

SAN DIEGO COUNTY
WATER AUTHORITY



SIXTH ANNUAL REPORT

1952

SAN DIEGO COUNTY WATER AUTHORITY

SIXTH ANNUAL REPORT

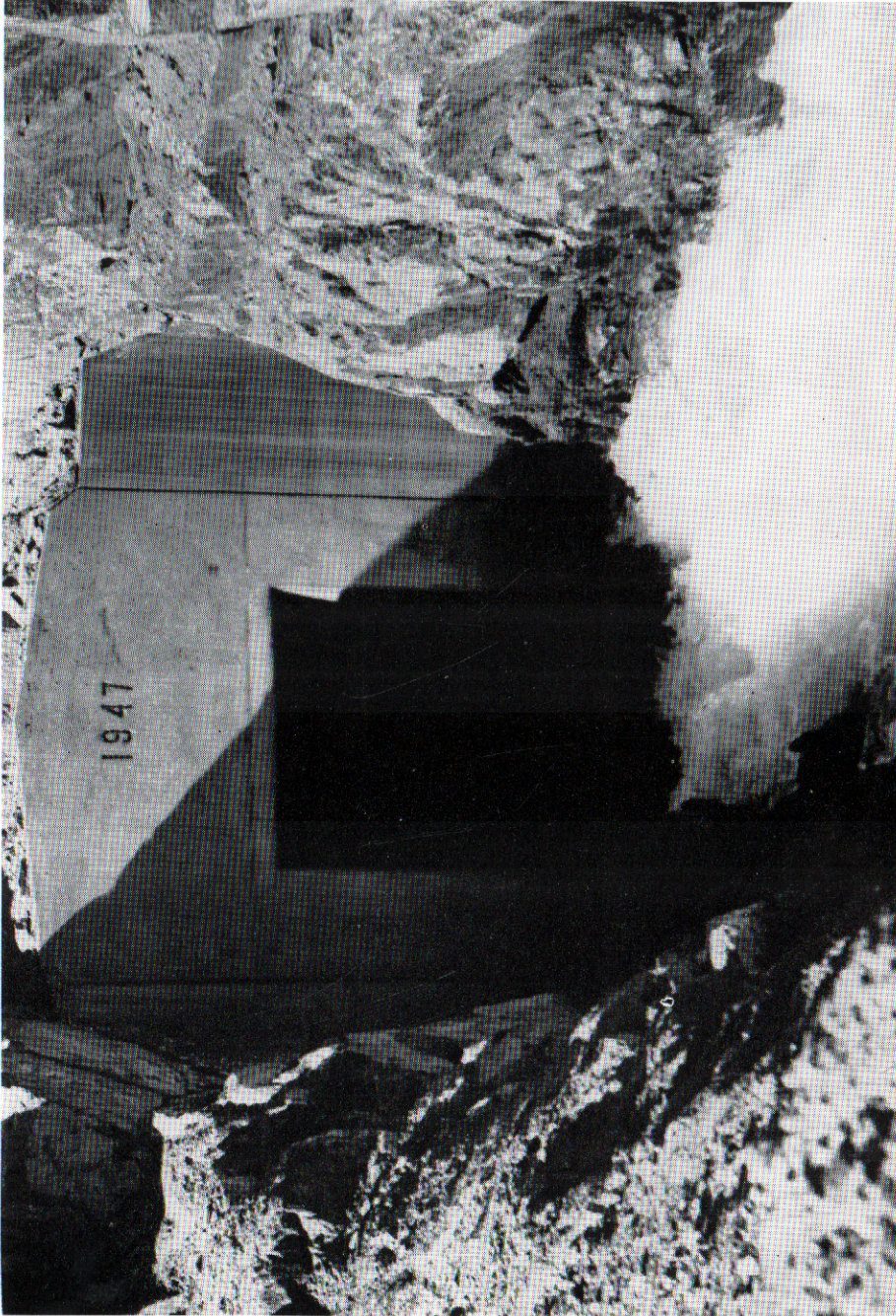
For Period

July 1, 1951 to June 30, 1952

J. L. BURKHOLDER
GENERAL MANAGER AND CHIEF ENGINEER

SAN DIEGO, CALIFORNIA

1952



San Diego Aqueduct Discharge of 95 c.f.s. from outlet portal of San Vicente Tunnel.

LETTER OF TRANSMITTAL

San Diego, California
December 10, 1952

BOARD OF DIRECTORS
SAN DIEGO COUNTY WATER AUTHORITY

Gentlemen:

Transmitted herewith is the Sixth Annual Report of the San Diego County Water Authority for the fiscal year ending June 30, 1952.

The report covers the operation and maintenance of the Authority for the fifth year of delivery of Colorado River water to its member agencies, and the construction of additional facilities on the distribution system. Also included is a brief account of current activities of The Metropolitan Water District of Southern California, of which the Authority is a member.

Very truly yours,

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

ROSTER

DIRECTORS

July 1, 1951, to June 30, 1952

Chula Vista.....	Arthur L. Lynds
Escondido.....	Carl M. Reed
Fallbrook Public Utility District.....	Otis P. Heald
Lakeside Irrigation District.....	(to 2/23/52) Allen G. Mitchell Jack E. McLean
La Mesa, Lemon Grove and Spring Valley Irrigation District.....	Mercel J. Shelton
National City.....	Delavan J. Dickson
Oceanside.....	Harold N. Beck
San Diego.....	J. William Fisher Fred A. Heilbron Arthur H. Marston Fred W. Simpson Raymond M. Wansley Bruce Watt
San Dieguito Irrigation District.....	Frank S. Jacobson
Santa Fe Irrigation District.....	D. Maitland Bakewell

OFFICERS OF THE BOARD

Chairman.....	Fred A. Heilbron
Vice-Chairman.....	Arthur L. Lynds
Secretary.....	Delavan J. Dickson
Executive Secretary.....	Dorothy D. Miller

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
Treasurer.....	Harry L. Hall
Superintendent, Maintenance and Operation.....	A. B. Gale

BOARD OF DIRECTORS

June 30, 1952



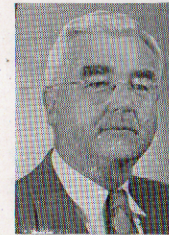
Vice Chairman
Arthur L. Lynds
Chula Vista



Chairman
Fred A. Heilbron
San Diego



Secretary
Delavan J. Dickson
National City



D. Maitland Bakewell
Santa Fe
Irrigation District



Harold N. Beck
Oceanside



J. William Fisher
San Diego



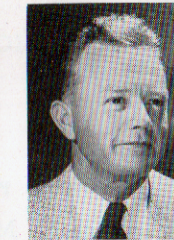
Otis P. Heald
Fallbrook Public
Utility District



Frank S. Jacobson
San Dieguito
Irrigation District



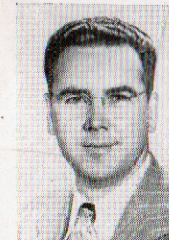
Arthur H. Marston
San Diego



Jack E. McLean
Lakeside Irrigation
District



Carl M. Reed
Escondido



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



Fred W. Simpson
San Diego



Raymond M. Wansley
San Diego



Bruce Watt
San Diego

COMMITTEES OF THE BOARD

June 30, 1952

ENGINEERING AND OPERATIONS

Mercel J. Shelton, Chairman
 J. William Fisher
 Frank S. Jacobson
 Arthur H. Marston
 Carl M. Reed

FINANCE AND INSURANCE

Harold N. Beck, Chairman
 Delavan J. Dickson
 Arthur L. Lynds
 Allen G. Mitchell
 Raymond M. Wansley
 Carl M. Reed

LEGAL AND CLAIMS

Allen G. Mitchell, Chairman
 D. Maitland Bakewell
 Delavan J. Dickson
 Otis P. Heald
 Raymond M. Wansley
 Bruce Watt

**ORGANIZATIONS, PERSONNEL
 AND PUBLIC RELATIONS**

Fred W. Simpson, Chairman
 D. Maitland Bakewell
 Harold N. Beck
 Frank S. Jacobson
 Bruce Watt

WATER PROBLEMS

Arthur H. Marston, Chairman
 J. William Fisher
 Fred A. Heilbron
 Otis P. Heald
 Arthur L. Lynds
 Mercel J. Shelton
 Fred W. Simpson

ROLL OF DIRECTORS

Since formation of Authority

CHULA VISTA

Arthur L. Lynds.....July 15, 1944 to Present

ESCONDIDO

Carl M. Reed.....Oct. 18, 1950 to Present

FALLBROOK PUBLIC UTILITY DISTRICT

Emil J. Schmitz.....July 15, 1944 to July 11, 1949

Franz R. Sachse.....July 11, 1949 to Nov. 17, 1950

Otis P. Heald.....Dec. 8, 1950 to Present

LAKESIDE IRRIGATION DISTRICT

Allen G. Mitchell.....July 15, 1944 to Feb. 23, 1952

Jack E. McLean.....April 1, 1952 to Present

LA MESA, LEMON GROVE AND SPRING VALLEY

IRRIGATION DISTRICT

William H. Jennings.....July 15, 1944 to February 13, 1948

Mercel J. Shelton.....February 13, 1948 to Present

NATIONAL CITY

George V. Johnson.....July 15, 1944 to July 15, 1947

Delavan J. Dickson.....August 5, 1947 to Present

OCEANSIDE

Harold N. Beck.....July 15, 1944 to Present

SAN DIEGO

Gerald E. Arnold.....July 27, 1948 to Aug. 17, 1950

J. William Fisher.....March 7, 1950 to Present

Fred A. Heilbron.....July 15, 1944 to Present

Arthur H. Marston.....July 15, 1944 to Present

Fred W. Simpson.....July 15, 1944 to Present

Raymond M. Wansley.....March 7, 1950 to Present

Walter B. Whitcomb.....July 15, 1944 to April 19, 1951

Bruce Watt.....August 14, 1950 to Present

SAN DIEGUITO IRRIGATION DISTRICT

Frank S. Jacobson.....December 22, 1948 to Present

SANTA FE IRRIGATION DISTRICT

D. Maitland Bakewell.....December 13, 1948 to Present

Directors From Agencies Which Have Withdrawn From the Authority

CORONADO

(Withdraw from Authority May 10, 1946)

George F. Neal.....July 15, 1944 to May 10, 1946

RAMONA IRRIGATION DISTRICT

(withdrew from Authority August 21, 1946)

Albert C. Bisher.....July 15, 1944 to August 21, 1946

SAN DIEGO COUNTY WATER AUTHORITY

MEMBER AGENCIES AS OF JUNE 30, 1952

<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
City of Escondido.....	Oct. 9, 1950

<i>Agencies which have withdrawn their corporate area from the Authority</i>	<i>Period of Membership</i>
City of Coronado.....	June 9, 1944 to May 10, 1946
Ramona Irrigation District.....	June 9, 1944 to Aug. 21, 1946

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Authority Buildings and Mobile Equipment at Escondido Headquarters.

FOREWORD

TWO IMPORTANT events occurred during the fiscal year ending June 30, 1952, which are of the greatest importance to the people of San Diego County. The prevailing drought was broken by an above-average rainfall. Stream runoff was not sufficient to fill all storage reservoirs in the County. However, it did provide an ample backlog of stored water and relieved the danger of exhausting reservoir supplies prior to completion of the Aqueduct.

In March, 1952, the Authority entered into an agreement with the United States Government, through the Navy Department, which provided that the Navy proceed immediately to complete the San Diego Aqueduct by construction of the Second Barrel.

Economic Growth of San Diego County

The many activities on which prosperity of the San Diego area depend continued to expand during the year. The 1952 Annual Business Survey, published by San Diego Chamber of Commerce, reported increased employment of civilian and military personnel on Naval installations from 59,000 in 1950 to approximately 80,000 with a total payroll of \$178,451,667 in 1951.

Aircraft and other industrial plants in the County employed an estimated 47,800 persons (21,100 more than in 1950) with an annual payroll of around \$170,000,000. In June, 1952 the number of employed persons in San Diego County, not including the military, was estimated at 210,600, a 12 per cent increase over the 187,000 employed in June, 1951.

Throughout the Authority area, building construction continued at a slightly higher rate than in the previous year. Within the City of San Diego building permits totaled \$36,880,918 for the first six months of 1952, an increase of 19.2 per cent over a similar period in 1951. Building expansion in the City of San Diego alone required the installation of 4,288 new water meters.

Growth in Population

The population of San Diego County as of April, 1952 was estimated at 688,000, an increase of about 120,000 in the two years since the last U. S. Census figure was compiled in 1950. A special Federal Census, taken in 1952, showed the City of San Diego to have a population of 434,924, an increase of 100,537 or a growth of 30.1 per cent

in the two-year period. Part of this growth was the result of an increase in military activity. The Census showed a military population of 16,743 in 1950 and 82,671 in 1952, an increase of 393.8 per cent.

The population of the County as tabulated by the U. S. Census Bureau since 1910 and the estimated population residing within the Authority area are shown in Table 1. Of the estimated 688,000 persons living in San Diego County in 1952, 85 per cent reside within the boundaries of the agencies comprising the Authority.

The population of the individual member agencies of the Authority, based on the 1950 U. S. Census Bureau tabulation and the 1952 population as estimated by the agencies, is shown in Table 2.

The City of El Cajon, included within the La Mesa, Lemon Grove and Spring Valley Irrigation District, shows the largest percentage population increase during the year, equal to approximately 27 per cent; whereas, the annual increase in population within the entire Authority equals 15 per cent. The density of population within the several member agencies, as shown in Table 2, varies from a maximum

TABLE 1
POPULATION—COUNTY AND AUTHORITY AREAS—1910 to 1952
(Includes Resident Military Personnel)

Year (as of April 1)	COUNTY		AUTHORITY		Per cent of County population in Authority
	Total population (1)	Average annual growth	Total population (2)	Average annual growth	
1910	61,665		46,000		74
1920	112,248	5,058	87,000	4,100	78
1930	209,659	9,741	173,000	8,600	82
1940	289,348	7,969	248,274	7,600	86
1946 (3)	502,804	26,746	(3) 440,659	20,361	88
1950	556,808				
1952	688,000	65,596	585,904	67,009	85

- (1) County population from U.S. Census Bureau Reports.
- (2) Authority population based on U.S. Census Bureau Reports. Population in years prior to Authority organization in 1944 are for Authority area as of 1944. Population in later years is for Authority as then constituted.
- (3) Based on Special Census, U.S. Census Bureau, exclusive of emergency Military personnel due to World War II.

TABLE 2
POPULATION—AUTHORITY CONSTITUENT AREAS AND COUNTY
(Includes Resident Military Personnel)

Constituent Areas	Area 6/30/52	Population—U.S. Census			Annual Increase 1950-52 Per cent	Density of Population 1952 Per Acres Mile
		1940 (1)	1950 (2)	1952 Estimate (5)		
Chula Vista	3,363	5,138	15,927	21,578	18	6.42
Escondido	1,878	4,560	6,608	7,400	6	3.94
Fallbrook Public Utility District	8,192	2,300	5,500	6,500	9	.79
Lakeside Irrigation District	1,560	1,000 (4)	2,000	2,100	3	1.35
La Mesa, Lemon Grove & Spring Valley Irrigation District:						
In City of El Cajon	(1,522)	1,471	5,600	8,653	27	5.69
In City of La Mesa	(3,243)	3,925	10,946	13,405	11	4.13
In Crest Public Utility District	(386)	—	928	1,200	15	3.11
In unincorporated areas	(6) (14,644)	11,704	26,688	34,290	14	2.34
Total	(6) 18,437	17,100	44,162	57,548	15	3.12
National City	4,260	10,344	21,199	26,832	13	6.30
Oceanside	6,597	4,651	12,880	18,377	21	2.79
San Diego	71,206	203,341	334,387	434,924	15	6.11
San Diegoito Irrigation District	4,020	(4) 2,400	6,223	6,993	6	1.74
Santa Fe Irrigation District	10,106	(4) 2,000	3,000	3,652	11	.36
Total Authority Area	129,619	252,834	451,886	585,904	15	4.52
San Diego County	2,725,100	289,348	556,808	688,000	12	.25

- (1) Population in agencies other than cities was estimated from population of judicial townships.
- (2) Population in agencies other than cities was furnished by agencies.
- (3) Includes areas which are a part of the City but not of the Authority.
- (4) Estimated.
- (5) Estimated by Agencies.
- (6) Does not include 23 acres of overlapping area in City of San Diego.

density of 6.42 persons per acre in the City of Chula Vista to a minimum of 0.36 persons per acre in the Santa Fe Irrigation District. The density of population within the entire Authority is 4.52 persons per acre.

Assessed Valuation

The assessed valuation of all taxable property within San Diego County, as reported by the County Assessor, reached an all-time high in 1951-52 of \$544,045,805, an increase of \$51,937,075 or 10.6 per cent above the assessed valuation in 1950-51.

The Authority, with only 10.4 per cent of the total County lying within its boundaries, included taxable property having a total assessed valuation of \$443,977,005 or 82 per cent of the assessed valuation for the entire County.

Assessed valuation for 1950-51 and 1951-52 of each Authority member agency is shown in Table 3. In 1950-51 the largest percentage increase in assessed valuation occurred in the Fallbrook Public Utility District with an increase of \$1,051,500 or 38.9 per cent of the 1950-51 valuation.

The assessed valuation of \$500,153,410 for the fiscal year 1952-53 of all taxable property lying within the boundaries of the Authority member agencies became available in August, 1952 and is included in Table 3 for reference purposes.

Climatological Conditions

A period of drought, which began in 1945 and promised to become the worst dry spell on record, was interrupted by an above-normal rainfall of 18.16 inches during the 1951-52 climatological year. The annual rainfall in the City of San Diego for the period of 1800 to 1952 is shown in Figure 1. The rainfall has been recorded at Lindbergh Field for the period from 1851 to 1952, and was computed several years ago for the period from 1800 to 1850 by Henry B. Lynch after considerable research.

Figure 1, showing alternating dry and wet periods as determined by accumulated departure from the mean, indicates that periods of drought in the past have continued from six to eight years.

The Water Conservation Effort

Because of the continued depletion of water reserves in local reservoirs resulting from the drought then in its sixth year, a County-wide

TABLE 3
ASSESSSED VALUATIONS—AUTHORITY CONSTITUENT AREAS AND COUNTY

Agency	Area 6/30/52 Acres	Assessed Valuations Secured and Unsecured		Per Acre	Annual Increase		Assessed Valuation 1952-53
		1950-51 Total	1951-52 Total		Per Cent	Per Cent	
Chula Vista	3,363	\$ 13,454,210	\$ 16,645,050	\$ 4,949	23.7	\$ 20,764,370	
Escondido	1,878	5,679,760	6,514,900	3,469	14.7	7,347,020	
Fallbrook Public Utility District	8,192	2,699,690	3,751,190	458	38.9	4,396,690	
Lakeside Irrigation District	1,560	747,210	826,470	530	10.6	985,680	
La Mesa, Lemon Grove and Spring Valley Irrigation District	18,460	35,654,120	42,750,760	2,316	19.9	50,063,670	
National City	4,260	10,897,650	12,164,200	2,855	11.6	13,859,190	
Oceanside	6,597	9,880,430	11,111,160	1,684	12.5	12,993,400	
San Diego	(3) 71,183	311,586,940	339,517,885	4,770	9.0	378,428,820	
San Dieguito Irrigation District	(2) 4,020	5,268,820	5,872,440	1,461	11.5	6,189,200	
Santa Fe Irrigation District	10,106	4,229,330	4,822,950	477	14.0	5,125,370	
Total Authority Area	129,619	\$400,098,160	\$443,977,005	\$3,425	11.0	\$500,153,410	
San Diego County	1,250,048 (1)	\$492,108,730	\$544,045,805	\$ 435	10.6		

(1) Excluding 1,475,052 acres of tax-exempt lands in San Diego County as of October 30, 1949.

(2) Includes area excluded from Agency but not from Authority.

(3) Does not include 23 acres of overlapping area in La Mesa, Lemon Grove and Spring Valley Irrigation District.

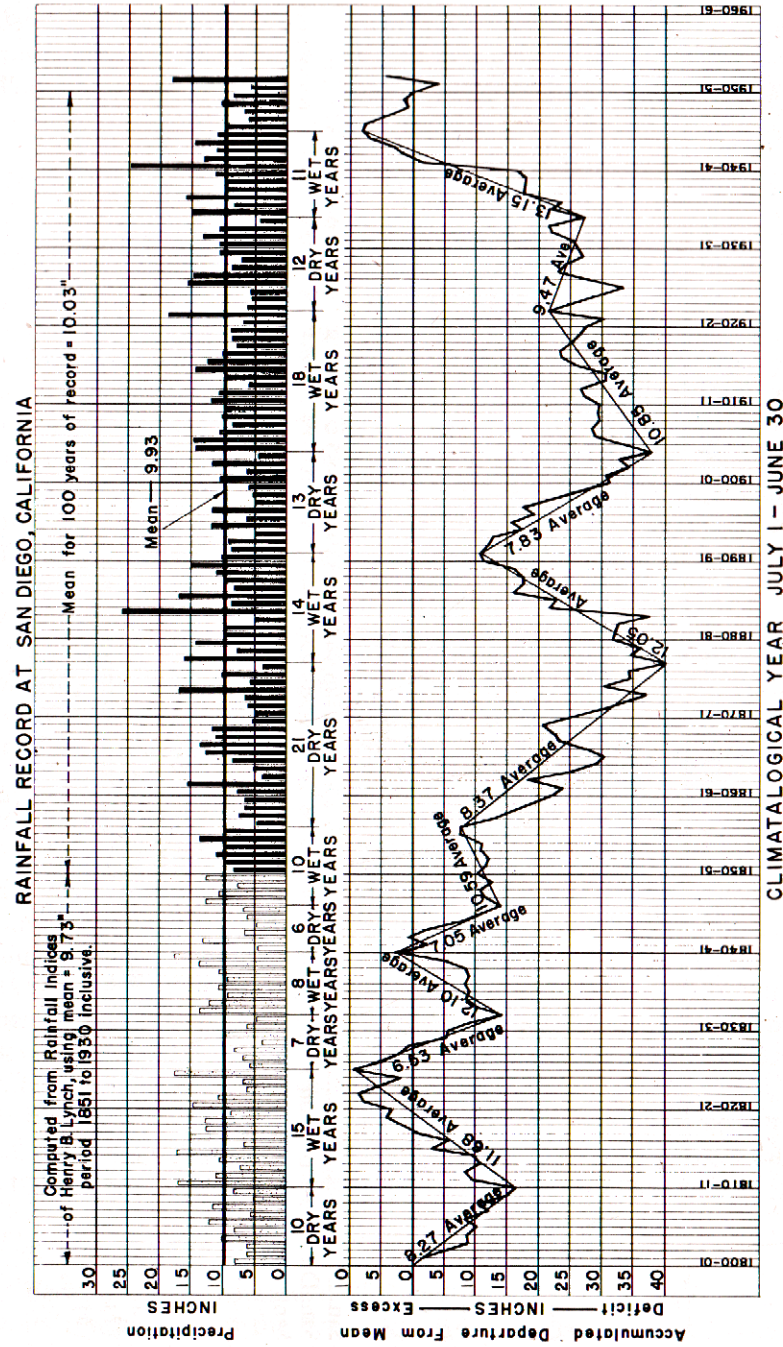


Figure 1. Rainfall Record at San Diego, California.

organization with the Authority cooperating was set up in April, 1951 and designated as "Save Our Water Committee." Through all media of publicity, this organization brought to the attention of water users in San Diego County the need for saving water and means by which savings could be made.

The objective was to hold water consumption to that of the previous year and thus prevent an anticipated 18,000 acre-foot increase in water use. This objective was practically attained. Following the winter rains, there was sufficient water available in storage to supply all anticipated needs of the agencies until the Second Barrel of the San Diego Aqueduct is completed. The need for strict conservation of water was ended and on March 31, 1952 the Committee suspended its program.

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 cooperate 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.
- 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.
- 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.
- 6- 9-44 The San Diego County Water Authority organized consisting of nine public agencies.
- 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.

- 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.
- 9-23-46 Supplemental Agreement No. 1 covering assignment of City-Navy Lease Contract NOy-13300 to San Diego County Water Authority formally executed by parties thereto.
- 10- 4-46 Contract signed by representatives of the United States of America, San Diego County Water Authority, and Metropolitan Water District providing for merger of the right of the City and/or County of San Diego to 112,000 acre feet of water in the Colorado River, with the right of the Metropolitan Water District to 1,100,000 acre feet, if annexation of Authority to Metropolitan Water District was consummated.
- 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 Au-

- thority 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.
- 1-27-47 Comptroller-General reported to the Congress questioning legality of expenditures on Aqueduct.
- 5- 1-47 Committee on Expenditures in Executive Departments rendered report to Congress recommending completion of Aqueduct.
- 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.
- 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 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.
- 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.
- 4-15-48 An Act of Congress (Public Law 482-80th Congress) was approved ratifying the actions of the executive branch of the Federal Government in proceeding with the construction of the San Diego Aqueduct.
- 4-25-49 Contract executed between the U.S. Bureau of Reclamation and the Authority relating to the investigation by the

- Bureau of the Second Barrel of the San Diego Aqueduct.
- 2-17-50 Contract executed between the City of San Diego and the Authority for the use of storage capacity by the Authority in San Vicente Reservoir.
- 8- 1-50 Fallbrook Public Utility District annexed additional area to the Authority.
- 10- 9-50 Corporate area of the City of Escondido annexed to the Authority and the Metropolitan Water District of Southern California.
- 1-19-51 Report by Bureau of Reclamation on "San Diego Project, Metropolitan Connection Enlargement" released in preliminary draft form for administrative use only.
- 4-13-51 First water delivered to City of Escondido through temporary connection.
- 10-11-51 Congress authorized construction of Second Barrel to San Diego Aqueduct by Public Law 171, 82d Congress.
- 4- 1-52 Contract NOy-13300, Supplemental Agreement No. 4, executed between the United States of America and San Diego County Water Authority for the completion of the San Diego Aqueduct by the construction of the Second Barrel.
- 11- 9-51 Contract executed between the United States and San Diego County Water Authority providing for preparation of designs and specifications by the Reclamation Bureau for construction of the Second Barrel of the San Diego Aqueduct prior to funds becoming available under Act of Congress.

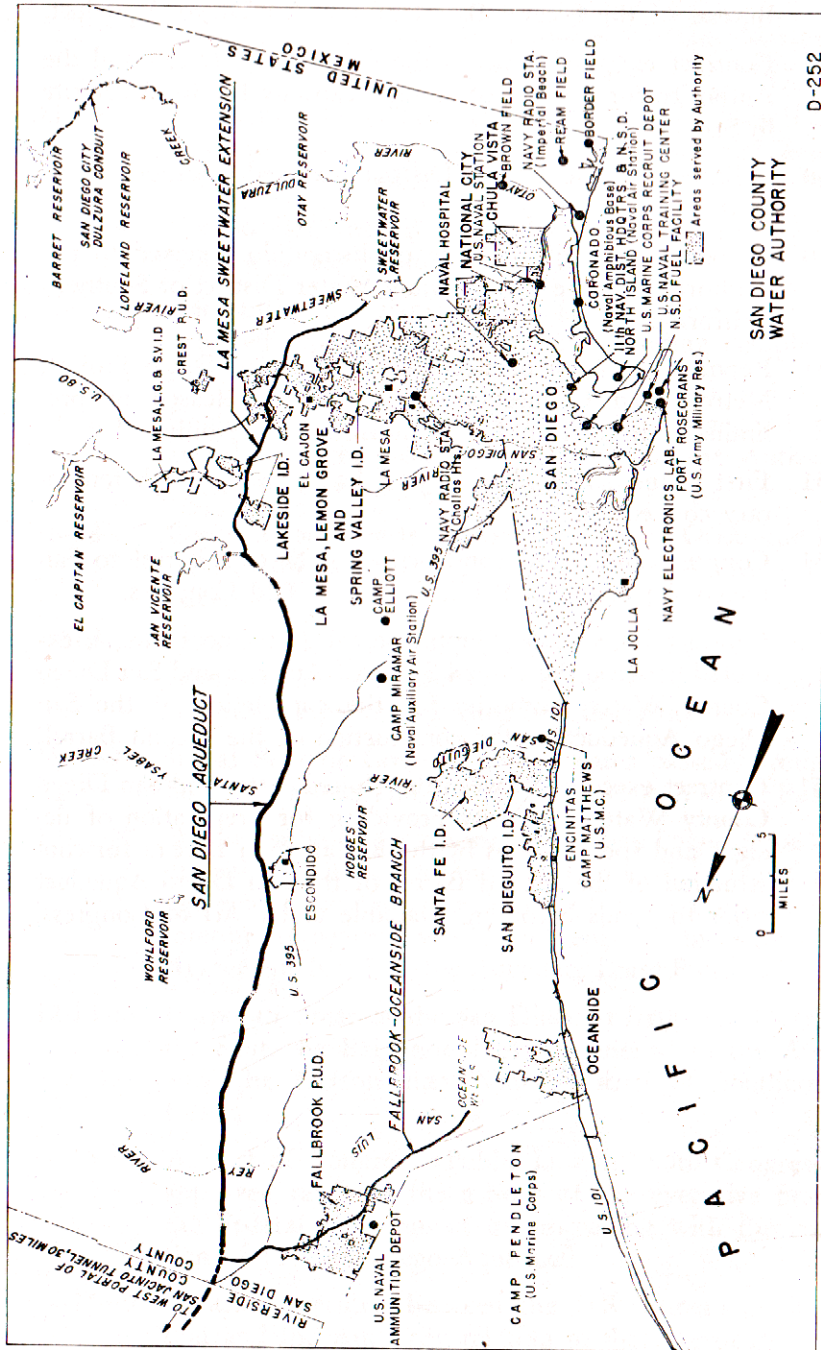


Figure 2. Areas in San Diego County Served by the San Diego County Water Authority through the San Diego Aqueduct and its Branches.

SECTION I

OPERATION AND MAINTENANCE

FOR THE fifth consecutive year the San Diego Aqueduct continued to be operated and maintained by the Authority under Supplemental Agreement No. 3 to Contract NOy-13300 between the United States and the Authority.

This agreement provides that pending completion of the Aqueduct and delivery of possession thereof to the Authority, as provided for in Contract NOy-13300, the Authority will assume the operation, maintenance, and repair of the Aqueduct and the cost thereof and pay to the United States 50 per cent of the rental rate prescribed by the terms of the Contract. As permitted under the Agreement, the operation and maintenance of the northerly one-half of the Aqueduct has been transferred to the Metropolitan Water District.

Authority-operated System

The Authority system includes that portion of the San Diego Aqueduct extending from a point 1,500 feet north of the San Luis Rey River to the San Vicente Reservoir, the Fallbrook-Oceanside branch, and the La Mesa-Sweetwater extension. The total length of these pipe lines is about 64 miles including tunnels with appurtenant structures. No change has occurred in the system during the 1951-52 fiscal year. The location of the Authority's portion of the San Diego Aqueduct and the two branch lines is shown in Figure 2.

The First Barrel of the Aqueduct has a design capacity of 85 c.f.s., except for tunnels which have been constructed to the ultimate Aqueduct design capacity of 165 c.f.s. However, flows as great as 106 c.f.s. have been brought in and delivered to member agencies during the recent emergency. A second pipe line between tunnels substantially paralleling the present line will be required to bring the entire Aqueduct up to its ultimate design capacity of 165 c.f.s.

The branch lines were designed and constructed to permit delivery to the member agencies served by these pipe lines quantities of water proportionate to their preferred rights in the ultimate Aqueduct capacity.

Operating Personnel

Operation and maintenance of the physical works of the Authority were carried on from the field headquarters at Escondido. The headquarters is manned by a force of seven men, and no change in personnel has occurred during the year.

In addition to maintenance and operation activities, this force has constructed such new facilities as were required during the year. This included construction of two metering and control stations, one to service the City of Escondido and the other to service the Eucalyptus area of the Lakeside Irrigation District, the latter outlet being the second for Lakeside Irrigation District.

Mechanical Equipment

No change was made during the year in the number or type of mobile units owned by the Authority. All mechanical equipment is housed at Escondido with the exception of one passenger car which is garaged in San Diego. A well-equipped repair shop with competent mechanics is maintained in Escondido to assure the proper upkeep of all equipment.

Patrol of Aqueduct and Branch Lines

A patrol of the Aqueduct was maintained and each of the fourteen open structures inspected daily during the period from July 1, 1951 up to and including April, 1952. During this period the Aqueduct carried, almost continuously, flows in excess of 100 c.f.s. Constant vigilance was required to detect any change in water level which might have indicated a reduction in carrying capacity, with possible overflowing of the open structures and consequent damage to the Aqueduct and right of way.

Flow in the Aqueduct was reduced to 95 c.f.s. for a short period of time in January and again in March. The reduction was made as a safety precaution. It was difficult to maintain daily inspection because of wet conditions of access roads. As road conditions improved and normal patrolling of the Aqueduct was resumed, the flow was gradually increased to full capacity.

The flow in the Aqueduct was substantially reduced in April as member agencies of the Authority began to use local supplies of water replenished by winter rains. The reduced flow eliminated the possibility of overflowing the walls of the structures, and patrolling of the Aqueduct was reduced to visiting open structures on alternate days.

Chlorination for Control of Bacterial Growth

Early in the operation of the Aqueduct it was noted that a bacterial growth started on the walls of the Aqueduct whenever water temperatures approached 80°, thereby seriously reducing the carrying capacity of the Aqueduct. The growth was first observed in the northerly section of the Aqueduct where water is received from San Jacinto Reservoir. The Metropolitan Water District experimented and found that a heavy dose of chlorine would kill the bacteria and restore the pipe to its previous capacity. Observations made by Metropolitan Water District indicated that chlorination of the flow at the entrance to the Aqueduct at San Jacinto Reservoir would apparently clear the pipe of bacteria as far as Red Mountain Tunnel.

Early in the summer of 1950, temporary chlorinating equipment was installed at the bifurcation structure at the south portal of Red Mountain Tunnel to permit injection of chlorine gas into the Aqueduct flow whenever evidence of bacterial growth was discovered within the pipe. In the fall, after water temperatures had dropped well below the critical temperatures, the equipment was removed and stored at Escondido.

In the summer of 1951, chlorinating equipment was again installed at the south portal of Red Mountain Tunnel. Evidence of bacteria growth appeared early in September, and in the period from September 10 to September 12 a total of 1¾ tons of chlorine was injected into the flow of the Aqueduct. On September 14 a rise of water elevation was noted at the open structure at the south portal of Lilac Tunnel indicating a bacterial growth in the Authority line between Lilac and Rainbow Tunnels. To correct this condition, the chlorinating apparatus was moved to the inlet structure of the Lilac Tunnel and ¼ ton of chlorine was injected into the Aqueduct flow. The growth was removed and a return to normal water elevation in the Aqueduct structures was noted. On September 21 a slight rise of water level was again noticed in the Aqueduct structures. The rise continued and chlorination of the water was again started on September 24 and continued for 24 hours, during which time ½ ton of chlorine was injected into the flowing water. At the end of September, water levels in the open structures were again at normal height; showing that the Aqueduct had been cleansed of all bacterial growth.

The Aqueduct flow was given a final dose of ¼ ton of chlorine in November. Chlorine residuals were observed in the water at the lower end of the Aqueduct indicating that the pipe line was free of bacterial

growth. The chlorinating equipment was dismantled, taken to Escondido headquarters, and stored during the winter.

Access and Patrol Roads

The Authority maintains about 37 miles of private roads which are traveled by the patrolmen in inspecting and maintaining the Authority system. During the four and one-half years of Aqueduct operation, below normal rainfall has made it possible to keep these roads in excellent condition with a minimum of effort except for the rainy periods in January and March.

In November 1951 light rains made conditions perfect for grading these roads with the motor grader and putting them in first-class condition for winter use. However, the heavy rains of late December and early January caused several washouts on access roads, principally, in Slaughterhouse Canyon, at both portals of Oat Hills Tunnel, and at San Luis Rey River crossing. During January a bulldozer and crew were kept busy repairing these washouts and other minor damages to the roads. In March heavy rainfall again caused several road washouts, the largest occurring in Poway Valley where several hundred cubic yards of material were required to restore the road to usable condition. By the end of April all roads had been worked over and were again in good condition for the dry season's use. Only occasional work was necessary on access roads during the remainder of the year.

In order to eliminate future washouts and make all points on the Aqueduct accessible during poor weather conditions, seven additional 16-inch corrugated steel culverts were installed during the year at points where experience during the past wet season indicated insufficient or lack of culvert capacity. Culverts have been placed principally on the roads in the vicinity of Oat Hills and Red Mountain Tunnels. A timber bridge on the access road, a short distance north of Rainbow Tunnel, was damaged by high flows in the stream and was rebuilt with rock abutments into a more substantial structure. It successfully withstood flood flows after being repaired.

Valves and Metering Equipment

The valves and metering equipment, which regulate and record the quantity of water delivered to Authority agencies, were given routine inspection and maintenance and have performed well during the year.

The Clayton pressure reducing valve at the Hodges metering station

closed unexpectedly on August 18, stopping a flow of 20 c.f.s. being diverted to Hodges Reservoir, and returned this flow to the Aqueduct in a comparatively short period of time. The surge in the Aqueduct, resulting from the sudden increase of flow, fortunately was not of sufficient magnitude to cause an overflow of water at nearby open structures and no damage resulted. The valve was dismantled for inspection, which showed that the shutdown was caused by erosion of the valve seat in the pilot valve preventing its tight closure. The main valve was found to be in excellent condition. After the pilot valve was replaced, service was restored and no more trouble was experienced.

Miscellaneous Maintenance Activities

The rainfall during the year was greater than in any year since the Aqueduct went into operation, and substantially increased regular maintenance activities.

Reports were received from several areas telling of wet conditions along the Aqueduct, and suggesting that the Aqueduct might have sprung a leak. Inspections were made of each area, but in every case the wet conditions were found to be due to runoff from the adjacent hillside and at no time was there any indication of leakage from the pipe line. With the advent of dry weather all wet areas dried up.

Walls at several open structures were raised with concrete blocks to give additional protection to the Aqueduct. Walls of the bifurcation structures at Oat Hills and Poway Tunnels were raised approximately 20 inches to prevent surface water in times of heavy runoff from getting into the pipe line. The walls of the bifurcation structure at the south portal of Fire Hill Tunnel were raised 20 inches to give additional freeboard and greater security whenever high flows were being carried in the Aqueduct. A small retaining wall of concrete blocks was constructed at a blowoff structure near Escondido to prevent irrigation waste water from flowing into the structure.

Improvements to Aqueduct structures were continued. Holes were drilled in the floors of two structures to permit seepage of condensation and rainwater leakage into the ground.

Regular maintenance of Aqueduct structures was a continuous activity throughout the year. Maintenance included such work as wire brushing of steel appurtenances whenever rust appeared, painting any exposed metal work with Inertol, painting of exterior walls of

superstructures at Eucalyptus, Hodges, and Red Mountain Stations, and keeping structures and surrounding areas clean and neat in appearance.

The meter and hydrant installed in August, 1950, to temporarily serve the water users in the Eucalyptus section of the Lakeside Irrigation District, were removed upon completion of the permanent metering station.

Authority Storage in San Vicente Reservoir

The right to store water in San Vicente Reservoir, acquired by an agreement with the City of San Diego in 1950, was exercised during the year, and a total of 5809.8 acre feet of water was placed in storage by the Authority to the accounts of five member agencies and for evaporation replacement. During the year 3504.8 acre feet of water previously stored was withdrawn, leaving a total of 6611.4 acre feet of water in storage in San Vicente Reservoir on June 30, 1952 for the account of the Authority.

The changes in quantities of water in storage to the accounts of several Authority agencies for the year are shown in Table 4.

TABLE 4
AUTHORITY STORAGE IN SAN VICENTE RESERVOIR
(Fiscal Year 1951-52)

Agency	Total Quantity in Storage 7/1/51 (acre-feet)	Placed into Storage During Fiscal Year (acre-feet)	Withdrawn During Fiscal Year (acre-feet)	Total Quantity in Storage 6/30/52 (acre-feet)
Chula Vista & National City (Calif. Water & Tel. Co., Agent)	0	0	0	0
Escondido	118.6	387.2	49.1	456.7
Fallbrook Public Utility District	2,224.6	2,926.3	1,320.8	3,830.1
Lakeside Irrigation District	0	0	0	0
La Mesa, Lemon Grove & Spring Valley Irrigation District	1,109.9	1,760.4	1,171.2	1,699.1
Oceanside	0	145.8	0	145.8
San Diego	0	0	0	0
San Dieguito Irrigation District	500.0	379.8	500.0	379.8
Santa Fe Irrigation District	0	0	0	0
Authority (for evaporation)	353.3	210.3	463.7	99.9
Totals	4,306.4	5,809.8	3,504.8	6,611.4

The total amount of water in storage at the end of each month in the combined reservoirs of Authority member agencies from 1947 to 1952, the period during which Colorado River water has been brought into the area, is shown in Figure 3.

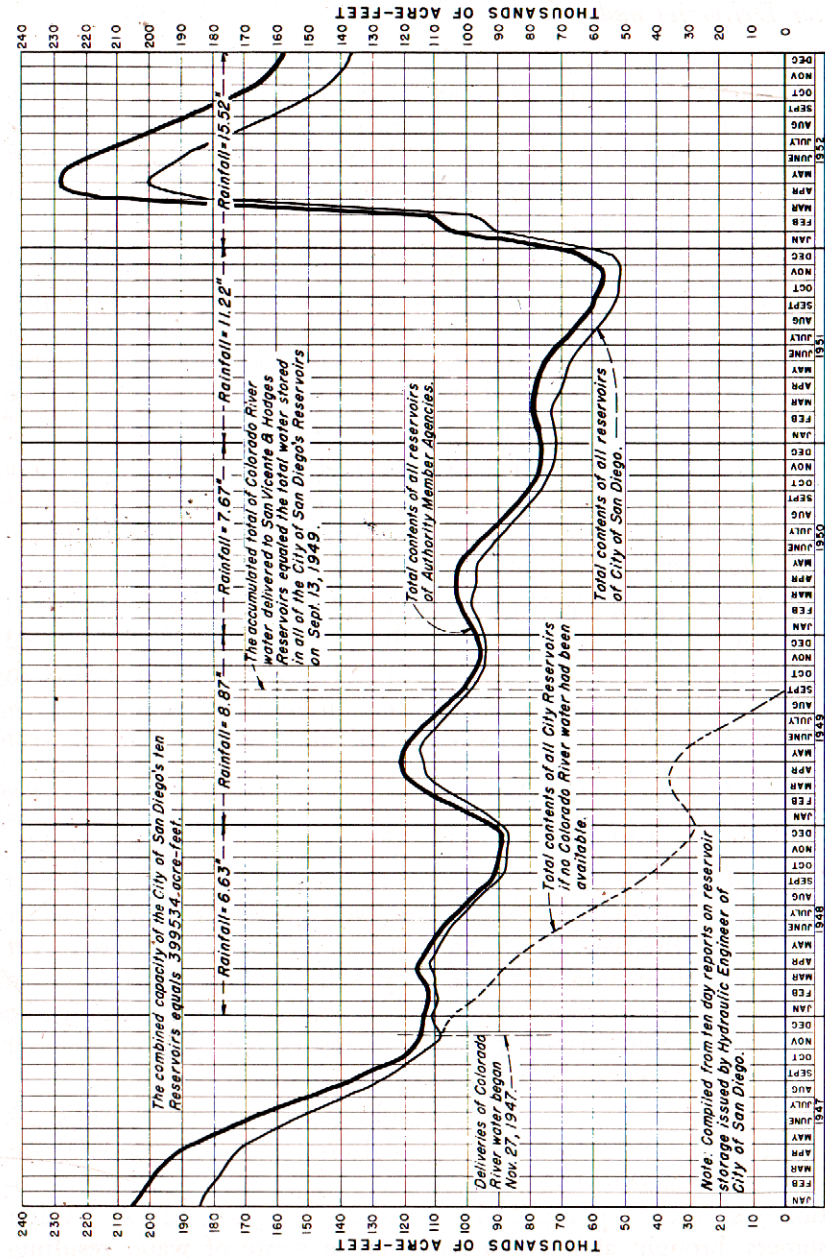


Figure 3. Amount of Water in Storage in Reservoirs of Authority Member Agencies.

Water Deliveries and Sales

The total amount of water sold during the 1951-52 fiscal year was 60,030.8 acre feet, a drop of about 24 per cent from the 79,259 acre feet sold in the previous year. The reduction in sales was due to a diminished demand for Colorado River water. The excellent runoff during the rainy season made it possible for agencies to meet their demands from local supplies.

For the period from July to February, the Aqueduct operated at full capacity with agencies receiving water on the basis of their preferred rights where requested. A total of 62,618 acre feet of water or an average flow of 86.26 c.f.s. was actually delivered from the Aqueduct; the 2587 acre feet above sales being water placed in storage in San Vicente Reservoir to the account of Authority agencies.

Monthly water sales to member agencies and deliveries from the Aqueduct are shown in Table 5. The maximum monthly quantity of water, 7502.0 acre feet, was sold in August, 1951; the minimum monthly quantity of 253.4 acre feet was sold in May, 1952.

The annual quantity of water in acre feet which has been delivered to member agencies since Colorado River water was first delivered on November 27, 1947 is shown in Table 6. During the past year an average flow of 86.2 c.f.s. was delivered, an amount somewhat below the average flow of 102.0 c.f.s. delivered in 1950-51—the peak year to date.

Water Production of Authority Agencies

The total quantity of water diverted by a member agency from local sources such as streams, reservoirs, and wells, together with the water received from the San Diego Aqueduct is referred to in this report as the water production of that agency. The water production of an agency is the water required by that agency to meet not only the demands of its consumers but the losses incurred in the transmission and distribution system of the agency.

Water production, as reported by Authority agencies, totaled 90,392.8 acre feet in the 1951-52 fiscal year, a decrease of 6339 acre feet or about 7 per cent below that of the previous year. This drop in production was caused primarily by a decrease in demand from water consumers, brought about by a reduction in waste of water resulting from the County-wide water conservation campaign, which was carried on vigorously during the major part of the year.

TABLE 5

Constituent Areas	May	June	Total 6 months	Yearly total	Yearly average
Chula Vista and National C (California Water & Tel.	0	0	1,549.4	6,649.0	9.16
Escondido	20.4	64.5	218.5	540.0	.74
Fallbrook Public Utility Dist	73.0	244.2	317.2	2,209.7	3.04
Lakeside Irrigation District	6.1	6.5	16.1	20.8	.03
La Mesa, Lemon Grove & S Valley Irrigation District	129.6	0	1,409.3	5,514.8	7.60
Oceanside	24.3	0	54.1	513.4	.71
San Diego	0	0	15,754.7	43,745.3	60.26
San Dieguito Irrigation Dist	0	0	0	691.0	.95
Santa Fe Irrigation District	0	0	0	146.8	.20
Total Sales to Agencies	253.4	315.2	19,319.3	60,030.8	82.69
Total to Authority Storage	+81.0	+82.7	+4,713.3	+5,763.2	+7.94
Total from Authority Storage	— 0	— 0	— 14.3	—3,176.0	—4.37
Total Deliveries from Aqueduct	334.4	397.9	24,018.3	62,618.0	86.26
Rate of Flow					
c.f.s. to Agencies	4.1	5.3	53.5		82.7
c.f.s. to Authority Storage	+1.3	+1.4	+13.1		+7.9
c.f.s. from " "	—0	—0	— .1		—4.4
Total deliveries from Aqueduct	5.4	6.7	66.5		86.2

62,638.5 acre-feet was delivered, less of 20.5 acre-feet from the Aqueduct, not including losses by evaporation.

TABLE 5
DELIVERIES AND SALES OF COLORADO RIVER WATER—FISCAL YEAR 1951-52
 (All figures in acre-feet)

TABLE 5

Constituent Areas	July	August	Sept.	Oct.	Nov.	Dec.	Total 6 months	Jan.	Feb.	Mar.	Apr.	May	June	Total 6 months	Yearly total	Yearly average
Chula Vista and National City (California Water & Tel. Co.)	663.7	887.5	881.2	899.9	881.5	885.8	5,099.6	872.8	553.0	123.6	0	0	0	1,549.4	6,649.0	9.16
Escondido	44.2	60.6	69.2	68.2	41.1	38.2	321.5	38.7	39.0	43.7	12.2	20.4	64.5	218.5	540.0	.74
Fallbrook Public Utility District ..	473.4	499.5	391.0	372.1	156.5	0	1,892.5	0	0	0	0	73.0	244.2	317.2	2,209.7	3.04
Lakeside Irrigation District	0.9	0.7	0.2	0.2	1.9	0.8	4.7	1.0	1.3	0.3	0.9	6.1	6.5	16.1	20.8	.03
La Mesa, Lemon Grove & Spring Valley Irrigation District	1,021.7	812.9	602.6	874.1	503.4	290.8	4,105.5	219.6	233.2	352.0	474.9	129.6	0	1,409.3	5,514.8	7.60
Oceanside	93.1	108.5	75.6	61.3	60.0	60.8	459.3	29.8	0	0	0	24.3	0	54.1	513.4	.71
San Diego	4,991.2	4,750.8	4,857.0	4,437.5	4,486.7	4,467.4	27,990.6	4,350.5	4,739.9	5,146.2	1,518.1	0	0	15,754.7	43,745.3	60.26
San Dieguito Irrigation District ..	80.0	320.0	291.0	0	0	0	691.0	0	0	0	0	0	0	0	691.0	.95
Santa Fe Irrigation District	61.5	61.5	23.8	0	0	0	146.8	0	0	0	0	0	0	0	146.8	.20
Total Sales to Agencies	7,429.7	7,502.0	7,191.6	6,713.3	6,131.1	5,743.8	40,711.5	5,512.4	5,566.4	5,665.8	2,006.1	253.4	315.2	19,319.3	60,030.8	82.69
Total to Authority Storage	+ 48.1	+ 43.0	+ 57.3	+ 47.5	+193.3	+660.7	+1,049.9	+639.1	+385.7	+450.2	+3,074.6	+81.0	+82.7	+4,713.3	+5,763.2	+7.94
Total from Authority Storage (1)	-963.9	-1,034.9	-928.9	-234.0	— 0	— 0	-3,161.7	— 0	— 0	- 14.3	— 0	— 0	— 0	- 14.3	-3,176.0	-4.37
Total Deliveries from Aqueduct ..	6,513.9	6,510.1	6,320.0	6,526.8	6,324.4	6,404.5	38,599.7	6,151.5	5,952.1	6,101.7	5,080.7	334.4	397.9	24,018.3	62,618.0	86.26
Rate of Flow																
c.f.s. to Agencies	120.8	122.0	120.9	109.2	103.0	93.4	111.6	89.7	96.8	92.1	33.7	4.1	5.3	53.5		82.7
c.f.s. to Authority Storage	+ 0.8	+ 0.7	+ 0.9	+0.8	+3.3	+10.7	+2.9	+10.4	+6.7	+7.3	+51.7	+1.3	+1.4	+13.1		+7.9
c.f.s. from " " (1)	-15.7	-16.8	-15.6	-3.8	—0	— 0	-8.7	— 0	—0	-0.2	— 0	—0	—0	— .1		-4.4
Total deliveries from Aqueduct	105.9	105.9	106.2	106.2	106.3	104.1	105.8	100.1	103.5	99.2	85.4	5.4	6.7	66.5		86.2

62,638.5 acre-feet was delivered into San Diego Aqueduct by The Metropolitan Water District at San Jacinto Reservoir. There was an estimated loss of 20.5 acre-feet from the Aqueduct, not including losses by evaporation.

TABLE 6
DELIVERIES OF COLORADO RIVER WATER—1947 to 1952
(All figures in acre-feet)

Constituent Areas	(1) 1947-48	1948-49	1949-50	1950-51	1951-52
Chula Vista and National City (California Water & Tel. Co.)	3,636.6	10,510.7	10,973.2	12,964.7	6,649.0
Escondido	—	—	—	117.1	540.0
Fallbrook Public Utility District	690.6	2,125.4	3,004.0	3,979.2	2,209.7
Lakeside Irrigation District	0	3.5	30.4	27.2	20.8
La Mesa, Lemon Grove & Spring Valley Irrigation District	4,256.3	8,080.1	4,792.6	8,282.5	5,514.8
Oceanside	0	1.5	127.8	558.5	513.4
San Diego	32,461.0	50,126.8	35,371.2	51,453.9	43,745.3
San Diego Irrigation District	—	451.3	1,655.0	1,043.8	691.0
Santa Fe Irrigation District	—	270.8	2,657.9	832.1	146.8
Total Sales to Agencies	41,044.5	71,570.1	58,612.1	79,259.0	60,030.8
Total to Authority Storage	0	0	+10,652.0	+ 821.4	+5,763.2
Total from Authority Storage	0	0	0	-6,265.5	-3,176.0
Total Deliveries	41,044.5	71,570.1	69,264.1	73,814.9	62,618.0
Rate of Flow					
c.f.s. to Agencies	98.3	98.9	81.0	109.5	82.7
c.f.s. to Authority Storage	0	0	+14.7	+1.1	+7.9
c.f.s. from Authority Storage	0	0	0	-8.6	-4.4
Total deliveries from Aqueduct	98.3	98.9	95.7	102.0	86.2

(1) The operation of the Aqueduct was formally initiated on November 27, 1947.

TABLE 7
WATER PRODUCTION OF AUTHORITY AGENCIES—FISCAL YEAR 1951-52

Constituent Areas	TOTAL WATER PRODUCTION			SOURCE OF WATER			
	as ac. ft.	as m.g.d.	as c.f.s.	Amount ac. ft.	Per cent	Amount ac. ft.	Per cent
Chula Vista and National City (Calif. W. and T. Co.)	10,491.0	9.34	14.45	3,841.0	36.6	6,650.0	63.4
Escondido	1,033.5	0.92	1.42	474.6	45.9	558.9	54.1
Fallbrook Public Utility District	5,803.4	5.17	7.99	3,525.0	60.7	2,278.4	39.3
Lakeside Irrigation District	196.8	0.18	.27	176.0	89.4	20.8	10.6
La Mesa, Lemon Grove and Spring Valley Irrigation District	9,857.9	8.78	13.58	3,651.2	37.0	6,206.7	63.0
Oceanside	2,954.8	2.63	4.07	2,441.4	82.6	513.4	17.4
City of San Diego:							
Inside City	53,784.0	47.88	74.10	13,607.2	25.3	40,176.8	74.7
Outside City (not in Authority)	1,406.2	1.25	1.94	1,406.2	100.0	0	0
San Diegoito Irrigation District	2,326.2	2.07	3.20	2,326.2	100.0	0	0
Santa Fe Irrigation District	2,539.0	2.26	3.50	2,392.2	94.2	146.8	5.8
Totals	90,392.8	80.48	124.52	33,841.0	37.4	56,551.8	62.6

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.

TABLE 8
WATER PRODUCTION BY AUTHORITY AGENCIES—FISCAL YEARS 1940-41 to 1951-52
(All figures in acre-feet)

Agency	From Local Sources						From Local and Authority Supplies					
	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52
Chula Vista and National City (Calif. W. and T. Co. Agent)	7,502	9,588	9,048	9,963	9,288	10,799	10,519	10,265	(2)11,293	(2)12,709	11,750	10,491
Escondido	526	547	663	668	711	707	835	934	801	858	1,034	1,033
Fallbrook Public Utility District	576	951	1,232	1,464	1,439	2,120	2,596	3,470	3,613	5,379	5,777	5,803
Lakeside Irrigation District	47	44	60	61	65	69	90	103	110	161	183	197
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	10,204	11,412	9,858
Oceanside	1,149	1,189	1,508	1,713	1,881	2,304	2,519	2,787	2,641	2,977	3,035	2,955
City of San Diego:												
Inside City	27,490	34,506	43,966	49,742	53,473	56,266	49,431	51,078	49,693	51,410	54,935	53,784
Outside City (not in Authority)	286	384	504	815	1,223	1,147	1,038	1,329	1,946	1,049	2,051	1,406
San Diegoito Irrigation District	2,014	1,917	2,280	2,521	2,611	2,966	3,369	3,034	2,303	2,899	3,039	2,326
Santa Fe Irrigation District	2,700	2,503	3,073	3,300	2,760	3,339	3,512	3,491	2,878	3,372	3,515	2,539
Totals	47,185	56,532	68,789	77,563	80,874	88,837	83,699	86,801	84,603	91,018	96,731	90,392

(1) Includes some water sold to areas adjacent to the two cities.
 (2) Includes evaporation losses of Colorado River water in Sweetwater Reservoir.
 (3) Delivery of Colorado River Water to original Authority Agencies started in 1947-48.
 (4) Delivery of Colorado River Water to San Diegoito Irrigation District started in 1948-49.
 (5) Delivery of Colorado River Water to Santa Fe Irrigation District started in 1948-49.
 (6) Delivery of Colorado River Water to City of Escondido started in 1950-51.

TABLE 9
UNIT WATER PRODUCTION—PER ACRE AND PER CAPITA—1951-1952

Area	Gross Area (1) acres	Total Production of water ac. ft.	Estimated area served by water system acres	Water production per acre ac.ft./acre/yr.	Estimated population	Water production per capita ac.ft./cap./yr.
California Water & Telephone Co.						
In Chula Vista	3,363	4,229.0	3,002	1.41	21,578	0.20
In National City	4,260	2,672.0	3,004	.89	26,832	0.10
Outside Cities (not in Authority)	9,864	3,590.0	(2) 3,094	1.16	12,800	0.28
Total (Calif. W. & T. Co.)	17,487	10,491.0	9,100	1.15	61,210	0.17
Escondido	1,878	1,033.5	1,360	.76	7,400	0.14
Fallbrook Public Utility District	8,192	5,803.4	6,700	.87	6,500	0.89
Lakeside Irrigation District	1,560	196.8	1,340	.14	2,100	0.09
La Mesa, Lemon Grove and Spring Valley Irrigation District	18,460	9,857.9	13,360	.74	57,548	0.17
Oceanside	6,597	2,954.8	3,336	.89	18,377	0.16
San Diego—Inside City	71,183	53,784.0	42,500	1.27	434,924	0.12
(4)						
Outside City (not in Authority)	(3)	1,406.2	—	—	—	—
San Dieguito Irrigation District	4,020	2,326.2	4,020	.58	6,993	0.33
Santa Fe Irrigation District	10,106	2,539.0	9,000	.28	3,652	0.70
Totals and Averages	139,483	90,392.8	90,446	1.00	598,704	0.15

(1) Does not include those areas which are a part of the agencies but not a part of the Authority.

(2) Includes 60 acres in San Diego served by Calif. Water & Telephone Co., and supplying 240 people.

(3) Not available.

(4) Does not include 23 acres of overlapping area in La Mesa, Lemon Grove and Spring Valley Irrigation District served with water by the District.

Water production of each agency and the division as to the source of water between local supplies and the Colorado River are shown in Table 7. The City of San Diego was not only the largest user of Colorado River water, with 40,176 acre feet coming from that source, but also had the highest percentage use of Colorado River water, 74.7 per cent of its total production.

The unit water production of agencies, in terms of per acre of estimated gross area served, and per capita are shown in Table 8. The unit water production varies from a high of 1.41 acre feet per acre in the Chula Vista area to a low of 0.14 acre feet per acre in the Lakeside Irrigation District area. The average water production throughout the Authority area is shown as being about 1.00 acre feet per acre. The average water production throughout the Authority is 0.15 acre feet per capita. This means that in the area the overall water requirements of 6.6 persons are being met with one acre foot of water in the Authority area.

The annual water production of member agencies of the Authority for the twelve-year period from July 1, 1940 to June 30, 1952 is shown in Table 8. Water production in the area has about doubled over the twelve-year period.

Preferential Water Rights of Member Agencies

The preferential rights of the member agencies to purchase water from the San Diego County Water Authority are determined from time to time by a procedure specifically set forth in the County Water Authority Act. In effect, such preferential rights bear the same relationship to the flow of the Aqueduct as the total accumulated taxes and related sums paid by each agency to the Authority (excluding payments for water) bear to the total of similar amounts paid to the Authority by all of the agencies. Thus, the preferred right of an agency is a right to purchase a flow of water which may vary from time to time with the total tax payments collected by the Authority from all of the agencies since its organization.

The flows in the present Aqueduct and in the Aqueduct when completed, computed as set forth above, to which the agencies are entitled as of June 30, 1952, are shown in Table 10. In computing the rights shown, the amounts still due under the terms of annexation from the City of Escondido, the San Dieguito Irrigation District, and the Santa Fe Irrigation District were included in determining the preferred rights.

TABLE 10
ESTIMATED PREFERENTIAL RIGHT TO PURCHASE COLORADO RIVER WATER
as of June 30, 1952

Constituent Areas	Total Amount paid by each member agency to 6/30/52	Amount remaining to be paid under terms of annexation	Total contributions paid and contracted for	Preferential right to purchase		
				Percentage of aqueduct flow	First Barrel c.f.s.	Completed Aqueduct c.f.s.
Chula Vista	\$ 80,953.29		\$ 80,953.29	3.30	3.50	7.10
Escondido	8,760.02	\$24,532.76	33,292.78	1.36	1.44	2.92
Fallbrook Public Utility District	19,127.10		19,127.10	0.78	0.83	1.68
Lakeside Irrigation District	3,923.76		3,923.76	0.16	0.17	0.34
La Mesa, Lemon Grove & Spring Valley Irrigation District	189,267.00		189,267.00	7.73	8.19	16.62
National City	65,692.10		65,692.10	2.68	2.84	5.76
Oceanside	56,700.24		56,700.24	2.32	2.46	4.99
San Diego	1,947,347.05		1,947,347.05	79.50	84.27	170.92
San Dieguito Irrigation District	20,311.60	8,936.12	29,247.72	1.19	1.26	2.56
Santa Fe Irrigation District	16,383.87	7,706.23	24,090.10	0.98	1.07	2.11
Total Authority	\$2,408,466.03	\$41,175.11	\$2,449,641.14	100.00	106.00	215.00

Based on the estimated maximum capacity of present single barrel aqueduct and the completed aqueduct.

Water Quality

The Authority continues to deliver water on a wholesale basis without treatment of any kind or preparation for domestic use. Chlorine is intermittently injected into the pipe line, but only for the purpose of assuring full capacity of the Aqueduct through elimination of algae and bacterial growth on the interior wall of the pipe. The Metropolitan Water District also chlorinates intermittently at the head of the Aqueduct for the same purpose.

The Metropolitan Water District takes frequent water samples at several points on the Colorado River Aqueduct to obtain analyses of the natural water in the Aqueduct for use in determining operation of the Weymouth Treatment Plant. One of the sampling stations is at the south portal of San Jacinto Tunnel at the point where water is diverted into the San Diego Aqueduct. The monthly chemical character of water samples, collected at this point, is shown in Table 11. The average hardness of the water during the year is 308 p.p.m., only slightly higher than the 301 p.p.m. average for the previous year. However, during the first six months the water had a total hardness somewhat higher than the previous year, and a total hardness somewhat lower during the months of March, April, and May.

The City of San Diego takes weekly samples of water entering San Vicente Reservoir. These are analyzed at the City's laboratory at the Alvarado Treatment Plant. Copies of the analyses are supplied to the Authority, and, in general, they show close agreement with those taken by Metropolitan Water District.

Frequent readings of temperatures of water flowing in the Aqueduct were taken as a routine activity of patrolmen. These readings showed a minimum water temperature of 51 degrees in the month of January and a maximum water temperature of 84 degrees in July.

TABLE 11

CHEMICAL CHARACTER OF NATURAL COLORADO RIVER
WATER

Year Ending June 30, 1952

Samples taken at entrance to San Diego Aqueduct by M.W.D. and analyzed
at District Laboratory

Month	Total Hardness as P.P.M. of CaCO ₃	Non Car- bonate Hardness as P.P.M. of CaCO ₃	Alkalinity as P.P.M. of CaCO ₃		Magnesium as P.P.M. of Mg.	Hydrogen Ion Concen- tration	Tempera- ture when sampled F°
			Total	Phenolph- thalen			
July	312	187	130	5	28	8.3	81
August	300	183	120	3	28	8.35	83
September	293	178	115	0	27.5	8.2	81
October	300	186	116	2	27.5	8.3	77
November	312	188	125	1	28	8.3	62
December	307	185	122	0	28	8.5	58
January	313	189	124	0	27.5	8.3	48
February	315	191	126	2	28	8.3	55
March	313	188	125	0	27	8.2	57
April	312	195	118	1	28	8.2	63
May	302	188	115	1	28	8.3	71
June	317	197	121	1	29	8.4	76
Average	308	188	121	1	28	8.3	68
Maximum	317	197	130	5	29	8.5	83
Minimum	293	178	115	0	27	8.2	48

SECTION II
ENGINEERING

DURING the fiscal year 1951-52, Engineering activities included work leading to the authorization of construction of the Second Barrel of the Aqueduct, reports on areas seeking annexation to the Authority, and a large number of routine activities.

San Diego Aqueduct

In the fiscal year of 1950-51, it became evident that the single barrel of the Aqueduct would not continue to meet the water demands of the Authority area in the future if the present rapid growth of the area continued. Since ownership of the Aqueduct rested with the U.S. Government, completion of the Second Barrel of the Aqueduct by the United States appeared to be the quickest means of obtaining an additional water supply. Legislation was therefore introduced in Congress to authorize completion of the project.

At the beginning of the fiscal year 1951-52, this legislation was still being considered with the final outcome uncertain. In view of this uncertainty and the continuation of drought conditions, a brief study was made early in July to determine the possibility of increasing the capacity of the present San Diego Aqueduct by the installation of booster pumping units. It would have required the closing of all structures to install these units, which would have been expensive. Furthermore, since the concrete pipe was designed and reinforced for increments of only 5-foot changes in head, no large increase in pressure anywhere along the line would have been possible without overstressing the pipe and possibly cracking it with resulting excessive leakage. The study indicated that only a very small additional amount of water might have been obtained, and that the cost would not have been warranted.

A brief technical report on the increase in use of water within the Authority area, particularly that used by military installations, was prepared early in July for use in presenting the need of the Second Barrel to the Congressional Armed Services Committee. Later, conferences were held with the Engineering staff of the Bureau of Yards and Docks in Washington, at which time this report and other requested data were discussed, and given to them for use in the preparation of their report.

Legislation authorizing construction of the Second Barrel progressed slowly through Congress, and on October 11, 1951 the bill received final Congressional approval under Public Law 171, 82d Congress, authorizing the Secretary of the Navy to enlarge existing water supply facilities for the San Diego, California, area in order to insure the existence of an adequate water supply for Navy installations and defense production plants in the area.

In September, when it appeared certain that the bill would ultimately be passed, conferences were held with members of the local and regional Reclamation Bureau staff to discuss ways by which surveys and design of the Second Barrel to the Aqueduct could be started at the earliest possible date. The quickest and most feasible method appeared to be for the Authority to advance the money required for the work until Federal funds became available.

On November 9, 1951, the Authority entered into a contract with the United States providing for the advancement of funds by the Authority to the Bureau of Reclamation for an immediate start on the preparation of designs and specifications for the Second Barrel pending availability of government funds.

The Navy had previously designated the Bureau of Reclamation as the construction agency which would accomplish the preparation of plans and supervision of the actual construction work. Under the contract for advancement of funds the Authority paid the Bureau of Reclamation a total of \$100,000, which fully financed the Bureau's engineering work until the end of May, 1952. All work thereafter was financed from Navy funds and will be included in the project cost to be repaid later by the Authority under terms of Supplemental Agreement No. 4 to Contract NOy-13300.

A conference with Reclamation Bureau personnel, to consider basic factors of design, was held in November and resulted in additional studies being set up to fix the capacity of the Second Barrel north of the Rainbow Tunnel. The authorizing bill states that the capacity of the Second Barrel of the Aqueduct should not be less than 80 c.f.s. An additional capacity of 40 c.f.s. appeared to be justified in the line north of Rainbow Tunnel to permit the complete utilization of the Aqueduct south of Rainbow Tunnel whenever maximum diversions were made to the Fallbrook-Oceanside branch and to provide capacity for possible future delivery of water to the Marine installation at Camp Pendleton. It was later determined by the Navy that under the authorization, no extra capacity could be provided north of San

Diego County above that needed to assure full utilization of the Aqueduct and its branches to meet the need in San Diego County. The design capacity finally adopted for the Second Barrel north of Rainbow Tunnel was 95 c.f.s., which provided an extra 15 c.f.s. in this section of the Aqueduct. This upper section could then supply sufficient water to permit utilization of the full capacity of the Aqueduct south of Rainbow Tunnel and of the Fallbrook-Oceanside branch when the demand required them to operate at full capacity.

A letter was prepared and forwarded to the Public Works Officer of the Eleventh Naval District giving the reasons for the 95 c.f.s. capacity requested for the Aqueduct north of Rainbow Tunnel. This letter, approved by the Authority Board, constituted the formal request on which the Navy adopted 95 c.f.s. as the design capacity for the Second Barrel north of Rainbow.

Conferences for the negotiation of contracts between the Navy and the Authority to provide for the construction of the Second Barrel of the San Diego Aqueduct were held at the Authority's offices through November 14 to 16, inclusive. The meetings were conducted by the General Counsel of the Authority. In addition to Authority and Navy personnel, representatives of the Metropolitan Water District, the Reclamation Bureau, and some of the Authority agencies were present at most of the meetings. A tentative contract was drafted and designated as Contract NOy-13300, Supplemental Agreement No. 4. It included the terms and conditions by which the Navy would construct the Second Barrel and make it available to the Authority. Contract NOy-13300, Collateral Agreement to Supplemental Agreement No. 4, was also drafted in which the agencies consented to certain conditions for delivery of water to the Government.

Early in the month of December, the Metropolitan Water District's Engineers and the Reclamation Bureau's Engineer in charge of the Escondido office, inspected a preliminary field location of the alignment of the Second Barrel, northerly of the San Luis Rey River, and agreed to the final alignment. In general, wherever blasting and deep cuts were necessary, the center line of the Second Barrel was located 50 to 75 feet from the First Barrel; otherwise, a 30-foot spacing from center line to center line of pipes was used. On most of the line the original right of way obtained for the First Barrel was sufficient for the construction of the Second Barrel, but in order to provide for the wider spacing required between the pipes in some places, additional permanent rights of way were required.

Later in the month Authority Engineers cooperated with the Bureau in establishing the first alignment of the Second Barrel southerly of the San Luis Rey River. A 30-foot spacing was normally used with a maximum 50-foot spacing wherever blasting was required. Where particularly rough topography was encountered and where blasting would not be required, the spacing was reduced to as little as 20 feet.

In April the final field layout of the Second Barrel was inspected, and the location of service outlets to be placed in the Second Barrel was determined. Sketches were prepared by the Authority establishing the location of service outlets so that they could later be interconnected to supply water to member agencies from either Barrel of the Aqueduct.

Preliminary studies were carried on during the past year by the Authority in anticipation of the construction of the Second Barrel to determine ways in which metering equipment could be incorporated into the diversion structure. The results of such studies were furnished the Reclamation Bureau when the design of the Second Barrel was taken over by the Bureau. After several exchanges of ideas a design of structure, which would perform as desired by the Authority, was prepared by the Bureau and was approved for construction.

In April preliminary profiles and layouts of the Second Barrel, from the northerly end of the San Luis Rey Siphon to the Red Mountain Tunnel, were carefully checked as to grade and location. There were some comments made and final approval was given.

Preliminary sketches were prepared by the Authority for a chlorination station to be installed as part of the Second Barrel construction at the entrance to the Lilac Tunnel. These sketches showed the requirements of the Authority for proper chlorination of the line, and were furnished the Bureau for their help in preparation of the final design.

The Bureau of Reclamation completed the first draft of plans and specifications covering construction of the northerly portion of the Second Barrel early in the month of June and forwarded copies to the Eleventh Naval District, the Metropolitan Water District, and the Authority for review. After a study of the plans by the several groups, a meeting was held on June 19 at the headquarters of the Public Works Officer, Eleventh Naval District, which was attended by members of the staffs of the respective agencies. Several suggested changes in plans and specifications were discussed and solutions agreed upon. At the conclusion of the meeting the construction plans were approved subject to such changes as were agreed upon. It is anticipated that requests for bids for the construction of the northerly portion of the Aqueduct will be advertised late in July.

Changes in Corporate Area

The area within the corporate boundaries of the Authority was increased during the year by 2,146 acres, making a total area within the Authority boundaries on June 30, 1952 of 129,619 acres. Territory was annexed to four Authority agencies; the Cities of Escondido, Oceanside, and San Diego, and the La Mesa, Lemon Grove and Spring Valley Irrigation District. Whenever an area is annexed to a member City of the Authority the area is automatically annexed to the Authority and Metropolitan Water District. The annexation of area to

TABLE 12
CONSTITUENT AREAS OF THE AUTHORITY
as of June 30

Constituent Areas	Area Within Authority—Acres			Per cent of total Authority area 6/30/52
	As of 6/30/51	Changes during year	As of 6/30/52	
	acres	acres	acres	
Chula Vista	3,363	0	3,363	2.59
Escondido (1)	1,870	8	1,878	1.45
Fallbrook Public Utility Dist. (1)	8,192	0	8,192	6.32
Lakeside Irrigation Dist. (2)	1,560	0	1,560	1.20
La Mesa, Lemon Grove & Spring Valley Irrigation Dist.: (2) (3)				
In City of El Cajon (1)	891	+(30)	921	.71
In City of La Mesa (1)	1,798	+(688)	2,486	1.91
In Crest Public Utility Dist.	386	0	386	.30
In unincorporated areas	15,753	-(1,086)	14,667	11.32
Total	18,828	-368	18,460	14.24
National City	4,260	0	4,260	3.29
Oceanside	6,490	107	6,597	5.09
San Diego	68,784	2,399	71,183	54.92
San Dieguito Irrig. Dist. (2) (3)	4,020	0	4,020	3.10
Santa Fe Irrigation District	10,106	0	10,106	7.80
Total Authority Area (1)	127,473	2,146	129,619	100.00
San Diego County			2,725,100	

- (1) Area revised from that in Fifth Annual Report, to conform with revised data received from agency.
 (2) Does not include areas annexed to agencies without making the same a part of the Authority.
 (3) Includes areas excluded from agency but still a part of the Authority.
 (4) Does not include 23 acres of overlapping area in La Mesa, Lemon Grove and Spring Valley Irrigation District, served with water by District.

La Mesa, Lemon Grove and Spring Valley Irrigation District requires the approval of both the Authority and the Metropolitan Water District before the annexed area could become a part of the Authority and Metropolitan Water District.

The areas within the boundaries of each of the Authority agencies, as of July 1, 1951, and the change in area during the past year are shown in Table 12.

A revision to the Authority Act was passed at the last session of the Legislature to permit a determination to be made as to which agency any overlapping area would lie within for Authority purposes. The City of San Diego and the La Mesa, Lemon Grove and Spring Valley Irrigation District have overlapping areas lying within their respective boundaries. Data and maps defining such overlapping areas were assembled and presented to the two agencies to assist them in complying with the Act. The City and District passed resolutions complying with this revision.

The La Mesa, Lemon Grove and Spring Valley Irrigation District and the San Dieguito Irrigation District have in the past excluded lands from their corporate areas, but the areas continued to be part of the Authority since no provision existed within the Authority Act for exclusion of territory except by exclusion of an entire member agency. The Authority Act was amended to make possible the exclusion of such areas from the Authority by resolution of the agency.

Data on areas excluded from member agencies, but still included within the Authority area, were prepared and sent to these agencies to assist them in taking the steps necessary to exclude these areas from the Authority in accordance with the revised Act.

The annual certificate, giving the changes in boundaries of the Authority during the year ending February 1, 1952, was prepared and copies of the statement were filed with the County Assessor, the State Board of Equalization, and the Metropolitan Water District for tax purposes.

Many conferences were held during the year in response to requests for information on the procedure for, and probable cost of annexation to the Authority. These requests came from individuals representing groups of land owners, committees, and from organized agencies. Whenever directed by the Board, factual reports were prepared on each area for use by the Board and its Committee in considering the annexation request and arriving at terms. Reports were prepared covering the proposed annexation of the area within San Luis Rey Heights Mutual Water Company, the Escondido Mutual Water Com-

pany, the City of Carlsbad, and the Vista Irrigation District. Brief memoranda were prepared covering many other areas. Where tentative approval was given to a request for annexation, legal boundary descriptions and maps of the area proposed to be annexed were carefully checked and revised.

TABLE 13
AREAS OF MEMBER AGENCIES LYING WITHIN
AND WITHOUT THE BOUNDARIES OF THE AUTHORITY
as of June 30, 1952

Member Agency	Total area lying within agency boundaries	Area within agency but not a part of Authority (1)	Area within agency and a part of Authority	Area excluded from agency but still a part of Authority	Total area within Authority's boundaries
	Acres	Acres	Acres	Acres	Acres
Chula Vista	3,363	0	3,363	0	3,363
Escondido	1,878	0	1,878	0	1,878
Fallbrook P. U. D.	8,192	0	8,192	0	8,192
Lakeside Irrig. Dist. ..	2,008	448	1,560	0	1,560
La Mesa, Lemon Grove & Spring Valley I. D.(4)	22,546	4,086	18,460	(3) 0	18,460
National City	4,260	0	4,260	0	4,260
Occasido	6,597	0	6,597	0	6,597
San Diego	71,183	0	71,183	0	71,183
San Dieguito I. D.....	3,993	30	3,963	57	4,020
Santa Fe Irrig. Dist....	10,106	0	10,106	0	10,106
Totals	134,126	4,564	129,562	57	129,619

NOTE: (1) An area when annexed to a city which is an independent agency of the Authority is automatically annexed to the Authority.

(2) Does not include 23 acres of overlapping area in La Mesa, Lemon Grove and Spring Valley Irrigation District.

(3) Does not include 223 acres annexed by City of San Diego.

(4) Does not include 106 acres annexed by City of San Diego.

Service Connections

Escondido Service Connection. The preparation of design and construction plans of this connection were completed in 1950-51, and described in the report for that year. Engineering assistance was given during the construction period. Installation was completed on July 25, 1951, and water was delivered to the City of Escondido through the completed service connection on July 28, 1951.

State Forestry Camp at Rainbow. A contract was entered into between the State of California and the Metropolitan Water District to

supply the State Forestry Camp at Rainbow with Colorado River water, since the Authority cannot sell water outside its corporate area without consent of the District. Delivery was to be made from the Authority's Fallbrook-Oceanside branch under this contract.

A connection for this service was designed to be incorporated with a former temporary service connection, previously installed to serve the Rainbow Public Utility District with surplus water.

Vista Service Connection. Work drawings were prepared for the construction of a temporary metering and control station through which water was to be delivered to the Vista Irrigation District. Such water was ordered by the City of San Diego, but delivered by the Authority to the Vista Irrigation District in exchange for water delivered by the Vista Irrigation District to the City at Hodges Reservoir.

The installation of the connection was located at Station 1121+70 on the Aqueduct, near the point where the Aqueduct crosses the Vista conduit. In order not to shut down the Aqueduct, a nozzle with a blind flange located nearby was not used, but a connection was made to a valved blowoff pipe. The meter consisted of a 12-inch by 8.602-inch orifice plate inserted in the connecting 12-inch piping, and a Builder's Recorder and Totalizer, located in a temporary wooden structure nearby. Funds for the cost of the complete installation were furnished by the Vista Irrigation District.

Access Roads

A right of way agreement for an access road to the Aqueduct north of Oat Hills Tunnel, across the Locker-Hutchings property, was entered into during the year. This right of way permitted the access road to be constructed at a much easier grade.

Miscellaneous Engineering Activities

In addition to the major activities of the engineering staff, as recorded in this section, there were many minor activities, some of which are listed below:

The Authority staff cooperated in many ways with the program of the Citizens' Water Committee. Data and charts were prepared for use in the campaign.

The County Registrar of Voters requested and received assistance in the preparation of a map showing the boundaries of the Authority in relation to the County precinct boundaries for use in setting up the election of February 26, 1952.

At the request of the U.S. Public Health Service, a basin report was prepared outlining the water supply available in San Diego County.

This report was later incorporated in a state-wide report.

A determination of the quantity of water used by the U.S. Government within each of the Authority's agencies was made for use in pressing for construction of the Second Barrel, and also for insertion in the Collateral Agreements to indicate current governmental requirements of water within each agency.

Several conferences of member agencies' operating heads were held during the year. A meeting was held on March 26, 1952, to consider the water requirements of the agencies during the coming year. Tabulations were prepared for this meeting from data previously furnished by the agencies showing the estimated water requirements for the year of 1952, and the available local water. A study of this tabulation showed that heavy rainfall had increased the water in storage to the point where ample water would be available to each agency during the following year.

Meetings were attended by members of the staff, at which possible future additional sources of water supply for San Diego County were discussed. These sources included water to be obtained from evaporation of sea water, reclamation of sewage, and development of the Feather River Project.

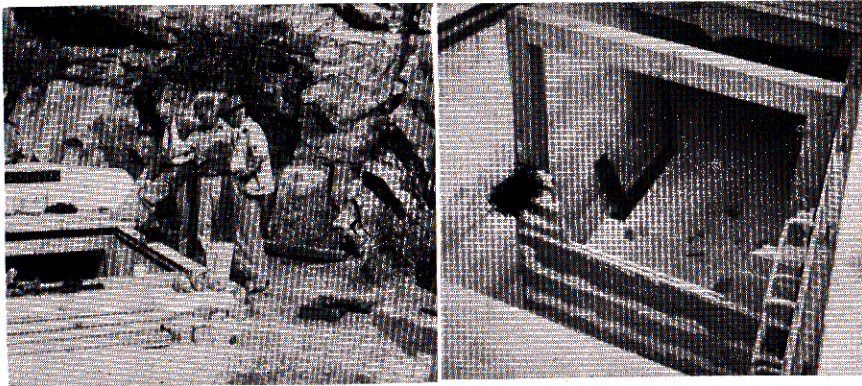
The quantity of water delivered to the Authority is measured by the Metropolitan Water District as it flows through a 72-inch by 36-inch venturi meter located at the head of the Aqueduct. Early in the summer, the flow in the Aqueduct was reduced below that at which accurate readings could be obtained. It therefore became necessary to utilize the smaller meters, through which the Authority delivered water to its agencies, in order to determine the full flow in the Aqueduct. A three-foot Cipolletti weir with stage recorder was designed and installed in the bifurcation structure at the intake portal of San Vicente Tunnel. The Cipoletti weir consisted of a heavy timber bulkhead in which a steel measuring weir was inserted. The stage recorder was a float-operated type, which continuously recorded the head of water on the weir. The installation of the weir was completed on May 20. Thereafter, the metered amounts delivered by the Authority to its agencies were furnished the Metropolitan Water District and used in the determination of water delivered to the Authority.

An inspection of the Oat Hills Tunnel was made on May 16 in company with Engineers from the Eleventh Naval District and from the Reclamation Bureau. The amount of water leakage into the Tunnel was measured. A memorandum was prepared on this inspection trip and distributed to interested parties.



View of Exterior

View of Plug Valve in sub-structure

Escondido Metering & Control StationInspection of Installation by
Mr. J. L. Burkholder & Mr. R. S. HolmgrenWeir partially completed steel-crest
in background.*Installation of Temporary Weir at San Vicente Tunnel.*SECTION III
CONSTRUCTION

DURING THE fiscal year, construction work by the Authority consisted of completing service connections already begun. All construction work was performed by Authority maintenance personnel.

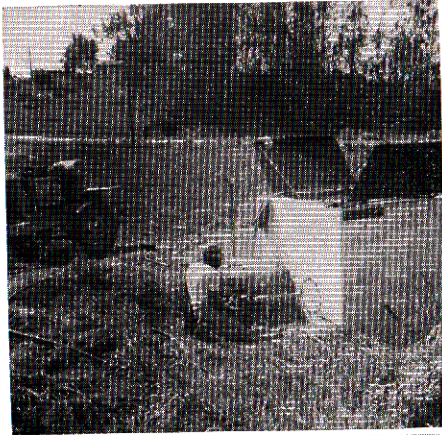
Escondido Service Connection. In February, 1951, a metering and control station to deliver water to the City of Escondido was begun, and completed by July, 1951. A small temporary metering station was used temporarily to supply water to the City during construction of the main station. Delivery of water through the permanent meter was begun on July 28. The City of Escondido leased the second room of the structure and installed chlorinating equipment for the purpose of chlorinating the Aqueduct water as it entered the City's system.

The construction work consisted of a concrete substructure in which the venturi meter and control valves were located. The superstructure has two rooms; one of which houses the Authority's meter instruments and provides access to the venturi tube and valves. It was built of concrete block with a solid concrete roof and steel sash windows, and was painted to conform with Authority standards.

The area in the vicinity of the superstructure was regraded on completion of construction to its original condition and seeded. A link-type fence was erected to enclose a small area surrounding the building.

Eucalyptus Service Connection. The permanent meter and control station through which the Authority delivered water to the Eucalyptus area of the Lakeside Irrigation District was completed during the month of July, and some water was delivered to the contractor for pipe testing of the District's distribution system on July 31. Regular deliveries were delayed because of difficulties in the operation of the District's pumping units. These pumps receive water from the Authority and pump it into the District's system and reservoir. The difficulties were finally corrected and water was delivered to the District on November 5, 1951.

Vista Service Connection. A temporary service connection to be used for delivery of Aqueduct water to Vista in exchange for water delivered by Vista to the City of San Diego was installed at Station



Cutting thru reinforced concrete structure with Authority personnel and equipment.



Chairman Heilbron inspecting Orifice pipe.



Orifice pipe in place.

Installation of Orifice Pipe at Sta 1121+70 for metering of temporary supply to Vista Irrigation District.

1121+70. In order not to require a shutdown of the Aqueduct, the connection was made to the blowoff piping which had already been installed as part of the Aqueduct.

The construction work consisted of breaking into the existing concrete blowoff structure and installing a new pipe connection to the Vista Irrigation District conduit. A stainless steel orifice plate was installed in the pipe for measuring the flow. The meter instrument was placed in a wooden structure attached to the concrete blowoff manhole.

The first water was delivered to Vista on January 1, 1951. Deliveries continued until April 15, 1951, when use of Authority water by the Vista Irrigation District was discontinued.

Rainbow State Forestry Camp. The State of California maintains a forestry fire and outlook camp about two miles east of the Aqueduct near Rainbow. The camp's water was supplied by a well which proved inadequate during the recent drought period. A contract was entered into by the State and the Metropolitan Water District for water to be delivered from the Aqueduct through the facilities of the Authority. The temporary service connection, previously installed to supply water to the Rainbow Public Utility District, was revamped and enlarged to include the meter which was to serve the State. Water will be taken by the Rainbow Forestry Camp at the metering structure and pumped by them in their pipe line to the camp which is located at a much higher elevation.

At the close of the year the Authority equipment was installed, but no water had been delivered since the State had not made connection to the Authority service outlet.

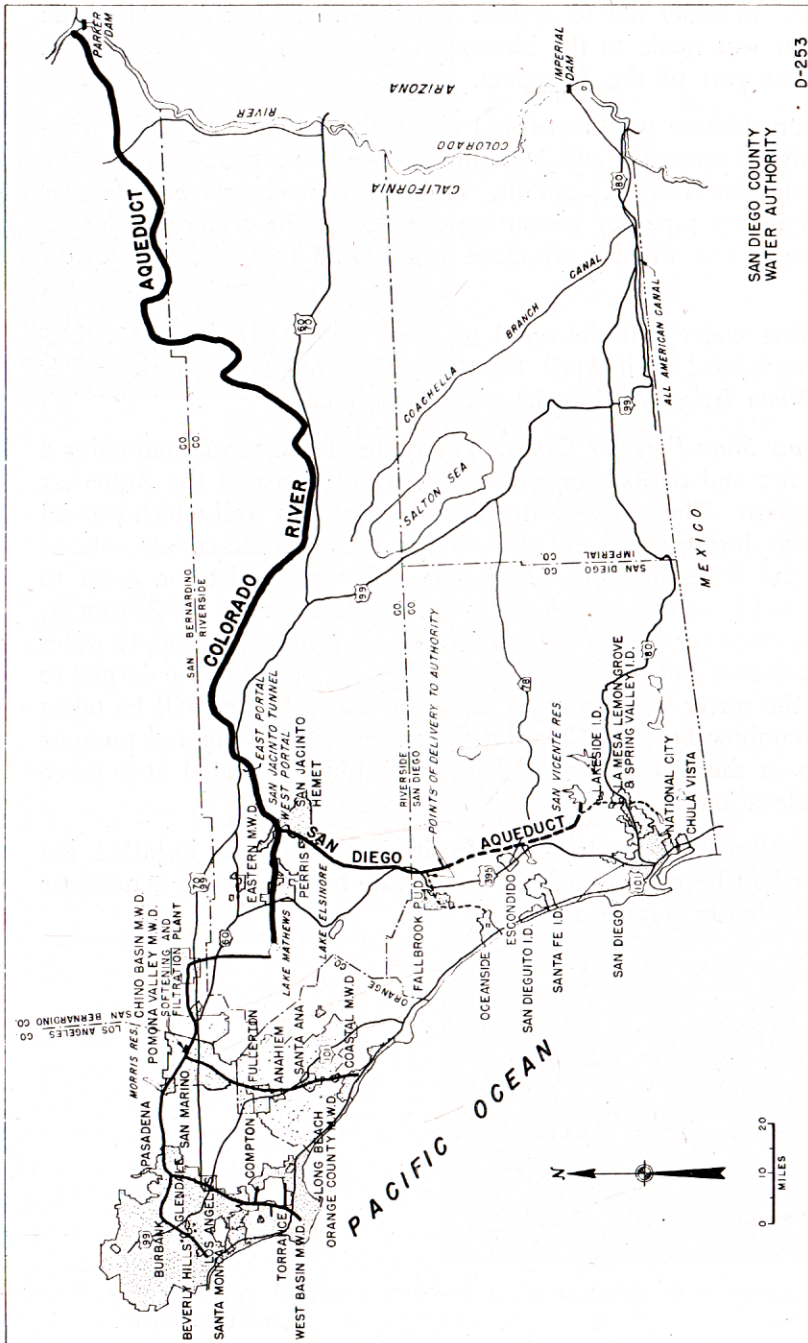


Figure 4. Colorado River Aqueduct System and Areas Served by Metropolitan Water District and San Diego County Water Authority.

SECTION IV
METROPOLITAN WATER DISTRICT

THE Authority has a large interest in the Metropolitan Water District; and because of this, the following information is included—which summarizes briefly the financial status and operation of the District.

During the year the corporate area of the Metropolitan Water District continued to expand. Two new agencies were annexed, the Chino Basin Municipal Water District, with an area of 58,899 acres and the Orange County Municipal Water District, with an area of 200,000 acres. The City of Inglewood and adjacent unincorporated areas were annexed to the West Basin Municipal Water District. There were also other smaller annexations to many of the constituent areas. At the end of the year the area of Metropolitan Water District was 995,130 acres, an increase for the year of 38 per cent.

The District area, as shown in Figure 4, now includes the corporate area of 47 cities and 20 water districts, of which the San Diego County Water Authority is the largest in area, and second only to the City of Los Angeles in assessed valuation. On the basis of this valuation the Authority has two representatives on the Board of Directors.

San Diego Aqueduct

The northerly one-half of the San Diego Aqueduct (north of San Luis Rey) continues to be maintained and operated by the District under terms of an agreement between the District and the Authority, entered into when the Authority was annexed to the District in 1946. The District has also agreed to maintain and operate the Second Barrel in this section of the Aqueduct, now under construction, when it is completed.

Area and Assessed Valuation

On June 30, 1952, the District had an area of almost a million acres (995,130 acres) and an assessed valuation in 1951 of \$4,693,-043,290; increases of 38 per cent and 9.6 percent respectively over the comparable area and assessed valuation in 1950. The average assessed valuation over the entire District in 1951 was approximately \$4700 per acre. The acreage and assessed valuation of the District for each fiscal year since its incorporation in 1929 are shown in Table 14.

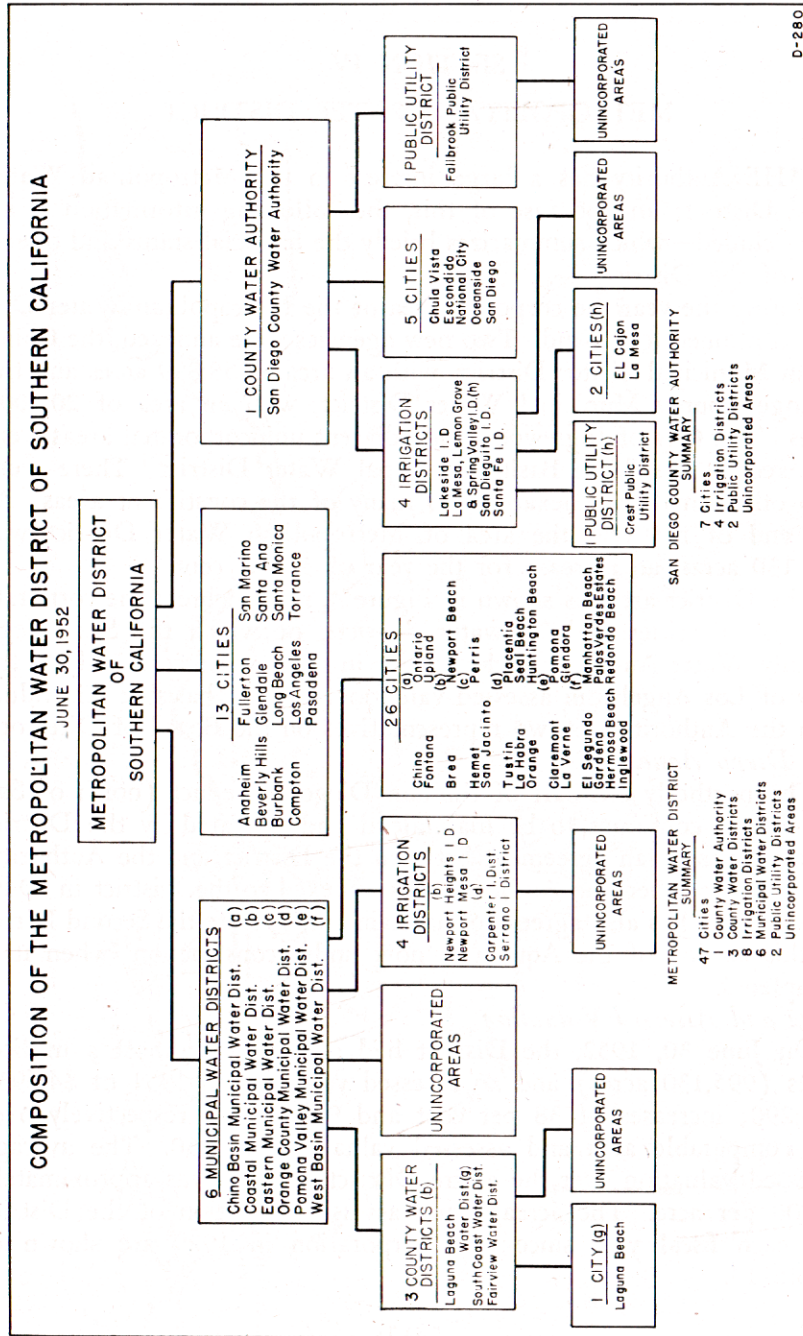


Figure 5. Composition of the Metropolitan Water District of Southern California.

TABLE 14
ASSESSED VALUATIONS AND TAX RATES OF THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Fiscal Year	Area (acres)	Assessed Valuations Total (1)	Tax Rate	
			Per \$100 Secured	Per \$100 Unsecured
1929-30	—	\$2,439,836,920	\$0.04	.00
1930-31	—	2,431,684,250	.03	.04
1931-32	—	2,382,184,445	.03	.03
1932-33	—	1,936,051,180	.04	.03
1933-34	—	1,654,403,890	.04	.04
1934-35	—	1,587,147,565	.10	.04
1935-36	—	1,783,531,020	.20	.10
1936-37	—	1,789,160,685	.37	.20
1937-38	—	1,827,765,725	.40	.37
1938-39	—	1,896,966,255	.40	.40
1939-40	—	1,910,152,190	.42	.40
1940-41	389,588	1,841,248,450	.49	.42
1941-42	399,875	1,900,599,934	.48	.49
1942-43	400,614	2,001,924,735	.48	.48
1943-44	401,190	2,005,496,430	.48	.48
1944-45	401,536	2,109,192,795	.48	.48
1945-46	402,779	2,159,731,425	.50	.48
1946-47	501,425	2,413,186,570	.48	.50
1947-48	546,573	3,443,212,822 (2)	.35	.48
1948-49	578,368	3,883,081,225	.34	.35
1949-50	585,184	4,181,812,855	.34	.34
1950-51	721,850	4,281,519,725	.31	.34
1951-52	995,130	4,693,043,290 (3)	.30	.31
1952-53	—	5,452,996,795	.28	.30

(1) Includes secured, unsecured, and public utility valuations.
 (2) First year in which Authority assessed valuation was included in District's assessed valuation.
 (3) Includes assessed valuation of Eastern Municipal District which annexation was completed on July 20, 1951.

Tax Rates

A decrease in rate occurred in the 1951-52 tax levy. The tax rate dropped from 31¢ to 30¢ per \$100 assessed valuation. This was the fifth decrease in the District's regular rate since annexation of the Authority in 1946. The District's regular tax rate was 50¢ per \$100 of assessed valuation the year prior to the Authority's annexation. The District's regular tax rate in each year since 1929-30, when the first tax was levied, is shown in Table 14.

In addition to the regular tax levy, which is spread uniformly against taxable property in all constituent areas, the District makes a special

tax assessment against taxable property in areas which still have outstanding indebtedness on annexation fees contracted for at the time of their annexation to the District.

The amount raised each year by the special tax levy on any area is substantially the same during the period agreed upon at the time the area was annexed. The annexation charge for the original Authority area and for areas since annexed to the Authority is payable over a period of 30 years from date of annexation. The total amounts paid by each Authority area to June 30, 1951, the tax levy for the fiscal year 1950-51, and the resulting tax rate are shown in Table 15.

Finances

The District's General Balance sheet as of June 30, 1952 is shown in Table 16. During the year outstanding Metropolitan Water District bonds in the amount of \$4,263,000 were redeemed. Payments were also made to the San Diego County Water Authority and the City of Pasadena on contractual obligations. These payments resulted in a decrease of \$4,693,000 in long-term indebtedness which on June 30, 1952 totaled \$186,732,000. Interest payments on Metropolitan Water District bonds equaled \$6,928,681 in this fiscal year.

The total cash and marketable securities held by the District increased during the year by \$3,064,920 to a total of \$35,376,247. Of this amount \$22,707,632 was held in the Interest and Redemption Fund for future use in meeting bond service.

Water Sales

The District obtains its water by pumping it from the Colorado River at Lake Havasu, a short distance above Parker Dam. The water is pumped through force lifts to its highest elevation at Hayfield from which point it flows by gravity through pipes and tunnels to Lake Mathews for supplying the Los Angeles Metropolitan area, and to the San Jacinto Reservoir from which the San Diego Aqueduct receives its water. The total water pumped from the Colorado River in the fiscal year 1951-52 was 216,255 acre feet. Of this quantity, 10,034 acre feet were lost by seepage and evaporation in the Aqueduct, some of which is open canal between the Colorado River and the Hayfield pumping plant. The leakage losses were less than in the previous year due to the relatively high minimum water temperature, which kept cracks to a minimum; the District's leakage losses were also reduced due to repair work in sealing of cracks.

TABLE 15

METROPOLITAN WATER DISTRICT SPECIAL TAX RATES ON AUTHORITY AREAS FOR ANNEXATION CHARGES

Agency & Area	Date of Annexation	Amount of Annexation Fee	Period of Special Tax Levies		Special Tax Levies to 6/30/51	Fiscal Year 1951-52		Remaining Balance of Annexation Fee 6/30/52
			First Year	Last Year		Tax Levy	Tax Rate \$/100	
Chula Vista	12-17-46	\$13,045,000.00	1947-48	1976-77	\$1,750,770.12	\$430,835.82	10¢	\$10,863,394.06
Fallbrook Public Utility District (area as of 12-17-1946)								
Lakeside Irrigation District (area as of 12-17-1946)								
La Mesa, Lemon Grove and Spring Valley Irrigation District (area as of 12-17-1946)								
National City	10-9-50	386,000.00	1951-52	1980-81	0	13,055.83	22¢	372,944.17
Oceanside								
San Diego	8-1-50	34,600.00	1951-52	1980-81	7,100.00	916.80	16¢	26,583.20
Escondido								
Fallbrook Public Utility District—1950 Annexation	7-18-52	352.00	1951-52	1951-52	0	352.00	Cash	0
Lakeside Irrigation District—1951 Annexation								
La Mesa, Lemon Grove and Spring Valley Irrigation District—Great Public Utility District Annexation	12-13-48	10,500.00	1949-50	1978-79	718.89	335.03	9¢	9,446.08
1951 Annexation	5-14-52	9,875.00	1951-52	1951-52	0	9,875.00	Cash	0
San Diego Irrigation District	12-13-48	187,100.00	1949-50	1978-79	12,800.71	6,472.37	11¢	167,826.92
Santa Fe Irrigation District	12-13-48	167,000.00	1949-50	1978-79	11,245.84	5,796.44	12¢	149,957.72
Totals		\$13,840,427.00			\$1,782,635.56	\$467,639.29		\$11,590,152.15

TABLE 16
GENERAL BALANCE SHEET JUNE 30, 1952
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
ASSETS

<i>Permanent Facilities:</i>			
Preliminary surveys, engineering and organization expense		\$ 4,631,318	
Original aqueduct construction	\$178,772,262		
Additional construction & improvements	8,055,403		
Morris Dam & appurtenant facilities	6,311,180		
San Diego Aqueduct (estimated)	7,000,000		
Parker Power Plant (estimated)	3,300,000	203,438,845	\$208,070,163
Other construction costs:			
By Los Angeles	\$ 1,203,778		
By Pasadena	209,738	\$ 1,413,516	
Unused power & diverted water to 7/31/41	2,790,868		
Interest on M.W.D. bonds during construction period	34,767,175	\$ 38,971,559	
Less interest received on construction funds		201,070	38,770,489
Contract obligations & commitments (in progress)			7,264,807
Inventories—Operation & Maintenance			451,897
<i>Cash:</i>			
On hand and on deposit	\$ 9,714,671		
Less outstanding demands	225,524		9,489,147
<i>Marketable Securities</i>			25,887,100
<i>Accounts Receivable:</i>			
Uncollected tax assessments			
Current year	\$ 369,136		
Prior years	393,542	\$ 762,678	
Interest accrued on government securities		43,425	
Cash with employees & others		2,425	
Water billings		236,646	
Sundry		10,065	1,055,239
<i>Accounts Receivable—Deferred:</i>			
Special charges—annexation	\$ 48,356,765		
Sundry	13,500		48,370,265
TOTAL ASSETS			\$339,359,107

TABLE 16 (Continued)
GENERAL BALANCE SHEET JUNE 30, 1952
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
LIABILITIES

<i>Long Term Indebtedness:</i>			
Outstanding M.W.D. bonds		\$173,193,000	
Contract obligations:			
City of Pasadena	\$ 3,864,000		
San Diego County Water Authority	6,375,000		
U.S. America—Parker Power House	3,300,000	13,539,000	\$186,732,000
<i>Accounts Payable:</i>			
Bond interest—coupons not presented	\$ 81,631		
Bond interest—accrued—not due		2,629,925	2,711,556
Sundry supplies & materials	\$ 165,842		
Employees' medical fund	10,898		
Special deposits	202,703		379,443
<i>Contract Obligations & Commitments (in progress)</i>			
			7,264,807
<i>Reserves for Depreciation, Etc.:</i>			
Depreciation of plant & equipment	\$ 3,020,249		
Replacement of automotive & construction equipment		52,810	
Reserve for industrial accident claims		31,051	
Reserve for fire, third party & automotive collision damage claims		71,251	3,175,361
<i>Capital Investment of Municipalities:</i>			
San Diego County Water Authority	8,220,163		
Other Municipalities	170,770,910		
Sub-Total	\$178,991,073		
Cities withdrawn & excluded	14,131	\$179,005,204	
Special charges—annexation		48,356,765	
Sub-Total		\$227,361,969	
<i>Cumulative Excess of Interest & Other Charges over Revenues:</i>			
This fiscal year	\$ 6,825,484		
Prior to this year	82,961,299	89,786,783	\$137,575,186
Funds collected & applied to construction	\$ 1,421,331		
Work contributed by municipalities (connections)	99,423	1,520,754	139,095,940
TOTAL LIABILITIES			\$339,359,107

The total water sales to member municipalities during the year was 151,290 acre feet, an increase of 12,796 acre feet over the previous year. The Authority purchased water from the District in the amount of 62,618 acre feet, or 41 per cent of the water sold by the District. A total of 193,754 acre feet was sold by the District during the year including that sold to areas outside its boundaries. This was a gain of 28,282 acre feet or 17 per cent over that sold in the previous year. Most of the water sold to areas outside the District, of which 39,177 acre feet was unsoftened water, was released into the Santa Ana River channel at the river crossing of the upper feeder for use in replenishing the underground storage of the Orange County Municipal District prior to its annexation.

Water sales to member Municipalities included natural and softened waters. The sales to each member agency and to others are shown in Table 17.

TABLE 17

WATER SALES BY METROPOLITAN WATER DISTRICT

Fiscal Years 1941-42 to 1951-52

Year	To Member Municipalities				Total to Agencies Acre feet	To Others Acre feet	Total Acre feet
	Natural Water		Softened Water				
	Acre feet	Per cent	Acre feet	Per cent			
1941-42	0	0	9,372.6	100	9,372.6	70.7	9,443.3
1942-43	0	0	14,457.8	100	14,457.8	2,626.4	17,084.2
1943-44	0	0	15,874.9	100	15,874.9	3,301.8	19,176.7
1944-45	0	0	30,591.3	100	30,591.3	1,715.7	32,307.0
1945-46	0	0	46,685.8	100	46,685.8	1,264.2	47,950.0
1946-47	0	0	59,861.8	100	59,861.8	524.0	60,385.8
1947-48	41,093.5	36	71,995.4	64	113,088.9	116.8	113,255.7
1948-49	71,642.6	49	73,237.1	51	144,879.7	128.4	145,008.1
1949-50	69,308.0	49	72,936.0	51	142,244.0	23,371.6	165,615.6
1950-51	75,000.9	54	63,493.1	46	138,494.0	26,978.6	165,472.6
1951-52	66,674.3	44	84,616.1	56	151,290.4	42,464.2	193,754.6

Water Rates

No change was made in the rate for water sold to member agencies during the year. The base rate for untreated water continued at \$10 per acre foot with an additional charge of \$10 per acre foot for treated water. The rate for water sold to nonmember agencies varies in accordance with agreements entered into with each such agency for the delivery of water.

Water Production of District Member Municipalities

The water production of member Municipalities of the District totaled 805,214 acre feet for the year, an increase of 9.1 per cent over the previous year. The agencies of the San Diego County Water Authority produced 90,393 acre feet of water during the year, or 11.2 per cent of the total produced within the District. The water production of each member Municipality is shown in Table 18.

Construction

The rapid increase in water requirements of the District area has necessitated a construction program which is expected to require the expenditure of approximately \$52,000,000 during the next three years. The program will include the installation of additional pumping units in each of the five stations and the laying of additional feeder pipe lines.

Quality of Water

Water for the Authority is diverted from the Colorado River Aqueduct before it reaches the Frank E. Weymouth Memorial Treatment and Softening Plant at La Verne and is therefore natural Colorado River water.

The average chemical analyses of Colorado River water before and after treatment at the Weymouth Memorial Treatment Plant at La Verne are shown in Table 19:

The average analyses of water samples taken at the west portal of San Jacinto Tunnel where water is diverted into the San Diego Aqueduct are shown in Table 20.

TABLE 18
WATER PRODUCTION—METROPOLITAN WATER DISTRICT CONSTITUENT AREAS

Constituent Area	Total Water Production			Source of Water Produced—1951-52			
	1950-51 amount ac. ft.	1951-52 amount ac. ft.	Per cent increase or decrease	M.W.D.			Other
				Amount ac. ft.	Per cent of total	Amount ac. ft.	
Anaheim	3,213	3,466	+ 7.9	2,899	83.7	567	16.3
Beverly Hills	8,844	8,302	- 1.7	1,831	22.1	6,471	77.9
Burbank	16,891	18,420	+ 9.1	960	5.2	17,460	94.8
China Basin M.W.D.	7,507	69,015	-	3,910	51.0	69,015	100.0
Coastal Municipal Water District	4,260	7,671	+ 2.2	57	1.2	3,761	49.0
Compton	3,994	4,569	+ 7.3	2,456	57.9	4,512	98.8
Fullerton	18,976	18,408	- 3.0	1,243	6.8	1,781	42.1
Glendale	34,730	35,300	+ 1.6	14,778	41.9	17,165	93.2
Long Beach	398,869	399,149	+ 0.1	15,852	4.0	383,297	58.1
Los Angeles	24,335	24,733	+ 1.6	12,632	51.1	12,101	48.9
Pasadena	49,496	45,904	- 7.3	4,935	10.8	40,949	89.2
Pomona Valley Municipal Water Dist.	96,731	90,393	- 6.6	55,572	61.5	34,821	38.5
San Diego County Water Authority*	4,002	3,649	- 8.8	6,714	88.8	3,649	100.0
San Marino	7,298	7,560	+ 3.6	10,807	95.4	846	11.2
Santa Ana	10,983	11,334	+ 3.3	3,540	57.9	527	4.6
Santa Monica	5,030	6,111	+ 21.5	6,420	13.7	2,571	42.1
Torrance	42,862	46,993	+ 9.6	144,626	18.0	40,573	86.3
West Basin Municipal Water District	738,023	805,214	+ 9.1	660,588	82.0		
Totals							

NOTE: Quantities include total water diverted into agencies' transmission and distribution systems from sources of supply.
* Water production reported by San Diego County Water Authority: Local 33,841 acre-feet, Metropolitan Water District 56,552 acre-feet—total 90,393 acre-feet. The difference between District and Authority figures for use of Colorado River water represents water in storage or loss by evaporation.

TABLE 19
ANALYSIS OF COLORADO RIVER WATER
AVERAGE FOR YEAR ENDING JUNE 30, 1952
(By The Metropolitan Water District of Southern California
at La Verne Treatment Plant)

Constituent	Symbol	Colorado River Water	
		Natural	Softened
Silica	SiO ₂	6.4 p.p.m.	8.6 p.p.m.
Iron	Fe	Tr	Tr
Calcium	Ca	77	30
Magnesium	Mg	29	12.5
Sodium	Na	98	180
Potassium	K	4	3
Carbonate	CO ₃	1	6
Bicarbonate	HCO ₃	139	116
Sulfate	SO ₄	286	286
Chloride	Cl	80	83
Nitrate	NO ₃	0.3	0.3
Boron	B	0.1	0.1
Fluoride	F	0.3	0.3
Total dissolved solids		652	668
Hardness as CaCO ₃			
Total		312	125
Carbonate		116	105
Noncarbonate		196	20
Free carbon dioxide	CO ₂	0	0
Hydrogen ion concentration	pH	8.4	8.8
Electrical conductivity	ECX10 ⁶	1025	1080

TABLE 20
ANALYSIS OF COLORADO RIVER AQUEDUCT WATER
TAKEN AT WEST PORTAL OF SAN JACINTO TUNNEL
For Year Ending June 30, 1952

Constituent	Symbol	Analyses		
		Average	Maximum	Minimum
Silica	SiO ₂	9.6 p.p.m.	10.5 p.p.m.	7.0 p.p.m.
Iron	Fe	0.04	0.05	0.01
Calcium	Ca	78	81	72
Magnesium	Mg	28	29	27
Sodium	Na	94	98	90
Potassium	K	4	5	4
Carbonate	CO ₃	2	6	0
Bicarbonate	HCO ₃	143	153	137
Sulphate	SO ₄	276	287	264
Chloride	Cl	76	79	73
Nitrate	NO ₃	.8	1.1	0.4
Total dissolved solids		639	656	618
Hardness as CaCO ₃				
Total		308	317	293
Carbonate		120	125	114
Noncarbonate		188	197	178
Alkalinity—Phenolphthalein		1	5	0
Alkalinity—Methyl Orange		120	125	114
Free carbon dioxide		1	2	0
Hydrogen ion concentration	pH	8.3	8.5	8.2
Electrical conductivity	ECX10 ⁶ @ 25° C	996	1035	896

NOTE: For analyses of monthly samples, see table 11.

SECTION V LEGAL

DURING THE year the Authority's General Counsel, in addition to the regular staff work of the Authority, was chiefly engaged in the negotiations with the United States Government and the Metropolitan Water District looking towards the construction of the Second Barrel of the San Diego Aqueduct.

Second Barrel Negotiations

The bill which had been introduced in Congress in the preceding fiscal year was finally approved as Public Law 171 of the 82d Congress on October 11, 1951, and at the same time an appropriation of \$18,000,000 was authorized by Congress for the use of the Navy in the construction of the line. The bill provided that the line should be constructed by the Navy, or any other governmental agency which the Navy might select, for the primary purpose of providing adequate water supply for governmental installations within the area of the San Diego County Water Authority, subject to the condition that the works should be constructed within the appropriation authorized and that the cost of construction would be reimbursable to the Government, under a contract with the County Water Authority which should include interest on the deferred payments of the true cost of construction at the prevailing long-term interest rates of government obligations.

Representatives of the Navy Department's Bureau of Yards and Docks arranged a conference in San Diego for the month of November, 1951, for the purpose of working out the terms of the proposed contract. Participating in the conference were James H. Howard, General Counsel of the Metropolitan Water District, Shelley J. Higgins, Assistant City Attorney of The City of San Diego, Phil D. Swing, counsel for the Fallbrook Public Utility District, and the Authority's staff. A form of contract was tentatively agreed upon which left the capacity of the line to be constructed subject to engineering determination but provided a minimum capacity of 80 cubic feet per second. Due to the interest of the United States in protecting its local installations, the contract required that each agency of the Authority enter into a direct agreement with the Government that the water to be delivered from the Aqueduct would be subject first to the obligation to supply

any governmental installation located within the corporate area of such member agency at a rate which would be nondiscriminatory. The proposed form of contract between the Government and the individual agencies was submitted to each of the member agencies of the Authority for their comments and acceptance or rejection. Each agency advised the Authority that the terms of the contract were acceptable and furnished an opinion of their legal adviser to the effect that the contract could be legally entered into by the agency.

The principal contract for the construction of the line provided for the transfer of the northern section to The Metropolitan Water District of Southern California, pursuant to the terms of annexation of the Authority to Metropolitan which obligated the District at its expense to enlarge the northern portion of the Aqueduct when necessary to fully serve the Authority area. Negotiations were entered into with the Board of Directors of the Metropolitan Water District to secure the District's acceptance and participation in the construction and financing of the Second Barrel of the Aqueduct under the proposed contract with the Government.

The Metropolitan Water District's Board of Directors found the contract to be objectionable for the reason that no specific capacity was provided for that portion of the line which Metropolitan was asked to take over and finance. In the negotiations following, the Government agreed to construct the line in the northern section at a capacity of 120 cubic feet per second, provided that the excess capacity over 80 cubic feet per second would be reserved for use by government installations to be supplied by the Metropolitan Water District. The directors of the Metropolitan Water District would not approve the reservation of capacity for governmental use—and as an alternative offered to construct the northerly portion of the line entirely at the District's expense and at such capacity as they desired. This suggestion proved to be unacceptable to the Government, the Navy Department taking the position that under Public Law 171 the Government was obligated to construct the entire line and was not authorized to permit the construction of any portion of it by other than a federal agency.

Following a series of conferences, including a joint conference between the Secretary of the Navy and representatives of the Authority and Metropolitan, it was agreed that the Government would construct the entire line, increasing the capacity of the northerly portion to be taken over by Metropolitan to 95 cubic feet per second—the Metropolitan Water District to have exclusive control of the northern portion

of the line, subject only to its obligation to deliver through such line the water to which the San Diego County Water Authority would be entitled from time to time as a unit member of the District.

The Government's agreement to construct the northerly portion of the line with a capacity of 95 cubic feet per second, rather than the 80 cubic feet per second design capacity of the remaining portion of the line, was obtained only after the Authority had established that the additional 15 second feet was required in order to assure the delivery through the Second Barrel of the full 80 second feet into the San Diego area below the Fallbrook-Oceanside Branch line.

With the approval of the governing bodies of all of the affected agencies obtained, an election on the authorization of the contract, held throughout the area of the County Water Authority on February 26, 1952, carried by a substantial majority. Separate contracts between each member agency and the Government were duly executed, and the contract for the construction of the Second Barrel and the repayment of the true cost thereof was entered into as of April 1, 1952. The rate of interest carried into the contract on the formula provided by Public Law 171 was established at 2.599 per cent.

Annexations

During the year the applications of the Carlsbad area, the Vista Irrigation District, and others, for annexation to the Authority, continued to receive the attention of the General Counsel. The application of the South Bay Irrigation District, which included the withdrawal of the City of Chula Vista as a separate unit of the Authority (its corporate area to remain within the Authority as a part of the South Bay Irrigation District), was perfected, and the annexation of the South Bay Irrigation District and withdrawal of the City of Chula Vista as a separate unit were effected shortly after the close of the fiscal year.

During the year the Authority was engaged in no litigation, nor was any legislation pending in the State Legislature affecting the County Water Authority Act.

EVERTS and ESENOFF
 Certified Public Accountants
 Suite 727, First National Building
 San Diego, California

September 30, 1952

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 beginning July 1, 1951, and ending June 30, 1952. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion the accompanying balance sheet and statement of income and surplus present fairly the financial position of the San Diego County Water Authority at June 30, 1952, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles 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

SECTION VI FINANCIAL

THE AUTHORITY'S financial operations have continued to reflect the long-range policy of the Board of Directors, as described in detail in the Third Annual Report. In general, operation and maintenance costs have been met primarily from revenues from the sale of water, while requirements for payments to the Federal Government, and for a sinking fund for the retirement of the Authority's bonded debt have been met by tax levies.

During the fiscal year 1951-52, water sales amounted to \$723,511.80, or \$222,300 less than the preceding year. This reduction in revenues, during a period of heavy expenditures in connection with the Second Barrel of the San Diego Aqueduct, depleted the General Fund to the point where it became necessary to re-impose a 2c tax levy for operation and maintenance for the first time since 1948-49. This did not, however, result in a higher total tax rate, as increased assessed valuation in the corporate area of the Authority made it possible to continue the previous year's rate of 10c per \$100.

Under the terms of the Authority-Navy lease-purchase contract, the cost of the San Diego Aqueduct, estimated at \$14,125,000, is to be repaid at \$500,000 per year, without interest. Prior to 1951-52, pending completion of the Aqueduct, payments were made under the terms of Supplemental Agreement No. 3 at the rate of \$250,000 per year. Effective January 1, 1952, as a result of the Government's determination that the Aqueduct was completed under the provisions of the contract, the temporary agreement was revoked, and payments since that date have been at the rate of \$500,000 per year, payable quarterly. Under the terms of the Authority's annexation to the Metropolitan Water District, the District pays the Authority one-half of that amount.

Following receipt of the Government's notification that the Aqueduct was determined to be complete as of January 1, 1952, an audit of the Government's statement of true cost was authorized by the Boards of Directors of the Authority and the Metropolitan Water District, with the District agreeing to share the cost. The firm of Everts and Esenoff, Certified Public Accountants, was engaged to perform the audit, and the work was in progress at the end of the fiscal year.

At June 30, 1952, cash and marketable securities amounted to \$1,488,443.28 as compared with \$1,378,084.88 in 1950-51. Of this amount, \$1,198,568.11 was in securities of the United States Government, earning an average rate of approximately 1.95 per cent. During the year reserves were increased by \$364,973.00, and long-term obligations were reduced by \$832,111.00. In the overall situation the equity accounts increased \$2,071,141.00, which was partially offset by a decrease in surplus of \$268,691.00, leaving a net increase of \$1,802,450.00 in the Authority's financial position for the year.

This report contains several tables in addition to those included in reports of previous years. It is hoped that such tables will assist in a better understanding of the Authority's financial position and in reflecting the results of the financial policies as determined by the Board of Directors.

The Authority's accounting system follows the basic principles of fund accounting normally used in municipalities, modified to the extent necessary to reflect conditions peculiar to the Authority. The accounts are maintained on the accrual basis, and with the exception of the plant ledger, the entire system has been adapted to machine accounting.

All accounts have been regularly audited by the firm of Everts and Esenoff, Certified Public Accountants, whose certificate is included in the report.

The financial operations of the Authority for the fiscal year 1951-52 are summarized in Tables 21 to 31, appearing in the following pages of this section.

TABLE 21
STATEMENT OF AUTHORITY ASSESSED VALUATIONS AND TAX RATES TO JUNE 30, 1952

Fiscal Year	Secured		Public Utilities	Unsecured Personal	Total	Tax Rate per \$100	
	Real	Personal				Secured	Unsecured
1945-46	\$212,082,975.00		\$28,253,700.00	\$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
1950-51	306,104,930.00		43,595,730.00	44,717,740.00	394,418,400.00	0.10	0.10
1951-52	344,620,030.00		48,452,940.00	50,904,035.00	443,977,005.00	0.10	0.10

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 22
STATEMENT OF INCOME AND EXPENSE
July 1, 1951 to June 30, 1952

INCOME DIVISION		
OPERATING INCOME		
Water sales		\$723,511.80
<i>Deduct Operating Costs</i>		
Cost of water sold:		
Inventory of water in storage		
7/1/51	\$ 34,888.40	
Water purchased	626,385.00	
Storage charges	6,097.60	
	<u>667,371.00</u>	
Less inventory of water in storage 6/30/52	64,306.40	\$603,064.60
Direct operating expense	32,816.98	
General and administrative expense	71,350.15	
	<u>707,231.73</u>	
Total Operating Costs		707,231.73
<i>Net Operating Income Before Depreciation and Debt Service Expense</i>		
		16,280.07
<i>Deduct Depreciation & Debt Service Expense:</i>		
Depreciation	99,910.72	
Debt Service Expense	40,949.55	140,860.27
	<u>140,860.27</u>	
<i>Net Operating Income (Deficit)</i>		(124,580.20)
INCOME CREDITS:		
Revenue from taxes	128,050.29	
Less collection expense	208.30	127,841.99
	<u>127,841.99</u>	
Miscellaneous revenues	3,616.03	131,458.02
	<u>131,458.02</u>	
Net Income for the year to Surplus		\$ 6,877.82

TABLE 22 (Continued)
STATEMENT OF INCOME AND SURPLUS
July 1, 1951 to June 30, 1952

SURPLUS DIVISION			
SURPLUS July 1, 1951:			
Appropriated surplus:			
Continuing appropriations	\$123,438.65		
Water in storage	34,888.40	\$158,327.05	
	<u>158,327.05</u>		
Unappropriated surplus		224,566.03	\$382,893.08
		<u>224,566.03</u>	
<i>Additions to Surplus:</i>			
Depreciation charged to operations, entailing no expenditure of current funds ..		99,910.72	
Refunds of prior year's expenditures		2,246.94	
Net income for the year from income division		6,877.82	
Petty cash fund*		100.00	109,135.48
		<u>109,135.48</u>	
Total			492,028.56
<i>Deductions from Surplus:</i>			
Expenditures for construction work		177,580.33	
Expenditures for furniture, fixtures and equipment		146.56	
Transfer to General Reserve Fund		200,000.00	377,726.89
		<u>377,726.89</u>	
Surplus June 30, 1952			\$114,301.67
			<u>\$114,301.67</u>
Consisting of:			
Appropriated surplus:			
Continuing appropriations	\$ 3,195.61		
Water in storage	64,306.40		
Petty cash fund	100.00	\$ 67,602.01	
	<u>67,602.01</u>		
Unappropriated surplus			46,699.66
			<u>46,699.66</u>
			\$114,301.67

* Previously included in reserves.

TABLE 23
STATEMENT OF FINANCIAL POSITION
June 30, 1952

ASSETS			
CURRENT ASSETS:			
Cash with treasurer	\$	47,907.34	
Petty cash		100.00	
Accounts receivable		5,572.70	
Delinquent taxes receivable	\$	2,830.53	
Less allowance for estimated losses		2,830.53	
Inventory of water in storage		64,306.40	
Total Current Assets	\$		117,886.44
OTHER ASSETS:			
Annexation charges receivable— not due			41,175.11
SPECIAL FUND ASSETS:			
General Reserve Fund:			
Cash with treasurer		100,109.40	
Interest receivable		2,745.00	
Investments		250,000.00	352,854.40
Bond Interest and Sinking Fund:			
Cash with treasurer		32,168.08	
Cash with fiscal agent for payment of bond interest		20,495.00	
Delinquent taxes receivable	4,478.09		
Less allowance for estimated losses	4,478.09		
Investments		472,752.13	525,415.21
U. S. Government Contract Fund:			
Cash with treasurer		89,095.35	
Delinquent taxes receivable	8,037.89		
Less allowance for estimated losses	8,037.89		
Investments		475,815.98	564,911.33
Due from Metropolitan Water District			6,437,500.00
Cost of participation rights in Metropolitan Water District to June 30, 1952		19,798,476.70	
Fixed Assets—Table 22	9,039,815.99		
Work in progress	249,812.48	9,289,628.47	29,088,105.17
			<u>\$37,127,847.66</u>

TABLE 23 (Continued)
STATEMENT OF FINANCIAL POSITION
June 30, 1952

LIABILITIES, RESERVES AND EQUITY ACCOUNTS			
CURRENT LIABILITIES:			
Accounts payable	\$	2,536.35	
Advances by agencies for construction		1,048.42	
Total Current Liabilities	\$		3,584.77
RESERVES:			
For annexation charges—not due		41,175.11	
For General Reserve Fund Balance ..		352,854.40	
For bond interest coupons matured .. \$	20,495.00		
For amount provided to retire bonds at maturity	504,920.21	525,415.21	
For amount provided to retire U.S. Government Contract obligation....		564,911.33	
Total Reserves			1,484,356.05
LONG TERM OBLIGATIONS:			
Bonds payable—not due		2,000,000.00	
Estimated balance due U. S. Govern- ment on cost of Aqueduct		12,875,000.00	
Balance due Metropolitan Water District on annexation charges		11,592,527.92	
Total Long Term Obligations....			26,467,527.92
EQUITY ACCOUNTS—Table 23		9,058,077.25	
SURPLUS—Exhibit B		114,301.67	9,172,378.92
			<u>\$37,127,847.66</u>

TABLE 24
STATEMENT OF GENERAL FIXED ASSETS
June 30, 1952

San Diego Aqueduct (est. Authority cost)	\$7,062,500.00
Hodges Outlet	8,710.79
Escondido Outlet	7,040.00
La Mesa-Sweetwater Extension	1,456,946.51
Lakeside Metering Station	2,622.04
Fallbrook-Oceanside Branch	833,782.70
Rainbow Metering Station	195.40
Escondido Headquarters	24,911.22
Furniture and fixtures	6,085.66
Office equipment	6,518.21
Engineering equipment	730.00
Automotive equipment	24,447.48
Miscellaneous equipment	3,553.30
	<hr/>
	9,438,043.31
Less allowance for depreciation	398,227.32
	<hr/>
Net book value June 30, 1952	\$9,039,815.99

TOTAL 25
STATEMENT OF EQUITY ACCOUNTS
June 30, 1952

<i>Investment in Fixed Assets:</i>			
Financed from bond funds	\$1,848,335.19		
Financed from U.S. Government contract	7,062,500.00		
Financed from current revenues	764,022.76		
Financed from agencies' contributions for special construction	12,997.84		
	<hr/>		
	9,687,855.79		
Less depreciation to June 30, 1952....	398,227.32		
	<hr/>		
Net Investment in Fixed Assets		\$ 9,289,628.47	
<i>Deduct:</i>			
Amount available for retirement of bonds	504,920.21		
Amount required for retirement of bonds	1,495,079.79	2,000,000.00	
	<hr/>		
Amount available for retirement of Authority's share of U.S. Government contract	564,911.33		
Amount required for retirement of Authority's share of U.S. Government contract	5,872,588.67	6,437,500.00	
	<hr/>		
Net Equity in Fixed Assets			\$ 852,128.47
Cost of participation rights in Metropolitan Water District		19,798,476.70	
Less amount unpaid at June 30, 1952		11,592,527.92	
		<hr/>	
Net Equity in Participation Rights			8,205,948.78
Total Equity Accounts, Net			<hr/> <hr/>
			\$9,058,077.25

TABLE 26
STATEMENT OF APPROPRIATIONS AND EXPENDITURES
July 1, 1951 to June 30, 1952

E&A No.	Purpose	Prior Year Appropriations Carried Over	Appropriations 1951-52	Expenditures 1951-52	Cancelled Appropriations	Unexpended Appropriations June 30, 1952
101	San Diego Aqueduct	\$ 1,360.26		\$ 150.89	\$ 1,209.37	\$3,195.61
110	Construction of Access Roads	3,195.61				
112	Preliminary Investigation, 2nd Barrel	17,851.85		7,261.16	10,590.69	
122	Construction of Escondido Outlet	1,030.93	\$ 1,100.00	2,130.93		
126	Plans and Specifications—2nd Barrel	100,000.00		100,000.00		
127	Operation and Maintenance	111,200.00		99,690.78	11,509.22	
128	Purchase of Water	779,000.00		632,482.60	146,517.40	
129	Authority Contributions to State Retirement System	6,400.00		6,072.46	327.54	
130	Bond Interest Coupon Redemption	40,750.00		40,750.00		
131	Lease-Purchase of San Diego Aqueduct	187,500.00		187,500.00		
134	Special Election for Approval of 2nd Barrel Contract	80,000.00		66,787.35	13,212.65	
		\$123,438.65	\$1,205,950.00	\$1,142,826.17	\$183,366.87	\$3,195.61

TABLE 27
SUMMARY STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
July 1, 1951 to June 30, 1952

	Cash Balance July 1, 1951	Cash Receipts	Inter-Fund Transfers		Cash Disbursements	Cash Balance June 30, 1952
			In	Out		
General Fund	\$131,269.50	\$1,030,596.01	\$137,597.62	\$140,247.81	\$1,111,107.98	\$ 47,907.34
Bond Interest & Sinking Fund	25,278.28	1,017,226.55		40,000.00	970,336.75	32,168.08
U. S. Contract Fund	125,006.34	916,134.01	3.61	95,696.03	856,352.58	89,095.35
General Reserve Fund	150,000.00	59,910.80	140,244.20		250,045.60	100,109.40
Water Conservation Trust Fund		12,082.35		1,701.59	10,380.76	
Total—All Funds	\$431,554.12	\$3,035,949.72	\$277,645.43	\$277,645.43	\$3,198,223.67	\$269,280.17

TREASURY CASH ON DEPOSIT JUNE 30, 1952

First National Trust & Savings Bank	\$553,997.94
Bank of America National Trust & Savings Association	70,495.00
Total Bank Balances	424,492.94
Less: Outstanding Warrants	\$134,717.77
Special Deposit for payment of Bond Interest Coupons	20,495.00
Treasury Cash June 30, 1952	\$269,280.17

TABLE 28
STATEMENT OF TAX ASSESSMENTS AND COLLECTIONS
as of June 30, 1952

Member Agency	Tax Assessments to Date	Adjustments to Tax Assessments	Tax Collections	Interest and Penalties	Tax on Options	Receipts in Lieu of Taxes	Misc. Tax Sales	Less Refunds	Net Total Collections	Uncollected 6-30-52
Chula Vista	\$ 78,150.01	\$ 74.85	\$ 77,491.36	\$ 194.83	\$.39	\$ 3,593.52	\$	\$ 326.81	\$ 80,953.29	\$ 733.50
Fallbrook P.U.D.	16,259.07	13.85	15,906.43	67.32	.24	3,156.58		3.47	19,127.10	366.49
Lakeside Irr. District	3,912.30	29.76	3,837.18	24.31	.05	45.00	19.38	2.16	3,923.76	104.88
La Mesa, Lemon Grove & Spring Valley I.D.	189,666.11	133.59	187,439.98	634.34	73.49	1,060.00	145.85	86.66	189,267.00	2,359.72
National City	62,569.89	97.50	61,929.27	189.27	5.58	4,005.72	14.66	452.40	65,692.10	738.12
Oceanside	54,841.09	112.90	54,150.59	144.30	5.11	2,462.93	62.69	62.69	56,700.24	803.40
San Diego	1,858,394.02	4,023.99	1,853,512.24	3,578.70	22.78	93,565.29	677.54	4,009.50	1,947,347.05	8,905.77
Santa Fe Irr. District	16,706.43	51.03	16,297.66	43.71	1.03		42.28	.81	16,383.87	459.80
San Dieguito Irr. Dist. Escondido	20,913.38	220.49	20,400.62	55.06	1.98		31.46	177.52	20,311.60	733.25
	8,901.60		8,760.02						8,760.02	141.58
Total Member Agencies	\$2,310,313.90	\$4,757.96	\$2,299,725.35	\$4,931.84	\$110.65	\$107,889.04	\$931.17	\$5,122.02	\$2,408,466.03	\$15,346.51
*Withdrawn Agencies	4,129.14	21.33	4,130.47	8.71	.15	186.64			4,345.97	
	\$2,314,443.04	\$4,779.29	\$2,303,875.82	\$4,940.55	\$110.80	\$108,075.68	\$931.17	\$5,122.02	\$2,412,812.00	\$15,346.51

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

ANALYSIS OF UNCOLLECTED TAXES BY FUNDS

General Fund	Table 23	\$ 2,830.53
Bond Interest and Sinking Fund	Table 23	4,478.09
U. S. Contract Fund	Table 23	8,037.89
Total as above		\$15,346.51

TABLE 29
STATEMENT OF LEGAL DEBT MARGIN
June 30, 1952

Assessed Valuation 1951-52	\$443,977,005.00
Debt Limit 15 Per Cent of Assessed Valuation*	\$66,596,550.00
Amount of Debt Applicable to Debt Limit:	
Total Bonded Debt	\$ 2,000,000.00
Estimated Balance Due U. S. Government on Cost of Aqueduct	\$12,875,000.00
Less amount to be paid by Metropolitan Water District	6,437,500.00
Balance Due Metropolitan Water District on Annexation Charges	11,592,527.00
Gross Debt	20,030,027.00
Less: Sinking Fund Balance	504,920.00
U. S. Contract Fund Balance	564,911.00
Legal Debt Margin	18,960,196.00
	\$ 47,636,354.00

*Section 5(7) of the County Water Authority Act provides that—"no authority incorporated hereunder shall incur indebtedness which, in the aggregate, shall exceed fifteen (15) per cent of the taxable property of the authority as shown by the last equalized assessment roll of the county in which the authority is located."

TABLE 30
STATEMENT OF BONDS PAYABLE
June 30, 1952

Description	Rate of Interest	Date of		Bonds		Sinking Fund			
		Issue	Maturity	Authorized	Issued	Outstanding	Required	Actual	Excess
Waterworks Bonds	2% - 2 1/2 %	1947	1971	\$2,000,000.00	\$2,000,000.00	\$2,000,000.00	\$434,782.60	\$504,920.21	\$70,137.61

STATEMENT OF BONDED DEBT MATURITIES

Fiscal Year	Bond Nos.	Rate	Interest Payable (1)		Bond Principal Payable (2)	Total Cash Required
			Rate	Amount		
1952-53	1-50	2 1/2 %	\$	40,125.00	\$	90,125.00
1953-54	51-100	2 1/2 %		38,875.00		88,875.00
1954-55	101-150	2 1/2 %		37,625.00		87,625.00
1955-56	151-200	2 %		36,500.00		86,500.00
1956-57	201-300	2 %		35,000.00		135,000.00
1957-58	301-400	2 %		33,000.00		133,000.00
1958-59	401-500	2 %		31,000.00		131,000.00
1959-60	501-600	2 %		29,000.00		129,000.00
1960-61	601-700	2 %		27,000.00		127,000.00
1961-62	701-850	2 %		24,500.00		174,500.00
1962-63	851-1000	2 %		21,500.00		171,500.00
1963-64	1001-1150	2 %		18,500.00		168,500.00
1964-65	1151-1300	2 %		15,500.00		165,500.00
1965-66	1301-1450	2 %		12,500.00		162,500.00
1966-67	1451-1600	2 %		9,500.00		159,500.00
1967-68	1601-1700	2 %		7,000.00		107,000.00
1968-69	1701-1800	2 %		5,000.00		105,000.00
1969-70	1801-1900	2 %		3,000.00		103,000.00
1970-71	1901-2000	2 %		1,000.00		101,000.00
				\$426,125.00	\$2,000,000.00	\$2,426,125.00

(1) Interest payable January 1 and July 1.

(2) Maturity day January 1.