EXHIBIT 12

PART 6

APPENDIX L

PROCEDURES FOR ESTIMATING AVERAGE CONSUMPTIVE USE AND DEEP PERCOLATION ON VARIOUS LAND USE CLASSES BY THE INTEGRATION METHOD

APPENDIX L

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APPENDIX L

PROCEDURES FOR ESTIMATING AVERAGE CONSUMPTIVE USE AND DEEP PERCOLATION ON VARIOUS LAND USE CLASSES BY THE INTEGRATION METHOD

The methods described herein are utilized to develop annual values for the depth of consumptive use and deep percolation of rain and delivered water applied on the various land use classes existing within the San Fernando, Eagle Rock, Sylmar and Verdugo Hydrologic Subareas. Unit consumptive use values are determined herein for use in the Integration Method as discussed in Chapter VI. For purposes of this appendix, the Eagle Rock and San Fernando Hydrologic Subareas have been considered as a single unit and the values thus derived for the San Fernando Subarea are intended to also apply to the Eagle Rock Subarea.

The term consumptive use, as utilized in this report, is defined as the amount of water used by the vegetative growth of a given area in transpiration or building of plant tissue and evaporated from adjacent soil. It also includes the evaporation of precipitation intercepted by vegetative growth or impervious area, the water evaporated in industrial processes, household uses, or that which is permanently incorporated in the product. Delivered water as heretofore defined is water delivered by man-made works to a given land use classification and has been discussed in Appendix J. Native waters are defined as precipitation and hill and mountain runoff.

Rainfall on the valley surface is partially disposed of as consumptive use and deep percolation. The remainder, termed residual rain, is runoff from the area on which the precipitation fell and contributes to the total runoff out of the area of investigation. The deep percolation of residual rain and hill and mountain runoff in transit between the point of application and the point of exit from the valley fill area is termed deep percolation in the stream system. Delivered water is disposed of by consumptive use, deep percolation, sewage and waste.

The annual depths of delivered and native waters which become consumptive use, deep percolation and residual rain at the area of application are treated herein. Available data concerning consumptive use comprise average amounts of consumptive use measured under certain climatic and water use conditions in various localities. In certain instances these data have been transposed to the Upper Los Angeles River area by correcting for the average temperature differences between the two localities. However, no satisfactory method has been developed to completely adjust these values for all the effects of variations in seasonal rainfall, rainfall patterns and fluctuations in the methods of applying delivered water in the two respective areas. It is apparent, therefore, that the values will give a relationship as to the relative use of water between various classifications but that the annual consumptive use of water may require adjustment to account for these effects.

The division of rain and delivered water into consumptive use, deep percolation and residual rain within the three basic hydrologic subareas has been estimated for each of the culture classifications listed in Appendix K. The depths of consumptive use, deep percolation and residual rain as well as the sum thereof have been computed on a gross acreage basis; that is, the value derived is applicable to the gross acreage including the proportion which is impervious and hence relatively nonconsumptive. Data utilized herein concerning precipitation, land use and delivered water are from Appendixes E, K, and J, respectively.

Evaporation of Precipitation

Evaporation is a function of vapor pressure which varies with humidity, temperature and wind movement. The evaporation pan is sensitive to these factors and is commonly utilized to determine rates of evaporation from water surfaces. The rate of evaporation from moist surfaces, such as saturated soils and wet impervious areas, has been considered to have an evaporation rate equivalent to that of a water surface. A study of evaporation pan records and meteorological data for various locations on the valley floor indicates that conditions at Encino Reservoir may be considered as representative of the valley floor.

Evaporation records for the 10-year period from 1946-47 through 1955-56 for the 24-inch diameter screened ground evaporation pan located at Encino Reservoir were utilized in determining rates of evaporation of rainfall from the valley floor. During this period the screened pan coefficient was 0.98 as determined by experiments at Encino Reservoir. This period was selected from the longer record available because prior to 1946-47 the evaporation pan was operated under conditions wherein the pan coefficient was uncertain, and subsequent to 1955-56 daily readings were not made.

From the 10-year period of record, average daily pan rates of evaporation were determined for each month of each year for storm periods and for nonstorm periods. In the determination of average daily rates of evaporation during storm periods, small individual storms were neglected when the daily evaporation rate exceeded the rainfall. The average daily evaporation rate during storms was determined by averaging the daily evaporation for the number of days that precipitation occurred. During June, July, August and September, storms were not prevalent but the records indicate that the evaporation rate during storms in these months was approximately 0.10 inch per day. The average daily rates thus determined are used in computing the evaporation of rainfall during the base period and are as follows:

AVERAGE DAILY RATES OF RAINFALL EVAPORATION*

In Inches

Month	During storm	After storm	Month	During storm	After storm
October	0.085	0.182	April	0.065	0.163
November	0.051	0.134	May	0.053	0.195
December	0.031	0.089	June	0.100	0.217
January	0.029	0.078	July	0.100	0.283
February	0.032	0.102	August	0.100	0.274
March	0.057	0.130	September	0.100	0.251

* Based on record of 24-inch diameter screened ground pan at Encino Reservoir.

The monthly evaporation shown in Table L-1 was computed as the sum of the daily evaporation from individual storms occurring in the month. Evaporation from individual storms on the valley floor was computed in the following manner:

1. An individual storm was considered to be a period of rainfall that is separated from another by at least two days of zero precipitation.

2. The daily rate of evaporation from all surfaces during and after storm periods was assumed equal to the average daily pan rate during like periods.

3. On pervious areas the evaporation computation consisted of two parts: (1) during storm periods the evaporation was computed using the daily evaporation rates shown on page L-9 for storm periods for the number of days in which precipitation occurred; and (2) after storm periods the evaporation was computed using the after storm rate shown on page L-9 up to a total of 0.60 inch, if available, or until another storm occurred. The sum of the two parts was the total evaporation for an individual storm from pervious areas. The 0.60 inch maximum is based on data published in State Division of Water Resources Bulletin No. 33,[6] which notes that observations made in Southern California indicate that the average evaporation loss from the topsoil is one-half acre-inch per acre after each rainstorm, although the total evaporation after a storm may amount to 0.7 inch.

4. On impervious areas the evaporation computation also consisted of two parts: (1) during storm periods the evaporation was computed using the daily evaporation rate shown on page L-9 for storm periods for the

number of days in which precipitation occurred; and (2) after storm periods the evaporation was computed using the after-storm rate on page L-9 until the sum of the two parts amounted to a maximum of 0.50 inch or until another storm occurred. The maximum of 0.50 inch was exceeded only when the storm period was sufficiently long so that the evaporation during the storm exceeded 0.50 inch. In such instances the evaporation after storms was considered to be zero. A study made of the Seco and Broadway Drains in the Raymond Basin indicated that the average evaporation after individual storms of more than one inch total precipitation on suburban areas is about 0.50 inch.

5. When the evaporation rate exceeded the daily precipitation the amount of the latter was taken as the daily evaporation.

Transpiration Requirements

Transpiration requirements have been determined experimentally for various types of crops in the area of investigation by the U. S. Department of Agriculture, Soil Conservation Service. Winter transpiration requirements for alfalfa and citrus only were available in the Upper Los Angeles River area. Values for the other crops were transposed to the Upper Los Angeles River area from the place of measurement by the ratio of the mean temperature and percentage of daylight hours at the two places.

Determination of monthly values of winter transpiration use by alfalfa and by citrus was based on studies made in the San Fernando Valley by the Soil Conservation Service[1/] [2/] in 1940. Records of rainfall and irrigation water were maintained and the soil moisture depletion was

TABLE L-1

MONTHLY EVAPORATION FOR PERVIOUS AND
IMPERVIOUS AREAS ON THE VALLEY FILL AREA

In Inches

Year	San Fernando Subarea																
	Pervious Areas								Impervious Areas								
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May-Sept.	Total
1928-29	0.3	0.8	1.2	0.8	1.3	0.8	1.0	6.7	0.3	0.5	1.0	0.5	1.0	0.5	0.6	0.6	5.0
29-30	0.1	0	0	1.6	0.5	1.7	0.3	4.2	0.1	0	0	1.0	0.5	1.1	0.3	0.3	3.3
1930-31	0.2	1.5	0	0.7	1.2	0	1.1	4.7	0.2	1.0	0	0.7	0.9	0	0.5	0.8	4.1
31-32	0.2	1.7	1.1	1.1	1.5	0.1	0.7	6.4	0.2	1.2	0.9	0.7	1.2	0.1	0.5	0.4	5.2
32-33	0.1	0	1.0	1.0	0	0.1	0.5	2.7	0.1	0	0.7	0.5	0	0.1	0.5	0.6	2.5
33-34	0.3	0	1.0	0.8	1.2	0	0	3.3	0.3	0	0.7	0.4	0.6	0	0	0.4	2.4
34-35	1.0	1.0	1.4	0.9	0.8	2.0	1.3	8.4	0.6	0.6	1.0	0.9	0.7	1.4	1.0	0.2	6.4
1935-36	0.2	1.0	0.7	0.2	1.9	0.6	0.6	5.2	0.2	0.8	0.6	0.2	1.4	0.6	0.5	0.1	4.4
36-37	1.4	0	1.2	1.1	1.8	1.8	0.3	7.6	0.9	0	1.0	1.1	1.4	1.0	0.3	0.2	5.9
37-38	0	0	1.6	0.9	1.3	1.6	0.7	6.1	0	0	1.3	0.6	1.2	1.0	0.7	0.3	5.1
38-39	0.1	0	0.9	1.6	0.9	1.2	0.3	5.0	0.1	0	0.5	1.3	0.5	1.0	0.3	0.7	4.4
39-40	0.1	0.2	0.7	1.4	2.0	0.6	1.6	6.6	0.1	0.2	0.7	1.0	1.4	0.3	1.1	0.1	4.9
1940-41	0.9	0.3	1.1	0.9	1.1	2.0	2.5	8.8	0.5	0.3	1.1	0.9	0.8	1.3	1.2	0.3	6.4
41-42	1.4	0.1	1.8	0.3	0.7	0.9	2.0	7.2	1.1	0.1	1.2	0.3	0.5	0.5	1.7	0.5	5.9
42-43	0.8	0.2	0.7	1.0	0.9	1.6	0.9	6.1	0.5	0.2	0.5	0.9	0.7	1.4	0.6	0	4.8
43-44	0.3	0.2	1.6	0.8	1.2	0.9	0.7	5.7	0.3	0.2	1.3	0.8	1.2	0.5	0.5	0.1	4.9
44-45	0.1	1.5	0.9	0	1.1	2.4	0.2	6.2	0.1	1.1	0.7	0	0.8	1.6	0.2	0.1	4.6
1945-46	0.9	0.3	0.9	0.3	0.7	1.7	0.5	5.3	0.9	0.3	0.7	0.3	0.6	0.9	0.5	0.2	4.4
46-47	0.8	1.8	1.4	0.3	0.3	1.3	0.1	6.0	0.8	1.1	1.0	0.3	0.3	1.2	0.1	0.2	5.0
47-48	0.1	0	0.9	0	0.7	1.5	0.9	4.1	0.1	0	0.6	0	0.5	1.0	0.9	0.3	3.4
48-49	0.2	0	1.3	1.3	1.1	1.1	0	5.0	0.2	0	1.1	0.8	0.9	1.1	0	0.5	4.6
49-50	0	0.9	1.3	1.3	0.9	0.8	0.9	6.1	0	0.5	1.0	1.0	0.5	0.5	0.5	0.5	4.5
1950-51	0.3	1.2	0.1	1.8	0.3	0.6	1.6	5.9	0.3	1.0	0.1	1.4	0.3	0.3	1.0	0.2	4.6
51-52	0.6	0.9	2.2	1.5	0.3	1.7	1.7	8.9	0.5	0.5	2.0	1.3	0.3	1.0	1.2	0.1	6.9
52-53	0	1.7	1.6	0.8	0	0.4	1.3	5.8	0	1.3	1.5	0.8	0	0.4	1.0	0.1	5.1
53-54	0	0.7	0.2	1.4	0.4	1.9	0.2	4.8	0	0.6	0.2	1.2	0.4	1.4	0.2	0	4.0
54-55	0	0.7	1.1	2.1	1.1	0.5	0.8	6.3	0	0.7	0.9	1.5	1.0	0.5	0.8	1.1	6.5
1955-56	0	1.2	1.2	0.9	0.6	0	1.5	5.4	0	0.6	0.9	0.9	0.5	0	1.1	0.8	4.8
56-57	0.4	0	0.1	1.8	0.5	1.6	0.9	5.3	0.4	0	0.1	1.0	0.3	1.3	0.5	0.2	3.8
57-58	1.6	0.6	1.4	0.4	1.2	1.6	1.2	8.0	1.0	0.4	1.0	0.4	1.1	1.6	0.6	0.4	6.5

MONTHLY EVAPORATION FOR PERVIOUS AND
IMPERVIOUS AREAS ON THE VALLEY FILL AREA
(continued)

In Inches

Year	Sylmar Subarea																
	Pervious Areas								Impervious Areas								
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May-Sept.	Total
1928-29	0.4	0.7	1.4	0.9	1.4	0.7	1.8	6.2	0.4	0.5	1.0	0.8	1.0	0.5	0.5	0.6	5.3
29-30	0.1	0	0	1.6	0.5	2.0	0.4	4.6	0.1	0	0	1.0	0.5	1.3	0.4	0.5	3.8
1930-31	0.7	1.6	0	1.0	1.0	0	1.0	5.3	0.5	1.2	0	1.0	0.9	0	0.5	1.0	5.1
31-32	0.2	1.8	1.6	0.9	1.7	0.3	0.7	7.2	0.2	1.5	1.5	0.8	1.3	0.3	0.5	0.4	6.5
32-33	0.1	0	1.3	1.3	0	0.3	0.8	3.8	0.1	0	1.0	0.7	0	0.3	0.5	0.9	3.5
33-34	0.6	0.1	0.5	0.7	1.1	0	0	3.0	0.5	0.1	0.5	0.5	0.6	0	0	0.9	3.1
34-35	0.8	1.3	1.6	1.2	0.9	2.3	1.6	9.7	0.5	1.2	1.3	1.2	0.7	1.5	1.4	0.2	8.0
1935-36	0.5	1.0	0.8	0.4	2.0	0.7	0.6	6.0	0.5	0.9	0.7	0.4	1.5	0.7	0.6	0.1	5.4
36-37	1.5	0	1.4	1.6	1.9	2.0	0.6	9.0	1.0	0	1.2	1.4	1.5	1.3	0.5	0.5	7.4
37-38	0	0	1.6	0.9	1.5	1.5	1.5	7.0	0	0	1.2	0.7	1.4	1.3	1.4	0.6	6.6
38-39	0.2	0	1.0	1.6	1.0	1.3	0.4	5.5	0.2	0	0.5	1.4	0.5	1.0	0.4	0.6	4.6
39-40	0.2	0.2	1.0	1.7	2.2	0.3	1.4	7.0	0.2	0.2	0.9	1.0	1.8	0.3	1.2	0	5.6
1940-41	0.8	0.2	1.6	1.7	1.4	2.0	2.7	10.4	0.5	0.2	1.4	1.3	1.1	1.3	1.4	0.2	7.4
41-42	1.5	0.1	2.0	0.3	0.6	0.9	2.5	7.9	1.5	0.1	1.7	0.3	0.5	0.8	2.2	0.5	7.6
42-43	1.0	0.6	0.8	1.1	0.9	2.0	0.9	7.3	1.0	0.6	0.6	1.0	0.7	1.6	0.5	0	5.7
43-44	0.2	0.3	1.8	1.3	1.3	1.0	0.7	6.6	0.2	0.3	1.6	1.3	1.1	0.5	0.5	0.5	6.0
44-45	0.1	1.8	0.8	0	0.9	2.6	0.4	6.6	0.1	1.4	0.7	0	0.7	1.9	0.4	0.6	5.8
1945-46	1.2	0.5	0.8	0.3	0.8	1.5	0.6	5.7	1.0	0.5	0.6	0.3	0.6	1.2	0.6	0.4	5.2
46-47	1.5	1.8	1.4	0.6	0.2	1.7	0.2	7.4	1.0	1.3	1.0	0.5	0.2	1.4	0.2	0.7	6.3
47-48	0.1	0	0.7	0	0.7	1.7	1.5	4.7	0.1	0	0.6	0	0.5	1.1	1.5	0.5	4.3
48-49	0.2	0	1.4	1.3	1.3	1.4	0.1	5.7	0.2	0	1.3	0.9	1.3	1.2	0.1	0.5	5.5
49-50	0	0.8	1.3	1.4	0.7	0.7	0.7	5.6	0	0.5	1.0	1.0	0.7	0.5	0.5	0.7	4.9
1950-51	0.7	1.3	0.2	2.0	0.5	0.6	1.5	6.8	0.5	1.0	0.2	1.5	0.5	0.5	1.3	0.5	6.0
51-52	0.7	0.8	2.4	1.6	0.2	1.5	1.7	8.9	0.5	0.5	1.9	1.3	0.2	1.2	1.0	0.1	6.7
52-53	0	1.1	1.9	1.0	0.2	0.7	1.5	6.4	0	0.9	1.7	0.9	0.2	0.5	1.0	0.2	5.4
53-54	0	0.7	0.2	1.4	0.6	1.9	0.5	5.3	0	0.5	0.2	1.2	0.6	1.4	0.5	0	4.4
54-55	0	0.7	1.1	2.1	1.2	0.3	1.2	6.6	0	0.7	1.0	1.8	1.0	0.3	1.0	1.1	6.9
1955-56	0	1.4	1.6	0.7	0.7	0	1.7	6.1	0	1.3	1.3	0.7	0.5	0	1.1	0.5	5.4
56-57	0.7	0	0.2	2.0	0.6	1.7	0.9	6.1	0.6	0	0.2	1.5	0.6	1.2	0.9	1.4	6.4
57-58	1.7	0.7	1.3	0.6	1.5	2.0	1.1	8.9	1.1	0.5	1.0	0.6	1.1	1.8	0.4	0.4	6.9

TABLE L-1

MONTHLY EVAPORATION FOR PERVIOUS AND IMPERVIOUS AREAS ON THE VALLEY FILL AREA (continued)

In Inches

Year	Verdugo Subarea																
	Pervious Areas								Impervious Areas								
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May-Sept.	Total
1928-29	0.7	0.7	1.4	0.9	1.5	0.6	1.0	6.8	0.5	0.5	1.0	0.7	1.0	0.6	0.6	0.7	5.6
29-30	0.1	0	0	1.4	0.7	1.8	0.1	4.1	0.1	0	0	1.0	0.6	1.2	0.1	1.0	4.0
1930-31	0.1	1.7	0	1.2	1.1	0	1.0	5.1	0.1	1.3	0	1.2	1.0	0	0.5	1.1	5.2
31-32	0.3	1.5	1.7	0.9	1.6	0	1.0	7.0	0.3	1.2	1.7	0.8	1.3	0	0.8	0.4	6.5
32-33	0.1	0	1.3	1.2	0	0.2	0.8	3.6	0.1	0	1.0	0.6	0	0.2	0.7	1.0	3.6
33-34	0.6	0.2	0.5	0.8	1.0	0.1	0.1	3.3	0.5	0.2	0.5	0.6	0.7	0.1	0.1	0.5	3.2
34-35	0.8	1.0	1.4	1.5	0.8	2.2	1.7	9.4	0.5	0.7	1.2	1.5	0.6	1.5	1.2	0.7	7.9
1935-36	0.5	0.9	0.8	0.2	1.9	0.8	0.7	5.8	0.5	0.7	0.6	0.2	1.4	0.8	0.5	0.3	5.0
36-37	1.7	0	1.5	1.9	1.9	1.8	0.3	9.1	1.0	0	1.2	1.5	1.5	1.0	0.3	0.5	7.0
37-38	0	0	1.6	0.8	1.4	1.5	1.3	6.6	0	0	1.2	0.8	1.4	1.0	1.3	0.6	6.3
38-39	0.3	0	0.9	1.5	1.0	1.3	0.5	5.5	0.3	0	0.5	1.3	0.5	1.1	0.5	0.7	4.9
39-40	0.3	0.2	1.0	1.5	2.0	0.3	1.2	6.5	0.2	0.3	0.8	1.0	1.7	0.3	1.0	0.2	5.5
1940-41	0.9	0.7	1.5	1.7	1.4	2.1	2.5	10.8	0.5	0.5	1.5	1.3	1.1	1.3	1.4	0.3	7.9
41-42	1.4	0.1	2.2	0.3	0.7	1.0	2.2	7.9	1.0	0.1	1.5	0.3	0.5	0.5	1.9	0.5	6.3
42-43	1.0	0.4	0.7	1.1	1.3	1.5	1.0	7.0	0.8	0.4	0.5	0.9	1.0	1.4	0.7	0	5.7
43-44	0.2	0.1	2.4	0.8	1.4	1.0	0.7	6.6	0.2	0.1	1.5	0.8	1.1	0.6	0.5	0.7	5.5
44-45	0	1.5	1.1	0	1.5	2.6	0.5	7.2	0	1.1	0.9	0	1.3	1.9	0.5	0.5	6.2
1945-46	0.9	0.3	0.9	0.2	0.9	1.7	0.7	5.6	0.6	0.3	0.6	0.2	0.7	1.1	0.7	0.3	4.5
46-47	1.9	2.1	1.1	0.6	0.3	1.6	0.3	7.9	1.3	1.7	0.8	0.5	0.3	1.4	0.3	0.8	7.1
47-48	0	0	0.9	0	0.9	1.6	1.4	4.8	0	0	0.7	0	0.7	1.2	1.1	0.3	4.0
48-49	0.4	0	1.5	2.2	1.7	2.3	0.1	7.2	0.4	0	1.4	1.0	1.5	1.8	0.1	0.6	6.8
49-50	0.2	0.8	1.2	1.6	0.8	0.7	0.8	6.1	0.2	0.5	1.0	1.0	0.8	0.5	0.5	0.9	5.4
1950-51	0.5	1.3	0	1.9	0.5	0.7	1.7	6.6	0.5	1.0	0	1.5	0.5	0.4	1.5	0.4	5.8
51-52	0.8	0.8	2.4	1.6	0.6	1.4	2.5	10.1	0.5	0.5	2.1	1.3	0.5	0.8	1.5	0.2	7.4
52-53	0	1.6	1.6	0.8	0.1	0.8	1.4	6.3	0	1.2	1.4	0.8	0.1	0.7	1.1	0.1	5.4
53-54	0	0.9	0.3	1.4	0.5	1.9	0.3	5.3	0	0.8	0.3	1.3	0.5	1.4	0.3	0.1	4.7
54-55	0	0.6	1.1	2.1	1.3	0.7	0.9	6.7	0	0.6	0.9	1.9	1.0	0.7	0.8	1.3	7.2
1955-56	0	1.0	1.5	0.8	0.7	0	1.9	5.9	0	0.9	1.0	0.8	0.5	0	1.3	0.5	5.0
56-57	0.6	0	0.2	1.8	0.8	1.1	0.9	5.4	0.5	0	0.2	1.0	0.6	1.1	1.5	1.3	5.2
57-58	1.3	0.8	1.3	0.5	1.6	2.1	1.1	8.7	0.8	0.4	1.0	0.5	1.5	1.8	0.5	0.4	6.9

determined by analyzing soil samples taken with a standard soil tube. These values were used without modification.

Monthly values of winter transpiration use by walnuts in the Upper Santa Ana River Valley[4] were transposed for use in the San Fernando Valley by means of the ratio of mean temperatures and percentage of daylight hours of the two areas. In the San Fernando Valley the U. S. Weather Bureau station in San Fernando, which has a 42-year period of temperature record, was used. In upper Santa Ana River Valley the temperature used was the average of the Pomona and Fontana Kaiser U. S. Weather Bureau stations which have 47 and 37 years of record, respectively. The ratio applied during the winter months was computed as follows:

Mean Temperature
October through April

San Fernando	58.0° F
Pomona	55.0° F
Fontana Kaiser	56.4° F

$$\text{Ratio} = \frac{58.0}{\frac{55.0 + 56.4}{2}} = 1.04$$

Since the percentage of daylight hours is nearly equivalent in the two areas, the values of Upper Santa Ana River Valley were increased by the factor of 1.04 to be applicable in San Fernando Valley.

Monthly values of winter transpiration use by deciduous trees in Upper Santa Ana River Valley[4] were transposed for use in San Fernando Valley by the aforementioned factor of 1.04. The transpiration use by deciduous trees was derived by the Soil Conservation Service[10] from measurements on Tuscan peach trees in the Ontario area, to which was added the transpiration use by the winter cover crops. The transpiration use values for walnuts are average for medium to large trees, considering that 50 percent of the orchard had winter cover crops.

The growing season of double-cropped truck was considered to extend from April through October. Consumptive use during two months of the winter period, October and April, was determined by the consumptive use formula $u = kf$[11] in which u is the monthly consumptive use, k is the monthly consumptive use coefficient and f is the monthly consumptive use factor derived from mean monthly temperature and monthly percent of daytime hours of the year. The value of k was taken to be 0.60 and the f value for October as 5.14 and for April as 5.29, resulting in the following values of u:

u (October) = 0.60 x 5.14 = 3.1 inches consumptive use.

u (April) = 0.60 x 5.29 = 3.2 inches consumptive use.

Transpiration use was then determined by subtracting evaporation which was estimated to be 0.5 inch per month for both October and April. Transpiration use during the remaining five winter months was taken to be 0.7 inch per month as estimated by the Soil Conservation Service.[2]

Monthly values of winter transpiration use by vineyards in Upper Santa Ana River Valley[4] were transposed for use in San Fernando Valley by the aforementioned factor of 1.04. It was considered that 75 percent of the vineyard lands had winter cover crops as was the case in the Upper Santa Ana River Valley.

Annual consumptive use by dry farm and native vegetation applicable to San Fernando Valley was computed by the Soil Conservation Service[5/] from Santa Ana River Valley data.[6/] Annual transpiration use was determined by subtracting the average annual evaporation, estimated to be 5.0 inches, from the annual consumptive use. Monthly values of transpiration use were computed by prorating the annual value in the same proportion as monthly values determined for nonirrigated hay and grain in Upper Santa Ana River Valley.[4/]

Monthly values of winter transpiration use by riparian vegetation, derived from results of a field study by Troxell[12/] on the river bottom lands in Santa Ana River Valley, were transposed for use in San Fernando Valley by the aforementioned factor of 1.04. The average monthly winter season transpiration requirements so determined for the aforementioned culture in the area of investigation are listed in Table L-2:

TABLE L-2

AVERAGE MONTHLY NET UNIT TRANSPIRATION RATES DURING WINTER SEASON

In Inches

Culture classification	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Sub-total
Alfalfa	2.9	2.1	0.9	0.9	1.1	2.1	2.2	12.2
Citrus	2.0	1.5	1.1	0.8	0.9	1.2	1.5	9.0
Walnuts	0.5	0.3	0.2	0.2	0.2	0.4	1.0	2.8
Deciduous	0.5	0.3	0.2	0.2	0.2	0.4	1.0	2.8
Truck - double crop	2.6	0.7	0.7	0.7	0.7	0.7	2.7	8.8
Vineyard	0.5	0.5	0.2	0.2	0.2	0.5	0.9	3.0
Dry farm and native vegetation	1.0	1.2	0.8	0.7	0.7	1.2	1.8	7.4
Riparian vegetation	3.7	3.0	2.1	2.9	1.7	3.7	4.3	21.4

Fall Soil Moisture Deficiency

Available soil moisture has been taken as the difference between the field capacity or the maximum ability of a soil to store water above the capillary fringe against the force of gravity, and the minimum moisture content below which insufficient moisture is available to the plant to support growth.

The fall soil moisture deficiency has been taken as the depth of water in inches required to bring the soil back to field capacity upon reaching the wilting coefficient. For any particular crop this amount may be determined as the crop root depth in feet multiplied by the ability of the soil to hold and release moisture to the roots in inches of water per foot of soil. Except for lawn grass in park and residential areas, it was assumed that this deficiency existed for all irrigated crops in the Upper Los Angeles River area at the end of the irrigation season on September 30.

The ability of soils to hold and release moisture is shown in Table L-3 for representative California soils. Kramer[7/] reports that this ability varies from 0.50 inch per foot to 3.00 inches per foot. The Soil Conservation Service[2/] reports that the ability to hold moisture in the area west of Sepulveda Boulevard varies from 1.22 to 2.01 inches per foot. The depth of rooting for truck crops is shown in Table L-4.

TABLE L-3

AVAILABLE WATER IN SOILS[3/]

Inches Per Foot of Depth

Soil type	Available water
Oakley fine sand	0.34
Salinas fine sandy loam	1.35
Yolo fine sandy loam	1.26
Delano sandy loam	0.80
Fresno sandy loam	1.31
Aiken clay loam	0.71
Salinas silt clay loam	2.53
Salinas clay	2.83
Yolo clay	2.36

TABLE L-4

DEPTH OF ROOTING OF TRUCK CROPS
(After Table 1)[8/]

Shallow-rooted (down to 2 feet)	Moderately deep-rooted (down to 4 feet)	Deep-rooted (down to 6 feet)
Brussels sprouts	Beans, pole	Artichokes
Cabbage	Beans, snap, spring	Asparagus
Cauliflower	Beans, snap, fall	Cantaloupes, inland valleys
Celery	Beets	Cantaloupes, Imperial Valley
Lettuce, winter	Carrots, coastal area	Lima beans
Lettuce, summar and fall	Carrots, Imperial Valley	Parsnips
Lettuce, Imperial Valley	Chard	Pumpkins
Onions, intermediate	Cucumber	Squash, winter
Onions, late	Eggplant	Sweet potatoes
Potatoes, early	Peas, winter	Tomatoes, inland valleys
Potatoes, late	Peas, fall	Tomatoes, coastal areas
Radish	Peas, Imperial Valley	Watermelons
Spinach	Peppers	
Sprouting broccoli	Squash, summer	
Sweet corn	Turnips	

The fall soil moisture deficiencies listed in Table L-5, with the exception of truck crops and lawn grass, are based on measurements made in the area of investigation by the Soil Conservation Service[1] and from agencies in other areas.[4] The fall soil moisture deficiency for truck crops was determined by their rooting depth[8] and the moisture-holding capacity of the soil. For lawn grass,* the fall soil moisture deficiency was adopted as one inch, due to the general practice of applying approximately one inch of water per irrigation with frequent applications. This results in a shallow rooting depth and a small fall soil moisture deficiency.

TABLE L-5

FALL SOIL MOISTURE DEFICIENCIES

In Inches

Crop	Fall soil moisture deficiency
Alfalfa and irrigated pasture	4
Citrus	3
Deciduous	10
Irrigated vineyard	9
Lawn grass (residential areas)	1
Native vegetation and dry farm	8
Truck[8]	5
Walnuts	10

Irrigation Efficiencies

Irrigation efficiency is the ratio of water consumed to water applied expressed as a percentage. Investigations were made by the U. S. Department of Agriculture in 1939 and 1940[1] in cooperation with the City of Los Angeles to determine irrigation efficiencies in the Upper Los Angeles River area. The values listed in Table L-6 show irrigation efficiencies for

*Residential areas.

various crops grown in the area of investigation and were based on results of the investigation as well as conferences with Mr. H. F. Blaney who was in charge of the work. The irrigation efficiencies listed were based on the amount of water delivered to the customer and on consumptive use. Evaporation of irrigation water, which is estimated to be about 15 percent of the total delivered water, is included in the consumptive use.

TABLE L-6

AVERAGE IRRIGATION EFFICIENCIES

In Percent

Crop	Average efficiency
Alfalfa and irrigated pasture	85
Citrus	80
Deciduous	85
Truck	70
Vineyard	80
Walnuts	85

Optimum Consumptive Use of Water by Lawn Grass

Optimum consumptive use of water by lawn grass was determined from measurements of consumptive use by lawn grass made through the use of experimental tanks installed in 1939 in the Raymond Basin.[9/] Available measurements were made during the six-year period starting October 1939 and ending September 1945. Data from only six of the eight tanks were used. Data from tanks Nos. 4 and 5 were not used because these tanks had a wider rim at the surface and the consumptive use measured from these tanks was consistently higher than from the remaining tanks during the growing season. The rims of the tanks were set flush with the outside ground surface and the ground surface inside was one-half inch below the rim. The ground sloped away from the tanks so that with appreciable rainfall, surface runoff from the tanks was possible.

The following criteria were used in determining optimum consumptive use values:

1. Only months where drainage through the tanks occurred were considered because it was believed that for months of zero drainage the supply may have been deficient and the optimum consumptive use not realized.

2. Data were eliminated for months where the preceding month had zero drainage because of the possibility that a portion of the applied water may have gone into soil storage rather than to drainage or consumptive use.

3. Data for months having high rainfall were also eliminated because of probable surface runoff which was not measured.

4. Data for months in which drainage from the preceding month's rain may have occurred were also not used.

5. Data were eliminated for months where the amount of irrigation water shown, including rain, was less than the measured amount of rain because of contradictory observations.

6. Months which had extreme variances between results from the various tanks were not used.

Table L-7 shows the Raymond Basin data from which the optimum values were selected for use in the Upper Los Angeles River area. Table L-8 shows a summary of the optimum values utilized in computing consumptive use by lawn grass.

TABLE L-7

DATA ON CONSUMPTIVE USE OF WATER BY LAWN GRASS FROM
EXPERIMENTAL TANKS AT MANZANITA AND MENTONE STREETS, PASADENA, CALIFORNIA

In Inches

Tank number	Item	1939-40 Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	Irrigation drainage consumptive use	6.80[b] 2.93 3.87[b]	4.47 2.10 2.37	3.71 2.21 1.50	4.44 3.54 0.90	4.34 3.15 1.19	3.48 0.85 2.63	4.94 0.95 3.99	5.27 0.46 4.81	4.91 0.18 4.73	7.28 0.41 6.87	7.11 1.27 5.84	5.54 1.37 4.17
2	Irrigation drainage consumptive use	7.11[b] 3.56 3.55[b]	4.47 2.18 2.29	3.71 2.08 1.63	4.44 3.46 0.98	4.34 3.18 1.16	3.48 0.88 2.60	4.94 1.05 3.89	5.27 0.63 4.64	4.91 0.04 4.87	7.28 0.63 6.65	7.11 1.29 5.82	5.54 1.20 4.34
3	Irrigation drainage consumptive use	6.61[b] 2.86 3.75[b]	4.47 2.16 2.31	3.71 1.98 1.73	4.44 3.16 1.28	4.34 3.00 1.34	3.48 0.90 2.58	4.94 1.10 3.84	5.27 0.58 4.69	4.91 0.08 4.83	7.28 0.52 6.76	7.11 1.49 5.62	5.54 1.47 4.07
6	Irrigation drainage consumptive use	7.22[b] 3.31 3.91[b]	4.47 2.18 2.29	3.71 2.15 1.56	4.44 3.32 1.12	4.34 3.02 1.32	3.48 0.81 2.67	4.94 0.98 3.96	5.27 0.54 4.73	4.91 0.03 4.88	7.28 0.06 7.22	7.11 1.22 5.89	5.54 1.34 4.20
7	Irrigation drainage consumptive use	6.52[b] 2.54 3.98[b]	4.47 2.11 2.36	3.71 2.07 1.64	4.44 2.94 1.50	4.34 2.67 1.67	3.48 0.78 2.70	4.94 1.03 3.91	5.27 0.89 4.38	4.91 0.21 4.70	7.28 0.74 6.54	7.11 1.83 5.28	5.54 1.47 4.07
8	Irrigation drainage consumptive use	7.19[b] 3.09 4.10[b]	4.47 2.05 2.42	3.71 2.26 1.45	4.44 3.45 0.99	4.34 3.11 1.23	3.48 0.91 2.57	4.94 1.00 3.94	5.27 0.69 4.58	4.91 0.27 4.64	7.28 0.26 7.02	7.11 1.14 5.97	5.54 1.29 4.25
Mean consumptive use of Tanks 1, 2, 3, 6, 7 and 8		3.86[a]	2.34[a]	1.59[a]	1.13[d]	1.32[d]	2.62[a]	3.92[a]		May through September 26.2[a]			
4	Irrigation drainage consumptive use	9.84[b] 4.78 5.06[b]	5.36 2.70 2.66	4.59 3.02 1.57	6.30[c] 5.17 1.13[c]	5.90[c] 4.58 1.32[c]	3.84 1.30 2.54	5.45 1.66 3.79	6.43 1.31 5.12	6.06 0.78 5.28	8.99 1.47 7.52	8.77 2.86 5.91	6.43 2.07 4.36
5	Irrigation drainage consumptive use	10.06[b] 5.02 5.04[b]	5.36 2.37 2.99	4.59 2.82 1.77	5.82[c] 4.69 1.13[c]	5.39[c] 4.07 1.32[c]	3.84 1.45 2.39	5.45 1.60 3.85	6.43 1.14 5.29	6.06 0.74 5.32	8.99 0.97 8.02	8.77 2.83 5.94	6.43 2.05 4.38
Rainfall		0.38	0.22	0.68	5.84	6.98	1.18	2.24	0.01	0.00	0.00	0.00	0.01

DATA ON CONSUMPTIVE USE OF WATER BY LAWN GRASS FROM
EXPERIMENTAL TANKS AT MANZANITA AND MENTONE STREETS, PASADENA, CALIFORNIA
(continued)

In Inches

Tank number	Item	1940-41 Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	Irrigation drainage consumptive use	5.54 1.55 3.99	3.06 2.08 0.98	8.22 0.96 7.26	2.59 2.26 -0.33	17.59 0.98 16.61	11.71 3.41 8.30	5.89 3.00 2.89	3.40 1.98 1.42	4.90 0.00 4.90	7.01 1.09 5.92	6.00 1.33 4.67	5.19 1.71 3.48
2	Irrigation drainage consumptive use	5.54 1.46 4.08	3.06 0.99 2.07	8.22 0.71 7.51	2.59 5.43 -2.84	17.59 1.37 16.22	11.71 3.94 7.77	5.89 3.60 2.29	3.40 1.33 2.07	4.90 0.00 4.90	7.01 0.65 6.36	6.00 1.12 4.88	5.19 1.35 3.84
3	Irrigation drainage consumptive use	5.54 1.67 3.87	3.06 1.95 1.11	8.22 0.93 7.29	2.59 3.38 -0.79	17.59 0.90 16.69	11.71 3.81 7.90	5.89 3.00 2.89	3.40 1.36 2.04	4.90 0.00 4.90	7.01 1.09 5.92	6.00 1.46 4.54	5.19 1.62 3.57
6	Irrigation drainage consumptive use	4.37 0.78 3.59	1.98 0.78 1.20	7.63 0.43 7.20	2.59 5.08 -2.49	17.59 1.32 16.27	11.71 4.37 7.34	5.77 3.60 2.17	1.97 1.02 0.95	2.62 0.00 2.62	4.12 0.00 4.12	3.96 0.00 3.96	3.57 0.00 3.57
7	Irrigation drainage consumptive use	4.37 1.02 3.35	1.98 0.40 1.58	7.63 0.34 7.29	2.59 5.43 -2.84	17.59 1.43 16.16	11.71 3.69 8.02	5.77 3.99 1.78	1.97 1.15 0.82	2.62 0.00 2.62	4.12 0.00 4.12	3.96 0.00 3.96	3.57 0.00 3.57
8	Irrigation drainage consumptive use	4.37 0.81 3.56	1.98 0.87 1.11	7.63 0.40 7.23	2.59 5.15 -2.56	17.59 1.46 16.13	11.71 4.46 7.25	5.77 3.87 1.90	1.97 0.65 1.32	2.62 0.00 2.62	4.12 0.00 4.12	3.96 0.00 3.96	3.57 0.00 3.57
Mean consumptive use of Tanks 1, 2, 3, 6, 7 and 8		3.74[a]	1.34[a]	7.30[f]	-1.87[i]	16.35[f]	7.76[f]	2.32[f]		May through September 18.2[g]			
4	Irrigation drainage consumptive use	4.95 1.15 3.80	2.26 1.46 0.80	7.66 4.87 2.79	2.59 3.63 -1.04	17.59 14.14 3.45	11.71 13.73 - 2.02	6.01 5.10 0.91	4.17 0.53 3.64	6.04 0.12 5.92	8.99 2.36 6.63	7.09 2.39 4.70	6.39 2.43 3.96
5	Irrigation drainage consumptive use	4.95 1.09 3.86	2.26 1.49 0.77	7.66 5.77 1.89	2.59 3.47 -0.88	17.59 10.42 7.17	11.71 11.81 - 0.10	5.86 5.34 0.52	2.41 0.28 2.13	3.40 0.00 3.40	5.08 0.00 5.08	5.00 0.00 5.00	4.41 0.00 4.41
Rainfall		1.73	0.80	7.38	2.59	17.59	11.71	5.41	0.05	0.01	0.02	0.02	T

TABLE L-7

DATA ON CONSUMPTIVE USE OF WATER BY LAWN GRASS FROM
EXPERIMENTAL TANKS AT MANZANITA AND MENTONE STREETS, PASADENA, CALIFORNIA
(continued)

In Inches

Tank number	Item	1941-42 Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	Irrigation drainage consumptive use	3.73 0.84 2.89	3.06 1.12 1.94	6.29 3.19 3.10	0.28 1.55 -1.27	2.24 0.56 1.68	3.51 0.37 3.14	3.39 0.51 2.88	4.99 0.28 4.71	6.18 0.51 5.67	7.63 0.74 6.89	5.90 0.78 5.12	5.70 0.66 5.04
2	Irrigation drainage consumptive use	3.82 0.59 3.23	2.96 1.15 1.81	6.29 3.50 2.79	0.28 1.55 -1.27	2.24 0.06 2.18	3.51 0.56 2.95	3.39 0.66 2.73	4.99 0.16 4.83	6.18 0.66 5.52	7.63 1.21 6.42	5.90 1.27 4.63	5.70 1.14 4.56
3	Irrigation drainage consumptive use	3.76 0.99 2.77	3.03 1.30 1.73	6.29 3.50 2.79	0.28 1.49 -1.21	2.24 0.00 2.24	3.51 0.56 2.95	3.39 0.60 2.79	4.99 0.22 4.77	6.18 0.60 5.58	7.63 1.05 6.58	5.90 0.93 4.97	5.70 0.66 5.04
6	Irrigation drainage consumptive use	3.11 0.00 3.11	2.96 0.00 2.96	6.29 0.00 6.29	0.53 1.30 -0.77	2.10 0.17 1.93	3.67 0.22 3.45	3.15 0.45 2.70	4.87 0.22 4.65	6.18 0.39 5.79	7.63 0.68 6.95	5.90 0.62 5.28	5.70 0.66 5.04
7	Irrigation drainage consumptive use	3.11 0.00 3.11	2.96 0.00 2.96	6.29 0.06 6.23	0.53 1.49 -0.96	2.10 0.25 1.85	3.67 0.34 3.33	3.15 0.60 2.55	4.88 0.28 4.60	6.18 0.45 5.73	7.63 0.84 6.79	5.90 0.81 5.09	5.70 1.41 4.29
8	Irrigation drainage consumptive use	3.11 0.00 3.11	2.96 0.00 2.96	6.29 0.22 6.07	0.53 1.46 -0.93	2.10 0.28 1.82	3.67 0.25 3.42	3.15 0.51 2.64	4.87 0.25 4.62	6.18 0.36 5.82	7.63 0.62 7.01	5.90 0.56 5.34	5.70 0.66 5.04
Mean consumptive use of Tanks 1, 2, 3, 6, 7 and 8		3.04[h]	2.39[h]	4.55[f]	-1.07[i]	1.95[a]	3.21[a]	2.72[a]	May through September 27.1[a]				
4	Irrigation drainage consumptive use	4.22 1.46 2.76	3.74 1.61 2.13	6.33 3.26 3.07	0.28 1.92 -1.64	2.49 0.25 2.24	3.98 0.40 3.58	3.54 0.90 2.64	6.17 0.56 5.61	7.65 0.81 6.84	9.42 1.24 8.18	7.17 1.30 5.87	7.05 1.35 5.70
5	Irrigation drainage consumptive use	3.45 0.00 3.45	3.64 0.00 3.64	6.33 2.08 4.25	0.59 1.98 -1.39	2.33 0.31 2.02	4.17 0.28 3.89	3.27 0.81 2.46	5.74 0.59 5.15	7.65 0.51 7.14	9.42 0.84 8.58	7.17 1.27 5.90	7.05 0.96 6.09
Rainfall		1.68	0.11	6.17	0.28	1.15	1.53	2.67	T	T	0.00	0.41	0.00

DATA ON CONSUMPTIVE USE OF WATER BY LAWN GRASS FROM
EXPERIMENTAL TANKS AT MANZANITA AND MENTONE STREETS, PASADENA, CALIFORNIA
(continued)

In Inches

Tank number	Item	1942-43 Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	Irrigation drainage consumptive use	2.63 0.40 2.23	0.51 0.01 0.50	1.76 0.01 1.75	NR NR NR	19.30 0.57 18.73	12.08 0.82 11.26	1.62 1.10 0.52	0.49 0.86 -0.37	0.53 0.02 0.51	2.85 0.00 2.85	1.78 0.00 1.78	3.20 0.00 3.20
2	Irrigation drainage consumptive use	2.63 0.59 2.04	0.51 0.01 0.50	1.76 0.03 1.73	NR NR NR	19.30 0.62 18.68	12.08 0.73 11.35	1.62 1.54 0.08	0.49 0.38 0.11	0.53 0.06 0.47	2.85 0.00 2.85	1.78 0.00 1.78	3.20 0.00 3.20
3	Irrigation drainage consumptive use	2.63 0.42 2.21	0.51 0.00 0.51	1.76 0.00 1.76	NR NR NR	19.30 0.69 18.61	12.08 0.84 11.24	1.62 1.45 0.17	0.49 0.02 0.47	0.53 0.04 0.49	2.85 0.00 2.85	1.78 0.00 1.78	3.20 0.00 3.20
6	Irrigation drainage consumptive use	2.28 0.50 1.78	0.22 0.00 0.22	1.10 0.00 1.10	NR NR NR	19.24 3.15 16.09	12.02 1.25 10.77	1.51 1.21 0.30	0.38 0.31 0.07	0.42 0.05 0.37	2.37 0.00 2.37	1.54 0.00 1.54	2.73 0.00 2.73
7	Irrigation drainage consumptive use	2.28 0.96 1.32	0.22 0.03 0.19	1.41 0.01 1.40	NR NR NR	19.24 0.66 18.58	12.02 0.90 11.12	1.51 2.14 -0.63	0.38 0.35 0.03	0.42 0.04 0.38	2.37 0.00 2.37	1.54 0.00 1.54	2.73 0.00 2.73
8	Irrigation drainage consumptive use	2.28 0.62 1.66	0.22 0.05 0.17	1.41 0.01 1.40	NR NR NR	19.24 0.83 18.41	12.02 1.15 10.87	1.51 1.68 -0.17	0.38 0.41 -0.03	0.42 0.05 0.37	2.37 0.00 2.37	1.54 0.00 1.54	2.73 0.00 2.73
Mean consumptive use of Tanks 1, 2, 3, 6, 7 and 8		1.87[e]	0.35[j]	1.52[j]	NR[k]	18.18[f]	11.10[f]	0.05[i]	May through September 7.7[g]				
4	Irrigation drainage consumptive use	3.41 1.44 1.97	0.41 0.06 0.35	2.54 0.26 2.28	NR NR NR	19.43 19.13 0.30	12.21 10.86 1.35	1.88 0.63 1.25	0.75 0.03 0.72	0.79 0.00 0.79	3.82 0.00 3:82	2.20 0.00 2.20	3.96 0.00 3.96
5	Irrigation drainage consumptive use	3.41 1.36 2.05	0.41 0.09 0.32	2.54 0.13 2.41	NR NR NR	19.43 2.43 17.00	12.21 3.33 8.88	1.88 2.05 -0.17	0.75 0.33 0.42	0.80 0.18 0.62	3.82 0.30 3.52	2.20 0.11 2.09	3.96 0.00 3.96
Rainfall		1.21	0.04	1.34	NR	19.06	11.84	1.15	0.02	0.06	0.00	0.00	T

TABLE L-7

DATA ON CONSUMPTIVE USE OF WATER BY LAWN GRASS FROM
EXPERIMENTAL TANKS AT MANZANITA AND MENTONE STREETS, PASADENA, CALIFORNIA
(continued)

In Inches

Tank number	Item	1943-44 Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	Irrigation-drainage consumptive use	3.17 0.00 3.17	3.03 0.00 3.03	NR NR NR	8.37 0.00 8.37	10.55 0.33 10.22	3.78 5.05 -1.27	1.21 0.31 0.90	3.05 0.00 3.05	1.73 0.00 1.73	1.42 0.00 1.42	1.66 0.00 1.66	2.40 0.00 2.40
2	Irrigation drainage consumptive use	3.17 0.00 3.17	3.03 0.00 3.03	NR NR NR	8.37 0.00 8.37	10.55 0.00 10.55	3.78 5.52 -1.74	1.21 0.11 1.10	3.05 0.00 3.05	1.73 0.00 1.73	1.42 0.00 1.42	1.66 0.00 1.66	2.40 0.00 2.40
3	Irrigation drainage consumptive use	3.17 0.00 3.17	3.03 0.00 3.03	NR NR NR	8.37 0.00 8.37	10.55 0.03 10.52	3.78 3.33 0.45	1.21 1.02 0.19	3.05 0.00 3.05	1.73 0.00 1.73	1.42 0.00 1.42	1.66 0.00 1.66	2.40 0.00 2.40
6	Irrigation drainage consumptive use	2.69 0.00 2.69	2.55 0.00 2.55	NR NR NR	8.37 0.00 8.37	10.55 0.43 10.12	3.78 6.75 -2.97	0.91 0.08 0.83	2.70 0.00 2.70	1.38 0.00 1.38	1.07 0.00 1.07	1.25 0.00 1.25	1.81 0.00 1.81
7	Irrigation drainage consumptive use	2.69 0.00 2.69	2.55 0.00 2.55	NR NR NR	8.37 0.00 8.37	10.55 0.32 10.23	3.78 5.62 -1.84	0.91 0.06 0.85	2.70 0.00 2.70	1.38 0.00 1.38	1.07 0.00 1.07	1.25 0.00 1.25	1.81 0.00 1.81
8	Irrigation drainage consumptive use	2.69 0.00 2.69	2.55 0.00 2.55	NR NR NR	8.37 0.00 8.37	10.55 0.00 10.55	3.78 5.18 -1.40	0.91 0.11 0.80	2.70 0.00 2.70	1.38 0.00 1.38	1.07 0.00 1.07	1.25 0.00 1.25	1.81 0.00 1.81
Mean consumptive use of Tanks 1, 2, 3, 6, 7 and 8		2.93[j]	2.79[j]	NR[k]	8.37[f]	10.37[f]	-1.46[i]	0.78[m]	May through September 9.2[g]				
4	Irrigation drainage consumptive use	3.84 0.00 3.84	3.70 0.00 3.70	NR NR NR	8.37 0.98 7.39	10.55 8.11 2.44	4.15 6.59 -2.44	1.86 0.08 1.78	3.83 0.00 3.83	2.51 0.00 2.51	2.20 0.00 2.20	2.57 0.00 2.57	3.70 0.00 3.70
5	Irrigation drainage consumptive use	3.84 0.00 3.84	NR NR NR	NR NR NR	8.37 0.10 8.27	10.55 1.53 9.02	3.78 5.80 -2.02	1.86 1.58 0.28	3.83 1.59 2.24	2.51 0.71 1.80	2.20 0.39 1.81	2.57 0.14 2.43	3.70 0.00 3.70
Rainfall		0.32	0.18	NR	8.37	10.55	3.78	0.02	1.63	0.31	0.00	T	0.03

DATA ON CONSUMPTIVE USE OF WATER BY LAWN GRASS FROM
EXPERIMENTAL TANKS AT MANZANITA AND MENTONE STREETS, PASADENA, CALIFORNIA
(continued)

In Inches

Tank number	Item	1944-45 Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	Irrigation drainage consumptive use	2.43 0.00 2.43	7.09 0.00 7.09	1.24 0.00 1.24	1.43 0.00 1.43	4.40 0.00 4.40	3.38 0.00 3.38	1.08 0.00 1.08	1.36 0.06 1.30	1.53 0.00 1.53	0.95 0.00 0.95	NR NR NR	NR NR NR
2	Irrigation drainage consumptive use	2.40 0.00 2.40	7.09 0.00 7.09	1.24 0.00 1.24	1.43 0.00 1.43	4.40 0.00 4.40	3.38 0.00 3.38	1.08 0.28 0.80	1.36 0.21 1.15	1.53 0.00 1.53	0.95 0.00 0.95	NR NR NR	NR NR NR
3	Irrigation drainage consumptive use	2.43 0.00 2.43	7.09 0.00 7.09	1.24 0.00 1.24	1.43 0.00 1.43	4.40 0.00 4.40	3.38 0.00 3.38	1.08 0.31 0.77	1.36 0.10 1.26	1.53 0.00 1.53	0.95 0.00 0.95	NR NR NR	NR NR NR
6	Irrigation drainage consumptive use	1.84 0.00 1.84	6.74 0.00 6.74	1.00 0.00 1.00	1.32 0.00 1.32	4.40 0.00 4.40	3.38 0.00 3.38	1.08 0.00 1.08	1.12 0.00 1.12	1.18 0.00 1.18	0.71 0.00 0.71	NR NR NR	NR NR NR
7	Irrigation drainage consumptive use	1.84 0.00 1.84	6.74 0.00 6.74	1.00 0.00 1.00	1.32 0.00 1.32	4.40 0.00 4.40	3.38 0.00 3.38	1.08 0.47 0.61	1.12 0.17 0.95	1.18 0.00 1.18	0.71 0.00 0.71	NR NR NR	NR NR NR
8	Irrigation drainage consumptive use	1.84 0.00 1.84	6.74 0.00 6.74	1.00 0.00 1.00	1.32 0.00 1.32	4.40 0.00 4.40	3.38 0.00 3.38	1.08 0.08 1.00	1.12 0.22 0.90	1.18 0.03 1.15	0.71 0.00 0.71	NR NR NR	NR NR NR
Mean consumptive use of Tanks 1, 2, 3, 6, 7 and 8		2.13[j]	6.92[f]	1.12[j]	1.38[j]	4.40[f]	3.38[j]	0.89[j]	May through September[k]				
4	Irrigation drainage consumptive use	3.73 0.00 3.73	7.87 0.00 7.87	1.76 0.00 1.76	1.69 0.25 1.44	4.40 0.24 4.16	3.38 1.54 1.84	1.08 0.97 0.11	1.88 0.29 1.59	2.31 0.00 2.31	1.47 0.00 1.47	NR NR NR	NR NR NR
5	Irrigation drainage consumptive use	3.70 0.00 3.70	7.87 0.10 7.77	1.76 0.35 1.41	1.69 0.27 1.42	4.40 0.13 4.27	3.38 0.91 2.47	1.08 0.48 0.60	1.88 1.27 0.61	2.31 0.34 1.97	1.47 0.16 1.31	NR NR NR	NR NR NR
Rainfall		0.06	5.67	0.29	0.96	4.40	3.38	1.08	0.41	0.11	0.00	NR	NR

The following footnotes indicate the utilization of the data from Tanks 1, 2, 3, 6, 7 and 8.

a. Data were utilized. (Value underlined.)
b. Partially estimated by interpolation.
c. Estimated by comparison with Tanks 1, 2, 3, 6, 7 and 8.
d. Data not used because irrigation was less than rainfall.
e. Data not used because of extreme variance between tanks.
f. Data not used because probable surface runoff occurred.
g. Data not used because zero drainage occurred in some months.
h. Data not used because of zero drainage through Tanks 6, 7 and 8.
i. Data not used because of probable drainage from water applied the preceding month.
j. Data not used because of zero or negligible drainage through tanks.
k. Data not used because of incomplete record.
m. Data not used because rainfall did not agree with nearby precipitation stations.

The optimum consumptive use during the winter season could not be accurately separated into evaporation and transpiration uses so that gross values of rain and delivered water were combined before disposal by consumptive use and deep percolation.

TABLE L-8

OPTIMUM CONSUMPTIVE USE OF WATER BY LAWN GRASS
FROM DATA OF RAYMOND BASIN TANKS 1, 2, 3, 6, 7, AND 8

In Inches

Date	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May-Sept.	Annual
1939-40	3.86	2.34	1.59			2.62	3.92	26.2	
41	3.74								
42					1.95	3.21	2.72	27.1	
43									
44									
45									
Average	3.8	2.3	1.6	1.6*	2.0	2.9	3.3	26.7	44.2

* January considered comparable with December.

Irrigation Water

The depth of delivered water for each irrigated crop and the methods by which they were obtained are shown in Appendix J.

Weighting Factors

Weighting factors used for the computation of consumptive use, deep percolation and residual rain on land use classifications were derived from a ratio of the pervious area to the total area. This ratio in effect adjusted the net unit value of consumptive use, deep percolation and residual rain so that the weighted unit values could be directly multiplied by the gross acreage for each classification to determine the disposal of water in acre-feet.

Irrigated Crops, Dry Farm and Native Vegetation

The weighting factor was found to vary with different types of land use and hydrologic subareas. For irrigated crops, dry farm and native vegetation on the valley floor, it was determined that approximately five percent of the area was impervious in San Fernando Hydrologic Subarea and ten percent impervious in Sylmar and Verdugo Hydrologic Subareas. The percent impervious represented the area of roads where no deep percolation could occur and consumptive use of rain limited to evaporation.

The percent impervious was determined for each hydrologic subarea by the use of Frank Carr's maps showing areas for irrigated crops in the City of Los Angeles west of Burbank. It is apparent that farms under cultivation in the San Fernando Subarea are on the average twice as large as those situated in either Sylmar or Verdugo Subareas. Roads in the agricultural area of San Fernando Subarea are generally located every one-half mile. The impervious areas in this one-quarter section include the roadway, shoulder and farmhouse area. The impervious area is approximately five percent of the quarter section.

In Sylmar and Verdugo Subareas, the roads are spaced at approximately every one-quarter mile. Due to the increased roads, the impervious area was increased to ten percent of the total irrigated acreage.

Residential

The landscaping of residential lots has changed within the span of the base period. This change not only affected the percent impervious on lots but also altered the area of the lot under cultivation. These changes are the result of smaller residential lot sizes and the increased beneficial use of the lot.

A representative sampling of residential lots in the four hydrologic subareas was made by the Referee in 1959. The purpose of this survey was to determine the relative amounts of impervious, irrigated lawn and garden, and native culture within the average lot. The age of the house was also obtained to relate these data to the beginning of the base period.

Based on this survey, it was found that the percent impervious had increased due to improvements. The average percent impervious existing in 1959 for homes in the area of investigation is listed in Table L-9.

TABLE L-9

PERCENT OF RESIDENTIAL LOT IMPERVIOUS

Age years	Percent impervious	
	1959	Adjusted
30 and older	42	32.7
15 - 29	49	37.3
10 - 14	53	
5 - 9	50.6	
1 - 4	56.2	

To adjust for improvements made to homes prior to 1945, it was assumed that 75 percent of the impervious area which existed on a lot in 1959 was made subsequent to 1945. The increase in impervious areas due to improvements on older homes was proportioned equally to the three periods established after 1945. The percent impervious for each period was weighted according to the age and acreage of residential in existence in the prior period and the increase in acreage of new residential areas. From the survey, the percentage of lots containing lawn and garden, deciduous and native areas was also determined. The composition and percentage of the residential lots existing within the base period are shown in Table L-10.

TABLE L-10

CULTURE BREAKDOWN OF RESIDENTIAL LOTS

In Percent

Period	Impervious	Lawn and garden	Deciduous	Native
1928-45	35	25	20	20
1946-50	40	30	15	15
1951-55	45	30	15	10
1956-58	50	35	10	5

Commercial and Industrial

Commercial and industrial acreages were assumed to be 100 percent impervious.

Miscellaneous

Miscellaneous contains land use classifications which are pervious and impervious. Based on the 1958 land use survey made by the

Referee, it was found that approximately 50 percent of the area was impervious and 50 percent native vegetation.

Disposal of Water by Irrigated Crops

Computation of the disposal of rain and delivered water by irrigated crops is performed monthly in the winter season by use of evaporation, transpiration and soil moisture deficiency values. Disposal during the summer season is accomplished by use of the irrigation efficiency and the soil moisture carry-over values.

The procedure used on the irrigated crops listed in Table L-5 is described by use of the sample computation made for alfalfa and irrigated pasture for the year 1940-41. The sample computation and accompanying detailed explanation are shown on Figure L-1.

Weighted disposal values shown at the end of the sample computation are the end product of the computations. These were obtained by weighting the disposal values according to the percent pervious and impervious for each land use classification.

Disposal of Water by Dry Farm and Native Vegetation

This computation is done in the same manner as that for irrigated crops. Values for delivered water are all zero since the only supply of water to this classification is rain.

FIGURE L-1

DISPOSAL OF WATER BY ALFALFA AND IRRIGATED PASTURE

In Inches Except as Noted

San Fernando Hydrologic Subarea for 1940-41 — 85 Percent Irrigation Efficiency - 5 Percent Impervious - 95 Percent Pervious

	Winter season: Oct. (1)	Nov. (2)	Dec. (3)	Jan. (4)	Feb. (5)	Mar. (6)	Apr. (7)	End of season (8)	Subtotal (9)	Growing season: Soil moisture carry-over (10)	Growing season: May-September (11)	Total to September 30: Inches (12)	Total to September 30: Feet (13)	Weighting factor (14)	Weighted values: Delivered water, in feet (15)	Weighted values: Rainfall, in feet (16)
1. Gross Rainfall	1.3	0.3	8.2	2.7	12.7	10.0	4.1		39.3		0.3	39.6	3.30			
2. Evaporation of Rainfall on Impervious Areas	0.5	0.3	1.1	0.9	0.8	1.3	1.2		6.1		0.3	6.4	0.53	0.05		0.03
3. Net Rainfall on Impervious Areas	0.8	0.0	7.1	1.8	11.9	8.7	2.9		33.2		0.0	33.2	2.77	0.05		0.14
4. Evaporation of Rain on Pervious Areas	0.9	0.3	1.1	0.9	1.1	2.0	2.5		8.8		0.3	9.1	0.76	0.95		0.72
5. Net Rainfall on Pervious Areas	0.4	0.0	7.1	1.8	11.6	8.0	1.6		30.5		0.0	30.5	2.54			
6. Total Irrigation Water	1.8	0.6	0.6	0.0	0.0	0.0	0.1		3.1		13.9	17.0	1.42			
7. Evaporation of Irrigation Water	0.3	0.1	0.1	0.0	0.0	0.0	0.0		0.5			0.5	0.04	0.95	0.04	
8. Net Irrigation Water	1.5	0.5	0.5	0.0	0.0	0.0	0.1		2.6							
9. Total Water Available on Pervious Area	1.9	0.5	7.6	1.8	11.6	8.0	1.7		33.1							
WATER DISPOSAL-PERVIOUS AREA																
10. Soil Moisture Deficiency, First of Month	4.0	4.0	4.0	0.0	0.0	0.0	0.0	0.5	3.5	R : DW 3.2 : 0.3						
11. Transpiration Rate	2.9	2.1	0.9	0.9	1.1	2.1	2.2									
12. Disposal of Net Water																
a. Transpiration	1.9	0.5	0.9	0.9	1.1	2.1	1.7	9.1	R : DW 8.4 : 0.7		R : DW 0.0 : 11.8	R : DW 8.4 : 12.5	R : DW 0.70 : 1.04	0.95	0.99	0.67
b. Soil Storage	0.0	0.0	4.0	0.0	0.0	0.0	0.0									
c. Deep Percolation	0.0	0.0	2.7	0.9	10.5	5.9	0.0	20.0	18.4 : 1.6		0.0 : 2.1	18.4 : 3.7	1.53 : 0.31	0.95	0.29	1.45
d. Subtotal	1.9	0.5	7.6	1.8	11.6	8.0	1.7									
13. Consumptive Use of Water in Soil Storage	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5 : 0.0		3.2 : 0.3	3.7 : 0.3	0.31 : 0.03	0.95	0.03	0.29

Weighted consumptive use = 1.06' from delivered water (sum of lines 7, 12a and 13).
= 1.71' from rain (sum of lines 2, 4, 12a and 13).
Weighted deep percolation = 0.29 from delivered water and 1.45' from rain (line 12c).
Residual rain = 0.14' from rain (line 3).

<u>Winter Season</u>

Columns 1 through 9

- Line 1 - Monthly rainfall from October through April from Table E-6.
- Lines 2 and 4 - Monthly evaporation of rainfall from Table L-1.
- Line 3 - Monthly net rainfall on impervious areas (line 1 minus line 2).
- Line 5 - Monthly net rainfall on pervious areas (line 1 minus line 4).
- Line 6 - Monthly depth of delivered irrigation water in Table J-8 divided by percent pervious (95 percent for this crop).
- Line 7 - Evaporation of delivered irrigation water (15 percent of line 6).
- Line 8 - Net irrigation water (line 6 minus line 7).
- Line 9 - Total water available on pervious areas (line 5 plus line 8).
- Line 10 - Fall soil moisture deficiency as of October 1 is entered in column 1 (Table L-5).
- Line 11 - Monthly transpiration rate (Table L-2).
- Line 12a, Line 12b, Line 12c, Line 12d, Line 13 - Monthly total water available on pervious areas is disposed of first by fulfilling the transpiration rate (line 11); second, soil moisture deficiency (line 10); and third, deep percolation. Each item must be met in the above order before the succeeding item is entered. The amount of transpiration (line 12a) cannot exceed the amounts in line 11. The amount of water transpired (12a) is equal to line 9 or line 11, whichever is the smaller. Any water remaining (line 9 minus line 12a) up to the amount of line 10 is placed in soil storage (12b) for use as transpiration (12a) in succeeding months whenever the water available (9) is less than the transpiration use requirement (11). The amount placed in soil storage (12b) during one month is subtracted from the amount of the soil moisture deficiency (10) for the following month. When water is withdrawn from soil storage to satisfy the transpiration rate, the amount is entered in line 13 and added to the soil moisture deficiency for the following months. The water remaining after transpiration and soil storage are satisfied is entered in line 12c as deep percolation. The amount of transpiration (line 12a), deep percolation (line 12c) and consumptive use of water in soil storage (line 13) are divided into their source of supply derived from precipitation and delivered water by the ratios of the subtotals for line 5 and line 8 to line 9 and entered in column 9. Line 12d is the sum of lines 12a, 12b and 12c and used as a check on the disposal of total water available on pervious areas (line 9).

<u>Growing Season</u>

Column 10

- Line 10 only - Soil moisture carry-over is equal to the amount in column 1, line 10, minus the amount in column 7, line 10, and is proportioned between precipitation and delivered water in the ratios of subtotals (column 9) for line 5 and line 6 to line 9.

Column 11

- Line 1 through 6 - Enter in column 11 as for winter season.
- Line 7 - Not used. Evaporation of irrigation included in irrigation efficiency.
- Line 12a - Consumptive use during the growing season is entered as the product of line 6 times the irrigation efficiency and proportioned according to the amounts of the source of supply derived from precipitation and delivered water (line 5 and line 6, column 11, (respectively).
- Line 12c - Same as line 12a except the values are multiplied by the reciprocal of irrigation efficiency.
- Line 13 - Soil moisture carry-over on line 10, column 10, becomes consumptive use during the growing season and is transferred to line 13, column 11.

Column 12

Sum of columns 9 and 11.

Column 13

Column 12 expressed in feet.

Column 14

Weighting factor for percent of impervious or pervious areas.

Columns 15 and 16

Final weighted values for the various items with total appearing at the bottom of the table.

Disposal of Water by Lawn Grass*

Culture in this classification consists of the irrigated lawn portion of installations such as golf courses, cemeteries, parks, and contains no impervious areas.

The depth of delivered water used for lawn grass was taken to be 3.2 feet based on irrigation records for this type of culture in the area. Total annual consumptive use of 3.67 feet was based on records from Raymond Basin Reference tanks. Consumptive use of rain and applied water was computed on the basis of the amount of each available.

Deep percolation was computed as the total available water less consumptive use. The deep percolation was proportioned into deep percolation of rain and delivered water on the basis of the amounts of each available.

Disposal of Water on Residential Areas

The disposal of water on the three portions of residential areas was made separately and the weighted values combined to give values for gross residential areas. A sample computation for the impervious and lawn area is shown on Figure L-2.

On the residential impervious area consumptive use consisted only of evaporation of rain. The remaining rain, less the portion of the lot (10 percent of the lot) which drains to the pervious area, was considered residual rain. On the pervious areas the method used during the winter is the same as that for irrigated crops. At the end of the winter season the disposal items were divided into quantities of rain and irrigation water based on the amount of each available during the season.

*Does not apply to residential lawn areas

FIGURE L-2

DISPOSAL OF WATER BY RESIDENTIAL IMPERVIOUS AND LAWN AREA

In Inches Except as Noted

Verdugo Hydrologic Subarea for 1940-41 — Percent of Residential Lot Lawn Grass: 25 — Percent Impervious: 35

	Winter season									Growing season		Total to September 30		Weighting factor	Weighted values	
	Oct. (1)	Nov. (2)	Dec. (3)	Jan. (4)	Feb. (5)	Mar. (6)	Apr. (7)	End of season (8)	Subtotal (9)	Soil moisture carry-over (10)	May-September (11)	Inches (12)	Feet (13)	(14)	Delivered water, in feet (15)	Rainfall, in feet (16)
1. Gross Rainfall	1.7	0.7	6.6	3.2	17.2	11.7	6.5		47.6		0.3	47.9	3.99			
2. Evaporation of Rainfall on Impervious Areas	0.5	0.5	1.5	1.3	1.1	1.3	1.4		7.6		0.3	7.9	0.66	0.35		0.23
3. Net Rainfall on Impervious Areas	1.2	0.2	5.1	1.9	16.1	10.4	5.1		40.0		0.0	40.0	3.33			1.05
4. Drainage of Impervious to Pervious	0.1	0.0	0.7	0.3	2.2	1.5	0.7		5.5		0.0					
5. Irrigation Water	2.8	1.4	1.1	0.4	0.0	0.2	0.4		6.3		17.0	23.3	1.94			
6. Net Water Available on Pervious Area	4.6	2.1	8.4	3.9	19.4	13.4	7.6		59.4		17.3					
WATER DISPOSAL-PERVIOUS AREA																
7. Soil Moisture Deficiency, First of Month	1.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	1.0	R 0.9 : DW 0.1						
8. Consumptive Use Requirement	3.8	2.3	1.6	1.6	2.0	2.9	3.3				26.7					
9. Disposal of Net Water																
a. Consumptive Use	3.8	2.1	1.6	1.6	2.0	2.9	3.3	17.3	R 15.5 DW 1.8		R 0.3 : DW 17.0	R 15.8 DW 18.8	R 1.32 DW 1.56	0.25	0.39	0.34
b. To Soil Storage	0.8	0.0	0.4	0.0	0.0	0.0	0.0									
c. Residual on Pervious Area	0.0	0.0	6.4	2.3	17.4	10.5	4.3	40.3	36.0 4.3		0.0 0.0	36.0 4.3	3.00 0.36	0.25	0.10	0.75
d. Subtotal	4.6	2.1	8.4	3.9	19.4	13.4	7.6									
10. Consumptive Use of Water in Soil Storage	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2 0.0		0.9 0.1	1.1 0.1	0.10 0.0	0.25	0.0	0.02

Weighted consumptive use = 0.39' delivered water and 0.59' rain.
Weighted deep percolation = 0.10' delivered water and 0.75' rain.
Weighted residual = 1.05' rain.

Line 4 = 10 percent of line 3 is distributed over the lawn area which equals to 25 percent of the lot, therefore, line 4 = $\frac{10\% \text{ of line 3} \times 35\%}{25\%}$

During the growing season it was considered that lawn grass consumed all available water up to the optimum amount* and excess water, if any, was considered to be deep percolation. It was assumed that the deciduous culture consumed all available water up to the average May-September consumptive use quantity of 28.4 inches and excess water, if any, was considered to be deep percolation. Native vegetation was considered to consume all available rain and soil moisture carry-over during the growing season.

The monthly depths of irrigation waters delivered to residential lawns and gardens for San Fernando, Sylmar and Verdugo Hydrologic Subareas are discussed and determined in Appendix J.

* See pages 20 through 25.

Disposal of Water in Industrial and Commercial Areas

There is a large variation in the amount of water used by different types of industries and commercial establishments in the area of investigation. For this reason it would have been desirable to separate the industrial and commercial water users into groups based on their relative consumptive uses. However, a review of available land use surveys indicates that this could not be satisfactorily accomplished, especially during the earlier portion of the base period. Commercial and industrial acreages have therefore been combined and treated as one group. Acreage of native vegetation in these land classes has been included in the overall acreage of native culture. Extensive lawn areas existing on the grounds of the various industrial and commercial establishments have also been considered separately and are included in the irrigated lawn grass category. Disposal of water applied to the pervious portion of the gross industrial and commercial areas has thus been separately accounted for.

Disposal of the water supply on the remaining impervious acreage in the industrial and commercial groups comprises evaporation of rainfall, industrial or commercial process consumption either by evaporation or incorporation into the product, sewage, evaporation from lined sumps, waste disposed through surface channels, and deep percolation. Deep percolation is a relatively small proportion of the industrial and commercial water utilized because it may only occur in the relatively few instances where waste is disposed to unlined sumps or channels and cesspools.

The 1958 land use survey indicates the following relationship existing between commercial and industrial acreage:

Water Service Area	1958 Culture Survey Commercial acreage	Industrial acreage
Owens River - City of Los Angeles		
San Fernando Subarea	4,173	3,311
Sylmar Subarea	123	8
Mission Wells - City of Los Angeles	145	78
Sunland and Tujunga - City of Los Angeles	194	2
Narrows - City of Los Angeles	336	939
City of Burbank	992	1,069
City of San Fernando	168	108
City of Glendale		
San Fernando Subarea	894	316
Verdugo Subarea	83	8
Crescenta Valley County Water District	133	14
TOTAL	7,241	5,853
PERCENT	55	45

The amount of water delivered to commercial and industrial users is available for the City of Los Angeles service area west of Burbank for the period 1928-29 through 1957-58 and in the City of Burbank from 1936-37 through 1957-58. In the City of Los Angeles, annual industrial and commercial water deliveries are available as a combined amount, based on the type of electrical power account.

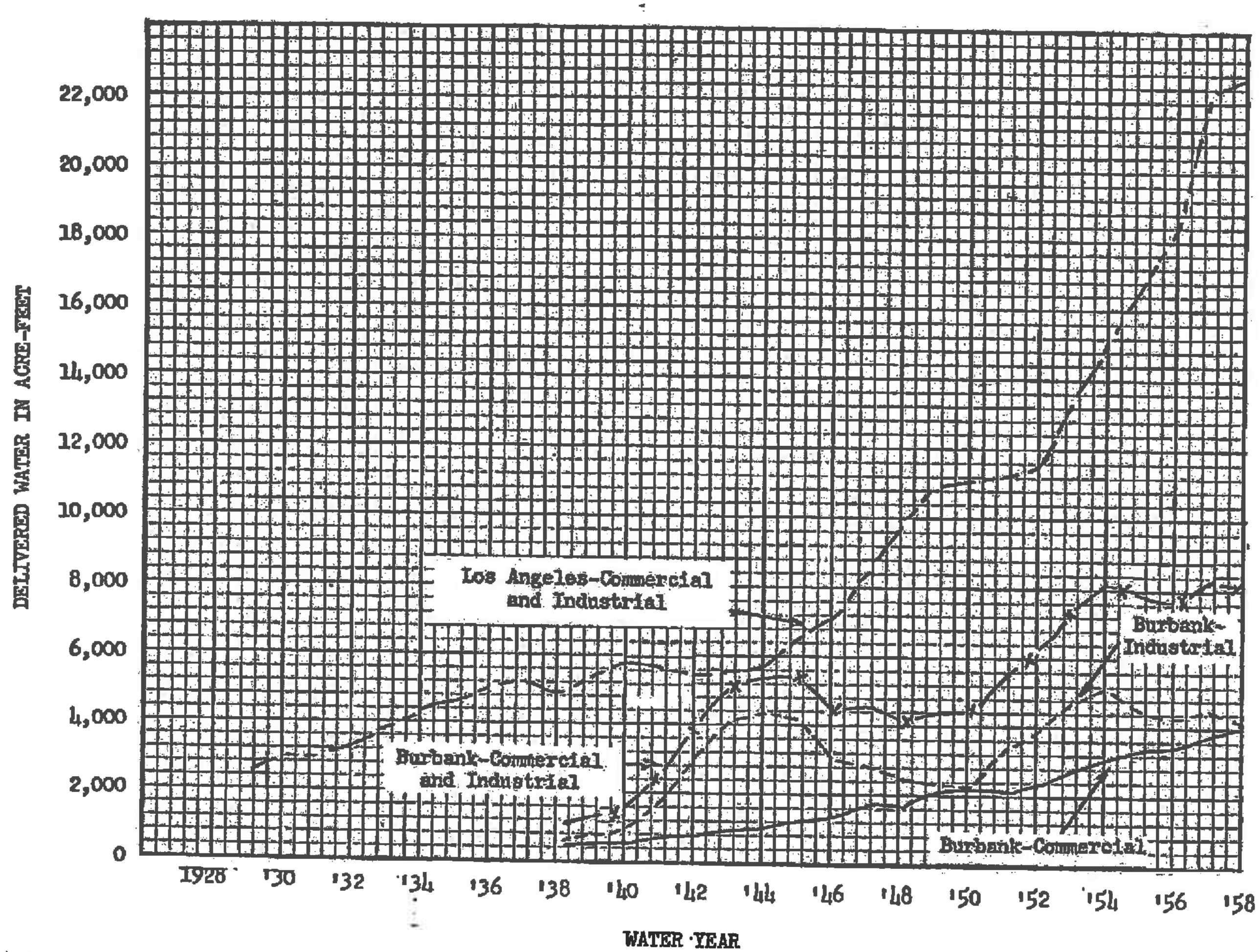
Electrical sales accounts include in one category all sales for commercial use, industrial use and some multiple dwellings where the water is served through one meter. The City of Burbank water sales records list commercial and industrial users separately based on actual type of water use.

The amount of industrial and commercial water sales in the two service areas is shown on Figure L-3, which indicates a sharp increase in the delivery of industrial water in Burbank during the periods of World War II and the Korean Police Action, while the deliveries of commercial water to this area show a more gradual increase during these periods.

The amount of water delivered to the Los Angeles-Owens area, depicted on Figure L-3, increased at a more or less uniform rate from 1928 through 1945. Commercial and industrial water sales increased rapidly during the periods of expanding population and industry following the war, as indicated by the uniform average annual increase in delivery of 1,300 acre-feet during the period 1947 through 1949 and 1,750 acre-feet during the period 1953 through 1956.

The computation of the disposal of water for industrial and commercial areas consists of the following; (1) evaporation of rain, (2) delivered water, (3) sewage, and (4) industrial wastes. The disposal of delivered water is based on data published in Table 11 of Bulletin 24, entitled "Los Angeles County Land and Water Use Survey, 1955", State Water Resources Board.

FIGURE L-3



SAN FERNANDO VALLEY REFERENCE

DELIVERIES OF WATER TO COMMERCIAL AND INDUSTRIAL AREAS IN THE CITY OF LOS ANGELES WEST OF BURBANK AND IN THE CITY OF BURBANK

STATE WATER RIGHTS BOARD

The unit values of delivered water less sewage as set forth in this bulletin are: 0.4 foot for strip commercial, 1.1 feet for downtown commercial and 1.4 feet for manufacturing industrial. These values were derived from acreages for each land use class excluding street rights of way. For use of these values with the land use survey made by the Board staff, the percentage of commercial and industrial lots occupied by streets was taken as 35 percent and 25 percent, respectively. The commercial acreages were equally divided into strip and downtown commercial to conform with the land use classification set forth in Bulletin 24.

A mean value for combined industrial and commercial areas was determined by weighting the aforementioned unit values with the area in each category existing as of 1958, resulting in a mean value of 0.85 foot. This value was applied to the combined industrial and commercial acreages for all years of the base period except 1940-41 through 1945-46 and 1951-52 through 1954-55 when the use was increased because of war activity.

Industries in Burbank, Glendale, and the Narrows service areas are considered to have been affected similarly by defense contracts resulting in an increased use of water. Since the City of Burbank is the only one of these service areas which measures industrial delivered water separately, the following adjustments were made based on delivered industrial water which occurred in the City of Burbank:

Year	Increased Industrial Deliveries in feet of depth
1940-41	0.85
1941-42 through 1944-45	1.70
1945-46	0.85
1951-52 through 1954-55	0.85

The mean value of 0.85 foot for delivered water less sewage was used for all years in the base period for San Fernando, Sylmar and Verdugo Subareas, except for the areas and years noted above as having higher deliveries. For the above years of increased deliveries a weighted value for the San Fernando Subarea was determined by using 1.70 feet and 2.55 feet for the industrial acreages in the Burbank, Glendale and the Narrows service areas. The proportion of commercial to industrial acreages for these service areas was based on the 1958 land use survey made by the Referee. The weighted value thus derived for the San Fernando Subarea was 1.00 foot and 1.15 feet for the increased use of 0.85 and 1.70 feet, respectively. The annual unit values of delivered water less sewage were then applied to the acreage classified as industrial and commercial in each of the subareas.

Industrial wastes discharged into the Los Angeles River, derived in Appendix N, were deducted from the computed commercial and industrial delivered water less sewage resulting in the annual consumptive use of commercial and industrial areas.

In the San Fernando Subarea an additional consumptive use of delivered water was added for the period 1954-55 through 1957-58. This additional consumptive use, as shown in Table L-11, was attributed to the breweries and the valley steam plant which were in operation at that time and was estimated as follows:

Plant: Anheuser Busch Brewery

Industrial area	26 acres
Delivered water	1,032 acre-feet (1955-56)
Gross depth per acre	39.7 feet
Sewage	421 acre-feet (March and April, 1955 spot measurements)
Consumptive use	611 acre-feet
Plant in operation	From March, 1955

Plant: Joseph Schlitz Brewery

Industrial area	17 acres
Delivered water	782 acre-feet (estimated by comparison to amount of sewage from Anheuser Busch)
Gross depth per acre	46.0 feet
Sewage	395 acre-feet (March and April, 1955 spot measurements)
Consumptive use	387 acre-feet
Plant in operation	From March, 1955

Plant: Valley Steam Plant (Los Angeles Department of Water and Power)

Industrial area 110 acres

Year	Delivered water, in acre-feet	Gross depth per acre, in feet	Sewage and waste, in acre-feet	Consumptive use,[a] in acre-feet	Consumptive use per acre, in feet	Deep percolation,[b] in acre-feet
1952-53	35	0.32		25	0.23	10
53-54	684	6.22		493	4.5	191
54-55	3,471	31.5		2,499	22.7	972
1955-56	6,056	55.2		4,360	39.6	1,700
56-57	6,976	63.5		5,023	45.7	1,952
57-58	7,000[c]	63.5	1,917[d]	5,083	46.3	1,920

a. Based on 1958 percentage of delivered water.
b. Delivered water minus consumptive use.
c. Estimated from calendar year measurements.
d. Estimated by the City of Los Angeles Department of Water and Power from operational records. The Valley Steam Plant was not connected to the sewers until October 15, 1958. Prior to this date, sewage and waste was discharged into the city's Gravel Pits or Tujunga Wash Channel.

TABLE L-11

ESTIMATED ADDITIONAL CONSUMPTIVE USE DUE TO
BREWERIES AND VALLEY STEAM PLANT

In Acre-Feet

Year	Anheuser Busch Brewery	Joseph Schiltz Brewery	Los Angeles Valley Steam Plant (L.A.D.W.&P.)	Total	Based on unit values	Additional consumptive use
1952-53			25	25	110	0
53-54			493	493	110	383
54-55	305	194	2,499	2,998	131	2,867
1955-56	611	387	4,360	5,358	130	5,228
56-57	611	387	5,023	6,021	130	5,891
57-58	611	387	5,083	6,081	130	5,951

Table L-12 shows the computation for obtaining the consumptive use for commercial and industrial areas.

TABLE L-12

COMMERCIAL AND INDUSTRIAL
CONSUMPTIVE USE OF DELIVERED WATER

In Acre-Feet

Year	Delivered water less sewage (1)	Industrial wastes (2)	Additional consumptive use (3)	Total commercial and industrial consumptive use (1)-(2)+(3)=(4)
1928-29	2,550	0	0	2,550
29-30	2,950	0	0	2,950
1930-31	3,340	0	0	3,340
31-32	3,740	0	0	3,740
32-33	4,140	0	0	4,140
33-34	4,540	0	0	4,540
34-35	4,930	0	0	4,930
1935-36	5,330	0	0	5,330
36-37	5,730	0	0	5,730
37-38	6,130	0	0	6,130
38-39	6,520	0	0	6,520
39-40	6,930	0	0	6,930
1940-41	8,590	540	0	8,050
41-42	10,400	1,090	0	9,310
42-43	10,940	1,640	0	9,300
43-44	11,480	2,190	0	9,290
44-45	12,000	2,740	0	9,260
1945-46	10,920	3,290	0	7,630
46-47	9,700	3,840	0	5,860
47-48	10,100	4,090	0	6,010
48-49	10,500	4,660	0	5,840
49-50	10,670	4,740	0	5,930
1950-51	10,840	4,810	0	6,030
51-52	12,920	5,280	0	7,640
52-53	13,130	6,080	0	7,050
53-54	13,330	5,980	380	7,730
54-55	13,420	6,350	2,870	9,940
1955-56	11,540	5,880	5,230	10,890
56-57	11,620	5,580	5,890	11,930
57-58	11,700	5,750	5,950	11,900

Consumptive Use of Riparian Vegetation

Riparian vegetation as set forth in Appendix K consists of vegetation growing in swamps, meadowlands and stream channels. The annual transpiration use for riparian vegetation, as heretofore established, is equal to 3.68 feet. The total annual consumptive use is therefore equal to the sum of the evaporation of rain on pervious areas and the annual transpiration use. Since the annual depth of precipitation cannot satisfy the consumptive use requirements, the difference was assumed to have been withdrawn from ground water storage. The annual consumptive use of riparian vegetation was calculated by the following equation:

$$\text{Consumptive Use} = \text{Evaporation of rain on pervious areas} + 3.68 = \text{Annual depth of precipitation} + \text{withdrawal from ground water storage}$$

Unit Values of Consumptive Use and Deep Percolation for Culture Classes

The unit values of consumptive use, deep percolation and residual rain, contained in Table L-13, L-14 and L-15 for the San Fernando, Sylmar and Verdugo Hydrologic Subareas, respectively, have been weighted for the percent of impervious area and therefore are to be applied to gross acreage in each land use class. Unweighted unit values of consumptive use and deep percolation of portions of the residential land use class areas are shown in Table L-15A. As previously noted, the Eagle Rock Subarea is combined with the San Fernando Subarea and the units values of consumptive use and deep percolation reflect the combined areas.

TABLE L-13

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION FOR
THE SAN FERNANDO AND EAGLE ROCK HYDROLOGIC SUBAREAS

In Acre-Feet per Gross Acre

Year	Deciduous						Citrus						Walnuts					
	Consumptive use			Deep percolation			Consumptive use			Deep percolation			Consumptive use			Deep percolation		
	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total
1928-29	0.96	1.10	2.06	0	0.16	0.16	0.96	1.26	2.22	0	0.26	0.26	0.94	1.21	2.15	0	0.17	0.17
29-30	0.97	1.17	2.14	0	0.15	0.15	0.90	1.29	2.19	0.08	0.29	0.37	0.98	1.27	2.25	0	0.17	0.17
1930-31	1.19	1.14	2.33	0.03	0.14	0.27	1.04	1.23	2.27	0.19	0.31	0.50	1.17	1.24	2.41	0.05	0.17	0.22
31-32	1.38	0.93	2.31	0.22	0.17	0.39	1.18	1.05	2.23	0.41	0.31	0.72	1.38	1.03	2.41	0.22	0.19	0.41
32-33	0.99	1.01	2.00	0.03	0.13	0.16	0.73	1.08	1.81	0.30	0.34	0.64	1.00	1.13	2.13	0.04	0.16	0.20
33-34	1.06	1.04	2.10	0.07	0.15	0.22	0.83	1.14	1.97	0.29	0.32	0.61	1.06	1.12	2.18	0.07	0.17	0.24
34-35	1.57	0.94	2.51	0	0.13	0.13	1.47	1.06	2.53	0.10	0.24	0.34	1.56	1.03	2.59	0	0.15	0.15
1935-36	0.99	1.18	2.17	0	0.16	0.16	0.86	1.29	2.15	0.14	0.32	0.46	0.99	1.31	2.30	0	0.18	0.18
36-37	1.47	1.01	2.48	0.37	0.21	0.58	1.30	1.12	2.42	0.56	0.34	0.90	1.46	1.12	2.58	0.38	0.23	0.61
37-38	1.37	0.93	2.30	0.59	0.22	0.81	1.19	1.05	2.24	0.78	0.35	1.13	1.38	1.02	2.40	0.60	0.23	0.83
38-39	1.55	1.19	2.74	0.16	0.10	0.26	1.28	1.21	2.49	0.43	0.37	0.80	1.48	1.13	2.61	0.22	0.31	0.53
39-40	1.33	1.02	2.35	0	0.15	0.15	1.07	1.10	2.17	0.27	0.30	0.57	1.33	1.12	2.45	0	0.17	0.17
1940-41	1.70	0.81	2.51	1.46	0.23	1.69	1.54	0.93	2.47	1.61	0.35	1.96	1.70	0.91	2.61	1.46	0.26	1.72
41-42	1.06	1.11	2.17	0	0.14	0.14	1.06	1.31	2.37	0	0.24	0.24	1.07	1.25	2.32	0	0.16	0.16
42-43	1.34	1.12	2.46	0.60	0.28	0.88	1.15	1.27	2.42	0.82	0.46	1.28	1.31	1.21	2.52	0.65	0.30	0.95
43-44	1.32	1.11	2.43	0.66	0.32	0.98	1.19	1.26	2.45	0.77	0.46	1.23	1.29	1.17	2.46	0.68	0.32	1.00
44-45	1.12	1.33	2.45	0	0.18	0.18	1.11	1.51	2.62	0.03	0.31	0.34	1.12	1.32	2.44	0	0.19	0.19
1945-46	1.09	1.43	2.52	0	0.18	0.18	0.93	1.55	2.48	0.15	0.39	0.54	1.09	1.53	2.62	0	0.18	0.18
46-47	1.15	1.55	2.70	0.03	0.22	0.25	1.01	1.65	2.66	0.17	0.43	0.60	1.14	1.60	2.74	0.05	0.23	0.28
47-48	0.62	1.58	2.20	0	0.19	0.19	0.61	1.84	2.45	0	0.30	0.30	0.61	1.71	2.32	0	0.20	0.20
48-49	0.65	1.66	2.31	0	0.20	0.20	0.65	1.91	2.56	0	0.30	0.30	0.66	1.78	2.44	0	0.21	0.21
49-50	0.85	1.58	2.43	0	0.14	0.14	0.78	1.69	2.47	0.08	0.41	0.49	0.83	1.69	2.52	0.03	0.23	0.26
1950-51	0.69	1.70	2.39	0	0.21	0.21	0.70	1.90	2.60	0	0.30	0.30	0.69	1.77	2.46	0	0.21	0.21
51-52	1.56	1.13	2.69	0.85	0.31	1.16	1.44	1.25	2.69	0.97	0.48	1.45	1.55	1.16	2.71	0.87	0.34	1.21
52-53	0.93	1.55	2.48	0	0.16	0.16	0.92	1.69	2.61	0.02	0.30	0.32	0.93	1.56	2.49	0	0.18	0.18
53-54	1.05	1.29	2.34	0	0.15	0.15	0.91	1.40	2.31	0.14	0.33	0.47	0.99	1.11	2.10	0.08	0.43	0.51
54-55	1.13	1.30	2.43	0.01	0.15	0.16	1.12	1.46	2.58	0.02	0.24	0.26	1.14	1.33	2.47	0.01	0.15	0.16
1955-56	1.26	1.18	2.44	0.05	0.17	0.22	1.15	1.29	2.44	0.16	0.30	0.46	1.25	1.21	2.46	0.07	0.18	0.25
56-57	1.02	1.63	2.65	0.02	0.20	0.22	0.91	1.80	2.71	0.12	0.45	0.57	1.00	1.79	2.79	0.04	0.24	0.28
57-58	1.59	1.25	2.84	0.57	0.27	0.84	1.40	1.37	2.77	0.76	0.43	1.19	1.56	1.30	2.86	0.60	0.29	0.89
Mean 1929-57	1.15	1.23	2.38	0.18	0.18	0.36	1.03	1.37	2.40	0.34	0.30	0.63	1.14	1.30	2.45	0.19	0.22	0.41

TABLE L-13

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION FOR
THE SAN FERNANDO AND EAGLE ROCK HYDROLOGIC SUBAREAS
(continued)

In Acre-Feet per Gross Acre

Year	Truck						Alfalfa and pasture						Vineyard					
	Consumptive use			Deep percolation			Consumptive use			Deep percolation			Consumptive use			Deep percolation		
	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total
1928-29	0.95	1.29	2.24	0	0.44	0.44	0.95	1.47	2.42	0	0.21	0.21	0.95	0.79	1.74	0	0.16	0.16
29-30	0.94	1.38	2.32	0.04	0.43	0.47	0.97	1.61	2.58	0	0.14	0.14	0.96	0.80	1.76	0	0.15	0.15
1930-31	1.10	1.33	2.43	0.10	0.44	0.54	1.15	1.50	2.65	0.06	0.21	0.27	1.19	0.81	2.00	0.03	0.14	0.17
31-32	1.23	1.06	2.29	0.36	0.46	0.82	1.28	1.21	2.49	0.31	0.26	0.57	1.34	0.65	1.99	0.25	0.17	0.42
32-33	0.82	1.12	1.94	0.22	0.46	0.68	0.79	1.26	2.05	0.24	0.28	0.52	0.99	0.71	1.70	0.04	0.13	0.17
33-34	0.91	1.17	2.08	0.22	0.46	0.68	0.90	1.34	2.24	0.22	0.27	0.49	1.05	0.72	1.77	0.08	0.15	0.23
34-35	1.46	1.08	2.54	0.10	0.41	0.51	1.57	1.24	2.81	0	0.18	0.18	1.58	0.66	2.24	0	0.13	0.13
1935-36	0.90	1.36	2.26	0.09	0.50	0.59	0.93	1.56	2.49	0.05	0.24	0.29	0.98	0.84	1.82	0	0.16	0.16
36-37	1.34	1.16	2.50	0.50	0.53	1.03	1.43	1.34	2.77	0.42	0.28	0.70	1.45	0.74	2.19	0.40	0.19	0.59
37-38	1.23	1.08	2.31	0.74	0.52	1.26	1.33	1.23	2.56	0.64	0.30	0.94	1.35	0.66	2.01	0.61	0.21	0.82
38-39	1.31	1.27	2.58	0.40	0.54	0.94	1.34	1.42	2.76	0.36	0.32	0.68	1.51	0.79	2.30	0.20	0.16	0.36
39-40	1.15	1.14	2.29	0.20	0.47	0.67	1.17	1.30	2.47	0.18	0.25	0.43	1.33	0.73	2.06	0.01	0.15	0.16
1940-41	1.61	0.94	2.55	1.55	0.49	2.04	1.71	1.06	2.77	1.45	0.29	1.74	1.66	0.58	2.24	1.50	0.21	1.71
41-42	1.07	1.34	2.41	0	0.41	0.41	1.07	1.50	2.57	0	0.20	0.20	1.08	0.82	1.90	0	0.14	0.14
42-43	1.20	1.31	2.51	0.76	0.64	1.40	1.28	1.51	2.79	0.68	0.40	1.08	1.33	0.89	2.22	0.64	0.27	0.91
43-44	1.23	1.28	2.51	0.73	0.64	1.37	1.33	1.50	2.83	0.64	0.40	1.04	1.32	0.90	2.22	0.66	0.28	0.94
44-45	1.09	1.58	2.67	0.03	0.53	0.56	1.14	1.79	2.93	0	0.25	0.25	1.13	1.08	2.21	0	0.23	0.23
1945-46	0.98	1.56	2.54	0.12	0.63	0.75	1.02	1.85	2.87	0.07	0.29	0.36	1.08	1.08	2.16	0	0.21	0.21
46-47	1.08	1.78	2.86	0.12	0.62	0.74	1.10	2.06	3.16	0.09	0.33	0.42	1.15	1.25	2.40	0.02	0.23	0.25
47-48	0.61	1.95	2.56	0	0.52	0.52	0.62	2.16	2.78	0	0.25	0.25	0.61	1.16	1.77	0	0.22	0.22
48-49	0.66	2.02	2.68	0	0.53	0.53	0.65	2.24	2.89	0	0.26	0.26	0.66	1.37	2.03	0	0.24	0.24
49-50	0.80	1.87	2.67	0.05	0.53	0.58	0.85	2.12	2.97	0.01	0.20	0.21	0.86	1.07	1.93	0	0.24	0.24
1950-51	0.69	1.99	2.68	0	0.54	0.54	0.70	2.28	2.98	0	0.25	0.25	0.70	1.36	2.06	0	0.23	0.23
51-52	1.47	1.29	2.76	0.94	0.67	1.61	1.56	1.50	3.06	0.84	0.41	1.25	1.55	0.91	2.46	0.86	0.29	1.15
52-53	0.93	1.82	2.75	0.02	0.49	0.51	0.93	2.05	2.98	0	0.23	0.23	0.92	1.17	2.09	0	0.22	0.22
53-54	0.93	1.44	2.37	0.12	0.50	0.62	1.01	1.66	2.67	0.04	0.23	0.27	1.06	0.95	2.01	0	0.18	0.18
54-55	1.11	1.52	2.63	0.02	0.41	0.43	1.12	1.72	2.84	0.01	0.20	0.21	1.11	1.04	2.15	0.02	0.18	0.20
1955-56	1.23	1.37	2.60	0.08	0.43	0.51	1.22	1.53	2.75	0.09	0.24	0.33	1.30	0.99	2.29	0.02	0.18	0.20
56-57	0.94	1.88	2.82	0.09	0.62	0.71	1.00	2.12	3.12	0.04	0.31	0.35	1.03	1.27	2.30	0.02	0.24	0.26
57-58	1.54	1.41	2.95	0.63	0.63	1.26	1.57	1.62	3.19	0.60	0.37	0.97	1.58	1.02	2.60	0.59	0.28	0.87
Mean 1929-57	1.07	1.43	2.49	0.26	0.51	0.77	1.11	1.63	2.73	0.22	0.27	0.49	1.15	0.92	2.07	0.18	0.20	0.38

TABLE L-13

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION FOR THE SAN FERNANDO AND EAGLE ROCK HYDROLOGIC SUBAREAS
(continued)

In Acre-Feet per Gross Acre

Year	Lawn grass: Consumptive use: Rain	Lawn grass: Consumptive use: Delivered water	Lawn grass: Consumptive use: Total	Lawn grass: Deep percolation: Rain	Lawn grass: Deep percolation: Delivered water	Lawn grass: Deep percolation: Total	Dry farm: Consumptive use: Rain	Dry farm: Deep percolation: Rain	Crop: Residual rain	Residential: Consumptive use: Rain	Residential: Consumptive use: Delivered water	Residential: Consumptive use: Total	Residential: Deep percolation: Rain	Residential: Deep percolation: Delivered water	Residential: Deep percolation: Total	Residential: Residual rain
1928-29	0.86	2.81	3.67	0.12	0.39	0.51	0.95	0	0.03	0.80	0.81	1.61	0.02	0.07	0.09	0.17
29-30	0.88	2.79	3.67	0.13	0.41	0.54	0.98	0	0.04	0.71	0.81	1.52	0.10	0.13	0.23	0.21
1930-31	1.03	2.64	3.67	0.22	0.56	0.78	1.22	0	0.05	0.84	0.71	1.55	0.15	0.13	0.28	0.28
31-32	1.25	2.42	3.67	0.40	0.78	1.18	1.46	0.14	0.06	0.95	0.41	1.36	0.32	0.10	0.42	0.38
32-33	0.92	2.75	3.67	0.15	0.45	0.60	1.00	0.04	0.04	0.64	0.39	1.03	0.18	0.07	0.25	0.27
33-34	0.98	2.69	3.67	0.19	0.51	0.70	1.11	0.01	0.05	0.69	0.44	1.13	0.18	0.08	0.26	0.30
34-35	1.23	2.44	3.67	0.39	0.76	1.15	1.57	0	0.05	1.17	0.33	1.50	0.11	0.04	0.15	0.34
1935-36	0.89	2.78	3.67	0.13	0.42	0.55	0.99	0	0.03	0.73	0.41	1.14	0.09	0.05	0.14	0.20
36-37	1.38	2.29	3.67	0.55	0.91	1.46	1.58	0.27	0.07	1.07	0.37	1.44	0.41	0.06	0.47	0.15
37-38	1.43	2.24	3.67	0.62	0.96	1.58	1.45	0.52	0.08	0.99	0.36	1.35	0.57	0.09	0.66	0.51
38-39	1.31	2.36	3.67	0.46	0.84	1.30	1.62	0.09	0.07	1.12	0.52	1.64	0.23	0.10	0.33	0.44
39-40	1.11	2.56	3.67	0.27	0.64	0.91	1.34	0	0.05	0.92	0.48	1.40	0.16	0.07	0.23	0.30
1940-41	1.86	1.81	3.67	1.44	1.39	2.83	1.82	1.35	0.14	1.24	0.35	1.59	1.19	0.10	1.29	0.87
41-42	0.93	2.74	3.67	0.16	0.46	0.62	1.06	0	0.03	0.86	0.53	1.39	0.04	0.05	0.09	0.19
42-43	1.43	2.24	3.67	0.61	0.96	1.57	1.41	0.55	0.08	0.97	0.60	1.57	0.57	0.13	0.70	0.51
43-44	1.43	2.24	3.67	0.62	0.96	1.58	1.40	0.57	0.08	0.97	0.60	1.57	0.57	0.16	0.73	0.52
44-45	0.98	2.69	3.67	0.19	0.51	0.70	1.12	0	0.04	0.82	0.73	1.55	0.09	0.08	0.17	0.25
1945-46	0.95	2.72	3.67	0.17	0.48	0.65	1.08	0	0.04	0.74	0.80	1.54	0.12	0.19	0.31	0.27
46-47	1.02	2.65	3.67	0.21	0.55	0.76	1.18	0	0.04	0.77	0.97	1.74	0.17	0.16	0.33	0.29
47-48	0.60	3.07	3.67	0.03	0.13	0.16	0.62	0	0.02	0.49	1.11	1.60	0.01	0.09	0.10	0.13
48-49	0.64	3.03	3.67	0.03	0.17	0.20	0.65	0	0.01	0.54	1.17	1.71	0.02	0.10	0.12	0.11
49-50	0.79	2.88	3.67	0.08	0.32	0.40	0.84	0	0.03	0.64	1.13	1.77	0.05	0.11	0.16	0.18
1950-51	0.67	3.00	3.67	0.04	0.20	0.24	0.69	0	0.02	0.58	1.20	1.78	0.02	0.08	0.10	0.13
51-52	1.61	2.06	3.67	0.90	1.14	2.04	1.68	0.73	0.10	1.02	1.01	2.03	0.70	0.22	0.92	0.78
52-53	0.85	2.82	3.67	0.11	0.38	0.49	0.94	0	0.03	0.67	1.25	1.92	0.09	0.15	0.24	0.21
53-54	0.93	2.74	3.67	0.16	0.46	0.62	1.06	0	0.04	0.64	1.19	1.83	0.16	0.21	0.37	0.31
54-55	0.98	2.69	3.67	0.18	0.51	0.69	1.14	0	0.03	0.84	1.16	2.00	0.08	0.12	0.20	0.24
1955-56	1.09	2.58	3.67	0.27	0.62	0.89	1.30	0	0.05	0.70	1.12	1.82	0.22	0.17	0.39	0.42
56-57	0.92	2.75	3.67	0.15	0.45	0.60	1.04	0	0.04	0.60	1.28	1.88	0.14	0.16	0.30	0.33
57-58	1.51	2.16	3.67	0.73	1.04	1.77	1.78	0.40	0.09	0.97	1.07	2.04	0.50	0.13	0.63	0.76
Mean 1929-57	1.07	2.60	3.67	0.31	0.60	0.91	1.18	0.15	0.05	0.82	0.78	1.60	0.23	0.11	0.35	0.33

TABLE L-13

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION FOR THE SAN FERNANDO AND EAGLE ROCK HYDROLOGIC SUBAREAS
(continued)

In Acre-Feet per Gross Acre

Year	Commercial and industrial: Consumptive use: Rain	Commercial and industrial: Consumptive use: Delivered water	Commercial and industrial: Consumptive use: Total	100 Percent impervious: Residual rain	Riparian: Consumptive use: Rain	Riparian: Consumptive use: Ground water	Riparian: Consumptive use: Total	Miscellaneous: Consumptive use: Rain	Miscellaneous: Deep percolation: Rain	Miscellaneous: Residual rain
1928-29	0.42	See Table L-12		0.56	0.98	3.27	4.25	0.70	0	0.28
29-30	0.28			0.73	1.01	3.09	4.10	0.64	0	0.37
1930-31	0.34			0.91	1.25	2.90	4.15	0.79	0	0.46
31-32	0.43			1.22	1.65	2.60	4.25	0.97	0.08	0.61
32-33	0.21			0.86	1.07	2.89	3.96	0.62	0.02	0.43
33-34	0.20			0.97	1.17	2.82	3.99	0.68	0.01	0.49
34-35	0.53			1.09	1.63	2.77	4.40	1.08	0	0.55
1935-36	0.37			0.65	1.01	3.11	4.12	0.70	0	0.33
36-37	0.49			1.43	1.93	2.40	4.33	1.07	0.14	0.72
37-38	0.43			1.62	2.05	2.16	4.21	0.97	0.28	0.81
38-39	0.37			1.40	1.77	2.41	4.18	1.03	0.05	0.70
39-40	0.41			0.97	1.38	2.86	4.24	0.90	0	0.49
1940-41	0.53			2.77	3.30	1.14	4.44	1.21	0.71	1.39
41-42	0.49			0.60	1.09	3.25	4.34	0.79	0	0.30
42-43	0.40			1.64	2.04	2.15	4.19	0.93	0.29	0.82
43-44	0.41			1.64	2.05	2.11	4.16	0.93	0.30	0.82
44-45	0.38			0.78	1.16	3.04	4.20	0.77	0	0.39
1945-46	0.37			0.75	1.12	3.02	4.14	0.75	0	0.37
46-47	0.42			0.81	1.23	2.97	4.20	0.82	0	0.41
47-48	0.28			0.35	0.64	3.41	4.05	0.45	0	0.18
48-49	0.38			0.29	0.67	3.48	4.15	0.52	0	0.15
49-50	0.37			0.50	0.87	3.36	4.23	0.62	0	0.25
1950-51	0.38			0.33	0.71	3.48	4.19	0.54	0	0.17
51-52	0.58			1.93	2.51	1.92	4.43	1.16	0.39	0.91
52-53	0.43			0.53	0.96	3.21	4.17	0.70	0	0.27
53-54	0.33			0.76	1.09	3.99	4.08	0.71	0	0.32
54-55	0.54			0.62	1.16	3.18	4.34	0.65	0	0.31
1955-56	0.40			0.96	1.36	2.85	4.21	0.86	0	0.48
56-57	0.32			0.75	1.07	3.07	4.14	0.69	0	0.38
57-58	0.54			1.70	2.24	2.14	4.38	1.18	0.21	0.85
Mean 1929-57	0.40			0.98	1.38	2.82	4.20	0.81	0.06	0.49

TABLE L-14

WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE SYLMAR HYDROLOGIC SUBAREA

In Acre-Feet per Gross Acre

Year	Deciduous: Consumptive use: Rain	Deciduous: Consumptive use: Delivered water	Deciduous: Consumptive use: Total	Deciduous: Deep percolation: Rain	Deciduous: Deep percolation: Delivered water	Deciduous: Deep percolation: Total	Citrus: Consumptive use: Rain	Citrus: Consumptive use: Delivered water	Citrus: Consumptive use: Total	Citrus: Deep percolation: Rain	Citrus: Deep percolation: Delivered water	Citrus: Deep percolation: Total	Walnuts: Consumptive use: Rain	Walnuts: Consumptive use: Delivered water	Walnuts: Consumptive use: Total	Walnuts: Deep percolation: Rain	Walnuts: Deep percolation: Delivered water	Walnuts: Deep percolation: Total
1928-29	1.03	1.11	2.14	0	0.15	0.15	1.06	1.28	2.34	0	0.25	0.25	1.04	1.21	2.25	0	0.17	0.17
29-30	1.17	1.12	2.29	0.01	0.14	0.15	0.97	1.17	2.14	0.20	0.32	0.52	1.13	1.20	2.33	0.04	0.16	0.20
1930-31	1.24	1.09	2.33	0.11	0.18	0.29	1.08	1.29	2.37	0.26	0.24	0.50	1.21	1.19	2.40	0.14	0.21	0.35
31-32	1.42	0.90	2.32	0.30	0.19	0.49	1.27	1.03	2.30	0.44	0.32	0.76	1.40	1.00	2.40	0.32	0.21	0.53
32-33	1.05	1.00	2.05	0.01	0.15	0.16	0.79	1.10	1.89	0.25	0.33	0.58	1.04	1.15	2.19	0.02	0.15	0.17
33-34	1.07	1.01	2.08	0.14	0.18	0.32	0.86	1.12	1.98	0.34	0.35	0.69	1.07	1.09	2.16	0.13	0.20	0.33
34-35	1.66	0.90	2.56	0.11	0.15	0.26	1.55	1.03	2.58	0.21	0.25	0.46	1.66	0.99	2.65	0.12	0.17	0.29
1935-36	1.19	1.11	2.30	0.08	0.17	0.25	0.94	1.17	2.11	0.34	0.38	0.72	1.19	1.22	2.41	0.10	0.21	0.31
36-37	1.58	0.94	2.52	0.49	0.21	0.70	1.41	1.05	2.46	0.67	0.34	1.01	1.58	1.06	2.64	0.50	0.23	0.73
37-38	1.44	0.87	2.31	0.70	0.24	0.94	1.25	1.01	2.26	0.88	0.36	1.24	1.44	0.99	2.43	0.70	0.24	0.94
38-39	1.44	1.06	2.50	0.27	0.21	0.48	1.21	1.15	2.36	0.50	0.39	0.89	1.42	1.17	2.59	0.30	0.23	0.53
39-40	1.36	0.96	2.32	0.02	0.14	0.16	1.10	1.06	2.16	0.28	0.29	0.57	1.35	1.08	2.43	0.03	0.16	0.19
1940-41	1.75	0.79	2.54	1.27	0.21	1.48	1.57	0.91	2.48	1.45	0.33	1.78	1.75	0.89	2.64	1.29	0.24	1.53
41-42	1.09	1.09	2.18	0	0.14	0.14	1.08	1.27	2.35	0	0.23	0.23	1.09	1.21	2.30	0	0.16	0.16
42-43	1.40	1.10	2.50	0.71	0.27	0.98	1.22	1.22	2.44	0.90	0.44	1.34	1.37	1.14	2.51	0.74	0.31	1.05
43-44	1.35	1.09	2.44	0.62	0.29	0.91	1.23	1.22	2.45	0.76	0.45	1.21	1.34	1.13	2.47	0.63	0.32	0.95
44-45	1.29	1.23	2.52	0	0.17	0.17	1.20	1.36	2.56	0.10	0.33	0.43	1.30	1.30	2.60	0	0.18	0.18
1945-46	1.16	1.31	2.47	0.07	0.20	0.27	0.98	1.41	2.39	0.24	0.40	0.64	1.12	1.36	2.48	0.11	0.24	0.35
46-47	1.28	1.45	2.73	0.12	0.25	0.37	1.17	1.56	2.73	0.24	0.44	0.68	1.27	1.49	2.76	0.14	0.27	0.41
47-48	0.68	1.52	2.20	0	0.18	0.18	0.69	1.79	2.48	0	0.29	0.29	0.69	1.66	2.35	0	0.19	0.19
48-49	0.86	1.62	2.48	0.01	0.18	0.19	0.86	1.83	2.69	0.01	0.31	0.32	0.86	1.72	2.58	0.01	0.21	0.22
49-50	0.95	1.46	2.41	0.13	0.32	0.45	0.86	1.60	2.46	0.20	0.32	0.52	0.92	1.56	2.48	0.16	0.41	0.57
1950-51	0.91	1.74	2.65	0	0.21	0.21	0.92	1.93	2.85	0	0.32	0.32	0.91	1.81	2.72	0	0.21	0.21
51-52	1.58	1.13	2.71	1.05	0.32	1.37	1.46	1.26	2.72	1.19	0.50	1.69	1.55	1.16	2.71	1.08	0.35	1.43
52-53	1.06	1.48	2.54	0.01	0.18	0.19	0.99	1.60	2.59	0.07	0.33	0.41	1.04	1.49	2.53	0.02	0.19	0.21
53-54	1.08	1.16	2.24	0.11	0.20	0.31	0.95	1.27	2.22	0.23	0.36	0.59	1.02	1.22	2.24	0.16	0.24	0.40
54-55	1.12	1.25	2.37	0.02	0.16	0.18	1.10	1.42	2.52	0.03	0.23	0.26	1.10	1.29	2.39	0.02	0.15	0.17
1955-56	1.32	1.08	2.40	0.19	0.20	0.39	1.22	1.19	2.41	0.26	0.33	0.59	1.30	1.11	2.41	0.20	0.21	0.41
56-57	1.15	1.52	2.67	0.01	0.19	0.20	1.06	1.70	2.76	0.11	0.40	0.51	1.13	1.66	2.79	0.04	0.23	0.27
57-58	1.62	1.17	2.79	0.76	0.27	1.03	1.47	1.27	2.74	0.90	0.44	1.34	1.59	1.21	2.80	0.76	0.31	1.07
Mean 1929-57	1.23	1.18	2.41	0.23	0.20	0.43	1.11	1.31	2.42	0.35	0.34	0.69	1.22	1.26	2.48	0.24	0.22	0.46

TABLE L-14

WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE SYLMAR HYDROLOGIC SUBAREA
(continued)

In Acre-Feet per Gross Acre

Year	Truck: Consumptive use: Rain	Truck: Consumptive use: Delivered water	Truck: Consumptive use: Total	Truck: Deep percolation: Rain	Truck: Deep percolation: Delivered water	Truck: Deep percolation: Total	Alfalfa and pasture: Consumptive use: Rain	Alfalfa and pasture: Consumptive use: Delivered water	Alfalfa and pasture: Consumptive use: Total	Alfalfa and pasture: Deep percolation: Rain	Alfalfa and pasture: Deep percolation: Delivered water	Alfalfa and pasture: Deep percolation: Total	Vineyard: Consumptive use: Rain	Vineyard: Consumptive use: Delivered water	Vineyard: Consumptive use: Total	Vineyard: Deep percolation: Rain	Vineyard: Deep percolation: Delivered water	Vineyard: Deep percolation: Total
1928-29	1.05	1.31	2.36	0	0.43	0.43	1.04	1.48	2.52	0	0.21	0.21	1.05	0.78	1.83	0	0.17	0.17
29-30	1.02	1.23	2.25	0.16	0.48	0.64	1.09	1.42	2.51	0.08	0.23	0.31	1.17	0.76	1.93	0.01	0.13	0.14
1930-31	1.17	1.28	2.45	0.18	0.48	0.66	1.26	1.46	2.72	0.09	0.24	0.33	1.23	0.77	2.00	0.12	0.17	0.29
31-32	1.30	1.05	2.35	0.41	0.46	0.87	1.38	1.20	2.58	0.34	0.26	0.60	1.41	0.65	2.06	0.31	0.16	0.47
32-33	0.87	1.14	2.01	0.17	0.45	0.62	0.86	1.29	2.15	0.19	0.28	0.47	1.06	0.73	1.79	0	0.13	0.13
33-34	0.91	1.15	2.06	0.29	0.48	0.77	0.92	1.31	2.23	0.27	0.30	0.57	1.04	0.71	1.75	0.15	0.16	0.31
34-35	1.60	1.05	2.65	0.18	0.41	0.59	1.68	1.21	2.89	0.07	0.20	0.27	1.65	0.64	2.29	0.12	0.14	0.26
1935-36	1.02	1.25	2.27	0.27	0.54	0.81	1.06	1.43	2.49	0.23	0.30	0.53	1.21	0.79	2.00	0.08	0.16	0.24
36-37	1.45	1.10	2.55	0.62	0.50	1.12	1.54	1.27	2.81	0.53	0.28	0.81	1.55	0.68	2.23	0.51	0.20	0.71
37-38	1.31	1.04	2.35	0.84	0.53	1.37	1.40	1.20	2.60	0.75	0.30	1.05	1.41	0.64	2.05	0.73	0.21	0.94
38-39	1.24	1.21	2.45	0.47	0.54	1.01	1.27	1.36	2.63	0.44	0.33	0.77	1.42	0.74	2.16	0.30	0.20	0.50
39-40	1.17	1.10	2.27	0.22	0.45	0.67	1.20	1.26	2.46	0.17	0.23	0.40	1.35	0.69	2.04	0.03	0.15	0.18
1940-41	1.70	0.92	2.62	1.31	0.47	1.78	1.80	1.07	2.87	1.22	0.28	1.50	1.72	0.56	2.28	1.31	0.19	1.50
41-42	1.09	1.30	2.39	0	0.40	0.40	1.09	1.45	2.54	0	0.20	0.20	1.08	0.79	1.87	0	0.14	0.14
42-43	1.29	1.24	2.53	0.82	0.64	1.46	1.36	1.41	2.77	0.76	0.39	1.15	1.39	0.87	2.26	0.73	0.25	0.98
43-44	1.31	1.25	2.56	0.69	0.61	1.30	1.40	1.45	2.85	0.59	0.40	0.99	1.36	0.88	2.24	0.62	0.27	0.89
44-45	1.19	1.43	2.62	0.10	0.52	0.62	1.30	1.65	2.95	0	0.24	0.24	1.29	1.01	2.30	0	0.21	0.21
1945-46	1.02	1.45	2.47	0.22	0.60	0.82	1.07	1.69	2.76	0.16	0.32	0.48	1.21	1.00	2.21	0.03	0.21	0.24
46-47	1.22	1.68	2.90	0.18	0.63	0.81	1.26	1.95	3.21	0.15	0.36	0.51	1.29	1.16	2.45	0.11	0.25	0.36
47-48	0.69	1.88	2.57	0	0.51	0.51	0.68	2.10	2.78	0	0.24	0.24	0.70	1.13	1.83	0	0.22	0.22
48-49	0.86	1.95	2.81	0.01	0.52	0.53	0.86	2.17	3.03	0.01	0.24	0.25	0.86	1.32	2.18	0.01	0.23	0.24
49-50	0.90	1.73	2.63	0.18	0.73	0.91	0.98	1.99	2.97	0.11	0.38	0.49	1.05	1.14	2.19	0.04	0.24	0.28
1950-51	0.93	1.03	1.96	0	0.55	0.55	0.92	2.32	3.24	0	0.27	0.27	0.92	1.37	2.29	0	0.25	0.25
51-52	1.48	1.29	2.77	1.14	0.70	1.84	1.64	1.50	3.14	0.99	0.43	1.42	1.55	0.91	2.46	1.08	0.30	1.38
52-53	1.01	1.72	2.73	0.04	0.53	0.57	1.07	2.00	3.07	0	0.22	0.22	1.07	1.14	2.21	0	0.21	0.21
53-54	0.97	1.31	2.28	0.21	0.52	0.73	1.06	1.52	2.58	0.13	0.27	0.40	1.12	0.89	2.01	0.05	0.19	0.24
54-55	1.10	1.47	2.57	0.03	0.40	0.43	1.11	1.65	2.76	0.02	0.19	0.21	1.11	0.98	2.09	0.03	0.17	0.20
1955-56	1.29	1.25	2.54	[illegible]	0.46	0.67	1.36	1.43	2.79	0.15	0.24	0.39	1.34	0.85	2.19	0.16	0.19	0.35
56-57	1.10	1.74	2.84	0.07	0.58	0.65	1.14	2.00	3.14	0.02	0.26	0.28	1.15	1.20	2.35	0.01	0.22	0.23
57-58	1.60	1.30	2.90	0.76	0.61	1.37	1.61	1.51	3.12	0.74	0.39	1.13	1.61	0.94	2.55	0.77	0.29	1.06
Mean 1929-57	1.15	1.33	2.48	0.31	0.52	0.83	1.20	1.56	2.76	0.26	0.28	0.54	1.23	0.89	2.12	0.23	0.20	0.42

TABLE L-14

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE SYLMAR HYDROLOGIC SUBAREA
(continued)

In Acre-Feet per Gross Acre

Year	Lawn grass: Consumptive use: Rain	Consumptive use: Delivered water	Consumptive use: Total	Deep percolation: Rain	Deep percolation: Delivered water	Deep percolation: Total	Dry farm: Consumptive use: Rain	Dry farm: Deep percolation: Rain	Crop residual rain	Residential: Consumptive use: Rain	Consumptive use: Delivered water	Consumptive use: Total	Deep percolation: Rain	Deep percolation: Delivered water	Deep percolation: Total	Residual rain
1928-29	0.95	2.72	3.67	0.17	0.48	0.65	1.04	0	0.07	0.84	0.78	1.62	0.08	0.08	0.16	0.21
29-30	1.06	2.61	3.67	0.23	0.58	0.81	1.18	0	0.10	0.84	0.76	1.60	0.12	0.17	0.29	0.30
1930-31	1.14	2.53	3.67	0.30	0.68	0.98	1.35	0	0.10	0.96	0.70	1.66	0.20	0.15	0.35	0.32
31-32	1.36	2.31	3.67	0.51	0.87	1.38	1.53	0.19	0.13	1.07	0.40	1.47	0.39	0.10	0.49	0.41
32-33	0.95	2.72	3.67	0.17	0.49	0.66	1.05	0	0.08	0.73	0.39	1.12	0.15	0.07	0.22	0.26
33-34	1.06	2.61	3.67	0.23	0.58	0.81	1.09	0.10	0.10	0.74	0.42	1.16	0.20	0.09	0.29	0.32
34-35	1.36	2.31	3.67	0.52*	0.89	1.41	1.79	0	0.12	1.31	0.32	1.63	0.20	0.04	0.24	0.38
1935-36	1.10	2.57	3.67	0.27	0.63	0.90	1.25	0.02	0.09	0.90	0.38	1.28	0.06	0.07	0.23	0.29
36-37	1.50	2.17	3.67	0.72	1.04	1.76	1.67	0.41	0.16	1.20	0.34	1.54	0.52	0.07	0.59	0.51
37-38	1.54	2.13	3.67	0.78	1.07	1.85	1.49	0.66	0.18	1.09	0.36	1.45	0.68	0.09	0.77	0.55
38-39	1.36	2.31	3.67	0.51	0.88	1.39	1.49	0.23	0.15	1.07	0.50	1.57	0.33	0.11	0.44	0.46
39-40	1.17	2.50	3.67	0.32	0.69	1.01	1.38	0	0.10	1.00	0.48	1.48	0.16	0.07	0.23	0.32
1940-41	1.07	1.60	3.67	1.44	1.38	2.82	1.86	1.13	0.27	1.32	0.35	1.67	1.04	0.09	1.13	0.84
41-42	0.95	2.72	3.67	0.17	0.50	0.67	1.09	0	0.05	0.91	0.52	1.43	0.04	0.05	0.09	0.16
42-43	1.54	2.13	3.67	0.76	1.06	1.82	1.46	0.66	0.18	1.04	0.59	1.63	0.63	0.13	0.76	0.57
43-44	1.47	2.20	3.67	0.67	1.01	1.68	1.46	0.52	0.17	1.06	0.60	1.66	0.52	0.15	0.67	0.52
44-45	1.10	2.57	3.67	0.27	0.64	0.91	1.30	0	0.09	0.96	0.71	1.67	0.13	0.10	0.23	0.28
1945-46	1.06	2.61	3.67	0.25	0.60	0.85	1.24	0	0.09	0.83	0.84	1.67	0.17	0.14	0.31	0.32
46-47	1.17	2.50	3.67	0.34	0.71	1.05	1.40	0	0.10	0.72	0.96	1.68	0.22	0.16	0.38	0.36
47-48	0.66	3.01	3.67	0.04	0.21	0.25	0.69	0	0.04	0.56	1.10	1.66	0.01	0.09	0.10	0.13
48-49	0.81	2.86	3.67	0.10	0.34	0.44	0.87	0	0.05	0.70	1.16	1.86	0.04	0.11	0.15	0.16
49-50	0.95	2.72	3.67	0.17	0.50	0.67	1.08	0	0.07	0.78	1.10	1.88	0.10	0.15	0.25	0.26
1950-51	0.84	2.83	3.67	0.11	0.38	0.49	0.92	0	0.05	0.74	1.18	1.92	0.05	0.10	0.15	0.18
51-52	1.72	1.95	3.67	1.12	1.27	2.39	1.74	0.90	0.23	1.07	0.99	2.06	0.88	0.23	1.11	0.93
52-53	0.95	2.72	3.67	0.17	0.48	-0.65	1.06	0	0.07	0.73	1.22	1.95	0.13	0.18	0.31	0.27
53-54	1.03	2.64	3.67	0.22	0.57	0.79	1.18	0	0.09	0.70	1.18	1.88	0.23	0.24	0.47	0.36
54-55	0.99	2.68	3.67	0.19	0.53	0.72	1.12	0	0.06	0.69	1.18	2.07	0.06	0.12	0.18	0.25
1955-56	1.21	2.46	3.67	0.38	0.76	1.14	1.50	0	0.12	0.82	1.11	1.93	0.28	0.19	0.47	0.52
56-57	1.03	2.64	3.67	0.21	0.54	0.75	1.17	0	0.07	0.76	1.29	2.05	0.14	0.18	0.32	0.31
57-58	1.65	2.02	3.67	0.95	1.15	2.10	1.79	0.58	0.20	1.13	1.06	2.19	0.66	0.15	0.81	0.89
Mean 1929-57	1.17	2.50	3.67	0.39	0.70	1.09	1.29	0.17	0.11	0.91	0.75	1.66	0.27	0.12	0.39	0.37

TABLE L-14

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE SYLMAR HYDROLOGIC SUBAREA
(continued)

In Acre-Feet per Gross Acre

Year	Commercial and industrial: Consumptive use: Rain	Consumptive use: Delivered water	Consumptive use: Total	100 Percent impervious: Residual rain	Miscellaneous: Consumptive use: Rain	Miscellaneous: Deep percolation: Rain	Miscellaneous: Residual rain
1928-29	0.44			0.67	0.78	0	0.34
29-30	0.32			0.96	0.80	0	0.48
1930-31	0.42			1.02	0.94	0	0.51
31-32	0.54			1.31	1.09	0.11	0.66
32-33	0.29			0.84	0.72	0	0.42
33-34	0.26			1.02	0.67	0.06	0.51
34-35	0.67			1.21	1.28	0	0.61
1935-36	0.45			0.92	0.90	0.01	0.46
36-37	0.62			1.62	1.20	0.23	0.81
37-38	0.55			1.76	1.08	0.37	0.88
38-39	0.38			1.48	1.00	0.13	0.74
39-40	0.43			1.02	0.98	0	0.51
1940-41	0.62	See Table L-12		2.68	1.33	0.63	1.34
41-42	0.63			0.51	0.89	0	0.26
42-43	0.47			1.82	1.03	0.37	0.91
43-44	0.50			1.65	1.04	0.29	0.83
44-45	0.48			0.90	0.93	0	0.45
1945-46	0.43			0.89	0.80	0	0.45
46-47	0.53			0.99	1.03	0	0.50
47-48	0.36			0.36	0.54	0	0.18
48-49	0.46			0.45	0.68	0	0.23
49-50	0.41			0.73	0.78	0	0.37
1950-51	0.50			0.46	0.73	0	0.23
51-52	0.58			2.30	1.21	0.50	1.15
52-53	0.45			0.68	0.79	0	0.34
53-54	0.37			0.90	0.62	0	0.45
54-55	0.57			0.62	0.89	0	0.31
1955-56	0.47			1.16	1.04	0	0.58
56-57	0.53			0.69	0.89	0	0.35
57-58	0.58			1.99	1.26	0.32	1.00
Mean 1929-57	0.47			1.09	0.93	0.09	0.55

TABLE L-15

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE VERDUGO HYDROLOGIC SUBAREA

In Acre-Feet per Gross Acre

Year	Deciduous						Citrus						Truck					
	Consumptive use			Deep percolation			Consumptive use			Deep percolation			Consumptive use			Deep percolation		
	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Delivered water	Total
1928-29	1.37	1.10	2.47	0	0.16	0.16	1.27	1.24	2.51	0.10	0.29	0.39	1.32	1.28	2.60	0.05	0.46	0.51
29-30	1.18	1.10	2.28	0.03	0.14	0.17	1.04	1.19	2.23	0.16	0.30	0.46	1.06	1.26	2.32	0.14	0.45	0.59
1930-31	1.24	1.09	2.33	0.11	0.18	0.29	1.11	1.20	2.31	0.23	0.34	0.57	1.16	1.28	2.44	0.19	0.48	0.67
31-32	1.44	0.87	2.31	0.60	0.22	0.82	1.29	1.00	2.29	0.77	0.35	1.12	1.33	0.99	2.32	0.70	0.52	1.22
32-33	1.10	0.96	2.06	0.25	0.19	0.44	0.85	1.04	1.89	0.51	0.39	0.90	0.94	1.08	2.02	0.43	0.51	0.94
33-34	1.13	0.94	2.07	0.74	0.25	0.99	0.92	1.05	1.97	0.95	0.41	1.36	0.99	1.07	2.06	0.88	0.56	1.44
34-35	1.93	0.66	2.59	0.59	0.19	0.78	1.66	0.99	2.65	0.65	0.29	0.94	1.77	1.02	2.79	0.54	0.44	0.98
1935-36	1.24	1.07	2.31	0.23	0.21	0.44	0.99	1.16	2.15	0.48	0.39	0.87	1.07	1.22	2.29	0.40	0.57	0.97
36-37	1.60	0.93	2.53	0.96	0.23	1.19	1.49	1.03	2.52	1.07	0.36	1.43	1.53	1.07	2.60	1.03	0.53	1.56
37-38	1.47	0.87	2.34	1.58	0.26	1.84	1.30	0.99	2.29	1.75	0.38	2.13	1.33	1.01	2.34	1.72	0.56	2.28
38-39	1.66	1.05	2.71	0.34	0.21	0.55	1.49	1.17	2.66	0.52	0.37	0.89	1.44	1.21	2.65	0.56	0.54	1.10
39-40	1.38	0.94	2.32	0.22	0.18	0.40	1.15	1.04	2.19	0.45	0.31	0.76	1.20	1.07	2.27	0.39	0.48	0.87
1940-41	1.81	0.78	2.59	1.85	0.23	2.08	1.70	0.90	2.60	1.98	0.33	2.31	1.83	0.90	2.73	1.82	0.49	2.31
41-42	1.33	1.08	2.41	0.01	0.14	0.15	1.30	1.25	2.55	0.04	0.25	0.29	1.33	1.30	2.63	0.01	0.40	0.41
42-43	1.41	1.04	2.45	1.70	0.31	2.01	1.23	1.16	2.39	1.89	0.50	2.39	1.29	1.19	2.48	1.82	0.69	2.51
43-44	1.39	1.08	2.47	0.82	0.31	1.13	1.31	1.21	2.52	0.91	0.46	1.37	1.35	1.22	2.57	0.86	0.64	1.50
44-45	1.44	1.16	2.60	0.38	0.24	0.62	1.30	1.29	2.59	0.52	0.40	0.92	1.30	1.33	2.63	0.50	0.62	1.12
1945-46	1.21	1.25	2.46	0.30	0.26	0.56	1.02	1.36	2.38	0.48	0.45	0.93	1.05	1.40	2.45	0.45	0.65	1.10
46-47	1.43	1.37	2.80	0.41	0.33	0.74	1.35	1.51	2.86	0.49	0.49	0.98	1.41	1.60	3.01	0.42	0.71	1.13
47-48	0.82	1.53	2.35	0	0.18	0.18	0.77	1.73	2.50	0.05	0.35	0.40	0.76	1.82	2.58	0.04	0.57	0.61
48-49	1.13	1.62	2.75	0.01	0.18	0.19	1.10	1.81	2.91	0.03	0.33	0.36	1.12	1.94	3.06	0.01	0.53	0.54
49-50	1.09	1.37	2.46	0.30	0.41	0.71	1.02	1.51	2.53	0.37	0.65	1.02	1.05	1.67	2.72	0.33	0.79	1.12
1950-51	0.93	1.74	2.67	0	0.21	0.21	0.91	1.93	2.84	0.01	0.32	0.33	0.92	2.03	2.95	0	0.55	0.55
51-52	1.69	1.10	2.79	1.48	0.35	1.83	1.37	1.23	2.60	1.58	0.53	2.11	1.60	1.28	2.88	1.56	0.71	2.27
52-53	1.03	1.47	2.50	0.02	0.19	0.21	0.97	1.61	2.58	0.07	0.32	0.39	0.97	1.72	2.69	0.06	0.53	0.59
53-54	1.17	1.08	2.25	0.52	0.28	0.60	1.03	1.18	2.21	0.63	0.45	1.08	1.07	1.22	2.29	0.60	0.61	1.21
54-55	1.32	1.26	2.58	0.01	0.15	0.16	1.25	1.36	2.61	0.08	0.29	0.37	1.30	1.45	2.75	0.05	0.43	0.48
1955-56	1.34	1.05	2.39	0.34	0.23	0.57	1.24	1.16	2.40	0.42	0.36	0.78	1.32	1.21	2.53	0.34	0.50	0.84
56-57	1.28	1.48	2.76	0.08	0.23	0.31	1.13	1.63	2.76	0.22	0.47	0.69	1.18	1.69	2.87	0.27	0.63	0.90
57-58	1.64	1.15	2.79	1.09	0.29	1.38	1.51	1.28	2.79	1.19	0.43	1.62	1.64	1.30	2.94	1.06	0.62	1.68
Mean 1929-57	1.32	1.15	2.47	0.48	0.23	0.71	1.20	1.27	2.47	0.60	0.38	0.98	1.24	1.33	2.57	0.55	0.56	1.11

TABLE L-15

FIRST TRIAL WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE VERDUGO HYDROLOGIC SUBAREA
(continued)

In Acre-Feet per Gross Acre

Year	Lawn grass						Dry farm		Crop	Residential						
	Consumptive use			Deep percolation			Consumptive use	Deep percolation		Consumptive use			Deep percolation			
	Rain	Delivered water	Total	Rain	Delivered water	Total	Rain	Rain	Residual rain	Rain	Delivered water	Total	Rain	Delivered water	Total	Residual rain
1928-29	1.14	2.53	3.67	0.31	0.68	0.99	1.38	0	0.10	1.03	0.60	1.63	0.14	0.08	0.22	0.31
29-30	1.06	2.61	3.67	0.24	0.59	0.83	1.20	0	0.10	0.91	0.66	1.57	0.11	0.12	0.23	0.31
1930-31	1.14	2.53	3.67	0.30	0.68	0.98	1.36	0	0.10	0.95	0.64	1.59	0.21	0.15	0.36	0.30
31-32	1.50	2.17	3.67	0.72	1.03	1.75	1.50	0.55	0.17	1.07	0.57	1.64	0.64	0.17	0.81	0.52
32-33	1.14	2.53	3.67	0.31	0.69	1.00	1.05	0.30	0.12	0.77	0.65	1.42	0.32	0.16	0.48	0.37
33-34	1.43	2.24	3.67	0.61	0.95	1.56	1.08	0.78	0.18	0.77	0.82	1.59	0.69	0.24	0.93	0.55
34-35	1.61	2.06	3.67	0.88	1.13	2.01	2.00	0.31	0.18	1.35	0.70	2.05	0.59	0.15	0.74	0.57
1935-36	1.21	2.46	3.67	0.37	0.74	1.11	1.30	0.17	0.12	0.94	0.70	1.64	0.31	0.14	0.45	0.34
36-37	1.69	1.98	3.67	1.06	1.25	2.31	1.72	0.84	0.22	1.20	0.76	1.96	0.91	0.18	1.09	0.69
37-38	1.87	1.80	3.67	1.46	1.40	2.86	1.49	1.57	0.28	1.12	0.72	1.84	1.35	0.24	1.59	0.88
38-39	1.47	2.20	3.67	0.68	1.02	1.70	1.63	0.18	0.18	1.29	0.82	2.11	0.34	0.19	0.53	0.55
39-40	1.28	2.39	3.67	0.44	0.81	1.25	1.45	0.15	0.13	1.00	0.89	1.89	0.33	0.19	0.52	0.40
1940-41	2.02	1.65	3.67	1.94	1.58	3.52	1.95	1.71	0.33	1.37	0.66	2.03	1.56	0.11	1.67	1.05
41-42	1.14	2.53	3.67	0.30	0.66	0.96	1.33	0	0.09	1.04	0.94	1.98	0.10	0.11	0.21	0.28
42-43	1.91	1.76	3.67	1.53	1.41	2.94	1.43	1.68	0.29	1.08	0.79	1.87	1.42	0.22	1.64	0.92
43-44	1.58	2.09	3.67	0.83	1.11	1.94	1.49	0.73	0.20	1.07	0.78	1.85	0.74	0.24	0.98	0.61
44-45	1.39	2.28	3.67	0.57	0.92	1.49	1.59	0.24	0.14	1.08	0.78	1.86	0.44	0.16	0.60	0.45
1945-46	1.25	2.42	3.67	0.39	0.76	1.15	1.35	0.16	0.13	0.85	0.88	1.73	0.36	0.18	0.54	0.42
46-47	1.39	2.28	3.67	0.57	0.93	1.50	1.56	0.27	0.14	1.05	0.89	1.94	0.42	0.18	0.60	0.50
47-48	0.77	2.90	3.67	0.08	0.32	0.40	0.82	0	0.05	0.61	1.05	1.66	0.05	0.12	0.17	0.20
48-49	0.99	2.68	3.67	0.19	0.52	0.71	1.13	0	0.06	0.90	0.92	1.82	0.08	0.10	0.18	0.22
49-50	1.17	2.50	3.67	0.32	0.69	1.01	1.38	0	0.10	0.92	0.87	1.79	0.20	0.15	0.35	0.37
1950-51	0.84	2.83	3.67	0.12	0.39	0.51	0.93	0	0.05	0.78	0.98	1.76	0.06	0.10	0.16	0.20
51-52	1.91	1.76	3.67	1.55	1.43	2.98	1.88	1.28	0.28	1.16	0.82	1.98	1.15	0.19	1.34	1.14
52-53	0.95	2.72	3.67	0.16	0.47	0.63	1.04	0	0.07	0.74	1.04	1.78	0.11	0.14	0.25	0.26
53-54	1.32	2.35	3.67	0.49	0.86	1.35	1.28	0.40	0.14	0.79	0.98	1.77	0.46	0.26	0.72	0.57
54-55	1.14	2.53	3.67	0.30	0.66	0.96	1.34	0	0.08	0.97	0.97	1.94	0.14	0.12	0.26	0.33
1955-56	1.32	2.35	3.67	0.48	0.85	1.33	1.61	0.06	0.14	0.88	1.04	1.92	0.37	0.19	0.56	0.62
56-57	1.14	2.53	3.67	0.31	0.68	0.99	1.35	0	0.10	0.88	1.04	1.92	0.28	0.19	0.47	0.46
57-58	1.76	1.91	3.67	1.18	1.28	2.46	1.83	0.87	0.24	1.04	1.14	2.18	0.73	0.17	0.90	1.06
Mean 1929-57	1.34	2.33	3.67	0.60	0.87	1.47	1.41	0.39	0.15	0.97	0.83	1.81	0.48	0.16	0.64	0.50

TABLE L-15

WEIGHTED UNIT CONSUMPTIVE USE AND DEEP PERCOLATION
FOR THE VERDUGO HYDROLOGIC SUBAREA
(continued)

In Acre-Feet per Gross Acre

Year	Commercial and industrial: Consumptive use: Rain	Commercial and industrial: Consumptive use: Delivered water	Commercial and industrial: Consumptive use: Total	100 percent impervious: Residual rain	Riparian: Consumptive use: Rain	Riparian: Consumptive use: Ground water	Riparian: Consumptive use: Total	Miscellaneous: Consumptive use: Rain	Miscellaneous: Deep percolation: Rain	Miscellaneous: Residual rain
1928-29	0.47			0.99	1.46	2.85	4.31	0.97	0	0.50
29-30	0.33			0.97	1.30	2.81	4.11	0.82	0	0.49
1930-31	0.43			1.02	1.45	2.76	4.21	0.95	0	0.51
31-32	0.54			1.67	2.21	2.09	4.30	1.08	0.31	0.84
32-33	0.30			1.17	1.47	2.59	4.06	0.72	0.17	0.59
33-34	0.27			1.77	2.02	1.96	4.00	0.72	0.44	0.89
34-35	0.66			1.82	2.48	2.05	4.53	1.40	0.17	0.91
1935-36	0.42			1.17	1.58	2.61	4.19	0.90	0.10	0.59
36-37	0.58			2.20	2.78	1.70	4.48	1.21	0.47	1.10
37-38	0.52			2.81	3.33	0.95	4.28	1.06	0.87	1.41
38-39	0.41			1.77	2.17	2.06	4.23	1.20	0.10	0.89
39-40	0.46			1.26	1.72	2.52	4.24	1.00	0.09	0.63
1940-41	0.66	See Table L-12		3.33	3.99	0.61	4.60	1.38	0.95	1.67
41-42	0.52			0.91	1.43	2.97	4.40	0.98	0	0.46
42-43	0.48			2.94	3.40	0.86	4.26	1.01	0.94	1.47
43-44	0.46			1.95	2.41	1.88	4.29	1.03	0.41	0.98
44-45	0.52			1.44	1.96	2.36	4.32	1.10	0.14	0.72
1945-46	0.37			1.25	1.62	2.55	4.17	0.91	0.09	0.63
46-47	0.59			1.38	1.97	2.43	4.40	1.14	0.15	0.69
47-48	0.33			0.54	0.87	3.23	4.10	0.61	0	0.27
48-49	0.57			0.62	1.18	3.20	4.38	0.88	0	0.31
49-50	0.45			1.03	1.48	2.80	4.28	0.97	0	0.52
1950-51	0.48			0.49	0.97	3.29	4.26	0.73	0	0.25
51-52	0.62			2.83	3.45	1.09	4.54	1.33	0.71	1.42
52-53	0.45			0.65	1.10	3.11	4.21	0.78	0	0.33
53-54	0.39			1.43	1.82	2.31	4.13	0.89	0.22	0.72
54-55	0.60			0.83	1.43	2.94	4.37	1.02	0	0.42
1955-56	0.42			1.38	1.80	2.43	4.23	1.07	0.04	0.69
56-57	0.43			1.03	1.46	2.86	4.32	0.95	0	0.52
57-58	0.58			1.94	2.94	1.50	4.44	1.27	0.49	0.97
Mean 1929-57	0.47			1.47	1.94	2.34	4.28	0.99	0.22	0.74

The unit values derived in this appendix are utilized for the purpose of determining recharge for each source of supply; i.e., native and delivered waters. The total consumptive use determined by the Integration Method as described herein and by the Inflow-Outflow Method, which is shown in Chapter V, are not equal. Adjustments which are made to the consumptive use as determined by the Integration Method are also discussed in Chapter VI.

TABLE L-15A

UNWEIGHTED UNIT DEPTHS OF CONSUMPTIVE USE AND
DEEP PERCOLATION ON RESIDENTIAL LAND USE AREAS

In Acre-Feet Per Acre

Year	San Fernando and Eagle Rock Subareas							
	Consumptive use						Deep percolation delivered water	
	Rain				Delivered water			
	Deciduous	Lawn grass	Native vegetation	Impervious	Deciduous	Lawn grass	Deciduous	Lawn grass
1928-29	0.99	1.01	0.98	0.42	1.73	1.81	0.20	0.10
29-30	0.93	0.86	1.01	0.28	1.77	1.77	0.29	0.29
1930-31	1.08	0.99	1.25	0.34	1.58	1.60	0.31	0.29
31-32	1.37	0.89	1.50	0.43	0.93	0.90	0.19	0.22
32-33	1.04	0.59	1.03	0.21	0.90	0.82	0.12	0.20
33-34	1.07	0.69	1.16	0.20	0.99	0.94	0.16	0.21
34-35	1.62	1.34	1.62	0.53	0.71	0.73	0.09	0.07
1935-36	1.01	0.74	1.02	0.37	0.88	0.88	0.11	0.12
36-37	1.53	1.04	1.65	0.49	0.76	0.79	0.17	0.12
37-38	1.42	0.97	1.50	0.43	0.80	0.80	0.21	0.19
38-39	1.54	1.34	1.68	0.37	1.16	1.14	0.21	0.22
39-40	1.34	0.94	1.38	0.41	1.08	1.07	0.15	0.16
1940-41	1.75	1.31	1.88	0.53	0.74	0.81	0.24	0.18
41-42	1.09	1.00	1.09	0.49	1.12	1.18	0.14	0.08
42-43	1.36	1.06	1.46	0.40	1.28	1.38	0.33	0.23
43-44	1.30	1.08	1.45	0.41	1.28	1.35	0.39	0.33
44-45	1.17	0.94	1.17	0.38	1.59	1.62	0.20	0.17
1945-46	1.03	0.88	1.12	0.37	1.87	1.94	0.78	0.24
46-47	1.11	0.83	1.23	0.42	2.13	2.16	0.37	0.32
47-48	0.63	0.61	0.63	0.28	2.39	2.51	0.27	0.16
48-49	0.67	0.64	0.67	0.38	2.52	2.65	0.30	0.17
49-50	0.89	0.78	0.87	0.37	2.48	2.55	0.28	0.23
1950-51	0.71	0.74	0.71	0.38	2.65	2.75	0.31	0.09
51-52	1.53	1.22	1.74	0.58	2.12	2.30	0.63	0.43
52-53	0.88	0.80	0.96	0.43	2.67	2.84	0.45	0.28
53-54	0.87	0.78	1.09	0.33	2.55	2.71	0.61	0.43
54-55	1.12	1.05	1.16	0.54	2.53	2.63	0.36	0.23
1955-56	1.09	0.96	1.36	0.40	2.44	2.50	0.52	0.33
56-57	0.94	0.88	1.07	0.32	2.69	2.92	0.54	0.33
57-58	1.54	1.35	1.82	0.54	2.19	2.44	0.50	0.24

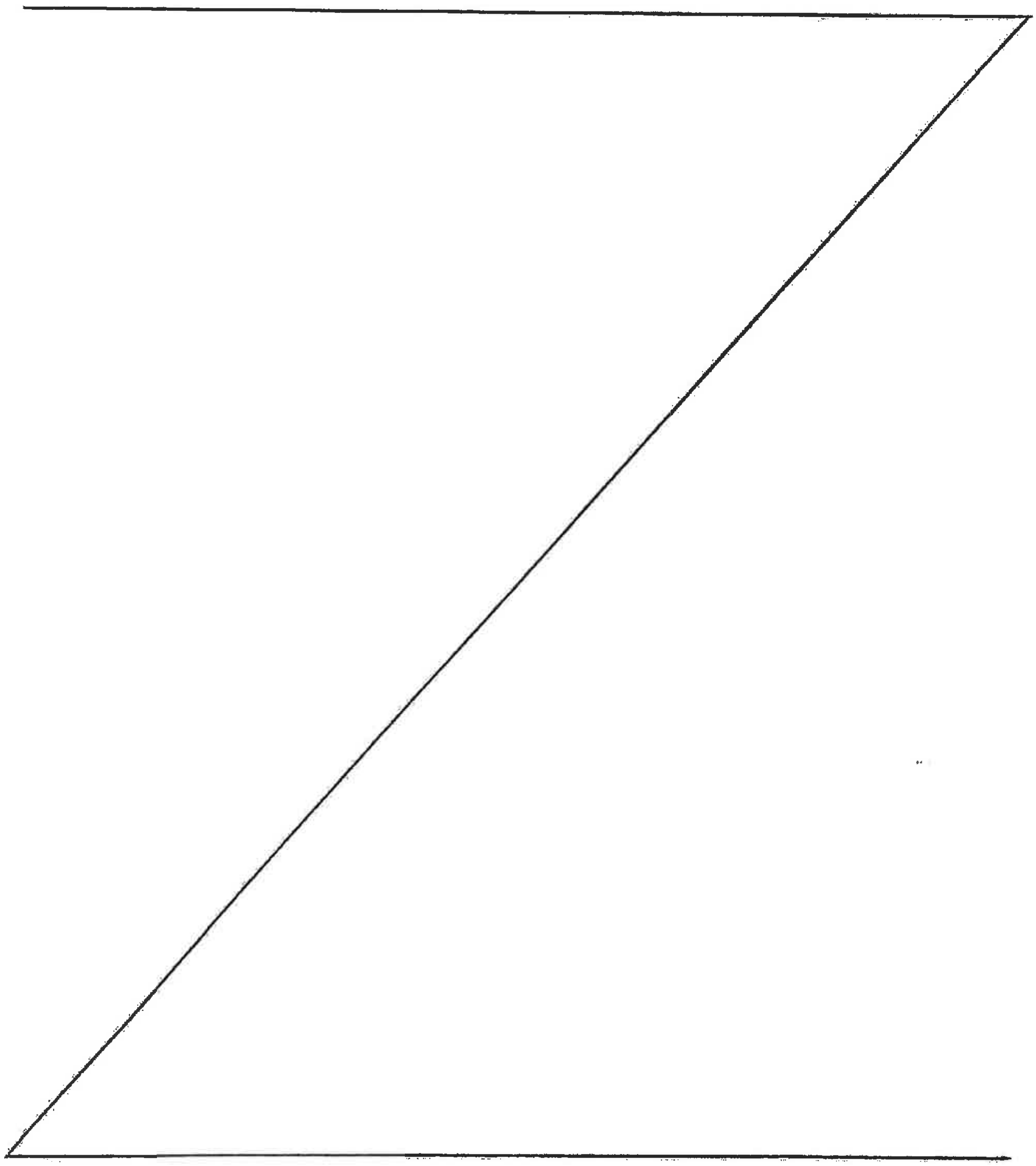
Year	Sylmar Subarea							
	Consumptive use						Deep percolation delivered water	
	Rain				Delivered water			
	Deciduous	Lawn grass	Native vegetation	Impervious	Deciduous	Lawn grass	Deciduous	Lawn grass
1928-29	1.13	1.00	1.12	0.44	1.71	1.76	0.20	0.32
29-30	1.07	1.01	1.28	0.32	1.69	1.71	0.38	0.36
1930-31	1.18	1.10	1.45	0.42	1.54	1.59	0.35	0.31
31-32	1.48	1.01	1.64	0.54	0.92	0.90	0.20	0.22
32-33	1.13	0.66	1.14	0.29	0.91	0.83	0.10	0.19
33-34	1.11	0.76	1.08	0.26	0.97	0.94	0.18	0.21
34-35	1.75	1.41	1.90	0.67	0.70	0.73	0.12	0.08
1935-36	1.28	0.88	1.34	0.45	0.85	0.84	0.13	0.14
36-37	1.69	1.12	1.79	0.62	0.74	0.78	0.18	0.13
37-38	1.53	1.07	1.59	0.55	0.78	0.79	0.22	0.20
38-39	1.50	1.24	1.61	0.38	1.12	1.13	0.24	0.24
39-40	1.39	1.00	1.48	0.43	1.06	1.07	0.17	0.15
1940-41	1.86	1.29	2.03	0.62	0.75	0.82	0.24	0.17
41-42	1.14	0.98	1.14	0.63	1.12	1.18	0.14	0.07
42-43	1.48	1.10	1.57	0.47	1.27	1.38	0.34	0.22
43-44	1.41	1.11	1.57	0.50	1.28	1.35	0.37	0.32
44-45	1.31	0.98	1.39	0.48	1.57	1.60	0.23	0.19
1945-46	1.12	0.99	1.33	0.43	1.81	1.91	0.37	0.27
46-47	1.30	0.99	1.51	0.53	2.07	2.15	0.42	0.33
47-48	0.72	0.69	0.72	0.36	2.38	2.49	0.27	0.17
48-49	0.90	0.84	0.91	0.46	2.53	2.62	0.30	0.19
49-50	1.04	0.96	1.14	0.41	2.33	2.47	0.43	0.29
1950-51	0.96	0.89	0.96	0.50	2.55	2.66	0.31	0.17
51-52	1.59	1.28	1.86	0.58	2.06	2.28	0.65	0.43
52-53	1.00	0.90	1.12	0.45	2.57	2.80	0.50	0.32
53-54	0.95	0.85	1.26	0.37	2.50	2.67	0.66	0.47
54-55	1.15	1.10	1.19	0.57	2.50	2.67	0.35	0.22
1955-56	1.22	1.09	1.62	0.47	2.35	2.51	0.62	0.38
56-57	1.09	0.98	1.23	0.53	2.68	2.91	0.55	0.34
57-58	1.63	1.35	1.93	0.58	2.17	2.40	0.48	0.28

TABLE L-15A

UNWEIGHTED UNIT DEPTHS OF CONSUMPTIVE USE AND
DEEP PERCOLATION ON RESIDENTIAL LAND USE AREAS

In Acre-Feet Per Acre

Year	Verdugo Subarea							
	Consumptive use						Deep percolation delivered water	
	Rain				Delivered water			
	Deciduous	Lawn grass	Native vegetation	Impervious	Deciduous	Lawn grass	Deciduous	Lawn grass
1928-29	1.37	1.19	1.46	0.47	1.32	1.35	0.21	0.17
29-30	1.17	1.15	1.30	0.33	1.51	1.45	0.24	0.28
1930-31	1.20	1.07	1.45	0.43	1.43	1.45	0.33	0.30
31-32	1.45	1.05	1.60	0.54	1.26	1.30	0.39	0.35
32-33	1.12	0.78	1.14	0.30	1.44	1.43	0.35	0.37
33-34	1.10	0.95	1.16	0.27	1.78	1.86	0.58	0.49
34-35	1.70	1.40	2.13	0.66	1.49	1.62	0.42	0.28
1935-36	1.26	1.02	1.39	0.42	1.52	1.59	0.34	0.27
36-37	1.66	1.20	1.85	0.58	1.60	1.75	0.48	0.33
37-38	1.48	1.27	1.59	0.52	1.55	1.68	0.61	0.47
38-39	1.66	1.73	1.97	0.41	1.80	1.87	0.45	0.38
39-40	1.28	1.10	1.55	0.46	1.93	2.05	0.48	0.34
1940-41	1.85	1.39	2.09	0.66	1.42	1.55	0.53	0.38
41-42	1.36	1.22	1.43	0.52	2.03	2.16	0.31	0.19
42-43	1.48	1.20	1.54	0.48	1.67	1.86	0.58	0.38
43-44	1.41	1.24	1.60	0.46	1.70	1.80	0.58	0.47
44-45	1.44	1.08	1.69	0.52	1.67	1.76	0.42	0.32
1945-46	1.17	1.02	1.44	0.37	1.88	2.00	0.49	0.38
46-47	1.46	1.14	1.67	0.59	1.89	2.02	0.49	0.37
47-48	0.83	0.77	0.87	0.33	2.23	2.30	0.32	0.24
48-49	1.18	1.01	1.18	0.57	2.01	2.05	0.24	0.20
49-50	1.23	1.11	1.48	0.45	1.84	1.96	0.41	0.29
1950-51	1.24	0.92	0.98	0.48	1.98	2.27	0.42	0.13
51-52	1.77	1.37	2.03	0.62	1.68	1.87	0.56	0.38
52-53	1.02	0.91	1.10	0.45	2.24	2.36	0.38	0.26
53-54	1.13	0.99	1.38	0.39	2.08	2.23	0.68	0.53
54-55	1.31	1.19	1.43	0.60	2.07	2.19	0.36	0.24
1955-56	1.30	1.29	1.73	0.42	2.18	2.36	0.58	0.38
56-57	1.25	1.34	1.46	0.43	2.26	2.35	0.48	0.39
57-58	1.64	1.36	1.96	0.58	2.28	2.59	0.63	0.33

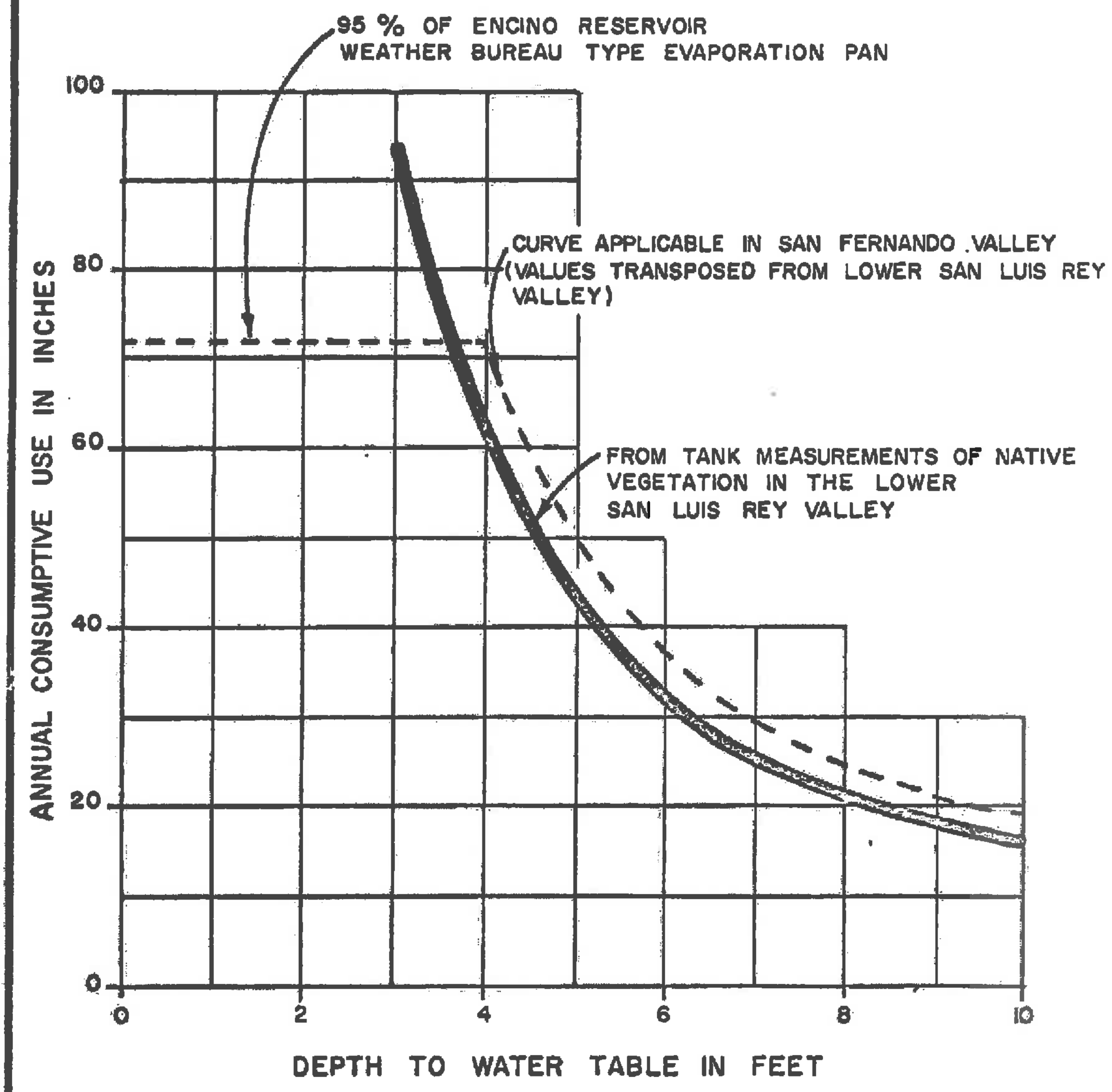


Excess Consumptive Use in High Water Table Areas

Consumptive use in high water table areas is greater than in other areas of similar culture due to the evaporation of moisture brought to the land surface by capillary action and the increased transpiration rates brought about by greater available supply of water. Consumptive use of ground water in these areas (excess consumptive use) is considered to be the difference between normal consumptive use, as heretofore discussed, and that by vegetation in high water table areas.

Figure L-4 shows the relationship between consumptive use and depth to water table determined from tank measurements in the Lower San Luis Rey Valley.[13/] Although the curve indicates consumptive use by native vegetation under high water table conditions it was assumed that it would be approximately representative of use by other types of culture in areas of similar high water table elevation.

San Fernando Valley, in comparison with Lower San Luis Rey Valley, is less exposed to the coastal influence and more exposed to the dry easterly winds; therefore, the curve for Lower San Luis Rey Valley was adjusted to give consideration to these factors. The curve was adjusted by using the relationship of the k (consumptive use coefficient) values of alfalfa and citrus of the two areas. The k values in San Fernando Valley are about 15 percent greater than in Lower San Luis Rey Valley so that the curve values were increased by that amount.



SAN FERNANDO VALLEY REFERENCE

CONSUMPTIVE USE IN HIGH WATER TABLE AREAS

STATE WATER RIGHTS BOARD

When the depth to water table is between zero and three feet, swampy conditions tend to exist and tank experiments in Lower San Luis Rey Valley[13/] and near Victorville, California[12/] indicate that the consumptive use is 95 percent of the evaporation from a Weather Bureau type pan. In this instance 95 percent of the Encino Reservoir Weather Bureau type pan is 72.0 inches. This value, as shown on Figure L-4, has been extended to include the depth to water of from zero to four feet.

Average net consumptive use values were computed for three increments of depth to water table to facilitate computations and are as follows:

Depth to Water Table, in feet	Average Net Consumptive Use	
	Inches	Feet
0 - 4	72.0	6.0
4 - 8	40.9	3.4
8 - 10	22.0	1.8

High Ground Water Areas in San Fernando Hydrologic Subarea

Contour maps showing depth to ground water were drawn for high ground water areas in San Fernando Subarea from piezometer and well measurements for each year of available data. The contour maps for the years 1932, 1942, 1949, 1954 and 1958 were superimposed on culture maps constructed from land use surveys. For each of these years the acreage of each type of culture within each increment of depth to water table was determined and the total acreage of each increment of depth to ground water for the remaining years was determined. The acreage of each culture class for these years was computed on a straight line proportional basis of the percentage of each as found in the years in which land use surveys were available.

The average net values of consumptive use in high water table areas were weighted with respect to the percent of pervious area for each culture class. The difference between this value and the weighted normal consumptive use for each culture class was considered to be excess consumptive use supplied from ground water. In instances where normal consumptive use exceeded the high water table consumptive use no excess was taken. The excess depth of use multiplied by the acreage of the particular culture class gave the acre-feet of excess consumptive use.

The annual acreages of high water table areas are shown in Table L-16 and the annual excess consumptive use from 1928-29 through 1957-58 is shown in Table L-17. The areal extent of the high water table area during 1943-44 is shown on Plate 29.

TABLE L-16

TOTAL ACREAGE IN HIGH GROUND WATER AREAS
IN WEST SAN FERNANDO HYDROLOGIC SUBAREA

In Acre-Feet

Year	Depth to ground water			Total
	0-4 feet	4-8 feet	8-10 feet	
1928-29	250	1,500	1,000	2,750
29-30	165	1,109	1,144	2,418
1930-31	5	615	1,511	2,131
31-32	512	792	1,322	2,626
32-33	0	905	996	1,901
33-34	18	1,182	846	2,046
34-35	320	1,544	669	2,533
1935-36	548	1,235	939	2,722
36-37	323	1,547	1,517	3,387
37-38	804	1,382	1,010	3,196
38-39	702	1,749	1,341	3,792
39-40	613	1,503	1,697	3,813
1940-41	910	3,610	2,336	6,856
41-42	555	2,861	2,471	5,887
42-43	2,918	3,043	2,997	8,958
43-44	2,550	6,289	3,501	12,340
44-45	191	2,385	3,390	5,966
1945-46	177	2,550	2,036	4,763
46-47	0	1,747	2,378	4,125
47-48	72*	1,507*	1,836*	3,415*
48-49	145	1,267	1,294	2,706
49-50	145	1,267	1,296	2,708
1950-51	80	1,399	1,141	2,620
51-52	263	1,844	1,321	3,428
52-53	228	1,697	911	2,836
53-54	127	1,200	890	2,217
54-55	11	1,106	1,057	2,174
1955-56	20	1,061	1,185	2,266
56-57	0	997	1,046	2,043
57-58	0	1,242	797	2,039

Average for 29-year period 1928-29 through 1956-57 = 3,746.

* Average of 1946-47 and 1948-49.

TABLE L-17

EXCESS CONSUMPTIVE USE OF
GROUND WATER IN HIGH GROUND WATER AREAS
IN WEST SAN FERNANDO HYDROLOGIC SUBAREA[a]

In Acre-Feet

Year	Depth to ground water			Total[b]
	0-4 feet	4-8 feet	8-10 feet	
1928-29	851	409	21	1,280
29-30	540	311	24	880
1930-31	20	189	33	240
31-32	1,580	262	30	1,870
32-33	0	322	23	350
33-34	64	448	20	530
34-35	1,002	625	17	1,640
1935-36	1,685	529	24	2,240
36-37	980	701	40	1,720
37-38	2,413	661	27	3,100
38-39	2,087	879	37	3,000
39-40	1,825	793	49	2,670
1940-41	2,667	1,987	68	4,720
41-42	5,920	1,643	74	7,640
42-43	8,439	1,843	87	10,370
43-44	7,419	4,004	98	11,520
44-45	584	1,593	91	2,270
1945-46	532	1,686	53	2,270
46-47	7	1,206	59	1,270
47-48	250	1,082	44	1,380
48-49	445	945	30	1,420
49-50	431	1,137	72	1,640
1950-51	229	1,379	73	1,680
51-52	745	1,482	113	2,340
52-53	635	1,413	96	2,140
53-54	346	764	114	1,220
54-55	22	874	135	1,030
1955-56	60	632	127	820
56-57	0	517	110	630
57-58	0	649	84	730
29-year average 1929-57				2,550

a. Does not include excess consumptive use in San Fernando Cienaga area

b. Rounded off to nearest 10.

Estimated Reduction in Consumptive Use of Ground Water* in High Ground Water Areas of Sylmar Hydrologic Subarea

Abstract

Extent of the area affected by the high ground water conditions in the Sylmar Subarea was determined by studies set forth in Appendix C, "Characteristics of Soils and Their Relationship to Past Vegetative and Water Table Conditions in San Fernando Cienaga Area". Maximum consumptive use of ground water under predevelopment conditions was calculated by two methods. The first used the relative elevation of the maximum concentration of calcium carbonate to determine the maximum average predevelopment elevation of the water table. The second method estimated maximum water table conditions using historic records, surveys, court transcripts and other sources. Using these estimated water table elevations in conjunction with values for consumptive use of ground water under high water table conditions obtained from the curve set forth on Figure L-4, maximum evapotranspiration use was estimated to be about 1,600 acre-feet per year (see Tables L-18 and L-19). The closeness of these results indicates that the calcium carbonate content of the soil reflects the approximate predevelopment water table conditions. From this it was assumed that the relative magnitude of the maximum concentration of calcium carbonate in a given soil profile is proportional to the approximate period of time that water levels were at this elevation. Inasmuch as there is no development in the westerly portion of the Sylmar cienaga area and data are not available therein during the base period,

* Excess consumptive use of ground water caused by high water table conditions as defined in this appendix.

average predevelopment consumptive use was estimated in each area and is about 700 acre-feet per annum for the eastern portion of the area and 200 acre-feet per annum for the western portion (see Table L-25). This value, compared with estimated consumptive use of ground water during the base period determined from water level measurements modified to reflect soil types, indicates an estimated average reduction of consumptive use of ground water from predevelopment to developed conditions of about 600 acre-feet per annum (see Tables L-20 and L-21).

The areas affected by high water table conditions were considered to be those delineated by the outer boundary of the soils described in Appendix C and delineated as Types B-1, B-2, B-3, SB-1 and T-1 on Plate 7. The boundary between the East and West Cienaga areas has been taken as the topographic divide near Lakeside Street. The western portion of the West Cienaga is now inundated by San Fernando Reservoir.[17/] Some water level data are available in the East Cienaga area; however, no reliable water levels are available for the predevelopment period in either area, and therefore elevations of the predevelopment water table and resulting consumptive use of ground water under predevelopment conditions have been estimated by means of the chemical analysis of the soil as hereinafter described. Some water level data in the East Cienaga area are available during the base period and these have been utilized in conjunction with the soil chemistry information in estimating average consumptive use of ground water under conditions of pumpage and water supply development existing during this latter period. The results obtained are approximations but are believed to be indicative of the order of magnitude of use of ground water for the conditions set forth.

Estimated Consumptive Use of Ground Water

To determine the annual historic consumptive use of ground water prior to development and during the base period, an analysis was made of the data set forth in Appendix C "Characteristics of Soils and Their Relationship to Past Vegetative and Water Table Conditions in San Fernando Cienaga Area" in order to define water table conditions during periods when water level observations were not available. This information combined with available data concerning unit consumptive use contained in this appendix provided a means of estimating the limits of consumptive use of ground water in the area.

Soil samples and chemical analyses described in Appendix C show large quantities of calcium carbonate ($CaCO_3$) present in the soils. It was concluded that the $CaCO_3$ was precipitated from the ground water which was concentrated through transpiration and evaporation under high water table conditions. This deposition takes place in the root zone immediately above the water table where ground water is being consumed by vegetation[16/], or in the zone of aeration at or near the surface where water is lifted by capillary action. The first condition is thought to have occurred in this area. Although the zone of maximum transpiration is immediately above the water table, it has been assumed that the depth to the zone of maximum $CaCO_3$ deposition indicates the average depth to water during the period of high water table conditions in which the accumulation of salts occurred. It is further assumed that the relative quantities of $CaCO_3$ deposited indicate the relative period of time that the water table was at that elevation and the relative amount of water transpired. Thus it is possible to estimate depth to water under predevelopment high water table conditions and the proportion of time it was at that depth if it is assumed that during the subsequent period, when the water table had been lowered by development of the ground water supply, leaching of salts from the soils by deep percolation of rainfall and excess irrigation water had not been sufficient to remove or lower the zone of maximum $CaCO_3$ appreciably.

To determine depth to water in the area susceptible to high ground water losses, the depth to maximum $CaCO_3$ content at each boring in the area was superimposed on the soils map depicted on Plate 7. This depth was taken as indicating the average position of the predevelopment maximum water table and contours of equal depth to water table were drawn. Acreages with equal depth to water were measured and the unit values developed in this appendix concerning consumptive use under high ground water table conditions were applied to determine theoretical consumptive use of ground water, assuming that the water table was at maximum level at all times. It was further assumed, for purposes of this study, that the outer boundary of Hesperia fine sandy loam delineates the areal extent of the transition zone of soils affected by high water table conditions (see Plate 7) and thus denotes the northern extremity of the moist area. The acreages and amounts of consumptive use of ground water so determined are set forth in Table L-18.

To ascertain the validity of the foregoing approach, high water table conditions were determined after development of surface flows but prior to appreciable ground water development from historic records available in various publications, court transcripts and surveys. All references to springs, cienagas and seepages in these records have been taken as evidence that the water table was at or near the surface. The location of each was superimposed on Plate 7 and the use of ground water estimated on this basis. Assumptions made in this analysis are as follows:

1. The water table would be at ten feet at the outer limits of the Hesperia fine sandy loam which marks the northerly extremity of soils affected by high water table conditions and it would be less than ten feet at all other limits.

2. Where springs or other evidence indicate that water was at or near the surface, it was assumed that the depth to water increased uniformly to the ten-foot depth at the outer limit of the Hesperia fine sandy loam.

3. The water table between springs and other indications of high ground water would be relatively level and continuous.

4. Where no records were available in the western portion of the study area, the edge of the Chino fine sandy loam was assumed to coincide with water table depths of less than four feet, as indicated in the areas where records were available, and the water table sloped uniformly to the aforementioned ten-foot boundary.

The acreages and amounts of consumptive use of ground water estimated under the foregoing assumptions and conditions are set forth in Table L-19 for comparison with results in Table L-18, which were derived by fixing maximum levels as indicated by location of maximum concentrations of $CaCO_3$.

Values derived in Tables L-18 and L-19 reflect the maximum annual consumptive use of ground water realized with maximum water levels continuously maintained over a long-time period; however, the supply to the area, which is basically derived from precipitation, varies as indicated by recorded periods

TABLE L-18

ESTIMATED MAXIMUM ANNUAL CONSUMPTIVE USE OF GROUND WATER UTILIZING $CaCO_3$ FOR DETERMINATION OF HIGH WATER TABLE CONDITIONS PRIOR TO ANY DEVELOPMENT IN AREA

Soil type[a] (1)	Acreage, in acres (2)	Average depth to water, in feet (3)	Depth of consumptive use,[b] in feet (4)	Total, in acre-feet (5)=(2)x(4)	Consumptive use of precipitation,[c] in acre-feet (6)	Net consumptive use of ground water, in acre-feet (7)=(5)-(6)
B1	191.7	Less than 4	6.0	1,150	264	886
B2	2.3	Less than 4	6.0	14	3	11
B3	3.2	Less than 4	6.0	19	4	15
SB1	93.0	Less than 4	6.0	558	128	430
T1	37.7	Less than 4	6.0	226	52	174
T1	23.0	5	4.16	96	32	64
T1	25.0	6	3.16	79	35	44
T1	24.3	7	2.5	61	34	27
T1	27.7	8	2.0	55	38	17
T1	20.0	9	1.75	35	28	7
TOTALS	447.9			2,293	618	1,675

a. See Plate 7.
b. See Figure L-4.
c. Product of average annual consumptive use of precipitation (1.38 feet) and acreage in Column (2).

TABLE L-19

ESTIMATED MAXIMUM ANNUAL CONSUMPTIVE USE OF GROUND WATER IN THE VICINITY OF THE SYLMAR HYDROLOGIC SUBAREA UNDER HIGH GROUND WATER TABLE CONDITIONS

Soil type[a] (1)	Acreage, in acres (2)	Average depth to water, in feet (3)	Depth of consumptive use,[b] in feet (4)	Total, in acre-feet (5)=(2)x(4)	Consumptive use of precipitation,[c] in acre-feet (6)	Net consumptive use of ground water, in acre-feet (7)=(5)-(6)
B1	191.7	Less than 4	6.0	1,150	264	886
B2	2.3	Less than 4	6.0	14	3	11
B3	3.2	Less than 4	6.0	19	4	15
SB1	93.0	Less than 4	6.0	558	128	430
T1	22.9	Less than 4	6.0	137	32	105
T1	23.9	5	4.16	99	33	66
T1	24.8	6	3.16	78	34	44
T1	28.8	7	2.5	72	40	32
T1	28.8	8	2.0	58	40	18
T1	28.5	9	1.75	50	39	11
Totals	447.9			2,235	617	1,618

a, b and c. See Table L-18.

of drought and abnormal wetness. During a normal precipitation cycle, such as the 85-year period from 1872-73 through 1956-57, precipitation was above normal for about one-third of the time and subnormal the remaining two-thirds. It was assumed that predevelopment ground water levels varied during a long-time period in accordance with precipitation trends; therefore, the maximum quantities estimated for continuous high water table conditions, as shown in Table L-18, were modified in proportion to the decrease in amounts of $CaCO_3$ indicated at the zone of maximum accumulation in each boring sampled throughout the area.

To determine this modification, and hence the average annual consumptive use of ground water during conditions prior to development, it was assumed that continuous deposition of $CaCO_3$ occurred historically at rates varying in proportion to the wetness or dryness of the period and that these wet and dry cycles and the resultant water level changes caused by them are related directly to the percent of $CaCO_3$ deposited at the zone of maximum concentration within the top five feet of soil. These assumptions are supported by tree-ring studies of Schulman[14/] and Troxel[15/], which indicate that there has been no major change in climatic patterns in Southern California for over 560 years, and studies by Doneen[16/] and others indicating that in situations where ground water is available and is naturally transpired or evaporated, the less soluble mineral salts therein are deposited in the zone of use. Thus the procedures utilized are believed applicable for long-time conditions and the concentration of $CaCO_3$ deposited would be proportional to the average quantity of ground water consumed. Inasmuch as there are no records of water levels in the West Cienaga area during the base period, the average predevelopment consumptive use of ground water was calculated for each of the cienaga areas so that a comparison could be made with consumptive use during the base period.

Available records indicate that the areal extent of the zone containing 25 percent $CaCO_3$ within four feet of the surface coincides with reported existence of perennial springs, cienagas and damp areas during the dry portion of the 1870's; therefore this area was taken as having a predevelopment average water table within four feet of the surface 100 percent of the time. The average annual consumptive use of ground water throughout the remainder of the area was taken as proportional to the relative concentration of $CaCO_3$ at any place, compared to the aforementioned annual use of ground water determined for the area containing a 25 percent concentration of these salts. For example, an area containing soils with a maximum concentration of 25 percent $CaCO_3$ in the top four feet of the soil profile was presumed to have experienced average water levels within four feet of the surface for 100 percent of the time, whereas an area containing soils with 10 percent concentration of $CaCO_3$ within the top four feet of soil profile was assumed to have experienced maximum water levels during only 40 percent of the time, and areas containing soils with five percent concentration of $CaCO_3$ within seven feet of the surface were assumed to have experienced maximum water levels at seven feet for only 20 percent of the time.

Areas which historically were effluent during dry cycles were considered to have a water table within four feet of the surface 100 percent of the time regardless of $CaCO_3$ content. The conditions causing variations in $CaCO_3$ concentrations in these areas are set forth on pages C-24 and C-25 of Appendix C. The greatest influence on salt concentrations was considered to be from the flushing effect adjacent to continuously flowing springs.

In order to modify the maximum amounts set forth in Table L-18, values of the average percent $CaCO_3$ were superimposed on Plate 7 along with the contours of the maximum percent $CaCO_3$ utilized for high water table conditions. Lines of equal percentage were drawn for 100 percent, 40 percent, 20 percent and zero percent of time, based on $CaCO_3$ content of 25 percent, equaling an average water table four feet from the surface 100 percent of the time. Soil boundaries along with percent $CaCO_3$ were used to determine areas similarly affected by high water table conditions in the area. For example, the 13-acre area of Chino fine sandy loam located near Bradley Avenue and Hubbard Street and similar soils near the Mission well field, which were strongly affected by high water table conditions, were given more weight in the modification of the 100 percent contour than Grangeville fine sandy loam, which is somewhat less strongly affected by high water table conditions. The outer boundary of the Hesperia fine sandy loam, which marks the extremity of the soils affected by high water table conditions, was taken as the boundary where the water table was never high enough for consumptive use of ground water to take place. The enclosed areas were measured and average consumptive use of ground water was computed as set forth in Table L-20.

For the base period 1928-29 through 1956-57, water table measurements are available only in the areas near and to the east of East Cienaga. Records are available of water surface elevation at San Fernando Reservoir which now inundates a portion of the West Cienaga but there are no ground water level measurements in the moist area surrounding West Cienaga. It was not possible to estimate consumptive use of ground water for this area during the base period.

To determine the consumptive use of ground water from the moist area surrounding the East (Porter) Cienaga during the base period 1928-29 through 1956-57, depth to water was plotted from all available records in the area for

TABLE L-20

ESTIMATED AVERAGE ANNUAL CONSUMPTIVE USE OF GROUND WATER PRIOR TO ANY DEVELOPMENT IN AREA

Soil Types (Plate 7)	Relative percent $CaCO_3$[a] (1)	Maximum consumptive use of ground water, in acre-feet per annum (Table L-18) (2)	Area with percent $CaCO_3$ shown in Col. (1), in acres (3)	Ratio of area in Col. (3) to total area (4)	Net consumptive use of ground water, in acre-feet per annum (5)=(1)x(2)x(4) (5)
			West Cienaga Area		
B1, B2, B3, SB1	100	1,342[b]	27.4	0.094	126.1
	70		20.7	0.071	66.7
	30		13.2	0.046	18.5
T1	10	333[c]	24.2	0.153	5.1
				Total	216.4
			East Cienaga Area		
B1, B2, B3, SB1	100	1,342[b]	67.7	0.234	314.0
	70		77.7	0.268	251.8
	30		83.3	0.287	115.5
T1	10	333[c]	133.5	0.846	28.2
				Total	709.5
				Grand Total	925.9

a. Based on maximum concentration (i.e. 25 percent) equivalent to 100 percent.
b. On a total area of 290 acres (Plate 7).
c. On a total area of 158 acres (Plate 7).

each year. It was assumed that the upturned ends of the Saugus formation are in contact with the recent alluvium and that there is a free interchange of water (see Appendix D). Contours were drawn showing equal depth to water and consumptive use of ground water was determined as heretofore described. The amount of consumptive use so determined for each year under these conditions is set forth in Table L-21 and can be compared with average predevelopment conditions in Table L-20.

TABLE L-21

ESTIMATED CONSUMPTIVE USE OF GROUND WATER FROM THE EAST CIENAGA IN SYLMAR SUBAREA 1928-29 THROUGH 1957-58

In Acre-Feet

Year	Consumptive use of ground water	Year	Consumptive use of ground water
1928-29	Less than 10	1945-46	172
29-30	Less than 10	46-47	139
		47-48	91
1930-31	60	48-49	51
31-32	63	49-50	46
32-33	255		
33-34	82	1950-51	46
34-35	136	51-52	Less than 10
		52-53	Less than 10
1935-36	Less than 10	53-54	Less than 10
36-37	58	54-55	Less than 10
37-38	36		
38-39	129	1955-56	Less than 10
39-40	121	56-57	Less than 10
		57-58	Less than 10
1940-41	159		
41-42	242		Average about 85
42-43	242		
43-44	242		
44-45	181		

Predevelopment Surface Water Supply

William Ham Hall in "Irrigation in Southern California", dated 1888, reported surface flow from the area as 10 miners inches (under four-inch pressure) at West Cienaga and 38 to 40 miners inches at East Cienaga. He also reported a flow of 50 miners inches in San Fernando Creek located to the west of the study area. It is noted in this respect that precipitation was above normal during the mid and late 1880's. Since little or none of the flow of San Fernando Creek is thought to have originated as rising water in the study area, it was disregarded and the predevelopment surface supply is thus computed as 50 miners inches or about 725 acre-feet per annum.

Summary and Conclusions

The estimated maximum theoretical consumptive use of ground water with water levels assumed at maximum elevation 100 percent of the time, as determined by maximum zone of accumulation of $CaCO_3$ and from maximum historic water elevations, was about 1,600 acre-feet per year (see Tables L-18 and L-19). An average annual consumptive use of ground water under predevelopment conditions was estimated to be about 900 acre-feet (see Table L-20).

During the base period the rate of consumptive use of ground water from the moist area surrounding East Cienaga averaged about 85 acre-feet per year and since about 1951 has been negligible (see Table L-21). Insufficient data are available for water-table conditions in the moist area surrounding West Cienaga and no estimates were made for consumptive use of ground water occurring there during the base period.

To evaluate the effect of lowering the water table and the resulting decrease in consumptive use of ground water, it has been assumed that the ground water divide between East and West Cienagas located near Lake Street, as shown on Plate 7, is coincidental with the topographic divide. As previously stated, there are little data available on the moist area in the vicinity of West Cienaga and it is not known what effect, if any, pumping has had upon this area. Proceeding on this basis, the average annual predevelopment consumptive use of ground water was estimated for each area as set forth in Table L-20. The consumptive use so estimated averages about 700 acre-feet per year in the moist area surrounding East Cienaga and 200 acre-feet per year in the area surrounding West Cienaga. During the base period, consumptive use of ground water in the eastern area was reduced to an average of about 85 acre-feet per year and an unknown amount for the western area, for a reduction in consumptive use of ground water of about 615 acre-feet per year in the East Cienaga area. This figure is tenuous, but from the data available it is a good indication as to the reduction of consumptive use of ground water in the East Cienaga area.

In addition to the reduction in consumptive use of ground water, the minimum surface flow from East Cienaga has been eliminated. Since West Cienaga is inundated by San Fernando Reservoir, it is not possible to determine the reduction in surface flow, if any, since development of the area. Thus, the total reduction in water leaving the East Cienaga area as consumptive use of ground water and surface outflow during the base period, as compared to predevelopment conditions, is equal to the 615 acre-feet reduced consumptive use plus the surface outflow reduction of 40 inches or 580 acre-feet, comprising a total average annual reduction of about 1,195 acre-feet.

Consumptive Use of Ground Water

The consumptive use of ground water by riparian vegetation and in high ground water areas has been hereinbefore discussed and is summarized in Table L-22.

Evaporation From Water Surfaces

Evaporation from water surfaces consists of evaporation from the City of Los Angeles terminal storage reservoirs and the flood control storage reservoir located at Hansen Dam. Various types of evaporation pans are installed at the three principal reservoirs of the City of Los Angeles. San Fernando Reservoir is equipped with a U. S. Weather Bureau type pan; Chatsworth Reservoir with a Los Angeles County Flood Control District ground pan; and Encino Reservoir with a U. S. Weather Bureau type pan and a Los Angeles County Flood Control District ground pan. Records of evaporation from these pans extend from 1932 to the present and are published in the State of California Bulletin No. 54-A and 54-B, entitled "Evaporation from Water Surfaces in California - Basic Data" and the Los Angeles County Flood Control District's Annual and Biennial Reports on Hydrologic Data.

TABLE L-22

SUMMARY OF CONSUMPTIVE USE OF GROUND WATER

In Acre-Feet

Year	High Ground Water Areas		Riparian	Total
	San Fernando Cienaga	Other areas	Vegetation	
1928-29	*	1,280	4,570	5,850
29-30	*	880	4,310	5,190
1930-31	60	240	4,050	4,350
31-32	60	1,870	3,620	5,550
32-33	260	350	4,030	4,640
33-34	80	530	3,920	4,530
34-35	140	1,640	3,850	5,630
1935-36	*	2,240	4,350	6,590
36-37	60	1,720	3,340	5,120
37-38	40	3,100	2,990	6,130
38-39	130	3,000	1,410	4,540
39-40	120	2,670	1,140	3,930
1940-41	160	4,720	440	5,320
41-42	240	7,640	1,290	9,170
42-43	240	10,370	830	11,440
43-44	240	11,520	840	12,600
44-45	180	2,270	1,190	3,640
1945-46	170	2,270	1,200	3,640
46-47	140	1,270	1,170	2,580
47-48	90	1,380	1,260	2,730
48-49	50	1,420	1,140	2,610
49-50	50	1,640	1,090	2,780
1950-51	50	1,680	1,160	2,890
51-52	*	2,340	570	2,910
52-53	*	2,140	960	3,100
53-54	*	1,220	880	2,100
54-55	*	1,030	890	1,920
1955-56	*	820	790	1,610
56-57	*	630	770	1,400
57-58	*	730	460	1,190
29-Year Average 1929-57				4,640

* Less than 10 acre-feet.

The pan evaporation for the U. S. Weather Bureau pan was reduced to an equivalent reservoir evaporation by a coefficient of 0.77, which is applicable to coastal areas in Southern California. With the Los Angeles County Flood Control District ground pan a coefficient of 0.81 was used for data prior to October 1, 1946 and a coefficient of 1.0 subsequent to that date, in accordance with studies made by the U. S. Department of Agriculture. The evaporation from the city's reservoir was thus computed based on these coefficients. The evaporation prior to 1932 was extrapolated based on the period for which data are available. Evaporation from the U. S. Weather Bureau type pan at Encino Reservoir was considered to be representative of evaporation from the water surface in San Fernando Valley. The mean annual U. S. Weather Bureau pan evaporation at Encino Reservoir for the period extending from 1932 to 1954 was 75.79 inches and equivalent to an evaporation of 58.3 inches from a water surface.

Precipitation on and total evaporation from water supply reservoirs is shown in Table M-1. The annual water surface evaporation from the flood control reservoir at Hansen Dam is based on the annual depth of evaporation for the water supply reservoirs. For the water supply reservoirs and for Hansen Dam it is assumed that the rain on the water surfaces is evaporated first. The difference between total evaporation and the evaporation of precipitation is considered to be evaporation of delivered water in the case of the water supply reservoirs and evaporation of runoff in the case of Hansen Dam. The total evaporation on water surface areas and the portions assigned to precipitation, delivered water and runoff are shown in Table L-22A.

TABLE L-22A

CONSUMPTIVE USE ON WATER SURFACE AREAS

In Acre-Feet

Year	Total evaporation (1)	Consumptive use of delivered water: (water supply reservoirs) (2)	Consumptive use of precipitation (3)	Consumptive use of runoff (Hansen Dam) (4)
1928-29	5,270	4,390	880	0
29-30	5,351	4,410	940	0
1930-31	5,991	4,880	1,110	0
31-32	4,597	3,240	1,360	0
32-33	5,389	4,550	840	0
33-34	5,237	4,270	970	0
34-35	4,293	2,880	1,410	0
1935-36	4,830	3,840	990	0
36-37	4,698	2,990	1,710	0
37-38	4,501	2,840	1,660	0
38-39	4,938	3,520	1,420	0
39-40	4,801	3,650	1,150	0
1940-41	4,770	1,500	3,060	210
41-42	5,420	3,870	1,010	540
42-43	5,390	3,070	1,900	420
43-44	5,180	2,860	1,940	380
44-45	5,080	3,440	1,150	490
1945-46	5,210	3,590	1,110	510
46-47	5,390	3,670	1,210	510
47-48	5,680	4,440	610	630
48-49	5,360	4,080	700	580
49-50	5,280	3,750	970	560
1950-51	5,220	3,840	810	570
51-52	5,200	2,390	2,450	360
52-53	5,440	3,870	1,000	570
53-54	4,890	3,300	1,100	490
54-55	5,350	3,720	1,100	530
1955-56	4,630	2,740	1,500	390
56-57	5,290	3,700	1,060	530
57-58	5,490	2,650	2,390	450
29-Year Average 1929-57	5,130	3,560	1,280	290

(1) Evaporation in water surface reservoirs x $\frac{\text{area of water surface}}{\text{area water surface reservoirs}}$

(2) Table 35, Column 10

(3) Table M-1, Column 6 plus rain on Hansen

(4) Column 1 - (Columns 2 and 3)

Consumptive Use of Distribution Losses

Water system loss is defined as being made up of leaks and breaks in water mains, meter slippage and unmetered water. In addition it includes a portion of the water used for fire protection and construction. Most of the water system loss occurs under roadways within the root zone of trees planted in the parkways.

From the data collected in the residential lot survey, it was determined that approximately 15 percent of the impervious area within the right of way of the street is covered by the spreading branches of trees. Since consumptive use is a function of the projected area of foliage, it was assumed that the water available beneath this foliage was consumed by trees. It was therefore assumed that 20 percent of the distribution loss was consumed and the remaining 80 percent available for deep percolation.

Disposition of Water Delivered to the Hills

The exact disposition of water delivered to the hill and mountain areas cannot be determined for the base period because of the lack of culture data. The only adequate culture data available were collected by the Board's staff in 1958. The acreages for the culture classifications determined in 1958 are shown in Table L-23.

TABLE L-23

1958 AREAL CULTURE IN THE HILL AND MOUNTAIN AREAS
AND 29-YEAR MEAN WEIGHTED UNIT VALUES FOR
CONSUMPTIVE USE OF DELIVERED WATER

Land use classification	Acreage, in acres	29-year mean unit values, Table L-13
Residential	8,710	0.78
Commercial and industrial	440	0.92
Citrus	723	1.36
Lawn grass (parks and cemetery)	1,628	2.50

The 29-year mean weighted unit value for the consumptive use of delivered water on the valley floor for San Fernando Subarea was used to determine the consumptive use of delivered water in the hill and mountain areas. The 29-year mean weighted unit values for the land use classifications are shown in Table L-23. Applying these unit values to the areas determined in 1958 and the sewage contributed from residential areas as shown in Table N-9, the disposition of delivered water can be itemized and is shown in Table L-24.

TABLE L-24

DISPOSITION OF DELIVERED WATER TO THE
HILL AND MOUNTAIN AREAS BASED ON 1958 CULTURE

In Acre-Feet

Residential	8,710 (acres) x 0.78	= 6,790
Commercial and industrial	440 (acres) x 0.92	= 400
Citrus	720 (acres) x 1.36	= 980
Lawn grass	1,630 (acres) x 2.50	= 4,080
Sewage (Table N-9, 1957-58)		= 6,550
	TOTAL	18,800 acre-feet
Estimated deliveries in 1957-58 to hill and mountain areas (Table J-13)		17,920

The total amount of water delivered to the hill and mountain areas in 1957-58 was 17,920 acre-feet as shown in Table J-13. The amount delivered is less than the estimated amount necessary to supply the consumptive use and sewage average requirements of the area based on unit values determined from studies made on the valley floor. This difference was expected since the mean rain in the hill and mountain areas is higher than on the valley floor. Since the above difference exists, the amount of deep percolation from delivered water to the hill and mountain areas is in all probability insignificant and may be assumed to be nil during 1958 and also during the 29-year base period.

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