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GEOLOGY AND WATER RESOURCES OF THE MOKELUMNE AREA, CALIFORNIA

BY

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CONTENTS

Surface water—Continued.

Ground-water recharge—Continued.

ILLUSTRATIONS

TABLES

FOREWORD

The demand for the data collected by the United States Geological Survey since the Mokelumne investigation was started, in April, 1926, has been so great that in May, 1929, a report containing some of the data was released for public inspection. Because of a growing urgent need for the data for legal purposes a report including all the data collected prior to June 30, 1929, and their interpretation was released in September, 1929.

The problems connected with the determination of the source and quantity of the ground-water supply of the Mokelumne area are so complex that some of them are not yet entirely solved. The very nature of the facts concerning underground-water supplies is such that patient and careful research over a long period is necessary before they can be interpreted with exactness.

One of the most essential facts to be ascertained in connection with the underground-water supply is the amount of recharge from the Mokelumne River between Lancha Plana and Woodbridge. Stream-flow records show diversified results from month to month, owing to unavoidable inaccuracies of measurement during high stages of the river and to power regulation. During the investigation some of the gaging stations were moved to better locations which improved the conditions of measurement. Furthermore, since the Pardee Dam was built the rapid fluctuations of the river due to power regulation in the headwaters and extremely high stages have been prevented. Both of these changes have improved conditions of measurement, and in the course of two more years the losses in the river should be better established than at present. After this report was written and just prior to its release stream-flow records from October 1, 1928, to July 31, 1929, were received. These records have been inserted in the report without any attempt at interpretation. They show a greater loss than the records for previous periods of the same duration, and hence they indicate the need for caution in reaching a conclusion as to the amount of loss from the Mokelumne River before additional records can be gathered.

Besides the additional stream-flow records needed, the percentage of rainfall that enters the ground to supply the wells in this area is yet to be determined. Sufficient evidence is presented in this report to show its importance, but several years of investigation will be required to establish the extent to which it replenishes the ground-water supply. Rainfall penetration in the valley floor is to be investigated during the coming rainy season. However, one season is not sufficient, because if it proves to be a season of subnormal rainfall only negative results may be obtained. Consequently, the work must be carried on for several years in order to obtain climatic variations.

Several other factors must also be ascertained. For instance, work is now in progress to obtain the specific yield of the water-bearing material that has been unwatered since 1906, in order that the amount of water withdrawn from storage since that time can be determined.

A decision on so paramount a question as the effect of the Mokelumne River upon the ground-water supply of the Mokelumne area would be premature at this time. If the research that is now in progress is extended over a few more years, sufficient additional facts can be gathered to make an intelligent and equitable decision.

GEOLOGY AND WATER RESOURCES OF THE MOKELUMNE AREA, CALIFORNIA

By H. T. Stearns, T. W. Robinson, and G. H. Taylor

ABSTRACT

The Mokelumne area is on the west side of the Great Valley of California near the confluence of the Sacramento and San Joaquin Rivers. The principal town is Lodi. The purpose of the investigation here recorded was to determine the source and quantity of the ground water that supplies the many wells in the area. The investigation was begun in 1926 and is still in progress. The area comprises seven physiographic subdivisions—mountains, foothills, red lands, terraces, low plains, valley flood plains, and delta country. The mountains are made up of the pre-Tertiary "Bedrock series" of the Sierra Nevada. The foothills consist of the Tertiary Ione formation, which is composed chiefly of silt and clay but includes some lignite and iron deposits and in places is capped with andesite breccias. The red lands are the early Pleistocene uplifted alluvial fans, and the low plains, valley flood plains, and delta country are younger alluvium.

The report includes all the available records of the surface water of the area. The principal streams are the Mokelumne River, Dry Creek, and Bear Creek. Only the Mokelumne River is perennial, and its average annual run-off is about 800,000 acre-feet. Records of all diversions from the Mokelumne River are given, including detailed descriptions of 57 pumping plants and the crops irrigated by them. These plants divert about 3,500 acre-feet per annum. In addition, the Woodbridge Canal diverts about 35,000 acre-feet for irrigation of the Woodbridge irrigation district.

The fluctuation of the water level in about 500 wells was measured periodically, and the measuring points were tied together by a network of level lines. Automatic water-stage recorders were used to determine the types of fluctuation. Fluctuations of the water table are caused by pumping, variation in stream flow, surface irrigation, transpiration by vegetation, changes in stage of the Woodbridge Reservoir, passage of railroad trains, and earthquakes. A decline of the water table amounting to a maximum of 14½ feet has been recorded near Lodi since 1907. This decline has been produced largely through overdraft by pumping, although a series of dry years has also occurred since 1907.

A record of 2,001 irrigation pumping plants on wells, including the area and kinds of crops irrigated, is given. The area irrigated by the use of ground water has progressively increased from 4,300 acres in 1909 to 45,800 acres in 1927. Tests on the use of water by 53 pumping plants on wells for the principal crops of the area are described in detail. The average use of water on orchard and vineyard land, exclusive of precipitation, was found to be about 1.30 acre-feet per acre per year, and for alfalfa and miscellaneous garden crops about 3 acre-feet per acre. From these figures it was computed that 64,800 acre-feet is pumped annually from the ground for irrigation. In addition, about 6,000 acre-feet is pumped for domestic use and stock.

Tests of specific yield were made on undisturbed soil columns and are described in detail. They are not yet finished but indicate a specific yield of less than 25 per cent for the water-bearing material. The principal aquifers are the arkosic sand strata of the younger alluvium. Good irrigation supplies are generally obtained at depths between 100 and 200 feet, and domestic supplies at less than 100 feet.

INTRODUCTION

LOCATION AND EXTENT OF THE AREA INVESTIGATED

The "Mokelumne area," as described in this report, lies about 25 miles south of Sacramento, Calif. It is between meridians 121° and 121° 30′ and is bounded on the north by the line common to Tps. 5 and 6 N. and on the south by the parallel of 38°. (See pl. 1.) The area is chiefly in San Joaquin and Sacramento Counties, but a small part is in Amador County. It is approximately rectangular, 27 miles long from east to west and 22 miles wide from north to south, and covers about 615 square miles. Parts of it on the west boundary lie a few feet below sea level, and the maximum altitude is about 350 feet above sea level on the tops of the highest foothills on the east side. The area is in the lower part of San Joaquin Valley, near its junction with the great Sacramento Valley, and extends eastward into the foothills of the Sierra Nevada. It is crossed from east to west by the Mokelumne River and Dry Creek. The Cosumnes River enters the area near the west boundary, and the Calaveras River flows southwestward across the southern edge of the area. All these streams empty into the San Joaquin River near its confluence with the Sacramento River. Except for a belt about 5 miles wide on the east side of the area, next to the foothills, it is level-floored and characteristic of the great San Joaquin Valley, of which it is a part. In the valley portion the land slopes westward at a rate of less than 10 feet to the mile.

The area 6 miles west of Lodi is known as the delta country, because it lies in the deltas of the Mokelumne, Calaveras, San Joaquin, and Sacramento Rivers. It lies at or below sea level and is protected from the flood waters of these rivers by a great network of levees. From its relation to sea level and its reclaimed and leveed character it is sometimes called the "Holland of America." Parts of the area are entirely surrounded by distributary sloughs of the rivers and are known as islands, because of which it is sometimes locally known as the island country.

The only city within the area is Lodi, but Stockton lies only 3 miles south of the south boundary. According to the San Joaquin County Directory for 1926, Lodi has a population of 7,600. In 1920 the United States census reported the population of the smaller towns in the area as follows: Galt, 1,150; Lockeford, 610; Clements, 320; Woodbridge, 200; Linden, 150.

The farm area surrounding these towns is one of the most thickly settled rural districts in the United States. There are more than 64 homes to the square mile in a few parts of the area, and a density of 20 homes to the square mile is common.

AGRICULTURAL DEVELOPMENT AND IRRIGATION

The Mokelumne area is a region of intensive agricultural development and is one of the richest and most fertile parts of San Joaquin Valley. The delta country is devoted chiefly to intensive truck gardening. The principal crops are lettuce, celery, onions, asparagus, beans, tomatoes, potatoes, corn, and pears. Canneries absorb a large portion of the products except the potatoes, celery, and onions, The remainder is mainly consumed by San Francisco and near-by cities or finds its way into eastern or foreign markets.

The pear orchards are chiefly located in the delta country; the other fruits are raised farther east. Grapes, peaches, apricots, prunes, cherries, almonds, and walnuts are grown in the vicinity of Lodi and Lockeford. Vineyards predominate, and because the conditions are very favorable to the production of Tokay grapes, Lodi has become known as the Tokay center of the world. According to the county horticultural records, 11,088 carloads of grapes were shipped from the Lodi area during the season of 1927.

In the eastern part of the region, where the land is rolling and the ground water is too deep for economical pumping, grazing and grain farming predominate. Considerable dairying is carried on by ranchers along Dry Creek and in the bottom lands of the Mokelumne River. Most of the milk produced by these dairies is evaporated at the Galt condensery of the Sego Milk Co.

Before irrigation was practiced the valley was devoted to stock raising and cereal crops. Because of the mild climate and concentrated winter rainfall, dry farming has been successful. In the area where ground water lies at shallow depths and is easily reached by deep-rooted plants irrigation is not necessary. At first the reclamation of the delta land by drainage and diking was more popular than irrigation from the river or wells. Then the lands east of the delta country were settled and dry farmed in large units. Later, as these large land holdings were subdivided and sold in small parcels to home seekers, irrigation became an economic necessity. A diversion dam was built at Woodbridge in 1891, and gravity water is now used by many people south and west of Lodi. Some of the ranches bordering the Mokelumne River divert water by means of pumps.

By far the larger part of the area is irrigated from wells. This practice is very popular because of its independence, ample supply, assurance of water in dry years, and economical operation. The area irrigated in this manner is constantly increasing. A census shows 2,000 individual pumping plants on wells in the Mokelumne area. A thorough canvass of these plants was made in 1926, 1927, and 1928. Most of them consist of a centrifugal pump driven by an electric motor. The others are operated by gasoline or distillate engines and tractors. Deep-well turbines are becoming more popular.

however, because pits are not required for their installation and because water lies deeper now than a decade ago. Also, with increased development more land is being irrigated nearer the foothills, where ground water is too deep to be lifted by horizontal centrifugal pumps.

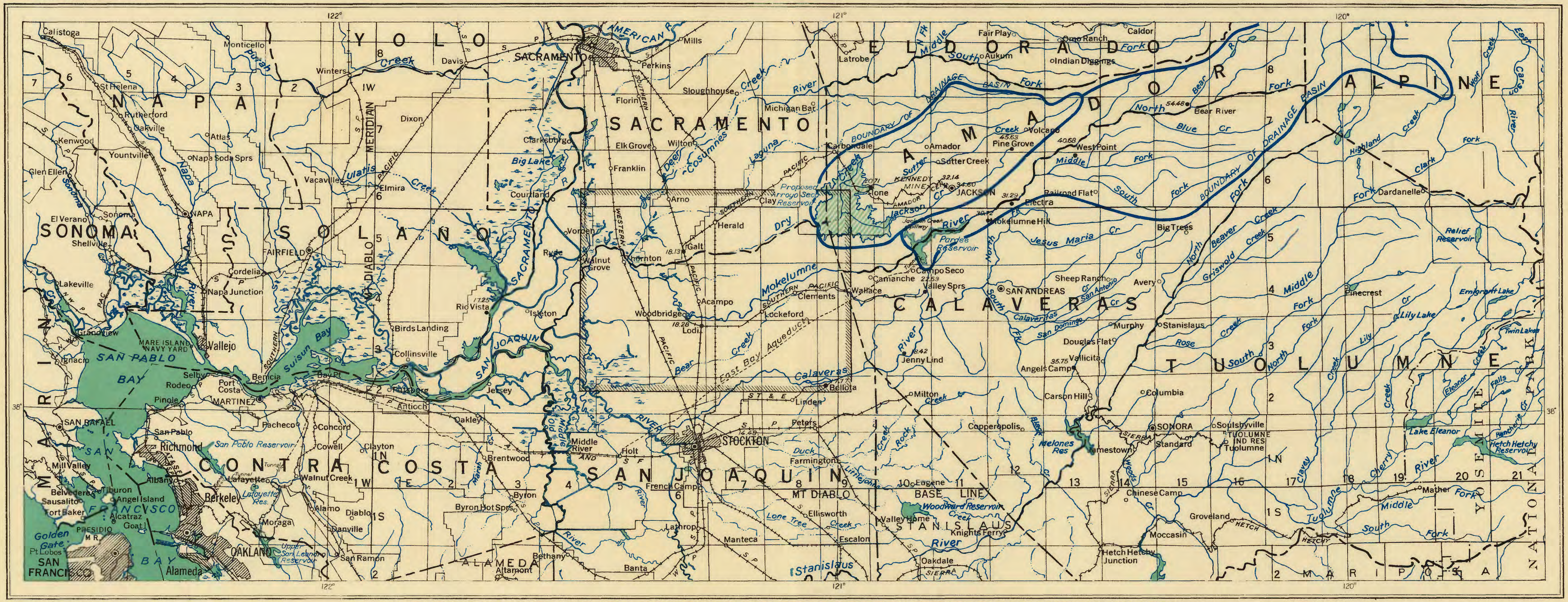
PURPOSE AND METHODS OF THE INVESTIGATION

Recognition of the great value of both surface and ground water for irrigation in the Mokelumne area led the United States Geological Survey, in financial cooperation with the East Bay Municipal Utility District, to undertake a survey of the waters of the valley. Later, cooperation was obtained also with the city of Stockton for the survey of the ground water in the vicinity of the Calaveras River and Little Johns Creek. Most of the territory covered by this Stockton survey lies south of the Mokelumne area and is not included in this report.

In the later part of 1924 the East Bay Municipal Utility District decided to build a dam 325 feet high across the Mokelumne River about 4 miles northeast of the old mining town of Lancha Plana or about 13½ miles by air line northeast of Clements. The State of California, in granting to the district the right to store water, attached to the permit the following clauses:

> In order to determine the extent of prior vested rights to the use of Mokelumne River water which percolates into or supplies underground basins, permittee shall conduct such a study of the replenishment of and draft upon underground storage supply from the Mokelumne River as to determine with reasonable certainty the effect of the proposed diversion and storage upon the underground supplies and shall file such information as a matter of public record with the division of water rights from time to time and at any time upon demand by the said division.
>
> The amount of water appropriated shall be limited to the amount which can be beneficially used and shall not exceed 310 cubic feet per second for direct diversion from January 1 to December 31 of each season and 217,000 acre-feet per annum for storage to be collected from about October 1 to about July 15 of each season, when there is unappropriated water available at the proposed point of diversion, the season of unappropriated water being in the years of normal flow from about December 1 to about July 15; provided, however, that combined diversion from natural flow and storage shall not exceed the equivalent of 310 cubic feet per second, or approximately 200,000,000 gallons per day.
>
> The maximum amount herein stated may be reduced in the license if investigation so warrants.

It was evident that a thorough study of the water problems and the status of irrigation development should be made in this area in view of the fact that the East Bay Muncipal Utility District plans to divert water out of the Mokelumne drainage basin to the East Bay cities through a pipe line over 100 miles long. (See pl. 1.) Water diverted through this pipe line will be taken so far outside of the drainage basin that there is no chance of any return flow. It is therefore desirable to ascertain the quantity of water that can be



Base from U. S. G. S. map of California, 1929.

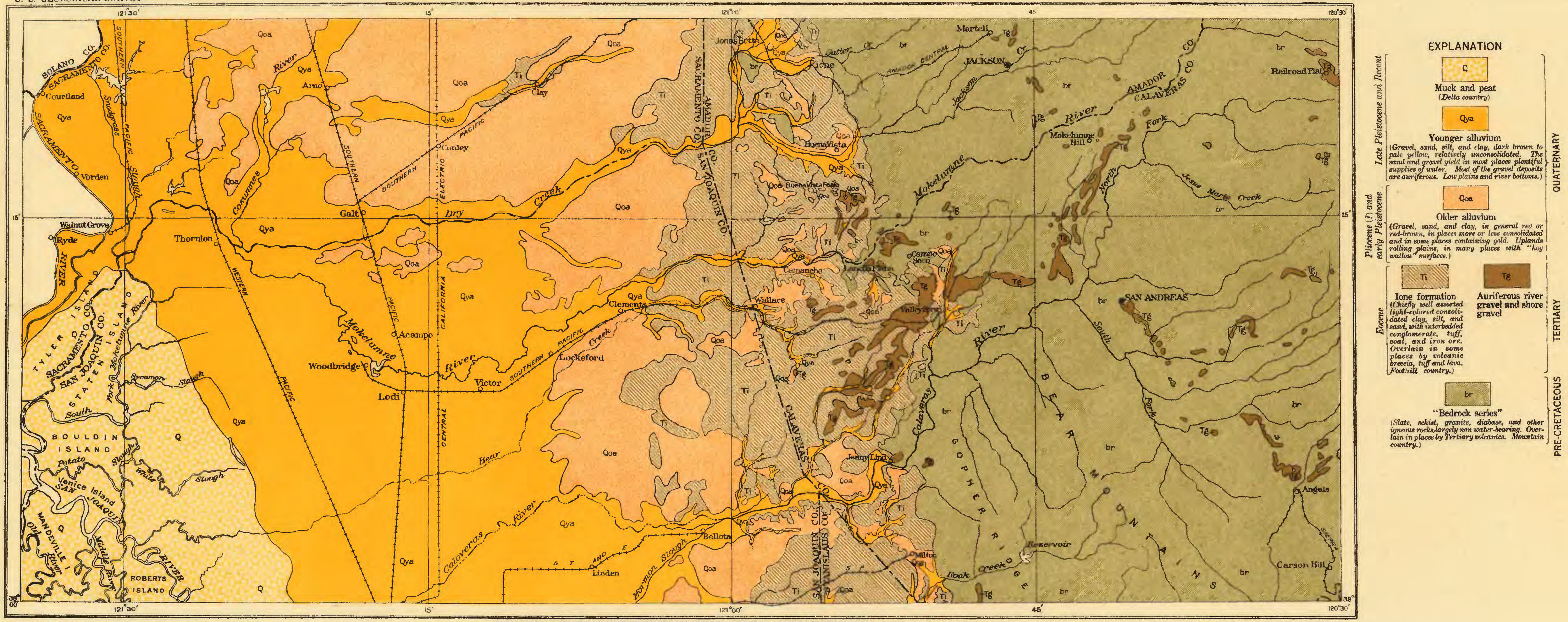
A. HOEN & CO. BALTIMORE, MD.

MAP SHOWING LOCATION OF AREA INVESTIGATED, SIXTEEN PRECIPITATION STATIONS, PROPOSED ARROYO SECO RESERVOIR, AND EAST BAY MUNICIPAL UTILITY DISTRICT RESERVOIRS, TUNNELS, AND PIPE LINE

0 10 20 30 40 Miles

1930

18.42 • Precipitation station. (Figures are long-term mean annual precipitation, in inches.)



GEOLOGIC MAP OF MOKELUMNE AREA, CALIFORNIA

Scale $\frac{1}{250,000}$

0 5 10 MILES

1930

Base from U. S. Geological Survey atlas sheets.

Geology west of meridian 121° by H. T. Stearns; east of that meridian from U. S. G. S. Folio 11, modified.

exported without interfering with the rights of the lawful appropriators and riparian users of the natural flow of the Mokelumne River and also to determine to what extent the great underground water reservoir of the area, which supplies 2,000 irrigation wells, is dependent upon the Mokelumne River for recharge.

The methods used to determine the flow of the Mokelumne River have followed a well-established practice. Gaging stations were erected at short intervals along the river from the point where it leaves the mountains downstream to the point where it is affected by the tide. These stations are equipped with Au continuous water-stage recorders or Stevens type E automatic 8-day water-stage recorders. Gagings were made at frequent intervals at these stations and at a station on the Woodbridge Canal, which diverts water from the Mokelumne River. The stream-gaging work was begun in March, 1926, and was done under the supervision of H. D. McGlashan, district engineer, United States Geological Survey, San Francisco, by B. S. Barnes from 1926 to 1928 and by C. D. Bue since 1928.

Numerous pumps divert water from the Mokelumne River. In order that the amount of water diverted in this manner could be determined, a canvass of the pump owners and the acreage irrigated by these pumps was necessary. This work was delegated to Mr. Taylor, who began field work September 10, 1926. Airplane photographs of the Mokelumne River and a strip of land about 1 mile wide on both sides of the river were made by Lieut. W. R. Taylor, of the United States War Department, in September, 1927, in order that the tracts of irrigated land along the river could be more accurately determined.

Two different methods are to be used to estimate the quantity of ground-water recharge—the water-table method and the absorption method. In the water-table method measurements of depth to water in wells are made at convenient intervals during a series of years, and the amount of fluctuation in the water table is determined from these measurements. Then, by means of specially conducted field tests and other methods, the average yield of the materials unwatered during the pumping season and the absorption capacity of the materials recharged during the rest of the year are determined. The volume of material unwatered during a period of declining water table is calculated from the decline of the water table, and the specific-yield factor is applied to estimate the volume of water yielded by material that is unwatered. Likewise, the amount of water added during the period of rising water table to recharge the volume of material saturated is estimated. If data are obtained as to withdrawals of ground water by pumping and natural processes, the recharge can be approximately computed. A large number of accurate data as to the fluctuation of the water table, specific yield, and quantity of water pumped in the Mokelumne area have been obtained and are presented in this paper, together with some tentative computations. The plan of the investigation is to lead up to more refined periodic inventories of recharge and withdrawals than has been possible in this report because of the urgent demand for the results.

The absorption method consists of determining by measurements of stream flow at different places the amount of seepage losses from the streams between these places, which expresses the amount of water absorbed by the alluvium and approximates the amount of annual recharge from the streams. In this area the absorption from streams was found to be so small a percentage of the run-off that the results obtained by this method were not as valuable as those obtained by the water-table method.

Depths to water in nearly 500 observation wells, evenly distributed over the area, were measured monthly for a year—from April, 1926, to April, 1927. Since that time about 125 of these wells have been measured monthly. In April and September all the observation wells are measured, because in April the highest stage of the water table is reached and in September the lowest stage is reached over most of the area.

The discharge of 53 irrigation-well pumps was measured with a weir or current meter, and the use of water was determined for the areas and crops irrigated by the respective pumps. According to the census taken during the investigation, 45,800 acres of land is irrigated by 2,001 pumps supplied by wells in the Mokelumne area. With these data the total amount of water pumped from the ground for irrigation has been estimated. In addition to the use of ground water for irrigation several thousand wells supply the rural and urban population with water. Altogether about 8.5 per cent of the total pumpage from wells is used in this way.

The fluctuations of the water table were also studied in detail by means of automatic recorders installed on carefully selected and representative wells in the area. These recorders register continuously on graph paper the minute fluctuations of the wells. With these instruments the fluctuations of the water table due to pumping and also to a variety of other causes are determined accurately.

Level lines were run to all observation wells in order that the altitude above sea level of the reference points from which measurements were made could be ascertained for use in preparing contour maps of the water table. An experiment was made in 1927 to determine the rate of flow through the alluvium by means of fluorescein dye, but no satisfactory results were obtained.

A geologic map of the Mokelumne area and the part of the Jackson quadrangle east of it was made (pl. 2), and the geology was studied with a view to determine the effect of the rock structure on the occurrence of ground water. Rock outcrops were examined for their permeability, especially in the intake area.

The amount of rainfall reaching the water table was studied by means of recorders that registered the response of the water table to rainfall in wells selected in areas of shallow ground water. Tests were also made to determine the recharge from irrigation and the specific yield of the materials in the belt of annual fluctuation of the water table. Nine rainfall stations were established during the investigation, and a few private rainfall records were gathered.

Gaging stations were installed and maintained on Dry and Bear Creeks to determine seepage losses from these creeks. A gaging station was maintained also on Goose Creek to determine the annual run-off in the foothill region.

The ground-water work was begun on April 6, 1926, by H. T. Stearns. T. W. Robinson devoted all of his time from April 15, 1926, to July 1, 1929, to the ground-water work. From July 15, 1926, to May 19, 1927, and during most of the time since July 1, 1928, Mr. Stearns was away on other assignments, but the work was carried on under his supervision by Mr. Robinson. Since August 1, 1927, G. H. Taylor devoted most of his time to ground-water work. On November 10, 1927, T. F. Baun was assigned to collect statistics on wells. He resigned on April 15, 1928, and F. B. Blanchard was appointed to complete the work. The entire ground-water investigation was made under the direction of O. E. Meinzer, geologist in charge of the ground-water division of the United States Geological Survey.

This report includes all the results of the investigation up to July 1, 1929. On account of the short period over which the observations have extended it is unsafe to attempt a final interpretation of the results at this time. Measurements of the depth to water in the observation wells are to be made for several years more, and certain of the gaging stations are to be maintained to record the hydrologic conditions in the area. It is also planned to continue the cylinder tests of specific yield and to take numerous volumetric samples of the water-bearing material that has been unwatered since 1906 to be tested for the specific yield. Tests of soil moisture are to be made to determine penetration of the rain on the valley floor and the replenishment of the ground-water supply from the rainfall on the area.

ACKNOWLEDGMENTS

The collection of well statistics required a visit to practically every ranch in the area. The willingness of the well owners and drillers to furnish information was a great factor in the success of this work. Special thanks are due to the owners of river pumps and to certain well owners who kept records of the number of hours of pumping and furnished considerable additional data. The writers are especially grateful to Messrs. G. G. Gillespie, Fred Kirschenmann, G. W. Lucas, Verne Hoffman, George Preszler, A. L. Paddleford, John Emde, C. B. Clancy, R. S. Featherstone, H. G. Kreth, J. F. Paulk, C. N. Adams, H. S. Magee, Garnet Griffith, J. Jory, D. Atkins, A. Frandy, N. V. Williams, John Kost, J. H. Willms, the late John Clements, and A. F. Forni, Mrs. Maestretti, the Woodbridge Golf Club, the Stockton Mokelumne Canal Co., and the California State Highway Commission for granting permission to install water-gage recorders on their properties; to Messrs. C. N. Adams, L. K. Marshall, J. J. Lillie, J. H. Willms, J. F. Blakely, George Locke, J. H. Sobey, O. V. Stolz, R. G. Huestis, G. E. Lawrence, and R. S. Featherston and Mrs. May Hamrick for their hearty cooperation in furnishing climatic records; to Messrs. R. S. Featherston, W. J. Robinson, jr., A. Taddei, A. S. Wegat, John Emde, Perry Clark, and H. Ingles for free use of their properties for tests of specific yield; to Mr. J. C. Lange for use of his well for a dye test; and to Messrs. George Preszler, C. B. Clancy, John Emde, J. C. Lange, and Fred Kirschenmann for permission to drill wells on their land. Mr. John A. Henning, superintendent of public utilities of the city of Lodi, cooperated by keeping accurate records of the amount of water pumped by the city. Mr. Charles H. Widdows, civil engineer, of Stockton, generously cooperated by furnishing all his measurements of the depth to water and other data collected by him during 1925 in this area. Mr. Frank Davis, chief engineer of the Woodbridge Irrigation District, furnished considerable information on the use of water in the district and assisted in a study of seepage losses from the Woodbridge Canal.

CLIMATE

TEMPERATURE

The mean temperature on the valley floor at Lodi is 60.1°, at Stockton 59.0°, and in the foothills at Mokelumne Hill (see pl. 2) 58.4°. The temperature decreases progressively eastward to the summit of the Sierra Nevada, where the mean annual temperature as shown by records for Summit, at 7,000 feet above sea level, is about 40°. Mean monthly and annual temperatures for Lodi, Mokelumne Hill, and Stockton are given in the following table.

Mean temperature, in degrees Fahrenheit, at Lodi, Mokelumne Hill, and Stockton

[From records of U. S. Weather Bureau]

	Length of records (years)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mean														
Lodi	30	46.2	50.1	54.7	58.3	63.4	69.1	73.7	73.0	69.7	62.3	53.6	47.3	60.1
Mokelumne Hill	29	44.0	47.1	49.4	54.6	59.4	68.8	76.7	74.7	68.5	60.9	52.1	44.6	58.4
Stockton	57	45.1	49.6	52.6	57.4	62.2	69.6	73.2	71.8	68.6	61.3	52.2	44.6	59.0
Mean maximum														
Lodi	12	53.0	56.5	63.5	72.0	76.7	85.2	90.8	88.5	82.6	73.8	62.7	53.0	71.5
Mokelumne Hill	17	52.9	56.2	59.9	66.6	73.5	83.5	91.5	90.1	82.8	73.8	62.6	53.7	70.6
Mean minimum														
Lodi	12	40.2	40.8	42.4	44.5	48.9	53.6	56.2	54.5	52.1	47.4	41.2	37.8	46.6
Mokelumne Hill	17	36.8	39.1	41.0	44.3	47.0	54.5	62.3	61.3	56.5	50.9	43.2	37.2	47.8

At Ione, in the foothills (see pl. 2), the highest temperature is 116° and the lowest 14°, a range of 102°. At Lodi and Galt the range is 89°. The monthly high and low temperatures for Galt, Ione, Lodi, and Mokelumne Hill are given in the table below.

Highest and lowest temperatures, in degrees Fahrenheit, at Galt, Ione, Lodi, and Mokelumne Hill

[From records of U. S. Weather Bureau]

	Length of record (years)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Highest														
Galt	19	75	78	89	98	100	108	112	114	105	98	85	79	114
Ione	19	75	79	84	93	105	113	116	111	105	94	88	82	116
Lodi	16	70	82	81	93	104	104	110	108	105	92	78	68	110
Mokelumne Hill	24	79	73	84	92	101	104	106	104	103	95	84	76	106
Lowest														
Galt	19	25	28	32	34	40	42	50	40	42	37	27	26	25
Ione	19	14	17	28	30	40	49	50	51	39	31	22	18	14
Lodi	16	22	24	29	32	36	43	45	40	40	31	25	21	21
Mokelumne Hill	24	18	20	26	29	30	40	35	42	39	30	24	21	18

From October 18, 1926, to January 25, 1929, the temperature of the Mokelumne River was recorded with a Bristol automatic recording thermometer at the Clements gaging station. The river temperature is slightly less than the mean monthly temperature at Sacramento. A graph showing the change in temperature of the river from day to day is given in Plate 3.

The prevailing wind direction is northwest on the valley floor except in December and January, when it is southeast. This area is favored during most of the hot months with ocean breezes from the Golden Gate, whereas the valley north of Sacramento and south of Stockton is shut off from these winds by the Coast Range.

The average date of the last killing frost in spring on the valley floor comes in February; in the foothills it occurs in March. The average date of the first killing frost in autumn on the valley floor and in the foothills is the last of November or the first week in December. The average growing season is about 275 days. Killing frosts occur later in the autumn and earlier in the spring at Galt and Valley Springs than at other stations; hence the growing season at these places is over 300 days. Thunderstorms and tornadoes are infrequent. A tornado visited the Lodi district at 1 p. m. November 12, 1926. It traveled northeastward and passed about 1½ miles south of Lockeford, uprooting trees and damaging buildings in a 2½-mile path. The total property damage was small. Another tornado occurred at noon December 10, 1928. It traveled in an easterly direction and passed about 7 miles north of Lockeford. Some buildings were wrecked and many trees blown down, but the total damage was small.

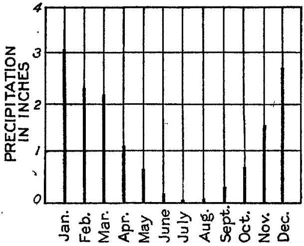
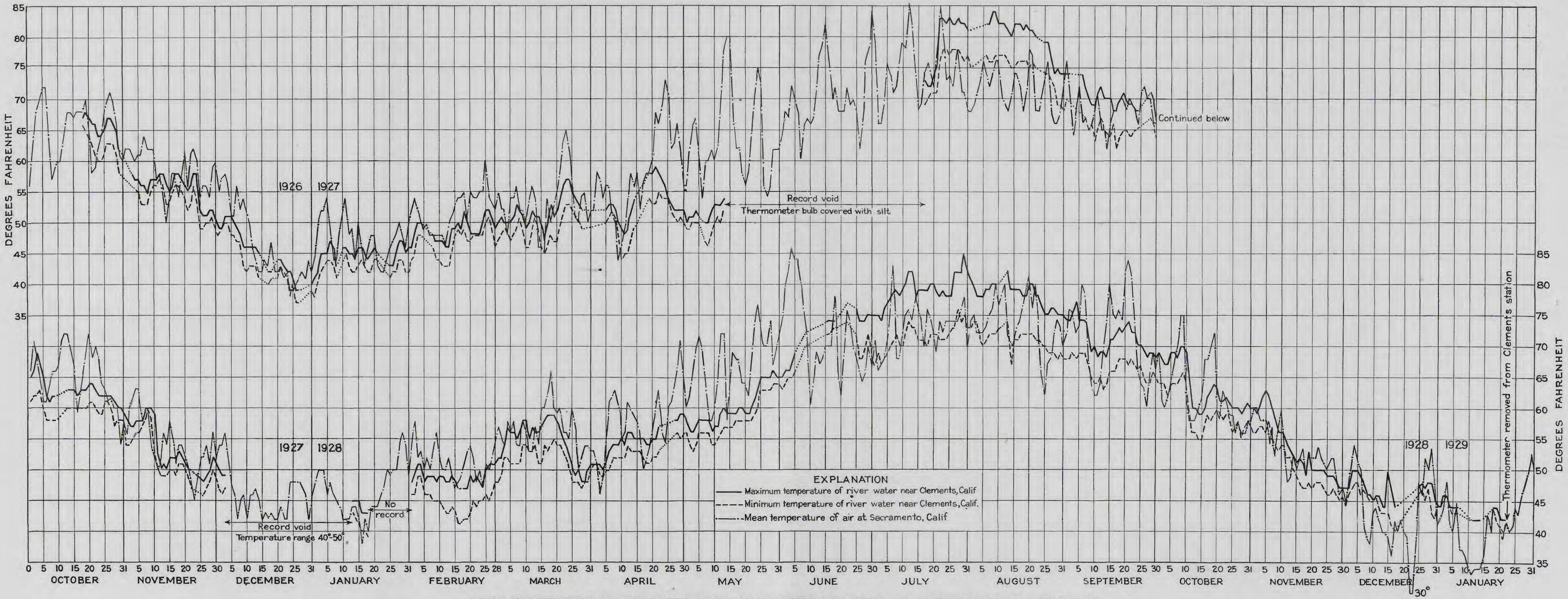


FIGURE 1.—Average monthly precipitation at Stockton

PRECIPITATION

The Mokelumne area has a wet and a dry season, due to the effect of temperature on the moist winds blowing off the Pacific Ocean. January is the wettest month and July the driest. The average monthly distribution of rainfall at Stockton is shown in Figure 1.

The mean annual precipitation is about 18 inches on the valley floor and increases to about 22 inches toward the foothills. In the headwater region of the Mokelumne River, at the Bear River, 5,800 feet above sea level, the mean annual precipitation is about 55 inches. The regional distribution of precipitation is shown on Plate 1, and the precipitation for 16 stations in or near the Mokelumne area is given in the following table:



DAILY TEMPERATURE OF MOKELUMNE RIVER AT CLEMENTS AND MEAN AIR TEMPERATURE AT SACRAMENTO

Annual precipitation, in inches, at 16 stations in or near the Mokelumne area

[From records of U. S. Weather Bureau. Location of stations is shown on Plate 2]

Year (Oct. 1 to Sept. 30)	Angels Camp	Bellota	Bear River	Electra	Galt	Ione	Jenny Lind	Jackson	Kennedy mine	Lodi	Mokelumne Hill	Rio Vista	Stockton	Valley Springs	West Point	Mill Creek No. 1
1866–67													25.34			
1867–68													20.68			
1868–69													16.45			
1869–70													7.64			
1870–71													6.73			
1871–72													20.80			
1872–73													13.31			
1873–74													15.37			
1874–75													10.91			
1875–76													18.33			
1876–77													7.03			
1877–78													18.76			
1878–79					13.47	16.93							11.46			
1879–80					16.40	21.79							15.34			
1880–81					16.17	17.36							14.68			
1881–82					12.73	19.07							10.19			
1882–83					6.63	17.16					21.42		14.94			
1883–84					18.43	29.95					38.62		20.37			
1884–85					9.61	13.86					23.81		9.43			
1885–86					20.35	25.14					41.67		17.36			
1886–87					13.31	15.39					21.62		8.10			
1887–88					12.93	11.04					19.31		11.42			
1888–89					15.22	14.05				16.12	19.68		12.11	14.11		
1889–90					34.43	33.10				34.44	56.37		22.94	39.35		
1890–91					16.45	13.21				15.73	24.95		9.72	18.52		
1891–92					15.21	19.37				17.00	29.33		12.09	18.92		
1892–93					28.87	21.87			44.27	25.79	40.46	10.51	15.94	29.34		
1893–94					21.78	21.00		40.48	44.51	23.07	36.79	19.44	17.46	26.19		
1894–95					27.89	23.74		50.21	54.58	26.15	45.38	25.29	18.52	33.30	60.66	
1895–96					22.85	19.20		32.73	36.12	18.35	31.02	19.75	14.39	20.71	39.93	
1896–97					21.36	23.73		32.62	46.05	19.24	40.97	17.69	12.47	30.02	45.60	
1897–98					12.62	14.15		19.62	22.32	9.70	18.39	8.83	7.25	13.00	23.52	
1898–99					15.60	19.52		29.85	28.88	14.98	26.79	15.08	14.10	26.45	33.73	
1899–1900					17.94	21.71		33.83	37.32	18.77	30.06	16.45	16.28	22.95	39.72	
1900–1					17.50	27.04		42.70	45.41	19.65	26.31	19.95	17.15	28.85	57.12	
1901–2					18.00	18.43		29.31	34.05	15.99	25.41	14.44	13.58	26.14	33.82	
1902–3					18.05	22.39		34.63	43.10	19.26	31.28	14.34	14.54	26.03	[a] 44.41	
1903–4					20.17	24.82			40.57	20.01	40.95	23.28	16.68	32.78	57.74	
1904–5				27.42	17.45	22.55			30.58	18.90	28.92	17.96	15.78	27.17	33.26	

[a] Estimated for March, April, May, and June, 1903.

Annual precipitation, in inches, at 16 stations in or near the Mokelumne area—Continued

[From records of U. S. Weather Bureau. Location of stations is shown on Plate 2]

Year (Oct. 1 to Sept. 30)	Angels Camp	Bellota	Bear River	Electra	Galt	Ione	Jenny Lind	Jackson	Kennedy mine	Lodi	Mokelumne Hill	Rio Vista	Stockton	Valley Springs	West Point	Mill Creek No. 1
1905-6	--------	--------	--------	42.83	24.68	31.13	--------	--------	37.45	24.53	43.23	21.30	18.74	28.63	57.28	[b] 66.60
1906-7	--------	--------	--------	50.74	26.83	33.62	--------	--------	45.78	25.84	48.99	--------	22.39	25.61	58.08	[b] 67.60
1907-8	--------	--------	34.77	19.90	13.58	14.37	16.47	--------	19.36	12.97	19.25	--------	11.28	14.81	23.33	24.65
1908-9	45.38	--------	68.42	38.64	21.94	25.91	10.38	--------	33.06	18.53	37.38	22.27	15.74	25.06	46.05	50.40
1909-10	28.81	--------	59.54	34.16	16.83	20.67	21.47	--------	30.44	15.78	33.58	15.21	14.14	23.68	41.14	49.64
1910-11	49.95	--------	72.29	47.17	25.87	30.18	17.18	--------	37.00	24.06	44.12	23.47	19.82	34.13	56.07	65.02
1911-12	25.11	13.61	38.48	24.20	13.78	15.02	26.92	--------	20.97	10.15	23.51	13.04	10.16	14.93	28.07	36.02
1912-13	17.43	9.47	39.64	18.34	8.38	11.92	9.55	--------	14.86	[c] 7.55	17.46	7.42	6.05	11.55	25.47	30.39
1913-14	45.63	25.05	68.24	38.16	23.18	22.86	22.17	--------	31.23	[c] 21.00	36.63	24.46	17.75	26.40	48.83	57.65
1914-15	37.93	23.74	--------	34.54	22.31	22.80	22.64	--------	28.10	[c] 20.50	36.69	20.95	17.46	26.30	43.97	49.59
1915-16	--------	24.20	--------	34.97	[d] 20.32	[d] 20.10	24.04	--------	29.40	[c] 22.42	30.78	24.03	18.21	--------	42.53	51.82
1916-17	--------	16.26	--------	28.87	[d] 13.94	[d] 17.25	17.66	--------	21.31	[c] 19.23	24.51	12.08	10.87	--------	35.43	45.79
1917-18	--------	15.82	--------	30.19	[d] 14.48	[d] 17.20	17.30	--------	26.16	[c] 16.38	27.43	14.96	12.30	--------	34.91	40.43
1918-19	--------	14.47	--------	24.69	[d] 16.45	[d] 14.91	17.41	--------	23.44	[c] 15.03	21.65	13.74	12.41	--------	28.73	37.37
1919-20	--------	14.20	--------	23.77	[d] 9.17	[d] 13.21	14.45	--------	20.99	[c] 9.54	19.50	8.95	7.64	--------	29.91	33.79
1920-21	--------	19.58	--------	31.89	[d] 19.55	[d] 26.57	19.92	--------	31.39	[c] 18.17	30.32	17.14	15.01	[e] 23.27	45.97	49.74
1921-22	--------	19.86	--------	30.95	[d] 17.18	[d] 24.30	23.55	--------	27.55	[c] 17.93	30.39	16.60	14.66	[e] 21.22	38.79	44.99
1922-23	--------	24.49	--------	37.21	[d] 20.79	[d] 27.22	20.83	--------	35.40	[c] 19.90	34.68	--------	17.38	[e] 23.90	43.26	47.93
1923-24	--------	8.37	--------	12.74	[d] 9.35	[d] 8.21	7.36	--------	11.54	[c] 7.91	11.21	--------	6.16	[e] 8.83	14.67	16.99
1924-25	--------	24.98	--------	34.70	[d] 21.55	[d] 29.15	23.06	--------	33.82	[c] 20.72	37.62	21.72	18.04	[e] 23.81	[f] 46.60	52.58
1925-26	--------	11.81	--------	20.47	[d] 16.09	[d] 16.45	14.45	--------	20.14	[c] 14.73	21.31	--------	16.11	[e] 13.01	28.58	31.93
1926-27	--------	18.35	--------	33.23	[d] 20.86	[d] 24.05	21.52	--------	27.95	17.07	32.62	--------	15.15	[e] 21.15	45.20	[g] 52.93
Mean	35.75	17.77	54.48	31.29	18.13	20.71	18.42	34.60	32.14	18.28	30.72	17.25	14.48	22.63	40.68	45.63
Length of record ... years	7	16	7	23	49	49	20	10	35	39	45	29	61	35	33	22
Altitude ... feet	1,535	130	5,800	725	49	287	300	1,900	1,500	50	1,550	35	23	673	2,326	2,500

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[b] Estimated.

[c] Record kept by Mrs. L. E. McClung, former Weather Bureau observer.

[d] From records of the Southern Pacific R. R.

[e] Record kept by J. J. Lillie.

[f] Estimated for September, 1924.

[g] Estimated for September, 1927.

The longest record of precipitation in the vicinity of the Mokelumne River is that at Stockton, which dates back to 1849. The annual variation of rainfall at this station is shown graphically in Figure 2. The United States Weather Bureau has published the monthly precipitation as far back as 1867. The monthly rainfall records prior to 1867 are given below:

Monthly and annual rainfall, in inches, at Stockton, 1849–1867 [a]

Year	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1849–50	0.250	1.500	2.250	12.500	4.500	0.500	10.000	4.250	0.250
1850–51	0	0	Tr.	Tr.	.650	.350	1.880	1.140	.690
1851–52	1.000	.180	2.140	7.070	.580	.120	6.400	.190	.300
1852–53	.003	0	6.000	13.410	2.400	.620	2.020	2.700	.250
1853–54	0	0	.610	1.350	2.640	8.940	3.600	3.240	.660
1854–55	0	.130	.310	.230	2.900	2.740	2.200	3.290	0
1855–56	0	0	.740	2.420	4.500	.020	.260	.160	.170
1856–57	0	.450	.830	2.900	1.375	4.801	.675	Tr.	Tr.
1857–58	0	.655	2.406	6.632	2.444	2.461	2.878	1.214	.203
1858–59	Tr.	3.010	.147	4.329	.964	3.906	1.637	.981	1.037
1859–60	.025	0	6.485	1.834	2.310	.931	5.110	2.874	2.491
1860–61	.063	.914	.181	4.282	2.668	2.920	3.320	.475	.590
1861–62	0	Tr.	2.170	8.637	15.036	4.260	2.800	.821	1.808
1862–63	0	.355	.005	2.327	1.733	2.751	2.360	1.693	.355
1863–64	.003	0	1.490	1.815	1.077	.180	1.303	1.080	.742
1864–65	.004	.120	6.718	7.867	4.776	.712	.481	1.370	.460
1865–66	.080	.480	2.427	.364	7.699	2.010	2.018	.476	2.252
1866–67	0	.001	2.426	9.511	3.440	7.104	1.010	1.805	.008

Year	June	July	Aug.	Year	Year ending—		
					Aug. 31	Sept. 30	Dec. 31
1849–50	0	0	0	1850	36.000	35.750	19.500
1850–51	0	0	0	1851	4.710	5.710	15.100
1851–52	0	0	0	1852	17.980	16.983	27.003
1852–53	0	0	0	1853	27.403	27.400	9.950
1853–54	0	0	0	1854	21.040	21.040	19.750
1854–55	0	0	0	1855	11.800	11.800	14.290
1855–56	0	.100	0	1856	8.370	8.370	9.390
1856–57	.350	0	Tr.	1857	11.381	11.381	16.894
1857–58	.098	0	Tr.	1858	18.991	18.991	16.784
1858–59	0	.549	0	1859	16.041	16.066	17.398
1859–60	.107	0	0	1860	22.716	22.754	19.263
1860–61	.135	0	0	1861	15.548	15.485	20.915
1861–62	.011	0	.006	1862	35.549	35.549	27.495
1862–63	0	0	0	1863	11.579	11.582	12.200
1863–64	.087	0	.085	1864	7.867	7.863	19.263
1864–65	0	.004	0	1865	27.512	22.588	11.154
1865–66	.100	.018	0	1866	17.924	17.844	26.511
1866–67	0	0	0	1867	25.305	25.337	--------

[a] These records were kept by Maj. J. D. Peters, of Stockton, and were published by the Stockton Record. They represent all available rainfall records prior to the establishment of the U. S. Weather Bureau station at the Stockton State Hospital.

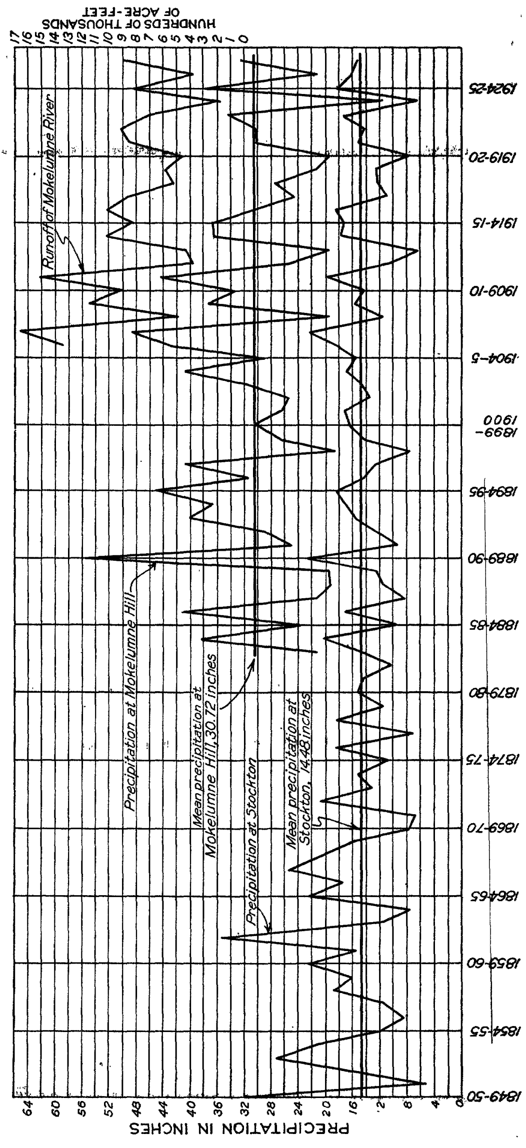

FIGURE 2.—Comparison of annual precipitation at Stockton and Mokelumne Hill with discharge of Mokelumne River at Clements

The records of precipitation at 14 stations in or near the Mokelumne area from October, 1925, to July, 1929, are given in the table below.

Monthly and annual precipitation, in inches, at 14 stations in or near the Mokelumne area for the period October 1, 1925, to July 31, 1929

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
1925–26													
Bellota [a]	0.20	0.73	1.67	2.00	3.85	0.51	2.71	0.14	0	0	0	0	11.81
Clements [a]	------	------	------	------	------	------	------	------	------	0	0	0	------
Elliott [a]	------	------	------	------	------	------	------	------	------	0	Tr.	0	------
Forni ranch [a]	------	------	------	------	------	------	------	------	------	------	------	------	------
Galt	Tr.	.65	1.94	1.49	6.76	.18	4.73	.34	0	0	Tr.	Tr.	16.09
Linden	.08	.90	1.30	1.90	4.24	.42	3.46	.20	0	0	Tr.	0	12.50
Lockeford	.10	.48	1.80	2.80	4.08	.35	6.40	.19	0	0	0	0	16.20
Lodi	.02	.63	1.64	2.29	5.72	.25	4.18	.31	0	0	Tr.	Tr.	15.04
Marshall ranch	0	.73	1.68	1.35	4.69	.34	4.99	.27	0	0	Tr.	0	14.05
Round Timbers	------	------	------	------	------	------	------	------	------	0	Tr.	Tr.	------
Victor	.09	.65	1.66	2.00	4.37	.28	5.12	.31	0	0	0	0	14.48
Wallace [a]	------	------	------	------	------	------	------	------	------	------	Tr.	Tr.	------
Valley Springs	0	.99	1.99	1.20	5.46	.37	2.77	.23	0	0	0	0	13.01
Ione	.40	.94	2.61	1.60	7.06	0	3.54	.30	0	0	0	0	16.45
1926–27													
Bellota [a]	1.08	5.06	1.17	2.80	4.80	1.12	1.92	.05	.35	0	0	0	18.35
Clements [a]	1.26	4.22	1.86	2.24	4.50	.77	2.29	.13	.43	0	0	0	17.70
Elliott [a]	1.37	4.59	.84	2.81	4.47	1.24	1.94	.50	.48	0	Tr.	Tr.	18.24
Forni ranch [a]	1.53	6.17	1.46	3.46	4.44	1.31	2.73	.30	.72	0	0	Tr.	22.12
Galt	1.37	4.73	.76	3.15	5.75	1.85	2.55	.23	.46	0	0	Tr.	20.85
Linden	.62	5.18	1.01	3.14	4.40	1.84	1.60	1.15	.41	0	0	Tr.	19.35
Lockeford	1.16	5.06	.98	3.49	5.46	1.46	2.86	.39	.46	0	0	0	21.32
Lodi [a]	.94	3.86	.89	2.73	4.47	1.87	1.74	.20	.34	0	0	.04	17.08
Marshall ranch	.35	4.54	.86	2.54	3.54	2.19	2.03	.29	.35	0	0	Tr.	16.69
Round Timbers	.71	3.36	.61	2.96	2.01	1.20	1.34	.15	.44	0	0	Tr.	12.78
Victor	1.13	3.44	.96	2.87	4.89	2.81	2.22	.68	.38	0	0	0	19.38
Wallace [a]	1.40	5.98	1.05	3.42	4.83	1.43	2.00	.32	.40	0	0	Tr.	20.83
Valley Springs	1.52	6.72	1.12	3.15	4.60	1.86	1.95	.21	.35	0	0	.02	21.50
Ione	1.55	6.85	1.25	3.60	5.00	1.85	3.05	.40	.50	0	0	0	24.05
1927–28													
Bellota [a]	2.06	1.92	2.33	0.95	2.02	4.94	0.60	0.30	0	0	0	0	15.12
Clements [a]	1.43	2.59	2.83	1.02	1.87	4.80	.37	.48	0	0	0	0	15.39
Elliott [a]	1.85	2.12	2.00	1.10	1.52	4.12	1.00	.38	Tr.	Tr.	0	Tr.	14.09
Forni ranch [a]	------	[b]2.53	2.23	1.62	2.10	5.02	------	------	------	------	------	------	------
Galt	2.08	2.31	[c]1.72	1.23	1.15	4.23	.87	.38	0	0	0	0	13.97
Linden	2.03	1.99	2.38	.77	1.91	4.56	.84	.14	Tr.	Tr.	0	Tr.	14.62
Lockeford	2.25	2.25	[c]2.28	.86	1.83	4.71	1.42	.41	0	0	0	0	16.01
Lodi [a]	1.92	2.33	1.99	1.05	1.34	4.00	1.48	.26	Tr.	0	0	0	14.37
Marshall ranch	[d]1.86	1.90	1.92	.63	1.27	4.02	.88	.18	0	0	0	0	12.66
Round Timbers	1.71	.87	1.16	.63	1.33	2.74	1.14	.53	0	0	0	0	10.17
Victor	2.05	2.25	2.32	.92	1.49	4.25	.77	.43	0	0	0	0	14.48
Wallace [a]	2.40	2.00	2.53	1.23	2.14	5.50	.36	.35	0	Tr.	0	0	16.51
Valley Springs	1.94	3.70	[d]2.73	1.43	2.46	5.33	1.48	0	Tr.	0	0	Tr.	19.07
Ione	1.85	2.95	2.80	[c]1.60	2.08	6.01	1.36	0	0	0	0	0	18.65
1928–29													
Bellota [a]	.07	4.00	2.08	2.27	1.10	1.46	1.09	.10	1.33	0	------	------	------
Clements [a]	.06	3.56	.80	2.57	1.16	1.46	0	0	1.21	0	------	------	------
Elliott [a]	.03	3.08	2.32	1.52	1.27	1.46	.77	.03	1.48	0	------	------	------
Galt	.04	2.40	2.12	1.31	1.34	2.15	.55	.02	1.16	0	------	------	------
Linden	.03	3.24	2.22	1.86	.83	1.24	.73	.13	1.20	0	------	------	------
Lockeford	.05	3.63	2.27	2.09	1.21	1.79	.57	.11	.79	0	------	------	------
Lodi [a]	.02	3.45	2.11	1.12	1.17	1.34	.44	Tr.	1.03	0	------	------	------
Marshall ranch	.02	3.57	2.39	1.62	1.01	1.55	.52	.02	1.14	0	------	------	------
Victor	0	3.17	2.39	1.52	1.22	1.85	.48	.06	1.20	0	------	------	------
Wallace [a]	.05	4.05	2.30	2.30	2.79	1.92	1.12	0	1.42	0	------	------	------
Valley Springs	.06	3.88	2.43	2.30	1.99	3.78	1.33	0	2.06	0	------	------	------
Ione	.08	4.07	1.97	2.64	1.78	1.71	1.20	0	1.62	0	------	------	------

[a] From records of U. S. Weather Bureau.

[b] Gage contained 1.89 inches on Nov. 3, 1927, which was the first time it was read since Oct. 1. At 8 a. m. Nov. 10, 0.64 inch was recorded for the total rainfall in the preceding 36 hours.

[c] Standard 8-inch gage installed. Old gage registered slightly high.

[d] Standard 8-inch gage installed. Old gage registered slightly low.

A close relation exists between the precipitation at Mokelumne Hill and the flow of the Mokelumne River at Clements. This relation is graphically shown in Figure 2. The run-off at Clements is not directly proportional to the precipitation in the headwater area. A certain amount of precipitation is lost annually by transpiration from vegetation and by other evaporation. When the precipitation for the year is low a larger percentage of the water that falls is lost by transpiration and evaporation than when it is high. Consequently, in dry years only a small percentage of the annual precipitation runs off. This condition is brought out by the data in the following table:

Run-off from and precipitation on drainage basin of Mokelumne River above Clements, 1905–1927

Year (Oct. 1 to Sept. 30)	Run-off				Average precipitation on drainage area (inches)[b]	Run-off in per cent of precipitation
	Total (acre-feet)	Per square mile (acre-feet)[a]	Depth on drainage area (inches)	Per cent of 22-year average		
1905–6	1,350,000	2,140	40.1	165	52.49	76.3
1906–7	1,670,000	2,640	49.5	204	56.29	88.0
1907–8	480,000	760	14.2	58.6	21.78	65.2
1908–9	1,150,000	1,820	34.1	140	43.12	79.1
1909–10	906,000	1,430	26.8	111	39.63	67.6
1910–11	1,530,000	2,420	45.4	187	53.09	85.5
1911–12	393,000	622	11.7	48.0	27.95	41.9
1912–13	423,000	670	12.6	51.6	22.92	55.1
1913–14	1,080,000	1,710	32.1	132	45.32	70.8
1914–15	823,000	1,300	24.4	100.5	41.20	59.3
1915–16	1,030,000	1,630	30.6	126	40.02	76.6
1916–17	868,000	1,370	25.7	106	33.65	76.4
1917–18	521,000	825	15.5	63.6	33.24	46.6
1918–19	590,000	934	17.5	72.1	28.11	62.2
1919–20	464,000	735	13.8	56.6	26.74	51.6
1920–21	865,000	1,370	25.7	105.7	39.48	65.0
1921–22	919,000	1,450	27.2	112	36.28	74.9
1922–23	703,000	1,110	20.8	85.8	40.77	51.1
1923–24	182,000	288	5.4	22.2	13.90	38.8
1924–25	824,000	1,300	24.4	100.4	42.88	56.9
1925–26	374,000	592	11.1	45.6	25.57	43.4
1926–27	879,000	1,390	26.1	107.1	41.00	63.6
Average	819,300	1,295	24.3	------------	36.61	66.4

[a] Drainage area 632 square miles.

[b] Average precipitation assumed to be mean of precipitation recorded at Mill Creek No. 1, West Point, Mokelumne Hill, and Electra, cooperative Weather Bureau stations.

A diagram showing the percentage of average run-off of the Mokelumne River at Clements for the period 1905 to 1927 in comparison with the percentage of average rainfall at Galt, Lodi, Stockton, Mokelumne Hill, Jackson, and West Point for the same period is given in Figure 3.

An important factor in ground-water recharge from rainfall is the duration of the wet and dry cycles. These cycles are shown by cumulative curves for three stations in Figure 4.

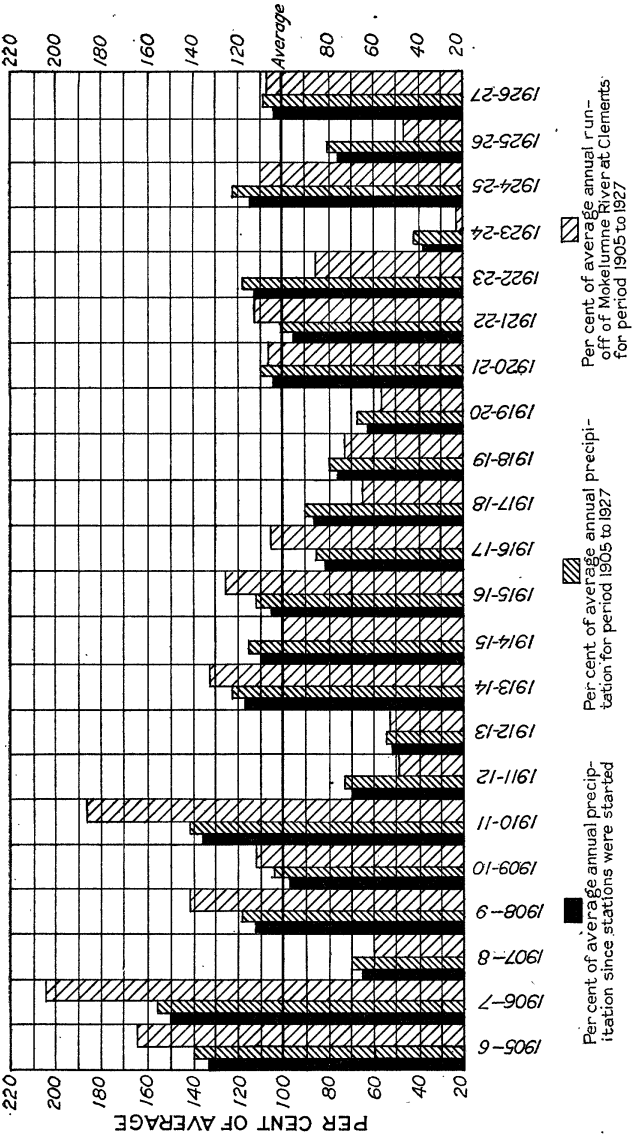

FIGURE 3.—Percentage of average run-off of Mokelumne River at Clements, 1905–1927, in comparison with percentage of average precipitation at Galt, Lodi, Stockton, Mokelumne Hill, Jackson, and West Point for the same period

EVAPORATION

The nearest evaporation station is about 40 miles southeast of Lodi and about 8 miles north of Oakdale, near the Woodward Reservoir, which is 215 feet above sea level and is typical of the low foothill country. The evaporation pan is 48 inches in diameter and 10 inches deep and is filled with water to a depth of 7 inches. It rests on wooden supports at the ground surface. The records for this pan are given below:

Evaporation, in inches, near Oakdale, Stanislaus County

[Altitude 215 feet. From records of U. S. Weather Bureau]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1918	------	------	------	6.213	9.071	14.226	13.942	12.670	5.647	4.964	2.289	0.847	--------
1919	1.622	1.676	3.359	4.896	9.152	13.798	15.497	14.394	9.964	6.880	4.443	1.323	87.004
1920	1.469	2.304	3.254	5.929	10.947	12.379	14.209	13.990	9.743	4.560	2.223	1.127	82.134
1921	1.261	1.694	2.694	6.900	8.582	13.373	17.034	14.651	10.351	------	------	------	--------
1922	1.085	1.882	3.144	5.720	9.888	12.223	15.331	13.246	11.785	6.044	1.738	1.057	83.143
1923	.832	1.518	4.646	4.477	9.358	10.570	15.232	13.127	10.195	5.784	3.408	1.682	80.829
1924	1.485	2.162	4.189	7.512	12.826	15.219	17.060	14.939	11.412	5.026	2.151	------	--------
1925	.830	1.762	2.819	4.306	------	------	------	12.624	8.068	4.783	2.112	.738	--------
1926	------	1.893	3.866	5.528	10.144	14.194	15.046	13.713	9.721	6.140	3.144	1.566	--------
1927	1.144	2.434	3.183	4.660	9.649	12.369	14.819	12.345	9.184	6.060	1.639	1.592	79.078
1928	.952	1.699	3.060	4.665	10.522	14.275	14.341	13.248	9.625	5.171	2.150	1.788	--------
Average	1.186	1.902	3.422	6.081	10.014	13.263	15.251	13.541	9.608	5.541	2.530	1.055	[a] 83.394

[a] Total mean monthly evaporation.

PHYSIOGRAPHY

The area mapped on Plate 2, extending from the Sierra Nevada on the east to the San Joaquin and Sacramento Rivers on the west, comprises six natural physiographic subdivisions—the mountains, the foothills, the red lands, the low plains, the valley flood plains, and the delta country.

Mountains.—The mountainous area comprises in general the part east of a line drawn between Valley Springs and Ione. At this line there is a change in the topography due to a change in geologic structure. Many of the ridges east of this line have a northwesterly trend following the strike of the "Bedrock series." The rise in altitude is gradual toward the crest of the Sierra Nevada, about 60 miles to the east. The Sierra Nevada is a great block of the earth's crust that has been uplifted on the east side and tilted toward the west. The gentle slope on the west side is an old, partly peneplaned surface, now deeply dissected by the major rivers. The storm centers in traveling from west to east are obstructed by this great range, and in passing over it the air is chilled so that most of the moisture is dropped either as rain or as snow. Consequently the west slope of the Sierra is well watered and is covered with a heavy growth of timber below the glaciated zone.

Foothills.—The foothills are characterized by flat-topped mesas capped by nearly horizontal beds of Tertiary sandstone or andesite breccia. (See pl. 2.) They occupy a belt about 8 miles wide west of a line drawn through Valley Springs and Ione. Toward the west, the direction in which they slope, the flat tops become smaller and smaller and are replaced by rounded knobs as a result of more complete removal by erosion. The average height of the mesas above the adjacent country rarely exceeds 200 feet, except in the buttes 3 miles west of Ione, which are 300 feet high.

Toward the mountains these hills are covered with chamiso, manzanita, and other shrubs and scrub oak, but toward the west, where there is less relief, they are pastured extensively.

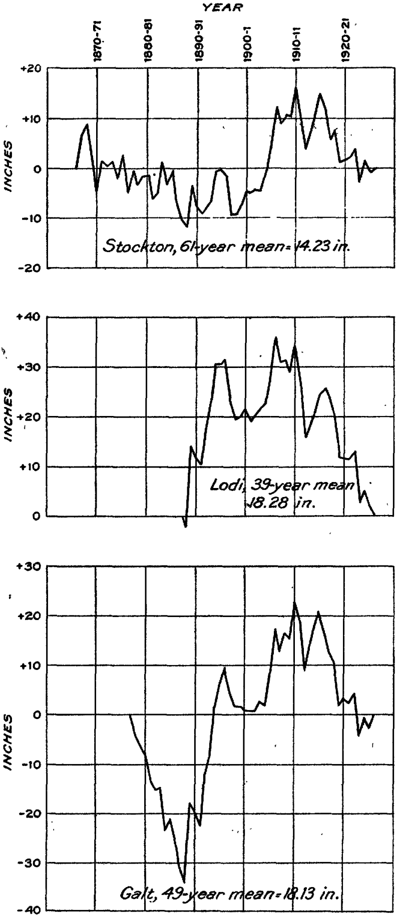

FIGURE 4.—Accumulated departure from normal precipitation at three stations in the Mokelumne area

Red lands.—The red lands occupy a belt about 3 miles wide adjoining the foothill region. North of Dry Creek the belt is much broader and extends as far west as Galt. These lands are undulatory and receive their name from the red soil that is characteristic of their surface. A few people call the belt "hog-wallow country," as hog-wallow depressions are common on its surface. It is underlain by partly consolidated alluvium that has been uplifted and partly dissected. The concentration of the gravel on much of its surface is caused by the weathering of a conglomerate and the removal by wind and water of the finer débris. This land is generally dry farmed, and extensive grain fields with a few scattered oak trees differentiate this belt from the foothill land with its brush and pastures, on the one side, and from the intensively cultivated vineyards and orchards of the low plains, on the other side. Owing to the poor underground drainage, shallow soil, and scalloped surface this land is not readily adaptable to irrigation.

The red lands originated from the dissection of uplifted alluvial slopes formed after the last major uplift of the Sierra Nevada. The streams that deposited this material carried most of it out into the middle of the Great Valley, leaving it less than 100 feet thick along the foothills. The coarseness of the deposit depends upon its closeness to the mountains or to the mouths of the canyons, where the streams changed their grade and dropped the heaviest débris.

Bryan [1] gives the following explanation of the erosive processes in operation in the red lands and why the hills are smooth and have rounded summits:

> The effect of this vegetative cover on erosive processes is striking, for the surface of the ground is protected during the five winter months of rainfall, and erosion takes place under conditions similar to those of a humid climate. During the summer, when the grass dries up and the surface of the ground is least protected, so little rain falls that no erosion takes place. In effect, the seasonal rainfall of the Sacramento Valley gives the topographic results of twice the amount. The mean annual rainfall of the Hungry Hollow and Montezuma Hills is between 20 and 25 inches; they have, however, the rounded forms, smooth slopes, and soil of an area with 40 to 50 inches of rain. If they received 20 inches more uniformly or even irregularly distributed throughout the year, the soft sands, incoherent gravels, and clays would doubtless be carved into more irregular hills and probably into badlands. A similar analysis of topographic form might be profitably made in the lower parts of the Sierra Nevada and Coast Range.
>
> The soils, however, because of freedom from plant growth and of thorough oxidation in the dry summer season, are similar to other arid soils in containing undecomposed feldspars and other minerals and in high nitrate content. It seems probable also that erosion, being operative for half the year only, is only half as rapid as in a humid climate.

Terraces.—The Mokelumne River is bordered by two well-defined terraces. The upper terrace near Clements is about 60 feet above the river and is steep sided. Its height above the river decreases westward and near Lodi is less than 20 feet. The distance between the two terraces is over half a mile in most places between Camanche and Woodbridge and a mile in the vicinity of Lockeford. This valley was cut in the older alluvium and then partly filled with sediment. The tops of the terraces are flat and are covered with sand and gravel,

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[1] Bryan, Kirk, Geology and ground-water resources of the Sacramento Valley, Calif.: U. S. Geol. Survey Water-Supply Paper 495, p. 20, 1923.

hence they are themselves dissected valley floors of a more ancient erosion cycle. The river has since incised itself into the latest flood-plain deposit for a depth of 15 feet near Clements, but during floods it overflows this plain. The same series of events occurred here as Bryan[2] found in the Sacramento Valley—(1) erosion of valleys in ths older alluvium; (2) deposition of sand and gravel on the floor of these valleys; (3) erosion of new valleys, leaving the remnants of the previous valley floors as the high terraces; (4) deposition of sand and gravel on the new flood plains; (5) erosion to the approximate level of the present stream channels, leaving as before the remnants of the previous valley floors as low terraces.

Bryan considered the diastrophic and climatic hypotheses as the two possible explanations of these terraces. He favored the climatic hypothesis as the cause of the changes in the regimens of the streams, and the writer (Stearns) favors that hypothesis also, because in the headwater region of the Mokelumne there existed glaciers in Pleistocene time which resulted from climatic changes. Matthes[3] has found evidence of two epochs of glaciation in the headwater region of the Tuolumne and Merced Rivers, not far south of the Mokelumne area, and it is probable that the fluctuation of climate that accompanied these glacial epochs accounts largely for the fluctuation in the volume and erosive power of the Mokelumne River. Bear Creek, which heads in the low foothills near the center of the Great Valley, lacks the terraces so characteristic of the streams that rise in the mountains.

Low plains.—The low plains are the gentle alluvial slopes between the red lands on the east and the delta country on the west. They appear so nearly level to the eye that it takes an instrument to determine in which direction water will flow over them. Until the country was thickly settled these plains were covered with patches of drifting sand, and even now many of the old shallow blow-outs are left. They are made conspicuous by pools forming in them during the irrigation season. These low plains received considerable sediment during the days of placer mining, because the streams were loaded with silt, and as a result their channels were more shifting. During the last decade levees have been constructed along the lower stretches of the Mokelumne River and Dry Creek to prevent overflow. This work has been only partly successful, for the Mokelumne overflowed its banks in 1907 and again in 1928. During both of these floods silt was left on the land.

Valley flood plains.—Both the Mokelumne River and Dry Creek have flood plains a quarter of a mile to a mile wide, which in most places are intensively farmed. These lands are underlain by gravel

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[2] Bryan, Kirk, op. cit., p. 21.

[3] Matthes, F. E., Evidences of recurrent glaciation in the Sierra Nevada of California [abstract]: Science, new ser., vol. 61, pp. 550–551, 1925.

and are covered with varying thicknesses of sandy silt. They are very flat except where high-water channels or oxbow lakes occur. The flood plain of the Mokelumne is about 15 feet above the river bed and is protected by levees, hence it is inundated only by exceptionally high water. The Dry Creek flood plain is subject to overflow each year.

The Mokelumne River follows a sinuous course through its flood plain, but its channel is not permanent. Notable changes have taken place in the location of the channel since the United States Geological Survey topographic maps were made two decades ago. Most of these shifts in the channel were brought about by the levees, which increased the gradient of the stream.

Delta country.—The Mokelumne River west of Lodi and beyond its confluence with the Cosumnes River divides into two main channels known as the North and South Forks,[4] both of which empty into the San Joaquin River. The land lying between these two forks is known as Staten Island. It is typical of the delta country, which is simply a network of sloughs of the San Joaquin, Mokelumne, and Sacramento Rivers at sea level, where these rivers discharge into Suisun Bay. The water in these sloughs was originally confined by natural levees built of silt dropped by the rivers during the flood seasons. The channels were kept open during the remaining months by the movement of the water, due to the rise and fall of the tide. Before reclamation the islands between the sloughs were swampy tracts where tules flourished.

In the early eighties these lands were reclaimed by dredging the sloughs and piling the dirt on top of the natural levees. Then open drainage ditches leading to the lowest part of each island were constructed and large pumps were installed to lift the rain water and ground water that entered the ditches over the levees. The soil of the islands is almost everywhere decomposed peat. It is a common practice to irrigate the land by siphoning the fresh water from the sloughs over the levees. The irrigation water not used for plant growth or lost by evaporation finds its way slowly to the drainage pumps and is lifted back into the sloughs whence it first came. In late years irrigation has been a necessity in order to wash the soil free of the alkali that accumulates on the surface from the evaporation of the capillary ground water. Owing to the increased use of water in the headwater region of the San Joaquin and Sacramento Rivers for irrigation, less fresh water has been entering the sloughs of the delta country, with the result that the salt water of the ocean has been invading the sloughs in amounts so large that when the water is siphoned out for irrigation it increases the alkali content of the soil instead of leaching it out as formerly. This condition has been critical

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Not to be confused with the North and South Forks at the headwaters of the Mokelumne.

during the recent dry years, and considerable litigation against the water users in the upper parts of the valleys has arisen.

The surface of many of the islands is from 1 to 6 feet below sea level. Starting at the sea-level contour line (see pl. 5) and extending westward 3 or 4 miles to the South Fork of the Mokelumne River are four sloughs. These sloughs appear to be remnants of abandoned distributary channels of the Mokelumne before it took its present course farther north. The tracts between these sloughs have been reclaimed in the same manner as the islands, except that some of them have levees constructed on the east side to protect them from the floods of the Mokelumne. In March, 1928, the Mokelumne River broke through its south levee near Woodbridge, and the water flowed westward, in part through Beaver Slough and in part over the land south of it. The water would have flooded valuable crops in the land south of this slough had it not been arrested by the north-south levee on the east side of the land between Beaver Slough and Hog Slough. The flood waters impounded by this levee were drained through pipes laid through the levee with check valves in one end operating in such a way that during low tide water drains into the slough and during high tide the valves in the outlets of the drainage pipes close.

GEOLOGY

GENERAL FEATURES

San Joaquin Valley, of which the Mokelumne area is only a small part, occupies a basin whose basement is probably a complex of granitic, schistose, and slaty rocks of pre-Cretaceous age similar to those that compose the greater part of the Sierra Nevada. On this basement complex rest sandstones and shales of Cretaceous age, which are known to thin toward the east side of the valley and which may or may not underlie the Mokelumne area.[5] According to Bryan [6] these formations carry little water and may be considered an impervious floor on which the Tertiary and Quaternary water-bearing formations have been deposited.

The following excerpt from a report on the ground water in San Joaquin Valley by Mendenhall, Dole, and Stabler [7] outlines the geology of this portion of the valley:

> The valley as a whole is a great structural trough and appears to have been such a basin since well back in Tertiary times. Since it assumed its general trough-like form, gradual subsidence, perhaps interrupted by periods of uplift, has continued and has been accompanied by deposition, alternating, at least along what

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[5] Diller, J. S., Tertiary revolution in the topography of the Pacific coast: U. S. Geol. Survey Fourteenth Ann. Rept., pt. 2, p. 415, 1894.

[6] Bryan, Kirk, Geology and ground-water resources of Sacramento Valley, Calif.: U. S. Geol. Survey Water-Supply Paper 495, p. 68, 1923.

[7] Mendenhall, W. C., Dole, R. B., and Stabler, Herman, Ground water in San Joaquin Valley, Calif.: U. S. Geol. Survey Water-Supply Paper 398, p. 19, 1916.

is now its western border, with intervals of erosion. This interrupted but on the whole continuous deposition seems to have been marine during the early and middle Tertiary; but during the later Tertiary and Pleistocene, when presumably the valley had been at least roughly outlined by the growth of the Coast Ranges, fresh-water and terrestrial conditions became more and more predominant, until the relations of land and sea, of rivers and lakes, of coast line and interior, of mountain and valley, as they exist now, were gradually evolved. As these conditions developed, the ancestors of the present rivers probably brought to the salt and fresh-water bodies that occupied the present site of the valley and its borders, or, in the latest phases of the development, to the land surface itself, the clays, sands, gravels, and alluvium that subsequently consolidated into the shales, sandstones, and conglomerates of the late Tertiary and Pleistocene series, just as the present rivers are supplying the alluvium that is even now accumulating over the valley floor.

PRE-TERTIARY FORMATIONS

The Mokelumne River and its tributaries rise in the crystalline rocks of the Sierra Nevada. The rocks about its headwaters are prevailingly schists, which have been produced by intense metamorphism of both ancient sediments and igneous rocks. With reference to these rocks Turner[8] says:

> The trend of the bands of altered sediments and of the schistose structure is generally from northwest to southeast, parallel to the trend of the range, but great masses of granite and other igneous rocks have been intruded among these schists, forming irregular bodies which interrupt the regular structure and which are generally bordered each by a zone of greater metamorphism. These schists with their associated igneous masses form the older of two great groups of rocks recognized in the Sierra Nevada. This group is generally called the Bedrock series.

The region east of a line drawn from Valley Springs and Ione (see pl. 2) is underlain by the "Bedrock series." These rocks are in general impermeable, and no water table in the ordinary meaning of the term exists in them. Wells in this region obtain their water from the contact of the soil with bedrock. A few springs issue from crevices in the bedrock, but most of them go dry during the summer. All these springs yield very small quantities of water.

An excellent opportunity existed during 1928 to study the circulation of water through the schists and slates of the "Bedrock series." A tunnel about 11,000 feet long was being driven by the East Bay Municipal Utility District from Campo Seco to the bottom of the Pardee Reservoir. It has an 8-foot horseshoe bore and was being driven from both ends. The west heading, at Campo Seco, was 3,800 feet long on April 13, 1928. It penetrates amphibolite schist and slate of the "Bedrock series." Over part of this tunnel there is a 200-foot overburden, and at the time of visit the rainy season was just ending, yet the total discharge was only about 10 gallons a minute. Furthermore, the inspector of the tunnel states that even

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[8] Turner, H. W., U. S. Geol. Survey Geol. Atlas, Jackson folio (No. 11), p. 1, 1894.

during long rainy spells the seepage into it does not appreciably increase. Wherever water was seeping into the tunnel it was following thin quartz veins along joint planes. The east heading of the tunnel penetrates black slate and porphyrite. The rocks in the first part are shattered in some places, necessitating timbering. At most of these places water was seeping into the tunnel. A considerable stream of water entered it at a plane filled with clay gouge. In driving the tunnel a considerable volume of water was sometimes struck. This soon drained out, but generally a small streamlet remained. Several of these pockets of water were struck, which indicates that the water is stored in a definite network of joints which is isolated from other similar systems by impermeable rock. During the construction of this part of the tunnel a spring on the surface was dried up after one of the pockets of water was drained. As in the other heading, most of the water entered along quartz veins. Many of the well-defined joint planes were dry. During heavy rains an appreciable increase in the discharge of this part of the tunnel was noted. On April 13, 1928, it was 2,500 feet long and was discharging about 150 gallons of water a minute. The discharge probably dwindled to a few gallons a minute during the summer after the rains ceased.

The Jurassic was the last period during which any of the sediments of the "Bedrock series" were laid down. At the end of this period a great disturbance compressed the formations, and the resulting upheaval outlined the present trend of the Sierra Nevada. Concurrent with the uplift of the range there was formed a great depression to the west. Into this depression were washed the sediments now known as the Knoxville, Horsetown, and Chico formations, of Cretaceous age. These rocks attain great thicknesses on the west side of the Sacramento Valley, but none of them crop out in the area shown on Plate 2, and so far as known they have not been penetrated by the drill in this area.

TERTIARY SYSTEM

IONE FORMATION

Erosion was renewed after the uplift that marked the end of the Cretaceous period. The sediments deposited in the Great Valley by the rivers of Tertiary time crop out along the western border of the metamorphic rocks in a series of almost horizontally bedded light-colored rocks known as the Ione formation. The areal extent of this formation is shown on Plate 2. Concurrent with the deposition of these sediments there were laid down on the slope of the Sierra Nevada the ancient deposits of auriferous gravel with their interbedded pipe clays.[9] The Ione formation is covered in many places by volcanic

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[9] Turner, H. W., op. cit., p. 4.

breccias and flows that now form resistant caps to the flat-topped buttes left by erosion. In the vicinity of Ione the lower portion of the Ione formation is well exposed. It is composed chiefly of white clay which is quarried for the manufacture of brick and pottery. (See pl. 4, *B*.) Overlying these clay beds to the west and south are beds of sandstone and fine-grained clay rocks. Some of the beds of sand associated with the clays near Ione consist of colorless quartz that is sufficiently pure to be used in the manufacture of optical glass. About a mile south of Buena Vista lignite is produced commercially in small quantities at the mine of the Buena Vista Coal Co. It does not stand exposure to the air very well, hence it can be used only locally. The mine includes about 1,100 feet of workings that are entered by means of an inclined shaft 95 feet deep. The coal exposed in the tunnels is 12 feet thick and has two clay seams in it. The upper seam is 2 inches thick. The coal bed dips 6° W. and strikes N. 15° W. It will probably not be fully exploited unless it is used at the mine to generate electric power. Only 1,600 gallons of water a day is pumped out of the mine to keep it dry.

Besides the coal seams, the Ione formation contains hematite iron ore, but it is not sufficient in quantity or good enough in quality to be mined economically at the present time, although the Ione Coal & Iron Co. has recently drilled a number of test holes in order to explore the extent and quality of coal and iron in the vicinity of Ione.

Most of the sandstone members of the formation are gray yellow, but near Ione there is one bed of red sandstone that has been quarried for building stone.

The thickness of the Ione formation, according to data gathered by Turner,[10] is more than 1,000 feet near Jones Butte, about 3 miles west of Ione. East of Buena Vista Peak the formation has a visible thickness of 600 feet. Well 4712A1,[11] drilled for oil by the Pacific Petroleum Producers at an altitude of 100 feet in the NW.¼ sec. 12, T. 4 N., R. 7 E., entered the Ione formation at a depth of 1,020 feet and was in a gray silty shale, presumably belonging to the Ione formation, at 1,975 feet, where drilling ceased. The Ione formation therefore has a thickness of more than 955 feet at this place.

This formation was originally described as Miocene, but Dickerson[12] has shown that in this region it is of Eocene age. Several minute fossil shells were found in the samples of sand obtained from 1,919 to 1,975 feet below the surface in well 4712A1. These fossils have been identified by Julia Gardner, of the United States Geological Survey, as marine pelecypods, a fragment of a tubular form, possibly *Denta-*

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[10] Turner, H. W., op. cit., p. 4.

[11] The well numbers used in this report indicate location—for example, well 4712A1 is well A1 in sec. 12, T. 4 N., R. 7 E.

[12] Dickerson, R. E., Stratigraphy and fauna of the Tejon Eocene of California: California Univ. Dept. Geology Bull., vol. 9, p. 417, 1916.

lium, and a gastropod tip, probably *Cancellaria* sp. They are of indeterminable age, for all the groups represented are common through the Tertiary and into the Recent.

A 6-foot bed of lignite was penetrated in well 4712A1 at a depth of 1,601 feet. Well 6736G1, drilled for oil in the SE. ¼ NW. ¼ sec. 36, T. 6 N., R. 7 E., penetrated 2 feet of lignite at a depth of 842 feet. This well is 7½ miles due north of well 4712A1 and 40 feet higher. The driller's record of well 4712A1 indicates that a 9-foot bed of water sand was struck at 1,343 feet and another one 10 feet thick at 1,540 feet. These two sand beds were the only ones yielding much water in the Ione formation. This record bears out the conclusion deduced from the character of the outcrops, that the Ione formation as a whole is a poor water bearer because so large a part of it is clay or sandy clay rock. Even the sandstone members are mostly compact, hard, and only slightly permeable.

The monoclinal structure of the Ione beds as they dip away from the mountains, together with the presence of numerous clay beds, should give rise to conditions favorable for artesian wells. A 12-inch well owned by E. W. Kennedy in the NE. ¼ SE. ¼ sec. 18, T. 5 N., R. 10 E., near Buena Vista, 240 feet deep, obtained 10 gallons a minute of flowing water from the Ione formation. The water has a temperature of 66° F. Wells 4712A1 and 6736G1 are the only ones that are positively known to enter the Ione formation on the valley floor, and they did not yield flowing water, even though the casing was carried down as drilling progressed. The water was under a subartesian head in the beds of the Ione formation in these wells. Farther east, in the foothill region, wells have been drilled as deep as 800 feet in the Ione formation without obtaining artesian water; hence this formation is not promising as a source of artesian water or of large supplies for irrigation.

NEOCENE GRAVELS

Turner [13] divides the Neocene gravel deposits into two classes—the auriferous river gravels and the nonauriferous shore gravels. The auriferous river gravels on the Sierra slopes are contemporaneous with the clay beds and sandstone of the Ione formation. They represent the heavier detritus dropped by the streams that dumped their finer sediments, now the Ione formation, into the gulf which then occupied the Great Valley of California. These gravels are found chiefly on ridge tops and are in places capped by volcanic material. Where the gravel beds have no covering it is usually evident that the overlying volcanic rocks have been eroded.[13] Some of the auriferous gravels are of later origin, for they contain andesite cobbles instead of the usual white quartz pebbles.

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[13] Turner, H. W., U. S. Geol. Survey Geol. Atlas, Jackson folio (No. 11), p. 4, 1894.

The nonauriferous shore gravels overlie the Ione formation and cap the ridges, principally in areas west and southwest of Valley Springs. This formation is cemented into a conglomerate and usually is made up of good-sized cobbles of a great variety of rocks cemented together by hydrous silicates of iron, which give it a dark-red or brown color. These deposits differ from the early auriferous gravels chiefly in containing volcanic rocks, but they are not easily distinguished from the later auriferous gravels. In fact, near Valley Springs shore gravels are continuous with auriferous river gravels. These shore gravels are well exposed in the cut of the Southern Pacific Railroad 1 mile southwest of Valley Springs. At this place they attain a thickness of 200 feet. In many places the gravel underlies cappings of andesite breccia, as at Jones Butte or in sec. 7, T. 4 N., R. 9 E., where shafts have been sunk to the gravel through the protective breccia cover.

The two kinds of Neocene gravels have not been differentiated on Plate 2 because both are indurated and of small area. As a whole they are practically impermeable and hence are unimportant as a source of water for wells or as an intake for ground water.

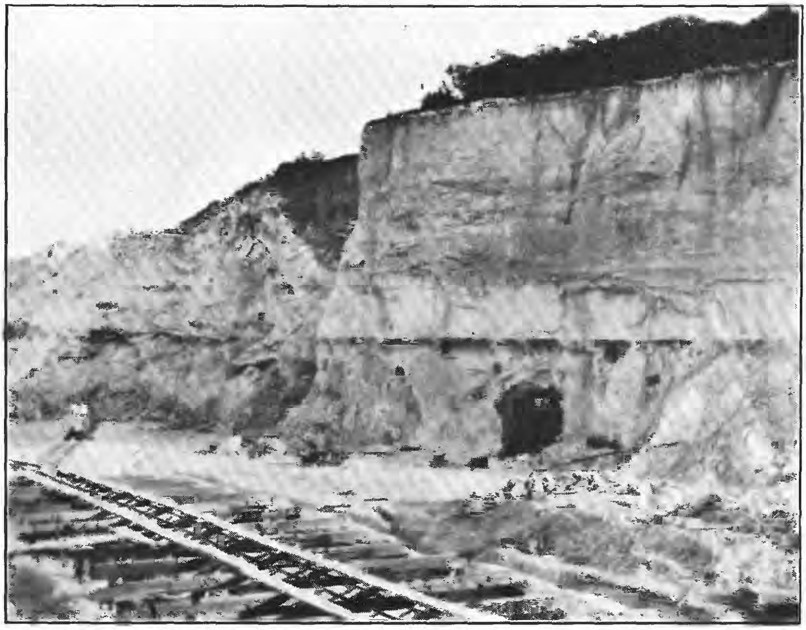
NEOCENE VOLCANIC DEPOSITS

White stratified deposits consisting chiefly of rhyolite tuff cover the gravel of the old river channels in many places and also overlie the Ione formation in the low foothills. This volcanic formation is exposed over several square miles near Buena Vista Peak. (See pl. 2.) It is also exposed at the Rocca Bella olive orchard, near Wallace; along the Mokelumne River northwest of Wallace; and in sec. 2, T. 3 N., R. 8 E., south of Clements. These tuff beds are impermeable and occupy so small an area that they are not differentiated from the Ione formation by a separate pattern on Plate 2.

Capping the flat tops of the mesas of the Ione formation in the lower foothills are andesite breccias and much less abundant lava flows. A careful study of the breccias shows that they are not flow breccias or block lava flows but volcanic mud flows. They contain angular, subangular, and rounded blocks of andesite cemented in a dark-colored matrix which in many places contains quartz grains. Cobbles of granite and metamorphic rock are found locally in the breccia, and in the northwestern part of the Goose Creek quadrangle a block of limestone was found in it.

The volcanic mud flows are evidently similar to the mud flow from Lassen Peak that occurred in 1915. After months of steam and ash eruptions a great blast occurred which devastated a wide area on the north side of Lassen Peak. Considerable snow evidently melted suddenly on the summit, and this water, together with the condensed volcanic steam, caused a great mud flow which moved down

A. PILES OF COBBLES LEFT BY A GOLD DREDGE ALONG MOKELUMNE RIVER NEAR CLEMENTS



B. CLAY PIT IN THE IONE FORMATION NEAR IONE

Both photographs by Harold T. Stearns.

the Hat Creek Valley for many miles. Blocks of andesite weighing as much as 30 tons were moved along in this mud flow. Earlier eruptions from the Lassen group of volcanoes have produced numerous mud flows of this type. These breccias and associated volcanic products in the vicinity of Lassen Peak are called Tuscan tuff by Diller [14] and considered to be Pliocene and possibly in part Miocene. Doubtless some of the tuff farther north is of later date, for small eruptions from this group of volcanoes continued throughout the Pleistocene epoch and the eruption of Lassen Peak in 1915 shows that these products are still being formed. In the Mokelumne area the andesitic breccias and flows are at least as old as Pliocene, for they choked the channels of the streams that were depositing the auriferous gravel and forced many of them to seek new channels. Now many of the gravel beds with their volcanic cap form mesas because of differential erosion since that time.

The volcanic deposits in the foothill region are compact and impermeable and yield practically no water. However, farther out in the valley the alluvial deposits of volcanic glass and pumice, correlatives of the andesite eruptives of the foothills, are great water bearers and attain considerable thickness. In well 4712A1, north of Lockeford, volcanic sand was struck at 475 feet, and beds of volcanic sand intermingled with clay and conglomerate containing pebbles of extrusive igneous rocks were encountered to a depth of 1,020 feet, where the Ione formation was penetrated. This log indicates that alluvial deposits correlative with the Tuscan tuff attained a thickness of 545 feet at this place before the older alluvium was deposited. The log as given in detail on page 278 shows that these volcanic sand beds are great aquifers, for the driller calls most of them "water sand." Several wells, such as 4829E1 and 4711D1, in the Lockeford region, obtain their chief supplies of water from the black volcanic sand beds that underlie this area at a depth of 500 feet. It is not known how deep this series of beds lies below the Lodi-Galt area, west of Lockeford and Elliott, because logs of the deep wells are not sufficiently accurate. Samples from wells nearly 800 feet deep in the vicinity of Galt indicate that the volcanic deposits, if present, lie at greater depths.

QUATERNARY SYSTEM

At the end of the Pliocene epoch the Sierra Nevada was greatly reduced by erosion, and the streams were considerably displaced by volcanic eruptions. Uplift over wide areas along normal faults introduced the Pleistocene epoch, and the streams, rejuvenated by their increased gradient, were able to cut deep canyons in the basement rocks. These canyons follow the fissure systems caused by

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[14] Diller, J. S., Tertiary revolution in the topography of the Pacific coast: U. S. Geol. Survey Fourteenth Ann. Rept., pt. 2, p. 412, 1894.

faulting, the presence of which facilitated erosion.[15] It was during this time that the Mokelumne River excavated its deep canyon. In the early part of this epoch the Mokelumne near Lancha Plana occupied a valley a little south of its present one, as is indicated by the gravel deposit near Camanche.

The swift mountain streams carried into the Great Valley large quantities of sediments swept from the mountain areas; hence deposition in the Great Valley continued throughout the period of uplift and increased with the new cycle of erosion.

OLDER ALLUVIUM

The deposits of the early part of the Pleistocene epoch accumulated in the form of great alluvial fans where the streams left the foothills. They consist of red, brown, and dark-yellow beds of gravel, sand, and clay and are as a rule indurated. Many of the clay beds are cemented to form hardpan. The conglomerate beds contain well-rounded cobbles consisting chiefly of hard rocks such as quartz and quartzite, with a small proportion of andesite, diabase, schist, and slate. These beds are exposed as a result of later uplift. In the foothills the older alluvium rests unconformably upon the Ione formation, andesite breccia, and Neocene gravels. In a few places it rests on the "Bedrock series." Its areal extent is shown on Plate 2.

The characteristic red color of the older alluvium serves to differentiate it from the lighter-colored younger alluvium where they occur close together, but samples collected from wells are not sufficiently different to permit separation by color or texture. If cores were obtained during the drilling, the older alluvium could probably in most places be separated from the younger alluvium by its compactness. The walls of dug wells in the older alluvium have stood for years without casing, whereas wells dug in the younger alluvium soon cave in if not cased. Over much of its area the older alluvium has a hog-wallow surface or has a well-developed drainage pattern, because of its indurated condition or the presence of hardpan at shallow depths, which arrests the downward percolation of rain water and causes it to run off as streams. Because of the shallow soil and impermeable condition beneath, farm lands in the older alluvium are devoted to pasture or cereal crops. Irrigation is not practiced extensively, chiefly because of these soil conditions and because the depth to water in most of the area of older alluvium is much greater than it is in the area of younger alluvium.

The sandy members are arkosic, consisting chiefly of quartz grains with undecomposed particles of feldspar and mica. Near the axis of the Great Valley samples from wells indicate that these beds contain considerable biotite mica and dark-colored quartz grains,

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[15] Turner, H. W., op. cit., p. 2.

locally in sufficient quantities to give the samples a gray color. The sand strata below the water table in this formation are in many places loosely consolidated and are usually good water bearers.

The older alluvium attains a thickness of 475 feet at the Pacific Petroleum Producers well (No. 4712A1) 4 miles north of Lockeford and 8 miles west of the foothills. At this place it is underlain by volcanic sand and pumice. Wells nearly 800 feet deep near Galt did not penetrate below arkosic beds belonging presumably to the older alluvium. It is believed that in the area as a whole the arkosic beds in the older alluvium do not yield as much water as the beds of black volcanic sand below them or the arkosic members of the younger alluvium above them.

Patches of the older alluvium have been worked for gold. One mile south of Camanche Bridge, in sec. 14, T. 4 N., R. 9 E., there was a gold dredge in operation a few years ago on a deposit more than 300 feet above the Mokelumne River. The water to float the dredge was pumped from the river at Camanche Bridge.

YOUNGER ALLUVIUM

Widespread uplift of the Sierra Nevada region ended the cycle of deposition of the older alluvium, and a new cycle of erosion began which carried away a considerable part of this alluvium in the foothill region. The débris swept into the Great Valley from the mountains, together with the part of the older alluvium removed by erosion, forms the younger alluvium in the Great Valley. It occupies a belt about 10 miles wide west of Linden, Lockeford, and Elliott. Even at the present time it is being laid down by the rivers, which occasionally overflow their banks and leave sand and silt on the land.

The younger alluvium forms great fans extending away from the points where the main rivers leave the mountains. The fans of the Mokelumne area lack the distinctness of shape that is characteristic of the alluvial fans of rivers farther south, in the more arid part of San Joaquin Valley. In some respects they resemble deltas more than they do fans, and because of their wide extent these fans or deltas of the Calaveras and Mokelumne Rivers and Dry Creek merge imperceptibly into one another. Before these streams were leveed they overflowed their banks in the springtime and broke up into a number of distributaries. In the spring of 1928 the Mokelumne River overflowed the levees at Woodbridge and deposited considerable silt on the adjacent land.

The paths of the ancient distributaries of the Mokelumne River are marked by pipes of gravel, which here and there are encountered in wells. In most of the wells these pipes are not good water bearers, evidently because they are not clean gravel; hence water does not move through them freely. The beds of pea or shot sized gravel are the best aquifers in the younger alluvium, although large supplies of water are obtained from the arkosic sand.

An opportunity to study the constituents of the cobble deposits is afforded in the flood plain between Clements and Camanche, where gold dredges have worked extensively. On Plate 4, *A*, are shown the piles of cobbles left in sec. 5, T. 4 N., R. 9 E., in the wake of a dredge. An examination of the undisturbed sections of gravel shows that they contain considerable silt and sand but not much washed gravel. Well 495Q1 is located in the cobble deposit in the Mokelumne River bottom lands east of Clements, but its water responds only slowly to changes of stage in the river, affording additional proof of the fact that these beds are poor aquifers.

The maximum thickness of the younger alluvium is unknown. It is probably not more than 200 or 300 feet near the center of San Joaquin Valley. The alluvium changes progressively westward from Lodi from sand to silt, silt to adobe, and adobe to peat. Near the axis of the Great Valley, under some of the islands west of Lodi, where the land has been reclaimed from sea-level marshes, the peat attains a thickness of more than 50 feet. The peat originates from the decayed tules that have flourished in this locality for many centuries. The accumulation of peat over the entire delta country seems to indicate that the water has not been more than 10 or 15 feet deep over this area for many hundreds of years and that the land has been slowly subsiding as the vegetable matter accumulated. Evidence that subsidence has occurred in this area since the advent of the Indians is found in the mounds formerly inhabited by them that are now below sea level. This subsidence of the axial part of the valley has apparently kept pace with the uplift in the adjacent Sierra Nevada, so that new cycles of erosion resulting from uplift in the mountains and the consequent rapid deposition in the Great Valley have not appreciably filled the axial portion much above its present level at any time. The conditions here afford an excellent illustration of the theory of isostasy, for long periods of unloading of the mountain block have always been followed by uplift, and subsidence has always accompanied the deposition and subsequent loading of the valley floor.

SURFACE WATER

METHODS USED IN OBTAINING STREAM-FLOW RECORDS

During the present investigation seven gaging stations have been maintained on the Mokelumne River between the junction of its three headwater forks and tidewater. The upper limit of the effect of tidewater was found to be about 9 miles below the gaging station at Woodbridge. Two gaging stations on Dry Creek and two gaging stations on Bear Creek were also maintained, to determine the flow of these streams and the quantities of water that they gained or lost by seepage. A gaging station was maintained near the mouth of Goose Creek to determine the ratio of run-off to rainfall, in order to ascertain the contributions to Dry Creek from the drainage area below the Ione gaging station. Records of daily discharge at these 12 stations are given in the following tables.

Records of operation and measurements of discharge of the pumps diverting water from the Mokelumne River were made. The acreage and kinds of crops irrigated by water from these pumps were obtained by field examinations supplemented by measurements made on airplane photographs. Records of the power used by the electrically driven pumps were obtained from the local power companies. From these data the diversions from the river by the pumping plants were computed.

Before 1926 most records of gage heights were obtained by local observers who read the gages once or twice daily.[16] The mean daily gage height was estimated from these data, and the daily, monthly, and annual run-off was taken from rating tables. The rating tables were made from rating curves, which were obtained by plotting the results of measurements with the discharge and the corresponding gage heights as coordinates.[17] Many early discharge measurements were made with a current meter, but in some surface and subsurface floats were used. The discharge of some streams was estimated from the run-off per square mile of near-by drainage areas.

The stream-flow records obtained since 1926 and published in this report have been obtained by the use of automatic water-stage recorders. Measurements of the discharge have been frequently made at each station, the interval between measurements depending upon the stage of the stream, the rate of change of the stage, and the percentage of deviation of the latest measurement from the rating curve. The small Price current meter has been used in all measurements.

MOKELUMNE RIVER

The Mokelumne River heads in Alpine County, among the peaks of the Sierra Nevada, at about 9,000 feet above sea level. It flows in a general direction a little south of west, passing through the Mother Lode gold-mining district and across the lower end of San Joaquin Valley, and empties into the San Joaquin River near Central Landing.

The three main headwater branches of the Mokelumne River are known as the North, Middle, and South Forks. (See pl. 1.) The North Fork drains more than two-thirds of the total drainage area of the Mokelumne and carries more than three-fourths of the total discharge and is the only fork heading in the snow fields of the Sierra Nevada. The Middle Fork joins the South Fork above the

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[16] U. S. Geol. Survey Water-Supply Paper 299, p. 27, 1912.

[17] Hoyt, J. C., and Grover, N. C., River discharge, 4th ed., pp. 91–92, 1924.

confluence of the North and South Forks, which is about 17 miles above the Pardee Dam of the East Bay Municipal Utility District. No large tributaries enter the Mokelumne between these three forks and the Cosumnes River. The Cosumnes also carries the run-off from Dry Creek into the Mokelumne River. The Mokelumne has a length of about 140 miles, 90 miles of which is in mountainous areas.

Above the junction of the North and South Forks the width of the drainage basin ranges from about 7 to 17 miles. Below the junction it narrows until the drainage divides form the rim of the V-shaped canyon through which the river flows. The river emerges from this canyon near Lancha Plana (see pl. 1) and enters its alluvial flood plain near Clements. The bottom lands between Lancha Plana and Clements are now strewn with large quantities of coarse gravel that have been left by gold dredges. From Clements to Lodi the river is bordered by well-defined terraces, and from Lodi to its mouth it is confined to its channel by artificial levees built on the top of natural levees.

An area of about 400 square miles in the upper part of the drainage basin of the Mokelumne River is included in national forests and is covered with coniferous trees. At lower altitudes the conifers are stunted or give way to deciduous trees. The middle part of the basin is covered with considerable underbrush. The timber and brush have been practically cleared from the ground below Clements, where the intensively cultivated areas are reached.

A low diversion dam has been built at Woodbridge and is used by the Woodbridge Irrigation District[17a] to divert water from the Mokelumne River for irrigation. It is about 15 feet high and consists of wooden flashboards supported by concrete piers. The top of the flashboards is 40.6 feet above sea level and the flow line of the diversion canal 31.7 feet.

Water was first diverted at the site of this dam in 1889. The first dam and head gates were built in 1891[18] but failed in 1895. The Stockton & Mokelumne Canal Co. bought the property in November, 1897. During 1899 it delivered water through the canal by gravity during high stages of the river and by pumping with a 26-inch centrifugal pump during low stages. The rated capacity of such a pump is about 56 cubic feet a second. The present dam was built during the summer of 1901, and no information showing how water was delivered during 1900 and 1901 is at hand.

During 1899[18] 1,098 acres was irrigated by water diverted at the location of this dam. In 1912[19] about 2,220 acres was irrigated; in 1926, 1927, and 1928, 4,128, 4,610, and 4,089 acres, respectively.

[17a] The Woodbridge Irrigation District purchased the system from the Stockton & Mokelumne Canal Co., Apr. 18, 1928.

[18] Lippincott, J. B., unpublished report made to the Woodbridge Canal & Irrigation Co., Apr. 15, 1902.

[19] California Conservation Comm. Rept., pp. 220–221, 1912.

The present reservoir, 40.6 feet above sea level, covers 385 acres and has a total capacity of 1,863 acre-feet. The capacity between the canal flow line and the top of the flashboards is 1,582 acre-feet. The next table gives the area and capacity of the reservoir for 2-foot changes in altitude of the water surface.

Area and capacity of Woodbridge Reservoir (Smith Lake), on Mokelumne River

Altitude (feet above sea level)	Area (acres)	Cumulative capacity (acre-feet)	Altitude (feet above sea level)	Area (acres)	Cumulative capacity (acre-feet)
24	[a] 0	0	36	151	714
26	[a] 17	17	38	216	1,081
28	[a] 35	69	40	346	1,644
30	52	156	[b] 40.6	[a] 385	1,863
32	72	281	42	474	2,463
34	105	458			

[a] Taken from an area curve.
[b] Top of flashboards.

All available stream-flow records of the Mokelumne River and its tributaries above the mouth of the Cosumnes River obtained by the United States Geological Survey are listed in the following tables. Records of daily discharge for years prior to 1925 can be found in the water-supply papers of the United States Geological Survey.

LICKING FORK OF MOKELUMNE RIVER NEAR RAILROAD FLAT[20]

LOCATION.—In E. ½ SE. ¼ sec. 26, T. 6 N., R. 14 E., at Mokelumne forest-ranger station, 100 feet above mouth of Big Canyon Creek and 6½ miles east of Railroad Flat, Calaveras County. Licking Fork joins South Fork 6 miles below station.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 23, 1911, to December 17, 1917 (incomplete), when the station was discontinued.

GAGE.—Vertical staff spiked to an alder tree 2 feet in diameter on left bank about 140 feet above ranger station. Gage read by employees of United States Forest Service. Before June 4, 1915, gage was on left bank 160 feet above and at different datum.

DISCHARGE MEASUREMENTS.—Made from foot log near gage, or by wading.

CHANNEL AND CONTROL.—Boulders and gravel; rough and fairly permanent. Banks high, not subject to overflow.

EXTREMES OF DISCHARGE.—1911–1917: Maximum stage recorded, 2.4 feet January 25, 1915; minimum stage recorded, 0.25 foot June 1 to 10, 1914 (discharges unknown). Both referred to old gage datum.

DIVERSION.—An irrigation ditch having a capacity of 1 second-foot heads above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation did not change during year. Rating curve well defined below 40 second-feet and extended above. Gage read to hundredths once daily. Daily discharge ascertained by applying gage height to rating table. Records excellent when gage is read.

COOPERATION.—Gage-height record furnished by United States Forest Service.

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[20] U. S. Geol. Survey Water-Supply Paper 461, pp. 185, 1917.

Monthly discharge of Licking Fork of Mokelumne River near Railroad Flat for the period October 23, 1911, to December 17, 1917

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1911–12				
October 23–31	1.5	1.4	1.44	26
November	7.3	1.5	2.22	132
December	[a] 6	[a] 2	2.85	175
January	8.8	2.8	3.90	240
February	3.2	2	2.66	153
March	[a] 13	2.5	5.27	324
April	[a] 12	5	6.70	399
May	14	4.7	8.08	497
June	4.4	1.3	2.49	148
July	1.1	.7	.80	49.2
August	.6	.6	.60	36.9
September	2.2	.6	.78	46.4
The period	----------	----------	----------	2,230
1912–13				
October	----------	----------	2.0	123
November	4.5	1.5	2.30	137
December	2.5	1.5	1.68	103
January	10	1.5	4.26	262
February	6.5	3.5	5.21	289
March	----------	----------	4.55	280
April	16	----------	12.2	726
May	8.5	1.5	3.94	242
June	----------	----------	1.34	80
July	----------	----------	.65	40
August	.3	.3	.3	18
September	.7	.3	.54	32
The year	----------	----------	3.22	2,330
1915 [b]				
March 24–31	27	24	25.2	400
April	27	19	23.9	1,420
May	39	16	23.6	1,450
June	15	5.8	8.63	514
July	5.6	2.4	3.83	236
August	2.4	1.7	2.02	124
September	1.8	1.3	1.56	93
The period	----------	----------	----------	4,240
1915–16				
October	1.9	1.3	1.70	105
April	26	14	20.8	1,240
May	12	6.3	8.50	523
June	6.0	3.8	4.76	283
July	3.9	2.1	2.82	173
August	2.0	1.1	1.49	92
September	2.2	1.1	1.52	90
1916–17				
October 1–16	3.8	1.7	2.23	70.8
April 12–30	51	21	34.1	1,290
May	31	11	21.0	1,290
June	10	3.8	6.54	389
July	4.1	1.6	2.98	183
August 1–16	2.3	.7	1.60	50.8
October 22–31	1.6	.8	1.22	24.2
November	3.6	1.4	2.90	173
December 1–17	3.8	2.6	2.84	95.8

[a] Estimated.

[b] No discharge records made from October, 1913, to Mar. 24, 1915. Partial gage-height records available.

SOUTH FORK OF MOKELUMNE RIVER NEAR RAILROAD FLAT

Location.—In sec. 34, T. 6 N., R. 14 E., at Laidet ranch, 5 miles above mouth of Licking Fork and 5 miles east of Railroad Flat, Calaveras County.

Drainage area.—Not measured.

Records available.—October 23, 1911, to September 30, 1928.

Equipment.—Water-stage recorder on right bank 700 feet above ranch buildings; used since August 17, 1928. April 1 to August 16, 1928, staff gage at same location, read twice daily; 1911 to March 31, 1928, staff gage 700 feet below, read twice daily. Discharge measurements made from cable 850 feet below present gage or by wading.

Channel and control.—Gravel at original location; shifted somewhat. At new site channel is boulders and gravel; control solid rock outcrop on which a low concrete dam has been built.

Extremes of discharge.—1911–1928: Maximum stage recorded, 6.9 feet at 4.20 p. m. January 25, 1914 (discharge, 3,330 second-feet); minimum discharge occurred on several days in July, August, and September, 1924 (discharge, 1.4 second-feet).

Diversions and regulation.—A small amount of water is used for irrigation at Laidet ranch.

Accuracy.—Rating curves well defined. Records good.

Monthly discharge of South Fork of Mokelumne River near Railroad Flat for the years ending September 30, 1912–1928

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1911–12				
October 23–31	8	7	7.47	133
November	[a] 40	4	9.41	560
December	[a] 16	7.2	8.68	534
January	47	12	18.7	1,150
February	15	8	11.3	650
March	76	8	28.9	1,780
April	70	26	34.7	2,060
May	98	49	64.4	3,960
June	48	12	23.4	1,390
July	12	5.4	7.71	474
August	5.8	4.3	5.35	329
September	18	4.3	5.47	325
The period				13,300
1912–13				
October	8	5	5.97	367
November	20	5.5	7.92	471
December	13	6	7.35	452
January	51	6	17.4	1,070
February	26	13	18.2	1,010
March	50	13	24.8	1,520
April	71	44	53.7	3,200
May	68	25	40.8	2,510
June	27	10	15.5	922
July	18	5.5	7.44	457
August	5.5	4	4.66	287
September	4.5	4	4.47	266
The year	71	4	17,3	12,500
1913–14				
October	5	4.5	4.89	301
November	23	5	8.88	528
December	258	6	20.4	1,250
January	2,000	46	323	19,900
February	1,240	73	242	13,400
March	222	115	178	10,900
April	295	105	158	9,400
May	105	50	78.4	4,820
June	50	21	35.1	2,090
July	28	10	15.5	953
August	13	6.5	8.89	547
September	7	6.5	6.85	408
The year	2,000	4.5	89.2	64,500

[a] Estimated.

Monthly discharge of South Fork of Mokelumne River near Railroad Flat for the years ending September 30, 1912–1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1914–15				
October	14	6.6	7.69	473
November	11	7.0	8.20	488
December	19	9.4	11.5	707
January	150	9.4	31.1	1,910
February	382	76	198	11,000
March	275	76	122	7,500
April	258	162	198	11,800
May	628	125	259	15,900
June	138	42	71.2	4,240
July	44	18	28.2	1,730
August	18	9.2	12.7	781
September	11	7.2	8.58	511
The year	628	6.6	78.8	57,000
1915–16				
October	10	8	8.94	550
November	28	8	11.0	655
December	66	11	22.8	1,400
January	338	15	107	6,580
February	360	76	177	10,200
March	1,010	190	348	21,400
April	380	174	240	14,300
May	174	65	109	6,700
June	65	30	43.4	2,580
July	30	12	19.1	1,170
August	12	6.5	9.11	560
September	7	3.9	5.30	315
The year	1,010	3.9	91.5	66,400
1916–17				
October	31	8	11.6	713
November	33	8	11.6	690
December	190	12	32.7	2,010
January	42	12	20.0	1,230
February	880	18	144	8,000
March	159	78	98.6	6,060
April	322	121	201	12,000
May	256	143	204	12,500
June	143	44	86.9	5,170
July	44	16	28.2	1,730
August	15	7	11.6	713
September	10	6.5	8.37	498
The year	880	6.5	70.9	51,300
1917–18				
October	8	6	6.69	411
November	16	6.5	8.15	485
December	41	7	11.3	695
January	12	6	8.02	493
February	89	7	28.3	1,570
March	581	25	159	9,780
April	159	103	131	7,800
May	99	32	61.8	3,800
June	30	13	19.7	1,170
July	12	4.3	7.64	470
August	6	2.8	3.81	234
September	27	2.6	6.45	384
The year	581	2.6	37.9	27,300
1918–19				
October	13	6.5	7.65	470
November	25	6.5	12.1	720
December	18	7	11.5	707
January	26	9	12.5	769
February	318	10	70.8	3,930
March	112	35	63.2	3,890
April	148	92	111	6,600
May	114	29	56.4	3,470
June	30	7	14.8	881
July	7.5	4.3	5.75	354
August	5.5	3.7	4.54	279
September	21	3.7	5.64	336
The year	318	3.7	31.0	22,400

Monthly discharge of South Fork of Mokelumne River near Railroad Flat for the years ending September 30, 1912–1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	14	4.5	7.04	433
November	16	4.5	6.30	375
December	114	10	39.1	2,400
January	18	8.5	12.4	762
February	17	5.5	11.2	644
March	298	54	96.5	5,930
April	380	----------	115	6,840
May	----------	49	90.9	5,590
June	46	18	26.6	1,580
July	11	4.6	6.70	412
August	7	3.0	4.08	251
September	4.6	2.4	3.19	190
The year	380	2.4	35.0	25,400
1920–21				
October	48	3.4	13.8	849
November	88	5.5	34.3	2,040
December	80	16	45.4	2,790
January	912	57	159	9,780
February	215	101	137	7,610
March	215	99	160	9,840
April	171	105	132	7,850
May	111	64	89.3	5,490
June	66	24	45.9	2,730
July	22	9	14.6	898
August	9.5	7.5	8.42	518
September	10	6	7.32	436
The year	912	3.4	70.3	50,800
1921–22				
October	9	6.5	7.45	458
November	16	7	9.68	576
December	111	7.5	23.1	1,420
January	140	14	28.5	1,750
February	286	13	105	5,830
March	294	50	106	6,520
April	358	107	191	11,400
May	552	184	330	20,300
June	177	40	87.6	5,210
July	38	19	26.4	1,620
August	17	10	13.1	805
September	10	8	8.80	524
The year	552	6.5	77.9	56,400
1922–23				
October	17	9	10.6	652
November	57	9.5	17.8	1,060
December	450	11	90.7	5,580
January	136	41	67.5	4,150
February	97	50	68.3	3,790
March	94	70	77.5	4,770
April	580	88	242	14,400
May	136	57	101	6,210
June	62	29	41.2	2,450
July	28	11	18.4	1,130
August	12	6	9.27	570
September	26	6	8.72	519
The year	580	6	62.5	45,300
1923–24				
October	18	8	10.1	621
November	15	7	9.47	564
December	17	9	11.8	726
January	46	9.0	14.7	904
February	97	12	25.6	1,470
March	22	8	13.3	818
April	35	12	22.4	1,330
May	12	5	7.37	453
June	5	2.4	3.28	195
July	2.4	1.4	1.99	122
August	1.8	1.4	1.43	87.9
September	2.0	1.4	1.64	97.6
The year	97	1.4	10.2	7,390

Monthly discharge of South Fork of Mokelumne River near Railroad Flat for the years ending September 30, 1912–1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924–25				
October	67	1. 6	10. 4	640
November	138	6	17. 0	1, 010
December	90	7. 5	24. 5	1, 510
January	46	11	20. 4	1, 250
February	1, 080	22	174	9, 660
March	150	61	82. 4	5, 070
April	358	107	192	11, 400
May	140	60	94. 4	5, 800
June	62	25	38. 3	2, 280
July	25	12	16. 4	1, 010
August	12	8	9. 18	564
September	8. 5	7	7. 60	452
The year	1, 080	1. 6	56. 2	40, 600
1925–26				
October	17	6	8. 47	521
November	14	7. 5	10. 2	607
December	25	9. 5	12. 0	738
January	107	7. 5	17. 5	1, 080
February	125	29	61. 1	3, 390
March	52	37	43. 6	2, 680
April	450	37	133	7, 910
May	41	20	29. 0	1, 780
June	18	8. 5	11. 9	708
July	8	4. 2	6. 43	395
August	4. 8	3. 3	4. 04	248
September	3. 9	2. 8	3. 29	196
The year	450	2. 8	28. 0	20, 300
1926–27				
October	4. 9	3. 5	3. 82	235
November	335	3. 7	50. 7	3, 020
December	56	16	27. 4	1, 680
January	74	18	38. 5	2, 370
February	510	36	197	10, 900
March	210	100	128	7, 870
April	820	146	228	13, 600
May	158	53	96. 3	5, 920
June	53	24	35. 3	2, 100
July	24	11	17. 4	1, 070
August	11	8	9. 13	561
September	9	7	8. 00	476
The year	820	3. 5	68. 8	49, 800
1927–28				
October	77	6. 5	11. 8	72. 6
November	56	11	27. 4	1, 630
December	18	14	16. 6	1, 020
January	37	13	18. 9	1, 160
February	152	24	44. 4	2, 550
March	1, 810	30	223	13, 700
April	295	66	141	8, 390
May	64	27	42. 0	2, 580
June	29	15	20. 9	1, 240
July	15	8. 5	11. 2	689
August	8	4. 7	5. 84	359
September	4. 9	3. 8	4. 27	254
The year	1, 810	3. 8	47. 3	34, 300

MIDDLE FORK OF MOKELUMNE RIVER AT WEST POINT

LOCATION.—In sec. 10, T. 6 N., R. 13 E., below highway bridge 1 mile south of West Point, Calaveras County, 3½ miles above junction with South Fork.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 9, 1911, to September 30, 1928.

Equipment.—Water-stage recorder on right bank 150 feet below highway bridge; used since August 18, 1928. October 6, 1926, to August 17, 1928, daily readings were made at a staff gage at same location. 1911 to October 5, 1926, a staff gage 1,000 feet above the bridge was used. Discharge measurements made from cable half a mile above gage or by wading.

Channel and control.—Boulders and gravel; fairly permanent at both locations.

Extremes of discharge.—1911–1928: Maximum stage recorded, 10.0 feet at 4 p. m. January 23, 1914 (discharge, 2,550 second-feet); minimum stage recorded, 2.16 feet August 18–23, 1924 (discharge, 0.2 second-foot).

Diversions and regulation.—Mokelumne Hill and Valley Springs ditch diverts water about 2 miles above the station. There are also four small diversions for local irrigation.

Accuracy.—Rating curves fairly well defined. Records good.

Monthly discharge of Middle Fork of Mokelumne River at West Point for the years ending September 30, 1912–1928

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1911–12				
October 9–31	16	10	12.2	557
November	46	9	12.7	756
December	27	10	15.4	947
January	99	16	33.7	2,070
February	31	18	21.6	1,240
March	168	19	47.7	2,930
April	113	30	41.5	2,470
May	135	60	80.2	4,930
June	60	12	26.2	1,560
July			8	492
August			6	369
September	10	5.6	6.28	374
The period				18,700
1912–13				
October	9	5	6.14	378
November	34	7.8	12	714
December	25	7.2	12.5	769
January	55	9	24.6	1,510
February	31	20	26.7	1,480
March	60	20	32.2	1,980
April	111	74	81.7	4,860
May	74	28	50.4	3,100
June	28	7.8	16.5	982
July	6.5	3.8	4.73	291
August	4.8	2.8	3.66	225
September	4	3	3.59	214
The year	111	2.8	22.8	16,500
1913–14				
October	5	3	4.3	264
November	12	6	8	476
December	85	6	16.5	1,010
January	2,550	64	622	38,200
February	1,010	74	242	13,400
March	230	155	188	11,600
April	280	125	182	10,800
May	140	74	115	7,070
June	74	22	42.2	2,510
July	22	6	12.2	750
August	6	4	5.1	314
September	6	5	5.3	315
The year	2,550	3	120	86,700

Monthly discharge of Middle Fork of Mokelumne River at West Point for the years ending September 30, 1912–1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1914–15				
October	13	5.2	6.55	403
November	8.2	6.7	7.33	436
December	18	7.6	9.63	592
January	136	7.8	28.4	1,750
February	376	64	168	9,330
March	376	72	120	7,380
April	213	128	172	10,200
May	494	121	244	15,000
June	188	32	77.4	4,610
July	31	10	19	1,170
August	11	5.4	7.86	483
September	6	5	5.88	350
The year	494	5	71.4	51,700
1915–16				
October	6.4	5.8	6.06	373
November	12	6.4	8.02	477
December	114	9.6	28.6	1,450
January	664	13	166	10,200
February	349	101	196	11,300
March	1,200	223	357	22,000
April	365	210	246	14,600
May	200	82	131	8,060
June	80	31	51	3,040
July	31	10	19.5	1,200
August	9.6	6.5	7.94	488
September	12	4.7	6.30	375
The year	1,200	4.7	101	73,600
1916–17				
October	38	12	15.8	972
November	34	12	15.3	910
December	170	19	41.3	2,540
January	97	27	41.1	2,530
February	965	34	198	11,000
March	155	91	116	7,130
April	315	125	203	12,100
May	230	140	193	11,900
June	155	38	95.8	5,700
July	35	11	21.1	1,300
August	12	5.5	8.31	511
September	6.5	4.9	5.54	330
The year	965	4.9	78.5	56,900
1917–18				
October	5	3.8	4.42	272
November	9.5	4.3	5.99	356
December	35	8	12.3	756
January	14	8	10.1	621
February	169	8	40.8	2,270
March	900	27	199	12,200
April	169	86	123	7,320
May	92	29	58.7	3,610
June	27	6.5	15.3	910
July	6	1.6	3.03	186
August	2.1	1.2	1.66	102
September	34	1.4	6.08	362
The year	900	1.2	40	29,000
1918–19				
October	25	5	7.73	475
November	25	5.5	10.8	643
December	38	9	12.3	756
January	31	10	13.5	830
February	454	11	78.1	4,340
March	160	50	78	4,800
April	178	105	130	7,740
May	160	25	58.6	3,600
June	25	7	12.1	720
July	7	1.2	3	184
August	1.4	1	1.18	72.6
September	12	1.2	2.15	128
The year	454	1	33.5	24,300

Monthly discharge of Middle Fork of Mokelumne River at West Point for the years ending September 30, 1912–1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	8	3.3	4.40	271
November	8	5	6.07	361
December	198	9	19.8	1,220
January	20	9	10.8	664
February	98	9	15.9	915
March	484	38	94.2	5,790
April	675	65	145	8,630
May	160	31	77	4,730
June	38	8.5	17.2	1,020
July	9	1.4	5.12	315
August	2.8	1	1.26	77.5
September	1.8	1.2	1.59	94.6
The year	675	1	33.2	24,100
1920–21				
October	65	2.2	10.5	646
November	86	7	23.4	1,390
December	264	18	55.3	3,400
January	640	46	130	7,990
February	253	92	131	7,280
March	338	152	213	13,100
April	198	105	135	8,030
May	127	75	92.9	5,710
June	75	16	36.8	2,190
July	16	5	8.65	532
August	4.7	2.1	2.74	168
September	4.3	1.8	2.63	156
The year	640	1.8	69.9	50,600
1921–22				
October	6.5	2.1	3.27	201
November	6.5	4	4.68	278
December	178	4.7	25.8	1,590
January	338	11	33.3	2,050
February	454	18	134	7,440
March	424	60	125	7,690
April	325	120	202	12,000
May	484	198	299	18,400
June	198	31	93.5	5,560
July	31	8.5	15.8	972
August	8	3.3	5.55	341
September	3.3	2.7	2.97	177
The year	484	2.1	78.4	56,700
1922–23				
October	8.5	3.3	5.01	308
November	69	6.5	14.7	875
December	484	8	100	6,150
January	160	31	65.4	4,020
February	98	53	68.8	3,820
March	98	60	70.4	4,330
April	544	75	204	12,100
May	127	55	89.7	5,520
June	53	16	32.2	1,920
July	15	4.7	9.6	590
August	4.7	3	4.04	248
September	19	1.6	3.98	237
The year	544	1.6	55.5	40,100
1923–24				
October	12	5.5	6.27	386
November	7	5.5	6.13	365
December	14	7	8.87	545
January	38	9	13.4	824
February	127	9	22	1,270
March	20	7	10.4	640
April	31	11	16.8	1,000
May	10	1.3	4.78	294
une	1.5	.4	.95	56.5
July	.4	.2	.22	13.5
August	.2	.2	.2	12.3
September	.8	.2	.39	23.2
The year	127	.2	7.47	5,430

Monthly discharge of Middle Fork of Mokelumne River at West Point for the years ending September 30, 1912–1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924–25				
October	55	0. 9	4. 85	298
November	143	4	12. 4	738
December	143	4	23. 5	1, 440
January	31	10	19	1, 170
February	1, 370	18	213	11, 800
March	220	60	84. 6	5, 200
April	366	120	205	12, 200
May	169	60	103	6, 330
June	60	12	31. 2	1, 860
July	14	3. 6	6. 91	425
August	3. 3	1. 6	2. 06	127
September	3	1. 6	2. 32	138
The year	1, 370	. 9	57. 7	41, 700
1925–26				
October	14	2. 6	5. 02	309
November	18	5	8. 3	494
December	29	6. 5	9. 47	582
January	152	6. 5	15. 1	928
February	264	27	72. 2	4, 010
March	50	25	37. 5	2, 310
April	484	27	110	6, 550
May	36	9	20. 5	1, 260
June	8. 5	1. 6	4. 6	274
July	1. 4	. 4	. 72	44. 3
August	. 7	. 4	. 44	27. 1
September	. 7	. 5	. 51	30. 3
The year	484	. 4	23. 2	16, 800
1926–27				
October	6. 5	. 5	2. 84	175
November	450	3. 5	57	3, 390
December	75	19	30. 1	1, 850
January	82	22	42. 8	2, 630
February	524	42	209	11, 600
March	197	106	132	8, 120
April	950	148	246	14, 600
May	166	55	107	6, 580
June	66	17	35. 7	2, 120
July	16	5	10. 6	652
August	5. 5	3. 2	3. 84	236
September	3. 5	3. 2	3. 34	199
The year	950	. 5	72. 1	52, 200
1927–28				
October	96	3. 5	10. 3	633
November	132	8. 5	21. 5	1, 280
December	103	12	19. 2	1, 180
January	54	13	21. 1	1, 300
February	218	22	49. 1	2, 820
March	1, 460	27	231	14, 200
April	368	96	175	10, 400
May	89	30	52. 3	3, 220
June	22	11	14. 8	881
July	11	1. 9	5. 22	321
August	1. 9	1	1. 54	94. 7
September	1. 8	1. 2	1. 35	80. 3
The year	1, 460	1	50. 2	36, 400

MOKELUMNE RIVER AT ELECTRA[21]

LOCATION.—3 miles above the wagon bridge on the Mokelumne Hill and Jackson road, half a mile below the Standard Electric Co.'s power house and the post office at Electra.

RECORDS AVAILABLE.—January 1 to June 30, 1901, and May 11, 1903, to December 31, 1904.

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[21] U. S. Geol. Survey Water-Paper 299, p. 369 ,1912

Equipment.—The gage was a large inclined timber bolted to a tree on the left bank. Discharge measurements were made by means of a cable and car 200 feet below the gage.

Channel and control.—The current is swift at all stages, but there are cross currents at extreme low water. Both banks are high and are not liable to overflow. The lower part of the right bank is composed of hard gravel. The upper part of the right bank and the entire left bank are composed of solid rock. The bed of the stream is composed of rock and gravel and is fairly permanent.

Accuracy.—Results at this station are fair.

Monthly discharge of Mokelumne River at Electra, 1901, 1903, and 1904

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1901				
January	4,600	330	1,000	61,488
February	13,210	610	3,302	183,384
March	4,020	1,130	2,004	123,221
April	3,160	950	2,040	121,388
May	9,980	1,960	4,627	284,503
June	6,790	1,350	3,833	228,145
July [a]			260	15,987
August [a]			190	11,683
September [a]			60	3,570
The period				1,030,000
October [a]			76	4,673
November [a]			210	12,496
December [a]			1,467	45,467
1903				
June	5,330	470	2,616	155,663
July	940	140	344	21,152
August	260	90	170	10,453
September	260	140	222	13,210
1903-4				
October	260	90	181	11,120
November	4,820	200	855	50,876
December	540	90	188	11,560
January	460	95	157	9,654
February	13,000	5	2,491	143,284
March	9,500	2,490	4,170	256,143
April	6,600	2,620	3,780	224,926
May	7,860	2,750	5,411	332,709
June	5,450	1,800	3,607	214,631
July	1,850	42	722	44,394
August	345	15	111	6,825
September	860	42	165	9,818
The year	13,000	5	1,820	1,320,000
1904				
October	5,630	150	827	50,850
November	580	70	189	11,246
December	1,950	95	315	19,369

[a] Approximate only.

MOKELUMNE RIVER NEAR MOKELUMNE HILL

Location.—At highway bridge 1¼ miles northwest of Mokelumne Hill, Amador County.

Drainage area.—539 square miles.

Records available.—November 11, 1927, to September 30, 1928.

Equipment.—Water-stage recorder in corrugated culvert-pipe well on left bank on downstream side of highway bridge. Discharge measurements made from downstream side of bridge.

Channel and control.—Gravel and boulders; control is a reef of solid rock and boulders; fairly permanent. Banks high and not subject to overflow.

Extremes of discharge.—Maximum stage during 1928, from water-stage recorder, 16.10 feet at 10 a. m. March 25 (discharge, 23,300 second-feet); minimum stage, from water-stage recorder, 0.97 foot at 9 a. m. August 13 (discharge, 18 second-feet).

Diversions and regulation.—Several small ditches divert water for mining and irrigation above the station. Power is developed on the North Fork at the Electra plant, and part of the water is diverted outside of the drainage basin through the Amador Canal. Flow is partly regulated by storage in Blue Lakes and Bear River and by the power plant at Electra.

Accuracy.—Stage-discharge relation changed slightly at low water during the storm of March 25, 1928. Rating curves well defined; 44 discharge measurements were made during the year. Water-stage recorder record excellent. Daily discharge ascertained by use of a discharge integrator except for a few days when mean daily gage heights were applied to the rating table and March 25–27, 1928, when hourly discharge was averaged. Records good.

Monthly discharge of Mokelumne River near Mokelumne Hill for the period November 11, 1927, to September 30, 1928

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
November 11–30	784	284	503	20,000
December	740	164	285	17,500
January	540	228	357	22,000
February	1,560	312	496	28,500
March	20,300	335	2,890	178,000
April	3,580	1,460	2,240	133,000
May	4,020	1,270	2,710	167,000
June	1,190	135	471	28,000
July	173	40	106	6,520
August	198	26	114	7,010
September	242	54	119	7,080
The period	20,300	26	----------	615,000

Daily discharge, in second-feet, of Mokelumne River near Mokelumne Hill, Calif. for the period November 11, 1927, to September 30, 1928

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	--------	333	294	424	335	2,880	3,990	1,190	102	93	95
2	--------	316	304	429	392	2,980	3,090	1,060	148	80	78
3	--------	326	393	861	434	2,560	2,620	980	168	112	54
4	--------	322	384	1,560	464	2,260	2,700	970	84	110	155
5	--------	260	402	835	499	2,150	3,060	880	108	104	242
6	--------	255	364	677	455	2,260	3,360	900	173	90	204
7	--------	272	337	625	522	2,340	3,690	779	114	142	112
8	--------	255	320	607	624	2,200	3,920	668	70	113	115
9	--------	291	428	515	627	2,180	3,100	483	93	101	55
10	--------	272	408	456	707	2,260	4,020	382	132	132	87
11	784	204	375	460	728	2,080	3,780	543	89	83	140
12	446	236	339	425	814	2,480	3,620	553	82	26	140
13	760	272	433	440	765	2,320	3,260	503	90	74	108
14	712	342	448	422	726	2,200	3,120	394	75	145	142
15	480	302	400	359	742	2,060	2,930	381	60	108	114
16	500	253	340	370	712	2,180	2,680	296	72	116	88
17	520	256	290	365	723	2,060	2,430	228	142	107	114
18	581	260	352	372	729	1,720	2,460	316	115	99	176
19	560	275	312	312	955	1,690	2,280	328	78	60	166
20	462	246	324	414	984	1,520	2,440	258	100	91	167
21	626	220	289	376	1,070	1,460	2,130	231	150	134	187
22	512	230	228	380	1,150	1,560	2,210	263	52	154	111
23	418	209	392	371	1,930	2,040	2,090	210	142	198	68
24	284	259	331	393	5,380	2,230	2,300	135	152	141	123
25	325	164	329	366	20,300	1,700	2,220	217	122	148	88
26	386	174	365	372	16,900	2,010	2,180	222	102	142	92
27	432	230	311	431	12,300	2,620	2,060	208	136	128	100
28	458	254	257	374	6,280	2,870	1,760	215	129	83	97
29	369	740	340	382	4,470	2,740	1,690	168	40	120	91
30	444	436	540	--------	3,660	3,580	1,420	155	86	160	57
31	--------	376	442	--------	3,090	--------	1,270	--------	95	136	--------

MOKELUMNE RIVER NEAR LANCHA PLANA

LOCATION.—In SW. ¼ sec. 4, T. 4 N., R. 10 E., above old Westmoreland suspension bridge, 1 mile east of Lancha Plana, Calaveras County.

DRAINAGE AREA.—575 square miles.

RECORDS AVAILABLE.—June 23, 1926, to September 30, 1928.

EQUIPMENT.—Water-stage recorder in concrete well and shelter on left bank 250 feet above the suspension bridge. Discharge measurements made from cable, 130 feet above the gage or by wading.

CHANNEL AND CONTROL.—Coarse gravel; remains of old dam act as high-water control.

EXTREMES OF DISCHARGE.—Maximum stage during 1928, from water-stage recorder, 19.65 feet at noon March 25 (discharge, 27,300 second-feet); minimum discharge, 28 second-feet from 5 to 8 p. m. August 13.

1926–1928: Maximum stage recorded, 1,965 feet at noon March 25, 1928 (discharge, 27,300 second-feet); minimum discharge, 21 second-feet November 2 and 7, 1926.

DIVERSIONS AND REGULATION.—See Mokelumne River near Mokelumne Hill.

ACCURACY.—Stage-discharge relation changed during high water of March 25, 1928. Rating curves fairly well defined below 16,000 second-feet and extended above; 56 discharge measurements were made during the year. Water-stage recorder record excellent except for October 1–31, 1928. Daily discharge ascertained by applying mean daily gage height to rating table from October 1 to April 11, 1928, and by us of a discharge integrator April 12 to September 30, 1928. Records good.

Monthly discharge of Mokelumne River near Lancha Plana for the period June 23, 1926, to July 31, 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1926				
June 23–30	122	49	99.6	1,580
July	142	43	98.2	6,040
August	154	55	99.6	6,120
September	170	38	96.8	5,760
The period				19,500
1926–27				
October	82	22	49.1	3,020
November	2,380	21	492	29,300
December	1,380	286	526	32,300
January	1,320	282	654	40,200
February	4,500	514	1,860	103,000
March	2,000	977	1,380	84,800
April	5,310	1,350	2,730	162,000
May	5,890	1,710	3,340	205,000
June	4,740	1,170	3,140	187,000
July	1,290	102	498	30,600
August [a]	206	47	124	7,620
September [a]	150	38	71.3	4,240
The year	5,890	21	1,230	889,000

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[a] Low-water records for 1928 and discharge measurement on Mar. 4, 1929, show about 5 second-feet more at Lancha Plana than at Clements. Discharge for August, September, and October, 1927, at Lancha Plana appears too low. No satisfactory explanation for this period. (See Clements record.)

Monthly discharge of Mokelumne River near Lancha Plana for the period June 23, 1926, to July 31, 1929—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
October [a]	564	43	111	6, 820
November	1, 650	106	470	28, 000
December	857	140	280	17, 200
January	537	254	355	21, 800
February	1, 900	351	528	30, 400
March	21, 400	356	2, 970	183, 000
April	3, 610	1, 490	2, 300	137, 000
May	4, 260	1, 220	2, 700	166, 000
June	1, 100	133	456	27, 100
July	173	42	109	6, 700
August	163	30	113	6, 950
September	244	54	121	7, 200
The year	21, 400	30	879	638, 000
1928–29				
October	144	38	75. 5	4, 640
November	349	28	79. 3	4, 720
December	444	29	106	6, 520
January	416	49	122	7, 500
February	950	64	235	13, 100
March	439	89	236	14, 500
April	1, 390	292	656	39, 000
May	3, 300	230	2, 140	132, 000
June	4, 510	242	862	51, 300
July	274	104	161	9, 900
The period	4, 510	28	----------	------------

[a] See footnote [a], p. 47.

Daily discharge, in second-feet, of Mokelumne River near Lancha Plana for the period June 23, 1926, to July 31, 1929

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1926									
1	--------	126	103	114	16	--------	124	64	109
2	--------	134	55	144	17	--------	86	90	84
3	--------	126	115	144	18	--------	92	133	113
4	--------	82	107	124	19	--------	51	104	96
5	--------	43	92	118	20	--------	112	126	50
6	--------	66	96	40	21	--------	111	110	90
7	--------	126	114	74	22	--------	128	92	112
8	--------	142	72	170	23	106	99	60	112
9	--------	136	62	150	24	117	126	150	132
10	--------	117	138	80	25	114	88	154	132
11	--------	76	112	108	26	122	56	86	80
12	--------	57	124	78	27	91	92	69	47
13	--------	80	133	61	28	49	92	104	46
14	--------	68	107	104	29	80	95	91	38
15	--------	102	68	110	30	118	96	64	44
					31	--------	115	94	--------

Daily discharge, in second-feet, of Mokelumne River near Lancha Plana for the period June 23, 1926, to July 31, 1929—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1926–27 [a]												
1	50	22	1,300	299	514	1,780	2,090	3,800	2,460	1,270	------	------
2	64	21	1,190	282	577	1,670	3,040	3,530	2,250	1,290	------	------
3	82	22	1,380	1,010	1,260	1,520	4,810	3,900	3,000	1,170	------	------
4	50	22	929	1,320	2,630	1,420	3,840	3,920	3,420	948	------	------
5	42	22	736	850	1,260	1,320	2,980	4,200	3,780	888	------	------
6	41	22	738	1,000	1,130	1,180	2,620	4,390	4,280	866	------	------
7	54	21	768	920	973	1,280	2,460	2,850	4,740	790	------	------
8	59	22	629	726	849	1,330	2,300	2,260	3,970	744	------	------
9	41	22	602	589	770	1,320	2,030	2,310	3,150	699	------	------
10	54	23	456	688	698	1,170	1,780	2,520	4,130	646	------	------
11	59	24	460	897	630	1,030	1,740	2,860	4,060	616	------	------
12	65	54	420	744	633	1,030	1,540	3,360	3,950	573	------	------
13	71	98	485	577	547	1,120	1,440	4,480	4,380	517	------	------
14	64	181	446	560	736	2,000	1,420	5,580	4,530	472	------	------
15	67	82	404	558	1,510	1,500	1,570	5,110	4,020	504	------	------
16	67	56	326	639	1,680	1,290	1,590	5,690	4,240	434	------	------
17	71	52	328	734	1,920	1,180	1,350	5,890	4,020	274	------	------
18	71	32	381	578	3,930	1,120	1,460	4,390	3,640	268	------	------
19	62	52	366	560	3,340	1,020	1,640	3,700	2,930	310	------	------
20	46	366	352	660	2,630	977	1,850	2,690	2,680	293	------	------
21	41	221	380	666	4,480	1,040	2,070	2,160	2,660	280	------	------
22	37	212	370	572	4,500	1,090	2,560	1,800	2,860	220	------	------
23	38	363	356	458	3,080	1,350	2,940	1,710	2,400	200	------	------
24	38	2,080	286	578	2,490	1,600	3,500	2,420	2,480	134	------	------
25	38	1,820	330	518	2,440	1,790	4,200	3,340	2,460	117	------	------
26	28	1,330	327	520	2,460	1,920	4,910	3,800	2,280	185	------	------
27	26	2,380	294	504	2,460	1,850	5,310	3,000	1,800	186	------	------
28	25	1,260	304	456	2,020	1,660	4,040	2,130	1,380	138	------	------
29	25	1,890	332	693	------	1,470	4,320	1,870	1,230	140	------	------
30	24	1,980	314	562	------	1,380	4,550	1,800	1,170	172	------	------
31	22	------	324	546	------	1,420	------	2,020	------	102	------	------
1927–28 [a]												
1	------	333	328	320	430	356	2,900	4,260	1,100	147	92	104
2	------	193	307	303	440	375	3,200	3,170	1,020	96	89	97
3	------	142	307	338	903	420	2,700	2,640	922	173	90	54
4	------	254	328	405	1,900	498	2,320	2,700	884	147	121	84
5	------	230	254	410	995	493	2,320	3,020	812	74	107	237
6	------	157	250	380	714	482	2,230	3,320	828	144	94	244
7	------	106	247	342	672	526	2,140	3,610	740	154	118	138
8	------	272	247	328	648	618	2,280	3,950	652	92	123	116
9	------	488	268	356	542	636	2,230	2,990	501	64	114	92
10	------	1,650	272	430	476	732	2,180	3,840	354	104	104	59
11	------	890	236	395	476	738	2,230	3,840	483	128	118	120
12	------	466	196	342	482	834	2,500	3,570	502	80	59	138
13	------	738	247	400	405	726	2,460	3,370	500	72	30	108
14	------	785	333	450	450	744	2,260	3,150	420	83	108	114
15	------	520	295	390	415	720	2,160	2,850	386	77	134	139
16	------	476	247	333	351	720	2,230	2,730	323	66	107	124
17	------	526	247	291	360	696	2,190	2,480	257	96	121	70
18	------	559	247	303	360	732	1,820	2,450	283	144	96	151
19	------	559	268	299	356	918	1,750	2,330	347	100	82	162
20	------	476	247	287	435	967	1,560	2,420	304	84	57	169
21	------	648	184	283	380	1,060	1,490	2,130	264	151	124	194
22	------	510	199	254	390	1,090	1,590	2,210	256	93	156	160
23	------	445	193	410	380	1,750	2,060	2,080	233	80	162	97
24	------	291	219	360	405	4,500	2,290	2,270	133	158	188	91
25	------	311	199	324	375	21,400	1,800	2,220	186	134	132	110
26	------	375	140	360	380	18,500	2,080	2,180	222	142	124	93
27	------	445	208	311	410	13,300	2,700	2,040	222	118	163	98
28	------	455	216	261	400	6,380	2,960	1,720	206	124	104	96
29	------	342	857	338	390	4,470	2,880	1,640	179	94	84	81
30	------	466	498	537	------	3,600	3,610	1,390	166	42	141	89
31	------	------	390	455	------	3,100	------	1,220	------	110	158	------
1928–29												
1	63	45	49	416	64	166	292	1,130	242	274	------	------
2	144	44	54	101	241	136	424	1,920	396	264	------	------
3	114	60	48	134	564	130	922	2,600	495	236	------	------
4	110	32	64	159	691	122	504	2,600	436	217	------	------
5	116	28	73	161	950	320	423	2,600	369	204	------	------

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[a] See footnote to monthly-discharge table.

Daily discharge, in second-feet, of Mokelumne River near Lancha Plana for the period June 23, 1906. to July 31, 1929—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1928-29												
6	90	30	80	132	487	330	428	1,970	302	204	------	------
7	76	59	83	88	288	439	441	1,440	360	202	------	------
8	53	66	89	112	288	327	446	1,900	436	192	------	------
9	78	66	70	119	202	258	454	2,900	500	166	------	------
10	84	88	67	80	166	180	454	2,900	1,070	142	------	------
11	72	41	70	64	126	361	446	2,900	1,110	142	------	------
12	74	133	100	92	149	188	441	2,900	685	142	------	------
13	87	107	98	89	186	174	482	2,900	545	140	------	------
14	112	124	29	71	156	89	605	2,900	700	118	------	------
15	68	155	33	109	157	108	590	2,900	890	104	------	------
16	84	349	34	104	134	212	595	2,900	4,510	104	------	------
17	69	123	29	73	120	222	955	2,800	3,280	104	------	------
18	62	58	114	61	122	225	1,330	3,300	1,680	111	------	------
19	82	45	164	169	169	228	1,390	3,200	1,760	138	------	------
20	83	71	179	217	164	233	764	2,320	1,190	138	------	------
21	76	74	94	161	156	236	344	1,880	944	140	------	------
22	38	67	98	102	138	242	352	2,140	862	153	------	------
23	54	66	151	101	126	247	340	2,360	570	153	------	------
24	60	64	39	82	122	254	356	2,500	396	153	------	------
25	78	60	46	49	92	254	615	2,230	396	153	------	------
26	54	57	88	158	161	257	868	1,600	396	153	------	------
27	54	62	111	124	170	260	1,100	936	391	153	------	------
28	52	71	111	154	180	268	1,100	500	360	149	------	------
29	39	76	235	120	------	258	1,110	495	302	149	------	------
30	48	58	444	96	------	308	1,110	341	274	151	------	------
31	68	------	339	90	------	291	------	230	------	147	------	------

MOKELUMNE RIVER NEAR CLEMENTS

Location.—In NW. ¼ sec. 15, T. 4 N., R. 8 E., at highway bridge 1 mile north of Clements, San Joaquin County.

Drainage area.—631 square miles.

Records available.—October 28, 1904, to September 30, 1928.

Equipment.—Water-stage recorder on left bank 75 feet below the bridge, used since April 19, 1926. Previous record was based on staff gages at the bridge.

Channel and control.—Sand and gravel; somewhat shifting. Right bank high; left bank overflowed above stage of 17 feet.

Extremes of discharge.—1904–1928: Maximum stage recorded, 22.45 feet March 25, 1928 (discharge, about 25,600 second-feet); no flow July 9, August 15 and 20–23, 1924. A peak of 22.0 feet with datum 2 feet higher than present gage occurred March 19, 1907 (discharge about 25,500 second-feet).

Diversions and regulation.—Several small ditches divert water for mining and irrigation above the station. Power is developed on the North Fork at the Electra plant, and part of the water is diverted outside of the drainage basin through the Amador Canal. Flow is partly regulated by storage in Blue Lakes and Bear River. Storage at Pardee Dam for the East Bay Municipal Utility District began on March 9, 1929.

Accuracy.—Stage-discharge relation not permanent. Rating curves well defined below 5,000 second-feet. Records good, except for extreme high water, for which they are fair.

Monthly discharge of Mokelumne River near Clements for the period January 1, 1905, to July 31, 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1905				
January	700	325	428	26,320
February	2,520	409	853	47,370
March	2,320	932	1,410	86,700
April	3,250	1,365	1,959	116,600
May	5,260	1,475	2,547	156,600
June	2,688	427	1,665	99,070
July	391	106	188	11,560
August	154	60	128	7,870
September	164	115	139	8,271
The period				560,000
1905-6				
October	164	60	114	7,010
November	134	43	79.4	4,725
December	144	69	97.0	5,964
January	6,960	55	996	61,200
February	2,000	350	808	44,900
March	7,750	880	2,520	155,000
April	5,380	2,110	2,940	175,000
May	6,750	2,730	4,700	289,000
June	8,740	3,580	6,020	358,000
July	7,480	730	3,540	218,000
August	680	160	356	21,900
September	350	150	202	12,000
The year	8,740	43	1,860	1,350,000
1906-7				
October	235	140	190	11,700
November	655	120	248	14,800
December	4,960	150	876	53,900
January	4,020	525	1,140	70,100
February	7,860	1,570	2,780	154,000
March	15,300	1,500	4,880	300,000
April	5,260	3,530	4,430	264,000
May	5,810	2,740	4,220	259,000
June	6,960	2,470	4,720	281,000
July	5,310	1,710	3,330	205,000
August	1,640	282	703	43,200
September	400	185	257	15,300
The year	15,300	120	2,314	1,670,000
1907-8				
October	375	220	276	17,000
November	282	135	234	13,900
December	770	167	328	20,200
January	1,030	295	537	33,000
February	917	242	393	22,600
March	1,180	260	817	50,200
April	2,960	725	1,730	103,000
May	2,680	1,350	1,900	117,000
June	1,840	570	1,260	75,000
July	570	85	229	14,100
August	130	80	104	6,400
September	165	97	135	8,030
The year	2,960	80	662	480,000
1908-9				
October	595	97	142	8,730
November	210	105	124	7,380
December	335	85	161	9,900
January	10,400	112	2,910	179,000
February	6,500	1,280	2,260	126,000
March	2,560	1,350	1,670	103,000
April	4,480	1,350	2,810	167,000
May	5,050	2,300	3,710	228,000
June	6,800	2,720	4,310	256,000
July	2,320	220	824	50,700
August	235	46	115	7,070
September	108	56	77.3	4,600
The year	10,400	46	1,593	1,150,000

Monthly discharge of Mokelumne River near Clements for the period January 1, 1905, to July 31, 1929—Continued.

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1909–10				
October	205	85	131	8,060
November	7,200	130	951	56,600
December	6,900	460	1,500	92,200
January	3,600	830	1,340	82,400
February	1,160	800	947	52,600
March	6,110	1,480	2,390	147,000
April	4,900	1,940	3,240	193,000
May	4,900	2,100	3,180	196,000
June	3,000	321	1,000	59,500
July	273	84	172	10,600
August	120	25	64.4	3,960
September	181	45	74.2	4,420
The year	7,200	25	1,249	906,000
1910–11				
October	149	62	107	6,580
November	244	111	170	10,100
December	710	170	356	21,900
January	16,700	159	2,400	148,000
February	8,800	1,120	2,570	143,000
March	7,210	1,430	3,310	204,000
April	6,720	2,860	4,310	256,000
May	7,500	2,730	4,260	262,000
June	8,030	3,100	5,570	331,000
July	5,160	465	1,910	117,000
August	445	150	268	16,500
September	205	112	156	9,280
The year	16,700	62	2,117	1,530,000
1911–12				
October	305	75	143	8,790
November	390	112	200	11,900
December	230	105	136	8,360
January	372	160	228	14,000
February	230	140	188	10,800
March	940	112	342	21,000
April	1,000	305	518	30,800
May	4,800	680	2,280	140,000
June	4,920	230	2,100	125,000
July	194	123	161	9,900
August	140	36	90.8	5,580
September	182	28	111	6,600
The year	4,920	28	541	393,000
1912–13				
October	182	23	85.5	5,260
November	1,520	160	522	31,100
December	266	111	171	10,500
January	1,260	130	368	22,600
February	605	220	356	19,800
March	782	176	352	21,600
April	3,340	810	1,410	83,900
May	3,840	1,140	2,410	148,000
June	2,120	282	930	55,300
July	371	102	171	10,500
August	235	26	136	8,360
September	140	69	107	6,370
The year	3,840	23	585	423,000
1913–14				
October	140	82	116	7,130
November	176	95	136	8,090
December	1,260	130	233	14,300
January	11,100	494	2,750	169,000
February	9,850	805	1,830	102,000
March	2,280	1,200	1,700	105,000
April	5,580	1,020	2,420	144,000
May	6,090	1,400	4,240	261,000
June	6,220	1,810	3,330	198,000
July	2,120	168	816	50,200
August	205	92	166	10,200
September	155	92	131	7,800
The year	11,100	82	1,490	1,080,000

Monthly discharge of Mokelumne River near Clements for the period January 1, 1905, to July 31, 1929—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1911–15				
October	220	100	132	8,120
November	235	92	134	7,970
December	600	125	205	12,600
January	1,080	115	318	19,600
February	3,540	700	1,350	75,000
March	2,120	600	999	61,400
April	4,060	1,260	2,240	133,000
May	6,630	1,260	3,550	218,000
June	7,750	1,800	3,880	231,000
July	1,800	157	715	44,000
August	172	68	92.8	5,710
September	157	83	107	6,370
The year	7,750	68	1,140	823,000
1915–16				
October	172	76	111	6,830
November	336	94	146	8,690
December	1,250	104	322	19,800
January	2,920	157	1,290	79,300
February	2,620	965	1,700	97,800
March	8,040	1,580	2,850	175,000
April	4,840	2,220	3,270	195,000
May	6,400	1,860	3,340	205,000
June	4,950	1,440	3,040	181,000
July	1,440	182	762	46,900
August	210	121	170	10,500
September	144	81	113	6,720
The year	8,040	76	1,420	1,030,000
1916–17				
October	472	121	206	12,700
November	274	121	198	11,800
December	1,510	196	449	27,600
January	1,080	182	326	20,000
February	6,400	196	1,250	69,400
March	1,780	740	967	59,500
April	4,570	1,260	2,250	134,000
May	5,970	2,170	3,370	207,000
June	7,550	1,810	4,440	264,000
July	1,740	136	765	47,000
August	186	105	152	9,350
September	136	85	95.4	5,680
The year	7,550	85	1,200	868,000
1917–18				
October	85	68	74.7	4,590
November	160	54	85.8	5,110
December	262	20	52.5	3,230
January	76	25	51.5	3,170
February	1,460	54	349	19,400
March	6,940	255	1,730	106,000
April	2,960	1,200	2,050	122,000
May	3,920	1,320	2,400	148,000
June	2,640	226	1,470	87,500
July	243	48	129	7,930
August	126	42	79.1	4,860
September	580	50	148	8,810
The year	6,940	20	719	521,000
1918–19				
October	482	138	223	13,700
November	297	149	207	12,300
December	262	116	204	12,500
January	280	96	168	10,300
February	7,060	96	848	47,100
March	1,760	478	838	51,500
April	5,500	1,200	2,450	146,000
May	5,980	2,040	4,010	247,000
June	1,760	95	568	33,800
July	174	24	90.4	5,560
August	125	50	80.2	4,930
September	149	38	87	5,180
The year	7,060	24	814	590,000

Monthly discharge of Mokelumne River near Clements for the period January 1, 1905, to July 31, 1929—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
October	149	33	76.2	4,690
November	125	56	88.5	5,270
December	571	86	192	11,800
January	280	63	127	7,810
February	354	70	143	8,230
March	2,550	373	709	43,600
April	4,820	459	1,490	88,700
May	5,500	1,830	3,120	191,000
June	2,550	210	1,320	78,500
July	995	10	224	13,800
August	171	25	95	5,840
September	124	45	81.3	4,840
The year	5,500	10	640	464,000
1920–21				
October	400	52	156	9,590
November	1,360	78	335	19,900
December	1,630	304	561	34,500
January	7,350	380	1,280	78,700
February	1,700	802	1,100	61,000
March	2,920	1,290	1,760	108,000
April	4,440	1,110	2,060	123,000
May	6,400	1,930	3,550	218,000
June	5,900	1,230	2,990	178,000
July	1,230	103	332	20,400
August	168	73	126	7,750
September	128	54	96	5,710
The year	7,350	52	1,190	865,000
1921–22				
October	144	46	117	7,190
November	133	46	76.2	4,530
December	700	46	177	10,900
January	1,930	111	312	19,200
February	4,630	221	1,060	58,900
March	1,930	500	919	56,500
April	3,820	795	1,790	107,000
May	7,770	2,170	5,170	318,000
June	7,970	2,090	4,700	280,000
July	1,700	110	638	39,200
August	215	90	165	10,100
September	188	52	128	7,620
The year	7,970	46	1,270	919,000
1922–23				
October	215	60	130	7,990
November	700	75	180	10,700
December	4,630	110	957	58,800
January	3,580	353	752	46,200
February	960	448	600	33,300
March	1,240	469	705	43,300
April	4,710	905	2,140	127,000
May	5,430	2,050	3,660	225,000
June	3,180	1,220	1,740	104,000
July	1,280	135	464	28,500
August	180	115	148	9,100
September	260	115	152	9,040
The year	5,430	60	971	703,000
1923–24				
October	225	82	153	9,410
November	175	82	119	7,080
December	155	82	113	6,950
January	310	68	141	8,670
February	990	90	277	15,900
March	257	116	182	11,200
April	1,400	166	892	53,100
May	1,770	125	990	60,900
June	162	8	70.7	4,210
July	57	0	19.8	1,220
August	32	0	5.42	333
September	137	3	50.0	2,980
The year	1,770	0	251	182,000

Monthly discharge of Mokelumne River near Clements for the period January 1, 1905, to July 31, 1929—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924–25				
October	890	13	86.8	5,340
November	2,120	92	306	18,200
December	2,330	157	400	24.600
January	890	200	366	22,500
February	9,700	208	1,930	107,000
March	1,910	790	1,330	81,800
April	6,910	1,400	2,750	164,000
May	6,550	2,190	3,860	237,000
June	2,960	970	2,090	124,000
July	925	90	341	21,000
August	300	80	166	10,200
September	230	54	133	7,910
The year	9,700	13	1,140	824,000
1925–26				
October	180	47	90.5	5,560
November	300	47	128	7,620
December	530	135	234	14,400
January	790	100	225	13,800
February	1,150	282	688	38,200
March	1.200	450	756	46,500
April	3,100	1,020	2,220	132,000
May	2,720	662	1,370	84,200
June	693	56	225	15.200
July	146	50	92.1	5,660
August	141	46	93.1	5,720
September	158	33	86.5	5,150
The year	3,100	33	517	374,000
1926–27				
October	89	18	47.8	2,940
November	2,490	16	481	28,600
December	1,400	252	531	32,600
January	1,320	273	663	40,800
February	4,840	526	1,880	104,000
March	1.770	968	1,300	79,900
April	5,320	1,320	2,630	156,000
May	6,160	1,590	3,280	202,000
June	4,680	1,120	3,070	183,000
July	1,220	120	509	31,300
August	240	70	156	9,590
September	187	54	98.0	5,830
The year	6,160	16	1,210	877,000
1927–28				
October	552	52	134	8,240
November	1,480	115	470	28,000
December	930	162	306	18,800
January	467	278	356	21,900
February	2,590	350	544	31,300
March	20,300	332	2,940	181,000
April	3,390	1,480	2,270	135,000
May	4,060	1,300	2,710	167,000
June	1,180	140	472	28,100
July	174	50	105	6,460
August	182	44	105	6,460
September	218	52	110	6,550
The year	20,300	44	879	639,000
1928–29				
October	119	38	72.5	4,460
November	240	29	76.5	4,550
December	384	30	95.2	5,850
January	442	62	133	8,180
February	980	59	234	13,000
March	380	94	231	14,200
April	1,400	259	608	36,200
May	3,220	235	2,090	129,000
June	4,060	226	856	50,900
July	265	102	154	9,470
The period	4,060	29	----------	----------

Daily discharge, in second-feet, of Mokelumne River near Clements for the period October 1, 1925, to July 31, 1929

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925–26												
1	54	110	352	248	790	510	1,020	2,150	693	102	124	85
2	47	80	530	248	835	450	1,060	2,190	658	128	50	141
3	54	80	370	212	970	530	1,020	2,490	584	125	74	136
4	54	54	212	230	925	490	1,520	2,720	548	116	121	125
5	54	62	248	248	835	510	1,520	2,640	528	68	90	139
6	47	47	212	248	925	530	2,470	1,680	669	54	86	57
7	180	62	282	248	925	678	2,330	1,240	369	106	95	42
8	180	90	300	248	470	678	3,100	1,050	444	122	88	130
9	100	80	195	248	410	700	2,330	940	271	146	46	158
10	165	135	195	248	430	610	1,770	925	239	110	96	89
11	135	150	230	150	570	510	1,700	935	239	100	105	98
12	54	150	212	180	925	490	1,580	1,090	213	50	100	85
13	100	212	180	195	880	610	2,330	1,170	184	80	93	49
14	110	248	150	180	880	790	2,680	1,380	125	70	110	83
15	122	265	135	122	925	1,200	2,750	1,580	172	68	80	81
16	122	165	150	110	1,150	1,200	2,890	1,540	184	130	60	87
17	165	150	135	110	790	745	3,100	1,620	184	79	68	73
18	80	135	135	110	632	745	1,770	1,600	184	104	113	81
19	71	100	230	100	745	745	1,460	1,900	160	50	87	92
20	80	150	248	110	925	610	1,700	1,800	125	82	116	42
21	80	90	265	100	530	610	2,220	1,460	72	112	111	68
22	62	90	230	165	490	678	2,400	1,270	127	104	94	81
23	62	100	248	150	410	835	2,300	1,110	98	100	64	100
24	80	110	248	195	370	1,200	2,630	925	72	93	120	102
25	90	122	230	150	282	1,060	2,860	766	86	103	141	109
26	47	135	150	150	296	1,200	2,940	697	92	56	114	100
27	62	122	212	165	490	790	2,600	734	106	64	79	48
28	80	150	248	212	450	745	2,960	763	56	84	79	45
29	90	90	248	410	-------	880	2,750	792	62	91	125	35
30	90	300	248	700	-------	1,060	2,860	721	96	78	56	33
31	90	-------	212	790	-------	1,060	-------	662	-------	79	100	------
1926–27												
1	43	17	1,390	313	526	1,710	1,950	3,820	2,250	1,200	70	178
2	54	16	1,200	273	586	1,530	2,910	3,470	2,130	1,220	132	146
3	89	16	1,400	714	1,220	1,440	3,750	3,750	2,840	1,120	180	183
4	52	16	1,020	1,320	2,840	1,370	4,200	3,820	3,260	922	152	109
5	51	17	798	879	1,300	1,270	3,050	4,040	3,680	878	173	88
6	38	17	730	1,140	1,220	1,400	2,630	4,360	4,040	855	184	118
7	45	17	820	993	1,040	1,200	2,430	2,980	4,680	765	106	182
8	66	16	649	728	855	1,220	2,250	2,250	4,040	742	85	178
9	43	17	596	575	810	1,270	2,010	2,190	3,190	698	126	187
10	46	18	544	634	720	1,150	1,710	2,370	4,040	675	186	83
11	64	19	460	914	675	1,040	1,590	2,700	3,960	652	173	66
12	64	29	424	745	630	990	1,440	3,190	3,890	550	155	54
13	73	52	442	575	610	1,040	1,370	4,200	4,440	502	162	58
14	66	167	444	522	742	1,770	1,340	5,480	4,520	472	168	61
15	73	92	400	538	1,530	1,420	1,400	5,160	3,960	504	88	62
16	60	73	374	642	1,710	1,220	1,530	5,480	4,200	464	162	67
17	62	49	271	765	1,890	1,120	1,320	6,160	3,960	318	168	56
18	77	33	360	610	3,610	1,080	1,340	4,520	3,610	278	169	60
19	62	32	384	578	3,750	990	1,470	3,750	2,980	338	178	54
20	43	193	317	675	2,630	968	1,710	2,770	2,630	318	172	5
21	38	245	363	698	4,120	968	1,890	2,130	2,560	312	164	60
22	35	158	375	630	4,840	1,010	2,370	1,770	2,770	253	84	77
23	33	215	346	518	3,190	1,220	2,770	1,590	2,310	248	158	105
24	35	1,340	320	558	2,490	1,420	3,330	2,250	2,370	210	164	134
25	35	2,350	283	558	2,370	1,590	4,040	3,190	2,370	120	168	78
26	33	1,350	326	558	2,370	1,710	4,840	3,610	2,190	217	186	54
27	24	2,490	252	566	2,370	1,710	5,320	2,980	1,710	214	197	100
28	21	1,460	287	490	1,950	1,590	4,200	2,250	1,340	200	192	110
29	20	1,730	292	698	-------	1,340	4,200	1,830	1,200	156	91	104
30	19	2,190	300	590	-------	1,270	4,520	1,710	1,120	188	202	72
31	18	-------	304	566	-------	1,240	-------	1,830	-------	183	240	------

Daily discharge, in second-feet, of Mokelumne River near Clements for the period October 1, 1925, to July 31, 1929—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1927–28												
1	142	336	364	350	403	360	2,800	4,060	1,180	162	86	120
2	78	224	325	318	395	332	3,220	3,130	1,060	106	82	90
3	52	165	339	332	758	395	2,870	2,620	935	156	72	74
4	88	222	360	399	2,590	475	2,380	2,640	855	174	100	52
5	142	257	287	395	1,120	435	2,170	2,920	820	90	98	163
6	86	194	269	392	685	471	2,240	3,250	825	106	97	218
7	90	115	266	353	660	451	2,310	3,510	765	174	81	167
8	142	233	284	339	610	542	2,240	3,810	675	111	125	110
9	80	467	272	346	556	588	2,170	2,960	530	68	106	108
10	63	1,480	300	415	493	660	2,240	3,710	400	84	97	64
11	90	1,030	272	403	459	685	2,170	3,840	505	123	123	72
12	124	506	205	356	484	760	2,360	3,560	520	91	83	118
13	138	638	248	378	388	685	2,440	3,350	515	72	44	119
14	114	610	336	443	459	710	2,220	3,150	440	80	54	96
15	90	547	339	403	431	660	2,150	2,860	405	72	133	122
16	78	455	287	360	350	660	2,180	2,780	350	56	103	106
17	54	520	263	308	374	660	2,190	2,540	285	61	116	82
18	104	534	248	278	370	710	1,840	2,480	305	125	100	102
19	96	547	284	325	378	810	1,720	2,420	360	112	96	148
20	120	511	257	300	364	910	1,560	2,440	315	76	58	144
21	94	610	245	300	388	940	1,480	2,220	275	106	87	159
22	105	524	219	281	388	1,000	1,520	2,300	260	132	129	166
23	106	459	230	395	378	1,630	1,940	2,180	240	58	160	108
24	74	356	216	388	395	4,370	2,230	2,300	140	134	182	71
25	114	314	263	314	370	18,900	1,830	2,260	190	147	128	102
26	119	350	162	325	378	20,300	1,960	2,280	209	122	130	82
27	264	443	219	342	360	14,200	2,540	2,140	225	104	136	83
28	552	431	219	290	411	6,580	2,840	1,800	208	123	116	90
29	325	384	930	290	370	4,540	2,810	1,700	210	120	80	90
30	213	447	565	455	------	3,660	3,390	1,530	171	50	106	81
31	202	------	403	467	------	3,080	------	1,300	------	67	146	------
1928–29												
1	62	47	45	442	83	175	262	1,060	226	265	------	------
2	102	39	47	142	59	152	259	1,640	316	259	------	------
3	119	63	50	135	615	130	925	2,590	442	226	------	------
4	102	36	48	138	575	96	545	2,590	420	217	------	------
5	107	29	64	160	980	229	398	2,590	350	190	------	------
6	97	29	75	142	533	336	406	2,160	295	187	------	------
7	80	32	85	94	318	380	412	1,360	292	184	------	------
8	60	54	91	100	303	310	416	1,620	398	184	------	------
9	64	59	85	117	181	289	420	2,870	454	160	------	------
10	80	85	70	91	202	199	420	2,870	804	135	------	------
11	75	49	63	75	123	332	416	2,800	1,210	128	------	------
12	68	59	82	78	145	224	406	2,800	730	130	------	------
13	83	168	121	87	175	205	409	2,730	478	130	------	------
14	97	143	60	71	187	117	546	2,730	636	130	------	------
15	91	162	32	91	165	94	542	2,730	730	104	------	------
16	74	240	30	204	140	181	530	2,730	4,060	104	------	------
17	76	214	32	89	148	217	795	2,670	3,720	102	------	------
18	62	82	43	78	112	226	1,250	3,080	1,800	102	------	------
19	71	40	140	239	172	229	1,400	3,220	1,890	123	------	------
20	77	53	170	316	178	232	900	2,450	1,330	130	------	------
21	76	64	123	181	162	235	322	1,750	1,030	130	------	------
22	53	65	91	117	162	241	316	2,030	880	138	------	------
23	41	63	55	114	123	247	307	2,240	662	142	------	------
24	52	60	37	76	132	250	261	2,450	392	145	------	------
25	69	59	93	84	98	250	526	2,240	388	145	------	------
26	66	54	65	62	135	253	698	1,750	388	145	------	------
27	58	52	123	158	168	256	1,030	1,060	395	148	------	------
28	48	60	106	127	172	259	1,030	636	374	148	------	------
29	44	67	172	122	------	256	1,030	546	313	150	------	------
30	38	67	384	96	------	278	1,060	430	274	150	------	------
31	55	------	268	93	------	283	------	235	------	145	------	------

MOKELUMNE RIVER NEAR VICTOR

Location.—In NW. ¼ SE. ¼ sec. 34, T. 4 N., R. 7 E., 1 mile northeast of Victor, San Joaquin County.

Drainage area.—Not measured.

Records available.—July 21, 1927, to December 31, 1928 (low-water records only).

Equipment.—Water-stage recorder on left bank. Discharge measurements made at or just below gage by wading.

Channel and control.—Sandy and somewhat shifting bottom. Banks overflowed at flood stages. Control indefinite and may be the dam at Woodbridge.

Diversions and regulation.—Between Victor and Clements there are diversions for irrigation. Flow partly regulated by storage developed on headwaters of North Fork.

Accuracy.—Stage-discharge relation not permanent. Standard rating curve fairly well defined by 25 discharge measurements made during the year. Water-stage recorder record excellent. Daily discharge ascertained by use of a discharge integrator using shifting-control method. Records fair.

Monthly discharge of Mokelumne River near Victor for the period July 21, 1927, to December 31, 1928

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927				
July 21-31	380	160	253	5,520
August	223	96	156	9,590
September	191	46	89.5	5,330
October 1-27	120	53	88.1	4,720
The period	380	46		25,160
1928				
June 24-30	208	134	179	2,490
July	166	54	98.5	6,060
August	180	37	97.2	5,980
September	218	52	109	6,490
October	118	36	67.4	4,140
November	307	23	75.7	4,500
December	331	33	96.8	5,950
The period	331	23		35,610

Daily discharge, in second-feet, of Mokelumne River near Victor for the period July 21 to October 27, 1927, and June 24, to September 30, 1928

Day	July	Aug.	Sept.	Oct.	Day	July	Aug.	Sept.	Oct.
1927					1927				
1		113	191	105	16		152	56	72
2		122	137	89	17		170	60	61
3		187	170	53	18		176	54	70
4		174	109	59	19		173	53	87
5		174	83	120	20		166	49	95
6		186	102	77	21	380	160	52	95
7		130	157	74	22	332	96	56	80
8		101	152	111	23	322	142	96	102
9		115	163	95	24	265	158	114	74
10		182	89	59	25	160	155	80	81
11		191	63	68	26	236	168	59	119
12		163	56	105	27	250	187	68	120
13		166	46	119	28	238	178	97	
14		173	53	107	29	178	96	97	
15		107	56	82	30	211	143	66	
					31	211	223		

Daily discharge, in second-feet, of Mokelumne River near Victor for the period July 21 to October 27, 1927, and June 24, to September 30, 1928—Continued

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1928					1928				
1	--------	155	84	122	16	--------	64	94	104
2	--------	114	76	92	17	--------	58	94	92
3	--------	132	75	80	18	--------	106	95	71
4	--------	166	86	52	19	--------	118	85	142
5	--------	102	99	113	20	--------	85	69	146
6	--------	85	88	218	21	--------	81	56	154
7	--------	154	76	189	22	--------	130	116	171
8	--------	120	112	113	23	--------	68	133	124
9	--------	80	98	104	24	163	94	180	84
10	--------	67	93	81	25	134	133	137	92
11	--------	98	104	58	26	197	104	126	89
12	--------	90	94	107	27	208	96	122	81
13	--------	68	56	124	28	198	102	124	89
14	--------	69	37	90	29	200	111	84	88
15	--------	76	112	114	30	156	74	78	76
					31	--------	54	129	--------

MOKELUMNE RIVER AT WOODBRIDGE

Location.—In NE. ¼ NE. ¼ sec. 34, T. 4 N., R. 6 E., at highway bridge a quarter of a mile northeast of Woodbridge, San Joaquin County.

Drainage area.—648 square miles, measured on topographic maps.

Records available.—May 27, 1924, to September 30, 1928 (low-water records only for 1924 and 1925).

Equipment.—Water-stage recorder 400 feet below bridge on left bank. Various gages in use since 1924, but all at practically same location. Discharge measurements made from cable 50 feet above gage or by wading.

Channel and control.—Channel is shifting sand. Control indefinite.

Extremes of discharge.—1924–1928: Maximum stage from water-stage recorder, 26.58 feet from 5 to 7 a. m. March 26, 1928 (discharge not determined); minimum stage from water-stage recorder, 1.38 feet at 8 a. m. September 3, 1924 (discharge, 0.9 second-foot).

Diversions and regulation.—Water is diverted by the Woodbridge Canal, at dam just above the bridge, for irrigation.

Accuracy.—Stage-discharge relations not permanent. Rating curves well defined. Records good.

Monthly discharge of Mokelumne River at Woodbridge for the period May 27, 1924, to July 31, 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924				
May 27-31	102	28	68.8	682
June	21	2.2	5.66	337
July	2.1	1.5	1.65	101
August	1.5	1.0	1.28	78.7
September	2.0	1.0	1.15	68.4
The period	-------	-------	-------	1,270
1924-25				
October	160	1.2	8.18	503
November	[a] 575	82	306	18,200
December	1,800	178	400	24,600
July 14-31	112	2.7	53.7	1,920
August	24	2.6	5.95	366
September	26	5.5	9.37	558
1925-26				
October	-------	-------	-------	-------
November	185	82	129	7,680
December	525	107	193	11,900
January	-------	-------	-------	-------
February	1,310	419	706	39,200
March 1-27	1,140	519	819	43,900
April 9-30	3,120	1,860	2,590	113,000
May	3,080	642	1,600	98,400
June	620	3.2	193	11,500
July	4.5	3.0	3.59	221
August	3.3	2.7	2.88	177
September	6	3.0	3.97	236
1926-27				
October	6	3.6	4.63	285
November	2,150	4.7	432	25,700
December	1,990	324	600	36,900
January	1,120	298	650	40,000
February	4,460	519	1,830	102,000
March	2,010	1,040	1,400	86,100
April	4,970	1,370	2,590	154,000
May	5,220	1,740	3,300	203,000
June	4,370	1,020	3,020	180,000
July	1,100	2.4	396	24,300
August	16	3.2	7.84	482
September	22	1.4	6.92	412
The year	5,220	1.4	1,180	853,000
1927-28				
October	452	3.0	62.1	3,820
November	1,300	138	429	25,500
December	770	160	293	18,000
January	452	264	351	21,600
February	1,440	188	484	27,800
March	-------	368	-------	-------
April	3,600	1,670	2,320	138,000
May	3,760	1,200	2,590	159,000
June	1,070	3.6	337	20,100
July	3.4	2.2	2.83	174
August	3.0	2.3	2.48	152
September	4.2	2.4	3.09	184
The year	-------	2.2	-------	-------
1928-29				
October	19	2.5	6.76	416
November	390	14	86.0	5,120
December	338	39	87.5	5,380
January	338	73	142	8,730
February	804	79	214	11,900
March	283	66	157	9,650
April	990	87	376	22,400
May	2,460	196	1,680	103,000
June	2,770	90	588	35,000
July	74	2.8	10.7	658
The period	2,770	2.5	-------	-------

[a] Estimated, Nov. 8-17.

Daily discharge, in second-feet, of Mokelumne River at Woodbridge for the period October 1, 1925, to July 31, 1929

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1925–26												
1	5	95	107	188	552	519	-------	3,080	576	4.2	3.0	3.0
2	5	106	340	206	574	868	-------	2,470	620	4.5	3.2	3.0
3	4.8	102	525	136	810	664	-------	2,460	598	4.5	3.2	3.2
4	4.8	106	370	143	834	642	-------	2,640	499	4.2	3.0	3.3
5	4.8	110	236	106	1,050	686	-------	2,920	446	4.2	2.8	3.6
6	4.8	115	170	155	906	796	-------	2,880	414	4.2	2.8	3.8
7	4.8	116	121	167	598	807	-------	2,180	383	4.2	2.7	3.2
8	4.8	101	167	175	576	818	-------	1,690	362	4.0	2.7	3.0
9	---------	91	154	179	554	818	3,120	1,490	311	3.8	2.7	3.2
10	---------	89	147	164	499	796	2,760	1,260	311	3.6	2.7	3.2
11	---------	122	139	130	488	752	2,360	1,240	238	3.8	2.7	3.5
12	---------	142	170	96	752	686	1,970	1,240	187	3.8	2.7	3.6
13	---------	107	186	132	1,060	642	1,900	1,280	157	3.6	2.7	3.8
14	---------	184	154	119	1,310	708	2,180	1,340	112	3.3	2.7	3.6
15	---------	185	119	-------	1,040	774	2,420	1,490	487	3.2	2.7	3.5
16	147	178	158	-------	994	928	2,680	1,620	23	3.0	3.0	3.6
17	167	146	165	-------	840	972	2,920	1,660	14	3.3	2.8	3.8
18	159	184	192	-------	686	1,020	2,920	1,690	9	3.3	2.7	4.0
19	139	179	179	-------	587	884	2,180	1,760	5	3.5	2.7	4.5
20	113	156	220	-------	796	818	1,860	1,860	4.7	3.0	2.8	4.5
21	95	121	168	-------	719	730	2,040	1,800	4.2	3.0	3.0	4.5
22	95	110	175	115	642	708	2,360	1,550	3.6	3.5	3.2	4.5
23	94	101	192	118	554	774	2,560	1,430	3.3	3.6	2.8	4.5
24	94	92	199	114	510	1,020	2,560	1,260	3.2	3.5	2.7	4.7
25	92	143	175	119	446	1,140	2,840	994	3.2	3.2	2.8	5
26	92	165	165	79	419	1,140	3,040	642	3.5	3.3	3.0	5.5
27	88	144	164	124	467	994	3,080	708	3.8	3.3	3.3	6
28	86	82	174	161	499	-------	2,960	730	4.0	3.2	3.2	4.9
29	84	148	184	138	-------	-------	3,120	730	4.2	3.2	3.0	4.5
30	81	142	199	617	-------	-------	3,080	752	4.0	3.2	3.0	4.2
31	83	---------	182	508	-------	-------	-------	686	---------	3.0	3.0	------
1926–27												
1	3.8	4.7	1,990	341	528	2,010	1,620	4,460	1,860	995	3.2	22
2	3.8	243	1,420	324	519	1,740	2,160	4,010	2,250	1,040	3.5	20
3	3.8	66	1,420	298	638	1,640	2,740	3,680	2,130	1,100	5	14
4	3.8	44	1,300	1,080	1,830	1,470	4,010	3,720	2,670	1,020	9	16
5	3.8	36	945	1,100	1,990	1,370	4,320	3,760	3,080	1,100	8	13
6	3.8	30	748	920	1,480	1,270	3,560	3,960	3,600	481	7.5	11
7	4.5	28	795	1,120	1,210	1,220	2,920	4,060	3,880	682	7.5	11
8	4.0	26	726	845	970	1,300	2,640	3,400	4,500	597	6	12
9	3.8	26	617	704	845	1,370	2,390	2,530	4,140	557	3.8	13
10	3.6	24	577	577	770	1,320	2,130	1,860	3,480	538	3.5	13
11	3.8	25	462	795	660	1,200	1,860	2,160	3,880	452	5.5	9.5
12	4.0	24	462	795	617	1,140	1,700	2,530	3,840	443	5.5	9
13	4.2	28	414	682	617	1,140	1,540	3,040	3,880	396	6	6
14	4.2	48	462	557	538	1,400	1,440	3,920	4,190	341	5.5	4.0
15	4.2	129	434	557	970	1,700	1,420	4,920	4,370	306	5.5	2.5
16	4.7	86	424	577	1,470	1,500	1,520	4,970	4,010	264	5.5	2.0
17	5.5	74	368	682	1,720	1,340	1,500	5,220	4,100	247	5.5	1.6
18	5.5	54	377	682	1,950	1,240	1,370	5,170	3,960	196	6	1.6
19	6	47	396	597	2,960	1,170	1,420	4,460	3,600	150	7.5	1.4
20	6	41	386	617	3,860	1,100	1,570	3,840	3,080	139	8.5	1.4
21	6	220	386	682	3,080	1,070	1,720	2,960	2,670	152	11	1.6
22	6	220	405	660	3,800	1,040	1,920	2,280	2,600	148	12	1.4
23	6	208	396	577	4,460	1,140	2,220	1,860	2,600	130	8.5	1.6
24	5.5	376	377	481	3,680	1,340	2,640	1,740	2,250	112	10	2.0
25	5	1,810	324	577	2,840	1,520	3,080	2,130	2,190	76	10	2.8
26	4.7	1,530	341	519	2,500	1,620	3,800	2,810	2,130	54	10	2.2
27	4.7	1,880	332	597	2,420	1,740	4,500	3,480	1,920	560	8.5	2.4
28	4.7	2,150	324	510	2,360	1,770	4,970	3,200	1,500	2.8	14	2.5
29	4.7	1,440	324	528	-------	1,620	4,550	2,530	1,070	2.8	16	3.2
30	4.7	2,030	350	638	-------	1,540	4,370	1,890	1,020	2.4	11	4.0
31	4.7	---------	332	538	-------	1,470	-------	1,800	---------	3.2	14	------
1927–28												
1	3.8	264	405	396	405	368	3,600	2,700	1,070	3.0	2.8	2.4
2	5.0	298	332	332	386	341	3,160	3,120	1,040	3.2	2.6	2.4
3	6.0	208	306	315	414	386	3,200	2,960	1,010	3.0	2.6	2.5
4	5.5	172	315	368	1,370	443	3,080	2,640	820	3.0	2.6	2.6
5	5.5	256	315	377	1,440	462	2,700	2,600	750	3.0	2.6	2.4

Daily discharge, in second-feet, of Mokelumne River at Woodbridge for the period October 1, 1925, to July 31, 1929—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1927–28												
6	7.5	215	264	396	870	481	2,460	2,780	700.0	2.8	2.6	2.4
7	7.5	164	256	368	682	462	2,500	3,040	650.0	2.6	2.5	3.2
8	6.5	138	264	341	617	519	2,430	3,360	610.0	3.0	2.5	3.4
9	8.0	298	264	332	597	577	2,360	3,640	480.0	3.4	2.6	3.0
10	8.0	481	281	396	519	597	2,280	3,360	350.0	2.4	2.6	2.8
11	6.0	1,300	290	405	462	682	2,250	3,480	390.0	2.6	2.6	2.6
12	5.0	682	239	386	462	682	2,190	3,760	500.0	2.4	2.4	2.5
13	6.0	481	223	359	434	748	2,300	3,600	400.0	2.8	2.5	2.5
14	6.0	748	272	414	424	682	2,420	3,360	280.0	2.8	2.5	2.4
15	6.0	638	341	434	424	660	2,300	3,080	220.0	2.8	2.4	2.4
16	4.8	481	324	377	215	682	2,190	2,840	170.0	3.0	2.3	2.6
17	4.0	481	272	341	188	660	2,190	2,670	128.0	2.6	2.3	2.6
18	3.0	481	264	298	231	660	2,080	2,500	71.0	2.8	2.3	2.6
19	3.0	519	264	324	281	682	1,980	2,320	68.0	2.4	2.4	3.6
20	3.0	519	281	306	264	870	1,980	2,250	95.0	2.4	3.0	3.1
21	4.0	481	264	298	332	895	1,820	2,250	83.0	2.2	2.4	3.8
22	4.2	538	215	290	298	945	1,670	2,130	61.0	2.4	2.3	3.7
23	5.0	462	223	272	306	1,120	1,670	1,980	52.0	2.6	2.3	3.8
24	8.0	405	215	414	519	1,740	1,670	1,950	46.0	3.2	2.6	4.2
25	2.8	306	231	341	405	2,780	2,040	2,010	26.0	3.0	2.5	4.0
26	2.5	315	208	315	359	-------	1,800	2,010	11.0	3.1	2.3	4.0
27	390.0	359	160	341	350	-------	1,950	1,950	5.0	3.0	2.3	3.8
28	452.0	396	208	303	396	-------	2,250	1,800	5.0	3.0	2.3	3.8
29	434.0	414	359	264	377	5,870	2,600	1,600	5.0	3.1	2.4	3.8
30	290.0	359	770	324	-------	4,970	2,600	1,500	3.6	3.1	2.4	3.8
31	223.0	-------	462	452	-------	4,240	-------	1,200	-------	3.0	2.4	-------
1928–29												
1	3.8	20	71	338	100	117	170	742	106	74	-------	-------
2	3.4	23	55	336	295	73	103	822	100	70	-------	-------
3	2.6	23	52	144	221	84	284	1,510	168	46	-------	-------
4	2.6	25	52	144	466	95	568	1,710	236	26	-------	-------
5	2.6	24	52	149	804	79	346	1,770	196	10	-------	-------
6	2.5	20	64	159	578	191	282	1,860	158	8	-------	-------
7	2.6	16	71	143	470	164	282	1,530	122	7.5	-------	-------
8	2.6	14	76	106	336	264	298	1,150	147	7	-------	-------
9	2.6	18	81	110	279	210	228	1,530	207	6	-------	-------
10	2.8	22	81	121	214	201	250	1,950	249	4.2	-------	-------
11	3.0	19	79	95	193	168	211	2,210	887	3.6	-------	-------
12	3.0	16	73	80	142	283	234	2,380	694	3.5	-------	-------
13	3.0	390	91	84	151	168	234	2,320	379	3.5	-------	-------
14	3.0	268	111	86	181	136	274	2,320	256	3.5	-------	-------
15	9	185	70	73	170	73	362	2,350	418	3.5	-------	-------
16	10	169	48	121	156	66	346	2,280	1,370	3.5	-------	-------
17	11	274	43	155	133	136	338	2,280	2,490	3.3	-------	-------
18	9	180	39	94	131	170	596	2,280	2,770	2.8	-------	-------
19	6.5	107	51	85	114	165	896	2,400	1,650	2.8	-------	-------
20	6	74	119	280	146	174	990	2,420	1,440	3.2	-------	-------
21	6	74	151	266	142	172	157	2,140	886	3.4	-------	-------
22	6	76	114	185	129	185	144	1,650	751	3.5	-------	-------
23	4.8	75	92	130	122	118	190	1,770	713	3.5	-------	-------
24	4.6	71	67	122	102	150	87	1,830	341	3.6	-------	-------
25	5	69	57	103	106	184	159	1,920	224	3.6	-------	-------
26	6.5	67	76	89	79	176	322	1,830	168	3.6	-------	-------
27	13	62	68	100	108	181	682	1,300	158	3.6	-------	-------
28	16	62	99	142	129	177	764	675	142	3.8	-------	-------
29	19	66	94	136	-------	170	764	427	123	3.8	-------	-------
30	19	72	176	127	-------	156	720	350	90	3.8	-------	-------
31	18	-------	338	103	-------	184	-------	196	-------	3.6	-------	-------

NOTE.—Discharge Mar. 26–28, 1928, not ascertained; considerable water escaped around gage.

WOODBRIDGE CANAL AT WOODBRIDGE

Location.—In NE. ¼ sec. 34, T. 4 N., R. 6 E., at Woodbridge, San Joaquin County.

Records available.—April 28, 1926, to September 30, 1928.

Equipment.—Water-stage recorder in corrugated culvert pipe well on left bank 20 feet above Southern Pacific Co.'s trestle. Discharge measurements made from specially constructed bridges below gage.

Channel and control.—Canal cut in earth, partly overgrown with tules. Five gates below gage affect the flow at the gage.

Extremes of discharge.—Maximum mean daily discharge during 1928, 200 second-feet June 16 and 20; no flow October 27 to April 23.

Regulation.—Regulated by headgates at the diversion dam.

Accuracy.—Stage-discharge relation depends on operation of gates below gage and is not permanent. Standard rating curve fairly well defined; 65 discharge measurements made during the year. Water-stage recorder record excellent. Daily discharge ascertained by applying mean daily gage height to rating table, using shifting-control method. Records fair.

Monthly discharge of Woodbridge Canal at Woodbridge for the period April 28, 1928, to July 31, 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1926				
April 28-30	57	52	53.7	320
May	110	54	88.2	5,420
June	116	30	95.9	5,710
July	82	50	63	3,870
August	80	56	66.8	4,110
September	88	52	66.4	3,950
October	51	11	36	2,210
November	9	0	.4	23.8
The season	116	0	----------	25,600
1927				
May	185	0	110	6,760
June	215	139	172	10,200
July	220	8	150	9,220
August	138	101	123	7,560
September	138	48	77.3	4,600
October	92	0	60.7	3,730
The season	220	0	----------	42,100
1928				
April	106	0	16.7	994
May	162	82	108	6,640
June	200	39	160	9,520
July	158	43	83.8	5,150
August	98	49	68.8	4,230
September	123	62	91	5,410
The season	200	0	----------	31,900
October	82	0	47.2	2,900
1929				
March	48	0	13	799
April	236	54	142	8,450
May	263	173	227	14,000
June	236	12	164	9,760
July	191	80	125	7,690
The period	263	0	----------	----------

Daily discharge, in second-feet, of Woodbridge Canal at Woodbridge for the period April 28, 1926, to July 31, 1929

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1926							1926						
1	------	69	99	71	60	66	16	------	99	44	51	69	56
2	------	69	102	74	71	66	17	------	99	88	58	62	58
3	------	83	99	82	64	74	18	------	99	102	57	57	57
4	------	88	102	80	56	78	19	------	102	110	58	66	60
5	------	92	113	76	58	80	20	------	106	116	51	68	66
6	------	83	110	68	58	83	21	------	102	113	50	74	57
7	------	66	102	58	57	69	22	------	96	102	56	76	54
8	------	57	102	60	60	56	23	------	88	102	60	74	54
9	------	54	102	68	62	62	24	------	82	99	64	66	58
10	------	66	110	74	57	74	25	------	88	99	66	69	71
11	------	76	106	74	62	73	26	------	99	99	69	78	82
12	------	80	102	74	69	71	27	------	110	96	60	80	88
13	------	85	99	60	71	69	28	52	102	92	54	74	78
14	------	88	88	54	69	60	29	52	102	80	57	71	64
15	------	96	30	52	71	57	30	57	106	69	60	76	52
							31	------	102	------	58	66	------

Day	Oct.	Nov.*	Apr.	May	June	July	Aug.	Sept.
1926–27								
1	36	9	------	------	167	215	132	138
2	38	3	------	------	139	135	109	126
3	40	------	------	------	161	143	112	117
4	50	------	------	------	183	182	129	120
5	51	------	------	54	195	25	128	110
6	46	------	------	64	154	185	128	97
7	39	------	------	78	153	220	136	97
8	34	------	------	27	140	210	122	105
9	33	------	------	------	146	187	104	120
10	32	------	------	57	149	187	101	128
11	29	------	------	122	149	180	112	96
12	35	------	------	150	149	195	124	73
13	39	------	------	148	155	190	130	64
14	45	------	------	185	163	178	135	60
15	48	------	------	170	169	178	133	48
16	50	------	------	160	192	208	114	48
17	48	------	------	185	205	174	115	50
18	46	------	------	164	205	150	116	51
19	48	------	------	147	180	154	121	52
20	46	------	------	147	163	173	118	52
21	42	------	------	147	168	175	122	52
22	39	------	------	155	177	166	120	51
23	34	------	------	132	190	156	113	52
24	30	------	------	140	170	137	120	64
25	28	------	------	148	210	121	130	68
26	26	------	------	143	210	115	134	57
27	24	------	------	139	180	20	136	52
28	20	------	------	135	157	8	138	57
29	16	------	------	126	175	58	128	57
30	13	------	------	127	215	90	114	57
31	11	------	------	153	------	121	128	------
1927–28								
1	50	------	------	116	146	158	62	92
2	64	------	------	120	138	150	63	92
3	60	------	------	95	126	120	62	85
4	52	------	------	85	126	112	60	75
5	56	------	------	88	138	109	61	62
6	72	------	------	102	154	109	63	82
7	75	------	------	112	170	102	63	116
8	76	------	------	142	142	112	61	123
9	92	------	------	162	146	102	69	109
10	88	------	------	146	170	85	69	95
11	75	------	------	146	150	76	66	82
12	69	------	------	123	39	79	72	76
13	79	------	------	116	116	74	66	82
14	88	------	------	102	182	57	55	88
15	88	------	------	95	192	52	49	85

* NOTE.—No flow December, 1926, to April, 1927.

Daily discharge, in second-feet, of Woodbridge Canal at Woodbridge for the period April 28, 1926, to July 31, 1929—Continued

Day	Oct.	Nov.	Apr.	May	June	July	Aug.	Sept.
1927–28								
16	82	--------	--------	95	200	48	60	92
17	75	--------	--------	92	196	43	63	92
18	63	--------	--------	85	192	50	65	85
19	62	--------	--------	85	196	73	63	82
20	70	--------	--------	88	200	74	58	98
21	73	--------	--------	88	187	65	52	109
22	62	--------	--------	82	178	69	54	120
23	76	--------	--------	88	174	75	65	123
24	79	--------	35	116	170	64	79	106
25	76	--------	65	106	146	76	95	88
26	79	--------	52	102	142	85	98	88
27	--------	--------	62	106	166	85	98	82
28	--------	--------	82	116	178	79	98	76
29	--------	--------	98	120	174	76	88	74
30	--------	--------	106	112	170	74	79	71
31	--------	--------	--------	126	--------	65	76	--------

Day	Oct.	Mar.	Apr.	May	June	July	Day	Oct.	Mar.	Apr.	May	June	July
1928–29							1928–29						
1	68	------	54	236	179	179	16	58	2	161	242	85	96
2	63	------	73	242	179	161	17	48	2.8	173	242	12	93
3	72	------	84	236	179	167	18	44	3.2	197	242	78	85
4	82	------	55	249	179	167	19	41	3.2	197	242	118	80
5	82	------	60	256	179	167	20	38	3.3	191	216	135	87
6	82	------	65	263	179	173	21	39	7.5	154	210	74	95
7	82	------	70	242	173	173	22	42	13	185	203	185	100
8	75	3	80	222	167	185	23	26	25	173	222	179	102
9	68	8	95	256	167	191	24	39	48	152	229	155	101
10	59	7	110	256	167	167	25	38	37	179	229	185	97
11	52	3	155	256	167	136	26	40	31	185	210	210	94
12	52	3.6	145	216	155	114	27	20	34	203	173	216	106
13	49	3.1	141	242	155	106	28	0	32	203	185	216	113
14	48	2.9	135	229	197	106	29	0	36	216	185	216	116
15	56	2.2	147	236	236	103	30	0	44	236	179	191	110
							31	0	48	------	179	------	102

MOKELUMNE RIVER NEAR THORNTON

Location.—In NW. ¼ SE. ¼ sec. 12, T. 4 N., R. 5 E., 2½ miles southeast of Thornton, San Joaquin County, just above tidewater.

Drainage area.—690 square miles.

Records available.—July 6, 1927, to September 30, 1928 (low-water records only).

Equipment.—Water-stage recorder in wooden well and shelter on left bank. Discharge measurements made by wading.

Channel and control.—Mud and fine sand; no well-defined control. Station is just above backwater from tides.

Extremes of discharge.—Minimum discharge during 1928, from water-stage recorder, 7.5 second-feet September 7, 13, and 14.

Diversions and regulation.—Water for irrigation is diverted by the Woodbridge Canal at the dam just above the bridge. Canal can divert about 300 second-feet. Low-water flow controlled by amount of water diverted at the dam.

Accuracy.—Stage-discharge relation continuously changing. Standard rating curve well defined; 18 discharge measurements made during the year. Water-stage recorder record good. Daily discharge ascertained by applying mean daily gage height to rating table, using shifting-control method. Records good.

Monthly discharge of Mokelumne River near Thornton for the period July 6, 1926 to September 30, 1928

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1926				
July 6–31	15	9.5	12.1	624
August	10	7.5	8.9	547
September	9.5	7.5	8.82	525
1926–27				
October	10	8.5	9.44	580
November 1–24	238	8.5	77.0	3,670
August	39	17	23.6	1,450
September	30	12	17.6	1,050
1927–28				
October 1–26	18	13	14.4	743
June 23–30	95	28	56.4	895
July	30	11	17.3	1,060
August	12	8.5	10.1	621
September	9.5	7.5	8.40	500

Daily discharge, in second-feet, of Mokelumne River near Thornton for the period July 6, 1926, to September 30, 1928

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1926				1926				1926			
1		10	8.5	11	14	9.5	8.5	21	12	8.5	8.5
2		10	8.5	12	12	9	8.5	22	12	8.5	9.5
3		10	8.5	13	13	9	8.5	23	9.5	8.5	9
4		9.5	8.5	14	13	7.5	9	24	11	8.5	9
5		9.5	8.5	15	13	8.5	9	25	11	8	7.5
6	15	10	9	16	12	8.5	9	26	11	8	8.5
7	14	10	9.5	17	12	8.5	9	27	11	8.5	9.5
8	13	9.5	9	18	12	8.5	9	28	11	8.5	9.5
9	13	9.5	9	19	12	8.5	9	29	11	8.5	9.5
10	14	9.5	8.5	20	12	8.5	8	30	11	8.5	9
								31	10	8.5	

Day		v		Sept.	Day	Oct.	Nov.	Aug.	Sept.
1926–27					1926–27				
1	9.5	8.5	39	25	16	9	104	19	15
2	10	100	35	30	17	9.5	90	18	15
3	9	112	31	27	18	9.5	77	17	13
4	9	61	31	24	19	9.5	68	17	13
5	9	44	30	24	20	9.5	54	18	13
6	9	37	29	22	21	10	106	19	12
7	8.5	33	27	21	22	10	228	20	12
8	8.5	31	27	21	23	10	191	20	12
9	9	30	24	21	24	10	238	20	12
10	10	28	22	22	25	10		21	13
11	10	28	22	22	26	10		22	13
12	9.5	31	21	20	27	10		22	13
13	9.5	29	21	19	28	9.5		24	13
14	9.5	33	21	18	29	9		25	13
15	9.5	87	21	16	30	9		25	13
					31	8.5		23	

Daily discharge, in second-feet, of Mokelumne River near Thornton for the period July 6, 1926, to September 30, 1928—Continued

Day	Oct.	June	July	Aug.	Sept.	Day	Oct.	June	July	Aug.	Sept.
1927–28						1927–28					
1	13	-------	30	11	95	16	14	-------	14	9	85
2	13	-------	29	11	95	17	14	-------	14	9	85
3	15	-------	28	11	95	18	14	-------	14	9	85
4	15	-------	28	11	85	19	13	-------	14	10	85
5	14	-------	25	11	85	20	13	-------	14	12	85
6	14	-------	19	11	80	21	13	-------	14	11	80
7	15	-------	20	11	75	22	14	-------	13	10	85
8	15	-------	21	11	80	23	15	83	13	9.5	85
9	15	-------	22	10	80	24	16	95	13	9	85
10	15	-------	21	11	80	25	18	74	13	9.5	85
11	15	-------	21	11	80	26	17	62	12	9.5	85
12	14	-------	21	11	80	27	-------	47	12	9	85
13	13	-------	17	10	75	28	-------	33	12	9.5	85
14	13	-------	13	10	75	29	-------	28	12	9	90
15	14	-------	14	9.5	85	30	-------	29	12	9	85
						31	-------	-------	11	8.5	-------

DRY CREEK

Dry Creek has its source in the foothills of the Sierra Nevada, at about 3,200 feet above sea level, and drains the relatively small area that lies between the Cosumnes and Mokelumne Rivers. Its course practically parallels the course of the Mokelumne in a general direction a little south of west. It is about 50 miles long and empties into the Cosumnes near Thornton, a short distance above the confluence of the Cosumnes with the Mokelumne River.

Dry Creek rises in a rough, hilly country and enters the rolling foothills near Ione, where it flows across the Ione formation. About 10 miles southwest of Ione Dry Creek reaches its alluvial flood plain and breaks up into several interlocking channels. These channels become sloughlike as they approach the Mokelumne River, and during flood seasons the stream overflows the adjacent country. Dry Creek has three main tributaries—Rancheria, Sutter, and Jackson Creeks. Goose Creek and Coyote Creek are two small tributaries that enter Dry Creek below the Ione gaging station.

The upper drainage basin of Dry Creek is sparsely forested and contains considerable underbrush. This brush and timber gradually thins out downstream until only scattered trees are found at the gaging station below Ione. Thence to the mouth of Dry Creek willow trees and brush grow along the several channels. The drainage basin around and above Ione is subject to brush fires, and a large part of it is burned over almost annually. The land in the drainage basin of Dry Creek is used mainly for grazing, although some dry farming is practiced between Ione and the mouth of Dry Creek.

Very little water from Dry Creek is used for irrigation, on account of the uncertainty of the supply. One or two small reservoirs on the upper tributaries help to supply water for some of the small towns near by. A small part of the water is used for gold mining. Whenever water is available about 6 second-feet is diverted from Jackson Creek for hydraulic mining at Lancha Plana. The waste water from the mine discharges into the Mokelumne River.

A small part of the upper drainage basin of Dry Creek generally receives a few inches of snow during the winter, but over the rest of the basin precipitation takes the form of rain. Storage of the run-off from Dry Creek for irrigation is not economically feasible, because of the small amount of water available, which would have to be supplemented by water diverted into the basin from some other stream. A few miles above the Ione gaging station and just below the junction of Jackson and Dry Creeks an excellent dam site exists, where a dam 135 feet high would create a reservoir with a capacity of 1,000,000 acre-feet.[22] (See pl. 1.) This reservoir would have to depend partly on a supply of water from the Mokelumne River, diverted through a natural gap on the north side of the Pardee Reservoir of the East Bay Municipal Utility District.

Very few run-off records of Dry Creek were kept before work was started on this investigation. The earliest available discharge measurements were made in 1911–12 by hydrographers of the United States Geological Survey. The State Engineering Department of California, under William Ham. Hall, estimated the run-off for the years 1878 to 1884.[23] All available records of the maximum, minimum, and mean monthly discharge and run-off in acre-feet of Dry Creek and its tributaries, based on actual gagings, are given in the following tables.

DRY CREEK NEAR IONE

LOCATION.—In sec. 11, T. 5 N., R. 8 E., at highway bridge at Forni's ranch, 2½ miles below mouth of Jackson Creek and 7 miles southwest of Ione, Amador County.

DRAINAGE AREA.—279 square miles (measured on topographic maps).

RECORDS AVAILABLE.—October 7, 1911, to June 30, 1912, and December 20, 1925, to September 30, 1928.

EQUIPMENT.—Water-stage recorder on left bank of left channel, in operation since November 24, 1926. Previous record was based on staff gages at practically the same location. Discharge measurements made from bridges or by wading.

CHANNEL AND CONTROL.—One main channel and three overflow channels above stage of 9 feet. Land between channels will be overflowed above 11 feet.

EXTREMES OF DISCHARGE.—1925–1928: Maximum stage, from water-stage recorder, 11.9 feet at 6 p. m. March 25, 1928 (discharge, 5,450 second-feet); no flow part of each year.

DIVERSIONS AND REGULATION.—Small diversions for local irrigation and mining above the station. There is a small diversion from the North Fork of the Mokelumne River into the Dry Creek drainage basin.

ACCURACY.—Stage-discharge relation shifting. Rating curves fairly well defined. 1925–1928 records good.

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[22] Stafford, H. M., Proceedings of the second Sacramento-San Joaquin River problems conference and water-supervision report: California Dept. Public Works, Div. Water Rights, Bull. 4, p. 73, 1924.

[23] U. S. Geol. Survey Water-Supply Paper 299, pp. 394–395, 1912.

Monthly discharge of Dry Creek near Ione for the periods October 7 to June 30, 1912, and December 20, 1925, to September 30, 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1911-12				
October 7-31	73	0	5. 58	277
November	88	3	16. 9	1, 010
December	73	12	17. 5	1, 080
January	680	19	90. 8	5, 580
February	59	12	19. 9	1, 140
March	1, 020	12	157	9, 650
April	250	12	68. 8	4, 090
May	250	12	38. 9	2, 390
June	12	0	. 5	29. 8
The period	1, 020	0		25, 200
1925-26				
December 20-31	11	0	1. 50	35. 7
January	115	0	10. 9	670
February	2, 220	26	365	20, 300
March	93	29	53. 4	3, 280
April	630	20	123	7, 320
May	30	0	9. 06	557
The period				32, 200
1926-27				
November	914	0	89. 1	5, 300
December	126	17	38. 6	2, 370
January	653	16	166	10, 200
February	2, 260	129	716	39, 800
March	706	104	192	11, 800
April	2, 810	76	409	24, 300
May	74	4. 2	34. 6	2, 130
June	17	0	3. 69	220
The year	2, 810	0	133	96, 100
1927-28				
November	40	0	5. 33	317
December	763	0	47. 9	2, 950
January	292	19	54. 4	3, 340
February	2, 030	47	178	10, 200
March	3, 830	35	578	35, 500
April	1, 270	57	259	15, 400
May	46	1. 4	22. 3	1, 370
June	2. 6	0	0. 23	13. 7
The year	3, 830	0	95. 3	69, 100
1928-29				
November	18	0	0. 63	37. 5
December	72	0	15. 2	935
January	288	10	57. 8	3, 550
February	868	29	133	7, 390
March	743	24	99. 4	6, 110
April	166	16	65. 4	3, 890
May	12	0	3. 15	194
June	26	0	2. 30	137
The year	868	0	30. 8	22, 200

Daily discharge, in second-feet, of Dry Creek near Ione for the period December 20, 1925, to September 30, 1929

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May
1925-26						
1			389	93	29	18
2			67	86	21	16
3			555	86	21	15
4			231	79	94	18
5		1.2	317	72	630	20
6		.7	158	62	453	25
7		.2	80	62	308	30
8		.2	42	75	282	25
9		.2	36	75	265	22
10		.2	26	68	256	19
11		.2	214	64	200	16
12		.1	1,060	64	125	14
13		.1	732	58	85	12
14		.1	1,190	52	80	10
15		.1	398	52	80	8
16		0.2	353	40	80	6
17		.5	222	40	75	4
18		1.0	214	40	75	2
19		1.9	214	40	70	1
20	11	2.8	2,220	40	65	
21	2.0	2.7	282	40	60	
22	.5	2.2	198	40	55	
23		2.2	206	40	50	
24		2.7	198	40	45	
25		1.7	185	40	40	
26		2.2	177	40	35	
27		1.7	146	29	30	
28		2.2	111	40	25	
29	1.0	115		40	22	
30	1.5	87		29	20	
31	2.0	108		29		

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1926-27								
1		126	18	129	240	823	72	17
2		86	16	180	214	1,220	74	13
3		83	26	1,050	256	2,810	67	9
4		54	31	2,240	222	1,370	62	5
5		47	23	708	195	860	57	7
6		49	653	613	177	635	54	7
7		94	418	483	168	478	62	7
8		62	190	353	162	380	64	7
9		47	133	274	198	353	58	7
10		34	222	231	195	310	46	8
11		30	238	200	156	284	44	7
12		27	154	168	140	267	42	6
13		25	126	151	146	231	35	5
14		22	102	294	706	201	25	3.0
15		20	105	1,720	371	193	26	1.8
16		18	206	1,480	282	245	22	1.0
17		17	180	1,010	240	189	18	
18		18	128	2,260	214	169	22	
19		19	114	1,160	177	151	20	
20		18	250	830	160	134	20	
21		22	206	915	150	127	22	
22		31	152	938	138	120	22	
23		36	129	698	130	108	19	
24	1.0	43	114	570	123	101	12	
25	91	31	98	463	118	97	11	
26	412	28	151	371	109	83	4.2	
27	914	26	206	308	105	83	6	
28	655	24	198	265	104	83	21	
29	382	22	240		112	77	25	
30	219	19	180		109	76	20	
31		18	154		121		21	
1927-28								
1		4.8	93	64	44	442	46.0	2.2
2		4.0	64	62	42	1,100	42.0	2.6
3		2.0	55	327	59	1,270	37.0	2.0
4			45	2,030	72	780	34.0	.2
5			36	585	63	545	34.0	
6			32	301	60	398	34.0	
7			30	211	55	329	33.0	
8			29	164	72	264	32.0	
9			30	138	92	225	37.0	
10			27	117	83	200	37.0	
11		3.0	25	103	72	187	32.0	
12		4.4	26	93	67	187	28.0	
13	3.0	3.2	26	81	67	169	27.0	
14	26.0	26.0	25	74	64	152	23.0	
15	4.0	57.0	26	67	53	166	27.0	

Daily discharge, in second-feet, of Dry Creek near Ione for the period December 20, 1925, to September 30, 1929—Continued

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1927-28								
16	--------	40.0	24	66	49	132	26.0	--------
17	--------	24.0	21	58	44	145	23.0	--------
18	--------	17.0	22	55	43	126	22.0	--------
19	--------	15.0	21	54	42	109	20.0	--------
20	--------	12.0	20	50	38	99	17.0	--------
21	40.0	11.0	19	49	35	96	15.0	--------
22	26.0	8.0	24	55	36	87	13.0	--------
23	11.0	8.0	292	52	360	82	13.0	--------
24	7.5	7.0	150	60	1,600	89	10.0	--------
25	6.0	6.5	90	57	3,830	81	8.5	--------
26	6.0	6.0	66	49	3,070	73	7.0	--------
27	6.0	6.5	57	49	3,830	68	4.5	--------
28	6.5	7.0	48	47	1,780	61	4.0	--------
29	6.0	763.0	81	48	995	57	2.8	--------
30	12.0	308.0	93	--------	702	57	1.8	--------
31	--------	142.0	89	--------	505	--------	1.4	--------
1928-29								
1	--------	--------	20	51	27	45	12.0	--------
2	--------	--------	18	162	26	41	11.0	--------
3	--------	--------	49	240	24	36	9.5	--------
4	--------	--------	80	868	24	51	11.0	--------
5	--------	--------	43	501	24	166	12.0	--------
6	--------	--------	36	317	26	119	12.0	--------
7	--------	--------	29	255	27	100	11.0	--------
8	--------	--------	23	165	26	93	6.0	--------
9	--------	--------	20	129	28	150	2.8	--------
10	--------	--------	18	109	743	117	2.2	--------
11	--------	1.4	32	99	402	98	1.5	--------
12	--------	30.0	19	90	229	84	1.1	--------
13	--------	55.0	12	80	166	74	.8	--------
14	--------	33.0	10	70	126	67	.4	--------
15	18.0	21.0	12	63	108	60	--------	--------
16	.8	16.0	50	56	96	57	--------	.8
17	--------	14.0	22	55	86	47	--------	26.0
18	--------	8.5	19	54	82	45	--------	25.0
19	--------	5.0	147	51	76	58	1.4	5.0
20	--------	5.0	288	44	68	70	2.3	2.2
21	--------	5.0	161	39	62	57	.7	1.1
22	--------	3.4	113	37	54	53	.1	8.5
23	--------	3.4	97	36	64	52	--------	.5
24	--------	7.0	80	34	77	46	--------	--------
25	--------	72.0	71	32	70	40	--------	--------
26	--------	50.0	63	31	67	38	--------	--------
27	--------	28.0	59	30	64	33	--------	--------
28	--------	28.0	54	29	59	25	--------	--------
29	--------	35.0	49	--------	53	23	--------	--------
30	--------	29.0	50	--------	50	16	--------	--------
31	--------	23.0	49	--------	48	--------	--------	--------

NOTE.—No flow May 20 to Nov. 23, 1926; June 17 to Nov. 12, Nov. 16–20, and Dec. 4–10, 1927; June 5 to Nov. 14 and Nov. 17 to Dec. 10, 1928; May 15–18, May 23 to June 15, and June 24 to Sept. 30, 1929.

DRY CREEK NEAR GALT

LOCATION.—In SE. ¼ sec. 34, T. 5 N., R. 6 E., 1 mile south of Galt, Sacramento County.

DRAINAGE AREA.—346 square miles.

RECORDS AVAILABLE.—December 4, 1926, to September 30, 1928.

EQUIPMENT.—Water-stage recorder in corrugated-pipe well on right bank of right channel at Southern Pacific Railroad trestle. Discharge measurements made from special bridge built for the purpose and by wading.

CHANNEL AND CONTROL.—Two main channels; bed of stream clay and may shift. No well-defined control. Land between channels overflows.

EXTREMES OF DISCHARGE.—Maximum stage during 1928, from water-stage recorder, 10.20 feet at 9 a. m. March 26 (discharge, 6,080 second-feet); no flow October 1 to December 15, December 21–28, and June 3 to September 30.

Diversions and regulation.—See Dry Creek near Ione.

Accuracy.—Stage-discharge relation changed slightly when drift was removed from gage and channel on March 13 and during storm of March 26. Rating curves fairly well defined by 14 discharge measurements made during 1928. Water-stage recorder record excellent. Daily discharge ascertained by applying mean daily gage height to rating table except on days of large fluctuation in flow, when hourly discharge was averaged. Records good.

Monthly discharge of Dry Creek near Galt for the period December 4, 1926, to September 30, 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1926-27				
December 4-31	61	2.4	18.9	1,050
January	688	6	179	11,000
February	2,180	138	797	44,300
March	540	94	191	11,900
April	2,610	72	414	24,600
May	68	2.4	29.9	1,840
June	12	0	1.10	65.5
The period				94,600
1927-28				
December	240	0	14.5	892
January	190	1.2	36.8	2,260
February	1,840	34	198	11,400
March	5,250	27	708	43,500
April	1,980	58	347	20,600
May	53	0.1	23.5	1,440
The year	5,250	0	110	80,100
1928-29				
December	22	0	2.65	163
January	220	1.0	42.2	2,590
February	510	21	106	5,890
March	427	14	77.2	4,750
April	134	16	58.9	3,500
May	9	0	1.36	83.6
The year	510	0		17,000

Daily discharge, in second-feet, of Dry Creek near Galt for the period December 4, 1926, to September 30, 1929

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1926-27							
1		6	146	302	194	68	12
2		6.5	138	255	896	67	8
3		6	280	246	1,650	64	5.5
4	61	24	2,130	274	2,610	58	2.7
5	35	23	1,340	218	1,310	53	.5
6	28	58	720	185	756	49	.2
7	48	688	612	167	548	50	.1
8	59	412	498	155	470	56	.2
9	36	197	416	166	426	56	1.0
10	24	152	349	192	385	48	1.6
11	18	341	284	166	345	38	.4
12	17	258	223	147	317	37	.4
13	14	154	189	140	261	35	.2
14	11	124	189	300	209	25	.1
15	6.5	106	804	540	184	21	
16	5	152	2,180	385	205	19	
17	2.6	264	1,660	305	205	15	
18	2.4	179	1,780	164	171	14	
19	4.6	142	2,100	195	156	17	
20	3.7	155	1,040	165	142	15	

Daily discharge, in second-feet, of Dry Creek near Galt for the period December 4, 1926, to September 30, 1929—Continued

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1926–27							
21	4	321	864	151	131	15	--------
22	10	197	1,180	140	122	16	--------
23	18	152	828	131	114	15	--------
24	28	131	640	122	107	14	--------
25	24	116	548	114	100	8.5	--------
26	17	102	470	104	90	6.5	--------
27	14	248	412	96	81	2.4	--------
28	12	184	365	94	81	3.1	--------
29	10	267	--------	95	77	14	--------
30	8.5	228	--------	108	72	14	--------
31	7.5	170	--------	101	--------	12	--------
1927–28							
1	--------	97.0	68	33	585	53.0	--------
2	--------	65.0	60	30	630	44.0	--------
3	--------	47.0	64	32	1,980	41.0	--------
4	--------	35.0	1,200	57	1,580	38.0	--------
5	--------	23.0	1,840	55	980	36.0	--------
6	--------	18.0	585	53	685	36.0	--------
7	--------	13.0	335	52	540	34.0	--------
8	--------	11.0	225	49	465	32.0	--------
9	--------	11.0	159	72	335	35.0	--------
10	--------	13.0	133	80	280	38.0	--------
11	--------	8.0	112	69	225	36.0	--------
12	--------	7.0	98	62	200	30.0	--------
13	--------	7.5	86	60	190	27.0	--------
14	--------	7.0	76	58	164	24.0	--------
15	--------	7.0	67	52	154	19.0	--------
16	1.8	7.0	62	43	152	30.0	--------
17	8.0	4.8	56	39	138	28.0	--------
18	2.0	3.4	52	35	138	26.0	--------
19	.2	3.5	49	36	118	23.0	--------
20	--------	2.8	46	33	104	21.0	--------
21	--------	1.7	43	29	97	19.0	--------
22	--------	1.2	42	27	91	16.0	--------
23	--------	34.0	47	43	86	14.0	--------
24	--------	190.0	44	698	82	11.0	--------
25	--------	111.0	50	2,610	87	8.0	--------
26	--------	72.0	42	5,250	77	5.0	--------
27	--------	56.0	40	4,560	71	2.5	--------
28	--------	50.0	37	3,890	66	.5	--------
29	12.0	54.0	34	1,980	58	.3	--------
30	240.0	99.0	--------	1,120	58	.2	--------
31	186.0	82.0	--------	740	--------	.1	--------
1928–29							
1	--------	4.1	30	20	40	9.0	--------
2	--------	1.6	61	19	36	6.5	--------
3	--------	1.0	176	18	32	5.0	--------
4	--------	35.0	230	16	33	3.8	--------
5	--------	40.0	510	16	90	4.4	--------
6	--------	26.0	355	15	134	4.1	--------
7	--------	19.0	290	16	107	4.3	--------
8	--------	14.0	210	15	89	2.7	--------
9	--------	9.5	155	14	109	1.5	--------
10	--------	7.0	120	49	134	.6	--------
11	--------	5.5	101	427	104	.2	--------
12	--------	20.0	89	275	86	.1	--------
13	--------	7.0	77	210	71	--------	--------
14	--------	2.6	68	158	64	--------	--------
15	--------	1.6	61	127	58	--------	--------
16	--------	31.0	51	107	54	--------	--------
17	--------	47.0	48	89	44	--------	--------
18	--------	24.0	44	80	37	--------	--------
19	--------	33.0	44	71	38	--------	--------
20	--------	168.0	38	64	58	--------	--------
21	--------	220.0	35	54	58	--------	--------
22	--------	144.0	32	48	46	--------	--------
23	--------	98.0	30	43	46	--------	--------
24	--------	71.0	28	66	43	--------	--------
25	--------	58.0	25	61	36	--------	--------
26	22	48.0	24	61	32	--------	--------
27	21	42.0	22	58	29	--------	--------
28	6	36.0	21	56	24	--------	--------
29	11	34.0	--------	51	19	--------	--------
30	14	30.0	--------	46	16	--------	--------
31	8	30.0	--------	43	--------	--------	--------

NOTE.—No flow June 15 to Dec. 15 and Dec. 20–28, 1927; June 1 to Dec. 25, 1928; May 13 to Sept. 30, 1929.

SUTTER CREEK NEAR VOLCANO

Location.—In sec. 22, T. 12 E., R. 7 N., about 1 mile southwest of Volcano, Amador County.

Drainage area.—Not measured.

Records available.—February 12, 1924, to September 30, 1927, when station was discontinued.

Equipment.—Water-stage recorder in concrete well and house on right bank. Discharge measurements made from cable 50 feet below gage or by wading.

Channel and control.—Sand, gravel, and small boulders. May shift somewhat. Banks high and not subject to overflow.

Extremes of discharge.—1924–1927: Maximum stage recorded, 5.3 feet at 1 a. m. February 6, 1925 (discharge, 1,560 second-feet); minimum discharge recorded, 0.1 second-foot September 11–15, 1924.

Diversions and regulation.—There are several small diversions above the station. Flow regulated at times by storage in settling basin of water diverted for hydraulic mining.

Accuracy.—Stage-discharge relation changes somewhat. Rating curves fairly well defined. Records good.

Monthly discharge of Sutter Creek near Volcano for the period February 12, 1924, to September 30, 1927

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1924				
February 12–19	7	4.0	4.83	172
March	30	3.8	8.67	533
April	23	3.8	7.38	439
May	4.2	.8	1.95	120
June	.7	.3	.41	24.4
July	.3	.1	.15	9.2
August	.1	.1	.10	6.1
September	.2	.1	.12	7.1
The period				1,310
1924–25				
October	24	0.2	1.68	103
November	217	2.1	13.2	786
December	61	5.5	18.2	1,120
January	33	11	17.5	1,080
February	585	14	126	7,000
March	99	20	37.6	2,310
April	130	56	82.2	4,890
May	54	18	34.2	2,100
June	18	6	11.6	690
July	7.5	2.2	4.29	264
August	2.3	1.5	1.83	113
September	3.5	2.0	2.78	165
The year	585	.2	28.5	20,600
1925–26				
October	7	2.0	3.34	205
November	7.5	4.2	5.50	327
December	20	4.2	7.51	462
January	56	4.2	7.88	485
February	159	19	61.5	3,420
March	26	6.5	16.4	1,010
April	102	6.5	32.7	1,950
May	17	3.0	9.33	574
June	3.0	1.5	2.32	138
July	1.5	.8	1.05	64.6
August	.8	.8	.80	49.2
September	1.1	.8	.85	50.6
The year	159	.8	12.0	8,740

Monthly discharge of Sutter Creek near Volcano for the period February 12, 1924, to September 30, 1927—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1926–27				
October	4.4	1.2	1.78	109
November	140	1.7	20.9	1,240
December	26	8.0	12.1	744
January	68	7.5	32.6	2,000
February	363	26	116	6,440
March	117	37	56.6	3,480
April	452	26	96.2	5,720
May	26	11	16.8	1,030
June	14	5.5	7.90	470
July	5.0	1.9	3.00	184
August	1.9	1.1	1.44	88.5
September	1.5	1.4	1.47	87.5
The year	452	1.1	29.9	21,600

SUTTER CREEK AT SUTTER CREEK

Location.—In sec. 7, T. 6 N., R. 11 E., three-eighths of a mile west of Sutter Creek, Amador County.

Drainage area.—Not measured.

Records available.—February 5, 1922, to September 30, 1928.

Equipment.—Staff gage in two sections on right bank 800 feet below footbridge. Discharge measurements made from footbridge or by wading.

Channel and control.—Large boulders and gravel. Willows on banks obstruct flow at high stages. One channel at all stages.

Extremes of discharge.—1922–1928: Maximum stage recorded, 7.5 feet (from flood marks) about 6 a. m. February 6, 1925 (discharge not determined); stream practically dry, except for town waste, during summer of 1924.

Diversions and regulation.—Stream is regulated to some extent by a small dam above town of Sutter Creek and release of mine water.

Accuracy.—Stage-discharge relation changes somewhat. Rating curve well defined below 400 second-feet. Staff gage read to hundredths twice daily. Records good except at high water, for which they are fair.

Monthly discharge of Sutter Creek at Sutter Creek for the period February 5, 1922, to September 30, 1928

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922				
February 5–28	1,630	27	322	15,300
March	305	68	118	7,260
April	265	45	93.9	5,590
May	75	28	42.6	2,620
June	24	5.5	15.9	946
July	10	.4	2.44	150
August	5.5	2.5	4.17	256
September	5.5	.8	2.24	133
The period				32,300

Monthly discharge of Sutter Creek at Sutter Creek for the period February 5, 1922, to September 30, 1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922–23				
October	18	1.5	5.36	330
November	180	5.5	32.0	1,900
December	3,240	13	326	20,000
January	1,050	40	186	11,400
February	123	75	97.6	5,420
March	89	49	63.3	3,890
April	600	62	155	9,220
May	68	24	44.2	2,720
June	31	13	21.8	1,300
July	15	4.9	8.72	536
August	8.5	3.2	4.61	283
September	14	4.0	5.62	334
The year	3,240	1.5	79.3	57,300
1923–24				
October	10	7	7.90	486
November	11	8	8.30	494
December	19	8	11.9	732
January	50	8	16.0	984
February	109	8	17.5	1,010
March	17	6.5	10.5	646
April	18	8	11.6	690
May	7.5	2.2	4.12	253
June	1.1	.7	0.81	48.2
July 1–5	.9	.8	0.82	8.1
The period	109	.7	----------	5,350
1924–25				
November	675	4.8	29.1	1,730
December	28	4.9	11.1	682
January	30	13	20.3	1,250
February	2,000	30	278	15,400
March	178	37	57.5	3,540
April	280	99	146	8,690
May	92	16	53.5	3,290
June	35	3.1	16.8	1,000
July	11	2.8	6.73	414
August	2.8	1.5	1.98	122
September	4.9	.9	1.57	93.4
The period	2,000	.9	----------	36,200
1925–26				
October	6	1.8	4.96	305
November	15	6.5	10.1	601
December	39	8.5	13.5	830
January	116	7.5	14.8	910
February	360	36	127	7,050
March	55	12	28.4	1,750
April	143	12	52.9	3,150
May	24	2.4	11.5	707
June	6.5	1.2	3.73	222
July	1.0	.8	0.88	54.1
August	1.3	.5	0.91	56.0
September	1.8	.8	1.27	75.6
The year	360	.5	21.7	15,700
1926–27				
October	8.5	2.0	4.17	256
November	300	6	51.5	3,060
December	44	2.0	19.5	1,200
January	218	15	49.9	3,070
February	500	38	208	11,600
March	135	28	60.2	3,700
April	650	33	179	10,700
May	32	12	21.7	1,330
June	19	4.2	11.5	685
July	4.0	0.8	2.16	133
August	1.3	0.5	0.76	46.7
September	7.0	0.5	0.92	54.7
The year	650	0.5	49.3	35,800

Monthly discharge of Sutter Creek at Sutter Creek for the period February 5, 1922, to September 30, 1928—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927–28				
October	9.5	1.7	3.15	194
November	129	5.5	18.6	1,100
December	525	9.5	35.8	2,200
January	37	11	19.4	1,190
February	425	13	43.6	2,510
March	2,640	13	254	15,600
April	425	16	87.9	5,230
May	19	9	15.6	959
June	12	4.0	6.30	375
July	5	1.9	3.14	193
August	1.7	1.4	1.45	89.2
September	1.6	1.3	1.41	83.9
The year	2,640	1.3	41.0	29,700

BEAR CREEK

Bear Creek is a small intermittent stream that heads near Valley Springs, in the low foothills of the Sierra Nevada, about 900 feet above sea level, flows in a general southwesterly direction for about 35 miles, and empties into the sloughs of the San Joaquin River near Stockton. Its drainage basin lies between the Mokelumne and Calaveras Rivers.

The upper part of the drainage basin is sparsely timbered and has a considerable covering of underbrush. Near Clements the creek leaves the low foothills and enters the rolling uplands, where the timber and brush has been cleared from the land to make it fit for grazing and agriculture. Southwest of Lodi, below the lower gaging station, the channel breaks up into several distributaries which eventually find their way into the sloughs of the delta country. Some of the lower channels of Bear Creek are utilized as drainage canals for waste water from the Woodbridge Canal. All the precipitation over the Bear Creek drainage basin occurs in the form of rainfall, hence the creek flows only during the rainy season and is very flashy.

BEAR CREEK NEAR CLEMENTS

Location.—In NE. ¼ sec. 28, T. 4 N., R. 8 E., 1 mile south of Clements, San Joaquin County.

Drainage area.—43 square miles.

Records available.—October 1, 1926, to September 30, 1927.

Equipment.—Water-stage recorder in timber well and shelter on left bank just below confluence of two channels of Bear Creek and below the highway bridge. Measurements made from the highway bridge.

Channel and control.—Bed of stream shale and gravel; should be fairly permanent.

Extremes of discharge.—Maximum stage during the year, from water-stage recorder, 8.6 feet at 8 p. m. February 3 (discharge, 755 second-feet); no flow October 1 to November 24, December 14 to January 5, and April 29 to September 30.

Diversions and regulation.—None.

Accuracy.—Stage-discharge relation slightly shifting. Rating curve well defined by 25 discharge measurements. Water-stage recorder record excellent. Daily discharge ascertained by applying mean daily gage height to rating table, except for March 4 to April 29, 1927, when shifting-control method was used. Records good.

Monthly discharge of Bear Creek near Clements for the year ending September 30, 1927

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November	160	0	14.3	851
December	13	0	1.18	72.6
January	233	0	20.5	1,260
February	364	4.3	88.0	4,890
March	29	1.0	5.86	360
April	166	0	9.90	589
The year	364	0	11.1	8,020

Note.—No flow October, 1926, and May to September, 1927.

Daily discharge, in second-feet, of Bear Creek near Clements for the year ending September 30, 1927

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1		3.6		4.3	10	21	16			20	262	6	1.7
2		4.5		7.5	8.5	22	17			17	66	4.9	1.7
3		13		316	16	166	18			7.5	364	4.1	1.2
4		4.3		292	16	32	19			6	76	3.2	1.1
5		2.2		69	9.5	13	20			48	46	2.4	1.1
6		1.4	233	104	6.5	7	21			18	66	2.2	1.1
7		3.6	42	43	5.5	5	22			8.5	79	2.0	1.1
8		2.2	16	23	5	3.9	23			5.5	32	1.8	1.1
9		1.0	9	17	5.5	3.4	24			4.5	74	1.6	.6
10		.3	53	12	6.5	2.6	25	55		4.1	42	1.6	.5
11		.2	30	10	4.5	2.2	26	148		16	24	1.2	.3
12		.1	14	8.5	4.1	2.2	27	160		27	18	1.1	.2
13		.1	8	7.5	3.9	2.0	28	40		13	13	1.1	.1
14			4.3	89	29	1.4	29	19		12		1.0	
15			7.5	298	12	1.4	30	6.5		7		1.4	
							31			5		3.7	

Note.—No flow Oct. 1 to Nov. 24, 1926, Dec. 14, 1926, to Jan. 5, 1927, and Apr. 29 to Sept. 30, 1927.

BEAR CREEK NEAR LOCKEFORD

Location.—In NE. ¼ sec. 14, T. 3 N., R. 7 E., at highway bridge 3 miles south of Lockeford, San Joaquin County.

Drainage area.—52 square miles.

Records available.—October 1, 1926, to September 30, 1928.

Equipment.—Water-stage recorder in timber well and shelter on left bank. Discharge measurements made from highway bridge or by wading.

Channel and control.—Soft shale, fairly permanent.

Extremes of discharge.—Maximum stage during 1928, from water-stage recorder, 10.29 feet at noon February 4 (discharge, 825 second-feet); no flow part of every month except April.

Diversions and regulation.—None.

Accuracy.—Stage-discharge relation not permanent. Rating curves poorly defined; 12 discharge measurements made during 1928. Water-stage recorder record excellent. Daily discharge ascertained by applying mean daily gage height to rating curves. Records fair.

Monthly discharge of Bear Creek near Lockeford for the years ending September 30, 1927–1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1926–27				
November	228	0	18.1	1,080
December	12	0	1.24	76.2
January	234	0	22.4	1,380
February	398	4.9	98.2	5,450
March	28	1.5	6.25	384
April	212	.3	13.0	774
May	.2	.1	.01	.6
The year	398	0	12.6	9,140
1927–28				
December	36	0	1.26	77.5
January	5.5	0	0.25	15.4
February	671	0	29.2	1,680
March	462	0	42.6	2,620
April	256	.5	18.5	1,100
May	.4	0	.02	1.2
The year	462	0	7.57	5,490
1928–29				
November	0.9	0	.06	3.6
December	43	0	2.98	183
January	238	.3	18.2	1,120
February	108	.4	11.5	639
March	13	.1	1.29	79.3
April	.1	0	.007	.4
The year	238	0	----------	2,030

Daily discharge, in second-feet, of Bear Creek near Lockeford for the years ending September 30, 1927–1929

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1926–27							
1	--------	4.3	--------	4.9	10	29	0.2
2	--------	2.8	--------	6	9	37	.1
3	--------	12	--------	294	13	212	--------
4	--------	6	--------	398	20	46	--------
5	--------	3.0	--------	57	10	15	--------
6	--------	1.7	234	104	7	8.5	--------
7	--------	1.7	79	46	6	6	--------
8	--------	3.3	20	26	5.5	4.8	--------
9	--------	1.6	11	18	6	3.9	--------
10	--------	.7	29	13	7	3.3	--------
11	--------	.4	37	10	6	2.7	--------
12	--------	.3	18	8.5	4.9	2.3	--------
13	--------	.3	10	7.5	4.0	2.8	--------
14	--------	.2	6.5	82	26	2.1	--------
15	--------	.1	6	390	14	1.9	--------
16	--------	.1	21	348	7	1.8	--------
17	--------	--------	23	67	5.5	1.8	--------
18	--------	--------	11	389	5	1.7	--------
19	--------	--------	7	80	4.0	1.2	--------
20	--------	--------	38	43	3.3	1.0	--------
21	--------	--------	25	50	2.7	.9	--------
22	--------	--------	11	80	2.4	.9	--------
23	--------	--------	6.5	37	2.1	.8	--------
24	--------	--------	5	78	1.9	.8	--------
25	39	--------	4.2	50	1.8	.5	--------
26	175	--------	6.5	28	1.6	.5	--------
27	228	--------	42	20	1.5	.4	--------
28	71	--------	15	14	1.5	.4	--------
29	20	--------	13	--------	1.5	.3	--------
30	9	--------	9	--------	1.5	.3	--------
31	--------	--------	6	--------	2.2	--------	--------

Daily discharge, in second-feet, of Bear Creek near Lockeford for the years ending September 30, 1927–1929—Continued

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1927–28							
1			0.6			12.0	0.4
2						107.0	.2
3				35.0		256.0	.1
4				671.0		67.0	
5				91.0		31.0	
6				25.0		19.0	
7				11.0		13.0	
8				6.0		9.0	
9				3.0		6.0	
10				2.0		4.6	
11				1.0		4.0	
12				.5		3.8	
13						3.0	
14						2.5	
15						2.2	
16						1.9	
17						1.6	
18						1.4	
19						1.3	
20						1.2	
21						1.1	
22						1.0	
23						1.0	
24			5.5		36	.9	
25			.8		324	.8	
26					234	.8	
27					462	.7	
28					176	.7	
29					46	.6	
30		36	.5		26	.5	
31		3	.4		18		
1928–29							
1			1.0	1.2	1.0	.1	
2			.7	23.0	.6	.1	
3			.6	24.0	.4		
4			8.5	108.0	.3		
5			4.0	71.0	.2		
6			2.4	25.0	.2		
7			1.6	18.0	.2		
8			1.1	10.0	.3		
9			.8	6.5	.3		
10			.5	5.0	1.6		
11			.4	4.0	13.0		
12			.4	3.3	5.0		
13		8.0	.3	2.9	3.8		
14		6.5	.3	2.5	3.7		
15	0.2	2.3	.3	2.2	2.1		
16	.3	1.2	104.0	1.8	1.5		
17	.9	.8	21.0	1.6	1.0		
18	.3	.4	8.5	1.6	.8		
19	.1	.3	93.0	1.7	.6		
20		.2	238.0	1.4	.5		
21		.1	31.0	1.3	.5		
22		.1	15.0	1.1	.4		
23		.1	10.0	1.0	.4		
24		.1	6.5	.9	.4		
25		43.0	4.0	.7	.2		
26		14.0	2.9	.7	.2		
27		5.5	2.2	.6	.2		
28		2.9	1.8	.4	.2		
29		2.8	1.5		.2		
30		2.6	1.3		.2		
31		1.6	2.1		.1		

NOTE.—No flow Oct. 1 to Nov. 24, 1926; Dec. 17, 1926, to Jan. 5, 1927; May 3 to Dec. 29, 1927; Jan. 2–23, 26–29, Feb. 1–2, 13–29, Mar. 1–23, May 4 to Sept. 30, 1928; Oct. 1 to Nov. 14, Nov. 20–30, Dec. 1–12, 1928; practically dry Apr. 3 to Sept. 30, 1929.

GOOSE CREEK

Goose Creek, a tributary to Dry Creek, is an intermittent stream which has its source in the rolling upland country north and east of Clements, at about 300 feet above sea level. The creek is about 7 miles long and drains a small area lying between Dry Creek and the Mokelumne River. This area has a very shallow soil cover and is underlain by the sandstone and clay beds of the Ione formation. The drainage area of 10.4 square miles is devoid of timber and brush and is used principally for grazing.

A gaging station was maintained near the mouth of Goose Creek during the rainy season of 1926–27, equipped with a Stevens type E 8-day water-stage recorder. However, when the records were compiled they were found to be incomplete on account of the backwater effects from Dry Creek. The gaging station was moved during the summer of 1927 to a location about 4,000 feet farther upstream, in order to place it above such effects.

GOOSE CREEK NEAR ELLIOTT

LOCATION.—In SW. ¼ sec. 29, T. 5 N., R. 8 E., 1½ miles above mouth and 4½ miles northeast of Elliott, San Joaquin County.

DRAINAGE AREA.—8.5 square miles.

RECORDS AVAILABLE.—October 1, 1927, to September 30, 1928.

EQUIPMENT.—Water-stage recorder in wooden well and shelter on left bank half a mile above highway bridge on road from Elliott. Measurements made by wading or from a gaging bridge 150 feet below gage.

CHANNEL AND CONTROL.—Clay and gravel; fairly permanent except that extreme high water causes a scour of the banks. Control is a low grass-grown bar of gravel and clay, permanent for low flows.

EXTREMES OF DISCHARGE.—Maximum stage during the year, from water-stage recorder, 5.36 feet at 9 a. m. March 25 (discharge, 271 second-feet); no flow several months during the year.

DIVERSION AND REGULATION.—None.

ACCURACY.—Stage-discharge relation not changed during the year. Rating curve well defined; 21 discharge measurements made during the year. Water-stage recorder record excellent. Daily discharge ascertained by applying mean daily gage height to rating table except on days of large change in stage, for which hourly discharge was averaged. Records good.

Monthly discharge of Goose Creek near Elliott for the years ending September 30, 1928 and 1929

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1927-28				
December	65	0	2.62	161
January	40	.2	2.34	144
February	137	.4	9.05	521
March	159	.1	12.1	744
April	38	0	2.83	168
The year	159	0	2.39	1,740
1928-29				
November	3.0	0	.17	10.1
December	21	0	1.98	122
January	88	.7	8.49	522
February	44	.1	4.42	245
March	5.5	0	.50	30.7
The year	88	0	----------	930

Daily discharge, in second-feet, of Goose Creek near Elliott for the years ending September 30, 1928 and 1929

Day	Dec.	Jan.	Feb.	Mar.	Apr.	Day	Nov.	Dec.	Jan.	Feb.	Mar.
1927-28						1928-29					
1	-------	4.0	1.8	0.4	2.5	1	-------	-------	1.0	4.2	0.1
2	-------	3.2	2.0	.4	38.0	2	-------	-------	.7	11.0	.1
3	-------	2.3	55.0	.7	22.0	3	-------	-------	9.5	13.0	.1
4	-------	2.0	137.0	.8	10.0	4	-------	-------	5.0	44.0	-------
5	-------	1.6	21.0	.6	4.5	5	-------	-------	2.8	12.0	-------
6	-------	1.5	12.0	.4	2.8	6	-------	-------	2.0	11.0	-------
7	-------	1.3	6.0	.3	1.6	7	-------	-------	1.5	7.5	-------
8	-------	1.1	5.0	.4	1.0	8	-------	-------	1.1	4.2	-------
9	-------	1.0	3.8	.7	.6	9	-------	-------	.8	3.2	.3
10	-------	.8	3.0	.7	.5	10	-------	-------	.8	2.3	5.5
11	-------	.7	2.5	.5	.2	11	-------	-------	.7	2.2	3.5
12	-------	.7	2.2	.4	.3	12	-------	-------	.7	1.8	1.3
13	-------	.7	2.0	.4	.2	13	-------	6.0	.7	1.3	1.8
14	-------	.7	1.6	.3	.1	14	-------	1.8	.7	1.1	.8
15	-------	.6	1.1	.2	.1	15	3.0	.8	1.3	.8	.5
16	0.1	.4	.7	.2	.1	16	1.5	.5	51.0	.7	.4
17	.1	.4	.6	.1	.1	17	.3	.4	8.0	.6	.2
18	-------	.4	.6	.1	.1	18	.1	.3	11.0	.6	.2
19	-------	.3	.6	.1	.1	19	.1	.1	88.0	.5	.1
20	-------	.3	.5	.1	-------	20	-------	.1	36.0	.4	.1
21	-------	.2	.4	.1	-------	21	-------	.1	11.0	.3	.1
22	-------	.3	.4	.1	-------	22	-------	.1	7.0	.2	.1
23	-------	24.0	.3	3.8	-------	23	-------	.1	4.8	.2	.1
24	-------	5.5	.3	21.0	-------	24	-------	14.0	3.5	.2	.1
25	-------	2.3	.4	159.0	-------	25	-------	21.0	3.0	.1	-------
26	-------	1.3	.4	64.0	-------	26	-------	5.0	2.3	.1	-------
27	-------	.8	.4	78.0	-------	27	-------	3.0	2.0	.1	-------
28	-------	.8	.4	26.0	-------	28	-------	2.8	1.6	.1	-------
29	65.0	7.0	.4	7.5	-------	29	-------	2.3	1.6	-------	-------
30	11.0	4.0	-------	4.0	-------	30	-------	1.6	1.5	-------	-------
31	5.0	2.2	-------	3.0	-------	31	-------	1.3	1.5	-------	-------

NOTE.—No flow Oct. 1 to Dec. 15 and Dec. 18-28, 1927; Apr. 20 to Nov. 14 and Nov. 20 to Dec. 12, 1928; Mar. 4-8, Mar. 25 to Sept. 30, 1929.

AREA OF DRAINAGE BASINS

The area of the drainage basin above each gaging station was determined from the topographic maps of the United States Geological Survey. All drainage areas were determined by the use of a planimeter except that of the Mokelumne River Basin above Clements, which was taken from previous water-supply papers.

Drainage areas in the Mokelumne River Basin

	Square miles
Mokelumne River:	
Above Big Bar gaging station	539
Above Pardee Dam	575
Above Lancha Plana gaging station	584
Above Clements gaging station	632
Above Woodbridge gaging station	648
Above Thornton	690
Dry Creek:	
Above Forni's gaging station (near Ione)	279
Above Galt gaging station	346
Bear Creek:	
Above Clements gaging station	43
Above Lockeford gaging station	52
Goose Creek:	
Above Elliott station (1927)	10. 4
Above Elliott station (1928)	8. 5

DIVERSIONS FROM MOKELUMNE RIVER

GRAVITY DIVERSIONS

Above the gaging station near Lancha Plana most of the diversions from the Mokelumne are effected by gravity. The Pacific Gas & Electric Co. has the largest diversion system in operation at the present time. The water diverted is used for power development and is all returned to the river. Ditches that were used for mining still exist, but diversions for mining are now very small. The East Bay Municipal Utility District has built a dam on the Mokelumne River about 3 miles above the Lancha Plana gaging station, to divert water to Oakland and adjoining cities for municipal use. This dam is about 350 feet high and will impound about 220,000 acre-feet. The initial capacity of the diversion system is to be about 75 second-feet. The completed project will furnish about 200,000,000 gallons of water a day to the East Bay cities.

Near Lancha Plana is the head of a small diversion ditch which was originally used by a gold dredging company but is now owned by Kreed, Hockenbeamer & Leach. It is maintained by local ranchers in return for the use of the water and is used to irrigate about 40 acres of land. The ditch parallels the bank of the Mokelumne River, in places running through pools made by gold dredgers, where considerable leakage occurs, but all the water eventually returns to the river through the river gravel. A few miscellaneous discharge measurements were made on this ditch, the largest of which showed about 3 second-feet near Lancha Plana. The flow in the ditch is very irregular, and no attempt was made to measure accurately the total amount of water diverted. A list of measurements made on this ditch is given in the subjoined table. With a use of water of 1.5 acre-feet per acre for the land under this ditch it is estimated that 60 acre-feet of water was diverted through the ditch.

Measurements of Lancha Plana diversion ditch

Date	Made by	Point of measurement	Discharge (second-feet)
Apr. 28, 1926	L. S. Hall	Headgates near Lancha Plana	3.02
Do	do	do	2.9
May 25, 1926	do	do	2.4
Aug. 11, 1926	B. S. Barnes	Crossing under highway at Cavagnero's ranch	.58
Sept. 16, 1926	B. S. Barnes and G. H. Taylor.	do	.75
May 12, 1927	G. H. Taylor	do	[a] 1.13
May 17, 1927	do	do	1.61
June 14, 1927	do	do	.89
June 30, 1927	do	do	.0
July 11, 1927	do	do	[b] .2
July 19, 1927	do	do	[b] .6
July 25, 1927	do	do	[b] .5
Aug. 13, 1927	do	do	.0

[a] Ditch started carrying water about Apr. 25, 1927.

[b] Estimated.

Two diversion gates, each 4 feet square, are located about 1 mile above the river bridge at Lockeford. The gates are on the south bank of the river and are placed in the levee of the Lockeford Protective District. Water can be diverted through these gates only during flood periods, when the river is high. About 40 acres of orchard is now flooded during the years when the flood waters are high enough to overtop the gate crest. It is estimated that about 50 acre-feet was diverted from the river during 1926 and 1927 by these gates. A small lake or slough near Lockeford also gets its principal supply of water from this source. The lake is used for watering stock, and a pump has been installed on its bank to raise water for irrigation, but the pump has not been used since 1925.

The next gravity diversion downstream from the Lockeford gates is at the Woodbridge Dam. The water diverted at this place is measured at the Woodbridge Canal gaging station.

During the operation of a small hydraulic gold mine at Lancha Plana water is diverted from Jackson Creek into the Mokelumne River. This plant operates only during the winter, when water can be obtained from Jackson Creek. It is the only place between the Pardee Dam and tidewater where water is diverted into the Mokelumne River in any appreciable amount. Measurements of the water used to operate the hydraulic mine on April 13 and May 5, 1927, gave 6.5 and 5.5 second-feet respectively.

Water diverted from Jackson Creek into Mokelumne River at the Lancha Plana placer mine

Date	Hours used [a]	Rate of discharge (second-feet)	Quantity (acre-feet)
1925			
December	148	3	37
1926			
January	64 96	3 6	16 48
February	163	6	81
March	144	6	71
April	92	6	46
May	80	6	40
			339
1927			
January	196	6	97
February	192	6	95
March	112	6	56
April	184	5	76
May	58	6	29
June	22	6	11
			364
1928			
January	128	6	64
February	200	6	99
March	192	6	95
April	0	0	0
May	31	6	15
			273

[a] From California Débris Commission, War Department.

PUMPING DIVERSIONS

RECORDS FOR 1926 AND 1927

Records of all pumping plants that pump from the Mokelumne River between the gaging stations near Thornton and near Lancha Plana were obtained during 1926 and 1927. The location of these plants is shown on Plate 5. They are numbered according to their position in upstream order, No. 1 being the first plant above the gaging station near Thornton. There are 57 pumps between the two stations, of which 37 were in operation during 1926 and 43 during 1927.

All the pumps but one are horizontal centrifugal pumps; the other one is a 5 by 5 inch double-acting plunger pump. The centrifugal pumps include two 3-inch, twelve 4-inch, eleven 5-inch, thirteen 6-inch, one 7-inch, four 8-inch, eight 10-inch, one 12-inch, one 14-inch, two 15-inch, and one taken out and size unknown; 63 per cent were of the 4, 5, and 6 inch sizes. Most of the plants are well housed, but some are only partly sheltered or have no shelter. The location of one or two of the pumps is only temporary, and they can be moved up or down the river bank to conform to the stage of the river.

Of the 57 plants 29 were electrical installations, with a total of 870 horsepower; 19 were gasoline or oil engines, with 323 horsepower;

and 9 were obsolete or not in use, so that no horsepower record was available. The 48 plants on which power units were installed had a total of 1,193 horsepower, or an average of 25 horsepower per plant.

The rate at which each of these pumps delivers water varies greatly. The suction head of the pump is continually changing with the stage of the river, and the discharge head depends upon the point at which the water is taken from the distribution line. The discharge head is constant for the pumps discharging directly into ditches. Nearly all the pumps draw sticks and other rubbish up the suction pipe, even though screens are used over the intakes. Pumps 10 and 21 have valves in either the discharge or suction pipes, which can be used to regulate the flow. Because of these variable conditions it is impossible to arrive at the actual amount of water pumped unless some means is employed to measure the total amount of water that is discharged from each pump during the entire season. Measurements on the pumps give the discharge only for the particular time and condition when they are made, and as the conditions of pumping are continually changing, estimates of the total amount of water discharged are only approximately correct. For each individual pump the errors in computing the total discharge on the basis of a few measurements may be either cumulative or compensating. However, the computation of the amount of water delivered by a number of pumps over a relatively long period is believed to be approximately correct.

Measurements of discharge were made with a small Price current meter. Considerable difficulty was encountered in getting the water into suitable ditches for measurement wherever the water was distributed through pipe lines. It was not possible to determine the leakage in the underground pipe lines, but wherever conditions required it this leakage was estimated and added to the measured discharge of the pump. Good measuring sections were found for all pumps that distributed the water through ditches. A few measurements were made with weirs, but owing to the slight gradient of the ditches it was very difficult to make satisfactory weir installations. The results from measurements on all pumps are representative of actual field conditions rather than of ideal conditions of pumping. The measurements on the centrifugal pumps ranged from about 225 to about 6,000 gallons a minute.

The static head is the difference in altitude between the water level on the suction side of the pump and the water level or end of the discharge pipe on the discharge side of the pump, as determined by a hand level. The static head against which the pumps work ranged from about 6 to about 75 feet, and the average was about 25 feet

The kilowatt input was determined by timing the revolutions of the meter disk with a stop watch and applying constants obtained from the power company.

The average electrical energy used in kilowatt-hours per acre-foot of water pumped was computed by using the average kilowatt input and the average discharge of the measurements made.

The power used was obtained from the power company's records and from field readings of the meters.

An attempt was made to get records of operation from the owners or operators of the pumps. Many of these records were incomplete, but a special effort was made to obtain accurate records on plants operated by gas or oil.

The quantity of water pumped in acre-feet was calculated by using the electrical power consumed, the record of operation, or a combination of power used and record of operation, or by estimating the use of water. The particular method used for any plant was the one that a personal knowledge of the local conditions seemed to indicate as most reliable. Diversions by most of the electrical installations were computed from the power consumption. About 3,460 acre-feet of water was pumped in 1926 and about 3,536 acre-feet in 1927.

The acreage and the kinds of crops irrigated were determined by field examination, by questioning the owners, and by measurements made on airplane photographs. The airplane photographs were a great aid in determining the correct location and area of the irregular tracts along the river. In 1926 water pumped from the river was used to irrigate 493 acres of orchard, 1,023 acres of vineyard, 315 acres of alfalfa, and 275 acres of miscellaneous crops, or a total of 2,106 acres; in 1927, 524 acres of orchard, 1,130 acres of vineyard, 300 acres of alfalfa, and 249 acres of miscellaneous crops, or a total of 2,203 acres.

The use of water for all crops on the land irrigated from the river averaged about 1.6 acre-feet per acre annually in 1926 and 1927 and ranged from about 0.45 to about 4.50 acre-feet. The use of water on any particular kind of crop irrigated from the river could not be determined, because of the diversity of crops irrigated by each pump and the impossibility of ascertaining how much pumping was done for each crop. A few pumps were used to irrigate some particular crop, but the acreage covered and the number of pumps were not large enough to warrant computing an average use of water for any one crop.

The cost of electric power and the "demand charge" (fixed charge based on horsepower of motor) were obtained from the local power company. A schedule of the electric charges is given in the discussion of tests of use of water on pumps operating on wells (p. 265).

The power cost per acre-foot of water pumped includes the cost of power actually used plus the demand charge. The weighted average cost per acre-foot of water pumped by all electrical plants was about $1.95 in 1926 and about $2.20 in 1927. The weighted average cost for the two years was about $2.08.

The power cost per acre irrigated includes the cost of power used plus the demand charge. The weighted average cost per acre irrigated was about $3.34 in 1926 and about $3.23 in 1927. The weighted average cost for the two years was about $3.29.

If all the pumps used in 1927 had been in operation at the same time, they would have diverted about 130 cubic feet of water per second from the Mokelumne River. If they were all operated simultaneously at their probable maximum capacity, they would divert about 160 cubic feet per second.

Many of the pumps are too large for the amount of land that is irrigated from them, and smaller pumps, although requiring a longer period of irrigation, would be much more economical. On account of the demand charge for an electrical installation, the pump selected should be of such a size that it could be run the maximum amount of time possible.

Seven of the plants were installed before 1900, 9 from 1901 to 1910, 18 from 1911 to 1920, and 19 from 1921 to 1927. The date of installation was not available for 4 of the 57 plants.

A description of all pumps recorded and the tests made on them is given in the following pages.

1. S. P. FRANDY

Location.—NW. ¼ SE. ¼ sec. 12, T. 4 N., R. 5 E.

First installation.—1925.

Power.—Fordson tractor.

Pump.—A belt-driven Byron Jackson 3-inch horizontal centrifugal pump was used in 1926 and was replaced by a 6-inch horizontal centrifugal pump in 1927. The pump is placed at a high or low level to correspond to the stage of the river, and the water is distributed through ditches.

Area irrigated.—About 8 acres of onions and 2 acres of beans were irrigated in 1926, and about 20 acres of onions and 10 acres of sudan grass in 1927.

Test.—A fair measuring section was found, and one measurement was made on each of the pumps with a current meter. On August 3, 1926, the discharge of the 3-inch pump was about 370 gallons a minute, and on August 3, 1927, the discharge of the 6-inch pump was about 785 gallons a minute. The record of operation for 1926 was incomplete, and a use of water of 1 acre-foot per acre was estimated. The record of operation for 1927 was 149.5 hours. As the measurement of discharge for 1927 was made when the river was at a low stage and the owner's record shows that about 70 per cent of the pumping was done when the river was high, the average discharge for 1927 was estimated to be 900 gallons a minute. Therefore the estimated amount of water pumped in 1926 was 10 acre-feet and in 1927 was 25 acre-feet.

2. MARION DEVRIES

Location.—NE. ¼ SW. ¼ sec. 8, T. 4 N., R. 6 E.

First installation.—Unknown.

Power.—60-horsepower Westinghouse motor.

Pump.—Direct-connected 14-inch Krogh horizontal centrigufal pump; twin 12-inch intake.

Area irrigated.—About 12 acres of alfalfa was irrigated in 1926 and 1927.

Test.—Three discharge measurements were made. After the first measurement the pump was cleaned, and blocks of wood, sticks, and other rubbish were found. The water is distributed through ditches, and the measuring section was good. On May 7, 1927, the pump was discharging 2,120 gallons a minute with a 6-foot static head. The power input was 20.40 kilowatts, and the power input per acre-foot of water pumped was 52.1 kilowatt-hours. On May 24, 1927, the pump was discharging 5,660 gallons a minute. The static head was 14 feet, and the power input was 41.93 kilowatts, which is equal to 40.1 kilowatt-hours per acre-foot irrigated. On August 17, 1927, the discharge of the pump was 5,070 gallons a minute with a static head of 19 feet. The power input was 45.50 kilowatts, which equals 48.6 kilowatt-hours per acre-foot of water pumped. The power consumption in 1926 was 2,688 kilowatt-hours; in 1927, 1,664 kilowatt-hours. The power input in 1926 was estimated to be 52.1 kilowatt-hours per acre-foot pumped, which gave 51 acre-feet of water pumped. The power consumption for the first irrigation in 1927 was approximately 576 kilowatt-hours. The power input of 52.1 kilowatt-hours per acre-foot gives a total of 11 acre-feet of water pumped during the first irrigation. The average power input for the rest of the 1927 season was 44.3 kilowatt-hours per acre-foot, which for the remaining power consumption of 1,088 kilowatt-hours gives a total pumpage of 25 acre-feet of water. No record of hours in operation was available. The total amount of water pumped in 1927 was therefore about 36 acre-feet. The use of water was thus 4.25 acre-feet per acre for 1926 and 3 acre-feet per acre for 1927.

This pump is very much too large for the area irrigated, as is shown by the cost of the water pumped. The cost for electric power for 1926 was $29.57, and the demand charge of $270 for a plant of this size brings the total power cost to $299.57. For 1927 the power cost was $18.30, and the total power cost, including the demand charge of $270, was $288.30. Thus, the cost per acre-foot of water pumped ranges from about $6 for 1926 to $8 for 1927; and the cost per acre irrigated for 1926 and 1927 is $24.96 and $24.03, respectively. The demand charge of the electric company prohibits the profitable operation of a plant of this size for the area irrigated. Either a smaller plant should be installed or the irrigated area increased. The cost per acre-foot of water pumped is too high for a pump of this size, and a thorough overhauling of the plant would probably lower it. The collection of rubbish in the pump increases this cost, which could be overcome by the installation of a suitable strainer on the suction pipe.

3. L. ABBA

Location.—NE. ¼ NE. ¼ sec. 21, T. 4 N., R. 6 E.

First installation.—About 1915.

Power.—5-horsepower Crocker-Wheeler motor.

Pump.—Belt-driven 3-inch Samson horizontal centrifugal pump.

Area irrigated.—2 acres of orchard, 2 acres of garden, and 5 acres of vineyard were irrigated in 1926 and 1927.

Test.—Two measurements were made. Water is distributed through ditches, and the measuring section was good. The measurement made June 11, 1927, gave the discharge of the pump as 320 gallons a minute with a static head of about 12 feet. The power input was 5.22 kilowatts, or 88.6 kilowatt-hours per acre-foot of water pumped. The measurement made June 14, 1927, gave a discharge of 235 gallons a minute, with a static head of about 11 feet and a power input of 4.46 kilowatts, or 103 kilowatt-hours per acre-foot of water pumped. The average of the two measurements was 278 gallons a minute, and the average power consumption per acre-foot of water pumped was 96.6 kilowatt-hours. The power consumption for 1926 was 464 kilowatt-hours; for 1927, 587 kilowatt-hours. The record of operation for 1926 was 103 hours; for 1927, 130.5 hours. The amount of water pumped, calculated from power consumption, was 4.8 acre-feet in 1926 and 6.1 acre-feet in 1927; calculated from the record of operation it was 5.3 acre-feet in 1926 and 6.8 acre-feet in 1927. The average amount of water pumped, as calculated from power consumption and from the owner's record, was 5 acre-feet in 1926 and 6.5 acre-feet in 1927. Thus the use of water was 0.56 acre-foot per acre in 1926 and 0.72 acre-foot per acre in 1927. The total electric cost for 1926 was $36.49 and for 1927 was $38.22, including a demand charge of $30 for each year. The cost of pumping per acre-foot was $7.30 for 1926 and $5.89 for 1927; the cost per acre irrigated was $4.05 for 1926 and $4.25 for 1927. This plant could probably handle a larger acreage, by which the cost per acre-foot of water pumped would be reduced. However, the plant is small, and to reduce the cost per acre-foot pumped to or below the average would require a larger pumping unit.

4. A. TADDEI

Location.—NE. ¼ NE. ¼ sec. 21, T. 4 N., R. 6 E.

First installation.—About 1905.

Power.—15-horsepower Westinghouse motor.

Pump.—Belt-driven 5-inch Monarch horizontal centrifugal pump.

Area irrigated.—About 15 acres of vineyard in 1926 and 1927 plus about 5 acres of alfalfa in 1927.

Test.—Two tests were made. The water was distributed through ditches, and the measuring section was good. A measurement made June 11, 1927, gave a discharge of about 950 gallons a minute, with a static head of 12 feet. The power input was 10.5 kilowatts, or 60.1 kilowatt-hours per acre-foot pumped. A measurement made August 16, 1927, gave a discharge of about 860 gallons a minute, with a static head of 26 feet. The power input was 9.36 kilowatts, or 59.2 kilowatt-hours per acre-foot pumped. The average discharge of the pump was 905 gallons a minute, and the average power consumption was 59.6 kilowatt-hours per acre-foot of water pumped. The total power consumption in 1926 was 1,460 kilowatt-hours; in 1927, 860 kilowatt-hours. The amount of water pumped, computed from the power consumption, was about 25 acre-feet in 1926 and about 15 acre-feet in 1927. A complete record of hours of operation is not available. The use of water was 1.67 acre-feet per acre in 1926 and 0.75 acre-foot per acre in 1927. The total electric cost for the operation of the pump in 1926 was $98.52 and in 1927 was $91.32, of which $81 was the demand charge in each year. The power cost of pumping per acre-foot of water was $3.94 in 1926 and $6.08 in 1927. The power cost per acre irrigated in 1926 was $6.56; in 1927, $4.56. This pump could be used more economically on a larger acreage.

5. L. T. MASON

Location.—NW. ¼ NW. ¼ sec. 2, T. 3 N., R. 6 E.

A small horizontal centrifugal pump was used only a short time in 1926 at this place. The pump was taken out in 1926, and the owner states that he does not intend to replace it. Water was distributed through pipe lines, connected with pumps operating on wells.

6. H. BECHTHOLD

Location.—SE. ¼ SE. ¼ sec. 36, T. 4 N., R. 6 E.

First installation.—About 1917.

Power.—6-horsepower gasoline engine.

Pump.—4-inch horizontal centrifugal pump. The location is temporary, and the pump is moved each year it is used.

Area irrigated.—There was no irrigation in 1926; 13 acres of vines were irrigated in 1927.

Test.—No test was made. Water has been used only for four years since the pump was first installed. A discharge of 425 gallons a minute was estimated for the pump, and the owner reported 120 hours of operation in 1927. The amount of water pumped in 1927 was therefore about 10 acre-feet, and the use of water was about 0.77 acre-foot per acre. A part of the water pumped was storage water from a small slough by the river.

7. GEORGE LAWRENCE

Location.—SW. ¼ SW. ¼ sec. 31, T. 4 N., R. 7 E.

First installation.—1886.

Power.—15-horsepower Robbins & Myers motor.

Pump.—Direct-connected 6-inch Vans horizontal centrifugal pump.

Area irrigated.—In conjunction with pump 8, 45 acres of orchard and 125 acres of vines were irrigated in 1926 and 1927. Of this land, 5 acres of orchard and 5 acres of vines belong to Jacob Gering.

Test.—Two measurements were made. Water was distributed through pipe lines in conjunction with pump 8. The measuring section was good, but the leakage in the pipe line was large. A measurement made June 7, 1927, gave a discharge of 1,130 gallons a minute, 5 per cent having been added for pipe-line leakage. The static head was 18 feet; the power input was 16.0 kilowatts, or 76.9 kilowatt-hours per acre-foot of water pumped. A measurement made August 10, 1927, gave a discharge of 700 gallons a minute, 5 per cent having been added for pipe-line leakage. The static head was 26 feet; the power input was 12.70 kilowatts, or 98.6 kilowatt-hours per acre-foot of water pumped. The average of the two measurements was 915 gallons a minute, and the average power consumption was 85.2 kilowatt-hours per acre-foot of water pumped. The amount of water pumped in 1926 was 177 acre-feet; in 1927, 127 acre-feet.

8. GEORGE LAWRENCE

Location.—SW. ¼ SW. ¼ sec. 31, T. 4 N., R. 7 E.

First installation.—1886.

Power.—30-horsepower Robbins & Myers motor.

Pump.—Direct-driven 10-inch Superior horizontal centrifugal pump.

Area irrigated.—See pump 7.

Tests.—Two measurements were made. Water was distributed through pipe lines in conjunction with pump 7. The measuring section was good, but leakage in the pipe line was large. A measurement made June 7, 1927, gave a discharge of 2,180 gallons a minute, 7 per cent having been added for leakage in the pipe line. The static head was 18 feet; the power input was 28.80 kilowatts, or 71.8 kilowatt-hours per acre-foot of water pumped. A measurement made on August 10, 1928, gave a discharge of 1,960 gallons a minute, 7 per cent having been added for leakage in the pipe line. The static head was 26 feet; the power input was 28.20 kilowatts, or 78.1 kilowatt-hours per acre-foot of water pumped. The average of the two measurements was 2,070 gallons a minute, and the average power consumption was 74.7 kilowatt-hours per acre-foot of water pumped.

As pumps 7 and 8 had the same meter, the power consumption of both pumps was combined. It was 39,840 kilowatt-hours in 1926 and 28,560 kilowatt-hours in 1927. The incomplete record of operation for 1926 gave 312 hours of operation for pump 7 and 280 hours of operation for pump 8. This record was not considered in these computations. The owner's record for 1927 gave 423 hours of operation for pump 7 and 686 hours of operation for pump 8. An estimate of the power consumption of each pump was made from the available records of the pumps. This division gave the power consumption for pump 7 as 15,140 kilowatt-hours in 1926 and 10,880 kilowatt-hours in 1927. Pump 8 then used 24,700 kilowatt-hours in 1926 and 17,680 kilowatt-hours in 1927. Therefore, pump 7 delivered about 177 acre-feet of water in 1926 and about 127 acre-feet of water in 1927. Pump 8 delivered about 331 acre-feet of water in 1926 and about 237 acre-feet of water in 1927. Thus the use of water was 2.99 acre-feet per acre in 1926 and 2.14 acre-feet per acre in 1927.

The total electric cost for both pumps was $613.08 and $585.72 in 1926 and 1927, respectively. The demand charge for the two pumps is $243 a year. The electric cost for both pumps combined was $1.21 per acre-foot of water pumped in 1926 and $1.61 per acre-foot of water pumped in 1927. These costs are both below the average. However, there is a larger possibility of error in the computations of total amount of water delivered by these pumps than there is for the average pump. The cost per acre irrigated for both pumps combined was $3.60 in 1926 and $3.44 in 1927.

9. P. O. CLARK

Location.—NW. ¼ NE. ¼ sec. 31, T. 4 N., R. 7 E.

First installation.—1922.

Power.—8-horsepower Fairbanks-Morse gasoline engine.

Pump.—Belt-driven 4-inch Golden West horizontal centrifugal pump.

Area irrigated.—5 acres of vines and miscellaneous crops during 1926 and 1927.

Test.—No test was made on the pump, but an estimated use of water of 1 acre-foot per acre per year gives 7.5 acre-feet of water pumped each year. Water used by this pump is obtained from the flood waters of the river, and there is no direct connection from the pump to the river.

10. S. POKERT

Location.—NE. ¼ SE. ¼ sec. 31, T. 4 N., R. 7 E.

First installation.—Unknown.

Power.—40-horsepower Westinghouse motor.

Pump.—Belt-driven 10-inch Monarch horizontal centrifugal pump. Cut-off plates having about 4-inch and 5-inch openings are placed between the pump outlet and the discharge pipe, to regulate the quantity of water desired.

Area irrigated.—The pump is used to irrigate Mr. Pokert's and Mr. Mettler's land, including 17 acres of orchard, 40 acres of vines, and 28 acres of alfalfa in 1926 and 1927.

Test.—Two measurements were made, both under unsatisfactory ditch conditions. Water is distributed through pipe lines. The measurement made October 4, 1926, gave a discharge of 915 gallons a minute, 2 per cent having been added for pipe-line leakage. The 5-inch cut-off was in place on the pump, and the measuring sections were only fair. The power input was 19.0 kilowatts, or 112.9 kilowatt-hours per acre-foot of water pumped. A measurement made April 8, 1927, gave a discharge of 730 gallons a minute. The measurement was made with the water flowing in three different ditches and was very unsatisfactory. The static head was 25 feet; the power input was 16.95 kilowatts, or 126 kilowatt-hours per acre-foot of water pumped. These measurements indicated that the average discharge of the pump was about 825 gallons a minute and the average power input was 17.98 kilowatts, or 118.3 kilowatt-hours per acre-foot of water pumped. The total power consumption in 1926 was 23,280 kilowatt-hours; in 1927, 15,060 kilowatt-hours. However, as the motor operated a wood saw in both years, and there was no record available of the power thus used, the power consumed in operating the pump can not be determined. No records of the hours of operation of the pump were available. A use of water of 1.50 acre-feet per acre per year was estimated, which gave 128 acre-feet of water pumped each year. The cost per acre-foot of water pumped and the cost per acre irrigated can not be computed because of insufficient data.

11. A. WERNER

Location.—NW. ¼ NW ¼ sec. 5, T. 3 N., R. 7 E.

This is a belt-driven 4-inch Monarch horizontal centrifugal pump. It was last used in 1922 to irrigate 10 acres of vineyard. The owner states that he does not intend to use the pump again. Water for irrigation is now being taken from a well.

12. F. G. CAREY

Location.—NW. ¼ NE. ¼ sec. 5, T. 3 N., R. 7 E.

First installation.—1922.

Power.—15-horsepower Sampson gasoline engine.

Pump.—Belt-driven 5-inch Krogh horizontal centrifugal pump.

Area irrigated.—10 acres of orchard and 17 acres of vines in 1926 and 1927.

Test.—One measurement was made. Water is distributed through pipe lines. The conditions for measurement were fair, but there was probably some pipe-line leakage. The measurement made April 11, 1927, gave a discharge of about 500 gallons a minute. The pumping record for 1927 was 548 hours of operation with the pump discharging 500 gallons a minute and 70 hours with the engine throttled and an estimated pump discharge of 350 gallons a minute. Thus the amount of water pumped in 1927 was about 55 acre-feet. The record of operation in 1926 was 456 hours, which, with the pump discharging 500 gallons a minute, gives 42 acre-feet of water pumped. The use of water was therefore 1.56 acre-feet per acre in 1926 and 2.04 acre-feet per acre in 1927. The water pumped is storage water in a slough, supplied by flood waters from the Mokelumne River.

13. WOODS-WILHOIT CO.

Location.—SW. ¼ NE. ¼ sec. 32, T. 4 N., R. 7 E.

First installation.—About 1913.

Pump.—25-horsepower General Electric motor.

Power.—Belt-driven Dorr 6-inch horizontal centrifugal pump.

Area irrigated.—Pumps 13, 14, and 15 delivered water in conjunction for 333 acres of vineyard in 1926 and 353 acres of vineyard in 1927.

Test.—Two measurements were made. Water was distributed through ditches, but pipe lines are being installed for use in the future. The measuring section was good, but the discharge pipe was leaking. The leakage from this pump ran back into the slough and was estimated as about 4 per cent of the total. A measurement made May 10, 1927, gave the pump discharge as 1,465 gallons a minute, with a static head of 22 feet. The power input was 20.85 kilowatts, or 77.3 kilowatt-hours per acre-foot of water pumped. A measurement made May 20, 1927, gave a pump discharge of 1,565 gallons a minute, with a static head of 20 feet. The power input was 21.1 kilowatts, or 73.2 kilowatt-hours per acre-foot of water pumped. The average of the measurements is a discharge of 1,515 gallons a minute and a power input of 75.2 kilowatt-hours per acre-foot of water pumped. The total power consumption was 4,460 kilowatt-hours in 1926 and 3,360 kilowatt-hours in 1927, indicating about 59 acre-feet of water pumped in 1926 and 45 acre-feet in 1927. The time of operation in 1926, estimated by the manager, was 292 hours; in 1927, from records kept, it was 157 hours. The estimate for 1926 indicated 81.5 acre-feet pumped, which is obviously in error as shown by comparison with the results based on the power consumption in 1926. In 1927 the amount of water pumped, computed from the record of operation, was 43.8 acre-feet, which checks with the result obtained from the power consumption. The total electric cost in 1926 was $188.52; in 1927, $175.32. Of these amounts, $135 is the demand charge. The cost per acre-foot of water pumped was $3.20 in 1926 and $3.89 in 1927. These costs could have been lowered somewhat by stopping the leak in the discharge pipe. The water obtained by this pump comes from a slough fed by the river.

14. WOODS-WILHOIT CO.

Location.—SE. ¼ NE. ¼ sec. 32, T. 4 N., R. 7 E.

First installation.—About 1913.

Power.—25-horsepower Fairbanks-Morse motor.

Pump.—Belt-driven 5-inch Golden West horizontal centrifugal pump.

Area irrigated.—See pump 13.

Test.—Two measurements were made. Water is distributed through a short pipe line and ditches. The measuring section was good, but the pipe line was leaking. A measurement made May 10, 1927, gave 460 gallons a minute, allowing 1 per cent for pipe-line leakage. The static head was 23 feet, and the power input was 8.46 kilowatts, or 99.8 kilowatt-hours per acre-foot of water pumped. A measurement made June 2, 1927, gave a discharge of 425 gallons a minute, with a static head of 22 feet. The power input was 7.81 kilowatts, or 99.9 kilowatt-hours per acre-foot of water pumped. The average discharge was therefore about 440 gallons a minute and the average power input was about 100 kilowatt-hours per acre-foot pumped. The total power consumption in 1926 was 1,470 kilowatt-hours; in 1927, 1,280 kilowatt-hours. The amount of water pumped, computed from these records, was about 15 acre-feet in 1926 and 13 acre-feet in 1927. The time of operation in 1926 was estimated by the manager at 227 hours. This gives the amount of water pumped in 1926 as 18.4 acre-feet, which is high in comparison with the results obtained from the power consumption. The record of operation in 1927 was 162 hours, which gives the amount of water pumped as 13.1 acre-feet. This result checks very closely with the result obtained from the power consumption for 1927. The total electric cost was $125.64 in 1926 and $123.36 in 1927, which includes a demand charge of $108 each year. The cost of water per acre-foot pumped was $8.36 in 1926 and $9.49 in 1927. Increasing the amount of water pumped would decrease the cost per acre-foot, for the demand charge amounts to about $7.70 per acre-foot under these conditions. The water for this plant is storage water in a slough supplied by the flood waters of the river.

15. WOODS-WILHOIT CO.

Location.—SE. ¼ NW. ¼ sec. 33, T. 4 N., R. 7 E.

First installation.—About 1913.

Power.—40-horsepower Westinghouse motor.

Pump.—Belt-driven 6-inch Golden West horizontal centrifugal pump.

Area irrigated.—See pump 13.

Test.—Two measurements were made. Water is distributed through pipe lines, and the measuring section was good, but the pipe lines were leaking. A measurement made May 21, 1927, gave the discharge as 1,480 gallons a minute, with 3 per cent added for pipe-line leakage. The static head was 34 feet; the power input was 27.85 kilowatts, or 102.1 kilowatt-hours per acre-foot pumped. A measurement made May 23, 1927, gave a discharge of 1,300 gallons a minute, with about 3 per cent added for leakage. The static head was 37 feet; the power input was 24.40 kilowatts, or 101.9 kilowatt-hours per acre-foot pumped. The average of the two measurements was a discharge of 1,390 gallons a minute and a power consumption of 102 kilowatt-hours per acre-foot of water pumped. The total power consumption was 8,688 kilowatt-hours in 1926 and 11,736 kilowatt-hours in 1927. The total amount of water pumped, computed from these figures, was 85 acre-feet in 1926 and 115 acre-feet in 1927. The time of operation in 1926, estimated by the manager, was 312 hours, which gives the amount of water pumped as 122 acre-feet. This is obviously too high in comparison with the figure obtained from the power consumption. The record of operation in 1927 was 479 hours, which gives the amount of water pumped as 123 acre-feet, or about the same as the result obtained from the power consumption. The total electric cost was $320.26 in 1926 and $356.83 in 1927, of which the demand charge is $216 each year. The cost per acre-foot of water pumped was $3.77 in 1926 and $3.10 in 1927. The total power cost per acre irrigated for pumps 13, 14, and 15 was $1.90 in 1926 and $1.86 in 1927. This is below the average and results from the low use of water. It is possible that the cost of irrigation from these three pumps could be decreased by doing all the work with pumps 13 and 15, thereby eliminating the electric charges on pump 14 and lowering the cost per acre-foot of the other two pumps. The use of water for pumps 13, 14, and 15 was 0.48 acre-foot per acre in 1926 and 0.49 acre-foot per acre in 1927.

16. H. C. LANGE

Location.—NE. ¼ NE. ¼ sec. 5, T. 3 N., R. 7 E.

First installation.—1905.

Power.—20-horsepower Cletrax tractor.

Pump.—Belt-driven 5-inch Byron Jackson horizontal centrifugal pump.

Area irrigated.—21 acres of vines in 1926 and 1927.

Test.—One measurement was made with a current meter checked by a simultaneous weir measurement. Water is distributed through pipe lines, and the measuring section was good. The current-meter measurement made April 7, 1927, gave a discharge of 673 gallons a minute. A simultaneous weir measurement, made with a Cippoletti weir, gave 652 gallons a minute. The average is about 665 gallons a minute. The owner estimated 864 hours of operation in 1926 and kept a record showing 389 hours of operation in 1927. The indicated amount of water pumped in 1926 was 106 acre-feet—obviously too large, so a use of water of 3 acre-feet per acre was assumed, which gives 63 acre-feet as the amount pumped in 1926. The amount pumped in 1927 was 48 acre-feet, as computed from the record of operation, and the use of water for 1927 was 2.28 acre-feet per acre.

17. P. JOENS

Location.—NE. ¼ NW. ¼ sec. 4, T. 3 N., R. 7 E.

First installation.—About 1890.

Power.—40-horsepower Fairbanks-Morse motor.

Pump.—Direct-connected 8-inch Sterling horizontal centrifugal pump.

Area irrigated.—Estimated by the operator to be about 85 acres of vines.

Test.—One volumetric measurement was made by timing with a stop watch the time required to fill two reservoirs at the head of the distribution line. The water is distributed through pipe lines in conjunction with several well pumps. The measurement made March 5, 1927, gave a pump discharge of about 2,500 gallons a minute. The static head was about 32 feet; the power input was 36.6 kilowatts, or 79.5 kilowatt-hours per acre-foot of water pumped. The total power consumption was 11,900 kilowatt-hours in 1926 and 19,900 kilowatt-hours in 1927. These figures gave 150 acre-feet of water pumped in 1926 and 250 acre-feet in 1927. The operator reported 600 hours of operation in 1926, which gave 276 acre-feet pumped. The record of operation is evidently incomplete, and the result obtained from the power consumption was assumed to be correct. The record of operation in 1927 was 614 hours, giving the amount of water pumped as 283 acre-feet. This approximates the result obtained from the power consumption. The use of water as based on the power-consumption computations was 1.77 acre-feet per acre in 1926 and 2.94 acre-feet per acre in 1927. The total electric cost in 1926 was $358.80; in 1927, $454.80. Of these amounts $216 is the demand charge. The power cost per acre-foot of water pumped was $2.39 in 1926 and $1.81 in 1927, and the power cost per acre irrigated $4.22 in 1926 and $5.35 in 1927.

18. J. J. SCHMIEDT AND OTHERS

Location.—NE. ¼ NE. ¼ sec. 33, T. 4 N., R. 7 E.

First installation.—1916.

A belt-driven 4-inch Golden West horizontal centrifugal pump is in place. The pump was not used in 1926 and 1927. Water is distributed through pipe lines.

19. E. V. HOFFMAN

Location.—NW. ¼ NW. ¼ sec. 34, T. 4 N., R. 7 E.

First installation.—1921.

Power.—15-horsepower Fairbanks-Morse motor.

Pump.—Direct-connected 5-inch Pelton horizontal centrifugal pump.

Area irrigated.—The owner estimated 10 acres of orchard, 10 acres of alfalfa, and 3 acres of vines irrigated in 1926. In 1927, 24 acres of orchard, 4 acres of alfalfa, and 3 acres of vines were irrigated.

Test.—One measurement was made. Water is distributed through pipe lines, and the measuring section was good. The measurement was made August 23, 1927, and gave a discharge of 920 gallons a minute, with a static head of 36 feet. The power input was 12.6 kilowatts, or 74.4 kilowatt-hours per acre-foot of water pumped. The total power consumption was 7,850 kilowatt-hours in 1926 and 4,430 kilowatt-hours in 1927. The amount of water pumped, computed from these figures, was 106 acre-feet in 1926 and 60 acre-feet in 1927. The owner's record of 366 hours of operation in 1926 was incomplete. The record of operation of 279 hours in 1927 gives 47 acre-feet of water pumped, but this record also was incomplete, and the results derived from power consumption were used for both years. The use of water was therefore 4.60 acre-feet per acre in 1926 and 1.94 acre-feet per acre in 1927. The use of water for 1926 is high, possibly owing to erroneous assumptions in calculating the amount of water pumped or to an error in the estimate of land irrigated. The total power cost was $175.20 in 1926 and $134.16 in 1927, of which $81 is the demand charge each year. The power cost per acre-foot of water pumped was therefore $1.64 in 1926 and $2.24 in 1927. The power cost per acre irrigated was $7.62 in 1926 and $4.33 in 1927.

20. J. J. KNOLL

Location.—SW. ¼ NW. ¼ sec. 34, T. 4 N., R. 7 E.

First installation.—About 1917.

Power.—Fordson tractor.

Pump.—Belt-driven 6-inch Golden West horizontal centrifugal pump.

Area irrigated.—The owner estimated about 10 acres of vineyard irrigated in 1926 and about 20 acres of vineyard in 1927.

Test.—Three measurements were made. Water is distributed through pipe lines, and measuring conditions were very poor. The plant is on a slough filled by overflow from the Mokelumne River. The measurement made April 14, 1927, gave a pump discharge of 800 gallons a minute; on April 19, 1927, the discharge was 720 gallons a minute, and on May 13, 1927, 910 gallons a minute. The average of the three measurements is 810 gallons. The owner reported an incomplete record of operation in 1926 of 40 hours. A use of water of 2 acre-feet per acre was estimated, and therefore the amount of water pumped in 1926 was about 20 acre-feet. The record of operation in 1927 was 278 hours, the amount of water pumped was about 42 acre-feet, and the use of water was about 2.10 acre-feet per acre.

21. F. KIRSCHENMANN AND WILLIAM PRESZLER

Location.—NW. ¼ SE. ¼ sec. 34, T. 4 N., R. 7 E.

First installation.—About 1911.

Power.—30-horsepower Robbins-Myers motor.

Pump.—A direct-connected 10-inch Superior horizontal centrifugal pump was used in 1926 and 1927. This installation was changed to a direct-connected 10-inch Vans horizontal centrifugal pump in 1928.

Area irrigated.—160 acres of vines in 1926 and 1927.

Test.—No measurement was made on this pump. Water is distributed through pipe lines. The discharge of the pump was estimated at about 2,000 gallons a minute, or about the same as pump 8, which is a similar pump operated under similar conditions. Four measurements of the power input, made February 19 and March 1, 7, and 16, 1927, gave an average of 25.05 kilowatts. This is equal to a power consumption of about 68 kilowatt-hours per acre-foot of water pumped. The total power consumption for 1926 was 13,640 kilowatt-hours; for 1927, 33,500 kilowatt-hours. The amount of water pumped in 1926, computed from these figures, was about 201 acre-feet; in 1927, about 493 acre-feet. No record of operation was available for 1926, but for 1927 it was 1,320 hours. This gave 486 acre-feet of water pumped in 1927, which is about the result computed from the power consumption. The use of water was 1.25 acre-feet per acre in 1926 and 3.06 acre-feet per acre in 1927. The total power cost was $325.68 in 1926 and $557 in 1927, of which $162 a year was the demand charge.

22. D. H. SOUCIE

Location.—NE. ¼ NE. ¼ sec. 3, T. 3 N., R. 7 E.

First installation.—1911.

Power.—15-horsepower Crocker-Wheeler motor.

Pump.—Direct-connected 5-inch Krogh horizontal centrifugal pump.

Area irrigated.—None in 1926; 21 acres of vines in 1927.

Test.—One measurement was made. Water is distributed through pipe lines, and the measuring conditions were very poor. The plant is located on a slough filled by overflow from the river. The measurement made April 29, 1927, gave a pump discharge of 1,000 gallons a minute, 2½ per cent being added for pipe-line leakage. The static head was 28 feet, and the power input was 13.28 kilowatts, or 72.1 kilowatt-hours per acre-foot pumped. As the power consumption in 1927 was 1,290 kilowatt-hours the amount of water pumped was about 18 acre-feet. The use of water was therefore 0.86 acre-foot per acre in 1927. From the owner's record of operation of 117 hours in 1927 the amount of water pumped was computed at 21.5 acre-feet. The total power cost for 1927 was $96.48, of which $81 was the demand charge. The cost per acre-foot of water pumped was $5.35, and the cost per acre irrigated was $4.59.

23. J. J. SCHMIEDT

Location.—NW. ¼ NW. ¼ sec. 2, T. 3 N., R. 7 E.

First installation.—1919.

Power.—15-horsepower Robbins & Myers motor.

Pump.—Direct-connected 5-inch Krogh horizontal centrifugal pump.

Area irrigated.—In 1926 and 1927 Mr. Schmiedt irrigated 8 acres of orchard and 6 acres of vineyard, Godfrey Kroll irrigated 7 acres of orchard and 33 acres of vines, and J. Ehrhardt irrigated 11 acres of vines—a total of 15 acres of orchard and 50 acres of vines.

Tests.—Two measurements were made. Water is distributed through pipe lines, and the measuring conditions were fair. The plant is on a slough filled by overflow from the river. The measurement made April 21, 1927, gave a discharge of 870 gallons a minute, with a static head of 36 feet. The power input was 11.80 kilowatts, or 73.6 kilowatt-hours per acre-foot of water pumped. The measurement made May 3, 1927, gave a discharge of 725 gallons a minute, with a static head of 30 feet. The power input was 10.7 kilowatts, or 80.2 kilowatt-hours per acre-foot of water pumped. The average discharge was about 800 gallons a minute, and the average power consumption about 76.5 kilowatt-hours per acre-foot pumped. The total power consumption in 1926 was 3,420 kilowatt-hours; in 1927, 5,210 kilowatt-hours. The amount of water used, computed from these figures, was about 45 acre-feet in 1926 and 68 acre-feet in 1927. No record of the number of hours of operation in 1926 was available. In 1927 Mr. Schmiedt operated 147 hours, Mr. Kroll 250 hours, and Mr. Ehrhardt 63 hours—a total of 460 hours. As computed from this record the amount of water pumped in 1927 was 68 acre-feet, which checks with the results obtained by using the power consumption. The use of water in 1926 was 0.69 acre-foot per acre; in 1927, 1.05 acre-feet per acre. The total power cost in 1926 was $122.04; in 1927, $143.52. Of these amounts $81 was the demand charge each year. The cost per acre-foot of water pumped was $2.72 in 1926 and $2.11 in 1927. The cost per acre irrigated was $1.88 in 1926 and $2.21 in 1927.

24. J. T. LANGFORD

Location.—NE. ¼ NW. ¼ sec. 35, T. 4 N., R. 7 E.

First installation.—1905.

Power.—15-horsepower United States motor.

Pump.—Direct-connected 5-inch Sterling horizontal centrifugal pump.

Area irrigated.—None in 1926; 86 acres of vineyard and 17 acres of orchard irrigated in conjunction with well 4726N1 in 1927.

Test.—No measurement of this pump was made. The water is distributed through pipe lines in conjunction with well 4726N1. The discharge of this pump was estimated to be 1,000 gallons a minute. A measurement of the power consumption June 1, 1927, gave 13.8 kilowatts, or about 75.0 kilowatt-hours per acre-foot of water pumped. The power consumption in 1927 was 2,590 kilowatt-hours, which gave about 35 acre-feet of water used. The owner's record of operation was 199 hours, which gave about 37 acre-feet of water used. This pump ran only part of the season of 1927, and the use of water can not be computed because it was operated in conjunction with well 4726N1. The use of water for both pumps combined is given on page 258 under well 4726N1. The power cost in 1927 was $108.48, of which $81 was the demand charge. This gives the total power cost per acre-foot of water pumped as $3.10.

25. F. H. BUCK CO.

Location.—NE. ¼ SE. ¼ sec. 26, T. 4 N., R. 7 E.

First installation.—1925.

Power.—25-horsepower Wagner motor.

Pump.—Direct-connected 6-inch Byron Jackson horizontal centrifugal pump.

Area irrigated.—40 acres of orchard and 50 acres of vineyard in 1926 and 1927, also 17 acres of vineyard interplanted with orchard irrigated for Glen Wright during both years.

Test.—Four measurements were made. The water is distributed through ditches, and the measuring conditions were good. The measurement made April 23, 1927, gave a discharge of 1,530 gallons a minute, with a static head of 33 feet. The power input was 18.8 kilowatts, or 66.7 kilowatt-hours per acre-foot of water pumped. The measurement made April 28, 1927, gave a discharge of 1,445 gallons a minute, with a static head of 30 feet. The power input was 19.0 kilowatts, or 71.4 kilowatt-hours per acre-foot pumped. The measurement made May 3, 1927, gave a discharge of 1,450 gallons a minute, with a static head of 30 feet. The power input was 19.3 kilowatts, or 72.3 kilowatt-hours per acre-foot pumped. The measurement made May 12, 1927, gave a discharge of 1,340 gallons a minute, with a static head of 32 feet. The power input was 18.9 kilowatts, or 76.6 kilowatt-hours per acre-foot pumped. The average discharge was 1,440 gallons a minute, and the average power consumption 71.7 kilowatt-hours per acre-foot of water pumped. The total power consumption for 1926 was 8,790 kilowatt-hours; for 1927, 5,420 kilowatt-hours. The amount of water pumped, computed from these figures, was 122 acre-feet in 1926 and 75.5 acre-feet in 1927. No record of operation was available for 1926, but for 1927 it was 274 hours. The amount of water pumped in 1927, computed from this record, was 72.6 acre-feet, which checks closely with the result obtained from the power consumption. The use of water was 1.35 acre-feet per acre in 1926 and 0.83 acre-foot per acre in 1927. The cost of power was $240.48 in 1926 and $200.04 in 1927, of which $135 was the demand charge each year. The power cost per acre-foot of water pumped was $1.97 in 1926 and $2.67 in 1927. The power cost per acre irrigated was $2.24 in 1926 and $1.87 in 1927.

26. F. H. BUCK CO.

Location.—NE. ¼ SE. ¼ sec. 26, T. 4 N., R. 7 E.

First installation.—About 1894.

This is a belt-driven 15-inch Byron Jackson horizontal contrifugal pump, operated by a steam engine. Use of the plant was discontinued in 1925.

27. BENJAMIN SMITH

Location.—NE. ¼ NE. ¼ sec. 26, T. 4 N., R. 7 E.

First installation.—About 1912.

Power.—15-horsepower Fairbanks-Morse gasoline engine.

Pump.—Belt-driven 4-inch Golden West horizontal centrifugal pump.

Area irrigated.—14 acres of orchard and 10 acres of vines in 1926 and 1927. In 1927 water was also obtained from well 4726C1 for 3 acres of the vineyard.

Test.—Three measurements were made. The water is distributed through ditches, and the measuring conditions were fair. A measurement made March 28, 1927, gave a discharge of 305 gallons a minute, but this measurement was of no value, as a fish was caught in the pump. Another measurement made the same day, when the pump was clean, gave a discharge of 400 gallons a minute, with a static head of 30 feet. The measurement made June 4, 1927, gave a discharge of 350 gallons a minute, with a static head of 34 feet. The measurement made June 9, 1927, gave 390 gallons a minute, with a static head of 34 feet. The average of the three measurements was 380 gallons a minute. The incomplete record of operation in 1926 was 140 hours, which gave about 10 acre-feet pumped. The record of operation in 1927 was 152 hours, which gave about 11 acre-feet of water pumped. The use of water in 1926 was therefore about 0.42 acre-foot per acre. The use of water in 1927, considering 3.6 acre-feet obtained from well 4726C1, was 0.61 acre-foot per acre.

28. GEORGE BLANKE

Location.—NE. ¼ NE. ¼ sec. 26, T. 4 N., R. 7 E.

First installation.—About 1920.

Power.—15-horsepower Fairbanks-Morse gasoline engine.

Pump.—Belt-driven 4-inch Golden West horizontal centrifugal pump.

Area irrigated.—13 acres of vineyard by Mr. Blanke in 1926 and 1927, and 15 additional acres of vineyard on the Storey ranch in 1927, making a total of 28 acres.

Test.—Six measurements were made. The water is distributed through ditches, and the measuring conditions were good. The measurements made March 28 and April 19, 1927, gave a discharge of 375 gallons a minute, with a static head of 40 feet. The measurements made April 8 and 22, 1927, gave a discharge of 475 gallons a minute, with static heads of 38 and 37 feet, respectively. The measurement made April 25, 1927, gave 480 gallons a minute, and the measurement May 11, 1927, gave 420 gallons a minute, with a static head of 36 feet. The average of the six measurements was about 435 gallons a minute. The record of operation in 1926 was 130 hours, which gave about 10 acre-feet of water pumped and a use of water of 0.77 acre-foot per acre. The record of operation in 1927 was 459 hours, which gave about 37 acre-feet of water pumped and a use of water of 1.32 acre-feet per acre.

29. MRS. E. C. BRYAN

Location.—SW. ¼ SW. ¼ sec. 24, T. 4 N., R. 7 E.

First installation.—1924.

This is a belt-driven 4-inch Byron Jackson horizontal centrifugal pump. The ocation is temporary, and the pump was run during the season of 1924 only.

30. E. J. LOCKE

Location.—NW. ¼ SE. ¼ sec. 25, T. 4 N., R. 7 E.

This is a belt-driven 6-inch San Francisco Tool Co. pump, first installed about 1909 and last used in 1925. Power was supplied by a tractor. The pump is located on a small pond, water being stored in the pond by the diversion of water from the Mokelumne River during flood periods.

31. E. J. LOCKE

Location.—NW. ¼ NW. ¼ sec. 30, T. 4 N., R. 8 E.

First installation.—About 1909.

Power.—25-horsepower Samson gasoline engine.

Pump.—Belt-driven 12-inch San Francisco Tool Co. pump.

Area irrigated.—40 acres of orchard that had been irrigated by this pump was irrigated by gravity diversion during flood periods in 1926 and 1927.

Test.—No test made. Last operation was in 1925.

32. FRED ALLEN

Location.—NW. ¼ NE. ¼ sec. 30, T. 4 N., R. 8 E.

First installation.—1924.

Power.—20-horsepower General Electric motor.

Pump.—Belt-driven 8-inch Sterling horizontal centrifugal pump.

Area irrigated.—37 acres of alfalfa in 1926 and 1927.

Test.—One measurement was made. The water is carried through a pipe line about 600 feet and distributed through ditches. The measuring section was good, but the pipe-line leakage was large. The measurement made August 8, 1927, gave a discharge of about 1,470 gallons a minute, which includes 10 per cent for pipe-line leakage. The static head was 16 feet; the power input was 16.92 kilowatts, or 62.5 kilowatt-hours per acre-foot of water pumped. In 1926 this pump was operated by a tractor, and no record of operation was available. A use of water of 0.50 acre-foot per acre was estimated for 1926, and therefore the amount of water pumped was about 18 acre-feet. In 1927 the amount of water pumped, computed from the power consumption of 2,628 kilowatt-hours, was about 42 acre-feet; computed from the record of operation of 139 hours, it was about 38 acre-feet. The result obtained from power consumption was assumed to be correct. Therefore the use of water for 1927 was 1.14 acre-feet per acre. The power cost in 1927 was $65.14, of which $33.60 was the demand charge. The power cost per acre-foot of water pumped was $1.55, and the cost per acre irrigated $1.76.

33. C. R. MONTGOMERY

Location.—SE. ¼ SE. ¼ sec. 19, T. 4 N., R. 8 E.

First installation.—1917.

Power.—20-horsepower Westinghouse motor.

Pump.—Belt-driven 6-inch Byron Jackson horizontal centrifugal pump.

Area irrigated.—None in 1926; 16 acres of garden truck in 1927.

Test.—One measurement was made. The water was distributed through ditches, and measuring conditions for 1927 were good. A pipe-distribution system was in place for 1928. The measurement made August 8, 1927, gave a discharge of 810 gallons a minute, with a static head of 19 feet. The power input was 11.95 kilowatts, or 80.2 kilowatt-hours per acre-foot pumped. The amount of water pumped in 1927, computed from the power consumption of 1,210 kilowatt-hours, was 15 acre-feet. The incomplete record of operation was 142 hours. The use of water for 1927 was 0.94 acre-foot per acre. The power cost was $51.12, of which $36.60 was the demand charge. The power cost per acre-foot of water pumped was therefore $3.41, and the cost per acre irrigated $3.20.

34. WOODBRIDGE FRUIT CO.

Location.—NE. ¼ SE. ¼ sec. 19, T. 4 N., R. 8 E.

First installation.—1926.

Power.—20-horsepower Robbins & Myers motor.

Pump.—Direct-connected 7-inch Superior horizontal centrifugal pump.

Area irrigated.—156 acres of orchard in 1926–27.

Test.—One measurement was made. Water was distributed through ditches, and the measuring conditions were fair. In 1926 there was a gasoline-driven 6-inch pump at a temporary location a few hundred feet upstream from the present pump. No measurement was made of this temporary pump. A record of operation of 1,004 hours in 1926 was reported, and the operator estimated the discharge of the pump at about 800 gallons a minute. This gave about 148 acre-feet of water pumped in 1926, and the use of water was therefore about 0.95 acre-foot per acre. A measurement of the new pump August 25, 1927, gave a discharge of 1,800 gallons a minute, with a static head of 18 feet. The power input was 17.75 kilowatts, or 53.6 kilowatt-hours per acre-foot of water pumped. The power consumption in 1927 was 7,960 kilowatt-hours, which gave 148 acre-feet of water pumped. No record of operation was available for 1927. The use of water in 1927 was 0.95 acre-foot per acre. The power cost in 1927 was $139.62, of which $44.10 was the demand charge. The cost per acre-foot of water pumped was therefore about 94 cents, which is exceptionally low. The cost per acre irrigated was 90 cents. These costs were reduced to some extent by reason of the reduced demand charge for a new installation in midseason.

35. A. COSTA

Location.—SE. ¼ SE. ¼ sec. 17, T. 4 N., R. 8 E.

First installation.—1920.

Power.—25-horsepower Westinghouse motor.

Pump.—Direct-connected 10-inch Price horizontal centrifugal pump.

Area irrigated.—12 acres of corn and young orchard, interplanted in 1926 and 1927.

Test.—One measurement was made. The water is distributed through ditches, and the measuring section was good, but the suction pipe of the pump was in bad condition. The measurement made August 16, 1927, gave a discharge of 1,870 gallons a minute, with a static head of 21 feet. The power input was 15.88 kilowatts, or 46.2 kilowatt-hours per acre-foot of water pumped. The power consumption in 1926 was 580 kilowatt-hours, which gave about 13 acre-feet of water pumped. Thus the use of water in 1926 was 1.08 acre-feet per acre. An incomplete record of operation of 70 hours was reported. The power consumption in 1927 was 1,000 kilowatt-hours, which gave about 22 acre-feet of water pumped. The use of water was 1.83 acre-feet per acre. No record of operation in 1927 was available. The power cost in 1926 was $141.96; in 1927, $147; these figures include a demand charge of $135 a year. The cost per acre-foot of water pumped in 1926 was therefore $10.90; in 1927, $6.69. The cost per acre irrigated in 1926 was $11.80; in 1927, $12.25. These costs are exceptionally high, because of the small area irrigated. The demand charge is so high for a plant of this size that it must supply a much larger acreage than at present to be profitable. If the area irrigated is not to be increased, a much smaller plant should be used. The admittance of air through a hole in the suction pipe decreased the efficiency of the pump.

36. P. MEGERLE

Location.—NW. ¼ NW. ¼ sec. 21, T. 4 N., R. 8 E.

First installation.—1914.

Power.—20-horsepower Samson gasoline engine.

Pump.—Belt-driven 6-inch Samson horizontal centrifugal pump.

Test.—No measurement made. Pump was last used in 1925.

37. R. S. FEATHERSTON

Location.—SE. ¼ SW. ¼ sec. 16, T. 4 N., R. 8 E.

First installation.—1924.

Power.—40-horsepower Westinghouse motor.

Pump.—Belt-driven 10-inch Sterling horizontal centrifugal pump.

Area irrigated.—25 acres of alfalfa and 15 acres of corn in 1926; 25 acres of alfalfa and about 58 acres of corn in 1927.

Test.—Three measurements were made. The water is carried in a pipe line with valves opening into ditches. Measuring conditions were good. The measurement made August 2, 1926, gave a discharge of 2,380 gallons a minute. The power input was 26.7 kilowatts, or 60.9 kilowatt-hours per acre-foot of water. The measurement made May 16, 1927, gave a discharge of 2,640 gallons a minute, with a static head of 10 feet. The power input was 27.2 kilowatts, or 55.9 kilowatt-hours per acre-foot pumped. The measurement made August 11, 1926, gave a discharge of 3,200 gallons a minute, with a static head of 20 feet. The power input was 25.1 kilowatts, or 42.6 kilowatt-hours per acre-foot pumped. The average of the three measurements was 2,740 gallons a minute and 52.2 kilowatt-hours per acre-foot of water pumped. The power consumption in 1926 was 3,680 kilowatt-hours, which gave 70 acre-feet of water pumped. The time of operation in 1926 was estimated by the owner at 240 hours, which would give 121 acre-feet pumped. This estimate is evidently low, and the result from power consumption is used for 1926. The power consumption in 1927 was 6,540 kilowatt-hours, which gave about 125 acre-feet of water pumped. The record of operation of 181 hours in 1927 gave only about 91 acre-feet of water pumped, showing that the record is incomplete, and therefore the result from the power consumption is used for 1927. The use of water in 1926 was 1.75 acre-feet per acre; in 1927, 1.51 acre-feet per acre. The power cost in 1926 was $260.16; in 1927, $294.48. Of these amounts $216 was the demand charge. The power cost of the water per acre-foot was $3.71 in 1926 and $2.35 in 1927, and the cost per acre irrigated was $6.50 in 1926 and $3.55 in 1927.

38. J. CLEMENTS

Location.—SE. ¼ NE. ¼ sec. 16, T. 4 N., R. 8 E.

First installation.—About 1900.

Power.—75-horsepower Fairbanks-Morse motor.

Pump.—Belt-driven 15-inch Byron Jackson horizontal centrifugal pump.

Area irrigated.—49 acres of orchard, 25 acres of vineyard, 60 acres of alfalfa, and 136 acres of corn in 1926; 49 acres of orchard, 25 acres of vineyard, 46 acres of alfalfa, and 25 acres of corn in 1927.

Test.—No direct test was possible with the instruments available. An estimate was made by determining the velocity of the water through the pipe line by means of a float. The water is distributed through pipe lines. The discharge of the pump was estimated July 22, 1927, at about 6,000 gallons a minute. The power input was 51.4 kilowatts, or about 46.5 kilowatt-hours per acre-foot of water pumped. The power consumption of 27,440 kilowatt-hours in 1926 and 19,960 kilowatt-hours in 1927 gave about 590 and 430 acre-feet, respectively, of water pumped. The record of operation of 538 hours in 1926 gave about 595 acre-feet of water pumped, which checks very closely with the result obtained from power consumption. The record of operation of 375 hours in 1927 gave 415 acre-feet of water pumped. The use of water, based on the power consumption, was 2.18 acre-feet per acre in 1926 and 2.96 acre-feet per acre in 1927. The power cost in 1926 and 1927 was $639.34 and $557.06, respectively, of which $337.50 was the annual demand charge. The cost per acre-foot of water pumped was $1.08 in 1926 and $1.29 in 1927. These costs are below the average and show that the unit cost can be kept low, even with a large installation, if a sufficient amount of water is pumped. The cost per acre irrigated in 1926 was $2.37; in 1927, $3.84.

39. R. S. FEATHERSTON

Location.—NW. ¼ NW. ¼ sec. 15, T. 4 N., R. 8 E.

First installation.—About 1897.

Power.—50-horsepower General Electric motor.

Pump.—Direct-connected 10-inch Sterling horizontal centrifugal pump.

Area irrigated.—25 acres of alfalfa in 1926; 25 acres of corn and 22 acres of vineyard in 1927.

Test.—Five measurements were made. The water is distributed through ditches and delivered at two points, one at a high head and one at a low head. Measuring conditions were good. The measurement made May 21, 1926, gave a discharge of 3,690 gallons a minute and a power input of 38.7 kilowatts, or 56.9 kilowatt-hours per acre-foot of water pumped. The pump was discharging at the low head, using a 14-inch discharge pipe. The measurement made June 18, 1927, gave a discharge of 3,500 gallons a minute, with a static head of 13 feet, using the 14-inch discharge pipe. The kilowatt input was 35.4 kilowatts, or 54.9 kilowatt-hours per acre-foot pumped. The average of the results with the low head and large discharge pipe was a discharge of 3,595 gallons a minute and a power input of 37.1 kilowatts, or a power consumption of 56.1 kilowatt-hours per acre-foot pumped. A measurement made July 6, 1927, gave a discharge of 895 gallons a minute, with a static head of 70 feet and an 8-inch discharge pipe.

The power input was 40.7 kilowatts, or 247 kilowatt-hours per acre-foot pumped. A measurement made July 8, 1927, gave 810 gallons a minute, with a static head of 71 feet. The power input was 41.3 kilowatts, or 277 kilowatt-hours per acre-foot pumped. The average of these results with the high static head and small discharge pipe was a discharge of about 850 gallons a minute and a power consumption of 264 kilowatt-hours per acre-foot of water pumped. A measurement made August 11, 1927, gave a discharge of 3,080 gallons per minute, with a static head of 22 feet and the 8-inch discharge pipe. The power input was 43.2 kilowatts, or 76.1 kilowatt-hours per acre-foot of water pumped. The record of operation of 102 hours in 1926 was incomplete, but the power consumption of 10,340 kilowatt-hours in 1926 gave 185 acre-feet of water pumped. The use of water was therefore 7.4 acre-feet per acre, which is exceptionally high; an explanation is not at hand. The power consumption in 1927 was 7,290 kilowatt-hours. The record of operation was 37½ hours with the large discharge pipe and low head, 111 hours with the small pipe and high head, and 28 hours with the small pipe and low head. Prorating the power consumption according to the hours run, meter readings, and kilowatt input gave 1,540 kilowatt-hours for the low head and large discharge pipe, 4,390 kilowatt-hours for the high head and small pipe, and 1,360 kilowatt-hours for the low head and small pipe. Thus the amount of water pumped for these conditions was 27, 17, and 18 acre-feet respectively, or a total of 62 acre-feet. The amount of water pumped computed from the record of operation for the same conditions as above was 25, 17, and 16 acre-feet respectively, or a total of 58 acre-feet. Only the vineyard demanded the discharge at the high head, and the use of water on the vineyard was about 0.77 acre-foot per acre; the use of water on the corn was about 1.80 acre-feet per acre. The total power cost was $338.74 in 1926 and $305.19 in 1927; of these amounts $225 was the annual demand charge. The cost per acre-foot of water pumped was $1.83 in 1926 and $4.92 in 1927. The unit cost in 1927 was materially increased by reducing the total amount of water pumped and by raising a portion of the water to a higher level. The cost per acre was $13.59 in 1926 and $6.50 in 1927.

40. E. H. THOMPSON

Location.—NE. ¼ NW. ¼ sec. 15, T. 4 N., R. 8 E.

First installation.—1923.

Power.—Tractor.

Pump.—Belt-driven 4-inch Sterling horizontal centrifugal pump.

Area irrigated.—About 12 acres of vines and 2 acres of garden and orchard.

Test.—No measurements were made. There was only a few hours of operation in 1926 and none in 1927.

41. M. H. STEELY

Location.—SE. ¼ SE. ¼ sec. 10, T. 4 N., R. 8 E.

First installation.—1923.

Power.—Fordson tractor.

Pump.—Belt-driven 6-inch Krogh horizontal centrifugal pump.

Area irrigated.—12 acres of alfalfa and 3 acres of corn in 1926; 12 acres of alfalfa in 1927.

Test.—One measurement was made. The water is distributed through a pipe line, and measuring conditions were fair. The measurement made June 15, 1927, gave a pump discharge of 1,260 gallons a minute, with a static head of 24 feet. The incomplete record of operation for 120 hours in 1926 gave about 28 acre-feet of water pumped and a use of water of about 1.86 acre-feet per acre. The record of operation for 176 hours in 1927 gave 41 acre-feet of water pumped and a use of water of 3.41 acre-feet per acre.

42. J. MEHRTEN

Location.—NW. ¼ NW. ¼ sec. 14, T. 4 N., R. 8 E.

First installation.—1907.

Power.—15-horsepower gasoline engine.

Pump.—Belt-driven 6-inch Krogh horizontal centrifugal pump.

Area irrigated.—There is about 30 acres of irrigable land under this pump, of which about 3 acres of potatoes was irrigated from pump 43 in 1927.

Test.—No test was made. The pump was not operated in 1926 or 1927. The water was distributed through ditches.

43. CORA TODMAN

Location.—NE. ¼ NW. ¼ sec. 14, T. 4 N., R. 8 E.

First installation.—About 1918.

Power.—15-horsepower Fairbanks-Morse gasoline engine.

Pump.—Belt-driven 6-inch Golden West horizontal centrifugal pump.

Area irrigated.—21 acres of orchard and alfalfa, interplanted, and 8 acres of alfalfa in 1926 and 1927. About 3 acres of potatoes under pump 42 were also irrigated from this pump in 1927.

Test.—Two measurements were made. The water was distributed through pipe lines, and measuring conditions were fair but subject to pipe-line leakage. The measurement made September 25, 1926, gave a discharge of 655 gallons a minute. The measurement made May 21, 1927, gave a discharge of 910 gallons a minute, with a static head of 23 feet. An average discharge of 800 gallons a minute was used in the computation of water pumped, as the plant was operated mostly when the river was at high stage, which gave a low static head. The record of operation in 1926 was 245 hours, which gave about 36 acre-feet of water pumped and a use of water of 1.24 acre-feet per acre. The record of operation in 1927 was 204 hours, which gave about 30 acre-feet of water pumped and a use of water of 0.94 acre-foot per acre.

44. A. P. HENNING

Location.—SW. ¼ NE. ¼ sec. 14, T. 4 N., R. 8 E.

First installation.—1913.

Power.—20-horsepower General Electric motor

Pump.—Direct-connected 4-inch horizontal centrifugal pump.

Test.—No measurement was made. The pump is on an old channel of the Mokelumne River and depends on water from floods. Last operation was in 1923.

45. LOUIS CASSINELLI AND LOUIS CALESTINI

Location.—SE. ¼ SE. ¼ sec. 11, T. 4 N., R. 8 E.

First installation.—About 1912.

Power.—40-horsepower General Electric motor.

Pump.—Direct-connected 10-inch Krogh horizontal centrifugal pump.

Area irrigated.—38 acres of alfalfa and 27 acres of corn in 1926 and 1927.

Test.—One measurement was made. The water is distributed through a pipe line and ditches, and measuring conditions were fair. The measurement made June 14, 1927, gave a discharge of 3,020 gallons a minute, including 2 per cent added for pipe-line losses. The static head was about 20 feet; the power input was 26.2 kilowatts, or 47.1 kilowatt-hours per acre-foot of water pumped. The power consumption in 1926 was 20,080 kilowatt-hours, which gave about 426 acre-feet of water pumped and a use of water of 6.56 acre-feet per acre. No record of operation was available for 1926, and the use of water was very low. The power consumption in 1927 was 13,960 kilowatt-hours, which gave about 296 acre-feet of water pumped and a use of water of 4.55 acre-feet per acre. The incomplete record of operation for 461 hours in 1927 gave about 256 acre-feet of water pumped. The result computed from the power consumption was estimated to be more nearly correct. The total power cost in 1926 was $456.96; in 1927, $383.52; the annual demand charge was $216. The power cost per acre-foot of water pumped in 1926 was $1.07; in 1927, $1.29. The power cost per acre irrigated in 1926 was about $7.04; in 1927, about $5.88.

46. F. L. NAYLOR AND OTHERS

Location.—NE. ¼ SE. ¼ sec. 11, T. 4 N., R. 8 E.

First installation.—1915.

Power.—50-horsepower Wagner electric motor.

Pump.—Direct-connected 8-inch Platt horizontal centrifugal pump.

Area irrigated.—About 122 acres of orchard, 17 acres of vines, 8 acres of corn, and 15 acres of potatoes, a total of 162 acres, in 1926 and 1927.

Test.—One measurement was made. The water is distributed through pipe lines, and measuring conditions were poor, being subject to a large leakage in the pipe lines. The measurement made July 26, 1927, including 5 per cent for pipe-line leakage, gave a discharge of 1,300 gallons a minute. The static head was 87 feet; the power input was 35.7 kilowatts, or 140 kilowatt-hours per acre-foot of water pumped. No complete record of operation for 1926 and 1927 was available. The power consumption in 1926 was 11,040 kilowatt-hours, which gave 74 acre-feet of water pumped and a use of water of about 0.47 acre-foot per acre. The power consumption in 1927 was 23,050 kilowatt-hours, which gave 155 acre-feet of water pumped and a use of water of 0.96 acre-foot per acre. The total power cost in 1926 was $346.44; in 1927, $478.55; the annual demand charge was $225. The power cost per acre-foot of water pumped in 1926 was $4.68; in 1927, $3.08. The power cost per acre irrigated was $2.14 in 1926 and $2.95 in 1927.

47. E. A. PUTNAM

Location.—SE. ¼ NW. ¼ sec. 12, T. 4 N., R. 8 E.

First installation.—About 1870.

Power.—25-horsepower motor.

Pump.—Belt-driven 8-inch Krogh horizontal centrifugal pump.

Area irrigated.—About 33 acres of alfalfa, partly intermingled with orchard, in 1926 and 1927.

Test.—One measurement was made by means of an 18-inch Cippoletti weir. The water is distributed through pipe lines. The measurement made July 30, 1927, gave a discharge of 1,400 gallons a minute. The static head was 26 feet, and the power input was 17.12 kilowatts, with a power consumption of 66.4 kilowatt-hours per acre-foot of water pumped. A small motor used to pump water for domestic use was connected to the same line as the pumping plant, and energy consumed by both pumps was registered on the same electric meter. For this reason it was impossible to obtain the exact power consumption for the pumping plant. The power consumption of the small pumping plant, estimated from meter readings during the winter, when the large pumping plant was not in operation, was about 45 kilowatt-hours a month. This amount was deducted from the total power consumption for each year. The power consumption in 1926 was estimated to be 7,300 kilowatt-hours, which gave 110 acre-feet of water pumped. The owner's estimated record of operation for 354 hours in 1926 gave 91 acre-feet of water pumped. The result derived from the power consumption was assumed to be correct, and the use of water for 1926 on this basis was 3.33 acre-feet per acre.

The power consumption in 1927 was estimated to be 6,300 kilowatt-hours, which gave 95 acre-feet of water pumped. The record of operation for 274 hours in 1927 gave 71 acre-feet pumped. The use of water in 1927, estimated from power consumption, was 2.87 acre-feet per acre. The total power cost for 1926 was $222.60; for 1927, $210.60. These figures are based on the estimated power consumption and include $135 as the annual demand charge. The cost per acre-foot of water pumped was therefore $2.02 in 1926 and $2.22 in 1927. The cost per acre irrigated was $6.95 in 1926 and $6.40 in 1927.

48. ED MILLER

Location.—NW. ¼ NW. ¼ sec. 7, T. 4 N., R. 9 E.

First installation.—1921.

Power.—Tractor.

Pump.—Belt-driven 3-inch Samson horizontal centrifugal pump.

Area irrigated.—About 2 acres of garden truck prior to 1926.

Test.—No measurement was made. The water was distributed through ditches, and the last operation was in 1924.

49. JOSEPH KISSEL

Location.—NW. ¼ SE. ¼ sec. 6, T. 4 N., R. 9 E.

First installation.—1920.

Power.—15-horsepower Fairbanks-Morse distillate engine.

Pump.—Belt-driven 5-inch Superior horizontal centrifugal pump.

Area irrigated.—8 acres of alfalfa in 1926 and 1927.

Test.—Two measurements were made. Water is distributed through a pipe line and ditch, and measuring conditions were good. The measurement made July 19, 1927, gave a discharge of 465 gallons a minute, but the pipe line was found to be broken, and this measurement was of no value. Another measurement made September 12, 1927, gave a discharge of 880 gallons a minute, 5 per cent having been added for pipe-line leakage. The static head was 27 feet. The owner's record of operation for 151 hours in 1926 gave about 24 acre-feet of water pumped and a use of water of 3 acre-feet per acre. The record of operation for 127 hours in 1927 gave 22 acre-feet of water pumped and a use of water of 2.75 acre-feet per acre.

50. ELMER STRUCKMANN

Location.—SE. ¼ SW. ¼ sec. 5, T. 4 N., R. 9 E.

First installation.—1927.

Power.—Fordson tractor.

Pump.—Belt-driven 5-inch American horizontal centrifugal pump.

Area irrigated.—5 or 6 acres in 1927.

Test.—No measurement was made. The pump is in a pit left by gold-dredging operations and does not pump directly from the river.

51. CHARLES CHILDS

Location.—NE. ¼ SW. ¼ sec. 4, T. 4. N., R. 9 E.

First installation.—About 1882.

Power.—Tractor.

Pump.—Belt-driven 4-inch Rumsey horizontal centrifugal pump.

Area irrigated.—17 acres of alfalfa in 1926 and 1927.

Test.—Three measurements were made. Water is distributed through a pipe line and ditch, and the measuring conditions were good. A measurement made July 19, 1926, gave a discharge of 450 gallons a minute; one made May 21, 1927, gave 560 gallons a minute, with a static head of 29 feet; and one made June 30, 1927, gave 645 gallons a minute, with a static head of 30 feet. The owner's estimate of operation for 150 hours in 1926, with an average discharge of 550 gallons a minute, gave about 15 acre-feet of water pumped. The record of operation for 147 hours in 1927 gave 15 acre-feet pumped. The use of water was about 0.88 acre-foot per acre for each year.

52. T. OSTERMAN

Location.—NE. ¼ NE. ¼ sec. 9, T. 4 N., R. 9 E.

First installation.—1911.

Power.—25-horsepower Fairbanks-Morse engine.

Pump.—Belt-driven 10-inch Samson horizontal centrifugal pump.

Area irrigated.—10 acres of alfalfa and 10 acres of corn in 1926 and 1927.

Test.—One measurement was made. The water is distributed through pipe lines, and the measuring conditions were good but subject to pipe-line leakage. The measurement made June 30, 1927, gave a discharge of 1,000 gallons a minute, 4 per cent having been added for pipe-line leakage. No record of operation for 1926 was available, and a use of water of 1 acre-foot per acre was assumed, which gave 20 acre-feet of water used. The record of operation for 152 hours in 1927 gave 28 acre-feet of water pumped and a use of water of 1.4 acre-feet per acre.

53. E. A. HILL ESTATE

Location.—NW. ¼ NW. ¼ sec. 11, T. 4 N., R. 9 E.

First installation.—1917.

Power.—Tractor.

Pump.—Belt-driven 4-inch National horizontal centrifugal pump.

Area irrigated.—In conjunction with pump 54, about 10 acres of alfalfa and garden truck were irrigated in 1926 and 1927.

Test.—One measurement was made. The water is distributed through ditches, and the measuring conditions were good. The measurement made May 17, 1927, gave a discharge of 500 gallons a minute, with a static head of 8 feet. No record of operation for 1926 was available, and a use of water of 1 acre-foot per acre was assumed, which gave 10-acre-feet of water used. The record of operation for 49 hours in 1927 gave 4.5 acre-feet of water pumped. The total amount pumped on 10 acres in 1927 (see pump 54) was 10.5 acre-feet, which gives a use of water of 1.05 acre-feet per acre.

54. E. A. HILL ESTATE

Location.—NW. ¼ NW. ¼ sec. 11, T. 4 N., R. 9 E.

First installation.—1922.

Power.—Tractor.

Pump.—Belt-driven 6-inch Globe horizontal centrifugal pump.

Area irrigated.—See pump 53.

Test.—No measurement was made. The discharge of the pump was estimated at 900 gallons a minute. No record of operation for 1926 was available, and the amount of water pumped was determined as shown under pump 53. The record of operation for 36 hours in 1927 gave a 6 acre-feet of water pumped. Adding the discharge of pump 53 gives 10.5 acre-feet of water pumped upon 10 acres, and the use of water was therefore 1.05 acre-feet per acre.

55. A. A. AND C. E. GILHOUSEN

Location.—NE. ¼ NW. ¼ sec. 12, T. 4 N., R. 9 E.

First installation.—1923.

Power.—One 50-horsepower Westinghouse motor and one 15-horsepower motor.

Pump.—Two 5-inch Krogh horizontal centrifugal pumps, tandem, one belt-connected and one direct-connected.

Test.—No measurement was made. The pump was used in 1923–24 to pump water for gold dredging. The water was pumped through a pipe line about 1 mile long and raised about 300 feet.

56. G. B. PODESTA

Location.—NE. ¼ NW. ¼ sec. 12, T. 4 N., R. 9 E.

First installation.—1907.

Power.—15-horsepower United States motor.

Pump.—Direct-connected 4-inch Sterling horizontal centrifugal pump.

Area irrigated.—27 acres of vineyard, 4 acres of alfalfa, and 2 acres of garden in 1926 and 1927.

Test.—Three measurements were made. The water is distributed through a ditch after being raised to the top of a hill, and the measuring conditions were good. A measurement made October 29, 1926, gave a discharge of 300 gallons a minute, with a static head of 75 feet. The power input was 15.42 kilowatts, or 279 kilowatt-hours per acre-foot of water pumped. A measurement made May 5, 1927, gave a discharge of 320 gallons a minute, with a static head of 72 feet. The power input was 15.80 kilowatts, or 268 kilowatt-hours per acre-foot pumped. On June 30, 1927, the discharge was 295 gallons a minute, with a static head of 74 feet. The power input was 15.25 kilowatts, or 281 kilowatt-hours per acre-foor of water pumped. The average of the three measurements was 305 gallons a minute and 275 kilowatt-hours per acre-foot of water pumped. The total power consumption in 1926 was 8,540 kilowatt-hours, which gave 31 acre-feet of water pumped; in 1927, 6,800 kilowatt-hours, or 25 acre-feet of water pumped. The incomplete record of operation for 132 hours in 1926 gave 7.5 acre-feet of water pumped, which is obviously too low. The incomplete record of operation for 377 hours in 1927 gave 21 acre-feet of water pumped. From the power consumption the use of water was computed at 0.99 acre-foot per acre for 1926 and 0.76 acre-foot per acre for 1927. The total power cost in 1926 was $183.42; in 1927, $162.60; the annual demand charge was $81. The power cost per acre-foot of water pumped was $5.91 in 1926 and $6.50 in 1927. These costs are high, because of the high static head. An increase in the amount of water pumped will lower the cost per acre-foot. The power cost per acre irrigated was $5.56 and $4.93 in 1926 and 1927, respectively.

57. C. S. HALL

Location.—SE. ¼ NE. ¼ sec. 6, T. 4 N., R. 10 E.

First installation.—1926.

Power.—9-horsepower gasoline engine.

Pump.—One 3-inch 2-stage horizontal centrifugal pump and one 5 by 5 inch double-acting plunger pump. Both pumps driven by the same engine.

Area irrigated.—None in 1926; 5 acres of clover and 1 acre of potatoes in 1927.

Test.—No test was made. Water is distributed through a small surface pipe line. The owner estimated the discharge of the two pumps at about 300 gallons a minute and gave a record of operation for 320 hours in 1927. This gave 18 acre-feet of water pumped and a use of water of 3 acre-feet per acre.

PUMPING DIVERSIONS IN 1928

The amount of water diverted monthly from the Mokelumne River during 1928 has been computed for each pump. Records of operation were kept by most of the owners or operators, and meter readings were made on each electrical plant on the 1st of every month. The discharge of the pumps was not remeasured in 1928, and the estimates of the amount of water diverted were based on the measurements made in 1926 and 1927.

The following table gives the estimated monthly amount of water delivered by each pump during 1928. According to these estimates a total of about 3,971 acre-feet was diverted by pumping. A summary of the diversions between successive gaging stations for 1928 appears in the second table.

Monthly diversions from Mokelumne River by pumps in 1928, in acre-feet

No.	Owner	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Total	Remarks
1	S. P. Frandy [a]					0.8	17.7	5.8	1.1				25.4	
2	M. DeVries												0	
3	L. Abba [b]					.2	.4	2.2	.6		0.2		3.6	
4	A. Taddei [b]					1.9	1.7	9.6	2.2				15.4	
5	L. T. Mason												0	
6	H. Bechthold [a]					5.8							5.8	Diverted from slough storage.
7	G. Lawrence [b]			21.2	45.7	17.4	14.1	27.0	12.1	7.5			145.0	
8	do. [b]			48.5	77.8	40.2	90.8	47.7	12.3	30.8	2.6		350.7	
9	P. O. Clark [a]				3.7	3.8							7.5	Diverted during flood season.
10	S. Pokert [b]			2.6	36.5	17.7	30.6	24.0	18.7	5.8			135.9	
11	A. Werner												0	
12	F. G. Carey												0	
13	Woods-Wilhoit Co. [b]			12.9	38.8	22.6	7.0		2.3				83.6	Diverted from slough storage.
14	do. [b]			14.6	15.8	12.9							43.3	Do.
15	do. [b]		29.0	49.3	14.6	37.5	30.1		8.2				168.7	
16	H. C. Lange [a]			72.2	10.3								82.5	
17	P. Joens [b]	14.8	210.2										225.0	
18	J. J. Schmiedt and others [b]			10.2	46.5	9.8							66.5	
19	E. V. Hoffman [b]			.8	25.3	17.7	18.2	16.1	5.8	1.0	1.4	0.8	87.1	
20	J. J. Knoll [a]				5.4	41.2	9.0						55.6	Do.
21	Kirschenmann & Preszler [b]	13.2	199.5	151	99	40.8	10.0	22.6	.2				536.3	
22	D. H. Soucie [b]		19.5					.1					19.6	Do.
23	J. J. Schmiedt [b]			33.6	2.7	9.9	21.1	1.0					68.3	Do.
24	J. T. Langford [b]				62.5	59.1	22.2						143.8	
25	F. H. Buck Co. [b]		12.4	55.6	9.1	99.2	12.1	.4	5.1	19.2			213.1	
26	do.												0	
27	Benjamin Smith [a]			5.3			11.3						16.6	
28	George Blanke [a]			4.0	16.0	9.5							29.5	
29	E. C. Bryan												0	
30	E. J. Locke												0	
30A	Woodbridge Fruit Co. [b]						39.8	42.3	5.3				87.4	
31	E. J. Locke												0	
32	Fred Allen [b]							17.1	15.1				32.2	
33	C. R. Montgomery [b]						12.5						12.5	
34	Woodbridge Fruit Co. [b]							64.4	166.6				231.0	
35	A. Costa [b]							13.7	11.8				25.5	
36	P. Megerle												0	
37	R. S. Featherston [b]					19.0	9.4	50.2	62.3			7.5	148.4	
38	J. Clements [b]					73.9	168.5	118.6	96.5				457.5	
39	R. S. Featherston												0	
40	E. H. Thompson												0	
41	M. H. Steely				[a] 9.0	[a] 9.0	[b] 5.7	[b] 11.9	[b] 8.3		[b] 7.1		51.0	
42	J. Mehrten												0	
43	C. Todman [a]					7.4	7.5	7.5	7.5	7.5	7.5	3.7	48.6	
44	A. P. Henning												0	
45	Cassinelli & Calestini [b]						65.5	7.0	19.8				92.3	

46	F. L. Naylor et al.[b]					15.9	38.8	4.2	15.8				74.7	
47	E. A. Putnam [b]				.4	18.6	14.2	7.6	11.7	1.6			54.1	
48	E. G. Miller												0	
49	J. Kissel [a]					4.2		4.2	2.7	2.8			13.9	
50	E. Struckmann												0	Not on river.
51	C. Childs [a]					7.5							7.5	
52	T. Osterman [a]					7.4	2.6	14.0	14.0				38.0	
53	E. A. Hill estate												0	
54	do												0	
55	A. A. and C. E. Gilhousen												0	
56	G. B. Podesta[b]				.3	3.2	4.4	6.6	4.0	4.2	2.1		24.8	
56A	G. H. Laraway[a]					10.7	10.7	10.7	10.7				42.8	
57	C. S. Hall												0	
		28.0	470.6	481.8	519.4	624.8	675.9	536.5	520.7	80.4	20.9	12.0	3,971.0	

[a] Computed from owner's record.

[b] Computed from power consumption.

Monthly diversions from Mokelumne River between successive gaging stations by pumps in 1928, in acre-feet

Water diverted from—	Between gaging stations at—	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
River	Lancha Plana and Clements				9.7	83.9	149.4	73.7	94.5	16.1	16.7	3.7	447.7
Do	Clements and Victor	13.2	211.9	215.9	186.6	301.5	285.8	329.3	362.9	19.2		7.5	1,933.8
Sloughs	do		19.5	33.6	2.7	9.9	21.1	1.1					87.9
River	Victor and Woodbridge	14.8	239.2	204.8	256.7	140.3	183.8	114.8	57.1	45.1	4.0	.8	1,261.4
Sloughs	do			27.5	63.7	86.3	16.0		2.3				195.8
River	Woodbridge and Thornton					2.9	19.8	17.6	3.9		.2		44.4
Total from river	Lancha Plana and Thornton	28.0	451.1	420.7	453.0	528.6	638.8	535.4	518.4	80.4	20.9	12.0	3,687.3
Total from sloughs	Clements and Woodbridge		19.5	61.1	66.4	96.2	37.1	1.1	2.3				283.7
Total from river and sloughs	Lancha Plana and Thornton	28.0	470.6	481.8	519.4	624.8	675.9	536.5	520.7	80.4	20.9	12.0	3,971.0

A summary of the amount of water diverted from the Mokelumne River between the gaging stations for 1926, 1927, and 1928 and of all diversions from the river during the same years is given in the next two tables.

Diversions from Mokelumne River by pumps in 1926, 1927, and 1928, in acre-feet

Diverted from—	Between gaging stations at—	1926	1927	1928
River	Lancha Plana and Clements	774	735	448
Do	Clements and Victor	1,367	1,495	1,934
Sloughs	do	45	86	88
River	Victor and Woodbridge	1,040	965	1,261
Sloughs	do	143	172	196
River	Woodbridge and Thornton	91	83	44
Total from river	Lancha Plana and Thornton	3,272	3,278	3,687
Total from sloughs	Clements and Woodbridge	188	258	284
Total from river and sloughs	Lancha Plana and Thornton	3,460	3,536	3,971

Summary of all diversions from Mokelumne River in 1926, 1927, and 1928, in acre-feet

	1926	1927	1928
From Lancha Plana diversion ditch [a]	60	60	60
From diversion gates near Lockeford [b]	50	50	50
From Woodbridge Irrigation District canal	[c] 25,634	42,070	31,944
Pumping from river	3,460	3,536	3,971
	[c] 29,204	45,716	36,025
Diversion into Mokelumne River by Lancha Plana gold mine	302	364	[d] 273
Net amount of water diverted from Mokelumne River	[c] 28,902	45,352	35,752

[a] July to November.
[b] Flood season.
[c] Record on canal did not start till Apr. 28, 1926, and therefore total diverted is not known.
[d] January, February, March, and May.

GROUND-WATER LEVELS

METHOD OF INVESTIGATION

A large number of wells were selected for observation, so far as possible one at each section corner. Altogether about 500 observation wells were recorded. (See table on pp. 292–398.) The wells selected were preferably abandoned or domestic wells located as far away from irrigation wells as practicable, in order that the water level in them would not be disturbed by local pumping. Therefore the measurements of depth to water indicate the general regional rise and fall of the ground-water reservoir under the area. It was not everywhere practicable to select shallow wells for observation, but it was found that the water level in deep wells coincided very nearly with the general water table, because of the lack of extensive artesian aquifers underlying the area, even at considerable depths. The agreement of the water level of the deep and shallow wells is brought out graphically in the water-table maps (pls. 6, 7, and 8) by the lack of irregularities in the contour lines. Although daily records of the change of the water level in some of the deep wells indicate that slight artesian pressure is present, the effect is not believed to be quantitatively important in monthly or seasonal changes in ground-water storage. The mere depth of an observation well is not proof in itself that the fluctuation in the water level is not that of the water table, because the amount and method of casing, the log of formations, and the type and position of perforations are extremely important and in this area are not readily nor accurately ascertainable. Even when very complete data are at hand these facts can be interpreted quite differently. In the ultimate determination holes would have to be drilled just to the water table and the fluctuations of the two types of wells studied by comparison. It is not economically feasible to drill the large number of water-table wells that would be required in an investigation of this sort, hence existing wells had to be utilized. Slight artesian pressure may be present in some of the observation wells and, if there, would indicate a slightly greater recharge and unwatering than actually occurs, but the annual inventories of ground-water storage would not be materially affected.

The depth to water in these observation wells was measured with a steel tape to the nearest 0.05 foot. Great care was taken to have the measurements accurate. The tape was allowed to rust and was then coated between measurements with chalk or dust. In this way a definite watermark was obtained on the tape. All measurements were made by men trained to the work. Whenever any doubt existed as to whether the tape was not recording the actual water level a number of measurements were made until several measurements checked with one another. The tape was loaded at the end with a strip of sheet lead, hence it was not difficult to ascertain if it was obstructed by irregularities in the casing or was coiling up on the bottom of the well.

All measurements were made from definitely established bench marks. On most wells that had wood curbs a copper washer bearing the letters "U. S. G. S. W. R." was set with a 2-inch copper nail, the head of which was the measuring point. On concrete curbs a cross was chiseled into the top surface, and at drilled wells the top of the iron casing was used as the measuring point. Each measuring point was marked in addition with red paint, and the number of the well was painted on the curb or pump. In this way little difficulty was experienced in rapidly obtaining accurate measurements of a great many wells. In general there are roads on each section line, and definite routes were laid out to expedite the work. Thus, measurements on all the observation wells were made within a few days.

A careful description of each bench mark was recorded, and its altitude above some permanent point was noted, so that future measurements could be made from the same datum. The owner might destroy the curb, thereby destroying the bench mark, but as a rule it was easily replaced with another if the reference point was undisturbed. A complete description of the bench mark of each well is given in the table.

Measurements of depth to water in wells in the vicinity of Lodi were made by W. N. White, of the United States Geological Survey, in 1907, and the records were published in Water-Supply Paper 398. His notebooks were consulted, and many of the old wells were identified and remeasured. In 1913 and 1914 Bryan [24] made measurements of the depth to water in a few wells between the Mokelumne River and Dry Creek, in the Lodi area. By means of Bryan's maps and notes, many of the wells were identified and remeasured. In 1925 Charles H. Widdows, consulting engineer in Stockton, made measurements of a number of wells in the vicinity of the Mokelumne River. Many of these wells were remeasured during the investigation. The wells measured in 1925 by Cyril Williams, consulting engineer of San Francisco, were also identified and remeasured. The measurements made by these previous investigators are included in the table. No efforts were spared to use all the available data in order to determine the fluctuation of the water level in the wells.

SIGNIFICANCE OF THE WATER TABLE

The water table is the upper surface of a zone of saturation except where that surface is formed by an impermeable body.[25] Below this surface all the spaces not occupied by rock are filled with water. Thus, the part of a well that extends into the zone of saturation is filled with water, and the water surface in the well may be regarded as the water table at that point. Actually it is seldom exactly at the level of the water table, because slight artesian or subnormal pressure due to local lenses of confined water causes the water in wells penetrating them to stand slightly higher or lower than the adjacent water table. This fact was established several times during the investigation by test holes drilled for other purposes. Thus, the water level in three wells in a single pit belonging to J. C. Lange, in the SE. ¼ NE. ¼ sec. 5, T. 3 N., R. 7 E., stood at slightly different heights, as shown in the table below. When the shallow well was bored the water overflowed on the floor of the pit and discharged into the deepest well.

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[24] Bryan, Kirk, Geology and ground-water resources of Sacramento Valley, Calif.: U. S. Geol. Survey Water-Supply Paper 495, pp. 147–252, 1923, and unpublished data.

[25] Meinzer, O. E., Outline of ground-water hydrology: U. S. Geol. Survey Water-Supply Paper 494, p. 32, 1923.

Water levels in three wells in the same pit on farm of J. C. Lange, sec. 5, T. 3 N., R. 7 E.

	Well 375H3	Well 375H4	Well 375H5
Depth of well, in feet	180	[a] 100	38
Water level in well, in feet above sea level:			
Apr. 6, 1926, 2.08 p. m.	42.48	42.93	43.18
May 2, 1926, 11 a. m.	43.93	43.78	44.08
May 10, 1926, 2.10 p. m.	43.63	43.48	43.88
May 24, 1926, 11.30 a. m.	43.93	43.78	44.13
June 4, 1926, 4.15 p. m.	43.68	43.57	43.77
Jan. 30, 1928	39.03	39.03	39.08

[a] Drilled to 185 feet but filled up with sand to 100 feet.

The wells in the Lodi area used for irrigation are finished at various depths in the sandy aquifers of the area. The clayey beds intercalated with the sandy members of the alluvium locally restrict the rapid movement of water from one aquifer to another during the pumping season. Consequently, slight differences of head, such as are found in wells 375H3, H4, and H5, occur because pumps in the vicinity of these three wells are drawing water from the aquifers of the two deeper wells (375H3 and H4). The water in the shallow well occurs in an aquifer above the levels at which the irrigation wells draw their supply and hence responds less to the withdrawals of water from the deeper strata than the water in the deeper wells. At the end of the irrigation season, as on January 30, 1928, the water stood at practically the same level in all three wells. An earnest attempt was made to avoid using wells of this type for observation.

A recording barometer was kept in Lodi to determine the effect of changes in barometric pressure on the water table in the wells equipped with water-stage recorders. As the water level in wells in artesian basins fluctuates with changes in barometric pressure on the confining beds above the artesian aquifer, the virtual absence of such fluctuations in the wells of the Lodi area is evidence that a water table exists and not a piezometric surface.[26] It is essential in the quantitative study of ground water in this area that the measurements of the depth to water record fluctuations of the water table instead of changes in artesian pressure.

In a few places the water table may be a level surface, but under most areas it has a gentle gradient. As Meinzer and Hare [27] have so aptly expressed it,

> A knowledge of its elevation and topography gives information in regard to the source, movement, and disposal of the underground water and in areas with little development gives a basis for forecasting the depth to water. It also gives a basis for future estimates of the effects of heavy pumping. A knowledge of

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[26] Fiedler, A. G., Report on investigations of the Roswell artesian basin, New Mexico: New Mexico State Engineer Seventh Bienn. Rept., pl. 7, 1926. Meinzer, O. E., Methods of estimating ground-water supplies; outline of available methods (mimeographed paper presented before the Society of Economic Geologists in New York), p. 23, December, 1928.

[27] Meinzer, O. E., and Hare, R. F., Geology and water resources of Tularosa Basin, N. Mex.: U. S. Geol. Survey Water-Supply Paper 343, p. 103, 1915.

the position of the water table relative to the land surface is important in its bearing on the cost of drilling and pumping, the quantity of underground water returned to the atmosphere, and the accumulation of alkali in the soil.

FORM OF THE WATER TABLE

The form and altitude of the water table in the Mokelumne area are shown by 10-foot contours on Plates 6 and 7, based on the well measurements given in the table.

In general the water table beneath the valley floor resembles the land surface in shape except that its slope from the uplands to the delta country is more gentle. From the line common to Rs. 8 and 9 E., near the east side of the area, to the sea-level contour the water-table gradient is about 5 feet to the mile, as compared to about 9 feet to the mile for the land surface. The water-table contours for both April and September indicate that ground water is moving from the foothills to the delta country. The 70-foot and 80-foot contours where they cross Dry Creek north of Clements show that Dry Creek is an influent, or losing stream for the 6-mile stretch east of Elliott, but west of Elliott the channel crosses compact alluvium, and the stream does not lose as rapidly. Likewise the contours indicate that the Mokelumne River becomes an influent stream from a point north of Clements to the Woodbridge Dam. From the dam to tidewater the contours indicate that it is an effluent, or gaining stream during the summer and fall. The gain in the Mokelumne River between Woodbridge and Thorton is sufficient to be measured. The ground-water contours show that the river appreciably affects the water table only in the bottom lands to a point near Lockeford. West of this place the stream bed becomes more permeable, owing to the transition from the older to the younger alluvium. From Lockeford to the Woodbridge Dam the contours bulge considerably downstream, and for a large part of this stretch the bulge is caused by the water that seeps out of the Woodbridge Reservoir.

FLUCTUATIONS OF THE WATER TABLE

GENERAL CONDITIONS

The water table in the ground-water reservoir beneath the Mokelumne area fluctuates much like the water surface of any storage reservoir. The ground-water reservoir has periods of filling, when the water table rises, and periods when withdrawals exceed the inflow, causing the water table to fall. The fluctuation of the water levels in the wells is an index to the inflow and outflow of water from the ground-water reservoir and hence to the safe yield of the reservoir, somewhat as the fluctuation of the water level in a surface reservoir indicates the amount of water in it. For this reason the types of fluctuation and their causes are discussed in the following pages. However, the water table fluctuates more in response to recharge or discharge of a given number of acre-feet of water than the water level in a surface reservoir having the same area, because 1 foot of water will produce a rise of several feet in the ground-water reservoir, and, on the other hand, several feet of saturated alluvium must be drained to yield 1 foot of water.

The rate at which the water table rises or falls depends on the rate at which the underground supply is replenished or withdrawn. The principal controlling factors in the rise and fall of the water table in the Mokelumne area are the amount of rainfall penetration, the recharge from streams crossing the area, and the amount withdrawn from the ground by pumps. In many basins in the arid West the controlling factors are rainfall and evaporation, but in this area evaporation is much less important. It has been noted by many observers in area of pumping in California that the rise corresponds to the beginning of the rainy season and reaches its highest stage just after the dry season begins. In the Lodi area the recovery of the water table at the time the rains begin is more a coincidence than an effect, because it is also the end of the irrigation season, when the pumps are shut down. The rise in the area of intensive pumping during the first part of the season of recovery is due largely to a hydrostatic adjustment with the cessation of pumping; hence it is essentially a pressure gradient effect. Ground water slowly flows into the cone of depression caused by the pumping until the depression is filled.

If the amount of water pumped out during the previous irrigation season is greater than the recharge, the water table fails to return to its previous maximum stage, and an annual decline results. Decline may progress for a number of years, but during a series of wet years the water table may finally return to its former position. During wet years there is not only an increase in recharge but also a decrease in withdrawals due to decreased irrigation demands. The heavy pumping that results in the lowering of the water table increases the storage capacity of the ground-water reservoir, so that in wet years the soil may absorb water that would have gone to waste if the water table had not been low. A rise and fall of the water table over a period of years is known as a secular fluctuation. A secular decline of the water table has been recorded at Lodi since 1906. There have doubtless been years in this falling stage, as in 1926, when the water table rose slightly, but the general trend has been downward.

When the water table subsides all the water in the ground above it does not drain downward. In the Mokelumne area, where the structure is complicated by lenses of clay, a relatively large percentage of water remains above the water table during periods of subsidence, and the specific yield of the material is rather small compared with the pore space. If the material is permanently unwatered a somewhat larger proportion of the water eventually drains out.

86579—30——9

ANNUAL FLUCTUATIONS

The annual fluctuation of the water table under the entire area is illustrated by Plates 6 and 7, which show the contours of the water table at the high and low stages each year. The fluctuation is not uniform over the area but ranges from less than a foot in one locality to 12 feet in another. The average annual fluctuation for the entire Mokelumne area is about 2 feet. An annual fluctuation was observed in all wells, as is shown by the measurements recorded in the table on pages 292–398. It is the result of all operative factors—pumpage, rainfall, stream flow, evaporation, transpiration, and discharge by underflow into the delta country. In general the highest stage is reached in April or May and the lowest in September or October of each year.

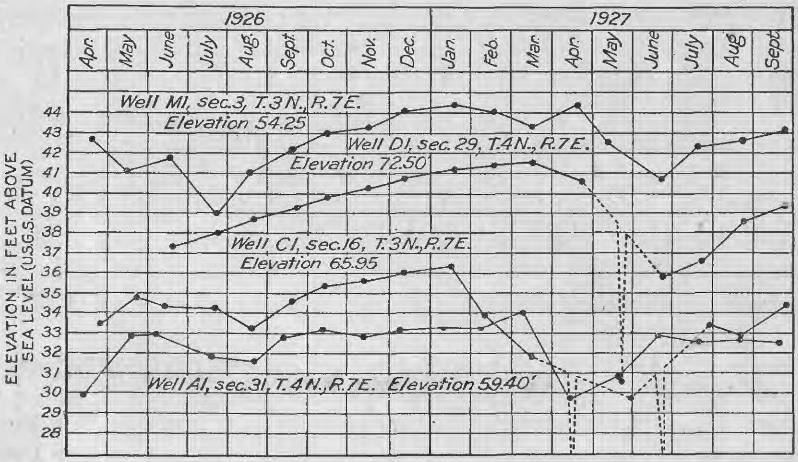

FIGURE 5.—Hydrographs of four wells illustrating the annual fluctuation of the water table in the Mokelumne pumping district

FLUCTUATIONS IN THE PUMPING DISTRICT

Pumping is started by a few irrigators as early as January, but most of the pumps start in April and May. This time coincides closely with the time when the water table begins its annual decline. As shown on page 271, about 70,800 acre-feet is withdrawn annually from the ground-water reservoir. The effect of pumping is shown by the hydrographs of wells in the heavily irrigated district in the vicinity of Lodi and Victor, given in Figure 5. The hydrographs of three of the wells show that in 1927 the decline of the water table started in March or April and reached the lowest stage in June, but that in 1926 the lowest stage was reached in July or August. In the heavily pumped district the fluctuation amounts to about 5 feet each year. In 1927 well 3716C1 reached its peak in January and its lowest point in June. It is believed that the early decline of this well resulted from pumping in January for irrigation.

FLUCTUATIONS OUTSIDE THE PUMPING DISTRICT

In Figure 6 the fluctuation of the water level is shown for five wells located outside the pumping area. In general the water levels in these wells reach their lowest stage in September and their highest stage in April or May. The wells nearest the mountains show a relatively small fluctuation, amounting to 2 feet or less, which decreases with their distance from the cone of influence of the pumping district. The amount of annual fluctuation increases toward the west, where it reaches a maximum of 5 feet next to the pumping district. This 5-foot fluctuation is caused chiefly by pumpage in the adjacent irrigated area. However, a comparison of the hydrographs in Figure 6 with those in Figure 5 brings out the lag in the recovery of the wells outside the pumping area. Thus in the wells in Figure 5 the water levels start to rise in June, with the shutting down of the pumps, whereas the lowest level is reached at a progressively later date as the periphery of the cone of depression in the water table is approached. This lag in time interval indicates the slowness with which the water table adjusts itself over extensive areas to slight regional changes in the shape of the water table. Doubtless because of this slow response to slight changes in hydrostatic pressure, the water table never fully reaches equilibrium before the next season's change again affects it. The water in all the wells shown in Figure 6 lies too deep to contribute to transpiration from plants adjacent to them, hence the fluctuations do not reflect changes resulting from crop growth. According to Lee and Ellis,[28] wherever the depth to ground water is greater than 9 feet, there is no evaporation from the

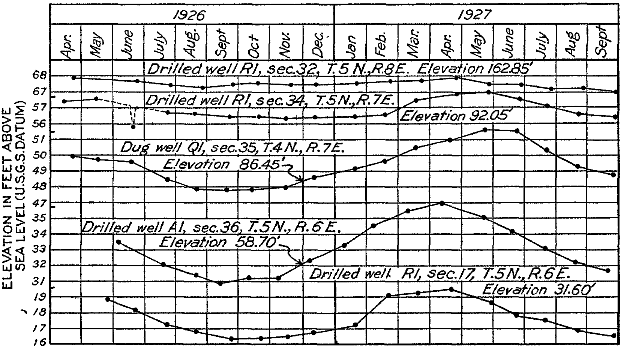

FIGURE 6.—Hydrographs of five wells illustrating the annual fluctuation of the water table outside the Mokelumne pumping district

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[28] Lee, C. H., and Ellis, A. J., Geology and ground waters of the western part of San Diego County, Calif.: U. S. Geol. Survey Water-Supply Paper 446, p. 104, 1919.

soil except as the surface may be temporarily moistened. Absorption by the roots of plants may, however, occur where the depth to ground water is greater.

FLUCTUATIONS IN THE WOODBRIDGE IRRIGATION DISTRICT

In the area west of Lodi the high and low stages of the water table occur at nearly the opposite time of the year to those in the pumping district. This condition is caused by irrigation with water diverted from the Mokelumne River and used in the Woodbridge irrigation district. Thus, when the lowest stage of the water table occurs in the Lodi pumping area the water table stands close to its highest in this district, only a few miles away. The soil is sandy, and the water table is close to the surface in this district, hence the amount of water used is great and the ground-water recharge considerable. The water level begins to decline at the end of the irrigation season and reaches its lowest level in December, January, or February. (See fig. 7.) Adequate proof exists that the losses by percolation from the canals in this district are heavy. For years many of the farmers adjacent to the canals have not had to buy water from the district because the land was subirrigated by seepage. The effect of irrigation is discussed further on pages 202–206.

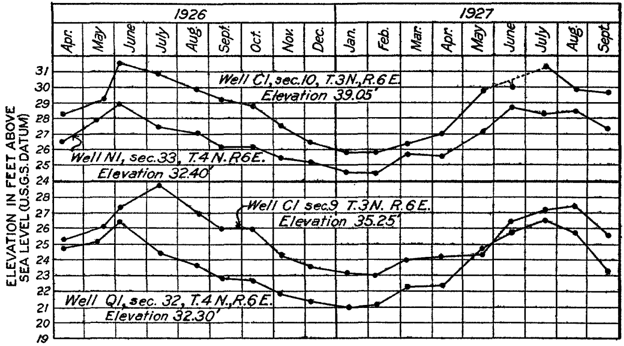


FIGURE 7.—Hydrographs of four wells illustrating the annual fluctuation of the water table in the Woodbridge irrigation district

FLUCTUATIONS IN LANDS ADJACENT TO MOKELUMNE RIVER

From Lancha Plana to Clements the annual fluctuation of wells adjacent to the Mokelumne River is slight because of the low permeability of the older alluvium. In Figure 8 the hydrograph of well 4815F1, in the Clements Cemetery, shows an annual change of only 1 foot. The high stage occurs late in the spring or in summer, corresponding in general to the period of high run-off in the river and

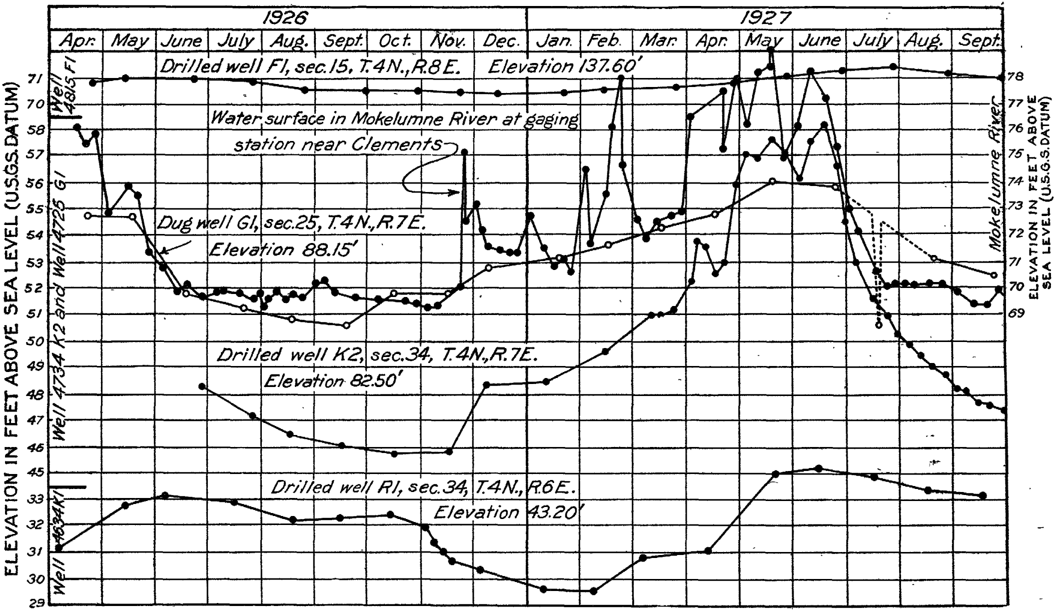


FIGURE 8.—Hydrographs of four wells illustrating the annual fluctuation of the water table along the Mokelumne River, with the hydrograph of the Mokelumne River at Clements for comparison

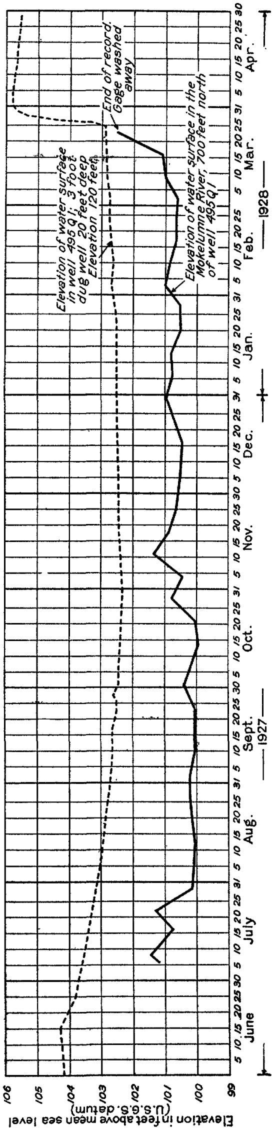


FIGURE 9.—Comparison of the water level in well 495Q1 with the water level of the Mokelumne River near by

the time when the water in the wells in the pumping district is at its lowest. Fluctuations of 12 feet in the stage of the river produced no pronounced rise or fall in the water level in this well, so far as was observed, though it is only a quarter of a mile from the river. Although this may be due to the fact that the measurements of the river and the well were a month apart, it is more probably due to the relatively impermeable rock between the well and the river. Support for the second explanation is found in the absence of observed pronounced rises of the water level in the well, such as are shown in the other hydrographs in Figure 8.

The water level in well 495Q1, on the Lucas ranch, in the narrow belt of auriferous gravel bordering the river between Lancha Plana and Clements, showed a rise of only 3 feet during the flood of March, 1928. This well is about 500 feet from the river, but the gravel of even the younger alluvium in this stretch of the flood plain is only slightly permeable except where it has been washed by gold dredges. This well was equipped with an automatic gage, and hence a continuous record was obtained. The record shows that the water level of this well did not fluctuate with the river except during the flood of March, 1928. (See fig. 9.)

Downstream from Clements the younger alluvium becomes thicker and sandy, and at Victor the older alluvium is absent. Wells in this stretch show greater annual fluctuations, some of them as much as

12 feet. The amount of rise in any of the wells is dependent upon its closeness to the river and the degree of permeability of the intervening material.

Well 4725G1, belonging to the La Lomita ranch, half a mile from the river, shows a pronounced response to the stage of the river even in the measurements made only once a month. A hydrograph of the river plotted on the basis of the average weekly stage at Clements is given for comparison in Figure 8.

Well 4734K2, belonging to Fred Kirschenmann, is 65 feet deep and 200 feet from the south bank of the river near Victor. (See fig. 8.) Well 4734K3, 12 feet away from K2, was equipped with a Stevens type E water-stage recorder which registered continuously the fluctuations of the water level in the well. The graph made by the recorder proved conclusively that the water in these wells fluctuated closely with the stage of the river. (See pl. 9.) This is also evident from a comparison of the graph of well K2 with the graph of the stage of the river in Figure 8. The shape of the K2 graph is especially significant because this well is near the center of the heavy-pumping district, yet its highest stage is reached at the same time that the irrigation wells reach their lowest.

Well 4634R1, belonging to Miss E. M. Smith, is 350 feet from the Woodbridge Reservoir. The water surface in the well is lower than the surface of the reservoir when filled, and the water table responds more quickly to rapid reservoir filling than to rapid emptying. The water level of the reservoir is maintained with only slight changes from May to November, and it is for this reason that there is so slight a change in the water level of the well during these months. The sudden drop in the water level in this well in November, 1926, as shown in Figure 8, resulted from the flashboards in the dam being taken out November 2. The rapidity of the decline was arrested during the later part of the month, because the river partly filled the reservoir as a result of a heavy rain.

Several automatic water-stage recorders were maintained on wells adjacent to the Mokelumne River. Hydrographs of the water level in these wells appear in Plate 9.

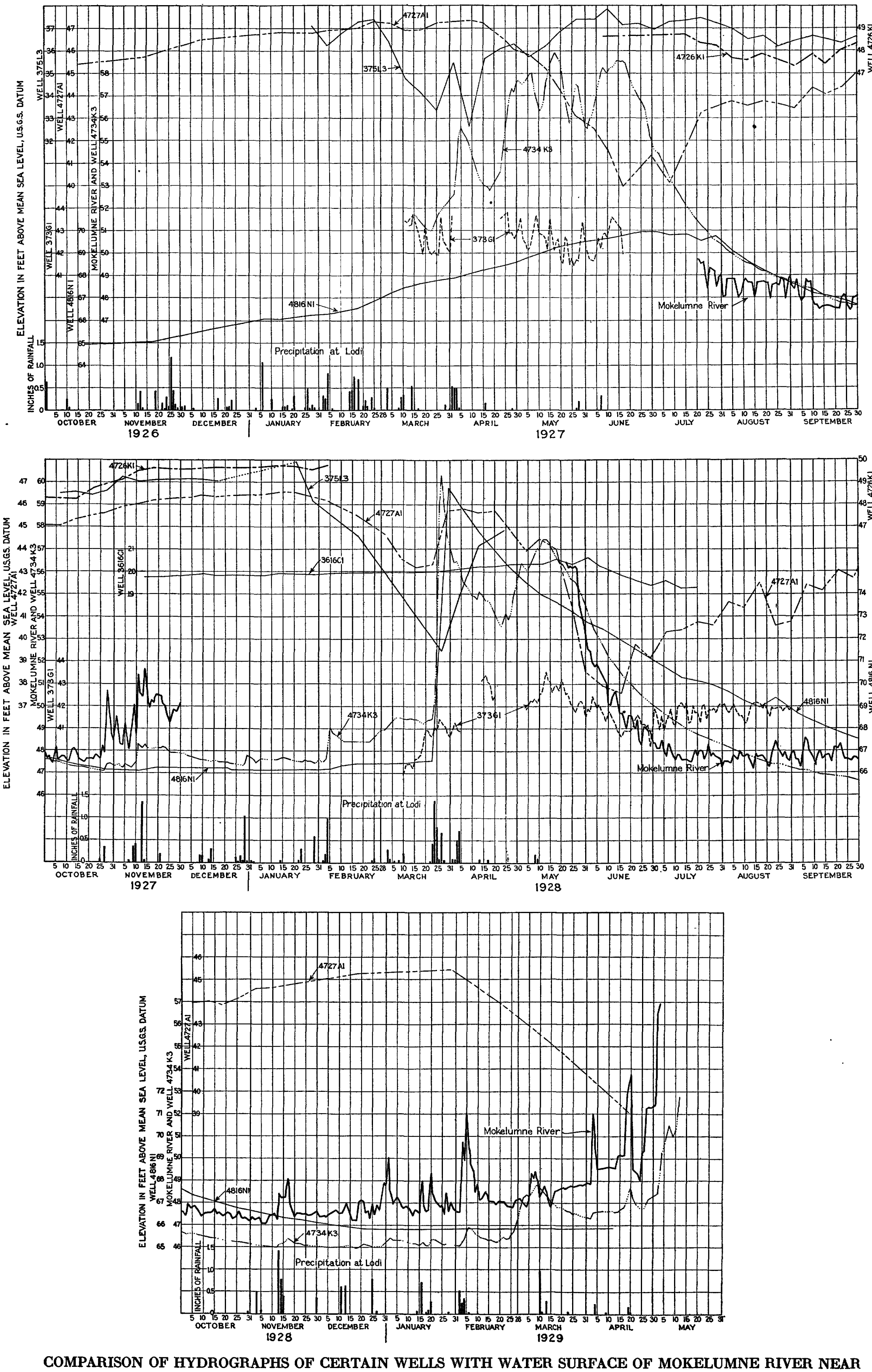
FLUCTUATIONS IN LANDS ADJACENT TO DRY CREEK

Several wells between the Ione and Galt gaging stations on Dry Creek were equipped with automatic water-stage recorders. All the wells showed a response to the intermittent flow of the creek, but they did not show pronounced fluctuations corresponding with the stage of the creek. Hydrographs of these wells, together with the daily discharge of Dry Creek at Ione and the rainfall at Elliott, are shown in Plate 10. All the wells were within half a mile of the creek, but none of them were shallow wells similar to those near the banks of the

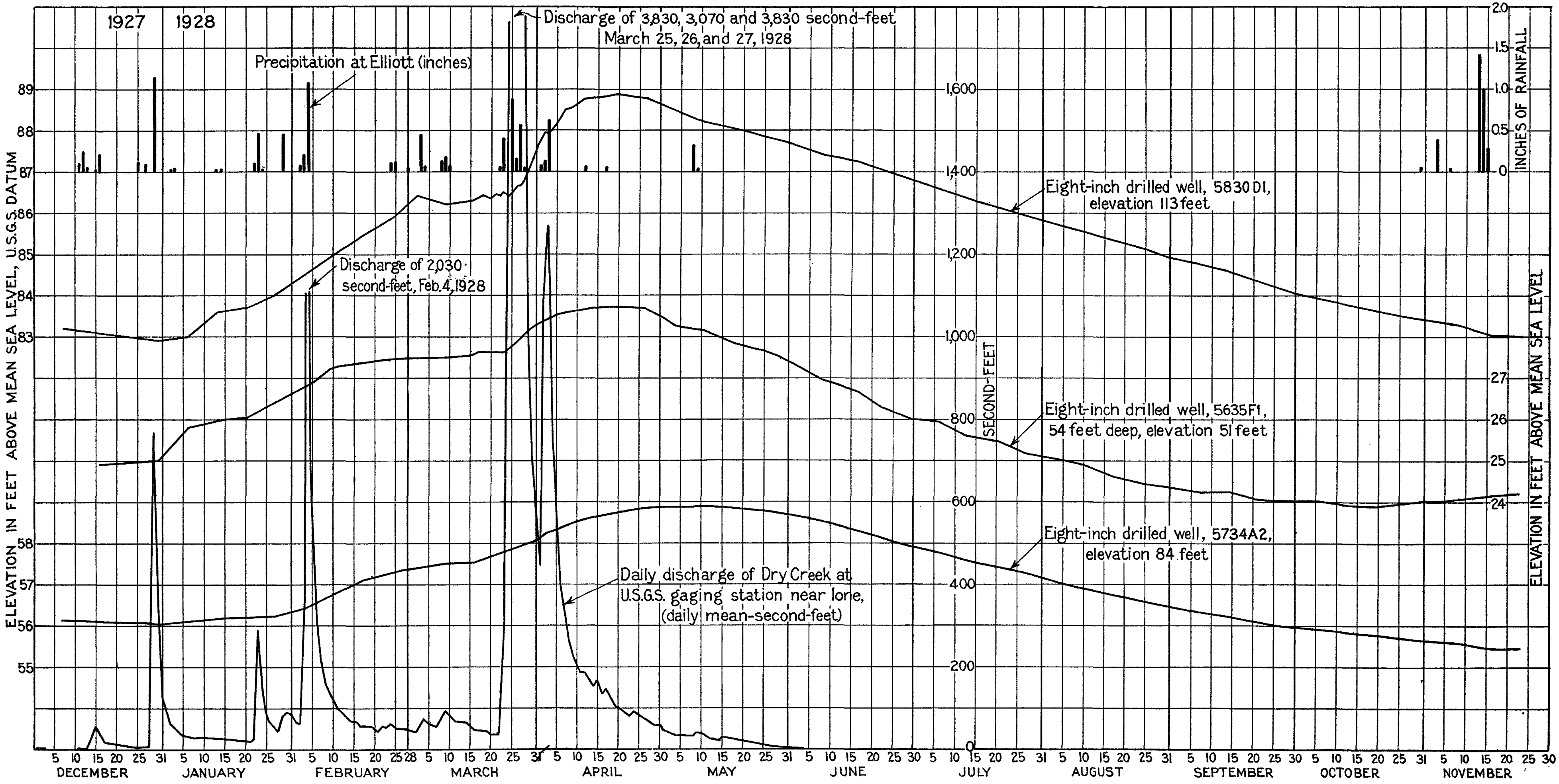
Mokelumne River. Furthermore, high stages of Dry Creek occurred at times of heavy storms, and hence it is difficult to decide how much of the rise in the water level in the wells was produced by Dry Creek and how much was produced by ground-water recharge from rain on the area surrounding the wells.

SUMMARY

An annual fluctuation varying in amount was found in all the wells, but the high and low in one place may occur at very different times of year than in another. However, the maximum stage of the water level in any one area is reached at about the same time each year and is a response to certain definite conditions. Thus in the pumping area the annual maximum occurs early in the spring and the minimum in June, July, or August. In areas outside the pumping district, but not within the Woodbridge irrigation district or close to a stream, the high stage occurs in April or May and the low stage in August or September, or, about two months later than in the pumping district. In the Woodbridge irrigation district the high stage comes in April, May, and June and the low stage in the winter—the reverse of the condition in the pumping district. In the territory adjacent to streams the high stage comes in May or June, depending on the time of highest stream flow, and the low stage comes late in the fall, at the time of lowest stream flow. Slight artesian pressure was found in some of the deep wells, but an effort was made to avoid these wells in the observation of the fluctuations. Because of these diverse conditions it is impossible to prepare contour maps showing the annual high and low stages of the water table for the entire Mokelumne area. April and September contours are shown on the water-table maps, Plates 6 and 7, because the water table in most of the area reaches its high and low stages, respectively, in these months. The water-table contours for July, 1929, the location of most of the observation wells, and areas of specified depths to water are shown on Plate 8. The contours for July, 1929, illustrate the effects of pumping around Lodi and the irrigation in the Woodbridge irrigation district on the water table. The 20-foot contour is nearly a closed contour, as a result of the heavy pumping in the Lodi pumping district during this time of the year. The areas of different depths to water as shown on this plate are probably slightly inaccurate in the vicinity of Dry Creek and the Mokelumne River, because of the steep or irregular topography bordering those streams. As the water table is nearly flat below any small area of land, a change of 10 or 20 feet in surface altitude would make a similar change in the depth to water. On the small scale of this map it is obviously impossible to show these many minor variations in the depth to water.



COMPARISON OF HYDROGRAPHS OF CERTAIN WELLS WITH WATER SURFACE OF MOKELUMNE RIVER NEAR VICTOR, AND RAINFALL AT LODI



COMPARISON OF HYDROGRAPHS OF THREE WELLS ALONG DRY CREEK WITH DISCHARGE OF DRY CREEK NEAR IONE AND RAINFALL AT ELLIOTT

ANNUAL CHANGE IN GROUND-WATER STORAGE

The annual fluctuation of the water table in a nonartesian area is an index to the volume of water stored in the ground. If the water table returns after the period of withdrawals to its position of the previous year recharge and discharge are in equilibrium. Because of variations in the amount of recharge and discharge, the water table does not always return to the same position each year. Therefore, if the water table fails to return by the end of the recharge season a certain volume of alluvium is unwatered. If the specific yield of this drained layer is known, or the ratio of the volume of water which, after being saturated, it will yield by gravity to its own volume, the decrease in storage for the year can be readily determined. In practice in the Mokelumne area the amount of water which the layer of water-bearing material will yield by gravity is not easily determined, because of the variation in texture of the material from place to place and because of the existence of clay beds which cause temporary or permanent perched bodies of ground water. However, if a sufficiently large number of wells are measured annually at the same time each year the change in volume of saturated material can be determined fairly accurately. Even if the specific yield of the material is unknown, the

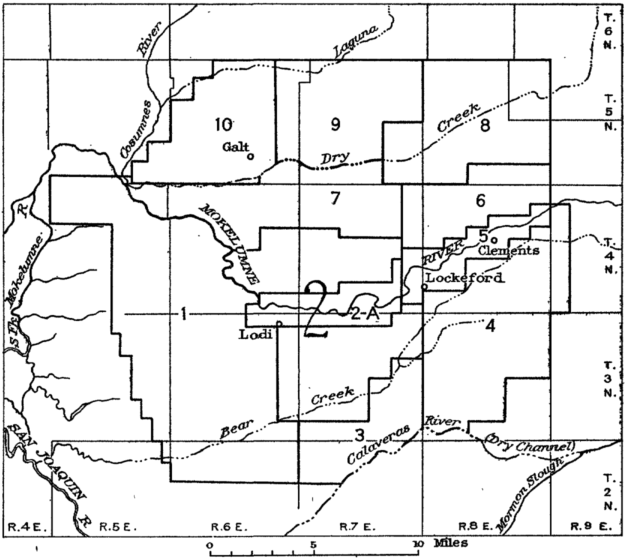


FIGURE 10.—Map of the Mokelumne area showing location of subareas used in computing volume of material saturated or unwatered

annual change in the volume of material saturated or unwatered is an excellent index to the annual variation in the amount of recharge and discharge.

During this investigation all the observation wells were measured in April and September, when the water table over much of the area reached its highest and lowest stages respectively. The entire Mokelumne area was then subdivided into 10 subareas, the divisions being based on the depth to water, the amount of water pumped, or special conditions of recharge, in order that the effect of these factors could be better studied. The location of these 10 subareas is shown in Figure 10, and the change in volume of saturated material from April, 1926, to April, 1929, for each area is given in the following table:

Changes in ground-water level and in volume of saturated material in subareas 1 to 10

Period covered	Subarea 1, 58,900 acres, including the Woodbridge irrigation district and adjacent tracts of moderate pumpage			Subarea 2, 35,700 acres of heavy pumpage with obvious recharge from Mokelumne River in lands adjacent to the river		
	Number of wells used in computation	Average rise or fall of water level	Volume of material saturated (+) or unwatered (−)	Number of wells used in computation	Average rise or fall of water level	Volume of material saturated (+) or unwatered (−)
		Feet	*Acre-feet*		*Feet*	*Acre-feet*
April to September, 1926	80	−2.8	−164,900	47	−1.9	−67,800
September, 1926, to April, 1927	84	+2.5	+147,200	63	+2.3	+82,100
April to September, 1927	83	−2.1	−123,700	67	−2.2	−78,500
September, 1927, to April, 1928	83	+1.6	+94,200	70	+1.7	+60,700
April to September, 1928	75	−2.2	−129,600	71	−2.9	−103,500
September, 1928, to April, 1929	76	+.4	+23,800	66	−1.2	−43,200
April to July, 1929	69	−.17	−10,100	70	−.77	−27,500
April, 1926, to April, 1927			−17,700			+14,300
April, 1927, to April, 1928			−29,500			−17,800
April, 1928, to April, 1929			−105,800			−146,700
April, 1926, to April, 1929			−153,000			−150,200
September, 1926, to September, 1927			+23,500			+3,600
September, 1927, to September, 1928			−35,400			−42,800
September, 1926, to September, 1928			−11,900			−39,200
	Subarea 3, 12,600 acres of moderate pumpage			Subarea 4, 29,700 acres of slight pumpage		
April to September, 1926	22	−2.6	−32,800	42	−0.8	−23,800
September, 1926, to April, 1927	22	+3.0	+37,800	51	+.7	+20,800
April to September, 1927	22	−2.9	−36,500	47	−1.5	−44,600
September, 1927, to April, 1928	22	+1.4	+17,600	47	+.9	+26,700
April to September, 1928	22	−3.2	−40,300	45	−1.5	−44,600
September, 1928, to April, 1929	22	+1.6	+20,000	46	+.4	+12,200
April to July, 1929	19	−2.85	−36,000	50	−1.42	−41,700
April, 1926, to April, 1927			+5,000			−3,000
April, 1927, to April, 1928			−18,900			−17,900
April, 1928, to April, 1929			−20,300			−32,400
April, 1926, to April, 1929			−34,200			−53,300
September, 1926, to September, 1927			+1,300			−23,800
September, 1927, to September, 1928			−22,700			−17,900
September, 1926, to September, 1928			−21,400			−41,700

Changes in ground-water level and in volume of saturated material in subareas 1 to 10—Continued

	Subarea 5, 8,000 acres of slight pumpage with obvious recharge from Mokelumne River			Subarea 6, 11,800 acres of slight pumpage		
April to September, 1926	8	−2.1	−16,800	18	−1.3	−15,300
September, 1926, to April, 1927	15	+2.8	+22,400	18	+.8	+9,400
April to September, 1927	17	−1.9	−15,200	19	−1.1	−13,000
September, 1927, to April, 1928	19	+3.7	+29,600	17	+.8	+9,400
April to September, 1928	16	−3.7	−29,600	14	−.9	−10,600
September, 1928, to April, 1929	17	−.3	−2,400	14	−.03	−400
April to July, 1929	19	−1.2	−9,600	14	−.95	−11,200
April, 1926, to April, 1927			+5,600			−5,900
April, 1927, to April, 1928			+14,400			−3,600
April, 1928, to April, 1929			−32,000			−11,000
April, 1926, to April, 1929			+12,000			−20,500
September, 1926, to September, 1927			+7,200			−3,600
September, 1927, to September, 1928			0.0			−1,200
September, 1926, to September, 1928			+7,200			−4,800

	Subarea 7, 20,800 acres of moderate pumpage			Subarea 8, 24,300 acres of no pumpage but obvious recharge from Dry Creek		
April to September, 1926	30	−2.2	−45,800	9	−2.2	−53,500
September, 1926, to April, 1927	29	+2.7	+56,100	17	+1.9	+46,200
April to September, 1927	29	−2.8	−58,200	19	−1.1	−26,700
September, 1927, to April, 1928	32	+2.3	+47,800	23	+1.8	+43,700
April to September, 1928	33	−3.0	−62,200	21	−2.1	−51,000
September, 1928, to April, 1929	32	+1.1	+22,100	22	+0.6	+16,300
April to July, 1929	30	−2.0	−41,600	22	−0.95	−23,100
April, 1926, to April, 1927			+10,300			−7,300
April, 1927, to April, 1928			−10,400			+17,000
April, 1928, to April, 1929			−40,100			−34,700
April, 1926, to April, 1929			−40,200			+25,000
September, 1926, to September, 1927			−2,100			+19,500
September, 1927, to September, 1928			−14,400			−7,300
September, 1926, to September, 1928			−16,500			+12,200

	Subarea 9, 19,800 acres of slight pumpage			Subarea 10, 18,900 acres of moderate pumpage		
April to September, 1926	15	−0.9	−17,800	30	−2.2	−41,600
September, 1926, to April, 1927	24	+0.8	+15,800	31	+3.2	+60,500
April to September, 1927	22	−0.9	−17,800	30	−2.9	−54,800
September, 1927, to April, 1928	21	+0.6	+11,900	30	+2.6	+49,100
April to September, 1928	20	−0.9	−17,800	31	−3.2	−60,500
September, 1928, to April, 1929	22	+0.2	+4,000	30	+1.5	+27,600
April to July, 1929	26	−0.5	−9,900	25	−1.7	−32,100
April, 1926, to April, 1927			−2,000			+18,900
April, 1927, to April, 1928			−5,900			−5,700
April, 1928, to April, 1929			−13,800			−32,900
April, 1926, to April, 1929			−21,700			−19,700
September, 1926, to September, 1927			−2,000			+5,700
September, 1927, to September, 1928			−5,900			−11,400
September, 1926, to September, 1928			−7,900			−5,700

The change in volume of material saturated from April, 1926, to April, 1929, for the entire Mokelumne area, of 240,500 acres, is summarized in the next table. From April, 1926, to April, 1927, there was an increase of 18,200 acre-feet in the volume of material saturated, and from September, 1926, to September, 1927, an increase of 29,300 acre-feet. Thus, at the end of the pumping season of 1927 there was more water stored in the ground than at the end of the previous season. However, from September, 1927, to April, 1929, there was a decrease in underground storage. From April, 1927, to April, 1928, 78,300 acre-feet of material was unwatered, and from

April, 1928, to April, 1929, an additional 469,700 acre-feet was unwatered. Thus in the 3-year period from April, 1926, to April, 1929, there was a net unwatering of 529,800 acre-feet of material. This decrease in storage is discussed further on pages 176–178.

A number of field experiments were made to determine the specific yield of the soil between the high and low stages of the water table. These tests are discussed in detail in another place (pp. 151–172). The specific yield of the soils examined was found to vary considerably, with an estimated average yield of about 10 per cent of their volume. If 529,800 acre-feet of material that was unwatered from April, 1926, to April, 1929, yielded 10 per cent of its volume, then about 53,000 acre-feet of water was withdrawn from storage, in excess of recharge, during this 3-year period. As shown on page 271, about 70,800 acre-feet of water is withdrawn annually from the ground for irrigation and domestic requirements in the Mokelumne area, hence the 53,000 acre-feet estimated decrease in storage during the 3-year period is about 25 per cent of the consumption in the same period. This rate of decrease in storage would be alarming if it were not for the fact that during the wet year 1927 there was a gain in storage, which suggests that this decrease in storage may be mostly a result of the dry season of 1928–29 and that the loss will be largely restored during a wet year in the future. Observations of the depth to water in the wells will have to be made for a number of years more before this suggestion can be verified.

Summary of seasonal gain or loss in volume of saturated material in the Mokelumne area (240,500 acres) and in each of the 10 subareas

	April to September, 1926	September, 1926, to April, 1927	April to September, 1927	September, 1927, to April, 1928	April to September, 1928	September, 1928, to April, 1929
Number of wells used in computations	301	354	355	364	347	----------
Average rise (+) or fall (−), in feet, of water level for entire area	−1.996	+2.071	−1.950	+1.624	−2.285	+0.332
Volume of material unwatered (−) or saturated (+), in acre-feet:						
Subarea 1	−164,900	+147,200	−123,700	+94,200	−129,600	+23,800
Subarea 2	−67,800	+82,100	−78,500	+60,700	−103,500	−43,200
Subarea 3	−32,800	+37,800	−36,500	+17,600	−40,300	+20,000
Subarea 4	−23,800	+20,800	−44,600	+26,700	−44,600	+12,200
Subarea 5	−16,800	+22,400	−15,200	+29,600	−29,600	−2,400
Subarea 6	−15,300	+9,400	−13,000	+9,400	−10,600	−400
Subarea 7	−45,800	+56,100	−58,200	+47,800	−62,200	+22,100
Subarea 8	−53,500	+46,200	−26,700	+43,700	−51,000	+16,300
Subarea 9	−17,800	+15,800	−17,800	+11,900	−17,800	+4,000
Subarea 10	−41,600	+60,500	−54,800	+49,100	−60,500	+27,600
Total change	−480,100	+498,300	−469,000	+390,700	−549,700	+80,000

Summary of annual and total gain or loss in volume of saturated material in the the Mokelumne area, 1926–1929, in acre-feet

	Year ending in April	Year ending in September
1926–27	+18, 200	+29, 300
1927–28	−78, 300	−159, 000
1928–29	−469, 700	----------
	−529, 800	−129, 700

DIURNAL FLUCTUATIONS

During the greater part of the year a daily or diurnal fluctuation of the water table occurs in the Mokelumne area. This fluctuation was not observed until the spring of 1927, because before that time measurements of the water level were made only monthly. In 1927 six Stevens 8-day type E water-stage recorders were installed on wells in the area adjacent to the river. These recorders operated on a time scale of 1 inch to 19 hours and a water-height scale of 1 inch to 0.2 foot. The water-height scale is interchangeable for a smaller scale, but the 0.2 scale was used on all recorders except one. On well 375L3, in sec. 5, T. 3 N., R. 7 E., a water-height scale of 1 inch to 0.5 foot was used because of the large drawdown caused by an adjacent pumping plant. This plant when in operation caused a fluctuation of the water level in the well that ranged from 12 to 15 feet.

There are several causes that produce a diurnal fluctuation of the water table. Only those which were observed and studied in the area will be discussed here—namely, pumping from wells, variation of stream flow, and plant growth. The diurnal fluctuation is caused by any one or any combination of these causes. They are discussed below in the order of their importance.

FLUCTUATION PRODUCED BY PUMPING

Daily withdrawals of ground water for irrigation cause the greatest daily fluctuation of the water level. The hydrograph of well 375L3, shown in Figure 11, illustrates the fluctuations of the ground-water level in an area in which there is heavy pumpage. The fluctuations are the result of general pumpage throughout the area and not due to any one particular pumping plant. The well is in the heart of the vineyard area, about 2 miles east of Lodi, and there are 12 irrigation pumping plants within a radius of half a mile of it. At times during the irrigation season all these plants are operating at once. The pumping plants are usually started about 5 a. m. and allowed to run continuously until about 6 p. m. This condition is illustrated by the hydrograph shown in Figure 12. Except on Sunday, March 20, the water level began to drop between 6 and 7 a. m. and continued until about 6 p. m. On Sunday there was practically no pumping, and consequently the water level rose at a more or less uniform rate until about 5 a. m. Monday, when a sudden drop occurred, and the decline continued until 5 p. m. This particular week-end recovery of the water level amounted to approximately 1½ feet and appears to be typical of the area east of Lodi.

A careful study of the graph shows that the water table declines at a uniform rate of about 0.15 foot an hour during the first four or five hours of pumping. Just before noon there is a change in the rate of decline, which slowly diminishes until about 6 p. m., when the curve reverses its direction. The change in the rate of decline may be explained as follows: A local depression of the water table is created through the withdrawal of ground water by pumpage. This depression has somewhat the shape of a large saucer or inverted dome, the deepest portion being in the center and the water table gradually approaching normal near the boundaries of the area. During the first few hours of pumping the circle of influence in which the water level is appreciably lowered is relatively small. Discharge from this area is at first greater than the recharge, and hence as pumping continues the circle of influence grows in size. The water level continues to lower until the circle of influence has spread so far that the flow into the area tributary to the depression is equal to the pumpage. If the rate of discharge remains the same and the rate of recharge is increased, it follows that there will be a change in the rate of decline, causing the water level to drop less rapidly than in the early hours of pumping. Other things may influence the rate of change also. For instance, a few pumping plants may

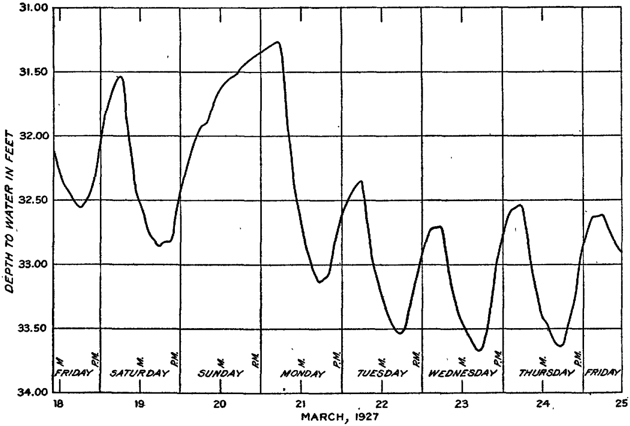


FIGURE 11.—Hydrograph of well 375L3 showing diurnal fluctuation produced by pumpage

shut down early in the afternoon, and this would cause a change in the rate of discharge and produce the effect noted.

The ascending portion of the curve in Figure 11 indicates a recovery of the water table caused by the recharge or inflow exceeding the discharge. The water level recovers rapidly and at a nearly uniform rate in the early part of the evening. After a few hours this rate changes, and recovery continues at a slightly decreasing rate until the curve again reverses direction. The cone of depression becomes smaller and the hydraulic gradient becomes flatter, causing a decrease in the rate of recharge. This diminishing rate of change is pronounced in the week-end recovery, as shown by the portion of the curve from Saturday night to Monday morning.

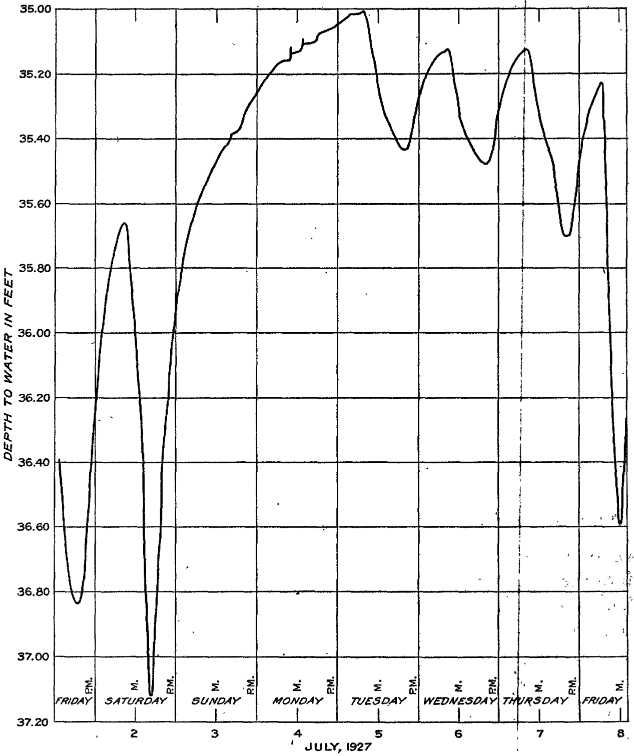


FIGURE 12.—Hydrograph of well 373G1 showing recovery of water table in pumping district over a holiday

Another very prominent feature is the gradual decline of the water level shown by the curve, which reaches a progressively lower point each day, owing to the continued daily pumping throughout the week. Thus each day the water level recovers less than it did during the preceding day. Such a condition of the water table is typical of any heavily pumped district in the Mokelumne area. Hence at the end of each week during the irrigation season the water level in the wells has dropped from several inches to a foot or more below the point where it stood the previous week. In the same hydrograph the blunt peak of the recovery curve for Wednesday, Thursday, and Friday is of interest. The curve begins to flatten out about 3 a. m. and continues flat until the daily decline commences at 6 a. m. This is probably due to the starting of some pumping plants early in the morning, before most of the pumps are running. This is often done, especially where horizontal centrifugal pumps are so located that a drop of a foot or two in the water level places the water beyond suction distance of the pump. Owners of such plants endeavor to do as much pumping as possible before the water level is lowered by the operation of adjacent plants.

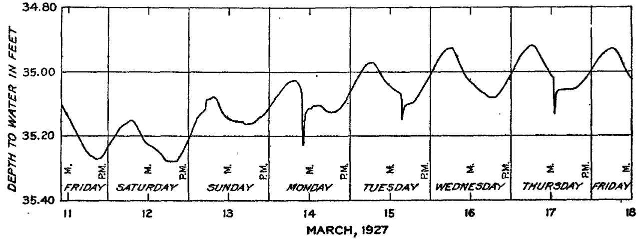
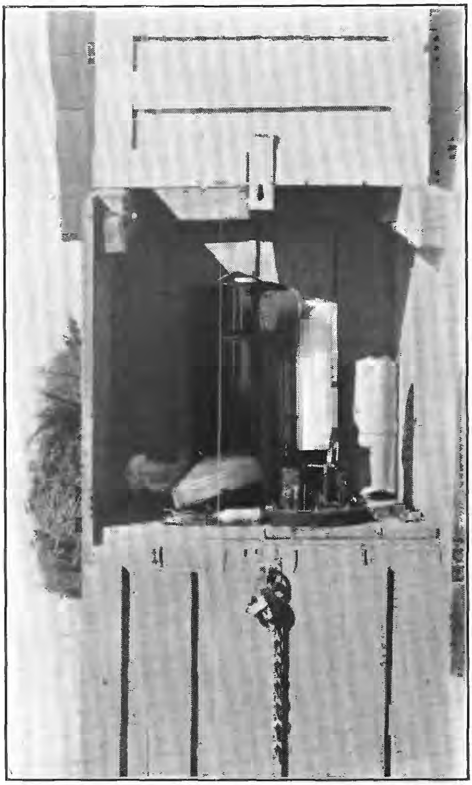


FIGURE 13.—Hydrograph of well 4727A1 showing diurnal fluctuation produced by pumpage

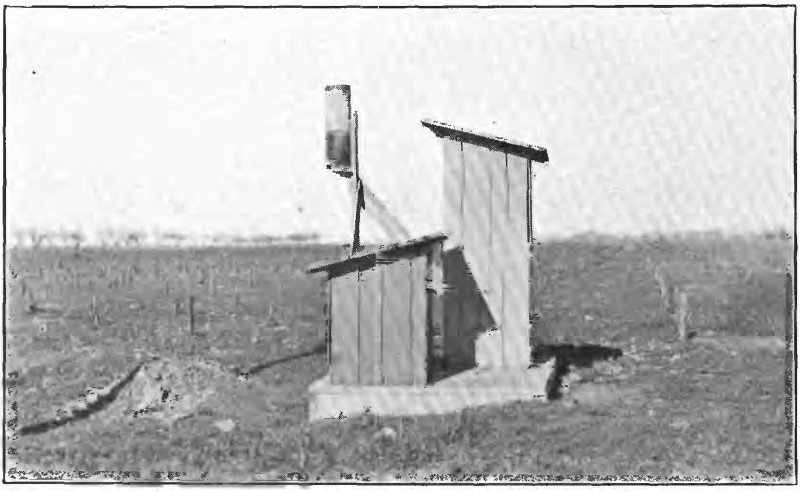
The hydrograph for well 373G1, in sec. 3, T. 3 N., R. 7 E., shown in Figure 12, is similar to that for well 375L3, with only one exception. During Sunday, July 3, and Independence Day, July 4, there was a very pronounced recovery of the water level as a result of pumps not operating. From Saturday evening, July 2, until Tuesday morning, July 5, the recovery amounted to about 2.10 feet.

The hydrograph of well 4727A1, shown in Figure 13, illustrates the diurnal fluctuation due to pumpage in another part of the area. This curve represents the period March 11–18, 1927, just a week preceding that shown for well 375L3 in Figure 11 and similar to it. However, portions of the curve representing recovery and decline of the water level are not so steep, nor is the amount of the fluctuation as great. Pumping in the vicinity of this well is not as great as in the vicinity of well 375L3, and for that reason the ascending and descending slopes of the curve are not so steep. Another striking



A. RECORDING EQUIPMENT AND SHELTER USED ON WELL 4734K3

Photograph by Thomas W. Robinson.



B. RAIN GAGE AND SHELTERS FOR WATER-STAGE RECORDERS ON WELL 373G1

Photograph by Harold T. Stearns.

AIRPLANE VIEW SHOWING LOCATION OF WELLS 4734K2, 4734K3, AND 373G1, THE VICTOR GAGING STATION, AND VINEYARDS AND ORCHARDS TYPICAL OF THE HEAVILY PUMPED DISTRICT NEAR VICTOR

Photograph by United States Army Air Corps.

feature of the curve is the absence of the pronounced week-end recovery of the water table. There appears to have been a slight recovery, but the effect is barely noticeable. The lowest point of the period occurred on Saturday between 6 and 9 p. m. The next lowest point, which occurred Sunday at 6 p. m., showed a recovery of 0.12 foot. This recovery is so small that it is practically negligible compared with what commonly occurs in the wells already discussed. The absence of a week-end recovery indicates that most of the pumping plants in the vicinity were allowed to run on Sunday. On Monday at 10 a. m., Tuesday at 4.30 p. m., and Thursday at 1 p. m. there was a sudden drop, with a gradual return to normal in the course of an hour. This drop was caused by the operation of a small pumping plant about 300 feet distant. The pump is used to fill a large tank for domestic water supply.

In contrast to the hydrograph of well 375L3 for March 18–25, 1927 (fig. 11), the hydrograph of well 4727A1 for March 11–18, 1927 (fig. 13), shows the water level to be steadily rising instead of declining, recharge being more rapid than discharge at this time in this locality because only a few pumps are operating here so early in the season.

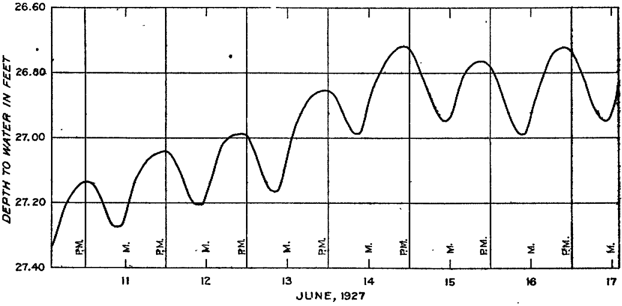


FIGURE 14.—Hydrograph of well 4734K3 showing diurnal fluctuations produced by diurnal fluctuation in the Mokelumne River near by

FLUCTUATIONS PRODUCED BY VARIATIONS IN STREAM FLOW

Another type of diurnal fluctuation besides that due to pumpage occurs in the water levels in wells near the Mokelumne River. This fluctuation is caused by the diurnal fluctuation of the adjacent stream and is illustrated by the hydrograph for well 4734K3, in sec. 34, T. 4 N., R. 7 E., shown in Figure 14. The diurnal fluctuation of the river is caused by power regulation at a dam in the headwaters. The well was drilled by the United States Geological Survey 200 feet from the south bank of the river about 1 mile north of Victor. It is a

10-inch well 52 feet deep, with 30 feet of 16-gage solid steel casing and 18 feet of 16-gage perforated casing. The top of the well is about 37 feet above the river bed at this point, and the bottom is about 15 feet below the river bed. Plate 11, *A*, shows the equipment and shelter used on this well, and Plate 12 is an airplane photograph showing the location of the well with respect to the river.

As shown by Figure 14, the peak of the fluctuation occurred between 10 p. m. and midnight, whereas in the wells affected by pumping the peak occurred about 5 a. m. The low stage occurred about 10 a. m. in this well and about 7 p. m. in the wells affected by pumping. During the period June 10–17 represented on the curve the average daily discharge of the river was about 4,100 second-feet. The day of greatest discharge was June 14, when an average of about 4,500 second-feet passed the Clements gaging station. On this day occurred the highest peak of the curve. The maximum fluctuation of the water level as represented by the curve was 0.60 foot. Figures 15 and 16 show the diurnal fluctuation in the same well at times of rapidly rising and rapidly falling water table corresponding to similar rising and falling stages of the river. The maximum stage of the

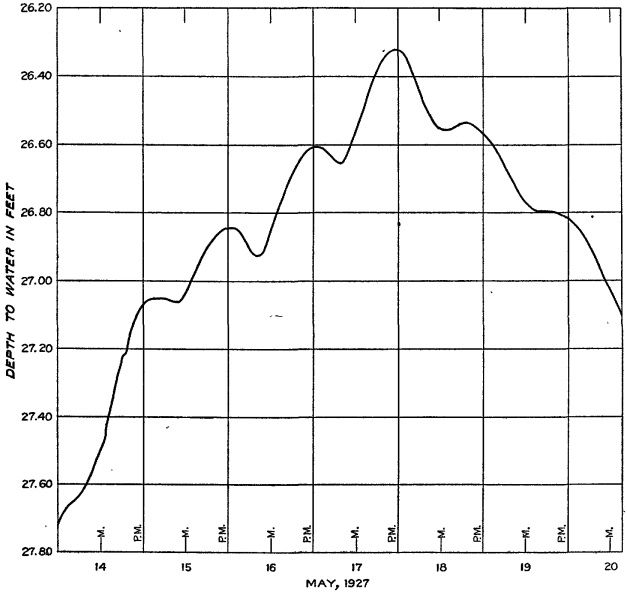


FIGURE 15.—Hydrograph of well 4734K3 showing diurnal fluctuations produced during a rising and falling stage of the Mokelumne River

river for the period May 13–20, 1927, as recorded by the gaging station at Clements, occurred at 9 a. m. May 17. The high point on the well curve for this period occurred at midnight May 17. This lag is due to the time interval required for the flood crest to travel from the Clements gaging station to the river bed opposite the location of the well and for the ground-water wave to reach the well from the river.

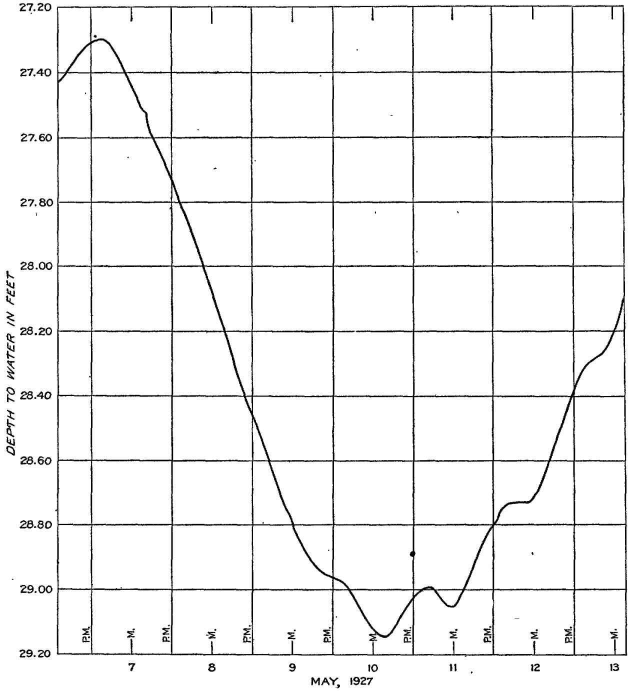


FIGURE 16.—Hydrograph of well 4734K3 showing diurnal fluctuations produced during a falling and rising stage of the Mokelumne River

FLUCTUATIONS PRODUCED BY TRANSPIRATION

During the spring and summer of 1927 several hydrographs showing diurnal fluctuations of the water level produced by transpiration were obtained. Figure 17 illustrates the diurnal change in the water level of well 4821H1 produced by transpiration from adjacent trees which depend upon ground water for their growth. During the daytime considerable water is transpired from the leaves and is replaced by absorption of ground water by the roots, but during the night the transpiration and absorption are much less. Consequently the water table penetrated by the root systems goes down during the day and recovers during the night. Thus a diurnal fluctuation is induced by the differences in the rate of transpiration between day and night.

SECULAR FLUCTUATIONS

It is known that in this area the water table has been declining for the last 20 years and perhaps longer, but accurate data on this decline are not abundant. However, through the reports of well owners, observations on dug wells, and measurements made by White[29] in 1906–7 and by Bryan[30] in 1913–14 the amount and rate of the decline are partly known.

It is common knowledge among the older landowners that the water now stands lower in wells than it did 10 or 20 years ago. At irrigation wells where horizontal centrifugal pumps are used, pits have been dug and later deepened in order to place the pumps within suction distance of the water. Many of the old irrigation well pits show evidences of having been deepened once, twice, or even three times. In a few places large subterranean cavities have been encountered while the pits were being deepened. These cavities were formed by large quantities of sand being pumped out of the upper strata along with the water during previous years when the ground water stood higher than at present.

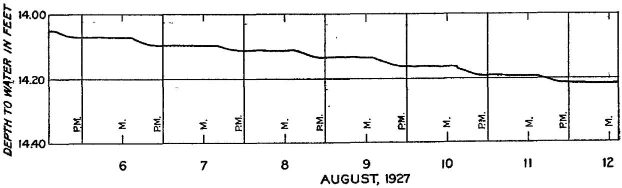


FIGURE 17.—Hydrograph of well 4821H1 showing diurnal fluctuation produced by transpiration from adjacent trees depending upon ground water

Along the foothills in the eastern part of the area there are a number of old dug wells which formerly contained water but are now abandoned and dry. Old windmills and pumps on these wells indicate that they were at one time in use. Most of the wells were dug 50 or 60 years ago and indicate that the water level then was several feet higher than at present.

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[29] Mendenhall, W. C., Dole, R. B., and Stabler, Herman, Ground water in San Joaquin Valley, Calif.: U. S. Geol. Survey Water-Supply Paper 398, pp. 183–187, 1916, and unpublished data in the files of the U. S. Geological Survey.

[30] Bryan, Kirk, Geology and ground-water resources of the Sacramento Valley, Calif.; U. S. Geol. Survey Water-Supply Paper 495, p. 152, 1923, and unpublished data in the files of the U. S. Geological Survey.

The measurements by White and Bryan give more specific data as to the amount of the decline in the last 20 years. The average rate of decline for this period in the area adjacent to the Mokelumne River between Lockeford and the San Joaquin-Calaveras County line is about 0.40 foot a year. An example of this decline is seen in the old well that supplied Lockeford until 1927. The depth to water in this well was 42 feet in 1907, 45 feet in 1913, and 52 feet in 1927. From these measurements it would appear that the level has declined at a fairly uniform rate of 0.50 foot a year since 1907. This example is probably typical of wells in the upland region.

The decline of the water table has been progressively greater in a westerly direction from Lockeford and reaches a maximum in the vicinity of Lodi. The depth to water in the George Preszler well in sec. 3, T. 3 N., R. 6 E., near Victor, was 22 feet in 1907, 34.50 feet in 1925, and 36 feet in 1927. This drop of 14 feet occurred in 20 years, or at the average rate of 0.70 foot a year. In the vicinity of Lodi the depth to water was 7 feet in 1907 and 21.50 feet in 1927. This subsidence of 14½ feet occurred in the same 20 years and is equivalent to an average decline of 0.72 foot a year. West of Lodi adequate comparative data are lacking, but measurements of wells 264H1 and 3627J1 and reports by owners indicate that the decline is much less than east of Lodi and is apparently only a few feet. This small decline is due to the fact that seepage from surface irrigation and the Woodbridge Canal tends to maintain a constant water level. A net decline has been recorded in many wells in this district since 1927, and it appears that pumping in the area to the east is slowly affecting this area.

In general the decline holds true for the entire area between Dry Creek and the Calaveras River. The measurements in the table on pages 139–142 show the change that has occurred in the water level in the wells since 1906. More comprehensive water-table data will be found in the table on pages 292–398.

In the J. T. Langford irrigation well, No. 4726N1, on the north side of the Mokelumne River 2 miles west of Lockeford, in a heavily pumped area, there has been no permanent decline of the water table since 1918. The measurements on this well are given in the following table.

Measurements of well 4726N1

[Bench mark is copper washer on base of pump, 32.50 feet below ground surface, altitude 59.60 feet, which is 32.50 feet below the reference bench mark, a copper washer on door sill]

Date	Depth to water (feet below bench mark)	Altitude of water level (feet above sea level)	Date	Depth to water (feet below bench mark)	Altitude of water level (feet above sea level)
1918			1927		
Mar. 4	[a] 8.35	[a] 51.25	Jan. 17	9.50	50.10
			Feb. 16	9.05	50.55
1921			Mar. 15	8.35	51.25
Jan. 31	[a] 7.85	[a] 51.75	Apr. 18	[b] 9.00	[b] 50.60
June 10	[a] 7.75	[a] 51.85	June 1	[b] 18.35	[b] 41.25
			June 2	[d] 10.75	[d] 48.85
1925			June 29	9.75	49.85
Mar. 26	[a] 9.10	[a] 50.50	July 29	[b] 16.35	[b] 47.85
Nov. 20	[a] [b] 15.00	[a] [b] 44.60	Aug. 22	11.75	47.85
Nov. 23	[a] [b] 16.80	[a] [b] 42.80	Sept. 27	11.35	48.25
1926			1928		
Mar. 26	[a] [b] 17.00	[a] [b] 42.60	Apr. 24	9.80	49.80
Apr. 13	[a] 10.40	[a] 49.20	May 24	10.05	49.55
Apr. 20	10.25	49.35	June 18	11.10	48.50
May 15	[c] 8.60	[c] 51.00	July 25	12.00	47.60
June 17	11.55	48.05	Aug. 23	([b])	([b])
July 23	[c] 14.30	[c] 47.20	Sept. 24	12.40	47.20
Aug. 18	12.40	47.20			
Sept. 23	12.65	46.95			
Oct. 25	11.20	48.40			
Nov. 15	11.05	48.55			
Dec. 9	9.85	49.75			

[a] Measurement by owner.
[b] Pumping.
[c] Pump running in adjacent well.
[d] Water in ditch near by.

The oldest record of the depth to water in the entire area is reported by R. J. Smith. He states that on April 16, 1885, the water stood 40 feet below the surface in well 386E1, on Bear Creek, 1 mile south of Lockeford. On April 15, 1927, the depth to water was 44.60 feet, hence the water table had fallen less than 5 feet at this place since 1885. This well is less than 2 miles from the heavily pumped Lodi district. J. G. Woodson, owner of well 477E2, in the SW. ¼ NW. ¼ sec. 7, T. 4 N., R. 7 E., reported April 12, 1926, that 20 years ago, when the pit was dug for the pump, there was 2 inches of water in the pit, and that by 1916 the water had risen 4 feet above the pit floor. In 1926 the water had fallen to a level 2 feet below the floor of the pit.

One cause of the change in water level is the intensive agricultural development which has taken place within the last 20 years. There has been an immense draft on the ground water by pumps, to furnish irrigation water for various types of crops during this time. A survey shows that this draft is increasing each year, as more and more land is being irrigated from wells.

Many persons believe that the rainfall has been below normal in the last 20 years. At Lodi for the 20-year period ending September 30, 1927, the mean rainfall was 16.45 inches, or only 1.81 inches below the 39-year mean. At Galt the mean for the same period was only 0.85 inch below the 49-year mean. For the 21-year period since White measured the wells (October 1, 1906, to September 30, 1927) the mean at Lodi was only 0.52 inch below the 39-year mean, and the mean at Galt was 0.49 inch above the 49-year mean.

These figures indicate that the mean rainfall for the last 20 years has not been very different from the long-term mean. However, this method of analyzing the precipitation does not bring out the true condition. The cumulative curves of precipitation in Figure 4 bring out the fact that the period since 1907 at Lodi, Galt, and Stockton has been a dry cycle compared with the period 1888 to 1907. Hence there has been an accumulated deficiency in rainfall on the valley floor in the last 15 or 20 years. Consequently a part of the decline in the Lodi region since 1907 may be due to the difference in precipitation. It is doubtful whether a large part can be attributed to this cause, however, for the water table has remained practically at the same level since 1913 just north of Dry Creek, a region where the water table has not been influenced by pumping. This condition is shown on Plate 13 by the ground-water contours for 1913 and 1929 in the vicinity of Dry Creek. Drainage in the delta country is not the cause, because the sea-level contour of the water table coincides closely with the sea-level land contour, a position where it must have been prior to reclamation of the delta country. A part of the decline in the heavily pumped district may be due to the fact that the water table never fully recovers from year to year, as it did in 1907, prior to the period of heavy pumpage. A small-scale illustration is found in the vicinity of a single pumping plant, where the water table rises rapidly to a certain level when the pump is shut off but may take weeks to reach the level at which it stood prior to the starting of the pump.

Measurements of depth to water level in wells by the United States Geological Survey from 1906 to 1929

[Measurements in 1906-7 by Walter N. White; in 1913-14 by Kirk Bryan and J. W. Muller. For detailed description of wells see table on pp. 292-398]

Well No.	Altitude of land surface (feet above sea level)	Date of measurement	Depth to water (feet)
261R1	35	Dec. 31, 1906	[a] 9
		Feb. 20, 1929	19.4
264H2	21	Jan. 2, 1907	12
		Feb. 20, 1929	10.5
2612M1	31	Dec. 31, 1906	7
		Feb. 20, 1929	19.0
2615H1	22.8	May 25, 1907	[a] 8
		May 19, 1926	6.90
		May 28, 1927	6.85
		May 22, 1928	7.40
		Feb. 18, 1929	14.8
2616G2	15	Jan. 2, 1907	10.5
		Feb. 20, 1929	[a] 13.8
3610P2	31	Jan. 1, 1907	[a] 8.5
		Dec. 21, 1928	[a] 13.6
3611D3	44	May 28, 1907	[a] 6
		Feb. 21, 1929	20.0
3611D18	42	May 28, 1907	5
		Feb. 21, 1929	17.7
3611G9	41	May 28, 1907	4
		Feb. 21, 1929	16.7
3611H2	43	May 28, 1907	[a] 5
		Dec. 20, 1928	19.3
3611Q3	40	May 28, 1907	[a] 5
		Dec. 20, 1928	16.5
3611R5	42	May 28, 1907	[a] 4
		Dec. 20, 1928	19.1
3612A1	46	May 27, 1907	7
		Feb. 21, 1929	21.0
3612A2	45	May 28, 1907	[a] 8
		Feb. 21, 1929	21.2
3612E2	43	May 28, 1907	[a] 6
		Dec. 20, 1928	19.1

[a] Reported.

Measurements of depth to water level in wells by the United States Geological Survey from 1906 to 1929—Continued

Well No.	Altitude of land surface (feet above sea level)	Date of measurement	Depth to water (feet)
3612J3	44	May 28, 1907	6
		Dec. 20, 1928	20.2
3612N5	44	May 27, 1907	[a] 4
		Dec. 20, 1928	20.6
3613B3	44	May 28, 1907	[a] 5
		Dec. 20, 1928	21.4
3613D1	50	Jan. 1, 1907	13
		Dec. 20, 1928	26.4
3613E7	42	May 28, 1907	[a] 7
		Dec. 20, 1928	19.9
3615P1	28.7	Jan. 1, 1907	[a] 8
		Jan. 13, 1927	[b] 8.20
		Jan. 18, 1928	8.50
		Feb. 18, 1928	9.7
		Jan. 21, 1929	9.95
3622Q1	30.9	Jan. 1, 1907	4
		Apr. 1, 1926	[c] 8.8
		Apr. 26, 1926	[e] 8.4
		Sept. 20, 1926	8.95
		Apr. 21, 1927	8.95
		Sept. 13, 1927	8.40
		Apr. 19, 1928	10.65
		Sept. 20, 1928	11.45
		Dec. 21, 1928	12.20
		Feb. 21, 1928	12.05
3624D1	46	Jan. 1, 1907	[a] 13
		Dec. 22, 1928	24.7
3624K2	40	Jan. 1, 1907	[a] 8
		Feb. 20, 1929	19.6
3624M2	44	Jan. 1, 1907	[a] 11
		Dec. 21, 1928	22.7
3624N1	43	Jan. 1, 1907	[a] 22
		Dec. 21, 1928	19.5
3627J1	26	Jan. 1, 1907	[a] 8
		Feb. 21, 1929	9.8
373G1	78.6	May 27, 1907	[a] 22
		May 27, 1927	[d] 37.2
		May 25, 1928	36.7
		Jan. 17, 1929	35.8
373M1	81.0	Jan. 13, 1907	[a] 24
		Jan. 17, 1927	37.20
		Feb. 18, 1929	41.8
374H4	74.4	May 27, 1907	18
		May 23, 1927	33.2
		May 23, 1928	32.40
		Jan. 22, 1929	33.8
374M2	73	May 27, 1907	[a] 22
375A1	61	May 27, 1907	[a] 15
		Feb. 18, 1929	33.0
375L1	66	May 27, 1907	[a] 16
		Mar. 29, 1927	29.7
375L3	66.3	May 27, 1907	[a] 18
		May 27, 1927	28.8
		May 23, 1928	29.6
		Feb. 19, 1929	33.8
375P1	61	May 27, 1907	15
		July 6, 1926	28.7
		June 11, 1928	30.2
		Feb. 18, 1929	31.9
376J1	53	May 27, 1907	9.9
		June 11, 1928	24.0
		Feb. 18, 1929	24.6
376K2	55	May 27, 1907	[a] 10
		Mar. 31, 1928	30.8
		June 11, 1928	26.3
376M1	60	May 27, 1907	[a] 16
		July 6, 1926	27.4
		Feb. 18, 1929	29.0
376N1	53	May 27, 1907	[a] 19
		Mar. 8, 1928	25.4
		Feb. 18, 1929	27.2
377M1	57	Jan. 12, 1907	[a] 16
		Feb. 20, 1929	33.0
377R1	55	Jan. 12, 1907	14
		Feb. 20, 1929	35.0
378J2	59	Jan. 12, 1907	[a] 17
		Feb. 20, 1929	31.4
378K1	60	Jan. 12, 1907	17.5
		Feb. 20, 1929	[a] 33.0
378N1	58	Jan. 12, 1907	[a] 16.8
		Feb. 20, 1929	36.4
379G1	68	Jan. 12, 1907	[a] 20
		Apr. 27, 1926	32.3
379K1	66	Jan. 12, 1907	[a] 18
		Jan. 15, 1929	37
3715B1	69	Jan. 12, 1907	[a] 18
		Feb. 19, 1929	40.5
3715C1	71	Jan. 12, 1907	18
		Feb. 19, 1929	36.1
3716K2	60	Jan. 12, 1907	[a] 13
		Feb. 19, 1929	29.8
3716L2	62	Jan. 12, 1907	14.7
		Feb. 19, 1929	33.4
3717B4	58	Jan. 12, 1907	[a] 17
		Feb. 19, 1929	35.8
3718E1	48	Jan. 1, 1907	[a] 12
		Feb. 20, 1929	26.5
3718K1	49	Jan. 1, 1907	[a] 15
		Dec. 22, 1928	26.4
3719E2	47	Jan. 1, 1907	[a] 12
		Feb. 20, 1929	25.4
3719H1	50	Jan. 1, 1907	[a] 12
		June 28, 1928	32.2
		Feb. 19, 1929	25.9
3719K1	46	Jan. 1, 1907	[a] 12
		Feb. 20, 1929	22.4
3721H1	60	Jan. 12, 1907	[a] 15
		Feb. 19, 1929	30.4
3722B1	66.9	Jan. 12, 1907	18
		Jan. 15, 1927	29.6
		Feb. 19, 1929	32.6
3728L1	55.4	Jan. 12, 1907	[a] 12
		Feb. 19, 1929	28.8
3728R1	54	Jan. 11, 1907	[a] 12
		Feb. 19, 1929	28.1
3730E2	41.8	Dec. 31, 1906	9
		Dec. 8, 1926	18.8
		Dec. 15, 1927	19.4
		Dec. 13, 1929	20.4
		Feb. 18, 1929	20.1
3730E10	41	Dec. 31, 1906	[a] 10
		Feb. 20, 1929	21
3730P3	41	Dec. 31, 1906	8
		Feb. 20, 1929	22.5
3731J1	39	Dec. 31, 1906	[a] 12
		Feb. 20, 1929	19.3
3733N2	50	Jan. 11, 1907	[a] 12
		Feb. 19, 1929	27.0
388E1	96	Jan. 14, 1907	34
		June 28, 1928	47.2
		Feb. 18, 1929	45.8
3817Q1	95	Jan. 14, 1907	33
		Feb. 18, 1929	46.8
3829F1	92	Jan. 14, 1907	30
		Feb. 18, 1929	44.0
3832G1	90	Jan. 14, 1907	[a] 29
		Feb. 18, 1929	42.1
453A1	8.3	Dec. 28, 1914	12
		Dec. 7, 1926	9.0
		Mar. 7, 1929	9.4
461R4	62	Nov. 25, 1914	24
		Jan. 7, 1928	25.8
		Mar. 6, 1929	26.2
462L2	51	Dec. 20, 1913	[a] 30
		Feb. 11, 1928	24.8
		Mar. 12, 1929	25.0

[a] Reported.

[b] Pump stopped a short time before measurement.

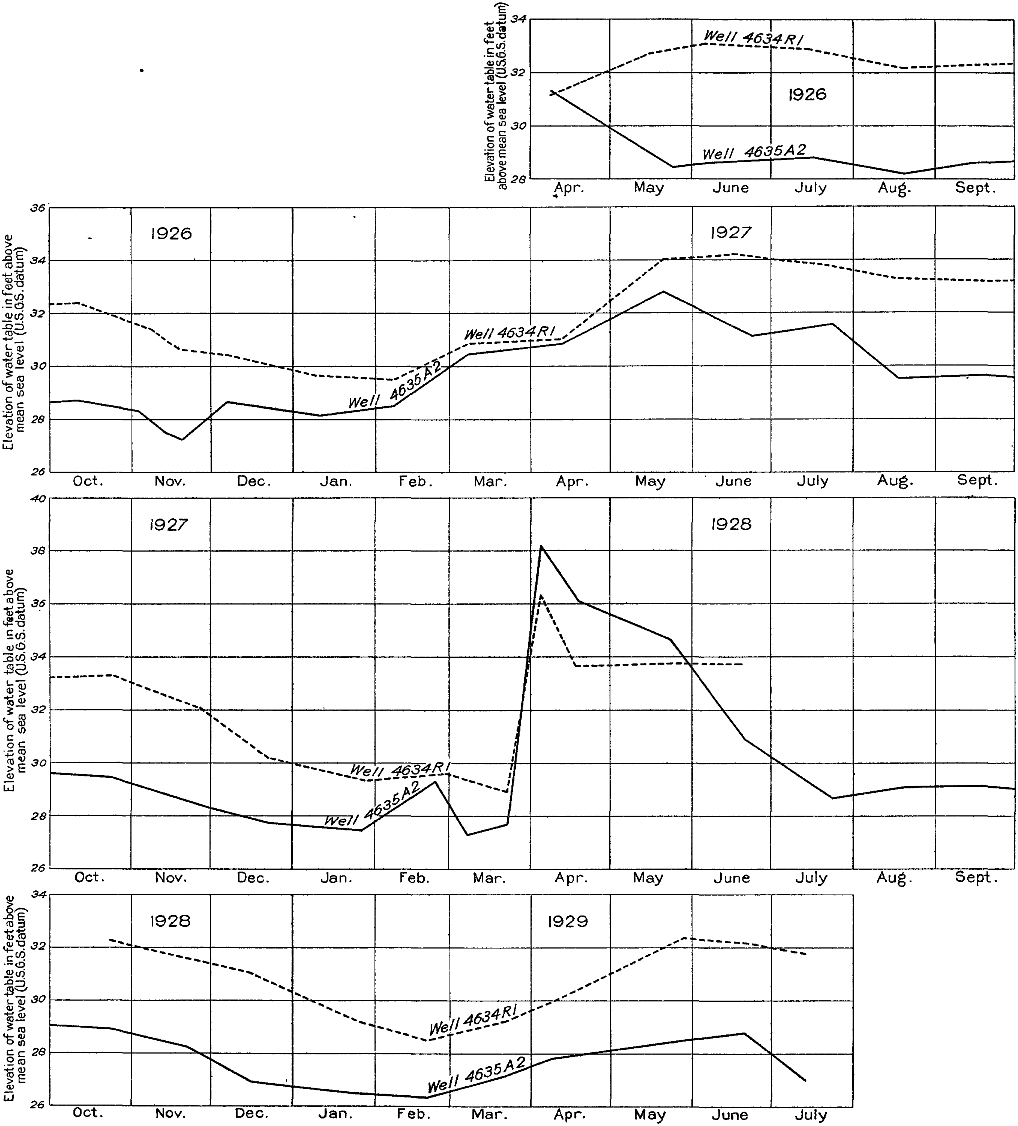
[c] By G. H. Teale, State division of water rights.

[d] Pump running in adjacent well.

[e] Probably 10-foot error in measurement. Should be 20 feet.

AIRPLANE VIEW OF WOODBRIDGE RESERVOIR WHEN IT WAS PRACTICALLY EMPTY IN THE FALL OF 1927, SHOWING THE LOCATION OF WELLS 4634R1, 4635E2, AND 4635A2 AND THE WOODBRIDGE GAGING STATIONS

Photograph by United States Army Air Corps.



HYDROGRAPHS OF TWO WELLS SHOWING RESPONSE OF WATER LEVEL IN WELLS TO STAGE OF WOODBRIDGE RESERVOIR

Measurements of depth to water level in wells by the United States Geological Survey from 1906 to 1929—Continued

Well No.	Altitude of land surface (feet above sea level)	Date of measurement	Depth to water (feet)
4610N2	39	Nov. 25, 1914	14.0
		Mar. 6, 1929	20.4
4613F1	53	Nov. 25, 1914	14
		Jan. 7, 1928	24.5
4613F2	52	Nov. 25, 1914	14
		Jan. 7, 1928	25.0
		Mar. 6, 1929	27.0
4614A1	44	Nov. 25, 1914	16
		Jan. 7, 1928	20.8
		Mar. 6, 1929	24.4
4614P2	45.6	Dec. 20, 1913	18.3
		Dec. 6, 1926	24.5
		Dec. 21, 1927	23.6
		Dec. 15, 1928	24.1
		Mar. 21, 1929	26.6
4624C1	55	Dec. 20, 1913	20.5
		May 25, 1926	30.0
		Mar. 6, 1929	28.2
476A1	63	Nov. 25, 1914	20.0
		Nov. 21, 1928	27.40
476B1	62	Nov. 25, 1914	21
		Jan. 7, 1928	26.8
		Mar. 6, 1929	26.8
477A1	[f] 62	Nov. 25, 1914	25
		Oct. 21, 1925	[f] 25.2
		Jan. 7, 1928	24.9
		Mar. 6, 1929	25.5
4714P1	93.5	Dec. 20, 1913	38.3
		Dec. 13, 1926	41.6
		Mar. 13, 1929	44.6
4718N1	60	Dec. 20, 1913	21.2
		Apr. 12, 1926	27.0
		Mar. 6, 1929	30.8
4735P1	85.0	Jan. 13, 1907	31
		Dec. 5, 1925	[f] 36.2
		Oct. 4, 1926	38.0
		June 28, 1928	34.8
		Feb. 18, 1929	38.2
4736F1	90	Jan. 13, 1907	30
		June 27, 1928	39.9
		Feb. 18, 1929	42.4
481L1	170.7	Dec. 22, 1913	84.8
		Dec. 11, 1926	86.0
		Mar. 13, 1929	86.8
483L1	159	Dec. 23, 1913	76
		Dec. 13, 1926	87.8
		Mar. 13, 1929	88.4
4810L1	153	Dec. 22, 1913	77.0
		Dec. 13, 1926	82.4
		Dec. 19, 1927	82.5
		Dec. 14, 1928	83.2
		Mar. 13, 1929	83.1
4811E1	104.4	Dec. 22, 1913	27.5
		Dec. 13, 1926	28.8
		Dec. 19, 1927	28.1
		Mar. 13, 1929	29.2
4811E2	136.8	Dec. 22, 1913	57.4
		Mar. 13, 1929	61.6
4811G1	148.8	Dec. 22, 1913	68.6
		Dec. 13, 1926	70.2
		Dec. 19, 1927	69.5
		Dec. 14, 1928	71.4
		Mar. 13, 1929	70.8
4813G1	160.2	Dec. 22, 1913	76.5
		Mar. 13, 1929	80.8
4814K1	133.7	Dec. 22, 1913	58
		Mar. 13, 1929	60.6
4821N1	125.6	Dec. 22, 1913	55.5
		Mar. 19, 1929	66.0
4822B1	145.6	Dec. 22, 1913	76
		Mar. 19, 1929	80.0
4830N1	104.8	Jan. 14, 1907	42
		Dec. 22, 1913	45
		Dec. 9, 1926	[e] 55.0
		Jan. 17, 1927	52.0
		Dec. 19, 1927	52.2
		Jan. 21, 1928	51.0
		Dec. 17, 1928	51.0
		Jan. 22, 1929	51.0
		Feb. 19, 1929	50.5
		Mar. 20, 1929	50.6
4832Q1	105.4	Dec. —, 1913	45.0
		Dec. 14, 1926	50.6
		Mar. 20, 1929	52
4917C1	171.8	Dec. 22, 1913	46.0
		Dec. 15, 1926	52.4
		Mar. 13, 1929	48.0
4918D1	188.8	Dec. 22, 1913	74.8
		Dec. 4, 1925	[f] 78.8
		Dec. 14, 1926	79.0
		Mar. 13, 1929	79.6
4918E1	157.9	Dec. 22, 1913	70.2
		Dec. 14, 1926	74.1
		Dec. 14, 1928	74.7
		Mar. 19, 1929	74.6
4932A1	230.8	Dec. —, 1913	162
		Dec. 14, 1926	149.5
		Mar. 13, 1929	149.2
5533H1	9.3	Dec. 29, 1914	12
		Dec. 7, 1926	9.1
		Mar. 7, 1929	9.2
5533R1	9.0	Dec. 28, 1914	12
		Mar. 7, 1929	10.1
563R1	49	Dec. 14, 1914	19
		Mar. 11, 1929	17.6
567Q1	26	Dec. 9, 1914	22
		Mar. 8, 1929	13.2
5610J1	45.2	Dec. 18, 1913	16.5
		Dec. 9, 1914	23.0
		Mar. 8, 1929	19.8
5611R1	56.0	Dec. 14, 1914	17.0
		Dec. 10, 1926	19.6
		Mar. 11, 1929	20.0
5613B1	60	Dec. 18, 1914	18
		Mar. 11, 1929	23.0
5615F1	44	Dec. 14, 1914	22
		Mar. 8, 1929	19.0
5616D1	42.5	Dec. 9, 1914	23
		Dec. 10, 1926	19.4
		Dec. 21, 1927	19.2
		Mar. 8, 1929	19.4
5616P1	32	Dec. 9, 1914	23
		Mar. 8, 1929	15.7
5617J1	26	Dec. 9, 1914	23
		Mar. 8, 1929	13.7
5617R2	34	Dec. 9, 1914	22
		Mar. 8, 1929	16.6
5618D1	28.5	Dec. 9, 1914	23
		Dec. 10, 1926	16.5
		Mar. 8, 1929	14.7
5620A1	26	Dec. 9, 1914	24
		Dec. 10, 1926	15.7
		Mar. 8, 1929	14.1
5620B1	28	Dec. 9, 1914	23
		Mar. 8, 1929	16.6
5620R1	34.5	Dec. 15, 1914	21
		Mar. 7, 1929	20.4
5622D1	46	Nov. 21, 1914	20
		Mar. 8, 1929	21.4
5622D2	46	Nov. 21, 1914	19
		Mar. 8, 1929	20.8
5622J1	44	Nov. 21, 1914	18
		Mar. 8, 1929	24.6

[e] Pump stopped a short time before measurement.
[f] By Cyril Williams.

Measurements of depth to water level in wells by the United States Geological Survey from 1906 to 1929—Continued

Well No.	Altitude of land surface (feet above sea level)	Date of measurement	Depth to water (feet)
5622K1	42	Nov. 21, 1914	17
		Mar. 8, 1929	22.0
5622M1	49.5	Dec. 15, 1914	22
		Dec. 10, 1926	22.9
		Dec. 21, 1927	22.9
		Dec. 15, 1928	24.2
		Mar. 8, 1929	23.2
5622M2	49	Dec. 15, 1914	22
		Mar. 8, 1929	22.9
5622N1	43	Nov. 25, 1914	19.3
		Mar. 7, 1929	25.2
5627D1	42	Dec. 15, 1914	22
		Mar. 8, 1929	24.5
5627F1	46	Dec. 15, 1914	21
		Mar. 7, 1929	26.6
5628C1	41	Nov. 26, 1914	21
		Mar. 7, 1929	24.2
5628L3	39	Nov. 25, 1914	15
		Mar. 7, 1929	22.4
5628N4	35	Nov. 25, 1914	18.5
		Mar. 7, 1929	20.6
5628R1	43	Nov. 25, 1914	21
		Mar. 7, 1929	23.6
5629Q3	33	Nov. 25, 1914	19
		Mar. 7, 1929	18.8
5631B3	23	Nov. 25, 1914	14
		Dec. 11, 1928	15.0
		Mar. 7, 1929	14.8
5631F2	22	Nov. 25, 1914	14
		Dec. 11, 1928	14.9
		Mar. 7, 1929	13.0
5632F1	28.5	Nov. 25, 1914	16
		Nov. 9, 1926	17.5
		Nov. 30, 1927	17.0
		Nov. 21, 1928	17.4
		Mar. 7, 1929	16.4
5633A2	40	Nov. 25, 1914	20
		Mar. 7, 1929	24.8
5633C1	40	Nov. 25, 1914	20
		Mar. 7, 1929	24.2
5633E1	35.0	Nov. 25, 1914	18
		Nov. 9, 1926	20.1
		Nov. 30, 1927	19.7
		Mar. 6, 1929	20.1
5634A2	43	Nov. 25, 1914	20
		Mar. 7, 1929	23.7
5634J2	42	Nov. 25, 1914	18.5
		Mar. 6, 1929	23.6
5636N1	50.5	Dec. 19, 1913	16.6
		Dec. 6, 1926	20.3
		Mar. 6, 1929	19.3
574Q1	76	Dec. 14, 1914	18.7
		Mar. 11, 1929	20.8
574R1	79	Dec. 14, 1914	19
		Mar. 11, 1929	18.8
575A1	66	Dec. 14, 1914	17
		Mar. 11, 1929	14.4
577F1	60	Dec. 18, 1914	17
		Mar. 11, 1929	14.6
577H1	66	Dec. 14, 1914	15
		Mar. 11, 1929	19.2
577P1	66	Dec. 18, 1914	18
		Mar. 11, 1929	22.7
578F1	70	Dec. 14, 1914	18
		Mar. 11, 1929	21.0
579R1	82.5	Dec. — 1913	22
		Mar. 12, 1929	25.2
5715J2	88.5	Dec. 14, 1914	18
		Mar. 12, 1929	30.8
5717K2	76	Dec. 14, 1914	18
		Mar. 12, 1929	26.5
5718C1	71	Dec. 18, 1914	18.2
		Mar. 11, 1929	24.6
5718J2	66	Dec. 18, 1914	16
		Mar. 11, 1929	23.5
5722E1	85	Dec. 14, 1914	19
		Mar. 12, 1929	31.4
5727B1	89	Dec. 14, 1914	19
		Mar. 12, 1929	32.4
5728A1	81	Nov. 20, 1914	20
		Nov. 16, 1926	28.2
		Nov. 29, 1927	28.2
		Nov. 22, 1928	28.5
		Mar. 12, 1929	28.8
5728C1	85	Nov. 20, 1914	18
		Mar. 12, 1929	31.9
5730C1	73	Dec. — 1913	26.5
		Dec. 10, 1926	27.8
		Mar. 12, 1929	28.0
5814J1	145	Dec. 23, 1913	47.3
		Mar. 13, 1929	48.9
6632D1	35	Dec. 18, 1913	11.6
		Dec. 8, 1914	16
		Mar. 8, 1929	9.6
6633P2	38	Dec. 18, 1913	10.5
		Dec. 9, 1914	22
		Mar. 8, 1929	10.8
6634J2	45	Sept. 8, 1913	16
		Mar. 11, 1929	16.5

FLUCTUATIONS DUE TO CHANGES IN THE STAGE OF THE WOODBRIDGE RESERVOIR

In a region composed of pervious material, where the ground water is tributary to a stream channel, the effect of damming and ponding the stream is to raise the ground-water level. If the pond or reservoir is permanent and the water level within it is maintained at a more or less uniform level, the ground water rises and eventually adjusts itself to the new condition. If, however, the reservoir is used only periodically, being full part of the time and empty part of the time, a periodic rise and fall of the water table results. The Woodbridge Reservoir (Smith Lake), which was formed by impounding water for diversion into the Woodbridge Canal, produces such a periodic effect upon the water table. An airplane photograph of the reservoir is shown in Plate 14. From May to November the reservoir is full; from November to May it is practically empty. The annual filling and emptying of the reservoir causes an annual rise and fall of the water table. This condition was noted in all wells in the vicinity of the reservoir in which the depth to water was measured. The hydrographs of wells 4634R1 and 4635A2, in Plate 15, show the effect on the water table of alternately filling and emptying the reservoir. From May to November the water level is considerably higher than from November to May. Plates 6 and 7 show the effect of storage in the reservoir on the water table. The 30-foot ground-water contour for April follows the edge of the reservoir with a small downstream bulge. The downstream bulge of this contour for September is very pronounced and indicates that there is ground-water recharge at this place. If the 30-foot contour had been drawn for June, when water storage is at a maximum, the downstream bulge would have been even more pronounced.

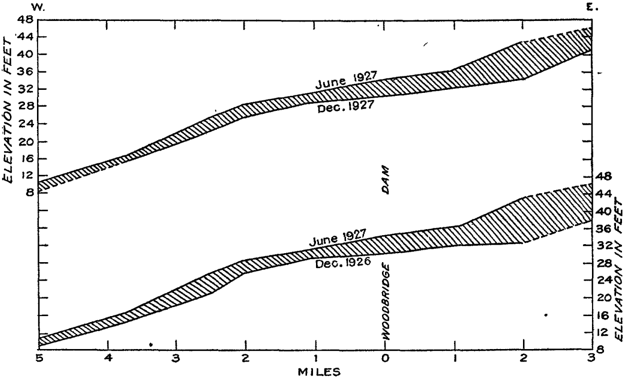


FIGURE 18.—Two sets of profiles of the water table near the Woodbridge Reservoir along line common to Tps. 3 and 4 N.

Figure 18 shows two sets of profiles of the water table along the line common to Tps. 3 and 4 N., for two different periods. The shaded areas show the change of the water table from December, 1926, to June, 1927, and from June to December, 1927. During June and December the water table is at its highest and lowest stages respectively in the vicinity of the reservoir. The maximum range of fluctuation is about 4 feet.

In Figure 18 the outlet of the reservoir at the Woodbridge Dam is taken as the starting point, and distances are given in miles east and west from that point. As shown by the profiles for June, 1927, the effect of the reservoir on the water table is a flattening of the hydraulic gradient for about 1 mile to the east and 2 miles to the west of the Woodbridge Dam. The hydraulic gradient within this part is about 3½ feet to the mile, whereas on each side, beyond the effect of the reservoir, it is about 6 feet to the mile. The average hydraulic gradient in the Mokelumne area is about 5 feet to the mile. The effect of storage in the reservoir has been to reduce the hydraulic gradient of the water table from 5 to 3½ feet to the mile.

At the end of each irrigation season any water stored in the reservoir is released by removing flashboards in the Woodbridge Dam. In 1926 the impounded water was released November 2. Immediately after the drainage of the reservoir and continuing throughout the month measurements of depth to water were made in nine wells near the reservoir. Without exception there was a lowering of the water level in the wells. The results of these measurements are given in the following table:

Response of the water level in wells to changes in water level of the Woodbridge Reservoir in the fall of 1926

Date	Altitude of water level (feet above sea level)									
	Reservoir	Well 4731N1	Well 4731A1	Well 361A1	Well 4636A1	Well 4635E2	Well 4635A2	Well 4635A1	Well 4634R1	Well 4626E1
Oct. 1	37.47									
Oct. 9	37.49									
Oct. 11				33.30	32.05		28.70		32.40	25.40
Oct. 12		35.05	33.15							
Oct. 16	37.64									
Oct. 22	37.39									
Oct. 27	36.79									
Oct. 29	36.54									
Oct. 30	36.39									
Nov. 3	28.99	34.70	32.95	31.75	31.90	31.25	28.30	28.65	31.85	25.55
Nov. 6	28.19									
Nov. 8		34.10	32.95	31.85	31.50	29.85	27.90	28.05	31.40	25.60
Nov. 13	27.59	33.60	32.80	31.35	31.15	29.05	27.50	27.60	31.00	24.40
Nov. 19		33.40	32.80	31.75	31.00	28.55	27.25	27.40	30.65	25.45
Nov. 23	28.19									
Nov. 27	31.54									
Dec. 4	29.89									
Dec. 6				32.65		30.10	28.65	28.85	30.45	26.00
Dec. 7		35.20	33.05		31.60					
Dec. 18	28.79									

The rise of the water table shown by the December measurements was due to a heavy rain November 24 and 25, which caused the river to raise the water level of the reservoir temporarily about 3½ feet. Figure 19 shows a profile of the water table for about 2½ miles north and 1 mile south of the reservoir on November 3 and 19. The profile was taken along the Sacramento and Woodbridge road north of the dam and along a projection of the line of this road south of the dam. The response of the water table to a change in water level of the reservoir is shown clearly in this figure. For the period from October 30 to November 23 the water level in the reservoir dropped 8.20 feet. The maximum drop of the water level in the wells from November 3 to 19 was 2.70 feet and occurred in well 4635E2. As shown by Figure 19, a change of 8.20 feet in the water level of the reservoir affected the water table for a distance of 1 mile on each side of it. The water table slopes away from the reservoir, indicating ground-water recharge. From Figures 18 and 19 it may be seen that the storage of water in the reservoir affects the water table for a considerable distance and that changes in the position of the water level exert a controlling influence on the fluctuation of the water table in the adjacent area.

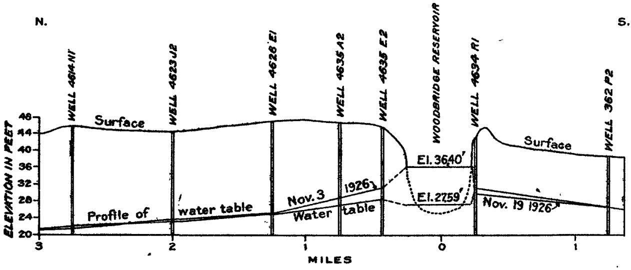


FIGURE 19.—Cross sections through the Woodbridge Reservoir showing the water table on November 3 and 19, 1926

SEISMIC FLUCTUATIONS

Veatch[31] has stated that earthquakes may produce fluctuations of the water table which are due to several causes—(1) fluctuation resulting directly from earth tremors, (2) deformation without faulting, resulting in a change in pressure, and (3) faulting producing new ground-water outlets which cause a rise or fall of the water level, according to its relation to the faulting. A fluctuation caused by an earthquake was noted in wells equipped with Stevens water-stage recorders in the Mokelumne area.[32]

According to an Associated Press dispatch, a distinct earthquake shock that rattled windows and doors and lasted several seconds was felt in Stockton and vicinity at 6.10 p. m. September 17, 1927. No damage was done. The wells that were affected by this earthquake are 17 miles north of Stockton. No one was found in Lodi who felt an earthquake at that time, hence it must have been practically imperceptible in the Lodi area. Another press dispatch states that

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[31] Veatch, A. C., Fluctuations of the water level in wells, with special reference to Long Island, New York: U. S. Geol. Survey Water-Supply Paper 155, p. 70, 1906.

[32] Stearns, H. T., Record of earthquake made by automatic recorders on wells in California: Seismol. Soc. America Bull., vol. 18, pp. 9-15, 1928.

sharp and destructive earthquakes were felt at Mina, Nev., at 6 p. m. on the same day and that the seismograph at Nevada University indicated that the epicenter was in the White Mountains, east of Bishop, Calif., which lies about 150 miles southwest of Lodi. At Bishop brick chimneys fell, dishes and other articles were thrown from shelves, and people were sent running into the street, and therefore the intensity of the shock at this place must have been VII on the Rossi-Forel scale.

The earthquake felt in Stockton at this time apparently originated near Bishop, about 145 miles to the southeast. The effects listed in the press dispatch indicate an intensity of IV at Stockton. As it was not felt in the Lodi area, it probably had an intensity of only I or II in the vicinity of the wells.

Stevens automatic water-stage recorders were installed on eight wells in the Mokelumne area. All the wells are in the younger alluvium of San Joaquin Valley or in the flood-plain deposits of the Mokelumne River. Four of the eight wells are shallow and extend below the water table for distances of 1.0 to 19.7 feet. The other four wells extend below the water table for distances of 110 to 162 feet. The Gillespie well, which penetrates only 110 feet below the water table, is connected with another well that extends 220 feet below the water table; hence its effective depth is 220 feet. Most if not all of the deep wells penetrate the older alluvium of San Joaquin Valley. A summary of the data regarding the eight wells is given in the table on page 147.

Wells in the Mokelumne area that were equipped with Stevens automatic water-stage recorders during the earthquake of September 17, 1927

Well No.	Owner	Location	Type	Diameter (inches)	Type of material penetrated by well	Altitude (feet above sea level)	Depth of well (feet)	Depth to water at time of earthquake (feet)	Amount of fluctuation of water in well due to earthquake (feet)
495Q1	R. Lucas	Sec. 5, T. 4 N., R. 9 E.	Dug	30	Recent alluvium, sand, and gravel of the flood plain of the Mokelumne River.	120.0	18.4	17.4	None.
4816N1	R. S. Feathersone	Sec. 16, T. 4 N., R. 8 E.	Bored	15	Recent alluvium, silt, and sand of the flood plain of the Mokelumne River.	81.5	19	14.5	None.
4821H1	John Clements	Sec. 21, T. 4 N., R. 8 E.	Dug	60	Recent alluvium; well may end in older alluvium	82.3	18	14.8	[a] None?
4734K3	U. S. Geological Survey	Sec. 34, T. 4 N., R. 7 E.	Drilled	10	Younger alluvium; sand 0–45.5 feet, clay 45.5–49 feet, gravel 49–54 feet.	82.3	54	34.3	None.
4726K1	A. F. Paddleford	Sec. 26, T. 4 N., R. 7 E.	do	12	Younger alluvium; sand and clay to bottom of well	93.0	[b,c] 180	45.7	Trace.
373G1	George Preszler	Sec. 3, T. 3 N., R. 7 E.	do	12	Starts in younger alluvium. Log unknown	78.8	[b] 200	35.5	0.02
4727A1	C. B. Clancy	Sec. 27, T. 4 N., R. 7 E.	do	12	do	81.8	[b,d] 150	37.6	.02
375L3	G. G. Gillespie	Sec. 5, T. 3 N., R. 7 E.	do	10	do	66.3	[e] 140	29.7	.05

[a] See p. 148.
[b] Reported.
[c] Connected underground to well 3 feet away which is 366 feet deep.
[d] Connected underground to well 10 feet away which is 225 feet deep.
[e] Connected underground to well 30 feet away which is 250 feet deep.

The recorders on the four shallow wells indicate that the water level was not disturbed by the earthquake. However, the recorder on shallow well 4821H1 was apparently shaken slightly. The water level in this well fluctuates very slowly and for the 24 hours preceding the earthquake had fallen only 0.02 foot. It appears from previous records that wherever there is only a very slight fall of the water level over so long a period the float usually lags slightly and causes jogs in the graph instead of a smooth curve. When the earthquake occurred the subsidence took place instantaneously instead of lasting for an hour or more, as usual. Because the float did not rise immediately after the earthquake it is believed that the effect was a slight jar of the instrument rather than that of a wave passing through the water in the well.

A definite fluctuation of the water level produced by the earthquake is easily discernible in the hydrographs of the four deep wells.

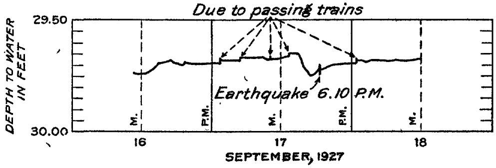

FIGURE 20.—Hydrograph of well 375L3 showing effect of passing trains and the earthquake of September 17, 1927

The hydrograph made by the Gillespie recorder shows that the water rose above and fell below the normal level as a result of the earthquake. The curve then continued on its normal path. Whether the water rose first or fell first can not be ascertained, because the movement was so rapid that the traces are superimposed. (See fig. 20.) In the same hydrograph there are five small marks on the graph which are due to railroad trains passing 204 feet north of the well. These marks show that the water level rises and falls in the well rapidly but does not subside below its normal level when a train passes. This effect is much more pronounced in the Preszler well record, where the scale is larger and the fluctuation greater. (See fig. 21.) This well is 117.5 feet north of the same railroad that passes the Gillespie well. The fluctuation due to the earthquake shows poorly in this graph, because the vertical line that was made nearly coincided with the line caused by water subsiding in the well because of pumpage. The types of shelters used for housing the recorders on this well are shown in Plate 11, *B*.

The hydrograph of the Clancy well showing the earthquake differs from the hydrographs of the other three deep wells in that the water in this well subsided and then recovered without rising above the normal water level. (See fig. 22.) The water level in this well was fluctuating more rapidly than in the other wells at the time of the earthquake because of drawdown by adjacent irrigation pumps, and this condition may have caused the dissimilarity. The sudden fall of the water level about two hours after the earthquake as shown in Figure 22 was not due to another earthquake but to pumpage near by.

The question arises whether the water in the shallow wells is affected by slight earth shocks. Three of the shallow wells that are several miles east of the deep wells but farther from the epicenter of the earthquake were unaffected. The shallow well 4734K3 was not affected by the earthquake, though only about three-quarters of a mile north of the Preszler well and about 1¾ miles southeast of the Clancy well, which were affected. It is evident, therefore, that during a seismic disturbance the fluctuation of the water level is more pronounced in deep wells than in shallow wells. This conclusion is further supported by the disturbance of the water levels caused by passing trains. An experimental well was drilled just to the water table, only 2 feet from the Preszler well, to determine what effect a train has on a shallow well as compared with a deep well. The new well was equipped with a recorder, which showed that it was unaffected by passing trains.

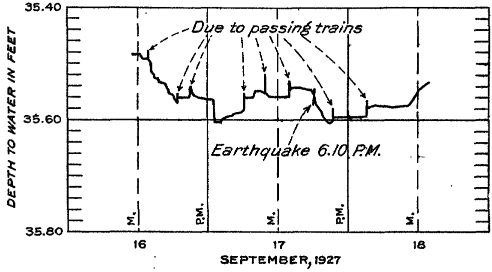

FIGURE 21.—Hydrograph of well 373G1 showing effect of passing trains and the earthquake of September 17, 1927

It is a well-known fact that during great earthquakes the water levels in wells fluctuate rapidly. This fact is often pointed out by observers indirectly when they state that wells and springs temporarily go dry during an earthquake. In so far as the writer is aware no one has called attention to minor fluctuations, instrumentally recorded, of the water levels at the time of distant shocks.

In 1892 King[33] discovered that railroad trains affect the water level in wells. The water rises suddenly and falls more slowly,

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[33] King, F. H., Observations and experiments on the fluctuations in the level and rate of movement of ground water on the Wisconsin Agricultural Experiment Station and at Whitewater, Wis.: U. S. Dept. Agr. Weather Bur. Bull. 5, p. 67, 1892.

eventually resuming its normal level. The weight of the train on the underlying formations causes a slight compression of the earth particles, and the ground waters are forced to assume a share of the additional weight. This hydrostatic pressure is transmitted to a distance in the deeper confined waters, just as hydrostatic pressure is transmitted in a closed pipe filled with water. The water near the water table in the shallow wells, being unconfined, is undisturbed, because the physical conditions necessary for transmission of the pressure are absent. In the same way it appears that an earthquake causes the water level in the deep wells, which penetrate aquifers with confined water, to be affected when the water level in the shallow wells remains undisturbed. The subject of the compressibility of artesian aquifers is more fully treated by Meinzer.[34]

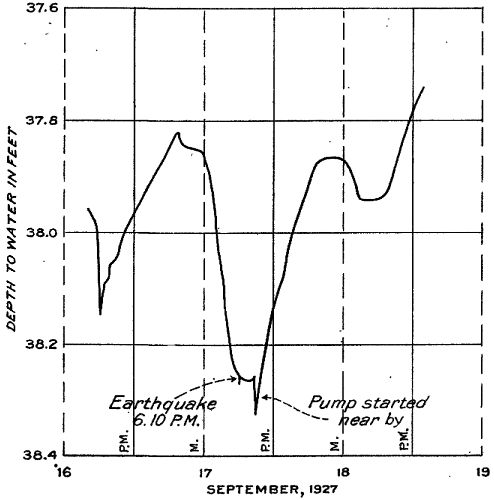

FIGURE 22.—Hydrograph of well 4727A1 showing effect of earthquake of September 17, 1927

Several major earthquakes have occurred recently in Alaska and Japan. These shocks were recorded by the seismograph at Berkeley, Calif., but no effects were visible on the hydrographs of the wells in this area. A slight earthquake occurred in the San Francisco Bay region February 15, 1927, and Dr. Perry Byerly, in charge of the seismographic station of the University of California at Berkeley, states that the epicenter was on the San Andreas fault about 60 miles northwest of Berkeley. On May 28, 1927, another earthquake

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[34] Meinzer, O. E., Compressibility and elasticity of artesian aquifers: Econ. Geology, vol. 23, pp. 263–291, 1928.

was felt by residents of the San Francisco Bay region. Neither of these earthquakes was recorded on the hydrographs of the wells near Lodi. However, as the wells near Lodi are on the east side of the San Joaquin River and only about 20 miles from the foothills of the Sierra Nevada, it would not be surprising to find that the wells are affected more by earthquakes in the Sierra Nevada than by those in the Coast Range.

SPECIFIC YIELD OF WATER-BEARING MATERIALS

TESTS MADE DURING 1927

The specific yield of a rock or soil has been defined by Meinzer[35] as "the ratio of (1) the volume of water which, after being saturated, it will yield by gravity to (2) its own volume. This ratio is stated as a percentage and may be expressed by the formula $Y = 100\frac{y}{v}$, in which Y is the specific yield, y is the volume of gravity ground water in the rock or soil, and v is the volume of the rock or soil."

In 1925 W. N. White, in an investigation of the quantities of ground water discharged by vegetation at Milford, Utah, developed a method for determining the specific yield of undisturbed soil columns.[36] This method has to a large extent been used in the Mokelumne investigation. Experimental field tests were made on undisturbed soil columns to determine the specific yield of the soil directly above the water table. These soil columns were obtained during the fall, when the water table was at its lowest level. In this way a test was made of the soil within the belt of fluctuation of the water table.

A cylinder 18 inches in diameter and 36 inches long made of 16-gage galvanized iron was used for the tests. The cylinder was butt-jointed and riveted, and the joints were floated with solder and scraped smooth on the inside. A 3-inch iron collar was riveted and spot welded to the top of the cylinder to prevent damage to the cylinder in driving it. The bottom outside edge of the cylinder was beveled with a file to facilitate driving, and three equally spaced holes were drilled near the top, through which wires were placed to lift it.

A 4-foot square pit was dug within 3½ or 4 feet of the water table. The cylinder was then driven into the bottom of the pit, and the soil was excavated around the cylinder as driving progressed. A driving cap of 2-inch planking was used on top and a 4 by 4 inch timber about 14 feet long, handled by two men, was used in a manner similar to a pile driver. Constant care was taken to keep the cylinder in a vertical position while it was being driven. Special care was

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[35] Meinzer, O. E., Outline of ground-water hydrology: U. S. Geol. Survey Water-Supply Paper 494, p. 28, 1923.

[36] White, W. N., Washington Acad. Sci. Jour., vol. 17, pp. 238–240, 1927.

taken as the soil neared the top of the cylinder to keep the soil from being compacted by the driving cap. Driving was stopped when the bottom of the cylinder was within a few inches of the water table. A strong flexible wire was then used to saw through the soil column at the bottom edge. Heavy wires were strung through the holes near the top of the cylinder by means of which the cylinder was lifted a fraction of an inch by either a lever or block and tackle. The cylinder was suspended only long enough to allow a 24 by 24 inch 16-gage galvanized-iron base plate to be slipped under it. If the soil was not compact enough to remain in the cylinder when lifted this much, the plate was forced under the cylinder by means of an automobile jack, special care being used to keep the plate flush with the bottom edge of the cylinder. The latter method proved to be the simpler of the two. The cylinder was then centered on the plate and leveled. It was found that for the base plate 12-gage galvanized iron is preferable to 16-gage.

Two 1½-inch holes were then drilled in the confined soil column about 4 inches from diametrically opposite sides of the cylinder. These holes were drilled to the bottom of the soil column with a wood auger welded to an extension handle. They were then cased with 1½-inch nickel-plated brass pipes. One of the pipes was perforated the entire length, except 6 inches on the upper end, and the other pipe was perforated only in the lower 6 inches. The perforations were one-sixteenth of an inch in diameter and were drilled in parallel rows about half an inch center to center. Plate 16, *A*, shows a 4-inch soil auger, the 18 by 36 inch soil cylinder, the 1½-inch wood bit with the extension handle, and the two 1½-inch perforated pipes.

Water was added to the soil in the cylinder by pouring it into the 1½-inch hole in which only the lower 6 inches of the casing was perforated. The water was removed from the cylinder by drawing it up into a glass tube or rubber hose, and the amount of water removed or added was measured in a glass graduate.

The distance to the water level in the small holes was measured with a steel tape from the bottom edge of a spirit level placed across the top of the cylinder. A small lead weight, with a blunt point, was placed on the end of the tape, and the measurement was taken when the point of the weight broke the mirror surface of the water in the 1½-inch holes. Measurements were made in one hole immediately after measurements had been made in the other, to ascertain whether or not the water table in the cylinder was level.

The most difficult problem in the whole experiment was to seal the joint between the bottom of the cylinder and the base plate. This joint had to be water-tight before the test could be made, and during the test it had to withstand a head of about 3 feet of water. Experience gained from these tests seems to indicate that soldering the joint is the only practicable method. A hot bituminous compound was brushed on the joint in several layers, but this method was found to be only temporary, as the pressure of the water in the cylinder gradually formed blowholes and leaks at the joint. Filling the space between the cylinder and a 3-inch collar around it with the compound also failed to give a tight permanent joint. Attempts were made to weld the joints on three cylinders during 1928, but this method failed, as expansion and contraction of the heated metal formed cracks both in the base plate and in the lower edge of the cylinder.

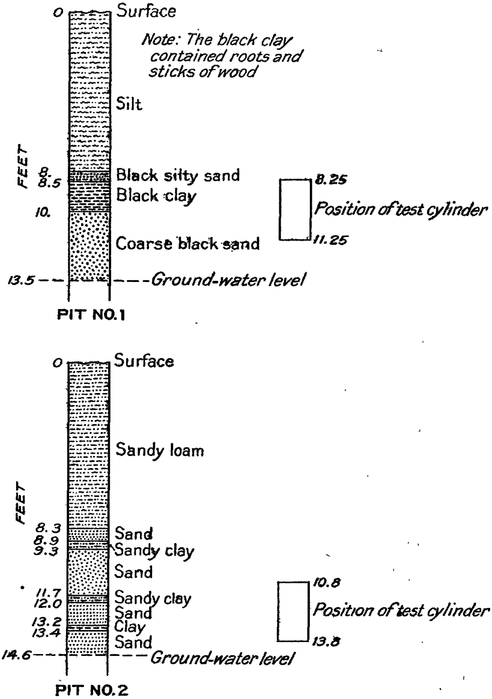


FIGURE 23.—Logs of pits 1 and 2 used in making tests of specific yield

Certain precautions are necessary to obtain a water-tight joint by soldering. All the test cylinders were soldered in the pits, with the base plate resting on the floor of the pit, and only one or two proved to be water-tight. The test cylinders should either be raised off the floor of the pit, placed on blocks, and allowed to dry or should be removed from the pit before drying and soldering. It is absolutely essential to have the joint and the soil adjacent to the joint dry, for otherwise steam will be formed by the heat of soldering, force itself through the solder, and cause leaks. A leak that is found after water has been added is very difficult to reseal, hence it is necessary to make a tight joint in the first attempt.

Tests 1, 2, and 3 were made in the recent flood-plain alluvium near Clements, along the Mokelumne River.

Test 1.—In the SE. ¼ SW. ¼ sec. 16, T. 4 N., R. 8 E. A 4 by 4 foot pit was dug and the soil column obtained September 22, 1927. A few old tree roots were encountered, but these gave no trouble in preparing the test, and a later examination indicated that the soil was not disturbed in the cylinder. This cylinder was soldered to the base plate, and a bituminous compound was used to stop a few leaks that developed in the soldered joint.

The cylinder remained in the shade except for a short period at noon each day, owing to the size and depth of the test pit. For this reason the temperature of the soil and surrounding air varied only a few degrees during the entire test. The evaporation from the top of the cylinder would have been very small, as the pit temperature was never much over 65° F. However, as an added precaution, several thicknesses of newspaper were placed over the top of the cylinder and covered with a 1-inch layer of damp sand.

The test was started September 23, 1927, and continued until September 27, when the cylinder was pulled. As the soil column slipped out of the cylinder it was examined closely to detect any disturbance of the soil caused by the driving. A well was then dug in the bottom of the pit, and a 10-inch casing with its upper end about 2½ feet below the ground surface was placed in the well. A cover was placed on top of the casing, and the pit was filled. The location of the buried casing was tied to two valves in a pipe line near by, so that it can be relocated and used to observe the fluctuations of the water table at this place. In Figure 23 is shown a log of the test pit.

Observations on specific-yield test 1

Date (1927)	Amount of water added or withdrawn (ounces)	Time water was added or withdrawn	Time of final measurement	Distance of water level from top of cylinder (feet)		Rise or fall of water level (feet)	Remarks
				Initial	Final		
Sept. 23	+20	10.56 a. m.	2.57 p. m.	--------	2.561	--------	Water added to make an artificial water table; temperature of water, 67° F.
	+10	2.57 p. m.	3.46 p. m.	2.561	2.340	+0.221	
	+20	3.49 p. m.	4.24 p. m.	2.340	1.921	+.419	
	−8	4.44 p. m.	5.05 p. m.	1.921	2.178	−.257	
	−12	5.15 p. m.	5.46 p. m.	2.178	2.535	−.357	Water temperature, 66° F.
26	0	------------	10.45 a. m.	--------	--------	--------	Water not in sight in either well; distance from top of cylinder to soil in the 2 wells is 2.88 and 2.68 feet.
	+10	10.58 a. m.	11.31 a. m.	--------	2.634	--------	Water added to make artificial water level; water temperature, 70° F.; temperature in cylinder, 62° F.
	+10	11.33 a. m.	12.44 p. m.	2.634	2.377	+.257	
	+10	12.48 p. m.	1.21 p. m.	2.377	2.101	+.276	
	+20	1.26 p. m.	1.59 p. m.	2.101	1.558	+.543	
	−10	2.10 p. m.	2.35 p. m.	1.558	1.880	−.322	Water temperature, 62° F.
	−10	2.43 p. m.	3.11 p. m.	1.880	2.162	−.282	
	−10	3.20 p. m.	3.41 p. m.	2.162	2.461	−.299	
	−6	3.48 p. m.	4.19 p. m.	2.461	2.633	−.172	
27	--------	------------	8.40 a. m.	--------	2.780	−.319	Distance from top of cylinder to soil in the 2 wells is 2.835 and 2.700 feet.

Computations of specific-yield test 1

Date (1927)	Net volume of water added or subtracted (cubic foot)	Rise or fall of water level (foot)	Time interval (minutes)	Net volume of soil affected (cubic foot)	Specific yield	
					Water level rising	Water level falling
Sept. 23	+0.00501	+0.221	48	0.3847	1.30	
Do	+.01058	+.419	35	.7297	1.45	
Do	−.00206	−.257	21	.4477		0.46
Do	−.00375	−.357	30	.6212		.60
Sept. 26	+.0040	+.257	71	.4477	.92	
Do	+.0036	+.276	33	.4802	.75	
Do	+.0075	+.543	33	.9456	.79	
Do	−.0026	−.322	25	.5601		.46
Do	−.00354	−.282	28	.4911		.72
Do	−.00308	−.299	21	.5206		.59
Do	−.00203	−.172	27	.2993		.69
Sept. 27		−.319	1,012			
Average					1.04	.59

Test 2.—In the SE. ¼ SW. ¼ sec. 16, T. 4 N., R. 8 E., about 1,500 feet northwest of test 1 and about 15 feet southwest of well 4816N1. The test pit was dug and the cylinder driven and sealed September 28, 1927. A bituminous compound was used to seal the joint between the cylinder and base plate, and the test was started September 29. On October 10 the bituminous sealing compound showed a "blister," and a leak soon developed. Several attempts to reseal the cylinder were made, but they were not effective, and the test was abandoned November 11. Figure 23 shows a log of test pit 2.

Observations on specific-yield test 2

Date (1927)	Amount of water added or withdrawn (ounces)	Time of change of water	Time of final measurement	Distance of water level from top of cylinder (feet)		Rise or fall of water level (feet)	Remarks
				Initial	Final		
Sept. 28	+60	5.00 p. m.					
29	+389				2.418		
	+48	11.48 a. m.	12.03 p. m.	2.418	2.160	+0.258	
	+128	12.16 p. m.	12.49 p. m.	2.160	1.900	+.260	
	+80	12.58 p. m.	1.35 p. m.	1.900	1.722	+.178	Temperature of water in cylinder, 68° F.
	+362	2.16 p. m.	2.39 p. m.	1.722	.950	+.772	Temperature of water added 69° F.
	−64	2.59 p. m.	3.39 p. m.	.950	1.288	−.338	
	−64	3.56 p. m.	4.34 p. m.	1.288	1.458	−.170	
30			9.28 a. m.		1.480	−.192	
	−64	9.44 a. m.	10.41 a. m.	1.480	1.629	−.149	
	−128	11.19 a. m.	12.38 p. m.	1.629	1.920	−.291	
	+416	1.17 p. m.	1.52 p. m.	1.920	.420	+1.500	Temperature of water added, 57° F.
	−144	2.19 p. m.	2.56 p. m.	.420	1.270	−.850	
	−160	3.26 p. m.	5.11 p. m.	1.270	1.631	−.361	Temperature of water removed, 63° F.
	−128	5.51 p. m.		1.631			
Oct. 1			9.20 a. m.		1.975	−.344	
	+256	9.45 a. m.		1.975			
2			11.05 a. m.		1.269	+.706	
	−176	11.40 a. m.		1.269			
			5.03 p. m.		1.774	−.505	
	−44	5.20 p. m.		1.774			
			9.10 a. m.		1.958	−.184	Temperature in cylinder, 5[illegible] F.
5	+256	9.40 a. m.		1.958			Temperature of water added, 51° F.
6			9.45 a. m.		1.230	+.728	
	+176	10.10 a. m.		1.230			
7			2.50 p. m.		.598	+.632	
	−104	3.10 p. m.		.598			
8			11.05 p. m.		2.177	−1.579	
	+104	11.25 a. m.		2.177			
10			4.20 p. m.		.725	+1.452	Cylinder leaking.

Observations on specific-yield test 2—Continued

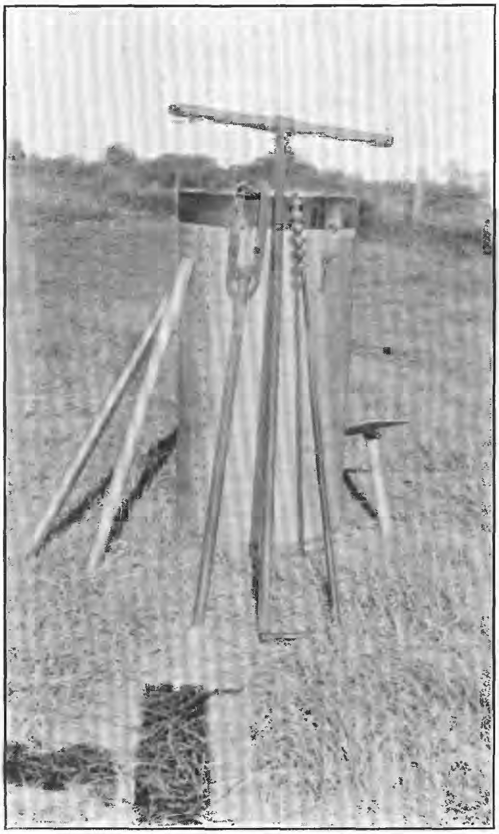
Date (1927)	Amount of water added or withdrawn (ounces)	Time of change of water	Time of final measurement	Distance of water level from top of cylinder (feet)		Rise or fall of water level (feet)	Remarks
				Initial	Final		
Nov. 4	--------	12.00 m.	-----------	--------	--------	--------	Cylinder resealed and water added to make an artificial water table.
5	+192	10.20 a. m.	-----------	2.278	--------	--------	Temperature of water in cylinder, 58° F.; temperature of water added, 59° F.
7	--------	-----------	11.00 a. m.	--------	1.799	+.479	Temperature of water in cylinder, 59° F.
	+192	11.20 a. m.	-----------	1.799	--------	--------	Temperature of water added, 59° F.
9	--------	-----------	1.30 p. m.	--------	1.377	+.422	Temperature of water in cylinder, 59° F.
	+128	1.50 p. m.	-----------	1.377	--------	--------	
11	--------	-----------	4.10 p. m.	--------	1.715	−.338	Cylinder leaking.
	--------	-----------	-----------	--------	.70	--------	Cylinder resealed and water added to make an artificial water table; water all leaked out of cylinder and test abandoned.

Computations of specific yield test 2

Date (1927)	Net volume of water added or subtracted (cubic foot)	Rise or fall of water level (feet)	Time interval (hours and minutes)		Net volume of soil affected (cubic feet)	Specific yield		Remarks
						Water level rising	Water level falling	
Sept. 29	+0.04375	+0.258		15	0.4486	9.25	--------	Doubtful results.
	+.1276	+.260		33	.4526	28.2	--------	
	+.0792	+.178		37	.3096	25.6	--------	
	+.3590	+.772		23	1.171	30.6	--------	
	−.0586	−.338		40	.5877	--------	9.96	Do.
	−.0627	−.170		38	.2958	--------	21.2	
30	−.0622	−.192	17	32	.3343	--------	18.6	
	−.0632	−.149		57	.2593	--------	24.4	
	−.1266	−.291	1	19	.5069	--------	25.0	
	+.3981	+1.500		35	2.608	15.3	--------	
	−.1296	−.850		37	1.479	--------	8.76	Do.
	−.1582	−.361	1	45	.6291	--------	25.2	
Oct. 1	−.1254	−.344	15	29	.5985	--------	21.0	
2	+.2501	+.706	25	20	1.229	20.4	--------	
	−.1716	−.505	5	23	.8786	--------	19.6	
5	−.0415	−.184	63	50	.3180	--------	12.0	
6	+.2496	+.728	24	5	1.2671	19.7	--------	
7	+.1685	+.632	28	40	1.0995	15.3	--------	
8	−.0698	−1.579	19	55	2.743	--------	2.54	Do.
10	+.0728	+1.452	16	55	2.525	2.88	--------	Cylinder leaking.
Nov. 7	+.1887	+.479	48	40	.8332	22.6	--------	
9	+.1901	+.422	50	10	.7356	25.8	--------	
11	[a] +.1338	−.338	50	20	------------	--------	--------	Do.

[a] Gross amount of water added.

The average specific yield of the soil in test 1, as shown in the table, is 1.04 for a rising water table and 0.59 for a falling water table. The time intervals allowed for the water level to reach an equilibrium were short, only one being over 50 minutes. The capillary fringe above the water table did not reach a state of equilibrium between each set of observations, with the time interval used. With a rising water table more water would probably have been drawn up into the soil above the water table if the time interval between changes of the water level had been increased. Similarly, with a



A. SOIL CYLINDER, 1½-INCH NICKEL TUBES, 4-INCH SOIL AUGER WITH EXTENSION HANDLE, AND 1½-INCH WOOD AUGER USED IN SPECIFIC-YIELD TESTS

B. DEEP-WELL TURBINE ON WELL 4715C1

Both photographs by Harold T. Stearns.

AIRPLANE VIEW OF MOKELUMNE RIVER BETWEEN LANCHA PLANA AND CLEMENTS, SHOWING THE ROWS OF GRAVEL LEFT BY GOLD DREDGES

Photograph by United States Army Air C

falling water table more water would have drained out by gravity from the soil above the water table if the time interval has been longer. In either case the resulting specific yield would have been larger and more nearly the actual specific yield if the time interval between changes of water in the cylinder had been greater. Experiments conducted the following year proved that an interval of several days is necessary to obtain accurate results.

The large amount of water added to test cylinder 2 to obtain an artificial water level in the cylinder, in comparison with test 1, indicates a much larger specific yield for the soil in test 2. The comments on the time interval for test 1 apply to some extent to the first part of test 2, but during the later part of the experiment the time interval was much longer. The average of all determinations of specific yield in test 2 (see table) is 19.6 for a rising water table and 17.2 for a falling water table. Omitting the determinations 9.25 and 2.88, which are apparently in error, gives an average specific yield of 22.6 for a rising water table. Omitting the determinations 9.96, 8.76, and 2.54, also obviously wrong, gives an average specific yield of 21.0 for a falling water table. No satisfactory explanation can be offered as to why the omitted results are so low. The average of the specific-yield determinations above 12.0 for a time interval of over 17 hours is 20.8 for a rising water table and 17.5 for a falling water table. The average of the determinations above 12.0 for a time interval of less than 5 hours is 24.9 for a rising water table and 24.5 for a falling water table.

The time interval did not have as great an effect on the soil of test 2 as it would have had on the soil of test 1, because of the difference in texture. Comparison of the logs in Figure 23 shows that the soil column of test 1 contained much more clay than the column of test 2.

A comparison of the results of test 2 indicates that the determinations of specific yield are higher for a short time interval between changes of water in the cylinder than for a long time interval. This result is opposite to what would be expected. It can not be due to leakage from the cylinder, for leakage would have increased the apparent specific yield and produced the same effect as a long time interval. Although it is possible that changes in barometric pressure or temperature would have made this apparent discrepancy, the actual cause has not been determined. Roughly, the specific yield of the soil in test 2 may be taken as about 20, and that in test 1 as about 1. The low results from test 1 in comparison with those from test 2 are due chiefly to the difference in the type of soil but also in part to the short time interval between addition and subtraction of the water.

TESTS MADE DURING 1928-29

One cylinder 18 inches in diameter and 36 inches long and six cylinders 18 inches in diameter and 42 inches long were driven during the fall of 1928. The 42-inch cylinders were found to be preferable to the 36-inch cylinder because a longer soil column and more of the capillary fringe is obtained. As the water table in the cylinders is raised by the introduction of water there is progressively more error introduced in the specific yield of the soil tested, because of the diminishing length of the capillary fringe. This error causes the resulting specific yield to be slightly less than it would be if the soil column were sufficiently long to include the entire capillary fringe. Sealing the cylinders was difficult, and one test column was ruined during sealing operations. The methods used have already been discussed.

The soil column of test 5 was left in the pit and the test carried out in the field. For the other tests the cylinders were moved to a central location, in order to save the time required in driving to the different pits. Extreme care was used not to disturb the soil columns in moving the cylinders.

Measurements of the depth to water in the 1½-inch wells were made with an electrical device, developed by the Bureau of Public Roads, United States Department of Agriculture, on cooperative irrigation investigations in the Sacramento and San Joaquin deltas. This instrument (fig. 24) is called a micro-hydro-gage and by means of a slow-motion screw and vernier attachment measures depths to water to thousandths of a foot.

In the following pages a brief discussion of each test is given. Test 5 (Clark's ranch) is the only one that is complete at present, and all the observations and an example of the methods of computing the results are given for this test only. A complete table of observations on the remainder of the tests will be given in a later report. The table on page 170 is a summary of the results on all tests obtained to date.

Cylinders 6 inches in diameter and 3 feet long were driven beside six of the 18-inch cylinders. In one of these small cylinders the soil column was compressed as much as 6 inches in the driving process, and in all of them it was compressed a sufficient amount to make them worthless for tests of specific yield. However, observations were made on the 6-inch cylinders for comparison, and the results obtained will be given in a later report after the tests are completed.

A consistent variation in the altitude of the water table in response to changes of temperature of the water in the cylinders was found in practically all the tests. It would be preferable to make the corrections of the depth to water to some standard temperature, in order to adjust the measurements for changes in temperature. In this investigation no standard temperature was used, but instead measurements were corrected to a temperature common to both sets of observations. If the temperature correction graph is a straight line for a homogeneous soil and for all temperatures, a standard correction temperature is unnecessary, because the results will be the same as long as both sets of observations used are corrected to the same temperature.

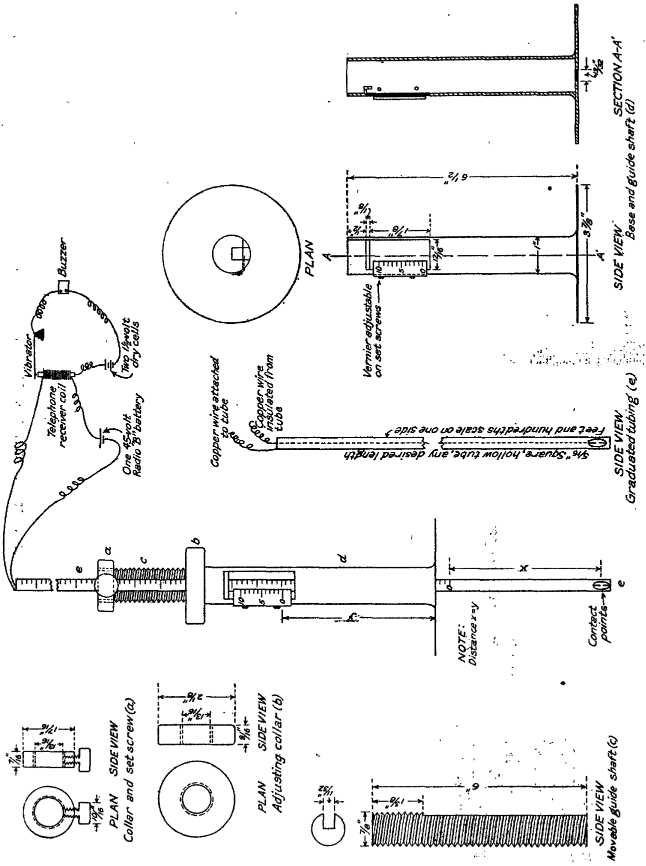


FIGURE 24.—Sketch showing assembly of micro-hydro-gage and electrical connections and details of parts

Test 3.—In the SE. ¼ SW. ¼ sec. 16, T. 4 N., R. 8 E., on R. S. Featherston's ranch. The soil column was obtained from the recent alluvium in the flood plain of the Mokelumne River near test pits 1 and 2. A log of the test pit is shown in Figure 25.

The test was begun September 20, 1928. Leaks developed at the joint between the cylinder and base plate. Unsuccessful attempts were made to reseal the cylinder, and it was then moved to Lodi, where sealing by welding was attempted. The water was finally allowed to thoroughly drain out of the cylinder, a tight joint was obtained, and the test started again January 25, 1929. A summary of the results obtained to date is shown in the table on page 170. For the period February 16 to April 30, 1929, the specific yield obtained was 5.1. When the readings were corrected for temperature variations from 50° F., the specific yield was

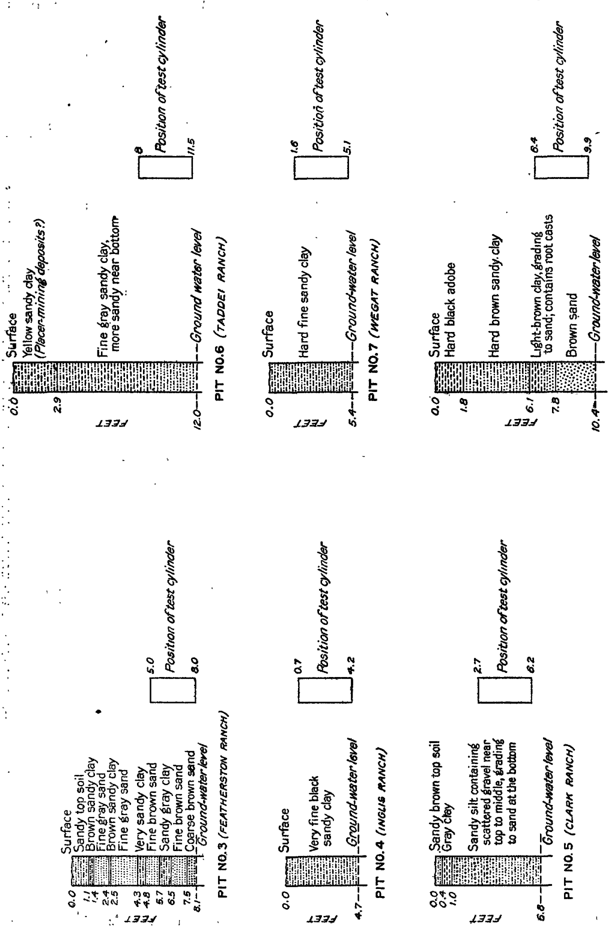


FIGURE 25.—Logs of pits 3 to 8 used in making tests of specific yield

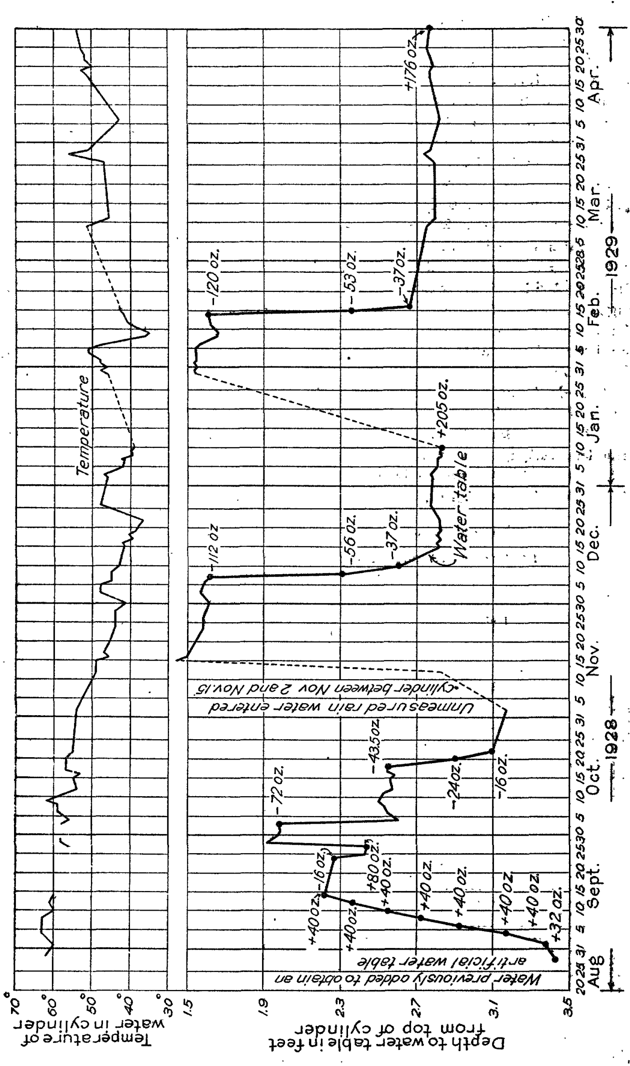


FIGURE 26.—Fluctuation of water table and of temperature of water in specific-yield test 5.

found to be 4.26. Between April 30 and June 26 the specific yield not corrected for temperature was 20.2, which compares favorably with the results obtained from test 2.

Test 4.—In the NW. ¼ SE. ¼ sec. 35, T. 4 N., R. 7 E., in the bottom lands and near the terrace of the Mokelumne River, on the Inglis ranch. A log of the test pit is shown in Figure 25.

The test was started August 28, 1928, but later the cylinder was moved to Lodi. Observations made until February 16, 1929, indicated that an equilibrium of the water table had not been reached. An undetected leak in the cylinder was suspected, and the cylinder was filled with water. After several days the leak became visible. The cylinder was then drained, resealed, and the test started again March 26. (See table, p. 170.) A period of 35 days was allowed for the water table in the cylinder to reach an equilibrium. Between April 30 and June 26 a specific yield of 4.4 was obtained, which was reduced to 2.44 when corrected to a temperature of 65° F. The variation of the water level due to changes in temperature was consistent and gave a correction of about 0.0096 foot per degree of change in temperature between April 19 and April 30, 1929. From June 7 to June 26 the temperature correction amounted to approximately 0.0087 foot per degree.

Test 5.—In the NW. ¼ SW. ¼ sec. 31, T. 4 N., R. 7 E., in the bottom lands of the Mokelumne River, on the Clark ranch. A log of the test pit is shown in Figure 25. The test was started August 28, 1929, and as no leaks developed during the test, it was completed in the field. The following tables give the results obtained. Figure 26 is a graph showing the fluctuation of the water table and the temperature of water in the cylinder.

Observations on specific-yield test 5, Clark ranch

[Water previously added to obtain artificial water table in cylinder]

Date	Time	Depth to water from top top of cylinder (feet)	Change of water (ounces)	Temperature of water in cylinder (°F.)	Depth to water [a] corrected for temperature (feet)
1928					
Aug. 28	10.30 a. m.	3.423	+32	62	----------
Sept. 1	9.40 a. m.	3.377	+40	60	----------
Sept. 4	3.00 p. m.	3.170	+40	63	----------
Sept. 6	4.00 p. m.	2.928	+40	63	----------
Sept. 8	11.30 a. m.	2.728	+40	63	----------
Sept. 10	4.00 p. m.	2.556	+40	60	----------
Sept. 12	11.30 a. m.	2.369	+40	61	----------
Sept. 14	2.30 p. m.	2.220	+40	60	----------
Sept. 24	1.50 p. m.	2.272	−16	----------	----------
Sept. 25	11.50 a. m.	2.434	----------	----------	----------
Sept. 26	9.20 a. m.	2.426	----------	----------	----------
Sept. 27	8.45 a. m.	2.441	+80	56	----------
Sept. 28	7.10 a. m.	1.911	----------	58	----------
Sept. 29	8.45 a. m.	1.949	----------	58	----------
Oct. 1	10.25 a. m.	1.993	----------	----------	----------
Oct. 3	11.15 a. m.	1.982	−72	58	----------
Oct. 4	11.45 a. m.	2.618	----------	56	----------
Oct. 6	11.10 a. m.	2.551	----------	59	----------
Oct. 8	8.30 a. m.	2.537	----------	59	2.545
Oct. 9	5.00 p. m.	2.506	----------	62	2.538
Oct. 11	1.20 p. m.	2.528	----------	----------	----------
Oct. 12	11.15 a. m.	2.578	----------	54	2.546
Oct. 15	5.20 p. m.	2.561	----------	55	2.537
Oct. 16	9.35 a. m.	2.589	----------	53	2.549
Oct. 17	2.50 p. m.	2.546	----------	57	2,538
Oct. 18	3.30 p. m.	2.554	−43.5	57	2.546
Oct. 20	12.00 m.	2.912	−24	57	----------
Oct. 22	5.00 p. m.	3.098	−16	55	----------
Nov. 2	10.30 a. m.	3.174	----------	54	----------
Nov. 12 [b]	9.05 a. m.	2.834	----------	49	----------

[a] All depths were corrected to a temperature of 45° F., except those for Oct. 1 to 18, which were corrected to 58° F.

[b] Unmeasured rain water entered cylinder between Nov. 2 and 15.

Observations on specific-yield test 5, Clark ranch—Continued

[Water previously added to obtain artificial water table in cylinder]

Date	Time	Depth to water from top top of cylinder (feet)	Change of water (ounces)	Temperature of water in cylinder (°F.)	Depth to water corrected for temperature (feet)
1928					
Nov. 15	11.00 a. m.	1. 444	----------	49	----------
Nov. 16	9.05 a. m.	1. 496	----------	46	----------
Nov. 17	9.40 a. m.	1. 502	----------	47	----------
Nov. 21	10.20 a. m.	1. 552	----------	45	----------
Nov. 24	10.00 a. m.	1. 585	----------	44	----------
Nov. 26	10.40 a. m.	1. 582	----------	44	----------
Nov. 28	10.00 a. m.	1. 598	----------	44	----------
Nov. 30	9.50 a. m.	1. 620	----------	41	----------
Dec. 3	10.05 a. m.	1. 564	----------	48	----------
Dec. 5	2.30 p. m.	1. 582	----------	48	----------
Dec. 6	12.45 p. m.	1. 612	----------	45	----------
Dec. 7	11.05 a. m.	1. 616	−112	45	----------
Dec. 8	11.45 a. m.	2. 308	−56	45	----------
Dec. 10	10.00 a. m.	2. 612	−37	43	----------
Dec. 15	2.15 p. m.	2. 820	----------	41. 5	----------
Dec. 16	5.15 p. m.	2. 814	----------	42	----------
Dec. 17	9.50 a. m.	2. 829	----------	39. 5	----------
Dec. 18	1.30 p. m.	2. 810	----------	40. 5	----------
Dec. 19	10.15 a. m.	2. 822	----------	38. 5	----------
Dec. 20	2.40 p. m.	2. 821	----------	38	----------
Dec. 22	11.05 a. m.	2. 820	----------	36. 5	----------
Dec. 26	10.25 a. m.	2. 776	----------	48	----------
1929					
Jan. 2	1.45 p. m.	2. 780	----------	46	2. 786
Jan. 3	9.55 a. m.	2. 776	----------	47	2. 789
Jan. 5	9.30 a. m.	2. 808	----------	42	2. 788
Jan. 7	10.40 a. m.	2. 811	----------	41. 5	2. 788
Do	4.45 p. m.	2. 800	----------	42. 5	2. 784
Jan. 8	9.45 a. m.	2. 826	----------	39. 5	2. 790
Jan. 9	10.10 a. m.	2. 820	----------	40	2. 787
Jan. 10	9.45 a. m.	2. 828	+205	39	2. 789
Jan. 29	9.30 a. m.	1. 544	----------	46	----------
Jan. 30	1.15 a. m.	1. 531	----------	48	----------
Jan. 31	9.15 a. m.	1. 546	----------	46	----------
Feb. 1	8.25 a. m.	1. 532	----------	48	----------
Feb. 2	9.35 a. m.	1. 544	----------	48	----------
Feb. 4	8.30 a. m.	1. 540	----------	51	1. 587
Feb. 5	1.40 p. m.	1. 542	----------	51	1. 589
Feb. 6	9.35 a. m.	1. 564	----------	47	1. 580
Feb. 8	9.15 a. m.	1. 652	----------	36	1. 581
Feb. 9	9.00 a. m.	1. 660	----------	35	1. 581
Feb. 11	4.15 p. m.	1. 616	----------	40	1. 577
Feb. 12	4.45 p. m.	1. 610	----------	41	1. 578
Feb. 14	1.45 p. m.	1. 607	−120	42	1. 583
Feb. 15	1.15 p. m.	2. 360	−53	43	----------
Feb. 16	3.45 p. m.	2. 662	−37	43	----------
Mar. 9	8.45 a. m.	2. 750	----------	51. 5	2. 789
Mar. 11	7.45 a. m.	2. 798	----------	45. 5	2. 801
Mar. 26	4.05 p. m.	2. 792	----------	47	2. 804
Mar. 28	5.00 p. m.	2. 737	----------	56	2. 803
Mar. 29	8.15 a. m.	2. 768	----------	51	2. 804
Apr. 6	9.40 a. m.	2. 820	----------	43	2. 808
Apr. 13	11.10 a. m.	2. 788	----------	48	2. 806
Apr. 18	2.20 p. m.	2. 762	----------	51. 5	2. 801
Apr. 19	4.20 p. m.	2. 764	----------	53	2. 812
Apr. 20	9.25 a. m.	2. 786	----------	50	2. 816
Apr. 22	4.50 a. m.	2. 770	----------	52	2. 812
Apr. 23	4.00 p. m.	2. 766	----------	52	2. 808
Apr. 25	5.00 p. m.	2. 758	----------	53	2. 806
Apr. 30 [a]	3.05 p. m.	2. 764	+176	54	2. 818

[a] Flood from Mokelumne River filled pit, stopping test.

Summary of results of specific-yield test 5, Clark ranch

Date	Change of water (ounces)	Average depth to water (feet)[a]		Temperature correction (foot per degree change)	Average depth to water corrected for temperature (feet)[a]		Corrected temperature (° F.)	Rise or fall of water level (feet)		Specific yield	
		Initial	Final		Initial	Final		Not corrected for temperature	Corrected for temperature	Not corrected for temperature	Corrected for temperature
1928											
Aug. 28-Sept. 1	+32	3.423	3.377	--------	--------	--------	----	+0.046	--------	(?)	------
Sept. 1-4	+40	3.377	3.170	--------	--------	--------	----	+.207	--------	10.2	------
Sept. 4-6	+40	3.170	2.928	--------	--------	--------	----	+.242	--------	8.3	------
Sept. 6-8	+40	2.928	2.728	--------	--------	--------	----	+.200	--------	10.6	------
Sept. 8-10	+40	2.728	2.556	--------	--------	--------	----	+.172	--------	12.6	------
Sept. 10-12	+40	2.556	2.369	--------	--------	--------	----	+.187	--------	11.4	------
Sept. 12-14	+40	2.369	2.220	--------	--------	--------	----	+.149	--------	14.7	------
Sept. 14-24	+40	2.220	2.272	--------	--------	--------	----	−.052	--------	(?)	------
Sept. 24-27	−16	2.272	2.434	--------	--------	--------	----	−.162	--------	4.5	------
Sept. 27-Oct. 3	+80	2.434	1.959	--------	--------	--------	----	+.475	--------	8.7	------
Oct. 3-18	−72	1.959	2.553	0.0080	1.959	2.543	58	−.594	−0.584	5.8	6.0
Oct. 18-Nov. 2	−83.5	2.553	3.174	--------	--------	--------	----	−.621	--------	6.6	------
Nov. 15-Dec. 7	[b] +(?)	3.174	1.563	.0266	--------	1.576	45	+1.611	--------	------	------
Dec. 7-Jan. 10	−205	1.563	2.806	.0065	1.576	2.785	45	−1.243	−1.209	8.5	8.8
1929											
Jan. 10-Feb. 14	+205	2.806	1.599	.0079	2.785	1.582	45	+1.207	+1.203	8.8	8.8
Feb. 14-Apr. 30	−210	1.599	2.773	.0060	1.582	2.806	45	−1.174	−1.224	9.3	8.9

[a] Measured from top of cylinder.
[b] Unmeasured rain water entered cylinder between Nov. 2 and 15.

The method used in computing the specific yield is shown by the following calculations made for the period between February 14 and April 30, 1929:

Cross-sectional area of a cylinder 18 inches in diameter=1.767 square feet.

Cross-sectional area of two tubes 1½ inches in diameter=0.0246 cubic foot.

One ounce of water=0.001044 cubic foot.

Water withdrawn (210 ounces)=0.2195 cubic foot.

Average depth to the water table between February 4 and 14, 1929=1.599 feet.

Average depth to the water table between March 9 and April 20, 1929=2.773 feet.

Average fall of the water table caused by withdrawing 0.2195 cubic foot of water=1.174 feet.

Volume of cylinder affected=1.174×1.767=2.0750 cubic feet.

Volume of tubes affected=1.174×0.0246=0.0289 cubic foot.

Net volume of soil affected=2.0750−0.0289=2.0461 cubic feet.

Net volume of water used=0.2195−0.0289=0.1906 cubic foot.

$$\text{Specific yield}=\frac{0.1906}{2.0461}=9.3 \text{ per cent.}$$

The correction of the depth to water due to temperature variation is made thus: When the depth to water is plotted against the corresponding temperature for the observations made between January 10 and February 14, 1929, only those observations made between February 4 and 14 define a straight line. Therefore, equilibrium of the water table was probably reached on February 4, and variations of the depth to water after that date were mainly due to temperature changes of the water. The observations made between February 4 and 14 were then corrected to a temperature of 45° F. by applying the temperature correction of 0.0079 foot per degree. (See fig. 30.) The corrected figures for the depth to water appear in the table on page 162; the average is 1.582 feet.

When the depth to water is plotted against the corresponding temperature for the observations made between March 9 and April 30, 1929, the observations made after March 11 define an approximately straight line. Equilibrium of the water table was therefore probably reached on March 11. Observations of the depth to water made between March 11 and April 30 were corrected to a temperature of 45° F by applying the temperature correction of 0.006 foot per degree. (See fig. 31.) The average corrected depth to water was 2.806 feet.

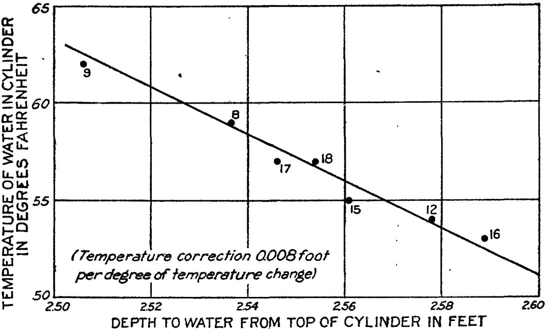


FIGURE 27.—Relation of temperature to depth to water in test cylinder 5, October 8-18, 1928

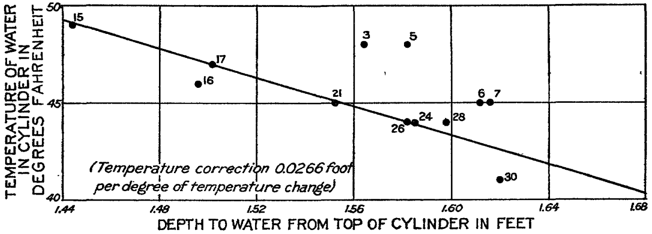


FIGURE 28.—Relation of temperature to depth to water in test cylinder 5, November 15 to December 7, 1928

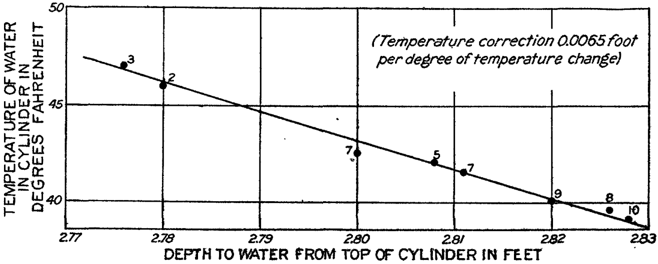


FIGURE 29.—Relation of temperature to depth to water in test cylinder 5, January 2-10, 1929

The fall of the water table, corrected for temperature, was then 2.806 − 1.582 = 1.224 feet. Then we have—

Volume of cylinder affected = 1.224 × 1.767 = 2.160 cubic feet.
Volume of tubes affected = 1.224 × 0.0246 = 0.0301 cubic foot.
Net volume of soil affected = 2.160 − 0.0301 = 2.1299 cubic feet.
Net volume of water used = 0.2195 − 0.0301 = 0.1894 cubic foot.

$$\text{Specific yield, corrected for temperature} = \frac{0.1894}{2.1299} = 8.9.$$

The determinations of specific yield from observations taken between August 28 and September 14, 1928, are too high (see table, p. 164), as is seen by referring to Figure 26 for those dates, which shows that the water table was continually rising. Sufficient time was not allowed for the water table to reach an equilibrium. Further proof of this was observed between September 14 and 24, when there was a fall of the water table after an addition of water. Capillary action was still drawing water from this and the previous additions into the soil above the water table. The specific yield of 4.5 between September 24 and 27 is doubtless too low, as will be shown by further observations. Although the graph of Figure 28 seems to indicate that an equilibrium had been reached, the observations should have extended over a longer period to be conclusive.

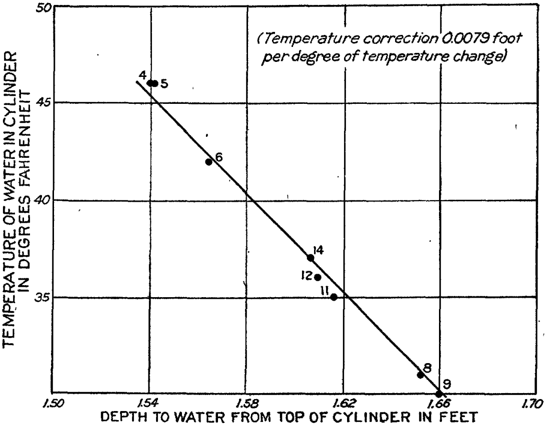


FIGURE 30.—Relation of temperature to depth to water in test cylinder 5, February 4–14, 1929

Between September 24 and October 3 the intervals of time should have been increased, to give conclusive proof of equilibrium. However, it will be noticed that water was withdrawn once and added once, and, owing to the short time interval of each, the determinations of specific yield were correspondingly low and high. Possibly the average of the two determinations, or 6.6, is nearly correct.

A fair result was obtained between October 3 and 18. The questionable factor during this period is whether or not the water table had reached equilibrium on October 3. It probably had not, as the quantity of water had been changed only six days before, but the change resulting from a longer time interval probably would not have been great.

Observations taken between October 8 and 18 gave a direct relation between the fluctuations of the water table and the changes of temperature of the water in the cylinder, which, in part at least, explains the fluctuations of the water table during these experiments. Figure 27 is a graph showing the temperature of the water in the cylinder plotted against the depth to the water table from the top of the cylinder. Observations for October 4 and 6 were discarded, as sufficient time had not been allowed for the water table to reach an equilibrium. This is shown by the distance off the straight line these observations would plot in Figure 27, it being assumed that the straight-line variation is correct. At this position of the water table the temperature correction is found from Figure 29 to be about 0.008 foot per degree. Thus it is seen that even after the water table has reached equilibrium, fluctuations will occur whenever there is a change of temperature of the water.

The table on page 164 gives the specific yield between October 3 and 18, uncorrected for temperature changes, as 5.8. This is the average from all the observations except those made on the 4th and 6th, because equilibrium had not been reached, and that made on the 11th, because the temperature was unknown. The table also gives the specific yield after the observations were corrected for a temperature of 58° F., to correspond with the initial temperature on October 3, as 6.0. Unless a much wider variation in temperature is found, giving a larger correction, it would seem that temperature corrections are of no practical value. However, the relation has experimental value, as it aids in explaining the fluctuations of the water table and also aids in determining when the water table has reached equilibrium.

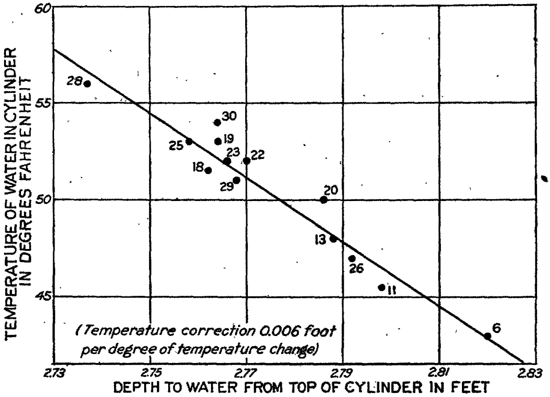


FIGURE 31.—Relation of temperature to depth to water in test cylinder 5, March 11 to April 30, 1929

For the period between October 18 and November 2 a specific yield of 6.6 was obtained from one observation, but rain water drained into the small wells of the cylinder before sufficient additional observations could be made to afford a conclusive determination. A period of 10 days had elapsed between the last withdrawal of water and the observation on which the specific yield was based. For the period between October 3 and 18 the fall of the water table on October 12 was about the average decline. Although the time interval between October 3 and 12 is only three-fifths as long as the interval between October 18 and November 2, the figure given for the specific yield between October 18 and November 2 is assumed to be nearly correct. More observations over a longer time and the application of the temperature correction might have changed the result a few per cent.

The entrance of rain water into the cylinder between November 2 and 15 required the establishment of a new water table, which was carried on until December 7. Water was then withdrawn and further observations made.

Figure 28 shows the temperature correction curve for the observations taken between November 15 and December 7; the correction amounts to 0.0266 foot per degree. This is about three and one-half times the amount indicated by the curve in Figure 27. This difference may be due to the water table being in a soil of different texture, for about 1 foot more of soil was saturated in one period than in the other. Also the temperature range was between 40° and 50° in one period, and between 50° and 60° in the other. However, the temperature correction is considerably higher than any other obtained. The correction curve for a wide range of temperature may not be a straight line, as shown in Figures 27 and 28, but a curve, However, a straight line or tangent to the actual curve will give approximate results for temperatures not varying far from the point of tangency.

The specific yield between December 7 and January 10 was determined as 8.5. This was a period of 34 days, and it is believed that the water table had practically reached an equilibrium on January 2. The temperature correction curve is shown in Figure 29 for observations made between January 2 and 10. The points all lie very close to a straight line drawn between them, and the correction is about 0.0065 foot per degree. Applying this correction to the observations made between January 2 and 10 changes the specific yield from 8.5 to 8.8.

The observations made from January 10 to February 14 indicate that the water table reached an equilibrium on February 4, as the observations made after that date plot nearly on a straight line, as shown in Figure 30. During this period the apparent specific yield was 8.76; applying the temperature correction of 0.0079 foot per degree gave a specific yield of 8.78. Comparison of the data for the period December 7 to January 10 with those for the period January 10 to February 14 shows that the change in the volume of water, the change of the water level in the cylinder, the time interval in days, the temperature correction, and the corrected specific yield are similar.

The period between February 14 and April 30 was more than twice as long as either of the two preceding periods. The change in volume of water and the temperature correction of 0.006 foot per degree were nearly the same. (See fig. 31.) The specific yield of 9.3 corrected for temperature gave 8.9, which is nearly the same as the result for the two preceding periods. During the last three periods of the test the time interval between the change of water and the time when approximate equilibrium was reached was 26, 25, and 25 days, respectively. The results obtained during these periods were also very consistent, whereas those obtained during the periods that were less than 20 days were not consistent.

It is believed from the data presented in the preceding pages that the time interval allowed between the changes of water should be at least 25 days for soil of this type, and if the temperature is not constant the time interval should be longer in order to determine the correction to be applied. The average of all results for specific yields obtained before December 7 on test 5 is 9.3, and the average of the results corrected for temperature obtained after December 7 is 8.8. Therefore it is believed that the specific yield of the soil in test 5 is approximately 10, because the soil column was not long enough to include all of the capillary fringe.

Test 6.—In the SE. ¼ NE. ¼ sec. 21, T. 4 N., R. 6 E., in the recent alluvial deposits of the Mokelumne River, on the Taddei ranch. A log of the test pit is shown in Figure 25.

The test was started September 21, 1928. Leaks developed, and the cylinder was moved to Lodi, resealed, and the test resumed December 19. The water table reached equilibrium about February 1, and 41 ounces of water was removed February 16. Between February 16 and April 30 a decline of the water table of 0.827 foot was recorded, giving a specific yield of 1.6. Correcting the observations to a temperature of 50° F. gave a specific yield of 1.2. The temperature correction computed from observations made between February 1 and 16 was about 0.0264 foot per degree. All the observed points except one or two plotted close to a straight line. Between March 26 and April 30 the temperature correction was about 0.0112 foot per degree. The points of the curve were somewhat scattered, but the general slope of the line was obvious.

Between April 30 and June 26 an addition of 40 ounces of water caused the water table to rise 0.821 foot and gave 1.5 as the specific yield. The temperature correction between June 7 and 26 was about 0.0192 foot per degree, determined from a well-defined temperature curve. Applying this figure to correct the observations to a temperature of 65° F. gave a specific yield of 2.6.

The average of the uncorrected specific yields was 1.55, and the average of the specific yields corrected for temperature was 1.91. The interval between the time the water was changed in the cylinder and the time equilibrium was apparently reached was 43, 38, and 38 days for the three sets of observations.

Test 7.—In the NE. ¼ NE. ¼ sec. 36, T. 4 N., R. 5 E., on the Wegat ranch. The log of the test pit is shown in Figure 25.

The test started September 25, 1928. Leaks developed in the joint of the cylinder, and it was moved to Lodi, resealed, and the test resumed December 18. On February 4 the cylinder was again leaking, but it was repaired and allowed to set until February 16, when 110 ounces of water was added, giving an average rise of the water table of 0.446 foot on April 6. On April 13 another leak was found, and the test was discontinued. The specific yield between February 16 and April 6 was 13.6, which is believed to be approximately correct for the soil tested, although other tests are needed to verify this result. Between February 5 and 16 a good temperature correction curve was obtained, showing the correction to be about 0.055 foot per degree. The other observations gave no well-defined temperature correction curve.

Test 8.—In the SW. ¼ SW. ¼ sec. 26, T. 3 N., R. 6 E., on Robinson's ranch. The log of the test pit is shown in Figure 25.

The test was started September 24, 1928, but leaks developed. The cylinder was moved to Lodi, resealed, and the test resumed November 7. On December 7 46 ounces of water was removed, which gave a fall of the water table of 1.759 feet by January 10. The specific yield was 0.16; corrected to a temperature of 46° F. it became 0.35. An addition of 46 ounces of water January 10 gave a rise of the water table of 1.353 feet by February 16 and a specific yield of 0.64; corrected to a temperature of 46° F. the specific yield is 0.65. Between February 16 and April 30 a withdrawal of 36 ounces of water gave a fall of the water table of 1.384 feet and a specific yield of 0.15. Applying the temperature correction gave a result that was obviously incorrect. Between April 30 and June 26 an addition of 40 ounces of water gave a rise of the water table of 1.181 feet and a specific yield of 0.62; correction to a temperature of 65° F. gave 1.11.

The temperature correction curves were fairly well defined, and the corrections were as follows: November 16 to December 3, 0.033 foot; January 2 to 10, 0.0218 foot; February 8 to 16, 0.0168 foot; April 3 to 30, 0.0172 foot; June 7 to 26, 1929, 0.018 foot. The intervals between the changes of water and the time equilibrium was apparently reached were 26, 29, 56, and 38 days, respectively.

Summary of data of specific yield tests 3 to 8

Test 3, Featherston ranch

Date of measurements		Time interval (days)	Average depth to water (feet)[a]		Average rise or fall of water level (feet)	Number of observations	Change of water (ounces)	Range of temperature (°F.)[b]	Specific yield		Temperature to which observations were corrected (°F.)
First	Last		First	Last					Computed	Corrected for temperature	
1929 Jan. 25	1929 Feb. 16	23	Dry.	1.585	--------	12	(c)	39.5–52	--------	--------	--------
Feb. 16	Apr. 30	73	1.585	2.521	−0.936	8	−102	56–62	5.1	4.26	50
Apr. 30	June 26	57	2.521	2.254	+.267	9	+96	63–82	20.2	--------	65

Test 4, Inglis ranch

Date of measurements		Time interval (days)	Average depth to water (feet)[a]		Average rise or fall of water level (feet)	Number of observations	Change of water (ounces)	Range of temperature (°F.)[b]	Specific yield		Temperature to which observations were corrected (°F.)
First	Last		First	Last					Computed	Corrected for temperature	
1929 Mar. 26	1929 Apr. 30	35	Dry.	2.577	--------	6	(c)	56–62	--------	--------	--------
Apr. 30	June 26	57	2.577	2.762	−0.185	11	−18	63–82	4.4	2.44	65

Test 5, Clark ranch

Date of measurements		Time interval (days)	Average depth to water (feet)[a]		Average rise or fall of water level (feet)	Number of observations	Change of water (ounces)	Range of temperature (°F.)[b]	Specific yield		Temperature to which observations were corrected (°F.)
First	Last		First	Last					Computed	Corrected for temperature	
1928 --------	1928 Aug. 28	--------	Dry.	3.423	--------	--------	(c)	62	--------	--------	--------
Aug. 28	Sept. 1	4	3.423	3.377	+0.046	1	+32	62–60	(?)	--------	--------
Sept. 1	Sept. 4	3	3.377	3.170	+.207	1	+40	60–63	10.2	--------	--------
Sept. 4	Sept. 6	2	3.170	2.928	+.242	1	+40	63	8.3	--------	--------
Sept. 6	Sept. 8	2	2.928	2.728	+.200	1	+40	63	10.6	--------	--------
Sept. 8	Sept. 10	2	2.728	2.556	+.172	1	+40	63–60	12.6	--------	--------
Sept. 10	Sept. 12	2	2.556	2.369	+.187	1	+40	60–61	11.4	--------	--------
Sept. 12	Sept. 14	2	2.369	2.220	+.149	1	+40	61–60	14.7	--------	--------
Sept. 14	Sept. 24	10	2.220	2.272	−.052	1	+40	--------	(?)	--------	--------
Sept. 24	Sept. 27	3	2.272	2.434	−.162	3	−16	--------	4.5	--------	--------
Sept. 27	Oct. 3	6	2.434	1.959	+.475	4	+80	58	8.7	--------	--------
Oct. 3	Oct. 18	15	1.959	2.553	−.594	7	−72	53–62	5.8	6.0	58
Oct. 18	Nov. 2	15	2.553	3.174	−.621	1	−83.5	54–57	6.6	--------	--------
Nov. 15	Dec. 7	23	--------	1.563	--------	12	(d)	41–49	--------	--------	--------
Dec. 7	1929 Jan. 10	34	1.563	2.806	−1.243	8	−205	39–47	8.5	8.8	45
1929 Jan. 10	Feb. 14	35	2.806	1.599	+1.207	8	+205	35–51	8.8	8.8	45
Feb. 14	Apr. 30	75	1.599	2.773	−1.174	14	−210	43–56	9.3	8.9	45

Test 6, Taddei ranch

Date of measurements		Time interval (days)	Average depth to water (feet)[a]		Average rise or fall of water level (feet)	Number of observations	Change of water (ounces)	Range of temperature (°F.)[b]	Specific yield		Temperature to which observations were corrected (°F.)
First	Last		First	Last					Computed	Corrected for temperature	
1928 Dec. 19	1929 Feb. 16	59	--------	2.287	--------	11	(c)	39.5–52	--------	--------	--------
1929 Feb. 16	Apr. 30	73	2.287	3.114	−0.827	13	−41	49–62	1.58	1.22	50
Apr. 30	June 26	57	3.114	2.293	+.821	10	+40	63.5–81.5	1.51	2.60	65

Test 7, Wegat ranch

Date of measurements		Time interval (days)	Average depth to water (feet)[a]		Average rise or fall of water level (feet)	Number of observations	Change of water (ounces)	Range of temperature (°F.)[b]	Specific yield		Temperature to which observations were corrected (°F.)
First	Last		First	Last					Computed	Corrected for temperature	
1929 Feb. 5	1929 Feb. 16	11	--------	2.815	--------	5	(c)	43–48	--------	--------	--------
Feb. 16	Apr. 6	49	2.815	2.369	+0.446	5	+110	48–60	13.6	--------	--------

Test 8, Robinson rsnch

Date of measurements		Time interval (days)	Average depth to water (feet)[a]		Average rise or fall of water level (feet)	Number of observations	Change of water (ounces)	Range of temperature (°F.)[b]	Specific yield		Temperature to which observations were corrected (°F.)
First	Last		First	Last					Computed	Corrected for temperature	
1928 Nov. 7	1928 Dec. 7	30	--------	1.595	--------	10	(c)	46–51	--------	--------	--------
Dec. 7	1929 Jan. 10	34	1.595	3.354	−1.759	8	−46	39–47	.16	.35	46
1929 Jan. 10	Feb. 16	37	3.354	2.001	+1.353	7	+46	39–47	.64	.65	46
Feb. 16	Apr. 30	73	2.001	3.385	−1.384	9	−36	54–63½	.15	(?)	50
Apr. 30	June 26	57	3.385	2.204	+1.181	11	+40	62–82	.62	1.11	65

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[a] Depth to water level from top of cylinder.

[b] Temperature of water in cylinder.

[c] Water previously added to obtain an artificial water table.

[d] Rain water entered cylinder and test started again.

SUMMARY

Tests 1, 2, and 5 are completed, but the remainder of the tests are still in progress, and the data obtained will be given in a later report. Additional observations are necessary and may change the results given here, hence these data are of a preliminary nature and subject to revision.

Test 1.—The time interval allowed for each determination was not long enough for accurate results. The average specific yield for a rising water table was 1.04 and for a falling water table 0.59. The average of the two is 0.82. The soil tested consisted of fine black clay and coarse black sand. The test was made chiefly on the fine black clay, which has a low specific yield and the result obtained is about what would be expected.

Test 2.—The soil was mainly a medium-coarse brown sand, hence the specific yield should be relatively high. The time interval for the first part of the experiment was short, being not over 45 minutes, but for the last part of the test the time interval ranged from about 1 hour to 50 hours. The specific yield was about 20.

Test 3.—The results of this test are not yet satisfactory, the specific yield ranging from 4.26 to 20.2. The soil is similar to that of test 2, and a specific yield of 15 or 20 would be expected. The temperature correction curves were not definite, but the corrections obtained were 0.015, 0.0084, and 0.014 foot per degree.

Test 4.—The soil tested was a very fine black sandy clay with a low specific yield. Owing to an undetected leak in the cylinder only one determination has been obtained so far. The specific yield was 4.4; corrected for temperature, 2.44. Two fairly well defined temperature correction curves have been obtained, showing corrections of 0.0096 and 0.0087 foot per degree.

Test 5.—The soil tested was a brown silty sand. This is doubtless the best test of the group and showed a specific yield of about 10. Very well defined temperature correction curves were obtained, giving corrections of 0.008, 0.0266, 0.0065, 0.0079, and 0.006 foot per degree. The time required for the water table to reach an equilibrium was established as being at least 25 days.

Test 6.—The soil tested was a fine black sandy silt. The specific yields were 1.6 and 1.4; corrected for temperature, 1.2 and 2.6. Fairly well defined temperature correction curves were obtained, showing corrections of 0.0264, 0.0112, and 0.0192 foot per degree. The time interval required for the water table to reach an equilibrium after a change of water was 43, 38, and 38 days for three series of observations.

Test 7.—The soil tested was a hard fine brown and gray sandy clay. Leakage caused considerable difficulty, and only one result of 13.6 for the specific yield was obtained. This result is believed to be high for soil of this texture, but additional data are needed to prove it. The result was obtained for a rising water table and would be too high if there was a small undetected leak in the cylinder. This is possible, for seven days after the last observation was made a leak appeared. Between February 5 and 16, 1929, a well-defined temperature correction curve was obtained, showing a correction of 0.055 foot per degree. Another series of observations gave no definite temperature correction curves, which may be an indication that an undetected leak was present.

Test 8.—The soil tested was a very hard sandy clay. The results are not consistent, for two tests gave a specific yield of 0.16 and 0.15 for a falling water-table, and two tests gave 0.64 and 0.62 for a rising water table. Application of the temperature corrections to the results did not make them more consistent.

The temperature correction curves were fairly well defined and showed corrections of 0.055, 0.033, 0.0218, 0.0168, 0.0172, and 0.018 foot per degree.

According to the records given on page 128, the volume of water-bearing material that was unwatered from April to September, exclusive of subarea 1, amounted to 315,200 acre-feet in 1926, 345,300 acre-feet in 1927, and 420,100 acre-feet in 1928 and averaged 360,200 acre-feet in the three years. The average annual withdrawal of water through wells, exclusive of subarea 1, is computed on page 274, to have been 53,800 acre-feet. If there were no recharge from April to September, and no discharge other than that by pumping from wells during this period, and if all the pumping occurred during this period, the specific yield could be approximately computed by dividing the average volume of water withdrawn (53,800 acre-feet) by the average volume of material unwatered (360,200 acre-feet). Such a computation would give a specific yield of about 15. If allowances are made for the modifying factors, however, it appears that the specific yield is more nearly 10. Intensive investigation that is now in progress should give a more accurate figure for average specific yield. Clark,[37] by two different methods, computed the specific yield of the water-bearing material in the southern part of the Santa Clara Valley to be about 12.

GROUND-WATER RECHARGE

GENERAL CONDITIONS

Ground water in the Mokelumne area is derived from precipitation either directly through percolation into the ground from rain falling on the intake area or indirectly by percolation from stream beds or canals crossing the valley floor, which are in turn supplied by precipitation on the catchment area. Therefore an estimate of the available annual recharge, which is equivalent to the safe yield of the underground reservoir, can be derived from determinations of the recharge from rainfall on the valley floor; of the losses from the Mokelumne River and from intermittent or ephemeral streams, such as Bear and Dry Creeks; and of percolation of irrigation water diverted from the Mokelumne River either by canals or pumps. All these factors are not readily determined, and hence the conclusion reached is necessarily only an estimate.

The source of the water in this great underground reservoir has been the subject of considerable speculation by the local residents. The most prevalent hypothesis is that the adjacent salt sea water supplies the fresh ground water by filtering through the sand, which removes the salt. As the salt is in solution, however, and not in suspension, it can not be filtered out of sea water by passing through the ground. Furthermore, the continual movement of ground water

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[37] Clark, W. O., Ground water in Santa Clara Valley, Calif.: U. S. Geol. Survey Water-Supply Paper 519, p. 70, 1924.

from the mountains toward the ocean prevents the salt water from moving landward. Salt-water invasion of the Lodi pumping area is remote so long as the Woodbridge irrigation district lies between it and Suisun Bay. Should the water table be drawn down several hundred feet below the surface as a result of pumping in the vicinity of Lodi, it would create a steep hydraulic gradient, but the ground water from Sacramento and San Joaquin Valleys and the Woodbridge irrigation district would migrate toward the Lodi cone of depression and tend to fill it, rather than the sea water. For these reasons the invasion of sea water appears remote. In well 4712A1, 4 miles north of Lockeford, fresh water is reported in marine sand 1,875 feet below sea level. The presence of fresh water so far below sea level in a marine deposit indicates that the slow movement of ground water during thousands of years has displaced any sea water that may have been trapped in the sediments when they were deposited in the inland sea that occupied the Great Valley during Tertiary time. Moreover, along some seacoasts even at the present time the sedimentary beds underlying the sea contain fresh water.[38]

RECHARGE FROM RAINFALL ON THE CATCHMENT AREA

The four principal geologic formations of this region in a general way crop out in belts trending north and occurring in order from east to west as follows: The "Bedrock series," forming the mountains; the Ione formation, in the foothills; the older alluvium, in the uplands; and the younger alluvium, in the lowlands and the delta country.

MOUNTAINS

The "Bedrock series" comprises relatively impermeable rocks through which little water percolates. Furthermore, the geologic structure trends north and south through this series, and in general this prevents the migration of ground water westward from the mountains to the Lodi area. Consequently, this belt can be neglected as a part of the ground-water intake area, although it is the chief catchment area of the surface water that supplies the streams in the Mokelumne area.

FOOTHILLS

The Ione formation, which forms the foothill belt, consists chiefly of impermeable clay beds, hence as a whole it also is relatively unimportant as a source of ground water for the Mokelumne area. It supplies very little of the ground water drawn by the irrigation wells. Its relatively impermeable condition accounts for the fact that it does not have any well-recognized, permanent water table. Wells obtaining water in this formation, unless drilled into a deep

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[38] Thompson, D. G., Ground-water supplies of the Atlantic City region: New Jersey Dept. Conservation and Development Bull. 30, pp. 27–29, 1928.

aquifer, usually yield only small quantities of water, and many of the shallow wells in it go dry each summer. Very few springs issue from it, and most of these go dry each fall. A well-developed stream pattern exists over much of this belt. Goose Creek receives its entire supply from run-off from the area underlain by these rocks. The Ione belt receives an average annual precipitation of only about 20 inches. The foothills are covered with grass, shrubs, and scrubby trees, which attest the scanty water supply. The precipitation that does not run off from this area is doubtless largely consumed by the vegetation growing upon it.

UPLANDS

The belt of older alluvium, which is intermediate in position between the foothills and the lowlands, consists of partly cemented sand, clay, and gravel. The water in this formation is usually found in the sandy members, because the gravel is for the most part tightly cemented. As a whole wells in this formation stand without casing and yield water in only sparing amounts. Domestic wells are successful, but many of them are so shallow that they go dry in summer. Deep irrigation wells do not obtain large quantities of water from this formation, hence they are generally carried down into the older volcanic series, which has been correlated with the Tuscan tuff (see p. 29) and which yields more water. The Tuscan tuff is a volcanic sand laid down in the valley in conjunction with the volcanic eruptions that produced the andesitic cappings in the foothills. These cap rocks are cemented volcanic mud flows that yield water only in sparing amounts and are not adequate to take in the water found in the correlated sands under the older alluvium. The annual precipitation on the belt underlain by this formation averages only 17 inches, and the compact and cemented alluvial deposits that cover the belt make it a poor intake area; consequently, the recharge from precipitation falling upon this belt is believed to form only a small percentage of the annual ground-water supply for the Mokelumne area.

LOWLANDS

The belt of lowland lies between the older alluvium of the uplands and the clay and peat of the delta country. It is covered entirely with younger alluvium, which contains many strata of permeable arkosic sand. It is from this formation that most of the water is pumped. The average annual rainfall on this belt is about 18 inches. The slight difference between the average for the uplands and lowlands is probably accidental. Practically all the land underlain by younger alluvium is intensively cultivated. Consequently, except during heavy and prolonged rainstorms, most of the rain falling on it is returned to the atmosphere by evaporation or transpiration.

During the rainy season of 1927–28 test holes were drilled in certain tracts to determine whether rain water was percolating downward to the water table. The results given in the table below show that in some places rain penetrated to the water table, but in other places it did not. These test holes were drilled near wells in which the fluctuation of the water table was registered continuously by recorders. Frequently some of the wells showed a pronounced though small rise after a rain, but the tests prove that the rise was not due to direct recharge from rainfall at the time of the storm. It was also found that in two wells side by side, one deep and the other shallow, the water level in the shallow one showed practically no change as a result of a rain, but the deep one usually responded quickly to a heavy rainfall. This is contrary to what would happen if rainfall percolated immediately to the water table and caused the rise. The rise in the deep well following a storm is probably due to the compression of aquifers containing confined water by the loading of the ground near the surface with many tons of rain water and by the changes in barometric pressure accompanying the storm. It is planned to make a more intensive study of the percolation of the rain during the winter of 1929–30 by determining the moisture content of numerous samples of soil from the surface down to the water table.

Boring tests to determine penetration of rainfall

Location	Date (1928)	Depth to dry soil (feet)	Depth to ground water (feet)	Total rainfall since summer of 1927 (inches)	Remarks
Preszler ranch, 35 feet east and 15 feet south from well 373G1.	Feb. 6	3.0	37.9	8.60	Irrigated 3 days before in a furrow 9 feet north of this hole. Water stood in ditch 24 hours.
Preszler ranch, 16 feet east and 30 feet north from well 373G1.	...do....	4.2	37.9	8.60	Do.
Preszler ranch, 3 feet northeast of well 373G1.	Apr. 5	6.0	37.7	13.60	Irrigation water 10 feet away. Water penetrated to 5 feet.
Featherston ranch, 15 feet east of specific-yield pit.	Feb. 6	3.5	15.3	9.51	
Featherston ranch, 10 feet southwest of pit.	...do....	2.5	15.3	9.51	
Featherston ranch, 15 feet north of well 4816N1.	...do....	(a)	14.5	9.51	
Clancy ranch, 30 feet southwest of well 4727A1.	Feb. 7	5.0	35.8	8.83	
Clancy ranch, 30 feet northeast of well 4727A1.	...do....	3.0	35.8	8.83	
Clancy ranch, 30 feet west of well 4727A1.	...do....	4.0	35.8	8.83	
Clancy ranch, 45 feet northwest of well 4727A1.	Apr. 5	5.1	36.2	14.01	
Emde ranch, 15 feet southeast of well 3616C1.	Feb. 6	(a)	9.8	7.61	
Emde ranch, 25 feet northeast of well 3616C1.	...do....	8.5	9.8	7.61	
Emde ranch, 30 feet northeast of well 3616D2.	Feb. 28	(a)	9.7	7.77	Nearly dry layer at 7 feet.
Emde ranch, 25 feet southeast of well 3616D2.	Apr. 5	6.3	9.5	12.90	No irrigation to date.

[a] Moist to water table.

Several wells in the younger alluvium, bored just to the water table, were equipped with recorders, and continuous records were obtained of the fluctuation of the water level in the wells. Hydrographs of these wells and the daily precipitation are shown in Plate 9. The lack of appreciable recharge from rainfall during the time covered by these observations for these particular places is apparent. Since April, 1926, however, there have been no very heavy rainstorms. Data presented by Sonderegger[39] indicate that ground-water recharge by direct percolation in the San Bernardino Valley does not occur when the rainfall in a single storm is less than 2 inches. He points out further that no recharge occurs from rainfall on the valley floor in years when the seasonal rainfall is less than 11 inches.

Further evidence that recharge occurs from direct percolation of rainfall on the valley floor is found in a comparison of run-off, rainfall, and material saturated with ground water in the table below.

Comparison of run-off, rainfall, and material saturated

Year ending Mar. 31—	Net change in volume of material saturated (+) or unwatered (−) (acre-feet) [a]	Rainfall at Lodi (inches)	Discharge of Mokelumne River at Clements (acre-feet)
1927	+18, 200	19. 25	536, 770
1928	−78, 300	[b] 14. 95	876, 960
1929	−469, 700	11. 02	399, 810

[a] The figures in this column show the volume of material recharged less the volume of material unwatered by discharge of ground water as computed in the table on p. 128.

[b] Of this amount 1.54 inches fell in the first 4 days of April, before the April measurements were made which would increase the effective rainfall for 1926–27 to 20.79 inches.

The amount of water pumped out of the ground was probably not exactly the same in each of the three years, and it is believed that differences in irrigation requirements for the crops due to differences in climate in these years are not adequate to account for the great differences in the volume of material saturated or unwatered annually, but that the differences represent chiefly response to changing conditions of recharge. During the year of highest run-off there was less recharge than during the year of highest precipitation, which indicates that rainfall on the valley floor is important in maintaining the water level in the wells in the area.

The fact that 469,700 acre-feet of water-bearing material was unwatered from April, 1928, to April, 1929, when only 11.02 inches of rain fell, agrees with Sondregger's conclusion that very little recharge occurs when the rainfall is 11 inches or less. In the storm of April 4, 1926, 4.06 inches fell at Lodi. Coming at the end of the rainy season, when the content of soil moisture was high, it probably

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[39] Sonderegger, A. L., Water supply from rainfall on valley floors: Am. Soc. Civil Eng. Proc., vol. 55, p. 1164, 1929.

contributed considerably to the water table. Had it occurred in the early part of the rainy season, when the soil moisture was low, it would have been much less effective.

In the rainy season of 1928–29 a lysimeter test was made in John Emde's field in sec. 16, T. 3 N., R. 6 E. A rain gage was placed in a tunnel 8.33 feet below the land surface and 2.0 feet above the water table. The soil above this lysimeter consisted of 8 feet of sand and clay of the younger alluvium. A total of 0.027 inch of water entered the gage, indicating that about 0.25 per cent of the 10.93 inches of rain recorded at the adjacent rain gage reached the zone of saturation. The results of the test show merely that at least a small percentage of the rainfall reached the water table. The actual amount reaching the water table per unit of surface was not determined by this test, because certain minute arrangements of the sand grains above the lysimeter might conduct water into it from a much larger area of ground surface than one equivalent in size to the top of the gage, or conversely it might have received inflow from a much smaller area. Tests recently made by H. F. Blaney and C. A. Taylor[40] near Ontario, Calif., indicate that water percolating downward through unsaturated material tends to follow the surfaces of the constituent grains and hence to move around the lysimeter rather than to enter it. Thus the amount collected in the lysimeter may be less than the amount that reached the water table. The results of quantitative tests to determine penetration of rain to the water table will always be low, because it is impossible to perform them in depressions where rain water naturally collects, such as in borrow pits along roads or in natural depressions where water collects in pools. Because of the permeable alluvium underlying these pools, rain water doubtless reaches the zone of saturation by percolation from them. Furthermore, the beds of the permeable sand in the younger alluvium generally occur as lenses or broad pipes underlain locally by relatively impermeable clay beds, hence any rain percolating to the water table would not necessarily percolate directly downward from the pool above but would tend to travel laterally through sand until the impermeable clay bed below pinched out. Then it would move downward by gravity until another clay bed was reached, where again it would move laterally until it reached another bed favorable for downward movement. It is the combination of these conditions that probably accounts for the fact that Bailey[41] did not find any recharge from his tank experiments in the Santa Clara Valley. Thus recharge from rain water is necessarily a slow and extended process and not restricted to the rainy season.

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[40] Unpublished data.

[41] Bailey, Paul, unpublished report on the water resources of the Santa Clara Valley, in files of Dept. Engineering, California.

The stage of the water table is not an exact index to the recharge from rainfall percolation, because it is complicated in this area by pumpage, irrigation seepage, and recharge from streams. A significant fact in connection with the Lodi area is that heavy rainfall occurring late in spring, as in April, 1926, saves the farmer from pumping for at least one irrigation. Thus a decrease in withdrawals of ground water is caused by heavy rains during the irrigation season. At Lodi, between April 4 and 9, 1926, 4.08 inches of rain fell; during March, 1926, only 0.25 inch; but during February, 1926, 5.72 inches. This heavy rainfall followed an extremely dry autumn, and although the rainfall for the entire year was only 15.10 inches and the run-off of the Mokelumne River was below normal, yet recharge exceeded ground-water withdrawals for the year. Thus the few heavy storms of this season may have been very effective in recharging the underground reservoir, and when combined with the decreased withdrawals of ground water caused by the storm in April the effect was to cause the water table to stand higher the following April.

DELTA COUNTRY

Recharge in the delta country, which occupies the belt of peaty and adobe soil between the younger alluvium and Suisun Bay, is unimportant in the ground-water supply because it is not available for irrigation pumps. The formation is only slightly permeable, and the water table is practically at the surface except when drainage pumps are operating. Furthermore, in this area discharge of ground water from the Mokelumne area takes place.

RECHARGE FROM MOKELUMNE RIVER

GROUND-WATER CONDITIONS BETWEEN GAGING STATIONS

Gaging stations to measure the flow of the Mokelumne River were established at several points in order to determine losses in the river. The Lancha Plana station is in the old "Bedrock series," where there is no underflow. Hence all water tributary to the river is forced to the surface as it passes over the bedrock in this gorge. About a mile below the gaging station the river leaves the gorge, and thence it flows to the Clements gaging station, 12 miles farther downstream, across the Ione formation and the older alluvium, both of which are relatively impermeable. A narrow flood plain, consisting of coarse but dirty gravel except where gold dredges have washed it clean, forms the bottom land between the benches of older rocks. These recent gravel deposits are underlain at shallow depths by the same relatively impermeable rocks that form the banks. Plate 17 is an airplane view of a stretch of the river between Lancha Plana and Clements showing the rows of gravel left by gold dredges.

At the Clements station the gravel and sand that make up the flood plain between the banks of compact older alluvium carry some underflow, which is not measured at the station. The water-table contours (see pl. 6) indicate that above this point no great amount of water is percolating away from the river channel. Below Clements, however, the flood plain widens rapidly, and below Victor the flood-plain alluvium merges imperceptibly with the lowland deposits. The water-table contours between Clements and Woodbridge show by their shape that in this stretch the river is a losing stream, and water percolating from the channel moves at an acute angle away from the river. (See pl. 6.) Furthermore, a comparison of the hydrographs of well 495Q1 (fig. 9), in the bottom lands between Lancha Plana and Clements, and well 4734K3 (pl. 9), midway between the Clements and Woodbridge stations, shows the small influence of the river on the water table in the first well and the large influence of the river on the water table in the second. The quick response of one well to the stage of the river as compared with the other is a good index of the permeable character of the formations over which the river flows. The hydrograph of well 4821H1, which derives its water chiefly from the older alluvium of the south side of the flood plain 1 mile downstream from Clements, shows no response to the stage of the river, whereas the hydrograph of well 4816N1, which derives its water from the flood-plain alluvium on the north bank of the river opposite well 4821H1, shows a notable response. Considerable indication of the permeable character of the alluvium between Clements and Woodbridge is found in any of the series of measurements (see table, pp. 292–398) of wells adjacent to this stretch of the river which derive their supply from the younger alluvium. The permeable character of the sand in the banks of the Woodbridge Reservoir, which is just upstream from the Woodbridge station, is evident upon field inspection. The fluctuations of the wells adjacent to the reservoir in response to the height of the lake are described on pages 142–145.

Between the Woodbridge station and tidewater the Thornton station was maintained during the low-water months. The channel between these two stations is mostly hardpan, and during the summer the river gains in this stretch, largely on account of return flow from the Woodbridge irrigation district. (See table, p. 203.)

RUN-OFF FROM THE MOKELUMNE RIVER DRAINAGE BASIN BETWEEN THE LANCHA PLANA AND WOODBRIDGE GAGING STATIONS

Run-off from rainfall between the gaging stations on the Mokelumne River must be taken into account in any computations involving the difference in amount of water passing the stations. The drainage area tributary to the river between the Lancha Plana and

Clements gaging stations is 48 square miles, and that between the Clements and Woodbridge stations is 16 square miles. It is estimated that the percentage of the rainfall that runs off these drainage areas is approximately the same as runs off the adjacent Bear Creek drainage area. The land between the Lancha Plana and Clements gaging stations has slightly steeper slopes than the Bear Creek drainage basin, but between the Clements and Woodbridge gaging stations the Mokelumne drainage area is slightly flatter. Other conditions, such as the geology and vegetation, are similar in the two basins. The run-off between the Lancha Plana and Clements gaging stations was computed to be about 8,460 acre-feet during 1927 and about 5,050 acre-feet during 1928. (See table below.) That between the Clements and Woodbridge gaging stations was computed to be about 2,590 acre-feet during 1927 and about 1,510 acre-feet during 1928.

Run-off from the Mokelumne River drainage basin between the Lancha Plana and Woodbridge gaging stations for the years ending September 30, 1927 and 1928

Month	Lancha Plana to Clements				Clements to Woodbridge			
	Rainfall [a]		Run-off		Rainfall [b]		Run-off	
	Inches	Acre-feet	Per cent [c]	Acre-feet	Inches	Acre-feet	Per cent [c]	Acre-feet
1926–27								
October	1.39	3,560	---	---	1.10	940	---	---
November	5.64	14,400	6.9	994	4.04	3,450	6.9	238
December	1.34	3,430	2.04	70	1.38	1,180	2.04	24
January	2.94	7,530	16.90	1,270	2.48	2,120	16.90	358
February	4.64	11,900	42.40	5,050	4.48	3,830	42.40	1,620
March	1.35	3,460	10.30	356	1.32	1,130	10.30	116
April	2.08	5,330	13.41	716	2.01	1,720	13.41	231
May	.22	564	.10	5	.16	137	10	1
June	.28	716	---	---	.38	324	---	---
	19.88	50,890	---	8,461	17.35	14,831	---	2,588
1927–28								
October	1.92	4,910	---	---	1.68	1,430	---	---
November	2.76	7,060	---	---	2.46	2,100	---	---
December	2.70	6,910	1.04	72	2.41	2,050	1.04	21
January	1.23	3,145	.45	14	1.04	886	.45	4
February	2.16	5,530	28.1	1,550	1.60	1,360	28.1	382
March	5.21	13,310	18.1	2,410	4.40	3,750	18.1	679
April	.74	1,890	53.1	1,000	.92	784	53.1	416
May	.27	691	.16	7	.37	316	.16	5
	16.99	43,446	---	5,053	14.88	12,676	---	1,507

[a] Mean rainfall from records of Valley Springs, Wallace, and Clements.
[b] Mean rainfall from records of Clements and Lockeford.
[c] Percentages from computations made for the run-off factor of Bear Creek above the Lockeford gaging station for the years ending Sept. 30, 1927 and 1928.

SEEPAGE LOSSES FROM THE MOKELUMNE RIVER BETWEEN THE LANCHA PLANA AND WOODBRIDGE GAGING STATIONS

By Lynn Crandall

The average annual run-off of the Mokelumne River is about 800,000 acre-feet. Measuring conditions at the several gaging stations on the stream were relatively unfavorable from July, 1926, to

September, 1928, but comparative records are available. The stream had a large diurnal fluctuation during this period, owing to power-plant operation, and nearly all the current-meter measurements were necessarily made on either rising or falling stages. The rating curves at the measuring stations shifted from time to time because sediment was being deposited in or eroded from the channel. Under these conditions it was impossible to determine stream flow as accurately as would have been possible under more favorable conditions, and, although the records were carefully made, the unavoidable errors in the calculated run-off might readily amount to 2 to 5 per cent or even more at times. With the discharge now controlled by the Pardee Reservoir, future records can be obtained with a considerably greater degree of accuracy.

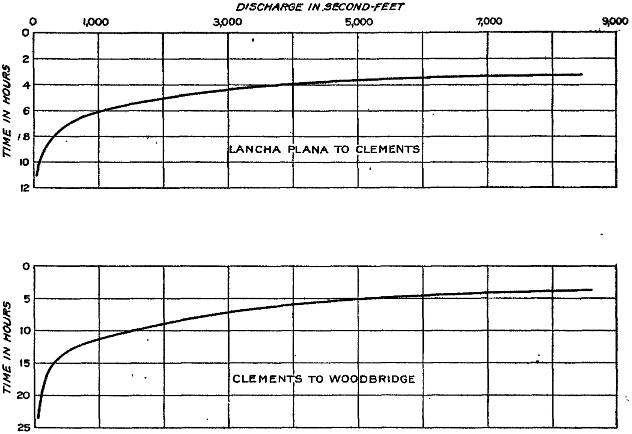


FIGURE 32.—Average time intervals for various discharges between gaging stations on Mokelumne River

The run-off of the Mokelumne River at the Lancha Plana station represents the discharge from the upper part of the stream, before any appreciable losses occur. The Clements station is 12 miles downstream from the Lancha Plana station, and the Woodbridge station is about 16 miles below the Clements station, just below the diversion dam of the Woodbridge irrigation district. (See pls. 6 and 14.)

The losses have been calculated by monthly averages between these stations and are shown in the subjoined tables. The recorded discharges at Lancha Plana and Woodbridge stations have been adjusted to dates at Clements by use of the average time interval between the stations shown in Figure 32. The plotted curves on this diagram are the averages of numerous comparative observations determined from the automatic gage records at the several stations. The run-off from precipitation on the intermediate drainage areas between gaging stations, as given in these tables, is based on precipitation and a percentage run-off factor derived from Bear Creek records and shown in more detail in the table on page 180.

Average loss, in second-feet, in Mokelumne River between Lancha Plana and Clements gaging stations, July 1, 1926, to September 30, 1928

Month	Supply (mean)					Water accounted for			Loss or gain, from records
	Discharge at Lancha Plana		Inflow between Lancha Plana and Clements		Total supply (Clements dates)	Discharge at Clements	Diversions between Lancha Plana and Clements	Total accounted for	
	Actual	Corrected to Clements dates	From precipitation on intermediate drainage area	From Jackson Creek diversion					
1926									
July	98.2	97.5			97.5	92.1	2.1	94.2	−3.3
August	99.6	100.8			100.8	93.1	2.1	95.2	−5.6
September	96.8	96.9			96.9	86.5	2.1	88.6	−8.3
The period	98.2	98.4			98.4	90.6	2.1	92.7	−5.7
1926–27									
October	49.1	49.3			49.3	47.8	2.1	49.9	+.6
November	491.7	479.4	16.7		496.1	481.1		481.1	−15.0
December	526.2	534.5	1.2		535.7	531.3		531.3	−4.4
January	653.7	652.6	20.7	1.6	674.9	663.3		663.3	−11.6
February	1,862.4	1,853.7	91.0	1.7	1,946.4	1,878.4		1,878.4	−68.0
March	1,382.5	1,383.1	5.8	.9	1,389.8	1,298.9		1,298.9	−90.9
April	2,731.7	2,724.1	12.0	1.3	2,737.4	2,629.3	2.1	2,631.4	−106.0
May	3,338.1	3,345.6		.5	3,346.1	3,277.4	2.1	3,279.5	−66.6
June	3,145.0	3,148.5		.2	3,148.7	3,074.7	2.1	3,076.8	−71.9
July	498.3	506.8			506.8	508.8	2.1	510.9	+4.1
August	123.8	122.6			122.6	156.0	2.1	158.1	+35.5
September	72.8	74.0			74.0	98.0	2.1	100.1	+26.1
The year	1,230.4	1,230.4	11.7	.5	1,242.6	1,211.2	1.2	1,212.4	−30.2
1927–28									
October	111.2	109.4			109.4	133.5		133.5	+24.1
November	470.3	470.3			470.3	470.3		470.3	
December	279.8	278.6	1.2		279.8	305.7		305.7	+25.9
January	354.7	354.6	.2	1.0	355.8	356.1		356.1	+.3
February	528.3	527.9	26.9	1.7	556.5	543.6		543.6	−12.9
March	2,970.4	2,958.5	39.2	1.5	2,999.2	2,940.6		2,940.6	−58.6
April	2,304.0	2,304.2	16.8		2,321.0	2,267.0	.3	2,267.3	−53.7
May	2,702.9	2,710.0	.1	.2	2,710.3	2,711.0	1.5	2,712.5	+2.2
June	456.2	463.7			463.7	472.4	2.8	475.2	+11.5
July	108.7	109.2			109.2	105.2	1.3	106.5	−2.7
August	112.9	112.4			112.4	104.7	1.8	106.5	−5.9
September	121.0	121.9			121.9	110.2	.5	110.7	−11.2
The year	879.0	879.0	7.0	.4	886.4	879.0	.7	879.7	−6.7

Average loss, in second-feet, in Mokelumne River between Clements and Woodbridge gaging stations, July 1, 1926, to September 30, 1928

Month	Supply				Water accounted for							Loss or gain, from records
	River discharge at Clements	Inflow from precipitation on intermediate drainage area	Released from Woodbridge Reservoir	Total supply	River discharge at Woodbridge	Woodbridge Canal	River at Woodbridge plus Woodbridge Canal		Diversions Clements to Woodbridge	Stored in Woodbridge Reservoir	Total accounted for	
							Actual	Corrected to Clements dates				
1926												
July	92.1			92.1	3.6	63.0	66.6	66.2	5.0		71.2	−20.9
August	93.1		0.6	93.7	2.9	66.8	69.7	69.9	4.6		74.5	−19.2
September	86.5		2.1	88.6	4.0	66.4	70.4	69.5	.8		70.3	−18.3
The period	90.6		.9	91.5	3.5	65.4	68.9	68.6	3.5		72.1	−19.4
1926–27												
October	47.8		3.3	51.1	4.6	36.0	40.6	39.7	.1		39.8	−11.3
November	481.1	4.0	9.9	495.0	431.6	.4	432.0	456.1	.1		456.2	−38.8
December	531.3	.4	1.1	532.8	600.5		600.5	582.8			582.8	+50.0
January	663.3	5.8	.3	669.4	650.2		650.2	653.4	.4		653.8	−15.6
February	1,878.4	29.2		1,907.6	1,825.1		1,825.1	1,841.9	6.8	3.1	1,851.8	−55.8
March	1,298.9	1.9		1,300.8	1,403.5		1,403.5	1,397.7	6.3	.3	1,404.3	+103.5
April	2,629.3	3.9		2,633.2	2,586.7		2,586.7	2,605.0	7.0	17.6	2,629.6	−3.6
May	3,277.4			3,277.4	3,301.6	109.8	3,411.4	3,400.0	7.0	51.3	3,458.3	+180.9
June	3,074.7		55.2	3,129.9	3,015.0	172.3	3,187.3	3,180.8	6.8		3,187.6	+57.7
July	508.8			508.8	396.4	149.5	545.9	530.6	5.7	1.1	537.4	+28.6
August	156.0			156.0	7.8	122.6	130.4	131.2	5.3	.8	137.3	−18.7
September	98.0		2.0	100.0	6.9	77.3	84.2	81.6	.9		82.5	−17.5
The year	1,211.2	3.6	6.2	1,221.0	1,177.0	56.0	1,233.0	1,233.0	3.8	5.9	1,242.7	+21.7
1927–28												
October	133.5		18.7	152.2	62.1	60.7	122.8	126.8	.2		127.0	−25.2
November	470.3			470.3	428.6		428.6	430.9	.1		431.0	−39.3
December	305.7	.3		306.0	293.1		293.1	292.8		.5	293.3	−12.7
January	356.1	.1		356.2	351.0		351.0	351.2	.5		351.7	−4.5
February	543.6	6.6		550.2	483.7		483.7	482.5	8.3		490.8	−59.4
March	2,940.6	11.0		2,951.6	[a] 2,828.5		2,828.5	2,855.0	8.2	78.0	2,941.2	−10.4
April	2,267.0	7.0	44.7	2,318.7	2,324.0	16.7	2,340.7	2,337.7	8.8		2,346.5	+27.8
May	2,711.0	.1	4.6	2,715.7	2,594.8	108.3	2,703.1	2,690.7	8.9		2,699.6	−16.1
June	472.4		6.1	478.5	336.7	160.1	496.8	482.3	8.7		491.0	+12.5
July	105.2		4.6	109.8	2.8	83.8	86.6	84.8	7.2		92.0	−17.8
August	104.7			104.7	2.5	68.8	71.3	72.2	6.7	3.3	82.2	−22.5
September	110.2		5.7	115.9	3.1	91.0	94.1	93.4	1.1		94.5	−21.4
The year	879.0	2.1	7.0	888.1	811.4	49.2	860.6	860.6	4.9	6.9	872.4	−15.7

[a] Includes estimated average discharge of 14,100 second-feet Mar. 25–28, based on comparison with Clement records. Woodbridge gage washed out during this period.

Apparent loss, in acre-feet, in Mokelumne River between Lancha Plana and Woodbridge gaging stations, October 1, 1928, to July 31, 1929

[From stream-flow records]

Month	Discharge					Loss or gain [a]		
	Lancha Plana	Clements	Woodbridge	Woodbridge Canal	Woodbridge plus canal	Lancha Plana to Clements	Clements to Woodbridge	Lancha Plana to Woodbridge
October	4,640	4,460	416	2,900	3,310	−180	−1,140	−1,320
November	4,720	4,550	5,120	----------	5,120	−170	[b]+570	[b]+400
December	6,520	5,850	5,380	----------	5,380	−670	−470	−1,140
January	7,500	8,180	8,730	----------	8,730	[b]+680	[b]+550	[b]+1,230
February	13,100	13,000	11,900	----------	11,900	−100	−1,100	−1,200
March	14,500	14,200	9,650	799	10,450	−300	−3,750	−4,050
April	39,000	36,200	22,400	8,450	30,850	−2,800	−5,350	−8,150
May	132,000	129,000	103,000	14,000	117,000	−3,000	−12,000	−15,000
June	51,300	50,900	35,000	9,760	44,760	−400	−5,140	−5,540
July	9,900	9,470	658	7,690	8,350	−430	−1,120	−1,550
	283,180	----------	----------	----------	----------	−7,370	−28,950	−36,320

[a] Loss includes evaporation and transpiration from the river channel, seepage into the ground, and pumping diversions, which amount to about 2,000 acre-feet a year. However, this apparent loss would be increased if the inflow from precipitation on the intermediate drainage area between stations and diversions into the Mokelumne River from Jackson Creek were included. The records are not corrected for channel storage.

[b] Gain due to run-off from intermediate drainage area. High rainfall occurred in these two months.

The losses thus shown between the stations are inconsistent for certain months, owing to unfavorable measuring conditions. The records for 1927 show an average apparent gain of 21.7 second-feet in the section between the Clements and Woodbridge stations, which is due to the large apparent gain during certain months. The records at the Woodbridge station for these months are believed to be in error owing to undetected shifts in the rating curve between measurements. During certain periods of falling stages there may be actual gains from bank storage which are not evident in the stream-flow records. The coarse clean gravel left in the path of the gold dredges may store water during high stages and allow it to drain out rapidly during falling stages.

The average water surface between the Lancha Plana and Woodbridge stations, including that of the river and that of the Woodbridge Reservoir, amounts to about 800 acres. The annual average evaporation at Oakdale, the nearest United States Weather Bureau evaporation station, is 83.40 inches. (See table, p. 18). Applying a coefficient of 0.66, to reduce this land-pan evaporation to evaporation from a water surface, gives a mean evaporation of 55.04 inches. The average annual precipitation at Lodi is 18.28 inches, leaving 36.76 inches as the net evaporation loss that may occur on this water surface.

Along the banks of the Mokelumne River a dense growth of live oaks, willows, and underbrush thrives on areas not cleared for cultivation. The area of this uncultivated timber and brush land between the Lancha Plana and Woodbridge gaging stations as determined from airplane photographs is about 1,700 acres. If the annual discharge by soil evaporation and transpiration from this land, exclusive of precipitation, is roughly estimated at 2 acre-feet per acre then the yearly loss from these bottom lands of the Mokelumne River is about 3,400 acre-feet.

According to the records of stream flow as shown in the preceding tables, there was an average loss of water between the Lancha Plana and Woodbridge stations, in the two and one-fourth years covered by the records, of 16.52 second-feet, or about 12,000 acre-feet a year, which is somewhat less than 2 per cent of the total flow of the river. On account of the unfavorable conditions for stream gaging and the inconsistent monthly losses as shown by the records, the data thus far obtained merely show that seepage losses are only a small percentage of the total annual discharge of the river. Further stream gaging will be required before the seepage losses can be certainly established.

MONTHLY CHANGE IN GROUND-WATER STORAGE IN LANDS ADJACENT TO MOKELUMNE RIVER

Numerous wells in lands adjacent to the Mokelumne River (subareas 5 and 2A, fig. 10) were measured monthly. On the basis of the fluctuation of the water level in these wells, the material saturated or unwatered each month was computed. The number of wells used in the calculations and the monthly and annual change in the volume of material saturated are given in the following tables.

Monthly change in volume of saturated material, in acre-feet, in subareas 5 and 2A

[Area, 16,200 acres]

Month [a]	Total number of wells used in computations	Average rise or fall of water level in entire area (feet)	Volume of material unwatered (−) or saturated (+) (acre-feet)
1926			
April-May	22	+0.64	+10,400
May-June	21	−1.65	−26,700
June-July	23	−.71	−11,500
July-August	27	−.29	−4,700
August-September	30	+.03	+500
September-October	34	+.60	+9,700
October-November	38	−.08	−1,300
November-December	38	+1.01	+16,400
December-January	37	+.02	+300
1927			
January-February	41	+.34	+5,500
February-March	40	+.36	+5,800
March-April	40	+.47	+7,600
April-May	37	+.68	+11,000
May-June	36	−.16	−2,600
June-July	37	−.92	−14,900
July-August	33	−.79	−12,800
August-September	34	−.03	−500
September-October	47	+.07	+1,100
October-November	45	+.17	+2,800
November-December	37	−.12	−1,900
December-January	38	−.19	−3,100

[a] Figures represent period from about the middle of one month to the middle of the next.

Monthly change in volume of saturated material, in acre-feet, in subareas 5 and 2A—Continued

Month	Total number of wells used in computations	Average rise or fall of water level in entire area (feet)	Volume of material unwatered (−) or saturated (+) (acre-feet)
1928			
January–February	40	−.39	−6,300
February–March	38	−.13	−2,100
March–April	41	+3.41	+55,300
April–May	45	+.06	+1,000
May–June	42	−2.00	−32,400
June–July	38	−.91	−14,800
July–August	36	−.36	−5,800
August–September	35	−.01	−200
September–October	32	+.20	+3,200
October–November	31	−.07	−1,100
November–December	34	−.11	−1,800
December–January	35	−.16	−1,000
1929			
January–February	32	−.40	−6,500
February–March	32	−.75	−12,200
March–April	29	−.04	−600
April–May	29	+1.80	+29,200
May–June	27	+.14	+2,300
June–July	31	−1.58	−25,600

Summary of change in volume of saturated material in subareas 5 and 2A

Period	Net gain or loss in volume of saturated material (acre-feet)
April, 1926, to September, 1926	−32,000
September, 1926, to April, 1927	+44,000
April, 1927, to September, 1927	−19,800
September, 1927, to April, 1928	+45,800
April, 1928, to September, 1928	−52,200
September, 1928, to July, 1929	−14,100
April, 1926, to July, 1929	−28,300

The computations were made for a strip of land that comprises subarea 5, used in the computation of the annual change in ground-water storage on page 127, and subarea 2A, a subdivision of subarea 2. The location of these areas is shown in Figure 10. They cover about 16,200 acres in a narrow belt from the line common to Rs. 8 and 9 E., about 2½ miles east of Clements, to the Woodbridge Dam. The eastern limit was determined by the 90-foot water-table contour line, which indicates that the river is neither gaining nor losing. (See pl. 6.) The Woodbridge Dam was selected as the western limit because below that point the river ceases to lose and begins to gain, and recharge from flood water does not appreciably benefit the pumping district. Ground-water conditions in this belt are discussed on pages 178–179. Subareas 5 and 2A are somewhat arbitrary. They do not mean that ground water derived by seepage from the Mokelumne River does not move beyond these boundaries, but they are areas in which the contours of the water table obviously indicate recharge from the river. Some water doubtless migrates from this belt toward the pumping district on both sides of the river.

From April to September, 1926, 32,000 acre-feet of water-bearing material was unwatered in this belt, which indicates that withdrawals from wells, transpiration, and ground-water movement away from the area exceeded the recharge from the river. From September, 1926, to April, 1927, 44,000 acre-feet of material was saturated, which indicates that total recharge exceeded total withdrawals. From September, 1928, to April, 1929, 20,000 acre-feet of material was unwatered, which indicates that the dry year which affected the rest of the area had a similar effect on this belt.

As there is considerable pumping prior to April from wells in or close to these two areas, a loss in storage in January, February, or March does not indicate that no recharge from the river occurred. Instead, it means that during the months showing a loss recharge from the river was less than discharge by percolation, transpiration, soil evaporation, and pumpage from wells. In any month in which there was not increase in storage the net increase does not represent the total recharge but rather the excess of recharge over discharge. Thus, the 600 acre-feet of material unwatered in these two areas from the middle of March to the middle of April, 1929, shows excess of withdrawals over recharge and is not an index to the amount of seepage from the Mokelumne River. These figures are therefore residual gains and losses. The plan of the investigation is to lead up to more refined periodic inventories of recharge and withdrawals than has been possible in this report because of the urgent demand for the results.

During the flood run-off of March and April, 1927, about 18,600 acre-feet of water-bearing material was saturated from the river or from rainfall on subareas 5 and 2A. If this material absorbed water to the extent of 10 per cent of its volume the net recharge during this period amounted to only 1,860 acre-feet of water. If it absorbed water to the extent of 20 per cent of its volume the net recharge amounted to only 3,720 acre-feet. The probable loss from the Mokelumne River based on stream-flow records for these two months amounted to about 5,965 acre-feet. (See table on p. 182.) On the basis of a 10 per cent specific yield this amount of water would fill 59,650 acre-feet of material, or if a 20 per cent factor is used it would fill about 29,825 acre-feet. The gain in ground-water storage indicated by well measurements does not bear out such a loss as is indicated by the stream-flow records.

Gaging conditions at stations on the river are only fair during high water; hence an error of as much as 5 per cent might occur in the discharge records. During March and April, 1927, the run-off at

Clements was about 236,000 acre-feet and an error of 5 per cent would amount to about 12,000 acre-feet. The ground-water method of computing recharge from the river during this flood period does not appear to involve comparable errors. The measurements of depth to water are very accurate, and the volume of saturated material computed from these measurements is relatively accurate. The volume of water that the material will absorb in percentage of the material saturated is known only within rather wide limits. Elaborate tests were made of materials in the flood plain, and sufficient work has been done on materials of similar texture by other investigators to indicate that their capacity lies somewhere between 5 and 30 per cent of their volume. The materials are for the most part silt and sand but in part cemented older alluvium. As the pore space of the materials, even above the capillary fringe, is partly filled with water which is retained by molecular attraction against gravity, the absorption capacity is less than the porosity by the amount of water held above the capillary fringe before the water table rises. The tests performed on undisturbed columns of these materials (pp. 151–172) indicate that the samples tested can absorb from 2 to 20 per cent of their volume, the amount depending upon their texture or their water content prior to saturation. It is possible that the estimate of 10 per cent as the average available pore space in the whole area based on the results obtained by these tests is considerably in error, but it is unlikely that the true figure is less than 5 per cent or more than 20 per cent. The total recharge from the river during this flood period is, of course, somewhat different from the net increase in storage.

During March, 1928, as a result of the great flood, 55,300 acre-feet of material became saturated. (See table, p. 186). If the volume of water required to produce this saturation was 10 per cent of the volume of material saturated, about 5,530 acre-feet of the flood water was added to the ground-water supply.

During the growing season about 3,000 acre-feet of water is pumped from the river for irrigating lands adjacent to it. Some of this water percolates below the root zone and becomes ground water, but a study of the use of water and amount of water pumped for these lands indicates that the crops raised on them consume slightly more water than is applied. This additional water is derived from the shallow water table beneath or from overflow water.

MOKELUMNE FLOOD OF MARCH, 1928

Warm rains on the snow fields in the headwaters of the Mokelumne in the later part of March, 1928, produced a flood run-off which was one of the two greatest recorded since the first United States Geological Survey gaging station was established in 1904 at Clements. A maximum stage of 22.45 feet was registered by the water-stage recorder

A. U. S. GEOLOGICAL SURVEY GAGING STATION AT CLEMENTS AT 11.33 A. M. MARCH 26, 1928

B. MOKELUMNE BEACH AMUSEMENT PARK WRECKED BY THE FLOOD OF MARCH, 1928

C. FLOOD WATERS OF MOKELUMNE RIVER ON BOTTOM LANDS NEAR LOCKEFORD, MARCH, 1928

All photographs by Harold T. Stearns.

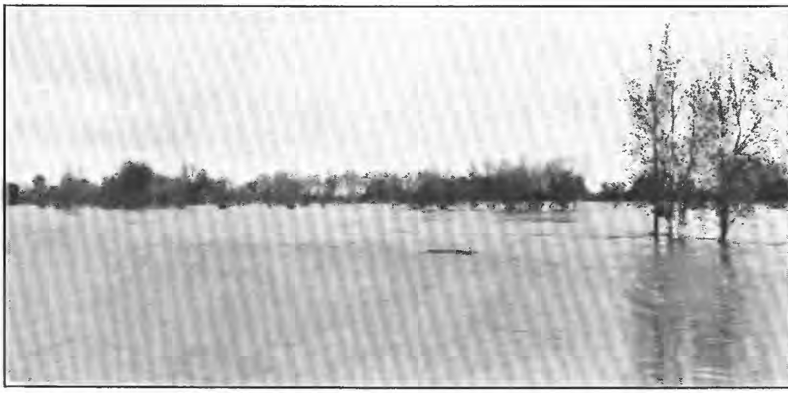
A. FRUIT TREES NEAR VICTOR SUBMERGED

B. VIEW LOOKING NORTH ALONG CHEROKEE LANE, SHOWING FLOOD WATERS OF MOKELUMNE RIVER

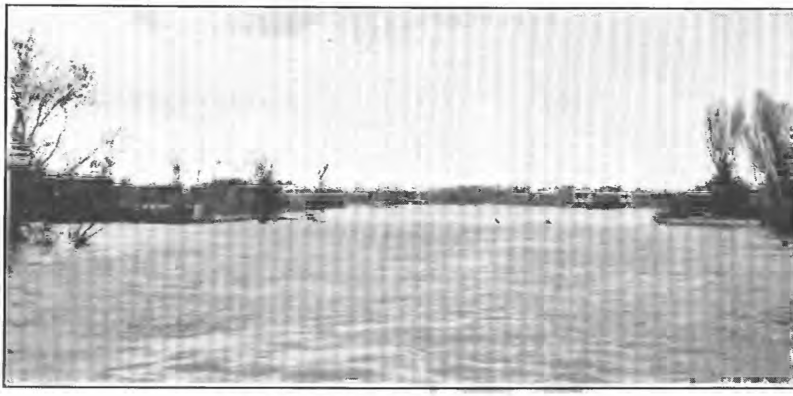
C. LODI-WOODBRIDGE HIGHWAY

VIEWS DURING FLOOD OF MARCH, 1928

Photographs by Harold T. Stearns.



A. WOODBRIDGE GOLF COURSE



B. WOODBRIDGE DAM SUBMERGED

C. WOODBRIDGE GAGING STATION

VIEWS DURING FLOOD OF MARCH, 1928

Photographs by Harold T. Stearns.

DEEP-WELL TURBINE ON WELL 4726E1

Photograph furnished by courtesy of Sterling Pump Co., Stockton.

from 3 to 5 p. m. March 25, with a discharge of about 25,600 second-feet. The flood waters of 1907 spread over a much greater territory, on account of the backwater effects of the Sacramento River, and the maximum recorded discharge at Clements, on March 19, 1907, was 25,500 second-feet. Some idea of the magnitude of the flood of 1928 is given by Plate 18, *A*, in which the gaging station at Clements is shown entirely surrounded by water. The water in the foreground covers the normally dry approach to the gaging station across a cultivated field. The main channel is back of the trees in the view. The flood waters wrecked some of the buildings of the Mokelumne Beach resort and would have carried away more of them if they had not been hurriedly anchored with cables to trees on the bank. A view of the wreckage at 11.40 a. m. March 26 is shown in Plate 18, *B*.

Near Lockeford the water spread out over the orchards and farm lands of the flood plain, doing considerable damage to the crops. A view of a partly submerged shed on La Lomita ranch, near Lockeford, three-quarters of a mile from the normal river bank, is given in Plate 18, *C*. The water shown in this view covers land planted chiefly to garden crops. The flood damaged the bridges across the river at Lockeford and Victor. The depth of the flood waters at Victor can be judged from Plate 19, *A*, which shows fruit trees in bloom a quarter of a mile from the river nearly submerged.

North of Lodi the river overflowed its banks, and water flowed down Cherokee Lane to Lockeford Street in Lodi. This water overflowed the approach to the main Sacramento Valley highway bridge. A view looking north along this highway to the Cherokee Lane Bridge at 9 a. m. March 26 is shown in Plate 19, *B*. For a time it appeared as if the flood waters would enter the business district of Lodi, where they would have done extensive property damage, but breaks in the levees farther downstream increased the capacity of the channel.

The water overflowed the south bank of the Woodbridge Reservoir and flooded about a mile of the Lodi-Woodbridge highway. The occupants of an automobile who drove into the flood waters were rescued by a boat on this highway. (See pl. 19, *C*.) Had it not been for reinforcing the levees near Woodbridge with sand bags much more water would have covered this region. The Woodbridge golf course was entirely under water, and it is reported that the cost of scraping the sand off the links was about $900. (See pl. 20, *A*.) For a time the town of Woodbridge was threatened, but the leak in the adjacent levee was successfully repaired. In Plate 20, *B*, the abutments of the Woodbridge Dam can be seen, but the dam is completely under water. The United States Geological Survey gaging station at Woodbridge was carried out during the flood. A view taken of this station at 10.55 a. m. March 27 is shown in Plate 20, *C*.

Below Woodbridge the levee broke and water flooded many acres of land near Thornton. When this water reached the delta country it accumulated behind a levee and formed a lake, which was eventually drained into one of the adjacent sloughs by means of pipes laid through the levees with valves that opened only during low tide. The water spread over so large an area at Woodbridge that it was impracticable to make measurements at this point. It is estimated from observations at the time that only about 100 second-feet passed the station, as the break in the levee occurred downstream. Much of the flood water that overflowed the banks near the Cherokee Lane Bridge drained back into the river, and most of the water that broke through the levee west of Woodbridge drained into the delta country. Owing to the fact that the lands overflowed were fairly level there were not many depressions except in borrow pits along the roads, where the water remained after the flood subsided. The stream-flow records show that less water passed the Woodbridge station than passed the Clements station during the peak discharge. This difference is to be largely accounted for by the fact that the channel widens out considerably west of Clements; hence considerable water was temporarily stored in the bottom lands between the gaging stations. This water drained out as the river subsided; hence a high stage occurred for a greater number of days at Woodbridge than at Clements. It was impossible to determine the exact seepage loss between Clements and Woodbridge by means of stream-flow records, because the gage at Woodbridge was washed out. However, an estimate of the seepage losses can be made by computing the change in volume of saturated soil in the lands adjacent to the river as determined from well measurements made before and after the flood. This estimate is made on page 188.

RECHARGE FROM INTERMITTENT STREAMS

PERCOLATION LOSSES FROM BEAR CREEK

For convenience the gaging station on Bear Creek near Clements is designated the upper Bear Creek station, and the gaging station near Lockeford the lower Bear Creek station. The drainage area of the creek above the upper station is called the upper drainage area, and that between the upper and lower stations the lower drainage area. The percentage of the rainfall that runs off the ground into the stream channel is called the run-off factor.

The gaging stations on Bear Creek were installed to determine the seepage loss of the surface waters by percolation from the bed of the creek. The stream-flow records show that there was a gain in run-off of 1,120 acre-feet between the upper and lower stations during the year ending September 30, 1927. (See tables on pp. 78–79.) The topography of the upper area is much steeper than that of the lower area, and therefore a larger percentage of the rainfall runs off from the upper area. Thus the run-off factor should be greater for the upper area than for the lower area, if the run-off as measured at each station is assumed to be due only to the rainfall on the drainage area above the stations. Computations based on the rainfall and run-off records of the two areas for the year ending September 30, 1927, show that the annual run-off factor for the upper area is 16.85 per cent, compared with 13.50 per cent for the lower area. If there is a large percolation loss from the stream bed between the upper and lower stations, the run-off measured at the lower one should be less than that measured at the upper one. This would decrease the run-off factor for the lower area and increase the difference between the run-off factors of the two areas. The difference in topography alone, however, is sufficient to account for the difference of 3.35 per cent between the run-off factors.

The bed of Bear Creek from the upper to the lower gaging stations is in the older alluvium, and a field inspection of the channel shows that the creek flows on either hardpan, compact sandstone, or conglomerate, all of which are nearly impermeable; hence appreciable losses by deep percolation do not appear probable. Water has been observed to stand in pools in the stream bed for two or three weeks after the stream has stopped flowing.

The ground-water contours in the vicinity of Bear Creek indicate that the percolation losses from the channel are small. Plate 6 shows, by the downstream bend in the 60-foot water-table contour line, that there may be a small loss from the creek bed in sec. 28, T. 4 N., R. 8 E. Contour lines downstream from the 60-foot line cross the stream channel at practically a right angle. This indicates no gain or loss in the stream bed west of the 60-foot contour. The 70-foot contour line, by its slight upstream bend, indicates that the stream may gain a small amount of water from inflow of ground water. No gain or loss of water from the stream bed is indicated by the ground-water contours upstream from the 70-foot contour line. It is shown on page 185 that the losses from the Mokelumne River are probably very small, amounting to only about 2 per cent. Wells near the banks of the river show a fluctuation of as much as 12 feet, due to the percolation of water from the river bed. (See pl. 9.) It is logical to expect wells near the banks of Bear Creek to show an appreciable fluctuation of the water level during the run-off period, if the seepage from Bear Creek is large. In Figure 33 the fluctuation of the water level in five wells near the banks of Bear Creek and the discharge of the creek at the gaging station near Lockeford are given for comparison. These wells are 25 to 700 feet from the creek banks. The following table gives the amount of the fluctuation in water level and the creek discharge for certain periods, beginning and ending with no flow in Bear Creek:

Comparison of the fluctuation of the water level in wells adjacent to Bear Creek with periods of run-off

	Rise or fall of water level in well (feet)					Discharge of Bear Creek near Lockeford (acre-feet)	Period of discharge (days)	Period discharge was in excess of 5 second-feet (days)
Well No. Distance from creek feet	4823E1 250	4831L1 25	4828J1 200	4829L1 700	386E1 500			
Nov. 15 to Dec. 16, 1926	+0.20	+0.85	−0.35	+0.10	+0.60	1,156	22	8
Dec. 16, 1926, to Jan. 25, 1927	−.20	+.20	+.35	+.25	−.10	1,199	20	19
Jan. 25 to Mar. 20, 1927	+.25	+.25	+.30	+.40		5,974	54	48
Mar. 20 to Apr. 25, 1927		+.25				811	36	7
Jan. 20 to Feb. 20, 1928		+.05	.00	−.05	−.25	1,694	14	7
Mar. 15 to Apr. 15, 1928		+.30	[a]+.50	+1.20	+.50	3,689	23	17
Dec. 13, 1928, to Apr. 12, 1929			−.45	−.80		2,022	111	24

[a] Windmill running during March measurement.

A study of the graphs in Figure 33 shows that there is no appreciable rise of the water table during or after the discharge peaks of Bear Creek. The largest rise, 0.85 foot, occurred in well 4831L1, which is only about 25 feet from the creek bank. During this same period the water level of well 4828J1 fell 0.35 foot. Measurements on four of the wells made in March, 1927, show an average rise of the water table of only 0.30 foot since January, 1927. The creek was flowing continuously during this period, and three discharge peaks of nearly 400 second-feet occurred. The water level in well 4831L1, measured during a peak flow in the creek in February, 1927, rose only 0.10 foot above that of the preceding month. The water level in well 386E1 declined 0.15 foot for the same period. During this period the creek had been flowing continuously and two peak discharges had occurred.

A peak discharge of over 650 second-feet in Bear Creek during February, 1928, did not affect the wells, although in March a slight rise occurred in well 4829L1. It is doubtful whether this was caused by seepage from Bear Creek. A slight rise of the water table that was noted in all the wells between March and April, 1928, may have been caused by small losses from the creek. Well 4829L1 showed a rise of 1.2 feet, which may be explained by the fact that the well was pumped by a windmill just before the March measurement. Three of the wells on which measurements were obtained show a drop of the water table between December 13, 1928, and April 12, 1929, a period during which Bear Creek was flowing continuously.

The topography of the drainage basin of Bear Creek causes a rapid run-off after storms, resulting in run-off peaks of short duration.

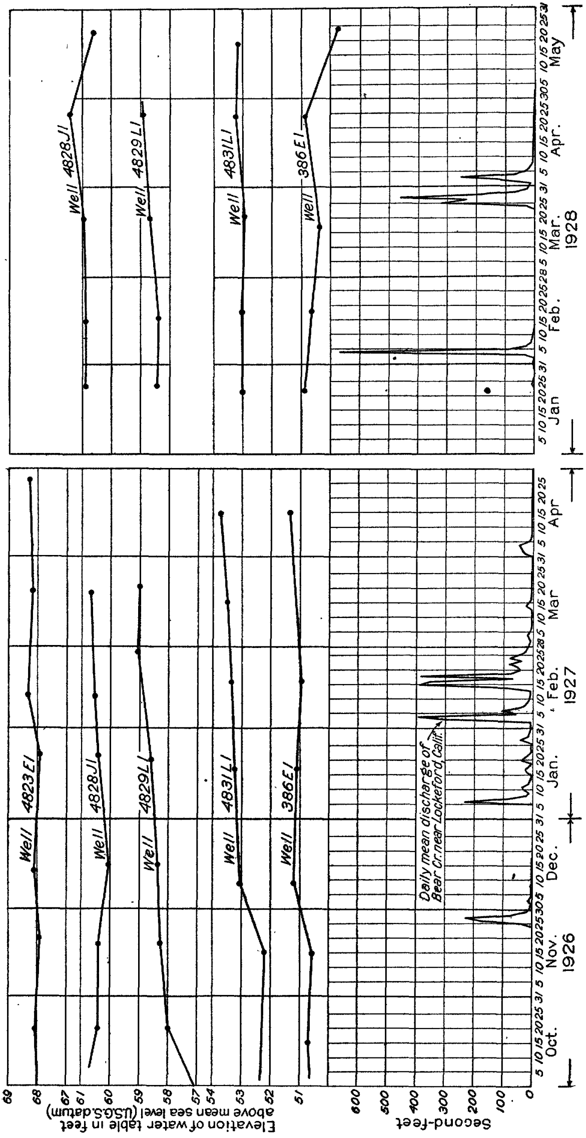


Figure 33.—Comparison of the hydrographs of five wells on the banks of Bear Creek with the discharge of Bear Creek near Lockeford

This condition is not favorable to large seepage losses from the creek bed.

In the preceding pages it is shown that a gain in run-off occurs between gaging stations, that the ground-water contours indicate no seepage losses, and that no appreciable fluctuation of the water level occurs in wells adjacent to the creek bank. Hence percolation losses from the Bear Creek stream bed are small and are believed to be negligible. For this reason the gaging station near Clements was abandoned after the first year's records.

RELATION OF RUN-OFF TO RAINFALL ON THE BEAR CREEK DRAINAGE BASIN

The monthly run-off factors are computed in the following pages for the drainage area of Bear Creek above the lower gaging station and are used to determine the run-off from the drainage area of Dry Creek between the Ione and Galt gaging stations.

The monthly rainfall over the Bear Creek drainage area was considered to be the same as the mean of the monthly rainfall at Valley Springs, Wallace, and Clements. The Valley Springs station is at the head of Bear Creek; the Wallace station is in the middle part of the basin; and the Clements station is representative of the lower part of the basin above the lower gaging station. It is believed that the average of the rainfall recorded at these three stations is very close to the average rainfall over the drainage basin of Bear Creek above the gaging station near Lockeford. The monthly run-off as measured at the gaging station near Lockeford was computed as a percentage of the monthly rainfall, and these data are given below.

Monthly rainfall, run-off, and run-off factors for Bear Creek drainage basin above the gaging station near Lockeford for the years ending September 30, 1927–1929

[Drainage area, 52 square miles]

Month	Rainfall [a]		Run-off		Month	Rainfall [a]		Run-off	
	Inches	Acre-feet	Acre-feet	Percentage of rainfall		Inches	Acre-feet	Acre-feet	Percentage of rainfall
1926–27					1927–28—Con.				
October	1.39	3,860	--------	--------	February	2.16	5,990	1,680	28.1
November	5.64	15,650	1,080	6.90	March	5.21	14,450	2,620	18.1
December	1.34	3,730	76.2	2.04	April	.74	2,050	1,100	53.6
January	2.94	8,160	1,380	16.90	May	.27	750	1.2	.16
February	4.64	12,850	5,450	42.40	The year	16.99	47,120	5,494.1	11.67
March	1.35	3,730	384	10.30					
April	2.08	5,760	774	13.41	1928–29				
May	.22	610	.6	.10	October	.06	165	--------	--------
June	.28	775	--------	--------	November	3.83	10,600	3.6	.03
September	.02	--------	--------	--------	December	1.84	5,100	183	3.59
The year	19.90	55,125	9,144.8	16.59	January	2.39	6,630	1,120	16.9
					February	1.98	5,490	639	11.6
1927–28					March	2.39	6,630	79.3	1.20
October	1.92	5,325	--------	--------	April	1.01	2,800	.4	.01
November	2.76	7,650	--------	--------	May	0	0	0	0
December	2.70	7,495	77.5	1.04	June	1.56	4,320	0	0
January	1.23	3,410	15.4	.45	The year	15.06	41,735	2,025	--------

[a] Mean rainfall from records of Valley Springs, Wallace, and Clements rainfall stations.

In February, 1927, 4.64 inches of rain fell, and the run-off factor was about six times the run-off factor for November, 1926, when 5.64 inches of rain fell. A rainfall of 1.39 inches in October, 1926, gave no run-off, but in December, 1926, 1.34 inches of rainfall gave 2.04 per cent run-off and in March, 1927, 1.35 inches rainfall gave 10.3 per cent run-off. Thus the run-off factor becomes much greater, with equal or less rainfall, as the ground becomes saturated. A large part of the first run-off goes to fill the depressions in the creek channel. Intense and frequent storms increase the percentage of run-off, as in February, 1927. When the rainfall is intense the losses by evaporation, transpiration, and seepage are not as great as when the same amount of rainfall is distributed over a longer time.

RELATION OF RUN-OFF TO RAINFALL ON THE GOOSE CREEK DRAINAGE BASIN

The stream-flow records of the Goose Creek drainage basin for the year ending September 30, 1927, were inadequate to compute run-off data, because of backwater from Dry Creek. The station was therefore moved upstream a few hundred yards. The following table shows that the yearly run-off factor was 23.9 per cent for 1928 and 15.43 per cent for 1929. The monthly run-off factors are applied to a portion of the Dry Creek drainage basin between the gaging stations near Ione and Galt to obtain the run-off from rainfall.

Monthly rainfall, run-off, and run-off factors for Goose Creek for the years ending September 30, 1928 and 1929

[Drainage area, 8.5 square miles]

Month	Rainfall [a]		Run-off		Month	Rainfall [a]		Run-off	
	Inches	Acre-feet	Acre-feet	Percentage of rainfall		Inches	Acre-feet	Acre-feet	Percentage of rainfall
1927–28					1928–29				
October	1.71	775			October	0.06	270		
November	2.55	1,155			November	3.57	1,620	10.1	0.6
December	2.54	1,150	161	14.0	December	1.70	770	122	15.8
January	1.24	560	144	25.7	January	2.24	1,015	522	51.4
February	1.82	825	521	63.1	February	1.40	635	245	38.6
March	4.98	2,260	744	32.9	March	1.54	698	30.7	4.4
April	.91	415	168	40.5	April	.66	299		
May	.29	130			May	.03	135		
					June	1.29	585		
The year	16.04	7,270	1,738	23.9	The year	12.49	6,027	929.8	15.43

[a] Average rainfall from records of Clements, Elliott, and Ione.

PERCOLATION LOSSES FROM DRY CREEK CHANNEL BETWEEN IONE AND GALT GAGING STATIONS

The area of the drainage basin tributary to Dry Creek between the gaging stations near Ione and Galt is 67 square miles. (See pl. 6 for location of gaging stations.) For convenience this drainage area is divided into two parts by the range line common to Rs. 7 and 8 E. This line is roughly the division between the "red lands" and the low plains. The "red lands" are characterized by undulatory surface with low, smooth hills having rounded summits. The poor underground drainage, shallow soil, and absence of vegetation in general are conducive to a high run-off. The low plains have a more gentle slope, more vegetation, and a greater depth of soil, which are not conducive to a high run-off. The part of the drainage area that lies between the dividing line and the gaging station near Ione is called the upper area, and the part of the drainage area that lies between the dividing line and the gaging station near Galt is called the lower area. This division is made to aid in determining more exactly the actual amount of rainfall on and run-off from the drainage area.

The drainage basin of Goose Creek, which is included in the upper area, is characteristic of the entire upper area. Therefore the percentage of the rainfall that runs off the Goose Creek drainage basin is representative of the percentage of rainfall that runs off the upper area and into the Dry Creek channel.

The lower area has different characteristics from the upper area, its topography, vegetation, and soil being similar to those of the Bear Creek drainage basin. The lower area and the Bear Creek drainage basin are also relatively close, one lying on one side of the Mokelumne River and the other on the other side. Therefore the percentage of rainfall that runs off the Bear Creek drainage area is believed to represent the approximate percentage of rainfall that runs off the lower area into the Dry Creek channel.

The depth of rainfall over the upper area is considered to be the average of the rainfall recorded at Clements, Ione, and Elliott. The depth of rainfall over the lower area is considered to be the average of the rainfall recorded at Galt and Elliott. The monthly rainfall in acre-feet was computed for each area on the basis of these records. The amount of water entering the Dry Creek channel as run-off was then calculated by multiplying the monthly rainfall over each area by the corresponding monthly run-off factor of Goose Creek and Bear Creek.

The run-off from the drainage basin above the gaging station near Ione, as recorded at that station, was then added to the amount of water which entered the channel as run-off between the gaging stations near Ione and Galt. This sum represents the amount of water passing the Galt gaging station if there is no seepage into or out of the stream bed between the stations.

The data on rainfall, run-off, and percolation loss for the drainage area and channel of Dry Creek between the gaging station near Ione and that near Galt, from October 1, 1926, to September 30, 1929, are given in the following table:

Monthly rainfall, run-off, and percolation loss of Dry Creek drainage basin between Ione and Galt gaging stations for the years ending September 30, 1927–1929

Month	Upper area (43.3 square miles)				Lower area (23.7 square miles)			
	Rainfall		Run-off		Rainfall		Run-off	
	Inches[a]	Acre-feet	Per cent[b]	Acre-feet	Inches[c]	Acre-feet	Per cent[d]	Acre-feet
1926-27								
October	1.39	3,220			1.37	1,720		
November	5.22	12,100	6.90	835	4.66	5,860	6.90	405
December	1.32	3,060	2.04	62	.80	1,010	2.04	21
January	2.88	6,660	16.90	1,125	2.98	3,750	16.90	635
February	4.66	10,800	42.40	4,580	5.11	6,440	42.40	2,730
March	1.28	2,960	10.30	300	1.54	1,940	10.30	200
April	2.43	5,620	13.41	755	2.24	2,820	13.41	375
May	.34	790	.10	1	.36	450	.10	
June	.47	1,090			.47	590		
The year	19.99	46,300		[e] 7,658	19.53	24,580		4,366
1927–28								
October	1.71	3,960			1.96	2,460		
November	2.55	5,900			2.21	2,780		
December	2.54	5,880	14.0	820	1.86	2,340	1.04	24
January	1.24	2,870	25.7	740	1.16	1,460	.45	7
February	1.82	4,210	63.1	2,660	1.33	1,670	28.1	470
March	4.98	11,510	32.9	3,790	4.18	5,260	18.1	950
April	.91	2,110	40.5	855	.94	1,180	53.1	625
May	.29	670			.38	480	.16	1
June								
The year	16.04	37,110		8,865	14.02	17,630		2,077
1928–29								
October	.06	140			.04	50		
November	3.57	8,250	.6	50	2.74	3,440	.03	
December	1.70	3,930	15.8	620	2.22	2,790	3.59	100
January	2.24	5,180	51.4	2,660	1.42	1,790	16.9	300
February	1.40	3.240	38.6	1,250	1.30	1,640	11.6	190
March	1.54	3,560	4.4	160	1.80	2,260	1.20	30
April	.99	2,290			.66	830	.01	
May								
June	1.44	3,333			1.32	1,661		
The year	12.94	29,923		4,740	11.50	14,461		620

[a] Average of rainfall at Clements, Ione, and Elliott.

[b] From Bear Creek run-off data, 1926–27; from Goose Creek run-off data, 1927–28 and 1928–29.

[c] Average of rainfall at Elliott and Galt.

[d] From Bear Creek run-off data.

[e] Applying estimated yearly run-off factor for Goose Creek to the rainfall over the upper area increases this figure about 8,000 acre-feet, and thus the probable loss is about 15,000 acre-feet.

Monthly rainfall, run-off, and percolation loss of Dry Creek drainage basin between Ione and Galt gaging stations for the years ending September 30, 1927–1929—Continued

Month	Total run-off (acre-feet)				
	Between stations	At Ione station	Above Galt station	At Galt station	Loss
1926–27					
November	1,240	5,300	6,540	[f] 5,867	673
December	83	2,370	2,453	[g] 1,680	773
January	1,760	10,200	11,960	11,000	960
February	7,310	39,800	47,110	44,300	2,810
March	500	11,800	12,300	11,700	600
April	1,130	24,300	25,430	24,000	830
May	1	2,130	2,131	1,840	291
June		220	220	66	154
The year	[e] 12,024	96,120	108,144	101,053	[e] 7,091
1927–28					
November		317	317		317
December	844	2,950	3,794	892	2,902
January	747	3,340	4,087	2,260	1,827
February	3,130	10,200	13,330	11,400	1,930
March	4,740	35,500	40,240	43,500	[f] 3,500
April	1,480	15,400	16,880	20,600	[f] 1,500
May		1,370	1,370	1,440	[f] 100
June		14	14		14
The year	10,941	69,091	80,032	80,092	12,090
1928–29					
November	50	37.5	87.5		87.5
December	720	935	1,655	163	1,492
January	2,960	3,550	6,510	2,590	3,920
February	1,440	7,390	8,830	5,890	2,940
March	190	6,110	6,300	4,750	1,550
April		3,890	3,890	3,500	390
May		194	194	84	110.4
June		137	137		137
The year	5,360	22,243	27,603	16,977	10,627

[e] Applying estimated yearly run-off factor for Goose Creek to the rainfall over the upper area increases this figure about 8,000 acre-feet, and thus the probable loss is abont 15,000 acre-feet.
[f] Estimated.
[g] Estimated Dec. 1–3.

Conditions at the two Dry Creek gaging stations are not favorable for accurate discharge measurements at all gage heights. Above a gage height of about 7 feet (discharge about 700 second-feet) at the station near Ione the water is divided into several channels. Above a gage height of about 7 feet (discharge about 400 second-feet) at the station near Galt there are several channels and the water is spread over a shallow section about 675 feet wide.

The water-stage recorder near Galt was not put into operation until December 3, 1926, and therefore the date the water started to flow through the Dry Creek channel near Galt can not be determined. This has made it necessary to estimate the run-off at the Galt station for November and December 1–3, 1926. During the year ending September 30, 1927, the flow through the Dry Creek channel was more or less uniform, with no long periods of large run-off. The mean daily discharge at Galt exceeded 2,000 second-feet on only four days, none of them consecutive, and exceeded 2,200 second-feet on only one day. Therefore, the flow for this year occurred at stages where gagings were reasonably accurate, and the seepage losses were more easily detected. The annual run-off factor computed for Goose Creek for the year ending September 30, 1927, with the annual run-off factors obtained for Goose Creek and Bear Creek during 1927 and 1928 as the basis of a proportion, is about 34 per cent. Applying 34 per cent as the run-off factor over the upper area gives a probable loss from the Dry Creek channel between gaging stations for the year ending September 30, 1927, of about 15,000 acre-feet.

The rainfall and run-off data of the Dry Creek drainage area for the year ending September 30, 1928, are shown in the table. For this year the Goose Creek run-off factors are applied to the upper area and the Bear Creek run-off factors to the lower area. The results given in the table for November, December, January, and February are believed to be approximately correct. The apparent gains that occurred during March, April, and May are believed to be due to inaccuracies in gagings during high stages and to the drainage of bank storage into the channels as the creek receded into them. Estimated losses for these months are based on a comparison with months of similar run-off for the year ending September 30, 1927, and a comparison of daily losses while the stream was at low flow. There were six consecutive days during March, 1928, when the mean daily discharge was over 1,100 second-feet. Only one discharge measurement was made during this peak flow, and owing to shallow water and cross currents measurements at such discharges are inaccurate. From all available data it is estimated that a loss of about 12,000 acre-feet from the Dry Creek channel occurred during the year ending September 30, 1928.

During the year ending September 30, 1929, the maximum discharge of Dry Creek at the Galt station was 820 second-feet, and the maximum mean daily discharge was 510 second-feet. Thus practically all the flow of Dry Creek during this year occurred at stages where measurements of the discharge gave accurate results. Therefore, the losses from the Dry Creek channel for the year, as shown in the table, represent the most accurate results obtained since the stations were installed. The total seepage loss for the year was about 10,500 acre-feet.

Losses from Dry Creek become larger as the area wetted by the stream increases. Thus in floods, when the creek overflows its banks, seepage losses increase proportionately. Some of the water that percolates into the soil during a flood drains back into the channel after the flood has subsided, thus reducing the net loss. Thus the amounts of percolation for different years having approximately the same amount of rainfall may vary, depending upon the characteristics of the run-off during each year.

The division of the table into months, though convenient for tabulation, does not give a true picture of actual conditions. The differences in channel storage at the beginning and end of each month have not been considered. The water that passes the upper station reaches the lower station in about 24 hours. During flood periods the time is reduced to about 20 hours. The results recorded in the table are approximate only. The factors upon which the computations depend are so numerous and variable that accurate results can not be hoped for. The greatest errors arise in the selection of run-off factors, the estimates of the rainfall over the area, the gathering of rainfall data, and the measurements of the flow of water in the stream. The resulting errors may be either cumulative or compensating, and these conditions should be considered when the computed data are being used. Records extending over a long period will give more nearly the true average than those for only a few years.

That loss occurs by percolation from the Dry Creek channel is shown by the ground-water contour map forming Plate 6. The contour lines indicate that the greatest amount of this loss occurs between the Ione gaging station and Elliott. West of Elliott the contour lines cross Dry Creek almost at a right angle, indicating that the losses are smaller downstream. The contour lines indicate where the loss occurs and not the amount, which is dependent upon the rate of movement of the water through the soil. Thick gravel deposits occur between Elliott and the Ione gaging station, the area of greatest loss, whereas downstream from Elliott the creek channel is almost free from gravel.

The contour lines show clearly that water is percolating from Dry Creek into the pumping area north of the Mokelumne River. However, all the water lost in Dry Creek does not ultimately find its way to the pumping district and help to replenish the ground-water reservoir north of the Mokelumne River. According to the water-table maps at least half of it moves northwestward from Dry Creek, and an appreciable part of it is dissipated by evaporation and transpiration from the shallow-water and tule district west of Galt. (See pls. 6 and 7.)

RECHARGE FROM IRRIGATION WATER

SUPPLIED BY WELLS

Recharge from irrigated lands supplied by water pumped from wells need not be considered, because the water returning to the zone of saturation by percolation below the root zone has been excluded from the calculations on pages 268–271 by which the consumptive use of water on these lands was computed.

SUPPLIED BY RIVER PUMPS

Ground-water recharge results from the water diverted by pumps from the river that percolates below the root zone. As shown on page 110, the average use of water on these lands is 1.6 acre-feet per acre, which is so low that practically all the water is consumed by the crops. In a few of the tracts listed in the table the use was much greater; hence some water doubtless percolated beyond the root zone and formed an addition to the ground-water body beneath. In 1928 4½ acres of alfalfa belonging to Mr. Featherston near Clements was irrigated on November 8 and 9. A total of 9¼ inches of water per acre was applied. After the last irrigation a rain of about 2.75 inches fell, making a total application of about 1 foot of water in four days. The depth of water in the field was 14 feet, and the average rise in 11 wells in the two and one-half days following the irrigation was about 0.1 foot. This slight rise might readily be attributed to the general rise of the water table with the approach of the winter; hence little or no water reached the zone of saturation during the time of the test. According to Crandall,[43] who has made numerous experiments near Jerome, Idaho, 1½ inches of water per foot of depth will be retained by a loess soil when the soil moisture has been reduced nearly to the wilting point. Consequently the 14-foot column of soil underlying the Featherston tract might have retained all the water applied during the four days of the test except that lost by transpiration and evaporation direct from the surface. The test shows conclusively, however, that even on the permeable bottom lands of the Mokelumne rapid percolation of large amounts of irrigation water does not occur.

In studying the data obtained from the pumping tests it was estimated that all water in excess of 1.30 acre-feet applied to gross acreages [44] of vineyard and orchard percolated below the root zone to the water table. Likewise, the consumptive use of water for alfalfa and miscellaneous crops was taken at 3 acre-feet per acre for gross acreages. The consumptive use assumed for these crops does not include rainfall. An appreciable part of the land supplied by river pumps is subirrigated or overflowed by the river, and the consumptive use of the crops exceeds the total amount of water pumped from the river. Recharge from lands where more water is applied than is consumed is offset by water taken directly from ground-water supply underlying lands with a shallow water table; hence contributions to the water table by river pumps can be neglected.

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[43] Crandall, Lynn, unpublished report on the North Side Twin Falls tract, Idaho.

[44] "Gross acreage" refers here to the area of the crop and, in addition, the land occupied by buildings or roads in the irrigated tract.

IN WOODBRIDGE IRRIGATION DISTRICT

The Woodbridge irrigation district is a belt of land about 5 miles wide, extending south from Woodbridge to the Calaveras River near Stockton. The Lodi pumping district lies east of it, and the delta country to the west. Water entering the zone of saturation percolates both eastward and westward into these areas, as shown by the ground-water contours in July. The original Stockton-Mokelumne Canal Co., which was purchased by the Woodbridge Irrigation District in 1928, was a water carrier. It was operated unprofitably for many years, because most of the farmers adjacent to the canals did not buy water, their lands being subirrigated by seepage from the canal system.

Figures showing the percentage loss of irrigation water through seepage from canals and laterals in projects of the United States Bureau of Reclamation have been compiled recently.[45] In canals built through sandy loam similar to that of the Woodbridge Canal system the losses ranged from 32 to 46 per cent, with an average loss of 40 per cent.

The land in this system is chiefly in vineyards, orchards, and alfalfa, and the average consumptive use for gross acreage of this district (including buildings, roads, etc.), exclusive of rainfall, is estimated to be about 2.0 acre-feet per acre, or somewhat greater than the consumptive use of orchards and vineyards. Diversions from the river into the canal begin in April and last until the first of November. In the period April 28 to September 30, 1926, 25,634 acre-feet was diverted from the Mokelumne River into this canal; in the entire irrigation season of 1927, 42,070 acre-feet; and in the entire irrigation season of 1928, 31,944 acre-feet.

Surface water was used to irrigate 4,128 acres in the Woodbridge irrigation district in 1926, 4,610 acres in 1927, and 4,089 acres in 1928. These figures represent gross areas, including roads, canals, etc. According to the irrigation well records (pp. 210–239) there are many stand-by plants that supply well water for lands in this tract when there is a shortage of river water. The records of the amount of water diverted in 1926 are incomplete, but it was probably a third less than during the following season. The shortage in 1926 made the water table appreciably lower within the district, as shown by Plates 6 and 7.

The irrigated lands in this district all lie relatively close to the land irrigated from wells. (See pl. 5.) As the record of water diverted in 1926 is incomplete, 1927 is the first year when recharge from irrigation water can be computed. On a basis of 2.0 acre-feet per acre as the consumptive use there was a ground-water increment and

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[45] Dibler, E. B., Use and waste of irrigation water; Eng. News-Record, vol. 100, p. 114. 1928.

waste of about 32,850 acre-feet in 1927 and about 23,750 acre-feet in 1928.

A gain is recorded during the low-water months in the Mokelumne River between the Woodbridge and Thornton gaging stations on account of waste into the river from the Woodbridge irrigation district and from ground-water contributions from lands adjacent to the river, as shown by the water-table contours on Plates 6 and 7. The gain in this stretch of the river is given in the table below.

Gain in Mokelumne River between Woodbridge and Thornton gaging stations, in acre-feet

Date	Discharge at Woodbridge	Discharge at Thornton	Loss or gain between Woodbridge and Thornton [a]
1926			
July 6–31	178	624	+446
August	177	547	+370
September	236	525	+289
October	285	580	+295
November 1–24	4,173	3,670	−503
1927			
August	482	1,450	+968
September	412	1,050	+638
October 1–26	260	743	+483
1928			
June 23–29	303	895	+592
July	174	1,060	+886
August	152	621	+469
September	184	500	+316
October	416	658	+242
November	5,120	5,050	−70
December	5,380	5,690	+310
Average monthly gain [b]			+393

[a] Losses are probably due to water going into storage in Tracy Lake slough.
[b] Based on complete months only.

According to the above records an average of about 3,000 acre-feet a year is returned to the river between Woodbridge and Thornton. An indeterminable but probably small part of this amount is ground water contributed from the north bank. An average annual return flow of about 2,500 second-feet may occur from the Woodbridge irrigation district. In addition to this water there is waste into sloughs which discharge directly into the delta country and which were not measured. During the irrigation season of 1930 the waste is to be measured, but at present this waste must be estimated. Mr. Frank Davis, chief engineer of the district, estimates that about 10 per cent of the water diverted is wasted into sloughs. If so, the waste into sloughs would have been about 3,300 acre-feet in 1927 and about 2,400 acre-feet in 1928, and the total waste and return flow would have been about 5,800 acre-feet in 1927 and about 4,900 acre-feet in 1928, leaving an estimated ground-water accretion in this district of 27,000 acre-feet in 1927 and 18,900 acre-feet in 1928, or an annual average of about 23,000 acre-feet in the two years. This figure is approximate only but gives the order of magnitude of the additions to ground-water supply in this area from irrigation water diverted from the Mokelumne River.

Ground-water accretions resulting from irrigation in this district are important because they will go a long way toward preventing the invasion of sea water into the Lodi pumping area if the water table should fall below sea level. On Plate 6 the contours show that the water table in general slopes toward the west, and hence that virtually all the ground water beneath the tract is moving toward the delta country. In the future, if the water table continued to decline in the Lodi pumping area, a stage will be reached where seepage water from this tract will flow toward the pumping area and will materially help to decrease the rate of decline. This condition is discussed in detail in connection with the future development of the ground-water supply on pages 271–274. At present it is necessary to calculate the benefit under existing circumstances.

As shown above, about 23,000 acre-feet is annually contributed to the water table in the Woodbridge irrigation district by percolation from the canals and from the irrigated land. An appreciable amount of this seepage is utilized by crops which are subirrigated in this district and which are not irrigated by surface water or by water from wells. Their acreage was not determined, nor was the amount of ground water discharged into the delta country from this district measured. These unknown factors make a complete inventory of the ground water in this district impossible. All the lands irrigated by wells in this district evidently derive their supply from the seepage losses from the land irrigated by surface water, and hence these lands have been segregated in the table below. It was necessary to draw a somewhat arbitrary boundary to separate the wells supplied by seepage water from the irrigation district from those that are not. This boundary was taken parallel to the Woodbridge Canal and, as a rule, about half a mile east of it.

Area, in acres, irrigated by well water supplied by recharge from the Woodbridge irrigation district

Section	Trees	Vines	Alfalfa	Miscellaneous	Total
T. 3 N., R. 5 E.:					
Sec. 1	11	133	79	----------	223
Sec. 12	----------	----------	----------	13	13
Sec. 13	----------	200¾	44	28	272¾
Sec. 24	1	----------	30	----------	31
T. 3 N., R. 6 E.:					
Sec. 3, W. ½	52½	102½	----------	31	186
Sec. 4	31	215	----------	2	248
Sec. 5	----------	160½	11½	----------	172
Sec. 6	----------	166	13¼	1	180¼
Sec. 7	28	167	30½	100½	326
Sec. 8	10	335	44¼	5	394¼
Sec. 9	15	274½	4	11½	305
Sec. 10	8	172	57½	53½	291

Area, in acres, irrigated by well water supplied by recharge from the Woodbridge irrigation district—Continued

Section	Trees	Vines	Alfalfa	Miscellaneous	Total
T. 3 N., R. 6 E.—Continued					
Sec. 15	½	131	39	175	345½
Sec. 16	10	119	15	160	304
Sec. 17		212½	144½	90	447
Sec. 18	15	154½	58½	269	497
Sec. 19		16		24	40
Sec. 20		26	90	256	372
Sec. 21		107	80	143	330
Sec. 22	9	91	23	113	236
Sec. 23	34	220			254
Sec. 26	36	140	7½	60½	244
Sec. 27	27	229	22	164	442
Sec. 28	11	15	53	111	190
Sec. 29		6	78½	17	101½
Sec. 30					
Sec. 31			1		1
Sec. 32			60		60
Sec. 33			10		10
Sec. 34					
Sec. 35	4½	151			155½
T. 4 N., R. 5 E.:					
Sec. 3	9		69		78
Sec. 4			4	2½	6½
Sec. 5	7		12		19
Sec. 6				1	1
Sec. 10			149		149
Sec. 12	1	14	43	1	59
Sec. 13		43	12	7	62
Sec. 14			40		50
Sec. 15			35		35
Sec. 23		60	2	18	80
Sec. 24		66	19	2	87
Sec. 25		140			140
Sec. 26		57	18		75
Sec. 35		25		6	31
Sec. 36		10			10
T. 4 N., R. 6 E.:					
Sec. 7		10		47	57
Sec. 8					
Sec. 16, N. ½	45	10			55
Sec. 17		208	45	11	264
Sec. 18		167	40	31	238
Sec. 19	42½	201½	24	84	322
Sec. 20	66	178	1	41	286
Sec. 21		25	27	7	59
Sec. 28					
Sec. 29		65	10		75
Sec. 30	6	114	6¾	13½	40¼
Sec. 31		56	7½	5	68½
Sec. 32					
Sec. 33	17	71	8¾	11½	108¼
Sec. 34	20	127½	3	59	209½
	487	5,192	1,582	2,175	9,437

According to the above table, this district contains 9,437 acres of land, of which 5,679 acres is in vineyard and orchard and 3,757 acres in alfalfa and miscellaneous crops. As some of the vineyards and orchards are not mature and hence require less water, and as not all of them are watered each year, it is estimated that about 15 per cent of the total is not actually irrigated. Thus the 5,679 acres recorded is reduced to about 4,850 acres, for which the consumptive use on the basis of 1.3 acre-feet per acre (see pp. 268–270) is about 6,300 acre-feet a year. Likewise some of the land recorded as being used for garden crops is not planted each year. Hence it is estimated that of the 3,757 acres recorded as being in alfalfa or miscellaneous crops, only about 3,400 acres is actually irrigated. Thus, the annual consumptive use of the alfalfa and miscellaneous crops at 3 acre-feet per acre is about 10,200 acre-feet. According to these computations, the total water consumed each year by all crops supplied by well water in the Woodbridge irrigation district is about 16,500 acre-feet. It has already been estimated that the annual recharge from the surface water used in this district is about 23,000 acre-feet, which is more than adequate to supply the water pumped from wells in the area. The surplus is consumed by the subirrigated vegetation or finds its way underground into the delta country. The decline of the water table in this district in 1928–29 indicates that ground-water additions were not adequate to replace ground-water consumption, and it is not unlikely that some of the decline was caused by water moving toward the heavily pumped district to the east. (See pl. 8.)

GROUND-WATER DISCHARGE

EFFECT OF RECLAMATION IN THE DELTA COUNTRY

Ground water from the Mokelumne area is being discharged at all times into the delta country, where part of it is evaporated or transpired or runs off as surface water. Some of the ground water percolating into this area is removed by drainage pumps and large amounts are pumped to the surface and consumed by crops or used as domestic or stock water. The various types of discharge are discussed in detail in the following pages.

Reclamation of the delta country west of Lodi was begun about 1888. At that time the land west of the sea-level contour line as shown on Plate 6 was flooded with water each spring by overflow from the San Joaquin, Sacramento, Calaveras, Mokelumne, and Cosumnes Rivers. Growing in the shallow water of this area were thick stands of tules. Tules also flourished for a mile or more east of the wetted area, deriving their moisture from shallow ground water. In the eighties there was no appreciable draft on the ground water in the land between these tules and the Sierra Nevada. Doubtless most of it was dissipated by evaporation and transpiration in the swamp lands of the delta country, but some of it may have drained into the lower stretches of the Mokelumne River and found its way into the ocean, as it does at present.

The tule land was the principal discharge area for the ground water of the Mokelumne area. However, even if the transpiration and evaporation losses from this discharge area had been determined at the time, they would not have shown the annual recharge of ground water in the Mokelumne area, because flood waters from the near-by rivers complicated the situation. For this reason the original area of tule land was not surveyed, and no attempt was made to determine the amount of natural ground-water discharge prior to settlement.

It has been stated that drainage of the delta country has lowered the water table in the Lodi area. The drainage pumps of the delta country keep the water table at all times from 5 to 15 feet below sea level. (See pl. 7.) With permeable soil extending toward the east this permanent lowering of the water table would have changed the base-level of hydraulic discharge of ground water, which in turn would have caused an adjustment of the hydraulic gradient of the water table tributary to this area. If such an adjustment took place it was entirely overcome by additional ground-water contributions from irrigation in the Woodbridge irrigation district prior to ground-water development in the Lodi pumping district. At the present time the sea-level contour of the water table coincides closely with the sea-level contour of the land, indicating that drainage does not affect the position or gradient of the water table farther east. Consequently, the decline of the water table in the Mokelumne area east of the delta country can not be due to drainage in the delta country. This conclusion is supported by the facts that in the vicinity of Lodi in 1907 the water table stood only 7 feet below the surface after drainage had been carried on in the delta country for 19 years, and that in the 12 years subsequent to 1907 the water table fell 15 feet, although the ground-water conditions in the delta country remained virtually the same.

IRRIGATION-WELL RECORDS

The census made in 1926, 1927, and 1928 of irrigation pumping plants and areas irrigated by them is given in the table on pages 210–239. The census covered all the land in Tps. 3, 4, and 5 N., Rs. 5, 6, 7, 8, and 9 E. Mount Diablo meridian. It covered 15 townships and was made by a house-to-house canvass. In three of the townships there is no land irrigated from wells. All pumping plants are listed in the table, whether in use or not, but irrigation wells from which the pumps had been removed were not included. The data on areas of irrigated land are based on the owners' statements and are gross figures, because practically all the reports included roads, home sites, etc., that are not irrigated. Wherever possible, the irrigated area reported was checked by automobile odometer. As the census extended over a 3-year period there were doubtless some changes in the status of the pumping plants and kinds of crops during this time. A summary of the pumping-plant data and the area irrigated in each township appears in the following table. The "miscellaneous crops" are chiefly garden vegetables. The acreage planted to alfalfa and vegetables changes considerably from year to year, but the total is probably nearly constant.

Summary of pumping plants on wells in the Mokelumne area used for irrigation

Location		Plants											Depth (feet)			Area irrigated (acres)				
				Number of wells drilled																
T. N.	R. E.	Total number	In operation, 1926–1928	Total number with date recorded	Before 1910	1911–1915	1916–1920	1921–1925	1926	1927	1928	Total number with depth recorded	Total	Average	Horsepower	Trees	Vines	Alfalfa	Miscellaneous	Total
3	5	19	19	7	----	1	1	3	2	--	--	11	921	84	270	12	334	153	41	540
3	6	527	511	287	56	44	86	72	6	20	3	334	21,722	65	5,090	778	6,067	1,028	2,200	10,073
3	7	529	514	272	32	65	79	72	9	11	4	325	50,731	156	5,971	1,471	9,422	634	691	12,203
3	8	12	11	5	----	1	2	1	--	1	--	6	1,812	302	138	------	398	17	10	425
4	5	35	34	21	1	1	6	10	3	--	--	22	2,041	93	454	17	415	413	37	882
4	6	307	285	241	33	49	65	68	20	5	1	104	18,626	179	3,416	1,161	5,417	360	622	7,560
4	7	353	345	246	33	46	65	80	13	9	--	263	54,728	208	4,581	3,276	6,365	513	397	10,551
4	8	28	24	20	1	----	4	10	4	1	--	23	9,291	404	644	329	311	367	110	1,117
4	9	3	2	2	----	1	----	1	--	--	--	2	873	291	40	------	------	------	7	7
5	5	4	3	1	----	----	----	----	1	--	--	1	678	678	105	126	------	14	28	168
5	6	146	130	73	8	28	20	14	2	1	--	79	7,948	101	1,277	293	469	890	146	1,798
5	7	38	32	17	----	3	3	7	1	2	1	23	3,912	170	369	26	241	93	101	461
		2,001	1,910	1,192	164	239	331	338	61	50	9	1,193	173,283	145	22,355	7,489	29,439	4,482	4,390	45,800

The agricultural development of the Mokelumne area is shown by a comparison of previous censuses of irrigated land with the one made during this investigation. In 1909 [46] the land irrigated from wells in the Stockton-Mokelumne area amounted to 8,642 acres. It is estimated that about half of this land lay within the Mokelumne area. In 1912 [46] another census showed 11,120 acres irrigated from wells in the Stockton-Mokelumne area. An inspection of the map accompanying the report shows that about half of this land lay in the Mokelumne area. Thus the increase in this area was from about 4,300 acres in 1909 to about 5,500 acres in 1912. An additional 2,200 acres was irrigated from the Woodbridge Canal in 1912. In 1920 the United States Department of Agriculture, in cooperation with the State of California, made another census. Copies of the original field sheets were measured with a planimeter, and it was found that about 44,260 acres was irrigated in 1920 in the Mokelumne area exclusive of the delta country. The census made during the present investigation shows that a total of about 52,400 acres was being irrigated from wells and by water diverted from the Mokelumne River. Thus the increase in irrigated land from 1920 to 1927 amounted to about 8,140 acres. The average increase since 1920 in area irrigated by ground water is estimated to be about 1,000 acres a year. The corresponding increase from 1912 to 1920 was about 4,800 acres a year; from 1909 to 1912, about 400 acres a year. Thus the peak of development of land irrigated by ground water has passed.

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[46] California Conservation Comm. Rept., p 221, 1912.

According to the census made in this investigation, there is 22,355 horsepower in use. Because some of the pump houses were locked it was impossible to determine the horsepower of all the motors; hence the total amount of horsepower is actually somewhat greater. On the basis of the records about 0.5 horsepower is used to irrigate each acre of land. Some of the pumps are operated with tractors. There are 2,001 irrigation plants, of which 1,910 were in use at the time of the census.

Wherever possible the depth of the well was obtained. The depth of 1,193 wells, or about half of the total number in use, was recorded. The average depth of these wells is 145 feet. The average depth for each township is given in the preceding table and is a good index to the depth at which an irrigation supply of water can be obtained.

The dates the wells were drilled were also recorded whenever the owners knew it. Of the 2,001 wells the dates of 1,192 were reported. The statistics given in the table seem to show an increase in drilling to 1925 and a decrease from 1926 to 1928, but most of the irrigated land was recorded prior to 1928; hence the figures for 1927 and 1928 are not significant. It is natural that fewer wells drilled prior to 1916 would be reported, because many of the properties have probably changed hands since that time, and the record of the dates when the wells were drilled has been lost. More information is available regarding the wells drilled in recent years. However, these figures show a pronounced and progressive increase in the number of new wells in each five-year period to 1925. A few old wells have been abandoned and new ones drilled near by to replace them, but these changes would not account for any appreciable part of the large number of new wells in the last decade.

In the well numbers used in the following table and elsewhere the first figure indicates the township, the second figure the range, the next one or two figures the section, the letter the 40-acre tract in the section as shown on the accompanying diagram, and the last figure the number of the well in that 40-acre tract. For example, well 4825G3 is well 3 in the SW. ¼ NE. ¼ sec. 25, T. 4 N., R. 8 E.

A	B	C	D
E	F	G	H
J	K	L	M
N	P	Q	R

Pumping plants on wells in the Mokelumne area used for irrigation

[Data collected in 1926, 1927, and 1928, by H. T. Stearns, T. W. Robinson, G. H. Taylor, T. F. Baun, and F. B. Blanchard]

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump [a]		Kind and amount of power [b]		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
351B2	W. G. DeVries		10	175	5	T	E	7½	1			
351B3	J. M. Posey		8	79	4	H	E	7½	[c]10	33		
351D1	Fred Villinger (Used together.)	1924	14	41	7	H	E	20		100		
351G1			14	80	7	H	G	20				
351H1			14	40	7	H	G	20				
351Q3	Betty E. Sargent (Used together.)	1926	12	94	6	H	G	20			[d]79	
3513D1		1926	14	92	6	H	G	20				[d]13
3513J1	G. Bayford				4	H	G	20		11		5
3513K1	O. S. Newman	1915	12	90	6	H	G	15		65		
3513K3	F. Perano	1923	12	80	5	H	G	15		17		
3513K4	Emerson Herrick		12		6	H	G	10		17¾		
3513N1	O. A. Shroyer				5	H	G	20		15		
3513N2	M. A. Treadway (Used with 3524A2.)				6	H	G	15		33	14	
3513P1	Fred Lohse (Used together.)		8		6	H	G	12		42		23
3513Q1			8		6	H	G	12				
3513Q2	O. S. Newman	1923	12	60	7	H	G	20			30	
3524A1	do	1917	12	90	6	H	G	15			30	
3524A2	M. A. Tredway (Used with 3513N2.)		12		6	H						
3524B1	O. S. Newman		8		2	H	G	1½	1			
361A2	J. A. Porterfield	1900	8		2	H	E	2	½	1¼		1¼
361A3	Emil Kirchhof	1905	8	45	3	H	E	5	1	5		½
361A4	M. J. Froehnert	1914	10	42	3½	H	E	5	3½	7		
361E2	John Ehlers	1919	6	65	3	H	G	6	2		2	1
361E3	D. Beronio	1896	7	30	2	H	E	3		1		4½
361E4	Joe Focacci	1912		30	3	H	E	5		3		4½
361H1	Frank Cordway	1923	10	35	3	H	E	7½		20		
362A1	L. T. Mason (Used with 362B1.)	1920	8	40	4	H	E	10		[e]40		
362A2	E. Montgomery	1920	10	10	2	H	E	5			[f]7	
362A3	L. Aldridge	1919	8	75	3	H	G	6	[c]3	3		
362A4	H. F. Putney	1921	10	182	4	H	E	7½		8½		
362B1	L. T. Mason (Used with 362A1.)	1921	8	40	4	H	G	10				
362B2	M. F. Ayers		10		4	H	E	10	15			
362C1	—— Roper (Used with 362D2.)	1914	6		2½	H	G	3		20		
362C2	L. Corda		6		3	H	E	5	½	2½	½	½
362C3	A. Graffigna	1908	6	73	2½	H	G	4	½	3½	1½	½
362C4	J. R. Harrison	1916	6		3	H	E	5	3	2		
362C5	J. Celle	1890	5	45	2	H	E	5		12		
362C6	Fred Kolb	1913	6	45	2	H	E	3	2½	3½		
362D1	G. Doering	1922	8		4	H	G	9		10		
362D2	A. Graffigna (Used with 362C1.)	1921	8	42	4	H	G	10				
362D3	F. Koenig	1900	6	45	3	H	E	5		[e]5		
362E1	John Ginocchio	1923	12	96	4	H	G	8	2	1		
362E2	J. Schmeidt	1922	6	45	3	H	E	5		3		
362E3	Sherwood-Bechman		8		3	H	E	5	2	4		
362E4	J. Ficken	1919	6	40	2	H	G	3	3			
362E5	E. A. Darling	1920	8	47	3	H	E	5	6			
362E6	Mrs. Geo. Robinson	1923	6		2	H	G	4		1		
362E7	Mrs. V. Gordon and J. Buckborough.	1918	8	80	3	H	E	5	½		2½	2
362E8	W. A. Morehead	1921	8	50	3	H	E	5	1		[f]1	
362E9	P. Schmeidt	1918	8		3	H	E	5		4		
362E10	Henry Reichel	1919	8	40	1½	H	E	3	1½			
362E11	J. J. Clark	1920	8	51	3	H	G	6	[g]½			1
362E12	—— Steel	1919	8	52	3	H	E	5	[g]3¼	½	¼	
362F1	Halloway				3	H	G	6	[c]5			
362F2	L. Villinger	1918	6		2	H	E	3	1			1

[a] All pumps listed are centrifugal pumps unless otherwise indicated. V, vertical; H, horizontal; T, deep-well turbine.

[b] E, electric; G, gasoline; D, distillate.

[c] Interset with vines.

[d] Used to supplement canal.

[e] Interset with trees.

[f] Planted in orchard.

[g] Cover crop planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed.	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
362F3	Andrew Raggi	1920	6	40	3	H	G	6	2½	2½	-----	-----
362F4	Peter Grattone	1917	8	92	3	H	E	5	-----	6½	[f] 1	½
362F5	G. Garabaldi	1922	8	90	2½	H	E	5	2	1	-----	-----
362F6	A. D. Villinger	1920	5	39	3	H	G	6	1	-----	-----	2
362F7	—— Ulitt	1917	8	-----	3	H	E	5	2	1	-----	-----
362F8	J. Raggi	-----	6	-----	4	H	G	8	-----	5	-----	-----
362F9	Antonio Avegio	1914	8	52	2½	H	E	5	[g] 2	3	-----	-----
362F10	—— Ayers	1925	8	80	2½	H	E	5	-----	5	-----	-----
362F11	L. Fugazi	1912	8	-----	3	H	G	5	2½	7½	-----	-----
362G1	do	1890	8	-----	3	H	E	5	½	19	-----	5
362G2	F. J. Mettler	1913	5	-----	2	H	E	3	-----	16	2	-----
363G3	C. Dollinger	1910	8	30	3	H	E	5	½	9	½	-----
362G4	E. L. Gholz	1907	8	70	3	H	E	7½	-----	8	[f] 1¾	¼
362G5	C. Perano	1910	8	-----	4	H	E	10	5	1	-----	7½
362H1	Elbert Wassink	-----	6	-----	1	H	E	2	-----	⅔	-----	⅓
362H2	C. Deneri	-----	8	-----	2	H	E	3	¼	½	-----	¼
362H3	H. W. Hoven	-----	8	-----	3	H	E	5	-----	7½	-----	½
362H4	Angelo Costa estate	1885	10	75	5	H	E	15	5	5	-----	1
362H5	Maria Focacci	1920	6	52	2	H	G	3	1	2	-----	1
362H6	A. J. Abshire	1922	8	74	3	H	E	5	2	2	-----	1
362H7	W. D. Williams	-----	8	-----	3	H	E	5	-----	-----	-----	2½
362H8	Andrew Kutlik	1918	6	38	3	H	E	5	-----	2½	-----	½
362H9	A. Menzel	1910	6	38	3	H	E	5	-----	-----	-----	3
362J1	L. Chapdelain (Used with 362K5.)	1913	12	105	7	H	E	20	-----	127	-----	-----
362K1	J. W. Wagers	1918	8	-----	3	H	E	5	[g] 3¼	[e] 5	[f] ½	-----
362K3	C. M. Long	1927	8	40	1½	H	E	3	-----	-----	[f] 1¼	-----
362K4	G. C. Irey	1918	8	40	3	H	G	8	6	6	-----	1
362K5	F. N. Vail (Used with 362J1.)	1923	12	120	5	H	E	15	-----	-----	-----	-----
362L1	M. Silva	1918	10	32	3	H	E	5	-----	5	-----	-----
362L2	P. L. Fry	-----	6	-----	2	H	E	3	-----	-----	-----	2
362L3	F. M. Troutner	-----	6	-----	2	H	E	5	1½	-----	½	½
362L4	C. G. Spiekerman	-----	6	-----	2	H	G	5	1½	1½	-----	-----
362M1	Ed Hutchins	1923	12	55	4	H	E	7½	-----	-----	-----	-----
362P1	W. H. Brown	-----	6	-----	2	H	E	5	-----	-----	-----	2
362P4	Hattie Bewley	-----	8	-----	3	H	E	5	-----	4	-----	-----
362Q1	Ed Hutchins	-----	10	-----	3	H	E	5	-----	-----	-----	20
363A1	B. A. Towne	-----	12	85	5	H	-----		-----	-----	-----	-----
363D1	R. L. Gerard	1920	10	150	5	H	D	15	20	-----	-----	-----
363F1	Lillian Schleef	1925	13	180	6	H	E	20	52½	37½	-----	-----
363G1	J. S. Gerard	-----	6	40	4	H	G		28	38	4	-----
363H1	do	1915	7	35	5	H	E	15				
363K1	Lodi Farm Co. (Used with 363N4.)	-----	10	-----	6	H	E	15	-----	65	-----	-----
363L1	F. B. Mills	1888	-----	-----	3	H	E	5	-----	-----	-----	2
363L2	do	1919	10	40	5	H	E	15	-----	68	-----	-----
363M1	Charles Weber	1908	10	48	5	H	G		-----	12½	-----	-----
363M2	J. O. Lockwood	1908	10	40	4	H	G	7½	-----	12½	-----	-----
363M3	Mrs. S. M. Knight	1910	6	50	4	H	E	7½	2½	2½	-----	-----
363N1	T. Noishiyama	1919	6	40	3	H	G	6	-----	-----	-----	5
363N3	D. Kihtara	1923	12	45	6	H	G	8	-----	-----	-----	6
363N4	Lodi Farm Co. (Used with 363K1.)	-----	10	-----	6	H	G	20	-----	-----	-----	-----
363P1	Lodi Farm Co.	1903	6	90	2	H	E	5	-----	-----	-----	10
363P2	do	-----	6	-----	4	H	E	10	-----	-----	-----	10
363R1	Mrs. F. B. Blazer	1927	10	50	4	H	E	10	-----	25	-----	-----
364B1	L. and G. L. Chapdelain (Used with 364F1.)	1921	12	105	6	H	E	20	27	153	-----	-----
364C1	Lorenze et al.	1923	10	45	4	H	E	10	-----	40	-----	-----
364F1	L. and G. L. Chapdelain (Used with 364B1.)	1923	12	105	6	H	G	20	-----	-----	-----	-----
364H2	F. E. Lowe	1926	10	75	5	H	G		4	7	-----	-----
364K1	E. C. Payne	-----	14	-----	6	H	-----		-----	-----	-----	-----
364P2	Mrs. M. V. Hall	-----	6	-----	3½	H	G	5	-----	15	-----	-----
364Q2	John Perrot	-----	6	-----	3	H	G	3	-----	-----	-----	2
365A1	Joe Maley	1910	8	50	3	H	E	5	-----	20	-----	-----
365D1	E. H. Stahl	1917	10	-----	6	H	G	12	-----	-----	-----	-----
365E1	F. M. Spenker	1921	14	72	5	H	E	10	-----	50	4	-----
365E2	do	1908	12	40	5	H	E	10				
365F1	A. Degener	1925	10	120	4	H	G	8	-----	17½	3½	-----
365F2	Mrs. E. Blohm	1923	10	85	4	H	G	10				

[e] Interset with trees.
[f] Planted in orchard.
[g] Cover crop planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
365H1	A. T. Lange	1916	12	------	6	H	E	15	------	38	2	------
365L1	Boyce Sisters	1919	10	85	6	H	G	15	------	------	------	------
365M1	do	1919	10	55	4	H	E	10	------	------	------	------
365N1	R. A. Northrop	------	6	95	4	H	G		------	20	------	------
365P1	C. E. Fare	1921	12	105	10	H	G	48	------	10	------	------
365P2	do	1919	6	108	3	H	E	5	------	5	2	------
366C1	C. A. James	1924	12	120	6	H	E	15	------	15	5	------
366D1	Mrs. S. T. Lloyd (Used with 366H1.)	1922	10	80	4	H	G		------	40	------	------
366H1	Mrs. S. B. and Geo. Lloyd (Used with 366D1.)	1915	10	85	4	H	E	7½	------	------	------	------
366M1	A Degener	1913	10	------	4	H	E	7½	------	5	5¼	------
366M2	W. Bishofberger	1904	8	60	3	H	E	5	------	25		
366M3	do	1921	6	80	3	H	G	6			------	------
366Q1	M. F. Ham[h]	1912	5	------	3	H	E	5	------	20	------	------
366R3	E. Martin	1910	10	21	4	H	E	7½	------	21	3	1
366R6	Ed Kurtz	1925	10	35	5	H	E	10	------	40	------	------
367A4	F. H. Aberle	------	8	------	5	H	G	20	------	6	------	1
367B1	J. Knothe	1918	8	82	4	H	E	7½	------	------	1	------
367B3	Paul Herman	1903	------	50	1½	H	E	3	------	3	------	------
367C1	R. S. Lowe	------	12	95	5	H	E	15	3	2	4	6
367C3	J. Aberle	------	10	110	6	H	E	15	------	18	2	3
367C4	I. Cross	------	10	------	5	H	E	10	6	12	------	5
367D2	J. Rode	------	12	------	6	H	E	10	------	20	------	------
367D3	Ralph Mills	1910	10	------	10	H	G	15	------	20	------	------
367E1	Fred Ziemann	1922	8	95	3½	H	G	8	------	15	------	------
367F1	R. O. Bell	1923	10	42	6	H	G		11	------	2½	47½
367F2	Emil Martin	1922	10	34	3	H	G	7½	------	------	------	2
367H1	E. E. Hatch	1915	6	------	3	H	E	5	------	30	10	------
367M1	J. H. Eccles	1917	8	84	5	H	E	10	------	------	------	------
367P1	S. Lima	1918	10	------	5	H	G	12	------	41	5	2
367P2	do	1918	10	------	5	H	G	12				
367Q1	Carl Allen	------	12	22	3	H	E	55	8	------	------	------
367Q3	M. B. Tribble	1923	14	26	5	H	G	6	------	------	6	14
367R2	E. C. Tribble	1923	12	26	6	H	G	15				
367R3	do	1912	12	140	6	H	G	15	------	------	------	20
368B5	J. L. Hemphill	1917	6	38	3	H	G	25	------	------	------	------
368C1	L. F. Hosmer	------	10	------	6	H	G	8	------	[e] 25	------	------
368D3	H. Nighswonger	------	6	------	4	H	E	10	------	10	3	------
368D4	R. J. Ford	----	6	------	2	H	E	5	------	6	4	------
368D5	(Used together.)	----	8	------	4	H	G	8	------	------	------	------
368G1	H. J. Couper[i]	1908	6	35	4	H	G	8	------	50	------	------
368H1	Andrew Jensen	------	10	------	4	H	G	7	------	8	------	2
368H4	Ralph Shadle	------	8	------	4	H	G	7	------	8	2	------
368K1	S. Gallo	1927	10	100	6			15	------	40	------	------
368L1	H. W. Sharp & Son	1917	10	40	3	H	E	5	------	20	------	------
368L2	J. W. Wisthoff	------	10	------	5	H	E	10	------	20	------	------
368M1	F. A. Rich	------	------	------	5	H	E	12	------	38	------	2
368N1	T. B. Sabine	------	10	60	6	H	E	15	------	12	25	1
368P2	G. W. Vallem	------	8	30	4	H	E	5	------	28	------	------
368P3	Vallem Bros	1924	10	100	5	H	E	10				
368P4	J. E. Bryant	------	8	------	6	H	G	12	------	------	10¼	------
368Q1	H. W. Sharp & Son	1907	4	60	2	H	E	3	------	3	------	------
368Q3	do	1920	10	40	4	H	E	7½	------	17	------	------
368R1	O. Wirtz	------	10	40	4	H	G	8	------	10	------	------
368R2	H. W. Sharp & Son	1915	10	80	5	H	E	10	10	40	------	------
369B2	J. L. Moore	1911	10	33	4	H	G	8	5	15	------	------
369E3	H. J. Couper	1925	6	127	4	H	G	8	------	------	------	10
369E5	C. V. Darrah	------	12	------	5	H	G	20	------	10	------	------
369F1	do	------	8	44	6	H	G		------	------	------	------
369F3	John Weber	------	12	------	3	H	G	6	------	10	------	------
369F5	M. McCann	1926	8	65	4	H	G	6	------	10	------	------
369K1	E. R. Mitchell	1922	6	60	4	H	G	20	------	5	2	------
369K2	W. S. Gambs	------	------	------	4	H	G	7	------	8	------	------
369L1	Earl Fruit Co	------	12	100	6	H	E	20	------	99	------	------
369M1	G. J. Lewis	1915	8	------	5	H	G	10	------	30	------	------
369N1	E. M. Moore	------	10	40	4	H	E	7½	------	40	------	------
369P2	E. A. Mitchell	1900	8	110	5	H	G	12	10	30	------	------
369P4	Henry Warnke	------	10	60	4	H	E	10	------	7½	2	1½
369R1	Emile Klapstein	------	8	------	3	H	E	5	------	10	------	------
3610B1	Mrs. M. J. Fore	------	12	75	6	H	E	15	------	17	------	------
3610F1	do	1924	6	50	4	H	G		------	------	20	20
3610G1	I. E. Hart	1917	10	52	3	H	G	6	3	------	3	4

[e] Interset with trees.

[h] With aid of ditch.

[i] With aid of canal.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
3610H1	Frank Williams	1918	8	35	2 H	G 3				4
3610J1	H. Klostermann		6	55	3 H	E 5		10		
3610J2	—— Deleport		10	80	5 H	E 10		20		
3610J3	Herman Volbright	1905	6	50	5 H	E 7½		20		
3610K1	F, Westmoreland		6	20	4 H	E 10			11	
3610K3	Jacob Hepper				2 H	E 5			2	2
3610K4	J. M. Hurd		6	25	3 H	E 5			5	
3610K5	S. Reiswig	1917			3 H	E 5		9		1
3610L1	Mrs. L. C. McMurtry	1919	10	80	4 H	E 10	5	25		
3610N1	L. M. Johnson		6	35	2 H	E 3		2½	2½	
3610N2	Frank Irey		6		3 H	E 5		5		
3610N3	Myrtle Garoleman	1911	6	35	1½ H	E 3		3½		1½
3610N4	Harry Siegalkoff	1912	8	22	2 H	G 3			4	1
3610N5	Earl Bunds	1918	8	35	4 H	E 5		20		
3610P1	Ray Van Buskirk	1924	10		4 H	E 10		40		
3610P2	do		10	80	4 H	E 5				
3610RI	N. McClintock	1924	10	50	6 H	G 20			10	20
3611A1	Ed Hutchins	1910	8	40	3 H	E 5				6
3611A2	do	1920	12	52	5 H	E 15		14		
3611A3	do	1918	12	40	5 H	E 10				20
3611B1	Mamie Jahant	1916	12	45	4 H	E 10		40		
3611C7	J. K. Nay		6	33	2½ H	E 5			1	
3611C8	M. J. Froehnert	1918	6		2 H	E 5	5			
3611C9	C. A. Schwemmer		6		3 H	E 5		5		
3611C10	Ira Wilkinson	1922			3 H	E 5			2	3
3611C11	J. G. Mainland	1915	9	40	2½ H	E 5				2
3611C12	Doctor Bewley	1925	8		3 H	G 6		6½		
3611D3	Mrs. E. DePauli	1900	10	36	4 H	E 10		9	[f] 11	
3611D11	George Organ	1915	6	65	1½ H	G 3				1½
3611D16	S. W. Allison	1919	10		3 H	E 5		2	3	1
3611D18	E. A. Allison	1900	10	45	4 H	E 7			1	5
3611E1	Nellie Hutchins	1918	12	45	5 H	E 15		47		8
3611F1	Walker estate		12	40	4 H	E 10	25			
3611G1	Paul Strula	1917	8		3 H	E 5		5		
3611G2	Ray E. Burson	1916	8		3 H	E 5		8		
3611G3	W. O. Barnhart	1912	8	90	3 H	E 5		4½		
3611G5	B. A. Scheppler	1912	6	54	3 H	E 5	2	2		
3611G7	L. A. Cheatham	1910	6		3 H	E 5		11		
3611G9	do	1910	8		2 H	G 6		6		
3611G10	F. S. Kolb	1907	6	47	3 H	E 5		[e] 4		
3611G11	Dan Ehrhardt				3 H	E 5	2	4		
3611G12	Abbott & Clark	1920	6	80	3 H	E 7½				6
3611H1	Mrs. E. De Pauli	1920	10	38	3 H	G 5	4½	12	1½	
3611H2	H. A. Goodman	1906	8	55	3 H	E 5				
3611K1	John Wiederich	1916	12		5 H	G 20		20		
3611L1	W. L. Lange	1910	12	60	5 H	E 10		15		
3611L2	Henry Fuchs	1915	10		3 H	E 7½		7½		
3611L3	J. M. Hill	1915	10		2½	4		8		
3611L5	M. M. Griswold	1922	10		3 H	E 7½		14		
3611M3	D. Schubert	1899	4	105	3 H	E 5	3	5		
3611M4	Fred Veit	1924	8	120	3 H	E 5		6		2½
3611P2	D. B. Doepke		10	156	5 H	G 15				12
3611Q1	Peter Zornig	1913	10	34	5 H	E 15		10		
3611Q3	C. A. Glick	1900	12	60	5 H	G 12		13		
3611Q5	L. R. Stone	1921	10	110	3 H	E 7½	10	5½		
3611R1	Herbert Kennedy	1926	8	47	5 H	E 15	3	16½	2½	
3611R5	J. M. Dargitz				3½ H	E 5		13	2	
3612A1	Paul Sturla	1907	10	100	6 H	E 15	7	23		
3612A2	Ed Spiekerman	1904	6		2 H	E 3				3
3612E1	C. A. Zinser	1917	6	30	1½ H	E 3				1
3612E2	John E. Neumann	1907	8	70	3 H	E 7½	2½	6	¾	1¾
3612E4	Andrew Rothgarn	1915	6	45	1½ H	E 3	1¼			¾
3612E8	A. M. Hill	1924	6		2 H	E 3			1½	½
3612E9	L. E. McClung	1897	4	70	3 H	E 5		4		1
3612F1	E. Mellmen	1920	5	66	2½ H	E 5	1	2		2
3612H3	Mrs. E. Krieger	1919	6	90	3 H	E 5		2		1
3612J1	G. Wigginton	1919	6	72	3 H	E 3	1¼			¼
3612J7	J. W. Doty	1910	4	70	2½ H	E 5	2			
3612J9	John Krossa	1917	10	60	3 H	E 5	2½			
3612J11	Georgella K. Yates and A. E. Rector.	1907	6	90	3 H	E 7½	3			3

[e] Interset with trees.

[f] Planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
3612J13	Albert Uhlinger	1912	6		3	H	E	3	2	3		
3612K3	Otto Thompson	1915	10		2½	H	E	5		4		2
3612K4	Mrs. J. B. Prentice	1922	6		3	H	E	5		5½		½
3612K6	J. R. Worden	1912	10		4	H	E	10		21		
3612L3	J. J. Mettler	1928	12	49	350	T	E	5		5		
3612L4	Henry Preszler		8		4	H	E	7½		40		
3612L5	Gust Frye		8		3	H	E	5	3			2
3612M2	Kruger estate	1918	10	73	4	H	E	10	2	12½		
3612M3	E. J. Weber	1920	10	188	4	H	E	10		10		
3612M4	O. H. Wells and Wood	1920	8		4	H	E	10		14		
3612N2	D. Bushman		8	35	4	H	E	7½		4½		
3612N5	W. H. Lorenze				6	H	E	15			40	
3612P1	Louis N. Springer	1912	8	55	5	H	E	10	18¾			
3612P3	J. F. Miller		8	60	4	H	E	7½	2	8		
3612P4	F. O. Weatherington	1897	6	60	3	H	E	5	4¾			1
3612P5	G. B. Scheideman	1915			3	H	E	5		5		1
3612P6	J. J. Knoll		8		3	H	E	5		5		
3612Q1	C. E. Mortenson	1915	6	83	3	H	E	5		7½		
3612Q2	M. Scheideman	1921	8	48	3	H	E	5		2		
3612Q3	G. Geringer	1925	6		1½	H	E	2		3		
3612Q4	John Motz	1915		47	4	H	E	7½		4½		1½
3612Q6	A. Nasman	1924	6	54	2	H	E	5	1		½	½
3612Q9	Mrs. J. Hoover	1917			3	H	E	5				1
3612Q10	C. Schamber	1922	6	48	3	H	E	5				1½
3612Q17	H. Hanson	1917	6	60	3	H	E	5				4
3612Q29	Mrs. A. E. Carroll	1917	5	80	3	H	E	5	1½			½
3612R1	Lodi Academy and Normal School.	1912	10	45	7	H	E	15	8	7	18	7
3613A1	W. L. Lange	1907	12	135	6	H	G	15		25		
3613B1	Glen Ayers			31	4	H	E	10	12	7		
3613B3	F. E. Lowe	1925	10	95	4	H	E	7½	1	20	2	7
3613B4	—— Spooner		10		4	H	E	10		15		
3613C1	William Mortenson		8	115	3	H	E	5		6		
3613C3	Gustav Albert	1912	11	142	4	H	E	7½	2	5		3
3613C5	N. N. Hanson	1919	6	35	3	H	E	5		2½	1	1½
3613D1	Mrs E. Pearson	1922	8	69	5	H	E	7½		10		
3613D2	Adam Mettler	1923	12	85	4	H	E	7½	1	4		
3613D3	A. L. Coffman		10	50	4	H	E	10		20		
3613E1	A. W. Meirer		6	45	3	H	E	5		7½		1
3613E3	R. L. Egbert				3	H	E	5		4		
3613E5	C. E. Ritter	1921	8	60	3	H	E	5	1	3½		½
3613E7	Fred Griess	1918	8		3	H	E	5		11	3	1
3613F1	K. Neuharth		12	180	6	H	E	15		22	[f] 8	
3613F3	H. A. Goodman	1921	8	45	3½	H	E	5	2½	7		
3613G1	Annie Calvin	1903	10		4	H	E	6	6¾	6¼		
3613G2	Theo, Knecht		12	140	4	H	E	10	2	8		
3613G5	William Bluck		6	27	3	H	E	7½	3½			1
3613H1	Elizabeth Miller	1919	12	91	5	H	E	15	10	20		
3613H2	A. Eddleman		8	48	3	H	E	5		10		
3613H3	Adolph Knecht	1919	5	30	3	H	E	7½		8½		1
3613H5	Frank Sorter	1892	6	38	4	H	E	10	[c] 2½	21¾	[f] ¾	
3613J1	Maris Bros. and Kamilos	1920	12	100	5	H	E	15		43½		
3613L1	G. W. Field			100	4	H	G	12				
3613L2	—— Bangs	1918	12	90	700	T	E	15		25		
3613M1	G. W. Field	1915	10	100	5	H	E	15	5½	11		
3613M3	R. A. Richards	1920	10		4	H	E	10		20		
3613M5	J. Zimbleman		10		4	H	E	10		9	2½	
3613N1	Maris Bros. and Kamilos	1922	12	85	5	H	E	15		40		
3613P1	Theo. Beckman		10		6	H	E	15		65	4	1
3613Q2	H. N. Blye	1910	6	32	3	H	E	5		9		
3613Q3	W. Cellarius	1924	8	95	3	H	E	5		7½		2¼
3613R1	J. O. Lockwood				4	H	E	10		8		
3613R2	R. A. Richards		10		4	H	E	10		12		
3613R4	do	1913	10		4	H	E	10		20		
3614B1	H. T. Bailey		10	90	5	H	E	15	18	45		
3614C1	T. H. Beckman	1915	12	80	8	H	E	30	40	145		
3614D1	do	1917	12	110	7	H	E	20				
3614L1	H. C. Beckman		12	40	6	H	G	15				60
3614M1	do	1922	12		5	H	E	15				50
3614N1	K. Neuharth		12	90	7	H	E	15		29½	7	
3614R1	H. C. Beckman		12	40	6	H	G	15				
3614R3	do	1927	14	120	900	T	E	15		20		
3615B1	W. E. Hines	1924	10	40	5	H	E	20		40		

[c] Interset with vines.

[f] Planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
3615B2	H. E. Hines	------	10	35	5	H	E	20	------	40	------	------
3615C1	J. J. Meier	1918	10	50	4	H	G	7½	½	13	------	1½
3615C2	G. Waters	1927	10	------	4	H	E	7½	------	16	------	2½
3615F3	J. W. Emde	------	12	280	6	H	E	15	------	22	------	13
3615F4	do	------	12	75	6	H	G	15	------	------	------	25
3615J1	J. W. Barlow	------	12	32	5	H	G	12	------	------	12	------
3615K1	A. A. Schaver	1927	8	45	4	H	G	20	------	------	------	40
3615K2	do	------	8	60	6	H	G	10				
3615K5	J. W. Barlow	------	12	44	6	H	G	12	------	------	19	6
3615P2	Fred Rond	------	10	45		H	G		------	------	8	7
3615R1	Mrs. J. Jefferson	1924	10	50	6	H	G	20	------	------	------	80
3616A1	Henry Perrin	------	12	40	4	H	E	7½	------	25	5	------
3616A3	S. N. Furry	------	12	60	5	H	G	20	------	9	------	------
3616D1	J. W. Emde	------	10	75	6	H	E	15	------	------	------	80
3616E2	V. Ambrosiz	1920	12	40	6	H	G	20	10	------	5	------
3616G1	J. W. Emde	1926	------	68	6	H	G	15	------	80	------	------
3616K1	Addie Guard	1910	10	------	4	H	G	8	------	5	5	------
3616R1	J. W. Emde	1927	12	103	7	H	E	20	------	------	------	80
3617A1	—— Helmie	------	12	------	7	H	G		------	20	------	------
3617B1	A. Faretti	------	10	70	7	H	E	20	------	------	40	------
3617C2	H. A. Lange	------	10	------	4	H	E	10	------	5	5	------
3617D1	W. A. Moore	------	10	------	5	H	E	10	------	80	------	------
3617D2	do	1925	10	44	5	H	G					
3617D3	do	1917	10	23	5	H	E	10				
3617F1	A. Faretti	------	10	35	7	H	E	20	------	40	40	20
3617H1	George Balmer	------	10	40	6	H	E	15	------	------	14	18
3617J1	J. K. Woods	1917	12	150	8	H	E	25	------	40	20	30
3617L1	F. P. Woods	1923	12	42	6	H	E	15	------	21½	------	------
3617M1	—— Colvin	------	12	40	5	H	E	15	------	------	17½	10
3617N1	F. H. Strebbe	------	10	30	4	H	E	7½	------	------	3	7
3617N3	J. K. Woods	1915	12	40	5	H	G	12	------	• 6	------	------
3617P1	do	------	12	45	6	H	G	20	------	------	------	------
3617Q1	Annie Kells	------	10	35	5	H	E	15	------	------	------	------
3617R1	D. L. Arberti	1926	10	------	4	H	E	7½	------	------	5	5
3618B1	T. W. Powell	1914	14	25	6	H	E	15	------	12	12	------
3618B2	do	1918	6	65	2	H	E	5	1	------	------	1
3618C1	C. E. Bowman	------	12	------	8	H	E	20	12	6	17	------
3618D1	S. N. Furry	1920	12	55	5	H	G	20	------	------	------	10
3618D2	W. B. White	------	12	------	6	H	E	15	------	------	------	27
3618E1	T. W. Powell	1918	12	65	------	------	------	------	------	------	------	------
3618G1	C. Glubrecht	------	12	75	5	H	G	15	------	10	------	10
3618H1	Eugene Miner	------	12	------	5	H	G	10	------	7	13	------
3618J2	M. A. Treadway	------	12	------	8	H	E	15	------	------	------	60
3618K1	F. R. Knittel	------	12	------	5	H	E	10	2	14	4	------
3618K3	A. Reppetti	------	12	------	4	H	G	8	------	10	------	------
3618K4	Louis Springer	------	8	------	3	H	G	8	------	10	------	------
3618L1	J. C. Reimer	------	10	------	3	H	E	5	------	19½	½	------
3618L2	R. Stirm	------	10	------	5	H	G	15	------	12	------	8
3618M1	A. McFarlan	------	6	------	4	H	G	12	------	½	------	19½
3618M3	L. J. Vallem	------	8	55	5	H	E	10	------	2½	------	15½
3618P1	John J. Baumbach	------	12	40	4	H	E	10	------	12	8	------
3618P3	G. Schulz	------	12	45	4	H	E	7½	------	16	4	------
3618R1	J. L. Perrin	1927	12	109	5	H	E	10	------	13	------	114
3618R4	O. A. Shroyer	------	12	------	5	H	G	20	------	10	------	------
3618R6	Fred Lohse	1925	12	68	5	H	G	20	------	------	------	4
3619B2	W. I. Neeley	------	8	------	5	H	G	15	------	16	------	24
3620A1	—— Perrins	------	12	32	6	H	E	10	------	------	------	30
3620B1	W. H. Thompson (Used with 3620D1 and F1.)	------	------	------	6	H	G	15	------	------	60	146
3620B3	Chas. Volbright	------	------	------	4	H	E	7½	------	26	------	------
3620D1	W. H. Thompson (Used with 3620B1 and F1.)	------	12	------	6	H	E	20	------	------	------	------
3620E2	Samuel Andrews (Used with 3620F2.)	------	10	------	5	H	G	22	------	------	5	20
3620E3	E. Weigum	------	12	38	5	H	G	7½	------	------	5	5
3620F1	W. H. Thompson (Used with 3620B1 and D1.)	------	12	------	8	H	G	20	------	------	------	------
3620F2	Samuel Andrews (Used with 3620E2.)	------	10	------	5	H	G	22	------	------	------	------
3620J1	Sid Allison (Used together.)	------	12	------	2	Lift	------	------	------	------	------	3
3620J2		------	12	------		Lift	------	------	------	------	------	------

• Interset with trees.

Pumping plants on wells in the Mokelumne area used for irrigation—**Continued**

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
3620M1	Johanna Bround (Used with 3620R1.)		12		7	H	E	15				45
3620N1	B. L. Stauffer		10	30	8	H	G	12			20	
3620P1	G. V. Beckman		8	20	7	H	G	10				7
3620R1	Johanna Bround (Used with 3620M1.)		12		8	H	G	15				
3621A1	B. Castelanelli	1916	12	65	6	H	G	12		40	15	
3621B1	do		12		3	H	E	5				5
3621C1	—— Phillippo		10	40	7	H	E	10		50	5	12
3621E1	T. Thorpe		8	60	4	H	G	8				20
3621F1	T. Thorpe (Used together.)		12	40	5	H	G	15			32	19
3621F2			12	40	3	H	G	6				
3621G1			12	40	5	H	G	10				
3621G2	F. J. Mattice (Used together.)		10		8	H	E	10			18	7
3621G3					6	H	G	10				
3621J1	J. Bround		12	30	5	H	E	10				30
3621M1	Johanna Bround (Used with 3622J1.)		12		6	H	G	15			10	50
3621R1	O. Russell	1927	12	40	5	H	G	12		17		
3622B1	R. Morrell	1928	10	42	5	H	E	10				20
3622C1	James M. Orr	1927	6	40	4	H	G	20				5
3622D1	Lorenzo Quaglia (Used with 3622H2.)	1927	12	46	5	H	G	20				20
3622E1	H. Kirschenmann		10		4	H	E	7½		20	15	5
3622F2	H. Kirschenmann (Used together.)		12	35	6	H	E	10			2	18
3622F2			10		4	H	G	15				
3622F3	—— Stewart				8	H	G	12		10		
3622H1	Frank Formento		8		4	H	G	20			6	13
3622H2	Lorenzo Quaglia (Used with 3622D1.)		12	40	6	H	G	20				
3622J1	Johanna Bround (Used with 3621M1.)		12	100	6	H	G	12				
3622N1	W. Bollinger (Used together.)		10	35	6	H	G	12				32
3622N2			10	35	3	H	G	8				
3622P2	Albert Heil		12	65	4	H	E	7½	5	25		
3622Q2	W. Heil		12		5	H	E	15	4	36		
3623H1	J. J. Mettler (Used with 3623R1.)		12	45	9	H	E	10	17	80		
3623J1	J. Rocca		12	49	6	H	G	20		(i)		
3623R1	J. J. Mettler (Used with 3623H1.)		12	45	9	H	E	10	17	80		
3624A1	Sanguinetti & Spooner (Used together.)		12		4	H	E	10		70		
3624A2			12		5	H	E	10				
3624B1	A. Ochler	1920	10	60	4	H	E	10	7	13		
3624B3	H. Seemann		12	80	5	H	E	10		2	4	4
3624B4	W. F. Ham		6		4	H	E	7½		10		
3624C1	Clara Haven		12		4	H	E	5		10		
3624C3	J. Gilbeau		10		6	H	E	5	1	9		
3624C4	S. P. Wetmore			100	6	H	E	15	20			
3624D1	Roy Mills		10	50	5	H	E	15	10	30		
3624E1	J. J. Mettler		10		4	H	E	10	19	18		
3624G1	E. E. Morse (Used together.)		12		8	T	E	15	25	92		
3624H1			6		4	H	E	7½				
3624H2			12		8	H	E	15				
3624J1	Quaschnick & Bro (Used together.)		10		4	H	G	6		28	[f] 2	
3624J2			6		3	H	E	5				
3624K1	D. E. Eddlemann		12	80	4	H	E	10		10		
3624K2	N. E. Tucker		12	80	4	H	G	7½		10		
3624K3	J. F. Schaeffer	Old	10	35	3	H	G	6		16		2
3624K4	—— Knudsen		8	84	4	H	G	8		8		
3624L1	L. Rabusin		8		4	H	E	7½		10	1	
3624L2	C. E. Minschall		8	62	4	H	G	8		10		
3624L3	T. C. Hawley	1919	4	90	4	H	E	5		2	2	
3624L4	—— Widerfelt	Old	4	27	4	H	E	5		4		1
3624L6	Anna Benedict		6		6	H	G	6				1
3624L7	—— Jefferson	Old	8	40	4	H	E	7½		5		
3624M1	George Hammer (Used together.)	1925	12	86	4	H	E	7½	4	15		
3624M2			10	68	3	H	E	5				
3624M3	T. Scott		12	65	4	H	E	10	2½	26		
3624N1	Fred Marchand		14	68	8	H	E	15	2	34		
3624P3	J. Jacobson	1910	10	175	7	H	E	10		25		15
3624Q1	W. J. Tarter		12	100	6	H	E	7½		10		
3624Q3	Albert Newman	1925	8	100	3	H	E	5		6	3	1

[f] Planted in orchard.

[i] Used when canal is dry.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
3624Q4	Lodi Farm Co.		12		8	H	E	15	5			15
3624R1	E. Wegehaupt	Old	8	75	6	H	E	7½		8	2	1
3625B1	W. G. Micke	1927	14	173	8	T	E	20		75		
3625C1	O. S. Norton	1927	14	174	8	T	E	20		44		
3625D1	Mrs. Emma Stokes	1924	10	71	4	H	E	10		20	2	22
3625D2	O. H. Widney	1908	10	120	5	H	E	7½		15		
3625D4	Clarence Hurd	1908		25	5½	H	E	5		24		9
3625H1	(Used together.)	1911	16	217	7	H	E	15				
3625H2	La Salle		10		6	H	E	10		22		
3625L1	E. E. Morse (Used with 3625R1 and 3636D1.)	1910	12	160	5	H	E	15	7	181		
3625M1	J. F. Leffman	1912	10	40	6	H	G	12			7	28
3625M2	(Used together.)	Old	10	40	6	H	E	15				
3625R1	E. E. Morse (Used with 3625L1 and 3636D1.)				7	T	E	15				
3626C1	B. Costa	1923	12	42	3½	H	G	12		5		5
3626C3	G. P. Ohlinger	1920	8	24	4	H	G	6		1	2½	16½
3626C4	(Used together.)		6	38	2	H	G	1½				
3626E1	G. V. Beckman		12	45	7	H	G	20	[d] 35			[d] 30
3626F1	C. I. Leach	1920	12	42	5	H	G	20		[d] 44		
3626J1	Fred Hieb		12		7	H	E	15		40		
3626N2	W. J. Robinson			50	10	H	G	25		35	5	
3626P1	M. Dayton	1927	8	32	3	H	G	20		6		9
3626Q1	S. Rocca	1927	8	60	3	H	G	20	1	9		
3627A2	M. B. White (Used with 3628D1.)	1927	8	40	4	H	E	5				32
3627A3	A. C. White				4	H	G	5		8		
3627B1	George Sterin				4	H	E	5				5
3627C1	George Barbero	1926	8		3½	H	E	5		15	[f] 1	
3627C2	Wilkerson & Merrill	1913		45	8	H	E	20	2			100
3627D1	G. V. Beckman		12	50	7	H	G	20		[d] 21		
3627E1	Mabel Hasse		8		4	H	G	6				
3627E2	W. S. Vineyard Co.		12		5	H	E	15	25	25		
3627J2	F. Hoff		8		5	H	G	10				
3627K2	R. E. Rode	1922	12	107	6	H	G	15		85		15
3627K3	(Used together.)	1918	12	57	5	H	G	16				
3627L1	Paul Berner			89	6	H	G	15		12	6	
3627M1	Henry Bender	1913	8		6	H	E	15		25	3	12
3627Q1	M. W. Hieb	1927	12	100	9	H	G	25		8	12	
3627R1	W. Becker				4	H	E	3		[d] 10		
3627R2	W. Heil				6	H	G	20		20		
3628A1	E. Owens	1924	10	34	4	H	E	7½			10	
3628A2	Chris Stroble				4	H	G	20	10		8	10
3628A3	(Used together.)				4	H	G	20				
3628A4	Chris Stroble		6		3½	H	G	3	1			1
3628B1	Lodi Farms Co.	1925	12	46	7	H	E	10				40
3628B2	B. Diehl		10		4	H	E	7½			30	
3628C1	J. M. Carson	Old.	12	50	6	H	E	15		15	5	20
3628D1	M. B. White (Used with 3627A2.)		12		4	H	E	5				
3628E1	Paul Koch		12		7	H	E	15				40
3629A2	Andrew Gomez	1921	6	37	2	H	G	4			1	
3629D2	James Hester				6	H	G	8			13	
3629E1	Andrew Gomez	1925	6	40	4	H	G	20			3½	
3629E2	R. A. Patterson		8	34	4	H	G	12		6	14	
3629E3	(Used together.)				2	H	G	3				
3629H1	A. E. Cooper	1909	8	64	4	H	G	20				4
3629M1	G. C. Lowry				7	H	E	15			47	13
3631P1	Gerlach & Lang	1925	6	76	2	H	G	6			1	
3632D1	J. C. Guggolz	1927	12	132	7	H	E	10			60	
3632H1	(Used together.)	1924	12	55	6	H	E	15				
3633J2	Clifford Bull	1928	12	110	6	H	G	10			10	
3635A1			10		5	H	G	9				
3635E1	John Facciano		10		6	H	G	10	2	14		
3635F1	Frank Chisholm		12		7	H	G	8		16		
3635G1	W. M. Whitcomb	1920	10	114	3	H	G	6	2½	4		
3635K1	A. Paul	1927	12	43	6	H	G	10		55		
3635K2	Joe Ferrari				7	T	E	10		62		
3635R2	I. D. Puaden	1927	10	91	5	H	G	20			7½	

[d] Used to supplement canal.

[f] Planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
3636A2	Mrs. Anna Kilgore		10		6 H	G 8		20		
3636B1	J. H. Perrin				2 H	E 3		22		
3636B2	(Used together.)				3 H	E 5				
3636D1	E. E. Morse (Used with 3625R1 and L1.)	Old.	12		5 H	E 15				
3636D2	A. H. Allwardt		10		4 H	E 7½			5	
3636E1	Paul Migliardi		8		3 H	G 6		11		
3636F1	—— Klemin (?)		8		4 H			8		
3636G1	John Chinn				3 H	G 8		16		
3636H1	E. Cramer		10	125	6 H	D 25	7	8		
3636H3	—— Greer (?)				4 H	G 30		15		
3636L1	Mrs. Gandil		10	69	5 H	E 15				10
3636M1	S. Soucie		10		5 H	E 10		20		
3636M2	John Sjosten	1910	10	64	4 H	G 8		10		• 6
3636M4	A. Erickson		12	106	7 T	E 10	4	6	10	
3636P1					3 H	G 5		10		
3636R3	L. W. Bunch				6 H	E 7½		10		6
371B1	Johnnie Hamburg	1913	12	215	2½ H	E 5			2	
371B2	J. J. Hayes		12	125	2½ H	E 5			[f]7	
371C2	Gus Moss	1922	10	135	[k]300 T	G 10		7½		
371C4	Louie Sanders		12	125	3 H	E 10		16		
371D1	W. L. Young	1912	12	368	5 H	E 15			7	8
371F1	——Maxwell	1902	10	70	3 H	E 7½			5	
371K1	Howard Gillespie	1919	14	595	[k]850 T	E 20		40		
371K2	C. E. Binger	1922	12	90	[k]1,000 T	E 20		40		
371L1	W. G. Liken	1914	12	336	4 H	G 10		10	5	
371Q1	Charles Stemeler	1924	12	610	[k]800 T	E 20			6	10
371R1	William Huires	1912	14	198	5 H	E 10	2	9	8	2
372C1	Bisa Galupi	1915	8	60	2 Lift.	G 2	2½			
372D1	P. R. Mindach	1923	10	199	4 H	G 10		•12	4	4
372E1	W. Bechthold				4 T	E 10		25		
372E2	John Weigum (Used with 372J1.)	1915	16	165	4 H	E 10		118		
372F1	Albert Nies	1926		186	6 H	E 20		50		
372G2	Ed Long	1922	6	80	2 H	E 5				
372H1	John Holman		10		4 H	D 15		39	2	4
372J1	John Weigum (Used with 372E2).	1921	14	300	4 H	E 15				
372K1	John Weigum		12	125	4 H	E 10		32		
372L2	C. H. Fox	1915	12	70	3 H	E 5			4	
372M2	Christ Kaul	1925	10	145	4 T	D 15		15		
372P1			12		4 H	E 10		30		
373C1	Jacob Knoll (Used with 373E2 and E3.)	1922	14	334	8 T	E 25	5	105		
373D2	Jacob Ehrhardt	1918			4 H	E 10		8		
373E2	Jacob Knoll		12	160	4 H	E 15				
373E3	(Used with 373C1.)		12	110	5 H	E 15				
373H1	Dave Weigum				6 H	E		10		
373J1	Knoll & Green	1914	12	530	5 H	E 15		• 65		
373K1	Mrs. H. F. Ellis	1920	10	580	5 H	E 20		• 50		
373L1	L. Withers		12	760	8 H	E 25		80		
373M1	Paul Sobkowsky	1919	10	125	4 H	E 10		23		
373M2	J. E. May		10	350	5 H	E 15	1½	16½	5½	
373N1	J. J. Schmeidt	1918			4 H	E 10	17	6		
373Q1	G. Mettler	1920	12	220	4 T	E 10		30		
374A1	M. C. Dow	1926	10	25	4 V	E 10		11		
374C1	J. B. Rogers	Old	8	46	3½ H	E 7½		15		
374C3	Howard Hastings		6		3 H	E		15		
374D1	H. A. Mettler		10		5 H	E 15		40		
374D3	A. C. Costa		10		5 H	E 10		20		
374F2	Peter Joens	1910	12	225	8 T	E 25	10	170		
374F4	(Used with river pump.)	1910	10	192	4 T	E 7½				
374G1	Herman Vollbrecht	1913	12	63	4 H	E 10		20		
374G3	O. L. Marrs (Used with 374F2 and F4 and river pump.)	1922	12	520	[k]700 T	E 20				
374H2	G. Mass		10	63	4 H	E 10		23		
374H4	Peter Heil			125	4 T	E 10		18		
374J1	F. H. Koster	1914	10	107	4 T	E 7½		12		
374K2	W. W. Gillespie	1913	12	62	[k]450 T	E 10		10		
374K3	D. D. Miller				5 H	E 10		25		
374K4	—— Bietz				6 T	E 15		15		
374L1	Louis Reuscher	1910	10	50	4 H	E 10		29		

• Interset with trees.

[f] Planted in orchard.

[k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
374M1	S. E. Morden	------	10	65	4	H	E	10	------	9	------	------
374M2	Mrs. L. M. Lewis	1917	12	115	4	H	D	15	------	20	------	------
374M3	D. Weigum	------	----	-----	4	H	E	10	------	21	------	------
374N2	E. F. Beckman	------	----	-----	7	T	E	20	------	18	------	------
374N3	Ed Larson	------	----	128	6	H	E	10	------	30	------	------
374Q2	Wock & Christman	------	----	-----	8	T	E	20	------	37	------	------
374Q3	Gottlieb Motz	1924	14	285	[k] 600	T	E	15	------	61	------	------
374Q4	Art. Mettler	1912	----	175	6	T	E	10	------	22	------	------
375A1	L. A. Milloglav	------	8	50	3	H	G	9	------	10	------	------
375A2	C. R. VanBuskirk	1914	8	180	3	H	E	7½	------	9½	------	------
375A3	A. A. Werner	1924	----	43	4	H	E	10	------	36	------	------
375B1	Joseph Kennison	1922	7	-----	4	H	E	10	15	17	------	3
375C1	F. Carey	------	12	150	4	H	G	20	------	12	------	------
375E1	Roma Wine Co	------	----	60	2½	H	E	5	------	2½	------	------
375E2	H. B. Barkis	------	----	-----	3½	H	E	10	------	20	------	5
375F1	A. A. Werner	1921	8	125	3½	H	E	7½	------	15	------	------
375G3	F. Lagomarsino	1912	8	76	3½	H	E	7½	------	17½	------	------
375G4	Byron Hulburd	------	----	-----	4	H	G	10	------	20	------	------
375H3	J. C. Lange	1917	10	180	5	H	G	15	------	20	------	------
375J1	J. J. Shafer	------	10	-----	4	H	E	10	------	10	------	------
375J2	Tom Goodwin	------	8	-----	2½	H	E	5	------	10	------	------
375J4	F. G. Smith	------	----	-----	8	H	E	25	5	20	------	------
375K2	B. Phillips	1909	12	85	5	H	E	15	------	45½	------	------
375L1	H. D. Binger	------	8	85	4	H	G	12	5	25	------	------
375L4	G. G. Gillespie	1923	14	250	[k] 980	T	E	20	------	28	------	------
375M2	E. Handel	1919	10	100	4	H	E	10	------	40	------	------
375M4	M. Handin	------	10	-----	5	H	E	10	------	68½	------	1½
375N2	Dennis Moran	1914	----	90	4	H	E	7½	------	10	------	------
375N4	C. W. Vollbrecht	------	----	-----	4	H	E	7½	------	18½	------	------
375N5	A. R. Stephen	1913	10	56	4	H	E	7¼	5½	5	------	------
375P1	Carl Pfeifle	------	8	35	4	H	E	7½	3	11	2	------
375P3	J. E. Bietz	------	6	-----	3	H	E	5	------	5	------	------
375P4	Mrs. Ella Wilson	1906	10	105	3	H	E	10	------	20	------	------
375P5	J. H. Hoeg	1910	8	107	4	H	G	10	------	10	------	------
375Q1	A. & H. E. Johns	1920	12	255	4	H	E	7½	------	5	------	5
376B1	L. & J. Anis	1913	10	70	4	H	G	8	3	23	[f] 4	------
376B2	Sam Miller	1918	10	-----	4	H	G	10	½	9½	------	------
376B3	F. W. Reynolds	------	8	-----	2	H	G	3	------	22	[f] 2	------
376B4	T. C. Pierce	1900	12	40	5	H	G	15				
376D1	H. T. Mason (Used with 376H1.)	------	14	390	5	H	G	20	------	80	------	------
376E1	P. W. Loewon	1923	6	-----	3	H	E	5	2	------	------	------
376F1	Mrs. Kerschenmann	1913	10	-----	4	H	E	10	------	15	------	------
376F2	P. J. Goehring	1918	12	333	6	H	E	20	10	33	------	4½
376G2	E. J. Steele	------	8	35	4	H	E	7½	------	18	------	------
376G5	C. A. Willis	1903	8	33	2	H	G	5	------	4	------	1
376H1	H. T. Mason (Used with 376D1.)	1922	12	190	[k] 600	T	E	15	------	------	------	------
376H2	R. G. Houston	Old	----	-----	3	H	E	7½	10	------	------	------
376J1	Frederich Gentner	1913	6	60	1½	H	E	3	½	------	------	½
376J2	C. C. Houston	1913	12	40	4	H	E	7½	------	15	------	1
376J3	F. J. Crowe	------	6	30	2	H	G	22	½	------	------	1½
376J4	W. J. Turner	1913	10	-----	3	H	E	5	------	9	------	1
376J5	—— Benedict	1922	8	36	2	H	E	5	------	2	------	------
376K1	Hannah Couper	1918	6	68	3	H	E	5	4	6	------	------
376K2	Levi Atwood	1924	10	85	4	H	E	7½	------	14	------	------
376K3	J. W. Pinkerton	1910	6	76	3	H	E	7½	------	8	------	------
376K4	J. F. Morrison	1900	10	70	1	H	E	3	------	------	------	1
376K5	E. S. Abbott	1925	8	96	1	H	E	3	------	------	------	1
376K6	C. M. Long	1906	10	84	3	H	G	6	------	½	2	½
376K7	do	1918	6	78	2½	H	E	3				
376K8	do	1906	10	30	1½	H	G	3				
376K9	F. A. Lattin	1906	6	40	2	H	E	5	1	2½	1	½
376M1	Henry Pope	1898	12	198	5	H	E	15	------	64	------	6
376N1	W. G. Micke	1907	10	-----	4	H	E	7½	------	19½	------	------
376N2	D. A. Walton	1922	6	50	2	H	E	5	------	5	------	------
376P1	Mrs. Ella Wilson	1895	8	-----	4	H	E	10	2	7	------	1
376P2	T. A. Pope	------	12	155	4	H	E	7½	------	20	------	------
376P3	G. Bischel	1919	6	-----	3	H	E	5	------	5	------	1
376P4	A. T. Rice	1920	4	54	1	H	E	2	------	½	------	½
376P5	John Caple	1918	6	70	3	H	G	5	½	1	------	½
376Q1	Mrs. L. Wilson	1919	10	100	4	H	E	7½	------	20	------	------
376Q3	G. Taylor	1913	8	-----	4	H	E	7½	2	8	------	------

[f] Planted in orchard.

[k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
376R1	F. A. Bawden	1923	10	65	3½	H	E	10				10
376R4	W. T. Wilson	1912	10	54	4½	H	E	7½		15		
376R5	Mrs. S. A. Bawden	1913	10	55	4	H	G	12½		9½		
377B1	W. G. Micke	1911		80	6	H	E	15	27½	44		
377B2	J. A. Duplisea	1921	10		4	H	E	10		14		
377C1	Perry Pope	1921	10	90	4	H	E	10		16		
377C2	Frank Pershing		6		2½	H	G	5		2		
377C3	C. Mittone		6		3	H	E	5		1		1
377C4	G. R. Houston		10		4	H	E	10	4	7		
377D1	C. C. Houston	1920	12		3	H	E	7½		7		
377E2	J. R. Hale	1927	12	160	4	H	E	10	15	20		
377F1	Mrs. M. J. Rixley		10		5	H	E	15		25		
377F2	Peter Hickerson	1920	10		5	H	E	15		22		
377F4	Mrs. L. E. McClung		10		4	H	G	12		13		
377H1	E. Eisler	1921	10	125	7	T	E	25		37		
377H2	Edwin Pope	1923	12	120	[k] 600	T	E	15		40		
377J1	John Groetken		10		3	H	E	7½		12		
377J2	F. W. Kettleman	1913	10	50	4	H	E	7½	10			
377K1	do	1915	10		4	H	E	7½		19		
377K2	John Kerschenmann		10		4	H	E	7½		18		
377L1	William Wittaker	1927	12	140	5	T	E	15	5	35		
377M1	Julius Woock	1908	12	120	[k] 600	T	E	15	2	36	2	
377N1	G. D. Kettleman	1923	16	365	[k]1,200	T	E	20	4½	23½	7	
377N4	Mrs. R. B. Thompson	1912	10	40	4	H	E	7½				
377P1	do	1912	10	60	4	H	E	7½		31		
377P2	John Wittmayer		10		4	H	G	10		9		
377Q1	Al. Burgstahler	1916	10	88	4	H	E	10	4	14		
377Q3	E. F. David	1913	8	108		H	E	7½	2	9		2
377R1	P. H. Glantz		10		4	H	E	15		20		
377R2	C. Jungeblut				5	H	E	15		14		6
378A1	Edwin Pope	1922	12	120	[k]1,000	T	E	20		74	4	
378B3	L. P. Maple				4	H	E	10		10		
378B5	A. Karnagel	1915	8	82	4	H	E	7½		10		
378B6	C. O. Johnson	1921	10	86	4	H	E	10		10		
378C1	A. Purdy	1920	10	82	4	H	G	10		15		
378C2	J. W. Wagemann	1926		45	4	H	G	8		10		
378C3	A. H. Baumbach	1923	12	160	6	T	E	15		20		
378C5	Bertha L. Mann	1905	10	140	4	H	E	10		10		
378D1	H. Geringer	1926	10	80	4	T	E	5		10		
378D4	Charles Joksch				2½	H	G	12		5		
378D5	George Meier		10	90	3½	H	E	10		10		
378F1	David Blanke	1917	10	90	3	H	E	7½		20		
378F2	O. Iklund	1924	14	200	[k] 750	T	E	20	[e] 2	18		
378G2	C. T. LaGrave	1920	10	140	4	H	E	10		8		
378G3	Henry Schiedman	1920	10	75	4	T	E	7½	1	11		
378G4	Henry Baumbach		10		4	H	E	10		10		
378H1	B. Jackson	1923	12	140	[k] 750	T	E	15		15		
378H3	John Reimche	1918	10		4	H	G	10		5		
378H4	John Hoerl	1913	10		4	H	G	10		5		
378J1	E. G. Spare		10		4	H	E	10		19		
378J2	G. C. Glantz		10		4	H	E	10		9		
378J4	J. Zimblemann				4	H	E	10	2	7		
378K1	F. E. Hosmer	1917		160	4	H	E	10	1	19		
378K3	A. Bechthold	1920	12	307	4	H	G	22		8		2
378K5	H. Baumbach				4	H	G	20		9		1
378L1	A. Baumbach		14	240	[k] 450	T	E	15		20		
378L2	J. L. Ruescher	1925	14	260	4	H	E	10		30		
378M1	C. Spiekerman	1925	12		[k]1,000	T	E	20		37		
378M2	Mrs. Rinde		10		4	H	G	10				
378N1	O. Pool	1905	10	110	4	H	E	10	½	19	½	
378N2	A. Bechthold	1915	10	120	4	H	E	7½		16		
378P1	C. O. Baumbach	1918	12	80	4	H	G	35		6		2
378P2	J. J. Jones	1921	14	112	[k] 750	T	E	20		42		
378Q1	Minnie Tecklenburg	1918	8	105	4	H	E	10		15	[f] 5	
378Q2	John Reimche		12	150	[k] 500	T	E	10		10		
378R1	D. D. Young	1918	12	82	4	H	E	10		20		
378R3	Henry Baumbach	1918	10	140	3	H	E	7½		20		
379A2	Earl Fruit Co				4	H	G			22		
379A3	D. D. Mettler	1920	12	265	4	H	E	10		45		
379A4	Peter Heil		12		5	H	E	10		15		
379B1	Henry Feillhardt		10		4	H	E	15		20		
379E1	Martin Reuscher	1922	14	296	[k]1,000	T	E	20		37		
379F1	J. E. Murphy	1925	14	250	[k] 750	T	E	15		30		

[e] Interset with vines. [f] Planted in orchard. [k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
379F2	D. D. Mettler		12	130	4	H	E	15		14		
379G1	John L. Seibel		10		6	H	E	10		65		
379G2	J. I. Eddleman	1922	14	250	[k] 750	T	E	15		30		
379H1	D. D. Mettler			47	3	H	E	10		20		
379K1	J. E. Hanel	1920	14	300	6	H	E	20	5	80	10	
379L1	J. L. Reuscher		14	240	[k] 400	T	E	10		20		
379M1	J. E. & E. F. Handel				[k] 750	T	E	15		50		
379P1	J. R. Wiederich	1920	12	296	4	H	E	10		30		
379Q1	Henry Preszler		14	300	5	H	E	15		20		
379Q3	Peter Joens				[k] 750	T	E	20		20		
379R1	—— Mulchey		10		5	H	E	15		40		
3710B1	H. J. Mettler		15	240	[k] 750	T	E	15		47		
3710B3	G. Mettler	1915	12	240	4	H	E	10		47		
3710C1	J. J. Knoll				6	T	E	10				
3710C2	Adolph Bechthold	1920	12	250	4	H	E	10		44½		
3710F1	D. D. Mettler	1919	14	85	5	H	E	20		90	10	
3710G1	E. Nies	1919	8	90	4	H	E	7½	3	19	3	
3710G2	Malcom Lear	1927	12	100	5	T	E	7½				
3710J1	P. J. Goehring				[k] 650	T	E	15		40		
3710K1	Ed Preszler	1925	14	88	[k] 700	T	E	15	2	38		
3710L1	John Bender		14	105	4	T	E	15	1½	35½	3	
3710M1	T. Gemar		14		4	H	E	10		20		
3710P1	Schonemaker & Balliet				7	H	E	25		80		
3710Q2	C. C. Nies	1911	8	300	4	H	E	10		16		
3710R1	Emanuel Handel	1921	10	160	4	H	E	10	2	53	10	
3711B1	Mrs. A. Tretheway	1914	12		5	H	E	20		40	15	12
3711H1	H. E. Blewett		10	400	4	H	E	7½			6	
3711K1	Doctor Nelson		14	700	6	H	E	25		80		
3711L1	Mrs. A. Tretheway				4	H	E	15	4	36	4	
3711N1	Tindell Bros				6	H	E	25		25		
3711R1	G. H. Harris		10		[k] 800	T	E	15		27		
3712D1	Andrew Biaggia		10	268	4	H	E	10			6	
3712F1	C. A. Bacon	1912	16	582	6	H	E	15		4	20	
3712G1	Ray Gower				7	T	E	25				
3712M1	Dr. L. Oliviery	1917	12	455	6	H	E	20	1	54		
3713D1	John Toon		10		5	H	E	15		55	10	10
3713M2	Ed Wageman	1912	12	320	6	H	E	15			15	45
3713M3	do	1912	16	160	5	H	E	15			15	20
3713R1	T. F. Daetweiler	1923	10	230	[k] 800	T	E	15			3	12
3714A1	John Bender		14		4	H	E	10		30		
3714A2	G. L. Fawcett				4	H	E	10			2	
3714B1	J. E. Jory		14	200	5	H	E	15		4	4	
3714B2	F. A. Hieb, jr				4	H	G	20		19	½	
3714G3	C. F. Faber		8	70	4	H	E	10		5	5	2
3714P2	Mary Tretheway	1907		500	4	H	E	10			10	
3715A1	J. Nies		10	55	4	H	E	10	8	30	2	
3715B1	J. J. Knoll	Old			[k] 700	T	E	15		20		
3715B2	Emanuel Handel					T	E	10		20		
3715C1	G. Hensel	1921	12	360	4	H	E	10		32	2	15
3715D1	H. Mettler		10	85	4	H	E	10		10		
3715D2	F. Gemar			70	5	T	E	7½		17		
3715F1	—— Vit			70	5	H	E	10		40		
3715F2	R. Jenner	1919	10	450	5	H	E	10		30		5
3715G1	B. Jackson	1923	12	325	[k] 750	T	E	15		40		
3715H1	F. Gemar	1926	12	70	6	T	E	15			5	
3715K1	H. F. Mettler	1922	14	380	[k]1,000	T	E	20		25	25	
3715K3	L. Mettler		12	150	[k] 400	T	E	10		27	1	2
3715N1	C. Geiszler		12	145	4	H	E	10		19	3	
3715N2	do		10		3	H	G	8	2	16		
3715Q1	Fred Hieb	1902	10	80	5	H	E	15		110	5	5
3716A1	John Young	1913	14	120		T	E	20		30		
3716A2	E. Loffelbein	1926	12	160	[k] 700	T	E	10		18	2	
3716B1	C. Fink	1920	14	295	5	H	E	15		29½	4	
3716B4	G. Ceilske		14		6	H	E	15	7	15		
3716C1	August Greber		15	160	3	H	E	10	4	12	2	
3716D1	G. Frey				4	H	E	10		50		
3716F1	F. Frey	1915	14	110	6	H	E	20	15	71		
3716G1	H. Haabesland	1925	12	127	[k] 450	T	E	7½		11	2	
3716G4	Adolf Frey	1926	14	186	6	H	E	15	1	28		
3716H1	C. Jenner	1921	10	125	[k] 450	T	E	20		20		
3716H2	Adolf Frey		14		6	H	G	12		4		
3716K1	Gust Frey	1923	14	173	[k]1,000	T	E	20		80		
3716L2	C. Dollinger				4	H	E	10		30		

[k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
3716M1	J. Melby	------	12	------	6	H	E	15	------	40	------	------
3716M2	G. N. Pelton	------	12	250	6	H	G	15	------	41	------	------
3716N1	L. K. Marshall	1919	14	200	6	H	E	20	40	37	------	------
3716P1	do	1917	6	65	2½	H	E	5				
3716P2	do	1916	12	40	4	H	E	7½				
3716Q1	J. J. Zechmeister	------	10	225	[k] 700	T	E	15	------	50	------	------
3717A1	Doctor Adams	1915	----	120	2½	H	E	7½	------	16½	------	------
3717A2	P. J. Zimbleman	------	10	------	3	H	E	15	------	15	5	------
3717B2	Conrad Baumbach	------	----	------	[k] 500	T	E	15	------	21	------	------
3717B4	John Rohrbach	1910	12	173	4	H	E	7½	------	10	------	------
3717C1	John H. Schmiedt	1922	8	170	3	H	E	7½	2½	9	½	------
3717C2	L. J. Chappieris	1916	8	80	3½	H	G	6	------	9	[f] 2	1
3717C3	R. J. Custer (Used with 3717F2.)	------	----	------	4	H	E	10	[c] 10	54	------	------
3717D3	E. Reuscher	Old.	12	110	3½	H	E	7½	------	10	------	------
3717D4	Fred Ingall	1925	8	165	3	H	E	5	------	4	------	1
3717D5	G. Lange	------	----	190	3½	H	E	10	------	15	------	------
3717E1	W. E. Shipman	1919	10	285	4	H	E	7½	22	12	3	------
3717F1	Herman Rinn	1914	10	96	4	H	E	7½	------	10	10	------
3717F2	R. J. Custer (Used with 3717C3.)	Old.	14	285	[k] 1,000	T	E	15	------	------	------	------
3717G1	Henry Reimche	------	----	------	3	H	G	5	------	8	------	------
3717H1	Mrs. M. B. Dunn	1920	12	180		T	E	20	------	16	4	------
3717J1	Mrs. O. M. Howland	------	----	------	4	H	E	10	------	12	------	------
3717J2	M. Newfield	------	----	------		H	E		------	------	------	1
3717J3	P. Cordes	------	10	172	4	H	E	10	6½	2½	4½	------
3717K1	—— Miller	1926	12	280	[k] 400	T	E	7½	------	9	------	------
3717K2	P. Cordes	1918	10	130	3	H	E	5	[g] 6	5	4	1
3717L1	Mrs. A. B. Merril	------	----	------	[k] 400	T	E	7½	------	20	------	------
3717M1	L. J. Chapperis	1921	8	128	4	H	G	8	------	13½	------	------
3717M2	L. W. Dye	------	----	------	4	H	E	10	1	26	------	------
3717N1	—— Oswalt	------	8	------	5	H	E	15	2	16	7	2
3717N4	John Kuehn	------	12	------	4	H	E	10	------	9	4	1
3717P1	F. W. Coblentz	1920	----	------	5	H	E	15	3	42	------	------
3717P4	W. F. Coblentz	------	----	------	5	H	E	10	2	18	------	------
3717Q1	W. L. Whitaker	1915	10	91	[k] 750	T	E	20	------	40	------	------
3717R1	N. Haabesland	1920	12	175	4	H	E	10	------	10	------	------
3717R2	Antone Bergstahler	------	----	------	4	H	E	10	------	9	1	------
3717R3	J. F. Merrill	1922	12	138	[k] 350	T	E	10	3	6	1	------
3717R4	Henry Abel	1922	8	190	4	H	E	10	------	10	------	------
3718A8	Mrs. P. H. Walker	1904	12	150	4	H	E	10	------	15	------	------
3718A9	H. M. Smith	------	----	------	5	H	E	15	------	15	------	------
3718A11	P. Krol	------	8	130	5	H	E	15	7	------	1	2
3718B1	G. F. Morel	------	----	------	4	H	E	7½	1	9	------	------
3718B4	Mrs. Tom Troy	1917	8	40	2	H	E	2½	1	------	------	------
3718B6	Henry Baumbach	------	----	------	[k] 750	T	E	15	------	------	------	------
3718B7	Adam Werner	------	----	------	4	H	E	7½	------	10	------	------
3718C1	J. J. Stritzel	1912	6	48	3	H	E	5	------	8	------	------
3718C3	Mrs. Karnagel	------	----	------	3	H	E	5	------	5	------	------
3718C5	W. T. Butler	------	----	------	2½	H	G	4	------	5	------	------
3718C7	P. J. Zimbelman	------	----	------	4	H	E	7½	------	10	------	------
3718C9	J. C. Zimbelman	1922	10	90	4	T	E	7½	------	10	------	------
3718D1	Herman Tecklenburg	------	12	96	[k] 700	T	E	15	31	28	------	------
3718E1	J. E. Sheehan	------	----	------	4	H	E	7½	------	------	[f] 10	------
3718E2	L. W. Dye	1912	8	90	4	H	E	7½	3½	6½	------	------
3718G2	B. T. Steele	------	10	130	4	H	E	7½	1	12	½	½
3718G3	Charles Beckman	1919	12	100	[k] 750	T	E	15	1	36	------	------
3718H1	Frank Kucera	1917	----	136	4	H	G	12	10	10	------	------
3718J1	Tindel estate	------	12	130	6	H	E	25	------	130	------	------
3718K1	do	1922	16	240	[k] 1,050	T	E	20				
3718K2	do	1922	16	280	[k] 1,050	T	E	20				
3718L1	Charles Beckman	1910	10	162	4	H	E	10	------	20	------	------
3718L2	do	1915	10	------	4	H	E	7½	------	20	------	------
3718M1	H. G. Menking	------	----	------	5	H	E	15	------	20	------	------
3718M3	O. H. Wells	------	----	------	5	H	E	15	------	20	------	------
3718N1	Charles Rasch	1919	12	120	4	H	E	5	------	3	------	------
3718N3	J. Garnero	1920	12	10	5	H	E	15	------	13	[f] 2	------
3718P1	J. F. Hooper	1905	6	42	2½	H	E	5	------	------	2	1
3718P3	Hurd & Bessck	1918	6	------	3	H	E	5	------	------	------	2
3718P4	do	1918	6	100	3	H	E	5	------	------	5	------
3718P5	W. C. Hoegerman	------	----	------	3	H	Lift.	5	------	5	------	------
3718Q1	C. O. Bewley	1915	12	86	4	H	E	10	------	26	3	3
3718Q3	Joe Dotson	------	8	------	3	H	E	5	9	------	------	------

[c] Interset with vines. [f] Planted in orchard [g] Cover crop planted in orchard. [k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
3718R1	H. W. Harney	1902	12	280	5	H	E	10	------	17	1	2
3718R3	Peter Heil	------	----	-----	4	H	E	10	------	20	------	------
3719A1	A. H. Ferdun	------	14	200	6	T	E	15	------	30	------	------
3719C1	Otto Neubauer	1920	14	180	6	H	E	15	------	10	------	------
3719C2	H. F. Merrill	------	12	-----	4	H	E	7½	------	9	------	1
3719C3	E. Stabbert	1919	10	160	5	H	E	10	------	8	------	2
3719C4	Carey Schuler (Used with 3719D1.)	1917	10	275	5	H	E	7½	------	------	------	------
3719D1	G. F. Schuler (Used with 3719C4.)	1917	10	260	4	H	E	7½	------	[e]30	------	------
3719D2	Charles Schuler	------	12	-----	5	H	E	10	------	[e]20	------	------
3719E1	Ferdun & Blodgett	------	----	-----	8	T	E	15	------	23	------	------
3719E2	Jacob Knoll	------	12	-----	5	H	E	15	------	45	------	------
3719E3	E. Hauff	------	----	-----	6	T	E	10	------	17	------	------
3719E4	Aaron Reuscher	------	10	40	3	H	E	5	------	5	------	------
3719F1	—— Cape(?)	------	10	-----	4	H	E	7½	------	14	------	------
3719G1	T. Madonna & Son (Used with 3719H1.)	1924	12	221	5	H	E	15	------	------	14	[f]26
3719G3	S. Smith	------	12	-----	6	H	E	15	------	3	5	2
3719H1	T. Madonna & Son (Used with 3719G1.)	1924	12	121	5	H	E	15	------	------	------	------
3719H2	Schuler Vineyard Co. (Used with 3720F1, F4, and B1.)	------	12	-----	6	H	E	10	------	16	------	14
3719J1	Frank Hogan	1912	14	75	6	H	E	15	35	40	------	50
3719K1	(Used together.)	Old.	14	-----	7	H	E	15	------	------	------	------
3719L1	Kate Mundy	1909	----	48	3	H	E	5	5	½	1	------
3719L3	C. D. Reimer	1916	8	-----	4	H	E	7½	3	2	------	------
3719L4	Mrs. Smith	------	8	-----	4	H	G	6	------	[e]5	------	------
3719L5	K. Carle	1913	10	135	4	H	E	7½	8	2	------	------
3719L6	V. Soto	------	6	-----	5	H	G	5	3	1	------	1
3719L7	A. W. McGowan	------	10	-----	5	H	E	5	------	------	[e]5	------
3719L8	Joseph Standa	Old.	10	127	4	H	G	6	2	2	------	1
3719M2	J. S. Montgomery	------	12	50	6	H	E	10	------	37	------	------
3719Q1	H. E. Dietrick	------	8	125	4	H	G	5	------	4	------	1
3719Q2	A. R. Gower	1910	10	49	5	H	E	10	4	6	------	------
3719Q3	M. Reuscher	------	10	-----	5	H	E	10	4	[e]5	------	1
3719Q4	H. A. Carter	1918	8	43	3	H	E	5	------	1	2½	1½
3719Q5	Chris Rieble	1914	8	190	4½	H	E	7½	------	[e]10	------	------
3719R1	A. S. Holman (Used with 3730D1.)	Old.	12	55	5	H	E	10	------	[e]27	20	------
3720A2	A. Veragulh	1918	10	190	4	H	E	7½	------	------	[i]7	------
3720B1	Schuler Vineyard Co. (Used with 3720F1 and F4.)	------	----	-----	5	H	E	10	------	97	------	------
3720B2	I. E. Closson	1917	14	170	3½	H	E	7½	------	10	------	------
3720B3	J. A. Peterson	------	6	New	6	H	E	7½	------	6	------	4
3720B5	Eugene Beckman	------	10	-----	4	H	G	6	------	10	------	------
3720C1	R. G. Huestis	------	10	164	5	H	E	10	3	36	4	------
3720D1	G. C. Lawry	1912	14	95	8	H	E	20	------	50	------	------
3720F1	Schuler Vineyard Co. (Used with 3720B1 and F4.)	------	----	-----	5	H	E	10	------	------	------	------
3720F3	J. Quaschnick	------	10	85	4	H	E	10	------	15	------	5
3720F4	Schuler Vineyard Co. (Used with 3720F1 and B1.)	------	----	-----	5	H	E	10	------	------	------	------
3720G1	Bank of Italy	------	12	230	4	H	E	7	1	9	10	------
3720H1	G. Garnero	1925	12	105	4	H	E	15	------	10	------	4
3720H2	Mrs. Ida Coblentz	------	12	250	6	H	E	15	------	------	------	20
3720J1	Costa Bros.	------	10	-----	5	H	E	10	------	40	------	------
3720J2	(Used together.)	------	12	-----	6	H	E	10	------	------	------	------
3720K1	W. A. Brown	1921	12	115	3	H	E	5	------	------	[f]8½	1½
3720K2	E. E. Durston	------	12	-----	5	H	E	15	------	19	[f]11	------
3720L1	John Schlenker	------	12	200	5	H	E	10	1	9	10	------
3720L4	G. Beckman	------	----	-----	4	T	E	5	------	5	------	------
3720L5	Charles Ludwig	1915	10	-----	5	H	E	10	5	[e]5	------	------
3720M1	G. & J. Field	------	----	-----	5	H	E	15	------	40	------	------
3720N1	Adam Mettler	------	15	-----	6	H	E	15	------	39	[f]1	------
3720P1	J. S. Montgomery	------	14	478	6	H	E	20	------	53	------	------
3720Q1	H. R. Whitaker	1920	10	108	[k]450	T	E	7½	------	8	------	------
3720R1	H. R. Whitaker et al.	------	----	-----	5	H	E	15	------	40	------	------
3721A2	G. Hanel	------	10	-----	4	H	E	15	------	------	------	------
3721B1	do	1922	12	150	6	H	E	20	24	50	6	------
3721C2	Frey, Handel & Witmeyer	------	14	-----	5	H	E	15	------	40	------	------

[e] Interset with trees. [f] Planted in orchard. [i] Cover crop planted in vineyard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power[a]	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
3721D1	Henry Schnaidt (Used with 3622A1 and A2.)		12		6 H	E 10		63	2	1
3721F1	G. Handel	1919			7 T	E 15		37	3	
3721F2	Laquens & Wiedrich		12		6 H	E 15	10	30		
3721H1	Handel Bros		10		5 H	E 7½		80		
3721H2	(Used together.)			175	6 T	E 10				
3721J1	S. F. Dozier (Used with 3721K1.)		12		6 T	E 15	60			
3721K1	W. F. Dozier		14		6 T	E 20				
3721L1	Henry Schnaidt		10		4½ H	E 10		10		
3721L2	do				8 T	E 20	30	40	82	
3721M1	L. H. Seibel	1920	12	80	5 H	E 15	11	60	3	
3722A1	Henry Schnaidt		8		6 H	E 10				
3722A2	(Used with 3721D1.)				7 H	E 15				
3722B1	Arthur Mettler		14		6 H	E 15	4	40		16
3722C1	F. P. Brown	1921	10	200	4 H	E 10		20		
3722E1	H. Mettler	1928			7 T	E 10		40		
3722J1	P. Fanos	1925	12	175	7 T	G 20		35		
3722K1	H. W. Watkins	1922	8	260	7 T	G 30	1	18	1	
3722Q1	do	1922	8	250	7 T	G 16		35		
3723C1	B. M. Horst		10	140	4 H	E 7½		12		5
3723D1	H. R. McNoble				4½ H	E 10		25		
3724B1	H. Kolb				5 T	E 7½		6½		
3724E1	L. Magellan				2½ H	E 5				3
3724E2	S. L. Bassett	1920	6	100	3 H	E 5				5
3724J2	Charles Nichols	1928			2½ H	E 5		6		
3724L1	John Gladish		12		4 H	E 5				2
3724L2	Mrs. E. Tanner		8		3½ H	G 6		1		
3724N1	F. F. Hibbard	1920		100	3 H	E 5	3			
3724Q1	N. O. Berkland	1917		90	3 H	G 6			1	
3724Q2	George MacGarver		6	118	2 H	G 4				3
3725B1	G. F. Schuler				3½ H	E 5			8	
3725D1	G. T. Macgarva	1913	10	120	6 H	E 15			20	
3725M1	J. A. Jory	1923	16		6 H	E 10			12	
3726A1	B. F. Pope	1905	10	133	6 H	G 10			7	
3726F2	John Waller	1918	10	130	4 H	E 10	4	6		
3726G2	G. Sandheim	1915	5	75	3 H	G 5				2
3726N1	A. B. Merten		12		6 H	E 15	13			
3727E1	H. A. Morel		10		3½ H	G 8		37	3	
3727F2	T. J. Brower	1914	8	60	5 H	G 6				1
3727R1	Louis Sanders		8		4 H	G 12				
3728E1	Mary J. Nolan		12		3 H	E 5				
3728E2	C. D. Doan		12		6 H	E 10	6	44		
3728L1	H. W. Haler		6		3 H	E 3				
3728Q1	K. Dolan		12		6 H	E 7½			2	
3728R1	R. G. Heeney		10		5 H	E 5	20	40		
3728R2	(Used together.)				5 T	E 7½				
3728R3					6 T	E 10				
3729A1	John Kirschenmann		10		6 H	G 20		35		
3729A2	M. E. Angier		12		6 H	E 15		45		
3729G1	do				8 T	E 20	80			
3729H2	Costa Bros		8		6 H	E 15		80		
3729M1	M. E. Angier		12		7 H	E 15	120			
3729M2	(Used together.)		12		7 H	E 15				
3729K1	O. S. Norton	1914	10	145	5 H	E 10		87		
3729P1	(Used together.)	1914	12	65	8 H	E 20		[a] 15		
3730A1	O. M. Lytle	1920	8	43	3 H	E 7½		6	2	
3730A3	John Clark	1903	6	68	3 H	G 6		10		
3730A4	C. J. Weber		8		5 H	E 5		10		
3730B1	W. C. McClellan		12	240	5 H	G 10		13		
3730B2	John Clark		6		3 H	G 5		10		
3730B3	(Used together.)		8		3½ H	G 7				
3730B5	George Beaman		6	75	2½ H	G 5		5		
3730C1	G. F. Morel (Used with 3730H2.)		12	40	5 H	E 15		25		
3730C2	G. L. Jones	1922	10	147	5 H	E 10	2	18		
3730C3	R. Williams		8		3 H	E 5		9		1
3730D1	M. E. Angier (Used with 3719R1.)		10	60	4 H	E 10	5	7		
3730D3	M. E. Angier		10	90	6 H					
3730D4	K. B. Flamm	1920			6 H	E 10		2½		
3730D5	Ridley, Taylor & Welch	1912	10	60	4 H	E 10	7½	2½		

[a] Interset with trees.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
3730E4	G. M. Cheatham		6		3 H	E 5				2½
3730E5	L. N. Lasell		8		2½ H	E 5	3			
3730E6	B. E. Gilmore		8		4 H	G 12				7
3730E8	Brodehl & Clements	1918			5 H	E 10	2	33		
3730E9	R. Aman		8		5 H	G 8	1	7	2	
3730F1	C. J. Weber		12		5 H	E 10		20		
3730F2	H. A. Powers				3½ H	E 5		8		
3730G1	G. M. Cheatham	1919	10	90	4 H	E 7½		14		
3730G2	M. Graglia	1920	10	95	4½ T	E 7½		13		
3730H1	M. D. Eaton	Old		90	6 T	E 15	12	22		1
3730H2	G. F. Morel (Used with 3730C1.)	1924	14	165	4 H	E 7½				
3730J1	L. C. Walling	1913	6	64	4 H	E 7½		15		
3730K1	H. H. Angier		12	200	5 H	E 15	19	6		
3730K3	E. T. Hawkins	1921	10	134	7 T	E 15	5	10		
3730K4	Mrs. Payton	1913	10	65	3 H	E 5		10		
3730L1	M. E. Angier		12	150	7 H	E 15	40			
3730L3	Grant Hendrick	1922	12	156	5 H	E 15	10			4
3730N1	E. E. Morse		10	93	3½ H	E 5		10		
3730P1	J. H. Bohnet	Old	12	50	4 H	E 10	4	21		
3730P2	F. A. Sanguinetti		8	118	4 H	G 8	5	15		
3730P3	(Used together.)			100	6 H	G 12				
3731A2	T. A. Strong	1913	4	103	1½ H	E 3				1
3731A3	C. Post (Used with 3731C2.)	1922		120	7 H	G 20		76		
3731B1	T. A. Strong	1913	6	62	4 H	G 8		15		
3731C1	Martin Perak	1916	6	56	3 H	G 5		2		2
3731C2	A. W. Post (Used with 3731A3.)	1922		80	7 H	G 20				
3731E1	George Meizner	1925	12	122	7 T	E 15		25	12	[f]25
3731G1	W. E. Wagner				3 H	E 5		5		
3731G2	D. V. Widney				3 H	G 22		15		
3731G3	(Used together.)		12		3 H	G 22				
3731G4	J. W. Walling	1912	8	75	6 H	E 5		15		
3731H1	Miss M. Whiting		10							
3731J1	J. C. Dutton	1907	10	60	4 H	G 6	3			
3731J2	T. Scott		10		4 H	G 6		10		
3731K1	J. W. Bunch		12	135	6 H	G 15		20		
3731M1	Blacklands Kadota Fig Co.	1927	12	260	5 H	E 15	104			
3731R1	(Used together.)	1927	12	275	4 H	E 15				
3732G1	E. W. Leffler	1919	10	126	5 H	G 12				
3732L1	do				5 H					
3732R1	C. H. Pierce		12	65	4 H	G 20	½		½	
3733H1	California Kadota Fig. Co. (Used with 3734A1 and B1.)		14	117	6 H	E 20	195			
3733L2	California Kadota Fig Co.		12	180	6 H	E 15	48			
3733N1	G. J. Leffler	1915	12	130	4 H	E 7½	1½		1½	
3733Q1	Fred Blanchre	1926	12	165	4 H	E 6	10			
3733Q3	S. Lindsay	1927	12	165	6 T	E 10				15
3733R2	O. F. Fischer	1927	12	91	2 Lift.	G 1½				1
3734A1	California Kadota Fig Co.		12		5 H	E 10				
3734B1	(Used with 3733H1.)		14		6 H	E 15				
3734H1	E. V. McCall		12		4 H	E 5	[c]23½		½	
3735D1	L. Rugani	1928	14	315	8 T	E 20	50	[l]100		[f]100
3735M1	(Used with 3735Q1 and R1.)	1927	14	215	8 T	E 20				
3735P1	W. E. Parker	1927	12	260	8 T	E 25	14			25
3735Q1	L. Rugani	1927	14	180	7 T	E 15				
3735R1	(Used with 3735D1 and M1.)	1928	12	135	7 T	E 15				
3736E1	E. Wilhoit (Used with 3736K1, P1, and P2.)				8½ T	E 25				[f]100
3736H1	J. N. Tone				6 H	E 15			7	
3736K1	E. Wilhoit				8 T	E 25				
3736P1		1927			8 T	E 20				
3736P2	(Used with 3736E1.)				8½ T	E 25				
3736Q1	Thomas Sanguinetti	1923	12	345	8 T	E 20	40	10		
386A1					6 T	G 10		12		
386C1	Fred Figge	1912		500	4 H	D 13				
686K1	A. Katz	1922	10	314	4 H	G 20			5	
383M2	S. Wakizaka	1927	10	153	[k]100 T	G 12		8		

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[c] Interset with vines.

[f] Planted in orchard.

[k] Gallons a minute.

[l] Cover crop planted in vineyard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed.	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
386N1	—— Wagaman				4	H	E					4
386Q1	Joe Golucie			500	8	T	G			8		
387J1	S. L. Wittmier	1920	12	80	6	T	E	7½		37	8	
387J2	John Schmidt				4	H	E	10		23		
388E1	H. Fetzer	1919	10	265	4	H	D	15			4	1
3817F1	—— Knoll					T	G	15		105		
3818B1	Dr. L. W. R. Langdon				[k]1,000	T	E	30		200		
3819J1	John Pugno		14		4	H	E	5		5		5
453E2	A. P. Nessen		8	150	2	H	E	2	8			
453P1	E. R. Pinkham	1926	10	30	6	H	E	15	1		29	
453R1	J. K. Dawson	1921	12	115	5	H	E	15			40	
454D1	P. Chinquini (?)	1926	10	200	5	H	G	20				2½
454N1	John Altnow	1925	10	206	6	H	G	12			[d]4	
455E1	Frank Ferrari				3	H	G	20			5	
455J2	H. R. Capples (?)		12	108	5	T	G	15	7		7	
456L2	Charles Lamb Co	1925	6	52	3	H	E	5				1
4510D2	Lewis, Simas & Jones (Used together.)		12		8	H	E	20			149	
4510H1			14		6	H	E	15				
4510H2			14		6	H	E	15				
4512N2	Lottie Howard (Used together.)	1923	10		4	H	E	7½	1		38	1
4512N3		1923	10	60	4	H	G	20				
4512N4	D. L. Ray	1923	10		4	H	G	8			5	
4512Q1	A. Frandy	1920	10	130	3	H	E	5		14		
4513D1	V. Barone		8		5	H	E	10		10	10	
4513H1	A. Panzica	1926	8	75	5	H	G	20		23		
4513R1	A. Maggia	1920		60	4	H	E	7½		10	2	7
4514C1	Harrie Whitten	1915			5	H	E	15			50	
4515G2	C. B. Orvis	1919		150	6	H	E	15			35	
4523Q3	Gustave Fuhrmann (Used together.)		6	80	4	H	G	7		60	2	18
4523R1			12	85	6	H	G	20				
4524A2	W. B. Vandewark	1910	6		5	H	G	16			7	
4524D2	George Murphy	Old.	6		3	H	G	5				2
4524D3	Frank Miller	1925	10	80	5	H	E	15		40		
4524H1	George Gorlis	1922	8	50	4	H	G	8		10	12	
4524P1	O. H. Wood		8	60	6	H	G	20		16		
4525R1	T. H. Beckman		12		6	H	E	15		140		
4526L1	D. H. Soucie	1920	10	75	4	H	G	6		27		
4526M1	Henry Perrin	1921	10	40	5	H	G	15		30		
4526P2	Delta Land Co	1920	14	65	6	H	E	15			18	
4535K1	J. O. Johnson	1924	12	110	6	H	G	18				
4535L1	V. Barone		12		4	H	G	8				6
4535Q1	John Gusdmono		12		5	H	G	10		25		
4536P2	C. A. Posey	1918	10	60	4	H	G	15		10		
461N1	Hugo Bates	1924	10	70	3	H	E	5	2	8		
461P1	J. A. Burt	1915	10	65	3	H	G	5	3	3		
461Q2	J. Zeng	1923	10	135	3	H	G	5	8			
461R3	E. Forget	1922	10	53	4	H	G	15		15	4	
461R4	Bert Saunders			38	3	H	G	15				
462C1	E. Gudel	1921	10	75	[k]700	T	E	15		12	10	
462J1	Mrs. M. H. McCauley		10	200	5	H	E	15			3	
462L1	Brown estate and Friedberger.		10		3	H	G	8	20	140		
462L2	do		10	85	5	H	E	15				
462M1	do		10	85	4	H	G	9				
462M2	do		10	85	3	H	G	5				
462R1	do		8		5	H	E	16				
463C1	French American Co (Used with 463D3.)	1918	10		4	H	G	12		50		
463D1	A. E. Tardel	1920	10	72	3	H	G	6				
463D3	French American Co (Used with 463C1.)	1918	10		6	H	G	12				
463H1	Fred Wageman	1920	8	45	2	H	G	7		6		
463H3	Anton Stephens	1915	6	75	4	H	G	20		6		
467J1	L. Poundstone	1924	10	85	4	H	G	20		10		
467N1	do	1923	10	90	6	H	G	20				13
467P1	do	1925	10	85	4	H	G	20				10
467P2	do	1926	10	90	4	H	G	20				15
467P3	do	1926	10	86	4	H	G	6				9
4610C1	G. B. McCauley	Old	14	100	6	H	G	15			30	
4610N2	Ing Bros	1905	12		10	H	E	35		120		
4611D2	F. W. Hitchcock		6	35	3	H	G	22			[f]5	
4611N1					7	T	E	25		70		
4612A1	C. Mitling	1907	10	85	3	H	E	5	5	4	2	1

[d] Used to supplement canal. [f] Planted in orchard. [k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4612D2	P. Lewis	1911	10	145	4	H	E	10	------	20	------	------
4612H1	J. C. Heuer	1921	6	84	4	H	G		5	15	------	------
4612H2	Charles Childers	1919	10	------	3	H	G	10	5	3	------	------
4612M1	G.A. Jahant	1922	12	200	6	H	E	15	------	18	------	------
4612R2	do	1905	10	100	3	H	E	5	------	9	------	------
4613A1	Mrs. Sarah Fanos	------	12	------	5	H	E	15	------	35	------	------
4613A2	A. E. Gordon (Used with 4613E1.)	1912	8	50	3	H	E	5	10	35	------	------
4613D1	Mrs. B. E. Ryan	------	10	------	5	H	E	15	20	30	------	------
4613E1	A. E. Gordon (Used with 4613A2.)	1916	10	50	4	H	E	10	------	------	------	------
4613F1	P. Hazen	1914	12	750	5	H	E	15	26	30	------	24
4613H1	Carl. T. Lind	1924	10	------	4	H	E	10	------	70	------	------
4613M1	L. H. Van Valkenburgh	1913	12	68	5	H	E	15	------	85	8	25
4613N1	John Thompson	1922	10	100	5	H	E	15	10	35	------	------
4613P1	Mrs. M. Jahant	1917	12	135	[k] 1,200	T	E	25	7	73	------	------
4613Q1	Mrs. Detert	1915	8	------	4	H	G	12	------	20	------	------
4613Q2	C. E. Mills	1913	6	------	3	H	E	5	5	[m] 13	[f] 2	------
4614B1	Jahant Sisters	1915	8	60	4	H	E	7½	------	30	------	------
4614E1	W. V. Jahant	1912	12	50	6	H	E	20	25	63	------	18
4614F1	do	1922	12	110	6	H	E	15				
4614H1	Jahant Sisters	1902	12	60	6	H	E	15	------	20	------	15
4614J1	D. E. Newton	------	8	------	5	H	E	10	------	20	1	------
4614K1	John Walter	1917	8	93	4	H	E	7½	------	15	------	------
4614K2	do	1915	6	94	3	H	E	5				
4614K4	P. T. Quinn	1917	10	------	4	H	E	10	------	20	------	------
4614L1	W. V. Jahant (Used with 4614Q1.)	1920	10	110	4	H	E	10	------	80	------	------
4614M1	P. Sirbmitesos	1926	10	53	3	H	G	15	------	15	------	------
4614N1	C. L. Newton	1912	8	47	6	H	E	15	------	50	------	------
4614P1	Paul Wencel	1911	12	100	4	H	E	10	------	20	------	------
4614P3	do	------	12	------	4	H	E	10	------	20	------	------
4614Q1	W. V. Jahant (Used with 4614L1.)	1913	12	110	6	H	E	20	------	------	------	------
4614R1	R. W. Gillette	------	12	90	4	H	E	10	------	------	20	------
4614R3	G. H. Lewis	1924	12	98	[k] 500	T	E	10	------	20	------	------
4615A1	T. C. Bender	1920	10	97	5	H	E	10	------	50	------	------
4615P1	A. R. Strother	1915	10	76	5	H	G	10	------	------	16	------
4615P3	Louis Manna	1925	10	50	4	H	E	10	------	10	------	------
4615R1	C. J. Bender	1917	12	77	6	H	E	15	------	65	5	------
4616D1	E. G. Bender	1920	10	86	5	H	E	10	------	30	------	------
4616L2	A. Taddei	------	------	------	6	H	G	12	------	------	------	20
4616M2	Dan Wageman	1920	8	87	4	H	G	7½	------	5	4	------
4616N2	N. V. Williams	------	12	------	7	H	E	20	45	10	------	------
4616R1	Adolfo Marsili	------	8	------	4	H	G	8	------	13	------	------
4616R3	W. Burger	1920	8	80	4	H	G	8	------	12	5	------
4617C1	—— Kessel	1926	8	115	5	H	G	20	------	10	10	11
4617C2	Harry McLane	1912	12	153	7	H	G	15	------	47	------	------
4617G1	Dennis Moran	1921	8	72	4	H	G	8	------	16	------	------
4617M1	O. K. Investment Co. (Used with 4617R1.)	------	12	------	7½	H	E	20	------	120	------	------
4617N1	J. A. Chapdelain	1921	12	210	7	H	E	25	------	------	35	------
4617P1	do	1921	12	110	7	H	E	25	------	15	------	------
4617R1	O. K. Investment Co. (Used with 4617M1.)	------	12	------	7½	H	E	20	------	------	------	------
4618B1	V. Chiddo	1927	7	155	5	H	G	20	------	20	------	------
4618B2	E. Soucie	1927	7	128	4	H	G	20	------	17	------	6
4618E1	V. Braghetta	1926	12	134	5	H	E	15	------	55	------	15
4618F1	do	1926	10	31	5	H	G	15				
4618H4	Marion De Vries	1925	12	68	5	H	G	20	------	------	------	10
4618L1	F. H. Buck Co.	1924	14	------	6	H	E	20	------	40	------	------
4618M2	Con Kromer	Old.	10	50	6	H		12	------	------	5	------
4618Q1	W. B. Van Dewark	1922	12	95	5	H	E	15	------	------	30	------
4618R1	H. Perrin	1913	12	60	5	H	E	15	------	35	[f] 5	------
4619A1	Mrs. C. Rolley	1925	8	44	6	H	E	10	------	35	5	------
4619B2	R. B. Forsyth (Used with 4619E1.)	1922	12	60	6	H	E	15	------	35	3	2
4619C1	Mrs. M. Hargis	1922	12	80	5	H	E	15	• 5	35	------	------
4619D1	J. Z. Alexander	1920	10	30	4	H	G	20	------	14	------	------
4619D4	(Used together.)	1922	10	35	4	H	G	20	------	------	------	------
4619E1	R. B. Forsyth (Used with 4619B2.)	1928	8	90	3	H	E	5	------	------	------	------

[f] Planted in orchard

[k] Gallons a minute.

[m] 3 acres interset with trees.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
4619E4	Schnake Bros	1924	10	46	3 H	G 5	2	7	------	------
4619F1	do	1926	10	80	5 H	G 20	------	------	10	------
4619G1	N. Rond	1905	6	52	4 H	E 10	------	14	------	3
4619H1	Gertrude A. Gray	1895	8	50	6 H	E 10	------	[n] 60	------	------
4619J1	H. C. Thiessen, jr	1921	6	60	3 H	E 5	------	------	------	5
4619J2	M. Leetzow	1926	7	50	4 H	E 7½	5	21	4	------
4619K1	do.[c]	1926	8	50	5 H	G 20	------	------	------	40
4619L1	C. L. Woods	1910	8	------	4 H	E 7½	------	------	2	------
4619M1	N. Bush	1922	6	------	3 H	E 5	------	15	------	------
4619M3	Scott MacDonald	1904	8	68	3 H	E 5	------	6	------	------
4619M6	Mrs. C. Aldridge (Used with 4619R3.)	1915	8	55	3 H	G 5	½	29½	------	------
4619P1	M. Leetzow	1926	8	50	5 H	G 20	------	------	------	30
4619R1	W. R. Kane	------	6	------	2 H	G 3	------	------	------	4
4619R3	Mrs. C. Aldridge (Used with 4619M6.)	1921	8	55	4 H	E 7½	------	------	------	------
4620A2	E. Banini	1925	10	49	6 H	------	------	------	------	------
4620A3	—— Locke	1918	12	68	9 H	------	------	------	------	------
4620B1	E. Banini	1925	10	------	5 H	------	------	------	------	------
4620D1	J. E. Greer	1912	12	44	6 H	E 20	10	------	------	30
4620G1	T. H. Strickland	1921	8	------	5 H	G 12	10	------	------	------
4620H1	F. H. Aberle	------	12	105	6 H	E 15	40	------	------	------
4620J1	Mrs. L. J. Greer	1926	10	56	4 H	G 20	------	------	------	6
4620L1	L. Chapdelain	------	12	98	5 H	G 20	3	17	------	------
4620L2	Mrs. M. Deviney	1917	6	------	3 H	G 5	3	16	[f] 1	------
4620N1	Chas. Greer	1927	10	------	4 H	G 20	------	------	------	5
4620P1	Chapdelain estate[c]	------	10	148	7 H	E 25	------	85	------	------
4620Q1	do	------	10	70	5 H	G 20	------	60	------	------
4620R2	do	------	10	62	5 H	G 20				
4620R3	do	------	10	105	5 H	G 20				
4621D2	G. E. Stewart	1924	10	------	6 H	------	------	------	------	------
4621E1	J. Kurtz	1924	12	325	6 H	E 15	------	20	------	------
4621J2	W. H. Brown	1924	8	27	3 H	G 5½	------	5	2	7
4621K1	H. D. Shinn	------	12	285	6 H	G 15	------	------	[f] 25	------
4621K2	W. H. Brown	1925	8	28	3 H	G 7	------	------	------	------
4622A1	E. A. Benedict	1919	8	60	4 H	E 10	3	13	4	5
4622B1	H. B. Marke	1915	8	------	4 H	E 10	------	------	10	------
4622B3	I. Elam	1919	10	65	3 H	E 7½	8	12	------	------
4622C1	C. L. Newton	1917	5	39	4 H	G 10	------	20	------	------
4622C3	W. B. May	1915	10	87	4 H	E 10	------	20	------	------
4622F2	J. H. Yenglin	1910	------	32	3 H	E 5	------	10	------	------
4622F3	W. Robinson	1917	10	------	3 H	E 5	------	[l] 5	------	------
4622F4	Henry Batch	1917	10	85	3 H	E 7½	------	6½	------	------
4622F6	—— Wendland	1915	8	62	4 H	E 10	------	15	------	------
4622F7	E. A. Benedict	1919	8	60	4 H	E 10	------	23	------	------
4622G1	C. C. Woodworth	1915	10	------	4 H	E 10	------	[e] 40	------	------
4622H1	do	1915	10	------	5 H	E 15	------	40	------	------
4622J1	J. Conklin	1915	12	------	4 H	G 7	15	3	------	------
4622J2	—— Northrop	------	10	------	6 H	------	------	30	------	------
4622K1	A. Maresili	1920	12	100	4 H	E 15	------	30	------	------
4622K2	A. Giorgi	1915	8	97	4 H	E 7½	------	10	------	------
4622L1	Nolan estate	1916	10	65	4 H	G 8	------	10	------	------
4622L2	Pacific Fruit Co	1918	10	65	7 H	E 15	------	[l] 30	------	------
4622M1	Nolan estate	1914	10	63	4 H	G 8	------	------	------	------
4622M2	do	1914	10	93	5 H	G 10	------	40	------	------
4622Q1	M. Manna	1915	8	80	4 H	E 10	------	18	2	------
4622Q3	—— Willa	1922	8	80	4 H	G 15	10	------	------	------
4622Q4	John Manna	1921	10	68	4 H	E 7½	------	10	------	------
4622R1	J. Hartman	1920	12	------	5 H	E 15	------	36	4	------
4623A1	J. M. White	1917	8	90	5 H	E 15	------	------	20	------
4623A3	do	1920	8	40	5 H	G 12	------	------	------	------
4623C1	C. C. Woodworth	1918	10	------	5 H	E 15	71	9	------	------
4623C2	do	1914	10	------	5 H	E 15				
4623D1	Adams & Porterfield	1914	10	90	4 H	E 10	------	------	------	------
4623E1	C. C. Woodworth	1914	12	------	5 H	E 15	40	------	------	------
4623G1	Everts Mills	1919	12	------	6 H	E 20	------	[l] 80	------	------
4623H1	George LeFeber	1912	10	316	4½ H	E 10	30	25	------	------
4623J1	C. W. Howard	1920	10	58	4 H	E 10	------	20	------	------
4623J3	F. Mills	------	8	------	4 H	E 10	------	20	------	------
4623K1	J. M. Miller	1920	10	------	4 H	G 10	------	10	------	------
4623K3	Otto Faust	1918	6	------	3 H	E 5	------	3½	------	------
4623K4	I. Wiltse	1916	10	102	4 H	G 9	10	5	------	------

[e] Interset with trees.
[c] With aid of canal.
[f] Planted in orchard.
[l] Cover crop planted in vineyard.
[n] 30 acres interset with trees.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
4623L1	Denehy & Howard	1920	10	72	4 H	E 10	-----	30	-----	-----
4623M1	—— Keany	1924	10	-----	5 H	E 15	-----	40	-----	-----
4623N1	—— Wilkinson	-----	8	-----	4 H	E 10	-----	40	-----	-----
4623P1	Mrs. C. C. Pattee	-----	8	-----	4 H	E 10	7	13	-----	-----
4623P3	Ben Grentz	1917	10	-----	4 H	E 10	-----	20	-----	-----
4623Q1	J. E. Conklin	1913	6	105	3 H	E 5	-----	-----	-----	4
4623Q2	C. V. Shields	1924	10	-----	3 H	E	3	20	-----	-----
4623R2	E. S. Ferguson	1908	8	108	3 H	E 7½	35	25	-----	-----
4623R3	do	1908	8	110	4 H	G 10				
4624B1	Mrs. M. Littlehale (Used with 4624F1.)	1916	12	140	5 H	E 15				
4624C2	W. H. Adams	1909	12	90	4 H	E 10	20	7	-----	-----
4624D1	William Petzinger	1911	10	92	5 H	E 15	41	9	-----	-----
4624F1	Mrs. M. Littlehale (Used with 4624B1.)	1916	12	140	5 H	E 15	-----	100	-----	-----
4624F2	Mrs. Mamie Jahant	1911	12	98	4 H	E 10	-----	60	-----	-----
4624G1	Mrs. N. C. Moore (Used with 4624M1 and R1.)	1900	8	-----	6 H	E 20	140	50	20	30
4624H1		1917	10	-----	6 H	E 20	-----	-----	-----	-----
4624K1	A. M. Tower	1907	8	-----	4 H	E 10	8	24	2	2
4624M1	Mrs. N. C. Moore (Used with 4624G1, H1, and R1.)	1900	8	-----	5 H	E 25	-----	-----	-----	-----
4624N1	E. Crump	-----	10	-----	4 H	E 10	-----	40	-----	-----
4624N3	W. Street	1920	8	100	4 H	G 8	-----	[e] 4	[f] 1 2	1½
4624P1	E. A. Humphrey	1905	10	75	4 H	E 10	15	25	-----	-----
4624P4	W. W. Henderson	1892	12	100	4 H	E 10	10	5	-----	-----
4624R1	Mrs. N. C. Moore (Used with 4624G1, H1, and M1.)	1900	10	-----	6 H	E 20	-----	-----	-----	-----
4625A1	Mrs. W. A. Shinn	1922	8	130	3 H	E 5	15	-----	-----	-----
4625A2	G. J. Oliver	1914	6	125	3 H	E 5	1	-----	-----	-----
4625A4	C. R. Van Buskirk (Used with 4625F1.)	-----	8	-----	3 H	E 7½	[c] 90	40½	-----	-----
4625B2	—— Madison	-----	10	-----	4 H	E 10	-----	35	-----	-----
4625B3	do	-----	10	-----	4 H	E 10				
4625D2	J. McKinley	1922	8	-----	4 H	E 10	4	5	-----	1
4625D3	Beckman, Welch & Thompson. (Used with 4625G1.)	1908	12	65	7 H	E 25	76	30	-----	-----
4625F1	C. R. Van Buskirk (Used with 4625A4.)	1922	10	218	4 H	E 10	-----	-----	-----	-----
4625G1	Beckman, Welch & Thompson. (Used with 4625D3.)	1908	12	70	7 T	E 20	-----	-----	-----	-----
4625H1	J. Prentice	1917	8	-----	4 H	E 10	-----	20	-----	-----
4625H2	E. L. Hibbs	1925	8	60	3 H	E 7½	4½	7	-----	-----
4625H3	Montgomery, Thompson & Focacci.	1917	8	50	3 H	E 7½	4	7	-----	-----
4625M1	O. Siegalkoff	1924	14	100	[k] 800 T	E 15	43	27	-----	-----
4625M2	do	1921	14	85	6 H	E 15				
4625M3	O. N. England	1915	8	53	6 H	E 25	16	14	-----	-----
4625P1	E. T. McKenzie	1922	16	599	5 H	E 15	2½	66	-----	-----
4625Q1	C. A. Pope	1919	10	87	3 H	G 8	-----	15	-----	-----
4625Q3	Chris Schlag	1923	8	-----	4 H	E 10	-----	10	-----	-----
4625Q4	N. Whittaker	1916	10	90	4 H	E 10	-----	35	-----	-----
4625R1	J. C. Burson	-----	6	-----	3 H	E 7½	-----	10	-----	-----
4625R3	C. W. Coffman	1907	10	95	3 H	E 5	4	6	-----	-----
4626A1	F. Mills	-----	10	-----	6 H	E 15	-----	30	-----	-----
4626B1	F. J. Engle	1920	8	-----	3 H	G 9	2	8	-----	-----
4626B2	Fred Sollars	1920	-----	-----	5 H	E 15	-----	30	-----	-----
4626D2	W. S. Blodgett	1922	12	90	6 H	E 15	-----	50	-----	50
4626E2	G. Resso	Old.	6	95	4 H	G 10	-----	20	-----	-----
4626E4	Mary E. Allspaugh	1920	12	90	9 H	E 15	-----	20	-----	20
4626E5	-----	-----	8	-----	4 H	E 7½	-----	24	-----	-----
4626J1	Mrs. E. Anderson	1924	4	87	2 H	G 1½	-----	-----	-----	2
4626K1	Mrs. R. C. Bridge (Used with 4626P1 and R1.)	1907	8	250	6 H	E 20	26	180	-----	3
4626K2		1907	8	250	5 H	E 15	-----	-----	-----	-----
4626N1	C. R. Rutlidge	-----	12	-----	6 H	E 15	-----	57	-----	-----

[c] Interset with vines. [e] Interset with trees. [f] Planted in orchard. [k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed.	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
4626P1	Mrs. R. C. Bridge (Used with 4626K1 and K2.)	1907	6	250	3 H	E 5				
4626R1		1907	8	250	6 H	E 20				
4627B2	Jacob Knoll	1910	12		6 H	E 15		40		
4627C1	F. H. Atchison	1907	8	60	4 H	E 10				
4627D1	Mrs. M. Farrell	1926	10		5 H					80
4627L1	do. (Used with 4627Q2.)	1915	12		6 H	E 20		100		
4627Q1	J. V. Bare	Old.	6		1½ H	E 3			2	
4627Q2	do. (Used with 4627L1.)	Old.	8		3 H	E 5				
4627R1	Washington Place		14		7 H	E 15	2	78		
4628R1	Wm. Leuchland	1916	8		4 H	G 5				
4628R4	—— Morehead		10		5 H	G 12				
4629A2	Chapdelain estate	1923	12	62	5 H	G 20		40		
4629P1	Clark Snyde	1915	12	40	5 H	E 10		5		
4629R1	J. V. Bare	1923	8		3 H	E 5		20		
4629R3	do.	1922	12		6 H	G 25			[f] 10	
4630D1	J. A. Chapdelain	1925	10	72	3 H	G 6		10		
4630F1	J. Vieira	1926	10	50	5 H	G 20		[l] 15		
4630J1	H. Siemering	1918	12	52	3 H	G 6	6	20	4	4
4630K1	H. Batch	1926	10		5 H	G 20		10		
4630K2	J. Filipidis	1922	8	50	3 H	E 5		9½		½
4630N1	G. Oxender	1922	8	35	H	G 6		16½	2½	1
4630N4	Louis Serra	1922	12	30	3 H	E 5		13	¼	
4630P1	S. Thomas	1926	8	47	3 H	E 5		10		
4630P2	L. McMillen	1920	10	40	4 H	E 7½		10		
4630Q1	A. Polonio	1927	10	50	5 H	G 12				8
4631D1	W. G. Bonine	1919	8		2¾ H	E 5		40		
4631D2	do.	1925	8	54	4 H	G 20				
4631D3	C. N. Fore	1914	12	60	4 H	E 7½		16	[f] 3½	
4631D5	G. Giorgi	1927	10		5 H	E 10				
4631N1	J. F. Schroeder	1926	10	64	3 H	E 5			4	1
4631N2	William Kane		8		3 H	G 8				
4631P1	J. A. Lauchland	1922	6	65	3 H	E 5				4
4632C1	O. Spenker	1924	10	35	5 H	G				
4633A2	J. F. Mortenson	1918	7	50	4 H	G 6				
4633A5	J. F. Blohm		10		5 H	E 10			5	
4633B1	do.		6		1½ H	G 3				
4633B2	Otto Poser		10	60	4 H	E 7½	2			
4633B3	C. E. Perryman		10	60	4 H	E 7½	13			
4633C1	E. H. Ridenour	1906	6	125	3 H	E 5	1			
4633C2	H. Walker		10		3 H	E 5		12		
4633C3	R. J. Stuck	1922	7	72	1 H	E 3				5
4633E1	Pete Hanson		8		3 H	E 5			[f] ½	1½
4633M1	C. A. Peterson	1919	8	50	4 H	G 20				3
4633N2	J. H. Williams	1924	6	55	3 H	G 6				1
4633N3	Gus Mikalis	1908	6	45	3 H	E 5		10		
4633N4	Mrs. E. D. Fore	1908	6	47	3 H	E 5		9		1
4633P1	G. H. Darrah	1924	10		4 H	E 10		20		
4633P2	Boyce Sisters		8		4 H	E 7½		20		
4633Q1	M. E. Roseberry	1907	4	75	3 H	G 5				
4633R1	Herman Kurtz	1922	10	48	[k] 600 H	E				
4633R3	C. A. Peterson	1923	10	50	4 H	E 7½	3¾		¼	
4634A1	M. Reimche		10		H	E 5		8		
4634A2	L. E. Gregson	1920	10	68	3 H	E 5		6	2	3
4634A3	John Nipkau	1926	10		5 H	G 15	[c] 20	40		
4634A5			12		3 H	E 5		10		
4634B1	George Finnin		6		4 H	G 8		2	1	3
4634C1	Woodbridge Golf & Country Club.	1925	6	38	4 T	E 10				53
4634E2	Mrs. Bechthold		10		4 H	G 8		24		
4634F1	—— Wilson	1926	10	130	3 H	G 20		8		
4634F2	P. Dole		10		4 H	G 6		10		
4634G1	J. S. Coleman		4	34	1½ H	E 3		[l] 1½		
4634K1	H. B. McClung	1898	8	60	4 H	G 6		18		
4634M1	Cemetery	1915	5	70	3 H	G 3				
4634P1	B. A. Town	1917	12	85	5 H	G 20				
4635A1	F. Journeay	1926	12	110	4 T	E 10		50		
4635A3	J. H. Willms				4 H	E 7½	30			
4635C1	John Bewley		8		5 H	G 10		35		
4635D1	W. C. Caldwell	1914	10	80	4 H	G 10		17		
4635D3	J. Schafer	1926	14	120	4 T	E 10		27		

[c] Interset with vines.
[f] Planted in orchard.
[k] Gallons a minute.
[l] Cover crop planted in vineyard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4635E1	J. B. Jones	Old	8	60	3	H	G	4	5	6	------	------
4636A2	Smith & Zimmerman	------	10	87	7	H	E	10	------	26	------	------
4636A3	P. Bosen	1908	6	------	2½	H	G	6	------	5	------	------
4636B2	P. S. Gray	Old.	8	65	4	H	E	10	------	31	------	------
4636C1	Patton & Wood	1912	10	55	4	H	E	10	------	24	------	------
4636C3	J. Nielsen	1918	10	50	4	H	G	9	------	15	------	------
4636D2	Henry Goehring	1917	10	------	3	H	E	5	------	15	------	------
4636D1	G. Bietz	1920	10	------	4	H	E	10	------	15	------	------
4636E1	Smith & Zimmerman	1922	12	137	7	H	G	15	------	25	------	------
4636F1	—— Utterback	1912	10	70		H	G		------	35	------	------
4636G1	—— McVicker	1924	6	60	3	H	E	5	------	3½	------	------
4636G2	J. Woock	1912	12	------	5	H	E	15	6	27	2	10
4636G3	John Chapdelain	------	10	------	4	H	E	10	------	15	------	------
4636H1	Frederick Merd	1912	6	------	4	H	E	7½	4	6	------	------
4636H3	Jacob Dollinger	1912	6	------	4	H	E	7½	------	10	------	------
4636H5	—— Krupp	1920	10	------	4	H	E	10	------	26	------	------
4636J1	E. Blazer	1917	10	28	4	H	G	12	------	12	------	------
4636K1	L. P. Newcomb	1917	------	------	4	H	G	12	------	22	1	------
4636M1	Raymond Mason	1917	13	204	4	H	E	10	1	29	------	------
4636N3	Frank H. Buck Co	------	10	------	5	H	G	15	25	35	------	------
4636P1	Stefano Sanguinetti Co	1885	12	135	4	H	E	10	4½	35	½	------
4636Q1	L. J. Loveless	1916	8	45	4	H	E	7½	9	14	2	------
471A1	A. Aldrich	1924	10	175	2½	H	E	5	------	------	1	------
471D1	J. W. Hill	------	6	400	4	H	E	15	------	------	------	------
471E2	E. Hart	------	------	250	4	H	E	10	------	------	8	12
471F1	J. B. Harrison	------	------	150	4	T	G	10	------	------	4	------
472B4	A. Klugow	1919	14	400	5	H	G	30	------	5	7	------
472C2	C. Hart	------	10	508	4	H	G	12	------	------	15	------
472N1	A. E. Wakefield	1927	12	440	6	T	E	15	------	40	------	------
473J1	—— Jowawlsing	1922	12	400		T	E	20	5	55	------	------
473M1	W. S. Ricketts	1921	12	275	[a]400	T	E	15	40	12	4	8
473P1	Pacific Fruit Exchange	------	12	400		T	E	20	------	50	------	------
473R2	Thompson Co	------	12	80		T	E	15	------	80	------	------
474A2	F. N. Galer	------	12	190	4	H	G	20	------	10	------	10
474Q1	—— Jowawlsing	1924	12	180		T	E	20	------	60	------	------
474R1	Pacific Fruit Exchange	------	12	500	6	H	E	25	------	75	------	------
475E2	P. Leakep	------	------	------	4	H	G	10	------	40	------	------
475E4	D. D. Werner	1920	6	54	3	H	E	10	------	20	------	------
475J1	—— Brown	1922	------	203	3	H	G	10	------	12	------	------
475M1	Frank Cordway	------	10	------	3	H	G	6	------	------	------	1
476A2	J. C. Marshall	1916	------	60	2	H	E	5	------	10	------	------
476B1	Mrs. E. A. Krieger	1900	6	------	3	H	G	6	------	27		
476B2	do	1915	6	------	4	H	G	9			------	------
476H1	Mary Kenefick	1915	8	50	5	H	G	12	------	------	------	4
476L1	G. S. Burtsh	1921	12	50	4	H	G	9	------	15	------	------
476M1	do	------	13	50	2	H	E	5	------	5	------	------
476P1	Frank Wessel	1921	8	50	3½	H	E	7½	------	11	2¼	------
476R3	M. Hake	------	10	250	4	H	E	10	------	30	------	------
477A1	R. B. Robinson	1860	10	135	3½	H	E	7½	½	4	1	4½
477E2	J. G. Woodson	1912	12	90	5	H	G	20	------	14	------	------
477H2	O. R. Dustin	1923	14	90	5	H	E	15	------	53⅓	------	------
477L1	Frank Irey (Used with 477Q1.)	1912	------	------	4	H	G	15	------	68	------	------
477M1	Fred Fischer	1921	12	70	5	H	E	15	------	16	8	------
477Q1	Frank Irey (Used with 477L1.)	1912	------	------	5	H	E	15	------	------	------	------
477R1	Fred Fischer	1916	12	62	4	H	E	10	------	9	8	------
478E1	E. Sullivan	1918	12	135	3	H	E	10	------	20	------	------
478E2	do	1908	6	90	1½	H	E	3	------	------	------	2
478M3	A. Hall	1921	8	126	4	H	G	8	12	------	------	------
478M4	Mrs. Bushman	1921	10	130	4	H	G	10	12	------	4	1
478N1	A. Carlson	1925	12	75	4	H	E	10	30	------	------	------
478P1	O. H. Smithson	1923	12	65	4	H	E	10	------	45	------	------
478Q2	M. B. Smithson	1920	12	45	5	H	E	15	------	40	------	------
478Q3	J. E. Stribling	1913	12	67	4	H	E	10	14	14	------	------
478R2	A. W. Andrews	1915	12	71	[a]600	T	E	15	12	------	8	------
479A1	—— Miller	1913	12	------	4	H	E	10	------	40	------	------
479B1	F. Ringe	------	------	------	4	H	E	10	------	8	6	6
479D1	E. Benedict	------	------	325		T	E	20	------	18	------	------
479F1	F. P. Hamsher	1915	12	400	4	H	G	15	4	8	12	------
479J1	Acampo Vineyard Co	------	12	146	5	H	E	15	------	42½	------	------
479J2	—— Vavero	1925	10	162	4	H	E	10	------	15	------	------
4710C1	S. Davis	1925	12	140	8	T	G	22	------	------	------	------

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[a] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4710E2	J. Michels	1919	12	379	5	H	G	15	6	13	------	------
4710F1	James Riordan	1927	14	190	4	H	G	15	10	40	------	------
4710K1	—— Sanier	1920	10	130	4	H	G	12	------	20	------	------
4710K2	L. Scobert	1921	12	80	4	H	G	12	2	18	------	------
4710N1	Klinger & Strickland	1923	14	70	4	H	G	12	20	------	------	------
4710P1	J. Gribaudo	1925	10	75	[k] 300	T	E	7½	------	[l] 10	------	------
4710P3	Klinger & Strickland	1927	12	172	4	H	G	12	10	------	------	------
4710P4	T. R. Griffith	1923	12	72	4	H	G	12	------	5	------	------
4710Q2	W. E. Underwood	------	12	430		T	E	25	50	30	------	------
4711A1	G. H. Seibel	1926	12	68	3	T	E	7½	------	------	------	5
4711D1	Reese Thompson	1921	14	520	[k] 800	T	E	20	------	------	------	------
4711F1	do	1923	14	670	[k] 1,000	T	E	25	------	30	25	------
4711P2	F. E. Lake	1911	12	208	5	H	E	15	5	------	------	------
4711Q1	Mrs. G. F. Wakefield	1918	6	130	4	H	E	7½	------	------	3	------
4711Q3	C. L. Seibel	------	10	170	4	H	E	10	1	9	------	------
4711R1	F. A. Zimmerman	------	14	190	3	H	E	7½	------	------	3	------
4712E1	Carl Leer	1920	----	560	5	T	E	25	------	20	4	------
4712L3	—— Anderson	1926	6	72	Lift.		E	5	3	2	------	------
4712P3	R. G. Ellingwood	1917	12	550	4	H	G	12	1	------	4	------
4713A2	C. W. Murray	1926	----	-----	5	T	E	10	------	20	------	5
4713B1	K. Cachuck	1927	12	110	3	T	E	10	1	11	------	------
4713C1	Eva P. Epstein	------	----	-----	[k] 300	T	E	10	10	10	------	------
4713E1	Joe Gilbeau	1926	14	-----	[k] 600	T	E	15	------	80	------	------
4713G1	—— Dobbins	------	----	-----	6	T	E	15	10	30	------	------
4713K1	B. A. Steele	------	12	175	[k] 500	T	G	16	------	20	------	10
4713P1	Fairbanks & Dement	1922	14	600	8	T	E	30	------	80	------	------
4714A1	John Priebe	1925	10	450	[k] 450	T	E	15	------	29	3	------
4714C1	E. C. Goodrich	------	----	-----	4	T	E	15	6	------	4	------
4714C2	T. O. Owens	1926	12	125	[k] 350	T	E	7½	7½	2½	------	------
4714D1	G. A. Herrick	1916	12	316	5	H	E	20	2	5	[f] 12	------
4714J1	Theobald Kirschenmann	1921	12	250	[k] 350	T	G	10	------	13	------	------
4714J2	G. G. Bertsch	1921	12	320	3	H	E	7½	------	18⅓	------	------
4714L1	Charles Olson	1922	10	554	5	T	E	10	------	------	1	------
4714M1	A. C. Duncan	1926	10	200	2	H	E	5	12	8	5	------
4714N1	John Molinego	------	10	70	[k] 300	T	E	10	------	13⅓	------	------
4714N2	Pete Rinaddo	1923	10	130	[k] 400	T	E	10	3	10⅓	------	------
4714P2	C. C. Fairchild	1921	12	234	4	H	E	15	------	40	------	------
4714Q1	Pete Rinaddo	1927	----	-----	5	H	E	7½	------	[l] 10	------	------
4714R2	do	------	----	-----	3	H	E		------	------	2	------
4715A2	E. R. LaValley	1919	----	420	6	H	G	20	------	10	------	------
4715B1	J. Frey	------	----	-----	6	T	G		------	8	------	------
4715B2	Dave Weber	------	----	-----	5	T	E	10	------	12	------	------
4715C1	R. L. Carter	1927	12	129	[k] 300	T	E	7½	12½	5	2½	------
4715C2	------	------	----	-----		H	E		------	------	------	------
4715D1	Leonard Baumbach	1926	12	140		T	E	10	------	20	------	------
4715D2	J. Riordon	1921	10	175	4	H	G	12	2	5	3	------
4715G1	------	------	----	-----	4	H	G	15	15	------	------	------
4715J1	Earl Fruit Co. (Used with 4715N1.)	------	----	-----	6	H	E	20	118	10	------	------
4715L1	T. Kirschenman	1926	14	130	[k] 400	T	E	10	------	51	------	------
4715N1	Earl Fruit Co. (Used with 4715J1.)	------	----	-----	5	H	E	15	------	------	------	------
4715P1	F. S. Grau	1917	----	85	6	H	E	20	30	------	------	------
4715Q1	——Drobney	1920	10	194	5	H	E	20	------	60	------	------
4716A1	P. Kiriaze	1925	----	75	6	T	E	10	------	15	[f] 5	------
4716E1	Earl Fruit Co.	------	----	-----	6	H	E	20	------	34½	------	------
4716J1	A. G. Young (Used with 4716P1.)	1911	12	100	4	H	E	20	50	70	------	------
4716M1	Grau & Ellis	1922	14	408	[k] 1,000	T	E	20	80	------	------	------
4716P1	A. G. Young (Used with 4716J1.)	1911	----	275	5	H	E	15	------	------	------	------
4716Q1	E. W. Einslie	1925	----	416	4	H	G	12	32	4	------	------
4717A1	J. Whitmeyer	Old.	12	100	6	H	E	15	------	28	------	------
4717A4	O. H. Smithson	Old.	12	100	4	H	E	10	------	10	------	------
4717B1	C. E. Gentner	1921	12	81	4	H	E	15	------	50	------	------
4717C1	Frank Stout	Old.	10	70	3	H	E	5	------	20	------	------
4717D1	C. Serr	1918	12	65	4	H	E	15	------	27	3	------
4717E1	Max Jensen	1914	8	100	3	H	E	5	13⅓	------	------	------
4717E2	J. N. Cousins	1908	8	100	3	H	E	10	13	6	------	------
4717H1	P. Anagnos	1922	12	200	4	H	E	10	------	20	------	------
4717J1	J. Witmeyer	------	8	100	3	H	E	5	------	14	------	------
4717K1	Andrew Berg estate	1915	12	50	3	H	G	6	------	20	------	------

[f] Planted in orchard. [l] Cover crop planted in vineyard. [k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4717M3	C. R. Dustin	-----	----	200	5	H	E	20	-----	40	-----	-----
4717N1	Hollenstein Bros	1925	8	76	3	H	E	7½	-----	20	-----	-----
4717N4	George Westfall	Old.	12	76	6	H	E	20	-----	49	-----	15
4717P1	A. S. Wright	1926	12	170	6	T	E	15	8	30	-----	-----
4717Q1	Bank of Italy	Old.	12	-----	6	H	E	15	53	20	2	5
4718A1	Fred Donald	1920	10	-----	4	H	E	10	-----	10	-----	-----
4718A2	Joe Garnero	1913	10	-----	4	H	E	10	14	6	-----	-----
4718C1	John Bechthold	1919	12	70	4	H	G		-----	55	15	-----
4718D1	C. Peck	-----	12	75	2½	H	E	5	-----	16	5	-----
4718E1	——Eltringham	1907	6	168	2½	H	E	5	25			
4718E2	do	1926	10	186	4	H	G	12		-----	-----	-----
4718E3	A. Westfall	1917	10	100	4	H	G	10	-----	15	-----	-----
4718E5	M. Knupfer	1920	8	55	3	H	E	10	8	2	-----	-----
4718F1	Fred Donald	1912	10	-----	4	H	E	15	3	29	-----	-----
4718F2	Mrs. E. Sargenti & Son	1910	10	100	4	H	E	15	8	13	7	-----
4718F3	J. Witt	1914	10	190	4	H	G	15	3	6	7	-----
4718H1	J. L. Pearson	1923	8	100	2	H	E	5	-----	20	-----	-----
4718H2	L. & C. Peck	1924	8	100	3	H	E	5	-----	20	-----	-----
4718J1	A. Friedberger	1920	10	400	4	H	E	10	-----	20	-----	-----
4718N1	E. O. Eddelman	1910	10	99	5	H	E	15	30	15	-----	-----
4718P1	A. H. Culbertson	1920	12	175	4	H	G	12	-----	15	10	5
4718P2	J. Culbertson	1918	10	85	4	H	E	10	-----	18	6	6
4718Q1	C. C. Burnett	1913	10	-----	4	H	E	10	56	-----	-----	4
4718Q2	do	1925	10	-----	5	H	G	15				
4718Q3	E. Leventni	1911	12	85	5	H	E	20	3	11	12	24
4718R1	G. A. Jahant	1920	12	92	6	H	E	20	15	55	-----	-----
4719A1	J. B. Linn	Old.	----	80	3	H	E	5	-----	-----	[f]5	-----
4719A2	John Mieko	1922	10	75	3	H	E	5	-----	-----	[f]5	-----
4719A4	B. E. Porter	1922	10	80	3	H	G	8	-----	-----	-----	-----
4719A6	J. Dietz	1922	6	-----	1½	H	E	3	-----	[e]4	-----	-----
4719B1	S. Sanguinetti (Used with 4719F1.)	1912	12	90	4	H	E	10	-----	[e]26 14	-----	-----
4719B3	Charles Villinger (Used with 4719F2.)	1920	10	85	3	H	E	7½	23	16	1	-----
4719C1	A. L. Van Valkenburgh	1923	14	350	[k]1,000	T	E	25	-----	60	-----	40
4719E1	Luther Mills	1912	10	100	5	H	E	15	3	[e]15 22	-----	-----
4719E3	Frank Minetta	1911	8	66	4	H	E	10	1	18	1	-----
4719F1	S. Sanguinetti (Used with 4719B1.)	1917	12	165	5	H	G	12	-----	-----	-----	-----
4719F2	Charles Villinger (Used with 4719B3.)	1908	10	-----	4	H	E	10	-----	-----	-----	-----
4719H1	G. Weyand	-----	10	-----	3	H	E	7½	-----	20	-----	-----
4719J1	C. Dexter	1911	8	70	4	H	E	10	15½	4½	-----	-----
4719J2	Amos Dunton	1917	8	50	3	H	E	5	10	10	-----	-----
4719K1	do	1912	10	60	5	H	G	12				
4719M1	J. N. Ballantyne	1909	10	90	5	H	E	15	30	20	-----	-----
4719P2	C. W. Van Gelder	1912	12	60	4	H	E	15	55	-----	-----	20
4719Q1	—— Graffigna	1923	10	300		T	E	20	60	10	5	-----
4719R1	—— Cornwall	1921	12	80	3	H	E	15	46	4	-----	-----
4720A1	Joe Lima	1922	12	200	5	H	E	15	-----	40	-----	-----
4720B1	A. Bauer	1918	12	287	5	H	E	20	-----	40	-----	-----
4720C1	A. P. Jocoby	1918	12	140	4	H	E	15	-----	20	-----	-----
4720D2	Paul Cooke	-----	----	-----		T	E	7½	-----	10	-----	-----
4720D3	Dr. A. M. Towers	1920	----	250	4	H	E	10	-----	15	-----	-----
4720D4	H. M. Cooper	Old.	12	-----	3	H	E	10	-----	15	-----	-----
4720F1	J. M. Prentice	1910	12	110	5	H	E	15	43	17	-----	-----
4720F2	Peter Nelson	1917	12	125	5	H	E	15	20	-----	20	-----
4720G1	Lewis Baumbach	1925	12	135	5	T	E	10	-----	18	-----	-----
4720G2	Joe Gilbeau	Old.	12	-----	6	H	E	20	-----	40	-----	-----
4720H1	J. C. Bewley	-----	14	-----	8	H	E	20	-----	40	-----	-----
4720J1	A. E. Wakefield	1912	6	125	2	H	E	5	-----	-----	-----	3
4720J2	E. H. Fink (Used with 4720K2.)	1914	8	137	4	H	E	10	-----	40	-----	-----
4720K1	A. E. Wakefield	1917	12	150	4	H	E	10	12	6	-----	-----
4720K2	E. H. Fink (Used with 4720J2.)	1911	8	120	5	H	E	15	-----	-----	-----	-----
4720L1	C. H. Buck	1920	10	700	5	H	E	15	20	[e]20	-----	-----
4720L2	do	1912	12	302	5	H	E	15	-----	35	-----	-----
4720M1	W. H. Lorenz	1922	----	625	7	T	E	25	-----	80	-----	-----
4720N2	Herbert Buck	1918	12	320	4	H	E	10	-----	-----	-----	-----
4720N3	do	-----	12	370	4	H	E	10	10	30	-----	-----
4720P1	G. W. Le Moyne	1918	----	460	6	H	E	20	-----	40	-----	-----
4720R1	W. H. Lorenz	-----	12	-----	7	H	E	20	-----	-----	-----	-----

[e] Interset with trees.

[f] Planted in orchard.

[k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4721B1	Fairbanks & Dement	1918		500	5	H	E	15		29		
4721C1	F. P. Blakesley	1920	12		5	H	E	15	5	10		5
4721C2	C. W. Van Gelder	1916	12	128	5	H	E	15	42	18		
4721D1	Emil Gentner		15			T	E	15		30		10
4721F1	Christopher & Saletta	Old.	14	400	6	H	E	20	20	20		[l] 16
4721F2	M. Manassero	Old.	10	300	4	H	E	15		34		
4721H1	L. E. Dierker	Old.	10	90	4	H	E	10	25	15		
4721J1	Fred Vossler	1926	12	70	3	T	E	7½	15			5
4721K1	Bank of Italy			525	6	H	D	25	36	7		7
4721L1	—— Brown	Old.	12		7	T	E	20		20		
4721M1	C. M. Hoffman		10	129	4	H	E	10		7	[f] 6	
4721M2	F. L. Terra	1918	12	155	5	H	E	20			22	5
4721M3	Jacob Marker				3	H	E	7½				
4721N1	J. O. Robb	Old.	6	300	4	H	G		3		3	4
4721P1	Mary J. O. Brown	1906			6	H	E	15	9			
4721Q1	J. W. Stuckenbruck	1915		225	4	H	E		12			
4721R1			14		8	H	E	20	20			
4721R2	Fred Mettler	1926	10	100	4	T	E	7½		17½		
4721R3	J. Utterback	1914	8	98	2½	H	E	5	2			3
4721R4	E. J. Stuckenbruck	1920	14	165	2½	H	E	5	4			
4722A1	C. Formati	1923	10	123	3	H	E	10	5	5		
4722A2	Leslie House		14		6	H	E	25	90	10		
4722B1	F. E. Hosmer	1908	10	160	6	H	E	20	5	35		
4722C1	J. J. Schmiedt	1916	12	192	5	H	E	15		40		
4722H1	do	1916	12	552	4	H	E	15		30		
4722J2	Mrs. S. A. Botts	1912	8		3	H	E	7½	7	7		
4722K1	Fairbanks & Dement	Old.	12	200	[k] 400	T	E	10		50		
4722L1	A. O. Eddleman	1907	10	340	6	H	E	20	22	38		
4722N1	D. F. Miller	1920	12	139	4	H	G	14	10		3	
4722N3	E. E. Brown	Old.	14		3	H	E	2½				7
4722P1	T. A. Botts	1920	10	87	6	H	E	15	40		10	
4722Q2	A. O. Eddleman	1909	12	380	6	H	E	20	40			
4722R1	Fairbanks & Dement	1907		290	6	H	E	20	79	21		
4722R2	do	1922		97	[k] 150	T	E	7½				2
4723A1	J. W. Newhardt	1914	12	260	6	H	E	25	80	10		10
4723B1	Platt Smith	1911		231	5	H	E	20	15	23		
4723F1	H. J. Corell	1925	12	410	4	T	E	15	14	20		
4723G1	Guy Adams	1920	14	630	[k] 860	T	E	20			50	
4723H1	John Molingo	1927	14	560	[k] 700	T	E	15				25
4723K1	Frank H. Buck Co		12	250	6	H	E	25	77	3		
4723M1	Frank Rinaudo		15	116	4	T	E	15	14	63	5	
4723P1	E. A. Humphrey	1922	14	622	7	H	E	25	35	43		
4723Q1	—— Priecie	1926	10	100		T	E			25		
4723R1	George Blanke		10		2½	H	G		1			
4725G1	Mossdale Farm Co	1922	14	545		T	E					20
4725R2	Mrs. H. L. Demangeot		48	95	2	Lift.	E	2				1½
4726A1	J. B. Cory (Used with 4726E1 and 4727H1.)	1917	12	500	6	H	E	20	170	65		5
4726B1			14	650	6	H	E	20				
4726C1	G. A. Brodehl	1922		140	5	T	E	15		10		
4726E1	J. B. Cory (Used with 4726A1, B1, and 4727H1.)	1918	12	650	8	T	E	25				
4726G2	E. J. Hatton	1920	12	140	4	H	E	10		25		
4726K1	A. L. Paddleford		12	366	8	H	E	25		80		
4726N1	J. T. Langford	Old.	10	414	6	H	E	25		110		
4727B1	C. B. Clancy	1900	10	350	[k] 1,000	H	E	20	73	27		
4727C1	F. H. Buck Co	1917	12	220	9	H	E	25	30			
4727F1	J. H. Clancy	1912	12	193	6	H	E	25	80			
4727H1	J. B. Cory (Used with 4726A1, B1, and E1.)	1921	12	835	8	T	E	25				
4727J1	J. L. Michelson		10		5	H	E	15		20		
4727K1	E. S. Clancy	1925	12	135	4	H	E	10	30			
4727M1	F. H. Buck Co	1922	14	610	14	T	E	50	265			
4727R1	do			225	6	H	E	25				
4728A1	J. E. Crump	Old.	14	80	6	H	E	20	125	35		
4728B1	do		14		6	H	E	20				
4728C1	A. P. Reese		14		6	H	E	20	40			
4728H1	Ing Bros		12		8	H	E	25	19	40		
4728J1	P. H. Gentner		10		4	H	E	10		20		
4728K1	W. H. Wilson	1920	14	230	4	H	E	15		30	3	
4728K2	do		12		7	H	G	20				

[f] Planted in orchard.

[k] Gallons a minute.

[l] Cover crop planted in vineyard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4728L1	G. W. Winship	1912	8	100	5	H	E	5	8	------	4	------
4728L2	M. Cross	1919	6	42	3	H	G	7	20	------	3	------
4728L4	Mrs. Rosa Wade	------	----	235	5	H	G	8	7	------	3	------
4728M1	Capt. M. T. Baily	1922	14	910	5	H	E	25	60	------	------	------
4728M2	Ed Frey	------	12	-----	4	H	E	10	11	------	------	------
4729A2	Jacob Schmierer	------	12	-----	6	H	E	15	18	19	------	------
4729B1	Mrs. Tandy	1913	10	125	5	H	G	25	5	------	------	15
4729B2	M. S. Reid	1920	----	74	4	H	D	6	------	32	------	------
4729D1	J. W. Stafford	1916	12	284	5	H	E	15	------	14	11	------
4729E1	G. P. Hansen	------	----	70	6	T	E	20	20	18	2	------
4729F1	Mrs. Brada	------	----	-----	6	H	E	15	------	23	------	4
4729G1	Ing Bros	------	12	-----	8	H	E	25	------	115	------	------
4279H1	do.	------	12	590	8	H	E	25				
4729H2	C. E. Keslar	------	12	185	6	H	E	10	20	------	------	------
4729J1	P. R. Peikert	------	12	-----	4	H	E	10	------	18	[f]2	------
4729K2	G. Weyand	------	12	-----	6	H	E	15	15	43	------	------
4729L1	Adolph Nies	1927	12	-----	4	H	G	15	------	10	------	------
4729L2	S. Namba	Old.	12	45	4	H	E	10	10	20	------	------
4729M1	Earl Fruit Co.	------	12	900	5	H	E	25	------	40	------	------
4729N1	—— Elliott	------	8	-----	4	H	E	10	------	20	------	------
4729N2	T. Thompson	------	8	-----	4	H	E	7½	------	18	------	------
4729P1	H. H. McComb	1913	8	63	4	H	E	10	------	50	------	------
4729P2	H. N. Madison	------	10	-----	4	H	E	7½	10	------	------	------
4729Q1	J. N. Ballentine	------	10	-----	4	H	E	10	7½	32½	------	------
4730A1	J. W. Pritchard	1901	8	90	5	H	G	10	18	12	------	------
4730B1	C. R. Van Buskirk	1923	8	-----	3	H	E	10	2	18	------	------
4730B3	F. D. Wardrobe	1920	10	124	4	H	E	10	8	10	------	2
4730C1	James Lerza	1915	8	-----	5	H	E	15	------	40	------	------
4730C3	J. W. Wakefield	1890	12	82	6	H	E	20	15	15	------	7
4730E1	Mat Mirko	1916	8	90	4	H	E	7½	------	16	------	------
4730E3	C. Weber	1908	8	-----	3	H	G	6	------	12	------	------
4730E5	J. C. Doherty	1916	8	-----	3	H	E	7½	15	5	------	------
4730E6	Miss Hattie Bewley	1908	6	-----	3	H	E	5	31	------	------	------
4730F1	do.	1908	8	-----	4	H	E	10				
4730H1	B. Taylor	1912	10	90	5	H	E	15	23	17	------	------
4730J1	Mrs. C. A. Barton	1900	8	63	4	H	G	8	------	30	5	5
4730J3	Mrs. Mirko	1924	12	-----	5	H	E	20	------	80	------	------
4730L1	W. E. Wagner	1904	6	110	3	H	E	7½	1	7	2	------
4730L2	S. T. Henderson	1904	8	60	4	H	E	10	------	30	------	------
4730M1	F. A. Garner	1922	10	-----	4	H	E	10	------	20	------	------
4730M2	S. Sasaki	1905	6	-----	3	H	E	5	4	6	------	------
4730P1	W. A. Floyd	1922	8	-----	4	H	E	10	1	19	------	------
4730P2	A. Asay	1921	10	80	4	H	E	10	3	15	------	2
4730Q1	S. D. Hildebrandt & Son	1925	12	80	4	H	E	10	5	12	3	------
4730Q3	------	1910	8	80	4	H	G	10	2	18	------	------
4730R1	Boyd Jacobs	1913	10	60	4	H	E	10	18⅓	------	------	------
4730R3	—— McKinzie	1920	10	-----	4	H	E	10	------	23	------	------
4730R4	J. Brauer	------	10	-----	3	H	E	5	------	9	------	------
4731A2	Henry Preszler	------	8	-----		H	E	10	------	20	------	------
4731A3	Jacob Dollinger	1915	10	-----	4	H	E	10	------	15	5	------
4731B2	C. D. Holbrook	1868	8	-----	4	H	E	10	15	5	------	------
4731B3	Henry Fiene	1908	8	65	4	H	E	10	3	13	------	1
4731C1	—— Valentine	------	----	200	5	H	E	15	------	30	------	------
4731E2	Miss K. Canfield	1905	14	87	4	H	E	10	------	20	------	------
4731E3	John Zobel	1912	8	-----	4	H	E	10	2	13	------	------
4731F1	W. S. Clark	1908	10	110	4	H	E	10	8	27	------	------
4731F3	R. L. Patton	1923	10	80	5	H	E	15	------	16	------	------
4731G1	A. Meier	1921	12	275	5	H	E	15	------	45	------	------
4731J1	Fred Woest	1917	6	30	4	H	G	6	------	------	------	------
4731J6	R. Patton	1920	8	-----	4	H	E	10	------	8½	------	------
4731K1	Gottfried Beisel	1923	10	70	3	H	E	5	------	8	------	------
4731L1	Karl Schaffer	1919	10	78	4	H	E	10	------	25	------	------
4731Q1	John Arcolin	------	4	-----	1½	H	E		------	------	------	1
4731R1	------	------	----	-----	3	H	G	6	------	10	------	------
4731R2	C. C. Houston	1920	8	60	3	H	E	7½	------	20	------	------
4732A1	E. H. Smith	1913	----	120		H	E	7½	4	[a]6	------	------
4732A2	J. C. Doherty	------	12	-----	6	H	E	15	------	40	------	------
4732A4	A. F. Rodgers	1905	12	120	5	H	G	10	------	27	------	------
4732B2	R. H. De Vinny	------	12	-----	4	H	E	10	10	50	------	------
4732C1	do.	------	10	-----	5	H	E	10				
4732F1	A. T. Dunton	------	12	-----	6	H	E	10	3	16	------	------
4733G1	J. E. Fitzsimmons	1904	8	-----	5	H	E	10	------	23	2	------
4733H1	D. Ledous	------	4	-----	2	H	G	3	1	------	------	1

[a] Interset with trees.

[f] Planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
4733H2	C. Wagner		8	100	4	H	E	15		19		
4733H4	R. Billigmeier		12	55	3	H	E	7½		13	3	
4733L2	Rosa C. Green	1920	8	112	5	T	E	20		20		
4733M2	J. J. Schmiedt	1910	12	136	4	H	E	15		46	5	
4733Q1	John Alexander	1915	12	150	6	H	E	15		20		
4733R2	Jacob Schmierer	1914	10	73	4	H	E	10	3½	18		
4733R3	Geo. Knoll	1921	10	230	5	T	E	15		20		
4734C1	G. R. Jack	1921	12	274	4	H	E	15	5	10	7	
4734D2	Fairbanks & Dement	1922	14	500	5	H	E	20	70			
4734F1	John Schmiedt		10	96	6	H	E.		4	26		
4734J2	David Baumbach	1923	12	193	[k] 750	T	E	20		20		
4734J3	August Knoll	1918	12	90	4	H	E	10		20		
4734N2	Jacob Schmierer	1914	10	183	5	H	E	15	1	46	3	
4735A1	J. D. Christian		12		6	H	E	20		70		
4735F1	P. Dietderich		10		4	H	E	10		6	10	10
4735G1	H. Inglis		18	260	2½	H	E	5				
4735M2	do	1913	20	342	8	H	E	35		97		30
4735Q2	H. Bonneface	1923	8	90	Lift.		G	1½				1
4735R1	S. M. McGary	1923	12	218	[k] 600	T	E	15		22½		
4736B1	N. H. Locke Co	1924	16	307	8	H	E	20			70	
4736D2	J. L. Brummel				4	H	E	10				2
4736L1	Barney Bonetto	1923	10	312	5	T	E	10		8½	1½	
4736L2	David Leer		14		5	H	E	20		20		
4736M1	Adam Wahl	1922	12	348	4	T	E	10		15		
4736N1	G. H. Inglis	1927	10	175	8	T	E	15		18	1	
4736Q1	Mike Koseolnik	1923	12	103	4	H	G	22		9		
4736Q3	S. R. Jones	1921	12	360	5	H	E	20		27		
4736R1	F. A. Stiegelmeier	1925	12	280	[k] 500	T	E	10		18		
483F2	Albert Hart	1922		500	[k] 500	T	G	25			20	
488E2	F. Czeloth	1927	12	320	[k] 500	T						
488K2	R. Callow	1923	12	400	[k] 400	T	G	16			2	
489N3	George Brandt	1916	12	325	[k] 1,000	T	E	30			20	
4812N1	Otto J. Koch			411		T	E	25	25		4	42
4814B1	P. F. Sievers	1926	12	334	5	H	Oil	15			15	
4814H2	Ed Harris		10		8	H	E	25		5	11	5
4814L1	Mrs. L. Durffee		14	350	6	T	E	20		27		
4815H2	Athern & Gersbacher		10	550	6	H	E	20			25	30
4815R1	T. E. Lane	1921	14	514	9	T	E	40			20	
4817L1	A. Costa	1919	16	503	[k] 1,500	T	E	75		60		
4817P1	W. H. Moffit					T	E	30			35	
4818A1	J. D. Hoskins	1926	14	440	[k] 750	T	E			50		
4819B1	Woodbridge Fruit Co. (Used with 4819K1.)	Old.	16	400	7	T	E	30	230			
4819C2	B. M. Shaffer	1926	12	387	[k] 600	T	E	15				
4819K1	Freeman Mills (Used with 4819B1.)	1920	12	80	4	H	E	10				
4821F1	L. J. Megerle	1924	12	620	8	H	E	15			7½	
4821L2	John Clements	1924			7	T	E	30				
4822L1	Mrs. A. Pierson	1908	10	260	1½	H	G	8				
4823A1	Chris Fahrner	1917	5	260	5	H	E	20	2	10		23
4823E2	E. M. Hauff	1922	12	497	[k] 750	T	E	30		5	4	6
4829D1	L. H. Schaffner	1926	12	325	8	T	E	20	60			
4829E1	W. S. Montgomery	1922	12	604	[k] 1,700	T	E	50	5	85	110	
4829L2	L. M. Montgomery				[k] 1,800	T	E	30			35	
4829M1	R. L. Cooke	1923	12	296	[k] 480	T	E	10	6		26	3
4830F1	Annie Holman and others	1925	10	480	6	H	E	25		15	33	
4831A1	Tony C. Zulum	1922		435	4	T	E	7½	3	4		1
4831C1	A. Strange				5	T	G	22		50		
498D2	G. W. Lucas	1911	10	515	5	H	G	15				3
4917B1	Fred Vilenger	1924	10			H	E					
4918E1	I. N. Miller		4	358	[k] 700	T	E	25				4
5528P1	Hans Schmidt				6	T	G	20			6	
5533M1	A. E. Dixon				7	T	E	15			8	28
5535R2	Thornton Orchard	1926	16	678	8½	T	E	40				
5536K1	do				8	T	E	30	126			
5613A1	—— Dutrow		8		3	H	G	3			1	
5613A2			12		3	H	G	6		3½		
5613C1	A. J. Marcoe	1908	6	47	1½	H	E	3			3	
5613D1	J. Kueny (Used with 5613H1.)		10	120	5	H	G	20		24		
5613E1	—— Methven				3½	H	G	6		1		
5613H1	J. Kueny (Used with 5613D1.)	1923	10	72	4	H	G	20				
5613J2	Maringa Bros		8		4	H	G	6				

[k] Gallons a minute.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
5614J1	—— McCord		10	50	5	H	E	7½			33	2
5615B1	W. N. Stock	1925	8	96	2	H	E	5			1½	
5615F1	J. M. Wiegand	1920	8	85	4	H	E	5			4	
5615H1	Henry Stamp		10	80	6	H	G	10			½	
5615J1			8		4	H	E	7½				6
5615K1	J. W. Swain	1909	8	171	5	H	E	7½			4	
5615M1	Sam Lima				4	H	E	5		17		
5615N1	Joe Furtado (Used with 5616R1.)		8	120	3	H	E	5			25	
5615P1	Louis Specht		8		3	H	E	5	3		7	
5615R1	Henry Winn				3	H	E	5		3	5	
5616B1	Henry Need				8	T	G	20			40	
5616B2	(Used together.)				8	T	E	25				
5616D2	Carl Johnson				3	H	G	20		12		
5616G1	J. A. Billicks, jr.		8		4	H	G	6				3
5616P1	S. Biaggi				4	H	G	15				
5616R1	Joe Furtado (Used with 5615N1.)		8	120	4	H	E	7½				
5617H1	L. Christensen		12	110	7	H	G	20			3	
5617R2	C. E. Hays		8		3	H	G	6			3	
5619D1	Mrs. J. Weldon (Used with 5620E 1.)		12	70	5	H	G	20		24	5	6
5619P1	M. R. Orr				5	H	E	7½			13	
5619R1	E. E. Niess	Old.	16	125	2	H	G	3				1
5619R2	do	1920	8	40	3	H	G	6				
5620A1	Annie O. Cota	1926	10	68	5	H	G	20			10	
5620B1	Mrs. A. Gori	1921	10	137	3	H	G	20				
5620E1	Mrs. J. Weldon (Used with 5619D1.)	Old.	12	70	5	H	G	20				
5620M2	W. Coupe		8	114	4	H	G	22			7	
5620P1	Mrs. A. Orr		12		4	H	E	10			18	
5620R1	Wm. Coupe		10		6	H	E	10				5
5621G1	Chris Hansen	1914		160	5	H	E					
5621K1	John Melhoff		8		6	H	E	7½	3		17	
5621L1	E. A. Williams		6	85	2½	H	E	5	2	8		
5621M1	J. W. Burtch		8	60	4	H	E	5	1		19	
5621P1	Tuxedo Land Co.		8	160	4	H	E	7½			35	
5621Q1	(Used together.)		8	160	5	H	E	7½				
5622A1	Hans Madsen		8	58	4	H	E	7½	30			27
5622A2	N. P. Nelsen		8	75	1½	H	G	1½				1
5622D1	T. A. Ouimet	1911	10	175	3	H	E	3	1		1	1
5622D2	Nick Berquist	1911	8	200	4	H	E	7½		15		
5622J1	J. M. Jones	1911	8		4	H	E	7½			30	
5622M2		1912			4	H	E					
5622Q1	C. Enjalran		6	125	2½	H	E	5			10	
5623J1	Sam Lima		8		4	H	E	7½	[c] 24			
5623K1	Pelton Faistina Co.				4	H	G	20	[c] 70			
5623K2	(Used with 5623P1.)	1924		106	4	H	G	20				
5623N1	M. S. Merrill		8		4	H	E	7½	5	15		
5623P1	Pelton Faistina Co. (Used with 5623K1 and K2.)	1917	8	96	4	H	G	20				
5624K1	C. E. Petersen	1924	10	58	4	H	G	20		21	4	
5624N1					4	H	G	16		10		
5625H1	Victor Vuillerminaz	1924	10	92	2	H	E	5		12		
5625M1	Fred Boessow	1910	7	180	3	H	E	10				6
5625P1	Ed. Anderson	1926	8	75	5	H	G	6				2
5625P2	J. W. Herzog	1916	8	75	4	H	G	7				15
5625P3	(Used together.)	1916	8	75	4	H	G	7				
5626J1	Mrs. McCauley		6	80	2	H	E	2				1
5626M1	—— Liebig(?)		6		2½	H	G	8	9	4		2
5626P1	F. B. Mills		12		6	H	G	15		28		
5627B1	John Dixon		8		5	H	E	7½			6	
5627C2	—— Versilian(?)	1927			3	H	G	20		2½		
5627C3	J. W. Larrick		6	80	2	H	E	3			1	
5627E1	J. A. Gustafson	1914	8	85	4	H	G	8			5	5
5627F1	Fred Harvey	1912	8		5	H	E	7½			24	
5627H1	Chris Bojohara				3	H	E	3		3		
5627H2	Mrs. C. Ambrogio		8		2	H	E	3			1	
5627J1	F. H. Harvey		8		5	H	E	7½				
5627K1	do		8		5	H	E	7½			15	
5627N1	E. A. Olin	1913	10	47	4	H	E	5	2		[f] 5	
5628A1	E. S. Glover				4	H	E	7½			20	
5628B1	G. Fahn		8	240	4	H	E	7½		7	13	

[c] Interset with vines.

[f] Planted in orchard.

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump		Kind and amount of power		Area irrigated (acres)			
									Trees	Vines	Alfalfa	Miscellaneous
5628C1	S. & C. E. Wolf	1912		60	3½	H	E	7½	12	10	11	
5628E1	Tom Gorgas		10		5	H	E	7½			12	
5628E3	Dr. Smith				5	H	E	7½			8	
5628F1	A. Medeck		8	108	4	H	E	7½			20	
5628G1	Peter Lippy				5	H	E	7½	[a] 10	7	7	1
5628J1	—— Younger(?)				5		E			20		
5628J2	Mrs. A. Cota		8	210	4	H	E	7½			26	
5628K1	Joseph Epp		8	85	4	H	E	7½			20	
5628L1	H. Christesen	1910	8		3	H	E	5			8	
5628L3	Mr. Van Horn		8		5	H	E	7½	10			
5628M1	Mr. McCord		8		5	H	E	7½			20	
5628N1	W. W. Gerrie	1917	10		4	H	E	7½			20	
5628N2	(Used together.)	1917	10		4	H	E	10				
5628P1	A. W. Curtis	1917	8		4	H	E	7½			15	
5628R1	Harry Myers	1913		45	4	H	E	7½			15	
5629B1	E. I. Turner	1915	10	140	6	H	E	8			15	
5629C3	Mrs. Alfred North		8		5	H	G	20	30	12		
5629D1	(Used together.)		8	90	6	H	E	10				
5629G1	A. E. Wright	1920	10	100	4	H	E	7½	4	40	1½	
5629G2	(Used together.)	1920	10	128	4	H	E	7½				
5629H1	J. G. Lakey				5	H	G	20			12	
5629H2	—— Cheeseman		10		5	H	E	5			5	1
5629J1	G. H. Oxly		8	85	4	H	E	7½	40			
5629K2	Charles Bergstrom		8		5	H	E	7½			20	
5629M1	Lee Williams		8		4½	H	E	7½		24		
5629P1	F. H. Harvey	1912	8	80	4	H	E	7½				
5629Q1	do	1912	8	80	4	H	E	7½				
5629Q2	do	1912	8	80	4	H	E	7½				
5629Q3	George Geiger	1912	6	117	5	H	G	12	2			23
5629Q4	do	1915	8	40								
5629R1	C. H. Young	1913	8		4	H	G	8			24	
5630A1	—— Bradford		14								38	
5631B1	F. H. Harvey [m]	1912	8	104	4	H	E	7½			20	10
5631E3	J. McGillivray	1924	16	105	7	H	E	25			80	
5632F1	L. J. Holmes	1912	10		4	H	E	15			10	
5632F2	do	1912	8	80	4	H	E	7½			7½	
5632F3	do	1912	8	80	4	H	E	7½				
5632F4	do	1912	8	140	4	H	E	7½				
5632K1	Mary Saner	Old	8		5	H	G	8				
5632Q1	do	1917	12	80	5	H	G	20			8	
5633A1	C. R. Mabee	1918	6		3	H	G	4				4
5633A2	—— Eden	1912				H	E					
5633B2	William Morris	1918	6	185	4	H	E	10			12	
5633C1	A. F. Horstkorta	1911		105	4	H	E	15			6	
5633C2	William Morris	1918	6	135	3	H	E	7½	1		2	1
5633D2	G. Gunterson	1923	8	70	3	H	G	5		2		1
5633E2	J. Decker (Used with 5633E4.)		6		4	H	G	6			16	
5633E3	J. Decker		8		6	H	G	15				
5633E4	do (Used with 5633E2.)		8		4	H	G	6				
5633H1	F. Schmidt	1923	10		4	H	G		10	30		
5633L4	Kreeger & Bowman	1910	10	117	4	H	G	10			6	
5634A1	P. McNamara	1920	10	45	4	H	E	10	12	15		
5634C1	P. T. Ghiglieri	1925	8	104	2½	H	G	6		9		
5634C3	H. A. Peterson	1917	6		2½	H	E	5	2	10		
5634C6	Mrs. G. Lippi	1907	6		3	H	E	7½		10		
5634D1	Marengo Bros	1921	8		3	H	E	7½		17		
5634F1	P. McNamara	1915	6	85	3	H	E	7½	6	12		7
5634G1	—— Takashi	1921	6	125	3	H	G	6		8		
5634G2	—— Lovett	1917	6		4	H	G	20				4
5634H1	Rocco Lavagnino	1918	10	160	4	H	E	7½		17		
5634J2	G. Miles	1910	10		5	H	E	10			14	
5635A2	Mrs. Annie Stupurak	1925	10	52	3	H	G					6
5635A5	W. A. Conklin	1915	8		4	H	E	10		13		1
5635B3	T. S. Donovan	1923	8	82	3	H	E	5		3		
5635B4	do	1917	8	65	3	H	E	5			5	
5635Q2	G. B. Sargent		8	89	6	H	E	15			12	
5636B1	Mrs. R. B. Garside	1913	8	60	3	H	G	5				2
5636E1	G. S Bill	1918	6	90	2½	H	G	4	4			2
5636E2	(Used together.)	1911	8	100	4	H	G	9				
5636M1	—— McClure		6		3	H	E	5			5	
5636N1	G. W. McKwinster	1910	6		1½	H	E	1				½
5715J1	Mrs. M. Donegan	1912	10	186	3	H	G	4½				½

[a] Interset with vines.

[m] Plant used on 8 wells

Pumping plants on wells in the Mokelumne area used for irrigation—Continued

No.	Owner	Year completed	Diameter (inches)	Depth (feet)	Size (inches) and type of pump	Kind and amount of power	Area irrigated (acres)			
							Trees	Vines	Alfalfa	Miscellaneous
5716A1	Ralph Post		12		6 H	E 10		40		
5717A1	C. J. Taylor				4 H	E 5				4
5717J1	H. H. Cole			37	4 H	G 8	11			1
5717J2	(Used together.)			137	4 H	G 20				
5717K1	Fred Jasper	1919	10	38	3 H	G 6	1		3	2
5717R2	C. H. Gordon		7	117	2½ H	E 5			3	
5718C1	A. S. Kirby	1911			H	E				
5718K1	Charles Wieland	1922	10	175	5 H	G 20		18		
5718Q2	Maude Q. Proctor		6	180	3 H	E 5			7	
5719F1	J. J. Simon				5 T			20		
5719Q1	—— Ollenberger	1927			5 T	E 7½			2	
5720D1	John Stofka		10		4 H	G 6		18	1	1
5720N1	—— Davies		10		5 H	E 5			1	
5720Q2					3 H	G 4	3			
5722A1	W. McEnerney				6 H	E 7½			4	
5728A2	G. F. Bechthold		8		5 H	G 20		20		
5728M1	John Johnston	1927	12	700	7 T	E 20			4	
5729C1	John Walsh	1922	8	75	3 H	E 5		10		
5729L1	John Lavagnino	1924	8		4 H	E 5		5		
5729M1	do	1922	10	165	3 H	E 7½		4		
5730B1	Adam Young		8	130	4 H	E 7½		30		
5730C1	—— Azevedo	1924	12	100	5 H	G 20				
5730H1	M. Azevedo	Old.	8		5 H	E 5			4	
5730J1	L. Gori	1924	6	75	1½ H	E 5				1
5730J2	do		10		6 H	G 10		6		
5730J3	A. Lanchart	1916	10	115	5 H	G 20			13	
5730N1	G. L. Hubert	1921		70	3 H	G 7½			10	
5731M1	F. H. Smith	1913		140	4 H	E 10	11			
5731R1	H. P. Hamel		8	50	2½ H	G 7			4	4
5732E1	Frank McEnerney	1926	10	198	5 H	E 15			12	18
5733A1	—— Kennefick	1928	12		5 H					
5734B1	C. N. Adams		14	300	8 T	G 16			25	
5736A1	French American Co		12	270	6 H					
5736B1	do		12	202	6 H					
5736E1	do	1920	12		[k]1,350 T	E 50		70		70
5736E2	do		12	120	6 H	E 25				
5736E3	do		12	332	6 H					

[k] Gallons a minute.

TESTS OF USE OF WATER

During the seasons of 1926 and 1927 pumping tests were made on 53 irrigation wells in the Mokelumne area. Most of these wells are within 2 miles of the Mokelumne River. The location of the wells is shown on Plate 5. The numbering system used is explained on page 209.

Of the pumping plants tested 37 were equipped with horizontal centrifugal pumps, 15 with turbine deep-well centrifugal pumps, and 1 with an ordinary vertical centrifugal pump. All the plants are permanent installations, and most of them are well sheltered and cared for.

The rate of discharge of the pumps remains very nearly constant throughout the irrigation season. Measurements made on the same pumping plant at different times of the season showed very small differences in the rate of discharge. For this reason but one discharge measurement was made on most of the plants. In four of the plants equipped with turbine pumps there is a valve in the discharge pipe by which the rate of discharge may be regulated from zero to full capacity. In the record of these plants an effort was made to determine the number of hours the pump was operated with the valve partly closed. The necessary correction was then applied for this period in order to calculate the total amount of water pumped.

Most of the pumps discharge into a cistern from which the water is distributed through pipe lines or open ditches. Nearly all the discharge measurements were made with a Price single-point current meter, and at most of the plants a good measuring section was available. To arrive at the discharge of two of the plants it was necessary to measure at each plant the flow of water in two separate ditches, and the sum of the two measurements was taken as the total discharge of the pump. Views of two pumping plants appear in Plates 16, *B*, and 21.

A description of each pumping plant on which tests were made and the results obtained are given in the following pages. The factory rating of the pump and motor or engine is used invariably. The static head represents the total difference in altitude between the water surface in the well during the operation of the pump and the level at which the water was discharged from the pumping plant. The power consumption of the plant at the time of measurement was obtained by timing the electric meter during the test and then computing the kilowatt input from a table of constants for electric meters furnished by the Pacific Gas & Electric Co. The power consumed, in kilowatt-hours, per acre-foot of water pumped was derived from the power consumption and the discharge. It is 325,851 (the number of gallons in 1 acre-foot) times the power consumption divided by the discharge in gallons a minute times 60, or gallons an hour. The energy consumption for the 1926 and 1927 seasons was received from the local office of the Pacific Gas & Electric Co. The quantity of water pumped by each plant for the two seasons was obtained by dividing the total energy consumption in kilowatt-hours by the kilowatt-hours per acre-foot of water pumped. For 10 of the plants the amount of water pumped was calculated from the owner's record. The acreage and types of crop irrigated are derived from the owner's statements, no accurate survey being made. The use of water was obtained by dividing the total amount of water pumped by the acreage irrigated. In the cost of electric power the "demand charge" is a service charge which the power company assesses to each electric motor to which it furnishes energy. This charge varies with the size of the motor. The schedule of demand charges and rates per kilowatt-hour of electric power is given in the table on page 265. The rate is based on a sliding scale, depending upon the size of the motor and amount of energy used. The cost of power per acre of land irrigated includes only the cost of power consumed plus the annual demand charge. No attempt was made to include depreciation, repairs, or original cost.

369L1. EARL FRUIT CO.

Location.—NW. ¼ SE. ¼ sec. 9, T. 3 N., R. 6 E.

Plant.—20-horsepower motor direct-connected to a 6-inch horizontal centrifugal pump. Well 12 inches in diameter and 100 feet deep, partly cased.

Area irrigated.—99+ acres of vineyard irrigated in 1926 and 1927.

Test.—The following results were obtained during a half-hour test on May 18, 1927: Power consumption, 9.60 kilowatts; water pumped, 595 gallons a minute; power consumed per acre-foot of water pumped, 87.6 kilowatt-hours.

Remarks.—The water was distributed through ditches. The measuring section was only fair, owing to the width of the ditch and the shallow depth of the water. The total power consumption for 1926 was 4,120 kilowatt-hours; for 1927, 7,700 kilowatt-hours. No record was available for the number of hours the pump was in operation during 1926; for 1927 the owner's record gave a total of 721 hours. The total amount of water pumped, computed from the power consumption, was 47.0 acre-feet during 1926 and 87.8 acre-feet during 1927. This gives a use of water of 0.47 acre-foot per acre for 1926 and 0.89 acre-foot per acre for 1927. The total cost of power, including a demand charge of $108, was $157.44 for 1926 and $200.40 for 1927. The cost per acre irrigated was $1.59 in 1926 and $2.02 in 1927; the cost per acre-foot of water pumped was $3.35 in 1926 and $2.28 in 1927. These unit costs are not excessive and indicate an economically designed pumping plant. The use of water is considerably lower than the average of the Mokelumne area.

3613D1. MRS. E. PEARSON

Location.—NE. ¼ NE. ¼ sec. 13, T. 3 N., R. 6 E.

Plant.—7½-horsepower motor direct-connected to a 5-inch horizontal centrifugal pump. Well 8 inches in diameter and 69 feet deep, cased to a depth of 46½ feet with stovepipe casing.

Area irrigated.—10 acres of vineyard in 1927.

Test.—The following results were obtained during a 1-hour test on June 8, 1927: Power consumption, 8.06 kilowatts; water pumped, 400 gallons a minute; power consumed per acre-foot of water pumped, 109.5 kilowatt-hours.

Remarks.—The water was distributed through ditches, and the measuring section was good. The total power consumption for 1926 was 265 kilowatt-hours; for 1927, 1,787 kilowatt-hours. No record was available for the number of hours the plant was in operation in 1926; for 1927 the owner gave a total of 226 hours. As computed from the power consumption 2.4 acre-feet of water was pumped in 1926 and 16.3 acre-feet in 1927. The amount of water pumped based on the owner's record was 16.6 acre-feet in 1927, which agrees very closely with the amount calculated from the power consumption. As it is not known exactly how much of the vineyard was irrigated in 1926, the use of water for that year can not be computed. The use of water in 1927 was 1.63 acre-feet per acre. The total cost of power, including a demand charge of $45, was $48.71 for 1926 and $70.02 for 1927. The cost per acre irrigated was $7 for 1927, and the cost per acre-foot of water pumped was $4.28. On account of the small amount of water pumped in 1926 the cost per acre-foot of water pumped was very high, amounting to $20.30. This figure is not considered in the estimates because it is not representative of average conditions. The unit costs for 1927 are above the average. It is believed that more economical irrigation would result if the acreage were increased.

3695B1. W. G. MICKE

Location.—NE. ¼ NW. ¼ sec. 25, T. 3 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a turbine with a rated capacity of 1,200 gallons a minute. Well 14 inches in diameter and 173 feet deep, partly cased with stovepipe casing.

Test.—The following results were obtained during an hour test on May 18, 1927: Power consumption, 17.28 kilowatts; water pumped, 855 gallons a minute; power consumed per acre-foot of water pumped, 109.7 kilowatt-hours; total static head, 46 feet.

Area irrigated.—75 acres of vineyard in 1927.

Remarks.—The water was distributed through ditches, and the measuring section was good. Drilling operations on this well were completed May 9, 1927, and the pump was installed shortly thereafter. At the time of measurement a considerable amount of sand was being pumped. It is possible that the capacity of the well was not fully developed at the time of measurement. However, observations later in the season indicated no material increase in the rate of discharge. It was the owner's intention to deepen the well and if possible increase its capacity before the season of 1928. The depth to water in the vicinity of the well is normally about 16 feet; during the test it was 45 feet. Thus the water was lowered 29 feet, which gives a yield of 0.65 second-foot per foot of drawdown. This yield is low compared to that of other wells in the Mokelumne area. The low yield is further indication that the well was not fully developed or that it was improperly finished. The total power consumption for 1927 was 18,980 kilowatt-hours. The owner's record for 1927 shows that the plant was in operation 1,130 hours. The total amount of water pumped, computed from the power consumption, was 173.0 acre-feet. This gives a use of water of 2.31 acre-feet per acre. The total cost of electric power was $310.22, which includes a demand charge of $128. The cost per acre of land irrigated was $4.16, and the cost per acre-foot of water pumped was $1.80. The high cost per acre irrigated is due to the high use of water.

3625D1. MRS. EMMA STOKES

Location.—NE. ¼ NE. ¼ sec. 25, T. 3 N., R. 6 E.

Plant.—10-horsepower motor direct-connected to a 4-inch horizontal centrifugal pump. Well 10 inches in diameter, 71 feet deep, and cased to a depth of 40 feet with stovepipe casing.

Area irrigated.—No record available of acreage in 1926. In 1927, 20 acres of vineyard, 2 acres of alfalfa, and 22 acres of beans.

Test.—During a half-hour test May 23, 1927, the water pumped amounted to 540 gallons a minute.

Remarks.—The water was distributed through pipes for a distance of about a quarter of a mile from the pumping plant and then through ditches. The measuring section was good. At the time of the test it was not possible to get the power input to the motor. The total power consumption for 1926 was 6,480 kilowatt-hours; for 1927, 9,600 kilowatt-hours. From the owner's record the plant was in operation 231½ hours during 1927—20¼ hours to irrigate the alfalfa, 168¼ hours to irrigate the vineyard, and 43 hours to irrigate the bean crop. The part of the record for the bean crop is incomplete, so no use of water will be figured for that crop. The total amount of water pumped to irrigate the alfalfa was 2.0 acre-feet, which gives the use of water as 1.01 acre-feet per acre. The total amount of water pumped to irrigate the vineyard was 16.8 acre-feet, which gives the use of water as 0.84 acre-foot per acre. The use of water for these two crops is lower than the average. The total power cost, including a demand charge of $60, was $133.58 for 1926 and $198.48 for 1927. If the entire 44 acres was under irrigation both years, this gives a cost of $3.03 per acre irrigated in 1926 and $4.51 in 1927. The cost per acre-foot of water pumped can not be computed, because the total amount of water pumped is unknown.

373C1. JACOB KNOLL

Location.—NW. ¼ NE. ¼ sec. 3, T. 3 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to an 8-inch deep-well turbine pump. Well 14 inches in diameter, 334 feet deep, and cased with stovepipe casing for 120 feet.

Area irrigated.—105 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test of the plant on August 11, 1927: Power consumption, 18 kilowatts; water pumped, 550 gallons a minute; power consumed per acre-foot of water pumped, 177.9 kilowatt-hours.

Remarks.—The water was distributed through pipe lines for an eighth of a mile from the plant, then through ditches. The measuring section was fair. The measurement of 550 gallons a minute includes an estimated leakage of 10 per cent in the pipe line. In 1926 the power consumption was 23,000 kilowatt-hours; in 1927, 31,040 kilowatt-hours. The owner's record, which was incomplete, gave 251 hours of operation during 1927. The amount of water pumped, calculated from the power consumption, was 129.5 acre-feet for 1926 and 174.8 acre-feet for 1927. This gives a use of water of 1.23 acre-feet per acre for 1926 and 1.66 acre-feet per acre for 1927. The total cost of power, including a demand charge of $135, was $411 for 1926 and $495.40 for 1927. The cost per acre irrigated was $3.91 in 1926 and $4.72 in 1927; the cost per acre-foot of water pumped was $3.17 in 1926 and $2.83 in 1927. The cost per acre irrigated was greater for 1927 than for 1926, but the cost per acre-foot of water pumped was less for 1927 than for 1926. This difference is due in part to the sliding scale of energy cost, of which large users are able to take advantage, and in part to the demand charge, which remains constant regardless of the amount of energy consumed. Thus the more acre-feet of water pumped the less the cost per acre-foot.

373K1. MRS. H. F. ELLIS

Location.—NE. ¼ SW. ¼ sec. 3, T. 3 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a 5-inch Superior horizontal centrifugal pump. Well 10 inches in diameter, 580 feet deep, and partly cased.

Area irrigated.—50 acres of vines interplanted with trees, all irrigated in 1926 but only 20 acres in 1927.

Test.—The following results were obtained during a 2-hour test May 24, 1927: Power consumption, 17.78 kilowatts; water pumped, 790 gallons a minute; power consumed per acre-foot of water pumped, 122.1 kilowatt-hours.

Remarks.—The water was distributed through two pipe lines for about one-eighth of a mile from the plant, then through ditches. In order to arrive at the total discharge it was necessary to measure each ditch separately and then total the results. Both measuring sections were fair. The total energy consumed for 1926 was 9,570 kilowatt-hours; for 1927, 2,350 kilowatt-hours. The water pumped, calculated from the power consumption, was 78.3 acre-feet in 1926 and 19.2 acre-feet in 1927. The owner's record showed 141 hours in operation for 1927, which would give 20.5 acre-feet of water pumped, or very nearly the same as that calculated from the power consumption. The use of water for 1926 was 1.57 acre-feet per acre; for 1927, 0.96 acre-foot per acre. The total power cost, including a demand charge of $108, was $222.84 for 1926 and $136.20 for 1927. Thus the cost per acre irrigated was $4.46 for 1926 and $6.81 for 1927. The cost per acre-foot of water pumped was $2.85 for 1926 and $7.10 for 1927. This plant is well designed to irrigate the total area of 50 acres, as shown by the unit costs of 1926, which are very close to the average. It is not economical to irrigate a smaller area, as may be seen by the increased unit costs in 1927, when only 20 acres was irrigated. If it is desired to irrigate only 20 acres in the future, the present pumping unit should be replaced with a smaller one. This would decrease the demand charge and also the unit costs.

373M2. J. E. MAY

Location.—NE. ¼ SE. ¼ sec. 3, T. 3 N., R. 7 E.

Plant.—15-horsepower motor belt-connected to a 5-inch horizontal centrifugal pump. Well 10 inches in diameter, 350 feet deep, and cased to a depth of 150 feet with stovepipe casing. There is another well 10 inches in diameter and 60 feet deep very close to this one, and the two may be connected underground.

Area irrigated.—16½ acres of vines interplanted with trees, 5½ acres of alfalfa, and 1½ acres of trees in 1927.

Test.—The following results were obtained during a 1-hour test May 12, 1927: Power consumption, 11.11 kilowatts; water pumped, 475 gallons a minute; power consumed per acre-foot of water pumped, 126.9 kilowatt-hours.

Remarks.—The water was distributed through pipe lines and then through ditches. The measuring section was fair. The discharge of 475 gallons a minute includes an estimated leakage of 5 gallons a minute at one valve in the pipe line. The power consumption was 3,220 kilowatt-hours for 1926 and 4,680 kilowatt-hours for 1927. The owner's incomplete record showed 48¼ hours in operation. Calculated from the power consumption, the amount of water pumped was 25.3 acre-feet in 1926 and 36.9 acre-feet in 1927. As it is not known how much land was irrigated in 1926, the use of water for that year can not be calculated. In 1927 the use of water for the 23½ acres was 1.57 acre-feet per acre. The total cost of power, including a demand charge of $81, was $119.64 for 1926 and $137.16 for 1927. For 1927 the cost per acre irrigated was $5.84. The cost per acre-foot of water pumped was $4.73 for 1926 and $3.72 for 1927. This pumping plant has been in use for a long time and is still giving good service. However, a complete overhauling would undoubtedly raise its efficiency.

374A1. M. C. DOW

Location.—NW. ¼ NW. ¼ sec. 4, T. 3 N., R. 7 E.

Plant.—10-horsepower motor direct-connected to a 4-inch vertical centrifugal pump. Well 10 inches in diameter, 25 feet deep, and cased 16 feet.

Area irrigated.—3 acres of alfalfa and 6 acres of miscellaneous crops in both 1926 and 1927.

Test.—The following results are the average of two 1-hour tests November 5, 1926, and April 29, 1927: Power consumption, 7.56 kilowatts; water pumped, 620 gallons a minute; power consumed per acre-foot of water pumped, 66.1 kilowatt-hours.

Remarks.—The water was distributed through pipe lines. The discharge measurement was made with a 3-foot 8-inch suppressed weir. This weir is a permanent installation by the owner and gives fair results. It was impossible to get the total power consumption, because power for domestic use was taken from the same line. The owner's record gives 436 hours of operation in 1926 and 435 hours in 1927. Computed from these records, the total amount of water pumped was 49.7 acre-feet in 1926 and 49.6 acre-feet in 1927. The use of water was 5.52 acre-feet per acre for 1926 and 5.51 acre-feet per acre for 1927 for the entire 9 acres and is considerably above the average. This high use of water is due to the kinds of crops raised, which are alfalfa and miscellaneous truck. These crops require a large number of irrigations during the season. No unit cost per acre irrigated can be figured, because the total power consumption is unknown. However, it appears to be above the average; the demand charge alone amounts to $60, or $6.66 per acre irrigated. The cost per acre-foot of water pumped would be low, because of the large quantity used.

374F4. PETER JOENS

Location.—SE. ¼ NW. ¼ sec. 4, T. 3 N., R. 7 E.

Plant.—7½-horsepower motor direct-connected to a 4-inch Byron Jackson vertical turbine. Two wells drilled to depths of 172 and 192 feet, each 10 inches in diameter, and cased for 40 feet with stovepipe casing.

Area irrigated.—170 acres of vineyard and 10 acres of trees, with the aid of three other pumping plants.

Test.—The following results were obtained during a 1-hour test March 10, 1927: Power consumption, 8.17 kilowatts; water pumped, 365 gallons a minute; power consumed per acre-foot of water pumped, 121.8 kilowatt-hours.

Remarks.—The water was distributed through pipe lines and then through ditches. The measuring section was good. As power for a number of domestic appliances was taken from the same line, the total amount of power used to operate the pump is unknown. The owner's record for 1927 gives 327 hours of operation. This gives 22.0 acre-feet of water pumped. It is not known how much land was irrigated by this pumping plant; hence the use of water and unit costs can not be computed.

374K2. W. W. GILLESPIE

Location.—NE. ¼ SW. ¼ sec. 4, T. 3 N., R. 7 E.

Plant.—10-horsepower motor direct-connected to a deep-well Krogh turbine with a rated capacity of 400 to 450 gallons a minute. Well 12 inches in diameter, 123 feet deep, and cased for 30 feet with stovepipe casing.

Area irrigated.—10 acres of vineyard in 1927.

Test.—The following results were obtained during a 1-hour test April 8, 1927: Power consumption, 8.64 kilowatts; water pumped, 405 gallons a minute; power consumed per acre-foot of water pumped, 1,159.9 kilowatt-hours; total static head, about 44 feet.

Remarks.—The water was distributed through ditches. The measuring section was fair. The pumping unit in this plant was installed only a week before the measurement. During 1927 the total power consumption was 2,743 kilowatt-hours. The owner's record showed 352 hours in operation. The amount of water pumped, calculated from the power consumption, was 23.7 acre-feet. This gives a use of water of 2.37 acre-feet per acre, which is above the average. The total cost of power, including a demand charge of $60, was $98.40 during 1927. The cost per acre irrigated was $9.84, and the cost per acre-foot of water pumped was $4.15. Both of these unit costs are above the average. This pumping plant is too large to be operated economically for the acreage irrigated. Twice as much land could be irrigated with considerable saving in the unit costs.

375G3. F. LAGOMARSINO

Location.—SW. ¼ NE. ¼ sec. 5, T. 3 N., R. 7 E.

Plant.—7½-horsepower motor belt-connected to a 3½-inch horizontal centrifugal pump. Well 8 inches in diameter, 76 feet deep, and partly cased.

Area irrigated.—17½ acres of vines during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test April 7, 1927: Power consumption, 8 kilowatts; water pumped, 305 gallons a minute; power consumed per acre-foot of water pumped, 142.4 kilowatt-hours.

Remarks.—The water was distributed through ditches, and the measuring section was fair. The total power consumption was 1,663 kilowatt-hours in 1926 and 2,172 kilowatt-hours in 1927. The amount of water pumped, calculated from the power consumption, was 11.7 acre-feet for 1926 and 15.2 acre-feet for 1927. There was no record of hours in operation in 1926; the owner's incomplete record for 1927 gave 90 hours. The use of water for 1926 was 0.67 acre-foot per acre and for 1927 was 0.87 acre-foot per acre, which is lower than the average. The total cost of power, including a demand charge of $45, was $68.28 for 1926 and $75.40 for 1927. In 1926 the cost per acre irrigated was $3.91 and in 1927 it was $4.30, which is about the average. The cost per acre-foot of water pumped was $5.84 for 1926 and $4.96 for 1927. This pumping plant is an old one, and a complete overhauling would no doubt raise its efficiency.

375G4. MRS. HULBURD

Location.—SW. ¼ NE. ¼ sec. 5, T. 3 N., R. 7 E.

Plant.—10-horsepower Hercules gas engine, belt-connected to a 4-inch horizontal centrifugal pump. Drilled well, partly cased.

Area irrigated.—20 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test June 6, 1927: Water pumped, 335 gallons a minute; total static head, about 43 feet.

Remarks.—The water was distributed through ditches, and the measuring section was good. No record was available for the hours operated during 1926 and 1927, nor for the operation cost. This pumping plant has been in use for a number of years. The drawdown amounted to 14 feet while the pump was discharging 0.75 cubic foot a second. The specific capacity of the well amounts to 0.05 cubic foot a second, or 45 gallons a minute per foot of drawdown. This is very low and if possible should be increased by cleaning and deepening the well.

375K2. B. PHILLIPS

Location.—NE. ¼ SW. ¼ sec. 5, T. 3 N., R. 7 E.

Plant.—15-horsepower motor direct-connected to a 5-inch horizontal centrifugal pump. Well 12 inches in diameter, 85 feet deep; no casing.

Area irrigated.—45½ acres of vineyard during 1926 and 1927.

Test.—During a 1-hour test March 28, 1927, the water pumped amounted to 725 gallons a minute.

Remarks.—The water was distributed through a pipe line for 0.4 mile and then through ditches. The measuring section was good. The total power consumption was 6,320 kilowatt-hours for 1926 and 6,180 kilowatt-hours for 1927. The owner's record showed 376 hours in operation for 1927. This gives the amount of water pumped as 50.3 acre-feet. The total cost of power, including a demand charge of $81, was $156.84 for 1926 and $155.16 for 1927. Thus the cost per acre irrigated was $3.45 in 1926 and $3.41 in 1927, and the cost per acre-foot of water pumped was $3.08 in 1927. These costs are below the average. This pumping plant is very well constructed and is kept in good running condition. It is well adapted for the acreage irrigated.

375L1. H. D. BINGER

Location.—NW. ¼ SE. ¼ sec. 5, T. 3 N., R. 7 E.

Plant.—12-horsepower gasoline engine belt-connected to a 4-inch horizontal centrifugal pump. Well 8 inches in diameter, 85 feet deep, and cased for 45 feet with stovepipe casing.

Area irrigated.—25 acres of vineyard and 5 acres of trees in 1927.

Test.—During a 1-hour test March 29, 1927, the water pumped amounted to about 170 gallons a minute.

Remarks.—The water is distributed through V-shaped concrete-lined ditches to the point of spreading. The measuring section was fair. No records were available on the amount of fuel used, the cost of operation, or the hours of operation. This plant is a very old one and needs a complete overhauling.

The rate of discharge is very low considering the size of the plant, and there is little doubt that the efficiency is also low. It is believed that a smaller plant properly installed would deliver the same amount of water at a greatly reduced cost.

375L4. G. G. GILLESPIE

Location.—NW. ¼ SE. ¼ sec. 5, T. 3. N., R. 7 E.

Plant.—20-horsepower motor direct-connected to an 8-inch Krogh deep-well turbine. Well 14 inches in diameter, 250 feet deep, and cased for 90 feet with stovepipe casing.

Area irrigated.—28 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test April 4, 1927: Power consumption, 18.45 kilowatts; water pumped, 980 gallons a minute; power consumed per acre-foot of water pumped, 102.2 kilowatt-hours; total static head, 45 feet.

Remarks.—The water was distributed through a pipe line for about 600 feet and then through ditches. The measuring section was good. The total power consumption was 5,360 kilowatt-hours in 1926 and 4,320 kilowatt-hours in 1927. According to the owner's record, which appears incomplete, the plant was in operation 155 hours during 1927. Computed from the power consumption the amount of water pumped during 1926 was 52.5 acre-feet; during 1927, 42.2 acre-feet. However, as this pumping plant was used to supply domestic needs all the water can not be considered as used for irrigation. If a family of four uses 500 gallons a day, the total amount used in a year will amount to 0.5 acre-foot. Deducting this amount from the water pumped in 1926 leaves 52 acre-feet to be used for irrigation; for 1927, 41.7 acre-feet. These figures show that the use of water for 1926 was 1.86 acre-feet per acre; for 1927, 1.49 acre-feet per acre. The total cost of power, including a demand charge of $108, was $172.32 in 1926 and $159.84 in 1927. Neglecting the small item of cost for power to pump domestic water gives the cost per acre irrigated as $6.16 in 1926 and $5.70 in 1927. These figures are considerably above the average. The cost per acre-foot of water pumped amounts to $3.28 for 1926 and $3.79 for 1927. This plant is larger than necessary to irrigate the present acreage. At least twice as much land could be irrigated from it satisfactorily.

377B1. W. G. MICKE

Location.—NE. ¼ NW. ¼ sec. 7, T. 3 N., R. 7 E.

Plant.—15-horsepower motor, belt-connected to a 6-inch horizontal centrifugal pump. Well drilled 80 feet deep with no casing.

Area irrigated.—27½ acres of orchard and 44 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 19, 1927: Power consumption, 12.58 kilowatts; water pumped, 565 gallons a minute; power consumed per acre-foot of water pumped, 121 kilowatt-hours.

Remarks.—The water was distributed through ditches, and the measuring section was good. The total power consumption was 14,070 kilowatt-hours in 1926 and 11,820 kilowatt-hours in 1927. There were no records of hours of operation for either year. Computed from the power consumption the amount of water pumped was 116.5 acre-feet in 1926 and 98 acre-feet in 1927. The use of water for the entire acreage was 1.63 acre-feet per acre for 1926 and 1.37 acre-feet per acre for 1927. The total cost of power, including a demand charge of $81, was $249.84 in 1926 and $222.84 in 1927. The cost per acre irrigated amounted to $3.49 in 1926 and $3.12 in 1927, and the cost per acre-foot of water pumped $2.14 in 1926 and $2.27 in 1927. These costs are considerably below the average. This pumping plant has been in operation for several years and is still giving good service. It is very well adapted for the acreage irrigated.

3716N1. L. K. MARSHALL

Location.—SW. ¼ SW. ¼ sec. 16, T. 3 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a Krogh 6-inch horizontal centrifugal pump. Two wells about 6 feet apart, one 14 inches in diameter and 80 feet deep and the other 14 inches in diameter and 200 feet deep. Both wells partly cased.

Area irrigated.—37 acres of vineyard and 40 acres of orchard, with the aid of two other pumping plants.

Test.—The following results were obtained during a 2-hour test July 1, 1926: Power consumption, 15.12 kilowatts; water pumped, 735 gallons a minute; power consumed per acre-foot of water pumped, 111.7 kilowatt-hours; total static head, 50 feet.

Remarks.—The water was distributed through pipe lines and then ditches. The measuring section was good. No records of power consumption or hours of operation were available for 1926 and 1927.

4512Q1. A. FRANDY

Location.—SW. ¼ SE. ¼ sec. 12, T. 4 N., R. 5 E.

Plant.—5-horsepower motor belt-connected to a 3-inch horizontal centrifugal pump; drilled well.

Area irrigated.—14 acres of vineyard during 1927.

Test.—The following results were obtained during a 1-hour test July 13, 1927: Power consumption, 4.05 kilowatts; water pumped, 295 gallons a minute; power consumed per acre-foot of water pumped, 74.6 kilowatt-hours; total static head, 25 feet.

Remarks.—The water was distributed through ditches, and the measuring section was good. The power consumption for 1927 was 2,337 kilowatt-hours. The owner's incomplete record showed 52 hours in operation. The amount of water pumped, as calculated from the power consumption, was 31.3 acre-feet. This figure indicates that the use of water was 2.24 acre-feet per acre for the 14 acres of vineyard. This is considerably higher than the average. The total cost of power, including a demand charge of $10.62, was $33.52 for 1927. The cost per acre irrigated was $2.39; the cost per acre-foot of water pumped was $1.07. This pumping plant was installed early in the spring of 1927. It is well adapted for the acreage under irrigation.

4616L2. A. TADDEI

Location.—NW. ¼ SE. ¼ sec. 16, T. 4. N., R. 6 E.

Plant.—12-horsepower gas engine belt-connected to a 6-inch horizontal centrifugal pump. Drilled well, partly cased.

Area irrigated.—20 acres of beans during 1927.

Test.—Two 1-hour tests June 11 and August 12, 1927, showed an average of 730 gallons a minute of water pumped.

Remarks.—The water was distributed through pipe lines and then through ditches. The discharge of 730 gallons a minute includes an estimated leakage of 10 per cent in the pipe line. The owner's record gave 169 hours of operation during 1927. Computed from this figure the amount of water pumped was 22.8 acre-feet, which for 20 acres is equivalent to a use of water of 1.14 acre-feet per acre. No records were available of the fuel consumption or the cost of operation, from which unit costs could be calculated. However, from an inspection of the plant it is believed that a complete overhauling would increase the efficiency and decrease the cost of operation. The plant has been in use for several years.

4624D1. W. C. PETZINGER

Location.—NE. ¼ NE. ¼ sec. 24, T. 4 N., R. 6 E.

Plant.—15-horsepower motor belt-connected to a 5-inch horizontal centrifugal pump. Well 10 inches in diameter, 92 feet deep, partly cased with galvanized-iron casing.

Area irrigated.—9 acres of vineyard and 41 acres of orchard during 1926 and 1927.

Test.—The following results were obtained during a 2-hour test May 10, 1926: Water pumped, 395 gallons a minute; total static head, 44 feet.

Remarks.—The water was distributed through pipe lines and then through ditches. A good measuring section was available. The total power consumption was 6,740 kilowatt-hours for 1926 and 8,750 kilowatt-hours for 1927. However, not all of this energy was used to operate the pump, as a 2-horsepower motor connected to the same line is used for domestic purposes. Therefore it is not possible to figure the amount of water pumped from the power consumption. From the owner's record the pumping plant was in operation 656 hours in 1926 and 804 hours in 1927. These figures indicate that the total amount of water pumped was 47.7 acre-feet in 1926 and 58.4 acre-feet in 1927. This gives the use of water for 1926 as 0.95 acre-foot per acre and for 1927 as 1.17 acre-feet per acre for the 50 acres of land irrigated. There is no way to figure the exact unit cost, on account of the 2-horsepower motor connected to the same line. However, including the demand charge and power consumption of both motors it is still below the average cost. The total cost for 1926 of both motors was $172.78 and for 1927 was $196.80. The cost per acre irrigated was $3.45 in 1926 and $3.94 in 1927, and the cost per acre-foot of water pumped was $3.61 in 1926 and $3.37 in 1927. If the cost of operation of the 2-horsepower motor were known and deducted from the total cost, the cost per acre irrigated and the cost per acre-foot of water pumped would be considerably less. This pumping plant is an economical installation and well adapted to the acreage irrigated.

4635A1. F. JOURNEAY

Location.—NW. ¼ NW. ¼ sec. 35, T. 4 N., R. 6 E.

Plant.—10-horsepower motor direct-connected to a Pacific deep-well turbine with a factory rating of 600 to 650 gallons a minute. Well 12 inches in diameter, 110 feet deep, and cased for 42 feet with stovepipe casing.

Area irrigated.—50 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 24, 1926: Power consumption, 9.25 kilowatts; water pumped, 645 gallons a minute; power consumed per acre-foot of water pumped, 77.8 kilowatt-hours; total static head, about 33 feet.

Remarks.—The water was distributed through pipe lines and then through ditches, and 2,400 feet of concrete pipe was used to distribute the water in the vineyard. The pumping plant had been in operation only three weeks prior to the test. A good measuring section was available. The total power consumption was 3,800 kilowatt-hours for 1926 and 3,790 kilowatt-hours for 1927. From the owner's records the hours of operation were 411 for 1926 and 407¼ for 1927. The amount of water pumped in 1926 was 48.8 acre-feet as calculated from the power consumption and 48.7 acre-feet as calculated from the owner's record; in 1927 the corresponding figures were 48.7 and 48.4 acre-feet. These figures agree very closely and indicate that the amount of water pumped can be calculated from the power consumption as accurately as from the owner's record of hours in operation. However, as the owner's record is often incomplete the better method is to calculate the amount of water pumped from the power consumption. The use of water was 0.98 acre-foot per acre for 1926 and 0.97 acre-foot per acre for 1927. This is lower than the average. The total cost of power, including a demand charge of $60, was $107.87 for 1926 and $113.06 for 1927. The greater cost for 1927, although less energy was used than in 1926, is due to the fact that in 1926 the pump was not installed until April, and under such conditions the energy is charged at a slightly reduced rate for the remainder of the year. The cost per acre irrigated was $2.16 in 1926 and $2.26 in 1927, and the cost per acre-foot of water pumped was $2.20 in 1926 and $2.32 in 1927. All these unit costs are considerably below the average and indicate a very economical operating plant. It is very well adapted for the acreage irrigated.

4635A3. J. H. WILLMS

Location.—NW. ¼ NW. ¼ sec. 35, T. 4 N., R. 6 E.

Plant.—7½-horsepower motor belt-connected to a 4-inch horizontal centrifugal pump. Drilled well, partly cased.

Area irrigated.—30 acres of cherry trees during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 24, 1926: Power consumption, 8.32 kilowatts; water pumped, 590 gallons a minute; power consumed per acre-foot of water pumped, 76.5 kilowatt-hours; total static head, about 34 feet.

Remarks.—The water was distributed through pipe lines and then through ditches. A good measuring section was available. The power consumption for 1926 was 2,770 kilowatt-hours; for 1927, 3,010 kilowatt-hours. No record was available for the hours in operation during 1926, but for 1927 the owner's incomplete record gave 313 hours. Computed from the power consumption the amount of water pumped was 36.2 acre-feet for 1926 and 39.4 acre-feet for 1927, and the use of water was 1.21 acre-feet per acre for 1926 and 1.31 acre-feet per acre for 1927. The total cost of power, including a demand charge of $45, was $83.78 for 1926 and $87.14 for 1927. This gives the cost per acre irrigated as $2.79 for 1926 and $2.90 for 1927. The cost per acre-foot of water pumped was $2.31 for 1926 and $2.21 for 1927. All these unit costs are considerably below the average. This pumping plant has been in use for several years and is still in good condition. It is well adapted for the acreage under irrigation, as sufficient water for irrigation can be pumped with a minimum of cost.

4636A2. SMITH & ZIMMERMAN

Location.—NW. ¼ NW. ¼ sec. 36, T. 4 N., R. 6 E.

Plant.—10-horsepower motor direct-connected to a 7-inch Van horizontal centrifugal pump. Well 12 inches in diameter, 87 feet deep, and has about 3 feet of stovepipe casing.

Area irrigated.—26 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 21, 1927: Power consumption, 10.16 kilowatts; water pumped, 590 gallons a minute; power consumed per acre-foot of water pumped, 93.4 kilowatt-hours; total static head, 29.5 feet.

Remarks.—Water is distributed through a pipe line for about 600 feet and then through ditches. The measuring section was good. The discharge of 590 gallons a minute includes an estimated leakage of 5 gallons a minute at one place in the pipe line. The power consumption was 2,076 kilowatt-hours in 1926 and 1,997 kilowatt-hours in 1927. No record was available of the hours of operation for 1926, but for 1927 the owner's record gives 191 hours. Computed from the power consumption, the amount of water pumped was 22.2 acre-feet in 1926 and 21.4 acre-feet in 1927. The amount calculated from the hours of operation during 1927 was 20.8 acre-feet. This plant was also used to pump water for domestic purposes. As the total amount of water pumped is included when figured from the total power consumption, and only that amount used for irrigation when figured from the owner's record, a correction must be applied to the former. If 500 gallons a day is assumed as the domestic consumption for a family of four, the amount of water thus used would amount to 0.5 acre-foot a year. Deducting this from the amount of water pumped as determined from the power consumption gives the total amount of water used for irrigation as 21.7 acre-feet in 1926 and 20.9 acre-feet in 1927. The last figure agrees very closely with that calculated from the owner's record for 1927. Thus the use of water was 0.83 acre-foot per acre for 1926 and 0.90 acre-foot per acre for 1927. The total cost of power, including a demand charge of $60, was $89.07 for 1926 and $87.95 for 1927. Neglecting the small cost for pumping domestic water would make the cost per acre irrigated $3.42 for 1926 and $3.38 for 1927. The cost per acre-foot of water pumped for irrigation was $4.01 for 1926 and $4.10 for 1927. These unit costs are very close to the average. This plant is of sufficient size to irrigate a much larger acreage with considerable saving in the unit costs.

4636E1. SMITH & ZIMMERMAN

Location.—SW. ¼ NW. ¼ sec. 36, T. 4 N., R. 6 E.

Plant.—15-horsepower distillate engine belt-connected to a Sterling 5-inch horizontal centrifugal pump. Well 12 inches in diameter, 137 feet deep, and partly cased with stovepipe casing.

Area irrigated.—25 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 9-hour test August 22, 1927: Fuel consumption, 1.5 gallons an hour; water pumped, 520 gallons a minute; fuel consumed per acre-foot of water pumped, 15.7 gallons; suction head, 15.5 feet; discharge head, 17 feet; total static head, 32.5 feet.

Remarks.—The water was distributed through ditches, and a fair measuring section was available. There was no record of the hours of operation for 1926 or 1927. According to the owner's record, the fuel consumption for 1927 was 305 gallons of distillate. At a fuel consumption of 1.5 gallons an hour, the quantity of distillate used per acre-foot of water pumped would be 15.7 gallons. Dividing the total fuel consumption for 1927 by this figure makes the total amount of water pumped 19.4 acre-feet. The use of water for the 25 acres of vineyard would thus be 0.77 acre-foot per acre. The cost of distillate in 1927 was 12½ cents a gallon, making the total cost for fuel consumed during the season $38. The cost per acre irrigated was $1.52, and the cost per acre-foot of water pumped $1.96. Both of these unit costs are considerably below the average. This is the only pumping plant equipped with an engine for which it was possible to obtain costs on fuel consumption. The costs as given are for fuel only and do not include the oil or grease necessary in the operation of the engine. According to the owner the engine has been in use for several years and is in need of a complete overhauling. Such an overhauling would no doubt lower the fuel consumption.

4713P1. FAIRBANKS & DEMENT

Location.—SE. ¼ SW. ¼ sec. 13, T. 4 N., R. 7 E.

Plant.—30-horsepower motor direct-connected to an 8-inch Price deep-well turbine. Well 14 inches in diameter, 600 feet deep, and partly cased at several different levels.

Area irrigated.—80 acres of vineyard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test August 8, 1927: Power consumption, 29.20 kilowatts; water pumped, 920 gallons a minute; power consumed per acre-foot of water pumped, 172.4 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a good measuring section was available. The total power consumption for 1926 was 19,390 kilowatt-hours; for 1927, 18,150 kilowatt-hours. The total amount of water pumped, calculated from the power consumption, was 112.2 acre-feet in 1926 and 105.2 acre-feet in 1927. There was no record of operation during 1926, but for 1927 the owner's record gives 642 hours. The amount of water pumped based on the owner's record was 109 acre-feet, which agrees very closely with the amount calculated from the power consumption. The use of water for 1926 was 1.40 acre-feet per acre; for 1927, 1.32 acre-feet per acre. The total cost of power, including a demand charge of $162, was $394.68 for 1926 and $379.80 for 1927. The cost per acre irrigated was $4.93 in 1926 and $4.75 in 1927. The cost per acre-foot of water pumped was $3.51 in 1926 and $3.60 in 1927. These costs are all above the average, owing to the depth from which the water is raised; nevertheless, the plant is fairly well adapted to the acreage under irrigation. Although no measurement of depth to water was possible at the time of the test, the depth to water in the locality of the well is normally about 52 feet. Assuming a drawdown of 10 to 15 feet gives a total static head of approximately 65 feet. At the time of the test the motor was operating with a 30 per cent overload.

4722K1. FAIRBANKS & DEMENT

Location.—NE. ¼ SW. ¼ sec. 22, T. 4 N., R. 7 E.

Plant.—10-horsepower motor direct-connected to a deep-well Krogh turbine with a capacity of 400 gallons a minute. Well 12 inches in diameter, 200 feet deep, and cased for 40 feet.

Area irrigated.—30 acres of vineyard and 20 acres of vineyard interplanted with trees during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 5, 1927: Power consumption, 7.08 kilowatts; water pumped, 220 gallons a minute; power consumed per acre-foot of water pumped, 175 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a fair measuring section was available. The total power consumption for 1926 was 9.260 kilowatt-hours; for 1927, 11,542 kilowatt-hours. There was no record of the time of operation during either 1926 or 1927. The total amount of water pumped, computed from power consumption, was 52.8 acre-feet in 1926 and 66.0 acre-feet in 1927. The use of water for the 50 acres was thus 1.06 acre-feet per acre for 1926 and 1.32 acre-feet per acre for 1927, which is slightly above the average. The total cost of power, including a demand charge of $60, was $189.64 for 1926 and $216.96 for 1927. The cost per acre irrigated was $3.79 for 1926 and $4.34 for 1927, and the cost per acre-foot of water pumped $3.58 for 1926 and $3.29 for 1927. The plant has been in operation for several years, and a thorough overhauling would no doubt raise its efficiency considerably.

4722P1. T. A. BOTTS

Location.—SE. ¼ SW. ¼ sec. 22, T. 4 N., R. 7 E.

Plant.—15-horsepower motor direct-connected to a 6-inch horizontal centrifugal pump. Well 10 inches in diameter, 87 feet deep, and uncased.

Area irrigated.—40 acres of orchard and 10 acres of alfalfa during 1926 and 1927.

Test.—During a 1-hour test May 13, 1927, the water pumped amounted to 370 gallons a minute.

Remarks.—The water was distributed through a pipe line for a quarter of a mile and then through ditches. A fair measuring section was available. The total power consumption was 5,480 kilowatt-hours for 1926 and 5,880 kilowatt-hours for 1927. No record of the hours of operation in 1926 was available; for

1927 the owner's record, which was complete except for a portion of one day, gave 495 hours. The total amount of water pumped in 1927, calculated from the owner's record, was 33.8 acre-feet. The use of water for the entire 50 acres under cultivation amounts to 0.68 acre-foot per acre. This is considerably below the average. The total cost of power, including a demand charge of $81, was $146.76 for 1926 and $151.56 for 1927. The cost per acre irrigated was $2.93 for 1926 and $3.03 for 1927, and the cost per acre-foot of water pumped during 1927 was $4.48. This pumping plant is well adapted to the acreage under irrigation. The cost per acre-foot of water is above the average, but this is due to the low use of water.

4722R1. FAIRBANKS & DEMENT

Location.—SE. ¼ SE. ¼ sec. 23, T. 4 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a 6-inch horizontal centrifugal pump. Well is 290 feet deep and partly cased.

Area irrigated.—33 acres of vineyard and 67 acres of trees during 1927.

Test.—The following results were obtained during a 1-hour test May 10, 1927: Power consumption, 11.82 kilowatts; water pumped, 370 gallons a minute; power consumed per acre-foot of water pumped, 173.5 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a good measuring section was available. No records of the total power consumption or number of hours the plant was in operation were available; hence the use of water and unit costs can not be computed.

4723F1. H. J. CORELL

Location.—SE. ¼ NW. ¼ sec. 23, T. 4 N. R. 7 E.

Plant.—15-horsepower motor direct-connected to a 4-inch Sterling deep-well turbine. Well is 12 inches in diameter, 410 feet deep, and cased for 100 feet.

Area irrigated.—20 acres of vineyard and 14 acres of orchard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 26, 1927: Power consumption, 11.69 kilowatts; water pumped, 330 gallons a minute; power consumed per acre-foot of water pumped, 192.4 kilowatt-hours; total static head, 60.51 feet.

Remarks.—The water was distributed through a pipe line for about 400 feet and then through ditches. A good measuring section was available. The total power consumption for 1926 was 5,900 kilowatt-hours; for 1927, 4,360 kilowatt-hours. There was no record available of the hours of operation during 1926, but for 1927 the owner's record gave 227. Computed from the power consumption the amount of water pumped during 1926 was 30.7 acre-feet; during 1927, 22.7 acre-feet. These figures give the use of water for 1926 as 0.90 acre-foot per acre and for 1927 0.67 acre-foot per acre. This is considerably less than the average. The total cost of power, including a demand charge of $81, was $151.80 for 1926 and $133.32 for 1927. The cost per acre irrigated amounted to $4.47 for 1926 and $3.92 for 1927; the cost per acre-foot of water pumped, $4.94 for 1926 and $5.88 for 1927. The cost per acre-foot of water pumped is above the average, owing to the low use of water on the land irrigated. If necessary a larger amount of water could be pumped with a considerable decrease in cost per acre-foot. The plant has been in operation three seasons and is very well adapted to the acreage irrigated.

4723K1. F. H. BUCK CO.

Location.—NE. ¼ SW. ¼ sec. 23, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to a 6-inch Golden West horizontal centrifugal pump. Well is 12 inches in diameter, 250 feet deep, and cased for 150 feet with galvanized-iron casing.

Area irrigated.—3 acres of vineyard and 77 acres of orchard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 5, 1927: Power consumption, 21.82 kilowatts; water pumped, 550 gallons a minute; power consumed per acre-foot of water pumped, 215.8 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a good measuring section was available. The total power consumption was 23,800 kilowatt-hours during 1926 and 13,900 kilowatt-hours during 1927.

No record of the hours of operation in 1926 was available, but for 1927 the owner's record gave 628 hours. Computed from the power consumption the total amount of water pumped was 110 acre-feet during 1926 and 64.5 acre-feet during 1927. The amount of water pumped during 1927 as calculated from the owner's record was 63.8 acre-feet, which agrees very closely with the amount calculated from the power consumption. The use of water for 1926 over the entire 80 acres was 1.38 acre-feet per acre and for 1927 was 0.81 acre-foot per acre. The total cost of power, including a demand charge of $135, was $420.60 for 1926 and $301.80 for 1927. Thus the total cost of power per acre irrigated was $5.26 for 1926 and $3.77 for 1927, and the total cost of power per acre-foot of water pumped $3.82 for 1926 and $4.68 for 1927. The decrease in cost per acre irrigated and the increase in cost per acre-foot of water pumped during 1927 was due to the low use of water in that year. This plant has been in operation several years and is still giving good service. It is fairly well adapted to the acreage under irrigation. Although a smaller plant could be installed it would increase the length of the irrigation season.

4723M1. F. RINAUDO

Location.—NE. ¼ SE. ¼ sec. 23, T. 4. N. R. 7 E.

Plant.—15-horsepower motor direct-connected to a 4-inch Sterling deep-well turbine. Well is 15 inches in diameter, 116 feet deep, and partly cased.

Area irrigated.—Exact acreage unknown.

Test.—The following results were obtained during a 1-hour test May 26, 1927: Power consumption, 10.86 kilowatts; water pumped, 325 gallons a minute; power consumed per acre-foot of water pumped, 181.2 kilowatt-hours; total static head, 62 feet.

Remarks.—The water was distributed through about 600 feet of pipe line and then through ditches. A fair measuring section was available. The total power consumption during 1926 was 9,680 kilowatt-hours; during 1927, 6,900 kilowatt-hours. No record was available of the hours of operation during 1926; for 1927 the owner's incomplete record gave 432 hours. Computed from the power consumption, the total amount of water pumped during 1926 was 53.4 acre-feet and during 1927 was 38 acre-feet. The total cost of power, including a demand charge of $81, was $197.16 for 1926 and $163.80 for 1927. These figures indicate that the cost per acre-foot of water pumped was $3.70 for 1926 and $4.30 for 1927. This pumping plant has been in operation only about three years.

4723P1. E. A. HUMPHREY

Location.—SE. ¼ SW. ¼ sec. 23, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to a 7-inch vertical centrifugal pump. Well is 14 inches in diameter, 622 feet deep, and partly cased.

Area irrigated.—43 acres of vineyard and 35 acres of trees during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 16, 1927: Power consumption, 25.75 kilowatts; water pumped, 1,010 gallons a minute; power consumed per acre-foot of water pumped, 138.3 kilowatt-hours.

Remarks.—The water was distributed through pipe lines for about 500 feet and then through ditches. A fair measuring section was available. The total power consumption for 1926 was 5,600 kilowatt-hours; for 1927, 7,040 kilowatt-hours. No record was available of the hours of operation during 1926; for 1927 the owner's record gave 307.5 hours. Computed from the power consumption, the total amount of water pumped during 1926 was 40.5 acre-feet and during 1927 was 50.8 acre-feet. The use of water for 1926 was 0.52 acre-foot per acre; for 1927, 0.65 acre-foot per acre. This is considerably lower than the average. The total cost of power, including a demand charge of $135, was $202.20 for 1926 and $219.48 for 1927. The cost per acre irrigated was $2.59 for 1926 and $2.81 for 1927, and the cost per acre-foot of water pumped $5 for 1926 and $4.30 for 1927. This cost per acre-foot of water pumped is considerably above the average and is due to the low use of water. A smaller pumping plant would furnish the same amount of water over a slightly longer period of time, with considerable saving in cost.

4726A1. J. B. CORY

Location.—NW. ¼ NW. ¼ sec. 26, T. 4 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a 6-inch Sterling horizontal centrifugal pump. Well is 12 inches in diameter, 500 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—170 acres of orchard, 65 acres of vineyard, and 5 acres of miscellaneous crops, with the aid of pumping plants 4726E1, 4726B1, and 4727H1, during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 11, 1927: Power consumption, 18 kilowatts; water pumped, 735 gallons a minute; power consumed per acre-foot of water pumped, 133 kilowatt-hours.

Remarks.—The water was distributed through a pipe line and then through ditches. A good measuring section was available. The total power consumption was 8,880 kilowatt-hours during 1926 and 7,310 kilowatt-hours during 1927. No record was available of the hours of operation during 1926; for 1927 the owner's incomplete record gives 262.5 hours. Computed from the power consumption the total amount of water pumped was 66.7 acre-feet in 1926 and 54.8 acre-feet in 1927. The total cost of power, including a demand charge of $108, was $214.56 for 1926 and $195.72 for 1927. The cost per acre-foot of water pumped amounted to $3.22 for 1926 and $3.57 for 1927. (For further discussion see well 4727H1, p. 256.)

4726B1. J. B. CORY

Location.—NE. ¼ NW. ¼ sec. 26, T. 4 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a 6-inch Sterling horizontal centrifugal pump. Well is 14 inches in diameter, 650 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—170 acres of orchard, 65 acres of vineyard, and 5 acres of miscellaneous crops, with the aid of pumping plants 4726A1, 4726E1, and 4727H1, during 1926 and 1927.

Test.—The following results are the average of two tests of 1 hour each June 2 and August 6, 1927: Power consumption, 13.7 kilowatts; water pumped, 595 gallons a minute; power consumed per acre-foot of water pumped, 125 kilowatt-hours; total static head, 50 feet.

Remarks.—The water was distributed through a pipe line and then through ditches. A good measuring section was available. The total power consumption was 9,100 kilowatt-hours during 1926 and 8,200 kilowatt-hours during 1927. No record of the time of operation in 1926 was available; for 1927 the owner's record gives 594 hours. Computed from the power consumption the total amount of water pumped during 1926 was 72.8 acre-feet; during 1927, 65.6 acre-feet. The total amount of water pumped as calculated from the owner's record for 1927 was 65.3 acre-feet, which corresponds very closely to the amount calculated from the power consumption. The total cost of power, including a demand charge of $108, was $217.20 for 1926 and $206.40 for 1927. The cost per acre-foot of water pumped amounted to $2.98 during 1926 and $3.15 during 1927. (For further discussion see well 4727H1, below.)

4726E1. J. B. CORY

Location.—SW. ¼ NW. ¼ sec. 26, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to an 8-inch Sterling deep-well turbine. Well is 12 inches in diameter, 650 feet deep, and partly cased.

Area irrigated.—170 acres of orchard, 65 acres of vineyard, and 5 acres of miscellaneous crops, with the aid of pumping plants 4726A1, 4726B1, and 4727H1, during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test August 8, 1927: Power consumption, 17.10 kilowatts; water pumped, 715 gallons a minute; power consumed per acre-foot of water pumped, 129.8 kilowatt-hours.

Remarks.—The water was distributed through a pipe line and then through ditches into checks. The measuring section was poor, on account of the sandy soil, which was scouring rapidly along the sides and bottom. The total power consumption was 17,840 kilowatt-hours during 1926 and 15,380 kilowatt-hours during 1927. No record was available for the time of operation during 1926; for 1927 the owner's record gave 857.5 hours. Computed from the power consumption the total amount of water pumped during 1926 was 137.5 acre-feet; during 1927, 118.3 acre-feet. The amount pumped in 1927 computed from the owner's record was 113.2 acre-feet, which checks fairly well with the amount calculated from the power consumption. The total cost of power, including a demand charge of $135, was $349.08 for 1926 and $319.56 for 1927. The cost per acre-foot of water pumped amounted to $2.54 for 1926 and $2.70 for 1927. (For further discussion see well 4727H1, below.)

4727H1. J. B. CORY

Location.—SE. ¼ NE. ¼ sec. 27, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to an 8-inch Sterling deep-well turbine. Well is 12 inches in diameter, 835 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—170 acres of orchard, 65 acres of vineyard, and 5 acres of miscellaneous crops, with the aid of pumping plants 4726A1, 4726B1, and 4726E1, during 1926 and 1927.

Test.—The following results are the average obtained during two tests of 1 hour each June 2 and August 6, 1927: Power consumption, 16.61 kilowatts; water pumped, 650 gallons a minute; power consumed per acre-foot of water pumped, 138.9 kilowatt-hours.

Remarks.—The water was distributed through ditches. A fair measuring section was available for the first measurement and a very good section for the second measurement. The total power consumption was 13,030 kilowatt-hours in 1926 and 9,970 kilowatt-hours in 1927. No record was available for the time of operation during 1926; for 1927 the owner's incomplete record gave 511 hours. Computed from the power consumption, the total amount of water pumped in 1926 was 93.9 acre-feet; in 1927, 71.9 acre-feet. The total cost of power, including a demand charge of $135, was $291.36 for 1926 and $254.64 for 1927. The cost per acre-foot of water pumped was $3.10 for 1926 and $3.55 for 1927.

The four pumping plants just described, 4726A1, 4726B1, 4726E1, and 4727 H1, were used together to irrigate 240 acres of land. In the following discussion they will be considered as a unit.

The total power consumption of the four plants was 48,850 kilowatt-hours in 1926 and 40,860 kilowatt-hours during 1927. No record of operation for 1926 was available; for 1927 the owner's incomplete record gave 2,225 hours. Computed from the power consumption the total amount of water pumped was 370.9 acre-feet during 1926 and 310.6 acre-feet during 1927. This gives a use of water of 1.55 acre-feet per acre for 1926 and 1.29 acre-feet per acre for 1927. The total cost of power, including a demand charge of $486 on the four plants, was $1,072.20 for 1926 and $976.32 for 1927. The cost per acre irrigated amounted to $4.47 for 1926 and $4.06 for 1927; the cost per acre-foot of water pumped, $2.83 for 1926 and $3.12 for 1927. These unit costs are below the average and indicate an economical installation. This arrangement of plants has been in use for several years and has proved very satisfactory.

4726C1. G. A. BRODEHL

Location.—NW. ¼ NE. ¼ sec. 26, T. 4 N., R. 7 E.

Plant.—15-horsepower motor direct-connected to a 5-inch Price deep-well turbine. Well is 140 feet deep and is partly cased with galvanized-iron casing.

Area irrigated.—3 acres of vineyard in 1926.

Test.—The following results were obtained during a 2-hour test March 30, 1926, in which two measurements were made with a current meter and one with a 12-inch Cippoletti weir: Power consumption, 11.25 kilowatts; water pumped, 415 gallons a minute; power consumed per acre-foot of water pumped, 147 kilowatt-hours.

Remarks.—The water was distributed through a pipe line and then through ditches. A good measuring section was available. No record was available of the power consumption for either 1926 or 1927. The owner's record gave 48 hours of operation for 1927, and from this figure the total amount of water pumped was calculated at 3.50 acre-feet. This gives the use of water as 1.7 acre-feet per acre. As no record of the total cost of power was available the cost per acre irrigated and the cost per acre-foot of water pumped can not be figured. This pumping plant normally irrigates 10 acres of vineyard, but in 1927 the vineyard was not irrigated, the only irrigation being 3 acres of a neighbor's vineyard. As unit cost figures are lacking, a comparison of costs can not be made. It is believed, however, that the plant is not an economical installation. The demand charge for a 15-horsepower motor is $81. If the 10 acres of vineyard were irrigated every year, the cost per acre irrigated would be $8.10 for the demand charge alone. A smaller plant would pump the same amount of water with a considerable saving in cost.

4726K1. A. L. PADDLEFORD

Location.—NE. ¼ SW. ¼ sec. 26, T. 4 N., R. 7 E.

Plant.—25-horsepower motor belt-connected to an 8-inch horizontal centrifugal pump. Well is 12 inches in diameter, 366 feet deep, and has 128 feet of galvanized-iron casing.

Area irrigated.—80 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test April 22, 1927: Power consumption, 20.02 kilowatts; water pumped, 965 gallons a minute; power consumed per acre-foot of water pumped, 112.6 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a good measuring section was available. The total power consumption was 11,860 kilowatt-hours in 1926 and 15,710 kilowatt-hours in 1927. No record was available for the hours of operation during either year. Computed from the power consumption the total amount of water pumped was 105.4 acre-feet in 1926 and 139.8 acre-feet in 1927. This gives the use of water as 1.32 acre-feet per acre for 1926 and 1.75 acre-feet per acre for 1927. The total cost of power, including a demand charge of $135, was $277.32 for 1926 and $323.52 for 1927. The cost per acre irrigated was $3.46 in 1926 and $4.04 in 1927; the cost per acre-foot of water pumped, $2.63 in 1926 and $2.31 in 1927. These unit costs are below the average and indicate an economical plant installation and operation. This plant has been in use for several years and is still giving efficient and satisfactory service.

4726N1. J. T. LANGFORD

Location.—SW. ¼ SW. ¼ sec. 26, T. 4 N., R. 7 E.

Plant.—25-horsepower motor belt-connected to a 6-inch horizontal centrifugal pump. Well is 10 inches in diameter, 414 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—In 1926, 86 acres of vineyard and 17 acres of orchard; in 1927, 40 acres of vineyard together with 46 acres of vineyard and 17 acres of orchard in conjunction with river pump 24.

Test.—Two tests were made. The following results were obtained during a 1-hour test June 1, 1927: Power consumption, 15.80 kilowatts; water pumped, 690 gallons a minute; power consumed per acre-foot of water pumped, 124 kilowatt-hours; total static head, 52 feet. A 1-hour test August 23, 1927, gave these results: Power consumption, 11.94 kilowatts; water pumped, 525 gallons a minute; power consumed per acre-foot of water pumped, 123.4 kilowatt-hours; total static head, 50.5 feet.

Remarks.—The water was distributed through pipe lines and ditches. The first measurement was made with a current meter in a ditch about 30 feet from the plant. The second was made by a 0.6-foot square orifice after the water had been carried through about 2,000 feet of concrete pipe. This measurement was made because the owner had reduced the speed of the pump, thereby reducing the discharge. Considerable pumping was done with this smaller rate of discharge. The total power consumption in 1926 was 17,880 kilowatt-hours. No record of the hours of operation was available. Computed from the power consumption the total amount of water pumped was 144.0 acre-feet. This gives a use of water over the 103 acres irrigated of 1.40 acre-feet per acre. The total power consumption in 1927 was 16,490 kilowatt-hours, of which 7,630 kilowatt-hours was used to pump water for the 40 acres of vineyard irrigated from this plant without the assistance of river pump 24. The time of operation from the owner's record was 508.5 hours. Computed from the power consumption the total amount of water pumped was 61.4 acre-feet, which gives a use of water of 1.54 acre-feet per acre.

No measurement of the discharge of the river pump was made, but it was estimated at about 1,000 gallons a minute; the average power consumption was 13.80 kilowatts; and from these two figures the power used per acre-foot of water pumped was computed as 750 kilowatt-hours. The total power consumed by the pumping plant to irrigate the 46 acres of vineyard was 3,685 kilowatt-hours and by the river pump 989 kilowatt-hours. No record of the time of operation of the river pump to irrigate this vineyard was available, but for the pumping plant the owner's record gave 284 hours. The amount of water pumped computed from the power consumption of the pumping plant was 29.6 acre-feet and from that of the river pump was 13.2 acre-feet, giving a total of 42.8 acre-feet. This figure gives a use of water of 0.93 acre-foot per acre.

During the time the 17 acres of orchard was irrigated the rate of discharge from the pumping plant was 525 gallons a minute. The total power consumed by the pumping plant to irrigate this orchard was 5,165 kilowatt-hours and by the river pump 1,601 kilowatt-hours. No record of the operation of the river pump was available; for the pumping plant the owner's record gave 439.5 hours. Computed from the power consumption, the amount of water pumped by the pumping plant was 41.8 acre-feet and by the river pump 21.3 acre-feet, a total of 63.1 acre-feet, or a use of water of 3.71 acre-feet per acre.

The total cost of power in 1926, including a demand charge of $135, was $349.56. This gives unit costs of $3.39 per acre irrigated and $2.42 per acre-foot of water pumped. The total cost of power of the pumping plant in 1927, including a demand charge of $135, was $332.88; and that of the river pump, including a demand charge of $81, was $108.48. In figuring the cost of power for each tract irrigated, the total cost of each pump was prorated among the tracts according to the amount of power consumed. Thus the cost of power for the 40 acres of vineyard irrigated by the pumping plant alone was $154.09, the cost per acre irrigated $3.85, and the cost per acre-foot of water pumped $2.51. The cost of power for the 46 acres of vineyard was $74.46 for the pumping plant and $41.42 for the river pump, a total of $115.88; the cost per acre irrigated was $2.52, and the cost per acre-foot of water pumped $2.70. The cost of power for the 17 acres of orchard was $104.33 for the pumping plant and $67.06 for the river pump, a total of $171.39. For the orchard the cost per acre irrigated was considerably higher than for the vineyards, amounting to $10.08, but the cost per acre-foot of water pumped was about the same, amounting to $2.72. The increase in cost per acre irrigated of the orchard was due to the high use of water for walnuts. With the exception of the cost per acre irrigated for the orchard, all the unit costs are exceptionally low and indicate economical operation.

4727C1. F. H. BUCK CO.

Location.—NW. ¼ NE. ¼ sec. 27, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to a 9-inch Byron Jackson horizontal centrifugal pump. Well is 12 inches in diameter, 220 feet deep, and cased for 66 feet.

Area irrigated.—265 acres of orchard in 1926 and 1927, with the aid of pumping plants 4727M1 and 4727R1.

Test.—The following results are the average obtained from two tests of 1 hour each June 1 and August 17, 1927: Power consumption, 13.70 kilowatts; water pumped, 615 gallons a minute; power consumed per acre-foot of water pumped, 120.9 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a fair measuring section was available for both measurements. The total power consumption in 1926 was 1,250 kilowatt-hours; in 1927, 3,080 kilowatt-hours. No record was available for the time of operation in 1926; for 1927 the owner's incomplete record gave 80 hours. The total amount of water pumped, computed from the power consumption, was 10.3 acre-feet in 1926 and 25.5 acre-feet in 1927. The total cost of power, including a demand charge of $135, was $150 for 1926 and $171.96 for 1927. These figures give a cost per acre-foot of water pumped from the plant of $14.55 for 1926 and $6.74 for 1927. (For further discussion see plant 4727R1, p. 260.)

4727M1. F. H. BUCK CO.

Location.—NE. ¼ SE. ¼ sec. 27, T. 4 N., R. 7 E.

Plant.—50-horsepower motor direct-connected to a 14-inch Sterling deep-well turbine. Well is 14 inches in diameter, 610 feet deep, and cased for 300 feet with galvanized-iron casing with the last 200 feet perforated.

Area irrigated.—265 acres of orchard in 1926 and 1927, with the aid of pumping plants 4727C1 and 4727R1.

Test.—The following results were obtained during a 1-hour test April 26, 1927: Power consumption, 34 kilowatts; water pumped, 1,470 gallons a minute; power consumed per acre-foot of water pumped, 125.5 kilowatt-hours.

Remarks.—The water was distributed through a ditch, and the measuring section, about 200 feet below the plant, was good. The total power consumption in 1926 was 26,860 kilowatt-hours; in 1927, 23,030 kilowatt-hours. No record of the time of operation in 1926 was available; for 1927 the owner's incomplete record gave 298 hours. The total amount of water pumped, computed from the power consumption, was 214 acre-feet in 1926 and 183.5 acre-feet in 1927. The total cost of power, including a demand charge of $225, was $520.46 for 1926 and $478.33 for 1927, and the cost per acre-foot of water pumped $2.43 in 1926 and $2.61 in 1927. (For further discussion see plant 4727R1, below.)

4727R1. F. H. BUCK CO.

Location.—SE. ¼ SE. ¼ sec. 27, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to a 6-inch Byron Jackson deep-well turbine. Well is 225 feet deep.

Area irrigated.—265 acres of orchard in 1926 and 1927, with the aid of pumping plants 4727C1 and 4727M1.

Test.—The following results were obtained during a 1-hour test May 5, 1927: Power consumption, 16.80 kilowatts; water pumped, 815 gallons a minute; power consumed per acre-foot of water pumped, 111.9 kilowatt-hours; total static head, 59 feet.

Remarks.—The water was distributed through ditches, and a good measuring section was available. At the time of measurement pumping plant 4734D2, 160 feet away, was in operation. The total power consumption in 1926 was 12,730 kilowatt-hours; in 1927, 10,930 kilowatt-hours. No record of the time of operation in 1926 was available; for 1927 the owner's incomplete record gave 486 hours. The total amount of water pumped, computed from the power consumption, was 114 acre-feet in 1926 and 97.8 acre-feet in 1927. The total cost of power, including a demand charge of $135, was $287.76 for 1926 and $266.16 for 1927, and the cost per acre-foot of water pumped $2.52 in 1926 and $2.72 in 1927.

The three pumping plants just described, 4727C1, 4727M1, and 4727R1, were used together to irrigate 265 acres of land. In the following discussion they will be considered as a unit. The total power consumption of the three plants was 40,840 kilowatt-hours in 1926 and 37,040 kilowatt-hours in 1927. No record of operation was available for 1926; for 1927 the owner's incomplete record gave a total of 864 hours. The total amount of water pumped, computed from the power consumption, was 338.3 acre-feet in 1926 and 306.8 acre-feet in 1927. From these figures the use of water for 1926 was computed as 1.28 acre-feet per acre and for 1927 as 1.16 acre-feet per acre. The total cost of power, including a demand charge of $495, was $958.34 in 1926 and $916.45 in 1927, the cost per acre irrigated $3.61 in 1926 and $3.46 in 1927, and the cost per acre-foot of water pumped $2.87 in 1926 and $2.98 in 1927. All these unit costs are below the average, indicating an economical installation and operation. They are also slightly below those of the J. B. Cory ranch, which has a similar arrangement of pumping plants. Such an arrangement appears to be very satisfactory for large areas.

4728M1. M. T. BAILY

Location.—NE. ¼ SE. ¼ sec. 28, T. 4 N., R. 7 E.

Plant.—25-horsepower motor direct-connected to a 5-inch Sterling horizontal centrifugal pump. Well is 14 inches in diameter, 910 feet deep, and cased for 260 feet with galvanized-iron casing.

Area irrigated.—60 acres of orchard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test November 2, 1926: Water pumped, 1,005 gallons a minute; total static head, 45.5 feet.

Remarks.—The water was distributed through ditches, and a good measuring section was available. There was no record of the power consumption for either 1926 or 1927, because power for an almond huller came through the same meter. No record of operation in 1926 was available; for 1927 the owner's record gave

232 hours. The total amount of water pumped, computed from this record, was 43 acre-feet, and the use of water for the 60 acres 0.72 acre-foot per acre.

4729D1. J. W. STAFFORD

Location.—NE. ¼ NE. ¼ sec. 29, T. 4 N., R. 7 E.

Plant.—15-horsepower motor direct-connected to a 5-inch horizontal centrifugal pump. Well is 12 inches in diameter, 284 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—12½ acres of alfalfa of his own and 12½ acres of miscellaneous crops for a neighbor in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 26, 1927: Power consumption, 11.25 kilowatts; water pumped, 425 gallons a minute; power consumed per acre-foot of water pumped, 143.8 kilowatt-hours; total static head, 47 feet.

Remarks.—The water was distributed through pipe lines for about 200 feet and then through ditches. A good measuring section was available. The total power consumption in 1926 was 6,040 kilowatt-hours; in 1927, 6,250 kilowatt-hours. No record of the hours of operation was available for either 1926 or 1927. The total amount of water pumped, computed from the power consumption, was 42.1 acre-feet in 1926 and 43.5 acre-feet in 1927. This gives a use of water for the 25 acres irrigated of 1.68 acre-feet per acre in 1926 and 1.74 acre-feet per acre in 1927. The total cost of power, including a demand charge of $81, was $153.48 in 1926 and $156 in 1927, the cost per acre irrigated $6.14 in 1926 and $6.23 in 1927, and the cost per acre-foot of water pumped $3.65 in 1926 and $3.59 in 1927. All these costs are above the average, owing to the type of crop irrigated. Alfalfa and miscellaneous crops have a higher use of water than orchards or vineyards. From a study of the costs, however, it is believed that a larger acreage could be irrigated from this plant with considerable decrease n unit costs. The water to irrigate the neighbor's 12½ acres of miscellaneous rops was furnished by Mr. Stafford at a rate of 75 cents per hour of operation.

4729P1. H. H. McCOMB

Location.—SE. ¼ SW. ¼ sec. 29, T. 4 N., R. 7 E.

Plant.—10-horsepower motor direct-connected to a 4-inch Krogh horizontal centrifugal pump. Well is 8 inches in diameter, 63 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—56 acres of vineyard during 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 26, 1927: Power consumption, 9.82; water pumped, 565 gallons a minute; power consumed per acre-foot of water pumped, 94.4 kilowatt-hours; total static head, 34 feet.

Remarks.—The water was distributed through a pipe line and ditches. A good measuring section was available. The total power consumption in 1926 was 3,107 kilowatt-hours; in 1927, 5,079 kilowatt-hours. No record of operation was available for 1926; for 1927 the owner's record gave 456 hours. The total amount of water pumped, computed from the power consumption, was 32.9 acre-feet in 1926 and 53.8 acre-feet in 1927. This gives the use of water as 0.59 acre-foot per acre in 1926 and 0.96 acre-foot per acre in 1927. The total cost of power, including a demand charge of $60, was $103.50 in 1926 and $131.09 in 1927, the cost per acre irrigated $1.85 in 1926 and $2.34 in 1927, and the cost per acre-foot of water pumped $3.14 in 1926 and $2.44 in 1927. These unit costs are considerably below the average and indicate an economical installation. An accurate measurement of depth to water was made while the pump was running and others at short intervals until the water table had returned to normal. The maximum drawdown at the end of the time was 0.10 foot. This is the only well measured in the Mokelumne area which had practically no drawdown.

4733H2. C. WAGNER

Location.—SE. ¼ NE. ¼ sec. 33, T. 4 N., R. 7 E.

Plant.—15-horsepower motor direct-connected to a 4-inch Superior horizontal centrifugal pump. Well is 8 inches in diameter, 100 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—19 acres of vineyard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test March 23, 1927: Power consumption, 9.38 kilowatts; water pumped, 320 gallons a minute; power consumed per acre-foot of water pumped, 159 kilowatt-hours; total static head, 44 feet.

Remarks.—The water was distributed through a pipe line and ditches. A fair measuring section was available. The total power consumption in 1926 was 4,170 kilowatt-hours; in 1927, 5,260 kilowatt-hours. No record of operation was available for either 1926 and 1927. The total amount of water pumped, determined from the power consumption, was 26.2 acre-feet in 1926 and 33.1 acre-feet in 1927. These figures indicate that the use of water was 1.38 acre-feet per acre in 1926 and 1.74 acre-feet per acre in 1927. The total cost of power, including a demand charge of $81, was $131.04 in 1926 and $133.12 in 1927, the cost per acre irrigated $6.89 in 1926 and $7.59 in 1927, and the cost per acre-foot of water pumped $5 in 1925 and $4.35 in 1927. These unit costs are considerably above the average. A smaller pumping plant could be used to irrigate the land or a larger acreage could be irrigated from this plant with considerable saving in cost.

4734D2. FAIRBANKS & DEMENT

Location.—NE. ¼ NE. ¼ sec. 34, T. 4 N., R. 7 E.

Plant.—20-horsepower motor belt-connected to a 5-inch horizontal centrifugal pump. Well is 14 inches in diameter, 100 feet deep, and partly cased with galvanized-iron casing. This well is connected underground to another well 14 inches in diameter and 500 feet deep.

Area irrigated.—70 acres of orchard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 3, 1927: Power consumption, 21.40 kilowatts; water pumped, 990 gallons a minute; power consumed per acre-foot of water pumped, 117.3 kilowatt-hours.

Remarks.—The water was distributed through ditches, and a good measuring section was available. The total power consumption was 13,960 kilowatt-hours in 1926 and 11,610 kilowatt-hours in 1927. No record of operation was available for either year. The total amount of water pumped, computed from the power consumption, was 118.8 acre-feet in 1926 and 99.0 acre-feet in 1927. These figures give a use of water of 1.70 acre-feet per acre in 1926 and 1.41 acre-feet per acre in 1927. The total cost of power, including a demand charge of $108, was $275.52 in 1926 and $247.32 in 1927, the cost per acre irrigated $3.93 in 1926 and $3.53 in 1927, and the cost per acre-foot of water pumped $2.32 in 1926 and $2.49 in 1927. These unit costs are below the average and indicate a well-designed and economically operated pumping plant. The use of water was above the average.

4734J3. AUGUST KNOLL

Location.—NW. ¼ SW. ¼ sec. 34, T. 4 N., R. 7 E.

Plant.—10-horsepower motor belt-connected to a 4-inch horizontal centrifugal pump. Well is 12 inches in diameter, 90 feet deep, and partly cased with galvanized-iron casing.

Area irrigated.—20 acres of vineyard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test May 4, 1927: Power consumption, 11.50 kilowatts; water pumped, 370 gallons a minute; power consumed per acre-foot of water pumped. 168.5 kilowatt-hours.

Remarks.—The water was distributed through ditches, and only a fair measuring section was available. The total power consumption was 1,327 kilowatt-hours in 1926 and 3,029 kilowatt-hours in 1927. Computed from the power consumption, the amount of water pumped in 1926 was 7.9 acre-feet; in 1927, 18.0 acre feet. These figures give a use of water in 1926 of 0.39 acre-foot per acre; in 1927, 0.90 acre-foot per acre. This is a remarkably low use of water compared with that for other vineyards in the same vicinity. The total cost of power, including a demand charge of $60, was $78.57 in 1926, and $102.41 in 1927, the cost per acre irrigated $3.92 in 1926 and $5.12 in 1927, and the cost per acre-foot of water pumped $9.95 in 1926 and $5.70 in 1927. These costs are somewhat above the average and are due to the small acreage irrigated and the low use of water.

4736B1. N. H. LOCKE CO.

Location.—NE. ¼ NW. ¼ sec. 36, T. 4 N., R. 7 E.

Plant.—20-horsepower motor direct-connected to a horizontal centrifugal pump. Well is 16 inches in diameter, 378 feet deep, and cased to a depth of 60 feet with galvanized-iron casing.

Area irrigated.—Exact acreage and crop irrigated in 1926 and 1927 unknown.

Test.—The following results were obtained during a 1-hour test August 8, 1927: Power consumption, 14.62 kilowatts; water pumped, 905 gallons a minute; power consumed per acre-foot of water pumped, 87.7 kilowatt-hours; total static head, about 35 feet.

Remarks.—The water was distributed through pipe lines and ditches, and a fair measuring section was available. An estimated leakage of 20 gallons a minute in the pipe line was added to the measured discharge to obtain the final result. The total power consumption was 10,570 kilowatt-hours in 1926 and 19,060 kilowatt-hours in 1927. No record was available for the hours of operation during 1926 or 1927. Computed from the power consumption the total amount of water pumped was 120.4 acre-feet in 1926 and 217.2 acre-feet in 1927. The total cost of power, including a demand charge of $108, was $234.84 in 1926 and $336.72 in 1927, and the cost per acre-foot of water pumped $1.95 in 1926 and $1.55 in 1927. This is a relatively new pumping plant, having been used only two years.

4815H2. ATHERN & GERSBACHER

Location.—SE. ¼ NE. ¼ sec. 15, T. 4 N., R. 8 E.

Plant.—20-horsepower motor direct-connected to a 6-inch Krogh horizontal centrifugal pump. Well is 10 inches in diameter, 550 feet deep, and cased for 36 feet with galvanized-iron casing.

Area irrigated.—25 acres of alfalfa and 30 acres of miscellaneous crops in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test August 16, 1927: Power consumption, 12.8 kilowatts; water pumped, 760 gallons a minute; power consumed per acre-foot of water pumped, 91.4 kilowatt-hours; total static head, 28 feet.

Remarks.—The water was distributed through pipe lines and ditches, and a good measuring section was available. The total power consumption was 15,750 kilowatt-hours in 1926 and 20,530 kilowatt-hours in 1927. No record was available for the hours of operation during either year. The total amount of water pumped, computed from the power consumption, was 172.5 acre-feet in 1926 and 224.4 acre-feet in 1927. These figures give a use of water of 3.13 acre-feet per acre in 1926 and 4.07 acre-feet per acre in 1927. This is very much higher than the average use of water and is due to the type of crops. Alfalfa and miscellaneous crops require several irrigations during the year. The total cost of power, including a demand charge of $108, was $297 in 1926 and $353.30 in 1927, the cost per acre irrigated $5.40 in 1926 and $6.42 in 1927, and the cost per acre-foot of water pumped $1.72 in 1926 and $1.57 in 1927. This plant appears to be of the right size for the acreage irrigated and the amount of water pumped. The cost per acre irrigated is high, and the cost per acre-foot of water pumped is low on account of the high use of water.

4819B1. WOODBRIDGE FRUIT CO.

Location.—NE. ¼ NW. ¼ sec. 19, T. 4 N., R. 8 E.

Plant.—30-horsepower motor belt-connected to a 7-inch Byron Jackson deep-well turbine. Well is 16 inches in diameter and 380 feet deep; amount and kind of casing unknown.

Area irrigated.—200 acres of orchard in 1926 and 1927.

Test.—The following results were obtained during a 1-hour test August 25, 1927: Power consumption, 27.45 kilowatts; water pumped, 800 gallons a minute; power consumed per acre-foot of water pumped, 186.2 kilowatt-hours.

Remarks.—The water was distributed through pipe lines and ditches. The measuring section was fair. An estimated leakage of 15 per cent in the pipe line was added to the measured discharge. The total power consumption was 84,220 kilowatt-hours in 1926 and 76,190 kilowatt-hours in 1927. No record for the hours of operation was available. The total amount of water pumped, computed from the power consumption, was 452.5 acre-feet in 1926 and 408 acre-feet in 1927. The use of water for 1926 was 2.26 acre-feet per acre; for 1927, 2.04 acre-feet per acre. The total cost of power, including a demand charge of $162, was $1,015.76 in 1926 and $951.52 in 1927, the cost per acre irrigated $5.08 in 1926 and $4.76 in 1927, and the cost per acre-foot of water pumped $2.24 in 1926 and $2.33 in 1927. These costs are not excessive when the acreage irrigated and amount of water pumped are considered. At the time of the test the motor was operating under a 45 per cent overload.

4821F1. L. J. MEGERLE

Location.—SE. ¼ NW. ¼ sec. 21, T. 4 N., R. 8 E.

Plant.—15-horsepower motor direct-connected to an 8-inch horizontal centrifugal pump. Well is 12 inches in diameter, 620 feet deep, and cased for 16 feet with galvanized-iron casing.

Area irrigated.—7½ acres of alfalfa in 1926 and 1927.

Test.—During a 1-hour test September 21, 1926, the water pumped amounted to 1,130 gallons a minute.

Remarks.—The water was distributed through ditches, and a good measuring section was available. No measurement of the power consumption was made at the time of the test, hence all calculations for the amount of water pumped are based on the owner's record. The total power consumption was 1,370 kilowatt-hours in 1927 and 1,670 kilowatt-hours in 1927. No record of operation during 1926 was available; for 1927 the owner's record gave 141 hours. The total amount of water pumped in 1927, computed from this record, was 29.4 acre-feet, and the use of water was therefore 3.92 acre-feet per acre. The total cost of power, including a demand charge of $81, was $97.44 in 1926 and $101.4 in 1927, the cost per acre irrigated $12.99 in 1926 and $13.48 in 1927, and the cost per acre-foot of water pumped was $3.44 in 1927. This plant could furnish water for an area at least three times as large as that now watered from it. It is not believed that the value of the crop grown warrants the high cost per acre irrigated. However, the owner contemplates increasing the area under irrigation about 10 acres in the future. At present this plant is a luxury.

A condensed summary of the chief items of the tests appears in the following table. The closely comparable results for the tests of 1926 and 1927 indicate that slight errors in individual tests have largely compensated each other in the annual results.

Average quantity of water used for irrigation and power cost per acre irrigated and per acre-foot of water pumped

Year	Quantity of water used			Power cost		
	Total number of pumping plants used in computations	Acre-feet per acre		Total number of pumping plants used in computations	Average cost	
		Vineyards and orchards	Alfalfa and miscellaneous crops		Per acre irrigated	Per acre-foot of water pumped
1926	33	1.37	2.97	33	$3.84	$2.82
1927	40	1.31	3.13	44	3.87	2.75
Weighted average		1.34	3.06		3.86	2.78

The schedule of electric charges which is in general use throughout the Mokelumne area is given below. An example of the application of this schedule is shown by pumping plant 4819B1, owned by the Woodbridge Fruit Co. The installation is a 30-horsepower motor direct-connected to a deep-well pump. The annual demand charge for a 30-horsepower motor is $5.40 per horsepower, or $162. The energy consumed during 1926 was 84,220 kilowatt-hours. The energy charge per kilowatt-hour per horsepower for a 30-horsepower motor is 1.2 cents for the first 1,000 kilowatt-hours, 1 cent for the second 1,000 kilowatt-hours, and 0.8 cent for the third 1,000 kilowatt-hours. Thus before a consumer having a 30-horsepower motor can avail himself of the 1-cent rate it is necessary to use 30,000 kilowatt-hours of energy. To get the 0.8-cent rate he must use 60,000 kilowatt-hours. The energy charge for the first block of 1,000 kilowatt-hours per horsepower would be 30,000 times 1.2 cents, or $360; for the second block, 30,000 times 1 cent, or $300; for the part of the third block consumed 24,220 times 0.8 cent, or $193.76. The total power charge is the annual demand charge of $162 plus the energy charges of $360, $300, and $193.76, or $1,015.76.

Schedule of charges for power in the Mokelumne area [a]

Size of installation (horsepower)	Annual demand charge per horsepower	Annual charge per kilowatt-hour per horsepower (cents) [b]			
		First 1,000 kilowatt-hours	Next 1,000 kilowatt-hours	Next 1,000 kilowatt-hours	Remainder
2-4	$6.60	1.6	1.2	0.9	0.7
5-14	6.00	1.4	1.1	.8	.7
15-49	5.40	1.2	1.0	.8	.7
50-99	4.50	1.1	.9	.75	.7
100-249	3.90	1.1	.9	.75	.7
250-499	3.75	1.05	.85	.75	.7
500-999	3.60	1.0	.85	.75	.7
1,000-2,499	3.30	1.0	.85	.75	.7
2,500 or more	3.00	1.0	.85	.75	.7

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[a] Furnished by the Pacific Gas & Electric Co., "Schedule P3, rate A, agricultural power service."
[b] Minimum total annual cost, $13.20.

In the 53 pumping tests that have been described it was found that the quantity of water used in a year ranged from 5.52 acre-feet per acre for alfalfa and miscellaneous crops to 0.47 acre-foot per acre for vineyards. The average for 1926 and 1927 was 3.06 acre-feet per acre for alfalfa and miscellaneous crops and 1.34 acre-feet per acre for vineyards and orchards.

In order to determine the average use of water in the Mokelumne area it was necessary to measure the discharge of as many pumping plants in as many different parts of the area as possible, without regard to type of soil or kind of crop. The owners cooperated by agreeing to keep a record of the actual hours of operation of the pumping plants during the season. Record forms were provided for this purpose and were tacked up in some convenient place in the pump house, preferably near the starting switch. Nearly all the discharge measurements were made by means of a Price current meter. The power input and the meter readings were recorded at the time of the test in order to calculate at the end of the season the amount of water pumped from the power consumption. In plants using gasoline or distillate as fuel an effort was made to determine the amount of fuel consumed. Thus there were two methods of computing the amount of water pumped—from the owner's record of hours in operation and from the power or fuel consumption. It was found that using the power or fuel consumption was much the better of the two. At many plants the owner's record of operation was incomplete, mainly because several different operators had stopped and started the pump. For this reason the amount of water pumped was computed from the power or fuel consumption. Where the owner's record was complete the amount of water pumped as computed from the record agreed very closely with that computed from the power consumption. This fact has been mentioned in the descriptions of the individual pumping plants, with a comparison of the results.

In the descriptions of several plants attention has been called to factors that render the plant an expensive source of water. In summarizing the results of the tests these factors may be mentioned again and their effect on the cost of irrigation noted.

The tendency throughout the Mokelumne area seems to be to install pumping plants capable of more work than is required of them. This may be due in part to the machinery salesmen and in part to the irrigator. Many irrigators install larger plants than they need, simply for convenience in operation. It is easier to run a large plant for a short time than to accomplish the same amount of irrigation with a smaller plant over a longer period. Some irrigators have planned a larger acreage than is at present being irrigated. The undue expense should be reduced by irrigating the additional land as soon as possible. For example, the owner of plant 4821F1 planned to irrigate practically double the acreage after the season of 1927.

Installing pumping plants with a greater capacity than the well can supply causes loss of efficiency from excessive drawdown and in centrifugal pumps from entrance of air into the pump, impairing the suction. An example is afforded by plant 3625B1. Here there was no loss of suction, as the pump was a deep-well turbine, but the drawdown was excessive. Such a condition may be overcome by enlarging and deepening the well or by sinking auxiliary wells near by and connecting them underground by blasting. Centrifugal pumps in good condition can lift water about 28 feet under suction, but a lift of not more than 20 feet is recommended for economical operation. The well may be improperly cased, the driller having cased off the water-bearing strata. If it is known at what depths the water-bearing strata occur, such a condition can be corrected by installing perforated casing or perforating the casing already in place at the proper depths.

At many of the pumping plants the end of the discharge pipe was higher than necessary. As a certain amount of work is required for every foot the water must be lifted, it is obvious that the end of the discharge pipe should be only high enough to deliver water into the ditches.

Some of the plants were found to be badly in need of overhauling, especially those with horizontal centrifugal pumps. Most of the deep-well turbines were in good condition. A pumping plant that is not operating at maximum efficiency not only increases the cost of pumping water but also increases the time required to irrigate the land, owing to the decreased discharge of the pump. Such a pumping plant is expensive to the irrigator, and the condition should be remedied as soon as possible.

There are many minor details in connection with the installation of a pumping plant, neglect of which causes loss of energy and increases the cost of pumping. Probably the most common of these is belt slippage. In general, the more direct the connection between the pump and motor or engine the better. For motor-driven pumps the ideal method of transmitting power is by direct connection between the pump and motor. This eliminates the loss of power that always occurs in indirect transmission. When belt transmission is used between pump and motor the belt should be kept as tight as possible and treated with belt dressing as often as necessary. Sharp turns and elbows in suction and discharge pipes should be avoided, as they increase the friction head, causing a decrease in efficiency.

The power cost per acre irrigated during 1926 and 1927 was found to range from $1.52 to $13.48 and to average $3.86. These figures do not include depreciation and repairs. During the two seasons the schedule of charges of the Woodbridge Irrigation District, then known as the Stockton-Mokelumne Canal, was $4 an acre for alfalfa and

$3 an acre for vineyards and orchards. A comparison of the costs indicates that irrigation by pumping is the more expensive.

The power cost per acre-foot of water pumped ranged from $1.07 to $14.55 and averaged $2.78. As the energy cost is based on a sliding scale the more water pumped the less the cost per acre-foot. As has been mentioned before, the tendency on the part of the irrigator in the Mokelumne area is to install a larger pumping plant than is necessary. As the demand charge is based on the size of the plant, it is believed that the unit costs of irrigation could be decreased by installing a smaller plant of the proper design. This would increase the number of hours required to irrigate the same piece of land, and there is a possibility that the additional overhead expense due to the longer period required for irrigation might offset any advantage in rates gained by installing the smaller pumping unit.

AMOUNT OF WATER PUMPED FROM WELLS

The amount of water pumped from wells in the Mokelumne area could have been determined by rating the discharge of each pump and keeping a record of the number of hours in use. To have done this for about 2,000 pumps, however, would have required many additional engineers, and even then the final result would not have been very accurate, because it would have been impossible to record the exact number of hours in use and to rate all the pumps for all changes in the water level in the wells. A method was adopted which has given more accurate results with much less labor. As already described, measurements were made of the discharge of 53 pumping plants, and information was obtained as to the acreage of crops of different kinds that were irrigated by each plant. The results of this work are given on pages 239–268. The average use of water on orchard and vineyard land, exclusive of rainfall, as determined for 28 pumping plants in 1926 and 41 in 1927, was about 1.30 acre-feet per acre. The acreages for which the use is computed are largely based upon the owners' statements of the land planted to these crops. Fortunately, the land is so valuable and so carefully subdivided that the reported acreage under each pump is probably accurate, though practically all the reports included some land occupied by home sites, roads, etc., that is not irrigated. This use of water for irrigating vineyards and orchards is so moderate that there can be no appreciable amount of percolation below the root zone. Practically all the water applied in irrigation is disposed of by evaporation and transpiration. The economical use of water thus indicated is largely due to the fact that the tracts are small and the water is supplied from wells close by; hence ditch losses are insignificant. Furthermore, there is almost no waste, because an irrigator is not allowed to run water on his neighbor's land and because much of the water is applied by means of pipe lines, which have almost no transmission losses. The farmers, as a rule, irrigate intelligently and test the depth of water penetration with soil augers.

According to the census given in the table on page 208, 36,928 gross acres of vineyard and orchard land was irrigated by wells. At the time of the census many of the landowners stated that they did not irrigate every year. Irrigation of vineyards has been considerably reduced in recent years, because many farmers believe that better grapes are raised with less water. Consequently, it is estimated that 15 per cent of this area is not irrigated each year. This reduced the area actually irrigated annually to 31,400 acres. If 1.30 acre-feet per acre, exclusive of rainfall, is used on 31,400 acres, about 40,800 acre-feet of water is annually pumped from the ground and consumed by vineyards and orchards in the Mokelumne area.

The average quantity of water used annually in irrigating alfalfa and miscellaneous garden crops as determined from the pumping tests made in 1926 and 1927 is about 3.05 acre-feet per acre for gross acreages of land, exclusive of rainfall. Some of the water applied for irrigating the alfalfa doubtless percolates below the root zone and returns to the zone of saturation. This amount is known to be small, as shown by experiments made by the United States Department of Agriculture on the use of water. Scofield and Wright [47] have made the most intensive study in late years of this subject. They state:

> It is not uncommon in irrigated regions having a long growing season to use 3 acre-feet of water on each acre of land, applied in 8 to 10 irrigations. This means that the average application is 4 inches or less for each irrigation. This quantity of water is barely sufficient to supply the needs of the crop and unavoidable evaporation losses.

This method of irrigation is similar to that used for alfalfa in the Mokelumne area; hence a use of 3.05 acre-feet for gross acreages of alfalfa and garden crops as determined by tests made during the present investigation must be close to the consumptive use exclusive of rainfall for crops of this type.

Members of the division of irrigation investigation and practice of the College of Agriculture of the University of California have for several years been studying the consumptive use of water at the experiment farm at Davis, about 50 miles from Lodi. Prof. Frank Adams and M. R. Huberty,[48] assistant irrigation engineer, have kindly supplied the following data in advance of publication:

> The results of the duty of water studies made at Davis and at Delhi indicate that a good stand of alfalfa on land adapted to its growth will require, in the Lodi area, from 30 to 36 acre-inches of water per acre per season in addition to

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[47] Scofield, C. S., and Wright, C. C., The water relations of Yakima Valley soil: Jour. Agr. Research, vol. 37, pp. 65–87, 1928.

[48] Letter from Mr. Huberty, dated May 29, 1929.

rainfall. Our use of water studies in Sacramento Valley indicate that a mature, vigorous growing orchard would have a consumptive use of from 24 to 30 acre-inches per acre. Young orchards or mature orchards of average vigor will require a lesser amount. Water-requirement studies of shipping grapes have not been made by our division. However, it is my opinion that the seasonal consumptive use of a mature vineyard of good vigor would be from 18 to 24 acre-inches per acre. The amounts given for orchards and vineyards include the water contributed by rainfall.

The results obtained at Davis are closely in accord with the tests carried on during this investigation and indicate that the quantity of water used for crops irrigated from wells is nearly the same as the consumptive use. In other words, not much of the water pumped from wells for irrigation percolates back to the ground-water supply.

The census (p. 208) shows that 8,872 acres was planted in alfalfa and miscellaneous crops. A part of this area, especially the land planted to garden crops, is not irrigated each year. Consequently it is estimated that only about 8,000 acres is actually irrigated each year. Applying a consumptive use of 3 acre-feet per acre, exclusive of rainfall, to the 8,000 acres shows about 24,000 acre-feet of water pumped from wells and not returned to the ground-water reservoir.

The total amount of water permanently withdrawn from the ground for irrigation in the Mokelumne area is therefore estimated to be 64,800 acre-feet annually. There is a variation in the amount of water pumped from year to year depending upon the amount of rainfall, but there was no practicable way to determine these annual differences, and the result given is believed to be about the average of the 3-year period 1926 to 1928.

Besides the ground-water withdrawals for irrigation there are drafts on the supply by about 3,000 individual domestic wells and by wells that serve a considerable municipal population. The city of Lodi pumps more water than any other settlement in the area, and records kept by the city engineer are summarized in the following table:

Water pumped by the city of Lodi, January, 1924, to June, 1929, in gallons

Month	1924	1925	1926	1927	1928	1929
January	49, 481, 000	22, 352, 000	[a] 23, 224, 000	48, 402, 000	36, 656, 000	36, 192, 000
February	49, 555, 500	19, 040, 000	[a] 44, 160, 000	43, 236, 000	34, 043, 600	37, 839, 200
March	61, 617, 750	57, 118, 000	85, 200, 000	71, 898, 000	39, 022, 400	47, 246, 800
April	74, 780, 500	63, 684, 000	[a] 93, 618, 000	88, 559, 000	[a] 56, 642, 800	85, 016, 400
May	124, 242, 500	118, 753, 600	[a] 133, 836, 000	[a] 143, 312, 000	[a] 101, 790, 000	[a] 122, 342, 400
June	131, 862, 000	137, 185, 500	[a] 140, 736, 000	[a] 156, 505, 500	[a] 130, 430, 400	120, 176, 000
July	144, 721, 000	149, 202, 000	[a] 168, 468, 000	[a] 146, 334, 000	[a] 124, 305, 600	------------
August	136, 206, 000	133, 708, 000	[a] 151, 563, 000	[a] 142, 174, 000	[a] 116, 816, 600	------------
September	116, 171, 000	108, 690, 000	[a] 143, 490, 000	[a] 119, 480, 000	100, 444, 400	------------
October	67, 730, 000	71, 520, 000	78, 942, 000	[a] 61, 897, 500	74, 854, 800	------------
November	26, 339, 000	[a] 13, 430, 000	62, 442, 000	48, 618, 000	50, 007, 600	------------
December	43, 508, 000	[a] 33, 840, 000	52, 812, 000	43, 740, 000	36, 551, 600	------------
The year	1, 026, 214, 250	928, 523, 100	1, 178, 491, 000	1, 135, 557, 000	901, 565, 800	------------

[a] During these months the city supply was supplemented by water pumped from a well belonging to the Van Pump Co.

The average annual pumpage is about 3,500 acre-feet. The county directory for 1926 gives the population of Lodi as 7,600; hence the average per capita use was 400 gallons a day. A considerable part of this water is used for irrigating lawns. Lockeford, Clements, Galt, and Victor have a total population of about 2,100, according to the census of 1920. Applying the per capita use at Lodi, which may be a little too high, indicates that these towns use about 832,000 gallons a day, or 1,000 acre-feet a year. The annual consumption of domestic and stock water for the rural population of 2,750 families has been estimated at 1,500 acre-feet. The estimated annual domestic and stock consumption of ground water for the entire area is thus 6,000 acre-feet. As this 6,000 acre-feet is also withdrawn from the ground annually, it must be added to the amount pumped for irrigation. This gives an average annual withdrawal from wells of 70,800 acre-feet.

EFFECTS OF PUMPAGE OF GROUND WATER

The decline of the water table in the Mokelumne area is an established fact. From 1906 to 1926 the water table fell 10 to 15 feet in the pumping district south of the Mokelumne River. Measurements north of the river as early as 1906 are not available, but in 1913 and 1914 wells were measured in this area, and the decline from 1913 to 1926 in the part where pumping is intensive amounted to about 6 feet. This decline of the water table can not be attributed entirely to changes of climate, even though 1924 and 1926 were dry years, because the water table north of Dry Creek, where no pumping is done, has not changed materially in this same period.

From April, 1926, to April, 1929, the water table in subarea 2, which is the district of most intensive pumping, declined 4.2 feet, though practically all of this decline occurred in the last year. During this 3-year period there was one fairly wet year and one dry year. Observations of the water level will have to be carried on for several years more to establish the average rate of decline.

The decline of the water table over the entire Mokelumne area for these same three years amounted to only 2.2 feet, as compared with the 4.2 feet in subarea 2.

Subarea 2 covers 35,700 acres. (See fig. 10.) According to the data presented in the table on page 126, 150,200 acre-feet of soil was unwatered in this area in the 3-year period ending in April, 1929. If this soil yielded 10 per cent of its volume, then about 15,000 acre-feet of water in excess of recharge was withdrawn from storage, or an average annual decrease in storage of 5,000 acre-feet. There was doubtless some inflow from lands adjacent to the area of intensive pumping; hence some of the soil unwatered under adjacent lands was due to pumping in subarea 2. Consequently any method to recharge artificially the alluvium under subarea 2 would have to replace also the water derived from storage under adjacent areas before an equilibrium could be established between recharge and withdrawals.

The Lodi pumping district is much more advantageously located in respect to supply than most other pumping districts in California, because a ground-water supply is assured providing the acreage of land irrigated by ground water is not greatly increased. As the years go by and the water table declines, the gradient of the water table in the country tributary to the district will be increased. If the decline should continue at the present rate of 1.4 feet a year, then in about 28 years the water table would fall to 10 feet below sea level. Other conditions being the same, at that time drainage pumps would not have to operate in the adjacent delta country except to remove surface water siphoned through the levees or seeping in under the levees. Practically all the ground water that was not being discharged in that area would then flow toward the ground-water depression in the Mokelumne pumping district. Furthermore, more water would have to be applied in the Woodbridge irrigation district because of the deeper water table in order to irrigate lands now subirrigated; hence additional water would be derived from this source also. In addition, some ground water would be derived also from San Joaquin and Sacramento Valleys and their master streams, because water percolating into the ground in the delta country from these streams would move inland. The combination of all these conditions, which would result from a lowering of the water table and a corresponding increase in the area tributary to the pumping district, would eventually increase the supply.

If the acreage irrigated is not increased, an equilibrium will eventually be reached between withdrawals and supply. There has been a steady increase in the amount of land irrigated from wells. Economic conditions largely determine the rate of land development, and hence the present rate of increase is not an index of future growth. Most of the good land has been developed, and only the rougher land and the land where the depth to water is great are not under irrigation. Furthermore, an increase in the pumping lift accompanying a decline of the water table tends to discourage new development; hence a great increase in the acreage of land irrigated with ground water is not expected.

By building a diversion dam on the Mokelumne River near Victor, water could be diverted by gravity canals and used to increase ground-water recharge by applying it to certain lands in the heart of the pumping district on both sides of the river. Rates of percolation in the Woodbridge irrigation district and elsewhere indicate that the sandy loam in the pumping district would lose by deep percolation about 1 cubic foot of water a day per square foot of wetted area. The rate of loss is, however, contingent upon whether the water is applied continuously or intermittently, and whether it is applied on one large area or on a number of smaller areas at some distance from one another. The daily loss per square foot of ground surface would be much less on a large tract of land where the ground water was not far below the surface.

Consequently, it is difficult to compute the area of land necessary to spread sufficient water to compensate for withdrawals from ground-water storage. The subject is complicated also by the fact that silting of the wetted tracts would decrease the rate of percolation. However, the silt content of the Mokelumne River will doubtless be greatly reduced by the storage of flood water in the Pardee Reservoir. Any silting could be overcome by occasionally drying up the spreading tracts and plowing or scraping the land. The size of the tracts most advantageous for the efficient and economical spreading of water by this method and the length of time the water should stand on each tract would have to be determined by experience. As spreading probably would not be attempted until the water table fell considerably lower than it is now, the increased depth to water would increase the time required for complete saturation of the soil under the spreading tracts. On the basis of a deep percolation of 1 cubic foot a day from each square foot of wetted area only about 14 acres would be required to sink 5,000 acre-feet of water, if the water was applied continuously throughout the year. In actual practice it would probably take several times this amount of land.

Instead of using the spreading method, the water might be used in the heart of the pumping district to irrigate land that is now irrigated with well water, thereby saving the cost of pumping the water to the surface. This procedure would not only reduce the total acreage supplied by ground water but at the same time would cause considerable additional water to percolate beyond the root zone and replenish the underground supply, as occurs at present in the Woodbridge irrigation district.

Thus there are three alternative methods to compensate for an overdraft of ground water. One method is to continue pumping until the area of influence increases to such an extent that the inflow equals the withdrawal. This method is the path of least resistance. However, in the end, with the deepening of wells, the change in pumps, the danger of alkali, and the additional pumping lift, it may be the most expensive. A second method is to divert water from the Mokelumne River and spread it on certain permeable areas in the heart of the pumping district to increase the recharge. A third method is to divert water from the Mokelumne River and use it for irrigation in the pumping district, thereby reducing the acreage to be supplied by ground water and incidentally increasing the recharge because of percolation of some of the water below the root zone. This method has the disadvantage as compared with the second that it requires water in the low-water season as well as in the high-water season. A combination of the second and third methods might prove be experience to be the most practicable. A fourth method would be to build a reservoir on Dry Creek to conserve its flood waters and to utilize the surplus water of the Mokelumne River, which could be diverted into Dry Creek through the Jackson spillway of the Pardee Reservoir. This water could then be used to irrigate lands in the uplands where the ground water is too far below the surface to be economically used for irrigation. Seepage from these irrigated lands would increase the ground-water supply for the pumping district farther west.

SUMMARY OF GROUND-WATER SUPPLY

According to computations that have been made, a total of about 70,800 acre-feet of water is annually withdrawn from wells in the Mokelumne area, of which about 17,000 acre-feet is supplied by recharge from irrigation water diverted from the Mokelumne River and used in the Woodbridge district or from rainfall on that district. Of this amount about 16,500 acre-feet is used for irrigation in the Woodbridge district (see p. 206) and about 500 acre-feet is used for domestic and stock supplies, including the water used in the town of Woodbridge. If 17,000 acre-feet pumped in the Woodbridge district is deducted from the total of 70,800 acre-feet of water pumped in the entire Mokelumne area, there is a balance of 53,800 acre-feet supplied from rainfall percolation, seepage losses from the Mokelumne River, Dry Creek, and Bear Creek, or underground storage. These data are summarized in the table below.

Estimated withdrawals of ground water by pumping from wells in the Mokelumne area, in acre-feet

Entire area:		
Well water used for irrigation	64, 800	
Well water used for domestic and stock supplies	6, 000	
Total ground-water withdrawals through wells		70, 800
Woodbridge irrigation district:		
Well water used for irrigation	16, 500	
Well water used for domestic and stock supplies	500	
Total ground-water withdrawals through wells		17, 000
Total ground-water withdrawals exclusive of the Woodbridge irrigation district		53, 800

According to the records shown on page 128, a total of 35,900 acre-feet of material in the Mokelumne area exclusive of subarea 1 (Woodbridge irrigation district) became saturated from April, 1926, to April, 1927. Therefore, if the specific yield is taken to be 10 per cent, the conclusion is reached that about 3,590 acre-feet of water was added to the ground-water supply in that year. The recharge during the year exclusive of the Woodbridge irrigation district therefore amounted to the pumpage (approximately 53,800 acre-feet) plus the increase in storage (approximately 3,590 acre-feet) plus an undetermined quantity that percolated to the delta lands through the country lying north of the Woodbridge irrigation district or was lost by transpiration or other evaporation in the shallow-water tracts along the Mokelumne River and Dry Creek.

According to the records given on page 128, in the area exclusive of the Woodbridge irrigation district 48,800 acre-feet of water-bearing material was unwatered from April, 1927, to April, 1928. The assumed specific yield of 10 per cent indicates that in that year 4,880 acre-feet was removed from storage to supply the excess of pumpage and natural losses over the recharge.

In the same area 363,900 acre-feet was unwatered from April, 1928, to April, 1929, and the assumed specific yield of 10 per cent indicates that the draft on storage to supply the excess of withdrawals over recharge amounted to 36,390 acre-feet.

On the assumption that the pumpage each year was 53,800 acre-feet the computations indicate a recharge in the Mokelumne area exclusive of the Woodbridge irrigation district of 57,390 acre-feet in 1926–27 and 48,920 acre-feet in 1927–28, plus the natural losses. Similar computation indicates very much smaller recharge in 1928–29. Obviously the computation of recharge for 1928–29 is subject to a much greater percentage of error than those for the first two years because of the much greater effect of any inaccuracy in the assumed specific yield.

The records given on page 128 indicate that in the area exclusive of the Woodbridge irrigation district 351,100 acre-feet of material became saturated from September, 1926, to April, 1927; 296,500 acre-feet from September, 1927, to April, 1928; and 56,200 acre-feet from September, 1928, to April, 1929. With an assumed specific yield of 10 per cent the excess of recharge over withdrawals during these periods is computed to be 35,110 acre-feet in 1926–27, 29,650 acre-feet in 1927–28, and only 5,620 acre-feet in 1928–29. These figures, of course, do not indicate the total annual recharge, because they do not include the recharge in the periods from April to September or the recharge required to supply the withdrawals in the periods from September to April and do not take account of variations in annual withdrawals. They are significant, however, in showing that there was only a small recharge in the winter of 1928–29, when the rainfall was light.

DEEP-WELL RECORDS AND WELL LOGS

Several deep wells have been drilled in the Mokelumne area in the last few years to obtain large supplies of water or in search of gas and oil. The logs of these holes are the only records available of what exists deep below the surface in this area; hence an effort was made to obtain as many of them as possible.

WELL IN T. 3 N., R. 7 E.

Driller's log of well 3718A8

[Mrs. P. H. Walker, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil and sand	15	15	Sand	2	105
Clay	5	20	Clay	2	107
Sand and gravel	30	50	Sand	3	110
Soft sand and clay	10	60	Clay	12	122
Gravel, sand, and soft clay	10	70	Soft clay and sand	4	126
Gravel	2	72	Clay	14	140
Soft sand and clay	22	94	Sand and water	10	150
Hard clay	9	103			

WELLS IN T. 4 N., R. 5 E.

Driller's log of well 4517J1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Peat	10	10	Black sand	8	358
Sand	8	18	Sand and gravel	27	385
Soft blue clay	27	45	Cemented sand	5	390
Stiff blue clay	10	55	Blue clay	15	405
Soft sandy blue clay	15	70	Packed sand	9	414
Blue clay (gumbo)	10	80	Blue soapstone clay	3	417
Soft sandy clay	20	100	Sand	41	458
Fine sand (would not stand)	10	110	Gravel and sand	9	467
Blue clay, little sand	84	194	Clay	5	472
Hard cemented sand	7	201	Sand	32	504
Fine and coarse gravel	15	216	Gravel	7	511
Blue clay	64	280	Hard clay	19	530
Cemented sand	10	290	Joint clay	10	540
Blue sand	60	350	Blue clay; sand at bottom	14	554

Driller's log of well 4519J1

[Libby, McNeill & Libby, owners]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	1	1	Dry sand	5	35
Peat	4	5	Blue clay	21	56
Soft clay	15	20	Water sand	--------	56+
Blue clay	10	30			

WELLS IN T. 4 N., R. 6 E.

A deep well was drilled in search of oil and gas on the south bank of the Mokelumne River in sec. 36, T. 4 N., R. 6 E., and is now pumped to supply the swimming pool at Lodi. The well was drilled by J. N. Jensen, of Sacramento. A workman who helped drill the well reports that the chief aquifer is at 1,259 feet, for at that depth the well began to flow. The flow increased as the well was drilled deeper, and considerable gas was also struck. Only sand, silt, and clay were encountered. The yield is reported to be 300,000 gallons in 17 hours. The well is 1,950 feet deep and was drilled in 1905. The water formerly discharged 8 feet above the ground surface. Originally a considerable part of the hole was cased, but now it has only 200 feet of casing. The original temperature of the water is reported to be 87° F. The well is now equipped with a Byron Jackson single-stage turbine with a 10-horsepower motor. This pump runs continuously and is reported to discharge 295 gallons a minute during the summer when the swimming pool is used. The temperature of the water after being conducted for about a mile through a pipe is 82° F.

WELLS IN T. 4 N., R. 7 E.

Driller's log of well 472N1

[G. Wakefield, owner]

	Thickness (feet)	Depth (feet)
Hard surface soil	3	3
Subsoil	3	6
Yellow clay	30	36
Sand	1½	37½
Soft brown clay	28½	66
Rock and brown clay	3	69
Washed gravel, grading downward into clay	8	77
Gray clay	5	82
Soft brown silt	43	125
Small cemented gravel	7	132
Red clay	2	134
Soft gray clay	16	150
Hard gray clay	5	155
Sandstone	20	175
Tough blue clay	5	180
Soft gray clay, grading into brown clay at 192 feet	9	190
Brown clay	13	205
Gray clay, grading into brown clay at 216 feet	10	215
Brown clay	4	220
Sticky gray clay	8	228
Brown clay	4	232
Brown sandstone	3	235
Small gravel	1	236
Sandstone	4	240
Brown clay	8	248
Hard red clay	3	251
Red brittle clay	19	270
Sticky gray clay	12	282
Brown clay	3	285
Red clay	10	295
Streak of small gravel and black sand	1	297
Gray clay	23	320
Blue clay	3	323
Pink clay	2	325
Gray clay	5	330
Hard sandstone	8	338
Gray clay	5	343
Small gravel	1	344
Hard red clay	10	354
Green clay	5	359
Hard red clay	11	370
Sandstone	5	375
Red clay	3	378
Red sandstone	16	394
Sand and gravel	1	395
Sticky gray clay	5	401
Red clay	4	406
Streak of gray sand	2	408
Sticky red clay	6	414
Sandstone	2	416
Red clay	10	426
Dark sandstone	11	438
Black sand	4	442
Sticky red clay	2	444

Driller's log of well 4711P2

[F. E. Lake, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Loam	6	6	Rock strata with clay between	30	130
Cement gravel	4	10	Sand and rock	70	200
Reddish clay	90	100	Gravel	8	208

The Pacific Petroleum Producers' oil well (4712A1), near Elliott, in sec. 12, T. 4 N., R. 7 E., 100 feet above sea level, was started in 1925 as a wild cat. Drilling stopped in the summer of 1926 at a depth of 1,975 feet. Jack Kirtley, one of the drillers, reports that occasional showings of gas and oil were found. Considerable fresh water was encountered, which greatly handicapped the drilling for oil. The record of the casing as kept by Mr. Kirtley is given below.

	Feet from ground surface		Feet from ground surface
20-inch	95	8-inch	1,510
15-inch	546	6¼-inch	1,900
12-inch	696	4½-inch	1,975
10-inch	1,362		

The last four joints of casing in the hole are perforated, as the owners thought they were going to pump oil from this level. According to the driller the hole yielded fresh water at 1,975 feet, or 1,875 feet below sea level. The log of the hole as recorded by the driller is given below. Samples taken at different depths were studied by the writer (Stearns), and he has added his description of them in parentheses after the driller's notes. The color of the samples has changed considerably since they have dried out. Many of the blue clays are now pale green, and much of the dark-colored sand mentioned by the driller is now light gray. The depth to water in the hole is reported to be 45 feet.

Driller's log of Pacific Petroleum Producers' well (4712A1)

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface soil	3	3	Coarse gravel	5	185
Sandy brown shale	6	9	Brown conglomerate. (Pebbles mostly of pea size.)	40	225
Brown sandstone. (Tan-colored hardpan containing numerous angular quartz grains as much as 2 millimeters in diameter.)	7	16	Gray shale	20	245
Brown shale	29	45	Light-brown clay	25	270
Water sand	8	53	Coarse gravel	5	275
Gray shale	12	65	Gray clay	55	330
Water, sand, and gravel	10	75	Brown sandy clay	55	385
Light-brown clay	25	100	Brown greasy clay	8	393
Dark-brown shale	15	115	Sandy clay	20	413
Brown conglomerate	65	180	Brown sticky clay	4	417
			Brown clay	53	470
			Sandy brown clay	5	475

Driller's log of Pacific Petroleum Producers' well (4712A1)—Continued

	Thickness (feet)	Depth (feet)
Black water sand. Same in Thompson's water well, across the street. (Sample consists of clean coarse black volcanic sand containing some angular quartz but mostly fragments of volcanic glass and white pumice 1 inch or less in diameter.)	10	485
Gray clay	32	517
Water sand	18	535
Brown sandy clay	6	541
Light sandy rock	1	542
Water sand. (Similar to bed of black volcanic sand at 485 feet)	5	547
Sand rock	1	548
Water sand. (Similar to bed of black volcanic sand at 485 feet.)	5	553
Dark brown clay	32	585
Coarse water sand and pumiceous gravel. (Similar to bed of black volcanic sand at 485 feet but contains much more pumice.)	11	596
Light-brown clay	20	616
Water sand. (Similar to bed of volcanic sand at 485 feet but contains more quartz and less pumice.)	4	620
Light-brown clay	6	626
Coarse water sand and gas; did not make water overflow top of casing. (Black volcanic sand similar to bed at 485 feet but containing practically no pumice. Some of the grains are well rounded and are the size of buckshot. Angular feldspar is also present.)	14	640
Light-brown shale	16	656
Sand; showing of oil and gas; heavy oil in sample. (Cuttings are chiefly fragments of crushed andesite and other dark-colored volcanic pebbles. A few quartz pebbles are also present. The sand is clean and very coarse, and there is a notable absence of pumice. Chiefly derived from the andesite mud flows of the Sierra Nevada)	7	663
Coarse gravel or conglomerate. (Very similar to sample taken at 656-663 feet except that it is more sandy and contains very few broken pebbles. It is nearly all of volcanic origin.)	12	675
Light tan-colored sandy shale	15	690
Sticky light-tan clay	18	708
Coarse sand carrying water. (Similar to bed at 675 feet, chiefly sand and pea-size gravel derived from volcanic rocks.)	12	720
Light-gray clay	20	740
Sandy tan-colored clay	5	745
Sand; showing of oil and gas. (Fine black volcanic sand and pea-size gravel.)	5	750
Coarse sand; showing of oil. (Fine black volcanic sand and pea-size gravel.)	5	755
Hard fine sand carrying oil; pebbles big as your fist. (Samples are andesite pebbles well rounded, sand is fine and black, of volcanic origin.)	5	760
Coarse (waterworn black) sand; showing of oil. (Similar to sand at 755 feet. No pumice in sample. From 764 to 770 feet sample contains rounded pebbles of volcanic rocks.)	10	770
Fine black (volcanic) sand with pebbles; showing of gas	20	790
Gray shale	2	792
Black (volcanic) sand (with pea-size gravel of volcanic origin)	18	810
Light tan-colored shale	12	822
Fine (black volcanic) sand	32	845
Coarse gray sand (and large fragments of acid pumice)	13	858
Hard "shell" rock	1	859
Light pinkish-brown clay	11	870
Fine black (volcanic) sand	25	895
Gray sticky clay	5	900
Fine black (volcanic) sand	26	926
Sandy gray clay	3	929
Sticky gray clay	3	932
Black (volcanic) sand	33	965
Hard sand shell with fossils. (Dark-gray volcanic sand. Driller thought pumice was fossils.)	6	971
Gray clay	7	978
Fine dark-gray (volcanic) sand. (The gray color is due chiefly to a larger amount of quartz than in the black volcanic sand.)	13	991
Hard rock shell	2	993
Hard fine gray (volcanic) sand	2	995
Gray clay	1	996
Hard gray (volcanic) sand (grading from fine to coarse); showing of oil and gas	22	1,018
Gray sandy clay	17	1,035
Coarse gray sand. (Derived in part from volcanic rocks and in part from granite, with conglomerate at 1,040 feet according to sample.)	2	1,037
Coarse gray sand	6	1,043
Light-colored hard sandrock. (Consists chiefly of quartz. The volcanic-rock fragments present may have come from some of the beds above and were mixed in drilling. Typical of Ione formation.)	1	1,044
Soft caving shale. (Light-colored clayey matrix containing clear particles of quartz and dark nodules of carbonaceous matter.)	21	1,065
Light sandy shale. (A sample at 1,105 feet is a mixture of sand from volcanic and granitic rocks. A sample at 1,119 feet is similar but contains slightly more volcanic sand.)	10	1,075
Sticky gray clay	45	1,120
White sticky clay (typical of Ione clay beds)	4	1,124
Sand; showing of gas and oil. (Sample at 1,131 to 1,143 feet shows pale-yellow fine-grained sand with a little clay derived from granitic rocks.)	3	1,127
Gray shale with a little sand and particles of coal (?)	13	1,140
Gray sandy shale	3	1,143
Gas sand; showing of oil. (Gray medium-textured sand derived from granitic and metamorphic rocks.)	2	1,145
White sticky clay	25	1,170
Hard rock (of similar composition to the bed at 1,143-1,145 feet)	5	1,175
Gray clay	9	1,184
Sandy gray clay showing gas	14	1,198
Soft sticky clay. (Sample at 1,203-1,210 feet is nearly all fine quartz sand and contains less dark minerals or rock fragments than any sample obtained above.)	9	1,207
Hard gray shell. (Sample at 1,219-1,220 feet pure-white quartz grains.)	3	1,210

Driller's log of Pacific Petroleum Producers' well (4712A1)—Continued

	Thickness (feet)	Depth (feet)
Sticky white clay. (Typical of Ione formation.)	21	1, 231
Light-gray rock. (Sample at 1,246 feet is pure-white quartz sand with a few flakes of mica.)	1	1, 232
Sticky blue shale; brought up a huge chunk on bit. (Sample at 1,250–1,253 feet pure-white quartz and a little mica.)	18	1, 250
Sandy greenish-gray shale	6	1, 256
Sand. (Sample at 1,260 feet quartz sand with a little mica.)	4	1, 260
Gray (quartz) sand; shows oil. (Sample at 1,278 feet is pale-green shale.)	5	1, 265
Blue sticky shale	35	1, 300
Gray sand; showing of oil	1	1, 301
Blue shale	11	1, 312
Sand. (Sample at 1,338 feet quartz sand with a small percentage of mica and hornblende.)	26	1, 338
Oil sand. (Fine-grained pale quartz sand.)	3	1, 341
Sticky blue shale	2	1, 343
Water sand. (Coarse sand derived from granitic and metamorphic rocks.)	9	1, 352
Sticky (pale-green) shale	3	1, 357
Blue oil sand. (Fine-grained sand consisting chiefly of quartz.)	2	1, 359
Blue shale	29	1, 388
Hard sand; showing of oil. (Similar to bed at 1,359 feet.)	6	1, 394
Blue shale	11	1, 403
Fine sandy blue shale	27	1, 430
Sticky (greenish) shale	10	1, 440
Blue sand. (Practically pure quartz sand. The blue color is due to dark-colored quartz grains.)	5	1, 445
Sticky pale-green shale	25	1, 470
Sandy blue shale	5	1, 475
Sticky blue shale	15	1, 490
Sandy blue shale	5	1, 495
Sticky blue shale	32	1, 527
Oil sand. (Light-colored fine-grained quartz sand containing a small percentage of dark mineral grains.)	12	1, 539
Blue shale	1	1, 540
Water sand; lots of water (fine sand). This sand heaved up 700 feet in well. This is fresh water and rises to 45 feet of top or shallow water table	10	1, 550
Light-blue shale	5	1, 555
Dark sandy blue shale. (Sample at 1,580 feet light-gray sticky shale.)	35	1, 590
Black rotten shale. (Sample at 1,590–1,598 feet sandy pale-green shale.)	8	1, 598
Blue sticky shale. (Sample at 1,600 feet gray-green sticky shale containing scattered minute quartz grains.)	3	1, 601
Black rotten shale. (Sample at 1,601–1,607 feet lignite.)	6	1, 607
Sticky blue shale. (Sticky green shale at 1,607–1,611 feet.)	31	1, 638
Black shale	2	1, 640
Sandy shale	2	1, 642
Sticky black shale. (Green clay containing carbonaceous matter at 1,654–1,658 feet.)	33	1, 675
Sticky blue shale	7	1, 682
Blue sandy shale. (Sandy blue-green shale at 1,675–1,682 feet.)	2	1, 684
Hard lime shell. (Fine-grained gray sandstone containing some limonitic cement at 1,690–1,691 feet.)	9	1, 693
Light-gray sandy shale. (Fine clean white quartz sand with very few grains of dark minerals at 1,748–1,757 feet.)	55	1, 748
Heaving oil and gas sand; bottom half water. Divided with thin substance like shale; not sufficient to plug in. (Fine clean white quartz sand with a few flakes of biotite at 1,757–1,765 feet. Similar to sample above.)	17	1, 765
Blue firm shale	3	1, 768
Water sand. (Conglomerate consisting of well-rounded quartz pebbles varying in size from buckshot to large peas, cemented by limonite. Dark-colored quartz pebbles predominate, making the sample decidedly different from any other samples taken from the well above this depth, 1,765–1,790 feet.)	11	1, 779
Dark-gray shale. (Bluish-black silty shale containing minute colorless quartz grains. Sample labeled 1,790 feet.)	11	1, 790
Dark shale. (Dark-colored shale containing flakes of carbonaceous matter. Sample labeled 1,810 feet.)	39	1, 829
Shell lime conglomerate. (Silty dark-gray shale at 1,829–1,830 feet.)	1	1, 830
Dark shale	5	1, 835
Dark sandy shale	8	1, 843
Dark sticky shale	7	1, 850
Sand	1	1, 851
Dark-gray sticky shale	11	1, 862
Hard brown sand shale. (Silty dark-gray shale at 1,862–1,867 feet.)	5	1, 867
Sticky brown shale. (Dark-gray shale containing flakes of carbonaceous matter at 1,867–1,875 feet.)	3	1, 870
Brown sandy shale	14	1, 884
Black lime shell. (Dark-gray shale containing flakes of carbonaceous matter at 1,885–1,918 feet.)	1	1, 885
Black shale. (Dark-gray shale at 1,918–1,919 feet.)	33	1, 919
Sand. (Gray sand containing tiny marine fossils (see p. 26) at 1,919–1,920 feet.)	1	1, 920
Hard shell. (Gray sand containing tiny marine fossils (see p. 26) at 1,920–1,922 feet.)	1	1, 921
Sand with fossil; shows of oil and gas. (Laminated silty dark-gray shale containing carbonaceous flakes on laminae interbedded with gray silty sand containing marine fossils, at 1,922–1,927 feet.)	6	1, 927
Black shale. (Fine gray sandstone consisting chiefly of quartz and mica cemented with limonite and containing fossils, at 1,962–1,971 feet.)	35	1, 962
Gray oil sand; shows fossils. (Gray silty shale containing all the types of marine fossils, at 1,971–1,975 feet.)	13	1, 975

Driller's log of well 4712G1

[F. R. DeMatty, owner]

	Thickness (feet)	Depth (feet)
Loam	5	6
Hard sand	5	10
Moist sand	1	11
Clay	7	18
Sand; water at 50 feet	32	50
Light sand	15	65
Brown hard clay	7	72
Sandstone	1	73
Brown sand	6	79
Blue tough clay	8	87
Soft yellow clay	11	98
Black gravel	2	100
Sandstone	5	105
Tough yellow clay	2	107
Brown sandstone	3	110
Brown rock	2	112
Soft brown clay	2	114
Brown rock	10	124
Soft brown clay	6	130
Tough brown clay	2	132
Brittle brown clay	3	135
Tough blue clay	4	139
Dark rock	3	142
Tough blue clay	5	147
Brittle brown clay	2	149
Tough brown clay	5	154
Dark sandstone	12	166
Tough blue clay	5	171
Brown stone	8	179
Soft brown clay	9	188
Sandstone, water bearing	4	192
Black gravel, water bearing	2	194
Sandstone	3	197
Tough blue clay	10	207
Brown clay	2	209
Tough blue clay	6	215
Brown rock	3	218
Tough brown clay	8	226
Brown stone	4	230
Dark sandstone	4	234
Tough brown clay	14	248
Dark sandstone	2	250
Coarse gravel, water bearing	3	253
Tough blue clay	2	255
Brittle blue clay	1	256
Tough blue clay	5	261
Brittle brown clay	15	276
Brown stone	2	278
Hard brown clay	11	289
Sandy brown clay	17	306
Fine gravel, water bearing	3	309
Tough blue clay	2	311
Brown rock	13	324
Hard brown clay	7	331
Brown rock	3	334
Sandstone	3	337
Brittle brown clay	5	342
Soft brown clay	6	348
Brittle brown clay	7	355
Tough blue clay	24	379
Hard sandstone	19	398
Dark sand	2	400
Sandstone	8	408
Tough blue clay	2	410
Sandstone	13	423
Hard red rock	5	428
White soft rock	1	429
Brown sandstone	4	433
Brown sand, water bearing	2	435
Dark sandstone	6	441
Black sand, water bearing	2	443
Sandstone	7	450
Black sand, water bearing	7	457

Driller's log of well 4714J1

[Theobold Kirschenmann, owner]

	Thickness (feet)	Depth (feet)
Clay	40	40
Gravel	16	56
Clay	71	127
Quicksand	3	130
Clay	114	244
Sand	6	250

Driller's log of well 4717P1

[A. S. Wright, owner]

	Thickness (feet)	Depth (feet)
Surface soil	4	4
Soft red clay	8	12
Hard red clay	2	14
Sandy loam	18	32
Fine caving sand	46	78
Coarse gravel and sand	3	81
Blue clay	16	97
Fine dark caving sand	6	103
Hard red clay	13	116
Soft sandstone	2	118
Clay	3	121
Red muddy sand	19	140
Clay	4	144
Fine sand	3	147
Gravel	3	150
Clay	3	153
Sand	3	156
Clay	14	170

Driller's log of well 4726G2

[E. J. Hatton, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand	32	32	Hard sticky clay	62	134
Clay	40	72	Gravel and sand; water stratum	6	140

Driller's log of well 4726K1

[A. L. Paddleford, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay	16	16	Clay	35	84
Sandy clay	4	20	Fine black sand	7	91
Red clay	7	27	Large gravel	4	95
Clay	5	32	Tough clay	4	99
Sand and clay	7	39	Clay with streak of sand	64	163
Sand	4	43	Sandy clay	12	175
Clay	3	46	Sand	5	180
Sand	3	49	Clay	185	365

Driller's log of well 4727A4

[U. S. Geological Survey]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Ground surface to bottom of pit (26.5 feet).			Sand	3.67	12.00
Sand and clay	5.70	5.70	Red clay	.25	12.25
Red clay	2.63	8.33	Clay and sand	1.25	13.50

Driller's log of well 4728M1

[M. T. Baily, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay and mud	42	42	Black sand	3	233
Sand; second water	23	65	Gravel	27	260
Fine-grained sand	25	90	Gray-brown sand; water stratum	50	310
Sand	20	110	Black caked sand; no water	50	360
Gray sand	100	210	Black water sand	135	495
Fine dark sand; soft water	20	230			

Driller's log of well 4736N1

[J. H. Inglis, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	11	11	Pack sand	6	100
Hardpan	3	14	Clay and sandstone	70	170
Sand (some clay)	56	70	Black sand and gravel	5	175
Gravel	24	94			

WELLS IN T. 4 N., R. 8 E.

About a mile east of well 4712A1, in sec. 7, T. 4 N., R. 8 E., is a well drilled for oil by O. L. Gregor, of Galt. Mr. Gregor kindly furnished the log of this well, which is given below. A comparison of this log with that of well 4712A1 shows how rapidly the strata change in thickness and character laterally. This is largely due to their disposition in alluvial slopes. However, this well entered volcanic sand at 463 feet and the Petroleum Producers' well entered it at 475 feet, which shows that the older alluvium overlying the volanic sand beds correlative with the Tuscan tuff has about the same thickness. The Gregor well is about 20 feet higher than well 4721A1.

Driller's log of well 487C1

[O. L. Gregor, owner]

	Thickness (feet)	Depth (feet)
Soil	3	3
Sandstone	1	4
Hard sticky clay	31	35
Red clay	5	40
Sandy blue shale	3	43
Cemented gravel	2	45
Brown sandstone	13	58
Black coarse sand; water	11	69
Red clay	3	72
Brown sandstone and brown shale	7	79
Brown shale	4	83
Sandstone and blue shale	7	90
Hard brown shale	5	95
Hard gravel and sand	5	100
Clay	15	115
Brown shale; traces of oil	3	118
Brown sandstone and clay	4	122
Clay and brown shale	3	125
Brown shale	20	145
Brown putty clay	2	147
Brown sandstone	9	156
Gray sandstone	2	158
Clay, paraffine	10	168
Gray clay	6	174
Fine brown sandstone	4	178
Sticky purple adobe	3	181
Hard red clay	7	188
Red clay and sandstone	4	192
Soft red clay	8	200
Hard gravel	8	208
Hard red clay; 12-inch casing landed	37	242
Soft red clay	3	245
Hard blue and gray sand	9	254
Blue shale	6	260
Brown shale	3	263
Blue clay	9	272
Soft brown clay	4	276
Black coarse sand	2	278
Brown shale	2	280
Hard sticky brown clay	14	294
Brown shale	6	300
Brown sandstone	7	307
Hard black fine sand	71	378
Brown shale; oil and gas	12	390
Fine brown sand: oil	8	398
Brown clay	12	410
Brown sandstone	10	420
Fine black sand	5	425
Brown shale	2	427
Brown sandstone	3	430
Cemented gravel	3	433
Brown sandstone	4	437
Coarse hard gravel	3	440
Brown sandstone	3	443
Sandstone and hard clay	4	447
Red coarse sandstone	9	456
Hard brown clay	5	461
Hard coarse gravel	2	463
Black free sand	7	470
Black free sand, harder	8	478
Hard black sandstone and gravel	7	485
Cemented cobbles	23	508
Brown sandstone	22	530
Large cemented cobbles	15	545
Hard clay	1	546
Fine brown sandstone	14	560
Hard red clay; 10-inch casing	5	565
Brown sandstone	5	570
Packed brown sandstone	2	572
Cemented gravel	7	579
Red clay; 7-inch casing	2	581
Clay and sandstone	7	588
Hard clay	1	589
Brown sandstone	6	595
Brown shale	10	605
Black sandstone	15	620
Black coarse sand	15	635
Fine hard black sandstone	37	672
Fine brown oil sand	6	678
Brown caprock; 5-inch casing	17	695
Cap rock, harder and finer, cemented	5	700
Black coarse sand	10	710
Sand and clay	20	730
Tight coarse sandstone	10	740
Fine black oil sand	19½	759½
Caprock	38½	798
Running black sand	12	810
Tight blue shale	60	870
Gray caprock	66	936
Fine gray oil sand; paraffine. Went a little deeper. Driller found shells in this well.		

Several logs that show the characteristics of the strata underlying T. 4 N., R. 8 E., are given on the following pages.

Driller's log of well 4814B1

[P. F. Sievers, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	25	25	Hard yellow shale	5	210
Rock and gravel	5	30	Black sandstone; packed sand	32	242
Very hard shale	30	60	Yellow hard sandstone	5	247
Sandstone	8	68	Yellow soft sandstone	8	255
Hard yellow shale	2	70	Yellow hard sandstone	18	273
Black sandstone	35	105	Soft black sandstone	14	287
Dark-yellow shale	18	123	Hard yellow sandstone	5	292
Black sandstone, soft	22	145	Hard yellow clay	35	327
Sand, gravel, and packed sand	25	170	Loose gravel, sand, and rock	7	334
Hard black sand	35	205			

Driller's log of well 4814F2

[O. S. Sievers, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	27	27	Soft white sandstone	5	40
Large gravel	8	35	Sandstone and gravel	2	42

Driller's log of well 4815R1

[T. E. Lane, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	16	16	Green sandstone	90	300
White fine sand; caves badly	16	32	Honeycomb shale and sandstone	100	400
Brown sandy clay	26	58	Hard rock, purplish	86	486
Large river gravel	10	68	Black sand with small gravel	4	490
Cemented gravel	42	110	Green sandstone to bottom	24	514
Black sand	100	210			

Driller's log of well 4818A1

[J. D. Hoskins, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clayey soil	30	30	Coarse cemented gravel	6	286
Dry sand	7	37	Clay	4	290
(?)	21	58	Sandstone	2	298
Gravel and sand	7	65	Sticky clay	7	305
Yellow clay	25	90	Hard red clay	10	315
Sandstone; drill brought up piece of bone and tooth of prehistoric animal	34	124	Red sandstone	20	335
Clay	20	144	Red clay	5	340
Sandstone	8	152	Yellow clay	5	345
Sand and fine gravel	1	153	Tough red clay	14	359
Sandstone	2	155	Porous sandstone	6	365
Red clay	37	192	Sticky clay	2	367
Red hard clay	11	203	Porous sandstone	6	373
Dark sandstone	2	205	Red clay	7	380
Yellow clay	5	210	Red sandstone	20	400
Sticky clay	10	220	Hard red sandstone	10	410
Sticky yellow clay	10	230	Dark-red sandstone	5	415
Red clay	8	238	Dark sandstone	1	416
Cemented gravel	6	244	Red sandstone	7	423
Clay	11	255	Soft dark sandstone	2	425
Sandstone	5	260	Clay	5	430
Blue clay	20	280	Black sand, water-bearer	5	435
			Light-colored clay	5	440

Driller's log of well 4830N2

[San Joaquin Water District No. 1, owner]

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	6	6	Sandstone	2	115
Hardpan	2	8	Hard clay	25	140
First water at 58 feet	52	60	Sandstone	4	144
Gravel	26	86	Hard clay	20	164
Hard clay	8	94	Soft clay	8	172
Dry sandstone	6	100	Hard clay	4	176
Clay	13	113	Sandstone	18	194

WELL IN T. 5 N., R. 5 E.

Only one well in T. 5 N., R. 5 E., has a log recorded. It is well 5535R2, in sec. 35, belonging to the Thornton Orchard Farms. It was drilled to a depth of 688 feet for water in 1927. When a depth of 645 feet was reached water began to overflow the casing, increasing steadily during a week's time from a trickle to a maximum of 15 gallons a minute. Considerable inflammable gas comes up with the water and doubtless causes the well to flow, on the principle of an air lift. The driller reported that after bailing the water will not overflow for two or three hours. The well is equipped with a Sterling deep-well turbine with an 8½-inch discharge and a 40-horsepower motor. Prior to the installation of this pumping machinery a test was made with a 7½-inch turbine and a 40-horsepower tractor. At the beginning of the test the water stood 9 feet below the surface, and during the test it was drawn down to 64 feet. Two days after the pumping test was over the water again overflowed the casing. The well has 568 feet of casing, part of which is perforated. Considerable black sand was pumped out of the well during a test made with a sand pump, which is reported to have delivered 1,400 gallons a minute. A few samples were collected during the drilling, and their description, together with the driller's log, is given on page 286.

Driller's log of well 5535R2

[Owner, Thornton Orchard Farms]

	Thickness (feet)	Depth (feet)
Soil	2	2
Dark clay	7	9
Sand and gray clay; water at 9 feet	7	16
Yellow clay	65	84
Sand and clay	11	95
Dark clay	5	100
Black muck and very fine sand	30	130
Blue shale	9	139
Blue sand and clay	10	149
Blue shale	5	154
Blue sandy clay	11	165
Blue shale	15	180
Light-blue sandstone. Water stands at 5½ feet below surface. Partly consolidated arkosic sandstone derived chiefly from granitic rocks. Biotite flakes 2 to 3 millimeters in diameter	4	184
Blue sand and clay	12	196
Blue shale	9	205
Blue clay with some fine sand	15	220
Blue shale	5	225
Sandy clay	11	236
Sand and shale	4	240
Blue shale. At 240 feet water level receded from 6 feet to 7 feet 6 inches. This seems to indicate a leakage into the sand at 240 feet	19	259
Hard blue shale	14	273
Blue shale with some sand	5	278
(?)	167	445
Blue tight shale; casing down 267 feet; water level 7 feet 6 inches	27	472
Blue shale with some sand at 480 feet. Sand struck at 480 feet is fairly coarse and contains some fine gravel. Water level dropped to 8 feet 6 inches	8	480
Shale and some sand	35	515
Blue clay	8	523
Gray arkosic sandstone	9	532
Tight conglomerate containing pea-size gravel. Dark-colored pebbles predominate, giving the conglomerate a bluish color. A few of the pebbles are derived from extrusive igneous rocks	3	535
Blue shale	15	550
Tight coarse sand; trace of fine sand	5	555
Blue shale	11	606
Tight coarse sandstone. Grains are the size of shot, and dark-colored ones predominate. Derived chiefly from intrusive rocks of granitic or dioritic type	7	613
Tight very fine pale-green sandstone	15	628
Hard blue silty shale	2	630
Blue clay	15	645
Clay with some fine sand	33	678
Clay	10	688

Casing at 567 feet. Perforated casing from 480 to 515 feet. Water rose to surface overnight. Flow increased to 15 gallons a minute after standing 48 hours.

WELLS IN T. 5 N., R. 6 E.

The Galt Condensery well (5627Q1) is the deepest one on record in T. 5 N., R. 6 E. This well is 525 feet deep and was started June 28 and finished August 26, 1926. A rotary rig was used, and L. C. Kimball & Co.'s driller was kind enough to keep a log and save samples. The well is 12 inches in diameter, and the casing is landed at 100 feet in hard clay. From 229 to 230 feet a sand stratum was penetrated which stood until a depth of 312 feet was reached, when it ran in and filled the hole to 224 feet. After bailing out the hole the sand ran in again and filled the hole to 224 feet. Then a 140-foot string of 2-foot lap-joint stovepipe casing was landed at a depth of 233 feet. Thus the top of the 10-inch casing extended up 7 feet into the 12-inch casing. The lower 30 feet of the 10-inch casing was perforated with a chisel. The cost of the drilling alone was $1,325.

A pumping test was made at the time when the hole had filled up to the 224-foot level with sand, and it yielded only 400 gallons a minute. The final pumping test at the end of the drilling gave a yield of 850 to 900 gallons a minute, according to information furnished by the driller. When a 40-horsepower Byron Jackson deep-well turbine was pumping at this rate the drawdown was 70 feet. On August 10 the depth of the hole was 312 feet and the depth to water was 26 feet. On August 17, when the depth to water was 17.50 feet, the water outside of the casing stood 21 feet below the surface. The driller's log, together with descriptions based on the examination of the samples, is given below.

Driller's log of well 5627Q1

[Owner, Galt Condensery. Drilled by L. C. Kimball & Co., Elk Grove, Calif.]

	Thickness (feet)	Depth (feet)
Surface soil	22	22
Loose sand and clay	6	28
Hard clay	34	62
Sticky hard clay	44	106
Hard red clay	21	127
Very hard blue clay	102	229
Sand, caving. (Coarse gray-blue arkosic sand containing biotite flakes 2 to 4 millimeters in diameter. Chiefly derived from acidic intrusive and metamorphic rocks similar to sand in well 5535R2 at 180–184 feet)	1	230
Hard blue clay	86	316
Sandstone	7	323
Blue clay. (Blue arkosic fine-grained sand at 362–365 feet)	57	380
Sandstone	6	386
Blue clay	17	403
Sandstone. (Blue arkosic sand consisting chiefly of light and dark quartz grains and flakes of biotite)	3	406
Blue shale	30	436
Sandstone. (Blue conglomerate with pebbles the size of a nut. Derived from old intrusive and metamorphic rocks of the Sierra Nevada)	6	442
Blue shale	6	448
Sandstone	6	454
Sandstone; fine gravel content	3	457
Thin strata of shale and sandstone. (Sample at 476 feet greenish-blue silty clay. Sample at 480–486 feet coarse gray-blue arkosic sand containing biotite flakes and derived from old basement complex of Sierra Nevada. Similar to specimen at 229–230 feet)	33	490
Blue shale	6	496
Sandstone. (Similar to sample at 480–486 feet)	6	502
Shale. (Sample at 504 feet greenish-brown silty clay)	20	522
Sandstone. (From 524 feet to bottom medium-textured dark-gray arkosic sand with a large percentage of biotite flakes.) Hole ends in blue shale	3	525

WELLS IN T. 6 N., R. 7 E.

In the vicinity of Clay four wells have been drilled in search of oil. O. L. Gregor, on whose property one of these wells was drilled, furnished the log given below. The gas escaping from this well was ignited by a spark from a gasoline engine and burned the building over the well. Some showings of oil were also reported.

Driller's log of well 6736G1

[O. L. Gregor, owner]

	Thickness (feet)	Depth (feet)
Red clay with sand and gravel; water at 56 feet	64	64
Fine black sand with traces of oil	3	67
Clay	73	140
Water sand; no water below this depth	5	145
Clay	125	270
Black coarse sand	5	275
Clay	121	396
Small gravel	4	400
Brown shale; heavy smell of kerosene	10	410
Fine black sand with gas and more oil	58	468
Bluish-green loose sandstone	372	840
Ione coal	2	842
Bluish-green loose sandstone	18	860
Light-colored sand; gas	10	870
Blue shale	260	1,130
Sticky black mass	4	1,134
Sticky blue clay with black veins	48	1,182
Gas and oil sand with big force. There were 5 upheavals in succession; the largest pushed up 502 feet in the 10-inch casing	8	1,190
Blue shale	160	1,350
Fine black packed sand, with oil	7	1,357

ARTESIAN WELL NEAR BUENA VISTA, AMADOR COUNTY

On July 28, 1926, an artesian well was completed in the NE. ¼ SE. ¼ sec. 18, T. 5 N., R. 10 E., near Buena Vista, in Amador County. It was drilled to a depth of 246 feet in the Ione formation. The chief aquifer is a bed of angular quartz gravel and sand at 226 to 228 feet. The depth to water in a shallow dug well near by is 22 feet. On October 2, 1926, the discharge of this well was 10 gallons a minute. The well is 12 inches in diameter, and the water issues at a temperature of 66° F. and contains some odorless gas. This well is owned by E. W. Kennedy, of Ione.

STAFF-GAGE READINGS

The following table gives the readings on the staff gages established in this area:

Readings on staff gages in the Mokelumne area

Lucas gage, Mokelumne River

[SE. ¼ SE. ¼ sec. 5, T. 4 N., R. 9 E. 0 of gage 95.75 feet above sea level]

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1927			1927			1928		
July 6	2.22 p. m.	5.46	Sept. 23	3.10 p. m.	4.30	Jan. 6	12.15 p. m.	5.00
Do	1.55 p. m.	5.22	Oct. 1	10.30 a. m.	4.65	Jan. 13	1.00 p. m.	5.05
July 8	4.20 p. m.	5.71	Oct. 14	4.50 p. m.	4.20	Jan. 20	1.00 p. m.	4.75
July 16	11.05 a. m.	5.02	Oct. 21	2.00 p. m.	4.30	Jan. 28	12.50 p. m.	4.80
July 22	4.15 p. m.	5.55	Oct. 28	4.50 p. m.	5.05	Feb. 3	3.00 p. m.	5.26
July 29	4.20 p. m.	4.40	Nov. 4	2.00 p. m.	4.70	Feb. 10	1.00 p. m.	5.10
Aug. 5	3.25 p. m.	4.35	Nov. 11	3.50 p. m.	5.60	Feb. 17	1.00 p. m.	4.90
Aug. 12	4.10 p. m.	4.30	Nov. 18	4.10 p. m.	5.10	Feb. 24	12.40 p. m.	4.90
Aug. 19	3.00 p.m.	4.39	Nov. 25	4.30 p. m.	4.90	Mar. 2	12.25 p. m.	4.85
Aug. 26	3.55 p. m.	4.45	Dec. 3	1.15 p. m.	4.80	Mar. 9	1.00 p. m.	5.25
Sept. 2	2.00 p. m.	4.45	Dec. 9	12.10 p. m.	4.75	Mar. 16	12.35 p. m.	5.35
Sept. 10	11.40 a. m.	4.30	Dec. 16	4.00 p. m.	4.70	Mar. 23	12.05 p. m.	6.80
Sept. 16	12.30 p. m.	4.30	Dec. 30	12.50 p. m.	5.18	Mar. 26 [a]		

[a] Gage washed out by flood.

Readings on staff gages in the Mokelumne area—Continued

Lockeford gage, Mokelumne River

[East side of highway bridge, north bank of river, SW. ¼ SW. ¼ sec. 24, T. 4 N., R. 7 E. 0 of gage 54 95 feet above sea level]

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1926			1927			1928		
Aug. 6	....	0.90	Apr. 6	5.45 p. m.	9.80	Jan. 6	1.30 p. m.	2.40
Aug. 18	4.45 p. m.	1.40	Apr. 9	9.35 a. m.	8.40	Jan. 13	12.00 m.	2.5
Sept. 3	2.00 p. m.	1.40	Apr. 15	2.40 p. m.	6.20	Jan. 20	2.30 p. m.	2.10
Sept. 9	11.45 a. m.	1.60	Apr. 18	5.00 p. m.	6.40	Jan. 28	11.10 a. m.	2.30
Sept. 16	10.00 a. m.	.90	Apr. 19	10.50 a. m.	6.10	Jan. 31	11.45 a. m.	3.00
Sept. 23	4.30 p. m.	1.30	Apr. 22	3.15 p. m.	9.70	Feb. 4	10.30 a. m.	9.90
Oct. 4	1.45 p. m.	.40	Apr. 25	3.30 p. m.	13.00	Feb. 10	11.35 a. m.	3.00
Oct. 8	11.30 a. m.	.30	Apr. 28	3.20 p. m.	12.90	Feb. 17	2.00 p. m.	2.2
Oct. 15	11.00 a. m.	.50	Apr. 29	10.20 a. m.	12.90	Feb. 24	1.50 p. m.	2.4
Oct. 23	11.15 a. m.	.20	May 2	10.35 a. m.	12.30	Feb. 29	11.10 a. m.	2.5
Oct. 30	11.15 a. m.	.10	May 6	3.40 p. m.	13.70	Mar. 2	1.10 p. m.	2.3
Nov. 6	11.00 a. m.	.00	May 10	3.00 p. m.	9.70	Mar. 9	1.40 p. m.	2.4
Nov. 13	11.00 a. m.	.50	May 12	10.50 a. m.	11.20	Mar. 16	1.10 p. m.	3.40
Nov. 15	1.30 p. m.	.80	May 20	2.40 p. m.	10.30	Mar. 23	12.35 p. m.	6.1
Nov. 18	10.30 a. m.	.35	May 21	12.05 p. m.	8.90	Mar. 27	3.00 p. m.	15.5
Nov. 27	9.30 a. m.	9.00	May 27	2.50 p. m.	11.00	Mar. 30	2.40 p. m.	10.90
Dec. 4	10.15 a. m.	5.20	June 3	2.25 p. m.	11.30	Apr. 6	2.15 p. m.	8.80
Dec. 9	3.00 p. m.	3.00	June 4	10.50 a. m.	11.80	Apr. 13	1.10 p. m.	9.2
Dec. 11	3.50 p. m.	2.60	June 7	10.45 a. m.	14.20	Apr. 30	3.20 p. m.	11.80
Dec. 15	4.10 p. m.	2.20	June 10	3.00 p. m.	13.50	May 18	11.00 a. m.	9.30
Dec. 29	3.50 p. m.	2.00	June 14	9.30 a. m.	13.90	June 8	1.00 p. m.	4.00
			June 17	2.00 p. m.	13.50	June 22	2.00 p. m.	1.90
1927			June 24	1.50 p. m.	10.50	June 29	3.10 p. m.	1.90
			July 1	1.50 p. m.	5.90	July 6	12.45 p. m.	.90
Jan. 3	4.30 p. m.	2.30	July 8	2.35 p. m.	3.90	July 13	2.20 p. m.	.85
Jan. 4	11.25 a. m.	6.00	July 22	2.35 p. m.	1.65	July 20	2.55 p. m.	1.00
Jan. 8	11.10 a. m.	3.85	July 29	2.45 p. m.	1.70	July 27	2.00 p. m.	1.30
Jan. 15	10.45 a. m.	3.35	Aug. 5	1.55 p. m.	1.65	Aug. 3	2.30 p. m.	.90
Jan. 21	10.00 a. m.	3.50	Aug. 12	2.30 p. m.	1.50	Aug. 10	2.55 p. m.	.90
Jan. 23	12.35 p. m.	2.00	Aug. 19	1.00 p. m.	1.60	Aug. 17	3.00 p. m.	1.10
Jan. 28	10.15 a. m.	3.00	Aug. 26	2.20 p. m.	1.65	Aug. 24	2.25 p. m.	1.90
Jan. 30	2.10 p. m.	3.20	Sept. 2	11.40 a. m.	1.20	Aug. 31	4.40 p. m.	1.60
Feb. 4	10.20 a. m.	11.70	Sept. 10	10.00 a. m.	.60	Sept. 7	2.45 p. m.	1.80
Feb. 11	10.30 a. m.	3.60	Sept. 16	3.45 p. m.	.50	Sept. 21	2.00 p. m.	1.70
Feb. 16	2.45 p. m.	7.10	Oct. 12	9.30 a. m.	.95	Sept. 24	1.05 p. m.	.70
Feb. 18	10.30 a. m.	9.50	Oct. 21	12.05 p. m.	.65	Oct. 5	2.25 p. m.	1.0
Feb. 28	4.00 p. m.	8.10	Oct. 28	3.20 p. m.	2.85	Oct. 19	2.15 p. m.	.6
Mar. 4	10.50 a. m.	6.20	Nov. 4	2.45 p. m.	2.10	Oct. 26	4.00 p. m.	.5
Mar. 11	10.15 a. m.	5.10	Nov. 11	2.50 p. m.	4.65	Nov. 2	9.50 a. m.	.4
Mar. 18	2.00 p. m.	5.10	Nov. 18	3.05 p. m.	2.95	Nov. 10	12.10 p. m.	.4
Mar. 25	3.00 p. m.	7.20	Dec. 3	11.20 p. m.	3.50	Nov. 16	4.40 p. m.	1.6
Apr. 2	10.00 a. m.	10.30	Dec. 16	2.20 p. m.	2.00	Nov. 23	2.25 p. m.	.3
Apr. 3	4.25 p. m.	13.30				Nov. 30	3.55 p. m.	.4

Victor gage, Mokelumne River

[East side of highway bridge, north bank of river, NW. ¼ NW. ¼, sec. 34, T. 4 N., R. 7 E. 0 of gage 41.04 feet above sea level]

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1926			1927			1927		
Sept. 23	3.45 p. m.	3.20	Jan. 3	3.30 p. m.	5.30	Mar. 3	9.30 a. m.	[a]11.30
Oct. 4	1.30 p. m.	3.00	Jan. 4	2.10 p. m.	9.55	Mar. 4	10.10 a. m.	10.75
Oct. 7	9.00 a. m.	2.70	Jan. 7	10.40 a. m.	8.90	Mar. 11	9.30 a. m.	9.20
Do	2.00 p. m.	2.70	Jan. 11	3.00 p. m.	8.10	Mar. 18	1.30 p. m.	9.10
Oct. 8	9.00 a. m.	2.95	Jan. 14	2.40 p. m.	6.10	Mar. 25	2.35 p. m.	10.90
Oct. 15	10.00 a. m	3.05	Jan. 20	4.10 p. m.	6.25	Apr. 2	9.40 a. m.	14.05
Oct. 23	11.30 a. m.	2.65	Jan. 28	9.45 a. m.	6.15	Apr. 3	4.35 p. m.	16.20
Oct. 28	1.30 a. m.	2.50	Feb. 4	9.45 a. m.	14.25	Apr. 4	5.00 p. m.	16.60
Oct. 30	11.30 a. m.	2.45	Feb. 6	5.00 p. m.	9.50	Apr. 6	12.18 p. m.	14.93
Nov. 4	9.40 a. m.	2.40	Feb. 10	11.00 a. m.	7.60	Do	5.30 p. m.	14.79
Nov. 6	11.15 a. m.	2.30	Feb. 11	9.50 p. m.	7.10	Apr. 7	10.35 a. m.	14.35
Nov. 13	11.10 a. m.	2.85	Feb. 16	10.45 a. m.	10.95	Do	3 40 p. m.	14.26
Nov. 27	10.20 a. m.	12.90	Feb. 17	2.50 p. m.	12.15	Apr. 9	9.10 p. m.	13.55
Nov. 30	9.45 a. m.	12.95	Feb. 18	10.00 a. m.	12.60	Apr. 15	2.15 p. m.	10.30
Dec. 4	10.25 a. m.	9.40	Do	4.30 p. m.	14.15	Apr. 16	9.00 a. m.	11.25
Dec 11	4.05 p. m.	5.00	Feb. 19	9.40 a. m.	18.70	Apr. 18	4.15 p. m.	10.20
Dec. 15	4.25 p. m.	5.45	Feb. 23	5.00 p. m.	17.95	Apr. 21	4.30 p. m.	12.05
Dec. 29	4.15 p. m.	5.10	Feb. 25	10.45 a. m.	14.15	Apr. 22	3.00 p. m.	13.40

[a] Overflowing.

Readings on staff gages in the Mokelumne area—Continued

Victor gage, Mokelumne River—Continued

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1927			1927			1928		
Apr. 23	9.20 p. m.	13.90	Aug. 5	10.45 a. m.	4.65	Mar. 9	2.30 p. m.	6.45
Apr. 26	8.45 a. m.	18.40	Aug. 12	1.45 p. m.	4.55	Mar. 16	1.45 p. m.	6.85
Apr. 28	9.15 a. m.	18.60	Aug. 19	1.45 p. m.	4.55	Mar. 23	1.05 p. m.	9.5
Apr. 29	9.55 a. m.	18.20	Aug. 26	1.45 p. m.	4.45	Mar. 30	3.20 p. m.	16.40
May 3	3.10 p. m.	18.35	Sept. 10	9.05 a. m.	3.80	Apr. 20	4.40 p. m.	11.30
May 6	11.55 a. m.	18.45	Oct. 7	10.50 a. m.	3.20	Apr. 27	3.00 p. m.	13.75
Do	3.50 a. m.	18.70	Oct. 13	9.15 a. m.	3.65	May 5	2.00 p. m.	14.50
May 10	9.15 a. m.	13.40	Oct. 21	10.50 a. m.	3.65	May 11	1.50 p. m.	16.30
Do	2.30 p. m.	13.80	Oct. 28	2.15 p. m.	6.60	May 18	10.30 a. m.	13.8
Do	5.10 p. m.	14.10	Nov. 11	2.10 p. m.	8.85	June 22	2.45 p. m.	5.10
May 11	1.15 p. m.	14.50	Nov. 18	2.30 p. m.	6.40	July 6	1.20 p. m.	3.82
Do	4.50 p. m.	14.90	Nov. 25	3.50 p. m.	5.30	July 13	3.10 p. m.	3.60
May 12	4.45 p. m.	15.70	Dec. 3	10.00 p. m.	5.30	July 20	5.20 p. m.	3.80
May 13	10.30 p. m.	15.95	Dec. 9	2.45 p. m.	5.05	July 27	2.25 p. m.	3.90
Do	2.15 p. m.	16.40	Dec. 16	1.25 p. m.	5.10	Aug. 3	3.40 p. m.	3.45
May 16	8.45 p. m.	16.70	Dec. 23	1.40 p. m.	4.90	Aug. 10	3.25 p. m.	3.60
Do	1.25 p. m.	17.30	Dec. 30	3.20 p. m.	6.85	Aug. 17	3.30 p. m.	3.70
Do	3.30 p. m.	17.60				Aug. 24	3.10 p. m.	4.40
May 19	3.05 p. m.	16.40	1928			Aug. 31	4.55 p. m.	4.05
May 20	2.10 p. m.	15.60				Sept. 7	3.10 p. m.	4.40
May 22	1.45 p. m.	11.70	Jan. 6	2.35 p. m.	5.60	Sept. 21	2.30 p. m.	4.05
May 27	2.35 p. m.	15.75	Jan. 13	10.35 a. m.	5.40	Sept. 25	9.45 a. m.	3.35
June 4	10.25 a. m.	15.20	Jan. 20	3.10 p. m.	5.10	Oct. 5	2.55 p. m.	3.6
June 8	3.40 p. m.	18.70	Jan. 28	10.15 a. m.	5.20	Oct. 12	3.10 p. m.	3.4
June 10	2.15 p. m.	18.50	Jan. 31	12.50 p. m.	6.35	Oct. 19	2.45 p. m.	3.2
June 17	1.45 p. m.	16.55	Feb. 4	9.45 a. m.	12.95	Oct. 22	4.35 p. m.	3.4
June 24	3.00 p. m.	14.50	Feb. 10	11.00 a. m.	6.70	Oct. 26	4.30 p. m.	3.30
June 29	9.45 p. m.	10.30	Feb. 17	2.35 p. m.	5.70	Nov. 2	10.15 a. m.	3.0
July 1	1.30 p. m.	9.50	Feb. 24	2.45 p. m.	5.70	Nov. 16	4.50 p. m.	4.25
July 6	2.15 p. m.	8.05	Feb. 29	------------	6.65	Nov. 23	2.35 p. m.	3.5
July 8	2.15 p. m.	7.75	Mar. 2	1.50 p. m.	5.10	Nov. 30	4.10 p. m.	3.35
July 22	1.55 p. m.	5.55	Mar. 3	9.30 a. m.	11.30	Dec. 14	11.10 a. m.	3.65

Cherokee Lane Bridge gage, Mokelumne River

[East side of highway bridge, south bank of river, on concrete bridge pier, SW. ¼ SW. ¼ sec. 31. T. 4 N., R. 7 E. 0 of gage 35.13 feet above sea level]

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1926			1927			1928		
Sept. 23	8.30 a. m.	3.15	Apr. 2	3.15 p. m.	6.65	Apr. 13	9.20 a. m.	7.00
Oct. 5	9.00 a. m.	2.70	Apr. 4	5.10 p. m.	11.80	May 11	8.50 a. m.	10.00
Oct. 9	11.00 a. m.	2.30	Apr. 5	10.00 a. m.	10.60	June 1	9.10 a. m.	5.85
Oct. 16	11.00 a. m.	2.45	Apr. 6	12.30 p. m.	9.00	June 8	9.15 a. m.	4.90
Oct. 21	4.30 p. m.	2.30	Apr. 7	10.50 a. m.	8.10	June 29	9.50 a. m.	5.00
Oct. 29	4.15 p. m.	1.35	Apr. 8	5.06 p. m.	7.36	July 13	4.15 p. m.	3.65
Nov. 27	10.30 a. m.	5.80	Apr. 18	5.30 p. m.	4.30	July 20	8.35 a. m.	3.75
Nov. 30	9.45 a. m.	6.15	Apr. 22	5.05 p. m.	6.35	July 27	8.45 a. m.	4.18
Dec. 4	10.50 a. m.	3.95	May 4	11.50 a. m.	10.60	Aug. 3	9.00 a. m.	3.72
Dec. 7	8.45 a. m.	2.40	May 13	11.55 a. m.	10.20	Aug. 10	9.55 a. m.	3.90
Dec. 18	4.45 p. m.	.50	May 19	4.55 p. m.	11.50	Aug. 17	10.10 a. m.	3.80
			May 21	9.30 a. m.	9.85	Aug. 24	10.10 a. m.	4.25
1927			June 17	1.25 p. m.	11.25	Aug. 31	9.30 a. m.	4.25
			July 18	1.30 p. m.	3.95	Sept. 7	10.10 a. m.	4.80
Jan. 5	11.40 a. m.	3.05	Aug. 2	4.30 p. m.	3.75	Sept. 21	9.00 a. m.	4.40
Jan. 7	11.25 a. m.	3.40	Aug. 10	5.00 p. m.	4.05	Oct. 5	8.45 a. m.	4.60
Jan. 11	8.50 a. m.	2.25	Sept. 20	12.55 p. m.	2.90	Oct. 12	------------	2.50
Jan. 14	5.00 p. m.	.60	Oct. 13	4.30 p. m.	3.35	Oct. 19	8.50 a. m.	2.78
Jan. 20	4.30 p. m.	1.30	Oct. 25	9.30 a. m.	3.05	Oct. 26	10.30 a. m.	2.50
Jan. 29	3.30 p. m.	1.30				Nov. 2	6.00 a. m.	3.02
Feb. 4	4.20 p. m.	6.40	1928			Nov. 9	2.00 p. m.	2.96
Feb. 16	5.00 p. m.	4.75				Nov. 16	11.45 a. m.	0
Mar. 6	4.20 p. m.	3.80	Mar. 30	9.50 a. m.	11.50	Nov. 23	9.45 a. m.	0
Mar. 25	4.35 p. m.	4.60	Apr. 6	9.30 a. m.	7.20			

Readings on staff gages in the Mokelumne area—Continued

Woodbridge Dam

[NE. ¼ NE. ¼ sec. 34, T. 4 N., R. 6 E. Bench mark is cross cut on top of west wing wall, upstream angle, altitude 47.62 feet above sea level. All measurements made down from bench mark]

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1926			1926			1928		
Aug. 3		9.40	Nov. 27	3.00 p. m.	16.15	Aug. 7		8.72
Aug. 10		9.91	Dec. 4	11.00 a. m.	17.80	Aug. 15		9.12
Aug. 19	1.30 p. m.	9.40	Dec. 18	4.50 p. m.	18.90	Aug. 21		8.80
Aug. 27	9.20 a. m.	9.00				Aug. 28		7.86
Sept. 2	9.30 a. m.	9.70	1927			Sept. 1		8.01
Sept. 8	10.15 a. m.	9.70				Sept. 11		8.36
Sept. 18	1.30 p. m.	9.25	Jan. 5	11.50 a. m.	18.20	Sept. 25		8.46
Oct. 1	9.30 p. m.	10.22	Jan. 20	4.35 p. m.	18.65	Sept. 29		8.93
Oct. 9	11.00 a. m.	10.20	Feb. 4	4.30 p. m.	15.95	Oct. 2		9.22
Oct. 16	11.15 a. m.	10.05	Apr. 2	3.30 p. m.	15.40	Oct. 9		9.30
Oct. 22	9.30 a. m.	10.30	May 9	3.30 p. m.	13.05	Oct. 12		9.54
Oct. 27	3.00 p. m.	10.90				Oct. 16		9.44
Oct. 29	4.30 p. m.	11.15	1928			Oct. 23		9.74
Oct. 30	11.30 a. m.	11.30				Oct. 29		9.64
Nov. 3	10.00 a. m.	18.70	July 2		7.69	Nov. 2		9.46
Nov. 6	11.45 a. m.	19.50	July 9		8.26	Nov. 6		9.52
Nov. 13	11.30 a. m.	20.10	July 31		8.63	Nov. 9		9.52
Nov. 23		19.50	Aug. 3		8.76	Nov. 12		9.66

Lockeford Slough gage

[East side of bridge piling, NE. ¼ SE. ¼ sec. 25, T. 4 N., R. 7 E. 0 of gage 46.44 feet above sea level]

Date	Time	Feet	Date	Time	Feet	Date	Time	Feet
1926			1927			1928		
Sept. 16	10.00 a. m.	5.30	Apr. 28	3.30 p. m.	16.10	Jan. 28	11.15 a. m.	7.40
Sept. 23	4.30 p. m.	5.10	Apr. 29	10.20 a. m.	15.70	Jan. 31	11.40 a. m.	7.38
Oct. 4	1.45 p. m.	5.00	May 2	10.30 a. m.	14.00	Feb. 4	10.35 a. m.	7.50
Oct. 8	11.30 a. m.	4.95	May 6	3.40 p. m.	13.85	Feb. 10	11.40 a. m.	7.60
Oct. 15	2.45 p. m.	4.90	May 10	12.30 p. m.	13.30	Feb. 17	2.00 p. m.	7.60
Oct. 23	11.00 a. m.	4.80	May 13	2.50 p. m.	12.85	Feb. 24	1.45 p. m.	7.50
Oct. 30	11.00 a. m.	4.75	May 20	2.45 p. m.	16.15	Feb. 29	11.05 a. m.	7.55
Nov. 6	10.45 a. m.	4.65	May 21	12.10 p. m.	15.80	Mar. 2	1.05 p. m.	7.60
Nov. 10	12.00 m.	4.65	May 27	2.55 p. m.	14.20	Mar. 9	1.35 p. m.	7.70
Nov. 13	10.50 a. m.	4.70	June 3	2.30 p. m.	12.90	Mar. 16	1.05 p. m.	7.70
Nov. 15	1.15 p. m.	4.70	June 4	10.55 a. m.	12.80	Mar. 23	12.30 p. m.	7.70
Nov. 18	10.30 a. m.	4.70	June 7	10.30 a. m.	13.50	Apr. 6	2.10 p. m.	15.8
Nov. 27	9.30 a. m.	5.20	June 10	9.35 a. m.	14.90	Apr. 13	1.05 p. m.	15.4
Nov. 30	10.50 a. m.	5.25	June 14	9.35 a. m.	15.80	Apr. 24	10.50 a. m.	14.80
Dec. 4	10.10 a. m.	5.25	June 17	2.00 p. m.	16.55	May 18	11.05 a. m.	15.2
Dec. 8	10.00 a. m.	5.20	June 24	1.50 p. m.	14.40	May 23	1.15 p. m.	15.00
Dec. 9	2.50 p. m.	5.40	June 25	11.35 a. m.	14.00	June 8	1.00 p. m.	13.60
Dec. 11	3.50 p. m.	5.40	July 1	1.55 p. m.	13.10	June 22	2.00 p. m.	12.70
Dec. 15	4.05 p. m.	5.40	July 8	2.40 p. m.	12.10	June 29	2.55 p. m.	12.10
Dec. 29	4.00 p. m.	5.20	July 21	2.35 p. m.	10.80	July 6	12.40 p. m.	11.70
			July 22	2.35 p. m.	10.75	July 13	2.15 p. m.	11.25
1927			July 29	2.45 p. m.	10.20	July 20	2.30 p. m.	10.90
			Aug. 5	2.00 p. m.	9.90	July 27	1.50 p. m.	10.50
Jan. 3	4.35 p. m.	5.40	Aug. 12	2.30 p. m.	9.60	Aug. 3	2.20 p. m.	10.20
Jan. 8	11.10 a. m.	5.45	Aug. 19	1.10 p. m.	9.25	Aug. 10	2.45 p. m.	9.90
Jan. 15	10.40 a. m.	5.50	Aug. 26	2.25 p. m.	8.95	Aug. 17	2.50 p. m.	9.65
Jan. 21	10.05 a. m.	5.60	Sept. 1	8.00 p. m.	8.85	Aug. 24	2.05 p. m.	9.30
Jan. 28	10.20 a. m.	5.70	Sept. 2	11.50 a. m.	8.75	Aug. 31	4.30 p. m.	9.10
Feb. 4	10.25 a. m.	5.95	Sept. 10	10.05 a. m.	8.48	Sept. 7	2.35 p. m.	8.80
Feb. 11	10.35 a. m.	6.05	Sept. 16	3.35 p. m.	8.30	Sept. 21	1.50 p. m.	8.50
Feb. 16	2.30 p. m.	6.35	Oct. 12	9.25 a. m.	7.65	Sept. 24	1.00 p. m.	8.40
Feb. 18	10.35 a. m.	6.40	Oct. 21	12.15 p. m.	7.45	Oct. 5	2.15 p. m.	8.10
Feb. 28	4.00 p. m.	10.40	Oct. 28	3.25 p. m.	7.35	Oct. 19	1.55 p. m.	7.80
Mar. 4	10.50 a. m.	10.20	Nov. 4	2.35 p. m.	7.45	Oct. 22	11.00 a. m.	7.70
Mar. 11	10.20 a. m.	9.75	Nov. 11	2.55 p. m.	7.45	Oct. 26	3.50 p. m.	7.50
Mar. 18	2.00 p. m.	9.50	Nov. 18	3.10 p. m.	7.50	Nov. 2	9.45 a. m.	7.50
Mar. 25	3.00 p. m.	9.40	Dec. 3	11.40 a. m.	7.40	Nov. 10	12.00 m.	7.40
Mar. 28	4.00 p. m.	10.40	Dec. 16	2.25 p. m.	7.30	Nov. 16	4.30 p. m.	7.70
Apr. 2	10.00 a. m.	9.30	Dec. 23	12.35 p. m.	7.30	Nov. 23	2.15 p. m.	7.70
Apr. 6	5.50 p. m.	13.00	Dec. 30	2.05 p. m.	7.50	Nov. 30	3.50 p. m.	7.50
Apr. 8	11.40 a. m.	13.05				Dec. 14	11.15 a. m.	7.60
Apr. 9	9.40 a. m.	12.80	1928					
Apr. 15	2.45 p. m.	11.40				1929		
Apr. 19	10.30 a. m.	11.00	Jan. 6	1.25 p. m.	7.35			
Apr. 22	3.20 p. m.	10.60	Jan. 13	12.00 m.	7.40	Jan. 11		7.50
Apr. 25	3.30 p. m.	10.50	Jan. 20	2.30 p. m.	7.40			

MEASUREMENTS OF DEPTH TO WATER

In the following table the depth to water is given in feet below the bench mark, and the altitude of the water level in feet above sea level. The depth of the well as given is usually reported.

Measurements of depth to water in observation wells

Date	Depth to water (feet)	Altitude of water table (feet)
262N1. G. L. M. Brokaw. 6-inch well, 30 feet deep, used for domestic supply. Bench mark is copper washer on pump support, or top of casing, 0.7 foot above ground; altitude, 26.10 feet		
1926		
Apr. 19	[a] 10.80	15.30
May 19	[b] 11.00	15.10
June 12	11.10	15.00
July 20	11.55	14.55
Aug. 16	12.10	14.00
Dec. 8	13.00	13.10
1927		
Jan. 13	[a] 12.95	13.15
Feb. 9	[a] 12.55	13.55
Mar. 14	11.40	14.70
Apr. 16	11.00	15.10
May 28	11.30	14.80
June 23	11.60	14.50
Aug. 19	12.10	14.00
Sept. 26	12.60	13.50
Oct. 24	[b] 12.50	13.60
1928		
Apr. 23	12.20	13.90
Sept. 21	13.30	12.80
1929		
Apr. 12	13.20	12.90
263A1. O. W. Earley. 6-inch well, 24 feet deep, used for stock. Bench mark is copper washer in windmill support, 0.1 foot above ground; altitude, 22.85 feet		
1926		
Apr. 19	7.80	15.05
May 19	8.30	14.55
June 12	8.25	14.60
July 20	9.20	13.65
Aug. 16	10.65	12.20
Sept. 16	11.10	11.75
Oct. 13	10.60	12.25
Nov. 10	10.80	12.05
Dec. 8	10.50	12.35
1927		
Jan. 13	10.45	12.40
Feb. 9	9.60	13.25
Mar. 12	8.05	14.80
Apr. 14	7.95	14.90
May 28	8.75	14.10
June 23	9.40	13.45
July 29	10.05	12.80
Aug. 19	9.85	13.00
Sept. 26	10.65	12.20
Nov. 28	10.40	12.45
Dec. 15	10.65	12.20
263A1—Con.		
1928		
Jan. 18	10.50	12.35
Feb. 16	10.10	12.75
Mar. 19	10.15	12.70
Apr. 21	9.30	13.55
May 22	9.75	13.10
June 18	([c])	---------
June 26	11.10	11.75
July 16	11.40	11.45
Aug. 20	Dry.	---------
Sept. 21	11.30	11.55
Oct. 19	11.15	11.70
Nov. 18	11.15	11.70
Dec. 13	11.00	11.85
1929		
Jan. 21	10.85	12.00
Feb. 18	10.40	12.45
Mar. 19	10.40	12.45
Apr. 12	10.65	12.20
May 27	11.60	11.25
June 20	11.25	11.60
264H1. John Gardner. 12-inch well, used for domestic supply. Bench mark is center line of suction flange, 1 foot above ground; altitude, 22.35 feet [d]		
1926		
Apr. 2	[e] 10.70	11.65
Apr. 26	[e] 8.90	13.45
Sept. 20	[c] 15.95	6.40
1927		
Apr. 21	9.00	13.35
264M1. 4-inch well, used for stock. Bench mark is top of casing, altitude 20.55 feet, which is 0.35 foot below reference bench mark, a copper washer in pump support 0.9 foot above ground. All measurements made from top of casing		
1926		
Apr. 19	8.40	12.15
May 19	11.40	9.15
June 12	9.00	11.55
July 20	10.70	9.85
Aug. 16	10.70	9.85
Sept. 16	[f] 12.35	8.20
Oct. 13	11.10	9.45
Nov. 10	[f] 12.45	8.10
Dec. 8	10.85	9.70
264M1—Con.		
1927		
Jan. 13	10.60	9.95
Feb. 9	9.70	10.85
Mar. 12	7.70	12.85
Apr. 14	7.70	12.85
May 28	9.05	11.50
June 23	9.80	10.75
July 29	10.25	10.30
Aug. 19	10.50	10.05
Sept. 13	10.80	9.75
Nov. 28	10.00	10.55
Dec. 15	10.90	9.65
1928		
Jan. 18	10.95	9.60
Feb. 16	10.65	9.90
Mar. 19	[f] 12.00	8.55
Apr. 19	10.90	9.65
May 22	11.05	9.50
June 18	[g] 10.50	10.05
July 16	[f] 10.90	9.65
Aug. 20	[f] 11.55	9.00
Sept. 20	11.60	8.95
1929		
Apr. 11	10.45	10.10
265R1. P. W. Holck. Bench mark is top of casing, altitude 16.40 feet, which is 0.20 foot above reference bench mark, a copper washer in pump support, 0.7 foot above ground. All measurements made from top of casing		
1926		
Apr. 19	5.40	11.00
May 19	7.30	9.10
June 11	8.10	8.30
July 20	9.20	7.20
Aug. 13	9.75	6.65
Sept. 16	10.20	6.20
Oct. 12	10.25	6.15
Nov. 10	10.30	6.10
Dec. 8	9.60	6.80
1927		
Jan. 13	9.20	7.20
Feb. 9	8.05	8.35
Mar. 14	5.25	11.15
Apr. 14	5.70	10.70
May 28	7.75	8.65
June 23	8.50	7.90
Aug. 19	9.80	6.60
Sept. 26	10.00	6.40
Oct. 24	10.20	6.20

[a] Creek or river flowing near by.

[b] Water in ditch near by.

[c] Pumping.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[f] Windmill running.

[f] Windmill running.

[g] Pump stopped a short time before measurement.

Measurements of depth to water in observation wells—Continued

265R1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 23	7.55	8.85
Sept. 21	10.60	5.80
1929		
Apr. 12	8.60	7.80

265R2. P. W. Holck. Bench mark is top of concrete curb; altitude, 15.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	5.40	10.55

266M1. Delta Feed Co. 8-inch well, used for domestic supply. Bench mark is top of casing, altitude 11.90 feet, which is 1.30 feet below reference bench mark, a copper washer in pump platform 1.70 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	5.50	6.40
May 19	8.50	3.40
June 11	8.55	3.35
July 20	9.40	2.50
Aug. 13	[f] 9.80	2.10
Sept. 16	10.15	1.75
Oct. 12	10.05	1.85
Nov. 10	9.95	1.95
Dec. 8	[f] 9.30	2.60
1927		
Jan. 13	[c] 8.90	3.00
Feb. 9	7.25	4.65
Mar. 14	4.45	7.45
Apr. 14	5.55	6.35
May 28	8.00	3.90
June 23	[f] 8.80	3.10
Aug. 19	9.65	2.25
Sept. 26	10.05	1.85
Oct. 24	[f] 10.10	1.80
1928		
Apr. 21	7.20	4.70
Sept. 21	[c] 10.90	1.00
1929		
Apr. 12	7.55	4.35

268F1. O. Finkbohner. 8-inch well, 35 feet deep, used for domestic supply. Bench mark is copper washer in pump support, 2.00 feet above ground; altitude 13.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	5.30	8.20

268H1. A. L. Hammer. 2-inch well, used for domestic supply. Bench mark is top of casing at ground surface; altitude, 14.25 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 7.60	6.65
Apr. 26	[e] 7.10	7.15
Sept. 20	11.00	3.25
1927		
Apr. 21	6.80	7.45
Sept. 16	10.75	3.50
1928		
Apr. 19	8.30	5.95
Sept. 20	11.30	2.95
1929		
Apr. 11	8.90	5.35

268R1. 6-inch well, used for domestic supply. Bench mark is top of casing at ground surface; altitude, 12.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 19	7.00	5.40
June 11	7.60	4.80
July 20	8.45	3.95
Aug. 13	8.85	3.55
Sept. 16	9.35	3.05
Oct. 12	9.35	3.05
Nov. 10	9.30	3.10
Dec. 8	8.80	3.60
1927		
Jan. 13	8.40	4.00
Feb. 9	7.50	4.90
Mar. 14	5.25	7.15
Apr. 14	5.25	7.15
May 28	7.00	5.40
June 23	7.85	4.55
Aug. 19	8.80	3.60
Sept. 26	9.15	3.25
Oct. 24	9.15	3.25
1928		
Apr. 23	6.85	5.55
Sept. 21	9.70	2.70

2610M1. P. C. Taylor. 8-inch well, 1,170 feet deep, used for domestic supply. Bench mark until Apr. 23, 1928, copper washer on 1 by 6 inch cross piece over old pit, 5.50 feet above ground surface, altitude 30.30 feet; after that date, top of casing, altitude 19.90 feet. This well shows gas pressure

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 19	11.80	18.50
June 12	10.60	19.70

2610M1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 20	12.80	17.50
Aug. 16	13.05	17.25
Sept. 16	13.30	17.00
Oct. 12	13.25	17.05
Nov. 10	12.95	17.35
Dec. 8	12.55	17.75
1927		
Jan. 13	12.25	18.05
Feb. 9	12.00	18.30
Mar. 14	11.80	18.50
Apr. 14	11.65	18.65
May 28	11.95	18.35
June 23	12.20	18.10
Aug. 19	13.30	17.00
Sept. 26	13.40	16.90
Oct. 24	13.15	17.15
1928		
Apr. 23	[h] 2.15	17.75
Sept. 21	3.60	16.30
1929		
Apr. 12	2.80	17.10

2611D1. Roker Realty Co. 4-inch well, used for domestic supply. Bench mark is copper washer in west side wall of pump house, level with top of casing, 0.5 foot above ground, altitude 31.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	13.60	17.50
May 20	14.00	17.10
June 12	14.00	17.10
July 20	14.80	16.30
Aug. 16	15.50	15.60
Sept. 16	16.25	14.85
Oct. 12	16.00	15.10
Nov. 10	16.05	15.05
Dec. 8	16.30	14.80
1927		
Jan. 13	16.40	14.70
Feb. 9	16.05	15.05
Mar. 14	14.75	16.35
Apr. 14	14.35	16.75
May 28	14.45	16.65
June 23	14.35	16.75
Aug. 19	15.05	16.05
Sept. 26	15.10	16.00
Oct. 24	15.30	15.80
1928		
Apr. 23	[f] 15.55	15.55
Sept. 21	([c])	---------
1929		
Apr. 12	16.30	14.80

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[c] Pumping.
[f] Windmill running.

[d] By city of Stockton.
[e] By G. H. Teale, State division of water rights.

[c] Pumping.
[f] Windmill running.
[h] New measuring point.

Measurements of depth to water in observation wells—Continued

2613L1. H. L. Jones. Bench mark until Dec. 13, 1928, top of casing, altitude 19.65 feet, which is 10.90 feet below reference bench mark, a copper washer on motor support 0.2 foot above ground; after that date, top of casing, altitude 18.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	4.10	15.55
May 20	[a] 7.40	12.25
July 20	4.25	15.40
Aug. 16	7.20	12.45
Sept. 16	6.70	12.95
Oct. 12	6.70	12.95
Nov. 12	7.10	12.55
Dec. 8	7.40	12.25
1927		
Jan. 13	7.55	12.10
Feb. 9	7.05	12.60
Apr. 16	5.10	14.55
May 28	5.70	13.95
June 23	3.45	16.20
July 29	4.20	15.45
Aug. 19	3.40	16.25
Sept. 26	4.70	14.95
Nov. 28	6.85	12.80
Dec. 15	6.90	12.75
1928		
Jan. 18	7.10	12.55
Feb. 16	6.90	12.75
Mar. 19	6.30	13.35
Apr. 23	5.85	13.80
May 22	(c)	---------
June 18	(c)	---------
July 16	(c)	---------
Aug. 20	6.75	12.90
Sept. 21	6.95	12.70
Oct. 19	6.30	13.35
Nov. 18	7.10	12.55
Dec. 13	[b] 7.60	11.25
1929		
Jan. 21	7.05	11.80
Feb. 18	6.80	12.05
Mar. 19	6.80	12.05
Apr. 12	5.60	13.25
May 27	5.85	13.00
June 20	5.85	13.00

2615E1. E. W. Hammer. 3-inch well, not in use. Bench mark is top of casing, altitude 17.75 feet, which is 0.6 foot below reference bench mark, a copper washer in pump support, 1.5 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	9.90	7.85

[a] Pumping.
[b] New measuring point.
[c] Pump running in adjacent well.

2615E2. E. W. Hammer. 4-inch well, 98 feet deep, used for domestic supply. Bench mark is top of casing, altitude 17.35 feet, which is 0.70 foot below reference bench mark, a copper washer in pump support, 1.50 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	9.60	7.75
May 19	10.20	7.15
June 12	11.00	6.35
July 20	11.30	6.05
Aug. 16	11.90	5.45
Sept. 16	12.40	4.95
Oct. 12	12.30	5.05
Nov. 10	12.25	5.10
Dec. 8	12.05	5.30
1927		
Jan. 13	11.85	5.50
Feb. 9	11.35	6.00
Mar. 14	10.30	7.05
Apr. 14	[a] 14.30	3.05
May 28	10.20	7.15
June 23	10.60	6.75
Aug. 19	11.85	5.50
Sept. 26	12.20	5.15
Oct. 24	12.25	5.10
1928		
Apr. 23	10.50	6.85
Sept. 21	13.05	4.30
1929		
Apr. 12	11.40	5.95

2615H1. J. H. Swain. Bench mark is top of casing, altitude 16.55 feet, which is 5.90 feet below reference bench mark, a copper washer in south door sill, 0.7 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[b] 6.60	9.95
Apr. 20	6.60	9.95
Apr. 26	[a] 6.40	10.15
May 19	6.90	9.65
June 12	7.20	9.35
July 20	7.60	8.95
Aug. 16	8.40	8.15
Sept. 16	9.15	7.40
Oct. 12	9.10	7.45
Nov. 10	9.10	7.45
Dec. 8	9.00	7.55
1927		
Jan. 13	8.85	7.70
Feb. 9	8.35	8.20
Mar. 14	7.25	9.30
Apr. 14	6.75	9.80
May 28	6.85	9.70
June 23	6.85	9.70
July 29	7.40	9.15
Aug. 19	6.85	9.70
Sept. 13	7.95	8.60
Oct. 24	8.25	8.30
Nov. 28	8.35	8.20
Dec. 15	5.70	10.85
1928		
Jan. 18	8.40	8.15
Feb. 16	8.15	8.40
Mar. 19	6.90	9.65
Apr. 19	7.35	9.20
May 22	7.40	9.15
June 18	7.90	8.65
July 16	8.40	8.15
Aug. 20	9.00	7.55
Sept. 20	9.25	7.30
Oct. 19	9.15	7.40
Nov. 18	9.15	7.40
Dec. 13	9.25	7.30
1929		
Jan. 21	9.25	7.30
Feb. 18	8.95	7.60
Mar. 19	8.70	7.85
Apr. 11	8.40	8.15
May 27	8.30	8.25
June 20	8.45	8.10

[a] Pumping.
[b] By G. H. Teale, State division of water rights.

2615H2. J. H. Swain. 4-inch well, 120 feet deep, used for domestic supply. Bench mark is top of intake pipe, altitude 22.60 feet, which is 0.4 foot below reference bench mark, a copper washer in pump support, 1.2 feet above ground. All measurements made from intake pipe

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	12.50	10.10

2616K1. 4-inch well, not in use. Bench mark is top of casing, altitude 12.05 feet, which is 1.85 feet below reference bench mark, a copper washer in pump support 2.30 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	10.10	1.95
May 19	11.00	1.05
June 11	11.60	.45
July 20	12.55	−.50
Aug. 13	12.95	−.90
Sept. 16	13.35	−1.30
Oct. 12	13.25	−1.20
Nov. 10	13.25	−1.20
Dec. 8	12.80	−.75
1927		
Jan. 13	12.40	−.30
Feb. 9	11.95	.15

Measurements of depth to water in observation wells—Continued

2616K1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Mar. 14	10.65	1.40
Apr. 14	10.15	1.90
May 28	11.20	.85
June 23	11.85	.20
July 29	12.80	−.75
Aug. 19	13.25	−1.20
Sept. 26	13.60	−1.55
Oct. 24	13.40	−1.35
Nov. 28	12.70	−.65
Dec. 15	12.55	−.50
1928		
Jan. 18	14.15	−2.10
Feb. 16	13.80	−1.75
Mar. 19	13.50	−1.45
Apr. 23	11.45	.60
May 22	12.05	.00
June 18	12.85	−.80
July 16	13.50	−1.45
Aug. 20	13.95	−1.90
Sept. 21	14.25	−2.20
Oct. 19	13.85	−1.80
Nov. 18	13.35	−1.30
Dec. 13	13.10	−1.05
1929		
Jan. 21	12.70	−.70
Feb. 18	12.40	−.35
Mar. 19	12.10	−.05
Apr. 12	12.05	.00
May 27	13.00	−.95
June 20	13.10	−1.05

2620C1. Vignolo & Picarda. 12-inch well, used for irrigation. Bench mark is top of casing, 0.80 foot above ground; altitude 9.30 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 7.90	1.40
Apr. 26	[e] 7.90	1.40
Sept. 20	11.75	−2.45
1927		
Apr. 21	[c] 23.60	−14.30
Sept. 16	11.20	−1.90
1928		
Apr. 19	8.30	1.00
Sept. 20	[c] 25.50	−16.20
1929		
Apr. 11	9.30	.00

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[c] Pumping.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

271D1. R. J. Benjamin. 10-inch well, 220 feet deep, used for irrigation. Bench mark is floor of concrete pit, altitude 48.00 feet, which is 23.0 feet below reference bench mark, a copper washer on north side of pump house. All measurements made from pit floor

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	4.30	43.70

271D2. R. J. Benjamin. 8-inch well, 78 feet deep, used for domestic supply. Bench mark is cross on concrete curb, at ground surface; altitude, 70.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	26.70	43.95
May 20	27.30	43.45
June 15	[f] 30.90	39.85
July 21	32.45	38.35
Aug. 16	30.00	40.70
Sept. 17	29.45	41.30
Oct. 13	28.45	42.30
Nov. 12	28.50	42.25
Dec. 8	28.00	42.75
1927		
Jan. 12	27.65	43.10
Feb. 9	27.40	43.35
Mar 15	27.05	43.70
Apr. 16	26.75	44.00
May 31	28.25	42.50
June 23	33.10	37.65
Aug. 21	[f] 23.35	37.50
Sept. 27	30.30	40.45
1928		
Apr. 23	28.90	41.85
Sept. 22	32.45	38.30
1929		
Apr. 15	30.45	40.30

271R1. Mrs. Petzinger. 8-inch well, used for domestic supply. Bench mark is top of casing, 0.70 foot above ground; altitude, 73.85 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 30.40	43.45
Apr. 26	[e] 30.10	43.75
Sept. 20	32.70	41.15

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[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[f] Pump running in adjacent well.

1927

271R1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
Apr. 19	31.55	42.30
Sept. 13	34.20	39.65
1928		
Apr. 16	32.60	41.25
Sept. 17	34.65	39.20
1929		
Apr. 9	31.85	42.00

272A1. 4-inch well, not in use. Bench mark is top of casing, altitude 48.40 feet, which is 12.65 feet below reference bench mark, a cross on concrete curb, 0.1 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 21	14.30	34.10
June 15	15.25	33.15
July 21	16.20	32.20
Aug. 16	16.50	31.90
Sept. 17	16.80	31.60
Oct. 14	16.40	32.00
Nov. 12	15.95	32.45
Dec. 8	15.55	32.85
1927		
Jan. 13	15.10	33.30
Feb. 9	14.80	33.60
Mar. 15	14.20	34.20
Apr. 16	13.80	34.60
May 31	15.00	33.40
June 23	16.10	32.30
Aug. 21	17.85	30.55
Sept. 27	17.60	30.80
1928		
Apr. 23	15.35	33.05
Sept. 22	19.40	29.00
1929		
Apr. 15	17.45	30.95
June 20	19.85	28.55

272C1. 10-inch well, not in use. Bench mark is copper washer in 12 by 12 inch beam, 1.00 foot above ground; altitude, 64.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 21	27.60	37.15
June 15	29.35	35.40
July 21	30.05	34.70
Aug. 16	30.60	34.15
Sept. 17	30.20	34.55
Oct. 14	29.65	35.10
Nov. 12	29.10	35.65
Dec. 8	28.80	35.95

Measurements of depth to water in observation wells—Continued

272C1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 13	28.40	36.35
Feb. 9	28.15	36.60
Mar. 15	27.65	37.10
Apr. 16	27.20	37.55
May 31	28.50	36.25
June 23	30.25	34.50
Aug. 21	31.70	33.05
Sept. 27	31.25	33.50
1928		
Apr. 23	28.90	35.85
Sept. 22	33.50	31.25
1929		
Apr. 15	30.85	33.90

274H1. I. T. Curry. 3-inch well, used for domestic supply. Bench mark until April 16, 1927, top of casing, 7.90 feet below ground, altitude 45.70 feet; after that date, top of casing, 16.20 feet below ground, altitude 37.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 24	[e] 19.00	26.70
Apr. 26	[e] 18.90	26.80
Sept. 20	23.95	21.75
1927		
Apr. 20	18.35	27.35
Sept. 13	23.45	21.25
1928		
Apr. 16	[h] 12.35	25.05
Sept. 17	18.90	18.50
1929		
Apr. 9	14.65	22.75

275C1. 4-inch well, not in use. Bench mark is copper washer on pump-flange support, 2.00 feet above ground; altitude, 47.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 15	23.60	23.65
July 21	24.80	22.45
Aug. 16	25.65	21.60
Sept. 17	26.20	21.05
Oct. 14	25.95	21.30
Nov. 12	25.40	21.85
Dec. 8	25.35	21.90
1927		
Jan. 13	23.20	24.05
Feb. 9	23.95	23.30
Mar. 15	22.45	24.80
Apr. 16	22.00	25.25
May 28	23.30	23.95
June 23	24.35	22.90
Aug. 21	26.40	20.85
Sept. 13	26.55	20.70
1928		
Apr. 16	24.25	23.00
Sept. 17	28.25	19.00
1929		
Apr. 9	26.10	21.15

276A1. Mrs. E. J. McCoy. 8-inch well, used for domestic supply. Bench mark is top of suction, 0.40 foot above ground; altitude, 38.20 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 16.90	21.30
Apr. 26	[e] 16.20	22.00
Sept. 20	19.20	19.00
1927		
Apr. 21	16.65	21.55
Sept. 13	18.55	19.65
1928		
Apr. 16	18.00	20.20
Sept. 17	19.70	18.50
1929		
Apr. 9	19.00	19.20

277A1. Rose Escobard. 4-inch well, 115 feet deep, used for domestic supply. Bench mark is top of casing or copper washer on water-tank sill, 0.5 foot above ground; altitude, 35.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	15.40	19.95
May 19	[b] 15.65	19.70
June 12	[b] 15.40	19.95
July 20	[b] 16.55	18.80
Aug. 16	18.40	16.95
Sept. 16	18.05	17.30
Oct 12	17.45	17.90
Nov 10	18.25	17.10
Dec. 8	18.50	16.85
1927		
Jan. 13	18.15	17.20
Feb. 9	17.60	17.75
Mar. 14	16.25	19.10
Apr. 16	16.05	19.30
May 28	[b] 16.40	18.95
June 23	17.05	18.30
July 29	17.00	18.35
Aug. 19	17.35	18.00
Sept. 26	17.00	18.35
Oct. 24	17.05	18.30
Nov. 28	18.20	17.15
Dec. 15	18.35	17.00
1928		
Jan. 18	18.45	16.90
Feb. 16	17.95	17.40
Mar. 19	17.90	17.45
Apr. 23	17.50	17.85
May 22	16.55	18.80
June 18	16.85	18.50
July 16	[i] 18.10	17.25
Aug. 20	18.40	16.95
Sept. 21	[b] 17.85	17.50
Oct. 19	17.75	17.60
Nov. 18	18.50	16.85
Dec. 13	19.00	16.35
1929		
Jan. 21	18.50	16.85
Feb. 18	17.60	17.75
Mar. 19	17.70	17.65
Apr. 12	[b] 17.00	18.35
May 27	[b] 17.00	18.35
June 20	16.65	18.70

277N1. Mrs. Lindley. 10-inch well, 250 feet deep. Bench mark is top of casing, altitude 26.55 feet, which is 6.60 feet below reference bench mark, a cross on concrete curb, north side, at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	9.25	17.30
Aug. 16	12.50	14.05
Sept. 16	12.40	14.15
Oct. 12	11.25	15.30
Nov. 12	12.15	14.40
Dec. 8	12.40	14.15
1927		
Jan. 13	12.35	14.20
Feb. 9	12.40	14.15
Mar. 14	10.65	15.90
Apr. 16	10.20	16.35
May 28	10.05	16.50
June 23	10.25	16.30
Aug. 19	10.15	16.40
Sept. 26	9.85	16.70
Oct. 24	11.80	14.75
1928		
Apr. 23	11.00	15.55
Sept. 21	11.10	15.45
1929		
Apr. 12	11.55	15.00

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[b] Water in ditch near by.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[h] New measuring point.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

278C1. G. W. Ashley. 4-inch well, 35 feet deep, not in use. Bench mark is top of casing, 0.2 foot above ground; altitude, 46.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 22	27.00	19.95
June 15	29.10	17.85
July 21	31.20	15.75
Aug. 16	31.90	15.05
Sept. 17	32.05	14.90
Oct. 14	31.05	15.90
Nov. 12	29.50	17.45
Dec. 8	29.10	17.85
1927		
Jan. 13	28.20	18.75
Feb. 9	27.70	19.25
Mar. 14	26.80	20.15
Apr. 16	26.15	20.80
May 28	28.20	18.75
June 23	29.80	17.15
Aug. 21	32.05	14.90
Sept. 27	32.30	14.65
1928		
Apr. 23	28.10	18.85
Sept. 21	34.80	12.15
1929		
Apr. 12	30.85	16.10

278N1. Mrs. R. D. Creaner. 8-inch well, 235 feet deep, used for domestic supply and irrigation. Bench mark is top of casing, altitude 34.15 feet, which is 6.10 feet below reference bench mark, a copper washer on door sill, south side, 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 22	18.35	15.80
June 15	20.50	13.65
July 21	22.75	11.40
Aug. 16	23.25	10.90
Sept. 17	23.35	10.80
Oct. 14	21.60	12.55
Nov. 12	20.30	13.85
Dec. 8	19.50	14.65
1927		
Jan. 13	18.80	15.35
Feb. 9	18.25	15.90
Mar. 14	17.45	16.70
Apr. 16	16.75	17.40
May 28	19.45	14.70
June 23	[c] 24.20	9.95
Aug. 21	23.00	11.15
Sept. 27	22.80	11.35
1928		
Apr. 23	18.90	15.25
Sept. 21	25.20	8.95
1929		
Apr. 12	21.60	12.55

[c] Pumping

279C1. Mary Luis. 6-inch well, not in use. Bench mark is cross on concrete curb, 0.4 foot above ground; altitude, 54.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	30.70	23.81

279C3. Mary Luis. 4-inch well, not in use. Bench mark is top of casing, 0.4 foot above ground; altitude, 52.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	28.60	23.85
May 21	28.65	23.80
June 15	[i] 32.45	20.00
July 21	34.75	17.70
Aug. 16	35.05	17.40
Sept. 17	34.90	17.55
Oct. 14	33.15	19.30
Nov. 12	31.85	20.60
Dec. 8	30.95	21.50
1927		
Jan. 13	30.20	22.25
Feb. 9	29.65	22.80
Mar. 15	28.60	23.85
Apr. 16	28.00	24.45
May 28	30.90	21.55
June 23	32.50	19.95
Aug. 19	35.45	17.00
Sept. 27	34.80	17.65
1928		
Apr. 23	29.90	22.55
Sept. 21	38.00	14.45
1929		
Apr. 15	33.10	19.35

2710M1. Anna Foscalina. 8-inch well, 85 feet deep, used for domestic supply and irrigation. Bench mark is top of casing, altitude 40.85 feet, which is 15.00 feet below reference bench mark, a copper washer on doorsill, 1.00 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 24	[e] 11.00	29.85
Apr. 22	10.30	30.55
Apr. 27	[e] 10.80	30.05
May 20	11.40	29.45
June 15	12.00	28.85
Aug. 16	[c] 20.55	20.30
Sept. 20	13.65	27.20

[c] Pumping.

[e] By G. H. Teale, State division of water rights.

[i] Pump running in adjacent well.

2710M1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 13	13.55	27.30
Dec. 8	12.85	28.00
1927		
Feb. 9	12.10	28.75
Apr. 16	11.15	29.70
Aug. 19	14.40	26.45
Sept. 13	14.50	26.35
1928		
Apr. 16	12.65	28.20
Sept. 17	16.15	24.70
1929		
Apr. 9	14.60	26.25

2713D1. Mrs. Rosetta Sayles. 10-inch well, 200 feet deep, used for domestic supply. Bench mark is top of casing, altitude 59.85 feet, which is 7.20 feet below reference bench mark, a chalk mark on motor support, 0.3 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	16.35	43.50
May 20	17.10	42.75
June 15	[i] 20.50	39.35
Aug. 16	20.70	39.15
Oct. 13	18.75	41.10
Dec. 8	18.20	41.65

2713N1. Mrs. J. Hill. 4-inch well, not in use. Bench mark is top of casing, at ground surface; altitude, 64.10 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 27.50	36.60
Apr. 27	[e] 26.90	37.20
Sept. 20	29.80	34.30
1927		
Apr. 19	27.30	36.80
Sept. 13	30.80	33.30
1928		
Apr. 16	28.55	35.55
Sept. 17	32.45	31.65
1929		
Apr. 9	30.40	33.70

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

2714C1. Louisa Hancock. 3-inch well, 36 feet deep, used for domestic supply. Bench mark is top of casing, altitude 63.25 feet, which is 1.40 feet below reference bench mark, a copper washer on pump support, 2.00 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	29.90	33.35
May 20	31.20	32.05
June 15	30.65	32.60
Aug. 16	34.30	28.95
Oct. 13	31.65	31.60
Dec. 8	31.45	31.80
1927		
Feb. 9	31.05	32.20
Apr. 16	30.50	32.75

2715J1. Ben Sanguinetti. 6-inch well, 80 feet deep, used for domestic supply. Bench mark is top of casing, altitude 43.10 feet, which is 7.85 feet below reference bench mark, a copper washer on door sill, north side, 0.3 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	20.00	23.10
May 20	21.10	22.00
June 15	[i] 22.75	20.35
July 21	24.80	18.30
Aug. 16	23.50	19.60
Oct. 13	25.85	17.25
Dec. 8	22.50	20.60
1927		
Feb. 9	21.55	21.55
Apr. 16	20.35	22.75
Aug. 19	24.45	18.65

2716J1. John Sarale. 6-inch well, used for domestic supply and irrigation. Bench mark is pump connection, altitude 33.95 feet, which is 10.30 feet below reference bench mark, a copper washer in wood curb 0.2 foot above ground. All measurements made from pump connection

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	15.30	18.65
May 20	16.10	17.85
June 15	17.75	16.20
July 21	19.55	14.40
Aug. 16	21.15	12.80
Dec. 8	18.20	15.75
1927		
Feb. 9	16.60	17.35
Apr. 16	15.70	18.25
Aug. 19	21.50	12.45

2718N1. J. B. Gotelli. 10-inch well, used for domestic supply. Bench mark is top of suction pipe, 0.80 foot below ground, altitude 30.70 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 16.10	14.60
Apr. 26	[e] 17.60	13.10
Sept. 21	18.35	12.35
1927		
Apr. 21	16.80	13.90
Sept. 13	15.90	14.80
1928		
Apr. 17	17.25	13.45
Sept. 19	19.40	11.30
1929		
Apr. 9	[i] 19.55	11.15

2719A1. T. Spano & Co. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 32.10 feet, which is 0.60 foot below reference bench mark, a copper washer on pump support, 1.80 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	17.90	14.20
May 20	18.60	13.50
June 12	15.90	16.20
July 20	21.60	10.50
Aug. 16	23.25	8.85
Sept. 16	22.40	9.70
Oct. 12	21.10	11.00
Nov. 12	21.10	11.00
Dec. 8	21.20	10.90
1927		
Jan. 13	21.10	11.00
Feb. 9	20.70	11.40
Mar. 14	19.10	13.00
Apr. 16	18.50	13.60
May 28	20.20	11.90
June 23	20.35	11.75
Aug. 19	21.00	11.10
Sept. 26	20.50	11.60
1928		
Apr. 23	18.95	13.15
Sept. 21	23.35	8.75
1929		
Apr. 12	20.65	11.45

2719N1. T. Merlo. 8-inch well, 50 feet deep, used for domestic supply. Bench mark is copper washer on pump support, west side, 1.50 feet above ground; altitude, 30.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	17.20	13.00
May 20	18.00	12.20
June 15	18.55	11.65
July 20	20.40	9.80
Aug. 6	21.50	8.70
Sept. 16	23.10	7.10
Oct. 12	22.60	7.60
Nov. 12	22.30	7.90
Dec. 8	21.75	8.95
1927		
Jan. 13	21.30	8.90
Feb. 9	19.55	10.65
Mar. 14	17.00	13.20
Apr. 14	16.15	14.05
Aug. 19	21.00	9.20
Sept. 26	21.25	8.95
1928		
Apr. 23	16.20	14.00
Sept. 21	22.60	7.60
1929		
Apr. 12	20.70	9.50

2720J1. G. Battilana. 4-inch well, used for domestic supply. Bench mark is top of casing, at ground surface; altitude 35.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	21.10	14.85
May 20	22.40	13.55
June 15	22.90	13.05
Aug. 16	25.35	10.60
Oct. 13	25.20	10.75
Dec. 8	24.40	11.55
1927		
Feb. 9	23.60	12.35
Apr. 16	21.75	14.20

2721F1. Jim Paullo. Bench mark until July 21, 1926, top of pump connection, altitude 35.35 feet, which is 9.90 feet below reference bench mark a copper washer on door sill, 0.9 foot above ground; after that date, top of pump connection, altitude 38.15 feet, which is 7.10 feet below reference bench mark. All measurements made from top of pump connections

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	16.80	18.55
May 20	18.50	16.85
June 15	18.55	16.80

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[i] Pump running in adjacent well.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

2721F1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 21	[h] 24.95	13.20
Aug. 16	20.00	18.15
Sept. 18	[c] 25.15	13.00
Oct. 13	20.05	18.10
Dec. 8	19.20	18.95
1927		
Feb. 9	18.40	19.75
Apr. 16	17.30	20.85
Aug. 19	20.95	17.20

2721G1. L. Delucchi. 8-inch well, used for irrigation. Bench mark until Sept. 13, 1927, top of casing, 12.70 feet below ground, altitude 33.45 feet; after that date, top of casing, 21.60 feet below ground, altitude 24.55 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 24	[e] 15.90	17.55
Apr. 27	[c e] 22.40	11.05
Sept. 20	17.40	16.05
1927		
Apr. 20	14.40	19.05
Sept. 13	[h] 9.90	14.65
1928		
Apr. 16	7.35	17.20
Sept. 17	11.50	13.05
1929		
Apr. 9	8.90	15.65

281Q1. A. Swank. 12-inch well, used for domestic supply. Bench mark is top of casing, 38.50 feet below ground; altitude, 78.80 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 12.50	66.30
Apr. 27	[e] 9.80	69.00
Sept. 20	13.95	64.85
1927		
Apr. 19	12.±	66.±
Sept. 13	13.90	64.90
1928		
Apr. 16	9.35	69.45
Sept. 17	13.00	65.80
1929		
Apr. 9	12.80	66.00

286J1. M. T. Burk. 8-inch well, 60 feet deep, used for domestic supply. Bench mark until August, 1927, copper washer in 4 by 4 inch pipe support, 3.4 feet above ground, altitude 73.85 feet; after that date, top of casing, altitude 70.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	29.20	44.65
May 20	30.60	43.25
June 15	31.70	42.15
July 21	31.45	42.45
Aug. 16	[f] 31.80	42.05
Sept. 20	31.75	42.10
Oct. 13	31.40	42.45
Nov. 12	32.10	41.75
Dec. 8	31.30	42.55
1927		
Jan. 13	30.95	42.90
Feb. 9	24.85	49.00
Mar. 15	30.45	43.40
Apr. 16	30.55	43.30
May 31	30.75	43.10
June 23	32.00	41.85
Aug. 21	[h] 29.55	41.10
Sept. 27	29.60	41.05
1928		
Apr. 23	28.80	41.85
Sept. 22	30.65	40.00
1929		
Apr. 15	29.00	41.65

289C1. J. H. Hale. 8-inch well, used for domestic supply. Bench mark is top of casing, at ground surface; altitude, 88.60 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 35.40	53.20
Apr. 27	[e] 35.50	53.10
Sept. 20	37.00	51.60
1927		
Apr. 19	34.95	53.65
Sept. 9	38.15	50.45
1928		
Apr. 16	36.70	51.90
Sept. 17	38.85	49.75
1929		
Apr. 9	39.15	49.45

2814C1. J. Potter. 8-inch well, used for irrigation. Bench mark is top of casing, 34 feet below ground; altitude, 66.25 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 24	[e] 3.20	63.05
Apr. 27	[e] 4.40	61.85
Sept. 20	7.35	58.90
1927		
Apr. 19	3.20	63.05
Sept. 13	7.90	58.35
1928		
Apr. 16	4.50	61.75
Sept. 17	([c])	--------
1929		
Apr. 9	9.10	57.15

2815N1. H. P. Lynch. 8-inch well, used for domestic supply. Bench mark is top of casing, 3.20 feet above ground; altitude, 90.30 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 24	[e] 34.50	55.80
Apr. 27	[e] 34.60	55.70
Sept. 20	36.20	54.10
1927		
Apr. 19	36.10	54.20
Sept. 13	37.05	53.25
1928		
Apr. 16	36.85	53.45
Sept. 17	38.55	51.75
1929		
Apr. 9	37.85	52.45

2818D1. C. A. Hedger. 12-inch well, used for irrigation. Bench mark is top of casing, 19.80 feet below ground; altitude, 55.40 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 8.90	46.50
Apr. 27	[e] 8.60	46.80
Sept. 20	11.20	44.20
1927		
Apr. 19	8.70	46.70
Sept. 13	12.20	43.20
1928		
Apr. 16	10.70	44.70
Sept. 17	14.00	41.40
1929		
Apr. 9	11.90	43.50

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[c] Pumping.
[d] By city of Stockton.
[e] By G. H. Teale, State division of water rights.
[h] New measuring point.

[d] By city of Stockton.
[e] By G. H. Teale, State division of water rights.
[f] Windmill running.
[h] New measuring point.

[c] Pumping.
[d] By city of Stockton.
[e] By G. H. Teale, State division of water rights.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
358F1. Richmond Chase Co. 6-inch well, used for industrial purposes. Bench mark is copper washer on pump support, 1.3 feet above ground; altitude, −6.05 feet		
1926		
May 26	3.95	−10.00
June 10	4.20	−10.25
Aug. 12	3.20	−9.25
Sept. 14	4.80	−10.85
Oct. 22	5.30	−11.35
359N1. 6-inch well, used for domestic supply. Bench mark until Dec. 17, 1926, copper washer on pump support 1.5 feet above ground, altitude −3.35 feet; after that date, top of casing, altitude −1.75 feet		
1926		
May 26	5.05	−8.40
June 10	4.55	−7.90
July 19	5.10	−8.45
Aug. 12	3.70	−7.05
Sept. 14	6.00	−9.35
Oct. 22	5.85	−9.20
Dec. 17	[h] 4.65	−6.40
1927		
Jan. 31	4.10	−5.85
Feb. 26	3.45	−5.20
Mar. 22	4.15	−5.90
Apr. 30	5.00	−6.75
Aug. 26	7.85	−9.60
Sept. 26	8.20	−9.95
1928		
Apr. 18	4.95	−6.70
Sept. 27	5.70	−7.45
1929		
Apr. 12	6.10	−7.85
359R1. Ernest Ferdun. 6-inch well, not in use. Bench mark is copper washer on old pump support, 1.3 feet above ground; altitude, 0.55 foot		
1926		
Apr. 24	4.80	−4.25
May 18	5.00	−4.45
June 10	[b] 4.50	−3.95
July 19	4.95	−4.40
Aug. 12	4.75	−4.20
Sept. 14	4.30	−3.75
Oct. 22	4.20	−3.65
Dec. 17	4.30	−3.75
1927		
Jan. 31	4.00	−3.45
Feb. 26	3.25	−2.70
Mar. 22	4.50	−3.95
359R1—Con.		
1927		
Apr. 30	5.50	−4.95
Aug. 26	5.20	−4.65
Sept. 26	5.50	−4.95
1928		
Apr. 18	4.65	−4.10
Sept. 27	6.55	−6.00
1929		
Apr. 12	5.00	−4.45
3513A1. F. Vail. 4-inch well, 68 feet deep, used for domestic supply. Bench mark is top of casing, altitude 10.80 feet, which is 0.70 foot below reference bench mark, a copper washer on pump support. All measurements made from top of casing		
1926		
Apr. 24	1.80	9.00
June 10	4.15	6.65
July 19	5.40	5.40
Aug. 12	6.00	4.80
Sept. 16	6.65	4.15
Oct. 22	6.80	4.00
Dec. 17	7.05	3.75
1927		
Jan. 31	5.25	5.55
Feb. 26	2.25	8.55
Mar. 22	2.40	8.40
Apr. 30	4.05	6.75
May 28	5.00	5.80
Aug. 26	6.20	4.60
Sept. 26	6.55	4.25
1928		
Apr. 18	4.25	6.55
Sept. 27	7.05	3.75
1929		
Apr. 12	5.00	5.80
3513D1. F. D. Ralls. (See p. 210.) Bench mark is top of casing, altitude 19.10 feet, which is 0.10 foot above reference bench mark, a copper washer on door sill at ground surface. All measurements made from top of casing		
1926		
Apr. 10	7.20	11.90
May 18	8.00	11.10
June 11	9.05	10.05
July 19	10.75	8.35
Aug. 13	11.65	7.45
Sept. 15	12.45	6.65
Oct. 22	[c] 14.40	4.70
Dec. 17	12.10	7.00
3513D1—Con.		
1927		
Jan. 21	11.80	7.30
Feb. 26	10.00	9.10
Mar. 22	8.80	10.30
Apr. 30	8.60	10.50
May 28	9.25	9.85
June 23	9.30	9.80
July 29	9.95	9.15
Aug. 18	10.75	8.35
Sept. 26	11.50	7.60
Oct. 24	11.90	7.20
Nov. 28	11.80	7.30
Dec. 15	11.70	7.40
1928		
Jan. 18	11.40	7.70
Feb. 16	10.85	8.25
Mar. 19	10.40	8.70
Apr. 18	9.85	9.25
May 21	7.70	11.40
June 18	9.90	9.20
July 16	11.25	7.85
Aug. 20	12.65	6.45
Sept. 21	13.15	5.95
Oct. 19	13.15	5.95
Nov. 18	13.00	6.10
Dec. 13	12.80	6.30
1929		
Jan. 21	12.40	6.70
Feb. 18	11.95	7.15
Mar. 19	11.55	7.55
Apr. 12	10.45	8.65
May 27	7.25	11.85
June 20	7.50	11.60
3515E1. Paul Williamson, 6-inch well, not in use. Bench mark until Dec. 17, 1926, copper washer on 1 by 4 inch plank 1.4 feet above ground, altitude 1.25 feet; after that date, top of casing, 1.00 foot above ground, altitude 0.75 foot		
1926		
May 26	5.40	−4.15
June 10	4.25	−3.00
July 19	6.80	−5.55
Aug. 13	5.20	−3.95
Sept. 16	4.45	−3.20
Oct. 22	[i] 3.00	−1.75
Dec. 17	[h] 2.65	−1.90
1927		
Jan. 31	3.65	−2.90
Feb. 26	3.00	−2.25
Mar. 22	4.25	−3.50
Apr. 30	5.25	−4.50
Aug. 26	4.55	−3.80
Sept. 26	4.55	−3.80
1928		
Apr. 18	4.70	−3.95
Sept. 27	3.20	−2.45
1929		
Apr. 12	3.75	−3.00

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[b] Water in ditch near by.
[h] New measuring point.

[c] Pumping.

[h] New measuring point.
[i] Adjacent land flooded.

Measurements of depth to water in observation wells—Continued

3516R1. Jesse Correia. 3-inch well, 35 feet deep, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, −1.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	4.40	−5.95
June 10	3.45	−5.00
Aug. 13	4.00	−5.55
Sept. 16	4.25	−5.80
Oct. 22	3.75	−5.30
Dec. 17	2.75	−4.30
1927		
Jan. 31	2.85	−4.40
Feb. 26	2.50	−4.05
Mar. 22	3.35	−4.90
Apr. 30	3.90	−5.45
Aug. 26	3.35	−4.90
Sept. 26	3.80	−5.35
1928		
Apr. 18	3.55	−5.10
Sept. 27	5.15	−6.70
1929		
Apr. 12	3.50	−5.05

3517C1. Richmond-Chase Co. 6-inch well, used for industrial purposes. Bench mark until Dec. 17, 1926, copper washer on pump support, 1.5 feet above ground, altitude −5.20 feet; after that date, top of casing, altitude −3.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 20	4.75	−9.95
June 10	[f] 6.65	−11.85
July 19	5.10	−10.30
Aug. 12	4.95	−10.15
Sept. 14	5.80	−11.00
Oct. 22	5.80	−11.00
Dec. 17	[h] 4.40	−7.95
1927		
Jan. 31	4.30	−7.85
Feb. 26	3.15	−6.70
Mar. 22	3.85	−7.40
Apr. 30	4.65	−8.20
Aug. 26	5.65	−9.20
Sept. 26	6.60	−10.15
1928		
Apr. 18	4.50	−8.05
Sept. 27	6.90	−10.45
1929		
Apr. 12	([k])	---------

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[f] Windmill running.
[h] New measuring point.
[k] Destroyed.

3521K1. R. F. Driscoll. 8-inch well, 45 feet deep, used for stock. Bench mark until Sept. 27, 1928, copper washer 0.4 foot above top of casing and 1.6 feet above ground, altitude −2.40 feet; after that date, top of casing, altitude −2.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	4.35	−6.75
June 10	4.10	−6.50
July 19	4.10	−6.50
Aug. 13	3.30	−5.70
Sept. 16	3.80	−6.20
Oct. 22	4.20	−6.60
Dec. 17	4.20	−6.60
1927		
Jan. 31	3.35	−5.75
Feb. 26	3.05	−5.45
Mar. 22	[f] 4.15	−6.55
Apr. 30	4.35	−6.75
Aug. 26	3.60	−6.00
Sept. 26	3.90	−6.30
1928		
Apr. 18	4.20	−6.60
Sept. 27	[h] 5.40	−8.20
1929		
Apr. 12	4.80	−7.60

3524D1. Mrs. Mary Tredway. 4-inch well, used for stock. Bench mark is top of casing and copper washer on post and pump support 0.25 foot above ground; altitude 12.95 feet.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	3.50	9.45
May 18	5.40	7.55
June 11	6.10	6.85
July 20	7.50	5.45
Aug. 13	8.50	4.45
Sept. 15	[f] 9.40	3.55
Oct. 13	8.60	4.35
Nov. 9	8.80	4.15
Dec. 7	[f] 8.80	4.15
1927		
Jan. 12	7.10	5.85
Feb. 8	5.90	7.05
Mar. 12	3.15	9.80
Apr. 14	3.60	9.35
May 28	5.60	7.35
June 23	[f] 6.60	6.35
Aug. 18	8.35	4.60
Sept. 26	8.50	4.45
Oct. 24	[f] 9.30	3.65
1928		
Apr. 28	[f] 5.10	7.85
Sept. 21	9.30	3.65
1929		
Apr. 12	7.00	5.95

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[f] Windmill running.
[h] New measuring point.

3528A1. F. G. Amoro. 6-inch well, 75 feet deep, used for stock. Bench mark is top of casing, at ground surface; altitude, −4.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	3.85	−8.65
June 10	2.45	−7.25
July 19	3.60	−8.40
Aug. 13	3.70	−8.50
Sept. 16	4.25	−9.05
Oct. 22	3.60	−8.40
Dec. 17	2.15	−6.95
1927		
Jan. 31	1.90	−6.70
Feb. 26	1.60	−6.40
Mar. 22	2.10	−6.90
Apr. 30	3.90	−8.70
Aug. 26	3.80	−8.60
Sept. 26	4.50	−9.30
1928		
Apr. 18	[f] 6.20	−11.00
Sept 27	4.70	−9.50
1929		
Apr. 12	3.25	−8.05

3529J1. A. T. Ferreira. 8-inch well, 125 feet deep, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude, −5.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	0.00	−5.45
Aug. 13	1.00	−6.45
Sept. 16	1.15	−6.60
Oct. 22	1.00	−6.45
Dec. 17	.45	−5.90
1927		
Mar. 22	.50	−5.95
Aug. 26	.95	−6.40
1928		
Apr. 18	.65	−6.10
Sept. 27	1.75	−7.20

361A1. J. A. Porterfield. 4-inch well, not in use. Bench mark is top of casing, 5.00 feet below concrete curb at ground surface; altitude, 48.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	15.85	33.00
May 17	14.20	34.65
June 15	15.90	32.95
July 14	16.20	32.65
Aug. 19	17.10	31.75
Sept. 13	15.90	32.95
Oct. 11	15.55	33.30

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[f] Windmill running.

Measurements of depth to water in observation wells—Continued

361A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Nov. 3	17.10	31.75
Nov. 8	17.00	31.85
Nov. 13	17.50	31.35
Nov. 19	17.10	31.75
Dec. 6	16.20	32.65
1927		
Jan. 10	16.40	32.45
Feb. 7	16.20	32.65
Mar. 7	13.90	34.95
Apr. 8	13.70	35.15
May 20	11.15	37.70
June 16	[i] 22.00	26.85
July 18	13.45	35.40
Aug. 17	14.95	33.90
Sept. 19	14.70	34.15
Oct. 24	15.90	32.95
Nov. 26	15.70	33.15
Dec. 22	16.40	32.45
1928		
Jan. 26	17.40	31.45
Feb. 23	16.50	32.35
Mar. 21	[i] 19.90	28.95
Mar. 27	12.80	36.05
Apr. 4	10.60	38.25
Apr. 19	11.70	37.15
May 24	12.40	36.45
June 19	15.10	33.75
July 23	14.85	34.00
Aug. 20	16.15	32.70
Sept. 19	15.25	33.60
Oct. 23	15.70	33.15
Nov. 21	15.95	32.90
Dec. 15	17.05	31.80
1929		
Jan. 24	18.55	30.30
Feb. 21	17.75	31.10
Mar. 21	17.65	31.20
Apr. 9	18.75	30.10
May 27	15.60	33.25
June 20	15.15	33.70

361J2. Fred Dougherty. 4-inch well, not in use. Bench mark is top of casing, 1.50 feet above ground; altitude, 48.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Jan. 19	19.80	28.30
Mar. 24	21.85	26.25
Mar. 27	21.50	26.60
Apr. 4	20.30	27.80
Apr. 17	20.35	27.75
May 23	22.05	26.05
June 21	23.00	25.10
July 24	23.50	24.60
Aug. 20	23.75	24.35
Sept. 18	23.30	24.80
Oct. 23	22.35	25.75
Nov. 21	20.95	27.15
Dec. 17	20.65	27.45
1929		
Jan. 24	20.60	27.50
Feb. 21	20.75	27.35
Mar. 21	22.25	25.85
Apr. 8	23.00	25.10
May 27	25.10	23.00
June 20	24.25	23.85

361Q2. Frank Cordway. 4-inch well, not in use. Bench mark until Mar. 21, 1929, top of pump base, 0.80 foot above ground, altitude 50.80 feet; after that date, top of casing, 0.50 foot above ground, altitude 50.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Jan. 19	23.65	27.15
Feb. 27	22.80	28.00
Mar. 21	24.95	25.85
Mar. 27	24.30	26.50
Apr. 17	23.35	27.45
May 23	27.05	23.75
July 24	28.50	22.30
Aug. 20	29.05	21.75
Sept. 18	28.60	22.20
Oct. 23	26.70	24.10
Nov. 21	25.05	25.75
Dec. 17	24.65	26.15
1929		
Jan. 24	24.35	26.45
Feb. 21	24.55	26.25
Mar. 21	[h] 26.05	24.45
Apr. 8	26.35	24.15
May 27	29.50	21.00
June 20	28.70	21.80

362F7. —— Uhtt. (See p. 211.) Bench mark is top of 2 by 12 inch plank over pit; altitude, 43.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 27	17.20	26.20

362P2. —— Fitzgerald. 6-inch well, used for domestic supply. Bench mark is copper washer on 2-foot plank at base of pump, 0.5 foot above ground; altitude 41.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	14.45	27.10
May 17	14.25	27.30
June 5	15.80	25.75
July 14	[c] 17.05	24.50
Aug. 13	15.60	25.95
Sept. 13	15.60	25.95
Oct. 11	15.20	26.35
Nov. 8	15.00	26.55
Dec. 6	14.85	26.70
1927		
Jan. 10	14.85	26.70
Feb. 7	14.90	26.65
Mar. 7	14.45	27.10
Apr. 12	14.30	27.25
May 19	15.10	26.45
June 16	14.60	26.95
July 18	14.90	26.65
Aug. 17	15.45	26.10
Sept. 17	15.35	26.20

362P2—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Oct. 24	14.80	26.75
Nov. 26	14.40	27.15
Dec. 21	14.45	27.10
1928		
Jan. 26	14.55	27.00
Feb. 28	14.75	26.80
Mar. 24	15.85	25.70
Mar. 27	15.70	25.85
Apr. 3	15.10	26.45
Apr. 17	14.40	27.15
May 23	14.90	26.65
June 19	15.70	25.85
July 24	15.75	25.80
Aug. 20	16.45	25.10
Sept. 18	16.40	25.15
Oct. 23	16.00	25.55
Nov. 21	15.45	26.10
Dec. 14	15.25	26.30
1929		
Jan. 23	15.45	26.10
Feb. 20	15.70	25.85
Mar. 21	16.10	25.45
Apr. 8	16.40	25.15
May 27	17.85	23.70
June 20	16.75	24.80

363F1. Lillian Schleef. (See p. 211.) Bench mark is top of concrete curb, west side, under trap door, 0.3 foot above ground; altitude, 40.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 26	13.80	27.15
May 29	11.85	29.10
June 20	11.40	29.55
Aug. 17	13.20	27.75
Sept. 4	13.30	27.65
Oct. 5	13.70	27.25
Nov. 6	14.10	26.85

363G1. J. S. Gerard. (See p. 211.) Bench mark is top of concrete curb, west side of pit, at ground surface; altitude, 42.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 26	15.75	26.95
July 13	13.65	29.05
Oct. 5	15.70	27.00

366A1. W. S. Harshner. 4-inch well, 62 feet deep, used for domestic supply. Bench mark is copper washer on 2-inch plank, 1.1 feet above ground; altitude, 24.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	4.60	19.80
May 14	6.00	18.40
June 5	6.30	18.10

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[i] Pump running in adjacent well.

[c] Pumping.

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
366A1—Con.		
1926		
July 14	[f] 6.70	17.70
Aug. 19	[f] 8.60	15.80
Sept. 13	[f] 9.50	14.90
Oct. 11	9.65	14.75
Nov. 8	10.05	14.35
Dec. 6	10.15	14.25
1927		
Jan. 10	10.25	14.15
Feb. 7	9.85	14.55
Mar. 7	7.90	16.50
Apr. 12	7.65	16.75
May 19	[f] 8.25	16.15
June 16	[f] 8.05	16.35
July 18	7.55	16.85
Aug. 17	8.05	16.35
Sept. 17	[f] 8.40	16.00
Oct. 24	[f] 9.00	15.40
Nov. 26	[f] 8.10	16.30
Dec. 22	9.00	15.40
1928		
Jan. 26	9.00	15.40
Feb. 28	8.40	16.00
Mar. 24	8.60	15.80
Mar. 27	8.25	16.15
Apr. 3	8.00	16.40
Apr. 17	7.80	16.60
May 23	7.75	16.65
June 19	8.15	16.25
July 24	8.60	15.80
Aug. 20	9.10	15.30
Sept. 18	8.95	15.45
Oct. 23	9.30	15.10
Nov. 21	9.20	15.20
Dec. 14	9.75	14.65
1929		
Jan. 23	9.40	15.00
Feb. 20	9.10	15.30
Mar. 21	9.30	15.10
Apr. 8	9.30	15.10
May 27	8.10	16.30
June 20	7.85	16.55

366R1. Ed Kertz. 4-inch well, not in use. Bench mark is top of casing, 1.2 feet above ground; altitude, 26.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 4	8.20	18.50
June 5	10.05	16.65
July 14	10.70	16.00
Aug. 19	11.80	14.90
Sept. 13	12.35	14.35
Oct. 11	12.50	14.20
Nov. 8	12.65	14.05
Dec. 6	12.50	14.20
1927		
Jan. 10	12.45	14.25
Feb. 7	12.20	14.50
Mar. 7	11.05	15.65
Apr. 12	10.35	16.35
366R1—Con.		
1927		
May 19	10.35	16.35
June 16	10.65	16.05
July 18	[i] 11.45	15.25
Aug. 17	11.60	15.10
Sept. 17	11.75	14.95
Oct. 24	11.85	14.85
Nov. 26	11.30	15.40
Dec. 22	11.70	15.00
1928		
Jan. 26	11.70	15.00
Feb. 28	11.45	15.25
Mar. 24	11.40	15.30
Mar. 27	11.75	14.95
Apr. 3	11.50	15.20
Apr. 17	11.10	15.60
May 23	11.00	15.70
June 19	12.35	14.35
July 24	12.20	14.50
Aug. 20	12.70	14.00
Sept. 18	13.05	13.65
Oct. 23	13.25	13.45
Nov. 21	13.10	13.60
Dec. 14	13.00	13.70
1929		
Jan. 23	12.90	13.80
Feb. 20	12.70	14.00
Mar. 21	12.55	14.15
Apr. 8	13.05	13.65
May 27	12.75	13.95
June 20	11.10	15.60

367R1. Tribble Bros. Well 20 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 12 inch plank, 2.50 feet above ground; altitude, 24.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	9.65	14.60
May 18	[i] 11.00	13.25
June 11	10.80	13.45
July 20	13.10	11.15
Aug. 13	[i] 14.20	10.05
Sept. 15	14.00	10.25
Oct. 12	13.80	10.45
Nov. 9	13.65	10.60
Dec. 7	13.40	10.85
1927		
Jan. 12	13.10	11.15
Feb. 8	12.80	11.45
Mar. 10	11.50	12.75
Apr. 13	10.40	13.85
May 28	[i] 11.20	13.05
June 23	12.50	11.75
July 29	13.70	10.55
Aug. 18	(l)	---------
Sept. 26	(l)	---------
367R1—Con.		
1928		
Apr. 18	9.25	15.00
Sept. 21	(m)	---------

368D1. G. W. Nighswonger. 8-inch well, 96 feet deep, used for domestic supply. Bench mark is top of casing, 0.25 foot below ground; altitude, 29.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	6.90	22.20
May 3	6.30	22.80
May 18	6.40	22.70
June 5	6.10	23.00

368D2. H. Nighswonger. 4-inch well, used for domestic supply. Bench mark is top of casing, altitude, 31.05 feet, which is 0.50 foot below reference bench mark, a copper washer in wood curb 1.2 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 14	7.20	23.85
Aug. 19	8.50	22.55
Sept. 13	9.40	21.65
Oct. 11	10.20	20.85
Nov. 8	10.90	20.15
Dec. 6	11.15	19.90
1927		
Jan. 10	11.35	19.70
Feb. 7	11.30	19.75
Mar. 7	10.10	20.95
Apr. 12	9.85	21.20
May 19	9.70	21.35
June 16	9.20	21.85
July 18	7.85	23.20
Aug. 17	8.25	22.80
Sept. 17	9.35	21.70
Oct. 24	10.40	20.65
Nov. 26	11.20	19.85
Dec. 22	10.80	20.25
1928		
Jan. 26	11.00	20.05
Feb. 28	11.25	19.80
Mar. 24	11.25	19.80
Mar. 27	11.30	19.75
Apr. 3	11.25	19.80
Apr. 17	10.65	20.40
May 23	9.75	21.30
June 19	8.90	22.15
July 24	9.65	21.40
Aug. 20	10.65	20.40
Sept. 18	10.80	20.25
Oct. 23	13.00	18.05
Nov. 21	12.35	18.70
1929		
Apr. 8	12.75	18.30

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[f] Windmill running.

[i] Pump running in adjacent well.

[l] Caved in.

[m] Dry at 10.50 feet.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
368P1. G. W. Vallem. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 24.60 feet, which is 1.30 feet below reference bench mark, a copper washer 2.4 feet above ground. All measurements made from top of casing		
1926		
Apr. 10	10.60	14.00
May 18	9.50	15.10
July 20	[i]17.30	7.30
Aug. 13	[i]17.15	7.45
Sept. 15	13.75	10.85
Oct. 12	13.25	11.35
Nov. 9	13.15	11.45
Dec. 7	13.95	10.65
1927		
Jan. 12	12.70	11.90
Feb. 8	12.45	12.15
Mar. 10	9.10	15.50
Apr. 13	10.80	13.80
May 28	10.80	13.80
June 23	[e]17.20	7.40
July 25	13.85	10.75
Aug. 18	15.00	9.60
Sept. 26	13.50	11.10
Oct. 24	13.20	11.40
Nov. 28	12.55	12.05
Dec. 15	12.70	11.90
1928		
Jan. 18	12.45	12.15
Feb. 16	12.20	12.40
Mar. 19	11.95	12.65
Apr. 18	11.55	13.05
May 21	13.05	11.55
June 18	[g]12.70	11.90
July 16	[i]17.20	7.40
Aug. 20	[f]16.15	8.45
Sept. 21	15.15	9.45
Oct. 19	14.65	9.95
Nov. 18	14.20	10.40
Dec. 13	13.95	10.65
1929		
Jan. 21	13.60	11.00
Feb. 18	13.35	11.25
Mar. 19	13.30	11.30
Apr. 12	13.05	11.55
May 27	14.80	9.80
June 20	15.10	9.50
369C1. H. J. Couper. 8-inch well, 93 feet deep, not in use. Bench mark until April 17, 1928, top of bent casing, 0.2 foot above ground, altitude 35.25 feet; after that date, top of casing 3.5 feet below ground, altitude 31.60 feet		
1926		
Apr. 10	9.95	25.30
May 18	9.20	26.05
June 5	7.80	27.45
369C1—Con.		
1926		
July 14	[b]6.55	28.70
Aug. 19	[b]8.30	26.95
Sept. 13	9.30	25.95
Oct. 11	9.30	25.95
Nov. 8	11.10	24.15
Dec. 6	11.65	23.60
1927		
Jan 10	12.10	23.15
Feb. 7	12.25	23.00
Mar. 7	11.25	24.00
Apr. 12	11.05	24.20
May 19	10.95	24.30
June 16	[i]8.75	26.50
July 18	[b]8.05	27.20
Aug. 17	8.80	27.45
Sept. 17	9.65	25.60
Oct. 24	10.35	24.90
Nov. 26	11.20	24.05
Dec. 21	11.60	23.65
1928		
Jan. 26	11.90	23.35
Feb. 28	12.15	23.10
Mar. 24	12.25	23.00
Mar. 27	12.25	23.00
Apr. 3	12.15	23.10
Apr. 17	[h]7.70	23.90
May 23	([c])	---------
June 19	[b]5.70	25.90
July 24	6.20	25.40
Aug. 20	7.25	24.35
Sept. 18	7.55	24.05
Oct. 23	8.30	23.30
Nov. 21	8.70	22.90
Dec. 14	8.90	22.70
1929		
Jan. 23	9.20	22.40
Feb. 20	9.35	22.25
Mar. 21	9.40	22.20
Apr. 8	9.20	22.40
May 27	[b]2.65	28.95
June 20	3.75	27.85
369P1. E. A. Mitchell. 8-inch well, 67 feet deep, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 30.30 feet		
1926		
Apr. 10	9.25	21.05
May 18	8.90	21.40
1927		
Sept. 26	12.15	18.15
Oct. 24	[f]12.30	18.00
Nov. 28	11.90	18.40
Dec. 15	11.85	18.45
369P1—Con.		
1928		
Jan. 18	11.20	19.10
Feb. 16	11.65	18.65
Mar. 19	[i]11.80	18.50
Apr. 18	11.30	19.00
May 21	11.40	18.90
June 18	12.30	18.00
July 16	12.90	17.40
Aug. 20	13.55	16.75
Sept. 21	13.90	16.40
Oct. 19	13.75	16.55
Nov. 18	13.50	16.80
Dec. 13	13.35	16.95
1929		
Jan. 21	13.15	17.15
Feb. 18	13.00	17.30
Mar. 19	12.85	17.45
Apr. 12	12.75	17.55
May 27	11.15	19.15
June 20	11.65	18.65
369Q1. Earl Fruit Co. 3-inch well, not in use. Bench mark until October 12, 1926, top of casing, 0.20 foot below ground, altitude 28.85 feet; after that date, top of casing, 0.8 foot above ground, altitude 29.90 feet		
1926		
May 18	7.60	21.25
June 11	8.00	20.85
July 20	9.55	19.30
Aug. 13	10.05	18.80
Sept. 15	9.40	19.45
Oct. 12	[h]10.45	19.45
Nov. 9	11.55	18.35
Dec. 7	11.50	18.40
1927		
Jan. 12	11.50	18.40
Feb. 8	11.35	18.55
Mar. 10	10.40	19.50
Apr. 13	9.95	19.95
May 18	9.50	20.40
May 28	9.50	20.40
June 23	10.35	19.55
July 29	9.80	20.10
Aug. 18	10.75	19.15
Sept. 26	([l])	---------
3610C1. S. A. Gillingham. 4-inch well, 30 feet deep, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 39.05 feet		
1926		
Apr. 10	10.95	28.10
May 17	[b]9.80	29.35
June 5	[b]7.50	31.55

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[e] Pumping.
[f] Windmill running.
[g] Pump stopped a short time before measurement.
[i] Pump running in adjacent well.

[b] Water in ditch near by.
[c] Pumping.
[f] Windmill running.
[h] New measuring point.
[i] Pump running in adjacent well.

[b] Water in ditch near by.
[h] New measuring point.
[i] Pump running in adjacent well.
[l] Caved in.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3610C1— Con.		
1926		
July 14	[b] 8.25	30.80
Aug. 19	[b] 9.20	29.85
Sept. 13	[b] 9.80	29.25
Oct. 11	[b] 10.25	28.80
Nov. 8	11.50	27.55
Dec. 6	12.55	26.50
1927		
Jan. 10	13.20	25.85
Feb. 7	13.20	25.85
Mar. 7	12.70	26.35
Apr. 12	[b] 12.05	27.00
May 19	[b] [f] 9.30	29.75
June 16	[b] [f] 9.25	29.80
July 18	[b] 7.75	31.30
Aug. 17	[b] 9.35	29.70
Sept. 17	9.45	29.60
Oct. 24	[b] [f] 9.35	29.70
Nov. 26	11.75	27.30
Dec. 21	12.45	26.60
1928		
Jan. 26	13.00	26.05
Feb. 28	12.60	26.45
Mar. 24	[b] 13.25	25.80
Mar. 27	[b] 12.80	26.25
Apr. 3	12.15	26.90
Apr. 17	12.80	26.25
May 23	[b] 10.30	28.75
June 19	[b] 10.10	28.95
July 24	[b] 10.40	28.65
Aug. 20	[b] 13.05	26.00
Sept. 18	[b] 11.80	27.25
Oct. 23	[b] 11.80	27.25
Nov. 21	13.10	25.95
Dec. 14	13.60	25.45
1929		
Jan. 23	13.95	25.10
Feb. 20	14.15	24.90
Mar. 21	14.50	24.55
Apr. 8	[b] 12.60	26.45
May 27	[b] 10.80	28.25
June 20	[b] 9.80	29.25

3612K1. —— Koster. 4-inch well not in use. Bench mark is top of casing or copper washer on 6 by 6 inch beam, west side, at ground surface; altitude, 45.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 16	20.20	25.25
May 18	20.05	25.40
June 11	21.60	23.85
July 20	22.20	23.25
Aug. 13	22.70	22.75
Sept. 15	22.65	22.80
Oct. 12	20.70	24.75
Nov. 9	19.90	25.55
Dec. 7	19.40	26.05
1927		
Jan. 12	19.15	26.30
Feb. 8	18.90	26.55
Mar. 10	19.80	25.65
3612K1— Con.		
1927		
Apr. 13	19.40	26.05
May 28	21.70	23.75
June 23	23.75	21.70
July 29	23.20	22.25
Aug. 18	23.15	22.30
Sept. 26	21.80	23.65
Oct. 24	20.50	24.95
Nov. 28	19.60	25.85
Dec. 15	19.40	26.05
1928		
Jan. 18	19.05	26.40
Feb. 16	18.95	26.50
Mar. 19	21.05	24.40
Apr. 18	21.35	24.10
May 21	22.55	22.90
June 23	23.90	21.55
July 16	23.50	21.95
Aug. 20	23.45	22.00
Sept. 21	22.90	22.55
Oct. 19	21.80	23.65
Nov. 18	20.75	24.70
Dec. 13	20.30	25.15
1929		
Jan. 21	20.05	25.40
Feb. 18	20.05	25.40
Mar. 19	21.90	23.55
Apr. 12	23.00	22.45
May 27	25.95	19.50
June 20	24.95	20.50

3613A1. W. L. Lange. (See p. 214.) Bench mark is copper washer on 2 by 6 inch well curb, 1 inch above ground; altitude, 44.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	20.50	24.00
May 18	19.75	24.75
June 11	20.40	24.10
July 20	21.90	22.60
Aug. 13	21.65	22.85
Sept. 15	21.20	23.30
Oct. 12	19.75	24.75
Nov. 9	19.35	25.15
Dec. 7	19.10	25.40
1927		
Jan. 13	19.00	25.50
Feb. 8	18.85	25.65
Mar. 10	19.20	25.30
Apr. 13	18.90	25.60
May 28	19.70	24.80
June 23	23.85	20.65
July 29	22.20	22.30
Aug. 18	21.85	22.65
Sept. 26	20.55	23.95
Oct. 24	19.95	24.55
Nov. 28	19.95	24.55
Dec. 15	20.00	24.50
1928		
Jan. 18	19.30	25.20
Feb. 16	19.40	25.10
Mar. 19	[i] 30.60	13.90
Apr. 18	20.80	23.70
3613A1— Con.		
1928		
May 21	22.35	22.15
June 18	24.70	19.80
July 16	24.15	20.35
Aug. 20	23.25	21.25
Sept. 21	22.50	22.00
Oct. 19	21.50	23.00
Nov. 18	21.00	23.50
Dec. 13	20.45	24.05
1929		
Jan. 21	20.60	23.90
Feb. 18	20.50	24.00
Mar. 19	21.95	22.55
Apr. 12	23.90	20.60
May 27	([c])	---------
June 20	24.70	19.80

3613Q1. H. N. Blye. 6-inch well, used for domestic supply. Bench mark is top of casing, 2.00 feet above ground; altitude, 45.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 11	21.10	24.35
July 20	22.20	23.25
Aug. 13	22.55	22.90
Sept. 15	22.05	23.40
Oct. 12	21.70	23.75
Nov. 10	21.20	24.25
Dec. 8	20.80	24.65
1927		
Jan. 13	20.45	25.00
Feb. 9	20.25	25.20
Mar. 12	20.05	25.40
Apr. 14	20.40	25.05
May 28	21.80	23.65
June 23	23.10	22.35
July 29	23.80	21.65
Aug. 19	23.25	22.20
Sept. 26	22.60	22.85
Oct. 24	22.15	23.30
Nov. 28	21.60	23.85
Dec. 15	21.30	24.15
1928		
Jan. 18	20.95	24.50
Feb. 16	20.80	24.65
Mar. 19	22.30	23.15
Apr. 18	22.90	22.55
May 21	23.80	21.65
June 18	23.60	21.85
July 16	25.40	20.05
Aug. 20	24.10	21.35
Sept. 21	24.00	21.45
Oct. 19	23.55	21.90
Oct. 26	23.40	22.05
Nov. 18	23.10	22.35
Dec. 13	22.65	22.80
1929		
Jan. 21	22.25	23.20
Feb. 18	22.10	23.35
Mar. 19	22.20	23.25
Apr. 12	[i] 24.90	20.55
May 27	[i] 27.25	18.20
June 20	26.10	19.35

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[b] Water in ditch near by.
[f] Windmill running.

[i] Pump running in adjacent well.

[c] Pumping.
[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

3615C1. J. J. Meier. (See p. 215.) Bench mark is top of casing, altitude 31.60 feet, which is 1.60 feet below reference bench mark, concrete floor of pump house. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	7.50	24.10
May 18	7.75	23.85
June 12	9.00	22.60
July 20	8.60	23.00
Aug. 13	[c] 16.45	15.15
Sept. 15	9.20	22.40
Oct. 12	8.85	22.75
Nov. 9	8.95	22.65
Dec. 7	9.05	22.55
1927		
Jan. 12	9.25	22.35
Feb. 8	9.15	22.45
Mar. 10	8.30	23.30
Apr. 13	8.10	23.50
May 28	8.80	22.80
June 23	8.00	23.60
July 29	8.90	22.70
Aug. 19	9.15	22.45
Sept. 26	9.05	22.55
Oct. 24	8.90	22.70
Nov. 28	8.95	22.65
Dec. 15	9.05	22.55
1928		
Jan. 18	9.25	22.35
Feb. 16	9.35	22.25
Mar. 19	9.45	22.15
Apr. 18	9.65	21.95
May 21	8.65	22.95
June 18	10.25	21.35
July 16	(c)	----------
Aug. 20	11.40	20.20
Sept. 21	11.00	20.60
Oct. 19	10.50	21.10
Nov. 18	10.70	20.90
Dec. 13	10.75	20.85
1929		
Jan. 21	10.80	20.80
Feb. 18	10.55	21.05
Mar. 19	10.70	20.90
Apr. 12	(c)	----------
May 27	8.00	23.60
June 20	8.60	23.00

3615P1. Fred Rond. 5-inch well, 40 feet deep, used for domestic supply. Bench mark is top of casing, at ground surface; altitude, 28.70 feet.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	5.85	22.85
May 18	6.55	22.15
July 20	[i] 18.20	10.50
Aug. 13	[i] 16.40	12.30
Sept. 15	[i] 15.25	13.45
Oct. 12	7.70	21.00
Nov. 9	7.85	20.85
Dec. 7	8.00	20.70
1927		
Jan. 13	[g] 8.20	20.50
Feb. 9	7.80	20.90
Mar. 12	6.55	22.15
Apr. 14	6.60	22.10
May 28	7.20	21.50
June 23	[i] 17.00	11.70
July 29	8.05	20.65
Aug. 19	9.25	19.45
Sept. 26	8.75	19.95
Oct. 24	8.50	20.20
Nov. 28	8.40	20.30
Dec. 15	8.45	20.25
1928		
Jan. 18	8.50	20.20
Feb. 16	8.40	20.30
Mar. 19	8.55	20.15
Apr. 18	8.15	20.55
May 21	(c)	----------
June 18	(c)	----------
June 26	8.85	19.85
July 16	8.80	19.90
Aug. 20	10.45	18.25
Sept. 21	10.35	18.35
Oct. 19	9.85	18.85
Oct. 26	9.95	18.75
Nov. 18	10.00	18.70
Dec. 13	10.00	18.70
1929		
Jan. 21	9.95	18.75
Feb. 18	9.70	19.00
Mar. 19	9.60	19.10
Apr. 12	9.95	18.75
May 27	9.20	19.50
June 20	8.85	19.85

3616C1. U. S. Geological Survey. Used for experiments. Bench mark until Dec. 10, 1927, top of casing, at ground surface, altitude 29.70 feet; after that date, top of instrument shelf, 3.80 feet above ground, altitude 33.48 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Nov. 14 [n]	9.97	19.73
Nov. 22	9.92	19.78
Nov. 28	9.90	19.80
Dec. 10	[h] 13.58	19.90
Dec. 16	13.65	19.83
Dec. 23	13.64	19.84
Dec. 30	13.66	19.82
1928		
Jan. 6	13.67	19.81
Jan. 13	13.56	19.92
Jan. 20	13.58	19.90
Jan. 28	13.59	19.89
Feb. 4	13.55	19.93
Feb. 10	13.55	19.93
Feb. 17	13.54	19.94
Feb. 24	13.52	19.96
Mar. 2	13.50	19.98
Mar. 9	13.50	19.98
Mar. 16	13.49	19.99
Mar. 23	13.49	19.99
Mar. 30	13.39	20.09
Apr. 6	13.32	20.16
Apr. 13	13.25	20.23
Apr. 21	13.19	20.29
Apr. 27	13.15	20.33
May 4	13.17	20.31
May 11	13.14	20.34
May 18	12.95	20.53
May 25	13.13	20.35
June 1	12.84	20.64
June 6	13.20	20.28
June 8	13.31	20.17
June 16	13.68	19.80
June 22	13.86	19.62
June 29	14.09	19.39
July 6	13.88	19.60
July 13	14.22	19.26
July 20	14.20	19.28
July 27 [o]	Dry	----------

3619B1. W. I. Neeley. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 15.60 feet, which is 0.50 foot below reference bench mark, a copper washer in pump support, 1.50 feet above ground. All measurements made from top of casing.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	4.40	11.20
May 18	5.90	9.70
July 20	8.40	7.20
Aug. 13	9.00	6.60
Sept. 15	9.60	6.00
Oct. 13	9.80	5.80
Nov. 9	9.65	5.95
Dec. 7	9.30	6.30
1927		
Jan. 12	8.75	6.85
Feb. 8	7.80	7.80
Mar. 12	5.80	9.80
Apr. 14	5.20	10.40
May 28	6.75	8.85
June 23	7.60	8.00
Aug. 18	9.55	6.05
Sept. 26	9.95	5.65
Oct. 24	9.95	5.65
1928		
Apr. 18	6.80	8.80
May 21	7.55	8.05
Sept. 21	10.60	5.00
1929		
Apr. 12	8.30	7.30

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[c] Pumping.

[i] Pump running in adjacent well.

[c] Pumping.

[g] Pump stopped a short time before measurement.

[h] New measuring point.

[i] Pump running in adjacent well.

[n] Water-stage recorder installed.

[o] Water-stage recorder removed.

Measurements of depth to water in observation wells—Continued

3620B2. Y. Tanabe. 8-inch well, used for domestic supply. Bench mark is top of casing and copper washer on 12 by 12 inch beam, 0.6 foot above ground; altitude, 20.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	4.60	16.00
May 18	6.15	14.45
July 20	9.20	11.40
Aug. 13	9.90	10.70
Sept. 15	10.50	10.10
Oct. 13	10.50	10.10
Nov. 9	10.30	10.30
Dec. 7	9.90	10.70
1927		
Jan. 12	9.55	11.05
Feb. 8	9.00	11.60
Mar. 12	6.70	13.90
Apr. 14	6.15	14.45
May 28	7.90	12.70
June 23	10.40	10.20
July 29	10.10	10.50
Aug. 18	12.50	8.10
Sept. 26	11.10	9.50
Oct. 24	11.00	9.60
Nov. 28	10.25	10.35
Dec. 15	10.10	10.50
1928		
Jan. 18	9.45	11.15
Feb. 16	9.20	11.40
Mar. 19	8.75	11.85
Apr. 18	8.10	12.50
May 21	[i] 12.85	7.75
June 18	9.75	10.85
July 16	11.35	9.25
Aug. 20	12.40	8.20
Sept. 21	12.65	7.95
Oct. 19	12.05	8.55
Nov. 18	11.40	9.20
Dec. 13	11.15	9.45
1929		
Jan. 21	10.80	9.80
Feb. 18	10.20	10.40
Mar. 19	9.80	10.80
Apr. 12	9.65	10.95
May 27	11.35	9.25
June 20	11.25	9.35

3620E1. S. Andrews. 4-inch well, used for domestic supply. Bench mark is copper washer in pump support, 0.4 foot above ground; altitude, 17.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	4.10	12.90
May 18	6.50	10.50
June 11	6.55	10.45
July 20	5.90	11.10
Aug. 13	[f] 9.20	7.80
Sept. 15	[f] 11.70	5.30
Oct. 13	9.30	7.70
Nov. 10	9.20	7.80
Dec. 7	8.85	8.15

3620E1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 12	8.45	8.55
Feb. 8	7.50	9.50
Mar. 12	4.65	12.35
Apr. 14	4.80	12.20
May 28	6.35	10.65
June 23	7.90	9.10
Aug. 18	[f] 10.80	6.20
Sept. 26	9.60	7.40
Oct. 24	9.65	7.35
1928		
Apr. 18	6.65	10.35
May 21	7.50	9.50
Sept. 21	11.00	6.00
1929		
Apr. 12	8.15	8.85

3620P1. George Beckman. 8-inch well, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 19.55 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 7.00	12.55
Apr. 26	[e] 5.80	13.75
Sept. 20	[f] 10.75	8.80
1927		
Apr. 21	6.20	13.35
Sept. 16	11.30	8.25
1928		
Apr. 19	[f] 7.60	11.95

3621B1. B. Castelanelli. (See p. 216.) Bench mark until Mar. 12, 1927, copper washer in pump support, 0.3 foot above ground, altitude 24.80 feet; after that date, top of casing, 0.2 foot below ground, altitude 24.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	6.80	18.00
May 18	[i] 8.60	16.20
June 11	9.75	15.05
July 20	[i] 13.65	11.15
Aug. 13	[i] 18.80	6.00
Sept. 15	12.00	12.80
Oct. 13	11.80	13.00
Nov. 9	11.35	13.45
Dec. 7	11.00	13.80

3621B1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 12	10.65	14.15
Feb. 8	10.10	14.70
Mar. 12	[h] 7.50	16.85
Apr. 14	7.00	17.35
May 28	8.80	15.55
June 23	9.70	14.65
Aug. 18	11.75	12.60
Oct. 24	11.10	13.25
1928		
Apr. 18	8.95	15.40
May 21	9.95	14.40
June 16	11.65	12.70
Sept. 21	13.85	10.50
1929		
Mar. 8	10.50	13.85
Apr. 12	10.30	14.05

3622Q1. William Heil. 4-inch well, used for domestic supply. Bench mark is top of casing, at ground surface; altitude, 30.85 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 8.80	22.05
Apr. 26	[e] 8.40	22.45
Sept. 20	8.95	21.90
1927		
Apr. 21	[i] 8.95	21.90
Sept. 13	8.40	22.45
1928		
Apr. 19	10.65	20.20
Sept. 20	11.45	19.40
1929		
Apr. 11	11.75	19.10

3623B1. H. C. Beckman. Used for domestic supply. Bench mark is copper washer in wood 6 by 6 inch post under tank, 1.8 feet above ground and top of casing, altitude 37.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 10	13.25	24.35
May 18	[b] 11.65	25.95
June 11	[b] 9.50	28.10
July 20	[b] 9.90	27.70
Aug. 13	[b] 10.45	27.15
Sept. 15	[b] 11.20	26.40
Oct. 12	[b] 11.40	26.20
Nov. 9	12.35	25.25
Dec. 7	13.10	24.50

[f] Windmill running.

[i] Pump running in adjacent well.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[f] Windmill running.

[i] Pump running in adjacent well.

[b] Water in ditch near by.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[h] New measuring point.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3623B1—Con.		
1927		
Jan. 13	13.70	23.90
Feb. 9	13.85	23.75
Mar. 12	13.20	24.40
Apr. 14	13.15	24.45
May 28	[b] 10.50	27.10
June 23	[b] 10.85	26.75
Sept. 26	[b] 12.15	25.45
Oct. 24	([b])	--------
Nov. 28	[b] 13.20	24.40
Dec. 15	[b] 13.45	24.15
1928		
Jan. 18	14.00	23.60
Feb. 16	14.15	23.45
Mar. 19	14.50	23.10
Apr. 18	14.80	22.80
May 21	[b] 13.45	24.15
June 15	[b] 13.10	24.50
July 16	[b] 13.00	24.60
Aug. 20	[b] 14.40	23.20
Sept. 21	[b] 14.30	23.30
Oct. 19	[b] 14.20	23.40
Oct. 26	[b] 14.35	23.25
Nov. 18	14.95	22.65
Dec. 13	15.25	22.35
1929		
Jan. 21	15.55	22.05
Feb. 18	15.55	22.05
Mar. 19	[b] 15.00	22.60
Apr. 12	[b] 14.45	23.15
May 27	[b] 13.20	24.40
June 20	[b] 13.50	24.10

3623P1. 6-inch well, used for stock. Bench mark is top of casing and copper washer in 2 by 4 inch pump support, 0.20 foot above ground; altitude, 35.10 feet.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	11.70	23.40
May 18	9.80	25.30
June 12	[b] 6.00	29.10
July 20	[b] 8.60	26.50
Aug. 13	[b] 9.60	25.50
Sept. 16	[b] 10.05	25.05
Oct. 13	[b] 10.70	24.40
Nov. 10	[b] 11.25	23.85
Dec. 8	12.15	22.95
1927		
Jan. 13	12.75	22.35
Feb. 9	13.00	22.10
Mar. 12	12.15	22.95
Apr. 14	11.90	23.20
May 28	[b] 9.10	26.00
June 23	[i] 8.40	26.70
Aug. 19	9.15	25.95
Sept. 26	10.20	24.90
Oct. 24	[b] 11.00	24.10
1928		
Apr. 21	13.80	21.30
Sept. 21	[b] 11.45	23.65
1929		
Apr. 12	[b] 12.00	23.10

3624P1. J. Jacobson. 6-inch well, 75 feet deep, used for domestic supply. Bench mark until June 23, 1927, copper washer in 4 by 4 inch old pump support, 1.00 foot above ground, altitude 40.50 feet; after that date, top of casing, 6.00 feet below ground, altitude 33.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	16.80	23.70
May 18	17.00	23.50
June 12	17.30	23.20
July 20	17.40	23.10
Aug. 13	18.40	22.10
Sept. 16	18.00	22.50
Oct. 13	17.75	22.75
Nov. 10	17.45	23.05
Dec. 8	17.30	23.20
1927		
Jan. 13	17.20	23.30
Feb. 9	17.10	23.40
Mar. 12	16.65	23.85
Apr. 14	16.25	24.25
June 23	[h] [i] 17.80	16.05
Aug. 19	12.95	20.90
Sept. 26	11.85	22.00
Oct. 24	11.45	22.40
1928		
Apr. 21	11.70	22.15
Sept. 21	13.35	20.50
1929		
Apr. 12	[i] 14.00	19.85

3626N1. W. J. Robinson. 4-inch well, used for domestic supply. Bench mark is top of casing and cross on concrete base, at ground surface; altitude, 30.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 3	9.60	20.95
Sept. 16	10.65	19.90
Oct. 13	10.80	19.75
Nov. 10	11.00	19.55
Dec. 8	11.15	19.40
1927		
Jan. 13	11.30	19.25
Feb. 9	11.05	19.50
Mar. 12	9.95	20.60
Apr. 14	9.75	20.80
May 28	10.25	20.30
June 23	10.60	19.95
Aug. 19	10.70	19.85
Sept. 26	10.40	20.15
Oct. 24	10.75	19.80
1928		
Apr. 23	11.75	18.80
Sept. 13	11.55	19.00
1929		
Apr. 12	12.50	18.05

3627C1. George Barbero. 8-inch well, used for domestic supply. Bench mark is top of pump flange, 0.4 foot above ground; altitude, 30.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	6.80	23.20
May 18	6.00	24.00
June 12	7.35	22.65
July 20	7.65	22.35
Aug. 13	[c] 15.90	14.10
Sept. 16	9.65	20.35
Oct. 13	9.70	20.30
Nov. 10	10.25	19.75
Dec. 8	10.60	19.40
1927		
Jan. 13	10.90	19.10
Feb. 9	10.70	19.30
Mar. 12	9.20	20.80
Apr. 14	9.05	20.95
May 28	8.35	21.65
June 23	8.30	21.70
Aug. 19	8.10	21.90
Sept. 26	9.65	20.35
Oct. 24	[f] 10.50	19.50
1928		
Apr. 21	[f] 10.95	19.05
Sept. 21	12.00	18.00

3627K1. R. E. Rode. 6-inch well, 75 feet deep, used for domestic supply. Bench mark is top of casing, 0.8 foot above ground; altitude, 26.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 19	7.40	19.55
June 12	[i] 8.45	18.50
July 20	[i] 10.80	16.15
Aug. 13	[i] 10.40	16.55
Do	[c] 15.25	11.70
Sept. 16	10.45	16.50
Oct. 13	10.60	16.35
Nov. 10	10.80	16.15
Dec. 8	10.80	16.15
1927		
Jan. 13	10.75	16.20
Feb. 9	10.40	16.55
Mar. 12	8.50	18.45
Apr. 14	8.20	18.75
May 28	8.65	18.30
June 23	9.50	17.45

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[b] Water in ditch near by.
[i] Pump running in adjacent well.

[b] Water in ditch near by.
[h] New measuring point.
[i] Pump running in adjacent well.

[c] Pumping.
[f] Windmill running.
[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3627K1—Con.		
1927		
Aug. 19	(c)	---------
Sept. 26	10.60	16.35
Oct. 24	10.80	16.15
1928		
Apr. 21	10.25	16.70
Sept. 21	11.50	15.45
1929		
Apr. 12	11.35	15.60

3628C1. J. M. Carson. (See p. 217.) Bench mark is top of casing, altitude 22.05 feet, which is 1.70 feet below reference bench mark, a copper washer in doorsill, south side of pump house, at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	3.80	18.25
May 18	4.70	17.35
July 20	7.75	14.30
Aug. 13	[i] 9.30	12.75
Sept. 16	8.80	13.25
Oct. 13	8.65	13.40
Nov. 10	8.30	13.75
Dec. 7	8.10	13.95
1927		
Jan. 12	7.85	14.20
Feb. 8	7.40	14.65
Mar. 12	4.80	17.25
Apr. 14	4.55	17.50
May 28	5.85	16.20
June 23	(c)	---------
Aug. 19	10.70	11.35
Sept. 26	9.75	12.30
Oct. 24	8.70	13.35
1928		
Apr. 21	7.40	14.65
Sept. 21	(c)	---------
1929		
Apr. 12	8.20	13.85

3629A1. 4-inch well, used for stock. Bench mark is copper washer on 2 by 6 inch well support, 2.4 feet above ground; altitude, 16.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	4.50	12.40
May 18	6.10	10.80
June 11	7.10	9.80
July 20	8.20	8.70
Aug. 13	8.80	8.10
Sept. 16	9.50	7.40
Oct. 13	9.75	7.15
Nov. 10	9.75	7.15
Dec. 7	9.40	7.50
3629A1—Con.		
1927		
Jan. 12	9.00	7.90
Feb. 8	7.70	9.20
Mar. 12	4.25	12.65
Apr. 14	5.05	11.85
May 28	7.00	9.90
June 23	7.80	9.10
Aug. 19	9.50	7.40
Sept. 26	10.05	6.85
Oct. 24	10.25	6.65
1928		
Jan. 28	7.80	9.10
Apr. 21	6.95	9.95
Sept. 20	10.80	6.10
1929		
Apr. 11	8.45	8.45

3629R1. G. C. Lowry. 4-inch well, used for domestic supply. Bench mark is top of casing, 1.60 feet above ground; altitude, 19.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 19	4.45	14.90
June 11	[b] 5.30	14.05
July 20	8.40	10.95
Aug. 13	9.15	10.20
Sept. 16	9.95	9.40
Oct. 12	9.90	9.45
Nov. 10	9.85	9.50
Dec. 8	9.20	10.15
1927		
Jan. 13	8.65	10.70
Feb. 9	6.60	12.75
Mar. 14	4.25	15.10
Apr. 14	5.05	14.30
May 28	6.90	12.45
June 23	8.05	11.30
Aug. 19	9.80	9.55
Sept. 26	10.40	8.95
Oct. 24	10.20	9.15
1928		
Apr. 21	7.45	11.90
Sept. 21	11.25	8.10
1929		
Apr. 12	9.40	9.95

3630M1. J. W. Emde. 4-inch well 36 feet deep, used for domestic supply. Bench mark is top of casing, level with copper washer in pump support 1.20 feet above ground; altitude, 14.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	3.10	11.20
May 19	5.30	9.00
3630M1—Con.		
1926		
June 11	5.90	8.40
July 20	7.25	7.05
Aug. 13	5.80	8.50
Sept. 16	8.40	5.90
Oct. 13	8.65	5.65
Nov. 10	8.75	5.55
Dec. 7	8.20	6.10
1927		
Jan. 12	7.75	6.55
Feb. 8	5.10	9.20
Mar. 12	3.00	11.30
Apr. 14	4.05	10.25
May 28	6.25	8.05
June 23	6.95	7.35
Aug. 19	8.35	5.95
Sept. 26	8.85	5.45
Oct. 24	9.10	5.20
1928		
Apr. 21	5.60	8.70
May 21	6.65	7.65
Sept. 21	9.30	5.00
1929		
Apr. 12	7.20	7.10

3631P1. Gerlach & Lang. (See p. 217.) Bench mark is top of casing, altitude 7.60 feet, which is 0.20 foot below reference bench mark, a copper washer in door sill, 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 19	5.45	2.15
June 11	6.55	1.05
July 20	7.80	—.20
Aug. 13	8.20	—.60
Sept. 16	8.50	—.90
Oct. 12	8.40	—.80
Nov. 10	8.10	—.50
Dec. 8	7.25	.35
1927		
Jan. 13	6.40	1.20
Feb. 9	4.00	3.60
Mar. 14	1.40	6.20
Apr. 14	2.95	4.65
May 28	6.35	1.25
June 23	7.30	.30
Sept. 26	8.65	—1.05
Oct. 24	8.55	—.95
1928		
Apr. 21	4.35	3.25
Sept. 21	8.35	—0.75
1929		
Apr. 12	4.90	2.70

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[c] Pumping.

[i] Pump running in adjacent well.

[b] Water in ditch near by.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3632N1. Otto Spenker. 4-inch well, used for domestic supply. Bench mark is top of casing, 2.00 feet above ground; altitude, 15.65 feet [d]		
1926		
Apr. 1	[e] 7.30	8.35
Apr. 26	[e] 6.70	8.95
Sept 20	[f] 11.45	4.20
1927		
Apr. 21	6.60	9.05
Sept. 16	[f] 11.20	4.45
1928		
Apr. 19	8.35	7.30
Sept. 20	[f] 11.80	3.85
1929		
Apr. 11	9.15	6.50
3633J1. 4-inch well, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude 21.00 feet		
1926		
May 19	9.70	11.30
June 11	[f] 10.50	10.50
July 20	[f] 11.45	9.55
Aug. 13	11.90	9.10
Sept. 16	12.70	8.30
Oct. 13	12.50	8.50
Nov. 10	12.55	8.45
Dec. 8	12.35	8.65
1927		
Jan. 13	11.95	9.05
Feb. 9	11.15	9.85
Mar. 14	[f] 8.50	12.50
Apr. 14	8.30	12.70
May 28	10.60	10.40
June 23	[f] 11.05	9.95
Aug. 19	12.20	8.80
Sept. 26	12.70	8.30
Oct. 24	[f] 13.00	8.00
1928		
Apr. 21	10.50	10.50
Sept. 21	13.25	7.75
1929		
Apr. 12	11.95	9.05
3634E1. L. E. Pyle. 4-inch well, 60 feet deep, used for domestic supply. Bench mark is top of casing, 0.7 foot above ground; altitude, 24.55 feet		
1926		
May 19	7.00	17.55
June 12	8.00	16.55
July 20	9.10	15.45
Aug. 16	9.90	14.65
Sept. 16	10.40	14.15
Oct. 13	10.55	14.00
Nov. 10	10.65	13.90
Dec. 8	10.45	14.10
1927		
Jan. 13	10.30	14.25
Feb. 9	9.70	14.85
Mar. 12	7.90	16.65
Apr. 14	7.85	16.70
May 28	8.60	15.95
June 23	9.25	15.30
Aug. 19	10.00	14.55
Sept. 26	10.40	14.15
Oct 24	10.55	14.00
1928		
Apr. 21	9.55	15.00
Sept. 21	11.10	13.45
1929		
Apr. 12	10.65	13.90
3635R1. Nettie Pruden. 8-inch well, 76 eet deep, used for stock. Bench mark is top of casing, 0.8 foot above ground; altitude, 33.30 feet		
1926		
May 19	12.80	20.50
June 12	12.30	21.00
July 21	12.85	20.45
Aug. 16	13.70	19.60
Sept. 16	14.05	19.25
Oct. 12	14.15	19.15
Nov. 10	14.50	18.80
Dec. 8	14.85	18.45
1927		
Jan. 13	15.05	18.25
Feb. 9	14.80	18.50
Mar. 12	13.70	19.60
Apr. 16	13.40	19.90
May 28	13.35	19.95
June 23	13.20	20.10
July 29	13.55	19.75
Aug. 19	13.75	19.55
Sept. 26	13.75	19.55
Oct. 24	[f] 13.90	19.40
Nov. 28	[f] 12.20	21.10
Dec. 15	14.70	18.60
1928		
Jan. 18	15.15	18.15
Feb. 16	15.10	18.20
Mar. 19	15.25	18.05
Apr. 23	14.85	18.45
May 22	[b] 14.50	18.80
June 26	[b, f] 14.40	18.90
July 16	[b] 14.30	19.00
Aug. 20	[b, i] 18.45	14.85
Sept. 21	[b] 14.50	18.80
Oct. 19	[b] 14.45	18.85
Nov. 18	14.90	18.40
Dec. 13	15.30	18.00
1929		
Jan. 21	15.60	17.70
Feb. 18	15.55	17.75
Mar. 19	15.45	17.85
Apr. 12	[b, f] 15.60	17.70
May 27	[b, f] 15.25	18.05
June 20	[b] 15.15	18.15
3636A1. —— Noce. 8-inch well, used for domestic supply. Bench mark is copper washer on 2 by 6 inch plank under tank, 0.4 foot above ground; altitude, 35.80 feet		
1926		
May 19	13.10	22.70
June 12	[b] 12.30	23.50
July 21	[b] 12.60	23.20
Aug. 16	[b] 14.30	21.50
Sept. 16	[b] 14.20	21.60
Oct. 14	[b] 14.70	21.10
Nov. 10	[b] 15.05	20.75
Dec. 8	15.50	20.30
1927		
Jan. 13	15.60	20.20
Feb. 9	15.40	20.40
Mar. 12	14.40	21.40
Apr. 14	14.15	21.65
May 28	14.05	21.75
June 23	13.95	21.85
Aug. 19	14.60	21.20
Sept. 26	[b] 14.55	21.25
Oct. 24	[b] 14.55	21.25
1928		
Apr. 23	[b] 16.00	19.80
Sept. 21	[b] 14.90	20.90
1929		
Apr. 12	[b] 15.80	20.00
3636R1. L. W. Bunch. 6-inch well, used for domestic supply. Bench mark is copper washer on 4 by 6 pump support; altitude, 38.65 feet		
1926		
Apr. 19	16.45	22.20
May 18	16.80	21.85
June 12	16.60	22.05

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[f] Windmill running.

[b] Water in ditch near by.

[f] Windmill runn.ng.

[i] Pump running in adjacent well.

[b] Water in ditch near by.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

3636R2. L. W. Bunch. 8-inch well, used for domestic supply. Bench mark is top of pump collar, 4.90 feet below ground; altitude 33.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 21	13.55	19.55
Aug. 16	14.50	18.60
Sept. 16	14.00	19.10
Oct. 12	13.60	19.50
Nov. 10	13.60	19.50
Dec. 8	13.60	19.50
1927		
Jan. 13	13.35	19.75
Feb. 9	12.70	20.40
Mar. 12	11.50	21.60
Apr. 16	11.10	22.00
May 28	12.65	20.45
June 23	13.30	19.80
July 29	14.10	19.00
Aug. 19	14.45	18.65
Sept. 26	13.45	19.65
Oct. 24	13.15	19.95
Nov. 28	13.40	19.70
Dec. 15	13.50	19.60
1928		
Jan. 18	13.45	19.65
Feb. 16	13.20	19.90
Mar. 19	13.50	19.60
Apr. 23	12.80	20.30
May 22	13.25	19.85
June 18	14.00	19.10
July 16	14.30	18.80
Aug. 20	15.10	18.00
Sept. 21	14.55	18.55
Oct. 19	13.90	19.20
Nov. 18	14.15	18.95
Dec. 13	14.30	18.80
1929		
Jan. 21	14.10	19.00
Feb. 18	13.85	19.25
Mar. 19	13.65	19.45
Apr. 12	14.00	19.10
May 27	14.60	18.50
June 20	14.60	18.50

371C1. Gus Moss. 8-inch well, not in use. Bench mark is top of casing, 1.4 feet above ground; altitude, 93.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	42.50	50.90
May 18	48.50	44.90
June 17	43.35	50.05
July 23	43.80	49.60
Aug. 17	44.00	49.40
Sept. 18	44.05	49.35
Oct. 14	43.65	49.75
Nov. 15	43.65	49.75
Dec. 9	43.30	50.10
1927		
Jan. 17	43.15	50.25
Feb. 16	43.10	50.30
Mar. 15	42.75	50.65
Apr. 15	42.55	50.85
May 23	42.65	50.75
June 25	43.20	50.20
July 19	46.80	46.60
Aug. 22	43.75	49.65
Sept. 27	43.95	49.45
Oct. 28	43.65	49.75
1928		
Apr. 24	43.05	50.35
May 23	43.50	49.90
Sept. 24	44.20	49.20
1929		
Apr. 16	44.85	48.55

371N1. Mabel Johnson. 12-inch well, 200 feet deep, used for domestic supply. Bench mark is copper washer on pump support, east side, 0.5 foot above ground; altitude, 85.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 16	38.60	47.05
May 17	38.70	46.95
June 17	40.45	45.20
July 23	40.90	44.75
Aug. 17	40.55	45.10
Sept. 18	39.95	45.70
Oct. 14	39.45	46.20
Nov. 15	39.10	46.55
Dec. 9	38.70	46.95
1927		
Jan. 17	38.45	47.20
Feb. 16	38.40	47.25
Mar. 15	38.40	47.25
Apr. 15	38.10	47.55
May 23	39.10	46.55
July 19	41.10	44.55
Aug. 22	40.90	44.75
Sept. 27	40.25	45.40
1928		
Apr. 24	39.15	46.50
Sept. 24	41.00	44.65
1929		
Apr. 17	42.75	42.90

371R1. William Huires. (See p. 218.) Bench mark is top of pump collar, altitude 64.25 feet, which is 20.50 feet below northeast concrete curb at ground surface. All measurements made from pump collar.

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 12	[p] 15.15	49.10
1926		
Apr. 28	14.70	49.55

372K1. John Weigum. (See p. 218.) Bench mark is ground surface; altitude, 81.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	35.80	46.00
Oct. 18	35.80	46.00

372L1. 6-inch well, not in use. Bench mark is copper washer on plank, 0.2 foot above ground; altitude, 83.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	37.15	45.65
May 18	[i] 37.15	46.65
June 17	38.10	45.70
July 22	40.00	43.80
Aug. 17	38.90	44.90
Sept. 18	(q)	----------
Oct. 14	(r)	----------
Nov. 15	(s)	----------
Dec. 9	37.40	46.40

373D1. Jacob Ehrhardt. 6-inch well, used for domestic supply. Bench mark is top of concrete pump base, 0.10 foot above ground; altitude, 81.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 5	35.70	46.20
1927		
Sept. 26	34.75	47.15
Oct. 28	34.30	47.60
Nov. 29	33.50	48.40
1928		
Jan. 28	35.05	46.85
Feb. 18	35.55	46.35
Mar. 17	35.90	46.00
Mar. 27	31.00	50.90
Apr. 4	31.00	50.90
Apr. 24	[g] 31.45	50.45
May 23	30.25	51.65
June 18	33.75	48.15
July 21	34.55	47.35
Aug. 25	35.00	46.90
Sept. 24	35.45	46.45
Oct. 22	35.65	46.25
Dec. 17	35.40	46.50
1929		
Jan. 22	35.70	46.20
Feb. 19	36.05	45.85
Mar. 20	36.45	45.45
Apr. 17	38.10	43.80
May 29	35.20	46.70
June 21	35.00	46.90

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[p] By Cyril Williams.

[g] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

[q] Dry at 38.10 feet.

[r] Dry at 37.80 feet.

[s] Dry at 37.70 feet.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
373G1. George Preszler. 12-inch well, 200 feet deep, not in use. Bench mark until Dec. 22, 1927, crayon mark on trap door into well pit, altitude 78.80 feet; after that date, top of 2 by 4 inch scantling over well pit, at ground surface, altitude 78.64 feet		
1925		
Dec. 7	[p] 34.58	44.22
1927		
Jan. 20 [n]	34.73	44.07
Jan. 28	34.88	43.92
Feb. 4	34.93	43.87
Feb. 11	35.59	43.21
Feb. 18	35.26	43.54
Feb. 25	35.14	43.66
Mar. 4	35.10	43.70
Mar. 11	35.38	43.42
Mar. 18	[i] 36.25	42.55
Mar. 25	36.83	41.97
Apr. 2	[i] 35.75	43.05
Apr. 9	34.28	44.52
Apr. 15	[i] 35.13	43.67
Apr. 22	35.33	43.47
Apr. 29	[i] 36.03	42.77
May 6	[i] 36.64	42.16
May 13	[i] 36.25	42.55
May 20	[i] 37.37	41.43
May 27	[i] 37.17	41.63
June 4	37.16	41.64
June 10	36.12	42.68
June 17	[i] 37.05	41.75
June 24	[i] 37.20	41.60
July 1	[i] 36.39	42.41
July 8	36.26	42.54
July 16	35.70	43.10
July 22	35.30	43.50
July 29	[i] 35.85	42.95
Aug. 5	36.32	42.48
Aug. 12	36.34	42.46
Aug. 19	36.38	42.42
Aug. 26	36.66	42.14
Sept. 2	35.49	43.31
Sept. 10	35.50	43.30
Sept. 16	35.48	43.32
Sept. 23	35.45	43.35
Sept. 30	35.30	43.50
Oct. 7	35.33	43.47
Oct. 11	35.22	43.58
Oct. 14	35.35	43.45
Oct. 21	35.17	43.63
Oct 28	35.16	43.64
Nov. 4	34.97	43.83
Nov 11	34.85	43.95
Nov. 18	34.73	44.07
Nov 25	34.71	44.09
Dec. 3	34.72	44.08
Dec. 9	34.68	44.12
Dec. 22	[h] 34.62	44.02
Dec. 27	34.61	44.03
1928		
Jan. 3	34.69	43.95
Jan. 11	34.95	43.69
Jan 13	34.78	43.86
373G1—Con.		
1928		
Jan. 19	35.21	43.43
Jan. 24	35.91	42.73
Jan. 27	[i] 37.06	41.58
Feb. 3	[i] 37.93	40.71
Feb. 6	[i] 37.91	40.73
Feb. 17	[i] 41.72	36.92
Feb. 24	[i] 41.07	37.57
Mar 2	[i] 40.75	37.89
Mar 9	39.95	38.69
Mar. 16	39.02	39.62
Mar. 23	38.02	40.62
Mar. 30	37.94	40.70
Apr. 6	37.74	40.90
Apr. 13	35.52	43.12
Apr. 20	36.38	42.26
Apr. 27	37.04	41.60
May 4	36.80	41.84
May 11	36.11	42.53
May 18	35.60	43.04
May 25	36.71	41.93
June 1	36.88	41.76
June 8	37.11	41.53
June 16	37.88	40.76
June 22	37.29	41.35
June 29	38.55	40.09
July 6	37.32	41.32
July 13	36.79	41.85
July 20	37.63	41.01
July 27	36.85	41.79
Aug. 3	37.10	41.54
Aug. 10	37.57	41.07
Aug. 17	36.79	41.85
Aug. 24	36.96	41.68
Aug. 31	36.75	41.89
Sept. 7	36.58	42.06
Sept. 14	36.55	42.09
Sept. 21	36.41	42.23
Sept. 28	36.39	42.25
Oct. 5	36.27	42.37
Oct. 12	36.20	42.44
Oct. 19	36.14	42.50
Oct. 26	36.09	42.55
Nov. 2	36.06	42.58
Nov. 10	36.10	42.54
Nov. 17	35.90	42.74
Nov. 23	35.87	42.77
Nov. 30	35.85	42.79
Dec. 7	35.88	42.76
Dec. 14	35.83	42.81
Dec. 21	35.84	42.80
1929		
Jan. 2	35.68	42.96
Jan. 10 [o]	35.80	42.84
373G2. George Preszler. 6-inch well, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 78.90 feet		
1926		
June 28	[f] 36.90	42.00
373G2—Con.		
1929		
Apr. 17	40.75	38.15
June 21	[f] 39.15	39.75
373G3. U. S. Geological Survey, 10-inch well, 35 feet deep, used for experiments. Bench mark is top of 2 by 4 inch scantling over well pit, at ground surface, altitude 78.64 feet		
1927		
Dec. 19 [n]	35.44	43.20
Dec. 27	34.78	43.86
1928		
Jan. 3	34.63	44.01
Jan. 11	34.65	43.99
Jan. 19	34.77	43.87
Jan. 20	34.79	43.85
Jan. 27	[i] 35.28	43.36
Feb. 3	[i] 37.23	41.41
Feb. 4	[i] Dry.	--------
Feb. 10	[i] 38.28	40.36
Feb. 17	[i] 30.16	48.48
Feb. 24	[i] 31.98	46.66
Mar. 2	[i] 32.29	46.35
Mar. 9	32.50	46.14
Mar. 16	33.80	44.84
Mar. 23	35.46	43.18
Mar. 30	32.80	45.84
Apr. 6	32.22	46.42
Apr. 13	32.41	46.23
Apr. 20	32.47	46.17
Apr. 27	--------	--------
May 4	31.92	46.72
May 11	32.23	46.41
May 18	32.36	46.28
May 25	32.49	46.15
June 1	33.09	45.55
June 8	34.90	43.74
June 16 [o]	Dry.	--------
373K1. Mrs. H. F. Ellis. (See p. 218.) Bench mark is ground surface; altitude, 77.80 feet [t]		
1925		
Oct. 9	[t] 35.90	41.90
373L1. L. Withers. (See p. 218.) Bench mark is ground surface; altitude, 77.10 feet [t]		
1925		
Oct. 9	[t] 35.00	42.10

[h] New measuring point.
[i] Pump running in adjacent well.
[n] Water-stage recorder installed.
[p] By Cyril Williams.

[f] Windmill running.
[i] Pump running in adjacent well.
[o] Water-stage recorder removed.

[f] Windmill running.
[i] Pump running in adjacent well.
[n] Water-stage recorder installed.
[o] Water-stage recorder removed.
[t] By C. H. Widdows.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
373M1. Paul Sobkowsky. 10-inch well. (See p. 218.) Bench mark is top of casing, altitude 54.25 feet, which is 27.30 feet below reference bench mark, a copper washer on east side of curb, 0.5 foot above ground. All measurements made from top of casing		
1926		
Apr. 19	11.65	42.6
May 15	[i] 13.20	41.05
June 17	12.40	41.85
July 22	15.30	38.95
Aug. 17	13.25	41.00
Sept. 18	12.05	42.20
Oct. 14	11.30	42.95
Nov. 15	10.95	43.30
Dec. 9	10.20	44.05
1927		
Jan. 17	9.85	44.40
Feb. 16	10.25	44.00
Mar. 15	10.90	43.35
Apr. 18	9.80	44.45
May 12	11.70	42.55
May 23	15.75	38.50
June 25	13.55	40.70
July 19	11.95	42.30
Aug. 22	11.65	42.60
Sept. 26	11.15	43.10
Oct. 28	10.75	43.50
Nov. 28	10.10	44.15
1928		
Apr. 24	12.95	41.30
May 23	12.80	41.45
Sept. 24	12.30	41.95
1929		
Feb. 18	14.95	39.30
Apr. 17	17.30	36.95
374A1. M. C. Dow. (See p. 218.) Bench mark is top of casing in shallow pit, 0.50 foot above ground; altitude, 51.65 feet		
1926		
June 30	11.80	39.85
July 22	[i] 14.40	37.25
Aug. 17	[i] 14.75	36.90
Sept. 18	12.00	39.65
Oct. 14	12.05	39.60
Nov. 4	12.70	38.95
Nov. 15	11.55	40.10
Dec. 9	8.05	43.60
1927		
Jan. 17	8.35	43.30
Feb. 16	5.90	45.75
Mar. 2	3.70	47.95
Mar. 15	5.05	46.60
Apr. 5	+.80	52.45
Apr. 29	+.60	52.25
May 23	3.00	48.65
June 24	2.00	49.65
July 19	8.80	42.85
374A1—Con.		
1927		
Aug. 10	13.60	38.05
Aug. 22	10.95	40.70
Sept. 26	11.55	40.10
Oct. 28	9.60	42.05
Nov. 28	9.55	42.10
Dec. 17	9.60	42.05
1928		
Jan. 21	10.10	41.55
Feb. 18	9.70	41.95
Mar. 17	8.55	43.10
Apr. 24	6.10	45.55
May 23	3.00	48.65
June 18	[i] 12.00	39.65
July 21	14.20	37.45
Aug. 25	11.25	40.40
Sept. 24	11.45	40.20
Oct. 22	11.90	39.75
Nov. 23	11.80	39.85
Dec. 17	12.15	39.50
1929		
Jan. 22	11.05	40.60
Feb. 19	11.50	40.15
Mar. 20	11.10	40.55
Apr. 17	9.55	42.10
May 29	[i] 9.10	42.55
June 21	5.45	46.20
374F1. Peter Joens. 4½-inch well, 110 feet deep, used for domestic supply. Bench mark is cross on concrete curb, 0.6 foot above ground; altitude, 70.95 feet		
1926		
June 30	31.50	39.45
July 22	31.65	39.30
Aug. 17	31.80	39.15
Sept. 15	32.05	38.90
Oct. 15	31.75	39.20
Nov. 22	31.60	39.35
Dec. 13	30.75	40.20
1927		
Jan. 17	30.70	40.25
Feb. 16	31.25	39.70
Mar. 15	[i] 37.50	33.45
Apr. 18	33.10	37.85
May 23	31.55	39.40
June 24	31.15	39.80
July 19	30.10	40.85
Aug. 22	33.00	37.95
Sept. 26	31.25	39.70
Oct. 28	31.15	39.80
Nov. 28	30.85	40.10
Dec. 17	30.85	40.10
1928		
Jan. 21	31.30	39.65
Feb. 18	36.40	34.55
Mar. 17	35.35	35.60
Mar. 27	34.80	36.15
Apr. 4	33.40	37.55
Aug. 25	33.00	37.95
1929		
Apr. 17	38.35	32.60
374H4. Peter Heil. (See p. 218.) Bench mark is bottom edge of pump base, east side, 1.00 foot above ground; altitude, 75.45 feet		
1926		
June 30	33.30	42.15
July 22	33.30	42.15
Aug. 17	33.40	42.05
Sept. 15	33.85	41.60
Oct. 14	33.55	41.90
Nov. 15	33.60	41.85
Dec. 9	33.20	42.25
1927		
Jan. 17	32.95	42.50
Feb. 16	33.70	41.75
Mar. 15	36.60	38.85
Apr. 18	33.20	42.25
May 23	34.20	41.25
June 24	32.60	42.85
July 19	31.90	43.55
Aug. 22	33.50	41.95
Sept. 26	32.90	42.55
Oct. 28	32.70	42.75
Nov. 28	32.60	42.85
Dec. 17	31.85	43.60
1928		
Jan. 21	32.50	42.95
Feb. 18	([c])	--------
Mar. 27	36.25	39.20
Apr. 4	37.55	37.90
Apr. 24	34.85	40.60
May 23	33.45	42.00
June 18	33.75	41.70
July 21	33.40	42.05
Aug. 25	33.45	42.00
Sept. 24	33.55	41.90
Oct. 22	34.75	40.70
Nov. 23	34.05	41.40
Dec. 17	34.10	41.35
1929		
Jan. 22	34.85	40.60
Feb. 19	([c])	--------
Mar. 20	([c])	--------
Apr. 17	40.85	34.60
May 29	37.00	38.45
June 21	35.70	39.75
374K2. W. W. Gillespie. (See p. 218.) Bench mark is top of casing, 17.90 feet below ground; altitude, 54.20 feet [b]		
1925		
Oct. 13	[b] 13.75	40.45
1926		
Oct. 6	13.70	40.50

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[i] Pump running in adjacent well.

[c] Pumping.

[b] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
374M1. S. E. Morden. (See p. 219.) Bench mark is top of casing, altitude 46.85 feet, which is 27.30 feet below reference bench mark, a copper washer in door sill 0.25 foot above ground. All measurements made from top of casing		
1925		
Oct. 9	[t] 9.75	37.10
1926		
April 14	7.45	39.40
May 15	5.15	41.70
June 17	4.60	42.25
375F1. A. A. Werner. (See p. 219.) Bench mark is copper washer on wooden curb of pit, 0.5 foot above ground; altitude, 66.07 feet		
1927		
Apr. 6	[c] 38.00	28.07
Apr. 8	[c] 38.65	27.42
1929		
Feb. 18	33.95	32.12
375G1. Byron Hulburd. 6-inch well, used for domestic supply. Bench mark is copper washer on 4 by 4 inch beam, 2.00 feet above ground; altitude, 69.05 feet		
1926		
Apr. 14	30.90	38.15
May 15	29.10	39.95
June 17	29.30	39.75
1927		
Apr. 6	[i] 33.55	35.50
Apr. 8	[i] 34.10	34.95
June 4	28.80	40.25
June 9	28.80	40.25
375G2. F. Lagomarsino. 6-inch well, 75 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 12 inch plank, 1.40 feet above ground; altitude, 66.75 feet		
1926		
July 1	28.70	38.05
July 22	29.60	37.15
Aug. 17	[f] 30.10	36.65
Sept. 15	30.15	36.60
Oct. 14	30.25	36.50
Nov. 15	30.45	36.30
Dec. 9	27.10	39.65
375G2—Con.		
1927		
Jan. 17	28.90	37.85
Feb. 16	28.90	37.85
Mar. 15	30.95	35.80
Apr. 6	[i] 32.00	34.75
Apr. 8	[i] 32.75	34.00
May 23	[f] 27.20	39.55
June 24	26.15	40.60
July 19	27.20	39.55
Aug. 22	28.70	38.05
Sept. 26	29.20	37.55
Oct. 28	29.60	37.15
1929		
Apr. 17	35.90	30.85
375G4. Byron Hulburd. (See p. 219.) Bench mark is point on well collar; altitude, 69.52 feet		
1927		
Apr. 6	27.05	42.47
Apr. 8	27.10	42.42
June 6	[c] 41.20	28.32
June 24	[i] 24.42	45.10
375H2. H. C. Lange. 4-inch well, not in use. Bench mark is top of casing, about 1 foot above ground; altitude, 70.97 feet		
1927		
Apr. 6	26.20	44.77
Apr. 7	26.10	44.87
Apr. 8	26.05	44.92
June 24	24.85	46.12
375H3. J. C. Lange. (See p. 219.) Bench mark is blue cross at top of concrete curb at east side of pit, at ground surface; altitude, 70.13 feet. Depth 80 feet		
1926		
Apr. 6	[u] 27.65	42.48
Do	27.25	42.88
May 2	26.20	43.93
May 10	26.50	43.63
May 24	26.20	43.93
June 4	26.45	43.68
June 24	([c])	---------
1928		
Jan. 30	31.10	39.03
375H4. J. C. Lange. Bench mark is blue cross at top of concrete curb at east side of pit, at ground surface; altitude, 70.13 feet. Drilled to 185 feet but filled up with sand to 100 feet		
1927		
Apr. 6	27.20	42.93
May 2	26.35	43.78
May 10	26.65	43.48
May 24	26.35	43.78
June 4	26.56	43.57
June 27	[c] 39.55	30.58
1928		
Jan. 30		
Jan. 30	31.10	39.03
375H5. J. C. Lange. 1¼-inch well, 38 feet deep, used for experiments. Bench mark is blue cross at top of concrete curb, at east side of pit, at ground surface; altitude 70.13 feet		
1927		
Apr. 6	26.95	43.18
Do	26.94	43.19
Apr. 7	26.70	43.43
Apr. 8	25.75	44.38
May 2	26.05	44.08
May 10	26.25	43.88
May 24	26.00	44.13
June 4	26.36	43.77
June 24	[c] 30.47	39.66
June 27	33.09	37.04
1928		
Jan. 30	31.05	39.08
375J1. J. J. Shafer. (See p. 219.) Bench mark is copper washer on top of concrete curb at ground surface, south side of pump house; altitude, 62.60 feet		
1926		
July 6	22.50	40.10
1927		
Apr. 6	30.95	31.65
Apr. 8	31.30	31.30
375J2. Tom Goodwin. (See p. 219.) Bench mark is copper washer in 2 by 4 inch scantling on concrete curb of pit, at ground surface; altitude, 61.95 feet		
1926		
July 6	27.35	34.60
1929		
Feb. 18	29.00	32.95
Apr. 26	37.60	24.35

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[c] Pumping.
[f] Windmill running.
[i] Pump running in adjacent well.
[t] By C. H. Widdows.

[c] Pumping.
[f] Windmill running.
[i] Pump running in adjacent well.
[u] Water flowing into well.

[c] Pumping.

Measurements of depth to water in observation wells—Continued

375L3. G. G. Gillespie. 10-inch well, 185 feet deep, not in use. Bench mark is top of casing, at ground surface; altitude, 66.27 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 1	29.90	36.37
Dec. 4	28.85	37.42
Dec. 11	28.95	37.32
1927		
Jan. 28[d]	29.17	37.10
Feb. 4	30.06	36.21
Feb. 11	29.45	36.82
Feb. 18	29.00	37.27
Feb. 25	28.89	37.38
Mar. 4	[b] 29.90	36.37
Mar. 11	31.49	34.78
Mar. 18	32.11	34.16
Mar. 25	32.92	33.35
Apr. 2	30.76	35.51
Apr. 4	[a] 45.00	21.27
Apr. 9	33.71	32.56
Apr. 16	30.57	35.70
Apr. 23	30.13	36.14
Apr. 29	29.92	36.35
May 6	30.48	35.79
May 13	30.06	36.21
May 20	29.40	36.87
May 27	28.86	37.41
June 4	28.86	37.41
June 10	28.39	37.88
June 17	29.08	37.19
June 24	29.06	37.21
July 1	29.29	36.98
July 8	28.96	37.31
July 16	28.90	37.37
July 22	28.80	37.47
July 29	29.01	37.26
Aug. 5	29.27	37.00
Aug. 12	29.74	36.53
Aug. 19	29.61	36.66
Aug. 26	30.05	36.22
Sept. 2	29.82	36.45
Sept. 10	29.63	36.64
Sept. 16	29.74	36.53
Sept. 23	29.92	36.35
Sept. 30	29.67	36.60
Oct. 7	29.76	36.51
Oct. 14	29.69	36.58
Oct. 21	29.84	36.43
Oct. 28	29.63	36.64
Nov. 4	29.48	36.79
Nov. 11	29.24	37.03
Nov. 18	29.16	37.11
Nov. 25	29.15	37.12
Dec. 3	29.15	37.12
Dec. 9	29.15	37.12
Dec. 17[e]	29.23	37.04
1928		
Jan. 21	29.35	36.92
Jan. 28	30.10	36.17
Feb. 18	32.70	33.57
Mar. 17	[c] 37.70	28.57
Mar. 27	[a] 36.80	29.47
Apr. 4	34.45	31.82
Apr. 13	32.10	34.17
Apr. 24	31.45	34.82

375L3—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
May 23	29.65	36.62
June 19	30.85	35.42
July 21	30.60	35.67
Aug. 25	30.80	35.47
Sept. 24	30.75	35.52
Oct. 22	30.75	35.52
Nov. 23	30.55	35.72
Dec. 17	30.60	35.67
1929		
Jan. 22	30.55	35.72
Feb. 19	33.75	32.52
Mar. 20	[c] 38.30	27.97
Apr. 17	[c] 37.00	29.27
May 29	32.90	33.37
June 21	32.20	34.07

375L5. H. D. Binger. 6-inch well, 65 feet deep, used for domestic supply. Bench mark is top of casing, 1.50 feet above ground; altitude, 68.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Mar. 29	35.15	33.75
Apr. 6	34.90	34.00
Apr. 8	35.35	33.55

375M2. E. Handel. (See p. 219.) Bench mark is top flange of pump connection, which is 26.10 feet below reference bench mark, a copper washer on 2 by 4 inch scantling at ground surface, altitude 68.95 feet. All measurements made from pump flange

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 1	6.35	62.60
1927		
Apr. 6	8.10	60.85
Apr. 8	8.60	60.35

375M3. M. Handin. 8-inch well, used for domestic supply. Bench mark is copper washer on 2 by 8 inch plank 1.00 foot above ground; altitude, 71.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 1	33.25	38.30
1927		
Apr. 6	35.15	36.40
Apr. 8	35.40	36.15

375N1. Dennis Moran. 60-foot well, used for domestic supply. Bench mark is copper washer on pump support 1.30 feet above ground; altitude, 69.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 17	28.80	33.10
July 22	28.25	33.65
Aug. 17	29.60	32.30
Sept. 18	28.30	33.60
Oct. 14	28.15	33.75
Nov. 15	28.10	33.80
Dec. 9	[f] 30.25	31.65
1927		
Jan. 17	27.50	34.40
Feb. 16	27.50	34.40
Mar. 15	30.50	31.40
Apr. 8	31.90	30.00
May 23	30.10	31.80
July 19	27.95	33.95
Aug. 22	27.65	34.25
1928		
Sept. 24	29.45	32.45

375P2. J. E. Bietz. 6-inch well, 40 feet deep, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 62.87 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 8	29.00	33.87
1927		
Apr. 6	30.60	32.27
Apr. 8	30.65	32.22

376G2. E. J. Steele. (See p. 219.) Bench mark is top of casing, altitude 39.70 feet, which is 18.6 feet below copper washer on doorsill. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[g] 24.10	15.60
1926		
Apr. 14	25.60	14.10

376G3. E. J. Steele. 6-inch well, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude, 58.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 14	25.50	32.90
July 17	24.75	33.65
Aug. 20	[c] 25.40	33.00

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[a] Pumping.

[b] Pump stopped a short time before measurement.

[c] Pump running in adjacent well.

[d] Water stage recorder installed.

[e] Water stage recorder removed.

[c] Pump running in adjacent well.

[f] Windmill running.

[c] Pump running in adjacent well.

[g] By C. H. Widdows.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
376G3—Con.		
1926		
Sept. 14	25.50	32.90
Oct. 12	25.35	33.05
Nov. 8	25.40	33.00
Dec. 7	24.90	33.50
1927		
Jan. 11	24.60	33.80
Feb. 7	24.45	33.95
Mar. 7	26.80	31.60
Apr. 8	25.65	32.75
May 20	25.95	32.45
June 16	26.10	32.30
July 18	25.60	32.80
Aug. 18	[i] 24.20	34.20
Sept. 26	24.65	33.75
Oct. 24	24.75	33.65
Nov. 26	24.65	33.75
Dec. 22	24.15	34.25
1928		
Jan. 25	24.70	33.70
Feb. 23	27.75	30.65
Mar. 26	28.65	29.75
Mar. 27	27.95	30.45
Apr. 4	27.40	31.00
Apr. 19	26.55	31.85
May 24	27.25	31.15
June 21	24.85	33.55
July 24	26.55	31.85
Aug. 20	25.60	32.80
Sept. 19	25.85	32.55
Oct. 23	25.80	32.60
Nov. 21	25.70	32.70
Dec. 17	25.85	32.55
1929		
Jan. 24	25.90	32.50
Feb. 21	29.00	29.40
Mar. 21	31.30	27.10
Apr. 9	30.30	28.10
May 27	[i] 28.30	30.10
June 20	27.60	30.80

376L1. Henry Pope. 4-inch well, not in use. Bench mark is copper washer on pump support, 1.50 feet above ground; altitude, 59.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 1	25.20	34.15
July 22	25.75	33.60
Aug. 17	25.80	33.55
Sept. 15	26.20	33.15
Oct. 14	25.70	33.65
Nov. 15	26.00	33.35
Dec. 9	25.35	34.00
1927		
Jan. 17	25.00	34.35
Feb. 16	25.05	34.30
Mar. 15	26.60	32.75
Apr. 8	26.40	32.95
May 23	25.00	34.35
June 24	24.70	34.65
July 19	24.55	34.80
Aug. 22	24.85	34.50
Sept. 26	24.15	35.20
Oct. 28	25.35	34.00
376L1—Con.		
1928		
Apr. 24	27.15	32.20
May 23	26.55	32.80
Sept. 24	26.40	32.95

378C1. A. Purdy. (See p. 220.) Bench mark is top of casing, altitude 40.25 feet, which is 25.20 feet below reference bench mark, a copper washer on northwest corner of well pit, 1.0 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	7.00	33.25
Oct. 6	5.40	34.85
1929		
Apr. 26	[o] 13.50	26.75

378C6. J. W. Wagemann. 6-inch well, 40 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 4 inch scantling, 1.0 foot above ground; altitude, 65.56 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 8	31.55	34.01
1927		
Apr. 6	32.15	33.41
Apr. 8	32.20	33.36

379B1. Henry Feillhardt. (See p. 220.) Bench mark is top flange of intake pipe, 25.16 feet below ground; altitude, 42.26 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 13	[p] 2.55	39.71

3710Q1. C. C. Nies. 6-inch well, 80 feet deep, used for domestic supply. Bench mark is top of casing, 0.80 foot above ground; altitude, 72.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	35.80	36.55
May 22	[f] 35.05	37.30
June 14	35.40	36.95
July 21	34.50	37.85
Aug. 17	35.55	36.80
Sept. 18	35.70	36.65
Oct. 13	33.85	38.50
Nov. 12	33.60	38.75
Dec. 9	33.20	39.15
3710Q1—Con.		
1927		
Jan. 15	32.65	39.70
Feb. 10	36.40	35.95
Mar. 15	[i] 39.05	33.30
Apr. 18	34.85	37.50
May 31	[i] 38.30	34.05
June 24	[f] 38.10	34.25
Aug. 20	[f] 36.40	35.95
Sept. 27	35.05	37.30
1928		
Apr. 23	38.30	34.05
Sept. 22	36.10	36.25
1929		
Apr. 15	[f] 42.30	30.05

3712R1. George Peterson. 6-inch well, 51 feet deep, used for domestic supply. Bench mark is top of casing or copper washer on 2 by 6 inch pump support, 1.1 feet above ground; altitude 83.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 28	36.60	47.00
May 18	[f] 37.75	45.85
June 14	38.00	45.60
July 21	38.00	45.60
Aug. 17	[f] 38.10	45.50
Sept. 18	38.00	45.60
Oct. 13	41.40	42.20
Nov. 12	37.25	46.35
Dec. 9	37.05	46.55
1927		
Jan. 15	[a] 36.85	46.75
Feb. 10	[a] 36.60	47.00
Mar. 15	36.75	46.85
Apr. 18	36.70	46.90
May 31	37.85	45.75
June 24	38.30	45.30
Aug. 20	[f] 39.70	43.90
Sept. 27	38.40	45.20
1928		
Apr. 23	37.55	46.05
Sept. 22	39.20	44.40
1929		
Apr. 15	39.05	44.55

3714C1. D. Akers. 12-inch well, 80 feet deep, used for domestic supply. Bench mark is copper washer on 2-inch plank, 1.2 feet above ground; altitude, 75.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 16	32.40	43.10
May 22	32.45	43.05

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[i] Pump running in adjacent well.

[f] Windmill running.

[o] Pump stopped a short time before measurement.

[p] By Cyril Williams.

[a] Creek flowing near by.

[f] Windmill running.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3714C1—Con.		
1926		
June 14	33.30	42.20
July 21	33.95	41.55
Aug. 16	33.65	41.85
Sept. 18	33.45	42.05
Oct. 13	32.85	42.65
Nov. 12	32.55	42.95
Dec. 9	32.30	43.20
1927		
Jan. 15	32.00	43.50
Feb. 10	[a] 32.00	43.50
Mar. 15	32.20	43.30
May 31	33.00	42.50
June 24	34.05	41.45
Aug. 20	34.40	41.10
Sept. 27	33.70	41.80
1928		
Apr. 23	33.40	42.10
Sept. 22	34.75	40.75
1929		
Apr. 15	36.55	39.95

3716C1. August Greber. (See p. 221.) Bench mark is top of casing, 0.8 foot above ground; altitude, 65.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 13	[p] 32.35	33.60
1926		
Apr. 27	32.60	33.35
May 22	31.20	34.75
June 14	31.75	34.20
July 21	31.80	34.15
Aug. 17	32.80	33.15
Sept. 17	31.35	34.60
Oct. 14	30.65	35.30
Nov. 12	30.30	35.65
Dec. 9	29.95	36.00
1927		
Jan. 15	29.60	36.35
Feb. 10	32.00	33.95
Mar. 15	34.20	31.75
Apr. 18	[c] 47.80	18.15
May 31	[i] 36.30	29.65
June 24	[c] 45.15	20.80
July 30	32.65	33.30
Aug. 20	33.00	32.95
Sept. 27	31.60	34.35
Oct. 26	30.95	35.00
Nov. 26	30.45	35.50
Dec. 15	30.40	35.55
1928		
Jan. 18	33.10	32.85
Feb. 16	38.90	27.05
Mar. 20	40.00	25.95

Date	Depth to water (feet)	Altitude of water table (feet)
3716C1—Con.		
1928		
Apr. 23	36.75	29.20
May 22	36.90	29.05
June 19	35.20	30.75
July 17	34.00	31.95
Aug. 22	33.75	32.20
Sept. 22	34.15	31.80
Oct. 20	32.25	33.70
Nov. 18	31.80	34.15
Dec. 13	31.40	34.55
1929		
Jan. 21	33.20	32.75
Feb. 18	36.75	29.20
Mar. 19	[i] 42.80	23.15
Apr. 15	[g] [i] 41.20	24.75
Apr. 19	42.60	23.35
Apr. 26	41.55	24.40
May 28	38.25	27.70
June 20	36.15	29.80

3716N1. L. K. Marshall. (See p. 222.) Bench mark is top of casing, 0.2 foot above ground; altitude, 61.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 1	[c] 45.60	15.50
July 21	32.60	28.50
Aug. 17	[c] 45.50	15.60
Sept. 17	31.60	29.50
Oct. 14	30.70	30.40
Nov. 12	30.20	30.90
Dec. 9	29.20	31.90
1927		
Jan. 15	29.25	31.85
Feb. 10	30.15	30.95
Mar. 15	30.85	30.25
Apr. 16	34.60	26.50
May 31	36.40	24.70
June 24	33.85	27.35
Aug. 20	33.25	27.85
Sept. 27	32.00	29.10
1928		
Apr. 23	(c)	---------
Sept. 21	33.30	27.80
1929		
Apr. 15	(c)	---------

3717B1. Conrad Baumbach. 6-inch well, used for domestic supply. Bench mark is top of casing, 0.4 foot above ground; altitude, 57.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 3	29.40	27.95
June 14	[f] 28.90	28.45
July 21	29.00	28.35

Date	Depth to water (feet)	Altitude of water table (feet)
3717B1—Con.		
1926		
Aug. 17	28.20	29.15
Sept. 17	29.00	28.35
Oct. 14	[f] 28.50	28.85
Nov. 12	28.50	28.85
Dec. 9	28.20	29.15
1927		
Jan. 15	27.95	29.40
Feb. 10	28.20	29.15
Mar. 15	29.00	28.35
Apr. 18	29.00	28.35
May 31	29.50	27.85
June 24	29.40	27.95
July 30	29.00	28.35
Aug. 20	29.25	28.10
Sept. 27	29.30	28.05
Oct. 26	29.00	28.35
Nov. 26	28.80	28.55
1928		
Jan. 18	28.55	28.80
Feb. 16	29.25	28.10
Mar. 20	31.00	26.35
Apr. 23	30.85	26.50
May 22	30.90	26.45
June 19	30.90	26.45
July 17	30.80	26.55
Aug. 22	30.65	26.70
Sept. 22	30.40	26.95
Oct. 20	30.25	27.10
Nov. 18	30.20	27.15
Dec. 13	29.85	27.50
1929		
Jan. 21	29.55	27.80
Feb. 18	[i] 30.20	27.15
Mar. 19	[i] 31.65	25.70
Apr. 15	[i] 31.15	26.20
May 28	32.00	25.35
June 20	31.65	25.70

3717D1. John Young. 10-inch well, not in use. Bench mark is top of casing, altitude, 41.70 feet, which is 20.80 feet below reference bench mark, a copper washer in doorsill, 0.5 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 16	12.60	29.10
May 22	10.50	31.20
June 14	10.50	31.20

3717D2. John Young. 6-inch well, used for domestic supply. Bench mark is copper washer on pump support, 1.50 feet above ground; altitude, 61.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 14	30.75	31.20
July 21	30.95	31.00

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[a] Creek flowing near by.

[c] Pumping.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

[c] Pumping.

[f] Windmill running.

[g] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

[f] Windmill running.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

3717D2—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 17	29.90	32.05
Sept. 17	29.90	32.05
Oct. 14	29.45	32.50
Nov. 12	29.15	32.80
Dec. 9	29.25	32.70
1927		
Jan. 15	29.75	32.20
Feb. 10	29.30	32.65
Mar. 15	[i] 31.30	30.65
Apr. 18	31.00	30.95
May 31	31.65	31.30
June 23	30.55	31.40
July 30	30.35	31.60
Aug. 20	30.20	31.75
Sept. 27	29.95	32.00
Oct. 26	29.70	32.25
Nov. 26	29.55	32.40
Dec. 15	29.00	32.95
1928		
Jan. 18	29.40	32.55
Feb. 16	31.45	30.50
Mar. 20	[f] 30.30	31.65
Apr. 23	32.55	29.40
May 22	32.10	29.85
June 19	31.70	30.25
July 17	31.30	30.65
Aug. 22	31.30	30.65
Sept. 22	31.00	30.95
Oct. 20	31.10	30.85
Dec. —	30.30	31.65
1929		
Jan. 21	30.25	31.70
Feb. 18	32.90	29.05
Mar. 19	[i] 33.90	28.05
Apr. 15	32.65	29.30
May 28	34.70	27.25
June 20	33.70	28.25

3717R1. N. Haabesland. (See p. 222.) Bench mark is top of casing, altitude 32.45 feet, which is 24.10 feet below reference bench mark, a copper washer on concrete curb 0.4 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	4.40	28.05
May 21	3.90	28.55
June 14	4.90	27.55

3718A1. John Zimbelmann. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 35.25 feet, which is 16.15 feet below reference bench mark, a copper washer on east side of door sill. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 16	10.60	24.65
May 18	10.10	25.15

3718A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 14	10.40	24.85
July 20	10.30	24.95
Aug. 13	11.25	24.00
Sept. 15	10.35	24.90
Oct. 12	9.90	25.35
Nov. 10	9.25	26.00
Dec. 8	8.65	26.60
1927		
Jan. 13	8.40	26.85
Feb. 9	8.10	27.15
Mar. 12	9.00	26.25
Apr. 14	9.60	25.65
May 28	[i] 14.90	20.35
June 23	12.30	22.95
July 29	11.80	23.45
Aug. 19	11.60	23.65
Sept. 29	11.05	24.20
Oct. 24	10.25	25.00
Nov. 28	9.35	25.90
Dec. 15	9.05	26.20
1928		
Jan. 18	9.05	26.20
Feb. 16	9.15	26.10
Mar. 19	12.15	23.10
Apr. 18	[i] 12.15	23.10
May 21	(e)	---------
May 22	13.10	22.15
June 18	12.40	22.85
July 16	[i] 13.25	22.00
Aug. 20	12.75	22.50
Sept. 21	12.35	22.90
Oct. 19	11.45	23.80
Nov. 18	11.10	24.15
Dec. 13	10.35	24.90
1929		
Jan. 21	10.00	25.25
Feb. 18	10.00	25.25
Mar. 19	[i] 13.50	21.75
Apr. 12	[i] 15.20	20.05
May 27	16.00	19.25
June 20	14.90	20.35

3718D1. Herman Tecklenburg. (See p. 222.) Bench mark is top of casing, altitude 31.20 feet, which is 24.80 feet below reference bench mark, a copper washer on door sill at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[j] 5.60	25.60
1926		
Apr. 16	6.60	24.60
May 22	5.30	25.90
June 14	6.00	25.20

3718N1. Charles Rasch. (See p. 222.) Bench mark is top of casing, altitude 32.80 feet, which is 16.20 feet below reference bench mark, a copper washer in roof sill of pit, east side, at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	8.10	24.70
May 18	7.90	24.90
June 12	10.00	22.80
1928		
Oct. 27	10.05	22.75
1929		
Jan. 2	9.05	23.75
Mar. 8	12.85	19.95

3720A2. U. Veraguth. (See p. 223.) Bench mark until Dec. 9, 1926, top of casing, altitude 36.50 feet, which is 16.80 feet below reference bench mark, a copper washer on east side of pit-house wall; after that date, top of casing, altitude 29.70 feet, which is 23.03 feet below reference bench mark, a copper washer in top of pit curb, east side, at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	10.50	26.00
May 21	9.90	26.60
June 19	12.80	23.70
July 21	[e] 26.30	10.20
Aug. 17	15.40	21.10
Sept. 17	13.00	23.50
Oct. 14	11.25	25.25
Nov. 12	10.05	26.45
Dec. 9	[h] 3.10	26.60
1927		
Jan. 15	2.30	27.40
Feb. 10	2.10	27.60
Mar. 15	3.45	26.25
Apr. 16	4.75	24.95
May 31	7.70	22.00
June 24	11.35	18.35
Aug. 20	9.10	20.60
Sept. 27	7.30	22.40
1928		
Apr. 23	9.30	20.40
Sept. 21	9.20	20.50
1929		
Apr. 15	10.65	19.05

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[f] Windmill running.

[i] Pump running in adjacent well.

[i] Pump running in adjacent well.

[j] By C. H. Widdows.

[e] Pumping.

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

3720C1. R. G. Huestis. (See p. 223.) Bench mark until Apr. 15, 1929, top of concrete casing, at ground surface, altitude 56.10 feet; after that date, top of pump base, altitude 56.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[i] 30.70	25.40
1926		
June 4	29.70	26.40
July 21	30.50	25.60
Aug. 17	31.65	24.45
Sept. 17	31.45	24.65
Oct. 14	30.15	25.95
Nov. 12	29.20	26.90
Dec. 9	28.40	27.70
1927		
Jan. 15	27.45	28.65
Feb. 10	27.35	28.75
Mar. 15	27.80	28.30
Apr. 16	29.80	26.30
May 31	33.70	22.40
June 24	32.40	23.70
Aug. 20	32.80	23.30
Sept. 13	32.10	24.00
1928		
Jan. 31	28.30	27.80
Apr. 16	33.10	23.00
Sept. 17	33.15	22.95
1929		
Apr. 15	[h] 35.25	20.95

3720D1. G. C. Lawry. (See p. 223.) Bench mark is elbow on suction pipe, 24.00 feet below ground; altitude, 32.50 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 1	[e] 11.10	21.40
Apr. 21	4.20	28.30
Sept. 20	4.70	27.80
1927		
Apr. 19	5.45	27.05

3721C1. Fred Schroeder. 6-inch well, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 60.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 16	31.40	28.70
May 21	30.80	29.30
June 19	32.45	27.65
3721C1—Con.		
1926		
July 21	31.25	28.85
Aug. 17	32.70	27.40
Sept. 18	30.95	29.15
Oct. 14	30.60	29.50
Nov. 12	28.40	31.70
Dec. 9	29.15	30.95
1927		
Jan. 15	28.65	31.45
Feb. 10	28.45	31.65
Mar. 15	28.30	31.80
Apr. 16	29.25	30.85
June 24	[i] 40.05	20.05
July 30	[i] 35.10	25.00
Aug. 20	(c)	---------
Sept. 27	31.70	28.40
Oct. 26	30.70	29.40
Nov. 26	30.10	30.00
Dec. 15	29.75	30.35
1928		
Jan. 18	29.40	30.70
Feb. 16	30.10	30.00
Mar. 20	[i] 37.60	22.50
Apr. 23	[c] 36.85	23.25
May 22	40.00	20.10
June 19	35.20	24.90
July 17	34.20	25.90
Aug. 22	33.45	26.65
Sept. 21	32.90	27.20
Oct. 20	32.50	27.60
Nov. 18	31.20	28.90
Dec. 13	31.05	29.05
1929		
Jan. 21	30.50	29.60
Feb. 18	30.35	29.75
Mar. 19	32.60	27.50
Apr. 15	[i] Dry.	---------
June 20	38.90	21.20

3721M1. *12-inch well, 80 feet deep.* Bench mark is copper washer on northwest corner of pump house, 1.50 feet above ground; altitude, 64.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 3	34.85	29.20
Sept. 18	33.70	30.35
Oct. 14	33.20	30.85
Nov. 12	32.80	31.25
Dec. 9	32.50	31.55
1927		
Jan. 15	32.00	32.05
Feb. 10	32.00	32.05
Mar. 15	32.15	31.90
Apr. 16	29.90	34.15
May 31	(c)	---------
June 20	[c] 52.00	12.05
Aug. 21	35.90	28.15
Sept. 27	34.50	29.55
1928		
Apr. 23	34.90	29.15
Sept. 21	38.25	25.80
3721M1—Con.		
1929		
Apr. 15	(c)	---------

3722B1. Arthur Mettler. (See p. 224.) Bench mark is top of casing, altitude 43.40 feet, which is 23.50 feet below concrete curb at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[i] 8.00	35.40
Nov. 23	[p] 6.60	36.80
1926		
Apr. 16	7.50	35.90
May 21	7.00	36.40
June 14	7.70	35.70
July 21	[c] 18.35	25.05
Aug. 17	8.55	34.85
Sept. 18	8.70	34.70
Oct. 14	7.30	36.10
Nov. 12	5.85	36.55
Dec. 9	6.55	36.85
1927		
Jan. 15	6.15	37.25
Feb. 10	6.25	37.15
Mar. 15	6.60	36.80
Apr. 16	6.75	36.65
May 31	8.10	35.30
June 24	9.45	33.95
Aug. 20	(c)	---------
Sept. 27	8.40	35.00
1928		
Apr. 23	9.00	34.40
Sept. 22	10.70	32.70
1929		
Feb 19	9.05	34.35
Apr 15	(c)	---------

3722C1. F. P. Brown. 10 inch well, used for irrigation. Bench mark is top of casing, 23.50 feet below ground; altitude, 42.65 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov 23	[p] 5.90	36.75
1926		
Apr. 1	[e] 7.50	35.15
Apr. 26	[e] 6.50	36.15
Sept. 20	7.05	35.60
1927		
Apr. 19	5.75	36.90
Sept. 13	7.95	34.70

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[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[h] New measuring point.

[i] By C. H. Widdows.

[c] Pumping.

[i] Pump running in adjacent well.

[c] Pumping.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[p] by Cyril Williams.

[i] By C. H. Widdows.

Measurements of depth to water in observation wells—Continued

3722C1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 16	7.60	35.05
Sept 17	9.15	33.50
1929		
Apr. 9	(c)	---------

3723C1. B. M. Horst. (See p. 224.) Bench mark is top of casing, altitude 56.05 feet, which is 14.70 feet below reference bench mark, a copper washer on pump house sill, north side, 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 23	[p] 14.85	41.20
1926		
Apr. 21	15.20	40.85
May 21	(c)	---------
June 14	16.00	40.05
July 21	16.50	39.55
Aug. 17	16.35	39.70
Sept. 18	17.15	38.90
Oct. 14	15.80	40.25
Nov. 12	15.55	40.50
Dec. 9	15.35	40.70
1927		
Jan. 15	15.00	41.05
Feb. 10	15.00	41.05
Mar. 15	15.15	40.90
Apr. 16	14.90	41.15
May 31	15.75	40.30
June 24	18.15	37.90
July 30	17.00	39.05
Aug. 20	16.95	39.10
Sept. 27	16.50	39.55
Oct. 26	16.20	39.85
Nov. 26	15.85	40.20
Dec. 15	15.75	40.30
1928		
Jan. 18	15.30	40.75
Feb. 16	16.40	39.65
Mar. 20	16.70	39.35
Apr. 23	16.40	39.65
May 22	17.25	38.80
June 19	(c)	---------
July 17	18.10	37.95
Aug. 22	18.30	37.75
Sept. 22	17.65	38.40
Oct. 20	17.35	38.70
Nov. 18	17.10	38.95
Dec. 17	17.00	39.05
1929		
Jan. 21	16.85	39.20
Feb. 18	17.00	39.05
Mar. 19	17.75	38.30
Apr. 15	18.10	37.95
May 28	19.30	36.75
June 20	18.90	37.15

3723P1. S. D. Moore. 12-inch well, 75 feet deep, used for domestic supply. Bench mark is top of casing, 1.4 feet above ground; altitude, 65.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 21	27.70	38.25
June 14	28.10	37.85
July 21	28.30	37.65
Aug. 17	28.55	37.40
Sept. 17	[f] 28.55	37.40
Oct. 14	28.50	37.45
Nov. 12	28.20	37.75
Dec. 8	28.20	37.75

3723P2. J. J. Pope. 4-inch well, 50 feet deep, not in use. Bench mark is top of casing, 1.30 feet above ground; altitude, 65.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 27	27.75	37.60
Feb. 10	27.60	37.75
Mar. 15	27.60	37.75
Apr. 16	27.40	37.95
May 31	27.70	37.65
June 24	28.20	37.15
Sept. 27	28.80	36.55
1928		
Apr. 23	28.70	36.65
Sept. 22	29.90	35.45
1929		
Apr. 15	30.00	35.35
May 28	30.75	34.60
June 20	30.90	34.45

3724C1. 10-inch well, not in use. Bench mark is top of casing, 0.9 foot above ground; altitude, 77.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 21	[p] 32.20	45.60
1926		
Apr. 21	32.30	45.50
May 21	33.20	44.60
June 14	34.20	43.60
July 21	35.00	42.80
Aug. 17	34.90	42.90
Sept. 18	33.45	44.35
Oct. 14	33.20	44.60
Nov. 12	33.00	44.80
Dec. 9	32.65	45.15
1927		
Jan. 15	32.55	45.25
Feb. 10	32.45	45.35
Mar. 15	32.60	45.20
Apr. 16	33.80	44.00

3724C1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
May 31	33.40	44.40
June 24	35.10	42.70
Aug. 20	34.10	43.70
Sept. 27	34.90	42.90
Oct. 26	33.60	44.20
1928		
Apr. 23	33.40	44.40
Sept. 22	34.95	42.85
1929		
Apr. 15	34.80	43.00

3725F1. 8-inch well, not in use. Bench mark is top of casing, altitude 70.80 feet, which is 0.70 foot below reference bench mark, a copper washer on 2 by 6 inch pump support 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	27.90	42.90
May 21	28.00	42.80
June 14	28.00	42.80
July 21	28.30	42.50
Aug. 16	28.35	42.45
Sept. 17	28.60	42.20
Oct. 14	28.70	42.10
Nov. 12	28.70	42.10
Dec. 8	28.70	42.10
1927		
Jan. 13	28.60	42.20
Feb. 10	28.35	42.45
Mar. 15	28.40	42.40
Apr. 16	28.25	42.55
May 31	28.40	42.40
June 23	[f] 30.90	39.90
Aug. 21	(e)	---------
1928		
Sept. 22	30.30	40.50
1929		
Apr. 15	30.30	40.50

3726G1. G. Sandheim. 4-inch well, 65 feet deep, used for domestic supply. Bench mark is top of casing, altitude 68.60 feet, which is 1.10 feet above reference bench mark, a copper washer in pump platform, 0.8 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	28.70	39.90
May 21	[f] 29.90	38.70
June 14	29.05	39.55

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[c] Pumping.
[p] By Cyril Williams.

[f] Windmill running.
[p] By Cyril Williams.

[f] Windmill running.
[e] Casing cemented over.

Measurements of depth to water in observation wells—Continued

3726G1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 21	30.50	38.10
Aug. 16	31.30	37.30
Sept. 17	30.55	38.05
Oct. 14	29.70	38.90
Nov. 12	29.30	39.30
Dec. 8	29.45	39.15
1927		
Jan. 13	29.30	39.30
Feb. 10	29.10	39.50
Mar. 15	28.90	39.70
Apr. 16	28.60	40.00
May 31	[f] 29.85	38.75
June 23	[f] 30.90	37.70
Aug. 21	[f] 30.90	37.70
Sept. 13	30.50	38.10
1928		
Jan. 31	31.20	37.40
Apr. 16	30.00	38.60
Sept. 17	32.40	36.20
1929		
Apr. 9	31.25	37.35
May 28	32.35	36.25
June 20	32.45	36.15

3727F1. T. J. Brower. 6-inch well, 60 feet deep, used for domestic supply. Bench mark until Apr. 15, 1929, top of water plug, 0.95 foot above top of casing, which is at ground surface, altitude 61.40 feet; after that date, top of casing, at ground surface, altitude 60.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 21	28.65	32.75
June 14	[f] 28.50	32.90
July 21	[f] 30.20	31.20
Aug. 17	29.95	31.45
Sept. 17	29.85	31.55
Oct. 14	29.85	31.55
Nov. 12	[f] 29.60	31.80
Dec. 8	29.30	32.10
1927		
Jan. 13	28.85	32.55
Feb. 10	28.85	32.55
Mar. 15	28.25	33.15
Apr. 16	28.20	33.20
May 31	28.20	33.20
June 23	29.00	32.40
Aug. 21	30.80	30.60
Sept. 27	30.15	31.25
1928		
Apr. 23	29.45	31.95
Sept. 22	31.65	29.75
1929		
Apr. 15	[h] 29.90	30.55

3727R1. Louis Sanders. 8-inch well, used for domestic supply. Bench mark is top of casing, altitude 45.20 feet, which is 14.75 feet below reference bench mark, a copper washer on pit curb, 0.20 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	11.60	33.60
May 21	10.50	34.70
June 15	11.00	34.20
July 21	12.30	32.90
Sept. 17	12.70	32.50
Oct. 14	12.40	32.80
Nov. 12	12.10	33.10
Dec. 8	11.90	33.30
1927		
Jan. 13	11.60	33.60
Feb. 10	[a] 11.20	34.00
Mar. 15	10.80	34.40
Apr. 16	10.60	34.60
May 31	10.70	34.50
June 24	11.90	33.30
Aug. 21	13.30	31.90
Sept. 27	13.10	32.10
1928		
Apr. 23	11.90	33.30
Sept. 22	14.10	31.10
1929		
Apr. 15	13.30	31.90

3728K1. Ray Odor. 4-inch well, not in use. Bench mark is top of 1½-inch elbow of suction pipe at top of well, at ground surface; altitude 54.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 22	26.90	27.85
June 14	28.30	26.45
July 21	29.30	25.45
Aug. 17	29.40	25.35
Sept. 17	29.15	25.60
Oct. 14	28.80	25.95
Nov. 12	28.40	26.35
Dec. 8	[a] 28.05	26.70
1927		
Jan. 15	[a] 27.45	27.30
Feb. 10	[a] 27.00	27.75
Mar. 15	[a] 26.15	28.60
Apr. 16	25.60	29.15
May 28	27.55	27.20
June 23	29.50	25.25
Aug. 21	30.25	24.50
Sept. 13	30.10	24.65
Oct. 19	29.45	25.30
1928		
Apr. 16	28.05	26.70
Sept. 17	31.00	23.75

3728K1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 9	29.40	25.35
May 28	31.25	23.50
June 20	31.55	23.20

3728L1. H. W. Haler. (See p. 224.) Bench mark is center line of pump flange, 16.10 feet below red keel mark at top of 2 by 4 inch scantling; altitude, 39.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 10.70	28.55
Apr. 22	10.60	28.65
Apr. 26	[e] 10.40	28.85
May 21	10.80	28.45
Sept. 20	13.30	25.95
1927		
Apr. 20	10.00	29.25
Oct. 19	13.30	25.95
1929		
Feb. 19	12.40	26.85

3729A1. John Kirschenmann. (See p. 224.) Bench mark is center line of suction flange, 20.60 feet below ground, altitude 29.90 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 5.00	24.90
Apr. 26	[e] 4.20	25.70
Sept. 20	8.00	21.90
Nov. 23	5.20	24.70
Dec. 8	4.85	25.05
1927		
Jan. 15	4.10	25.80
Feb. 9	3.65	26.25
Mar. 14	3.00	26.90
Apr. 16	3.15	26.75
Mar. 28	9.55	20.35
1928		
Apr. 16	7.05	21.85
Sept. 17	10.00	19.90
1929		
Apr. 9	8.80	21.10

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[f] Windmill running.
[h] New measuring point.
[a] Creek flowing near by.
[d] By city of Stockton.
[e] By G. H. Teale, State division of water rights.

Measurements of depth to water in observation wells—Continued

3729H1. Sam Stall. 6-inch well, used fer domestic supply. Bench mark is top of casing, altitude 51.75 feet, which is 0.30 foot below reference bench mark, a copper washer on pump support at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	27.50	24.25
May 22	28.40	23.35
June 14	[f] 30.85	20.90
July 21	[f] 30.35	21.40
Aug. 17	28.35	23.40
Sept. 17	[f] 28.20	23.55
Oct. 14	27.10	24.65

3730E2. A. D. Howe. 6-inch well, used for domestic supply. Bench mark is concrete floor of pump house, at ground surface; altitude, 41.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 17	17.80	24.00
May 18	19.10	22.70
June 12	20.70	21.10
July 21	23.25	18.55
Aug. 16	22.10	19.70
Sept. 16	22.00	19.80
Oct. 13	20.25	21.55
Nov. 10	19.85	21.95
Dec. 8	19.10	22.70
1927		
Jan. 13	18.85	22.95
Feb. 9	18.30	23.50
Mar. 12	17.35	24.45
Apr. 14	17.00	24.80
May 28	21.20	20.60
June 23	23.70	18.10
July 29	24.00	17.80
Aug. 19	24.70	17.10
Sept. 26	21.60	20.20
Oct. 24	20.40	21.40
Nov. 28	19.70	22.10
Dec. 15	19.40	22.40
1928		
Jan. 18	19.20	22.60
Feb. 16	19.00	22.80
Mar. 19	20.45	21.35
Apr. 23	19.75	22.05
May 21	21.10	20.70
June 18	24.50	17.30
July 16	24.80	17.00
Aug. 20	24.60	17.20
Sept. 21	23.45	18.35
Oct. 19	22.00	19.80
Nov. 18	20.90	20.90
Dec. 13	20.45	21.35
1929		
Jan. 21	20.20	21.60
Feb. 18	20.10	21.70
Mar. 19	20.30	21.50
Apr. 12	22 30	19.50
May 27	25.30	16.50
June 20	24.80	17.00

[f] Windmill running.

3730E3. R. Aman. 5-inch well, used for domestic supply. Bench mark is top of suction pipe, 3.80 feet below ground; altitude, 38.25 feet [d]

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Mar. 23	[e] 14.80	23.45
Apr. 26	[e] 13.90	24.35
Sept. 20	17.15	21.10
1927		
Apr. 21	13.65	24.60
Sept. 13	18.35	19.90
1928		
Apr. 16	15.95	22.30
Sept. 17	19.40	18.85
1929		
Apr. 9	17.25	21.00

3730L1. M. E. Angier. (See p. 225.) Bench mark is floor of pit, altitude 28.55 feet, which is 20.15 feet below reference bench mark, a copper washer in door sill, 1.50 feet above ground. All measurements made from floor of pit

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[k] 7.55	21.00
1926		
Aug. 3	9.25	19.30
Sept. 17	[k] 8.00	20.55
Oct. 14	6.20	22.35
Nov. 12	5.30	23.25
Dec. 8	4.75	23.80
1927		
Jan. 15	4.10	24.45
Feb. 10	3.55	25.00
Mar. 15	2.50	26.05
May 28	([c])	--------
June 21	10.00	18.55
Aug. 21	10.30	18.25
Sept. 27	7.65	20.90
1928		
Apr. 23	6.40	22.15
Sept. 22	[i] 9.65	18.90
1929		
Apr. 15	8.60	19.95

[c] Pumping.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[i] Pump running in adjacent well.

[k] By C. H. Widdows.

3731A1. A. W. Post. 6-inch well, 60 feet deep, used for domestic supply. Bench mark is top of casing, at ground surface; altitude, 40.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	16.40	23.85
May 18	17.40	22.85
June 12	18.95	21.30
July 21	23.90	16.35
Aug. 16	21.10	19.15
Sept. 16	17.45	22.80
Oct. 13	19.80	20.45
Nov. 10	19.25	21.00
Dec. 8	18.95	21.30
1927		
Jan. 13	19.20	21.05
Feb. 9	18.10	22.15
Mar. 12	17.55	22.70
Apr. 14	16.50	23.75
May 28	[i] 25.30	14.95
June 23	21.45	18.80
July 29	25.30	14.95
Aug. 18	([c])	--------
Sept. 26	20.35	19.90
Oct. 24	19.70	20.55
Nov. 28	18.00	22.25
Dec. 15	19.15	21.10
1928		
Jan. 18	19.05	21.20
Feb. 16	18.85	21.40
Mar. 19	19.40	20.85
Apr. 23	18.75	21.50
May 21	20.05	20.20
June 18	22.85	17.40
July 16	26.10	14.15
Aug. 20	22.90	17.35
Sept. 21	22.15	18.10
Oct. 19	21.15	19.10
Nov. 18	([l])	--------
Dec. 13	20.05	20.20
1929		
Jan. 21	19.80	20.45
Feb. 18	19.55	20.70
Mar. 19	19.65	20.60
Apr. 12	20.80	19.45
May 27	23.10	17.15
June 20	22.90	17.35

3733H1. California Kadota Fig Co. (See p. 225.) Bench mark is top of casing, altitude 34.05 feet, which is 21.80 feet below reference bench mark, a copper washer on sill of entrance to pit shed, 1.40 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	5.50	28.55
May 21	5.80	28.25
June 15	8.65	25.40

[c] Pumping.

[i] Pump running in adjacent well.

[l] Caved in.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3733H1—Con.		
1926		
July 21	[c] 25.25	8.80
Sept. 17	8.75	25.30
Oct. 14	8.30	25.75
Nov. 12	7.80	26.25
Dec. 8	7.40	26.65
1927		
Jan. 15	6.80	27.25
Feb. 10	6.30	27.75
Mar. 15	5.35	28.70
Apr. 16	3.80	29.25
May 28	5.80	28.25
June 23	([c])	----------
Sept. 27	9.05	25.00
1928		
Apr. 23	6.80	27.25
Sept. 21	10.45	23.60
1929		
Apr. 15	8.55	25.50
3733Q2. Fred Blanchre. 6-inch well, 84 feet deep, used for domestic supply. Bench mark is top of casing, 0.10 foot above ground; altitude, 52.05 feet		
1926		
May 21	24.50	27.55
June 15	25.85	26.20
July 21	27.70	24.35
Aug. 16	28.30	23.75
Sept. 17	27.90	24.15
Oct. 14	27.55	24.50
Nov. 12	27.00	25.05
Dec. 8	26.45	25.60
1927		
Jan 13	25.90	26.15
Feb. 9	25.25	26.80
Mar. 15	24.10	27.95
Apr. 16	23.80	28.25
May 28	24.65	27.40
June 23	25.80	26.25
Aug. 19	29.30	22.75
Sept. 27	28.15	23.90
1928		
Apr. 23	25.60	26.45
Sept. 21	30.10	21.95
1929		
Apr. 15	27.95	24.10
May 28	29.80	22.25
June 20	30.75	21.30
3734H2. J. W. Hannah. 4-inch well, used for domestic supply. Bench mark until Sept. 20, 1926, bottom of suction flange, 5.2 feet below ground, altitude 58.00 feet; after that date, bottom of nut on suction pipe, 11.5 feet below ground, altitude 52.60 feet [d]		
1926		
Mar. 24	[e] 20.13	32.47
Apr. 26	[e] 20.22	32.38
Sept. 20	23.30	29.30
1927		
Apr. 19	[h] 20.15	32.45
Sept. 13	22.20	30.40
1928		
Sept. 17	22.85	29.75
1929		
Apr. 9	21.45	31.15
382C1. Dan Linn. 4-foot well, used for domestic supply. Bench mark is copper washer in well cover, 0.5 foot above ground; altitude, 186.15 feet. Perched-water well.		
1926		
Apr. 28	73.80	112.35
June 23	[f] 74.10	112.05
Aug. 23	74.35	111.80
Oct. 19	73.55	112.60
Dec. 14	73.05	113.10
1927		
Feb. 26	73.20	112.95
Apr. 27	75.70	110.45
Oct. 4	74.50	111.65
1928		
Apr. 26	73.60	112.55
Sept. 27	74.80	111.35
283D1. 4-foot well, 100 feet deep, not in use. Bench mark is cut on curb, 3.00 feet above ground; altitude, 180.64 feet		
1925		
Oct. 27	[p] 102.45	78.19
383D1—Con.		
1926		
Apr. 28	102.50	73.14
1928		
Apr. 25	103.60	77.04
1929		
Apr. 16	104.05	76.59
383R1. Ralph Lucas. 4-foot well, 90 feet deep, used for domestic supply. Bench mark is copper washer in 6 by 6-inch post, 1.5 feet above ground; altitude, 142.80 feet		
1925		
Nov. 5	[p] 67.95	74.85
1926		
Apr. 29	68.35	74.45
June 23	[f] 68.20	74.60
Aug. 23	68.50	74.30
Oct. 19	68.30	74.50
Dec. 14	68.60	74.20
1927		
Feb. 26	68.50	74.30
Apr. 27	68.70	74.10
July 27	68.90	73.90
Oct. 4	69.50	73.30
Oct. 26	69.25	72.55
Nov. 26	68.90	73.90
1928		
Jan. 18	69.00	73.80
Feb. 16	68.95	73.85
Mar. 19	69.15	73.65
Apr. 25	69.05	73.75
May 22	69.35	73.45
June 19	69.15	73.65
July 17	[f] 69.50	73.30
Aug. 22	69.30	73.50
Sept. 26	69.30	73.50
Oct. 20	69.35	73.45
Nov. 19	69.40	73.40
Dec. 17	69.50	73.30
1929		
Jan. 21	69.60	73.20
Feb. 18	69.40	73.40
Mar. 19	69.40	73.40
Apr. 16	69.50	73.30
May 28	69.85	72.95
June 20	68.90	73.90

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[c] Pumping.

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[f] Windmill running.

[h] New measuring point.

[p] By Cyril Williams.

[f] Windmill running.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
384N1. George Linn. 10-inch well, 66 feet deep, used for domestic supply. Bench mark is top of casing, at ground surface; altitude, 113.75 feet		
1926		
Apr. 29	57.05	56.70
1929		
Apr. 15	59.15	54.60
384Q1. George H. Linn. 3-foot well, 140 feet deep, used for domestic supply. Bench mark is top of brick curb, 0.5 foot above ground; altitude, 121.15 feet		
1926		
Apr. 29	63.15	58.00
1929		
Apr. 15	64.95	56.20
May 28	65.65	55.50
June 20	[f] 66.20	54.95
385A1. C. K. Weber. 4-foot well, 60.5 feet deep, used for domestic supply. Bench mark is copper washer on cover of well, 0.4 foot above ground; altitude 105.00 feet		
1925		
Oct. 12	[p] 61.80	43.20
1926		
Apr. 27	[f] 53.30	51.70
May 18	[f] 51.55	53.45
June 16	[f] 56.40	48.60
July 23	[f] 56.00	49.00
Aug. 17	[f] 55.00	50.00
Sept. 23	55.85	49.15
Oct. 15	53.20	51.80
Nov. 15	52.20	52.80
Dec. 9	52.05	52.95
1927		
Jan. 17	51.70	53.30
Feb. 16	51.45	53.55
Mar. 15	51.80	53.20
Apr. 15	51.25	53.75
May 23	[f] 56.50	48.50
June 29	[f] 56.65	48.35
July 19	57.70	47.30
Aug. 22	57.70	47.30
Sept. 27	[g] 58.55	46.45
1928		
Apr. 24	52.35	52.65
Sept. 24	53.95	51.05
385L1. C. B. McPhearson. 7-inch well, used for domesic supply. Bench mark is top of casing, altitude, 109.50 feet, which is 0.80 foot below reference bench mark, a copper washer in wooden pump support, 2.5 feet above ground. All measurements made from top of casing		
1926		
Apr. 30	55.10	54.40
June 23	55.50	54.00
Aug. 23	55.30	54.20
Sept. 24	55.45	54.05
Oct. 19	56.05	53.45
Dec. 14	55.35	54.15
1927		
Jan. 31	55.20	54.30
Feb. 22	55.30	54.20
Mar. 19	59.15	50.35
Apr 27	55.80	53.70
June 29	56.25	53.25
Aug. 29	56.05	53.45
Oct. 4	[f] 58.00	51.50
1928		
Apr. 25	56.80	52.70
Sept. 26	56.90	52.60
1929		
Apr. 15	56.60	52.9
386E1. R. J. Smith. 5-inch well, 76 feet deep, used for domestic supply. Bench mark is top of casing and copper washer, 0.6 foot above ground; altitude, 96.60 feet		
1885		
Apr. 16	[w] 40.00	56.60
1925		
Oct. 12	[p] 45.20	51.40
1926		
Apr. 28	45.00	51.60
May 18	45.05	51.55
June 16	46.00	50.60
July 23	46.15	50.45
Aug. 17	46.20	50.40
Sept. 23	46.10	50.50
Oct. 15	45.90	50.70
Nov. 15	46.00	50.60
Dec. 9	45.40	51.20
1927		
Jan. 17	45.50	51.10
Feb. 16	45.65	50.95
Mar. 15	[c] 49.65	46.95
Apr. 15	45.20	51.40
May 23	46.30	50.30
386E1—Con.		
1927		
June 29	[c] 49.70	46.90
July 19	46.80	49.80
Aug. 22	47.80	48.80
Sept. 27	46.45	50.15
Oct. 28	46.05	50.55
Nov. 28	45.80	50.80
Dec. 17	45.50	51.10
1928		
Jan. 21	45.70	50.90
Feb. 18	45.95	50.65
Mar. 17	46.20	50.40
Apr. 24	45.70	50.90
May 23	46.85	49.75
June 18	46.75	49.85
July 20	([c])	---------
Aug. 27	47.25	49.35
Sept. 24	46.90	49.70
Oct. 22	47.15	49.45
Nov. 20	46.40	50.20
Dec. 17	46.35	50.25
1929		
Jan. 22	46.45	50.15
Feb. 19	46.50	50.10
Mar. 20	[g] 48.70	47.90
Apr. 16	47.35	49.25
May 29	[g] 48.45	48.15
June 21	47.85	48.75
386H1. L. M. Hall. 4-foot well, not in use. Bench mark is copper washer on southeast corner of 2 by 4 inch scantling, 2.50 feet above ground; altitude, 104.20 feet		
1925		
Nov. 20	[p] 50.05	54.15
Nov. 27	[p] 49.95	54.25
1926		
Apr. 27	50.10	54.10
May 18	49.50	54.70
June 16	50.30	53.90
July 23	50.65	53.55
Aug. 17	50.70	53.50
1927		
Jan. 17	50.70	53.50
Feb. 16	47.95	56.25
Mar. 15	46.30	57.90
Apr. 15	46.20	58.00
May 23	47.20	57.00
June 29	50.05	54.15
July 19	50.70	53.50
Aug. 22	51.05	53.15
Sept. 8	51.20	53.00
Sept. 27	51.25	52.95

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[f] Windmill running.
[g] Pump stopped a short time before measurement.
[p] By Cyril Williams.

[c] Pumping.
[p] By Cyril Williams.
[w] By owner.

[c] Pumping.
[g] Pump stopped a short time before measurement.
[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
386H1—Con.		
1928		
Apr. 24	50.90	53.30
May 23	51.00	53.20
Sept. 24	57.80	46.40
1929		
Apr. 16	52.40	51.80

386M1. W. Early. 3-foot well, 53 feet deep, used for domestic supply. Bench mark is copper washer on cover of well, 1.0 foot above ground; altitude 97.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 20	[p] 43.85	53.85
Nov. 27	[p] 45.35	52.35
1926		
Apr. 27	[f] 48.10	49.60
May 18	44.95	52.75
June 16	44.50	53.20
July 23	[f] 52.80	44.90
Aug. 17	46.95	50.75
Sept. 23	44.60	53.10
Oct. 15	44.65	53.05
Nov. 15	44.60	53.10
Dec. 9	44.55	53.15
1929		
Apr. 16	46.15	51.55

388A1. Henry Fetzer. 6-inch well, used for domestic supply. Bench mark is top of casing, 10.6 feet above ground; altitude 96.42 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 20	[p] 43.65	52.77
Nov. 27	[p] 43.45	52.97
1926		
Apr. 27	43.40	53.02
June 16	43.80	52.62

388H1. C. H. Disch. 4-inch well 50 feet deep, used for domestic supply. Bench mark is copper washer on 4 by 4 inch pump support, 1.00 foot above ground; altitude, 103.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	49.10	54.10
June 23	48.75	54.45
Aug. 28	48.90	54.30
Sept. 24	49.30	53.90
Oct. 19	49.00	54.20
Dec. 14	49.20	54.00

[f] Windmill running.
[p] By Cyril Williams.

Date	Depth to water (feet)	Altitude of water table (feet)
388H1—Con.		
1927		
Jan. 31	49.10	54.10
Feb. 22	49.30	53.90
Mar. 19	49.30	53.90
Apr. 27	49.45	53.75
June 29	[f] 50.25	52.95
Aug. 29	49.70	53.50
Oct. 4	[f] 50.70	52.50
1928		
Apr. 25	49.85	53.35
Sept. 26	50.45	52.75
1929		
Apr. 15	50.65	52.55

389Q1. Charles Swanson. 10-inch well, 80 feet deep, used for domestic supply. Bench mark is copper washer on pump platform, 0.2 foot above ground; altitude, 127.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 19	[p] 69.15	57.95
Nov. 20	[p] 69.25	57.85
Nov. 27	[p] 69.15	57.95
1926		
Apr. 28	69.50	57.60
June 16	69.55	57.65
Aug. 23	69.80	57.30
Oct. 19	70.00	57.10
Dec. 14	70.30	56.80
1927		
Feb. 22	70.20	56.90
Apr. 27	70.35	56.75
June 10	70.30	56.80
Sept. 27	70.65	56.45
1928		
Jan. 31	70.55	56.55
Apr. 25	70.90	56.20
Sept. 29	71.45	55.65
1929		
Apr. 15	71.70	55.40
May 28	72.35	54.75
June 20	71.95	55.15

3810D1. J. B. Mitchell. 4-foot well, 65 feet deep, used for domestic supply. Bench mark is blue cross on east side of concrete curb, 1.00 foot above ground; altitude, 128.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 29	56.20	72.75
Aug. 23	55.00	73.95
Oct. 19	54.85	74.10
Dec. 14	54.55	74.40

[f] Windmill running.
[p] By Cyril Williams.

Date	Depth to water (feet)	Altitude of water table (feet)
3810D1—Con.		
1927		
Feb. 22	55.10	73.85
Apr. 27	56.45	72.50
July 30	56.80	72.15
Aug. 31	54.85	74.10
Oct. 4	[f] 58.70	70.25
1928		
Apr. 25	54.80	74.15
Sept. 26	56.95	72.00
1929		
Apr. 16	55.25	73.70

3811J1. Well used for stock. Bench mark is iron support for pipe, 0.20 foot above ground; altitude, 137.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 6	[p] 61.20	76.50
Nov. 27	[p] 61.15	76.55
1926		
Apr. 29	61.25	76.45
June 23	[f] 67.15	70.55
Aug. 23	61.95	75.75
Oct. 19	61.70	76.00
Dec. 14	61.75	75.95
1927		
Feb. 22	[a] 60.20	77.50
Apr. 27	61.70	76.00
July 30	62.75	74.95
Aug. 26	62.40	75.30
Oct. 4	[f] 69.90	67.80
Oct. 26	69.60	68.10
Nov. 26	62.15	75.55
Dec. 15	62.10	75.60
1928		
Jan. 18	62.00	75.70
Feb. 16	[a] 61.95	75.75
Mar. 20	62.05	75.65
Apr. 25	61.95	75.75
May 22	62.10	75.60
June 19	[f] 70.50	67.20
July 17	66.40	71.30
Aug. 22	66.15	71.55
Sept. 26	[f] 68.55	69.15
Oct. 20	62.70	75.00
Nov. 19	62.60	75.10
Dec. 17	62.35	75.35
1929		
Jan. 21	61.65	76.05
Feb. 18	62.00	75.70
Mar. 19	62.35	75.35
Apr. 16	[z] 62.40	75.30
May 28	64.00	73.70
June 20	([f])	--------

[a] Creekor river flowing near by.
[f] Windmill running.
[p] By Cyril Williams.
[z] Water standing in adjacent channel.

Measurements of depth to water in observation wells—Continued

3811N1. Marshall Davis. 10-inch well, not in use. Bench mark is blue cross at top of casing, 0.2 foot above ground; altitude, 166.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 6	[p] 93.80	72.35
Nov. 27	[p] 94.05	72.10
1926		
June 10	98.00	68.15
Aug. 23	([l])	---------

3811N2. Marshall Davis. 4-foot well, used for domestic supply. Bench mark is copper washer on well cover, 1.00 foot above ground; altitude 159.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 6	[p] 96.80	62.55
Nov. 27	[p] 96.10	63.25
1926		
June 10	96.70	62.65
1927		
June 10	97.30	62.05

3812P1. Frank Breitenbucker. 4-foot well, 209 feet deep, used for domestic supply. Bench mark is copper washer on well cover, 0.5 foot above ground; altitude 183.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 8	116.10	67.40
Aug. 23	117.20	66.30
Oct. 19	116.60	66.90
Dec. 14	117.60	65.90
1927		
Feb. 22	117.10	66.40
Apr. 27	116.90	66.60
June 10	[f] 116.70	66.80
Sept. 7	116.75	66.75
1928		
Apr. 25	117.50	66.00
Sept. 29	118.10	65.40
1929		
Apr. 16	118.35	65.15

[f] Windmill running.
[l] Caved in.
[p] By Cyril Williams.

3814D1. C. D. Mohrmann. 3-foot well, 203 feet deep, used for domestic supply. Bench mark until April 27, 1927, copper washer on well curb, 1 foot above ground, altitude 187.60 feet; after that date, 0.05 foot above old bench mark, altitude 187.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 10	122.70	64.90
Aug. 23	126.20	61.40
Oct. 19	123.10	64.50
Dec. 14	123.60	64.00
1927		
Feb. 22	123.30	64.30
Apr. 27	[h] 123.60	64.00
June 10	[f] 123.45	64.20
Sept. 7	127.30	60.35
1928		
Apr. 25	124.30	63.35
Sept. 29	124.90	62.75
1929		
Apr. 16	125.05	62.60

3814J1. 5-foot well, not in use. Bench mark is copper washer on 2 by 12 inch well cover, 1.00 foot above ground; altitude 146.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 6	[p] 84.35	62.25
Nov. 27	[p] 84.35	62.25
1926		
Apr. 28	84.50	62.10
June 16	84.65	61.95
Aug. 23	84.95	61.65
Oct. 19	85.10	61.50
Dec. 14	85.90	60.70
1927		
Feb. 22	86.45	60.15
Apr. 27	86.60	60.00
June 10	85.40	61.20
July 30	85.60	61.00
Aug. 31	86.65	59.95
Sept. 27	86.15	60.45
Oct. 29	86.85	59.75
Nov. 26	88.05	58.55
Dec. 15	Dry.	
1928		
Jan. 18	86.00	60.60
Feb. 16	86.00	60.60
Mar. 20	86.10	60.50
Apr. 25	[y] Dry.	

[f] Windmill running.
[h] New measuring point.
[p] By Cyril Williams.
[y] Abandoned.

3814Q1. William McPherson. 8-inch well, 190 feet deep, used for domestic supply. Bench mark is copper washer on 6 by 6 inch pump support, 1.50 feet above ground; altitude, 174.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Nov. 4	112.55	62.40
Dec. 14	118.25	56.70
1927		
Feb. 22	112.60	62.35
Apr. 27	112.60	62.35
June 10	[g] 112.60	62.35
1928		
Apr. 25	117.80	57.15
Sept. 29	114.30	60.65

3815D1. Joe Strmiska. 6-inch well, 225 feet deep, used for domestic supply. Bench mark is top of well curb, 0.7 foot above ground; altitude, 152.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 28	90.80	61.90
June 16	91.10	61.60
Aug. 23	91.70	61.00
Oct. 19	91.60	61.10
Dec. 14	91.60	61.10
1927		
Feb. 22	91.35	61.35
Apr. 27	91.40	61.30
June 10	[f] 91.50	61.20
July 30	92.00	60.70
Aug. 31	92.25	60.45
Sept. 27	92.20	60.50
Oct. 29	92.35	60.35
Nov. 26	92.40	60.30
1928		
Jan. 18	92.10	60.60
Feb. 16	93.50	59.20
Mar. 20	93.25	59.45
Apr. 25	92.15	60.55
May 22	92.45	60.25
June 19	[f] 93.15	59.55
July 17	94.50	58.20
Aug. 22	95.30	57.40
Sept. 29	96.00	56.70
Oct. 20	93.65	59.05
Nov. 18	94.15	58.55
1929		
Jan. 21	95.65	57.05
Feb. 18	95.50	57.20
Mar. 19	92.80	59.90
Apr. 15	93.20	59.50
May 28	93.65	59.05
June 20	([c])	---------

[c] Pumping.
[f] Windmill running.
[g] Pump stopped a short time before measurement.

Measurements of depth to water in observation wells—Continued

3815K1. *Frank Weiblen.*, *4-foot* well, 75 feet deep, used for domestic supply. Bench mark until July 17, 1928, end of bolt on pulley support, 2.5 feet above ground; altitude, 130.20 feet; after that date, top of concrete curb; altitude, 129.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 6	[p] 71.10	59.10
1926		
Apr. 29	71.35	58.85
June 16	71.55	58.65
Aug. 23	72.00	58.20
Oct. 19	72.10	58.10
Dec. 14	72.30	57.90
1927		
Feb. 22	72.15	58.05
Apr. 27	72.40	57.80
June 10	72.20	58.00
July 30	72.75	57.45
Aug. 31	72.90	57.30
Sept. 27	[f] 74.10	56.10
Oct. 29	[g] 73.75	56.45
Nov. 26	72.95	57.25
Dec. 15	68.10	62.10
1928		
Jan. 18	73.30	56.90
Feb. 16	73.40	56.80
Mar. 20	74.15	56.05
Apr. 25	73.50	56.70
May 22	73.10	57.10
June 19	74.80	55.40
July 17	[h] 73.30	56.40
Aug. 22	74.70	55.00
Sept. 29	74.70	55.00
Oct. 20	73.70	56.00
Nov. 18	75.50	54.20
Dec. 17	73.30	55.90
1929		
Jan. 21	73.85	55.85
Feb. 18	77.20?	52.50?
Mar. 19	77.00?	52.70?
Apr. 15	73.80	55.90
May 28	74.45	55.25
June 20	75.40	54.30

3817C1. 8-inch well, 60 feet deep, used for stock. Bench mark is top of casing, altitude 97.10 feet, which is 0.70 foot below reference bench mark, a copper washer on 4 by 6 inch pump support, 2.0 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 19	[p] 43.40	53.70
Nov. 27	[p] 43.40	53.70
3817C1—Con.		
1926		
Apr. 28	43.60	53.50
June 16	43.90	53.20
Aug. 23	43.95	53.15
Oct. 19	44.20	52.90
Dec. 14	44.35	52.75
1927		
Feb. 22	44.45	52.65
Apr. 27	44.50	52.60
June 10	44.50	52.60
Sept. 27	44.80	52.30
1928		
Apr. 25	45.15	51.95
Sept. 29	45.60	51.50
1929		
Apr. 15	45.85	51.25

3817N1. 4-inch well, used for stock. Bench mark is top of casing, 1.2 feet above ground altitude 97.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 27	[p] 46.35	51.15
1926		
Apr. 28	46.50	51.00
May 18	46.50	51.00
July 21	46.90	50.60
Aug. 17	47.10	50.40
Sept. 18	47.30	50.20
Oct. 13	47.30	50.20
Nov. 12	47.35	50.15
Dec. 9	47.40	50.10
1927		
Jan. 15	47.10	50.40
Feb. 10	47.05	50.45
Mar. 15	47.20	50.30
Apr. 16	47.05	50.45
May 31	47.20	50.30
June 10	47.25	50.25
July 30	47.60	49.90
Aug. 20	47.75	49.75
Sept. 27	(f)	--------
Oct. 26	(f)	--------
Nov. 26	47.90	49.60
Dec. 15	48.10	49.40
1928		
Jan. 18	[b] 47.95	49.55
Feb. 16	48.20	49.30
Mar. 20	[b] 48.00	49.50
Apr. 23	47.95	49.55
May 22	48.00	49.50
June 19	48.20	49.30
July 17	48.45	49.05
Aug. 22	48.60	48.90
Sept. 22	48.80	48.70
Oct. 20	48.85	48.65
Nov. 18	48.80	48.70
Dec. 17	48.75	48.75
3817N1—Con.		
1929		
Jan. 21	49.00	48.50
Feb. 18	48.85	48.65
Mar. 19	48.90	48.60
Apr. 15	48.90	48.60
May 28	49.20	48.30
June 20	49.30	48.20

3818P1. 6-inch well, not in use. Bench mark is pump flange, 0.5 foot above ground; altitude 95.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Nov. 11	[p] 47.45	48.30
Nov. 27	[p] 47.35	48.40
1926		
June 14	47.80	47.95
July 21	49.10	46.65
Aug. 16	48.40	47.35
Sept. 18	48.55	47.20
Oct. 13	48.50	47.25
Nov. 12	48.35	47.40
Dec. 9	48.25	47.50
1927		
Jan. 15	48.05	47.70
Feb. 10	48.95	46.80
Mar. 15	48.05	47.70
Apr. 16	47.90	47.85
May 31	48.40	47.35
June 10	48.70	47.05
July 30	48.80	46.95
Aug. 20	49.05	46.70
Sept. 27	49.15	46.60
Oct. 26	49.00	46.75
Nov. 26	48.85	46.90
1928		
Jan. 18	51.00	44.75
Feb. 16	48.60	47.15
Mar. 20	49.20	46.55
Apr. 23	49.55	46.20
May 22	49.20	46.55
June 19	49.50	46.25
July 17	49.80	45.95
Aug. 22	50.20	45.55
Sept. 22	50.05	45.70
1929		
Apr. 15	50.00	45.75

3819J1. John Pugno. (See p. 226.) Bench mark is top of casing, altitude 53.30 feet, which is 23.60 feet below reference bench mark, a copper washer on sill at west side of pump shed, 0.5 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	7.00	46.30
May 20	7.00	46.30
Aug. 17	[c] 14.90	38.40
Oct. 14	7.40	45.90
Dec. 8	7.00	46.30

[f] Windmill running.

[g] Pump stopped a short time before measurement.

[h] New measuring point.

[p] By Cyril Williams.

[b] Water in ditch near by.

[f] Windmill running.

[p] By Cyril Williams.

[c] Pumping.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3819J1—Con.		
1927		
Jan. 15	6.80	46.50
Feb. 10	6.65	46.65
Mar. 15	6.60	46.70
Apr. 16	6.55	46.75
May 28	7.40	45.90
June 24	8.40	44.90
Aug. 24	8.75	44.55
Sept. 27	8.45	44.85
1928		
Apr. 23	(c)	---------
Sept. 22	9.80	43.50
1929		
Apr. 15	9.15	44.15
3820L1. A. Backman. 60-inch well, over 200 feet deep, used for domestic supply. Bench mark is copper washer on well cover 1.3 feet above ground; altitude 94.00 feet		
1926		
Apr. 29	41.65	52.35
June 16	43.10	50.90
Aug. 23	44.10	49.90
Oct. 19	43.05	50.95
Dec. 14	54.05	50.95
1927		
Feb. 22	42.70	51.30
Apr. 27	42.50	51.50
June 10	43.30	50.70
Sept. 27	44.35	49.65
1928		
Apr. 25	43.80	50.20
Sept. 29	45.65	48.35
1929		
Apr. 15	45.80	48.20
May 28	46.70	47.30
June 20	46.80	47.20
3826J1. L. M. Walker. 8-inch well, not in use. Bench mark is top of casing, 1.5 feet above ground; altitude 120.55 feet		
1926		
Apr. 29	60.50	60.05
June 16	61.10	59.45
Aug. 23	62.05	58.50
Oct. 19	61.90	58.65
Dec. 14	61.65	58.90
1927		
Feb. 22	61.20	59.35
Apr. 27	61.05	59.35
June 10	61.25	59.30
Sept. 27	62.70	57.85
3826J1—Con.		
1928		
Apr. 25	62.10	58.45
Sept. 29	63.95	56.60
1929		
Apr. 15	63.40	57.15
May 28	64.15	56.40
June 20	64.30	56.25
3827P1. 8-inch well, not in use. Bench mark is top of casing, 1.5 feet above ground; altitude 117.30 feet		
1926		
Apr. 29	60.65	56.75
June 16	61.80	55.50
Aug. 23	62.80	54.50
Oct. 19	61.95	55.35
Dec. 14	61.65	55.65
1927		
Feb. 22	61.35	55.95
Apr. 27	61.00	56.30
June 10	61.25	56.05
Sept. 27	62.95	54.35
1928		
Apr. 25	62.15	55.15
Sept. 29	64.30	53.00
1929		
Apr. 15	63.85	53.45
May 28	64.95	52.35
June 20	65.10	52.20
3828K1. A. B. Dassal. 10-inch well, used for stock. Bench mark is top of casing, altitude 106.05 feet, which is 1.0 foot below reference bench mark, a copper washer on 4 by 4 inch pipe support, 2.0 feet above ground. All measurements made from top of casing		
1926		
Apr. 29	55.25	50.80
June 16	[f] 54.35	51.70
Aug. 23	54.65	51.40
Oct. 19	53.30	52.75
Dec. 14	53.05	53.00
1927		
Apr. 27	52.40	53.65
June 10	[f] 53.50	52.55
Sept. 27	54.40	51.65
1928		
Apr. 25	53.75	52.30
Sept. 29	55.60	50.45
1929		
Apr. 15	56.45	49.60
3829L1. 8-inch well, used for stock. Bench mark until Sept. 27, 1927, copper washer on 2 by 4 inch pump support, 0.7 foot above ground, altitude 99.45 feet; from that date until Apr. 15, 1929, top of casing, 0.3 foot above ground, altitude 99.05 feet; after Apr. 15, 1929, top of casing, altitude 98.95 feet		
1926		
Apr. 28	48.40	51.05
June 16	49.65	49.80
Aug. 23	(y)	---------
Oct. 19	49.55	49.90
Dec. 14	49.25	50.20
1927		
Feb. 22	49.65	49.80
Apr. 27	48.70	50.75
June 10	49.65	49.80
Sept. 27	[h] 50-25	48.80
1928		
Apr. 25	49.65	49.30
Sept. 29	51.20	47.75
1929		
Apr. 15	[h] 51.20	47.75
May 28	52.25	46.70
June 20	52.50	46.45
3831E1. Mrs. T. M. Plotz. 10-inch well, 145 feet deep, used for domestic supply. Bench mark is top of casing, altitude 63.90 feet, which is 13.80 feet below reference bench mark, a copper washer on well cover, 1.30 feet above ground. All measurements made from top of casing		
1926		
May 20	20.40	43.50
June 15	22.00	41.90
July 21	21.60	42.30
Aug. 16	21.70	42.20
Sept. 17	[c] 26.40	37.50
Oct. 13	19.90	44.00
Nov. 12	19.70	44.20
Dec. 8	19.30	44.60
1927		
Jan. 13	19.15	44.75
Feb. 9	18.90	45.00
Mar. 15	18.65	45.25
Apr. 16	18.40	45.50
May 31	20.00	43.90
June 23	23.40	40.50
Aug. 21	22.85	41.05
Sept. 27	21.15	42.75
1928		
Apr. 23	20.25	43.65
Sept. 22	22.85	41.05

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[c] Pumping.

[f] Windmill running.

[c] Pumping.

[h] New measuring point.

[y] Dry at 50.00 feet.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
3831E1—Con.		
1929		
Apr. 15	22.25	41.65
3831R1. Ed. A. Metcalfe. 10-inch well, used for domestic supply. Bench mark is top of casing, 17.00 feet below ground; altitude, 62.20 feet [d]		
1926		
Apr. 1	[e] 16.10	46.10
Apr. 26	[e] 15.70	46.50
Sept. 20	17.85	44.35
1927		
Apr. 19	15.95	46.25
Sept. 13	18.75	43.45
1928		
Apr. 16	17.75	44.45
Sept. 17	20.20	42.00
1929		
Apr. 9	19.30	42.90
3833C1. J. E. Frazier. 8-inch well, used for domestic supply. Bench mark is top iron clamp on top of casing, 1.7 feet above ground; altitude 98.10 feet		
1926		
Apr. 29	46.20	51.90
June 16	[i] 47.15	50.95
Aug. 23	47.70	50.40
Oct. 19	45.85	52.25
Dec. 14	45.50	52.60
1927		
Feb. 22	45.05	53.05
Apr. 27	44.90	53.20
June 10	[f] 46.70	51.40
1928		
Apr. 25	46.30	51.80
Sept. 29	48.30	49.80
1929		
Apr. 15	48.25	49.85
May 28	49.55	48.55
June 20	[f] 50.70	47.40

[d] By city of Stockton.

[e] By G. H. Teale, State division of water rights.

[f] Windmill running.

[i] Pump running in adjacent well.

Date	Depth to water (feet)	Altitude of water table (feet)
3835A1. 36-inch well, used for domestic supply. Bench mark is copper washer on 4 by 6 inch pump support, 0.4 foot above ground; altitude, 136.30 feet		
1926		
Apr. 29	76.90	59.40
395A1. Chris Winzelburger. 4-foot well, used for domestic supply. Bench mark is copper washer on pump support, 0.8 foot above ground; altitude, 293.45 feet		
1926		
June 10	55.40	238.05
Aug. 24	55.50	237.95
Oct. 19	55.40	238.05
Dec. 14	56.55	236.90
1927		
Feb. 26	55.65	237.80
Apr. 27	55.65	237.80
Oct. 4	55.70	237.75
1928		
Apr. 26	55.70	237.75
Sept. 29	[f] 55.70	237.75
441J1. 6-inch well, used for domestic supply. Bench mark is under side of pump collar, altitude 1.30 feet, which is 0.50 foot above reference bench mark, a copper washer in 8 by 8 inch wooden pump base 0.6 foot above ground. All measurements made from pump collar		
1926		
May 15	5.20	−3.90
June 9	5.85	−4.55
July 19	7.20	−5.90
Aug. 12	7.40	−6.10
Sept. 14	8.10	−6.80
Oct. 12	7.90	−6.60
Nov. 9	7.40	−6.10
Dec. 7	5.90	−4.60
1927		
Jan. 12	5.40	−4.10
Feb. 8	4.60	−3.30
Mar. 10	4.35	−3.05
Apr. 13	4.50	−3.20
May 21	5.40	−4.10
Aug. 18	7.45	−6.15
Sept. 30	7.80	−6.50
1928		
Apr. 26	4.50	−3.20
1929		
Apr. 16	5.20	−3.90

[f] Windmill running.

Date	Depth to water (feet)	Altitude of water table (feet)
453A1. 8-inch well, not in use. Bench mark is top of casing, altitude 8.80 feet, which is 1.60 feet below reference bench mark, a copper washer on pump platform 2.1 feet above ground. All measurements made from top of casing		
1926		
May 13	8.40	0.40
June 9	9.20	−.40
July 19	9.90	−1.10
Aug. 12	10.30	−1.50
Sept. 14	10.75	−1.95
Oct. 12	11.15	−2.35
Nov. 9	11.20	−2.40
Dec. 7	10.60	−1.80
1927		
Jan. 12	10.35	−1.55
Feb. 8	9.85	−1.05
Mar. 10	8.70	.10
Apr. 13	8.25	.55
May 21	8.10	.70
Aug. 18	9.90	−1.10
Sept. 30	10.30	−1.50
1928		
Apr. 3	10.65	−1.85
Apr. 26	8.75	.05
Sept. 20	10.80	−2.00
1929		
Mar. 7	9.85	−1.05
Apr. 16	10.15	−1.35
453C1. F. A. Roberts. 6-inch well, used for domestic supply. Bench mark until Oct. 12, 1926, copper washer on old 4 by 4 inch beam of pump platform 0.8 foot above ground, altitude 9.95 feet; after that date, top of casing, altitude 9.95 feet, which is 0.3 foot below reference bench mark, a copper washer on pump support		
1926		
May 13	5.60	4.35
June 9	6.35	3.60
July 19	7.70	2.25
Aug. 12	7.50	2.45
Sept. 14	7.90	2.05
Oct. 12	[h] 9.30	.65
Nov. 9	[i] 9.70	.25
Dec. 7	8.15	1.80
1927		
Jan. 12	8.20	1.75
Feb. 8	7.90	2.05
Mar. 10	5.70	4.25
Apr. 13	5.40	4.55
May 21	5.20	4.75
Aug. 18	6.80	3.15
Sept. 30	7.25	2.70

[i] Pump running in adjacent well.

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
453C1—Con.		
1928		
Apr. 3	5.45	4.50
Apr. 26	6.30	3.65
Sept. 20	f 9.55	.40
1929		
Apr. 16	7.55	2.40

453L1. Western Pacific R. R. Co. 18-inch well, 270 feet deep, used for industrial purposes. Bench mark is top of casing, altitude 9.45 feet, which is 4.90 feet below reference bench mark, a copper washer on doorstep, 1.1 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1924		
July 19	w 9.75	−0.30
Do	e w 18.60	−9.15
Nov. 1	w 9.80	−.35
1926		
Apr. 26	6.50	2.95
May 15	8.40	1.05
June 19	9.80	−.35
July 19	e 21.80	−12.35
July 28	w 9.30	.15
Do	e w 20.25	−10.80
July 31	w 9.35	.10
Do	e w 19.90	−10.45
Aug. 4	w 9.55	−.10
Do	e w 20.80	−11.35
Aug. 7	w 9.60	−.15
Do	e w 21.30	−11.85
Aug. 11	w 10.85	−1.40
Do	e w 21.35	−11.90
Aug. 12	g w 14.20	−4.75
Aug. 14	w 12.00	−2.55
Do	e w 22.00	−12.55
Aug. 22	w 9.80	−.35
Do	e w 21.00	−11.55
Sept. 4	w 11.40	−1.95
Do	e w 22.20	−12.75
Sept. 11	w 9.20	.25
Do	e w 21.10	−11.65
Sept. 14	e 22.80	−13.35
Sept. 18	w 9.90	−.45
Do	e w 21.80	−12.35
Sept. 25	w 9.80	−.35
Do	e w 21.75	−12.30
Oct. 2	w 9.65	−.20
Do	e w 21.50	−12.05
Oct. 12	10.00	−.55
Oct. 16	w 9.65	−.20
Do	e w 21.65	−12.20
Oct. 23	w 10.00	−.55
Do	e w 22.35	−12.90
Nov. 9	10.80	−1.35
Dec. 7	10.15	−.70
Dec. 11	w 9.50	−.05
Do	e w 21.50	−12.05
453L1—Con.		
1927		
Jan. 12	9.50	−.05
Feb. 8	8.80	.65
Mar. 10	6.80	2.65
Apr. 13	6.35	3.10
Aug. 18	10.90	−1.45
Sept. 30	11.40	−1.95
1928		
Apr. 3	6.55	2.90
Apr. 26	7.35	2.10
Sept. 20	13.75	−4.30
1929		
Apr. 16	12.80	−3.35

455H1. 6-inch well, not in use. Bench mark until Nov. 9, 1926, top of casing, 3.8 feet above ground; altitude, 6.25 feet; after that date, top of casing; altitude, 3.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	10.00	−3.75
May 15	10.10	−3.85
June 9	b 9.55	−3.30
July 19	10.10	−3.85
Aug. 12	10.05	−3.80
Sept. 14	9.90	−3.65
Oct. 12	10.00	−3.75
Nov. 9	h 7.55	−3.80
Dec. 7	7.05	−3.30
1927		
Jan. 12	7.00	−3.25
Feb. 8	6.55	−2.80
Mar. 10	4.90	−1.15
Apr. 13	4.95	−1.20
May 21	b 6.40	−2.65
Aug. 18	7.80	−4.05
Sept. 30	6.95	−3.20
1928		
Apr. 3	7.10	−3.35
Apr. 26	7.15	−3.40
Sept. 20	6.00	−2.25
1929		
Apr. 16	7.25	−3.50

455J1. H. R. Capples(?). 4-inch well, 300 feet deep, used for domestic supply. Bench mark is top of casing, altitude 3.85 feet, which is 0.40 foot above reference bench mark, a copper washer set on door sill, 0.4 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	7.70	−3.85
May 15	e 8.50	−4.65
455J1—Con.		
1926		
June 9	8.05	−4.20
July 19	8.55	−4.70
Aug. 12	f 9.45	−5.60
Sept. 14	9.00	−5.15
Oct. 12	9.05	−5.20
Nov. 9	8.55	−4.70
Dec. 7	9.75	−5.90
1927		
Jan. 12	7.80	−3.95
Feb. 8	7.50	−3.65
Mar. 10	6.20	−2.35
Apr. 13	6.20	−2.35
Aug. 18	f 9.05	−5.20
Sept. 30	f 9.65	−5.80
1928		
Apr. 3	7.55	−3.70
Apr. 26	7.45	−3.60
Sept. 20	f 10.15	−6.30
1929		
Apr. 16	7.95	−4.10

456L1. Charles Lamb Co. 4-inch well, 140 feet deep, not in use. Bench mark is top of casing, 0.3 foot above ground; altitude, 4.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	11.50	−6.70
May 15	11.80	−7.00
June 9	12.30	−7.50
July 19	13.15	−8.35
Aug. 12	13.50	−8.70
Sept. 14	13.70	−8.90
Oct. 12	13.20	−8.40
Nov. 9	12.55	−7.75
Dec. 7	12.30	−7.50
1927		
Jan. 12	12.20	−7.40
Feb. 8	11.60	−6.80
Mar. 10	10.60	−5.80
Apr. 13	10.15	−5.35
May 21	10.80	−6.00
Aug. 18	12.80	−8.00
Sept. 30	13.05	−8.25
1928		
Apr. 3	11.25	−6.45
Apr. 26	11.55	−6.75
Sept. 20	13.05	−8.25
1929		
Apr. 16	11.80	−7.00

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[e] Pumping.
[f] Windmill running.
[g] Pump stopped a short time before measurement.
[w] Measurement by owner.

[b] Water in ditch nearby.
[e] Pumping.
[h] New measuring point.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

456L2. Charles Lamb Co. 6-inch well, 52 feet deep, used for stock. Bench mark is top of casing, altitude −5.70 feet, which is 10.2 feet below reference bench mark, a copper washer on pit curb at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	1.00	−6.70
May 15	1.20	−6.90
1927		
May 21	.30	−6.00

457G1. Charles Lamb Co. 6-inch well, 32 feet deep, used for stock. Bench mark is top of casing, 1.70 feet above ground; altitude, 1.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	[f] 10.40	−8.60
May 15	10.20	−8.40
June 9	11.30	−9.50
July 19	[f] 12.25	−10.45
Aug. 12	10.50	−8.70
Sept. 14	9.95	−8.15
Oct. 12	8.00	−6.20
Nov. 9	6.30	−4.50
Dec. 7	5.90	−4.10
1927		
Jan. 12	5.90	−4.10
Feb. 8	5.15	−3.35
Mar. 10	4.55	−2.75
Apr. 13	5.85	−4.05
May 21	8.00	−6.20
Aug. 18	10.95	−9.15
Sept. 30	11.80	−10.00
1928		
Apr. 26	9.55	−7.75
Sept. 20	11.25	−9.45
1929		
Apr. 16	9.20	−7.40

459J1. 6-inch well, not in use. Bench mark is top of casing, 1.50 feet above ground; altitude 0.90 foot

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 19	7.50	−6.60
Aug. 12	7.60	−6.70
Sept. 14	7.60	−6.70
Oct. 12	6.90	−6.00
Nov. 9	6.00	−5.10
1927		
Aug. 18	7.80	−6.90
Sept. 30	7.65	−6.75
1928		
Apr. 26	(k)	--------

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[f] Windmill running.
[k] Well destroyed.

459N1. Mrs. E. R. Cornell. 4-inch well, 3.50 feet deep, used for stock. Bench mark until June 9, 1926, copper washer on pump collar, 1.3 feet above ground, altitude 0.15 foot; after that date, at ground surface, altitude −1.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	2.50	−2.35
May 15	2.60	−2.45
June 9	[h] 2.90	−4.05
July 19	2.90	−4.05
Aug. 12	3.40	−4.55
Sept. 14	3.30	−4.45
Oct. 12	3.00	−4.15
Nov. 9	2.70	−3.85
1927		
May 21	2.10	−3.25
Aug. 18	3.00	−4.15
Sept. 30	3.35	−4.50
1928		
Apr. 26	1.30	−2.45
Sept. 20	(k)	--------

4510D1. J. K. Dawson. 6-inch well, 82.50 feet deep, used for domestic supply. Bench mark until Apr. 16, 1929, top of casing, altitude 12.30 feet, which is 1.15 feet below reference bench mark, a copper washer on pump support, 1.2 feet above ground; after that date, top of casing, altitude 5.40 feet, which is 7.0 feet below ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	8.20	4.10
May 15	9.60	2.70
June 9	10.55	1.75
July 19	[f] 12.90	−.60
Aug. 12	13.65	−1.35
Sept. 14	13.80	−1.50
Oct. 12	12.30	.00
Nov. 9	13.00	−.70
Dec. 7	12.00	.30
1927		
Jan. 12	11.60	1.70
Feb. 8	10.70	1.60
Mar. 10	8.90	3.40
Apr. 13	8.35	3.95
May 21	9.30	3.00
Aug. 18	[f] 13.00	−.70
Sept. 30	11.55	.75
1928		
Apr. 3	10.75	1.55
Apr. 26	[f] 9.45	2.85
Sept. 20	12.50	−.20
1929		
Apr. 16	[h] 4.85	.55

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[f] Windmill running.
[h] New measuring point.
[k] Well destroyed.

4511J1. 6-inch well, used for stock. Bench mark is top of casing, altitude 10.30 feet, which is 0.70 foot below reference bench mark, a copper washer in wooden pump support 0.70 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	3.80	6.50
May 15	5.50	4.80
June 9	4.85	5.45
July 19	7.30	3.00
Aug. 12	8.70	1.60
Sept. 14	8.10	2.20
Oct. 12	9.00	1.30
Nov. 9	9.85	.45
Dec. 7	9.00	1.30
1927		
Jan. 12	8.45	1.85
Feb. 8	6.75	3.55
Mar. 10	4.55	5.75
Apr. 13	5.00	5.30
May 21	4.90	5.40
Aug. 18	[f] 7.40	2.90
Sept. 30	[b] [f] 7.50	2.80
1928		
Apr. 3	3.50	6.80
Apr. 26	4.90	5.40
Sept. 19	5.65	4.65
1929		
Apr. 16	6.15	4.15

4512N1. O. S. Murphy and E. R. Hopkins. 8-inch well, 75 feet deep, used for domestic supply. Bench mark is top of casing, altitude 15.70 feet, which is 1.80 feet below reference bench mark, a copper washer on pump support, 2.2 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	5.20	10.50
May 15	6.40	9.30
June 9	7.90	7.80
July 19	9.65	6.05
Aug. 12	10.85	4.85
Sept. 14	11.50	4.20
Oct. 12	10.55	5.15
Nov. 9	10.50	5.20
Dec. 7	9.85	5.85
1927		
Jan. 12	9.25	6.45
Feb. 8	7.95	7.75
Mar. 10	5.10	10.60
Apr. 13	5.15	10.55
May 21	5.95	9.75
Aug. 18	9.60	6.10
Sept. 30	9.75	5.95

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[b] Water in ditch near by.
[f] Windmill running.

Measurements of depth to water in observation wells—Continued

4512N1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 3	3.90	11.80
Apr. 26	4.65	11.05
Sept. 19	12.65	3.05
1929		
Apr. 16	10.90	4.80

4512R1. W. G. Erick. 6-inch well, used for domestic supply. Bench mark is top of casing, at ground surface, altitude 20.60 feet, which is 0.45 foot below reference bench mark, a bolthead on pump support. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	8.20	12.40
May 14	8.55	12.05
June 8	9.95	10.65
July14	12.25	8.35
Aug. 19	13.45	7.15
Sept. 13	13.45	7.15
Oct. 11	13.15	7.45
Nov. 8	12.95	7.65
Dec. 6	11.65	8.95
1927		
Jan .10	12.00	8.60
Feb. 7	11.30	9.30
Mar. 7	8.30	12.30
Apr. 12	7.60	13.00
May 19	8.35	12.25
June 16	11.45	9.15
July 18	14.10	6.50
Aug. 17	12.20	8.40
Sept. 17	12.80	7.80
Oct. 24	12.35	8.25
Nov. 26	11.50	9.10
Dec. 22	11.85	8.75
1928		
Jan. 26	11.10	9.50
Feb 28	10.45	10.15
Mar. 24	10.00	10.60
Mar. 27	2.35	18.25
Apr. 3	4.15	16.45
Apr. 17	6.00	14.60
May 23	7.60	13.00
June 19	13.00	7.60
July 24	11.55	9.05
Aug. 21	12.15	8.45
Sept. 18	12.35	8.25
Oct. 23	12.45	8.15
Nov. 21	12.10	8.50
Dec. 14	11.95	8.65
1929		
Jan. 23	11.45	9.15
Feb. 20	11.35	9.25
Mar .21	11.20	9.40
Apr. 8	11.15	9.45
May 27	11.75	8.85
June 20	11.20	9.40

4515G1. C. B. Orvis. 8-inch well, 150 feet deep, used for domestic supply. Bench mark is copper washer on wooden well capping, 1.6 feet above ground; altitude, 10.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	7.30	3.20
May 15	[i] 9.00	1.50
June 9	[c] 10.85	−.35
July 19	11.40	−.90
Aug. 12	[f] 12.30	−1.80
Sept. 14	[f] 12.30	−1.80
Oct. 12	[c] 21.00	−10.50
Nov. 10	[f] 12.30	−1.80
Dec. 7	10.75	−.25
1927		
Jan. 12	9.10	1.40
Feb. 8	7.35	3.15
Mar. 10	5.30	5.20
Apr. 13	6.55	3.95
May 21	[f] 9.30	1.20
Aug. 18	11.15	−.65
Sept. 30	11.30	−.80
1928		
Apr. 3	4.50	6.00
Apr. 26	7.30	3.20
Sept. 19	13.25	−2.75
1929		
Apr. 16	9.30	1.20

4517N1. Libby, McNeill & Libby. 4-inch well, 50 feet deep, not in use. Bench mark is copper washer on pump support, 2 feet above ground; altitude, −1.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	5.50	−6.95
May 15	6.10	−7.55
June 10	7.50	−8.95
July 19	6.80	−8.25
Aug. 12	6.55	−8.00
Sept. 14	7.90	−9 35
Oct. 12	8.00	−9.45
Nov. 10	7.60	−9.05
Dec. 7	6.65	−8.10
1927		
Jan. 12	7.20	−8.65
Feb. 8	5.65	−7.10
Mar. 10	5.40	−6.85
Apr. 13	5.70	−7.15
May 21	5.75	−7.20
Aug. 18	7.40	−8.85
Sept. 30	8.20	−9.65
1928		
Apr. 26	([k])	

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[c] Pumping.
[f] Windmill running.
[i] Pump running in adjacent well.
[k] Well destroyed.

4521H1. Thompson & Folger. 4-inch well, used for stock. Bench mark is top of casing, altitude 6.70 feet, which is 1.45 feet below reference bench mark, a copper washer on pump support, 2.3 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	5.25	1.45
May 15	6.80	−.10
June 10	8.95	−2.25
July 19	9.65	−2.95
Aug. 12	10.10	−3.40
Sept. 14	10.50	−3.80
Oct. 12	10.50	−3.80
Nov. 10	8.60	−1.90
Dec. 7	6.50	.20
1927		
Jan. 12	5.30	1.40
Feb. 8	3.50	3.20
Mar. 10	2.45	4.25
Apr. 13	4.70	2.00
1928		
Oct. 4	9.00	−2.30

4522D1. 5-inch well, used for stock. Bench mark is copper washer on pump support 2.20 feet above ground; altitude, 10.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	4.80	5.85
May 15	6.40	4.25
June 9	[f] 10.00	.65
July 19	8.30	2.35
Aug. 12	[f] 9.50	1.15
Sept. 14	[f] 10.25	.40
Oct. 12	9.20	1.45
Nov. 10	[f] 8.85	1.80
Dec. 7	[f] 10.45	.20
1927		
Jan. 12	6.05	4.60
Feb. 8	3.75	6.90
Mar. 10	3.30	7.35
Apr. 13	4.40	6.25
May 21	[f] 7.40	3.25
Aug. 18	[f] 8.00	2.65
Sept. 30	7.05	3.60
1928		
Apr. 3	1.50	9.15
Apr. 26	5.25	5.40
Sept. 19	9.05	1.60
Oct. 4	8.70	1.95
1929		
Apr. 16	[f] [i] 6.00	4.65

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[f] Windmill running.
[i] Adjacent land flooded.

Measurements of depth to water in observation wells—Continued

4523Q1. Gustave Fuhrmann. Well not in use. Bench mark is top of casing, altitude 14.20 feet, which is 1.70 below reference bench mark, a copper washer on old-pump support, 2.3 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	3.55	10.65
May 15	4.65	9.55
June 10	5.60	8.60
July 19	7.30	6.90
Aug. 12	8.00	6.20
Sept. 14	8.00	6.20
Oct. 12	8.20	6.00
Nov. 10	7.90	6.30
Dec. 7	7.40	6.80
1927		
Jan. 12	7.20	7.00
Feb. 8	5.65	8.55
Mar. 10	4.00	10.20
Apr. 13	4.45	9.95
May 23	6.75	7.45
Aug. 18	7.30	6.90
Sept. 30	7.15	7.05
1928		
Apr. 3	3.55	10.65
Apr. 26	4.60	9.60
Sept. 19	7.70	6.50
1929		
Apr. 16	5.75	8.45

4524A1. W. B. Vandewark. 6-inch well, used for domestic supply. Bench mark is top of casing and copper washer, 0.4 foot above ground; altitude, 16.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	±6.	±10.
June 9	6.20	10.25
July 19	7.30	9.15
Aug. 12	8.35	8.10
Sept. 14	8.75	7.70
Oct. 12	8.90	7.55
Nov. 10	8.30	8.15
Dec. 7	8.15	8.30
1927		
Jan. 12	8.20	8.25
Feb. 8	6.90	9.55
Mar. 10	4.60	11.85
Apr. 13	5.00	11.45
May 21	6.00	10.45
Aug. 18	6.30	10.15
Sept. 30	7.15	9.30
1928		
Apr. 3	5.25	11.20
Apr. 26	5.30	11.15
Sept. 19	7.75	8.70
1929		
Apr. 16	6.50	9.95

4524D1. George Murphy. 6-inch well, 60 feet deep, used for domestic supply. Bench mark mark is top of casing, 0.6 foot above ground; altitude, 21.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	5.10	16.00
May 14	5.80	15.30
June 5	6.45	14.65
July 14	7.55	13.55
Aug. 19	8.90	12.20
Sept. 13	9.50	11.60
Oct. 11	9.80	11.30
Nov. 8	9.70	11.40
Dec. 6	9.60	11.50
1927		
Jan. 10	9.50	11.60
Feb. 7	9.15	11.95
Mar. 7	7.30	13.80
Apr. 12	6.55	14.55
May 19	6.80	14.30
June 16	7.10	14.00
July 18	7.85	13.25
Aug. 17	8.15	12.95
Sept. 17	8.40	12.70
Oct. 24	8.55	12.55
Nov. 26	8.40	12.70
Dec. 22	8.15	12.95
1928		
Jan. 26	8.05	13.05
Feb. 28	7.65	13.45
Mar. 24	7.55	13.55
Mar. 27	7.35	13.75
Apr. 3	7.15	13.95
Apr. 17	6.60	14.50
May 23	6.75	14.35
June 19	6.50	14.60
July 24	6.70	14.40
Aug. 21	7.85	13.25
Sept. 18	8.25	12.85
Oct. 23	8.30	12.80
Nov. 21	8.20	12.90
Dec. 14	8.25	12.85
1929		
Jan. 23	8.25	12.85
Feb. 20	8.00	13.10
Mar. 21	8.00	13.10
Apr. 8	8.05	13.05
May 27	7.45	13.65
June 20	6.50	14.60

4526N1. 6-inch well, not in use. Bench mark is top of casing, 1.8 feet above ground; altitude, 12.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	5.30	6.90
May 15	6.35	5.85
June 10	6.20	6.00
July 19	7.40	4.80
Aug. 12	8.50	3.70
Sept. 14	8.65	3.55
Oct. 12	8.55	3.65
Nov. 10	8.65	3.55
Dec. 7	8.10	4.10
1927		
Jan. 12	7.45	4.75
Feb. 8	5.50	6.70
Mar. 10	5.40	6.80
Apr. 13	5.25	6.95
May 23	6.30	5.90
Aug. 18	6.55	5.65
Sept. 30	6.95	5.25
1928		
Apr. 3	4.20	8.00
Apr. 26	5.90	6.30
Sept. 19	7.40	4.80
1929		
Apr. 16	6.70	5.50

4526P1. Delta Land Co. 6-inch well, used for domestic supply. Bench mark is top of casing, 1.2 feet above ground; altitude, 14.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	6.15	8.55
May 15	6.00	8.70
June 10	6.20	8.50
July 19	9.00	5.70
Aug. 12	8.35	6.35
Sept. 14	8.40	6.30
Oct. 12	8.40	6.30
Nov. 10	8.45	6.25
Dec. 7	8.05	6.65
1927		
Jan. 12	7.80	6.90
Feb. 8	6.10	8.60
Mar. 10	4.40	10.30
Apr. 13	5.30	9.40
May 23	6.10	8.60
Aug. 18	6.80	7.90
Sept. 30	7.15	7.55
1928		
Apr. 3	4.40	10.30
Apr. 26	5.80	8.90
Sept. 19	7.15	7.55
Oct. 4	7.30	7.40
1929		
Apr. 16	7.00	7.70

4533Q1. 3-foot well, not in use. Bench mark is copper washer on well cover, 1.5 feet above ground; altitude, 3.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 27	3.60	0.20
May 15	4.00	-.20

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4533Q2. J. D. Hoppe. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 5.80 feet, which is 1.2 feet below reference bench mark, a copper washer on pump support, 2.7 feet above ground. All measurements made from top of casing		
1926		
Apr. 27	[f] 5.60	0.20
May 15	5.80	.00
June 10	6.30	−.50
July 19	[f] 6.90	−1.10
Aug. 12	6.45	−.65
Sept. 14	6.05	−.25
Oct. 12	5.40	.40
Nov. 10	5.10	.70
Dec. 7	3.90	1.90
1927		
Apr. 13	4.35	1.45
May 23	5.55	.25
Aug. 18	5.15	.65
Sept. 30	5.65	.15
1928		
Apr. 26	5.20	.60
Sept. 19	5.55	.25
1929		
Apr. 16	5.15	.65
4535P1. Charles Kelley. 10-inch well, used for domestic supply. Bench mark is top of casing, altitude 11.70 feet, which is 0.10 foot above reference bench mark, a cross in concrete curb, 0.5 foot above ground. All measurements made from top of casing		
1926		
Apr. 24	3.00	8.70
May 15	3.60	8.10
June 10	4.00	7.70
July 19	5.75	5.95
Aug. 12	5.50	6.20
Sept. 14	5.80	5.90
Oct. 12	5.60	6.10
Nov. 10	5.65	6.05
Dec. 7	4.80	6.90
1927		
Jan. 12	4.50	7.20
Feb. 8	2.65	9.05
Mar. 10	1.95	9.75
Apr. 13	3.05	8.65
May 23	3.40	8.30
Aug. 18	4.75	6.95
Sept. 30	4.50	7.20
1928		
Apr. 3	2.10	9.60
Apr. 26	3.80	7.90
Sept. 19	4.80	6.90
1929		
Apr. 16	3.90	7.80
4536P1. 4-inch well, used for domestic supply. Bench mark is top of casing, 1.0 foot above ground; altitude, 19.30 feet		
1926		
June 10	5.40	13.90
Aug. 12	5.50	13.80
Sept. 14	8.00	11.30
Oct. 12	7.85	11.45
Nov. 10	8.00	11.30
Dec. 7	7.80	11.50
1927		
Jan. 12	8.05	11.25
Feb. 8	7.15	12.15
Mar. 10	5.00	14.30
Apr. 13	5.40	13.90
May 23	5.95	13.35
Aug. 18	6.10	13.20
Sept. 30	6.70	12.60
1928		
Apr. 3	5.40	13.90
Apr. 26	5.65	13.65
Sept. 19	6.15	13.15
1929		
Apr. 16	7.00	12.30
461Q1. 6-inch well, not in use. Bench mark is top of casing, 0.6 foot above ground; altitude, 58.00 feet		
1926		
May 12	23.60	34.40
June 7	23.20	34.80
July 17	25.20	32.80
Sept. 13	24.50	33.50
Oct. 11	24.50	33.50
Nov. 8	23.50	34.50
Dec. 6	24.20	33.80
1927		
Jan. 11	24.10	33.90
Feb. 7	23.90	34.10
Mar. 8	23.55	34.45
Apr. 13	23.60	34.40
July 19	23.95	34.05
Aug. 18	24.35	33.65
Sept. 20	24.45	33.55
Oct. 25	24.30	33.70
Nov. 30	24.35	33.65
Dec. 21	24.00	34.00
1928		
Jan. 25	23.45	34.55
Feb. 23	24.00	34.00
Mar. 21	23.80	34.20
Apr. 17	23.60	34.40
May 24	23.45	34.55
June 21	[i] 29.00	29.00
July 23	24.65	33.35
Aug. 21	25.00	33.00
Sept. 19	25.20	32.80
Oct. 23	25.20	32.80
Nov. 21	25.10	32.90
Dec. 17	25.00	33.00
461Q1—Con.		
1929		
Jan. 23	24.85	33.15
Feb. 20	24.70	33.30
Mar. 21	24.55	33.45
Apr. 9	24.50	33.50
May 27	25.10	32.90
June 20	26.00	32.00
461R3. E. Forget. (See p. 226.) Bench mark is top of wooden wall of pit, at ground surface; altitude, 61.25 feet[p]		
1925		
Oct. 22	[p] 25.10	36.15
1928		
Jan. 7	24.50	36.75
462L1. Brown estate and Friedberger. (See p. 226.) Bench mark is copper washer on north side of curb in 2 by 6 inch plank, at ground surface; altitude, 51.05 feet		
1926		
Apr. 15	23.00	28.05
May 17	23.00	28.05
June 6	23.55	27.50
July 17	[c] 32.10	18.95
Aug. 19	25.75	25.30
Sept. 13	25.70	25.35
Oct. 11	25.60	25.45
Nov. 8	25.55	25.50
Dec. 6	24.95	26.10
1927		
Jan. 10	24.25	26.80
Feb. 7	23.65	27.40
Mar. 8	23.05	28.00
Apr. 12	22.60	28.45
May 20	22.70	28.35
June 17	23.30	27.75
July 18	24.40	26.65
Aug. 17	24.95	26.10
Sept. 20	25.05	26.00
Oct. 25	25.20	25.85
Nov. 30	25.00	26.05
Dec. 21	24.95	26.10
1928		
Jan. 25	24.50	26.55
Feb. 21	23.90	27.15
Mar. 21	23.60	27.45
Apr. 17	23.10	27.95
May 23	23.10	27.95
June 20	24.20	26.85
July 23	25.05	26.00
Aug. 21	25.15	25.90
Sept. 19	25.65	25.40
Oct. 23	25.60	25.45
Nov. 21	25.50	25.55
Dec. 15	25.40	25.65
1929		
Jan. 23	25.10	25.95
Feb. 20	24.40	26.65
Mar. 21	24.00	27.05
Apr. 8	23.85	27.20
May 27	25.00	26.05
June 20	25.20	25.85

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[f] Windmill running.

[i] Pump running in adjacent well.

[c] Pumping.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

463H1. Fred Wageman. (See p. 226.) Bench mark is top of casing, altitude 32.70 feet, which is 13.70 feet below reference bench mark, a copper washer in south side of wooden pump platform 1.80 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	8.50	24.20
June 8	9.60	23.10
July 16	[e] 14.00	18.70
Aug. 19	10.60	22.10
Sept. 13	10.80	21.90
Oct. 11	10.95	21.75
Nov. 8	11.30	21.40
Dec. 6	10.80	21.90
1927		
Jan. 10	10.30	22.40
Feb. 7	9.75	22.95
Mar. 8	9.05	23.65
Apr. 12	8.30	24.40
May 20	8.05	24.65
July 18	9.05	23.65
Aug. 17	9.65	23.05
Dec. 21	10.50	22.20
1928		
Jan. 26	10.05	22.65
Feb. 27	9.60	23.10
Mar. 21	9.40	23.30
Apr. 5	9.10	23.60
Apr. 18	8.70	24.00
May 23	8.30	24.40
June 20	9.00	23.70
July 23	9.70	23.00
Aug. 21	9.95	22.75
Sept. 19	10.40	22.30
Oct. 23	10.65	22.05
Nov. 21	10.80	21.90
Dec. 15	10.85	21.85
1929		
Jan. 23	10.55	22.15
Feb. 20	10.50	22.20
Mar. 21	9.75	22.95
Apr. 8	9.50	23.20
May 27	9.95	22.75
June 20	10.50	22.20

463H2. Anton Stephens. 6-inch well, used for domestic supply. Bench mark is top blue mark on casing; altitude, 45.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Sept. 20	21.70	23.90
Oct. 25	22.10	23.50
Nov. 30	22.15	23.45

465R1. Mrs. C. B. McCauley. 4-inch well, used for domestic supply. Bench mark is top of casing, 0.2 foot above ground; altitude, 33.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	17.20	16.30
June 8	17.65	15.85
July 16	18.75	14.75
Aug. 19	19.55	13.95
Sept. 13	[g] 20.20	13.30
Oct. 11	[e] 22.65	10.85
Nov. 8	20.85	12.65
Dec. 6	20.65	12.85
1927		
Jan. 10	20.15	13.35
Mar. 8	17.15	16.35
Apr. 12	[f] 15.95	17.55
May 20	[f] 15.75	17.75
July 18	17.20	16.30
Aug. 17	18.20	15.30
Sept. 20	[e] 20.90	12.60
Oct. 25	19.90	13.60
Nov. 30	20.15	13.35
Dec. 21	[e] 22.40	11.10
1928		
Jan. 25	19.90	13.60
Feb. 27	19.10	14.40
Mar. 22	18.75	14.75
Apr. 5	17.60	15.90
Apr. 18	16.60	16.90
May 23	16.10	17.40
June 20	16.90	16.60
July 23	18.10	15.40
Aug. 21	18.95	14.55
Sept. 19	19.65	13.85
Oct. 23	20.45	13.05
Nov. 21	20.55	12.95
Dec. 15	20.90	12.60
1929		
Jan. 23	20.90	12.60
Feb. 20	20.20	13.30
Mar. 21	18.70	14.80
Apr. 8	19.20	14.30
May 27	([e])	---------
June 20	19.70	13.80

466C1. Mrs. C. B. McCauley. 4-inch well, used for domestic supply. Bench mark is copper washer on 2 by 6 inch pump support, 1.8 feet above ground; altitude, 27.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	14.40	13.30
June 8	15.30	12.40
July 16	16.70	11.00
Aug. 19	17.70	10.00
466C1—Con.		
1926		
Sept. 13	18.60	9.10
Oct. 11	18.65	9.05
Nov. 8	18.80	8.90
Dec. 6	17.80	9.90
1927		
Jan. 10	16.75	10.95
Mar. 8	12.30	15.40
Apr. 12	[a] 11.05	16.65
May 20	13.30	14.40
June 18	14.35	13.35
July 18	15.50	12.20
Aug. 17	16.70	11.00
Sept. 30	17.65	10.05
Oct. 25	18.30	9.40
Nov. 30	18.15	9.55
Dec. 21	16.55	11.15
1928		
Jan. 25	17.55	10.15
Feb. 27	15.75	11.95
Mar. 22	16.00	11.70
Apr. 17	12.15	15.55
May 23	13.70	14.00
June 20	15.15	12.55
July 23	16.60	11.10
Aug. 21	17.50	10.20
Sept. 19	18.15	9.55
Oct. 23	18.55	9.15
Nov. 21	18.75	8.95
Dec. 15	18.60	9.10
1929		
Feb. 20	16.80	10.90
Mar. 21	16.20	11.50
Apr. 8	16.40	11.30
May 27	17.25	10.45
June 20	17.70	10.00

467D1. Mrs. C. B. McCauley. 7-inch well, 15 feet deep, not used. Bench mark until May 27, 1929, copper washer on top of 4 by 4 inch post, 1.3 feet above ground, altitude 25.55 feet; after that date, top of casing, altitude 24.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	11.80	13.75
June 8	12.70	12.85
July 16	14.20	11.35
Aug. 19	Dry.	---------
1927		
May 20	10.00	15.55
1929		
Apr. 8	14.75	10.80
May 27	[h] 13.65	11.10
June 20	14.00	10.75

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[e] Pumping.

[f] Windmill running.

[g] Pump stopped a short time before measurement.

[a] Creek or river flowing nearby.

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

469P1. Mrs. C. B. McCauley. 4-inch domestic well. Bench mark until June 18, 1927, top of casing, altitude 33.40 feet, which is 0.3 foot below reference bench mark, a copper washer in wooden well cover 1.7 feet above ground; after that date, copper washer in pump support 2.0 feet above ground, altitude 35.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	14.90	18.50
June 6	16.10	17.30
July 16	19.10	14.30
Aug. 19	19.70	13.70
Sept. 13	20.05	13.35
Oct. 11	20.70	12.70
Nov. 22	20.50	12.90
Dec. 6	19.05	14.35
1927		
Jan. 10	18.15	15.25
Feb. 7	17.75	15.65
Mar. 8	15.75	17.65
Apr. 12	14.70	18.70
May 20	11.65	21.75
June 18	[h]14.15	21.40
July 18	17.65	17.90
Aug. 17	20.00	15.55
Sept. 19	21.15	14.40
Oct. 25	21.35	14.20
Nov. 30	20.50	15.05
Dec. 21	20.80	14.75
1928		
Jan. 25	20.55	15.00
Feb. 27	19.95	15.60
Mar. 22	19.85	15.70
Apr. 5	14.75	20.80
Apr. 18	14.95	20.60
May 23	14.90	20.65
June 20	17.85	17.70
July 23	20.30	15.25
Aug. 21	21.40	14.15
Sept. 18	21.90	13.65
Oct. 23	22.15	13.40
Nov. 21	21.70	13.85
Dec. 15	21.75	13.80
1929		
Jan. 23	21.45	14.10
Feb. 20	21.25	14.30
Mar. 21	21.25	14.30
Apr. 8	21.05	14.50
May 27	18.95	16.60
June 20	19.70	15.85

4610N1. Ing Bros. 4-inch well, not in use. Bench mark is top of casing, altitude 38.35 feet, which is 0.9 foot below reference bench mark, a copper washer on old pump support, 2.0 feet above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	18.20	20.15
June 6	[i]20.50	17.85
July 16	20.40	17.95
4610N1—Con.		
1926		
Aug. 19	20.60	17.75
Sept. 13	20.90	17.45
Oct. 11	20.75	17.60
Nov. 22	20.65	17.70
Dec. 6	20.35	18.00
1927		
Jan. 10	19.95	18.40
Feb. 7	19.55	18.80
Mar. 8	18.75	19.60
Apr. 12	17.90	20.45
May 20	17.40	20.95
June 18	[i]19.80	18.55
July 18	19.85	18.50
Aug. 17	19.65	18.70
Sept. 19	19.90	18.45
Oct. 25	20.20	18.15
Nov. 30	19.85	18.50
Dec. 21	19.70	18.65
1928		
Jan. 25	19.50	18.85
Feb. 27	19.15	19.20
Mar. 22	19.15	19.20
Apr. 5	17.80	20.55
Apr. 18	17.35	21.00
May 23	17.30	21.05
June 20	19.40	18.95
July 23	19.90	18.45
Aug. 21	20.15	18.20
Sept. 18	20.35	18.00
Oct. 23	20.50	17.85
Nov. 21	20.40	17.95
Dec. 15	20.35	18.00
1929		
Jan. 23	20.15	18.20
Feb. 20	19.95	18.40
Mar. 6	19.95	18.40
Mar. 21	19.90	18.45
Apr. 8	19.85	18.50
May 27	20.90	17.45
June 20	20.65	17.70

4611D1. F. W. Hitchcock. 6-inch well, used for domestic supply. Bench mark is copper washer on doorsill, 0.6 foot above ground; altitude, 53.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	24.00	29.05
June 7	25.35	27.70
July 17	27.05	26.00
Aug. 20	26.50	26.55
Sept. 13	23.25	29.80
Oct. 11	26.00	27.05
Nov. 8	25.80	27.25
Dec. 6	25.85	27.20
1927		
Jan. 10	25.40	27.65
Feb. 7	22.85	30.20
Mar. 8	24.50	28.55
Apr. 12	24.05	29.00
May 20	23.95	29.10
June 17	24.90	28.15
July 19	26.05	27.00
4611D1—Con.		
1927		
Aug. 18	[f]26.45	26.60
Sept. 20	[f]25.80	27.25
Oct. 25	25.55	27.50
Nov. 30	25.50	27.55
Dec. 21	25.45	27.60
1928		
Jan. 25	25.30	27.75
Feb. 23	24.95	28.10
Mar. 22	24.80	28.25
Apr. 17	[f]24.60	28.45
May 23	[f]24.40	28.65
June 21	26.20	26.85
July 23	[f]27.50	25.55
Aug. 21	26.25	26.80
Sept. 19	26.50	26.55
1929		
Apr. 9	25.40	27.65

4612F1. Tom Herron. 6-inch well, 54 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 4 inch pump support, at ground surface; altitude, 54.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 25	22.40	31.95
June 7	22.55	31.80
July 17	28.55	25.80
Aug. 20	24.00	30.35
Sept. 13	24.20	30.15
Oct. 11	24.15	30.20
Nov. 8	24.10	30.25
Dec. 7	23.90	30.45
1927		
Jan. 11	23.70	30.65
Feb. 7	23.50	30.85
Mar. 10	(l)	---------

4612H1. J. C. Heuer. (See p. 227.) Bench mark is top of concrete wall of pit, at ground surface; altitude, 62.44 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p]26.25	36.19

4612M1. G. A. Jahant. (See p. 227.) Bench mark is floor of pump house, 0.60 foot above ground; altitude, 63.68 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p]28.34	35.34

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[h] New measuring point.

[i] Pump running in adjacent well.

[f] Windmill running.

[l] Caved in.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

4612N1. George Jahant. 10-inch well, used for stock. Bench mark is copper washer in wooden pump support 0.5 foot above ground; altitude, 51.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 25	21.90	29.35
June 8	21.80	29.45
July 17	[f] 23.70	27.55
Aug. 20	23.60	27.65
Sept. 13	[f] 23.90	27.35
Oct. 12	22.90	28.35
Nov. 9	22.65	28.60
Dec. 7	22.30	28.95
1927		
Jan. 11	22.00	29.25
Feb. 7	21.50	29.75
Mar. 10	21.30	29.95
Apr. 13	20.50	30.75
May 20	[f] 22.10	29.15
June 17	[f] 23.20	28.05
July 19	[f] 23.75	27.50
Aug. 18	[f] 24.35	26.90
Sept. 19	24.20	27.05
Oct. 25	[f] 24.40	26.85
Nov. 30	23.20	28.05
1928		
Jan. 26	22.75	28.50
Feb. 21	21.85	29.40
Mar. 22	[f] 22.40	28.85
Apr. 17	21.30	29.95
May 23	[f] 22.55	28.70
June 21	[f] 24.25	27.00
July 24	[f] 24.60	26.65
Aug. 21	25.15	26.10
Sept. 18	24.30	26.95
Oct. 23	24.50	26.75
Nov. 21	23.60	27.65
1929		
Apr. 9	22.90	28.35

4612R1. John Retzinger. 6-inch well, 87 feet deep, used for domestic supply. Bench mark is top of casing, 7.0 feet below ground; altitude, 50.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 25	15.25	35.10
June 7	16.35	34.00
July. 17	18.10	32.25
Aug 20	18.10	32.25
Sept. 13	17.70	32.65
Oct. 12	17.20	33.15
Nov. 9	16.90	33.45
Dec. 7	16.30	34.05
1927		
Jan. 11	15.90	34.45
Feb. 7	15.60	34.75
Mar. 10	15.15	35.20
Apr. 23	14.65	35.70
May 20	15.65	34.70
June 17	16.95	33.40
July 19	(c)	---------
Aug. 18	18.50	31.85
Sept. 20	[c] 15.30	35.05
Oct. 25	17.35	33.00
Nov. 30	16.70	33.65
Dec. 21	16.90	33.45
1928		
Jan. 25	16.05	34.30
Feb. 21	15.90	34.45
Mar. 22	[c] 17.10	33.25
Apr. 17	15.50	34.85
May 23	16.80	33.55
June 21	(c)	---------
July 24	19.50	30.85
Aug. 21	19.35	31.00
Sept. 18	19.00	31.35
Oct. 23	18.30	32.05
Nov. 21	17.75	32.60
Dec. 17	(c)	---------
1929		
Jan. 24	17.00	33.35
Feb. 20	16.65	33.70
Mar. 21	16.85	33.50
Apr. 8	18.45	31.90
May 27	20.25	30.10
June 20	20.50	29.85

4613H1. Carl T. Lind. (See p. 227.) Bench mark is top of concrete wall, at ground surface; altitude, 58.90 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 25.68	33.22

4613M1. L. H. Van Valkenburgh. (See p. 227.) Bench mark is top of concrete wall of pit; altitude, 61.19 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 28.45	32.74

4614J2. D. E. Newton. 8-inch well, 140 feet deep, not in use. Bench mark is top of casing, 0.10 foot below ground; altitude, 43.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	20.40	22.85
June 6	20.80	22.45
July 16	22.70	20.55
Aug. 19	[i] 28.75	14.50
Sept. 13	23.05	20.20
Oct. 11	22.55	20.70
Nov. 8	22.20	21.05
Dec. 6	21.90	21.35
1927		
Jan. 10	21.50	21.75
Feb. 7	21.25	22.00
Mar. 8	20.80	22.49
Apr. 12	20.30	22.95
May 20	[i] 24.60	18.65
July 18	23.15	20.10
Aug. 17	22.90	20.35
Sept. 19	22.65	20.60
Oct. 25	22.20	21.05
Nov. 30	21.80	21.45
1928		
Jan. 26	21.20	22.05
Feb. 27	21.00	22.25
Mar. 22	21.10	22.15
Apr. 5	28.05	15.20
Apr. 18	20.70	22.55
May 23	24.35	18.90
June 20	23.65	19.60
July 23	25.85	17.40
Aug. 21	23.75	19.50
Sept. 18	23.30	19.95
1929		
Apr. 8	22.50	20.75

4614P2. Paul Wencel. 4-inch well, used for domestic supply. Bench mark is copper washer on floor of garage, 0.4 foot above ground; altitude, 46.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	22.45	23.60
June 6	25.05	21.00
July 16	17.35?	28.70
Aug. 19	25.60	20.45
Sept. 13	[c] 26.40	19.65
Oct. 11	24.60	21.45
Nov. 8	24.05	22.00
Dec. 6	24.50	21.55
1927		
Jan. 10	23.10	22.95
Feb. 7	[c] 24.10	21.95
Mar. 8	22.50	23.55
Apr. 12	21.85	24.20
May 20	(c)	---------
June 17	21.85	24.20
July 18	26.35	19.70
Aug. 17	26.50	19.55
Sept. 19	24.90	21.15
Oct. 25	24.40	21.65
Nov. 30	23.65	22.40
Dec. 21	23.65	22.40
1928		
Jan. 26	23.00	23.05
Feb. 27	[c] 24.60	21.45
Mar. 22	25.15	20.90
Apr. 5	23.25	22.80
Apr. 19	22.70	23.35
May 23	22.60	23.45
June 20	(c)	---------
July 23	(c)	---------
Aug. 21	(c)	---------
Sept. 18	25.65	20.40
Oct. 23	23.15	22.90
Nov. 21	24.35	21.70
Dec. 15	24.10	21.95

[f] Windmill running.

[c] Pumping.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

[c] Pumping.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

4614P2—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Jan. 23	23.60	22.45
Feb. 20	23.35	22.70
Mar. 21	27.05	19.00
Apr. 8	26.50	19.55
May 27	28.55	17.50
June 20	28.80	17.25

4614R2. Ralph W. Gillette. 8-inch well, 100 feet deep, used for domestic supply. Bench mark is copper washer on pump-house floor, at ground surface; altitude, 49.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 25	25.80	23.50
1927		
May 20	[f] 24.50	24.80

4616L1. A Taddei. 4-inch well, used for stock. Bench mark is top of casing, about 0.6 foot above ground; altitude, 36.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Sept. 19	21.65	15.25
Oct. 14	22.10	14.80
Nov. 30	20.20	16.70
1928		
Jan. 26	20.50	16.40
Feb. 27	20.20	16.70
Mar. 22	19.85	17.05
Apr. 5	13.40	23.50
Apr. 18	14.55	22.35
May 23	14.90	22.00
June 20	18.75	18.15
July 23	20.85	16.05
Aug. 21	21.90	15.00
Sept. 18	22.75	14.15
Oct. 23	22.45	14.45
Nov. 21	21.90	15.00
Dec. 15	21.95	14.95
1929		
Apr. 8	21.25	15.65

4616N1. N. V. Williams. 12-inch well, 134 feet deep, not in use. Bench mark is top of casing, 1.2 feet above ground; altitude, 33.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Feb. 1	[w] 18.00	15.65
Mar. 3	[w] 17.00	16.65
Apr. 1	[w] 16.10	17.55
Apr. 9	10.90	22.75
May 14	15.25	18.40
June 6	17.00	16.65
July 14	19.70	13.95

[f] Windmill running.

[w] Measurement by owner.

4616N1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 19	20.45	13.20
Sept. 13	20.85	12.80
Oct. 11	21.00	12.65
Nov. 8	20.90	12.75
Dec. 6	20.00	13.65
1927		
Jan. 10	19.05	14.60
Feb. 7	18.55	15.10
Mar. 7	16.70	16.95
Apr. 12	15.60	18.05
May 19	13.20	20.45
June 16	13.55	20.10
July 18	16.85	16.80
Aug. 17	19.05	14.60
Sept. 17	19.75	13.90
Oct. 24	20.90	12.75
Nov. 26	19.05	14.60
Dec. 22	19.05	14.60
1928		
Jan. 26	18.95	14.70
Feb. 27	18.70	14.95
Mar. 24	18.90	14.75
Mar. 27	11.90	21.75
Apr. 2	10.75	22.90
Apr. 17	12.15	21.50
May 23	13.25	20.40
June 19	16.75	16.90
July 24	19.20	14.45
July 27 [n]	19.42	14.23
Aug. 3	19.45	14.20
Aug. 10	19.57	14.08
Aug. 17	19.74	13.91
Aug. 24	19.90	13.75
Aug. 31	20.03	13.62
Sept. 7	20.15	13.50
Sept. 14	20.30	13.35
Sept. 21	20.38	13.27
Sept. 28	20.46	13.19
Oct. 5	20.52	13.13
Oct. 12	20.58	13.07
Oct. 19	20.63	13.02
Oct. 26	20.67	12.98
Nov. 2	20.67	12.98
Nov. 9	20.67	12.98
Nov. 16	20.49	13.16
Nov. 23	20.33	13.32
Nov. 30	20.34	13.31
Dec. 7	20.37	13.28
Dec. 14	20.30	13.35
Dec. 21	20.34	13.31
1929		
Jan. 3	20.11	13.54
Jan. 10	20.09	13.56
Jan. 12	20.10	13.55
Jan. 17	20.17	13.48
Jan. 24	20.10	13.55
Jan. 31	20.17	13.48
Feb. 8	19.91	13.74
Feb. 15	19.90	13.75
Feb. 21	19.98	13.67
Mar. 1	20.06	13.59
Mar. 8	20.21	13.44
Mar. 15	20.24	13.41
Mar. 23	20.34	13.31
Mar. 29	20.18	13.47
Apr. 5	20.50	13.15
Apr. 13	20.31	13.34
Apr. 20 [o]	20.75	12.90
May 27	18.75	14.90
June 20	19.30	14.35

[n] Water-stage recorder installed.

[o] Water-stage recorder removed.

4617D1. Vesper Williams. 4-inch well, not in use. Bench mark is copper washer on north corner of 2 by 6 inch pump support 1.8 feet above ground; altitude, 32.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Sept. 17	21.55	11.30
Dec. 22	21.10	11.75
1928		
Apr. 17	11.90	20.95
May 23	13.05	19.80
1929		
Apr. 8	20.15	12.70

4617D2. Angelo Costa. 6-inch well, used for domestic supply. Bench mark is top of casing, 3.20 feet above ground; altitude, 33.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Oct. 24	23.50	10.20
Nov. 26	20.70	13.00
1928		
Jan. 26	20.75	12.95
Feb. 27	20.80	12.90
Mar. 24	18.80	14.90
Apr. 17	13.45	20.25
May 23	14.20	19.50
June 20	20.70	13.00
July 24	23.00	10.70
Aug. 21	23.40	10.30
Sept. 18	23.60	10.10
Nov. 21	22.50	11.20
Dec. 14	22.50	11.20
1929		
Jan. 24	22.10	11.60
Feb. 18	21.95	11.75
Mar. 29	22.30	11.40
Apr. 8	21.40	12.30
May 27	17.75	15.95
June 20	18.20	15.50

4618M1. Con Kromer. 4-inch well, 30 feet deep, used for stock. Bench mark until Oct. 11, 1926, copper washer on plank, 1.5 feet above ground, altitude 27.65 feet; after that date, top of casing, at ground surface, altitude 26.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	12.40	15.25
May 14	12.30	15.35
June 5	13.20	14.45
July 14	15.25	12.40
Aug. 19	16.60	11.05
Sept. 13	16.55	11.10
Oct. 11	[h] 15.40	10.75
Nov. 8	15.40	10.75
Dec. 6	15.15	11.00

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4618M1—Con.		
1927		
Jan. 10	14.70	11.45
Feb. 7	14.40	11.75
Mar. 7	12.95	13.20
Apr. 12	11.90	14.25
May 19	13.35	12.80
June 16	13.55	12.60
July 18	13.70	12.45
Aug. 17	16.10	10.05
Sept. 17	14.55	11.60
Oct 24	15.50	10.65
Nov. 26	13.95	12.20
Dec. 22	13.80	12.25
1928		
Jan. 26	13.75	12.40
Feb. 28	13.45	12.70
Mar. 24	13.25	12.90
Mar. 27	12.15	14.00
Apr. 3	11.00	15.15
Apr. 17	9.55	16.60
May 23	10.85	15.30
June 19	13.00	13.15
July 24	12.20	13.95
Aug. 21	13.40	12.75
Sept. 18	14.45	11.70
Oct. 23	14.60	11.55
Nov. 21	14.60	11.55
Dec. 14	14.45	11.70
1929		
Jan. 23	14.35	11.80
Feb. 20	14.00	12.15
Mar. 21	14.05	12.10
Apr. 8	14.05	12.10
May 27	14.60	11.55
June 20	12.55	13.60

4619R1. W. R. Kane. (See p. 228.) Bench mark is copper washer on 4 by 4 inch base of pump, 0.3 feet above ground; altitude, 27.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	9.00	18.80
May 14	7.40	20.40
June 6	[b] 7.85	19.95
July 14	8.60	19.20
Aug. 19	10.80	17.00
Sept. 13	11.10	16.70
Oct. 11	12.00	15.80
Nov. 8	12.20	15.60
Dec. 6	12.50	15.30
1927		
Jan. 10	12.75	15.05
Feb. 7	12.55	15.25
Mar. 7	11.70	16.10
Apr 12	11.00	16.80
May 19	10.55	17.25
June 16	9.25	18.55
July 18	7.90	19.90
Aug. 17	[b] 7.60	20.20
Sept. 17	8.70	19.10
Oct. 24	7.65	20.15
Nov. 26	9.65	18.15
Dec. 22	10.25	17.55

Date	Depth to water (feet)	Altitude of water table (feet)
4819R1—Con.		
1928		
Jan. 26	10.65	17.15
Feb. 28	10.70	17.10
Mar. 24	10.85	16.95
Mar. 27	10.60	17.20
Apr. 3	10.35	17.45
Apr. 17	10.15	17.65
May 23	9.35	18.45
June 19	9.10	18.70
July 24	8.40	19.40
Aug. 21	9.60	18.20
Sept. 18	9.90	17.90
Oct. 23	10.20	17.60
Nov. 21	10.55	17.25
Dec. 14	11.05	16.75
1929		
Jan. 23	11.50	16.30
Feb. 20	11.60	16.20
Mar. 21	11.75	16.05
Apr. 8	12.15	15.65
May 27	[b] 8.90	18.90
June 20	7.95	19.85

4620M1. E. A. Lee. 6-inch well, 50 feet deep, not in use. Bench mark until Apr. 8, 1929, top of casing, 1.00 foot above ground, altitude 32.90 feet; after that date, top of concrete curb, altitude 32.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 1	16.00	16.90
Nov. 8	16.25	16.65
Dec. 6	16.50	16.40
1927		
Jan. 10	16.35	16.55
Feb. 7	16.20	16.70
Mar. 7	15.10	17.80
Apr. 12	14.25	18.65
May 19	13.25	19.65
June 16	13.50	19.40
July 18	11.45	21.45
Aug. 17	12.25	20.65
Sept. 17	13.20	19.70
Oct. 24	14.65	18.25
Nov. 26	14.95	17.95
1929		
Apr. 8	16.40	16.05

4620R1. Mrs. A. Chapdelain. 4-inch well, used for stock. Bench mark is pump flange, 2.30 feet above ground, altitude 33.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	12.40	21.45
May 14	10.50	23.35
June 6	[b] 9.00	24.85
July 14	10.10	23.75
Aug. 19	[b] 13.10	20.75
1927		
Dec. 22	14.05	19.80

Date	Depth to water (feet)	Altitude of water table (feet)
4620R1—Con.		
1928		
Jan. 26	14.55	19.30
Feb. 27	14.10	19.75
Mar. 24	15.30	18.55
Mar. 27	15.00	18.85
Apr. 3	14.65	19.20
Apr. 18	13.60	20.25
May 23	11.05	22.80
June 19	[b] 9.70	24.15
July 24	9.10	24.75
Aug. 21	10.80	23.05
Sept. 18	11.70	22.15
Oct. 23	13.25	20.60
Nov. 21	14.50	19.35
Dec. 14	15.15	18.70
1929		
Jan. 24	15.90	17.95
Feb. 18	16.15	17.70
Mar. 29	16.30	17.55
Apr. 8	15.60	18.25
May 27	[b] 7.85	26.00
June 20	8.20	25.65

4621D1. Louis Abba. 6-inch well, 40 feet deep, used for domestic supply. Bench mark is top of casing, altitude 29.85 feet, which is 8.10 feet below reference bench mark, a copper washer in wooden platform 0.3 feet above ground, altitude 37.95 feet. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	8.40	21.45
June 8	11.25	18.60
July 16	14.40	15.45
Aug. 14	14.90	14.95
Sept. 13	15.00	14.85
Oct. 11	14.85	15.00
Nov. 8	14.40	15.45
Dec. 6	10.85	19.00
1927		
Jan. 10	11.30	18.55
Feb. 7	9.50	20.35
Mar. 8	8.50	21.35
Apr. 12	7.30	22.55
June 23	6.25	23.60
July 18	11.20	18.65
Aug. 17	13.80	16.05
Sept. 19	14.20	15.65
Oct. 24	14.25	15.60
Nov. 30	12.05	17.80
Dec. 21	12.45	17.40
1928		
Jan. 26	12.15	17.70
Feb. 27	11.85	18.00
Mar. 22	10.90	18.95
Apr. 5	2.65	27.20
Apr. 18	5.10	24.75
May 23	5.90	23.95
June 20	11.65	18.20
July 23	13.80	16.05
Aug. 21	14.45	15.40
Sept. 18	15.60	14.25
1929		
Apr. 8	13.05	16.80

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[b] Water in ditch near by.

[b] Water in ditch near by.

[b] Water in ditch near by.

Measurements of depth to water in observation wells—Continued

4622F1. J. H. Yenglin. 6-inch well, 58 feet deep, used for domestic supply. Bench mark is top of casing, 1.5 feet above ground; altitude, 39.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	[i] 20.50	19.05
June 8	19.10	20.45
July 16	21.90	17.65
Aug. 14	21.95	17.60
Sept. 13	21.60	17.95
Oct. 11	21.60	17.95
Nov. 8	20.95	18.60
Dec. 6	20.00	19.55
1927		
Jan. 10	19.30	20.25
Feb. 7	18.85	20.70
Mar. 8	17.40	22.15
Apr. 12	16.60	22.95
June 23	[i] 22.25	17.30
July 18	20.90	18.65
Aug. 17	20.40	19.15
Sept. 19	20.70	18.85
Oct. 24	20.75	18.80
Nov. 22	19.55	20.00
1928		
Jan. 26	19.15	20.40
Feb. 27	18.80	20.75
Mar. 22	19.20	20.35
Apr. 5	12.90	26.65
Apr. 18	14.00	25.55
May 23	14.85	24.70
June 20	19.40	20.15
July 23	20.35	19.20
Aug. 21	21.05	18.50
Sept. 18	21.75	17.80
Oct. 23	21.05	18.50
Nov. 21	20.70	18.85
Dec. 15	20.45	19.10
1929		
Jan. 23	20.05	19.50
Feb. 20	19.95	19.60
Mar. 21	21.65	17.90
Apr. 8	22.20	17.35
May 27	[i] 25.50	14.05
June 20	24.65	14.90

4623J2. C. W. Howard. 6-inch well, 40 feet deep, used for domestic supply. Bench mark is copper washer on inside of lid, at ground surface; altitude, 44.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 8	21.50	23.35
May 14	20.20	24.65
June 6	21.90	22.95
July 16	23.40	21.45
Aug. 19	22.60	22.25
Sept. 13	22.85	22.00
Oct. 11	22.15	22.70
Nov. 8	21.70	23.15
Dec. 6	21.35	23.50
1927		
Jan. 10	20.80	24.05
Feb. 7	20.50	24.35
Mar. 8	20.00	24.85
Apr. 12	19.55	25.30
May 20	22.90	21.95
July 18	23.45	21.40
Aug. 17	22.15	22.70
Sept. 19	22.10	22.75
Oct. 24	21.65	23.20
Nov. 30	21.10	23.75
1928		
Jan. 26	20.65	24.20
Feb. 27	20.70	24.15
Mar. 22	22.25	22.60
Apr. 5	18.95	25.90
Apr. 18	18.30	26.55
May 23	18.35	26.50
June 20	22.90	21.95
July 25	22.50	22.35
Aug. 21	23.10	21.75
Sept. 18	22.90	21.95
1929		
Apr. 8	24.90	19.95

4625D1. J. McKinley. 6-inch well, used for domestic supply. Bench mark is top of casing, 0.2 foot above ground; altitude, 58.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 8	[t] 27.55	31.15
1926		
Apr. 12	28.90	29.80
May 17	27.95	30.75
June 8	29.80	28.90
July 17	[c] 30.70	28.00
Aug. 20	29.30	29.40
Sept. 13	[c] 29.60	29.10
Oct. 12	28.45	30.25
Nov. 9	27.85	30.85
Dec. 7	27.35	31.35
1927		
Jan. 11	26.80	31.90
Feb. 8	26.70	32.00
Mar. 8	26.55	32.15
Apr. 13	[c] 28.35	30.35
May 20	29.40	29.30
June 17	[c] 31.00	27.70
July 19	31.20	27.50
Aug. 18	30.50	28.20
Sept. 20	29.60	29.10
Oct. 25	28.80	29.90
Nov. 30	27.90	30.80
Dec. 22	27.50	31.20
1928		
Jan. 25	27.20	31.50
Feb. 23	27.10	31.60
Mar. 22	29.10	29.60
Apr. 17	28.65	30.05
May 24	29.05	29.65
June 21	31.35	27.35
July 24	31.40	27.30
Aug. 21	31.10	27.60
Sept. 18	30.70	28.00
Oct. 30	29.55	29.15
Nov. 21	29.00	29.70
Dec. 17	28.45	30.25
1929		
Jan. 24	27.95	30.70
Feb. 20	28.10	30.65
Mar. 21	29.60	29.10
Apr. 9	30.90	27.80
May 27	(c)	---------
June 20	33.75	24.95

4625D2. J. McKinley. (See p. 229.) Bench mark is doorsill of pump house at ground surface; altitude, 58.84 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 27.33	31.51
Oct. 22	[p] 27.21	31.63

4625H3. Montgomery, Thompson & Focacci. (See p. 229.) Bench mark is top of concrete wall of pit, at ground surface; altitude 56.98 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 25.28	31.70
Oct. 22	[p] 25.05	31.93

4626D1. W. S. Blodgett. 4-inch well, 100 feet deep, not in use. Bench mark is top of casing, 0.4 foot above ground; altitude, 51.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 25	24.35	27.15
June 8	[i] 25.30	26.20
July 17	25.50	26.00
Aug. 14	25.15	26.35
Sept. 13	24.90	26.60
Oct. 11	24.45	27.05
Nov. 9	24.05	27.45
Dec. 7	23.80	27.70
1927		
Jan. 11	23.45	28.05
Feb. 8	24.60	26.90
Mar. 8	24.45	27.05
Apr. 13	23.75	27.75
May 20	26.20	25.30
June 17	25.75	25.75
July 19	27.25	24.25
Aug. 18	26.70	24.80
Sept. 19	28.35	23.15

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[i] Pump running in adjacent well.

[c] Pumping.

[t] By C. H. Widdows.

[c] Pumping

[i] Pump running in adjacent well.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

4636D1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Oct. 25	24.30	27.20
Nov. 30	23.85	27.65
Dec. 22	24.15	27.35
1928		
Jan. 25	24.15	27.35
Feb. 23	25.00	26.50
Mar. 22	25.20	26.30
Apr. 5	24.10	27.40
Apr. 18	23.55	27.95
May 24	25.15	26.35
June 21	27.05	24.45
July 24	25.95	25.55
Aug. 21	27.50	24.00
Sept. 18	26.30	25.20
Oct. 23	25.00	26.50
Nov. 21	24.50	27.00
Dec. 17	24.30	27.20
1929		
Jan. 24	24.85	26.65
Feb. 20	25.65	25.85
Mar. 21	26.00	25.50
Apr. 9	26.90	24.60
May 27	[i] 32.00	19.50
June 20	32.80	18.70

4636E1. G. Resso. 4-inch well, used for domestic supply. Bench mark is top of casing, 1.50 feet above ground; altitude, 47.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 24	21.80	25.65
June 6	21.90	25.55
July 16	22.65	24.80
Aug. 19	22.60	24.85
Sept. 13	22.65	24.80
Oct. 11	22.05	25.40
Nov. 3	21.90	25.55
Nov. 8	21.85	25.60
Nov. 13	22.05	24.40
Nov. 19	22.00	25.45
Dec. 6	21.45	26.00
1927		
Jan. 10	21.20	26.25
Feb. 7	21.10	26.35
Mar. 7	19.95	27.50
Apr. 12	20.40	27.05
May 20	19.70	27.75
June 23	19.85	27.60
July 18	20.00	27.45
Aug. 17	21.90	25.55
Sept. 19	21.55	25.90
Oct. 24	21.45	26.00
Nov. 30	21.25	26.20
Dec. 22	21.30	26.15
1928		
Jan. 26	21.40	26.05
Feb. 23	21.35	26.10
Mar. 22	23.65	23.80
Apr. 5	13.30	34.15
Apr. 18	14.00	33.45
May 23	16.20	31.25

[i] Pump running in adjacent well.

4636E1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
June 20	21.35	26.10
July 23	[i] 22.80	24.65
Aug. 21	22.40	25.05
Sept. 18	23.20	24.25
1929		
Apr. 8	24.95	22.50

4627A1. Margaret Farrell. 6-inch well, 45 feet deep, used for domestic supply. Bench mark is top of casing, altitude 36.10 feet, which is 3.90 feet below reference bench mark, a copper washer on doorsill, 0.1 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	11.60	24.50
July 16	18.35	17.75
Aug. 19	19.00	17.10
Sept. 13	19.00	17.10
Oct. 11	19.00	17.10
Nov. 8	18.55	17.55
Dec. 6	14.55	21.55
1927		
Jan. 10	15.00	21.10
Feb. 7	13.75	22.35
Mar. 8	11.60	24.50
Apr. 12	10.15	25.95
June 23	6.00	30.10
July 18	[a] 18.45	17.65
Aug. 17	21.30	14.80
Sept. 19	18.05	18.05
Oct. 24	18.50	17.60
Nov. 30	15.80	20.30
Dec. 22	16.35	19.75
1928		
Jan. 26	16.00	20.10
Feb. 27	15.70	20.40
Mar. 22	15.00	21.10
Apr. 5	2.15	33.95
Apr. 18	5.60	30.50
May 23	7.30	28.80
June 20	13.80	22.30
July 23	17.15	18.95
Aug. 21	17.95	18.15
Sept. 18	18.40	17.70
Oct. 23	18.55	17.55
Nov. 21	17.65	18.45
Dec. 15	17.65	18.45
1929		
Jan. 23	17.15	18.95
Feb. 20	17.15	18.95
Mar. 21	17.95	18.15
Apr. 8	17.10	19.00
May 27	13.60	22.50
June 20	13.50	22.60

[a] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

4627B1. Jacob Knoll. 4-inch well, used for domestic supply. Bench mark is top of casing, altitude 40.55 feet, which is 0.3 foot below reference bench mark, a copper washer in wooden pump support 0.4 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 11	[i] 17.80	22.75
June 8	18.55	22.00
July 16	21.00	19.55
Aug. 19	22.25	18.30
Sept. 13	21.60	18.95
Oct. 11	21.50	19.05
Nov. 8	21.10	19.45
Dec. 6	19.80	20.75
1927		
Jan. 10	19.25	21.30
Feb. 7	18.85	21.70
Mar. 8	17.10	23.45
Apr. 12	16.10	24.45
June 23	18.10	22.45
July 18	18.55	22.00
Aug. 17	20.15	20.40
Sept. 19	20.35	20.20
Oct. 24	20.65	19.90
Nov. 30	19.45	21.10
Dec. 22	19.40	21.15
1928		
Jan. 26	19.60	20.95
Feb. 27	19.20	21.35
Mar. 22	19.95	20.60
Apr. 5	7.10	33.45
Apr. 18	8.50	32.05
May 23	11.05	29.50
June 20	15.35	25.20
July 23	18.95	21.60
Aug. 21	20.40	20.15
Sept. 18	21.00	19.55
1929		
Apr. 8	22.35	18.20

4630A1. Evelyn Sparling. 12-inch well, 28 feet deep, used for domestic supply. Bench mark until April 12, 1927, top of casing, altitude 20.10 feet, which is 3.00 feet below reference bench mark, a copper washer in doorsill 0.3 foot above ground; after that date, top of concrete casing, altitude 21.95 feet. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	2.75	17.35
May 14	3.50	16.60
June 5	[b] 3.20	16.90
July 14	3.70	16.40
Aug. 19	[b] 5.05	15.05
Sept. 13	5.95	14.15
Oct. 11	6.60	13.50
Nov. 8	7.00	13.10
Dec. 6	7.25	12.85

[b] Water in ditch near by.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4630A1—Con.		
1927		
Jan. 10	7.40	12.70
Feb. 7	7.95	12.15
Mar. 7	4.85	15.25
Apr. 12	[h] 6.80	15.15
May 19	5.20	16.75
June 16	5.25	16.70
July 18	[b] 4.65	17.30
Aug. 17	[b] 5.60	16.35
Sept. 17	6.55	15.40
Oct. 24	6.80	15.15
Nov. 26	7.25	14.70
Dec. 22	7.55	14.40
1928		
Jan 26	7.45	14.50
Feb. 28	7.05	14.90
Mar. 24	7.25	14.70
Mar. 27	6.60	15.35
Apr. 3	6.25	15.70
Apr. 17	6.50	15.45
May 23	4.60	17.35
June 19	4.10	17.85
July 24	5.00	16.95
Aug. 21	6.25	15.70
Sept. 18	4.75	17.20
Oct. 23	5.95	16.00
Nov. 21	7.40	14.55
Dec. 14	7.30	14.65
1929		
Jan. 23	7.20	14.75
Feb. 20	7.05	14.90
Mar. 21	7.45	14.50
Apr. 8	7.45	14.50
May 27	[b] 7.35	14.60
June 20	[b] 7.20	14.75

4630N1. G. Oxender. (See p. 230.) Bench mark is top of casing, 0.3 foot above ground; altitude, 24.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	3.80	20.45
May 14	5.70	18.55
June 5	6.65	17.60
July 14	10.00	14.25
Aug. 19	10.10	14.15
Sept. 13	10.00	14.25
Oct. 11	9.90	14.35
Nov. 8	9.10	15.15
Dec. 6	9.85	14.40
1927		
Jan. 10	9.95	14.30
Feb. 7	9.60	14.65
Mar. 7	7.45	16.80
Apr. 12	7.35	16.90
May 19	7.90	16.35
June 16	9.45	14.80
July 18	11.30	12.95
Aug. 17	10.70	13.55
Sept. 17	9.30	14.95
Oct. 24	9.00	15.25
Nov. 26	8.45	15.80
Dec. 22	8.60	15.65
4630N1—Con.		
1928		
Jan. 26	8.55	15.70
Feb. 28	8.15	16.10
Mar. 24	8.25	16.00
Mar. 27	7.75	16.50
Apr. 3	7.50	16.75
Apr. 17	[c] 13.65	10.60
May 23	9.50	14.75
June 19	(c)	---------
July 24	(c)	---------
Aug. 21	(c)	---------
Sept. 18	8.70	15.55
Oct. 23	8.30	15.95
Nov. 21	8.20	16.05
Dec. 14	8.40	15.85
1929		
Jan. 23	8.45	15.80
Feb. 20	8.20	16.05
Mar. 21	8.35	15.90
Apr. 8	8.55	15.70
May 27	10.75	13.50
June 20	10.75	13.50

4631D1. W. G. Bonine. (See p. 230.) Bench mark is top of casing, altitude 30.55 feet, which is 1.00 foot below reference bench mark, a copper washer in 2 by 4 inch floor joist 1.00 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	7.30	23.25
May 14	8.30	22.25
June 5	9.00	21.55
July 14	[c] 16.20	14.35
Aug. 19	[c] 13.70	16.85
Aug. 19	[g] 13.30	17.25
Sept. 13	11.40	19.15
Oct. 11	[f] 11.75	18.80
Nov. 8	12.10	18.45
Dec. 6	12.15	18.40
1927		
Jan. 10	12.35	18.20
Feb. 7	12.25	18.30
Mar. 7	10.90	19.65
Apr. 12	10.55	20.00
May 19	(c)	---------
June 16	10.30	20.25
July 18	(c)	---------
Aug. 17	11.30	19.25
Sept. 17	11.75	18.80
Oct. 24	12.30	18.25
Nov. 26	11.90	18.65
Dec. 22	10.90	19.65
1928		
Jan. 26	11.00	19.55
Feb. 28	10.90	19.65
Mar. 24	11.15	19.40
Mar. 27	10.85	19.70
Apr. 3	10.65	19.90
Apr. 17	10.50	20.05
4631D1—Con.		
1928		
May 23	10.30	20.25
June 19	12.50	18.05
July 24	10.55	20.00
Aug. 21	11.50	19.05
Sept. 18	11.15	19.40
Oct. 23	11.10	19.45
Nov. 21	11.20	19.35
Dec. 14	11.35	19.20
1929		
Jan. 23	10.70	19.85
Feb. 20	11.50	19.05
Mar. 21	11.60	18.95
Apr. 8	11.60	18.95
May 27	(c)	---------
June 20	10.60	19.95

4632Q1. 6-inch well, used for stock. Bench mark is top of casing, 2.00 feet above ground; altitude, 32.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	7.55	24.75
May 14	7.10	25.20
June 5	[b] 5.85	26.45
July 14	7.90	24.40
Aug. 19	8.70	23.60
Sept. 13	9.40	22.90
Oct. 11	9.60	22.70
Nov. 8	10.45	21.85
Dec. 6	10.90	21.40
1927		
Jan. 10	11.30	21.00
Feb. 7	11.15	21.15
Mar. 7	9.95	22.35
Apr. 12	9.95	22.35
May 19	[b] 7.70	24.60
June 16	[b] 6.50	25.80
July 18	[b] 5.75	26.55
Aug. 17	[b] 6.55	25.75
Sept. 17	8.05	24.25
Oct. 24	8.50	23.80
Nov. 26	9.70	22.60
Dec. 22	10.05	22.25
1928		
Jan. 26	[b] 10.45	21.85
Feb. 28	10.45	21.85
Mar. 24	[b] 10.60	21.70
Mar. 27	[b] 10.35	21.95
Apr. 3	10.40	21.90
Apr. 17	10.25	22.05
May 23	9.90	22.40
June 19	[b] 6.55	25.75
July 24	[b] 7.60	24.70
Aug. 20	8.20	24.10
Sept. 18	7.75	24.55
Oct. 23	9.50	22.80
Nov. 21	10.75	21.55
Dec. 14	11.15	21.15
1929		
Jan. 23	[f] 12.00	20.30
Feb. 20	11.40	20.90

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[b] Water in ditch near by.

[h] New measuring point.

[c] Pumping.

[f] Windmill running.

[g] Pump stopped a short time before measurement.

[b] Water in ditch near by.

[c] Pumping.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4632Q1—Con.		
1929		
Mar. 21	11.60	20.70
Apr. 26	[b] 7.30	25.00
May 27	[b] 4.40	27.90
June 20	5.55	26.75

4633A1. J. F. Blohm. 5-inch well, used for domestic supply. Bench mark is copper washer on 2 by 4 inch scantling, 2.00 feet above ground; altitude, 36.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	9.60	26.40
May 14	9.90	26.10
June 6	8.05	27.95
July 14	10.00	26.00
Aug. 19	11.65	24.35
Sept. 13	12.05	23.95
Oct. 11	13.65	22.35
Nov. 8	12.60	23.40
Dec. 6	12.60	23.40
1927		
Jan. 10	12.85	23.15
Feb. 7	12.80	23.20
Mar. 7	12.00	24.00
Apr. 12	12.30	23.70
May 19	10.80	25.20
June 16	9.30	26.70
July 18	8.80	27.20
Aug. 17	9.65	26.35
Sept. 17	11.00	25.00
Oct. 24	12.50	23.50
Nov. 26	11.20	24.80
Dec. 22	11.50	24.50
1928		
Jan. 26	11.90	24.10
Feb. 27	12.05	23.95
Mar. 24	12.00	24.00
Mar. 27	11.95	24.05
Apr. 4	11.70	24.30
Apr. 17	11.80	24.20
May 23	11.10	24.90
June 19	10.65	25.35
July 24	10.20	25.80
Aug. 21	10.90	25.10
Sept. 18	11.60	24.40
Oct. 23	12.70	23.30
Nov. 21	12.25	23.75
Dec. 14	12.35	23.65
1929		
Jan. 23	12.60	23.40
Feb. 20	12.70	23.30
Mar. 21	12.85	23.15
Apr. 8	12.70	23.30
May 27	9.65	26.35
June 20	8.55	27.45

4633N1. J. H. Williams. 4-inch well, 20 feet deep, used for stock. Bench mark is copper washer on 2 by 6 inch plank 0.2 foot above ground; altitude 32.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	5.85	26.55
May 14	4.70	27.70
June 5	3.50	28.90
July 14	5.00	27.40
Aug. 19	5.40	27.00
Sept. 13	6.25	26.15
Oct. 11	6.25	26.15
Nov. 8	6.95	25.45
Dec. 6	7.30	25.10
1927		
Jan. 10	7.75	24.65
Feb. 7	7.85	24.55
Mar. 7	6.65	25.75
Apr. 12	6.95	25.45
May 19	5.25	27.15
June 16	3.70	28.70
July 18	4.20	28.20
Aug. 18	[b] 3.95	28.45
Sept. 17	5.10	27.30
Oct. 24	5.55	26.85
Nov. 26	6.30	26.10
Dec. 22	6.65	25.75
1928		
Jan 26	7.25	25.15
Feb. 28	7.40	25.00
Mar. 24	7.80	24.60
Mar. 27	7.60	24.80
Apr. 4	7.35	25.05
Apr. 17	7.20	25.20
May 23	7.05	25.35
June 19	[b] 4.65	27.75
July 24	6.05	26.35
Aug. 20	6.00	26.40
Sept. 18	5.95	26.45
1929		
Apr. 8	8.50	23.90

4633R1. Herman Kurtz. (See p. 230.) Bench mark is copper washer on 2 by 4 inch inside sill, or top of casing, at ground surface; altitude 39.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	9.50	29.55
June 5	7.60	31.45
July 14	8.00	31.05
Aug. 19	8.50	30.55
Sept. 13	8.60	30.45
Oct. 11	8.60	30.45
Nov. 8	9.05	30.00
Dec. 6	9.75	29.30
1927		
Jan. 10	10.55	28.50
Feb. 7	10.95	28.10
Mar. 7	9.95	29.10
4633R1—Con.		
1927		
Apr. 12	10.35	28.70
May 20	9.60	29.45
June 16	7.90	31.15
July 18	7.90	31.15
Aug. 17	[b] 7.90	31.15
Sept. 19	7.95	31.10
Oct. 24	8.75	30.30
Nov. 26	9.05	30.00
Dec. 22	9.70	29.35
1928		
Jan. 26	10.50	28.55
Feb. 28	10.75	28.30
Mar. 24	11.35	27.70
Mar. 27	10.30	28.75
Apr. 4	9.25	29.80
Apr. 18	9.50	29.55
May 24	8.60	30.45
June 20	8.30	30.75
Oct. 23	9.30	29.75
Nov. 21	9.65	29.40
Dec. 14	10.20	28.85
1929		
Jan. 23	11.15	27.90
Feb. 20	11.65	27.40
Mar. 21	11.75	27.30
Apr. 8	11.10	27.95
May 27	9.05	30.00
June 20	([c])	---------

4634A1. M. Reimche. (See p. 230.) Bench mark is top of casing in pit, altitude 35.80 feet, which is 5.45 feet below reference bench mark, a copper washer in 2 by 4 inch doorsill 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 9	7.50	28.30
May 14	5.80	30 00
June 6	[b] 4.00	31.80
1928		
Jan. 26	7.85	27.95

4634A2. L. E. Gregson. (See p. 230.) Bench mark is top of casing, altitude 35.00 feet, which is 5.60 feet below reference bench mark, a copper washer on 2 by 4 inch door sill, 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 7	[b] 3.20	31.80
July 14	[d] 5.75	29.25
Aug. 19	6.35	28.65

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[b] Water in ditch near by.

[b] Water in ditch near by.

[b] Water in ditch near by.

[c] Pumping.

[d] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4634A2—Con.		
1926		
Sept. 13	6.30	28.70
Oct. 11	6.60	28.40
Nov. 8	6.90	28.10
Dec. 6	7.25	27.75
1927		
Jan. 10	7.85	27.15
Feb. 7	8.05	26.95
Mar. 7	6.80	28.20
Apr. 12	6.35	28.65
May 19	[b] 4.50	30.50
June 16	[b] [i] 1.90	33.10
July 18	[b] 2.00	33.00
Aug. 17	[b] 3.45	31.55
Sept. 19	4.45	30.55
Oct. 24	5.30	29.70
Nov. 26	6.35	28.65
Dec. 22	7.10	27.90
1928		
Feb. 27	8.25	26.75
Mar. 24	8.35	26.65
Mar. 27	7.90	27.10
Apr. 4	6.85	28.15
Apr. 18	5.95	29.05
May 23	3.95	31.05
June 19	[b] 4.05	30.95
July 24	([c])	----------
Aug. 21	5.30	29.70
Sept. 18	5.50	29.50
Oct. 23	6.20	28.80
Nov. 21	6.85	28.15
Dec. 15	7.70	27.30
1929		
Jan. 23	8.70	26.30
Feb. 20	9.15	25.85
Mar. 21	[i] 10.20	24.80
Apr. 8	8.35	26.65
May 27	[b] 3.80	31.20
June 20	[b] 3.60	31.40

4634R1. Miss E. M. Smith. 10-inch well, 120 feet deep, not in use. Bench mark is top of casing at ground surface; altitude, 43.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 8	12.05	31.15
May 14	10.50	32.70
June 5	10.10	33.10
July 14	10.30	32.90
Aug. 19	11.00	32.20
Sept. 13	10.90	32.30
Oct. 11	10.80	32.40
Nov. 3	11.35	31.85
Nov. 8	11.80	31.40
Nov. 13	12.20	31.00
Nov. 19	12.55	30.65
Dec. 6	12.75	30.45
1927		
Jan. 10	13.55	29.65
Feb. 7	13.70	29.50
Mar. 7	12.35	30.85
4634R1—Con.		
1927		
Apr. 12	12.15	31.05
May 20	9.20	34.00
June 16	9.00	34.20
July 18	9.35	33.85
Aug. 17	9.90	33.30
Sept. 19	10.00	33.20
Oct. 24	9.90	33.30
Nov. 26	11.10	32.10
Dec. 22	13.00	30.20
1928		
Jan. 28	13.85	29.35
Feb. 27	13.60	29.60
Mar. 22	14.25	28.95
Apr. 4	6.90	36.30
Apr. 17	9.55	33.65
May 23	9.45	33.75
June 19	9.45	33.75
Oct. 23	10.95	32.25
Dec. 15	12.15	31.05
1929		
Jan. 23	13.95	29.25
Feb. 20	14.70	28.50
Mar. 21	14.00	29.20
Apr. 8	13.25	29.95
May 27	10.85	32.35
June 20	11.00	32.20

4635A1. F. Journeay. (See p. 230.) Bench mark is cross on concrete base of pump, at ground surface; altitude, 49.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 8	19.65	29.35
May 24	[c] 32.40	16.60
Nov. 3	20.35	28.65
Nov. 8	20.95	28.05
Nov. 13	21.40	27.60
Nov. 19	21.60	27.40
Dec. 6	20.15	28.85
1927		
May 20	15.50	33.50
June 19	[c] 28.25	20.75
June 23	[c] 29.35	19.65
Aug. 17	[g] 27.00	22.00
1928		
Mar. 7	22.30	26.70

4635A2. F. Journeay. 6-inch well, 100 feet deep, used for domestic supply. Bench mark is cross on top of concrete curb of pit, at ground surface; altitude 46.80 feet.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 8	15.50	31.30
May 24	[i] 18.35	28.45
4635A2—Con.		
1926		
June 6	18.20	28.60
July 16	18.00	28.80
Aug. 19	18.60	28.20
Sept. 13	18.20	28.60
Oct. 11	18.10	28.70
Nov. 3	18.50	28.30
Nov. 8	18.90	27.90
Nov. 13	19.30	27.50
Nov. 19	19.55	27.25
Dec. 6	18.15	28.65
1927		
Jan. 10	18.65	28.15
Feb. 7	18.30	28.50
Mar. 7	16.35	30.45
Apr. 12	15.95	30.85
May 20	14.00	32.80
June 23	[i] 15.65	31.15
July 18	15.20	31.60
Aug. 17	[i] 17.25	29.55
Sept. 19	17.15	29.65
Oct. 24	17.35	29.45
Nov. 30	18.50	28.30
Dec. 22	19.05	27.75
1928		
Jan. 26	19.35	27.45
Feb. 23	17.50	29.30
Mar. 7	19.50	27.30
Mar. 22	19.10	27.70
Apr. 4	8.60	38.20
Apr. 18	10.70	36.10
May 23	12.15	34.65
June 20	15.85	30.95
July 23	18.10	28.70
Aug. 20	17.70	29.10
Sept. 18	17.65	29.15
Oct. 23	17.90	28.90
Nov. 21	18.55	28.25
Dec. 15	19.85	26.95
1929		
Jan. 23	20.30	26.50
Feb. 20	20.45	26.35
Mar. 21	19.65	27.15
Apr. 8	19.00	27.80
May 27	18.30	28.50
June 20	18.00	28.80

4635E2. F. Journeay. 4-inch well, 85 feat deep, used for domestic supply. Bench mark is copper washer on pump support or top of casing, 0.3 foot above ground; altitude, 46.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 24	[i] 12.20	34.45
Aug. 3	13.95	32.70
Nov. 3	15.40	31.25
Nov. 8	16.80	29.85
Nov. 13	17.60	29.05
Nov. 19	18.10	28.55
Dec. 6	16.55	30.10

[b] Water in ditch near by.

[c] Pumping.

[i] Pump running in adjacent well.

[c] Pumping.

[g] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

[i] Pump running in adjacent well

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4635E2—Con.		
1927		
Jan. 10	17.50	29.15
Feb. 7	16.90	29.75
Mar. 7	14.90	31.75
Apr. 12	14.25	32.40
May 20	9.15	37.50
June 23	[i] 9.65	37.00
July 18	11.05	35.60
Sept. 19	13.00	33.65
Oct. 24	13.30	33.35
Nov. 30	17.30	29.35
1928		
Jan. 26	18.40	28.25
Feb. 23	15.50	31.15
Mar. 22	17.30	29.35
Apr. 4	9.00	37.65
Apr. 18	11.45	35.20
May 23	10.45	36.20
June 20	11.40	35.25
July 23	13.15	33.50
Aug. 20	13.05	33.60
Sept. 18	12.75	33.90
1929		
Apr. 8	15.05	31.60

4636A1. Smith & Zimmerman. 6-inch well, used for stock. Bench mark is top of casing and copper washer, at ground surface; altitude, 44.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 14	18.25	31.65
Sept. 13	17.90	32.00
Oct. 11	17.85	32.05
Nov. 3	18.00	31.90
Nov. 8	18.40	31.50
Nov. 13	18.75	31.15
Nov. 19	18.90	31.00
Dec. 7	18.30	31.60
1927		
Jan. 11	18.45	31.45
Feb. 7	18.60	31.30
Mar. 7	17.20	32.70
Apr. 13	17.75	32.15
May 20	[i] 21.75	28.15
June 23	16.00	33.90
July 18	17.00	32.90
Aug. 18	17.20	32.70
Sept. 19	16.95	32.95
Oct. 25	17.15	32.75
Dec. 22	18.55	31.35
1928		
Jan. 25	19.00	30.90
Feb. 23	21.00	28.90
Mar. 22	20.60	29.30
Mar. 27	18.30	31.60
Apr. 4	16.50	33.40
Apr. 18	16.55	33.35
May 24	16.95	32.95
June 21	16.60	33.30
July 24	17.60	32.30
Aug. 20	18.15	31.75
Sept. 18	17.60	32.30
Oct. 23	17.80	32.10
Nov. 21	18.25	31.65
Dec. 17	19.30	30.60

Date	Depth to water (feet)	Altitude of water table (feet)
4636A1—Con.		
1929		
Jan. 24	19.80	30.10
Feb. 21	21.60	28.30
Mar. 21	22.90	27.00
Apr. 9	22.60	27.30
May 27	19.80	30.10
June 20	19.40	30.50

4636M1. Raymond E. Mason. (See p. 231.) Bench mark is top of concrete wall of pit; altitude, 59.27 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 13	[p] 22.80	36.47
Oct. 22	[p] 23.73	35.54

4636R1. Henry Bechtold. 6-inch well, 60 feet deep, used for domestic supply. Bench mark is copper washer on 1 by 4 inch plank on south side of well curb, at ground surface; altitude, 59.10 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 13	[p] 22.15	36.95
Oct. 22	[p] 23.30	35.80
1926		
Apr. 12	22.10	37.00

471A1. A. Aldrich. (See p. 231.) Bench mark is copper washer on 4 by 4 inch beam, 1.00 foot above ground; altitude, 106.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	43.40	63.00
May 14	43.50	62.90
June 18	44.40	62.00

471D1. J. W. Hill. 6-inch well, 400 feet deep, not in use. Bench mark until November 16, 1926, copper washer on 2 by 4 inch pipe support, 2.00 feet above ground, altitude 107.50 feet; after that date, copper washer on 2 by 12 inch plank, 1.8 feet above ground, altitude 107.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 23	[p] 46.15	61.35
1926		
Apr. 21	45.20	62.30
May 14	45.15	62.35
June 18	[f] 47.10	60.40

Date	Depth to water (feet)	Altitude of water table (feet)
471D1—Con.		
1926		
July 22	48.10	59.40
Aug. 18	[f] 47.30	60.20
Sept. 23	48.00	59.50
Oct. 18	46.55	60.95
Nov. 16	[h] 46.15	61.20
Dec. 10	45.90	61.45
1927		
Jan. 18	45.55	61.80
Feb. 19	45.20	62.15
Mar. 16	44.90	62.45
Apr. 26	44.65	62.70
May 25	[f] 47.40	59.95
June 23	[f] 47.20	60.15
July 25	[f] 47.20	60.15
Aug. 24	46.70	60.65
Sept. 29	[f] 47.05	60.30
Oct. 27	46.25	61.10
Nov. 29	46.10	61.25
Dec. 20	45.90	61.45
1928		
Jan. 24	45.80	61.55
Mar. 21	45.80	61.55
Apr. 25	45.55	61.80
May 24	45.75	61.60
June 21	47.70	59.65
July 19	47.30	60.05
Aug. 27	[f] 47.40	59.95
Sept. 25	[f] 47.25	60.10
Oct. 22	46.90	60.45
Nov. 20	46.75	60.60
Dec. 17	[f] 46.80	60.55
1929		
Jan. 22	46.45	60.90
Feb. 19	46.25	61.10
Mar. 20	46.45	60.90
Apr. 17	46.80	60.55
May 28	48.00	59.35
June 21	(f)	---------

472C2. C. Hart. (See p. 231.) Bench mark is top of sill, 1.00 foot below ground; altitude, 99.01 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 28	[p] 41.00	58.01

472D1. Mr. McGaffy. 5-foot well 80 feet deep, used for domestic supply. Bench mark is cross cut in brick on top of well curb, 0.1 foot above ground; altitude 94.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 31.85	62.95
1926		
Aug. 10	32.30	62.50
Sept. 23	32.40	62.40
Oct. 18	32.40	62.40

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[i] Pump running in adjacent well.

[f] Windmill running.

[p] By Cyril Williams.

[f] Windmill running.

[h] New measuring point.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

472D1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Nov. 15	32.10	62.70
Dec. 9	32.50	62.30
1927		
Jan. 18	32.55	62.25
Feb. 17	32.05	62.75
Mar. 16	32.00	62.80
Apr. 26	31.65	63.15
May 25	31.60	63.20
June 24	31.60	63.20
July 21	31.80	63.00
Aug. 24	32.05	62.75
Sept. 27	32.20	62.60
Oct. 27	32.25	62.55
Nov. 29	32.35	62.45
Dec. 19	32.80	62.00
1928		
Jan. 24	35.10	59.70
Mar. 21	33.10	61.70
Apr. 25	32.10	62.70
May 24	32.35	62.45
June 21	32.65	62.15
July 19	32.85	61.95
Aug. 27	33.80	61.00
Sept. 25	32.90	61.90
Oct. 22	33.45	61.35
Nov. 20	33.10	61.70
Dec. 17	33.00	61.80
1929		
Jan. 22	33.05	61.75
Feb. 19	33.15	61.65
Mar. 20	33.15	61.65
Apr. 17	33.25	61.55
May 28	33.40	61.40
June 21	33.50	61.30

472R1. Gustav Rausser. 3-foot well, 68 feet deep, used for domestic supply. Bench mark is top of concrete curb, 1 foot above ground; altitude, 104.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 28	[p] 46.60	57.95
1926		
Apr. 21	46.40	58.15
May 17	46.60	57.95
June 18	47.10	57.45
July 23	47.25	57.30
Aug. 18	[f] 48.50	56.05
Sept. 23	47.50	57.05
Oct. 18	47.55	57.00
Nov. 16	47.90	56.65
Dec. 10	47.25	57.30
1927		
Jan. 18	47.10	57.45
Feb. 17	47.30	57.25
Mar. 16	46.95	57.60
Apr. 26	47.20	57.35
May 25	[f] 49.70	54.85

472R1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
June 24	[f] 48.40	56.15
Aug. 24	48.20	56.35
Sept. 29	[f] 49.35	55.20
Oct. 27	47.75	56.80
Nov. 29	47.60	56.95
1928		
Jan. 24	47.35	57.20
Mar. 21	47.25	57.30
Apr. 25	47.20	57.35
May 24	47.65	56.90
June 21	47.40	57.15
July 19	49.10	55.45
Aug. 27	48.50	56.05
Sept. 25	50.20	54.35
Oct. 22	48.20	56.35
Nov. 20	48.00	56.55
Dec. 17	[f] 51.15	53.40
1929		
Jan. 22	48.05	56.50
Feb. 19	48.10	56.45
Mar. 20	48.10	56.45
Apr. 17	49.20	55.35
May 28	50.40	54.15
June 21	[f] 52.30	52.25

473R1. Thompson Co. 10-inch well. Bench mark is concrete platform of well surrounding casing, at ground surface; altitude 102.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	47.60	55.30
May 17	47.35	55.55
June 18	48.10	54.80
July 23	[e] 56.90	46.00
Aug. 18	48.40	54.50
Sept. 23	48.25	54.65
Oct. 18	48.15	54.75
Nov. 16	48.15	54.75
Dec. 13	48.10	54.80
1927		
Jan. 11	48.00	54.90
Feb. 10	47.90	55.00
Mar. 16	47.70	55.20
Apr. 25	47.55	55.35
May 25	47.60	55.30
June 24	[e][i] 57.30	45.60
Aug. 24	49.40	53.50
Sept. 27	48.90	54.00
1928		
Apr. 25	48.10	54.80
Sept. 25	50.00	52.90
1929		
Apr. 17	49.40	53.50

474A1. Gaylor estate. 6-inch well, 28 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 6 inch base of pump, 1 foot above ground; altitude 75.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 13	26.00	49.50
May 14	25.50	50.00
June 18	26.00	49.50
July 22	26.50	49.00
Aug. 18	26.05	49.45
Sept. 23	26.25	49.25
Oct. 15	27.30	48.20
Nov. 15	26.40	49.10
Dec. 9	26.00	49.50
1927		
Jan. 18	26.35	49.15
Feb. 17	26.20	49.30
Mar. 16	25.60	49.90
Apr. 23	25.20	50.30
May 25	25.15	50.35
June 24	25.05	50.45
July 21	25.80	49.70
Aug. 24	26.00	49.50
Sept. 27	26.10	49.40
Oct. 27	26.30	49.20
Nov. 29	26.50	49.00
Dec. 19	26.50	49.00
1928		
Jan. 24	26.20	49.30
Mar. 21	27.35	48.15
Apr. 24	26.00	49.50
May 24	25.90	49.60
June 21	26.25	49.25
July 19	26.50	49.00
Aug. 27	26.80	48.70
Sept. 24	26.95	48.55
Oct. 22	27.00	48.50
Nov. 20	27.15	48.35
Dec. 17	27.20	48.30
1929		
Jan. 22	27.90	47.60
Feb. 19	27.25	48.25
Mar. 20	27.25	48.25
Apr. 17	27.65	47.85
May 28	27.50	48.00
June 21	27.60	47.90

474C1. 6-inch well, used for stock. Bench mark is copper washer on pump support, 1.2 feet above ground; altitude, 91.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 14	38.40	52.70
June 18	38.70	52.40
July 22	41.05	50.05
Aug. 18	39.50	51.60
Sept. 23	38.90	52.20
Oct. 18	38.95	52.15
Nov. 15	39.00	52.10
Dec. 10	39.00	52.10
1927		
Feb. 17	38.70	52.40
Mar. 16	37.90	53.20

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[f] Windmill running.
[p] By Cyril Williams.

[e] Pumping.
[f] Windmill running.
[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
474C1—Con.		
1928		
Apr. 25	37.05	54.05
Sept. 24	39.40	51.70
1929		
Apr. 17	39.75	51.35

476A1. J. C. Marshall. 6-inch well, 54 feet deep, used for domestic supply. Bench mark is top of casing, 1 foot above ground; altitude, 64.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 22	[p] 27.60	37.20
1926		
Apr. 12	24.70	39.50
May 17	25.10	39.10
June 7	25.40	38.80
July 16	26.20	38.00
Aug. 19	26.60	37.60
Sept. 13	26.90	37.30
Oct. 11	27.00	37.20
Nov. 8	27.05	37.15
Dec. 6	26.85	37.35
1927		
Jan. 11	26.35	37.85
Feb. 7	26.00	38.20
Mar. 10	25.25	38.95
Apr. 13	24.85	39.35
May 20	24.75	39.45
June 17	24.65	39.55
July 18	[1] 28.65	35.55
Aug. 17	26.40	37.80
Sept. 20	26.65	37.55
Oct. 25	26.95	37.25
Nov. 30	26.95	37.25
Dec. 21	26.95	37.25
1928		
Jan. 24	26.60	27.60
Feb. 21	26.25	27.95
Mar. 22	26.00	38.20
Apr. 17	25.50	38.70
May 24	[1] 28.85	35.35
June 21	26.05	38.15
July 23	[1] 26.65	37.55
Aug. 21	27.30	36.90
Sept. 19	27.50	36.70
Oct. 23	27.50	36.70
Nov. 21	28.40	35.80
Dec. 17	27.55	36.65
1929		
Jan. 23	27.35	36.85
Feb. 20	26.95	37.25
Mar. 21	26.60	37.60
Apr. 8	26.50	37.70
May 27	27.20	37.00
June 20	27.45	36.75

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[1] Pump running in adjacent well.

[p] By Cyril Williams.

476D1.—Mary Kenefick. 6-inch well, 45 feet deep, used for domestic supply. Bench mark is copper washer on well-curb cover, 0.2 foot above ground; altitude, 72.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	27.10	44.95
June 18	27.65	44.40
July 22	28.15	43.90
Aug. 18	28.35	43.70
Sept. 23	28.50	43.55
Oct. 15	28.55	43.50
Nov. 15	28.60	43.45
Dec. 9	28.45	43.60
1927		
Jan. 18	28.15	43.90
Feb. 17	27.90	44.15
Mar. 16	27.35	44.70
Apr. 23	26.90	45.15
May 25	27.95	44.10
June 24	28.45	43.60
Sept. 27	29.25	42.80
1928		
Jan. 13	29.25	42.80
Apr. 25	27.70	44.35
Sept. 24	29.15	42.90
1929		
Apr. 17	28.90	43.15

476J1. Mrs. Robins. 5-inch well, not in use. Bench mark is top of wooden pump support, 2 feet above ground; altitude, 62.50 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 22	[p] 26.55	35.95
1927		
Dec. 14	27.00	35.50

476R1. William W. Lange. 7-inch well, 75 feet deep, not in use. Bench mark is top of casing, 2 feet above ground; altitude, 73.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	30.00	43.20
May 17	30.55	42.65
June 18	31.50	41.70
July 22	31.80	41.40
Aug. 18	32.05	41.15
Sept. 23	32.90	40.30
Oct. 15	31.65	41.55
Nov. 15	31.50	41.70
Dec. 9	31.35	41.85
1927		
Jan. 18	31.10	42.10
Feb. 17	(1)	----------

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[1] Caved in.

[p] By Cyril Williams.

477A1. R. B. Robinson. (See p. 231.) Bench mark is top of 2 by 4 inch scantling, 0.3 foot above ground; altitude, 62.51 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 25.20	37.31
1928		
Jan. 7	25.04	37.47
1929		
Mar. 6	26.00	36.51

477E1. J. G. Woodson. 6-inch well, 35 feet deep, used for domestic supply. Bench mark is top of casing, 1.50 feet above ground; altitude 62.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	25.20	37.70
May 17	26.50	36.40
June 7	[1] 27.20	35.70
July 17	28.45	34.45
Aug. 19	27.80	35.10
Sept. 13	27.70	35.20
Oct. 11	27.35	35.55
Nov. 8	27.30	35.60
Dec. 6	26.80	36.10
1927		
Jan. 11	26.50	36.40
Feb. 7	26.30	36.60
Mar. 10	25.90	37.00
Apr. 13	25.40	37.50
May 20	25.40	37.50
June 17	26.65	36.25
July 19	28.15	34.75
Aug. 18	28.70	34.20
Sept. 20	27.90	35.00
Oct. 25	27.50	35.40
Nov. 30	28.35	34.55
Dec. 21	27.00	35.90
1928		
Jan. 25	26.80	36.10
Feb. 23	26.35	36.55
Mar. 22	[1] 26.25	36.65
Apr. 17	26.20	36.70
May 24	27.10	35.80
June 21	30.65	32.25
July 23	28.85	34.05
Aug. 21	28.85	34.05
Sept. 19	28.70	34.20

477E2. J. G. Woodson. (See p. 231.) Bench mark is copper washer in 2 by 12 inch plank at top of pit curb, 1.0 foot above ground: altitude, 62.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	24.40	37.60

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[1] Pump running in adjacent well.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
477E2—Con.		
1929		
Apr. 9	26.35	35.65

477H1. O. R. Dustin. 6-inch well, 45 feet deep, used for domestic supply. Bench mark is top of 1-inch board covering casing, 0.5 foot above ground; altitude, 68.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	26.00	42.30
June 18	[i] 36.30	32.00
July 22	29.40	38.90
Aug. 18	29.35	38.95
Sept. 23	28.65	39.65
Oct. 15	27.95	40.35
Nov. 15	27.65	40.65
Dec. 9	27.20	41.10
1927		
Jan. 18	26.85	41.45
Feb. 16	25.90	42.40
Mar. 16	25.75	42.55
Apr. 23	25.55	42.75
June 24	[i] 38.20	30.10
Aug. 24	29.15	39.15
Sept. 27	28.90	39.40
1928		
Apr. 25	26.50	41.80
Sept. 24	29.90	38.40
1929		
Apr. 17	28.40	39.90

479E1. 6-inch well, used for domestic supply. Bench mark is top of inside casing, altitude 77.05 feet, which is 0.3 foot below reference bench mark, a copper washer on northwest corner of pump support, 0.8 foot above ground

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 14	29.85	47.20
June 19	32.10	44.95
July 23	31.80	45.25
Aug. 18	31.60	45.45
Sept. 23	31.20	45.85
Oct. 18	30.85	46.20
Nov. 16	30.65	46.40
Dec. 9	30.45	46.60
1927		
Jan. 18	30.15	46.90
Feb. 17	31.20	45.85
Mar. 16	29.35	47.70
Apr. 23	29.10	47.95
May 26	28.60	48.45
June 24	31.95	45.10
Aug. 24	32.00	45.05
Sept. 27	32.90	44.15

[i] Pump running in adjacent well.

Date	Depth to water (feet)	Altitude of water table (feet)
479E1—Con.		
1928		
Apr. 25	30.25	46.80
Sept. 24	32.65	44.40
1929		
Apr. 17	33.35	43.70

479R1. Drilled well used for domestic supply. Bench mark is top of well cover, 1.10 feet above ground; altitude, 87.07 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 15	[p] 37.95	49.12

4712E1. Carl Leer. (See p. 232.) Bench mark is cement block inside pump house, 0.9 foot above ground; altitude, 107.45 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 28	[p] 49.71	57.74

4713P1. 12-inch well, 55 feet deep, not in use. Bench mark is top of casing, 2 feet above ground; altitude, 112.35 feet.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	53.00	59.35
May 13	53.05	59.30
June 18	55.20	57.15
July 23	53.75	58.60
Aug. 18	54.10	58.25
Sept. 23	53.70	58.65
Oct. 18	52.50	59.85
Nov. 16	53.50	58.85
Dec. 13	54.50	57.85
1927		
Jan. 18	53.50	58.85
Feb. 17	53.65	58.70
Mar. 16	53.40	58.95
Apr. 23	53.20	59.15
May 26	53.75	58.60
June 24	54.65	57.70
Aug. 24	56.15	56.20
Sept. 27	54.00	58.35
1928		
Apr. 25	54.35	58.00
Sept. 25	54.80	57.55
1929		
Apr. 17	54.80	57.55

[p] By Cyril Williams.

4713A1. C. W. Murray. 6-foot well, not in use. Bench mark is copper washer on 2 by 12 inch plank on side of well, 1 foot above ground; altitude, 109.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1924		
Oct. 13	[p] 54.20	55.45
1926		
Apr. 20	51.70	57.95

4713E1. Joe Gilbeau. 14-inch well, not in use. Bench mark is top of concrete pump base, 1.10 feet above ground; altitude, 107.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	50.95	56.20
May 17	51.90	55.25
June 19	54.20	52.95
July 23	[e] 67.55	39.60
Aug. 18	54.90	52.25
1927		
May 26	([e])	
July 24	[e] 67.65	39.50

4713N1. Fairbanks & Dement. 6-inch well, 100 feet deep, used for domestic supply. Bench mark is top of west cross board under board at pump base, 1.6 feet above ground; altitude, 105.66 feet. [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 13	[p] 51.15	54.51

4714P1. C. C. Fairchild. 6-inch well, 45 feet deep, not in use. Bench mark is top of casing, 0.5 foot above ground; altitude, 94.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	42.30	51.80
June 19	[i] 47.75	46.35
July 23	45.35	48.75
Aug. 18	45.10	49.00
Sept. 23	44.10	50.00
Oct. 18	42.75	51.35
Nov. 16	42.45	51.65
Dec. 13	41.85	52.25
1927		
Jan. 18	41.90	52.20
Feb. 17	41.20	52.90

[e] Pumping.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—**Continued**

4714P1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Mar. 16	40.80	53.30
Apr. 23	41.15	52.95
May 25	45.25	48.85
June 24	[g] 49.70	44.40
July 22	47.00	47.10
Aug. 24	46.15	47.95
Sept. 27	44.25	49.85
Nov. 29	42.10	52.00
1928		
Apr. 24	44.50	49.60
Sept. 25	45.25	48.85
1929		
Mar. 13	44.85	49.25
Apr. 17	46.85	47.25

4714R1. 8-inch well, not in use. Bench mark is cross on concrete curb, at ground surface; altitude, 102.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 10	49.50	52.90
Sept. 23	49.60	52.80
Oct. 18	49.45	52.95
Nov. 16	49.25	53.15
Dec. 13	49.15	53.25
1927		
Jan. 18	48.75	53.65
Feb. 19	49.05	53.35
Mar. 16	48.30	54.10
Apr. 23	48.00	54.40
May 26	48.55	53.85
June 24	49.10	53.30
July 22	49.65	52.75
Aug. 24	49.85	52.55
Sept. 29	49.80	52.60
Oct. 27	49.70	52.70
Nov. 29	49.45	52.95
Dec. 19	50.45	51.95
1928		
Jan. 23	49.00	53.40
Feb. 18	50.00	52.40
Mar. 22	48.80	53.60
Apr. 24	48.70	53.70
May 24	48.75	53.65
June 18	49.60	52.80
July 20	50.15	52.25
Aug. 23	50.65	51.75
Sept. 25	50.65	51.75
Oct. 22	50.40	52.00
Nov. 20	50.25	52.15
Dec. 17	49.95	52.45
1929		
Jan. 22	49.80	52.60
Feb. 19	49.55	52.85
Mar. 20	49.70	52.70
Apr. 17	50.00	52.40
May 29	50.85	51.55
June 21	52.00	50.40

[g] Pump stopped a short time before measurement.

4715A1. E. R. LaValley. 10-inch well, 60 feet deep, used for domestic supply. Bench mark until Sept. 27, 1927, copper washer on 2 by 4 inch scantling on well cover, 0.2 foot above ground, altitude 88.30 feet; after that date, 0.5 foot below well curb, altitude 88.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	37.90	50.40
June 19	38.70	49.60
July 23	39.15	49.15
Aug. 18	[f] 39.00	49.30
Sept. 23	39.00	49.30
Oct. 18	38.80	49.60
Nov. 16	39.80	48.50
Dec. 13	39.30	49.00
1927		
Jan. 18	38.45	49.85
Feb. 17	38.50	49.80
Mar. 16	38.20	50.10
Apr. 23	38.10	50.20
May 25	38.10	50.20
June 24	39.10	49.20
Aug. 24	39.30	49.00
Sept. 27	[h] 39.15	49.00
1928		
Apr. 25	39.45	48.70
Sept. 25	40.15	48.00
1929		
Apr. 17	40.05	48.10

4715D1. Leonard Baumbach. (See p. 232.) Bench mark is top of casing, 0.2 foot above ground; altitude, 96 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	42.85	53.15
May 15	43.90	52.10
June 19	[e] 55.30	40.70
July 23	[i] 46.80	49.20
Aug. 18	47.05	48.95
Sept. 23	45.05	50.95
Nov. 16	43.85	52.15
Dec. 13	43.45	52.55
1927		
Jan. 18	43.20	52.80
Feb. 17	43.15	52.85
Mar. 16	42.75	53.25
Apr. 23	42.70	53.30
May 25	45.50	50.50
June 24	[e] 57.60	38.40
Aug. 24	46.05	49.95
Sept. 27	45.10	50.90

[e] Pumping.
[f] Windmill running.
[h] New measuring point.
[i] Pump running in adjacent well.

4715D1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 25	43.95	52.05
Sept. 25	47.60	48.40
1929		
Apr. 17	48.55	47.45

4716B1. Used for stock. Bench mark is copper washer on east side on 2 by 12 inch plank in well cover, 1.00 foot above ground; altitude, 79.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	32.00	47.60
June 19	[f] 32.90	46.70
July 23	33.20	46.40
Aug. 18	[f] 33.40	46.20
Sept. 23	33.40	46.20
Oct. 15	33.15	46.45
Nov. 16	32.90	46.70
Dec. 13	32.75	46.85
1927		
Jan. 18	32.55	47.05
Feb. 17	32.75	46.85
Mar. 16	32.10	47.50
Apr. 23	31.90	47.70
May 25	32.20	47.40
June 24	35.55	44.05
Aug. 24	33.60	46.00
Sept. 27	33.65	45.95
1928		
Apr. 25	32.30	47.30
Sept. 24	34.45	45.15
1929		
Apr. 17	33.90	45.70

4717M1. C. R. Dustin. 4-inch well, 100 feet deep, not used. Bench mark is copper washer and top of casing, 1.50 feet above ground; altitude, 78.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 25	36.30	41.90
Nov. 16	36.05	42.15
Dec. 9	35.65	42.55
1927		
Jan. 18	35.35	42.85
Feb. 17	35.30	42.90
Mar. 16	34.70	43.50
Apr. 23	35.00	43.20
May 25	41.20	37.00
June 24	45.20	33.00
Aug. 24	38.90	39.30
Sept. 27	37.50	40.70
1928		
Apr. 24	36.00	42.20
Sept. 24	42.30	35.90
1929		
Apr. 17	42.25	35.59

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

4717N1. Hollenstein Bros. (See p. 233.) Bench mark is top of casing, altitude 38.30 feet, which is 30.35 feet below reference bench mark, a copper washer in well curb, 0.5 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	1.20	37.10
May 17	[g] 1.90	36.40

4717N2. G. Karnago. 6-inch well, used for domestic supply. Bench mark is top of casing, 1.5 feet above ground; altitude, 71.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	34.00	37.00
June 18	35.40	35.60
July 22	[f] 36.70	34.30
Aug. 18	[f] 34.95	36.05
Sept. 23	36.00	35.00
Oct. 15	35.55	35.45
Nov. 15	34.90	36.10
Dec. 9	34.50	36.50
1927		
Jan. 18	33.80	37.20
Feb. 16	33.35	37.65
Mar. 15	32.90	38.10
Apr. 23	32.45	38.55
May 25	33.85	37.15
June 24	36.40	34.60
Aug. 24	31.60	39.40
Sept. 27	36.90	34.10
1928		
Apr. 25	33.65	37.35
Sept. 24	37.90	33.10
1929		
Apr. 17	35.90	35.10
May 28	[i] 38.15	32.85

4718A3. Joe Garnero. 6-inch well, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 59.75 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 25.00	34.75

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[f] Windmill running.

[g] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

4718D1. O. Peck. (See p. 233.) Bench mark is top of casing, altitude 45.75 feet, which is 25.50 feet below reference bench mark, a copper washer on 2 by 6 inch plank across pit. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	4.70	41.05
May 17	[e] 8.10	37.65
June 18	10.15?	35.60
July 22	[e] 12.50	33.25

4719A1. J. B. Linn. (See p. 233.) Bench mark until Dec. 17, 1928, copper washer on 2 by 4 inch base of pump, altitude 48.65 feet, which is 11.75 feet below reference bench mark, a copper washer on 6 by 6 inch beam on wood curb, 0.5 foot above ground; after that date, top of concrete curb of pit, south side, altitude 59.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	15.35	33.30
May 17	16.50	32.15
June 8	[i] 20.15	28.50
July 17	20.10	28.55
Aug. 20	19.30	29.35
Sept. 14	18.50	30.15
Oct. 12	17.40	31.25
Nov. 22	16.25	32.40
1927		
Jan. 11	15.45	33.20
Feb. 7	15.00	33.65
Mar. 10	14.75	33.90
Apr. 13	14.50	34.15
May 20	17.80	30.85
June 17	[g] 22.10	26.55
July 18	21.90	26.75
Aug. 18	12.60	36.05
Sept. 20	19.60	29.05
Oct. 25	17.75	30.90
Nov. 30	16.90	31.75
Dec. 21	16.60	32.05
1928		
Jan. 26	16.10	32.55
Feb. 23	15.70	32.95
Mar. 22	15.70	32.95
Apr. 17	15.85	32.80
May 24	19.00	29.65
June 21	([e])	---------
July 24	22.70	25.95
Aug. 21	([e])	---------
Sept. 18	([e])	---------
Oct. 23	18.55	30.10
Nov. 21	17.95	30.70
Dec. 17	[h] 28.75	30.80
4719A1—Con.		
1929		
Jan. 24	28.05	31.50
Feb. 20	27.70	31.85
Mar. 21	30.50	29.05
Apr. 9	31.15	28.40
May 27	([e])	---------
June 20	35.15	24.40

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[e] Pumping.

[g] Pump stopped a short time before measurement.

[h] New measuring point.

[i] Pump running in adjacent well.

4719A3. John Mieko. 3-inch well, 47 feet deep, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 58.96 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 26.97	31.99

4720D1. Paul Cooke. 6-inch well, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude, 76.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 13	33.90	42.55
May 14	33.70	42.75
June 19	37.80	38.65
July 23	36.95	39.50
Aug. 18	36.90	39.55
Sept. 23	36.05	40.40
Oct. 15	([z])	---------

4721D1. Emil Gentner. (See p. 234.) Bench mark is copper washer on 6 by 6 inch beam, about 1.00 foot above ground; altitude, 84.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 18	37.05	47.50
June 19	42.70	41.85
July 23	[e] 52.90	31.65
Aug. 18	40.24	44.30
Sept. 23	[e] ±56.2	±28.3
Oct. 18	37.90	46.65
Nov. 16	37.55	47.00
Dec. 13	37.05	47.50
1927		
Jan. 18	36.70	47.85
Feb. 17	36.70	47.85
Mar. 16	36.30	48.25
Apr. 23	36.65	47.90
May 25	39.85	44.70
June 24	43.90	40.65
July 22	([e])	---------
Aug. 24	41.85	42.70
Sept. 27	39.30	45.25
1928		
Apr. 24	39.40	45.15
Sept. 25	([e])	---------

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[e] Pumping.

[p] By Cyril Williams.

[z] Filled in.

Measurements of depth to water in observation wells—Continued

4721D1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 17	43.60	40.95

4722A1. C. Formati. (See p. 234.) Bench mark is 4 by 6 inch base of pump, altitude 51.93 feet, which is 31.70 feet below reference bench mark, a copper washer on wood curb, at ground surface. All measurements made from base of pump [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 15	[p] 5.20	46.73
1926		
Apr. 14	3.80	48.13
May 18	4.40	46.53

4722J1. George Knoll. 10-inch well, not in use. Bench mark is copper washer on 2 by 6 inch well cover, 1.4 feet above ground; altitude, 81.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 18	34.45	47.20
June 19	39.25	42.40
1927		
May 25	[f] 37.60	44.05
June 24	40.05	41.60
Sept. 27	37.55	43.10

4723A1. J. W. Newhardt. (See p. 234.) Bench mark is upper pump flange, altitude 59.00 feet, which is 36.60 feet below reference bench mark, a copper washer on well curb, at ground surface

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 13	6.70	52.30
May 18	7.40	51.60

4723M1. Frank Rinaudo. (See p. 234.) Bench mark is top pump brace, 0.37 foot above casing and 0.40 foot above ground; altitude, 96.97 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 13	[p] 43.60	53.37

4723R1. George Blanke. (See p. 234.) Bench mark is copper washer on west side of curb, 0.20 foot above ground; altitude, 97.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	41.50	55.55
May 15	41.20	55.85
June 17	46.20	50.85
July 23	46.30	50.75
Aug. 18	46.55	50.50
Sept. 23	48.40	48.65
Oct. 15	44.65	52.40
Nov. 15	44.30	52.75
Dec. 9	42.55	54.50
1927		
Jan. 17	41.40	55.65
Mar. 16	41.40	55.65
Apr. 18	41.35	55.70
May 23	42.60	54.45
June 29	45.30	51.75
July 22	45.10	51.95
Aug. 22	46.05	51.00
Sept. 27	45.50	51.55
Oct. 27	44.40	52.65
Nov. 29	43.15	53.90
Dec. 19	43.50	53.55
1928		
Jan. 23	43.55	53.50
Feb. 18	43.50	53.55
Mar. 22	45.25	51.80
Mar. 27	50.25	46.80
Apr. 4	40.80	56.25
Apr. 24	42.05	55.00
May 23	42.40	54.65
June 18	46.40	50.65
July 20	48.35	48.70
Aug. 23	49.30	47.75
Sept. 24	45.95	51.10
Oct. 22	45.55	51.50
Nov. 20	44.80	52.25
Dec. 17	44.65	52.40
1929		
Jan. 22	44.20	52.85
Feb. 19	44.30	52.75
Mar. 20	46.35	50.70
Apr. 17	48.05	49.00
May 29	48.45	48.60
June 21	47.50	49.55

4725G1. La Lomita ranch. 3-foot dug and drilled well, 545 feet deep, used for domestic supply and irrigation. Bench mark until January 21, 1928, top of brick casing, at ground surface, altitude 88.15 feet; after that date, top of I beam, altitude 90.72 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	33.50	54.65
May 18	33.50	54.65
June 17	36.40	51.75
July 23	[c] 36.95	51.20
Aug. 17	37.40	50.75
Sept. 23	37.60	50.55
Oct. 15	36.40	51.75
Nov. 15	[c] 36.40	51.75
Dec. 9	35.35	52.80

4725G1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 17	35.00	53.15
Feb. 16	34.50	53.65
Mar. 16	33.90	54.25
Apr. 18	33.40	54.75
May 23	32.10	56.05
June 25	32.30	55.85
July 19	38.10	50.05
Aug. 22	35.00	53.15
Sept. 26	35.70	52.45
Oct. 27	35.55	52.60
Nov. 28	35.15	53.00
1928		
Jan. 21	[h] 36.30	54.42
Feb. 18	36.10	54.62
Mar. 17	36.25	54.47
Apr. 4	28.10	62.62
Apr. 24	29.45	61.27
May 23	30.05	60.67
June 18	32.10	58.62
July 20	34.05	56.67
Aug. 23	35.75	54.97
Sept. 24	([c])	--------
Oct. 22	37.70	53.02
Nov. 23	37.50	53.22
Dec. 17	37.40	53.32
1929		
Jan. 22	37.20	53.52
Feb. 19	37.20	53.52
Mar. 20	38.20	52.52
Apr. 16	([c])	--------
May 29	[g] 40.70	50.02
June 21	([c])	--------
July 18	[g] 41.00	[g] 49.72
Aug. 15	([c])	--------
Sept. 11	([c])	--------
Oct. 8	37.65	53.07
Nov. 7	37.95	52.77
Nov. 12	37.75	52.97
Dec. 3	37.70	53.02
Dec. 6	37.65	53.07

4725G2. La Lomita ranch. 4-inch well, used for domestic supply. Bench mark is top of casing, 1.3 feet above ground; altitude, 89.29 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 12	[p] 35.65	53.64

4725R1. L. J. Locke. Bench mark is copper washer on plank well cover, at ground surface; altitude, 104.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 12	[p] 51.45	53.30
Oct. 18	[t] 51.80	52.95
1926		
Sept. 10	53.40	51.35

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[f] Windmill running.
[p] By Cyril Williams.

[c] Pumping.

[c] Pumping.
[g] Pump stopped a short time before measurement.
[h] New measuring point.
[p] By Cyril Williams.
[t] By C. H. Widdows.

Measurements of depth to water in observation wells—**Continued**

Date	Depth to water (feet)	Altitude of water table (feet)
4725R1—Con.		
1927		
May 23	49.45	55.30
June 25	48.65	56.10
Sept. 27	51.80	52.95
Dec. 19	51.75	53.00
1928		
Apr. 24	46.65	58.10
1929		
Apr. 16	50.25	54.50

4725R2. Mrs. H. L. Demangeot. (See p. 234.) Bench mark is top east side of brick curb, 0.5 foot above ground; altitude 106.31 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 12	[p] 53.15	53.16
Oct. 18	[i] 46.45	59.86

4726G1. [d] E. J. Hatton. 6-inch well, over 100 feet deep, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 92.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 8	42.15	50.25
1927		
Sept. 27	41.85	50.55
1928		
Apr. 24	40.40	52.00
May 24	40.15	52.25
June 18	41.80	50.60
July 20	42.20	50.20
Sept. 24	42.85	49.55
Oct. 22	42.60	49.80
Nov. 20	42.45	49.95
Dec. 17	42.15	50.25
1929		
Jan. 29	41.90	50.50
Feb. 21	41.95	50.45
Mar. 20	[i] 45.25	47.15
Apr. 17	44.40	48.00
May 29	44.35	48.05
June 21	45.10	47.30

4726K1. A. L. Paddleford. (See p. 234.) Bench mark is top of instrument shelf, 3.5 feet above ground; altitude, 96.64 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 28	48.30	48.34
4726K1—Con.		
1927		
June 8	48.00	48.64
July 15[a]	47.92	48.72
July 22	48.29	48.35
July 29	48.38	48.26
Aug. 5	48.96	47.68
Aug. 12	49.07	47.57
Aug. 19	48.80	47.84
Aug. 26	49.04	47.60
Sept. 2	49.32	47.32
Sept. 10	48.84	47.80
Sept. 16	49.24	47.40
Sept. 23	48.61	48.03
Oct. 1	48.34	48.30
Oct. 7	48.37	48.27
Oct. 14	48.39	48.25
Oct. 21	47.95	48.69
Oct. 28	47.70	48.94
Nov. 4	47.52	49.12
Nov. 11	47.13	49.51
Nov. 18	47.09	49.55
Nov. 25	47.06	49.58
Dec. 3	47.05	49.59
Dec. 9	46.99	49.65
Dec. 16	47.00	49.64
Dec. 23	47.00	49.64
Dec. 30	46.98	49.66
1928		
Jan. 6	46.96	49.68
Jan. 13	46.88	49.76
Jan. 20	46.90	49.74
Jan. 28	47.08	49.56
Feb. 4[e]	46.88	49.76

4726N1. J. T. Langford. (See p. 234.) Bench mark is copper washer on 6 by 6 inch base of pump, 32.50 feet below ground, altitude 59.60 feet, which is 32.50 feet below reference bench mark, a copper washer on door sill

Date	Depth to water (feet)	Altitude of water table (feet)
1918		
Mar. 4	[w] 8.35	51.25
1921		
Jan. 31	[w] 7.85	51.75
June 10	[w] 7.75	51.85
1925		
Mar. 26	[w] 9.10	50.50
Nov. 20	[c] [w] 15.00	44.60
Nov. 23	[c] [w] 16.80	42.80
1926		
Mar. 26	[c] [w] 17.00	42.60
Apr. 13	[w] 10.40	49.20
Apr. 20	10.25	49.35
May 15	[i] 8.60	51.00
June 17	11.55	48.05
July 23	[c] 14.30	45.30
Aug. 18	12.40	47.20
Sept. 23	12.65	46.95
Oct. 25	11.20	48.40
Nov. 15	11.05	48.55
Dec. 9	9.85	49.75
4726N1—Con.		
1927		
Jan. 17	9.50	50.10
Feb. 16	9.05	50.55
Mar. 15	8.35	51.25
Apr. 18	[i] 9.00	50.60
June 1	[c] 18.35	41.25
June 2	[g] 10.75	48.85
June 29	9.75	49.85
July 29	[c] 16.35	43.25
Aug. 22	11.75	47.85
Sept. 27	11.35	48.25
1928		
Apr. 24	9.80	49.80
May 24	10.05	49.55
June 18	11.10	48.50
July 25	12.00	47.60
Aug. 23	(c)	----------
Sept. 24	12.40	47.20

4727A1. C. B. Clancy. 12-inch well, 150 feet deep, not used. Bench mark until Jan. 14, 1927, copper washer on 6 by 6 inch beam over pit, at ground surface, altitude 81.85 feet; after that date, top of 2 by 12 inch pit cover at northeast corner of trap door, altitude 81.99 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 14	35.85	46.00
May 15	34.70	47.15
June 17	[i] 40.75	41.10
July 23	39.60	42.25
Aug. 18	38.80	43.05
Sept. 23	38.65	43.20
Oct. 15	36.45	45.40
Nov. 15	36.10	45.75
Dec. 9	35.35	46.50
1927		
Jan. 14[a]	35.20	46.79
Jan. 21	35.20	46.79
Jan. 28	35.21	46.78
Feb. 4	35.12	46.87
Feb. 11	35.07	46.92
Feb. 18	35.00	46.99
Feb. 25	34.70	47.29
Mar. 4	34.77	47.22
Mar. 11	35.10	46.89
Mar. 18	35.06	46.93
Mar. 25	34.73	47.26
Apr. 2	34.68	47.31
Apr. 9	34.63	47.36
Apr. 15	34.73	47.26
Apr. 22	35.24	46.75
Apr. 29	35.93	46.06
May 6	36.19	45.80
May 13	36.71	45.28
May 20	[i] 37.72	44.27
May 27	[i] 38.90	43.09
June 4	[i] 39.45	42.54
June 10	[i] 40.37	41.62
June 17	[i] 42.04	39.95
June 24	[i] 41.24	40.75

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[i] Pump running in adjacent well.
[p] By Cyril Williams.
[d] By C. H. Widdows.

[c] Pumping.
[i] Pump running in adjacent well.
[a] Water-stage recorder installed.
[e] Water-stage recorder removed.
[w] Measurement by owner.

[c] Pumping.
[g] Pump stopped a short time before measurement.
[i] Pump running in adjacent well.
[a] Water-stage recorder installed.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4727A1—Con.		
1927		
July 1	[i] 40.61	41.38
July 8	[i] 41.88	40.11
July 15	[i] 40.37	41.62
July 22	[i] 38.76	43.23
July 29	[i] 38.43	43.56
Aug. 5	[i] 38.24	43.75
Aug. 12	[i] 38.44	43.55
Aug. 19	[i] 38.26	43.73
Aug. 26	[i] 38.37	43.62
Sept. 2	[i] 38.59	43.40
Sept. 10	37.64	44.35
Sept. 16	37.96	44.03
Sept. 23	37.65	44.34
Oct. 1	36.96	45.03
Oct. 7	36.93	45.06
Oct. 14	36.66	45.30
Oct. 21	36.49	45.53
Oct. 28	36.34	45.65
Nov. 4	36.08	45.91
Nov. 11	35.95	46.04
Nov. 18	35.77	46.22
Nov. 25	35.73	46.26
Dec. 3	35.68	46.31
Dec. 5	35.68	46.31
Dec. 9	35.58	46.41
Dec. 16	35.64	46.35
Dec. 23	35.58	46.41
Dec. 30	35.56	46.43
1928		
Jan. 6	35.55	46.44
Jan. 13	35.42	46.57
Jan. 20	35.46	46.53
Jan. 28	35.64	46.35
Feb. 4	35.82	46.17
Feb. 10	36.15	45.84
Feb. 17	36.48	45.51
Feb. 24	36.95	45.04
Mar. 2	37.34	44.65
Mar. 9	38.44	43.55
Mar. 16	38.81	43.18
Mar. 23	38.70	43.29
Mar. 30	36.24	45.75
Apr. 6	36.18	45.81
Apr. 13	36.34	45.65
Apr. 20	36.25	45.74
Apr. 27	37.12	44.87
May 4	[i] 38.08	43.91
May 11	[i] 37.53	44.46
May 18	[i] 37.98	44.01
May 25	[i] 40.45	41.54
June 1	[i] 43.44	38.55
June 8	[i] 44.10	37.89
June 16	[i] 44.42	37.57
June 22	[i] 42.18	39.81
June 29	[i] 42.86	39.13
July 6	[i] 41.64	40.35
July 13	[i] 41.58	40.41
July 20	[i] 41.21	40.78
July 27	[i] 41.35	40.64
Aug. 3	40.34	41.65
Aug. 10	[i] 40.57	41.42
Aug. 17	39.50	42.49
Aug. 24	[i] 41.41	40.58
Aug. 31	[i] 41.21	40.78
Sept. 7	39.61	42.38
Sept. 14	39.83	42.16
Sept. 21	39.00	42.99
Sept. 28	39.29	42.70
Oct. 5	38.03	43.96
Oct. 12	37.95	44.04
Oct. 19	38.09	43.90
Oct. 26	37.80	44.19

[i] Pump running in adjacent well.

Date	Depth to water (feet)	Altitude of water table (feet)
4727A1—Con.		
1928		
Nov. 2	37.38	44.61
Nov. 10 [o]	37.36	44.63
Dec. 17	36.75	45.24
1929		
Jan. 29	36.55	45.44
Feb. 21	[i] 38.15	43.84
Mar. 20	40.25	41.74
Apr. 17	42.75	39.24
May 29	42.75	39.24
June 20	42.00	39.99

4727A4. U. S. Geological Survey. 10-inch well, 40 feet deep, used for experiments. Bench mark is top of instrument shelf, 3.0 feet above ground; altitude, 85.04 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Dec. 16 [n]	39.28	45.76
Dec. 23	38.76	46.28
Dec. 30	38.10	46.94
1928		
Jan. 6	38.25	46.79
Jan. 13	38.26	46.78
Jan. 20	38.24	46.80
Jan. 28	38.25	46.79
Feb. 4	38.12	46.92
Feb. 10	38.40	46.64
Feb. 17	38.72	46.32
Feb. 24	39.06	45.98
Mar. 2	39.45	45.59
Mar. 9	39.96	45.08
Mar. 16	40.42	44.62
Mar. 23	Dry.	----------
Mar. 30	39.55	45.49
Apr. 6	39.07	45.97
Apr. 13	39.16	45.88
Apr. 20	39.11	45.93
Apr. 27	39.54	45.50
May 4	40.02	45.02
May 11	40.16	44.88
May 18	40.39	44.65
May 25	40.94	44.10
June 1	38.66	46.38
June 8	38.70	46.34
June 16 [o]	40.00	45.04

4727K1. E. S. Clancy. (See p. 234.) Bench mark is top of casing, 0.30 foot above ground; altitude, 82.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 5	36.85	45.55
Sept. 23	37.45	44.95
Oct. 15	36.10	46.30
Nov. 15	35.95	46.45
Dec. 9	35.10	47.30
1927		
Jan. 17	34.80	47.60
Feb. 16	34.50	47.90

[i] Pump running in adjacent well.

[n] Water-stage recorder installed.

[o] Water-stage recorder removed.

Date	Depth to water (feet)	Altitude of water table (feet)
4727K1—Con.		
1927		
Mar. 16	34.45	47.95
Apr. 18	34.10	48.30
May 12	34.75	47.65
May 23	35.80	46.60
June 29	36.40	46.00
July 22	36.40	46.00
Aug. 27	[e] 37.40	45.00
Sept. 27	36.15	46.25
Oct. 28	35.70	46.70
Nov. 28	35.25	47.15
Dec. 19	35.15	47.25
1928		
Jan. 23	35.10	47.30
Feb. 18	36.15	46.25
Mar. 22	38.75	43.65
Mar. 27	34.80	47.60
Apr. 4	34.85	43.55
Apr. 24	35.30	47.10
May 24	36.75	45.65
June 18	38.00	44.40
July 20	38.20	44.20
Aug. 23	38.70	43.70
Sept. 24	37.35	45.05
1929		
Apr. 17	41.20	41.20

4727N1. Verne Hoffman. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 65.65 feet, which is 13.30 feet below reference bench mark, a copper washer on concrete curb, at ground surface. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 19.35	46.30
1926		
Apr. 14	14.30	51.35
May 15	[g] 14.90	50.75
June 19	[g] 18.00	47.65
July 23	[e] 24.90	40.75
Sept. 23	[e] 23.55	42.10
Oct. 15	20.80	44.85
Nov. 15	20.85	44.80
Dec. 9	17.95	47.70
1927		
Jan. 17	18.05	47.60
Feb. 16	16.70	48.95
Mar. 16	15.10	50.55
Apr. 18	14.20	51.45
May 23	11.80	53.85
June 24	11.40	54.25
July 22	([e])	----------
Aug. 24	([e])	----------
Sept. 27	20.10	45.15
Oct. 27	19.50	46.55
Nov. 29	18.85	46.80

[e] Pumping.

[g] Pump stopped a short time before measurement.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

4727N1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Jan. 24	19.05	46.60
Feb. 18	18.80	46.85
Mar. 22	17.75	47.90
Mar. 27	13.00	52.65
Apr. 4	12.80	52.85
Apr. 24	13.80	51.85
May 24	12.10	53.55
June 18	16.70	48.95
July 21	19.50	46.15
Aug. 23	20.25	45.40
Sept. 24	20.55	45.10
Oct. 22	20.90	44.75
Nov. 20	20.85	44.80
Dec. 17	21.05	44.60
1929		
Jan. 29	20.45	45.20
Feb. 21	20.60	45.05
Mar. 20	19.40	46.25
Apr. 17	18.85	46.80
May 29	14.80	50.85
June 20	15.10	50.55

4728M1. Capt. M. T. Baily. (See p. 235.) Bench mark is top of casing, 1.50 feet above ground; altitude, 80.88 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 15	[p] 35.20	45.68
1926		
Oct. 28	35.50	45.38

4729A1. Wishbone Inn. 6-inch well, used for domestic supply. Bench mark until July 22, 1926, copper washer on south side of curb, 2.00 feet above ground, altitude 65.65 feet; after that date, copper washer on 4 by 4 inch beam, 0.3 foot above ground, altitude 64.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	32.70	32.95
June 17	33.50	32.15
July 22	[h] 31.15	33.80
Aug. 18	31.00	33.95
Sept. 23	30.55	34.40
Oct. 15	30.00	34.95
Nov. 15	29.40	35.55
Dec. 9	29.00	35.95
1927		
Jan. 17	28.35	36.60
Feb. 16	28.05	36.90
Mar. 16	27.80	37.15
Apr. 23	28.65	36.30
June 24	[c] 34.20	30.75

4729A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
June 24	[g] 33.75	31.20
Aug. 24	31.60	33.35
Sept. 27	31.00	33.95
1928		
Apr. 24	29.35	35.60
Sept. 24	32.50	32.45
1929		
Apr. 17	33.80	31.15

4729D1. J. W. Stafford. (See p. 235.) Bench mark is top of casing, 1.6 feet above ground; altitude, 72.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 17	31.10	41.40
June 17	35.15	37.35
July 23	34.55	37.95
Aug. 18	33.75	38.75
Sept. 23	33.25	39.25
Oct. 15	32.65	39.85
Nov. 15	32.30	40.20
Dec. 9	31.75	40.75
1927		
Jan. 17	31.30	41.20
Feb. 16	31.10	41.40
Mar. 16	31.05	41.45
Apr. 23	31.80	40.70
May 25	[c] 41.95	30.55
June 24	36.65	35.85
July 21	[g] 35.90	36.60
Aug. 24	33.95	38.55
Sept. 27	33.20	39.30
Oct. 28	32.70	39.80
Nov. 29	32.10	40.40
Dec. 19	31.85	40.65
1928		
Jan. 24	31.65	40.85
Feb. 18	32.20	40.30
Mar. 7	32.80	39.70
Mar. 22	34.25	38.25
Apr. 24	32.60	39.90
May 24	34.80	37.70
June 19	[c] 45.45	27.05
July 19	37.50	35.00
Aug. 23	35.20	37.30
Sept. 24	([c])	---------
Oct. 22	33.90	38.60
Nov. 20	33.35	39.15
Dec. 17	33.05	39.45
1929		
Jan. 29	32.70	39.80
Feb. 21	33.55	38.95
Mar. 20	35.50	37.00
Apr. 17	([c])	---------
May 29	([c])	---------
June 20	37.60	34.90

4729N3. 4-inch well 54 feet deep, used for domestic supply. Bench mark is top of east side of casing, altitude 61.75 feet, which is 0.47 foot below reference bench mark, a copper washer in top of 2 by 6 inch beam of pump support, 1.1 feet above ground

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
July 17	32.15	29.60
Aug. 16	31.55	30.20
Sept. 11	30.55	31.20
Oct. 9	29.75	32.00
Nov. 6	29.15	32.60
Dec. 6	28.70	33.05

4729P1. H. H. McComb. (See p. 235.) Bench mark is top of casing, altitude, 42.95 feet, which is 24.50 feet below reference bench mark, a copper washer on doorsill of pump house, 0.4 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 13	6.00	36.95
May 17	4.50	38.45
June 17	5.85	37.10
July 22	5.40	37.55
Aug. 18	[c] 5.60	37.35
Sept. 23	5.50	37.45
Oct. 15	5.35	37.60
Nov. 15	5.00	37.95
Dec. 9	4.70	38.25
1927		
Jan. 17	4.35	38.60
Feb. 16	4.20	38.75
Mar. 15	3.65	39.30
Apr. 23	6.35	36.60
May 25	5.00	37.95
May 26	[c] 5.43	37.52
Do	[g] 5.33	37.62
June 24	5.00	37.95
July 22	4.90	38.05
Aug. 22	5.00	37.95
Sept. 27	5.00	37.95
Oct. 28	4.85	38.10
Nov. 29	4.60	38.35
Dec. 19	1.65	41.30
1928		
Jan. 24	4.50	38.45
Feb. 18	4.90	38.05
Mar 22	([c])	---------
Apr. 24	5.65	37.30
May 24	([c])	---------
June 19	6.60	36.35
July 19	([c])	---------
Aug. 23	([c])	---------
Sept. 24	6.40	36.55
Oct. 22	6.20	36.75
Nov. 20	6.00	36.95
Dec. 17	5.80	37.15

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[c] Pumping.
[h] New measuring point.
[p] By Cyril Williams.

[c] Pumping.
[g] Pump stopped a short time before measurement.

[c] Pumping.
[g] Pump stopped a short time before measurement.

Measurements of depth to water in observation wells—Continued

4729P1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Jan. 29	5.65	37.30
Feb. 21	5.70	37.25
Mar. 20	([c])	----------
Apr. 17	([c])	----------
May 28	([aa])	----------
June 20	([c])	----------

4730J1. Mrs. C. A. Barton. (See p. 235.) Bench mark is door sill of pump house, 1.00 foot above ground; altitude, 60.24 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 26.95	33.29
Oct. 22	[p] 26.75	33.49

4731A1. Henry Preszler. 4-inch well, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 59.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	29.50	29.90
May 17	26.45	32.95
June 8	26.45	32.95
July 17	27.60	31.80
Aug. 20	27.70	31.70
Sept. 13	27.05	32.35
Oct. 12	26.25	33.15
Nov. 3	26.45	32.95
Nov. 8	26.45	32.95
Nov. 13	26.60	32.80
Nov. 19	26.60	32.80
Dec. 7	26.35	33.05
1927		
Jan. 11	26.15	33.25
Feb. 7	26.20	33.20
Mar. 7	25.35	34.05
Apr. 13	[i] 29.70	29.70
May 20	[i] 28.50	30.90
June 17	26.45	32.95
July 18	26.85	32.55
Aug. 18	26.65	32.75
Sept. 20	26.90	32.50
Oct. 25	26.00	33.40
Nov. 30	26.00	33.40
Dec. 22	26.10	33.30
1928		
Jan. 25	26.50	32.90
Feb. 23	28.05	31.35
Mar. 22	30.10	29.30
Apr. 4	29.30	30.10
Apr. 18	27.55	31.85
May 24	26.45	32.95
June 21	[i] 30.15	29.25
July 24	27.85	31.55
Aug. 20	28.95	30.45
Sept. 18	27.80	31.60
Oct. 23	27.00	32.40
Nov. 21	26.80	32.60
Dec. 17	27.05	32.35

4731A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Jan. 24	27.25	32.15
Feb. 21	27.70	31.70
Mar. 21	30.00	29.40
Apr. 9	31.40	28.00
May 27	[i] 33.80	25.60
June 20	30.65	28.75

4731A3. Jacob Dollinger. (See p. 235.) Bench mark is top of concrete wall of pit, 0.80 foot above ground; altitude, 61.01 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 25.90	35.11
Oct. 22	[p] 26.66	34.35

4731N1. Jacob Goehring. 8-inch well, 42 feet deep, used for domestic supply. Bench mark is top of casing, 0.10 foot above ground; altitude, 58.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	21.80	36.45
May 17	19.80	38.45
June 8	20.30	37.95
July 17	22.00	36.25
Aug. 20	22.75	35.50
Sept. 14	22.90	35.35
Oct. 12	23.20	35.05
Nov. 3	23.55	34.70
Nov. 8	24.15	34.10
Nov. 13	24.65	33.60
Nov. 19	24.85	33.40
Dec. 7	23.05	35.20
1927		
Jan. 11	23.50	34.75
Feb. 7	23.10	35.15
Mar. 7	[f] 21.60	36.65
Apr. 8	19.55	38.70
May 20	15.00	43.25
June 16	15.35	42.90
July 18	19.65	38.60
Aug. 18	20.90	37.35
Sept. 19	21.70	36.55
Oct. 25	22.30	35.95
Nov. 26	23.40	34.85
Dec. 22	24.10	34.15
1928		
Jan. 25	24.20	34.05
Feb. 23	23.65	34.60
Mar. 24	24.15	34.10
Mar. 27	20.95	37.30
Apr. 4	18.90	39.35
Apr. 19	19.95	38.30
May 24	18.30	39.95
June 21	20.40	37.85
July 24	21.40	36.85
Aug. 20	22.15	36.10
Sept. 18	22.40	35.85
Oct. 23	23.05	35.20
Nov. 21	23.90	34.35
Dec. 17	25.25	33.00

4731N1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Jan. 24	25.40	32.85
Feb. 21	25.45	32.80
Mar. 21	25.25	33.00
Apr. 9	23.70	34.55
May 27	19.45	38.80
June 20	20.40	37.85

4731Q1. John Arcolin. 4-inch well. Bench mark until Sept. 26, 1927, top of casing, 0.5 foot above ground, altitude 57.75 feet; after that date, top of casing, 4.0 feet below ground, altitude 53.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 22	16.10	41.65
July 22	20.50	37.25
1927		
Sept. 26	[h] 14.20	39.25
Oct. 28	16.20	37.25
Nov. 28	16.60	36.85
Dec. 17	17.05	36.40
1928		
Jan. 21	17.20	36.25
Feb. 18	17.95	35.50
Mar. 17	17.30	36.15
Mar. 27	.00	53.45
Apr. 4	12.65	40.80
Apr. 24	12.65	40.80
May 23	11.20	42.25
June 18	15.25	38.20
July 21	15.60	37.85
Aug. 25	16.00	37.45
Sept. 24	16.15	37.30
Oct. 22	16.20	37.25
Nov. 23	17.90	35.55
Dec. 17	18.55	34.90
1929		
Jan. 22	18.35	35.10
Feb. 19	19.50	33.95
Mar. 20	20.55	32.90
Apr. 17	[g] 18.15	35.30
May 29	14.30	39.15
June 21	14.00	39.45

4732K1. Woods & Wilhoit estate. 6-inch well, over 50 feet deep, used for domestic supply. Bench mark is top of casing, 0.10 foot above ground; altitude 60.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Nov. 4	22.95	37.30
1927		
Sept. 27	21.65	38.60
Oct. 28	21.95	38.30
Nov. 29	20.35	39.90
Dec. 19	20.70	39.55

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[c] Pumping.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

[aa] Caved in 8.5 feet below top of casing.

[f] Windmill running.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

[g] Pump stopped a short time before measurement.

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

4732K1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Jan. 24	20.55	39.70
Feb. 18	20.00	40.25
Mar. 22	19.75	40.50
Mar. 27	6.75	53.50
Apr. 4	12.45	47.80
Apr. 24	14.70	45.55
May 24	13.15	47.10
June 19	18.15	42.10
July 21	20.95	39.30
Aug. 23	22.30	37.95
Sept. 24	22.00	38.25
Oct. 22	22.60	37.65
Nov. 20	22.05	38.20
Dec. 17	22.35	37.90
1929		
Jan. 29	21.90	38.35
Feb. 21	21.85	38.40
Mar. 20	22.20	38.05
Apr. 17	21.50	38.75
May 28	13.25	47.00
June 20	14.30	45.95

4733F1. Woods & Wilhoit estate. 6-inch well, 72 feet deep, used for domestic supply. Bench mark until Apr. 24, 1928, top of casing, 0.3 foot above ground, altitude 73.55 feet; after that date, top of 2 by 12 inch plank at top of pit curb, altitude 72.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Nov. 4	32.30	41.25
1927		
Sept. 27	31.05	42.50
Oct. 28	30.70	42.85
Nov. 29	30.15	43.40
1928		
Jan. 24	30.50	43.05
Feb. 18	30.55	43.00
Mar. 22	29.40	44.15
Mar. 27	23.15	50.40
Apr. 4	25.10	48.45
Apr. 24	[h] 25.75	46.95
May 24	25.10	47.60
June 19	28.85	43.85
July 21	[g] 31.50	41.20
Aug. 23	31.05	41.65
Sept. 24	31.35	41.35
Oct. 22	31.55	41.15
Nov. 20	31.50	41.20
Dec. 17	31.45	41.25
1929		
Jan. 29	31.10	41.60
Feb. 21	31.20	41.50
Mar. 20	31.05	41.65
Apr. 17	30.15	42.55
May 28	27.65	45.05
June 20	27.40	45.30

4734D1. Fairbanks & Dement. 6-inch well, used for domestic supply. Bench mark is copper washer or top of casing, 1.00 foot above ground; altitude, 89.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	41.30	48.10
May 15	38.75	50.65
June 17	41.50	47.90
July 23	42.70	46.70
Aug. 18	42.80	46.60
Sept. 23	[i] 44.60	44.80
Oct. 15	42.20	47.20
Nov. 15	41.80	47.60
Dec. 9	40.50	48.90
1927		
Jan. 17	40.10	49.30
Feb. 16	39.60	49.80
Mar. 16	38.50	50.90
Apr. 18	38.25	51.15
May 23	41.10	48.30
June 29	39.10	50.30
July 22	[i] 41.75	47.65
Aug. 27	[i] 43.50	45.90
Sept. 27	41.50	47.90
Oct. 28	41.40	48.00
Nov. 28	40.75	48.65
Dec. 19	41.00	48.40
1928		
Apr. 24	[i] 41.60	47.80
May 24	[i] 42.80	46.60
June 18	40.55	48.85
July 20	[i] 44.20	45.20
Aug. 23	[i] 44.10	45.30
Sept. 24	[i] 45.45	43.95
Oct. 22	42.45	46.95
Nov. 20	42.00	47.40
Dec. 17	41.75	47.65
1929		
Jan. 29	41.60	47.80
Feb. 21	41.90	47.50
Mar. 20	44.70	44.70
Apr. 17	[i] 47.45	41.95
May 29	42.80	46.60
June 21	41.90	47.50

4734D2. Fairbanks & Dement. (See p. 236.) Bench mark is top of casing, 2.00 feet above ground; altitude, 89.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	43.85	45.55
1927		
Sept. 26	43.00	46.40
Oct. 28	41.40	48.00
1928		
Jan. 24	41.00	48.40
Feb. 18	42.20	47.20
Mar. 22	[e] 41.70	47.70
Mar. 27	40.30	49.10
Apr. 4	41.25	48.15

4734J1. David Baumbach. 6-inch well, 90 feet deep, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude, 76.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 32.15	44.65
1926		
Apr. 14	32.00	44.80
May 15	28.95	47.85
June 17	28.45	48.35
July 22	31.70	45.10
Aug. 17	32.60	44.20
Sept. 15	33.90	42.90
Oct. 14	33.35	43.45
Nov. 15	33.35	43.45
Dec. 9	31.95	44.85
1927		
Jan. 17	31.15	45.65
Feb. 16	30.75	46.05
Mar. 15	29.80	47.00
Apr. 18	29.40	47.40
May 23	27.10	49.70
June 24	26.00	50.80
July 19	27.00	49.80
Aug. 22	([i])	------
Sept. 27	31.45	45.35
Oct. 28	32.10	44.70
Nov. 28	31.60	45.20
Dec. 17	31.50	45.30
1928		
Jan. 21	31.60	45.20
Feb. 18	32.80	44.00
Mar. 17	34.00	42.80
Mar. 27	32.75	44.05
Apr. 4	31.45	45.35
Apr. 24	29.25	47.55
May 23	27.40	49.40
June 18	28.30	48.50
July 21	30.45	46.35
Aug. 25	32.10	44.70
Sept. 24	32.75	44.05
Oct. 22	33.05	43.75
Nov. 23	33.10	43.70
Dec. 17	33.10	43.70
1929		
Jan. 22	32.85	43.95
Feb. 19	[i] 33.80	43.00
Mar. 20	35.80	41.00
Apr. 17	36.10	40.70
May 29	32.15	44.65
June 21	31.00	45.80

4734K2. Fred Kirschenmann. 14-inch well, 66 feet deep, not in use. Bench mark is top of casing, at ground surface; altitude, 82.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 28	34.20	48.30
July 22	35.25	47.25
Aug. 17	36.00	46.50

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[g] Pump stopped a short time before measurement.

[h] New measuring point.

[e] Pumping.

[i] Pump running in adjacent well.

[i] Pump running in adjacent well.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4734K2—Con.		
1926		
Sept. 15	36.40	46.10
Oct. 14	36.65	45.85
Nov. 15	36.65	45.85
Dec. 9	34.10	48.40
1927		
Jan. 3	35.05	47.45
Jan. 11	34.05	48.45
Feb. 16	32.90	49.60
Mar. 11	31.54	50.96
Mar. 18	31.58	50.92
Mar. 25	31.27	51.23
Apr. 2	30.25	52.25
Apr. 4	28.74	53.76
Apr. 9	28.87	53.63
Apr. 15	29.96	52.54
Apr. 22	29.49	53.01
Apr. 29	26.58	55.92
May 6	25.49	57.01
May 13	25.68	56.82
May 20	24.88	57.62
May 27	25.46	57.04
June 4	26.32	56.18
June 10	24.97	57.53
June 17	24.37	58.13
June 24	25.83	56.67
July 1	28.06	54.44
July 8	29.49	53.01
July 16	30.94	51.56
July 22	31.52	50.98
July 29	32.21	50.29
Aug. 5	32.69	49.81
Aug. 12	33.09	49.41
Aug. 19	33.48	49.02
Aug. 26	33.75	48.75
Sept. 2	34.05	48.45
Sept. 10	34.35	48.15
Sept. 16	34.73	47.77
Sept. 23	34.81	47.69
Sept. 30	35.10	47.40
Oct. 7	35.21	47.29
Oct. 15	35.44	47.06
Oct. 21	35.38	47.12
Oct. 28	34.93	47.57
Nov. 4	35.18	47.32
Nov. 11	34.11	48.39
Nov. 18	34.45	48.05
Nov. 25	34.47	48.03
Dec. 3	34.75	47.75
Dec. 9	34.89	47.61
Dec. 23	35.09	47.41
Dec. 30	34.56	47.94
1928		
Jan. 6	34.95	47.55
Jan. 13	34.89	47.61
Jan. 20	35.00	47.50
Jan. 28	35.05	47.45
Feb. 4	29.95	52.55
Feb. 10	32.74	49.76
Feb. 17	34.45	48.05
Feb. 24	34.33	48.17
Mar. 2	34.10	48.40
Mar. 9	33.75	48.75
Mar. 16	33.60	48.90
Mar. 27	25.20	57.30
Mar. 30	26.50	56.00
Apr. 6	27.80	54.70
Apr. 13	28.00	54.50
Apr. 20	28.99	53.51
Apr. 27	28.69	53.81
May 4	27.33	55.17
May 11	26.23	56.27
4734K2—Con.		
1928		
May 18	26.95	55.55
May 25	27.56	54.94
June 1	29.07	53.43
June 8	30.22	52.28
June 16	31.36	51.14
June 22	32.00	50.50
June 29	32.60	49.90
July 6	33.15	49.35
July 13	33.61	48.89
July 20	33.94	48.56
July 27	34.22	48.28
Aug. 3	34.61	47.89
Aug. 10	34.89	47.61
Aug. 17	35.06	47.44
Aug. 24	35.14	47.36
Aug. 31	35.37	47.13
Sept. 7	35.40	47.10
Sept. 14	35.75	46.75
Sept. 21	35.70	46.80
Sept. 28	35.95	46.55
Oct. 5	36.00	46.50
Oct. 12	36.17	46.33
Oct. 19	36.30	46.20
Oct. 26	36.33	46.17
Nov. 2	36.45	46.05
Nov. 10	36.47	46.03
Nov. 23	36.50	46.00
Nov. 30	36.45	46.05
Dec. 7	36.46	46.04
Dec. 14	36.38	46.12
Dec. 21	36.34	46.16
1929		
Jan. 10	36.30	46.20
Jan. 17	36.70	45.80
Jan. 24	36.29	46.21
Jan. 31	36.40	46.10
Feb. 8	35.80	46.70
Feb. 15	36.20	46.30
Feb. 21	36.31	46.19
Mar. 1	35.65	46.85
Mar. 8	34.74	47.76
Mar. 15	35.30	47.20
Mar. 23	35.34	47.16
Mar. 29	35.38	47.12
Apr. 6	35.11	47.39
Apr. 13	35.18	47.32
Apr. 20	34.12	48.38
Apr. 27	34.37	48.13
May 4	32.48	50.02
May 11	30.65	51.85
May 18	29.19	53.31
May 25	29.13	53.37
June 1	32.05	50.45
June 8	32.89	49.61
June 15	33.05	49.45
June 21	31.12	51.38

4734K3. U. S. Geological Survey. 10-inch well, 54 feet deep, used for experiments. Bench mark is top of instrument shelf, marked by blue arrow; altitude, 85.44 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Mar. 11 [a]	34.00	51.44
Mar. 18	34.14	51.30
Mar. 25	33.96	51.48
Apr. 2	33.00	52.44
4734K3—Con.		
1927		
Apr. 4	30.14	55.30
Apr. 9	30.64	54.80
Apr. 15	32.43	53.01
Apr. 22	32.16	53.28
Apr. 29	28.18	57.26
May 6	27.43	58.01
May 13	28.08	57.36
May 20	27.16	58.28
May 27	27.93	57.51
June 4	28.86	56.58
June 10	27.34	58.10
June 17	26.84	58.60
June 24	28.51	56.93
July 1	30.81	54.63
July 8	32.14	53.30
July 16	33.40	52.04
July 20	33.97	51.47
July 22	34.21	51.23
July 29	34.94	50.50
Aug. 5	35.50	49.94
Aug. 12	35.92	49.52
Aug. 19	36.27	49.17
Aug. 26	36.58	48.86
Sept. 2	36.80	48.64
Sept. 10	37.07	48.37
Sept. 16	37.45	47.99
Sept. 23	37.69	47.75
Sept. 30	37.83	47.61
Oct. 7	38.00	47.44
Oct. 15	38.15	46.29
Oct. 21	38.25	47.19
Oct. 22	38.28	47.16
Oct. 28	38.06	47.38
Nov. 4	38.12	47.32
Nov. 11	37.12	48.32
Nov. 18	37.35	48.09
Nov. 25	37.53	47.91
Dec. 3	37.67	47.77
Dec. 9	35.82	49.62
Dec. 16	37.88	47.56
Dec. 23	38.02	47.42
Dec. 30	37.66	47.78
1928		
Jan. 6	37.79	47.65
Jan. 13	37.81	47.63
Jan. 20	37.89	47.55
Jan. 28	37.94	47.50
Feb. 4	37.20	48.24
Feb. 10	36.94	48.50
Feb. 17	38.03	47.41
Feb. 24	36.87	48.57
Mar. 2	36.42	49.02
Mar. 9	35.98	49.46
Mar. 16	36.12	49.32
Mar. 23	35.96	49.48
Mar. 30	27.92	57.52
Apr. 6	29.92	55.52
Apr. 13	30.32	55.12
Apr. 20	31.36	54.08
Apr. 27	31.28	54.16
May 4	29.37	55.07
May 11	28.10	57.34
May 18	28.88	56.56
May 25	29.78	55.66
June 1	31.33	54.11
June 8	32.79	52.65
June 16	33.97	51.47
June 22	34.66	50.78
June 29	36.29	49.15
July 6	35.85	49.59
July 13	36.35	49.09
July 20	36.71	48.73
July 27	37.00	48.44

[a] Water-stage recorder installed.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4734K3—Con.		
1928		
Aug. 3	37.37	48.07
Aug. 10	37.62	47.82
Aug. 17	37.87	47.57
Aug. 24	38.04	47.40
Aug. 31	38.24	47.20
Sept. 7	38.30	47.14
Sept. 14	38.54	46.90
Sept. 21	38.63	46.81
Sept. 28	38.77	46.67
Oct. 5	38.89	46.55
Oct. 12	39.03	46.41
Oct. 19	39.15	46.29
Oct. 26	39.23	46.21
Nov. 2	39.34	46.10
Nov. 10	39.41	46.03
Nov. 16	39.18	46.26
Nov. 23	39.34	46.10
Nov. 30	39.40	46.04
Dec. 7	39.42	46.02
Dec. 14	39.34	46.10
Dec. 21	39.31	46.13
1929		
Jan. 2	39.01	46.43
Jan. 10	39.24	46.20
Jan. 17	39.37	46.07
Jan. 24	39.24	46.20
Jan. 31	39.35	46.09
Feb. 8	38.73	46.71
Feb. 15	29.11	46.33
Feb. 21	39.00	46.44
Mar. 1	36.74	48.70
Mar. 8	36.65	48.79
Mar. 15	37.44	48.00
Mar. 23	37.86	47.58
Mar. 29	38.08	47.36
Apr. 6	37.84	47.60
Apr. 13	37.88	47.56
Apr. 20	36.87	48.57
Apr. 27	37.38	48.06
May 4	35.08	50.36
May 11	32.66	52.78
May 18	30.84	54.60
May 25	31.15	54.29
June 1	34.44	51.00
June 8	35.60	49.84
June 15	35.86	49.58
June 21	33.48	51.96

4734N1. Jacob Schmierer. 5-inch well, 73 feet deep, used for domestic supply. Bench mark is top of casing, altitude 76.30 feet, which is 0.7 foot below reference bench mark, a copper washer in wooden pump support 1 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 8	[a] 33.30	43.00
1926		
June 28	31.45	44.85

4735F1. P. Dietderich. (See p. 236.) Bench mark is cross cut in concrete curb, at ground surface; altitude, 67.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 4	19.95	47.20
Nov. 10	20.55	46.60
Dec. 8	18.90	48.25
1927		
Mar. 3	17.20	49.95
Apr. 29	17.50	49.65
June 3	19.95	47.20
1929		
Apr. 26	24.20	42.95
June 21	18.90	48.25

4735G1. H. Inglis. 18-inch well, 260 feet deep, not in use. Bench mark is top of casing, at ground surface; altitude, 62.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Dec. 5	[b] 12.50	49.80
1926		
Oct. 4	13.70	48.60
Oct. 21	13.25	49.05
Nov. 15	13.35	48.95
Nov. 15	12.95	49.35
Dec. 9	11.50	50.80
Dec. 10	11.45	50.85
1927		
Jan. 17	11.35	50.95
Feb. 16	10.25	52.05
Mar. 3	9.65	52.65
Mar. 16	10.10	52.20
Apr. 16	10.45	51.85
Apr. 28	9.55	52.75
May 23	11.30	51.00
June 3	11.46	50.84
June 25	11.25	51.05
July 19	13.30	49.00
Aug. 22	13.20	49.10
Sept. 26	13.20	49.10
Oct. 28	12.35	49.95
Nov. 28	11.35	50.95
Dec. 17	11.65	50.65
1928		
Jan. 21	11.50	50.80
Feb. 18	11.30	51.00
Mar. 17	[d] 12.60	49.70
Apr. 24	11.20	51.10
May 23	12.00	50.30
Sept. 24	14.90	47.40
4735G1—Con.		
1929		
Apr. 17	17.50	44.80
June 21	14.60	47.70

4735M1. H. Inglis. 14-inch well, used for domestic supply. Bench mark is top of casing, at concrete base of pump, 1 foot above ground; altitude, 88.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 11	40.40	48.15
1928		
May 23	38.75	49.80
June 18	40.70	47.85
July 25	41.70	46.85
Aug. 23	42.40	46.15

4735M2. H. Inglis. (See p. 236.) Bench mark is cross on concrete pump base, 2.0 feet above ground; altitude, 62.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 11	14.30	47.70
Oct. 14	13.75	48.25
Oct. 21	13.65	48.35
Nov. 15	13.50	48.50
Dec. 9	12.45	49.55
1927		
Jan. 17	12.15	49.85
Feb. 16	11.60	50.40
Mar. 16	11.15	50.85
Apr. 18	11.10	50.90
July 19	13.60	48.40
Aug. 22	([e])	---------
Oct. 27	13.35	48.65
Nov. 28	12.65	49.35
Dec. 17	12.65	49.35
1928		
Jan. 21	12.55	49.45
Feb. 18	12.40	49.60
Mar. 17	14.90	47.10
Apr. 24	[f] 4.45	57.55
May 23	[f] 2.90	59.10
June 18	[f] 6.60	55.40
July 21	([e])	---------
Aug. 25	([e])	---------
Sept. 24	14.80	47.20
Oct. 22	14.15	47.85
Nov. 23	13.70	48.30
Dec. 17	13.40	48.60
1929		
Jan. 22	13.40	48.60
Feb. 19	13.80	48.20
Mar. 20	16.00	46.00
Apr. 26	16.70	45.30
May 29	([e])	---------
June 21	([e])	---------

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[a] By C. H. Widdows.

[b] By Cyril Williams.

[d] Water standing in adjacent channel.

[e] Pumping.

[f] Adjacent land flooded.

Measurements of depth to water in observation wells—Continued

4735P1. M. & M. Ryan. 5-foot well, 50 feet deep, used for domestic supply. Bench mark is top of brick curb, north side of pit, 0.5 foot above ground; altitude, 85.55 feet [b]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Dec. 5	[b] 36.75	48.80
1926		
Oct. 4	38.50	47.05
1928		
June 28	35.30	50.25
1929		
Feb. 18	38.65	46.90
Apr. 17	39.65	45.90
May 29	37.35	48.20
June 21	37.25	48.30

4735Q1. St. Joachim's Cemetery 3-foot well. Bench mark is copper washer on northwest side of well curb, at ground surface; altitude, 86.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 30	[b] 37.55	48.90
Dec. 5	[b] 37.35	49.10
1926		
Apr. 19	36.50	49.95
May 15	36.80	49.65
June 17	36.90	49.55
July 23	38.00	48.45
Aug. 17	38.60	47.85
Sept. 18	38.75	47.70
Oct. 14	38.65	47.80
Nov. 15	38.50	47.95
Dec. 9	37.80	48.65
1927		
Jan. 17	37.35	49.10
Feb. 16	36.80	49.65
Mar. 16	36.05	50.40
Apr. 18	35.50	50.95
May 23	34.85	51.60
June 25	34.90	51.55
July 21	36.10	50.35
Aug. 22	37.20	49.25
Sept. 26	37.75	48.70
Oct. 28	37.85	48.60
Nov. 28	37.45	49.00
Dec. 17	37.35	49.10
1928		
Jan. 21	37.20	49.25
Feb. 18	37.45	49.00
Mar. 17	38.00	48.45
Mar. 27	37.05	49.40
Apr. 4	35.90	50.55
Apr. 24	35.30	51.15
May 23	34.55	51.90
June 18	35.85	50.60
July 21	37.20	49.25
Aug. 25	37.95	48.50
Sept. 24	38.40	48.05
Oct. 22	38.55	47.90
Nov. 23	([c])	---------

[b] By Cyril Williams.
[c] Filled in.

4736B1. N. H. Locke Co. (See p. 236.) Bench mark is top of concrete curb, at ground surface; altitude, 60.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	7.85	52.95
May 15	7.70	53.10
June 19	11.10	49.70
July 23	[c] 33.00	27.80
Aug. 17	[c] 34.80	26.00
Sept. 18	11.70	49.10
Oct. 14	10.30	50.50
Nov. 15	10.00	50.80
Dec. 9	9.00	51.80
1927		
Jan. 17	8.70	52.10
Feb. 16	8.20	52.60
Mar. 15	7.80	53.00
Apr. 18	7.65	53.15
May 23	[c] 33.50	27.30
June 25	11.00	49.80
July 19	11.45	49.35
Aug. 22	([c])	---------
Sept. 27	[c] 32.65	28.15
Oct. 27	9.80	51.00
Nov. 28	9.15	51.65
Dec. 19	9.10	51.70
1928		
Jan. 21	8.90	51.90
Feb. 18	9.10	51.70
Apr. 24	5.50	55.30
May 23	3.90	56.90
June 18	7.45	53.35
July 21	([c])	---------
Aug. 25	([c])	---------
Sept. 24	([c])	---------
Oct. 22	10.80	50.00
1929		
Apr. 16	13.05	47.75
May 11	13.45	47.35
June 21	14.90	45.90

4736D1. J. L. Brummel. 6-inch well, not in use. Bench mark is top of pump collar, at ground surface; altitude, 63.70 feet [b]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 29	[b] 11.65	52.05
Dec. 5	[b] 11.45	52.25
1926		
Sept. 10	13.05	50.65

4736D2. J. L. Brummel. (See p. 236.) Bench mark is top of concrete curb, at trap door; altitude 105.50 feet [b]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 12	[b] 53.29	52.21

[c] Pumping.
[b] By Cyril Williams.

481B1. 4-foot well, not in use. Bench mark is copper washer on 1 by 12 inch old well curb, 0.5 foot above ground; altitude, 165.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 1	81.30	84.40
May 13	81.20	84.50
June 25	81.30	84.40
1927		
May 28	81.60	84.10
June 29	81.40	84.30
July 25	81.50	84.20
Aug. 26	81.50	84.20
Sept. 30	81.50	84.20
Oct. 27	81.40	84.30
Nov. 29	81.60	84.10
Dec. 19	82.75	82.95
1928		
Jan. 23	81.60	84.10
Feb. 20	81.65	84.05
Mar. 20	81.75	83.95
Apr. 26	81.70	84.00
May 23	81.70	84.00
June 25	81.70	84.00
July 18	81.70	84.00
Aug. 23	81.70	84.00
Sept. 25	81.70	84.00
1929		
Apr. 12	81.95	83.75
May 28	82.00	83.70
June 21	82.00	83.70

481L1. 3-foot well, not in use. Bench mark is cross cut in west side of concrete curb, 3 feet above ground; altitude, 173.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 20	[b] 88.90	84.80
1926		
June 16	88.80	84.90
July 29	88.80	84.90
Aug. 26	89.15	84.55
Sept. 30	89.25	84.45
Oct. 20	89.15	84.55
Nov. 18	89.15	84.55
Dec. 11	89.05	84.65
1927		
Jan. 21	89.35	84.35
Feb. 11	89.20	84.50
Mar. 23	89.15	84.55
Apr. 26	89.10	84.60
May 28	88.90	84.80
June 29	88.45	85.25
July 29	89.00	84.70
Aug. 29	89.15	84.55
Sept. 30	89.15	84.55

[b] By Cyril Williams.

Measurements of depth to water in observation wells—**Continued**

Date	Depth to water (feet)	Altitude of water table (feet)
481L1—Con.		
1928		
Apr. 26	89.30	84.40
May 23	89.05	84.65
Sept. 25	89.45	84.25
1929		
Mar. 13	89.80	83.90
Apr. 12	89.70	84.00

482D1. A. A. Fitzgerald. 4-foot well, not in use. Bench mark is copper washer on 6 by 6 inch old pump support, 2.3 feet above ground; altitude, 163.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 22	[p] 84.80	79.00
1926		
May 1	84.50	79.30
May 13	84.50	79.30
June 25	84.55	79.25
July 29	84.70	79.10
Aug. 26	84.75	79.05
Sept. 24	84.55	79.25
Oct. 18	84.65	79.15
Nov. 18	84.65	79.15
Dec. 13	84.75	79.05
1927		
Jan. 21	84.75	79.05
Feb. 25	85.00	78.80
Mar. 23	84.80	79.00
Apr. 26	84.75	79.05
May 28	85.00	78.80
June 29	84.85	78.95
July 25	84.85	78.95
Aug. 26	84.90	78.90
Sept. 30	84.95	78.85
Oct. 27	85.00	78.80
Nov. 29	85.00	78.80
Dec. 19	85.95	77.85
1928		
Jan. 23	85.10	78.70
Feb. 20	85.05	78.75
Mar. 20	85.20	78.60
Apr. 24	85.05	78.75
May 23	85.10	78.70
June 25	85.15	78.65
July 19	85.05	78.75
Aug. 23	85.25	78.55
Sept. 25	85.25	78.55
Oct. 22	85.35	78.45
Nov. 20	85.40	78.40
Dec. 14	85.35	78.45
1929		
Jan. 22	85.55	78.25
Feb. 19	85.40	78.40
Mar. 20	85.45	78.35
Apr. 12	85.35	78.45
May 28	85.65	78.15
June 21	85.50	78.30

482E1. A. A. Fitzgerald. 4-foot well, 86 feet deep, used for domestic supply. Bench mark is copper washer on 4 by 4 inch beam on bottom of well cover, north side, 0.5 foot above ground; altitude, 156.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 1	79.60	77.30
May 13	79.90	77.00
June 25	79.55	77.35
July 29	79.85	77.05
Aug. 26	[f] 80.10	76.80
Sept. 14	79.85	77.05
Oct. 25	[e] 81.45	75.45
Nov. 18	79.70	77.20
Dec. 13	79.75	77.15
1927		
Jan. 21	79.70	77.20
Feb. 25	79.90	77.00
Mar. 23	80.25	76.65
Apr. 26	79.80	77.10
Aug. 26	80.15	76.75
1928		
Apr. 26	80.20	76.70
Sept. 25	80.55	76.35
1929		
Apr. 12	80.30	76.60

483F1. Albert Hart. 3-foot well, 120 feet deep, used for domestic supply. Bench mark is copper washer on pump support, 1.00 foot above ground; altitude, 148.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	76.35	71.85
May 13	76.55	71.65
June 25	76.60	71.60
July 28	76.90	71.30
Aug. 26	[f] 77.25	70.95
1927		
May 28	76.85	71.35
June 29	[f] 77.70	70.50
Sept. 30	77.20	71.00
1928		
Apr. 23	[f] 77,30	70.90

483L1. William Perry. 3 foot well, 96 feet deep, used for domestic supply. Bench mark is copper washer on 6 by 6 inch base of pump, 1.00 foot above ground; altitude, 159.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[p] 88.35	71.50
483L1—Con.		
1926		
Apr. 23	88.00	71.85
May 13	87.90	71.95
June 25	88.20	71.65
July 28	88.80	71.05
Aug. 26	88.35	71.50
Sept. 24	88.25	71.60
Oct. 18	88.20	71.65
Nov. 18	88.45	71.40
Dec. 13	88.40	71.45
1927		
Jan. 21	88.35	71.50
Feb. 28	88.65	71.20
Mar. 16	88.35	71.50
Apr. 26	88.10	71.75
May 28	88.35	71.50
June 29	88.40	71.45
Aug. 22	88.60	71.25
Sept. 30	88.65	71.20
1928		
Apr. 26	88.50	71.35
Sept. 25	88.90	70.95
1929		
Mar. 13	89.10	70.75
Apr. 12	88.90	70.95

486N1. Charles Steely. 4-foot well, 60 feet deep, used for domestic supply. Bench mark is copper washer on well platform, at ground surface; altitude, 119.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	57.90	61.45
May 13	57.90	61.45
June 18	59.60	59.75
July 22	60.00	59.35
Aug. 18	[f] 60.80	58.55
Sept. 23	59.75	59.60
Oct. 18	58.80	60.55
Nov. 16	58.85	60.50
Dec. 10	59.50	59.85
1927		
Jan. 18	58.25	61.10
Feb. 19	57.45	61.90
Mar. 16	57.85	61.50
Apr. 26	57.70	61.65
May 25	60.00	59.35
June 24	[f] 60.20	59.15
Aug. 24	61.15	58.20
Sept. 29	59.40	59.95
Nov. 29	59.40	59.95
1928		
Apr. 25	58.15	61.20
Sept. 25	[f] 60.30	59.05
1929		
Apr. 17	59.85	59.50

[p] By Cyril Williams.

[e] Pumping.
[f] Windmill running.
[p] By Cyril Williams.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

488A1. Ruddie Sinz. 6-inch well, 78 feet deep, used for domestic supply. Bench mark is copper washer on top of curb, 1.50 feet above ground; altitude, 132.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	68.40	64.15
May 13	[f] 68.10	64.45
June 18	69.45	63.10
July 22	72.35	60.20
Aug. 18	69.60	62.95

488A2. Ruddie Sinz. 12-inch well, 172 feet deep, not in use. Bench mark is top of casing, about 1.00 foot above ground; altitude, 133.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 23	70.05	63.35
Oct. 18	69.70	63.70
Nov. 15	69.90	63.50
Dec. 13	69.60	63.80
1927		
Jan. 18	69.40	64.00
Mar. 16	69.20	64.20
Apr. 26	68.85	64.55
May 25	69.15	64.25
June 24	70.10	63.30
Aug. 24	70.70	62.70
Sept. 29	70.20	63.20
1928		
Apr. 25	([bb])	---------

488D1. George Brandt. 4-foot well, not in use. Bench mark is copper washer on well cover, 1.00 foot above ground; altitude, 140.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	75.00	65.25
May 13	74.30	65.95
June 25	75.15	65.10
July 28	75.50	64.75
Aug. 26	75.70	64.55
Sept. 24	76.10	64.15
Oct. 18	75.20	65.05
Nov. 18	75.15	65.10
Dec. 13	75.05	65.20
1927		
Jan. 18	74.90	65.35
Feb. 28	74.55	65.70
Mar. 16	74.75	65.50
Apr. 26	74.60	65.65
May 28	[f] 77.70	62.55
June 29	[f] 78.45	61.80
Aug. 24	[f] 79.20	61.05
Sept. 30	78.35	61.90
Oct. 27	[f] 76.50	63.75

[f] Windmill running.
[bb] Nailed up.

488D1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 24	74.85	65.40
Sept. 25	[f] 77.40	62.85
1929		
Apr. 12	75.80	64.45

489H1. Dilman Stacey. 4-foot well, used for stock. Bench mark is copper washer on north side of concrete curb, 1.5 feet above ground; altitude, 146.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	75.20	70.80
May 13	75.55	70.45
June 25	75.60	70.40
July 28	75.50	70.50
Aug. 26	[f] 76.40	69.60
Sept. 24	82.80	63.20
Oct. 18	75.80	70.20
Nov. 18	86.75	59.25
Dec. 13	76.00	70.00
1927		
Jan. 18	75.80	70.20
Feb. 28	76.05	69.95
Mar. 16	76.60	69.40
Apr. 26	76.50	69.50
May 28	[f] 77,10	68.90
June 29	76.15	69.85
July 27	76.45	69.55
Aug. 24	76.30	69.70
Sept. 30	76.45	69.55
1928		
Apr. 24	76.35	69.65
Sept. 25	[f] 77.35	68.65
1929		
Apr. 12	[f] 77.20	68.80

489N1. George Brandt. 12-inch well, 70 feet deep, used for domestic supply. Bench mark is copper washer on well cover, 0.1 foot above ground; altitude, 129.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	61.90	67.30
May 15	61.90	67.30
June 25	62.15	67.05
July 29	62.70	66.50
Aug. 26	62.50	66.70
Sept. 24	62.45	66.75
Oct. 18	62.50	66.70
Nov. 18	62.40	66.80
Dec. 13	62.50	66.70
1927		
Jan. 18	62.40	66.80
Feb. 25	62.50	66.70
Mar. 16	62.40	66.80
Apr. 26	62.30	66.90

[f] Windmill running.

489N1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
May 26	[i] 62.50	66.70
June 29	62.75	66.45
July 25	62.90	66.30
Aug. 24	63.00	66.20
Sept. 30	62.95	66.25
Oct. 27	62.90	66.30
Dec. 19	62.80	66.40
1928		
Jan. 23	62.95	66.25
Feb. 20	62.80	66.40
Mar. 20	62.95	66.25
Mar. 27	63.00	66.20
Apr. 4	63.20	66.00
Apr. 24	62.85	66.35
May 24	62.85	66.35
June 25	63.15	66.05
July 18	63.30	65.90
Aug. 23	63.55	65.65
Sept. 25	63.50	65.70
Oct. 22	63.70	65.50
Nov. 20	63.55	65.65
Dec. 14	63.50	65.70
1929		
Jan. 22	63.50	65.70
Feb. 19	63.55	65.65
Mar. 20	63.60	65.60
Apr. 12	63.60	65.60
May 28	63.95	65.25
June 21	64.05	65.15

4810L1. M. H. Steely. 4-foot well, 87 feet deep, used for domestic supply. Bench mark is copper washer in south end of pump support at top of concrete curb, 1.00 foot above ground; altitude, 154.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	83.00	71.05
May 13	82.90	71.15
June 25	83.00	71.05
July 28	83.10	70.95
Aug. 26	83.30	70.75
Sept. 24	83.30	70.75
Oct. 18	[f] 83.60	70.45
Nov. 18	83.45	70.60
Dec. 13	83.40	70.65
1927		
Jan. 21	83.45	70.60
Feb. 25	83.45	70.60
Mar. 16	83.45	70.60
Apr. 26	83.25	70.80
May 28	83.60	70.45
June 29	[f] 83.10	70.95
July 25	83.30	70.75
Aug. 29	84.05	70.00
Sept. 30	[f] 85.00	69.05
Oct. 27	83.55	70.50
Nov. 29	83.75	70.30
Dec. 19	83.50	70.55

[f] Windmill running.
[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4810L1—Con.		
1928		
Jan. 23	83.80	70.25
Feb. 20	83.75	70.30
Mar. 20	83.90	70.15
Apr. 24	83.60	70.45
May 23	83.70	70.35
June 25	82.30	71.75
July 18	83.75	70.30
Aug. 23	[f] 84.10	69.95
Sept. 25	[f] 84.85	69.20
Oct. 22	[e] 84.40	69.65
Nov. 20	84.05	70.00
Dec. 14	84.25	69.80
1929		
Jan. 22	84.20	69.85
Feb. 19	84.40	69.65
Mar. 13	84.10	69.95
Apr. 12	84.90	69.15
May 28	[e] 84.50	69.55
June 21	85.20	68.85

4810L2. T. Garibaldi. 6-foot well, 87 feet deep, used for domestic supply. Bench mark is top of 2-inch plank over well, 0.90 foot above ground; altitude, 145.12 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 8	[p] 73.80	71.32

4811E1. Nora Gibson. 4-foot well, not used. Bench mark is cross cut in concrete curb, 2.5 feet above ground; altitude, 106.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 1	29.70	77.15
May 13	29.60	77.25
June 25	29.80	77.05
July 29	30.30	76.55
Aug. 26	30.55	76.30
Sept. 24	30.85	76.00
Oct. 18	31.05	75.80
Nov. 18	31.25	75.60
Dec. 13	31.30	75.55
1927		
Jan. 21	30.75	76.10
Feb. 25	27.35	79.50
Mar. 16	27.75	79.10
Apr. 26	27.40	79.45
May 28	28.40	78.45
June 29	28.70	78.15
July 25	29.00	77.85
Aug. 29	29.45	77.40
Sept. 30	29.85	77.00
Oct. 27	30.15	76.70
Nov. 29	30.40	76.45
Dec. 19	30.55	76.30
4811E1—Con.		
1928		
Jan. 23	32.70	74.15
Feb. 20	30.75	76.10
Mar. 20	30.95	75.90
Apr. 24	29.45	77.40
May 23	29.40	77.45
June 25	29.65	77.20
July 18	29.90	76.95
Aug. 23	30.40	76.45
Sept. 25	30.80	76.05
1929		
Mar. 13	31.65	75.20
Apr. 12	31.70	75.15
May 28	31.85	75.00
June 21	31.85	75.00

4811E2. Nora Gibson. 5-foot well, 65 feet deep, used for domestic supply. Bench mark is copper washer on 4 by 6 inch pipe brace, 0.5 foot above ground; altitude, 137.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 1	60.50	76.80
June 25	60.50	76.80
1929		
Mar. 13	62.10	75.20

4811G1. 6-foot well, used for stock. Bench mark is copper washer on 6 by 6 inch pump support, 3.4 feet above ground, altitude 152.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 1	73.15	79.10
May 13	73.00	79.25
June 25	72.85	79.40
July 29	72.90	79.35
Aug. 26	73.20	79.05
Sept. 24	73.10	79.15
Oct. 18	73.25	79.00
Nov. 18	73.50	78.75
Dec. 13	73.60	78.65
1927		
Jan. 21	73.65	78.60
Feb. 25	73.30	78.95
Mar. 16	72.95	79.30
Apr. 26	72.60	79.65
May 28	72.70	79.55
June 29	74.35	77.90
July 25	72.15	80.10
Aug. 29	72.25	80.00
Sept. 30	72.40	79.85
Oct. 29	72.55	79.70
Nov. 29	72.80	79.45
Dec. 19	72.90	79.35
1928		
Jan. 23	73.10	79.15
Feb. 20	73.25	79.00
Mar. 20	73.15	79.10
4811G1—Con.		
1928		
Apr. 24	73.25	79.00
May 23	73.10	79.15
June 25	72.95	79.30
July 18	72.95	79.30
Aug. 23	73.25	79.00
Sept. 25	74.45	77.80
Oct. 22	73.55	78.70
Nov. 20	73.80	78.45
Dec. 14	74.75	77.50
1929		
Jan. 22	74.05	78.20
Feb. 19	74.20	78.05
Mar. 13	74.20	78.05
Mar. 20	74.30	77.95
Apr. 12	74.30	77.95
May 28	74.40	77.85
June 21	74.35	77.90

4812D1. Mrs. Clara Howard. 3-foot well, used for domestic supply. Bench mark is copper washer on 4 by 4 inch beam on northwest side of well curb, 3.00 feet above ground; altitude, 134.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 16	[p] 47.63	87.02
1926		
June 12	47.30	87.35
July 29	47.90	86.75
Aug. 25	48.00	86.65
Sept. 24	47.95	86.70
Oct. 20	48.05	86.60
Nov. 20	48.65	86.00
Dec. 15	48.05	86.60
1927		
Jan. 22	48.15	86.50
Feb. 11	47.75	86.90
Mar. 23	47.45	87.20
Apr. 26	47.15	87.50
May 26	46.90	87.75
June 29	46.60	88.05
July 25	46.95	87.70
Aug. 31	47.35	87.30
Oct. 1	47.60	87.05
Oct. 27	47.75	86.90
Nov. 29	47.90	86.75
Dec. 19	47.80	86.85
1928		
Jan. 23	47.95	86.70
Feb. 20	47.95	86.70
Mar. 20	48.00	86.65
Apr. 24	47.00	87.65
May 23	46.80	87.85
June 25	47.15	87.50
July 18	47.40	87.25
Aug. 22	47.80	86.85
Sept. 26	47.90	86.75
1929		
Apr. 15	48.40	86.25

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[f] Windmill running.

[e] Pumping.

[p] By Cyril Williams.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

4812K1. E. A. Putman. 3-foot well, 23 feet deep, used for domestic supply. Bench mark until Apr. 15, 1929, copper washer on well curb, 2.8 feet above ground, altitude 107.05 feet; after that date, nail head on well curb, altitude 106.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 12	23.30	83.75
July 29	24.20	82.85
July 29	[c] 24.70	82.35
Aug. 25	24.65	82.40
Sept. 24	25.00	82.05
Oct. 20	25.45	81.60
Nov. 20	25.75	81.30
Dec. 15	25.15	81.90
1927		
Jan. 22	25.45	81.60
Feb. 11	24.90	82.15
Mar. 23	23.75	83.30
Apr. 13	23.65	83.40
Apr. 26	23.40	83.65
May 28	22.00	85.05
June 10	22.10	84.95
June 14	22.10	84.95
Aug. 15	23.30	83.75
Oct. 1	24.80	82.25
Oct. 27	25.05	82.00
Nov. 27	25.20	81.85
1928		
Apr. 25	20.80	86.25
May 23	21.40	85.65
Sept. 26	25.75	81.30
1929		
Apr. 15	[b] 25.95	80.95
May 23	24.75	82.15

4812N1. Otto Koch. (See p. 236.) Bench mark is copper washer on pump support, 1.00 foot above ground, or top of north pump base; altitude, 114.55 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 14	[p] 33.33	81.22
Dec. 6	[p] 34.05	80.50
1926		
June 12	33.75	80.80
July 29	[c] 40.00	74.55
1927		
Apr. 13	33.35	81.20
1928		
Apr. 25	33.00	81.55
1929		
Apr. 15	35.40	79.15

4813G1. H. A. Miller. 3-foot well, 80 feet deep, used for domestic supply. Bench mark is copper washer on curb, 1.50 feet above ground; altitude, 161.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	81.00	80.65
May 13	80.75	80.90
June 24	80.90	80.75
July 30	81.15	80.50
Aug. 25	81.45	80.20
Sept. 24	81.50	80.15
Oct. 20	81.15	80.50
Nov. 20	81.25	80.40
Dec. 14	81.50	80.15
1927		
Jan. 22	81.45	80.20
Feb. 11	81.00	80.65
Mar. 23	81.20	80.45
Apr. 26	81.15	80.50
May 28	81.40	80.25
June 29	81.25	80.40
July 25	81.35	80.30
Aug. 31	[g] 82.70	78.95
Oct. 31	81.70	79.95
Oct. 27	81.50	80.15
Nov. 29	81.55	80.10
Dec. 19	81.50	80.15
1928		
Jan. 23	81.55	80.10
Feb. 20	81.55	80.10
Mar. 20	81.75	79.90
Apr. 25	81.60	80.05
May 23	81.75	79.90
June 25	81.70	79.95
July 18	81.85	79.80
Aug. 22	82.00	79.65
Sept. 26	82.20	79.45
Oct. 20	82.35	79.30
1929		
Mar. 13	82.25	79.40
Apr. 15	82.20	79.45

4814E1. J. Merton. 54-inch well, 25 feet deep, not in use. Bench mark is cross cut in top of concrete curb, east side, 2.50 feet above ground; altitude, 99.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
July 26	23.00	76.10
Oct. 4	23.00	76.10
Oct. 27	23.10	76.00
Nov. 29	23.30	75.80
1928		
Jan. 28	23.75	75.35
Feb. 20	23.80	75.30
Mar. 20	24.10	75.00
Mar. 27	24.00	75.10

4814E1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 4	24.00	75.10
Apr. 23	23.95	75.15
May 23	23.80	75.30
June 25	23.30	75.80
July 18	23.05	76.05
Aug. 22	22.65	76.45
Sept. 25	22.65	76.45
Oct. 20	22.70	76.40
Nov. 20	23.05	76.05
Dec. 14	23.30	75.80
1929		
Jan. 22	23.60	75.50
Feb. 19	23.80	75.30
Mar. 20	23.95	75.15
Apr. 12	24.00	75.10
May 28	23.85	75.25
June 21	23.55	75.55

4814K1. C. C. Gillief. 4-foot well, 65 feet deep, used for domestic supply. Bench mark is concrete curb at ground surface; altitude, 133.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	59.80	73.95
May 13	60.45	73.30
June 24	60.50	73.25
July 28	60.35	73.40
Aug. 25	60.70	73.05
Sept. 24	[c] 61.70	72.05
Oct. 20	60.15	73.60
Nov. 20	60.15	73.60
Dec. 13	60.15	73.60
1927		
Jan. 22	60.05	73.70
Feb. 11	59.95	73.80
Mar. 19	60.05	73.70
Apr. 26	60.85	72.90
May 28	60.40	73.35
June 29	60.50	73.25
July 25	60.75	73.00
Aug. 29	61.70	72.05
Oct. 1	60.95	72.80
Oct. 27	60.45	73.30
Nov. 29	60.35	73.40
Dec. 19	60.50	73.25
1928		
Jan. 23	60.35	73.40
Feb. 20	[c] 60.50	73.25
Mar. 20	60.50	73.25
Mar. 27	60.95	72.80
Apr. 4	60.65	73.10
Apr. 25	60.55	73.20
May 23	60.70	73.05
June 25	61.50	72.25
July 18	61.95	71.80
Aug. 22	61.70	72.05
Sept. 26	61.50	72.25
Oct. 20	61.00	72.75
1929		
Mar. 13	60.65	73.10
Apr. 15	61.05	72.70

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[c] Pumping.
[b] New measuring point.
[p] By Cyril Williams.

[g] Pump stopped a short time before measurement.

[c] Pumping.

Measurements of depth to water in observation wells—Continued

4815A1. R. Grant. 10-inch well, 50 feet deep, used for domestic supply. Bench mark is top of platform of pump, 0.5 foot above ground; altitude, 96.85 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 10	[p] 27.83	69.02

4815B1. —— Thompson. 6-inch drilled well in bottom of 3-foot dug pit, used for domestic supply. Bench mark is top of casing, altitude 74.05 feet, which is 32 feet below reference bench mark, on top of west side of brick curb, at ground surface

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	6.00	68.05
1929		
Oct. 4	6.35	67.70
Nov. 6	5.45	68.60
Nov. 12	6.25	67.80

4815F1. Clements Cemetery. 6-inch well. Bench mark is top of casing, 2.50 feet above ground; altitude, 137.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 15	[p] 66.15	71.45
1926		
Apr. 23	66.70	70.90
May 13	66.60	71.00
June 25	66.60	71.00
July 28	66.80	70.80
Aug. 25	67.10	70.50
Sept. 30	67.10	70.50
Oct. 18	67.15	70.45
Nov. 18	67.20	70.40
Dec. 13	67.20	70.40
1927		
Jan. 21	67.20	70.40
Feb. 11	67.10	70.50
Mar. 23	66.95	70.65
Apr. 26	66.75	70.85
May 28	66.50	71.10
June 29	66.25	71.35
July 25	66.20	71.40
Aug. 29	66.40	71.20
Sept. 30	66.60	71.00
Oct. 27	66.70	70.90
Nov. 29	66.85	70.75
Dec. 19	67.55	70.05
1928		
Jan. 23	67.00	70.60
Mar. 20	67.15	70.45
4815F1—Con.		
1928		
Mar. 27	67.00	70.60
Apr. 4	66.70	70.90
Apr. 25	65.70	71.90
May 23	64.95	72.65
June 25	64.95	72.65
July 18	65.15	72.45
Aug. 22	65.50	72.10
Sept. 25	65.85	71.75
Oct. 20	66.10	71.50
Nov. 20	66.30	71.30
Dec. 14	66.50	71.10
1929		
Jan. 22	66.70	70.90
Feb. 19	67.10	70.50
Mar. 20	67.00	70.60
Apr. 12	67.10	70.50
May 28	67.25	70.35
June 21	67.30	70.30

4815K1. John Clements. Well 150 feet deep, used for stock. Bench mark is top of platform of pump, 0.30 foot above ground; altitude, 91.53 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 9	[p] 22.25	69.28

4815N1. John Clements. 5-foot well, 11 feet deep, not in use. Bench mark is top of plank pump support, 0.5 foot above ground; altitude, 82.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 7	11.40	71.45
1927		
Aug. 29	11.80	71.05
1928		
Apr. 25	7.05	75.80
Sept. 26	10.35	72.50

4815R1. T. E. Lane. (See p. 236.) Bench mark is top of pump frame at oil feeder, 1.00 foot above ground; altitude, 130.91 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 68.32	62.59

4816N1. R. S. Featherstone. 15-inch well, 19 feet deep, not in use. Bench mark is top of casing, 2.00 feet above ground; altitude, 83.54 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 7	17.15	66.39
Oct. 18	18.60	64.94
Nov. 18	18.45	65.09
Dec. 11	18.00	65.54
1927		
Jan. 7[a]	17.44	66.10
Jan. 14	17.46	66.08
Jan. 21	17.37	66.17
Jan. 28	17.31	66.23
Feb. 4	17.25	66.29
Feb. 11	17.13	66.41
Feb. 18	17.03	66.51
Feb. 25	16.71	66.83
Mar. 4	16.34	67.20
Mar. 11	16.10	67.44
Mar. 18	15.92	67.62
Mar. 25	15.79	67.75
Apr. 2	15.66	67.88
Apr. 9	15.45	68.09
Apr. 15	15.28	68.26
Apr. 22	15.15	68.39
Apr. 29	14.98	68.56
May 6	14.70	68.84
May 13	14.49	69.05
May 20	14.23	69.31
May 27	14.07	69.47
June 4	14.01	69.53
June 10	13.88	69.66
June 17	13.75	69.79
June 24	13.58	69.96
July 1	13.59	69.95
July 8	13.84	69.70
July 16	13.80	69.74
July 22	14.00	69.54
July 29	13.78	69.76
Aug. 5	14.44	69.10
Aug. 12	14.92	68.62
Aug. 19	15.31	68.23
Aug. 26	15.67	67.87
Sept. 2	15.94	67.60
Sept. 10	16.25	67.29
Sept. 16	16.45	67.09
Sept. 26	16.72	66.82
Sept. 30	16.84	66.70
Oct. 7	17.01	66.53
Oct. 14	17.16	66.38
Oct. 21	17.25	66.29
Oct. 28	17.37	66.17
Nov. 4	17.40	66.14
Nov. 11	17.43	66.11
Nov. 19	17.32	66.22
Nov. 25	17.27	66.27
Dec. 3	17.26	66.28
Dec. 16	17.32	66.22
Dec. 21	17.29	66.25
Dec. 23	17.35	66.19
Dec. 30	17.40	66.14
1928		
Jan. 6	17.38	66.16
Jan. 13	17.37	66.17
Jan. 20	17.35	66.19
Jan. 28	17.37	66.17
Feb. 4	17.34	66.20

[p] By Cyril Williams.

[p] By Cyril Williams.

[a] Water-stage recorder installed.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4816N1—Con.		
1928		
Feb. 10	17.20	66.34
Feb. 17	17.11	66.43
Feb. 24	17.08	66.46
Mar. 2	17.09	66.45
Mar. 9	17.08	66.46
Mar. 16	17.00	66.54
Mar. 23	16.96	66.58
Mar. 30	4.76	78.78
Apr. 6	5.76	77.78
Apr. 13	6.76	76.78
Apr. 20	7.55	75.99
Apr. 27	8.34	75.20
May 4	9.03	74.51
May 11	9.57	73.97
May 18	9.92	73.62
May 25	10.31	73.23
June 1	10.72	72.72
June 8	11.12	72.42
June 16	11.59	71.95
June 22	11.97	71.57
June 29	12.40	71.14
July 6	12.83	70.71
July 13	13.26	70.28
July 20	13.41	70.13
July 27	13.58	69.96
Aug. 3	13.91	69.63
Aug. 10	14.29	69.25
Aug. 17	14.60	68.94
Aug. 24	14.18	69.36
Aug. 31	14.70	68.84
Sept. 7	15.12	68.42
Sept. 14	15.43	68.11
Sept. 21	15.70	67.84
Sept. 28	15.96	67.58
Oct. 5	16.19	67.35
Oct. 12	16.40	67.14
Oct. 19	16.59	66.95
Oct. 26	16.76	66.78
Nov. 2	16.91	66.63
Nov. 10	17.08	66.46
Nov. 16	17.22	66.32
Nov. 23	17.31	66.23
Nov. 30	17.43	66.11
Dec. 7	17.51	66.03
Dec. 14	17.60	65.94
Dec. 21	17.68	65.86
1929		
Apr. 12	17.65	65.89
May 28	16.35	67.19
June 21	16.20	67.34

4817F1. A. Costa. 8-inch well, 82 feet deep, used for stock. Bench mark until May 26, 1927, top of casing, 0.3 foot above ground, altitude 130.40 feet; after that date, copper washer on 2 by 6 inch plank, 1.9 feet above top of casing, altitude 132.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	68.15	62.25
May 15	67.45	62.95
June 25	68.40	62.00
July 29	69.70	60.70
Aug. 26	[f] 69.80	60.60
Oct. 18	68.90	61.50
Nov. 18	68.65	61.75
Dec. 13	66.00	64.40

[f] Windmill running.

Date	Depth to water (feet)	Altitude of water table (feet)
4817F1—Con.		
1927		
Jan. 18	68.10	62.30
Feb. 25	68.00	62.40
Mar. 16	67.80	62.60
May 26	[f] [h] 70.80	61.50
Aug. 24	71.75	60.55
Sept. 30	70.55	61.75
1928		
Apr. 24	69.55	62.75
Sept. 25	[f] 72.75	59.55
1929		
Apr. 12	71.00	61.30
May 28	71.60	60.70

4817M1. A. Costa. 6-inch well, 150 feet deep, used for stock. Bench mark is top of casing, 1.7 feet above ground; altitude, 128.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	67.80	61.05
May 15	66.05	62.80
June 25	67.90	60.95
July 29	69.30	59.55
Aug. 26	69.70	59.15
Sept. 24	[f] 68.70	60.15
Oct. 18	66.90	61.95
Nov. 18	[f] 67.55	61.30
Dec. 13	65.90	62.95
1927		
Jan. 18	65.60	63.25
Feb. 28	[f] 67.00	61.85
Mar. 16	65.25	63.60
Apr. 26	64.75	64.10
May 26	[f] 67.35	61.50
June 29	[f] 68.10	60.75
July 25	67.00	61.85
Aug. 24	[f] 68.70	60.15
Sept. 30	[f] 67.70	61.15
Oct. 27	68.20	60.65
Nov. 29	66.30	62.55
Dec. 19	66.15	62.70
1928		
Jan. 23	66.55	62.30
Feb. 20	66.00	62.85
Mar. 20	[f] [i] 70.20	58.65
Mar. 27	65.20	63.65
Apr. 4	64.95	63.90
Apr. 24	64.95	63.90
May 24	[f] 67.20	61.65
June 25	70.00	58.85
July 18	69.40	59.45
Aug. 23	[f] 69.60	59.25
Sept. 25	[f] 69.90	58.95
Oct. 22	65.10	63.75
Nov. 20	66.05	62.80
Dec. 14	66.80	62.05

[f] Windmill running.

[h] New measuring point.

[i] Pump running in adjacent well.

Date	Depth to water (feet)	Altitude of water table (feet)
4817M1—Con.		
1929		
Jan. 22	66.55	62.30
Feb. 19	66.65	62.20
Mar. 20	67.00	61.85
Apr. 12	[f] 67.80	61.05
May 28	([c])	--------
June 21	[f] 70.65	58.20

4818A1. J. D. Hoskins. (See p. 236.) Bench mark is top of casing, at ground surface; altitude, 116.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 20	57.50	59.05
May 13	57.55	59.00
June 19	60.20	56.35
July 23	60.50	56.05
Aug. 18	60.20	56.35
Sept. 23	59.80	56.75
Oct. 18	58.65	57.90
Nov. 16	58.45	58.10
Dec. 13	58.10	58.45
1927		
Jan. 18	57.85	58.70
Feb. 19	57.75	58.80
Mar. 16	57.35	59.20
Apr. 23	57.15	59.40
June 24	60.35	56.20
Aug. 24	60.30	56.25
Sept. 29	59.45	57.10
Nov. 28	58.40	58.15
1928		
Apr. 25	57.75	58.80
Sept. 25	60.20	56.35
1929		
Apr. 17	60.20	56.35

4819A1. 12-inch well, not in use. Bench mark is top of casing, 2.00 feet above ground; altitude, 110.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	51.50	58.60
May 15	51.15	58.95
June 19	53.70	56.40
July 23	55.00	55.10
Aug. 18	53.40	56.70
Sept. 23	53.10	57.00
Oct. 18	51.50	58.60
Nov. 16	52.20	57.90
Dec. 13	51.45	58.65
1927		
Jan. 18	51.35	58.75
Feb. 19	51.20	58.90
Mar. 16	50.55	59.55
Apr. 23	50.15	59.95
May 26	50.15	59.95
June 29	52.10	58.00
July 22	52.45	57.65

[c] Pumping.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4819A1—Con.		
1927		
Aug. 24	53.85	56.25
Sept. 27	51.75	58.35
Oct. 28	51.25	58.85
Nov. 28	51.30	58.80
Dec. 20	51.75	58.35
1928		
Jan. 23	51.70	58.40
Feb. 18	54.85	55.25
Mar. 22	52.15	57.95
Mar. 27	51.45	58.65
Apr. 4	51.25	58.85
Apr. 24	50.85	59.25
May 24	53.50	56.60
June 18	(a)	---------

4819C1. B. M. Shaffer. 4-foot well, 124 feet deep, used for domestic supply. Bench mark is copper washer on cover, 2.50 feet above ground; altitude, 113.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	54.70	58.55
May 15	54.00	59.25
June 19	55.90	57.35
July 23	55.60	57.65
Aug. 18	55.15	58.10
Sept. 23	[b] 51.25	62.00
Oct. 18	[b] 50.50	62.75
Nov. 16	53.45	59.80
Dec. 13	54.20	59.05
1927		
Jan. 18	54.30	58.95
Feb. 19	54.30	58.95
Mar. 16	53.75	59.50
Apr. 23	54.90	58.35
May 26	(a)	---------

4819C2. B. M. Shaffer. (See p. 236.) Bench mark is iron base of pump, 1.00 foot above ground; altitude, 112.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 22	53.50	58.55
1927		
May 26	54.70	57.35
June 29	57.40	54.65
July 22	57.80	54.25
Aug. 24	57.65	54.40
Sept. 29	55.40	56.65
Oct. 28	54.75	57.30
Nov. 29	54.20	57.85
Dec. 17	54.10	57.95
1928		
Jan. 23	54.00	58.05
Feb. 18	54.00	58.05
Mar. 22	51.90	60.15
Mar. 27	53.55	58.50
4819C2—Con.		
1928		
Apr. 4	53.35	58.70
Apr. 24	53.25	58.80
May 24	55.80	56.25
June 18	58.45	53.60
July 20	58.60	53.45
Aug. 23	57.45	54.60
Sept. 25	56.45	55.60
Oct. 22	55.75	56.30
Nov. 20	55.20	56.85
Dec. 17	54.85	57.20
1929		
Jan. 22	54.75	57.30
Feb. 19	54.70	57.35
Mar. 20	54.35	57.70
Apr. 17	56.75	55.30
May 29	58.05	54.00
June 21	57.55	54.50

4820G1. L. H. Schafner. 8-inch well, 18 feet deep, used for stock. Bench mark is top of casing, 1.0 foot above ground; altitude, 76.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 7	12.70	63.45
1927		
May 27	4.55	71.60
Sept. 30	10.95	65.20
Oct. 27	11.45	64.70
1928		
Apr. 25	5.40	70.75
Sept. 26	11.30	64.85
1929		
Apr. 12	11.80	64.35

4820L1. Ernest McKinley. 6-inch well, not in use. Bench mark is copper washer on old pump support, 1.30 feet above ground; altitude, 116.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 9	52.70	63.55
1927		
May 27	48.95	67.30
Sept. 30	51.60	64.65
Oct. 27	52.00	64.25
1928		
Apr. 25	47.90	68.35
Sept. 26	(bb)	---------

4821B1. L. F. Stabell. 8-inch well, used for domestic supply. Bench mark is copper washer on 8 by 6 inch pump support. 0.5 foot above ground; altitude, 82.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 31	[p] 16.80	65.95
Dec. 4	[p] 16.75	66.00
1926		
Sept. 3	17.50	65.25
Oct. 20	18.65	64.10
Nov. 18	17.80	64.95
1927		
Jan. 22	16.95	65.80
Feb. 26	16.10	66.65
Mar. 19	15.80	66.95
May 27	15.25	67.50
June 29	15.25	67.50
July 25	16.30	66.45
Aug. 29	17.30	65.45
Sept. 30	17.50	65.25
Oct. 27	17.50	65.25
Nov. 29	17.30	65.45
Dec. 19	17.35	65.40
1928		
Jan. 23	17.15	65.60
Feb. 20	17.05	65.70
Mar. 20	17.30	65.45
Apr. 25	7.15	75.60
May 22	9.40	73.35
June 19	11.65	71.10
July 17	13.35	69.40
Aug. 22	15.15	67.60
Sept. 25	16.35	66.40
Oct. 22	16.65	66.10
Nov. 20	16.80	65.95
Dec. 17	16.90	65.85
1929		
Jan. 21	16.90	65.85
Feb. 18	16.65	66.10
Mar. 19	16.65	66.10
Apr. 12	16.60	66.15
May 28	16.10	66.65
June 21	16.45	66.30

4821F1. L. J. Megerle. (See p. 236.) Bench mark is copper washer on 2 by 4 inch scantling at north side of pit, 0.2 foot above ground; altitude, 81.20 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 31	[p] 18.05	63.15
Dec. 4	[p] 17.90	63.30
1926		
Sept. 4	20.10	61.10

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[b] Water in ditch near by.
[a] Filled in.

[bb] Nailed up.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

4821H1. John Clements. 5-foot well, 18 feet deep, used for domestic supply. Bench mark is copper washer on well cover, west side of trap door, on 2 by 12 inch plank, about 0.50 foot above ground; altitude, 82.31 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 7	14.55	67.76
1927		
Jan. 6 [a]	15.47	66.84
Jan. 7	15.42	66.89
Jan. 14	15.33	66.98
Jan. 21	15.28	67.03
Jan. 28	15.21	67.10
Feb. 4	15.11	67.20
Feb. 11	14.89	67.42
Feb. 18	14.61	67.70
Feb. 25	14.42	67.89
Mar. 4	14.28	68.03
Mar. 11	14.17	68.14
Mar. 18	14.05	68.26
Mar. 25	13.96	68.35
Apr. 2	13.81	68.50
Apr. 9	13.68	68.63
Apr. 15	13.65	68.66
Apr. 22	13.62	68.69
Apr. 29	13.64	68.67
May 6	13.65	68.66
May 13	13.70	68.61
May 20	13.77	68.54
May 27	13.84	68.47
June 4	13.89	68.42
June 10	13.91	68.40
June 17	14.05	68.26
June 24	14.14	68.17
July 1	13.92	68.39
July 8	13.81	68.50
July 16	13.76	68.55
July 22	13.84	68.47
July 29	13.97	68.34
Aug. 5	14.05	68.26
Aug. 12	14.22	68.09
Aug. 19	14.33	67.98
Aug. 26	14.48	67.83
Sept. 2	14.62	67.69
Sept. 10	14.75	67.56
Sept. 16	14.85	67.46
Sept. 23	14.94	67.37
Oct. 1	15.08	67.23
Oct. 7	15.19	67.12
Oct. 14	15.32	66.99
Oct. 21	15.37	66.94
Oct. 28	15.41	66.90
Nov. 4	15.40	66.91
Nov. 11	15.42	66.89
Nov. 18	15.38	66.93
Nov. 25	15.36	66.95
1928		
Apr. 25	7.20	75.11
May 22	8.35	73.96
June 19	9.70	72.61
Sept. 25	14.15	68.16
1929		
Apr. 12	14.30	68.01
May 28	14.00	68.31

[a] Water-stage recorder installed.

4821J2. P. H. Megerle. 4-foot well, 18 feet deep, used for stock. Bench mark is top of concrete curb, 2.50 feet above ground; altitude, 80.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 8	17.70	63.15
Oct. 22	17.90	62.95
1927		
May 27	15.10	65.75
July 8	15.35	65.50
Sept. 30	16.70	64.15
Nov. 29	16.75	64.10
1928		
Jan. 23	16.20	64.65
Mar. 20	16.55	64.30
Apr. 25	8.45	72.40
July 18	12.40	68.45
Aug. 22	13.75	67.10
1929		
Apr. 12	15.80	65.05
May 28	16.25	64.60

4821L2. John Clements. Bench mark is top of pump-base arch, on north side of pump, 0.65 foot above ground; altitude, 124.65 feet [p]

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 31	[p] 61.15	63.50
Dec. 4	[p] 61.05	63.60

4821N1. Charles Smith. 4-foot well, used for domestic supply. Bench mark is copper washer on well cover, 0.20 foot above ground; altitude, 125.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	65.80	59.95
May 13	65.80	59.95
June 24	66.70	59.05
July 30	[e] 68.20	57.55
Aug. 24	68.25	57.50
Sept. 24	66.60	59.15
Oct. 20	65.35	60.40
Nov. 18	65.50	60.25
Dec. 13	64.70	61.05
1927		
Jan. 22	64.80	60.95
Feb. 11	64.90	60.85
Mar. 19	64.15	61.60
May 27	65.20	60.55
June 29	66.80	58.95
July 25	([c])	---------
Aug. 29	([c])	---------
Sept. 30	66.15	59.60
Oct. 27	65.50	60.25
Nov. 29	65.00	60.75
Dec. 19	65.05	60.70

[c] Pumping.

[e] Pump stopped a short time before measurement.

[p] By Cyril Williams.

4821N1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Jan. 23	64.70	61.05
Feb. 20	64.65	61.10
Mar. 20	65.50	60.25
Mar. 27	65.75	60.00
Apr. 4	64.25	61.50
Apr. 25	65.70	60.05
May 22	66.60	59.15
June 25	67.80	57.95
July 18	([c])	---------
Aug. 22	([c])	---------
Sept. 25	67.45	58.30
Oct. 22	66.65	59.10
Nov. 19	65.95	59.80
Dec. 17	([c])	---------
1929		
Jan. 21	65.65	60.10
Feb. 18	65.80	59.95
Mar. 19	66.15	59.60
Apr. 12	66.65	59.10
May 28	([c])	---------
June 21	68.00	57.75

4822B1. Clements town well. 4-foot well. Bench mark is copper washer on floor of pump house, 0.5 foot above ground; altitude 146.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	80.30	65.80
May 13	81.85	64.25
June 24	82.20	63.90
July 29	[c] 84.10	62.00
Aug. 25	[c] 84.80	61.30
Sept. 24	[c] 83.15	62.95
Oct. 20	[c] 81.95	64.15
Nov. 18	81.85	64.25
Dec. 13	82.10	64.00
1927		
Jan. 21	83.10	63.00
Feb. 11	81.10	65.00
Mar. 19	81.85	64.25
Apr. 26	82.70	63.40
May 28	81.90	64.20
June 29	82.65	63.45
July 25	[c] 83.10	63.00
Aug. 29	82.10	64.00
Sept. 29	[e] 84.90	61.20
Oct. 29	83.05	63.05
Nov. 29	83.65	62.45
Dec. 19	82.40	63.70
1928		
Jan. 23	83.75	62.35
Feb. 20	81.20	64.90
Mar. 20	[c] 81.55	64.55
Mar. 27	81.15	64.95
Apr. 4	79.70	66.40
Apr. 25	[e] 80.95	65.25
Apr. 26	80.10	66.00
May 23	79.95	66.15
June 25	81.15	64.95

[c] Pumping.

[e] Pump stopped a short time before measurement.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4822B1—Con.		
1928		
July 17	81.60	64.50
Aug. 22	81.70	64.40
Sept. 26	[c] 83.10	63.00
Oct. 20	80.75	65.35
Nov. 19	81.80	64.30
Dec. 17	80.40	65.70
1929		
Jan. 27	80.85	65.25
Feb. 18	80.40	65.70
Mar. 19	80.50	65.60
Apr. 12	80.80	65.30
May 28	82.25	63.85
June 20	[g] 82.30	63.80
4822M1. L. L. Brandt. 4-foot well, 86 feet deep, used for domestic supply. Bench mark is top of north side of concrete curb, 0.5 foot above ground; altitude, 149.45 feet		
1925		
Oct. 27	[p] 81.35	68.10
1926		
Apr. 29	81.25	68.20
June 24	82.00	67.45
July 30	81.60	67.85
Aug. 25	81.70	67.75
Sept. 24	81.80	67.65
Oct. 20	82.00	67.45
Nov. 20	81.90	67.55
Dec. 13	81.85	67.60
1927		
Jan. 22	82.00	67.45
Feb. 11	81.60	67.85
Mar. 19	81.80	67.65
Apr. 26	81.70	67.75
May 27	[f] 84.80	64.65
June 29	82.80	66.65
Aug. 29	82.30	67.15
Oct. 1	82.40	67.05
1928		
Apr. 25	82.05	67.40
Sept. 26	([c])	--------
1929		
Apr. 15	82.75	66.70
4823A1. Chris Fahrner. (See p. 236.) Bench mark is top of concrete curb, 0.50 foot above ground; altitude, 130.37 feet [p]		
1925		
Oct. 10	[p] 61.64	68.73
4823E1. E. Hauff. 4-foot well, 70 feet deep, used for domestic supply. Bench mark is cross cut in concrete curb, 1.1 foot above ground; altitude, 128.90 feet		
1925		
Oct. 27	[p] 60.35	68.55
1926		
Apr. 29	60.20	68.70
June 24	60.45	68.45
July 30	60.70	68.20
Aug. 25	60.80	68.10
Sept. 24	60.90	68.00
Oct. 20	60.85	68.05
Nov. 20	61.00	67.90
Dec. 13	[a] 60.80	68.10
1927		
Jan. 22	[a] 61.00	67.90
Feb. 11	[a] 60.60	68.30
Mar. 19	[a] 60.75	68.15
Apr. 26	[a] 60.60	68.30
May 27	59.50	69.40
June 29	[f] 61.35	67.55
July 25	61.20	67.70
Aug. 29	61.60	67.30
Oct. 1	61.50	67.40
Oct. 27	61.45	67.45
1928		
Apr. 26	60.95	67.95
Sept. 26	61.85	67.05
1929		
Apr. 15	61.55	67.35
4824M1. F. Rabb. 3-foot well, used for stock. Bench mark is blue cross on well cover, 0.8 foot above ground; altitude, 165.85 feet		
1926		
June 16	89.45	76.40
July 30	[f] 90.40	75.45
Aug. 24	89.60	76.25
Oct. 19	89.65	76.20
Dec. 14	90.00	75.85
1927		
Feb. 28	89.90	75.95
Apr. 27	89.90	75.95
Oct. 4	90.30	75.55
1928		
Apr. 26	90.35	75.50
Oct. 1	90.55	75.30
1929		
Apr. 16	[x] 90.60	75.25
4825K1. Clarence Simpson. 4-foot well, 122 feet deep, used for domestic supply. Bench mark is cross on pump support, 1.8 feet above ground; altitude, 194.05 feet		
1926		
Apr. 28	119.70	74.35
Aug. 24	119.90	74.15
Oct. 20	120.00	74.05
Dec. 15	120.55	73.50
1927		
Feb. 28	120.40	73.65
Apr. 27	120.30	73.75
Oct. 4	120.50	73.55
1928		
Apr. 26	120.60	73.45
Sept. 28	121.00	73.05
1929		
Apr. 15	121.20	72.85
4826H1. J. N. Keebler. 3-foot well, 35 feet deep, used for domestic supply. Bench mark is cross on north side of concrete curb, 1.8 feet above ground; altitude, 166.95 feet Perched-water well		
1926		
Apr. 29	35.00	131.95
June 23	34.20	132.75
July 30	33.50	133.45
Aug. 24	32.40	134.55
Oct. 20	31.85	135.10
Dec. 15	32.50	134.45
1927		
Feb. 28	30.75	136.20
Apr. 27	31.25	135.70
Oct. 4	32.35	134.60
1928		
Apr. 26	[f] 31.95	135.00
Sept. 28	32.40	134.55
1929		
Apr. 15	32.40	134.55
4826K1. John W. Galloway. 4-foot well, 110 feet deep, used for domestic supply. Bench mark is cross on 6 by 6 inch base of pump, 1.00 foot above ground; altitude, 173.20 feet		
1925		
Oct. 27	[p] 105.10	68.1

[c] Pumping.

[f] Windmill running.

[g] Pump stopped a short time before measurement.

[p] By Cyril Williams.

[a] Creek or river flowing near by.

[f] Windmill running.

[p] By Cyril Williams.

[x] Water standing in adjacent channel.

[f] Windmill running.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

4826K1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 29	104.20	69.00
June 24	105.60	67.60
Aug. 24	105.60	67.60
Oct. 20	104.35	68.85
Dec. 15	103.60	69.60
1927		
Feb. 28	103.20	70.00
Oct. 4	103.80	69.40
1928		
Apr. 26	103.30	69.90
Oct. 1	104.35	68.85
1929		
Apr. 15	104.20	69.00

4827J1. D. M. Atkins. 5-foot well, 75 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 12 inch plank, 1.6 feet above ground; altitude, 127.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	62.90	64.20
June 23	64.10	63.00
July 30	f 64.70	62.40
Aug. 24	64.70	62.40
Sept. 24	64.40	62.70
Oct. 20	64.00	63.10
Nov. 20	g 64.10	63.00
Dec. 15	63.90	63.20
1927		
Jan. 31	63.40	63.70
Feb. 26	63.40	63.70
Mar. 19	f 63.65	63.45
Apr. 26	63.00	64.10
May 27	f 64.25	62.85
June 29	64.40	62.70
Aug. 26	65.00	62.10
Oct. 4	64.80	62.30
Oct. 26	64.30	62.80
Nov. 26	63.90	63.20
Dec. 15	64.00	63.10
1928		
Jan. 18	65.40	61.70
Feb. 16	63.65	63.45
Mar. 20	64.20	62.90
Apr. 25	63.45	63.65
May 22	64.25	62.85
June 19	65.15	61.95
July 17	f 65.20	61.90
Aug. 22	66.55	60.55
Sept. 26	65.30	61.80
Oct. 20	65.15	61.95
Nov. 19	64.40	62.70
Dec. 17	64.65	62.45
1929		
Jan. 21	a 64.65	62.45
Feb. 18	64.25	62.85
Mar. 19	64.50	62.60
Apr. 15	64.75	62.35
May 28	65.80	61.30
June 20	66.10	61.00

4828J1. Edward and William Harris. 5-foot well, 140 feet deep, used for domestic supply. Bench mark is copper washer on 6 by 8 inch pump support, 1.00 foot above ground; altitude, 114.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	46.90	67.15
May 15	45.85	68.20
June 23	44.05	70.00
July 30	43.20	70.85
Aug. 24	40.60	73.45
Sept. 24	52.85	61.20
Oct. 20	53.65	60.40
Nov. 18	53.65	60.40
Dec. 15	54.00	60.05
1927		
Jan. 21	a 53.65	60.40
Feb. 11	a 53.50	60.55
Mar. 19	a 53.35	60.70
June 29	56.35	57.70
July 25	56.10	57.95
Aug. 29	c 56.95	57.10
Oct. 27	c 54.05	60.00
Nov. 29	53.70	60.35
Dec. 15	53.45	60.60
1928		
Jan. 23	53.15	60.90
Feb. 16	53.15	60.90
Mar. 20	f 53.10	60.95
Apr. 25	52.60	61.45
May 22	53.45	60.60
June 28	55.25	58.80
July 18	(c)	----------
Aug. 22	55.90	58.15
Sept. 26	55.30	58.75
Oct. 22	54.70	59.35
Nov. 20	54.10	59.95
Dec. 17	53.95	60.10
1929		
Jan. 21	a 53.80	60.25
Feb. 18	53.70	60.35
Mar. 19	54.15	59.90
Apr. 12	54.40	59.65
May 28	56.25	57.80
June 21	56.55	57.50

4829E1. W. S. Montgomery. (See p. 236.) Bench mark is top of casing, 0.8 foot above ground; altitude, 109.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 30	p 51.60	57.70
Dec. 7	p 51.25	58.05
1926		
Apr. 19	51.30	58.00
May 15	51.20	58.10
June 19	c +60.00	±49.00
July 23	c 74.20	35.10

4829E1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 17	54.30	55.00
Sept. 24	53.95	55.35
Oct. 15	52.60	56.70
Nov. 15	52.40	56.90
Dec. 9	51.90	57.40
1927		
Jan. 17	51.70	57.60
Feb. 16	51.40	57.90
Mar. 15	51.25	58.05
Apr. 15	51.00	58.30
May 27	52.65	56.65
June 29	(c)	----------
July 25	54.70	54.60
Aug. 22	(c)	----------
Sept. 27	53.20	56.10
Oct. 24	52.55	56.75
Nov. 28	52.15	57.15
Dec. 19	52.10	57.20
1928		
Jan. 21	51.90	57.40
Feb. 18	51.95	57.35
Mar. 17	52.65	56.65
Mar. 27	51.25	58.05
Apr. 4	51.10	58.20
Apr. 24	51.15	58.15
May 23	(c)	----------
June 18	(c)	----------
July 20	(c)	----------
Aug. 25	(c)	----------
Sept. 24	54.85	54.45
Nov. 20	52.90	56.40
Dec. 17	52.80	56.50
1929		
Jan. 21	52.70	56.60
Feb. 19	52.65	56.65
Mar. 20	53.50	55.80
Apr. 16	(c)	----------
May 29	(c)	----------

4829L1. L. M. Montgomery. 7-inch well, 150 feet deep, used for domestic supply. Bench mark until Oct. 20, 1926, copper washer on 2 by 12 inch pump support, 0.8 foot above ground, altitude 117.50 feet; after that date, cross on concrete curb or top of casing, 0.25 foot below old bench mark, altitude 117.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	58.70	58.80
May 15	58.30	59.20
June 23	i 63.50	54.00
July 30	63.75	53.75
Aug. 24	63.70	53.80
Sept. 24	60.70	56.80
Oct. 20	h 59.25	58.00
Nov. 18	59.00	58.25
Dec. 15	58.90	58.35

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a Creek or river flowing near by.
f Windmill running.
g Pump stopped a short time efore measurement.

a Creek or river flowing near by.
c Pumping.
f Windmill running.
p By Cyril Williams.

c Pumping.
h New measuring point.
i Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4829L1—Con.		
1927		
Jan. 22	58.65	58.60
Feb. 26	58.20	59.05
Mar. 19	58.25	59.00
May 27	57.80	59.45
June 29	61.40	55.85
July 25	(e)	--------
Aug. 29	[i] 63.90	53.35
Oct. 27	59.45	57.80
Nov. 26	59.05	58.20
Nov. 29	[i] 61.70	55.55
Dec. 15	61.10	56.15
1928		
Jan. 23	58.80	58.45
Feb. 16	58.85	58.40
Mar. 20	59.55	57.70
Apr. 25	58.35	58.90
May 22	62.70	54.55
June 28	64.90	52.35
July 18	62.60	54.65
Aug. 22	62.90	54.35
Sept. 26	61.60	55.65
Oct. 22	[e]+65.00	--------
Nov. 20	59.80	57.45
Dec. 17	59.70	57.55
1929		
Jan. 21	59.65	57.60
Feb. 18	[a] 59.65	57.60
Mar. 19	59.95	57.30
Apr. 12	60.50	56.75
May 28	(e)	--------
June 21	62.95	54.30

4830G2. F. C. Allen. 4-foot well, 61 feet deep. Bench mark is copper washer on well cover, 0.30 foot above ground; altitude, 107.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 10	59.95	47.10
Oct. 15	62.85	44.20
1927		
May 27	49.40	57.65
June 29	49.60	57.45
July 25	49.60	57.45
Aug. 22	49.65	57.40
Sept. 30	50.05	57.00
Oct. 27	50.50	56.55
Nov. 28	50.55	56.50
Dec. 19	51.95	55.10
1928		
Jan. 21	52.30	54.75
Feb. 18	50.35	56.70
Mar. 17	50.10	56.95
Mar. 27	46.80	60.25
Apr. 4	46.45	60.60
Apr. 24	46.65	60.40
May 23	45.50	61.55
June 18	46.60	60.45
July 20	47.55	59.50
Aug. 25	47.85	59.20
Sept. 24	48.75	58.30
4830G2—Con.		
1929		
Jan. 21	49.65	57.40
Apr. 16	49.75	57.30
June 21	49.95	57.10

4830N1. N. H. Locke Co. 4-foot well, Lockeford town well. Bench mark is copper washer on well cover, 0.5 foot above ground; altitude, 105.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 19	55.10	50.15
Do	[e] 59.10	46.15
May 18	(e)	--------
July 23	[e] 61.70	43.55
Aug. 17	51.85	53.40
Sept. 23	51.85	53.40
Oct. 15	51.55	53.70
Nov. 15	50.15	55.10
Dec. 9	[g] 55.00	50.25
1927		
Jan. 17	52.00	53.25
Feb. 16	52.10	53.15
Mar. 15	51.20	54.05
Apr. 15	50.60	54.65
May 27	50.15	55.10
June 25	[i] 50.35	54.90
July 19	[i] 50.70	54.55
Aug. 22	51.15	54.10
Sept. 27	51.60	53.65
Oct. 27	51.40	53.85
Nov. 28	51.25	54.00
Dec. 19	52.25	53.00
1928		
Jan. 21	51.00	54.25
Feb. 18	50.95	54.30
Mar. 17	51.00	54.25
Mar. 27	49.70	55.55
Apr. 4	50.00	55.25
Apr. 24	48.75	56.50
May 23	48.05	57.20
June 18	48.70	56.55
July 20	49.50	55.75
Aug. 25	[i] 50.20	55.05
Sept. 24	50.70	54.55
Oct. 22	50.90	54.35
Nov. 20	50.95	54.30
Dec. 17	51.00	54.25
1929		
Jan. 22	51.00	54.25
Feb. 19	50.95	54.30
Mar. 20	51.10	54.15
Apr. 16	51.30	53.95
May 29	[i] 51.70	53.55
June 21	50.85	54.40

4831L1. N. H. Locke Co. 10-inch well, 135 feet deep, used for stock. Bench mark is top of casing, 1.7 feet above ground; altitude, 95.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 41.80	53.55
Oct. 27	[p] 41.85	53.50
1926		
Apr. 27	41.55	53.80
May 18	41.40	53.95
June 17	42.10	53.25
July 23	42.50	52.85
Aug. 17	42.65	52.70
Sept. 23	42.75	52.60
Oct. 15	[e]±59.00	±36.00
Nov. 15	43.15	52.20
Dec. 9	[a] 42.30	53.05
1927		
Jan. 17	[a] 42.10	53.25
Feb. 16	[a] 42.00	53.35
Mar. 15	[a] 41.85	53.50
Apr. 15	[a] 41.60	53.75
May 23	41.80	53.55
June 29	42.50	52.85
July 19	43.70	51.65
Aug. 22	43.10	52.25
Sept. 27	47.25	48.10
Oct. 27	43.15	52.20
Nov. 28	42.60	52.75
Dec. 17	40.65?	54.70?
1928		
Jan. 21	[a] 42.35	53.00
Feb. 18	[a] 42.30	53.05
Mar. 21	[a] 42.40	52.95
Apr. 24	[a] 42.10	53.25
May 23	42.20	53.15
June 18	44.70	50.65
July 20	43.65	51.70
Aug. 25	43.50	51.85
Sept. 24	43.75	51.60
Oct. 22	43.45	51.90
Nov. 20	43.20	52.15
Dec. 17	47.25	48.10
1929		
Jan. 22	[a] 43.00	52.35
Feb. 19	[a] 43.00	52.35
Mar. 20	43.10	52.25
Apr. 16	43.40	51.95
May 29	44.00	51.35
June 21	44.20	51.15

4832Q1. Jacob Vix. 3-foot well, 110 feet deep, used for domestic supply. Bench mark is copper washer in well cover, 1.1 feet above ground; altitude, 106.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 28	51.30	55.15
June 23	52.85	53.60
July 30	[f] 54.90	51.55

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[a] Creek or river flowing near by.
[e] Pumping.
[i] Pump running in adjacent well.

[e] Pumping.
[g] Pump stopped a short time before measurement.
[i] Pump running in adjacent well.

[a] Creek or river flowing near by.
[e] Pumping.
[f] Windmill running.
[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4832Q1—Con.		
1926		
Aug. 23	53.15	53.30
Sept. 24	52.75	53.70
Oct. 19	52.50	53.95
Nov. 20	52.75	53.70
Dec. 14	51.70	54.75
1927		
Jan. 31	51.35	55.10
Feb. 22	51.20	55.25
Mar. 19	51.20	55.25
Apr. 27	[f] 52.05	54.40
June 29	53.25	53.20
July 30	51.00	55.45
1928		
Apr. 25	51.90	54.55
Sept. 26	([bb])	---------
1929		
Mar. 20	53.10	53.35

4834E1. C. L. Weber. Well 105 feet deep, used for domestic supply. Bench mark is copper washer on 6 by 6 inch pump support, 1.2 feet above ground; altitude, 159.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	96.60	63.15
June 23	96.80	62.95
July 30	[e] 104.50	55.25
Aug. 24	96.50	63.25
Sept. 24	97.05	62.70
Oct. 20	96.25	63.50
Dec. 15	96.80	62.95
1927		
Jan. 31	96.30	63.45
Feb. 26	96.40	63.35
Mar. 19	96.60	63.15
Apr. 26	96.85	62.90
May 27	[f] 97.95	61.80
June 29	96.90	62.85
July 20	97.80	61.95
Aug. 29	97.20	62.55
Oct. 4	[f] 97.85	61.90
Oct. 26	[f]+100.00	
Nov. 26	96.85	62.90
1928		
Jan. 18	97.00	62.75
Feb. 16	96.75	63.00
Mar. 20	96.90	62.85
Apr. 25	96.80	62.95
May 22	97.90	61.85
June 19	[f]+99.00	60.00
July 17	98.55	61.20
Aug. 22	+100.60	—59.10
Sept. 26	97.60	62.15
1929		
Apr. 15	97.90	61.85

4834G1. Frank Athern. 4-foot well, 114 feet deep, used for domestic supply. Bench mark is cross on north side of concrete curb, 0.6 foot above ground; altitude, 173.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 27	104.40	68.80
1926		
Apr. 29	104.60	68.60
June 24	105.60	67.60
July 30	105.80	67.40
Aug. 24	104.00	69.20
Sept. 24	104.10	69.10
Oct. 20	[e]104.40	68.80
Dec. 15	104.60	68.60
1927		
Feb. 28	104.45	68.75
Apr. 26	104.90	68.30
May 27	[f] 110.00	63.20
Oct. 4	109.00	64.20
1928		
Apr. 26	105.10	68.10
Sept. 26	[f] 106.80	66.40
1929		
Apr. 15	105.85	67.35

4834Q1. Mrs. L. Matthews. 6-foot well, not in use. Bench mark is cross cut on concrete curb, 0.5 foot above ground; altitude, 162.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[p] 90.85	71.80
Oct. 27	[p] 90.85	71.80
1926		
Apr. 28	91.60	71.05
June 23	91.20	71.45
July 30	93.10	69.55
Aug. 23	91.50	71.15
Sept. 24	91.35	71.30
Oct. 19	91.35	71.30
Dec. 14	91.65	71.00
1927		
Feb. 26	91.75	70.90
Mar. 19	91.75	70.90
Apr. 26	91.50	71.15
May 27	91.80	70.85
June 29	91.75	70.90
July 30	96.50	66.15
Aug. 31	97.40	65.25
Oct. 26	93.90	68.75
Nov. 26	94.90	67.75
Dec. 15	97.30	65.35
4834Q1—Con.		
1928		
Jan. 18	92.30	70.35
Feb. 16	92.20	70.45
Mar. 20	94.25	68.40
Apr. 25	92.20	70.45
May 22	92.20	70.45
June 19	92.10	70.55
July 17	92.40	70.25
Aug. 22	92.35	70.30
Sept. 26	96.35	66.30
Oct. 20	93.25	69.40
Nov. 19	93.15	69.50
Dec. 17	92.75	69.90
1929		
Jan. 21	92.60	70.05
Feb. 18	92.50	70.15
Mar. 19	92.70	69.95
Apr. 16	92.75	69.90
May 28	92.75	69.90
June 20	92.80	69.85

4836P1. H. A. Meyers. 4-foot well, 160 feet deep, used for domestic supply. Bench mark is cross cut in concrete curb, east side, 0.3 foot above ground; altitude, 226.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 28	153.50	72.90
June 23	[f]155.10	71.30
Aug. 23	156.75	69.65
Oct. 19	153.40	73.00
Dec. 14	151.20	75.20
1927		
Feb. 26	153.00	73.40
Apr. 27	154.35	72.05
Oct. 4	[f]157.80	68.60
1928		
Apr. 26	154.55	71.85
Sept. 27	[f]156.00	70.40
1929		
Apr. 16	154.80	71.60

493N1. 4-foot well, 15 feet deep, not in use. Bench mark is copper washer on well curb, 4 feet above ground; altitude, 140 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 19	14.15	125.85
Oct. 30	14.85	125.15
Dec. 11	6.70	133.30
1927		
Feb. 28	5.80	134.20
Apr. 29	8.10	131.90

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[f] Windmill running.
[e] Pump stopped a short time before measurement.
[bb] Nailed up.

[f] Windmill running.
[e] Pump stopped a short time before measurement.
[p] by Cyril Williams.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

495Q1. Geo. W. Lucas. 2-foot well, used for domestic supply. Bench mark until May 26, 1927, copper washer on north side of curb, 1.5 feet above ground, altitude 120.90 feet; from May 26 to June 25, 1927, blue cross 0.87 foot lower, altitude 120.03 feet; from June 25 to Sept. 27, 1927, top of instrument shelf, altitude 123.87 feet; Sept. 27, 1927, to Sept. 26, 1928, top of instrument shelf, altitude 123.86 feet; after Sept. 26, 1928, top of well platform, altitude 120.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 13	17.35	103.55
June 24	([cc])	---------
Oct. 20	([dd])	---------
1927		
May 26	[h] 15.90	104.13
June 16	16.70	103.33
June 25 [a]	[h] 20.09	103.78
July 1	20.17	103.70
July 8	20.31	103.56
July 16	20.45	103.42
July 22	20.57	103.30
July 29	20.70	103.17
Aug. 5	20.81	103.06
Aug. 12	20.92	102.95
Aug. 19	20.99	102.88
Aug. 26	21.09	102.78
Sept. 2	21.18	102.69
Sept. 10	21.22	102.65
Sept. 16	21.23	102.64
Sept. 23	21.34	102.53
Sept. 26	21.34	102.53
Sept. 27	[h] 21.18	102.68
Oct. 1	21.40	102.46
Oct. 7	21.44	102.42
Oct. 14	21.46	102.40
Oct. 21	21.63	102.23
Oct. 28	21.51	102.35
Nov. 4	21.49	102.37
Nov. 11	21.48	102.38
Nov. 18	21.46	102.40
Nov. 25	21.43	102.43
Dec. 3	21.43	102.43
Dec. 16	21.39	102.47
Dec. 23	21.39	102.47
Dec. 30	21.39	102.47
1928		
Jan. 6	21.38	102.48
Jan. 13	21.36	102.50
Jan. 20	21.36	102.50
Jan. 28	21.30	102.56
Feb. 3	21.28	102.58
Feb. 10	21.25	102.61
Feb. 17	21.19	102.67
Feb. 24	21.12	102.74
Mar. 2	21.08	102.78
Mar. 9	21.04	102.82
Mar. 16	21.02	102.84
Mar. 23	21.00	102.86
Mar. 30	18.18	105.68
Apr. 6	18.08	105.78
Apr. 13	18.19	105.67
Apr. 20	18.24	105.62
Apr. 27	18.31	105.55
Apr. 30 [b]	18.35	105.51
Sept. 26	20.54	103.32
1929		
Apr. 15	[h] 17.00	103.40

[h] New measuring point.
[a] Water-stage recorder installed.
[b] Water-stage recorder removed.
[cc] Dry at 18 feet.
[dd] Dry at 17.50 feet.

496F1. Joe Kissel. 3-foot well, 30 feet deep, used for stock. Bench mark is copper washer on top of curb, 1 foot above ground; altitude, 119.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 16	[f] 19.20	100.15
July 29	23.00	96.35
Aug. 26	21.80	97.55
Sept. 30	20.70	98.65
Oct. 23	19.20	100.15
Nov. 18	19.15	100.20
Dec. 11	18.80	100.55
1927		
Jan. 21	18.15	101.20
Feb. 11	18.00	101.35
Mar. 23	17.80	101.55
June 29	[f] 27.50	91.85
Sept. 30	24.45	94.90
1928		
Apr. 24	17.65	101.70
1929		
Apr. 12	18.25	101.10

497A1. Ed Miller. 10-inch well, 71 feet deep, used for domestic supply. Bench mark is copper washer on pump support, 1 foot above ground; altitude, 156.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 12	65.20	91.65
July 29	65.30	91.55
Aug. 25	65.35	91.50
Sept. 24	65.30	91.55
Oct. 20	65.45	91.40
Nov. 20	65.60	91.25
Dec. 15	65.60	91.25
1927		
Jan. 22	65.75	91.10
Feb. 11	65.45	91.40
Mar. 23	65.60	91.25
Apr. 26	65.45	91.40
May 26	65.55	91.30
June 29	65.40	91.45
July 25	65.35	91.50
Aug. 31	65.55	91.30
Oct. 1	65.75	91.10
Oct. 27	65.60	91.25
Nov. 29	65.70	91.15
1928		
Jan 25	65.80	91.05
Feb. 20	65.75	91.10
Apr. 24	66.60	90.25
May 23	65.60	91.25
June 25	65.60	91.25
July 18	65.60	91.25
Aug. 22	65.70	91.15
Sept. 26	65.80	91.05
Oct. 20	65.85	91.00
Nov. 19	65.90	90.95
Dec. 14	65.90	90.95

[f] Windmill running.

497A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Jan. 22	65.95	90.90
Feb. 18	65.95	90.90
Mar. 19	66.00	90.85
Apr. 15	66.00	90.85
May 28	66.05	90.80
June 21	66.05	90.80

497D1. Mrs. R. Lucas. 3-foot well, 30 feet deep, used for domestic supply. Bench mark until July 29, 1926, copper washer on pump support, about 1 foot above ground, altitude 123.85 feet; after that date, 0.15 foot lower, altitude 123.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	27.00	96.85
June 24	[g] 28.60	95.25
July 29	[h] 27.50	96.20
Aug. 25	[e] 27.25	96.45
Sept. 24	26.50	97.20
Oct. 20	25.80	97.90
Nov. 20	25.00	98.70
Dec 15	23.10	100.60
1927		
Jan. 22	24.35	99.35
Feb. 11	23.00	100.70
Mar. 23	21.95	101.75
Apr. 26	22.65	101.05
May 26	23.10	100.60
June 15	24.35	99.35
Oct. 1	24.95	98.75
1928		
Apr. 24	21.70	102.00
Sept. 26	27.75	95.95
1929		
Apr. 15	25.25	98.45

497L1. L. A. Matthews. 3-foot well, used for domestic supply. Bench mark is copper washer on west side of well curb, 4 feet above ground; altitude, 181.05 feet. Perched-water well.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 12	45.80	135.25
July 29	45.90	135.15
Aug. 25	[e] 47.40	133.65
Sept. 24	[g] 48.90	132.15
Oct. 20	46.80	134.25
Nov. 20	45.20	135.85
Dec. 15	45.20	135.85
1927		
Jan. 22	45.15	135.90
Feb. 11	44.80	136.25

[e] Pumping.
[g] Pump stopped a short time before measurement
[h] New measuring point.

Measurements of depth to water in observation wells—Continued

497L1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Mar. 23	44.40	136.65
Apr. 26	45.00	136.05
May 26	45.10	135.95
June 29	46.40	134.65
Oct. 1	44.40	136.65
1928		
Apr. 24	43.90	137.15
Sept. 26	47.80	133.25

498D1. George W. Lucas. 3-foot well, used for domestic supply. Bench mark is copper washer on 4 by 4 inch beam, 3.5 feet above ground; altitude, 130.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	19.20	110.95
June 24	19.05	111.10
July 30	19.40	110.75
Aug. 25	19.65	110.50
Sept. 24	20.20	109.95
Oct. 20	20.50	109.65
Nov. 20	20.75	109.40
Dec. 15	20.30	109.85
1927		
Jan. 22	19.60	110.55
Feb. 11	19.05	111.10
Mar. 23	18.00	112.15
Apr. 26	17.85	112.30
May 26	18.30	111.85
June 15	18.50	111.65
July 25	19.20	110.95
Sept. 30	19.75	110.40
1928		
Apr. 24	19.10	111.05
Sept. 26	20.25	109.90
1929		
Apr. 15	20.05	110.10

498D2. George W. Lucas. (See p. 236.) Bench mark is blue cross on east side of concrete curb at ground surface; altitude, 127.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	10.65	117.20
June 24	17.00	110.85

498L1. *5-foot* well, *not* in use. Bench mark is copper washer on top of curb, north side, 3.00 feet above ground; altitude, 193.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 21	[a] 66.15	127.50
Dec. 4	[a] 66.15	127.50
1926		
May 12	66.40	127.25
June 24	66.30	127.35
July 30	66.40	127.25
Aug. 25	66.40	127.25
Sept. 24	66.50	127.15
Oct. 20	66.40	127.25
Nov. 20	66.50	127.15
Dec. 15	66.60	127.05
1927		
Jan. 22	66.50	127.15
Feb. 11	66.50	127.15
Mar. 23	66.70	126.95
Apr. 26	66.45	127.20
May 26	66.45	127.20
June 29	66.50	127.15
Sept. 16	66.40	127.25
1928		
Apr. 24	66.55	127.10
Sept. 26	66.45	127.20
1929		
Apr. 15	66.75	126.90

498R1. 4-foot well, used for domestic supply. Bench mark is copper washer on well cover, at ground surface; altitude, 192.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	59.90	132.10

499D1. 3-foot well, 21 feet deep, not in use. Bench mark is copper washer on top of curb, 0.5 foot above ground; altitude, 147.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	20.10	127.40

499D2. Osterman Bros. 6-inch well, not in use. Bench mark is top of casing, 0.80 foot above ground; altitude, 183.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	55.50	127.80
Aug. 11	55.60	127.70

499D3. 3-foot well, used for domestic supply. Bench mark is copper washer on pump support, 1 foot above ground; altitude, 172.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	42.30	130.50

499D4. Osterman Bros. 4½-foot well, used for domestic supply. Bench mark is copper washer on well cover, 6 feet above ground; altitude, 148.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 25	22.60	125.65
Dec. 15	22.25	126.00
1927		
Feb. 28	19.50	128.75
Apr. 29	20.25	128.00

499D5. Osterman Bros. Well used for domestic supply. Bench mark is copper washer on pump support, 1.50 feet above ground; altitude, 184.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 26	56.35	127.80
Dec. 15	57.30	126.85
1927		
Feb. 28	56.55	127.60
Apr. 29	57.25	126.90

499M1. 5-foot well, 24 feet deep, not in use. Bench mark is copper washer in 4 by 4 inch beam at southwest corner of curb, 4 feet above ground; altitude 183.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 11	29.80	153.45
Oct. 25	29.90	153.35
Dec. 15	30.05	153.20
1927		
Feb. 28	30.20	153.05
Apr. 29	23.25	160.00

4912J1. 6-foot well, used for stock. Bench mark is copper washer on 6 by 6 inch beam, 0.5 foot above ground; altitude, 175.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 9	24.45	151.25
Sept. 30	28.50	147.20
Oct. 25	[f] 27.75	147.95
Dec. 11	25.65	150.05
1927		
Feb. 28	22.00	153.70
Apr. 29	22.70	153.00

[a] By Cyril Williams.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4915P1. S. Rossetti. 3-foot well, 116 feet deep, used for domestic supply. Bench mark is copper washer on top of well curb, 3.50 feet above ground ; altitude, 200.10 feet		
1926		
June 8	66.50	133.60
Aug. 11	52.65	147.45
Oct. 25	44.60	155.50
Dec. 15	38.75	161.35
1927		
Feb. 28	11.55	188.55
Apr. 29	51.40	148.70
4917C1. Mrs. Annie Harris. Well 65 feet deep, used for domestic supply. Bench mark is copper washer on well cover, 1.5 feet above ground; altitude, 173.35 feet		
1926		
May 12	52.10	121.25
June 24	52.10	121.25
July 30	54.85	118.50
Aug. 24	[c] 64.30	109.05
Sept. 24	56.00	117.35
Oct. 20	53.75	119.60
Nov. 20	49.25	124.10
Dec. 15	53.90	119.45
1927		
Jan. 22	[g] 50.25	123.10
Feb. 11	49.40	123.95
Mar. 23	50.00	123.35
Apr. 26	49.30	124.05
May 26	49.75	123.60
June 29	49.70	123.65
Oct. 1	58.05	115.30
1928		
Apr. 24	53.55	119.80
Sept. 26	58.25	115.10
1929		
Mar. 13	49.45	123.90
Apr. 15	52.15	121.20
4918B1. L. A. Matthews. 4-foot well, 86 feet deep, not in use. Bench mark is copper washer on pump support, 1.2 feet above ground; altitude, 174.40 feet		
1925		
Oct. 21	[p] 74.60	99.80
Dec. 4	[p] 74.75	99.65
1926		
June 16	74.80	99.60
July 29	74.90	99.50
4918B1—Con.		
1927		
May 26	75.05	99.35
June 29	74.10	100.30
Oct. 1	74.50	99.90
1928		
Apr. 24	75.50	98.90
1929		
Apr. 15	76.00	98.40
4918D1. 4-foot well, used for stock. Bench mark is copper washer on well cover, 1.00 foot above ground; altitude 189.85 feet		
1925		
Oct. 9	[p] 80.33	109.52
Dec. 4	[p] 79.80	110.05
1926		
May 12	79.80	110.05
June 24	82.00	107.85
July 29	85.10	104.75
Aug. 24	[f] 81.70	108.15
Sept. 24	[f] 81.20	108.65
Oct. 20	81.85	108.00
Nov. 20	80.05	109.80
Dec. 14	80.00	109.85
1927		
Jan. 22	80.00	109.85
Feb. 11	79.65	110.20
Mar. 23	79.75	110.10
Apr. 26	80.90	108.95
May 26	80.00	109.85
June 29	[f] 83.40	106.45
Oct. 1	80.05	109.80
1928		
Apr. 24	80.55	109.30
Sept. 26	82.30	107.55
1929		
Mar. 13	80.55	109.30
Apr. 15	80.45	109.40
4918E1. I. N. Miller. (See p. 236.) Bench mark is copper washer on doorsill; altitude, 157.90 feet		
1926		
May 12	73.80	84.10
Aug. 25	74.85	83.05
Sept. 24	74.15	83.75
Oct. 25	74.15	83.75
Nov. 20	74.05	83.85
Dec. 14	74.15	83.75
4918E1—Con.		
1927		
Jan. 22	74.25	83.65
Mar. 23	74.10	83.80
Apr. 26	73.85	84.05
May 28	74.30	83.60
June 29	74.20	83.70
Oct. 27	74.35	83.55
Nov. 29	74.30	83.60
1928		
Apr. 25	74.40	83.50
May 23	74.40	83.50
June 25	74.50	83.40
Sept. 26	74.80	83.10
Oct. 20	74.60	83.30
Nov. 19	74.65	83.25
Dec. 14	74.70	83.20
1929		
Jan. 22	74.80	83.10
Feb. 18	74.55	83.35
Mar. 19	74.65	83.25
Apr. 15	74.75	83.15
May 28	75.35	82.55
June 21	74.90	83.00
4918E2. 3-foot well, not in use. Bench mark is copper washer on south side of well curb, 5.00 feet above ground; altitude, 161.10 feet. **Perched-water well**		
1925		
Oct. 19	[p] 21.40	139.70
Dec. 1	[p] 21.45	139.65
1926		
May 12	21.55	139.55
June 24	21.60	139.50
July 29	21.55	139.55
Aug. 24	21.60	139.50
Sept. 24	21.60	139.50
Oct. 20	21.55	139.55
Nov. 20	21.55	139.55
Dec. 14	21.60	139.50
1927		
Jan. 22	21.55	139.55
Feb. 11	21.45	139.65
Mar. 23	18.15	142.95
Apr. 26	19.05	142.05
May 26	20.35	140.75
June 29	([l])	---------
4918Q1. L. Murphy. 6-foot well, 30 feet deep, used for domestic supply. Bench mark is copper washer on well curb, at ground surface; altitude 152 feet. **Perched-water well**		
1925		
Oct. 10	[p] 12.75	139.25

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[c] Pumping.

[g] Pump stopped a short time before measurement.

[p] By Cyril Williams.

[f] Windmill running.

[l] Caved in.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
4918Q1—Con.		
1926		
June 16	[c]12.95	139.05
July 29	12.15	139.85
Aug. 24	[e]14.85	137.15
Sept. 24	[e]21.00	131.00
Oct. 20	14.10	137.90
Nov. 20	14.05	137.95
Dec. 14	[a]12.80	139.20
1927		
Jan. 22	[a c]11.60	140.40
Feb. 11	[a]5.75	146.25
Mar. 23	[a]4.60	147.40
Apr. 26	[a]4.80	147.20
May 26	6.95	145.05
June 29	12.60	139.40
Oct. 1	15.90	136.10
1928		
Apr. 24	[e]7.90	144.10
Apr. 25	6.35	145.65
Sept. 26	14.40	137.60
1929		
Apr. 15	8.45	143.55

4919M1. Wallace Bros. 3-foot well, used for domestic supply. Bench mark is copper washer on pump support, 1.00 foot above ground; altitude, 174.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 10	79.70	94.40
July 30	79.90	94.20
Aug. 24	79.65	94.45
Sept. 24	80.20	93.90
Oct. 20	79.90	94.20
Nov. 20	79.80	94.30
Dec. 14	79.95	94.15
1927		
Jan. 22	80.05	94.05
Feb. 11	79.65	94.45
Mar. 23	79.85	94.25
Apr. 26	79.80	94.30
June 29	79.90	94.20
Oct. 1	80.10	94.00
1928		
Apr. 26	80.00	94.10
Sept. 26	80.20	93.90
1929		
Apr. 15	80.20	93.90

4922C1. J. C. Esmond. 4-foot well, used for stock. Bench mark is copper washer on well cover, 1.50 feet above ground; altitude, 207.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 8	36.20	171.45
Dec. 15	35.85	171.80
1927		
Feb. 28	35.50	172.15
Apr. 29	35.40	172.25

4924J1. L. B. Sammis. Bench mark is iron flange of pump, 0.4 foot above ground; altitude, 316.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 8	159.10	157.15
Aug. 11	159.10	157.15
Oct. 25	158.90	157.35
Dec. 15	159.15	157.10
1927		
Feb. 28	158.90	157.35
Apr. 29	158.40	157.85

4924P1. L. B. Sammis. 3-foot well, 35 feet deep, used for domestic supply. Bench mark is copper washer on pump support, north side, 0.3 foot above concrete curb, which is 1.00 foot above ground; altitude, 282.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 3	24.10	258.00
Aug. 11	24.80	257.30
Oct. 25	23.35	258.75
Dec. 15	25.00	257.10
1927		
Feb. 28	24.80	257.30
Apr. 29	23.90	258.20

4930A1. William Murdock. 5-foot well, not in use. Bench mark is copper washer on 4 by 4 inch beam at south side of well cover, 0.4 foot above ground; altitude, 162.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	80.75	82.10
June 24	85.95	76.90
July 30	86.25	76.60
Aug. 24	88.00	74.85
Oct. 19	86.25	76.60
Dec. 14	83.70	79.15
4930A1—Con.		
1927		
Feb. 28	[a]79.85	83.00
Apr. 27	81.40	81.45
Oct. 4	88.15	74.70
1928		
Apr. 26	82.40	80.45
Oct. 1	87.50	75.35
1929		
Apr. 16	85.75	77.10

4930F1. C. Beck. 5½-foot well, 115 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 12 inch well cover, 0.9 foot above ground; altitude, 192.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	110.40	81.85
June 24	110.70	81.55
Aug. 24	110.70	81.55
Oct. 19	110.55	81.70
Dec. 14	110.95	81.30
1927		
Feb. 28	[f]111.70	80.55
Apr. 27	111.35	80.90
Oct. 4	112.95	79.30
1928		
Apr. 26	111.10	81.15
Sept. 29	[f]113.25	79.00
1929		
Apr. 16	111.45	80.80

4930G1. Fred Allen. 6-inch well, used for stock. Bench mark is copper washer on well cover, 0.8 foot above ground; altitude, 212.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 30	125.70	87.00
June 24	124.80	87.90
Aug. 24	124.50	88.20
Oct. 19	124.40	88.30
Dec. 14	124.60	88.10
1927		
Apr. 27	124.60	88.10
Oct. 4	124.75	87.95
1928		
Apr. 26	125.70	87.00
Sept. 29	[f]127.25	84.45
1929		
Apr. 16	125.30	87.40

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[a] Creek or river flowing near by.

[c] Pumping.

[e] Pump stopped a short time before measurement.

[a] Creek or river flowing near by.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

4930N1. H. A. Meyers. 6-foot well, used for stock. Bench mark is cross on concrete curb, 0.4 foot above ground; altitude, 234.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 28	160.30	74.35
June 23	160.10	74.55
Aug. 24	160.90	73.75
Oct. 20	159.90	74.75
Dec. 14	159.35	75.30
1927		
Feb. 26	159.20	75.45
Apr. 27	159.55	75.10
Oct. 4	159.75	74.90
1928		
Apr. 26	160.80	73.85
Oct. 1	160.15	74.50
1929		
Apr. 16	160.05	74.60

4931J1. Fred Winzelberger. 12-inch well, 244 feet deep, used for domestic supply. Bench mark is iron support for pipe, 0.40 foot above ground; altitude, 258.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 28	184.60	74.30
June 23	[f] 184.70	74.20
Aug. 23	184.60	74.30
Oct. 19	184.40	74.50
Dec. 14	184.80	74.10
1927		
Feb. 26	184.80	74.10
Apr. 27	184.70	74.20
Oct. 4	185.00	73.90
1928		
Apr. 26	185.20	73.70
Sept. 27	[f] 185.90	73.00
1929		
Apr. 16	185.70	73.20

4932A1. Chris Winzelberger. 4-foot well, used for stock. Bench mark until Mar. 13, 1929, copper washer on pump support, 2.50 feet above ground, altitude 233.25 feet; after that date, top of pump platform, 0.5 foot above ground, altitude 231.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 10	[c] 151.70	81.55
Aug. 24	[c] 152.10	81.15
Oct. 19	[c] 152.70	80.55
Dec. 14	151.50	81.75
4932A1—Con.		
1927		
Apr. 27	152.25	81.00
Oct. 4	([c])	---------
1928		
Apr. 26	151.70	81.55
Sept. 29	([c])	---------
1929		
Mar. 13	[h] 149.75	81.50
Apr. 16	149.90	81.35

4932J1. Chris Winzelberger. 4-foot well, used for domestic supply. Bench mark is copper washer on pipe support, 1.50 feet above ground; altitude, 280.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 10	198.70	81.30
Aug. 24	198.90	81.10
Oct. 19	198.90	81.10
Dec. 14	199.30	80.70
1927		
Feb. 26	199.20	80.80
Apr. 27	199.15	80.85
Oct. 1	[f] 199.90	80.10
1928		
Apr. 26	199.40	80.60
Sept. 29	[f] 200.90	79.10
1929		
Apr. 16	199.80	80.20

552P1. John Kammerer. 6-inch well, 70 feet deep, used for domestic supply. Bench mark until Aug. 25, 1927, copper washer on pump support, 0.7 foot above ground, altitude 22.70 feet; after that date, top of suction pipe, 2.45 feet below old bench mark, altitude 20.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 22	[i] 16.20	6.50
July 31	15.90	6.80
Aug. 21	16.40	6.30
Sept. 25	17.20	5.50
Oct. 21	16.95	5.75
Nov. 22	17.00	5.70
Dec. 10	16.50	6.20
1927		
Jan. 19	16.65	6.05
Feb. 23	16.00	6.70
Mar. 17	15.25	7.45
552P1—Con.		
1927		
Apr. 25	14.50	8.20
Aug. 25	[h] 14.20	6.05
Sept. 28	14.45	5.80
1928		
Apr. 26	12.85	7.40
Sept. 27	16.90	3.35
1929		
Apr. 16	14.80	5.45

553L1. E. Bradford. 8-inch well, used for domestic supply. Bench mark is copper washer on 2 by 6 inch plank, 1.70 feet above ground; altitude, 22.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 22	17.80	5.15
July 31	[i] 17.95	5.00
Aug. 21	[f] 18.70	4.25
Sept. 25	18.35	4.60
Oct. 21	18.30	4.65
Nov. 22	18.25	4.70
Dec. 10	18.25	4.70
1927		
Jan. 19	18.20	4.75
Feb. 23	17.55	5.40
Mar. 17	17.20	5.75
Apr. 25	17.05	5.90
Aug. 25	18.00	4.95
Sept. 28	([l])	---------
1928		
Apr. 26	17.50	5.45
Sept. 27	18.95	4.00
1929		
Apr. 16	18.65	4.30

554C1. 10-inch well, used for stock. Bench mark is copper washer on 2 by 4 inch scantling, 2.00 feet above ground; altitude, 17.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 26	14.90	2.55

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[c] Pumping.
[f] Windmill running.

[c] Pumping.
[f] Windmill running.
[h] New measuring point.
[i] Pump running in adjacent well.

[f] Windmill running.
[h] New measuring point.
[i] Pump running in adjacent well.
[l] Caved in.

Measurements of depth to water in observation wells—Continued

556C1. L. J. Lambert. 6-inch well, 102 feet deep, used for domestic supply. Bench mark is copper washer on 4 by 4 inch doorsill, 0.2 foot above ground; altitude, 10.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 26	[i] 15.50	−5.45
Aug. 21	15.00	−4.95
Sept. 25	14.05	−4.00
Oct. 21	13.70	−3.65
Nov. 22	13.10	−3.05
Dec. 10	12.80	−2.75
1927		
Apr. 25	9.25	.80
Aug. 25	[c] 20.20	−10.15
Sept. 28	14.10	−4.05
1928		
Apr. 26	10.90	−.85
Sept. 27	15.15	−5.10
1929		
Apr. 16	[e] 12.20	−2.15

557L1. Edith Dierssen. 12-inch well, 120 feet deep. Bench mark is top of casing, altitude 2.00 feet, which is 6.00 feet below reference bench mark, a copper washer on 4 by 4 inch beam, 0.4 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 26	5.30	−3.30
July 31	[c] 21.80	−19.80
Aug. 21	6.55	−4.55
Sept. 25	6.25	−4.25
Oct. 21	5.60	−3.60
Nov. 22	5.15	−3.15
Dec. 10	4.70	−2.70
1927		
Jan. 19	4.10	−2.10
Feb. 23	.80	1.20
Mar. 17	.35	1.65
Apr. 25	1.50	.50
Aug. 25	8.20	−6.20
Sept. 28	5.85	−3.85
1928		
Apr. 26	3.30	−1.30
Sept. 27	7.00	−5.00
1929		
Apr. 16	6.20	−4.20

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[c] Pumping.

[e] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

559E1. Mayme Elder. 6-inch well, used for stock. Bench mark is top of casing, 1.00 foot above ground; altitude 15.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 26	14.50	1.00
July 31	[f] 15.15	.35
Aug. 21	[f] 15.70	−.20
Sept. 25	[f] 15.40	.10
Oct. 21	14.70	.80
Nov. 22	15.00	.50
Dec. 10	14.95	.55
1927		
Jan. 19	14.85	.65
Feb. 23	14.05	1.45
Mar. 17	13.60	1.90
Apr. 25	13.75	1.75
Aug. 25	14.00	1.50
Sept. 28	[f] 14.70	.80
1928		
Apr. 26	[f] 14.80	.70
Sept. 27	14.85	.65
1929		
Apr. 16	14.90	.60

5512R1. J. E. Olson. 6-inch well, 20 feet deep, used for domestic supply. Bench mark is top of casing and copper washer, 1.50 feet above ground; altitude, 20.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	9.80	10.95
June 21	11.50	9.25
July 24	11.30	9.45
Aug. 20	14.00	6.75
Sept. 25	14.95	5.80
Oct. 21	15.05	5.70
Nov. 16	15.20	5.55
Dec. 10	[a] 10.55	10.20
1927		
Jan. 19	[a] 7.60	13.15
Feb. 23	[a] 4.00	16.75
Mar. 17	5.45	15.30
Apr. 25	6.20	14.55
Aug. 25	13.10	7.65
Sept. 28	14.20	6.75
1928		
Apr. 19	6.10	14.65
June 25	11.10	9.65
Sept. 22	14.75	6.00
1929		
Apr. 9	8.05	12.70

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[a] Creek or river flowing near by.

[f] Windmill running.

5514D1. O. A. Wilder. 8-inch well, 95 feet deep, not in use. Bench mark is top of casing, 0.50 foot above ground; altitude, 19.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 22	12.50	7.00
July 31	[i] 15.95	3.55
Aug. 21	15.60	3.90

5514D2. O. A. Wilder. 10-inch well, used for stock. Bench mark is top of casing, 1.50 feet above ground; altitude, 16.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Sept. 25	13.70	2.70
Oct. 21	14.05	2.35
Nov. 22	14.10	2.30
Dec. 10	13.20	3.20
1927		
Jan. 19	11.55	4.85
Feb. 23	[a] 6.00	10.40
Mar. 17	5.00	11.40
Apr. 25	5.20	11.20
Aug. 25	12.40	4.00
Sept. 28	13.20	3.20
1928		
Apr. 26	5.30	11.10
Sept. 27	13.75	2.65
1929		
Apr. 16	10.20	6.20

5515A1. E. Morse. 8-inch well, used for domestic supply. Bench mark is top of casing, altitude 16.65 feet, which is 0.6 foot below reference bench mark, a copper washer 0.8 foot above ground

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 22	14.15	2.50
July 31	[f] 15.20	1.45
Aug. 21	[f] 14.95	1.70
Sept. 25	[f] 15.20	1.45
Oct. 21	14.45	2.20
Nov. 22	[f] 16.20	.45
Dec. 10	15.00	1.65
1927		
Jan. 19	14.90	1.75
Feb. 23	14.25	2.40
Mar. 17	13.90	2.75
Apr. 25	14.20	2.45
Aug. 25	13.90	2.75

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[a] Creek or river flowing near by.

[f] Windmill running.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

5515A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 26	13.20	3.45
Sept. 27	14.00	2.65
1929		
Apr. 16	[c] 14.45	2.20

5517M1. McCormick Bros. 10-inch well, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude 12.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 26	11.35	0.90
July 31	12.35	−.10
Aug. 21	12.30	−.05
Sept. 25	13.00	−.75
Oct. 21	12.35	−.10
Nov. 22	12.30	−.05
Dec. 10	12.00	.25
1927		
Jan. 19	11.65	.60
Feb. 23	9.35	2.90
Mar. 17	9.50	2.75
Apr. 25	9.50	2.75
Aug. 25	12.05	.20
Sept. 28	12.05	.20
1928		
Apr. 26	10.00	2.25
Sept. 27	12.45	−.20
1929		
Apr. 16	11.80	.45

5522B1. Mrs. L. J. Nicolaus. 6-inch well, 200 feet deep, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude 17.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 22	16.80	0.90
July 31	16.45	1.25
Aug. 21	16.85	.85
Sept. 25	17.15	.55
Oct. 21	17.20	.50
Nov. 22	17.40	.30
Dec. 10	17.10	.60
1927		
Jan. 19	16.80	.90
Feb. 23	15.10	2.60
Mar. 17	14.20	3.50
Apr. 25	[f] 14.50	3.20
Aug. 25	15.50	2.20
Sept. 28	[f] 16.50	1.20
1928		
Apr. 26	12.90	4.80
Sept. 27	16.30	1.40
1929		
Apr. 16	16.10	1.60

5524R1. Mrs. Mary Orr. 6-inch well, not in use. Bench mark is top of casing, 0.5 foot above ground; altitude, 23.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	14.95	8.80
June 21	15.65	8.10
July 24	16.70	7.05
1927		
May 31	14.20	9.55
June 23	14.80	8.95

5524R2. Mrs. Mary Orr. 6-inch well, not in use. Bench mark is top of casing; altitude 23.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 20	17.35	6.20
Sept. 27	17.70	5.85
Oct. 21	18.20	5.35
Nov. 16	18.40	5.15
Dec. 10	18.25	5.30
1927		
Jan. 19	17.60	5.95
Feb. 23	15.50	8.05
Mar. 17	14.80	8.75
Apr. 25	13.80	9.75
June 23	14.80	8.75
July 21	15.60	7.95
Aug. 25	16.65	6.90
Sept. 28	17.40	6.15
Oct. 27	17.80	5.75
Nov. 30	18.95	4.60
Dec. 21	17.95	5.60
1928		
Jan. 25	17.60	5.95
Feb. 27	17.15	6.40
Apr. 19	15.10	8.45
May 24	14.80	8.75
June 25	15.45	8.10
July 25	16.20	7.35
Aug. 27	17.00	6.55
Sept. 20	17.45	6.10
Oct. 22	17.95	5.60
Nov. 22	18.25	5.30
Dec. 15	18.30	5.25
1929		
Jan. 23	18.25	5.30
Feb. 20	17.70	5.85
Mar. 21	17.15	6.40
Apr. 9	16.85	6.70
May 28	16.65	6.90
June 21	16.90	6.65

5532J1. Bob Blossom. 3-inch well, 145 feet deep, used for domestic supply. Bench mark is top of casing, 1.0 foot above ground; altitude, 1.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	4.10	−2.35
May 15	[b] 4.00	−2.25
June 9	4.15	−2.40
July 19	4.95	−3.20
Aug. 12	4.95	−3.20
Sept. 14	5.10	−3.35
Oct. 12	5.50	−3.75
Nov. 9	[e] 6.30	−4.55
Dec. 7	5.10	−3.35
1927		
Jan. 12	4.85	−3.10
Feb. 8	4.35	−2.60
Mar. 10	2.85	−1.10
Apr. 13	3.70	−1.95
May 21	4.35	−2.60
Aug. 18	4.85	−3.10
Sept. 30	5.10	−3.35
1928		
Apr. 26	4.15	−2.40
Sept. 20	5.05	−3.30
1929		
Apr. 16	4.60	−2.85

5532R2. B. V. Gustafson. 6-inch well, 40 feet deep, not in use. Bench mark is top of casing, 0.4 foot above ground; altitude, 4.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 26	6.00	−1.50
May 15	5.50	−1.00
June 9	6.05	−1.55
July 19	5.30	−.80
Aug. 12	[b] 4.90	−.40
Sept. 14	5.00	−.50
Oct. 12	6.05	−1.55
Nov. 9	5.70	−1.20
Dec. 7	5.50	−1.00
1927		
Jan. 12	6.00	−1.50
Feb. 8	4.80	−.30
Mar. 10	3.25	1.25
Apr. 13	4.05	.45
May 21	[b] 4.55	−.05
Aug. 18	5.15	−.65
Sept. 30	[i] 3.95	.55
1928		
Apr. 26	6.10	−1.60
Sept. 20	4.45	.05
1929		
Apr. 16	6.65	−2.15

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[c] Pumping.

[f] Windmill running.

[b] Water in ditch near by.

[b] Water in ditch near by.

[e] Pump stopped a short time before measurement.

[i] Adjacent land flooded.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5533H1. W. C. Housken. 6-inch well, used for domestic supply. Bench mark is top of casing, 0.3 foot above ground; altitude, 9.60 feet		
1926		
May 13	7.30	2.30
June 9	[b] 5.75	3.85
July 19	7.55	2.05
Aug. 12	8.00	1.60
Sept. 14	9.20	.40
Oct. 12	9.85	−.25
Nov 9	10.10	−.50
Dec 7	9.10	.50
1927		
Jan. 12	8.90	.70
Feb 8	8.05	1.55
Mar. 10	6.20	3.40
Apr. 13	5.90	3.70
May 21	5.30	4.30
Aug. 18	7.65	1.95
Sept 30	9.40	.20
1928		
Apr. 3	6.30	3.30
Apr. 26	7.00	2.60
Sept. 20	9.55	.05
1929		
Mar. 7	9.20	.40
Apr. 16	10.35	−.75
5535E1. Andrew Pistali. 8-inch well, used for domestic supply. Bench mark is copper washer on 2 by 4 inch scantling at doorsill, 0.5 foot above ground; altitude, 12.50 feet		
1926		
May 13	6.70	5.80
June 9	7.15	5.35
July 19	8.60	3.90
Aug. 12	8.85	3.65
Sept. 14	9.00	3.50
Oct. 12	9.40	3.10
Nov. 9	9.40	3.10
Dec. 7	8.70	3.80
1927		
Jan. 12	8.10	4.40
Feb. 8	7.15	5.35
Mar. 10	5.40	7.10
Apr. 13	4.75	7.75
May 21	5.55	6.95
Aug. 18	9.90	2.60
Sept. 30	10.00	2.50
1928		
Apr. 26	3.15	9.35
Sept. 20	10.00	2.50
1929		
Apr. 16	7.80	4.70
5535E2. Andrew Pistali. 5-inch well, used for stock. Bench mark is top of casing, 2.3 feet above ground; altitude, 18.1 feet		
1927		
May 21	11.45	6.65
5535G2. 6-inch well, not in use. Bench mark is top of casing, altitude 17.90 feet, which is 2.00 feet above reference bench mark, a copper washer on pump support, 2.3 feet above ground. All measurements made from top of casing		
1926		
May 13	9.60	8.30
June 9	9.70	8.20
July 19	9.80	8.10
Aug. 12	10.15	7.75
Sept. 14	10.40	7.50
Oct. 12	10.25	7.65
Nov. 9	10.30	7.60
Dec. 7	9.45	8.45
1927		
Jan. 12	9.10	8.80
Feb. 8	8.60	9.30
Mar. 10	7.95	9.95
Apr. 13	7.60	10.30
May 21	7.70	10.20
Aug. 18	8.65	9.25
Sept. 30	9.40	8.50
1928		
Apr. 26	7.05	10.85
Sept. 20	12.30	5.60
1929		
Apr. 16	11.55	6.35
5535R1. Thornton Orchard Farms. 10-inch well, used for domestic supply. Bench mark is top of casing, 0.9 foot above ground; altitude, 16.60 feet		
1926		
May 13	7.60	9.00
June 8	7.85	8.75
July 19	9.90	6.70
Aug. 12	10.50	6.10
Sept. 14	11.75	4.85
Oct. 12	10.80	5.80
Nov. 9	11.10	5.50
Dec. 7	10.50	6.10
1927		
Jan. 12	10.70	5.90
Feb. 8	8.35	8.25
Mar. 10	5.35	11.25
Apr. 13	4.80	11.80
May 21	([c])	--------
Aug. 18	14.60	2.00
Sept. 30	10.90	5.70
1928		
Apr. 26	4.95	11.65
Sept. 20	[d] 19.30	−2.70
563R1. 8-inch well, used for domestic supply. Bench mark is copper washer on pump support, 1.20 feet above ground; altitude, 50.15 feet		
1926		
May 28	17.95	32.20
June 21	18.60	31.55
July 26	19.40	30.75
Aug. 20	19.55	30.60
Sept. 27	19.80	30.35
Nov. 16	19.70	30.45
1927		
Jan. 19	18.70	31.45
Mar. 17	17.65	32.50
Apr. 25	17.50	32.65
Aug. 25	19.95	30.20
Sept. 28	19.65	30.50
1928		
Apr. 19	17.10	33.05
Sept. 24	20.25	29.90
1929		
Mar. 11	18.95	31.20
Apr. 9	19.00	31.15
564M1. A. J. Angrav. 6-inch well, not in use. Bench mark is top of casing, 0.9 foot above ground; altitude, 37.85 feet		
1926		
May 29	11.40	26.45
June 21	12.30	25.55
July 26	12.90	24.95
Aug. 20	13.30	24.55
Sept. 27	13.65	24.20
Nov. 16	13.50	24.35
1927		
Jan. 19	11.40	26.45
Mar. 17	10.05	27.80
Apr. 25	10.40	27.45
Aug. 28	13.20	24.65
Sept. 28	13.45	24.40
1928		
Apr. 19	10.80	27.05
Sept. 24	13.85	24.00
1929		
Apr. 9	12.05	25.80

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[b] Water in ditch near by.

[c] Pumping.

[d] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

569J1. George Need. 8-inch well, 40 feet deep, used for stock. Bench mark is copper washer and top of casing, 1.50 feet above ground; altitude, 39.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	18.35	21.15
June 21	18.70	20.80
July 24	19.50	20.00
Aug. 20	[f] 20.80	18.70
Sept. 27	20.55	18.95
Oct. 21	[f] 21.05	18.45
Nov. 16	20.75	18.75
Dec 10	20.55	18.95
1927		
Jan. 19	20.05	19.45
Feb. 23	19.15	20.35
Mar. 17	18.55	20.95
Apr. 25	[f] 18.40	21.10
Aug. 25	[f] 19.80	19.70
Sept. 28	20.25	19.25
1928		
Apr. 19	18.60	20.90
Sep. 22	20.65	18.85
1929		
Mar. 8	19.95	19.55
Apr. 9	19.65	19.85

5610J1. Fred Gerling. 8-inch well, 60 feet deep, used for domestic supply. Bench mark is copper washer on pump support, 1.50 feet above ground; altitude, 46.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 29	19.80	26.95
June 21	20.40	26.35
July 26	[f] 21.40	25.35
Aug. 20	21.80	24.95
Sept. 27	21.70	25.05
Nov. 16	21.25	25.50
1927		
Jan. 19	21.10	25.65
Mar. 17	20.00	26.75
Apr. 25	19.60	27.15
Aug. 25	21.20	25.55
Sept. 28	21.60	25.15
1928		
Apr. 28	19.10	27.65
Sept. 22	22.10	24.65
1929		
Mar 8	21.25	25.50
Apr. 9	21.20	25.55

5610R1. J. M. Linscott. 8-inch well, used for stock. Bench mark until Aug. 25, 1927, copper washer in wooden pump support 1.00 foot above ground, altitude 51.15 feet; Aug. 25, 1927, to June 21, 1929, top of casing, 0.95 foot below old bench mark, altitude 50.20 feet; after June 21, 1929, top of casing, 20 feet below ground, altitude 30.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	22.00	29.15
June 21	[c] 27.15	24.00
July 24	22.75	28.40
Aug. 20	23.00	28.15
Sept. 27	[g] 23.20	27.95
Oct. 21	23.10	28.05
Nov. 16	[g] 23.20	27.95
Dec. 10	23.00	28.15
1927		
Jan. 19	22.90	28.25
Feb. 23	22.60	28.55
Mar. 17	22.40	28.75
Apr. 25	22.00	29.15
May 31	22.05	29.10
June 23	22.20	28.95
Aug. 25	[h] 22.75	27.45
Sept. 28	22.30	27.90
Nov. 30	22.10	28.10
Dec. 21	22.80	27.40
1928		
Feb. 21	21.80	28.40
Mar. 21	21.75	28.45
Apr. 19	21.50	28.70
May 24	21.85	28.35
June 25	22.05	28.15
July 25	(c)	---------
Aug. 27	22.70	27.50
Sept. 24	22.95	27.25
Oct. 22	23.80	26.40
Nov. 22	22.85	27.35
Dec. 15	22.70	27.50
1929		
Jan. 23	22.55	27.65
Feb. 20	22.40	27.80
Mar. 21	22.30	27.90
Apr. 9	22.25	27.95
May 28	(c)	---------
June 21	[h] 3.35	26.75

5611R1. I. L. Umphenour. 6-inch well, not in use. Bench mark is top of casing, 0.5 foot above ground; altitude, 56.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	19.50	37.00
June 21	19.90	36.60
July 26	20.35	36.15

5611R1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 20	[i] 22.20	34.30
Sept. 27	20.15	36.35
Oct. 21	20.05	36.45
Nov. 16	20.00	36.50
Dec. 10	20.10	36.40
1927		
Jan. 19	19.95	36.55
Feb. 23	19.85	36.65
Mar. 23	19.70	36.80
Apr. 25	19.50	37.00
May 31	19.50	37.00
June 23	[c] 21.55	34.95
Aug. 25	[i] 22.20	34.30
Sept. 28	20.25	36.25
1928		
Apr. 19	19.85	36.65
Sept. 24	20.60	35.90
1929		
Mar. 11	20.40	36.10
Apr. 9	20.40	36.10

5613J1. Maringa Bros. 6-inch well, used for stock. Bench mark is top of highest part of casing, 0.20 foot above ground; altitude, 57.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	22.10	35.65
June 21	[f] 22.20	35.55
July 26	22.30	35.45
Aug. 20	22.80	34.95

5613J2. Maringa Bros. 8-inch well, used for domestic supply. Bench mark is concrete floor of pit, altitude 43.70 feet, which is 14.50 feet below reference bench mark, a copper washer in 2 by 12 inch doorsill on north side of pump house, 0.50 foot above ground. All measurements made from concrete floor

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 21	7.85	35.85
Sept. 27	8.20	35.50
Oct. 21	8.20	35.50
Nov. 16	7.80	35.90
Dec. 10	8.35	35.35
1927		
Jan. 19	8.20	35.50
Feb. 23	8.25	35.45
Mar. 17	7.90	35.80
Apr. 25	7.75	35.95
May 31	[g] 8.70	35.00

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[f] Windmill running.

[c] Pumping.

[g] Pump stopped a short time before measurement.

[h] New measuring point.

[c] Pumping.

[f] Windmill running.

[g] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

5613J2—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
June 23	6.75	36.95
Aug. 25	([c])	----------
Sept. 28	8.15	35.55
1928		
Apr. 19	7.60	36.10
Sept. 24	8.65	35.05
1929		
Apr. 9	8.70	35.00

5615L1. 8-inch well, used for domestic supply. Bench mark is hole on south side of casing 1.00 foot above ground; altitude, 49.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	21.65	28.05
June 21	22.15	27.55
July 24	22.50	27.20
Aug. 20	22.40	27.30
Sept. 27	22.65	27.05
Oct. 21	22.45	27.25
Nov. 16	22.45	27.25
Dec. 10	22.40	27.30
1927		
Jan. 19	22.30	27.40
Feb. 23	22.10	27.60
Mar. 17	21.85	27.85
Apr. 25	21.50	28.20
May 31	22.55	27.15
June 23	22.80	26.90
July 21	22.15	27.55
Aug. 25	22.65	27.05
Sept. 28	22.60	27.10
Oct. 27	22.55	27.15
Nov. 30	22.40	27.30
Dec. 21	22.35	27.35
1928		
Jan. 24	22.00	27.70
Feb. 21	20.15	28.55
Mar. 21	22.10	27.60
Apr. 19	21.90	27.80
May 24	22.15	27.55
June 25	22.45	27.25
July 25	23.15	26.55
Aug. 27	23.45	26.25
Sept. 24	23.95	25.75
Oct. 22	23.80	25.90
Nov. 22	23.15	26.55
Dec. 15	23.05	26.65
1929		
Jan. 23	22.85	26.85
Feb. 20	22.80	26.90
Mar. 21	22.65	27.05
Apr. 9	22.75	26.95
May 28	24.75	24.95
June 21	24.05	25.65

5616A1. J. H. Cuppers. 6-inch well, 90 feet deep, used for domestic supply. Bench mark until November, 1927, top of casing and copper washer, 0.50 foot above ground, altitude 37.65 feet; from November, 1927, to Mar. 21, 1929, iron pump base, altitude 26.45 feet; after Mar. 21, 1929, top platform of pump base, altitude 37.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	16.60	21.05
June 21	17.00	20.65
July 24	17.80	19.85
Aug. 20	18.30	19.35
Sept. 27	18.85	18.80
Oct. 21	19.10	18.55
Nov. 16	19.00	18.65
Dec. 10	18.90	18.75
1927		
Jan. 19	18.60	19.05
Feb. 23	17.80	19.85
Mar. 17	17.25	20.40
Apr. 25	16.70	20.95
May 31	16.55	21.10
July 21	17.25	20.40
Aug. 25	18.20	19.45
Sept. 28	18.50	19.15
Nov. 30	[h] 7.85	18.60
Dec. 21	7.40	19.05
1928		
Jan. 28	7.30	19.15
Feb. 27	7.00	19.45
Mar. 21	6.80	19.65
Apr. 19	6.25	20.20
May 24	5.80	20.65
July 25	7.80	18.65
Aug. 27	8.00	18.45
Sept. 22	8.35	18.10
Oct. 22	8.65	17.80
Nov. 22	8.45	18.00
Dec. 15	8.40	18.05
1929		
Jan. 23	8.15	18.30
Feb. 20	7.85	18.60
Mar. 21	[h] 18.90	18.70
Apr. 9	18.35	19.25
May 28	18.95	18.65
June 21	19.30	18.30

5616D1. C. P. Lee. 6-inch well, used for domestic supply. Bench mark is copper washer on 4 by 4 inch beam, 1.90 feet above ground; altitude, 44.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	19.70	24.85
June 21	19.85	24.70
July 24	20.65	23.90
Aug. 20	21.10	23.45
Sept. 27	21.65	22.90
Oct. 21	21.60	22.95
Nov. 16	19.45	25.10
Dec. 10	21.40	23.15

5616D1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 19	21.15	23.40
Feb. 23	20.65	23.90
Mar. 17	20.25	24.30
Apr. 25	19.70	24.85
May 31	19.65	24.90
June 23	19.90	24.65
July 21	20.30	24.25
Aug. 25	21.10	23.45
Sept. 28	21.35	23.20
Oct. 27	20.85	23.70
Nov. 30	21.35	23.20
Dec. 21	21.20	23.35
1928		
Jan. 24	21.15	23.40
Feb. 27	20.85	23.70
Mar. 21	20.65	23.90
Apr. 19	18.95	25.60
May 24	20.15	24.40
June 25	20.80	23.75
July 25	21.50	23.05
Aug. 27	21.85	22.70
Sept. 22	22.05	22.50
1929		
Mar. 8	21.30	23.25
Apr. 9	21.20	23.35

5617R1. Barnes & Hanson. 6-inch well, 60 feet deep, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 31.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	12.80	18.80
June 21	13.45	18.15
July 24	14.35	17.25
Aug. 20	14.80	16.80
Sept. 27	15.25	16.35
Oct. 21	15.20	16.40
Nov. 16	15.15	16.45
Dec. 10	14.85	16.75
1927		
Jan. 19	14.40	17.20
Feb. 23	12.50	19.10
Mar. 17	12.25	19.35
Apr. 25	12.20	19.40
May 31	12.95	18.65
June 23	13.80	17.80
July 21	13.95	17.65
Aug. 25	14.65	16.95
Sept. 28	15.10	16.50
Oct. 27	15.30	16.30
Nov. 30	14.85	16.75
Dec. 21	14.70	16.90
1928		
Jan. 25	14.40	17.20
Feb. 27	14.00	17.60
Mar. 21	13.10	18.50
Apr. 19	12.75	18.85
May 24	13.30	18.30
June 25	14.15	17.45
July 25	14.80	16.80
Aug. 27	15.30	16.30
Sept. 20	15.70	15.90

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[c] Pumping.

[h] New measuring point.

Measurements of depth to water in observation wells—Continued

5617R1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Oct. 22	15.80	15.80
Nov. 22	15.50	16.10
Dec. 15	15.35	16.25
1929		
Jan. 23	15.05	16.55
Feb. 20	14.75	16.85
Mar. 8	14.60	17.00
Mar. 21	14.45	17.15
Apr. 9	[i] 14.90	16.70
May 28	15.25	16.35
June 21	15.55	16.05

5618D1. George Ferguson. 6-inch well, 90 feet deep, used for stock. Bench mark is copper washer on 12 by 12 inch pump support, 1.10 feet above ground; altitude 29.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	15.35	14.40
June 21	16.15	13.60
July 24	17.30	12.45
Aug. 20	[f] 18.20	11.55
Sept. 25	17.70	12.05
Oct. 21	19.00	10.75
Nov. 16	19.10	10.65
Dec. 10	17.75	12.00
1927		
Jan. 19	16.50	13.25
Feb. 23	14.30	15.40
Mar. 17	14.00	15.75
Apr. 25	14.20	15.55
Aug. 25	17.40	12.35
Sept. 28	18.25	11.50
1928		
Apr. 19	14.25	15.50
May 24	15.05	14.70
June 25	[f] 16.75	13.00
Sept. 22	18.55	11.20
1929		
Mar. 8	16.00	13.75
Apr. 9	16.00	13.75

5620A1. Annie Orr Cota. 10-inch well. (See p. 237.) Bench mark is top of casing, altitude 18.20 feet, which is 8.40 feet below reference bench mark, a copper washer on 4 by 4 inch beam at east side of pump house, 0.3 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	4.50	13.70
June 21	5.60	12.60
July 24	[e] 16.45	1.75
Aug. 20	7.20	11.00
Sept. 27	7.60	10.60
Oct. 21	7.20	11.00
Nov. 16	7.50	10.70
Dec. 10	6.45	11.75
1927		
Jan. 19	5.50	12.70
Feb. 23	3.45	14.75
Mar. 17	3.05	15.15
Apr. 25	3.05	15.15
Aug. 25	6.90	11.30
Sept. 28	7.25	10.95
1928		
Apr. 19	3.60	14.60
Sept. 20	7.80	10.40
1929		
Mar. 8	5.85	12.35
Apr. 9	5.45	12.75

5620M1. Mrs. Wm. Coupe. 10-inch well, used for domestic supply. Bench mark is top of casing, 0.9 foot above ground; altitude, 33.90 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	17.00	16.90
June 21	17.80	16.10
July 24	18.80	15.10
Aug. 20	19.30	14.60
Sept. 27	19.65	14.25
Oct. 21	19.45	14.45
Nov. 16	19.30	14.60
Dec. 10	19.00	14.90
1927		
Jan. 19	18.55	15.35
Feb. 23	17.45	16.45
Mar. 17	16.85	17.05
Apr. 25	16.45	17.45
May 31	17.30	16.60
June 23	17.85	16.05
July 21	18.60	15.30
Aug. 25	16.20	17.70
Sept. 28	16.45	17.45
Oct. 27	19.55	14.35
Nov. 30	18.95	14.95
Dec. 21	17.75	16.15
1928		
Jan. 25	18.45	14.45
Feb. 27	18.10	15.80
Mar. 21	17.90	16.00
Apr. 19	17.10	16.80
May 24	17.55	16.35
June 25	18.70	15.20
July 25	19.35	14.55
Aug. 27	19.85	14.05
Sept. 20	20.20	13.70
1929		
Apr. 9	18.50	15.40

5620R1. Wm. Coupe. 10-inch well. (See p. 237.) Benchmark is top of casing, altitude 21.70 feet, which is 13.40 feet below reference bench mark, a copper washer on 2 by 4 inch pump sill, east side, 0.4 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	6.20	15.50
June 21	7.20	14.50
1928		
Apr. 19	6.05	15.65
Sept. 20	9.70	12.00
1929		
Mar. 7	7.45	14.25
Apr. 9	7.70	14.00

5621G1. Chris Hansen. (See p. 237.) Bench mark is top of old hand-pump suction pipe and copper washer on 1 by 12 inch board, 1.00 foot above ground; altitude, 42.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	21.25	20.95
June 21	22.00	20.20
Aug. 20	22.80	19.40
Sept. 27	23.15	19.05
Oct. 21	22.90	19.30
Nov. 16	22.70	19.50
Dec. 10	22.60	19.60
1927		
Jan. 19	22.30	19.90
Feb. 23	22.00	20.20
Mar. 17	21.65	20.55
Apr. 25	21.10	21.10
Aug. 25	22.60	19.60
Sept. 28	22.85	19.35
1928		
Apr. 19	21.50	20.70
Sept. 24	23.40	18.80
1929		
Mar. 8	22.65	19.55
Apr. 9	22.40	19.80

5622M1. L. Korn. 6-inch well, 110 feet deep, used for domestic supply. Bench mark is top of casing, 0.5 foot above ground; altitude, 50.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	22.55	27.50
June 21	22.70	27.35
July 24	23.20	26.85
Aug. 20	23.25	26.80
Sept. 27	23.30	26.75
Oct. 21	23.45	26.60

[e] Pumping.
[f] Windmill running.
[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

5622M1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Nov. 16	23.55	26.50
Dec. 10	23.40	26.65
1927		
Jan. 19	23.40	26.65
Feb. 23	23.15	26.90
Mar. 17	22.95	27.10
Apr. 25	22.70	27.35
May 31	22.60	27.45
June 23	22.60	27.45
July 21	23.05	27.00
Aug. 25	23.10	26.95
Sept. 28	23.30	26.75
Oct. 27	23.40	26.65
Nov. 30	23.40	26.65
Dec. 21	23.35	26.70
1928		
Jan. 24	23.35	26.70
Feb. 21	23.20	26.85
Mar. 21	23.15	26.90
Apr. 19	22.95	27.10
May 24	22.85	27.20
June 25	23.10	26.95
July 25	23.45	26.60
Aug. 27	23.60	26.45
Sept. 24	23.75	26.30
Oct. 22	23.85	26.20
Nov. 22	23.95	26.10
Dec. 15	24.75	25.30
1929		
Jan. 23	23.85	26.20
Feb. 20	23.75	26.30
Mar. 7	23.70	26.35
Mar. 21	23.65	26.40
Apr. 9	23.60	26.45
May 28	24.10	25.95
June 21	24.20	25.85

5624R1. 6-inch well, used for stock. Bench mark is top of pump collar, 1.3 feet above ground; altitude, 69.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 23	[p] 28.10	41.35
1927		
May 31	[f] 27.80	41.65
Dec. 21	17.90	51.55
1929		
Apr. 9	29.50	39.95

5625E1. Well used for stock. Bench mark is top of casing, 1.5 feet above ground; altitude, 57.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	23.10	33.90
June 22	24.35	32.65
July 26	24.90	32.10
Aug. 26	25.25	31.75
Sept. 27	25.55	31.45
Oct. 21	25.75	31.25
Nov. 16	25.85	31.15
Dec. 10	25.65	31.35
1927		
Jan. 19	25.15	31.85
Feb. 23	24.45	32.55
Mar. 17	24.00	33.00
Apr. 25	23.60	33.40
May 31	23.60	33.40
June 23	23.85	33.15
July 21	24.20	32.80
Aug. 25	24.75	32.25
Sept. 28	25.05	31.95
Oct. 27	25.35	31.70
Nov. 30	25.50	31.50
Dec. 20	25.20	31.80
1928		
Jan. 24	25.30	31.70
Feb. 21	24.85	32.15
Mar. 21	24.70	32.30
Apr. 19	24.10	32.90
May 24	24.00	33.00
June 25	24.40	32.60
July 25	24.90	32.10
Aug. 27	25.30	31.70
Sept. 24	25.60	31.40
1929		
Mar. 12	25.40	31.60
Apr. 9	25.10	31.90

5626G1. 8-inch well, not in use. Bench mark is top of casing; altitude, 52.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Oct. 27	23.15	29.55
Nov. 5	23.20	29.50
Nov. 30	23.25	29.45
Dec. 20	22.75	29.95
1928		
Jan. 24	23.10	29.60
Feb. 21	22.70	30.00
Mar. 21	22.40	30.30
May 24	21.80	30.90
June 25	22.15	30.55
July 25	22.55	30.15
Aug. 27	23.05	29.65
Oct. 22	23.60	29.10
Nov. 22	23.75	28.95
Dec. 15	23.75	28.95
1929		
Jan. 23	23.70	29.00
Feb. 20	23.30	29.40
Mar. 21	23.00	29.70
Apr. 9	22.85	29.85
May 28	23.05	29.65
June 21	23.40	29.30

5626L1. L. Pfaffenback. 6-inch well, used for domestic supply. Bench mark is copper washer on pump support, 1.5 feet above ground; altitude 54.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	23.60	30.40
June 22	23.90	30.10
July 26	24.50	29.50
Aug. 26	24.85	29.15
Sept. 27	25.15	28.85
Oct. 21	25.30	28.70
Dec. 10	25.25	28.75
1927		
Jan. 19	24.75	29.25
Feb. 23	24.15	29.85
Mar. 17	23.75	30.25
Apr. 25	23.30	30.70
May 31	23.15	30.85
June 23	23.35	30.65
July 21	23.70	30.30
Dec. 20	25.05	28.95
1928		
June 25	23.90	30.10
Aug. 27	24.80	29.20
Sept. 24	25.15	28.85
1929		
Apr. 9	[c] 24.60	29.40

5627C1. —— Sparks. 10-inch well, used for domestic supply. Bench mark is copper washer in 4 by 4 inch upright pump support, 0.9 foot above ground; altitude, 50.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	27.20	23.25
June 21	27.50	22.95
July 24	28.70	21.75
Aug. 20	[f] 28.95	21.50
Sept. 27	28.70	21.75
Oct. 21	28.15	22.30
Nov. 16	28.40	22.05
Dec. 10	28.20	22.25
1927		
Jan. 19	27.90	22.55
Feb. 23	27.45	23.00
Mar. 17	27.10	23.35
Apr. 25	26.80	23.65
May 31	27.70	22.75
July 21	28.60	21.85
Aug. 25	28.65	21.80
Sept. 28	28.70	21.75
Nov. 30	28.20	22.25
1928		
Jan. 24	28.70	21.75
Feb. 21	27.60	22.85
Mar. 21	27.50	22.95
Apr. 19	26.30	24.15

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[f] Windmill running.

[p] By Cyril Williams.

[c] Pumping.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

5627C1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
May 24	27.35	23.10
June 25	28.00	22.45
July 25	28.45	22.00
Aug. 27	28.75	21.70
Sept. 20	29.75	20.70
Oct. 22	28.95	21.50
Nov. 22	28.75	21.70
Dec. 15	28.55	21.90
1929		
Jan. 23	28.40	22.05
Feb. 20	28.15	22.30
Mar. 21	28.40	22.05
Apr. 9	28.10	22.35
May 28	28.95	21.50
June 21	29.10	21.35

5629C1. E. I. Turner. 6-inch well, 90 feet deep, used for domestic supply. Bench mark is top of casing, 0.9 foot above ground; altitude, 26.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 27	[i] 12.50	13.70
June 21	13.40	12.80
July 24	14.30	11.90
Aug. 20	[c] 19.70	6.50
Sept. 27	15.15	11.05
Oct. 21	14.00	12.20
Nov. 16	13.85	12.35
Dec. 10	13.50	12.70
1927		
Jan. 19	13.05	13.15
Feb. 23	12.15	14.05
Mar. 17	11.65	14.55
Apr. 25	11.10	15.10
May 31	11.25	14.95
June 23	[c] 16.90	9.30
July 21	[c] 17.50	8.70
Aug. 25	15.30	10.90
Sept. 28	14.30	11.90
Oct. 27	17.80	8.40
Nov. 30	13.30	12.90
Dec. 21	13.15	13.05
1928		
Jan. 25	12.85	13.35
Feb. 27	12.45	13.75
Mar. 21	12.30	13.90
Apr. 19	11.70	14.50
May 24	12.15	14.05
June 25	13.40	12.80
July 25	13.90	12.30
Aug. 27	(c)	---------
Sept. 20	14.45	11.75
Oct. 22	14.90	11.30
Nov. 22	13.95	12.25
Dec. 15	13.80	12.40
1929		
Jan. 23	13.45	12.75
Feb. 20	13.15	13.05
Mar. 21	13.50	12.70
Apr. 9	13.90	12.30
May 28	(c)	---------
June 21	15.55	10.65

5631E1. Jim McGillivray. 6-inch well, 32 feet deep, used for domestic supply. Bench mark is copper washer on 3 by 12 inch pump support, 1.2 feet above ground; altitude 22.35 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 13	10.70	11.35

5631E2. Jim McGillivray. 5-inch well, not in use. Bench mark is copper washer on 2 by 12 inch upright, 1.00 foot above ground; altitude, 22.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 13	10.40	11.65
June 8	11.20	10.85
July 19	13.00	9.05
Aug. 20	13.85	8.20
Sept. 14	14.00	8.05
Oct. 12	14.10	7.95
Nov. 9	14.30	7.75
Dec. 7	14.15	7.90
1927		
Jan. 12	13.80	8.25
Feb. 8	13.05	9.00
Mar. 10	9.35	12.70
Apr. 13	8.15	13.90
May 21	9.40	12.65
June 23	13.00	9.05
July 18	14.30	7.75
Aug. 17	13.60	8.45
Sept. 30	14.55	7.50
Oct. 25	13.90	8.15
Nov. 30	13.80	8.25
Dec. 22	14.10	7.95
1928		
Jan. 25	13.35	8.70
Feb. 27	13.00	9.05
Mar. 21	12.70	9.35
Apr. 19	9.80	12.25
May 23	11.95	10.10
June 20	11.35	10.70
July 23	12.80	9.25
Aug. 21	14.90	7.15
Sept. 19	(c)	---------
Oct. 23	14.40	7.65
Nov. 21	(c)	---------
Dec. 17	14.35	7.70
1929		
Jan. 23	14.20	7.85
Feb. 20	13.80	8.25
Mar. 21	13.45	8.60
Apr. 9	13.20	8.85
May 28	14.60	7.45
June 20	14.80	7.25
July 15	16.90	5.15
Dec. 9	16.00	6.05

5632F1. L. J. Holmes. (See p. 238.) Bench mark is top of casing; altitude, 28.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 8	(c)	---------
Aug. 20	16.90	11.75
Sept. 14	17.35	11.30
Oct. 12	17.55	11.10
Nov. 9	17.65	11.00
Dec. 7	17.35	11.30
1927		
Jan. 12	16.90	11.75
Feb. 8	15.90	12.75
Mar. 10	14.20	14.45
Apr. 13	12.40	16.25
July 18	(c)	---------
Aug. 17	(c)	---------
Sept. 30	16.65	12.00
Nov. 30	17.10	11.55
Dec. 21	16.95	11.70
1928		
Jan. 26	16.70	11.95
Feb. 27	15.70	12.95
Mar. 24	15.60	13.05
Apr. 19	14.05	14.60
May 23	14.20	14.45
June 20	(c)	---------
July 23	16.70	11.95
Aug. 21	(c)	---------
Sept. 19	17.20	11.45
Oct. 23	17.50	11.15
Nov. 21	17.55	11.10
Dec. 17	17.50	11.15
1929		
Jan. 23	17.30	11.35
Feb. 20	16.70	11.95
Mar. 6	16.55	12.10
Mar. 21	16.25	12.40
Apr. 9	16.10	12.55
May 28	16.60	12.05
June 20	17.05	11.60

5633E1. J. C. Carly Co. 4-inch well, used for domestic supply. Bench mark is copper washer on pump support, 1.5 feet above ground; altitude, 36.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 13	19.40	17.10
June 8	20.10	16.40
July 19	21.70	14.80
Aug. 20	21.30	15.20
Sept. 14	[i] 23.60	12.90
Oct. 12	22.00	14.50
Nov. 9	21.90	14.60
Dec. 7	21.65	14.85
1927		
Jan. 12	21.95	14.55
Feb. 8	20.40	16.10
Mar. 10	19.00	17.50
Apr. 13	18.95	17.55

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[c] Pumping.

[i] Pump running in adjacent well.

[c] Pumping.

[i] Pump running in adjacent well.

[c] Pumping.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

5633E1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
May 21	[f] 18.05	18.45
June 23	[i] 21.90	14.60
July 18	20.70	15.80
Aug. 17	[i] 23.65	12.85
Sept. 30	21.95	14.55
Oct. 25	22.05	14.45
Nov. 30	21.20	15.30
Dec. 21	21.85	14.65
1928		
Feb. 27	20.90	15.60
Mar. 24	20.65	15.85
Apr. 19	18.85	17.65
May 23	19.40	17.10
June 20	20.45	16.05
July 23	21.50	15.00
Aug. 21	22.05	14.45
Sept. 19	23.15	13.35
1929		
Mar. 6	21.60	14.90
Apr. 9	21.00	15.50

5634J1. G. Miles. 6-inch well, used for domestic supply. Bench mark until July 18, 1927, copper washer on 2 by 6 inch pump support, 1.6 feet above ground, altitude 41.70 feet; after that date, 0.4 foot above old bench mark, altitude 42.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 12	19.70	22.00
June 8	20.80	20.90
July 19	22.65	19.05
Aug. 20	23.85	17.85
Sept. 14	23.70	18.00
Oct. 12	[e] 24.50	17.20
Nov. 9	23.50	18.20
Dec. 7	22.15	19.55
1927		
Jan. 12	20.95	20.75
Feb. 8	19.45	22.25
Mar. 10	18.45	23.25
Apr. 13	17.85	23.85
May 21	18.80	22.90
June 23	20.25	21.45
July 18	[h] 22.75	19.35
Aug. 17	23.15	18.95
Sept. 30	23.55	18.55
Oct. 25	23.75	18.35
Nov. 30	23.35	18.75
Dec. 21	23.25	18.85
1928		
Jan. 25	22.10	20.00
Feb. 27	20.65	21.45
Mar. 24	20.80	21.30
Apr. 19	19.05	23.05
May 23	20.20	21.90

5634J1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
June 20	21.50	20.60
July 23	22.75	19.35
Aug. 21	23.80	18.30
Sept. 19	24.00	18.10
Oct. 23	24.10	18.00
Nov. 21	23.95	18.15
Dec. 17	23.65	18.45
1929		
Jan. 23	22.90	19.20
Feb. 20	21.25	20.85
Mar. 21	20.60	21.50
Apr. 9	20.65	21.45
May 28	22.30	19.80
June 21	23.05	19.05

5635A1. Mrs. Annie Stupurak. 6-inch well, 82 feet deep, not in use. Bench mark is top of casing, 0.40 foot above ground; altitude, 50.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	22.60	27.90
May 17	23.50	27.00
June 7	[f] 24.00	26.50
July 16	24.65	25.85
Aug. 20	25.40	25.10
Sept. 14	26.00	24.50
Oct. 12	25.95	24.55
Nov. 9	25.90	24.60
Dec. 7	25.20	25.30
1927		
Jan. 11	24.25	26.25
Feb. 8	23.25	27.25
Mar. 10	22.20	28.30
Apr. 13	21.60	28.90
May 21	22.30	28.20
July 18	[i] 24.45	26.05
Aug. 17	24.60	25.90
Sept. 30	25.30	25.20
Oct. 25	25.45	25.05
Nov. 30	25.20	25.30
Dec. 21	25.15	25.35
1928		
Jan. 24	24.40	26.10
Feb. 21	23.45	27.05
Mar. 30	22.80	27.70
Apr. 19	22.25	28.25
May 23	22.75	27.75
June 21	23.80	26.70
July 23	24.55	25.95
Aug. 21	26.10	24.40
Sept. 19	25.80	24.70
Oct. 23	26.00	24.50
Nov. 21	25.85	24.65
Dec. 17	25.45	25.05
1929		
Jan. 23	25.10	25.40
Feb. 20	24.05	26.45
Mar. 21	23.50	27.00
Apr. 9	23.35	27.15

5635A1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
May 28	24.65	25.85
June 20	25.35	25.15

5635F1. John Kost. 8-inch well, 54 feet deep, not in use. Bench mark is top of casing, 2.00 feet above ground; altitude, 53.42 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Nov. 14	30.53	22.89
Dec. 16 [n]	28.52	24.90
Dec. 21	28.46	24.96
Dec. 28	28.44	24.98
Dec. 30	28.37	25.05
1928		
Jan. 6	27.63	25.79
Jan. 13	27.44	25.98
Jan. 20	27.40	26.02
Jan. 28	26.93	26.49
Feb. 3	26.68	26.74
Feb. 4	26.59	26.83
Feb. 10	26.17	27.25
Feb. 17	26.06	27.36
Feb. 24	26.01	27.41
Mar. 2	26.00	27.42
Mar. 9	25.94	27.48
Mar. 16	25.83	27.59
Mar. 23	25.87	27.55
Mar. 30	25.18	28.24
Apr. 6	24.88	28.54
Apr. 13	24.75	28.67
Apr. 20	24.72	28.70
Apr. 27	24.78	28.64
May 4	25.18	28.24
May 11	25.26	28.16
May 18	25.60	27.82
May 25	25.73	27.69
June 1	26.03	27.39
June 8	26.47	26.95
June 16	26.70	26.72
June 22	27.12	26.30
June 29	27.39	26.03
July 6	27.46	25.96
July 13	27.81	25.61
July 20	27.91	25.51
July 27	28.26	25.16
Aug. 3	28.36	25.06
Aug. 10	28.45	24.97
Aug. 17	28.74	24.68
Aug. 24	28.95	24.47
Aug. 31	29.07	24.35
Sept. 7	29.18	24.24
Sept. 14	29.15	24.27
Sept. 21	29.36	24.06
Sept. 28	29.42	24.00
Oct. 5	29.35	24.07
Oct. 12	29.52	23.90
Oct. 19	29.55	23.87
Oct. 26	29.43	23.99
Oct. 30	29.38	24.04
Nov. 2	29.37	24.05
Nov. 9	29.33	24.09
Nov. 16	29.25	24.17
Nov. 23	29.19	24.23
Nov. 30	29.12	24.30
Dec. 7 [o]	29.06	24.36

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[e] Pumping.

[f] Windmill running.

[h] New measuring point.

[i] Pump running in adjacent well.

[f] Windmill running.

[i] Pump running in adjacent well.

[n] Water-stage recorder installed.

[o] Water-stage recorder removed.

Measurements of depth to water in observation wells—Continued

5635Q1. G. B. Sargent. 6-inch well, 89 feet deep, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 48.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 24	17.90	31.05
May 17	18.70	30.25
June 6	[g] 19.70	29.25
July 16	22.10	26.85
Aug. 19	22.50	26.45
Sept. 13	22.60	26.35
Oct. 11	22.15	26.80
Nov. 8	22.05	26.90
Dec. 6	19.20	29.75
1927		
Jan. 10	18.05	30.90
Feb. 7	16.75	32.20
Mar. 10	16.95	32.00
Apr. 13	16.60	32.35
May 21	[g] 18.45	30.50
June 17	[i] 21.20	27.75
July 19	20.55	28.40
Aug. 17	23.65	25.30
Sept. 20	22.40	26.55
Oct. 25	21.90	27.05
Nov. 30	21.25	27.70
Dec. 21	21.10	27.85
1928		
Jan. 24	19.30	29.65
Feb. 21	18.25	30.70
Mar. 24	18.50	30.45
Apr. 17	17.25	31.70
May 23	19.05	29.90
June 21	20.60	28.35
July 23	23.15	25.80
Aug. 21	22.05	26.90
Sept. 19	22.15	26.80
Oct. 23	([e])	--------
Nov. 21	21.85	27.10
Dec. 17	21.60	27.35
1929		
Jan. 23	19.60	29.35
Feb. 20	18.55	30.40
Mar. 21	18.05	30.90
Apr. 8	18.10	30.85
May 27	20.15	28.80
June 20	20.85	28.10

5636A1. G. S. Bill. 4-inch well, 40 feet deep, not in use. Bench mark is top of casing, 1.60 feet above ground; altitude, 58.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 7	25.15	33.55
July 16	26.70	32.00
Aug. 19	27.25	31.45
Sept. 13	27.80	30.90
Oct. 11	27.55	31.15
Nov. 8	27.60	31.10
Dec. 6	26.40	32.30
1927		
Jan 11	25.45	33.25
Feb. 7	24.10	34.60
Mar. 10	23.20	35.50
Apr. 13	22.75	35.95
May 20	23.70	35.00
June 17	24.60	34.10
July 19	25.65	33.05
Aug. 17	26.45	32.25
Sept. 20	27.00	31.70
Nov. 30	27.10	31.60
Dec. 21	27.05	31.65
1928		
Jan. 24	26.10	32.60
Feb. 27	24.75	33.95
Mar. 21	24.80	33.90
Apr. 17	23.45	35.25
May 24	24.45	34.25
June 21	25.55	33.15
July 23	[i] 26.50	32.20
Aug. 21	27.40	31.30
Sept. 19	27.60	31.10
Oct. 23	27.85	30.85
Nov. 21	27.70	31.00
1929		
Apr. 8	24.90	33.80

5636N1. G. W. McKwinster. 6-inch well, used for domestic supply. Bench mark is top of casing, altitude 47.20 feet, which is 4.40 feet below reference bench mark, a copper washer in wooden doorsill 1.00 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 25	15.90	31.30
June 7	15.90	31.30
July 16	17.70	29.50
Aug. 19	18.25	28.95
Sept. 13	18.25	28.95
Oct. 11	18.05	29.15
Nov. 8	18.05	29.15
Dec. 6	16.90	30.30
1927		
May 20	15.00	32.20
June 17	16.10	31.10
Aug. 17	17.50	29.70
Sept. 20	17.80	29.40
Oct. 25	15.80	31.40
Nov. 30	17.40	29.80
1928		
Jan. 24	17.40	29.80
Feb. 21	15.95	31.25
Mar. 21	15.95	31.25
Apr. 18	15.30	31.90
May 23	15.75	31.45
June 21	16.70	30.50
July 23	17.25	29.95
Aug. 21	17.85	29.35
Sept. 19	18.20	29.00
1929		
Mar. 6	15.90	31.30
Apr. 8	15.65	31.55

572D1. 6-inch well, used for domestic supply. Bench mark is top of casing and floor of pump house, at ground surface, altitude 136.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 1	71.30	64.85
July 27	71.60	64.55
Sept. 29	71.65	64.50
Nov. 17	71.70	64.45
1927		
Jan. 24	71.85	64.30
Mar. 21	71.70	64.45
Apr. 28	71.70	64.45
Aug. 26	71.85	64.30
Sept. 28	71.80	64.35
1928		
Apr. 20	71.80	64.35
Sept. 25	72.15	64.00
1929		
Apr. 10	72.30	63.85

574A1. Mrs. Rhoder. 10-inch well, not in use. Bench mark is cross on top brick of pit curb, at ground surface; altitude, 77.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 29	20.90	56.50
July 26	21.20	56.20
Sept. 27	21.35	56.05
Nov. 17	21.45	55.95
1927		
Jan. 24	21.35	56.05
Mar. 21	21.00	56.40
Apr. 28	20.85	56.55
Aug. 26	21.30	56.10
Sept. 29	21.45	55.95
1928		
Apr. 20	21.20	56.20
Sept. 25	21.80	55.60

574A2. Mrs. Rhoder. 10-inch well. Bench mark is top of casing, 1.0 foot above ground; altitude, 77.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 10	22.25	55.50

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[e] Pumping.

[g] Pump stopped a short time before measurement.

[i] Pump running in adjacent well.

[i] Pump running in adjacent well.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
574Q1. H. S. Genasci. 10-inch well, used for domestic supply. Bench mark is copper washer on 4 by 6 inch pump support, 0.5 foot above ground; altitude, 76.65 feet		
1926		
June 1	19.50	57.15
July 26	19.75	56.90
Sept. 27	19.90	56.75
Nov. 17	19.85	56.80
1928		
Apr. 20	[f] 20.75	55.90
Sept. 25	[f] 21.15	55.50
1929		
Mar. 11	20.80	55.85
Apr. 10	20.80	55.85
575A1. H. E. Fleming. Well 50 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 12 inch pump support, 0.3 foot above ground; altitude, 66.10 feet		
1926		
May 29	13.75	52.35
July 26	14.00	52.10
Sept. 27	13.75	52.35
Nov. 17	14.15	51.95
1927		
Jan. 24	13.95	52.15
Mar. 21	13.70	52.40
Apr. 28	13.50	52.60
Aug. 26	13.70	52.40
Sept. 29	13.75	52.35
1928		
Sept. 25	14.15	51.95
1929		
Mar. 11	14.40	51.70
Apr. 10	14.60	51.50
576P1. 10-inch well, not in use. Bench mark is cross on concrete curb, 0.2 foot above ground; altitude, 67.35 feet		
1926		
May 28	18.70	48.65
June 21	18.75	48.60
July 26	19.05	48.30
Aug. 20	19.20	48.15
Sept. 27	19.35	48.00
Nov. 16	19.45	47.90
Dec. 10	19.35	48.00
1927		
Jan. 19	19.10	48.25
Feb. 23	18.60	48.75
576P1—Con.		
1927		
Mar. 17	18.45	48.90
Apr. 25	18.35	49.00
Aug. 25	19.10	48.25
Sept. 28	19.30	48.05
1928		
Apr. 19	18.90	48.45
Sept. 24	19.70	47.65
1929		
Apr. 9	19.60	47.75
577E1. Well not in use. Bench mark is copper washer in pump support, 1.70 feet above ground; altitude, 67.10 feet		
1925		
Oct 24	[p] 21.05	46.0
1926		
May 28	20.60	46.50
June 21	20.70	46.40
July 26	21.00	46.10
Aug. 20	21.10	46.00
Sept. 27	21.30	45.80
Oct. 21	21.35	45.75
Nov. 16	21.40	45.70
Dec. 10	21.45	45.65
1927		
Jan. 19	21.35	45.75
Feb. 23	20.95	46.15
Mar. 17	20.55	46.55
Apr. 25	20.70	46.40
1928		
Apr. 19	20.95	46.15
Sept. 24	21.60	45.50
1929		
Mar. 11	21.60	45.50
Apr. 9	21.65	45.45
578H1. 6-inch well, not in use. Bench mark is top of casing, at ground surface; altitude, 76.90 feet		
1926		
May 29	22.30	54.60
July 26	22.80	54.10
Sept. 27	22.90	54.00
Nov. 17	22.90	54.00
1927		
Jan. 24	22.95	53.95
Mar. 21	22.40	54.50
Apr. 28	22.30	54.60
Aug. 26	22.90	54.00
Sept. 29	23.00	53.90
578H1—Con.		
1928		
Apr. 20	23.20	53.70
578J1. T. L. Quiggle. 6-inch well, 132 feet, used for domestic supply. Bench mark is top of casing, altitude 60.80 feet, which is 12.00 feet below reference bench mark, cross on concrete curb, 0.3 foot above ground. All measurements made from top of casing		
1926		
June 1	9.00	51.80
July 26	8.40	52.40
Sept. 27	9.60	51.20
Nov. 17	9.70	51.10
1927		
Jan. 24	7.55	53.25
Mar. 21	9.05	51.75
Apr. 28	8.90	51.90
Aug. 26	9.55	51.25
Sept. 28	9.70	51.10
1928		
Apr. 20	9.40	51.40
Sept. 25	10.05	50.75
1929		
Apr. 10	10.10	50.70
579N1. W. J. Thomas. 8-inch well, 60 feet deep, not in use. Bench mark is top of casing, 0.7 foot above ground; altitude, 72.05 feet		
1926		
May 29	[x] 13.75	58.30
July 26	[x] 14.30	57.75
Sept. 27	[x] 15.50	56.55
Nov. 17	[x] 16.00	56.05
1927		
Jan. 24	[a] 15.30	56.75
Mar. 21	[a] 10.40	61.65
Apr. 28	[a] 12.20	59.85
May 31	[x] 13.80	58.25
Aug. 26	15.10	56.95
Sept. 28	[x] 15.60	56.45
1928		
Apr. 20	[x] 12.50	59.55
Sept. 25	[x] 16.25	55.80
1929		
Apr. 10	[x] 14.85	57.20

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[f] Windmill running.

[p] By Cyril Williams.

[a] Creek or river flowing near by.

[x] Water standing in adjacent channel.

Measurements of depth to water in observation wells—Continued

579R1. 8-inch well, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude, 83.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 1	25.75	57.80
July 26	26.00	57.55
Sept. 27	25.50	58.05
Nov. 17	25.55	58.00
1927		
Jan. 24	25.60	57.95
Mar. 21	25.60	57.95
Apr. 28	25.25	58.30
May 31	[f] 26.65	56.90
Aug. 26	25.60	57.95
Sept. 28	[f] 27.70	55.85
1928		
Apr. 20	25.70	57.85
Sept. 25	[f] 26.85	56.70
1929		
Mar. 12	26.20	57.35
Apr. 10	26.25	57.30

5710Q1. H. R. Mullins. 10-inch well, used for domestic supply. Bench mark is top of concrete curb, at ground surface; altitude, 115.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	54.00	61.00
July 27	54.60	60.40
Sept. 27	54.75	60.25
Nov. 17	54.85	60.15
1927		
Jan. 24	54.90	60.10
Mar. 21	54.90	60.10
Apr. 28	54.80	60.20
Aug. 26	54.95	60.05
Sept. 28	55.00	60.00
1928		
Apr. 20	55.10	59.90
Sept. 25	55.30	59.70
1929		
Apr. 10	55.50	59.50

5711E1. 6-inch well, not in use. Bench mark is copper washer on pump support, 0.04 foot above ground; altitude, 109.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 1	47.95	61.35
July 27	48.20	61.10
Sept. 27	48.25	61.05
Nov. 17	48.30	61.00

5711E1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Jan. 24	48.30	61.00
Mar. 21	48.85	60.45
Apr. 28	48.20	61.10
Aug. 26	49.60	59.70
Sept. 28	48.40	60.90
1928		
Apr. 20	48.50	60.80
Sept. 25	48.70	60.60
1929		
Apr. 10	48.85	60.45

5711M1. J. F. McKenzie. 12-inch well, 115 feet deep, used for stock. Bench mark until Apr. 28, 1927, copper washer in 2 by 12 inch plank, 0.2 foot below ground, altitude 130.40 feet; after that date, top of casing, altitude 130.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
July 27	[c] 79.80	50.60
Sept. 29	66.60	63.80
Nov. 17	[c] 80.00	50.40
1927		
Jan. 24	66.10	64.30
Mar. 21	±66.00	±64.40
Apr. 28	[h] 65.45	65.15
Aug. 26	66.70	63.90
Sept. 29	[f] 75.50	55.10
1928		
Apr. 20	69.90	60.70
1929		
Apr. 10	66.25	64.35

5714H1. 10-inch well, not in use. Bench mark until Mar. 21, 1927, copper washer on old pump support, 1.70 feet above ground, altitude 113.00 feet; after that date, top of casing, 0.6 foot below copper washer, altitude 112.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	48.00	65.00
July 27	48.70	64.30
Sept. 29	48.70	64.30
Nov. 17	48.85	64.15
1927		
Jan. 24	48.75	64.25
Mar. 21	[h] 47.60	64.80
Apr. 28	47.35	65.05

5714H1—Con.

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Aug. 26	48.25	64.15
Sept. 29	48.25	64.15
1928		
Apr. 21	47.85	64.55
Sept. 26	48.65	63.75
1929		
Apr. 10	48.60	63.80

5714N1. 8-inch well, not in use. Bench mark is top of casing, 0.5 foot above ground; altitude, 91.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	29.55	61.95
July 27	30.70	60.80
Sept. 27	30.15	61.35
Nov. 17	[f] 34.30	57.20
1927		
Jan. 24	30.20	61.30
Mar. 21	29.60	61.90
Apr. 28	29.40	62.10
Aug. 26	30.25	61.25
Sept. 28	32.45	59.05
1928		
Apr. 21	30.00	61.50
1929		
Apr. 10	30.65	60.85

5715J1. Mrs. M. Donegan. 10-inch well, used for domestic supply. Bench mark is copper washer in 1 by 12 inch plank at side of pit, 0.70 foot above ground; altitude, 88.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1914		
Dec. 14	[ee] 18.70	70.00
1926		
June 1	30.90	57.80
1928		
Apr. 20	31.25	57.45
Sept. 25	31.75	56.95

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[c] Pumping.

[f] Windmill running.

[h] New measuring point.

[ee] By Kirk Bryan, U. S. Geological Survey.

Measurements of depth to water in observation wells—Continued

5715J2. Mrs. M. Donegan. 8-inch well, not in use. Bench mark until Mar. 12, 1929, top of casing, 1.1 feet above ground, altitude 89.45 feet; after that date, top of casing, altitude 88.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 1	30.80	58.65
July 26	31.15	58.30
Sept. 27	31.30	58.15
Nov. 17	31.40	58.05
1927		
Jan. 24	31.25	58.20
Mar. 21	30.95	58.50
Apr. 28	30.80	58.65
May 31	31.00	58.45
Aug. 26	31.45	58.00
1929		
Mar. 12	[h] 31.60	57.35
Apr. 10	31.65	57.30
July 16	32.55	56.40
Oct. 11	32.30	56.65

5717B1. C. H. Gordon. 10-inch well, 130 feet deep, used for domestic supply. Bench mark until Sept. 29, 1927, copper washer on 2 by 4 inch scantling, 0.10 foot above ground, altitude 79.80 feet; after that date, top of casing, 0.25 foot above copper washer, altitude 80.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 2	26.65	53.15
July 26	27.00	52.80
Sept. 27	27.15	52.65
Nov. 17	27.05	52.75
1927		
Jan. 24	27.05	52.75
Mar. 21	26.75	53.05
Apr. 28	26.55	53.25
May 31	26.90	52.90
Sept. 29	[h] 27.35	52.70
1928		
Apr. 20	27.15	52.90
Sept. 25	27.75	52.30
1929		
Mar. 12	27.80	52.25
Apr. 10	27.85	52.20

[h] New measuring point.

5718J1. Charles Wieland. 8-inch well, used for domestic supply. Bench mark is copper washer on pump support, 1.10 feet above ground; altitude, 67.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	25.40	41.90
June 21	23.40	43.90
July 26	24.20	43.10
Aug. 20	[f] 26.40	40.90
Sept. 27	23.70	43.60
Oct. 21	23.75	43.55
Nov. 16	23.80	43.50
Dec. 10	23.80	43.50
1927		
Jan. 19	23.75	43.55
Feb. 23	23.55	43.75
Mar. 17	23.40	43.90
Apr. 25	23.25	44.05
May 31	23.25	44.05
June 23	23.55	43.75
Aug. 21	23.80	43.50
Sept. 28	25.10	42.20
1928		
Apr. 19	23.75	43.55
Sept. 24	[f] 24.75	42.55

5718J2. Charles Wieland. 8-inch well, used for domestic supply. Bench mark is top of 2 by 6 inch plank around top of curb, east side, at ground surface; altitude, 66.60 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1929		
Apr. 10	23.60	43.00

5718M1. B. L. Whitehead. 8-inch well, 40 feet deep, used for domestic supply. Bench mark is copper washer on pump support 1.20 feet above ground; altitude, 70.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 1	20.10	50.20
July 26	21.00	49.30
Sept. 27	20.50	49.80
Nov. 17	20.40	49.90
1927		
Jan. 24	20.55	49.75
Mar. 21	20.25	50.05
Apr. 28	20.10	50.20
May 31	[f] 21.85	48.45
Aug. 26	20.55	49.75
Sept. 28	20.60	49.70

[f] Windmill running.

5718M2. 6-inch well, not in use. Bench mark is top of casing, 0.5 foot above ground; altitude, 71.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1928		
Apr. 20	21.70	49.85
Sept. 25	22.15	49.40
1929		
Apr. 10	22.30	49.25

5723E1. 6-inch well, used for stock. Bench mark is top of casing, 1.00 foot above ground; altitude, 97.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	34.80	62.25
July 27	36.10	60.95
Sept. 27	35.00	62.05
Nov. 17	35.00	62.05
1927		
Jan. 24	34.95	62.10
Mar. 21	34.70	62.35
Apr. 28	34.55	62.50
Aug. 26	34.90	62.15
Sept. 28	34.95	62.10
1928		
Apr. 21	35 ±	62 ±

5724B1. Well not in use. Bench mark is copper washer on pump support, at ground surface; altitude, 139.95 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 1	84.10?	55.85
1927		
Mar. 21	74.00	65.95
Aug. 26	74.70	65.25
Sept. 29	74.35	65.60
1928		
Apr. 21	74.20	65.75

5724P1. Henry Kohnke. 6-inch well, 100 feet deep, not in use. Bench mark is top of casing, at ground surface; altitude, 104.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Sept. 28	38.65	65.45
Oct. 27	38.75	65.35
Nov. 29	38.90	65.20
Dec. 20	38.15	65.95

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5724P1—Con.		
1928		
Jan. 28	39.70	64.40
Feb. 21	38.30	65.80
Mar. 21	38.25	65.85
Apr. 21	37.80	66.30
May 24	37.70	66.40
June 25	38.60	65.50
July 19	38.70	65.40
Aug. 27	39.10	65.00
Sept. 26	39.15	64.95
Oct. 22	39.30	64.80
Nov. 22	39.30	64.80
Dec. 17	39.40	64.70
1929		
Jan. 22	39.15	64.95
Feb. 19	38.90	65.20
Mar. 20	38.65	65.45
Apr. 11	38.75	65.35
May 28	39.40	64.70
June 21	39.40	64.70

5725B1. Henry Kohnke. 4-foot well, used for stock. Bench mark is top of brick curb, southwest side, 0.40 foot above ground; altitude, 106.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Sept. 28	[f] 34.90	71.60
Oct. 27	28.00	78.50
Nov. 29	34.35	72.15
Dec. 20	27.55	78.95
1928		
Jan. 28	24.80	81.70
Feb. 21	[f] 23.70	82.80
Mar. 21	[b] 23.10	83.40
Apr. 21	22.10	84.40
May 24	23.35	83.15
June 25	25.40	81.10
July 19	25.50	81.00
Aug. 27	26.90	79.60
Sept. 26	28.35	78.15
Oct. 22	28.00	78.50
Nov. 22	28.30	78.20
Dec. 17	29.55	76.95
1929		
Jan. 22	23.75	82.75
Feb. 19	22.70	83.80
Mar. 20	22.60	83.90
Apr. 11	22.80	83.70
May 28	24.00	82.50
June 21	[f] 26.90	79.60

5726G1. 6-inch well, used for domestic supply. Bench mark until Sept. 28, 1927, top of suction pipe, 1.40 feet above ground, altitude 102.90 feet; after that date, top of casing, 1.00 foot above ground, altitude 102.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Aug. 26	24.80	78.10
Sept. 29	26.10	76.80
Oct. 21	26.75	76.15
Nov. 16	27.50	75.40
Dec. 10	24.60	78.30
5726G1—Con.		
1927		
Jan. 19	21.75	81.15
Feb. 23	19.35	83.55
Mar. 21	19.45	83.45
Apr. 28	19.15	83.75
May 31	19.70	83.20
June 23	20.00	82.90
July 21	21.55	81.35
Aug. 26	23.15	79.75
Sept. 28	[h] 23.90	78.50
Oct. 27	19.95	82.45
Nov. 29	25.80	76.60
Dec. 20	25.35	77.05
1928		
Jan. 28	22.60	79.80
Feb. 21	[f] 20.80	81.60
Mar. 21	[f] 20.60	81.80
Apr. 21	18.85	83.55
May 24	19.35	83.05
June 25	20.80	81.60
July 19	21.65	80.75
Aug. 27	23.30	79.10
Sept. 26	24.70	77.70
Oct. 22	25.40	77.00
Nov. 22	26.30	76.10
Dec. 17	26.65	75.75
1929		
Jan. 22	23.10	79.30
Feb. 19	21.40	81.00
Mar. 20	20.70	81.70
Apr. 11	20.05	82.35
May 28	(c)	----------
June 21	21.70	80.70

5727C1. A. C. Loll. 6-inch well, 62 feet deep, not in use. Bench mark is top of casing, 0.5 foot above ground; altitude 94.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	32.40	62.15
July 26	32.60	61.95
Aug. 26	32.15	62.40
Sept. 27	32.85	61.70
Oct. 21	33.00	61.55
Nov. 16	33.00	61.55
Dec. 10	33.10	61.45
1927		
Jan. 19	33.15	61.40
Feb. 23	32.90	61.65
Mar. 21	32.75	61.80
Apr. 28	32.30	62.25
May 31	32.00	62.55
June 23	31.95	62.60
July 21	32.10	62.45
Aug. 26	32.30	62.25
Sept. 28	32.50	62.05
Oct. 27	31.50	63.05
Nov. 29	32.85	61.70
Dec. 20	32.85	61.70
1928		
Jan. 28	33.00	61.55
Feb. 21	33.05	61.40
5727C1—Con.		
1928		
Mar. 21	33.00	61.55
Apr. 21	32.95	61.60
May 24	32.55	62.00
June 25	32.55	62.00
July 19	32.70	61.85
Aug. 27	32.90	61.65
Sept. 26	33.10	61.45
Oct. 22	33.25	61.30
Nov. 22	33.30	61.25
Dec. 17	33.45	61.10
1929		
Jan. 22	33.55	61.00
Feb. 19	33.55	61.00
Mar. 20	33.55	61.00
Apr. 11	33.55	61.00
May 28	34.10	60.45
June 21	33.65	60.90

5728A1. George F. Bechthold. 6-inch well, used for domestic supply. Bench mark is top of casing, 1.00 foot above ground; altitude, 82.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	28.70	53.60
July 26	[f] 30.10	52.20
Aug. 26	[f] 29.90	53.40
Sept. 27	29.20	53.10
Oct. 21	29.20	53.10
Nov. 16	29.25	53.05
Dec. 10	29.20	53.10
1927		
Jan. 19	29.15	53.15
Feb. 23	29.00	53.30
Mar. 21	28.90	53.40
Apr. 28	28.70	53.60
May 31	28.70	53.60
June 23	28.70	53.60
July 21	28.85	53.45
Aug. 26	29.10	53.20
Sept. 28	29.15	53.15
Oct. 27	29.20	53.10
Nov. 29	29.25	53.05
Dec. 20	29.40	52.90
1928		
Jan. 28	29.35	52.95
Feb. 21	29.05	52.25
Mar. 21	29.25	53.05
Apr. 20	29.15	53.15
May 24	29.10	53.20
June 25	29.25	53.05
July 19	29.75	52.55
Aug. 27	29.50	52.80
Sept. 25	29.50	52.80
Oct. 22	29.60	52.70
Nov. 22	29.55	52.75
Dec. 17	29.65	52.65
1929		
Jan. 22	29.45	52.85
Feb. 19	29.75	52.55
Mar. 12	29.75	52.55
Mar. 20	29.75	52.55
Apr. 10	29.75	52.55
May 28	29.90	52.40
June 21	30.00	52.30

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[b] Water in ditch near by.
[f] Windmill running.

[c] Pumping.
[f] Windmill running.
[h] New measuring point.

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

5729J1. 8-inch well, used for stock. Bench mark is top of casing, 2.00 feet above ground; altitude 73.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
May 31	24.70	48.70
July 21	25.85	47.55
Aug. 26	25.65	47.75
Sept. 28	27.00	46.40
Oct. 27	26.20	47.20
Nov. 29	26.30	47.10
Dec. 20	26.35	47.05
1928		
Jan. 24	26.90	46.50
Feb. 21	25.90	47.50
Mar. 21	25.70	47.70
Apr. 20	25.25	48.15
May 24	25.35	48.05
June 25	[f] 27.95	45.45
July 19	[f] 26.10	47.30
Aug. 27	26.70	46.70
Sept. 25	27.40	46.00
Oct. 22	26.65	46.75
Nov. 22	26.80	46.60
Dec. 17	26.85	46.55
1929		
Jan. 22	26.80	46.60
Feb. 19	26.50	46.80
Mar. 20	26.30	47.10
Apr. 10	26.20	47.20
May 28	26.80	46.60
June 21	[f] 28.80	44.60

5730C1. 12-inch well, 100 feet deep, not in use. Bench mark is copper washer on 2 by 12 inch plank, 0.2 foot above ground; altitude, 73.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	26.80	46.25
June 22	27.10	45.95
July 26	27.30	45.75
Aug. 26	27.70	45.35
Sept. 27	27.80	45.25
Oct. 21	28.00	45.05
Nov. 16	27.95	45.10
Dec. 10	27.80	45.25
1927		
Jan. 19	27.50	45.55
Feb. 23	27.20	45.85
Mar. 17	26.95	46.10
Apr. 25	26.70	46.35
May 31	26.55	46.50
June 23	26.70	46.35
Aug. 26	27.20	45.85
Sept. 28	27.35	45.70
1928		
Apr. 19	27.15	45.90
May 24	27.05	46.00
Sept. 24	27.95	45.10
1929		
Mar. 12	27.95	45.10
Apr. 9	27.90	45.15

5730D1. 6-inch well, not in use. Bench mark is top of casing and copper washer, 0.3 foot above ground; altitude, 72.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 26	25.10	47.20
July 26	25.55	46.75

5730J1. L. Gori. 6-inch well, 75 feet deep, used for domestic supply. Bench mark is top of casing, altitude 53.55 feet, which is 6.00 feet below reference bench mark, a copper washer in wooden doorsill, 0.2 foot above ground. All measurements made from top of casing

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 23	[p] 14.55	39.00
1926		
May 26	12.70	40.85
June 22	13.80	39.75
July 26	15.95	37.60
Aug. 26	14.70	38.85
Sept. 27	15.05	38.50
Oct. 21	15.10	38.45
Nov. 16	15.05	38.50
Dec. 10	14.10	39.45
1927		
Jan. 19	13.10	40.45
Feb. 23	11.55	42.00
Mar. 17	11.45	42.10
Apr. 25	11.40	42.15
May 31	12.30	41.25
June 23	12.90	40.65
July 21	13.60	39.95
Aug. 25	14.25	39.30
Sept. 28	14.60	38.95
Oct. 27	14.80	38.75
Nov. 30	14.70	38.85
Dec. 20	9.65	43.90
1928		
Jan. 24	8.20	45.35
Feb. 21	12.90	40.65
Mar. 21	12.95	40.60
Apr. 19	11.75	41.80
May 24	12.60	40.95
June 25	13.50	40.05
July 25	14.20	39.35
Aug. 27	15.10	38.45
Sept. 24	15.15	38.40
Oct. 22	15.30	38.25
Nov. 22	15.20	38.35
Dec. 15	15.15	38.40
1929		
Jan. 23	14.60	38.95
Feb. 20	13.65	39.90
Mar. 21	13.20	40.35
Apr. 9	13.35	40.20
May 28	14.20	39.35
June 21	14.55	39.00

5730N1. G. L. Hubert. Well 70 feet deep, not in use. Bench mark is top of curb, 1.00 foot above ground; altitude, 64.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 23	[p] 27.70	37.10
1926		
Apr. 12	24.50	40.30
May 17	24.70	40.10
June 7	26.50	38.30
July 17	[e] 34.20	30.60
Aug. 19	[e] 36.20	28.60
Sept. 13	28.00	36.80
Oct. 11	28.10	36.70
Nov. 8	28.40	36.40
Dec. 6	26.40	38.40
1927		
Jan. 11	25.20	39.60
Feb. 7	23.60	41.20
Mar. 10	23.20	41.60
Apr. 13	22.75	42.05
May 20	24.20	40.60
June 17	25.25	39.55
July 19	([e])	---------
Aug. 17	27.75	37.05
Sept. 20	27.90	36.90
Oct. 25	28.20	36.06
Nov. 30	27.80	37.00
Dec. 15	27.45	37.35
1928		
Jan. 24	26.25	38.55
Feb. 21	24.90	39.90
Mar. 21	25.35	39.45
Apr. 17	23.50	41.30
May 24	25.20	39.60
June 21	26.30	38.50
July 23	([e])	---------
Aug. 21	28.05	36.75
Sept. 19	28.70	36.10
Oct. 23	28.65	36.15
Nov. 21	28.50	36.30
Dec. 17	28.25	36.55
1929		
Jan. 23	27.20	37.60
Feb. 20	25.55	39.25
Mar 21	24.95	39.85
Apr. 8	25.30	39.50
May 27	([e])	---------
June 20	27.50	37.30

5731M2. F. H. Smith. 6-inch well, 65 feet deep, used for stock. Bench mark is top of casing, at ground surface; altitude, 70.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 18	24.60	45.50
June 18	25.40	44.70
July 22	26.05	44.05
Aug. 18	26.50	43.60
Sept. 23	26.80	43.30

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[f] Windmill running.

[p] By Cyril Williams.

[e] Pumping.

[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5731M2—Con.		
1926		
Oct. 15	26.80	43.30
Nov. 15	26.90	43.20
Dec. 9	26.25	43.85
1927		
Jan. 18	25.65	44.45
Feb. 17	24.55	45.55
Mar. 16	23.90	46.20
Apr. 23	22.20	47.90
May 25	24.35	45.75
June 24	25.20	44.90
July 22	25.90	44.20
Aug. 24	26.35	43.75
Sept. 27	26.65	43.45
Oct. 27	26.80	43.30
Nov. 29	26.80	43.30
Dec. 19	26.70	43.40
1928		
Jan. 24	26.35	43.75
Feb. 21	25.45	44.65
Mar. 21	25.45	44.65
Apr. 25	25.60	44.50
May 24	25.10	45.00
June 21	26.15	43.95
July 19	26.80	43.30
Aug. 27	27.05	43.05
Sept. 24	27.50	42.60
Oct. 22	27.25	42.85
Nov. 20	27.20	42.90
Dec. 17	27.25	42.85
1929		
Jan. 22	26.95	43.15
Feb. 19	26.25	43.85
Mar. 20	25.85	44.25
Apr. 17	26.10	44.00
May 28	26.80	43.30
June 21	27.05	43.05

5733E1. E. Kenefick. 4-inch well, used for stock. Bench mark until Jan. 22, 1929, copper washer on pump support, 1.50 feet above ground, altitude 74.85 feet; after that date, top of casing, altitude 74.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Oct. 25	23.85	51.00
Nov. 15	24.50	50.35
Dec. 9	23.20	51.65
1927		
Jan. 18	[a] 22.40	52.45
Feb. 17	[a] 20.25	54.60
Mar. 16	[a] 19.35	55.50
Apr. 23	[a] 19.35	55.50
May 25	20.20	54.65
June 24	21.05	53.80
July 19	21.75	53.10
Aug. 24	22.65	52.20
Sept. 27	[f] 26.40	48.45
Oct. 27	23.65	51.20
Nov. 29	24.30	50.55
Dec. 19	23.80	51.05
5733E1—Con.		
1928		
Jan. 24	[a] 23.40	51.45
Feb. 21	[a] 22.00	52.85
Mar. 21	[a] 21.90	52.95
Apr. 25	[a] 20.35	54.50
May 24	22.20	52.65
June 21	21.85	53.00
July 19	22.75	52.10
Aug. 27	23.55	51.30
Sept. 24	24.00	50.85
Oct. 22	24.30	50.55
Nov. 20	24.45	50.40
Dec. 17	24.55	50.30
1929		
Jan. 22	[h] 22.65	51.40
Feb. 19	21.80	52.25
Mar. 20	21.35	52.70
Apr. 17	21.60	52.45
May 28	23.00	51.05
June 21	28.85	51.20

5734A1. C. N. Adams. 4-foot well, 135 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 10 inch plank on well curb, 1.00 foot above ground; altitude, 87.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 12	25.85	61.45
May 14	27.00	60.30
June 18	28.10	59.20
July 22	29.30	58.00
Aug. 18	30.20	57.10
Sept. 23	30.60	56.70
Oct. 18	31.00	56.30
Nov. 15	31.20	56.10
Dec. 10	29.95	57.35
1927		
Jan. 18	27.75	59.55
Feb. 17	26.05	61.25
Mar. 16	25.35	61.95
Apr. 25	24.70	62.60
May 25	[f] 27.00	60.30
June 24	27.20	60.10
July 21	28.30	59.00
Aug. 24	29.40	57.90
Sept. 27	30.15	57.15
Oct. 27	30.75	56.55
Nov. 29	30.85	56.45
Dec. 19	30.90	56.40
1928		
Jan. 24	30.35	56.95
Feb. 18	[g] 30.15	57.15
Mar. 21	28.20	59.10
Apr. 25	26.20	61.10
May 25	27.25	60.05
June 22	28.70	58.60
July 20	29.55	57.75
Aug. 24	30.95	56.35
Sept. 21	31.35	55.95
5734A1—Con.		
1928		
Oct. 26	31.55	55.75
Nov. 23	31.70	55.60
Dec. 17	([e])	---------
1929		
Jan. 22	31.25	56.05
Feb. 19	28.60	58.70
Mar. 20	28.55	58.75
Apr. 17	27.80	59.50
May 28	30.20	57.10
June 21	30.70	56.60

5734A2. C. N. Adams. 8-inch well, used for stock. Bench mark is top of instrument shelf, 4.0 feet above ground and 3.65 feet above top of casing; altitude, 86.66 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Dec. 7 [n]	30.50	56.16
Dec. 16	30.53	56.13
Dec. 23	30.57	56.09
Dec. 30	30.61	56.05
1928		
Jan. 6	30.55	56.11
Jan. 13	30.44	56.22
Jan. 20	30.46	56.21
Jan. 26	30.42	56.24
Feb. 3	30.25	56.41
Feb. 17	29.57	57.09
Feb. 24	29.38	57.28
Mar. 2	29.25	57.41
Mar. 9	29.19	57.47
Mar. 16	29.12	57.54
Mar. 30	28.63	58.03
Apr. 6	28.30	58.36
Apr. 13	28.10	58.56
Apr. 20	27.93	58.73
Apr. 27	27.84	58.82
May 4	27.81	58.85
May 11	27.79	58.87
May 18	27.82	58.84
May 25	27.89	58.77
June 1	28.02	58.64
June 8	28.20	58.46
June 16	28.35	58.31
June 22	28.53	58.13
June 29	28.70	57.96
July 6	28.87	57.79
July 13	29.07	57.59
July 20	29.24	57.42
July 27	29.41	57.25
Aug. 3	29.60	57.06
Aug. 10	29.76	56.90
Aug. 17	29.91	56.75
Aug. 24	30.06	56.60
Aug. 31	30.20	56.46
Sept. 7	30.33	56.33
Sept. 14	30.45	56.21
Sept. 21	30.55	56.11
Sept. 28	30.67	55.99
Oct. 5	30.77	55.89
Oct. 12	30.84	55.82
Oct. 19	30.92	55.74
Oct. 26	30.99	55.67
Nov. 2	31.05	55.61

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[a] Creek or river flowing near by.
[f] Windmill running.

[a] Creek or river flowing near by.
[f] Windmill running.
[g] Pump stopped a short time before measurement.
[h] New measuring point.

[e] Pumping.
[n] Water-stage recorder installed.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5734A2—Con.		
1928		
Nov. 9	31.10	55.56
Nov. 16	31.17	55.49
Nov. 23 [d]	31.20	55.46

5734R1. Dr. Ben Stetson. Bench mark is top of casing, 1.9 feet below ground; altitude, 92.05 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 13	34.65	57.40
May 14	34.40	57.65
June 18	[c] 36.20	55.85
July 22	35.30	56.75
Aug. 18	35.50	56.55
Sept. 23	35.70	56.35
Oct. 18	35.70	56.35
Nov. 15	35.75	56.30
Dec. 10	35.70	56.35
1927		
Jan. 18	35.65	56.40
Feb. 17	35.45	56.60
Mar. 16	34.55	57.50
Apr. 25	34.15	57.90
May 25	34.10	57.95
June 24	34.60	57.45
July 19	35.00	57.05
Aug. 24	35.45	56.60
Sept. 27	35.60	56.45
Oct. 27	35.75	56.30
Nov. 29	35.75	56.30
Dec. 19	35.75	56.30
1928		
Jan. 24	35.80	56.25
Feb. 21	35.70	56.35
Mar. 21	35.65	56.40
Apr. 25	35.25	56.80
May 24	35.35	56.70
June 21	35.75	56.30
July 19	36.05	56.00
Aug. 27	36.30	55.75
Sept. 25	36.40	55.65
Oct. 22	36.50	55.55
Nov. 20	36.55	55.50
Dec. 17	36.55	55.50
1929		
Jan. 22	36.55	55.50
Feb. 19	36.50	55.55
Mar. 20	36.45	55.60
Apr. 17	36.55	55.50
May 28	36.80	55.25
June 21	36.95	55.10

584Q1. I. L. Bordon. 6-inch well, not in use. Bench mark is top of casing, 1.00 foot above ground; altitude, 182.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 3	103.00	79.25
July 28	103.20	79.05
Sept. 29	103.20	79.05
Nov. 17	103.20	79.05
584Q1—Con.		
1927		
Jan. 24	103.40	78.85
Mar. 21	103.40	78.85
Apr. 28	103.30	78.95
Sept. 29	103.20	79.05
1928		
Apr. 23	103.45	78.80
Sept. 26	103.60	78.65
1929		
Apr. 11	103.75	78.50

586B1. Albert Covell. Used for domestic supply. Bench mark until Apr. 20, 1928, copper washer on pump support, 1.20 feet above ground, altitude 166.95 feet; after that date, moved to new curb, 1.35 feet above ground, altitude 167.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 2	97.50	69.45
July 27	97.80	69.15
Sept. 29	97.75	69.20
Nov. 17	97.80	69.15
1927		
Jan. 24	97.90	69.05
Mar. 21	97.95	69.00
Apr. 28	97.80	69.15
Aug. 26	97.90	69.05
Sept. 8	97.90	69.05
1928		
Apr. 20	[h] 98.15	68.95
Sept. 26	98.50	68.60
1929		
Apr. 10	98.45	68.65

5810F1. 6-inch well, not in use. Bench mark is top of old pump flange, 1.50 feet above ground; altitude, 150.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 3	66.30	84.50
July 28	66.40	84.40
Sept. 29	66.55	84.25
Nov. 17	66.90	83.90
1927		
Jan. 25	67.10	83.70
Sept. 29	([i])	---------

5810N1. I. L. Bordon. 12-inch well, 110 feet deep, used for stock. Bench mark is top of casing and copper washer, 0.2 foot above ground; altitude, 137.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 3	50.40	87.15
July 28	50.85	86.70
Sept. 29	51.00	86.55
Nov. 17	50.90	86.65
1927		
Jan. 24	51.35	86.20
Mar. 21	51.00	86.55
Apr. 28	50.65	86.90
Sept. 29	50.65	86.90
1928		
Apr. 23	[f] 51.50	86.05
Sept. 27	50.60	86.95
1929		
Apr. 11	50.85	86.70

5812E1. A. F. Forni. 3-foot well, used for stock. Bench mark until Feb. 26, 1929, copper washer on 6 by 6 inch beam at southeast side of well, 2.00 feet above ground, altitude 170.00 feet; after that date, top of iron rim on concrete curb, 2.5 feet above ground, altitude 170.50 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 14	59.40	110.60
July 28	59.65	110.35
Sept. 29	60.25	109.75
Nov. 17	59.70	110.30
1927		
Jan. 25	59.85	110.15
1929		
Feb. 26	[h] 59.85	110.65
Mar. 13	59.80	110.70
Apr. 11	[g] 59.90	110.60

5812E2. A. F. Forni. 4-foot well, not in use. Bench mark is copper washer on well cover, 3.10 feet above ground; altitude 156.30 feet. Perched-water well

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 8	26.40	129.90
1927		
Mar. 23	23.05	133.25
Apr. 28	21.50	134.80
June 7	24.65	131.65

[c] Pumping.
[d] Water-stage recorder removed.

[h] New measuring point.
[i] Caved in.

[f] Windmill running.
[g] Pump stopped a short time before measurement.
[h] New measuring point.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5812E2—Con.		
1927		
Sept. 29	28.40	127.90
Nov. 3	28.85	127.45
1928		
Apr. 23	18.70	137.60
June 28	25.00	131.30
Sept. 27	28.5.	127.80
5814J1. I. L. Bordon. 3-foot well, used for domestic supply. Bench mark is copper washer on pump support, 1.00 foot above ground; altitude, 146 feet		
1926		
May 14	50.90	95.10
July 28	51.30	94.70
Sept. 29	53.30	92.70
Nov. 17	51.90	94.10
1927		
Jan. 25	50.10	95.90
Mar. 23	50.85	95.15
Apr. 28	49.75	96.25
June 7	52.00	94.00
Sept. 29	50.60	95.40
Nov. 3	51.05	94.95
1928		
Apr. 23	49.45	96.55
Sept. 27	50.55	95.45
1929		
Mar. 13	49.85	96.15
Apr. 11	49.85	96.15
5815P1. 6-inch well, used for stock. Bench mark is copper washer on 2 by 12 inch pump support, 0.4 foot above ground; altitude, 140.45 feet		
1926		
June 3	53.70	86.75
July 28	53.65	86.80
Sept. 29	53.80	86.65
Nov. 18	53.90	86.55
1927		
Jan. 25	54.10	86.35
Mar. 23	53.95	86.50
Apr. 28	53.85	86.60
June 7	53.75	86.70
Sept. 29	53.90	86.55
1928		
Apr. 23	53.90	86.55
Sept. 27	54.00	86.45
1929		
Apr. 11	54.25	86.20
5818A1. 6-inch well, 25 feet deep, not in use. Bench mark is top of casing, 1.40 feet above ground; altitude 155.60 feet. Perched-water well		
1926		
June 1	20.50	135.10
July 27	21.50	134.10
Sept. 29	22.10	133.50
Nov. 17	22.25	133.35
1927		
Jan. 24	12.85	142.75
Mar. 21	18.40	137.20
1928		
Sept. 26	21.10	134.50
5818A2. 6-inch well, used for domestic supply and stock. Bench mark is top of pump platform, 2.0 feet above ground; altitude, 156.20 feet		
1929		
Apr. 10	88.00	68.20
5820J1. John Clements. 4-foot well, 35 feet deep, used for domestic supply. Bench mark is copper washer on well cover, 1.50 feet above ground; altitude, 117.45 feet		
1926		
Apr. 23	18.80	98.65
May 13	18.70	98.75
July 26	20.75	96.70
Sept. 27	23.05	94.40
Nov. 18	24.20	93.25
1927		
Jan. 24	21.15	96.30
Mar. 21	16.60	100.85
Apr. 28	15.95	101.50
May 28	16.70	100.75
June 23	17.40	100.05
Aug. 26	19.50	97.95
Sept. 29	20.60	96.85
Oct. 27	21.60	95.85
Dec. 20	22.65	94.80
1928		
Jan. 28	21.20	96.25
Feb. 21	19.70	97.75
Mar 21	19.10	98.35
Apr. 21	16.25	101.20
May 24	16.90	100.55
June 21	17.70	99.75
July 19	18.65	98.80
Aug. 23	20.05	97.40
Sept. 26	21.05	96.40
Oct. 26	22.40	95.05
Nov. 23	22.75	94.70
1929		
Apr. 11	19.30	98.15
5821E1. I. L. Bordon. 4-foot well, used for stock. Bench mark is copper washer on well cover, 0.5 foot above ground; altitude, 126.95 feet. Perched-water well		
1926		
Apr. 23	29.50	97.45
May 14	29.25	97.70
July 27	31.40	95.55
Sept. 29	[f]41.10	85.85
Nov. 18	40.80	86.15
1927		
Jan. 24	38.90	88.05
Mar. 21	35.80	91.15
Apr. 28	34.80	92.15
May 28	35.10	91.85
June 23	35.30	91.65
Aug. 26	36.40	90.55
Sept. 29	37.05	89.90
Nov. 5	38.30	88.65
1928		
Apr. 23	33.05	93.90
Sept. 26	([ff])	---------
1929		
Apr. 11	34.50	92.45
5821E2. I. L. Bordon. 6-inch well, used for domestic supply. Bench mark is top of pump platform; altitude, 127.10 feet		
1929		
Apr. 11	50.30	76.80
5822Q1. I. L. Bordon. 6-inch well, used for domestic supply. Bench mark until Mar. 23, 1927, copper washer on pump support, 0.5 foot above ground, altitude 207.30 feet; after that date, top of casing, at ground surface, altitude 206.80 feet		
1926		
May 14	128.50	78.80
July 28	128.70	78.60
Sept. 29	129.30	78.00
Nov. 18	128.80	78.50
1927		
Mar. 23	[h]128.15	78.65
Apr. 28	128.20	78.60
June 7	128.20	78.60
Sept. 29	128.45	78.35
1928		
Apr. 23	128.55	78.25
Sept. 27	128.85	77.95
1929		
Mar. 13	128.85	77.95
Apr. 11	128.90	77.90

[f] Windmill running.

[h] New measuring point.

[ff] Boarded up.

Measurements of depth to water in observation wells—Continued

5824Q1. T. Barmet. 5-foot well, not in use. Bench mark is copper washer on well cover; altitude, 237.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 2	132.20	105.25
July 28	132.50	104.95
Sept. 29	132.40	105.05
Nov. 18	132.65	104.80
1927		
Jan. 25	132.60	104.85
Mar. 23	132.75	104.70
Sept. 29	132.70	104.75
1928		
Apr. 23	132.35	105.10
Sept. 27	132.25	105.20
1929		
Apr. 11	132.30	105.15

5826H1. Will Hart. 4½-foot well, 135 feet deep, used for domestic supply. Bench mark is copper washer on 2 by 12 inch well cover, 0.8 foot above ground; altitude, 209.75 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 3	122.70	87.05
July 28	122.85	86.90
Sept. 29	122.70	87.05
Nov. 18	122.75	87.00
1927		
Jan. 25	122.90	86.85
Mar. 23	122.80	86.95
Sept. 29	122.90	86.85
1928		
Apr. 23	123.05	86.70
Sept. 27	123.35	86.40
1929		
Apr. 11	123.30	86.45

5829A1. —— Griffith. 3-foot well, not in use. Bench mark is copper washer in wood cover, at ground surface; altitude, 114.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
Sept. 29	32.40	82.15
Oct. 27	33.95	80.60
Nov. 29	35.30	79.25
1928		
Jan. 24	27.30	87.25
Feb. 21	23.20	91.35
5829A1—Con.		
1928		
Mar 21	26.25	88.30
Apr. 21	23.80	90.75
May 24	28.45	86.10
June 21	28.25	86.30
July 19	28.95	85.60
Aug. 23	31.00	83.55
Sept. 26	31.70	82.85
Oct. 26	33.45	81.10
Nov. 23	34.85	79.70
Dec. 17	32.35	82.20
1929		
Jan. 22	[a] 26.15	88.40
Feb. 19	[s] 24.75	89.80
Mar. 20	26.45	88.10
Apr. 11	28.00	86.55
May 28	35.30	79.25
June 21	30.40	84.15

5830D1. Mrs. Maestretti. 8-inch well, not in use. Bench mark until Dec. 7, 1927, top of casing, 0.5 foot above ground, altitude 113.40 feet; after that date, top of instrument shelf, 2.64 feet above ground, altitude 116.04 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
July 25	26.80	86.60
Aug. 26	27.80	85.60
Sept. 29	28.70	84.70
Oct. 27	29.45	83.95
Nov. 29	[h] 32.69	83.35
Dec. 7 [n]	32.81	83.23
Dec. 16	32.92	83.12
Dec. 23	33.02	83.02
Dec. 30	33,13	82.91
1928		
Jan. 6	32.99	83.05
Jan. 13	32.43	83.61
Jan. 20	32.33	83.71
Jan. 27	32.01	84.03
Feb. 3	31,54	84.50
Feb. 10	31.08	84.96
Feb. 17	30.59	85.45
Feb. 24	30.18	85.86
Mar. 2	29.62	86.42
Mar. 9	29.84	86.20
Mar. 16	29.72	86.32
Mar. 23	29.58	86.46
Mar. 30	28.73	87.31
Apr. 6	27.69	88.35
Apr. 13	27.24	88.80
Apr. 20	27.15	88.89
Apr. 27	27.27	88.77
May 4	27.59	88.45
May 11	27.82	88.22
May 18	27.99	88.05
May 25	28.17	87.87
5830D1—Con.		
1928		
June 1	28.39	87.65
June 8	28.63	87.41
June 16	28.78	87.26
June 22	29.02	87.02
June 29	29.22	86.82
July 6	29.41	86.63
July 13	29.67	86.37
July 20	29.85	86.19
July 27	30.08	85.96
Aug. 3	30.30	85.74
Aug. 10	30.45	85.59
Aug. 17	30.69	85.35
Aug. 24	30.89	85.15
Aug. 31	31.14	84.90
Sept. 7	31.29	84.75
Sept. 14	31.45	84.59
Sept 21	31.69	84.35
Sept. 28	31.95	84.09
Oct. 5	32.11	83.93
Oct. 12	32.23	83.81
Oct. 19	32.37	83.67
Oct. 26	32.52	83.52
Nov. 2	32.65	83.39
Nov. 9	32.79	83.25
Nov. 16	33.03	83.01
Nov. 23 [e]	33.02	83.02
Dec. 17	33.25	82.79
1929		
Jan. 22	[a] 32.45	83.59
Feb. 19	31.10	84.94
Mar. 20	30.35	85.69
Apr. 11	30.20	85.84
May 28	30.75	85.29
June 21	31.30	84.74

5830E1. R. G. Campbell. 8-inch well, 30 feet deep, used for domestic supply. Bench mark until Aug. 26, 1927, base of pump, 1.50 feet above ground, altitude 108.75 feet; after that date, top of casing, 0.85 foot below base of pump, altitude 108.30 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	25.10	83.65
May 14	24.95	83.80
July 27	28.10	80.65
Sept. 29	33.80	74.95
Nov. 18	30.60	78.15
1927		
Jan. 24	28.30	80.45
Mar. 21	23.15	85.60
Apr. 28	22.85	85.90
May 28	[f] 23.35	85.40
June 23	[f] 26.15	82.60
July 25	25.50	83.25
Aug. 26	[h] 26.15	82.15
Sept. 29	27.50	80.80
Do	[f] 32.70	75.60

[a] Creek or river flowing near by.
[h] New measuring point.
[n] Water-stage recorder installed.
[s] Water standing in adjacent channel.

[a] Creek or river flowing near by.
[f] Windmill running.
[h] New measuring point.
[e] Water-stage recorder removed.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5830E1—Con.		
1927		
Oct. 27	28.00	80.30
Nov. 29	28.70	79.60
Dec. 20	28.90	79.40
1928		
Jan. 24	29.00	79.30
Feb. 21	25.50	82.80
Mar. 19	24.50	83.80
Apr. 21	21.65	86.65
May 24	23.30	85.00
June 21	23.50	84.80
July 19	24.90	83.40
Aug. 23	26.95	81.35
Sept. 26	([c])	---------
Oct. 26	28.40	79.90
Nov. 23	28.80	79.50
Dec. 17	29.10	79.20
1929		
Jan. 22	28.40	79.90
Feb. 19	26.00	82.30
Mar. 20	28.60	79.70
Apr. 11	30.00	78.30
May 28	27.60	80.70
June 21	30.15	78.15

5830F1. 10-inch well, not in use. Bench mark until Nov. 29, 1927, top of casing, at ground surface, altitude 109.55 feet; after that date, base of pump, altitude 110.10 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1927		
July 25	26.25	83.30
Aug. 26	26.70	82.85
Sept. 29	27.30	82.25
Nov. 29	[h] 32.15	77.95
Dec. 20	29.20	80.90
1928		
Jan. 24	35.50	74.60
Feb. 21	[b] 30.05	80.05
Apr. 21	28.70	81.40
May 24	28.10	82.00
June 21	27.50	82.60
July 19	28.25	81.85
Aug. 23	28.55	81.55
Sept. 26	28.70	81.40
Oct. 26	29.30	80.80
Nov. 23	29.80	80.30
Dec. 17	30.10	80.00
1929		
Jan 22	29.40	80.70
Feb. 19	30.20	79.90
Mar. 20	29.85	80.25
Apr. 11	29.60	80.50
May 28	29.30	80.80
June 21	29.40	80.70

[b] Water in ditch near by.
[c] Pumping.
[h] New measuring point.

5831E1. Milo Dye. 4-foot well, 45½ feet deep, used for domestic supply. Bench mark is copper washer on well cover, at ground surface; altitude 102.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 21	37.20	65.25
May 14	37.10	65.35
June 18	[f] 40.00	62.45
Aug. 18	39.00	63.45
Sept. 23	[f] 39.90	62.55
Oct. 18	38.60	63.85
Nov. 15	38.60	63.85
Dec. 10	38.30	64.15
1927		
Jan. 18	37.90	64.55
Feb. 19	37.45	65.00
Mar. 16	37.10	65.35
Apr. 26	36.70	65.75
May 25	37.50	64.95
June 23	37.55	64.90
July 25	[f] 41.30	61.15
Aug. 24	39.05	63.40
Sept. 29	38.70	63.75
Oct. 29	38.65	63.80
Nov. 29	38.75	63.70
Dec. 19	38.50	63.95
1928		
Jan. 24	38.40	64.05
Feb 21	[f] 39.80	62.65
Mar. 21	38.00	64.45
Apr. 25	37.40	65.05
May 24	38.45	64.00
June 21	40.10	62.35
July 19	39.85	62.60
Aug. 27	[f] 41.40	61.05
Sept. 25	[f] 41.35	61.10
Oct. 22	39.10	63.35
Nov. 20	39.05	63.40
Dec 17	39.85	62.60
1929		
Jan. 22	38.85	63.60
Feb. 19	38.45	64.00
Mar. 20	38.60	63.85
Apr. 17	38.70	63.75
May 28	40.20	62.25
June 21	41.10	61.35

5832A1. Joaquin Vargas. 6-inch well, used for stock. Bench mark is copper washer on pump support, 0.20 foot above ground; altitude, 145.00 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
Apr. 23	77.40	67.60
June 18	77.90	67.10
July 22	78.10	66.90
Aug. 18	78+	67−
Sept. 23	78+	67−
Oct. 18	77.5+	67.5−
Nov. 15	77.5+	67.5−
5832A1—Con.		
1927		
Jan. 18	77+	68−
Aug. 24	77+	68−
Sept. 8	82+	63−
Oct. 28	78.40	66.60
Nov. 28	78.20	66.80
Dec. 19	78.10	66.90
1928		
Jan. 24	77.90	67.10
Feb. 21	77.90	67.10
Mar. 21	79.25	65.75
Apr. 23	77.45	67.55
May 24	77.65	67.35
June 21	78.30	66.70
July 19	78.40	66.60
Aug. 23	79.65	65.35
Sept. 24	([c])	---------
Oct. 22	78.70	66.30
Nov. 23	80.45	64.55
Dec. 17	78.70	66.30
1929		
Jan. 22	78.65	66.35
Feb. 19	78.75	66.25
Mar. 20	78.45	66.55
Apr. 17	78.35	66.65
May 28	78.90	66.10
June 21	78.90	66.10

[f] Windmill running.

5832B1. 8-inch well, not in use. Bench mark until Mar. 23, 1927, copper washer on well cover, 1.3 feet above ground, altitude 163.15 feet; after that date, top of casing, 0.30 foot below old bench mark, altitude 162.85 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 22	[p] 95.20	67.95
1926		
Apr. 23	95.20	67.95
June 25	95.60	67.55
July 28	95.80	67.35
Aug. 26	95.95	67.20
Sept. 24	95.75	67.40
Oct. 18	95.65	67.50
Nov. 18	95.75	67.40
Dec. 13	95.75	67.40
1927		
Jan. 21	95.65	67.50
Feb. 25	95.40	67.75
Mar. 23	[h] 95.15	67.70
Apr. 26	94.90	67.95
May 28	95.40	67.45
June 29	94.50	57.45
July 25	95.75	67.10
Aug. 26	95.70	67.15
Sept. 30	95.85	67.00
Oct. 27	[g] 95.90	66.95

[c] Pumping.
[g] Pump stopped a short time before measurement.
[h] New measuring point.
[p] By Cyril Williams.

Measurements of depth to water in observation wells—Continued

Date	Depth to water (feet)	Altitude of water table (feet)
5832R1—Con.		
1928		
Jan. 23	95.55	67.30
Feb. 20	95.35	67.50
Mar. 20	95.50	67.35
Apr. 23	95.20	67.65
May 23	95.30	67.55
June 21	95.85	67.00
July 19	95.85	67.00
Aug. 23	96.10	66.75
Sept. 25	96.10	66.75
Oct. 22	96.20	66.65
Nov. 20	96.05	66.80
Dec. 14	96.00	66.85
1929		
Jan. 22	96.05	66.80
Feb. 19	96.00	66.85
Mar. 20	95.90	66.95
Apr. 12	95.95	66.90
May 28	96.35	66.50
June 21	96.70	66.15

5834B1. 6-inch well, not in use. Bench mark is top of casing, about at ground surface; altitude, 212.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 13	137.50	74.75
July 28	137.40	74.85
Sept. 29	137.70	74.55
Nov. 18	137.85	74.40
1927		
Jan. 25	137.70	74.55
Mar. 23	137.90	74.35
Apr. 28	137.85	74.40
June 7	138.00	74.25
Sept. 29	137.90	74.35
1928		
Apr. 23	138.00	74.25
Sept. 27	138.40	73.85
1929		
Mar. 13	140.90	71.35
Apr. 11	138.40	73.85

5834N1. 4-foot well, used for stock. Bench mark is cross cut in concrete curb, 0.5 foot above ground; altitude, 166.40 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 22	[p] 96.90	69.50
1926		
Apr. 23	94.95	71.45
May 13	[f] 97.20	69.20
June 25	95.30	71.10
July 28	95.60	70.80
Aug. 26	97.20	69.20
Sept. 24	[f] 98.30	68.10

[f] Windmill running.
[p] By Cyril Williams.

Date	Depth to water (feet)	Altitude of water table (feet)
5834N1—Con.		
1926		
Oct. 18	96.40	70.00
Nov. 18	95.45	70.95
Dec. 13	95.30	71.10
1927		
Jan. 21	95.40	71.00
Feb. 25	95.45	70.95
Mar. 23	95.35	71.05
Apr. 26	96.95	69.45
May 28	97.20	69.20
June 29	95.90	70.50
July 27	95.55	70.85
Aug. 26	96.05	70.35
Sept. 30	96.95	69.45
Oct. 27	95.60	70.80
Nov. 29	96.00	70.40
Dec. 19	96.00	70.40
1928		
Jan. 23	96.65	69.75
Feb. 20	95.85	70.55
Mar. 20	95.90	70.50
Apr. 23	95.30	71.10
May 23	96.50	69.90
June 21	98.45	67.95
July 19	97.55	68.85
Aug. 23	95.75	70.65
Sept. 25	96.00	70.40
Oct. 22	96.60	69.80
Nov. 20	97.30	69.10
Dec. 14	96.25	70.15
1929		
Jan. 22	98.40	68.00
Feb. 19	97.75	68.65
Mar. 20	96.10	70.30
Apr. 12	96.00	70.40
May 28	96.80	69.60
June 21	96.4±	70.0±

5836P1. 4-foot well, used for stock. Bench mark is copper washer on 6 by 6 inch pump support 0.7 foot above ground; altitude, 167.65 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1925		
Oct. 20	[p] 84.95	82.70
1926		
May 1	83.40	84.25
May 13	83.50	84.15
June 25	83.75	83.90
July 29	83.90	83.75
Aug. 26	[f] 85.60	82.05
Sept. 24	83.80	83.85
Oct. 18	[f] 85.40	82.25
Nov. 18	[f] 84.60	83.05
Dec. 13	83.70	83.95
1927		
Jan. 21	83.75	83.90
Feb. 25	83.90	83.75
Mar. 23	83.80	83.85

[f] Windmill running.
[p] By Cyril Williams.

Date	Depth to water (feet)	Altitude of water table (feet)
5836P1—Con.		
1927		
Apr. 26	83.80	83.85
May 28	[f] 86.45	81.20
Sept. 30	87.80	79.85
1928		
Apr. 23	84.20	83.45
1929		
Apr. 12	[f] 85.00	82.65

5931H1. 3-foot well, not in use. Bench mark is top of 2 by 4 inch scantling at northwest corner of well curb, 3.00 feet above ground; altitude, 159.55 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 17	23.60	135.95
July 29	23.70	135.85
Aug. 26	23.75	135.80
Oct. 25	23.85	135.70
Nov. 18	23.45	136.10
Dec. 13	23.90	135.65
1927		
Jan. 21	23.85	135.70
Mar. 23	15.55	144.00

6538N1. 8-inch well, used for stock. Bench mark is copper washer on 1 by 4 inch board, 1.50 feet above ground; altitude 16.70 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 26	17.30	−0.60
July 31	[f] 20.20	−3.50
Aug. 21	[f] 19.60	−2.90
Sept. 25	[f] 19.65	−2.95
Oct. 21	16.15	.55
Nov. 22	15.85	.85
Dec. 10	15.70	1.00
1927		
Jan. 19	15.35	1.35
Feb. 23	14.55	2.15
Mar. 17	14.05	2.65
Apr. 25	13.50	3.20
Aug. 25	15.90	.80
Sept. 28	[f] 19.50	−2.80
1928		
Apr. 26	14.25	2.45
Sept. 27	17.05	−.35
1929		
Apr. 16	15.35	1.35

[f] Windmill running.

Measurements of depth to water in observation wells—Continued

6633P1. Bench mark is top of casing, 0.5 foot below ground, altitude, 37.20 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 29	8.70	28.50
June 21	9.40	27.80
July 26	10.10	27.10
Aug. 20	10.65	26.55
Sept. 27	10.90	26.30

6634J1. Arno School. 6-inch well, not in use. Bench mark is top of casing, 0.4 foot above ground; altitude, 46.45 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 29	14.20	32.25
June 21	15.00	31.45
July 26	15.30	31.15
Aug. 20	15.50	30.95
Sept. 27	15.85	30.60
Nov. 16	15.85	30.60
1927		
Jan. 19	14.70	31.75
Mar. 17	13.15	33.30
Apr. 25	13.25	33.20
Aug. 25	15.90	30.55
Sept. 28	15.70	30.75
1928		
Apr. 19	13.85	32.60
Sept. 24	16.15	30.30

6634M1. T. Silver. 8-inch well, not in use. Bench mark is top of casing, 2.00 feet above ground; altitude, 56.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	18.25	38.00
June 21	18.60	37.65
July 26	19.10	37.15
Aug. 20	19.65	36.60
Sept. 27	19.70	36.55
Nov. 16	19.80	36.45
1927		
Jan. 19	19.05	37.20
Mar. 17	17.75	38.50
Apr. 25	17.65	38.60
Aug. 25	19.20	37.05
Sept. 28	19.65	36.60
1928		
Apr. 19	18.20	38.05
Sept. 24	19.85	36.40
1929		
Mar. 11	19.25	37.00
Apr. 9	19.15	37.10

6636J1. D. D. Uomin. 10-inch well, used for domestic supply. Bench mark is top of casing, 3.80 feet below ground; altitude, 53.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
May 28	11.20	42.60
June 21	11.30	42.50
July 26	11.70	42.10
Aug. 20	11.90	41.90
Sept. 27	12.20	41.60
Nov. 16	12.40	41.40
1927		
Jan. 19	11.95	41.85
Mar. 17	11.10	42.70
Apr. 25	10.85	42.95
Aug. 25	11.65	42.15
Sept. 28	11.90	41.90
1928		
Apr. 19	11.40	42.40
Sept. 24	12.45	41.35
1929		
Mar. 11	12.25	41.55
Apr. 9	12.25	41.55

6725F1. —— Darling. 6-inch well, abandoned oil well. Bench mark is top of casing, 4.00 feet above ground; altitude, 176.25 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 19	85.60	90.65
July 27	86.80	89.45
Sept. 29	88.70	87.55
Nov. 17	88.55	87.70
1927		
Aug. 26	96.95	79.30
Sept. 8	97.30	78.95
1928		
Apr. 20	90.30	85.95

6831H1. Southern Pacific Co. 8-inch well, used for stock. Bench mark is top of west side casing, 1.5 feet above ground altitude, 197.80 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 19	125.20	72.60
July 26	124.60	73.20
Sept. 27	125.30	72.50
Nov. 17	125.30	72.50
1927		
Jan. 24	125.60	72.20
Mar. 21	125.55	72.25
Sept. 8	124.50	73.30
1928		
Apr. 20	125.60	72.20
Sept. 25	125.65	72.15
1929		
Apr. 10	126.00	71.80

6834Q1. E. A. Maestretti. 5-foot well, 135 feet deep, used for domestic supply. Bench mark is copper washer on 6 by 6 inch windmill support, 2.50 feet above ground; altitude, 220.15 feet

Date	Depth to water (feet)	Altitude of water table (feet)
1926		
June 3	129.40	90.75
July 28	129.50	90.65
Sept. 29	129.60	90.55
Nov. 17	129.10	91.05
1927		
Jan. 24	129.30	90.85
Mar. 21	129.35	90.80
Sept. 29	129.30	90.85
1928		
Apr. 23	129.65	90.50
Sept. 27	130.00	90.15
1929		
Apr. 11	130.10	90.05

INDEX

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