CA-161

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Manager, Veterans Administration Hospital
Livermore, California

July 15, 1949

49-100

Joseph F. Poland, District Geologist, Sacramento, Calif.

New well for water supply at Hospital.

Attn: Dan J. Hurt, Executive Officer

Reference is made to the letter of June 3, 1949, from F. H. Dryden, Veterans Administration, Washington, to the Director of the Geological Survey, requesting the assistance of the Geological Survey in selecting a site for a new water well to alleviate the present water-supply emergency at the Veterans Hospital near Livermore, California.

In accordance with this request Messrs. J. F. Poland and G. F. Worts, Jr. of the Geological Survey made a 2-day field investigation in June 1949, contacted Mr. Dan J. Hurt, Executive Officer at the Veterans Hospital, and obtained available information on the Hospital water supply. Current data on wells and water levels were supplied by the California Division of Water Resources, which is conducting a water-supply investigation in the Livermore Valley and has a field office at the Livermore City Hall, with Mr. R. A. Sasye in charge. A comprehensive investigation of ground water in the Livermore Valley made in 1933 by M. B. Smith-/

/ Smith, M. B., Ground water in the Livermore Valley, California, typewritten Master's thesis, Geology Department, Stanford University, 83 pp., May 1934.

supplied an excellent background of ground-water conditions, pumping draft, and water-level change up to 1933. Three of the illustrations from Smith's report have been utilized in this memorandum to show pertinent ground-water features. These are his map 3, showing wells and ground-water contours, Livermore Valley, on May 19, 1933; Section 1, showing well logs along line ABCD of map 3; and graph 2, showing water levels along line A'BCC' of map 3.

The Veterans Hospital location has been plotted on map 3. The Hospital has utilized three water wells in the past 26 years. General data for these wells are listed in the following table:

Wells used to supply Veterans Hospital, 1923 to 1949

V.A. Well	Local name	Number on map 3	Period of use	Depth (feet)	Yield (gpm)	Drawdown (feet)
2	Holmes well	77	1923-32	500	--	--
3	Inman well	69	1930 to 4/49	600	a 240	110
4	Kaiser well	79	1932 to date	470	500	32

a. Well failed April 1949

The locations of these wells are shown on map 3. V.A. wells 2 and 3 were about 3.5 miles northwest of the Hospital and V.A. well 4 is about the same distance northerly from the Hospital. Eight-inch cast-iron mains run from wells 3 and 4 to well 2. The water is boosted to the Hospital from this location. Total lift is about 500 feet to a booster at the bottom edge of the property, plus an 80-lb. (185 foot) lift to the reservoir serving the Hospital. Pumping demand in summer months is approximately 350,000 gallons a day, according to Mr. Fred Chartier, Engineer Officer.

In connection with the well development, the Veterans Administration owns a 5-acre tract at V. A. well 2, also a strip 16 feet wide from the Holmes well to the Inman well, which accomodates the pipe line and the electric power line.

In April 1949 V. A. well 3 failed and although an attempt was made to clean out the well, yield was negligible. Therefore, since April 1949, V. A. well 4 has been the sole source of supply.

Ground-water conditions.- Livermore Valley is an alluvial plain about 13 miles long and 4 miles wide. The plain is underlain by deposits of gravel, sand, silt, and clay 400 to 500 feet thick, of Quaternary age. These alluvial deposits have been built up by the detritus carried westward in the two principal streams, the Arroyo Mocho and the Arroyo del Valle. The physical character of the alluvial deposits is shown by the well logs of Section 1. Logs of V.A. wells 2, 3, and 4 (Nos. 77, 69, and 77 of map 3) are shown on this section.

The Quaternary alluvial deposits are underlain by the "Livermore gravels," of probable Pliocene age. These so-called gravels actually consist of alternating layers of clay, clay and gravel, and cemented gravel, which are semiconsolidated and partially decomposed by weathering. Beneath the well lands of the Veterans Administration, the "Livermore gravels" are of unknown thickness. However, the total thickness of the Quaternary alluvium and "Livermore gravels" together is probably at least 1,000 feet in this area.

It is estimated by the California Division of Water Resources that 17,000 acre-feet of ground water was pumped from the Livermore Valley in 1948. Nearly all of this water was taken from the alluvial deposits of Quaternary age which are tapped to their full depth by water wells throughout the Valley. Some of the wells tap the "Livermore gravels" which locally supply several hundred gallons a minute to single wells. In general, however, the "Livermore gravels" constitute a poor aquifer and at places wells 300 to 400 feet deep in those gravels yield only 25 to 50 gpm.

On the other hand, yields of wells tapping the alluvium range from 200 to 2,500 gallons a minute, and drawdowns range from a few feet to 150 feet.

As shown by the ground-water contours of map 3, movement of ground water is westward from Livermore to Pleasanton. A ground-water barrier occurs about a mile west of Livermore and another near Pleasanton; these probably are barrier faults. They serve to divide the main valley into two ground-water basins, the Elliott basin between Livermore and Pleasanton and the Pleasanton basin west of the latter town. The City of San Francisco has a large well field in the Pleasanton basin and at times has pumped as much as 4,000 acre-feet a year from this well field. Largely because of this heavy municipal draft, the Pleasanton basin yielded about 60 percent of the total valley pumpage from 1916 to 1933. The pumping in the Elliott basin is chiefly to supply several large gravel plants and several tens of irrigation wells.

The perennial yield of the valley has been estimated by M. B. Smith to be 10,000,000 gallons a day, or about 11,200 acre-feet a year. Recharge is chiefly by percolation through the coarse gravels in the channels of the Arroyos Mocho and del Valle. The water-level profiles of graph 2 show a general decline of the water table since 1916. Water levels near V.A. wells 2 and 3 fell about 80 feet from 1916 to 1933 and have declined about 25 feet since that date, or a total of some 85 feet from 1916 to 1949. The average rate of decline was about $3\frac{1}{2}$ feet a year from 1916 to 1933 and $1\frac{1}{2}$ feet a year since 1933.

The water level at V.A. well 3 was about 30 feet below the land surface in 1916, declined to 90 feet in 1933, and reportedly was 120 feet in the autumn of 1948. As long as the present period of deficient rainfall continues, it is likely that the water level in that area will decline as much as 4 to 5 feet a year. However, about 300 feet or 75 percent of the alluvial deposits in the vicinity remain saturated at the present time. Also, the pumping lift is becoming excessive for irrigation of some crops and the irrigation draft will decrease if levels decline as much as 50 feet more.

Suggested location and type of well.- From consideration of the geology and ground-water conditions, it is believed that a site near V.A. well 3 is most favorably situated with respect to lands now owned by the Veterans Administration. Therefore it is suggested that a test bore be drilled at a location approximately 100 feet south of V.A. well 3 (Inman well), to a depth of 750 feet. The deposits to a depth of 500 to 600 feet have been penetrated by nearby wells and appear to be moderately productive. The character of the deposits below this depth is conjectural but they are believed worth testing with the drill to 750 feet, provided that a test hole can be bored at a reasonable cost. The depth of completion should depend on the results of the test bore but should not be less than 500 feet nor more than 750 feet. The cost of the test bore could be kept low by arranging to have the drilling form a part of the completion of a rotary-drilled supply well.

Memo to Veterans Admin. Hospital
July 15, 1949 (Revised)

In view of the reported character of the water-bearing materials in the area, it is believed that a gravel-envelope well would be most productive. The pilot hole (which would serve as the test well) may be from 8 to 14 inches in diameter but is usually 10 or 12 inches; the hole is generally reamed to 24 inches; and the casing, preferably machine-perforated, generally is 12 or 14 inches in diameter. The casing should be centered in the 24-inch hole by the use of centering guides spaced 50 feet apart. Gravel used in the envelope should not exceed one-half inch in diameter, and the slot size of the casing preferably should be about midway in the size range of the gravel chosen.

If desired, the Geological Survey will inspect the test bore log as soon as completed and give advice on depth of completion.

Joseph F. Poland
District Geologist

G. F. Worts, Jr.
Geologist

cc: 2 to Mr. A. N. Sayre
extra to V.A.,Livermore.

As shown by the ground-water contours of map 3, movement of ground water is westward from Livermore to Pleasanton. A ground-water barrier occurs about a mile west of Livermore and another near Pleasanton; these probably are barrier faults. They serve to divide the main valley into two ground-water basins, the Elliott basin between Livermore and Pleasanton and the Pleasanton basin west of the latter town. The city of San Francisco has a large well field in the Pleasanton basin and at times has pumped as much as 4,000 acre-feet a year from this well field. Largely because of this heavy municipal draft, the Pleasanton basin yielded about 60 percent of the total valley pumpage from 1916 to 1933. The pumping in the Elliott basin is chiefly to supply several large gravel plants and several tens of irrigation wells.

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The water level at V. A. well 3 was about 30 feet below the land surface in 1916, declined to 90 feet in 1933, and reportedly was 120 feet in the autumn of 1948. As long as the present period of deficient rainfall continues, it is likely that the water level in that area will decline as much as 4 to 5 feet a year. However, about 300 feet or 75 percent of the alluvial deposits in the vicinity remain saturated at the present time. Also, the pumping lift is becoming excessive for irrigation of some crops and the irrigation draft will decrease if levels decline as much as 50 feet more.

Suggested location and type of well.- From consideration of the geology and ground-water conditions, it is believed that a site near V.A. well 3 is most favorably situated with respect to lands now owned by the Veterans Administration. Therefore it is suggested that a test bore be drilled at a location approximately 100 feet south of V.A. well 3 (Inman well), to a depth of 750 feet. The deposits to a depth of 500 to 600 feet have been penetrated by nearby wells and appear to be moderately productive. The character of the deposits below this depth is conjectural but are believed worth testing with the drill to 750 feet, provided a test hole can be bored at a cost of not more than ~~$2 to $3 a foot~~ reasonable. The depth of completion should depend on the results of the test bore but should not be less than 500 feet nor more than 750 feet. The cost of the test bore could be kept low by arranging to have the drilling form a part of the completion of a rotary-drilled supply well.

~~It is suggested that a gravel-envelope well be completed at this site, with an outside wall diameter of 24 inches. It is presumed that the casing size will be 12 or 14 inches. The casing preferably should be centered in the 24-inch hole by the use of centering guides spaced 50 feet apart. Gravel used in the envelope should not exceed one-half inch in diameter.~~

~~If desired, the Geological Survey will inspect the test bore log as soon~~ In view of the reported character of the water-bearing materials in the area, it is believed that a gravel-envelope well would be most productive. The pilot hole (which would serve as the test well) may be from 8 to 14 inches in diameter

If desired, the Geological Survey will inspect the test bore log as soon as completed and give advice on depth of completion.

JFP

Joseph F. Poland
District Geologist

G. F. Worts, Jr.
Geologist

cc: 2 to Mr. A. N. Sayre
extra to V.A., Livermore.

CA 161

UNITED STATES
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY
GROUND WATER BRANCH
2520 MARCONI AVENUE
SACRAMENTO 15, CALIFORNIA

January 18, 1950

Cfmcy

Manager
Veterans Administration Hospital
Livermore, California

Mr. Worts and I have reviewed the driller's log and the electric log for th test bore drilled at the location 100 feet south of your well V.A. 3 (Inman well) and have discussed the drilling record with Messrs. Van Blitter, Chartier, and Gale of your staff.

As a result of this review, it is suggested that the test bore be reamed out and completed as a gravel envelope well to a depth of 710 feet below land surface.

On the basis of the two logs, it appears advisable to place perforated casing opposite the following depth intervals, namely: 180-200, 220-260, 300-340, 380-420, 460-500, 560-600, 640-660 feet. It is suggested that the perforations be approximately 1/4-inch wide with length and spacing according to standard practice. The total length of perforations here listed is 240 feet.

Very truly yours

JFP

Joseph F. Poland
District Geologist

3 carbons enclosed
cc: Mr. Sayre