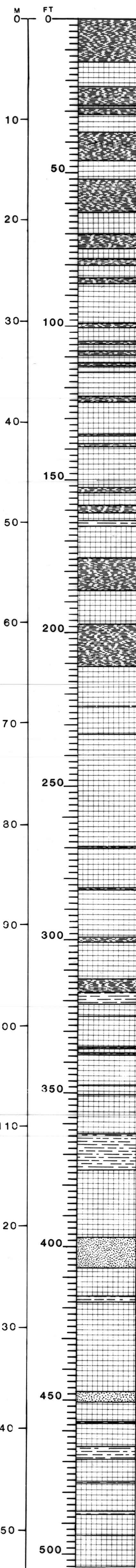
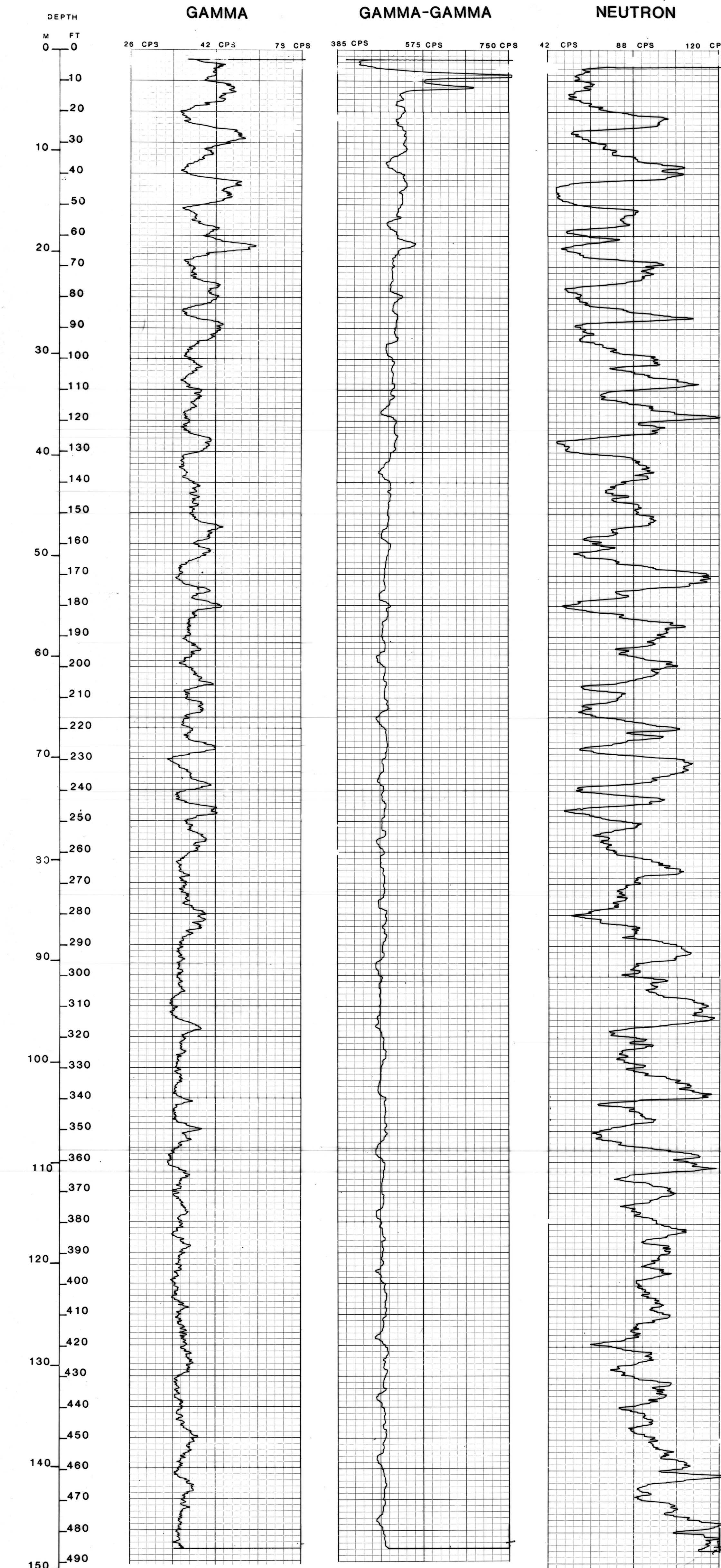


GEOPHYSICAL LOGS FROM BRISTOL DRY LAKE TEST WELL NO. 1

LITHOLOGIC LOGS FROM BRISTOL DRY LAKE TEST WELL NO. 1



Depth (Feet)	Depth (Meters)	Description
0 - 14	0 - 4.3	CLAY, silty, green, saline efflorescence crust at surface
14 - 22	4.3 - 6.7	SALT, mixed with 10 percent moderate-yellowish-brown (10YR 5/4) calcareous SILT
22 - 28	6.7 - 8.5	CLAY, dark-yellowish-brown (10YR 4/2), moderate-yellowish-brown (10YR 5/4), moderate brown (5YR 4/4), light-olive-gray (5Y 5/2), and moderate-olive-brown (5Y 4/4), calcareous
28 - 29	8.5 - 8.8	SALT
29 - 31	8.8 - 9.4	CLAY, moderate-yellowish-brown (10YR 5/4), calcareous
31 - 37.5	9.4 - 11.4	SALT, mixed with 10 percent light-olive-gray (5Y 5/2) calcareous SILT
37.5 - 46	11.4 - 14.0	CLAY, silty, moderate-yellowish-brown (10YR 5/4), calcareous
46 - 52	14.0 - 15.8	SALT, interbedded with dark-yellowish-brown (10YR 4/2) calcareous silty CLAY
52 - 63	15.8 - 19.2	CLAY, silty, dark-yellowish-brown (10YR 4/2), calcareous
63 - 70	19.2 - 21.3	SALT, clean from 63 - 67 ft (19.2 - 20.4 m), mixed with 10 percent dark-yellowish-brown (10YR 4/2) calcareous SILT from 67 - 70 ft (20.4 - 21.3 m)
70 - 75	21.3 - 22.9	CLAY, silty, light-olive-gray (5Y 5/2), calcareous
75 - 78	22.9 - 23.8	SALT and SILT, same as interval 31 - 37.5 ft (9.4 - 11.4 m)
78 - 80	23.8 - 24.4	CLAY, variegated dark-yellowish-brown (10YR 4/2) and dark gray (N3), calcareous
80 - 84	24.4 - 25.6	SALT
84 - 86	25.6 - 26.2	CLAY, silty, moderate-olive-brown (5Y 4/4) and dark-yellowish-brown (10YR 4/2), calcareous
86 - 99.5	26.2 - 30.3	SALT, clean from 86 - 92 ft (26.2 - 28.0 m), mixed with 5 percent dark-yellowish-brown (10YR 4/2) calcareous SILT from 92 - 99.5 ft (28.0 - 30.3 m). BR-1-1 collected from this unit
99.5 - 100.5	30.3 - 30.6	CLAY, silty, grayish-olive, (10Y 4/2), calcareous
100.5 - 115	30.6 - 35.1	SALT, with interbeds of dark-yellowish-brown (10YR 4/2) calcareous CLAY at 105 - 105.5 ft (32.0 - 32.2 m), 108 - 109.5 ft (32.9 - 33.4 m), and 112 - 113 ft (34.1 - 34.4 m)
115 - 123	35.1 - 37.5	SALT, mixed with 5 percent dark-yellowish-brown (10YR 4/2) calcareous SILT
123 - 124.5	37.5 - 37.9	CLAY, light-olive-gray (5Y 5/2), calcareous
124.5 - 163	37.9 - 49.7	SALT, mixed with 5 percent light-olive-gray (5Y 5/2) calcareous SILT. Unit includes interbeds of dark-yellowish-brown (10YR 4/2) calcareous silty CLAY at 135 - 135.5 ft (41.1 - 41.3 m), grayish-olive (10Y 4/2) calcareous CLAY at 138 - 139 ft (42.1 - 42.4 m), and dark-yellowish-brown calcareous CLAY at 158.5 - 161 ft (48.3 - 49.1 m)
163 - 165	49.7 - 50.3	SILT, light-olive-gray (5Y 5/2) calcareous
165 - 175.5	50.3 - 53.5	SALT, mixed with 5 percent light-olive-gray (5Y 5/2) calcareous SILT. Unit includes interbeds of light-olive-gray calcareous CLAY at 169.5 - 170.5 ft (51.7 - 52.0 m) and 173 - 173.5 ft (52.7 - 52.9 m)
175.5 - 186	53.5 - 56.7	CLAY, light-olive-gray (5Y 5/2), calcareous, mixed with SALT
186 - 197	56.7 - 60.0	SALT, mixed with 5 percent light-olive-gray (5Y 5/2) calcareous SILT
197 - 211	60.0 - 64.3	CLAY, dark-yellowish-brown (10YR 4/2), calcareous, mixed equally with SALT. Unit includes interbeds of grayish-olive (10Y 4/2) calcareous CLAY at 201 - 201.5 ft (61.3 - 61.6 m)
211 - 224	64.3 - 68.3	SALT, mixed with 5 percent light-olive-gray (5Y 5/2) calcareous SILT. Unit includes 25 percent dark-yellowish-brown (10YR 4/2) calcareous CLAY from 216 - 220 ft (65.4 - 67.1 m)
224 - 233	68.3 - 71.0	SALT
233 - 313	71.0 - 95.4	SALT, mixed with 5 to 15 percent dark-yellowish-brown (10YR 4/2) and light-olive-gray (5Y 5/2) calcareous SILT. Unit includes interbeds of dark-yellowish-brown silty CLAY at 249.5 - 250 ft (76.0 - 76.2 m), and light-olive-gray calcareous CLAY at 269.5 - 270 ft (82.1 - 82.3 m), 283 - 283.5 ft (86.3 - 86.4 m), and 299.5 - 300.5 ft (91.3 - 91.6 m)
313 - 317	95.4 - 96.6	CLAY, silty, dark-yellowish-brown (10YR 4/2), calcareous
317 - 321	96.6 - 97.8	SILT, dark-yellowish-brown (10YR 4/2), calcareous
321 - 325	97.8 - 99.1	SALT, equally mixed with variegated dark-yellowish-brown (10YR 4/2) and light-brown (5YR 5/6) calcareous silty CLAY
325 - 347	99.1 - 105.8	SALT, mixed with 5 to 15 percent light-olive-gray (5Y 5/2) and olive-gray (5Y 4/1) calcareous SILT. Unit includes interbeds of light-olive-gray calcareous CLAY at 333 - 335.5 ft (102.1 - 102.3 m) and 337 - 337.5 ft (102.7 - 102.9 m)
347 - 350.5	105.8 - 106.8	SALT, mixed with 15 percent light-olive-gray (5Y 5/2) very fine SAND
350.5 - 363.5	106.8 - 110.8	SALT, clean. Unit includes interbed of brown fine clean sand at 357.5 - 358 ft (109.0 - 109.1 m)
363.5 - 375	110.8 - 114.3	SILT, clayey, dark-yellowish-brown (10YR 4/2), mixed with 20 percent SALT
375 - 397	114.3 - 121.0	SALT, mixed with 15 percent olive-gray (5Y 4/1) SILT
397 - 407	121.0 - 124.1	SAND, light-olive-brown (5Y 5/6), very fine, mixed equally with SALT
407 - 447	124.1 - 136.2	SALT, mixed with 15 percent light-olive-gray (5Y 5/2) calcareous SILT. Unit includes interbed of moderate-olive-brown (5Y 4/4) calcareous SILT at 416 - 418 ft (126.8 - 127.4 m)
447 - 450.5	136.2 - 137.3	SAND, grayish-olive (10Y 4/2), very fine, calcareous, mixed equally with SALT
450.5 - 494	137.3 - 150.6	SALT, mixed with 15 to 20 percent dark-yellowish-brown (10YR 4/2) calcareous SILT. Unit includes interbeds of dark-yellowish-brown calcareous SILT uncontaminated with SALT at 457 - 457.5 ft (139.3 - 139.4 m), 465 - 469 ft (141.7 - 143.0 m), 476.5 - 477 ft (145.2 - 145.4 m), and 486 - 487.5 ft (148.1 - 148.6 m)
494 - 504	150.6 - 153.6	SALT, clean. BR-1-2 collected from this unit

INTRODUCTION

Geophysical, lithologic, and water quality data from Bristol Dry Lake, California, were obtained in May, 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 94-59), for the management, use, development, and protection of public lands within the California Desert Conservation Area (under 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 bottom 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 148.1 m (486 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 (^{137}Cs), Americium-Beryllium ($\text{Am}^{241}\text{-Be}$) 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)	10.0	3.14	7.0
Sensitivity potential (open dial division)	10.0	5.0	8.1
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 charts: National Research Council reprint 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 BRISTOL 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		Specific gravity	Specific conductance (microhm/cm at 25°C)	Percent sodium	SAR (sodium absorption ratio)
				lab	field				
BR-1-1	5/2/78	95	24.2	7.3	6.1	1.219	205,000	80	182
BR-1-2	5/2/78	504	26.4	7.5	6.5	1.190	210,000	94	405

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)
BR-1-1	28 ^{±0.4} *	15,000	1,200	86,000	3,800	1.0	24	210,000	1.8	2.7	0.06
BR-1-2	14 ^{±0.4} *	1,300	920	78,000	3,000	0.85	170	180,000	1.0	2.3	0.08

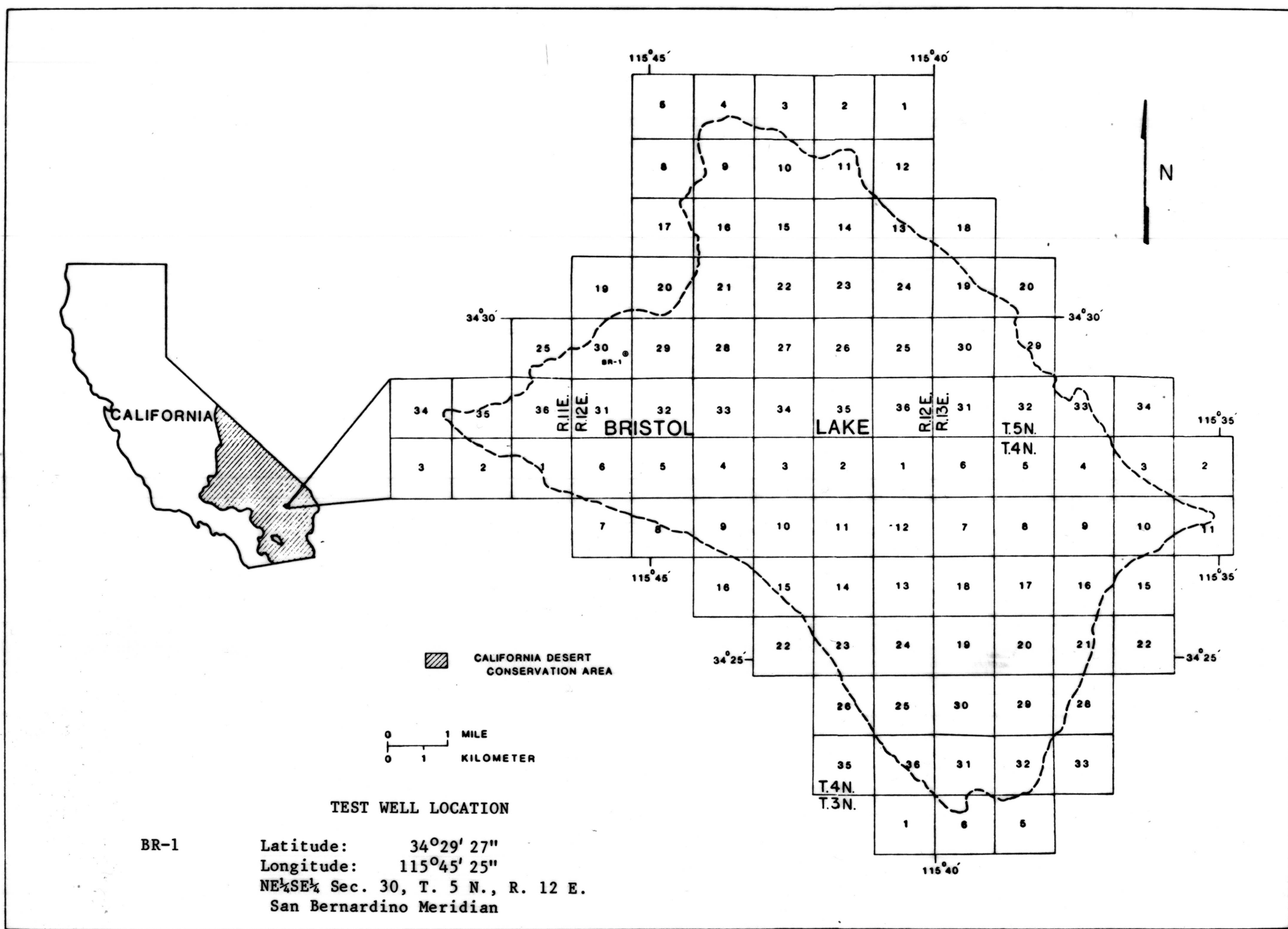
Test Well number	Bicarbonate (HCO ₃) ^f	Manganese (Mn)	Iron (FE)	Boron (B)	Lithium (Li)	Strontium (Sr)	Uranium (U)	Solids, residue on evaporation at 180°C (TDS)	Total Alkalinity Calcium Carbonate (CaCO ₃)	Total hardness	Percent Difference
BR-1-1	22	6,800	3,700	8,500	87,000	650,000		236,000	18	43,000	-11.69
BR-1-2	43	7,800	2,900	7,100	71,000	500,000	0.00092	285,000	35	7,600	-16.93

* SAR Water Classification

10 Excellent
16-18 Good
18-26 Fair
26 Poor

* Determined on 1:200 dilution.

Calculated.



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

BY
J. P. CALZIA