

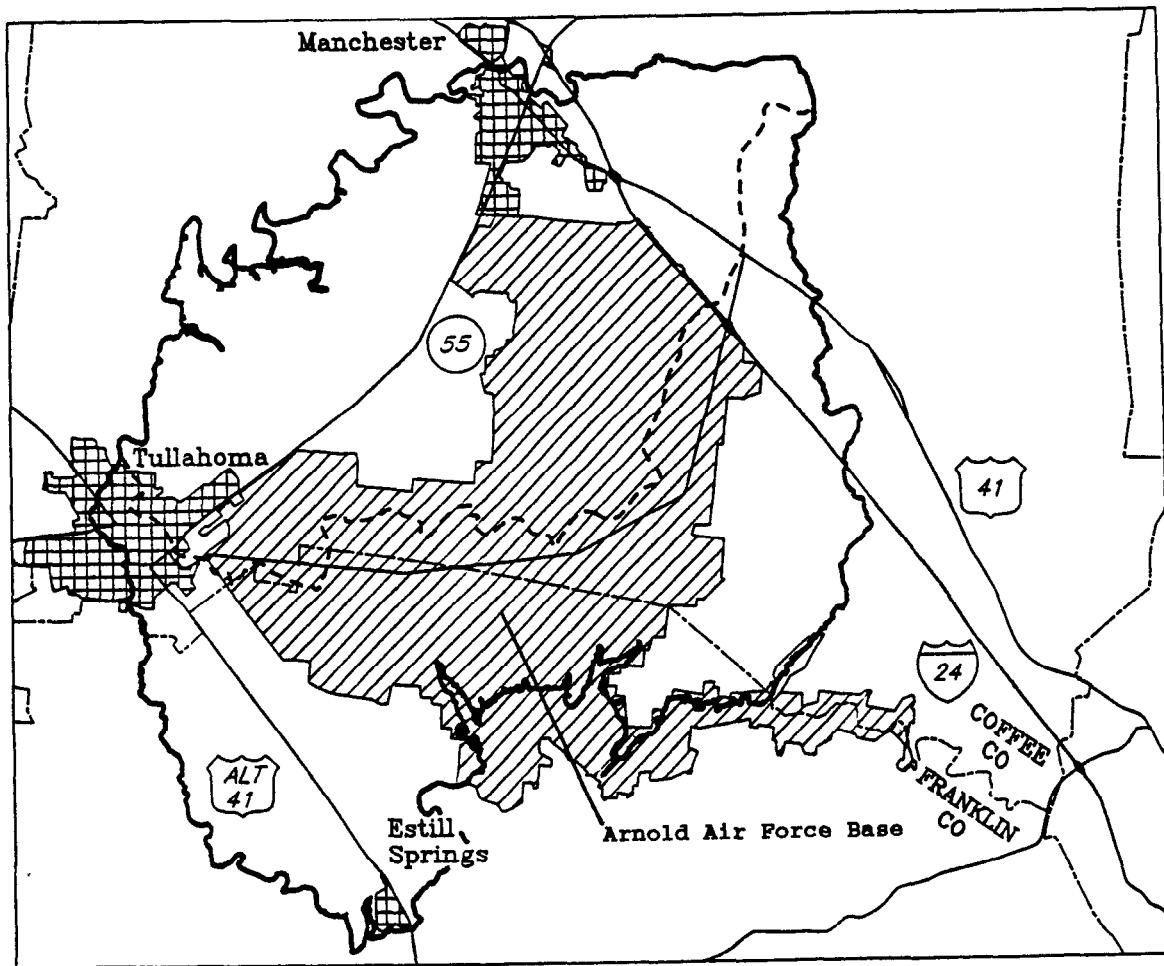


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Open-File Report 92-135

WELL-CONSTRUCTION, WATER-LEVEL, GEOPHYSICAL, AND WATER-QUALITY DATA FOR GROUND-WATER MONITORING WELLS FOR ARNOLD AIR FORCE BASE, TENNESSEE



Prepared by the
U.S. GEOLOGICAL SURVEY

in cooperation with the
UNITED STATES AIR FORCE,
ARNOLD AIR FORCE BASE



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**WELL-CONSTRUCTION, WATER-LEVEL, GEOPHYSICAL,
AND WATER-QUALITY DATA FOR GROUND-WATER
MONITORING WELLS FOR ARNOLD AIR
FORCE BASE, TENNESSEE**

By CONNOR J. HAUGH, ELIZABETH N. MAHONEY, and JOHN A. ROBINSON

U.S.GEOLOGICAL SURVEY

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Prepared in cooperation with the

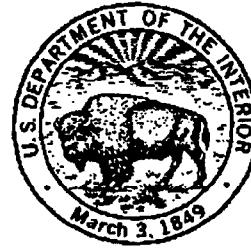
**UNITED STATES AIR FORCE,
ARNOLD AIR FORCE BASE**

Nashville, Tennessee

1992

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CONVERSION FACTORS, VERTICAL DATUM, AND SITE-NUMBERING SYSTEM

<i>Multiply</i>	<i>By</i>	<i>To obtain</i>
foot (ft)	0.3048	meter
gallon per minute (gal/min)	0.06308	liter per second
microsiemens per centimeter at 25°C ($\mu\text{S}/\text{cm}$)	1	micromhos per centimeter at 25°C

Temperature in degrees Celsius ($^{\circ}\text{C}$) can be converted to
degrees Fahrenheit ($^{\circ}\text{F}$) as follows:
$$^{\circ}\text{F} = 1.8 \times ^{\circ}\text{C} + 32$$

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929--a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

Site-numbering system: The U.S. Geological Survey assigns each site in this report a local Tennessee well number and a station identification number. The local well number is used as a concise label for a site. The station identification number is used as an identifier for site data stored in the national computer data base of the U.S. Geological Survey. These numbering systems are used in addition to the well numbers assigned by Arnold Engineering Development Center.

The local well number in Tennessee consists of three parts: (1) an abbreviation of the name of the county in which the well is located; (2) a letter designating the 7 $\frac{1}{2}$ -minute topographic quadrangle on which the well is plotted; and (3) a number generally indicating the numerical order in which the well was inventoried. The symbol Cf:G-010, for example, indicates that the well is located in Coffee County on the "G" quadrangle and is identified as well 10 in the numerical sequence. Quadrangles are lettered from left to right, beginning in the southwest corner of the county.

The station identification number is a unique number for each site based on a latitude and longitude grid system. The number consists of 15 digits. The first 6 digits denotes the degrees, minutes, and seconds of latitude, the next 7 digits denotes degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells within a 1-second grid.

WELL-CONSTRUCTION, WATER-LEVEL, GEOPHYSICAL, AND WATER-QUALITY DATA FOR GROUND-WATER MONITORING WELLS FOR ARNOLD AIR FORCE BASE, TENNESSEE

By Connor J. Haugh, Elizabeth N. Mahoney, and John A. Robinson

ABSTRACT

Sixty-five wells were installed at 39 sites in the Arnold Air Force Base area in Coffee and Franklin Counties, Tennessee. The wells were installed to provide information on subsurface lithology, aquifer characteristics, ground-water levels, and ground-water quality. Well depths ranged from 11 to 384 feet.

Water-quality samples were collected from 60 wells and analyzed for common inorganic ions, trace metals, and volatile organic compounds. The median dissolved-solids concentrations were 60 milligrams per liter in the shallow aquifer, 48 milligrams per liter in the Manchester aquifer, 1,235 milligrams per liter in the Fort Payne aquifer, and 1,712 milligrams per liter in the upper Central Basin aquifer.

Caliper, temperature, natural gamma, electric, neutron porosity, gamma-gamma density, and acoustic velocity borehole-geophysical logs were obtained for the six deep wells completed below the Chattanooga Shale. Petrographic and modal analysis were performed on rock samples from each deep well. These six deep wells provide the first information in the study area on hydraulic head and water quality from below the Chattanooga Shale.

INTRODUCTION

As part of the U.S. Air Force Installation Restoration Program (IRP), numerous site-specific ground-water investigations have been conducted at sites of potential ground-water contamination on Arnold Air Force Base (AAFB). However, the regional hydrogeology of AAFB has not been defined in sufficient detail to provide quantification of the occurrence, direction, and velocities of ground-water flow. The U.S. Geological Survey (USGS), in cooperation with the U.S. Air Force and Arnold Air Force Base (AAFB), is conducting a comprehensive investigation of the hydrogeology of the AAFB area.

The primary mission of AAFB is to support the development of aerospace systems. This is accomplished through test facilities at Arnold Engineering Development Center (AEDC). AEDC occupies about 4,000 acres in the center of AAFB. Ground-water contamination in selected areas of the AAFB facility has occurred as the result of base operations and past disposal practices. Ground-water investigations have been conducted or are currently in progress at several sites at AAFB.

The USGS identified locations outside the site-specific study areas where additional data were needed to understand the regional hydrogeologic system (J.V. Brahana, U.S. Geological Survey, written commun., 1990). Between October 1990 and February 1991, 65 wells were drilled at 39 sites to provide this hydrologic and geologic information including (1) subsurface lithology, (2) aquifer characteristics, (3) water levels, and (4) ground-water quality. Six of the wells were drilled through the Chattanooga Shale to provide information in the study area on the deep ground-water system.

Purpose and Scope

The report documents well-construction details and water-level measurements for 65 wells installed by the USGS. Water-quality analyses are reported for 60 wells that were sampled. Lithologic descriptions and borehole-geophysical data are presented for six deep wells. Continuous water-level data are presented for five wells drilled previous to this study.

Study Area

The AAFB occupies about 40,000 acres of Coffee and Franklin Counties, Tennessee (fig. 1). The study area extends beyond the boundaries of the AAFB to include major hydrologic and physiographic features important to the regional ground-water system. The study area includes about 180 square miles within six USGS 7 $\frac{1}{2}$ -minute topographic quadrangles, including Normandy Lake, Manchester, Hillsboro, Tullahoma, Capital Hill, and Alto.

The AAFB area lies on the eastern Highland Rim physiographic province (Miller, 1974) and ranges from poorly drained, flat uplands to valley-dissected, sloping escarpments. Land surface altitudes within the study area range from greater than 1,100 feet above sea level at the Duck River-Elk River drainage divide to less than 890 feet above sea level in the valleys.

Hydrogeologic Setting

The study area is covered by regolith derived from the *in situ* weathering of Mississippian carbonates (in descending order): the St. Louis Limestone, the Warsaw Formation, and the Fort Payne Formation (Wilson, 1976). The regolith is typically 30 to 90 feet thick and consists primarily of clayey chert rubble with some silt and sand. Typically, the regolith grades upward from gravel-sized chert rubble at the top of bedrock into clay-sized chert particles at land surface (Burchett, 1977).

The bedrock underlying the regolith consists of the Fort Payne Formation. The Fort Payne Formation is an indurated siliceous limestone containing many chert nodules and platy chert stringers. The upper part of the Fort Payne bedrock contains many fractures and solution openings.

Underlying this bedrock unit is the Chattanooga Shale. The Chattanooga Shale consists of about 22 feet of a fissile, black, carbonaceous shale. Underlying the Chattanooga Shale are dark blue-gray bioclastic and argillaceous limestones of Late Ordovician age. Several different zones or aquifers can be identified in the study area. The Chattanooga Shale is considered to be the base of the freshwater ground-water system in the study area. The ground-water system above the Chattanooga Shale can be divided into three aquifers: the shallow aquifer, the Manchester aquifer, and the Fort Payne aquifer.

The shallow aquifer is described as alluvial, residual silt and sand deposits, and clayey chert particles. It is not continuous throughout the study area and is perched at some locations. The Manchester aquifer, the most productive of the zones, consists of chert rubble at the base of the regolith and solution openings in the upper part of the bedrock (Burchett and Hollyday, 1974). The Fort Payne aquifer corresponds to the lower part of the Fort Payne bedrock where solution openings are less developed.

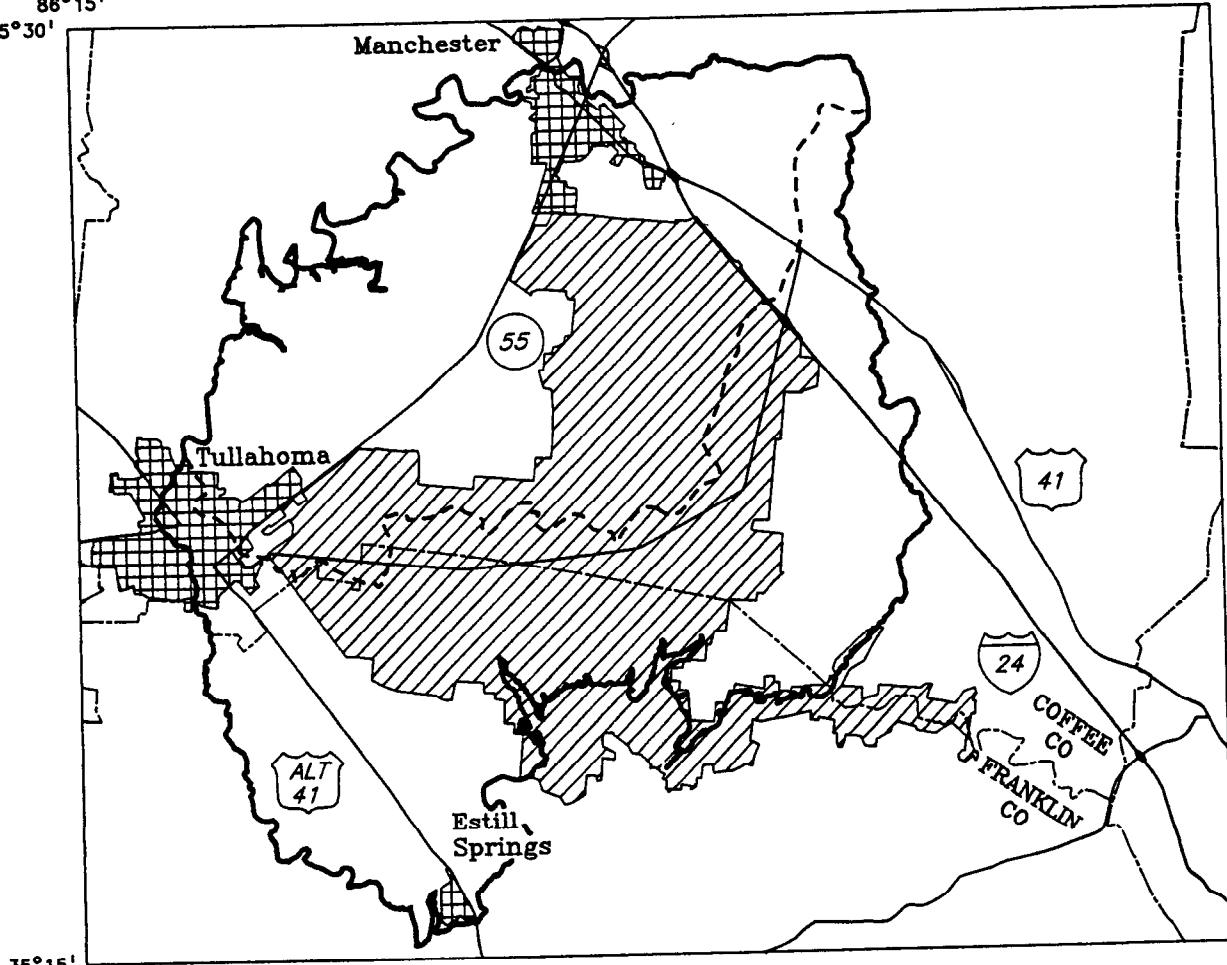
The Ordovician limestones below the Chattanooga Shale comprise the upper Central Basin aquifer. The Chattanooga Shale isolates this deeper aquifer from the aquifers above it.

WELL CONSTRUCTION

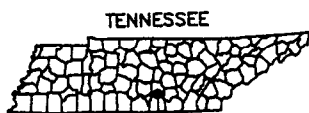
Sixty-five wells were installed at 39 sites in the AAFB area (fig. 2). Eight of the wells were completed in the shallow aquifer, 41 were completed in the Manchester aquifer, 10 were completed in the Fort Payne aquifer,

86° 15'
35° 30'

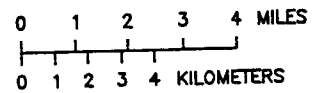
85° 52' 30"



35° 15'



Study area



EXPLANATION





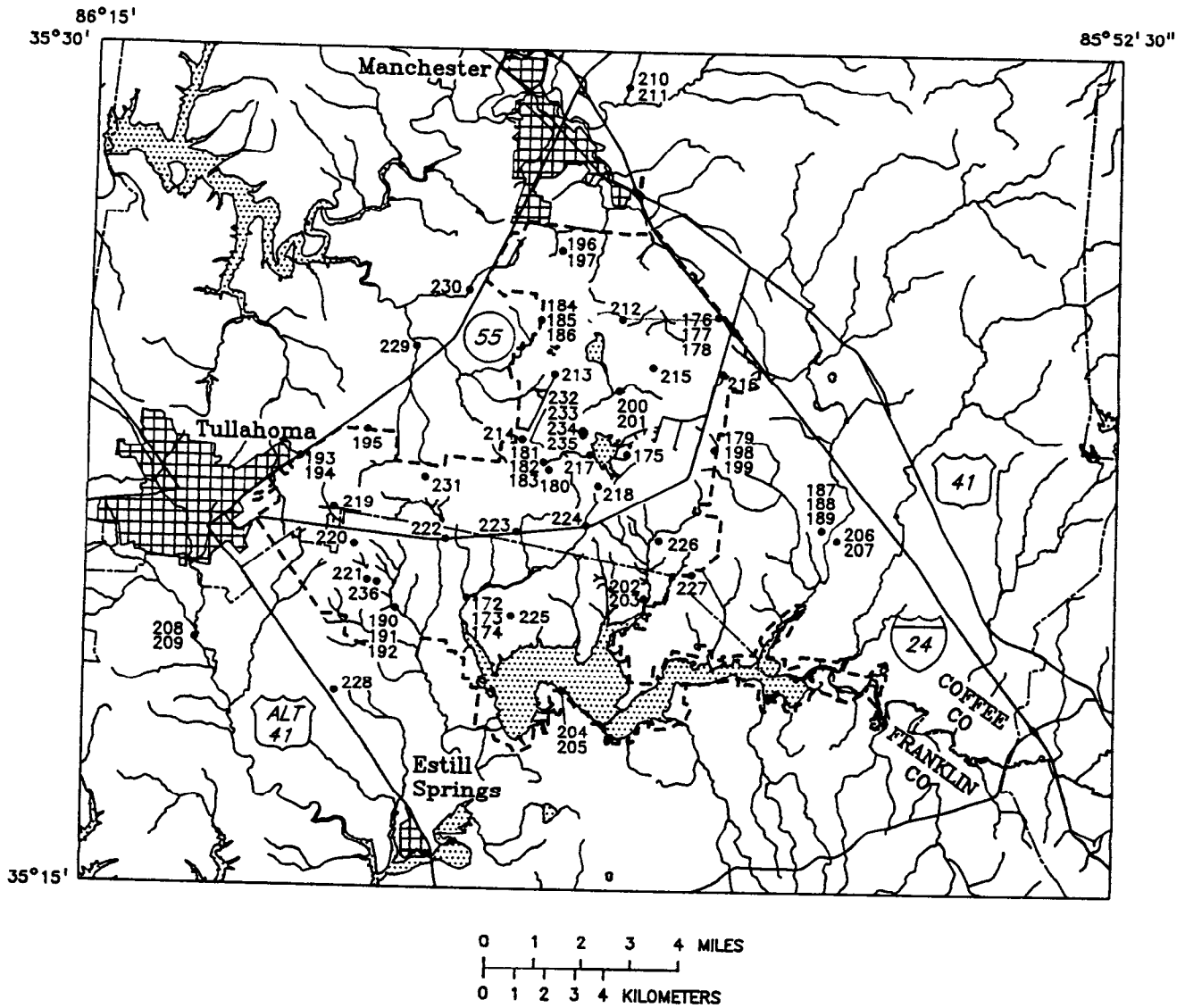
-  ARNOLD AIR FORCE BASE
-  INCORPORATED TOWNS
-  HYDROLOGIC BOUNDARY--
Delineation of regional
ground-water flow
system underlying
Arnold Air Force Base
-  DRAINAGE DIVIDE--Surface
water north and west
of the divide flows to
the Duck River. Surface
water south and east of
the divide flows to the
Elk River

Figure 1.--Location of the study area.



- EXPLANATION**
- ARNOLD AIR FORCE BASE BOUNDARY
 - 207 WELL LOCATION AND NUMBER

Figure 2.--Locations of the wells installed by the USGS in the Arnold Air Force Base area.

and six were completed in the upper Central Basin aquifer. Standard air-rotary techniques were used for drilling all wells. For wells completed in the regolith, either an 8- or 11-inch borehole was drilled to the desired depth. For wells completed in the rock, an 11-inch borehole was drilled through the regolith to a minimum of 2 feet into rock. Then, a nominal 8-inch-diameter steel surface casing was set into rock and the base sealed with bentonite clay. The borehole was advanced in bedrock with an 8-inch air-hammer bit to the desired depth.

Well-construction techniques used in this study followed guidelines outlined by the U.S. Environmental Protection Agency in the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (1986). All wells were completed with 4-inch-diameter, schedule 40, threaded PVC casing and screen. A sand pack was installed from the bottom of the borehole to a minimum of 2 feet above the top of the screen. A 2-foot bentonite seal was placed above the sand pack. The annulus was then grouted from the top of the seal to land surface with a neat cement grout (fig. 3). Screen lengths for the regolith wells were either 5 or 10 feet. Screen lengths for the rock wells were either 10 or 20 feet. Slot sizes on all screens were 0.010 inch. Well-construction data are summarized in table 1.

GROUND-WATER LEVELS

The depth to ground water and water-level fluctuations at the AAFB were determined by collection of monthly and continuous ground-water levels. Monthly ground-water level measurements for the 65 wells drilled by the USGS were provided by the AAFB. These data are presented in table 2 for the period May 1991 through January 1992. The data indicate water-level fluctuations range from greater than 25 feet in well AEDC-213 to less than 2 feet in well AEDC-188. Water levels in several of the wells completed into rock took months to recover after sampling; therefore, water levels measured for some wells for certain months do not represent a static water level. These values are shown in parentheses in table 2.

Continuous ground-water levels were recorded in five wells (figs. 4, 5, and 6). The five wells, AEDC-91, -92, -93, -135, and -147, existed prior to well installation for this investigation. Three of the wells, AEDC-91, -92, and -93, are located in a cluster near the center of the AAFB and are completed at depths of about 121, 86, and 38 feet, respectively. They are screened in the lower part of the Manchester, the upper part of the Manchester, and the shallow aquifer, respectively. Water levels in this cluster indicate a downward vertical gradient. Well AEDC-135 is located in the northwestern corner of the AAFB and is completed in the lower part of the Manchester aquifer at a depth of about 55 feet. Well AEDC-147 is located in the southwestern part of the AAFB and is completed in the lower part of the Manchester aquifer at a depth of about 86 feet.

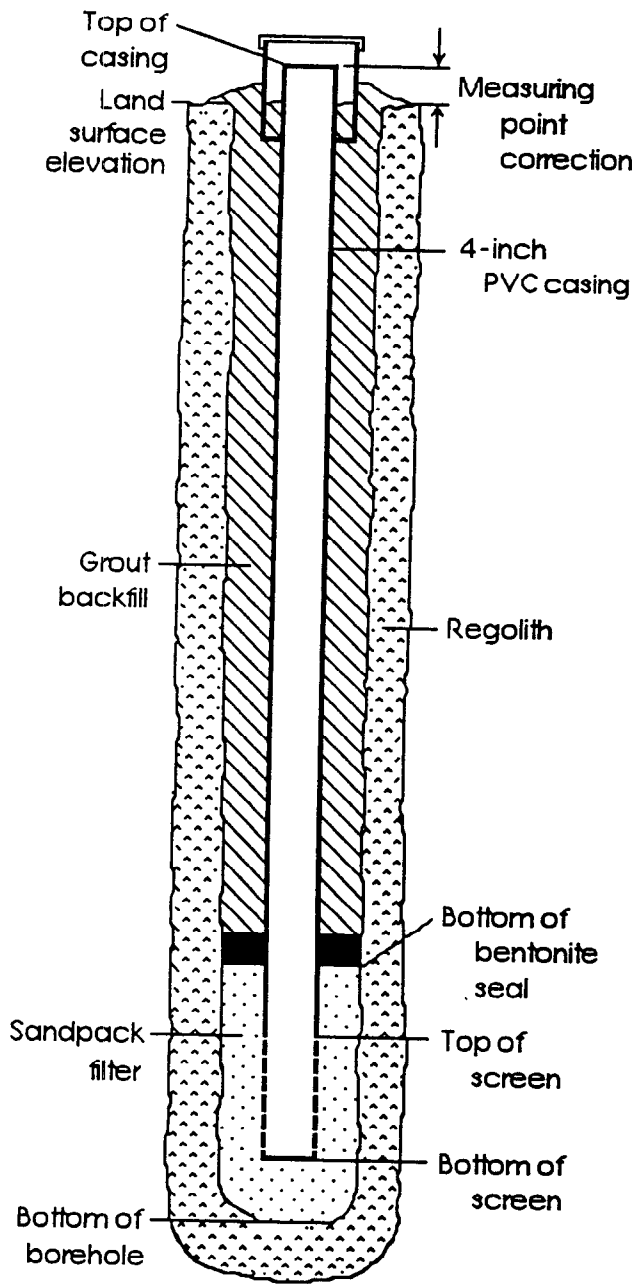
Rainfall data also were collected and are presented in table 3. Total rainfall measured for the water year October 1990 to September 1991 is 61.04 inches. Twenty-five percent of this total or 15.03 inches was recorded during the month of December.

BOREHOLE GEOPHYSICS

Borehole-geophysical logs provide a continuous record of the physical properties of the rocks encountered in a well and can provide indirect information on the lithology and hydraulic properties of the rock. Caliper, temperature, natural gamma, electric, neutron porosity, gamma-gamma density, and acoustic velocity logs were obtained on the six deep wells. The logs were run on the total depth of the open hole after the surface casing was set and before the PVC casing and screen were installed. Unstable borehole conditions near a cavity in well AEDC-176 prevented running acoustic velocity and electric logs past a depth of 112 feet.

The following discussion on the various types of logs is generalized. A more detailed discussion of the theory and interpretation of geophysical logs is beyond the scope of this report, but may be found in various texts on the subject, such as Keys and MacCary (1971) and Keys (1990).

WELL COMPLETED IN REGOLITH



WELL COMPLETED IN ROCK

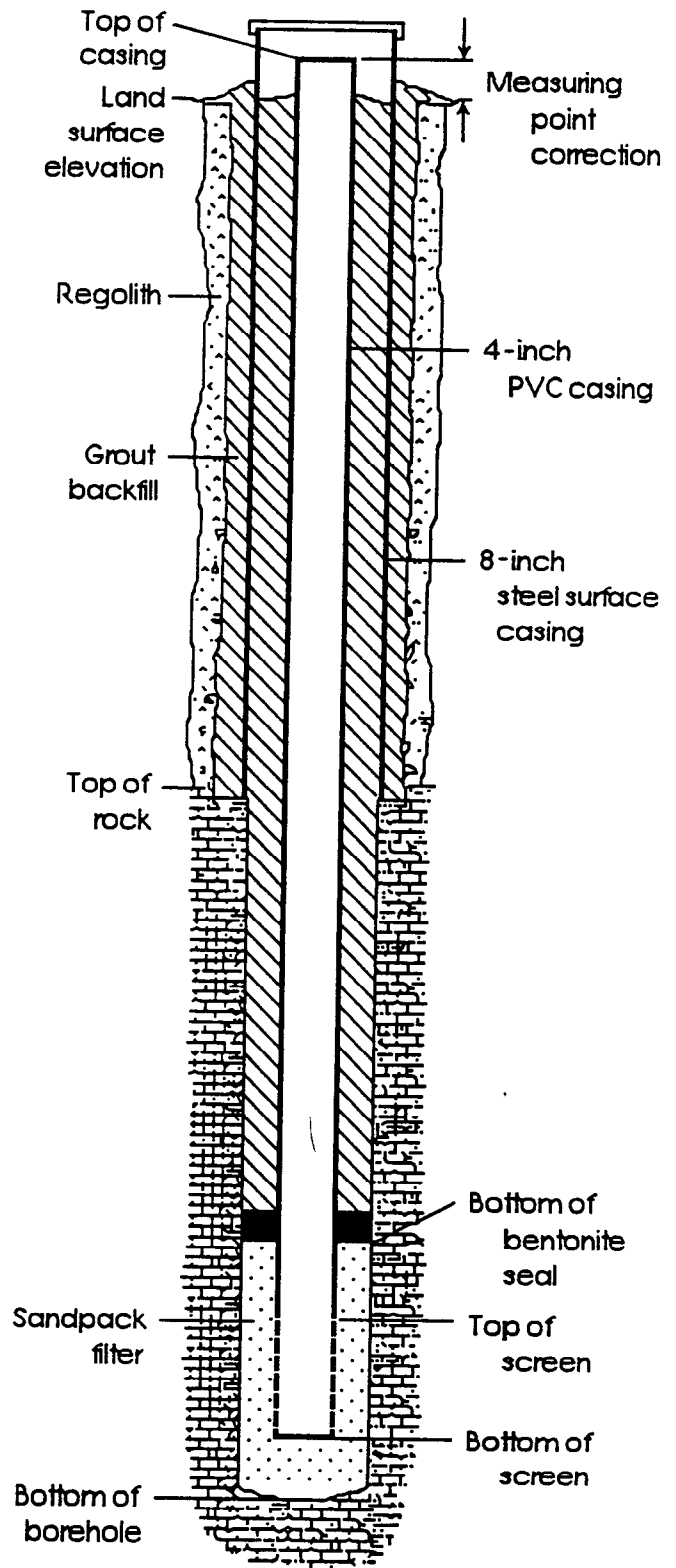


Figure 3.--Well-construction diagrams.

Table 1.--Well-construction data for monitoring wells for Arnold Air Force Base

[AEDC, Arnold Engineering Development Center; USGS, United States Geological Survey; --, no data; SH, shallow aquifer; MN, Manchester aquifer; FP, Fort Payne aquifer; UCB, Upper Central Basin aquifer]

AEDC well name	Local well number	USGS site identification	Land surface elevation (feet)	Measuring point height (feet)	Surface casing depth (feet)	Depth to bottom of seal (feet)	Screened interval (feet)	Depth to bottom of borehole (feet)	Hydro-geologic unit	Date of construction
AEDC-172	Fr:S-001	352011086063901	970.01	0.45	37	87	110 - 130	183	UCB	10-23-90
AEDC-173	Fr:S-004	352011086063902	971.17	.85	39	47	49 - 59	60	MN	12-18-90
AEDC-174	Fr:S-005	352011086063903	970.40	2.80	--	18	20 - 30	35	MN	12-19-90
AEDC-175	Cf:G-009	352247086031301	1,080.31	1.60	71	130	270 - 290	320	UCB	11-15-90
AEDC-176	Cf:G-006	352515086011701	1,088.51	1.95	24	288	340 - 360	384	UCB	10-29-90
AEDC-177	Cf:G-028	352515086011702	1,088.40	1.24	22	105	107 - 117	127	MN	02-28-91
AEDC-178	Cf:G-029	352515086011703	1,088.23	1.93	--	11	13 - 18	19	SH	02-28-91
AEDC-179	Cf:G-014	352253086011903	1,072.06	1.30	--	32	34 - 44	47	SH	01-10-91
AEDC-180	Cf:G-007	352229086045601	1,063.70	.75	67	118	120 - 130	131	UCB	10-31-90
AEDC-181	Cf:G-010	352237086050302	1,029.25	1.00	63	80	90 - 100	101	FP	11-21-90
AEDC-182	Cf:G-011	352237086050303	1,029.00	2.76	--	60	63 - 73	74	MN	11-20-90
AEDC-183	Cf:G-012	352237086050304	1,029.48	2.40	--	30	33 - 43	45	MN	11-26-90
AEDC-184	Cf:G-008	352509086051101	1,105.14	.64	29	240	250 - 270	320	UCB	11-02-90
AEDC-185	Cf:G-016	352509086051102	1,104.96	.30	27	47	50 - 60	61	MN	12-07-90
AEDC-186	Cf:G-018	352509086051103	1,104.82	1.40	--	15	17 - 27	27	MN	12-10-90
AEDC-187	Cf:D-001	352129085585501	1,009.86	1.10	91	200	220 - 240	300	UCB	01-07-91
AEDC-188	Cf:D-007	352129085585502	1,011.14	.90	92	98	101 - 111	112	FP	01-15-91
AEDC-189	Cf:D-003	352129085585503	1,010.57	2.16	--	57	59 - 69	85	MN	01-07-91
AEDC-190	Fr:R-007	351959086081301	977.23	.54	62	72	74 - 84	88	FP	11-29-90
AEDC-191	Fr:R-008	351959086081302	977.65	2.20	--	30	33 - 43	47	MN	11-30-90
AEDC-192	Fr:R-009	351959086081303	977.51	.92	--	26	29 - 39	42	SH	11-29-90
AEDC-193	Cf:F-003	352240086102101	1,036.49	.80	47	79	99 - 109	119	FP	02-14-91
AEDC-194	Cf:F-004	352240086102102	1,037.35	3.70	--	34	36 - 43	47	SH	02-14-91
AEDC-195	Cf:F-005	352310086085401	1,044.38	1.94	--	47	48 - 58	64	MN	02-26-91
AEDC-196	Cf:G-015	352624086044301	1,081.49	.65	48	70	98 - 108	167	FP	12-07-90
AEDC-197	Cf:G-017	352624086044302	1,082.80	2.52	--	28	32 - 42	48	SH	12-06-90
AEDC-198	Cf:G-032	352253086011901	1,072.12	1.12	106	115	122 - 132	133	FP	01-18-91
AEDC-199	Cf:D-009	352253086011902	1,073.06	2.00	--	88	90 - 100	100	MN	01-18-91
AEDC-200	Cf:G-021	352354086032501	1,067.46	1.24	56	72	74 - 84	84	MN	12-18-90
AEDC-201	Cf:G-022	352354086032502	1,067.09	2.74	--	39	41 - 51	58	MN	12-12-90
AEDC-202	Fr:S-002	352013086024701	981.34	2.82	73	71	72 - 82	91	MN	12-14-90
AEDC-203	Fr:S-003	352013086024702	977.84	1.42	--	41	43 - 53	53	MN	12-17-90
AEDC-204	Fr:S-006	351833086043301	964.63	.86	52	65	104 - 114	116	FP	12-19-90
AEDC-205	Fr:S-007	351833086043302	963.02	1.42	--	37	39 - 49	50	MN	01-02-91
AEDC-206	Cf:D-004	352118085583401	1,005.50	1.52	20	61	65 - 75	77	FP	01-10-91
AEDC-207	Cf:D-006	352118085583402	1,007.74	.09	--	4	4 - 9	11	MN	01-10-91
AEDC-208	Fr:R-012	351924086124601	1,029.16	-.90	89	100	108 - 118	119	FP	02-08-91
AEDC-209	Fr:R-013	351924086124602	1,028.98	-.18	--	66	69 - 79	79	MN	02-08-91
AEDC-210	Cf:G-024	352922086032101	1,046.17	1.80	42	70	90 - 100	130	FP	02-06-91
AEDC-211	Cf:G-025	352922086032102	1,046.81	2.42	--	28	30 - 40	40	MN	02-06-91
AEDC-212	Cf:G-020	352511086032301	1,098.12	2.80	--	12	17 - 27	29	MN	12-10-90
AEDC-213	Cf:G-033	352411086045101	1,070.47	2.76	--	43	49 - 59	61	MN	01-28-91
AEDC-214	Cf:G-023	352302086053201	1,059.49	1.12	--	65	69 - 79	79	MN	01-25-91
AEDC-215	Cf:G-019	352420086024101	1,075.75	1.75	--	46	48 - 58	61	MN	12-10-90
AEDC-216	Cf:G-013	352414086011001	1,054.37	1.66	--	46	49 - 59	62	MN	12-04-90
AEDC-217	Cf:C-002	352246086040201	1,045.97	3.30	--	41	47 - 57	57	MN	01-24-91
AEDC-218	Cf:C-001	352213086035001	1,083.20	2.20	--	60	66 - 76	76	MN	01-24-91
AEDC-219	Cf:B-002	352146086093601	1,070.09	1.96	--	60	63 - 73	87	MN	01-31-91
AEDC-220	Fr:R-010	352107086090901	1,105.76	2.04	--	72	74 - 84	88	MN	12-04-90
AEDC-221	Fr:R-012	352028086085101	1,025.51	3.08	--	63	68 - 78	80	MN	01-29-91
AEDC-222	Fr:S-009	352114086070801	1,046.08	2.10	--	75	83 - 93	93	MN	02-04-91
AEDC-223	Cf:C-005	352123086053701	1,046.90	2.02	--	54	59 - 69	71	MN	02-01-91
AEDC-224	Cf:C-004	352130086040501	1,079.74	1.62	--	67	73 - 83	85	MN	01-31-91
AEDC-225	Fr:S-008	351952086054201	1,046.42	2.70	--	53	55 - 65	66	MN	01-24-91
AEDC-226	Cf:C-006	352115086022901	1,057.97	2.38	--	70	79 - 89	91	MN	01-30-91
AEDC-227	Cf:C-003	352039086014501	1,060.04	2.82	--	73	79 - 89	91	MN	01-29-91
AEDC-228	Fr:R-015	351830086092501	1,030.96	-.50	--	63	65 - 75	78	MN	02-25-91
AEDC-229	Cf:F-002	352439086075201	977.82	2.24	--	10	13 - 18	22	MN	02-05-91
AEDC-230	Cf:F-001	352540086064501	1,019.44	2.42	--	11	15 - 20	22	MN	02-05-91
AEDC-231	Cf:B-001	352220086073701	1,046.92	1.94	--	54	61 - 71	74	MN	01-29-91
AEDC-232	Cf:G-026	352307086041201	1,092.47	1.90	--	66	71 - 81	81	MN	02-21-91
AEDC-233	Cf:G-027	352310086041401	1,094.90	1.55	--	37	42 - 52	53	SH	02-21-91
AEDC-234	Cf:G-030	352312086041201	1,090.30	1.65	--	38	43 - 53	53	SH	02-21-91
AEDC-235	Cf:G-031	352310086041001	1,093.56	1.32	--	44	48 - 58	58	SH	02-21-91
AEDC-236	Fr:R-016	352026086083801	1,022.86	2.10	--	75	78 - 88	92	MN	02-26-91

359 TLS=29 FT.

Table 2.--Monthly water-level data for monitoring wells for Arnold Air Force Base

[AEDC, Arnold Engineering Development Center; --, no data; water levels shown in parentheses are recovering from sampling and may not represent a static water level]

AEDC well number	Water level ¹ , in feet below land surface									
	May 1991	June 1991	July 1991	August 1991	September 1991	October 1991	November 1991	December 1991	January 1992	
172	(33.68)	(28.59)	(25.79)	(23.43)	(21.69)	(21.03)	(20.41)	(19.97)	(19.08)	
173	flowing	-0.03	0.79	1.19	1.51	1.56	1.83	0.29	-0.81	
174	2.38	4.06	4.88	4.72	5.34	5.19	5.50	2.72	2.65	
175	130.42	136.10	139.64	142.96	144.68	146.34	147.46	149.02	148.35	
176	(122.40)	(110.91)	113.97	117.35	118.77	118.25	117.89	117.35	116.75	
177	20.21	27.01	27.91	32.17	33.25	33.75	34.21	16.17	15.71	
178	13.69	9.37	15.43	16.35	16.39	16.13	7.43	10.07	11.49	
179	25.35	29.03	31.75	33.67	34.79	35.99	36.57	32.75	29.70	
180	(111.25)	(111.15)	(111.07)	(110.97)	(110.93)	(110.89)	(110.87)	(110.85)	(110.80)	
181	20.40	19.40	21.28	23.60	24.97	26.06	27.06	26.84	26.20	
182	17.29	18.86	21.42	24.58	27.35	29.58	31.60	31.86	28.54	
183	16.37	17.96	20.54	23.92	26.64	28.86	30.94	31.16	--	
184	(139.61)	(137.90)	(136.80)	(135.76)	(135.02)	(134.74)	(134.34)	(134.04)	(133.46)	
185	35.70	40.50	41.78	43.36	44.04	44.30	44.48	38.70	35.20	
186	14.65	15.05	19.01	21.05	22.29	22.99	21.95	6.83	8.50	
187	33.00	33.92	34.60	35.16	35.44	35.62	35.80	34.28	33.80	
188	38.75	39.46	40.10	40.32	40.36	40.23	39.46	38.42	38.95	
189	37.29	38.64	39.42	39.50	39.54	39.46	38.88	36.24	37.14	
190	31.25	33.52	34.40	35.30	35.58	36.15	36.34	34.02	32.94	
191	28.40	31.26	32.48	33.80	34.36	35.04	35.38	32.48	30.98	
192	26.79	29.58	--	32.80	33.50	34.20	34.54	32.04	30.31	
193	(87.50)	(84.40)	(81.50)	(80.40)	(80.04)	(80.02)	(80.02)	(80.04)	(79.90)	
194	35.25	38.88	39.56	40.44	41.62	40.66	40.72	35.82	34.74	
195	28.68	34.32	36.82	38.66	39.48	40.36	40.92	33.50	29.92	
196	(66.90)	(53.85)	(48.64)	(43.80)	(41.62)	(79.42)	(67.80)	(61.56)	(56.00)	
197	31.98	36.19	38.75	41.83	dry	dry	dry	31.37	30.68	
198	27.38	32.98	36.02	38.22	39.68	41.54	41.72	34.52	32.78	
199	27.10	32.64	35.64	37.76	39.28	41.06	41.30	34.50	32.55	
200	4.86	9.62	12.50	17.36	20.62	22.40	24.10	9.82	6.26	
201	4.41	9.21	12.11	17.01	20.23	22.01	23.71	9.41	5.81	
202	14.39	15.77	16.42	17.34	18.00	18.39	19.16	18.62	17.82	
203	9.58	10.90	11.58	12.62	13.38	13.84	14.60	14.00	13.02	
204	(84.28)	(80.82)	(78.02)	(75.08)	(72.82)	(71.23)	(69.82)	(68.74)	(67.02)	
205	1.98	2.72	3.06	3.36	3.38	3.69	4.40	3.94	--	
206	32.73	33.47	33.93	34.15	34.19	34.17	33.53	31.77	32.83	
207	dry	dry	dry	dry	dry	dry	dry	dry	dry	
208	55.37	58.32	58.90	60.02	60.32	60.40	60.44	56.72	56.84	
209	42.20	46.88	49.14	50.72	52.06	52.76	53.38	44.96	43.22	
210	7.40	8.25	9.05	10.13	9.29	10.07	9.51	6.89	7.40	
211	12.53	12.05	13.99	14.63	13.93	14.83	12.17	9.29	9.83	
212	23.45	dry	dry	dry	dry	dry	dry	26.10	22.65	
213	20.64	25.14	28.68	37.14	41.22	44.18	46.26	31.54	26.84	
214	57.78	61.73	62.63	65.15	67.27	69.13	70.83	69.57	--	
215	8.35	14.35	18.13	23.55	26.60	28.24	29.75	17.75	12.30	
216	21.59	25.76	28.78	32.24	35.21	37.22	39.18	30.14	26.74	
217	flowing	-1.50	-0.34	1.00	1.74	2.40	2.68	-1.20	-1.70	
218	6.50	11.30	13.32	16.04	17.30	18.06	18.36	6.77	5.95	
219	18.45	26.00	29.86	33.38	34.86	35.88	36.48	25.60	19.28	
220	34.69	37.40	38.84	40.58	41.68	42.87	43.68	42.04	38.64	
221	9.80	13.10	14.92	16.84	17.94	19.13	19.70	14.50	11.70	
222	54.51	57.80	59.76	61.70	62.80	64.22	65.08	62.92	59.70	
223	41.08	43.14	44.94	47.74	49.64	51.81	53.20	53.56	51.24	
224	16.00	18.98	20.52	21.60	22.28	22.86	23.38	20.26	18.23	
225	44.49	45.24	45.80	46.68	46.52	47.72	48.14	48.38	47.09	
226	31.16	35.82	36.74	37.52	38.00	38.27	38.48	34.34	33.17	
227	31.09	36.88	38.60	40.68	42.17	43.12	43.84	39.02	35.98	
228	63.15	64.40	65.36	66.70	67.04	67.78	68.12	68.40	67.54	
229	8.50	10.26	10.50	--	--	--	--	--	--	
230	6.50	10.21	10.38	10.78	10.81	10.88	10.94	6.02	6.70	
231	21.63	27.00	30.28	32.94	33.02	34.09	34.64	29.64	23.30	
232	59.50	61.90	63.70	65.10	65.84	66.20	66.54	64.10	76.80	
233	50.13	51.03	dry	dry	dry	dry	dry	dry	dry	
234	52.43	dry	dry	dry	dry	dry	dry	dry	dry	
235	58.81	dry	dry	dry	dry	dry	dry	dry	dry	
236	68.34	71.32	72.38	74.12	74.88	75.96	76.46	74.76	71.97	

¹Water levels were measured each month within a 3-day period, generally during the third week of each month.

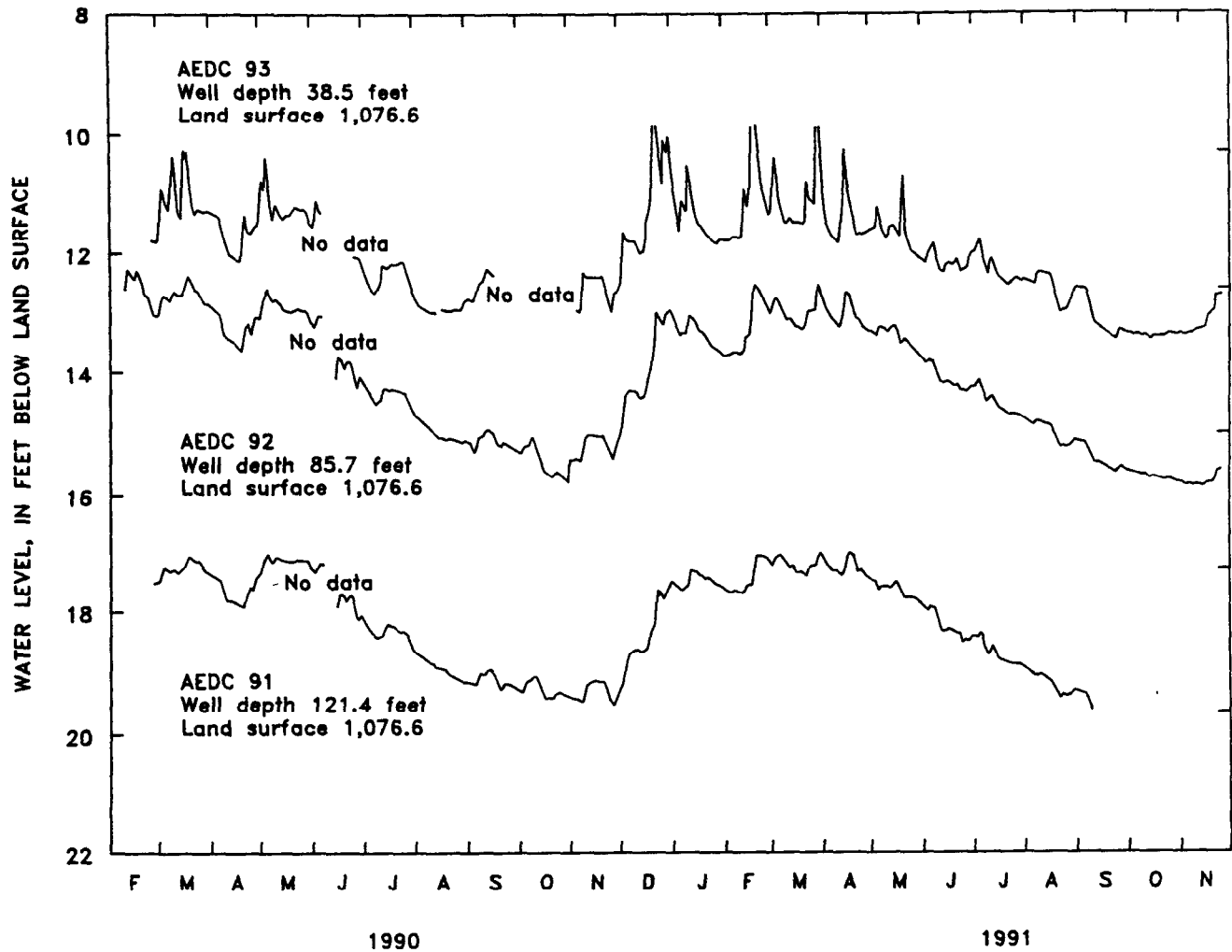


Figure 4.--Hydrographs for wells AEDC-91, -92, and -93 for the period February 1990 through November 1991.

Caliper logs provide a record of the diameter of the borehole. Increases in borehole diameter, such as those caused by large fractures or solution openings, appear as a deflection to the right on the caliper log. The caliper tool used in this study was the three-arm type that provides a more accurate measurement of the borehole diameter than single-arm calipers.

Temperature logs record the air or water temperature adjacent to the probe and can provide useful information on the movement of water through a borehole. The recorded temperature might indicate the temperature of adjacent rocks and their contained fluids. The temperature will increase with depth, as a function of the geothermal gradient if no flow exists in the borehole. If vertical flow of water occurs in a well, the temperature log through that interval will show little change. Similarly, gas entering the borehole also will disturb the geothermal gradient.

Natural gamma logs measure the amount of natural gamma radiation present in the rock. Increases in gamma radiation appear as deflections to the right on the log and are usually caused by clay or shale lithologies. Limestones and clean sandstones typically have low gamma values.

Neutron logs record the hydrogen content in the rocks and provide an indirect measurement of the water content or porosity of the rocks. Hydrogen in the rock attenuates the neutron activity resulting in a decrease in the number of counts per second recorded by the tool. In aquifers, the increased hydrogen is associated with increased water content (higher porosity) within the aquifer material. The tool used in this study was calibrated for quantitative measurement of porosity in percent.

Gamma-gamma logs provide information on the attenuation of gamma radiation through the aquifer material. The amount of attenuation is directly related to the bulk density of the aquifer. Bulk density is the mass of aquifer material per unit volume. An increase in attenuation (decrease in counts per second and deflection to the right on the log) is caused by an increase in bulk density. The tool used in this study was calibrated to read density directly in grams per cubic centimeter.

Acoustic-velocity logs record the travel time of an acoustic wave from transmitters to receivers in the probe. The acoustic energy travels through the fluid in the borehole and through surrounding rock at a velocity that is related to the matrix mineralogy and porosity of the rocks. An uncased borehole, filled with fluid is required to

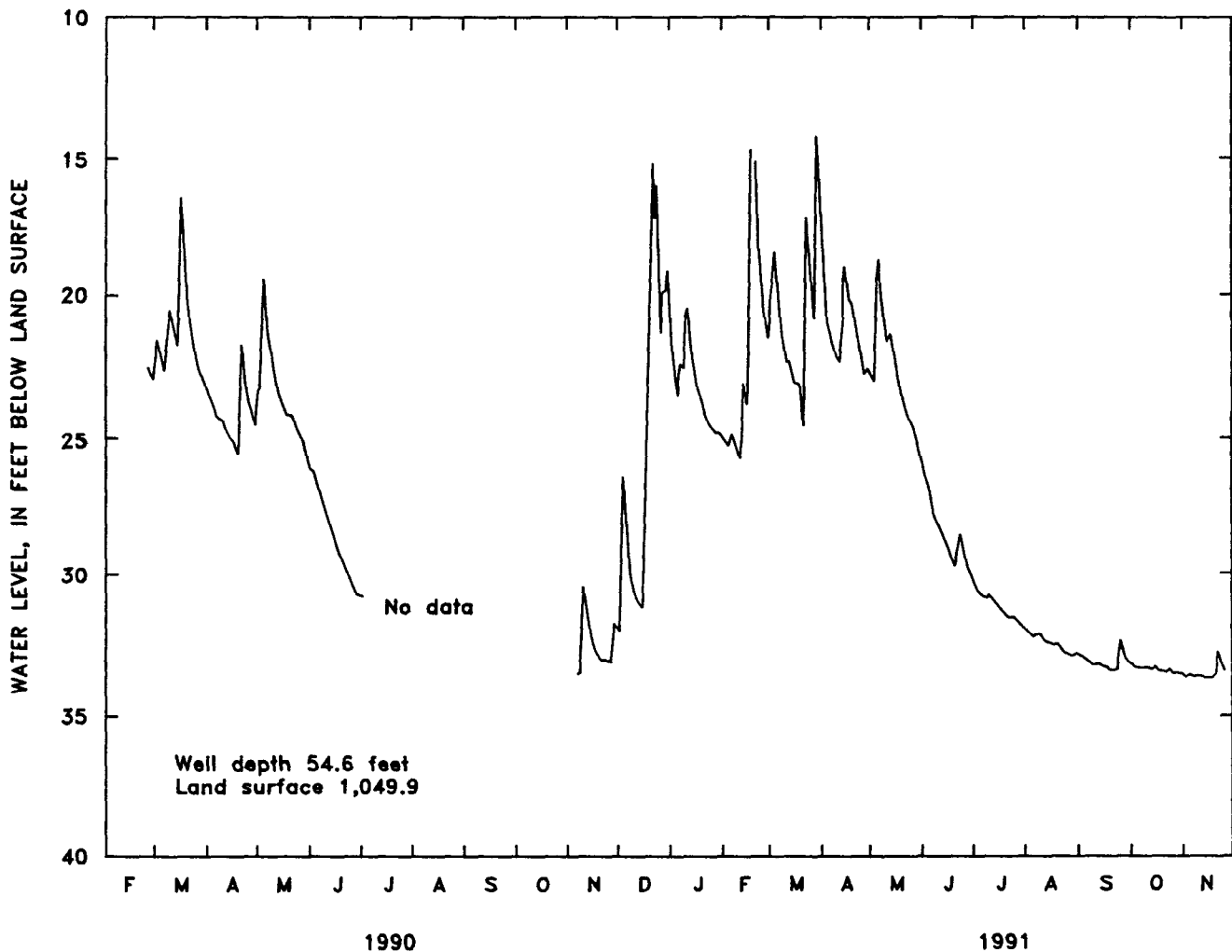


Figure 5.--Hydrograph for well AEDC-135 for the period February 1990 through November 1991.

couple the signal to the surrounding rocks. The acoustic velocity increases, or transit times decrease, with increasing rock hardness; therefore, the transit time can be related to primary porosity. Secondary porosity is not detected by acoustic-velocity logs as the acoustic wave travels the fastest path around solution openings. Many rock types will be characterized by a limited range of transit times; therefore, acoustic-velocity logs provide information on lithology. Lithologies of shale have longer transit times than limestones (Keys, 1990).

Electric logs measure the potential differences due to the flow of electric current in and adjacent to a well. Two common types of electrical logs are spontaneous-potential and resistivity logs. Spontaneous-potential logs can be useful in determining lithology and the salinity of formation water. If the borehole fluid is fresher than the native interstitial water, a negative spontaneous potential occurs. If the salinities are reversed, the response also is reversed. Resistivity logs measure apparent resistivity between electrodes. This information can be used to determine lithology and water quality. The tool used in this study recorded spontaneous-potential, long-normal resistivity, and short-normal resistivity.

Geophysical logs, lithologic descriptions, and analyses of rock samples from drilling for each of the six deep wells are presented in Appendix 1.

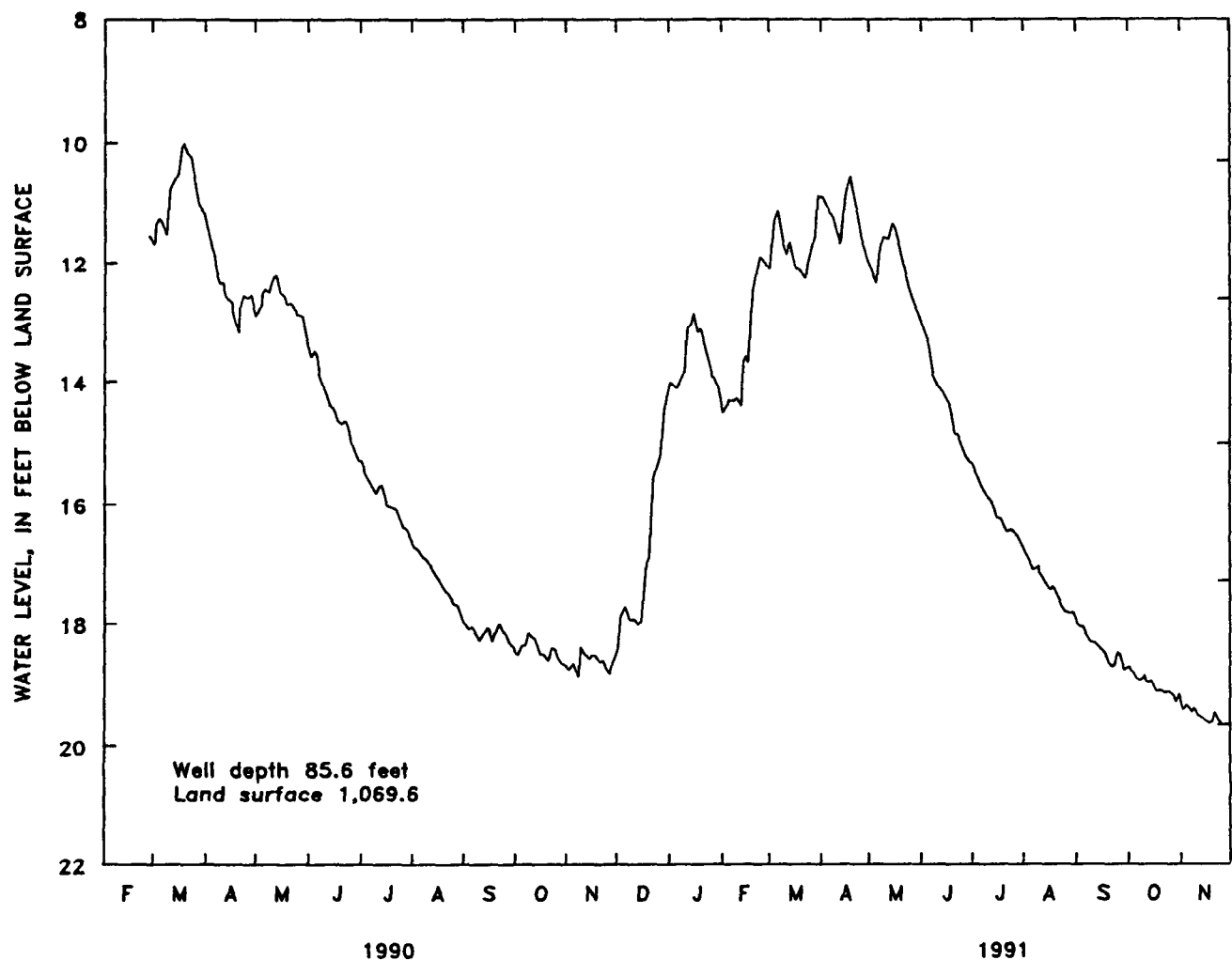


Figure 6.--Hydrograph for well AEDC-147 for the period February 1990 through November 1991.

Table 3.--Rainfall data for Arnold Air Force Base area

[--, no data]

DAY	Rainfall, in inches, water year October 1989 to September 1990											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	0.00	0.00	0.00	0.26	0.00	1.51	0.00	0.02	0.00	0.00
2	---	---	.00	.00	.47	.95	.00	.00	.00	.00	.00	.00
3	---	---	.00	.00	2.00	.02	.00	.00	1.71	.00	.00	.00
4	---	---	.00	.66	.25	.00	.00	.91	.00	.00	.02	.00
5	---	---	.00	.17	.00	.00	.00	.00	.00	.00	.07	.00
6	---	---	.00	.12	.03	.00	.52	.00	.00	.00	.00	.00
7	---	---	.23	.16	.05	.00	.00	.00	.00	.00	.00	.02
8	---	---	.38	.48	.00	.76	.00	.00	.00	.00	.00	.00
9	---	---	.00	.00	1.68	.69	.00	.21	.00	.70	.00	.00
10	---	---	.00	.04	.69	.00	.25	.57	.00	.07	.00	.25
11	---	---	.12	.00	.00	.00	.00	.00	.00	.00	.00	.29
12	---	---	.03	.00	.00	.00	.00	.00	.00	2.01	.00	1.19
13	---	---	.00	.00	.00	.00	.00	.00	.00	.29	.00	.12
14	---	---	.00	.00	.00	.00	.06	.00	.64	.00	.00	.14
15	---	---	.00	.00	1.74	.71	.00	.00	.00	.00	.00	.00
16	---	---	.00	.00	.19	1.46	.00	.00	.00	.00	.00	.00
17	---	---	.00	.45	.00	.04	.20	.67	.00	.00	.00	.00
18	---	---	.00	.17	.14	.00	.00	.00	.07	.01	.00	.00
19	---	---	.19	.00	.00	.01	.00	.12	.00	.00	.00	.32
20	---	---	.00	1.66	.00	.00	.00	.54	.00	.00	.00	.00
21	---	---	.00	.00	.00	.00	1.81	.51	.91	.11	.10	1.48
22	---	---	.00	.00	.21	.00	.00	.00	.07	.33	.00	.02
23	---	---	.00	.00	.02	.00	.00	.00	.00	.01	.00	.00
24	---	---	.00	.27	.01	.00	.00	.00	.00	.00	.00	.00
25	---	---	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26	---	---	.00	.00	.00	.00	.00	.26	.00	.00	.00	.00
27	---	---	.00	.00	.00	.00	.00	.21	.00	.00	.00	.00
28	---	---	.00	.11	.00	.00	.53	.00	.00	.00	.00	.00
29	---	---	.19	1.53	---	.46	.00	.00	.00	.00	.36	.00
30	---	---	.77	.00	---	.07	.00	.00	.00	.00	.00	.00
31	---	---	.73	.00	---	.01	---	.00	---	.00	.00	---
TOTAL	---	---	2.64	5.82	7.48	5.44	3.37	5.51	3.40	3.55	0.55	3.83

Rainfall, in inches, water year October 1990 to September 1991

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00
2	.00	.00	.00	.00	.00	.06	.00	.00	.00	.35	.00	.00
3	.15	.00	1.44	.00	.00	.92	.00	.00	.00	.00	.00	.00
4	.78	.00	.00	.00	.01	.00	.00	.92	.50	.23	.00	.00
5	.00	.27	.00	.00	.26	.00	.32	.83	.00	.00	.00	.00
6	.00	.00	.00	.65	.12	.00	.00	.03	.00	.00	.00	.00
7	.02	.00	.00	1.66	.00	.00	.00	.00	.00	.00	.04	.00
8	1.72	.45	.00	.00	.00	.00	.48	.30	.00	.00	.00	.00
9	.00	1.05	.00	.00	.00	.00	.22	.00	.00	.05	.00	.00
10	.16	.00	.00	.87	.00	.00	.20	.02	.00	.14	.11	.28
11	.00	.00	.00	.12	.00	.00	.00	.00	.03	.03	.00	.30
12	.00	.00	.00	.00	.00	.63	.31	.78	.14	.00	.00	.12
13	.00	.00	.32	.00	1.22	.02	.66	.00	.00	.02	.00	.00
14	.00	.00	.00	.00	.00	.00	.47	.00	.00	.00	.00	.04
15	.00	.00	.18	.05	.00	.00	.76	.00	.00	.05	.00	.00
16	.00	.06	.30	.21	.00	.00	.00	.00	.00	.00	.00	.00
17	.00	.00	.51	.00	1.50	.38	.00	.00	.00	.02	.00	.00
18	.43	.00	.36	.00	3.24	.00	.00	.02	.00	.00	.09	.00
19	.00	.00	.00	.11	2.86	.00	.15	2.15	.00	.00	.10	.00
20	.00	.00	1.11	.04	.11	.00	.00	.01	.02	.00	.00	.00
21	.00	.00	3.22	.00	.00	.00	.00	.00	1.03	.00	.00	.00
22	.57	.06	5.49	.00	.15	.43	.00	.00	.06	.00	.00	.00
23	.48	.01	.10	.00	.01	.72	.00	.28	.00	.00	.00	.03
24	.01	.00	.00	.00	.00	.00	.00	.00	.00	.49	.00	1.71
25	.16	.00	.00	.00	.10	.00	.00	.00	.06	.00	.14	.00
26	.00	.00	.06	.00	.01	.00	.00	.16	.00	.00	.48	.00
27	.00	.93	1.13	.04	.00	.08	.12	.00	.00	.00	.00	.00
28	.00	.24	.09	.02	.00	.24	.30	.00	.02	.00	.00	.00
29	.00	.00	.08	.00	---	2.51	.68	.00	.00	.00	.53	.00
30	.00	.00	.64	.53	---	.42	.02	.00	.00	.00	.00	.00
31	.00	---	.00	.00	---	.00	---	.00	---	.00	.02	---
TOTAL	4.48	3.07	15.03	4.30	9.59	7.15	4.69	5.50	1.86	1.38	1.51	2.48

GROUND-WATER QUALITY

Water-quality samples were collected from 60 wells. Samples were analyzed for major inorganic constituents, trace metals, and volatile organic compounds. Samples were collected, treated, and preserved using procedures established and documented by the USGS (Claassen, 1982; Pritt and Jones, 1989; and Wood, 1976). Samples for dissolved analysis were filtered using an acetate membrane filter with a mean pore size of 0.45 micron. Samples for metal analysis were treated with one milliliter nitric acid to lower the pH to less than 2. Samples for volatile organic compound analysis were chilled immediately after collection and kept chilled until analyzed.

Wells were purged prior to sampling using a submersible pump. For most wells, specific conductance, temperature, pH, and Eh were monitored in a flow cell during well purging to determine when an appropriate amount of water had been purged from a well. Samples were collected after values of these monitored properties had stabilized. Samples for inorganic analysis were collected from the discharge line of the submersible pump. Samples for VOC analysis were collected with a 2-inch stainless-steel bailer. The bailer was field rinsed with a minimum of three bails full of well water before collecting the sample. Between wells, the bailer was cleaned by washing with laboratory detergent and tap water, then rinsing with tap water, and a final rinse with deionized water. The pump was cleaned by flushing with tap water.

Several of the wells had yields of less than 0.5 gallon per minute. For these wells, one casing volume was purged, then the well was allowed to recover before purging again. A minimum of three casing volumes were purged before sampling. These wells were AEDC-175, -179, -181, -186, -193, -198, -208, and -212. For these wells, physical properties were monitored with grab samples during purging.

A few of the wells drilled into rock had yields so low that the well would take several weeks or months to purge three casing volumes. These wells were purged as much as practical, then the sample collected at the midpoint of the well screen with either a submersible pump or a downhole sampler. These wells were AEDC-172, -176, -180, -184, -196, and -204.

All samples were analyzed for inorganic constituents and volatile organic compounds by the USGS National Water Quality Laboratory in Arvada, Colorado. Field quality-assurance samples also were collected for analysis for volatile organic compounds. These included field duplicates, equipment blanks, a trip blank, and an analysis of the AEDC tap water that was used to rinse sampling equipment.

Inorganic Constituents and Physical Properties

Samples were analyzed for major and trace inorganic constituents. The results of the water-quality analyses indicate the variation of geochemical processes affecting water from the various aquifers. The dissolved-solids concentrations ranged from 11 milligrams per liter (mg/L) in wells AEDC-216 and AEDC-217 to 8,810 mg/L in well AEDC-187. Wells AEDC-216 and AEDC-217 were completed in the upper part of the Manchester aquifer at depths of 59 and 57 feet below land surface, respectively. Well AEDC-187 is a deep well completed in the upper Central Basin aquifer at a depth of 240 feet below land surface. The median dissolved-solids concentrations were 60 mg/L in the shallow aquifer, 48 mg/L in the Manchester aquifer, 1,235 mg/L in the Fort Payne aquifer, and 1,712 mg/L in the upper Central Basin aquifer. The median values for each aquifer of other select constituents are shown in table 4. Most of the inorganic constituents followed a similar trend with the lowest concentrations in the shallow and Manchester aquifers and the highest concentrations in the upper Central Basin aquifer.

The complete analytical results for the inorganic constituents and physical properties of the ground-water samples are listed in Appendix 2. Values for the physical properties reported in Appendix 2 were measured in the field at the time ground-water samples were collected.

Table 4.--Median values by aquifers of selected constituents in water from wells sampled at Arnold Air Force Base

[$\mu\text{S}/\text{cm}$, microsiemens per centimeter at 25° Celsius; mg/L, milligrams per liter; mV, millivolts; °C, degrees Celsius; $\mu\text{g}/\text{L}$, micrograms per liter; Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent]

Constituent	Aquifer			
	Shallow	Manchester	Fort Payne	Upper Central Basin
Specific conductance ($\mu\text{S}/\text{cm}$)	104	87	1,635	2,365
pH (standard units)	6.2	6.0	7.2	7.5
Alkalinity (mg/L as CaCO_3)	38	39	181	159
Oxidation reduction potential (mV)	447	440	159	95
Hardness (mg/L as CaCO_3)	47	40	840	360
Calcium (mg/L)	17	11	195	102
Magnesium (mg/L)	1.2	2.0	38	18
Sodium (mg/L)	1.5	1.0	58	365
Potassium (mg/L)	0.70	.30	3.1	20
Chloride (mg/L)	1.9	1.4	14	340
Sulfate (mg/L)	3.0	1.4	865	310
Fluoride (mg/L)	.10	.10	.45	.60
Silica (mg/L)	7.4	8.1	9.4	9.3
Dissolved solids (mg/L), residue at 180 °C	60	48	1,235	1,712
Solids (mg/L), sum of constituents	58	52	1,330	1,800
Barium ($\mu\text{g}/\text{L}$)	14	4.0	20	64
Iron ($\mu\text{g}/\text{L}$)	14	6.0	76	515
Lithium ($\mu\text{g}/\text{L}$)	<4.0	<4.0	180	650
Manganese ($\mu\text{g}/\text{L}$)	10	14	80	150
Strontium ($\mu\text{g}/\text{L}$)	44	15	1,900	2,000

Volatile Organic Compounds

Most of the volatile organic compounds analyzed for were below the detection limits (Appendix 3). However, some compounds were detected. Approximately one-half of the wells sampled showed the presence of aromatic hydrocarbons such as benzene, toluene, ethyl-benzene, and xylenes (BTEX). The highest concentrations of BTEX were found below the Chattanooga Shale in the upper Central Basin aquifer (table 5). These compounds occur naturally in association with petroleum deposits (natural gas and crude oil) and shale lithologies as well as in many refined petroleum products (Swanson, 1960; Slaine and Barker, 1990). When their presence is detected in ground water, it is often difficult to distinguish between naturally occurring BTEX and contamination from refined petroleum products from sources such as spills and landfill leachate (Barker and others, 1988). The median, maximum, and minimum values for these compounds for wells sampled in each aquifer are shown in table 5. None of these compounds were detected in any of the field blanks.

Three wells, AEDC-190, AEDC-199, and AEDC-216 contained water with chlorinated organic compounds such as tetrachloroethylene, 1,1,1-trichloroethane, 1,1-dichloroethane, and 1,1-dichloroethylene at concentrations of 1.1 $\mu\text{g}/\text{L}$ or less. None of these compounds were detected in the field blanks. Well AEDC-190 also showed trichlorofluoromethane present at 15 $\mu\text{g}/\text{L}$. Trichlorofluoromethane was detected in several of the field blanks, but at levels of 0.3 and 0.2 $\mu\text{g}/\text{L}$, 50 times less than the level in well AEDC-190.

Table 5.--Summary by aquifer of concentrations of BTEX compounds in water from wells sampled at Arnold Air Force Base

[Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent; µg/L, micrograms per liter]

Constituent		Aquifers			
		Shallow	Manchester	Fort Payne	Upper Central Basin
Benzene (µg/L)	Median	<0.2	<0.2	2.0	700
	Maximum	.5	12	1,400	6,200
	Minimum	<.2	<.2	<.2	<0.2
Toluene (µg/L)	Median	<.2	.4	2.8	210
	Maximum	1.1	7.6	800	3,500
	Minimum	<.2	<.2	.2	<.2
Ethyl-benzene (µg/L)	Median	<.2	<.2	.6	5.6
	Maximum	.2	.6	94	180
	Minimum	<.2	<.2	<.2	<.2
Xylene (µg/L)	Median	<.2	<.2	2.4	27
	Maximum	.7	1.7	360	920
	Minimum	<.2	<.2	<.2	<.2

During the analysis for the volatile organic compounds, the presence of other organic compounds were detected and identified by the lab chemist (M.C. Noriega, U.S. Geological Survey, written commun., 1991). These results are discussed below, but are not listed in Appendix 3. Carbon disulfide was detected in several samples. The samples and levels for carbon disulfide are as follows: AEDC-195, 0.7 µg/L; AEDC-198, 1.7 µg/L; AEDC-199, 0.7 µg/L; AEDC-222, 1.5 µg/L; AEDC-226, 0.5 µg/L; and AEDC-227, 2.4 µg/L. Water from wells AEDC-179, -185, -186, -188, and -202 also contained detectable alkane compounds, but the individual compounds were not identified nor were the concentrations quantified.

Several of the samples for volatile organic compound analysis had hydrogen sulfide present. Hydrogen sulfide interferes with the analysis; therefore, the lab added cuprous chloride to the sample to precipitate out the sulfur product. The sample was then filtered through a 0.45-micron filter to remove the precipitate before analysis. Samples with hydrogen sulfide present included AEDC-181, -187, -190, -198, and -208.

Quality Assurance/Quality Control Samples

Approximately 10 percent of the field samples were quality assurance and quality control (QA/QC) samples. Field quality-assurance samples were collected and analyzed for volatile organic compounds. These samples included duplicates from wells AEDC-182, -230, and -236, equipment blanks for the downhole sampler and the bailer, a trip blank, and a sample of the AEDC tap water. The results of the analysis of the field quality-assurance samples are shown in Appendices 4 and 5.

The USGS laboratory follows standard QA/QC practices for all volatile organic analyses. These practices include lab blanks, quality-control check standards, surrogate spikes, matrix spikes, and duplicate analysis. Reagent blanks are run one daily or one for every 10 samples analyzed, whichever is greater. The analysis does not proceed unless the blank is free of contaminants.

Quality-control check standards are run daily for approximately 60 compounds. Recovery percentages are recorded for each compound and are expected to be within 60 to 140 percent. Recovery percentages for check standards for each day samples were analyzed are listed in Appendix 6.

Surrogate standards of D4 1,2-dichloroethane, D8 toluene, and 1,4-bromofluorobenzene are spiked into each sample analyzed. If the recovery results are less than 70 percent or greater than 130 percent, then a duplicate sample (if available) is analyzed. Surrogate spike recovery percentages are listed in Appendix 7.

Matrix spikes of five compounds, 1,1-dichloroethene, benzene, trichloroethene, toluene, and chlorobenzene, are analyzed 1 in every 20 samples. Low recoveries from matrix spikes indicate interferences from the sample matrix. Matrix spike results are listed in Appendix 8.

Duplicate samples are analyzed 1 in every 10 samples. If relative percent difference is greater than 30 percent, another replicate (if available) is analyzed. These data are presented in Appendix 9.

SUMMARY

Sixty-five wells were installed by the U.S. Geological Survey at 39 sites in the Arnold Air Force Base area. The wells are intended to provide information on subsurface lithology, aquifer characteristics, and water levels. Eight of the wells were completed in the shallow aquifer, 41 were completed in the Manchester aquifer, 10 were completed in the Fort Payne aquifer, and six were completed in the upper Central Basin aquifer. The six deep wells provide the first information in the study area on hydraulic head and water quality from below the Chattanooga Shale. Well depths ranged from 11 to 384 feet below land surface.

Caliper, temperature, natural gamma, electric, neutron porosity, gamma-gamma density, and acoustic velocity borehole-geophysical logs were obtained from the six deep wells. Petrographic and modal analyses also were performed on rock samples from each deep well.

Water-quality samples were collected from 60 wells and analyzed for common inorganic ions, trace metals, and volatile organic compounds. The median dissolved-solids concentrations were 60 mg/L in the shallow aquifer, 48 mg/L in the Manchester aquifer, 1,235 mg/L in the Fort Payne aquifer, and 1,712 mg/L in the upper Central Basin aquifer. Most of the inorganic constituents followed a similar trend with the lowest concentrations in the shallow and Manchester aquifers and the highest concentrations in the upper Central Basin aquifer.

Most of the volatile organic compounds analyzed for were below the detection limits. However, approximately one-half of the wells sampled showed the presence of BTEX compounds. The highest concentrations of BTEX were found below the Chattanooga Shale in the upper Central Basin aquifer. Three wells, AEDC-190, AEDC-199, and AEDC-216 contained water with chlorinated organic compounds such as tetrachloroethylene, 1,1,1-trichloroethane, 1,1-dichloroethane, and 1,1-dichloroethylene at concentrations of 1.1 $\mu\text{g/L}$ or less. Well AEDC-190 also showed trichlorofluoromethane present at 15 $\mu\text{g/L}$.

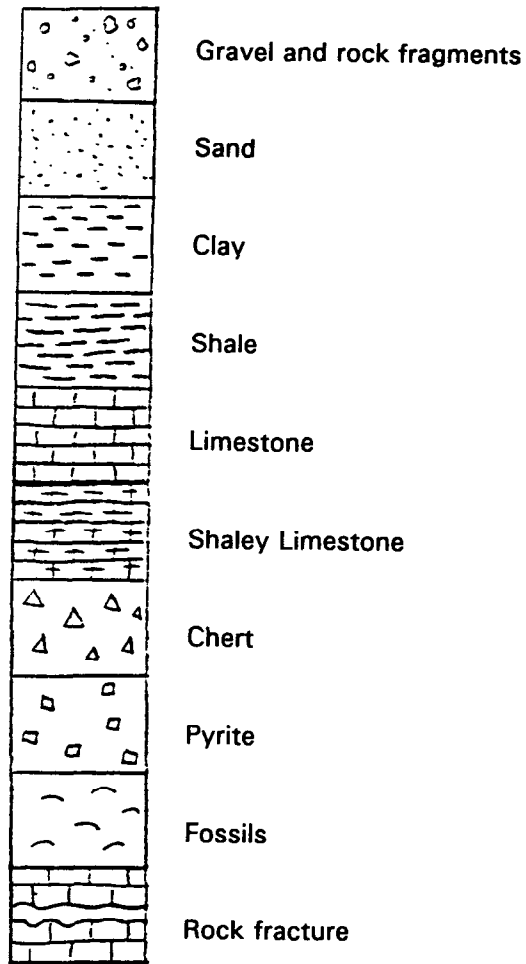
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APPENDIX 1

**Lithologic descriptions, rock sample analyses, and geophysical
logs for wells AEDC-172, -175, -176, -180, -184, and -187**

EXPLANATION: LITHOLOGY

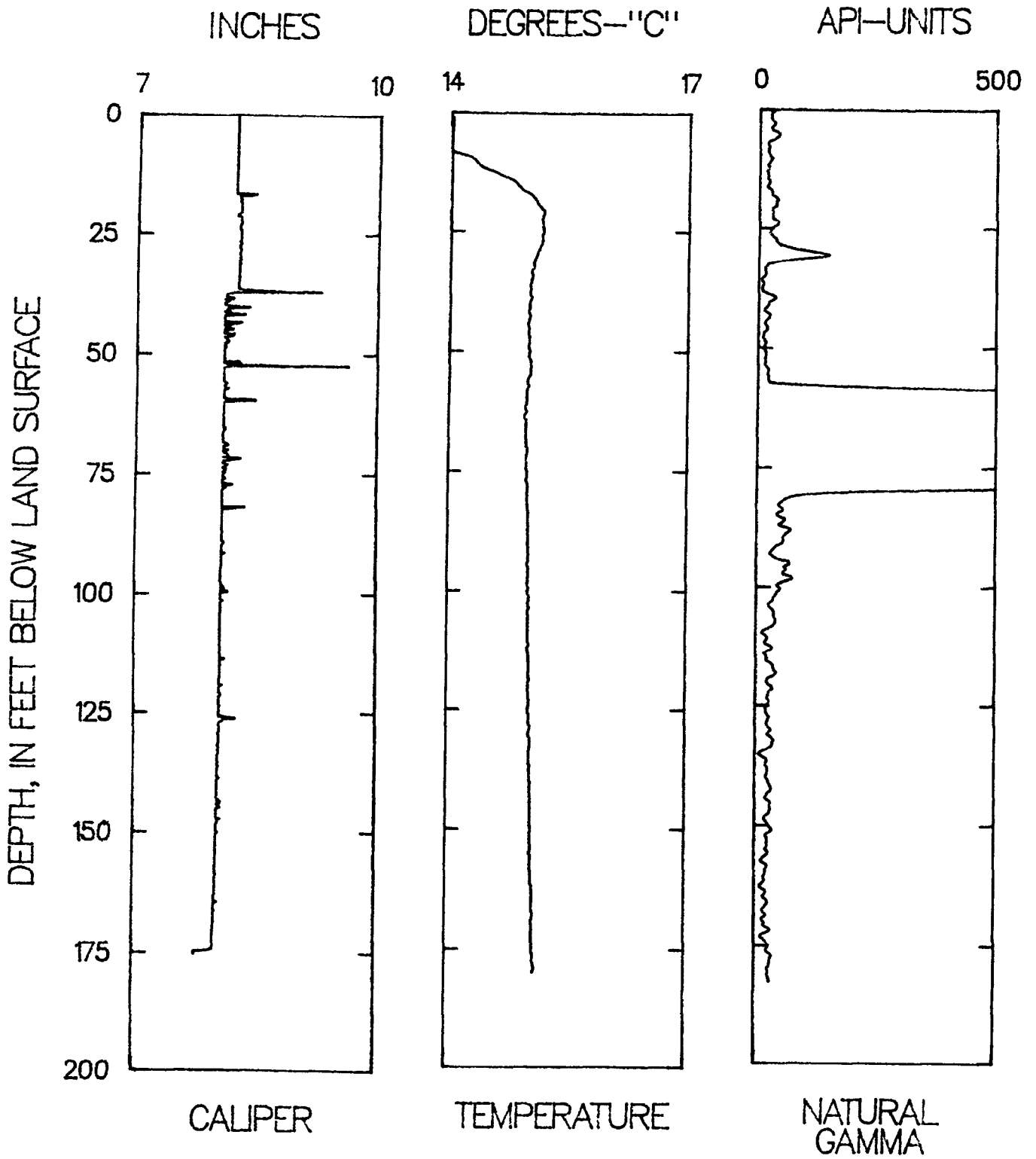


Explanation of symbols used for lithologic logs.

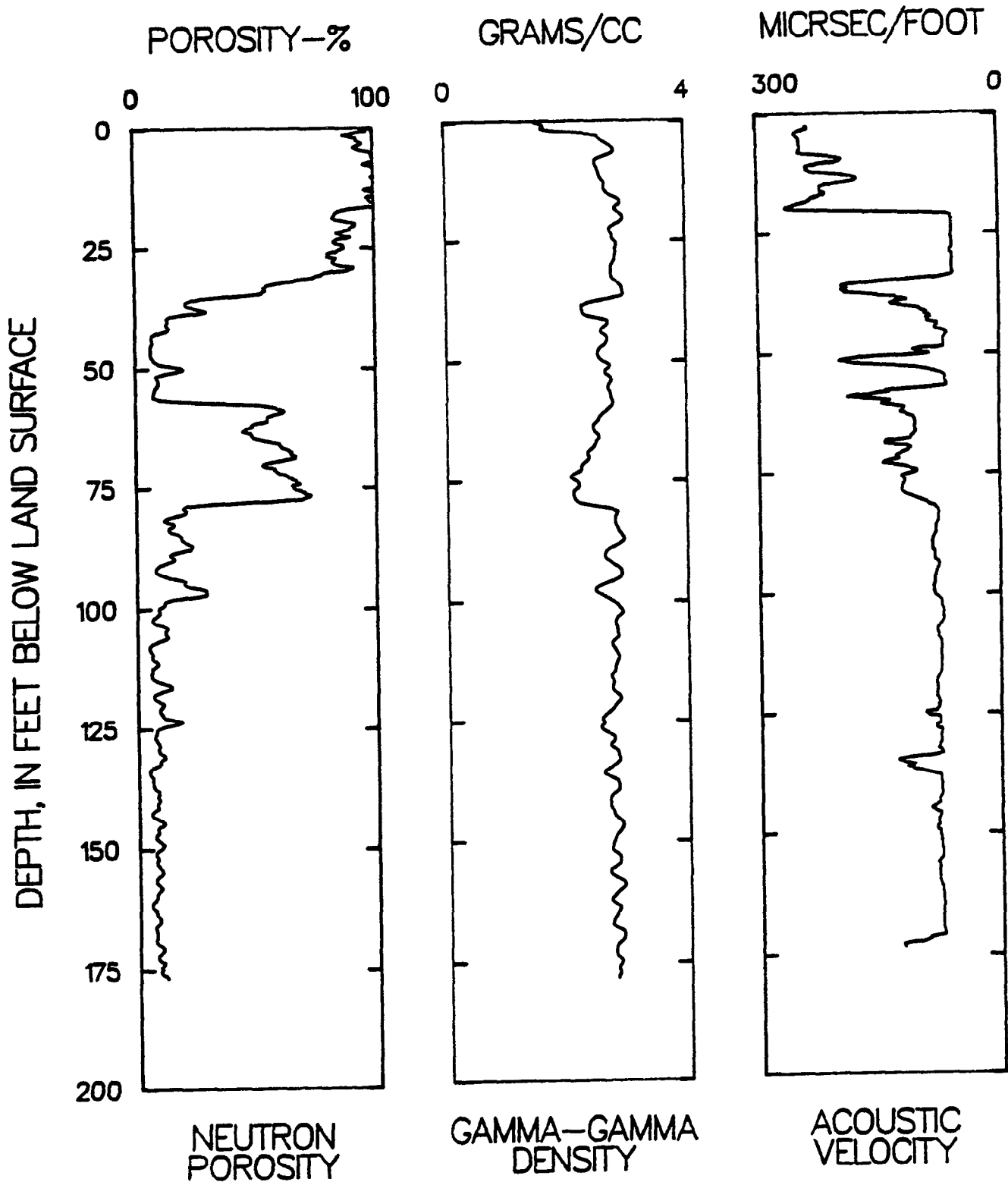
AEDC-172

LITHOLOGY LAND SURFACE	DEPTH, IN FEET	DESCRIPTION	ROCK SAMPLE ANALYSIS, IN PERCENT (%)
	0		
	10	Chert, rubble, gravel, and sand fragments in a brown clay matrix. Higher chert content at 10 feet.	
	20		Chert: 90% quartz, 10% hematite.
	30		
	40	Fort Payne limestone at 33 feet, dark, dusky gray limestone with chert fragments. Hit fractured rock at 41 and 51 feet.	Chert: 90% quartz, 10% hematite.
	50		Chert: 85% quartz, 10% calcite, 5% hematite.
	60	Chattanooga Shale at 58 feet, black shale containing minor amounts of pyrite.	Shale: clay minerals, quartz, pyrite, black matrix material.
	70		
	80		Packstone: 85% calcite sparite, 10% matrix,
	90	Ordovician limestone at 82 feet, olive-gray limestone with minor red-brown limestone.	5% quartz, <1% clay.
100	Minor amounts of fossil fragments. Fracture at 117 feet.	Packstone: 60% calcite sparite, 20% matrix, 10% quartz, 10% pyrite.	
110		Wackestone: 30% calcite spar cement, bioclasts, <1% pyrite.	
120	Dark to medium gray limestone, fine-grained mixed with shaley limestone.		
130			
140			
150			
160	Mixed, dark gray, shaley limestone and minor fine-grained greenish-gray limestone. Strong sulfur odor.	Wackestone: 50% bioclasts 50% calcite spar cement.	
170			
180	Bottom of hole at 183.		

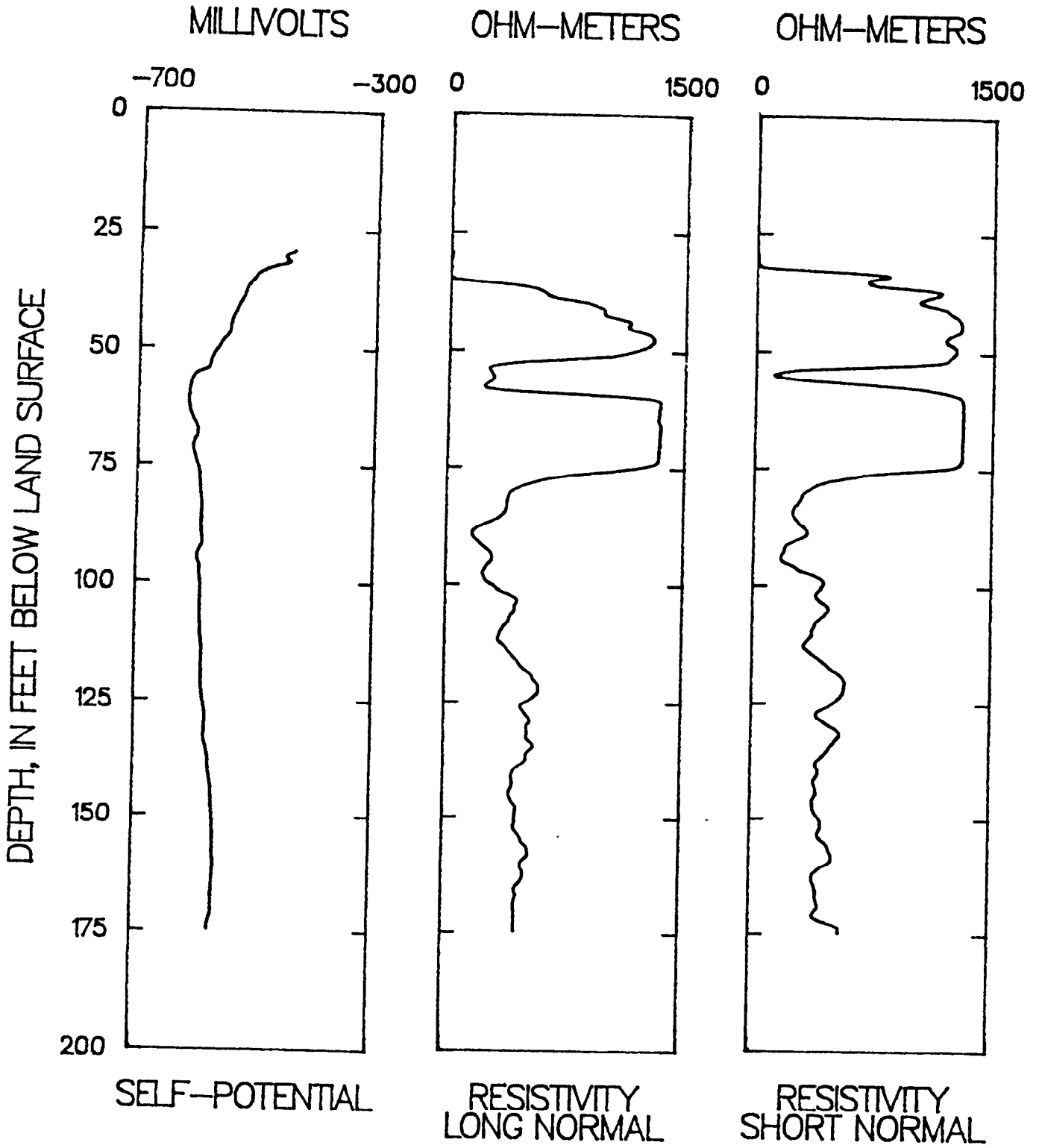
Lithologic descriptions and rock sample analysis for well AEDC-172.



Caliper, temperature, and natural gamma logs for well AEDC-172.

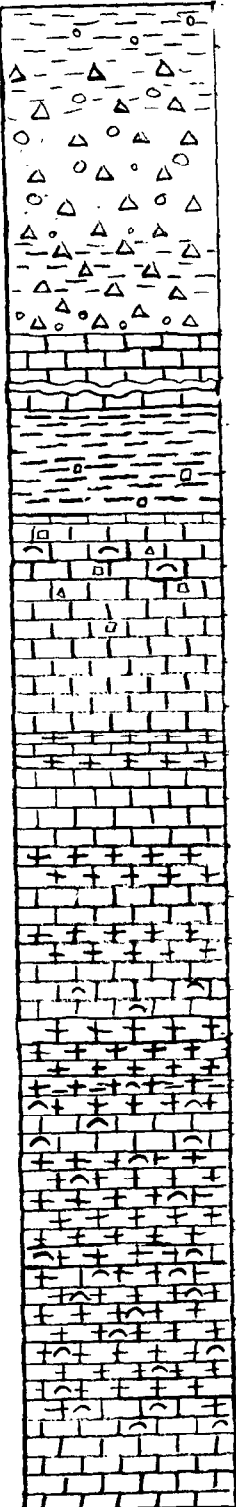


Neutron, gamma-gamma, and acoustic velocity logs for well AEDC-172.

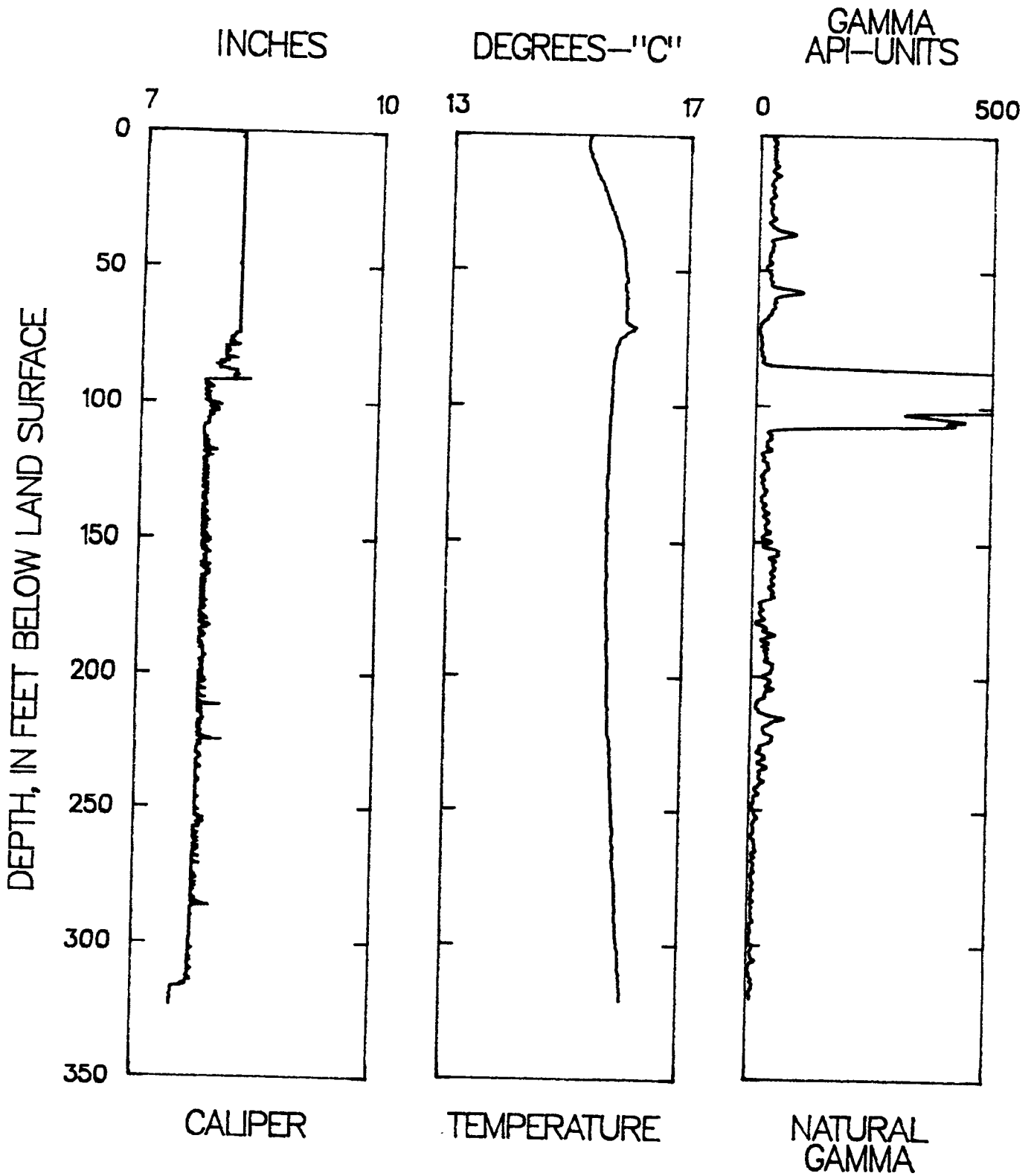


Electric logs for wells AEDC-172.

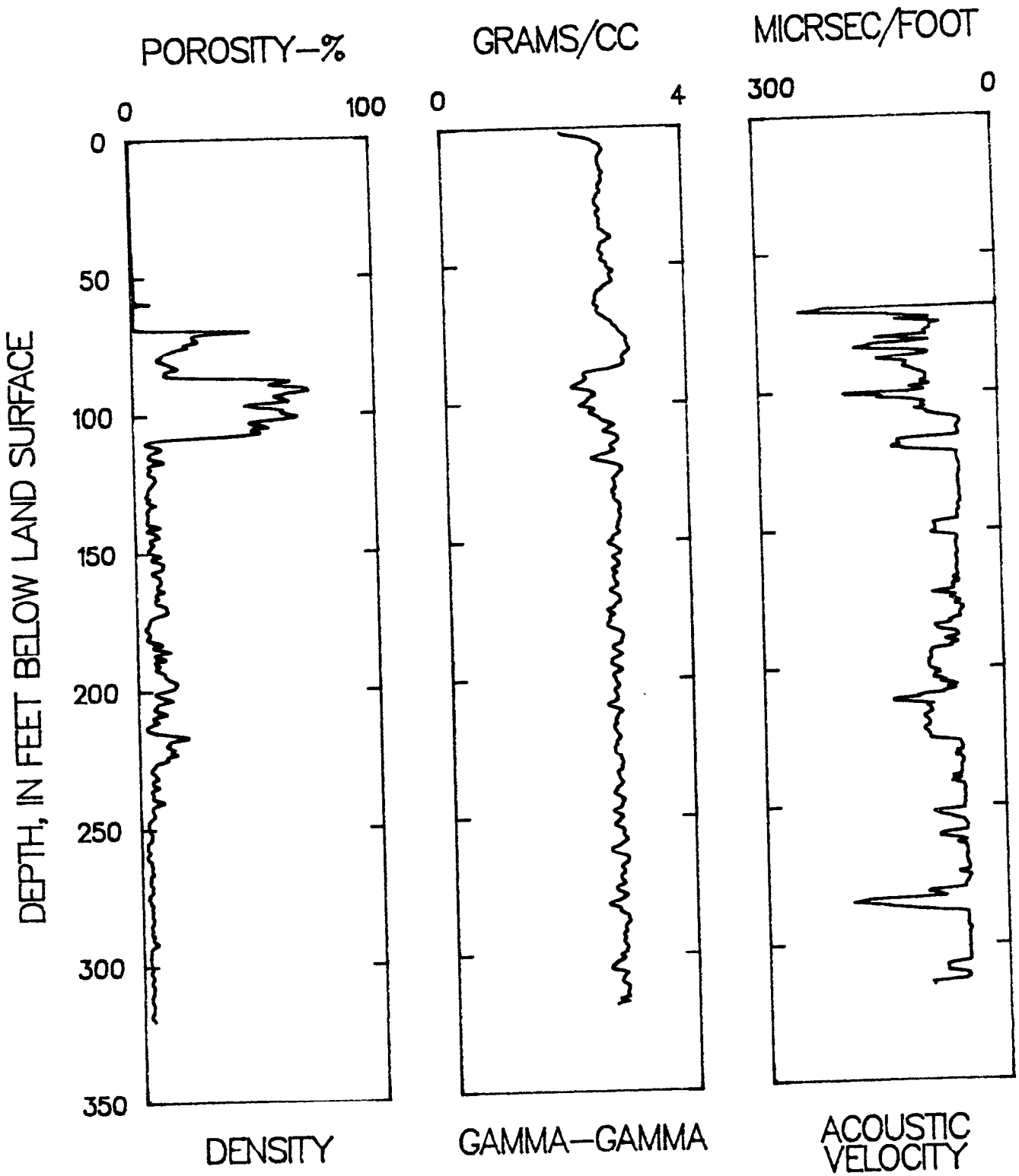
AEDC-175

LITHOLOGY LAND SURFACE	DEPTH, IN FEET	DESCRIPTIONS	ROCK SAMPLE ANALYSIS, IN PERCENT (%)
	0		
	10	Red clay matrix, rubble.	
	20	Red clay, rubble, and chert.	
	30	Large chert and rock fragments.	
	40	Brown color, large chert and rock fragments.	
	50	Mostly chert fragments.	
	60	Chert rubble with rock fragments. (90% chert with some clay.)	Chert: 80% quartz, 20% siliceous fossil fragments, ~1% hematite.
	70	Chert fragments and rock rubble. Limestone at 71 feet.	
	80	Light gray-green limestone. Fracture at 80.1 feet. Water at 84 feet.	Packstone: 70% calcite sparite, 30% matrix. Chert (at 84 feet): 60% quartz, 30% calcite, 10% matrix, ~1% hematite.
	90	Chattanooga Shale at 86 feet, black shale containing minor amounts of pyrite.	Shale: Clay minerals, quartz, pyrite, black matrix material.
	100		
	110	Dense dark and light gray limestone at 108 feet.	
	120	Medium to dark gray limestone, minor chert, calcite, and fossil fragments.	Wackestone: 55% bioclasts, 30% calcite spar cement, 10% matrix, 5% pyrite.
	130	Medium gray limestone, no fossils.	Wackestone: 60% bioclasts, 35% calcite spar cement, 5% pyrite.
	140	Dark gray limestone.	
	150	Medium gray limestone, fine-grained, intermixed with green shaley limestone, calcite specs, and some shale.	Wackestone: 70% bioclasts, 30% calcite spar cement, ~1% quartz, <1% pyrite.
	160		
	170		
	180		
	190	Light to medium gray limestone, green limestone, some calcite.	
	200	Medium green-gray shaley limestone.	
	210	Light gray limestone, some fossils.	
	220	Dark gray shaley limestone.	
	230	Medium to light gray fossiliferous Ordovician limestone (brachiopods and bryozoans), some limestone easily breakable, shale-like. Some calcite specs.	Wackestone: 65% bioclasts, 30% calcite spar cement, 5% quartz, ~1% pyrite.
	240		
	250		Packstone: 70% calcite sparite, 20% quartz, 10% matrix, ~1% pyrite.
	260		
	270		
	280		Packstone: 80% calcite sparite, 15% quartz, 5% bioclasts.
	290		
	300		Wackestone: 70% bioclasts, 25% calcite spar cement, 5% pyrite, <1% quartz.
	310		Wackestone: 60% bioclasts, 40% calcite spar cement, ~1% pyrite.
320	Bottom of hole at 320 feet.		

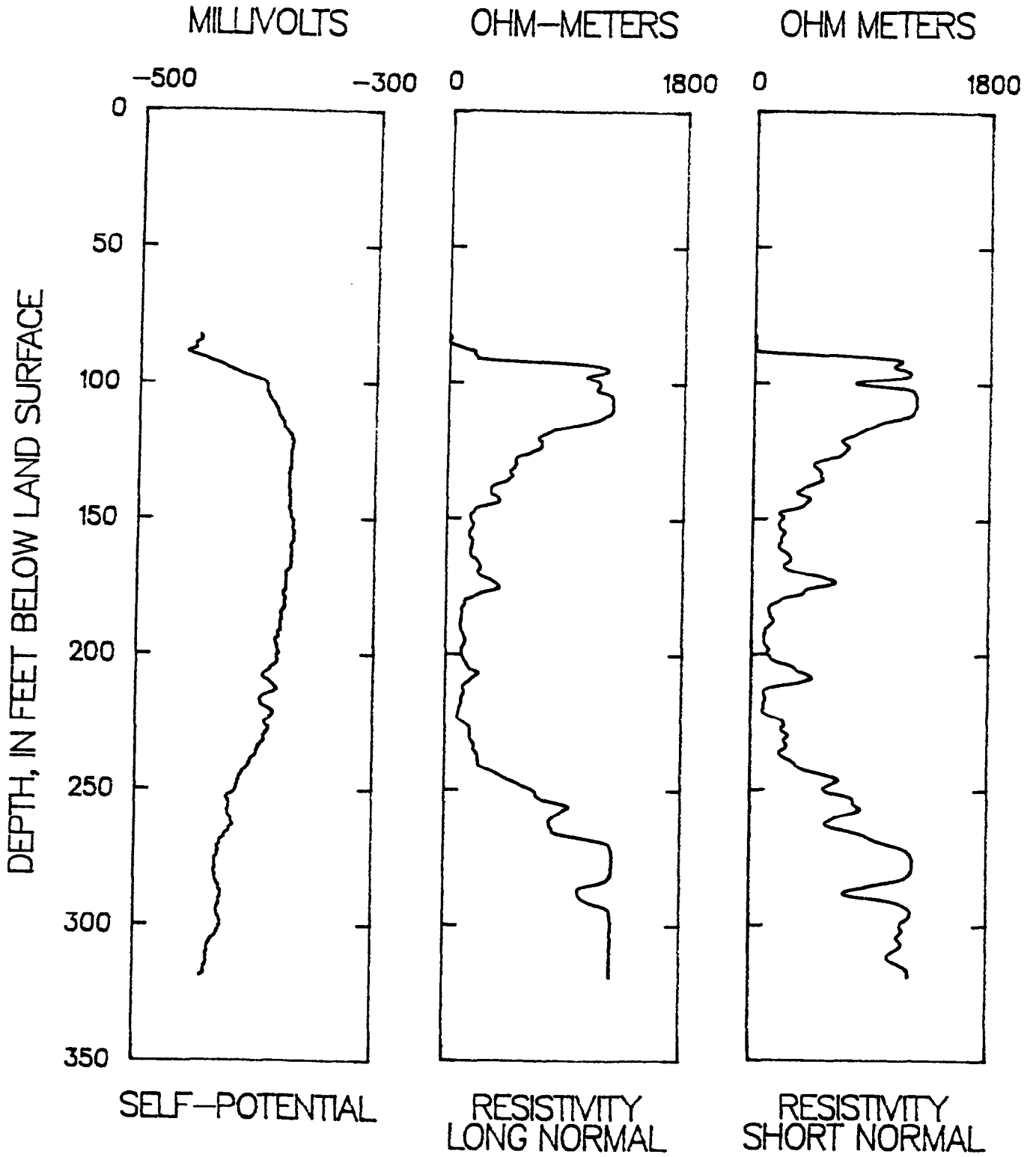
Lithologic descriptions and rock sample analysis for well AEDC-184.



Caliper, temperature, and natural gamma logs for well AEDC-175.



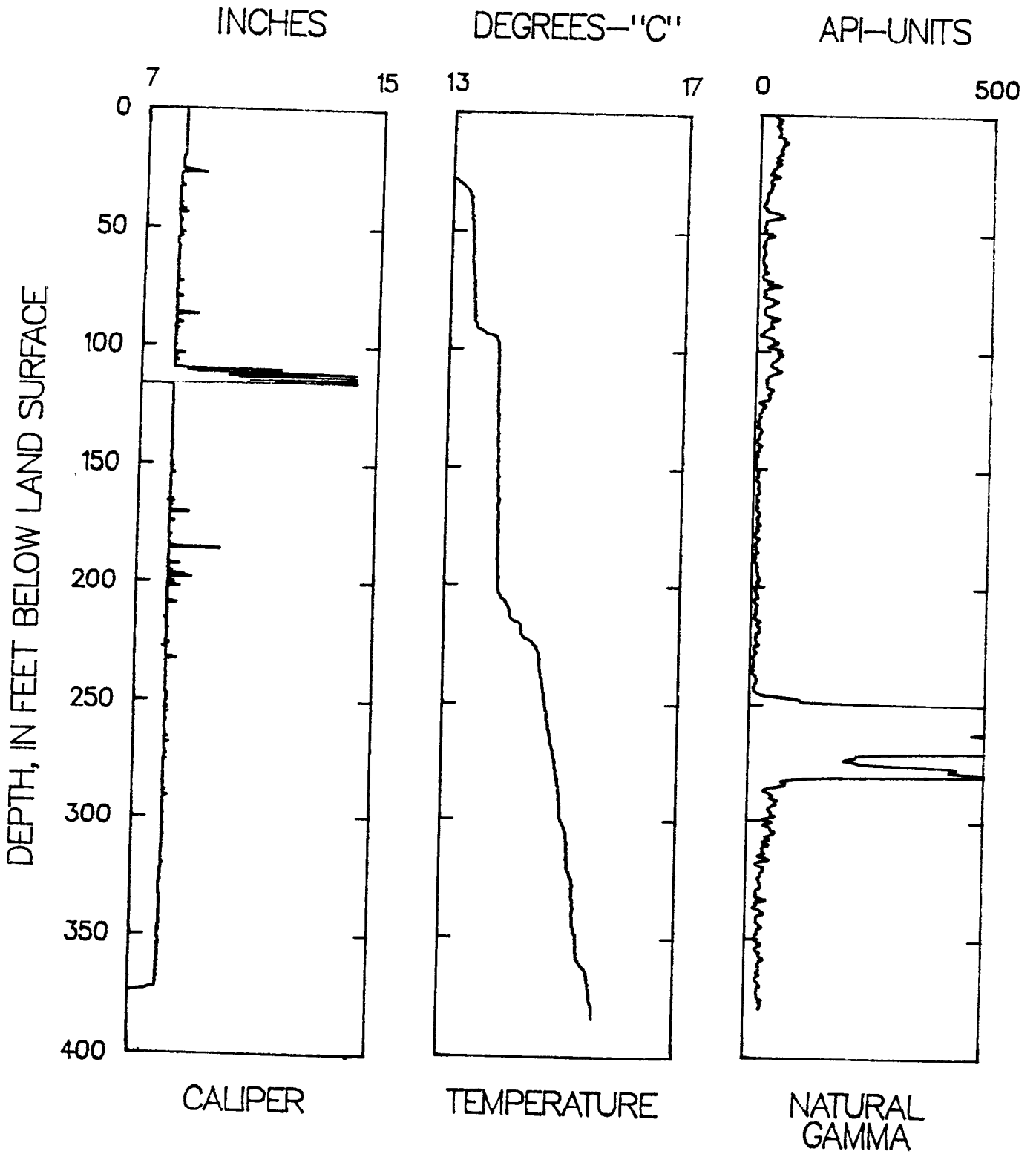
Neutron, gamma-gamma, and acoustic velocity logs for well AEDC-175.



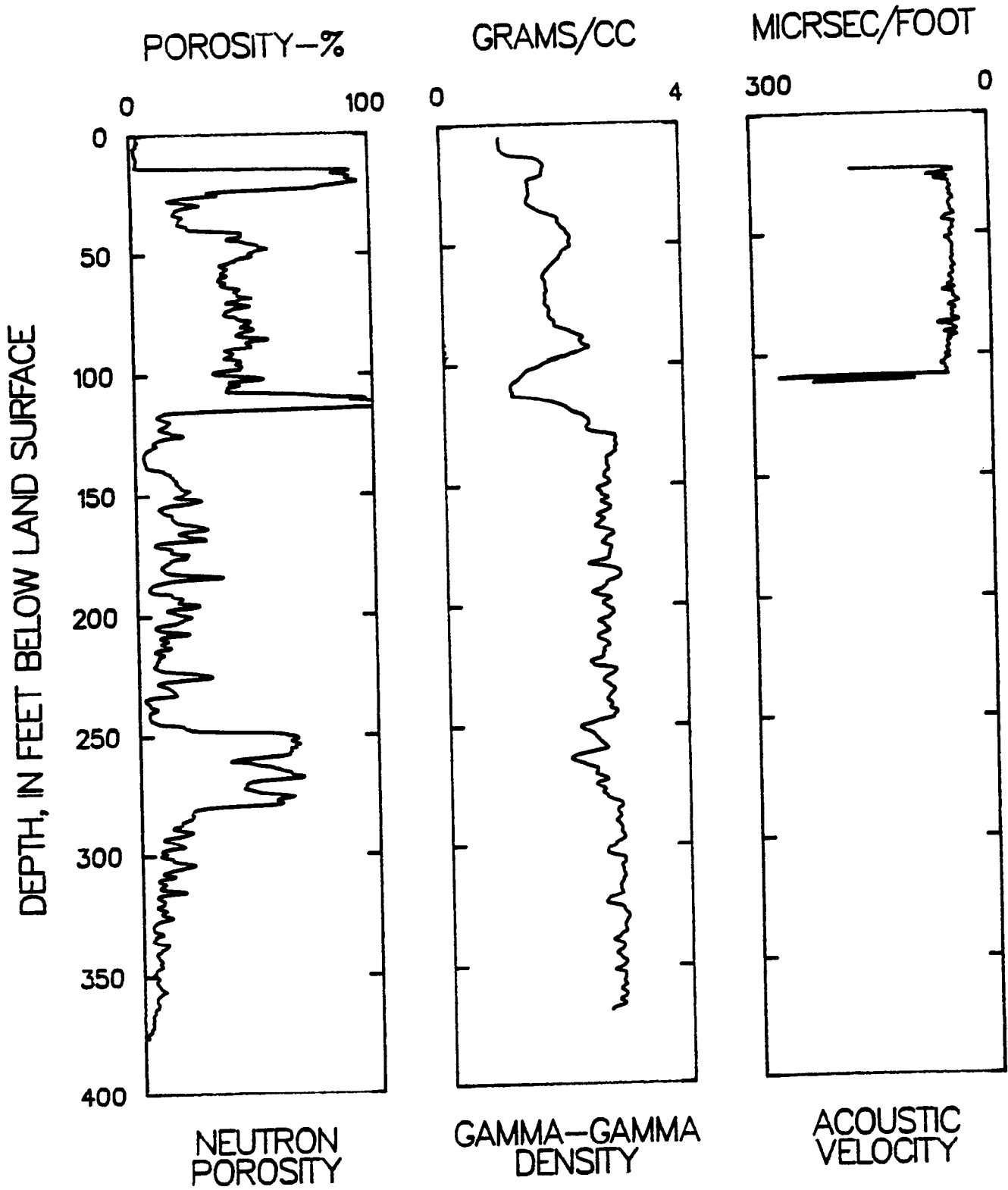
Electric logs for wells AEDC-175.

LITHOLOGY LAND SURFACE	DEPTH, IN FEET	DESCRIPTION	ROCK SAMPLE ANALYSIS, IN PERCENT (%)
	0		
	10	Mud, chert, and gravel.	
	20	Chert and gravel.	Chert (at 22 feet): 85% quartz, 10% siliceous fossil fragments, 5% hematite.
	30	Fort Payne limestone at 24 feet.	Wackestone: 70% bioclasts, 30% calcite spar.
	40	Medium to light gray shaley limestone. Fracture at 41 feet.	
	50	Medium gray limestone, coarse-grained.	
	60		Wackestone: 60% bioclasts, 30% calcite spar cement, 10% quartz, ~1% pyrite.
	70		
	80		
	90	Fractured limestone at 88-90 feet.	Wackestone (at 88 feet): 75% bioclasts, 20% calcite spar cement, 5% quartz, ~1% pyrite.
	100	Medium to dark gray limestone, some chert.	Chert: 65% quartz, 30% matrix, 5% hematite.
	110	Fractured limestone at 110-118 feet, 4 foot cavity at 112-118 feet.	
	120	Medium to light gray limestone, chert.	
	130		
	140	Cherty, medium to light gray limestone with calcite specs.	
	150		Packstone: 65% calcite sparite, 35% matrix, <1% pyrite.
	160	Light gray, fine-grained limestone, calcite and rock fragments.	
	190		Packstone: 95% calcite, 5% matrix, <1% pyrite.
	200	Light gray limestone, some shaley limestone, chert, some calcite.	
	210		
	220		
	230	Dark to medium gray fine-grained limestone, chert, and calcite.	
	240		
	250	Chattanooga Shale at 252 feet. Sulfur odor.	Chert: 80% quartz, 15% matrix, 5% hematite. Shale: Clay minerals, quartz, pyrite, black matrix material.
	260	Black shale, some green shale.	
	270		
	280		Shale: Clay minerals, quartz, pyrite, black matrix material.
	290	Light gray limestone at 284 feet. Dark gray shaley limestone.	
	300	Green fine-grained limestone, mixed with gray limestone, calcite specs, and quartz pieces.	
	310		Packstone: 85% calcite sparite, 10% matrix, 5% quartz, ~1% pyrite.
	350	Dark and medium gray fossiliferous limestone, calcite pieces.	Wackestone: 60% bioclasts, 40% calcite spar cement, <1% quartz, <1% pyrite.
	360		
	370		
	380	Bottom of hole at 384 feet.	Wackestone: 50% bioclasts, 50% calcite spar cement.

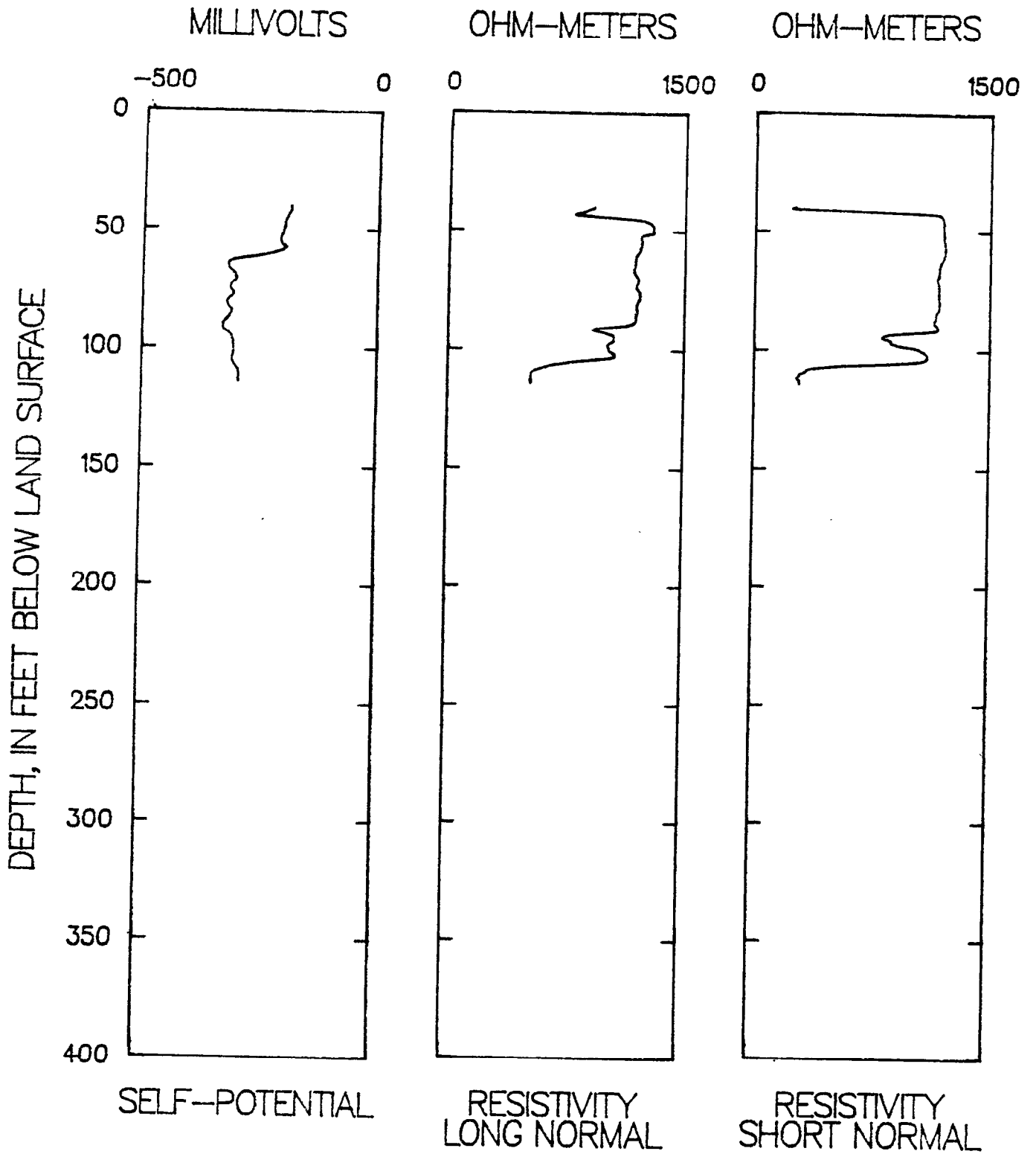
Lithologic descriptions and rock sample analysis for well AEDC-187.



Caliper, temperature, and natural gamma logs for well AEDC-176.



Neutron, gamma-gamma, and acoustic velocity logs for well AEDC-176.

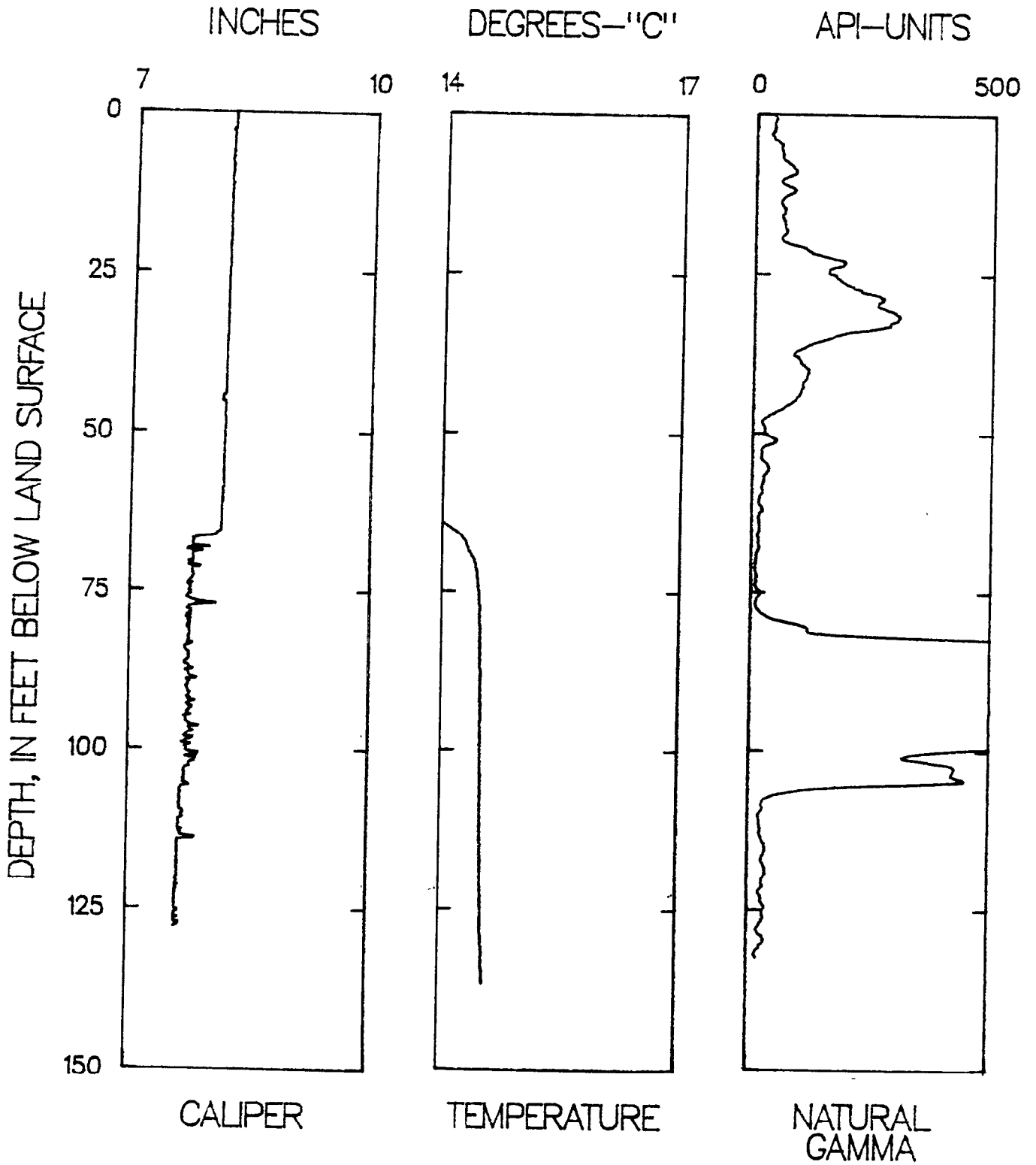


Electric logs for well AEDC-176.

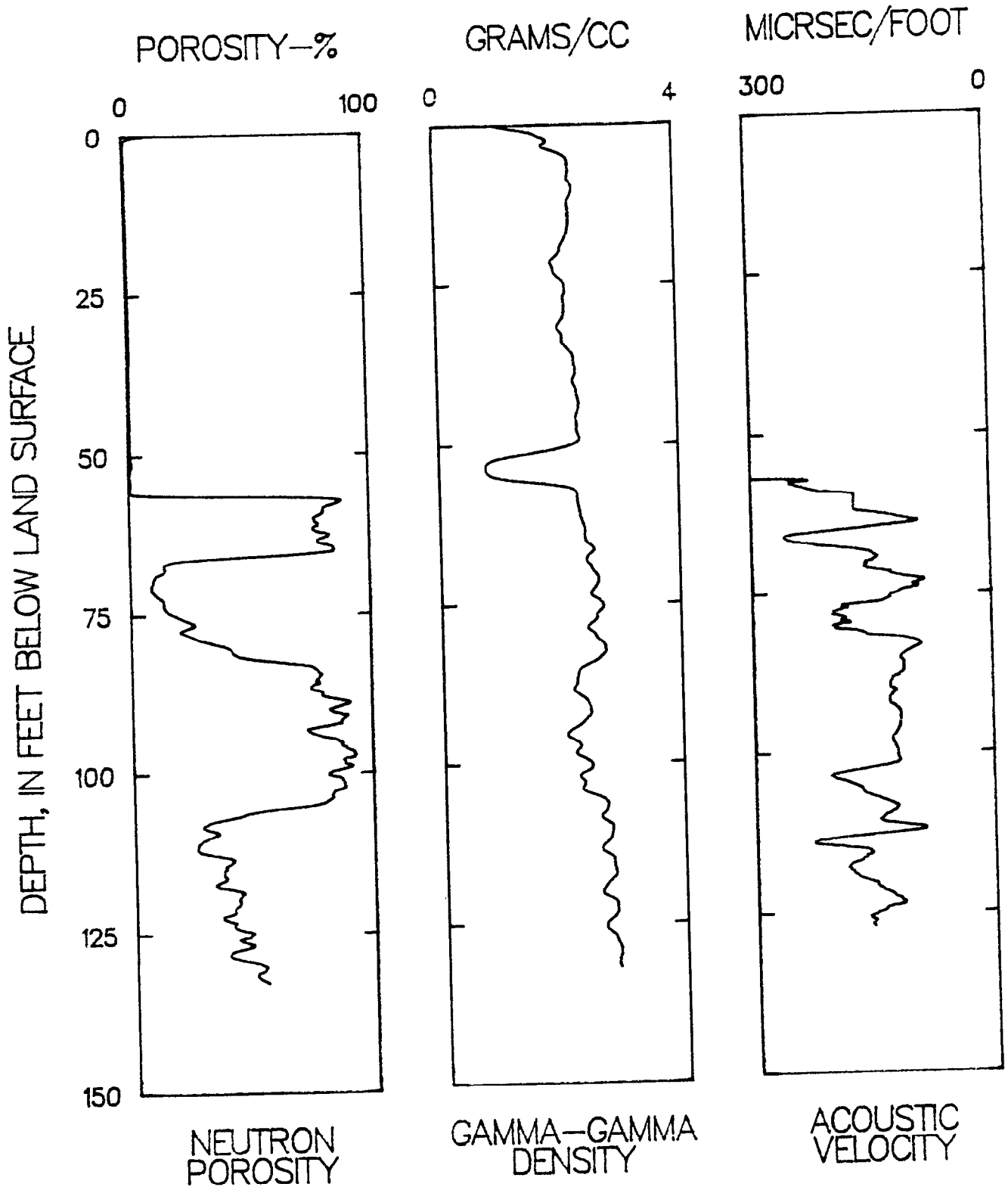
AEDC-180

LITHOLOGY LAND SURFACE	DEPTH, IN FEET	DESCRIPTIONS	ROCK SAMPLE ANALYSIS, IN PERCENT (%)
	0		
	10	Rock and chert fragments, gravel mixed in a red-brown clay matrix.	Chert: 90% quartz, 5% matrix, 5% hematite.
	20		
	30		Chert: 85% quartz, 10% matrix, 5% hematite.
	40	Higher chert content in matrix from 40 to 64.5 feet.	
	50		
	60	Light gray, fine-grained limestone. Changes to dark gray shaley limestone.	Chert: 85% quartz, 10% matrix, 5% hematite.
	70		Wackestone: 30% bioclasts, 70% calcite spar cement.
	80	Chattanooga Shale at 83 feet, black shale, strong sulfur odor.	Chert (at 183 feet): 90% quartz, 5% matrix, 5% hematite.
	90		
	100		Packstone: 60% calcite sparite, 20% matrix, 20% quartz, <1% pyrite.
	110	Dark to light gray fine-grained Ordovician limestone at 108 feet.	Packstone: 75% calcite sparite, 20% quartz, 5% matrix, <1% pyrite.
	120	Hit fractured limestone at 115 feet.	
130	Medium gray limestone, some calcite. Bottom of hole at 131 feet.	Wackestone: 40% bioclasts, 50% calcite spar cement, 10% matrix, <1% pyrite.	

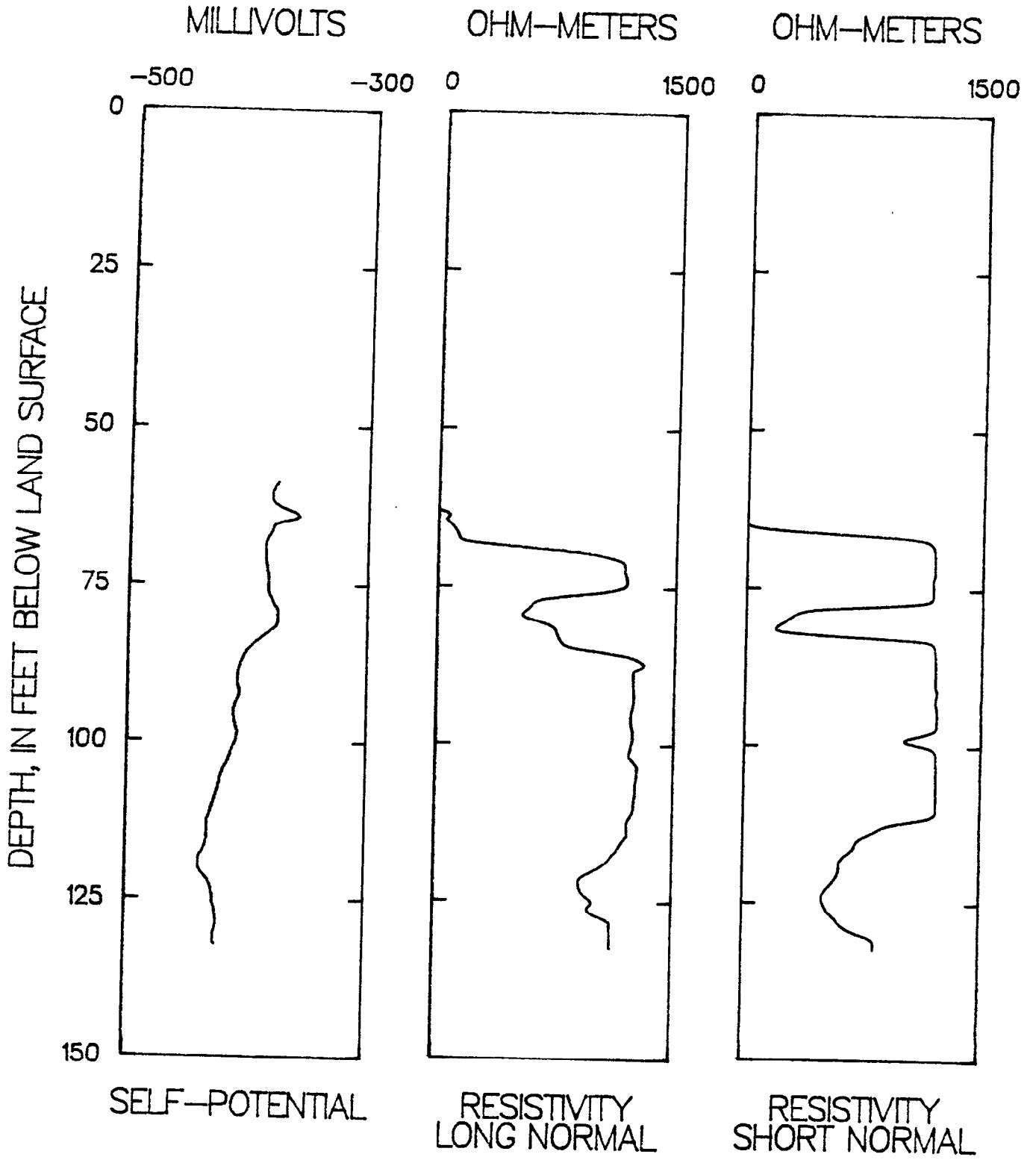
Lithologic descriptions and rock sample analysis for well AEDC-180.



Caliper, temperature, and natural gamma logs for well AEDC-180.



Neutron, gamma-gamma, and acoustic velocity logs for well AEDC-180.



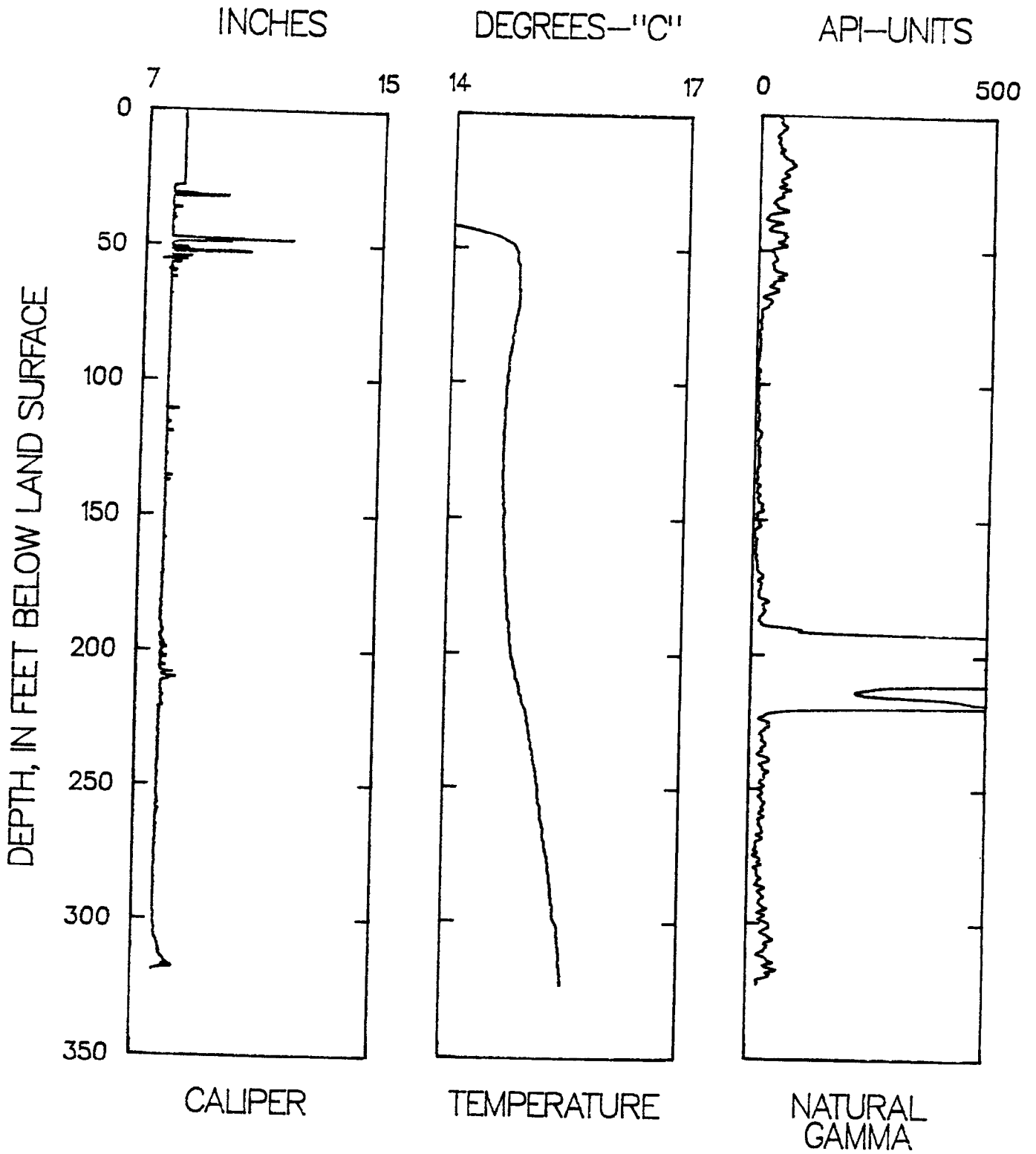
Electric logs for well AEDC-180.

AEDC-184

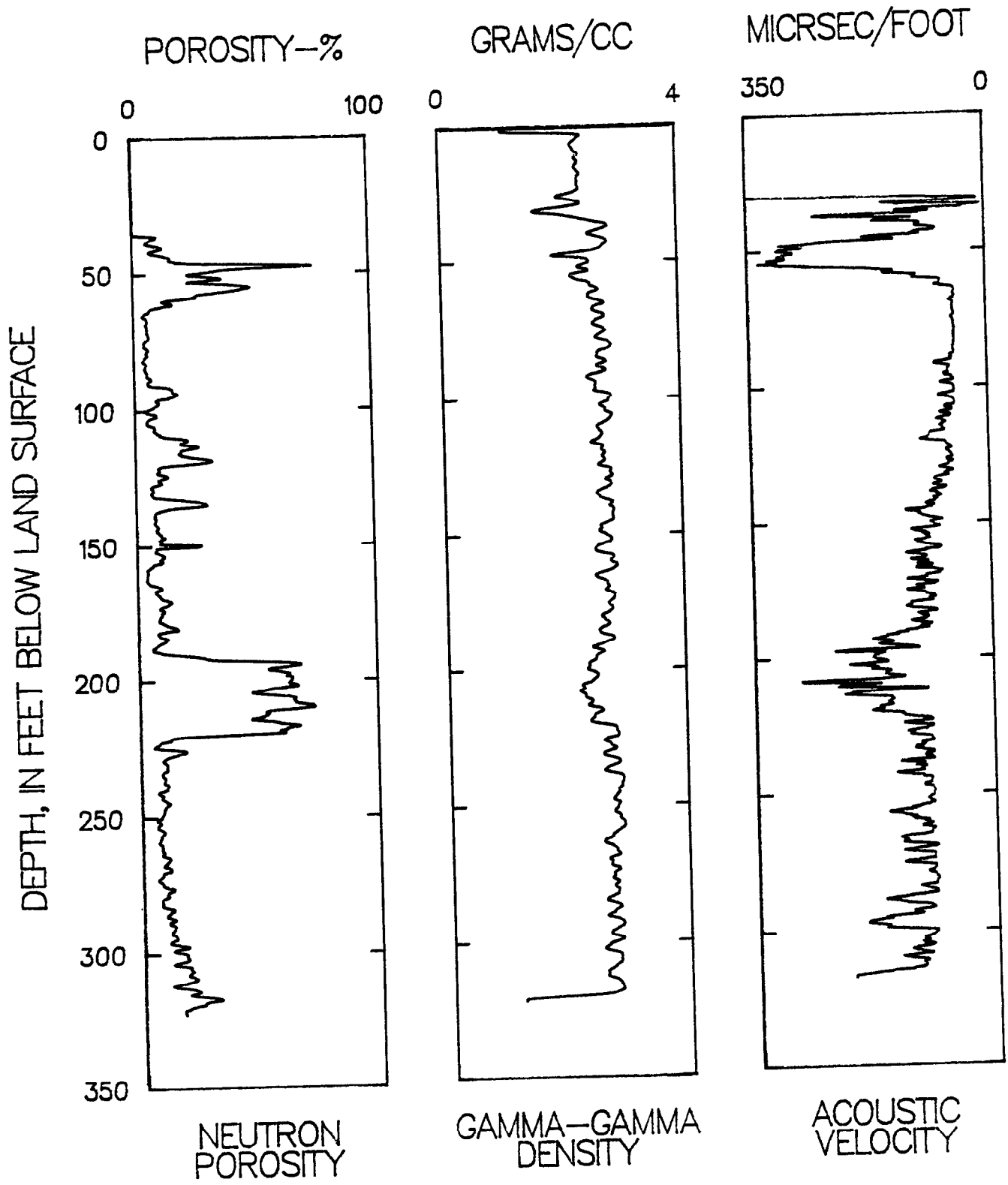
ROCK SAMPLE ANALYSIS, IN PERCENT (%)

LITHOLOGY LAND SURFACE	DEPTH, IN FEET	DESCRIPTION	ROCK SAMPLE ANALYSIS, IN PERCENT (%)
	0		
	10	Brown-red clay with chert and rock fragments.	Chert: 95% quartz, 5% hematite.
	20	Limestone at 27 feet.	
	30	Medium gray limestone. Hit fracture at 38 feet (5 gpm).	Packstone: 80% calcite sparite, 20% matrix, ~1% pyrite.
	40	Shaley, light to medium gray limestone. Hit fracture at 48 to 49 feet (25-30 gpm).	
	50	Fracture at 50 to 54 feet. Mud, rock fragments, chert, and rubble included within fracture.	
	60		
	70	Light to dark gray limestone, chert.	
	80	Medium gray limestone, rock fragments.	
	90	Light to medium gray limestone, chert, calcite.	
	100		
	110		
	120	Hit fractured limestone at 118 to 118.5 feet (40 gpm).	
	130		
	140		
	150	Sulfur odor. Fracture at 152 feet.	Wackestone: 40% bioclasts, 50% calcite spar cement, 10% quartz, <1% pyrite.
	160	Medium gray shaley limestone.	
	170	Dark gray limestone, 50% chert, some green shale.	Wackestone: 50% bioclasts, 30% calcite spar cement, 20% quartz.
	180	Green shale at 183 feet, limestone fragments and chert specs.	Wackestone (at 183 feet): 30% bioclasts, 70% calcite spar cement.
	190		
	200	Chattanooga Shale at 191 feet, black shale with sulfur odor.	Shale: Clay minerals, quartz, pyrite, black matrix material.
	210		
	220	Ordovician limestone at 219 feet. Dark to light gray fossiliferous limestone (brachiopods).	
	230		
	240		Wackestone: 50% bioclasts, 45% calcite spar cement, 5% pyrite.
	250		
	260		
	270		Wackestone: 60% bioclasts, 40% calcite spar cement, 5% pyrite.
	280	Medium to light gray limestone, some calcite, some fossils.	
	290		
	300		
	310		
	320	Bottom of hole at 320 feet.	Wackestone: 50% bioclasts, 50% calcite spar cement, ~1 pyrite.

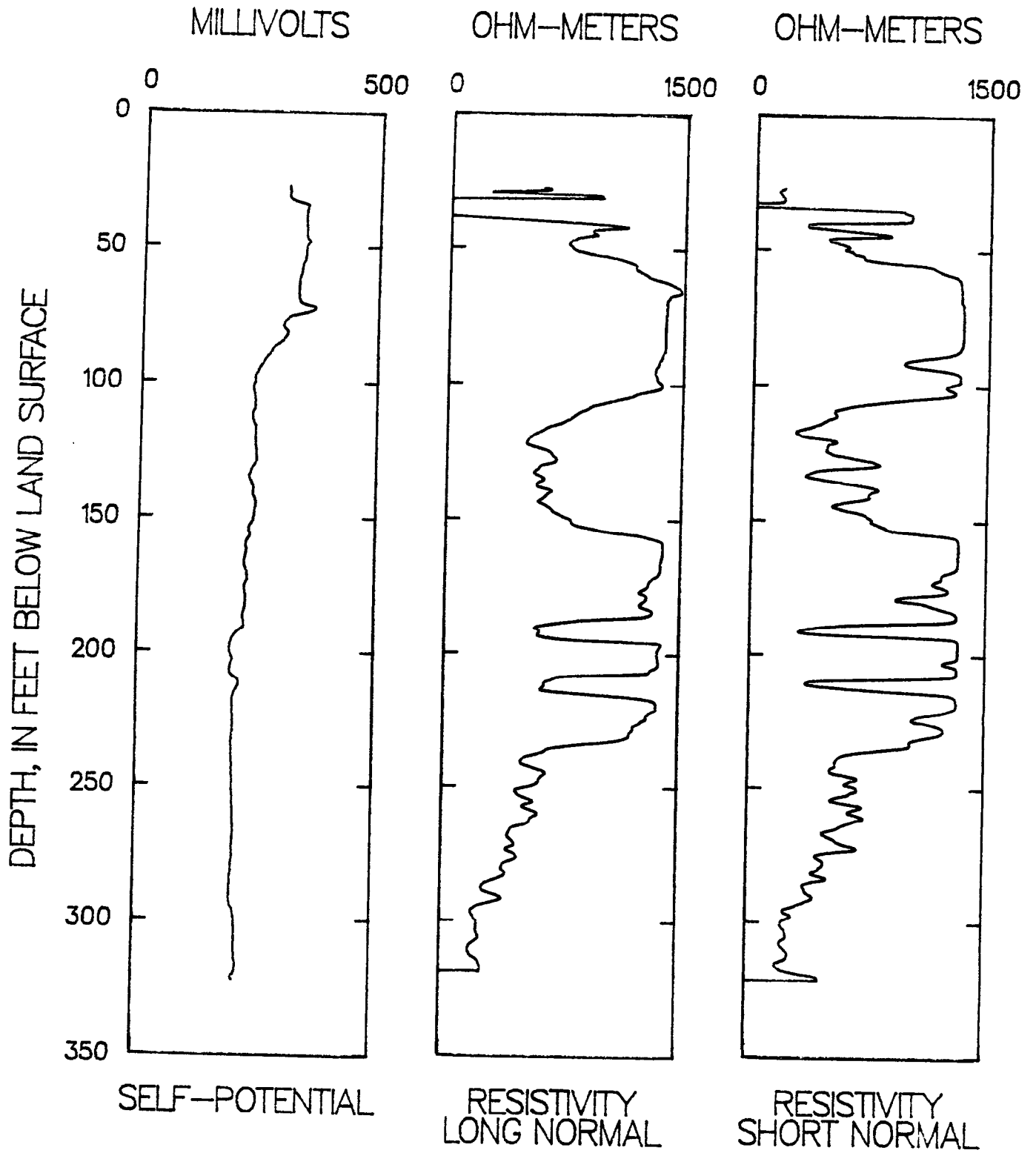
Lithologic descriptions and rock sample analysis for well AEDC-184.



Caliper, temperature, and natural gamma logs for well AEDC-184.



Neutron, gamma-gamma, and acoustic velocity logs for well AEDC-184.

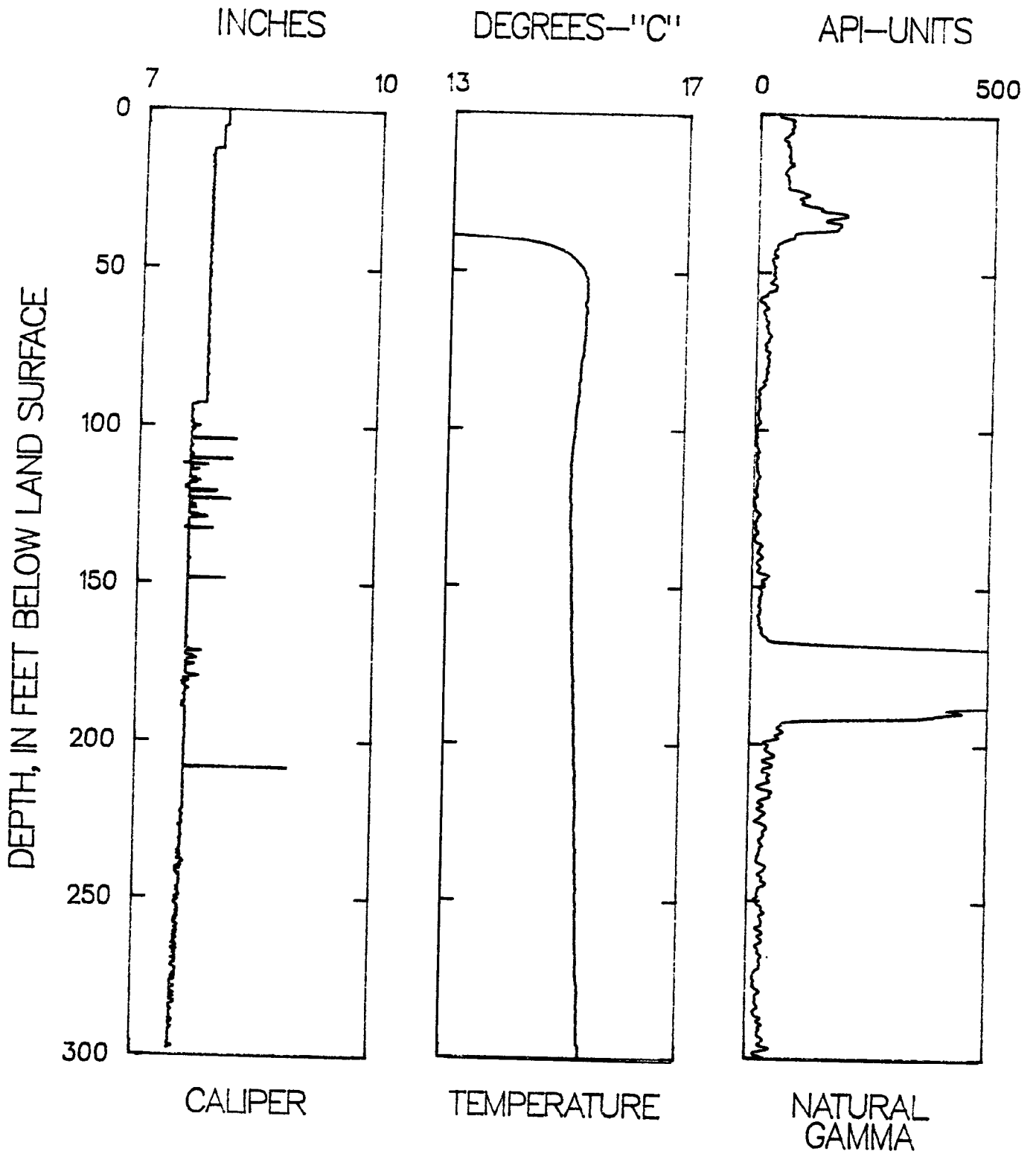


Electric logs for well AEDC-184.

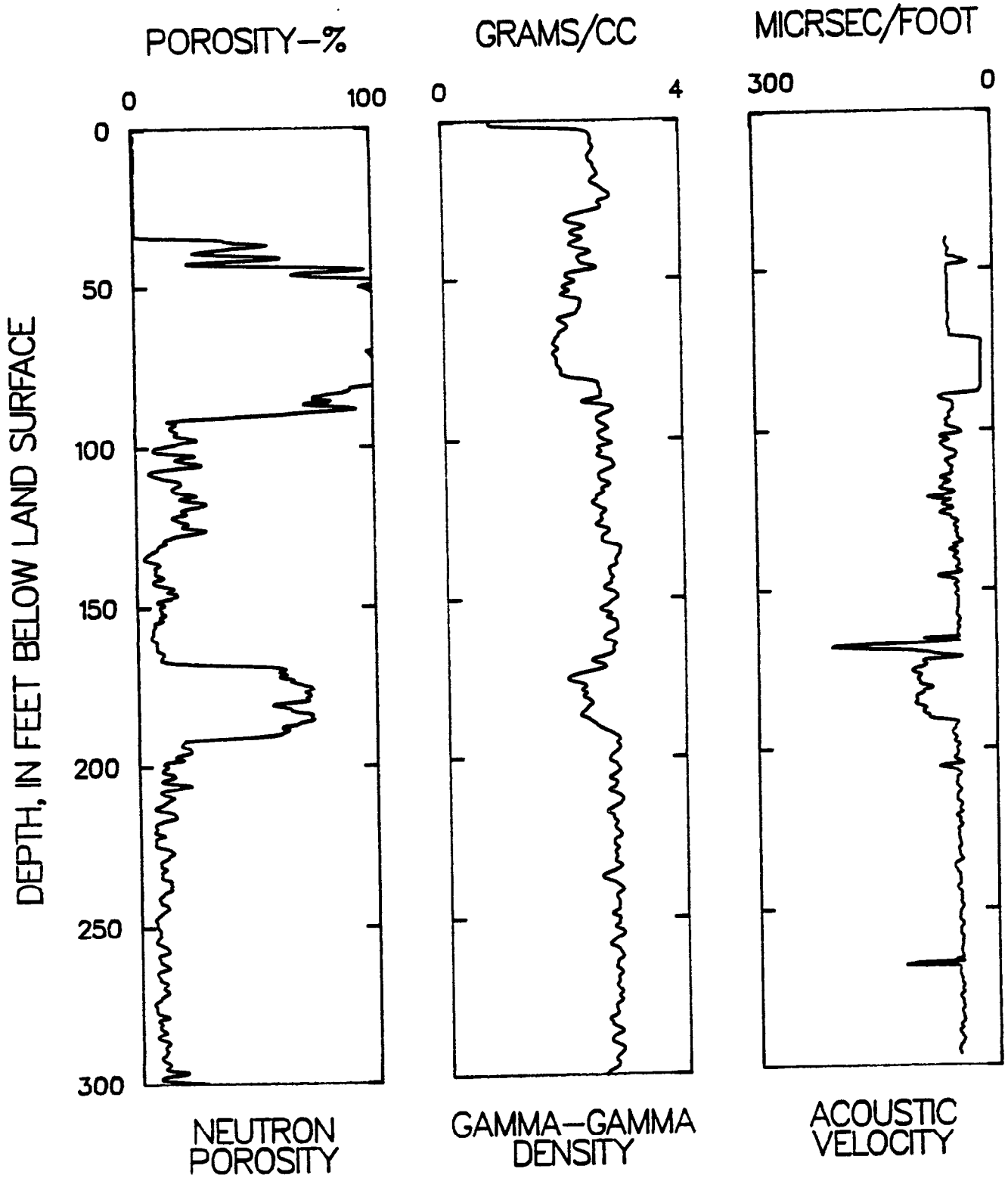
AEDC-187

LITHOLOGY LAND SURFACE	DEPTH, IN FEET	DESCRIPTION	ROCK SAMPLE ANALYSIS, IN PERCENT (%)									
	0											
	10	Red-brown clay matrix containing rock rubble, sand, and chert.	Chert: 85% quartz, 10% matrix, 5% hematite.									
	20											
	30											
	40											
	50											
	60											
	70											
	80											
	86			Hit limestone rock at 86 feet.								
	90			Olive-gray limestone, micritic, some quartz fragments, sulfur odor.	Chert: 85% quartz, 10% matrix, 5% hematite.							
	100											
	110											
	120											
	130											
		130	Olive-gray chert and limestone, some clay, sulfur odor.			Packstone: 95% calcite sparite, 5% matrix, <1% hematite.						
		140										
		146					Dark gray limestone, calcite crystals, green and black shale at 146 feet.	Wackestone: 35% bioclasts, 60% calcite spar cement, 5% hematite.				
		150					Olive-gray limestone and chert, few quartz chips.					
		160					Green limestone, olive-gray chert, strong sulfur odor.	Chattanooga Shale.	Wackestone: 50% bioclasts, 40% calcite spar cement, 10% quartz, <1% pyrite.			
170												
180												
189		Dark gray limestone at 189 feet.		Packstone (at 192 feet): 60% calcite sparite 20% matrix, 20% calcite vugs, <1% pyrite.								
200		Olive-green to gray limestone, calcite chips.			Packstone: 65% calcite sparite, 15% matrix, 20% calcite vugs.							
210												
220	Olive-gray limestone, some calcite, fossils.	Olive-gray micritic limestone.	Wackestone: 50% bioclasts, 30% calcite spar cement, 10% quartz, 10% matrix.									
230												
240				Light to dark gray limestone, coarse-grained, some chert.	Wackestone: 80% bioclasts, 20% calcite spar cement, <1% pyrite.							
250												
260						Light coarse to dark shaley limestone, some calcite specs.	Wackestone: 60% bioclasts, 40% calcite spar cement, <1% pyrite.					
270								Medium gray coarse to dark gray shaley limestone, minor calcite specs and fossils (brachiopods).	Wackestone: 65% bioclasts, 35% calcite spar cement, <1% pyrite.			
280										Wackestone: 80% bioclasts, 20% calcite spar cement, <1% pyrite.		
300											Green shaley limestone. Bottom of hole at 300 feet.	Wackestone: 50% bioclasts, 50% calcite spar cement, <1% pyrite.

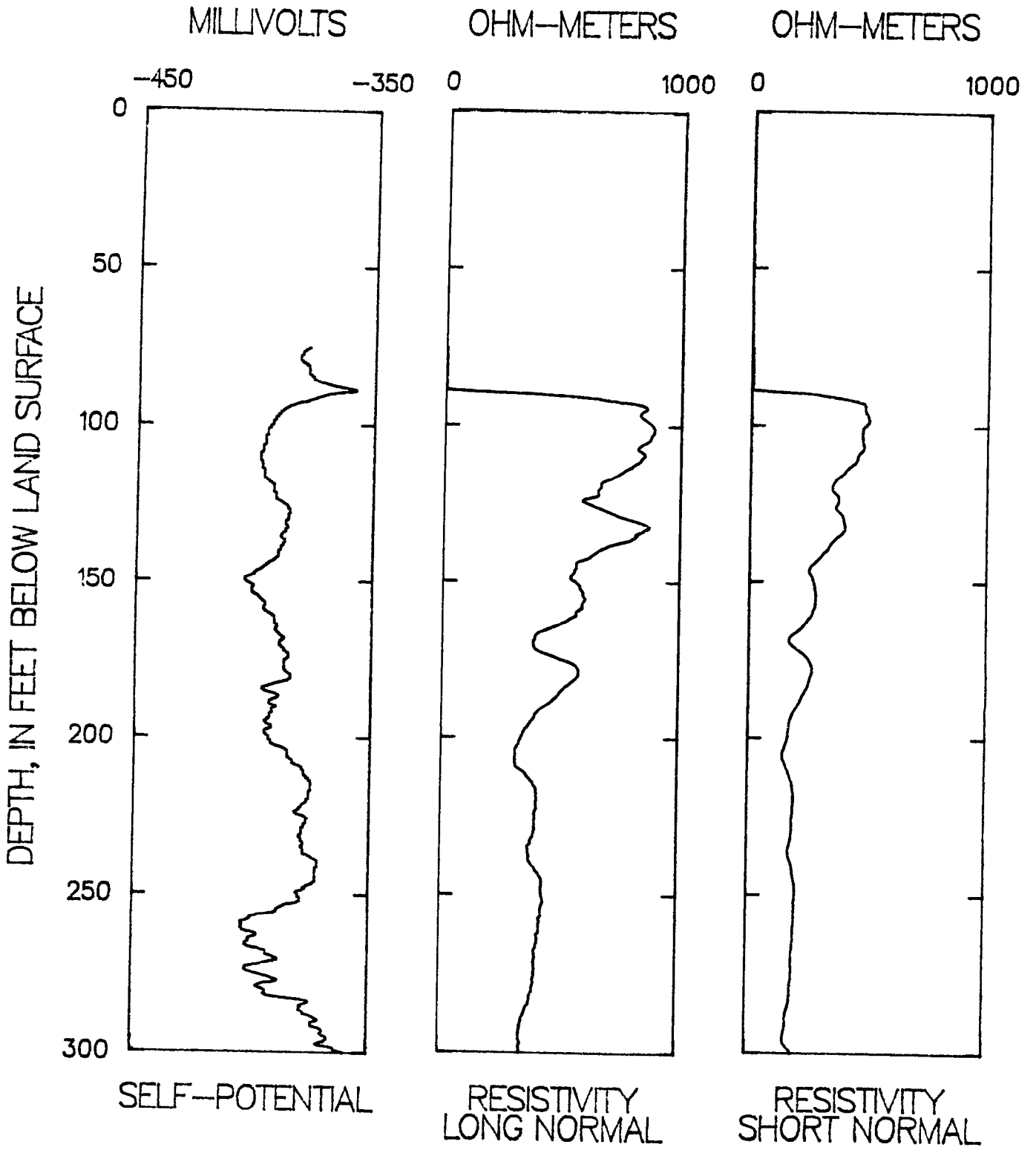
Lithologic descriptions and rock sample analysis for well AEDC-187.



Caliper, temperature, and natural gamma logs for well AEDC-187.



Neutron, gamma-gamma, and acoustic velocity logs for well AEDC-187.



Electric logs for well AEDC-187.

APPENDIX 2

Inorganic constituents and physical properties of ground-water
samples from wells in the Arnold Air Force Base area

Inorganic constituents and physical properties of ground-water samples from wells in the Arnold Air Force Base area

[mg/L, milligrams per liter; ug/L, micrograms per liter; uS/cm, microsiemens per centimeter; deg C, degrees Celsius; NTU, nephelometric turbidity units; mV, millivolts; --, no data. Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent]

AEDC WELL NUMBER	LOCAL TENNESSEE WELL NUMBER	STATION NUMBER	DATE	SPECIFIC CONDUCTANCE (uS/cm)	PH (standard units)	ALKALINITY FIELD (mg/L as CaCO3)	TEMPERATURE WATER (deg C)	TURBIDITY (NTU)	OXIDATION REDUCTION POTENTIAL (mV)
AEDC-172	Fr:S-001	352011086063901	05-02-91	3390	7.1	170	19.0	10	--
AEDC-173	Fr:S-004	352011086063902	04-18-91	212	7.9	96	14.5	0.50	365
AEDC-174	Fr:S-005	352011086063903	04-18-91	179	7.4	90	15.5	13	420
AEDC-175	Cf:G-009	352247086031301	05-02-91	5870	7.5	128	19.0	25	--
AEDC-176	Cf:G-006	352515086011701	05-01-91	1340	7.5	148	16.5	1.2	--
AEDC-177	Cf:G-028	352515086011702	04-11-91	302	7.0	140	14.0	2.0	270
AEDC-178	Cf:G-029	352515086011703	04-10-91	104	6.2	38	14.5	170	450
AEDC-179	Cf:G-014	352253086011903	04-24-91	66	5.4	30	18.5	44	200
AEDC-180	Cf:G-007	352229086045601	05-03-91	1020	7.7	128	19.0	4.6	380
AEDC-181	Cf:G-010	352237086050302	05-03-91	1640	6.9	392	19.0	20	--
AEDC-182	Cf:G-011	352237086050303	04-29-91	110	6.3	60	14.5	1.1	460
AEDC-183	Cf:G-012	352237086050304	04-26-91	19	4.6	--	16.5	0.70	430
AEDC-184	Cf:G-008	352509086051101	05-01-91	525	7.5	204	16.5	1.0	--
AEDC-185	Cf:G-016	352509086051102	04-15-91	280	7.7	134	16.0	2.1	300
AEDC-186	Cf:G-018	352509086051103	04-16-91	301	7.2	138	19.5	0.50	350
AEDC-187	Cf:D-001	352129085585501	04-18-91	15000	7.2	1900	16.5	0.60	-190
AEDC-188	Cf:D-007	352129085585502	04-17-91	1520	7.4	138	16.5	1.0	-62
AEDC-189	Cf:D-003	352129085585503	04-17-91	208	9.4	90	17.0	1.0	270
AEDC-190	Fr:R-007	351959086081301	04-30-91	1230	7.2	622	15.5	4.0	620
AEDC-191	Fr:R-008	351959086081302	04-30-91	94	6.9	39	20.0	0.40	160
AEDC-192	Fr:R-009	351959086081303	05-01-91	22	4.7	4	21.5	0.40	330
AEDC-193	Cf:F-003	352240086102101	05-02-91	1630	7.8	118	17.0	6.0	--
AEDC-194	Cf:F-004	352240086102102	04-23-91	187	6.6	82	15.0	85	447
AEDC-195	Cf:F-005	352310086085401	04-19-91	24	5.3	10	15.0	11	530
AEDC-196	Cf:G-015	352624086044301	05-01-91	5890	7.0	216	18.5	1.3	-80
AEDC-197	Cf:G-017	352624086044302	04-12-91	164	6.6	76	15.5	37	520
AEDC-198	Cf:G-032	352253086011901	04-24-91	2110	6.7	348	17.5	6.0	-170
AEDC-199	Cf:D-009	352253086011902	04-23-91	47	5.9	19	15.5	1.4	400
AEDC-200	Cf:G-021	352354086032501	04-25-91	154	7.0	80	15.0	17	470
AEDC-201	Cf:G-022	352354086032502	04-25-91	45	5.7	21	15.0	5.2	540
AEDC-202	Fr:S-002	352013086024701	04-17-91	95	6.6	49	15.0	3.2	330
AEDC-203	Fr:S-003	352013086024702	04-17-91	30	5.4	11	14.5	15	570
AEDC-204	Fr:S-006	351833086043301	05-02-91	2270	7.2	110	17.0	1.5	400
AEDC-205	Fr:S-007	351833086043302	04-16-91	32	5.7	14	16.0	65	530
AEDC-206	Cf:D-004	352118085583401	04-16-91	436	7.7	146	15.5	0.40	380
AEDC-208	Fr:R-012	351924086124601	04-30-91	3250	6.8	704	17.0	1.0	600
AEDC-209	Fr:R-013	351924086124602	04-10-91	87	6.6	41	15.5	10	470
AEDC-210	Cf:G-024	352922086032101	04-11-91	462	7.4	144	15.5	0.40	-100
AEDC-211	Cf:G-025	352922086032102	04-12-91	125	5.8	42	15.5	14	350
AEDC-212	Cf:G-020	352511086032301	04-23-91	202	6.2	100	18.0	6.4	780
AEDC-213	Cf:G-033	352411086045101	04-26-91	25	4.6	10	15.5	3.2	590
AEDC-214	Cf:G-023	352302086053201	04-26-91	94	6.3	44	16.0	2.5	370
AEDC-215	Cf:G-019	352420086024101	04-16-91	15	5.3	6	15.0	18	580
AEDC-216	Cf:G-013	352414086011001	04-11-91	56	6.3	27	15.5	2.2	400
AEDC-217	Cf:C-002	352246086040201	04-25-91	17	5.1	7	15.5	0.20	440
AEDC-218	Cf:C-001	352213086035001	04-25-91	73	6.0	33	16.5	0.60	350
AEDC-219	Cf:B-002	352146086093601	04-26-91	186	6.8	95	15.5	42	440
AEDC-220	Fr:R-010	352107086090901	04-25-91	50	5.6	19	15.5	7.0	330
AEDC-221	Fr:R-017	352028086085101	04-30-91	11	4.9	4	15.5	1.0	560
AEDC-222	Fr:S-009	352114086070801	04-24-91	148	6.5	68	15.0	5.1	470
AEDC-223	Cf:C-005	352123086053701	04-23-91	34	5.5	14	15.0	13	520
AEDC-224	Cf:C-004	352130086040501	04-24-91	17	5.1	10	16.5	78	580
AEDC-225	Fr:S-008	351952086054201	04-19-91	17	4.8	4	16.0	1.0	380
AEDC-226	Cf:C-006	352115086022901	04-18-91	93	4.9	44	15.5	2.5	460
AEDC-227	Cf:C-003	352039086014501	04-17-91	91	6.1	46	15.5	11	480
AEDC-228	Fr:R-015	351830086092501	04-18-91	24	5.9	10	15.5	5.5	260
AEDC-229	Cf:F-002	352439086075201	04-10-91	108	6.4	38	15.0	500	--
AEDC-230	Cf:F-001	352540086064501	04-11-91	151	6.3	67	14.0	1.5	330
AEDC-231	Cf:B-001	352220086073701	04-23-91	14	4.1	--	17.0	2.8	500
AEDC-236	Fr:R-016	352026086083801	04-30-91	72	5.7	28	16.0	1.1	530

**Inorganic constituents and physical properties of ground-water samples
from wells in the Arnold Air Force Base area--Continued**

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	HARD- NESS TOTAL (mg/L as CaCO3)	CALCIUM DIS- SOLVED (mg/L as Ca)	MAGNE- SIUM, DIS- SOLVED (mg/L as Mg)	SODIUM, DIS- SOLVED (mg/L as Na)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (mg/L as K)	CHLO- RIDE, DIS- SOLVED (mg/L as Cl)
AEDC-172	Fr:S-001	710	250	20	510	8	60	30	360
AEDC-173	Fr:S-004	110	36	5.0	1.0	0.0	2	0.20	0.40
AEDC-174	Fr:S-005	92	29	4.8	0.80	0.0	2	0.20	0.50
AEDC-175	Cf:G-009	1700	570	72	740	8	48	15	1200
AEDC-176	Cf:G-006	440	150	16	140	3	41	4.1	120
AEDC-177	Cf:G-028	140	48	5.2	6.5	0.2	9	0.40	11
AEDC-178	Cf:G-029	47	17	1.2	1.3	0.1	6	0.30	1.5
AEDC-179	Cf:G-014	21	7.3	0.64	3.8	0.4	25	3.0	1.9
AEDC-180	Cf:G-007	150	35	16	220	8	75	5.6	320
AEDC-181	Cf:G-010	--	140	77	100	--	--	4.3	6.0
AEDC-182	Cf:G-011	51	15	3.2	1.0	0.1	4	1.5	0.90
AEDC-183	Cf:G-012	5	1.3	0.40	1.0	0.2	30	0.20	1.9
AEDC-184	Cf:G-008	190	53	13	31	1	24	26	15
AEDC-185	Cf:G-016	140	38	12	1.8	0.1	3	1.6	2.4
AEDC-186	Cf:G-018	150	36	14	2.0	0.1	3	2.2	3.0
AEDC-187	Cf:D-001	280	45	39	3100	82	95	54	4000
AEDC-188	Cf:D-007	840	200	82	30	0.5	7	0.70	22
AEDC-189	Cf:D-003	95	28	6.0	4.6	0.2	9	4.6	3.4
AEDC-190	Fr:R-007	300	65	34	140	4	50	2.8	27
AEDC-191	Fr:R-008	41	9.8	4.1	1.0	0.1	5	0.70	1.5
AEDC-192	Fr:R-009	5	1.4	0.45	1.1	0.2	28	0.70	2.0
AEDC-193	Cf:F-003	780	260	32	64	1	15	15	21
AEDC-194	Cf:F-004	83	26	4.3	5.4	0.3	12	2.3	4.2
AEDC-195	Cf:F-005	10	3.0	0.59	1.0	0.1	18	0.20	1.0
AEDC-196	Cf:G-015	1300	450	43	740	9	55	16	860
AEDC-197	Cf:G-017	79	29	1.7	1.5	0.1	4	0.70	1.1
AEDC-198	Cf:G-032	1300	310	120	38	0.5	6	2.3	4.1
AEDC-199	Cf:D-009	22	5.9	1.8	0.80	0.1	7	0.10	1.2
AEDC-200	Cf:G-021	78	22	5.7	0.90	0.0	2	0.10	1.6
AEDC-201	Cf:G-022	21	6.4	1.2	0.80	0.1	8	0.20	1.4
AEDC-202	Fr:S-002	46	12	3.8	0.80	0.0	4	0.70	0.50
AEDC-203	Fr:S-003	12	3.7	0.64	0.80	0.1	12	0.40	1.0
AEDC-204	Fr:S-006	1400	540	21	53	0.6	7	3.4	7.5
AEDC-205	Fr:S-007	3	0.70	0.30	5.8	1	78	0.40	1.2
AEDC-206	Cf:D-004	220	69	12	2.2	0.1	2	0.80	6.3
AEDC-208	Fr:R-012	880	190	96	450	7	53	10	64
AEDC-209	Fr:R-013	40	11	3.1	1.2	0.1	6	0.60	1.5
AEDC-210	Cf:G-024	230	52	24	3.5	0.1	3	0.20	3.8
AEDC-211	Cf:G-025	56	14	5.0	2.2	0.1	8	0.40	4.9
AEDC-212	Cf:G-020	100	23	11	1.3	0.1	3	1.9	3.0
AEDC-213	Cf:G-033	7	1.3	0.87	1.1	0.2	25	0.20	1.7
AEDC-214	Cf:G-023	48	13	3.8	0.60	0.0	3	0.10	1.3
AEDC-215	Cf:G-019	3	0.88	0.30	0.90	0.2	29	1.0	1.0
AEDC-216	Cf:G-013	23	5.8	2.0	1.4	0.1	11	1.3	0.50
AEDC-217	Cf:C-002	6	1.6	0.50	1.0	0.2	26	0.20	0.90
AEDC-218	Cf:C-001	36	11	2.0	1.2	0.1	7	0.10	0.90
AEDC-219	Cf:B-002	88	32	2.0	1.7	0.1	4	0.30	1.7
AEDC-220	Fr:R-010	18	5.5	1.1	2.0	0.2	18	1.4	1.4
AEDC-221	Fr:R-017	3	0.65	0.22	0.60	0.2	33	0.10	0.70
AEDC-222	Fr:S-009	76	21	5.7	0.90	0.0	3	0.20	1.6
AEDC-223	Cf:C-005	15	5.3	0.42	0.80	0.1	10	0.10	1.6
AEDC-224	Cf:C-004	6	1.7	0.38	1.4	0.3	34	0.10	0.90
AEDC-225	Fr:S-008	4	0.98	0.39	0.90	0.2	32	0.10	1.4
AEDC-226	Cf:C-006	44	13	2.7	1.1	0.1	5	0.40	0.30
AEDC-227	Cf:C-003	45	12	3.6	0.60	0.0	3	0.10	1.9
AEDC-228	Fr:R-015	10	2.6	0.92	0.90	0.1	16	0.10	1.1
AEDC-229	Cf:F-002	45	13	3.1	1.7	0.1	7	1.6	1.8
AEDC-230	Cf:F-001	74	24	3.3	1.2	0.1	3	0.50	1.7
AEDC-231	Cf:B-001	2	0.60	0.17	1.4	0.4	57	0.10	1.1
AEDC-236	Fr:R-016	33	11	1.3	1.5	0.1	9	0.40	0.80

**Inorganic constituents and physical properties of ground-water samples
from wells in the Arnold Air Force Base area--Continued**

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	SULFATE DIS- SOLVED (mg/L as SO ₄)	FLUO- RIDE, DIS- SOLVED (mg/L as F)	SILICA, DIS- SOLVED (mg/L as SiO ₂)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (mg/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (mg/L)	ARSENIC DIS- SOLVED (ug/L as As)	BARIUM, DIS- SOLVED (ug/L as Ba)	BERYL- LIUM, DIS- SOLVED (ug/L as Be)
AEDC-172	Fr:S-001	1300	0.50	9.0	2450	2580	<1	59	<2
AEDC-173	Fr:S-004	7.9	<0.10	8.1	114	119	<1	<2	<0.5
AEDC-174	Fr:S-005	1.8	<0.10	7.8	90	101	<1	2	<0.5
AEDC-175	Cf:G-009	1900	0.80	13	4290	4560	<1	70	<2
AEDC-176	Cf:G-006	490	0.70	10	974	1020	<1	58	<0.5
AEDC-177	Cf:G-028	8.0	0.50	8.2	172	168	<1	26	<0.5
AEDC-178	Cf:G-029	6.3	0.20	5.8	42	58	<1	24	<0.5
AEDC-179	Cf:G-014	3.8	<0.10	6.6	60	43	<1	14	<0.5
AEDC-180	Cf:G-007	66	0.30	8.5	742	780	<1	70	<0.5
AEDC-181	Cf:G-010	840	0.7	9.3	1130	--	1	19	<0.5
AEDC-182	Cf:G-011	1.3	<0.10	8.1	59	64	<1	11	<0.5
AEDC-183	Cf:G-012	0.30	<0.10	8.0	12	17	<1	13	<0.5
AEDC-184	Cf:G-008	61	0.50	9.6	315	329	2	42	<0.5
AEDC-185	Cf:G-016	12	0.60	8.3	145	159	4	6	<0.5
AEDC-186	Cf:G-018	13	<0.10	9.0	159	164	<1	6	<0.5
AEDC-187	Cf:D-001	130	1.7	6.8	8810	8360	<1	<100	<10
AEDC-188	Cf:D-007	730	0.40	9.6	1180	1140	<1	13	<0.5
AEDC-189	Cf:D-003	4.6	0.20	9.9	110	108	1	9	<0.5
AEDC-190	Fr:R-007	4.8	0.60	11	659	630	<1	39	<0.5
AEDC-191	Fr:R-008	1.2	<0.10	7.5	48	52	<1	3	<0.5
AEDC-192	Fr:R-009	0.50	<0.10	7.4	19	17	<1	5	<0.5
AEDC-193	Cf:F-003	890	0.20	8.6	1290	1330	<1	24	<0.5
AEDC-194	Cf:F-004	3.0	0.10	7.9	105	105	<1	26	<0.5
AEDC-195	Cf:F-005	0.30	0.20	8.3	19	21	<1	2	<0.5
AEDC-196	Cf:G-015	1600	0.50	9.0	4100	3790	3	45	<0.5
AEDC-197	Cf:G-017	3.0	0.10	7.8	93	92	<1	6	<0.5
AEDC-198	Cf:G-032	1200	0.80	13	1790	1880	<1	9	<2
AEDC-199	Cf:D-009	1.2	<0.10	8.1	40	33	<1	3	0.7
AEDC-200	Cf:G-021	1.7	<0.10	8.2	83	88	<1	<2	<0.5
AEDC-201	Cf:G-022	0.40	<0.10	7.8	27	31	<1	4	<0.5
AEDC-202	Fr:S-002	1.4	<0.10	8.0	53	56	<1	2	<0.5
AEDC-203	Fr:S-003	2.3	0.20	6.0	18	23	<1	4	<0.5
AEDC-204	Fr:S-006	1300	0.10	10	2120	2010	<1	23	<2
AEDC-205	Fr:S-007	1.4	<0.10	8.3	22	28	<1	4	<0.5
AEDC-206	Cf:D-004	59	<0.10	7.1	244	247	<1	16	<0.5
AEDC-208	Fr:R-012	1100	0.70	12	2340	2240	3	21	<2
AEDC-209	Fr:R-013	0.70	0.10	8.0	26	51	<1	6	<0.5
AEDC-210	Cf:G-024	110	0.40	8.1	267	268	<1	<2	<0.5
AEDC-211	Cf:G-025	1.6	<0.10	7.8	64	62	<1	11	<0.5
AEDC-212	Cf:G-020	3.8	0.20	5.8	103	113	<1	10	<0.5
AEDC-213	Cf:G-033	<0.10	<0.10	8.0	16	--	<1	10	0.6
AEDC-214	Cf:G-023	1.3	0.10	7.6	78	56	<1	3	<0.5
AEDC-215	Cf:G-019	<0.20	<0.10	7.6	16	--	<1	3	<0.5
AEDC-216	Cf:G-013	0.60	<0.10	8.3	11	36	<1	3	<0.5
AEDC-217	Cf:C-002	0.90	0.10	8.7	11	19	<1	4	<0.5
AEDC-218	Cf:C-001	1.7	<0.10	8.5	62	47	<1	<2	<0.5
AEDC-219	Cf:B-002	2.6	<0.10	8.4	108	102	<1	5	<0.5
AEDC-220	Fr:R-010	1.7	<0.10	7.9	43	34	<1	9	<0.5
AEDC-221	Fr:R-017	0.30	<0.10	7.8	27	13	<1	3	<0.5
AEDC-222	Fr:S-009	5.6	0.10	7.7	78	85	<1	4	<0.5
AEDC-223	Cf:C-005	0.60	0.10	9.8	23	28	<1	10	<0.5
AEDC-224	Cf:C-004	0.40	0.10	9.0	12	20	<1	4	<0.5
AEDC-225	Fr:S-008	0.50	<0.10	8.1	16	15	<1	3	<0.5
AEDC-226	Cf:C-006	1.4	0.10	8.7	53	56	<1	8	<0.5
AEDC-227	Cf:C-003	2.1	<0.10	7.7	50	54	<1	3	<0.5
AEDC-228	Fr:R-015	0.70	<0.10	7.9	21	21	<1	2	<0.5
AEDC-229	Cf:F-002	5.1	0.10	7.3	52	61	<1	16	<0.5
AEDC-230	Cf:F-001	4.2	0.10	6.3	85	83	<1	8	<0.5
AEDC-231	Cf:B-001	0.70	<0.10	8.1	12	16	<1	4	<0.5
AEDC-236	Fr:R-016	1.1	<0.10	8.2	46	44	<1	5	<0.5

**Inorganic constituents and physical properties of ground-water samples
from wells in the Arnold Air Force Base area--Continued**

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	CADMIUM DIS- SOLVED (ug/L as Cd)	CHRO- MIUM, DIS- SOLVED (ug/L as Cr)	COBALT, DIS- SOLVED (ug/L as Co)	COPPER, DIS- SOLVED (ug/L as Cu)	IRON, DIS- SOLVED (ug/L as Fe)	LEAD, DIS- SOLVED (ug/L as Pb)	MANGA- NESE, DIS- SOLVED (ug/L as Mn)	MOLYB- DENUM, DIS- SOLVED (ug/L as Mo)
AEDC-172	Fr:S-001	5.0	<1	<9	<1	1200	<1	300	<30
AEDC-173	Fr:S-004	<1.0	<1	<3	1	<3	5	<1	<10
AEDC-174	Fr:S-005	<1.0	<1	<3	1	48	<1	1	<10
AEDC-175	Cf:G-009	<3.0	<1	<9	<1	610	<1	150	<30
AEDC-176	Cf:G-006	<1.0	<1	<3	<1	420	<1	170	<10
AEDC-177	Cf:G-028	<1.0	<1	<3	1	7	<1	7	<10
AEDC-178	Cf:G-029	<1.0	<1	<3	1	14	1	19	<10
AEDC-179	Cf:G-014	<1.0	<1	<3	<1	43	<1	22	<10
AEDC-180	Cf:G-007	<1.0	2	<3	1	840	1	86	<10
AEDC-181	Cf:G-010	<1.0	<1	3	1	57	2	61	<10
AEDC-182	Cf:G-011	<1.0	<1	<3	1	4	<1	18	<10
AEDC-183	Cf:G-012	<1.0	<1	<3	35	<3	1	20	<10
AEDC-184	Cf:G-008	<1.0	<1	<3	<1	180	1	150	10
AEDC-185	Cf:G-016	<1.0	<1	<3	1	<3	2	3	10
AEDC-186	Cf:G-018	<1.0	<1	<3	2	7	1	2	<10
AEDC-187	Cf:D-001	<2.0	<1	8	<2	140	<2	20	<1
AEDC-188	Cf:D-007	<1.0	<1	<3	2	18	2	26	<10
AEDC-189	Cf:D-003	<1.0	<1	<3	<1	<3	<1	6	<10
AEDC-190	Fr:R-007	<1.0	<1	<3	<1	11	<1	10	<10
AEDC-191	Fr:R-008	<1.0	<1	<3	<1	9	<1	23	<10
AEDC-192	Fr:R-009	<1.0	<1	<3	<1	55	<1	10	<10
AEDC-193	Cf:F-003	<1.0	1	<3	<1	200	1	100	<10
AEDC-194	Cf:F-004	<1.0	<1	<3	<1	4	<1	10	<10
AEDC-195	Cf:F-005	<1.0	<1	<3	<1	7	1	4	<10
AEDC-196	Cf:G-015	<1.0	2	<3	<1	160	<1	730	<10
AEDC-197	Cf:G-017	<1.0	<1	<3	1	8	1	8	<10
AEDC-198	Cf:G-032	<3.0	4	<9	<1	95	<1	140	<30
AEDC-199	Cf:D-009	<1.0	1	<3	1	8	1	5	<10
AEDC-200	Cf:G-021	<1.0	<1	<3	1	<3	<1	<1	<10
AEDC-201	Cf:G-022	<1.0	<1	<3	1	3	<1	63	<10
AEDC-202	Fr:S-002	<1.0	<1	<3	36	23	3	6	<10
AEDC-203	Fr:S-003	<1.0	<1	<3	1	<3	<1	7	<10
AEDC-204	Fr:S-006	<3.0	<1	<9	<1	210	2	560	<30
AEDC-205	Fr:S-007	1.0	<1	<3	<1	<3	1	38	<10
AEDC-206	Cf:D-004	1.0	<1	<3	1	3	1	<1	<10
AEDC-208	Fr:R-012	4.0	5	<9	1	110	<1	200	<30
AEDC-209	Fr:R-013	<1.0	<1	<3	1	11	<1	11	<10
AEDC-210	Cf:G-024	<1.0	<1	<3	<1	9	<1	9	<10
AEDC-211	Cf:G-025	<1.0	1	<3	<1	18	2	5	<10
AEDC-212	Cf:G-020	<1.0	1	<3	3	3	<1	24	<10
AEDC-213	Cf:G-033	<1.0	<1	<3	2	<3	1	28	<10
AEDC-214	Cf:G-023	<1.0	<1	<3	1	31	1	6	<10
AEDC-215	Cf:G-019	<1.0	<1	<3	1	11	1	14	<10
AEDC-216	Cf:G-013	<1.0	2	<3	1	39	<1	18	<10
AEDC-217	Cf:C-002	<1.0	<1	<3	3	5	1	17	<10
AEDC-218	Cf:C-001	<1.0	<1	<3	1	<3	<1	3	<10
AEDC-219	Cf:B-002	<1.0	<1	<3	1	<3	1	57	<10
AEDC-220	Fr:R-010	<1.0	<1	<3	<1	8	1	14	<10
AEDC-221	Fr:R-017	<1.0	<1	<3	1	5	1	12	<10
AEDC-222	Fr:S-009	<1.0	<1	<3	1	3	<1	2	<10
AEDC-223	Cf:C-005	<1.0	<1	<3	1	6	<1	19	<10
AEDC-224	Cf:C-004	<1.0	<1	<3	1	28	<1	24	<10
AEDC-225	Fr:S-008	<1.0	<1	<3	1	5	1	85	<10
AEDC-226	Cf:C-006	<1.0	<1	<3	1	9	<1	38	<10
AEDC-227	Cf:C-003	<1.0	<1	<3	1	<3	1	5	<10
AEDC-228	Fr:R-015	<1.0	<1	<3	1	18	<1	3	<10
AEDC-229	Cf:F-002	2.0	<1	<3	1	45	<1	810	<10
AEDC-230	Cf:F-001	<1.0	<1	<3	2	8	2	110	<10
AEDC-231	Cf:B-001	<1.0	2	<3	3	6	<1	98	<10
AEDC-236	Fr:R-016	<1.0	<1	<3	1	30	<1	160	<10

**Inorganic constituents and physical properties of ground-water samples
from wells in the Arnold Air Force Base area--Continued**

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	NICKEL, DIS-SOLVED (ug/L as Ni)	SILVER, DIS-SOLVED (ug/L as Ag)	STRONTIUM, DIS-SOLVED (ug/L as Sr)	VANADIUM, DIS-SOLVED (ug/L as V)	ZINC, DIS-SOLVED (ug/L as Zn)	ALUMINUM, DIS-SOLVED (ug/L as Al)	LITHIUM, DIS-SOLVED (ug/L as Li)	SELENIUM, DIS-SOLVED (ug/L as Se)
AEDC-172	Fr:S-001	<1	<1.0	1900	<18	27	10	960	<1
AEDC-173	Fr:S-004	1	1.0	28	<6	4	<10	<4	<1
AEDC-174	Fr:S-005	2	<1.0	19	<6	<3	<10	<4	<1
AEDC-175	Cf:G-009	1	1.0	6600	<18	39	10	1200	<1
AEDC-176	Cf:G-006	<1	<1.0	2100	<6	15	<10	86	<2
AEDC-177	Cf:G-028	<1	<1.0	830	<6	6	20	<4	<1
AEDC-178	Cf:G-029	<1	<1.0	56	<6	13	40	<4	<1
AEDC-179	Cf:G-014	5	<1.0	44	<6	65	<10	<4	<1
AEDC-180	Cf:G-007	1	<1.0	740	<6	17	30	340	<1
AEDC-181	Cf:G-010	<1	<1.0	9600	<6	22	20	240	<1
AEDC-182	Cf:G-011	1	<1.0	47	<6	5	30	10	<2
AEDC-183	Cf:G-012	2	<1.0	12	<6	13	10	<4	<1
AEDC-184	Cf:G-008	1	<1.0	420	<6	4	10	51	<1
AEDC-185	Cf:G-016	9	<1.0	350	<6	7	<10	6	<1
AEDC-186	Cf:G-018	1	<1.0	39	<6	10	<10	10	<1
AEDC-187	Cf:D-001	4	<2.0	7500	860	<10	<10	8500	<1
AEDC-188	Cf:D-007	1	<1.0	2000	<6	5	<10	93	<1
AEDC-189	Cf:D-003	<1	<1.0	92	<6	<3	130	10	<1
AEDC-190	Fr:R-007	<1	<1.0	1700	<6	17	<10	450	<2
AEDC-191	Fr:R-008	2	<1.0	15	<6	10	<10	<4	<1
AEDC-192	Fr:R-009	3	<1.0	9	<6	94	<10	<4	<1
AEDC-193	Cf:F-003	8	<1.0	1400	<6	25	20	240	<1
AEDC-194	Cf:F-004	<1	<1.0	96	<6	5	<10	<4	<1
AEDC-195	Cf:F-005	5	<1.0	7	<6	6	<10	<4	<1
AEDC-196	Cf:G-015	1	<1.0	3100	<6	6	30	3900	<1
AEDC-197	Cf:G-017	1	<1.0	32	<6	9	30	<4	<1
AEDC-198	Cf:G-032	<1	<1.0	4300	<18	23	20	97	<1
AEDC-199	Cf:D-009	<1	<1.0	10	<6	17	<10	<4	<1
AEDC-200	Cf:G-021	1	<1.0	13	<6	<3	<10	<4	<1
AEDC-201	Cf:G-022	3	<1.0	8	<6	5	20	<4	<1
AEDC-202	Fr:S-002	4	<1.0	16	<6	<3	<10	5	<1
AEDC-203	Fr:S-003	1	<1.0	16	<6	7	<10	<4	<1
AEDC-204	Fr:S-006	1	<1.0	1800	<18	59	20	120	<1
AEDC-205	Fr:S-007	1	<1.0	12	<6	<3	<10	<4	<1
AEDC-206	Cf:D-004	6	<1.0	300	<6	6	<10	5	<1
AEDC-208	Fr:R-012	4	<1.0	5100	<18	80	<10	1300	<2
AEDC-209	Fr:R-013	2	<1.0	13	<6	7	20	<4	<1
AEDC-210	Cf:G-024	<1	<1.0	950	<6	5	<10	17	<1
AEDC-211	Cf:G-025	3	<1.0	33	<6	23	20	<4	<1
AEDC-212	Cf:G-020	2	<1.0	38	<6	28	<10	<4	<1
AEDC-213	Cf:G-033	3	<1.0	8	<6	7	30	<4	<1
AEDC-214	Cf:G-023	1	<1.0	11	<6	3	<10	<4	<1
AEDC-215	Cf:G-019	<1	<1.0	15	<6	<3	20	<4	<1
AEDC-216	Cf:G-013	2	<1.0	27	<6	8	<10	5	<1
AEDC-217	Cf:C-002	3	<1.0	4	<6	20	20	<4	<1
AEDC-218	Cf:C-001	1	<1.0	7	<6	5	<10	<4	<1
AEDC-219	Cf:B-002	1	<1.0	21	<6	4	10	<4	<1
AEDC-220	Fr:R-010	1	<1.0	37	<6	<3	<10	4	<1
AEDC-221	Fr:R-017	<1	<1.0	<1	<6	13	20	<4	<1
AEDC-222	Fr:S-009	<1	<1.0	24	<6	<3	<10	<4	<1
AEDC-223	Cf:C-005	<1	<1.0	15	<6	<3	40	<4	<1
AEDC-224	Cf:C-004	1	<1.0	10	<6	6	50	<4	<1
AEDC-225	Fr:S-008	4	<1.0	9	<6	20	<10	<4	<1
AEDC-226	Cf:C-006	5	<1.0	28	<6	6	<10	<4	<1
AEDC-227	Cf:C-003	1	<1.0	13	<6	<3	<10	<4	<1
AEDC-228	Fr:R-015	4	<1.0	9	<6	11	<10	<4	<1
AEDC-229	Cf:F-002	35	<1.0	73	<6	110	40	<4	<1
AEDC-230	Cf:F-001	2	<1.0	68	<6	35	<10	<4	<1
AEDC-231	Cf:B-001	4	<1.0	8	<6	24	<10	<4	<1
AEDC-236	Fr:R-016	3	<1.0	9	<6	19	60	<4	<1

APPENDIX 3

Volatile organic compounds in ground water
from wells sampled in the Arnold Air Force Base area

Volatile organic compounds in ground water from wells sampled in the Arnold Air Force Base area

(ug/L, microgram per liter. Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent)

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	STATION NUMBER	DATE	DIBROMO-METHANE WATER WHOLE RECOVER (ug/L)	DI-CHLORO-BROMO-METHANE TOTAL (ug/L)	CARBON-TETRA-CHLORIDE TOTAL (ug/L)	1,2-DI-CHLORO-ETHANE TOTAL (ug/L)	BROMO-FORM TOTAL (ug/L)	CHLORO-DI-BROMO-METHANE TOTAL (ug/L)	CHLORO-FORM TOTAL (ug/L)
AEDC-172	Fr:S-001	352011086063901	05-02-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-173	Fr:S-004	352011086063902	04-18-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-174	Fr:S-005	352011086063903	04-18-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-175	Cf:G-009	352247086031301	05-02-91	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-176	Cf:G-006	352515086011701	05-01-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-177	Cf:G-028	352515086011702	04-11-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-178	Cf:G-029	352515086011703	04-10-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-179	Cf:G-014	352253086011903	04-24-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.60
AEDC-180	Cf:G-007	352229086045601	05-03-91	<0.20	0.20	<0.20	<0.20	<0.20	<0.20	3.9
AEDC-181	Cf:G-010	352237086050302	05-03-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	2.0
AEDC-182	Cf:G-011	352237086050303	04-29-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-183	Cf:G-012	352237086050304	04-26-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.30
AEDC-184	Cf:G-008	352509086051101	05-01-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-185	Cf:G-016	352509086051102	04-15-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-186	Cf:G-018	352509086051103	04-16-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-187	Cf:D-001	352129085585501	04-18-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-188	Cf:D-007	352129085585502	04-17-91	<0.20	0.40	<0.20	<0.20	<0.20	<0.20	5.6
AEDC-189	Cf:D-003	352129085585503	04-17-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-190	Fr:R-007	351959086081301	04-30-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.2
AEDC-191	Fr:R-008	351959086081302	04-30-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.7
AEDC-192	Fr:R-009	351959086081303	05-01-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-193	Cf:F-003	352240086102101	05-02-91	<0.20	0.80	<0.20	<0.70	<0.20	<0.20	12
AEDC-194	Cf:F-004	352240086102102	04-23-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-195	Cf:F-005	352310086085401	04-19-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-196	Cf:G-015	352624086044301	05-01-91	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-196	Cf:G-015	352624086044301	10-09-91	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-197	Cf:G-017	352624086044302	04-12-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-198	Cf:G-032	352253086011901	04-24-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.7
AEDC-199	Cf:D-009	352253086011902	04-23-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.70
AEDC-200	Cf:G-021	352354086032501	04-25-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-201	Cf:G-022	352354086032502	04-25-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-202	Fr:S-002	352013086024701	04-17-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-203	Fr:S-003	352013086024702	04-17-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-204	Fr:S-006	351833086043301	05-02-91	<0.20	0.90	<0.20	<0.20	<0.20	<0.20	11
AEDC-205	Fr:S-007	351833086043302	04-16-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-206	Cf:D-004	352118085583401	04-16-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
AEDC-208	Fr:R-012	351924086124601	04-30-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.90
AEDC-209	Fr:R-013	351924086124602	04-10-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-210	Cf:G-024	352922086032101	04-11-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-211	Cf:G-025	352922086032102	04-12-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-212	Cf:G-020	352511086032301	04-23-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-213	Cf:G-033	352411086045101	04-26-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-214	Cf:G-023	352302086053201	04-26-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.80
AEDC-215	Cf:G-019	352420086024101	04-16-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-216	Cf:G-013	352414086011001	04-11-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-217	Cf:C-002	352246086040201	04-25-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-218	Cf:C-001	352213086035001	04-25-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-219	Cf:B-002	352146086093601	04-26-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-220	Fr:R-010	352107086090901	04-25-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.0
AEDC-221	Fr:R-017	352028086085101	04-30-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-222	Fr:S-009	352114086070801	04-24-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-223	Cf:C-005	352123086053701	04-23-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.90
AEDC-224	Cf:C-004	352130086040501	04-24-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-225	Fr:S-008	351952086054201	04-19-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.50
AEDC-226	Cf:C-006	352115086022901	04-18-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-227	Cf:C-003	352039086014501	04-17-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-228	Fr:R-015	351830086092501	04-18-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.80
AEDC-229	Cf:F-002	352439086075201	04-10-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-230	Cf:F-001	352540086064501	04-11-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-231	Cf:B-001	352220086073701	04-23-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.90
AEDC-236	Fr:R-016	352026086083801	04-30-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.60

Volatile organic compounds in ground water from wells sampled in the Arnold Air Force Base area--Continued

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	TOLUENE TOTAL (ug/L)	BENZENE TOTAL (ug/L)	CHLORO-BENZENE TOTAL (ug/L)	CHLORO-ETHANE TOTAL (ug/L)	ETHYL-BENZENE TOTAL (ug/L)	METHYL-BROMIDE TOTAL (ug/L)	METHYL-CHLORIDE TOTAL (ug/L)	METHYL-ENE CHLORIDE TOTAL (ug/L)	TETRA-CHLORO-ETHYLENE TOTAL (ug/L)
AEDC-172	Fr:S-001	350	1600	<0.20	<0.20	2.4	<0.20	<0.20	<0.20	<0.20
AEDC-173	Fr:S-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-174	Fr:S-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-175	Cf:G-009	3500	6200	<2.0	<2.0	180	<2.0	<2.0	<2.0	<2.0
AEDC-176	Cf:G-006	7.8	27	<0.20	<0.20	7.8	<0.20	<0.20	<0.20	<0.20
AEDC-177	Cf:G-028	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-178	Cf:G-029	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-179	Cf:G-014	0.70	0.40	<0.20	<0.20	0.20	<0.20	<0.20	<0.20	<0.20
AEDC-180	Cf:G-007	<0.20	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-181	Cf:G-010	4.8	2.8	<0.20	<0.20	3.7	<0.20	<0.20	<0.20	<0.20
AEDC-182	Cf:G-011	1.2	1.0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-183	Cf:G-012	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-184	Cf:G-008	670	1200	<0.20	<0.20	37	<0.20	<0.20	<0.20	<0.20
AEDC-185	Cf:G-016	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-186	Cf:G-018	1.0	0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-187	Cf:D-001	70	210	<0.20	<0.20	3.3	<0.20	<0.20	<0.20	<0.20
AEDC-188	Cf:D-007	0.20	0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-189	Cf:D-003	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-190	Fr:R-007	2.0	1.8	<0.20	<0.20	0.30	<0.20	<0.20	<0.20	<0.20
AEDC-191	Fr:R-008	7.6	12	<0.20	<0.20	0.60	<0.20	<0.20	<0.20	<0.20
AEDC-192	Fr:R-009	1.1	0.50	<0.20	<0.20	0.20	<0.20	<0.20	<0.20	<0.20
AEDC-193	Cf:F-003	25	22	<0.20	<0.20	2.8	<0.20	<0.20	<0.20	<0.20
AEDC-194	Cf:F-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-195	Cf:F-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-196	Cf:G-015	800	1400	<2.0	<2.0	94	<2.0	<2.0	<2.0	<0.20
AEDC-196	Cf:G-015	1500	2800	<2.0	<2.0	180	<2.0	<2.0	<2.0	<2.0
AEDC-197	Cf:G-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-198	Cf:G-032	1.1	0.40	<0.20	<0.20	0.20	<0.20	<0.20	<0.20	<0.20
AEDC-199	Cf:D-009	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
AEDC-200	Cf:G-021	0.70	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-201	Cf:G-022	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-202	Fr:S-002	0.40	0.60	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-203	Fr:S-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-204	Fr:S-006	17	16	<0.20	<0.20	1.0	<0.20	<0.20	<0.20	<0.20
AEDC-205	Fr:S-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-206	Cf:D-004	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-208	Fr:R-012	3.6	3.1	<0.20	<18	0.90	<0.20	<4.3	<0.20	<0.20
AEDC-209	Fr:R-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-210	Cf:G-024	0.50	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-211	Cf:G-025	0.30	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-212	Cf:G-020	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-213	Cf:G-033	0.80	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-214	Cf:G-023	0.60	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-215	Cf:G-019	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-216	Cf:G-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.1
AEDC-217	Cf:C-002	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-218	Cf:C-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-219	Cf:B-002	0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-220	Fr:R-010	0.60	0.30	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-221	Fr:R-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-222	Fr:S-009	1.0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-223	Cf:C-005	2.2	0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-224	Cf:C-004	1.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-225	Fr:S-008	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-226	Cf:C-006	0.30	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-227	Cf:C-003	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-228	Fr:R-015	1.1	1.4	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-229	Cf:F-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-230	Cf:F-001	0.50	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-231	Cf:B-001	0.50	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-236	Fr:R-016	<0.20	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Volatile organic compounds in ground water from wells sampled in the Arnold Air Force Base area--Continued

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	TRI-CHLORO-FLUORO-METHANE TOTAL (ug/L)	1,1-DI-CHLORO-ETHANE TOTAL (ug/L)	1,1-DI-CHLORO-ETHYLENE TOTAL (ug/L)	1,1,1-TRI-CHLORO-ETHANE TOTAL (ug/L)	1,1,2-TRI-CHLORO-ETHANE TOTAL (ug/L)	1,1,2,2-TETRA-CHLORO-ETHANE TOTAL (ug/L)	1,2-DI-CHLORO-BENZENE TOTAL (ug/L)	1,2-DI-CHLORO-PROPANE TOTAL (ug/L)	1,3-DI-CHLORO-BENZENE TOTAL (ug/L)
AEDC-172	Fr:S-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-173	Fr:S-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-174	Fr:S-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-175	Cf:G-009	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-176	Cf:G-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-177	Cf:G-028	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-178	Cf:G-029	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-179	Cf:G-014	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-180	Cf:G-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-181	Cf:G-010	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-182	Cf:G-011	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-183	Cf:G-012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-184	Cf:G-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-185	Cf:G-016	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-186	Cf:G-018	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-187	Cf:D-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-188	Cf:D-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-189	Cf:D-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-190	Fr:R-007	15	<0.20	0.40	0.40	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-191	Fr:R-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-192	Fr:R-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-193	Cf:F-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-194	Cf:F-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-195	Cf:F-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-196	Cf:G-015	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-196	Cf:G-015	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-197	Cf:G-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-198	Cf:G-032	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-199	Cf:D-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-200	Cf:G-021	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-201	Cf:G-022	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-202	Fr:S-002	<0.20	<0.20	<0.20	<0.20	<0.22	<0.20	<0.20	<0.20	<0.20
AEDC-203	Fr:S-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-204	Fr:S-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-205	Fr:S-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-206	Cf:D-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-208	Fr:R-012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-209	Fr:R-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-210	Cf:G-024	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-211	Cf:G-025	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-212	Cf:G-020	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-213	Cf:G-033	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-214	Cf:G-023	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-215	Cf:G-019	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-216	Cf:G-013	<0.20	0.90	0.40	0.50	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-217	Cf:C-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-218	Cf:C-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-219	Cf:B-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-220	Fr:R-010	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-221	Fr:R-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-222	Fr:S-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-223	Cf:C-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-224	Cf:C-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-225	Fr:S-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-226	Cf:C-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-227	Cf:C-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-228	Fr:R-015	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-229	Cf:F-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-230	Cf:F-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-231	Cf:B-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-236	Fr:R-016	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Volatile organic compounds in ground water from wells sampled in the Arnold Air Force Base area--Continued

AEDC LOCAL NUMBER	TENNESSEE LOCAL WELL NUMBER	1,4-DI-CHLORO-BENZENE TOTAL (ug/L)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (ug/L)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (ug/L)	CIS-1,3-DI-CHLORO-PROPENE TOTAL (ug/L)	VINYL CHLORIDE TOTAL (ug/L)	TRI-CHLORO-ETHYLENE TOTAL (ug/L)	1,2-DI-CHLORO-ETHYLENE WATER WHOLE RECOVER (ug/L)	STYRENE TOTAL (ug/L)	1,1-DI-CHLORO-PROPENE, WH TOTAL (ug/L)
AEDC-172	Fr:S-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<1.6	<0.2
AEDC-173	Fr:S-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-174	Fr:S-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-175	Cf:G-009	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-176	Cf:G-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-177	Cf:G-028	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-178	Cf:G-029	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-179	Cf:G-014	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-180	Cf:G-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-181	Cf:G-010	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-182	Cf:G-011	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-183	Cf:G-012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-184	Cf:G-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<1.6	<0.2
AEDC-185	Cf:G-016	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-186	Cf:G-018	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-187	Cf:D-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-188	Cf:D-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-189	Cf:D-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-190	Fr:R-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-191	Fr:R-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-192	Fr:R-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-193	Cf:F-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.3	<0.2
AEDC-194	Cf:F-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-195	Cf:F-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-196	Cf:G-015	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	<2.0
AEDC-196	Cf:G-015	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
AEDC-197	Cf:G-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-198	Cf:G-032	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-199	Cf:D-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-200	Cf:G-021	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-201	Cf:G-022	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-202	Fr:S-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-203	Fr:S-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-204	Fr:S-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-205	Fr:S-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-206	Cf:D-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-208	Fr:R-012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-209	Fr:R-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-210	Cf:G-024	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-211	Cf:G-025	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-212	Cf:G-020	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-213	Cf:G-033	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-214	Cf:G-023	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-215	Cf:G-019	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-216	Cf:G-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-217	Cf:C-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-218	Cf:C-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-219	Cf:B-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-220	Fr:R-010	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-221	Fr:R-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-222	Fr:S-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-223	Cf:C-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-224	Cf:C-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-225	Fr:S-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-226	Cf:C-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-227	Cf:C-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-228	Fr:R-015	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-229	Cf:F-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-230	Cf:F-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-231	Cf:B-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-236	Fr:R-016	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2

Volatile organic compounds in ground water from wells sampled in the Arnold Air Force Base area--Continued

AEDC WELL NUMBER	TENNESSEE LOCAL WELL NUMBER	2,2-DI CHLORO- PRO- PANE WAT, WH TOTAL (ug/L)	1,3-DI CHLORO- PRO- PANE, WAT. WH TOTAL (ug/L)	O- CHLORO- TOLUENE WATER WHOLE TOTAL (ug/L)	PARA- CHLORO- TOLUENE WATER, WHOLE, TOTAL (ug/L)	123-TRI CHLORO- PROPANE WATER WHOLE TOTAL (ug/L)	1,1,1,2 TETRA- CHLORO- ETHANE, WAT, WH TOTAL (ug/L)	1,2- DIBROMO ETHANE WATER WHOLE TOTAL (ug/L)	XYLENE TOTAL WATER WHOLE TOT REC (ug/L)	BROMO- BENZENE WATER, WHOLE, TOTAL (ug/L)
AEDC-172	Fr:S-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	46	<0.20
AEDC-173	Fr:S-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-174	Fr:S-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-175	Cf:G-009	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	920	<2.0
AEDC-176	Cf:G-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	3.3	<0.20
AEDC-177	Cf:G-028	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-178	Cf:G-029	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-179	Cf:G-014	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.7	<0.20
AEDC-180	Cf:G-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-181	Cf:G-010	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	15	<0.20
AEDC-182	Cf:G-011	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.4	<0.20
AEDC-183	Cf:G-012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-184	Cf:G-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	110	<0.20
AEDC-185	Cf:G-016	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-186	Cf:G-018	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.4	<0.20
AEDC-187	Cf:D-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	7.1	<0.20
AEDC-188	Cf:D-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-189	Cf:D-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-190	Fr:R-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	1.0	<0.20
AEDC-191	Fr:R-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	1.7	<0.20
AEDC-192	Fr:R-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.6	<0.20
AEDC-193	Cf:F-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	15	<0.20
AEDC-194	Cf:F-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-195	Cf:F-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-196	Cf:G-015	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	360	<2.0
AEDC-196	Cf:G-015	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	750	<2.0
AEDC-197	Cf:G-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-198	Cf:G-032	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	1.0	<0.20
AEDC-199	Cf:D-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.3	<0.20
AEDC-200	Cf:G-021	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-201	Cf:G-022	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-202	Fr:S-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-203	Fr:S-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-204	Fr:S-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	5.9	<0.20
AEDC-205	Fr:S-007	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-206	Cf:D-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-208	Fr:R-012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	3.8	<0.20
AEDC-209	Fr:R-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-210	Cf:G-024	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-211	Cf:G-025	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-212	Cf:G-020	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-213	Cf:G-033	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.3	<0.20
AEDC-214	Cf:G-023	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-215	Cf:G-019	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-216	Cf:G-013	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-217	Cf:C-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-218	Cf:C-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-219	Cf:B-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-220	Fr:R-010	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.3	<0.20
AEDC-221	Fr:R-017	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-222	Fr:S-009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-223	Cf:C-005	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.4	<0.20
AEDC-224	Cf:C-004	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-225	Fr:S-008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-226	Cf:C-006	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-227	Cf:C-003	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.3	<0.20
AEDC-228	Fr:R-015	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.4	<0.20
AEDC-229	Cf:F-002	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-230	Cf:F-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-231	Cf:B-001	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.2	<0.20
AEDC-236	Fr:R-016	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20

APPENDIX 4

Field quality-assurance sample data
for volatile organic compounds for wells sampled
in the Arnold Air Force Base area

Field quality-assurance sample data for volatile organic compounds for wells sampled in the Arnold Air Force Base area

[ug/L; microgram per liter. Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent]

Quality-assurance sample identifier	DATE	DI-BROMOMETHANE WATER WHOLE RECOVER (ug/L)	DI-CHLORO-BROMOMETHANE TOTAL (ug/L)	CARBON-TETRA-CHLORIDE TOTAL (ug/L)	1,2-DI-CHLOROETHANE TOTAL (ug/L)	BROMOFORM TOTAL (ug/L)	CHLORO-DI-BROMOMETHANE TOTAL (ug/L)	CHLOROFORM TOTAL (ug/L)
AEDC-182 Duplicate	04-29-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-230 Duplicate	04-11-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-236 Duplicate	04-30-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.60
AEDC-176 Downhole blank	05-01-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	1.0
AEDC-196 Bailer blank	05-01-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.30
AEDC-196 Bailer blank	10-09-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20
Trip/Van blank	05-02-91	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.70
AEDC Tap Water	05-03-91	<0.20	7.1	<0.20	<0.20	<0.20	0.40	73

Quality-assurance sample identifier	TOLUENE TOTAL (ug/L)	BENZENE TOTAL (ug/L)	CHLORO-BENZENE TOTAL (ug/L)	CHLORO-ETHANE TOTAL (ug/L)	ETHYL-BENZENE TOTAL (ug/L)	METHYL-BROMIDE TOTAL (ug/L)	METHYL-CHLORIDE TOTAL (ug/L)	METHYL-ENE CHLORIDE TOTAL (ug/L)	TETRA-ETHYL-ENE TOTAL (ug/L)
AEDC-182 Duplicate	1.2	1.0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-230 Duplicate	0.40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-236 Duplicate	0.20	0.30	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-176 Downhole blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20
AEDC-196 Bailer blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20
AEDC-196 Bailer blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20
Trip/Van blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	<0.20
AEDC Tap water	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Quality-assurance sample identifier	TRI-CHLORO-FLUOROMETHANE TOTAL (ug/L)	1,1-DI-CHLOROETHANE TOTAL (ug/L)	1,1-DI-CHLORO-ETHYL-ENE TOTAL (ug/L)	1,1,1-TRI-CHLORO-ETHANE TOTAL (ug/L)	1,1,2-TRI-CHLORO-ETHANE TOTAL (ug/L)	1,1,2,2-TETRA-CHLORO-ETHANE TOTAL (ug/L)	1,2-DI-CHLORO-BENZENE TOTAL (ug/L)	1,2-DI-CHLORO-PROPANE TOTAL (ug/L)	1,3-DI-CHLORO-BENZENE TOTAL (ug/L)
AEDC-182 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-230 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-236 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-176 Downhole blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.50	<0.20
AEDC-196 Bailer blank	0.30	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC-196 Bailer blank	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Trip/Van blank	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
AEDC Tap water	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Quality-assurance sample identifier	1,4-DI-CHLORO-BENZENE TOTAL (ug/L)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (ug/L)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (ug/L)	CIS-1,3-DI-CHLORO-PROPENE TOTAL (ug/L)	VINYL-CHLORIDE TOTAL (ug/L)	TRI-CHLORO-ETHYL-ENE TOTAL (ug/L)	1,2-DI-CHLORO-ETHENE WATER WHOLE RECOVER (ug/L)	STYRENE TOTAL (ug/L)	1,1-DI-CHLORO-PROPENE, WAT, WH TOTAL (ug/L)
AEDC-182 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-230 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-236 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-176 Downhole blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-196 Bailer blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC-196 Bailer blank	<0.20	<0.20	<0.2	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
Trip/Van blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2
AEDC Tap water	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.2	<0.2

**Field-quality assurance sample data for volatile organic compounds for wells sampled
in the Arnold Air Force Base area--
Continued**

Quality- assurance sample identifier	2,2-DI CHLORO- PRO- PANE WAT, WH TOTAL (ug/L)	1,3-DI CHLORO- PRO- PANE, WAT. WH TOTAL (ug/L)	0- CHLORO- TOLUENE WATER WHOLE TOTAL (ug/L)	PARA- CHLORO- TOLUENE WATER, WHOLE, TOTAL (ug/L)	123-TRI CHLORO- PROPANE WATER WHOLE TOTAL (ug/L)	1,1,1,2 TETRA- CHLORO- ETHANE, WAT, WH TOTAL (ug/L)	1,2- DIBROMO ETHANE WATER WHOLE TOTAL (ug/L)	XYLENE TOTAL WATER WHOLE TOT REC (ug/L)	BROMO- BENZENE WATER, WHOLE, TOTAL (ug/L)
AEDC-182 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	0.5	<0.20
AEDC-230 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-236 Duplicate	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-176 Downhole blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-196 Bailer blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC-196 Bailer blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
Trip/Van blank	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20
AEDC Tap water	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20

APPENDIX 5

Field duplicate-sample analysis

Field duplicate-sample analysis

[Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent; --, no data]

Compound	AEDC-182			AEDC-230		
	Original	Duplicate	Relative percent difference ¹	Original	Duplicate	Relative percent difference ¹
Dibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Carbontetrachloride	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Bromoform	<0.2	<0.2	--	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Chloroform	<0.2	<0.2	--	<0.2	<0.2	--
Toluene	1.2	1.2	0.0	0.5	0.4	22
Benzene	1.0	1.0	0.0	<0.2	<0.2	--
Chlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Ethylbenzene	<0.2	<0.2	--	<0.2	<0.2	--
Methylbromide	<0.2	<0.2	--	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--	<0.2	<0.2	--
Tetrachloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
Trichlorofluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	<0.2	--
Styrene	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	<0.2	--
Xylene	0.4	0.5	22	<0.2	<0.2	--
Bromobenzene	<0.2	<0.2	--	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference of the reported values divided by their average.

Field duplicate-sample analysis--Continued

Compound	AEDC-236		Relative percent difference ¹
	Original	Duplicate	
Dibromomethane	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--
Carbontetrachloride	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--
Bromoform	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--
Chloroform	0.6	0.6	0.0
Toluene	<0.2	0.2	--
Benzene	0.2	0.3	40
Chlorobenzene	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--
Ethylbenzene	<0.2	<0.2	--
Methylbromide	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--
Tetrachloroethylene	<0.2	<0.2	--
Trichlorofluoromethane	<0.2	<0.2	--
1,1-dichloroethane	<0.2	<0.2	--
1,1-dichloroethylene	<0.2	<0.2	--
1,1,1-trichloroethane	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--
Styrene	<0.2	<0.2	--
1,1-dichloropropene	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--
Xylene	<0.2	<0.2	--
Bromobenzene	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference of the reported values divided by their average.

APPENDIX 6

Laboratory quality-control check standards recovery percentages

Laboratory quality-control check standards recovery percentages

Compound	Date of analysis					
	04-18-91	04-24-91	04-26-91	04-30-91a	04-30-91b	05-03-91
Dichlorodifluoromethane	121	149	118	88	103	99
Chloromethane	125	111	102	108	125	115
Vinyl chloride	100	112	101	102	107	96
Bromomethane	106	126	111	104	117	93
Chloroethane	118	124	117	100	112	94
Trichlorofluoromethane	110	124	104	144	93	109
1,1-dichloroethene	110	114	103	109	103	102
Dichloromethane	117	124	104	96	107	100
Trans 1,2-dichloroethene	109	118	105	116	113	105
1,1-dichloroethane	116	129	113	119	107	107
2,2-dichloropropane	85	111	110	125	95	92
Bromochloromethane	120	113	101	108	100	93
Cis 1,2-dichloroethene	109	126	99	104	104	91
Chloroform	116	125	109	106	100	103
1,1,1-trichloroethane	107	120	108	116	103	100
Carbon tetrachloride	108	124	112	111	101	98
1,1-dichloropropene	113	123	113	122	104	111
Benzene	117	126	108	113	104	107
1,2-dichloroethane	122	131	111	99	104	109
Trichloroethene	118	119	105	115	103	101
1,2-dichloropropane	117	125	105	103	99	102
Dibromomethane	119	124	97	98	94	98
Bromodichloromethane	119	127	105	107	101	100
2-chloroethylvinyl ether	111	122	82	101	86	99
Cis 1,3-dichloropropene	109	125	105	111	106	103
Dibromochloromethane	97	100	104	113	100	93
1,2-dibromoethane	100	99	96	105	94	104
Chlorobenzene	100	99	110	116	105	99
1,1,1,2-tetrachloroethane	99	103	107	108	98	109
Ethylbenzene	101	102	114	116	109	106
M&p-xylene	102	103	113	116	107	103
O-xylene	100	101	110	110	100	105
Styrene	98	101	104	116	92	85
Bromoform	98	111	102	111	89	111
Isopropylbenzene	112	114	123	123	114	99
Bromobenzene	101	105	103	107	99	105
1,2,3-trichloropropane	92	109	92	101	93	105
1,1,2,2-tetrachloroethane	96	109	100	101	88	105
n-propylbenzene	97	98	109	119	101	105
2-chlorotoluene	102	102	112	117	103	103
4-chlorotoluene	103	101	110	121	99	104
1,3,5-trimethylbenzene	102	105	113	117	107	104
Tertbutylbenzene	103	105	116	122	107	112
1,2,4-trimethylbenzene	110	111	118	122	113	107
Secbutylbenzene	109	109	123	118	114	99
p-isopropyltoluene	102	104	116	125	106	100
1,3-dichlorobenzene	97	98	102	108	95	99
1,4-dichlorobenzene	103	102	105	105	100	106
1,2-dichlorobenzene	107	103	102	104	99	98
n-butylbenzene	107	108	124	120	113	102
1,2-dibromo-3-chloropropane	107	109	101	91	100	102
Toluene	113	122	110	116	105	103
Trans 1,3-dichloropropene	107	127	100	111	100	99
1,1,2-trichloroethane	92	94	98	103	100	104
Tetrachloroethene	92	93	106	121	99	101
1,3-dichloropropane	92	97	100	101	98	106
1,2,4-trichlorobenzene	107	104	105	115	96	98
Naphthalene	107	102	95	101	102	102
Hexachlorobutadiene	100	92	105	131	103	102
1,2,3-trichlorobenzene	98	90	90	109	94	103

Laboratory quality control check standards recovery percentages--Continued

Compound	Dates of analysis				
	05-08-91a	05-08-91b	05-15-91	10-21-91	10-23-91
Dichlorodifluoromethane	115	69	104	104	86
Chloromethane	122	98	93	139	117
Vinyl chloride	114	86	105	127	109
Bromomethane	95	81	99	135	109
Chloroethane	91	79	102	121	99
Trichlorofluoromethane	111	134	170	122	100
1,1-dichloroethene	115	91	109	118	113
Dichloromethane	105	102	101	111	98
Trans 1,2-dichloroethene	116	98	107	119	102
1,1-dichloroethane	115	98	105	113	100
2,2-dichloropropane	105	121	110	96	96
Bromochloromethane	101	94	104	103	94
Cis 1,2-dichloroethene	101	89	104	105	91
Chloroform	108	97	110	107	94
1,1,1-trichloroethane	108	99	111	105	96
Carbon tetrachloride	102	100	112	107	97
1,1-dichloropropene	117	104	110	114	100
Benzene	111	96	111	106	95
1,2-dichloroethane	104	92	111	101	92
Trichloroethene	105	96	108	117	88
1,2-dichloropropane	101	92	115	98	88
Dibromomethane	98	94	105	98	91
Bromodichloromethane	100	99	106	130	108
2-chloroethylvinyl ether	96	101	108	97	92
Cis 1,3-dichloropropene	103	106	117	106	97
Dibromochloromethane	108	112	115	146	123
1,2-dibromoethane	111	98	103	103	98
Chlorobenzene	105	101	97	105	96
1,1,1,2-tetrachloroethane	120	99	115	107	98
Ethylbenzene	120	96	104	107	96
M&p-xylene	115	100	109	106	99
o-xylene	110	95	114	108	96
Styrene	112	99	102	107	95
Bromoform	85	119	130	153	99
Isopropylbenzene	123	99	107	112	104
Bromobenzene	105	100	101	105	93
1,2,3-trichloropropane	105	97	102	101	96
1,1,2,2-tetrachloroethane	107	90	113	79	93
n-propylbenzene	117	100	105	108	98
2-chlorotoluene	116	102	102	108	100
4-chlorotoluene	113	109	107	112	101
1,3,5-trimethylbenzene	116	99	108	107	96
Tertbutylbenzene	123	100	106	109	100
1,2,4-trimethylbenzene	120	106	115	111	101
Secbutylbenzene	105	99	106	107	98
p-isopropyltoluene	105	105	111	108	101
1,3-dichlorobenzene	112	95	103	108	98
1,4-dichlorobenzene	104	92	106	104	94
1,2-dichlorobenzene	103	92	102	103	93
n-butylbenzene	121	99	106	106	97
1,2-dibromo-3-chloropropane	98	96	94	116	105
Toluene	97	98	103	107	95
Trans 1,3-dichloropropene	105	111	126	97	96
1,1,2-trichloroethane	108	93	106	100	93
Tetrachloroethene	107	106	106	109	96
1,3-dichloropropane	98	96	101	103	94
1,2,4-trichlorobenzene	103	106	113	103	96
Naphthalene	102	105	109	103	93
Hexachlorobutadiene	103	106	108	107	96
1,2,3-trichlorobenzene	101	99	103	105	95

APPENDIX 7

Holding times and surrogate spike recovery percentages

Holding times and surrogate spike recovery percentages

[S1, D-4 1,2-dichloroethane; S2, D-8 toluene; S3, 1,4-bromofluorobenzene]

AEDC well number	Date sampled	Date analyzed	Holding time (days)	S1	S2	S3
AEDC-172	05-02-91	05-08-91	6	97	100	96
AEDC-173	04-18-91	04-25-91	7	119	77	104
AEDC-174	04-18-91	04-25-91	7	107	88	107
AEDC-175	05-02-91	05-08-91	6	89	98	93
AEDC-176	05-01-91	05-03-91	2	98	102	93
AEDC-177	04-11-91	04-18-91	7	104	95	102
AEDC-178	04-10-91	04-18-91	8	93	102	111
AEDC-179	04-24-91	04-30-91	6	96	96	107
AEDC-180	05-03-91	05-08-91	5	97	97	94
AEDC-181	05-03-91	05-08-91	5	93	100	113
AEDC-182	04-29-91	05-08-91	10	93	101	95
AEDC-183	04-26-91	04-30-91	4	100	94	96
AEDC-184	05-01-91	05-08-91	7	103	100	94
AEDC-185	04-15-91	04-25-91	10	113	80	99
AEDC-186	04-16-91	04-25-91	9	110	84	103
AEDC-187	04-18-91	04-27-91	9	97	85	90
AEDC-188	04-17-91	04-25-91	8	109	80	97
AEDC-189	04-17-91	04-25-91	8	111	86	103
AEDC-190	04-30-91	05-09-91	10	95	98	111
AEDC-191	04-30-91	05-03-91	4	98	99	94
AEDC-192	05-01-91	05-08-91	7	87	100	96
AEDC-193	05-02-91	05-08-91	6	89	96	102
AEDC-194	04-23-91	05-01-91	9	102	100	104
AEDC-195	04-19-91	04-26-91	7	99	99	103
AEDC-196	05-01-91	05-08-91	7	98	95	93
AEDC-196	10-09-91	10-21-91	12	95	101	97
AEDC-197	04-12-91	04-19-91	7	102	96	104
AEDC-198	04-24-91	05-01-91	8	101	95	92
AEDC-199	04-23-91	04-30-91	7	102	99	98
AEDC-200	04-25-91	05-01-91	7	102	83	93
AEDC-201	04-25-91	05-01-91	7	99	92	96
AEDC-202	04-17-91	04-25-91	8	115	78	95
AEDC-203	04-17-91	04-24-91	7	102	109	111
AEDC-204	05-02-91	05-08-91	6	95	96	91
AEDC-205	04-16-91	04-25-91	9	106	89	112
AEDC-206	04-16-91	04-25-91	9	109	88	108
AEDC-208	04-30-91	05-09-91	10	98	86	94
AEDC-209	04-10-91	04-18-91	8	95	105	103
AEDC-210	04-11-91	04-18-91	7	106	98	103
AEDC-211	04-12-91	04-19-91	7	102	93	102

Holding times and surrogate spike recovery percentages--Continued

[S1, D-4 1,2-dichloroethane; S2, D-8 toluene; S3, 1,4-bromofluorobenzene]

AEDC well number	Date sampled	Date analyzed	Holding time (days)	S1	S2	S3
AEDC-212	04-23-91	04-30-91	7	104	99	102
AEDC-213	04-26-91	05-01-91	6	99	100	96
AEDC-214	04-26-91	05-01-91	6	93	95	97
AEDC-215	04-16-91	04-25-91	9	106	96	105
AEDC-216	04-11-91	04-18-91	7	99	99	110
AEDC-217	04-25-91	04-30-91	5	107	100	94
AEDC-218	04-25-91	05-01-91	7	101	95	91
AEDC-219	04-26-91	05-01-91	6	101	101	92
AEDC-220	04-25-91	05-01-91	7	102	100	89
AEDC-221	04-30-91	05-08-91	9	93	103	97
AEDC-222	04-24-91	05-01-91	8	96	94	98
AEDC-223	04-23-91	05-01-91	9	95	98	97
AEDC-224	04-24-91	05-01-91	8	98	93	106
AEDC-225	04-19-91	04-26-91	7	98	105	107
AEDC-226	04-18-91	04-25-91	7	106	89	104
AEDC-227	04-17-91	04-24-91	7	100	98	108
AEDC-228	04-18-91	04-25-91	7	108	90	103
AEDC-229	04-10-91	04-19-91	9	105	94	106
AEDC-230	04-11-91	04-19-91	8	107	94	100
AEDC-231	04-23-91	05-01-91	9	109	97	102
AEDC-236	04-30-91	05-08-91	9	94	102	95
AEDC-182 Field duplicate	04-29-91	05-08-91	10	95	101	95
AEDC-230 Field duplicate	04-11-91	04-19-91	8	104	86	99
AEDC-236 Field duplicate	04-30-91	05-08-91	9	97	101	93
AEDC-176 Downhole blank	05-01-91	05-08-91	7	92	95	97
AEDC-196 Bailer blank	05-01-91	05-08-91	7	105	103	97
AEDC-196 Bailor blank	10-09-91	10-21-91	12	95	99	97
Trip blank	05-02-91	05-15-91	13	102	96	94
AEDC tap water	05-03-91	05-08-91	5	99	96	98

APPENDIX 8

Matrix spike recovery percentages

Matrix spike recovery percentages

Compound	AEDC-211	AEDC-215	AEDC-221	AEDC-231
1,1-Dichloroethene	110	114	131	105
Benzene	120	134	132	112
Trichloroethene	103	116	119	102
Toluene	104	118	123	105
Chlorobenzene	105	115	140	100
S1	106	106	93	112
S2	95	94	101	91
S3	101	106	102	92

APPENDIX 9

Laboratory duplicate-sample analysis

Laboratory duplicate-sample analysis

[Values given as < (less than) indicate that the concentration was below the detection level of the analytical method used and does not indicate the presence or absence of the constituent; --, no data]

Compound	AEDC-177			AEDC-178		
	Original	Duplicate	Relative percent difference ¹	Original	Duplicate	Relative percent difference ¹
Dibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Carbontetrachloride	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Bromoform	<0.2	<0.2	--	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Chloroform	<0.2	<0.2	--	<0.2	<0.2	--
Toluene	0.2	0.2	0.0	<0.2	<0.2	--
Benzene	<0.2	<0.2	--	<0.2	<0.2	--
Chlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Ethylbenzene	<0.2	<0.2	--	<0.2	<0.2	--
Methylbromide	<0.2	<0.2	--	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--	<0.2	<0.2	--
Tetrachloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
Trichlorofluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	<0.2	--
Styrene	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	<0.2	--
Xylene	<0.2	<0.2	--	<0.2	<0.2	--
Bromobenzene	<0.2	<0.2	--	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference between the reported values divided by their average.

Laboratory duplicate-sample analysis--Continued

Compound	AEDC-190			AEDC-193		
	Original	Duplicate	Relative percent difference ¹	Original	Duplicate	Relative percent difference ¹
Dibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--	0.8	0.8	0.0
Carbontetrachloride	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--	<0.8	<0.7	--
Bromoform	<0.2	<0.2	--	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Chloroform	1.7	1.2	34	12	14	15
Toluene	1.8	2.0	11	25	28	11
Benzene	1.8	1.8	0.0	22	26	17
Chlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Ethylbenzene	0.3	0.3	0.0	2.8	3.0	6.9
Methylbromide	<0.2	<0.2	--	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--	<0.2	<0.2	--
Tetrachloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
Trichlorofluoromethane	18	15	18	<0.2	<0.2	--
1,1-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethylene	0.7	0.4	55	<0.2	<0.2	--
1,1,1-trichloroethane	0.6	0.4	40	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	<0.2	--
Styrene	<0.2	<0.2	--	<0.3	<0.3	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	<0.2	--
Xylene	1.0	1.0	0.0	15	16	6
Bromobenzene	<0.2	<0.2	--	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference between the reported values divided by their average.

Laboratory duplicate-sample analysis--Continued

Compound	AEDC-198			AEDC-204		
	Original	Duplicate	Relative percent difference ¹	Original	Duplicate	Relative percent difference ¹
Dibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--	0.9	0.9	0.0
Carbontetrachloride	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Bromoform	<0.2	<0.2	--	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Chloroform	1.7	1.7	0.0	11	11	0.0
Toluene	1.1	1.6	37	17	17	0.0
Benzene	0.4	0.5	22	16	19	17
Chlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Ethylbenzene	0.2	0.3	40	1.0	1.0	0.0
Methylbromide	<0.2	<0.2	--	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--	<0.2	<0.2	--
Tetrachloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
Trichlorofluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	<0.2	--
Styrene	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	<0.2	--
Xylene	1.0	1.5	40	5.9	6.6	11
Bromobenzene	<0.2	<0.2	--	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference between the reported values divided by their average.

Laboratory duplicate-sample analysis--Continued

Compound	AEDC-205			AEDC-222		
	Original	Duplicate	Relative percent difference ¹	Original	Duplicate	Relative percent difference ¹
Dibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Carbontetrachloride	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Bromoform	<0.2	<0.2	--	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Chloroform	<0.2	<0.2	--	<0.2	<0.2	--
Toluene	<0.2	<0.2	--	1.0	0.9	11
Benzene	<0.2	<0.2	--	<0.2	<0.2	--
Chlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Ethylbenzene	<0.2	<0.2	--	<0.2	<0.2	--
Methylbromide	<0.2	<0.2	--	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--	<0.2	<0.2	--
Tetrachloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
Trichlorofluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	<0.2	--
Styrene	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	<0.2	--
Xylene	<0.2	<0.2	--	0.2	0.2	0.0
Bromobenzene	<0.2	<0.2	--	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference between the reported values divided by their average.

Laboratory duplicate-sample analysis--Continued

Compound	AEDC-225			Bailer blank		
	Original	Duplicate	Relative percent difference ¹	Original	Duplicate	Relative percent difference
Dibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorobromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Carbontetrachloride	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Bromoform	<0.2	<0.2	--	<0.2	<0.2	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	<0.2	--
Chloroform	0.5	0.4	22	0.3	0.2	40
Toluene	0.2	0.2	0.0	<0.2	<0.2	--
Benzene	<0.2	<0.2	--	<0.2	<0.2	--
Chlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Chloroethane	<0.2	<0.2	--	<0.2	<0.2	--
Ethylbenzene	<0.2	<0.2	--	<0.2	<0.2	--
Methylbromide	<0.2	<0.2	--	<0.2	<0.2	--
Methylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Methylenechloride	<0.2	<0.2	--	0.2	0.1	67
Tetrachloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
Trichlorofluoromethane	<0.2	<0.2	--	0.3	0.2	40
1,1-dichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	<0.2	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	<0.2	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
Vinylchloride	<0.2	<0.2	--	<0.2	<0.2	--
Trichloroethylene	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	<0.2	--
Styrene	<0.2	<0.2	--	<0.2	<0.2	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	<0.2	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	<0.2	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	<0.2	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	<0.2	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	<0.2	--
Xylene	<0.2	<0.2	--	<0.2	<0.2	--
Bromobenzene	<0.2	<0.2	--	<0.2	<0.2	--

¹The relative percent difference is calculated as the difference between the reported values divided by their average.

Laboratory duplicate sample analysis--Continued

AEDC-228

Compound	Original	Duplicate	Relative percent difference ¹	Triplicate	Relative percent difference with original ¹	Relative percent difference with duplicate ¹
Dibromomethane	<0.2	<0.2	--	<0.2	--	--
Dichlorobromomethane	<0.2	<0.2	--	<0.2	--	--
Carbontetrachloride	<0.2	<0.2	--	<0.2	--	--
1,2-dichloroethane	<0.2	<0.2	--	<0.2	--	--
Bromoform	<0.2	<0.2	--	<0.2	--	--
Chlorodibromomethane	<0.2	<0.2	--	<0.2	--	--
Chloroform	1.2	0.7	53	0.4	100	55
Toluene	1.9	0.9	71	0.4	130	77
Benzene	2.5	1.2	70	0.5	133	82
Chlorobenzene	<0.2	<0.2	--	<0.2	--	--
Chloroethane	<0.2	<0.2	--	<0.2	--	--
Ethylbenzene	0.2	<0.2	--	<0.2	--	--
Methylbromide	<0.2	<0.2	--	<0.2	--	--
Methylchloride	<0.2	<0.2	--	<0.2	--	--
Methylenechloride	<0.2	<0.2	--	<0.2	--	--
Tetrachloroethylene	<0.2	<0.2	--	<0.2	--	--
Trichlorofluoromethane	<0.2	<0.2	--	<0.2	--	--
1,1-dichloroethane	<0.2	<0.2	--	<0.2	--	--
1,1-dichloroethylene	<0.2	<0.2	--	<0.2	--	--
1,1,1-trichloroethane	<0.2	<0.2	--	<0.2	--	--
1,1,2-trichloroethane	<0.2	<0.2	--	<0.2	--	--
1,1,2,2-tetrachloroethane	<0.2	<0.2	--	<0.2	--	--
1,2-dichlorobenzene	<0.2	<0.2	--	<0.2	--	--
1,2-dichloropropane	<0.2	<0.2	--	<0.2	--	--
1,3-dichlorobenzene	<0.2	<0.2	--	<0.2	--	--
1,4-dichlorobenzene	<0.2	<0.2	--	<0.2	--	--
Dichlorodifluoromethane	<0.2	<0.2	--	<0.2	--	--
Trans 1,3-dichloropropene	<0.2	<0.2	--	<0.2	--	--
Cis 1,3-dichloropropene	<0.2	<0.2	--	<0.2	--	--
Vinylchloride	<0.2	<0.2	--	<0.2	--	--
Trichloroethylene	<0.2	<0.2	--	<0.2	--	--
1,2-dichloroethene	<0.2	<0.2	--	<0.2	--	--
Styrene	<0.2	<0.2	--	<0.2	--	--
1,1-dichloropropene	<0.2	<0.2	--	<0.2	--	--
2,2-dichloropropane	<0.2	<0.2	--	<0.2	--	--
1,3-dichloropropane	<0.2	<0.2	--	<0.2	--	--
Ortho-chlorotoluene	<0.2	<0.2	--	<0.2	--	--
Para-chlorotoluene	<0.2	<0.2	--	<0.2	--	--
1,2,3-trichloropropane	<0.2	<0.2	--	<0.2	--	--
1,1,1,2-tetrachloroethane	<0.2	<0.2	--	<0.2	--	--
1,2-dibromoethane	<0.2	<0.2	--	<0.2	--	--
Xylene	0.8	0.2	120	<0.2	--	--
Bromobenzene	<0.2	<0.2	--	<0.2	--	--

¹The relative percent difference is calculated as the difference between the reported values divided by their average.

Note: Sample results for volatile organic compounds from well AEDC-228 were not reproducible. Lab reported average values.