STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

GOODWIN J. KNIGHT, Governor
FRANK B. DURKEE, Director of Public Works
A. D. EDMONSTON, State Engineer

SOUTHERN CALIFORNIA AREA INVESTIGATION

MEMORANDUM REPORT
ON
WATER CONDITIONS IN ANTELOPE VALLEY

IN KERN, LOS ANGELES AND
SAN BERNARDINO COUNTIES

FEBRUARY 1955

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. EDMONSTON, STATE ENGINEER
CHIEF OF DIVISION

GOODWIN J. KNIGHT
GOVERNOR OF CALIFORNIA

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Department of Public Works

SACRAMENTO

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February 23, 1955

Mr. Frank B. Durkee, Director
Department of Public Works
Public Works Building
Sacramento, California

Dear Mr. Durkee:

Transmitted herewith is a report entitled "Memorandum Report on Water Conditions in Antelope Valley in Kern, Los Angeles, and San Bernardino Counties." The investigation was conducted with funds appropriated for the Southern California Area Investigation, as provided by the Legislature under Chapter 832, Statutes of 1929.

The report describes water conditions in Antelope Valley as determined from data on file in the offices of the Division of Water Resources and other local agencies. No field studies were conducted due to the limited funds available.

Very truly yours,

/s/ A. D. EDMONSTON

A. D. Edmonston
State Engineer

ACKNOWLEDGMENT

In connection with the preparation of this report, valuable assistance and cooperation were received from the following:

Los Angeles County Agricultural Commissioner
Los Angeles County Flood Control District
Los Angeles County Tax Assessor
Los Angeles County Regional Planning Commissioner
Southern California Edison Company, Lancaster District
Kern County Department of Agriculture
United States Department of The Interior, Geological Survey
Commanding Officer, Edwards Air Force Base

ORGANIZATION

STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

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MEMORANDUM REPORT
ON
WATER CONDITIONS IN ANTELOPE VALLEY
KERN, LOS ANGELES, AND SAN BERNARDINO COUNTIES

1. INTRODUCTION

Authorization

This study was conducted with funds appropriated for the Southern California Area Investigation, as provided by the Legislature under Chapter 832, Statutes of 1929. This legislation authorizes and provides funds for "work of exploration, investigation and preliminary plans in furtherance of a coordinated plan for the conservation, development and utilization of the water resources of California".

Scope of Investigation and Report

The purpose of this report is to describe the water conditions in Antelope Valley as determined from data on file in the offices of the Division and other local agencies. No field studies were conducted due to the limited funds available.

Related Investigations and Reports

In response to House Resolution No. 101, resolved by the Assembly of the State Legislature on February 16, 1946, the Division of Water Resources conducted a study on the water supply of Antelope Valley and submitted a report of that study to the Assembly in May, 1947. Subsequent to that date, the activities of the Division in Antelope Valley have been largely limited to the semiannual measurement of depths to ground water in selected wells in cooperation with Los Angeles County Flood Control District. At the present time the Water Quality Function of the Division's southern California office is engaged in a

study for Lahontan Regional Water Pollution Control Board to determine suitable locations in the valley for proposed dump sites. In this study it will be necessary to determine the areal extent and thickness of the clay members overlying the water-bearing formations. In addition, Division geologists are mapping the areal geology of the valley as part of the state-wide water resources investigation.

The United States Department of Interior, Geological Survey, Ground Water Branch, has recently completed a detailed geologic and hydrologic study pertaining to ground water in that portion of Antelope Valley lying in and adjacent to Edwards Air Force Base near Muroc, California. Although the results of that study have not been published, the Commanding Officer of the Base has granted permission to the Geological Survey to release basic data to the Division of Water Resources.

The Los Angeles County Tax Assessor, Agricultural Commissioner, and Regional Planning Commission periodically collect and, in some cases, report data relative to assessed valuation, crop acreage, population, and dwelling units in the Los Angeles County portion of the Valley.

Reports which were reviewed in connection with the preparation of this report are as follows:

California State Department of Public Works, Division of Water Resources. "Irrigation Requirements of California Crops". Bulletin No. 51. 1945.

California State Department of Public Works, Division of Water Resources. "Report to the Assembly of the State Legislature on Water Supply of Antelope Valley in Los Angeles and Kern Counties Pursuant to House Resolution Number 101 of February 16, 1946". May, 1947.

California State Water Resources Board. "Report on Feasibility of Feather River Project and Sacramento-San Joaquin Delta Diversion Projects Proposed as Features of The California Water Plan". May, 1951.

California State Water Resources Board. "Water Utilization and Requirements of California". Bulletin No. 2. Publication pending.

Ewing, Paul A. "The Irrigation Development of Antelope Valley, California". United States Department of Agriculture, Soil Conservation Service, Division of Irrigation. October, 1945.

Johnson, Harry R. "Water Resources of Antelope Valley". United States Department of Interior, Geological Survey. Water Supply Paper 278. 1911.

Litz, Marvin G., Bond, Charles F., and Donnan, William W. "Sprinkler Irrigation Trials-Antelope Valley Soil Conservation District". United States Department of Agriculture, Division of Irrigation, Soil Conservation Service. March, 1951.

Snyder, J. Herbert. "Ground-Water Overdraft". California Agriculture, Division of Agricultural Sciences, University of California. Volume 8, Numbers 3, 4, and 5. March, April, and May, 1954.

Thayer, Warren N. "Geologic Features of Antelope Valley, California". Los Angeles County Flood Control District. October, 1946.

Thompson, David G. "The Mojave Desert Region, California". United States Department of Interior, Geological Survey. Water Supply Paper 578. 1929.

United States Department of Commerce, Bureau of the Census. "Fourteenth Census of the United States, State Compendium, California". 1924.

University of California Agricultural Experiment Service and United States Department of Agriculture. "Report of the Second Antelope Valley Agricultural Program Building Conference". 1941.

University of California Agricultural Extension Service and United States Department of Agriculture. "Alfalfa Cost and Management Study, Antelope Valley". 1948.

Area Under Investigation

Boundaries and Topography. The Antelope Valley drainage area, comprising over 2,000 square miles, is located in Los Angeles, Kern, and San Bernardino Counties in the southwestern portion of the Mojave Desert, as shown on Plate 1. The San Gabriel Mountains, exceeding 9,000 feet elevation in some locations, and their westerly extension, the Sierra Pelona Range, border Antelope Valley on the south, and the Tehachapi Mountains border the valley on the west and northwest. In places, the Tehachapi Mountains surpass an elevation of 6,000 feet above sea level. The northern boundary of Antelope Valley, as recently delineated by the United States Geological Survey, extends from Tehachapi Pass, near Warren, southeasterly to an area of unnamed buttes

about five miles northeast of Bissell, then northeasterly to Castle Butte located north of Rodgers Dry Lake. The valley is bounded on the east by a low discontinuous chain of buttes which separate Antelope Valley from El Mirage Valley just east of the Los Angeles-San Bernardino County line. The elevation of the valley floor ranges from about 2,300 feet to 3,400 above sea level.

Ground Water Basins. The ground water basins which are delineated on Plate 2 are those defined in "Report to the Assembly of the State Legislature on Water Supply of Antelope Valley in Los Angeles and Kern Counties Pursuant to House Resolution Number 101 of February 16, 1946", May, 1947. Since that date, studies by the United States Geological Survey in the Antelope Valley area and reconnaissance work by Division of Water Resources in connection with the preparation of State Water Resources Board Bulletin No. 3, have indicated the existence of other sub-basins in the Antelope Valley area and also possible revision of basin boundaries from those indicated on Plate 2. Inter-basin boundaries, with the possible exception of the Rosamond Fault, have been taken as the sudden steepening of the hydraulic gradient, and no surface evidence of faults or flexures exists.

The ground water basins are composed of sediments of recent alluvium which have eroded from the surrounding mountains during past geologic times. The water-bearing zones underlying the lower portions of Antelope Valley are overlain with layers of clay and silt creating confined aquifers and, in the past, flowing wells were common. The boundary of artesian flow in 1908 is delineated on Plate 2. Most of the water flowing from these wells was unfortunately wasted through evaporation, and this practice was responsible, in part, for the present high concentrations of alkali in certain areas of the valley. From data available at this time, it is indicated that in the central portion of Antelope Valley there are three main ground water zones: the "semi-perched", "pumping", and "deep" zones. The "pumping" zone is the major producing aquifer,

although there is evidence to indicate the "deep" zone also contains water of good quality.

Professor J. Herbert Snyder stated in his article "Ground-Water Overdraft", California Agriculture, April, 1954, that initially in Antelope Valley there were 10 million acre-feet of ground water stored in the material between the ground surface and a depth of 500 feet. The 500-foot depth was assumed to be the probable economic limit of pumping for most crops. Plate 2 shows the areal geology, major faults, and ground water sub-basins in the southern portion of the valley which were defined in "Report to the Assembly of the State Legislature on Water Supply of Antelope Valley in Los Angeles and Kern Counties Pursuant to House Resolution Number 101 of February 16, 1946", May, 1947. Plate 3 shows graphic logs of typical wells.

Climate. The climate of Antelope Valley is characterized by high winds, high summer temperatures, low humidity, and comparatively scant rainfall. Summer temperatures frequently reach 110° F. with winter temperatures usually falling to below freezing. In 1953, the highest and lowest temperatures recorded at Lancaster were 107° F. and 12° F., respectively. The growing season is usually considered to extend from April through October. Estimated mean annual precipitation on the valley floor is about eight inches. Studies by the United States Department of Agriculture, Soil Conservation Service, in 1951, indicate that during the period from 1937 through 1949, the wind velocity at Backus Ranch, located about five miles north of Rosamond, from March through June exceeded five miles per house at least once a day for a total of 49 days. These studies also showed that annual evaporation from a standard United States Weather Bureau pan varied from 103.5 to 128.8 inches at Backus Ranch during the same 13-year period.

Present Development. The rapid increase in population which has taken place in the Los Angeles and San Diego areas has also been experienced in Antelope Valley, where the population has doubled since the end of World War II. Land use has changed from predominantly cattle and sheep grazing to about equal areas of dry-farming and irrigated crops with some increase in industry, especially aircraft manufacturing and testing. Military installations, such as Edwards Air Force Base, have influenced the economic development of the valley, especially as regards housing and commercial enterprises. The recent increase in irrigated crop acreage has created a critical water supply problem in the area. Water supplies are obtained largely by pumping from ground water storage, although the Palmdale and Littlerock Creek Irrigation Districts utilize surface flow from Little Rock Creek.

2. WATER SUPPLY

Precipitation

As is characteristic of the desert regions of southern California, precipitation is sparse in Antelope Valley with the estimated average annual precipitation, for the period from 1933-34 through 1953-54, at Lancaster and Palmdale being 7.44 and 9.28 inches, respectively. In 1953-54, 5.67 inches of rain fell at Lancaster and a total of 8.81 inches was observed at Palmdale. Much of the moisture in the storms coming from the west and southwest is removed by the high mountains which separate Antelope Valley from the South Coastal Area. Rainfall in the San Gabriel Mountains exceeds 45 inches in certain locations. Table 1 lists the average monthly and annual precipitation at four stations in Antelope Valley.

It is believed that most of the rainfall on the valley floor is consumed through transpiration or evaporates from the ground surface, and only in very wet years is there a direct contribution to the ground water. No

significant direct contribution to the ground water apparently occurs in the lower portions of the valley, except in the "semi-perched" zone, since the main water-bearing aquifers are overlain with silt and clay deposits in this area.

Runoff

Almost one-half of the runoff to the Valley occurs in Big Rock and Little Rock Creeks. The flows in Amargosa and Cottonwood Creeks are probably third and fourth in size, respectively. Oak Creek in the Tehachapi Mountains, lying in the northwest corner of the valley, and Sheep Creek, situated in the southeast portion of the Valley, contribute some runoff to the Valley, although it is believed that Sheep Creek also contributes runoff to the Mojave River area. The runoff for more than half the mountainous area is not carried by perennial streams, but by intermittent streams that flow only after rains. In most years, the contribution to the ground water from these ephemeral streams is small, but in exceptionally wet years the contribution may be appreciable. It is reported in United States Geological Survey Water Supply Paper 578, "The Mojave Desert Region, California", 1929, that the total annual runoff from the mountain areas into Antelope Valley averages about 75,000 acre-feet, and the averaged contribution to the ground water from all sources was about 50,000 acre-feet per year, of which by far the largest portion resulted from runoff from the mountains. The Division's 1947 report to the State Assembly estimated the mean seasonal mountain runoff reaching the valley to be 66,400 acre-feet. The average seasonal runoff for Big Rock Creek near Valyermo for the period 1923-24 through 1952-53, is 11,810 acre-feet, and for Little Rock Creek near Little Rock for the period 1930-31 through 1953-54, the average seasonal runoff is 14,130 acre-feet.

Fluctuation of Ground Water Levels

Ground water levels have steadily declined in Antelope Valley for the past quarter century, indicating that net use of ground water has continuously

exceeded replenishment of the ground water supply. A net drop in ground water levels of about five feet occurred from the spring of 1953 to the spring of 1954, with depths to ground water varying from approximately 10 feet south of Rosamond Dry Lake, to about 380 feet in the Rock Creek area. Ground water levels recovered an average of about seven feet between the fall of 1953 and the spring of 1954. Fluctuations of water levels at three key wells within Lancaster Basin are shown on Plate 4.

Historic changes in ground water levels several miles east of Lancaster are typified by the hydrograph of well No. 7N/11W-24A. Since the beginning of record for this well in 1932, the ground water level has dropped 116 feet with the well going dry in 1954 at a depth of about 188 feet. The ground water level elevation at well No. 6N/11W-12A, located on the east edge of Little Rock Creek about eight miles northeast of Palmdale, has dropped from approximately elevation 2,370 feet in 1941 to about elevation 2,293 feet in August of 1954. Well No. 7N/12W-15C flowed from 1924 through 1933; since 1942, the depth to ground water has increased about 75 feet. This well is located in Lancaster.

Plate 5 shows lines of equal elevation of ground water for the spring of 1954 in that portion of the Valley where depths to ground water are measured regularly by the Division of Water Resources and Los Angeles County Flood Control District. The decrease in ground water storage in Antelope Valley from the fall of 1953 to the fall of 1954 was computed to be approximately 206,000 acre-feet.

Water Conservation

As stated heretofore, by far the largest portion of the total contribution to the ground water occurs as natural stream bed percolation. Little Rock Creek and Big Rock Creek are the principal streams entering the Valley. These streams might be the suitable locations for artificial recharging projects. However, a report by the United States Department of Agriculture, Soil Conservation Service, entitled "Feasibility of Spreading Water at Mouth of Rock Creek

in Antelope Valley, California", dated September, 1944, stated that in only six of the 18 years included in the study would spreading have had any appreciable benefit. During this period, 1923 through 1940, an average of about 3,000 acre-feet per annum would have been available for spreading.

In 1946 and 1947, prior to the time the Los Angeles Aqueduct operated at full capacity, 7,250 acre-feet of Owens River and Mono Basin water were artificially recharged in Kings Canyon by the United States Soil Conservation Service, with between 6,000 and 7,000 acre-feet being spread in 82 days. No water has been recharged at these grounds since 1947.

Water made available by the authorized Feather River Project, a considered route for which is shown on Plate 6, could be used directly and/or discharged from the aqueduct onto the many alluvial fans for recharge of the ground water. Utilization of the ground water reservoirs to the maximum feasible extent would minimize the necessary surface distribution system and would enable the continued use of existing wells and pumping plants.

Little Rock Reservoir, on Little Rock Creek, is owned by the Palmdale and Littlerock Creek Irrigation Districts and is operated to supply irrigation water to these agencies. A portion of the impounded water is conveyed to Harold Reservoir for use by the Palmdale Irrigation District.

Quality of Water

The quality of water in Antelope Valley is generally good and has been so historically, although some samples obtained from shallow wells have proven to be somewhat high in dissolved solids, probably as a result of the high alkalinity of the soils in certain areas. The deeper wells provide water of good quality for domestic, industrial, and agricultural purposes, and although this water may be high in per cent sodium, the total dissolved solids are sufficiently low that no undesirable salt condition has been observed in the

generally sandy soils of the irrigated areas. The Division of Water Resources is presently engaged in establishing a key well sampling program in Antelope Valley which will reveal the water quality of the various aquifers underlying the Valley. Typical mineral analyses of ground water appear in Table 2.

3. WATER UTILIZATION

Historic Use of Water

The area irrigated has, in general, continued to expand since the first agricultural development in the valley, with the greatest rate of expansion occurring since 1944, according to data reported by the Los Angeles County Agricultural Commissioner. In connection with development of irrigated lands, six irrigation districts were organized under the Wright Act between 1890 and 1895. However, the Littlerock Creek Irrigation District is the only one that is presently operative. A new Palmdale Irrigation District has been organized which replaced the original Palmdale District.

Agriculture in the valley in the 1890's and 1900's consisted principally of dry farming, deterred somewhat by a conflict between the farmers and cattle and sheep ranchers. It is reported in United States Geological Survey Water Supply Paper 578 that 750 carloads of wheat were shipped from Antelope Valley in 1893, most of it presumably from the region between Quartz Hill and Neenach. The paucity and irregularity of rainfall caused sufficient crop failures during the development of the Valley that the practice of irrigation has become more and more popular in spite of ever increasing pumping lifts.

Present Water Utilization

In the Los Angeles County portion of Antelope Valley there is now a population of over 27,000, an assessed valuation of about $43,000,000, and approximately 78,000 acres under irrigation. Unfortunately, population, assessed valuation, and land use data for that portion of Antelope Valley within Kern County are not readily available. Preliminary data obtained from the Kern County Department of Agriculture revealed that in 1954 there were about 7,600 acres of land under irrigation north and east of Willow Springs.

The population of the Valley within Los Angeles County has increased from about 840 in 1900 to approximately 27,370 in 1954. Estimated population during this period is given in Table 3 and shown on Plate 7.

TABLE 3

ESTIMATED POPULATION OF ANTELOPE VALLEY AND VICINITY WITHIN LOS ANGELES COUNTY[a]

(Data obtained from Los Angeles County Regional Planning Commission and adjusted to represent desired area)

Year	Population	Year	Population
1900	842[b]	1946	10,640
1910	1,979[b]	1947	11,731
1920	3,036[b]	1948	13,015
1930	5,960	1949	13,819
1940	8,155	1950	16,364
1941	8,664	1951	17,336
1942	9,383	1952	19,245
1943	9,642	1953	23,084
1944	10,043	1954	27,370
1945	10,180		

a Population data are for April of the years shown and represent the population in United States Department of Commerce, Bureau of Census Tracts Nos. 559, 560, 561, 562, 563A, and 563B used by the Los Angeles County Regional Planning Commission and comprising the Los Angeles County portion of Antelope Valley, and small adjacent valley and foothill areas.

b Data from United States Department of Commerce, Bureau of the Census, "Fourteenth Census of the United States, State Compendium, California", 1924, and is for Antelope and Fairmont Townships comprising the Los Angeles County portion of Antelope Valley and small adjacent valley and foothill areas.

Plate 8 illustrates the marked increase in assessed valuation, quadrupling since the end of World War II. Annual assessed valuations from 1914 through 1954, are listed in Table 4.

TABLE 4

ANNUAL ASSESSED VALUATION OF ANTELOPE VALLEY
AND VICINITY WITHIN LOS ANGELES COUNTY

(Data obtained from Los Angeles County Tax Assessor)

Year	Assessed valuation	Year	Assessed valuation
1914	$3,504,100	1935	$ 7,360,010
		1936	7,340,160
1915	3,788,110	1937	7,429,250
1916	3,976,475	1938	7,321,845
1917	4,528,682	1939	7,632,745
1918	4,708,755		
1919	5,172,880	1940	7,711,255
		1941	7,786,605
1920	5,395,540	1942	8,304,791
1921	5,562,745	1943	8,813,790
1922	5,677,495	1944	9,419,315
1923	8,218,460		
1924	8,327,040	1945	9,990,435
		1946	10,737,120
1925	8,528,500	1947	13,217,100
1926	8,445,595	1948	14,707,905
1927	8,837,980	1949	17,749,260
1928	8,866,420		
1929	9,605,710	1950	18,901,250
		1951	21,982,150
1930	8,826,415	1952	26,532,835
1931	8,849,715	1953	33,986,900
1932	7,049,225	1954	42,865,710
1933	5,814,905		
1934	5,665,230		

Land Use. A land use survey conducted by the Division of Water Resources in the fall of 1949 indicated that at that time there were 73,600 acres irrigated, 88,470 acres devoted to nonirrigated crops, and 1,100 acres classified as urban and suburban water service areas. The results of this survey are presented in Table 5.

TABLE 5

SUMMARY OF LAND USE IN ANTELOPE VALLEY
FALL 1949

Class and type of land use	:	Area in acres	
Irrigated lands			
Alfalfa		62,100	
Pasture		100	
Orchard		4,500	
Truck crops		100	
Miscellaneous field crops		200	
Hay and grain		4,200	
Farm lots		900	
Included nonwater service area		1,500	73,600
Nonirrigated lands			
Pasture, grapes, hay, and grain		84,684	
Fallow		3,790	88,474
Urban and suburban lands		1,100	1,100
TOTAL			163,174

Unfortunately, no recent complete land use surveys have been conducted, although much valuable data has been obtained from the Los Angeles County Agricultural Commissioner for that portion of Antelope Valley within Los Angeles County. Agricultural land use data for the period 1940 through 1953, as reported by the Commissioner, are presented in Table 6. The number of acres of each crop as listed in this table is not necessarily the total number of acres of that crop under cultivation in the Los Angeles County portion of Antelope Valley, but

is only the number of acres reported to the Commissioner. These data are presented merely to provide an indication of the relative magnitude of the acreages of the various classes and types of agricultural land use. The area of lands being irrigated during this period is depicted on Plate 9.

Edwards Air Force Base, located near Muroc in the northeast portion of Antelope Valley, comprises approximately 460 square miles and is the largest military installation in the Valley. It is understood that further expansion of this Base is contemplated. The Marine Corps Auxiliary Air Station of Mojave embraces about three-and one-half square miles, and is not considered to appreciably affect water conditions in the valley. Both bases obtain their water from the ground water supply.

The recent rapid increase in urbanization in the Los Angeles area, with its accompanying high land costs and residential development, has resulted in several aircraft manufacturers establishing plants in Antelope Valley. All the aircraft industries in the valley, including five of the major corporations, are located at Palmdale Airport. Other industrial activity includes the construction of a reported 12 million dollar cement plant about six miles west of Mojave.

Although the net use of water by these industries may not be substantial in itself, the residential and commercial use developed as result of the industries does impose a significant draft on the ground water supply. Where irrigated lands have been converted to urban use, the effect on the water supply may not be noticeable; however, where there is a transformation from nonirrigated agricultural use to urban use, the change in net use of water may be considerable.

Rate of development and increase in water utilization in Antelope Valley are reflected by the increase in power sales. Agricultural power is used principally to operate well pumps, and therefore changes in agricultural power sales are an indication of changes in the amount of water pumped from wells and applied to crops, although as pumping lifts increase, the number of kilowatt-hours required to pump an acre-foot of water increases. By use of electric power records, and assuming an average pumping plant energy utilization of 1.90 kilowatt-hours per acre-foot per foot of total pumping head and an average total

pumping head of 175 feet, it was estimated that about 480,000 acre-feet of water were pumped from the ground water supply in 1953. Of this amount, it is estimated that about 240,000 acre-feet were consumptively used.

Urban, agricultural, and industrial electric power sales have increased 59, 24 and 12 per cent, respectively, from 1949 through 1952, as indicated in Table 7. Sales of agricultural power have increased from about 21,575,000 kilowatt-hours in 1927 to over 161,289,000 kilowatt-hours in 1953, as shown in Table 8 and on Plate 10. Table 9 indicates the average monthly distribution of agricultural electrical power sales.

TABLE 7

POWER SALES WITHIN LANCASTER DISTRICT
OF SOUTHERN CALIFORNIA EDISON COMPANY*

In Kilowatt-Hours

Year	Agricultural	Residential	Commercial	Industrial	Highway lighting and public streets	Municipal light and power	Total
1949	109,857,984	19,014,862	8,960,111	72,862,074	400,602	4,481,363	215,576,996
1950	121,624,753	21,289,251	9,816,802	79,057,468	653,397	4,899,319	237,340,990
1951	138,249,080	25,891,883	10,991,337	84,513,989	729,578	5,330,415	265,706,282
1952	136,034,130	32,517,571	12,975,933	81,483,166	809,745	5,971,324	269,791,869

* Lancaster District encompasses entire Antelope Valley and Gorman

TABLE 8

ANNUAL AGRICULTURAL POWER SALES WITHIN LANCASTER DISTRICT OF SOUTHERN CALIFORNIA EDISON COMPANY

Year	Kilowatt-hours	Year	Kilowatt-hours
1927	21,575,387	1940	39,804,883
28	28,604,011	41	31,937,315
29	36,545,046	42	44,790,903
		43	47,412,334
1930	40,127,057	44	50,813,056
31	37,574,421		
32	26,452,939	45	59,363,778
33	23,342,419	46	69,746,931
34	31,029,494	47	82,537,667
		48	99,760,942
35	29,756,145	49	109,857,984
36	35,033,094		
37	34,693,969	1950	121,624,753
38	36,103,543	51	138,249,080
39	38,807,103	52	136,034,130
		53	161,289,527

TABLE 9

AVERAGE MONTHLY DISTRIBUTION OF AGRICULTURAL ELECTRICAL POWER SALES FOR THE PERIOD FROM 1941 THROUGH 1953

In Per Cent

Jan.	0.63	July	12.65
Feb.	0.66	Aug.	18.38
March	1.67	Sept.	12.82
April	5.90	Oct.	15.29
May	8.32	Nov.	6.22
June	14.22	Dec.	3.24
		TOTAL	100.00

Unit Use of Water. The estimated mean seasonal unit values of consumptive use of water on irrigated lands in Antelope Valley are shown in Table 10. These values were estimated in connection with the preparation of State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California". It is of interest to note that the estimated mean seasonal unit consumptive use value for alfalfa, including rainfall, is 3.6 feet, while studies by the Agricultural Extension Service, University of California, indicate the average depth of applied water for alfalfa in the valley to be about six feet. These estimates indicate that the irrigation efficiency for alfalfa is about 50 per cent, assuming a normal seasonal rainfall of eight inches, and that normal seasonal deep penetration of applied water is approximately 3.0 feet in irrigated alfalfa areas. As stated hereinafter, this percolation to the ground water supply may or may not reach the main pumping aquifers which in some locations are overlain with relatively impermeable strata.

TABLE 10

ESTIMATED MEAN SEASONAL UNIT VALUES OF CONSUMPTIVE USE OF WATER ON IRRIGATED LANDS IN ANTELOPE VALLEY

Irrigated crop	Depth in feet
Alfalfa	3.6
Pasture	3.4
Orchard	2.8
Vineyard	3.0
Truck crops	2.0
Sugar beets	2.6
Miscellaneous field crops	2.1
Hay and grain	1.4

1949-50 and Probable Ultimate Water Requirements

Applying the estimated mean seasonal unit values of consumptive use of water as shown in Table 10 to the land use survey data included herein in Table 5, 5, and considering the water service area efficiency of 90 per cent assumed in

State Water Resources Board Bulletin No. 2, the estimated 1949-50 mean seasonal consumptive requirement for water in Antelope Valley is computed to be 226,000 acre-feet. This is the amount of water actually consumed and not available for future use, and it does not include that portion of the applied water which returns to the ground water. Probably in many cases the excess water does not return to the aquifer from which it was withdrawn, due to the relatively impermeable layers overlying the main producing zones in some areas. Under such conditions, the irrigation water percolating below the root zone probably contributes to the perched or semi-perched water supply.

From studies carried out in conjunction with the preparation of the afore-mentioned Bulletin No. 2, it has also been estimated that the probable ultimate water service area in Antelope Valley will total 1,546,200 acres, of which 609,300 acres will be irrigated, or approximately eight times the 1949-50 area of irrigated lands. From these same studies, it has been estimated that the probable ultimate mean seasonal consumptive requirement for water for Antelope Valley is 1,522,000 acre-feet, of which 1,488,300 acre-feet will be for irrigation. Table 11 indicates the estimated 1949-50 and probable ultimate mean seasonal consumptive requirements for water for various types of land use.

TABLE 11

ESTIMATED 1949-50 AND PROBABLE ULTIMATE MEAN SEASONAL CONSUMPTIVE REQUIREMENTS FOR WATER IN ANTELOPE VALLEY

Classification of land	Estimated mean seasonal consumptive water requirements, in acre-feet	
	1949-50	Probable ultimate
Irrigated	221,900	1,488,300
Farm lots	800	8,600
Urban and suburban	2,200	23,600
Other water service areas	700	1,300
TOTAL	225,600	1,521,800

Supplemental Water Requirements

The Division of Water Resources estimated that the mean annual overdraft in Antelope Valley was 60,000 acre-feet in 1947 and 160,000 acre-feet in 1949-50, and there is every indication that the present overdraft is even greater. With full development of potential water-using lands, it is estimated that the requirement for supplemental water in Antelope Valley would be about 1,456,000 acre-feet per annum.

In spite of the existing overdraft and the apparent "mining" of ground water, the depth to ground water over most of the valley apparently has not yet increased to the extent that it is uneconomical to pump ground water for agricultural or other uses.

4. PLANS FOR WATER DEVELOPMENT

Feather River Project

The Feather River Project appears to afford the most likely source of supplemental water for Antelope Valley. As shown on Plate 6, the route of the Feather River Project, as proposed in the State Water Resources Board Publication, "Report on Feasibility of Feather River Project and Sacramento-San Joaquin Delta Diversion Projects Proposed as Features of The California Water Plan", May, 1951, borders, in general, the southern boundary of Antelope Valley at an elevation sufficient to supply water by gravity to most of the valley, either by direct pipe line or possibly through artificial recharging on the alluvial deposits. As previously mentioned, the geologic structure of the valley may be conducive for the artificial recharging of water on the alluvial cones in the foothill areas.

Creation of a Water District

The Antelope Valley Water District Committee was organized on January 23, 1954, for the purpose of ascertaining what type of water district would best fulfill the needs of the Valley, in particular, the need for the creation of a district authorized to contract with the State for the importation of supplemental water. The committee consists of a representative from each of the twelve Antelope Valley organizations listed below and a thirteenth member to be appointed by the twelve members:

Pomona Grange
Antelope Valley Farm Center
Palmdale Irrigation District
Littlerock Creek Irrigation District
Eastside Ranchers
Westside Ranchers
Palmdale Chamber of Commerce
Lancaster Chamber of Commerce
Antelope Valley Soil Conservation District
Civic Groups, Inc.
A. F. of L. Lockheed Chapter
Palmdale

Assemblyman Allen Miller, representing the Antelope Valley area, was appointed a standing committeeman.

Subsequent to the formation of this committee, members have studied the legislative acts under which the various water districts are created, such studies culminating in the introduction of Assembly Bill No. 88 by Assemblyman Miller on January 4, 1955, which bill would create the "Antelope Valley Water District", comprising generally those lands in Antelope Valley lying within Los Angeles County.

Under provision of this act, the powers of the proposed district would include the following:

1. Conservation, reclamation, and importation of water
2. Flood control
3. Selling of water to cities, agencies, corporations, and individuals
4. Acquisition, construction, operation, and maintenance of water supply facilities

5. Acquisition of water, water rights, and lands
6. Performance of investigations
7. Incurring of indebtedness and issuance of bonds
8. Making of contracts
9. Exercising the right of eminent domain

5. CONCLUSIONS

1. The present natural water supply of Antelope Valley is limited to precipitation on the valley floor and runoff from tributary areas, the latter which is estimated to be about 66,000 acre-feet per year. It is believed that most of the rainfall on the valley floor is consumed and that there is little direct contribution to ground water from this source. The regimen of runoff is such that small flows percolate to the ground water naturally while flood flows terminate on the valley floor and evaporate.

2. Ground water levels have, in general, declined continuously for the past quarter century, with an average drop of five feet occurring from the spring of 1953 to the spring of 1954. Depths to ground water now range from about 10 feet near Rosamond Dry Lake to about 380 feet in the Rock Creek area.

3. A preliminary estimate, using electric power records and estimates of average pumping plant efficiency and average total pumping head, indicated that in the order of 480,000 acre-feet of ground water were pumped in Antelope Valley in 1953.

4. In the Los Angeles County portion of Antelope Valley there are approximately 78,000 acres under irrigation.

5. The average annual overdraft in Antelope Valley was estimated by the Division of Water Resources to be approximately 60,000 acre-feet in 1947 and 160,000 acre-feet in 1949-50. It is evident that the present overdraft is even greater; however, in spite of the historic drop in ground water levels, it apparently is still economical to pump and utilize ground water in Antelope Valley.

6. It is believed that the only feasible source of supplemental water is that which may be obtained through the authorized Feather River Project of the State of California. Water from the aqueduct could be applied directly to the land and also used to recharge the depleted ground water reservoir.

7. Due to the relative location of this rich agricultural valley with respect to the Los Angeles Metropolitan Area, the Valley's recent and prospective growth both in urban and agricultural developments, the existing large overdraft, and in consideration of the prospective supplemental water supply from the Feather River Project, it is believed a comprehensive geologic and hydrologic investigation of the area is needed.

8. Such a detailed investigation should include the determination of the following:

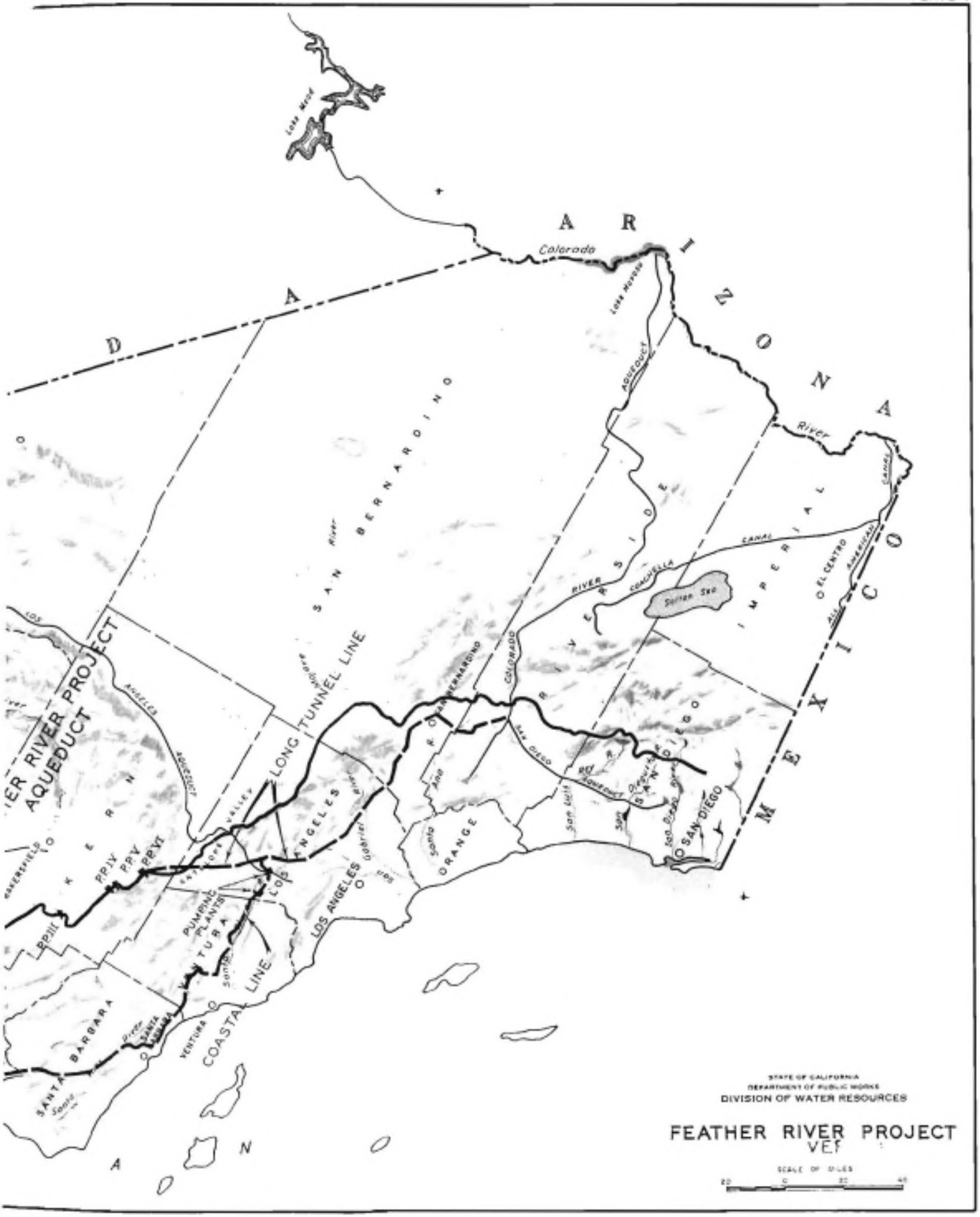
a. Physical structure of basins
b. Water supply
c. Water utilization including estimates of historic net withdrawals from the ground water supply
d. Water quality
e. Supplemental water requirements
f. Plans for water development, including the use of Feather River Project Water, and utilization of ground water storage in connection therewith

It is estimated that such an investigation, and a report thereon, would cost on the order of $100,000 and would require three years to complete.


OREGON
Crater Lake Reservoir
Klamath River
Shasta Reservoir
SACRAMENTO
REDDING
Trinity
Eel River
HUMBOLDT
MENDOCINO
LAKE
GLENN
COLUSA
SUTTER
OROVILLE RESERVOIR
FEATHER RIVER
SACRAMENTO RIVER
SOLANO
SONOMA
MARIN
SAN FRANCISCO
PACIFIC


N E V A D A
FEATHER RIVER PROJECT
DELTA CROSS CHANNEL
SAN LUIS RESERVOIR
FRESNO RESERVOIR
PUMPING PLANTS
COASTAL LINE
C O C E A N

PLATE 1



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

FEATHER RIVER PROJECT

VEF

SCALE OF MILES

PWS-0070-0038

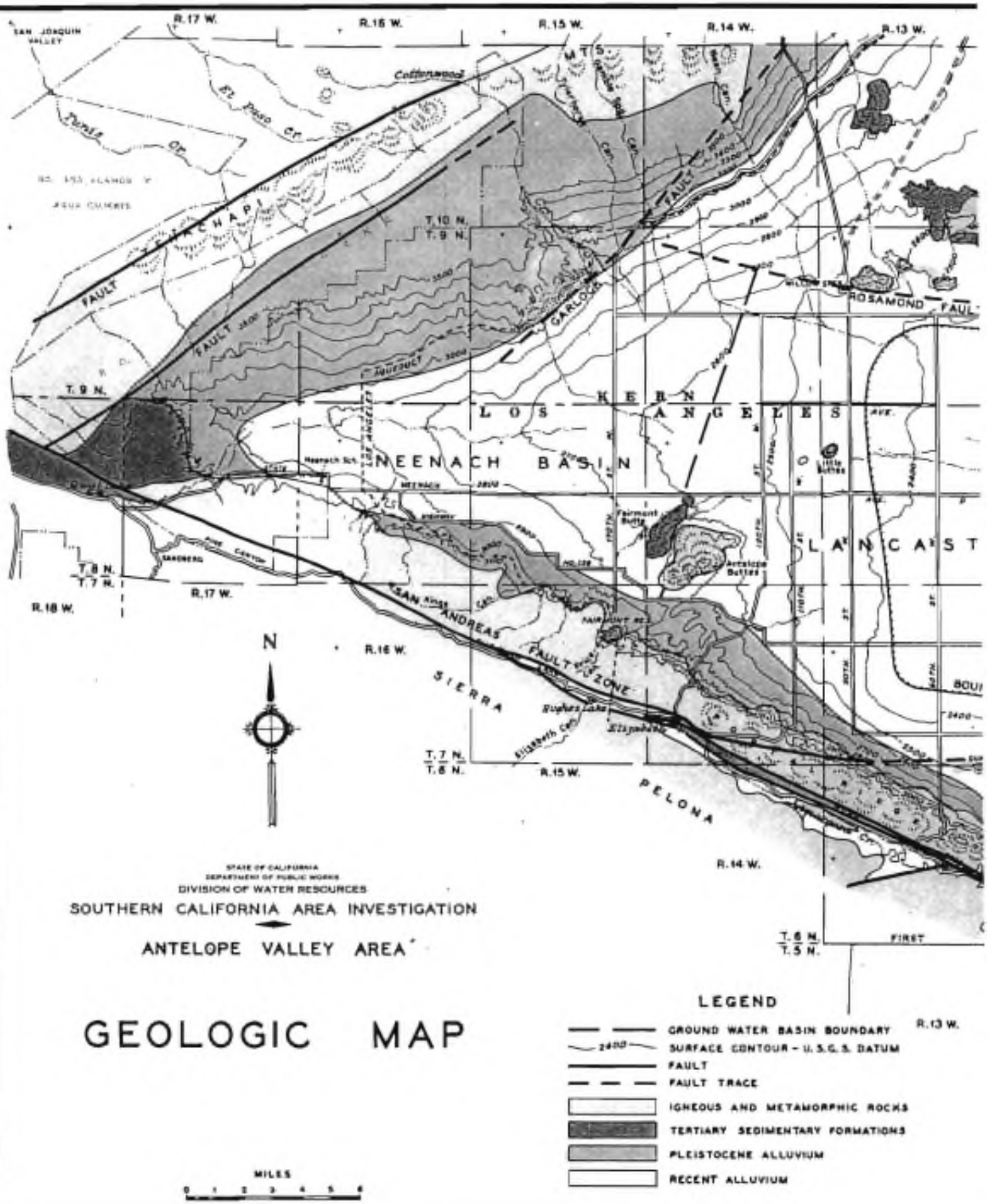


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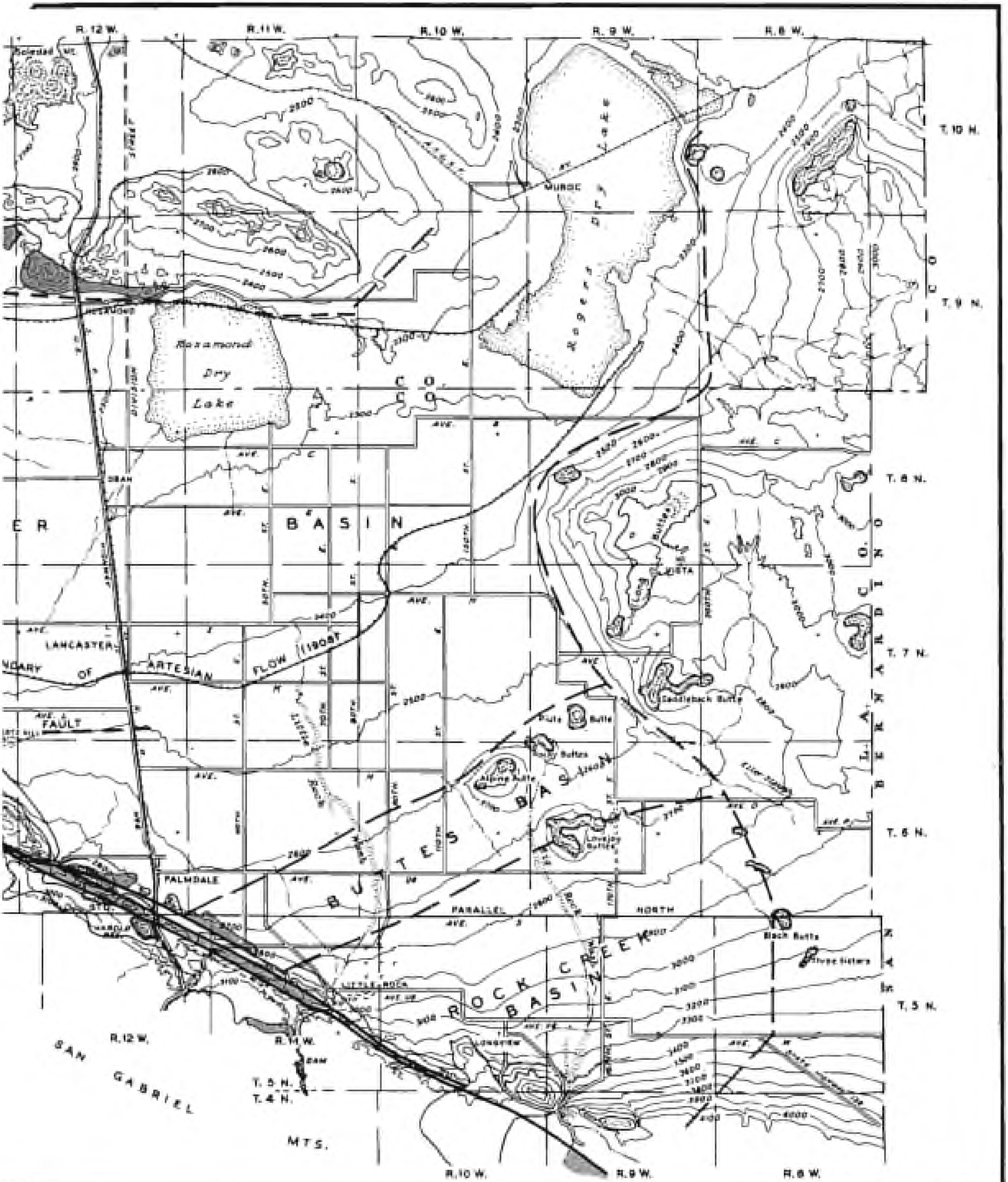
PLATE 2



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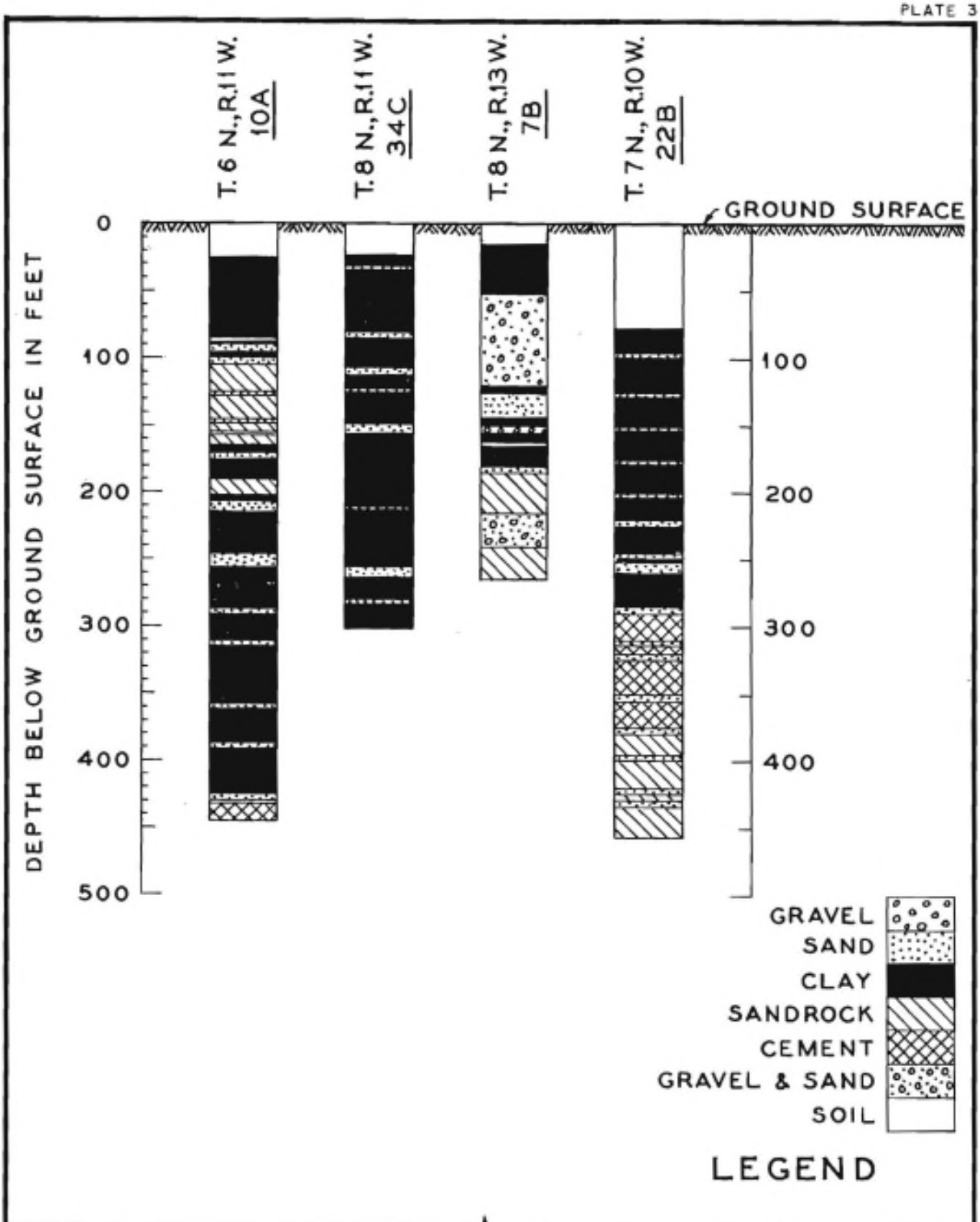
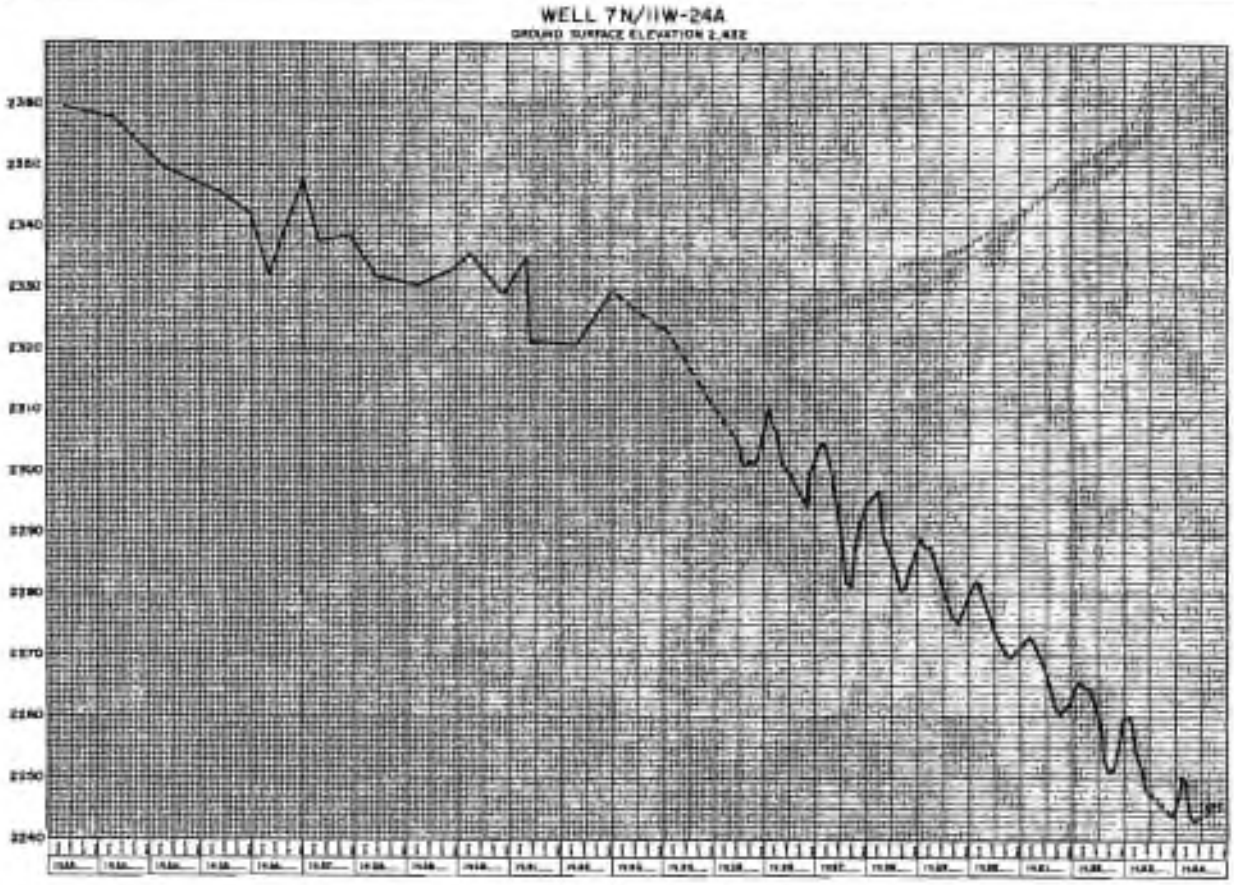
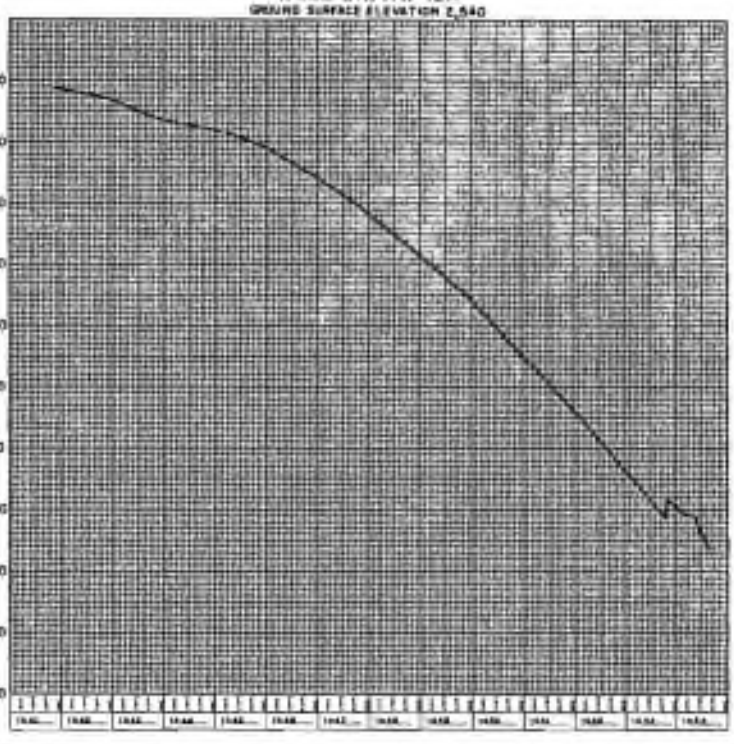
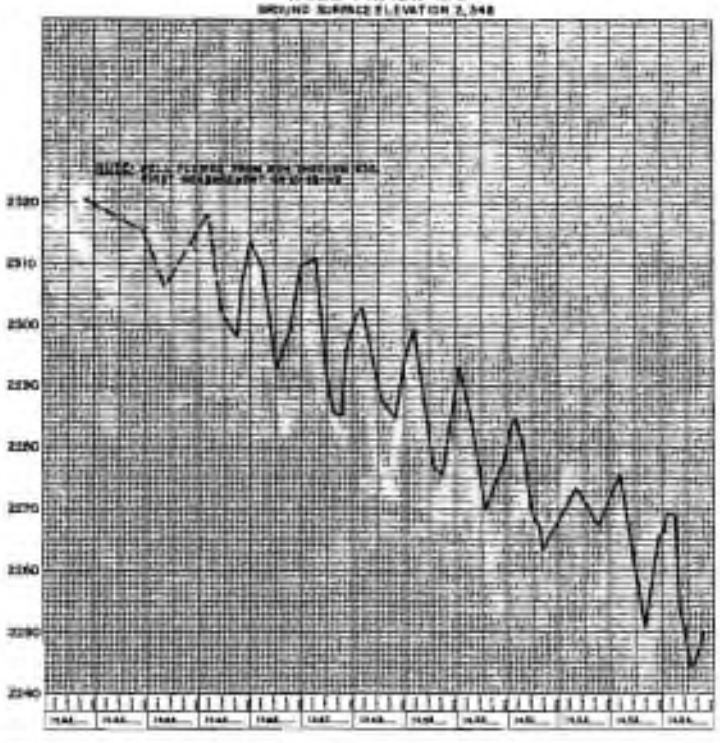


GRAPHIC LOGS OF TYPICAL WELLS IN ANTELOPE VALLEY

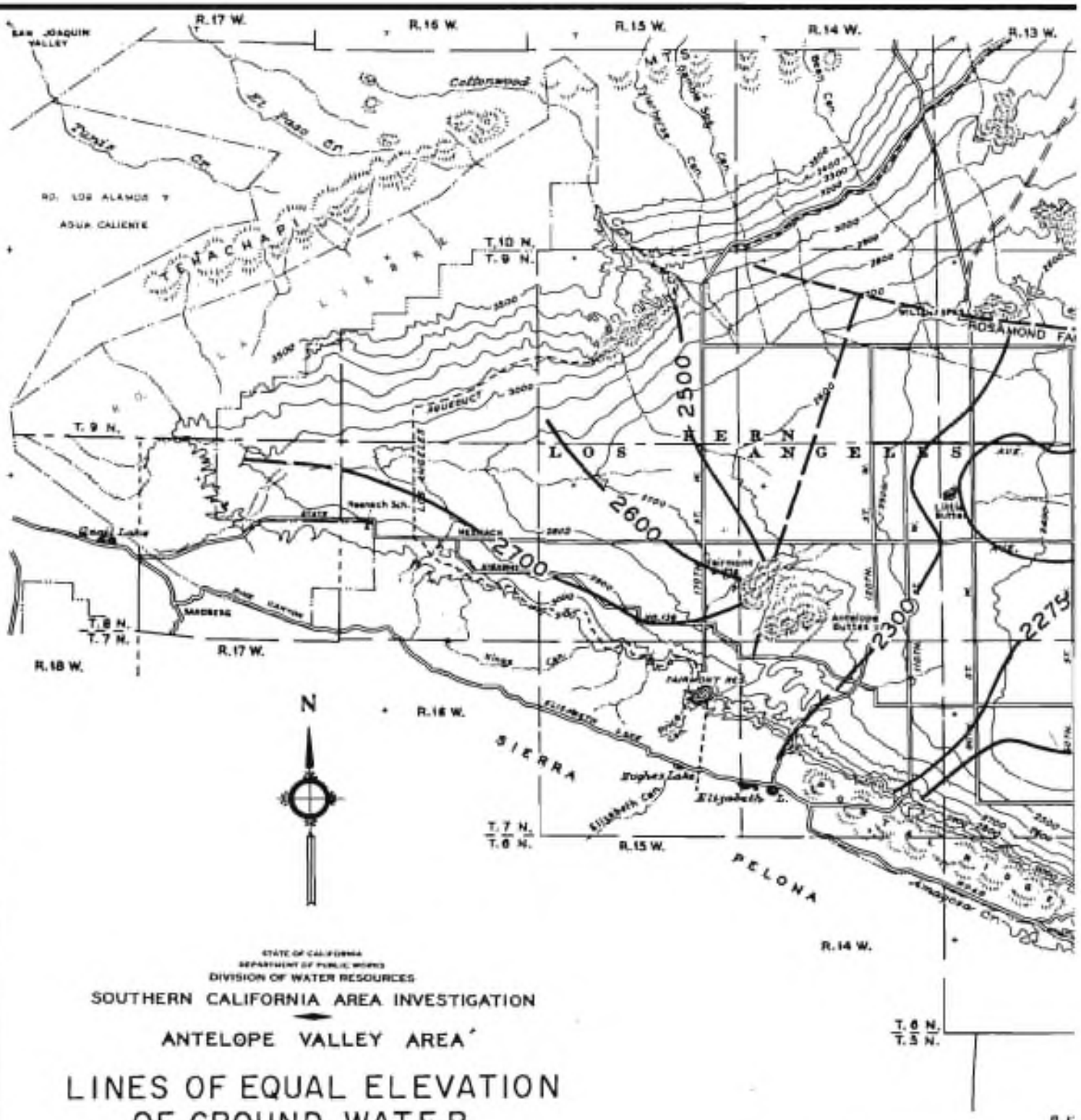
PWS-0070-0041







FLUCTUATION OF WATER LEVELS AT KEY WELLS WITHIN
LANCASTER BASIN OF ANTELOPE VALLEY



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SOUTHERN CALIFORNIA AREA INVESTIGATION

ANTELOPE VALLEY AREA

LINES OF EQUAL ELEVATION OF GROUND WATER "IN PUMPING ZONE"

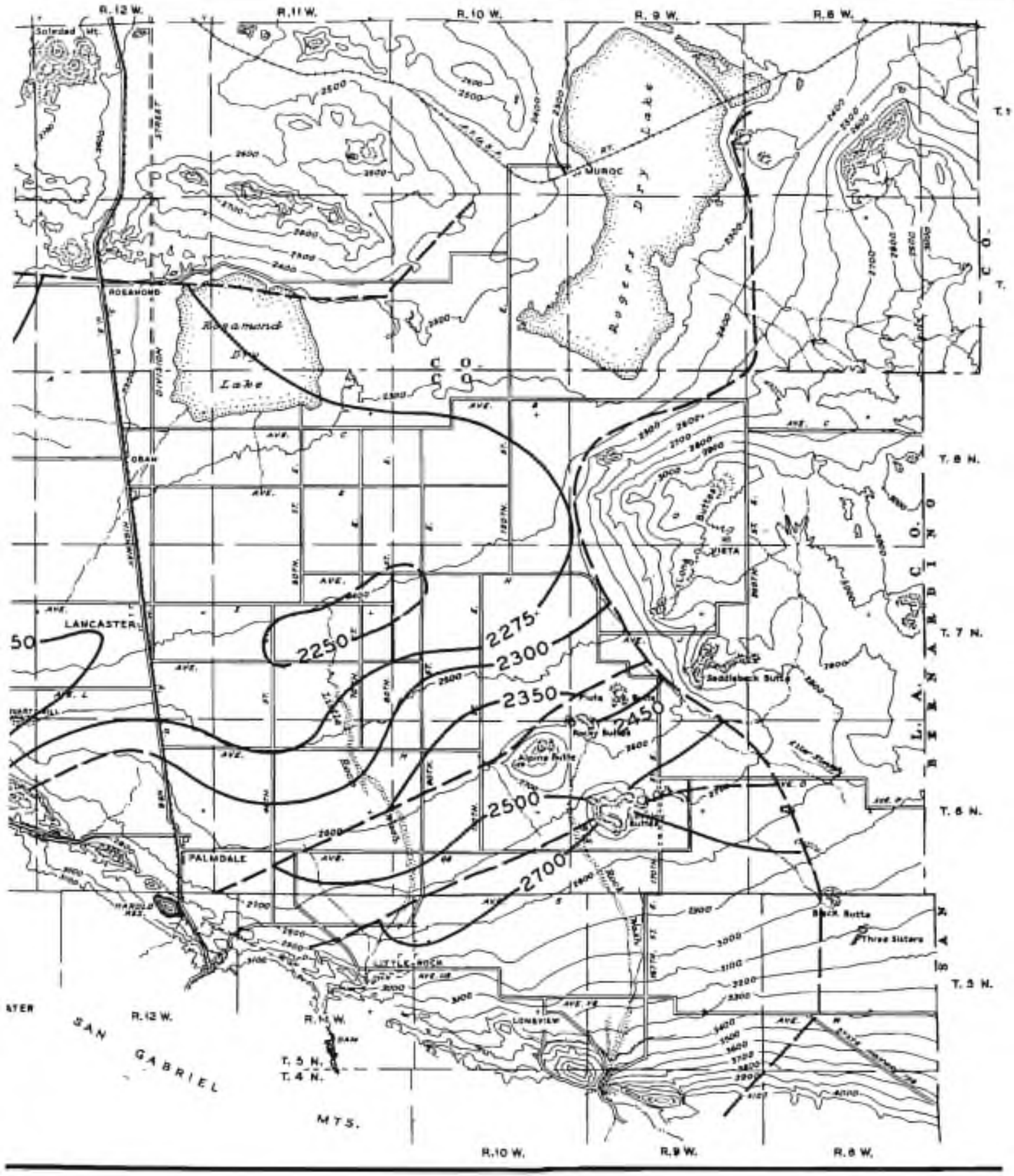
SPRING OF 1954

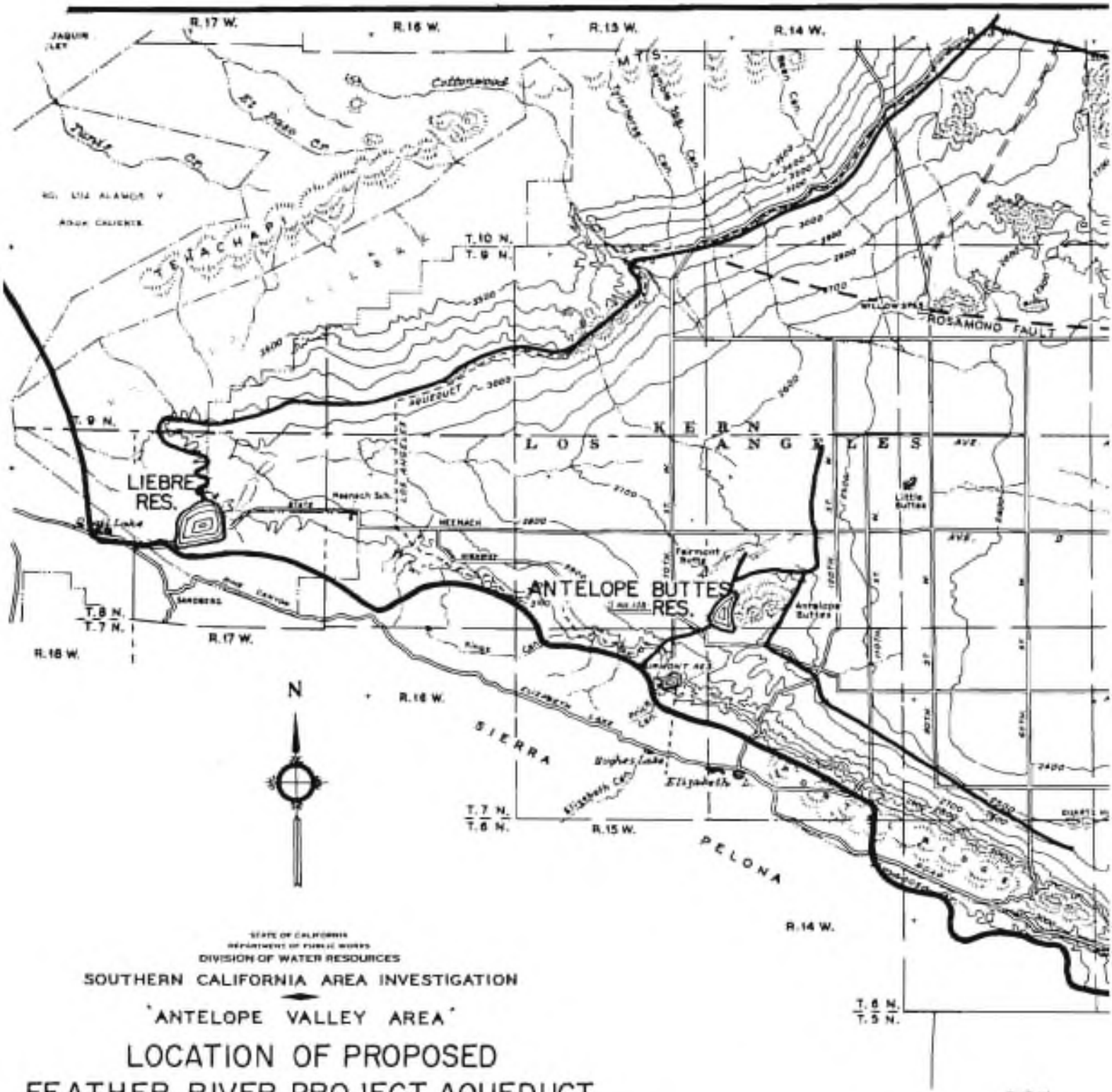
LEGEND

- 2250 — LINES OF EQUAL ELEVATION OF GROUND WATER
- GROUND WATER BASIN BOUNDARY
- 2400 — SURFACE CONTOUR - U.S.G.S. DATUM
- A LANCASTER BASIN
- B NEENACH BASIN
- C BUTTES BASIN
- D ROCK CREEK BASIN

0 1 2 3 4 5 6
SCALE OF MILES

PWS-0070-0043


R. 12 W.
R. 11 W.
R. 10 W.
R. 9 W.
R. 8 W.
Soledad Mt.
ROSAMOND
Rosamond Dry Lake
Rogers Dry Lake
MUROC
EDWARDS AIR FORCE BASE
LANCASTER
PALMDALE
VISTA
Saddleback Butte
Alpine Butte
Rocky Butte
Black Butte
Three Sisters
LITTLE ROCH
LONEPINE
2250
2275
2300
2350
2450
2500
2700
T. 8 N.
T. 7 N.
T. 6 N.
T. 5 N.
T. 4 N.
T. 5 N.
SAN GABRIEL MTS.



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WATER RESOURCES

SOUTHERN CALIFORNIA AREA INVESTIGATION

"ANTELOPE VALLEY AREA"

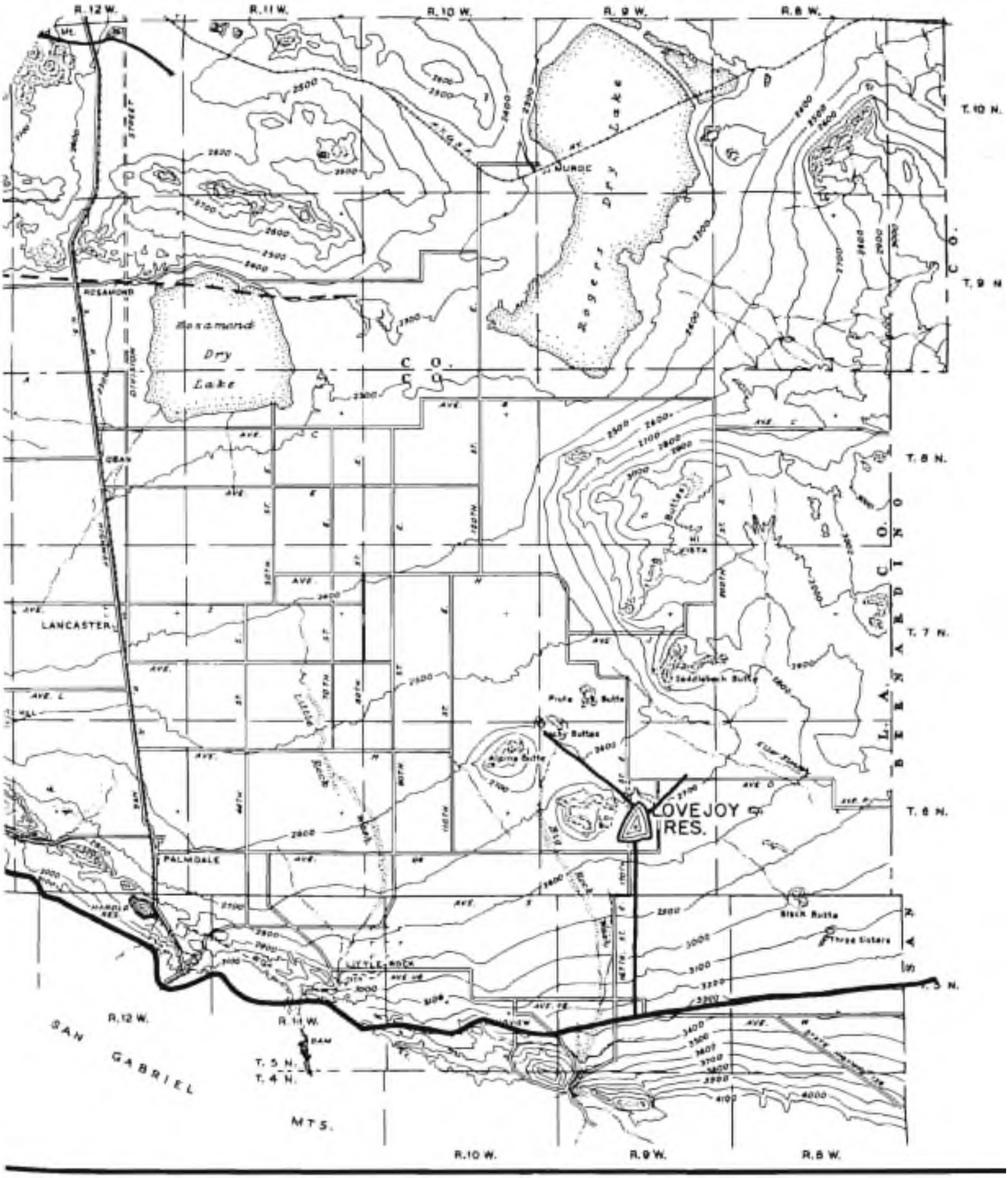
LOCATION OF PROPOSED FEATHER RIVER PROJECT AQUEDUCT, MAJOR DISTRIBUTION LINES, AND RESERVOIRS

LEGEND

MAIN AQUEDUCT
DISTRIBUTION LINE

0 1 2 3 4 5 6
SCALE OF MILES

PWS-0070-0045



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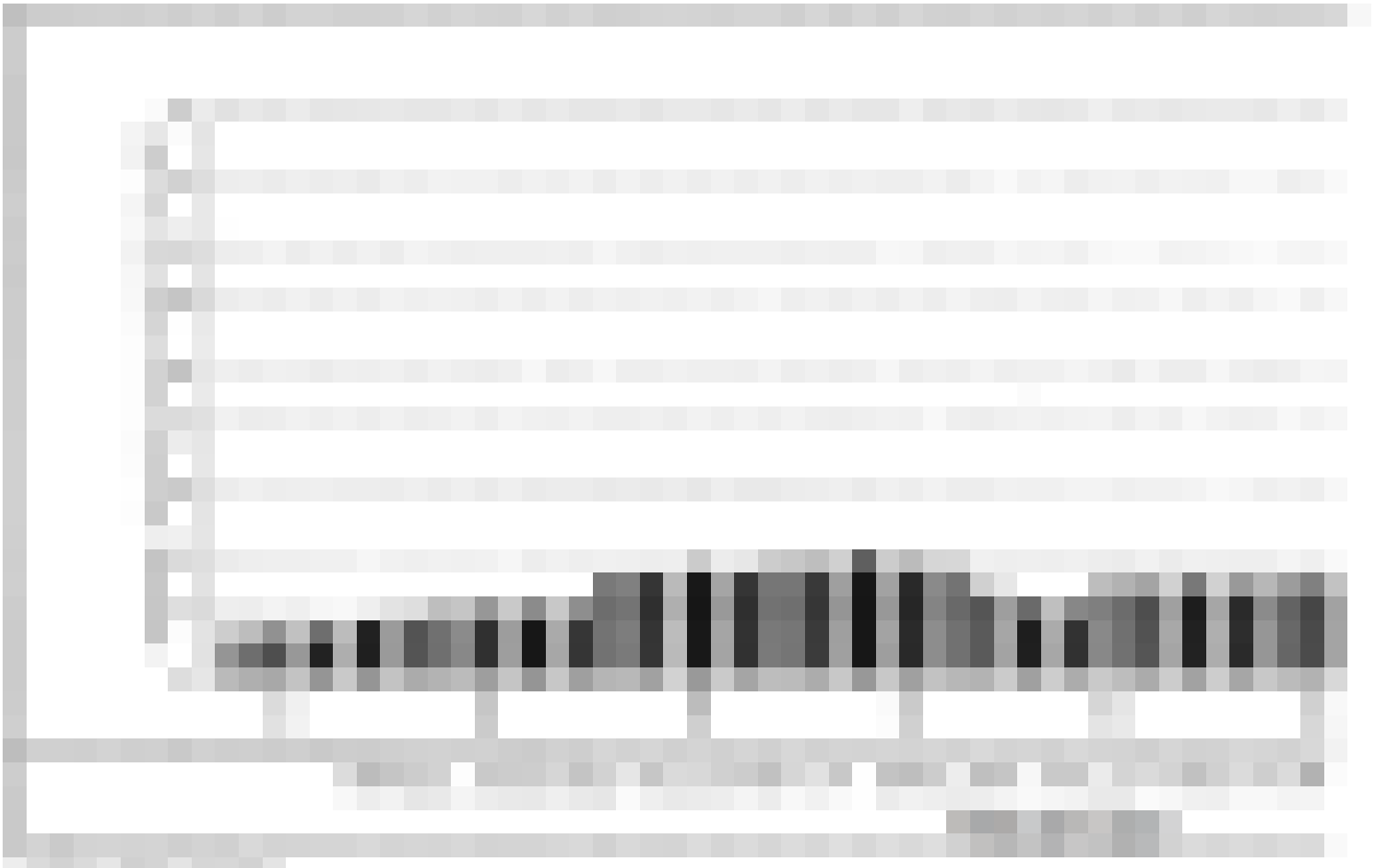
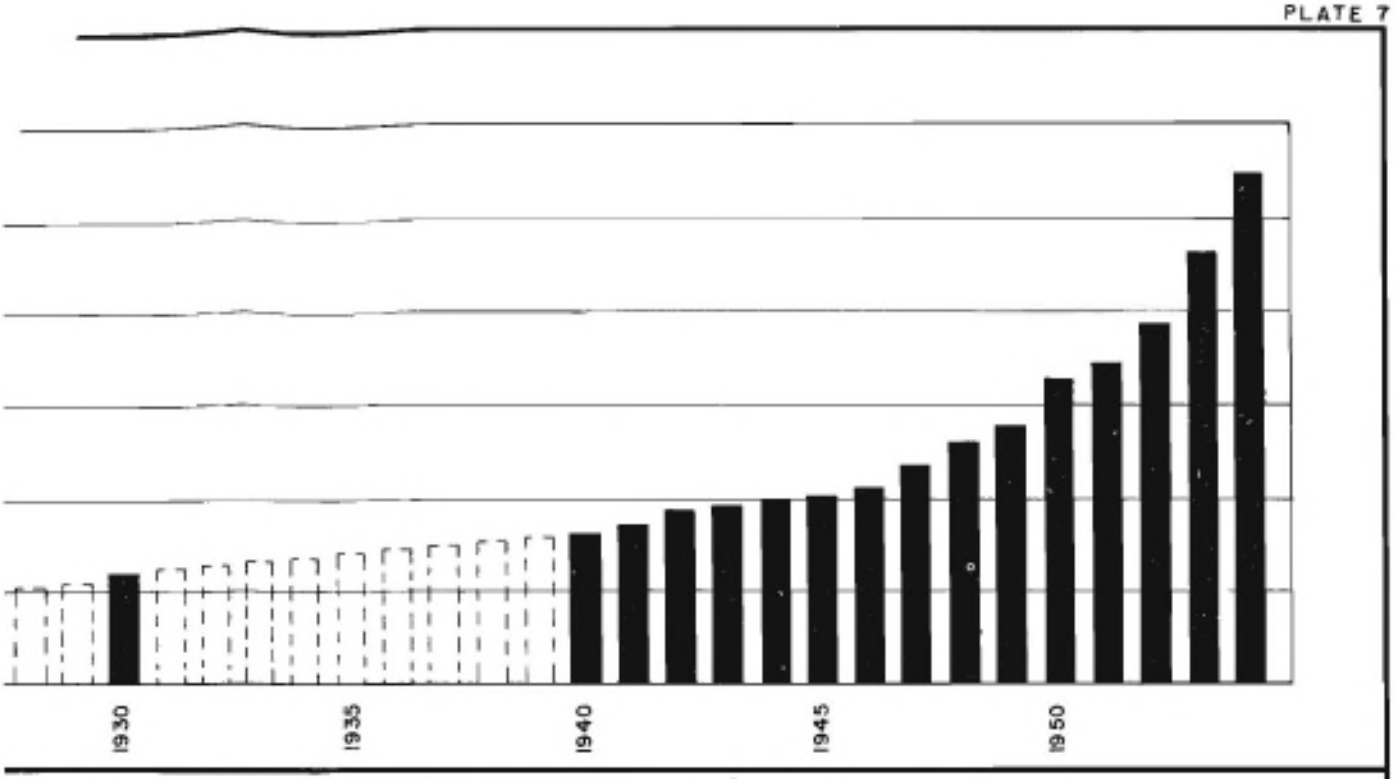
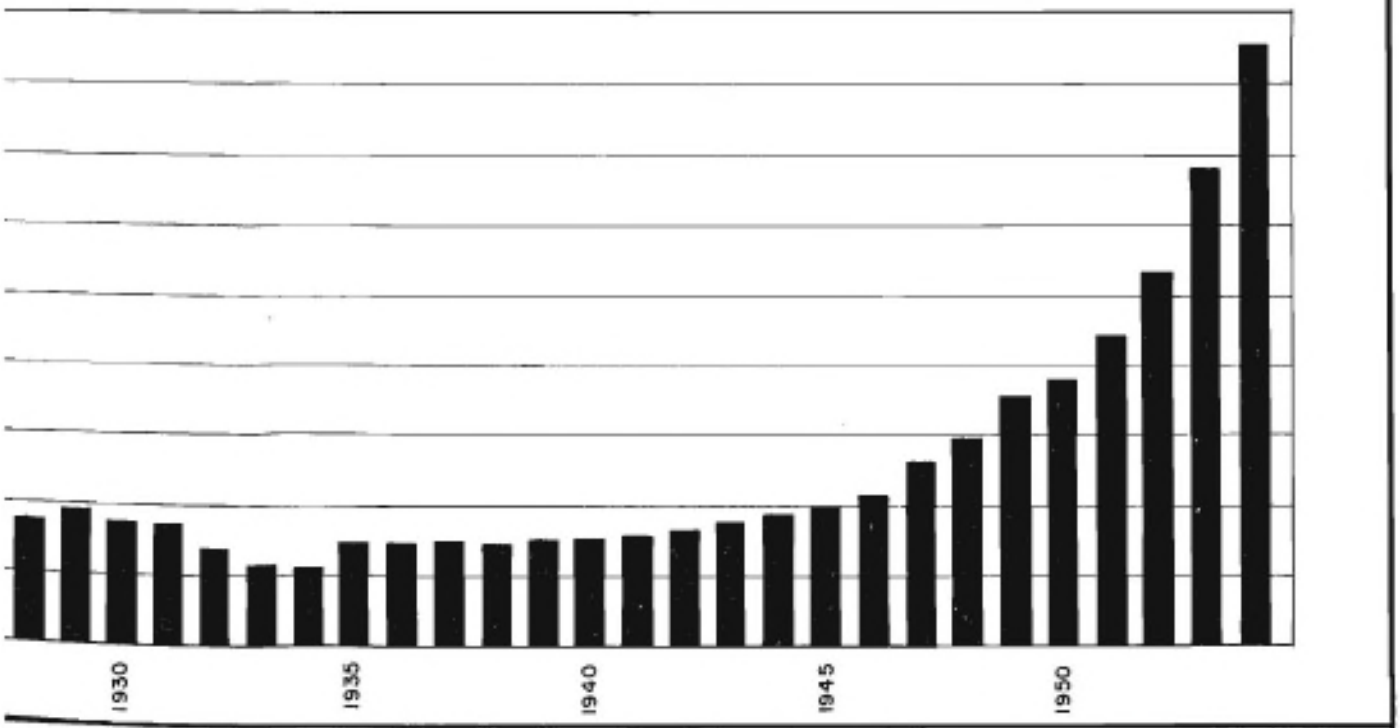


PLATE 7



OF ANTELOPE VALLEY AND VICINITY WITHIN LOS ANGELES COUNTY

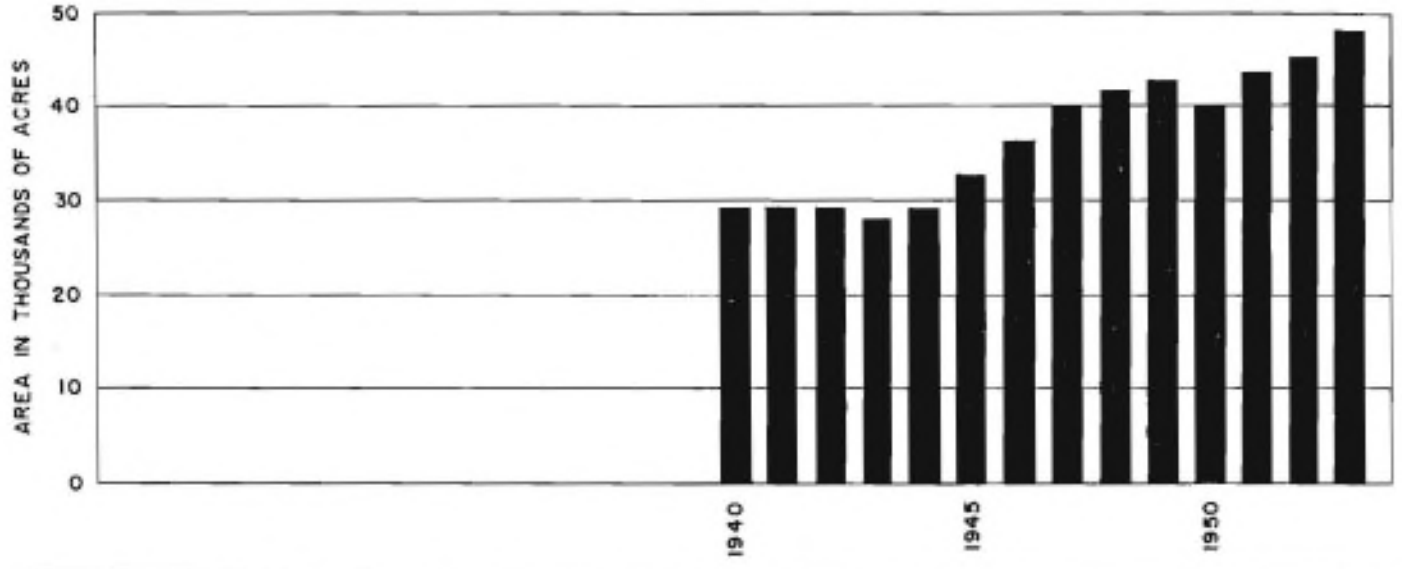
PLATE 8



OF ANTELOPE VALLEY AND VICINITY WITHIN LOS ANGELES COUNTY

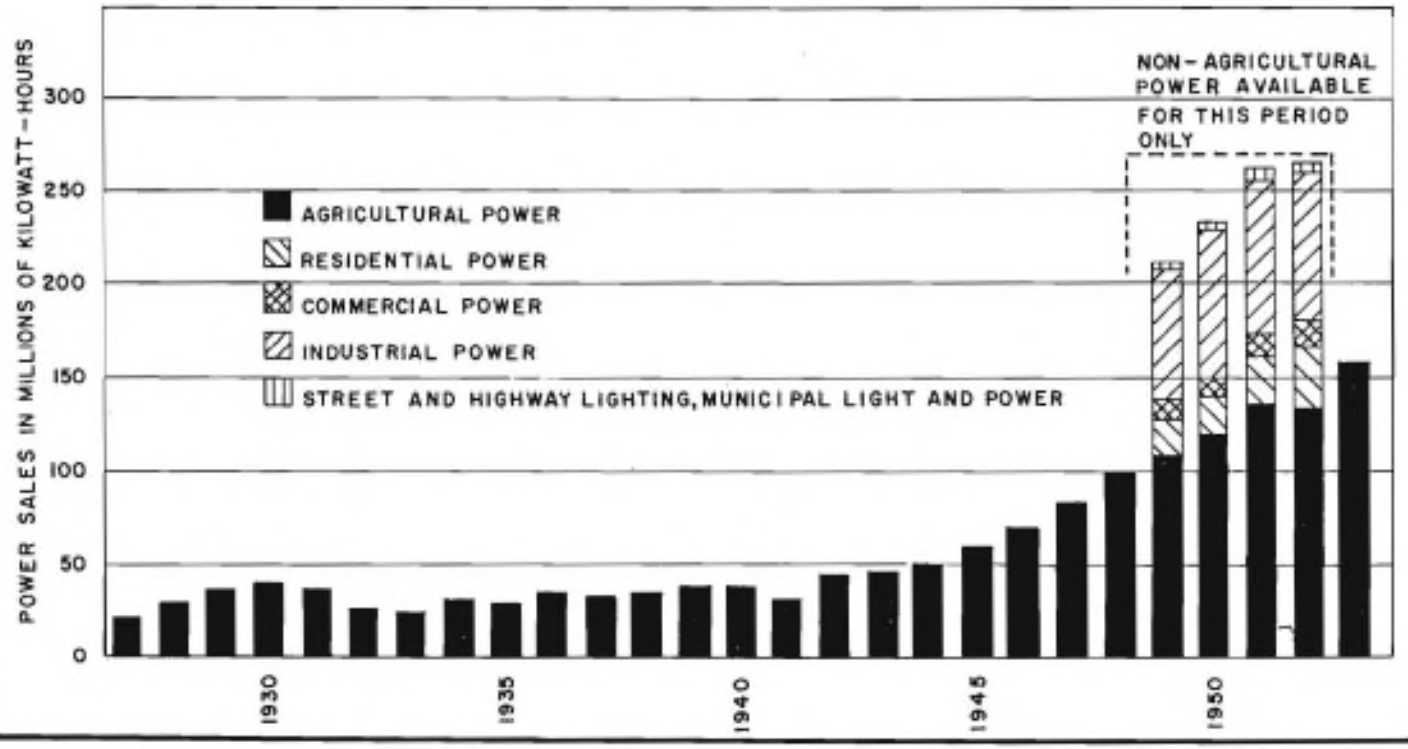
PWS-0070-0048

PLATE 9



AREA OF IRRIGATED CROPS IN ANTELOPE VALLEY, WITHIN LOS ANGELES COUNTY, AS REPORTED BY THE LOS ANGELES COUNTY AGRICULTURAL COMMISSIONER

PLATE 10



ELECTRICAL POWER SALES WITHIN LANCASTER DISTRICT OF SOUTHERN CALIFORNIA EDISON COMPANY

PWS-0070-0049

DIVISION OF WATER RESOURCES