

SAN DIEGO COUNTY
WATER AUTHORITY



THIRD ANNUAL REPORT

1949

SAN DIEGO COUNTY WATER AUTHORITY

THIRD ANNUAL REPORT

For Period

July 1, 1948 to June 30, 1949

J. L. BURKHOLDER

GENERAL MANAGER AND CHIEF ENGINEER

SAN DIEGO, CALIFORNIA

1949



FRED A. HEILBRON
*Chairman of the Board of Directors
and Director from San Diego since June 9, 1944*

LETTER OF TRANSMITTAL

San Diego, California
February 10, 1950

BOARD OF DIRECTORS
SAN DIEGO COUNTY WATER AUTHORITY

Gentlemen:

The report of the San Diego County Water Authority for the fiscal year ending June 30, 1949, is transmitted herewith.

Covered in the report are the operation and maintenance activities of the Authority through the second year of delivery of Colorado River water in the coastal areas of San Diego County and a brief summary of current data relative to the operations of The Metropolitan Water District of Southern California.

Very truly yours,

J. L. BURKHOLDER,
General Manager and Chief Engineer.

R O S T E R

DIRECTORS

July 1, 1948 to June 30, 1949

Chula Vista.....	Arthur L. Lynds
Fallbrook Public Utility District.....	Emil J. Schmitz
Lakeside Irrigation District.....	Allen G. Mitchell
La Mesa, Lemon Grove and Spring Valley Irrigation District.....	M. J. Shelton
National City.....	Delavan J. Dickson
Oceanside.....	Harold N. Beck
San Diego.....	G. E. Arnold Fred A. Heilbron Arthur H. Marston Fred W. Simpson Walter B. Whitcomb
San Dieguito Irrigation District.....	Frank S. Jacobson
Santa Fe Irrigation District.....	D. M. Bakewell

OFFICERS OF THE BOARD

Chairman.....	Fred A. Heilbron
Vice-Chairman.....	Arthur L. Lynds
Secretary.....	Delavan J. Dickson
Executive Secretary.....	Eleanor Longfellow
Treasurer.....	Walter B. Whitcomb

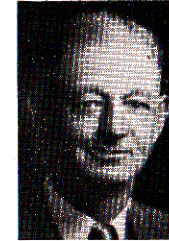
EXECUTIVE OFFICERS AND OPERATING STAFF

General Manager and Chief Engineer.....	J. L. Burkholder
General Counsel.....	W. H. Jennings
Assistant Chief Engineer.....	Richard S. Holmgren
Controller.....	Charles L. Royer
Assistant Controller.....	Mary G. Unger
Superintendent, Maintenance and Operation.....	A. B. Gale

BOARD OF DIRECTORS



Vice Chairman
A. L. Lynds
Chula Vista



Chairman
Fred A. Heilbron
San Diego



Secretary
D. J. Dickson
National City



G. E. Arnold
San Diego



D. M. Bakewell
Santa Fe
Irrigation District



H. N. Beck
Oceanside



Frank S. Jacobson
San Dieguito
Irrigation District



Arthur H. Marston
San Diego



F. W. Simpson
San Diego



A. G. Mitchell
Lakeside Irrigation
District



E. J. Schmitz
Fallbrook Public
Utility District



M. J. Shelton
La Mesa, Lemon Grove and
Spring Valley Irrigation District



Treasurer
Walter B. Whitcomb
San Diego

COMMITTEES OF THE BOARD

June 30, 1949

FINANCE AND BUDGET

Walter B. Whitcomb, Chairman
 Harold N. Beck
 Frank S. Jacobson
 Arthur L. Lynds
 Allen G. Mitchell
 M. J. Shelton

LANDS AND RIGHTS OF WAY

Fred A. Heilbron, Chairman
 Harold N. Beck
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Arthur H. Marston, Chairman
 Delavan J. Dickson
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PERSONNEL

Arthur H. Marston, Chairman
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SAN DIEGO COUNTY WATER AUTHORITY

MEMBER AGENCIES AS OF JUNE 30, 1949

<i>Member Agency</i>	<i>Date of Entry</i>
City of Chula Vista.....	June 9, 1944
Fallbrook Public Utility District.....	June 9, 1944
Lakeside Irrigation District.....	June 9, 1944
La Mesa, Lemon Grove and Spring Valley Irrigation District.....	June 9, 1944
City of National City.....	June 9, 1944
City of Oceanside.....	June 9, 1944
City of San Diego.....	June 9, 1944
San Dieguito Irrigation District.....	Dec. 13, 1948
Santa Fe Irrigation District.....	Dec. 13, 1948

<i>Agencies which have withdrawn their corporate area from the Authority</i>	<i>Date of Withdrawal</i>
City of Coronado.....	May 10, 1946
Ramona Irrigation District.....	Aug. 21, 1946

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FOREWORD

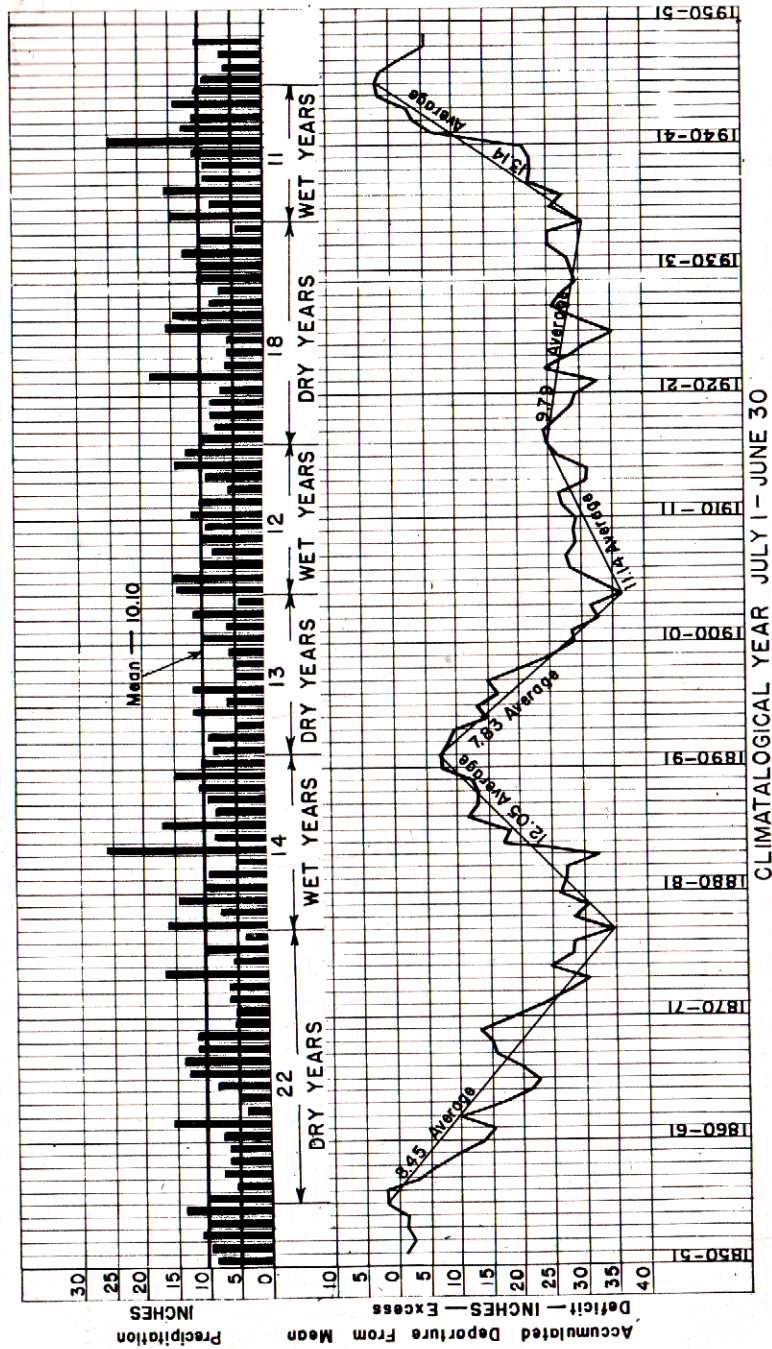
The period covered by this report, July 1, 1948, to June 30, 1949, covers the first full fiscal year of operation of the San Diego Aqueduct and its branch lines. Except for four short shutdowns the aqueduct system was in operation continuously throughout the year, delivering a total of about 72,000 acre-feet of Colorado River water to member agencies of the Authority, an amount equal to about 85 per cent of the total water consumed within these agencies during the year.

The current drought cycle continued throughout the year. Although precipitation during the winter months was about normal, its distribution and timing were such that very little flow occurred in the major streams of the area, resulting in only a comparatively small runoff to the water supplies stored in local reservoirs. However, the Colorado River water brought into the area by the San Diego Aqueduct not only satisfied all the water requirements of the Authority agencies, but actually increased their water reserves by about 10,000 acre-feet, to a total of 115,000 acre-feet at the end of the year, which represents only 24 per cent of the total storage capacity of the reservoirs.

Growth of County and Authority

BUSINESS. The major activities which form the basis for the economy of San Diego County are those concerned with tourists, agriculture, industry, and the Navy. The 1948 income from all of these sources increased over the 1947 income by about 21 million dollars. The total income for the year from these four sources totaled about 265 million dollars. The largest increase occurred in the field of industry, where payrolls showed a growth of 8 million dollars above the 1947 total of 66 million dollars, the largest since the peak of 1945 when the industrial payroll totaled about 80 million dollars.

POPULATION. The population of San Diego County is estimated to have increased by about 48,000 persons during the year to reach a total of 633,000 on June 30, 1949. Of the total County population, 80 per cent or 508,800 people resided within the Authority area as then constituted. The available population figures for the County since 1910, together with the number and per cent of the County population residing in each year within the total Authority area, are given in Table 1.



CLIMATOLOGICAL YEAR JULY 1 - JUNE 30
 FIG. 1. Rainfall Record at San Diego, California.

TABLE 1
 POPULATION—COUNTY AND AUTHORITY AREAS—1910 to 1949
 Includes Civilian and Military
 (as of April 1)

Year	COUNTY		AUTHORITY		Per cent of County population in Authority
	Total population (1)	Average annual growth	Total population (2)	Average annual growth	
1910	62,000		46,000		74
1920	112,000	5,000	87,000	4,100	78
1930	210,000	9,800	173,000	8,600	82
1940	289,000	7,900	248,300	7,600	86
1948	585,000 (3)	48,000	472,800	28,100	81
1949	633,000 (3)		508,800	34,200	80

(1) County population for 1940 and prior thereto from U.S. Census.
 (2) Authority organized in 1944; population for prior years is for Authority area as originally organized.
 (3) Estimated by special sub-committee of San Diego Chamber of Commerce.

The population residing in each agency of the Authority in 1940 as determined by the United States Census and in 1949 as estimated by the Research Department of the San Diego Chamber of Commerce is given in Table 2. The estimates indicate an increase in population of about 260,500 within the Authority area in this 9-year period, equal to a growth of 105 per cent. The largest percentage increase, 240 per cent, occurred in the City of El Cajon. The smallest growth took place within the Santa Fe Irrigation District with an increase of 50 per cent. Table 2 also shows data on the density of population, which indicates that the greatest density exists in the City of San Diego with 6.33 persons per acre, and National City a close second with 5.84 persons per acre. The average population density of the Authority area is 4.42 per acre, while the entire County area has only 0.23 persons per acre or 149 per square mile.

ASSESSED VALUATION. The assessed valuation of San Diego County is continuing to climb and in the fiscal year 1948-49 reached the all-time high of 435 million dollars, an increase of about 42 million dollars or about 11 per cent above the previous year. Of this assessed valua-

TABLE 2
POPULATION—AUTHORITY CONSTITUENT AREAS
(Includes Civilian and Military)

Constituent Areas	Area 1949 Acres	Population			Density of Population 1949	
		U.S. Census 1949 (1)	Estimated 1949 (2)	Increased 1940-49	Per acre	Per sq. mi.
Chula Vista	3,283	5,138	16,000	211	4.87	3,119
Fallbrook Public Utility District	4,740	2,300	4,000	74	.84	540
Lakeside Irrigation District	1,415	(4) 1,000	2,000	100	1.41	905
La Mesa, Lemon Grove & Spring Valley Irrigation District:						
In City of El Cajon	(3) 812	1,471	5,000	240	6.16	3,940
In City of La Mesa	(3) 1,906	3,925	10,500	168	5.51	3,526
In Crest Public Utility District	385		1,500		3.90	2,500
In unincorporated areas	15,556	11,704	26,000	122	1.67	1,070
Total	(18,659)	(17,100)	(43,000)	151	2.30	1,475
National City	3,425	10,344	20,000	93	5.84	3,737
Oceanside	5,993	4,651	13,000	180	2.17	1,388
San Diego	63,344	203,341	401,000	97	6.33	4,052
San Dieguito Irrigation District	4,020	(4) 2,400	6,800	183	1.69	1,083
Santa Fe Irrigation District	10,106	(4) 2,000	3,000	50	.30	190
Total Authority Area	114,985	248,274	508,800	105	4.42	2,832
San Diego County	2,725,100	289,348	633,000	119	.23	149

(1) Population in agencies other than cities was estimated from population of judicial townships.

(2) Based on data furnished by the agencies.

(3) Does not include areas within the City but not in the District.

(4) Estimated.

tion about 347 million dollars, or 80 per cent, represented property located within the Authority. The assessed valuations for each of the Authority agencies for the years 1948-49 and 1949-50 are included in Table 3. These show continuing increases for all member agencies, totaling about 31 million dollars for the year. The rate of increase (9.1 per cent) is slightly larger than the rate for the County as a whole (8.0 per cent). The increases varied from a high of 19.6 per cent in the City of Oceanside, closely followed by the La Mesa, Lemon Grove and Spring Valley Irrigation District with 19.2 per cent, to a low of 4.0 per cent in the Santa Fe Irrigation District. The assessed valuation per acre varies from a high of \$4800 in the City of San Diego to a low of \$378 in the Santa Fe Irrigation District. The average assessed valuation for the entire Authority area is about \$3300 per acre, compared with an average assessed valuation for the County as a whole, excluding tax-exempt lands, of \$360.

Annexations and Exclusions

The corporate area of the Authority as of June 30, 1949, embraced the territory of six cities, four irrigation districts, and two public utility districts, located in the 60-mile coastal belt of San Diego County, their combined areas totaling 114,985 gross acres, an increase of 16,555 acres over the total for the preceding year.

Three annexations of new territory, requiring the consent of the Boards of Directors of the Authority and of the Metropolitan Water District, were completed during the year. Two of these, the San Dieguito Irrigation District and the Santa Fe Irrigation District, increased the number of member agencies of the Authority to nine while the third, that of the Crest Public Utility District, being a direct annexation to an existing member agency, the La Mesa, Lemon Grove and Spring Valley Irrigation District, resulted in an increase in the Authority's corporate area, but not in the number of member agencies. The remaining annexations consisted of new territory totaling 2,044 acres, which automatically became part of the Authority annexations to the four cities having separate membership therein, as shown by Table 4.

Preferential Water Rights of Member Agencies

The procedure for determining the preferential rights of Authority agencies in the present capacity of the San Diego Aqueduct is set forth in the County Water Authority Act. The preferential right of each

TABLE 3
 ASSESSED VALUATIONS—AUTHORITY AND COUNTY

Agency	Area Acres	Assessed Valuations Secured and Unsecured		Increase Per cent	Assessed Valuation 1949-50 Per acre
		1948-49	1949-50		
Chula Vista	3,283	\$ 10,901,560	\$ 12,735,200	16.8	\$3,879
Fallbrook Public Utility District	4,740	2,274,700	2,532,730	11.3	534
Lakeside Irrigation District	1,415	626,800	677,990	8.2	479
La Mesa, Lemon Grove and Spring Valley Irrigation District	18,659	26,834,740	31,985,530	19.2	1,714
National City	3,425	9,175,530	9,749,585	6.3	2,847
Oceanside	5,993	7,763,870	9,283,590	19.6	1,549
San Diego	63,344	281,309,690	302,764,970	7.6	4,780
San Dieguito Irrigation District	4,020	4,536,630	4,975,240	9.7	1,238
Santa Fe Irrigation District	10,106	3,671,320	3,819,380	4.0	378
Total Authority Area	114,985	\$347,094,840	\$378,524,215	9.1	\$3,292
San Diego County	1,302,900 (1)	\$435,000,220	\$469,759,905	8.0	360

(1) Excluding 1,422,200 acres of tax-exempt lands in San Diego County.

TABLE 4
 CONSTITUENT AREA OF THE AUTHORITY
 as of June 30, 1949

Constituent Areas	Area — Acres			Per cent of total area 6/30/49
	As of 6/30/48	Annexed during year	As of 6/30/49	
Chula Vista	3,236	47	3,283	2.85
Fallbrook Pub. Util. Dist.	4,740	0	4,740	4.12
Lakeside Irrigation Dist.	1,415	0	1,415	1.23
La Mesa, Lemon Grove & Spring Valley Irri. Dist.	18,274	385	18,659	16.23
National City	(2) 3,412	13	3,425	2.98
Oceanside	5,900	93	5,993	5.21
San Diego	(2) 61,453	1,891	63,344	55.09
San Dieguito Irri. District.	(1) 4,020	4,020	4,020	3.50
Santa Fe Irrigation Dist.	(1) 10,106	10,106	10,106	8.79
Total Authority Area	98,430	16,555	114,985	100.00
San Diego County			2,725,100	

(1) Annexed to Authority on December 13, 1948.

(2) Area changed from that in Second Annual Report to conform with revised data received from agency.

agency bears the same relationship to the aqueduct capacity as the total accumulated taxes and related sums paid by such agency to the Authority bear to the total of similar amounts paid to the Authority by all its agencies.

Since no Authority tax payments have been received from the agencies annexed during the fiscal year, a determination of water rights on the basis of actual amounts received as of June 30, 1949, would indicate that these agencies had no preferential water rights. However, under the terms of annexation, these agencies agreed to pay, over a period of ten years, an amount substantially equal to the back taxes which they would have paid had they been members of the Authority from its inception, plus delinquent interest. The amounts which the agencies have contracted to pay the Authority have been considered, together with the sums actually paid, in determining the preferential rights of the agencies. The tentative preferential water rights of each agency on this basis, as of June 30, 1949, are shown in Table 5.

TABLE 5
PREFERENTIAL ENTITLEMENT TO COLORADO RIVER WATER
as of June 30, 1949

Constituent Areas	Total amount paid by each member agency to 6/30/49	Amount remaining to be paid under terms of annexation	Total contributions paid and contracted for	Preferential right to purchase		Equivalent acre-feet per year, assuming continuous flow except for 3% shutdown
				Percentage of aqueduct flow	Equivalent flow	
				Per cent	c.f.s.	Acre-feet
Chula Vista	\$ 35,814.57	\$ -0-	\$ 35,814.57	3.17	3.01	2,115
Fallbrook Public Utility District	7,202.30	-0-	7,202.30	.64	.61	427
Lakeside Irrigation District	1,601.54	-0-	1,601.54	.14	.13	94
La Mesa, Lemon Grove & Spring Valley Irrigation District	76,080.59	861.00	76,941.59	6.81	6.47	4,543
National City	30,868.82	-0-	30,868.82	2.73	2.59	1,821
Oceanside	25,003.88	-0-	25,003.88	2.21	2.10	1,474
San Diego	927,214.92	-0-	927,214.92	82.06	77.96	54,746
San Dieguito Irrigation District	-0-	13,733.00	13,733.00	1.22	1.16	814
Santa Fe Irrigation District	-0-	11,541.00	11,541.00	1.02	.97	680
Total Authority	\$1,103,786.62	\$26,135.00	\$1,129,921.62	100.00	95.00	66,714

Preferential rights determined on assumption that taxes contracted for by an agency under terms of annexation are included as basis for computing rights under Section 5 (11) of County Water Authority Act.

CHRONOLOGY OF PERTINENT EVENTS

- 10-23-23 Preliminary studies of Colorado River as a source of additional water supply were begun by City of Los Angeles.
- 9-17-24 Colorado River Aqueduct Association organized at Pasadena, California.
- 6- 2-25 City of Los Angeles issued \$2,000,000 Colorado River project bonds for preliminary surveys and investigations.
- 4-15-26 City of San Diego filed application with the Division of Water Resources of the State of California for a permit to divert 155 c.f.s. from the Colorado River annually.
- 7-29-27 Metropolitan Water District Act enacted by California Legislature permitting noncontiguous cities and districts to co-operate in acquisition of domestic water supplies.
- 12- 6-28 The Metropolitan Water District of Southern California organized with eleven member cities.
- 4-24-30 Metropolitan Water District contracted with the United States for storage of water and for 36 per cent of the power generated at Hoover Dam.
- 4-26-30 States for storage of water and for 36 per cent of the power generated at Hoover Dam.
- 8-18-31 Seven Party Water Agreement of 1930 signed by representatives of Palo Verde Irrigation District, Imperial Irrigation District, Coachella Valley County Water District, Metropolitan Water District of Southern California, City of Los Angeles, City of San Diego and County of San Diego fixing the priorities of the respective water rights in the Colorado River.
- 9-29-31 A construction bond issue of \$220,000,000 was approved by Metropolitan Water District electors.
- 1-25-33 Construction work on Colorado River Aqueduct was started on Coachella Tunnel at Fargo Adit.
- 2-15-33 Contract executed between Secretary of the Interior and The City of San Diego providing for 250,000 acre-feet of storage capacity in Boulder Reservoir, and for the delivery of 112,000 acre-feet of water to San Diego City and/or County each year at a point in the Colorado River immediately above Imperial Dam.
- 10- 2-34 Contract executed between Secretary of the Interior and The City of San Diego, providing for construction of capacity in

- All-American Canal Project for the diversion and carriage of 155 c.f.s. allotment of Colorado River water to The City and/or County of San Diego.
- 2-12-37 Hill-Ready-Buwalda report rendered to City of San Diego favoring further development of local resources, to be followed later by the construction of a trans-mountain connection to the Colorado River through the All-American Canal.
- 8-31-41 Initial stage of Colorado River aqueduct construction completed and water system placed in operating status.
- 5-17-43 County Water Authority Act as introduced in the California legislature by Senator Ed Fletcher approved by the Governor of California and filed with the Secretary of State.
- 5-28-43 Contract executed between Bureau of Reclamation and Federal Works Agency acting for the Government, and The City of San Diego, providing for report on estimated cost of an aqueduct connection between The Metropolitan Water District and the water systems serving San Diego and adjacent county areas.
- 5-29-43 Contract executed between the Bureau of Reclamation and the City Manager of The City of San Diego and the Chairman of the Board of Supervisors of San Diego County acting for the San Diego area, providing for a report on an aqueduct connection between All-American Canal and the water systems serving San Diego and adjacent county areas.
- 6- 9-44 The San Diego County Water Authority organized, consisting of nine public agencies.
- 10- 3-44 Appointment by President Roosevelt of a committee on San Diego water problems.
- 11-29-44 The President of the United States transmits a communication to the Senate approving the Report of the Committee on San Diego Water Problems, and advising that he has directed immediate construction by the Federal Government of an aqueduct connecting the Colorado River Aqueduct of The Metropolitan Water District with the water system of San Diego at its San Vicente Reservoir.

- 5-18-45 First contract on San Diego Aqueduct awarded by U. S. Navy for construction of Poway, Fire Hill, and San Vicente tunnels.
- 10-17-45 Contract executed between the U. S. Navy, acting for the Government, and The City of San Diego providing for the continuation of construction of the San Diego Aqueduct and lease of aqueduct to The City of San Diego, with privilege of later transferring to the Authority.
- 3-29-46 The Board of Directors of the Authority apply to the Board of Directors of the District for consent to annex the corporate area of the Authority to the Metropolitan Water District.
- 5-10-46 The withdrawal of The City of Coronado from the Authority officially completed by filing of proceedings by Secretary of Authority in the office of the Secretary of State.
- 6-28-46 Board adopted Resolution No. 17, declaring intention to call an election to authorize incurring of bonded indebtedness of \$2,000,000 to construct distribution lines.
- 8-15-46 Proposed contract merging water rights of City of San Diego with those of the Metropolitan Water District approved by the Authority, and the General Manager and Chief Engineer authorized to execute same on behalf of Authority.
- 8-21-46 Withdrawal of Ramona Irrigation District from the Authority officially completed by filing of proceedings with Secretary of State.
- 9- 6-46 Board of Directors of Authority made formal application to the Metropolitan Water District for consent to annex the corporate area of the Authority to the District.
- 9-23-46 City of San Diego executed Supplemental Agreement No. 1 covering assignment of City - Navy Lease Contract NOy-13300 to Authority.
- 10- 4-46 Board of Directors of the Metropolitan Water District gave formal consent to annexation of the corporate area of the Authority to the District, and fixed terms and conditions of annexation.
- 10-21-46 A delegation of Authority and City officials appeared before President's Reconstituted Committee asking for refinancing of San Diego Aqueduct.

- 11- 5-46 The Authority electors approved three propositions relative to proposed importation of Colorado River water: (1) annexation of corporate area of Authority to the Metropolitan Water District; (2) Supplemental Contract No. 1 transferring most of provisions of Aqueduct Lease-Purchase Contract from City to Authority; (3) incurring bonded indebtedness of \$2,000,000 for construction of branch lines. City of San Diego electors also approved Proposition No. 2.
- 12-17-46 The corporate area of the San Diego County Water Authority officially became annexed to The Metropolitan Water District of Southern California.
- 12-20-46 Authority sold its \$2,000,000 bond issue for branch lines to syndicate headed by Bank of America National Trust and Savings Association.
- 1- 3-47 Chairman Heilbron and General Manager and Chief Engineer Burkholder elected to serve on Metropolitan Water District Board of Directors to represent the Authority.
- 1-27-47 Comptroller-General reports to the Congress questioning legality of expenditures on aqueduct.
- 2-25-47 Delegation from The City of San Diego, the Authority and the Metropolitan Water District appeared in Washington before Committee on Expenditures in Executive Departments regarding legality of expenditures on aqueduct.
- 5- 1-47 Committee on Expenditures in Executive Departments renders report to Congress recommending completion of aqueduct.
- 6-23-47 County Water Authority Act revised by amending Section 10 concerning annexations.
- 7- 2-47 Contract for construction of La Mesa-Sweetwater Extension awarded by the Board of Directors of the Authority to American Pipe and Construction Company.
- 7-24-47 Ordinance No. 33 adopted by the Board of Directors of the Authority fixing rate of \$12 per acre-foot for water delivered to member agencies.
- 8-28-47 Contract for Easterly Section of Fallbrook-Oceanside Branch awarded by Board of Directors of the Authority to Edward Green.

- 11-13-47 Contract for Westerly Section of Fallbrook-Oceanside Branch awarded by Board of Directors of the Authority to American Pipe and Construction Company.
- 11-24-47 Initial flow of Colorado River water passed through San Diego Aqueduct and discharged into San Vicente Reservoir.
- 12-11-47 Citizens' Aqueduct Celebration Committee sponsored a county-wide celebration commemorating the completion of the San Diego Aqueduct and the relief of an impending water shortage. Booklet entitled "San Diego's Quest for Water" presented to guests.
- 12-11-47 Water Authority took possession of San Diego Aqueduct for operation and maintenance on terms of informal interim agreement pending completion of the construction. The interim agreement was later replaced by Supplemental Agreement No. 3 to the Aqueduct Lease-Purchase Contract.
- 5-14-48 Construction contracts for the La Mesa-Sweetwater Extension formally completed.
- 6-28-48 Construction contracts for Fallbrook-Oceanside Branch completed.
- 12-13-48 Corporate areas of the San Dieguito Irrigation District and the Santa Fe Irrigation District annexed to the Authority and The Metropolitan Water District of Southern California.



Aqueduct pipe in place.

SECTION I

OPERATION AND MAINTENANCE

The San Diego Aqueduct and its branch lines were in continuous operation during the year except for brief periods totaling about 62 hours. The shutdowns were necessary in connection with the installation of the Hodges Service Outlet and the inspection and repair of metering and chlorinating equipment. Except for these shutdowns, water deliveries to the San Diego Aqueduct from the Colorado River Aqueduct were maintained throughout the year at flows varying from a maximum of 102 c.f.s. to a minimum of about 90 c.f.s.

Water deliveries to member agencies during the period totaled 71,570 acre-feet, an average of about 6000 acre-feet per month. With the exception of Oceanside, which took delivery of only a token supply, deliveries were made practically on a continuous basis to all agencies.

Permanent maintenance and operation headquarters were established on Authority-owned property in Escondido in July, 1948, and operation and maintenance of the aqueduct system has been carried on from this site since that time.

Patrol of Aqueduct System

The patrolling and inspection of the aqueduct system, comprising about 68 miles of water lines, is one of the most important tasks performed by the operation and maintenance crews. The patrol work is performed daily except Sunday by two crews, each consisting of one patrolman and jeep. Open vent structures and control stations are regularly checked each day, while air valves and blowoffs are inspected and tested for proper operation about once each week. The manhole structures are visited not less than once each month. Patrol crews render written reports to the superintendent at the conclusion of each day's trip. Unusual circumstances, such as failure of meter recording equipment or washouts, are reported to headquarters from the nearest telephone.

During the short shutdown on March 30, 1949, in preparation for the aqueduct capacity test, an inspection was made of tunnels for aquatic growth or signs of deterioration. All tunnels except Poway and the northerly one-half of Fire Hall were entered and inspected throughout their entire length and found in good condition.



Typical patrol roads along Aqueduct.

Operation and Maintenance of System

Access to the aqueduct is dependent upon the use of 29.2 miles of Authority-constructed patrol roads, 14.9 miles of which are located on the aqueduct right of way and 14.3 miles on private property. These

Constituent Areas	DELIVERIES			
	July	August	Sept.	Oct.
Chula Vista and National City (California Water & Tel. Co.).....	955.5	985.8	897.9	927.9
Fallbrook Public Utility District	412.5	433.2	429.1	235.1
Lakeside Irrigation District	0	0	0	0
La Mesa, Lemon Grove & Spring Valley Irrigation District	1,041.3	1,076.0	1,094.7	1,137.5
Oceanside	0	0	0	0
San Diego	3,409.8	3,670.7	3,524.6	3,852.6
San Dieguito Irrigation District
Santa Fe Irrigation District
Totals	5,819.1	6,165.7	5,946.3	6,153.1
Average c.f.s.	94.64	100.28	99.93	100.07

(1) Plus 25.9 acre-feet delivered to Vista Irrigation District and
71,676.8 acre-feet delivered into Aqueduct
80.7 acre-feet total losses=0.11%.

(2) Reduction due to shutdown for making the

(3) Reduction due to reduction of flows during

TABLE 6
DELIVERIES OF COLORADO RIVER WATER—1948-49
(All figures in acre-feet)

Constituent Areas	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Yearly total	Yearly average
														c.f.s.
Chula Vista and National City (California Water & Tel. Co.)....	955.5	985.8	897.9	927.9	820.6	931.5	936.2	845.8	899.7	881.1	935.1	493.6	10,510.7	14.52
Fallbrook Public Utility District	412.5	433.2	429.1	235.1	96.0	33.7	16.9	21.8	42.3	184.8	100.1	119.9	2,125.4	2.94
Lakeside Irrigation District	0	0	0	0	0	0	0	0	0	0.1	0.1	3.3	3.5	0.02
La Mesa, Lemon Grove & Spring Valley Irrigation District	1,041.3	1,076.0	1,094.7	1,137.5	444.6	614.9	430.4	388.8	238.0	541.3	464.0	608.6	8,080.1	11.16
Oceanside	0	0	0	0	1.5	0	0	0	0	0	0	0	1.5	0.0021
San Diego	3,409.8	3,670.7	3,524.6	3,852.6	4,267.2	4,650.9	4,902.1	4,422.8	4,794.2	3,673.1	4,571.2	4,387.6	50,126.8	69.24
San Dieguito Irrigation District	---	---	---	---	---	0	0	0	0	148.8	153.7	148.8	451.3	1.07
Santa Fe Irrigation District	---	---	---	---	---	0	0	0	0	89.3	92.2	89.3	270.8	0.64
Totals	5,819.1	6,165.7	5,946.3	6,153.1	5,629.9	6,231.0	6,285.6	5,679.2	5,974.2	5,518.5	6,316.4	5,851.1	71,570.1	
Average c.f.s.	94.64	100.28	99.93	100.07	(2) 94.61	101.34	102.23	102.26	97.16	(3) 92.74	102.73	98.33	(1)	98.86

(1) Plus 25.9 acre-feet delivered to Vista Irrigation District in repayment of water loaned during construction of aqueduct.
71,676.8 acre-feet delivered into Aqueduct by The Metropolitan Water District at San Jacinto Reservoir.
80.7 acre-feet total losses=0.11%.

(2) Reduction due to shutdown for making the Lake Hodges service connection.

(3) Reduction due to reduction of flows during test for aqueduct capacity.

roads traverse rugged mountainous terrain where native materials are ideal for constructing inexpensive farm-type roads. Their maintenance has been accomplished generally by working the surface with a small patrol-type road grader. Maintenance costs, which have been low due to lack of heavy rains, may be expected to increase in years of heavy rainfall.

During the year the metal work in 40 out of the 71 structures on the main aqueduct was painted with Inertol and the work was continuing into the next year. This includes all the structures on the Authority portion of the aqueduct except the open vent structures. In many cases these structures were completed long before the various construction schedules were completed and maintenance forces were available to keep the structures unwatered, and the exposed metal work became badly rusted. Extensive wire-brushing was required to remove loose paint and rust prior to painting.

Sections of the steel grating covering the openings on the bifurcation structures were removed to provide access for the tunnel inspection on March 30. When they were replaced, it was noted that many sections of grating were too short to fill completely the recessed seat provided in the top of the concrete walls. As a result, one end of the grating could fall into the opening and be carried into the pipe line, with possible serious results. A thorough inspection was made of all the gratings, and 35 sections were found to be defective. To eliminate the danger, extensions were added to the end of each section, which automatically centered each grating over the structure opening when in place.

Delivery of water to Authority agencies is regulated and metered at three small concrete buildings known as Lakeside, Fallbrook, and Lake Hodges control stations. These buildings house the control valves, meters, and flow recording equipment.

Operation of the control stations is performed by the patrolmen who visit the stations daily except Sundays. Flow charts are taken off the recording instruments and replaced with new charts each week. Valve settings are changed as necessary to meet the required water deliveries of member agencies.

The upkeep of the control stations is performed by the regular maintenance crews. The routine work consists of greasing the plug valves, painting to prevent corrosion of metal parts, and inspection and upkeep of recording instruments. No operational difficulties have been experienced at any of these stations except at Lake Hodges where high pressures, 233 pounds per square inch, in the aqueduct required the

installation of a pressure reducing valve to prevent excessive wear in the main control valve. The difficulty was due to excessive vibration of the valve control piping, which cracked on several occasions causing an increase in the water being delivered to Lake Hodges and a leak at the station which caused severe erosion on the hillside, with attending deposits on a public highway located at the toe of the slope. These difficulties were satisfactorily taken care of by representatives of the manufacturer of the valve.

The areas around the aqueduct structures enclosed within fences have been maintained in a slightly condition by clearing weeds and grass from time to time as required.

Water Sales

The quantity of water delivered by the Authority to its member agencies during the fiscal year totaled 71,570.1 acre-feet, an amount sufficient to supply each agency's requirements for supplemental water. The maximum quantity of water delivered in any month during the year was 6316.4 acre-feet in the month of May and the minimum was 5518.5 acre-feet in the month of April. The quantities sold month by month to each agency are given in Table 6.

Water Consumption

Water consumption in the corporate area of the Authority during the year totaled 83,802 acre-feet, equivalent to a continuous flow of about 115.8 c.f.s. The water consumption within the agencies is shown in Table 7. The water use within the City of San Diego was 49,693 acre-feet, about 60 per cent of the total of 83,802 acre-feet. According to the City's report, 59 per cent of the water used was obtained from local water sources and 41 per cent from the Colorado River water. The quantity of Colorado River water consumed during the year represents only about one-half of the amount delivered, the balance after accounting for losses being stored in the San Vicente and Sweetwater Reservoirs.

The total quantity of water in storage on June 30, 1949, 114,650 acre-feet, as compared with the amount in storage the previous June showed an increase of only about 9,000 acre-feet during the year in spite of slightly above-normal rainfall and delivery of about 72,000 acre-feet of Colorado River water, the maximum possible flow.

Of the 125,478 acres lying within the corporate area of the Authority and adjacent areas served by existing water systems, it is estimated that an area of about 79,000 gross acres is capable of receiving water from such systems without making major extension to the systems. The

TABLE 7
WATER USE BY CONSTITUENT AREAS—FISCAL YEAR 1948-49

Constituent Areas	TOTAL WATER USE			SOURCE OF WATER		
	as ac. ft.	as m.g.d.	as c.f.s.	LOCAL	COLORADO RIVER	
				Amount ac. ft.	Amount ac. ft.	Per cent
Chula Vista and National City (California Water & Tel. Co.)	11,293	10.08	15.60	3,964	7,329	35
Fallbrook Public Utility District	3,613	3.22	4.99	1,531	2,082	42
Lakeside Irrigation District	110	0.10	0.15	107	3	97
La Mesa, Lemon Grove and Spring Valley Irrigation District	9,325	8.32	12.88	3,991	5,334	43
Oceanside	2,641	2.36	3.65	2,641	0	100
City of San Diego:						
Inside City	49,693	44.36	68.63	29,123	20,570	59
Outside City (not in Authority)	1,946	1.74	2.69	1,946	0	100
San Dieguito Irrigation District	2,303	2.06	3.18	1,852	451	80
Santa Fe Irrigation District	2,878	2.57	3.98	2,607	271	91
Totals	83,802	74.81	115.75	47,762	36,040	57
						43

NOTE: This table is a compilation of data furnished by member agencies. Figures include losses in transmission and distribution systems but not in conservation reservoirs.

remaining area, about 48,000 acres, is capable of being served only if major extensions to existing works are constructed. The water use on the 79,000 acres is about 1.1 acre-feet per acre per year, being a minimum of 0.8 acre-feet within the La Mesa, Lemon Grove and Spring Valley Irrigation District and a maximum of 1.4 acre-feet in the City of Chula Vista. The estimated 519,000 people residing within the service area of the Authority use an estimated 0.16 acre-foot per year per capita, equivalent to 143 gallons per day per capita. The use of water per acre and per capita within each of the Authority agencies is shown in Table 8.

The total water use of the Authority constituent areas, 83,802 acre-feet, was less than the water consumed in the previous year by about 2,000 acre-feet and was less than the use of the areas in the maximum water-use year of 1945-46 by about 4000 acre-feet. The cause of the decrease in water use is probably due to a combination of circumstances, such as the extensive areas of agricultural land which were temporarily in a non-water using status pending the completion of subdivisional and building activities, and the unusually even distribution of the winter and spring rainfall.

The water use by constituent areas for each fiscal year in the period from July 1, 1940, to June 30, 1949, is shown in Table 9.

Water Quality

Analyses of samples of Colorado River water taken at the head of the San Diego Aqueduct, the west portal of San Jacinto Tunnel, were made by the Metropolitan Water District at frequent intervals during the year beginning in January. These are shown in Table 10, from which it may be noted that the total dissolved solids and hardness varied from maximums of 624 ppm and 311 ppm in February, 1949, to minimums of 595 ppm and 300 ppm in May, 1949. In general, there has been an improvement in the average salinity and hardness content of the outflow from Lake Mead, which supplies the Metropolitan Water District Aqueduct and in turn the San Diego Aqueduct. Since this improvement is believed to be due to the increase in river discharge experienced in 1947 and 1948, it may be expected that the return of a cycle of deficient runoff may again cause an increase in hardness and salinity.

Because the purpose of the Authority is to deliver water to its several agencies in wholesale amounts for distribution to consumers, no attempt is being made to treat Colorado River water or to prepare it in any manner for human consumption.

TABLE 8
WATER USE OF AUTHORITY AGENCIES PER ACRE AND PER CAPITA—1948-49

Agency	Gross area acres	Estimated area served by water system acres	Estimated total use of water acre-feet	Water duty ac. ft./acre	Estimated population	Water use per capita ac. ft./ cap./yr.
Chula Vista and National City:						
In Chula Vista	3,283	3,283	4,459 (1)	1.4	16,000	.28
In National City	3,425	3,425	2,870 (1)	0.8	20,000	.14
Outside Cities (not in Authority)	10,493	3,150	3,964 (1)	1.3	10,500	.38
Total	(17,201)	(9,858)	(11,293)	1.1	(46,500)	.24
Fallbrook Public Utility District	4,740	3,500	3,613	1.0	4,000	.90
Lakeside Irrigation District	1,415	120	110	0.9	2,000	.06
La Mesa, Lemon Grove and Spring Valley Irrigation District	18,659	12,374	9,325	0.8	43,000	.22
Oceanside	5,993	2,562	2,641	1.0	13,000	.20
City of San Diego:						
Inside City	63,344	45,000	49,693	1.1	401,000	.12
Outside City (not in Authority)	(4)	(4)	1,946	—	(4)	—
San Diegoito Irrigation District	4,020	2,600	2,303	0.9	6,800	.34
Santa Fe Irrigation District	10,106	2,700	2,878	1.1	3,000	.96
Totals	125,478 (5)	78,714 (5)	83,802	1.1	519,300	.16

(1) Includes reservoir evaporation losses.
 (2) Served by California Water and Telephone Company.
 (3) Including lands receiving or entitled to receive water from Upper Otay Reservoir and from pipe lines between conservation reservoirs and City limits and area served by Del Mar Light and Power Company.
 (4) Not available.
 (5) Including lands not in the Authority but receiving or entitled to receive water from member agencies of the Authority.

TABLE 9
WATER USE BY CONSTITUENT AREAS—FISCAL YEARS 1940-41 to 1948-49
(All figures in acre-feet)

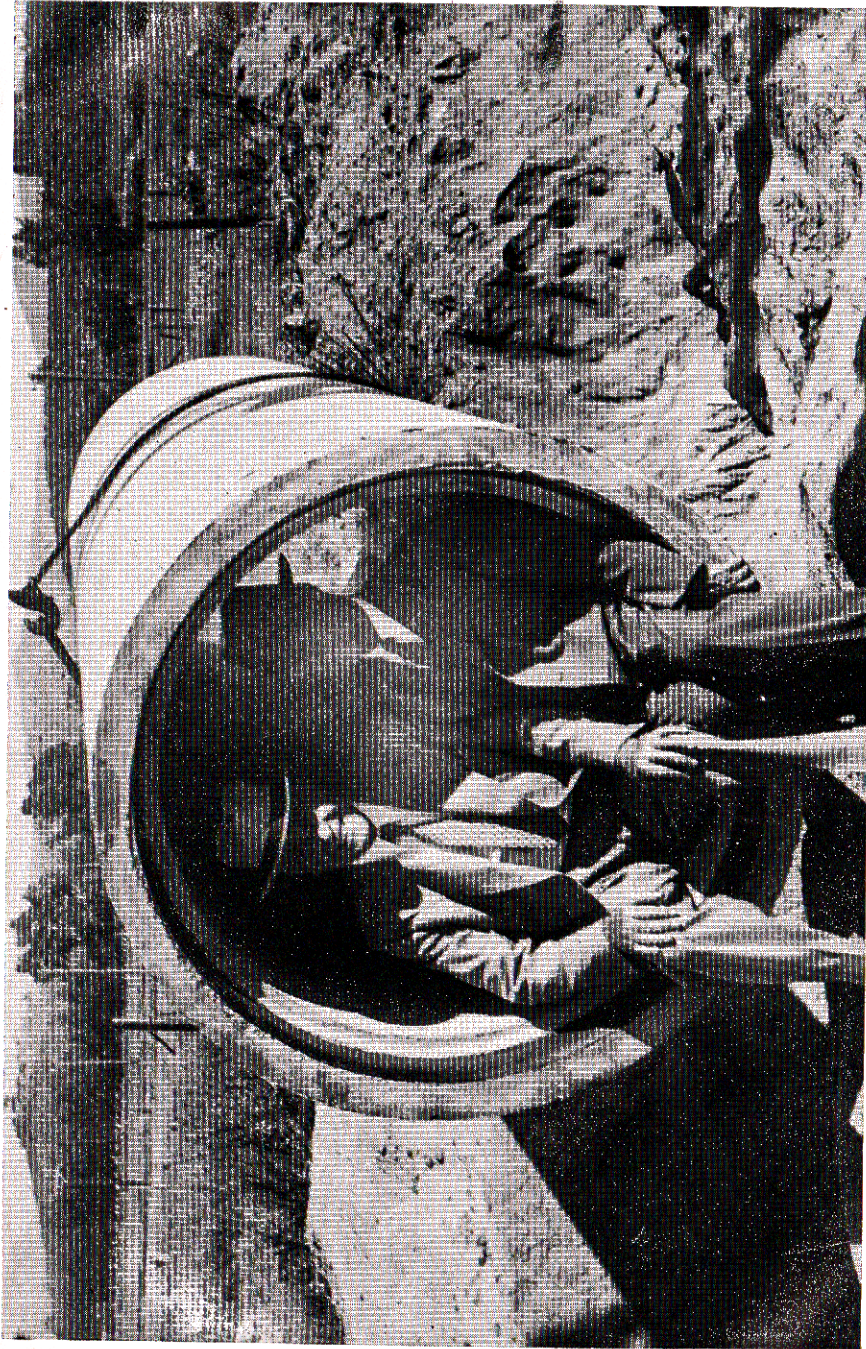
Agency	From Local Sources								From Local and Authority supplies 1948-49
	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	
Chula Vista and National City (California Water and Tel. Co.) (1)	7,502	9,388	9,048	9,963	9,288	10,799	10,519	10,265	11,293 (2)
Fallbrook Public Utility District	576	951	1,232	1,464	1,439	2,120	2,596	3,470	3,613
Lakeside Irrigation District	47	44	60	61	65	69	90	103	110
La Mesa, Lemon Grove and Spring Valley Irrigation District	4,895	4,903	6,455	7,316	7,423	8,920	9,790	10,290	9,325
Oceanside	1,149	1,189	1,508	1,713	1,881	2,304	2,519	2,787	2,641
City of San Diego:									
Inside City	27,490	34,506	43,966	49,742	53,473	56,266	49,431	51,078	49,693
Outside City (not in Authority)	286	384	504	815	1,223	1,147	1,038	1,329	1,946
Total	(27,776)	(34,890)	(44,470)	(50,557)	(54,696)	(57,413)	(50,469)	(52,407)	(51,639)
San Dieguito Irrigation District	2,014	1,917	2,280	2,521	2,611	2,966	3,369	3,034	2,303
Santa Fe Irrigation District	2,700	2,503	3,073	3,300	2,760	3,539	3,512	3,491	2,878
Totals	46,659	55,985	68,126	76,895	80,163	88,130	82,864	85,847	83,802

(1) Includes some water sold to areas adjacent to the two cities.

(2) Includes evaporation losses of Colorado River water in Sweetwater Reservoir.

TABLE 10
ANALYSES OF COLORADO RIVER WATER SAMPLES TAKEN FROM ENTRANCE TO SAN DIEGO
AQUEDUCT AT WEST PORTAL OF SAN JACINTO TUNNEL
(Samples taken and analyzed by The Metropolitan Water District of Southern California)

Constituent	Symbol	Date Samples				
		Jan. 3, 1949	Feb. 7, 1949	May 10, 1949	June 6, 1949	
Silica	SiO ₂	10.0 p.p.m.	9.6 p.p.m.	8.9 p.p.m.	9.4 p.p.m.	
Iron	Fe	0.05	0.02	0.08	0.03	
Calcium	Ca	82	84	78	79	
Magnesium	Mg	25	24.5	25.5	25.5	
Sodium and Potassium	Na and K	86	90	85	88	
Carbonate	CO ₃	2	4	2	4	
Bicarbonate	HCO ₃	151	150	142	137	
Sulphate	SO ₄	258	267	253	261	
Chloride	Cl	70	69	71	72	
Nitrate	NO ₃	1.1	1.3	0.9	0.8	
Total dissolved solids		610	624	595	608	
Hardness as CaCO ₃						
Total		308	311	300	302	
Carbonate		128	129	120	118	
Noncarbonate		180	182	180	184	
Free carbon dioxide	CO ₂	1	2	1	1	
Hydrogen ion concentration	pH	8.3 at 22° C	8.1 at 23° C	8.3 at 25° C	8.3 at 23° C	
"Per cent sodium"		38	39	38	39	
Electrical conductivity	ECX10 ⁶ @ 25° C	985	980	955	967	



Pipe for La Mesa-Sweetwater Extension.

SECTION II ENGINEERING

During the fiscal year engineering activities included the preparation of working drawings on a number of small construction projects, the preparation of several reports, and attention to a multitude of proceedings and routine details. The construction projects referred to include the Escondido Headquarters, Lake Hodges and Red Mountain control stations, and access and patrol roads. The principal engineering studies were those pertaining to the proposed enlargement of the San Diego Aqueduct.

Escondido Headquarters

The Authority early in 1948 purchased land in Escondido for an operation and maintenance headquarters. At the time of purchase the land was under lease to the S. A. Healy Company, one of the contractors on the San Diego Aqueduct, who owned and occupied several buildings used as headquarters in the prosecution of the work on the aqueduct. These buildings, together with some of the Escondido engineering buildings transferred to the Authority by the Navy, were converted into a headquarters for the Authority's operating and maintenance forces. An office building transferred to the Authority by the Navy, together with a small tool shed and the fence which formerly enclosed a parking area, were declared surplus and sold to the City of Escondido.

Working drawings and specifications covering the moving and remodeling of the buildings were prepared, and inspection of the work was maintained during construction.

Lake Hodges Control Station

The continued lack of substantial runoff from the San Dieguito water shed area caused a serious deficiency of water in Hodges Reservoir early in 1948. To relieve the shortage, the City of San Diego requested the Authority to install an additional service outlet from the aqueduct at the earliest date possible. The requirements of the City were such as to make it necessary to divert 15 to 20 c.f.s. from the aqueduct at a pressure of 233 p.s.i. and, after metering, to discharge this flow into a city gravity pipe line discharging into the reservoir. The plans prepared by the engineering section included a takeoff and

valve box on the aqueduct line, a Venturi meter tube, and a small concrete structure housing the recording instruments and the final control valve. A pressure reducing valve located in the valve box reduces the initial pressure to about 75 p.s.i. Further pressure reduction is accomplished by a standard plug valve before delivery is made to the City lines.

With the later annexation of the San Dieguito and Santa Fe Irrigation Districts, these Districts entered into an agreement with the City under which they acquired an interest in the City's pipe line and ditch and temporary storage in Hodges Reservoir. This permitted the Districts to take delivery of their allotment of Colorado River water at the Lake Hodges control station.

Working drawings of the structures and piping were prepared by the engineering staff, and valves, meters, and recording equipment were purchased under special Board authorization. An informal agreement was entered into with the City covering the construction of the station by City crews and the payment therefor by the Authority. The Authority maintained an engineer-inspector at the site during the construction period. Upon final completion, one-half the total cost of the station was paid for by the City of San Diego, the other portion of the cost being absorbed by the Authority on behalf of the two newly annexed agencies, the San Dieguito and the Santa Fe Irrigation Districts, the policy of the Board being to pay for one outlet for each agency and to require payment therefor from agencies requiring the installation of any additional outlets.

Red Mountain Control Station

The Fallbrook Public Utility District in order to improve service to its consumers began construction in April, 1949, of the Red Mountain storage reservoir located on the south slope of Red Mountain. The Authority was requested to provide a second delivery point from the Fallbrook-Oceanside Branch to serve this reservoir, which lies some 1500 feet north of the line. Preliminary plans covering the installation of necessary valves and metering equipment were prepared and an estimate of cost of the proposed work was made. Construction of the station was authorized early in December, 1948.

The Red Mountain Control Station consists of two small concrete structures, a vault housing the emergency shut-off valve, and a small two-story building housing the control valve and the recording equip-

ment. A cast-iron Venturi tube and a short section of steel pipe connect the vault with the building. The construction was accomplished by the construction forces of the Fallbrook Public Utility District under the terms of an informal agreement with the Authority. The valves, metering, and recording equipment were purchased by the Authority. The entire construction cost is to be repaid by the District in accordance with the Board's policy of providing only one outlet to each agency at Authority expense.

At the end of the fiscal year construction work at the station had been substantially completed except for the small building housing the control valve and equipment. Water deliveries from the station were initiated through a temporary hookup on July 9, 1949.

Acquisition of Rights of Way for Patrol Roads

The form of easement used by the Navy Department in acquiring rights of way for the construction of the San Diego Aqueduct carried the right to travel along the aqueduct line for operation and maintenance purposes. However the problem of gaining access during construction to the line was left to be worked out by each contractor.

The roads built by the contractors for use during construction were in many cases located on private property, and they could not be used for access and patrol purposes until easements covering their use for this purpose had been obtained.

It was necessary therefore to locate and plat these construction roads, together with existing public roads adjacent to the aqueduct line, in order to determine the rights of way which should be acquired from private owners in order to gain access to the aqueduct at convenient points and to patrol the line in an efficient manner. In preparing this study certain surveys made by the Navy Engineering Department, together with new surveys made by Authority forces, were prepared covering each parcel of land to be acquired for this purpose.

Easements for the ingress and egress roads were generally obtained without cash payment in exchange for an agreement providing continuous maintenance of the roadway at Authority expense. This was an economical arrangement since the patrol road along the aqueduct must also be maintained by the Authority. By June 30, 1949, agreements for the use of 7.2 miles of access roads had been entered into with the owners of 25 parcels of land.

In order to prepare legal descriptions and plans for the right of way agreements, it was necessary to survey the alignment of the roads involved in the agreements. Field surveys were accomplished by an engineering party recruited from operation and maintenance personnel. All plats and descriptions necessary for the acquisition of the rights of way were prepared in the engineering office.

Some of the problems connected with securing of ingress and egress rights of way to the aqueduct were solved by enlisting cooperation of the officials of San Diego County. An agreement was entered into between the County and the Authority providing for the taking over and the improvement by the County of a 1.7 mile reach of privately owned road known as Betsworth Road. One-half the cost of this work is to be borne by the Authority. The work on this road will be performed during the 1949-50 fiscal year, and its completion will provide an all-weather access road to that remote portion of the aqueduct situated in the vicinity of Red Mountain and Oat Hills tunnels. The County also granted the Authority permission to improve about two miles of a long-unused County roadway which has its southern terminus in Reidy Canyon and extends northerly to Moosa Canyon over extremely mountainous terrain. This road constitutes a dry weather access road to the same reach of aqueduct (Oat Hills and Red Mountain tunnels) which will later have all-weather service by Betsworth Road. The work of widening and generally improving this road has now been completed and has effected a saving of about eight miles in the distance traveled by the aqueduct patrol force.

Maps have been prepared, scale 1 inch equals 1000 feet, covering the alignment of the San Diego Aqueduct in San Diego County, showing all roads both public and private which might be useful in gaining ingress and egress to the aqueduct. By convenient symbols the maps show such pertinent information as the agency responsible for maintenance and upkeep, and type of surfacing.

Flow Tests

During the month of December, 1947, rather extensive tests were made on several sections of the aqueduct to determine its carrying capacity and coefficient of flow. Tests were of particular interest because of the long reaches of uniform diameter of pipe utilized in the construction of the aqueduct and the opportunity presented here to accurately determine head loss by direct measurements to water surface at open structures. The work was done under the personal supervision

of Mr. Fred C. Scobey, with the personnel of the Metropolitan Water District, the U. S. Bureau of Reclamation, and the Authority co-operating. The results obtained from these tests indicated a possible inaccuracy in the measurement of the flows entering the upper end of the pipe. In order to check the results of the first tests, additional tests were made in April, 1949, and were again supervised by Mr. Scobey and participated in by the personnel taking part in the first test. The results of these tests are not as yet available.

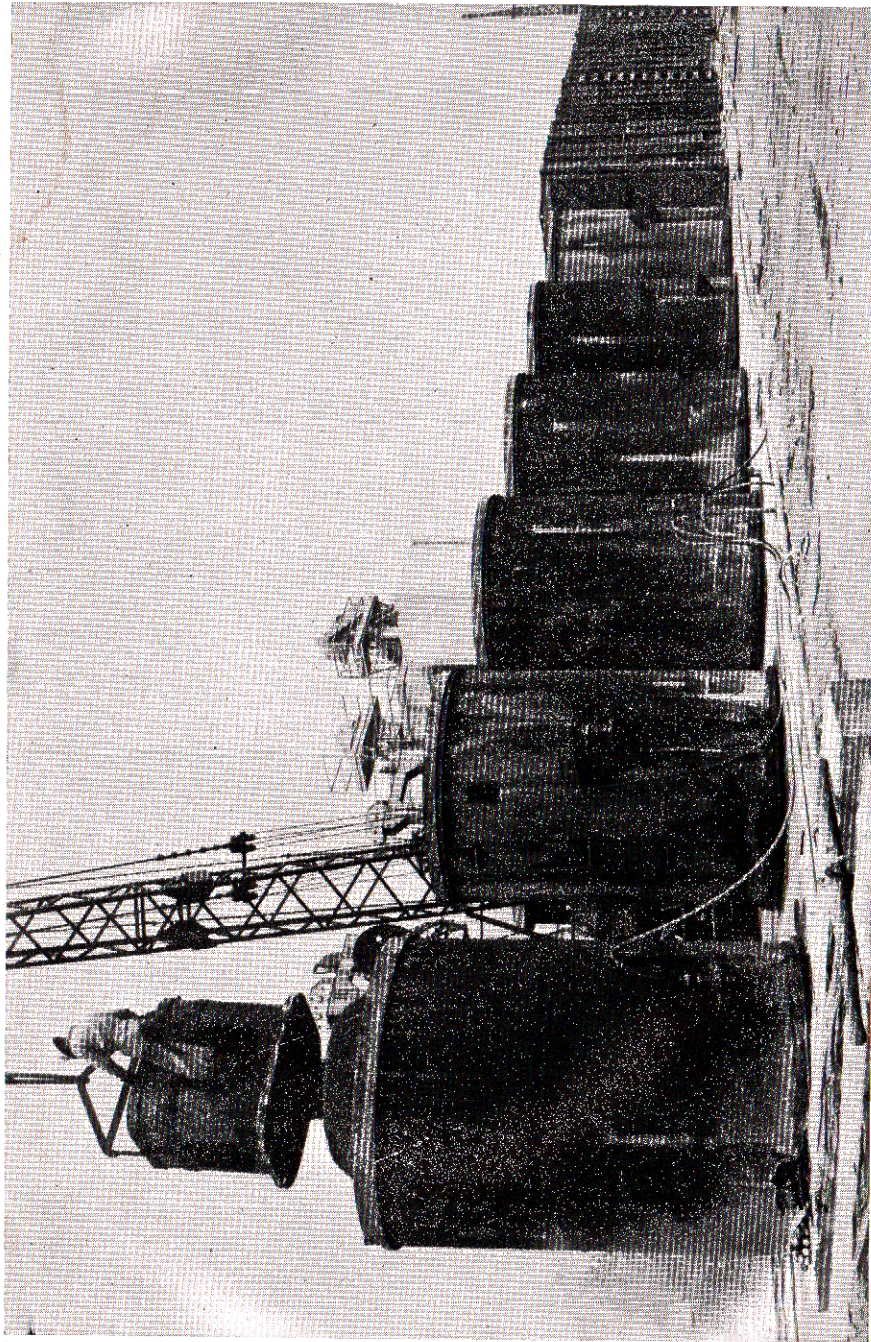
Construction Records of San Diego Aqueduct

On completion of construction, all Navy records and field books were transferred to the Public Works Office of the Eleventh Naval District in San Diego, where they are to be retained and made available to the Authority whenever necessary. Records of the inspection reports had been made in duplicate, and copies of these were made available for the files of the Authority and the Metropolitan Water District.

More detailed descriptions of the construction methods are contained in reports on the project by the Navy Department and the Bureau of Reclamation. The titles of these reports are "San Diego Aqueduct Project, Report on the Need, Preconstruction Planning, Administration, Construction History and Financing, Eleventh Naval District," dated July 1948, and "Investigation, Design and Construction of the San Diego Aqueduct, U. S. Department of the Interior, Bureau of Reclamation," dated June 1948.

San Diego Aqueduct Completion Studies

Following approval by the Board on April 20, 1949, of the execution of a contract between the Bureau of Reclamation and the Authority covering the investigation and report on completion of the San Diego Aqueduct, engineering studies were undertaken by the engineering staff of alternate routes which might be followed in constructing the second barrel of the aqueduct. Various routes were plotted on U.S.G.S. topographic maps, profiles were prepared, and preliminary estimates of costs were made for the various routes investigated. The purpose of this work was to determine by process of elimination which route might warrant the making of more detailed studies by Bureau of Reclamation forces. The results of these studies were later turned over to the Bureau.



Fabrication of Aqueduct pipe.

Determination of Safe Operating Capacity

The maximum safe operating capacity of the aqueduct when first placed in operation was found to be about 104 c.f.s. With the coming of the summer of 1948, a bacterial growth occurred in the upper section of the aqueduct, and this capacity was slowly reduced to a low of about 95 c.f.s. At that time, for the purpose of killing the growth, the Metropolitan Water District began chlorination of the water at the outlet of San Jacinto Reservoir, and this resulted in the partial restoration of the original safe capacity. After the exceptionally cold weather of January 1949, the safe capacity further increased to 103 c.f.s.; but with the coming of warm weather, the elevation of water in the open vent structures became dangerously high, and progressive cut-backs in flow were found necessary. At the end of the fiscal year it was evident that the bacterial growth in the southerly portion of the aqueduct was increasing, in spite of the chlorination at San Jacinto Reservoir, and that additional chlorination would be required at approximately the upper limits of the Authority section of the line if a capacity greater than 90 c.f.s. was to be maintained.

Fortunately, the elevation of the water surface at all the open vent structures had been accurately taken and recorded for various flows since the beginning of operation, and it was possible to construct graphs showing the relationship under normal flow conditions between water levels and rates of flow at each open structure. These observations were of material assistance in determining the reasons for reduction of capacity on the various reaches of the aqueduct and in formulating remedial measures for critical points on the line. One of these measures was the raising of walls at certain open vent structures which were proven to be definite bottlenecks to the maintenance of higher safe capacities.

San Vicente Metering Station

A study has been made and preliminary plans have been prepared covering the future construction of a metering station located on the main aqueduct immediately west of the north portal of San Vicente Tunnel, designed to measure the flow of water into San Vicente Reservoir. At the present time the flow of water into San Vicente Reservoir can be determined only by deducting from the measured deliveries at San Jacinto Reservoir all the other diversions from the aqueduct. It is planned to construct this station at some future time when discharges

into San Vicente Reservoir can be temporarily discontinued. Its installation will provide direct measurements of all water deliveries.

Miscellaneous

The legal descriptions of boundaries of the Authority as of the end of 1948 were checked with the agencies and brought up to date to include all annexations and exclusions made during the year. Complete records of all changes were filed with the Metropolitan Water District, with the County Assessor, and with the Board of Equalization.

The contract drawings for the La Mesa-Sweetwater Extension and the Fallbrook-Oceanside Branch have been revised and corrected to show the changes as actually constructed. All right-of-way drawings have been checked and where found necessary they have been revised to conform with the legal descriptions as purchased.

Records of water sales and water use by member agencies for the fiscal year have been assembled monthly. Estimates of possible future water demands have been prepared.

Delivery of water to storage reservoirs by 10-day periods have been computed and furnished the City of San Diego to assist them in the preparation of statement showing amount of water in storage at the end of 10-day periods.

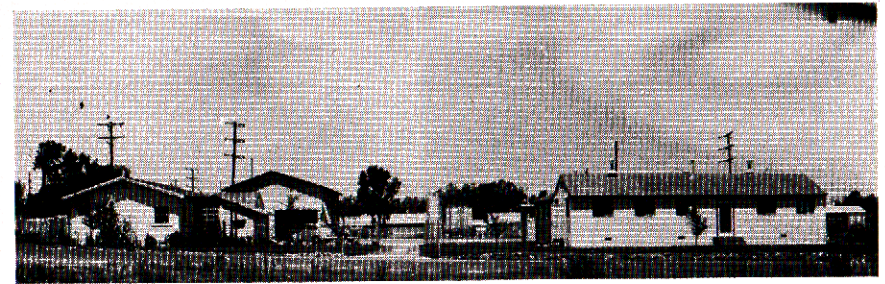
The amount of water delivered monthly to member agencies has been computed at the end of each month and statements prepared, which were used as the basis for water billing.

SECTION III CONSTRUCTION

Construction work performed during the 1948-49 fiscal year included an operating and maintenance headquarters at Escondido, patrol and access roads required for the operation and maintenance of the aqueduct, and two additional control stations required to facilitate service. Minor work completed during the same period consisted of raising side walls on certain bifurcation structures on the aqueduct and the installation of gates and drainage culverts on access roads. These jobs were accomplished by the regular maintenance crew.

Escondido Headquarters

Of the seven buildings comprising the completed Escondido Headquarters, three were purchased on their present site from the S. A. Healey Company (an aqueduct contractor), three were acquired from the Navy and were moved in from another site, and one, the garage, was newly constructed.



Field Headquarters at Escondido.

The former office of the S. A. Healey Company was remodeled into a small residence to be used by the superintendent. The work consisted of placing a continuous concrete wall under the exterior sills of the building, altering the interior partitions and relocating exterior doors and windows where necessary to provide four rooms with bath and utility room. A small porch protects the entrance and improves the appearance of the building. The exterior walls were stuccoed and the trim painted. The work was completed and the building was occupied by the Superintendent in September.

The former S. A. Healey Company's shop building required but few alterations and was maintained on its original foundations. A metal roofed open shed and one side of the shop were removed and this material was used in the construction of a storage garage for automobiles and equipment. The building was repaired, electric wiring was modified to serve rearrangement of equipment, and the interior and exterior walls were painted.

The S. A. Healey Company's warehouse building was maintained at its original location, the only work required being the addition of a concrete floor and painting of the exterior walls.

The three buildings taken over by the Authority as part of the aqueduct construction plant were moved a distance of about one-half mile to the headquarters site and set on new foundations. The work was accomplished by contract with a local moving contractor. The buildings consisted of an office building, a small dormitory, and a small building on skids formerly used as a portable laboratory.

The office building was cut in two parts prior to moving, and each part moved independently. Concrete foundation walls were placed under its exterior walls and new girders and piers were added under the drafting room to dampen excessive vibration. Partitions were rearranged to give more efficient use of the floor space. The interior walls, floor, and roof were painted. The exterior walls were stuccoed.

The dormitory building was placed on concrete piers, exterior partitions removed, and converted into a small office for use of the superintendent.

No alterations were made in the portable laboratory building except to place on concrete blocks.

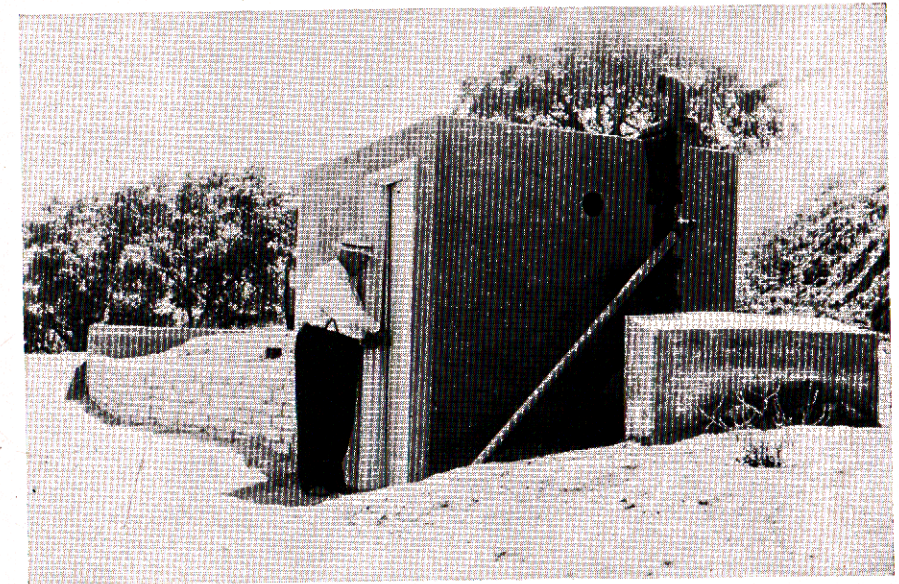
The other work accomplished at the headquarters site consisted of constructing an open shed garage, which provides shelter for nine pieces of equipment and an equipment wash rack, the installation of a 1000-gallon gasoline tank with an electric pump and metering device, and the building of a wire mesh fence around the shop and storage area. The shop area was regraded and surfaced with disintegrated granite. The area around the main office building and the superintendent's residence was planted to grass and landscaped.

The Authority maintenance crew accomplished all the work required to complete this program except the installation of plumbing, electrical wiring, fencing, the application of stucco, and the moving of the buildings. This latter work was performed by awarding six informal contracts, details of which are shown on Table 11.

Lake Hodges Control Station

A description of the Lake Hodges Control Station appears under Section II of this report.

While the Authority purchased all piping, valves, and other equipment required for the construction of this station, the San Diego Water Department performed the major construction work under an informal agreement with the Authority, which had previously prepared plans for the station. At that time the Water Department was engaged in the construction of other work in the vicinity and had experienced crews available for pouring concrete and installing metal work. Authority maintenance crew installed the meter recording equipment and performed other minor construction at the station.



Lake Hodges Control Station.

The work was completed and the station placed in operation on February 16, 1949.

TABLE 11
SCHEDULE OF SUBCONTRACTS—ESCONDIDO HEADQUARTERS

Contract	Description of Work	Contract awarded	Work started	Contract completed	Contractor	Amount of contract
Spec. # 106	House moving	6-28-48	7- 1-48	7-16-48	August Anderson	\$ 475.00
"	Plumbing	6-28-48	7- 1-48	8-20-48	Traviss Plumbing Shop	1,002.00
"	Electrical work	6-28-48	7- 1-48	8-20-48	Philard Inc.	386.50
"	Plastering					
"	(Superintendent's residence)	6-28-48	9-13-48	10- 8-48	Anthony Arena	367.20
P.O. # 495	Fencing	8-18-48	9-27-48	10-22-48	Cyclone Fence Division	1,057.42
	Stucco					
	(Bureau of Reclamation Office)	5-19-49	5-23-49	6-24-49	F. M. McPherson	465.75

Red Mountain Control Station

The Red Mountain Control Station is described in Section II of this report. The Authority purchased the valves, meter tube, recording equipment, and accessories and entered into an agreement with the Fallbrook Public Utility District providing for their installation and the building of necessary structures by that District. The work of installing the meter recording equipment and pressure gauges was performed by Authority maintenance crew. The work was performed under Authority engineering inspection. All work on this station was substantially completed at the end of the fiscal year.

Access and Patrol Roads

As shown by the studies described in Section II in the paragraph dealing with the acquisition of patrol road rights of way, it became necessary subsequent to taking over the aqueduct from the Navy, to construct or to improve about 30 miles of roads in order to efficiently patrol the aqueduct. These roads may be roughly classified as 15 miles of patrol roads on aqueduct rights of way, 10 miles of access roads covered by easements granted to the Authority, and 2 miles of public road constructed by San Diego County and partially paid for by the Authority. In addition the Authority rehabilitated a 2-mile length of unused old County road connecting Reidy and Moosa Canyons.

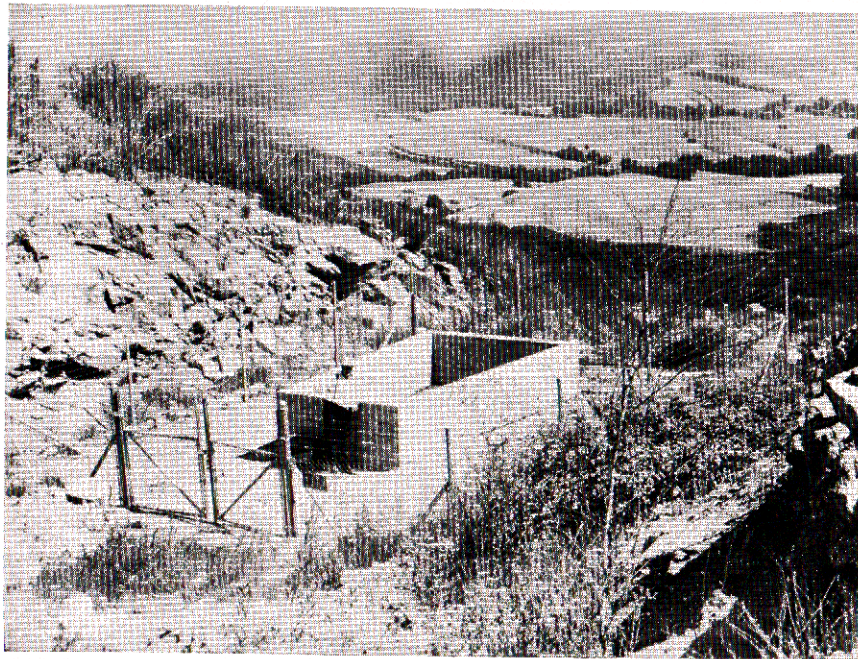
The construction accomplished on the access and patrol roads consisted chiefly of grading and drainage work with a road patrol. A bulldozer was employed where large quantity of earth work was required to be moved. Galvanized corrugated culverts were installed to improve drainage wherever necessary.

Fortunately the native materials consisted largely of disintegrated granite, which affords excellent road surfacing material at small expense. In constructing the roads, the objective kept in mind was to secure an all-weather single lane road for travel in a jeep. In dry weather all the roads are passable with an automobile. The program of road building was practically completed during the fiscal year except for work by the County on Betsworth Road, but maintenance work will be required after each heavy rain.

Raising Walls of Aqueduct Structure

The extensive tests to determine the capacity of the San Diego Aqueduct which were made in December 1947 indicated that several of the

open structures on the aqueduct would overflow before the maximum capacity was reached in the other structures, thus limiting the capacity of the entire aqueduct. As a result of these tests, the walls of the critical structures located at the south portals of Lilac, Oat Hills, and Fire Hill tunnels were raised from two to three feet with concrete block masonry reinforced with vertical and horizontal steel. In order to prevent high water in the bifurcation structures from overflowing the bulkheads protecting the second barrel openings and escaping through these openings, it was necessary to construct concrete covers over these openings before the raised walls could be effective. The work was accomplished by the regular maintenance crew.



Open structure portal of Lilac Tunnel showing masonry walls added to increase safety.

These walls received a test in June 1949 when a bacterial growth in the line caused the water to rise at the outlet structure of Oat Hills Tunnel above the top of new masonry wall. A small overflow occurred, causing erosion of the material surrounding the structure. The small damage was repaired by a day's work with the bulldozer and a small crew of men. The water was kept within the structure walls at the other critical points.

SECTION IV

METROPOLITAN WATER DISTRICT

The Authority was annexed to the Metropolitan Water District on December 17, 1946. At that time the Authority consisted of the Cities of Oceanside, San Diego, National City, Chula Vista; the Lakeside and the La Mesa, Lemon Grove and Spring Valley Irrigation Districts; and the Fallbrook Public Utility District. During the past year the San Dieguito and the Santa Fe Irrigation Districts have annexed to the Authority and to the Metropolitan Water District. Fred A. Heilbron and J. L. Burkholder continued to represent the Authority on the Metropolitan Water District's Board of Directors.

District Financing

A bond issue of 220 million dollars was authorized by the Metropolitan Water District electors on September 29, 1931, to finance the construction of the then-proposed Colorado River aqueduct. At the close of the 1948-49 fiscal year a total of \$184,684,000 in bonds had been issued to finance the initial stages of construction, including four million dollars of bonds sold during the year to finance the construction of the second unit of the treatment plant at La Verne and additional pipe line construction on the Metropolitan area distributing system. At the end of the fiscal year, bonds in a value of \$1,818,000 had been redeemed, leaving \$182,866,000 in bonds still outstanding.

To meet the bond service charges and operation maintenance expense, the District has levied taxes sufficient to meet the difference between these requirements and the income from the sale of water. Such taxes have increased from a minimum of 3 to 4 cents per \$100 in the pre-construction years to a maximum of 50 cents in 1945-46 just prior to the annexation of the San Diego County Water Authority. Upon annexation of the Authority the tax rate dropped to 35 cents, due in part to a rather large increase in the assessed valuation of the original District area and to the large increase in assessed valuation of the District resulting from annexation of the Authority. The assessed valuation of the District and the regular tax rate levied on the District area for each year since 1929, the date of the first levy, are given in Table 12.

In addition to the regular taxes shown in this table, special taxes have been levied against all areas annexed after the original formation of the District. The amount of these special taxes and the period over

TABLE 12

ASSESSED VALUATIONS AND TAX RATE OF THE
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Fiscal Year	Assessed Valuations Total (1)	Tax Rate Per \$100 Secured (2)
1929-30	\$2,439,836,920	\$0.04
1930-31	2,431,684,250	.03
1931-32	2,382,184,445	.03
1932-33	1,936,051,180	.04
1933-34	1,654,403,890	.04
1934-35	1,587,147,565	.10
1935-36	1,783,531,020	.20
1936-37	1,789,160,685	.37
1937-38	1,827,765,725	.40
1938-39	1,896,966,255	.40
1939-40	1,910,152,190	.42
1940-41	1,841,248,450	.49
1941-42	1,900,599,934	.48
1942-43	2,001,924,735	.48
1943-44	2,005,496,430	.48
1944-45	2,109,192,795	.48
1945-46	2,159,731,425	.50
1946-47	2,413,186,570	.48
1947-48	3,443,212,822 (3)	.35
1948-49	3,883,081,225	.34
1949-50	4,181,812,855	.34

(1) Includes secured, unsecured, and public utility valuations.

(2) Unsecured tax rate is equal to rate set for previous year.

(3) First year in which Authority assessed valuation was included in District's assessed valuation.

which they are to be collected are defined in the terms of annexation. These amounts approximately equal the back taxes computed to the date of annexation, plus delinquent interest on the tax levies which would have been made at 4 per cent.

The annexation charges of the Authority to be raised by special tax levies over a 30-year period beginning in 1948-49 total \$13,045,000, of which \$230,000 is the capitalized value of replacement energy being furnished by the Metropolitan Water District. This replacement energy is due the United States because of the change in diversion point of the Government's allotment of Colorado River water to the City and/or County of San Diego from Imperial Dam to Parker Dam; and the energy so lost at Parker Dam is being replaced concurrently, under the annexation agreement between the District and the Author-

ity, with equivalent energy generated at Hoover Dam and delivered at Parker Dam over the transmission facilities. The District's special tax rates on the areas within the several Authority agencies for the past three years are shown by Table 13.

TABLE 13
METROPOLITAN WATER DISTRICT SPECIAL TAX RATES
ON AUTHORITY AGENCIES

Agency	Tax Rate—Cents per \$100		
	1947-48	1948-49	1949-50
Chula Vista	17	13	11
Fallbrook Public Utility District	17	13	11
Lakeside Irrigation District	17	13	11
La Mesa, Lemon Grove and Spring Valley Irrigation District:			
Original area	17	13	11
Crest Public Utility District	—	—	13
National City	17	13	11
Oceanside	17	13	11
San Diego	17	13	11
San Dieguito Irrigation District	—	—	13
Santa Fe Irrigation District	—	—	15

The amount of money to be raised by the District each year from each area remains practically constant, but because of the increased assessed valuations, the tax rate on the original Authority area dropped from 17 cents in 1947 to 11 cents per \$100 in 1949. The areas of the San Dieguito and the Santa Fe Irrigation Districts and of the Crest Public Utility District, a portion of the La Mesa, Lemon Grove and Spring Valley Irrigation District, did not annex until 1948, with the result that two additional years of taxes were added to the annexation charges to be paid by these agencies. As a result the 1949-50 tax rates of these areas are slightly higher than those in the original areas, that for the Santa Fe Irrigation District being 15 cents and for the other two districts 13 cents, against the 11 cents for the original area.

The District continues to improve its financial position, its total reserves in cash and Government securities increasing during the year about \$1,700,000 to over 26 million dollars in 1949. Its total assets increased over 10 million dollars to 280 million dollars. Permanent facilities of the District increased in value during the year by about 3 million dollars to \$253,200,000. A General Balance Sheet as of June 30, 1949, showing the assets and liabilities of the District as of that date, is contained in Table 14.

TABLE 14
GENERAL BALANCE SHEET JUNE 30, 1949
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

ASSETS

<i>Permanent Facilities:</i>			
Preliminary surveys, engineering and organization expense		\$ 4,631,317.57	
Original aqueduct construction	\$178,781,519.68		
Additions and betterments	5,019,542.41		
Morris Dam and appurtenant works	6,311,180.46		
San Diego Aqueduct (estimated)	6,500,000.00		
Parker Power House (estimated)	3,300,000.00	\$199,912,242.55	
Inventories	1,660.96	199,913,903.51	\$204,545,221.08
<i>Other construction costs:</i>			
Los Angeles	\$ 1,203,778.49		
Pasadena	209,737.73	\$ 1,413,516.22	
Unused power and water to 7/31/41	2,790,868.25		
Bond interest during construction	34,767,174.97	\$ 38,971,559.44	
Less interest received on construction funds		201,070.37	38,770,489.07
Inventories—Operation and Maintenance		284,540.99	
<i>Cash:</i>			
On hand and on deposit	\$ 8,503,778.53		
Less outstanding demands	170,564.16		8,333,214.37
<i>Government Securities held</i>			
<i>Accounts Receivable:</i>			
Uncollected tax assessments—1948/49	\$ 403,591.98		
Uncollected tax assessments—prior years	325,928.58	\$ 729,520.56	
Miscellaneous	\$ 196,090.36		
Cash with employees	2,000.00		
Cash deposited with State Compensation Insurance Fund	500.00		
Cash deposited with American Airlines, Inc.	425.00		
Interest receivable	38,307.22	237,322.58	966,843.14
<i>Accounts Receivable—Deferred</i>			
U. S. Government rate adjustment	\$ 193,374.34		
Annexation charges (unassessed)	18,173,975.11		18,367,349.45
			<u>\$289,758,923.80</u>

TABLE 14 (Continued)
GENERAL BALANCE SHEET JUNE 30, 1949
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

LIABILITIES

<i>Long Term Indebtedness:</i>			
Outstanding bonds	\$182,866,000.00		
Contractual Obligation:			
City of Pasadena	4,404,000.00		
San Diego County Water Authority	6,312,500.00		
U.S. America—Parker Power House	3,300,000.00		\$196,882,500.00
<i>Accounts Payable Due:</i>			
Bond interest—coupons not presented	\$ 64,185.00		
Special deposits	155,756.54		
Miscellaneous	999,788.03		1,219,729.57
<i>Accrued Bond Interest—Not Due</i>			
			2,792,982.92
<i>Reserve for Replacements</i>			
			2,009,183.23
<i>Reserve for Workmen's Compensation and Fire Insurance</i>			
			89,045.77
<i>Capital Investment:</i>			
Municipalities:	\$135,070,208.04		
Withdrawn Cities	14,079.76	\$135,084,287.80	
Annexation charges—unassessed	18,173,975.11		
		\$153,258,262.91	
<i>Cumulative Excess of Interest and Other Charges over Revenues:</i>			
For this fiscal year	\$ 7,831,388.43		
Prior to this fiscal year	60,182,146.27	68,013,534.70	\$ 85,244,728.21
<i>Funds Collected and Applied to Construction</i>			
		1,421,330.69	
<i>Work Contributed by Municipalities (connections)</i>			
		99,423.41	86,765,482.31
			<u>\$289,758,923.80</u>

District Water Sales

The total water pumped from the Colorado River at Lake Havasu during the past year totaled 170,541 acre-feet. At Hayfield, the last pumping station on the aqueduct, a total of 155,551 acre-feet was pumped to the highest level on the aqueduct. The difference, 14,990 acre-feet, between that pumped at Lake Havasu and that at Hayfield approximately represents losses in the canals and reservoirs between the river and the pumping station at Hayfield. This quantity, although large for the present volume of water pumped, would increase only slightly were the aqueduct operating at full capacity.

The total water sales of the District during 1948-49 were about 145,000 acre-feet, about 41,000 acre-feet more than was sold in 1947-48. The bulk of this increase resulted from the Authority taking water for the entire year, whereas water was taken for only a 7-month period in the 1947-48 year. Increases occurred in the water sales of six of the District's agencies. Water was taken during the year by all agencies except San Marino, whose system is not at present connected to the District works.

Water Rates

The rate for softened water furnished by the District to its member agencies was increased on July 1, 1949, from \$15 to \$18 per acre-foot. This change was made after considerable study by the District staff, which indicated that the previous charge of \$15 per acre-foot for treatment did not meet the actual cost of operating the treatment plant, plus the charge for raw water.

The total water sales of the District to its member agencies for the past four years are shown in Table 15.

District Water Consumption

The total water consumption of the constituent areas within the Metropolitan Water District, as shown in Table 16, during the 1948-49 fiscal year totaled 659,135 acre-feet, an increase of 7.2 per cent over the 1947-48 total of 614,823 acre-feet. Table 16 also shows the consumption of the several agencies of the District, the change in consumption from that of the previous year, the source of the water consumed, and the amount obtained from local supplies and from the District.

TABLE 15
(a) WATER SALES BY METROPOLITAN WATER DISTRICT TO MEMBER AGENCIES—1945-1949

	1945-46	1946-47	1947-48	1948-49
	acre-feet	acre-feet	acre-feet	acre-feet
SOFTENED WATER				
Anaheim	2,516.7	2,558.6	2,585.0	2,575.6
Beverly Hills	3,051.1	3,933.7	2,576.6	1,903.7
Burbank	624.1	1,492.8	1,720.6	589.6
Coastal Metropolitan Water District	1,441.5	1,655.3	2,611.9	2,740.7
Compton	491.5	1,475.2	1,386.5	360.7
Fullerton	979.2	1,235.2	1,210.6	1,275.5
Glendale	0	527.6	906.4	382.7
Long Beach	9,582.6	10,815.1	13,855.1	15,831.2
Los Angeles	4,093.5	7,657.8	12,661.0	14,337.2
Pasadena	8,789.2	12,354.2	14,673.1	16,037.2
San Marino	0	0	0	0
Santa Ana	5,511.5	5,366.3	5,727.8	5,646.9
Santa Monica	9,471.3	10,224.4	10,606.0	10,162.6
Torrance	133.6	565.6	1,474.8	1,388.8
West Basin Municipal Water District	—	—	—	4.7
Sub-total	46,685.8	59,861.8	71,995.4	73,237.1
U. S. and California at Spadra	163.7	212.4	79.3	—
Total Softened Water	46,849.5	60,074.2	72,074.7	73,237.1 (2)
NATURAL WATER				
San Diego County Water Authority	—	0	41,093.5 (1)	71,642.6
U. S. Army	1,100.5	311.6	87.5	—
Total Natural Water	1,100.5	311.6	41,181.0	71,642.6 (2)
Grand Total	47,950.0	60,385.8	113,255.7	144,879.7 (2)
Expressed in other units:				
Cubic feet per second	66.23	83.41	156.01	200.12
Million gallons daily	42.81	53.91	100.83	129.34

(1) For 7-month period. First delivery of water to Authority was made on 11/24/47.
(2) Includes water sold to Metropolitan Water District member agencies only.

(b) TOTAL SALES SOFTENED AND UNSOFTENED WATER—1941-1949

Year	Acre-feet	Annual Increase
		Per cent
1941-42	9,443.3	—
1942-43	17,013.5	80.2
1943-44	19,175.7	12.7
1944-45	32,307.0	68.5
1945-46	47,950.0	48.4
1946-47	60,385.8	25.9
1947-48	113,255.7	87.6
1948-49	144,879.7 (1)	27.9

(1) Includes water sold to M.W.D. member agencies only.

TABLE 16
WATER CONSUMPTION—METROPOLITAN WATER DISTRICT CONSTITUENT AREAS

Constituent Area	Total Water Consumption			Source of Water Consumed—1948-1949			
	1947-48 amount ac. ft.	1948-49 amount ac. ft.	Per cent increase or decrease	Local		M.W.D. Amount ac. ft.	
				Amount ac. ft.	Per cent of total		
Anaheim	2,853	2,713	4.9	138	5.1	2,575	94.9
Beverly Hills	10,402	10,175	2.2	8,266	81.3	1,909	18.7
Burbank	16,100	15,780	2.0	15,190	96.3	590	3.7
Coastal Municipal Water District ..	4,645	6,950	49.6	4,209	60.6	2,741	39.4
Compton	4,742	4,234	10.7	3,873	91.5	361	8.5
Fullerton	3,286	3,251	1.1	1,975	60.8	1,276	39.2
Glendale	19,933	20,086	0.8	19,703	98.1	383	1.9
Long Beach	35,118	34,270	2.4	18,439	53.8	15,831	46.2
Los Angeles	383,737	393,527	2.6	379,171	96.4	14,356	3.6
Pasadena	23,940	23,962	0.1	7,953	33.2	16,009	66.8
San Diego County Authority*	85,934	83,802	2.5	12,159	14.5	71,643	85.5
San Marino	3,339	3,673	10.0	3,673	100.0	—	—
Santa Ana	6,580	6,666	1.3	1,019	15.3	5,647	84.7
Santa Monica	10,752	10,402	3.3	239	2.3	10,163	97.7
Torrance	3,462	3,234	6.6	1,845	57.1	1,389	42.9
West Basin Municipal Water Dist.	0	36,410	+100.0	36,405	100.0	5	—
Totals	614,823	659,135	+ 7.2	514,257	78.0	144,878	22.0

NOTE: Quantities include total water diverted into agencies' transmission and distribution systems from sources of supply.
* Water use reported by San Diego County Water Authority local 47,762 acre-feet, Metropolitan Water District 36,040 acre-feet—total 83,802 acre-feet. The difference between District sales and Authority use of Colorado River water represents water in storage or loss by evaporation.

Quality of Water

Most of the District water, except that delivered to the San Diego Aqueduct at the west portal of San Jacinto Tunnel, is treated and softened at the District's plant at La Verne. Construction work is now in progress which will increase the capacity of the plant from 100 c.f.s. to 200 c.f.s. in the near future. Chemical analyses of water entering and leaving the plant are regularly made. The results of the analyses are shown by Table 17.

TABLE 17

ANALYSIS OF COLORADO RIVER WATER—
AVERAGE FOR YEAR ENDING JUNE 30, 1949

(By The Metropolitan Water District of Southern California
at La Verne Treatment Plant)

Constituent	Symbol	Colorado River Water	
		Natural	Softened
Silica	SiO ₂	8.5 p.p.m.	12.2 p.p.m.
Iron	Fe	Trace	Trace
Calcium	Ca	84 "	32 "
Magnesium	Mg	80 "	13 "
Sodium and Potassium	Na & K	107 "	203 "
Carbonate	CO ₃	2 "	13 "
Bicarbonate	HCO ₃	140 "	109 "
Sulfate	SO ₄	314 "	316 "
Chloride	Cl	85 "	95 "
Nitrate	NO ₃	0.2 "	0.2 "
Boron	B	0.1 "	0.1 "
Fluoride	F	0.5 "	0.5 "
Total dissolved solids		701 "	740 "
Hardness as CaCO ₃			
Total		334 "	133 "
Carbonate		119 "	111 "
Noncarbonate		215 "	22 "
Free carbon dioxide	CO ₂	1 "	0 "
Hydrogen ion concentration	pH	8.3	8.8
Electrical conductivity	ECX10 ⁶	1100	1180

SECTION V

LEGAL

The work of the Authority's General Counsel is closely associated with that of the other departments of the organization. All resolutions and ordinances considered by the Board of Directors are prepared by him and nearly all contracts and many memorandums and reports are drafted by him or in consultation with him. During the preceding fiscal year, in addition to the regular consultations with the Staff and the work with the Board of Directors, the General Counsel completed the proceedings for the annexation of the San Dieguito and the Santa Fe Irrigation Districts and the Crest Public Utility District territory of the La Mesa, Lemon Grove and Spring Valley Irrigation District. Throughout the year a number of other areas within San Diego County inquired regarding annexation procedure and the possibilities of their inclusion within the Water Authority and the Metropolitan Water District. Some of these inquiries will no doubt result in formal application for annexation and others will result in at least the formation of public districts of the type legally qualified to become members of the Authority. In either instance the Authority's General Counsel will supervise the procedure in connection with such application or the formation of districts in order that any application received by the Authority will be properly processed from the standpoint of the legal requirements.

No litigation was pending or instituted during the fiscal year, nor was any in contemplation.

The Authority's Board of Directors, having established a financial program under which bond service charges and United States Contract payments would be accumulated in reserve funds against the years of heavy repayment in order that a fluctuating tax rate might be eliminated, found that it would be desirable to invest the accumulating reserves in income-paying securities. There being no provision in the Authority's enabling act for the investment of surplus funds, Counsel was instructed to prepare an amendment to the act for that purpose and to have it introduced in the legislature. The act was prepared and was introduced by Assemblywoman Niehouse. Through her good offices the Authority's bill was adopted without opposition and was signed by the Governor. It is believed that with this implementation reasonably substantial earnings can be accomplished.

Boundary problems continued to be a matter of concern to the Authority's Counsel and to the Counsel for the Metropolitan Water District. As detailed studies of the boundaries of the Authority's various member agencies continued, it was discovered that there were errors in the generally accepted boundaries of a number of the member agencies which had existed over a considerable period of time. The correction of these errors required the repeated filing of amended boundary descriptions, changing the description of the boundaries of not only the member agencies but of the Water Authority and the Metropolitan Water District in San Diego County. Another serious problem resulted from a number of overlaps in the boundaries between The City of San Diego and the La Mesa, Lemon Grove and Spring Valley Irrigation District. Because of this situation several parcels of taxable property lie within the boundaries of both agencies. As The City of San Diego has paid in cash the amount of its annual assessments to the Metropolitan Water District while the Irrigation District has permitted its annual assessments to be levied upon the property within its boundaries, it becomes essential that there be a definite method of determining in which agency a particular parcel of taxable property is located for tax purposes when it lies physically within the boundaries of both agencies. No remedy short of an amendment to the Water Authority Act appears feasible and the General Counsel is working with the Counsel for The Metropolitan Water District of Southern California on the preparation of corrective legislation for this purpose.

As no material change in the Water Authority Act has occurred since the publication of the Second Annual Report, a copy of the Act is omitted from this report.

SECTION VI

FINANCIAL

The financial program of the Authority has been planned to meet the requirements of three major phases of the Authority's development: Organization, Construction, and Operation. Details of the first two phases were contained in the First and Second Annual Reports issued by the Authority.

Upon completion of the initial construction program the Authority entered the third, or Operation, phase and, in order to meet the requirements of maintenance and operation, retirement of long-term obligations, and miscellaneous construction work, a financial structure has been developed which will provide a sound financial program at minimum cost to the taxpayer. As authorized by the Board of Directors, the steps toward this end are described below.

Improvement Fund

The Improvement Fund was established to account for the proceeds from the sale of two million dollars in bonds issued in accordance with the provisions of an election held November 5, 1946. Upon completion of construction of the aqueduct extension and a branch line authorized by that election, the "Improvement Fund of 1947" was closed out and the balance of \$167,163.14 was transferred to a "Bonds Interest and Sinking Fund," which can be disbursed only for the payment of interest and principal on bonds.

General Reserve Fund

The Authority has two primary sources of revenue from which to acquire the funds necessary to finance its operations, the maintenance of facilities, the purchase of water for resale to member agencies, the repayment of the cost of construction of the aqueduct, and the servicing and retirement of bonds issued to finance the construction of branch lines. These sources of revenue are the collections from its member agencies for sales of water purchased from the Metropolitan Water District and the collections of its annual tax levies.

In the development of the financial program, it became apparent that funds were needed for payment of current and continuing items of expense prior to receipt of collection from tax levies, and also that some funds should be immediately available in case of emergency for

repairs in excess of usual operation and maintenance, in order to prevent serious and prolonged interruption of the delivery of water to member agencies.

To remedy the situation, the Board of Directors established the General Reserve Fund as a permanent revolving fund for the purposes of keeping the Authority on a cash basis and accumulating funds for making immediate repairs to the aqueduct system in the event of damage or partial destruction from unpredictable causes. The fund is maintained in an amount not to exceed \$150,000.00.

Taxes

The tax rate of 14 cents per \$100 assessed valuation was continued for the fiscal year 1948-49 with the hope of effecting a reduction in the rate adopted for the fiscal year 1949-50. (1) During the year studies were made of the Authority's present financial condition and possible future requirements. Studies were also made of all estimated revenues, including revenues from water sales, interest on surplus money invested, and proceeds of tax levies.

On the basis of these studies, the Board of Directors adopted a policy of funding the Authority's long-term obligations. Under this policy it is believed that unless an unexpected emergency arises, uniform or decreasing tax rates can be maintained, and periods of peak requirements for debt service can be met without the necessity of correspondingly sharp increases in tax levies, and that tax requirements can be held to a minimum by practicing economy in all operations and from the investment of sinking fund balances.

Adoption on May 12, 1949 of the long-range program followed a report from the Budget and Finance Committee, which estimated that taking into account the fund balances at June 30, 1949, and with all estimated revenues accounted for, the Authority can in all probability meet its fixed obligations and other costs over the next twenty years, with the exception of the possible construction of the second barrel, on the following basis:

1. **BONDS INTEREST AND SINKING FUND.** An annual maximum levy of 3 cents, together with the balance remaining in the fund on June 30, 1949, decreased by any increase in assessed valuation, will amortize all bond service charges, both principal and interest, including the

(1) The 1949-50 tax rate was set at 10 cents, a decrease of 4 cents under that of 1948-49.

years of heaviest bond payment (1961-62) when the bond service charges will equal \$174,500, which would otherwise require a levy of approximately 6 cents that particular year.

2. **U. S. CONTRACT FUND.** An annual maximum levy of 7 cents, together with the balance remaining in that fund on June 30, 1949, will amortize the U. S. Contract Fund, the levy to be decreased in the event of any substantial increase in assessed valuations.

3. **OPERATION AND MAINTENANCE.** A charge for water sold after July 1, 1949, of \$2.00 per acre-foot above the price paid to the Metropolitan Water District may be expected to substantially finance the cost of operating and maintaining the Authority works without tax levies for that purpose, provided the moneys remaining in the General Fund on June 30, 1949, are carried over into the 1949-50 fiscal year for use in that and succeeding fiscal years. This conclusion has been reached following a study of possible weather cycles indicating a widely fluctuating sale of water with consequent fluctuations in tax rate unless the General Fund is stabilized by the carry-over of funds accumulated during dry years for use in subsequent wet years.

Adoption of the above long-range policy was made possible by a combination of several factors: (1) Construction of branch lines was accomplished for approximately \$185,000 less than original estimates; (2) Sale of water continued to exceed the estimates; (3) Repayment to the United States of the cost of the San Diego Aqueduct under provisions of Supplemental Agreement No. 3 continued at one-half the amount specified under Contract NOy-13300, pending formal completion of the aqueduct, whereas because of the possibility that, at any time, the temporary agreement may be terminated and full contract payments required, taxes have been necessarily levied to meet maximum requirements.

Investments

Because the County Water Authority Act did not clearly provide for investing surplus funds of the Authority, the Board of Directors authorized the Treasurer to enter into agreements with banks for inactive or "time" deposits in order that the funds of the Authority might be productive of earnings. Agreements were executed with The First National Bank of San Diego and the Bank of America National Trust and Savings Association under provisions of the Public Depository Act of the State of California (Statutes 1933, Chapter 189) and amendments thereto.

Recent action by the State Legislature amended the County Water Authority Act, and the Treasurer will be permitted, effective October 1, 1949, to invest surplus funds in Government and other approved securities.

Audits

All accounts have been regularly audited by the firm of Everts and Esenoff, Certified Public Accountants, whose reports have been furnished the Board of Directors, and whose letter covering their examination of financial records for the fiscal year 1948-49 follows:

EVERTS and ESENOFF
 Certified Public Accountants
 Suite 726, First National Building
 San Diego, California
 August 26, 1949

Board of Directors
 San Diego County Water Authority
 314-321 Land Title Building
 San Diego 1, California
 Gentlemen:

We have examined the financial records of the San Diego County Water Authority for the period from July 1, 1948 to June 30, 1949. Our examination was made in accordance with the generally accepted auditing standards, and included such tests of accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying combined balance sheet—all funds, and the related statement of revenues and expenditures and surplus balances present fairly the financial position of each fund of the San Diego County Water Authority at June 30, 1949 and the results of its operations for the fiscal year then ended, in conformity with generally accepted principles of fund accounting applied on a basis consistent with that of the preceding year.

Yours very truly,
 (signed) CHAS. C. PORTER
 For Everts and Esenoff
 Certified Public Accountants

Financial Statements

The following Tables 18 to 25 set forth the financial operations for the fiscal year 1948-49.

TABLE 18
 STATEMENT OF REVENUES
 Fiscal Year Ended June 30, 1949

	Estimated Total for Year	Actual Revenue for Year	Excess or Deficiency* of Estimated over Actual
GENERAL FUND			
Taxes, secured, current levy	\$ 141,700.00	\$ 141,625.85	\$ 74.15
Taxes, unsecured, current levy ..	23,500.00	23,438.19	61.81
Taxes, secured, prior years' levies	—	2,136.90	2,136.90*
Taxes, unsecured, prior years' levies	—	(cr) 97.54	97.54
Penalties and interest on delinquent taxes	—	320.71	320.71*
Miscellaneous tax on options	—	7.93	7.93*
Receipts in lieu of taxes	7,000.00	8,498.21	1,498.21*
Sale of water	840,000.00	858,551.12	18,551.12*
Excess on miscellaneous tax sales	—	.06	.06*
Rentals	1,200.00	1,315.00	115.00*
Earnings on bank deposits	—	909.77	909.77*
Miscellaneous	800.00	285.90	514.10
Total—General Fund	\$1,014,200.00	\$1,036,992.10	\$22,792.10*
BONDS INTEREST AND SINKING FUND			
Taxes, secured, current levy	\$ 56,350.00	\$ 56,330.33	\$ 19.67
Taxes, unsecured, current levy ..	9,350.00	9,375.55	25.55*
Taxes, secured prior years' levies	—	1,098.71	1,098.71*
Taxes, unsecured, prior years' levies	—	(cr) 17.85	17.85
Penalties and interest on delinquent taxes	—	131.25	131.25*
Miscellaneous tax on options	—	4.13	4.13*
Receipts in lieu of taxes	2,100.00	3,258.50	1,158.50*
Total—Bonds Interest & Sinking Fund	\$ 67,800.00	\$ 70,180.62	\$ 2,380.62*
U. S. CONTRACT FUND			
Taxes, secured, current levy	\$ 199,500.00	\$ 197,156.13	\$ 2,343.87
Taxes, unsecured, current levy ..	30,750.00	32,813.75	2,063.75*
Taxes, secured, prior years' levies	—	2,197.33	2,197.33*
Taxes, unsecured, prior years' levies	—	(cr) 35.73	35.73
Penalties and interest on delinquent taxes	—	339.93	339.93*
Miscellaneous tax on options	—	10.16	10.16*
Receipts in lieu of taxes	10,500.00	11,404.53	904.53*
Sale of discarded materials	—	2,000.00	2,000.00*
Total—U. S. Contract Fund	\$ 240,750.00	\$ 245,886.10	\$ 5,136.10*
TOTAL ALL FUNDS	\$1,322,750.00	\$1,353,058.82	\$30,308.82*

TABLE 19

COMBINED BALANCE SHEET—ALL FUNDS
June 30, 1949

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SAN DIEGO COUNTY WATER AUTHORITY

ASSETS	Total All Funds	General Fund	Bonds Interest & Sinking Fund	U. S. Contract Fund	General Reserve Fund
<i>Current Assets</i>					
Cash with Treasurer	\$ 805,620.72	\$ 232,717.04	\$ 220,140.05	\$ 202,763.63	\$150,000.00
Special deposits	20,545.00	100.00	20,545.00		
Petty cash	100.00	74,731.29	840.07		
Accounts receivable	75,571.36				
Total Current Assets	\$ 901,837.08	\$ 307,548.33	\$ 241,525.12	\$ 202,763.63	\$150,000.00
<i>Other Assets</i>					
Taxes receivable—delinquent	\$ 17,685.37	\$ 6,470.64	\$ 2,663.67	\$ 8,551.06	\$
Annexation charges receivable— not due	26,135.00	26,135.00			
Due from Metropolitan Water District (share of aqueduct cost)	7,312,500.00			7,312,500.00	
Future tax requirements for retirement of bonds and U.S. Government contract at maturity	8,888,756.25		1,779,019.88	7,109,736.37	
Total Other Assets	\$16,245,076.62	\$ 32,605.64	\$1,781,683.55	\$14,430,787.43	\$ 0
<i>Rights, Plant and Equipment</i>					
Cost of participation rights in Metropolitan Water District	\$15,498,929.66		\$	\$	\$
San Diego Aqueduct—estimated cost	15,000,000.00				
La Mesa-Sweetwater Extension	1,436,707.70				
Fallbrook-Oceanside Branch	814,203.14				
Escondido Headquarters	23,538.59				
Furniture and Fixtures	4,272.69				
Office Equipment	5,312.67				
Engineering Equipment	730.00				
Automotive Equipment	22,659.61				
Miscellaneous Equipment	1,929.32				
Total Rights, Plant & Equipment	\$32,808,283.58	\$32,808,283.58	\$ 0	\$ 0	\$ 0
Construction work in progress	\$ 57,873.92	\$ 37,828.04	\$ 0	\$ 20,045.88	\$ 0
Total Assets	\$50,013,071.20	\$33,186,265.59	\$2,023,208.67	\$14,625,596.94	\$150,000.00

FINANCIAL

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LIABILITIES	Total All Funds	General Fund	Bonds Interest & Sinking Fund	U. S. Contract Fund	General Reserve Fund
<i>Current Liabilities</i>					
Accounts payable	\$ 189.85	\$ 189.85	\$	\$	\$
Contracts payable	116.44	116.44			
Bond interest coupons payable	20,545.00		20,545.00		
Total Current Liabilities	\$ 20,851.29	\$ 306.29	\$ 20,545.00	\$ 0	\$ 0
<i>Reserves</i>					
For petty cash	\$ 100.00	\$ 100.00	\$	\$	\$
For delinquent taxes receivable	17,685.37	6,470.64	2,663.67	8,551.06	
For work in progress	57,873.92	37,828.04		20,045.88	
For annexation charges—not due	26,135.00	26,135.00			
For depreciation	4,093.64	4,093.64			
Total Reserves	\$ 105,887.93	\$ 74,627.32	\$ 2,663.67	\$ 28,596.94	\$ 0
<i>Continuing Appropriations</i>	\$ 61,725.49	\$ 61,725.49	\$ 0	\$ 0	\$ 0
<i>Long Term Obligations</i>					
Bonds outstanding—not due	\$ 2,000,000.00	\$	\$2,000,000.00	\$	\$
Contractual obligation—U.S. Gov't	14,625,000.00			14,625,000.00	
Annexation charges due Metropolitan Water District	12,498,962.58	12,498,962.58			
Total Long Term Obligations	\$29,123,962.58	\$12,498,962.58	\$2,000,000.00	\$14,625,000.00	\$ 0
<i>Investment in Fixed Assets</i>					
Financed by bond issue	\$ 1,848,335.19	\$ 1,848,335.19	\$	\$	\$
Financed by U.S. Gov't contract	15,000,000.00	15,000,000.00			
Financed by agencies' payments to M.W.D.	2,999,967.08	2,999,967.08			
Financed by Authority revenues	451,663.85	451,663.85			
Financed by agencies' contributions for special construction	5,261.24	5,261.24			
Total Investment in Fixed Assets	\$20,305,227.36	\$20,305,227.36	\$ 0	\$ 0	\$ 0
Unappropriated Surplus	\$ 395,416.55	\$ 245,416.55	\$ 0	\$ 0	\$150,000.00
Total Liabilities	\$50,013,071.20	\$33,186,265.59	\$2,023,208.67	\$14,625,596.94	\$150,000.00

NOTE: At June 30, 1949, the Bonds Interest and Sinking Fund and the U. S. Contract Fund had surplus balances of \$220,980.12 and \$202,763.63 respectively. In accordance with action May 12, 1949, by the Board of Directors, in funding the obligations of those funds, the balances have been applied to reduce future tax requirements.

TABLE 20
STATEMENT OF APPROPRIATIONS AND EXPENDITURES
July 1, 1948 to June 30, 1949

	Prior Year Appropriations Carried Over	Appropriations 1948-49	Expenditures 1948-49	Cancelled Appropriations 1948-49	Unexpended Appropriations June 30, 1949
Plant and Equipment	\$ 9,094.62	\$	\$ 3,221.45 (cr)	\$ 12,316.07	\$ 1,360.26
San Diego Aqueduct	3,028.65		1,668.39		
La Mesa-Sweetwater Extension	30,662.40		192.35	30,470.05	
Fallbrook-Oceanside Branch	22,404.73		227.60	22,177.13	
Construction of Maintenance Headquarters, Escondido	9,751.77	2,500.00	11,855.79		395.98
Maintenance and Operation of San Diego Office		84,662.00	65,673.13	18,988.87	
Maintenance and Operation of Escondido Field Office		43,380.00	28,318.63	15,061.37	
Purchase of Water from Metropolitan Water District		589,600.00	573,100.80	16,499.20	
Construction of Additional Outlets, Lake Hodges		21,000.00	4,355.40		16,644.60
Construction of access roads		15,000.00	4,871.11		10,128.89
Construction of Additional Outlets on Fallbrook-Oceanside Branch		6,620.00	2,865.89		3,754.11
Preliminary Investigation (2nd barrel) Completion of San Diego Aqueduct		31,500.00	5,058.35		26,441.65
Lakeside Irrigation District Service Line.....		3,000.00			3,000.00
Protection of Water Rights		7,289.60	5,324.80	1,964.80	
	\$74,942.17	\$804,551.60	\$700,290.79	\$117,477.49	\$61,725.49

TABLE 21
SUMMARY STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
Fiscal Year Ended June 30, 1949

	Cash Balance July 1, 1948	Cash Receipts	Inter-Fund Transfers		Cash Disbursements	Cash Balance June 30, 1949
			In	Out		
General Fund	\$108,978.70	\$1,230,526.31	\$	\$339,756.32	\$ 767,031.65	\$232,717.04
Improvement Fund	203,889.49			167,163.14	36,726.35	
Bonds Interest & Sinking Fund ..	44,379.11	27,471.58	209,534.36		61,245.00	220,140.05
U. S. Contract Fund	83,059.31	222,319.22	147,385.10		250,000.00	202,763.63
General Reserve Fund			150,000.00			150,000.00
Total All Funds	\$440,306.61	\$1,480,317.11	\$506,919.46	\$506,919.46	\$1,115,003.00	\$805,620.72

TREASURY CASH ON DEPOSIT JUNE 30, 1949

First National Trust and Savings Bank	\$723,489.32
Bank of America National Trust and Savings Association	175,902.85
Total bank balances	\$899,392.17
Deposit in transit	124.66
	\$899,516.83
Less: Outstanding warrants	\$73,351.11
Special deposit for payment of interest coupons	20,545.00
Treasury Cash June 30, 1949	\$805,620.72

TABLE 22
STATEMENT OF TAX ASSESSMENTS AND COLLECTIONS
as of June 30, 1949

Member Agency	Tax assessments to date	Adjustments	Tax assessments	Tax collections	Interest and penalties	Tax on options	Receipts in lieu of taxes	Excess on misc. tax sales	Less refunds	Net total collections	Uncollected 6-30-49
Chula Vista	\$ 35,123.23	\$ 17.32	\$ 33,843.44	\$ 68.51	\$.34	\$ 1,928.17	\$ —	\$ 25.89	\$ 35,814.57	\$ 1,287.32	
Fallbrook Public Utility District	7,243.46	5.20	6,944.34	18.45	.24	242.64	—	3.37	7,202.30	304.32	
Lakeside Irr. District	1,632.81	22.29	1,297.20	6.45	.05	—	—	2.16	1,601.54	77.90	
La Mesa, Lemon Grove & Spring Valley I.D.	78,082.19	42.17	75,880.30	201.01	36.39	—	—	37.11	76,080.59	2,239.57	
National City	29,583.91	24.72	28,698.05	52.42	4.74	2,143.41	—	29.80	30,868.82	899.66	
Oceanside	24,337.36	15.49	23,735.62	41.01	5.11	1,269.92	—	47.78	25,003.88	608.78	
San Diego	887,190.14	562.58	875,279.58	1,148.22	16.49	51,840.91	.06	1,070.34	927,214.92	12,265.49	
Total member agencies	\$1,063,213.10	\$689.77	\$1,045,978.53	\$1,536.07	\$63.36	\$57,425.05	\$.06	\$1,216.45	\$1,103,786.62	\$17,683.04	
*Withdrawn agencies..	4,129.14	20.56	4,147.37	7.83	.15	186.64	—	—	4,341.99	2.33	
	\$1,067,342.24	\$710.33	\$1,050,125.90	\$1,543.90	\$63.51	\$57,611.69	\$.06	\$1,216.45	\$1,108,128.61	\$17,685.37	

* Coronado 5/10/46.
Ramona Irrigation District 8/21/46.

COLLECTION EXPENSE—COUNTY OF SAN DIEGO

Fiscal year 1945-46	\$ 439.40
1946-47	471.12
1947-48	1,147.44
1948-49	1,350.04

TABLE 23
STATUS OF TAX COLLECTIONS

Fiscal year	Tax assessments including adjustments	Taxes collected during fiscal year	Taxes uncollected at end of fiscal year	Per cent uncollected	Subsequent cancellations and additions by County Auditor	Subsequent uncollected June 30, 1949
1945-46	\$ 96,131.33	\$ 94,656.51	\$ 1,474.82	1.53	—	\$ 1,460.11
1946-47	107,808.89	105,753.78	2,055.11	1.90	—	1,854.18
1947-48	389,591.57	381,563.14	8,028.43	2.06	—	5,575.09
1948-49	474,520.78	459,504.39	15,016.39	3.16	—	—
						\$ 14.71
						200.93
						2,453.34
						15,016.39

TABLE 24
AUTHORITY ASSESSED VALUATIONS AND TAX RATES

Fiscal year	Secured Real Personal	Public Utilities	Unsecured Personal	Total	Tax Rate per \$100 Secured	Unsecured
1945-46	\$212,082,975.00	\$28,233,700.00	\$29,960,130.00	\$270,296,805.00	\$0.04	\$0.00
1946-47	208,715,150.00 (1)	29,433,450.00	30,665,910.00	268,814,510.00	0.04	0.04
1947-48	233,579,990.00	32,740,680.00	40,977,850.00	307,298,520.00 (2)	0.14	0.04
1948-49	254,227,570.00	37,482,020.00	47,177,300.00	338,886,890.00	0.14	0.14
1949-50	290,351,875.00	42,429,140.00	45,743,200.00	378,524,215.00	0.10	0.14

Debt limit 15 per cent of last equalized assessed valuation of Authority.

Basis of assessment approximately 50 per cent.

- (1) City of Coronado and Ramona Irrigation District secured assessed valuation not included in this or subsequent tax levies by the Authority, they having withdrawn from the Authority prior to 1946-47.
- (2) City of Coronado and Ramona Irrigation District not included in this or subsequent total valuation.

TABLE 25

SCHEDULE OF BONDED DEBT AND ANNUAL REQUIREMENTS

Fiscal Year	Interest Payable (1)	Bond Principal Payable (2)	Total Cash Required
1946-47	\$ 20,375.00	\$ —	\$ 20,375.00
1947-48	40,750.00	—	40,750.00
1948-49	40,750.00	—	40,750.00
1949-50	40,750.00	—	40,750.00
1950-51	40,750.00	—	40,750.00
1951-52	40,750.00	—	40,750.00
1952-53	40,125.00	50,000.00	90,125.00
1953-54	38,875.00	50,000.00	88,875.00
1954-55	37,625.00	50,000.00	87,625.00
1955-56	36,500.00	50,000.00	86,500.00
1956-57	35,000.00	100,000.00	135,000.00
1957-58	33,000.00	100,000.00	133,000.00
1958-59	31,000.00	100,000.00	131,000.00
1959-60	29,000.00	100,000.00	129,000.00
1960-61	27,000.00	100,000.00	127,000.00
1961-62	24,500.00	150,000.00	174,500.00
1962-63	21,500.00	150,000.00	171,500.00
1963-64	18,500.00	150,000.00	168,500.00
1964-65	15,500.00	150,000.00	165,500.00
1965-66	12,500.00	150,000.00	162,500.00
1966-67	9,500.00	150,000.00	159,500.00
1967-68	7,000.00	100,000.00	107,000.00
1968-69	5,000.00	100,000.00	105,000.00
1969-70	3,000.00	100,000.00	103,000.00
1970-71	1,000.00	100,000.00	101,000.00
	\$650,250.00	\$2,000,000.00	\$2,650,250.00

(1) Interest rate on bonds maturing in 1953 to 1955 inclusive is $2\frac{1}{2}\%$; 1956-1971 inclusive, 2% ; payable January 1 and July 1.

(2) Maturity day, January 1.