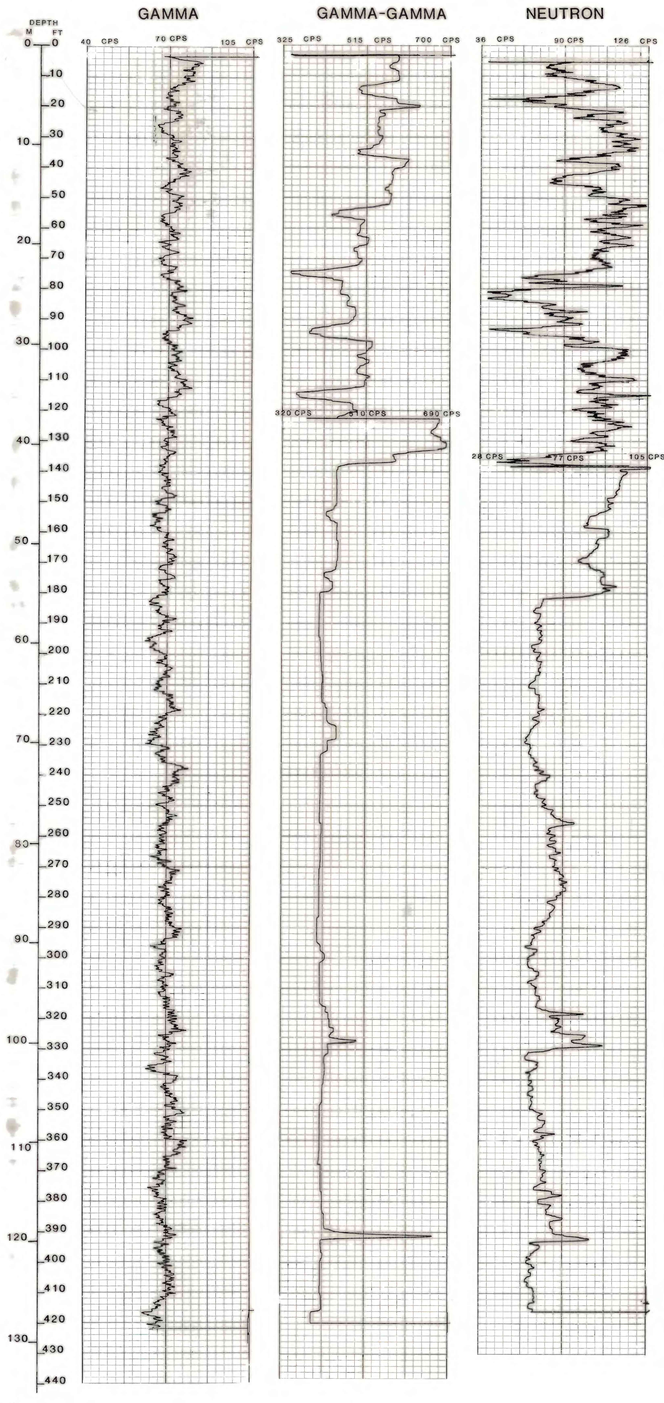
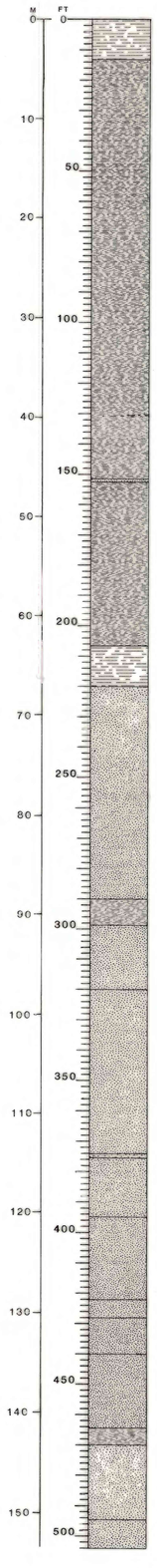
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 91-267
PLATE 1 OF 1

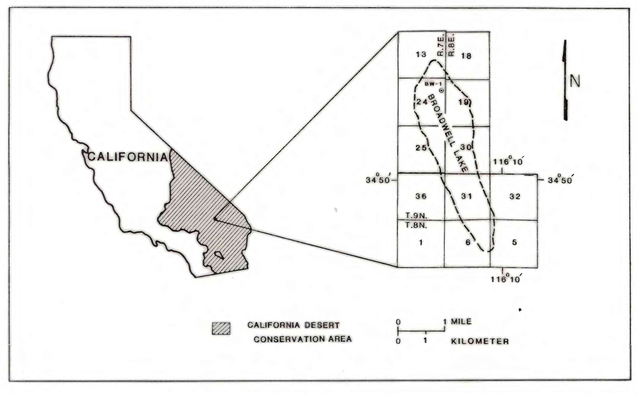
GEOPHYSICAL LOGS FROM BROADWELL DRY LAKE TEST WELL NO. 1



LITHOLOGIC LOGS FROM BROADWELL DRY LAKE TEST WELL NO. 1



Depth (Feet)	Depth (Meters)	Description
0 - 13	0 - 4.0	SILT, clayey, moderate-yellowish-brown (10YR 5/4), unconsolidated
13 - 151	4.0 - 46.0	CLAY, silty, moderate-yellowish-brown (10YR 5/4). Unit includes rare (1 percent or less) salt crystals at 42 - 49 ft (12.8 - 14.9 m) and minor (less than 5 percent) coarse sand from 123 ft (27.5 m) to base of unit. BW-1-1 collected from this unit
151 - 152.5	46.0 - 46.5	SAND, dark-yellowish-brown (10YR 4/2), very fine to fine
152.5 - 207	46.5 - 63.1	CLAY, silty, moderate brown (5YR 4/4). Silt and sand content increases from less than 5 percent and 1 percent, respectively, to 10 percent silt and sand from 170 ft (51.8 m) to base of unit
207 - 220	63.1 - 67.1	SILT, clayey, dark-yellowish-brown (10YR 4/2)
220 - 290	67.1 - 88.4	SAND, dark-yellowish-brown (10YR 4/2), very fine to fine, occasional thin (less than 1 ft, 0.3 m) interbeds of moderate brown (5Y 4/4) and dark-yellowish-brown (10YR 4/2) CLAY. Sand beds include abundant (greater than 10 percent) mafic minerals
290 - 299	88.4 - 91.1	CLAY, moderate brown (5Y 4/4) and pale olive (10Y 6/2), calcareous
299 - 320	91.1 - 97.5	SAND, silty, dark-yellowish-brown (10YR 4/2), very fine to fine, occasional angular granitic granule 0.1 in. (2.5 mm) maximum diameter
320 - 374	97.5 - 114.0	SAND, same as above, interbedded with moderate-yellowish-brown (10YR 5/4) CLAY
374 - 375	114.0 - 114.3	SANDSTONE, dark-yellowish-brown (10YR 4/2), very hard
375 - 395	114.3 - 120.4	SAND, dark-yellowish-brown (10YR 4/2), coarse, interbedded with moderate-yellowish-brown (10YR 5/4) CLAY. Sand beds include occasional angular, dark, fine-grained granitic granules, 0.1 in. (2-3 mm) maximum diameter
395 - 422	120.4 - 128.6	SAND, dark-yellowish-brown (10YR 4/2), very fine to fine, and dark-yellowish-brown SILT interbedded with moderate-yellowish-brown (10YR 5/4) CLAY
422 - 428	128.6 - 130.5	SAND, dark-yellowish-brown (10YR 4/2) very fine to fine, and 5 percent GRAVEL of rounded andesite granules
428 - 440	130.5 - 134.1	SAND interbedded with CLAY, same as interval 375 - 395 ft (114.3 - 120.4 m)
440 - 465	134.1 - 141.7	SAND and SILT, interbedded with CLAY, same as interval 395 - 422 ft (120.4 - 128.6 m)
465 - 470	141.7 - 143.3	CLAY, sandy, pale olive (10Y 6/2) and moderate yellowish-brown (10YR 5/4)
470 - 495	143.3 - 150.9	SAND and SILT, interbedded with CLAY, same as interval 395 - 422 ft (120.4 - 128.6 m)
495 - 504	150.9 - 153.6	SAND, silty, dark-yellowish-brown (10YR 4/2) fine to medium. BW-1-2 collected from this unit



TEST WELL LOCATION

BW-1 Latitude: 34°51' 38"
Longitude: 116°11' 20"
SE¼NE¼ Sec. 24, T. 9 N., R. 7 E.
San Bernardino Meridian

INTRODUCTION

Geophysical, lithologic, and water quality data from Broadwell Dry Lake, California, were obtained in July, 1978. These data provide feasible mineral resource input to the Bureau of Land Management's comprehensive long-range plan, authorized by the Federal Land Policy and Management Act of October 21, 1976 (Public Law 94-579), for the management, use, development, and protection of public lands within the California Desert Conservation Area (index map).

DRILLING AND LITHOLOGIC LOGGING TECHNIQUES

The test well was completed by the reverse circulation drilling technique. Drilling fluids, either air or water or both, are pumped down the outer annulus of dual-wall drill pipe to an open-throat button bit. The drilling fluids and cuttings then are forced up the inner annulus of the drill pipe to the surface. This technique assures recovery of uncontaminated sediment and water samples. In situ ground water is used as a drilling fluid as much as possible; otherwise a fine mist of imported fresh water and air is used.

Lithologic characteristics of the samples of the drill cuttings are described in the field. Field descriptions are later supplemented by laboratory examination. The rock color chart (Goddard and others, 1948) is used to color classify damp to wet samples. Sediment names are described by Wentworth (1922). Percentage of lithologic constituents listed in the lithologic description are approximate. "No Recovery" is used where samples are not collected.

WATER QUALITY

Water samples are collected at the first aquifer with significant flow and at total depth (T.D.) by stopping drill rotation and pumping air through the drill string. The aquifer is allowed to flow for several minutes before a water sample is collected. The water temperature, pH, and specific gravity of raw and filtered untreated samples are measured in the field.

GEOPHYSICAL LOGGING TECHNIQUES

Radioactive geophysical logs, including gamma, gamma-gamma, and neutron logs, are obtained from the land surface to a depth of 128.6 m (422 ft). Radioactive logs are run through the drill pipe because the playa sediments would squeeze in and heal the test well before conventional electric logs could be completed in a open test well. Total thickness of the dual-wall drill pipe is 15.88 mm (0.63 in.) The radioactive source of the gamma-gamma log is Cesium (Cs^{137}); Americium-Beryllium (Am^{241}-Be) source is used for the neutron log.

GEOPHYSICAL LOGGING PARAMETERS

	Natural Gamma	Gamma-Gamma	Neutron
Scale switch (CPS)	0-50	0-100	0-50
Time constant (seconds)	4	4	4
Position potential (dial division)	10	2.0 & 1.7	9.6 & 5.0
Sensitivity potential (span: dial division)	10	3.07 & 3.0	4.7 & 2.0
Input pulse (volts)	1.2	1.2	1.2
Polarity (N = Negative, P = Positive)	N	N	N
Logging speed (ft/min)	17	17	17
Tool length (ft)	2.8	2.8	4.5
Source spacing (in.)		16	6

ACKNOWLEDGMENTS

G. Thomas Server provided laboratory lithologic descriptions. Geophysical logging was performed by James Cathcart of the Office of Energy Resources, U.S. Geological Survey, Denver, Colorado.

REFERENCES

Goddard, E.N., chm, and others, 1949, Rock-color chart: National Research Council; reprinted by Geological Society of America, 1951, 1963, 1970, 6 p.

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

WATER QUALITY DATA FROM BROADWELL DRY LAKE TEST WELL NO. 1
(Analyses by U.S. Geological Survey, Water Resource Division, Denver Colorado)

Test Well number	Date of collection	Depth of water sample (ft)	Water temperature (°C)	pH lab	pH field	Specific gravity	Specific conductance (microhms/cm at 25°C)	Percent sodium	SAR* (sodium absorption rate)
BW-1-1	7/6/78	135	29.1	7.7	7.8	1.010	8,547	87	33
BW-1-2	7/6/78	504		7.7	7.8	1.015	10,800	95	76

Results in mg/L

Test Well number	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Phosphorus (P)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Total Nitrate (NO_2+NO_3)	Iodide (I)
BW-1-1	7.1	180	16	1,700	20	0.00	1,200	2,100	7.3	2.1	0.35
BW-1-2	18	65	6.3	2,400	63	0.00	1,700	2,600	8.9	0.72	0.33

Results in mg/L

Test Well number	Bicarbonate (HCO_3)+	Manganese (Mn)	Iron (FE)	Boron (B)	Lithium (Li)	Strontium (Sr)	Uranium (U)	Solids, residue on evaporation at 180°C (TDS)	Total Alkalinity Calcium Carbonate ($CaCO_3$)	Total Hardness	Percent Difference
BW-1-1	134	0.370	0.410	10.000	0.180	1.800		5,370	110	520	-1.28
BW-1-2	171	0.160	0.380	8.800	1.500	0.920	0.0049	6,660	140	190	-1.03

* SAR — Water Classification

SAR	Water Classification
10	Excellent
10-18	Good
18-26	Fair
26	Poor

+ Calculated.

GEOPHYSICAL, LITHOLOGIC, AND WATER QUALITY DATA FROM BROADWELL DRY LAKE, SAN BERNARDINO COUNTY, CALIFORNIA

BY

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1991

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.