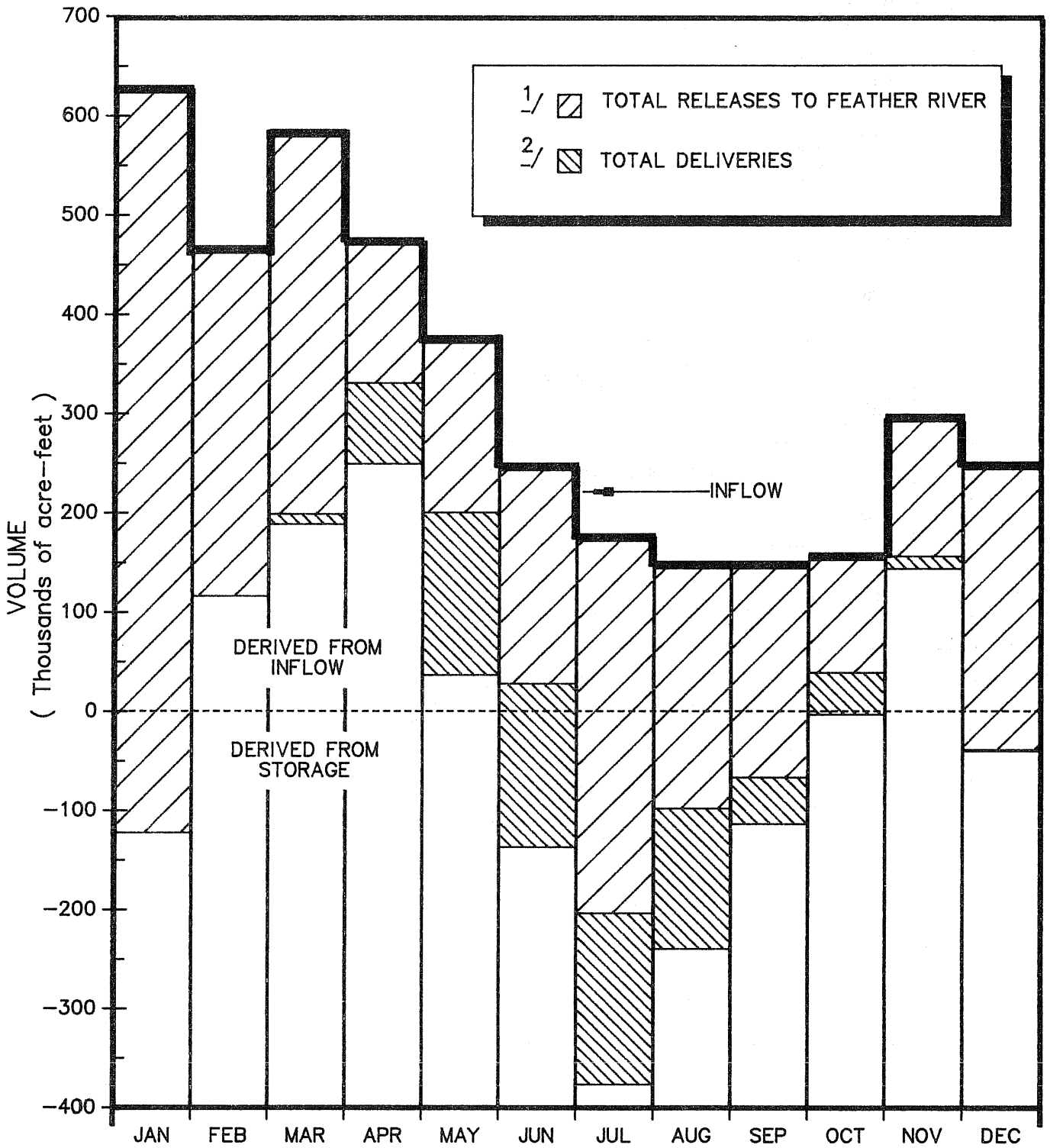
(in acre-feet except as noted)

MONTH	LAKE STORAGE			OUTFLOW							INFLOW
				REGULATED RELEASE							
	WATER SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	STREAMFLOW MANT.	WATER SUPPLY CONTRACT	WATER RIGHT ENTITLEMENT	TOTAL REGULATED RELEASE	SPILL	ESTIMATED EVAPORATION AND SEEPAGE	TOTAL OUTFLOW	COMPUTED OR ESTIMATED
	1	2	3	4	5	6	7	8	9	10	11
ANTELOPE LAKE				Capacity 22,566 acre-feet							
JAN	5002.43	22,965	-463	1,230	0	0	1,230	3,396	66	4,692	4,229
FEB	5002.44	22,975	10	1,150	0	0	1,150	2,388	75	3,613	3,623
MAR	5002.87	23,380	405	1,230	0	0	1,230	5,776	113	7,119	7,524
APR	5002.32	22,862	-518	5,379	0	0	5,379	4,003	188	9,570	9,052
MAY	5002.53	23,059	197	615	0	0	615	7,944	303	8,862	9,059
JUN	5002.07	22,629	-430	1,104	0	0	1,104	1,666	496	3,266	2,836
JUL	4997.87	18,905	-3,724	3,626	0	0	3,626	1	773	4,400	676
AUG	4995.90	17,292	-1,613	1,230	0	0	1,230	0	723	1,953	340
SEP	4994.14	15,924	-1,368	1,190	0	0	1,190	0	457	1,647	279
OCT	4993.10	15,147	-777	1,230	0	0	1,230	0	179	1,409	632
NOV	4993.63	15,540	393	1,190	0	0	1,190	0	118	1,308	1,701
DEC	4993.16	15,191	-349	1,230	0	0	1,230	0	82	1,312	963
TOTAL	---	---	-8,237	20,404	0	0	20,404	25,174	3,573	49,151	40,914
FRENCHMAN LAKE				Capacity 55,477 acre-feet							
JAN	5586.54	53,200	-3,709	6,343	0	0	6,343	1,465	110	7,918	4,209
FEB	5586.14	52,587	-613	2,823	0	0	2,823	0	108	2,931	2,318
MAR	5586.69	53,431	844	5,744	0	0	5,744	0	307	6,051	6,895
APR	5588.25	55,871	2,440	3,247	0	0	3,247	154	314	3,715	6,155
MAY	5587.96	55,412	-459	1,262	611	0	1,873	2,122	525	4,520	4,061
JUN	5585.43	51,510	-3,902	0	4,149	0	4,149	0	818	4,967	1,065
JUL	5582.69	47,482	-4,028	0	3,390	0	3,390	0	1,080	4,470	442
AUG	5579.53	43,076	-4,406	0	3,666	0	3,666	0	972	4,638	232
SEP	5578.21	41,313	-1,763	0	1,237	0	1,237	0	785	2,022	259
OCT	5577.88	40,879	-434	0	486	0	486	0	315	801	367
NOV	5578.32	41,458	579	10	241	0	251	0	210	461	1,040
DEC	5578.64	41,882	424	123	0	0	123	0	146	269	693
TOTAL	---	---	-15,027	19,552	13,780	0	33,332	3,741	5,690	42,763	27,736
LAKE DAVIS				Capacity 84,371 acre-feet							
JAN	5772.77	75,653	-6,443	9,870	5	0	9,875	0	272	10,147	3,704
FEB	5773.42	78,143	2,490	912	17	0	929	0	268	1,197	3,687
MAR	5773.99	80,361	2,218	5,480	11	0	5,491	0	467	5,958	8,176
APR	5774.47	82,254	1,893	2,700	13	97	2,810	0	788	3,598	5,491
MAY	5774.62	82,851	597	799	430	35	1,264	0	1,315	2,579	3,176
JUN	5774.13	80,911	-1,940	774	42	416	1,232	0	2,101	3,333	1,393
JUL	5773.33	77,795	-3,116	799	57	430	1,286	0	2,336	3,622	506
AUG	5772.45	74,443	-3,352	799	60	430	1,289	0	2,408	3,697	345
SEP	5771.79	71,979	-2,464	1,190	0	28	1,218	0	1,864	3,082	618
OCT	5771.47	70,801	-1,178	1,230	3	0	1,233	0	884	2,117	939
NOV	5771.77	71,905	1,104	1,190	1	0	1,191	0	588	1,779	2,883
DEC	5771.64	71,423	-482	1,230	0	0	1,230	0	406	1,636	1,154
TOTAL	---	---	-10,673	26,973	639	1,436	29,048	0	13,697	42,745	32,072

* At end of month.

FIGURE L: OROVILLE-THERMALITO COMPLEX
1984

INFLOW, RELEASES AND DIVERSIONS



1/ Total of Fish Barrier Dam, Fish Hatchery, and Thermalito Afterbay River Outlet releases.

2/ Total of Palermo Canal, Butte Co., Thermalito Irrigation District, Western Canal, Richvale Canal, P.G.& E. Lateral, and Sutter Butte diversions.

TABLE 7: LAKE OROVILLE MONTHLY OPERATION

(in acre-feet except as noted)

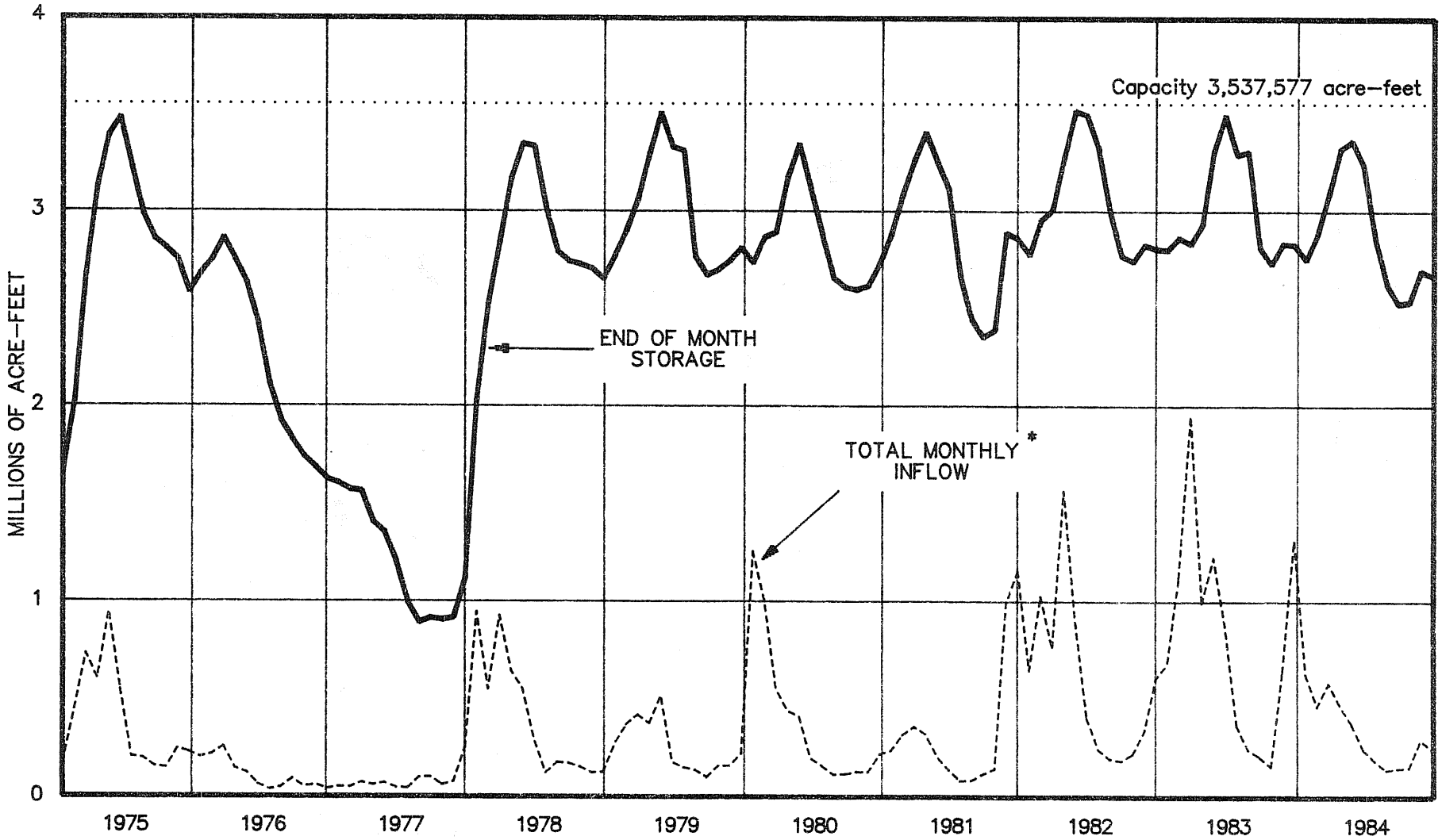
Capacity 3,537,577 acre-feet

MONTH	YEAR	WATER SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	OUTFLOW						INFLOW	
					POWER	PALERMO CANAL	SPILLWAY LEAKAGE	EVAP-ORATION	SPILL	TOTAL OUTFLOW	PUMPBACK	INFLOW 1/
JAN	1984	845.93	2,754,127	-76,683	671,379	74	54	1,290	33,894	706,691	0	630,008
	1983	849.69	2,804,192	-4,558	543,430	76	190	685	145,896	690,277	898	684,821
FEB	1984	855.84	2,887,450	133,323	342,967	73	135	1,342	0	344,517	11,544	466,296
	1983	854.47	2,868,755	64,563	720,593	72	111	993	339,179	1,060,948	0	1,125,511
MAR	1984	870.45	3,092,201	204,751	385,093	83	319	3,568	0	389,063	8,713	585,101
	1983	851.95	2,834,589	-34,166	875,439	75	12	1,128	1,111,944	1,988,598	0	1,954,432
APR	1984	886.01	3,321,365	229,164	237,214	220	762	4,349	0	242,545	44,085	472,624
	1983	859.32	2,935,325	100,736	889,024	169	196	2,974	1,256	893,619	0	994,355
MAY	1984	888.79	3,363,555	42,190	325,141	995	1,000	8,191	0	335,327	0	377,517
	1983	885.22	3,309,445	374,120	844,811	446	607	6,138	0	852,002	0	1,226,122
JUN	1984	880.18	3,234,121	-129,434	370,788	1,150	972	9,623	0	382,533	4,813	248,286
	1983	897.06	3,491,329	181,884	687,072	1,190	1,954	8,682	0	698,898	0	880,782
JUL	1984	854.60	2,860,730	-373,391	553,155	1,085	484	11,310	0	566,034	14,625	178,018
	1983	883.88	3,289,297	-202,032	558,973	1,250	1,819	10,883	0	572,925	0	370,893
AUG	1984	836.64	2,633,088	-227,642	397,255	1,224	97	9,735	0	408,311	30,934	149,735
	1983	866.52	3,036,148	-253,149	485,418	1,230	1,004	10,525	0	498,177	0	245,028
SEP	1984	828.44	2,529,336	-103,752	278,512	1,188	0	8,308	0	288,008	36,070	148,186
	1983	850.74	2,818,286	-217,862	416,706	1,160	311	8,731	0	426,908	0	209,046
OCT	1984	829.16	2,538,329	8,993	163,631	479	0	3,346	0	167,456	22,352	154,097
	1983	844.24	2,731,831	-86,455	237,940	835	10	4,821	0	243,606	0	157,151
NOV	1984	841.74	2,699,079	160,750	143,079	138	0	894	0	144,111	7,845	297,016
	1983	852.18	2,837,695	105,864	470,915	188	60	1,031	89,106	561,300	20,263	646,901
DEC	1984	839.71	2,672,684	-26,395	279,020	141	0	957	0	280,118	4,591	249,132
	1983	851.67	2,830,810	-6,885	879,101	70	58	384	444,512	1,324,125	0	1,317,240
TOTAL	1984	---	---	-158,126	4,147,234	6,850	3,823	62,913	33,894	4,254,714	185,572	3,911,016
	1983	---	---	22,060	7,609,422	6,761	6,332	56,975	2,131,893	9,811,383	21,161	9,812,282

* At end of month.

1/ Computed inflow excluding pumpback.

FIGURE M: LAKE OROVILLE OPERATION



* Excludes pumpback.

FIGURE N: OPERATION OF LAKE OROVILLE FOR FLOOD CONTROL
1983-1984

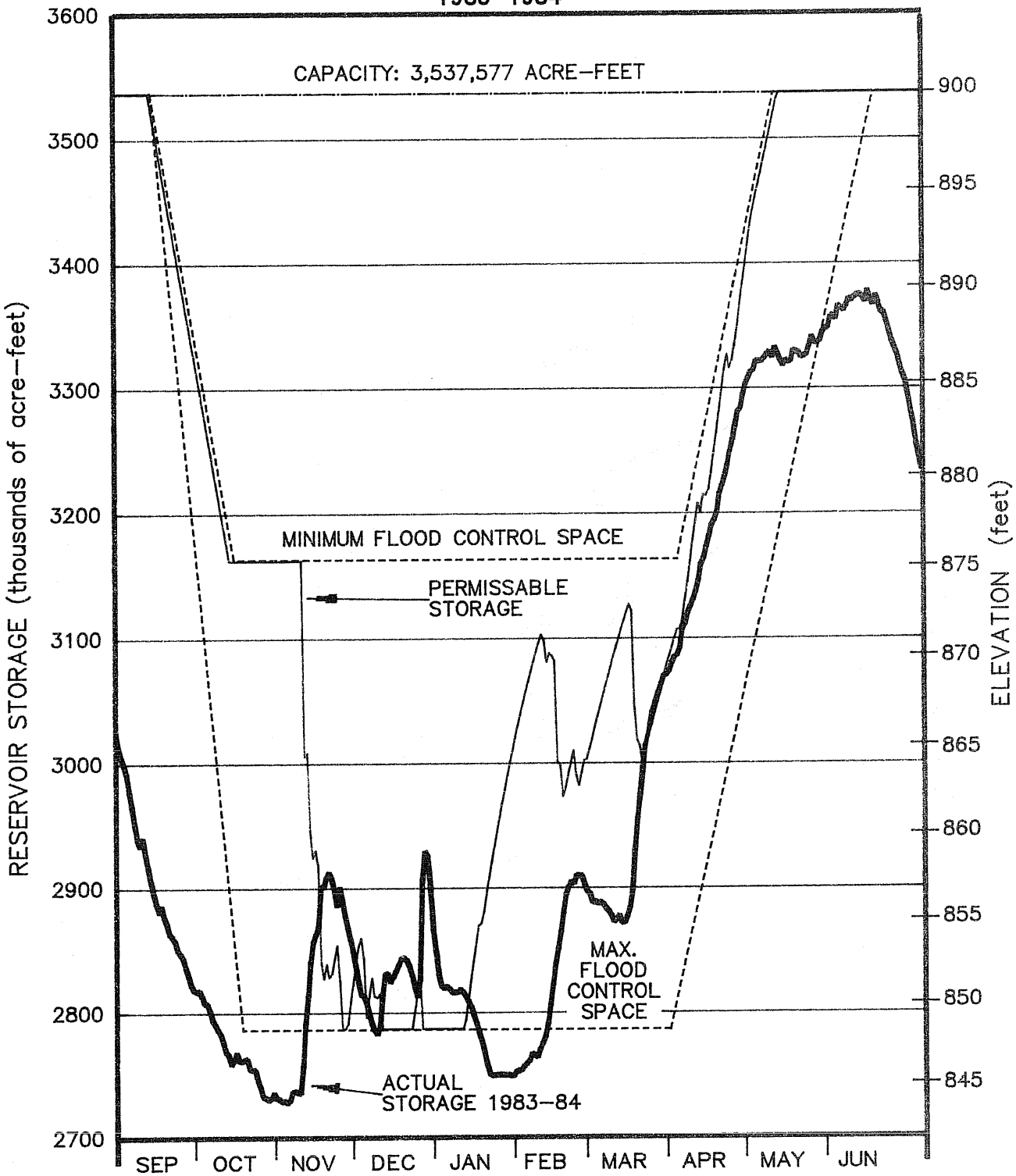


FIGURE O: LAKE OROVILLE ISOTHERMS
1984
(temperature in degrees Fahrenheit)

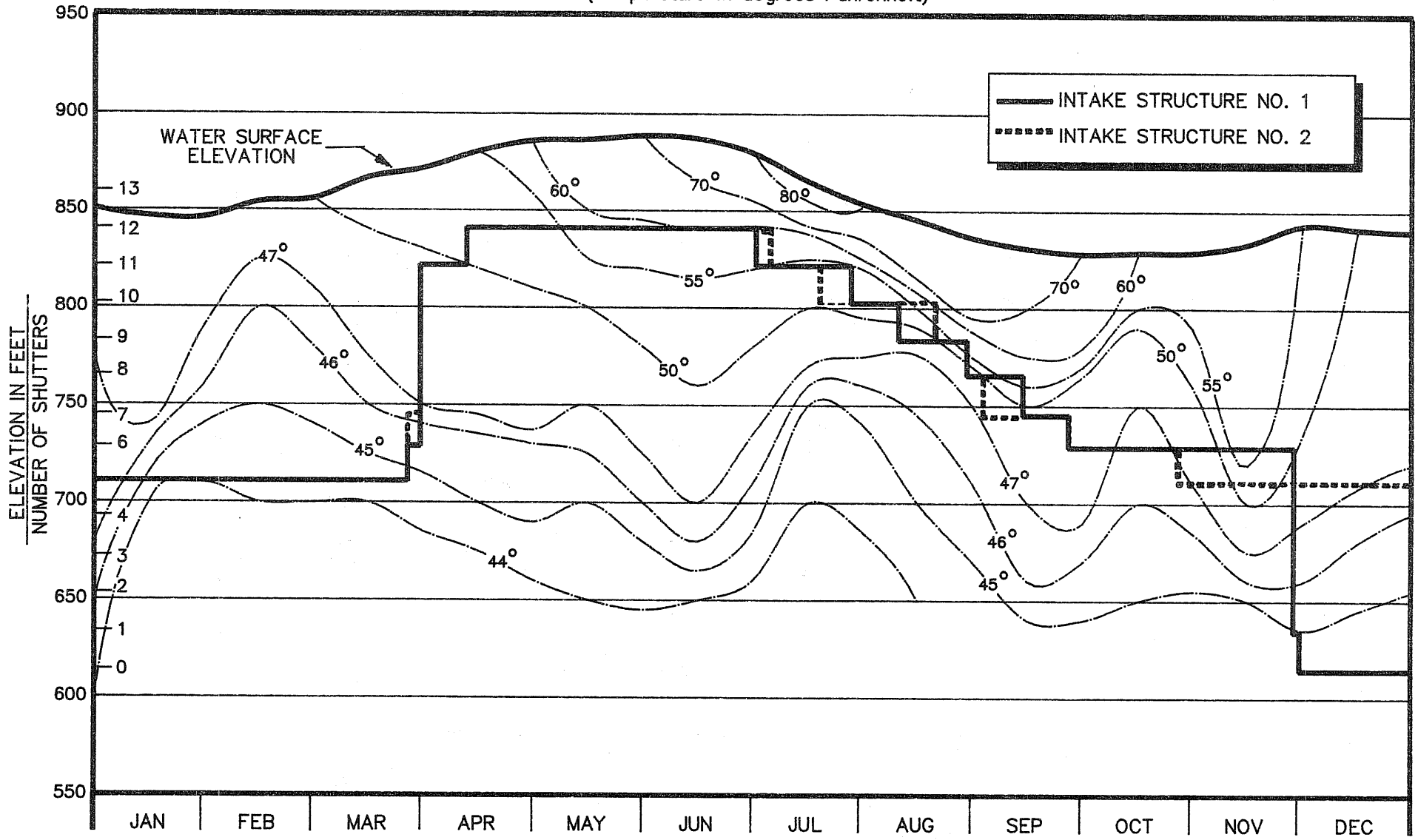


TABLE 8: OROVILLE-THERMALITO COMPLEX MONTHLY STORAGE*

(elevation in feet, storage in acre-feet)

MONTH	YEAR	THERMALITO DIVERSION DAM POOL		THERMALITO FOREBAY		THERMALITO AFTERBAY	
		ELEVATION	STORAGE	ELEVATION	STORAGE	ELEVATION	STORAGE
JAN	1984	223.19	12,774	223.38	10,765	128.19	26,403
	1983	224.74	13,269	222.84	10,438	127.89	25,502
FEB	1984	223.30	12,809	223.22	10,667	128.42	27,104
	1983	223.70	12,936	220.66	9,154	128.00	25,831
MAR	1984	223.62	12,910	223.82	11,034	129.90	31,820
	1983	224.17	13,086	222.10	9,995	127.80	25,235
APR	1984	223.44	12,853	223.20	10,655	126.94	22,748
	1983	224.54	13,204	221.24	9,490	127.14	23,316
MAY	1984	223.48	12,866	223.60	10,899	128.12	26,191
	1983	224.28	13,121	220.90	9,292	131.23	36,361
JUN	1984	223.00	12,714	223.70	10,960	128.21	26,464
	1983	223.26	12,796	222.96	10,510	128.74	28,093
JUL	1984	224.10	13,063	224.38	11,380	128.93	28,688
	1983	224.47	13,182	224.26	11,305	129.02	28,972
AUG	1984	224.21	13,098	224.20	11,268	126.98	22,861
	1983	223.88	12,993	223.52	10,850	128.40	27,042
SEP	1984	223.80	12,967	223.70	10,960	125.00	17,581
	1983	224.21	13,098	224.30	11,330	130.35	33,325
OCT	1984	223.80	12,967	223.59	10,893	127.44	24,179
	1983	223.80	12,967	223.80	11,021	129.93	31,919
NOV	1984	223.03	12,723	223.11	10,601	130.58	34,106
	1983	224.54	13,204	222.42	10,186	129.02	28,972
DEC	1984	223.48	12,866	223.62	10,911	127.21	23,516
	1983	224.91	13,323	222.18	10,043	132.08	39,412

* At end of month.

DELTA FIELD DIVISION

Water Storage

Maximum storage in Lake Del Valle of 40,020 ac-ft was reached on May 22, equalling the operational storage capacity of the Lake. Storage above 39,000 ac-ft is flood reservation between November 1 and March 31, and above 40,000 ac-ft is flood reservation between April 1 and October 31. Minimum storage of 25,050 ac-ft occurred on November 28, which was about 63 percent of the operational storage capacity. Table 9 on page 50 and figure P on page 51, present reservoir operations for Lake Del Valle in 1984. Table 10 on page 52, presents Clifton Court Forebay's monthly operations in 1984.

Water Deliveries

Comparisons of the 1984 water deliveries to the three areas the Division serves and their percent differences from 1983 deliveries are shown in the following table:

Area	Water Deliveries (in ac-ft)	Increase from 1983 (in percent)
California Aqueduct	7,344	92
North Bay Aqueduct	2,923	28
South Bay Aqueduct	125,726	10

Of the total entitlement water delivered in the Delta Field Division, 86,333 ac-ft was for municipal and industrial purposes.

In addition to the SWP deliveries, 525 ac-ft of federal CVP water was wheeled through the California Aqueduct to Tracy Golf and Country Club, and 10 ac-ft of CVP water was wheeled to Musco Olive Products Inc.

A total of 158 ac-ft of SWP water was delivered from Lake Del Valle for use at public recreation facilities administered by the East Bay Regional Park District.

Table 1 on page 15, presents water deliveries by year with totals to date for individual agencies.

Pumping Plants

Pumping at Banks Pumping Plant for 1984 totaled 2,184,255 ac-ft, 66 percent more than that pumped during 1983.

Of that total, 416,425 ac-ft was pumped for the USBR and consisted of 192,144 ac-ft of D-1485 water to replace capacity foregone in May and June due to CVP export reductions, 76,914 ac-ft of Cross Valley Canal Water, 144,555 ac-ft of MWD exchange water, 2,444 ac-ft of Green Valley Water District water, and 368 ac-ft of water for Tracy Golf and Country Club [6].

Pumping at South Bay Pumping Plant totaled 108,392 ac-ft for 1984, about 61 percent more than the amount pumped in 1983, while pumping at Del Valle Pumping Plant was only 2,165 ac-ft for the year. Pumping at Cordelia Pumping Plant totaled 2,908 ac-ft for the year.

Outages and Limitations

Major outages affecting or influencing operations of the Delta Field Division in 1984 were:

* The No. 2 discharge line at Banks Pumping Plant was out of service from January 1 through February 24 to inspect cracks in the line, and also from September 11 through October 5 to remove Unit No. 4 discharge valve and replace the upstream and downstream "O" rings. The No. 3 discharge line was out of service from March 14 through April 6 to inspect the line, repair Unit No. 6 discharge valve "O" ring seat, and for annual maintenance.
* A section of the South Bay Aqueduct, downstream from South Bay Pumping Plant, was out of service from November 4 through November 16 to install a trash rake at Lupin Check.
* The following individual 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 1984.

Unit	Outage Beginning	Outage Ending	Reason
Cordelia Pumping Plant:			
2	11/27/84	---	Replace pump bearings.
Banks Pumping Plant:			
2	10/15/84	10/26/84	Annual maintenance.
3	10/31/84	11/30/84	Annual maintenance.
4	8/14/84	8/31/84	Re-pack pump & annual maintenance.
5	2/21/84	2/29/84	Annual maintenance.
7	9/04/84	9/14/84	Annual maintenance.

6 Amounts of water pumped at Banks Pumping Plant for federal contractors may not reflect amounts delivered for the same time frame, since pumping and delivery do not necessarily take place concurrently.

Unit	Outage Beginning	Outage Ending	Reason
South Bay Pumping Plant:			
1	10/01/84	---	Overhaul pump and motor.
2	2/29/84	3/30/84	Replace with new unit.
	11/26/84	11/29/84	Annual maintenance.
4	3/28/84	8/11/84	Repair broken shaft.
	11/14/84	12/14/84	Remove and replace motor.
5	11/20/84	11/21/84	Annual maintenance.
6	2/29/84	3/28/84	Replace with new unit.
9	11/29/84	---	Repair motor breaker.

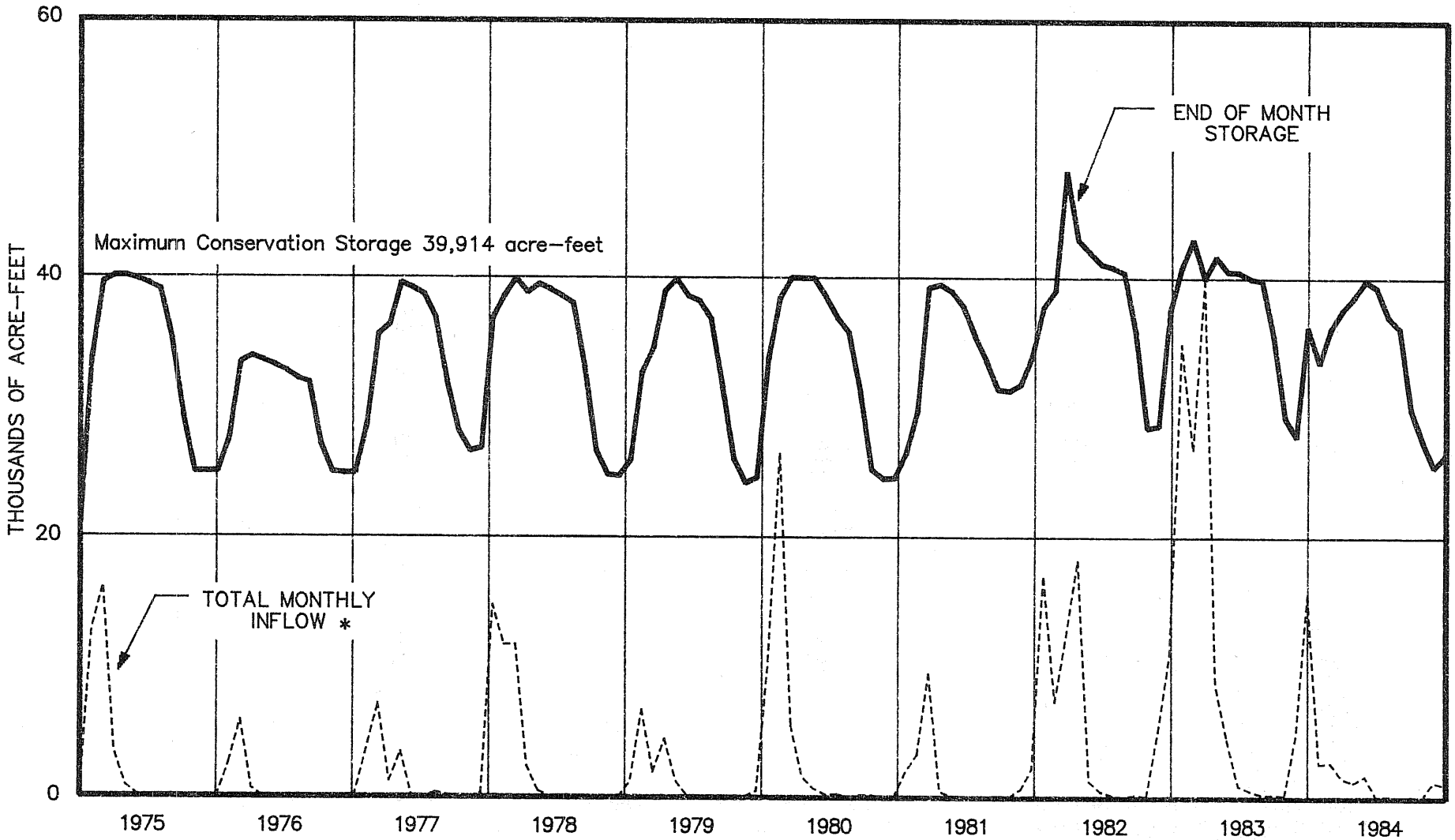
TABLE 9: LAKE DEL VALLE MONTHLY OPERATION
1984

(in acre-feet except as noted)

MONTH	WATER* SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	INFLOW		OUTFLOW					PRECIPITATION (inches)
				NATURAL	SOUTH BAY AQUEDUCT	SOUTH BAY AQUEDUCT	RECREATION 1/	ARROYO VALLE	TOTAL	EVAPORATION (in feet)	
JAN	693.44	33,507	-2,746	2,675	0	5,355	5	0	5,355	.1267	.41
FEB	697.55	36,174	2,667	2,738	0	0	5	0	0	.1492	2.30
MAR	699.64	37,581	1,407	1,575	0	0	6	0	0	.3575	.96
APR	701.14	38,612	1,031	732	504	0	10	0	0	.4433	.59
MAY	702.96	39,886	1,274	64	1,661	89	12	0	89	.7533	.00
JUN	702.13	39,302	-584	131	0	158	26	131	289	.8233	.01
JUL	698.93	37,099	-2,203	182	0	1,676	25	182	1,858	1.0000	.00
AUG	697.56	36,180	-919	85	0	562	21	0	562	.8170	.00
SEP	687.62	29,968	-6,212	153	0	5,801	18	153	5,954	.7700	.00
OCT	683.35	27,556	-2,412	82	0	2,326	14	0	2,326	.3250	1.56
NOV	679.45	25,503	-2,053	1,268	0	3,249	9	0	3,249	.1358	4.45
DEC	681.31	26,464	961	1,020	0	0	7	12	12	.9250	1.59
TOTAL	---	---	-9,789	10,705	2,165	19,216	158	478	19,694	6.6261	11.87

* At end of month.
1/ To East Bay Regional Park District.

FIGURE P: LAKE DEL VALLE OPERATION



* Natural and pumped inflows.

TABLE 10: CLIFTON COURT FOREBAY MONTHLY OPERATION

(elevation in feet, storage in acre-feet)

MONTH	YEAR	WATER SURFACE ELEVATION*	END OF MONTH STORAGE*	STORAGE CHANGE	INFLOW
JAN	1984	2.61	23,898	-1,212	18,552
	1983	3.69	26,238	2,903	379,642
FEB	1984	0.50	19,340	-4,558	108,668
	1983	2.09	22,773	-3,465	344,774
MAR	1984	0.83	20,052	712	158,995
	1983	2.89	24,504	1,731	83,158
APR	1984	-0.15	17,940	-2,112	218,657
	1983	2.44	23,530	-974	6,690
MAY	1984	1.97	22,513	4,573	175,867
	1983	1.83	22,211	-1,319	24,818
JUN	1984	1.14	20,721	-1,792	183,146
	1983	3.13	25,024	2,813	117,481
JUL	1984	0.67	19,707	-1,014	286,062
	1983	0.80	19,987	-5,037	72,201
AUG	1984	1.55	21,606	1,899	306,240
	1983	1.15	20,742	755	174,169
SEP	1984	1.22	20,893	-713	134,333
	1983	2.00	22,578	1,836	45,486
OCT	1984	0.83	20,052	-841	114,287
	1983	1.77	22,081	-497	21,130
NOV	1984	0.73	19,836	-216	238,004
	1983	1.58	21,671	-410	43,583
DEC	1984	1.01	20,440	604	273,699
	1983	3.17	25,110	3,439	29,753
TOTAL	1984	---	---	-4,670	2,216,510
	1983	---	---	1,775	1,342,885

* At end of month.

SAN LUIS FIELD DIVISION

Water Storage

San Luis Reservoir storage reached its maximum of the year, 2,023,644 ac-ft, on April 9. Maximum operating storage is 2,027,835 ac-ft. Drawdown to the minimum storage for the year, 796,917 ac-ft, occurred on September 5. Table 11 on page 56 and figure Q on page 57, present San Luis Reservoir operations during 1984. Table 12 on page 58, presents the monthly operation of O'Neill Forebay during 1984.

Water Deliveries

Deliveries in the San Luis Field Division consisted of 472 ac-ft of SWP water to 830 acres of wildlife mitigation lands located below O'Neill Forebay and at the Pilibos Wildlife Area for the Department of Fish and Game, and 55 ac-ft of SWP recreation water delivered to the Department of Parks and Recreation.

CVP water delivered in the San Luis Field Division during 1984 totaled 1,540,707 ac-ft, a 21 percent increase over 1983 total. The SWP has no water service contractors who take delivery in the San Luis Field Division. The following tabulation details the components of these CVP water deliveries made in the San Luis Field Division:

Component	Amount (ac-ft)
Delivered from Joint-Use facilities.	1,540,274
Delivered from San Luis Reservoir and O'Neill Forebay to Department of Parks and Recreation.	42
Delivered from O'Neill Forebay to Department of Fish and Game.	264
Delivered to Mendota Waterfowl Habitat area for Department of Fish and Game.	127

Table 13 on page 59, presents a monthly operations summary of the State-Federal San Luis Joint-Use facilities.

Pumping Plants

Total pumping in 1984 at San Luis Pumping-Generating Plant was 1,305,573 ac-ft, which was 65 percent of the amount pumped in 1983. Total water released from San Luis Reservoir to O'Neill Forebay for generation was 1,564,696 ac-ft, more than three times the amount in 1983.

Total pumping at Dos Amigos Pumping Plant in 1984 was 3,385,255 ac-ft, which was more than twice the amount pumped in 1983.

Mitigation Water

The SWP's share of wildlife mitigation water for 1984 totaled 4,143 ac-ft. This water was conveyed to the California Department of Fish and Game through the Grasslands Water District and Los Banos Gravel Company through the Delta-Mendota Canal, Mendota Pool, and O'Neill Forebay. In addition, the SWP share of wildlife habitat water to the Pilibos Wildlife Habitat Area in 1984 was 145 ac-ft. In 1984, the SWP paid back the USBR for 1983 mitigation water by delivering 3,298 ac-ft of water to the Bureau in O'Neill Forebay. The SWP pays back the USBR 55 percent of wildlife mitigation water the year after that water is delivered.

Outages and Limitations

* The following individual units at the two pumping plants in the San Luis 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 1984.

Unit	Outage Beginning	Outage Ending	Reason
San Luis Pumping-Generating Plant:			
3	3/24/84	5/11/84	Annual maintenance.
5	2/24/84	2/29/84	Repair pump packing & replace damaged ball valve
	3/09/84	3/14/84	Re-pack pump.
	9/28/84	----	Annual maintenance, repair leaks from head-cover, and replace wear rings.
7	5/09/84	5/11/84	Place weights and make generator mode balance runs.

Unit	Outage Beginning	Outage Ending	Reason
Dos Amigos Pumping Plant:			
2	2/29/84	3/09/84	Inspect brakes and amortisseur straps.
	10/01/84	10/05/84	Repair amortisseur straps
3	1/10/84	3/09/84	Overhaul vane control system.
	5/22/84	5/24/84	Replace broken seal ring bolts.
4	10/30/84	----	Re-wind motor and annual maintenance.
5	3/19/84	3/30/84	Repair three rotor pole pieces.

TABLE 11: SAN LUIS RESERVOIR MONTHLY OPERATION

(in acre-feet except as noted)

MONTH	YEAR	RESERVOIR STORAGE*			INFLOW	OUTFLOW			GAIN (+) LOSS (-)	EVAPORATION	PRECIPITATION (in inches)
		WATER SURFACE ELEVATION (in feet)	STORAGE	MONTHLY STORAGE CHANGE	SAN LUIS P-G PLANT PUMPING	SAN LUIS P-G PLANT GENERATION	PACHECO TUNNEL (future facility)				
JAN	1984	531.63	1,885,162	-3,222	0	1,569			-1,653	801	.21
	1983	453.00	1,002,166	537,765	544,549	0			-6,784	603	3.34
FEB	1984	537.40	1,957,113	71,951	97,449	12,808			-12,690	2,104	.63
	1983	503.31	1,545,817	543,651	544,059	0			-408	1,129	2.51
MAR	1984	541.85	2,013,241	56,128	66,583	7,658			-2,797	5,163	.30
	1983	530.36	1,869,451	323,634	319,829	180			3,985	2,128	3.96
APR	1984	540.41	1,995,018	-18,223	34,479	47,719			-4,983	7,564	.15
	1983	540.63	1,997,798	128,347	142,785	2,085			-12,353	4,767	1.45
MAY	1984	516.76	1,704,091	-290,927	37,477	326,201			-2,203	12,401	.00
	1983	542.59	2,022,628	24,830	32,407	2,448			-5,129	8,983	.06
JUN	1984	481.34	1,298,825	-405,266	45,294	450,629			69	11,455	.00
	1983	542.24	2,018,186	-4,442	64,874	61,026			-8,290	11,617	.00
JUL	1984	448.03	952,802	-346,023	93,102	439,267			142	13,157	.00
	1983	533.89	1,913,232	-104,954	47,090	142,197			-9,847	13,091	.00
AUG	1984	432.07	800,071	-152,731	61,219	207,732			-6,218	10,033	.00
	1983	529.33	1,856,743	-56,489	79,467	123,986			-11,970	11,961	.94
SEP	1984	433.38	812,264	12,193	66,801	50,087			-4,521	7,754	.00
	1983	536.02	1,939,820	83,077	136,389	39,162			-14,150	8,620	1.34
OCT	1984	448.65	958,914	146,650	158,462	3,979			-7,833	3,880	.90
	1983	540.68	1,998,430	58,610	65,351	0			-6,741	4,762	.62
NOV	1984	479.63	1,280,213	321,299	338,950	9,530			-8,121	1,672	2.48
	1983	538.84	1,975,215	-23,215	24,334	45,015			-2,534	2,053	2.53
DEC	1984	505.57	1,572,041	291,828	305,757	7,517			-6,412	847	1.20
	1983	531.89	1,888,384	-86,831	0	92,559			5,728	1,182	3.15
TOTAL	1984	---	---	-316,343	1,305,573	1,564,696			-57,220	76,831	5.87
	1983	---	---	1,423,983	2,001,134	508,658			-68,493	70,896	19.90

* At end of month.

FIGURE Q: SAN LUIS RESERVOIR OPERATION

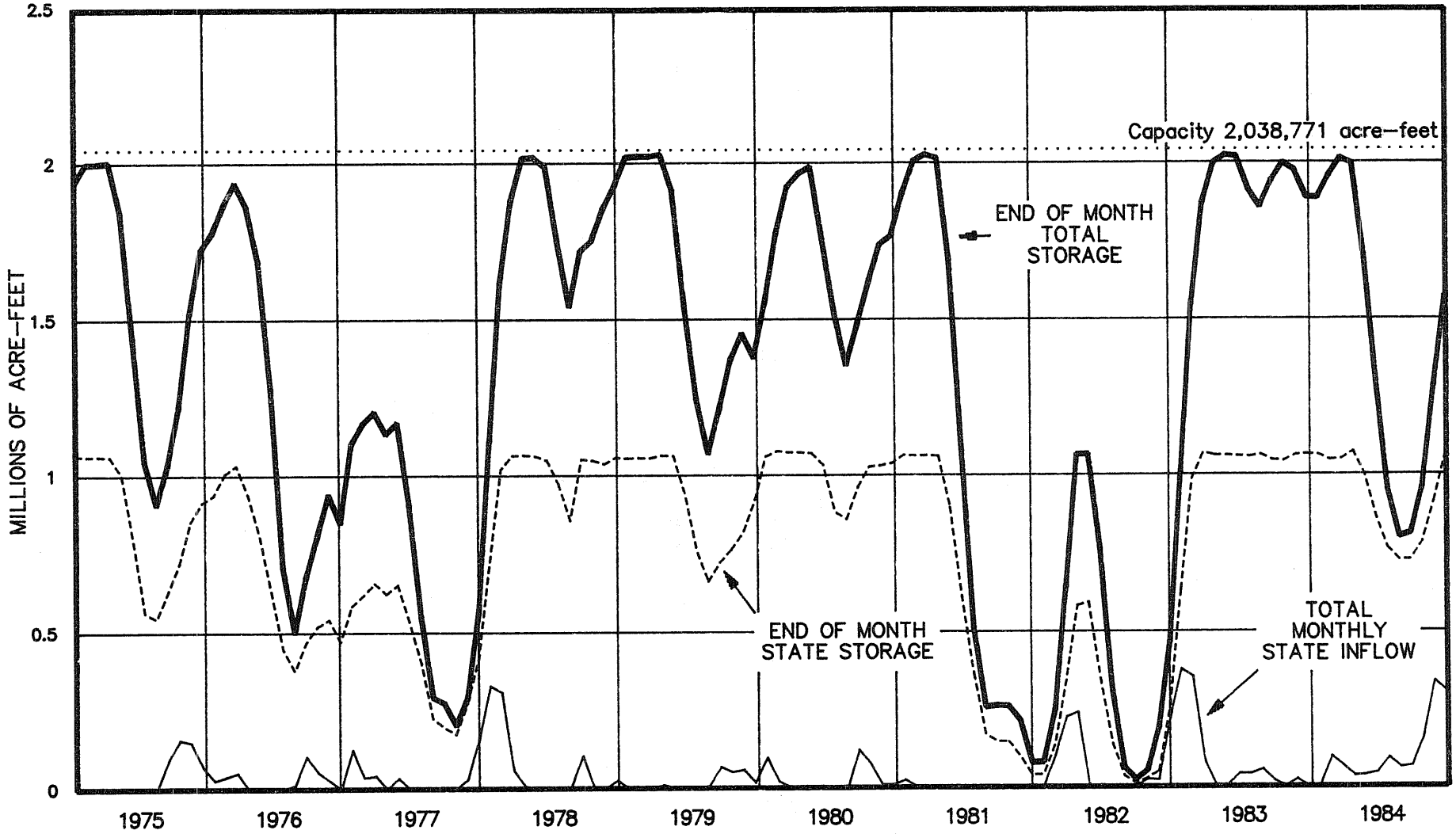


TABLE 12: O'NEILL FOREBAY MONTHLY OPERATION

(in acre-feet except as noted)

MONTH	YEAR	RESERVOIR STORAGE			INFLOW			OUTFLOW				GAIN (+) LOSS (-)
		WATER* SURFACE ELEVATION (in feet)	STORAGE*	MONTHLY 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	
JAN	1984	215.79	32,845	-2,746	77,263	1,569	19,310	0	0	102,098	798	2,008
	1983	221.79	47,835	-1,214	235,352	0	381,674	0	544,549	69,588	136	-3,967
FEB	1984	219.95	43,023	10,178	174,331	12,808	105,806	0	97,449	195,377	1,992	12,051
	1983	220.20	43,671	-4,164	212,739	0	352,286	0	544,059	23,795	731	-604
MAR	1984	219.11	40,864	-2,159	159,847	7,658	146,940	0	66,583	246,045	3,634	-342
	1983	221.53	47,152	3,481	246,369	180	84,190	0	319,829	4,379	238	-2,812
APR	1984	220.02	43,204	2,340	86,522	47,719	203,101	0	34,479	303,557	2,711	5,745
	1983	221.58	47,283	131	206,762	2,085	4,538	0	142,785	74,437	1,022	4,990
MAY	1984	222.92	50,833	7,629	18,696	326,201	148,344	56,681	37,477	391,675	4,446	4,667
	1983	220.76	45,132	-2,151	129,771	2,448	13,970	0	32,407	115,809	1,541	1,417
JUN	1984	219.95	43,023	-7,810	0	450,629	162,548	65,052	45,294	505,203	5,363	-75
	1983	220.67	44,897	-235	108,832	61,026	92,382	0	64,874	198,498	2,900	3,797
JUL	1984	221.13	46,101	3,078	1,935	439,267	262,765	8,577	93,102	598,015	6,301	5,106
	1983	221.00	45,760	863	116,901	142,197	53,661	0	47,090	266,221	4,211	5,626
AUG	1984	221.07	45,944	-157	28,911	207,732	282,916	0	61,219	461,117	5,360	7,980
	1983	222.36	49,341	3,581	133,950	123,986	153,640	0	79,467	330,270	3,767	5,509
SEP	1984	220.57	44,635	-1,309	57,668	50,087	123,223	0	66,801	167,220	2,227	3,961
	1983	221.58	47,283	-2,058	166,458	39,162	28,408	0	136,389	104,230	2,022	6,555
OCT	1984	221.08	45,970	1,335	128,666	3,979	107,497	0	158,462	79,111	588	-646
	1983	222.01	48,411	1,128	112,384	0	14,617	196	65,351	58,375	437	-1,514
NOV	1984	223.32	51,901	5,931	221,186	9,530	235,698	0	338,950	121,467	235	169
	1983	216.35	34,114	-14,297	47,791	45,015	41,277	0	24,334	126,300	613	2,867
DEC	1984	221.08	45,970	-5,931	239,760	7,517	265,349	0	305,757	214,370	72	1,642
	1983	216.98	35,591	1,477	94,328	92,559	23,776	0	0	214,410	262	5,486
TOTAL	1984	---	---	10,379	1,194,785	1,564,696	2,063,497	130,310	1,305,573	3,385,255	33,727	42,266
	1983	---	---	-13,458	1,811,637	508,658	1,244,419	196	2,001,134	1,586,312	17,880	27,350

* At end of month.

TABLE 13: MONTHLY OPERATIONS SUMMARY, STATE-FEDERAL SAN LUIS JOINT-USE FACILITIES 1984

(in acre-feet except as noted)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Check 12													
State	19,310	105,483	142,556	171,390	145,704	162,548	182,790	155,071	116,226	107,497	174,894	163,603	1,647,072
Federal	0	323	4,384	31,711	2,640	0	79,975	127,845	6,997	0	60,804	101,746	416,425
Total	19,310	105,806	146,940	203,101	148,344	162,548	262,765	282,916	123,223	107,497	235,698	265,349	2,063,497
O'Neill P-G Plant Amount Pumped													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	77,263	174,331	159,847	86,522	18,696	0	1,935	28,911	57,668	128,666	221,186	239,760	1,194,785
Total	77,263	174,331	159,847	86,522	18,696	0	1,935	28,911	57,668	128,666	221,186	239,760	1,194,785
Released for Gen.													
Federal	0	0	0	0	56,681	65,052	8,577	0	0	0	0	0	130,310
O'Neill Forebay Storage*													
State	15,299	21,220	23,055	21,439	25,555	26,539	11,360	14,846	19,153	27,266	39,878	14,585	—
Federal	17,546	21,803	17,809	21,765	25,278	16,484	34,741	31,098	25,482	18,704	12,023	31,385	—
Total	32,845	43,023	40,864	43,204	50,833	43,023	46,101	45,944	44,635	45,970	51,901	45,970	—
San Luis Reservoir Storage*													
State	1,061,686	1,045,422	1,048,159	1,072,391	999,673	862,245	764,245	726,563	727,062	784,058	911,388	1,061,180	—
Federal	823,476	911,691	965,082	922,627	704,418	436,580	188,557	73,508	85,202	174,856	368,825	510,861	—
Total	1,885,162	1,957,113	2,013,241	1,995,018	1,704,091	1,289,825	952,802	800,071	812,264	958,914	1,280,213	1,572,041	—
San Luis P-G Plant Amount Pumped													
State	0	1,781	11,933	34,479	37,477	45,294	93,102	61,219	53,073	65,283	141,327	160,836	705,804
Federal	0	95,668	54,650	0	0	0	0	0	13,728	93,179	197,623	144,921	599,769
Total	0	97,449	66,583	34,479	37,477	45,294	93,102	61,219	66,801	158,462	338,950	305,757	1,305,573
Released for Gen.													
State	1,569	11,065	7,658	7,506	145,767	211,152	191,180	95,481	50,087	3,979	9,530	7,517	742,491
Federal	0	1,743	0	40,213	180,434	239,477	248,087	112,251	0	0	0	0	822,205
Total	1,569	12,808	7,658	47,719	326,201	450,629	439,267	207,732	50,087	3,979	9,530	7,517	1,564,696
Dos Amigos P.P. Amount Pumped													
State	27,551	112,176	136,258	149,193	197,945	284,581	282,355	188,180	108,244	43,017	30,578	58,444	1,618,522
Federal	74,547	83,201	109,787	154,364	193,730	220,622	315,660	272,937	58,976	36,094	90,889	155,926	1,766,733
Total	102,098	195,377	246,045	303,557	391,675	505,203	598,015	461,117	167,220	79,111	121,467	214,370	3,385,255

* At end of month.

SAN JOAQUIN FIELD DIVISION

Water Deliveries

Of the 1,232,328 ac-ft total SWP water delivered to SWP water service contractors in the San Joaquin Field Division during 1984, about 75 percent was entitlement water, 21 percent was surplus water, three percent was preconsolidation repayment water, and one percent was divided between 1982 exchange, 1977 emergency relief, and carry-over water. The largest delivery (1,099,391 ac-ft) was to the Kern County Water Agency (KCWA). This represented 89 percent of the total SWP water delivered within the Field Division.

Of the total entitlement water delivered in the San Joaquin Field Division, 94,049 ac-ft was for municipal and industrial purposes.

In addition to SWP deliveries, 95,406 ac-ft of federal CVP water was wheeled through SWP facilities to KCWA's Cross Valley Canal to be delivered to Cross Valley Canal contractors, and 2,557 ac-ft of CVP water was wheeled to Green Valley Water District.

See table 1 on page 15, for water deliveries by year with totals to date for individual agencies.

Pumping plants

The following table presents the total pumping at the six pumping plants in the Division during 1984, and their percent increases over 1983 totals:

Pumping Plant	1984 Total (ac-ft)	Increase Above 1983 (percent)
Coastal Branch:		
Las Perillas	148,240	+40
Badger Hill	145,683	+34
California Aqueduct:		
Buena Vista	710,647	+25
Wheeler Ridge	568,417	+22
Ira J. Chrisman Wind Gap	505,698	+20
A.D. Edmonston	488,972	+20

The 1984 increase in pumping was representative of the more normal water conditions than occurred in 1983, which resulted in increased water deliveries in 1984.

Outages and Limitations

Major outages affecting or influencing operations of the Division in 1984 were:

* Las Perillas Pumping Plant discharge line was out of service from February 15 through 17 to replace Unit No. 1 discharge valve "O" ring.
* Wheeler Ridge Pumping Plant discharge line No. 1 was out of service from March 14 through 19 to remove Unit No. 3 discharge valve.
* Ira J. Chrisman Wind Gap Pumping Plant discharge line No. 3 was out of service from September 3 through 20 to repair leaks in the line. Discharge line No. 4 was out of service from March 13 through April 20 to repack expansion joints, and again from September 18 through October 9 to repair leaks in the line.
* A. D. Edmonston Pumping Plant east discharge line was out of service from April 30 through December 24 to remove Units No. 1,5, and 11 discharge valves and place bumped heads, and to replace Units No. 7,9, and 13 discharge valves.
* The following individual units at the six pumping plants in the 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 1984.

Coastal Branch:

Unit	Outage Beginning	Outage Ending	Reason
Las Perillas Pumping Plant:			
4	11/28/84	----	Annual maintenance.
5	10/23/84	11/28/84	Annual maintenance.
6	10/11/84	11/28/84	Annual maintenance.
Badger Hill Pumping Plant:			
2	9/13/84	9/14/84	Maintenance on switchgear
4	1/28/84	4/26/84	Repair amortisseur straps
6	9/12/84	----	Overhaul pump and motor.

California Aqueduct:

Unit	Outage Beginning	Outage Ending	Reason
Buena Vista Pumping Plant:			
2	12/31/84	----	Annual maintenance.
3	3/20/84	----	Repair discharge valve seats & annual maintenance
5	1/01/84	2/24/84	Annual maintenance.
6	6/11/84	12/31/84	Annual maintenance & replace impeller.
8	4/18/84	4/27/84	Remove and replace old back-fill system.
9	2/03/84	4/20/84	Annual maintenance.
Wheeler Ridge Pumping Plant:			
6	6/11/84	----	Remove and replace pump impeller and for electrical maintenance.
Ira J. Chrisman Wind Gap Pumping Plant:			
1	1/01/84	9/01/84	Annual maintenance.
2	3/14/84	3/16/84	Install new amortisseur straps.
3	9/03/84	9/20/84	Repair discharge line.
4	9/18/84	10/09/84	Repair discharge line.
6	1/05/84	1/09/84	Repair leak in back-fill line.
	3/27/84	3/30/84	Replace broken bolts on packing box.
8	12/28/84	----	Repair leaks.
9	9/18/84	10/02/84	Inspect impeller.
	12/04/84	12/12/84	Repair pin hole leak on back-fill valve.
A. D. Edmonston Pumping Plant:			
7	2/23/84	3/23/84	To repair switch No.567 air system.
8	8/08/84	8/23/84	To weld new isophase bus between Units No.8 and 10.
9	2/23/84	3/23/84	To repair switch No.567 air system.
13	All of 1984		Complete unit overhaul.

SOUTHERN FIELD DIVISION

Water Storage

At the start of the 1984 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 616,510 ac-ft, or 86 percent of the combined capacity (717,251 ac-ft). Combined storage at the end of the year was 501,683 ac-ft, or 70 percent of the combined capacity. In addition, 21,994 ac-ft of natural flow was released through the Project's Southern reservoirs in 1984.

A table of reservoir storages for the Southern Field Division follows:

Reservoir & Operational Capacity (ac-ft)	Start of 1984 (ac-ft)	End of 1984 (ac-ft)	Maximum (ac-ft)	Date	Minimum (ac-ft)	Date
Pyramid Lake (169,901)	152,761	153,727	167,959	12/12	137,249	11/16
Elderberry Forebay (28,230)	30,193	28,092	32,806	6/15	6,187	12/17
Castaic Lake (319,247)	270,390	133,369	270,390	1/1	65,416	11/4
Silverwood Lake (73,032)	38,040	62,190	74,075	9/24	38,040	1/1
Lake Perris (126,841)	125,126	124,305	125,377	5/15	121,836	10/27

Summaries of operations for those reservoirs are in pages 66 through 74.

Water Deliveries

The total SWP water delivered to SWP water service contractors in the Southern Field Division was 563,918 ac-ft, a 14 percent increase over the amount delivered in 1983. This total includes 3,977 ac-ft of SWP recreation water. Of the total entitlement water delivered in the Field Division, 373,100 ac-ft was for municipal and industrial purposes.

SWP recreation water delivered in 1984 consisted of 1,776 ac-ft to the California Department of Parks and Recreation (80 ac-ft at Silverwood Lake, 1,414 ac-ft at Lake Perris, seven ac-ft at Pyramid Lake, and 275 ac-ft released to maintain a trout fishery in Piru Creek). An additional 2,201 ac-ft was delivered to Los Angeles County Recreation Department at Castaic Lake.

Table 1 on page 15, presents water deliveries by year with totals to date for individual agencies.

Outages and Limitations

Major outages affecting or influencing operations in the Division in 1984 were:

* Pearblossom Pumping Plant discharge line No. 1 was out of service from September 24 through the end of the year to repair Unit No. 1 discharge valve seat, repair Unit No. 3 high pressure drain valve, and install shut-off valve in No. 1 surge chamber water level sight glass. The No. 2 discharge line was out of service from September 19 through 24 to remove Unit No. 6 bumped head.
* As described in more detail on page 4, a break occurred in the Lower Quail Canal on January 16, about one mile below Quail Lake. The major portion of the repair work was completed and the canal was made operational to the depth of 23 ft by November 8. Repairs on the canal continued into 1985.
* As described in more detail on page 5, Castaic Lake was drawn down in April to allow for repair work on the intake tower. Refilling commenced on November 4.
* The following individual 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 1984.

East Branch:

Unit	Outage Beginning	Outage Ending	Reason
Pearblossom Pumping Plant:			
1	3/05/84	3/30/84	Annual maintenance.
5	3/04/84	3/29/84	Annual maintenance.
6	9/24/84	----	Annual maintenance.
Devil Canyon Power Plant:			
1	3/27/84	3/29/84	Install strain gages in wheel pit.
2	12/03/84	----	Annual maintenance.

West Branch:

Unit	Outage Beginning	Outage Ending	Reason
Oso Pumping Plant:			
1	2/06/84	6/22/84	Five year maintenance.
2	9/26/84	12/07/84	Repair leaking joints in discharge line.
4	7/18/84	----	Remove impeller for inspection.
5	8/27/84	8/31/84	Repair thrust bearing oil pump piping.
7	7/17/84	----	Remove impeller for inspection and annual maintenance.
8	2/01/84	2/08/84	Inspect and repair high pressure oil lines to thrust bearings.
	6/21/84	9/19/84	Replace guide bearings and repair leaking joints on discharge line.
William E. Warne Power Plant:			
1	1/03/84	1/06/84	Repair anti reversing device.
	1/17/84	1/23/84	Brake modifications.
	1/31/84	2/08/84	Relocate generator lower guide bearing oil level switch.
	8/07/84	8/10/84	Annual maintenance.
2	1/03/84	1/06/84	Repair anti reversing device.
	1/07/84	1/27/84	Generator efficiency test
	4/02/84	4/05/84	Relocate generator lower guide bearing oil level switch.
	8/09/84	8/14/84	Annual maintenance.
	8/23/84	8/31/84	Inspect and repair hydraulic oil lines to the needle valves.

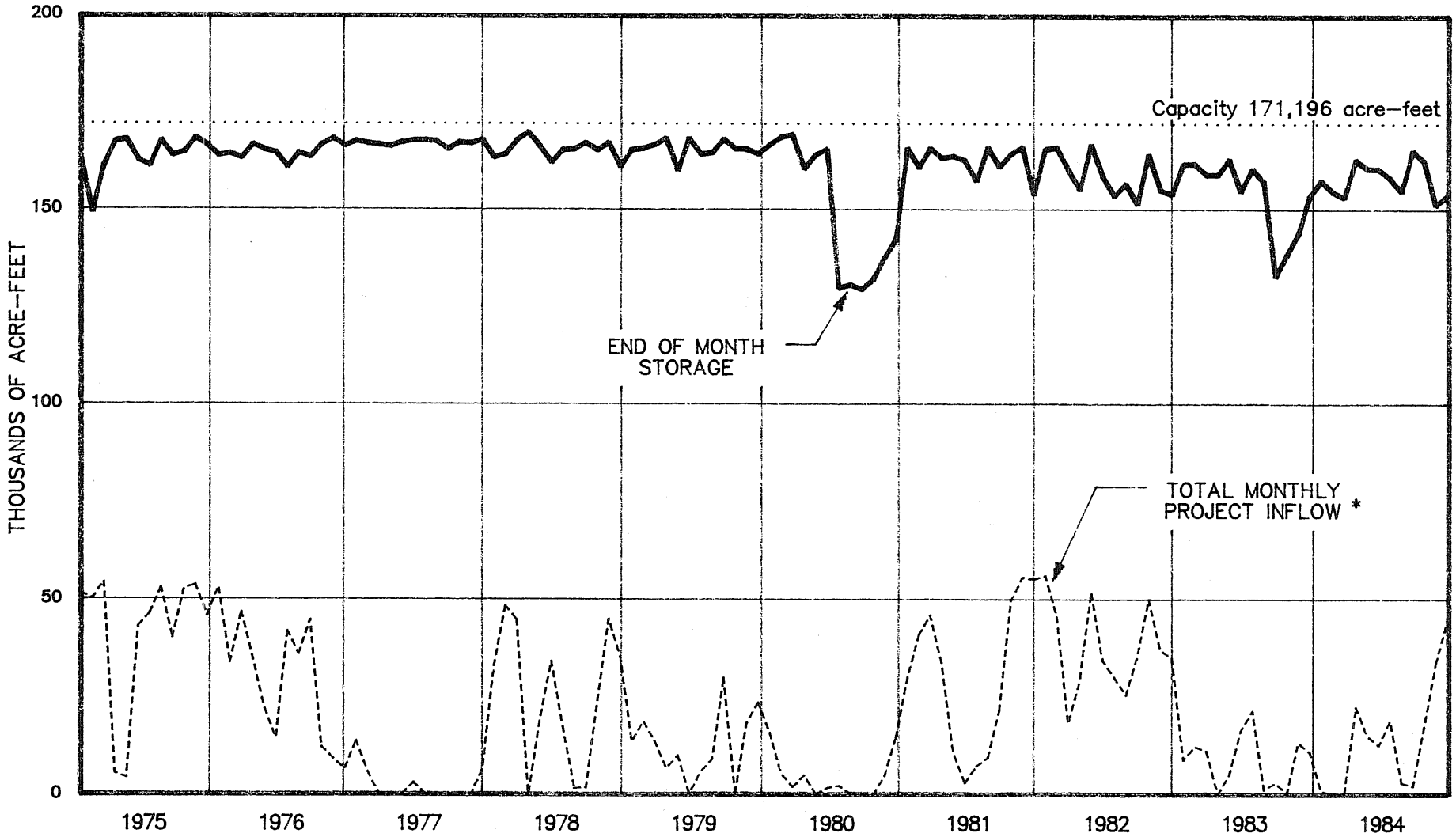
TABLE 14: PYRAMID LAKE MONTHLY OPERATION
1984

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION	TOTAL STORAGE 1/	STORAGE CHANGE	INFLOW			OUTFLOW					COMPUTED LOSSES (-) GAINS (+)
					PROJECT			TO PIRU CREEK				
				NATURAL	WARNE POWER-PLANT	PUMPBACK 2/	ANGELES TUNNEL	NATURAL INFLOW RELEASE 3/	PROJECT WATER FOR FISH ENHANCEMENT			
JAN	2568.04	(2,418) 157,359	3,958	2,456	764	98,172	95,138	2,001				-295
FEB	2565.72	(2,510) 154,527	-2,832	1,538	70	96,100	95,915	1,446				-3,179
MAR	2564.51	(1,251) 153,063	-1,464	1,409	269	121,709	117,809	2,668				-4,374
APR	2572.41	(1,223) 162,785	9,722	1,088	22,404	118,061	125,021	1,116				-5,694
MAY	2570.55	(1,232) 160,461	-2,324	813	15,056	112,952	127,340	804				-3,001
JUN	2570.47	(990) 160,361	-100	507	12,559	121,607	124,863	749				-9,161
JUL	2568.60	(566) 158,048	-2,313	468	18,984	132,173	145,186	892				-7,860
AUG	2565.76	(79) 154,576	-3,472	435	2,999	113,886	115,236	922				-4,634
SEP	2574.30	(0) 165,168	10,592	526	2,085	98,296	88,029	605		262		-1,419
OCT	2572.06	(0) 162,346	-2,822	517	1,759	64,044	67,769	517		13		-843
NOV	2564.60	(356) 151,171	-11,175	915	33,642	16,277	57,724	559				-3,726
DEC	2565.06	(153) 153,727	2,556	1,080	44,628	12,229	54,994	1,283				896
TOTAL	---	---	326	11,752	155,219	1,105,506	1,215,024	13,562		275		-43,290

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 R: PYRAMID LAKE OPERATION



* Excludes pumpback by LADWP through Castaic Powerplant.

TABLE 15: ELDERBERRY FOREBAY MONTHLY OPERATION
1984

(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		PUMPBACK TO PYRAMID LAKE 1/	
						NATURAL	PROJECT		
JAN	1527.60	(1,829) 27,139	-2,769	95,138	591	0	0	98,172	-326
FEB	1532.80	(2,183) 29,532	2,393	95,915	354	0	0	96,100	2,224
MAR	1533.00	(2,363) 29,626	94	117,809	180	0	0	121,709	3,814
APR	1517.30	(0) 22,709	-6,917	125,021	74	2,437	15,066	118,061	3,552
MAY	1535.00	30,573	7,864	127,340	16	16	11,037	112,952	4,513
JUN	1527.90	27,274	-3,299	124,863	0	0	10,617	121,607	4,062
JUL	1533.60	29,908	2,634	145,186	0	0	14,010	132,173	3,631
AUG	1538.70	32,364	2,456	115,236	0	0	2,027	113,886	3,133
SEP	1517.90	22,956	-9,408	88,029	0	0	0	98,296	859
OCT	1521.40	24,424	1,468	67,769	0	0	1,791	64,044	-466
NOV	1473.10	8,299	-16,125	57,724	3	3	57,022	16,277	-550
DEC	1529.70	28,093	19,794	54,994	388	388	22,097	12,229	-874
TOTAL	---	---	-1,815	1,215,024	1,606	2,844	133,667	1,105,506	23,572

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

TABLE 16: CASTAIC LAKE MONTHLY OPERATION
1984

(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	SUBSURFACE	
JAN	1485.69	(1,501) 262,024	-8,706	1,279	0	0	7,572	1,981	1,781	184	-432
FEB	1482.18	(1,130) 255,127	-6,897	789	0	0	6,240	1,209	987	173	-237
MAR	1468.20	(-313) 228,641	-26,486	484	0	0	24,278	2,012	1,743	184	-680
APR	1460.36	(263) 214,447	-14,194	275	2,437	15,066	31,617	2,235	1,957	179	1,880
MAY	1446.83	(0) 191,068	-23,379	114	16	11,037	34,989	666	209	184	1,109
JUN	1431.22	(0) 165,888	-25,180	58	0	10,617	36,242	0	0	58	387
JUL	1418.86	(0) 147,229	-18,659	22	0	14,010	35,785	0	0	22	3,094
AUG	1394.32	(0) 113,571	-33,658	17	0	2,027	35,863	0	0	17	161
SEP	1369.56	(22) 84,251	-29,320	22	0	0	30,291	0	0	0	949
OCT	1353.00	(0) 67,298	-16,953	51	0	1,791	18,974	0	0	73	179
NOV	1395.93	(0) 115,639	48,341	111	3	57,022	8,920	674	0	114	799
DEC	1409.15	(1,046) 133,369	17,730	672	388	22,097	6,642	0	0	14	1,215
TOTAL	—	—	-137,361	3,894	2,844	133,667	277,413	8,777	6,677	1,202	8,424

1/ Natural inflow storage shares are shown in brackets.

FIGURE S: CASTAIC LAKE OPERATION

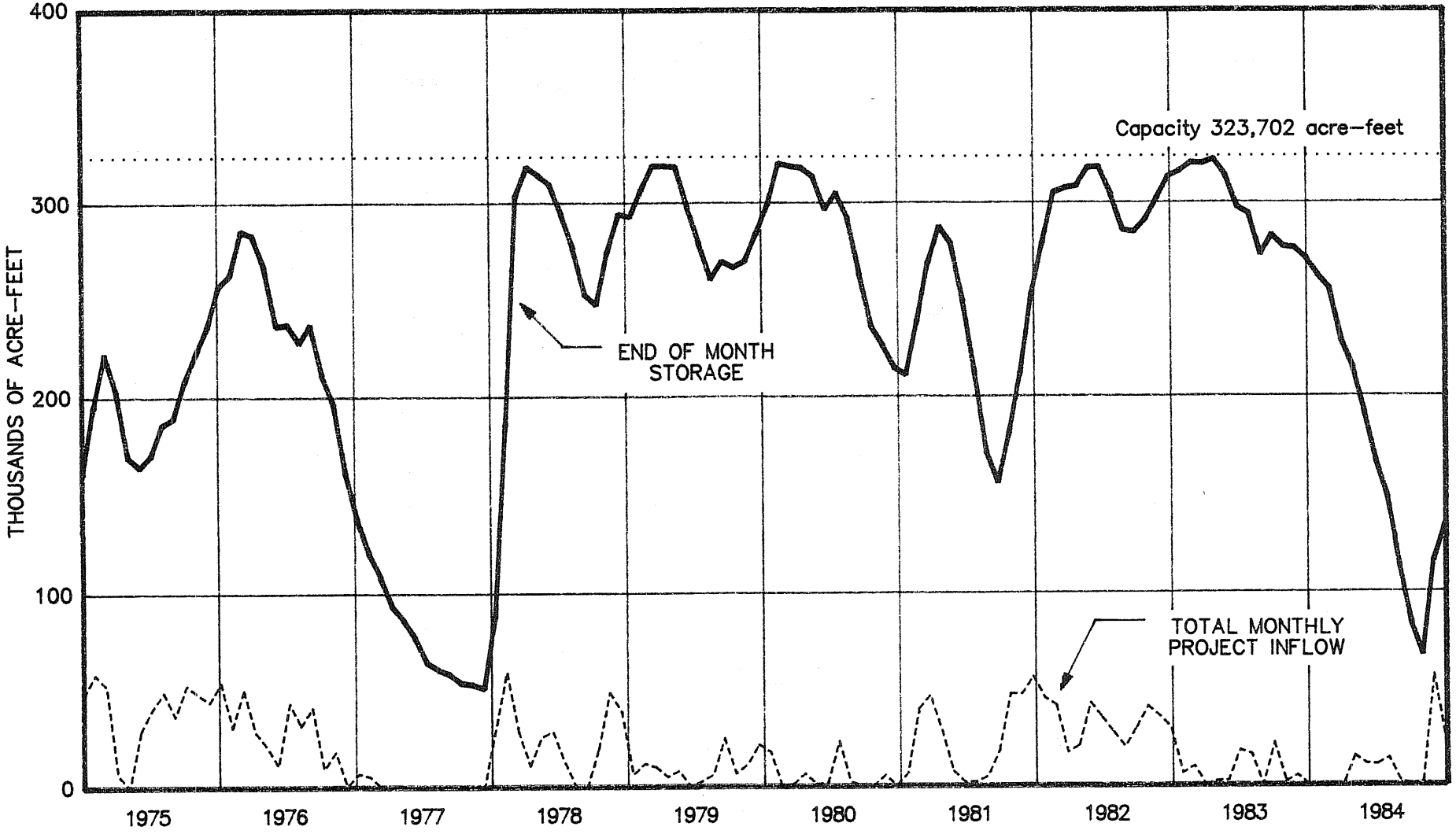


TABLE 17: SILVERWOOD LAKE MONTHLY OPERATION
1984

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	STORAGE 1/	STORAGE CHANGE	INFLOW		OUTFLOW			COMPUTED LOSSES	NATURAL INFLOW EXCHANGED OR RELEASED 2/
				NATURAL	PROJECT	SAN BERNARDINO TUNNEL	AT TURNOUT (CLAWA)	NATURAL INFLOW TO MOJAVE RIVER		
JAN	3328.31	(1,422) 51,332	14,222	1,166	16,020	3,708	62	8	814	971
FEB	3348.80	(1,150) 69,052	17,720	575	21,350	5,452	50	10	1,307	847
MAR	3346.64	(638) 67,052	-2,000	511	14,850	19,000	41	12	1,692	1,023
APR	3344.26	(411) 64,885	-2,167	363	41,220	43,147	74	12	-517	590
MAY	3339.94	(318) 61,048	-3,837	168	21,340	26,178	90	11	934	261
JUN	3345.92	(242) 66,392	5,344	44	48,400	43,471	148	11	530	120
JUL	3344.60	(152) 65,192	-1,200	0	30,230	32,531	160	11	1,272	90
AUG	3350.98	(-70) 71,102	5,910	0	44,950	37,436	103	11	-1,490	222
SEP	3352.54	(-259) 72,590	1,488	0	41,000	40,003	171	11	673	189
OCT	3345.48	(-269) 65,991	-6,599	4	0	5,747	106	14	-736	14
NOV	3339.56	(-178) 60,717	-5,274	104	0	5,029	82	13	-254	13
DEC	3341.24	(2,482) 62,190	1,473	3,089	0	2,661	121	429	1,595	429
TOTAL	—	—	25,080	6,024	279,360	264,363	1,208	553	5,820	4,769

1/ Natural inflow storage shares are shown in brackets.

2/ Total releases made from Mojave Siphon to Las Flores Ranch Co., in exchange for natural inflow stored in lake, and from Silverwood Lake to Mojave River from outlet works for Mojave W.A. The difference between this total column and the natural inflow released to Mojave River equals the Las Flores Ranch.

FIGURE T: SILVERWOOD LAKE OPERATION

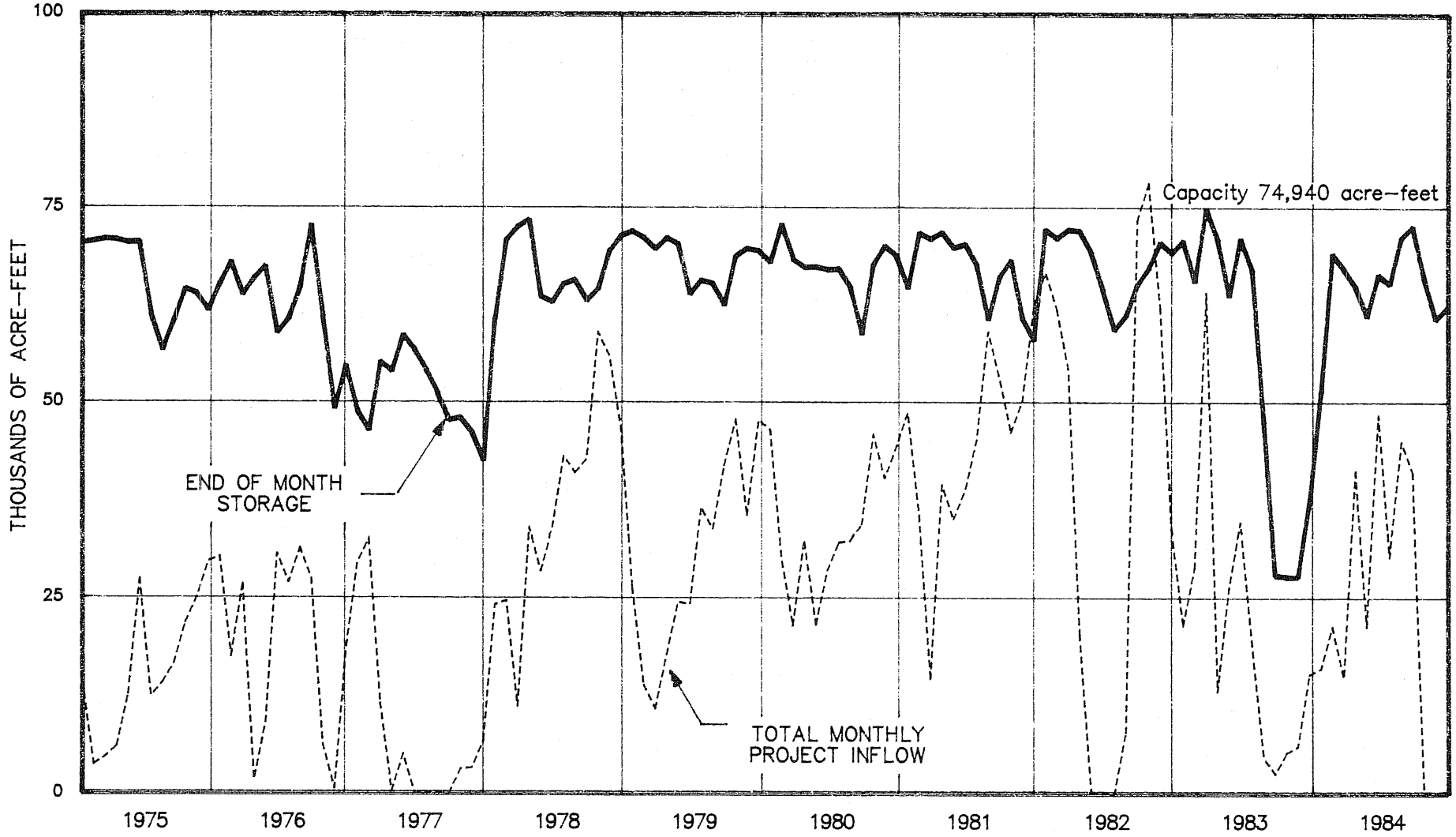
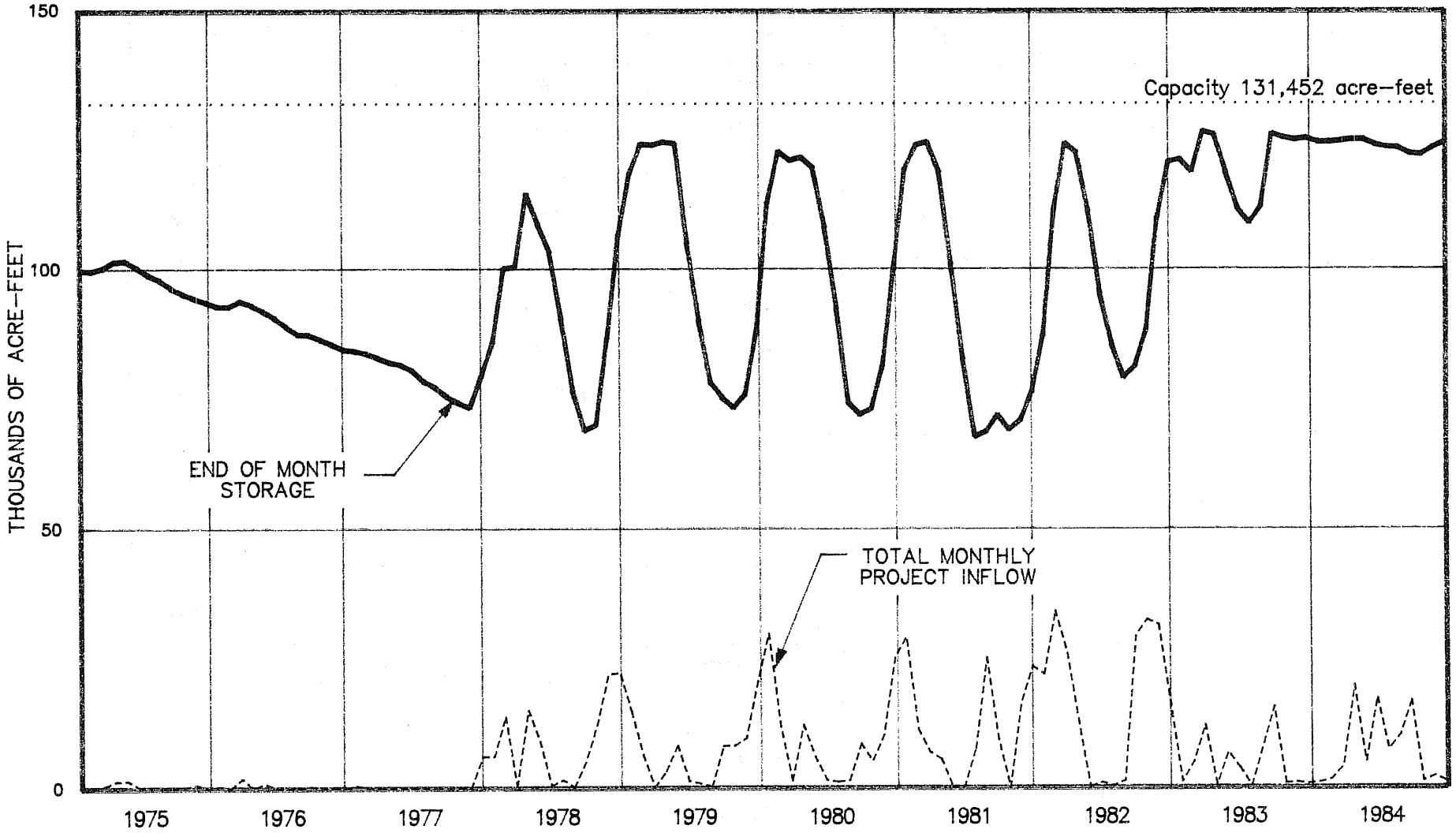


TABLE 18: LAKE PERRIS MONTHLY OPERATION
1984

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE	STORAGE CHANGE	INFLOW	OUTFLOW	COMPUTED LOSSES (-) GAINS (+)
DEC	1587.26	125,149				
JAN	1586.94	124,419	-730	1,054	466	-1,318
FEB	1586.94	124,419	0	1,636	466	-1,170
MAR	1587.02	124,601	182	4,132	2,728	-1,222
APR	1587.13	124,850	249	19,627	17,692	-1,686
MAY	1587.13	124,850	0	4,995	3,600	-1,395
JUN	1586.71	123,896	-954	17,378	16,958	-1,374
JUL	1586.50	123,420	-476	7,393	6,761	-1,108
AUG	1586.44	123,283	-137	10,179	8,191	-2,125
SEP	1585.96	122,197	-1,086	16,783	17,613	-256
OCT	1585.86	121,971	-226	1,304	509	-1,021
NOV	1586.44	123,283	1,312	2,213	453	-448
DEC	1586.89	124,305	1,022	1,210	428	240
TOTAL			-844	87,904	75,865	-12,883

FIGURE U: LAKE PERRIS OPERATION



APPENDIX

SECTION I	SUMMARY OF GOVERNOR EDMUND G. BROWN CALIFORNIA AQUEDUCT	77
SECTION II	PUMPING PLANTS	89
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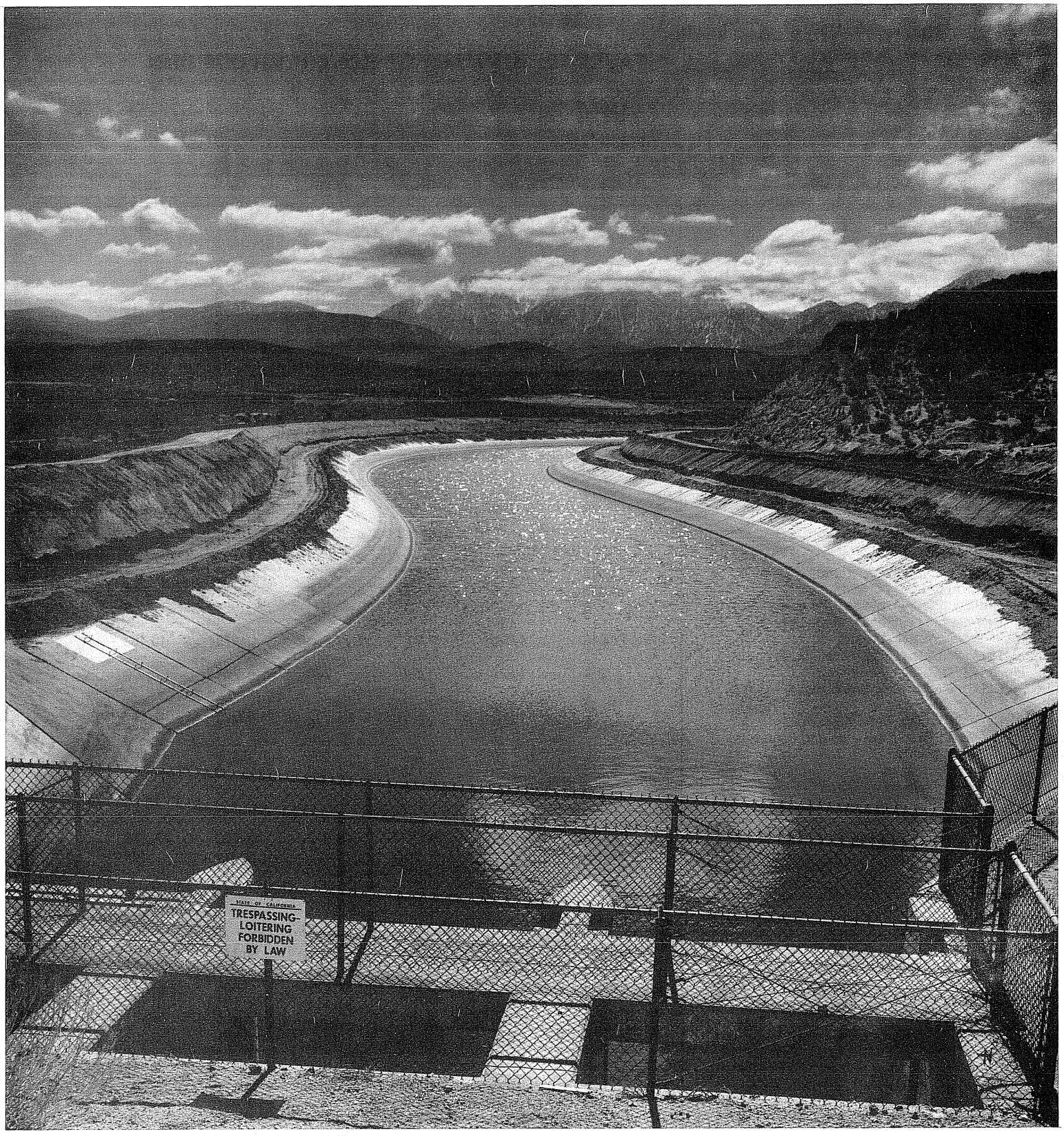
SUMMARY OF GOVERNOR EDMUND G. BROWN CALIFORNIA AQUEDUCT OPERATION

SECTION I



GOVERNOR EDMUND G. BROWN CALIFORNIA AQUEDUCT
(Outlet from Pearblossom Pumping Plant)

Construction began in 1985 for raising the canal lining of the California Aqueduct's East Branch by four feet as part of the East Branch enlargement.

TABLE 19: SUMMARY OF GOVERNOR EDMUND

1984

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
DELTA FIELD DIVISION						
North Bay Aqueduct						
Pumped at Cordelia Pumping Plant	58	54	69	75	113	249
Change in Storage	0	0	0	-6	-12	12
Computed Losses (-), Gains (+)	0	0	0	0	0	0
Delivered to Contracting Agencies	58	54	69	81	125	237
California Aqueduct						
Pumped at Harvey O. Banks Delta Pumping Plant	20,372	113,226	157,466	214,679	164,799	178,221
Pumped at South Bay Pumping Plant	1,069	7,152	9,233	10,109	14,360	13,178
Delivered to Contracting Agencies	4	228	852	1,325	1,218	1,461
Change in Storage	-90	303	2	97	146	122
Outflow at Check 12	19,310	105,806	146,940	203,101	148,344	162,545
Computed Losses (-), Gains (+)	-79	263	-439	-47	-731	-915
South Bay Aqueduct						
Pumped at South Bay Pumping Plant	1,069	7,152	9,233	10,109	14,360	13,178
Inflow from Lake Del Valle	5,355	0	0	0	89	289
Outflow (Pumped at Lake Del Valle)	0	0	0	504	1661	0
Delivered to Contracting Agencies Project Water Only	4,912	5,620	7,201	7,855	10,279	10,463
Del Valle Natural Inflow Exchanged and Released from Aqueduct	228	1,522	1,570	732	64	0
Del Valle Natural Inflow Released from Aqueduct	1,274	0	0	0	0	131
Del Valle Stored Water Released	0	0	0	0	0	158
Del Valle Stored Exchange and Released from Aqueduct	0	0	452	1,008	2,360	2,705
Change in Storage	0	0	0	0	0	0
Computed Losses (-), Gains (+)	-10	-10	-10	-10	-85 1/	-10
Lake Del Valle Operation:						
End-of-Month Storage	33,507	36,174	37,581	38,612	39,886	39,302
Change in Storage	-2,746	2,667	1,407	1,031	1,274	-584
SAN LUIS FIELD DIVISION						
O'Neill Forebay Operation						
End-of-Month Storage	32,845	43,023	40,864	43,204	50,833	43,023
Inflow, California Aqueduct	19,310	105,806	146,940	203,101	148,344	162,548
Inflow, O'Neill P.- G. Plant	77,263	174,331	159,847	86,522	18,696	0
Inflow, San Luis P.- G. Plant	1,569	12,808	7,658	47,719	326,201	450,629
Change in Storage	-2,746	10,178	-2,195	2,304	7,629	-7,810
Delivered to Federal Customers	798	1,993	3,636	2,677	4,387	5,301
Delivered to Dept. of Parks and Rec. (State)	1	1	3	7	8	9
Delivered to Dept. of Fish and Game (State)	0	0	0	40	79	69
Outflow, O'Neill P.- G. Plant	0	0	0	0	56,681	65,052
Outflow, San Luis P.- G. Plant	0	97,449	66,583	34,479	37,477	45,294
Computed Losses (-), Gains (+)	2,008	12,051	-378	5,709	4,667	-75
Outflow, Dos Amigos P.P.	102,098	195,377	246,045	303,557	391,675	505,203
San Luis Reservoir Operation						
State End-of-Month Storage	1,061,686	1,045,422	1,048,159	1,072,391	999,673	862,245
Total End-of-Month Storage	1,885,162	1,957,113	2,013,421	1,995,018	1,704,091	1,289,825
Inflow, San Luis P.- G. Plant	0	97,449	66,583	34,479	37,477	45,294
Change in Storage	-3,222	71,951	56,308	-18,403	-290,927	-414,266
Computed Losses (-), Gains (+)	-1,653	-12,690	-2,617	-5,163	-2,203	-8,931
Outflow, San Luis P.- G. Plant	1,569	12,808	7,658	47,719	326,201	450,629

1/ Includes pipeline break loss of 75 acre-feet out of Reach 9 on May 10, 1984.

G. BROWN CALIFORNIA AQUEDUCT OPERATION

1984
(in acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							DELTA FIELD DIVISION
							North Bay Aqueduct
221	277	210	410	513	659	2,908	Pumped at Cordelia Pumping Plant
-9	8	2	-7	1	-4	-15	Change in Storage
0	0	0	0	0	0	0	Computed Losses (-), Gains (+)
230	269	208	417	512	663	2,923	Delivered to Contracting Agencies
							California Aqueduct
279,416	298,587	131,247	114,926	238,220	273,096	2,184,255	Pumped at Harvey O. Banks Delta Pumping Plant
13,550	13,952	7,235	9,082	1,466	8,006	108,392	Pumped at South Bay Pumping Plant
1,569	657	270	196	93	6	7,879	Delivered to Contracting Agencies
332	-216	-229	-1,922	1,949	-2	492	Change in Storage
262,765	282,916	123,223	107,497	235,785	265,349	2,063,581	Outflow at Check 12
-1,200	-1,278	-748	-73	1,073	263	-3,911	Computed Losses (-), Gains (+)
							South Bay Aqueduct
13,550	13,952	7,235	9,082	1,466	8,006	108,392	Pumped at South Bay Pumping Plant
1,858	562	5,954	2,326	3,249	12	19,694	Inflow from Lake Del Valle
0	0	0	0	0	0	2,165	Outflow (Pumped at Lake Del Valle)
10,957	11,865	11,787	10,421	3,437	6,988	101,785	Delivered to Contracting Agencies Project Water Only
0	0	0	0	140	1,008	5,264	Del Valle Natural Inflow Exchanged and Released from Aqueduct
182	85	153	87	1,128	12	3,052	Del Valle Natural Inflow Released from Aqueduct
1,676	477	1,239	890	0	0	4,440	Del Valle Stored Water Released
2,583	2,077	0	0	0	0	11,185	Del Valle Stored Exchange and Released from Aqueduct
0	0	0	0	0	0	0	Change in Storage
-10	-10	-10	-10	-10	-10	-195	Computed Losses (-), Gains (+)
							Lake Del Valle Operation:
37,099	36,180	29,968	27,556	25,503	26,464	—	End-of-Month Storage
-2,203	-919	-6,212	-2,412	-2,053	961	-9,789	Change in Storage
							SAN LUIS FIELD DIVISION
							O'Neill Forebay Operation
46,101	45,944	44,635	45,970	51,901	45,970	—	End-of-Month Storage
262,765	282,916	123,223	107,497	235,698	265,349	2,063,497	Inflow, California Aqueduct
1,935	28,911	57,668	128,666	221,186	239,760	1,194,785	Inflow, O'Neill P.- G. Plant
439,267	207,732	50,087	3,979	9,530	7,517	1,564,696	Inflow, San Luis P.- G. Plant
3,078	-157	-1,309	1,335	5,931	-5,931	10,307	Change in Storage
6,268	5,351	2,171	589	229	59	33,459	Delivered to Federal Customers 1/
10	10	3	1	1	1	55	Delivered to Dept. of Parks and Rec. (State)
41	17	58	1	7	13	325	Delivered to Dept. of Fish and Game (State)
8,577	0	0	0	0	0	130,310	Outflow, O'Neill P.- G. Plant
93,102	61,219	66,801	158,462	338,950	305,757	1,305,573	Outflow, San Luis P.- G. Plant
5,106	7,980	3,961	-646	169	1,642	42,194	Computed Losses (-), Gains (+)
598,015	461,117	167,220	79,111	121,467	214,370	3,385,255	Outflow, Dos Amigos Pumping Plant
							San Luis Reservoir Operation
764,245	726,563	727,062	784,058	911,388	1,061,180	—	State End-of-Month Storage
952,802	800,071	812,264	958,914	1,280,213	1,572,041	—	Total End-of-Month Storage
93,102	61,219	66,801	158,462	338,950	305,757	1,305,573	Inflow, San Luis P.- G. Plant
-337,023	-152,731	12,193	146,650	321,299	291,828	-316,343	Change in Storage
9,142	-6,218	-4,521	-7,833	-8,121	-6,412	-57,220	Computed Losses (-), Gains (+)
439,267	207,732	50,087	3,979	9,530	7,517	1,564,696	Outflow, San Luis P.- G. Plant

1/ Includes 264 acre-feet (Federal Share) delivered to the Dept. of Fish and Game, and 42 acre-feet (Federal Share) delivered to the Dept. of Parks and Recreation.

TABLE 19: SUMMARY OF GOVERNOR EDMUND

1984

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
SAN LUIS FIELD DIVISION (Cont.)						
California Aqueduct (Pools 14 thru 21)						
Inflow, Dos Amigos (State)	27,551	112,176	136,258	149,193	197,945	284,581
Inflow, Dos Amigos (Federal)	74,547	83,201	109,787	154,364	193,730	220,622
Inflow, Floodwater	0	0	0	0	0	0
Change in Storage	396	154	2,042	-452	182	-792
Delivered to Federal Customers	73,096	82,105	101,996	121,511	179,337	206,085
Computed Losses (-), Gains (+)	-3,159	-1,287	-5,823	-6,361	-2,527	-1,478
Outflow, Check 21 (State)	25,418	111,314	131,013	146,146	196,373	284,560
Outflow, Check 21 (Federal)	15	510	5,164	29,976	13,245	13,852
Delivered to Dept. of Fish and Game (State)	13	6	7	14	11	20
SAN JOAQUIN FIELD DIVISION						
California Aqueduct, Check 21 to Buena Vista Pumping Plant						
Inflow, Check 21 (State)	25,418	111,314	131,013	146,146	196,373	284,560
Inflow, Check 21 (Federal)	15	510	5,164	29,976	13,245	13,852
Inflow, Kern River Intertie (State)	21,835	5,903	0	0	0	0
Delivered to Contracting State Agencies	6,920	56,299	72,292	67,935	102,481	140,832
Delivered to Federal Customers	0	0	5,164	17,232	10,605	13,396
Delivered for Repayment of Pre-consolidation Water	637	647	724	653	622	8,653
Change in Storage	-671	859	296	-431	74	-59
Outflow, Buena Vista P.P.	31,026	43,394	43,650	76,419	69,566	104,237
Coastal Br. Diversion	7,019	7662	16,060	12,656	19,499	22,778
Computed Losses (-), Gains (+)	-2,337	-8,866	2009	-1,658	-6,771	-8,575
California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.						
Inflow, Buena Vista P.P.	31,026	43,394	43,650	76,419	69,566	104,237
Delivered to Contracting State Agencies	7,297	15,147	14,141	6,316	15,085	25,271
Change in Storage	69	36	-143	205	-319	-9
Outflow, Wheeler Ridge P.P.	23,553	28,725	30,139	70,861	58,449	78,586
Computed Losses (-), Gains (+)	-107	514	487	963	3,649	-389
California Aqueduct, Wheeler Ridge to Ira J. Chrisman Wind Gap P.P.						
Inflow, Wheeler Ridge P.P.	23,553	28,725	30,139	70,861	58,499	78,586
Delivered to Contracting State Agencies	1,000	2,156	5,715	4,145	7,648	7,687
Change in Storage	17	-35	41	-80	68	-39
Outflow, Ira J. Chrisman Wind Gap P.P.	22,213	25,766	23,529	65,492	45,874	70,888
Computed Losses (-), Gains (+)	-323	-838	-854	-1304	-4909	-50
California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmunston P.P.						
Inflow, Ira J. Chrisman Wind Gap P.P.	22,213	25,766	23,529	65,492	45,874	70,888
Delivered to Contracting State Agencies	465	807	2,171	2,039	3,034	4,281
Change in Storage	46	-75	-12	97	-38	15
Outflow, A.D. Edmunston P.P.	21,685	25,088	21,200	63,773	43,694	68,694
Computed Losses (-), Gains (+)	-17	54	-170	417	816	2,102
Coastal Branch, California Aqueduct						
Inflow, Las Perillas P.P.	7,019	7662	16,060	12,656	19,499	22,778
Delivered to Contracting State Agencies	6.865	6,992	15,120	12,507	18,332	21,222
Delivered to Federal Customers	15	510	0	0	68	388
Change in Storage	-4	19	-16	11	3	-10
Computed Losses (-), Gains (+)	-143	-141	-956	-138	-1096	-1,178

G. BROWN CALIFORNIA AQUEDUCT OPERATION (Continued)

1984
(in acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							SAN LUIS FIELD DIVISION (Cont.)
							California Aqueduct (Pools 14 thru 21)
282,355	188,180	108,244	43,017	30,578	58,444	1,618,522	Inflow, Dos Amigos (State)
315,660	272,937	58,976	36,094	90,889	155,926	1,766,733	Inflow, Dos Amigos (Federal)
0	0	0	0	0	0	0	Inflow, Floodwater
1,399	-817	-933	-675	-121	1,381	1,764	Change in Storage
261,079	195,559	46,966	32,713	69,713	137,088	1,507,248	Delivered to Federal Customers 1/
-2,493	-6,060	-6,078	-1,561	-307	-240	-37,374	Computed Losses (-), Gains (+)
279,585	185,664	105,834	42,833	30,530	56,931	1,596,201	Outflow, Check 21 (State)
53,453	74,633	9,259	2,666	21,026	18,719	242,518	Outflow, Check 21 (Federal)
6	18	16	13	12	11	147	Delivered to Dept. of Fish Game (State)
							SAN JOAQUIN FIELD DIVISION
							California Aqueduct, Check 21 to Buena Vista Pumping Plant
279,585	185,664	105,834	42,833	30,530	56,931	1,596,201	Inflow, Check 21 (State)
53,453	74,633	9,259	2,666	21,026	18,719	242,518	Inflow, Check 21 (Federal)
0	0	0	0	0	0	27,738	Inflow, Kern River Intertie (State)
171,954	130,131	36,235	18,839	4,575	12,663	821,156	Delivered to Contracting State Agencies
13,760	14,943	9,140	2,631	3,218	5,317	95,406	Delivered to Federal Customers
11,674	10,740	2,533	4,295	2,194	2,732	46,104	Delivered for Repayment of Pre-consolidation Water
28	889	-417	-459	241	61	411	Change in Storage
100,396	86,441	57,919	10,823	37,845	48,931	710,647	Outflow, Buena Vista P.P.
27,548	15,794	7,167	6,307	1,827	3,923	148,240	Coastal Br. Diversion
-7,678	-1,359	-2,516	-3,063	-1,656	-2,023	-44,493	Computed Losses (-), Gains (+)
							California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.
100,396	86,441	57,919	10,823	37,845	48,931	710,647	Inflow, Buena Vista P.P.
31,161	25,530	4,718	2,476	1,136	1,415	149,693	Delivered to Contracting State Agencies
-98	455	-157	-195	96	164	104	Change in Storage
70,227	60,978	54,121	8,556	36,707	47,465	568,367	Outflow, Wheeler Ridge P.P.
894	522	763	14	94	113	7,517	Computed Losses (-), Gains (+)
							California Aqueduct, Wheeler Ridge to Ira J. Chrisman Wind Gap P.P.
70,227	60,978	54,121	8,556	36,707	47,465	568,417	Inflow, Wheeler Ridge P.P.
7,653	3,511	2,761	3,385	1,754	2,433	49,848	Delivered to Contracting State Agencies
52	-6	-12	7	23	-32	4	Change in Storage
61,480	56,652	50,508	4,217	34,463	44,616	505,698	Outflow, Ira J. Chrisman Wind Gap P.P.
-1,042	-821	-864	-947	-467	-448	-12,867	Computed Losses (-), Gains (+)
							California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmunston P.P.
61,480	56,652	50,508	4,217	34,463	44,616	505,698	Inflow, Ira J. Chrisman Wind Gap P.P.
4,337	3,714	1,835	1,425	784	692	25,584	Delivered to Contracting State Agencies
-50	0	72	-11	202	-124	122	Change in Storage
58,796	54,168	49,509	2,990	34,415	44,960	488,972	Outflow, A.D. Edmunston P.P.
1,603	1,230	908	187	938	912	8,980	Computed Losses (-), Gains (+)
							Coastal Branch, California Aqueduct
27,548	15,794	7,167	6,307	1,827	3,923	148,240	Inflow, Las Perillas P.P.
25,377	14,986	7,002	6,124	1,675	3,741	139,943	Delivered to Contracting State Agencies
672	674	119	35	0	76	2,557	Delivered to Federal Customers
15	2	-17	5	15	-18	5	Change in Storage
-1,484	-132	-63	-143	-137	-124	-5,735	Computed Losses (-), Gains (+)

1/ Includes 127 acre-feet (Federal Share) delivered to Dept. of Fish and Game.

TABLE 19: SUMMARY OF GOVERNOR EDMUND

1984

(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.	21,685	25,088	21,200	63,773	43,694	68,694
Change in Storage	-1	-5	3	-3	5	0
Computed Losses (-), Gains (+)	-8	-8	-10	-4	-26	-18
Outflow, West Branch	2,156	7	245	17,991	15,110	12,740
Outflow, East Branch	19,522	25,078	20,942	45,781	28,553	55,936
California Aqueduct, Junction of West Branch to Pearblossom P.P.						
Inflow	19,522	25,078	20,942	45,781	28,553	55,936
Change in Storage	180	63	-180	319	-226	-438
Delivered to Contracting Agencies	489	727	2,399	3,559	4,170	4,428
Computed Losses (-), Gains (+)	-574	-555	-741	-304	-1,901	-1,362
Outflow, Pearblossom P.P.	18,279	23,733	17,982	41,599	22,708	50,584
California Aqueduct, Pearblossom P.P. to Silverwood Lake						
Inflow, Pearblossom P.P.	18,279	23,733	17,982	41,599	22,708	50,584
Change in Storage	162	7	-44	1	-17	47
Deliveries (Exchange of Natural Inflow)	963	837	1,011	578	250	109
Computed Losses (-), Gains (+)	-1,134	-1,539	-2,165	200	-1,135	-2,028
Outflow to Silverwood Lake	16,020	21,350	14,850	41,220	21,340	48,400
Silverwood Lake Operation						
Inflow, Project	16,020	21,350	14,850	41,220	21,340	48,400
Inflow, Natural	1,166	575	511	363	168	44
Change in storage	14,222	17,720	-2,000	-2,167	-3,837	5,344
Delivered to Contracting Agencies	62	50	41	74	90	148
Outflow, Natural Inflow Released	8	10	12	12	11	11
Computed Losses (-), Gains (+)	814	1,307	1,692	-517	934	530
Outflow, Project Water at San Bernardino Tunnel	3,708	5,452	19,000	43,147	26,178	43,471
California Aqueduct, Silverwood Lake to Lake Perris						
Inflow, San Bernardino Tunnel	3,708	5,452	19,000	43,147	26,178	43,471
Change in Storage	7	-11	-7	1	6	-1
Delivered to Contracting Agencies	3,048	3,825	14,873	23,516	21,161	26,091
Operational Losses (-), Gains (+)	401	-2	-2	-3	-16	-3
Outflow to Lake Perris	1,054	1,636	4,132	19,627	4,995	17,378
Lake Perris Operation						
Inflow	1,054	1,636	4,132	19,627	4,995	17,378
Change in Storage	-730	0	182	249	0	-954
Delivered to Contracting Agencies	64	466	2,728	17,696	3,658	16,958
Computed Losses (-), Gains (+)	-1,720	-1,170	-1,222	-1,682	-1,337	-1,374
Outflow	0	0	0	0	0	0

G. BROWN CALIFORNIA AQUEDUCT OPERATION (Continued)

1984
(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
58,796	54,168	49,509	2,990	34,415	44,960	488,972	Inflow, A.D. Edmonston P.P.
-4	2	-5	1	-5	-7	-19	Change In Storage
-20	-17	-11	-9	-11	-8	-150	Computed Losses (-), Gains (+)
18,893	3,313	2,181	2,742	34,409	44,959	154,746	Outflow, West Branch
39,887	50,836	47,322	238	0	0	334,095	Outflow, East Branch
							California Aqueduct, Junction of West Branch to Pearblossom P.P.
39,887	50,836	47,322	2,052	1,229	0	337,138	Inflow
401	-137	564	-156	26	-647	-231	Change In Storage
5,401	4,858	3,292	1,514	1,056	770	32,663	Delivered to Contracting Agencies
-1,499	-1,245	-789	-694	-147	123	-9,688	Computed Losses (-), Gains (+)
32,586	44,870	42,677	0	0	0	295,018	Outflow to Pearblossom P.P.
							California Aqueduct, Pearblossom P.P. to Silverwood Lake
32,586	44,870	42,677	0	0	0	295,018	Inflow, Pearblossom P.P.
83	-158	456	-245	-77	40	255	Change in Storage
79	211	178	0	0	0	4,216	Exchange of Natural Inflow
-2,194	133	-1,043	-245	-77	40	-11,187	Computed Losses (-), Gains (+)
30,230	44,950	41,000	0	0	0	279,360	Outflow to Silverwood Lake
							Silverwood Lake Operation
30,230	44,950	41,000	0	0	0	279,360	Inflow, Project
0	0	0	4	104	3,089	6,024	Inflow, Natural
-1,200	5,910	1,488	-6,599	-5,274	1,473	25,080	Change in Storage
160	103	171	106	82	121	1,208	Delivered to Contracting Agencies
11	11	11	14	13	429	553	Outflow, Natural Inflow Released
1,272	-1,490	673	-736	-254	1,595	5,820	Computed Losses (-), Gains (+)
32,531	37,436	40,003	5,747	5,029	2,661	264,363	Outflow, Project Water at San Bernardino Tunnel
							California Aqueduct, Silverwood Lake to Lake Perris
32,531	37,436	40,003	5,747	5,029	2,661	264,363	Inflow, San Bernardino Tunnel
0	0	-1	1	6	-7	-6	Change in Storage
25,135	27,254	23,218	4,440	2,809	1,457	176,827	Delivered to Contracting Agencies
-3	-3	-3	-2	-1	-1	362	Operational Losses (-), Gains(+)
7,393	10,179	16,783	1,304	2,213	1,210	87,904	Outflow to Lake Perris
							Lake Perris Operation
7,393	10,179	16,783	1,304	2,213	1,210	87,904	Inflow
-476	-137	-1,086	-226	1,312	1,022	-844	Change In Storage
6,761	8,191	17,613	509	453	428	75,525	Delivered to Contracting Agencies
-1,108	-2,125	-256	-1,021	-448	240	-13,223	Computed Losses (-), Gains (+)
0	0	0	0	0	0	0	Outflow

TABLE 19: SUMMARY OF GOVERNOR EDMUND

1984

(in acre-feet)

DESCRIPTION	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
SOUTHERN FIELD DIVISION (Cont.)						
West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.						
Inflow	2,156	7	245	17,991	15,110	12,740
Change in Storage	-3	-16	8	-10	15	-1
Computed Losses (-), Gains (+)	-24	-23	-31	-13	-78	-56
Outflow, Oso Pumping Plant	2,135	0	206	17,988	15,017	12,685
West Branch California Aqueduct Oso P.P. to Pyramid Lake						
Inflow, Oso P.P.	2,135	0	206	17,988	15,017	12,685
Change in Storage	1,044	-89	-195	-4,404	-26	-126
Operational Losses (-), Gains (+)	-327	-19	-132	12	13	-252
Outflow through William E. Warne P.P. to Pyramid Lake	764	70	269	22,404	15,056	12,559
Pyramid Lake Operation						
End-of-Month Storage	157,359	154,527	153,063	162,785	160,461	160,361
Change in Storage	3,958	-2,832	-1,464	9,722	-2,324	-100
Inflow, Project	764	70	269	22,404	15,056	12,559
Inflow, Natural	2,456	1,538	1,409	1,088	813	507
Inflow, Pumpback from Elderberry Forebay	98,172	96,100	121,709	118,061	112,952	121,607
Delivered to Dept. of Parks and Rec. (State)	0	1	1	1	0	1
Computed Losses (-), Gains (+)	-295	-3,178	-4,373	-5,693	-3,001	-9,160
Outflow, Angeles Tunnel	95,138	95,915	117,809	125,021	127,340	124,863
Outflow, Natural Inflow Released to Piru Creek	2,001	1,446	2,668	1,116	804	749
Outflow, Project Water to Piru Creek for Fish Enhancement	0	0	0	0	0	0
Elderberry Forebay Operation						
End-of-Month Storage	27,139	29,532	29,626	22,709	30,573	27,274
Change in Storage	-2,769	2,393	94	-6,917	7,864	-3,299
Inflow, Project through Castaic P-G Plant	95,138	95,915	117,809	125,021	127,340	124,863
Inflow, Natural	591	354	180	74	16	0
Computed Losses (-), Gains (+)	-326	2,224	3,814	3,552	4,513	4,062
Outflow, Pumpback to Pyramid Lake	98,172	96,100	121,709	118,061	112,952	121,607
Outflow, Project Water Released to Castaic Lake	0	0	0	15,066	11,037	10,617
Outflow, Natural Inflow Released to Castaic Lake	0	0	0	2,437	16	0
Castaic Lake Operation						
End-of-Month Storage	262,024	255,127	228,641	214,447	191,068	165,888
Change in Storage	-8,706	-6,897	-26,486	-14,194	-23,379	-25,180
Inflow, Project	0	0	0	15,066	11,037	10,617
Inflow, Natural	1,279	789	484	275	114	58
Inflow, Natural Releases from Elderberry Forebay	0	0	0	2,437	16	0
Delivered to Contracting Agencies	7,572	6,240	24,278	31,617	34,989	36,242
Computed Losses (-), Gains (+)	-432	-237	-680	1,880	1,109	387
Outflow, Castaic Afterbay	1,981	1,209	2,012	2,235	666	0
Castaic Lagoon Operation						
Inflow	1,981	1,209	2,012	2,235	666	288
Change in Storage	-35	-2	2	6	-16	-126
Operational Losses (-), Gains (+)	-51	-51	-83	-93	-289	-356
Outflow, Subsurface	184	173	184	179	184	58
Outflow, Surface	1,781	987	1,743	1,957	209	0

G. BROWN CALIFORNIA AQUEDUCT OPERATION (Continued)

1984
(in acre-feet)

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION (cont.)
							West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.
18,893	3,313	2,181	2,742	34,409	44,959	154,746	Inflow
-12	6	-15	4	-6	-8	-38	Change In Storage
-62	-51	-33	-28	-678	-430	-1,507	Computed Losses (-), Gains (+)
18,843	3,256	2,163	2,710	33,737	44,537	153,277	Outflow, Oso Pumping Plant
							West Branch California Aqueduct Oso P.P. to Pyramid Lake
18,843	3,256	2,163	2,710	33,737	44,537	153,277	Inflow, Oso P.P.
-123	167	-104	863	53	-176	-3,116	Change In Storage
18	-90	-182	-88	-42	-85	-1,174	Operational Losses (-), Gains (+)
18,984	2,999	2,085	1,759	33,642	44,628	155,219	Outflow through William E. Warne P.P. to Pyramid Lake
							Pyramid Lake Operation
158,048	154,576	165,168	162,346	151,171	153,727	---	End-of-Month Storage
-2,313	-3,472	10,592	-2,822	-11,175	2,556	326	Change In Storage
18,984	2,999	2,085	1,759	33,642	44,628	155,219	Inflow, Project
468	435	526	517	915	1,080	11,752	Inflow, Natural
132,173	113,886	98,296	64,044	16,277	12,229	1,105,506	Inflow, Pumpback from Elderberry Forebay
0	1	262	14	0	1	282	Delivered to Dept. of Parks and Rec. (State)
-7,860	-4,633	-1,157	-829	-3,726	897	-43,008	Computed Losses (-), Gains (+)
145,186	115,236	88,029	67,769	57,724	54,994	1,215,024	Outflow, Angeles Tunnel
892	922	605	517	559	1,283	13,562	Outflow, Natural Inflow released to Piru Creek
0	0	262	13	0	0	275	Outflow, Project Water to Piru Creek for Fish Enhancement
							Elderberry Forebay Operation
29,908	32,364	22,956	24,424	8,299	28,093	---	End-of-Month Storage
2,634	2,456	-9,408	1,468	-16,125	19,794	-1,815	Change in Storage
145,186	115,236	88,029	67,769	57,724	54,994	1,215,024	Inflow, Project through Castaic P-G Plant
0	0	0	0	3	388	1,606	Inflow, Natural
3,631	3,133	859	-466	-550	-874	23,572	Computed Losses (-). Gains(+)
132,173	113,886	98,296	64,044	16,277	12,229	1,105,506	Outflow, Pumpback to Pyramid Lake
14,010	2,027	0	1,791	57,022	22,097	133,667	Outflow, Project Water Released to Castaic Lake
0	0	0	0	3	388	2,844	Outflow, Natural Inflow Released to Castaic Lake
							Castaic Lake Operation
147,229	113,571	84,251	67,298	115,639	133,369	---	End-of-Month Storage
-18,659	-33,658	-29,320	-16,953	48,341	17,730	-137,361	Change In Storage
14,010	2,027	0	1,791	57,022	22,097	133,667	Inflow, Project
22	17	22	51	111	672	3,894	Inflow, Natural
0	0	0	0	3	388	2,844	Inflow, Natural Releases from Elderberry Forebay
35,785	35,863	30,291	18,974	8,920	6,642	277,413	Delivered to Contracting Agencies
3,094	161	949	179	799	1,215	8,424	Computed Losses (-), Gains (+)
0	0	0	0	674	0	8,777	Outflow, Castiac Afterbay
							Castaic Lagoon Operation
504	319	0	0	674	0	9,888	Inflow
40	-51	-107	-456	461	-85	-369	Change in Storage
-442	-353	-107	-383	-99	-71	-2,378	Operational Losses (-), Gains
22	17	0	73	114	14	1,202	Outflow, Subsurface
0	0	0	0	0	0	6,677	Outflow, Surface

1/ Includes inflow of 1,111 acre-feet during June, July, and August from L.A. Co. Parks.

PUMPING PLANTS

SECTION II

TABLE 20: PROJECT PUMPING PLANTS
1984
(in acre-feet)

PUMPING PLANTS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt	0	11,544	8,713	44,085	0	4,813	14,625	30,934	36,070	22,352	7,845	4,591	185,572
Thermalito	0	13,447	12,323	52,995	0	4,508	17,644	33,244	38,925	20,513	7,846	4,578	206,023
Cordelia	58	54	69	75	113	249	221	277	210	410	513	659	2,908
South Bay	1,069	7,152	9,233	10,109	14,360	13,178	13,550	13,952	7,235	9,082	1,466	8,006	108,392
Del Valle	0	0	0	504	1,661	0	0	0	0	0	0	0	2,165
Banks													
State	20,372	112,903	153,082	182,968	162,159	178,221	199,441	170,746	124,250	114,926	177,416	171,350	1,767,834
Federal	0	323	4,384	31,711	2,640	0	79,975	127,845	6,997	0	60,804	101,746	416,425
San Luis 1/													
State	0	1,781	11,933	34,479	37,477	45,294	93,102	61,219	53,073	65,283	141,327	160,836	705,804
Federal	0	95,668	54,650	0	0	0	0	0	13,728	93,179	197,623	144,921	599,769
O'Neill 2/													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	77,263	174,331	159,847	86,522	18,696	0	1,935	28,911	57,668	128,666	221,186	239,760	1,194,785
Dos Amigos 1/													
State	27,551	112,176	136,258	149,193	197,945	284,581	282,355	190,604	111,112	43,017	30,578	58,444	1,623,814
Federal	74,547	83,201	109,787	154,364	193,730	220,622	315,660	270,513	56,108	36,094	90,889	155,926	1,761,441
Las Perillas	7,019	7,662	16,060	12,656	19,499	22,778	27,548	15,794	7,167	6,307	1,827	3,923	148,240
Badger Hill	7,226	7,471	16,785	12,800	20,169	23,568	27,960	16,322	7,320	6,632	1,856	3,877	151,986
Buena Vista	31,026	43,394	43,650	76,419	69,566	104,237	100,396	86,441	57,919	10,823	37,845	48,931	710,647
Wheeler Ridge	23,553	28,725	30,139	70,861	58,499	78,586	70,227	60,978	54,121	8,556	36,707	47,465	568,417
Ira J. Chrisman Wind Gap	22,213	25,766	23,529	65,492	45,874	70,888	61,480	56,652	50,508	4,217	34,463	44,616	505,698
A.D. Edmonston	21,685	25,088	21,200	63,773	43,694	68,694	58,796	54,168	49,509	2,990	34,415	44,960	488,972
Oso	2,135	0	206	17,988	15,017	12,685	18,843	3,256	2,163	2,710	33,737	44,537	153,277
Castaic	95,138	95,915	117,809	125,021	127,340	124,863	145,186	115,236	88,029	67,769	57,724	54,994	1,215,024
Pearblossom	18,279	23,733	17,982	41,599	22,708	50,584	32,586	44,870	42,677	0	0	0	295,018

1/ Joint State-Federal Facility.
2/ O'Neill Pumping Plant is a Federal facility.

Total State:	8,839,791
Total Federal:	3,972,420
Total Project:	12,812,211

WATER QUALITY

SECTION III

MAP 4
WATER QUALITY MONITORING STATIONS

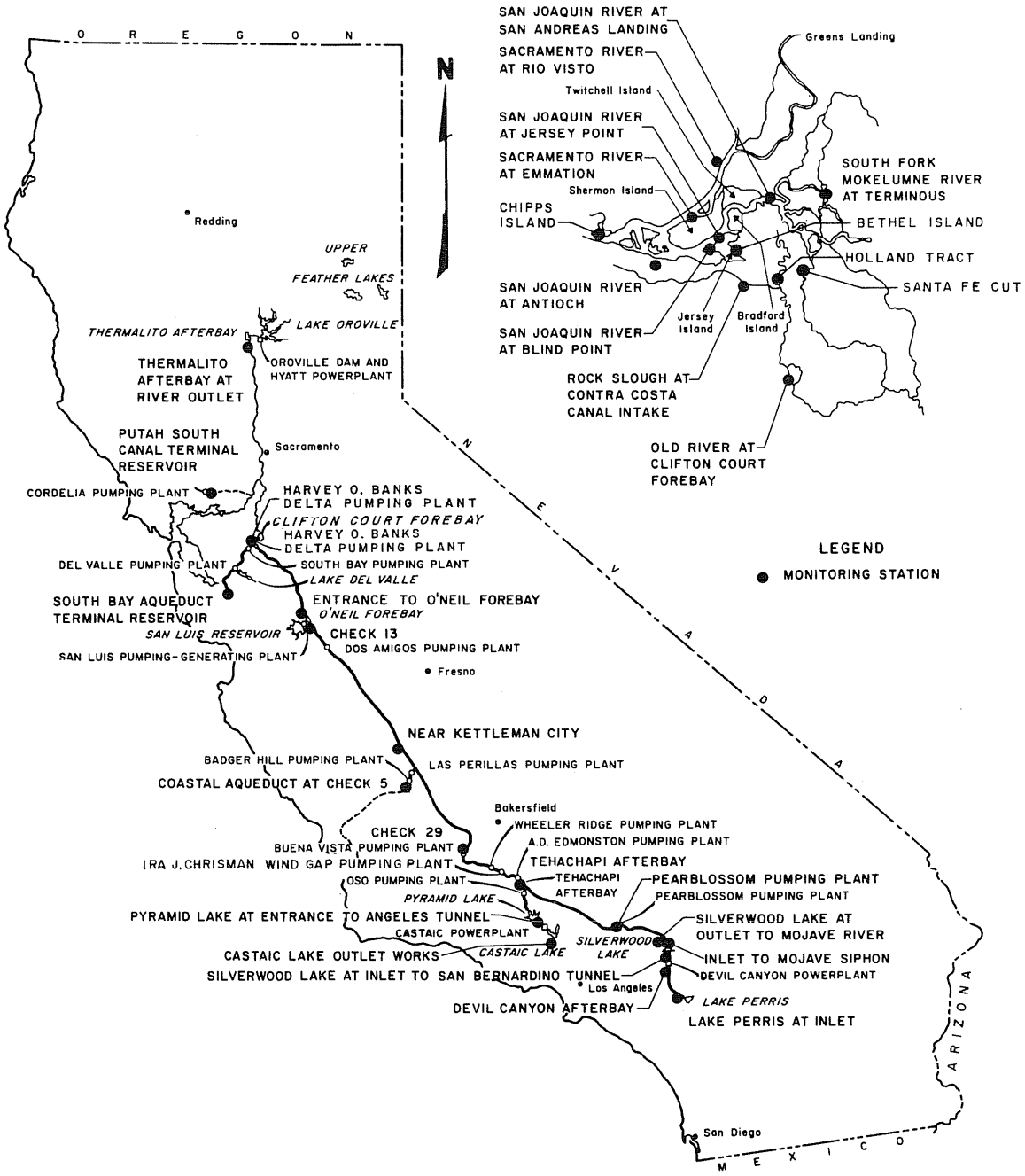


TABLE 21: THERMALITO AFTERBAY AT FEATHER RIVER OUTLET
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	50	57	54	52	57	53	57	65	52	54	53	60	55
Total Hardness	30	30	30	32	32	32	33	32	32	32	32	36	32
Chlorides	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulfates	2	2	2	1	2	2	2	3	1	2	3	2	2
Sodium	3	3	3	3	3	3	3	3	3	3	3	4	3
% Sodium (%)	18	18	18	17	17	17	16	17	17	17	16	19	17
Specific Conductance	72	74	75	74	76	76	80	82	81	80	80	84	78
pH	7.2	7.4	7.3	7.3	7.3	7.4	7.2	7.2	7.3	7.2	7.2	7.3	7.3
Boron	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Fluoride													0.0
Lead													0.00
Selenium													0.00
Hexavalent Chromium													0.00
Arsenic													0.00
Iron													0.00
Manganese													0.00
Magnesium	3	3	3	3	3	3	3	3	3	3	3	4	3
Copper													0.00
Calcium	7	7	7	7	8	8	8	8	8	8	8	8	8
Zinc													0.00
Phenol													0.000
Color (units)													0

* Specific Conductance 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 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) 1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	173	192	182	182	180	170	175	184	170	191	172	193	180
Total Hardness	139	146	141	143	143	147	143	148	147	150	139	155	145
Chlorides	5	6	6	7	5	5	5	5	19	5	6	7	7
Sulfates	22	24	22	23	20	20	22	20	5	21	20	25	20
Sodium	10	12	11	11	10	10	10	10	9	10	9	13	10
% Sodium (%)	14	15	15	14	13	13	13	13	12	13	12	15	14
Specific Conductance	301	322	316	316	304	306	306	311	310	316	306	344	313
pH	8.2	8.6	8.5	7.0	7.9	7.1	7.1	8.0	8.0	8.5	7.8	8.5	8.2
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
Fluoride													0.0
Lead													0.00
Selenium													0.00
Hexavalent Chromium													0.00
Arsenic													0.00
Iron													0.00
Manganese													0.00
Magnesium	24	25	24	25	25	26	25	26	26	26	24	26	25
Copper													0.00
Calcium	16	17	17	16	16	16	16	16	16	17	16	19	17
Zinc													0.00
Phenol													0.000
Color (units)													0

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 23: CALIFORNIA AQUEDUCT AT HARVEY O. BANKS DELTA PUMPING PLANT 1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	166	190	216	177	168	165	136	132	154	160	135	153	163
**Total Hardness	68	77	85	72	70	69	59	58	65	68	59	65	68
**Chlorides	31	39	47	35	32	31	23	22	28	30	23	28	31
**Sulfates	27	30	34	28	28	27	20	19	25	26	20	24	26
**Sodium	27	32	37	29	28	27	21	20	24	26	20	24	26
**% Sodium(%)	46	47	49	47	46	46	43	43	45	45	43	45	45
** Specific Conductance	278	322	367	299	285	279	225	218	258	271	224	257	274
Specific Conductance	253	354	372	299	304	285	226	201	253	270	214	270	275
pH	7.6	7.8	7.8	7.9	7.5	7.1	6.9	7.7	7.4	8.4	7.7	7.6	7.8
Boron	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.1	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	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.000	0.000	0.000	0.000	0.00
Hexavalent Chromium		0.00							0.00				0.00
Arsenic	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iron	0.03	0.03	0.05	0.02	0.05	0.05	0.01	0.39	0.04	0.32	0.08	0.10	0.10
Manganese	0.06	0.06	0.08	0.04	0.02	0.01	0.04	0.04	0.01	0.04	0.04	0.03	0.04
Magnesium	6	8	10	8	9	9	7	7	8	8	7	8	8
Copper	0.02	0.00	0.02	0.01	0.01	0.02	0.01	0.00	0.02	0.03	0.01	0.02	0.01
Calcium	12	18	18	15	16	15	12	11	13	15	13	16	15
Zinc	0.02	0.01	0.02	0.02	0.01	0.03	0.02	0.01	0.02	0.02	0.02	0.02	0.02
Phenol		0.000							0.000				0.000
Color(units)	12	8	20	10	20	40	15	25	10	18	25	25	19

* Specific Conductance 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 pH, % sodium and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 24:SOUTH BAY AQUEDUCT TERMINAL RESERVOIR
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	214	178	199	164	151	150	132	116	175	157	216	140	166
**Total Hardness	97	83	91	77	72	71	60	50	88	76	116	65	79
**Chlorides	43	30	38	25	20	20	14	9	28	22	41	17	25
**Sulfates	34	29	32	27	24	23	19	16	29	25	38	21	26
**Sodium	34	26	31	23	19	18	14	11	24	20	33	16	22
**% Sodium (%)	43	40	42	39	36	36	34	32	37	36	38	35	38
** Specific Conductance	370	303	342	278	259	256	223	193	304	271	380	239	285
Specific Conductance	416	326	367	304	283	278	280	204	363	270	460	269	318
pH	8.0	8.2	8.0	8.5	8.3	7.5	7.0	7.9	7.6	7.8	8.1	7.9	8.0
Boron	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.2
Fluoride	0.1	0.0	0.1	0.1	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	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.000	0.000	0.000	0.000	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	0.01	0.00
Iron	0.02	0.01	0.01	0.20	0.06	0.07	0.03	0.04	0.06	0.24	0.00	0.05	0.07
Manganese	0.00	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.16	0.01	0.03
Magnesium	22	8	10	9	9	9	10	7	17	8	24	8	12
Copper	0.01	0.01	0.02	0.02	0.02	0.04	0.03	0.03	0.01	0.03	0.01	0.01	0.02
Calcium	36	17	19	16	16	15	16	11	27	15	37	16	20
Zinc	0.01	0.01	0.01	0.02	0.01	0.03	0.02	0.01	0.02	0.03	0.02	0.01	0.02
Phenol		0.000							0.001				0.001
Color (units)	15	8	15	8	10	30	10	20	5	20	10	20	14

* Specific Conductance 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 pH, % sodium and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 25: CALIFORNIA AQUEDUCT ENTRANCE TO O'NEILL FOREBAY
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	179	183	217	178	161	164	143	125	141	153	132	151	160
**Total Hardness	73	75	85	73	69	70	63	57	62	66	59	66	68
**Chlorides	35	36	47	34	30	31	25	20	24	28	22	27	30
**Sulfates	29	29	35	29	27	27	22	17	21	25	19	24	25
**Sodium	29	30	37	29	26	27	22	18	21	24	19	24	26
**% Sodium(%)	46	47	49	46	45	45	43	41	43	44	42	44	45
** Specific Conductance	303	311	371	302	275	280	241	208	238	260	221	257	272
Specific Conductance	286	294	368	308	275	274	214	199	242	276	218	270	269
pH	8.1	8.0	7.9	8.4	7.8	6.9	7.0	7.8	7.8	8.0	8.0	7.8	7.9
Boron	0.4	0.2	0.2	0.2	0.2	0.1	0.0	0.2	0.2	0.2	0.1	0.1	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	0.01	0.00	0.00	0.00
Selenium	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.000	0.000	0.000	0.000	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	0.01	0.00
Iron	0.03	0.01	0.02	0.01	0.07	0.05	0.03	0.03	0.06	0.24	0.13	0.23	0.08
Manganese	0.00	0.01	0.02	0.02	0.01	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.01
Magnesium	7	7	10	9	8	9	7	7	8	8	7	8	8
Copper	0.02	0.00	0.02	0.01	0.03	0.02	0.02	0.01	0.03	0.04	0.02	0.02	0.02
Calcium	15	15	19	16	15	15	11	11	12	15	13	16	14
Zinc	0.02	0.00	0.02	0.01	0.03	0.01	0.02	0.02	0.03	0.03	0.02	0.02	0.02
Phenol		0.000							0.000				0.000
Color(units)	12	8	12	12	10	25	15	20	12	15	20	20	15

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 26: CALIFORNIA AQUEDUCT AT CHECK 13
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	174	210	236	210	175	172	158	149	165	176	178	178	182
**Total Hardness	72	85	93	85	74	73	68	65	71	75	75	75	76
**Chlorides	34	46	54	46	36	35	31	29	33	36	37	37	38
**Sulfates	31	36	40	36	29	29	25	23	27	30	30	30	31
**Sodium	29	37	43	37	30	29	26	24	28	30	31	30	31
**% Sodium(%)	47	49	50	49	47	47	46	45	46	47	47	47	47
** Specific Conductance	298	363	408	363	305	299	275	258	288	307	311	310	315
Specific Conductance	266	347	408	359	296	298	267	251	268	296	306	308	306
pH	8.0	8.0	7.5	7.6	7.7	7.4	7.5	8.1	7.8	7.9	8.0	8.0	7.8
Boron	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1
Fluoride	0.1	0.1	0.1	0.1	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	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.000	0.000	0.000	0.000	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	0.00
Iron	0.04	0.01	0.01	0.01	0.05	0.03	0.04	0.02	0.06	0.05	0.05	0.05	0.04
Manganese	0.02	0.02	0.02	0.02	0.11	0.01	0.01	0.01	0.00	0.02	0.02	0.02	0.02
Magnesium	7	8	10	10	8	8	8	7	9	9	9	8	8
Copper	0.01	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.01
Calcium	14	17	20	19	16	16	15	14	14	15	16	17	16
Zinc	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.01	0.02	0.03	0.02	0.01	0.02
Phenol		0.002							0.001				0.002
Color(units)	15	8	15	12	10	15	10	20	8	15	25	20	14

* Specific Conductance 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 pH, % sodium and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 27: CALIFORNIA AQUEDUCT NEAR KETTLEMAN CITY
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	174	187	236	224	178	175	165	150	161	166	175	180	181
**Total Hardness	71	76	93	89	75	74	70	64	68	70	74	75	75
**Chlorides	36	39	49	46	37	36	34	30	33	34	36	38	37
**Sulfates	29	32	42	40	27	26	24	21	23	24	26	27	28
**Sodium	29	32	41	39	30	30	28	24	27	28	30	31	31
**% Sodium (%)	47	47	49	48	47	47	46	45	46	46	47	47	47
** Specific Conductance	296	319	400	379	308	303	285	258	277	286	303	311	311
Specific Conductance	302	344	419	359	298	297	276	244	302	298	306	296	312
pH	7.8	7.6	7.6	7.7	7.7	7.7	7.8	7.7	8.0	8.1	8.0	7.7	7.8
Boron	0.2	0.3	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.2
Fluoride	0.1	0.1	0.1	0.1	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	0.00	0.01	0.01	0.00	0.00	0.000	0.000	0.000	0.000	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	0.00
Iron	0.01	0.02	0.01	0.01	0.04	0.04	0.05	0.05	0.05	0.02	0.03	0.09	0.04
Manganese	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01
Magnesium	8	8	11	10	8	8	8	7	9	9	9	8	9
Copper	0.01	0.02	0.02	0.05	0.02	0.02	0.07	0.02	0.05	0.01	0.02	0.02	0.03
Calcium	16	17	21	18	16	16	16	13	15	16	16	16	16
Zinc	0.02	0.02	0.03	0.00	0.01	0.02	0.08	0.01	0.06	0.01	0.02	0.02	0.03
Phenol		0.001							0.000				0.001
Color (units)	10	10	18	18	12	30	15	25	12	10	25	20	17

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 28: COASTAL BRANCH AT CHECK 5
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	165	192	232	249	194	170	164	154	161	167	215	179	187
**Total Hardness	66	75	89	95	80	71	69	65	68	70	87	74	76
**Chlorides	29	37	51	57	40	33	31	29	31	32	46	36	38
** Sulfates	30	33	39	41	33	27	25	22	24	26	38	29	31
**Sodium	26	32	41	45	33	27	26	23	25	27	38	29	31
**% Sodium(%)	46	48	50	51	47	45	44	44	44	45	49	46	47
** Specific Conductance	264	314	388	420	329	284	272	252	267	278	371	300	312
Specific Conductance	284	341		384	304	298	273	256	294	280	300	296	308
pH	8.2	7.9	7.6	7.4	7.6	8.0	7.6	7.9	7.9	8.2	8.2	7.9	7.9
Boron	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2
Fluoride	0.2	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.2	0.1	0.2	1.8	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	0.01	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01
Hexavalent Chromium		0.00			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	0.05	0.07	0.04	0.05	0.19	0.23	0.10	0.08	0.04	0.05	0.03	0.07	0.08
Manganese	0.02	0.01	0.02	0.00	0.01	0.03	0.03	0.00	0.00	0.00	0.02	0.01	0.01
Magnesium	7	8	11	10	8	8	8	7	9	8	9	9	9
Copper	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.02
Calcium	16	18	20	21	19	17	16	14	16	15	17	17	17
Zinc	0.02	0.02	0.02	0.03	0.04	0.05	0.02	0.01	0.03	0.02	0.01	0.01	0.02
Phenol		0.002			0.004				0.01				0.005
Color(units)													0

* Specific Conductance 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 pH, % sodium and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 29: CALIFORNIA AQUEDUCT AT CHECK 29
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	122	178	239	235	191	186	178	169	167	174	177	184	183
**Total Hardness	51	71	92	91	79	77	74	71	70	73	74	76	75
**Chlorides	16	31	52	50	40	39	36	33	33	35	36	38	36
**Sulfates	18	28	39	38	30	29	27	25	25	26	27	28	28
**Sodium	18	29	42	41	32	31	30	28	28	29	30	31	31
**% Sodium(%)	43	47	50	49	47	47	47	46	46	46	47	47	47
** Specific Conductance	192	292	399	391	324	316	302	286	283	294	300	312	308
Specific Conductance	185	283	411	398	305	300	275	256	284	290	297	322	301
pH	8.1	7.9	7.5	8.4	8.0	7.9	7.7	8.0	7.8	8.3	8.2	8.0	8.0
Boron	0.1	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.2
Fluoride	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.2	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	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Hexavalent Chromium		0.00			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	0.06	0.07	0.14	0.09	0.08	0.10	0.10	0.04	0.06	0.06	0.08
Manganese	0.02	0.01	0.02	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.01
Magnesium	4	6	10	11	9	8	8	7	8	9	9	8	8
Copper	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01
Calcium	14	16	20	21	17	18	16	15	15	14	17	18	17
Zinc	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.00	0.03	0.02	0.02	0.01	0.02
Phenol		0.021			0.006				0.01				0.012
Color(units)	7	8	15	6	7	8	8	8	2	5	6	4	7

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 30: CALIFORNIA AQUEDUCT AT TEHACHAPI AFTERBAY
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	121	147	214	212	175	171	171	155	160	171	167	196	172
**Total Hardness	54	63	86	85	75	74	74	68	70	74	77	78	73
**Chlorides	13	19	42	41	30	29	29	24	26	29	30	32	29
**Sulfates	22	26	38	37	27	27	27	23	24	26	24	31	28
**Sodium	18	23	37	37	30	30	30	26	27	29	27	30	29
**% Sodium (%)	42	44	49	49	47	46	46	45	46	46	42	45	46
**Specific Conductance	200	246	367	362	306	299	299	269	278	300	—	--	293
Specific Conductance	205	244	418	403	332	296	275	256	281	305	284	307	301
pH (moles/l)	7.9	8.6	7.9	7.6	7.9	7.3	7.6	7.4	7.7	8.1	8.1	7.7	7.8
Boron	0.1	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.2
Fluoride	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	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													
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	0.02	0.01	0.01	0.01	0.02	0.03	0.02	0.05	0.02	0.01	0.03	0.02	0.02
Manganese	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
Magnesium	5	6	10	11	10	9	9	8	7	9	9	8	8
Copper	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Calcium	14	14	22	19	17	16	15	13	16	16	16	18	16
Zinc	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.01	0.01	0.00	0.01
Phenol													
Color (units)	3	3	3	4	3	4	4	6	3	4	4	5	4

Note: November and December TDS, TH, Cl, SO_4, Na, and %Na are all from lab values. There was no continuous EC record for these two months due to Aqueduct being dewatered.

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 31: PYRAMID LAKE AT ENTRANCE TO ANGELES TUNNEL
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	245	281	286	262	271	275	228	219	274	246	242	312	262
Total Hardness	144	151	158	151	146	137	124	131	142	144	142	161	144
Chlorides	16	18	16	16	22	24	26	25	24	23	25	26	22
Sulfates	91	97	96	89	88	82	72	78	85	89	84	93	87
Sodium	26	26	26	26	30	30	30	30	32	32	32	34	30
% Sodium(%)	28	27	26	27	30	31	34	33		32	32	31	30
Specific Conductance	409	424	389	417	423	406	387	402	429	430	439	472	419
pH(moles/l)	7.5	8.4	8.7	8.2	8.6	8.2	8.2	8.2	7.9	8.0	7.9	7.5	8.1
Boron	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.4	0.4
Fluoride	0.5	0.4	0.3	0.5	0.4	0.4	0.3	0.4	0.5	0.4	0.4	0.6	0.4
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	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hexavalent Chromium													
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
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	12	13	14	13	13	12	12	13	12	13	12	16	13
Copper	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium	38	39	40	39	37	35	30	31	37	36	37	38	36
Zinc	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.00	0.02	0.01	0.00	0.01
Phenol													
Color(units)	5	2	2	3	2	3	2	3	1	3	2	3	3

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 32: CASTAIC LAKE AT OUTLET WORKS
1984

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	295	290	299	322	299	322	365	317	423	378	328	340	332
Total Hardness	158	162	162	171	172	180	182	182	201	213	171	176	178
Chlorides	38	40	41	39	37	36	36	33	34	35	28	29	36
Sulfates	92	94	92	96	98	108	114	120	133	140	107	108	109
Sodium	39	38	39	38	38	39	38	39	40	40	35	36	38
% Sodium(%)	35	33	34	32	32	32	31	31	30	29	30	30	32
Specific Conductance	516	499	501	503	510	516	528	535	574	601	505	508	525
pH	7.5	8.3	8.7	9.3	8.8	8.2	8.5	8.1	7.9	7.4	8.2	7.0	8.5
Boron	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.3
Fluoride	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.4	0.4
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	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
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	14	15	15	16	17	17	17	17	18	19	16	16	16
Copper	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
Calcium	40	40	40	42	41	44	45	45	51	54	42	44	44
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.01	0.00	0.01
Phenol													0.000
Color(units)	4	3	2	4	2	2	2	1	0	4	2	2	2

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 33: CALIFORNIA AQUEDUCT AT CHECK 59
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
** Total Dissolved Solids	87	120	199	212	180	170	164	151	163	217	166	159	166
** Total Hardness	43	55	82	87	78	74	71	66	71	92	72	69	72
** Chlorides	8	18	44	49	33	30	28	24	27	47	29	26	30
** Sulfates	14	19	34	37	28	26	24	22	24	37	25	23	26
** Sodium	13	20	36	39	33	30	29	26	29	42	29	28	29
** % Sodium (%)	40	44	49	49	48	47	47	46	47	50	47	47	47
** Specific Conductance	154	211	350	373	321	301	289	263	286	393	293	279	293
Specific Conductance	159	140	359	407	349	309	291	270	266	295	310	295	288
pH	7.8	7.6	8.5	8.3	8.5	7.6	7.8	8.0	7.7	8.6	8.7	8.6	8.3
Boron	0.1	0.1	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.1	0.2
Fluoride	0.2	0.2	0.1	0.2	0.0	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	0.00	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	0.04	0.00	0.01	0.02	0.02	0.02	0.03	0.01	0.01	0.01	0.00	0.02
Manganese	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.02	0.01	0.01	0.00	0.01
Magnesium	3	2	9	11	10	9	8	10	7	9	9	8	8
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Calcium	12	13	20	20	18	17	17	10	15	14	16	16	16
Zinc	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.00	0.01
Phenol													0.000
Color (units)	4	5	2	4	4	4	4	1	4	4	3	3	4

* Specific Conductance 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 pH, % sodium and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 34: CALIFORNIA AQUEDUCT AT INLET TO MOJAVE SIPHON
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	80	104	162	179	155	147	158	155	164	172	174	165	151
**Total Hardness	41	50	70	76	67	64	68	67	71	74	74	71	66
**Chlorides	2	11	31	37	31	28	32	31	34	37	37	34	29
**Sulfates	12	16	26	29	23	21	23	23	25	26	27	25	23
**Sodium	12	16	28	31	27	25	27	27	29	31	31	29	26
**% Sodium(%)	39	42	46	47	46	46	46	46	47	47	48	47	46
** Specific Conductance	140	183	284	314	270	255	276	270	287	303	307	289	265
Specific Conductance	145	136	341	419	360	309	294	272	262	302	318	289	287
pH	7.4	7.6	8.8	8.1	8.7	7.9	8.1	8.0	7.7	8.6	8.3	8.1	8.3
Boron	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2
Fluoride	0.3	0.1	0.1	0.2	0.0	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	0.00	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	0.03	0.00	0.01	0.02	0.02	0.01	0.11	0.01	0.00	0.01	0.00	0.02
Manganese	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Magnesium	3	2	9	11	10	8	8	11	7	9	9	8	8
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Calcium	13	13	19	21	19	18	18	9	15	16	18	17	16
Zinc	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.01
Phenol													0.000
Color (units)	5	6	2	5	4	4	4	4	3	3	1	3	4

* Specific Conductance 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 pH, % sodium and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 35: SILVERWOOD LAKE AT OUTLET TO MOJAVE RIVER
1984

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	83	122	121	186	205	179	173	161	152	157	160		155
Total Hardness	45	48	56	72	78	82	78	73	72	69	76		69
Chlorides	9	12	18	30	37	36	34	31	30	30	29		27
Sulfates	12	15	20	36	41	39	37	32	25	26	28		28
Sodium	13	15	18	28	34	32	31	30	27	27	27		26
% Sodium(%)	37	40	40	45	48	45	45	46	44	45	43		43
Specific Conductance	152	161	207	289	305	318	302	298	278	285	280		263
pH	7.7		9.0	6.9	8.2	7.4	8.7	8.8	8.1	7.5	7.8		8.4
Boron	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2		0.2
Fluoride	0.3	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.3	0.2	0.2		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	0.03	0.01	0.00	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00		0.01
Manganese	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02		0.01
Magnesium	3	3	4	7	8	9	8	8	7	7	8		7
Copper	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Calcium	13	14	16	17	18	18	18	16	17	16	17		16
Zinc	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.01		0.01
Phenol													0.000
Color(units)	4	3	3	2	2	3	3	3	2	3	1		3

Note: No record for December.

* Specific Conductance 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 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
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	85	99	131	195	187	214	179	160	169	128	162		156
Total Hardness	45	48	54	72	82	82	78	76	74	73	73		69
Chlorides	9	10	16	30	37	36	34	32	30	30	29		27
Sulfates	12	14	19	36	44	38	36	34	26	28	27		28
Sodium	13	14	17	28	34	32	31	30	27	27	27		26
% Sodium(%)	38	38	40	45	47	45	45	45	43	44	44		43
Specific Conductance	153	154	201	292	326	316	307	303	283	280	281		265
pH	7.9		9.1	8.4	8.3	7.2	8.8	8.9	8.8	7.8	7.8		8.6
Boron	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2
Fluoride	0.3	0.2	0.0	0.1	0.2	0.1	0.1	0.1	0.2	0.1	0.2		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	0.03	0.01	0.00	0.02	0.03	0.01	0.00	0.02	0.00	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	0.01		0.00
Magnesium	3	3	4	7	9	9	8	8	7	8	8		7
Copper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Calcium	13	14	15	17	18	18	18	17	18	16	16		16
Zinc	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.00	0.01	0.01		0.01
Phenol													0.000
Color (units)	5	3	3	3	3	2	4	2	4	4	1		3

Note: No record for December.

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

TABLE 37: DEVIL CANYON AFTERBAY
1984

Constituents *	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
**Total Dissolved Solids	105	106	123	162	178	180	174	165	159	158	156	152	151
**Total Hardness	42	43	50	65	76	77	75	72	69	69	68	67	64
**Chlorides	10	11	15	26	35	35	33	30	27	26	26	25	25
**Sulfates	16	16	19	26	26	26	25	24	22	22	22	21	22
**Sodium	12	12	16	25	30	31	29	27	25	25	25	24	23
**% Sodium(%)	38	39	41	45	46	46	46	45	44	44	44	44	44
**Specific Conductance	143	147	179	258	313	315	304	286	273	271	267	259	251
Specific Conductance	158	168	197	289	325	316	318	305	279	281	286	278	267
pH	7.3	6.8	7.2	7.5	7.7	7.3	7.8	7.9	7.4	7.7	7.4	7.6	7.6
Boron	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.2	0.2	0.2	0.1	0.2	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	0.00	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	0.00	0.02	0.02	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.01
Manganese	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
Magnesium	3	4	6	7	9	9	8	9	7	8	7	8	7
Copper	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Calcium	13	14	11	17	18	18	18	15	17	16	18	17	16
Zinc	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.00	0.01	0.03	0.00	0.01
Phenol													0.000
Color(units)	4	4	2	4	3	4	5	3	3	4	2	1	3

* Specific Conductance 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 pH, % sodium, and as otherwise noted. Each value is obtained from a once-monthly sample.

** Values correlated from continuous EC.

TABLE 38: LAKE PERRIS AT INLET
1984

Constituents*	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL Average
Total Dissolved Solids	192	159	170	175	176	162	200	173	186	169	186	204	179
Total Hardness	76	78	80	77	80	82	82	80	78	80	80	77	79
Chlorides	37	37	36	36	35	37	37	38	39	38	37	36	37
Sulfates	30	32	29	27	30	33	34	32	32	33	31	31	31
Sodium	30	30	30	31	31	32	32	34	34	33	32	33	32
% Sodium(%)	45	45	44	46	45	45	45	47	47	46	46	47	46
Specific Conductance	311	312	278	312	258	319	315	341	334	329	323	325	313
pH	8.1	8.6	8.8	8.7	7.8	8.1	8.0	8.9	8.2	8.0	7.9	8.0	8.4
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	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Manganese	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
Magnesium	8	8	9	12	9	9	9	9	8	9	9	9	9
Copper	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Calcium	17	18	17	11	17	18	18	17	18	17	17	16	17
Zinc	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.01
Phenol													0.000
Color(units)	4	5	2	3	2	3	2	2	3	3	2	4	3

* Specific Conductance 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 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
1984

(in parts per million)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
DELTA PUMPING PLANT												
Chlorinated Hydrocarbons		0.00000			0.00016			0.00000			0.00001	
Organic Phosphorous					0.00000			0.00000				
Herbicides		0.00000						0.00000			0.00002	
Combinations of C, P, and N Types												
DISCHARGE FOR O'NEILL PUMPING PLANT												
Chlorinated Hydrocarbons											0.00004	
Organic Phosphorous		0.00022										
Herbicides		0.00000									0.00002	
Combinations of C, P, and N Types												
NEAR KETTLEMAN CITY (CHECK 21)												
Chlorinated Hydrocarbons		0.00000			0.00007			0.00001			0.00011	
Organic Phosphorous					0.00000			0.00000				
Herbicides		0.00000						0.00003			0.00001	
Combinations of C, P, and N Types												
TEHACHAPI AFTERBAY												
Chlorinated Hydrocarbons		0.00012			0.00009			0.00000				
Organic Phosphorous					0.00001			0.00000				
Herbicides		0.00000			0.00010			0.00003				
Combinations of C, P, and N Types												