

Hydrogeologic and Water-Quality Data for the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

By Emily C. Hammond and Clifton F. Bell

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CONVERSION FACTORS, VERTICAL DATUM, ABBREVIATED WATER-QUALITY
UNITS, AND TRADE-NAME DISCLAIMER

Multiply	By	To obtain
foot (ft)	0.3048	meter
inch (in.)	25.4	millimeter (mm)
square mile (mi ²)	2.590	square kilometer
mile (mi)	1.609	kilometer
gallon (gal)	3,785	milliliter (mL)

Water temperature is expressed in degrees Celsius (°C), which can be converted to degrees Fahrenheit (°F) by the following equation:

$$^{\circ}\text{F} = 1.8 (^{\circ}\text{C}) + 32$$

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.

Abbreviated water-quality units: Chemical concentration and specific electrical conductance in this report are expressed in metric units. Chemical concentration is expressed in milligrams per liter (mg/L) or in micrograms per liter (µg/L). Specific electrical conductance of water is expressed in microsiemens per centimeter at 25 degrees Celsius (µS/cm).

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Hydrogeologic and Water-Quality Data for the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

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Abstract

Hydrogeologic and water-quality data were collected at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site at Dahlgren, Virginia, as part of a hydrogeologic assessment of the shallow aquifer system begun in 1993. The U.S. Geological Survey conducted this study to provide the U.S. Navy with hydrogeologic data to aid in the evaluation of the effects from remediation of contaminated sites and to protect against additional contamination. This report describes the ground-water observation-well network, hydrogeologic, and water-quality data collected between October 1993 and April 1995. The report includes a description of the locations and construction of 28 observation wells on the Explosive Experimental Area. Hydrogeologic data include lithologic logs, geophysical logs, and vertical hydraulic conductivity measurements of selected core intervals. Hydrologic data include synoptic and hourly measurements of ground-water levels, and observation-well slug tests to determine horizontal hydraulic conductivity. Water-quality data include analyses of major dissolved constituents in ground water and surface water.

INTRODUCTION

The Naval Surface Warfare Center, Dahlgren Site (NSWC DL) at Dahlgren, Va., was established in 1918 as a proving ground for naval ordnance (fig. 1). Today the NSWC DL Mainside also designs both offensive and defensive naval surface warfare systems, including computer models for missile flight and artificial satellite

motion. The Explosive Experimental Area (EEA), which is south of Machodoc Creek, is used for testing naval ordnance. In the past, activities conducted at the NSWC DL have had the potential to contaminate ground water, soil, and (or) surface water. The U.S. Environmental Protection Agency placed the NSWC DL on the National Priority List (NPL) in February 1992, and categorized six sites on the EEA as Solid Waste Management Units (SWMU's) (Halliburton NUS, 1995). SWMU's are areas where solid wastes have been systematically released, even if the areas were not intended for the management of solid or hazardous wastes.

In 1993, the U. S. Geological Survey (USGS), in cooperation with the NSWC DL, began an investigation of the shallow aquifer system underlying the EEA. The USGS conducted this study to provide the U.S. Navy with information to assist in further NPL activities. The study was designed to provide basic hydrogeologic and water-quality data for describing the natural properties and characteristics of the shallow aquifer system. Characterization of individual SWMU's was not an objective of this study.

Purpose and Scope

The purpose of this report is to present hydrogeologic and general water-quality data collected at the EEA of the NSWC DL, Dahlgren, Va., between October 1993 and April 1995. The report includes (1) descriptions of the observation-well network, (2) hydrogeologic data, and (3) water-quality data. The hydrogeologic and water-quality data are presented in figures and tables.

Twenty-eight observation wells were installed at 20 locations on the EEA of the NSWC DL. Lithologic descriptions and geophysical logs from the 28 observation wells were recorded. Selected intervals were cored

for analysis of mineralogic characteristics and vertical hydraulic conductivity. Data are presented from slug tests of 27 observation wells. These slug tests were subsequently used to estimate horizontal hydraulic conductivity. Synoptic water levels were measured periodically in all of the wells. Hourly water levels were recorded by analog-to-digital recorders (ADR's) on 10 wells. Water samples were collected from all 28 observation wells and from 3 surface-water sampling sites. The water samples were analyzed for selected constituents to establish background water-quality conditions.

Description of Study Area

The NSWCDL is located in King George County, Va., and is bounded on the east by the Potomac River (fig. 1). The topography at NSWCDL is generally flat, with a maximum relief of about 20 ft over most of the site. The land use on the installation is forest, open field, marsh, and military operations facilities. Upper Machodoc Creek divides the installation into two areas: the Mainside to the north, which is approximately 2,678 acres, and the EEA to the south, which is approximately 1,614 acres (pl. 1). On the EEA, surface-water bodies include Black Marsh and several unnamed tributaries to Upper Machodoc Creek.

Unconsolidated sedimentary deposits of the Atlantic Coastal Plain underlie the NSWCDL. These deposits consist of tabular bodies of interbedded sand, silt, and clay, and range in age from Cretaceous to Quaternary (Meng and Harsh, 1988). Deposits of the Tabb Formation of Pleistocene age crop out at the surface of the installation (Mixon and others, 1989). At some locations on the EEA, the surficial material is fill.

The shallow aquifer system underlying the NSWCDL (fig. 2), as defined in this report, consists of the Columbia aquifer, which is usually unconfined, and a confined aquifer (unpublished data on file in the Virginia District office of the U.S. Geological Survey). The Columbia aquifer is underlain by the upper confining unit, which overlies the upper confined aquifer. The upper confined aquifer is underlain by the Nanjemoy-Marlboro confining unit. In some areas of the EEA, the upper confining unit and upper confined aquifer are missing and the Columbia aquifer lies directly on the Nanjemoy-Marlboro confining unit (unpublished data on file in the Virginia District office of the U.S. Geological Survey).

Previous Investigations

An Initial Assessment Study was performed at the NSWCDL in 1981 (Fred C. Hart Associates, 1983), which identified 36 potentially contaminated sites on the NSWCDL. Of the 36 potentially contaminated sites, 10 sites are located on the EEA; however, Confirmation Studies were not recommended for any of these sites (O'Brien and Gere, 1986). A final Site Management Plan was developed in 1995 (Halliburton NUS, 1995) that designated 2 of the 10 EEA sites as SWMU's, and provides estimated schedules for conducting Comprehensive Environmental Response, Compensation, and Liability Act activities. The USGS began a hydrogeologic framework investigation of the Mainside in 1992. Hydrogeologic and water-quality data collected for the study are presented in a data report (Bell and others, 1994) and in unpublished data on file in the Virginia District office of the U.S. Geological Survey.

Acknowledgments

The authors wish to thank Ann Swope, Billie Weedon, Collins Johnson, and other members of the Environmental Division, NSWCDL, for their assistance in project planning and implementation. James DeShazo, facilities manager, and Robert Hoyer assisted in coordinating activities at the EEA. The U.S. Army Corps of Engineers (COE) completed the drilling operations at the EEA in a safe and efficient manner under the supervision of Charles Brown.

DESCRIPTION OF OBSERVATION-WELL NETWORK

Observation wells were sited to obtain maximum areal coverage of the EEA study area, to have drill sites accessible by drilling equipment, and to avoid areas of known or suspected contamination. Observation well locations are shown on plate 1.

Well Construction

All 28 observation wells installed at the NSWCDL for the hydrogeologic assessment were constructed of 4-in. inside-diameter polyvinyl chloride (PVC) casing. Twenty wells were screened in the Columbia aquifer, of which 17 wells were augered and 3 wells (wells EEA-S6,

S8, S11) were drilled by hydraulic rotary method. Four wells were screened in the upper confined aquifer and four wells were screened in the Nanjemoy-Marlboro confining unit by hydraulic rotary methods. In order to avoid possible contamination of the confined aquifers from the Columbia aquifer during drilling, 10-in. inside-diameter PVC casing was set and grouted into the upper confining unit before drilling continued through the aquifer below. Wells in the Columbia aquifer were constructed with 5-, 10-, 15-, or 20-ft screens, wells in the upper confined aquifer were constructed with 10-foot screens, and wells in the Nanjemoy-Marlboro confining unit were constructed with 10-ft screens. Stainless steel centralizers were placed at the top and bottom of well screens. Details on the construction of individual wells are presented in table 1 and figure 3.

Location and Numbering System of Wells

The 20 observation wells in the Columbia aquifer are each identified with a local number preceded by the letters "EEA-S" (EEA-S1 to S20). The eight wells in the upper confined aquifer and Nanjemoy-Marlboro confining unit are identified by a local number preceded by the letters "EEA-M" (EEA-M1 to M8). The locations of these wells on the installation are shown on plate 1.

A unique USGS identifier was assigned to each well for the Ground-Water Site-Inventory file, a national data base maintained by the USGS. These USGS identifiers are based on the Virginia coordinate grid number of the USGS standard series 7.5-minute topographic quadrangle. Each well is numbered in accordance with the grid of its location and the chronological order in which the well was installed. For example, the USGS number 54Q 22 corresponds to the 22d well installed by the USGS in the area covered by the Dahlgren quadrangle, which has a Virginia coordinate grid number of 54Q.

The latitudes and longitudes of observation wells were determined by a Magellan (NAV 5000 PRO) portable Global Positioning System receiver, and checked on topographic maps. Elevations of land-surface datums and measuring points were leveled in from bench marks by the USGS to an accuracy of 0.01 ft.

HYDROGEOLOGIC DATA

This section describes lithologic and geophysical logs for observation wells, mineralogic and vertical hydraulic conductivity data from laboratory analysis of 36 Shelby tube core samples, and hydrologic data from water-level measurements and aquifer tests.

Lithologic and Geophysical Logs

Sediment samples were recovered using split-spoon samplers and lithologic descriptions were logged during drilling operations at 20 observation wells. Grain size according to the Wentworth scale (Leeder, 1982) was recorded, as well as color (Munsell Color, 1975), sedimentary structures, degree of moistness, and other observations, such as the presence of organic material, shell material, indurated material, glauconite, or mica (table 2). At some intervals, no representative material was recovered with the samplers.

Geophysical logs were recorded at all drill sites (figs. 4–12). A probe was lowered to the bottom of the borehole and the geophysical response was recorded as the probe was raised. Natural gamma-radiation logs were run at all wells in the Columbia aquifer, the upper confined aquifer, and the Nanjemoy-Marlboro confining unit after the installation of casing. Natural gamma-radiation, spontaneous potential, single-point resistance, 16-in. normal resistivity, and 64-in. normal resistivity logs were run at boreholes for wells screened in the upper confined aquifer and Nanjemoy-Marlboro confining unit prior to installation of the casing; natural gamma-radiation and electromagnetic (EM) induction conductivity logs were run at these same boreholes after installation of the casing. Along certain intervals in the wells, the EM induction conductivity signal was affected by metal centralizers, therefore, these data are not presented.

Shelby Tubes

Thirty-six Shelby tube cores from 18 observation wells were analyzed by the U.S. Army COE, Ohio River Division Laboratory, Cincinnati, Ohio, for vertical hydraulic conductivity (table 3), and mineralogy (table 4). Vertical hydraulic conductivity was measured by the falling-head permeameter method. Mineralogy was determined by visual inspection and x-ray diffraction. The core intervals were chosen to characterize vertical and areal variations in lithology.

Hydrologic Data

Water levels in wells were monitored to determine the response of ground-water levels to precipitation, tidal influence, and evapotranspiration. Precipitation data, not shown in this report, were collected by the NSWCDL. Measurements of tidal fluctuations, also not shown in this report, were collected by the USGS from a tide gage installed on the north side of Upper Machodoc Creek.

Ground-Water Levels

Water levels were measured periodically at each of the 28 observation wells installed for the study (table 5). Measuring points were established for each well on the top of the casing; the elevations of these measuring points were surveyed by the USGS from bench marks to an accuracy of 0.01 ft. Water levels in wells were measured to an accuracy of 0.01 ft by chalked steel tape. These water-level measurements were then subtracted from the elevations of the respective measuring points to obtain the elevations of the water levels.

In addition to the periodic measurements, ADR's were installed on 10 wells (EEA-M1, S1, M3, S3, M4, S4, M6, S6, M8, and S8) for the continuous monitoring of water levels. The ADR's recorded measurements every hour. Continuous (hourly) data are used to observe seasonal and short-term variations in water levels, and to allow direct comparison of the effects of tidal influences, precipitation events, and other hydrologic variables on water levels in different aquifers. Water-level data from ADR's are presented in hydrographs, showing minimum daily water levels (relative to sea level) (figs. 13-22) from March 1994 to April 1995.

Slug Tests

Slug tests, by the volume-displacement method, were conducted on all 28 observation wells to determine horizontal hydraulic conductivity. An In-Situ Hermit (1000B) data logger and pressure transducer were used to record the water levels. Prior to the introduction of the slug, the water level was monitored for 10 minutes so that any rising or falling background trend could be established and subtracted from the water-level recovery. The slug was introduced by a sand-filled PVC cylinder of known volume. The cylinder was rapidly lowered into the well, causing a temporary rise in the water level. The data logger recorded the rise and decline of the water level over time until the water level returned to

equilibrium. Instantaneous water levels were recorded at intervals ranging from every 0.2 seconds at the beginning of the test to every 30 seconds at the end of the test (table 6). An additional slug test was performed on some wells by recording the rise in water level after removal of the slug from the well and the subsequent rise to equilibrium. Rising-head and falling-head data from slug tests are presented in graphs that show the depth of the water level below the measuring point over the course of the slug test (figs. 23-49).

WATER-QUALITY DATA

Field parameters and the concentrations of selected chemical constituents were measured in ground-water and surface-water samples from the NSWCDL. This water-quality data can be used to assess background geochemistry of ground water and surface water at the NSWCDL. Reporting limits for all water-quality constituents are given in table 7. Chemical analyses of surface-water and ground-water samples are listed in tables 8 and 9, respectively.

Location and Methods of Field Sampling

Water samples were collected from the 28 observation wells, from 2 surface-water sites in Machodoc Creek, and from 1 surface-water site in Black Marsh (pl. 1) in July 1994. Ground-water samples were collected using a stainless steel submersible pump with a Teflon discharge tube. Each well was purged of at least three well volumes of water prior to sampling, unless the well went dry in which case the water level was allowed to recover prior to sampling. Surface-water samples were collected with a weighted-bottle sampler using the equal-width-increment method (Edwards and Glysson, 1988). Prior to collecting water-quality samples, all equipment was cleaned thoroughly with laboratory detergent and rinsed with tap and distilled water. The outside of the pump and Teflon tubing were rinsed with distilled water between wells, and the entire system was flushed with distilled water after each day of sampling.

Temperature, dissolved oxygen (DO), specific conductance, pH, and alkalinity were measured in the field. Temperature and DO were measured in wells and surface water after sampling, using a YSI (model 54A) dissolved oxygen meter with cable and submersible stirrer. The DO meter was calibrated to air at least once

per day. Specific conductance and pH were measured in unfiltered water samples using an Orion (model 122) specific conductance meter with glass conductivity cell and Orion (SA 250) pH meter with gel-filled pH electrode, respectively. The calibration of the specific conductance meter was checked each day using three solutions of known conductance. The pH meters were calibrated each day using two solutions of known pH values (usually pH 4 and 7). Alkalinities were determined by incremental titration of 100-mL filtered water samples with sulfuric acid.

Water samples collected for dissolved inorganic analyses were filtered immediately after collection to minimize oxidation of any chemically reduced solutes and then placed in acid-rinsed bottles. The filtering was accomplished using a peristaltic pump and a 142-mm-diameter filter-plate assembly with 0.45-mm pore-size filter membrane. The filter membranes were flushed with 200 mL of American Society of Testing and Materials Type II water before filtration of the sample. Water samples collected for major cations and metals were acidified to pH 2 with concentrated nitric acid. All bottles containing water samples were placed in sealed plastic bags, chilled with ice, and shipped overnight to the laboratories in high-impact plastic ice chests.

Quality controls included duplicate samples, an equipment blank, and a carbon-free de-ionized water blank. Duplicate samples were collected at approximately 10 percent of the sampling sites, including one duplicate surface-water sample, to determine the reproducibility of water-quality data. Analyses of duplicate samples are presented in tables 8 and 9 with results from the other samples. A carbon-free de-ionized water blank and an equipment blank of carbon-free de-ionized water were passed through the pump and tubing to determine the cleanliness of equipment and sample-collection procedures.

Methods of Laboratory Analysis

All water-quality samples were sent to the USGS National Water Quality Laboratory in Arvada, Colo., for determination of inorganic constituents and organic carbon. Metals and major cations were determined using inductively coupled argon plasma. Chloride and fluoride were determined by a colorimetric method, and sulfate was determined by a turbidimetric method. Total dissolved solids were measured as residue-on-evaporation at 180°C. The analytical methods are

described in Fishman and Friedman (1989) and Wershaw and others (1987). Laboratory quality-assurance procedures are described in Friedman and Erdmann (1982) and Jones (1987).

DATA MANAGEMENT

Data from field activities were recorded in bound notebooks and validated by the field personnel and a reviewer. Well-construction data and periodic water-level measurements were entered into the USGS Ground-Water-Site-Inventory file, a storage and retrieval system that is part of the National Water Information System (NWIS). The continuous ground-water-level data were entered into the USGS Automated Data Processing System (ADAPS), which is also part of NWIS. ADAPS consists of a collection of computer programs and files designed to provide a comprehensive system of up-to-date standardized water-data processing procedures. All water-quality data from the USGS National Water Quality Laboratory were reviewed and verified by laboratory and project personnel, and entered into the USGS Quality of Water Data Base, which is part of NWIS. The original field notebooks and hard copies of all well-construction, water-level, and water-quality data are stored at the USGS, Virginia District office, in Richmond, Va.

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TABLES

Table 1. Well-construction data for observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia
 [Methods of construction: hydraulic rotary (wells EEA-S6, EEA-S8, EEA-S11), solid-stem auger (wells EEA-S2, EEA-S5, EEA-S7), and hollow-stem auger (all others). Depths are measured from land-surface datum, altitude is in reference to sea level. All wells have 4 inch screen/casing internal diameter. Interval between bottom of sand pack and bottom of hole is filled with bentonite seal. N/A, not applicable. For locations of observation wells, see plate 1]

Local well no.	USGS well no.	Latitude	Longitude	Land-surface datum altitude (feet)	Date of completion	Depth of well (feet)	Depth of hole (feet)	Hydrogeologic unit	Interval of screen (feet)	Interval of sand pack (feet)	Interval of bentonite seal (feet)	Interval of bentonite grout (feet)
EEA-S1	54Q56	38°17'37"	77°02'46"	24.46	12-06-93	24.7	25.0	Columbia aquifer	12.2 - 22.2	7 - 25	0 - 7	N/A
EEA-S2	54Q58	38°17'46"	77°02'00"	17.89	11-11-93	16.8	17.0	Columbia aquifer	9.3 - 14.3	5 - 17	0 - 5	N/A
EEA-S3	54Q60	38°17'59"	77°01'14"	8.36	12-04-93	32.6	33.5	Columbia aquifer	20.1 - 30.1	4 - 33	0 - 4	N/A
EEA-S4	54Q62	38°18'14"	77°03'03"	23.83	12-09-93	12.5	13.0	Columbia aquifer	5.0 - 10.0	2 - 13	0 - 2	N/A
EEA-S5	54Q64	38°17'58"	77°02'30"	22.02	10-29-93	13.3	13.5	Columbia aquifer	2.8 - 12.8	2 - 13	0 - 2	N/A
EEA-S6	54Q66	38°18'35"	77°01'56"	14.05	11-15-93	19.7	20.0	Columbia aquifer	12.2 - 17.2	4 - 20	0 - 4	N/A
EEA-S7	54Q68	38°18'29"	77°04'01"	12.45	11-03-93	20.2	20.5	Columbia aquifer	9.7 - 19.7	4 - 20	0 - 4	N/A
EEA-S8	54Q70	38°18'57"	77°03'27"	16.17	11-15-93	17.7	18.0	Columbia aquifer	10.2 - 15.2	3 - 18	0 - 3	N/A
EEA-S9	54Q71	38°18'30"	77°03'18"	21.24	12-10-93	20.2	20.5	Columbia aquifer	9.7 - 19.7	5 - 20	0 - 5	N/A
EEA-S10	54Q72	38°17'59"	77°02'57"	24.76	12-07-93	15.6	17.0	Columbia aquifer	8.1 - 13.1	5 - 17	0 - 5	N/A
EEA-S11	54Q73	38°17'25"	77°02'45"	25.14	12-03-93	31.3	32.0	Columbia aquifer	18.8 - 28.8	7 - 32	0 - 7	N/A
EEA-S12	54Q74	38°17'32"	77°02'12"	12.70	12-07-93	19.5	20.0	Columbia aquifer	9.0 - 19.0	5 - 20	0 - 5	N/A
EEA-S13	54Q75	38°17'29"	77°02'10"	23.11	12-08-93	33.2	35.0	Columbia aquifer	20.7 - 30.7	5 - 35	0 - 5	N/A
EEA-S14	54Q76	38°17'34"	77°01'45"	22.20	12-10-93	19.6	20.0	Columbia aquifer	9.1 - 19.1	5 - 20	0 - 5	N/A
EEA-S15	54Q77	38°17'36"	77°01'38"	21.73	12-11-93	25.2	25.5	Columbia aquifer	14.7 - 24.7	8 - 25	0 - 8	N/A
EEA-S16	54Q78	38°18'12"	77°01'52"	16.33	12-06-93	20.0	20.0	Columbia aquifer	7.5 - 17.5	5 - 20	0 - 5	N/A
EEA-S17	54Q79	38°18'25"	77°02'11"	11.43	12-10-93	16.6	20.0	Columbia aquifer	9.1 - 14.1	6 - 20	0 - 6	N/A
EEA-S18	54Q80	38°18'17"	77°02'31"	15.20	12-07-93	14.7	15.0	Columbia aquifer	7.2 - 12.2	4 - 15	0 - 4	N/A
EEA-S19	54Q81	38°18'20"	77°02'45"	13.21	12-09-93	12.2	13.0	Columbia aquifer	4.7 - 9.7	3 - 13	0 - 3	N/A
EEA-S20	54Q82	38°18'30"	77°02'45"	11.81	12-09-93	22.3	25.0	Columbia aquifer	4.8 - 19.8	3 - 25	0 - 3	N/A
EEA-M1	54Q55	38°17'37"	77°02'46"	24.44	11-19-93	70.4	75.0	Upper confined aquifer	49.9 - 59.9	41 - 65	40 - 41	0 - 40
EEA-M2	54Q57	38°17'46"	77°02'00"	17.77	11-10-93	63.9	70.0	Nanjemoy-Marlboro confining unit	48.4 - 58.4	44 - 70	38 - 44	0 - 38
EEA-M3	54Q59	38°17'59"	77°01'14"	8.16	11-08-93	95.2	110.0	Upper confined aquifer	82.7 - 92.7	76 - 93	69 - 76	0 - 69

Table 1. Well-construction data for observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia
 [Methods of construction: hydraulic rotary (wells EEA-S6, EEA-S8, EEA-S11), solid-stem auger (wells EEA-S2, EEA-S5, EEA-S7), and hollow-stem auger (all others). Depths are measured from land-surface datum, altitude is in reference to sea level. All wells have 4 inch screen/casing internal diameter. Interval between bottom of sand pack and bottom of hole is filled with bentonite seal. N/A, not applicable. For locations of observation wells, see plate 1]

Local well no.	USGS well no.	Latitude	Longitude	Land-surface datum altitude (feet)	Date of completion	Depth of well (feet)	Depth of hole (feet)	Hydrogeologic unit	Interval of screen (feet)	Interval of sand pack (feet)	Interval of bentonite seal (feet)	Interval of bentonite grout (feet)
EEA-M4	54Q61	38°18'14"	77°03'03"	23.94	12-02-93	68.0	70.0	Nanjemoy-Marlboro confining unit	52.5 – 62.5	47 – 70	42 – 47	0 – 42
EEA-M5	54Q63	38°17'58"	77°02'30"	22.42	10-28-93	62.2	85.0	Nanjemoy-Marlboro confining unit	49.7 – 59.7	44 – 66	42 – 44	0 – 42
EEA-M6	54Q65	38°18'35"	77°01'56"	14.15	11-13-93	106.0	110.0	Upper confined aquifer	86.0 – 96.0	81 – 110	74 – 81	0 – 74
EEA-M7	54Q67	38°18'29"	77°04'01"	12.61	11-02-93	68.7	70.0	Nanjemoy-Marlboro confining unit	48.2 – 58.2	46 – 70	43 – 46	0 – 43
EEA-M8	54Q69	38°18'57"	77°03'27"	16.12	11-17-93	84.1	85.0	Upper confined aquifer	68.6 – 78.6	62 – 85	58 – 62	0 – 58

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

[in., inch; ft, foot; cm, centimeter; mm, millimeter; %, percent; <, less than; >, greater than; depth, feet below land surface datum; for locations of observation wells, see plate 1; codes in parentheses are color codes according to Munsell Color (1975), grain size is according to Wentworth scale (Leeder, 1982)]

Depth (feet)	Description
Well EEA-S9 (54Q 71)	
0.0-2.0	Clay, (10YR 6/2) and (10YR 7/4) and (10YR 6/6), plastic, no mica, no glauconite. Mottled.
2.5-5.0	Clayey silt which grades downward into silty sand, very-fine-grained, (5Y 6/4), some mica, some dark minerals.
5.0-7.0	Silty sand, very-fine-grained, (5Y 5/2) and (10YR 6/6), micaceous. Contains ironstone nodules. Mottled.
10.0-12.0	Silty pebbly clayey sand, very-fine-grained, (5Y 6/1) to (5Y 4/1), very poorly sorted, some mica, mottled, grades downward into silty sand, very-fine-grained, (5Y 6/1) to (5Y 4/1), micaceous, some glauconite, with clasts of clay, (10YR 4/2).
17.0	Silty sand, very-fine-grained, (5GY 4/1), micaceous, glauconitic. Contains moderate numbers of bivalve fragments.
Well EEA-S10 (54Q 72)	
0.0-2.0	Silty clay, (10YR 6/2), no mica, no glauconite. Slightly mottled.
2.0-5.0	Silty clayey sand, very-fine- to fine-grained, (5Y 6/1), no mica, no glauconite.
5.0-7.0	Sand, very-fine- to medium-grained, (5YR 5/2) grading downward to (10YR 7/4), little mica, 3-5% dark minerals
9.0	Driller indicates greenish sediment on augers
10.0-15.5	Silty sand, very-fine-grained, (5GY 2/1), micaceous, some glauconite. Massively bedded.
15.5-17.0	Silty sand, very-fine-grained, (5Y 4/1), micaceous, some glauconite. Contains abundant <i>Macrocallista</i> .
Well EEA-S11 (54Q 73)	
0.0-3.2	Clayey silt, (10YR 6/2) to (10YR 4/2), micaceous, no glauconite. Contains roots and other plant material.
3.2-4.0	Sand, very-fine- to fine-grained, (10YR 8/2), well-sorted, some dark minerals.
4.0-6.0	Sand, fine- to coarse-grained, interbedded (3-5 cm) with sand, very-fine- to fine-grained, well-sorted. Both sediments mottled, color (5YR 5/6) and (10YR 8/2) and (10YR 6/6). Contains 30-cm diameter quartz pebble.
6.0-8.0	Sand, very-fine- to fine-grained, (10YR 8/2), well-sorted, some mica, some dark minerals. Slightly mottled.
8.0-10.0	Sand, very-fine-grained, (5YR 5/6) and (10YR 6/2), well-sorted, some mica some dark minerals. Mottled.
10.0-12.0	Silty sand, very-fine-grained, (5Y 6/1), some mica, some dark minerals.
12.0-14.0	Clayey sandy silt, (5Y 6/1) to (5Y 4/1), micaceous, some dark minerals. Sand is very-fine-grained.
14.0-16.0	Sandy silt, (5Y 4/1), some mica, some dark minerals. Sand is very-fine-grained.
16.0-18.0	Sand, fine- to very-fine-grained, (5G 6/1) little mica, some dark minerals.
18.0-20.0	Sand, very-fine to fine-grained, (5G 6/1), some mica, some dark minerals.
20.0-22.0	Sand, very-fine-grained, (5G 6/1), some mica, some dark minerals.
24.5	Sand, very-fine-grained, (5Y 6/1), some mica, some dark minerals. Contains little plant material (leaves).
30.0-31.8	Sand, fine- to medium-grained, (5Y 6/1) to (5Y 4/1), some mica, some dark minerals.
31.8-32.0	Clay, (5Y 4/1), plastic, little mica, no glauconite. Contains black (organic?) streaks and plant material.
34.0	Clay, (5GY 6/1) to (5Y 6/1), plastic, no mica, no glauconite. Contains very chalky carbonate fragments.
Well EEA-S12 (54Q 74)	
0.0-2.0	Sandy silt, (10YR 5/4) to (10YR 4/2), some mica, no glauconite. Sand is very-fine-grained. Contains modern roots and other plant material.
2.0-5.0	Sand, very-fine- to medium-grained, (10YR 6/6), little mica, some dark minerals.
5.0-7.0	Sand, as 2-5 ft interval, grades downward into pebbly sand, medium- to fine-grained, (10YR 8/2) and (10YR 7/4). Sand is subangular. Pebbles are 2-4 mm in diameter. Mottled.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-S12 (54Q 74)—Continued	
7.0-10.0	Sand, as bottom of 5-7 ft interval except some coarse-grained sand. At 7 ft hit lag of subrounded pebbles, 5-10 mm diameter.
10.0-12.0	Pebbly sand, medium- to fine-grained, (10YR 5/4), no mica, no glauconite. Pebbles are 5-10 mm in diameter and rounded.
14.0	Sand, fine-grained, (5Y 6/1), well-sorted, massively bedded, no mica, no glauconite.
15.0-20.4	Sand, as at 14 ft except some mica.
20.4-22.0	Clay, (5GY 6/1) to (5GY 4/1), plastic, little mica, no glauconite. Contains black (organic?) streaks.
Well EEA-S13 (54Q 75)	
0.0-2.0	Sandy silt, (10YR 5/4) to (10YR 4/2), no mica, no glauconite. Sand is very-fine-grained. Contains modern wood and roots.
3.0-5.0	Sandy silt, (10YR 5/4) to (10YR 4/2), no mica, no glauconite. Sand is very-fine-grained. Contains modern wood and roots.
5.0-10.0	Sand, fine-grained, (10YR 8/2) and (10YR 7/4), well-sorted, some dark minerals. At 6 ft hit thin pebble lag.
10.0-12.0	Sand, as 5-10 ft interval except has thin (<1 mm) bands of iron staining, (10YR 6/6).
15.0-17.0	Sand, medium-grained, (10YR 8/2) to (10YR 7/4), no mica, some dark minerals. Contains pebbles, 5-10 mm diameter, at 16.5-17.0 ft.
20.0-22.0	Sand, fine- to very-fine-grained, some medium-grained, (10YR 7/4) and (5YR 5/6), some dark minerals. Contains 2-3 cm bands of iron staining.
25.0-27.0	Not recovered.
25.0-30.0	Sand, fine-grained, (5Y 6/1), well-sorted.
30.0-32.0	Sand, very-fine-grained, (5Y 6/1), well-sorted, no mica, some dark minerals.
37.0	Clay, (5GY 4/1), plastic, some mica, no glauconite.
Well EEA-S14 (54Q 76)	
0.0-2.0	Sand, very-fine-grained, (10YR 7/4) to (10YR 5/4), no mica, some dark minerals. Contains modern roots and leaves.
2.0-5.0	Pebbles at 2.5-3.0 ft High TIP reading and root-like odor at 5.0 ft.
5.0-6.8	Pebbly sand, fine- to medium-grained, (10YR 8/6) to (10YR 6/6), no mica, no glauconite. Pebbles are 4-12 mm in diameter.
6.8-7.0	Clay, (5YR 5/6) and (10YR 6/6), plastic, micaceous, no glauconite. Contains wavy laminations and lenses of sand, fine- to medium-grained. Very mottled.
10.0-12.0	Sand, very-fine-grained, (5Y 7/2), well-sorted, some mica, some dark minerals. Contains quartz pebbles at 10.5 ft.
15.0-15.5	Silty sand, very-fine-grained, (10YR 6/6) and (10YR 5/4), no mica, some dark minerals.
15.5-17.0	Silty clayey sand, very-fine-grained, (10YR 5/4) grading downward into (5GY 4/1), some mica.
21.0	Silty sand, very-fine-grained, (5GY 4/1), micaceous, some glauconite.
Well EEA-S15 (54Q 77)	
0.0-2.0	Silty sand, very-fine-grained, (10YR 5/4), some mica, no glauconite. Contains abundant modern root and leaves.
4.0	Thin pebble lag.
5.0-7.0	Sand, very-fine-grained, (N9), well-sorted, massively bedded, no mica, no glauconite.
7.0-10.0	Sand, fine-grained, (10YR 8/6), well-sorted, no mica, some dark minerals. Dry.
10.0-12.0	Sand, very-fine- to fine-grained, some medium-grained, (10YR 8/2) and (10YR 7/4) and (10YR 6/6), well-sorted, no mica, some dark minerals. Mottled. Dry.
15.0-17.0	Sand, very-fine-grained, (10YR 8/2), well-sorted, micaceous, some dark minerals.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-S15 (54Q 77)—Continued	
20.0-21.7	Sand, medium- to very-fine-grained, some coarse-grained, (5YR 6/6) and (5Y 7/2), little mica, some dark minerals, grades downward into silty sand, very-fine-grained. Mottled.
21.7-22.0	Clayey silt, (5GY 4/1), micaceous, some glauconite, very-fine-grained. Contains clasts of clay, (10YR 4/2).
25.0-27.0	Clayey sandy silt, micaceous, some glauconite. Sand is very-fine-grained. Contains poorly preserved wood fragments.
Well EEA-S16 (54Q 78)	
0.0-2.0	Clayey sandy silt, (10YR 6/2), little mica, no glauconite. Sand is very-fine-grained. Contains modern roots, other plant material. Slightly mottled.
2.0-5.0	Sand, very-fine-grained, (10YR 8/2) to (10YR 7/4), no mica, no glauconite. Mottled.
5.0-7.0	Sand, very-fine grained grading downward to fine-grained, (10YR 7/4) to (10YR 6/2), some mica, no glauconite. Mottled.
7.0-9.0	Silty sand, fine- to very-fine-grained, (10YR 7/4) to (10YR 6/2).
9.0-11.3	Silty sand, fine- to very-fine-grained. (10YR 8/2) and (10YR 6/6), some mica, no glauconite. Mottled. Sediments wet at approximately 10 ft.
11.3-12.0	Sand, medium- to fine-grained, (N7) and (10YR 6/6), no mica. Mottled.
13.5-15.0	Silty clayey sand, very-fine-grained, (5GY 4/1), very micaceous, no glauconite. Contains poorly preserved organic material. Color change occurs at 13.5 ft.
15.0-20.0	Silty sand, very-fine-grained, (5Y 4/1), very micaceous, some dark minerals. Bioturbated appearance.
20.0-22.0	Silty sand, very-fine-grained, (5GY 4/1), micaceous, glauconitic. Bioturbated. Contains abundant <i>Macrocallista</i> shell and shell fragments. Contains clasts of silty clay, (10YR 4/2), very micaceous.
Well EEA-S17 (54Q 79)	
0.0-2.0	Silty pebbly sand, very-fine-grained, (10YR 5/4) to (10YR 4/2), very poorly sorted, some mica, no glauconite. Pebbles are 2-5 mm in diameter. Contains modern roots.
2.0-5.3	Clayey sandy silt, (10YR 6/6) to (10YR 5/4). Sand is very-fine-grained. Contains some plant material.
5.3-7.0	Clay, (10YR 7/2) and (5YR 5/6), plastic, no mica, no glauconite. Contains ironstone nodules (2-5 mm diameter). Mottled. Driller reports "gravel sound" at 7 ft.
10.0-12.0	Silty pebbly sand, very-fine-grained, (10YR 4/2), little mica, grades downward into sand, very-fine-grained, (10YR 7/4) and (5YR 5/6), well-sorted, some mica, some dark minerals. Wet.
15.0-17.0	Silty clay, (5Y 4/1), micaceous, no glauconite. Massively bedded.
22.0	Clay, (5Y 4/1), plastic, micaceous, some dark minerals. Contains rare white chalky grains (<1 mm diameter).
Well EEA-S18 (54Q 80)	
0.0-2.0	Sandy clayey silt, (10YR 6/2) to (10YR 4/2), no mica, no glauconite. Sand is very-fine-grained. Contains modern roots and other plant material. Slightly mottled.
2.0-3.0	Silty clay, (10YR 6/2) and (10YR 6/6), plastic, no mica, no glauconite. Very mottled.
5.0-7.0	Clay, (10YR 6/2) and (10YR 6/6), plastic, no mica, no glauconite. Very mottled. Wet at 9 ft.
10.0-12.0	Silty clay, micaceous, some glauconite, grades downward into sandy clayey silt, (5GY 4/1), micaceous, some glauconite. Sand is very-fine-grained. Lower unit contains streaks of clay, (5YR 3/2), micaceous, no glauconite.
17.0	Silty sand, very-fine-grained, (5GY 4/1), micaceous, glauconitic. Contains abundant <i>Macrocallista</i> , rare <i>Turritella</i> .

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-S19 (54Q 81)	
0.0-2.0	Silty sand, very-fine-grained, (10YR 6/2) to (10YR 4/2), no mica, no glauconite. Contains modern roots. Probably fill material.
3.0	Clayey sandy silt, (5Y 4/1), little mica, no glauconite. Sand is very-fine-grained.
5.0-7.0	Silty sand, fine- to very-fine-grained, (10YR 4/2), some mica, no glauconite. Contains wood fragments. Color changes to (5Y 6/1) at 6.5 ft. Possibly fill material.
10.0-10.5	Silty sand, very-fine-grained, (5Y 4/1), micaceous, glauconitic. Massively bedded. Slightly mottled.
10.5-12.0	Silty sand, very-fine-grained, (5Y 4/1) and (5GY 4/1), micaceous, glauconitic. Bioturbated. Contains abundant <i>Macrocallista</i> .
15.0	Silty sand, as 10.5-12 ft interval. Contains <i>Macrocallista</i> , <i>Venericardia</i> , one scaphopod shell (<i>Dentalium?</i>) noted.
Well EEA-S20 (54Q 82)	
0.0-2.0	Clayey silt, (10YR 6/2) to (10YR 4/2), no mica, no glauconite.
3.0-7.0	Clay, (10YR 7/4) and (10YR 6/6), plastic, little mica, no glauconite. Mottled.
7.0	Clayey pebbly sand, fine- to medium-grained, (10YR 6/2) to (10YR 4/2), poorly sorted. Pebbles are 10-25 mm in diameter, subrounded.
10.0-12.0	Clay, (10YR 6/2) and (5YR 5/6), plastic, little mica, no glauconite. Contains small (1-5 mm) nodules of ironstone. Mottled.
15.0-17.0	Clay, as 10-12 ft interval.
17.0	Sand, very-fine-grained, (5Y 6/1) to (5Y 4/1), well-sorted, some mica, no glauconite.
20.0-22.0	Sand, very-fine-grained, (5Y 6/1) to (5Y 4/1), well-sorted, micaceous, some dark minerals.
25.0-27.0	Clayey silt grading downward into clay, (5Y 6/1) to (5Y 4/1), micaceous, no glauconite.
Well EEA-M1 (54Q 55)	
0.0-2.0	Clayey sandy silt, olive-gray (5Y 4/1), little mica, no glauconite. Sand is very-fine-grained. Contains plant material. Slightly mottled. Dry.
2.0-4.0	Clay which coarsens downward into silty clay, very-pale-orange (10YR 8/2) and pale-yellowish-brown pale-yellowish-brown (10YR 6/2), no mica, no glauconite. Top 6 in. is organic rich. Mottled. Dry.
4.0-4.5	Silty clay, very-pale-orange (10YR 8/2) and brownish-gray (5YR 4/1), no mica, no glauconite. Slightly mottled. Pebble lag at 4.5 ft.
4.5-6.0	Pebbly sand, very-pale-orange (10YR 8/2) to pale-yellowish-brown (10YR 6/2), very-fine- to fine-grained, well-sorted, some mica, no glauconite. Pebbles are 1-10 mm in diameter, angular.
6.0-8.0	Sand, light-gray (N6) and grayish-orange (10YR 7/4), very-fine- to medium-grained, about 1% dark minerals, no mica, no glauconite. Slightly mottled.
8.0-10.0	Pebbly sand, very-pale-orange (10YR 8/2) to pale-yellowish-brown (10YR 6/2), medium- to coarse-grained, no mica, no glauconite. Pebbles are 1-5 mm in diameter. Wet.
13.0	Sand, dark-greenish-gray (5GY 4/1), very-fine-grained, well-sorted, no mica, no glauconite.
14.0-16.0	Silty sand, olive-gray (5Y 4/1), very-fine-grained, no mica, no glauconite. Contains dark (organic?) stains and rare clay flasers.
18.0-19.7	As 14-16 ft interval except mottled; color dark-greenish-gray (5GY 4/1) and medium-bluish-gray (5B 5/1).
19.7-20.0	Pebbly sand, brownish-gray (5YR 4/1), very-fine-grained. Pebbles are 1-5 mm in diameter, subangular.
22.0-24.0	Silty clay, dark-greenish-gray (5GY 4/1), micaceous, no glauconite. Driller notes "good clay" at 23.5 ft.
28.5	Clay, dark-greenish-gray (5G 4/1), plastic, some mica, no glauconite. Contains rare plant material.
30.0-40.0	Clay, as at 28.5 ft. Abundant wood fragments/ plant material.
40.0-42.0	Clay, dark-greenish-gray (5G 4/1), plastic, micaceous, no glauconite. Rare plant material.
42.0-50.0	Clay, as 40-42 ft interval, some sand, very-fine- to fine-grained, some pebbles (1-5 mm). Contains abundant plant material. Clay speckled. Driller notes "sand" at 44-48 ft; "gravel" at 48 ft; "out of gravel" at 49.5 ft.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

[Depth (feet)]	Description
Well EEA-M1 (54Q 55)—Continued	
50.0-52.0	Sand, dark-greenish-gray (5GY 4/1), very-fine- to fine-grained, well-sorted, micaceous, some glauconite.
50.0-60.0	Clay, as 40-50 ft interval, and sand, very-fine- to fine-grained, micaceous, increasingly glauconitic. Driller notes “interbedded sand and clay.”
60.0-62.0	Sand, medium- to coarse-grained, pebbles, and silty clay, interbedded, olive-gray (5Y 4/1) to dark-greenish-gray (5GY 4/1), micaceous, some glauconite in sand. Contains wood fragments.
60.0-65.0	Sand, medium- to coarse-grained. Contains wood fragments. Driller notes “much harder material” at 64 ft.
65.0-70.0	Sand, coarse- to medium-grained, and pebbles, and clay, very glauconitic.
70.0-72.0	Silty sandy clay, olive-gray (5Y 4/1), very micaceous, very glauconitic. Sand is very-fine-grained. Contains moderate numbers of bivalves (<i>Venericardia</i> , <i>Macrocallista</i>).
77.0	Silty sandy clay, greenish-black (5GY 2/1) to dark-greenish-gray (5GY 4/1), micaceous, very glauconitic. Sand is very-fine-grained. Contains bivalve fragments.
Well EEA-M2 (54Q 57)	
0 -2.0	Sand is very-fine- to fine-grained. Contains rare quartz pebbles (1-5 mm), and modern rootlets. Not mottled.
2.0-4.5	Pebbly sand, dark-yellowish-orange (10YR 6/6) to moderate-yellowish-brown (10YR 5/4), very-fine- to fine-grained, some mica. Slightly mottled.
4.5-5.5	Sand, grayish-orange (10YR 7/4), fine-grained, well-sorted, little mica. Contains 8 cm quartz pebble at 5.5 ft.
5.5-6.0	Pebbly sand, dark-yellowish-orange (10YR 6/6) to moderate-yellowish-brown (10YR 5/4), very-fine- to fine-grained, poorly-sorted. Pebbles are subangular to subrounded. Mottled.
6.0-8.0	Pebbly sand, dark-yellowish-orange (10YR 6/6) to moderate-yellowish-brown (10YR 5/4), very-fine- to fine-grained, poorly-sorted, some mica. Pebbles are subrounded. Contains roots and woody material. Grades downward into sand, grayish-orange (10YR 7/4) to dark-yellowish-orange (10YR 6/6), fine-grained, well-sorted, no mica, about 1% dark minerals.
9.0	Pebbly sand, very-pale-orange (10YR 8/2) to pale-yellowish-orange (10YR 8/6), fine-grained, well-sorted, about 1% dark minerals. Slightly mottled. Dry.
10.0-12.0	Pebbly sand, very-pale-orange (10YR 8/2) and dark-yellowish-orange (10YR 6/6) and light-brown (5YR 5/6), fine- to coarse-grained, pebbles are 1-5 mm in diameter. Mottled.
12.0-14.0	Pebbly sand, light-brown (5YR 5/6) and (10YR 6/2) and very-pale-orange (10YR 8/2), fine- to very-fine-grained. Pebbles are 1-5 mm in diameter. Mottled. Damp. Contains pale-yellowish-brown (10YR 6/2) clay bed 13.1-13.7 ft. Damp.
14.0-16.0	Silty clayey sand, dark-greenish-gray (5GY 4/1), very-fine-grained, no mica, no glauconite.
16.0-18.0	Silty clay, dark-greenish-gray (5GY 4/1), some mica, no glauconite.
19.0	Silty clay, dark-greenish-gray (5GY 4/1), some mica.
20.0-30.0	Clay, as previous description; also in cuttings: clay, dark-yellowish-brown (10YR 4/2), plastic.
30.0-32.0	Clay, medium-bluish-gray (5B 5/1) to dark greenish-gray (5G 4/1), plastic, no mica, no glauconite. Contains sparse shell material, organic material. Slightly mottled.
30.0-40.0	Clay, as 30-32 ft interval until about 36 ft, where driller reports chatter. Driller says “only a few inches of gravel.” Orange-stained pebbles and woody material in cuttings
40.0-42.0	Silty sand, dark greenish-gray (5G 4/1), very-fine-grained, micaceous, glauconitic. Wavy bedding. Contains sparse shell material and organic material.
40.0-45.0	Silty sand, greenish-black (5GY 2/1), very-fine-grained, micaceous, glauconitic.
45.0-50.0	Sandy silt, dark-greenish-gray (5GY 4/1), very glauconitic. Sand is very-fine-grained. Contains shell fragments. Driller reports “softer to cut” at about 48 ft.
50.0-52.0	Clayey sand, greenish-black (5GY 2/1), very-fine- to fine-grained, micaceous, glauconitic. Bioturbated. Contains moderate numbers of shells (<i>Macrocallista</i>).
57.0	Silty clayey sand, very-fine-grained, micaceous, glauconitic. Bioturbated. Abundant large <i>Venericardia</i> . Driller reports “cut faster” at about 54 ft.
71.5	Sandy clay, dark-greenish-gray (5GY 4/1), micaceous, glauconitic. Sand is very-fine-grained.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-M3 (54Q 59)	
0.0-2.0	Sandy silt, dark-yellowish-orange (10YR 6/6), very-fine-grained, no mica. Contains rare subangular pebbles and modern plant material.
2.0-4.0	Silty sand, grayish-orange (10YR 7/4) to dark-yellowish-orange (10YR 6/6), very-fine-grained, some mica. Contains subrounded pebble lag at 4.0 ft. Mottled.
4.0-4.4	Silty sand, dark-yellowish-orange (10YR 6/6), very-fine-grained, no mica. Contains pebble lag at 4.4 ft.
4.4-6.0	Silty sandy clay, pale-yellowish-brown (10YR 6/2) and dark-yellowish-orange (10YR 6/6), some mica. Sand is very-fine-grained. Contains roots and other plant material. Mottled.
6.0-8.0	Clayey sandy silt, pale-yellowish-brown (10YR 6/2) and dark-yellowish-orange (10YR 6/6), little mica, <1% dark minerals. Sand is very-fine-grained. Contains roots and other plant material. Mottled. Moist at 7 ft.
10.0	Pebbly sand, grayish-orange (10YR 7/4), medium-grained
10.0-12.0	Pebbly sand, pinkish gray (5YR 8/1) to grayish-orange (10YR 7/4), medium- to coarse-grained, about 1% dark minerals. Pebbles are up to 10 mm in diameter, subrounded to angular.
12.0-14.0	Pebbly sand, light-gray (N6), medium- to coarse-grained, poorly-sorted, about 1% dark minerals. Pebbles are up to 10 mm in diameter, subrounded.
14.0-16.0	Pebbly sand, light-gray (N6), medium- to coarse-grained. Pebbles are up to 20 mm in diameter, subrounded to subangular.
16.0-18.0	Pebbly sand, moderate-yellowish-brown (10YR 5/4) to dark-yellowish-orange (10YR 6/6), medium- to coarse-grained. Pebbles are up to 20 mm in diameter, subrounded. Contains some silt, very little clay.
18.0-20.0	Sandy pebbles, dark-yellowish-orange (10YR 6/6) to moderate-yellowish-brown (10YR 5/4), up to 30 mm in diameter, subrounded to subangular. Sand is medium- to coarse-grained.
25.0-27.0	Pebbly sand, pale-yellowish-brown (10YR 6/2), medium- to coarse-grained. Pebbles are up to 5 mm in diameter, subangular to subrounded.
30.0-32.0	Contact at about 30 ft. Silty sand, olive-gray (5Y 4/1), very-fine-grained, well sorted, some mica, no glauconite. Massively bedded.
37.0	Clay, dark-greenish-gray (5GY 4/1), plastic, very little mica, no glauconite. Contains large wood fragments.
40.0-42.0	Clay, dark-greenish-gray (5GY 4/1), plastic, no mica, no glauconite. Massively bedded. Contains articulated clams (<i>Mercenaria?</i>).
40.0-50.0	Clay, dark-greenish-gray (5G 4/1), plastic, no mica, no glauconite. Contains shell and wood fragments possibly derived from above.
50.0-52.0	Clay, dark-greenish-gray (5GY 4/1), plastic, no mica, no glauconite. Massively bedded. Contains sparse organic material.
60.0-62.0	Clay, olive-gray (5Y 4/1), plastic, little mica. Massively bedded. Contains moderate amounts of organic material.
60.0-70.0	as 60-62 ft interval
70.0-72.0	Sand, dark-greenish-gray (5GY 4/1), medium- to fine-grained, and sandy clayey silt, dark-greenish-gray (5GY 4/1), thinly interbedded (10-30 mm), no mica, glauconitic. Coarsens downward. Sand occurs as lenses in clayey silt and is very-fine- to fine-grained. Driller notes "sand starts at about 70.5 ft."
81.0	Sand, (5GY 6/1), medium- to coarse-grained, no mica, glauconitic.
80.0-90.0	Sand and clay (from above?), glauconitic.
90.0-92.0	Sand, (5GY 2/1), fine-grained, some mica, very glauconitic.
90.0-110.0	Driller notes "gravel" at 94 ft. Driller notes "good clay" at 98.5 ft; "sand and clay" at 102 ft; "clay" at 106 ft.
112.0	Silty sandy clay, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), micaceous, very glauconitic. Most sand is glauconite and is very-fine- to fine-grained. Bioturbated.
Well EEA-M4 (54Q 61)	
0-2.0	Sandy clayey silt, pale-yellowish-brown (10YR 6/2), little mica. Sand is very-fine- to fine-grained. Contains modern roots. Slightly mottled.
2.0-4.0	Silty sand, pale-yellowish-brown (10YR 6/2), very-fine-grained, grading downwards into sand, pale-yellowish-brown (10YR 6/2), fine- to medium-grained, well-sorted, about 1% dark minerals. Slightly mottled.
4.0-4.5	Sand, pale-yellowish-brown (10YR 6/2), medium-grained, well-sorted.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-M4 (54Q 61)—Continued	
4.5-5.1	Clay, dark gray (N3), plastic. Contains roots, plant material.
5.1-5.5	Pebbly sand, olive-gray (5Y 4/1), coarse-grained. Pebbles are subrounded.
5.5-6.0	Sand, light-brown (5YR 5/6) to dark-yellowish-orange (10YR 6/6), medium-grained, poorly sorted, some mica. Mottled.
6.0-8.0	Pebbly sand, pale-yellowish-brown (10YR 6/2) and dark-yellowish-orange (10YR 6/6) and grayish-green (10GY 5/2), medium-grained. Mottled. Grades downward into sand, greenish-black (5GY 2/1), fine- to very-fine-grained, micaceous, some glauconite. Contains ghost fossils.
8.0-10.0	Silty sand, dark-greenish-gray (5GY 4/1) to olive-gray (5Y 4/1), very-fine-grained, micaceous, some glauconite. Contains some lenses of sand, very-fine-grained. Bioturbated. Dry.
10.0-12.0	Silty sand, greenish-black (5GY 2/1), fine- to very-fine-grained, some silt, micaceous, little glauconite. Massively bedded. Contains moderate numbers of bivalve fragments (2-4 mm).
12.0-14.0	Silty sand, very-fine-grained, micaceous, some glauconite (very-fine-grained). Massively bedded. Contains abundant bivalve fragments and whole shells (<i>Macrocallista</i>).
14.0-16.0	Silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), very-fine-grained, micaceous, some glauconite (very-fine-grained). Massively bedded. Contains abundant bivalve shells (<i>Macrocallista</i>).
18.0-20.0	Silty sand, olive-gray (5Y 4/1) to dark-greenish-gray (5GY 4/1), very-fine-grained, micaceous, little glauconite (very-fine-grained). Contains moderate to abundant bivalve shells (<i>Macrocallista</i>).
21.7	Silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), very-fine-grained, micaceous, little glauconite (very-fine-grained). Contains abundant bivalve shells (<i>Macrocallista</i> , <i>Turritella</i>).
20.0-30.0	As previous description, more glauconite.
30.0-32.0	Silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1) very-fine- to fine-grained, micaceous, some glauconite (very-fine-grained). Contains abundant large <i>Venericardia</i> , <i>Macrocallista</i> (up to 2 cm).
40.0-42.0	Silty sand, greenish-black (5GY 2/1), very-fine- to fine-grained, micaceous, very glauconitic. Appears bioturbated. Contains rare bivalve fragments and clay-filled burrows.
40.0-50.0	No apparent change. Driller notes "harder" at 44 ft. Switched to rock bit; out of hard beds at 44.4 ft. Carbonate-cemented Nanjemoy in cuttings.
50.0-52.0	Silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), fine- to very-fine-grained, micaceous, glauconitic (fine-grained). Massively bedded. Contains rare (<i>Venericardia</i>). Driller notes 'sandier' at 58.8 ft.
60.0-62.0	Sand and silty clay, interbedded, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), micaceous, glauconitic. Bioturbated. Sand is very-fine-grained and occurs in lenses and thin beds. Contains rare bivalves.
70.0-72.0	Clay and sand, interbedded, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), micaceous. Sand is very-fine-grained and glauconitic. Bioturbated. Contains sand-filled burrows and rare <i>Venericardia</i> .
Well EEA-M5 (54Q 63)	
0-2.0	Silty sand, light-olive-gray (5Y 5/2), fine- to very-fine-grained. Contains rootlets.
2.0-3.0	Silty sand, light-olive-gray (5Y 5/2), fine-grained.
3.0-4.0	Sandy silt, moderate-brown (5YR 4/1). Contains subrounded to well-rounded white quartz pebbles (2-5 mm).
4.0-5.0	Silty sand, pale-yellowish-brown (10YR 6/2), fine- to medium-grained. Contains 40 mm pebble lag at 5 ft.
5.0-6.0	Sand, pale-yellowish-brown (10YR 6/2), medium-grained, subangular to subrounded.
6.0-8.0	Sand, pale-yellowish-brown (10YR 6/2), medium-grained, subangular to subrounded, well-sorted.
8.0-9.0	Pebbly sand, pale-yellowish-brown (10YR 6/2), medium-grained, subangular to subrounded, well-sorted. Pebbles are 10-15 mm in diameter, subangular.
9.0-10.0	Pebbly sand, yellowish-gray (5Y 7/2), medium-grained. Pebbles are angular to subangular.
10.0-11.0	Sand, yellowish-gray (5Y 7/2) to pale-yellowish-brown (10YR 6/2), medium-grained.
11.0-12.0	Silty sand, dark-greenish-gray (5GY 4/1 to 5G 4/1), fine- to very-fine-grained. Large rounded quartz pebble (50 mm) at 11 ft.
12.0-13.0	Silty sand, dark-greenish-gray (5G 4/1), fine- to very-fine-grained.
13.0-14.0	Silt, grayish-olive-green (5GY 3/2), some mica.
14.0-16.0	same as 13-14 ft.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-M5 (54Q 63)—Continued	
18.5	Sand, greenish-black (5GY 2/1), fine- to very-fine-grained, micaceous, very glauconitic.
20.0-22.0	Sand, dark-greenish-gray (5GY 4/1), very-fine- to fine-grained, micaceous, glauconitic. Contains shell fragments. Contains quartz pebble (75 mm) at 21.5 ft (from above?).
25.0-27.0	Silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), fine-grained, micaceous, glauconitic. Contains abundant bivalve fragments and whole shells (<i>Macrocallista</i> , <i>Cubitostrea</i>), some shells articulated.
30.0-32.0	Silty sand, dark-greenish-gray (5GY 4/1), fine-grained, micaceous, glauconitic. Contains bivalve fragments and whole shells (<i>Macrocallista</i> , <i>Cubitostrea</i>). Massively bedded.
35.0-37.0	Silty sand, dark-greenish-gray (5GY 4/1), fine-grained, micaceous, glauconitic. Contains bivalve fragments and whole shells (<i>Macrocallista</i> , <i>Cubitostrea</i>). Massively bedded.
40.0-42.0	Silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), medium- to fine-grained, micaceous, very glauconitic. Contains bivalves (<i>Macrocallista</i> , <i>Venericardia</i> , <i>Cubitostrea</i>). Massively bedded.
45.0-47.0	Silty sand, greenish-gray (5GY4/1) to greenish-black (5GY 2/1) very-fine- to medium-grained, micaceous, very glauconitic. Massively bedded. Sparsely fossiliferous (<i>Macrocallista</i> , <i>Venericardia</i>).
50.0-52.0	Silty sand, greenish-black (5GY 2/1), fine-grained, micaceous, very glauconitic. Massively bedded. Sparsely fossiliferous (<i>Venericardia</i>), shells chalky. Contains 3" diameter carbonate concretion at 51.7 ft.
55.0-57.0	Silty sand, greenish-black (5GY 2/1), fine- to very-fine-grained, micaceous, very glauconitic. Bioturbated. Moderately fossiliferous (<i>Venericardia</i> , <i>Macrocallista</i>).
60.0-62.0	Silty sand, dark-greenish-gray (5GY4/1), fine- to very-fine-grained, micaceous, glauconitic. Bioturbated. Sparsely fossiliferous (<i>Venericardia</i>).
65.0-67.0	Clayey silty sand, dark-greenish-gray (5GY 4/1) to greenish-black (5GY 2/1), fine-grained, micaceous, glauconitic. Bioturbated. Contains plant material. Fossiliferous (<i>Venericardia</i> , <i>Cubitostrea</i>).
70.0-72.0	Sandy silty clay, dark-greenish-gray (5GY4/1), micaceous, glauconitic. Sand is very-fine-grained. Sparsely fossiliferous. Contains plant stem.
75.0-77.0	Silty sandy clay, dark-greenish-gray (5GY 4/1), micaceous, glauconitic. Sand is very-fine-grained. Contains sparse chalky shell fragments.
80.0-82.0	Silty sandy clay, micaceous, glauconitic. Sand is fine- to medium-grained. Bioturbated. Contains thin layers of bivalves (<i>Venericardia</i>).
85.0-87.0	Clayey sandy silt, olive-gray (5Y4/1) to greenish-black (5GY2/1), micaceous, glauconitic. Sand is medium-grained, occurs in lenses of mostly (>80%) glauconite. Contains thin layers of bivalves (<i>Venericardia</i>).
Well EEA-M6 (54Q 65)	
0-2.5	Oyster shells (<i>Crassostrea virginica</i>) in matrix of organic-rich silt, grayish-brown (5YR 3/2) to dusky-brown (5YR 2/2). Contains modern roots. Probably fill material.
2.5-3.7	Clayey silt, moderate-yellowish-brown (10YR 5/4), some mica.
3.7-4.0	Sand, grayish-orange (10YR 7/4) to dark-yellowish-orange (10YR 6/6), very-fine to medium-grained, poorly sorted, little mica, <1% dark minerals. Mottled.
4.0-6.0	Sand, dark-yellowish-orange (10YR 6/6) to moderate-yellowish-brown (10YR 5/4), which fines downward from fine-grained to coarse-grained at base of interval, medium-sorted, some mica. Contains pebble lag at 5.8 ft and plant material. Wet at 5.3 ft.
6.0-8.0	Clay, pale-yellowish-brown (10YR 6/2) and light-brown (5YR 5/6), plastic. Wavily mottled. Contains carbonate nodules (0.5-3 cm).
8.0-10.8	Clay, very-pale-orange (10YR 8/2) to pale-yellowish-brown (10YR 6/2), plastic, no mica, no glauconite. Massively bedded. Slightly mottled.
10.8-12.0	Pebbly sand, (10YR 8/6) and very-pale-orange (10YR 8/2) and light-brown (5YR 5/6), fine-grained, no mica, no glauconite. Pebbles are 5-20 mm in diameter. Mottled.
12.0-14.0	Sand, very-pale-orange (10YR 8/2), fine-grained, well-sorted, no mica, about 2% dark minerals. Mottled. Wet.
14.0-16.0	Sand, dark-yellowish-orange (10YR 6/6), fine- to very-fine-grained, well-sorted, no mica, about 1% dark minerals. Massively bedded.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-M6 (54Q 65)—Continued	
16.8-17.6	Pebbly sand, (N6), coarse-grained, no mica, no glauconite. Pebbles are 2-10 mm in diameter. Contains thin peaty bed at 16.8 ft.
17.6-18.0	Sandy silt, micaceous, no glauconite. Sand is very-fine-grained. Contains plant material, wood fragments.
18.0-20.0	Silty clay, olive-gray (5Y 4/1) to dark-greenish-gray (5GY 4/1), fining downward into clay, dark-greenish-gray (5GY 4/1), plastic, micaceous, no glauconite. Contains plant material, wood fragments.
22.0	Clay, medium-light-gray (N6) and dark-yellowish-orange (10YR 6/6), plastic, little mica, no glauconite. Contains lenses of very-fine- to fine-grained sand. Mottled.
20.0-30.0	Clay, medium-light-gray (N6) and dark-yellowish-orange (10YR 6/6), plastic. Contains abundant wood fragments.
30.0-32.0	Sandy clayey silt, medium-gray (N5), no mica, about 2% dark minerals. Sand is very-fine-grained. Contains plant material.
30.0-40.0	Clay and coarse-grained sand. Contains abundant plant fragments, possibly from above. Driller noted "harder at 34 ft," "softer again" at 38 ft.
40.0-40.8	Silty sand, medium-gray (N5), very-fine-grained, micaceous, no glauconite, <1% dark minerals.
40.8-42.0	Silty clay, medium-gray (N5), micaceous, no glauconite. Contains black organic stains and sparse shell material.
40.0-50.0	Clay, plastic, and very-fine-grained sand, and pebbles (2-5 mm), glauconite. One shell fragment noted.
50.0-52.0	Silty clay with lenses of very-fine-grained sand, pale-brown (5YR 5/2), micaceous, organic rich. Contains small (<1 mm) shell/fossil material. Contains plant material.
50.0-60.0	Sandy clay, micaceous, no glauconite. Sand is very-fine- to medium-grained.
60.0-80.0	Silty clay with abundant lenses of very-fine-grained sand, grayish-brown (5YR 3/2), very micaceous, no lauconite, organic-rich. Contains abundant plant material and sparse carbonate fossil material (<1 mm).
80.0-90.3	Clay and silt thinly interbedded (1-3 mm) with very-fine-grained sand, dark-greenish-gray (5GY 4/1), micaceous, no glauconite. Contains abundant plant material.
90.3-92.0	Pebbly sand, greenish-black (5GY 2/1), fine- to medium-grained, poorly sorted, no mica, very glauconitic. Pebbles are 2-10 mm in diameter. Contains wood fragments.
90.0-100.0	Clay, some silt, and sand, very-fine- to coarse-grained, glauconitic. Driller says "out of sand and gravel" at approximately 93.5 ft.
102.0	Silty sand, greenish-black (5GY 2/1), very-fine-grained, micaceous, glauconitic.
100.0-110.0	Silty sand, very-fine-grained. Glauconitic.
110.0-112.0	Sand, fine-grained, and clay, interbedded, greenish-black (5GY 2/1), some mica, glauconitic. Heavily bioturbated.
Well EEA-M7 (54Q 67)	
0-3.4	Sandy silt, pale-yellowish-brown (10YR 6/2) to dark-yellowish-orange (10YR 6/6), no mica, no glauconite. Sand is very-fine-grained. Contains modern roots. Not mottled.
3.4-4.0	Silty clay, light-brown (5YR 5/6), no mica, no glauconite. Not mottled. Dry.
4.0-6.0	Sand, dark-yellowish-orange (10YR 6/6) and light-brown (5YR 5/6), very-fine- to fine-grained, no mica, no glauconite. Below 5 ft contains thin (<2 mm) flasers of mottled clay.
6.0-8.0	Sand, very-pale-orange (10YR 8/2), fine- to very-fine-grained, well-sorted, no mica, no glauconite. Dark-yellowish-orange (10YR 6/6) below 7.7 ft.
8.0-11.2	Sand, pale-yellowish-brown (10YR 6/2) to dark-yellowish-orange (10YR 6/6), fine-grained, well-sorted. Mottled. Pebble lag at 11.2 ft. Wet at approximately 11 ft.
11.2-12.0	Silty clayey sand, dusky-yellow-green (5GY 5/2), very-fine- to fine-grained, micaceous, some glauconite. Contains ironstone concretions.
12.0-14.0	Sandy clayey silt, dusky-yellow-green (5GY 5/2), some mica, glauconitic. Sand is very-fine-grained. Contains ironstone concretions.
16.0	Clayey sandy silt, some mica, glauconitic. Sand is very-fine-grained. Contains thin (<1 mm) lenses of sand.
16.0-18.0	Clayey sandy silt, dusky-yellow-green (5GY 5/2), some mica, glauconitic. Sand is very-fine-grained. Bioturbated. Contains organic material and thin (<1 mm) lenses of sand. Mottled. Wet at approximately 17 ft.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-M7 (54Q 67)—Continued	
18.0-20.0	Clayey sandy silt, dusky-yellow-green (5GY 5/2) and light-brown (5YR 5/6), micaceous, glauconitic. Sand is very-fine-grained. Mottled. Bottom 3 in.: silty clay, dark-greenish-gray (5GY 4/1), micaceous, no glauconite.
20.0-30.0	Silt, some clay, some very-fine-grained sand, dark-greenish-gray (5G 4/1) to greenish-black (5G 2/1), some mica, glauconitic. Most sand is glauconite. Contains shell fragments.
30.0-32.0	Silty sand, very-fine-grained to fine-grained, and clay, dark-greenish-gray (5G 4/1) to greenish-black (5G 2/1), micaceous, glauconitic. Clay occurs in flasers and interbeds. Bioturbated. Contains fragmental and whole shells (<i>Macrocallista</i> , <i>Venericardia</i>).
30.0-40.0	Sandy clayey silt, dark-greenish-gray (5G 4/1) to greenish-black (5G 2/1), some mica, glauconitic. Sand is very-fine- to fine-grained. Contains shell fragments.
40.0-42.0	Silty clayey sand, dark-greenish-gray (5G 4/1) to greenish-black (5G 2/1), very-fine- to fine-grained, some mica, glauconitic. Moderately fossiliferous with chalky bivalves.
40.0-50.0	Sandy clayey silt, dark-greenish-gray (5G 4/1) to greenish-black (5G 2/1), micaceous, glauconitic. Sand is very-fine- to fine-grained. Contains abundant shell fragments. At bottom of interval material becomes clayey silt, dark-greenish-gray (5GY 4/1), less glauconitic.
52.0	Silty clayey sand, greenish-black (5GY 2/1), very-fine-grained, micaceous, very glauconitic. Contains sparse shells and shell fragments.
50.0-60.0	Silt and clay, some sand, dark-greenish-gray (5GY 4/1), some mica, glauconitic. Contains shell fragments.
60.0-62.0	Silty sandy clay, dark-greenish-gray (5GY 4/1), micaceous, glauconitic. Sand is very-fine- to fine-grained. Bioturbated. Contains lenses of sand (>80% glauconite) and thin (2-4 cm) beds of chalky bivalves (<i>Venericardia</i>).
60.0-65.0	Clayey sandy silt, dark-greenish-gray (5GY 4/1), micaceous, glauconitic. Contains shell fragments.
67.0	Sand, fine- to very-fine-grained, and silty clay, interbedded, dark-greenish-gray (5GY 4/1), micaceous, glauconitic. Bioturbated.
70.0-72.0	Silty clay, with abundant lenses of very-fine- to fine-grained sand, dark-greenish-gray (5GY 4/1), micaceous, glauconitic. Contains moderate amounts of shell material.
Well EEA-M8 (54Q 69)	
0-0.5	Silt, moderate-yellowish-brown (10YR 5/4) to pale-yellowish-brown (10YR 6/2), some mica, no glauconite. Contains modern roots. Contains medium-grained sand bed (1 cm thick) at 0.5 ft.
0.5-2.0	Clay, light-brown (5YR 5/6) to moderate-yellowish-orange (10YR 6/4), plastic, no mica, no glauconite. Contains organic material. Wavily mottled.
2.0-2.2	Clayey silt, moderate-yellowish-brown (10YR 5/4), little mica, no glauconite. Mottled.
2.2-4.0	Pebbly sand, very-pale-orange(10YR 8/2) to dark-yellowish-orange (10YR 6/6), fine- to coarse-grained, poorly sorted, fining upwards, no mica, no glauconite. Pebbles are 1-5 mm in diameter.
4.0-6.0	Pebbly sand, light-brown (5YR 5/6), coarse- to fine-grained, poorly sorted, no mica, <1% dark minerals. Pebbles are 1-25 mm in diameter and subrounded. Heavily mottled.
6.0-8.0	Pebbly sand, dark-yellowish-orange (10YR 6/6), coarse- to medium-grained, poorly sorted, no mica, <1% dark minerals. Pebbles are 1-20 mm in diameter. Mottled.
8.0-10.0	Pebbly sand, dark-yellowish-orange (10YR 6/6), very-fine-grained, little mica, <1% dark minerals. Pebbles are 1-5 mm in diameter. Medium-bluish-gray (5B 5/1) at bottom.
10.0-12.0	Sand, olive-gray (5Y 4/1), very-fine- to fine-grained, well-sorted, little mica, <1% dark minerals. Wet.
12.0-15.2	Sand, dark-greenish-gray (5GY 4/1), very-fine- to fine-grained, well-sorted, no mica, <1% dark minerals. Contains dark organic(?) stains. Contains pebble lag at 15.2 ft.
15.2-16.0	Silty clay, dark-greenish-gray (5GY 4/1), some mica, no glauconite.
16.0-20.0	Clay, dark-greenish-gray (5GY 4/1), plastic, little mica. Speckled (glauconite? organic material?).
24.0	Clay, dark-greenish-gray (5GY 4/1), plastic, some mica, no glauconite. Contains sparse chalky fossil fragments and plant material.
30.0-32.0	Silty clay with lenses of sand, olive-gray (5Y 4/1), some mica, no glauconite. Sand is very-fine-grained. Contains abundant plant material, wood fragments.

Table 2. Lithologic logs of observation wells at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued

Depth (feet)	Description
Well EEA-M8 (54Q 69)—Continued	
30.0-40.0	No apparent change
40.0-42.0	Clay, olive-gray (5Y 4/1), plastic, micaceous, speckled. Contains moderate amounts of chalky fossil fragments.
40.0-50.0	No apparent change; some very-fine-grained sand in cuttings
50.0-51.0	Clay, as 40-42 ft interval
51.0-52.0	Sand, olive-gray (5Y 4/1), fine-grained, well-sorted, micaceous, 2-3% dark minerals (glauconite?).
50.0-60.0	Clay, as 40-50 ft interval. Abundant wood fragments, abundant dark very fine sand (glauconite? organic material?). Little mica. Olive-gray (5Y 4/1) and dark-greenish-gray (5GY 4/1). Driller reports "hit log at approximately 54 ft.
60.0-62.0	Sand, very-fine-grained, and sand, medium-grained, and clay, and peat (wood), interbedded, olive-gray (5Y 4/1) and dark-greenish-gray (5GY 4/1), little mica. Pebbles at base of interval.
60.0-70.0	Peat, and sand, very-fine- to fine-grained, and large wood fragments, and pebbles (1-20 mm).
70.0-72.0	Clay, and sand, medium-grained, and peat, interbedded (4-6 cm), olive-gray (5Y 4/1) to dark-greenish-gray (5GY 4/1). Clay has some mica. Sand is glauconitic.
70.0-80.0	Sand and pebbles and wood fragments. Wood is packed with glauconitic fine sand and gravel. Driller notes chatter at 74-78.5 ft.
80.0-82.0	Silty sand, dark-greenish-gray (5GY 4/1), very-fine-grained, micaceous, some glauconite. Abundant <i>Macrocallista</i> .
87.0	Silty sand, dark-greenish-gray (5GY 4/1), very-fine-grained, micaceous, some glauconite. Abundant bivalve fragments (<i>Macrocallista</i>).

Table 3. Depth, lithology, and vertical hydraulic conductivity measurements of selected core intervals at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

[Datum is sea level; (-) indicates below sea level; ft-BLS, feet below land surface; ft/d, foot per day; --, no data]

Local well no.	Sample no.	Depth to top of interval (ft-BLS)	Depth to bottom of interval (ft-BLS)	Altitude of top of interval (feet)	Hydrogeologic unit of sample	Lithology conductivity	Vertical hydraulic (ft/d)
EEA-S3	ST-22	8.0	9.0	0.4	Columbia aquifer	Sandy clay	2.27×10^{-3}
EEA-S6	ST-14	14.0	16.0	.0	Columbia aquifer	Silty sand	1.42×10^{-1}
EEA-S9	ST-29	15.0	17.0	6.2	Nanjemoy-Marlboro confining unit	Silty sand	1.56×10^{-2}
EEA-S10	ST-24	17.0	18.3	7.8	Nanjemoy-Marlboro confining unit	Silty sand	1.08×10^{-2}
EEA-S11	ST-20	22.0	24.5	3.1	Columbia aquifer	Silty sand	1.16×10^{-1}
EEA-S11	ST-21A	32.0	33.0	-6.9	Upper confining unit	Clayey sand	1.34×10^{-3}
EEA-S11	ST-21B	33.0	33.7	-7.9	Upper confining unit	Sandy clay	3.68×10^{-5}
EEA-S12	ST-25	12.0	14.0	.7	Columbia aquifer	Silty sand	8.22×10^{-2}
EEA-S12	ST-26A	20.0	21.0	-7.3	Upper confining unit	Sandy clay	2.47×10^{-4}
EEA-S12	ST-26B	21.0	21.4	-8.3	Upper confining unit	Sandy silt	1.84×10^{-2}
EEA-S13	ST-27	35.0	37.0	-11.9	Upper confining unit	Clay	4.25×10^{-5}
EEA-S14	ST-30	20.0	21.0	2.2	Upper confining unit	Silty sand	1.08×10^{-2}
EEA-S18	ST-23	15.0	17.0	.2	Nanjemoy-Marlboro confining unit	Silty sand	2.38×10^{-2}
EEA-S19	ST-28	13.0	15.0	.2	Nanjemoy-Marlboro confining unit	Silty sand	2.72×10^{-2}
EEA-M1	ST-17	26.5	28.5	-2.1	Upper confining unit	Clay	1.30×10^{-3}
EEA-M1	ST-18	75.0	77.0	-50.6	Nanjemoy-Marlboro confining unit	Sandy clay	3.40×10^{-4}
EEA-M2	ST-08A	8.0	8.4	9.8	Columbia aquifer	Silty sand	1.19×10^{-0}
EEA-M2	ST-08B	8.4	9.0	9.4	Columbia aquifer	Sand	4.25×10^{-0}
EEA-M2	ST-09	18.0	20.0	.2	Upper confining unit	Sandy clay	1.59×10^{-4}
EEA-M2	ST-10	55.0	57.0	-37.2	Nanjemoy-Marlboro confining unit	Silty sand	3.68×10^{-2}
EEA-M2	ST-11	69.5	71.5	-51.7	Nanjemoy-Marlboro confining unit	Sandy silt	5.95×10^{-5}
EEA-M3	ST-06	35.0	37.0	-26.8	Upper confining unit	Clay	1.30×10^{-4}
EEA-M3	ST-07	110.0	112.0	-101.8	Nanjemoy-Marlboro confining unit	Silty sand	8.79×10^{-3}
EEA-M4	ST-19	20.0	21.7	3.9	Nanjemoy-Marlboro confining unit	Silty sand	3.68×10^{-3}
EEA-M5	ST-01	16.0	18.5	6.4	Nanjemoy-Marlboro confining unit	Silty sand	1.05×10^{-2}
EEA-M6	ST-12A	20.0	20.3	-6.0	Upper confining unit	Clayey sand	9.64×10^{-5}
EEA-M6	ST-12B	20.3	20.8	-6.2	Upper confining unit	Gravelly sand	7.09×10^{-1}
EEA-M6	ST-12C	20.8	21.4	-6.7	Upper confining unit	Sandy clay	5.10×10^{-5}
EEA-M6	ST-13A	100.0	100.4	-85.8	Nanjemoy-Marlboro confining unit	Sandy gravelly clay	--
EEA-M6	ST-13B	100.4	101.7	-86.2	Nanjemoy-Marlboro confining unit	Silty sand	7.09×10^{-2}
EEA-M7	ST-02	5.0	7.0	7.6	Columbia aquifer	Silty sand	2.07×10^{-1}
EEA-M7	ST-03	14.0	16.0	-1.4	Nanjemoy-Marlboro confining unit	Silty sand	5.10×10^{-3}
EEA-M7	ST-04	50.0	52.0	-37.4	Nanjemoy-Marlboro confining unit	Clayey sand	1.42×10^{-3}
EEA-M7	ST-05	65.0	67.0	-52.4	Nanjemoy-Marlboro confining unit	Clayey sand	1.25×10^{-4}
EEA-M8	ST-15	22.0	24.0	-5.9	Upper confining unit	Clay	6.52×10^{-6}
EEA-M8	ST-16	85.0	87.0	-68.9	Nanjemoy-Marlboro confining unit	Silty sand	3.12×10^{-3}

Table 4. Relative percentage of abundance of minerals in selected core intervals at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

[values given in weight percent; --, mineral not found; depth of samples can be found on table 3]

Sample	Local well no.	Quartz	Ortho-class	Plagio-class	Illite	Chlorite	Pyrite	Siderite	Calcite
ST-22	EEA-S3	96.2	--	--	3.6	--	--	--	--
ST-14	EEA-S6	87.3	5.5	1.2	5.9	--	--	--	--
ST-29	EEA-S9	80.0	8.0	(2)	9.6	--	2.2	--	--
ST-24	EEA-S10	79.1	6.7	(2)	11.9	--	2.3	--	--
ST-20	EEA-S11	71.5	(2)	7.1	14.3	7.1	--	--	--
ST-21A	EEA-S11	99.5	(2)	--	(2)	--	--	--	--
ST-21B	EEA-S11	75.8	5.1	--	10.6	8.5	(2)	--	--
ST-25	EEA-S12	99.8	(2)	--	--	--	--	--	--
ST-26A	EEA-S12	99.8	(2)	--	--	--	--	--	--
ST-26B	EEA-S12	96.3	3.7	(2)	--	--	--	--	--
ST-27	EEA-S13	85.9	4.0	3.6	2.4	4.1	--	--	--
ST-30	EEA-S14	87.7	2.0	(2)	9.2	--	1.2	--	--
ST-23	EEA-S18	88.9	2.7	--	6.2	--	2.1	--	--
ST-28	EEA-S19	68.8	17.0	3.1	8.4	--	2.7	--	--
ST-17	EEA-M1	79.4	--	4.0	11.9	4.6	--	--	--
¹ ST-18	EEA-M1	87.4	--	--	12.5	--	(2)	--	--
ST-08A	EEA-M2	93.6	2.3	4.1	(2)	(2)	--	--	--
ST-08B	EEA-M2	99.8	(2)	(2)	--	--	--	--	--
ST-09	EEA-M2	91.1	2.3	(2)	4.2	2.4	--	--	--
ST-10	EEA-M2	90.5	--	--	9.4	--	(2)	--	--
ST-11	EEA-M2	86.2	--	--	13.8	--	(2)	--	--
ST-06	EEA-M3	60.1	--	6.1	15.4	8.0	10.4	--	--
ST-07	EEA-M3	95.1	--	--	4.9	--	--	--	--
ST-19	EEA-M4	90.3	5.4	(2)	3.3	--	1.0	--	--
ST-01	EEA-M5	91.3	5.1	(2)	3.8	--	(2)	--	--
ST-12A	EEA-M6	97.1	(2)	(2)	2.8	--	--	--	--
ST-12B	EEA-M6	97.3	(2)	--	2.6	--	--	--	--
ST-12C	EEA-M6	88.3	3.4	4.4	2.1	--	--	5.3	--
¹ ST-13A	EEA-M6	88.4	(2)	--	11.5	--	(2)	--	--
ST-13B	EEA-M6	99.8	(2)	--	--	--	--	--	--
ST-02	EEA-M7	98.6	--	--	1.4	--	--	--	--
ST-03	EEA-M7	87.2	5.7	(2)	7.2	--	--	--	--
¹ ST-04	EEA-M7	58.9	11.1	--	13.0	--	6.2	(2)	10.8
ST-05	EEA-M7	79.8	5.6	--	14.2	--	(2)	--	--
ST-15	EEA-M8	91.9	5.7	--	2.3	--	--	--	--
ST-16	EEA-M8	81.7	2.3	--	15.8	--	(2)	--	--

¹ Mixed-layer clay present.

² Trace amounts (less than 1 percent).

Table 5. Periodic measurements of ground-water levels at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia, March 1994 through April 1995

[Land-surface datum elevation is in feet above sea level; water levels are in feet above or below (-) sea level]

Local well number: EEA-S1
 USGS well number: 54Q56
 Land-surface datum elevation: 24.46

Local well number: EEA-S2
 USGS well number: 54Q58
 Land-surface datum elevation: 17.89

Date	Water level						
<i>1994</i>		Aug. 29	19.14	<i>1994</i>		Dec. 5	3.65
Mar. 17	23.27	Oct. 4	18.81	Mar. 29	11.49	Dec. 20	3.68
Mar. 23	23.38	Oct. 25	18.41	May 2	7.98	<i>1995</i>	
Mar. 29	23.92	Dec. 20	19.19	May 31	6.75	Jan. 27	3.88
May 2	21.88	<i>1995</i>		July 6	5.60	Feb. 24	4.08
May 31	20.06	Jan. 27	21.03	Aug. 3	4.91	Apr. 3	4.36
July 6	18.91	Feb. 24	21.61	Aug. 29	4.46		
Aug. 1	18.92	Apr. 3	21.03	Oct. 4	3.82		

Local well number: EEA-S3
 USGS well number: 54Q60
 Land-surface datum elevation: 8.36

Local well number: EEA-S4
 USGS well number: 54Q62
 Land-surface datum elevation: 23.83

Date	Water level						
<i>1994</i>		Aug. 29	1.18	<i>1994</i>		Aug. 29	19.93
Mar. 16	1.11	Oct. 4	.78	Mar. 17	22.73	Oct. 4	19.83
Mar. 23	1.52	Oct. 25	1.53	Mar. 23	22.99	Oct. 25	19.47
Mar. 29	1.38	Dec. 20	.52	Mar. 29	23.59	Dec. 20	20.10
May 2	.27	<i>1995</i>		May 2	21.81	<i>1995</i>	
May 31	.86	Jan. 27	.48	May 31	19.92	Jan. 27	22.07
July 6	1.08	Feb. 24	.96	July 6	19.43	Feb. 24	22.46
Aug. 1	1.18	Apr. 3	.78	Aug. 3	22.13	Apr. 3	21.85

Local well number: EEA-S5
 USGS well number: 54Q64
 Land-surface datum elevation: 22.02

Local well number: EEA-S6
 USGS well number: 54Q66
 Land-surface datum elevation: 14.05

Date	Water level						
<i>1994</i>		Dec. 20	15.81	<i>1994</i>		Oct. 4	3.33
May 2	21.30	<i>1995</i>		Mar. 16	6.96	Oct. 25	2.88
May 31	18.40	Jan. 27	16.76	Mar. 23	5.87	Dec. 20	3.22
July 6	16.33	Feb. 24	17.38	Mar. 29	11.32	<i>1995</i>	
Aug. 1	16.63	Apr. 3	17.53	May 31	3.23	Jan. 27	4.73
Aug. 29	16.16			July 6	2.74	Feb. 24	4.55
Oct. 4	16.04			Aug. 1	3.52	Apr. 3	3.58
Dec. 5	15.82			Aug. 29	3.34		

Table 5. Periodic measurements of ground-water levels at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia, March 1994 through April 1995—Continued

[Land-surface datum elevation is in feet above sea level; water levels are in feet above or below (-) sea level]

Local well number: EEA-S7
 USGS well number: 54Q68
 Land-surface datum elevation: 12.45

Local well number: EEA-S8
 USGS well number: 54Q70
 Land-surface datum elevation: 16.17

Date	Water level						
<i>1994</i>		Dec. 5	0.62	<i>1994</i>		Aug. 29	8.75
Mar. 29	4.02	Dec. 20	.83	Mar. 15	14.01	Oct. 4	8.65
May 2	2.59	<i>1995</i>		Mar. 23	13.36	Oct. 25	8.25
May 31	1.87	Jan. 27	.87	Mar. 29	15.16	Dec. 20	8.22
July 6	1.05	Feb. 24	.85	May 2	11.22	<i>1995</i>	
Aug. 3	.71	Apr. 3	1.18	May 31	9.75	Jan. 27	9.14
Aug. 29	.61			July 6	8.89	Feb. 24	9.11
Oct. 4	.66			Aug. 3	9.07	Apr. 3	9.11

Local well number: EEA-S9
 USGS well number: 54Q71
 Land-surface datum elevation: 21.24

Local well number: EEA-S10
 USGS well number: 54Q72
 Land-surface datum elevation: 24.76

Date	Water level						
<i>1994</i>		Dec. 5	13.47	<i>1994</i>		Dec. 5	18.92
Mar. 29	21.24	Dec. 20	13.70	Mar. 29	24.67	Dec. 20	18.85
May 2	18.27	<i>1995</i>		May 2	22.76	<i>1995</i>	
May 31	15.50	Jan. 27	14.52	May 31	20.25	Jan. 27	21.63
July 6	13.97	Feb. 24	14.90	July 6	18.97	Feb. 24	22.97
Aug. 3	14.74	Apr. 3	15.14	Aug. 3	21.77	Apr. 3	22.03
Aug. 29	14.37			Aug. 29	19.94		
Oct. 24	13.83			Oct. 4	18.67		

Local well number: EEA-S11
 USGS well number: 54Q73
 Land-surface datum elevation: 25.14

Local well number: EEA-S12
 USGS well number: 54Q74
 Land-surface datum elevation: 12.70

Date	Water level						
<i>1994</i>		Dec. 5	18.45	<i>1994</i>		Dec. 5	5.18
Mar. 29	23.80	Dec. 20	18.50	Mar. 29	7.82	Dec. 20	5.20
May 2	21.67	<i>1995</i>		May 2	6.35	<i>1995</i>	
May 31	20.62	Jan. 27	19.34	May 31	5.71	Jan. 27	5.41
July 6	17.58	Feb. 24	19.62	July 6	5.00	Feb. 24	5.35
Aug. 1	17.54	Apr. 3	19.54	Aug. 1	5.05	Apr. 3	5.30
Aug. 29	17.66			Aug. 29	4.99		
Oct. 4	17.44			Oct. 4	4.93		

Table 5. Periodic measurements of ground-water levels at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia, March 1994 through April 1995—Continued

[Land-surface datum elevation is in feet above sea level; water levels are in feet above or below (-) sea level]

Local well number: EEA-S13
 USGS well number: 54Q75
 Land-surface datum elevation: 23.11

Local well number: EEA-S14
 USGS well number: 54Q76
 Land-surface datum elevation: 22.20

Date	Water level						
<i>1994</i>		Dec. 5	6.65	<i>1994</i>		Dec. 5	7.09
Mar. 29	8.70	Dec. 20	6.65	Mar. 29	18.20	Dec. 20	7.08
May 2	8.39	<i>1995</i>		May 2	13.34	<i>1995</i>	
May 31	7.90	Jan. 27	6.69	May 31	11.63	Jan. 27	7.20
July 6	7.30	Feb. 24	6.73	July 6	9.89	Feb. 24	7.41
Aug. 1	7.11	Apr. 3	6.82	Aug. 1	7.53	Apr. 3	7.89
Aug. 29	6.91			Aug. 29	7.76		
Oct. 4	6.65			Oct. 4	6.35		

Local well number: EEA-S15
 USGS well number: 54Q77
 Land-surface datum elevation: 21.73

Local well number: EEA-S16
 USGS well number: 54Q78
 Land-surface datum elevation: 16.33

Date	Water level						
<i>1994</i>		Dec. 5	-0.05	<i>1994</i>		Dec. 5	9.17
Mar. 29	9.63	Dec. 20	.26	Mar. 29	16.03	Dec. 20	9.32
May 2	9.40	<i>1995</i>		May 2	12.93	<i>1995</i>	
May 31	7.04	Jan. 27	.85	May 31	10.68	Jan. 27	10.87
July 6	3.38	Feb. 24	1.15	July 6	8.85	Feb. 24	11.35
Aug. 1	1.55	Apr. 3	1.46	Aug. 1	9.17	Apr. 3	10.82
Aug. 29	.97			Aug. 29	9.09		
Oct. 4	-.64			Oct. 4	8.73		

Local well number: EEA-S17
 USGS well number: 54Q79
 Land-surface datum elevation: 11.43

Local well number: EEA-S18
 USGS well number: 54Q80
 Land-surface datum elevation: 15.20

Date	Water level						
<i>1994</i>		Dec. 5	3.39	<i>1994</i>		Dec. 5	11.50
Mar. 29	9.81	Dec. 20	3.35	Mar. 29	13.41	Dec. 20	10.99
May 2	2.98	<i>1995</i>		May 2	11.62	<i>1995</i>	
May 31	2.57	Jan. 27	3.86	May 31	10.75	Jan. 27	11.42
July 6	1.80	Feb. 24	3.61	July 6	9.79	Feb. 24	11.45
Aug. 1	2.13	Apr. 3	3.08	Aug. 3	11.95	Apr. 3	11.21
Aug. 29	2.94			Aug. 29	10.08		
Oct. 4	3.15			Oct. 4	10.18		

Table 5. Periodic measurements of ground-water levels at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia, March 1994 through April 1995—Continued

[Land-surface datum elevation is in feet above sea level; water levels are in feet above or below (-) sea level]

Local well number: EEA-S19
 USGS well number: 54Q81
 Land-surface datum elevation: 13.21

Local well number: EEA-S20
 USGS well number: 54Q82
 Land-surface datum elevation: 11.81

Date	Water level						
<i>1994</i>		Dec. 20	10.11	<i>1994</i>		Dec. 5	9.53
May 2	11.17	<i>1995</i>		Mar. 29	11.43	Dec. 20	8.12
May 31	10.65	Jan. 27	10.31	May 2	9.22	<i>1995</i>	
July 6	10.60	Feb. 24	10.06	May 31	8.36	Jan. 27	8.65
Aug. 3	11.60	Apr. 3	9.93	July 6	7.78	Feb. 24	8.39
Aug. 29	10.67			Aug. 3	10.64	Apr. 3	7.86
Oct. 4	10.57			Aug. 29	8.21		
Dec. 5	10.23			Oct. 4	8.11		

Local well number: EEA-M1
 USGS well number: 54Q55
 Land-surface datum elevation: 24.44

Local well number: EEA-M2
 USGS well number: 54Q57
 Land-surface datum elevation: 17.77

Date	Water level						
<i>1994</i>		Aug. 29	14.52	<i>1994</i>		Dec. 5	5.04
Mar. 17	16.73	Oct. 4	14.06	Mar. 29	6.33	Dec. 20	5.03
Mar. 23	16.75	Oct. 25	13.90	May 2	6.03	<i>1995</i>	
Mar. 29	16.92	Dec. 20	13.85	May 31	5.71	Jan. 27	5.09
May 2	16.56	<i>1995</i>		July 6	5.42	Feb. 24	5.12
May 31	16.00	Jan. 27	14.22	Aug. 3	5.35	Apr. 3	5.09
July 6	15.00	Feb. 24	14.69	Aug. 29	5.21		
Aug. 1	14.55	Apr. 3	15.06	Oct. 4	5.03		

Local well number: EEA-M3
 USGS well number: 54Q59
 Land-surface datum elevation: 8.16

Local well number: EEA-M4
 USGS well number: 54Q61
 Land-surface datum elevation: 23.94

Date	Water level						
<i>1994</i>		Aug. 29	1.85	<i>1994</i>		Aug. 29	19.27
Mar. 16	1.84	Oct. 4	1.62	Mar. 17	23.26	Oct. 4	19.09
Mar. 23	2.12	Oct. 25	2.03	Mar. 23	23.30	Oct. 25	18.73
Mar. 29	1.76	Dec. 20	1.42	Mar. 29	23.74	Dec. 20	19.34
May 2	1.46	<i>1995</i>		May 2	22.04	<i>1995</i>	
May 31	1.77	Jan. 27	1.30	May 31	19.97	Jan. 27	21.71
July 6	1.85	Feb. 24	1.64	July 6	18.69	Feb. 24	22.55
Aug. 1	1.84	Apr. 3	1.57	Aug. 3	20.06	Apr. 3	21.89

Table 5. Periodic measurements of ground-water levels at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia, March 1994 through April 1995—Continued

[Land-surface datum elevation is in feet above sea level; water levels are in feet above or below (-) sea level]

Local well number: EEA-M5
 USGS well number: 54Q63
 Land-surface datum elevation: 22.42

Local well number: EEA-M6
 USGS well number: 54Q65
 Land-surface datum elevation: 14.15

Date	Water level						
<i>1994</i>		Dec. 5	15.87	<i>1994</i>		Aug. 29	2.48
Mar. 29	22.30	Dec. 20	16.04	Mar. 16	2.63	Oct. 4	2.45
May 2	21.65	<i>1995</i>		Mar. 23	2.75	Oct. 25	2.59
May 31	18.85	Jan. 27	16.98	Mar. 29	2.80	Dec. 20	2.22
July 6	16.75	Feb. 24	17.54	May 2	2.50	<i>1995</i>	
Aug. 1	16.58	Apr. 3	17.98	May 31	2.71	Jan. 27	1.97
Aug. 29	16.51			July 6	2.56	Feb. 24	2.21
Oct. 4	16.44			Aug. 1	2.51	Apr. 3	2.29

Local well number: EEA-M7
 USGS well number: 54Q67
 Land-surface datum elevation: 12.61

Local well number: EEA-M8
 USGS well number: 54Q69
 Land-surface datum elevation: 16.12

Date	Water level						
<i>1994</i>		Dec. 5	0.62	<i>1994</i>		Aug. 29	3.24
Mar. 29	1.96	Dec. 20	.68	Mar. 15	3.08	Oct. 4	2.96
May 2	2.15	<i>1995</i>		Mar. 23	3.53	Oct. 25	3.11
May 31	1.88	Jan. 27	.73	Mar. 29	3.20	Dec. 20	2.69
July 6	-3.91	Feb. 24	.83	May 2	2.95	<i>1995</i>	
Aug. 3	.91	Apr. 3	.89	May 31	3.58	Jan. 27	2.85
Aug. 29	.78			July 6	3.01	Feb. 24	2.92
Oct. 4	.66			Aug. 3	3.12	Apr. 3	2.71

Table 6. Slug-test data for observation well EEA-S1 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia¹

[For location of observation well, see plate 1]

Well EEA-S1

Static water level: 9.67 feet below measuring point

Date: March 10, 1994

Elapsed time (minutes)	Depth of water below static water level (feet)
0.0034	1.98
.0067	1.98
.0100	1.98
.0134	1.98
.0167	1.97
.0200	1.97
.0234	1.97
.0267	1.97
.0300	1.97
.0334	1.97
.0367	1.97
.0400	1.96
.0434	1.96
.0467	1.96
.0500	1.96
.0534	1.96
.0567	1.96
.0600	1.96
.0634	1.96
.0667	1.96
.0700	1.96
.0734	1.96
.0767	1.96
.0800	1.95
.0834	1.95
.0867	1.95
.0900	1.95
.0934	1.95
.0967	1.95
.1000	1.95
.1034	1.95
.1067	1.95

¹The remaining pages of table 6 are stored on diskette, located at the back of this report.

Table 7. Reporting units and limits for selected water-quality constituents

[°C, degrees Celsius; µg/L, micrograms per liter; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25°C]

Constituent	Reporting unit	Reporting limit
Specific conductance, field	µS/cm	1
pH, field	standard pH units	.1
Temperature, field	°C	.1
Dissolved oxygen, field	mg/L, as O ₂	.1
Alkalinity, field	mg/L, as CaCO ₃	1
Calcium	mg/L, as Ca	.1
Magnesium	mg/L, as Mg	.1
Sodium	mg/L, as Na	.1
Potassium	mg/L, as K	.1
Sulfate	mg/L, as SO ₄	.1
Chloride	mg/L, as Cl	.1
Fluoride	mg/L, as F	.1
Bromide	mg/L, as Br	.01
Silica	mg/L, as SiO ₂	.1
Dissolved solids, residue at 18°C	mg/L	1
Aluminum	µg/L, as Al	10
Iron	µg/L, as Fe	10
Manganese	µg/L, as Mn	10
Dissolved organic carbon	mg/L, as C	.1
Suspended organic carbon	mg/L, as C	.1

Table 8. Concentrations of major dissolved constituents in surface water from the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

[°C, degrees Celsius; µg/L, micrograms per liter; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25°C; >, greater than; <, less than; for surface-water sample locations, see plate 1]

Local well no.	Date	Specific conductance, field (µS/cm)	pH, field	Temperature, field (°C)	Oxygen, dissolved, field (mg/L, as O ₂)	Calcium (mg/L, as Ca)	Magnesium (mg/L, as Mg)	Sodium (mg/L, as Na)	Potassium (mg/L, as K)	Alkalinity, field (mg/L, as CaCO ₃)
EEA-SW1	07-20-94	7,440	6.0	29.0	5.4	66	150	1,300	49	26
EEA-SW2	07-20-94	9,200	7.0	30.0	6.5	79	190	1,500	63	30
¹ EEA-SW2	07-20-94	9,200	7.0	30.0	6.5	77	190	1,500	64	52
EEA-SW3	07-20-94	9,520	6.4	27.5	3.6	84	200	1,600	61	22

Local well no.	Sulfate (mg/L, as SO ₄)	Chloride (mg/L, as Cl)	Fluoride (mg/L, as F)	Bromide (mg/L, as Br)	Silica (mg/L, as SiO ₂)	Solids, dissolved (residue at 180°C)	Aluminum (µg/L, as Al)	Iron (µg/L, as Fe)	Manganese (µg/L, as Mn)	Carbon, organic, dissolved (mg/L, as C)	Carbon, organic, suspended (mg/L, as C)
EEA-SW1	320	2,200	.20	7.6	8.7	4,430	<10	20	50	4.2	>3.3
EEA-SW2	400	2,800	.30	9.8	6.1	5,410	10	30	20	3.9	.8
¹ EEA-SW2	400	2,800	.30	9.7	6.0	5,410	<10	20	10	2.9	.7
EEA-SW3	410	2,900	.30	10	2.3	5,530	<10	40	90	6.0	1.4

¹Duplicate sample.

Table 9. Concentrations of major dissolved constituents in ground water from the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia

[°C, degrees Celsius; µg/L, micrograms per liter; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25°C;

--, data not collected; >, greater than; <, less than; for locations of observation wells, see plate 1]

Local well no.	USGS well no.	Date	Specific conductance, field (µS/cm)	pH, field (standard units)	Temperature, field (°C)	Oxygen, dissolved, field (mg/L, as O ₂)	Calcium (mg/L, as Ca)	Magnesium (mg/L, as Mg)	Sodium (mg/L, as Na)	Potassium (mg/L, as K)
EEA-S1	54Q56	06-22-94	225	5.9	14.0	4.3	13	3.9	9.3	2.7
EEA-S2	54Q58	06-27-94	65	5.0	14.5	5.8	3.4	1.8	2.2	<.10
EEA-S3	54Q60	06-14-94	7,600	6.4	13.0	.1	220	160	1,100	27
EEA-S4	54Q62	07-05-94	300	6.3	16.0	1.8	46	2.1	8.4	2.8
EEA-S5	54Q64	06-29-94	151	5.2	15.0	5.2	6.7	2.2	14	.60
EEA-S6	54Q66	06-17-94	258	6.0	--	--	17	1.2	24	4.0
EEA-S7	54Q68	06-30-94	137	5.1	16.0	4.3	6.7	2.4	11	.90
EEA-S8	54Q70	06-23-94	169	4.2	14.0	7.4	12	3.0	6.2	3.7
¹ EEA-S8	54Q70	06-23-94	170	4.2	14.0	7.4	12	3.0	6.1	3.8
EEA-S9	54Q71	06-20-94	315	6.5	13.5	8.2	44	3.5	9.3	4.6
EEA-S10	54Q72	06-20-94	680	6.8	13.0	--	44	16	82	2.9
EEA-S11	54Q73	06-24-94	88	6.0	12.5	.3	5.3	.82	3.1	1.0
EEA-S12	54Q74	06-28-94	63	6.0	14.0	3.8	4.8	.91	1.8	.40
EEA-S13	54Q75	06-28-94	143	5.9	12.0	.2	14	2.5	2.9	1.3
EEA-S14	54Q76	06-15-94	103	5.0	12.0	.9	17	2.1	2.3	1.0
EEA-S15	54Q77	06-15-94	215	4.5	12.0	7.2	17	3.4	4.9	2.7
EEA-S16	54Q78	06-16-94	88	5.0	13.5	3.0	1.4	1.1	11	1.6
EEA-S17	54Q79	06-16-94	56	5.6	13.5	9.0	2.6	.86	4.2	.60
EEA-S18	54Q80	06-21-94	197	6.3	13.0	7.7	27	2.5	6.2	1.9
EEA-S19	54Q81	06-21-94	616	6.3	15.0	5.6	96	5.3	3.8	6.2
EEA-S20	54Q82	06-24-94	48	5.2	14.0	.6	1.5	.97	3.0	1.2
EEA-M1	54Q55	06-22-94	338	6.4	15.0	.3	19	7.0	34	10
EEA-M2	54Q57	06-27-94	535	7.9	15.0	.3	33	5.3	76	11
EEA-M3	54Q59	06-14-94	600	6.9	15.0	.5	30	14	66	12
EEA-M4	54Q61	07-05-94	575	6.9	15.0	2.3	34	15	65	12
EEA-M5	54Q63	06-30-94	620	8.1	14.0	6.0	21	9.0	100	18
EEA-M6	54Q65	06-17-94	595	6.6	15.0	.2	39	11	66	10
¹ EEA-M6	54Q65	06-17-94	592	6.5	15.0	.2	39	11	66	10
EEA-M7	54Q67	06-30-94	1,330	6.6	--	--	140	59	57	30
EEA-M8	54Q69	06-23-94	552	6.6	14.5	.5	27	6.9	78	7.7

¹ Duplicate sample.

Table 9. —Continued

Alka- linity, field (mg/L, as CaCO ₃)	Sulfate (mg/L, as SO ₄)	Chloride (mg/L, as Cl)	Fluoride (mg/L, as F)	Silica (mg/L, as SiO ₂)	Solids, dissolved (residue at 180°C)	Alumi- num (µg/L, as Al)	Iron (µg/L, as Fe)	Manga- nese (µg/L, as Mn)	Carbon, organic, dissolved (mg/L, as C)	Carbon, organic, suspended (mg/L, as C)	Local well no.
31	51	7.3	0.40	28	141	20	13,000	160	2.4	0.8	EEA-S1
5	12	3.7	<.10	13	44	100	12	10	.6	.2	EEA-S2
489	130	2,100	.10	16	4,510	10	40,000	550	14	.6	EEA-S3
11	30	4.6	<.10	20	198	<10	28	34	3.0	2.2	EEA-S4
4	31	16	.50	15	92	530	280	35	1.4	.3	EEA-S5
266	16	4.2	.10	10	334	10	230	100	1.3	>3.3	EEA-S6
15	54	20	.20	39	175	30	150	23	2.7	.9	EEA-S7
5	40	9.5	<.10	13	96	150	470	82	1.1	.2	EEA-S8
5	40	9.3	<.10	14	95	150	350	81	1.0	.2	EEA-S8
105	31	3.1	.10	32	204	20	150	47	2.2	.9	EEA-S9
278	81	4.1	1.0	46	442	<10	170	72	3.5	.1	EEA-S10
29	.60	3.0	.70	40	89	30	9,600	110	.7	--	EEA-S11
16	8.4	2.9	<.10	11	51	20	3,500	85	1.3	1.1	EEA-S12
29	15	6.1	.10	18	51	20	1,500	59	1.0	.1	EEA-S13
6	32	3.4	.50	9.9	68	550	9	27	1.0	.7	EEA-S14
6	41	27	1.5	41	150	1,700	970	89	1.9	1.3	EEA-S15
4	16	6.9	<.10	24	72	60	19	22	1.4	.4	EEA-S16
4	11	2.0	<.10	18	1,010	10	19	22	3.8	2.3	EEA-S17
75	11	3.0	.10	20	116	<10	28	34	1.2	.9	EEA-S18
315	1.0	2.1	<.10	21	342	20	12,000	730	14	5.0	EEA-S19
6	6.9	1.9	<.10	16	37	--	350	110	1.3	1.1	EEA-S20
146	1.7	3.6	.60	42	210	<10	1,900	58	3.9	.1	EEA-M1
252	7.9	2.3	1.3	17	304	40	41	3	7.7	.3	EEA-M2
251	2.5	20	.50	38	353	10	2,300	98	4.5	.3	EEA-M3
285	19	3.0	.30	57	387	20	110	18	4.1	.9	EEA-M4
280	8.7	4.6	.70	32	392	10	27	5	5.4	3.5	EEA-M5
267	.40	12	.40	48	368	10	2,600	220	2.5	.2	EEA-M6
267	.50	11	.40	48	374	20	2,700	220	2.7	.3	EEA-M6
198	510	4.4	.20	31	1,010	10	19	22	3.8	2.3	EEA-M7
279	<.10	9.7	.70	43	317	10	3,800	190	--	--	EEA-M8

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ILLUSTRATIONS

GEOLOGIC UNIT		HYDROGEOLOGIC UNIT
HOLOCENE	Alluvial, paludal, and fill deposits	Columbia aquifer
PLEISTOCENE	Tabb Formation	
	Pleistocene deposits undifferentiated	upper confining unit
EOCENE	Nanjemoy Formation	upper confined aquifer
		Nanjemoy-Marlboro confining unit
PALEOCENE	Marlboro Clay	

NOT TO SCALE

Figure 2. Geologic and hydrogeologic units of the shallow aquifer system at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. From unpublished data on file in the Virginia District office of the U.S. Geological Survey.

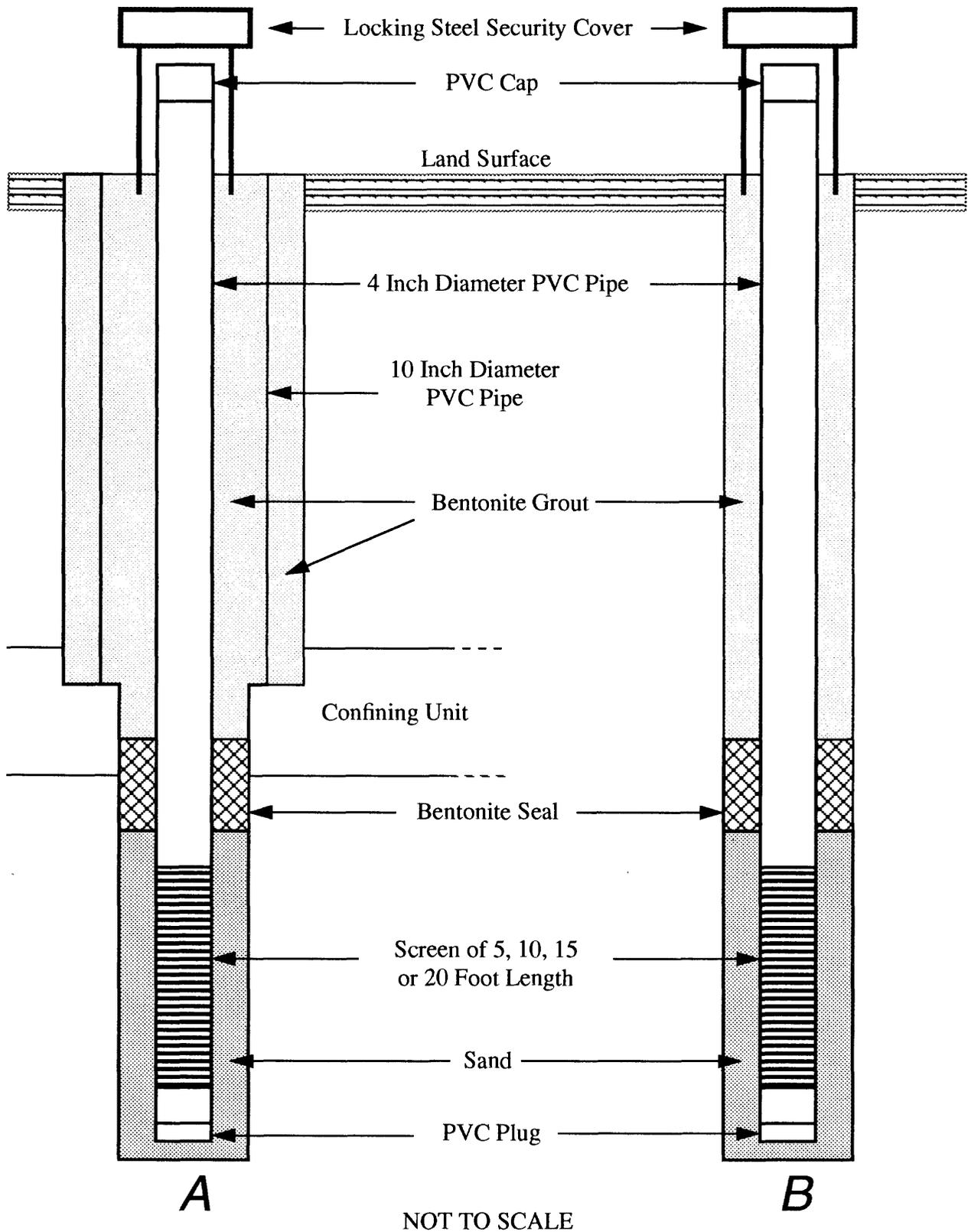


Figure 3. Standard construction of wells completed in a (A) confined aquifer and (B) unconfined aquifer.

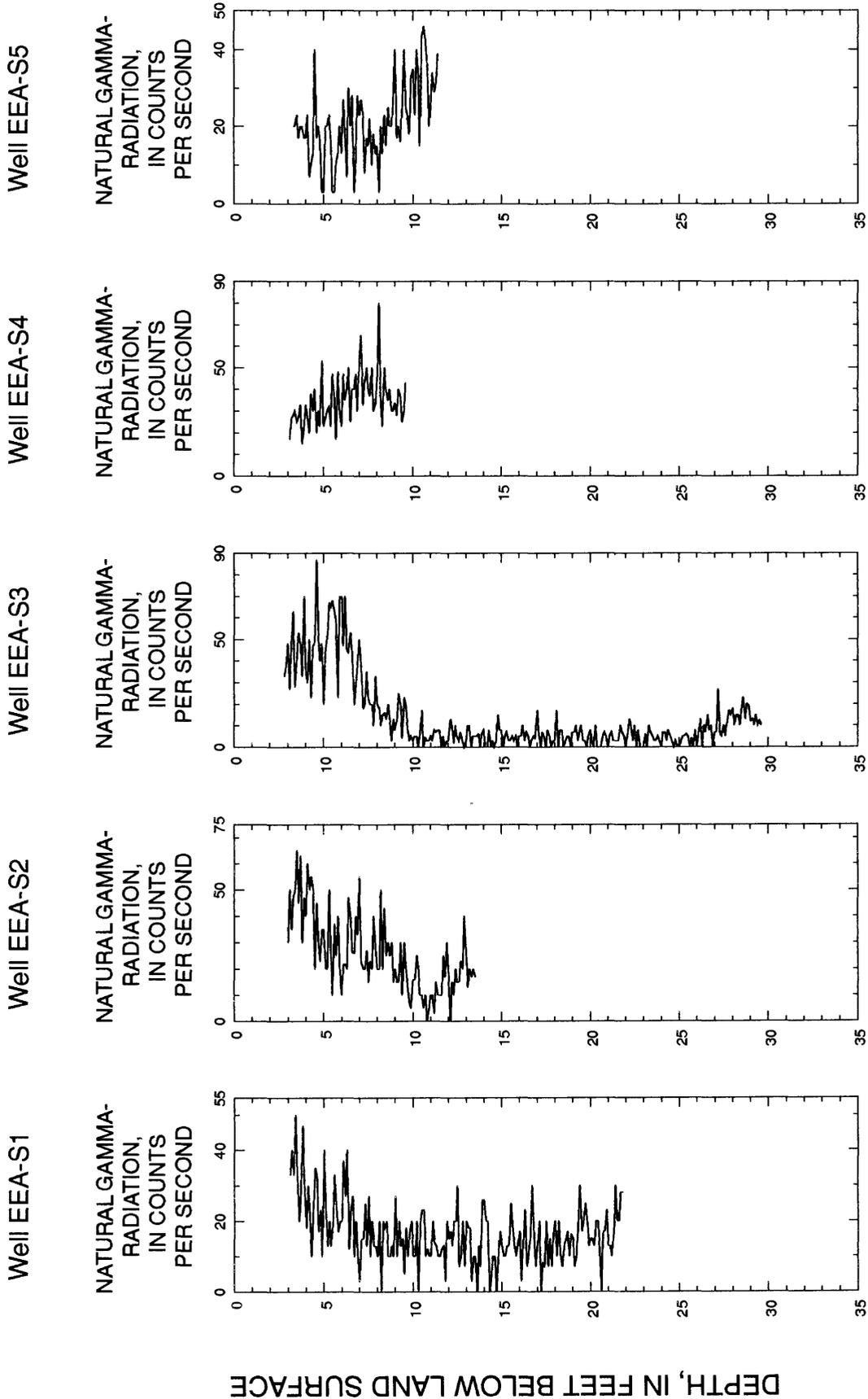


Figure 4. Natural gamma-radiation logs of observation wells in the Columbia aquifer at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia.

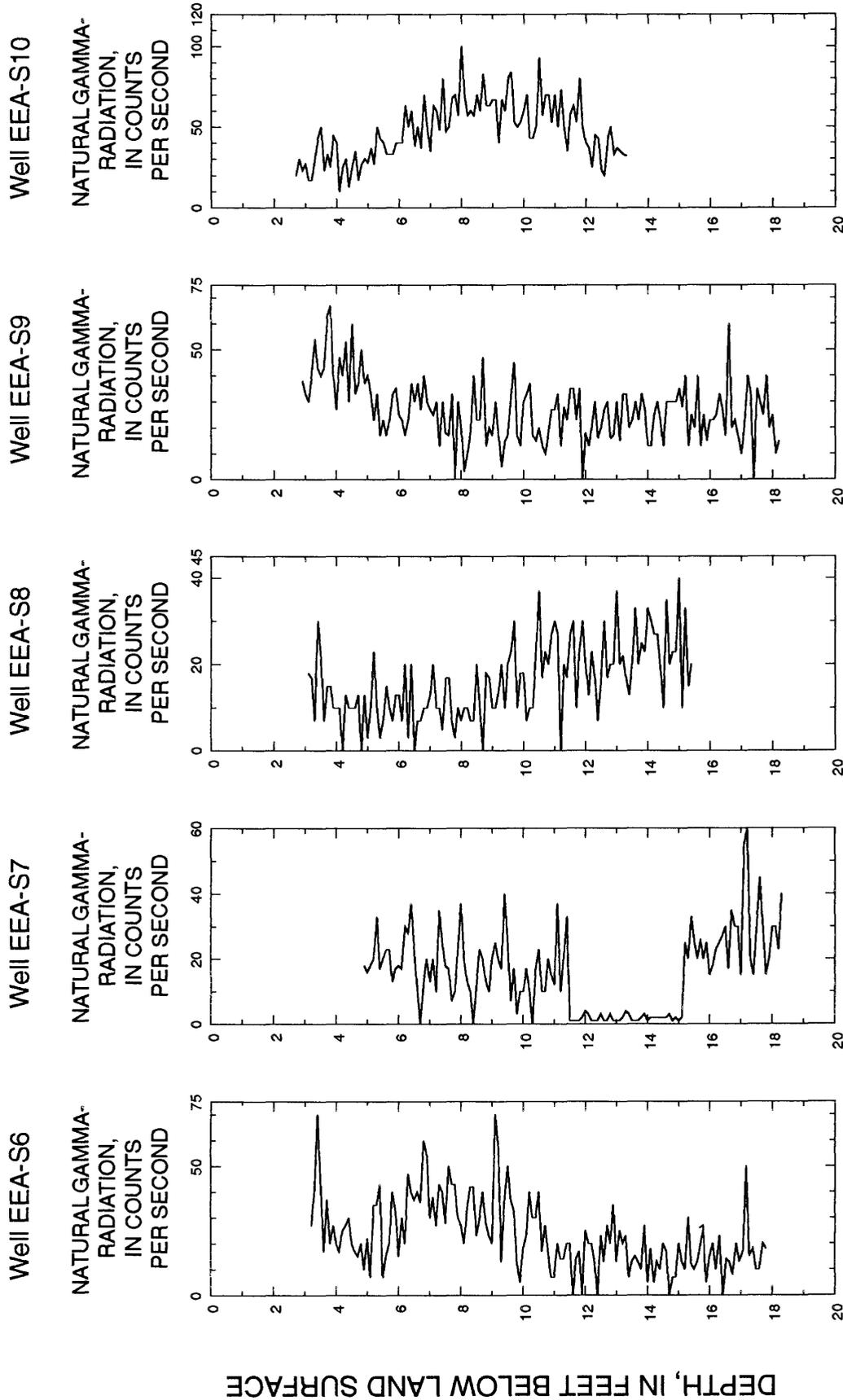


Figure 4. Natural gamma-radiation logs of observation wells in the Columbia aquifer at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued.

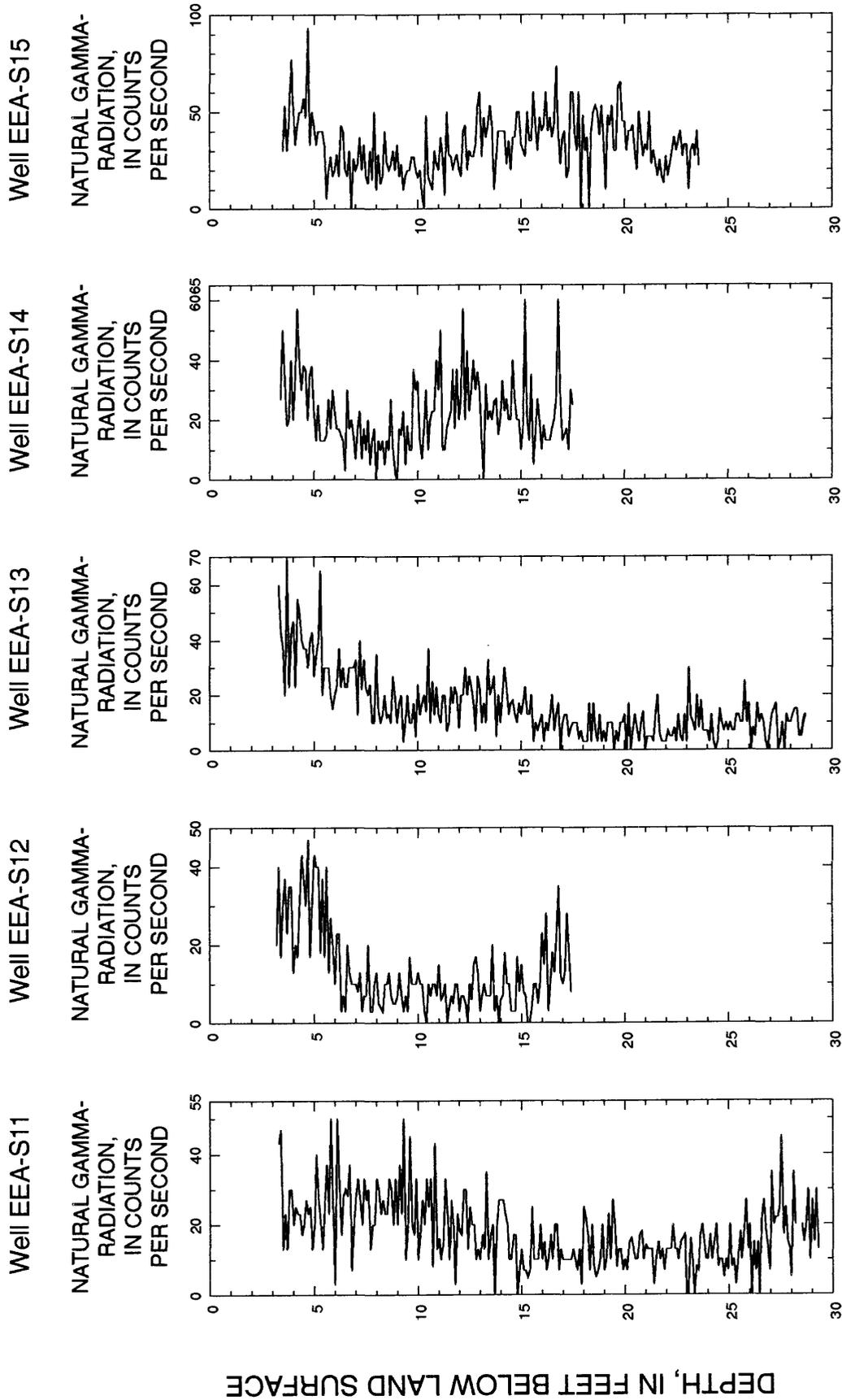


Figure 4. Natural gamma-radiation logs of observation wells in the Columbia aquifer at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued.

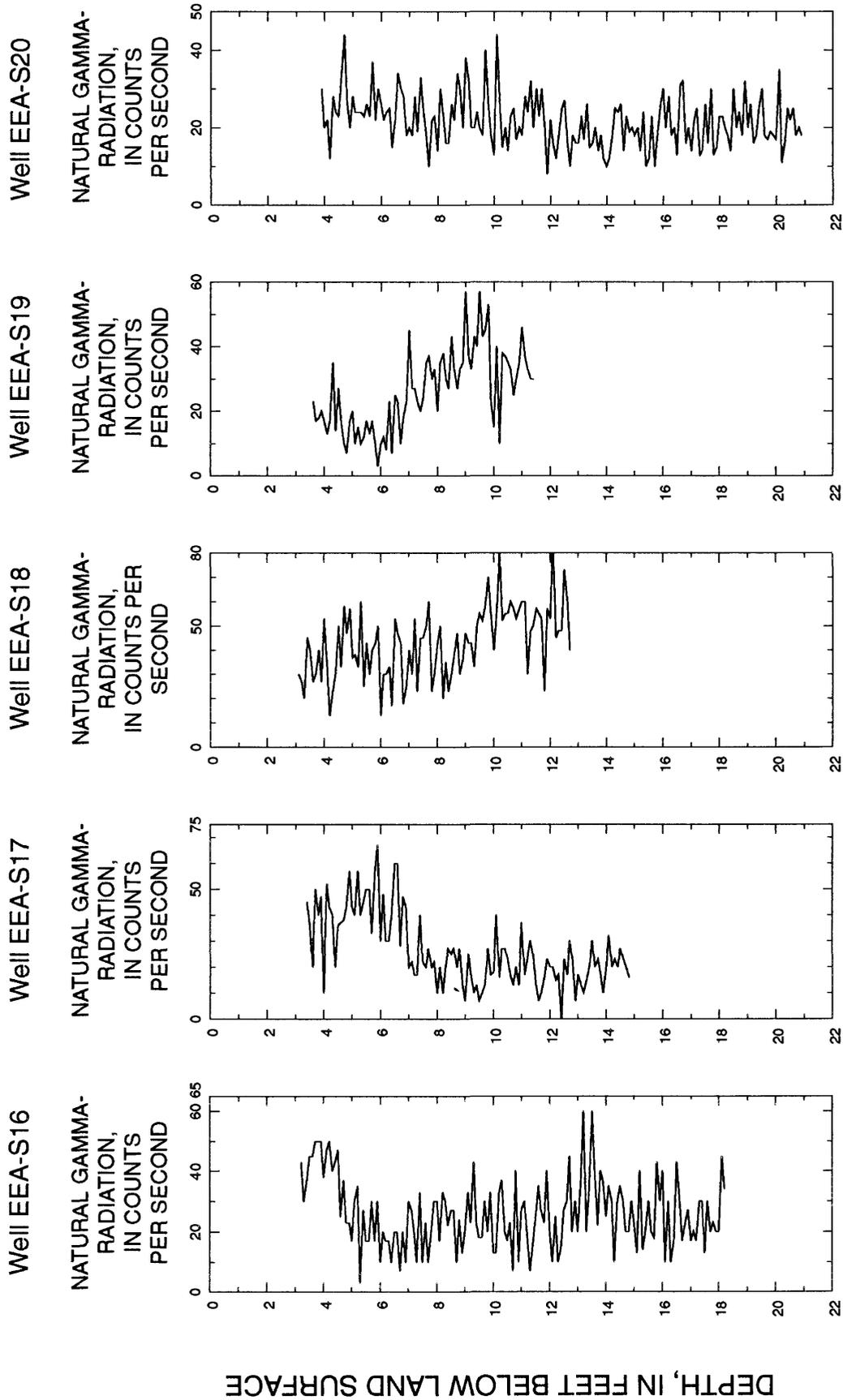


Figure 4. Natural gamma-radiation logs of observation wells in the Columbia aquifer at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia—Continued.

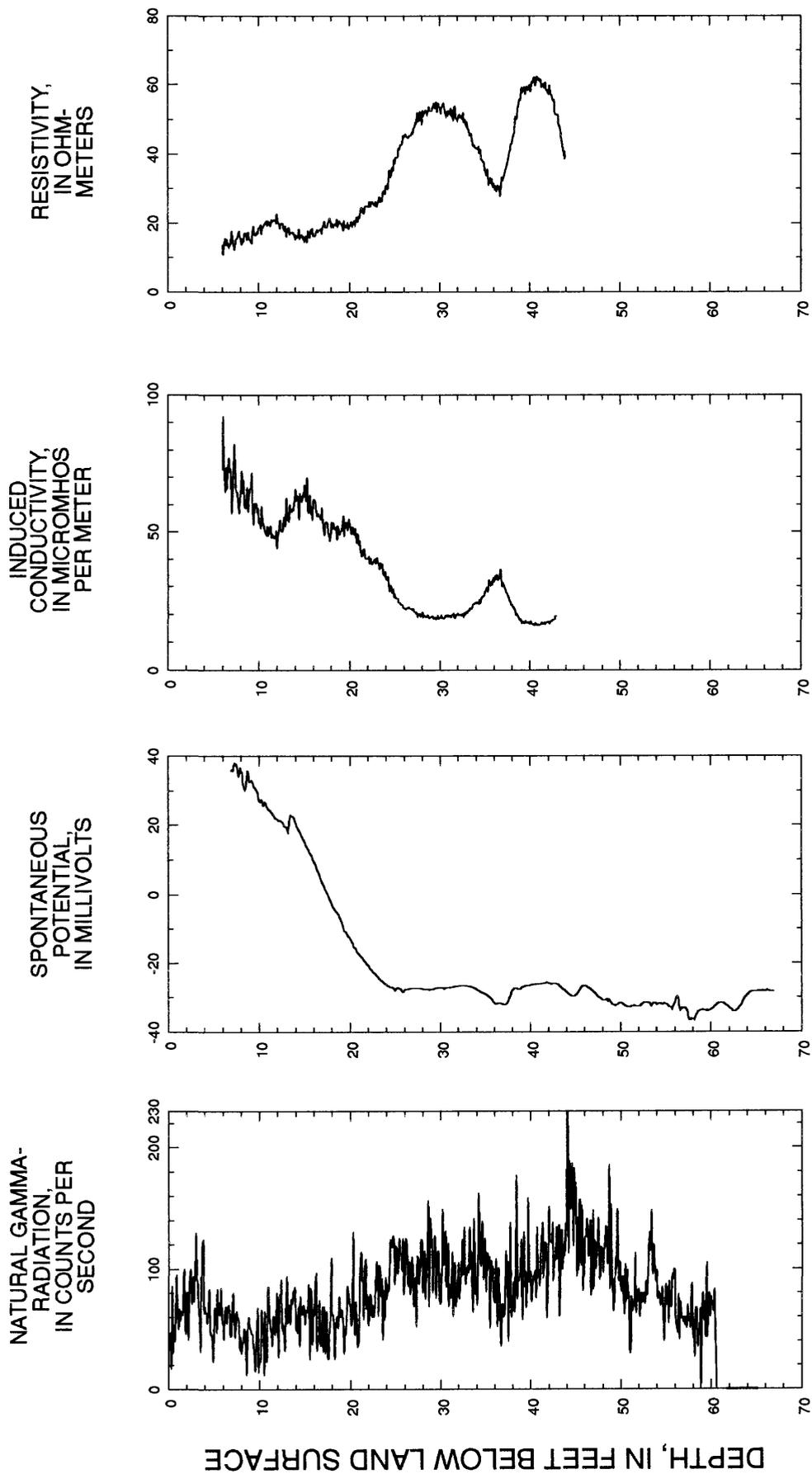


Figure 5. Selected geophysical logs of observation well M-1 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

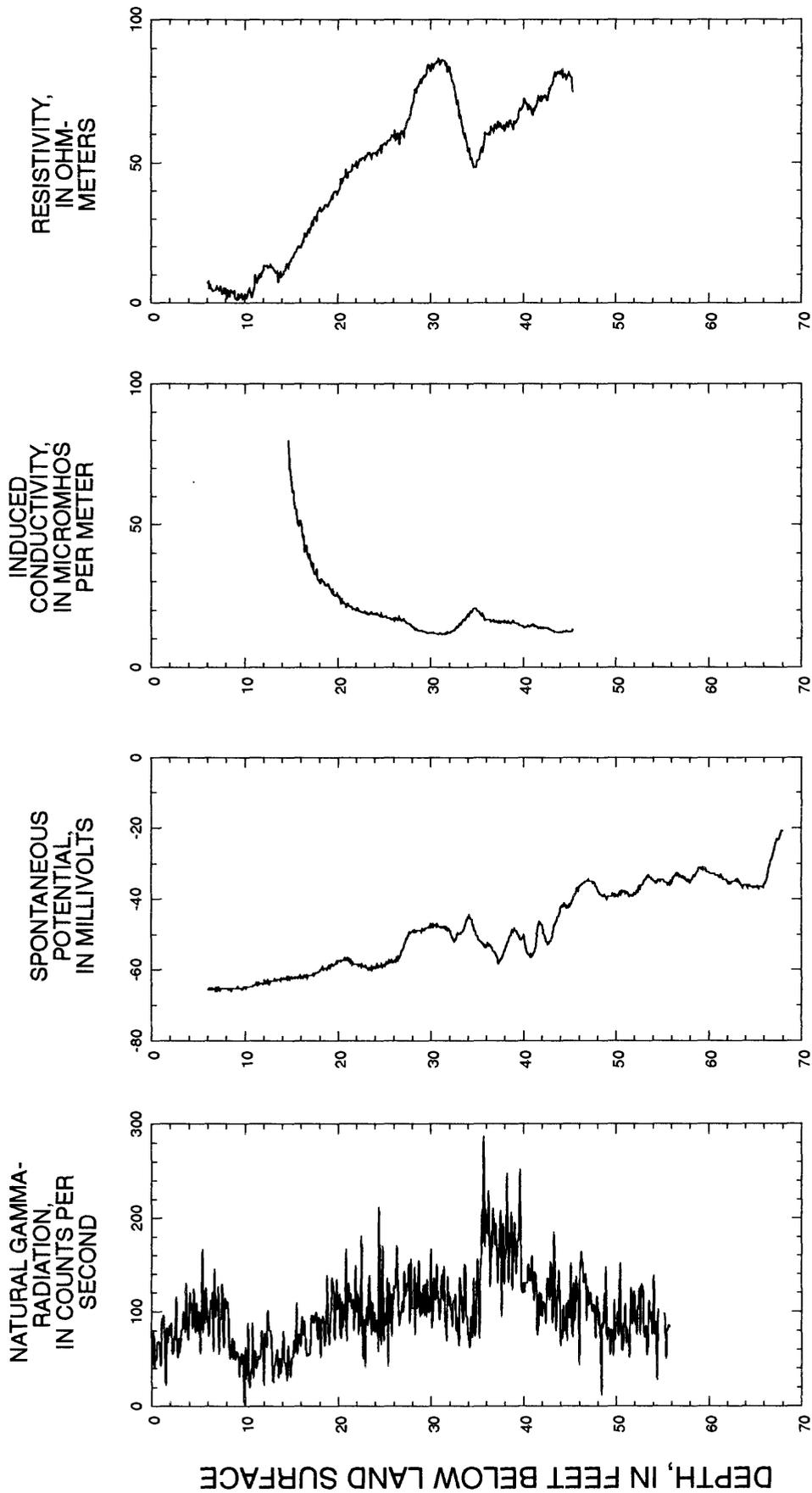


Figure 6. Selected geophysical logs of observation well M-2 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

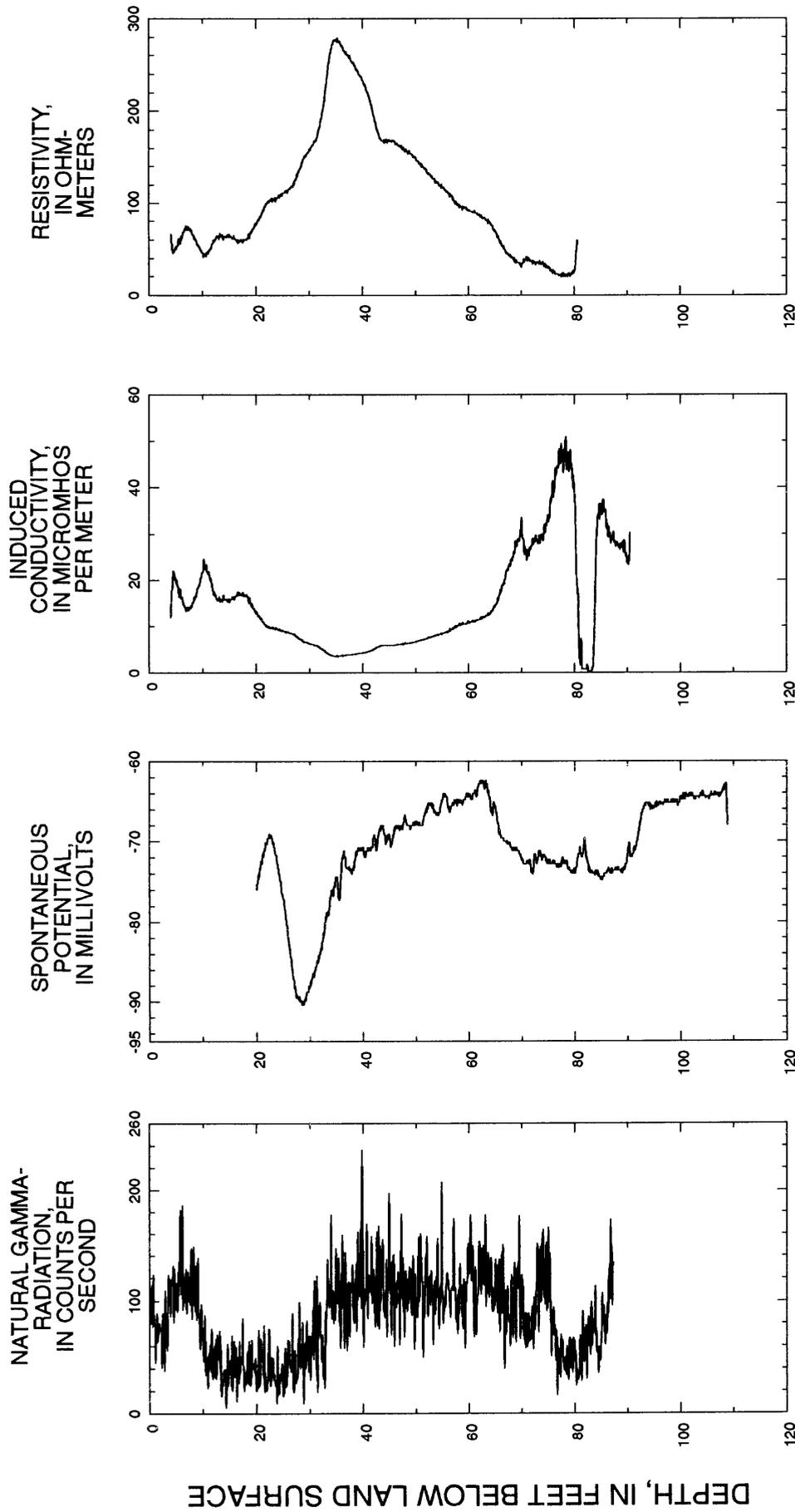


Figure 7. Selected geophysical logs of observation well M-3 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

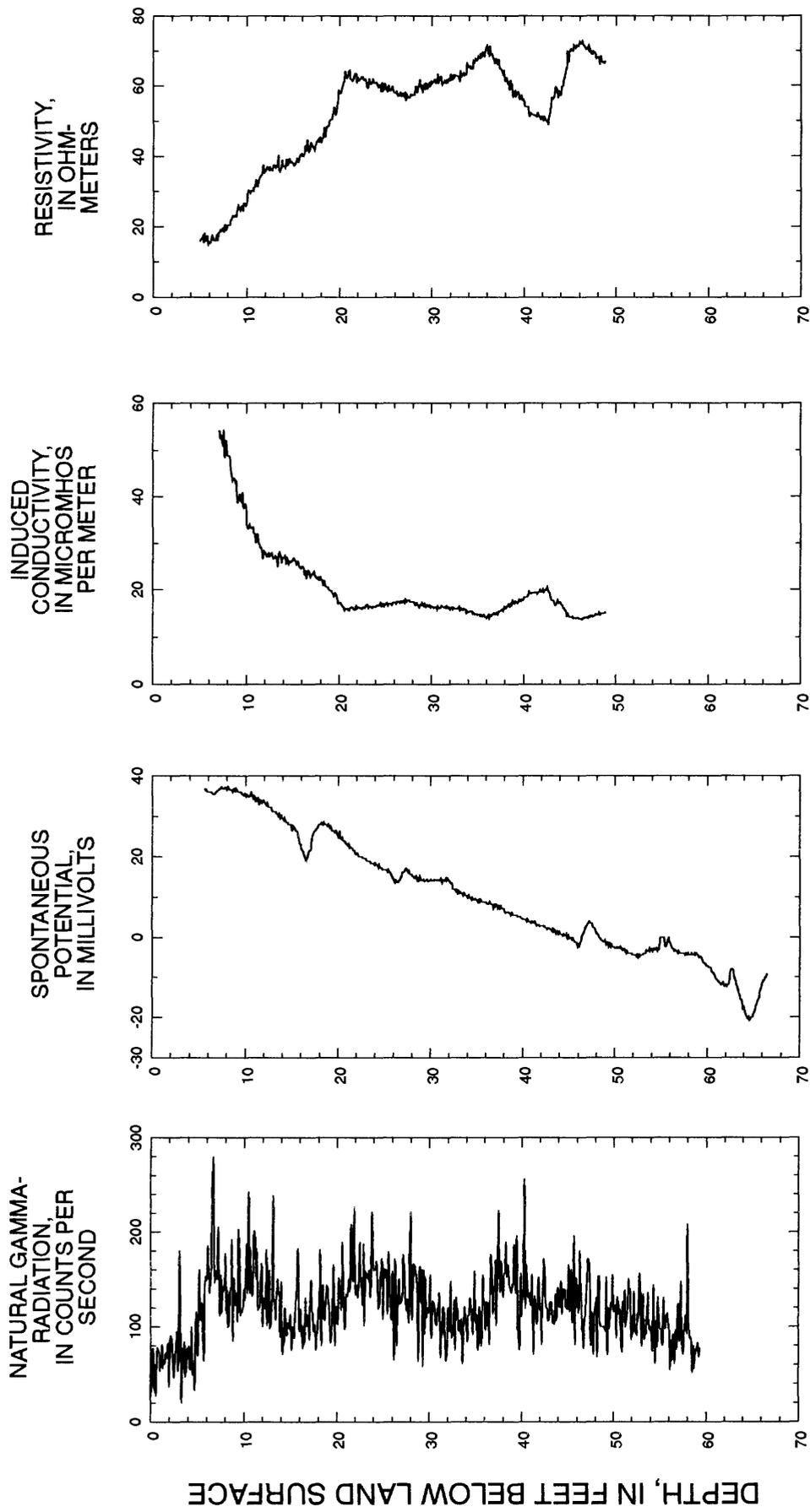


Figure 8. Selected geophysical logs of observation well M-4 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

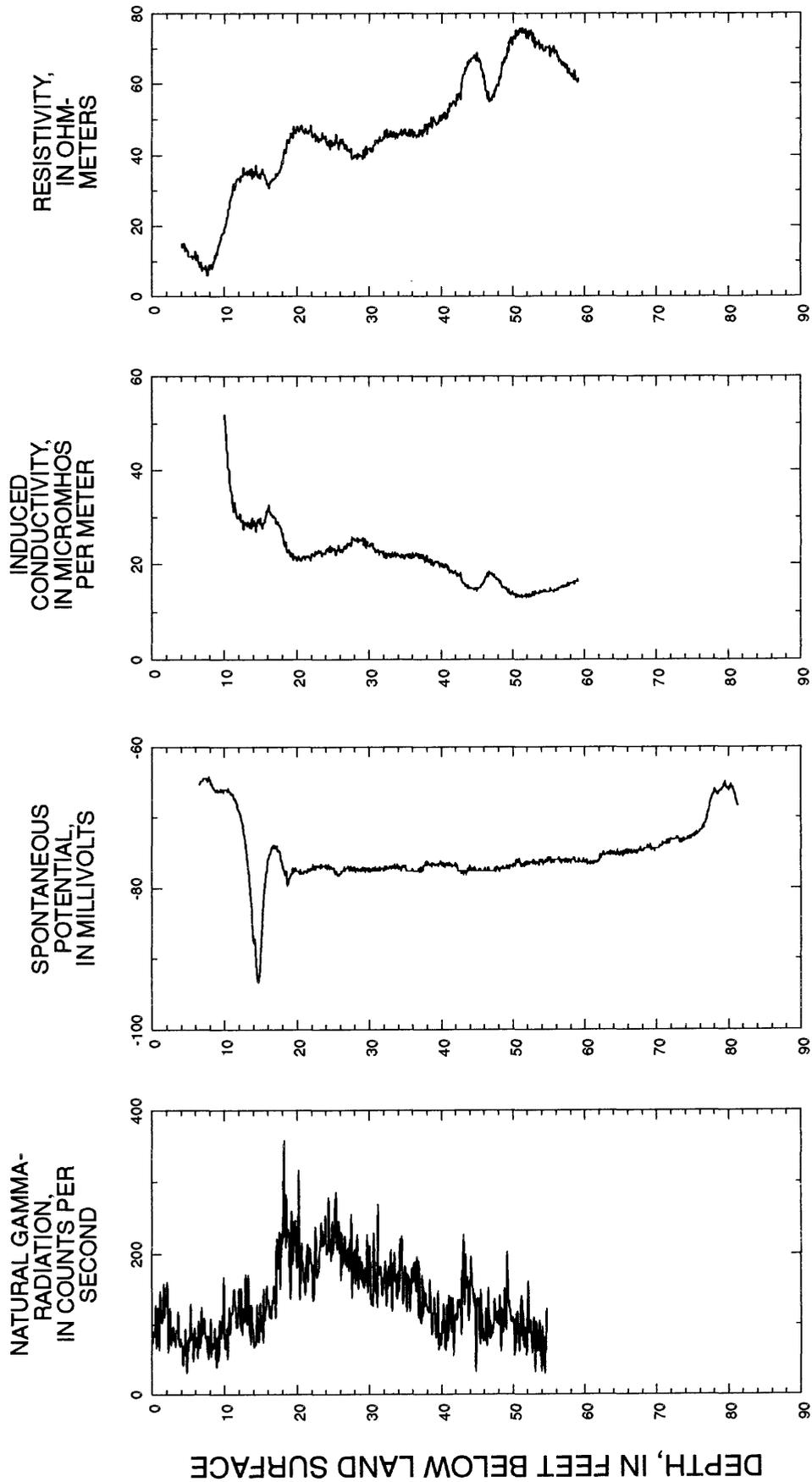


Figure 9. Selected geophysical logs of observation well M-5 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren Virginia. For location of observation well, see plate 1.

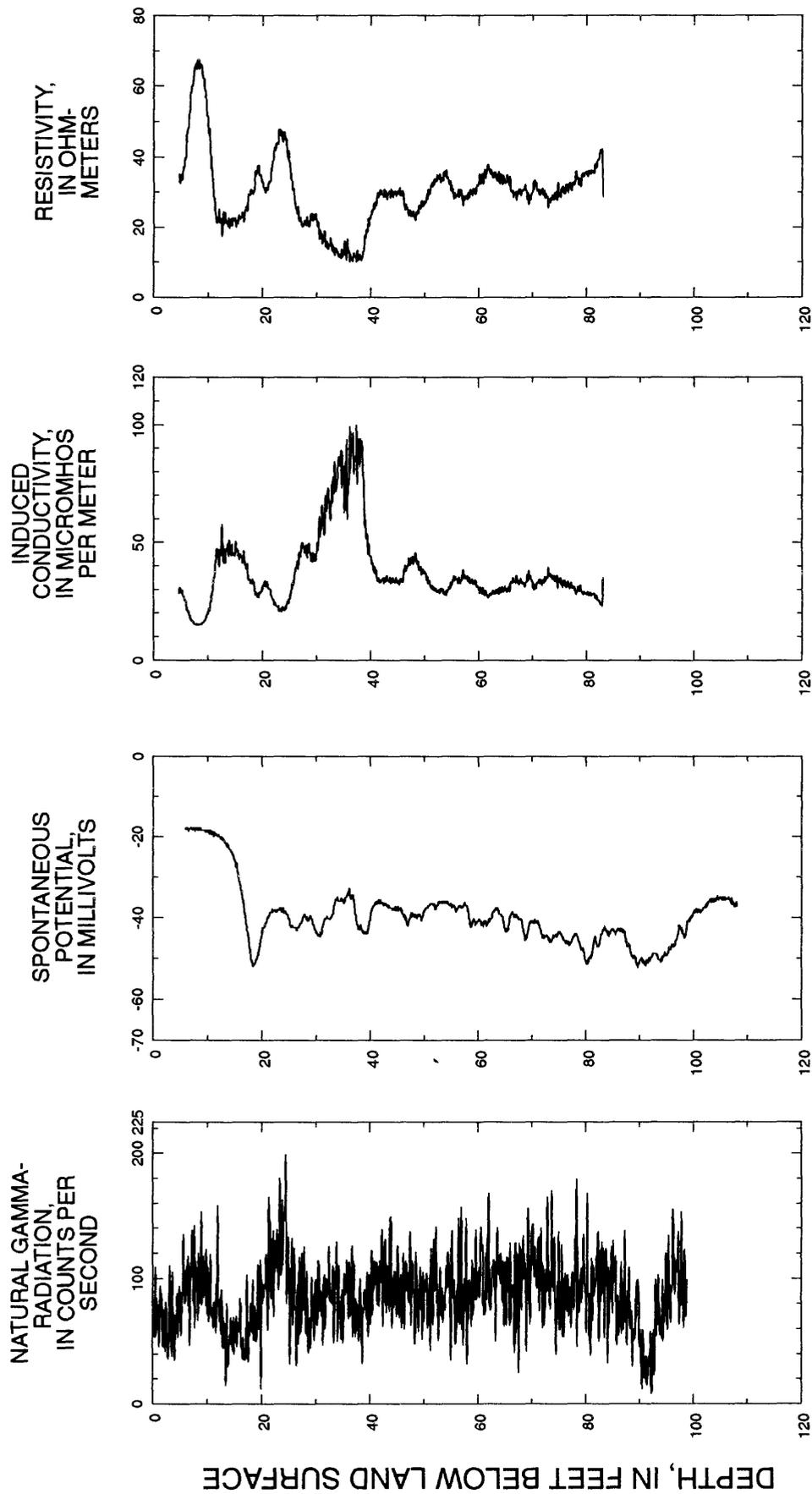


Figure 10. Selected geophysical logs of observation well M-6 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

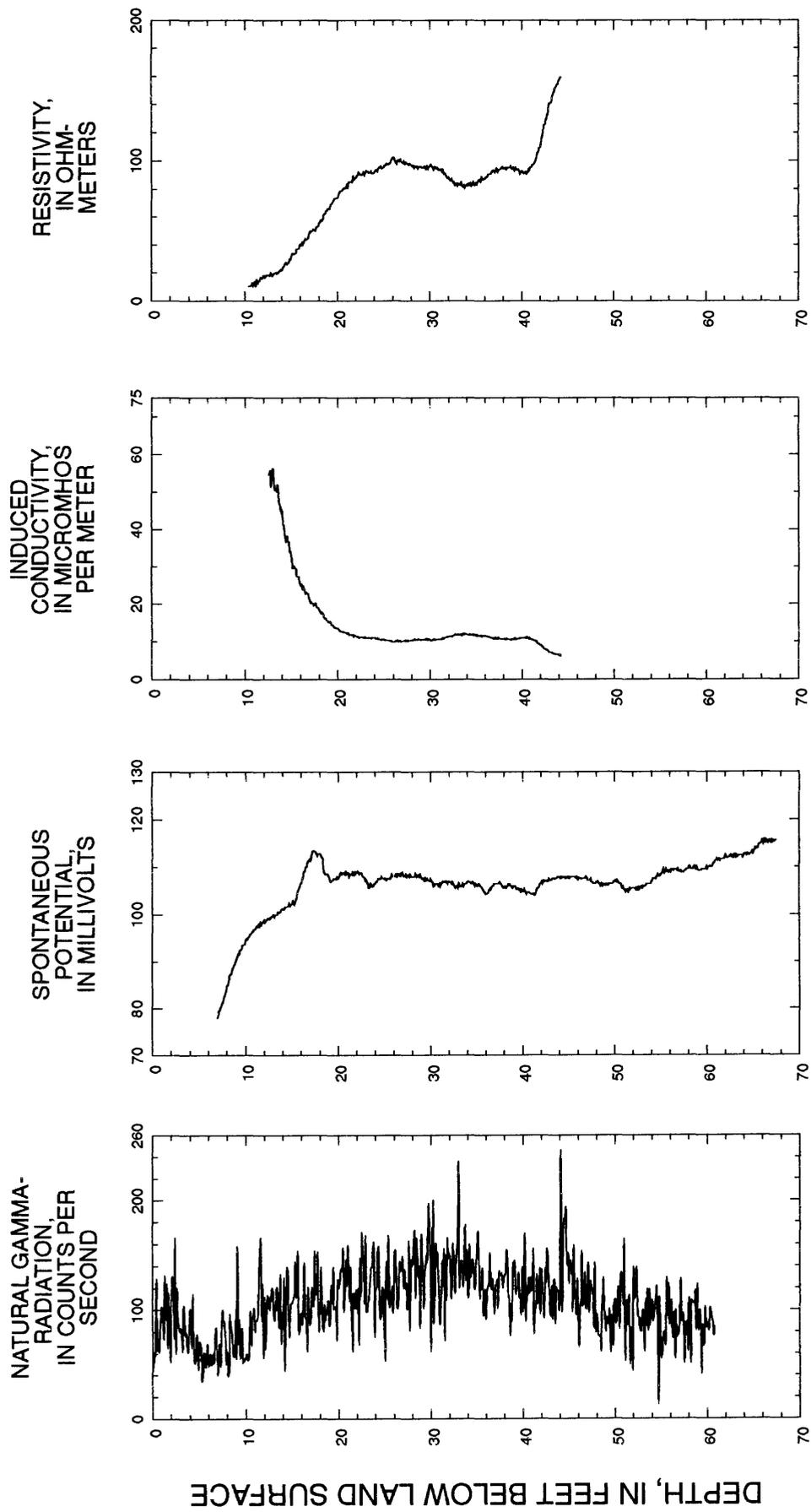


Figure 11. Selected geophysical logs of observation well M-7 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

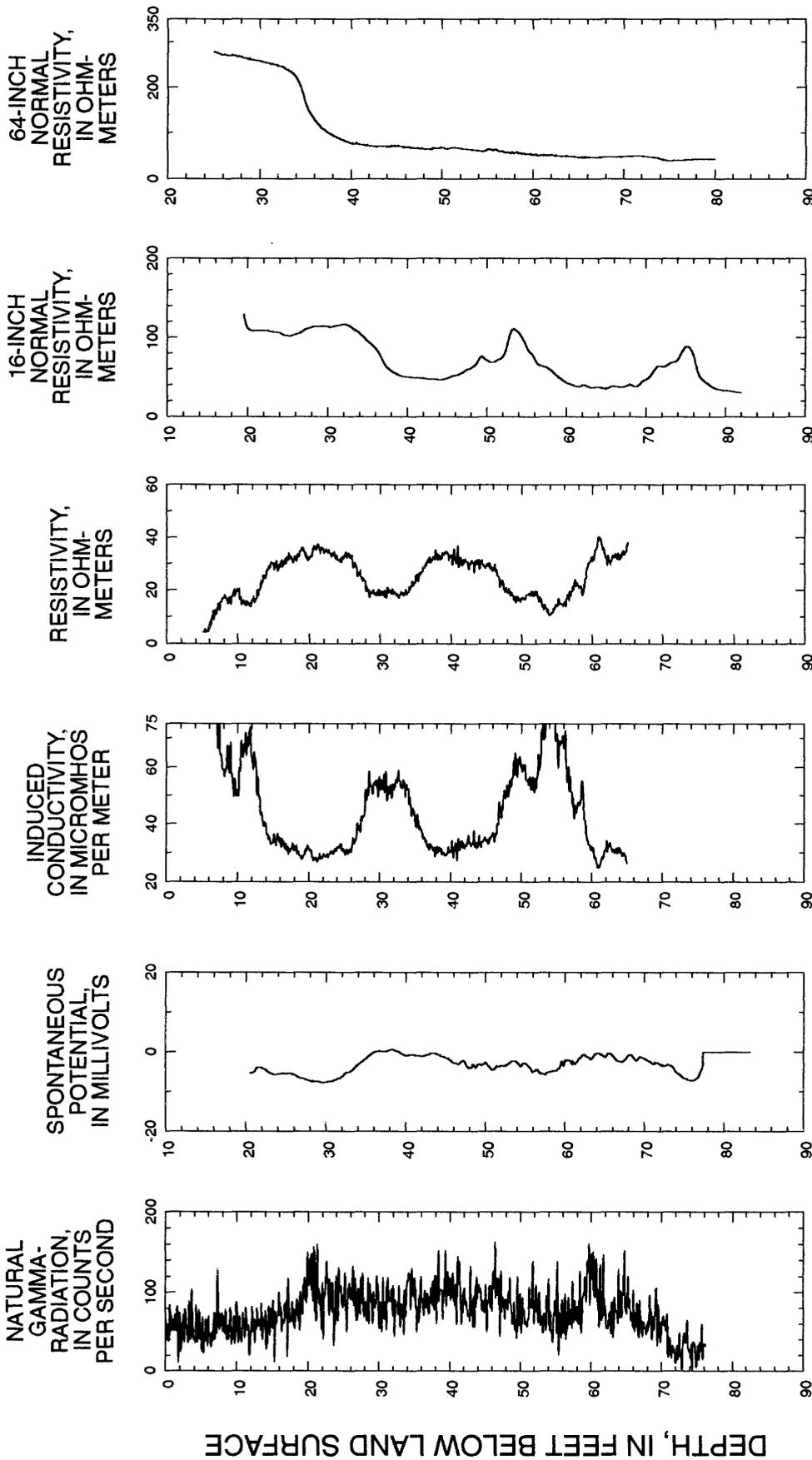


Figure 12. Selected geophysical logs of observation well M-8 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

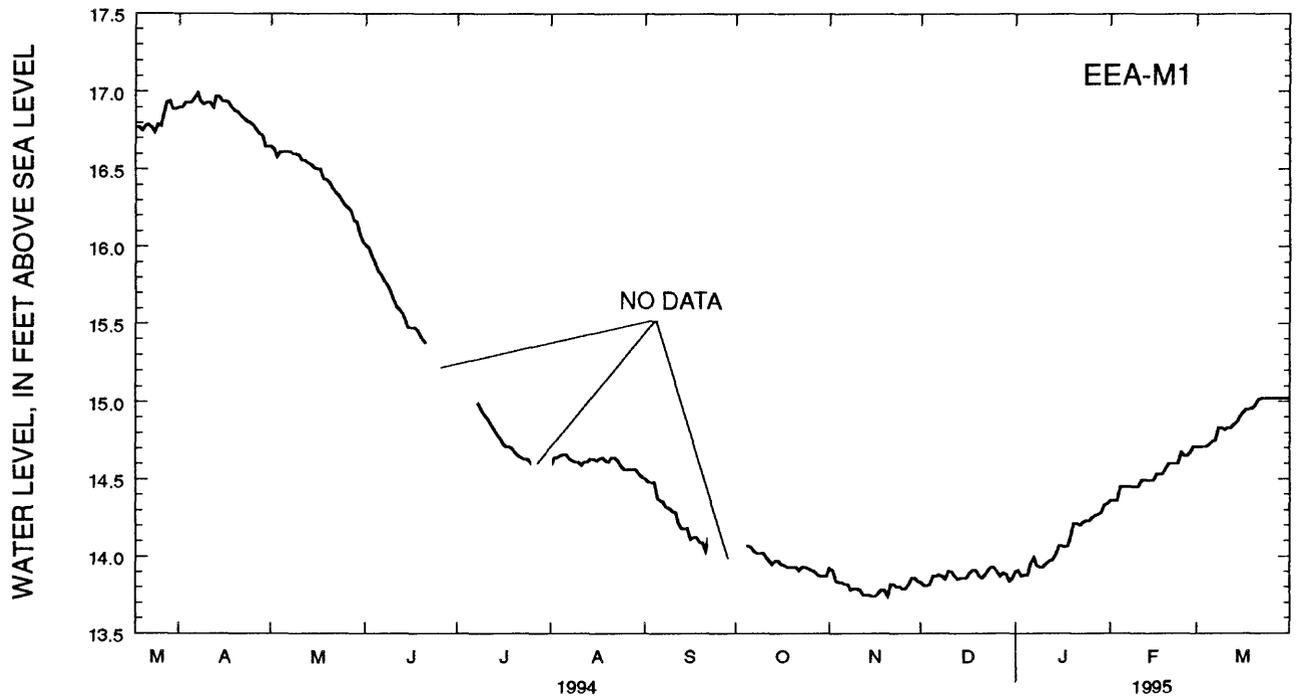


Figure 13. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-M1 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

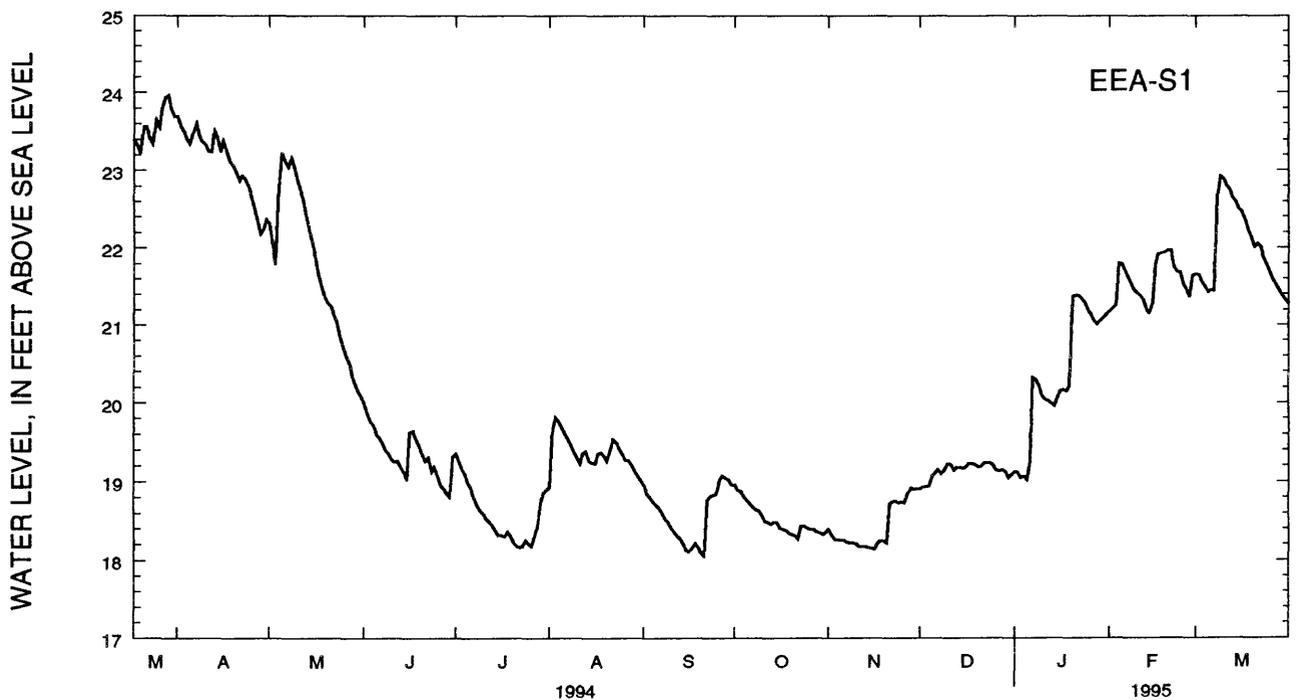


Figure 14. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-S1 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

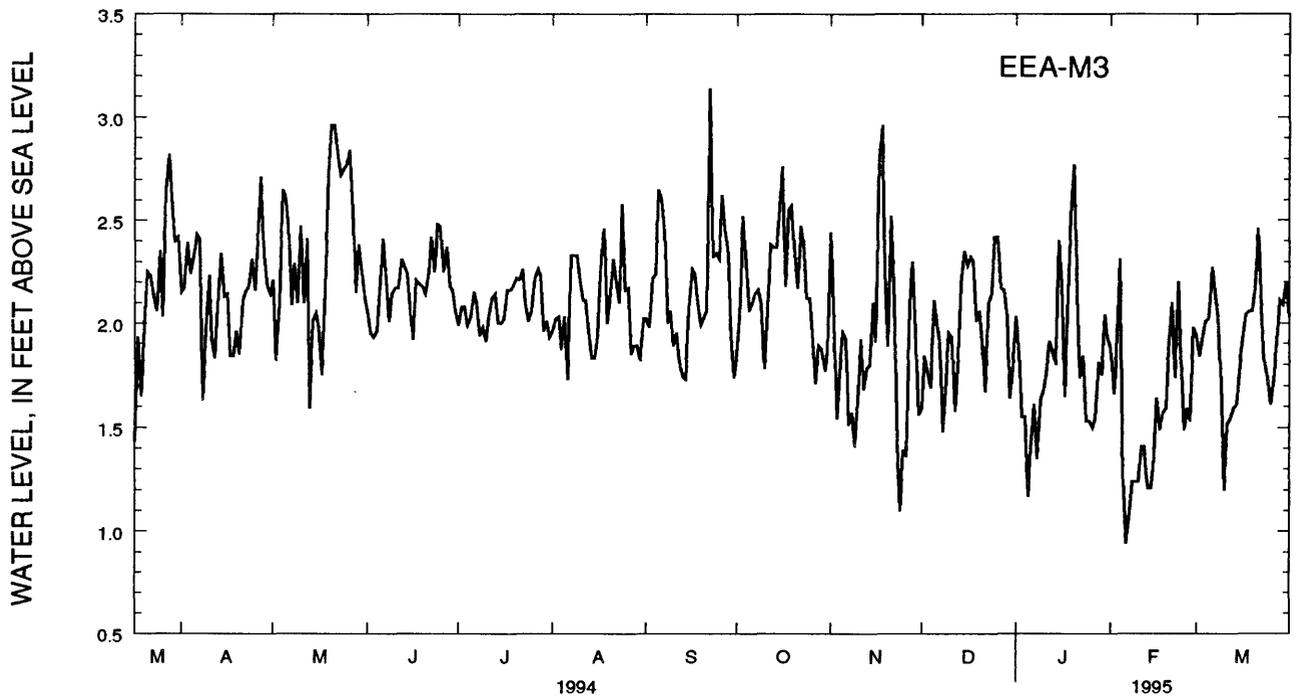


Figure 15. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-M3 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

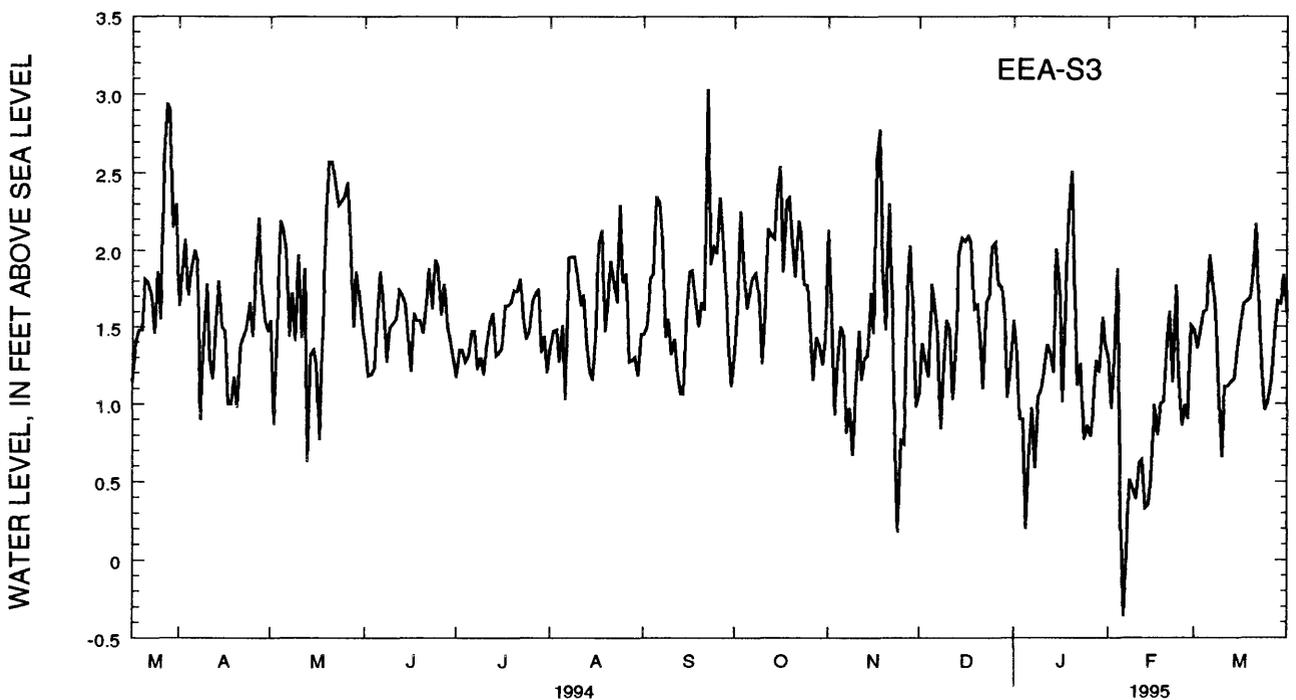


Figure 16. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-S3 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

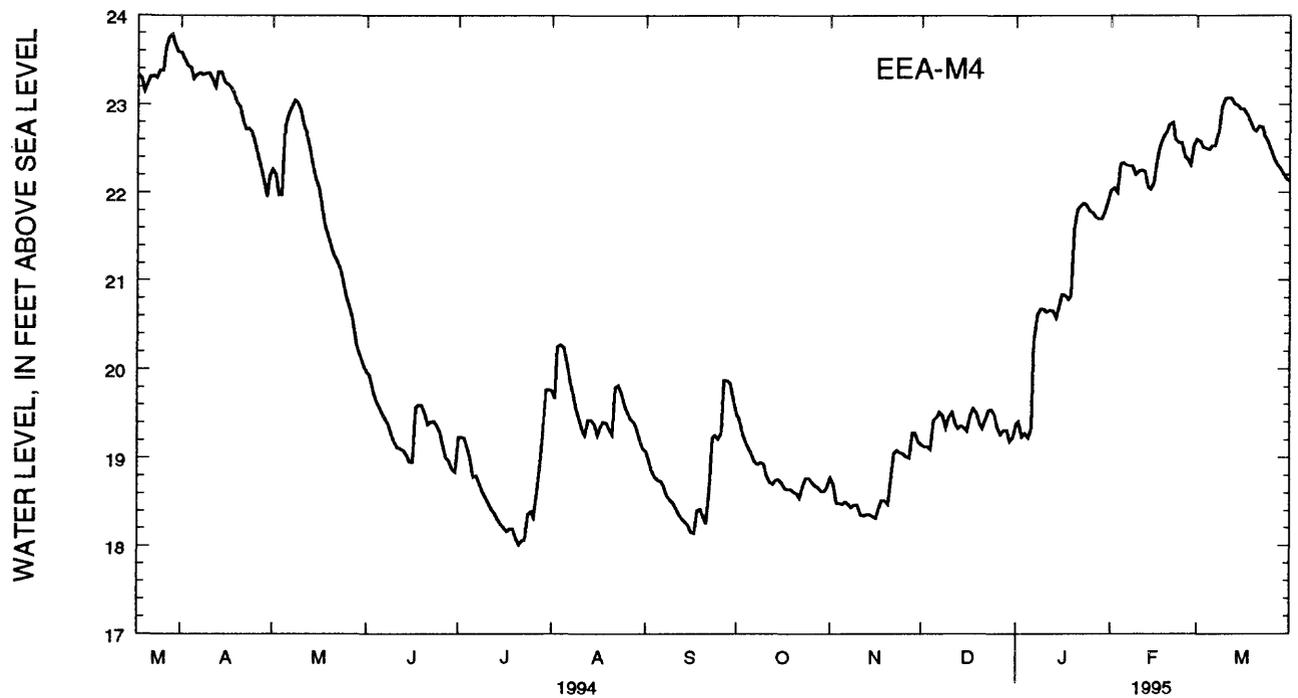


Figure 17. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-M4 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

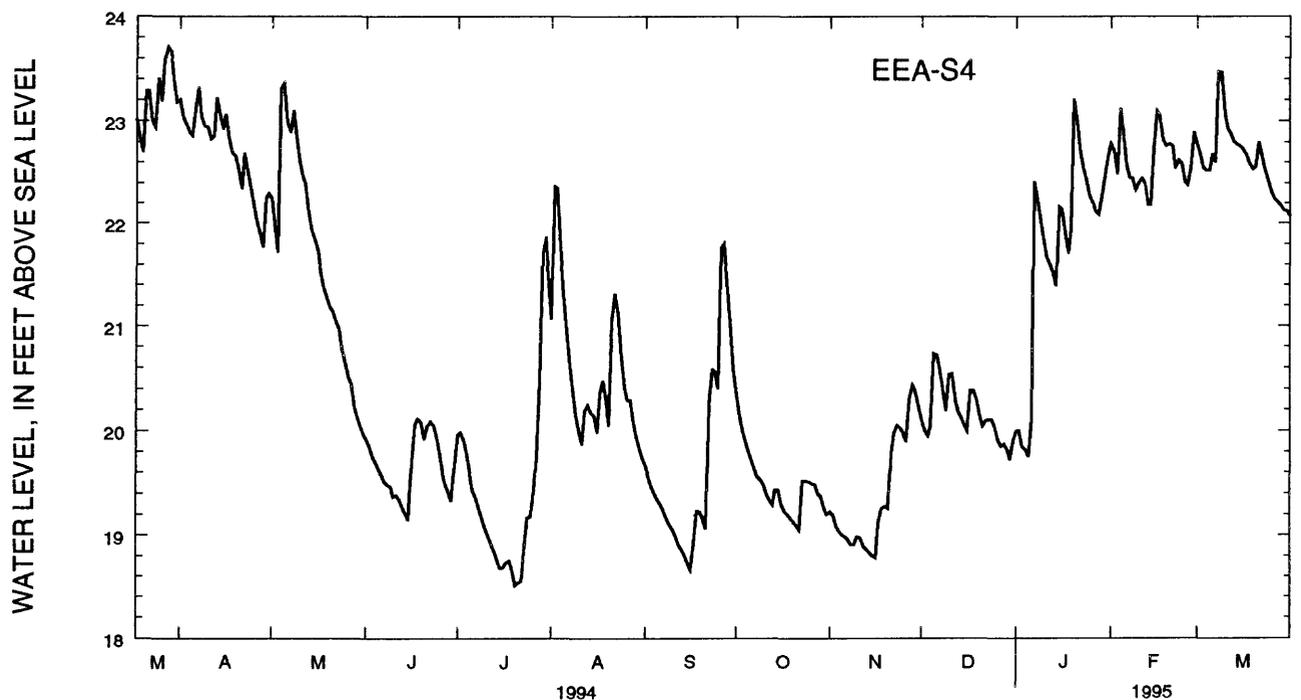


Figure 18. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-S4 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

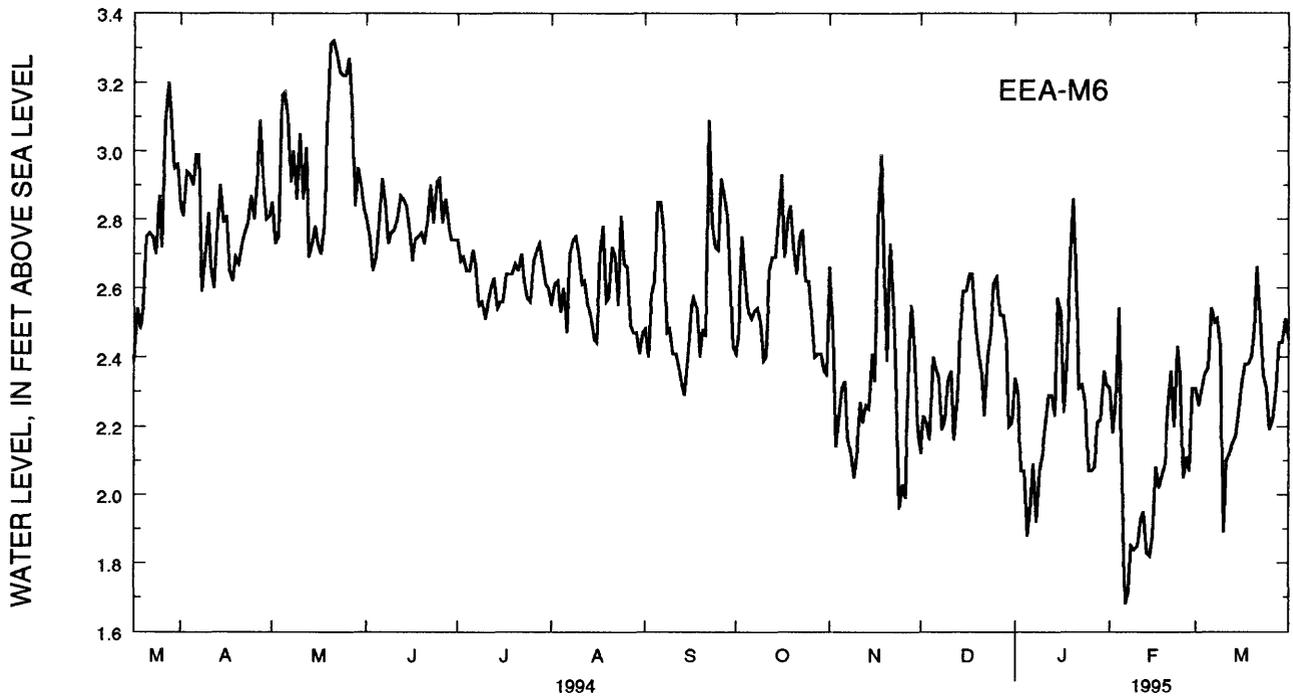


Figure 19. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-M6 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

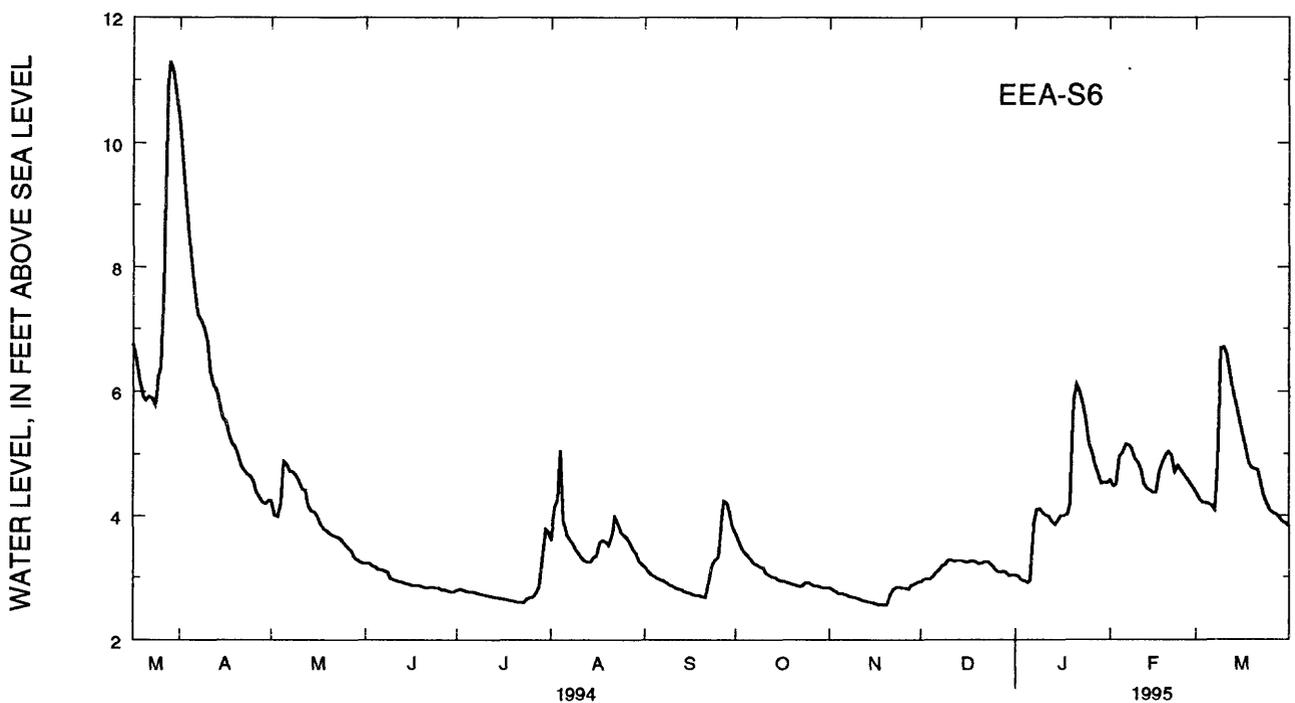


Figure 20. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-S6 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

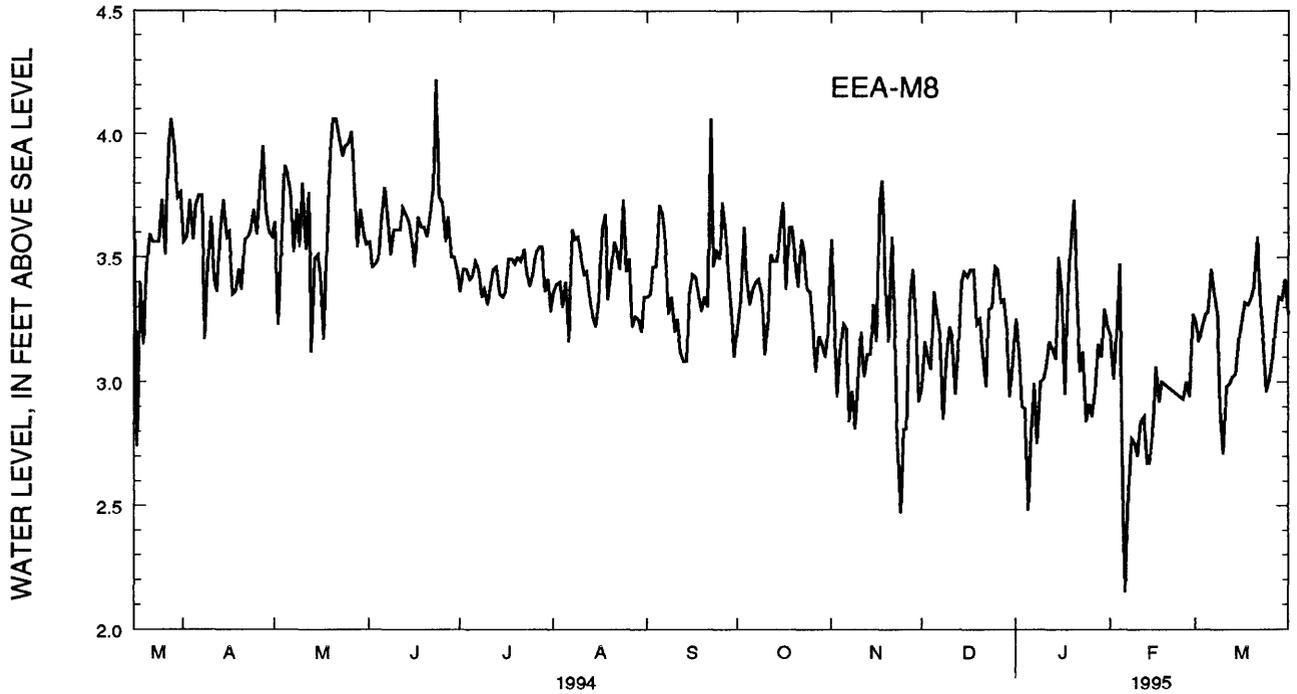


Figure 21. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-M8 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

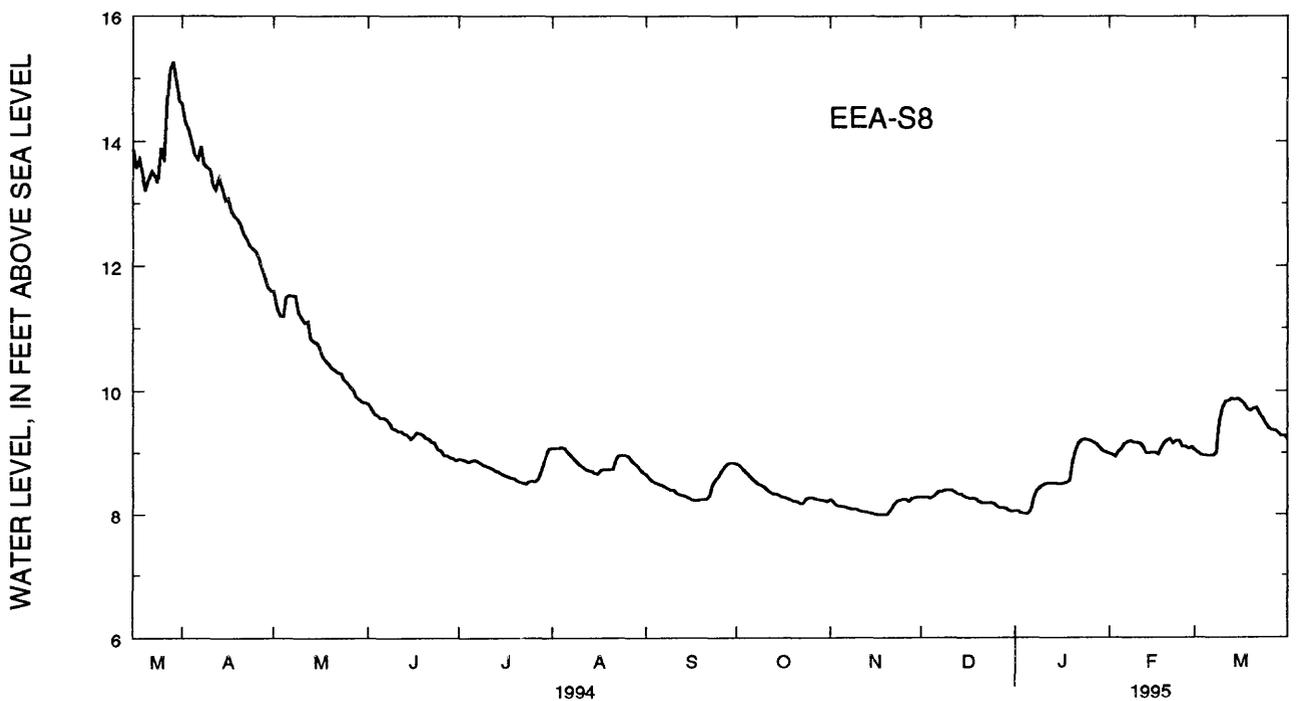


Figure 22. Hydrograph showing minimum daily water level relative to sea level for observation well EEA-S8 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

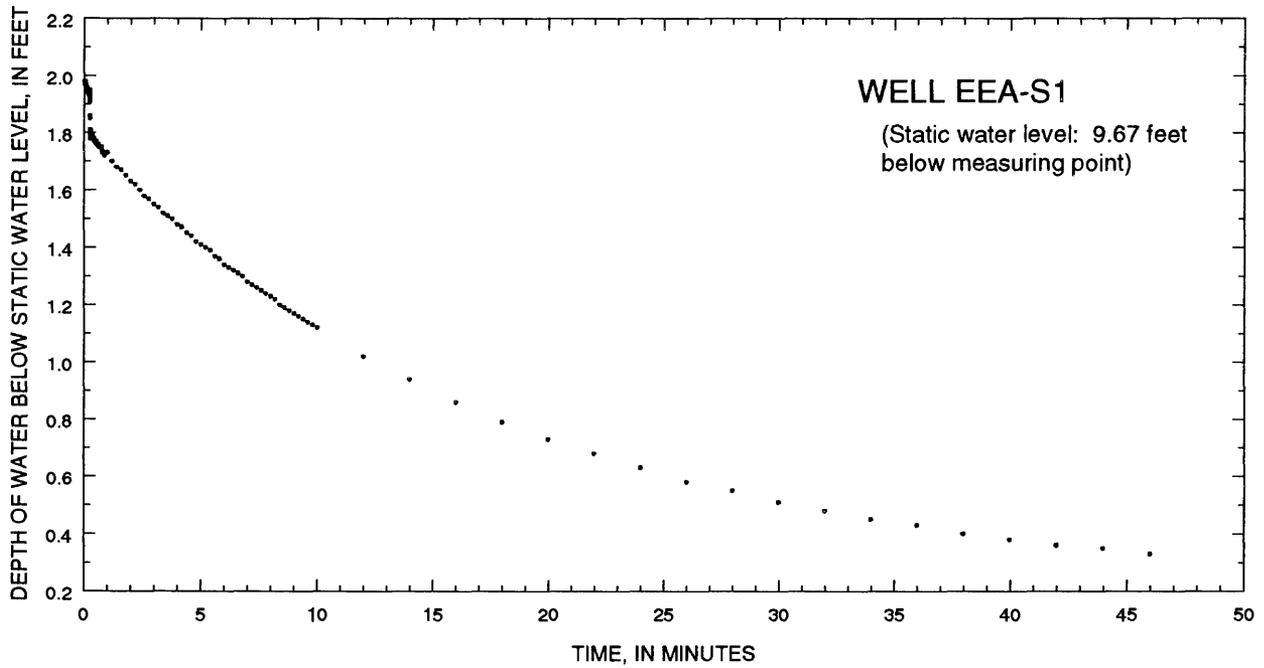


Figure 23. Rising-head data for slug test of observation well EEA-S1 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

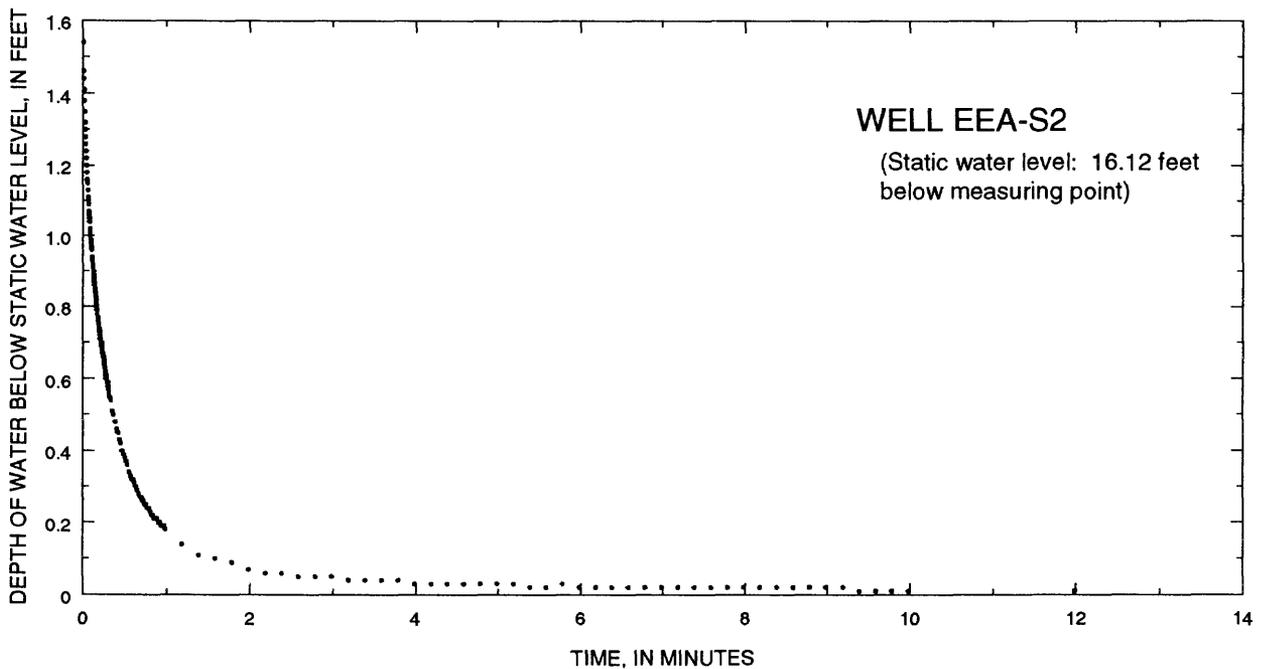


Figure 24. Rising-head data for slug test of observation well EEA-S2 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

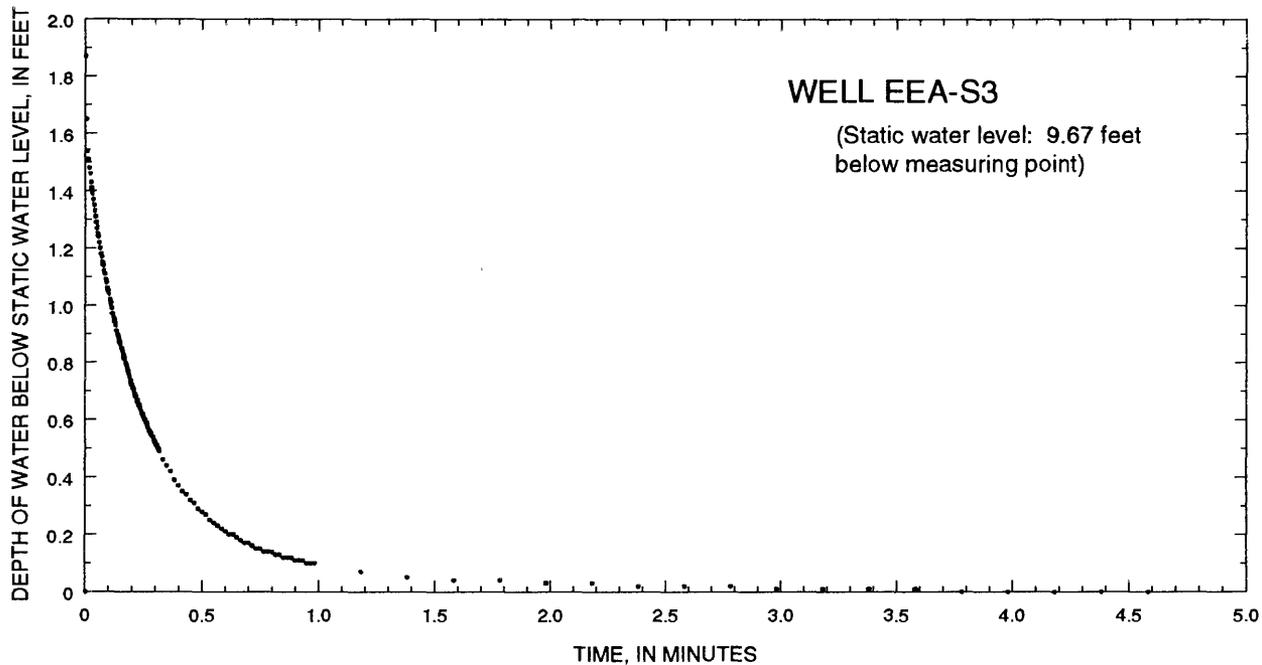


Figure 25. Rising-head data for slug test of observation well EEA-S3 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

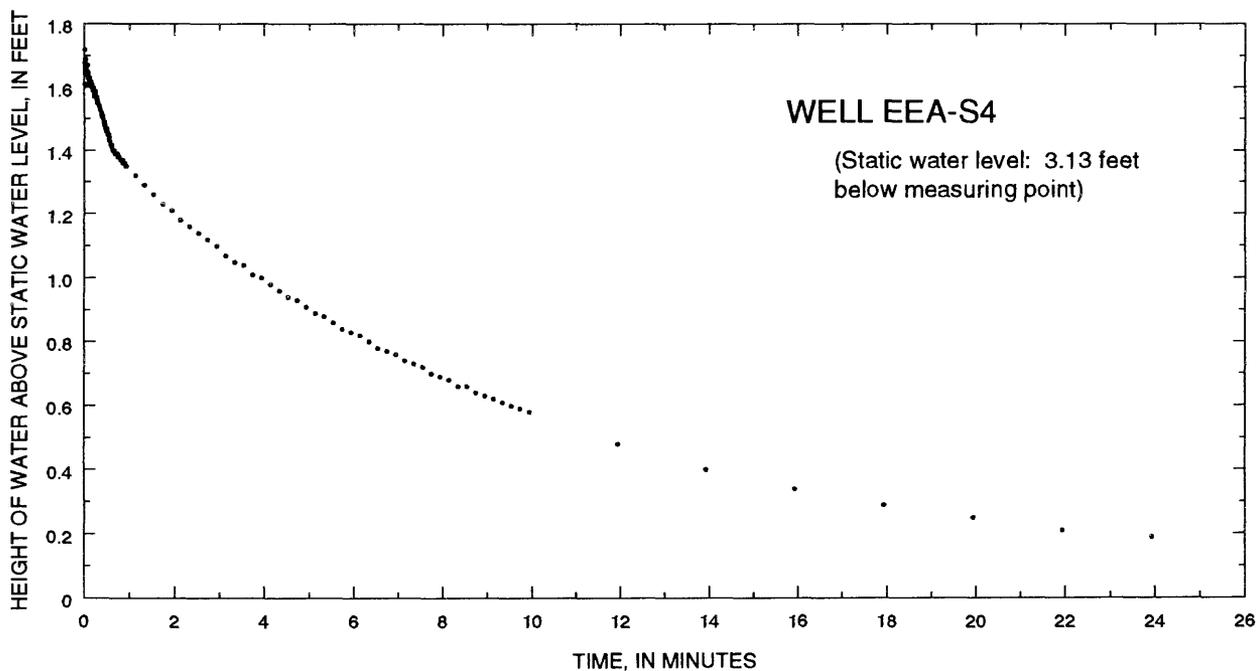


Figure 26. Falling-head data for slug test of observation well EEA-S4 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

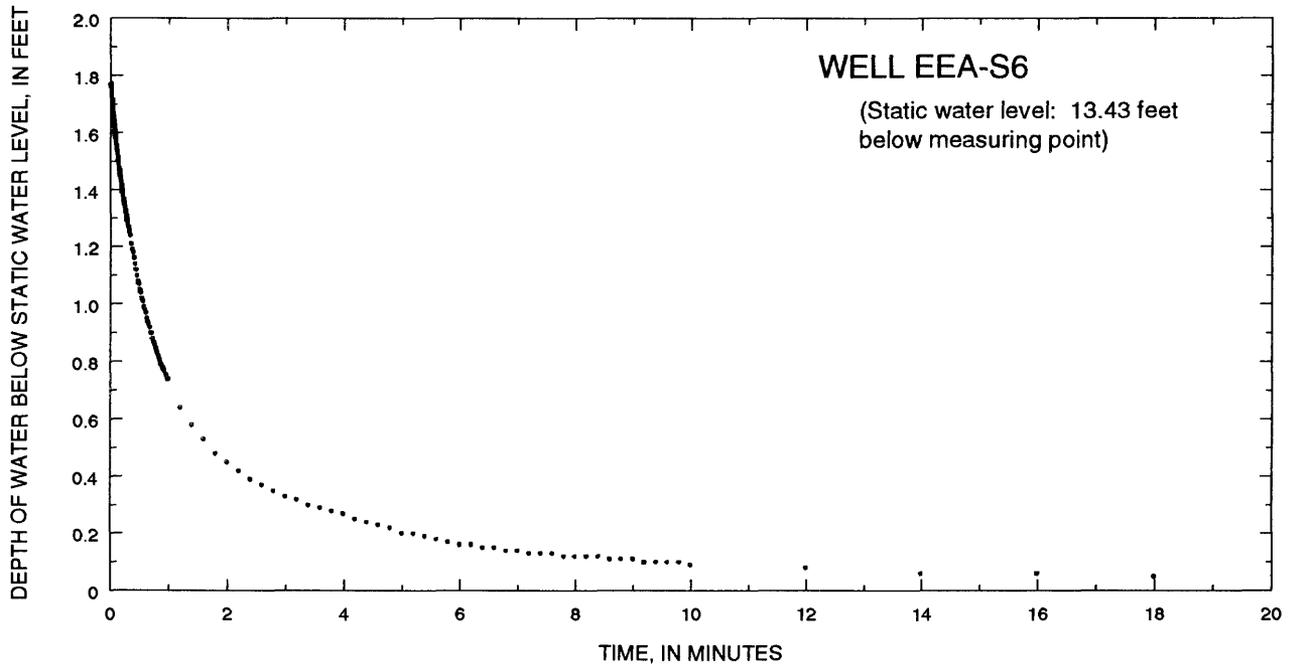


Figure 27. Rising-head data for slug test of observation well EEA-S6 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

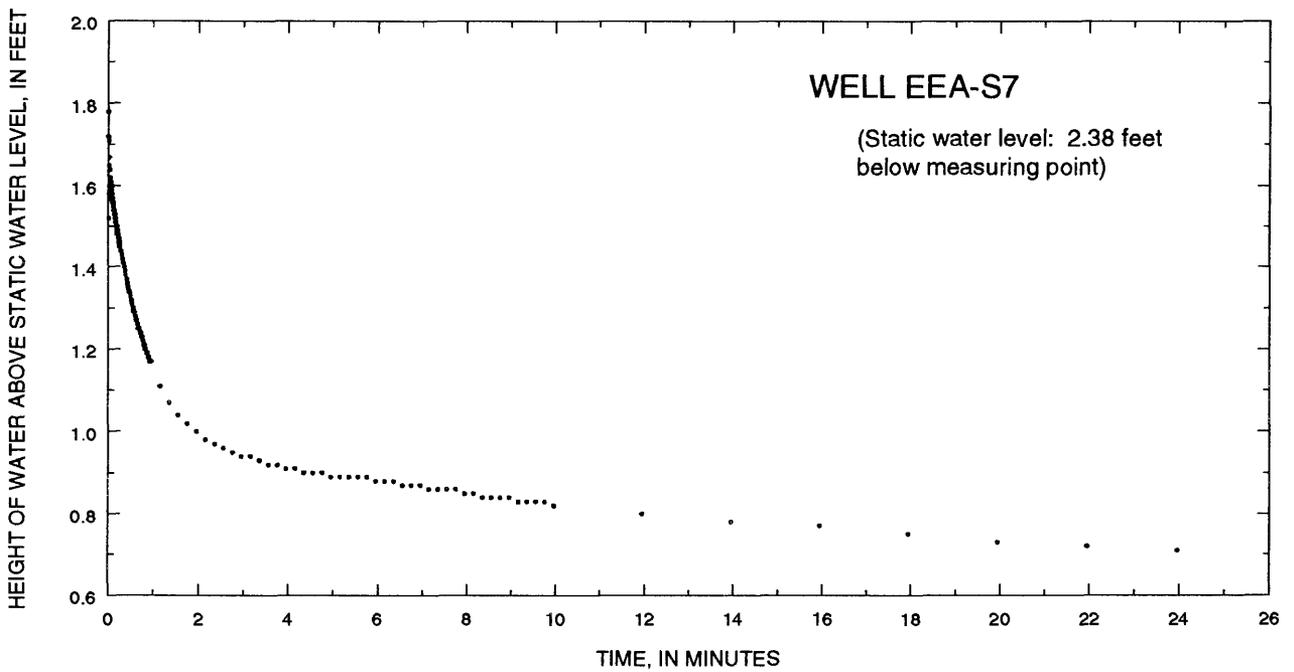


Figure 28. Falling-head data for slug test of observation well EEA-S7 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

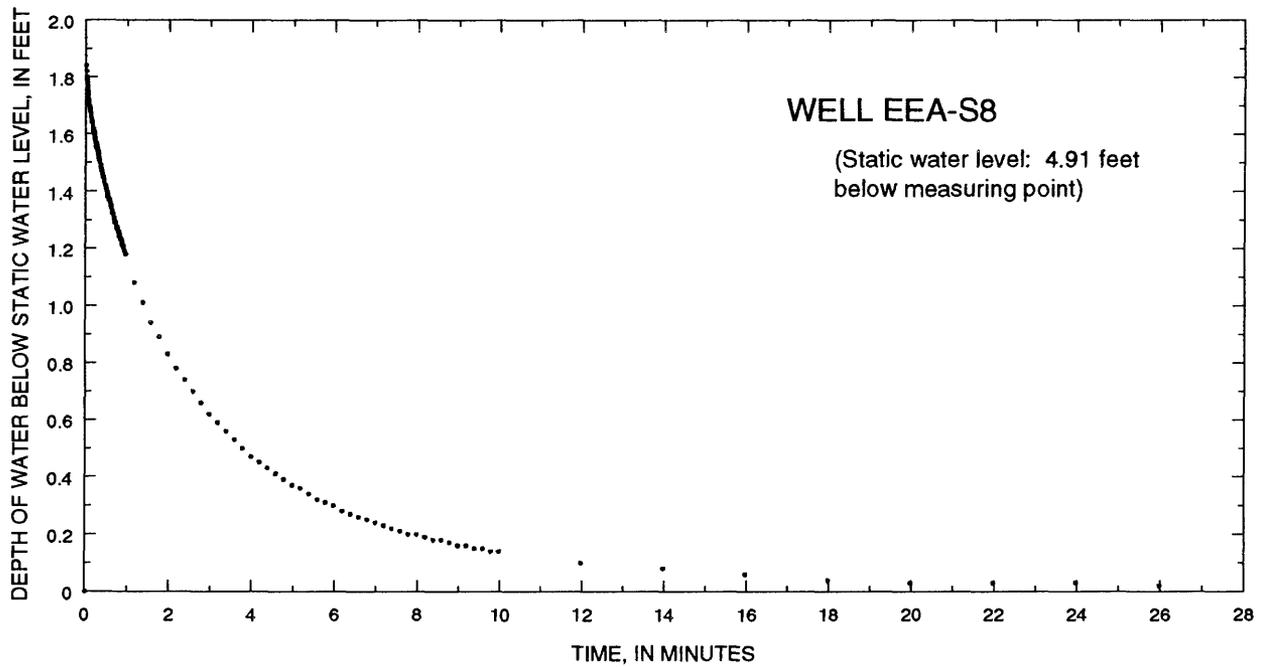


Figure 29. Rising-head data for slug test of observation well EEA-S8 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

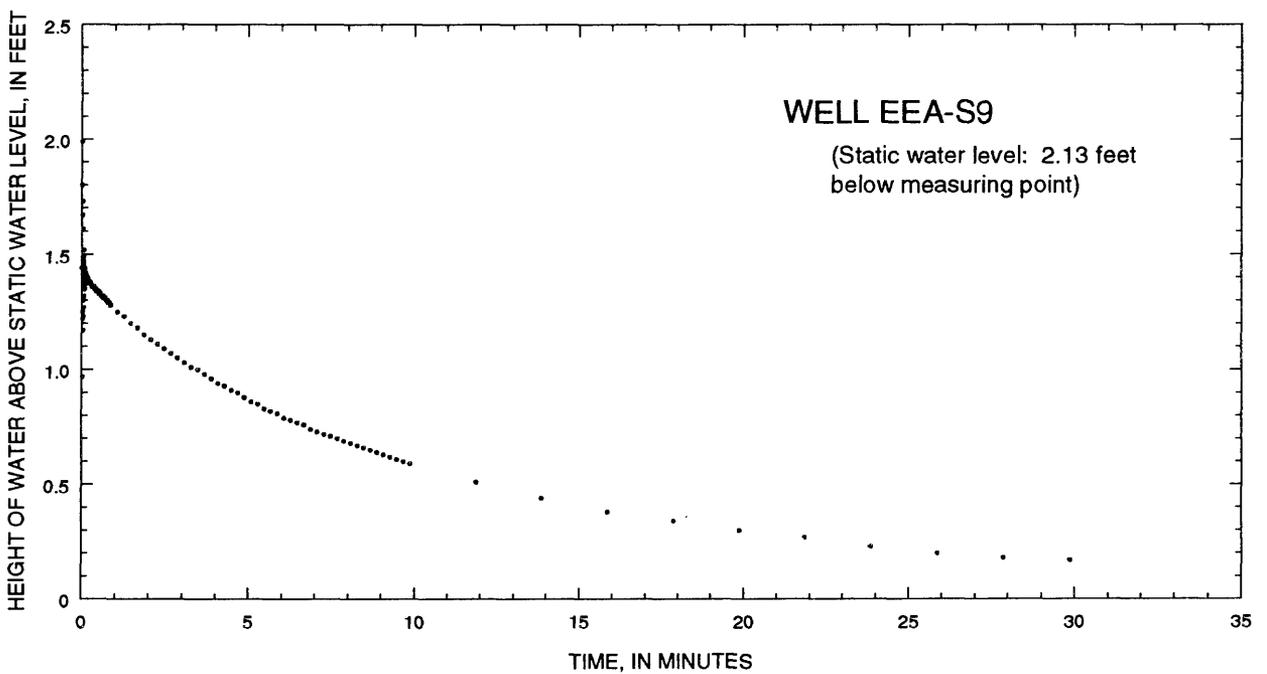


Figure 30. Falling-head data for slug test of observation well EEA-S9 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

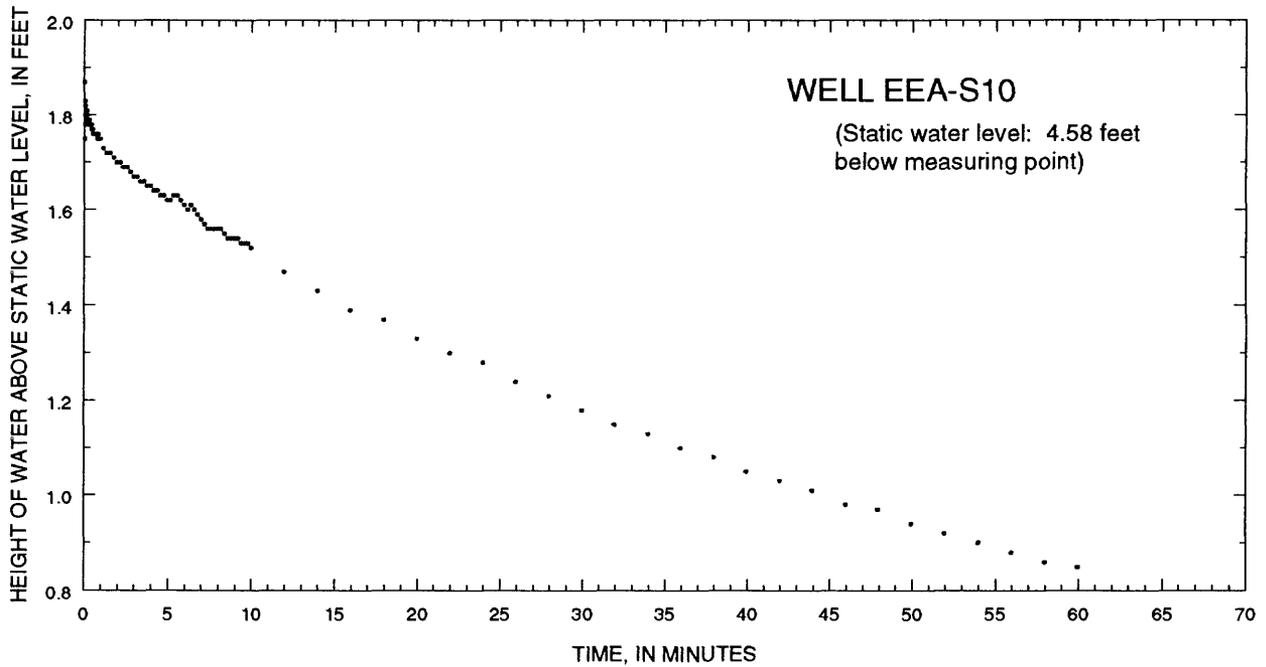


Figure 31. Falling-head data for slug test of observation well EEA-S10 at the Explosive Experimental Area, Naval Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

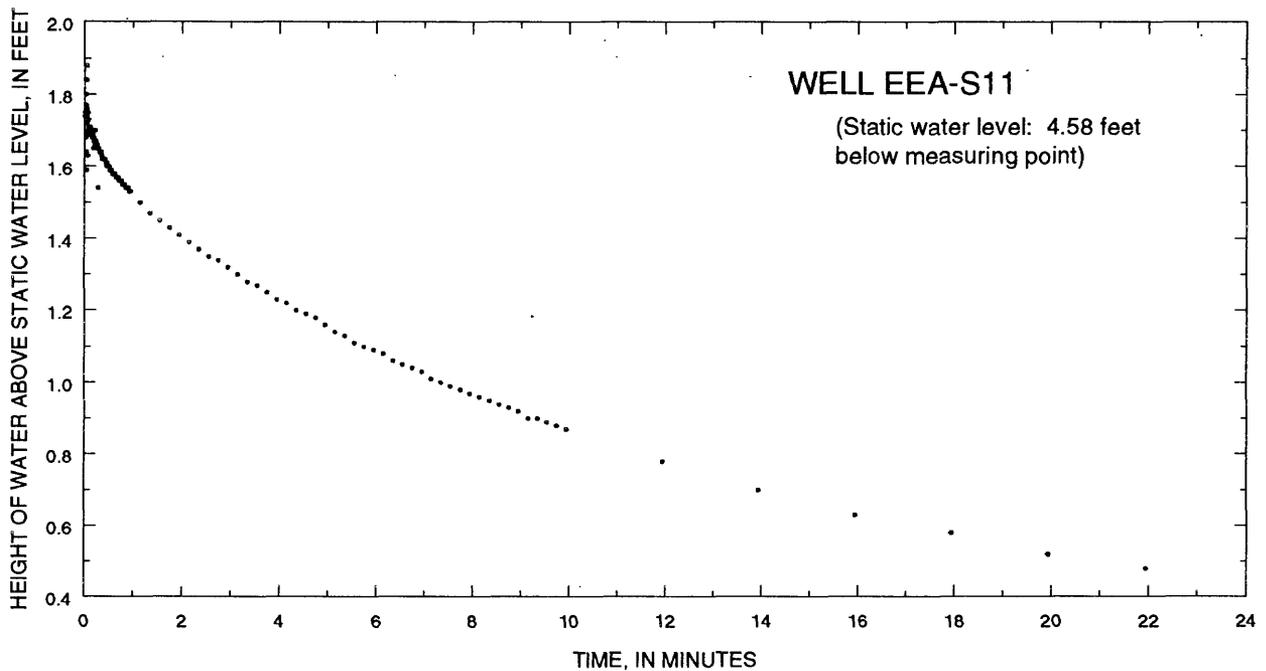


Figure 32. Falling-head data for slug test of observation well EEA-S11 at the Explosive Experimental Area, Naval Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

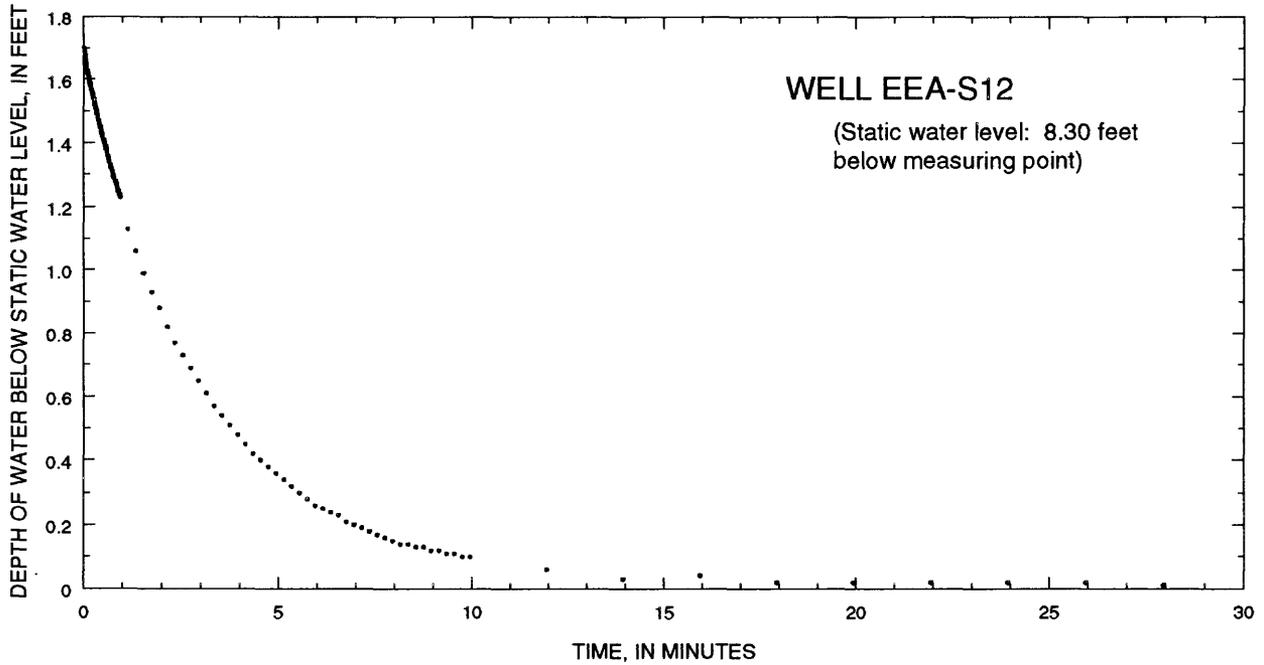


Figure 33. Rising-head data for slug test of observation well EEA-S12 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

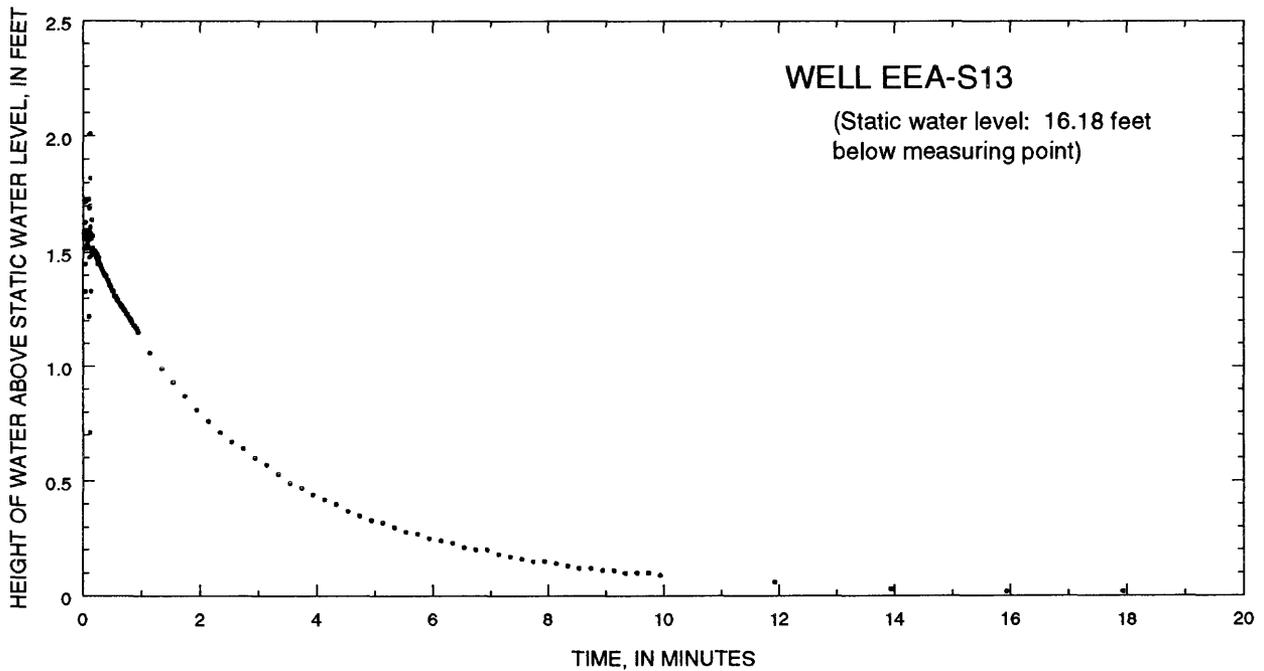


Figure 34. Falling-head data for slug test of observation well EEA-S13 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

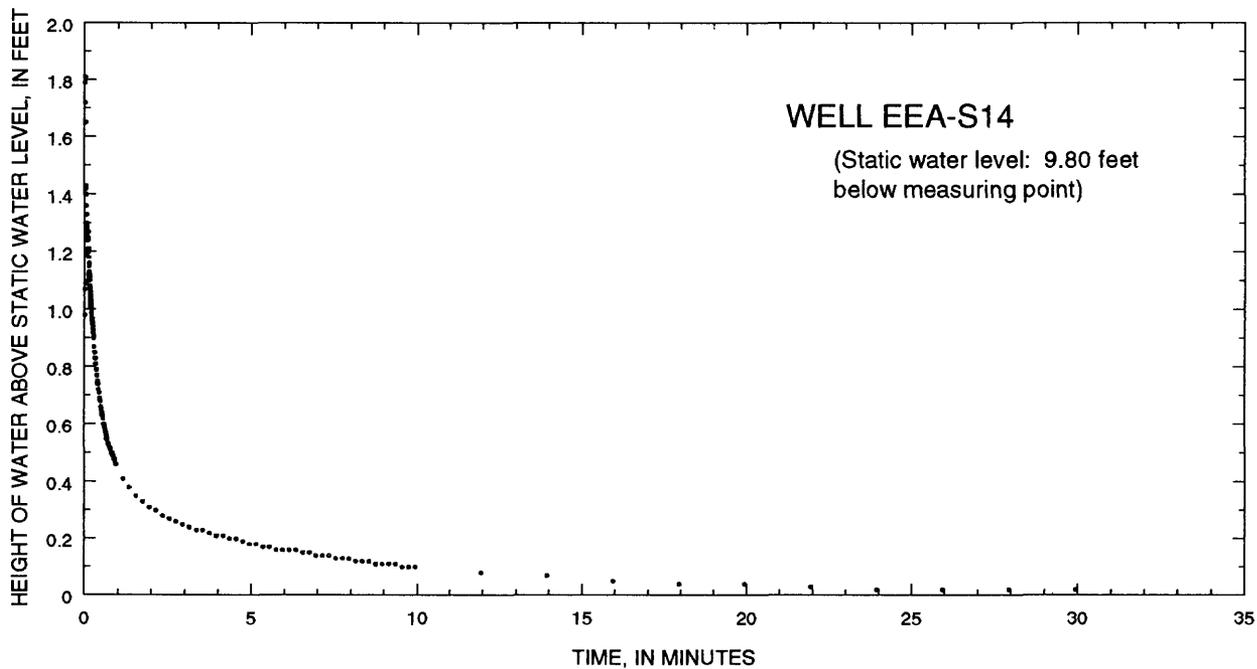


Figure 35. Falling-head data for slug test of observation well EEA-S14 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

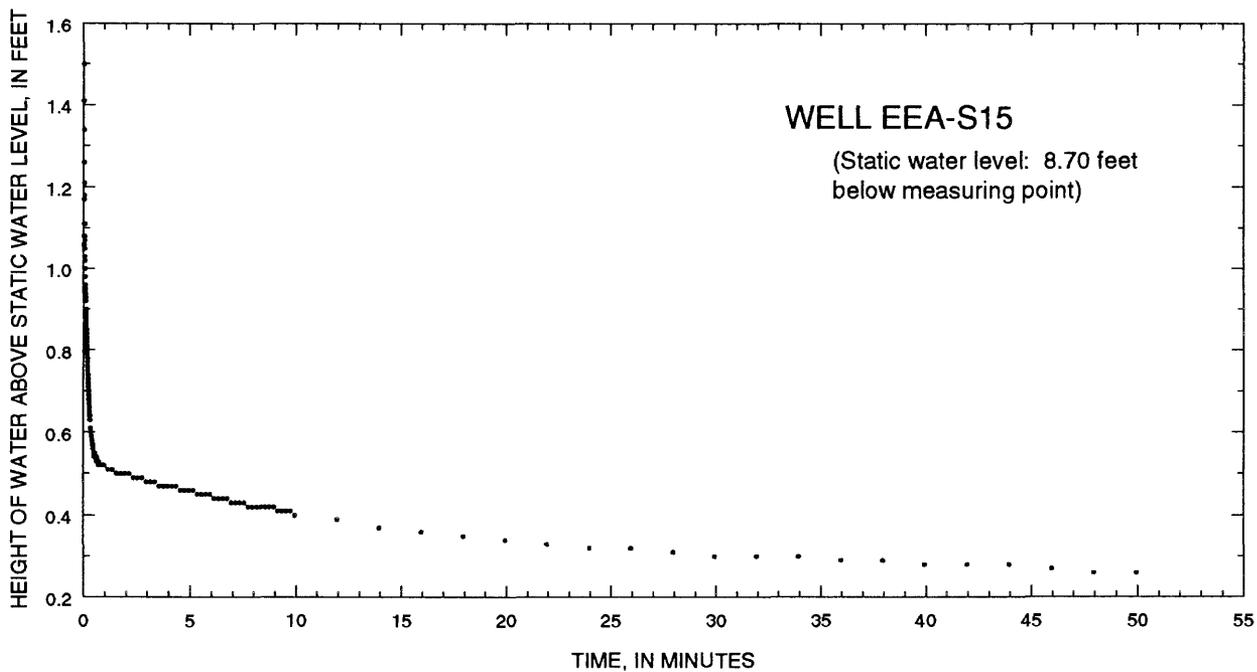


Figure 36. Falling-head data for slug test of observation well EEA-S15 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

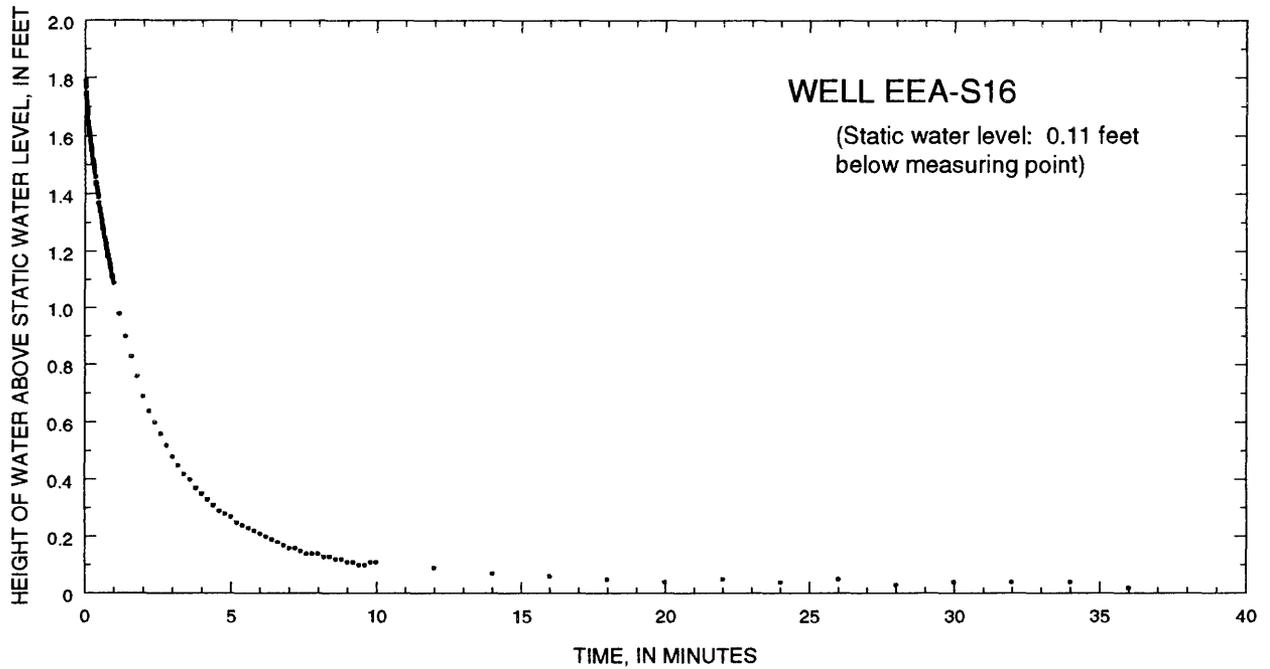


Figure 37. Falling-head data for slug test of observation well EEA-S16 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

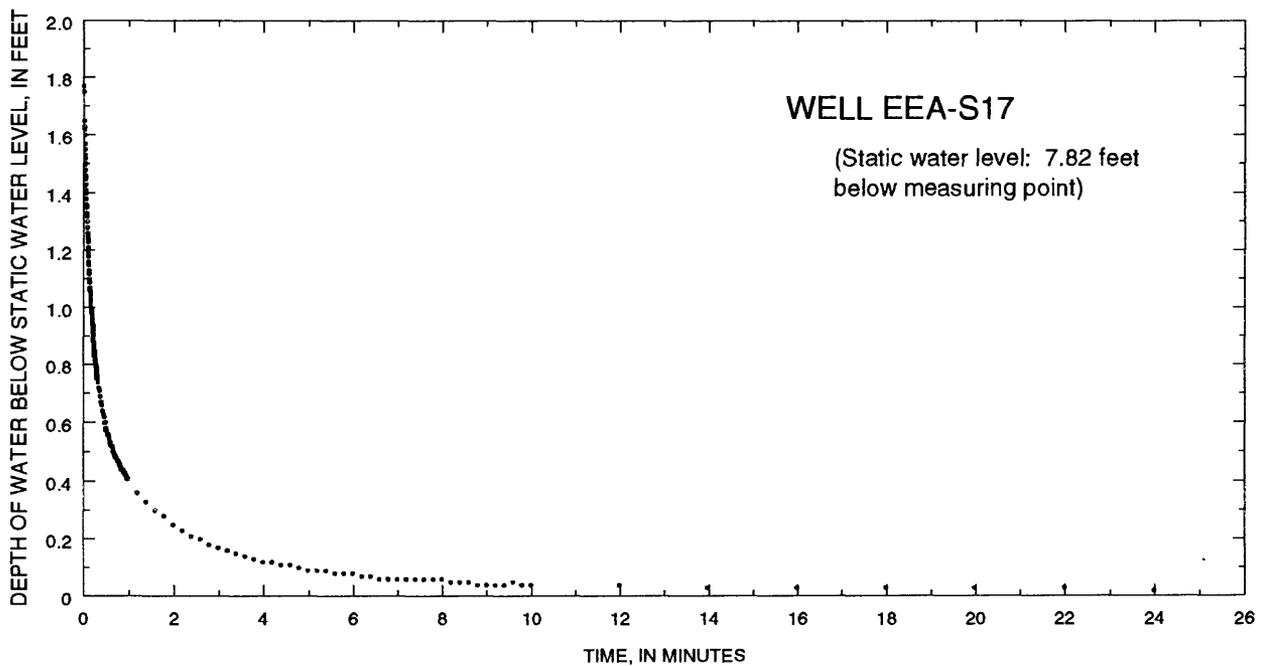


Figure 38. Rising-head data for slug test of observation well EEA-S17 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

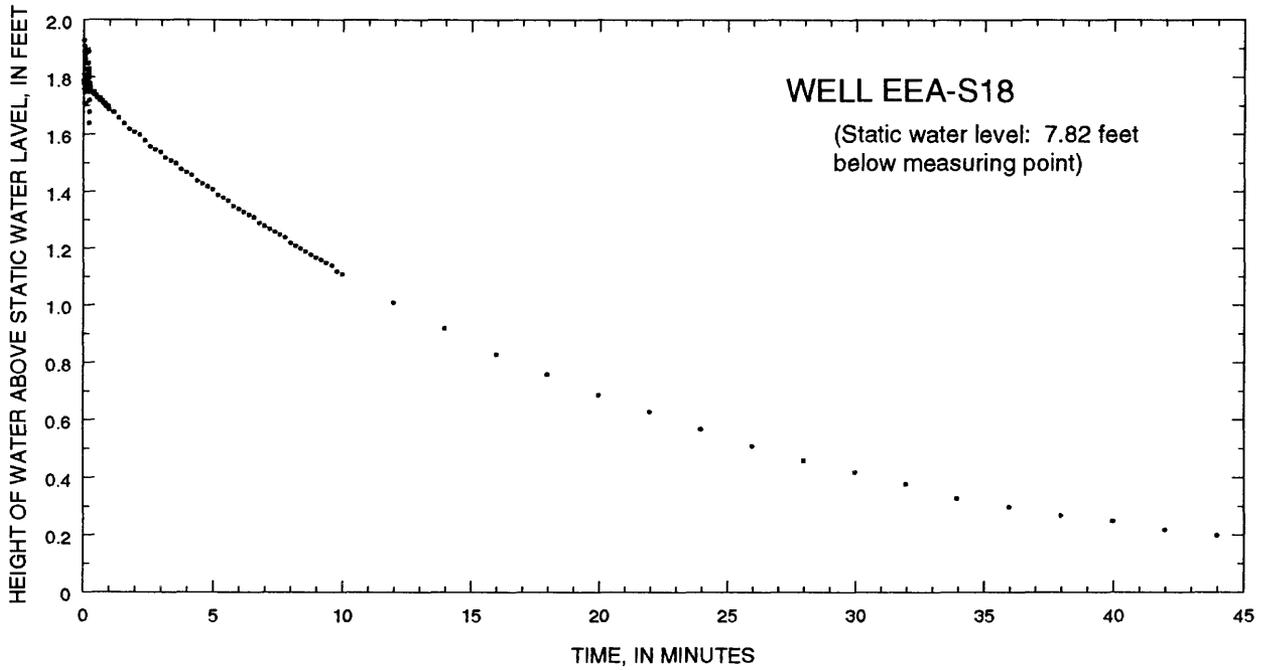


Figure 39. Falling-head data for slug test of observation well EEA-S18 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

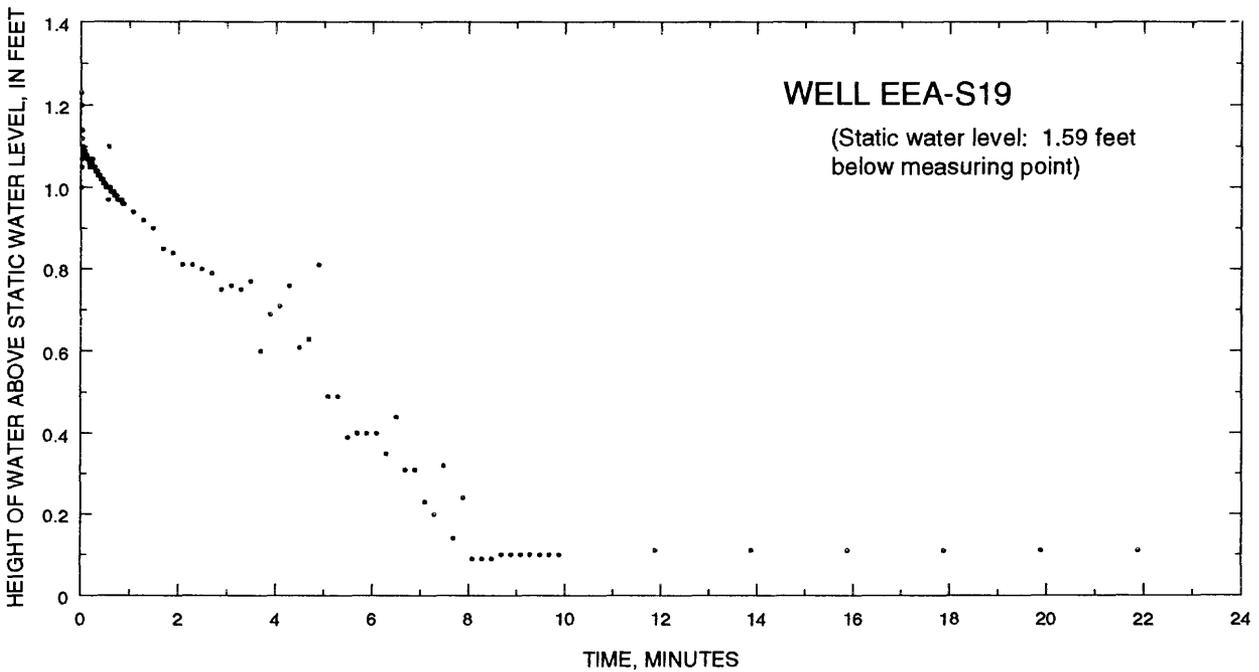


Figure 40. Falling-head data for slug test of observation well EEA-S19 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

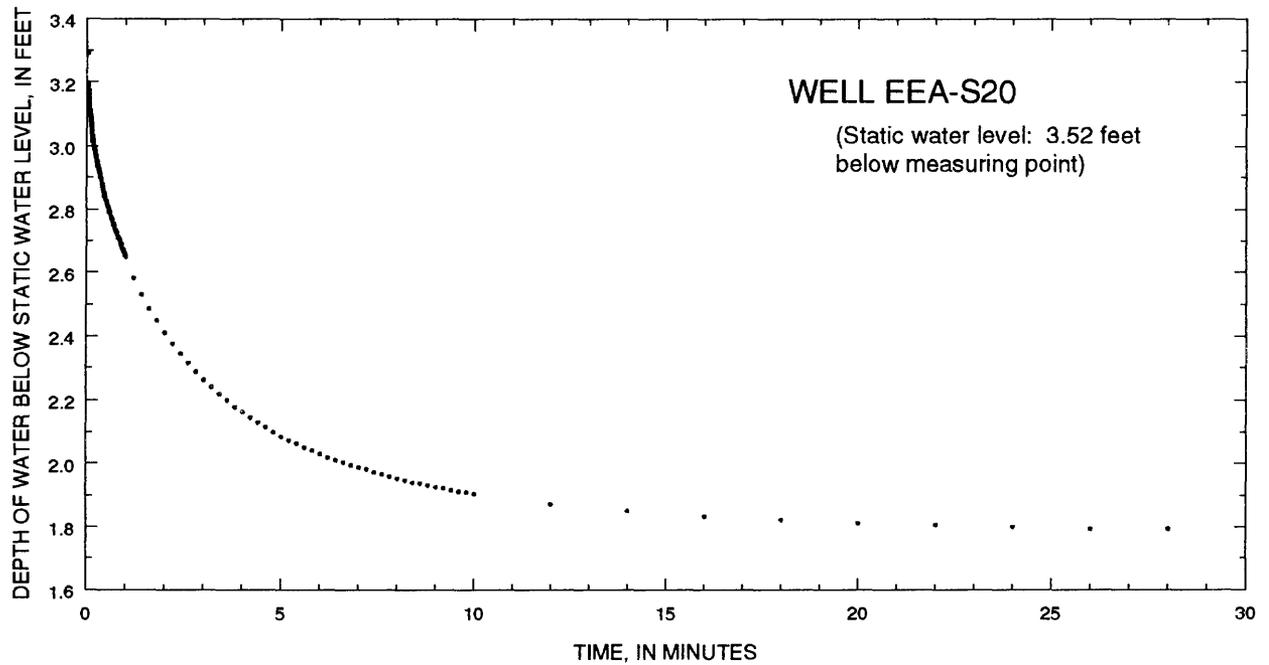


Figure 41. Rising-head data for slug test of observation well EEA-S20 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

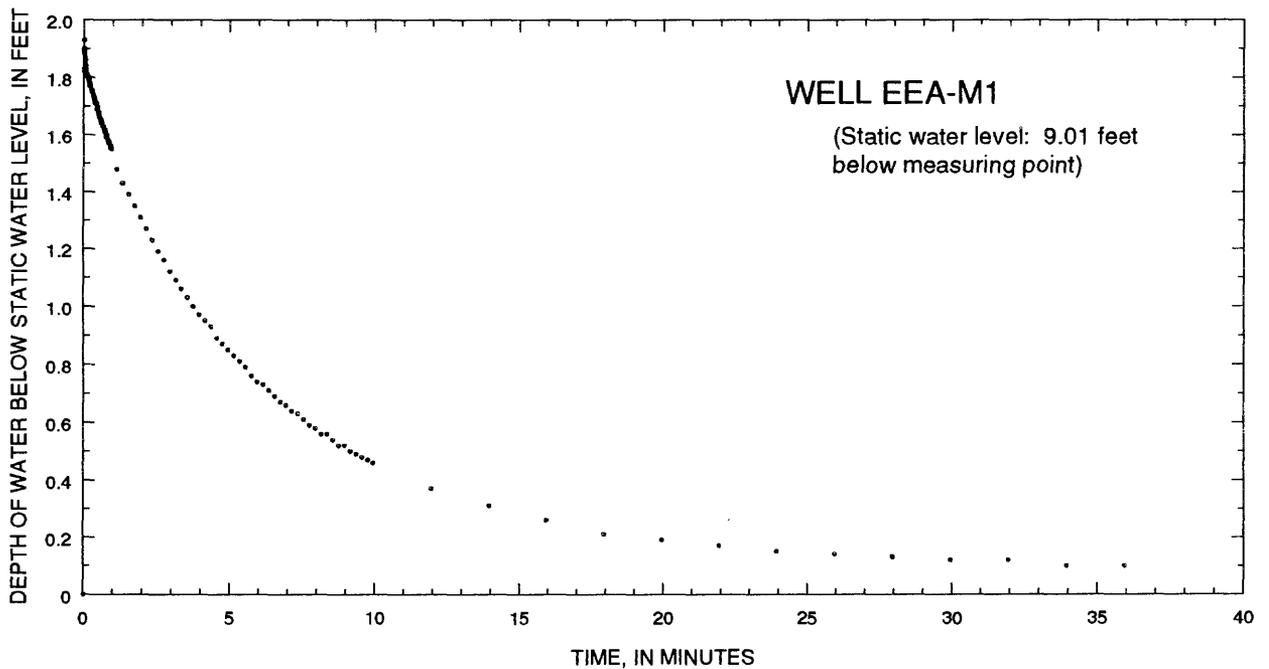


Figure 42. Rising-head data for slug test of observation well EEA-M1 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

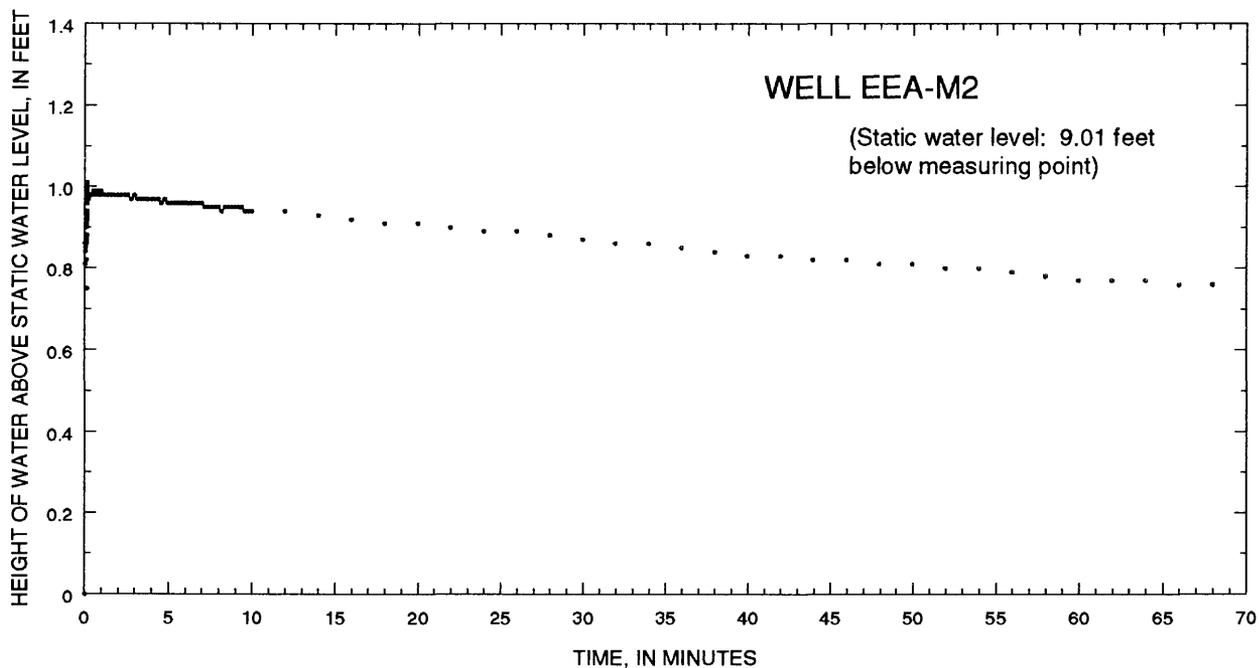


Figure 43. Falling-head data for slug test of observation well EEA-M2 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

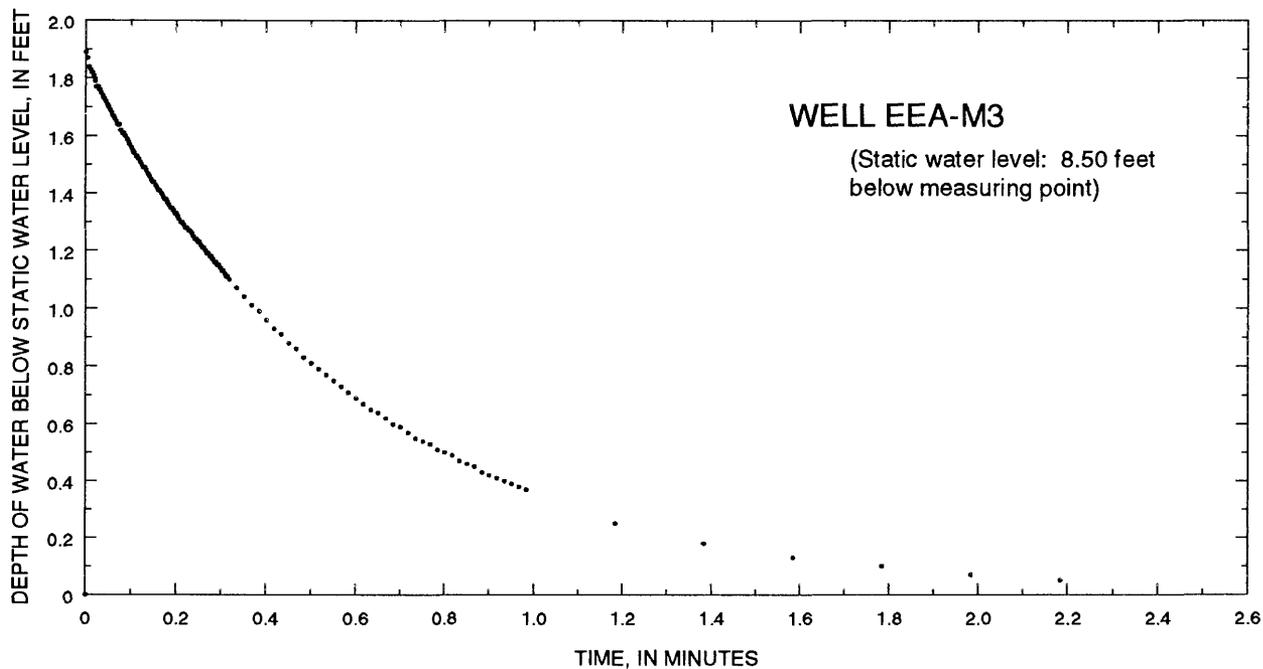


Figure 44. Rising-head data for slug test of observation well EEA-M3 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

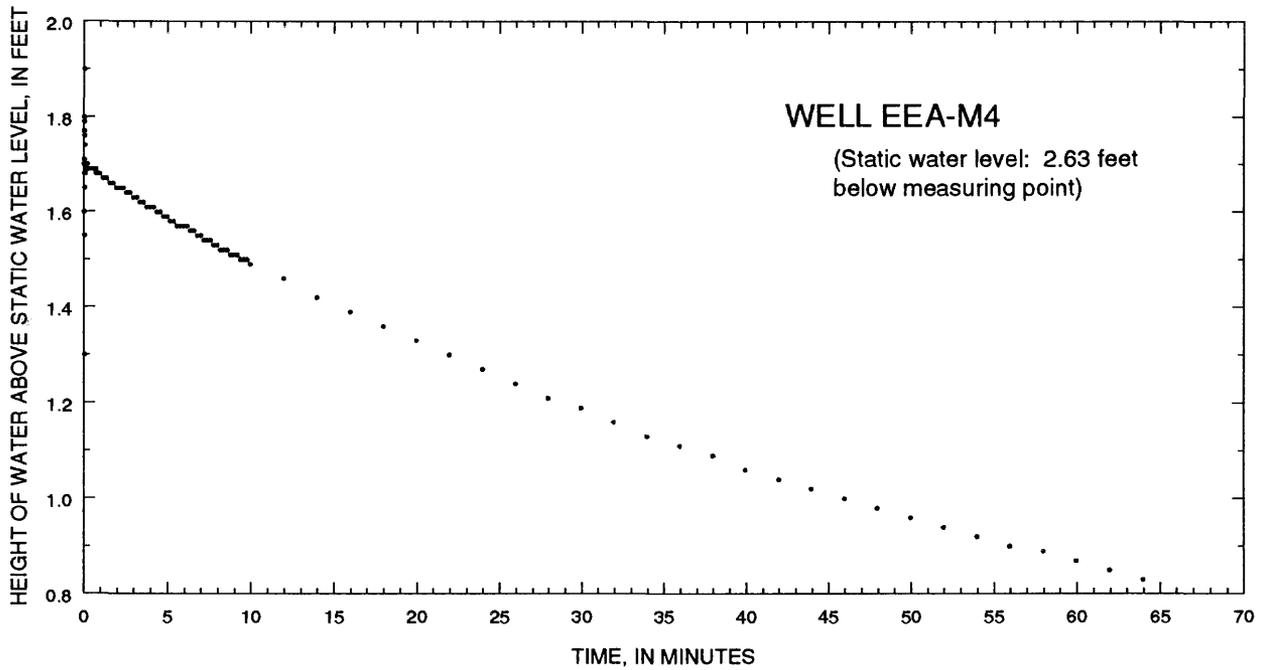


Figure 45. Falling-head data for slug test of observation well EEA-M4 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

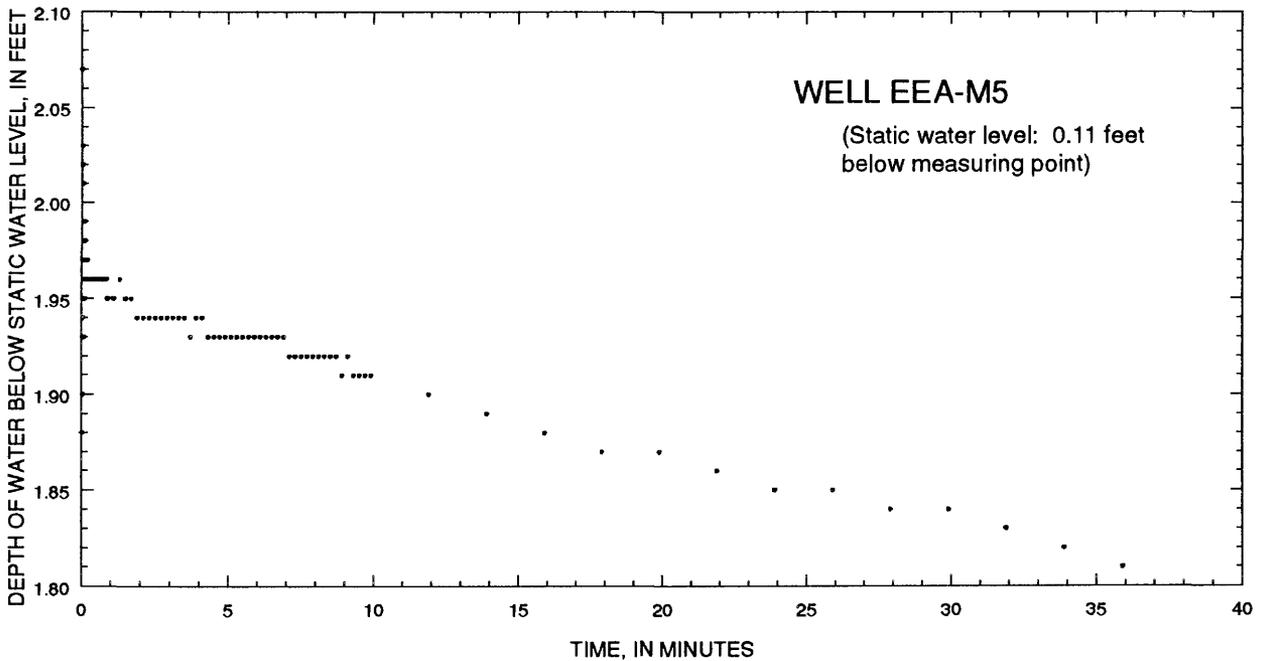


Figure 46. Rising-head data for slug test of observation well EEA-M5 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

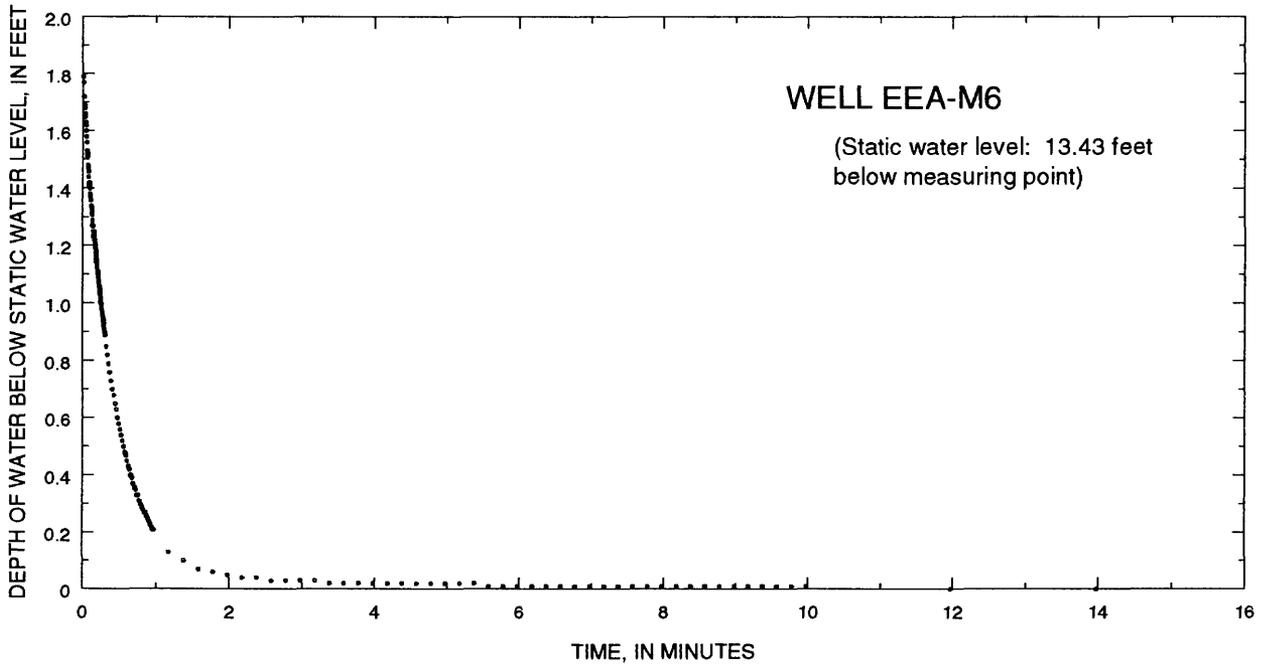


Figure 47. Rising-head data for slug test of observation well EEA-M6 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

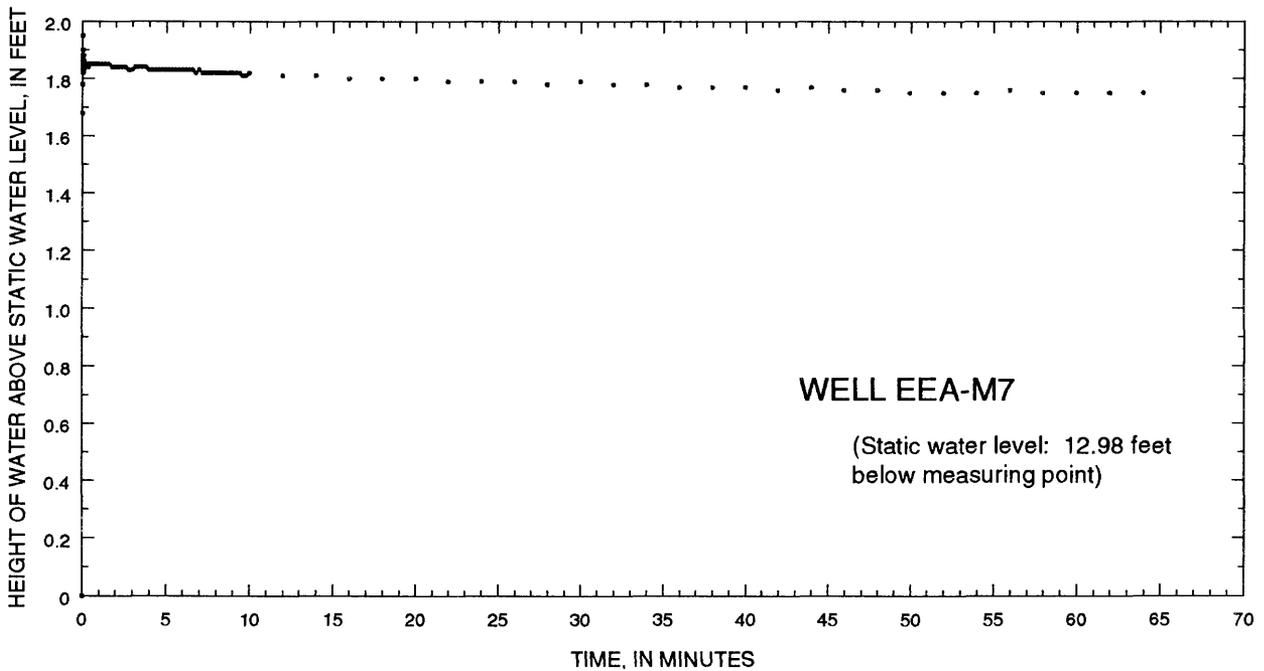


Figure 48. Falling-head data for slug test of observation well EEA-M7 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.

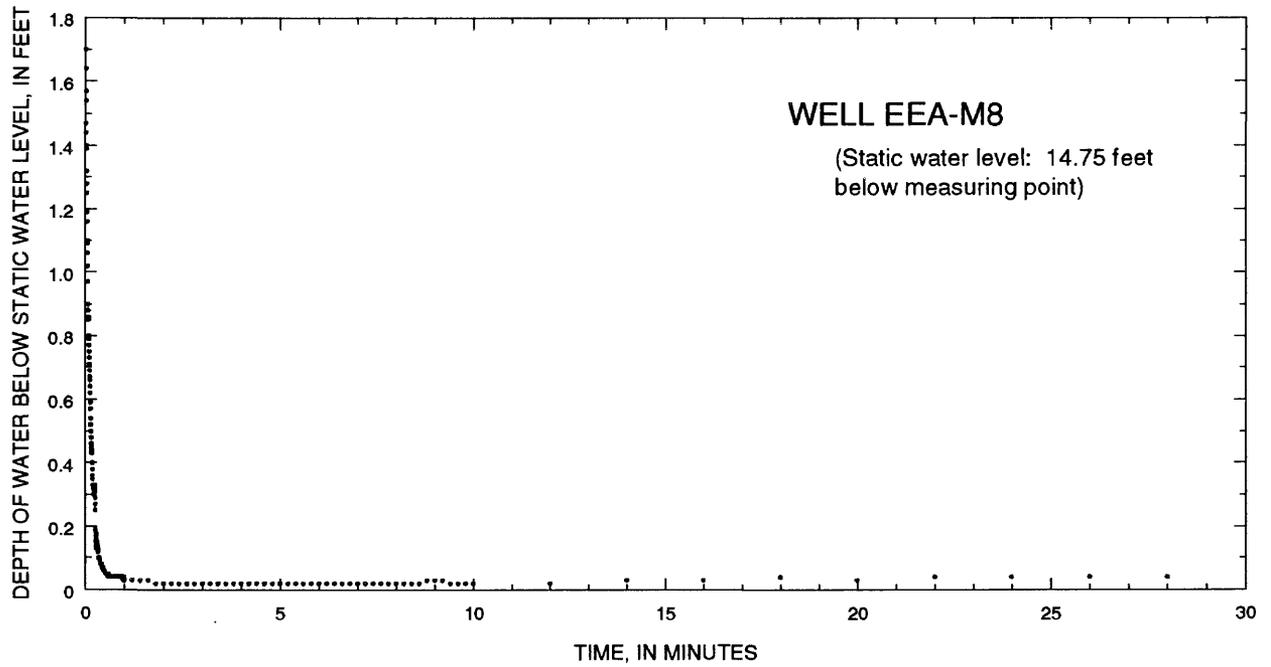


Figure 49. Rising-head data for slug test of observation well EEA-M8 at the Explosive Experimental Area, Naval Surface Warfare Center, Dahlgren Site, Dahlgren, Virginia. For location of observation well, see plate 1.