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DEPARTMENT OF WATER RESOURCES
Division of Operations and Maintenance

STATE WATER PROJECT ANNUAL REPORT OF OPERATIONS 1988

June 1991

Douglas P. Wheeler
Secretary for Resources
The Resources
Agency

Pete Wilson
Governor
State of
California

David N. Kennedy
Director
Department of
Water Resources

This is the fifteenth 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 1988, and includes revisions to the data published in the monthly "State Water Project, Operations Data".

Keith G. Barrett

Keith G. Barrett, Chief
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UNITS AND ABBREVIATIONS

The following names, terms, and units commonly used throughout this report are defined here and when first used in the text.

ft	feet
AF	acre-feet
ac-ft	acre-feet
cfs	cubic feet per second
KW	kilowatt
KWh	kilowatt-hour
KV	kilovolt
MW	megawatt
MWh	megawatt-hour
DWR	Department of Water Resources
SWP	State Water Project
CVP	Central Valley Project
USBR	U.S. Bureau of Reclamation
SWRCB	State Water Resources Control Board
D-1485	Water Rights Decision 1485
Banks Pumping Plant	Harvey O. Banks Delta Pumping Plant
California Aqueduct	Governor Edmund G. Brown California Aqueduct

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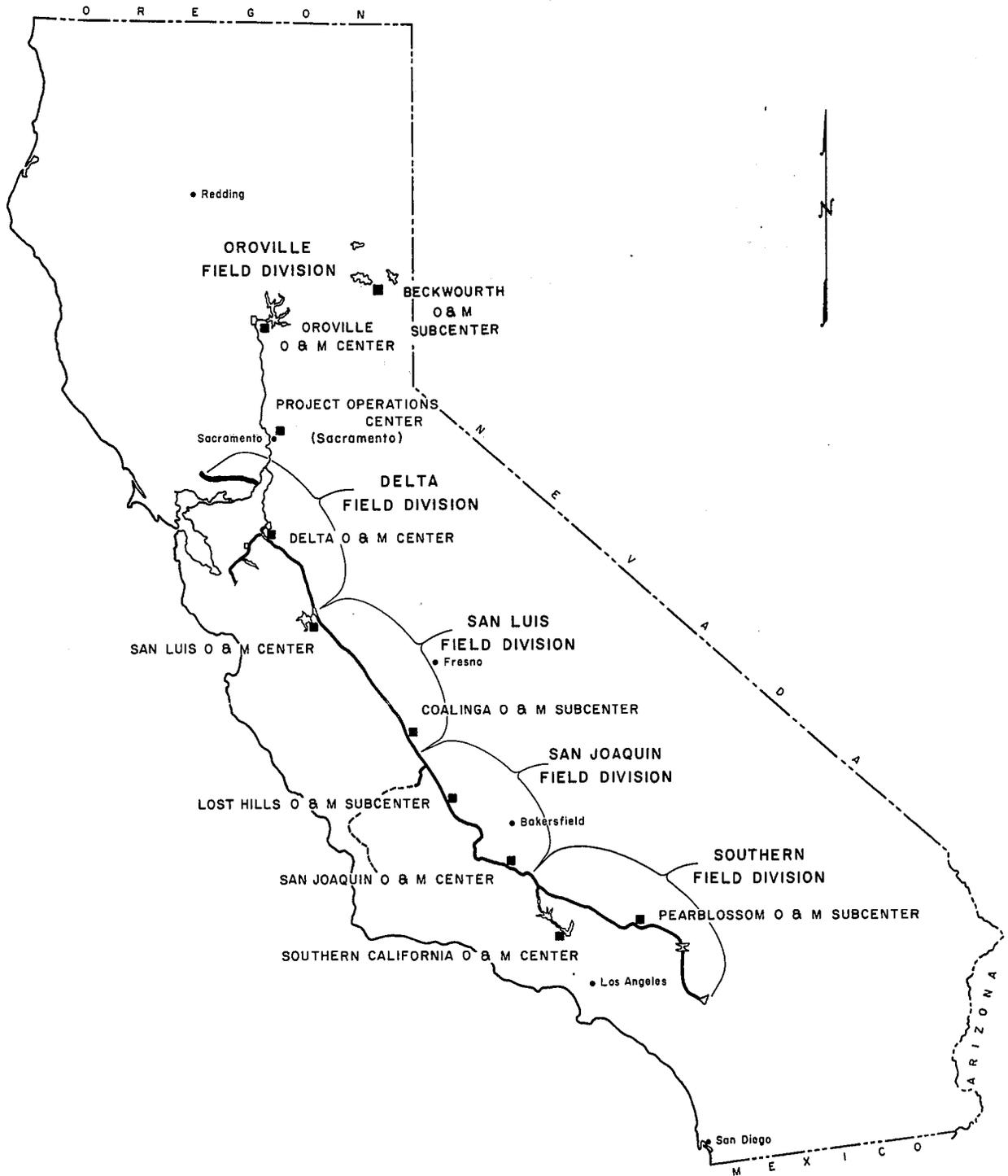
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MAP 1 FIELD DIVISION BOUNDARIES



INTRODUCTION

The 1988 Annual Report of Operations for the State Water Project (SWP) is divided into eight parts. The first two parts, "Introduction and Highlights of 1988 Operation" and "Project Status in 1988," 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 following four sections cover water quality, water conditions, water operations, and energy operations in 1988. 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 two appendices, tabulating and depicting Project operations in 1988. Appendix I covers operations of the Aqueduct. Appendix II covers various types of water quality measurement analyses for selected stations throughout the Project.

HIGHLIGHTS OF 1988 OPERATION

Total precipitation was below average for the 1987-88 water year (October 1, 1987 through September 30, 1988) in California. During the first third of the water year, precipitation in the Sacramento and Feather River drainage basins was 95 percent of average. A dry trend began in mid-January and continued through February, when precipitation for the month was only nine percent of average in the northern half of the Central Valley. By the end of February 1988, seasonal precipitation in the Sacramento River Basin was only about 75 percent of average. Although dry conditions persisted through March, April's above-average precipitation over much of the State improved California's water supply outlook. As of May 1, statewide precipitation during the 1987-88 water year was 80 percent of average. Precipitation, in terms of percent of average, was highest in the Colorado River desert area and lowest in the San Joaquin and North Lahontan areas.

The May 1 forecast of the Sacramento River Index for unimpaired runoff in the 1987-88 water year was 8.8 million acre-feet (AF), only 47 percent of average. The water year was therefore classified as critical by the State Water Resources Control Board's (SWRCB) Decision 1485 (D-1485) standards (10.2 million AF or less). This was the second consecutive critical year, and only the third time in this century that back-to-back critical years have occurred.

Unimpaired runoff to Lake Oroville was 2.0 million AF for the year (about 50 percent of average), but was 1.2 million AF above the 1976-77 drought water year's cumulative unimpaired runoff, which was only 17 percent of average.

Unimpaired runoff to Shasta Lake was 3.9 million AF for the year (about 65 percent of average), but was 2.1 million AF above the 1976-77 drought water year's unimpaired runoff, which was

only 30 percent of average.

The Department of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) declared balanced Delta water conditions twice during 1988: from February 23 through November 26 and from December 3 through December 25. This was the fifth consecutive year, and the seventh of the nine years in this decade, in which balanced water conditions were declared. Balanced water conditions exist when upstream reservoir storage releases, plus other inflows, approximately equal the water supply needed to (1) satisfy Sacramento Valley and Sacramento-San Joaquin Delta in-basin needs, including Delta water quality requirements, and (2) meet export needs. During balanced water conditions, DWR and USBR adjust their reservoir storage releases and Delta exports to enable each agency to meet its share of in-basin uses and Delta outflow.

The SWP delivered 2,906,492 AF of water in 1988, including 2,385,122 AF of entitlement water, and 521,370 AF of other water.

The SWP generated a total of 5,123,117 megawatt hours (MWh) of energy (3,107,822 MWh from hydro-electric power plants) in 1988 and used 6,437,729 MWh to deliver water to contractors. The SWP also purchased 148,221 MWh and sold 1,683,866 MWh of energy. For further explanation of the numbers in this paragraph, refer to Figure F, page 19; Figure H, page 23; and the Energy Operations section, pages 16 through 23.

In 1988, DWR purchased 119,029 AF of water from Yuba County Water Agency's (YCWA) New Bullard's Bar Reservoir. This purchase, which began on July 1 and was completed on September 30, 1988, allowed DWR to hold a corresponding amount of water in Lake Oroville, increasing the water supply for the 1988-89 water year.

PROJECT STATUS IN 1988

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. Additional facilities added later to the Project were: William E. Warne Power Plant which began generation on November 17, 1982; Reid Gardner Unit No. 4 (a coal-fired unit owned jointly with Nevada Power Company) which began operation on July 26, 1983; Bottle Rock Powerplant (a geothermal plant) which began generation on February 26, 1985, and Alamo Powerplant which began operation on July 1, 1986.

The switchyard for the new Cordelia Pumping Plant on the North Bay Aqueduct was activated for the first time on December 2, 1987. Barker Slough Pumping Plant

switchyard was energized on December 4, 1987.

SWP facilities in operation during 1988 included: 22 reservoirs with a gross capacity of 6,797,171 AF; seven power plants with a total output capacity of 1,686 megawatts (MW)^{1/}; 16 pumping plants housing 112 units with a total motor rating of 2,768 MW^{2/}; and 537 miles of aqueduct.

During 1988, water was delivered from SWP facilities to:

- * 26 State long-term water service contractors.
- * 4 public agencies receiving recreation water (Department of Fish and Game, Department of Parks and Recreation, Los Angeles County Recreation Department, and the East Bay Regional Park District).
- * Several local agencies and farmers receiving water to satisfy prior water rights.
- * 3 Local agencies receiving other water.

In addition, SWP facilities were used to deliver a total of 1,747,422 AF of federal water to USBR customers.

1 Includes 202 MW of federal power generation output at William R. Gianelli Pumping-Generating Plant, and excludes 1,036 MW from Castaic Powerplant for LADWP.

2 Includes 261 MW of federal pumping capacity at William R. Gianelli Pumping-Generating Plant and Dos Amigos Pumping Plant.

OPERATING

MAJOR OUTAGES AND LIMITATIONS

Major outages and operating limitations of SWP facilities during 1988 were:

- * In preparation for plant expansion, Devil Canyon Power Plant was out of service from January 23 through 29 to permit installation of a temporary cofferdam in the afterbay. During the scheduled outage of the Power Plant, bumped heads were placed on the intake valves of the San Bernardino Tunnel and valves were repaired while the tunnel was dewatered for inspection. Also, four seals were installed in expansion joints of the Santa Ana Pipeline during this outage. The Powerplant was returned to full service in early March.
- * On February 24, the water level in pools 65 and 66 upstream of Mojave Siphon was lowered to facilitate lining repairs. Broken lining was revealed in pool 66, and the canal was out of service for repairs until March 7.
- * On March 10, pool 10 was shut down to allow repair of cracks in the aqueduct lining. Divers sealed the cracks and filled voids behind the lining, and the pool was returned to service on March 30. On December 14 new cracks were discovered in the same area of pool 10. Pools 10, 11, and 12 were drawn down to the normal minimum operating level to facilitate the repair work. The cracks were repaired, and the pools were returned to normal operation on December 21.
- * On June 10, Edmonston Pumping Plant tripped because of a moderate earthquake (5.1 on the Richter scale) located approximately three miles northeast of Porter Tunnel. Four of the six 230 kV switchyard electrical circuit breakers were damaged. Power to the plant was out until June 14, when the plant returned to service. Five pump units were made available when power was restored. More pumps and circuit breakers became available as repair work progressed. Repairs were completed on October 13.
- * A leak of about 100 gallons per minute was discovered on June 16 at joint 4 on the West Barrel of the Pastoria Siphon between Tehachapi Tunnels 2 and 3. The June 10 earthquake was believed to have caused this leak. The line was taken out of service from June 23 through 30 for repairs. After regular operation began, another leak (about 30 gpm) was discovered at joint 9. This new leak was repaired in September during a scheduled inspection outage.
- * The North Bay Aqueduct, which was essentially completed in May, 1988, started water deliveries on June 16 to the cities of Benicia and Vallejo from Cordelia Pumping Plant.
- * On September 23, in preparation for the Tehachapi Tunnels scheduled inspection, Oso Pumping Plant was unavailable for service. On September 25, Warne Powerplant was unavailable for service while Peace Valley Pipeline was drained to inspect for algae inside the pipeline. On September 26, the Lower Quail Canal water level was lowered to permit inspection of the canal liner. These outages took place during a scheduled inspection of Tehachapi Tunnels 1, 2, and 3, and Porter Tunnel. The inspection was completed on October 5.
- * The Lake Perris bypass line was removed from service from October 24 through 27 while The Metropolitan Water District of Southern California installed a second reverse flow bypass pump, increasing from 20 cfs to about 60 cfs the capacity to supply Mills Filtration Plant from Lake Perris.
- * On November 9, the Mojave Siphon Pipeline ruptured at milepost 405.38, washing out a 20-foot by 40-foot hole above the pipeline and scattering sections of the concrete pipe as far as 500 feet. Only about four acre-feet of water escaped before the siphon was isolated by closing check 66. Pumping was curtailed at Pearblossom Pumping Plant, and all water pumped at Edmonston Pumping Plant was diverted to the West Branch via Oso Pumping Plant. The siphon returned to service on November 25 after repairs were completed.
- * From late November through December, water quality conditions and high tides in the Delta contributed to the reduction of SWP pumping at Banks Pumping Plant. During this period, activity at the plant consisted mostly of pumping for USBR. This pumped water replaced the exports foregone by the USBR at Tracy Pumping Plant when Keswick Reservoir re-leases were reduced. The reductions were for regulating the water temperature in the upper Sacramento River, thereby enhancing conditions for the 1988 fall salmon run.

WATER QUALITY STANDARDS

SWP and Sacramento-San Joaquin Delta water quality conditions are summarized below. Detailed water quality reports appear in Appendix E to Bulletin 132, published separately as *Water Operations in the Sacramento-San Joaquin Delta*, and in DWR's monthly *State Water Project Operations Data*.

Water quality and SWP operations in the Delta are governed by the SWRCB's D-1485. This decision protects beneficial uses of Delta water by establishing water quality standards, export limitations, and minimum outflows from the Delta. These standards are based on the water year type. The 1987-88 water year was classified as critical under the Sacramento River Index (formerly the Four Basin Index) of D-1485, permitting less restrictive water quality standards for the Delta.

The Delta Outflow Index (DOI) is a calculated approximation of the Delta freshwater outflow past Chipps Island near Pittsburgh. The month of January had the highest average DOI (about 17,630 cfs) and daily DOI (about 29,163 cfs). The lowest average monthly DOI occurred in September (about 2,190 cfs), and the lowest daily was in October (about 1,100 cfs). During 1988, all minimum flows in the Sacramento River at Rio Vista, all Delta salinity standards, and all export limitations imposed by D-1485 were met.

The January 1981 agreement between DWR and the North Delta Water Agency (NDWA) assures that the State will maintain a dependable water supply of adequate quality for agricultural uses within the boundaries of the NDWA. The agreement is an SWP water quality obligation and serves as a measure of Delta water quality conditions. Under this agreement, water quality standards for electrical conductivity (EC) at the Emmaton station on the Sacramento River are at times more stringent than those required by D-1485. During 1988, the 14-day running mean Emmaton EC standard of 2.79 microsiemens per centimeter (uS/cm) was exceeded sporadically from October 19 through the year's end.

To assure NDWA a water supply of adequate quality, as required under the NDWA agreement, DWR provided an alternative source of irrigation water for Sherman Island. Water was diverted upstream from Emmaton at Threemile Slough, where salinity levels were lower. An agreement signed by DWR, NDWA, and Reclamation District

341 on November 17, 1988, established the following conditions for the Threemile Slough diversion: (1) water taken from Threemile Slough would not be of lower quality than the water at Emmaton; (2) for the duration of the agreement, the Emmaton EC standard would be applied to water diverted from Threemile Slough; and (3) for the duration of the agreement, DWR would be relieved of meeting the EC standard at Emmaton.

A temporary overland facility similar to the one installed during the drought of 1977 was then brought into service to transport the irrigation water from Threemile Slough to Sherman Island. The agreement was terminated and the overland facility removed from service in late January 1989.

The Suisun Marsh Salinity Control Gates at Montezuma Slough began operating in early November 1988. The control structure consists of three radial gates, a boat lock, and a maintenance channel with removable stop logs. The facility will be operated as needed from October through May each year to decrease salinity in Montezuma Slough (per D-1485 requirements) by allowing freshwater flow into Suisun Marsh and restricting saline tidal incursions.

The March 1987 Suisun Marsh Preservation Agreement (among DWR, USBR, the Department of Fish and Game, and the Suisun Resource Conservation District) established EC salinity standards at three locations. The westernmost site is in Montezuma Slough at Beldon's Landing, which is about 12 miles downstream (northwest) of the control structure. The November and December EC standards are 16.5 uS and 15.5 uS, respectively. The EC at Beldon's Landing was approximately 20.0 uS at the beginning of November. After the gates had been operating for twelve days, the EC had dropped to around 11.0 uS and remained at this level through December. The EC was also reduced in the western part of the marsh from about 22.0 uS to 18.0 uS.

While it is still too early to determine if additional facilities will be needed to achieve the Suisun Marsh goals set forth in the preservation agreement, the Montezuma Slough control structure substantially improved the water quality in the marsh in a relatively short time.

Under the Interagency Delta Health Aspects Monitoring Program, water samples were again collected from the Delta in 1988 and analyzed for

minerals, pesticides, organic pollutants, and trihalomethane precursors. As an adjunct to this study, DWR also started a special 30-month study of agricultural drainage in the Delta to determine its effects on trihalomethane precursors in Delta water and to evaluate alternative remedies.

Considerable attention has been focused on trihalomethane precursors in the Delta because trihalomethanes are potential carcinogens, and more stringent federal drinking water standards for trihalomethanes are expected. Recent evidence shows elevated levels of precursors in some agricultural drainage from the peat soil of Delta islands. However, metals, minerals, and pesticides that affect human health are within acceptable levels in Delta water supplies.

During the summer of 1988, the Delta was monitored for phytoplankton productivity. Early detection of phytoplankton blooms was achieved through increasing sampling stations and sampling frequency over D-1485 requirements.

The phytoplankton productivity pattern in the Delta for 1988 was somewhat atypical. Usually, a series of phytoplankton blooms in the Delta begins in the spring and ends in the fall. However, in 1988 there was only a single, intense, late spring bloom of the filamentous diatom *Melosira granulata* throughout much of the central Delta. The bloom lasted from May 20 through June 6 and produced 30-50 micrograms/liter (ug/l) of chlorophyll "a." *M. granulata* blooms clog the filters of municipal water treatment plants.

This late spring bloom was followed by a brief, mid-July bloom of the centric diatom *Skeletonema potamos* in the Mildred Island area. Chlorophyll "a" levels were over 30 ug/l, with a maximum concentration of 36 ug/l. Fluorometer readings confirmed that this bloom was localized but had spread into adjacent channels, producing moderate levels of chlorophyll "a" (10-15 ug/l) in nearby Latham Slough and Empire Cut.

Lesser amounts of chlorophyll "a" from the bloom, measurable above background, were recorded in Middle River as far south as Santa Fe Cut and as far north as Columbia Cut. Although this *S. potamos* bloom did not reach the intensity or expand to the area of the late spring *M. granulata* bloom, it did appear to support the hypothesis that flooded islands in the central Delta

may serve as "seeding" areas for further Delta phytoplankton blooms. Subsequent monitoring did not discover any additional late summer or fall phytoplankton blooms in the Delta, Suisun Bay, or San Pablo Bay. Chlorophyll "a" levels did not exceed background levels (5 ug/l or less). Continuous monitoring at the Banks Pumping Plant revealed only the late spring phytoplankton bloom entering the SWP water supply.

The 1986-87 and 1987-88 water years were both classified as critical and were characterized by low Delta outflow and summer salinity intrusion. Phytoplankton productivity was lower for these years than for normal years, but was higher than the phytoplankton productivity measured during the 1976-77 drought.

A vegetation survey of the central and south Delta was conducted on November 9 and 10, 1988. This survey augmented the annual survey conducted by the Department of Food and Agriculture to monitor for any introduction of *Hydrilla verticillata* into the region. Hydrilla is a serious aquatic pest weed that could disrupt operation of the SWP and other water supply systems if it were accidentally introduced into the Delta. No hydrilla was found.

The occurrence of a second consecutive critical water year reduced runoff and increased salinity intrusion into the Delta. Generally, water entering the California Aqueduct has higher levels of salinity during a critical year.

During 1988, the monthly water quality objectives for total dissolved solids, chlorides, and percent sodium were exceeded at many locations for all or part of the year. The objective for total dissolved solids was exceeded at Banks Pumping Plant during November and was also exceeded from Banks Pumping Plant to check 21 of the California Aqueduct (near Kettleman City) in December. During the last five months of the year, the chloride objective was exceeded at all stations south of the Delta except Castaic Lake and Lake Perris. Percent sodium objectives were exceeded at all stations south of the Delta during much of the year.

DWR continued monthly monitoring of asbestos in SWP waters south of the Delta. Results indicate that asbestos remained essentially at background levels during 1988.

FIGURE A: MEAN DAILY CHLORIDE LEVELS AT DELTA STATIONS
1988

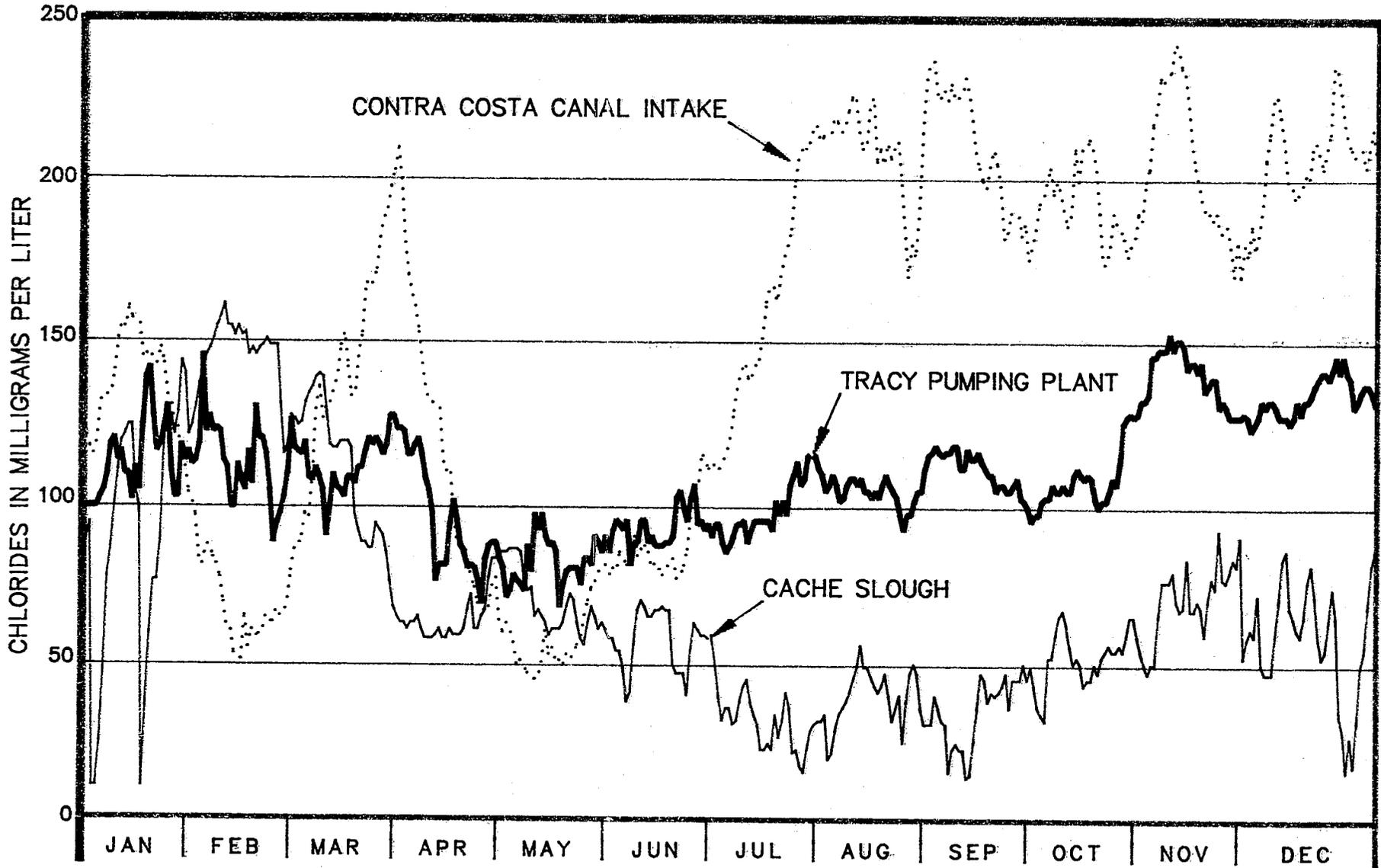
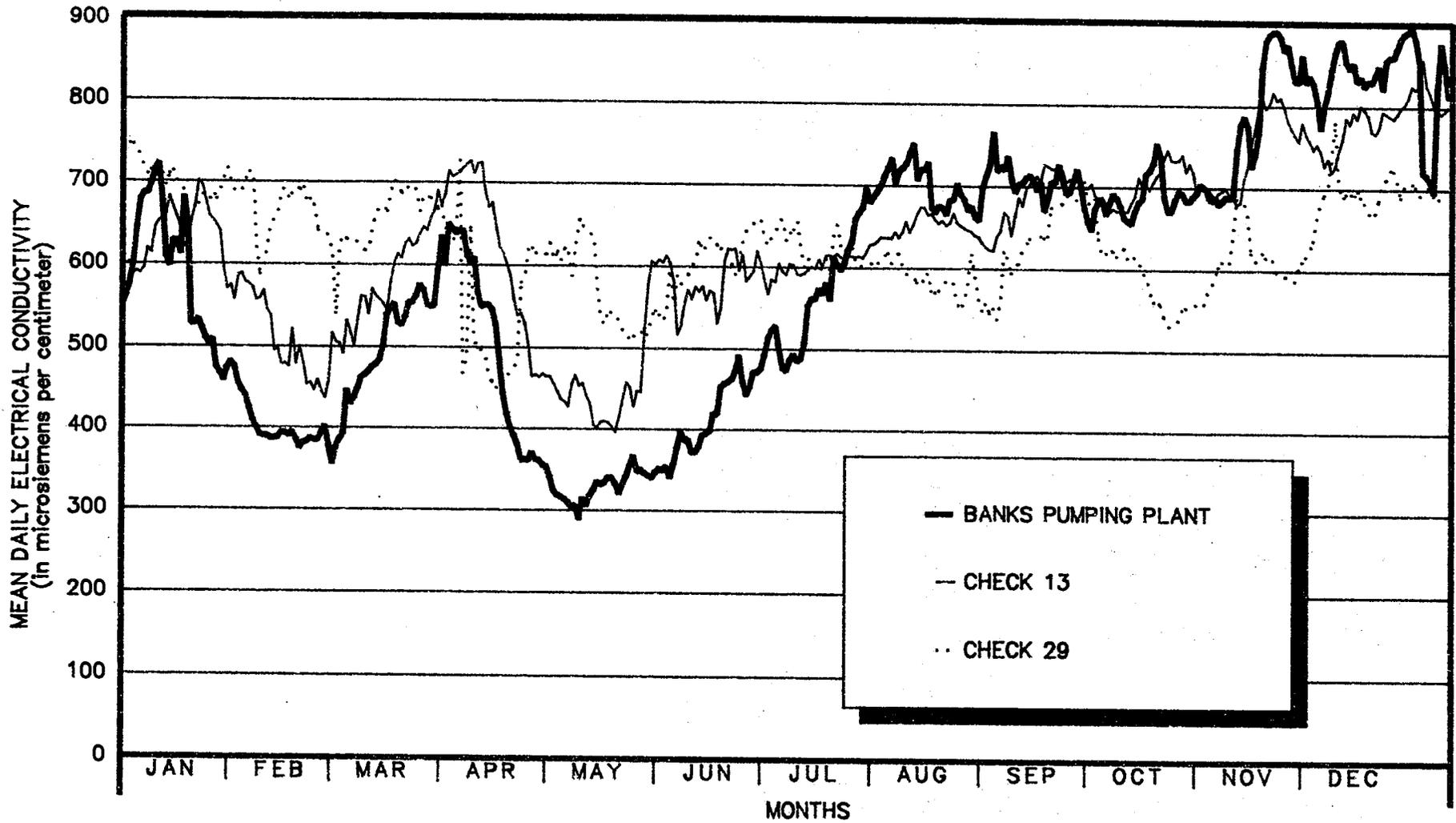


FIGURE B: MEAN DAILY ELECTRICAL CONDUCTIVITY AT SWP LOCATIONS
1988



Note: Estimated values are shown for days when no data was available.

WATER CONDITIONS

Based on criteria in D-1485, the 1987-88 water year was classified as a "critical" year. The final determination of year classification is made in May, based on current water year forecasts of the "Sacramento River Index" (formerly 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 8,800,000 (9,190,000) AF for the 1987-88 water year, which was 50 (51) percent of average for the four basins^{3/}. The May 1 forecast was in the range classified as "critical" in D-1485. However, this amount was above the 8.1 million AF index in 1976, and well above the 5.1 million AF index in 1977.

Actual unimpaired runoff for the 1987-88 water year was well below average throughout the State of California. Unimpaired runoff, state wide for the water year, was 47 percent of average, ranging from 20 percent of average in the

Sacramento Valley	73% of average
San Joaquin Valley	65% of average
South Coastal	98% of average

Central Coastal hydrographic area to about 50 percent of average in the Colorado Desert area. Total volume of actual runoff for the water year in the Central Valley was only 13.3 million ac-ft.

In the Feather River basin, the primary source of water supply for the State Water Project, water year total precipitation was 60 percent of average, and the total unimpaired runoff for 1988 was about 46 percent of average. Maximum snowpack water equivalent was 83 percent of average.

State-wide precipitation to May 1, during the 1987-88 water year, was 82 percent of average, compared to 61 percent of average for the corresponding 1986-87 period. Several of the hydrographic areas that are representative of these conditions are shown in the graphic below.

April 1 snow surveys, which typically show the maximum snow water equivalent^{4/} for the season, showed snow-stored water amounts that were well below average on the majority of snow courses measured. Snowpack water equivalent measurements in Sacramento Valley watersheds were 20 percent of average. San Joaquin Valley watersheds were higher at 45 percent of average.

3/ Unimpaired runoff averages are based on the 50-year period 1936-1985.

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 below average. The combined storage of these reservoirs on January 1 was about 1.1 million ac-ft below their combined operational capacity. At the end of 1988, this combined storage was about 1.07 million ac-ft (30 percent less than the combined storage at the end of 1987). The tabulation below compares 1987 and 1988 year-end storage in the principal SWP reservoirs:

Lake Oroville storage started the year below 1987 levels and roughly paralleled 1987 until April 13, when storage peaked at 2,765,523 AF, or 79 percent of total capacity. Then storage dropped substantially until it reached it's lowest level at 1,484,341 AF (42%) on October 9. Storage showed a moderate recovery in November and December and reached 1,660,266 AF (47%) on December 31.

San Luis Reservoir started 1988 at only 54 percent of capacity for State storage and at approximately 63 percent of total storage. Total storage peaked on May 2 at 1,853,540 AF. Rapid State and federal drawdown

began around mid-April. State drawdown occurred at a lower rate than the federal drawdown. The lowest total storage for the year, 396,523 AF (20%), was reached on September 9. Total storage increased to 854,053 AF (approximately 42 percent of maximum) by December 31.

Lake Del Valle storage is normally held to a maximum of 40,000 AF between Memorial Day and Labor Day for recreational purposes. In 1988, The Corps of Engineers approved an additional 2,000 AF of storage during this period. Seasonal storage in Lake Del Valle topped out at 41,273 AF on June 12.

Reservoir	Storage (ac-ft)	
	12/31/87	12/31/88
Lake Oroville	2,388,007	1,660,266
Lake Del Valle	24,440	24,532
San Luis Reservoir *	569,636	247,952
Pyramid Lake	160,585	157,630
Castaic Lake	286,567	258,455
Silverwood Lake	68,400	71,720
Lake Perris	112,496	115,734
Total	3,610,131	2,536,289
Total difference		-1,073,842
* SWP share.		

SWP southern reservoirs (Pyramid, Castaic, Silverwood, and Lake Perris) started the season at above-average levels (approximately 90 percent of operational capacity). After normal operation throughout the summer months, the combined totals of the southern reservoirs returned to within 86 percent of full storage.

A detailed description of the individual reservoirs is presented in the "Project Operations By Field Division" Section under their respective divisions, beginning on page 33.

AQUEDUCT OPERATIONS

In 1988, a total of 1,441,224 AF of Central Valley Project (CVP) water was delivered from the San Luis Joint-Use Facilities to the federal San Luis service area. The Department of Water Resources operates and maintains the joint-use facilities, including the 102 miles of aqueduct between O'Neill Forebay and Kettleman City.

Releases from Lake Del Valle into the South

Bay Aqueduct began on August 22, at the request of the South Bay Aqueduct water service contractors. These releases continued through August and totaled 1,682 AF. The released water was part of the additional 2,000 AF of storage approved earlier in the year by the U.S. Army Corps of Engineers. The releases were used to reduce the high Delta water chloride levels to improve water quality in the South Bay Aqueduct.

**TABLE 1: PROJECT PUMPING PLANTS
1988
(in acre-feet)**

PUMPING PLANTS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt	50,879	33,140	10,852	399	3,828	8,162	1,033	19,731	47,504	64,316	86,799	70,616	397,259
Thermalito	61,521	37,111	12,427	772	4,650	10,160	787	22,580	55,486	76,573	107,258	85,174	474,499
Barker Slough	84	0	0	57	171	1,592	3,652	3,209	3,499	3,022	2,139	1,709	19,134
Cordelia	24	8	0	0	162	1,593	3,654	3,209	3,499	3,022	2,051	1,619	18,841
Cordelia Interim	691	679	118	121	7	0	0	0	0	0	0	0	1,616
South Bay	8,141	6,933	16,238	16,156	17,602	15,847	16,208	13,633	10,154	9,424	9,866	10,774	150,976
Del Valle	0	0	5,260	6,246	4,453	1,020	0	0	0	0	0	0	16,979
Banks													
State	374,215	322,858	243,764	201,926	184,398	166,927	104,305	137,683	164,532	71,631	70,821	123,206	2,166,266
Federal	8,910	9,861	15,114	53,239	0	0	95,606	106,923	32,235	42,676	68,858	54,605	488,027
San Luis 1/													
State	274,740	132,381	52,297	38,659	16,922	0	0	0	46,968	13,837	11,391	41,410	628,605
Federal	86,377	0	41,279	68,449	12,759	0	0	0	60,016	56,360	150,669	160,961	636,870
Dos Amigos 1/													
State	93,722	132,334	183,684	181,684	186,470	280,385	374,819	291,559	158,776	115,739	117,312	154,990	2,271,474
Federal	139,331	189,215	89,719	87,044	117,632	239,722	288,315	209,984	52,300	43,619	28,751	27,501	1,513,133
Las Perillas	2,125	7,272	9,272	11,327	15,486	20,920	26,539	18,511	9,728	9,567	2,144	1,448	134,339
Badger Hill	2,138	7,260	9,272	11,327	15,486	20,901	26,329	18,361	9,716	9,541	2,171	1,473	133,975
Buena Vista	71,953	41,991	119,492	134,927	117,869	107,340	151,226	119,704	100,161	71,742	88,146	128,408	1,252,959
Wheeler Ridge	71,041	29,708	100,284	130,003	110,104	83,906	120,846	94,802	95,295	68,305	87,935	129,288	1,121,517
Ira J. Chrisman													
Wind Gap	69,748	26,575	94,686	124,751	104,059	76,217	112,419	88,594	91,907	65,180	85,814	125,433	1,065,383
A.D. Edmonston	70,478	27,020	94,433	124,260	103,212	75,623	110,721	87,177	90,174	64,539	85,346	123,730	1,056,713
Oso	46,104	22,511	41,799	57,340	35,192	24,390	41,339	31,300	46,374	15,818	56,251	82,177	500,595
Castaic 2/	56,694	42,667	24,182	7,355	22,815	22,362	9,556	44,650	65,274	43,356	26,391	60,726	426,028
Pearblossom	24,906	3,517	52,849	66,707	65,889	47,007	64,217	50,225	40,437	45,476	27,331	42,366	530,927

1/ Joint State-Federal Facility.

2/ Pumping at Castaic is for the City of Los Angeles.

Total State: 11,942,057

Total Federal: 2,638,030

Total Los Angeles: 426,028

Total Project: 15,006,115

239001

WATER DELIVERIES

The total amount of water delivered by the SWP in 1988 was 4,986,912 AF. Included in this total: 2,390,011 AF of SWP water (a 13 percent increase over the 1987 amount); 832,786 AF to satisfy prior water rights (listed on page 34); 10,827 AF of local supply water (a 48 percent decrease from the 1987 amount), 1,646 AF of Napa County Flood Control and Water Conservation District Local water, 3,726 AF of Vallejo Permit water, 306,692 AF of CVP water delivered through SWP facilities, and 1,441,224 AF of CVP water delivered through joint-use facilities. The table below shows these various water deliveries by water type, and a discussion of these different types follows the table.

Type	Amount (ac-ft)
1988 Entitlement Water	2,308,792
1987 carryover entitlement	67,581
Ground water recovery	8,749
Transferred Entitlement Water	300
Recreation Water	4,889
Subtotal	2,390,011
Napa Co. FC&WCD (Non-SWP)	1,646
Vallejo Permit (non-SWP)	3,726
Local Supply Water (non-project)	10,827
Total	2,406,210

In the Fall of 1987, 26 long-term contractors requested 2,625,328 AF of entitlement water and 18,565 AF of deferred entitlement (wet weather) water. In December of 1987, DWR approved 2,255,000 AF of 1988 entitlement water deliveries. Additionally, 72,708 AF of 1987 carryover entitlement water was approved. No wet weather water was approved. The initial approved schedule reflected a 371,685 AF reduction for all agricultural entitlement requests. Based on an improved February 1 water supply forecast, DWR reinstated full agricultural delivery requests and gave agricultural contractors the option of revising their requests. Entitlement requests for 1988 totaled 2,595,120 AF after the agricultural contractors' revised requests were approved.

Actual entitlement water delivered in 1988 to the 26 contractors requesting deliveries totaled 2,385,122 AF. This amount includes 67,581 AF of 1987 carryover entitlement water, 8,749 AF of

water recaptured from storage by San Bernadino Valley Municipal Water District, and 300 AF of agricultural entitlement water transferred from Tulare Lake Basin Water Storage District to Empire West Side Irrigation District.

Mojave Water Agency did not initially request any entitlement water but took 9 AF at a temporary turnout for construction use. Nineteen contractors took less entitlement water than initially requested, two contractors took exactly the entitlement water they initially requested, and two contractors took all of their initially requested Table A entitlements.

In 1988, the following contractors received more water than they originally requested.

Contractor	Requested Increase (acre-feet)
Castaic Lake Water Agency	504
Crestline-Lake Arrowhead Water Agency	6
Mojave Water Agency	9

Recreation water is used both at SWP recreation facilities and for fish and wildlife mitigation and enhancement. In 1988, a total of 4,889 AF was conveyed under this category, as follows:

- * 1,421 AF for public recreation facilities at Lake Del Valle, San Luis Reservoir, O'Neill Forebay, Silverwood Lake, Pyramid Lake, Castaic Lake, and Lake Perris.
- * 2,028 AF released for maintaining a trout fishery in Piru Creek.
- * 1,060 AF for replacing water losses at Castaic Lagoon.
- * 380 AF for about 770 acres of wildlife mitigation lands near O'Neill Forebay and for the Pilibos Wildlife Area (40 miles south of Los Banos).

Table 2 on Page 12, shows water deliveries by years, with totals to date, for individual agencies. Figure C on Page 13, shows annual totals for California Aqueduct deliveries. Water deliveries by field division are presented in Map 2 on Page 14.

TABLE 2: WATER DELIVERIES 1962-1988

(in acre-feet)

AGENCY	1962-1983	1984	1985	1986	1987	1988	TOTALS
OROVILLE FIELD DIVISION							
LAST CHANCE CREEK W.D. (Local Supply)	115,363	13,782	13,117	14,379	9,444	6,988	173,073
PLUMAS CO. F.C. & W.C.D.	4,880	272	254	317	452	523	6,698
PALERMO CANAL 1/	122,576	6,850	7,195	7,970	8,612	8,374	161,577
COUNTY OF BUTTE	4,072	177	308	313	459	385	5,714
THERMALITO I.D. (Local Supply)	8,612	1,869	2,229	2,051	2,338	2,417	19,516
THERMALITO AFTERBAY 1/	12,375,650	822,721	861,554	786,489	825,905	822,164	16,494,483
UPPER FEATHER RIVER LAKES 1/	107,091	2,020	2,019	2,041	2,203	2,248	118,228
YUBA CITY	0	108	62	328	88	303	889
DELTA FIELD DIVISION							
NAPA CO. F.C. & W.C.D. (Local Supply)	76,380	2,923	4,039	3,519	7,693	7,038	101,592
ALAMEDA CO. W.D. (Local Supply)	359,402	13,723	22,289	21,170	25,475	33,464	475,523
A.C.F.C. & W.C.D., ZONE 7 (Local Supply)	265,555	20,340	21,773	23,468	26,397	27,252	384,785
PLEASANTON TOWNSHIP W.D.	674	0	0	0	0	0	674
SANTA CLARA VALLEY W.D.	854,826	91,663	101,938 6/	90,595	94,949	87,961	1,321,932
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.	89,984	7,344	6,197	5,354	5,880	4,412	119,171
MUSTANG W.D.	42,556	0	0	0	0	0	42,556
TRACY GOLF & COUNTRY CLUB	1,800	525	463	454	491	590	4,323
GRANITE CONSTRUCTION	120	0	0	0	0	0	120
LAKE DEL VALLE (E.B.R.P.D.)	963	158	152	130	137	142	1,682
ORESTIMBA CREEK	100	0	0	0	0	0	100
MUSCO OLIVE (C.V.P. water)	0	10	18	9	19	30	86
SOLANO CO. F.C.W.C.D.	0	0	0	1,400	1,550	13,452	16,402
SAN LUIS FIELD DIVISION							
DEPT. PARKS & REC. (STATE)	491	55	10	10	8	7	581
DEPT. FISH & GAME (STATE)	3,485	472	485	440	590	380	5,852
FED. CUSTOMERS (REC.+ JOINT-USE)	14,775,094	1,540,707	1,295,647	1,371,722	1,462,359	1,441,898	21,887,422
FED. CUSTOMERS (MISC.)	61,059	0	28,000	0	9,335	149,192	247,586
SAN JOAQUIN FIELD DIVISION							
TULARE LAKE BASIN W.S.D.	1,714,867	5,743	206,678	92,143	144,290	95,566 12/	2,259,287
EMPIRE WEST SIDE I.D.	56,699	0	5,197	2,300	4,401	3,775 13/	72,372
COUNTY OF KINGS	27,700	3,100	3,400	3,700	4,000	4,000	45,900
HACIENDA W.D. 2/	75,895	0	0	0	0	0	75,895
KERN CO. W.A.	10,373,850	1,099,391	1,083,749	929,278 8/	1,028,124	1,009,520	15,523,912
KERN WATER BANK	0	0	0	0	7,501 10/	0	7,501
DUDLEY RIDGE W.D.	867,249	64,600	62,009	51,152	46,288	47,994	1,139,292
DEVILS DEN W.D.	235,908	20,845 4/	18,194	17,271	14,394	11,534	318,146
J.G. BOSWELL	667,005	30,725	0	0	0	0	698,530
SHELL CAL PROD. 3/	76,387	7,924	0	1,603	0	0	85,914
GREEN VALLEY W.D.	8,331	2,557	166	0	0	0	11,054
U.S.B.R. (FISH & WILDLIFE)	11,700	0	0	4,000	0	0	15,700
U.S.B.R. (CVP WATER)	316,306	95,406	130,763	13,050	137,289	156,241 14/	849,025
WHEELER RIDGE W.S.D.	92	0	0	0	0	0	92
SOUTHERN FIELD DIVISION							
A.V.E.K. W.A.	410,190	32,662	37,064	32,449	34,089	34,079	580,533
M.W.D. OF S.C.	5,293,332	460,699 5/	729,209 7/	708,840	712,424	902,564	8,607,062
LITTLEROCK CREEK I.D.	4,838	1	0	163	1,085	419	6,506
MOJAVE W.A.	57,589	0	0	0	17	9	57,615
DESERT W.A.	152,300	25,000	27,000	29,000	31,500	34,000	298,800
COACHELLA VALLEY W.D.	97,809	15,768	16,989	18,210	19,431	20,652	188,859
CRESTLINE-LAKE ARROWHEAD W.A.	11,830	1,128	1,422	1,506	1,849	2,006	19,741
SAN GABRIEL VALLEY M.W.D.	47,227	7,656	5,028	9,454	10,630	8,948	88,943
SAN BERNARDINO VALLEY M.W.D.	142,898	5,556	7,390	6,421	19,075 11/	21,386	202,726
DEPT. PARKS & REC., L.A. CO. REC. DEPT.	10,994	3,977	3,386	3,285	6,937	4,360	32,939
PIRU CREEK FISH ENHANCEMENT	2,915	0	0	0	0	0	2,915
CASTAIC LAKE W.A.	25,970	11,477	12,401	13,928	16,167	18,904	98,847
PALMDALE W.D.	0	0	1,558	3,096	5,379	1,770	11,803
UNITED WATER C.D. (Local Supply)	0	0	0	998	0	0	998
TOTALS	50,170,363	4,100,534	4,719,352	4,274,006	4,729,254	4,986,042	73,300,424

- 1/ Prior water right entitlement.
- 2/ Hacienda Water District was annexed by Tulare Lake Basin W.S.D. in 1981.
- 3/ Repayment of preconsolidation water.
- 4/ Includes 559 acre-feet of 1982 Exchange water stored in Lake Oroville and 126 acre-feet stored in a MWDSC ground water basin.
- 5/ Billed for 126 acre-feet of 1982 Exchange Water, but not included here. Includes 3,111 acre-feet of local-out through reach 30.
- 6/ Includes 4,300 acre-feet of C.V.P. exchange water.
- 7/ Includes 45,584 acre-feet of Local-Out.
- 8/ Include 1,703 acre-feet transferred to Tulare Lake Basin W.S.D.
- 9/ Includes 6,500 acre-feet to K.C.W.D., 6,500 to Lakeside I.W.D., and 50 to Green Valley W.D.
- 10/ Advance storage of ground water, by agreement between K.C.W.A. and D.W.R.
- 11/ Includes 324 acre-feet of Local-Out.
- 12/ Includes 1,550 acre-feet transferred to Westlands W.D. (Federal)
- 13/ Includes 300 acre-feet transferred to Tulare Lake B.W.S.D. as Entitlement.
- 14/ Includes 3,000 acre-feet transferred to Westlands W.D. (Federal)



TABLE 2: WATER DELIVERIES 1962-1988

(in acre-feet)

AGENCY	1962-1983	1984	1985	1986	1987	1988	TOTALS
OROVILLE FIELD DIVISION							
LAST CHANCE CREEK W.D. (Local Supply)	115,363	13,782	13,117	14,379	9,444	6,988	173,073
PLUMAS CO. F.C. & W.C.D.	4,880	272	254	317	452	523	6,698
PALERMO CANAL 1/	122,576	6,850	7,195	7,970	8,612	8,374	161,577
COUNTY OF BUTTE	4,072	177	308	313	459	385	5,714
THERMALITO I.D. (Local Supply)	8,612	1,869	2,229	2,051	2,338	2,417	19,516
THERMALITO AFTERBAY 1/	12,375,650	822,721	861,554	786,489	825,905	822,164	16,494,483
UPPER FEATHER RIVER LAKES 1/	107,091	1,803	2,019	2,041	2,203	2,248	117,405
YUBA CITY	0	108	62	328	88	303	889
DELTA FIELD DIVISION							
NAPA CO. F.C. & W.C.D. (Local Supply)	76,380	2,923	4,039	3,519	7,693	7,038	101,592
ALAMEDA CO. W.D. (Local Supply)	359,402	13,723	22,289	21,170	25,475	33,464	475,523
A.C.F.C. & W.C.D., ZONE 7 (Local Supply)	265,555	20,340	21,773	23,468	26,397	27,252	384,785
PLEASANTON TOWNSHIP W.D.	674	0	0	0	0	0	674
SANTA CLARA VALLEY W.D.	854,826	91,663	101,938 6/	90,595	94,949	87,961	1,321,932
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.	89,984	7,344	6,197	5,354	5,880	4,412	119,171
MUSTANG W.D.	4,256	0	0	0	0	0	4,256
TRACY GOLF & COUNTRY CLUB	1,800	525	463	454	491	590	4,323
GRANITE CONSTRUCTION	120	0	0	0	0	0	120
LAKE DEL VALLE (E.B.R.P.D.)	983	158	152	130	137	142	1,882
ORESTIMBA CREEK	100	0	0	0	0	0	100
MUSCO OLIVE (C.V.P. water)	0	10	18	9	19	30	86
SOLANO CO. F.C.W.C.D.	0	0	0	1,400	1,550	13,452	16,402
SAN LUIS FIELD DIVISION							
DEPT. PARKS & REC. (STATE)	491	55	10	10	8	7	581
DEPT. FISH & GAME (STATE)	3,485	472	485	440	590	380	5,852
FED. CUSTOMERS (REC.+ JOINT-USE)	14,775,094	1,540,707	1,295,647	1,371,722	1,462,359	1,421,166	21,866,695
FED. CUSTOMERS (MISC.)	61,059	0	28,000	0	9,335	149,192	247,586
SAN JOAQUIN FIELD DIVISION							
TULARE LAKE BASIN W.S.D.	1,714,867	5,743	206,678	92,143	144,290	94,316 12/	2,258,037
EMPIRE WEST SIDE I.D.	56,699	0	5,197	2,300	4,401	3,475	72,072
COUNTY OF KINGS	27,700	3,100	3,400	3,700	4,000	4,000	45,900
HACIENDA W.D. 2/	75,895	0	0	0	0	0	75,895
KERN CO. W.A.	10,373,850	1,099,391	1,083,749	929,278 8/	1,028,124	1,009,520	15,523,912
KERN WATER BANK	0	0	0	0	7,501 10/	0	7,501
DUDLEY RIDGE W.D.	867,249	64,600	62,009	51,152	46,288	47,994	1,139,292
DEVILS DEN W.D.	235,908	20,845 4/	18,194	17,271	14,394	11,534	318,146
J.G. BOSWELL	86,705	30,725	0	0	0	0	117,430
SHELL CAL PROD. 3/	76,387	7,924	0	1,603	0	0	85,914
GREEN VALLEY W.D.	8,331	2,557	166	0	0	0	11,054
U.S.B.R. (FISH & WILDLIFE)	11,700	0	0	4,000	0	0	15,700
U.S.B.R. (CVP WATER)	316,306	95,406	130,763	13,050	137,289	153,211	846,025
WHEELER RIDGE W.S.D.	92	0	0	0	0	0	92
SOUTHERN FIELD DIVISION							
A.V.E.K. W.A.	410,190	32,662	37,064	32,449	34,089	34,079	580,533
M.W.D. OF S.C.	5,293,332	457,582 5/	729,209 7/	708,840	712,424	902,564	8,803,951
LITTLE ROCK CREEK I.D.	4,838	1	0	163	1,085	419	6,506
MOJAVE W.A.	57,589	0	0	0	17	9	57,615
DESERT W.A.	152,300	25,000	27,000	29,000	31,500	34,000	298,800
COACHELLA VALLEY W.D.	97,809	15,768	16,989	18,210	19,431	20,652	188,859
CRESTLINE-LAKE ARROWHEAD W.A.	11,830	1,128	1,422	1,506	1,849	2,006	19,741
SAN GABRIEL VALLEY M.W.D.	47,227	7,656	5,028	9,454	10,630	8,948	88,943
SAN BERNARDINO VALLEY M.W.D.	142,898	5,556	7,390	6,421	19,075 11/	21,386	202,726
DEPT. PARKS & REC., L.A. CO. REC. DEPT.	10,994	3,977	3,386	3,285	6,937	4,360	32,939
PIRU CREEK FISH ENHANCEMENT	2,915	0	0	0	0	0	2,915
CASTAIC LAKE W.A.	25,970	11,477	12,401	13,928	16,167	18,904	98,847
PALMDALE W.D.	0	0	1,558	3,096	5,379	1,770	11,803
UNITED WATER C.D. (Local Supply)	0	0	0	998	0	0	998
TOTALS	49,350,963	4,416,600	4,719,352	4,274,006	4,729,254	4,961,635	72,451,810

1/ Prior water right entitlement.

2/ Hacienda Water District was annexed by Tulare Lake Basin W.S.D. in 1981.

3/ Repayment of preconsolidation water.

4/ Includes 559 acre-feet of 1982 Exchange water stored in Lake Oroville and 126 acre-feet stored in a MWDC ground water basin.

5/ Billed for 126 acre-feet of 1982 Exchange Water, but not included here. Includes 3,111 acre-feet of local-out through reach 30.

6/ Includes 4,300 acre-feet of C.V.P. exchange water.

7/ Includes 45,584 acre-feet of Local-Out.

8/ Include 1,703 acre-feet transferred to Tulare Lake Basin W.S.D.

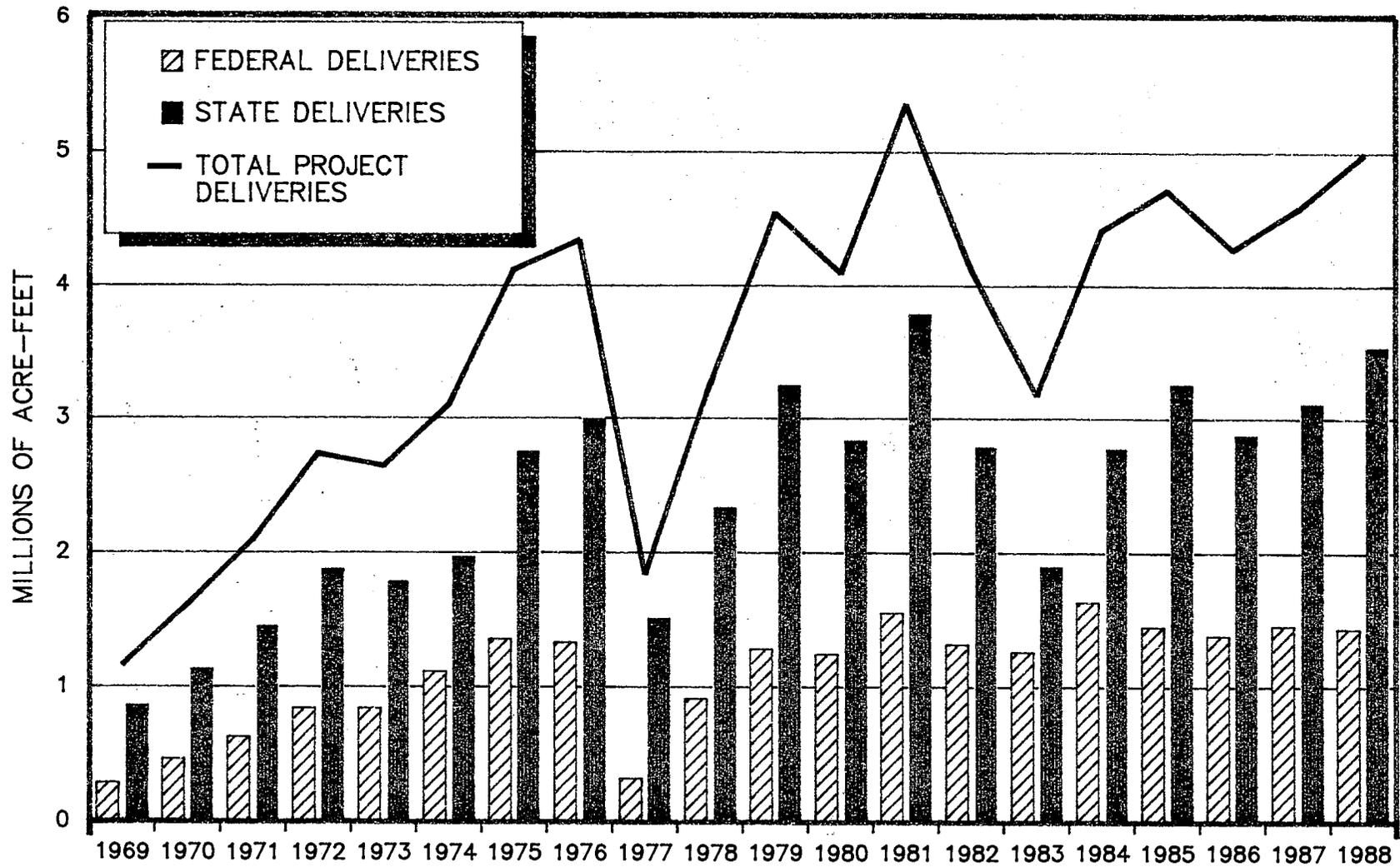
9/ Includes 6,500 acre-feet to K.C.W.D., 6,500 to Lakeside I.W.D., and 50 to Green Valley W.D.

10/ Advance storage of ground water, by agreement between K.C.W.A. and D.W.R.

11/ Includes 324 acre-feet of Local-Out.

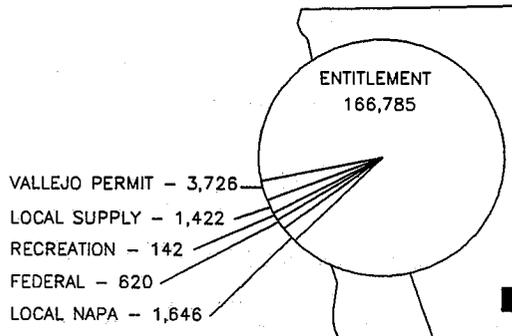
12/ Does not include 1,550 acre-feet transferred to Westlands W.D. (Federal).

FIGURE C: TOTAL PROJECT DELIVERIES
ANNUAL TOTALS

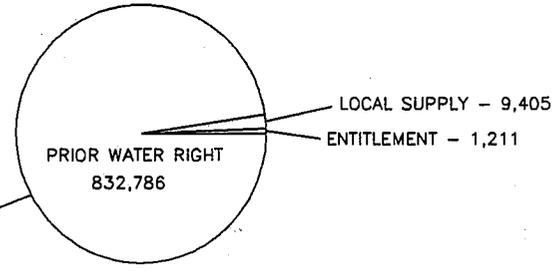


MAP 2 WATER DELIVERIES 1988 (in acre-feet)

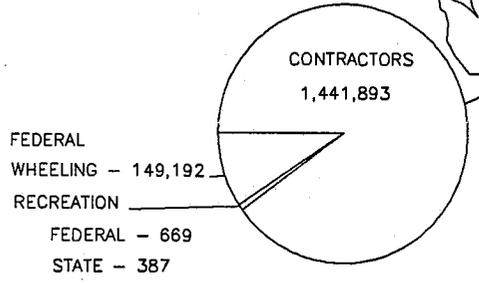
DELTA FIELD DIVISION
(TOTAL DELIVERIES - 174,341)



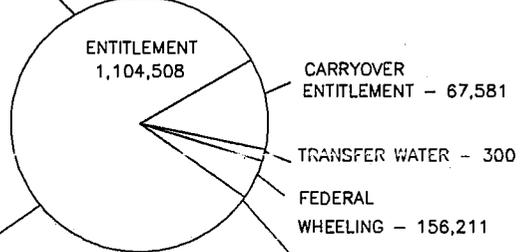
OROVILLE FIELD DIVISION
(TOTAL DELIVERIES - 843,402)



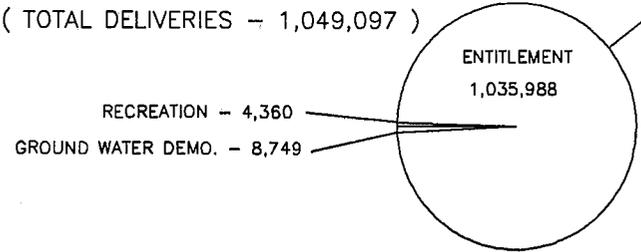
SAN LUIS FIELD DIVISION
(TOTAL DELIVERIES - 1,591,472)



SAN JOAQUIN FIELD DIVISION
(TOTAL DELIVERIES - 1,328,600)



SOUTHERN FIELD DIVISION
(TOTAL DELIVERIES - 1,049,097)



Total Deliveries
4,986,912

ENERGY OPERATIONS

ENERGY SOURCES

Energy generation from the State Water Project's (SWP) seven hydroelectric plants (Hyatt, Thermalito, Gianelli, William E. Warne, Castaic, Alamo and Devil Canyon) during 1988, totalled about 3,107,822 megawatt hours (MWh), as illustrated in Figure D on page 16. This is a 15 percent increase from that generated in 1987, and was sufficient to meet only about 52 percent of SWP energy requirements in 1988.

Edward Hyatt and Thermalito Power plants supplied 1,551,802 MWh in 1988, which is 12 percent above the amount generated in 1987, but well below the estimated average annual output of about 2,380,000 MWh at these plants. Generation at Edward Hyatt and Thermalito Power plants is shown in Figure E on page 18.

The combined energy generation at the SWP energy recovery plants (Gianelli, William E. Warne, Castaic, Alamo and Devil Canyon) totaled 1,556,020 MWh in 1988. This is a 17 percent increase over the amount generated in 1987.

Bottle Rock Powerplant, a 55-MW geothermal plant, began commercial operation on February 26, 1985. The powerplant supplied the SWP with a total of 141,819 MWh in 1988, which is a 41 percent decrease over the amount supplied in 1987.

Reid Gardner Unit No. 4 supplied the SWP with 1,633,309 MWh of energy in 1988, a 63 percent increase over the amount supplied in 1987.

Under a 50-year contract with the Kings River Conservation District, DWR receives all of the output of the 165-MW Pine Flat Powerplant. The plant furnished 130,312 MWh to the SWP in 1988 (only 51 percent of that furnished in 1987).

DWR has a contract with TERA Corporation for purchase of the energy production from two hundred 50-KW wind turbines to be constructed at Bethany Wind Park near the South Bay Pumping Plant. Only forty five wind turbines were operational at the end of 1988, and delivered 4,516 MWh to the SWP during the year.

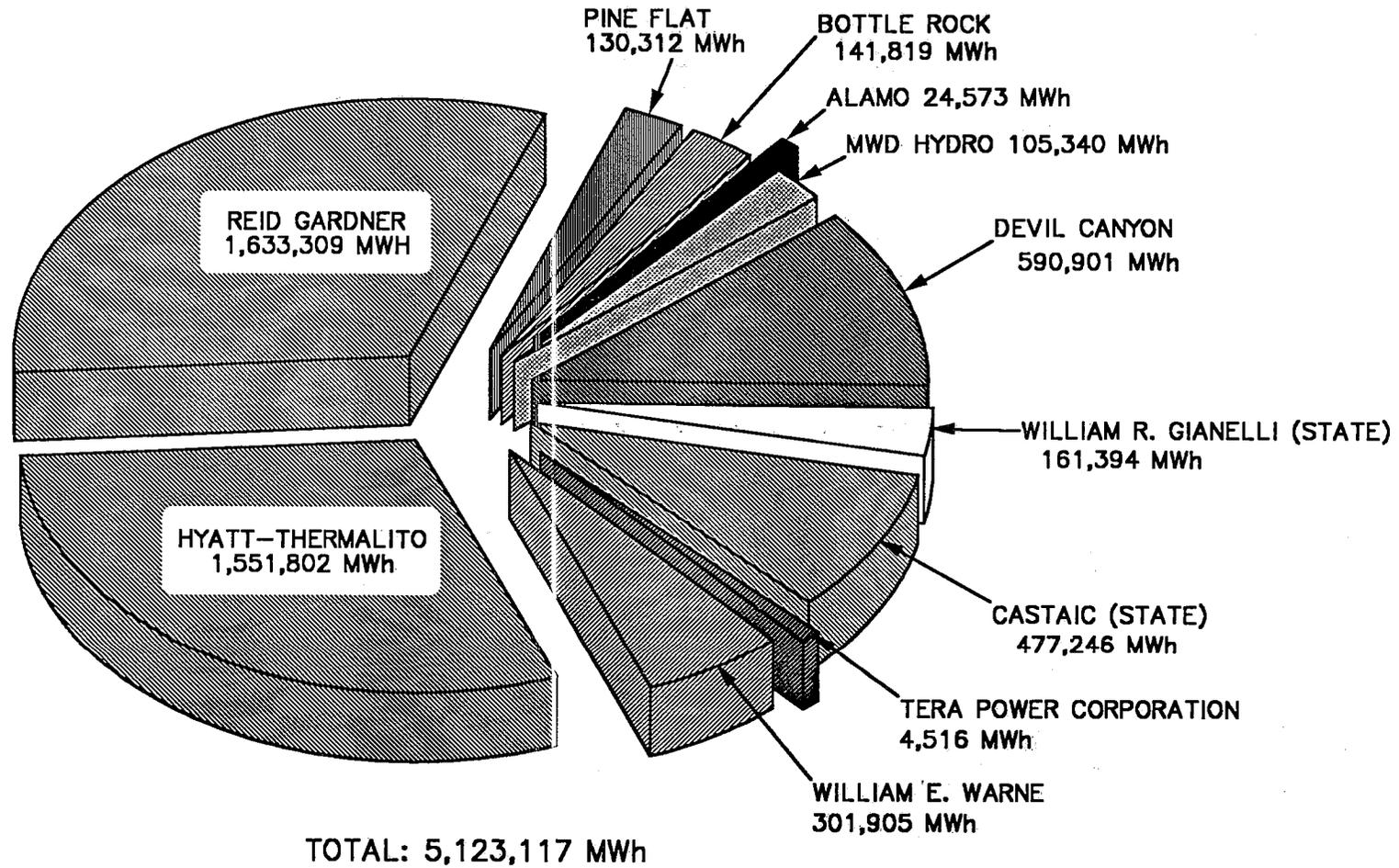
SWP energy generation as a part of all SWP energy sources in 1988 is illustrated in Figure D on page 16.

The SWP receives energy under contract from five small hydroelectric facilities (total capacity of 30 MW) owned and operated by The Metropolitan Water District of Southern California. In 1988, these plants furnished 105,340 MWh of energy to the SWP. DWR has exchange arrangements with Southern California Edison (SCE) and the Los Angeles Department of Water and Power 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 Power plants' generation and all of the output of Devil Canyon Power Plant and Alamo Power Plant 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. SCE return and additional energy to the SWP during 1988 was 2,685,030 MWh.

DWR purchased 148,221 MWh from various utilities in 1988. Most of the energy purchased came from the Pacific Northwest via DWR's contracted 300 MW of transmission capacity in the extra high voltage Pacific Northwest Intertie.

FIGURE D: SWP ENERGY SOURCES
1988



Note: These are SWP locations only. Purchases, Other Sources, and SCE Return Additional are not shown here. All values are metered readings at plants and are not adjusted for transmission losses.

**TABLE 3: PROJECT POWER RESOURCES
1988**

(in megawatthours)

RESOURCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
^{1/} Hyatt-Thermalito	55,792	60,745	135,001	162,764	132,289	189,829	241,443	160,824	129,878	102,966	101,286	78,985	1,551,802
Bottle Rock	16,470	14,916	14,679	15,321	15,472	13,826	12,953	12,766	3,459	8,568	6,519	6,870	141,819
William R. Gianelli													
State	0	240	3,670	9,598	17,036	29,887	63,944	27,976	3,213	4,659	1,171	0	161,394
Federal	0	2,741	675	0	28,646	75,081	40,050	12,536	490	0	0	0	160,219
Total	0	2,981	4,345	9,598	45,682	104,968	103,994	40,512	3,703	4,659	1,171	0	321,613
^{2/} William E. Warne	28,183	14,028	25,358	34,280	20,901	15,023	24,816	19,514	26,985	9,190	34,514	49,113	301,905
Castaic (State Share)	42,912	22,512	39,528	55,483	33,024	26,496	38,448	30,800	43,120	10,691	56,448	77,784	477,246
Alamo	1,475	355	2,396	2,910	2,618	2,154	2,654	2,245	1,966	2,278	1,273	2,249	24,573
Devil Canyon	26,233	4,490	65,560	62,137	73,173	64,112	64,128	52,320	56,839	59,998	28,764	33,147	590,901
Tera Corp.	36	47	258	351	684	585	681	713	479	414	134	134	4,516
MWD Hydro	29,520	34,900	0	0	0	0	0	0	0	0	23,860	17,060	105,340
Reid Gardner	166,665	152,985	167,184	53,673	148,550	120,453	146,798	153,217	131,092	137,021	121,887	133,784	1,633,309
Pine Flat	0	2,155	18,047	10,212	12,217	51,763	35,918	0	0	0	0	0	130,312
^{3/} Purchases	0	2,850	12,088	52,289	25,043	24,039	1,848	13,893	7,088	18	0	9,065	148,221
^{4/} Other Sources/Exchanges	44,152	34,891	7,165	33,541	67,603	42,418	3,537	12,096	40,412	30,219	36,517	41,583	394,134
SCE Return Additional	357,541	143,757	179,773	240,240	121,392	26,266	173,589	180,915	188,861	213,954	472,230	386,512	2,685,030

1/ Includes Table Mountain and Hyatt out adjusted to Tesla.

2/ Includes station-service energy.

3/ Includes Salt River Project, Portland General Electric, British Columbia Hydro Authority, Southern California Edison, Bonneville Power Authority, Pacific Gas and Electric, Washington Water & Power Co., Montana Power Co., San Diego Gas & Electric, Arizona Public Service Co., and Pacific Power & Light.

4/ Includes Salt River Project, Southern California Edison, Western Area Mid-Pacific, Los Angeles Dept. of Water and Power, Bonneville Power Authority, City of Vernon, and Pacific Gas & Electric.

State: 8,350,502

Federal: 160,219

Total Project: 8,510,721

FIGURE E: OPERATION OF EDWARD HYATT AND THERMALITO POWERPLANTS

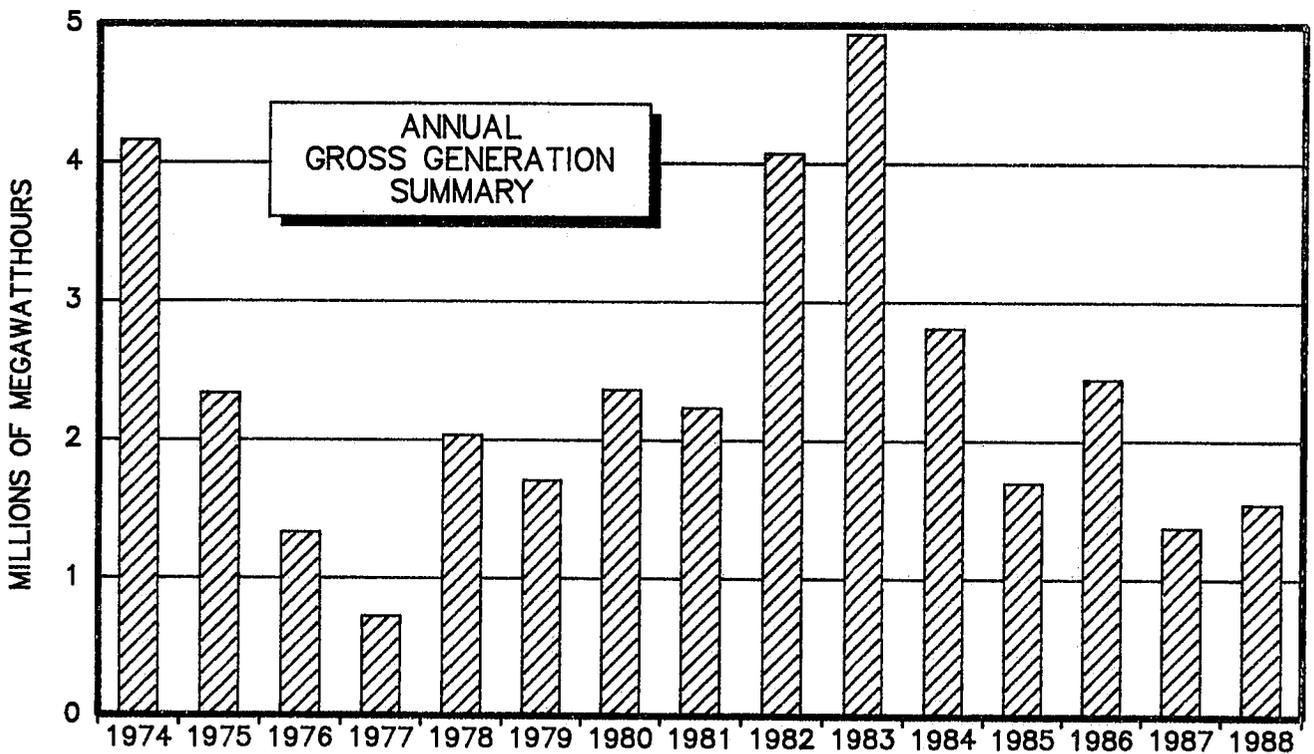
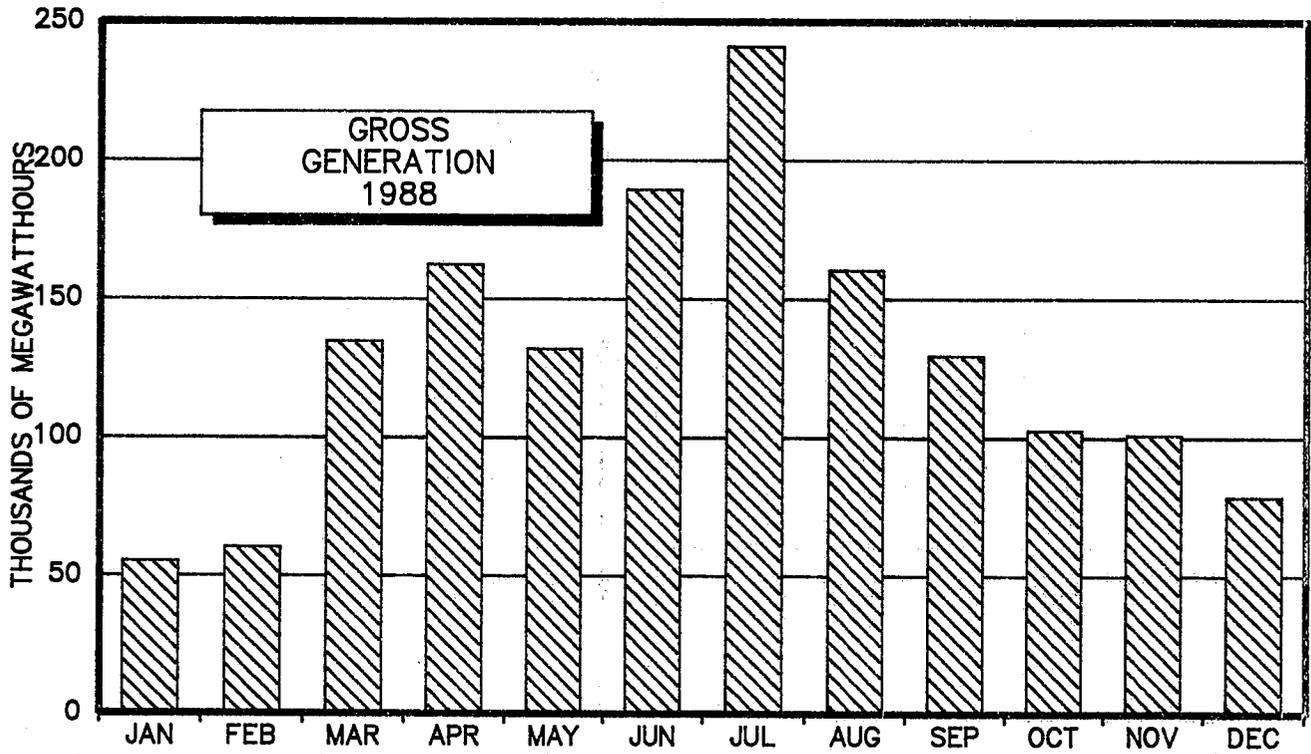
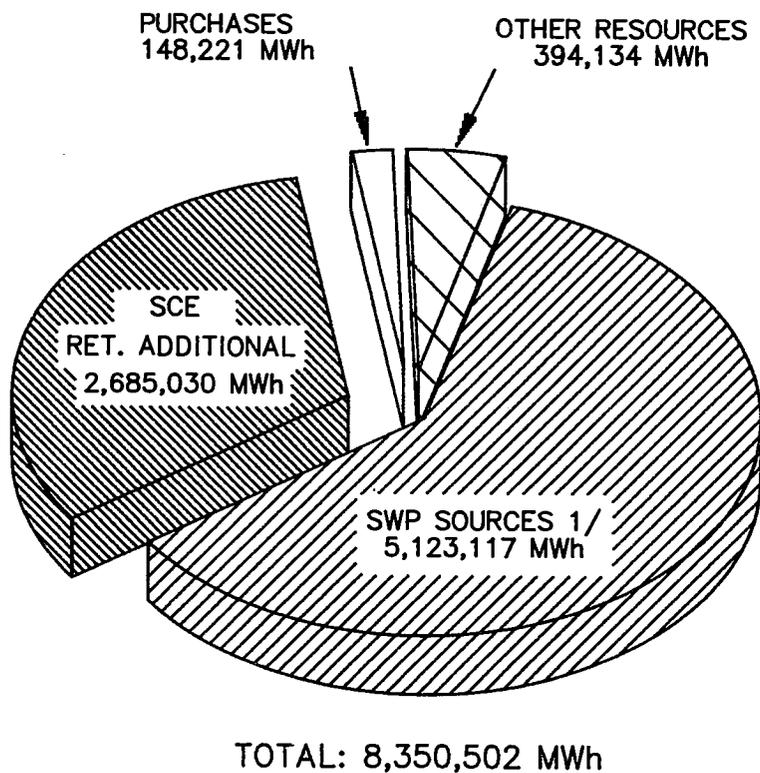


FIGURE F: ENERGY RESOURCES
(STATE ONLY)
1988



PURCHASES

1. Salt River Project	102,062 MWh
2. Portland General Electric	13,710 MWh
3. British Columbia Hydro Authority	9,116 MWh
4. Southern California Edison	8,042 MWh
5. Bonneville Power Authority	6,200 MWh
6. Pacific Gas and Electric	2,465 MWh
7. Washington Water and Power Co.	2,065 MWh
8. Montana Power Company	1,600 MWh
9. San Diego Gas and Electric	1,330 MWh
10. Arizona Public Service Company	831 MWh
11. Pacific Power and Light	800 MWh
	<u>148,221 MWh</u>

OTHER RESOURCES

1. Southern California Edison	201,148 MWh
2. Bonneville Power Authority	148,300 MWh
3. Pacific Gas and Electric	20,127 MWh
4. City of Vernon	13,464 MWh
5. Los Angeles Dept. of Water and Power	5,444 MWh
6. Salt River Project	4,200 MWh
7. Western Area Mid Pacific	1,452 MWh
	<u>394,135 MWh</u>

SCE RETURN ADDITIONAL

1. Total Received from SCE	4,058,615 MWh
2. SCE Hyatt-Thermalito Entitlement	-652,771 MWh
3. SCE Devil Canyon Entitlement	-590,901 MWh
4. SCE Alamo Entitlement	-24,573 MWh
5. MWD Hydro Entitlement	-105,340 MWh
	<u>2,685,030 MWh</u>

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

ENERGY LOADS

Total energy used by the SWP during 1988 was 6,437,729 MWh, not including 216,220 MWh for system losses. This amount was a 28 percent increase from that used in 1987. SWP energy use was nearly evenly distributed between the Pacific Gas & Electric Company service area and the SCE service area. SWP energy loads by field division are shown in Figure G on page 21, and also are listed in Table 4 on page 22.

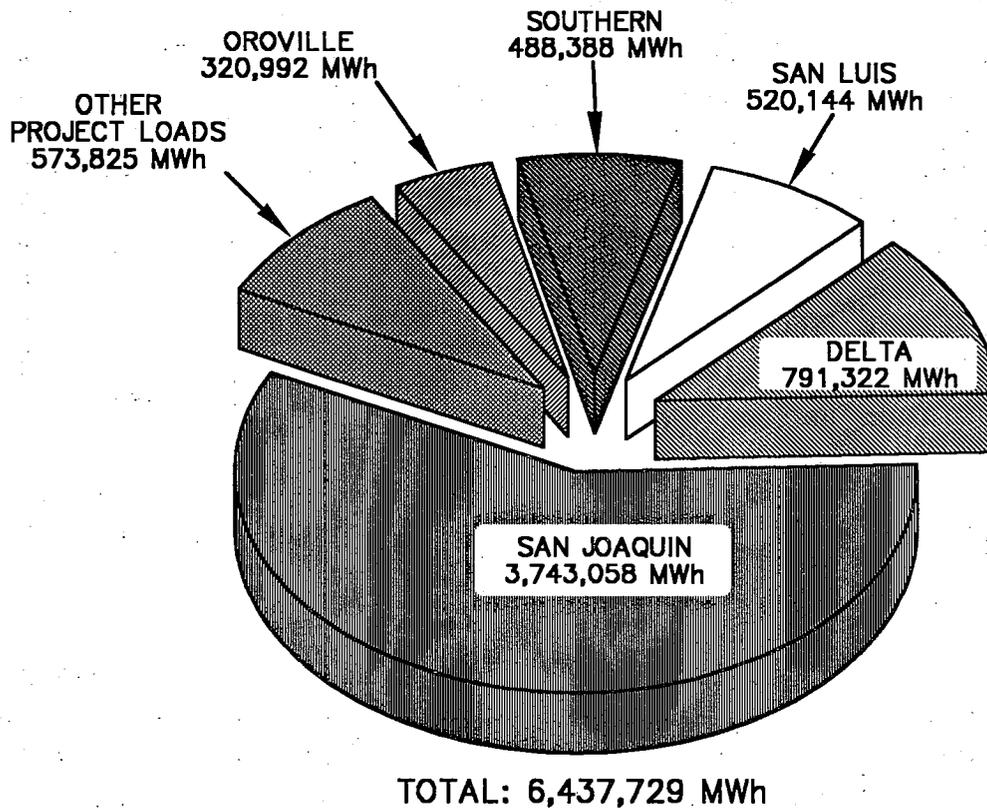
During 1988, SWP energy supplies (including substantial purchases under contractual obligations) exceeded SWP needs, and DWR sold the excess energy under power sale contracts to 15 utilities at current market rates. The total sale of energy during 1988 was 1,683,866 MWh. The decision to sell the power took into consideration projected SWP operations and changes in the power market as well as energy losses, transmission costs, and dispatching costs. DWR's computerized accounting system quickly monitors the status of the power purchases and sales operation. The

revenue from these energy sales during 1988 exceeded expenditures for purchases and transmission services. This reflects only the cash transactions during 1988, 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 and OM&R costs associated with the output of Pine Flat Powerplant.
- * debt service, OM&R, and fuel costs associated with Reid Gardner Unit No. 4 and other SWP owned generation facilities.

Energy loads in 1988 are illustrated in Figure H on page 23. Table 1 on page 10 presents totals for monthly pumping throughout the SWP.

**FIGURE G: PROJECT ENERGY LOADS
(BY FIELD DIVISION)
1988**



OROVILLE FIELD DIVISION

1. Hyatt-Thermalito Complex (Pump-back and Station Service) 320,992 MWh

DELTA FIELD DIVISION

1. North Bay 10,723 MWh
2. South Bay 129,260 MWh
3. Del Valle 1,169 MWh
4. Harvey O. Banks Delta 649,232 MWh
5. Bottle Rock (Station Service) 938 MWh

SAN LUIS FIELD DIVISION

1. William R. Gianelli 210,022 MWh
2. Dos Amigos 309,123 MWh
3. Pine Flat (Station Service) 999 MWh

SAN JOAQUIN FIELD DIVISION

1. Las Perillas 9,657 MWh
2. Badger Hill 25,839 MWh
3. Buena Vista 306,446 MWh
4. Wheeler Ridge 311,962 MWh
5. Wind Gap 686,705 MWh
6. A.D. Edmonston 2,402,449 MWh

SOUTHERN FIELD DIVISION

1. Oso 137,876 MWh
2. Pearblossom 350,153 MWh
3. William E. Warne (Station Service) 359 MWh

OTHER PROJECT LOADS

1. Southern California Edison 391,378 MWh
2. Bonneville Power Authority 148,300 MWh
3. City of Vernon 13,464 MWh
4. Pacific Gas and Electric 9,213 MWh
5. Nevada Power 8,635 MWh
6. Salt River Project 2,628 MWh
7. South Bay Station Service 207 MWh

**TABLE 4: PROJECT ENERGY USES
1988**

(in megawatthours)

SOURCE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Hyatt-Thermalito Pumpback and Station Service	41,593	30,947	10,297	536	3,481	7,489	905	15,280	37,522	50,013	68,451	54,478	320,992
North Bay 3/	382	337	81	88	134	904	0	336	1,834	2,235	2,160	2,232	10,723
South Bay	6,652	5,613	13,717	13,873	15,247	13,705	14,000	11,847	8,819	7,894	8,394	9,499	129,260
Del Valle	8	6	306	450	300	65	4	5	5	6	6	8	1,169
Banks													
State	111,701	96,640	71,898	60,178	55,763	50,072	31,171	41,336	49,527	21,835	21,660	37,451	649,232
Federal	2,646	2,926	4,487	15,811	0	0	28,395	31,757	9,574	12,675	20,450	16,217	144,938
Bottlerock 1/	23	21	2	0	21	0	0	0	120	125	325	301	938
San Luis													
State	91,247	47,726	19,786	14,952	7,392	133	102	290	10,065	3,360	3,233	11,736	210,022
Federal	27,672	0	16,702	26,073	5,023	0	0	0	12,093	12,194	34,749	43,777	178,283
Dos Amigos													
State	12,475	17,282	25,204	24,011	26,461	37,579	52,317	41,145	21,739	15,384	15,070	20,456	309,123
Federal	19,167	27,125	12,042	12,208	14,889	34,320	40,152	27,864	6,390	5,709	4,533	4,314	208,713
Pine Flat 1/	27	127	0	40	87	0	28	208	198	198	85	1	999
Las Perillas	166	513	659	815	1,099	1,531	1,938	1,344	688	626	158	120	9,657
Badger Hill	390	1,359	1,756	2,210	3,020	4,117	5,146	3,548	1,837	1,791	391	274	25,839
Buena Vista	17,796	10,436	29,214	32,887	28,785	26,179	36,909	29,305	24,430	17,481	21,594	31,430	306,446
Wheeler Ridge	20,125	8,495	28,128	35,938	30,643	23,202	33,426	26,203	26,425	19,146	24,342	35,889	311,962
Wind Gap	45,183	17,669	61,324	80,303	66,966	49,224	72,303	57,241	58,768	41,865	54,924	80,935	686,705
A.D. Edmonston	160,456	61,661	215,406	283,348	223,930	170,647	250,856	197,850	205,009	146,202	193,564	283,520	2,402,449
Oso	12,660	6,377	11,518	15,669	9,658	6,864	11,253	8,649	12,666	4,477	15,515	22,570	137,876
Pearblossom	17,052	2,708	34,767	43,696	43,046	30,975	42,250	32,966	26,641	29,799	18,140	28,113	350,153
Wm. E. Warne 1/	34	77	55	23	1	13	6	17	24	88	20	1	359
Other Project Loads 2/	44,191	53,191	38,729	20,415	40,502	70,548	114,882	50,985	34,206	37,022	31,916	37,238	573,825

1/ Station Service only.

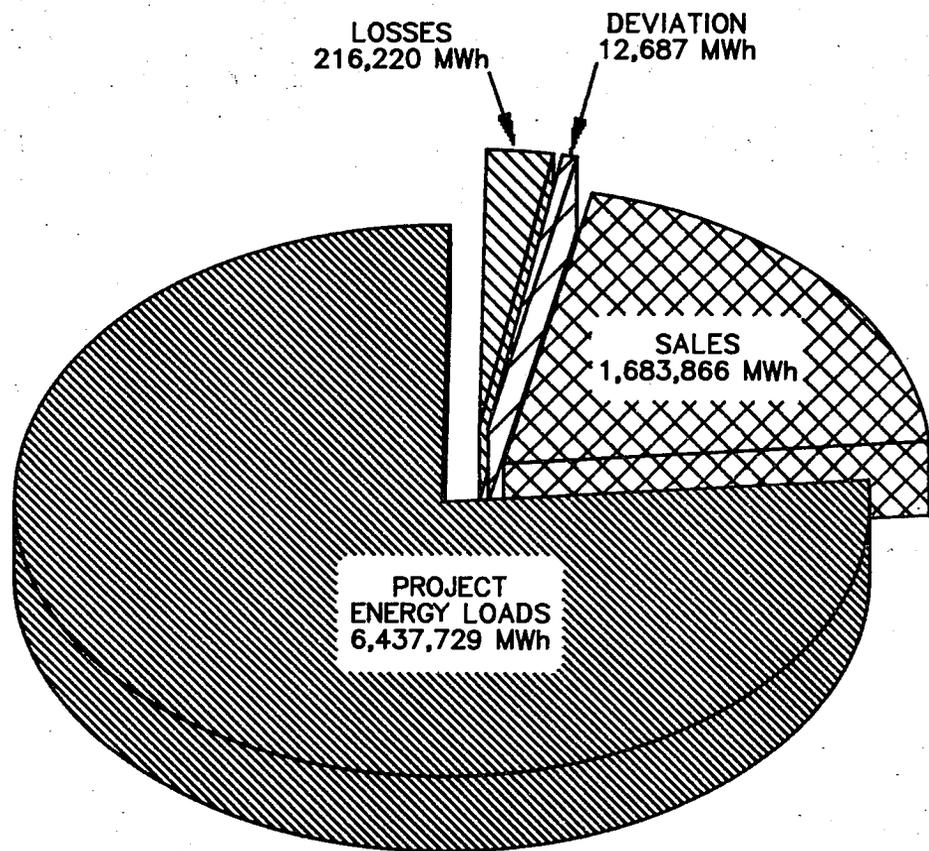
2/ Includes Southern California Edison, Bonneville Power Authority, City of Vernon, Nevada Power Company, Salt River Project, Project Emergency Service, and Deviation Adjustment for Pacific Gas and Electric.

3/ Includes Barker Slough, Cordelia Interim, and Cordelia Pumping Plants. Beginning in July, this table shows scheduled energy paid back to Pacific Gas and Electric.

Total State: 6,437,729
Total Federal: 531,934
Total Project: 6,969,663

FIGURE H: TOTAL ENERGY LOAD

1988



SALES

1. City of Vernon	473,803 MWh
2. Pacific Gas and Electric Company	445,753 MWh
3. Turlock Irrigation District	241,031 MWh
4. Southern California Edison	167,190 MWh
5. Nevada Power	130,324 MWh
6. Metro. Water Dist. of So. California	105,340 MWh
7. Modesto Irrigation District	65,875 MWh
8. Northern California Power Agency	35,295 MWh
9. City of Azusa	7,590 MWh
10. City of Anaheim	6,610 MWh
11. Salt River Project	3,160 MWh
12. Los Angeles Dept. of Water & Power	1,265 MWh
13. City of Riverside	350 MWh
14. City of Glendale	180 MWh
15. San Diego Gas and Electric	100 MWh

TOTAL: 8,350,502 MWh

Note: See Figure G for breakdown of Project Energy Loads.

SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS

The State Water Project (SWP) operations in the Sacramento-San Joaquin Delta are greatly influenced by the classification of year type as prescribed by the SWRCB D-1485. Earlier forecasts of the Sacramento Valley unimpaired runoff for the four river basins, confirmed by the May 1 forecast, classified the 1987-88 water year as a "critical year," thus relaxing water quality standards under D-1485. Water quality conditions were good throughout 1988, and all D-1485 standards were met.

The Delta Outflow Index (DOI) is a calculated value that is a relative measure of the net westerly flow of fresh water at Chippis Island near Pittsburgh. The DOI averaged slightly over 17,600 cfs in January of 1988, peaking at 29,163 cfs on January 9. The index averaged about 4,600 cfs in February, 5,500 cfs in March, 9,700 cfs in April. The index monthly average continued to decline through the summer, reaching a low of just under 2,200 cfs in September. Delta outflows generally increased during the fall, and the index average reached about 6,800 cfs in December. At all times, Delta outflow remained above the minimum needed to meet D-1485 standards. Sacramento River flow at Rio Vista also remained above the required minimum D-1485 standards.

SWP export of Delta water is limited by (1) the physical capacity of the Banks Pumping Plant at 6,400 cfs, (2) SWRCB's D-1485 May through July export limitations, and (3) Fish Pump Agreement May and June pumping restrictions. The D-1485 pumping limitations allow a mean daily pumping rate of 3,000 cfs or less during May, 3,000 cfs in June, and 4,600 cfs in July. Under the Fish Pump Agreement, May and June mean daily pumping rate cannot exceed 2,000 cfs, and the May 17-31 mean daily pumping rate cannot exceed 3,000 cfs for the period. In 1988, these limits were met with small margins by SWP.

During 1988, 2,166,279 AF were exported from the Delta for the SWP. January was the month of greatest total export with 374,216 AF and November was the month of lowest total export with 70,823 AF. The amount of water exported from the Delta in 1988 was 298,844 AF more than in 1987. Throughout the year, and especially during the summer months, pumping rates are increased on the weekends to take advantage of

less costly off-peak energy. This produces peaks in the export rate at about seven-day intervals.

Figure I on page 26 shows 1988 water quality data compared to their respective standards at three Delta stations: Emmaton, Jersey Point, and Terminous. Figure J on page 27 shows 1988 high-high tide at Antioch, the DOI, and Delta inflow.

DWR and USBR declared balanced water conditions^{5/} in the Sacramento-San Joaquin Delta twice during 1988: from February 23 through November 26 and from December 3 through December 25. 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 Coordinated Operation Agreement between the State and the U. S. Government which was signed on November 24, 1986. Figures K-1, K-2, and K-3 on pages 28, 29 and 30 show CVP-SWP coordinated operations for 1988. 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 so that water data at the Delta will then be referenced to the same time basis. For data comparisons and calculations at the Delta, storage withdrawals from Whiskeytown and Shasta Lakes are time lagged by five days, those from Lake Oroville are lagged by two days, and those from Folsom Lake are lagged by one day.

During the time when balanced water conditions were in effect, the State provided its share of storage releases to meet D-1485 water quality requirements of the Federal-State Coordinated Operation Agreement and the in-basin use.

Table 5 on page 31 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 DOI, provides a fresh

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.

water barrier to the more-saline water from the west, and thus maintains 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 DOI) is available for export from the Delta in accordance with the terms of D-1485.

The striped bass index, which indicates the number of young bass (averaging one and one-half inches in length) in the Sacramento-San Joaquin Delta, was the lowest in 29 years during the summer of 1988. The 1988 index was 4.6. Average indexes for the years 1958-76 and 1977-87 were 66.6 and 24.8, respectively. A low 1988 index was expected as a result of the drought conditions that prevailed in 1987 and 1988. Fishery experts continue to investigate possible causes for the decrease in the striped bass population.

Total exports (state and federal) for the year from the Delta by SWP facilities were about 3.94 million AF. For a detailed description of federal pumping at Harvey O. Banks Delta Pumping Plant, see page 42.

Operation of the SWP and CVP either increases or reduces the mean DOI. The DOI was augmented by the operation of the SWP in June, July, and August and reduced during the remainder of the year. The monthly mean rate of reduction during the year was about 3,371 cfs, and the monthly mean rate of augmentation was about 1,212 cfs. The DOI remained well above the level

required by D-1485 throughout 1988. Table 6 on page 32 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. 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.

By a February 1969 joint agreement among DWR, USBR, the U.S. Fish and Wildlife Service, and the Department of Fish and Game, DWR installs a temporary rock barrier on Old River during years when fall flows are forecast to be low. This barrier aids survival of migrating salmon and steelhead by increasing fall flows in the lower San Joaquin River near Stockton. In 1988, the barrier was installed on September 22 and removed on December 2.

A rock barrier on Middle River, constructed under the October 1986 South Delta Agreement, was installed on May 28, 1988. This barrier, which stores Middle River flows during high tide for use during low tide, keeps the Middle River water elevation high enough to allow agricultural water diversion.

For further information and data on 1988 Delta operations, see *DWR Bulletin 132-88, The California State Water Project; Appendix E, Water Operations in the Sacramento-San Joaquin Delta During 1988.*

FIGURE I: WATER QUALITY CONDITIONS AT SELECTED DELTA STATIONS
1988

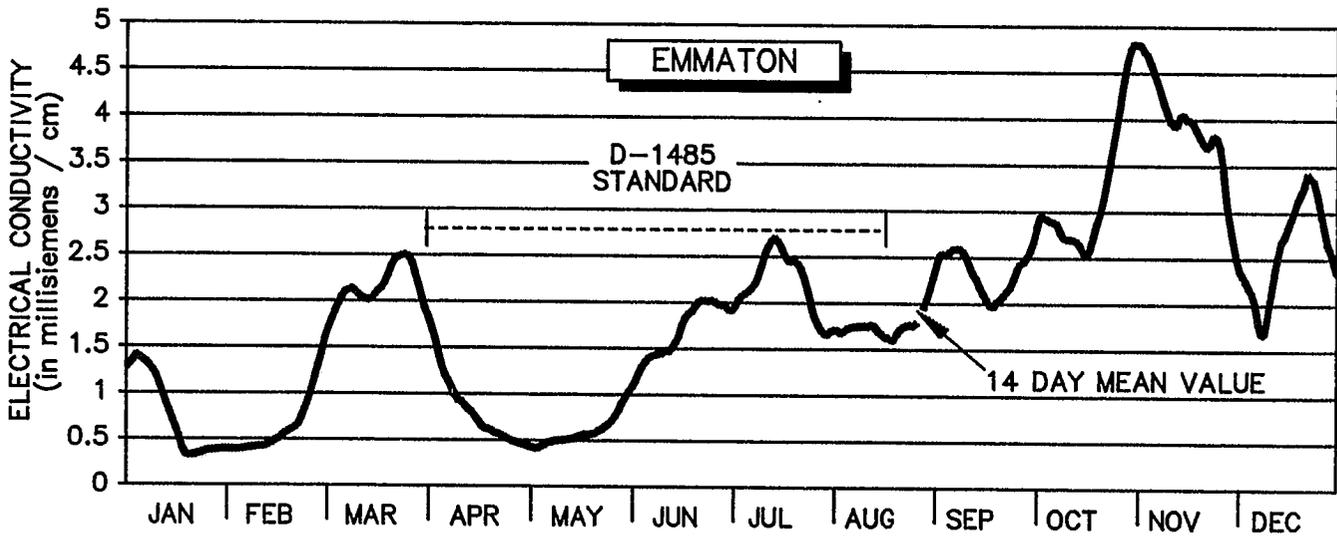
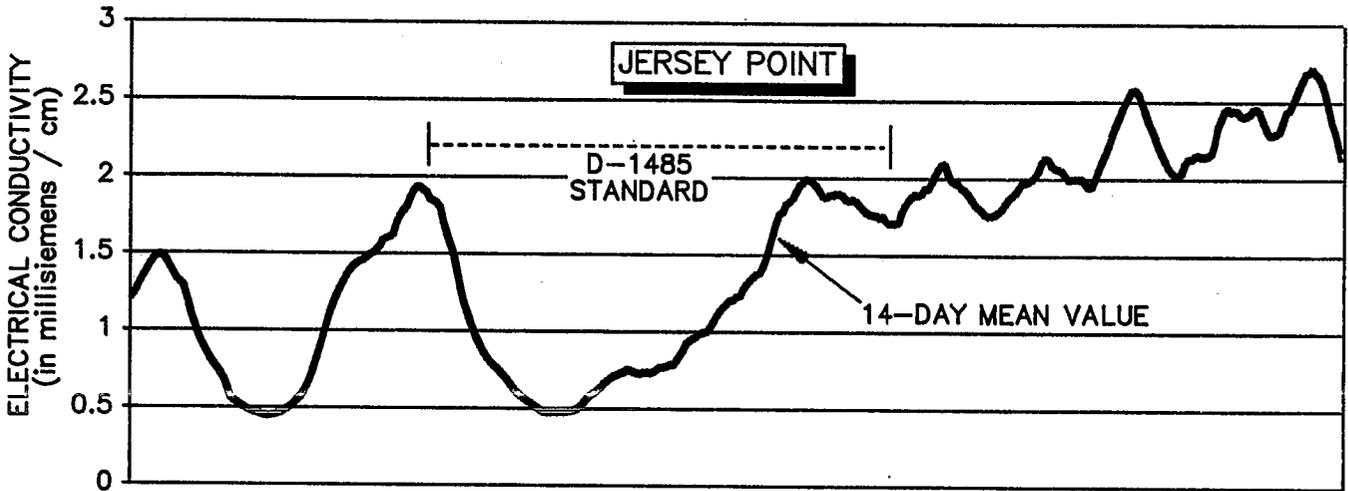
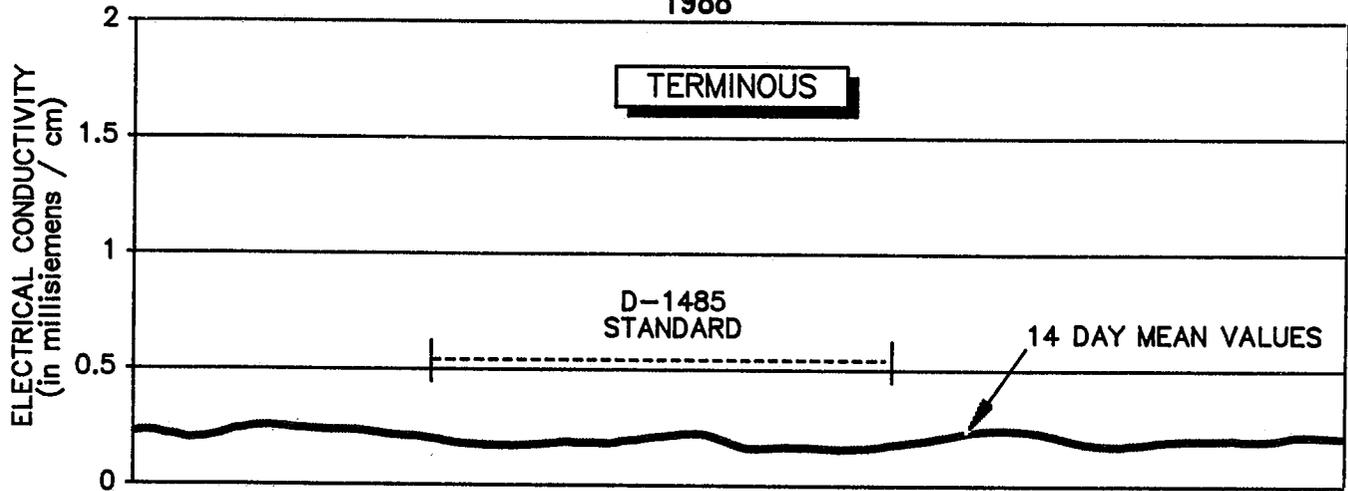


FIGURE J: DELTA TIDE, INFLOW, AND OUTFLOW INDEX
1988

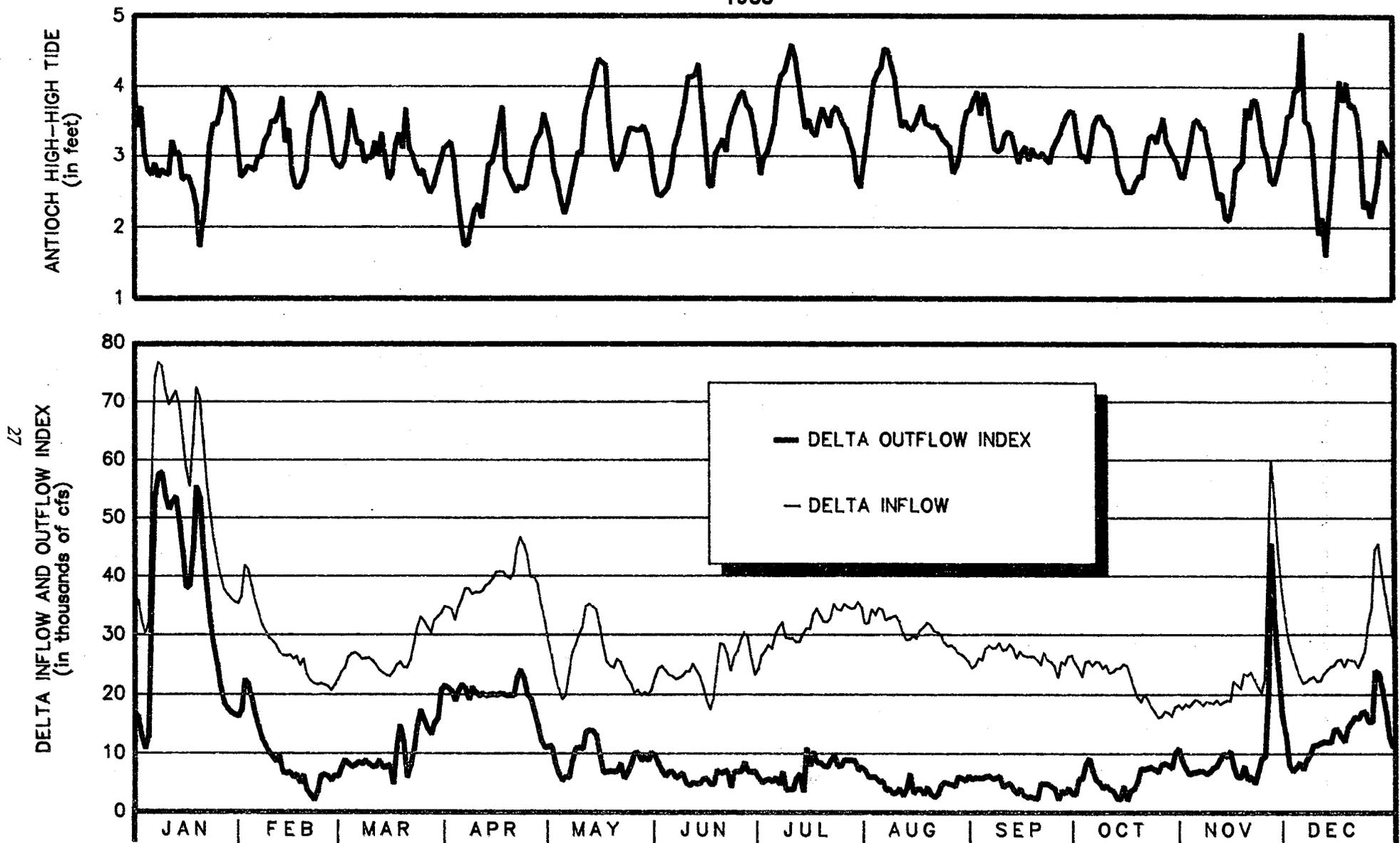
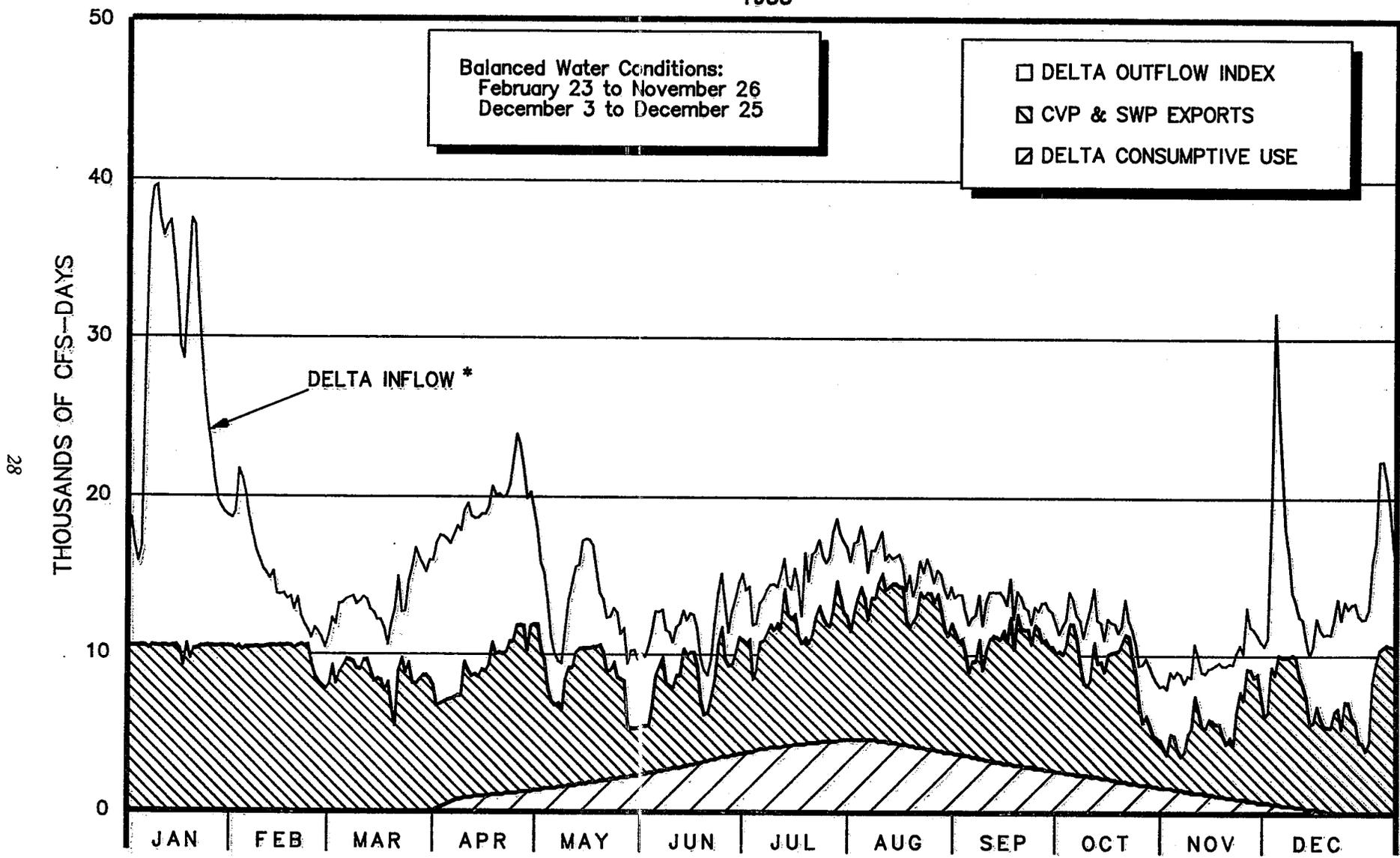


FIGURE K-1: COORDINATED DELTA OPERATIONS
1988



* Delta inflow = Exports + Outflow + Consumptive use.

FIGURE K-2: COORDINATED DELTA OPERATIONS
LAGGED STORAGE WITHDRAWALS
1988

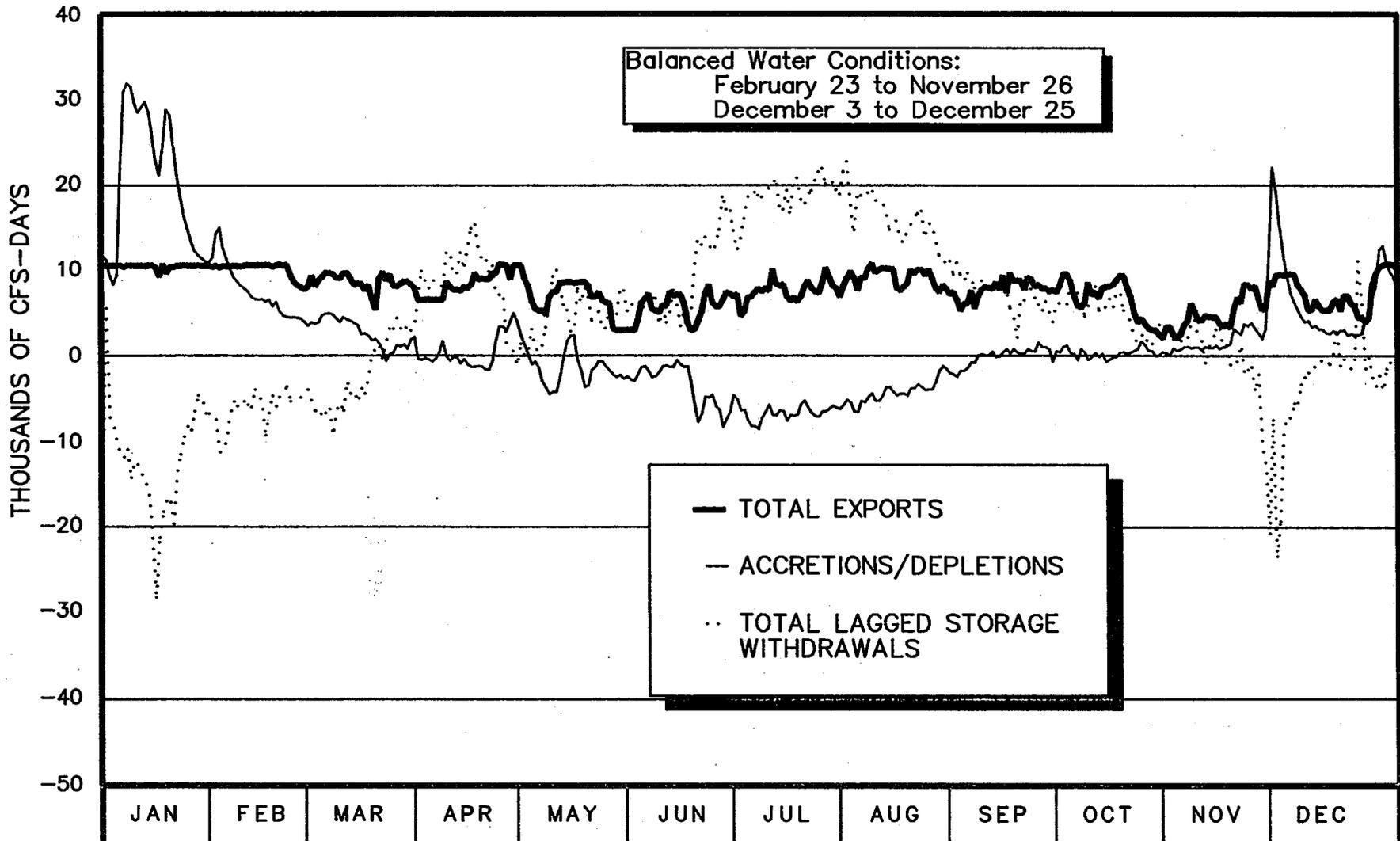
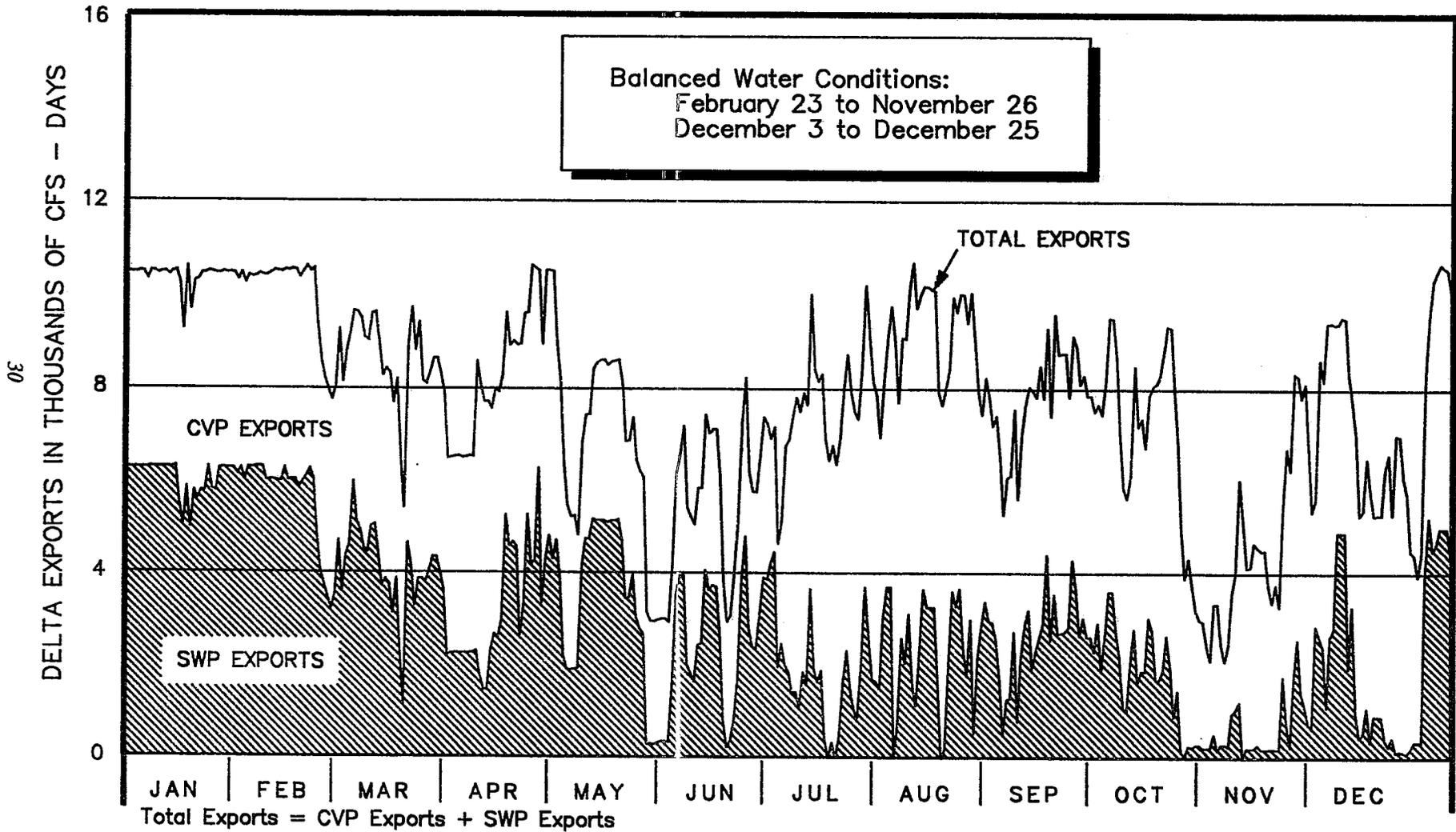


FIGURE K-3: COORDINATED DELTA OPERATIONS
DELTA EXPORTS
1988



**TABLE 5: SACRAMENTO BASIN AND SACRAMENTO-SAN JOAQUIN DELTA OPERATIONS
1988**

(in thousands of acre-feet except as noted)

MONTH	UPSTREAM RESERVOIR RELEASES TO RIVER			SACRAMENTO RIVER IN-BASIN USE 2/	DELTA INFLOW			DELTA USES			DELTA EXPORTS		
	KESWICK 1/	OROVILLE 1/	NIMBUS		SACRAMENTO RIVER AT SACRAMENTO 3/	SAN JOAQUIN RIVER AT VERNALIS 4/	TOTAL 5/	DELTA CONSUMPTIVE USE	DELTA OUTFLOW INDEX		TOTAL EXPORTS	EXPORTED BY DWR	EXPORTED BY USBR 6/
									TOTAL	AVERAGE CFS			
JAN	195	74	62	1,244	1,562	93	1,655	-56	1,084	17,630	383	374	9
FEB	193	69	58	419	701	78	779	-38	266	4,630	333	324	9
MAR	381	171	64	151	700	144	844	-10	338	5,494	259	244	15
APR	687	218	65	33	1,004	126	1,130	62	578	9,723	255	202	53
MAY	640	89	82	-109	671	102	773	121	280	4,559	184	184	0
JUN	646	178	93	-226	630	93	723	191	189	3,181	167	184	0
JUL	872	261	174	-404	896	80	976	268	221	3,602	200	104	96
AUG	760	160	89	-227	820	97	917	252	143	2,324	245	138	107
SEP	464	143	65	19	691	87	778	174	130	2,190	197	165	32
OCT	363	121	59	18	574	69	643	118	195	3,158	114	71	43
NOV	281	83	38	266	675	72	747	55	331	5,558	140	71	69
DEC	350	77	31	317	763	87	850	2	417	6,777	178	123	55
TOTAL	5,832	1,644	880	1,501	9,687	1,128	10,815	1,139	4,172	---	2,655	2,184	488

- 1/ Time lagged values (Keswick: 5 days; Oroville: 2 days).
- 2/ Positive values are accretions; negative values are 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.
- 6/ USBR water pumped at Harvey O. Banks Delta Pumpingplant.

**TABLE 6: DELTA OUTFLOW INDEX 1/
1988**

(in cfs-days except as noted)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	8,481	8,719	3,842	10,620	5,692	4,158	2,599	3,080	3,018	2,898	3,799	4,096
2	8,132	11,292	4,474	10,330	4,242	3,582	2,774	3,059	2,990	2,963	3,311	3,584
3	6,472	10,938	4,160	9,978	3,366	3,139	2,872	3,051	2,971	4,132	3,439	3,887
4	5,449	9,725	3,934	10,417	2,749	3,498	2,669	2,661	3,110	4,643	3,489	4,277
5	6,424	8,362	4,073	10,885	3,054	3,521	3,009	2,732	3,143	3,600	3,573	3,744
6	18,577	7,298	4,298	10,587	3,028	2,982	2,443	1,918	2,925	2,820	3,563	4,503
7	27,210	6,233	4,181	9,663	4,455	3,170	3,475	2,090	2,988	2,579	3,340	4,974
8	28,982	5,691	4,437	10,683	5,476	3,379	1,958	1,637	3,157	2,128	3,524	5,739
9	29,163	5,091	4,158	10,226	5,533	2,535	1,997	1,749	2,228	2,354	3,849	5,750
10	27,042	4,746	3,931	9,964	5,419	2,339	1,987	2,074	2,406	2,015	4,007	5,919
11	25,969	4,373	3,967	10,146	6,877	2,577	2,958	1,471	2,565	1,862	4,568	6,052
12	26,600	4,845	4,462	9,969	7,004	2,472	3,324	2,044	1,996	1,229	5,025	6,009
13	27,021	3,458	3,861	10,030	6,947	2,521	1,824	3,354	1,614	1,176	4,794	6,008
14	24,901	3,371	3,925	10,106	6,516	2,884	5,484	1,677	2,084	2,296	5,240	7,058
15	22,236	3,460	4,059	10,002	4,876	2,932	4,062	2,046	1,496	1,100	3,861	7,080
16	19,175	3,039	2,464	10,145	3,437	2,457	5,169	2,044	1,331	1,881	3,086	6,488
17	19,388	3,244	5,407	10,111	3,500	2,461	4,282	1,606	1,376	2,063	3,063	6,083
18	22,254	2,536	7,428	9,964	3,562	3,629	4,264	2,208	1,257	2,678	3,992	7,258
19	27,912	3,211	6,055	10,012	3,505	3,382	3,987	1,589	1,211	3,799	2,846	7,683
20	26,846	1,893	3,041	9,976	3,545	3,506	3,955	1,350	2,516	3,723	3,111	8,148
21	22,435	1,479	3,995	11,475	4,196	3,620	4,484	1,568	2,470	3,828	2,527	8,015
22	19,038	1,044	5,330	12,157	2,959	2,209	4,899	2,334	2,451	3,905	3,531	8,519
23	16,186	1,710	7,440	11,403	3,464	3,510	4,007	2,617	2,257	3,707	4,623	8,604
24	14,114	3,133	8,738	10,033	4,134	3,522	4,024	2,523	2,052	3,507	4,829	7,716
25	12,584	3,268	7,880	9,679	5,053	3,583	4,540	2,429	1,157	4,114	9,840	7,763
26	10,637	3,119	7,157	8,543	5,104	4,304	4,476	2,282	1,899	4,218	22,954	12,027
27	9,327	2,742	6,672	7,387	4,479	3,546	4,493	3,095	1,694	4,054	15,990	11,863
28	8,870	3,179	7,643	6,067	4,689	3,486	4,432	2,955	2,128	3,849	12,077	10,502
29	8,544	3,096	8,046	5,541	4,493	3,539	3,670	2,773	1,634	5,075	8,229	8,736
30	8,349		10,457	5,596	5,133	3,003	3,917	3,153	1,567	5,251	6,649	6,435
31	8,222		10,807		4,844		3,631	2,897		4,444		5,576
TOTAL	546,540	134,295	170,322	291,695	141,331	95,446	111,665	72,066	65,691	97,891	166,729	210,096
AVE.	17,630	4,631	5,494	9,723	4,559	3,182	3,602	2,325	2,190	3,158	5,558	6,777
MAX.	29,163	11,292	10,807	12,157	7,004	4,304	5,484	3,354	3,157	5,251	22,954	12,027
MIN.	5,449	1,044	2,464	5,541	2,749	2,209	1,824	1,350	1,157	1,100	2,527	3,584
TOTAL IN AF	1,084,062	266,374	337,834	578,577	280,330	189,317	221,488	142,943	130,298	194,167	330,707	416,725

1/ Excludes Yolo Bypass flows, if any.

PROJECT OPERATIONS BY FIELD DIVISION

OROVILLE FIELD DIVISION

Water Storage

The SWP's water storage facilities north of the Delta include Lake Oroville, Thermalito Forebay and Afterbay (Oroville-Thermalito Complex) and upper Feather River reservoirs consisting of Lake Davis, Frenchman Lake, and Antelope Lake. Lake Oroville operations stores winter and spring runoff for later SWP use.

None of the Upper Feather River reservoirs filled or spilled in 1988. Prior to 1987 Antelope Lake had spilled every year since its original filling in 1965 except 1977. Monthly operations for the three upper Feather River reservoirs are presented in Table 7 on page 35.

During 1988, inflow into Lake Oroville was insufficient to cause encroachment into the lake's

flood control reservation. The lake was not operated for flood control, and no water was released from the Oroville Dam spillway in 1988.

The computed inflow to Lake Oroville during 1988 was 1,665,889 AF. The maximum daily inflow into the lake was 18,699 AF on January 16, and the maximum daily release to the Feather River from the lake was 10,909 AF on June 22, 23, and 24. The minimum daily inflow into the lake was estimated at 12 AF on September 30.

Detailed information on Lake Oroville and the Oroville-Thermalito complex water operations is presented on pages 36 through 41.

The following table presents the 1988 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	16,414	5/10	13,072	11/10
Frenchman Lake	55,477	32,126	3/18	21,783	11/30
Lake Davis	84,371	55,426	1/16	41,448	11/06
Lake Oroville	3,537,577	2,765,523	3/13	1,484,341	11/09

Water Deliveries

Water stored in Lake Oroville is released into the Thermalito Diversion Pool, from which specified quantities are released into both the Feather River and the Thermalito Power Canal. The Power Canal supplies water first to the Thermalito Forebay and then to Thermalito Afterbay. From the Thermalito Afterbay, additional water is released to the Feather River and several local distribution systems for use in the Feather River Service Area (FRSA). Lake Oroville is operated for power generation, flood control, recreation, and fish and wildlife enhancement in addition to water supply. All of the water delivered to SWP contractors in the

Oroville Field Division was for municipal and industrial purposes.

In addition to Feather River releases, water is released from the Oroville-Thermalito complex to water rights holders predating the SWP construction. These deliveries are collectively called diversions to the FRSA and flow through the Sutter-Butte, Western, Richvale, P.G.& E. lateral, and Palermo outlets. FRSA diversions are not considered SWP benefits as they pre-dated and would have occurred in the absence of the SWP to the limit of available natural river flows. Nearly all FRSA diversions are for agricultural uses.

A total of 830,538 AF was diverted from the Feather River to the FRSA during 1988. The highest rates of diversion were from May through August with mean diversion rates above 2,400 cfs. About 15 to 25 percent of the total FRSA amount diverted eventually returns to the Feather River.

Deliveries during 1988 in the Oroville Field Division are shown in the table on the right:

Table 2 on page 12 shows water deliveries by year with totals to date for individual agencies.

Agency	Amount (ac-ft)
State Water Project (SWP) Contractors:	
County of Butte	385
Plumas County	523
Yuba City	303
Local Supply (under special contracts):	
Last Chance Water District	6,988
Thermalito Irrigation District	2,417
Prior Water Rights Entitlement:	
Upper Feather Lakes	2,248
Palermo Canal	8,374
Thermalito Afterbay Deliveries:	
Sutter-Butte Canal	508,220
PGandE Lateral	3,165
Richvale Canal	74,697
Western Canal	236,082
Total	843,402

Outages and Limitations

The following units at the Thermalito power plant were out of service for the times and reasons noted:

Unit	Outage Beginning	Outage Ending	Reason
1	05/06/88	05/20/88	Rewind one stator coil.
2	01/04/88	01/15/88	Annual maintenance.

The following units at the Edward Hyatt Pumping Generating plant were out of service for the times and reasons noted:

Unit	Outage Beginning	Outage Ending	Reason
1	04/12/88	04/25/88	Annual maintenance.
	10/03/88	10/17/88	Annual maintenance.
2	05/10/88	05/26/88	Annual maintenance and install new temperature device.
	11/02/88	11/16/88	Annual maintenance.
3	03/01/88	03/17/88	Annual maintenance.
	10/18/88	11/01/88	Annual maintenance.
4	01/01/88	01/06/88	Repair failure to start.
	01/10/88	01/19/88	Repair failure to start.
	01/25/88	02/29/88	Connect new control system, rewedge stator, and annual maintenance.
	04/01/88	04/07/88	Replace Turbine Shutoff Valve downstream seat O rings.
5	03/21/88	03/31/88	Annual maintenance and control system work.
	11/15/88	12/01/88	Repair packing box and annual maintenance.
6	04/26/88	05/09/88	Annual maintenance and install new temperature device.
	05/09/88	05/11/88	Repair voltage regulator.
	12/02/88	12/22/88	Repair cavitation damage and annual maintenance.

TABLE 7: UPPER FEATHER AREA LAKES MONTHLY OPERATION

1988

(in acre-feet except as noted)

MONTH	LAKE STORAGE			OUTFLOW						INFLOW	
	WATER SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	REGULATED RELEASE				SPILL	ESTIMATED EVAPORATION AND SEEPAGE	TOTAL OUTFLOW	COMPUTED OR ESTIMATED
				STREAMFLOW MAINT.	WATER SUPPLY CONTRACT	WATER RIGHT ENTITLEMENT	TOTAL REGULATED RELEASE				

ANTELOPE LAKE Capacity 22,566 acre-feet

JAN	4,991.70	14,139	-92	615	0	0	615	0	49	664	572
FEB	4,992.09	14,415	276	372	0	0	372	0	56	428	704
MAR	4,993.56	15,488	1,073	307	0	0	307	0	88	395	1,468
APR	4,994.69	16,344	856	298	0	0	298	0	152	450	1,306
MAY	4,994.64	16,168	-176	307	0	0	307	0	324	631	455
JUN	4,993.88	15,727	-441	298	0	0	298	0	311	609	168
JUL	4,992.87	14,979	-748	307	0	0	307	0	514	821	73
AUG	4,991.87	14,259	-720	307	0	0	307	0	443	750	30
SEP	4,990.99	13,644	-615	298	0	0	298	0	347	645	30
OCT	4,990.35	13,206	-438	307	0	0	307	0	161	468	30
NOV	4,990.98	13,637	431	298	0	0	298	0	108	406	837
DEC	4,991.09	13,713	76	307	0	0	307	0	76	383	459
TOTAL	---	---	-518	4,021	0	0	4,021	0	2,629	6,650	6,132

FRENCHMAN LAKE Capacity 55,477 acre-feet

JAN	5,569.83	31,181	514	123	0	0	123	0	77	200	714
FEB	5,570.23	31,623	442	115	0	0	115	0	77	192	634
MAR	5,570.56	31,991	368	94	12	188	294	0	134	428	796
APR	5,570.57	32,002	11	44	75	156	275	0	223	498	509
MAY	5,567.43	28,610	-3,392	0	3,044	0	3,044	0	490	3,534	142
JUN	5,565.24	26,384	-2,226	0	1,819	0	1,819	0	508	2,327	101
JUL	5,563.57	24,754	-1,630	0	1,029	0	1,029	0	693	1,722	92
AUG	5,562.19	23,453	-1,301	0	769	0	769	0	593	1,362	61
SEP	5,561.40	22,726	-727	44	194	0	238	0	519	757	30
OCT	5,561.06	22,418	-308	105	46	0	151	0	218	369	61
NOV	5,561.52	22,836	418	119	0	0	119	0	145	264	682
DEC	5,561.96	23,240	404	123	0	0	123	0	101	224	628
TOTAL	---	---	-7,427	767	6,988	344	8,099	0	3,778	11,877	4,450

LAKE DAVIS Capacity 84,371 acre-feet

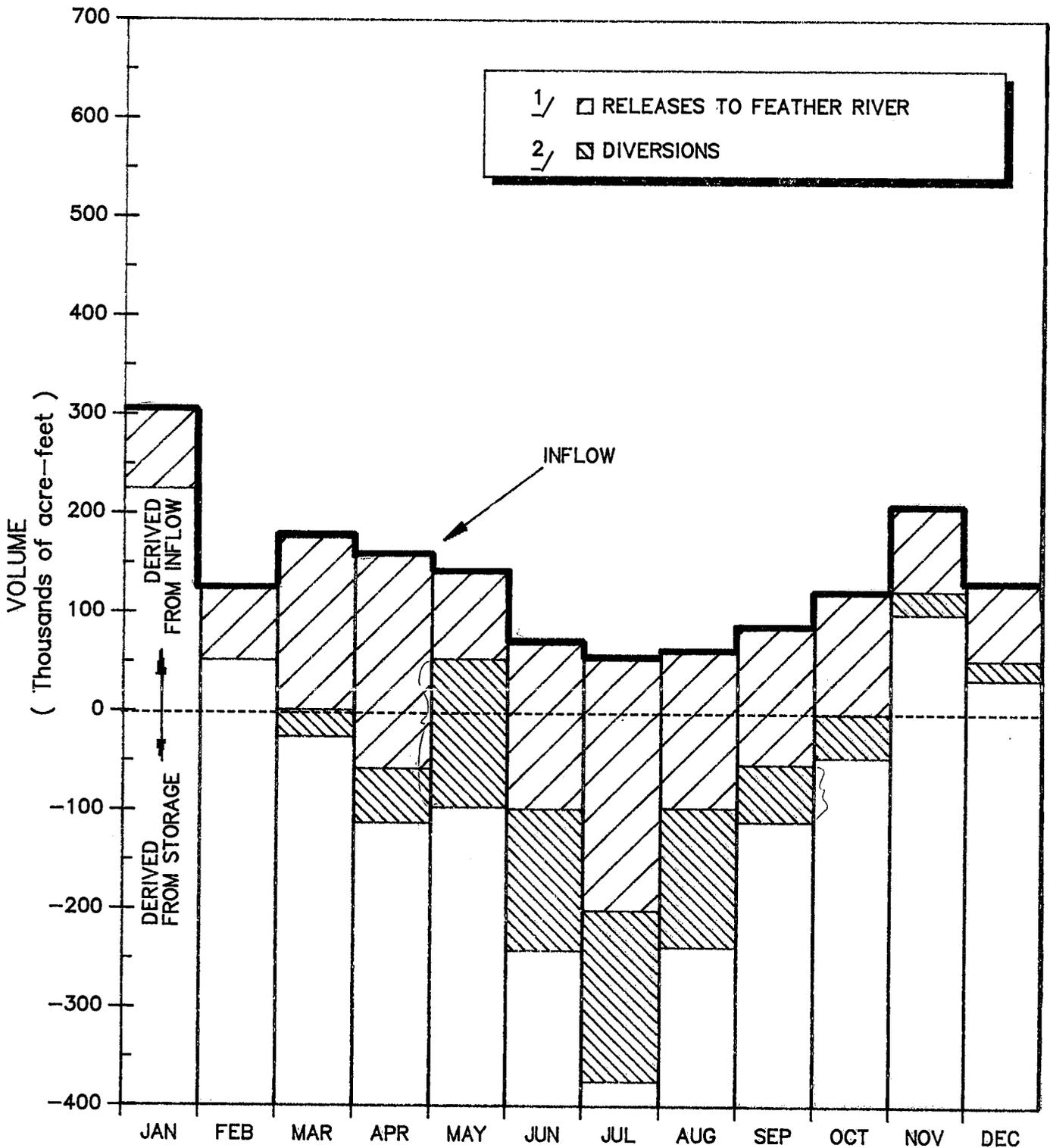
JAN	5,766.87	55,043	159	922	25	0	947	0	223	1,170	1,329
FEB	5,766.64	54,315	-728	863	13	0	876	0	222	1,098	370
MAR	5,766.71	54,536	221	619	36	0	655	0	380	1,035	1,256
APR	5,766.47	53,780	-756	512	39	83	634	0	630	1,264	508
MAY	5,765.92	52,072	-1,708	246	92	369	707	0	1,242	1,949	241
JUN	5,765.32	50,246	-1,826	238	65	357	660	0	1,520	2,180	354
JUL	5,764.47	47,719	-2,527	246	103	369	718	0	1,960	2,678	151
AUG	5,763.61	45,238	-2,481	246	95	369	710	0	1,810	2,520	39
SEP	5,762.86	43,139	-2,099	238	66	357	661	0	1,526	2,187	88
OCT	5,762.33	41,691	-1,448	594	32	0	626	0	867	1,493	45
NOV	5,762.82	43,029	1,338	595	10	0	605	0	435	1,040	2,378
DEC	5,762.82	43,029	0	615	11	0	626	0	302	928	928
TOTAL	---	---	-11,855	5,934	587	1,904	8,425	0	11,117	19,542	7,687

* At end of month.

FIGURE L : OROVILLE-THERMALITO COMPLEX

INFLOW, RELEASES AND DIVERSIONS

1988



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 8: LAKE OROVILLE MONTHLY OPERATION

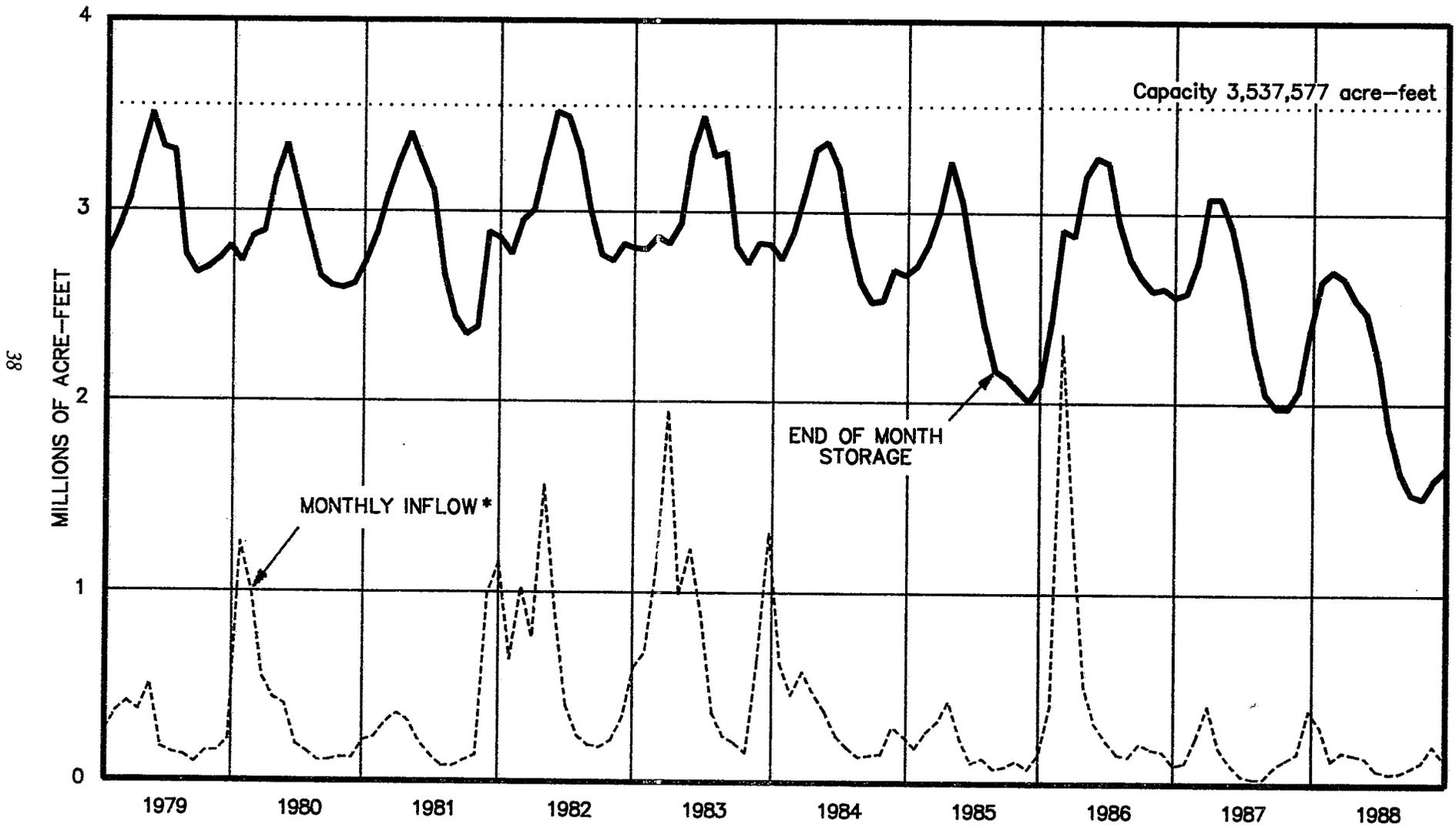
(in acre-feet except as noted)

Capacity 3,537,577 acre-feet

MONTH	YEAR	WATER SURFACE ELEVATION	STORAGE	STORAGE* CHANGE	OUTFLOW						PUMPBACK	COMPUTED TOTAL INFLOW (excluding pumpback)
					POWER	PALERMO CANAL	SPILLWAY LEAKEAGE	EVAPORATION	SPILL	TOTAL OUTFLOW		
JAN	1988	837.90	2,649,289	261,282	93,046	143	63	862	0	94,114	50,879	304,517
	1987	832.80	2,584,139	20,081	139,321	258	0	961	0	140,540	47,726	112,895
FEB	1988	841.94	2,701,689	52,400	104,469	174	149	2,505	0	107,297	33,140	126,557
	1987	845.14	2,743,689	159,550	88,564	237	0	1,558	0	90,359	4,768	245,141
MAR	1988	838.86	2,661,680	-40,009	223,005	383	214	3,733	0	227,335	10,852	176,474
	1987	869.46	3,078,012	334,323	95,147	276	165	2,620	0	98,208	18,400	414,131
APR	1988	830.31	2,552,740	-108,940	266,187	715	36	3,481	0	270,419	399	161,080
	1987	869.45	3,077,869	-143	187,218	658	305	5,437	0	193,618	545	192,930
MAY	1988	824.37	2,478,918	-73,822	217,213	901	0	4,934	0	223,048	3,828	145,398
	1987	858.82	2,928,412	-149,457	258,753	1,152	228	7,101	0	267,234	12,605	105,172
JUN	1988	804.14	2,238,794	-240,124	316,193	1,018	0	6,468	0	323,679	8,162	75,393
	1987	838.88	2,661,938	-266,474	305,985	1,190	60	8,716	0	315,951	4,862	44,615
JUL	1988	769.62	1,867,685	-371,109	422,182	1,115	0	8,068	0	431,365	1,033	59,223
	1987	808.59	2,290,153	-371,785	392,948	1,230	0	8,416	0	402,594	1,930	28,879
AUG	1988	746.51	1,645,221	-222,464	297,805	1,107	0	6,460	0	305,372	19,731	63,177
	1987	787.37	2,052,510	-237,643	281,463	1,230	0	8,127	0	290,820	21,966	31,211
SEP	1988	733.54	1,528,900	-116,321	247,354	1,115	0	5,296	0	253,765	47,504	89,940
	1987	780.41	1,978,538	-73,972	181,611	1,125	0	5,737	0	188,473	19,150	95,351
OCT	1988	731.01	1,506,898	-22,002	202,590	1,008	0	3,359	0	206,957	64,316	120,639
	1987	780.26	1,976,965	-1,573	135,185	902	0	4,394	0	140,481	8,092	130,816
NOV	1988	742.21	1,605,991	99,093	195,712	491	0	863	0	197,066	86,799	209,360
	1987	788.99	2,069,358	92,393	125,809	254	0	1,144	0	127,207	51,564	168,036
DEC	1988	748.14	1,660,266	54,275	150,037	204	0	969	0	151,210	70,616	134,869
	1987	816.88	2,388,007	318,649	120,417	100	0	741	0	121,258	46,690	393,217
TOTAL	1988	---	---	-727,741	2,735,793	8,374	462	46,998	0	2,791,627	397,259	1,666,627
	1987	---	---	-176,051	2,312,421	8,612	758	54,952	0	2,376,743	238,298	1,962,394

*At end of month

FIGURE 14: LAKE OROVILLE OPERATION



* Excludes pumpback.

FIGURE N: OPERATION OF LAKE OROVILLE FOR FLOOD CONTROL
1987-88

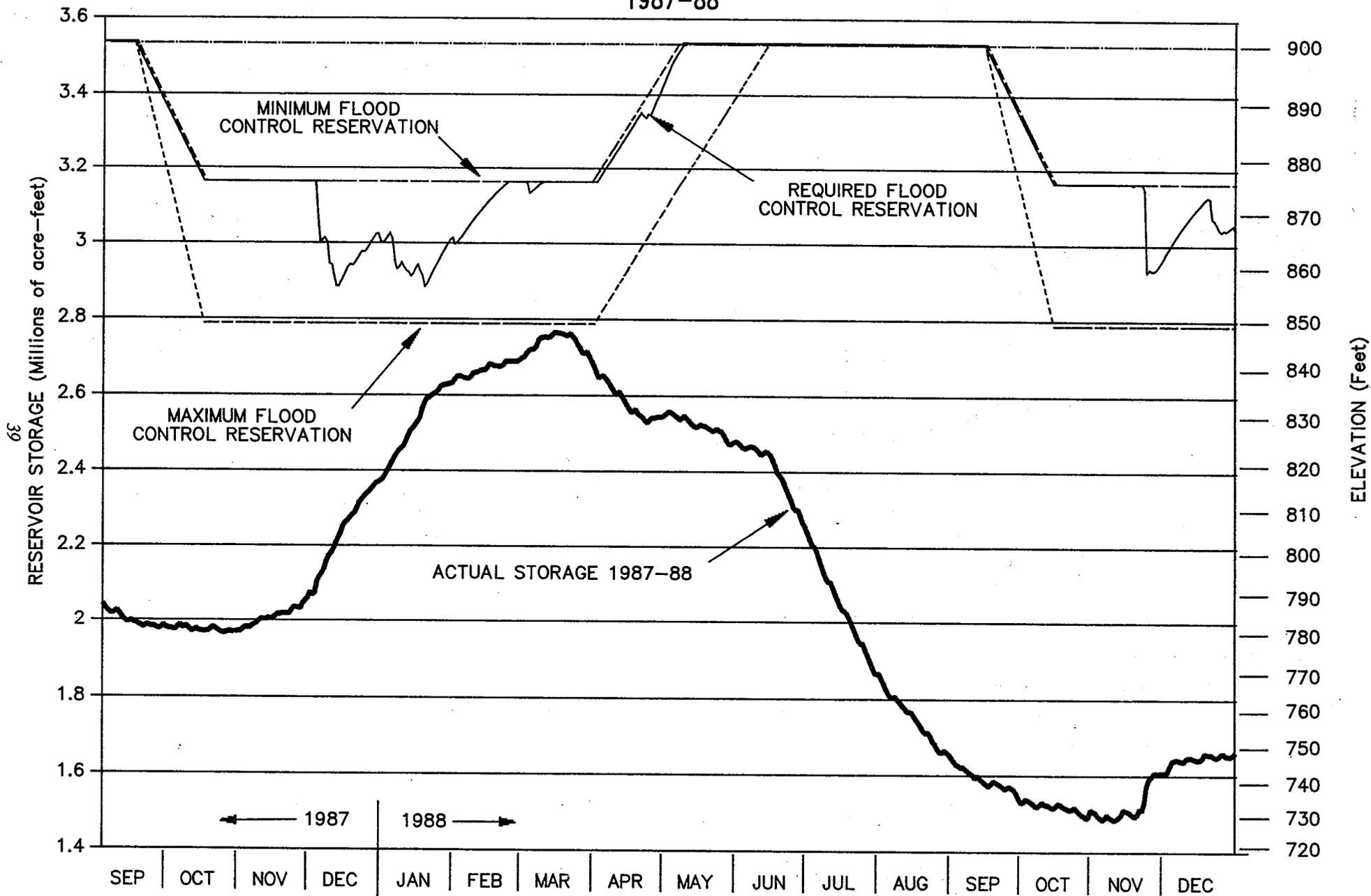
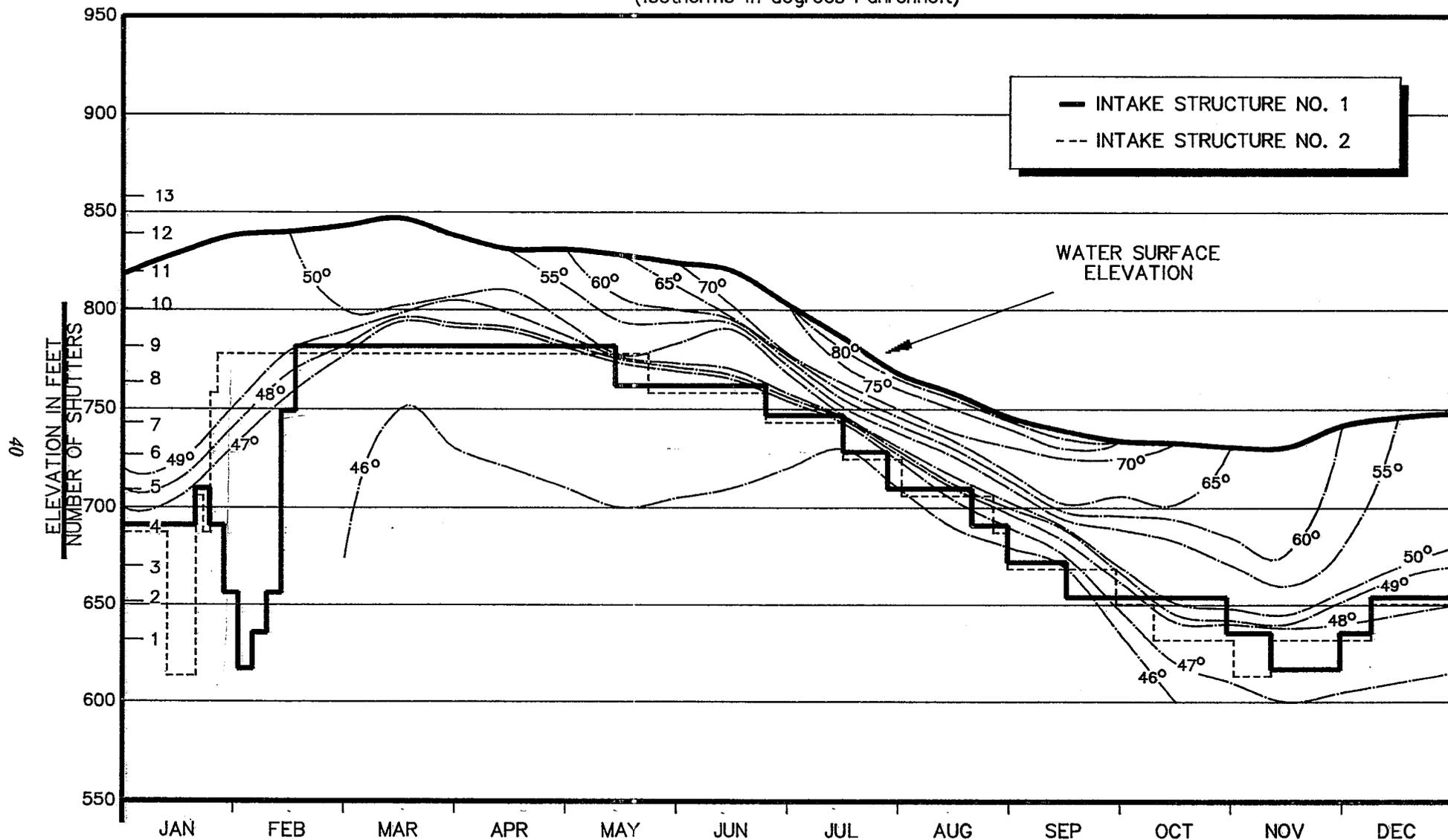


FIGURE 0: LAKE OROVILLE TEMPERATURES
 1988
 (isotherms in degrees Fahrenheit)



Note: Temperature data is obtained once per month, approximately every 25 to 30 days, and averaged for the rest of the year.

TABLE 9: OROVILLE-THERMALITO COMPLEX MONTHLY STORAGE

(elevations in feet, end of month storage in acre-feet)

MONTH	YEAR	THERMALITO DIVERSION DAM POOL		THERMALITO FOREBAY		THERMALITO AFTERBAY	
		ELEVATION	STORAGE	ELEVATION	STORAGE	ELEVATION	STORAGE
JAN	1988	223.17	12,945	223.88	11,071	126.75	22,216
	1987	223.08	12,739	223.14	10,619	130.14	32,618
FEB	1988	223.11	12,749	223.00	10,534	131.20	36,256
	1987	224.25	13,111	224.00	11,144	130.79	34,827
MAR	1988	223.41	12,844	223.30	10,716	133.66	45,384
	1987	223.44	12,853	223.30	10,716	129.09	29,194
APR	1988	222.89	12,679	222.72	10,365	131.78	38,322
	1987	223.93	12,692	222.88	10,462	130.04	32,285
MAY	1988	223.62	12,910	223.46	10,813	129.58	30,770
	1987	222.34	12,507	222.30	10,114	227.96	25,711
JUN	1988	223.48	12,866	223.60	10,899	129.49	30,478
	1987	223.62	12,910	224.02	11,157	130.28	33,088
JUL	1988	222.64	12,601	222.60	10,293	131.04	35,685
	1987	223.60	12,904	223.94	11,107	135.68	53,557
AUG	1988	228.22	12,703	223.00	10,534	130.04	32,285
	1987	223.62	12,910	223.96	11,120	130.97	35,451
SEP	1988	223.22	12,783	222.96	10,510	133.43	44,491
	1987	223.30	12,809	223.42	10,789	134.54	48,872
OCT	1988	223.99	13,028	224.04	11,169	128.42	27,104
	1987	223.33	12,818	223.28	10,704	133.38	44,298
NOV	1988	223.30	12,809	223.08	10,582	132.85	42,274
	1987	223.59	12,901	223.66	10,935	128.79	28,249
DEC	1988	223.66	12,923	223.66	10,935	132.01	39,156
	1987	222.50	12,557	222.90	10,474	129.30	29,865

DELTA FIELD DIVISION

Water Storage

The maximum storage in Lake Del Valle of 41,273 AF was reached on June 12, exceeding the operational storage capacity of the lake (a permit discussed on page 9 allowed for exceeding the normal operational storage capacity). Storage above 39,000 AF is flood reservation between November 1 and March 31, and storage above 40,000 AF is flood reservation between April 1

and October 31. The minimum storage of 24,532 AF occurred on January 1 and again on January 9, about 63 percent of the operational storage capacity. Table 10 on page 44 and Figure P on page 45 present reservoir operations for Lake Del Valle in 1988. Table 11 on page 46 presents Clifton Court Forebay's monthly operations in 1988.

Water Deliveries

Comparisons of the 1988 water deliveries to the three areas the Delta Field Division serves and their percent differences from 1987 deliveries are shown in the following table:

Area	Water Deliveries (in ac-ft)	Difference from 1987 (in percent)
California Aqueduct	4,412	-31
North Bay Aqueduct	7,038	-24
South Bay Aqueduct	162,129	+9

Of the total SWP entitlement water delivered in the Delta Field Division, 156,305 AF was for municipal and industrial purposes.

In addition to the SWP deliveries, 590 AF of Central Valley Project (CVP) water was wheeled through the Governor Edmund G. Brown California Aqueduct (California Aqueduct) to Tracy Golf and Country Club, and 30 AF of CVP water was wheeled to Musco Olive Products Inc.

Also, a total of 142 AF of SWP water was delivered from Lake Del Valle for use at public recreation facilities administered by the East Bay Regional Park District.

Table 2 on page 12 presents water deliveries by year with totals to date for individual agencies.

Pumping Plants

Pumping at Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant) for 1988 totaled 2,654,293 AF, 21 percent more than that pumped during 1987. Of that total, 488,027 AF was pumped for USBR.

In complying with D-1485 limitations on Delta diversions described on page 29, the USBR foregoes up to 193,590 AF of its May-June diversion capacity at its Tracy Pumping Plant. This foregone capacity is then replaced by pumping

CVP water at Banks Pumping Plant. 193,590 AF of CVP water was pumped at Banks Pumping Plant in 1988 to replace capacity foregone in May and June due to CVP export reductions. Pumping at South Bay Pumping Plant totaled 150,976 AF for 1988, 3 percent more than the amount pumped in 1987, while pumping at Del Valle Pumping Plant was only 16,979 AF for the year. Pumping at the three North Bay Pumping Plants totaled 39,591 AF for the year.

Outages and Limitations

The table on the right presents the times and reasons that units at the pumping plants in the Delta Field Division were out of service. If no date is given in the "Outage Ending" column, the unit remained out of service at the end of 1988:

Unit	Outage Beginning	Outage Ending	Reason
Banks Pumping Plant:			
1	05/22/88	06/03/88	Annual Maintenance.
	09/05/88	09/09/88	Repair #3 discharge valve.
2	06/05/88	06/17/88	Annual maintenance.
3	06/27/88	09/09/88	Annual maintenance and repair discharge valve.
4	05/02/88	05/13/88	Routine maintenance.
6	10/23/88	12/01/88	Annual maintenance.
South Bay Pumping Plant:			
1	10/24/88	10/28/88	Annual maintenance.
2	11/21/88	11/29/88	Annual maintenance.
4	06/15/88	06/22/88	Repack the pump.
5	01/11/88	01/15/88	Annual maintenance.
	11/02/88	11/10/88	Annual maintenance.
6	02/22/88	02/26/88	Annual maintenance.
	11/08/88	11/18/88	Annual maintenance.
7	12/15/88	-----	Motor repairs.
8	02/01/88	02/08/88	Annual maintenance.
9	01/19/88	01/22/88	Annual maintenance.
	02/25/88	03/01/88	Replace field application panel.
Del Valle Pumping Plant:			
1	04/23/88	05/12/88	Repair DC motor.
2	05/19/88	06/19/88	Excessive vibration.
Cordelia Pumping Plant:			
1	01/26/88	04/12/88	Excessive vibration.
2	02/17/88	02/26/88	Replace bearings.
	04/12/88	07/13/88	Replace bearings.

TABLE 10: LAKE DEL VALLE MONTHLY OPERATION

1988

(in acre-feet except as noted)

MONTH	WATER* SURFACE ELEVATION (in feet)	STORAGE*	STORAGE CHANGE	INFLOW			OUTFLOW				PRECIPITATION (inches)
				NATURAL 2/	SOUTH BAY AQUEDUCT	SOUTH BAY AQUEDUCT	RECREATION 1/	ARROYO VALLE	EVAPORATION	TOTAL	
JAN	678.84	25,195	755	800	0	0	8	0	37	45	2.05
FEB	678.76	25,155	-40	228	0	0	3	181	84	268	0.26
MAR	688.42	30,438	5,283	175	5,266	0	5	0	153	158	0.91
APR	698.10	36,541	6,103	15	6,249	0	8	0	153	161	1.24
MAY	703.75	40,447	3,906	-351	4,449	0	14	0	178	192	0.42
JUN	704.48	40,970	523	-113	1,024	2	17	0	369	388	0.05
JUL	703.74	40,440	-530	-9	0	0	22	0	499	521	0.00
AUG	701.35	38,758	-1,682	9	0	1,265	22	0	404	1,691	0.00
SEP	691.54	32,321	-6,437	72	0	6,136	21	0	352	6,509	0.01
OCT	684.02	27,924	-4,397	123	0	4,307	14	0	199	4,520	0.20
NOV	681.00	26,301	-1,623	84	0	1,627	6	0	74	1,707	2.07
DEC	678.83	25,190	-1,111	294	0	1,346	2	0	57	1,405	1.68
TOTAL	—	—	-5	1,327	16,988	14,683	142	181	2,559	17,565	8.89

*At end of month.

1/ To East Bay Regional Park District.

2/ Includes Lake losses (-) and gains (+)

FIGURE P: LAKE DEL VALLE OPERATION

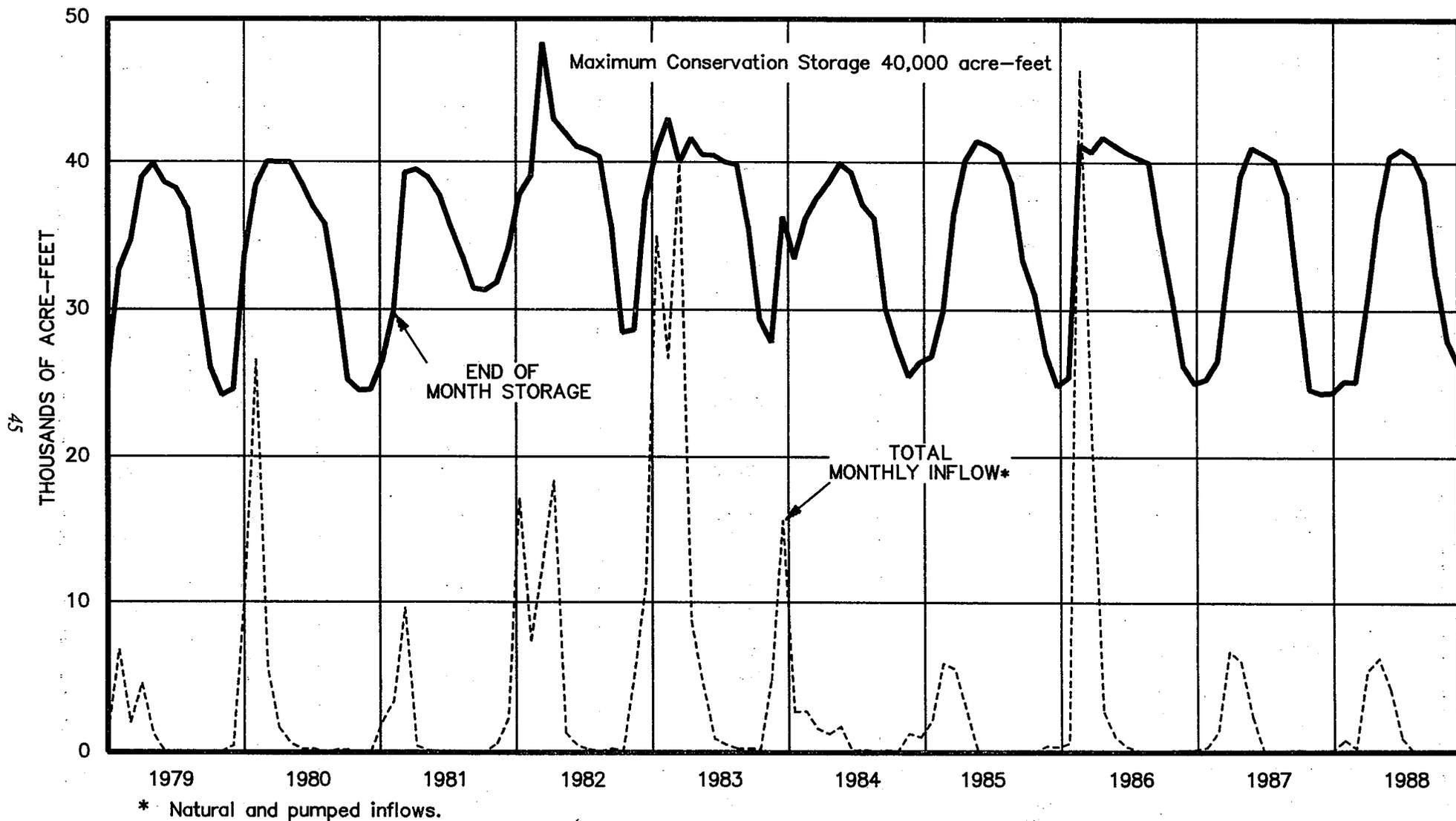


TABLE 11: CLIFTON COURT FOREBAY MONTHLY OPERATION

(elevation in feet, storage in acre-feet)

MONTH	YEAR	WATER SURFACE ELEVATION*	STORAGE*	STORAGE CHANGE	INFLOW
JAN	1988	-0.69	16,778	-301	382,824
	1987	1.36	21,196	1,598	130,759
FEB	1988	-0.36	17,488	710	333,721
	1987	0.94	20,289	-907	150,327
MAR	1988	-1.42	15,210	-2,278	260,315
	1987	1.06	20,548	259	189,905
APR	1988	-1.61	14,802	-408	259,541
	1987	-1.19	15,704	-4,844	153,357
MAY	1988	1.21	20,872	6,070	195,740
	1987	1.06	20,548	4,844	134,270
JUN	1988	-1.77	14,458	-6,414	165,733
	1987	-0.53	17,122	-3,426	122,307
JUL	1988	-2.07	13,815	-643	207,183
	1987	-1.68	14,652	-2,470	269,106
AUG	1988	-1.22	15,639	1,824	253,500
	1987	-0.78	16,585	1,933	312,007
SEP	1988	-1.29	15,489	-150	201,403
	1987	-1.15	15,790	-795	274,578
OCT	1988	-0.46	17,273	1,784	118,272
	1987	-0.05	18,155	2,365	107,969
NOV	1988	-0.80	16,542	-731	139,144
	1987	0.01	18,285	130	81,917
DEC	1988	-1.40	15,253	-1,289	176,522
	1987	-0.55	17,079	-1,206	296,809
TOTAL	1988	--	--	-1,826	2,693,898
	1987	--	--	-2,519	2,223,311

*At end of month.

SAN LUIS FIELD DIVISION

Water Storage

San Luis Reservoir total storage reached its maximum of the year, 1,853,540 AF, on May 2. Maximum operating storage capacity is 2,027,835 AF. Drawdown to the minimum total storage for the year, 396,523 AF, occurred on September 9. The State's share of San Luis Reservoir storage reached

the maximum of 1,072,152 AF on May 18, while the minimum of 211,794 AF was reached on December 24. Table 12 on page 49 and Figure Q on page 50 present San Luis Reservoir operations during 1988. Table 13 on Page 51 presents the monthly operation of O'Neill Forebay during 1988.

Water Deliveries

SWP water deliveries in the San Luis Field Division during 1988 consisted of 380 AF delivered to 830 acres of wildlife mitigation lands located below O'Neill Forebay at the Pilibos Wildlife Area for the Department of Fish and Game, and 7 AF of recreation water delivered to the Department of Parks and Recreation.

CVP water delivered in the San Luis Field Division during 1988 totaled 1,441,224 AF, a 1 percent decrease from 1987 totals. The SWP has no water service contractors who take delivery in the San Luis Field division. The following tabulation details the components of the CVP water deliveries made in the San Luis Field Division:

Component	Amount (ac-ft)
Delivered from the Joint-Use facilities	1,441,224
Delivered to Grass Lands Water District for the Department of Fish and Game.	130
Delivered from O'Neill Forebay to the Department of Fish and Game.	250
Delivered from O'Neill Forebay to the Department of Parks and Recreation.	7

Table 14 on page 52 presents a monthly operational summary of the State-Federal San Luis Joint-Use facilities.

Pumping Plants

Total pumping in 1988 at Willam R. Gianelli Pumping-Generating Plant was 1,265,475 AF, a 30 percent increase from the amount pumped in 1987. Total water released from San Luis Reservoir to O'Neill Forebay for generation was 1,544,563 AF, a

4 percent increase over the 1987 amount.

Total pumping at Dos Amigos Pumping plant in 1988 was 3,784,607 AF, a three percent increase over the amount pumped in 1987.

Outages and Limitations

The table on the right presents the units at the two pumping plants in the San Luis Field Division that 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 1988.

Unit	Outage Beginning	Outage Ending	Reason
William R. Gianelli Pumping-Generating Plant:			
1	04/03/88	05/24/88	Repair rotor, pole pieces, and amortisseur straps.
	09/21/88	09/23/88	Repair amplydine breaker and annual maintenance.
2	04/01/88	06/01/88	Repair amortisseur straps.
4	07/02/88	08/28/88	Repair amortisseur straps.
6	02/04/88	03/29/88	Repair amortisseur straps and rebuild head cover
7	02/02/88	02/12/88	Repair amortisseur straps.
	08/26/88	09/28/88	Repair head cover.
	12/16/88	12/21/88	Repair faulty brakes
8	01/01/88	01/31/88	Annual maintenance and repair head cover.
Dos Amigos Pumpingplant:			
1	01/15/88	08/02/88	Rewind stator, inspect rotor clean and paint scroll case, and replace wear ring.
2	06/29/88	07/01/88	Excessive vibration.
	07/03/88	07/07/88	Excessive vibration.
4	04/18/88	04/21/88	Replace speed switch.
	09/08/88	11/30/88	Annual maintenance.
5	12/08/88	-----	Annual maintenance.
6	03/14/88	03/29/88	Inspect rotor and amortisseur straps.

TABLE 12: 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	STORAGE CHANGE	GIANELLI P-G PLANT PUMPING	GIANELLI P-G PLANT GENERATION	PACHECO TUNNEL (CVP)	SPILL			
JAN	1988	508.86	1,610,486	342,631	361,117	0	7,747	0	-10,739	825	1.72
	1987	540.52	1,996,408	79,937	82,697	0	0	0	-2,760	1,490	1.15
FEB	1988	517.93	1,718,108	107,622	132,381	11,536	11,593	0	-1,630	2,767	0.67
	1987	542.47	2,021,105	24,697	25,929	1,392	0	0	160	2,519	2.46
MAR	1988	523.17	1,781,370	63,262	93,576	16,406	12,769	0	-1,139	6,075	0.33
	1987	542.80	2,025,295	4,190	5,260	0	133	0	-937	4,235	1.89
APR	1988	528.18	1,842,590	61,220	107,108	36,654	5,472	0	-3,762	6,799	1.51
	1987	534.00	1,914,602	-110,693	1,551	109,030	43	0	-3,171	8,950	0.17
MAY	1988	515.24	1,685,940	-156,650	29,681	174,860	8,212	0	-3,259	10,110	0.36
	1987	506.58	1,583,809	-330,793	2,383	329,380	206	0	-3,590	10,610	0.32
JUN	1988	474.89	1,229,080	-456,860	0	449,181	6,982	0	-697	10,774	0.12
	1987	460.45	1,077,695	-506,114	0	503,200	3,142	0	228	11,161	0.00
JUL	1988	419.91	689,933	-539,147	0	533,540	7,868	0	2,261	12,694	0.00
	1987	422.74	715,058	-362,637	0	354,466	7,096	0	-1,075	9,923	0.00
AUG	1988	386.95	423,039	-266,894	0	256,983	8,637	0	-1,274	8,545	0.00
	1987	402.60	543,727	-171,331	17,107	177,566	7,878	0	-2,994	8,487	0.00
SEP	1988	395.55	487,973	64,934	106,984	27,241	8,220	0	-6,589	5,931	0.00
	1987	419.70	688,082	144,355	170,610	13,149	5,739	0	-7,367	6,252	0.00
OCT	1988	399.24	516,875	28,902	70,197	30,332	7,302	0	-3,661	3,931	0.00
	1987	427.05	753,936	65,854	115,636	39,771	7,355	0	-2,656	4,054	1.11
NOV	1988	416.31	658,461	141,586	162,060	7,758	6,984	0	-5,732	1,730	0.83
	1987	446.81	940,812	186,876	207,077	10,725	5,117	0	-4,359	1,525	0.37
DEC	1988	437.82	854,053	195,592	202,371	0	5,378	0	-1,401	980	2.21
	1987	478.49	1,267,855	327,043	348,750	0	7,394	0	-14,313	1,392	1.99
TOTAL	1988	---	---	-413,802	1,265,475	1,544,491	97,164	0	-37,622	71,161	7.75
	1987	---	---	-648,616	977,000	1,538,679	44,103	0	-42,834	70,598	9.46

* At end of month.

FIGURE Q: SAN LUIS RESERVOIR OPERATION

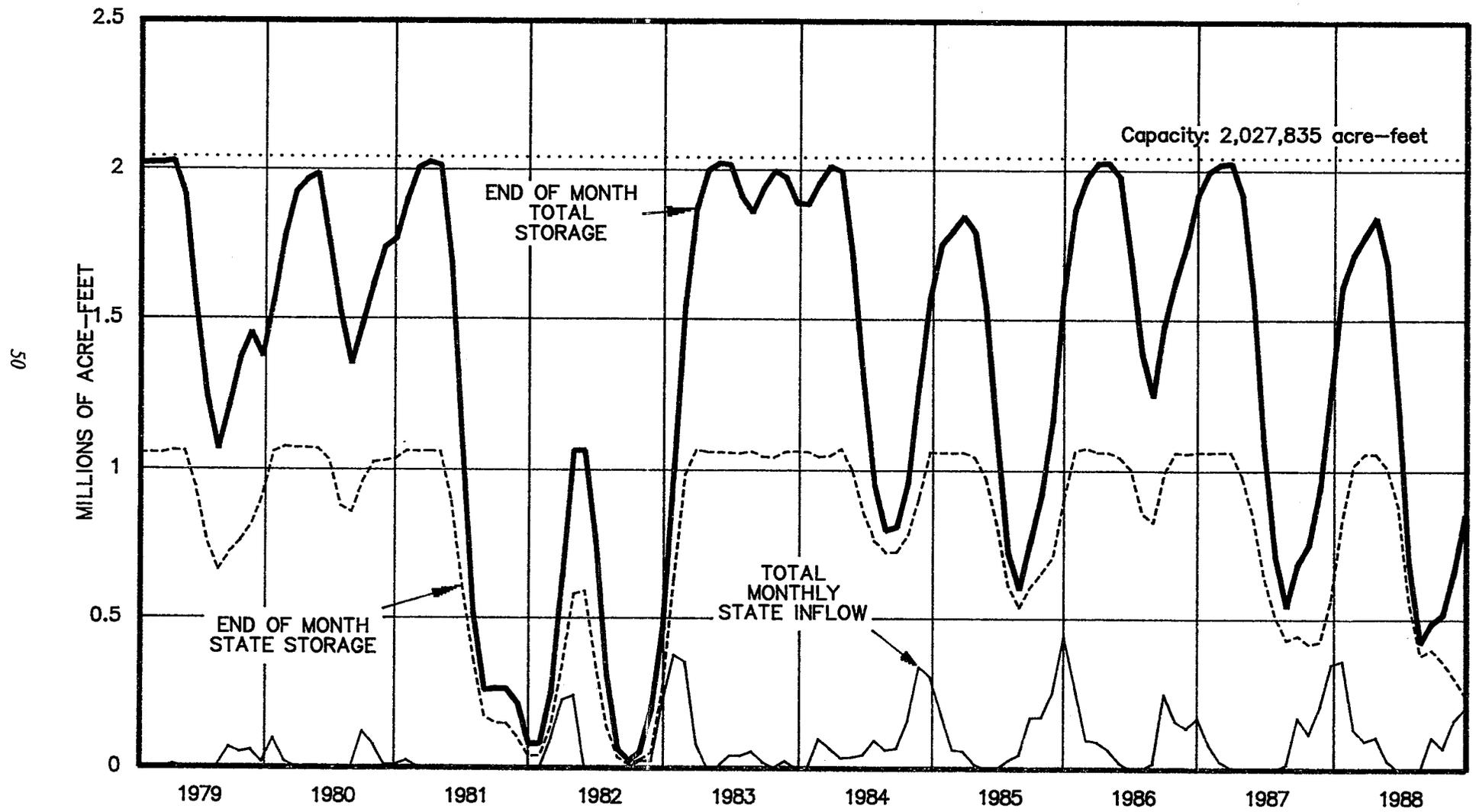


TABLE 13: O'NEILL FOREBAY MONTHLY OPERATION

(in acre-feet except as noted)

MONTH	YEAR	RESERVOIR STORAGE*			INFLOW			OUTFLOW				GAIN (+) LOSS (-)
		WATER SURFACE ELEVATION (in feet)	STORAGE	STORAGE CHANGE	O'NEILL P-G PLANT PUMPING	GIANELLI P-G PLANT GENERATION	CALIFORNIA AQUEDUCT CHECK 12	O'NEILL P-G PLANT GENERATION	GIANELLI P-G PLANT PUMPING	DOS AMIGOS PUMPING	DELIVERIES	
JAN	1988	220.20	43,671	-6,362	212,011	0	376,162	0	361,117	233,053	47	-318
	1987	221.35	46,679	-5,222	208,002	0	120,970	0	82,697	241,987	271	-9,239
FEB	1988	222.29	49,155	5,484	128,212	11,536	325,408	60	132,381	321,549	1,052	-4,630
	1987	219.00	40,584	-6,095	160,614	1,392	141,551	0	25,929	279,612	665	-3,446
MAR	1988	220.64	44,818	-4,337	117,366	16,406	241,343	36	93,576	273,403	3,277	-9,160
	1987	219.37	41,528	944	69,874	0	173,598	0	5,260	233,554	1,879	-1,835
APR	1988	222.93	50,859	6,041	112,710	36,654	238,702	0	107,108	268,728	2,550	-3,639
	1987	222.50	49,713	8,185	84,611	109,030	136,260	0	1,551	312,153	3,715	-4,297
MAY	1988	221.14	46,128	-4,731	17,589	174,860	165,534	24,278	29,681	304,102	2,935	-1,718
	1987	220.23	43,749	-5,964	6,148	329,380	104,154	36,107	2,383	402,422	3,233	-1,501
JUN	1988	221.52	47,125	997	0	449,181	148,823	67,918	0	520,107	4,892	-4,090
	1987	221.27	46,469	2,720	0	503,200	99,577	64,740	0	526,209	4,490	-4,618
JUL	1988	223.07	51,233	4,108	1,423	533,540	181,331	31,698	0	663,134	6,409	-10,945
	1987	222.19	48,889	2,420	5,996	354,466	245,858	5,856	0	584,279	5,155	-8,610
AUG	1988	221.29	46,521	-4,712	25,504	256,983	228,540	4,069	0	501,543	5,772	-4,355
	1987	220.24	43,775	-5,114	42,296	177,566	289,306	1,741	17,107	483,528	4,540	-7,366
SEP	1988	219.95	43,023	-3,498	107,007	27,241	185,500	0	106,984	211,076	2,796	-2,390
	1987	221.45	46,941	3,166	110,857	13,149	264,121	0	170,610	210,161	2,132	-2,058
OCT	1988	218.70	39,825	-3,198	88,557	30,332	100,513	0	70,197	159,358	731	7,686
	1987	220.75	45,106	-1,835	117,548	39,771	97,235	1,171	115,636	137,390	1,485	-707
NOV	1988	221.69	47,572	7,747	180,855	7,758	123,678	0	162,060	146,063	736	4,315
	1987	219.33	41,426	-3,680	208,305	10,725	73,863	0	207,077	81,497	293	-7,706
DEC	1988	222.90	50,779	3,207	229,849	0	162,444	0	202,371	182,491	189	-4,035
	1987	222.62	50,033	8,607	244,338	0	292,318	0	348,750	177,154	105	-2,040
TOTAL	1988	---	---	746	1,221,083	1,544,491	2,477,978	128,059	1,265,475	3,784,607	31,386	-33,279
	1987	---	---	-1,868	1,258,589	1,538,679	2,038,811	109,615	977,000	3,669,946	27,963	-53,423

* At end of month.

TABLE 13: 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	STORAGE CHANGE	O'NEILL P-G PLANT PUMPING	GIANELLI P-G PLANT GENERATION	CALIFORNIA AQUEDUCT CHECK 12	O'NEILL P-G PLANT GENERATION	GIANELLI P-G PLANT PUMPING	DOS AMIGOS PUMPING	DELIVERIES	
JAN	1988	220.20	43,671	-6,362	212,011	0	376,162	0	361,117	233,053	47	-318
	1987	221.35	46,679	-5,222	208,002	0	120,970	0	82,697	241,987	271	-9,239
FEB	1988	222.29	49,155	5,484	128,212	11,536	325,408	60	132,381	321,549	1,052	-4,630
	1987	219.00	40,584	-6,095	160,614	1,392	141,551	0	25,929	279,612	665	-3,446
MAR	1988	220.64	44,818	-4,337	117,366	16,406	241,343	36	93,576	273,403	3,277	-9,160
	1987	219.37	41,528	944	69,874	0	173,598	0	5,260	233,554	1,879	-1,835
APR	1988	222.93	50,859	6,041	112,710	36,654	238,702	0	107,108	268,728	2,550	-3,639
	1987	222.50	49,713	8,185	84,611	109,030	136,260	0	1,551	312,153	3,715	-4,297
MAY	1988	221.14	46,128	-4,731	17,589	174,860	165,534	24,278	29,681	304,102	2,935	-1,718
	1987	220.23	43,749	-5,964	6,148	329,380	104,154	36,107	2,383	402,422	3,233	-1,501
JUN	1988	221.52	47,125	997	0	449,181	148,823	67,918	0	520,107	4,892	-4,090
	1987	221.27	46,469	2,720	0	503,200	99,577	64,740	0	526,209	4,490	-4,618
JUL	1988	223.07	51,233	4,108	1,423	533,540	181,331	31,698	0	663,134	6,409	-10,945
	1987	222.19	48,889	2,420	5,996	354,466	245,858	5,856	0	584,279	5,155	-8,610
AUG	1988	221.29	46,521	-4,712	25,504	256,983	228,540	4,069	0	501,543	5,772	-4,355
	1987	220.24	43,775	-5,114	42,296	177,566	289,306	1,741	17,107	483,528	4,540	-7,366
SEP	1988	219.95	43,023	-3,498	107,007	27,241	185,500	0	106,984	211,076	2,796	-2,390
	1987	221.45	46,941	3,166	110,857	13,149	264,121	0	170,610	210,161	2,132	-2,058
OCT	1988	218.70	39,825	-3,198	88,557	30,332	100,513	0	70,197	159,358	731	7,686
	1987	220.75	45,106	-1,835	117,548	39,771	97,235	1,171	115,636	137,390	1,485	-707
NOV	1988	221.69	47,572	7,747	180,855	7,758	123,678	0	162,060	146,063	736	4,315
	1987	219.33	41,426	-3,680	208,305	10,725	73,863	0	207,077	81,497	293	-7,706
DEC	1988	222.90	50,779	3,207	229,849	0	162,444	0	202,371	182,491	189	-4,035
	1987	222.62	50,033	8,607	244,338	0	292,318	0	348,750	177,154	105	-2,040
TOTAL	1988	—	—	746	1,221,083	1,544,491	2,477,978	128,059	1,265,475	3,784,607	31,386	-33,279
	1987	—	—	-1,868	1,258,589	1,538,679	2,038,811	109,615	977,000	3,669,946	27,963	-53,423

* At end of month.

TABLE 14: MONTHLY OPERATIONS SUMMARY, STATE-FEDERAL SAN LUIS JOINT-USE FACILITIES

1988

(in acre-feet except as noted)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
California Aqueduct													
Check 12 State	367,252	315,547	226,229	185,463	165,534	148,823	85,725	121,617	153,265	57,837	54,820	107,839	1,989,951
Federal	8,910	9,861	15,114	53,239	0	0	95,606	106,923	32,235	42,676	68,858	54,605	488,027
Total	376,162	325,408	241,343	238,702	165,534	148,823	181,331	228,540	185,500	100,513	123,678	162,444	2,477,978
O'Neill Pumping													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	212,011	128,212	117,366	112,710	17,589	0	1,423	25,504	107,007	88,557	180,855	229,849	1,221,083
Total	212,011	128,212	117,366	112,710	17,589	0	1,423	25,504	107,007	88,557	180,855	229,849	1,221,083
O'Neill Generation													
Federal	0	60	36	0	24,278	67,918	31,698	4,069	0	0	0	0	128,059
O'Neill Forebay Storage*													
State	23,181	16,392	15,455	15,228	22,952	14,767	16,428	23,303	25,049	22,774	13,022	20,242	xxxx
Federal	20,490	32,763	29,363	35,631	23,176	32,358	34,805	23,218	17,974	17,051	34,550	30,537	xxxx
Total	43,671	49,155	44,818	50,859	46,128	47,125	51,233	46,521	43,023	39,825	47,572	50,779	xxxx
San Luis Reservoir Storage*													
State	838,599	1,020,042	1,057,860	1,057,796	1,007,399	885,923	559,392	379,479	399,179	358,870	305,350	247,990	xxxx
Federal	771,887	698,066	723,510	784,794	678,541	343,157	130,541	43,560	88,794	158,005	353,111	606,063	xxxx
Total	1,610,486	1,718,108	1,781,370	1,842,590	1,685,940	1,229,080	689,933	423,039	487,973	516,875	658,461	854,053	xxxx
Gianelli Pumping													
State	274,740	132,381	52,297	38,659	16,922	0	0	0	46,968	13,837	11,391	41,410	628,605
Federal	86,377	0	41,279	68,449	12,759	0	0	0	60,016	56,360	150,669	160,961	636,870
Total	361,117	132,381	93,576	107,108	29,681	0	0	0	106,984	70,197	162,060	202,371	1,265,475
Gianelli Generation													
State	0	925	13,853	36,654	65,527	125,627	327,775	179,212	23,644	30,332	7,758	0	811,307
Federal	0	10,611	2,553	0	109,333	323,554	205,765	77,771	3,597	0	0	0	733,184
Total	0	11,536	16,406	36,654	174,860	449,181	533,540	256,983	27,241	30,332	7,758	0	1,544,491
San Felipe Project													
Federal	7,747	11,593	12,769	5,472	8,212	6,982	7,868	8,637	8,220	7,302	6,984	5,378	97,164
Dos Amigos P.P. Amount Pumped													
State	93,722	132,334	183,684	181,684	186,470	280,385	374,819	291,559	158,776	115,739	117,312	154,990	2,271,474
Federal	139,331	189,215	89,719	87,044	117,632	239,722	288,315	209,984	52,300	43,619	28,751	27,501	1,513,133
Total	233,053	321,549	273,403	268,728	304,102	520,107	663,134	501,543	211,076	159,358	146,063	182,491	3,784,607

* At end of month.

SAN JOAQUIN FIELD DIVISION

Water Deliveries

All of the 1,172,389 AF of SWP water delivered to SWP water service contractors in the San Joaquin Field Division during 1988 was entitlement water. The largest delivery (1,009,520 AF) was to the Kern County Water Agency (KCWA), which represented 86 percent of the total SWP water delivered within the Division.

Of the total SWP entitlement water delivered

in the San Joaquin Field Division, only 126,409 AF was for municipal and industrial purposes.

In addition to SWP deliveries, 156,211 AF of CVP water was wheeled through SWP facilities to KCWA's Cross Valley Canal to be delivered to Cross Valley Canal contractors. Table 2 on page 12 presents water deliveries by year with totals to date for individual agencies.

Pumping plants

The table on the right presents the total pumping at the six pumping plants in the San Joaquin Field Division during 1988 and their percent differences from 1987 totals. For more details, see Table 20, pages 74 and 75.

Pumping Plant	1988 Total (ac-ft)	Difference from 1987 (percent)
California Aqueduct:		
Buena Vista	1,252,959	+17
Wheeler Ridge	1,121,517	+18
Ira J. Chrisman Wind Gap	1,065,383	+18
A. D. Edmonston	1,056,713	+19
Coastal Branch:		
Las Perillas	134,339	-6
Badger Hill	133,975	-6

Outages and Limitations

Coastal Branch:

The table on the right presents the units at the two pumping plants in the Coastal Branch of the California Aqueduct in the San Joaquin Field Division that 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 1988.

Unit	Outage Beginning	Outage Ending	Reason
Las Perillas Pumping Plant			
2	01/21/88	01/29/88	Annual maintenance.
3	01/28/88	02/11/88	Annual maintenance.
Badger Hill Pumping Plant			
4	12/28/88	-----	Annual maintenance.
5	01/01/88	01/12/88	Check amortisseur straps.

California Aqueduct:

The following units at the four pumping plants in the San Joaquin Field Division were out of service for the times and reasons noted. If no date is given in the "Outage Ending" column, the unit remained out of service at the end of 1988.

Unit	Outage Beginning	Outage Ending	Reason
Buena Vista Pumping Plant			
1	01/01/88	10/13/88	Annual maintenance and impeller repair.
3	04/17/88	04/20/88	Excessive vibration.
5	10/17/88	-----	Annual maintenance, and repair discharge valve "O" ring seals.
9	11/04/88	11/07/88	Repair field breaker.
Wheeler Ridge Pumping Plant			
2	01/01/88	04/12/88	Install new stainless steel impeller.
3	05/28/88	05/31/88	Repair start sequence.
5	04/28/88	-----	Annual maintenance and repair discharge valve.
6	01/04/88	03/17/88	Repair air cooler leak.

Unit	Outage Beginning	Outage Ending	Reason
Ira J. Chrisman Wind Gap Pumping Plant			
1	04/19/88	04/29/88	Excessive pump guide bearing temperature.
4	07/15/88	07/19/88	Check amortisseur straps.
5	11/09/88	-----	Annual maintenance.
6	01/11/88	08/25/88	Repair pump casing leak.
	09/26/88	10/28/88	Annual maintenance.
7	04/04/88	04/07/88	Repair discharge valve.
	07/21/88	-----	Replace nose cone and discharge valve seats.
9	02/18/88	02/26/88	Repair discharge valve.
A.D.Edmonston Pumping Plant			
2	03/09/88	-----	Rewind motor.
5	02/02/88	02/12/88	Clean silt from unit intake.
7	09/06/88	-----	Replace thrust bearing.
9	11/08/88	11/14/88	Annual breaker maintenance.

SOUTHERN FIELD DIVISION

Water Storage

At the start of 1988, total combined reservoir storage in the Southern Field Division's five reservoirs (Pyramid Lake, Elderberry Forebay, Castaic Lake, Silverwood Lake, and Lake Perris) was 656,793 AF, or 92 percent of the combined capacity (717,251 AF). Combined storage at the

end of the year was 628,362 AF, or 88 percent of the combined capacity. In addition, 7,186 AF of natural flow was released through the Project's southern reservoirs in 1988. Summaries of operations for those reservoirs are in pages 72 through 79.

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

Reservoir	Normal Operational Capacity (ac-ft)	Start of 1988 (ac-ft)	End of 1988 (ac-ft)	Maximum (ac-ft)	Date	Minimum (ac-ft)	Date
Pyramid Lake	169,901	163,011	157,630	169,372	10/18	150,745	2/18
Elderberry Forebay	28,230	23,008	24,823	30,478	12/21	15,495	10/20
Castaic Lake	319,247	289,049	258,455	317,785	5/5	147,551	11/8
Silverwood Lake	73,032	69,229	71,720	73,668	12/26	48,015	10/21
Lake Perris	126,841	112,496	115,734	125,217	1/23	104,577	12/11

Water Deliveries

The total SWP water delivered to SWP water service contractors in the Southern Field Division was 1,049,097 AF, a 21 percent increase over the amount delivered in 1987. Of the total entitlement water delivered within the division, 1,024,146 AF was for municipal and industrial purposes.

Recreation and Fish and Wild Life water delivered in the Southern Field Division in 1988 is depicted in the table below:

At Silverwood Lake	110 AF
At Lake Perris	861 AF
At Pyramid Lake	2 AF
At Piru Creek trout fishery	2,028 AF
At Castaic Lake	1,359 AF
Total	4,360 AF

Pumping Plants

The table on the right presents the total pumping at the three pumping plants in the Southern Field Division during 1988. For more details, see Table 20, pages 74 and 75.

Pumping Plant	1988 Total (ac-ft)
Oso	500,595
Castaic	426,028
Pearblossom	530,927

Outages and Limitations

East Branch:

The following individual units in the two plants on the East Branch of the California Aqueduct 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 1988.

Outage Unit	Outage Beginning	Outage Ending	Reason
Alamo Powerplant			
Alamo Powerplant was limited to a maximum output of 4 Megawatts throughout 1988 because of the possibility of unit damage during load rejection at higher speeds.			
1	09/11/88	09/19/88	Install pressure sensor transducers in Draft Tube.
Pearblossom Pumping Plant:			
1	09/26/88	10/14/88	Annual maintenance, replace O rings on discharge valve.
2	09/04/88	09/09/88	Repair discharge valve hydraulic oil leak.
4	06/06/88	06/28/88	Annual maintenance, inspect and repair rotor field lead wire.
6	06/27/88	07/29/88	Annual maintenance.
Devil Canyon Powerplant:			
2	01/25/88 07/27/88	03/01/88 07/30/88	Annual maintenance. Clear carbon dust from unit.

West Branch:

The following individual units of the two plants on the West Branch of the California Aqueduct 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 1988.

Outage Unit	Outage Beginning	Outage Ending	Reason
Oso Pumping Plant:			
4	05/23/88	06/08/88	Annual maintenance.
5	06/13/88	07/11/88	Annual maintenance.
6	01/11/88	01/29/88	Annual maintenance.
8	11/09/88	11/16/88	Repair faulty unit breaker.
William E. Warne Powerplant:			
1	05/02/88	05/01/88	Annual maintenance.
2	06/03/88	06/30/88	Annual maintenance.

**TABLE 15: PYRAMID LAKE MONTHLY OPERATION
1988**

(in acre-feet except as noted)

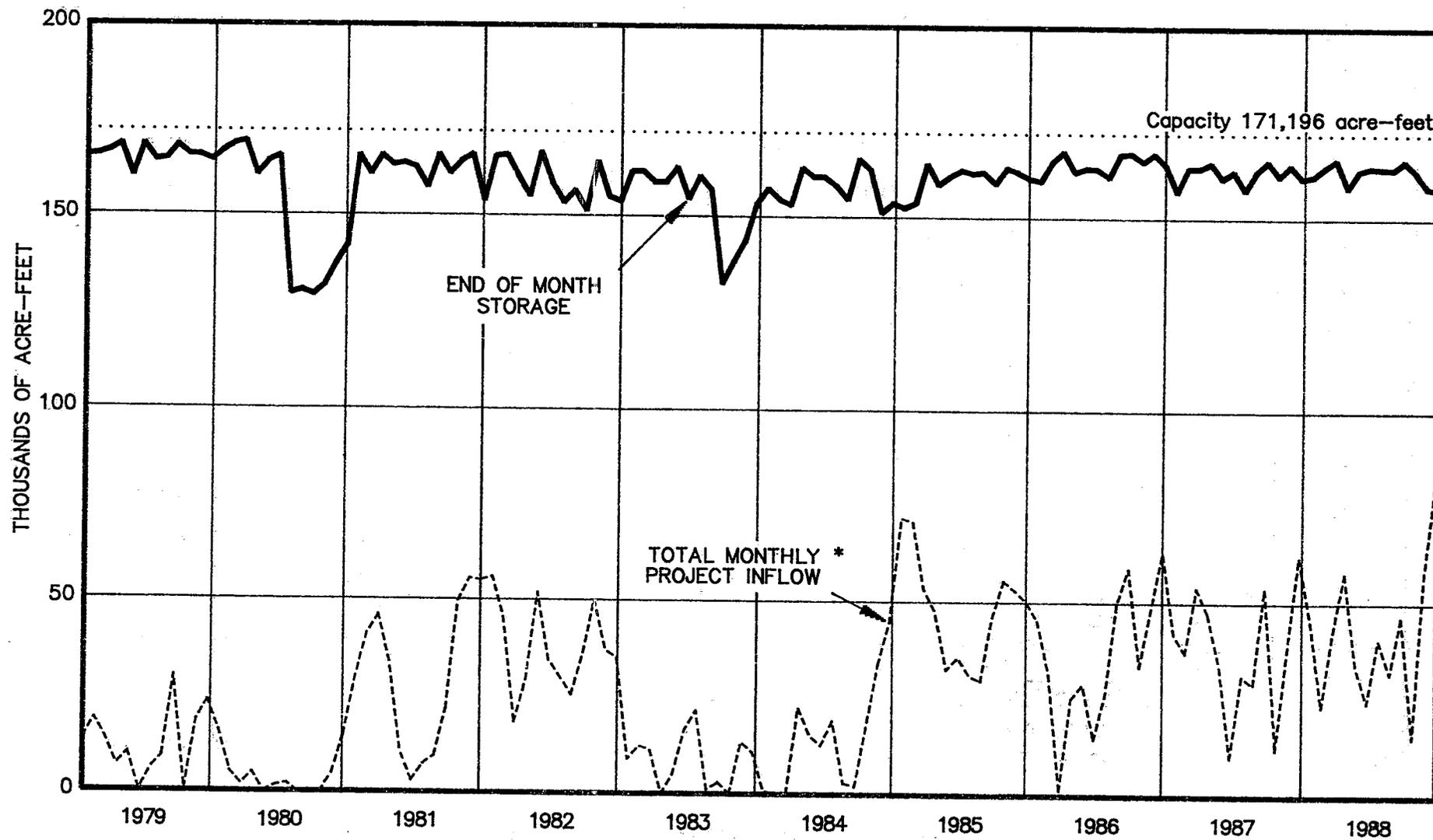
MONTH	WATER SURFACE ELEVATION (in feet)	3/ TOTAL STORAGE	3/ NATURAL INFLOW STORAGE SHARES	STORAGE CHANGE	INFLOW			OUTFLOW				COMPUTED LOSSES (-) GAINS (+)
					NATURAL	PROJECT		ANGELES TUNNEL	TO PIRU CREEK			
						WARNE POWER-PLANT	PUMPBACK 1/		NATURAL INFLOW RELEASE 2/	RECREATION (METERED WATER)	PROJECT WATER FOR FISH ENHANCEMENT	
JAN	2,571.12	161,171	1,959	586	2,972	45,634	56,694	101,237	1,864	0	0	-1,613
FEB	2,572.97	163,488	460	2,317	5,097	23,165	42,667	63,202	6,596	0	0	1,186
MAR	2,574.55	165,485	973	1,997	4,912	42,632	24,182	63,314	4,399	2	0	-2,014
APR	2,568.78	158,270	1,323	-7,215	2,122	57,881	7,355	71,969	1,772	0	0	-832
MAY	2,572.20	162,521	508	4,251	1,141	33,773	22,815	51,328	1,956	0	0	-194
JUN	2,572.94	163,451	322	930	496	24,260	22,362	44,931	682	0	0	-575
JUL	2,572.79	163,262	0	-189	275	40,610	9,556	49,207	597	0	249	-577
AUG	2,572.69	163,136	0	-126	208	31,704	44,650	75,730	208	0	618	-132
SEP	2,574.21	165,054	0	1,918	192	46,487	65,274	108,432	192	0	572	-839
OCT	2,572.07	162,358	0	-2,696	255	15,057	43,356	60,391	255	0	510	-208
NOV	2,568.83	158,331	0	-4,027	360	57,683	26,391	85,515	360	0	79	-2,507
DEC	2,568.26	157,630	240	-701	757	83,472	60,726	143,452	517	0	0	-1,687
TOTAL	---	---	---	-2,955	18,787	502,358	426,028	918,708	19,398	2	2,028	-9,992

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

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

3/ At end of month.

FIGURE R: PYRAMID LAKE OPERATION



* Excludes pumpback by LADWP through Castaic Powerplant.

TABLE 16: ELDERBERRY FOREBAY MONTHLY OPERATION

1988

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE 2/	STORAGE CHANGE	INFLOW		OUTFLOW			COMPUTED LOSSES (-) GAINS (+)
				CASTAIC POWERPLANT GENERATION	NATURAL	TO CASTAIC LAKE		PUMPBACK TO PYRAMID LAKE 1/	
						NATURAL	PROJECT		
JAN	1,522.49	24,568	-1,469	101,237	477	477	48,877	56,694	2,865
FEB	1,525.49	25,881	1,313	63,202	429	429	21,229	42,667	2,007
MAR	1,513.33	20,839	-5,042	63,314	667	667	43,873	24,182	-301
APR	1,530.30	28,120	7,281	71,969	268	268	54,533	7,355	-2,800
MAY	1,519.58	23,383	-4,737	51,328	63	63	29,610	22,815	-3,640
JUN	1,511.56	20,094	-3,289	44,931	0	0	25,270	22,362	-588
JUL	1,513.72	20,942	848	49,207	0	0	38,673	9,556	-130
AUG	1,509.44	19,278	-1,664	75,730	0	0	32,037	44,650	-707
SEP	1,509.01	19,114	-164	108,432	0	0	42,898	65,274	-424
OCT	1,523.49	25,002	5,888	60,391	0	0	10,404	43,356	-743
NOV	1,522.24	24,460	-542	85,515	0	0	59,930	26,391	264
DEC	1,523.08	25,752	1,292	143,452	5	5	80,956	60,726	-478
TOTAL	---	---	-285	918,708	1,909	1,909	488,290	426,028	-4,675

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

2/ At end of month.

TABLE 17: CASTAIC LAKE MONTHLY OPERATION

1988

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE 2/	NATURAL INFLOW STORAGE SHARES 2/	STORAGE CHANGE	INFLOW			OUTFLOW		NATURAL INFLOW RELEASED FROM CASTAIC LAGOON		COMPUTED LOSSES (-) GAINS (+)
					NATURAL	FROM ELDERBERRY FOREBAY		DELIVERIES	RELEASED TO CASTAIC LAGOON	SURFACE	SUBSURFACE	
						NATURAL	PROJECT					
JAN	1,507.79	307,819	663	21,252	562	477	48,877	23,962	1,251	364	184	-3,451
FEB	1,501.33	293,987	765	-13,832	391	429	21,229	33,022	815	544	174	-2,044
MAR	1,503.25	298,059	891	4,072	451	667	43,873	38,903	1,014	809	183	-1,002
APR	1,509.98	312,592	1,119	14,533	479	268	54,533	41,758	591	341	178	1,602
MAY	1,500.37	291,964	259	-20,628	155	63	29,610	50,415	1,132	900	178	1,091
JUN	1,486.63	263,888	190	-28,076	39	0	25,270	53,240	0	0	108	-145
JUL	1,476.62	244,406	0	-19,482	14	0	38,673	57,075	310	0	204	-784
AUG	1,466.13	224,851	0	-19,555	6	0	32,037	50,733	426	0	6	-439
SEP	1,455.01	205,029	0	-19,822	0	0	42,898	60,611	534	0	0	-1,575
OCT	1,423.76	154,490	0	-50,539	7	0	10,404	61,949	0	0	7	999
NOV	1,440.27	180,267	0	25,777	20	0	59,930	34,299	35 1/	0	20	91
DEC	1,483.87	258,435	80	78,168	158	5	80,956	1,571	44	0	83	-1,336
TOTAL	---	---	---	-28,132	2,282	1,909	488,290	507,538	6,152	2,958	1,325	-6,993

1/ Water released to Castaic Lagoon through M.W.D. 182" line.

2/ At end of month.

FIGURE S: CASTAIC LAKE OPERATION

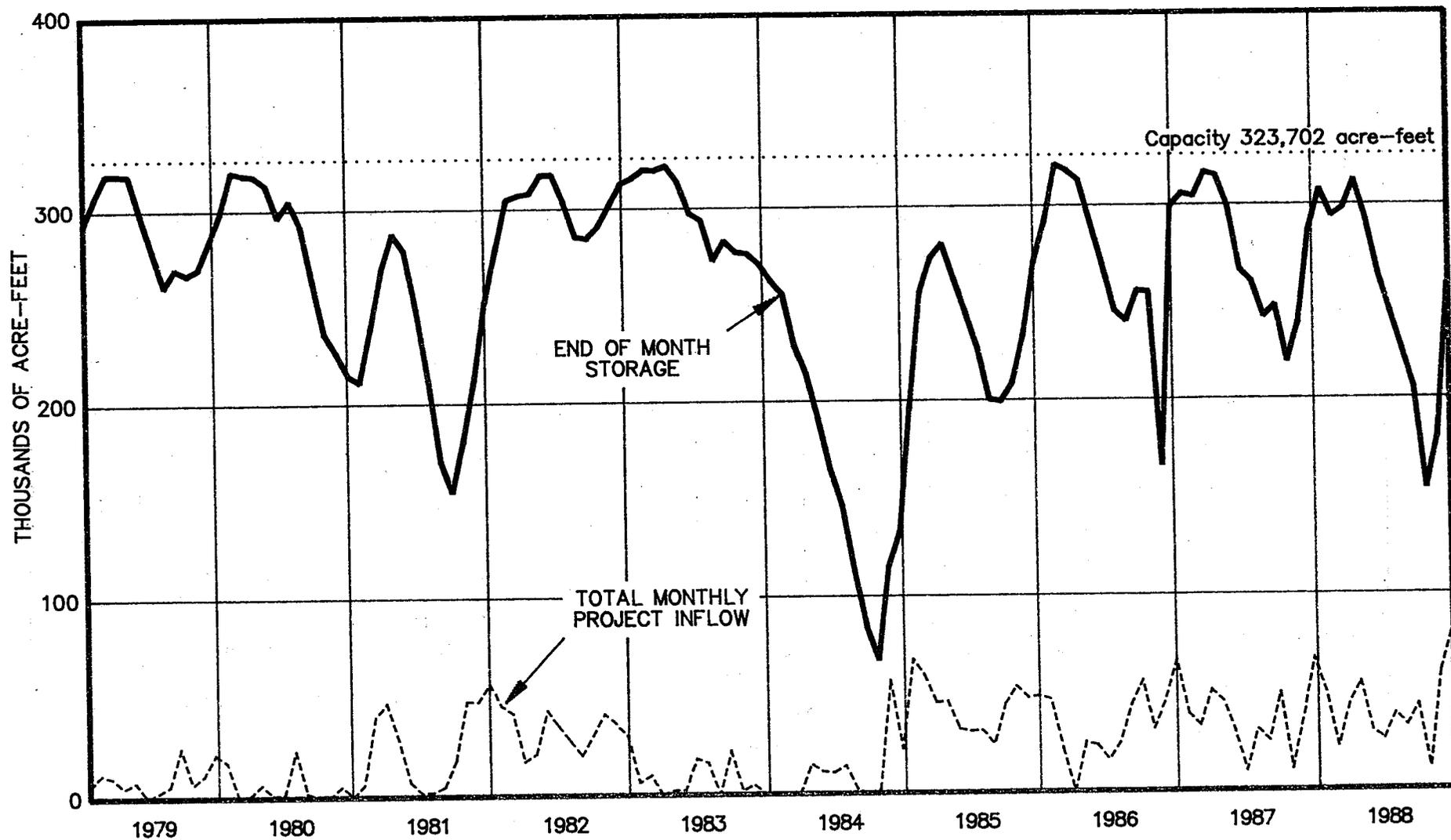


TABLE 18: SILVERWOOD LAKE MONTHLY OPERATION

1988

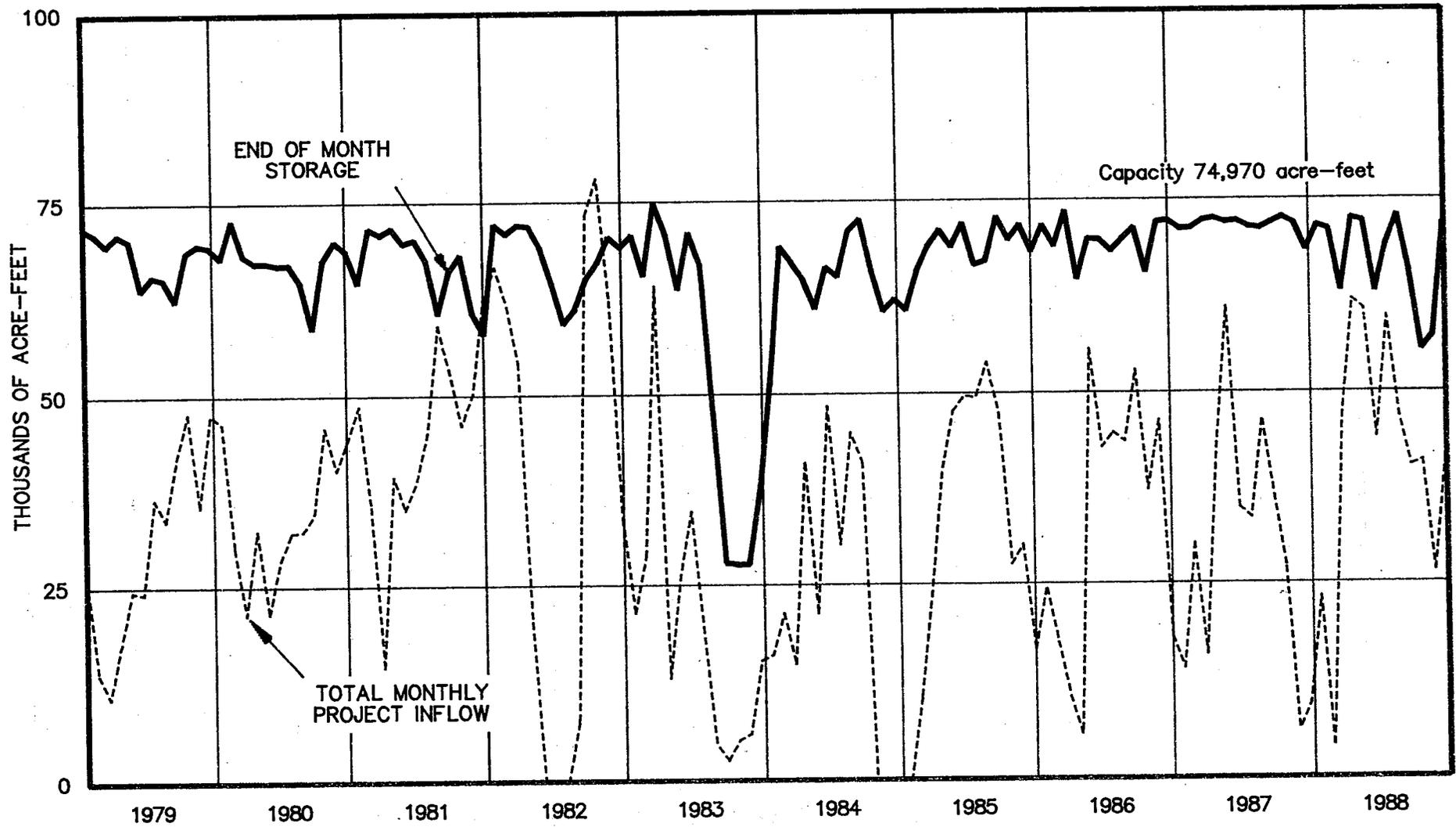
(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	STORAGE 2/	NATURAL INFLOW STORAGE SHARES 2/	STORAGE CHANGE	INFLOW		OUTFLOW			COMPUTED LOSSES (-) GAINS (+)	NATURAL INFLOW EXCHANGED OR RELEASED 1/
					NATURAL	PROJECT	SAN BERNARDINO TUNNEL	AT (CLAWA) TURNOUT	NATURAL INFLOW TO MOJAVE RIVER		
JAN	3351.44	71,539	651	3,139	1,185	23,200	21,711	212	315	992	806
FEB	3350.94	71,064	645	-475	690	3,791	3,927	126	16	-887	696
MAR	3342.30	63,129	763	-7,935	812	46,920	57,542	128	183	2,186	694
APR	3352.40	72,456	1,655	9,327	1,510	61,960	54,664	133	12	666	618
MAY	3352.06	72,130	1,029	-326	545	60,660	62,334	151	485	1,439	1,171
JUN	3342.04	62,898	706	-9,232	140	44,120	54,440	180	11	1,139	463
JUL	3348.80	69,052	324	6,154	6	59,750	54,580	244	11	1,233	388
AUG	3352.80	72,839	158	3,787	0	46,790	43,630	241	11	879	166
SEP	3345.00	65,554	146	-7,285	0	40,340	47,918	201	12	506	12
OCT	3333.38	55,456	134	-10,098	0	40,990	52,196	201	12	1,321	12
NOV	3335.44	57,182	137	1,726	12	26,550	24,393	139	9	-295	9
DEC	3351.64	71,730	644	14,548	656	41,520	27,390	159	12	-67	149
TOTAL	---	---	---	3,330	5,556	496,591	504,725	2,115	1,089	9,112	5,184

1/ 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 for Mojave W.D. The difference between this total column and the natural inflow released to Mojave River equals the Las Flores Ranch.

2/ At end of month.

FIGURE T: SILVERWOOD LAKE OPERATION



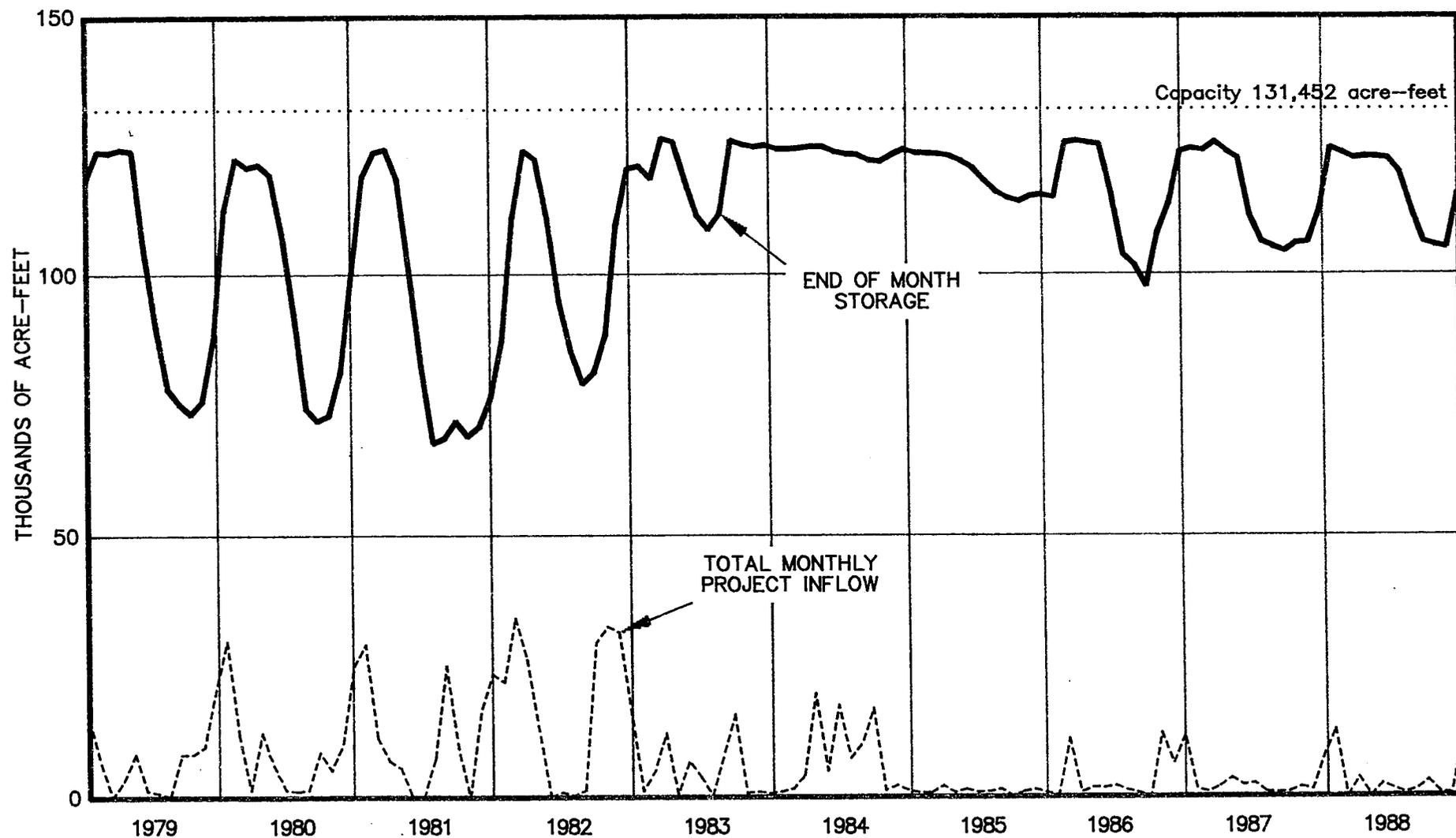
**TABLE 19: LAKE FERRIS MONTHLY OPERATION
1988**

(in acre-feet except as noted)

MONTH	WATER SURFACE ELEVATION (in feet)	TOTAL STORAGE 1/	STORAGE CHANGE	INFLOW	OUTFLOW	COMPUTED LOSSES (-) GAINS (+)
JAN	1,587.00	124,556	12,060	12,643	414	-169
FEB	1,586.58	123,601	-955	0	1,004	49
MAR	1,586.11	122,536	-1,065	3,489	1,924	-2,630
APR	1,586.22	122,785	249	0	471	720
MAY	1,586.20	122,740	-45	2,351	568	-1,828
JUN	1,586.07	122,446	-294	1,381	534	-1,141
JUL	1,584.87	119,744	-2,702	565	1,844	-1,423
AUG	1,581.64	112,584	-7,160	1,334	7,223	-1,271
SEP	1,578.77	106,353	-6,231	2,989	8,118	-1,102
OCT	1,578.43	105,625	-728	679	495	-912
NOV	1,578.22	105,175	-450	453	403	-500
DEC	1,583.07	115,734	10,559	11,232	433	-240
TOTAL	—	—	3,238	37,116	23,431	-10,447

1/ At end of month.

FIGURE U: LAKE PERRIS OPERATION



**SUMMARY OF
AQUEDUCT OPERATIONS**

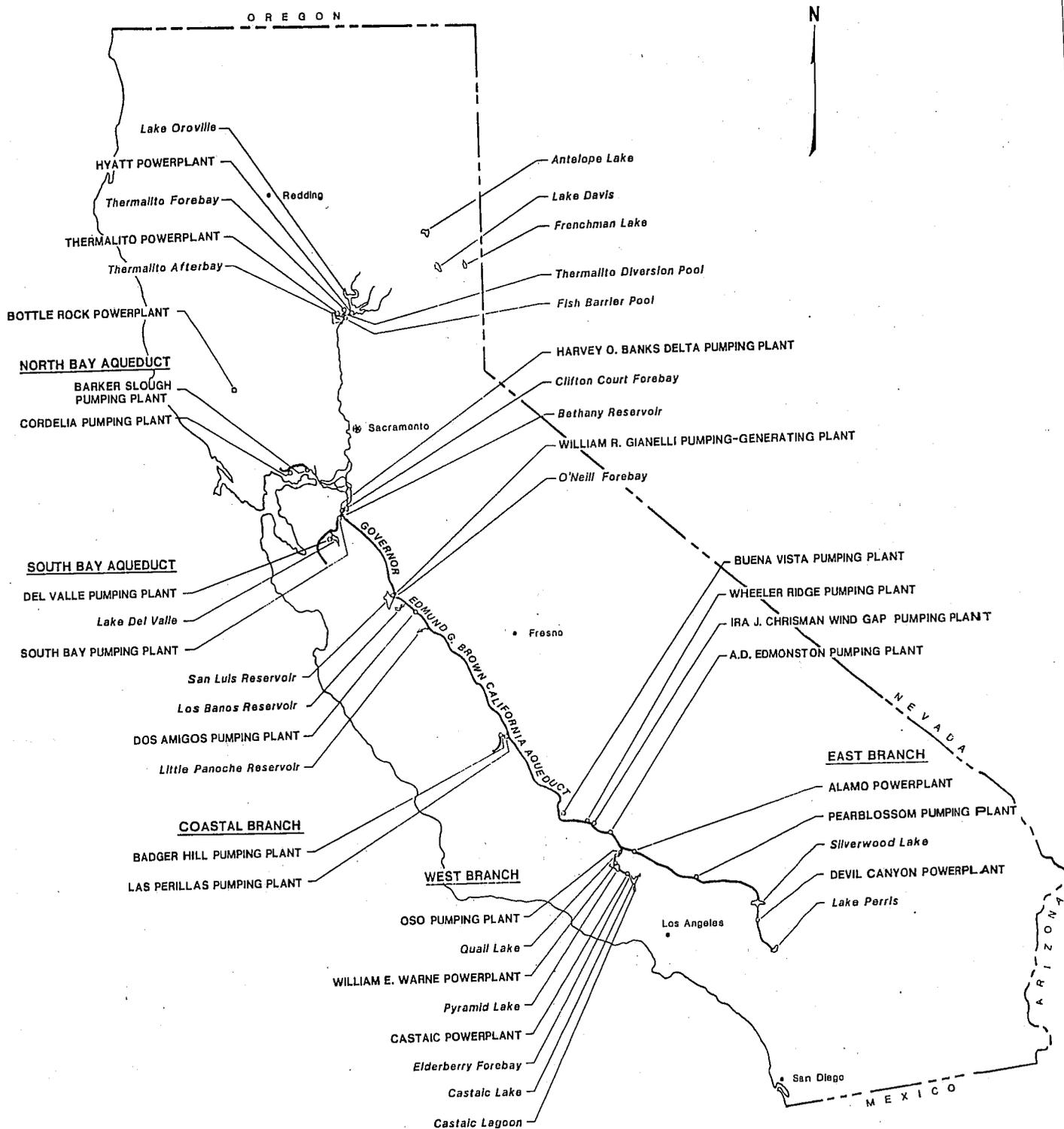
APPENDIX I

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MAP 3 PROJECT FACILITIES



1/

William R. Gianelli Pumping-Generating Plant, previously known as San Luis Pumping-Generating Plant, will be the name designating this facility throughout this report.

**TABLE 20: SUMMARY OF GOVERNOR EDMUND
1988**

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
DELTA FIELD DIVISION						
North Bay Aqueduct	Note: North Bay Aqueduct, South Bay Aqueduct, and Lake Del Valle they are shown here					
Pumped at Barker Slough Pumping Plant 1/ Change in Storage, Travis Tank	84	0	0	57	171	1,592
Delivery (Travis Turnout)	0	0	0	0	0	-1
Pumped at Cordelia Pumping Plant 2/ Deliveries	715	687	118	121	169	1,593
Change in Storage, Napa Terminal Tank	724	676	120	120	173	1,596
Computed Losses (-), Gains (+)	-9	11	-2	1	-4	-3
California Aqueduct	0	0	0	0	0	0
Pumped at Harvey O. Banks Delta Pumping Plant	383,125	332,719	258,878	255,165	184,398	166,927
Pumped at South Bay Pumping Plant Delivered to Contracting Agencies	8,141	6,933	16,238	16,159	17,628	15,847
Change in Storage	8	330	807	325	513	933
Outflow at Check 12	-176	540	-879	429	-104	88
Computed Losses (-), Gains (+)	376,162	325,408	241,343	238,702	165,534	148,823
South Bay Aqueduct	1,010	492	-1,369	450	-827	-1,236
Pumped at South Bay Pumping Plant Inflow from Lake Del Valle	8,141	6,933	16,238	16,159	17,628	15,847
Outflow (Pumped into Lake Del Valle)	0	181	0	0	0	0
Delivered to Contracting Agencies Project Water Only	0	0	5,266	6,249	4,449	1,024
Del Valle Natural Inflow Exchanged and Released from Aqueduct	7,357	6,837	10,773	9,857	13,143	14,813
Del Valle Natural Inflow Released from Aqueduct	774	47	175	40	0	0
Del Valle Stored Water Released	0	181	0	0	0	0
Del Valle Stored Exchange and Released from Aqueduct	0	0	0	0	0	0
Change in Storage	0	0	0	0	0	0
Computed Losses (-), Gains (+)	0	0	0	0	0	0
Lake Del Valle Operation:	-10	-49	-24	-13	-36	-10
End-of-Month Storage (State) Change in Storage	25,195	25,155	30,438	36,541	40,702	41,338
	729	-40	5,283	6,103	4,161	636
SAN LUIS FIELD DIVISION						
O'Neill Forebay Operation						
End-of-Month Storage	43,671	49,155	44,818	50,859	46,128	47,125
Inflow, California Aqueduct	376,162	325,408	241,343	238,702	165,534	148,823
Inflow, O'Neill P.- G. Plant	212,011	128,212	117,366	112,710	17,589	0
Inflow, Gianelli P.- G. Plant	0	11,536	16,406	36,654	174,860	449,181
Change in Storage	-6,362	5,484	-4,337	6,041	-4,731	997
Delivered to Federal Customers	43	1,020	3,250	2,534	2,904	4,891
Delivered to Dept. of Parks and Rec. (State)	0	0	1	0	1	1
Delivered to Dept. of Fish and Game (State)	4	32	26	16	30	0
Outflow, O'Neill P.- G. Plant	0	60	36	0	24,278	67,918
Outflow, Gianelli P.- G. Plant	361,117	132,381	93,576	107,108	29,681	0
Outflow, Dos Amigos P.P.	233,053	321,549	273,403	268,728	304,102	520,107
Computed Losses (-), Gains (+)	-318	-4,630	-9,160	-3,639	-1,718	-4,090
San Luis Reservoir Operation						
State End-of-Month Storage	838,599	1,020,042	1,057,860	1,057,796	1,007,399	885,923
Total End-of-Month Storage	1,610,486	1,718,108	1,781,370	1,842,590	1,685,940	1,229,080
Inflow, Gianelli P.- G. Plant	361,117	132,381	93,576	107,108	29,681	0
Change in Storage (Total)	342,631	107,622	63,262	61,220	-156,650	-456,860
Outflow, Gianelli P.- G. Plant	0	11,536	16,406	36,654	174,860	449,181
Outflow, Pacheco Tunnel	7,747	11,593	12,769	5,472	8,212	6,982
Computed Losses (-), Gains (+)	-10,739	-1,630	-1,139	-3,762	-3,259	-697

1/ May value reflects 7 ac-ft inflow from interim plant and 9 ac-ft used to fill Cordelia Reservoir.
2/ January value includes 1 ac-ft from Solano I.D. to fill new pipeline.

G. BROWN CALIFORNIA AQUEDUCT OPERATION 1988

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION	
are not within the Edmond G. Brown California Aqueduct, for completeness.								DELTA FIELD DIVISION
								North Bay Aqueduct
3,652	3,209	3,499	3,022	2,139	1,709	19,134	Pumped at Barker Slough Pumping Plant 1/	
-2	0	0	0	0	0	-3	Change in Storage, Travis Tank	
0	0	0	0	0	2	2	Delivery (Travis Turnout)	
3,654	3,209	3,499	3,022	2,051	1,619	20,457	Pumped at Cordelia Pumping Plant 2/	
3,654	3,214	3,495	3,026	2,047	1,613	20,458	Deliveries	
0	-5	4	-4	4	6	-1	Change in Storage, Napa Terminal Tank	
0	0	0	0	0	0	0	Computed Losses (-), Gains (+)	
								California Aqueduct
								Pumped at Harvey O. Banks Delta Pumping Plant
199,911	244,606	196,767	114,307	139,679	177,811	2,654,293	Pumped at South Bay Pumping Plant	
16,208	13,633	10,154	9,424	9,866	10,774	151,005	Delivered to Contracting Agencies	
1,172	554	261	102	18	9	5,032	Change in Storage	
176	286	-186	-182	66	-148	-90	Outflow at Check 12	
181,331	228,540	185,500	100,513	123,678	162,444	2,477,978	Computed Losses (-), Gains (+)	
-1,024	-1,593	-1,038	-4,450	-6,051	-4,732	-20,368		
								South Bay Aqueduct
								Pumped at South Bay Pumping Plant
16,208	13,633	10,154	9,424	9,866	10,774	151,005	Inflow from Lake Del Valle	
0	1,265	6,136	4,307	1,627	1,346	14,862	Outflow (Pumped into Lake Del Valle)	
0	0	0	0	0	0	16,988	Delivered to Contracting Agencies	
								Project Water Only
16,198	14,888	16,280	13,721	11,483	11,905	147,255	Del Valle Natural Inflow Exchanged and Released from Aqueduct	
0	0	0	0	0	205	1,241	Del Valle Natural Inflow Released from Aqueduct	
0	0	0	0	0	0	181	Del Valle Stored Water Released	
0	0	0	0	0	0	0	Del Valle Stored Exchange and Released from Aqueduct	
0	0	0	0	0	0	0	Change in Storage	
-10	-10	-10	-10	-10	-10	-202	Computed Losses (-), Gains (+)	
								Lake Del Valle Operation:
40,817	39,126	32,617	28,097	26,390	25,190	---	End-of-Month Storage (State)	
-521	-1,691	-6,509	-4,520	-1,707	-1,200	724	Change in Storage	
								SAN LUIS FIELD DIVISION
								O'Neill Forebay Operation
								End-of-Month Storage
51,233	46,521	43,023	39,825	47,572	50,779	---	Inflow, California Aqueduct	
181,331	228,540	185,500	100,513	123,678	162,444	2,477,978	Inflow, O'Neill P.- G. Plant	
1,423	25,504	107,007	88,557	180,855	229,849	1,221,083	Inflow, Gianelli P.- G. Plant	
533,540	256,983	27,241	30,332	7,758	0	1,544,491	Change in Storage	
4,108	-4,712	-3,498	-3,198	7,747	3,207	746	Delivered to Federal Customers	
6,370	5,760	2,717	730	736	174	31,129	Delivered to Dept. of Parks and Rec. (State)	
1	1	1	1	0	0	7	Delivered to Dept. of Fish and Game (State)	
38	11	78	0	0	15	250	Outflow, O'Neill P.- G. Plant	
31,698	4,069	0	0	0	0	128,059	Outflow, Gianelli P.- G. Plant	
0	0	106,984	70,197	162,060	202,371	1,265,475	Outflow, Dos Amigos P.P.	
663,134	501,543	211,076	159,358	146,063	182,491	3,784,607	Computed Losses (-), Gains (+)	
-10,945	-4,355	-2,390	7,686	4,315	-4,035	-33,279		
								San Luis Reservoir Operation
								State End-of-Month Storage
559,392	379,479	399,179	358,870	305,350	247,990	---	Total End-of-Month Storage	
689,933	423,039	487,973	516,875	658,461	854,053	---	Inflow, Gianelli P.- G. Plant	
0	0	106,984	70,197	162,060	202,371	1,265,475	Change in Storage (Total)	
-539,147	-266,894	64,934	28,902	141,586	195,592	-413,802	Outflow, Gianelli P.- G. Plant	
533,540	256,983	27,241	30,332	7,758	0	1,544,491	Outflow, Pacheco Tunnel	
7,868	8,637	8,220	7,302	6,984	5,379	97,165	Computed Losses (-), Gains (+)	
2,261	-1,274	-6,589	-3,661	-5,732	-1,400	-37,621		

**TABLE 20: SUMMARY OF GOVERNOR EDMUND
1988**

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
SAN LUIS FIELD DIVISION (Cont.)						
California Aqueduct (Pools 14 thru 21)						
Inflow, Dos Amigos P.P. (State)	93,722	132,334	183,684	181,684	186,470	280,385
Inflow, Dos Amigos P.P. (Federal)	139,331	189,215	89,719	87,044	117,632	239,722
Inflow, Floodwater	0	7	8	0	0	0
Change in Storage	26	1,720	-1,770	90	-1,208	1,398
Delivered to Federal Customers	131,606	182,573	78,190	77,626	107,118	224,918
Outflow, Check 21 (State)	93,686	135,287	186,819	185,438	189,187	283,459
Outflow, Check 21 (Federal)	7,710	10,447	12,641	12,564	11,733	18,445
Delivered to Dept. of Fish and Game (State)	6	19	5	1	15	17
Computed Losses (-), Gains (+)	-19	8,490	2,474	6,991	2,743	8,130
SAN JOAQUIN FIELD DIVISION						
California Aqueduct, Check 21 to Buena Vista Pumping Plant						
Inflow, Check 21 (state)	93,686	135,287	186,819	185,438	189,187	283,459
Inflow, Check 21 (Federal)	7,710	10,447	12,641	12,564	11,733	18,445
Inflow, Kern River Intertie (State)	0	0	0	0	0	0
Delivered to Contracting State Agencies	15,767	80,633	52,689	35,514	49,536	148,742
Delivered to Federal Customers	7,711	10,388	12,641	12,564	11,733	18,359
Delivered for Repayment of Pre-consolidation Water	0	0	0	0	0	0
Change in Storage	237	265	-676	87	237	-289
Outflow, Buena Vista P.P.	71,953	41,991	119,492	134,927	117,869	107,340
Coastal Br. Diversion	2,125	7,272	9,272	11,327	15,486	20,920
Computed Losses (-), Gains (+)	-3,603	-5,185	-6,042	-3,583	-6,059	-6,832
California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.						
Inflow, Buena Vista P.P.	71,953	41,991	119,492	134,927	117,869	107,340
Delivered to Contracting State Agencies	2,021	12,523	19,589	8,039	9,074	24,768
Change in Storage	120	-109	-69	9	2	-80
Outflow, Wheeler Ridge P.P.	71,041	29,708	100,284	130,003	110,104	83,806
Computed Losses (-), Gains (+)	1,229	131	312	3,124	1,311	1,154
California Aqueduct, Wheeler Ridge to Ira J. Chrisman Wind Gap P.P.						
Inflow, Wheeler Ridge P.P.	71,041	29,708	100,284	130,003	110,104	83,906
Delivered to Contracting State Agencies	287	1,769	4,439	3,637	5,016	6,089
Change in Storage	-51	21	22	-24	8	0
Outflow, Ira J. Chrisman Wind Gap P.P.	69,748	26,575	94,686	124,751	104,059	76,217
Computed Losses (-), Gains (+)	-1,057	-1,343	-1,137	-1,639	-1,021	-1,600
California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmunston P.P.						
Inflow, Ira J. Chrisman Wind Gap P.P.	69,748	26,575	94,686	124,751	104,059	76,217
Delivered to Contracting State Agencies	38	162	891	514	1,586	1,782
Change in Storage	-24	61	-96	-38	72	-73
Outflow, A.D. Edmunston P.P.	70,478	27,020	94,433	124,260	103,212	75,623
Computed Losses (-), Gains (+)	744	668	542	-15	811	1,115
Coastal Branch, California Aqueduct						
Inflow, Las Perillas P.P.	2,125	7,272	9,272	11,327	15,486	20,920
Delivered to Contracting State Agencies	1,783	6,663	8,185	10,355	13,911	19,482
Delivered to Federal Customers	0	59	0	0	0	86
Change in Storage	7	-8	19	1	-22	3
Computed Losses (-), Gains (+)	-335	-558	-1,068	-971	-1,597	-1,349

G. BROWN CALIFORNIA AQUEDUCT OPERATION 1988

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							SAN LUIS FIELD DIVISION (Cont.)
							California Aqueduct (Pools 14 thru 21)
374,819	291,559	158,776	115,739	117,312	154,990	2,271,474	Inflow, Dos Amigos P.P. (State)
288,315	209,984	52,300	43,619	28,751	27,501	1,513,133	Inflow, Dos Amigos P.P. (Federal)
0	0	0	0	706	3,538	4,259	Inflow, Floodwater
806	-518	-719	394	255	-140		Change in Storage
272,651	191,070	39,101	29,698	25,066	30,407	1,390,024	Delivered to Federal Customers
377,289	297,230	161,224	115,764	119,160	156,540	2,301,083	Outflow, Check 21 (State)
18,327	23,114	14,598	14,257	5,404	3,970	153,210	Outflow, Check 21 (Federal)
18	16	16	6	2	9	130	Delivered to Dept. of Fish and Game (State)
5,957	9,369	3,144	761	3,118	4,757	55,915	Computed Losses (-), Gains (+)
							SAN JOAQUIN FIELD DIVISION
							California Aqueduct, Check 21 to Buena Vista Pumping Plant
377,289	297,230	161,224	115,764	119,160	156,540	2,301,083	Inflow, Check 21 (state)
18,327	23,114	14,598	14,257	5,404	3,970	153,210	Inflow, Check 21 (Federal)
0	0	0	0	0	0	0	Inflow, Kern River Intertie (State)
187,960	154,348	47,684	25,844	22,819	23,779	845,315	Delivered to Contracting State Agencies
18,101	22,960	14,584	14,257	5,404	3,830	152,532	Delivered to Federal Customers
0	0	0	0	0	0		Delivered for Repayment of Pre-consolidation Water
121	76	171	184	-355	338	396	Change in Storage
151,226	119,704	100,161	71,742	88,146	128,408	1,252,959	Outflow, Buena Vista P.P.
26,539	18,511	9,728	9,567	2,144	1,448	134,339	Coastal Br. Diversion
-11,669	-4,745	-3,494	-8,427	-6,406	-2,707	-68,752	Computed Losses (-), Gains (+)
							California Aqueduct, Buena Vista P.P. to Wheeler Ridge P.P.
151,226	119,704	100,161	71,742	88,146	128,408	1,252,959	Inflow, Buena Vista P.P.
32,122	26,340	6,159	3,168	1,737	1,013	146,553	Delivered to Contracting State Agencies
45	89	23	61	-128	-37	-74	Change in Storage
120,846	94,802	95,295	68,305	87,935	129,288	1,121,417	Outflow, Wheeler Ridge P.P.
1,787	1,527	1,316	-208	1,398	1,856	14,937	Computed Losses (-), Gains (+)
							California Aqueduct, Wheeler Ridge to Ira J. Chrisman Wind Gap P.P.
120,846	94,802	95,295	68,305	87,935	129,288	1,121,517	Inflow, Wheeler Ridge P.P.
6,609	4,769	2,531	3,168	1,447	2,233	41,994	Delivered to Contracting State Agencies
-14	8	16	37	-37	31	17	Change in Storage
112,419	88,594	91,907	65,180	85,814	125,433	1,065,383	Outflow, Ira J. Chrisman Wind Gap P.P.
-1,832	-1,431	-841	80	-711	-1,591	-14,123	Computed Losses (-), Gains (+)
							California Aqueduct, Ira J. Chrisman Wind Gap P.P. to A.D. Edmunston P.P.
112,419	88,594	91,907	65,180	85,814	125,433	1,065,383	Inflow, Ira J. Chrisman Wind Gap P.P.
1,929	1,415	1,421	695	141	338	10,912	Delivered to Contracting State Agencies
5	0	-175	216	-12	14	-50	Change in Storage
110,721	87,177	90,174	64,539	85,346	123,730	1,056,713	Outflow, A.D. Edmunston P.P.
236	-2	-487	270	-339	-1,351	2,192	Computed Losses (-), Gains (+)
							Coastal Branch, California Aqueduct
26,539	18,511	9,728	9,567	2,144	1,448	134,339	Inflow, Las Perillas P.P.
23,030	16,164	8,986	8,888	2,209	1,313	120,969	Delivered to Contracting State Agencies
226	154	14	0	0	0	539	Delivered to Federal Customers
26	-19	2	16	-13	3	15	Change in Storage
-3,257	-2,212	-726	-663	52	-132	-12,816	Computed Losses (-), Gains (+)

**TABLE 20: SUMMARY OF GOVERNOR EDMUND
1988**

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
SOUTHERN FIELD DIVISION						
California Aqueduct, A.D. Edmonston P.P. to Junction of West Branch						
Inflow, A.D. Edmonston P.P.	70,478	27,020	94,433	124,260	103,212	75,623
Change in Storage	1	3	-6	1	4	1
Outflow, West Branch	46,090	22,534	41,729	57,245	35,169	24,442
Outflow, East Branch	24,393	4,479	52,727	67,046	68,050	51,164
Computed Losses (-), Gains (+)	6	-4	17	32	11	-16
California Aqueduct, Junction of West Branch to Pearblossom P.P.						
Inflow (Aqueduct)	24,393	4,479	52,727	67,046	68,050	51,164
Change in Storage	-719	199	-301	542	148	-767
Delivered to Contracting Agencies	623	452	1,430	2,157	2,860	3,704
Outflow, Pearblossom P.P.	24,906	3,517	52,849	66,707	65,889	47,007
Computed Losses (-), Gains (+)	417	-311	1,251	2,360	847	-1,220
California Aqueduct, Pearblossom P.P. to Silverwood Lake						
Inflow, Pearblossom P.P.	24,906	3,517	52,849	66,707	65,889	47,007
Change in Storage	49	-562	648	-70	100	-141
Deliveries (Exchange of Natural Inflow)	491	680	511	606	686	452
Outflow to Silverwood Lake	23,200	3,791	46,920	61,960	60,660	44,120
Computed Losses (-), Gains (+)	-1,166	392	-4,770	-4,211	-4,443	-2,576
Silverwood Lake Operation						
Inflow, Project	23,200	3,791	46,920	61,960	60,660	44,120
Inflow, Natural	1,185	690	812	1,510	545	140
Change in storage	3,139	-475	-7,935	9,327	-326	-9,232
Delivered to Contracting Agencies	212	126	128	133	151	180
Outflow, Natural Inflow Released	315	16	183	12	485	11
Outflow, San Bernardino Tunnel	21,711	3,927	57,542	54,664	62,334	54,440
Computed Losses (-), Gains (+)	992	-887	2,186	666	1,439	1,139
California Aqueduct, Silverwood Lake to Lake Perris						
Inflow, San Bernardino Tunnel	21,711	3,927	57,542	54,664	62,334	54,440
Change in Storage	-41	0	1	0	4	-2
Delivered to Contracting Agencies	9,108	4,197	54,051	54,725	59,977	53,058
Outflow to Lake Perris	12,643	0	3,489	0	2,351	1,381
Operational Losses (-), Gains (+)	-1	270	-1	61	-2	-3
Lake Perris Operation						
Inflow	12,643	0	3,489	0	2,351	1,381
Change in Storage	12,060	-955	-1,065	249	-45	-294
Delivered to Contracting Agencies	414	1,004	1,924	471	568	534
Outflow	0	0	0	0	0	0
Computed Losses (-), Gains (+)	-169	49	-2,630	720	-1,828	-1,141

G. BROWN CALIFORNIA AQUEDUCT OPERATION (Continued)

1988

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION
							California Aqueduct, A.D. Edmonston P.P. to Junction of West Branch
110,721	87,177	90,174	64,539	85,346	123,730	1,056,713	Inflow, A.D. Edmonston P.P.
4	-11	-72	61	2	6	-6	Change in Storage
41,310	31,220	46,084	16,011	56,230	82,117	500,181	Outflow, West Branch
69,421	55,984	44,184	48,479	29,122	41,633	556,682	Outflow, East Branch
14	16	22	12	8	26	144	Computed Losses (-), Gains (+)
							California Aqueduct, Junction of West Branch to Pearblossom P.P. <i>EAST</i>
69,421	55,984	44,184	48,479	29,122	41,633	556,682	Inflow (Aqueduct)
0	662	233	-103	-246	-389	-741	Change in Storage
6,210	6,258	5,144	3,232	2,664	1,583	36,317	Delivered to Contracting Agencies
64,217	50,225	40,437	45,476	27,331	42,366	530,927	Outflow, Pearblossom P.P.
1,006	1,161	1,630	126	627	1,927	9,821	Computed Losses (-), Gains (+)
							California Aqueduct, Pearblossom P.P. to Silverwood Lake
64,217	50,225	40,437	45,476	27,331	42,366	530,927	Inflow, Pearblossom P.P.
97	-82	-574	572	118	-185	-30	Change in Storage
377	155	0	0	0	137	4,095	Deliveries (Exchange of Natural Inflow)
59,750	46,790	40,340	40,990	26,550	41,520	496,591	Outflow to Silverwood Lake
-3,993	-3,362	-671	-3,914	-663	-894	-30,271	Computed Losses (-), Gains (+)
							Silverwood Lake Operation
59,750	46,790	40,340	40,990	26,550	41,520	496,591	Inflow, Project
6	0	0	0	12	656	5,556	Inflow, Natural
6,154	3,787	-7,285	-10,098	1,726	14,548	3,330	Change in storage
244	241	201	201	139	159	2,115	Delivered to Contracting Agencies
11	11	12	12	9	12	1,089	Outflow, Natural Inflow Released
54,580	43,630	47,918	52,196	24,393	27,390	504,725	Outflow, San Bernardino Tunnel
1,233	879	506	1,321	-295	-67	9,112	Computed Losses (-), Gains (+)
							California Aqueduct, Silverwood Lake to Lake Perris
54,580	43,630	47,918	52,196	24,393	27,390	504,725	Inflow, San Bernardino Tunnel
-3	-5	11	-7	3	-6	-45	Change in Storage
54,015	42,298	44,916	51,522	23,936	16,163	467,966	Delivered to Contracting Agencies
565	1,334	2,989	679	453	11,232	37,116	Outflow to Lake Perris
-3	-3	-2	-2	-1	-1	312	Operational Losses (-), Gains (+)
							Lake Perris Operation
565	1,334	2,989	679	453	11,232	37,116	Inflow
-2,702	-7,160	-6,231	-728	-450	10,559	3,238	Change in Storage
1,844	7,223	8,118	495	403	433	23,431	Delivered to Contracting Agencies
0	0	0	0	0	0	0	Outflow
-1,423	-1,271	-1,102	-912	-500	-240	-10,447	Computed Losses (-), Gains (+)

**TABLE 20: SUMMARY OF GOVERNOR EDMUND
1988**

(in acre-feet)

DESCRIPTION	JAN	FEB	MAR	APR	MAY	JUN
SOUTHERN FIELD DIVISION (Cont.)						
West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.						
Inflow	46,090	22,534	41,729	57,245	35,169	24,442
Change in Storage	3	10	-18	3	12	2
Outflow, Oso Pumping Plant	46,104	22,511	41,799	57,340	35,192	24,380
Computed Losses (-), Gains (+)	17	-13	52	98	35	-60
West Branch California Aqueduct Oso P.P. to Pyramid Lake						
Inflow, Oso P.P.	46,104	22,511	41,799	57,340	35,192	24,380
Change in Storage	599	-402	-257	-280	1,040	263
Outflow through William E. Warne P.P. to Pyramid Lake	45,634	23,165	42,632	57,881	33,773	24,260
Operational Losses (-), Gains (+)	129	252	576	261	-379	143
Pyramid Lake Operation						
Inflow, from Warne	45,634	23,165	42,632	57,881	33,773	24,260
Inflow, Natural	2,972	5,097	4,912	2,122	1,141	496
Inflow, Pumpback from Elderberry Forebay	56,694	42,667	24,182	7,355	22,815	22,362
Change in Storage	586	2,317	1,997	-7,215	4,251	930
Delivered to Dept. of Parks and Rec. (State)	0	0	2	0	0	0
Outflow, Pyramid Release	1,864	6,596	4,399	1,772	1,956	682
Outflow, Angeles Tunnel	101,237	63,202	63,314	71,969	51,328	44,931
Computed Losses (-), Gains (+)	-1,613	1,186	-2,014	-832	-194	-575
Elderberry Forebay Operation						
Inflow, Project through Castaic P-G Plant	101,237	63,202	63,314	71,969	51,328	44,931
Inflow, Natural	477	429	667	268	63	0
Change in Storage	-1,469	1,313	-5,042	7,281	-4,737	-3,289
Outflow, Pumpback to Pyramid Lake	56,694	42,667	24,182	7,355	22,815	22,362
Outflow, Released to Castaic Lake	49,354	21,658	44,540	54,801	29,673	25,270
Computed Losses (-), Gains (+)	2,865	2,007	-301	-2,800	-3,640	-588
Castaic Lake Operation						
Inflow, Project	49,354	21,658	44,540	54,801	29,673	25,270
Inflow, Natural	562	391	451	479	155	39
Change in Storage	21,252	-13,832	4,072	14,533	-20,628	-28,076
Delivered to Contracting Agencies	23,962	33,022	38,903	41,758	50,415	53,240
Outflow, Castaic Afterbay	1,251	815	1,014	591	1,132	0
Computed Losses (-), Gains (+)	-3,451	-2,044	-1,002	1,602	1,091	-145
Castaic Lagoon Operation						
Inflow (Includes recreation inflow)	1,251	815	1,014	591	1,132	0
Change in Storage	675	32	-65	-12	-51	-233
Outflow	548	718	992	519	1,078	108
Operational Losses (-), Gains (+)	-28	-65	-87	-84	-105	-125

G. BROWN CALIFORNIA AQUEDUCT OPERATION (Continued)

1988

(in acre-feet)

JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	DESCRIPTION
							SOUTHERN FIELD DIVISION (Cont.)
							West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.
41,310	31,220	46,084	16,001	56,230	82,117	197 500,171	Inflow
13	-32	-222	188	5	19	-17	Change in Storage
41,339	31,300	46,374	15,818	56,251	82,177	500,585	Outflow, Oso Pumping Plant
42	48	68	5	26	79	397	Computed Losses (-), Gains (+)
							West Branch California Aqueduct Oso P.P. to Pyramid Lake
41,339	31,300	46,374	15,818	56,251	82,177	500,585	Inflow, Oso P.P.
345	77	-47	513	-675	-571	605	Change in Storage
40,610	31,704	46,487	15,057	57,683	83,472	502,358	Outflow through William E. Warne P.P. to Pyramid Lake
-384	481	66	-248	757	724	2,378	Operational Losses (-), Gains (+)
							Pyramid Lake Operation
40,610	31,704	46,487	15,057	57,683	83,472	502,358	Inflow, from Warne
275	208	192	255	360	757	18,787	Inflow, Natural
9,556	44,650	65,274	43,356	26,391	60,726	426,028	Inflow, Pumpback from Elderberry Forebay
-189	-126	1,918	-2,696	-4,027	-701	-2,955	Change in Storage
0	0	0	0	0	0	2	Delivered to Dept. of Parks and Rec. (State)
846	826	764	765	439	517	21,426	Outflow, Pyramid Release
49,207	75,730	108,432	60,391	85,515	143,452	918,708	Outflow, Angeles Tunnel
-577	-132	-839	-208	-2,507	-1,687	-9,992	Computed Losses (-), Gains (+)
							Elderberry Forebay Operation
49,207	75,730	108,432	60,391	85,515	143,452	918,708	Inflow, Project through Castaic P-G Plant
0	0	0	0	0	5	1,909	Inflow, Natural
848	-1,664	-164	5,888	-542	1,292	-285	Change in Storage
9,556	44,650	65,274	43,356	26,391	60,726	426,028	Outflow, Pumpback to Pyramid Lake
38,673	32,037	42,898	10,404	59,930	80,961	490,199	Outflow, Released to Castaic Lake
-130	-707	-424	-743	264	-478	-4,675	Computed Losses (-), Gains (+)
							Castaic Lake Operation
38,673	32,037	42,898	10,404	59,930	80,961	490,199	Inflow, Project
14	6	0	7	20	158	2,282	Inflow, Natural
-19,482	-19,555	-19,822	-50,539	25,777	78,168	-28,132	Change in Storage
57,181	51,153	61,145	61,949	34,229	1,571	508,528	Delivered to Contracting Agencies
204	6	0	0	35	44	5,092	Outflow, Castaic Afterbay
-784	-439	-1,575	999	91	-1,336	-6,993	Computed Losses (-), Gains (+)
							Castaic Lagoon Operation
310	426	534	0	35	44	6,152	Inflow (Includes recreation inflow)
-112	67	181	-311	-233	-111	-173	Change in Storage
204	6	0	7	20	83	4,283	Outflow
-218	-353	-353	-304	-248	-72	-2,042	Operational Losses (-), Gains (+)

WEST

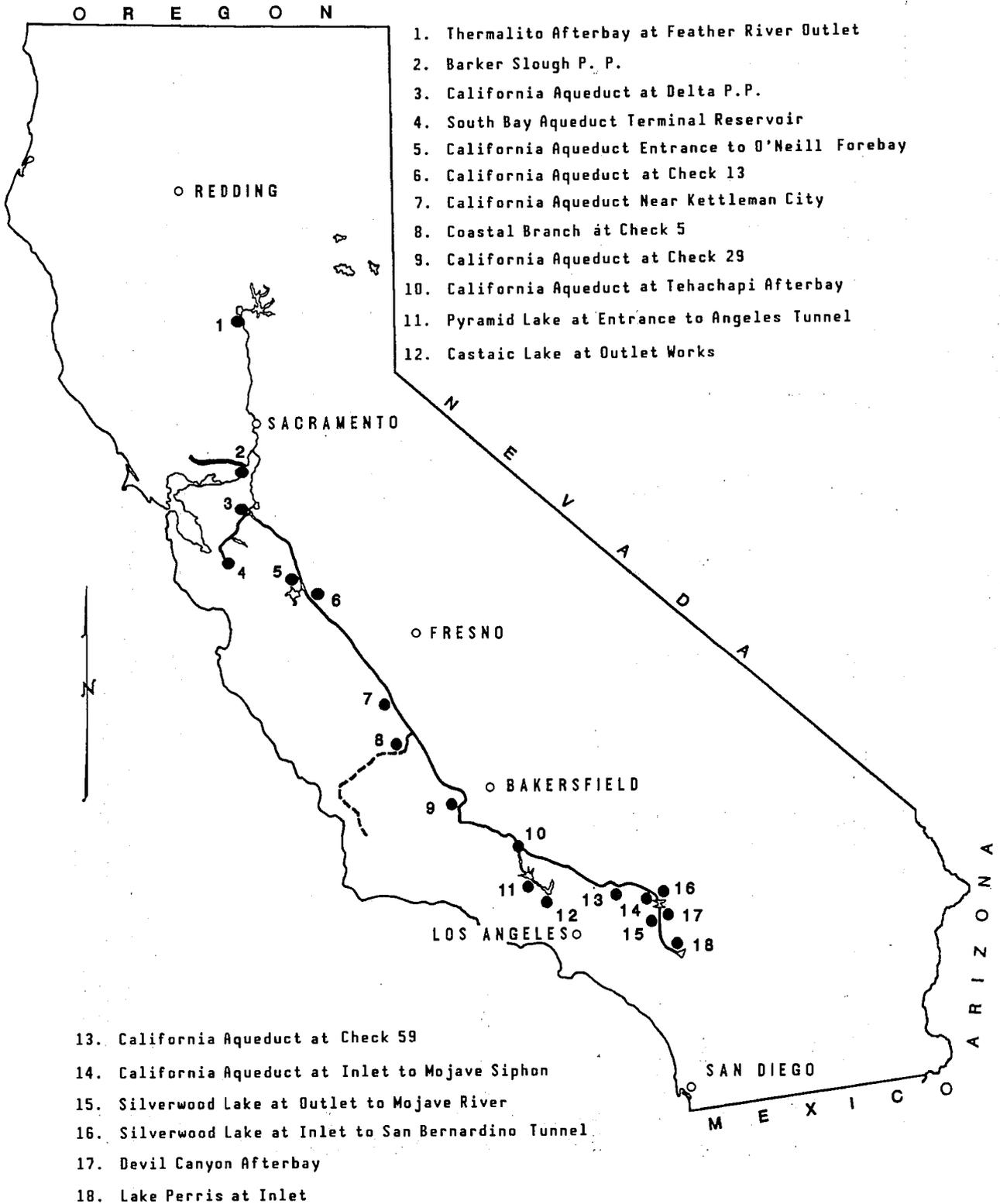
WATER QUALITY

APPENDIX II

MAP 4

WATER QUALITY MONITORING STATIONS

(as reported on pages 82 through 99 of this report)



1. Thermalito Afterbay at Feather River Outlet
2. Barker Slough P. P.
3. California Aqueduct at Delta P.P.
4. South Bay Aqueduct Terminal Reservoir
5. California Aqueduct Entrance to O'Neill Forebay
6. California Aqueduct at Check 13
7. California Aqueduct Near Kettleman City
8. Coastal Branch at Check 5
9. California Aqueduct at Check 29
10. California Aqueduct at Tehachapi Afterbay
11. Pyramid Lake at Entrance to Angeles Tunnel
12. Castaic Lake at Outlet Works

13. California Aqueduct at Check 59
14. California Aqueduct at Inlet to Mojave Siphon
15. Silverwood Lake at Outlet to Mojave River
16. Silverwood Lake at Inlet to San Bernardino Tunnel
17. Devil Canyon Afterbay
18. Lake Perris at Inlet

TABLE 21: THERMALITO AFTERBAY AT FEATHER RIVER OUTLET*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids	57	61	58	63	63	66	60	67	63	61	77	59	63
Total Hardness	42	36	36	36	39	39	39	42	39	46	46	46	41
Chlorides	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulfates	3	3	2	1	2	2	4	3	2	2	2	2	2
Sodium	4	4	4	3	4	3	4	4	4	4	4	4	4
Percent Sodium	17	19	20	16	19	15	19	18	19	16	16	16	18
Electrical Conductivity*	86	92	89	91	90	87	89	91	96	94	104	117	94
pH	8.2	8.1	7.6	8.2	8.2	7.9	8.6	8.4	8.3	8.1	8.1	9.1	8
Boron	<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
Fluoride													
Lead													
Selenium													
Hexavalent Chromium													
Arsenic													
Iron													
Manganese													
Magnesium	4	4	4	4	4	4	4	4	4	5	5	5	4
Copper													
Calcium	10	8	8	8	9	9	9	10	9	10	10	10	9
Zinc													
Phenol													
Color (units)													
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/17	09/21	10/19	11/16	12/21	

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

<X.X = none detected at stated detection level

TABLE 22: BARKER SLOUGH PUMPING PLANT *

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids	191	209	361	321	413	345	180	232	168	190	182	173	247
Total Hardness	146	174	189	182	199	174	95	102	100	111	104	98	140
Chlorides	8	8	56	32	58	49	19	18	18	21	20	23	28
Sulfates	24	26	64	43	59	55	22	20	19	20	19	23	33
Sodium	12	13	62	38	58	52	23	23	22	26	23	24	31
Percent Sodium	15	14	42	32	39	40	35	33	33	34	33	35	32
Electrical Conductivity	333	347	623	525	652	552	287	284	284	312	293	291	399
pH	8.3	8.5	8.0	8.5	8.3	8.1	8.3	8.3	8.0	8.2	7.8	7.8	8.2
Boron	0.2	0.2	0.3	0.3	0.4	0.4	0.2	0.2	0.1	0.1	0.1	0.1	0.22
Fluoride													
Lead													
Selenium													
Hexavalent Chromium													
Arsenic													
Iron													
Manganese													
Magnesium	25	30	30	29	32	27	14	15	14	16	<1	14	22
Copper													
Calcium	17	20	26	25	27	25	15	16	17	18	17	16	20
Zinc													
Phenol													
Color (units)													
Sampling Date	01/19	02/16	03/16	04/20	05/18	06/15	07/20	08/17	9/21	10/19	11/16	12/21	

* Electrical Conductivity is in microsiemens/cm (microsiemens are equivalent to micromhos; to obtain millisiemens, divide by 1,000). All other constituents are in milligrams per liter except for pH, percent 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 *
1988**

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	340	233	294	272	197	256	346	402	398	395	465	477	340
Total Hardness**	130	96	115	108	84	103	132	150	149	148	170	174	130
Chlorides**	106	58	85	75	42	68	108	133	131	130	161	166	105
Sulfates**	66	41	55	50	33	46	67	80	79	78	94	97	66
Sodium**	71	43	58	53	33	49	72	87	86	85	103	106	71
Percent Sodium**	54	49	53	52	46	51	55	56	56	56	57	57	53
Electrical Conductivity***	592	399	508	469	335	441	603	703	696	691	816	837	591
Electrical Conductivity	570	377	641	423	373	483	599	628	670	686	804	800	588
pH	8.0	8.0	8.1	8.2	8.2	8.1	8.1	8.0	8.9	8.0	7.7	7.8	8.2
Boron	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.3	0.2
Fluoride	0.1	0.0	0.1	0.0	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.1	0.1
Lead	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Selenium	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Hexavalent Chromium		<0.005							<0.005				>0.001
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.002
Iron	0.071	0.018	0.025	0.006	0.008	0.014	0.006	0.006	0.009	0.008	0.047	0.041	0.022
Manganese	0.024	0.017	0.024	0.018	0.007	0.017	0.015	0.013	0.014	0.009	0.016	0.018	0.016
Magnesium	15	14	18	13	11	15	16	16	19	19	22	22	17
Copper	<0.005	0.010	0.011	<0.005	<0.005	0.016	0.014	0.006	0.006	<0.005	<0.005	0.012	0.011
Calcium	17	20	25	18	16	22	18	17	19	20	22	23	20
Zinc	0.012	0.009	0.016	0.015	0.02	0.017	0.013	0.027	0.013	0.025	0.019	0.037	0.018
Phenol		0.007							<0.001				0.007
Color (units)	25	40	20	25	35	60		30	20	20	15	35	30
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/19	08/17	9/20	10/19	11/15	12/14	

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

** Values correlated from continuous EC.

*** Continuous EC value.

<X.XXX = none detected at stated detection level

TABLE 24: SOUTH BAY AQUEDUCT TERMINAL RESERVOIR*

1988

Constituents	JAN	FEB	MAR	APR	MAY	/2		AUG	SEP	OCT	NOV	DEC	Annual Average
						JUNE	JULY						
Total Dissolved Solids**	332	248	294	273	198	243	349	383	365	376	439	460	330
Total Hardness**	131	103	118	111	87	101	136	147	141	145	166	172	130
Chlorides**	96	59	80	70	38	57	104	118	111	115	143	152	95
Sulfates**	76	50	64	57	34	48	81	92	86	90	109	116	75
Sodium**	66	44	56	50	31	42	70	79	74	77	93	99	65
Percent Sodium**	52	48	51	50	44	48	53	54	53	54	55	56	51
Electrical Conductivity***	582	426	512	472	334	417	613	675	642	662	778	817	578
Electrical Conductivity	573	376	594	464	374	447	588	614	614	658	756	466	544
pH	7.9	8.2	8.2	8.4	8.3	8.0	8.2	8.1	8.2	8.0	8.0	7.8	8.1
Boron	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Fluoride	0.0	0.0	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.1
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	>0.005
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	>0.001
Hexavalent Chromium		<0.005	<0.005						<0.005				>0.001
Arsenic	0.002	0.003	0.001	0.002	0.002	-	0.003	0.002	0.003	0.002	0.002	0.002	0.002
Iron	0.021	0.664	0.008	0.011	0.030	-	0.030	0.007	0.016	<0.005	0.103	0.059	0.095
Manganese	0.009	0.024	0.008	0.009	0.009	-	0.024	<0.005	0.010	0.007	0.016	0.018	0.013
Magnesium	16	14	18	13	12	13	16	17	20	19	22	20	17
Copper	0.005	0.005	0.005	0.008	0.013	-	0.019	0.008	0.009	0.006	0.006	0.011	0.009
Calcium	18	20	22	18	16	19	18	18	24	22	24	21	20
Zinc	0.024	0.021	0.016	0.018	0.038	-	0.028	0.007	0.022	0.031	0.021	0.029	0.023
Phenol		0.003							0.001				0.002
Color (units)	40		20	20	35	80	35	40	15	20	5	3	28
Sampling Date	01/19	02/16	03/15	04/19	05/17	06/14	07/19	08/16	9/20	10/18	11/15	12/20	

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

** Values correlated from continuous EC.

*** Continuous EC value.

/2 Minor element data unavailable at this time.

<X.XXX = none detected at stated detection level

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

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	338	220	278	300	210	227	322	391	408	406	407	455	330
Total Hardness**	136	94	114	122	90	96	130	154	160	160	160	177	133
Chlorides**	105	51	77	88	46	54	98	129	138	137	137	159	102
Sulfates**	75	41	57	64	38	43	71	90	95	95	95	109	73
Sodium**	70	39	54	60	36	40	66	84	89	89	89	102	68
Percent Sodium**	53	48	51	52	47	48	53	55	55	55	55	56	52
Electrical Conductivity***	592	375	481	522	356	387	563	688	720	717	718	806	577
Electrical Conductivity	579	378	584	468	362	441	581	614	649	709	695	765	569
pH	8.0	8.1	8.2	8.3	8.1	8.1	8.2	8.1	8.1	8.0	8.1	7.9	8.1
Boron	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.2
Fluoride	0.1	0.0	0.1	0.0	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.1
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.03	<0.005	0.030
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexavalent Chromium		<0.005							<0.005				<0.001
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.002
Iron	0.082	0.038	0.010	0.022	0.008	0.009	0.032	0.015	<0.005	0.009	0.093	0.025	0.031
Manganese	0.017	0.020	0.012	0.010	0.005	0.072	0.005	0.005	0.005	<0.005	0.038	0.010	0.018
Magnesium	16	14	18	14	11	14	16	17	19	20	20	20	17
Copper	0.009	0.006	0.009	0.006	0.013	0.008	0.009	0.014	0.009	0.014	0.111	0.020	0.019
Calcium	18	21	21	18	15	19	18	18	20	20	20	21	19
Zinc	0.017	0.017	0.019	0.007	0.016	0.025	0.012	0.034	0.018	0.053	0.104	0.033	0.030
Phenol		0.001							0.003				0.002
Color (units)	40	35	20	20	30	40	35	30	20	15	15	20	27
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/17	9/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

<X.XXX = none detected at stated detection level

TABLE 26: CALIFORNIA AQUEDUCT AT CHECK 13*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	360	293	339	340	273	331	348	369	395	398	426	448	360
Total Hardness**	140	117	133	133	110	130	136	143	152	154	163	171	140
Chlorides**	106	78	97	98	69	94	101	110	121	122	134	143	106
Sulfates**	76	59	71	71	53	69	73	79	86	87	94	100	76
Sodium**	72	56	67	67	51	65	69	74	81	82	89	94	72
Percent Sodium**	53	51	52	53	50	52	53	53	54	54	54	55	53
Electrical Conductivity***	635	511	595	598	473	581	612	650	698	705	756	796	634
Electrical Conductivity	610	567	590	528	409	585	604	653	688	713	816	786	629
pH	8.2	8.1	8.2	8.4	8.3	8.1	8.6	8.6	8.4	8.4	8.0	7.8	8.3
Boron	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.0	0.0	0.1	0.0	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.1	0.1
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexavalent Chromium		<0.005							<0.005				0.000
Arsenic	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.003	0.003	0.002	0.002	0.002	0.002
Iron	0.144	0.116	0.056	0.032	0.074	0.011	0.012	0.025	0.015	0.019	0.012	0.360	0.073
Manganese	0.019	0.023	0.014	0.008	0.01	<0.007	0.007	0.009	0.009	<0.005	0.015	0.015	0.012
Magnesium	18	18	17	15	13	17	17	18	19	21	22	22	18
Copper	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.007
Calcium	21	30	24	19	18	23	23	21	22	22	27	27	23
Zinc	0.005	0.022	0.012	0.007	0.005	0.005	0.013	0.007	<0.005	0.012	0.009	0.008	0.010
Phenol		0.012							0.013				0.013
Color (units)	40	35	20	20	25	15	20	15		20	20	25	23
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/17	9/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

<X.XXX = none detected at stated detection level

TABLE 27: CALIFORNIA AQUEDUCT NEAR KETTLEMAN CITY*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	373	319	326	371	268	341	355	384	413	421	438	473	373
Total Hardness**	142	124	127	141	108	131	136	146	155	158	163	175	142
Chlorides**	102	83	86	102	65	91	96	106	117	120	126	138	103
Sulfates**	75	63	65	75	52	68	71	78	84	86	90	98	75
Sodium**	70	60	61	70	50	64	67	73	78	80	83	90	70
Percent Sodium**	52	51	51	52	50	52	52	52	52	53	53	53	52
Electrical Conductivity***	640	548	560	636	461	585	609	659	708	723	751	811	641
Electrical Conductivity	653	567	566	609	408	571	594	634	712	698	726	767	625
pH	8.2	8.1	8.0	8.3	8.1	7.9	8.8	8.6	8.0	8.3	8.1	7.8	8.3
Boron	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Fluoride	0.1	0.1	0.1	0.0	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.1	0.1
Lead	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	0.005
Selenium	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Hexavalent Chromium		<0.005							<0.005				0.000
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002
Iron	0.090	0.123	0.037	0.032	0.083	0.018	0.015	0.015	0.020	0.022	0.041	0.048	0.045
Manganese	0.009	0.016	0.005	<0.005	<0.005	<0.005	0.008	<0.005	0.007	<0.005	<0.005	<0.005	0.009
Magnesium	18	17	17	17	12	16	17	18	19	20	20	21	18
Copper	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.007
Calcium	25	27	25	22	18	22	23	23	22	21	24	26	23
Zinc	0.005	0.006	<0.005	<0.005	<0.005	0.007	0.008	0.008	0.010	0.024	0.008	0.009	0.009
Phenol		0.010							0.006				0.008
Color (units)	30	35	20	10	25	20	15	15	15	15	10	20	19
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/19	08/17	09/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

<X.XXX = none detected at stated detection level

TABLE 28: COASTAL BRANCH AT CHECK 5*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	386	300	300	340	252	302	299	342	369	374	****	410	334
Total Hardness**	149	119	119	133	103	120	119	133	143	145	****	157	131
Chlorides**	112	79	79	94	60	79	78	95	105	107	****	121	92
Sulfates**	85	61	61	72	48	61	61	73	80	81	****	91	70
Sodium**	79	58	58	68	46	58	58	68	75	76	****	85	66
Percent Sodium**	54	52	52	53	50	52	52	53	53	54	****	54	52
Electrical Conductivity***	675	520	520	592	433	522	518	595	643	653	****	717	581
Electrical Conductivity	586	530	506	609	408	500	587	643	681	690	****	767	592
pH	7.9	7.8	8.5	7.9	7.9	7.7	8.4	8.0	8.3	7.7	****	7.9	8.0
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	****	0.4	0.2
Fluoride	0.1	0.2	0.4	0.2	0.2	0.2	0.1	0.6	0.1	0.3	****	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	****	0.000	0.000
Hexavalent Chromium											****		0.000
Arsenic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****	0.00	0.00
Iron	0.05	0.07	0.05	0.10	0.09	0.02	0.02	0.02	0.02	0.02	****	0.01	0.04
Manganese	0.01	0.00	0.00	0.01	0.02	0.00	0.01	0.01	0.00	0.00	****	0.03	0.01
Magnesium	13	16	17	17	13	14	16	16	16	19	****	19	16
Copper	0.02	0.02	0.01	0.04	0.03	0.02	0.01	0.01	0.01	0.01	****	0.02	0.02
Calcium	26	25	23	23	16	22	25	22	24	21	****	26	23
Zinc	0.01	0.03	0.02	0.03	0.03	0.02	0.04	0.03	0.02	0.03	****	0.01	0.02
Phenol									0.002		****		0.002
Color (units)													
Sampling Date	01/19	02/16	03/15	04/19	05/17	06/14	07/19	08/16	09/20	10/18	****	12/20	

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

** Values correlated from continuous EC.

*** Continuous EC value.

****NO SAMPLE, AQUEDUCT DEWATERED

TABLE 29: CALIFORNIA AQUEDUCT AT CHECK 29*

1988

Constituents	JAN	FEB	MAR	1/ APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	391	390	420	358	310	349	356	370	375	389	391	426	377
Total Hardness**	152	152	163	141	123	137	140	145	146	152	152	165	147
Chlorides**	114	114	126	101	82	98	100	106	108	113	114	128	109
Sulfates**	88	88	96	78	64	76	78	82	83	87	88	98	84
Sodium**	81	81	89	73	61	71	72	76	77	81	81	90	78
Percent Sodium**	54	54	54	53	52	53	53	53	47	54	54	54	53
Electrical Conductivity***	693	692	749	632	540	614	628	654	663	690	694	760	667
Electrical Conductivity	555	534	514	632	422	517	593	639	674	678	680	760	600
pH	8.0	7.7	8.0	7.8	7.8	7.8	8.9	8.1	8.1	8.0	7.8	7.9	8.2
Boron	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.2
Fluoride	0.1	0.2	0.4	0.1	0.2	0.2	0.2	0.1	0.5	0.2	0.3	0.1	0.2
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.12	0.07	0.05	0.04	0.03	0.04	0.02	0.02	0.01	0.01	0.02	0.04	0.04
Manganese	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00
Magnesium	16	16	17	17	13	15	16	16	17	18	18	19	17
Copper	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01
Calcium	22	24	24	24	16	22	25	24	23	38	26	26	25
Zinc	0.01	0.01	0.01	0.02	0.03	0.01	0.03	0.03	0.02	0.02	0.00	0.01	0.02
Phenol		0.002							0.002				0.002
Color (units)	8	18	5	4	4	3	5	4	8	4	7	10	7
Sampling Date	01/19	02/16	03/15	04/19	05/17	06/14	07/19	08/16	09/20	10/18	11/15	12/20	

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

** Values correlated from continuous EC.

*** Continuous EC value.

1/ This month's data are all lab values.

TABLE 30: CALIFORNIA AQUEDUCT AT TEHACHAPI AFTERBAY*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	304	321	317	361	284	311	314	331	334	363	375	405	335
Total Hardness**	122	127	126	142	115	124	125	131	132	142	146	157	132
Chlorides**	82	89	87	105	74	85	86	93	94	106	110	122	94
Sulfates**	66	71	70	83	60	68	69	74	75	84	88	97	75
Sodium**	60	65	64	75	55	62	63	67	68	75	78	86	68
Percent Sodium**	52	53	53	54	51	52	52	53	53	54	54	55	53
Electrical Conductivity***	528	557	550	630	492	539	545	575	580	633	654	708	583
Electrical Conductivity	596	584	474	623	454	484	596	645	693	617	667	759	599
pH	7.6	7.7	7.3	7.7	7.6	7.9	8.3	7.5	8.0	7.9	7.9	7.9	7.8
Boron	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.4	0.2
Fluoride	0.2	0.5	0.2	0.1	0.3	0.1	0.1	0.2	0.2	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	0.00
Selenium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.04	0.05	0.01	0.00	0.01	0.00	0.01	0.10	0.02	0.00	0.00	0.01	0.02
Manganese	0.01	0.00	0.02	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Magnesium	16	17	16	16	14	14	16	16	16	19	17	20	16
Copper	0.00	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.01
Calcium	25	22	22	26	18	22	24	23	24	21	24	25	23
Zinc	0.00	0.00	0.00	0.03	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Phenol													
Color (units)	7	10	7	3	8	3	4	4	6	3	6	8	6
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/15	9/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 31: PYRAMID LAKE AT ENTRANCE TO ANGELES TUNNEL*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids	398	350	297	344	316	318	316	302	400	368	349	396	346
Total Hardness	134	139	131	134	131	124	126	129	126	130	129	148	132
Chlorides	118	114	82	106	83	90	94	97	109	109	115	123	103
Sulfates	54	56	59	58	58	53	50	47	46	54	49	54	53
Sodium	81	74	63	78	62	63	64	64	74	72	76	77	71
Percent Sodium	56	53	52	56	51	53	53	52	57	55	57	54	54
Electrical Conductivity	630	635	544	607	544	544	545	539	623	623	608	688	594
pH	7.9	8.0	7.8	8.0	7.8	7.7	7.9	8.1	8.0	7.9	7.8	8.0	7.9
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2
Fluoride	0.2	0.5	0.2	0.2	0.2	0.5	0.2	0.1	0.2	0.2	0.3	0.3	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00
Manganese	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.02
Magnesium	18	18	16	16	16	15	10	16	16	17	15	19	16
Copper	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Calcium	24	26	26	27	26	25	34	25	24	24	27	28	26
Zinc	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00
Phenol													
Color (units)	4	5	6	4	2	5	3	3	4		3	5	4
Sampling Date	01/20	02/23	03/21	04/21	05/17	06/14	07/06	08/16	9/21	10/18	11/15	12/20	

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

TABLE 32: CASTAIC LAKE AT OUTLET WORKS*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids	298	303	313	317	340	350	398	356	363	414	357	404	351
Total Hardness	122	129	132	136	136	144	152	150	148	157	152	148	142
Chlorides	77	80	81	84	88	94	94	90	95	96	100	104	90
Sulfates	60	57	63	63	67	69	70	71	66	75	72	64	66
Sodium	60	56	62	63	64	66	70	66	67	66	65	71	65
Percent Sodium	51	48	51	51	51	50	51	49	50	48	49	52	50
Electrical Conductivity	513	521	537	543	567	581	681	537	629	668	608	647	586
pH	8.1	8.0	7.9	8.3	7.6	8.3	8.3	8.1	7.8	7.8	7.6	7.8	8.0
Boron	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Fluoride	0.2	0.5	0.2	0.3	0.4	0.5	0.3	0.1	0.2	0.2	0.3	0.2	0.3
Lead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Selenium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.01	0.01	0.00	0.00	0.00	0.00	0.00	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	17	18	15	16	18	17	17	18	17	17	17
Copper	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
Calcium	26	27	25	25	30	31	31	32	31	33	33	31	30
Zinc	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Phenol													
Color (units)	5	5	3	9	5	3	3	5	3	4	3	4	4
Sampling Date	01/19	02/23	03/15	04/18	05/31	06/13	07/18	08/15	9/21	10/17	11/14	12/19	

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

TABLE 33: CALIFORNIA AQUEDUCT AT CHECK 59*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	320	319	306	348	301	307	300	322	329	337	346	392	327
Total Hardness**	120	120	116	129	115	116	114	121	123	126	129	143	123
Chlorides**	86	86	81	97	79	81	78	87	90	93	97	115	89
Sulfates**	69	69	65	78	63	65	63	70	72	75	78	92	72
Sodium**	64	64	60	71	59	61	59	64	66	68	71	82	66
Percent Sodium**	54	54	53	55	53	53	53	54	54	54	55	56	54
Electrical Conductivity***	565	564	538	619	530	541	527	569	582	599	616	704	580
Electrical Conductivity	601	625	494	656	422	579	609	615	695	690	713	771	623
pH	7.8	8.1	7.1	7.8	7.7	8.0	7.7	8.6	8.0	7.8	7.8	7.8	8.0
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2
Fluoride	0.2	0.4	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.4	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.05	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.01	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	0.06	0.00	0.01
Magnesium	17	15	16	16	12	17	15	17	17	18	20	19	17
Copper	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.01
Calcium	25	30	24	27	21	24	24	24	24	23	19	25	24
Zinc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.00	0.01	0.01
Phenol													
Color (units)	7	10	4	4	4		6	3	6	5	7	10	6
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/17	9/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 34: CALIFORNIA AQUEDUCT AT INLET TO MOJAVE SIPHON*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	275	297	238	294	351	292	303	317	324	357	369	395	318
Total Hardness**	112	120	99	119	139	118	122	127	129	141	145	154	127
Chlorides**	70	78	55	77	100	76	81	86	89	102	106	116	86
Sulfates**	56	63	45	62	79	61	65	69	71	81	85	93	69
Sodium**	54	60	44	59	74	58	61	65	67	75	78	85	65
Percent Sodium**	51	52	50	52	54	52	52	53	53	54	54	55	53
Electrical Conductivity***	480	519	412	514	618	510	531	555	568	628	650	697	557
Electrical Conductivity	596	595	484	660	408	577	596	629	700	699	735	759	620
pH	7.8	8.1	7.8	7.7	7.8	8.0	7.9	8.1	8.1	7.8	7.5	7.9	7.9
Boron	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.4	0.2	0.3	0.2	0.2
Fluoride	0.2	0.4	0.2	0.1	0.2	0.2	0.1	0.2	0.2	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	0.00
Selenium	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.04	0.03	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Manganese	0.02	0.01	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.00	0.04	0.00	0.01
Magnesium	16	17	15	16	13	16	16	16	16	17	20	19	16
Copper	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.01
Calcium	24	24	26	28	21	24	24	26	24	23	21	24	24
Zinc	0.01	0.00	0.02	0.00	0.00	0.02	0.00	0.02	0.02	0.01	0.01	0.00	0.01
Phenol													
Color (units)	8	5	7	4	5	3	7	4	5	5	5	6	5
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/17	9/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

TABLE 35: SILVERWOOD LAKE AT OUTLET TO MOJAVE RIVER*

1988

Constituents	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids	366	363	300	371	309	298	373	318	350	418	421	384	356
Total Hardness	118	121	118	134	112	115	120	122	119	125	129	136	122
Chlorides	120	118	103	117	91	87	96	99	113	128	134	142	112
Sulfates	43	44	46	53	44	44	46	43	43	46	41	48	45
Sodium	81	78	69	78	64	60	70	67	72	78	80	87	74
Percent Sodium	59	57	53	56	56	54	56	55	57	58	58	59	57
Electrical Conductivity	597	600	549	615	526	501	556	577	615	661	685	750	603
pH	8.1	7.8	7.6	7.8	8.0	7.9	7.9	7.8	7.8	7.6	7.8	7.2	7.8
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.2
Fluoride	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.3	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Manganese	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Magnesium	16	16	16	18	15	14	14	15	15	17	18	19	16
Copper	0.00	0.00	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Calcium	21	22	21	24	20	23	25	24	23	22	22	23	23
Zinc	0.00	0.00	0.17	0.01	0.00	0.00	0.01	0.03	0.01	0.00	0.00	0.00	0.02
Phenol													
Color (units)	3	2	7	3	3	3	7	3	2	5	5	5	4
Sampling Date	01/20	02/17	03/14	04/19	05/18	06/14	07/19	08/16	9/20	10/18	11/15	12/20	

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

TABLE 36: SILVERWOOD LAKE AT INLET TO SAN BERNARDINO TUNNEL*

1988

Constituents													Annual
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Average
Total Dissolved Solids	355	355	332	360	310	286	343	316	422	424	421	390	360
Total Hardness	115	121	121	128	116	116	122	122	124	128	129	142	124
Chlorides	115	116	111	100	91	86	97	99	115	126	134	145	111
Sulfates	39	44	44	51	43	44	44	43	43	46	43	47	44
Sodium	75	76	74	69	64	60	70	64	77	80	85	85	73
Percent Sodium	57	57	58	54	55	53	56	54	58	58	59	57	56
Electrical Conductivity	585	595	575	588	526	490	556	577	629	662	687	740	601
pH	8.1	7.8	7.7	7.7	7.9	7.9	8.1	8.3	7.9	7.6	7.5	7.2	7.9
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.2
Fluoride	0.1	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.2	0.2	0.1	0.8	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manganese	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Magnesium	14	16	16	17	16	15	15	15	16	17	18	20	16
Copper	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	23	22	22	23	20	22	24	24	23	23	22	24	23
Zinc	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Phenol													
Color (units)	5	3	3	3	3	3	4	3	5	5	5	5	4
Sampling Date	01/20	02/17	03/14	04/19	05/18	06/14	07/19	08/16	9/20	10/18	11/15	12/20	

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

TABLE 37: DEVIL CANYON AFTERBAY*

1988

Constituents	1/ JAN	1/ FEB	1/ MAR	1/ APR	1/ MAY	JUNE	1/ JULY	AUG	SEP	OCT	NOV	DEC	Annual Average
Total Dissolved Solids**	247	334	331	324	338	289	317	305	327	343	356	366	323
Total Hardness**	98	122	121	119	123	109	117	114	120	124	128	130	119
Chlorides**	60	94	93	90	95	76	87	83	91	98	102	107	90
Sulfates**	43	62	61	60	63	52	58	56	61	64	67	69	60
Sodium**	46	67	66	65	68	56	63	60	65	69	72	75	65
Percent Sodium**	51	55	55	54	55	53	54	54	54	55	55	56	54
Electrical Conductivity***	430	584	579	566	591	504	554	533	572	601	623	642	565
Electrical Conductivity	576	584	579	566	539	504	554	580	620	673	692	734	600
pH	7.9	7.9	7.6	7.7	7.8	7.6	7.6	7.7	7.8	7.9	7.3	7.4	7.7
Boron	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.2	0.2	0.3	0.4	0.2	0.2
Fluoride	0.2	0.4	0.2	0.2	0.2	0.4	0.1	0.2	0.2	0.2	0.2	0.3	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Manganese	0.02	0.00	0.07	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.02
Magnesium	15	16	16	16	15	13	15	16	16	17	18	19	16
Copper	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Calcium	21	20	22	23	22	24	25	25	22	24	22	23	23
Zinc	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.03	0.02	0.01	0.02	0.00	0.01
Phenol													
Color (units)	4	5	7	7	4	5	6	6	5	5	6	5	5
Sampling Date	01/20	02/17	03/16	04/20	05/18	06/15	07/20	08/17	9/21	10/19	11/16	12/21	

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

** Values correlated from continuous EC.

*** Continuous EC value.

1/ This month's data are all lab values."

TABLE 38: LAKE PERRIS AT INLET*

1988

Constituents													Annual
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Average
Total Dissolved Solids	255	228	221	254	258	247	276	289	262	319	312	256	265
Total Hardness	94	91	94	92	94	98	101	130	105	102	108	102	101
Chlorides	67	66	67	68	68	70	69	67	71	72	74	70	69
Sulfates	37	35	38	40	41	41	44	38	41	43	42	41	40
Sodium	50	46	51	52	52	52	56	50	54	52	53	51	52
Percent Sodium	53	51	55	56	55	54	55	46	53	53	52	53	53
Electrical Conductivity	412	412	412	423	434	429	443	430	465	486	486	468	442
pH	7.8	7.9	7.6	8.0	7.0	7.8	7.9	7.8	7.8	7.4	7.6	7.2	7.7
Boron	0.2	0.1	0.2	0.2	0.2	0.2	0.6	0.2	0.3	0.5	0.5	0.2	0.3
Fluoride	0.2	0.4	0.2	0.2	0.4	0.2	0.2	0.1	0.2	0.2	0.3	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Manganese	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium	13	13	13	12	12	13	13	20	14	12	14	14	14
Copper	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Calcium	16	15	16	17	18	18	19	19	19	21	20	18	18
Zinc	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.01
Phenol													
Color (units)	2	5	2	2	0	0	3	3	4	4	7	2	3
Sampling Date	01/19	02/16	03/14	04/18	05/31	06/13	07/18	08/15	9/19	10/17	11/14	12/19	

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

TABLE 39: WATER QUALITY
MINIMUM DETECTION CONCENTRATIONS FOR TESTED SUBSTANCES*

<u>CARBAMATES</u>	Reporting Limit (micrograms/liter)	<u>MISC. PESTICIDES (CONT.)</u>	Reporting limit (micrograms/liter)
1-Naphtol	4.00	Benfluralin	0.01
3-Hydroxycarbofuran	2.00	Glyphosate	100
Aldicarb	2.00	Propargite	1
Aldicarb Sulfone	2.00	Trifluralin	0.01
Aldicarb Sulfoxide	2.00	<u>ORGANIC PHOSPHORUS PESTICIDES</u>	
Cabaryl	2.00	Azinphosmethyl	0.05
Cabofuran	2.00	Carbophenothion (Trithion)	0.02
Methiocarb	4.00	Chlorpyrifos	0.01
Methomyl	2.00	Demeton	0.02
Oxamyl	2.00	Diazinon	0.01
<u>CHLORINATED HYDROCARBONS</u>		Dimethoate	0.01
Alachlor	0.05	Disulfoton	0.01
Aldrin	0.01	Ethion	0.01
Atrazine	0.02	Malathion	0.01
BHC (alpha, beta, delts, gamma)	0.01	Methidathion	0.02
Captan	0.02	Methyl Parathion	0.01
Chlordane	0.05	Mevinphos	0.01
Chlorothalonil	0.01	Naled	0.02
Chlorpropham	0.02	Parathion	0.01
Chlorpyrifos	0.01	Phorate	0.01
DCPA	0.01	Phosalone	0.02
DDD, DDE, DDT	0.01	Phosmet	0.02
Dichloran	0.01	Profenofos	0.01
Dicofol	0.01	s,s,s-Tributyl Phosphorotrithioate (DEF)	0.01
Dieldrin	0.01	<u>PURGEABLE ORGANICS</u>	
Diuron	0.05	1,1,1-Trichloroethane	0.5
Endosulfan Sulfate	0.01	1,1,2-Trichloroethane	0.5
Endosulfan (I,II)	0.01	1,1-Dichloroethane	0.5
Endrin	0.01	1,1-Dichloroethylene	0.5
Endrin Aldehyde	0.01	1,2-Dichloroethane	0.5
Heptachlor	0.01	1,2-Dichlorobenzene	0.5
Heptachlor Epoxide	0.01	1,2-Dechloropropane	0.5
Methoxychlor	0.01	1,3-Dechlorobenzene	0.5
PCB (various isomers)	0.1	1,4-Dechlorobenzene	0.5
PCNB	0.01	Benzene	0.5
Simazine	0.02	Bromodichloromethane	0.5
Thiobencarb	0.02	Bromoform	0.5
Toxaphene	0.2	Carbon tetrachloride	0.5
<u>HERBICIDES</u>		Chlorobenzene	0.5
2,4, - D	0.1	Chloroform	0.5
2,4 - DB	0.1	cis-1,2-Dechloroethylene	0.5
2,4,5 - TP	0.1	Dibromochloromethane	0.5
2,4,5 - T	0.1	Ethylbenzene	0.5
Dicamba	0.1	Tetrachloroethylene	0.5
MCPA	0.1	Toluene	0.5
MCPP	0.1	trans-1,2-Dichloroethylene	0.5
Pentachlorophenol (PCP)	0.1	Trichloroethylene	0.5
<u>MISC. PESTICIDES</u>		Trichlorofluoromethane	0.5
Acephate	0.1	Vynil chloride	0.5
Aminomethylphosphonic	100	Xylene (s) 1	0.5

*Listed are those pesticides that would be detected by lab scans currently used for pesticide analysis, and the minimum concentration at which these substances can be detected. Detected amounts from the quarterly sampling program are shown below:

PESTICIDES IN THE CALIFORNIA AQUEDUCT

STATION	1988			
	FEB	MAY	AUG	NOV
<u>HARVEY O. BANKS DELTA PUMPING PLANT</u>				
Chlorinated Hydrocarbons			None Detected	None Detected
Simazine	0.00001			
Miscellaneous		0.00006 D/		
<u>O'NEILL PUMPING PLANT DISCHARGE</u>				
Chlorinated Hydrocarbons			None Detected	None Detected
Atrazine	0.00003			
Simazine	0.00001	0.00013		
Miscellaneous		0.00170 A/ 0.00190 B/		
<u>NEAR KETTLEMAN CITY (CHECK 21)</u>				
Chlorinated Hydrocarbons		None Detected		None Detected
Simazine	0.00002			
Miscellaneous			0.00053 E/ 0.00006 C/	
<u>TEHACHAPI AFTERBAY</u>				
Chlorinated Hydrocarbons				
Simazine	0.00001	None Detected	None Detected	None Detected

A/ Bromomethane
 B/ Dioxathion
 C/ Ethyl Benzene

D/ Toluene
 E/Total Xylenes