Core Logs From Two Test Holes Near Kramer San Bernardino County California

By D. D. DICKEY

GEOLOGIC INVESTIGATIONS IN THE MOJAVE DESERT AND ADJACENT REGION, CALIFORNIA

GEOLOGICAL SURVEY BULLETIN 1045-B

Detailed logs of drill cores of Quaternary and Tertiary sediments

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1957

UNITED STATES DEPARTMENT OF THE INTERIOR

FRED A. SEATON, *Secretary*

GEOLOGICAL SURVEY

Thomas B. Nolan, *Director*

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. • Price 45 cents (paper cover)

CONTENTS

ILLUSTRATIONS

GEOLOGIC INVESTIGATIONS IN THE MOJAVE DESERT AND ADJACENT REGION, CALIFORNIA

CORE LOGS FROM TWO TEST HOLES, NEAR KRAMER SAN BERNARDINO COUNTY, CALIFORNIA

By D. D. DICKEY

ABSTRACT

Between July 1954 and May 1955 two test holes were drilled near Kramer, Calif., on the Mojave Desert. Four Corners test hole 1 was drilled in sec. 20, T. 10 N., R. 6 W., San Bernardino base line and meridian, to a depth of 1,561 feet in a basin filled with Quaternary and Tertiary sediments. The core is predominantly sand and conglomerate composed of mostly unweathered quartz monzonite debris.

Four Corners test hole 2 was drilled in sec. 5, T. 10 N., R. 8 W., in a separate sediment-filled basin. The core from this hole is less consolidated and more weathered. It is predominantly clay, silt, sand, and gravel composed of quartz monzonitic and volcanic material.

Detailed logs of the cores are given in this report.

INTRODUCTION

As part of the investigation of the geology of the Mojave Desert, two test holes were drilled near Kramer, Calif., to obtain information on the subsurface geology. Kramer is in the western part of the Mojave Desert on U. S. Highway 466, 2½ miles west of the junction of U. S. Highways 466 and 395. This junction, locally called Four Corners, is about half way between the towns of Mojave and Barstow. (See fig. 3.)

The geology of part of the area near Kramer is described in reports by Gale (1946) and Bowen (1954). During 1952 the U. S. Geological Survey studied the area that includes the drill sites. The geology was examined by T. W. Dibblee, Jr., and S. J. Muessig, and seismic, gravity, and aeromagnetic surveys were made under the direction of D. R. Mabey. Reports on these recent surveys are unpublished, but information from them was used in selecting the two drill sites, each at or near a point underlain by the deepest fill of a basin.

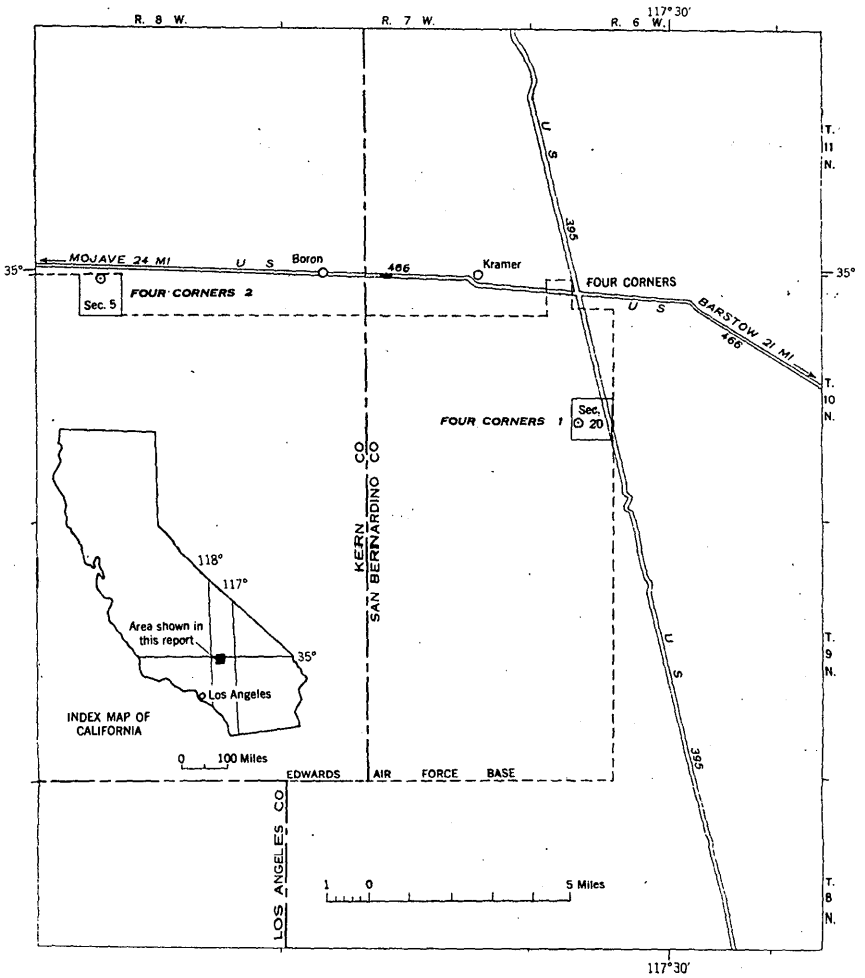

FIGURE 3.—Index map showing location of Four Corners test holes 1 and 2 near Kramer, Calif.

According to Gale (1946, p. 335), the stratigraphic section of the area is as follows:

Quaternary

Recent alluvium (Stream and flood-plain deposits).

Older alluvium (Bench gravel, sand and boulders).

(Unconformity)

Tertiary

Ricardo formation of Gale (1946)—Fanglomerate, including lake beds * * * and Saddleback basalts of Gale (1946) * * *.

(Unconformity)

Rosamond formation of Gale (1946)—Fanglomerate, containing clayey, sandy, arkosic, and tuffaceous sediments, local deposits of

white clay and magnesite; regionally contemporaneous with rhyolite-latite lavas and tuffs spread from vents widely distributed throughout this general region.

(Major unconformity)

Pre-Tertiary (basement) complex

Granitoid rock (quartz monzonite and similar plutonic igneous intrusive rocks), and related pegmatite dikes, of supposed Late Jurassic age.

FOUR CORNERS TEST HOLE 1

Four Corners test hole 1 is located 1,800 feet north and 1,080 feet east of the SW corner of sec. 20, T. 10 N., R. 6 W., San Bernardino base line and meridian. It was started July 26, 1954, and by December 13, 1954, was 1,561 feet deep. On December 14, the drill tools became stuck at 1,549 feet and could not be freed.

The sediments penetrated are firmly to well consolidated, poorly sorted clastic material, composed chiefly of debris derived from quartz monzonite. The fragments are subangular and mostly unweathered, with quartz, feldspars, and biotite being recognizable with the naked eye. The sediments below 1,151 feet are finer than those above this depth, but otherwise little else is different.

The stratigraphic divisions of Gale are difficult to recognize in the drill core, but the following interpretations were made:

0– 128 feet Recent alluvium
128–1,151 feet Older alluvium
1,151–1,561 feet Ricardo formation of Gale (1946)

Reasons for placing the stratigraphic divisions at the above depths are as follows:

The top 128 feet in Four Corners test hole 1 was soft and easy to drill. From 128 to 1,151 feet the sediments were well consolidated, required a diamond bit to drill, and contained many boulders and cobbles. Below 1,151 feet the sediments were finer grained, and no boulders and only a couple of cobbles were encountered.

Tertiary Rosamond formation of Gale (1946) crops out about a mile northeast of Four Corners test hole 1, according to T. W. Dibblee, Jr., in a report currently being prepared, but it was not found in the hole.

Water stands in the hole to a depth of about 120 feet below the ground level.

FOUR CORNERS TEST HOLE 2

Four Corners test hole 2 is located 500 feet south and 2,640 feet east of the NW corner of sec. 5, T. 10 N., R. 8 W., San Bernardino base line and meridian. It was started February 21, 1955, and was terminated May 3, 1955, at a depth of 1,714.5 feet.

The sediments penetrated are, for the most part, poorly consolidated to firmly consolidated clastic material. The sand is arkosic and the grains are subangular to subrounded. Bedding and sorting are rare and the rocks are a mixture of clastic material of various sizes. A unit described as sand, for instance, contains sand as the most plentiful constituent, but clay and silt may each be present in smaller quantities that together make up more than 50 percent of the unit.

A possible correlation with the units of Gale is as follows:

0–1,175 feet Recent alluvium
1,175–1,714.5 feet Ricardo formation of Gale (1946)

The division between Recent alluvium and Gale's Ricardo formation in Four Corners test hole 2 is mostly arbitrary. Within an interval of a few hundred feet, the color of the sediments graded from light brown down to gray green. Also, the consolidation of the sediments generally increased downward within this interval. The depth 1,175 feet is close to the middle of this transition zone and arbitrarily chosen as the division point between Recent alluvium and the Ricardo formation of Gale.

Quartz monzonite crops out about 4 miles east of Four Corners test hole 2, but it was not encountered in this hole.

LOGGING METHOD

The wet core was logged in the field with the aid of a hand lens soon after its recovery from the hole. The dried core was logged in the laboratory, after both holes had been completed, in an attempt to obtain uniformity of detail and description. A hand lens, a binocular microscope, and a petrographic microscope were used to examine the dry core. Sediment names are in accordance with those suggested by Wentworth (1922) and color descriptions are in accordance with the Rock-Color Chart (Goddard and others, 1948) distributed by the National Research Council. R. D. Allen, U. S. Geological Survey, made microscopic determinations as noted in the log.

Where core recovery for any given run[1] was less than 100 percent, the position and composition of missing core were estimated on the basis of cuttings and drilling characteristics as well as on the nature of the adjacent core.

The left half of the graphic logs on plate 2 represents actual core; the right half represents interpreted core. Each short horizontal line on the right side of the graphic logs indicates the end of a run.

[1] The term "run" refers to the length of hole drilled between removals of the core barrel from the hole. Generally a run was 10 feet.

CORE LOGS OF FOUR CORNERS TEST HOLES 1 AND 2

Test hole 1

[Sixty-three percent of core recovered. Depth is to bottom of unit]

Depth (feet)	*Unit thickness (feet)*	*Description*
128	128	Not cored. Cuttings were sand and silt composed of quartz, feldspars, and biotite. This unit probably consists of poorly consolidated silt, sand, friable cobbles, and friable boulders.
140	12	Not cored. Cuttings are the same as those in the 128 feet above. This unit is probably well-consolidated sand and silt, containing hard pebbles, cobbles, and boulders of quartz monzonite.
1, 151	1, 011	Conglomerate, well-consolidated, calcareous; composed of silt, sand, pebbles, cobbles, and boulders. Ninety-nine percent of this material is derived from quartz monzonite, the remainder from aplite, lava, and metavolcanic rocks. The amount and size of boulders and cobbles decreased in the bottom 100 feet of this unit. The color from 140–400 feet is yellowish gray (5*Y* 7/2). From 400 to 1,151 feet the color ranges from light olive gray (5*Y* 6/1) to greenish gray (5*GY* 6/1). Bedding dips 3° at 1,137 feet.
1, 162	11	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, subangular, very fine to very coarse; contains numerous granules and pebbles.
1, 164	2	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, argillaceous, very fine to medium, crossbedded.
1, 169	5	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine to very coarse; contains many granules.
1, 169. 2	. 2	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine and fine, crossbedded.
1, 171	1. 8	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine to very coarse; contains many granules.
1, 173	2	Sand, greenish-gray (5*GY* 6/1), calcareous, very well cemented, medium to very fine.
1, 181	8	Sand, greenish-gray (5*GY* 6/1) to yellowish-gray (5*Y* 8/1), slightly calcareous, very fine to very coarse; contains many granules and some pebbles.
1, 211	30	Sand, yellowish-gray (5*Y* 8/1), slightly calcareous, very fine to very coarse; contains some granules. Bedding dips 7°.
1, 220	9	Sand, light greenish-gray (5*GY* 8/1), very fine to very coarse but predominantly fine. Some granules present.
1, 226	6	Sand, light greenish-gray (5*GY* 8/1), very fine to very coarse; contains numerous granules.
1, 234	8	Silt, greenish-gray (5*GY* 6/1), crossbedded. Bedding is horizontal.
1, 236	2	Clay, greenish-gray (5*GY* 6/1), well-indurated, horizontally laminar.
1, 238	2	Sand, greenish-gray (5*GY* 6/1), very fine to very coarse; contains some granules.
1, 242	4	Sand, greenish-gray (5*GY* 6/1), silty, very fine, crossbedded.

Test hole 1—Continued

Depth (feet)	*Unit thickness (feet)*	*Description*
1,243	1	Clay, greenish-gray (5*GY* 6/1), silty.
1,246	3	Silt, greenish-gray (5*GY* 6/1), argillaceous; contains much very fine sand.
1,248	2	Sand, greenish-gray (5*GY* 6/1), argillaceous, silty, very fine to very coarse, contains numerous granules and a few pebbles.
1,251	3	Silt, greenish-gray (5*GY* 6/1), argillaceous, horizontally bedded. A couple of bands of clay grade into argillaceous silt within this unit.
1,252	1	Sand, very light gray (*N* 8), very fine to very coarse; contains some granules. This unit becomes finer grained with increasing depth.
1,254	2	Silt, greenish-gray (5*GY* 6/1), argillaceous, horizontally thin-bedded; contains some very fine sand.
1,256	2	Sand, greenish-gray (5*GY* 6/1) to very light gray (*N* 8), argillaceous, very fine, with distorted bedding. A thin layer of fine to very coarse sand is present at 1,256 feet.
1,258	2	Silt, greenish-gray (5*GY* 6/1), argillaceous, horizontally thin-bedded; contains some very fine sand.
1,258.5	.5	Sand, greenish-gray (5*GY* 6/1), silty, very fine to fine.
1,268	9.5	Silt and clay, greenish-gray (5*GY* 6/1), horizontally thin-bedded; argillaceous silt and silty clay.
1,269	1	Silt, greenish-gray (5*GY* 6/1), argillaceous, massive; contains some very fine sand.
1,271	2	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine to coarse.
1,272	1	Silt, greenish-gray (5*GY* 6/1), argillaceous.
1,280	8	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine to very coarse; contains numerous granules. The sand becomes finer with increasing depth. A volcanic cobble is present at 1,775 feet.
1,282	2	Silt, dark greenish-gray (5*G* 4/1), argillaceous, arenaceous.
1,302	20	Sand, greenish-gray (5*GY* 6/1), calcareous, very fine to very coarse; contains some granules.
1,309	7	Sand, greenish-gray (5*GY* 6/1) to yellowish-gray (5*Y* 8/1), calcareous, silty, very fine; contains a few layers of coarser sand and granules.
1,312	3	Sand, yellowish-gray (5*Y* 8/1), slightly calcareous, well-cemented, very fine to coarse.
1,314	2	Cobbles and pebbles, quartz monzonite. Poor core recovery.
1,336	22	Sand, greenish-gray (5*GY* 6/1) to yellowish-gray (5*Y* 8/1), very fine to coarse.
1,340	4	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine to very coarse; contains numerous granules and a few pebbles.
1,351	11	Silt, greenish-gray (5*GY* 6/1), slightly calcareous, argillaceous, crossbedded; contains some very fine sand. Bedding is horizontal.

Test hole 1—Continued

Depth (feet)	Unit thickness (feet)	Description
1,352	1	Sand, very light gray (*N* 8), calcareous, very fine to very coarse.
1,354	2	Sand, greenish-gray (5*GY* 6/1), very fine to medium.
1,356	2	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, very fine to very coarse; contains numerous granules.
1,359	3	Sand, greenish-gray (5*GY* 6/1), calcareous, very fine, thin-bedded.
1,361	2	Clay, greenish-gray (5*GY* 6/1), silty.
1,363	2	Silt, greenish-gray (5*GY* 6/1), slightly calcareous, argillaceous, arenaceous.
1,363.5	.5	Sand, greenish-gray (5*GY* 6/1), slightly calcareous, silty, very fine.
1,364.5	1	Silt, greenish-gray (5*GY* 6/1), slightly calcareous, contains much very fine sand.
1,365	.5	Sand, greenish-gray (5*GY* 6/1), very fine to medium.
1,369	4	Sand, greenish-gray (5*GY* 6/1), argillaceous, silty, very fine to medium; contains a few thin beds of silt.
1,374	5	Sand, greenish-gray (5*GY* 6/1), calcareous, silty, very fine to very coarse.
1,385	11	Sand, light olive-gray (5*Y* 6/1), slightly calcareous, very fine to very coarse; contains numerous granules and a few pebbles.
1,387	2	Sand, light olive-gray (5*Y* 6/1), calcareous, silty, very fine.
1,393	6	Sand, greenish-gray (5*GY* 6/1), calcareous, silty, very fine to very coarse; contains scattered granules and a few thin horizontal beds of silt.
1,400	7	Sand, greenish-gray (5*GY* 6/1), calcareous, very fine to very coarse; contains numerous granules and a few pebbles.
1,422	22	Sand, light olive-gray (5*Y* 6/1), calcareous, silty, very fine to very coarse, but predominantly fine and medium. A quartz monzonite cobble is present at 1,404 feet and a thin silt layer occurs at 1,415 feet.
1,431	9	Sand, light olive-gray (5*Y* 6/1), slightly calcareous, very fine to very coarse; contains some granules and a few pebbles.
1,436	5	Sand, greenish-gray (5*GY* 6/1), calcareous, silty, very fine.
1,437	1	Sand, light olive-gray (5*Y* 6/1), very fine to very coarse; contains numerous granules and some pebbles.
1,463	26	Sand, greenish-gray (5*GY* 6/1), calcareous, silty, very fine to medium; alternating massive and thin beds.
1,483	20	Sand, greenish-gray (5*GY* 6/1) to light olive-gray (5*Y* 6/1), calcareous, massive, very fine to very coarse; contains granules. Layers of thin-bedded very fine sand occur thoughout this unit.
1,498	15	Sand, greenish-gray (5*GY* 6/1), calcareous, very fine to very coarse; contains numerous granules and a few pebbles. A quartz monzonite cobble is present at 1,483 feet.
1,513	15	Sand; same as that at 1,483 feet.

418067—57——2

Test hole 1—Continued

Depth (feet)	Unit thickness (feet)	Description
1,533	20	Sand, greenish-gray (5*GY* 6/1) to light olive-gray (5*Y* 6/1), calcareous, very fine to very coarse, but predominantly fine and medium. A couple of quartz monzonite pebbles are present at 1,525 feet.
1,561	28	Sand, greenish-gray (5*GY* 6/1) to light olive-gray (5*Y* 6/1), slightly calcareous, silty, very fine to very coarse; contains numerous granules and some pebbles.

Test hole 2

[Thirty percent of core recovered. Depth is to bottom of unit]

40	40	No core. Probably silt and sand.
45	5	Sand, grayish-orange (10*YR* 7/4), calcareous, very fine grained; contains streaks of white carbonate.
65	20	Sand, grayish-orange (10*YR* 7/4), calcareous, very fine to coarse, subangular; contains streaks of white carbonate.
100	35	Sand, grayish-orange (10*YR* 7/4), calcareous, unsorted, fine and very fine, contains small, unoriented streaks of white carbonate.
118	18	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous; contains sand, streaks of white carbonate, and a small amount of black stain in minute fractures. The core breaks along these fractures and gives an appearance of black mottling.
128	10	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous, calcareous; contains black mottling (as described at 118 feet) and horizontal streaks of white carbonate.
138	10	Silt. Same as that described at 128 feet, but color is light brown (5*YR* 6/4).
148	10	No core. Probably silt and sand.
155	7	Silt, grayish-orange (10*YR* 7/4), argillaceous; contains some black mottling (as described at 118 feet).
158	3	Sand, grayish-orange (10*YR* 7/4), very fine.
168	10	No core. Probably poorly consolidated sand.
176	8	Silt, yellowish-gray (5*Y* 7/2), calcareous, well-cemented; contains very fine sand and much white carbonate.
178	2	Clay, pale yellowish-brown (10*YR* 6/2), calcareous; contains much white carbonate.
190	12	No core. Probably poorly consolidated sand and silt.
200	10	Silt, grayish-orange (10*YR* 7/4), calcareous, argillaceous, medium well-cemented; contains much very fine sand.
210	10	Clay, grayish-orange (10*YR* 7/4), calcareous, silty.
223	13	Silt, grayish-orange (10*YR* 7/4), argillaceous, medium well-cemented; contains much very fine sand, small patches of white carbonate, and some black mottling (as described at 118 feet).
225	2	Silt, grayish-orange (10*YR* 7/4), calcareous, argillaceous; contains much very fine sand.
233	8	Clay, pale yellowish-brown (10*YR* 6/2); contains very pale orange (10 *YR* 8/2) lime.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
237	4	Sand, pale-brown (5*YR* 5/2), well-cemented, very fine; contains patches of very pale orange (10*YR* 8/2) carbonate.
240	3	Clay, pale yellowish-brown (10*YR* 6/2); contains patches of white carbonate.
263	23	Clay, moderate yellowish-brown (10*YR* 5/4); contains very pale orange (10*YR* 8/2) patches of carbonate and some black mottling.[2] Two high angle slickensides are in this unit.
317	54	Clay, moderate brown (5*YR* 4/4); contains patches of very pale orange (10*YR* 8/2) carbonate and some thin stringers of white carbonate. Horizontal bedding occurs at 267 feet and a slickenside dipping 50° occurs at 286 feet. Small patches of green clay occur at 315 feet.
325	8	Clay, moderate yellowish-brown (10*YR* 5/4); contains as much as 30 percent of very pale orange (10*YR* 8/2) carbonate.
343	18	Silt, dusky-yellow (5*Y* 6/4), argillaceous; contains as much as 30 percent of white carbonate in patches.
380	37	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains a little white carbonate.
383	3	Sand, grayish-orange (10*YR* 7/4), very fine to coarse, medium well-cemented, with patches of white carbonate.
390	7	Sand, very coarse; indicated only by very coarse sand that coats core from just below this depth; no core recovered.
393	3	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous, calcareous; contains small white limy areas and a little black mottling.[2]
405	12	No core. Probably poorly cemented silt and sand.
405.2	.2	Sand, very pale orange (10*YR* 8/2), calcareous, fine to very coarse, well-cemented.
413	7.8	Clay, grayish-orange (10*YR* 7/4), silty, with small unoriented stringers of white carbonate.
416	3	Gravel; poorly consolidated sand and pebbles.
423	7	Sand, grayish-orange (10*YR* 7/4), silty, argillaceous, very fine; contains irregular patches and stringers of white carbonate.
433	10	Sand, grayish-orange (10*YR* 7/4), silty.
441	8	Clay, grayish-orange (10*YR* 7/4), silty; contains some small white stringers of volcanic ash, a little white carbonate and some black mottling.[2]
442	1	Silt, grayish-orange (10*YR* 7/4), arenaceous; has some horizontal partings partly filled with white volcanic ash.
443	1	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains many horizontal stringers of white lime.

[2] A sample taken at 594 feet is described by R. D. Allen. The black substance can be divided into shiny black and dull brown-black constituents on the basis of hand-lens inspection. The shiny black mineral is hematite; it exhibits deep-red interference color in converging light with crossed nicols. The dull brown-black substance is opaque to translucent (brown) in immersion. It is nonmagnetic and not organic and chemical work would be necessary to identify the mineral.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
444	1	Sand, very pale orange (10*YR* 8/2), calcareous, fine to very coarse, well-cemented; contains some granules.
449	5	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains a little white volcanic ash.
453	4	Silt, grayish-orange (10*YR* 7/4), argillaceous.
454	1	Sand, grayish-orange (10*YR* 7/4), silty, very fine to fine; grades downward to arenaceous silt.
455	1	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous.
460	5	Clay, grayish-orange (10*YR* 7/4) silty; contains some white volcanic ash, especially in horizontal partings.
462	2	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains some white volcanic ash and white carbonate.
470	8	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains horizontally oriented stringers of white carbonate.
483	13	Clay, grayish-orange (10*YR* 7/4); contains black mottling,[2] white volcanic ash, and small stringers of white carbonate.
492	9	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains some white volcanic ash, white carbonate, and black mottling.[2]
493	1	Silt, grayish-orange (10*YR* 7/4), argillaceous; contains small, short stringers of white volcanic ash.
505	12	Sand; probably sediments of same color as above and ranging in grain size from clay to pebbles but predominantly sand.
524	19	Sand, grayish-orange (10*YR* 7/4), silty, calcareous, very fine, medium well-cemented.
525	1	Sand, grayish-orange (10*YR* 7/4), calcareous, unsorted, very fine to very coarse, well-cemented.
535	10	Sand, grayish-orange (10*YR* 7/4), calcareous, fine and very fine, well-cemented.
536	1	Sand, grayish-orange (10*YR* 7/4), calcareous, very fine to very coarse, pebbly.
540	4	Clay, grayish-orange (10*YR* 7/4); contains some white carbonate and some white volcanic ash, especially in horizontal partings.
540.5	.5	Sand, grayish-orange (10*YR* 7/4), fine.
541.5	1	Clay, grayish-orange (10*YR* 7/4), silty, with some black mottling[2] and horizontal partings filled with white volcanic ash.[3]
545	3.5	Sand, grayish-orange (10*YR* 7/4), calcareous, fine and very fine, well-cemented; contains horizontal streaks of white carbonate and volcanic ash.
558	13	Sand, grayish-orange (10*YR* 7/4), silty, very fine and fine, medium well-cemented.
562	4	Sand, grayish-orange (10*YR* 7/4), silty, unsorted, very fine, fine, and medium, medium well-cemented; contains a little white volcanic ash.

[2] See footnote 2, p. 71.

[3] Silica-rich volcanic glass. The index of refraction averages about 1.455, slightly lower than that for pure silica glass because microscopic (and probably submicroscopic) pores depress the index. Determination by R. D. Allen.

Test hole 2—Continued

Depth (feet)	*Unit thickness (feet)*	*Description*
567	5	Sand, grayish-orange (10*YR* 7/4), silty, medium well-cemented.
569	2	Silt, grayish-orange (10*YR* 7/4), argillaceous; contains some white volcanic ash and some black mottling.[2]
575	6	Sand, grayish-orange (10*YR* 7/4), calcareous, very fine to coarse, well-cemented.
579	4	Clay, grayish-orange (10*YR* 7/4), silty; contains small amounts of white volcanic ash and a little black mottling.[2]
581	2	Sand, very pale orange (10*YR* 8/2), calcareous, fine to very coarse, well-cemented.
590	9	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous.
593	3	Silt, grayish-orange (10*YR* 7/4), argillaceous, slightly arenaceous.
595	2	Clay, grayish-orange (10*YR* 7/4); contains small amounts of white volcanic ash and black mottling.[2]
596	1	Silt, very pale orange (10*YR* 8/2), argillaceous.
597	1	Silt, very pale orange (10*YR* 8/2), arenaceous.
598	1	Sand, very pale orange (10*YR* 8/2), silty.
600	2	Sand, very pale orange (10*YR* 8/2), to white (*N* 9), calcareous, very fine, well-cemented.
601	1	Silt, grayish-orange (10*YR* 7/4), arenaceous.
605	4	Silt, grayish-orange (10*YR* 7/4), argillaceous; contains some white volcanic ash and black mottling.[2]
607	2	Silt, grayish-orange (10*YR* 7/4), arenaceous; contains some white volcanic ash.
617	10	Silt, grayish-orange (10*YR* 7/4); contains some white volcanic ash.
637	20	No core; probably poorly consolidated sand.
641	4	Silt, grayish-orange (10*YR* 7/4).
645	4	Silt, very pale orange (10*YR* 8/2), argillaceous, with a little black mottling.[2]
649	4	Silt, very pale orange (10*YR* 8/2), calcareous.
655	6	Silt, very pale orange (10*YR* 8/2), arenaceous; contains a little white volcanic ash.
656	1	Clay, very pale orange (10*YR* 8/2), silty; contains a little white volcanic ash and some black mottling.[2]
666	10	Silt, very pale orange (10*YR* 8/2), calcareous, arenaceous.
666.5	.5	Clay, grayish-orange (10*YR* 7/4), calcareous.
670	3.5	Sand, grayish-orange (10*YR* 7/4), silty, very fine to very coarse; medium well-cemented; contains granules.
671	1	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous.
676	5	Sand, grayish-orange (10*YR* 7/4), silty, unsorted, very fine to very coarse.
678	2	Clay, grayish-orange (10*YR* 7/4), black mottled.[2]
679	1	Silt, grayish-orange (10*YR* 7/4), arenaceous.
682	3	Clay, grayish-orange (10*YR* 7/4), silty, with some black mottling.[2]
685	3	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous.

[1] See footnote 2, p. 71.
[2] See footnote 3, p. 72.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
685.5	0.5	Sand, very pale orange (10*YR* 8/2), calcareous, very fine to coarse, well-cemented.
686	.5	Sand, grayish-orange (10*YR* 7/4), silty, very fine.
691	5	Clay, grayish-orange (10*YR* 7/4), slightly silty, contains some white volcanic ash and black mottling.[2]
694	3	Silt, grayish-orange (10*YR* 7/4), calcareous; contains patches and horizontal stringers of white carbonate.
696	2	Clay, grayish-orange (10*YR* 7/4), with a little black mottling.[2]
706	10	Sand, grayish-orange (10*YR* 7/4), silty, very fine to very coarse; contains some granules.
716	10	Sand, grayish-orange (10*YR* 7/4), silty, pebbly. Granitic and metamorphic pebbles were cored.
717	1	Sand, very pale orange (10*YR* 8/2), calcareous, fine to very coarse; contains some granules.
721	4	Sand, very pale orange (10*YR* 8/2), silty, very fine and fine.
724	3	Clay, very pale orange (10*YR* 8/2) to grayish-orange (10*YR* 7/4), silty, with some black mottling.[2]
726	2	Sand, very pale orange (10*YR* 8/2), silty, fine to very fine.
728	2	Silt, grayish-orange (10*YR* 7/4), argillaceous.
730	2	Silt, very pale orange (10*YR* 8/2), calcareous, arenaceous.
732	2	Silt, grayish-orange (10*YR* 7/4), arenaceous.
734	2	Sand, very pale orange (10*YR* 8/2), silty, fine.
739	5	Silt, very pale orange (10*YR* 8/2), argillaceous, arenaceous, with some black mottling.[2]
742	3	Sand, grayish-orange (10*YR* 7/4), silty, fine.
745	3	Silt, grayish orange (10*YR* 7/4), with some black mottling [2] and some dark yellowish-orange (10*YR* 6/6) clay.
757	12	Sand, grayish-orange (10*YR* 7/4) silty, fine to very fine; contains as much as 20 percent medium and coarse sand and granules.
760	3	Sand, very pale orange (10*YR* 8/2), very fine.
764	4	Silt, very pale orange (10*YR* 8/2), argillaceous; contains very little black mottling [2] and white volcanic ash.
770	6	Silt, very pale orange (10*YR* 8/2), arenaceous, calcareous; streaked with white carbonate.
772	2	Clay, very pale orange (10*YR* 8/2), silty; streaked with white carbonate.
776	4	Silt, very pale orange (10*YR* 8/2), arenaceous.
786	10	No core. Probably sand.
788	2	Sand, very pale orange (10*YR* 8/2), silty, very fine.
790	2	Silt, very pale orange (10*YR* 8/2).
791	1	Sand, very pale orange (10*YR* 8/2), to white (*N* 9) calcareous, very fine to coarse.
793	2	Silt, very pale orange (10*YR* 8/2), calcareous, arenaceous; contains streaks and patches of white volcanic ash.
796	3	Silt, very pale orange (10*YR* 8/2), calcareous, arenaceous; contains bands and streaks of white carbonate.
798	2	Sand, very pale orange (10*YR* 8/2), silty, very fine.

[2] See footnote 2, p. 71.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
800	2	Silt, grayish-orange (10*YR* 7/4), argillaceous.
805	5	Silt, very pale orange (10*YR* 8/2) to white (*N* 9), calcareous, arenaceous; becomes more arenaceous with depth.
807	2	Sand, very pale orange (10*YR* 8/2), silty, very fine to coarse sand; contains white volcanic ash.
816	9	Sand, very pale orange (10*YR* 8/2), very fine; contains a little white volcanic ash.
817	1	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous.
824	7	Sand, grayish-orange (10*YR* 7/4), silty, very fine; contains some black mottling.[2]
826	2	Silt, very pale orange (10*YR* 8/2), argillaceous.
835	9	Silt, very pale orange (10*YR* 8/2), arenaceous, calcareous.
836	1	Sand, very pale orange (10*YR* 8/2), silty, very fine.
845	9	Silt, grayish-orange (10*YR* 7/4), argillaceous, arenaceous, calcareous, with a little black mottling [2] and white volcanic ash. Slickensides dipping 75° occur at 836 feet.
850	5	Sand, grayish-orange (10*YR* 7/4), very fine to coarse.
856	6	Gravel; only granitic, volcanic, and metamorphic pebbles and cobbles cored, but these probably embedded in a sand matrix.
857	1	Sand, very pale orange (10*YR* 8/2), silty, very fine.
861	4	Silt, very pale orange (10*YR* 8/2), highly calcareous, arenaceous. Horizontal slickensides on a vertical shear occur here.
866	5	Sand, very pale orange (10*YR* 8/2), silty, calcareous, very fine to coarse; contains some white volcanic ash.
868	2	Silt, grayish-orange (10*YR* 7/4); contains some white volcanic ash.
870	2	Silt, very pale orange (10*YR* 8/2), calcareous, arenaceous.
895	25	Silt, grayish-orange (10*YR* 7/4) to very pale orange (10*YR* 8/2), argillaceous; contains much white carbonate.
896	1	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous.
904	8	No core. Probably silt.
913	9	Silt, grayish-orange (10*YR* 7/4), calcareous.
922	9	Sand, grayish-orange (10*YR* 7/4), silty, very fine.
924	2	Silt, grayish-orange (10*YR* 7/4).
933	9	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous.
944	11	Sand, grayish-orange (10*YR* 7/4), calcareous, silty, very fine to coarse, but predominantly fine.
947	3	Sand, grayish-orange (10*YR* 7/4), calcareous, very fine to very coarse, but predominantly coarse.
958	11	Silt, grayish-orange (10*YR* 7/4), arenaceous.
963	5	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous.
964	1	Sand, grayish-orange (10*YR* 7/4), medium to coarse.
976	12	Silt, grayish-orange (10*YR* 7/4), slightly calcareous; contains fine and very fine sand. At 975 feet there is a 4-inch band of limy silt.

[2] See footnote 2, p. 71.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
978	2	Silt, grayish-orange (10*YR* 7/4), calcareous; contains granules, much medium to very coarse sand, and much white carbonate.
982	4	Silt, grayish-orange (10*YR* 7/4).
984	2	Silt, grayish-orange (10*YR* 7/4); contains coarse to very coarse sand and granules.
986	2	Silt, grayish-orange (10*YR* 7/4); contains much white carbonate and medium to very coarse sand and granules.
995	9	Silt, grayish-orange (10*YR* 7/4), highly arenaceous.
995.2	.2	Sand, grayish-orange (10*YR* 7/4), very coarse, pebbly.
1,008	12.8	Silt, grayish-orange (10YR 7/4), arenaceous.
1,012	4	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous, well-cemented.
1,012.2	.2	Sand, grayish-orange (10*YR* 7/4), fine, very well cemented.
1,014	1.8	Silt, grayish-orange (10*YR* 7/4), slightly arenaceous.
1,024	10	Sand, grayish-orange (10*YR* 7/4), silty, coarse to very coarse. Poor core recovery.
1,025	1	Silt, grayish-orange (10*YR* 7/4), arenaceous, slightly calcareous.
1,026	1	Silt, grayish-orange (10*YR* 7/4), slightly calcareous.
1,028.5	2.5	Silt, grayish-orange (10*YR* 7/4), argillaceous.
1,029	.5	Silt, medium light-gray (*N*6), slightly calcareous.
1,033	4	Silt, grayish-orange (10*YR* 7/4), arenaceous.
1,035	2	Sand, grayish-orange (10*YR* 7/4) silty, fine and very fine.
1,038	3	Silt, grayish-orange (10*YR* 7/4), arenaceous; calcareous in places. A few small spots of pale blue-green (5*BG* 7/2) silt present.
1,039	1	Silt, light olive-gray (5*Y* 6/1), calcareous.
1,040	1	Silt, very light gray (*N* 8), calcareous.
1,043	3	Silt, light olive-gray (5*Y* 6/1), arenaceous.
1,045	2	Sand, very pale orange (10*YR* 8/2), calcareous, silty, fine and very fine.
1,048	3	Silt, grayish-orange (10*YR* 7/4), arenaceous.
1,053	5	Silt, grayish-orange (10*YR* 7/4), crossbedded.
1,054	1	Silt, grayish-orange (10*YR* 7/4), arenaceous.
1,065.5	11.5	Silt, grayish-orange (10*YR* 7/4), arenaceous; calcareous in places.
1,065.7	.2	Sand, very pale orange (10*YR* 8/2), calcareous, silty, fine to coarse.
1,066	.3	Silt; same as that described at 1,065.5 feet.
1,069	3	Silt, yellowish-gray (5*Y* 7/2), arenaceous; calcareous in places.
1,073	4	Sand, yellowish-gray (5*Y* 8/1), silty, very fine to coarse.
1,073.5	.5	Silt, yellowish-gray (5*Y* 8/1), arenaceous.
1,074	.5	Clay, dark yellowish-brown (10*YR* 4/2).
1,076	2	Silt, yellowish-gray (5*Y* 7/2), argillaceous.
1,081	5	Silt, yellowish-gray (5*Y* 7/2), calcareous, arenaceous.
1,084	3	Silt, moderate yellowish-brown (10*YR* 5/4), arenaceous.
1,084.2	.2	Sand, very pale orange (10*YR* 8/2), calcareous, fine to very coarse.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
1,090	5.8	Gravel; granitic and volcanic pebbles and cobbles cored, but matrix probably silt and sand.
1,095	5	Silt, moderate yellowish-brown (10*YR* 5/4), arenaceous.
1,102	7	Sand, very pale orange (10*YR* 8/2), calcareous, silty, fine to very coarse, but predominantly fine.
1,124	22	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous. Poor core recovery.
1,136	12	Silt, grayish-orange (10*YR* 7/4), slightly arenaceous; calcareous in places.
1,142	6	Silt, yellowish-gray (5*Y* 7/2), calcareous, arenaceous; cross-bedded at 1,136 feet.
1,144	2	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous. Some white volcanic ash occurs at 1,144 feet.
1,146	2	Silt, yellowish-gray (5*Y* 7/2).
1,146.2	.2	Sand, very pale orange (10*YR* 8/2), very fine to very coarse.
1,149	2.8	Silt, grayish-orange (10*YR* 7/4).
1,155	6	Silt, yellowish-gray (5*Y* 7/2), arenaceous.
1,156	1	Silt, grayish-orange (10*YR* 7/4), calcareous, argillaceous, arenaceous.
1,164	8	Sand, yellowish-gray (5*Y* 7/2), silty, very fine to fine.
1,164.2	.2	Sand, very pale orange (10*YR* 8/2), calcareous, very fine to very coarse.
1,174	9.8	Silt, grayish-orange (10*YR* 7/4) to very pale orange (10*YR* 8/2), limy, arenaceous.
1,180	6	Silt, yellowish-gray (5*Y* 7/2), calcareous. Poor core recovery.
1,184	4	Silt, very pale orange (10*YR* 8/2), calcareous, arenaceous.
1,187	3	Silt, yellowish-gray (5*Y* 7/2), arenaceous; calcareous at 1,184 feet.
1,191	4	Silt, very pale orange (10*YR* 8/2).
1,201	10	Silt, yellowish-gray (5*Y* 7/2), arenaceous; calcareous in places.
1,202	1	Silt, grayish-orange (10*YR* 7/4), calcareous, arenaceous.
1,220	18	Gravel; granitic and volcanic pebbles and cobbles cored, but matrix probably sand and silt.
1,233	13	Sand, yellowish-gray (5*Y* 7/2), silty, very fine to very coarse.
1,236	3	Sand, yellowish-gray (5*Y* 7/2), silty, very fine.
1,241	5	Silt, grayish-orange (10*YR* 7/4), arenaceous.
1,244	3	Sand, very pale orange (10*YR* 8/2), silty, very fine to very coarse; contains granules and pebbles. Coarseness increases with depth.
1,266	22	Gravel; granitic and volcanic pebbles and cobbles and a small amount of grayish-orange (10*YR* 7/4), arenaceous silt cored.
1,270	4	Sand, grayish-orange (10*YR* 7/4), silty, very fine to very coarse.
1,316	46	Gravel; granitic and volcanic pebbles and cobbles averaging between 1 and 2 inches in diameter comprise most of core, but matrix probably sand and silt.

Test hole 2—Continued

Depth (feet)	Unit thickness (feet)	Description
1,318	2	Clay, light olive-gray (5Y 5/2); contains silt and very fine sand. This is rubbery when wet.
1,340	22	Gravel; granitic and volcanic pebbles and cobbles cored, but matrix probably sand, silt, and clay.
1,346	6	No core. A bit sample at 1,346 feet is light-olive (5Y 5/2), clay, silt, and sand.
1,348	2	Sand, yellowish-gray (5Y 7/2), silty, very fine to very coarse, with very fine sand predominating. Some granules present.
1,378	30	Sand, yellowish-gray (5Y 7/2), silty, poorly consolidated, very fine. No core from 1,356-1,376 feet, but this is probably the same material.
1,382	4	Gravel; volcanic and granitic pebbles and cobbles cored, but matrix probably fine sand.
1,386	4	Silt; a light olive-gray (5Y 6/1), argillaceous silt bit sample was obtained at 1,386 feet.
1,387	1	Silt, yellowish-gray (5Y 7/2), arenaceous, with the sand being very fine.
1,389	2	Silt, yellowish-gray (5Y 7/2), argillaceous, arenaceous; contains granitic and volcanic pebbles.
1,391	2	Silt, dusky-yellow (5Y 6/4), highly arenaceous.
1,396	5	Sand, yellowish-gray (5Y 7/2), silty, very fine.
1,417	21	Silt, yellowish-gray (5Y 7/2), with much very fine sand and a few very thin streaks of dark yellowish-brown (10YR 4/2), clay in bedding planes dipping 10°.
1,430	13	Gravel; granitic and volcanic pebbles and cobbles as much as 3 inches in diameter cored, but matrix probably sand and silt.
1,431	1	Silt, yellowish-gray (5Y 7/2); some very fine sand.
1,436	5	Gravel; granitic and volcanic pebbles and cobbles cored, but matrix probably silt and sand.
1,437	1	Clay, yellowish-gray (5Y 7/2), silty, arenaceous; very sticky when wet.
1,468	31	Gravel; granitic and volcanic pebbles and cobbles cored, but matrix probably silt and sand. No core from 1,456 to 1,466 feet.
1,470	2	Silt, grayish-orange (10YR 7/4), argillaceous, arenaceous.
1,478	8	Gravel; granitic and metamorphic pebbles and cobbles cored, but matrix probably silt and sand.
1,484	6	Silt, grayish-orange (10YR 7/4), arenaceous.
1,487	3	Silt, yellowish-gray (5Y 7/2), arenaceous.
1,491	4	Gravel; granitic and volcanic pebbles and cobbles cored, but matrix probably silt and sand.
1,496	5	No core. Probably silt and sand.
1,505	9	Gravel; granitic and volcanic pebbles and cobbles in a yellowish-gray (5Y 7/2) arenaceous silt.
1,511	6	Silt, grayish-orange (10YR 7/4); contains much very fine sand.
1,547	36	Gravel; granitic pebbles and cobbles and yellowish-gray (5Y 7/2) arenaceous silt cored.

Test hole 2—Continued

Depth (feet)	*Unit thickness (feet)*	*Description*
1, 556	9	Silt, yellowish-gray (5*Y* 7/2), argillaceous, arenaceous.
1, 577	21	Silt, yellowish-gray (5*Y* 7/2) arenaceous; calcareous in places.
1, 590	13	Silt, yellowish-gray (5*Y* 7/2), argillaceous, arenaceous.
1, 604	14	Silt, very light gray (*N* 8), calcareous, arenaceous.
1, 658	54	Gravel; granitic and volcanic pebbles and cobbles in yellowish-gray (5*Y* 7/2) to dusky yellow-green (5*GY* 5/2) clay, silt, and sand.
1, 664	6	Silt, yellowish-gray (5*Y* 8/1), arenaceous.
1, 672	8	Gravel; granitic and volcanic pebbles and cobbles in a matrix of light olive-gray (5*Y* 6/1) clay, silt, and sand.
1, 703	31	Silt, light olive-gray (5. 6/1), calcareous, well-cemented; contains some very fine sand.
1, 714. 5	11. 5	Silt, greenish-gray (5*GY* 6/1), calcareous, very well-cemented; contains some very fine sand.

LITERATURE CITED

Bowen, O. E., Jr., 1954, Geology and mineral deposits of Barstow quadrangle, San Bernardino County, Calif.: Calif. Div. Mines Bull. 165, p. 76–88.

Gale, H. S., 1946, Geology of the Kramer borate district, Kern County, Calif.: Calif. Jour. Mines and Geology, v. 42, p. 325–378.

Goddard, E. N. (chm.), and others, 1948, Rock-color chart: Washington, D. C., Natl. Research Council.

Wentworth, C. K., 1922, A scale of grade and class terms for clastic sediments: Jour. Geology, v. 30, p. 377–392.

U. S. GOVERNMENT PRINTING OFFICE: 1957