Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina

Chapter B: Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer

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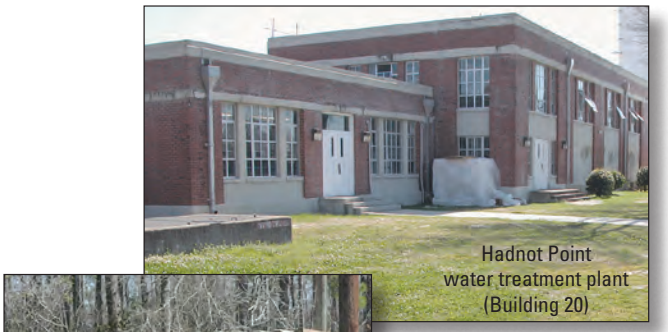

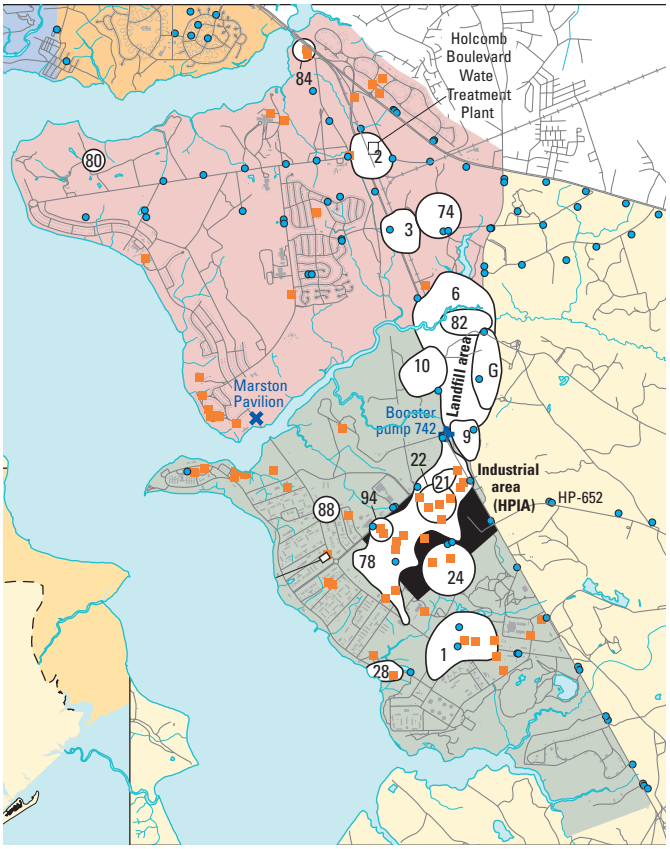

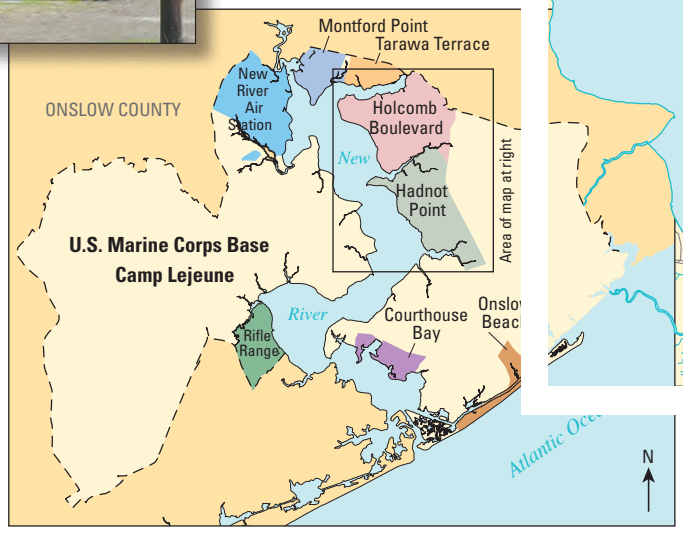

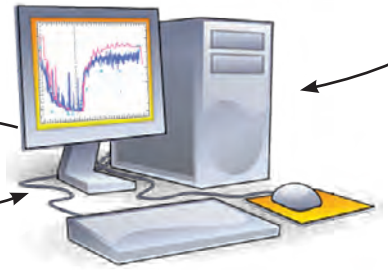

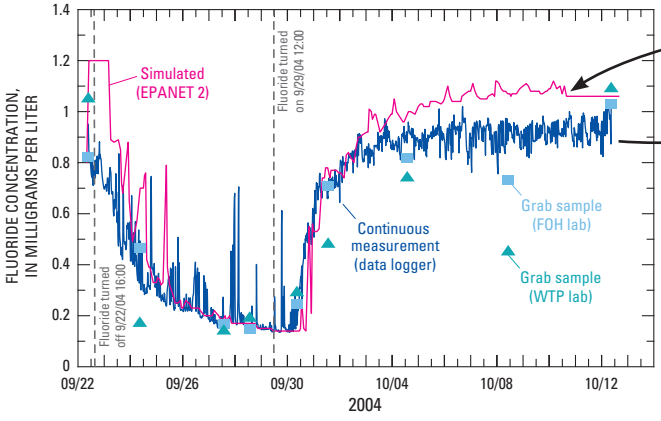

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Atlanta, Georgia – January 2012

This report has been redacted by the Agency for Toxic Substances and Disease Registry (ATSDR) to address security concerns related to identification of coordinate locations of active drinking-water-supply wells. This was done in response to a request from the Department of the Navy based on 18 U.S. C. 795(a); Department of Defense Instructions, 2000.16; and SECNAV M-5510.36 (Major General J.A. Kessler, U.S. Marine Corps to Dr. Thomas Sinks, Deputy Director, ATSDR, written communication, January 5, 2012). An unredacted version of this report was peer reviewed prior to publication.

Front cover: Historical reconstruction process using data, information sources, and water-modeling techniques to estimate historical contaminant concentrations.

Maps: U.S. Marine Corps Base Camp Lejeune, North Carolina; Holcomb Boulevard and Hadnot Point areas showing extent of sampling at installation restoration program sites (white numbered areas), above-ground and underground storage tank sites (orange squares), and water-supply wells (blue circles).

Photograph (upper): Hadnot Point water treatment plant (Building 20).

Photograph (lower): Well house building for water-supply well HP-652.

Graph: Measured fluoride data and simulation results for Paradise Point elevated storage tank (S-2323) for tracer test of the Holcomb Boulevard water-distribution system, September 22–October 12, 2004; simulation results obtained using EPANET 2 water-distribution system model assuming last-in first-out plug flow (LIFO) storage tank mixing model. [WTP lab, water treatment plant water-quality laboratory; FOH lab, Federal Occupational Health Laboratory]

Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina

Chapter B: Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer

By Robert E. Faye

Agency for Toxic Substances and Disease Registry
U.S. Department of Health and Human Services
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January 2012

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Suggested citations

Chapter B Report

Faye RE. Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina—Chapter B: Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer. Atlanta, GA: Agency for Toxic Substances and Disease Registry; 2012.

Plate B1

Maslia ML, Anderson BA, Suárez-Soto RJ, Sautner JB, Bove FJ, Ruckart PZ, Faye RE, Aral MM, Guan J, Jang W, Chang B, Telci IT, Zhang A, and Jones LE. Plate B1—Location of Wells and Boreholes, Installation Restoration Program Site Areas, Above-Ground and Underground Storage Tank Sites, and Water-Distribution Systems (2004), Hadnot Point, Holcomb Boulevard, and Tarawa Terrace and Vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina. Atlanta, GA: Agency for Toxic Substances and Disease Registry; 2012.

Foreword

The Agency for Toxic Substances and Disease Registry (ATSDR), an agency of the U.S. Department of Health and Human Services, is conducting an epidemiological study to evaluate whether in utero and infant (up to 1 year of age) exposures to volatile organic compounds (such as trichloroethylene, tetrachloroethylene, and benzene) in drinking water at U.S. Marine Corps Base Camp Lejeune, North Carolina, were associated with specific birth defects and childhood cancers. The study includes births occurring during the period 1968–1985 to women who were pregnant while they resided in family housing at the base. During 2004, the study protocol received approval from the Centers for Disease Control and Prevention Institutional Review Board and the U.S. Office of Management and Budget.

Historical exposure data needed for the epidemiological case-control study are limited. To obtain estimates of historical exposure, ATSDR is using water-modeling techniques and the process of historical reconstruction. These methods are used to quantify concentrations of particular contaminants in finished water and to compute the level and duration of human exposure to contaminated drinking water.

Eight water-distribution systems have supplied or currently (2011) are supplying drinking water to family housing and other facilities at U.S. Marine Corps Base Camp Lejeune, North Carolina. The three distribution systems of interest to this study—Tarawa Terrace, Hadnot Point, and Holcomb Boulevard—have historically supplied drinking water to the majority of family housing units at the Base. During 2007–2009, ATSDR published historical reconstruction results for Tarawa Terrace and vicinity. Results for Hadnot Point, Holcomb Boulevard, and vicinity—based on information gathering, data interpretations, and water-modeling analyses—are now presented as another series of ATSDR reports supporting the current health study. These reports provide comprehensive descriptions of information, data analyses and interpretations, and modeling results used to reconstruct historical contaminant levels in drinking water within the service areas of the Hadnot Point and Holcomb Boulevard water treatment plants and vicinities. Each topical subject within the historical reconstruction process is assigned a chapter letter. Specific topics for each chapter report are listed below:

- **Executive Summary**
- **Chapter A:** Summary of Findings
- **Chapter B:** Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer
- **Chapter C:** Occurrence of Selected Contaminants in Groundwater at Installation Restoration Program sites
- **Chapter D:** Occurrence of Selected Contaminants in Groundwater at Above Ground and Underground Storage Tank (AST/ UST) sites
- **Chapter E:** Physical, Chemical, and Fate Properties of Selected Contaminants in Soil and Groundwater and Computations of Contaminant Mass in Soil and Groundwater
- **Chapter F:** Descriptions and Characterizations of Data Pertinent to Water-Supply Well Capacities, Histories, and Operations
- **Chapter G:** Descriptions and Characterizations of Water-Level Data and Groundwater Flow for the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer

- **Chapter H:** Development and Application of a Methodology to Characterize Present-Day and Historical Water-Supply Well Operations
- **Chapter I:** Theory, Development, and Application of Linear Control Model Methodology to Reconstruct Historical Contaminant Concentrations at Selected Water-Supply Wells
- **Chapter J:** Simulation of Three-Dimensional Groundwater Flow
- **Chapter K:** Source Characterization and Simulation of Fate and Transport of Selected Volatile Organic Compounds in the Vicinities of the Hadnot Point Industrial Area and Landfill
- **Chapter L:** Source Characterization and Simulation of the Migration of Light Non-aqueous Phase Liquids (LNAPLs) in the Vicinity of the Hadnot Point Industrial Area
- **Chapter M:** Field Tests, Data Analyses, and Simulation of the Distribution of Drinking Water with Emphasis on Intermittent Transfers of Drinking Water Between the Hadnot Point and Holcomb Boulevard Water-Distribution Systems
- **Chapter N:** Supplemental Information

An electronic version of this report, *Chapter B: Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer*, will be made available on the ATSDR Camp Lejeune Web site at *http://www.atsdr.cdc.gov/sites/lejeune/index.html*. Readers interested solely in a summary of this report or any of the other reports can refer to *Chapter A: Summary of Findings* that also will be available on the ATSDR Web site.

Contents

Figures (Figures B6–B34 are in back of report)

Tables (Tables B5–B7 and B9–B25 are in back of report)

Appendix B1 Tables

Conversion Factors

Multiply	By	To obtain
	Length	
inch	2.54	centimeter (cm)
inch	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile	1.609	kilometer (km)
mile, nautical (nmi)	1.852	kilometer (km)
yard (yd)	0.9144	meter (m)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m^3)
million gallons (Mgal)	3,785	cubic meter (m^3)
	Flow rate	
foot per day (ft/d)	0.3048	meter per day (m/d)
gallon per minute (gpm)	0.06309	liter per second (L/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
inch per year (in/yr)	25.4	millimeter per year (mm/yr)
	Hydraulic conductivity	
foot per day (ft/d)	0.3048	meter per day (m/d)
	Hydraulic gradient	
foot per day (ft/d)	0.3048	meter per day (m/d)

Concentration Conversion Factors and Datums

Unit	To convert to	Multiply by
microgram per liter (µg/L)	milligram per liter (mg/L)	0.001
microgram per liter (µg/L)	milligram per cubic meter (mg/m^3)	1
microgram per liter (µg/L)	microgram per cubic meter ($µg/m^3$)	1,000
parts per billion by volume (ppbv)	parts per million by volume (ppmv)	1,000

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft^3/d)/ft^2]ft. In this report, the mathematically reduced form, foot squared per day (ft^2/d), is used for convenience.

English to metric conversions are only for liquids, not gases.

Glossary and Abbreviations

Definitions of terms and abbreviations used throughout this report are listed below.

—A—

AST Above-ground storage tank

ATSDR Agency for Toxic Substances and Disease Registry

—B—

BBLAQ Brewster Boulevard lower aquifer

BBLCU Brewster Boulevard lower confining unit

BBUAQ Brewster Boulevard upper aquifer

BBUCU Brewster Boulevard upper confining unit

bgs Below ground surface

Bldg Building

bls Below land surface

BTEX Benzene, toluene, ethylbenzene, and xylene; a group of VOCs found in petroleum hydrocarbons, such as gasoline, and other common environmental contaminants

—C—

calibration *See* model calibration

CERCLA The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund

CLW Camp Lejeune water document

—D—

DCE	DCE	dichloroethylene
	1,1-DCE	1,1-dichloroethylene or 1,1-dichloroethene
	1,2-DCE	1,2-dichloroethylene or 1,2-dichloroethene
	cis-1,2-DCE	*cis*-1,2-dichloroethylene or *cis*-1,2-dichloroethene
	trans-1,2-DCE	*trans*-1,2-dichloroethylene or *trans*-1,2-dichloroethene

DEM Digital elevation model

density The mass per unit volume of material, expressed in terms of kilograms per cubic meter or grams per cubic centimeter

DVD Digital video disc

—E—

epidemiological study A study to determine whether a relation exists between the occurrence and frequency of a disease and a specific factor such as exposure to a toxic compound found in the environment

exposure Pollutants or contaminants that come in contact with the body and present a potential health threat

—F—

fate and transport Also known as mass transport; a process that refers to how contaminants move through, and are transformed in, the environment

finished water Groundwater that has undergone treatment at a water treatment plant and is delivered to a person's home.

ft Foot or feet

ft/d Foot per day

—G—

gal Gallon or gallons

GC/MS Gas chromatograph/Mass spectrometer

GIS Geographic information system

gpm Gallon per minute

GPS Global positioning system

—H—

historical reconstruction A diagnostic analysis used to examine historical characteristics of groundwater flow, contaminant fate and transport, water-distribution systems, and exposure

HPFF Hadnot Point Fuel Farm

HPIA Hadnot Point Industrial Area

hydraulic conductivity A coefficient of proportionality describing the rate at which water can move through a permeable medium

—I—

IAS Initial Assessment Study

IR Installation Restoration

IRP Installation Restoration Program

—K—

kg Kilogram

—L—

LCHAQ Lower Castle Hayne aquifer

LCHCU Lower Castle Hayne confining unit

leakance The ratio of the vertical hydraulic conductivity of a confining bed to the thickness of the confining bed.

LNAPL Light nonaqueous phase liquids

—M—

MCHAQ Middle Castle Hayne aquifer

MCHCU Middle Castle Hayne confining unit

MG Million gallons

MGD Million gallons per day

mg/L Milligram per liter; 1 part per million (ppm), a unit of concentration

model calibration The process of adjusting model input parameter values until reasonable agreement is achieved between model-predicted outputs or behavior and field observations

—N—

N/A Not available

NACIP Navy Assessment and Control of Installation Pollutants

NAD 83 North American Datum of 1983

NCDENR North Carolina Department of Environment and Natural Resources

NGVD 29 National Geodetic Vertical Datum of 1929

NPL National Priorities List; the USEPA's official list of uncontrolled hazardous waste sites which are to be cleaned up under the Superfund legislation

—P—

PCE Tetrachloroethene, tetrachloroethylene, 1,1,2,2-tetrachloroethylene, or perchloroethylene; also known as PERC® or PERK®

PHA Public health assessment; an evaluation conducted by ATSDR of data and information on the release of hazardous substances into the environment in order to assess any past, present, or future impact on public health

potentiometric level A level to which water will rise in a tightly cased well

potentiometric surface An imaginary surface defined by the levels to which water will rise in tightly cased wells. The water table is a particular potentiometric surface

—R—

RCRA Resource Conservation and Recovery Act of 1976

RI Remedial investigation

RI/FS Remedial Investigation/Feasibility Study

—S—

saturated zone Zone at or below the water table

SI Site investigation

SR Highway or state route

storativity The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head

—T—

TCE 1,1,2-trichloroethene, or 1,1,2-trichloroethylene, or trichloroethylene

transmissivity The rate at which water of a prevailing density and viscosity is transmitted through a unit width of an aquifer or confining bed under a unit hydraulic gradient

TTAQ Tarawa Terrace aquifer

—U—

UCHCU Upper Castle Hayne confining unit

UCHLU Upper Castle Hayne aquifer lower unit

UCHRBU Upper Castle Hayne aquifer–River Bend unit

UCHRBU&LU Upper Castle Hayne aquifer–River Bend and Lower units

unsaturated zone Zone or area above the water table; also known as the vadose zone

USEPA U.S. Environmental Protection Agency

USGS U.S. Geological Survey

USMCB U.S. Marine Corps Base

UST Underground storage tank

—V—

variability Observed differences attributable to heterogeneity or diversity in a model parameter, an exposure parameter, or a population

VC Vinyl chloride or chloroethene

VOC Volatile organic compound; an organic chemical compound (chlorinated solvent) that has a high enough vapor pressure under normal circumstances to significantly vaporize and enter the atmosphere. VOCs are considered environmental pollutants, and some may be carcinogenic

—W—

water-distribution system A water-conveyance network consisting of hydraulic facilities such as wells, reservoirs, storage tanks, high-service and booster pumps, and a network of pipelines for delivering drinking water

water table Also known as the phreatic surface; the surface where the water pressure is equal to atmospheric pressure

WTP Water treatment plant

—Symbols—

µg/L Microgram per liter; 1 part per billion (ppb), a unit of concentration used in groundwater sampling

Use of trade names and commercial sources is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry or the U.S. Department of Health and Human Services.

Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina

Chapter B: Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer

By Robert E. Faye[1]

Abstract

The Agency for Toxic Substances and Disease Registry, an agency of the U.S. Department of Health and Human Services, is conducting an epidemiological study to evaluate whether in utero and infant (up to 1 year of age) exposures to volatile organic compounds (such as trichloroethylene, tetrachloroethylene, and benzene) in drinking water supplied to family housing units at U.S. Marine Corps Base Camp Lejeune, North Carolina, were associated with specific birth defects and childhood cancers. The study includes births occurring during the period 1968–1985 to women who were pregnant while they resided in family housing at the base. During 2004, the study protocol received approval from the Centers for Disease Control and Prevention Institutional Review Board and the U.S. Office of Management and Budget.

Historical exposure data needed for the epidemiological case-control study are limited. To obtain estimates of historical exposure, water-modeling methods and techniques are applied to complete the process of historical reconstruction. These methods are used to quantify concentrations of particular contaminants in finished water and to compute the level and duration of human exposure to contaminated drinking water.

During 2007–2009, ATSDR published historical reconstruction results for Tarawa Terrace and vicinity. Similar results for Hadnot Point, Holcomb Boulevard, and vicinity—based on information gathering, data interpretations, and water-modeling analyses—are the focus of current studies, of which this report is a major component. This report, Chapter B, is 1 of 14 reports planned to describe and summarize groundwater and geohydrologic data and water-modeling results necessary to reconstruct historical contaminant levels in drinking water at Hadnot Point, Holcomb Boulevard, and vicinity. This report specifically provides detailed analyses and interpretations of well, borehole, and geophysical data used to develop the geohydrologic framework of the Brewster Boulevard and Castle Hayne aquifer systems and the Tarawa Terrace aquifer. The geometry and lithology of seven aquifers and related confining units are described in a series of sections, maps, and tables. Hydraulic characteristics, including hydraulic conductivity, transmissivity, storativity, and leakance parameters, are tabulated for several geohydrologic units. Where data density is sufficient, maps showing spatial distributions of hydraulic conductivity are included.

Background

U.S. Marine Corps Base (USMCB) Camp Lejeune is located in the Coastal Plain of North Carolina, in Onslow County, south of the City of Jacksonville and about 70 miles northeast of the City of Wilmington, North Carolina. The focus of this investigation is the areas served by the water-distribution networks supplied by the Hadnot Point and Holcomb Boulevard water treatment plants (WTPs), herein called the study area or the Hadnot Point–Holcomb Boulevard study area. In general, the study area is bordered on the north by Northeast Creek and North Carolina Highway 24 (SR 24), to the west by New River, to the south by Frenchs Creek, and generally to the east by the drainage divides of the upstream tributaries of Wallace and Frenchs Creeks (Figure B1, Plate B1). The total study area is approximately 50 square miles.

Eight water-distribution systems have supplied or currently (2011) are supplying drinking water to family housing and other facilities at USMCB Camp Lejeune, North Carolina. Three water-distribution systems historically supplied drinking water to family housing at USMCB Camp Lejeune—Tarawa Terrace, Hadnot Point, and Holcomb Boulevard. Two of the water-distribution systems were contaminated

[1]Consultant to Eastern Research Group, Inc., Lexington, Massachusetts.

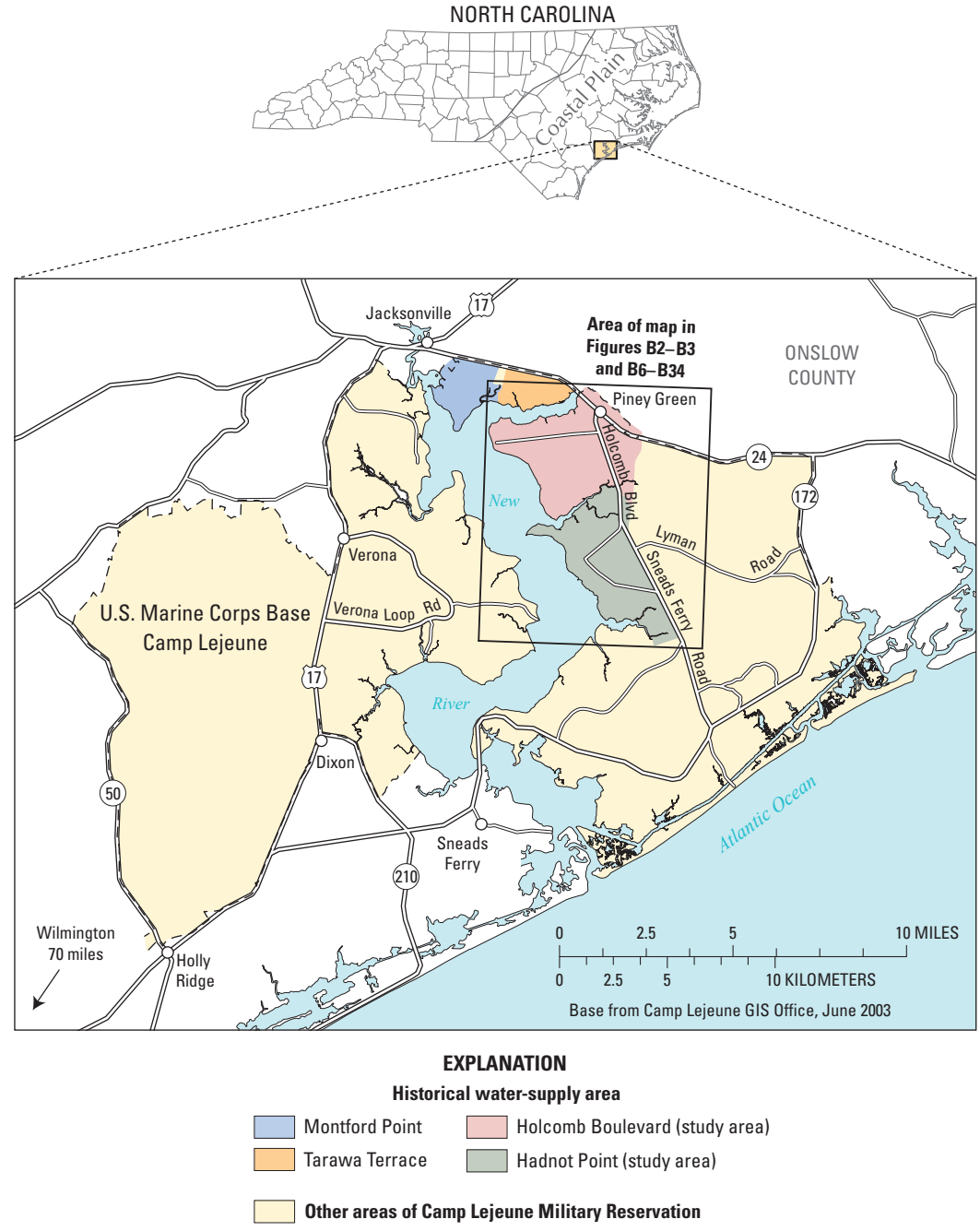


Figure B1. Study area and cultural and geographic features at U.S. Marine Corps Base Camp Lejeune, North Carolina.

with volatile organic compounds (VOCs). Groundwater supplied to the Tarawa Terrace WTP was contaminated with tetrachloroethylene (PCE). Groundwater supplied to the Hadnot Point WTP was contaminated mostly with trichloroethylene (TCE), as well as PCE and refined petroleum products such as benzene, toluene, ethylbenzene, and xylene (BTEX). Groundwater supplied to the Holcomb Boulevard WTP was mostly uncontaminated. The Hadnot Point WTP was constructed probably during 1941 and 1942, along with much of the original infrastructure of the Base. Construction of the Holcomb Boulevard WTP was completed during the summer of 1972. Family housing areas within the study area with corresponding populations are listed in Table B1. Until the summer of 1972, all finished water[2] distributed to family housing units and all other facilities within the study area

[2]For this study, finished water is defined as groundwater that has undergone treatment at a WTP and delivered to a family housing unit or other facility.

Table B1. Chronology of Hadnot Point and Holcomb Boulevard family and bachelor housing construction and contemporary populations, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NA, not available]

Housing area	Year built	Number of units	Type of units	Resident population[1]
Bachelor Housing	NA	NA	NA	NA/13,427
Berkeley Manor	1962/1963	677	Single	2,721/2,486
Hospital Point	1947	24	Single (?)	NA/86
Midway Park	1942/1943	699	Single and duplex	1,726/1,809
Paradise Point	1942	5	Single	
	1947	100	Single	
	1948	67	Single	
	1962	123	Single	
	1999	(total) 510	Single	1,854/1,665
Watkins Village	1978/1979	250	Townhouses	1,342/1,347

[1] The first number is the resident population indicated by hand-written notes on the maps listed below under Data sources. The second number is the resident population in 1999 reported by ECG, Inc. (1999, Appendix 2)

Data sources:

ECG, Inc. 1999

U.S. Marine Corps Base Camp Lejeune

Map of Berkeley Manor area, June 30, 1979

Map of Midway Park housing area and Naval Hospital, July 31, 1984

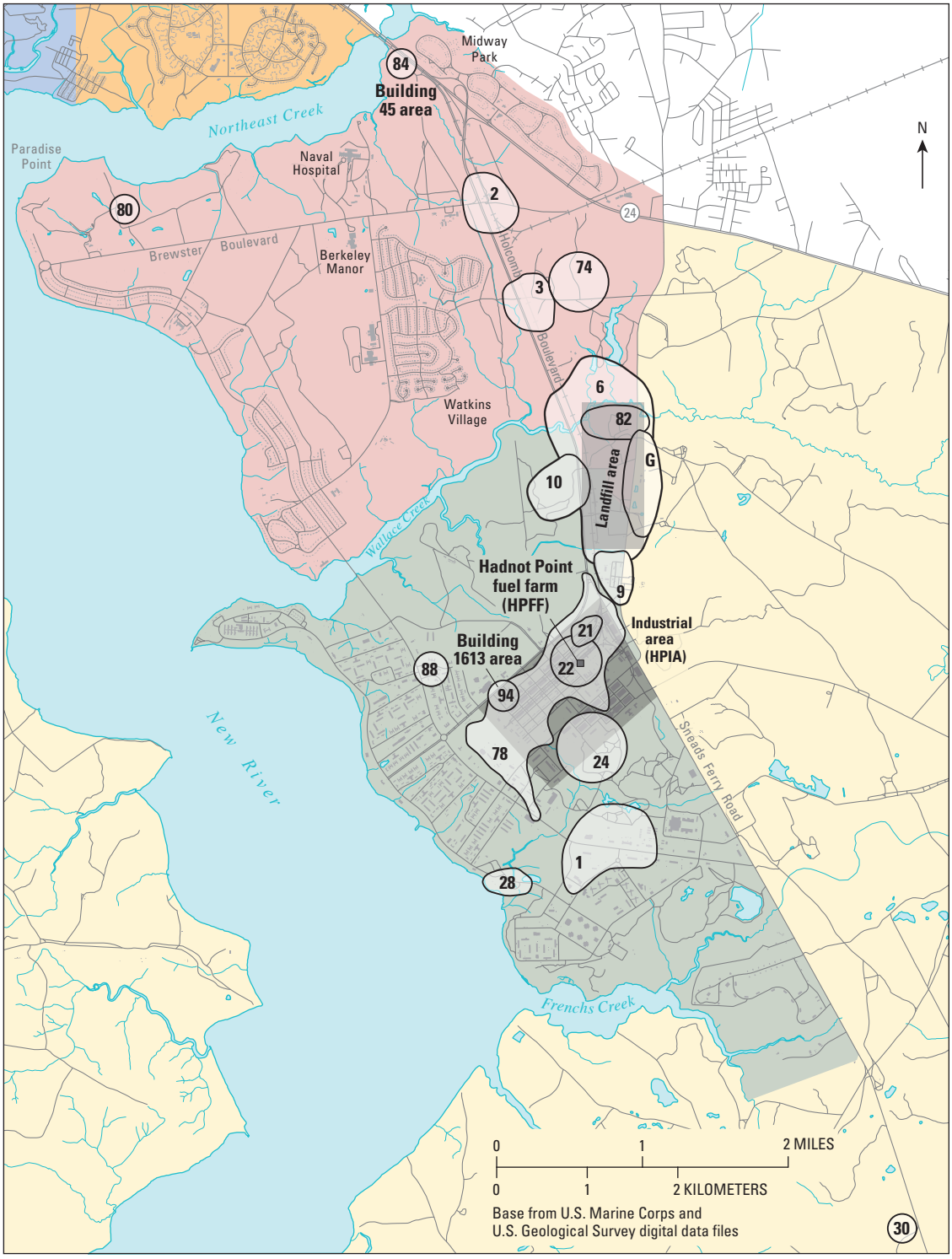
Map of Officer Quarters, Paradise Point area, July 31, 1984

Map of Watkins Village, June 30, 1979

Scott R. Williams, U.S. Marine Corps Base Camp Lejeune, written communication, September 9, 2008

was supplied by the Hadnot Point WTP. Subsequent to 1972, finished water distributed to Berkeley Manor, Midway Park, Paradise Point, and Watkins Village family housing areas was supplied by the Holcomb Boulevard WTP.

Between October 1980 and August 1982, routine gas chromatograph/mass spectrometer (GC/MS) analyses for trihalomethane in water samples collected from the Hadnot Point WTP were interrupted by interference from constituents in the water samples thought to be halogenated hydrocarbons (Grainger Laboratories, written communication, August 10, 1982; Camp Lejeune Water Documents CLW #436, #438, #441, #443, #592, #5177, #5179, #5180; Elizabeth A. Betz, written communication, August 19, 1982; Camp Lejeune Water Documents CLW #606–607). Subsequent analyses confirmed the presence of PCE and TCE in the water samples ranging, respectively, from not detected to 15 micrograms per liter (µg/L) and from 19 to 1,400 µg/L. Discovery of contaminated water supplies at USMCB Camp Lejeune initiated a series of assessments of groundwater contamination within the Hadnot Point–Holcomb Boulevard study area beginning in 1984 and continuing to the present day (2011). In 1991, all groundwater contaminant investigation and remediation activities at USMCB Camp Lejeune were placed under the oversight of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA) (Environmental and Safety Designs, Inc. 1996; Baker Environmental, Inc. 1999). Investigations of groundwater contamination under the auspices of CERCLA have been conducted at 19 sites within the study area as a part of the Installation Restoration Program (IRP) (Figure B2, Plate B1; IRP Site 96 is not shown on Plate B1). In general, IRP investigations address the occurrence of all contaminants of concern to this study—PCE, TCE, dichloroethylene (DCE), vinyl chloride, and BTEX components. At many locations at USMCB Camp Lejeune, investigations of groundwater contamination conducted under the provisions of RCRA are dedicated to the discovery and remediation of soil and groundwater contamination caused by refined petroleum products leaking from underground and above-ground storage tanks (USTs and ASTs) (Baker Environmental, Inc. 1993a). To date (2011), RCRA investigations that address contamination at UST and AST locations have occurred at approximately 60 RCRA sites located throughout the study area and were largely concentrated at and in the vicinity of the Hadnot Point Industrial Area (HPIA), supply well HP-645, Midway Park, Hospital Point, immediately west of Watkins Village, and near IRP Site 1, southeast of the HPIA (Plate B1, Figure B3). Because of contaminants discovered within the Hadnot Point WTP distribution network during the latter part of 1984 and early 1985, operations at all recognized contaminated supply wells within the study area were terminated by February 1985 (Faye et al. 2010).



EXPLANATION

Historical water-supply areas of Camp Lejeune Military Reservation

- Montford Point
- Tarawa Terrace
- Holcomb Boulevard
- Hadnot Point

Other areas of Camp Lejeune Military Reservation

28 **CERCLA** (Comprehensive Environmental Response, Compensation, and Liability Act)—Installation Restoration Program site and number and approximate areal extent of sampling during contaminant delineation

Figure B2. Installation Restoration Program (CERCLA) site locations and Site G, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

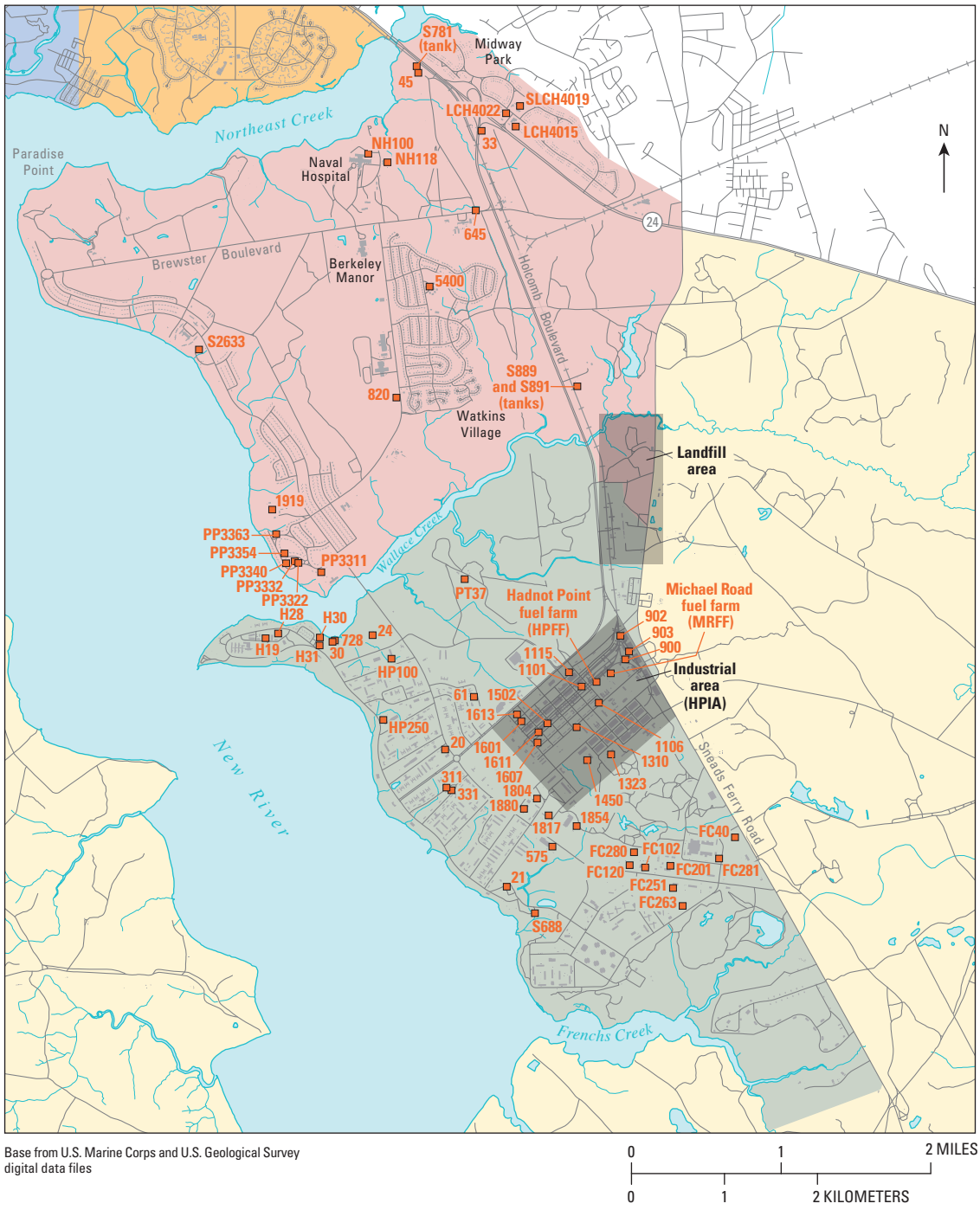


Figure B3. Underground and above-ground storage (RCRA) site locations, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Purpose of Study

The current health study of birth defects and specific childhood cancers by the Agency for Toxic Substances and Disease Registry (ATSDR) requires estimates or direct knowledge of contaminant concentrations in finished water delivered to family housing within the study area. When direct knowledge of contaminant concentrations in finished water is unavailable, historical reconstruction is used to provide estimates of contaminant concentrations. Characteristically, historical reconstruction includes the application of simulation tools, such as models, to re-create or represent past conditions (Rodenbeck and Maslia 1998; McLaren/Hart-ChemRisk 2000; Maslia et al. 2001; Costas et al. 2002; Reif et al. 2003; Kopecky et al. 2004). At USMCB Camp Lejeune, historical reconstruction methods include linking materials mass balance (mixing) and water-distribution system models to groundwater-flow and transport models (Maslia et al. 2009). Groundwater fate and transport models are based to a large degree on groundwater-flow velocities or specific discharges simulated by a groundwater-flow model (Faye 2007b; Faye and Valenzuela 2007). Data necessary for the construction of a groundwater-flow model are the vertical and spatial (vertical and horizontal) distribution (geometry) of aquifers and confining units and their respective hydraulic characteristics, such as hydraulic conductivity and specific storage. This study, Chapter B, describes and quantifies the geometry and hydraulic characteristics of the aquifers and confining units that compose the Brewster Boulevard and Castle Hayne aquifer systems and the Tarawa Terrace aquifer within the Hadnot Point–Holcomb Boulevard study area. Unit geometry is described by contour maps showing altitude at the top of vertically contiguous units and unit thickness. Hydraulic characteristics of aquifers are quantified in terms of horizontal hydraulic conductivity, transmissivity, storativity, and leakance parameters. For aquifers where point data are sufficiently plentiful, hydraulic conductivity is represented by contour maps.

Previous Investigations

One of the earliest investigations of groundwater supplies in the area that would later become USMCB Camp Lejeune was conducted during April 1941 by David G. Thompson of the U.S. Geological Survey (USGS). Thompson reported his results to the Navy by memorandum (Thompson 1941) and briefly described the results of test drilling in the vicinities of Paradise and Hadnot Points (Plate B1). Limestone and related rocks in the subsurface were described using drillers' terms such as "coquina," "shell rock," and "hard rock" and as occurring in several "phases." "Coquina" and "shell rock" were described as masses of loosely cemented shells; limestone was described as both compact and solid ("hard rock") and porous and soft and containing cavities. Based on limited data, limestone was also described as occurring at substantially varying depths throughout the base area and occurring at increasing depth in a southeasterly direction. Results of the geohydrologic framework analysis described herein corroborate Thompson's observations.

Legrand (1958, 1959) evaluated the contemporary (1958) water supply at USMCB Camp Lejeune east of New River and constructed 22 test wells to depths ranging from about 200 to 500 feet (ft) below ground surface (bgs). Detailed well construction and lithologic data were collected at many borehole locations along with borehole geophysical (electric) logs, water-level data, and water-quality data. Legrand (1959) describes subsurface rocks in this area as occurring in nearly horizontal beds to a depth of about 250 ft bgs and composed of fine- to medium-grained sand, loose shells, "shellrock," and clay, all in varying thicknesses and proportions. "Shellrock" in the Hadnot Point area was described as "rather thin" and "subordinate in quantity to sand." The major water-bearing rocks within USMCB Camp Lejeune were identified as "sediments of Tertiary age," chiefly the Castle Hayne Formation. Borehole data, particularly electric logs, collected at boreholes T-1 to T-8, T-12, and T-22 were used extensively in the conceptualization and development of the geohydrologic framework described herein. With the exception of borehole T-22, locations of LeGrand's boreholes are shown on Plate B1, and electric logs from several of these boreholes are shown in sections A–A' and B–B' (Figure B5). Boreholes T-1 to T-8 were located in the Hadnot Point area, mostly along Piney Green Road and in the immediate vicinity of the HPIA (Plate B1). Lithologic data reported by LeGrand (1979) at borehole locations T-1, T-4, T-7, T-8, and T-12 (Plate B1) are reproduced herein in Appendix B1 as Tables B1.1–B1.5, respectively. Cuttings descriptions listed on several of these logs are described as "wash" or "washed down" from intervals higher than the reported depth. As such, descriptions of cuttings, especially from deep intervals of the borehole, must be considered not entirely representative of the reported depth.

Brown et al. (1972) compiled comprehensive surface and thickness maps and numerous sections showing, in detail, the structural and stratigraphic framework of the Atlantic Coastal Plain between New York and North Carolina. Several sections included lithostratigraphic descriptions of Middle Eocene age and younger rocks from boreholes in Onslow and adjacent counties of North Carolina.

Harned et al. (1989) conducted a comprehensive and detailed review of groundwater conditions throughout USMCB Camp Lejeune during 1986 and 1987. Water-level measurements were obtained in almost all active and several abandoned supply wells. Continuous water-level data at several supply and observation wells were published in the form of hydrographs indicating conditions during several months of 1986 and 1987. Construction and well-capacity test data also were reported for many supply wells. Annual water use, as an average in millions of gallons per day (MGD), was reported during 1975–1987 for seven USMCB Camp Lejeune WTPs, including Hadnot Point and Holcomb Boulevard. Annual water use at the Hadnot Point WTP was reported for most of the years from 1959 to 1986.

Existing borehole geophysical logs and drillers' logs were collected and assembled from USMCB Camp Lejeune files, and additional geophysical logs were obtained at test wells and where existing wells were accessible. Published well data refer largely to the period 1941–1986, when a substantial number of supply wells were constructed in the Hadnot Point–Holcomb Boulevard study area. Of significance are three published "hydrogeologic" sections constructed generally east to west and north to south across USMCB Camp Lejeune east of the New River. Harned et al. (1989) subdivided their "hydrogeologic" framework into "Surficial" and "Castle Hayne" aquifers, separated by thin, discontinuous confining units. Much of the "Castle Hayne aquifer" is shown as being composed of sediments of Oligocene age, extending from 25 to 40 ft bgs to depths ranging from about 150 to 250 ft bgs. Sediments of Miocene age are not identified on the "hydrogeologic" sections; however, the correlation chart of Harned et al. (1989) includes a "Castle Hayne confining unit" of lower Miocene age and equivalent as part of the Belgrade Formation. This confining unit is not specifically identified on the "hydrogeologic" sections but probably is represented by thin, discontinuous confining layers that separate the "Surficial" and "Castle Hayne" aquifers. The lower part of the "Castle Hayne aquifer" is shown to be of Middle Eocene age and is relatively thin compared to overlying sediments, ranging in thickness only from about 40 to 70 ft. Below the "Castle Hayne aquifer" lies a continuous unit identified as the "Beaufort confining unit" of Paleocene age. Modified versions of these sections are shown in Figure B5. The vertical sequences of relatively thick permeable rocks separated by thin, less permeable confining units were based largely on electric-log signatures and generally extend from land surface to the base of sediments of interest to this study. Borehole electric logs, well capacity and pump test data, well-location maps, and water-level data collected by Harned et al. (1989) provided the bases for much of the geohydrologic framework described herein.

Cardinell et al. (1993) used much of the borehole data collected previously by Harned et al. (1989) to extend "hydrogeologic" sections west of the New River and south to the coastal margin of USMCB Camp Lejeune. Sections by Cardinell et al. specifically identify a "Castle Hayne confining unit," separating "Surficial" and "Castle Hayne" aquifers, but do not specify the age of sediments. Cardinell et al. (1993) also place the top of the "Beaufort" confining unit lower in the section compared to the location shown by Harned et al. (1989). Cardinell et al. (1993, Table 3) list the altitudes at the top and thicknesses of the "Surficial aquifer," the "Castle Hayne confining unit," the "Castle Hayne aquifer," and the "Beaufort confining unit." Highly generalized maps showing the altitude at the top and base of the "Castle Hayne aquifer" also were constructed for the entire area of USMCB Camp Lejeune. Altitude at the top of the "Castle Hayne aquifer" within the study area is shown to range between 10 and about –30 ft. Corresponding thickness ranges between 250 and about 350 ft. Seismic reflection or surface resistivity data were collected and analyzed and used to estimate the base of the "Castle Hayne aquifer" at several locations within the study area. More than 100 miles of seismic reflection data were collected within the New River estuary and revealed the locations of numerous buried paleostream channels to a depth of about 250 ft. Such channels probably occur, as well, in substantial numbers within the subsurface of the study area.

A comprehensive "hydrogeologic" framework, which subdivided the entire sequence of Coastal Plain sediments in central North Carolina into 14 aquifers and confining units, was described by Lautier (2001). Of a total of 17 sections, 3 traverse the study area, and sediments of interest to this study were differentiated into a "Castle Hayne confining unit" and a "Castle Hayne aquifer," overlain and underlain, respectively, by a "Surficial aquifer" and either the "Beaufort" or "Peedee" confining unit. The distinction as to whether or not the "Beaufort" or "Peedee" is present in the study area is unclear in those parts of the "hydrogeologic" sections that traverse USMCB Camp Lejeune. Within the study area, highly generalized maps indicate that the altitude at the top of the "Castle Hayne confining unit" occurs between about –25 and –100 ft and thickness ranges between 0 and 20 ft. Similarly, the altitude at the top of the "Castle Hayne aquifer" is shown to occur between about –50 and –100 ft, and "permeable thickness" ranges between about 180 and 240 ft.

Faye (2007a) subdivided the Coastal Plain sediments between land surface and the base of the Castle Hayne Formation at USMCB Camp Lejeune into a Castle Hayne aquifer system consisting of upper, middle, and lower Castle Hayne aquifers and respective confining units. Also delineated were several units that overlie the Castle Hayne aquifer system named, youngest to oldest, the Brewster Boulevard and Tarawa Terrace aquifers, each also paired with a corresponding confining unit. The altitude at the top of each named aquifer and confining unit was listed in appropriate tables and represented by contour maps. The thickness of each named aquifer and confining unit was also represented by contour maps. Altitude at the top of the uppermost unit of the Castle Hayne aquifer system ranged from about 0 to –80 ft. Thickness of the Castle Hayne Formation, which included most of the defined Castle Hayne aquifer system, was shown to range between 165 and 265 ft. Hydraulic conductivity data were tabulated for several aquifers and shown on contour maps where unit data were sufficiently numerous. Horizontal hydraulic conductivity determined from analyses of aquifer-test data at wells open to the Castle Hayne aquifer system ranged from less than 10 to about 40 feet per day (ft/d). The southern part of the area delineated by Faye (2007a) corresponds exactly to the northern part of the current study area between Northeast and Wallace Creeks (Plate B1).

As part of a more comprehensive investigation of groundwater supplies and saltwater intrusion in Onslow County, North Carolina, Fine (2008) delineated a "hydrogeologic" framework for Onslow County and parts of adjacent counties inclusive of the entire sequence of Coastal Plain sediments. Section C–C' of Fine (2008) traverses northwest to southeast across the entire study area and, based largely on correlation

of signatures shown on natural gamma borehole logs, shows units of interest to this study subdivided into a "surficial aquifer" and "upper" and "lower" Castle Hayne aquifers separated by respective confining units. Maximum thickness of the combined "upper" and "lower" Castle Hayne aquifers is about 250 ft. The "Beaufort confining unit" is shown to occur at the base of the "Lower Castle Hayne aquifer" and to underlie the entire study area. Altitude at the top of the "Beaufort confining unit" appears to range from about –250 to –300 ft.

Several reports that profoundly contributed to the conceptualization of a geologic framework for this study were those of Geophex, Ltd. (1994), Harris et al. (2000), and LaGesse and Read (2006). Geophex, Ltd. (1994) constructed several test wells at various depths at the Bow site located west of the New River approximately 1.9 miles northeast of the town of Verona and about 8.1 miles directly west of Hadnot Point supply well HP-651 (Plate B1). Test well Bow-1 (ON-C-1-94; North Carolina State Plane coordinates N: 347859 E: 2461222) is the well of major interest to this study and was constructed to a depth of 341 ft. Electric and natural gamma borehole geophysical logs were obtained for the entire borehole length along with cores of borehole samples collected continuously between depths of 35 and 331 ft. Detailed geologic and lithostratigraphic descriptions of core samples in conjunction with similarly detailed interpretations of borehole geophysical logs and the correlation of site data with previous regional investigations by the USGS and others resulted in the identification of several geologic units of major interest to this study, including the Belgrade and River Bend Formations, respectively, of Miocene and Oligocene age and the Castle Hayne Formation, largely of middle Eocene age (Table B2). The River Bend Formation was identified from about 50 to 150 ft bgs; the Castle Hayne Formation was identified from about 150 to 350 ft bgs. Geologic formations below the Castle Hayne Formation were not identified. Harris et al. (2000) subjected three samples collected at the Bow-1 borehole to strontium dating analysis and confirmed much of the Oligocene section of the Bow-1 borehole as identified by Geophex, Ltd. (1994). The depth of the deepest sample analyzed was 144 ft. In addition, Harris et al. (2000) obtained two samples from a single depth at a borehole (CB-1) in the vicinity of Courthouse Bay, several miles south of the study area (Plate B1), and also subjected those samples to strontium dating analysis. These samples also were determined to be of Oligocene age at a depth of 142 ft bgs. LaGesse and Read (2006) followed the lead of Coffey (2000) and used petrographic methods in conjunction with thin sections from reconstituted cores and cuttings to determine four Eocene depositional sequences (E1–E4) and one Oligocene sequence (O1) at the Bow-1 site. The Castle Hayne Formation was recognized at the Bow-1 site at depths between about 157 and 340 ft bgs, inclusive of Eocene depositional sequences E1–E3B and all within the middle (E1–E3A) or late (E3B) Eocene. The uppermost Eocene sequence (E4) was recognized at the Bow-1 site at depths between about 148 and157 ft bgs and was also assigned to the late Eocene by LaGesse and Read (2006). However, depositional sequence E4 was not correlated with a recognized formation. Only the lower part of the River Bend

Table B2. Generalized relation between Quaternary- and Tertiary-age geologic and geohydrologic units, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina (modified from Harned et al. 1989 and Cardinell et al. 1993).

Geologic unit			Geohydrologic unit
System	Series	Formation	
Quaternary	Holocene Pleistocene	Undifferentiated	Brewster Boulevard upper aquifer
Tertiary	Pliocene	Absent	Absent
	Miocene	Pungo River Formation, undifferentiated	Brewster Boulevard upper confining unit Brewster Boulevard lower aquifer
		Belgrade Formation, undifferentiated	Brewster Boulevard lower confining unit Tarawa Terrace aquifer (upper part)
	Oligocene	River Bend Formation, undifferentiated	Tarawa Terrace aquifer (middle and lower parts) Upper Castle Hayne confining unit (previously designated the Tarawa Terrace confining unit in Faye [2007a])
	Late Eocene	Unnamed unit	Upper Castle Hayne aquifer–River Bend unit
	Middle Eocene	Castle Hayne Formation	Local confining unit
			Upper Castle Hayne aquifer–Lower unit
			Middle Castle Hayne confining unit
			Middle Castle Hayne aquifer
			Lower Castle Hayne confining unit
			Lower Castle Hayne aquifer
	Paleocene	Beaufort Formation, undifferentiated	Beaufort confining unit (generally occurs at top of Beaufort Formation)

Formation was recognized in the Bow-1 borehole, all within the Oligocene sequence (O1). LaGesse and Read (2006) identify the Bow-1 borehole as the "Onslow County Core" (ON-C-1-94). The BOW-1 borehole is identified by the North Carolina Department of Environment and Natural Resources (NCDENR) as borehole ON-C-01-94 (John Nickerson, NCDENR, written communication, September 23, 2010).

Other reports and documents that contributed to a conceptualization of the geologic framework within the study area are those of Baum et al. (1979a,b), Upchurch (1979), Harris et al. (1986), Russell (1987), Moran (1989), Rossbach and Carter (1991), Carter and Nekola (1992), and Hoffman et al. (1997). Most of these publications provided valuable lithostratigraphic descriptions of geologic formations that probably occur or whose chronostratigraphic equivalents occur within the study area. For example, Upchurch (1979) provides a detailed lithostratigraphic section of the Castle Hayne Formation at a quarry exposure in New Hanover County, southwest of the study area. Similar descriptions of the Pungo River Formation northeast of the study area in Beaufort County are provided by Carter and Nekola (1992). Quarry and outcrop exposures and corresponding lithostratigraphic descriptions of the Belgrade Formation in Onslow County, the Castle Hayne Formation in New Hanover County, and the Beaufort Formation in Lenoir County, all within the Coastal Plain of North Carolina are provided by Baum et al. (1979b).

Table B3. Installation Restoration sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Site number[1]	Site name
1	French Creek liquids disposal area
2	Former nursery day-care center (Building 712)
3	Old creosote site
6	Storage/disposal lots 201 and 203
9	Fire fighting training pit
10	Original base landfill
21	Transformer storage lot 140
22[2]	Industrial Area tank farm
24	Industrial Area fly ash dump
28	Industrial Area burn dump
30	Sneads Ferry Road fuel tank sludge disposal area
74	Mess hall grease pit area
78	Hadnot Point Industrial Area
80	Paradise Point golf maintenance area
82	VOC disposal area at Piney Green Road
84	Building 45 area
88	Building 25
94	Building 1613 area
Site G[3]	Proposed Camp Lejeune landfill

[1] See Figure B2 for location

[2] Monitor wells merged with Site 78

[3] Not an Installation Restoration site. Several monitor wells merged with Site 6

Investigations of groundwater contamination conducted under the auspices of CERCLA and RCRA occurred at numerous locations within the study area (Figures B2, B3; Tables B3, B4). Multiple investigations, resulting in hundreds of site assessments and similar reports, occurred at almost every IRP location and at many UST and AST locations. Specific citations of reports at each investigation location are too numerous to include within the text of this report. However, a citation for every report from which data were extracted for this study is included herein in the list of References. Reports identified by a "CERCLA Administrative Record file" number refer to various IRP locations (Table B3, Figure B2). Reports identified using a "Leaking Underground Storage Tank Program" number or other identifier such as a building number refer to various UST or AST investigation locations (Table B4, Figure B3).

Table B4. Underground and above-ground storage tank sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[FC, French Creek; H, Hospital; HP, Hospital Point; LCH, Low cost housing; NH, New Hospital]

Site name	Site name
Building 20	Building FC120
Building 21	Building FC201
Building 24	Building FC251
Building 30	Building FC263
Building 33	Building FC280
Building 45 area	Building FC281
Building 61	Building H19
Building 311	Building H28
Building 331	Building H30
Building 575	Building HP100
Building 645 area	Building HP118
Building 728	Building HP250
Building 820	Building LCH4015
Building 900	Building LCH4022
Building 1101	Building NH100
Building 1115	Building NH118
Building 1310	Building PP3311
Building 1323	Building PP3322
Building 1450	Building PP3332
Building 1502	Building PP3340
Building 1601	Building PP3354
Building 1607	Building PT5
Building 1613 area	Building PT37
Building 1804	Building S688
Building 1817	Building S1856
Building 1854	Building S2633
Building 1880	Building SLCH4019
Building 5400	Hadnot Point fuel farm
Building FC40	Michael Road fuel farm
Building FC102	Tanks S889 and S891

[1] See Figure B3 for location. The word "Building" is not shown

Methods

Methods applied to the development of a geohydrologic framework for the Hadnot Point–Holcomb Boulevard study area are highly similar to the methods described by Faye (2007a) regarding similar investigations at Tarawa Terrace (Figure B1). First, a conceptual geologic framework was developed using published lithostratigraphic and chronostratigraphic studies of geologic units and formations at or in the vicinity of USMCB Camp Lejeune and Onslow County. Geologic units within the study area were identified and correlated with published results based largely on lithostratigraphic similarities. Subsequently, a geohydrologic framework was established within the geologic framework based largely on descriptions of sediment and rock lithology, ultimately resulting in the identification and correlation of permeable and poorly permeable zones within the subsurface of the study area. Permeable units such as sands and limestone saturated with freshwater (dissolved-solids concentration less than 5,000 milligrams per liter [mg/L]) correspond to zones of relatively high electrical resistivity, and corresponding "signatures" noted on borehole electric logs are commonly understood to indicate water-bearing intervals (for example, aquifers). Conversely, electric log "signatures" indicating zones of relatively low resistivity correspond to poorly permeable units such as silts, clays, and sandy clays and are commonly understood to yield little or no water to wells (for example, confining units; Figure B4). Using such "signatures" as guidelines, in conjunction with descriptions of rocks and sediments[3] noted on driller's and borehole logs, the overall structure of the geohydrologic framework for the study area was established and aligned along generally north-south and east-west sections, similar to the "hydrogeologic" sections of Harned et al. (1989) and Cardinell et al. (1993) (Figure B5).

Detailed studies of subsurface lithology resulting from the collection and examination of cores frequently occurred in conjunction with investigations of groundwater contamination (Tables B3, B4). Typically, cores were obtained during the drilling of boreholes, preparatory to the installation of monitor wells. Because most occurrences of groundwater contamination were observed at shallow depth, most monitor wells were constructed only to depths of about 30 ft bgs or less and most cores collected were likewise limited in their depth of penetration. At several IRP and UST sites, however, groundwater contamination occurs at considerable depth, and core descriptions recorded on boring logs are available at depths ranging from about land surface to about 250 ft bgs. Several boring logs describe sequentially consecutive (continuous) or partially continuous core collections. Because cores are obtained in-situ from the subsurface, the lithology described in the boring log is unique to the reported depth interval. On the other hand, descriptions of cuttings obtained during well drilling and recorded on driller's logs are not necessarily as reliable with respect to the reported depth interval and are frequently unreliable because of sidewall caving and a time lag caused by the circulation of cuttings through the drill stem or annular space to the surface during drilling. Several of the most useful boring logs and driller's logs with respect to the detail of descriptions, the continuity of core descriptions with depth, and depth of penetration are reproduced in Appendix B1 as Tables B1.1–B1.63. Where lithologic descriptions at a borehole are based largely or entirely on core samples and an interval description is missing (Tables B1.6–B1.63), the interval referred to in the text is extended to the depth at the top of the next lowest geohydrologic unit. This approach conforms to the practice of collecting core samples when the onsite geologist believes a change in lithology has possibly occurred based on drilling conditions. This approach was maintained even when the cored and drilled intervals were consistent at a particular borehole.

Because the occurrence of limestone and related carbonate rocks such as shell hash, shell sand, or similar formations occur frequently in the subsurface in the study area and are expected to be substantially more permeable than contiguous clastic sediments, occurrences of such rocks also were summarized at IRP and UST sites and at Hadnot Point and Holcomb Boulevard supply well locations (Tables B5–B7, at back of report). Lithologic descriptions at framework control points in this text can be cross referenced to respective boring logs listed in Appendix B1 by site name and table number.

Intermediate to the lines of section (Figure B5), framework control points were established largely based on lithostratigraphic analysis of borehole electric and natural gamma logs, lithologic descriptions noted on boring logs and, to a substantially lower degree, rock lithology described on driller's logs. These data, in conjunction with unit correlations along section lines, identified vertically contiguous aquifers and confining units at well and borehole locations throughout most of the study area. A total of 14 aquifers and confining units were identified. All but one aquifer and one confining unit were assembled into either the Brewster Boulevard or Castle Hayne aquifer systems (Table B8). The altitude of every contact between aquifers and confining units was recorded at each borehole or well location (Tables B9–B22, at back of report) and subsequently spatially distributed as point data. The point data, in turn, were interpolated throughout the study area and immediate vicinity using a method of kriging in order to map the top surface and thickness of each identified geohydrologic unit (Figures B6–B31). Point data used to map the thickness of most geohydrologic units were the differences in altitude between a unit top and bottom at a single location. These maps and related point data constitute the geohydrologic framework of the Hadnot Point–Holcomb Boulevard study area. The amount of point data available to map individual geohydrologic units declines with increasing depth of the unit within the subsurface. Point data are substantially limited below the Middle Castle Hayne confining unit (Tables B18–B22). Accordingly, rates of decline shown on surface contour maps of the Middle Castle Hayne aquifer and

[3]In this report, the terms "rocks" and "sediments" are used interchangeably.

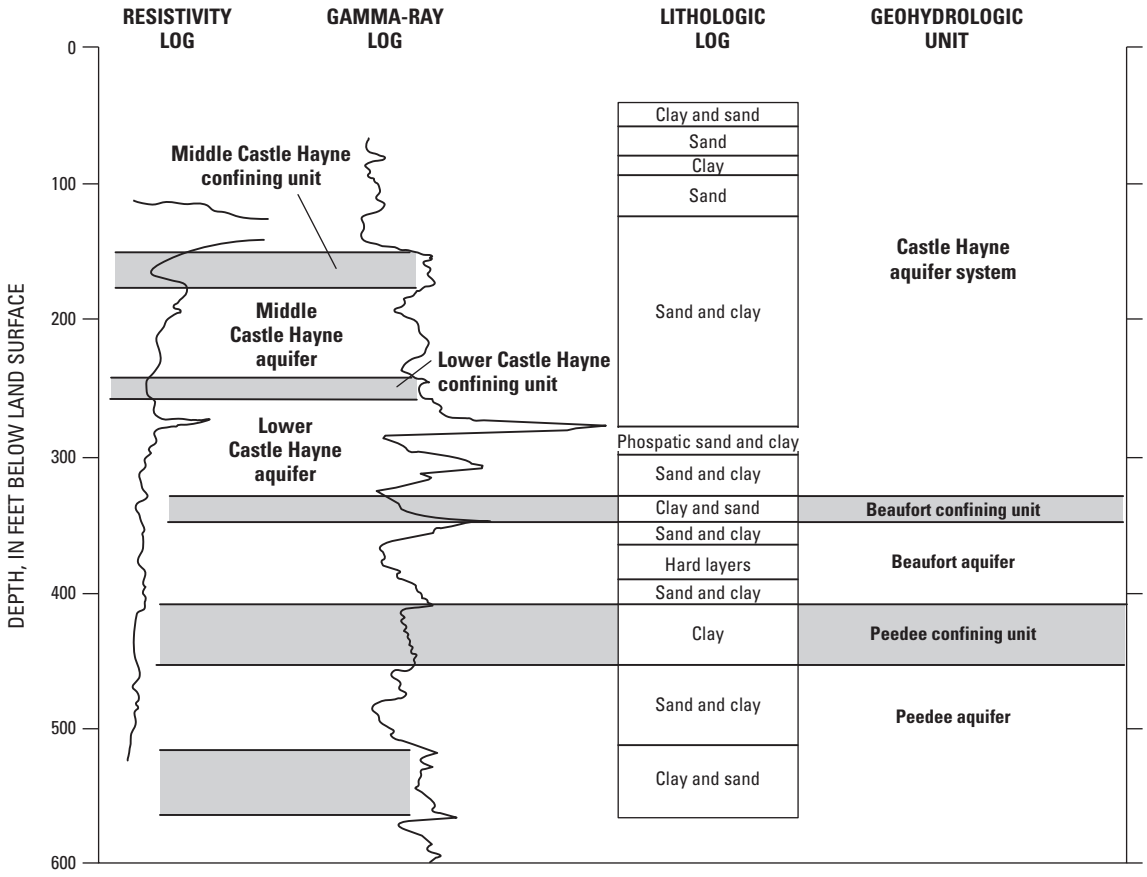


Figure B4. Correlation of geophysical logs, lithologic log, and geohydrologic units, borehole X24S2a, U.S. Marine Corps Base Camp Lejeune, North Carolina (modified from Cardinell et al. 1993, Figure 4; see Plate B1 for site location).

Table B8. Geohydrologic units and unit thickness within the Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Units are listed shallowest to deepest and youngest to oldest; N/A, not available]

Geohydrologic unit	Thickness range, in feet
Brewster Boulevard aquifer system	
Brewster Boulevard upper aquifer	4 to 42
Brewster Boulevard upper confining unit	1 to 22
Brewster Boulevard lower aquifer	4 to 48
Brewster Boulevard lower confining unit	2 to 30
Tarawa Terrace aquifer	8 to 86
Castle Hayne aquifer system	
Upper Castle Hayne confining unit	4 to 40
Upper Castle Hayne aquifer–River Bend unit	16 to 70
Local confining unit	8 to 23
Upper Castle Hayne aquifer–Lower unit	10 to 48
Middle Castle Hayne confining unit	12 to 27
Middle Castle Hayne aquifer	62 to 122
Lower Castle Hayne confining unit	18 to 38
Lower Castle Hayne aquifer	64 to 86
Beaufort confining unit	N/A

deeper units appear relatively uniform and appear to occur without substantial interruption. Such appearances are probably misleading with respect to the actual configuration of the unit surface and occur only because of the few data available to map the surface.

Unit tops reported to the nearest tenth of a foot in Tables B9–B22 correspond to control points where land-surface altitude was determined using standard surveying techniques or was estimated using maps derived from a digital elevation model (DEM). In addition, where the unit is reported as "missing," lithologic descriptions reported on the borehole or driller's log indicate an absence of a respective aquifer or confining unit lithology at the borehole location. Where the unit is reported as "undefined," the depth interval between consecutive lithologic descriptions, as reported on a borehole or driller's log, is too large or too general to adequately assign the lithology to a specific geohydrologic unit. Where a unit is "missing" or "undefined," it is considered to be a local anomaly and is not represented on unit surface maps. Also, as previously stated, fewer point data are available with increasing depth of the geohydrologic unit. In general, core descriptions of unit lithology are limited in number or completely unavailable below the Upper Castle aquifer–River Bend unit (Table B8). Accordingly, point data used to map

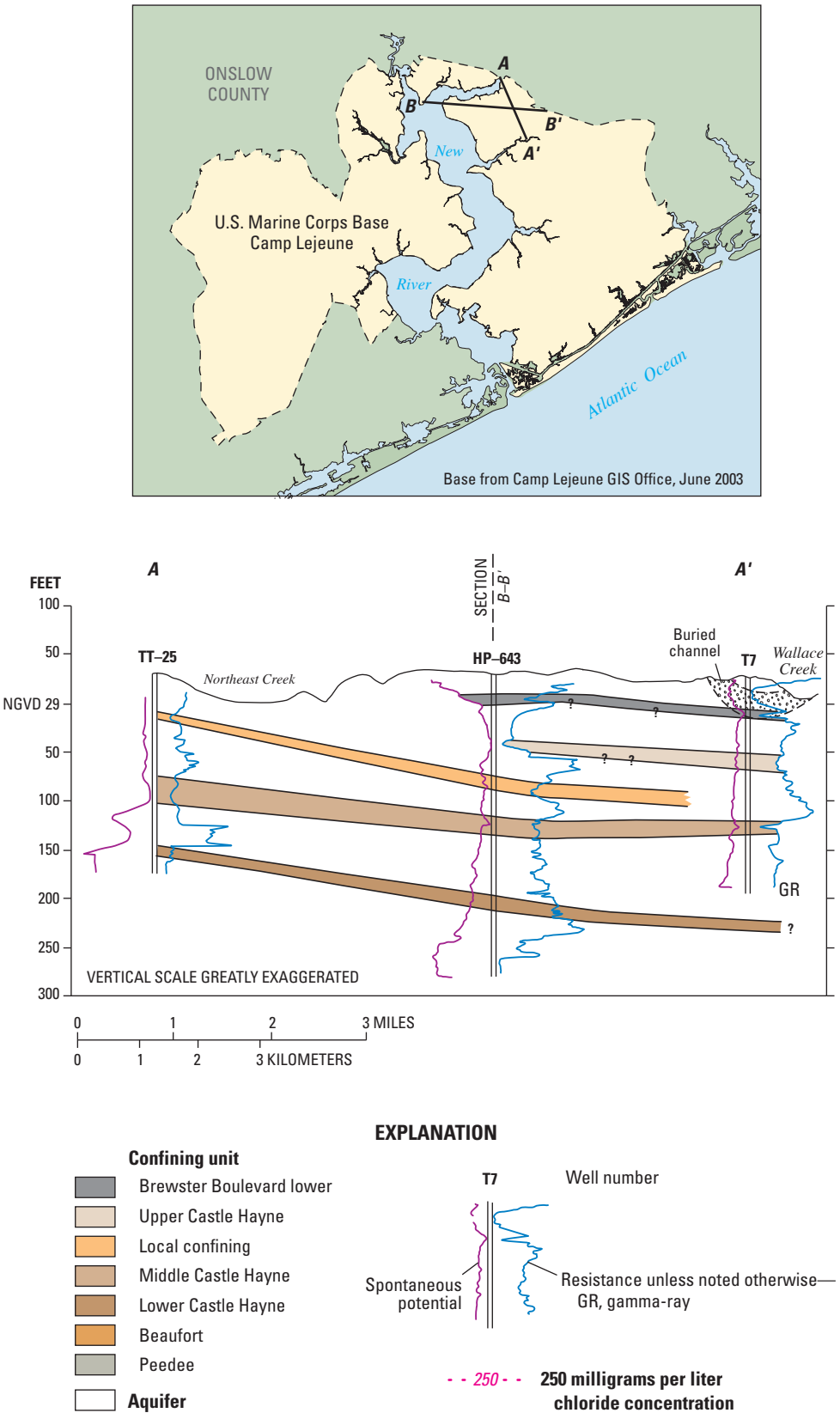


Figure B5. Geohydrologic sections *A–A'* and *B–B'*, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina (modified from Cardinell et al. 1993; see Plate B1 for site locations).

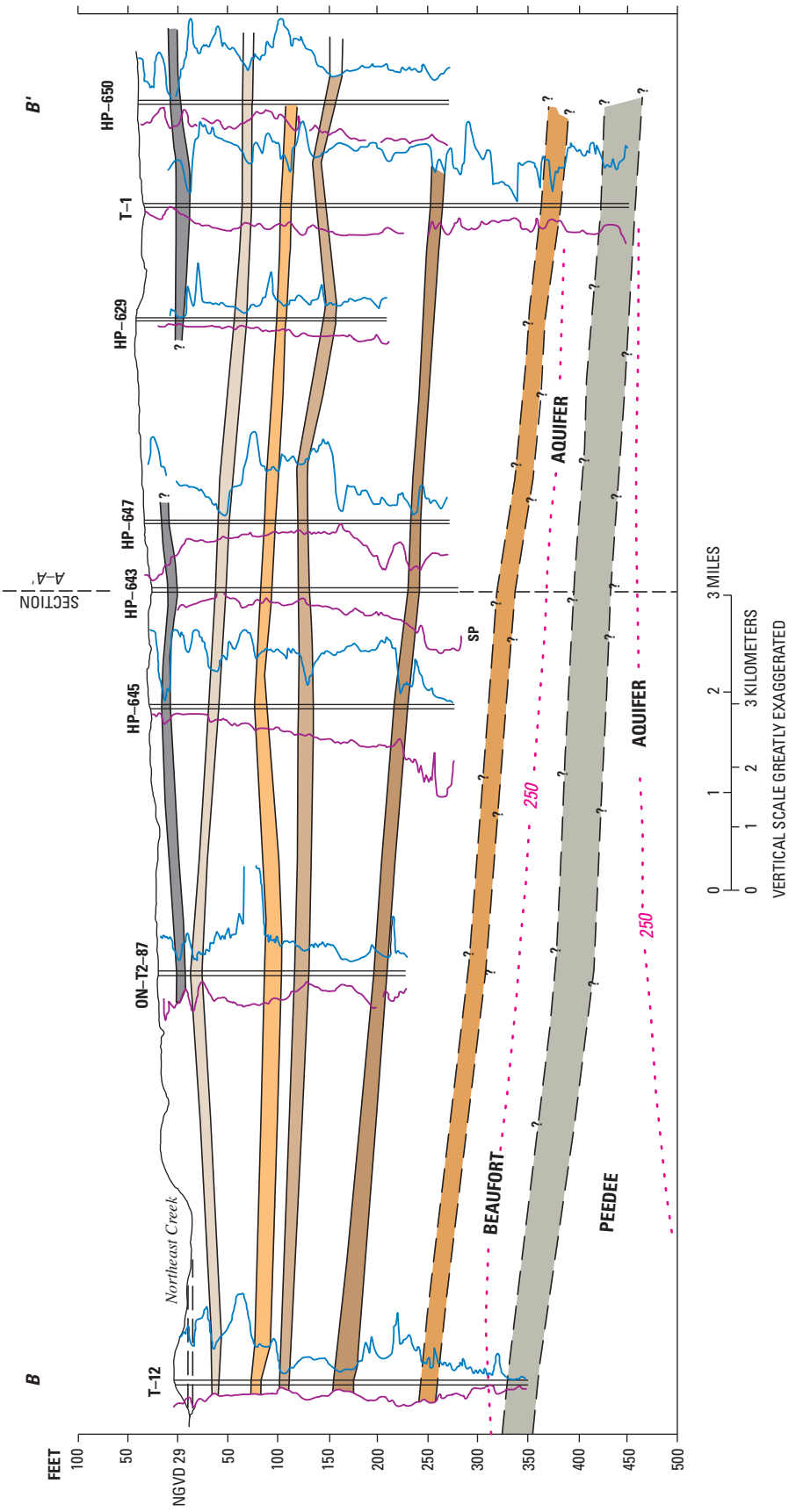


Figure B5. Geohydrologic sections *A–A'* and *B–B'*, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina (modified from Cardinell et al. 1993; see Plate B1 for site locations).—Continued

unit surfaces and thicknesses below the Upper Castle Hayne aquifer–River Bend unit were based almost entirely on interpretations of borehole geophysical logs (electric and natural gamma logs).

For all units, the number of point data used to map a surface was greater than the number of corresponding data used to map thickness because electric or borehole logs did not penetrate the entire thickness of every identified unit at every log location. Accordingly, a direct comparison of unit altitude and thickness at a particular location using tabulated data (Tables B9–B22) paired with corresponding interpolated contour maps (Figures B6–B31) may differ slightly. Such differences are generally less than one contour interval as shown on the respective surface maps. Regardless, all surfaces and thicknesses shown on geohydrologic unit contour maps included herein should be considered estimated or approximate and subject to change as additional borehole data are collected and made available for interpretation in the future.

Hydraulic characteristic data, including horizontal hydraulic conductivity, transmissivity, storativity, and leakance factors, were determined from field test data collected at numerous supply and monitor well locations within the study area. Field tests included single-well tests, which were conducted almost exclusively in supply wells under confined aquifer conditions, and slug tests and multiple-well aquifer tests, which were conducted almost exclusively in monitor wells under unconfined aquifer conditions. Single-well tests were either step-drawdown tests or constant-rate discharge tests. Step-drawdown tests are characterized by drawdown data recorded at the pumped well for a specified time interval during several continuous cycles of increasing rates of discharge. At USMCB Camp Lejeune, specified time intervals for step-drawdown cycles ranged from about 10 minutes to 1 hour, and discharge rates during test cycles typically ranged between 50 and 500 gallons per minute (gpm). Drawdown for constant-rate discharge tests in single wells was frequently recorded for periods of hours or days. Discharge rates were similar to those reported for step-drawdown tests. Multiple-well tests are characterized by drawdown measurements collected at one or more observation wells during pumping at a constant rate of discharge at a nearby distal well. Discharge rates during multiple-well tests at IRP and UST monitor wells at USMCB Camp Lejeune were typically small (30 gpm or less), and test periods generally ranged from several hours to 1 day. Discharge during multiple-well tests using supply wells HP-642 and HP-708 as the pumped wells ranged between 85 and 150 gpm, and test durations ranged to about 3 days. Slug tests are characterized by the near instantaneous addition or removal of a specified volume of water to or from a well. At USMCB Camp Lejeune, slug tests were typically conducted in 2-inch-diameter monitor wells constructed with a short slotted opening of 5 ft or less. Slug tests were characteristically short-interval tests and were generally completed in 5 minutes or less. Both falling- and rising-head slug tests were commonly conducted at monitor wells and frequently at the same well (Tables B23–B25).

Methods of analysis applied to step-drawdown tests were based largely on the method described by Rorabaugh (1953), modified with additions by Earlougher (1977) and Lee (1982). Constant-rate discharge single-well tests were analyzed by methods first described by Cooper and Jacob (1946). For multiple-well tests, different analytical methods were applied depending on whether aquifer conditions were confined or unconfined. Where pumping and observation wells were open to confined aquifers, methods first described by Theis (1935) and Walton (1962) were applied to the analyses of time-drawdown data in observation wells. Where vertical leakage was suspected during confined aquifer tests, analytical methods developed by Hantush and Jacob (1955) and Hantush (1964) were applied, resulting in the computation of a leakance factor. Such factors were used to determine vertical hydraulic conductivity of water-bearing units within the radius of influence of the pumped well (Table B25). Results of multiple-well tests in unconfined aquifers were analyzed using methods described by Neuman (1972) or by distance-drawdown methods (Jacob 1963). Application of the Neuman (1972) method also resulted in a Beta factor that can be used to compute vertical hydraulic conductivity of water-bearing units affected by the test. Distance-drawdown methods apply when three or more observation wells are constructed at different radial distances from the pumped well. The discharge well is pumped at a constant rate until static drawdown conditions occur at all observation wells. The static drawdown and radial distance from the pumped well are recorded for each observation well and, along with the test discharge rate, constitute a set of data available for graphical analysis. Slug tests were analyzed using either the methods described by Bouwer and Rice (1976) or those described by Hvorslev (1951). Slug-test results listed in Tables B23–B24 were accepted as reported in various consultant reports, following review of data tables and related graphical and computational procedures. With the exception of analyses using the Neuman (1972) and Hantush (1964) methods, almost all analyses of aquifer-test data reported herein, regardless of test method, were accomplished during this study by using computer codes written for the public domain by Halford and Kuniansky (2002). Analyses using the methods of Neuman (1972) and Hantush (1964) were accomplished with commercial software by Environmental Simulations, Inc. (2003).

Land-surface altitude data at borehole/monitor well locations (Tables B5–B7, Tables B1.1–B1.63) were either obtained directly from site assessment and characterization reports (see CERCLA Administrative Record files and Leaking Underground Storage Tank Program files listed in the References section under various authorships), calculated from relevant information provided in these reports, or estimated using a DEM. Calculated land-surface altitudes were based on reported top-of-casing altitudes and corresponding reported lengths of the casing riser above or below land surface. Land-surface or top-of-casing altitudes obtained from reported information were predominantly based on the National Geodetic Vertical Datum of 1929 (NGVD 29). In several reports, however,

the relevant datum was simply reported as "mean sea level," or a reference to a vertical datum was omitted entirely. The vertical datum used to assign a land-surface altitude to borehole data extracted from these reports was also presumed to be NGVD 29. The vertical datum reportedly used to assign top-of-casing altitudes included in at least one report published between 2005 and 2008 was the North American Vertical Datum of 1988 (NAVD 88). For consistency these data were converted to NGVD 29, as reported herein. During the same time period, resurveys of top-of-casing altitudes were conducted at monitor wells at most UST and IRP site within the HPIA, including the Hadnot Point fuel farm (HPFF) and Building 1115, at UST site Building 820, and at UST site Building 645 (Plate B1). More than likely, these surveys were conducted using highly accurate global positioning system (GPS) techniques, and the top-of-casing altitudes at the respective well locations were adopted for this study to calculate land-surface altitude (Tables B1.36–B1.62) (Shaw Environmental, Inc. 2007a,b; Catlin Engineers and Scientists 2008).

Geologic Framework

Relatively unconsolidated, seaward-dipping sediments of Cretaceous and Tertiary age compose a major part of the emerged Coastal Plain of southeastern North Carolina. Sediments of the Coastal Plain are generally older westward and are progressively younger and thicken in a wedge-like manner southeastward and seaward.

Geologic units of primary interest to this study are those that occur between land surface in the immediate study area and the generally recognized base of the Castle Hayne Formation. With the exception of investigations at the Bow-1 borehole (ON-C-01-94), located about 8 miles west of the study area, the lithostratigraphic top of the Castle Hayne Formation has not been definitively identified at USMCB Camp Lejeune (Table B1.63). At the Bow-1 site, the top of the Castle Hayne Formation was recognized by Geophex, Ltd. (1994) at a depth of about 148 ft bgs (altitude –125 ft) at the top of several inches of a "dark green to black, very well-indurated phosphate/glauconite crust." Underlying the crust was a "hard light gray moldic limestone." LaGesse and Read (2006) tentatively assigned the uppermost part of this limestone to their late Eocene sequence E4 (Table B2) and placed the top of the Castle Hayne Formation at the Bow-1 site at a poorly defined transgressive sequence boundary at a depth of about 157 ft bgs (altitude –134 ft). Below the top of the Castle Hayne Formation, LaGesse and Read (2006) described alternating layers of moldic, marly, carbonate rocks variously characterized as grainstone/packstone and wackestone/packstone, marked at the base by a transgressive sequence boundary at a depth of about 220 ft bgs (sequence E3B; altitude –197 ft). The age assigned to these sediments ranged from early late Eocene to late middle Eocene. Below 220 ft bgs to the base of the Castle Hayne Formation at about 340 ft bgs (altitude –317 ft), LaGesse and Read (2006) assigned all rocks to a middle Eocene age (sequences E1, E2, E3A). Carbonate rocks between 220 ft bgs and 340 ft bgs were described as mixed and fine skeletal grainstone/packstone and wackestone/packstone with alternating layers of bryozoan-echinoid grainstone/packstone. Deposition of the entire Castle Hayne Formation at the Bow-1 site, according to LaGesse and Read (2006), occurred during four and possibly five transgressive sequences. Geophex, Ltd. (1994) placed the base of the "Castle Hayne Aquifer" at the Bow-1 site at a depth of about 326 ft bgs (altitude –303 ft) at the top of several inches of a "lens of dark brown chert." Sediments directly overlying the chert were described as "silty unindurated limestone" containing scattered well-preserved oyster shells. Sediments underlying the chert were described as "light gray sandy silt with minor fossil (bryozoan) content;" porosity was characterized as "very low." Geophex, Ltd. (1994) assigned sediments below the base of the "Castle Hayne Aquifer" to the Beaufort confining unit of Cardinell et al. (1993), but acknowledged a probable association of these sediments with the basal part of the Castle Hayne Formation.

Geophex, Ltd. (1994) also qualitatively evaluated porosity at other intervals within the Castle Hayne Formation at the Bow-1 borehole, including a section of "muddy limestone" between 170 and 205 ft bgs (altitude –147 to –182 ft), described as a likely confining unit of "greatly reduced" porosity. Similarly, an interval of "very muddy, unindurated limestone" was characterized as a "semi-confining unit" of "reduced porosity" between 250 and 260 ft bgs (altitude –227 to –237 ft). Most of the interval between 205 and 325 ft bgs (altitude –182 to –302 ft) was described as a "hard, gray moldic limestone interbedded with hard shell-hash limestone and unindurated shell hash zones;" porosity was characterized as "extremely high."

Sediments between about 148 and 157 ft bgs (altitude –125 to –134 ft) and immediately overlying the Castle Hayne Formation at the Bow-1 site were described by LaGesse and Read (2006) as a bryozoan-echinoid grainstone/packstone and were assigned, tentatively, to the late Eocene series (sequence E4). These rocks were previously assigned to the top of the Castle Hayne Formation by Geophex, Ltd. (1994). Overlying the carbonate rocks from about 60 to 148 ft bgs (altitude –37 to –125 ft), LaGesse and Read (2006) identified a single transgressive sequence of glauconitic sand and moldic marl and assigned the entire sequence to the early Oligocene series lower River Bend Formation (sequence O1; Table B2). The marl of this sequence occurred at the base of the glauconitic sand between about 130 and 148 ft bgs (altitude –107 to –125 ft), immediately overlying the late Eocene series carbonate rocks (sequence E4). Sediments between 45 and 60 ft bgs (altitude –22 to –37 ft) were described by LaGesse and Read (2006) as sand interbedded with thin sandy mollusk grainstone/packstone carbonates of upper Oligocene (?) age.

The age of much of the Oligocene section at the Bow-1 location was confirmed by the analyses of selected foraminiferal samples to determine the strontium isotopic ratios $^{87}Sr/^{86}Sr$ (Harris et al. 2000). Samples were extracted from cores at depths of 57.4, 113.8, and 144.0 ft bgs (altitude –34.2, –90.6, and –120.8 ft, respectively; Table B1.63). Sample ages

were determined to be entirely Oligocene and to correspond to two distinct depositional sequences. Thickness of the lowermost sequence is about 100 ft and was lithostratigraphically correlated with the lower River Bend Formation. Thickness of the younger depositional sequence is about 28 ft and was likewise correlated with the upper part of the River Bend Formation. The dominant lithology of both sequences is very fine to fine calcareous quartz sand. The lowermost sample analyzed by Harris et al. (2000) collected from 144 ft bgs is just 4.0 ft above the top of the Castle Hayne Formation at 148 ft bgs, as assigned by Geophex, Ltd. (1994). Harris et al. (2000) also obtained two foraminiferal samples from cores at a borehole they identified as CB-1, located in the Courthouse Bay area of USMCB Camp Lejeune and probably located near or in the vicinity of supply well BA-145 (Table B7). Location coordinates and land-surface altitude at the CB-1 borehole were not provided by Harris et al. (2000). Both samples at the CB-1 borehole were collected from a core at a depth of 142.0 ft bgs and were also subjected to analyses for the isotopic ratio $^{87}Sr/^{86}Sr$. Analyses indicated a younger Oligocene age than the uppermost sample collected at the Bow-1 site. The two Oligocene depositional sequences observed at the Bow-1 location also were observed at the CB-1 site, apparently based on lithostratigraphic correlation of core samples with recognized contemporaneous formations in Onslow and nearby counties and cores from the Bow-1 borehole. Thickness of the lowermost sequence (lower River Bend Formation) recognized by Harris et al. (2000) is greater than 110 ft at the CB-1 site. Corresponding thickness of the younger sequence (upper River Bend Formation) is 88 ft.

Sediments between 20 and 45 ft bgs (altitude 3 to –22 ft) at the Bow-1 borehole were described by Geophex, Ltd. (1994) as a carbonate-bearing, medium- to coarse-grained quartz sand containing numerous shells and macrofossil fragments and was assigned to the Pollocksville Member of the Belgrade Formation (Table B2). The type area for the Belgrade Formation is located in a quarry near the Town of Belgrade in northeastern Onslow County, about 16 miles northeast of the study area (not shown on Plate B1). At the type area, thickness of the Belgrade Formation is approximately 26 ft. As described by Baum et al. (1979b), the Belgrade formation at the type area consists, base to top, of about 5 ft of sandy-molluscan biomicrudite overlain by about 3 ft of unconsolidated calcareous quartz sand (arenite). The remainder of the formation is composed of about 18 ft of sandy pelecypod-mold biomicrudite. Discomformably overlying this sequence is approximately 3 ft of sandy, molluscan calcarenite that grades upward to about 3 ft of unfossilliferous clay. This uppermost sequence of sandy calcarenite and clay is named the Haywood Landing Member of the Belgrade Formation by Baum et al. (1979b). Russell (1987), however, differentiates the entire Belgrade formation into the largely contemporaneous Haywood Landing and Pollocksville Members, which grade laterally into one another in a generally seaward direction, Pollocksville Member to Hayward Landing Member (Russell 1987). Although not formally recognized in the immediate vicinity of USMCB Camp Lejeune, sediments equivalent in age (Miocene) and lithologically similar to the Belgrade Formation probably occur in the near subsurface within the study area.

The lithology of sediments between land surface and about 20 ft bgs (altitude 3 ft) at the Bow-1 site was described by Geophex, Ltd. (1994) as "interbedded fine sands, silts, and clayey silts" and were assigned to "undifferentiated Pleistocene and Holocene strata." Although poorly differentiated, these sediments may also be partially equivalent to the Pungo River Formation of Miocene age (Cardinell et al. 1993). Two members of the Pungo River Formation have been identified in its type area at the Lee Creek Mine near Aurora, Beaufort County, North Carolina, northeast of the study area. The basal or Bellhaven Member is primarily a phosphatic sand ranging in color from greenish brown to greenish gray and intercalated with diatomaceous clay and sandy limestone. The upper or Bonnerton Member is a gray phosphatic sandy limestone that grades upward to a gray sand with shell fragments and, near the top, a yellow-green sand and silty, clayey sand containing abundant fossil fragments (Carter and Nekola 1992).

Brown et al. (1972) identified chronostratigraphic units at several boreholes within Onslow County, including sediments of Cretaceous through post-Miocene age (Table B2). Brown et al. (1972) differentiated the age of rocks of interest to this study using stage and chronostratigraphic nomenclature, specifically the stage term "Claiborne" and the chronostratigraphic series terms "Oligocene" and "Miocene." In the vicinity of the study area, rocks recognized by Brown et al. (1972) as "Claiborne" are considered herein to be of Middle Eocene age and to correspond to most or all of the Castle Hayne Formation (The American Association of Petroleum Geologists 1983).

The borehole nearest the study area described by Brown et al. (1972) (ON-OT-25) was located in the vicinity of Sneads Ferry, approximately 10 miles southwest of the center of the study area (Plate B1, inset map; North Carolina State Plane coordinates: North 295165, East 2489291). Shell limestone, sandy limestone, and calcareous fine sand of Middle Eocene age were recognized between altitudes –297 and –499 ft. Limestones of Middle Eocene age were shown to unconformably overlie calcareous, fine sands of Cretaceous age. Rocks of Oligocene age, composed for the most part of sandy shell limestone, were recognized between altitudes –89 and –297 ft. A calcareous sand, about 20 ft thick, occurred at the base of the Oligocene section. Sediments designated as post-Miocene in age and composed of clay and clayey sand were shown to occur between land surface and altitude –89 ft. A 15-ft-thick clay was recognized in this section between altitudes –37 and –52 ft. A land-surface altitude of 8.0 ft was reported at this location (Brown et al. 1972, Section C–C', Plate 25).

Chronostratigraphic units recognized by Brown et al. (1972) at a borehole located approximately 12 miles northwest of the study area (borehole ON-OT-27) were similar to those recognized in the vicinity of Sneads Ferry southwest of the study area (North Carolina State Plane coordinates: North 394511, East 2441392). At this location,

rocks of Middle Eocene age were composed entirely of shell limestone between altitudes –4 and –84 ft. This limestone uncomformably overlies a clay of assigned Cretaceous age. A sandy limestone of Oligocene age was recognized between altitudes 20 and –4 ft and appears to conformably overlie the shell limestone of Middle Eocene age. Two sequences of post-Miocene sediments were identified; a basal clay of approximate thickness 15 ft occurs between altitudes 35 ft and about 20 ft, and a fine sand occurs between altitudes 35 ft and land surface. Land surface is reported at altitude 50 ft at this location (Brown et al. 1972, Section V–V', Plate 44).

Brown et al. (1972) also recognized sediments of Middle Eocene and younger age at a borehole approximately 15 miles almost directly north of the study area (borehole ON-OT-11; North Carolina State Plane coordinates: North 422422, East 2480961). Sediments of Middle Eocene age occurred between altitudes –30 and –140 ft and were composed mostly of shell limestone. Sand content increased with depth. Clayey sands of Cretaceous age were recognized directly underlying the limestone of Middle Eocene age. Sediments of Oligocene age at this location were composed of a basal unit of shell limestone between altitudes 25 and –30 ft and sand between altitudes 42 and 25 ft. A thin veneer of post-Miocene age sands was recognized between altitude 42 ft and land surface at altitude 50 ft (Brown et al. 1972, Section D–D', Plate 26).

Rocks at the base of the Castle Hayne Formation within Onslow County and to the southwest in adjacent Pender County were variously assigned to the Beaufort Formation of Paleocene age (The American Association of Petroleum Geologists 1983; Geophex, Ltd. 1994) or to sediments of Cretaceous age (Brown et al. 1972). Cretaceous-age rocks at the base of the Castle Hayne Formation in coastal North Carolina have previously been assigned to the Peedee Formation, the uppermost unit of which in Onslow County and neighboring counties is named the Rocky Point Member. At its type section near the town of Castle Hayne in Pender County, the Rocky Point Member is described as a sandy, pelecypod-mold biosparrudite. The exposed thickness of the section is about 30 ft (Baum et al. 1979b). At a borehole in adjacent Brunswick County, the Rocky Point Member is composed of well-indurated, sandy, fossiliferous biomicrite, biomicrudite, and biomicrosparite. Thickness of the entire Rocky Point Member section at this borehole is approximately 80 ft (Harris et al. 1986). The Beaufort Formation, however, appears regionally to consist largely of unconsolidated sediments and characteristically fine- to medium-grained glauconitic quartz sand locally interbedded with moldic biosparudite (Hoffman et al. 1997). An exposure of the Beaufort Formation in Lenoir County, north of Onslow County, consists of about 15 ft of siliceous mudstone, chert, and sandstone overlain by a weathered, clayey, glauconitic sand. The mudstone and sandstone unit is assigned to the Jericho Run Member of the Beaufort Formation. The overlying sand is unnamed (Baum et al. 1979b).

Several boreholes within the study area possibly were drilled to or completed within the Beaufort Formation. At borehole T-10 located in the northern part of Tarawa Terrace (Plate B1), the driller's log indicates that drilling was terminated in "fine sand and sandstone" at a depth of 250 ft bgs, which may indicate rocks at or near the top of the Jericho Run Member of the Beaufort Formation. At borehole T-12, near the tip of Montford Point (Faye 2007a) (Plate B1), driller's descriptions of cuttings indicate "fine sand and streaks of rock" from about 240 to 300 ft bgs (Table B1.5). Drilling times in this interval were excessive, taking 2.5 hours to drill 25 ft. Soft clay occurred at about 327 ft. The excessive drill times are possibly indicative of chert or sandstone, which are also characteristic of the Jericho Run Member. At borehole T-1, located just south of SR 24 in the north-central part of the study area (Table B1.1, Plate B1), sand and streaks of hard rock occurred from about 380 ft to 450 ft bgs, according to the driller's log. "Sandy clay," characterized as "hard" and "medium soft," occurred between about 450 and 480 ft bgs. Such lithologies more resemble descriptions of the Beaufort Formation than either the Castle Hayne Formation or the Rocky Point Member of the Peedee Formation. Cuttings descriptions recorded at borehole T-8, located on the north shore of Frenchs Creek near its confluence with New River (Table B1.4, Plate B1) included "sandstone" from 415 to about 450 ft bgs. "Fine sand" and "sandy clay" occurred between about 450 and 500 ft bgs. Such descriptions are more indicative of the Jericho Run Member of the Beaufort Formation than of the Castle Hayne or Peedee Formations. Note that Brown et al. (1972, Plate 15) did not recognize rocks of Paleocene age within the study area nor within almost all of Onslow County.

Geohydrologic Framework

Fourteen aquifers and confining units were identified within the study area between land surface and the base of the Castle Hayne aquifer system. Geohydrologic units were named after local cultural features or recognized geologic formations (for example, Castle Hayne Formation and Beaufort Formation; Table B8). Following the lead of Harned et al. (1989) and Cardinell et al. (1993), the top of the Beaufort confining unit is recognized herein as the base of the Castle Hayne aquifer system at USMCB Camp Lejeune and vicinity. Note, however, that the top of the Beaufort Formation and the top of the Beaufort confining unit may not coincide in all locations.

From shallowest to deepest, identified geohydrologic units within the study area are the Brewster Boulevard upper aquifer, Brewster Boulevard upper confining unit, Brewster Boulevard lower aquifer, Brewster Boulevard lower confining unit, Tarawa Terrace aquifer, Upper Castle Hayne confining unit, upper Castle Hayne aquifer–River Bend unit, Local confining unit, upper Castle Hayne aquifer–Lower unit, Middle Castle Hayne confining unit, Middle Castle Hayne aquifer, Lower Castle Hayne confining unit, Lower Castle Hayne aquifer, and the Beaufort confining unit (Table B8). For this study, the Brewster Boulevard units are combined into the Brewster Boulevard aquifer system. Similarly, the Castle Hayne units are combined into the Castle Hayne aquifer system (Faye 2007a).

Between Northeast and Wallace Creeks, the Brewster Boulevard lower aquifer and lower confining unit correspond nearly one-to-one to the Brewster Boulevard aquifer and confining unit of Faye (2007a), with differences attributed to additional data obtained and analyzed during this study. Similar but minor differences also occur with respect to other geohydrologic units described herein for similar reasons. Where data are sufficient, mapped units shown herein are characterized by a moderate to high degree of local irregularity. Such irregularities are shown on respective maps as hachured areas or areas of closed contours where surfaces are lower or higher than adjacent areas. Mapped surfaces likely represent highly subdued replicas of eroded surfaces that at one or several times were exposed and subjected to erosion, weathering, dissolution, and similar agents. As such, surface irregularities possibly correspond to relict highlands, stream channels, and karst features. Of particular note are buried stream channels that were recognized in abundance by Cardinell et al. (1993) in the subsurface below New River. Such channels are probably ubiquitous throughout the study area, given the numerous depositional sequences noted by LaGesse and Read (2006, Figure B5). Channel systems exposed during a period of seaward regression were subsequently filled with sand and other detrital material from the relict landscape during the following depositional event. In their original state, stream channels were incised within in-situ deposits of limestone, sands, and clays of the contemporary terrain, possibly to considerable depth. Cardinell et al. (1993, Figure 7) indicate stacked buried channels beneath New River extending to depths in excess of 150 ft. In their current buried state, relict sand-filled stream channels are probable preferential paths of groundwater flow across confining units and toward major drainages such as New River and Wallace Creek. As such, confining units identified as part of the geohydrologic framework are frequently characterized in the following sections as "missing" or "undefined" and "thin" or "absent." Relict karst features noted as possible irregularities on surface maps shown herein are possibly remnants of sinkholes or similar enlarged solution features or fracture features.

Northeast and Wallace Creeks are probably incised within the upper part of the Tarawa Terrace aquifer. Wallace Creek and other large tributaries to the New River, such as Cogdels and Bearhead Creeks, are incised within the Brewster Boulevard aquifer system. As such, contours shown herein on respective surface maps represent relict rather than contemporary structure (Figure B5).

Brewster Boulevard Upper Aquifer

Brewster Boulevard is the west-east trending road that extends from Paradise Point to the west to Holcomb Boulevard to the east (Plate B1). The Brewster Boulevard upper aquifer occurs only in the vicinity and south of Brewster Boulevard. The top of the Brewster Boulevard upper aquifer corresponds almost everywhere within the study area to land surface (Table B9) and, as such, closely corresponds to the topographic contours shown on Plate B1. Accordingly, altitude at the top of the upper aquifer varies considerably, ranging from near sea level to the west near the shores of New River to more than 40 ft in the vicinity of SR 24 in the northeastern part of the study area. With several local exceptions in the vicinity of Paradise Point, thickness of the upper aquifer varies relatively uniformly from about 10 ft in the vicinity of Brewster Boulevard to more than 35 ft near the southeastward limit of the study area (Figure B6). Sediments of the Brewster Boulevard upper aquifer are typically fine sands, clayey sands, and silty sands. Construction debris occasionally is found in the uppermost part of the unit. Color varies considerably and is frequently white or gray, or black or brown. Typical Brewster Boulevard upper aquifer lithologies are listed in the Appendix in Table B1.11 (0.0–22.0 ft bgs), Table B1.14 (0.0–15.0 ft bgs), Table B1.27 (0.0–20.0 ft bgs), and Table B1.32 (0.0–18.0 ft bgs).

For this study, the entire Brewster Boulevard upper aquifer is assigned to the undifferentiated Pleistocene and Holocene interbedded sands and silts, similar to those recognized at the Bow-1 site by Geophex, Ltd. (1994). However, basal clayey and silty sands of the aquifer in the southeastern part of the study area may be equivalent to the upper part of the Bonnerton Member of the Pungo River Formation of Miocene age (Table B2).

Brewster Boulevard Upper Confining Unit

The Brewster Boulevard upper confining unit separates the upper and lower Brewster Boulevard aquifers and consists of discontinuous, probably lensoidal, silty, sandy clays and clayey, sandy silts. Color is consistently a dark bluish- or greenish-gray. Local descriptions of the upper confining unit are listed in Table B1.15 (20.0–27.0 ft bgs), Table B1.30 (10.0–30.0 ft bgs), Table B1.32 (18.0–28.0 ft bgs), and Table B1.35 (14.0–23.0 ft bgs). At many locations throughout the study area, the Brewster Boulevard upper confining unit is either missing entirely or too thin and sandy to be an effective confining unit (Table B10). Accordingly, with few exceptions, available borehole data indicate that the upper and lower Brewster Boulevard aquifers are hydraulically well connected throughout the study area where both aquifers occur. A significant exception occurs in the immediate vicinity of IRP Site 88 (Figure B2) and east of McHugh Boulevard, where the Brewster Boulevard upper confining unit is highly competent and substantially interrupts the downward vertical migration of tetrachloroethylene (Faye et al. 2010, Figures C28, C29).

Altitude at the top of the upper confining unit is somewhat to highly variable, particularly east of Watkins village in the vicinity of Holcomb Boulevard and west of the HPIA, and varies from about 20 ft in an area south of Brewster Boulevard to about –15 ft near Sneads Ferry Road in the southwestern part of the study area (Figure B7). Altitude decreases more or less uniformly northwest to southeast.

Unit thickness is about 20 ft in the southernmost-central part of the study area (Figure B8). Elsewhere, unit thickness appears to be highly variable and varies generally between 3 and 11 ft.

Assignment of the Brewster Boulevard upper confining unit to a unique geologic formation is highly tentative because of its sporadic occurrence and diverse lithology. Based almost entirely on its stratigraphic location, largely at the base of undifferentiated Pleistocene and Holocene sediments, the Brewster Boulevard upper confining unit is assigned herein to the upper part of the Pungo River Formation of Miocene age, undifferentiated.

Brewster Boulevard Lower Aquifer

The Brewster Boulevard lower aquifer of this report between Northeast and Wallace Creeks corresponds nearly one-to-one with the Brewster Boulevard aquifer of Faye (2007a); exceptions occur when additional borehole data became available as a result of CERCLA and RCRA authorized investigations (Table B11). Altitude at the top of the aquifer is somewhat variable, particularly in the vicinity of McHugh Boulevard and River Road between Wallace and Frenchs Creeks, where data density is relatively high (Figure B9, Plate B1). South of Brewster Boulevard, altitude at the top of the unit varies from about 30 ft south of Brewster Boulevard to less than –20 ft near Sneads Ferry Road in the southwestern part of the study area.

Thickness of the aquifer also varies considerably throughout the study area, ranging from less than 10 ft in an area north of Wallace Creek to more than 45 ft near New River and Frenchs Creek (Figure B10, Plate B1). Thickness appears to generally increase north to south and west to east.

The characteristic lithology of the Brewster Boulevard lower aquifer is a somewhat silty, gray to white, fine- to medium-grained sand. Thin lenses or beds of silt and clay probably occur throughout much of the aquifer. Color varies locally from green to tan to brown. Shells and shell fragments occur frequently near the base of the aquifer. Peat and phosphatic sands were observed within the Brewster Boulevard lower aquifer in boreholes at the HPIA (Table B1.53, 23.5–27.5 ft bgs; Table B6, HPFF_MW66, 34.0–41.0 ft bgs). Typical Brewster Boulevard lower aquifer lithologies are listed in Table B1.6 (20.0–65.0 ft), Table B1.13 (19.0–54.0 ft bgs), Table B1.35 (23.0–53.0 ft bgs), Table B1.53 (14.0–53.0 ft bgs), and Table B1.60 (19.0–55.0 ft bgs). Locally, limestone fragments and fossiliferous, sandy limestone occur near the top of the aquifer. The sands are frequently cemented and contain shells (Table B5: 01-GW11, 11–17 ft bgs; 01-GW17DW, 25–27 ft bgs; 02-GW03D, 24–26 ft bgs; and Table B6: Bldg331_MW13, 29–50 ft bgs; Bldg 900_MW01, 38–44.2 ft bgs; Bldg1613_MW15, 20.5–40 ft bgs). At the HPIA, much of the aquifer thickness consists of weathered, sandy, fossiliferous limestone (Table B6: HPFF_MW07, 43–52 ft bgs; HPFF_MW09, 40–50 ft bgs; HPFF_MW10, 55–82 ft bgs; HPFF_MW43, 30–45 ft bgs; and Table B7: HP-601, 26–61 ft bgs; HP-603, 22–48 ft bgs; HP-606, 49–65 ft bgs). Locally, the limestone within the Brewster Boulevard lower aquifer is possibly cavernous (Table B7, HP-617 (new), 60–70 ft bgs).

Although highly tentative, the stratigraphic position of the Brewster Boulevard lower aquifer along with occurrences of weathered, fossiliferous limestone and phosphatic sands within the unit indicate a possbile Miocene age and correlation with the Pungo River Formation, undifferentiated.

Brewster Boulevard Lower Confining Unit

The Brewster Boulevard lower confining unit separates the Brewster Boulevard lower aquifer and Tarawa Terrace aquifer. Although core descriptions used to define the unit surface are limited, available data indicate a generally uniform southeast-trending surface beginning near the southern shore of Northeast Creek. A maximum altitude of about 20 ft bgs occurs in the vicinity of Midway Park and declines to an altitude of about 60 ft bgs near the far boundary of the study area (Figure B11, Table B12). Locally the unit is discontinuous and probably lensoidal. Irregularities in the surface occur near Watkins Village and Wallace Creek but are minor with respect to the overall surface trend.

Thickness of the lower confining unit also generally increases to the south and southeast; however, trends are locally interrupted and highly irregular. Thickness increases from about 5 ft near the southern shore of Northeast Creek to 25 ft in the vicinity of borehole T-8 located on the north shore of Frenchs Creek (Figure B12).

Lithology of the Brewster Boulevard lower confining unit is characteristically a sandy silt or clay. Sand content is frequently minor. Color is typically gray but varies locally from green-gray to gray-brown. In the vicinity of IRP Site 6, south of Wallace Creek, the confining unit is possibly a mud-filled limestone at the top and grades to a silty, clayey fine-grained sand at the base (Figure B2; Table B1.13, 46.5–55.5 ft bgs). Limestone with thin beds of silt and clay also occurs infrequently at or near the top of the confining unit at the HPIA (Table B6, HPFF_MW65, 49–51 ft bgs). Local descriptions of the Brewster Boulevard lower confining unit are listed in Table B1.8 (15–20.0 ft bgs), Table B1.10 (13–19 ft bgs), Table B1.12 (32.0–36.0 ft bgs), Table B1.13 (46.5–55.5 ft bgs), Table B1.22 (50.0–55.0 ft bgs), Table B1.31 (3.0–10.0 ft bgs), Table B1.36 (15.0–21.0 ft bgs), Table B1.55 (48.0–53.0 ft bgs), and Table B1.60 (55.0–60.0 ft bgs).

For this study, the Brewster Boulevard lower confining unit is assigned to the upper part of the Belgrade Formation of Miocene age (Table B2). The unit may be chronostratigraphically equivalent to the 6 ft of sandy molluscan calcarenite and unfossiliferous clay described as the uppermost part of the Belgrade Formation at the formation type area in northeast Onslow County (Baum et al. 1979b).

Tarawa Terrace Aquifer

The Tarawa Terrace aquifer occurs throughout the study area and is composed largely of dense, calcareous, gray, commonly silty, fine-grained sand interbedded with relatively thick segments of weathered, sandy, fossiliferous limestone. Thin lenses and beds of silt and clay occur frequently. Shell and limestone fragments are common within much of the aquifer. Core descriptions of typical Tarawa Terrace lithology are listed in Table B1.3 (43–80 ft bgs), Table B1.4 (96–137 ft bgs), Table B1.34 (58–82 ft bgs), Table B1.39 (15–52 ft bgs), and Table B1.60 (60–80 ft bgs). Less complete lithologic descriptions are listed in Table B5 (06-GW01D, 46.4–47 ft bgs) and in Table B6 (Bldg33_MW09, 31–32 ft bgs; Bldg645_MW14, 24–30 ft bgs; HPFF_MW60, 55–65 ft bgs).

The surface of the Tarawa Terrace aquifer trends generally south and southeastward across the study area from an altitude of about 5 ft near the south shore of Northeast Creek to about –80 ft near Frenchs Creek (Figure B13, Table B13). Aquifer thickness also increases somewhat uniformly to the southeast from a minimum of about 10 ft near Paradise Point to more than 80 ft at the southernmost point of the study area near Sneads Ferry Road (Figure B14).

Based on a stratigraphic position below rocks of presumed Miocene age and a predominant lithology of fine-grained, calcareous sands containing shell and limestone fragments, the upper part of the Tarawa Terrace aquifer is herein assigned to the Belgrade Formation, undifferentiated (Table B2). An unspecified middle and lower part of the aquifer is assigned to the undifferentiated River Bend Formation of Oligocene age. LaGesse and Read (2006) assigned the entire Oligocene sequence at the Bow-1 site to the lower River Bend Formation (sequence O1).

Upper Castle Hayne Confining Unit

The Upper Castle Hayne confining unit separates the Tarawa Terrace aquifer and the Upper Castle Hayne aquifer–River Bend unit. The confining unit probably occurs throughout the study area but is largely undifferentiated in driller's logs and in the few cored sections that penetrate the unit. Consequently, control points used to map the top and thickness of the Upper Castle Hayne confining unit (Figures B15, B16) were determined almost exclusively from interpretations of electric logs obtained at supply and test wells and at several monitor wells in the vicinity of the HPIA and near UST site HP-645 (Plate B1). As such, the altitude at the top of the Upper Castle Hayne confining unit ranges from about –10 ft in the vicinity of Paradise Point to lower than –150 ft near the southeastern limit of the study area. The surface declines generally uniformly northwest to southeast (Figure B15, Table B14).

Thickness of the unit ranges from less than 10 ft near the intersection of Brewster and Holcomb Boulevards to about 35 ft south of SR 24 in the east-central part of the study area (Figure B16). Thickness is highly variable, and consistent trends are not apparent.

Faye (2007a) used highly generalized descriptions from several driller's logs and described the confining unit as a white, green, or blue sandy clay. At monitor well HPFF_GW60 (Table B1.60), a green silty, very fine- to fine-grained sand containing several thin segments of highly weathered, sandy limestone and shell fragments is assigned herein to the Upper Castle Hayne confining unit (80.0–108.0 ft bgs). At monitor well Bldg645_MW22, "gray, hard sand and marl layers" occur between 55.0 and 65.0 ft bgs and is also assigned to the Upper Castle Hayne confining unit (Catlin Engineers and Scientists 2008). At supply well HP-662, near the southeastern limit of the study area, the unit is described as "clay" between 165 and 175 ft bgs (C.W. Brinkley & Son, Inc., driller's log, written communication, August 29, 1983) (Plate B1). Locally the confining unit is discontinuous.

The Upper Castle Hayne confining unit is assigned herein to the base of the River Bend Formation (Table B2) and thus represents the base of rocks of Oligocene age in the study area. This unit possibly is equivalent to the marl recognized by LaGesse and Read (2006) at the base of Oligocene rocks in the Bow-1 borehole.

In the Tarawa Terrace series of reports and in Chapter C of this series (Hadnot Point–Holcomb Boulevard series), the Upper Castle Hayne confining unit was designated the Tarawa Terrace confining unit (Faye 2007a, Faye et al. 2010)

Upper Castle Hayne Aquifer–River Bend Unit

The surface of the River Bend unit of the Upper Castle Hayne aquifer is correlated herein with sequence E4 of LaGesse and Read (2006) at the Bow-1 site and thus probably represents the surface of rocks of Late Eocene age within the study area. Geophex, Ltd. (1994) recognized this surface as the top of the Castle Hayne Formation; however, LaGesse and Read (2006) located the surface of the Castle Hayne Formation approximately 10 ft below the base of Oligocene Rocks at the top of their sequence E3B.

The characteristic lithology of the River Bend unit, as indicated in many boring logs, is a dense, sandy, weathered, fossiliferous limestone or a sand that contains abundant limestone and shell fragments. The limestone is infrequently accompanied by marl or "limey mud" and may contain layers of sand and clay. The sand is frequently described as "hard" or "dense," which probably indicates a cemented matrix. Core descriptions of lithology at or near the top of the River Bend unit are listed in Table B1.13 (110.0–117.0 ft bgs), Table B1.17 (86.3–111.0 ft bgs), Table B1.22 (96.0–104.0 ft bgs), Table B1.36

(65.0–82.0 ft bgs),Table B1.45 (79.0–106.0 ft bgs), Table B1.48 (86.0–90.0 ft bgs), and Table B1.60 (108.0–138.0 ft bgs). Locally, limestone within the River Bend unit is cavernous (Table B1.14, monitor well 06-GW01DA, 127.0 ft bgs). In cuttings descriptions, the top of the River Bend unit is typically recorded as "shell rock" with sand or "coquina" with sand. The rocks may be classified as "hard" or "soft" (Table B7: CCC-1, 49–75 ft bgs; HP-608, 117–126 ft bgs; HP-616, 87–127 ft bgs).

Altitude at the surface of the River Bend unit ranges from about –30 ft in the vicinity of Paradise Point to about –160 ft at Sneads Ferry Road near the southeastern boundary of the study area. The surface declines at a generally uniform rate northwest to southeast (Figure B17, Table B15). Thickness of the River Bend unit ranges from about 20 ft in the eastern part of the study area near SR 24 to more than 65 ft in the southeastern part near Sneads Ferry Road (Figure B18).

Local Confining Unit

The Local confining unit separates the River Bend and Lower units of the Upper Castle Hayne aquifer and is correlated herein with the uppermost part of transgressive sequence E3B, recognized by LeGesse and Read (2006) in the Bow-1 borehole as the top of the Castle Hayne Formation. A similar assignment is recognized herein. Faye (2007a) assigned the surface of the Local confining unit to the top of the Castle Hayne Formation in the Tarawa Terrace and Montford Point areas of USMCB Camp Lejeune (Figure B1). The age of sequence E3B is possibly best described as transitional between late Middle Eocene and early Late Eocene (LaGesse and Read 2006).

Faye (2007a) described the Local confining unit as a "lean clay," "clay medium hard," and "silty fine sand" in the vicinities of Tarawa Terrace and Montford Point and as locally thin or absent in the vicinity of supply wells HP-641, HP-650, HP-651, HP-709, HP-710, and borehole T-7 (Plate B1). At supply well HP-611 (new), east of the HPIA, the top of the local confining unit is recognized as a "yellowish green silt" between 165 and 170 ft bgs (S.H. Barner, Inc., driller's log, written communication, March 13, 1997). At supply well HP-703, between Brewster Boulevard and Northeast Creek, the Local confining unit is described as a "white clay" between 105 and 110 ft bgs (R.L. Magette Co., driller's log, written communication, October 21, 1985). Similarly, at HP-649, near SR 24 in the north-central part of the study area, the unit is described as "clay" between 140 and 150 ft bgs (Corbin Construction Co., driller's log, written communication, October 18, 1971) (Table B16). Few monitor well boreholes in the study area penetrate to the Local confining unit, and core descriptions of the unit are largely unavailable. In addition, fine-grained sediments such as clays and marls are typically suspended in drilling mud during borehole drilling and, as such, are not easily distinguished from the drilling mud. Accordingly, control points used to define the surface and thickness of the unit were obtained almost entirely from interpretations of electric logs at supply and test wells.

The surface of the Local confining unit trends northwest to southeast at a generally uniform rate; however, the rate of decline increases somewhat south of Wallace Creek (Figure B19). The surface is interrupted by only minor irregularities. Surface altitudes range from about –40 ft in the vicinity of Paradise Point, Tarawa Terrace, and Montford Point, to about –220 ft near the southeastern boundary of the study area (Plate B1, Table B16). Unit thickness is consistent compared to thickness descriptions of overlying geohydrologic units and ranges only from about 10 to 20 ft throughout the study area (Figure B20). Locally, where the unit is thin or absent, the River Bend and Lower units of the Upper Castle Hayne aquifer compose a single aquifer.

Upper Castle Hayne Aquifer–Lower Unit

With the exception of cuttings descriptions at monitor well 78-642-1, control points used to map the top and thickness of the Lower unit of the Upper Castle Hayne aquifer were derived entirely from interpretations of electric logs at supply and test wells (Table B1.30, Table B17). As such, the surface of the Lower unit is configured similarly to that of the overlying Local confining unit but at a lower altitude (Figures B19, B21). Altitude ranges from about –50 ft in the southeastern part of Tarawa Terrace to about –230 ft north of Frenchs Creek in the southeastern part of the study area. Thickness of the Lower unit is greatest south of Northeast Creek in the vicinity of Brewster Boulevard (about 45 ft), and thins west to east as well as southeastward to a minimum of 20 ft near the headwaters of Frenchs Creek (Figure B22).

The lithology of the Lower unit is apparently somewhat to highly consistent, based on a limited number of descriptions in driller's logs, and appears to be a gray sand containing shells and thin beds of sandy limestone. Faye (2007a) describes unit lithology in the vicinity of borehole T-1, near SR 24 in the north-central part of the study area, as "medium, soft shellrock and sand" (Plate B1, Table B1.1, 147–158 ft bgs). At borehole T-7, north of Wallace Creek in the central part of the study area, the Lower unit is described as a medium-grained, gray sand containing loose shells and "streaks" of shellrock (Faye 2007a) (Plate B1, Table B1.3, 120–152 ft bgs). The driller's log at supply well HP-614 (new) lists "limestone" and "fine gray sand" in the interval recognized as the Upper Castle Hayne aquifer–Lower unit, between 150 and 170 ft bgs (S.H. Barner, Inc., driller's log, written communication, November 11, 1994). Supply well HP-614 (new) is located near SR 24 in the eastern part of the study area (Plate B1). The age of rocks of the Lower unit is considered herein to be transitional, ranging from late Middle Eocene to early Late Eocene, and is assigned to sequence E3B recognized at the Bow-1 site by LaGesse and Read (2006).

Middle Castle Hayne Confining Unit

The Middle Castle Hayne confining unit separates the Lower unit of the Upper Castle Hayne aquifer from the Middle Castle Hayne aquifer. The unit is poorly differentiated in driller's logs or not differentiated at all, similar to data available for the Local confining unit. Accordingly, control points used to define the surface and thickness of the Middle Castle Hayne confining unit were obtained almost entirely from interpretations of electric logs at supply and test wells. The surface of the Middle Castle Hayne confining unit declines to the south and southeast across the study area and ranges in altitude from about –70 ft in the southeastern part of Tarawa Terrace to lower than –230 ft near the confluence of Frenchs Creek and New River (Table B18, Figure B23). Thickness of the confining unit is highly consistent within the study area and is about 25 ft with no apparent area-wide trends (Figure B24).

The lithology of the Middle Castle Hayne confining unit is apparently diverse, as noted in the following descriptions; however, the predominant lithology appears to be a gray, green, or blue sandy clay, locally containing shells and possibly thin beds of limestone. Based on a few descriptions of cuttings listed in driller's logs, Faye (2007a) described the Middle Castle Hayne confining unit as a clay or "gray silty clay with shell" in the vicinities of Tarawa Terrace and Montford Point (Figure B1). The confining unit is described in the driller's log at borehole T-1, located south of SR 24 in the central part of the study area (Plate B1), as a "medium soft clay and rock" in the interval 158–167 ft bgs (Table B1.1). At borehole T-8, located on the north bank of Frenchs Creek near New River, the confining unit occurs between 218 and 247 ft bgs, where cuttings are described as "fine sandy clay, little rock, soft" (Table B1.4). At supply well HP-700, south of Northeast Creek near Brewster Boulevard, the confining unit is described in a driller's log as "green clay and limestone" between 140 and 155 ft bgs (R.L. Magette Co., driller's log, written communication, February 6, 1986). At supply well HP-705, located southeast of Midway Park near SR 24 (Plate B1), the confining unit within the interval 160–170 ft bgs is described as "limestone mixed with blue clay" (R.L. Magette Co., driller's log, written communication, February 2, 1986). Near the HPIA at supply well HP-602, the Middle Castle Hayne confining unit is described as "yellow sandy muck" between 176 and 189 ft bgs (Layne Atlantic Co., driller's log, written communication, November 29, 1941). East of the HPIA at supply well HP-611 (new), a green clay noted in the interval 210–220 ft bgs is probably part of this confining unit (S.H. Barner, Inc., driller's log, written communication, March 13, 1997). In Watkins Village at supply well HP-607 (new), the confining unit is described as "clay" between 143 and 158 ft bgs (Carolina Well and Pump Co., Inc., driller's log, written communication, August 21, 1984). At supply well HP-557 located south of SR 24 near the eastern boundary of the study area, the Middle Castle Hayne confining unit is described as a "dark gray clay" containing limestone and fine gray sand between 165 and 195 ft bgs (S.H. Barner, Inc., driller's log, written communication, December 22, 1998). Rocks of the Middle Castle Hayne confining unit are assigned herein to sequence E3A, as recognized by LaGesse and Read (2006) in the Bow-1 borehole, and are considered of Middle Eocene age.

Middle Castle Hayne Aquifer

Monitor, test, and supply wells that penetrate to the Middle Castle Hayne aquifer are relatively few in number compared to wells that bottom in overlying units, and consequently, fewer descriptions of unit lithology are available. Control points used to map the surface and thickness of the aquifer were derived entirely from the interpretation of electric logs at supply and test wells. Based on previous descriptions by Faye (2007a) in the vicinity of Tarawa Terrace and Montford Point and several boring logs within the study area, the lithology of the Middle Castle Hayne aquifer is predominantly a gray, fine- to medium-grained calcareous sand containing abundant shells and interbedded with silt, clay, and limestone. Locally the sand is dense and probably cemented. Monitor well boreholes that penetrate the aquifer are known to occur only at IRP Site 6, located immediately south of Wallace Creek and east of Holcomb Boulevard (Plate B1). At this location, the Middle Castle Hayne aquifer generally occurs below 186 ft bgs and is characterized in several boring logs as a gray and green, dense, fine- to coarse-grained sand containing traces of silt and clay. Shells were observed infrequently in cores (Tables B1.14, B1.18, and B1.19). At borehole T-1, located southeast of Midway Park and near SR 24 (Plate B1), the Middle Castle Hayne aquifer is described in the driller's log as a "greenish" soft sand that grades upward to "fine pepper sand," several thick segments of clay, and a substantial interval of "fine to medium gray sand" (Table B1.1, 187–286 ft bgs). At borehole T-8, located on the north shore of Frenchs Creek near new River (Plate B1), the lithology of the interval recognized as the Middle Castle Hayne aquifer appears on the electric log largely as a sand or sandy limestone interbedded with several relatively thick segments of clay. The driller's log, however, describes the interval as an upper unit of mostly clay and a lower unit of mostly sand and hard "shellrock" (Table B1.4, 247–336 ft bgs).

The surface of the Middle Castle Hayne aquifer declines relatively uniformly to the southeast and south and ranges in altitude from about –90 ft in the southeastern part of Tarawa Terrace to lower than –230 ft near borehole T-8 near the confluence of Frenchs Creek and New River (Table B19, Figure B25). Thickness of the aquifer increases eastward and southeastward from about 55 ft near Paradise Point to about 120 ft near the eastern limits of the study area near SR 24 (Figure B26). The age of rocks of the Middle Castle Hayne aquifer are herein assigned to the Middle Eocene sequence E3A of LeGesse and Read (2006), as recognized in the Bow-1 borehole.

Lower Castle Hayne Confining Unit

The surface and thickness representations of the Lower Castle Hayne confining unit are, at best, highly generalized because of the limited number of control points available to map the unit (Figures B27, B28; Table B20). The unit surface apparently declines somewhat uniformly to the south and southeast and ranges in altitude from about –150 ft near Tarawa Terrace to about –320 ft near the confluence of Frenchs Creek and New River. Unit thickness appears highly consistent and ranges only from a minimum of less than 20 ft near Wallace Creek to a maximum of about 36 ft near borehole T-8 in the southern part of the study area. Relatively thick sections also occur southeast of Midway Park and near Paradise Point.

Faye (2007a) describes the lithology of the Lower Castle Hayne confining unit at borehole T-12 at the southern tip of Montford Point (Plate B1) as a "greenish," soft, sandy clay (Table B1.5, 152–188 ft bgs). At borehole T-1, located southeast of Midway Park and adjacent to SR 24, lithology of the unit is described as a "soft sandy clay" with "streaks of soft rock" and a "medium hard" sandy clay (Table B1.1, 286–311 ft bgs). At supply well HP-621 (new), located east of Piney Green Road and south of SR 24 (Plate B1), the unit is described as a green clay containing fine gray sand between 290 and 310 ft bgs (S.H. Barner, Inc., driller's log, written communication, April 26, 1995). Other point data used to map unit surface and thickness were derived entirely from the interpretation of electric and natural gamma borehole geophysical logs (Figures B27, B28).

Rocks of the Lower Castle Hayne confining unit are correlated herein with sequence E2 of LaGesse and Read (2006) as noted at the Bow-1 site. The resulting age of the rocks is Middle Eocene.

Lower Castle Hayne Aquifer

Highly generalized maps of the surface and thickness of the Lower Castle Hayne aquifer are shown in Figures B29 and B30, respectively. The surface declines relatively uniformly from an altitude of about –180 ft near Tarawa Terrace to about –360 ft near borehole T-8 near the confluence of Frenchs Creek and New River. The appearance of uniformity in the surface is probably misleading and is a result of the few number of control points used to map the surface (Figure B29, Table B21). Thickness of the aquifer ranges only from about 55 to 85 ft and appears to increase to the east and south (Figure B30).

At borehole T-12, located at the southern tip of Montford Point (Plate B1), lithology of the Lower Castle Hayne aquifer appears to be mostly fine sand and "shellrock" (Table B1.5, 188–252 ft bgs). A similar lithology occurs at borehole T-1, located southeast of Midway Park (Plate B1), and includes "shellrock" and sand interbedded with several thick sections of soft, sandy clay (Table B1.1, 311–402 ft bgs). At borehole T-8, located near the confluence of Frenchs Creek and New River (Plate B1), aquifer lithology appears to be "soft black clay and streaks of hard rock" (Table B1.4, 368–415 ft bgs).

Rocks of the Lower Castle Hayne aquifer are assigned herein to a Middle Eocene age and correlated with either sequence E1 or E2 of LaGesse and Read (2006), as recognized in the Bow-1 borehole.

Beaufort Confining Unit

Rocks presumably within the Jericho Run Member of the Beaufort Formation were described previously in the Geologic Framework section of this report and, as such, are assigned to a Paleocene age and sequence P1 of LaGesse and Read (2006). For this study, the top of the Beaufort Formation and the top of the Beaufort confining unit are generally considered identical surfaces. A highly generalized map of the surface of the Beaufort confining unit/Formation is shown in Figure B31 (Table B22). The surface is shown to decline relatively uniformly from a maximum altitude of about –225 ft north of Northeast Creek to about –425 ft near the confluence of Frenchs Creek and New River (Figure B31). This surface defines the base of the Castle Hayne aquifer system and, tentatively, the base of the Castle Hayne Formation within the study area.

Thickness of the Castle Hayne Formation

The surface of the Local confining unit was previously identified as an approximate top of the Castle Hayne Formation in the study area (Figure B19). Similarly, the base of the Castle Hayne Formation was defined as the top of the Beaufort Formation (Figure B31). Accordingly, the difference in altitude between the two surfaces corresponds to a highly generalized and approximate map of thickness of the Castle Hayne Formation in the study area (Figure B32). Referring to this map, formation thickness is shown to decline from a minimum of about 175 ft north of the study area to a maximum of about 250 ft southeast of Midway Park and adjacent to SR 24. Thickness also appears to increase to the east and decrease to the west and south of the center of the study area. Thickness is about 225 ft near the western and southwestern boundaries of Hadnot Point and is about 225 ft near the southern boundary. Brown et al. (1972) indicated a thickness of about 200 ft for rocks of Middle Eocene age about 10 miles southwest of the study area near Sneads Ferry (Plate B1) (Brown et al. 1972, borehole ON-OT-75, Section C–C', Plate 25). LaGesse and Read (2006) assigned a thickness to the Castle Hayne Formation of about 180 ft at the Bow-1 site, about 8 miles directly west of the study area.

Horizontal Hydraulic Conductivity

Results of more than 200 aquifer and slug tests are listed in Tables B23–B25 for monitor wells at IRP and UST sites and at Hadnot Point and Holcomb Boulevard supply wells. A skin factor associated with several supply wells is listed in Table B25 and is included herein as an indirect measure of well efficiency—the larger the skin factor, the poorer the well efficiency (Halford and Kuniansky 2002). For all tests, horizontal hydraulic conductivity ranged from about 1.0 to more than 500 ft/d. The largest conductivity was determined using step-drawdown data at supply well HP-620, which was completed as an open borehole within a karst limestone cavity (Table B25).

Most aquifer tests and many slug tests were conducted in wells open to more than a single aquifer (Tables B23–B25). Results from a total of 77 tests were assigned uniquely to elements of the Brewster Boulevard aquifer system. Of these, horizontal hydraulic conductivity was determined as a direct result of test analysis at 54 monitor well or supply well locations. The arithmetic mean of horizontal hydraulic conductivity at these 54 locations was 12.0 ft/d. The standard deviation and geometric mean were 19.6 ft/d and 4.0 ft/d, respectively. Horizontal hydraulic conductivity ranged from less than 1.0 to 87 ft/d. Similar statistics were determined for 29 test results assigned for the most part to the Upper Castle Hayne aquifer. The arithmetic and geometric means were 28.5 ft/d and 23.7 ft/d, respectively. The standard deviation was 16.2 ft/d and horizontal hydraulic conductivity values ranged from 1.6 to 79 ft/d. Significantly fewer test results were uniquely assigned to the Tarawa Terrace and Middle Castle Hayne aquifers, nine and three results, respectively. The arithmetic and geometric means of results from the Tarawa Terrace aquifer were 17.3 ft/d and 10.0 ft/d, respectively. The standard deviation was 18.2 ft/d. Horizontal hydraulic conductivities ranged from 1.0 to 62 ft/d. Because of the limited number of data, only an arithmetic mean was computed for the results from the Middle Castle Hayne aquifer, which equaled 24 ft/d. Horizontal hydraulic conductivity values ranged from 10.0 to 33.0 ft/d.

Test results representing the Brewster Boulevard aquifer system and the Upper Castle Hayne aquifer were also available to map distributions of horizontal hydraulic conductivity for these units (Figures B33, B34). Where multiple test results were available at a single location, a single result representing either the largest hydraulic conductivity value or the conductivity value determined from the most reliable test was selected for plotting. In addition, transmissivity and an estimate of aquifer thickness were used to compute horizontal hydraulic conductivity in areas where horizontal hydraulic conductivity was not determined directly from the test analysis. A total of 23 test results were used to map a highly generalized distribution of horizontal hydraulic conductivity representing the Brewster Boulevard aquifer system. Horizontal hydraulic conductivity appears to generally increase southward and eastward from the northern limits of the study area (Figure B33). A southward increase in conductivity is further indicated by a test result of 64 ft/d at supply well HP-585 (Table B25). This well is located south of the study area along Sneads Ferry Road and is shown neither on Plate B1 nor on Figure B33. A similar highly generalized distribution of horizontal hydraulic conductivity within the Upper Castle Hayne aquifer is shown in Figure B34. Mapped values of hydraulic conductivity included results from a total of 29 tests. Relatively high values of conductivity occur northwest of the intersection of Brewster and Holcomb Boulevards and just south of the intersection of Wallace Creek and Holcomb Boulevard. Conductivity generally declines to the east, west, and south of these areas.

Discussion

Point data assigned to map the tops and thicknesses of the geohydrologic units in the study area decrease in number and density with unit depth, thus increasing the subjectivity and generalization of interpolated results. For example, a total of 248 control points were used to map the top of the Brewster Boulevard upper confining unit; however, only 21 points were available to map the top of the Lower Castle Hayne confining unit. Nevertheless, the unit maps and related control data described herein (Figures B6–B33, Tables B9–B22) are considered integral to the groundwater-flow model used for historical reconstruction and were used to assign layers and layer geometry during flow-model construction. Specific aspects of control point location uncertainties are thoroughly discussed and quantified in Chapter C of the Hadnot Point–Holcomb Boulevard series of ATSDR reports (Faye et al. 2010) and are not discussed herein. Uncertainties with respect to aquifer- and slug-test results relate largely to disparities between actual field conditions and the assumptions necessary to achieve an analytical solution for various theoretical well and aquifer/confining unit configurations. For example, most aquifer-test methods are based on the

assumption that pumped and observation wells are open to the same and entire thickness of the water-bearing unit being tested; also assumed is that transmissivity and storativity are spatially and temporally constant. At USMCB Camp Lejeune, water-supply and monitor wells located within the study area were not specifically designed or constructed for the purposes of aquifer characterization. Accordingly, aquifer- and slug-test data derived from these wells do not totally conform to all of the assumptions deemed necessary for a theoretical analytical solution. Regardless, the methods referenced previously have been applied successfully under similar conditions and restrictions with apparently valid results, and test results reported herein are considered equally valid (Faye and McFadden 1986; Faye and Smith 1994).

Summary and Findings

The geohydrologic framework inclusive of the Castle Hayne Formation and younger sediments between Northeast and Frenchs Creeks at U.S. Marine Corps Base Camp Lejeune, North Carolina, is described and quantified. The framework is composed of 14 units, 7 of which correspond to the Upper, Middle, and Lower Castle Hayne aquifers and related confining units of the Castle Hayne aquifer system. Directly overlying the Upper Castle Hayne aquifer system is the Tarawa Terrace aquifer. The Brewster Boulevard aquifer system is between land surface and the top of the Tarawa Terrace aquifer and consists of the upper and lower Brewster Boulevard aquifers and related confining units. The top of the Beaufort confining unit is at the base of the Castle Hayne aquifer system and corresponds to the base of sediments of interest to this study.

The Castle Hayne aquifer system contains the major water-bearing units of the study area, and most supply wells are completed in at least one aquifer of the system. Much of the Castle Hayne aquifer system consists of fine-grained, silty and clayey sand interbedded with sandy, fossiliferous limestone. Relatively thin, discontinuous beds and lenses of clay occur frequently within the sand aquifers. Limestone beds are generally thin compared to sand thicknesses and are also discontinuous and occasionally cavernous. Confining units are characterized by clays and silty clays of significant thickness and several are probably persistent across much of the study area. Confining unit thickness rarely exceeds 20 ft. Lithology of the Tarawa Terrace aquifer and the lower aquifer of the Brewster Boulevard aquifer system is mostly a fine- to medium-grained, somewhat silty sand containing shells and thin lenses and beds of silt and clay. Thin beds of sandy, fossiliferous limestone occur locally near the top of the Tarawa Terrace aquifer and within the Brewster Boulevard lower aquifer. The uppermost units of the Brewster Boulevard aquifer system are entirely clastic and are composed mostly of fine-grained, silty sand and discontinuous, possibly lensoidal sandy clays. In general, geohydrologic units trend and thicken northwest to southeast across the study area. Maximum thickness of the Castle Hayne aquifer system is approximately 300 ft.

Field data collected during 169 aquifer tests at supply and monitor wells were analyzed using a variety of methods to compute horizontal hydraulic conductivity, transmissivity, storativity, and leakance factors for several geohydrologic units. Horizontal hydraulic conductivity values determined from slug-test data at 66 monitor-well locations were reviewed and also assigned to geohydrologic units. Test results assigned to the Brewster Boulevard aquifer system and the Upper Castle Hayne aquifer were sufficiently numerous to map corresponding distributions of horizontal hydraulic conductivity within the study area and compute respective means and standard deviations. Geometric means of conductivities determined for the Brewster Boulevard aquifer system and the Upper Castle Hayne aquifer equaled 4.0 and 23.7 ft/d, respectively.

Acknowledgments

The author of this report acknowledges the managers and staff of the U.S. Geological Survey Water Science Center in Raleigh, North Carolina. In particular, the contributions of Melinda J. Chapman, Douglas A. Harned, and Stephen S. Howe are acknowledged for providing critical well construction and well log data used in this study. John Nickerson and Jeff Lautier of the North Carolina Department of Environment and Natural Resources provided logs and location data for boreholes of interest in Onslow County and neighboring counties. Also acknowledged are the voluminous contributions of technical reports and map data provided by staff of the Environmental Management Division, U.S. Marine Corps Base Camp Lejeune, North Carolina. The contributions of Scott R. Williams are particularly acknowledged for his assistance and cooperation in providing this information. The expert and highly professional preparation of the text and illustrations of this report by Caryl J. Wipperfurth and Kimberly A. Waltenbaugh of the U.S. Geological Survey Science Publishing Network are gratefully acknowledged.

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Figures B6–B34

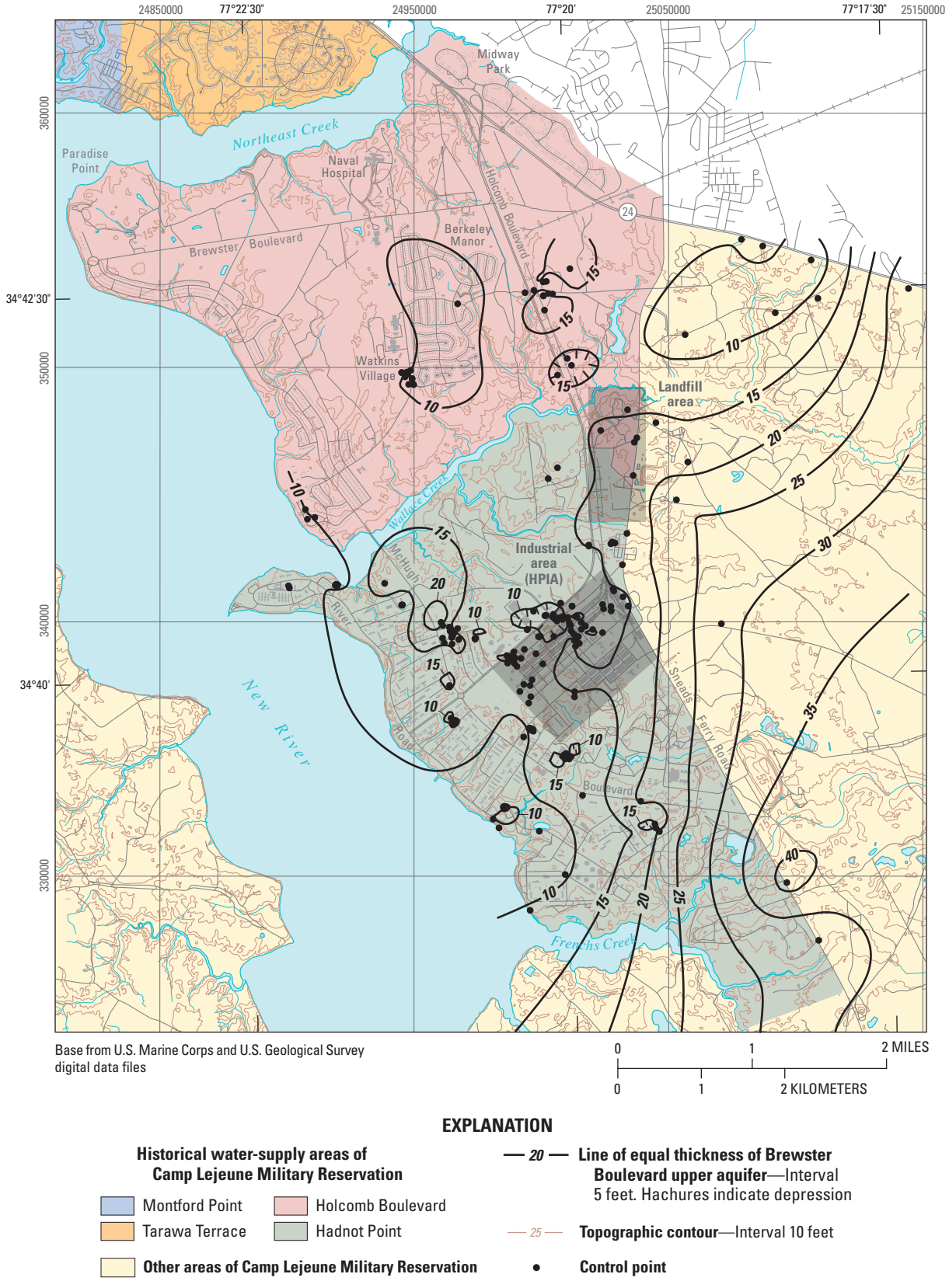


Figure B6. Thickness of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

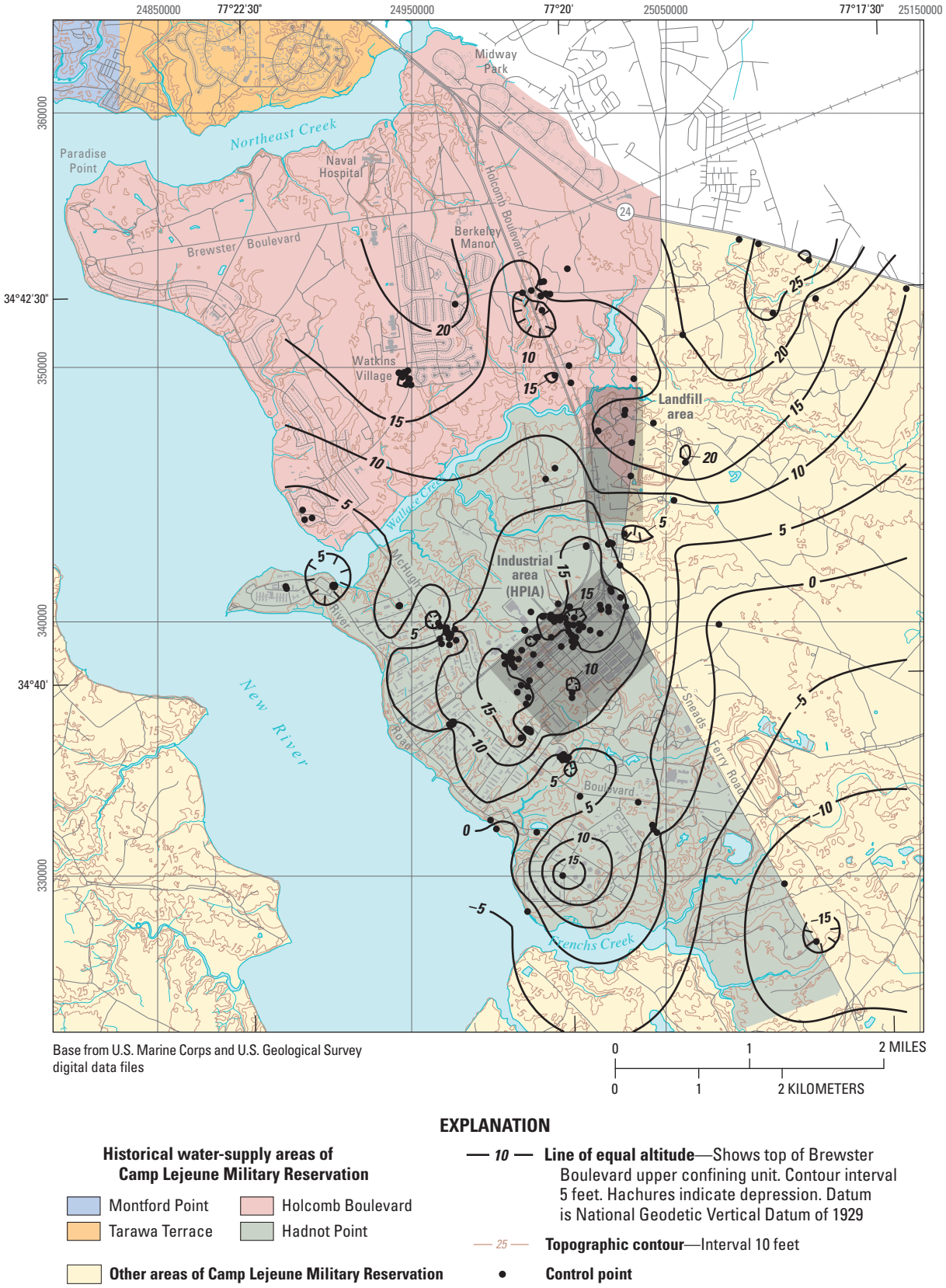


Figure B7. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

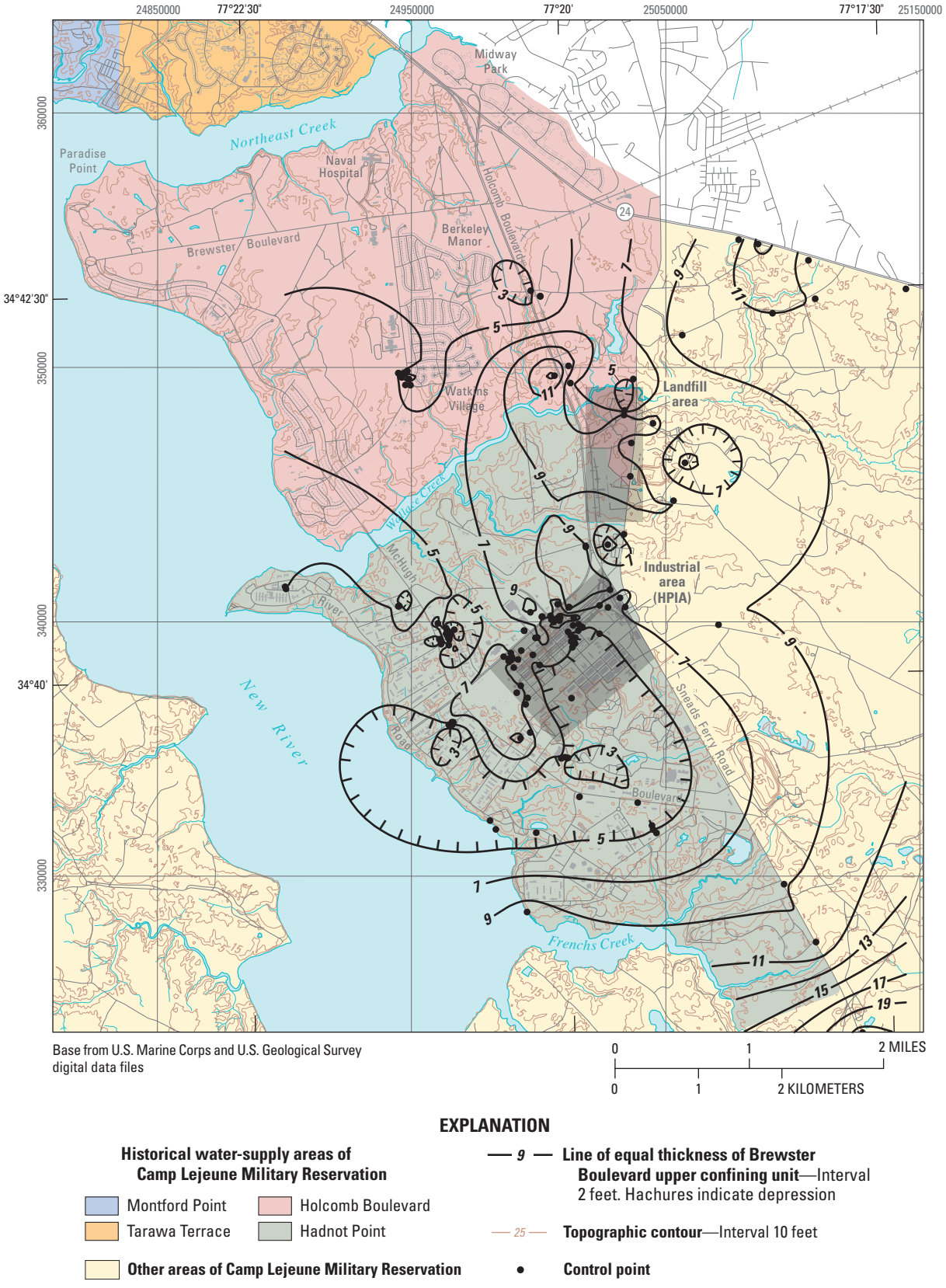


Figure B8. Thickness of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

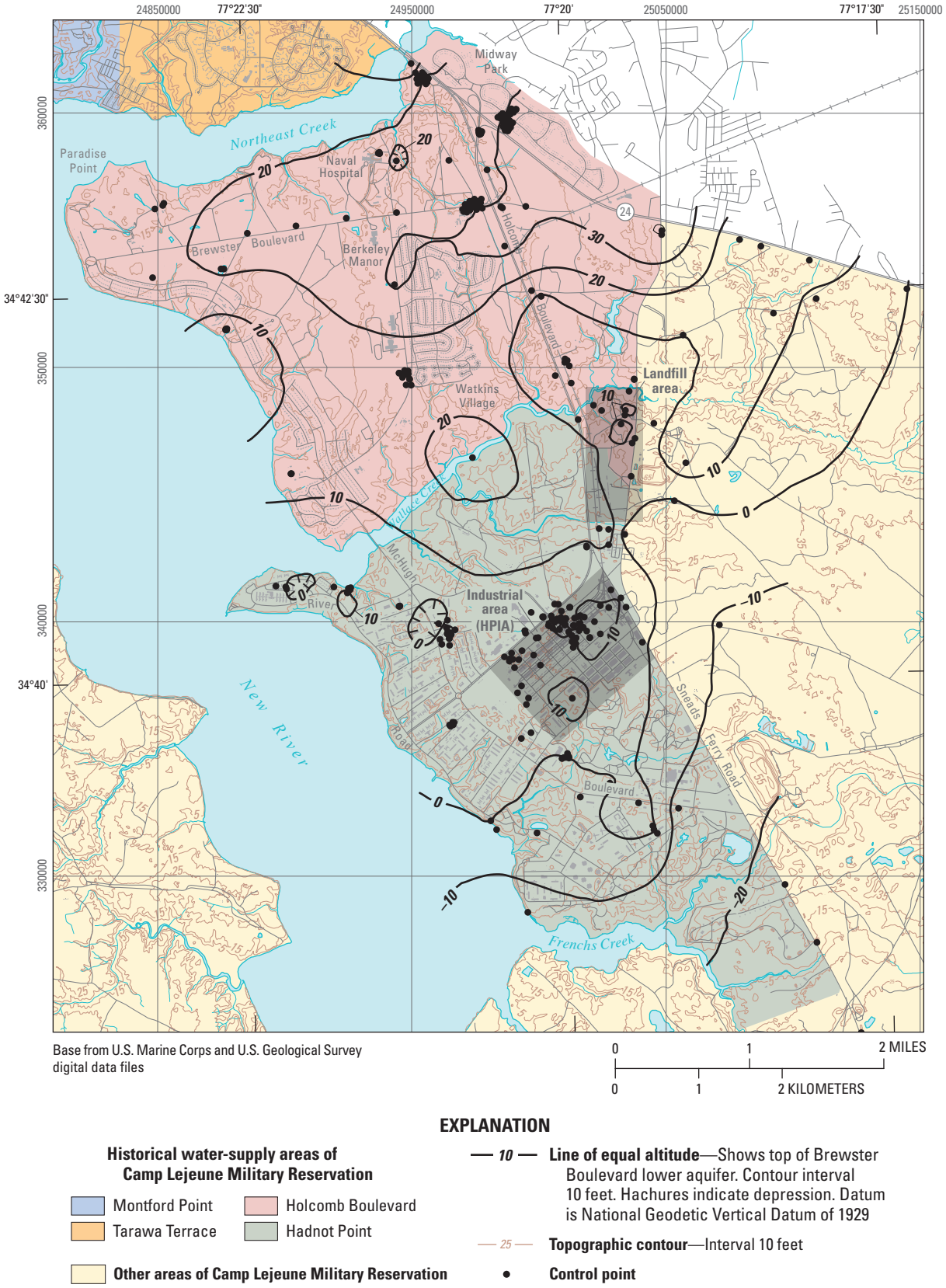


Figure B9. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

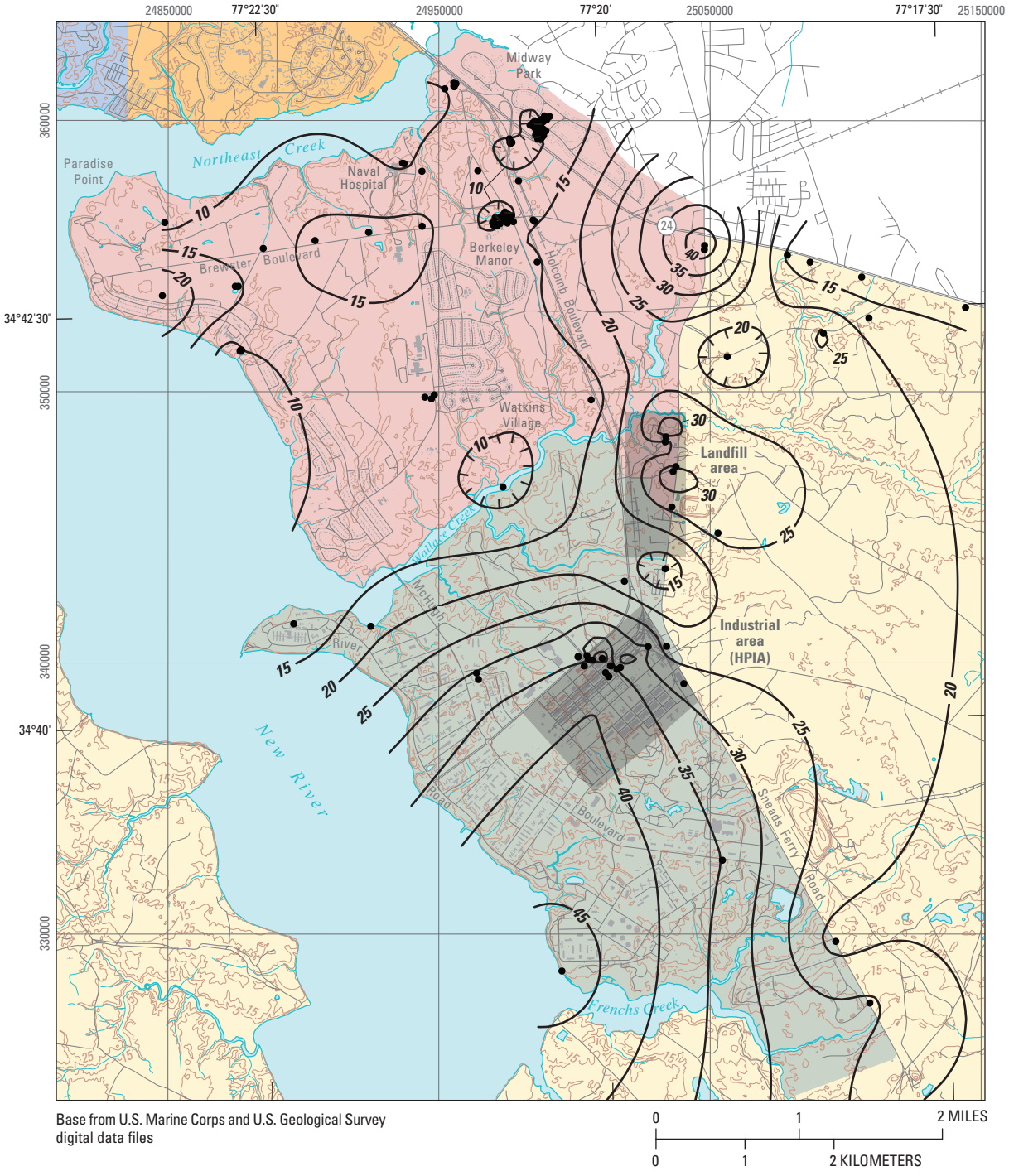


Figure B10. Thickness of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

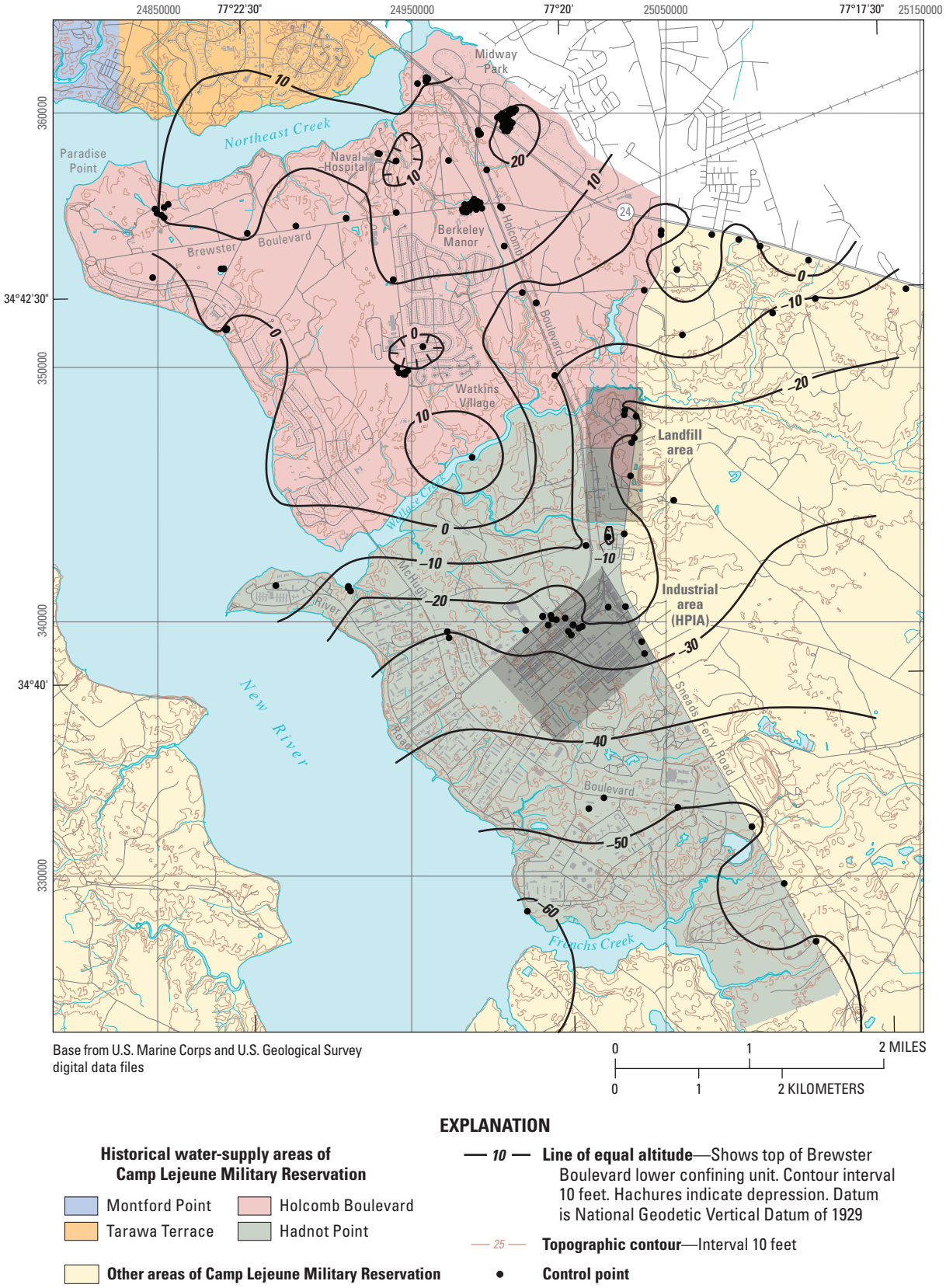


Figure B11. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

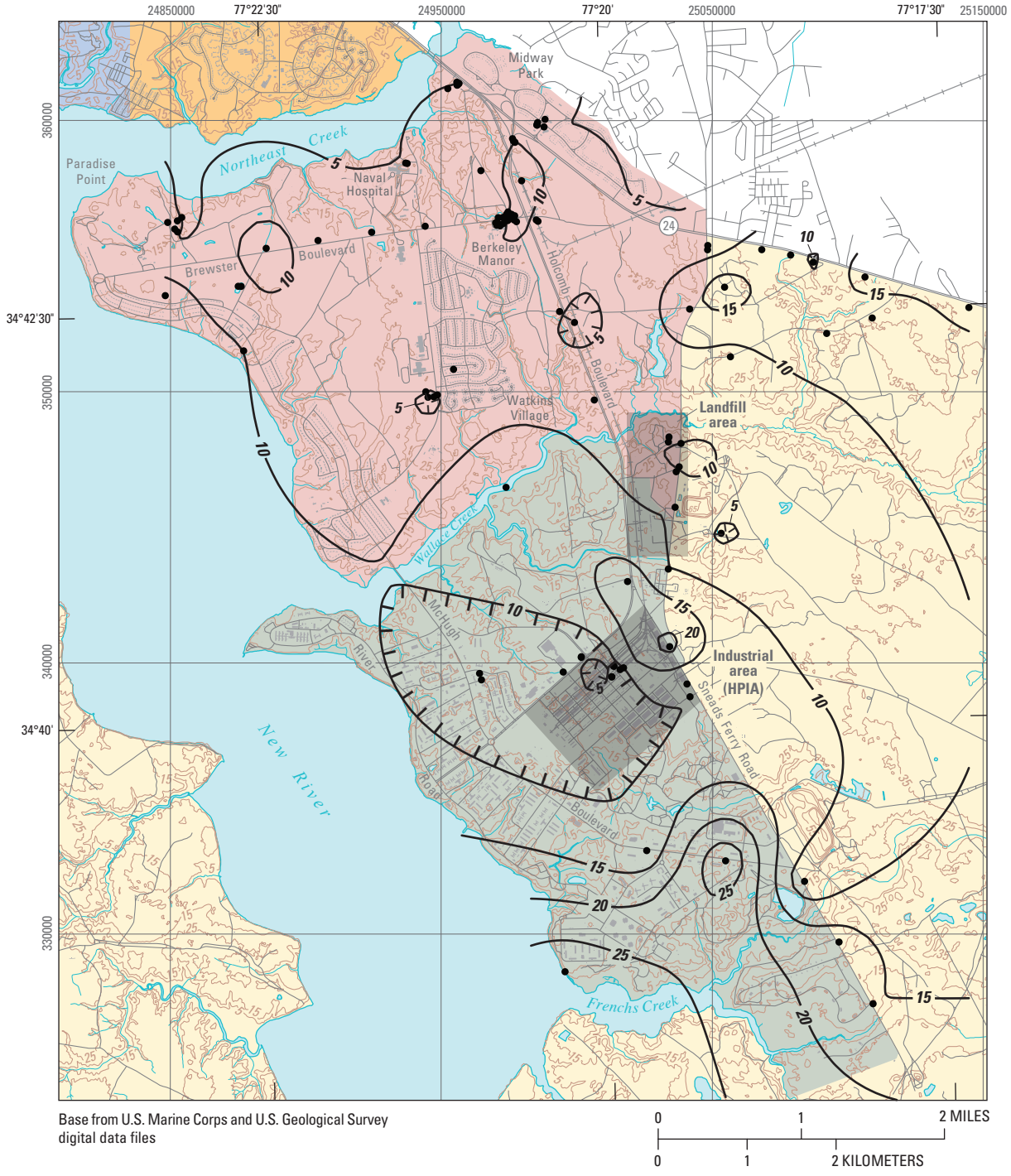


Figure B12. Thickness of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

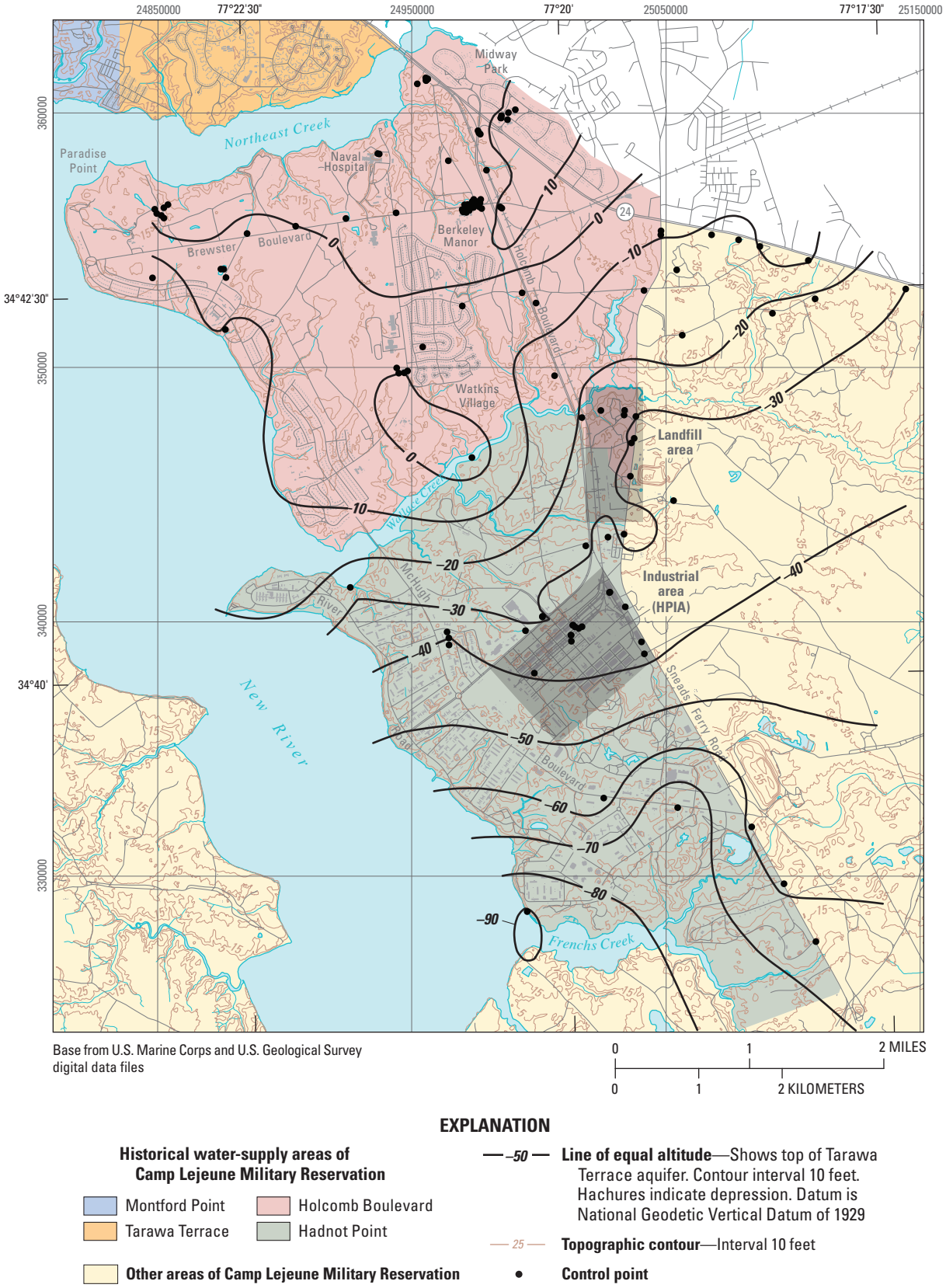


Figure B13. Altitude at the top of the Tarawa Terrace aquifer, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

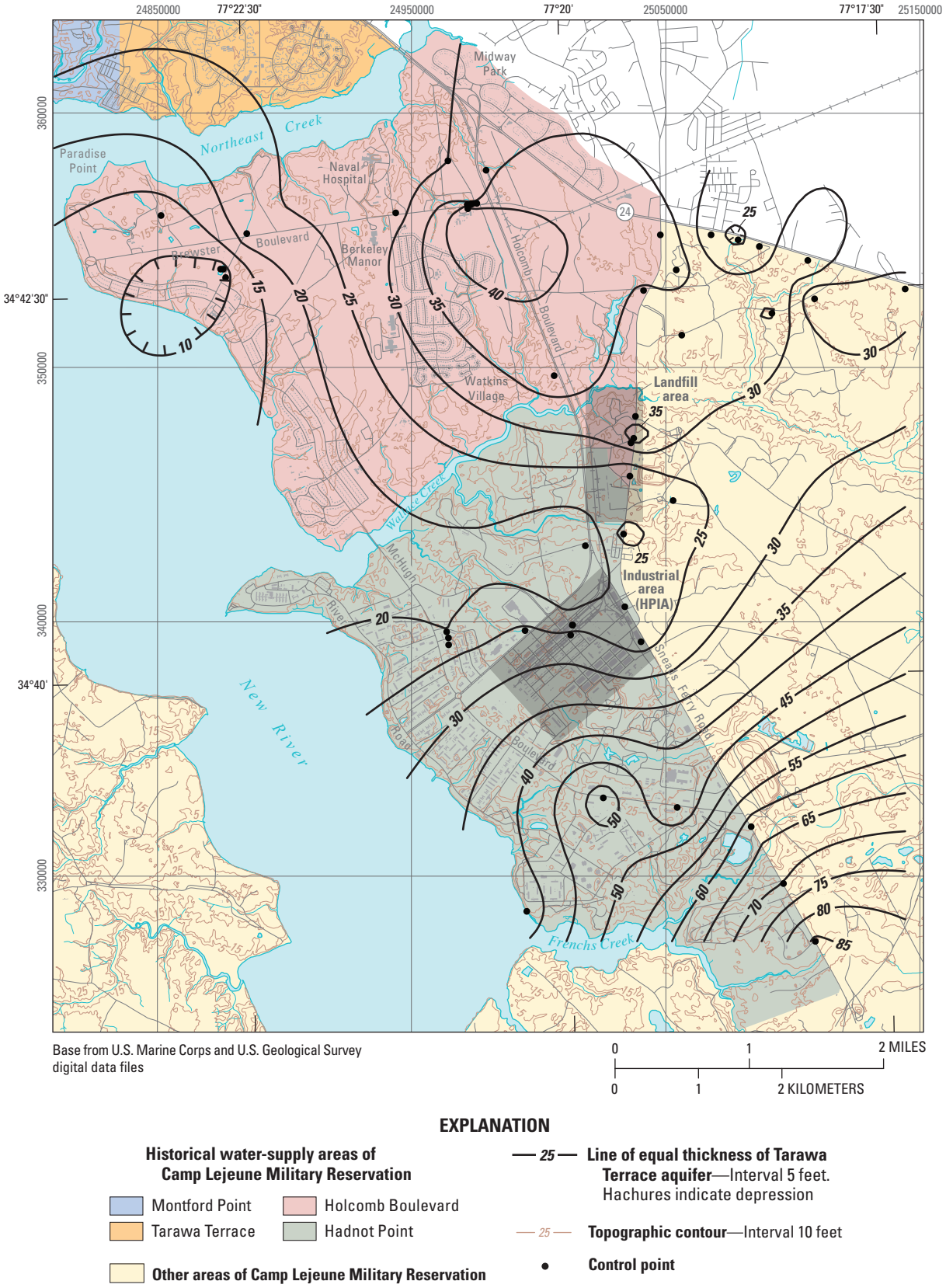
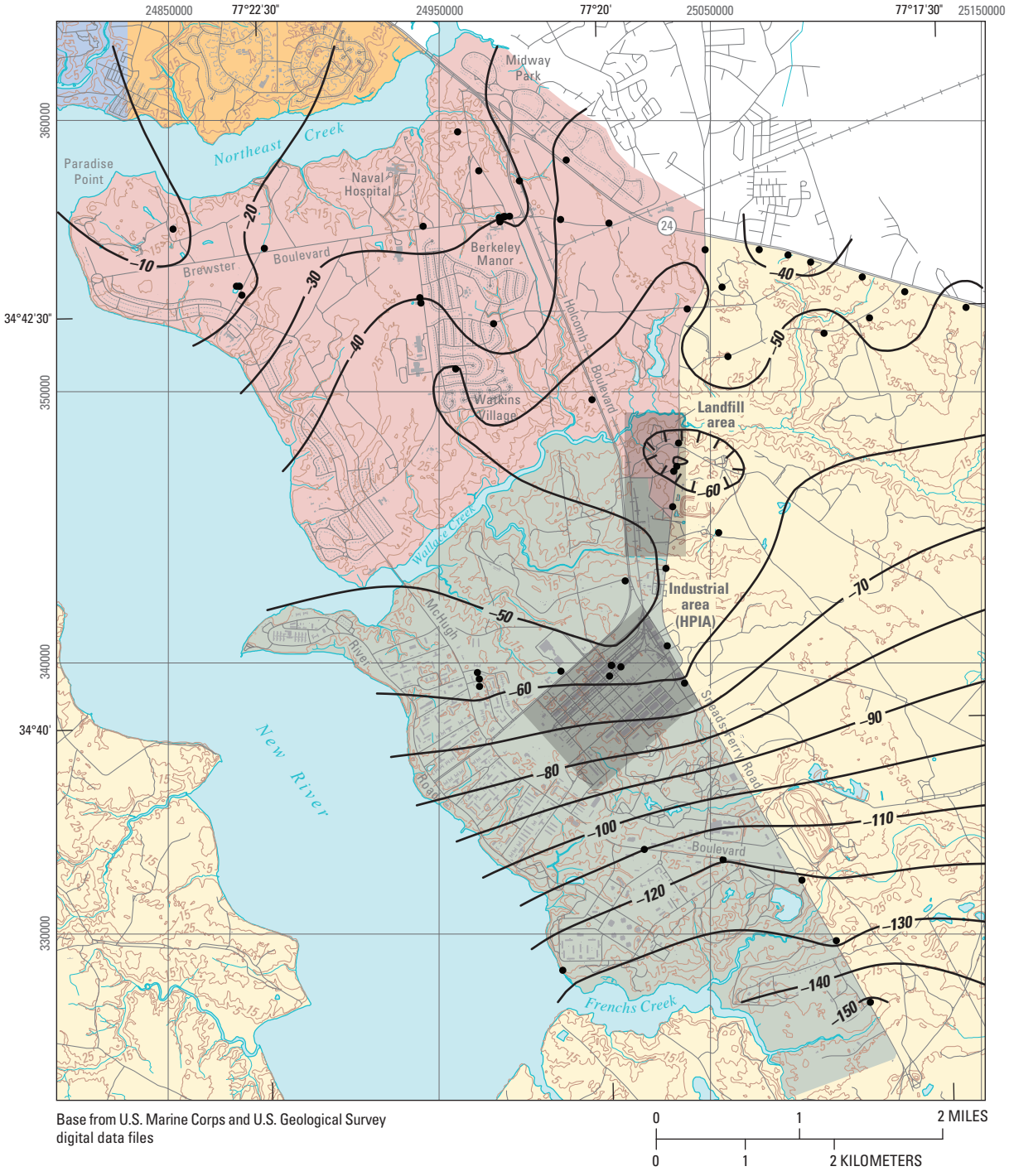


Figure B14. Thickness of the Tarawa Terrace aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.



EXPLANATION

Historical water-supply areas of Camp Lejeune Military Reservation

- Montford Point
- Holcomb Boulevard
- Tarawa Terrace
- Hadnot Point
- **Other areas of Camp Lejeune Military Reservation**

—50— **Line of equal altitude**—Shows top of Upper Castle Hayne confining unit. Contour interval 10 feet. Hachures indicate depression. Datum is National Geodetic Vertical Datum of 1929

— 25 — **Topographic contour**—Interval 10 feet

• **Control point**

Figure B15. Altitude at the top of the Upper Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

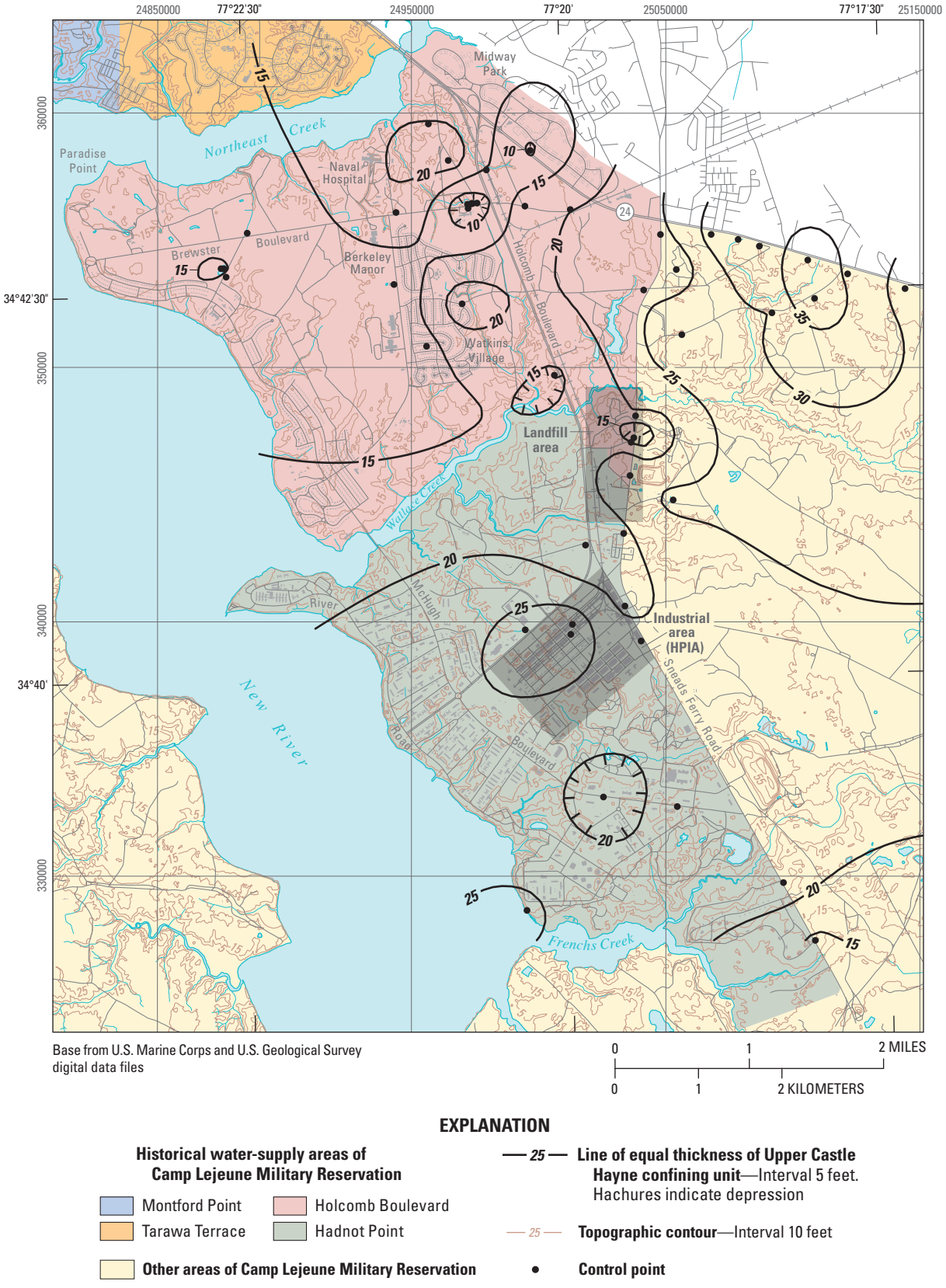


Figure B16. Thickness of the Upper Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

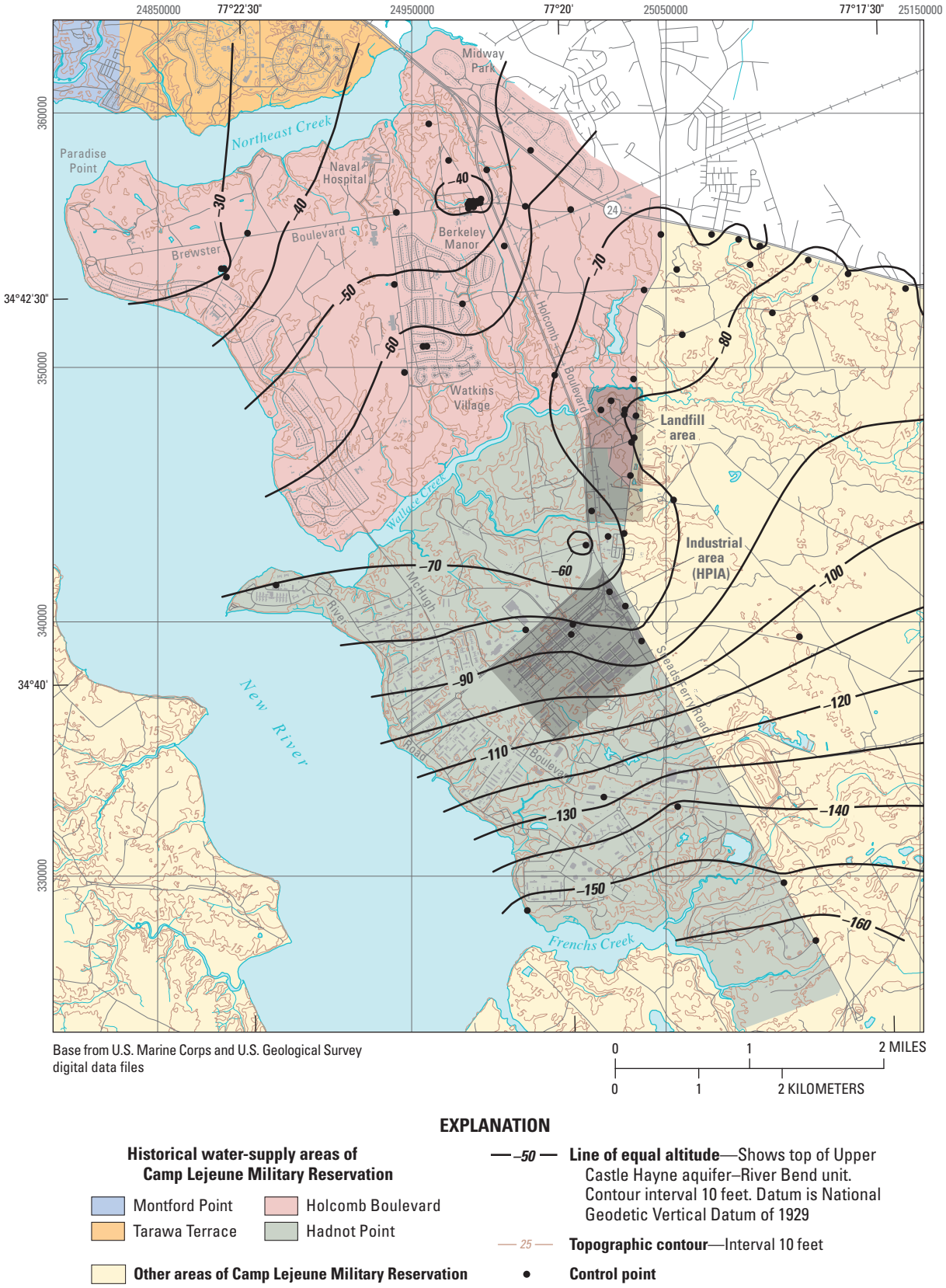


Figure B17. Altitude at the top of the Upper Castle Hayne aquifer–River Bend unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

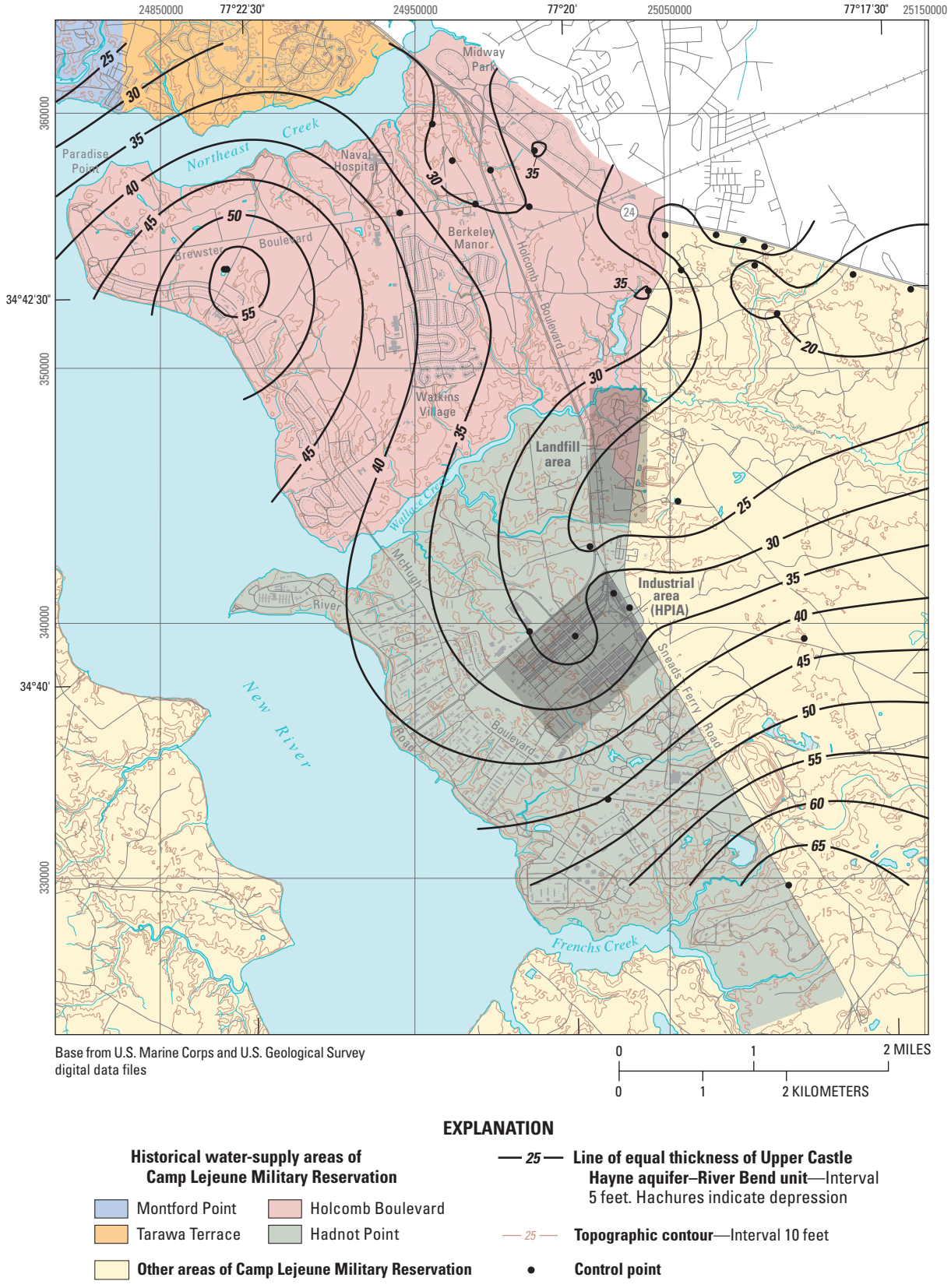


Figure B18. Thickness of the Upper Castle Hayne aquifer–River Bend unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

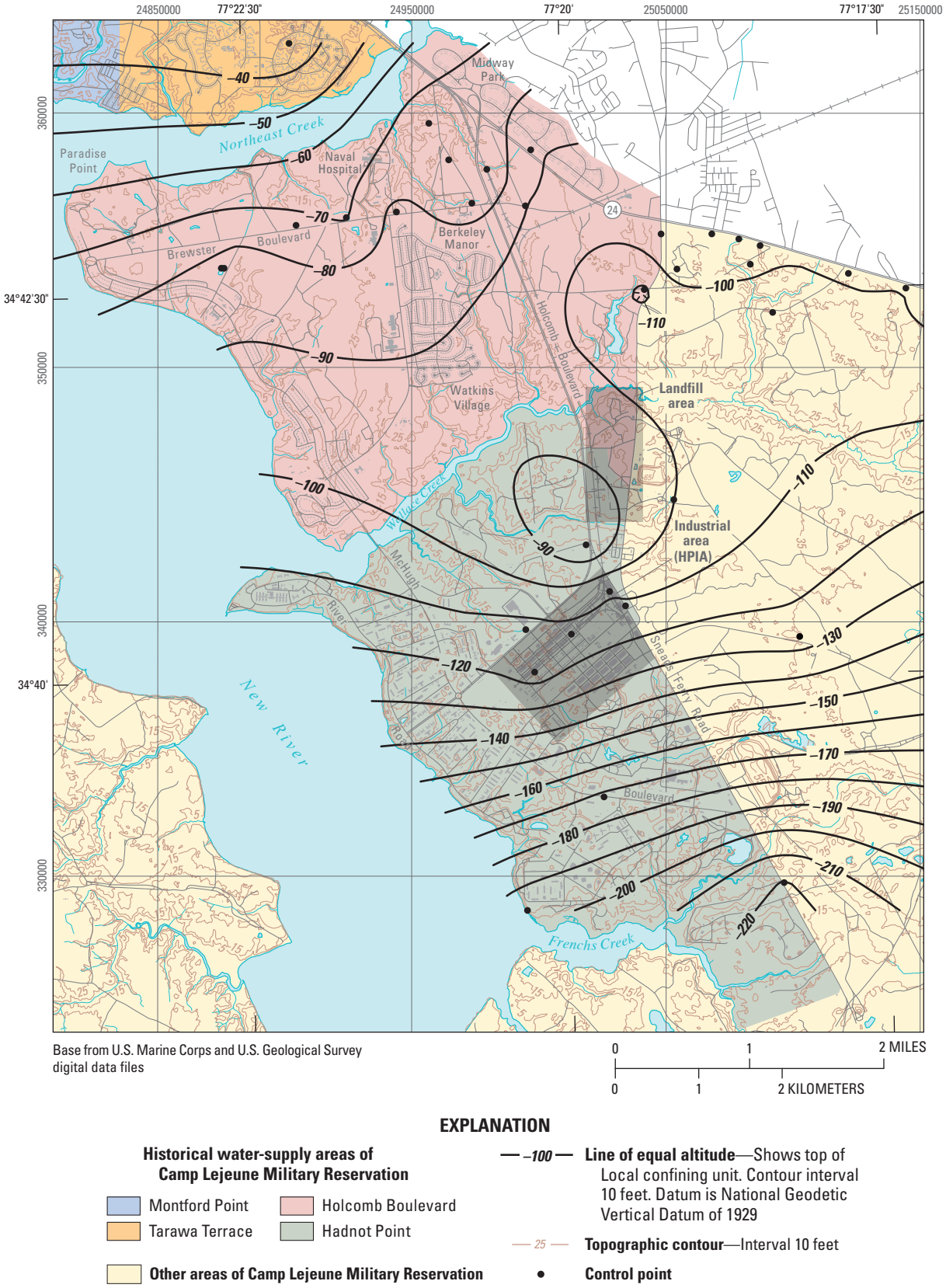
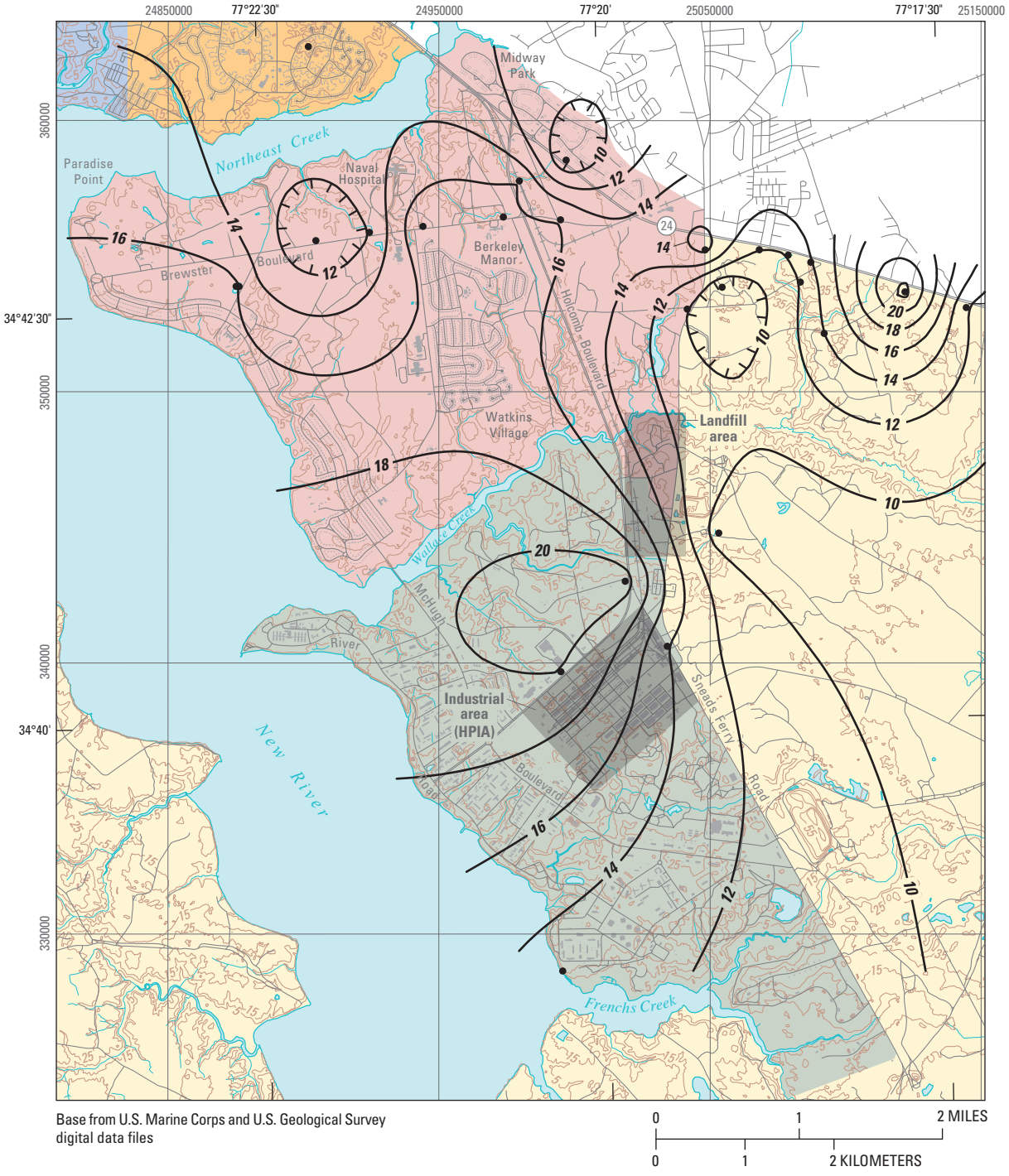


Figure B19. Altitude at the top of the Local confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.



EXPLANATION

Historical water-supply areas of Camp Lejeune Military Reservation

- Montford Point
- Holcomb Boulevard
- Tarawa Terrace
- Hadnot Point
- **Other areas of Camp Lejeune Military Reservation**

— 25 — **Line of equal thickness of Local confining unit**—Interval 2 feet. Hachures indicate depression

— 25 — **Topographic contour**—Interval 10 feet

• **Control point**

Figure B20. Thickness of the Local confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

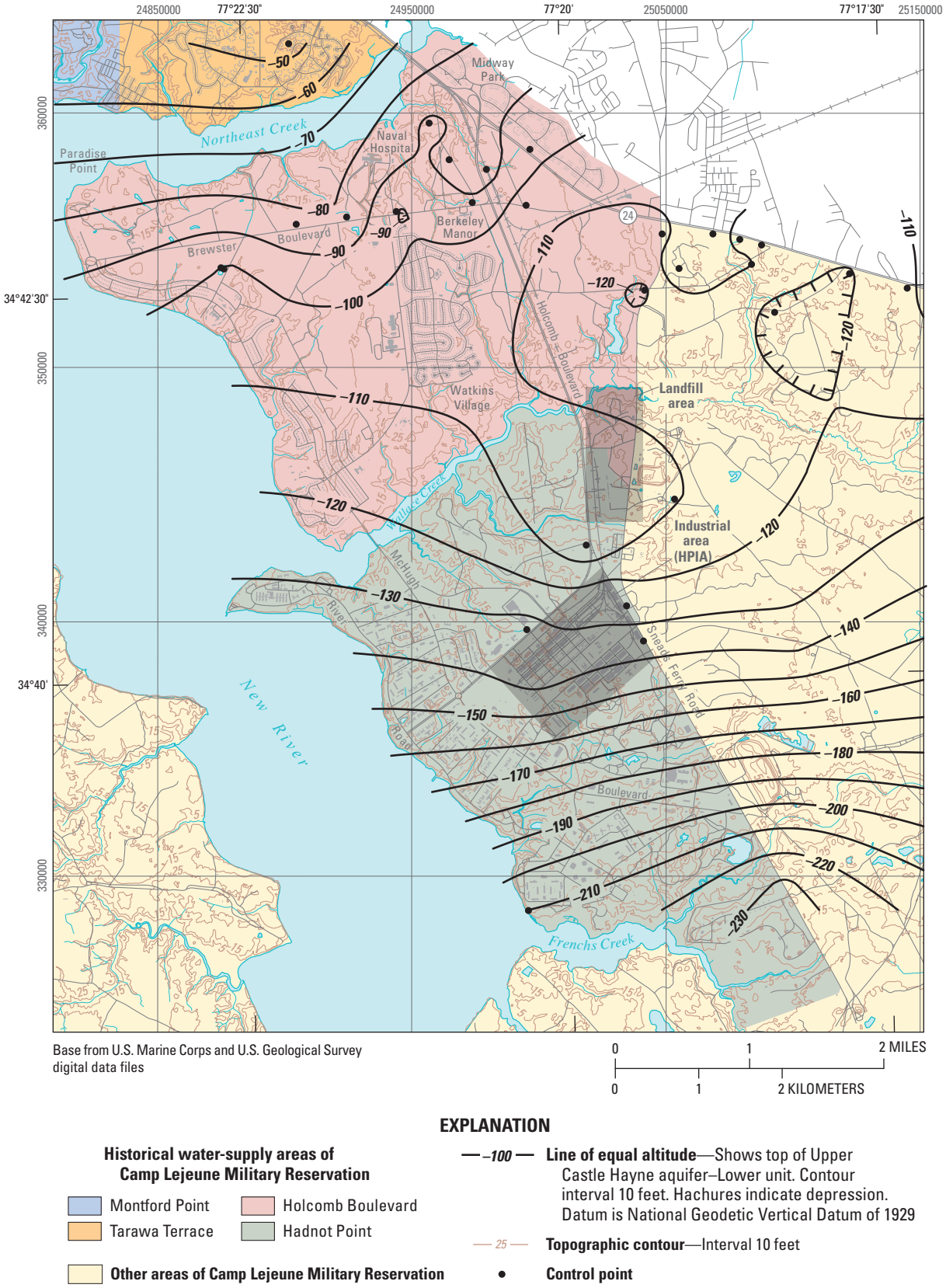


Figure B21. Altitude at the top of the Upper Castle Hayne aquifer–Lower unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

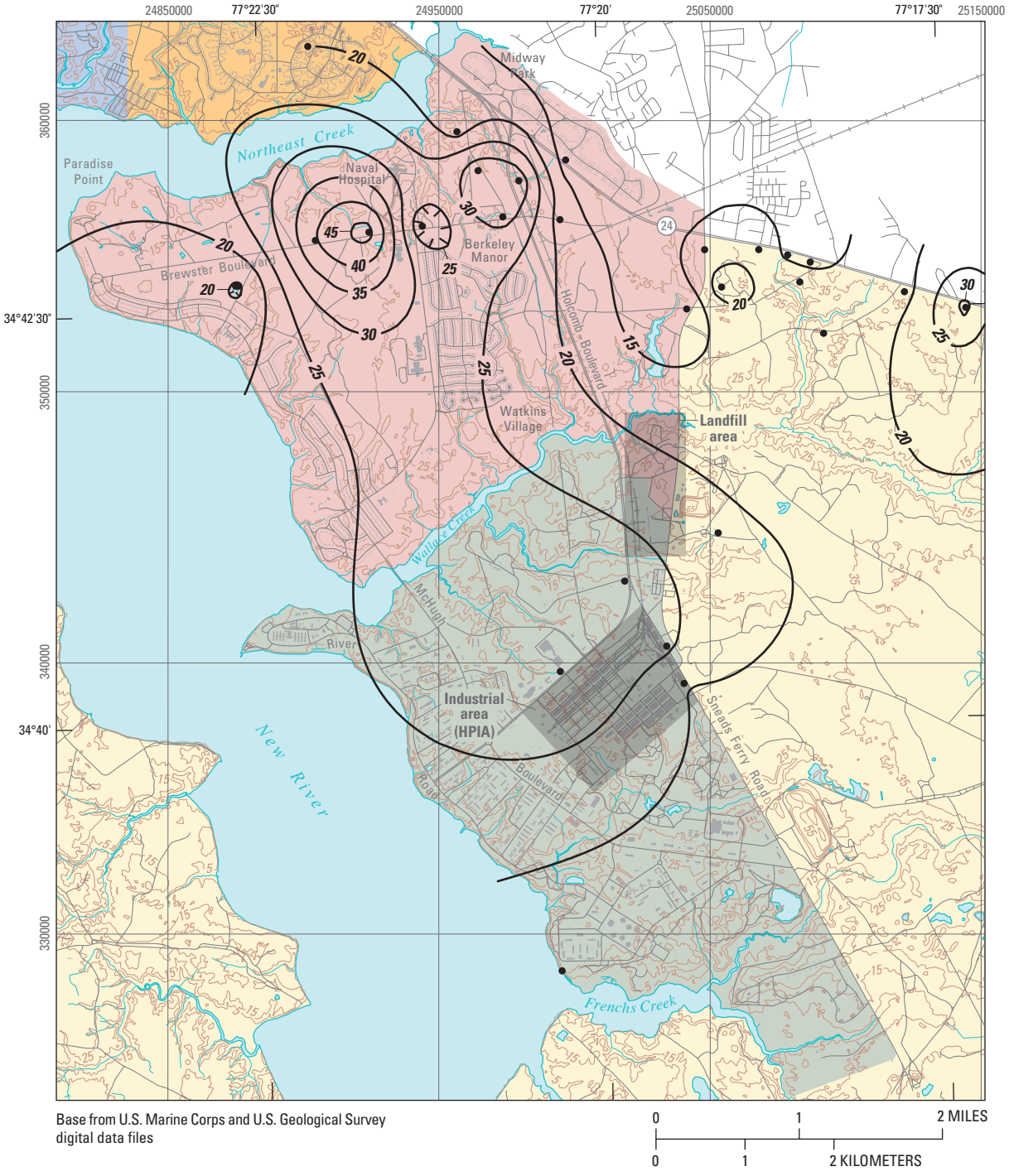


Figure B22. Thickness of the Upper Castle Hayne aquifer–Lower unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

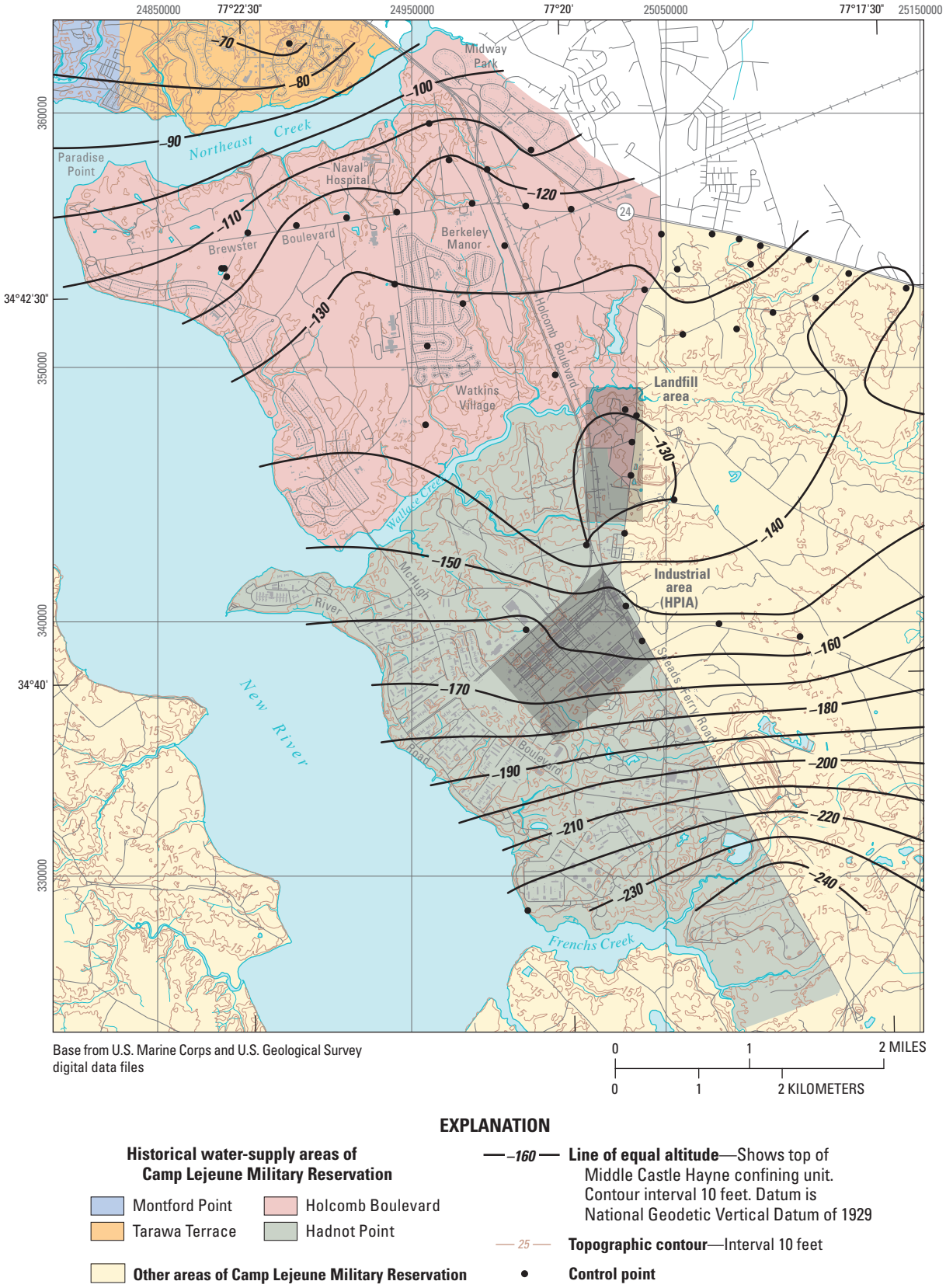


Figure B23. Altitude at the top of the Middle Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

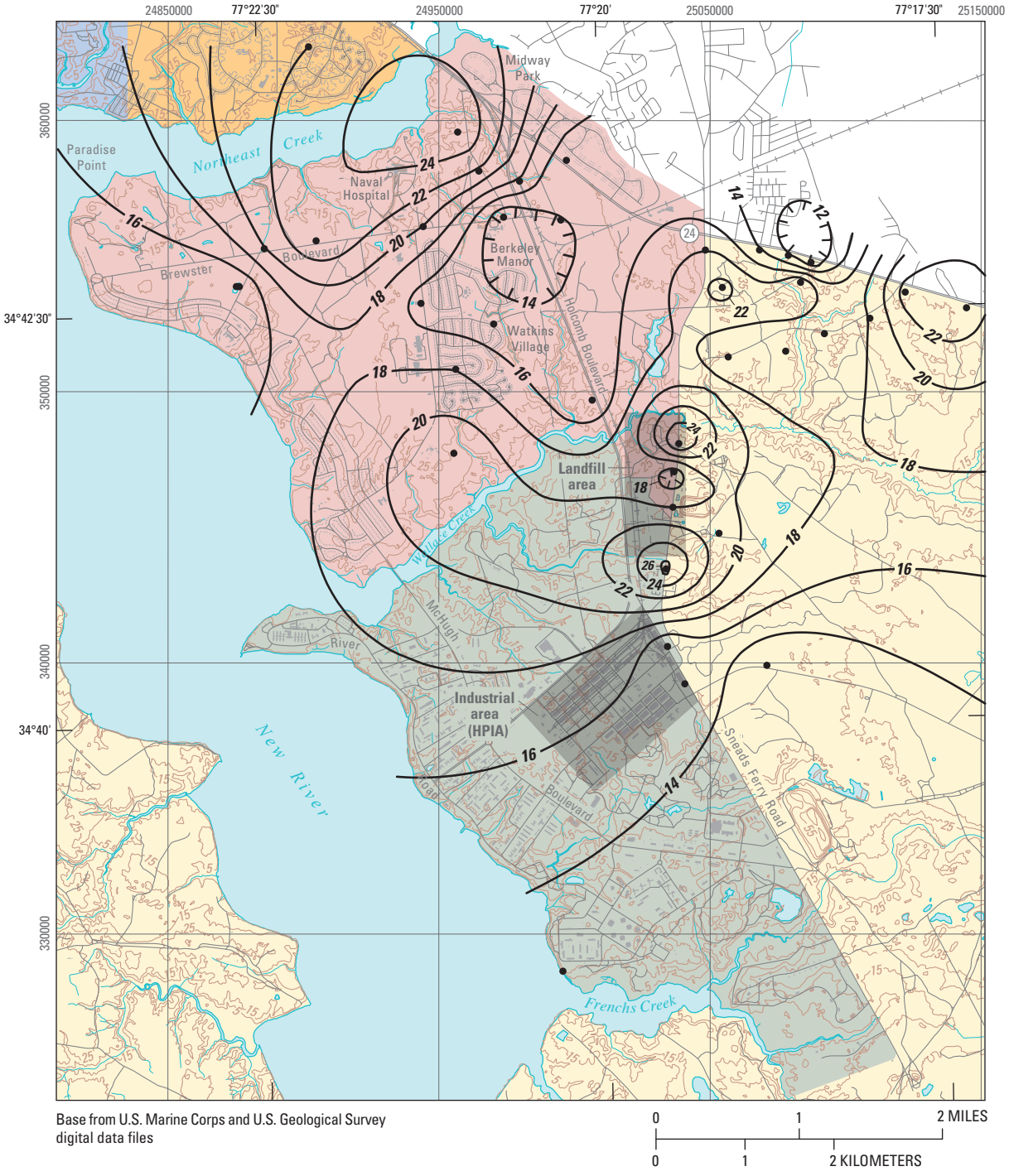


Figure B24. Thickness of the Middle Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

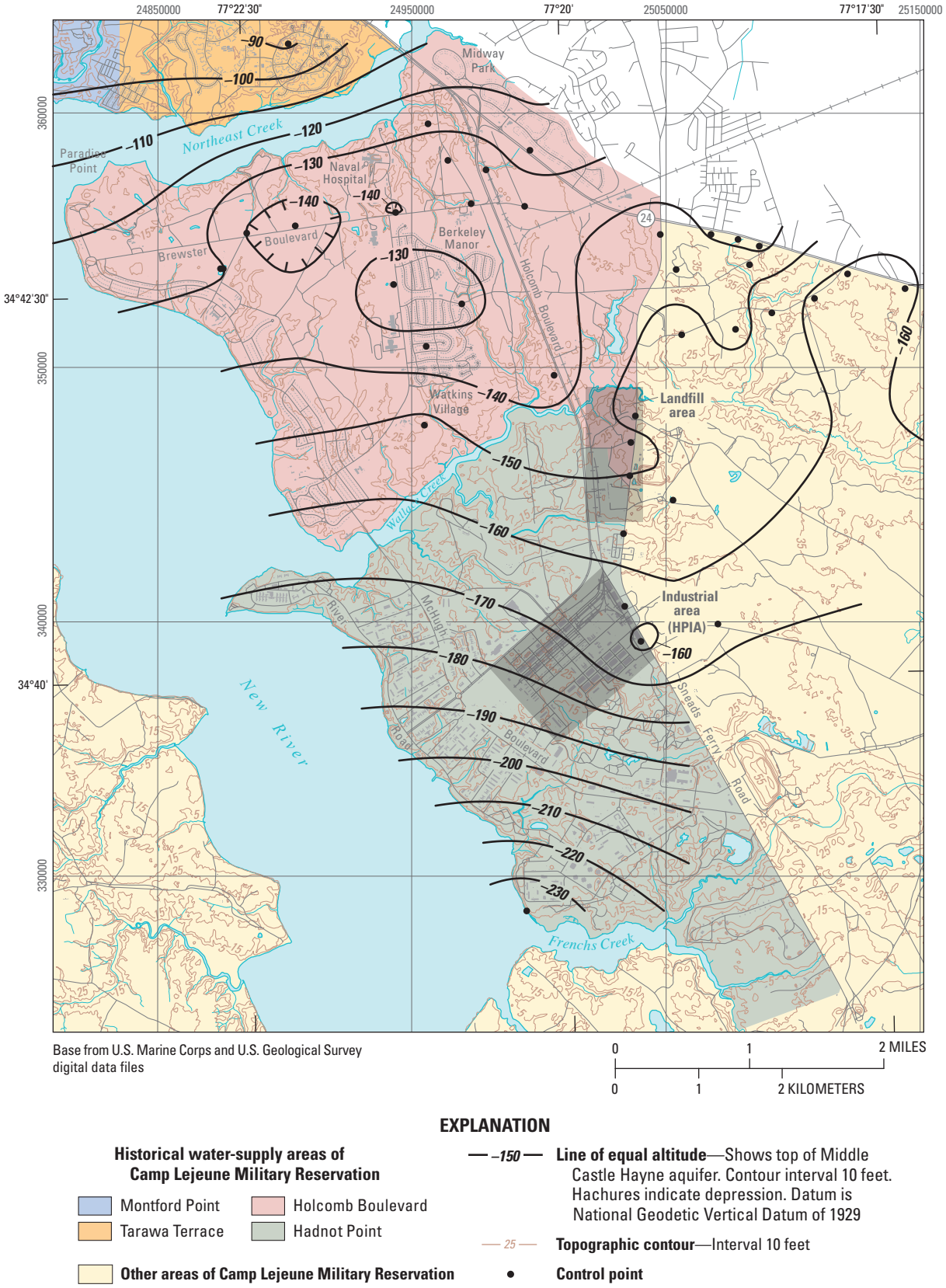


Figure B25. Altitude at the top of the Middle Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

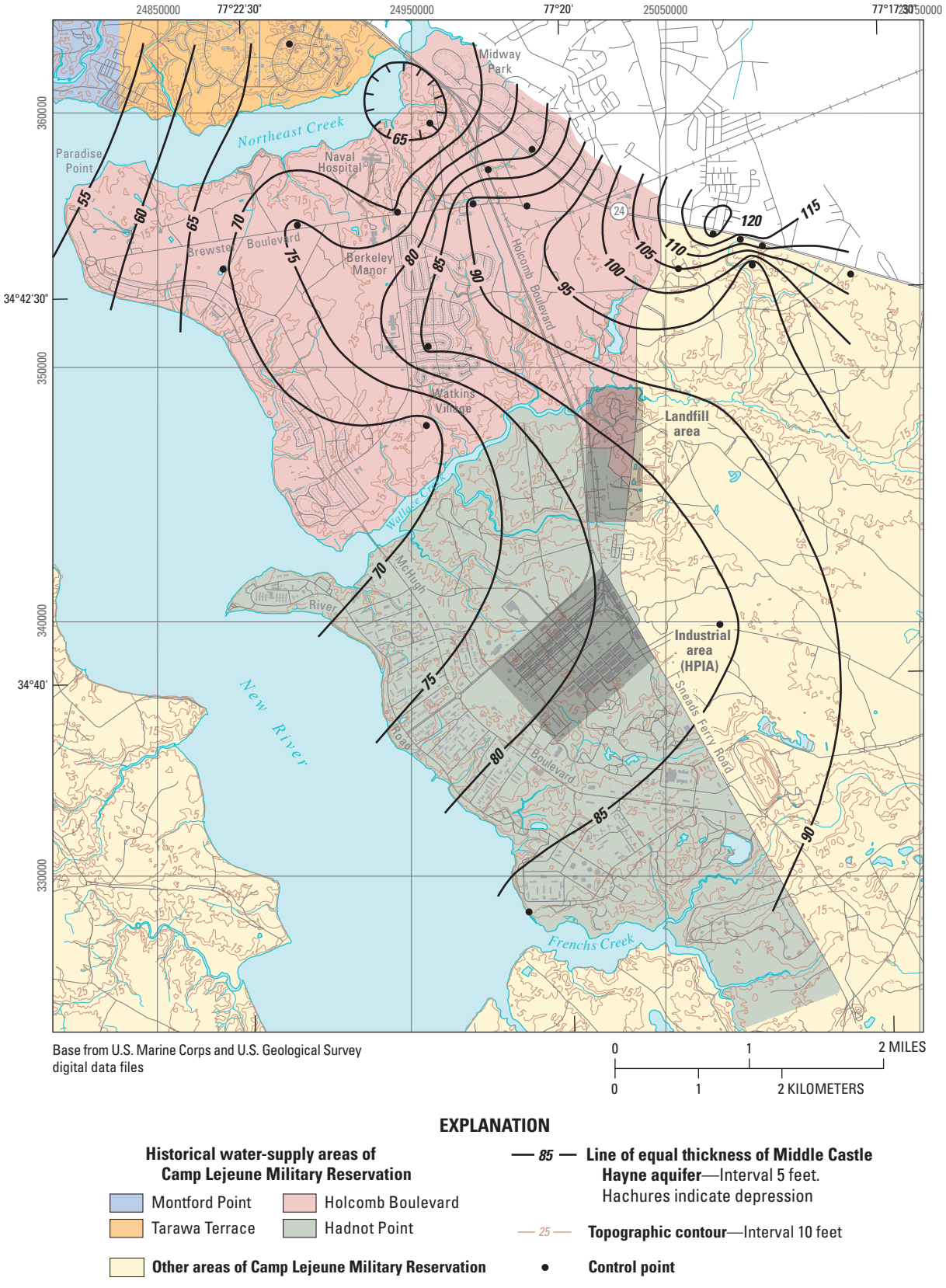


Figure B26. Thickness of the Middle Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

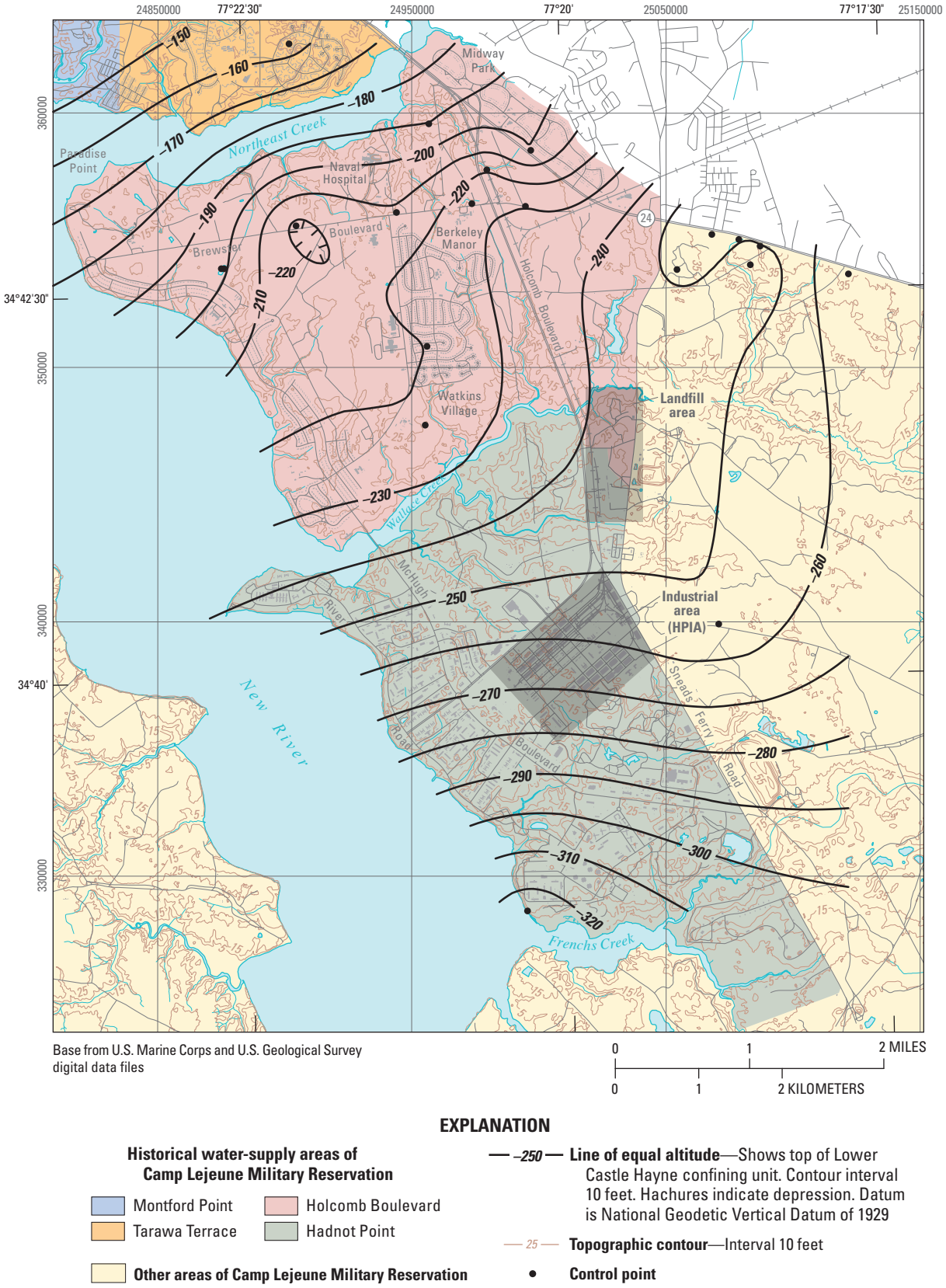


Figure B27. Altitude at the top of the Lower Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

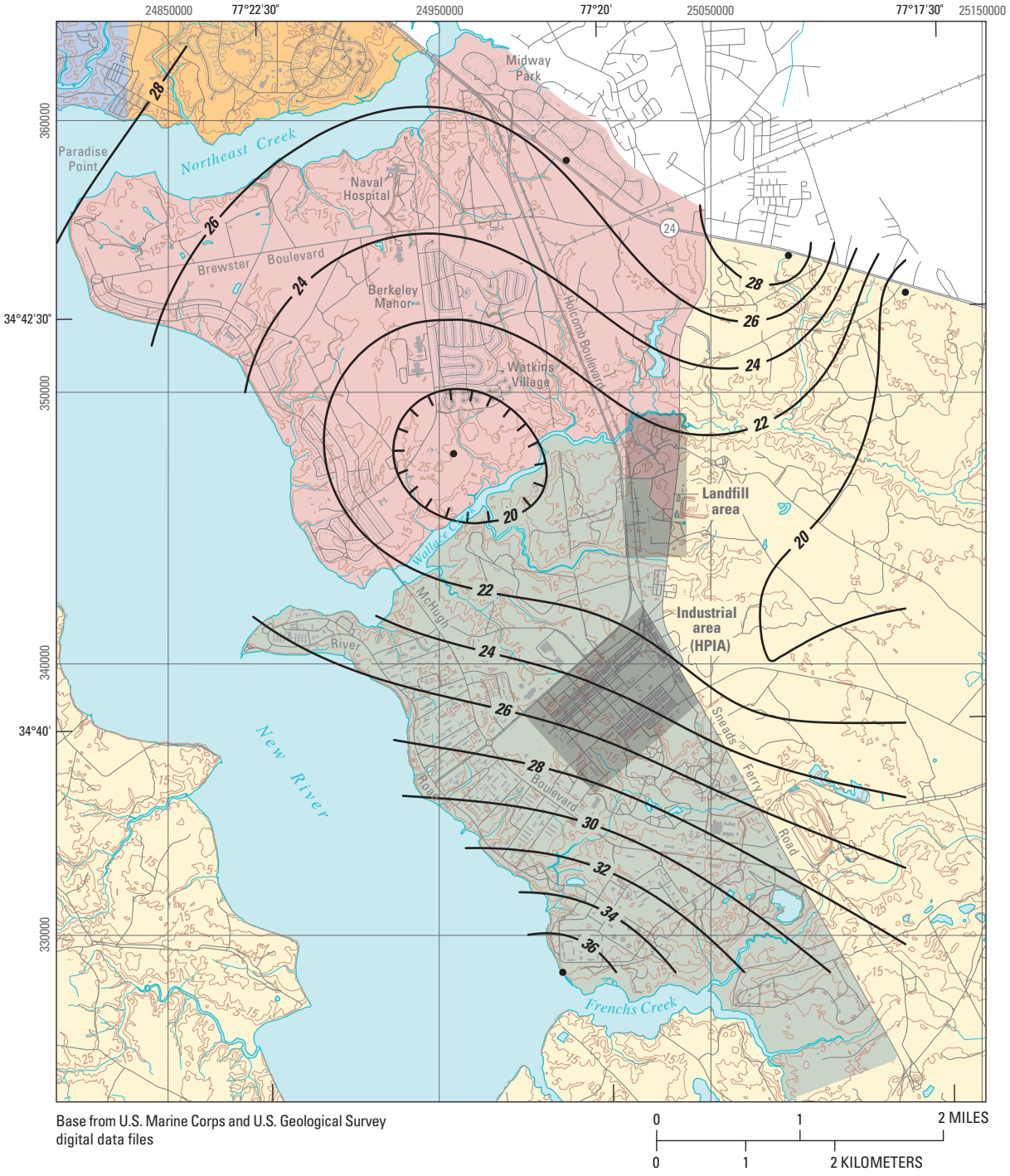


Figure B28. Thickness of the Lower Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

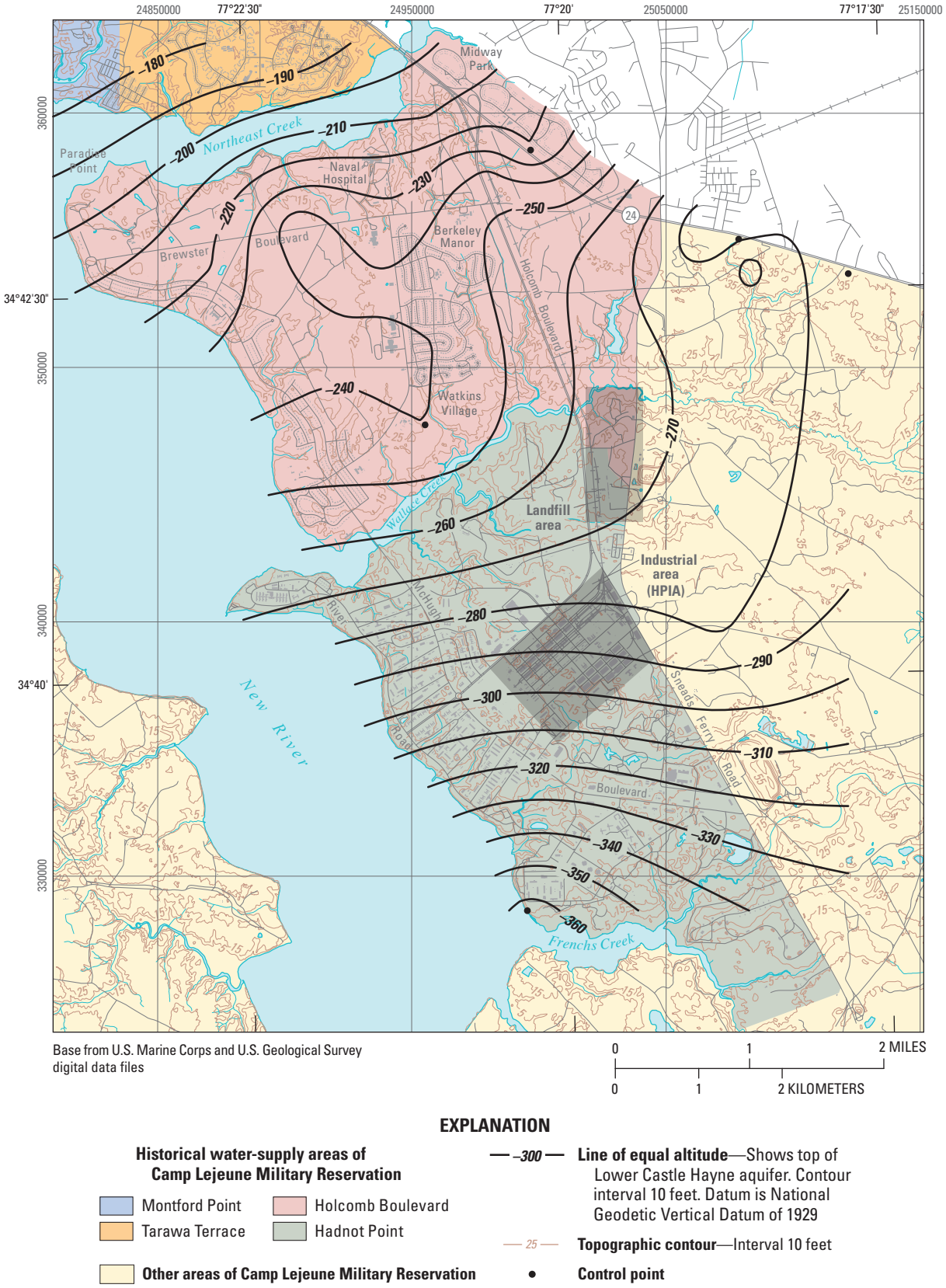


Figure B29. Altitude at the top of the Lower Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

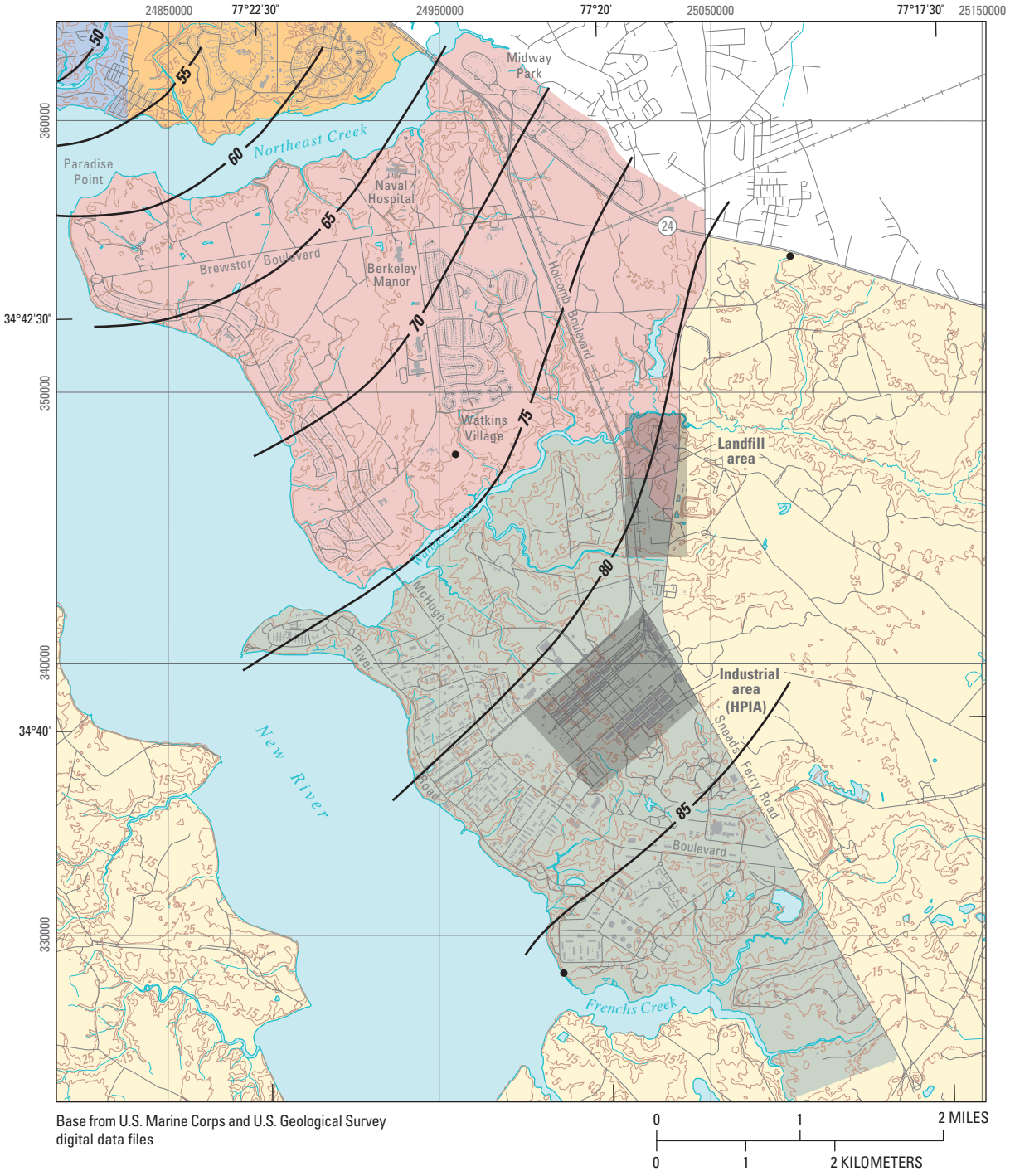


Figure B30. Thickness of the Lower Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

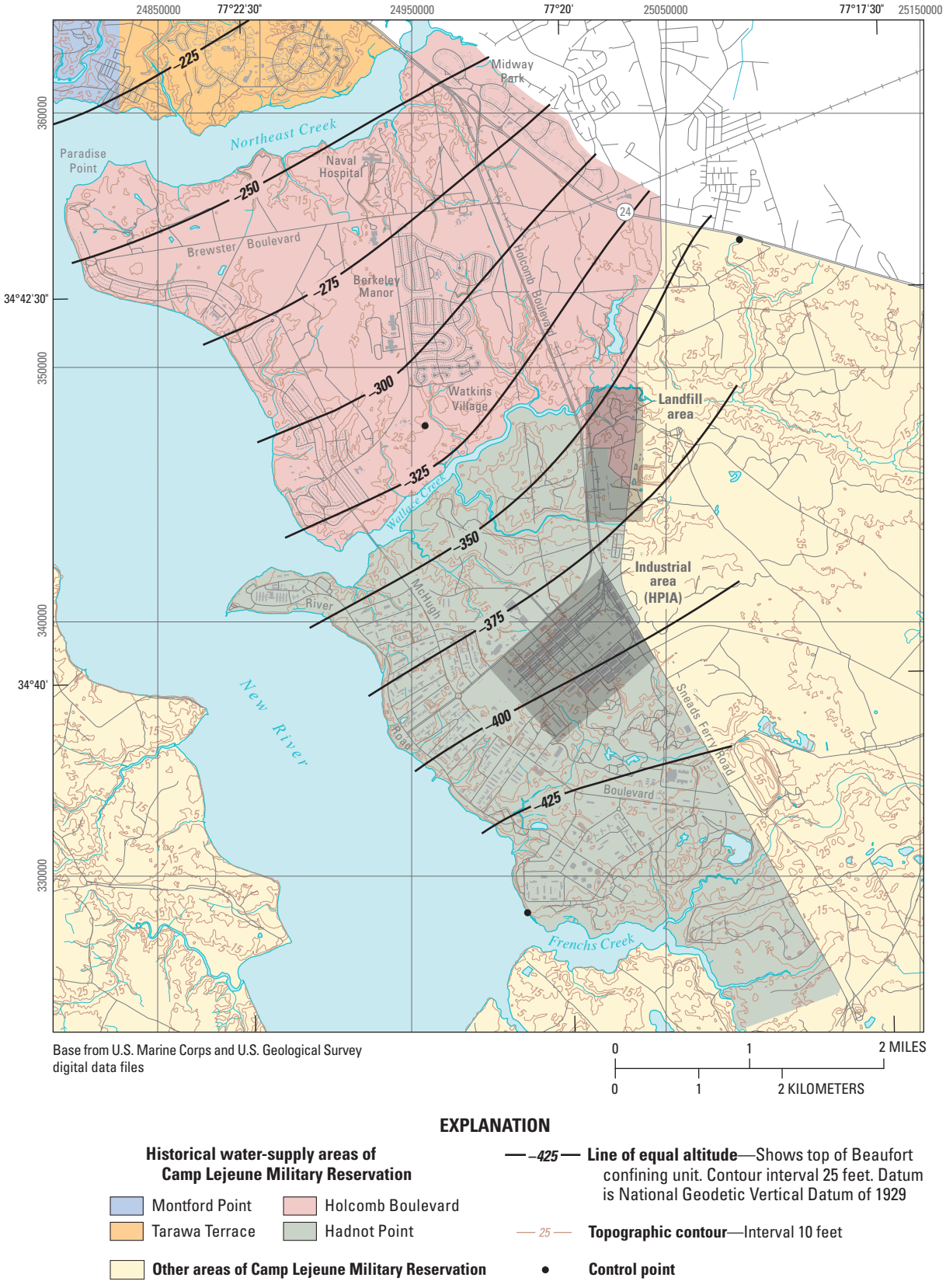


Figure B31. Altitude at the top of the Beaufort confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

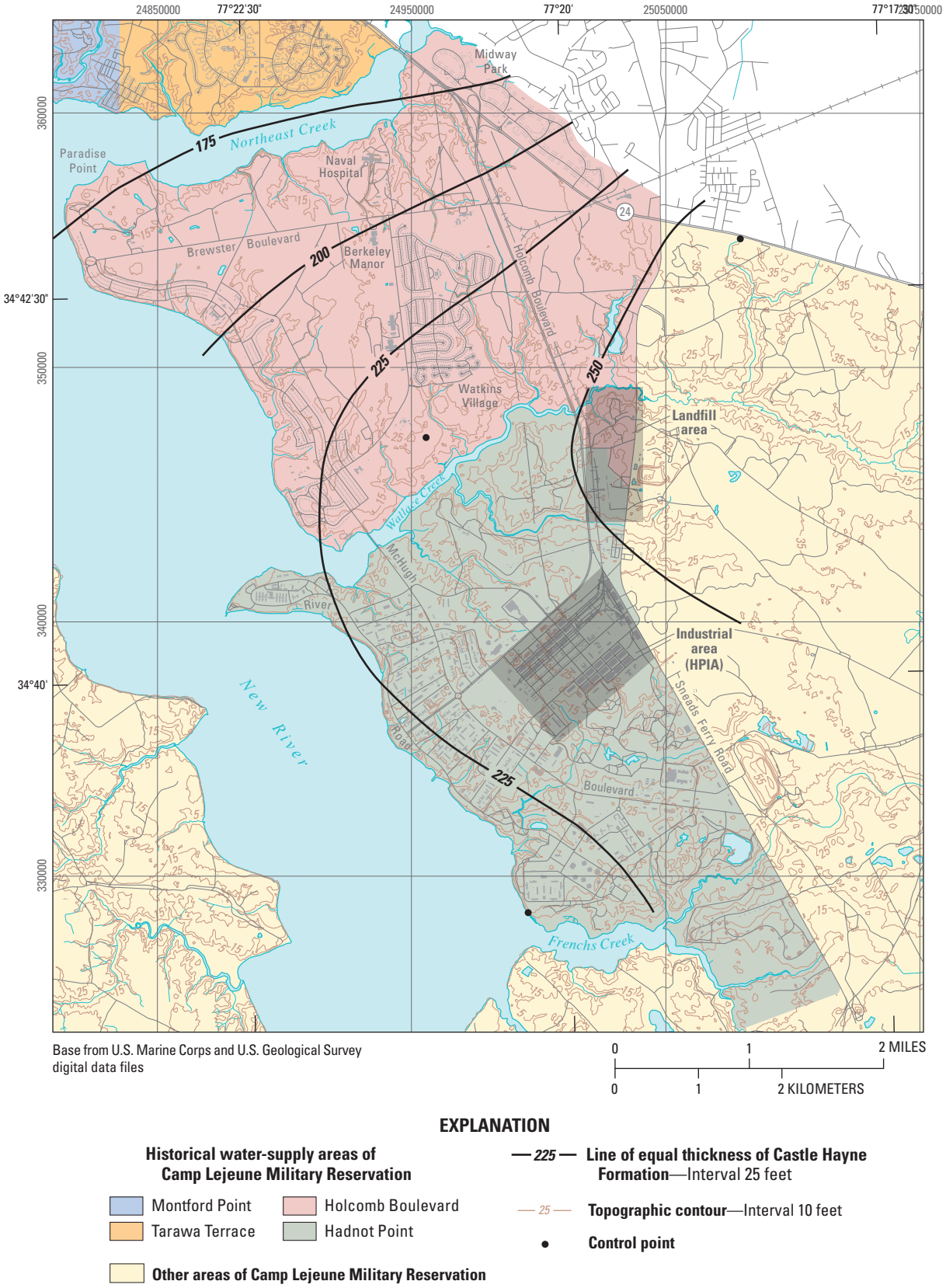


Figure B32. Highly generalized map of thickness of the Castle Hayne Formation, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

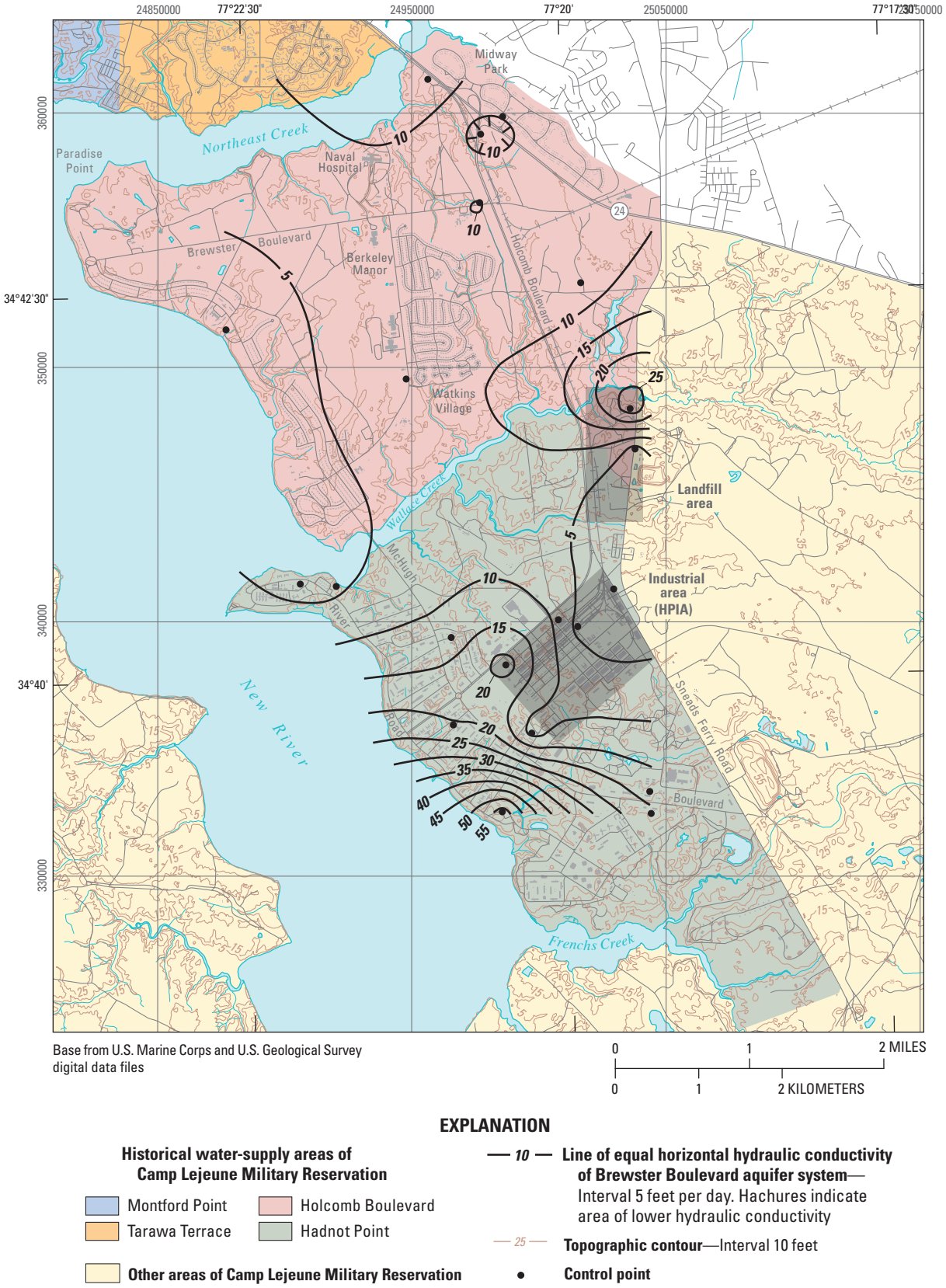


Figure B33. Horizontal hydraulic conductivity of the Brewster Boulevard aquifer system, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

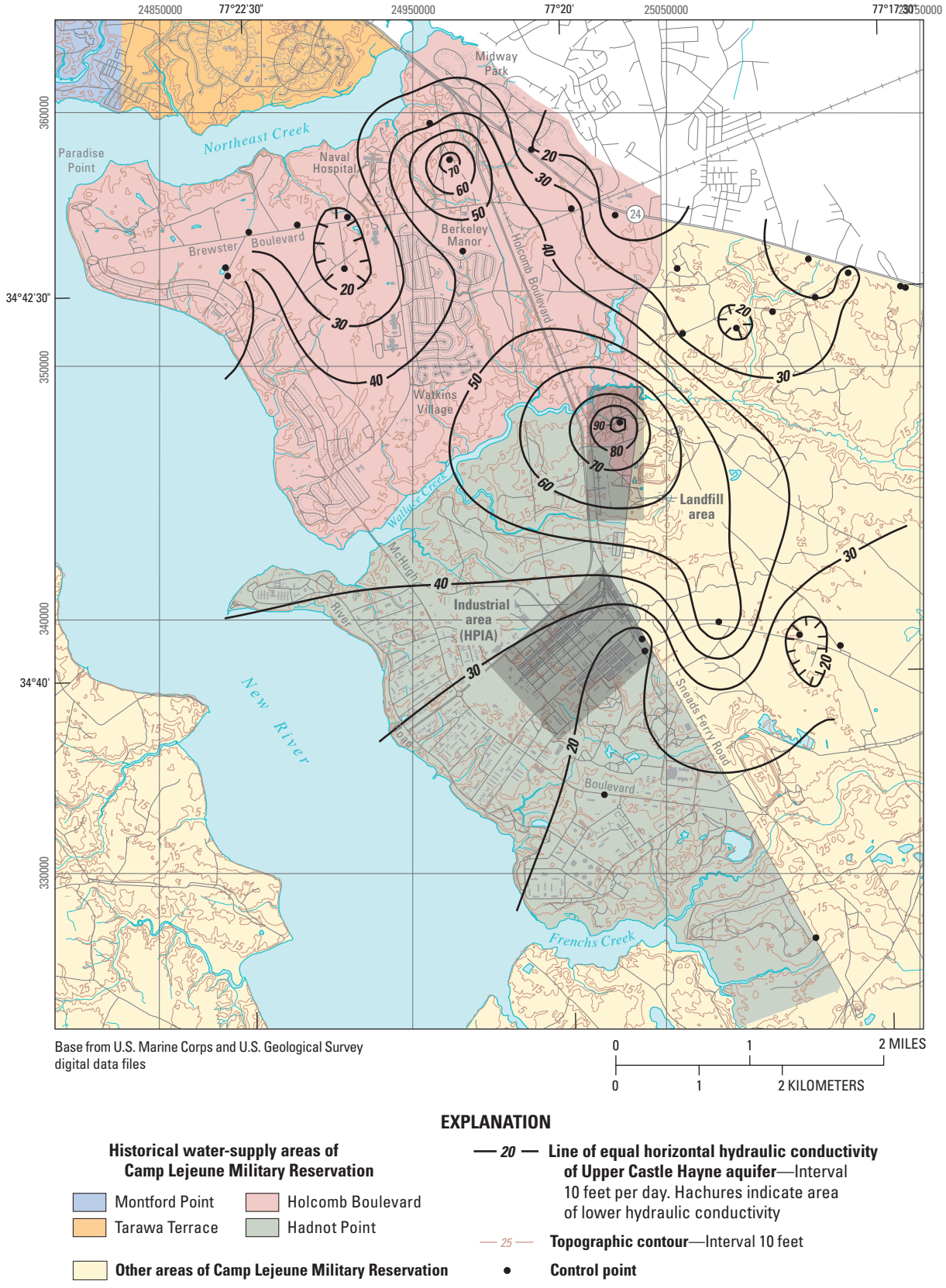


Figure B34. Horizontal hydraulic conductivity of the Upper Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

Tables B5–B7 and B9–B25

This report has been redacted by the Agency for Toxic Substances and Disease Registry (ATSDR) to address security concerns related to identification of coordinate locations of active drinking-water-supply wells. This was done in response to a request from the Department of the Navy based on 18 U.S. C. 795(a); Department of Defense Instructions, 2000.16; and SECNAV M-5510.36 (Major General J.A. Kessler, U.S. Marine Corps to Dr. Thomas Sinks, Deputy Director, ATSDR, written communication, January 5, 2012). An unredacted version of this report was peer reviewed prior to publication.

Table B5. Summary of limestone occurrences and occurrences of similar rocks in boreholes at Installation Restoration Program sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Site name: first two numbers refer to Installation Restoration Program site, location shown in Plate B1 and Figure B2, numbers following hyphen refer to monitor-well name; in core description, depth is in feet (ft) below land surface; *(marl?)*, italics are author's annotation; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name	Location coordinates[1]		Land-surface altitude, in feet NGVD 29	Core description
	North	East		
01-GW11	334163	2502775	10.4[2]	Limestone pieces with shell fragments and sand 11–17 ft; bottom at 17.0 ft.
01-GW16DW	332642	2501970	20.8[2]	Limestone, fossiliferous with shell fragments, cemented 100–102 ft; bottom at 122.0 ft.
01-GW17	333651	2502776	20.1[2]	Limestone, cemented with shell fragments 21–23 ft; bottom at 25.0 ft.
01-GW17DW	333674	2502775	19.1[2]	Limestone, fossiliferous with shell fragments, cemented 25–27 ft, 105–107 ft; bottom at 122.0 ft.
02-GW03D	356275	2498552	33.1[2]	"Limestone gravel" with sand 24–26 ft; "limestone fragments" 95–97 ft; bottom at 100.0 ft.
06-GW01D	348137	2503363	32.8[2]	Limestone fragments and "mud" *(marl?)* with shells 46.4–47.0 ft. Limestone fragments 70–71 ft, with "limey mud" *(marl?)* and shells 110–117 ft; bottom at 117.0 ft.
06-GW01DA	348320	2503384	32.7[2]	Lost circulation and ground surface caved at 127 ft; bottom at 236.5 ft.
06-GW02D	347220	2503760	35.1[2]	Limestone fragments "limey mud" *(marl?)* 115–122 ft; bottom at 122.0 ft.
06-GW03D	347811	2504501	34.2[2]	Limestone fragments with sand 190.8–191 ft; bottom at 201.5 ft.
06-GW07D	344336	2502082	17.4[2]	Limestone fragments with sand "limey mud" *(marl?)* 85–102 ft; bottom at 107.0 ft.
06-GW27D	348316	2502449	22.5[2]	Limestone fragments with shell fragments and "limey mud" *(marl?)* 100–107 ft; bottom at 112.0 ft.
06-GW28D	348677	2502849	28.7[2]	Limestone fragments with sand and shell fragments 106–112 ft; bottom at 115.0 ft.
06-GW30D	349532	2503730	9.9[2]	Limestone fragments with sand and shells 85–102 ft; bottom at 161.9 ft.
09-GW07D	343333	2502729	28.3[2]	Limestone fragments with sand and shell fragments 96–102 ft; bottom at 110.0 ft.
28-GW01DW	331870	2498323	5.5[2]	Limestone, fossiliferous with sand 110.8–111 ft; bottom at 134.0 ft.
28-GW07DW	331745	2499147	3.6[2]	Limestone, fossiliferous with sand and shell fragments 101.0–101.1 ft; bottom at 132.0 ft.
28-GW09DW	332857	2498262	4.5[2]	Limestone, fossiliferous with sand 94–96 ft; bottom at 128.0 ft.
78-GW09-3	337981	2499832	24.3[2]	"Rock" with shells 65–75 ft; bottom at 150 ft.
78-GW17-3	339236	2501288	29.5[3]	"Rock" with shells 64–70 ft; bottom at 150 ft.
78-GW24-2	341169	2502808	30.8[2]	"Rock" 66–72 ft; bottom at 75 ft.
78-GW24-3	341153	2502785	30.6[2]	"Rock layer" 74–75 ft, 83–84 ft; bottom at 155 ft.
78-GW32-2	339494	2501261	27.0[2]	"Shelly limestone" with sand and "shell material" 44–77 ft, 104–109 ft, 139–141.5 ft, "fossiliferous limestone" 67–74 ft; bottom at 149 ft.
78-GW32-3	339474	2501278	27.3[2]	Limestone fragments with sand 54–64 ft, "shelly limestone" 64–68 ft, limestone fragments with sand and shell fragments 104–142 ft; bottom at 160 ft.

[1] Location coordinates are North Carolina State Plane coordinates North American Datum of 1983

[2] Land-surface altitude reported in data sources below or in site specific data sources listed in Faye et al. (2010)

[3] Land-surface altitude estimated from digital elevation model

Data sources:

CERCLA Administrative Record files #258, #1272, #1503, #1505, #1706
Leaking Underground Storage Tank Program file #450
Baker Environmental, Inc. 1993df, 1995c, 1996g
Environmental Science and Engineering, Inc. 1988

Table B6. Summary of limestone occurrences and occurrences of similar rocks in boreholes at underground and above-ground storage tank sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[In core description, depth is in feet (ft) below land surface; *(cavernous?)*, italics are author's annotation; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet NGVD 29	Core description
	North	East		
Bldg33_MW09	2497640	359237	31.9[3]	Limestone, "slightly weathered" "molds of pelecypods common" 31–32 ft; bottom at 32.0 ft.
Bldg33_MW10	2497704	359188	31.5[3]	Limestone, "crushed" "partially weathered" 31–33 ft; bottom at 33 ft.
Bldg33_MW11	2497649	359234	31.6[3]	Limestone, "partially weathered" "cobble and larger sized" 30–32 ft; bottom at 32.0 ft.
Bldg331_MW13	2496650	336060	21.7[3]	Limestone fragments with sand and shell fragments 29–50 ft; bottom at 50.0 ft.
Bldg645_MW10	2497270	356193	28.5[4]	Limestone, fragmented sand matrix mollusca molds 24–30 ft; bottom at 52.0 ft.
Bldg645_MW14	2497263	356192	28.7[4]	Limestone, fragmented "moderate cement" mollusca molds 24–30 ft; bottom at 35.0 ft.
Bldg645_MW15	2497372	356445	27.3[4]	Limestone, sandy clay matrix 4- to 6-inch sand layers 65–82 ft; bottom at 82.0 ft.
Bldg645_MW16	2497229	356255	28.7[4]	Limestone, sandy fossiliferous "pelecypod molds" 60–73 ft, fragments 79–80 ft; bottom at 80.0 ft.
Bldg645_MW17	2497205	356418	28.0[4]	Limestone, fragments with sand 25–27 ft, angular 40–42 ft, fossiliferous 58–80 ft; bottom at 80.0 ft.
Bldg645_MW18	2497584	356462	29.7[4]	Limestone fragments weathered 40–42 ft, with sand layers 58–80 ft; bottom at 80.0 ft.
Bldg645_MW28	2497414	356538	28.2[4]	Limestone, with sand highly weathered with calcareous fragments 78–80 ft; bottom at 80.0 ft.
Bldg645_MW29	2497577	356533	27.2[4]	Limestone, with silty to clayey sand highly weathered 78–80 ft; bottom at 80.0 ft.
Bldg645_MW30	2497692	356479	30.1[4]	Limestone, sandy silty weathered 78–80 ft; bottom at 80.0 ft.
Bldg645_MW31	2497589	356470	29.7[4]	Limestone, silty sandy weathered 79–101 ft; bottom at 101.0 ft.
Bldg645_MW32	2497539	356213	30.3[4]	Limestone fragments with sand and shell fragments 38–50 ft; bottom at 78.0 ft.
Bldg645_MW35	2497433	356308	27.6[4]	Limestone fragments with sand and shell fragments 79–106 ft; bottom at 106.0 ft.
Bldg645_MW36	2497721	356622	32.8[5]	Limestone fragments and gravels with silty to clayey sand 78–80 ft; bottom at 80.0 ft.
Bldg820_MW09D	2494709	349790	33.0[5]	Limestone, fossiliferous with abundant shell fragments 86–100 ft; bottom at 100.0 ft.
Bldg900_MW01	2502732	340573	30.1[3]	Limestone fragments "cobble sized" 38–44.2 ft; bottom at 50.0 ft.
Bldg1115_MW18	2501041	340142	24.7[6]	Limestone, weathered sandy 40–52 ft; fossils 35–37.5 ft; bottom at 52.0 ft.
Bldg1115_MW19	2501013	339902	26.4[6]	Limestone fragments with sand 34–37 ft, sandy limestone 37.5–52 ft; bottom at 52.0 ft.
Bldg1115_MW23	2501038	340138	24.5[6]	Limestone fragments with sand 40–42.5 ft, sandy limestone 45–51.3 ft; bottom at 51.3 ft.
Bldg1115_MW24	2500373	339864	25.9[6]	Limestone fragments with clayey sand 52–56 ft, sandy limestone fossiliferous 56–74 ft; bottom at 80.0 ft.
Bldg1115_MW25	2500691	340076	25.8[6]	Limestone, with sandy clay layers sandy fossiliferous 53–72 ft; bottom at 80.0 ft.
Bldg1613_MW13	2499321	338878	24.3[7]	Limestone, fragmented sandy 35–52 ft, fossil molds; bottom at 52.0 ft.

Table B6. Summary of limestone occurrences and occurrences of similar rocks in boreholes at underground and above-ground storage tank sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[In core description, depth is in feet (ft) below land surface; *(cavernous?)*, italics are author's annotation; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet NGVD 29	Core description
	North	East		
Bldg1613_MW14	2499026	338641	26.4[7]	Limestone fragments with sand 40–52 ft; bottom at 52.0 ft.
Bldg1613_MW15	2498652	338350	26.5[7]	Limestone, sandy with shells and cemented sands 20.5–40 ft; bottom at 40.0 ft.
Bldg1854_MW06	2500965	334681	17.6[6]	Limestone, occurs as "sandy gravel" with clay 42.5–47.5 ft; bottom at 50.0 ft.
Bldg1854_MW08	2501165	334659	10.5[6]	Limestone fragments with sand and shell fragments 35–42.5 ft; bottom at 42.5 ft.
Bldg1880_MW05	2499327	335345	26.2[6]	"Rock fragments" with sand and shell fragments 48.5–50 ft; bottom at 50.0 ft.
BldgFC201E_PW01	2504284	333374	20.1[7]	Limestone fragments with silty sand 25–37 ft; bottom at 37.0 ft.
BldgLCH4015_MW13	2498774	359756	33.7[3]	Limestone fragments weathered with silty sand 33–50 ft; bottom at 50.0 ft.
BldgLCH4015_MW19	2498765	359521	32.9[3]	Limestone fragments cemented shelly with silty sand 35–50 ft; bottom at 50.0 ft.
BldgLCH4015_MW20	2498673	359412	32.4[3]	Limestone fragments weathered with silty sand 33–45 ft; bottom at 50.0 ft.
HPFF_MW07	2501550	340211	28.4[6]	Limestone, sandy fossiliferous 43–52 ft, limestone fragments 50–52 ft; bottom at 52.0 ft.
HPFF_MW09	2501162	339614	27.2[6]	Limestone, sandy fossiliferous (echinoderm spines) 40–50 ft; bottom at 50.0 ft.
HPFF_MW10	2501690	339828	32.4[6]	Limestone fragments, with sand and clay 55–82 ft, fossils 70–82 ft; bottom at 82.0 ft.
HPFF_MW43	2499441	339657	22.6[6]	Limestone, weathered with sand 30–45 ft; bottom at 80.0 ft.
HPFF_MW44	2499432	339663	22.6[6]	Limestone, weathered with silty sand and shell fragments 29–36 ft, sandy 43–48.5 ft; bottom at 50.0 ft.
HPFF_MW45	2500149	340193	25.0[6]	Limestone, weathered with sand 59.7–60 ft; bottom at 80.0 ft.
HPFF_MW46	2500150	340216	25.1[6]	Limestone, weathered with sand and shells 59.7–60 ft; bottom at 150.0 ft.
HPFF_MW49	2500603	340709	23.9[6]	Limestone, weathered with silty sand and shell fragments 39–41 ft, 52–54 ft; bottom at 23.9 ft.
HPFF_MW50	2500598	340730	23.1[6]	Limestone fragments with sand and shell 37.5–39.5 ft, sandy limestone 48.5–49.5 ft; bottom at 50.5 ft.
HPFF_MW52	2501196	340580	28.0[6]	Limestone, weathered with silty cemented sand 43–45 ft, 58.5–63.5 ft; bottom at 150.0 ft.
HPFF_MW53	2501197	340585	27.9[6]	Limestone fragments with silty sand 42.5–44.5 ft; bottom at 50.0 ft.
HPFF_MW55	2501202	340583	28.0[6]	Limestone, weathered with silty cemented sand 43–45 ft, sandy with shells 58.5–59 ft; bottom at 80.0 ft.
HPFF_MW56	2500509	340102	26.4[6]	Limestone, drill rods fell 54–61 ft *(cavernous?)*, limestone with sand weathered 93–95 ft; bottom at 150.0 ft.
HPFF_MW58	2500999	339889	26.3[6]	Limestone, 58–59.5 ft; bottom at 80.0 ft.
HPFF_MW59	2501522	340220	28.0[6]	Limestone, weathered sandy 57.5–59.5 ft; bottom at 80.0 ft.
HPFF_MW60	2501342	339869	27.4[6]	Limestone fragments with silty sand 44–47 ft, sandy limestone weathered 49–51 ft. Limestone fragments with silty clayey sand and shell fragments 55–60 ft. Limestone, weathered fossiliferous 60–65 ft, 96–102 ft; bottom at 150.0 ft.

Table B6. Summary of limestone occurrences and occurrences of similar rocks in boreholes at underground and above-ground storage tank sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[In core description, depth is in feet (ft) below land surface; *(cavernous?)*, italics are author's annotation; NGVD 29, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet NGVD 29	Core description
	North	East		
HPFF_MW62	2501269	339476	27.4[6]	Limestone, weathered sandy with silt 43–50 ft; bottom at 155.0 ft.
HPFF_MW64	2501566	339668	28.1[6]	Limestone fragments with shell fragments and sand 49–51 ft; bottom at 51.0 ft.
HPFF_MW65	2501580	339743	30.1[6]	Limestone, weathered sandy with silt and clay 49–51 ft, 59–69 ft; bottom at 77.0 ft.
HPFF_MW66	2501437	339379	27.5[6]	Limestone fragments 42–50 ft, fossil fragments with phosphatic sands 34–41 ft; bottom at 50.0
HPFF_MW67	2501436	339384	27.4[6]	Limestone, weathered sandy 48–49 ft, 2-inch core within 63–65 ft; bottom at 77.0 ft.
HPFF_MW69	2501863	339650	29.9[6]	Limestone fragments with silty sand 44–48.8 ft; bottom at 50.0 ft.
HPFF_MW70	2501988	339398	30.8[6]	Limestone, weathered with silty sand 48–49 ft; bottom at 50.0 ft.
HPFF_MW71	2501979	339389	30.7[6]	Limestone, 2-inch core recovered between 69.5–74.5 ft; bottom at 80.0 ft.
HPFF_MW72	2501447	339378	28.0[6]	Limestone, weathered with silty sand 32–34 ft, 44.5–48 ft; bottom at 50.0 ft.
HPFF_MW73	2499685	340389	24.4[6]	Limestone, "gravel-sized" "clasts" with silty and clayey sand 38–45 ft; bottom at 50.0 ft.
HPFF_MW74	2499680	340383	24.4[6]	Limestone, "clasts" 38–40 ft, gravels "very hard" 53–54 ft; bottom at 80.0 ft.
HPFF_MW75	2501429	339802	27.4[6]	Limestone, layer 45.5–47 ft, fractured fossiliferrous clasts with shell fragments gravel "fossil marl" 58–65 ft, circulation lost at 60 ft; bottom at 80.0 ft.
HPFF_MW76	2499879	339379	23.2[6]	Limestone, gravels with "limey sand" and "fossil clasts" 38–40 ft; bottom at 50.0 ft.

[1] See Plate B1 and Figure B3 for Underground Storage Tank site locations

[2] Location coordinates are North Carolina State Plane coordinates North American Datum of 1983

[3] Land-surface altitude either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface

[4] Land-surface altitude either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 ft

[5] Land-surface altitude either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007b)

[6] Land-surface altitude either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)

[7] Land-surface altitude estimated from digital elevation model

Data sources:

Leaking Underground Storage Tank Program files #63, #67, #86, #99, #237, #370, #377, #410, #418, #450, #456, #528, #548, #710, #716, #717, #645_Addl_SiteAssess

Catlin Engineers and Scientists 1998b, 2002a, 2003c, 2008

Geophex, Ltd 2002

Law Engineering, Inc. 1996ab

Law Engineering and Environmental Services, Inc. 1996bd, 1997b

OHM Remediation Services Corp. 2002a

Richard Catlin and Associates, Inc. 1995ac, 1996abd, 1998a

Table B7. Summary of limestone occurrences and occurrences of similar rocks noted in driller's logs at supply wells, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[In cuttings description, depth in feet (ft) below ground surface; NGVD 29, National Geodetic Vertical Datum of 1929; USGS, U.S. Geological Survey]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet NGVD 29	Cuttings description
	North	East		
BA-145	307550	2515500	21.2[3]	Limestone with shell 20–30 ft, limestone 30–140 ft, limestone with sand 150–230 ft, limestone with clay 230–328 ft, green water 230–240 ft, hard rock at 328 ft; bottom at 328 ft.
CCC-1	360997	2483873	24.3[4]	"Coquina rock" 49–75 ft; bottom at 103 ft.
CCC-2	362507	2483431	22.0[3]	"Shell rock" with sand 41–79 ft, "soft rock" with sand 79–93 ft; bottom at 102 ft.
HP-37	341418	2489651	9.2[4]	"Very hard rock" at 110 ft; bottom at 110 ft.
HP-557	Redacted	Redacted	34.8[3]	"Shell limestone" with sand and clay 60–75 ft, limestone with sand 75–95 ft, limestone with sand shell clay 95–125 ft, limestone with sand 125–165 ft, limestone with clay and sand 165–300 ft, limestone with "rock" 290–300 ft; bottom at 300 ft.
HP-595	Redacted	Redacted	42.0[4]	Limestone with shell clay and sand 55–150 ft, limestone with sand and shell 150–195 ft, limestone with sand shell clay 195–240 ft, limestone with clay and sand 240–275 ft; bottom at 275 ft.
HP-596	Redacted	Redacted	44.3[3]	Limestone with sand clay shell 55–215 ft, limestone with pebbles and sand 85–95 ft, limestone with clay silty sand 165–210 ft; bottom at 215 ft.
HP-601	339693	2499568	23.0[5]	"Shell rock" 26–32, 38–61, 78–100 ft, "very hard rock" 194–204 ft; bottom at 204 ft.
HP-602	340638	2500652	25.0[5]	"Coquina" with sand 45–132 ft, "soft coquina" 150–160 ft; bottom at 189 ft.
HP-603	338762	2498518	24.8[4]	"Coquina" hard and soft 22–48 ft, "very hard" coquina 53–60 ft, "shell rock" with sand 84–115 ft, 127–175 ft; bottom at 251 ft.
HP-604	343071	2501865	31.2[4]	"Hard shell rock" 65–67 ft, well completed at 195 ft.
HP-605	338997	2504185	30.3[4]	"Rock" with sand, hard and soft, 70–76 ft, "hard shell rock" 109–113 ft; bottom at 205 ft.
HP-606	Redacted	Redacted	31.8[5]	"Shell rock" 49–65 ft, "shell rock" with sand and clay 82–105 ft, "shell rock" with sand, hard and soft 131–160 ft, 165–196 ft; bottom at 220 ft.
HP-607 (old)	337925	2502102	29.0[4]	Hard and soft rock with shell and sand 58–116 ft, "rock" 171–190 ft, well completed at 190 ft.
HP-607 (new)	Redacted	Redacted	31.1[3]	"Shell rock" 84–143 ft, "shell rock, hard" 158–175 ft; bottom at 200 ft.
HP-608	337098	2499607	29.9[5]	"Hard rock" 20–37 ft, hard, medium hard, and soft rock 37–108 ft, "soft shell rock and sand" 117–126 ft, "hard rock" 161–166 ft; bottom at 170 ft.
HP-609	334393	2506828	29.3[4]	Hard, medium, and soft rock 46–105 ft, "very hard rock" 151–156 ft; bottom at 156 ft.
HP-610	345268	2501654	27.9[5]	"Rock" with sand and shells 94–169 ft, "hard rock" 169–171 ft, "rock, sand and shells" 171–198 ft; bottom at 198 ft.
HP-611 (old)	350816	2495437	31.0[4]	"Hard rock" 86–112 ft, "hard rock" with sand 112–162 ft; bottom at 168 ft.
HP-611 (new)	Redacted	Redacted	40.0[4]	"Limestone" with sand and shell 55–215 ft, "green clay" 215–220 ft; bottom at 220 ft.
HP-612 (old)	352428	2496995	31.8[4]	"Shell rock" hard and soft with sand 37–81 ft, 84–190 ft; bottom at 198 ft.
HP-613	352946	2499350	21.2[4]	"Coquina rock" 32–46 ft, 60–67 ft, "soft rock with fossils" 46–54 ft, "soft rock" 90–97 ft, "hard rock" 110–122 ft, "shell rock and sand" 122–140 ft, "extra hard rock" 153–163 ft, 167–170 ft, "soft rock and sand" 163–167 ft; bottom at 170 ft.

Table B7. Summary of limestone occurrences and occurrences of similar rocks noted in driller's logs at supply wells, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[In cuttings description, depth in feet (ft) below ground surface; NGVD 29, National Geodetic Vertical Datum of 1929; USGS, U.S. Geological Survey]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet NGVD 29	Cuttings description
	North	East		
HP-614 (old)	353455	2494270	31.4[4]	"Coquina rock" 82–91 ft, "rock" hard and soft with sand and shells 95–178 ft, bottom at 178 ft.
HP-614 (new)	Redacted	Redacted	37.1[3]	"Limestone" with sand 120–160 ft, "limestone" and "rock" 145–155 ft, "limestone" with sand and clay 175–330 ft; bottom at 330 ft.
HP-615	354285	2496367	30.7[4]	"Shell rock" with sand 43–65 ft, 86–154 ft, "hard rock" 154–162 ft; bottom at 162 ft.
HP-616	354772	2498638	33.3[4]	"Rock" 41–71 ft, "coquina rock" 87–127 ft, "hard rock" 127–172 ft; bottom at 176 ft.
HP-617 (new)	Redacted	Redacted	39.8[3]	"Limestone" with sand 80–320 ft, lost water 60–70 ft, 80–90 ft, 180–190 ft, "rock started at 323 ft;" bottom at 330 ft.
HP-620	353181	2506668	35.0[4]	"Cavern," "hard rock" 47–54 ft; bottom at 54 ft.
HP-621 (old)	355383	2504816	40.8[4]	"Shell rock" 37–39 ft, 50–53 ft; bottom at 80 ft.
HP-621 (new)	Redacted	Redacted	40.9[3]	"Limestone" with "mud" 50–80 ft, limestone with sand and clay 80–210 ft, "hard rock" 311 ft; bottom at 312 ft.
HP-623	350823	2495593	29.8[4]	"Shell rock" 114–136 ft, "used a lot of water" 114–123 ft, "shell rock medium-water" 168–203 ft; bottom at 257 ft.
HP-624	333975	2502633	15.5[4]	"Shell rock" 20–31 ft, 46–50 ft, 60–70 ft, "soft shell rock" with sand 120–130 ft; bottom at 220 ft.
HP-625	332687	2505415	24.7[4]	"Shell rock" porous 73–98 ft, "shell rock" with sand 104–112 ft, soft shell rock 187–197 ft; bottom at 228 ft.
HP-626	332058	2508327	26.0[4]	"Shell rock" with sand and shell 79–90 ft, 115–126 ft, 146–157 ft, "lost 2 ft" between 79–85 ft; bottom at 207 ft.
HP-627 (old)	329529	2509747	30.7[4]	"Shell rock" hard 46–70 ft, "shell rock" with sand 93–105 ft, hard and soft 128–135 ft, "shell rock" 153–158; bottom at 187 ft.
HP-627 (new)	Redacted	Redacted	34.2[3]	"Limestone" with shells, sand and clay 80–315 ft; bottom at 315 ft.
HP-628 (old)	326487	2511431	17.5[4]	"Shell rock" 38–58 ft, 76–84 ft, "shell rock" with sand 84–145 ft; bottom at 167 ft.
HP-628 (new)	Redacted	Redacted	23.6[3]	"Rock" 82–90 ft, 112–122 ft, 130–145 ft; bottom at 201 ft.
HP-629 (old)	323807	2512647	29.8[4]	"Shell rock" hard and soft 51–84 ft, "shell rock" soft 96–126 ft, "shell rock" hard 162–165 ft; bottom at 208 ft.
HP-633	349702	2500647	25.6[5]	"Shell rock" with sand 130–150 ft, 180–200 ft; bottom at 205 ft.
HP-634	340948	2503179	30.8[5]	"Shell rock" soft 70–80 ft; bottom at 225 ft.
HP-635	343426	2503346	20.2[5]	"Shell rock" 44–47 ft, "shell rock" hard 59–61 ft, "shell rock" hard and soft 136–155 ft; bottom at 215 ft.
HP-636	345819	2503608	28.8[5]	"Shell rock" hard and soft with sand 122–178 ft; bottom at 227 ft.
HP-643	356093	2494391	29.0[5]	"Limestone" with sand 75–250 ft, "hard rock" 250–270 ft; bottom at 309 ft.
HP-644	356265	2495875	30.7[5]	Limestone and sand 75–185 ft, 238–260 ft; bottom at 310 ft.
HP-645	356438	2497358	27.4[5]	Limestone and sand 70–155 ft, 180–240 ft, hard limestone with sand 240–265 ft; bottom at 302 ft.
HP-647	Redacted	Redacted	30.3[5]	Limestone with sand 87–207 ft, "hard rock" with clay 273–305 ft; bottom at 305 ft.
HP-648	Redacted	Redacted	33.3[5]	Limestone and sand, some clay 43–268 ft, bottom at 309 ft.
HP-649	354769	2508706	37.9[5]	"Limerock" with sand 40–60 ft, "limestone" with sand 120–130 ft, "rock" with sand 150–180 ft; bottom at 310 ft.

Table B7. Summary of limestone occurrences and occurrences of similar rocks noted in driller's logs at supply wells, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[In cuttings description, depth in feet (ft) below ground surface; NGVD 29, National Geodetic Vertical Datum of 1929; USGS, U.S. Geological Survey]

Site name[1]	Location coordinates[2]		Land-surface altitude, in feet NGVD 29	Cuttings description
	North	East		
HP-650	Redacted	Redacted	37.4[5]	Limestone and sand continuous 50–140 ft, "rock" with sand and limestone 140–170 ft; bottom at 310 ft.
HP-651	348083	2503829	32.0[5]	Sand and limestone continuous 50–80 ft, 100–210 ft, "limestone" 80–100 ft, "sand and limestone" 250–260 ft; bottom at 310 ft.
HP-652	Redacted	Redacted	32.9[5]	"Shell rock" with clay 50–60 ft, limestone with sand and clay 60–90 ft; bottom at 310 ft.
HP-653	351211	2503838	31.3[4]	"Soft limestone" with sand 54–190 ft; bottom at 270 ft.
HP-660	339652	2499482	23.8[4]	"Rock" with sand and shell 70–90 ft, 100–120 ft; bottom at 200 ft.
HP-662	Redacted	Redacted	13.7[3]	Limestone 55–100 ft, limestone with sand 100–150 ft; bottom at 250 ft.
HP-663	Redacted	Redacted	36.0[3]	Limestone 130–145 ft; bottom at 250 ft.
HP-698	Redacted	Redacted	23.3[3]	Limestone 85–120 ft; bottom at 250 ft.
HP-699	Redacted	Redacted	23.1[3]	"Limestone and sand" 70–125 ft; bottom at 250 ft.
HP-700	355278	2488526	23.0[3]	Limestone with green clay 65–155 ft; bottom at 250 ft.
HP-701	Redacted	Redacted	20.8[3]	Limestone with shells 35–50 ft, 65–100 ft; bottom at 250 ft.
HP-703	Redacted	Redacted	29.5[3]	No limestone, "shell rock," "rock," "limerock," or coquina noted in driller's log; bottom at 250 ft.
HP-704	Redacted	Redacted	26.5[3]	No limestone, "shell rock," "rock," "limerock," or coquina noted in driller's log; bottom at 250 ft.
HP-705	Redacted	Redacted	39.3[3]	Limestone hard with sand and blue clay 35–85 ft, 120–170 ft; bottom at 300 ft.
HP-707	353837	2492298	25.1[3]	Limestone 80–140 ft; bottom at 250 ft.
HP-708	Redacted	Redacted	39.8[5]	Limestone 70–215 ft, limestone with green clay 215–250 ft; bottom at 250 ft.
HP-709	Redacted	Redacted	28.0[3]	Limestone with gray clay 40–95 ft, limestone 95–100 ft, limestone with green and gray clay150–200 ft; bottom at 250 ft.
HP-710	Redacted	Redacted	32.1[3]	Limestone with green clay 60–120 ft, limestone with green and white clay 120–185 ft; bottom at 250 ft.
HP-711	Redacted	Redacted	34.9[3]	Limestone with gray clay 65–80 ft, limestone 80–105 ft, limestone with white clay 105–170 ft, limestone with green clay 170–205 ft; bottom at 250 ft.
LCH-4007	357219	2501452	40.6[5]	"Hard rock" 36–59 ft, "hard rock" with "shell rock" 49–59 ft, "shell rock" 102–127 ft; bottom at 193 ft.
M-1	358656	2499538	32.7[4]	Soft "coquina rock" 40–43 ft, "coquina rock" hard and soft 54–133 ft; bottom at 153 ft.
M-2	357175	2501411	41.2[4]	"Shell rock," hard and soft with sand 42–155 ft; bottom at 155 ft.
R Well	353534	2484804	20.4[3]	"Coquina rock," hard 65–81 ft, 94–104 ft, "shell rock" with sand 81–94 ft; bottom at 104 ft.
S190A	353875	2487604	21.4[3]	Limestone and soft limestone 65–120 ft; bottom at 250 ft.

[1] See Plate B1 for location; location of well BA-145 not shown

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

[3] Land-surface altitude estimated from digital elevation model

[4] Land-surface altitude reported in data sources listed below

[5] Land-surface altitude calculated using measurements of well house structure and contents shown on U.S. Geological Survey well schedules and reported altitude of well house floor

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base, Camp Lejeune, North Carolina

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
01-GW07	332234	2501551	20.2
01-GW08	332716	2501579	19.4
01-GW09	333130	2501612	14.9
01-GW10	333867	2502095	15.3
01-GW11	334163	2502775	10.4
01-GW12	334048	2503302	13.8
01-GW13	332899	2503901	29.5
01-GW14	334048	2503302	13.8
01-GW16	332660	2501994	20.7
01-GW16DW	332642	2501970	20.8
01-GW17	333651	2502776	20.1
01-GW17DW	333674	2502775	19.1
03-MW01	352563	2500000	31.4
03-MW02	352823	2500068	32.4
03-MW02DW	352801	2500072	32.2
03-MW02IW	352813	2500068	32.5
03-MW03	353411	2499911	29.4
03-MW04	352927	2499859	30.9
03-MW05	352639	2499963	31.8
03-MW06	352246	2500114	27.9
03-MW07	352902	2500267	31.0
03-MW08	353356	2500064	30.1
03-MW09	353376	2500187	31.5
03-MW10	352883	2500432	32.4
03-MW11	352531	2499898	26.7
03-MW11IW	352544	2499897	25.3
03-MW12	353025	2499695	27.7
03-MW13	352933	2499347	20.8
06-GW01	348127	2503343	31.3
06-GW01D	348137	2503363	undefined
06-GW01DA	348320	2503384	32.7
06-GW02	347214	2503751	36.2
06-GW02D	347220	2503760	undefined
06-GW03	347739	2502666	29.1
06-GW03D	347811	2504501	34.2
06-GW04	346437	2502778	25.5
06-GW05	346233	2502452	25.3
06-GW06	345360	2502750	24.4
06-GW07	344414	2502106	15.6
06-GW08	344392	2502799	18.0
06-GW11	347504	2502329	32.4
06-GW12	344362	2502314	17.0
06-GW13	344366	2502549	18.1
06-GW14	344589	2502928	25.5
06-GW15	347784	2503211	26.1
06-GW15D	347767	2503174	25.2
06-GW16	346496	2502546	24.9
06-GW17	345001	2503233	25.7
06-GW18	345731	2503377	26.5
06-GW19	346289	2503020	25.2
06-GW20	346519	2502192	22.5
06-GW21	346816	2501743	27.9
06-GW22	345993	2502502	24.5
06-GW23	346993	2502738	24.5
06-GW25	346792	2503435	32.1
06-GW26	347656	2501883	25.0
06-GW27D	348316	2502449	undefined
06-GW28D	348677	2502849	28.7
06-GW28S	348623	2502900	27.6
06-GW31	347162	2502005	27.8
06-GW32	348840	2502690	19.6
06-GW33	348457	2503167	20.0
06-GW34	348434	2503483	29.0
06-GW36D	350271	2502282	15.6
06-GW37D	348037	2501703	14.0
09-GW04	342217	2503183	28.3
09-GW05	343113	2502785	28.0
09-GW06	343041	2502726	28.7
09-GW07D	343333	2502729	undefined
09-GW07S	343321	2502750	26.2
09-GW08	343070	2502890	26.0
10-MW02	346534	2501587	27.0
10-MW03	345831	2501347	21.6
10-MW04	346037	2500627	17.1
10-MW06	346952	2501230	18.7
10-MW08	345608	2500261	20.8
10-MW09	346633	2501145	16.6
10-TW01 (1998)	346802	2501411	26.2
10-TW02 (1998)	346530	2501583	27.0
10-TW03 (1998)	345825	2501343	22.0
10-TW04	346037	2500626	17.6
10-TW05	345640	2500887	23.1

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
10-TW06	346953	2501226	18.6
10-TW07	345909	2500273	28.0
10-TW08	345609	2500260	20.7
10-TW09	346632	2501140	16.6
22-MW01	339573	2501718	28.3
22-MW02	339809	2501960	30.0
22-MW03	339367	2501802	29.0
22-MW04	339588	2502080	29.8
22-MW05	339792	2501434	28.5
22-MW06	340026	2501789	27.8
22-MW07	340071	2501495	28.4
22-MW08	339959	2501383	27.8
22-MW09	339116	2501482	28.8
22-MW10	339835	2501814	28.1
22-MW11	340014	2501237	26.5
22-MW12	340158	2501386	26.9
22-MW13	340281	2501716	28.8
22-MW14	339578	2501217	27.7
22-MW15	339367	2501442	28.3
22-MW16	339951	2501560	28.4
22-MW17	339717	2501638	29.5
22-MW18	339635	2501874	29.9
22-MW19	339838	2502137	29.4
22-MW20	340181	2501167	26.8
28-GW01	331849	2498323	4.8
28-GW01DW	331870	2498323	5.5
28-GW05	331719	2499911	8.6
28-GW06	332194	2498094	14.2
28-GW07	331751	2499119	3.8
28-GW07DW	331745	2499147	3.6
28-GW08	332239	2499096	11.6
28-GW09DW	332857	2498262	4.5
30-GW03	318911	2514553	40.5
74-GW03A	353878	2501115	33.4
74-GW04	353437	2501304	32.7
74-GW05	353028	2501327	32.8
74-GW06	353337	2501567	31.6
74-GW07	352655	2501624	32.4
74-GW08	352836	2502538	28.4
78-642-1	339211	2504048	28.9
78-642-2	338741	2504161	30.1
78Bldg902_P01	341270	2502816	30.1
78Bldg902_P02	341240	2502892	30.4
78Bldg902_RW-01	341293	2502855	30.3
78-GW01	337222	2499145	27.6
78-GW02	337018	2499576	28.5
78-GW03	336765	2499494	26.7
78-GW04-1	337457	2499549	27.6
78-GW05	338211	2499027	25.0
78-GW06	338641	2498839	25.5
78-GW07	338538	2499392	25.7
78-GW08	338709	2499778	25.6
78-GW09-1	337998	2499701	26.1
78-GW09-2	337995	2499690	25.6
78-GW09-3	337995	2499836	24.8
78-GW10	338309	2500046	26.0
78-GW11	337865	2500178	25.8
78-GW12	338457	2500632	27.7
78-GW13	339567	2499458	missing
78-GW14	339391	2499956	20.6
78-GW15	339109	2500535	24.9
78-GW16	339006	2501332	27.2
78-GW17-1	339371	2500975	27.9
78-GW17-2	339198	2501229	29.7
78-GW17-3	339236	2501288	29.5
78-GW18	339766	2500665	27.0
78-GW19	340220	2500628	missing
78-GW20	340704	2500752	19.8
78-GW21	339539	2502400	29.9
78-GW22	340395	2502740	30.5
78-GW23	340686	2502468	30.3
78-GW24-1	341181	2502845	30.8
78-GW24-2	341169	2502808	30.8
78-GW24-3	341153	2502785	30.6
78-GW25	340951	2503205	30.4
78-GW26	342950	2501860	32.6
78-GW29	335465	2499141	23.4
78-GW32-3	339474	2501278	27.3
78-GW40	340651	2502400	29.3
78-GW41	340991	2502751	28.8
78-GW42	337497	2499302	28.0

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
78-N-TW12	340646	2502383	29.3
78-N-TW13	341083	2502740	29.7
82-MW03	348220	2502375	22.0
88-EX01	339427	2496473	undefined
88-EX02	339440	2496476	undefined
88-EX03	339451	2496479	undefined
88-EX04	339420	2496500	undefined
88-EX04R	339420	2496500	undefined
88-EX05	339428	2496504	undefined
88-EX06	339438	2496505	undefined
88-HC01	339411	2496484	undefined
88-HC02	339454	2496495	undefined
88-IN01	339422	2496487	undefined
88-IN02	339435	2496489	undefined
88-IN03	339444	2496492	undefined
88-IW01	339428	2496495	25.6
88-MW01	339268	2496740	26.5
88-MW02DW	339364	2496466	26.6
88-MW03DW	339508	2496540	25.9
88-MW04DW	339090	2496474	25.0
88-MW05DW	339601	2496397	24.7
88-MW06IW	339340	2496286	24.6
88-MW07IW	339945	2496042	23.7
88-MW08IW	339572	2495868	23.0
88-MW09IW	339080	2496132	22.0
88-RW01	339435	2496475	25.5
88-RW02	339430	2496488	25.5
88-RW04	339417	2496511	undefined
88-TW04IW	339352	2496459	26.5
88-TW05	339225	2496434	25.7
88-TW05IW	339228	2496433	undefined
88-TW06	339496	2496512	23.6
88-TW07	339309	2496617	26.5
88-TW08	339548	2496377	24.7
88-TW08IW	339541	2496376	undefined
88-TW09	339353	2496363	25.7
88-TW11	339211	2496647	26.1
88-TW12	339187	2496531	26.6
88-TW13	339262	2496340	undefined
88-TW14	339413	2496633	26.1
88-TW15	339408	2496330	undefined
88-TW16	339085	2496245	undefined
88-TW17	338997	2496424	undefined
88-TW18	339264	2496021	undefined
88-TW19	339573	2495863	undefined
88-TW19IW	339577	2495861	undefined
88-TW20IW	339130	2496170	21.0
88-TW21IW	339325	2496100	23.8
88-TW22IW	339596	2496140	23.3
88-TW23IW	339760	2496365	24.0
88-TW24IW	339820	2496110	18.2
88-TW25IW	340078	2496390	18.7
88-TW26IW	339700	2496690	21.8
88-TW27IW	339576	2495960	22.7
88-TW28IW	339700	2496000	24.6
88-WP01AQT	339439	2496484	undefined
88-WP02AQT	339440	2496485	undefined
BA-145	307550	2515500	21.2
Bldg20-MW01	337457	2496375	26.5
Bldg21_DW01	332689	2498546	6.9
Bldg21_DW02	332686	2498564	7.1
Bldg21_DW03	332644	2498579	5.1
Bldg21_DW04	332600	2498520	8.9
Bldg21_MW01	332635	2498568	7.4
Bldg21_MW02	332659	2498558	8.4
Bldg21_MW03	332667	2498643	11.5
Bldg21_MW04	332621	2498600	6.2
Bldg21_MW05	332668	2498494	6.9
Bldg21_MW06	332644	2498507	6.4
Bldg21_MW07	332695	2498510	3.2
Bldg21_MW08	332700	2498534	5.4
Bldg21_MW09	332682	2498606	7.6
Bldg21_RW01	332659	2498573	8.3
Bldg24_MW01	341481	2493819	27.6
Bldg61_MW01	339284	2497385	22.9
Bldg61_MW02	339300	2497374	21.2
Bldg61_MW03	339318	2497402	21.2
Bldg311_MW01	336170	2496433	21.0
Bldg331_MW01	335906	2496507	16.9
Bldg331_MW02	335956	2496560	18.6
Bldg331_MW03	335995	2496595	19.7
Bldg331_MW04	336012	2496628	20.3

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
Bldg331_MW05	336065	2496646	21.7
Bldg331_MW06	336049	2496609	19.3
Bldg331_MW07	336093	2496580	19.3
Bldg331_MW08	335988	2496442	16.0
Bldg331_MW09	336038	2496514	18.7
Bldg331_MW10	336064	2496542	18.6
Bldg331_MW11	335960	2496474	16.0
Bldg331_MW12	335968	2496619	19.5
Bldg331_MW13	336060	2496650	21.7
Bldg331_MW14	335991	2496590	19.6
Bldg331_MW15	335911	2496513	16.8
Bldg331_PW16	336065	2496598	19.1
Bldg575_MW01	333891	2500063	11.8
Bldg820_MW02	349804	2494711	30.1
Bldg820_MW03	349773	2494676	29.8
Bldg820_MW04	349794	2494639	30.4
Bldg820_MW05	349848	2494580	30.4
Bldg820_MW06	349724	2494733	30.2
Bldg820_MW07	349549	2494901	25.1
Bldg820_MW08	349545	2494901	25.2
Bldg820_MW09	349798	2494713	29.7
Bldg820_MW09D	349790	2494709	33.0
Bldg820_MW10	349615	2494623	30.1
Bldg820_MW11	349886	2494705	29.1
Bldg820_MW12	349729	2494666	30.2
Bldg820_MW13	349724	2494778	28.8
Bldg820_MW14	349894	2494889	29.4
Bldg820_MW15	350068	2494638	29.9
Bldg820_MW16	349785	2494489	30.2
Bldg820_MW17	349785	2494495	30.4
Bldg820_MW18	349626	2494497	29.2
Bldg820_MW19	349622	2494493	29.6
Bldg820_MW20	349434	2494602	29.7
Bldg820_MW21	349431	2494608	29.8
Bldg820_MW22	349326	2494768	30.2
Bldg820_MW23	349320	2494766	29.4
Bldg820_MW24	349311	2494966	27.4
Bldg820_MW27	349916	2494683	30.4
Bldg820_MW28	349989	2494414	28.8
Bldg820_MW29	349872	2494841	27.4
Bldg820_MW30	350142	2494819	30.2
Bldg820_MW31	350163	2494600	30.6
Bldg820_MW32	350090	2494399	29.7
Bldg820_MW33	349872	2494365	29.7
Bldg820_MW34	349929	2494460	30.0
Bldg820_PW01	349750	2494725	29.8
Bldg900_MW01	340573	2502732	27.8
Bldg900_MW02	340481	2502441	30.5
Bldg900_MW04	340642	2502667	29.7
Bldg900_MW05	340635	2502768	29.8
Bldg900_MW06	340512	2502706	31.2
Bldg900_MW07	340513	2502794	30.2
Bldg1115_MW01	339765	2500525	22.2
Bldg1115_MW02	339872	2500370	21.7
Bldg1115_MW03	339713	2500787	23.7
Bldg1115_MW04	340266	2500465	22.5
Bldg1115_MW05	340058	2500823	24.1
Bldg1115_MW06	340097	2500518	23.8
Bldg1115_MW07	339897	2501006	21.8
Bldg1115_MW08	340151	2500439	23.9
Bldg1115_MW09	340432	2500868	missing
Bldg1115_MW10	340074	2500690	missing
Bldg1115_MW11	340000	2500606	18.6
Bldg1115_MW12	340172	2500846	23.6
Bldg1115_MW13	340077	2500689	missing
Bldg1115_MW14	340002	2500600	22.6
Bldg1115_MW15	340176	2500843	23.6
Bldg1115_MW16	340128	2500697	24.9
Bldg1115_MW17	340247	2500467	missing
Bldg1115_MW18	340143	2501041	24.7
Bldg1115_MW19	339902	2501013	24.4
Bldg1115_MW20	339715	2500794	24.6
Bldg1115_MW21	339867	2500374	21.0
Bldg1115_MW22	340244	2500473	24.1
Bldg1115_MW23	340138	2501039	24.5
Bldg1115_MW24	339864	2500373	20.9
Bldg1115_MW25	340077	2500691	missing
Bldg1310_MW01	338279	2500993	30.8
Bldg1310_MW02	338306	2500960	29.8
Bldg1310_MW03	338328	2500985	30.0
Bldg1323_MW01	337304	2502213	28.2
Bldg1323_MW02	337334	2502187	27.8

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
Bldg1450_MW01	337070	2501301	25.5
Bldg1450_MW02	337128	2501307	25.9
Bldg1450_MW03	337131	2501303	25.9
Bldg1450_MW04	337086	2501243	25.1
Bldg1450_MW05	337009	2501298	25.4
Bldg1450_MW06	337060	2501360	26.0
Bldg1450_MW08	337210	2501305	26.4
Bldg1502_MW01 (1995)	338378	2499982	26.1
Bldg1502_MW02 (1995)	338382	2499986	26.0
Bldg1502_MW03	338386	2499984	26.1
Bldg1502_MW04	338386	2499999	25.2
Bldg1502_MW01 (2001)	338081	2499813	25.9
Bldg1502_MW02 (2001)	337953	2499669	26.7
Bldg1601_DP14	338089	2499647	25.6
Bldg1601_DP15	338119	2499628	26.8
Bldg1601_DP16	338112	2499588	25.8
Bldg1607_MW01	337695	2499646	26.3
Bldg1607_MW02	337686	2499624	26.5
Bldg1607_MW03	337707	2499620	26.9
Bldg1613_AS11 (sparge)	338545	2498958	25.2
Bldg1613_AS14 (sparge)	338632	2498859	25.7
Bldg1613_MW01	338784	2498912	25.9
Bldg1613_MW02	338741	2499189	26.3
Bldg1613_MW03	338527	2499193	25.9
Bldg1613_MW04	338469	2498825	24.3
Bldg1613_MW05	338586	2498741	23.4
Bldg1613_MW06	338725	2498789	26.1
Bldg1613_MW07	338880	2499335	24.0
Bldg1613_MW08	338340	2498661	28.0
Bldg1613_MW09	338328	2498928	25.9
Bldg1613_MW10	338636	2499029	26.5
Bldg1613_MW11	338558	2498839	25.1
Bldg1613_MW12	338372	2499092	26.5
Bldg1613_MW13	338878	2499321	24.3
Bldg1613_MW14	338641	2499026	26.4
Bldg1613_MW15	338350	2498652	26.5
Bldg1613_MW16	338641	2499026	26.4
Bldg1804_DMW13	335657	2499674	23.3
Bldg1817_MW01	334946	2499993	26.4
Bldg1854_DP01	334730	2500901	18.9
Bldg1854_DP02	334665	2500941	17.7
Bldg1854_DP03	334661	2500879	18.0
Bldg1854_DP04	334709	2500869	19.3
Bldg1854_DP05	334674	2500890	18.1
Bldg1854_DP06	334648	2500910	17.2
Bldg1854_DP07	334651	2500958	17.8
Bldg1854_DP08	334703	2500939	17.5
Bldg1854_DP09	334629	2500924	17.6
Bldg1854_DP10	334608	2500931	17.8
Bldg1854_DP11	334559	2500924	17.6
Bldg1854_DP12	334752	2500943	17.6
Bldg1854_DP13	334685	2501050	21.4
Bldg1854_DP16	334564	2501088	11.6
Bldg1854_MW01	334686	2500938	17.6
Bldg1854_MW02	334642	2500891	17.4
Bldg1854_MW03	334667	2500826	19.9
Bldg1854_MW05	334784	2500969	18.3
Bldg1854_MW06	334681	2500965	17.6
Bldg1854_MW07	334692	2500856	19.5
Bldg1854_MW08	334659	2501165	10.5
Bldg1880_MW01	335334	2499167	25.6
Bldg1880_MW02	335354	2499123	24.6
Bldg1880_MW03	335328	2499165	25.0
Bldg1880_MW04	335349	2499333	25.4
Bldg1880_MW05	335344	2499327	25.2
Bldg1880_MW06	335286	2499202	25.8
Bldg1880_MW07	335336	2499239	25.7
Bldg1880_TW08	335430	2499295	25.8
Bldg5400_PZ01	353754	2495810	30.8
Bldg5400_PZ02	353697	2495782	30.5
Bldg5400_PZ03	353704	2495835	31.2
Bldg5400_PZ04	353646	2495827	31.0
BldgFC40_SB01	334352	2506581	27.3
BldgFC40_DPT01	334364	2506581	26.7
BldgFC102_MW01 (March 1993)	333444	2503463	23.3
BldgFC102_MW02 (March 1993)	333494	2503444	21.2

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
BldgFC102_MW03 (March 1993)	333490	2503479	21.1
BldgFC120_MW01	333370	2502847	24.9
BldgFC120_MW02	333386	2502869	24.3
BldgFC120_MW03	333361	2502886	25.5
BldgFC201E_E01	333362	2504283	19.2
BldgFC201E_E02	333346	2504294	19.5
BldgFC201E_E03	333340	2504280	19.5
BldgFC201E_MW04	333321	2504238	20.5
BldgFC201E_MW05	333306	2504366	20.1
BldgFC201E_MW06	333367	2504322	19.3
BldgFC201E_MW07	333411	2504321	17.6
BldgFC201E_MW08	333406	2504266	17.8
BldgFC201E_MW09	333413	2504206	17.4
BldgFC201E_MW11	333574	2504263	16.0
BldgFC201E_MW12	333549	2504390	17.0
BldgFC201E_MW13	333406	2504482	19.8
BldgFC201E_MW14	333201	2504297	23.1
BldgFC201E_MW15	333275	2504170	21.6
BldgFC201E_MW16	333448	2504132	16.4
BldgFC201E_PW01	333374	2504284	20.1
BldgFC251_MW01 (1994)	332552	2504401	28.4
BldgFC251_MW01 (1995)	332319	2504263	25.1
BldgFC251_MW02 (1994)	332509	2504382	27.8
BldgFC251_MW02 (1995)	332610	2504385	30.1
BldgFC251_MW03 (1994)	332540	2504365	28.1
BldgFC251_MW03 (1995)	332428	2504557	24.4
BldgFC251_MW04	332711	2504348	28.2
BldgFC251_MW05	332473	2504236	28.1
BldgFC251_MW06	332312	2504275	27.7
BldgFC251_MW07	332541	2504350	27.7
BldgFC251_MW08	332529	2504359	28.0
BldgFC263_MW01	332081	2504450	18.0
BldgFC263_MW02	332010	2504811	21.1
BldgFC263_MW03	331892	2504581	20.4
BldgFC263_MW04	332117	2504737	19.5
BldgFC263_MW05	331786	2504800	20.0
BldgFC263_MW06	331702	2504632	20.2
BldgFC263_MW07	331841	2504506	20.4
BldgFC263_MW08	332002	2504462	19.1
BldgFC263_MW09	332015	2504334	14.0
BldgFC263_MW10	331901	2504931	20.4
BldgFC263_MW11	332006	2504753	20.8
BldgFC263_MW12	331928	2504678	21.0
BldgFC263_MW13	331706	2504639	22.0
BldgFC263_MW14	332124	2504732	21.2
BldgFC263_MW15	331932	2504684	22.6
BldgFC263_MW16	331940	2504681	21.1
BldgFC280_MW01	333576	2505522	20.0
BldgFC281_MW01	333623	2506017	23.8
BldgH19_MW01	341413	2489976	11.1
BldgH19_MW02	341409	2490000	11.1
BldgH19_MW03	341408	2490011	11.4
BldgH19_MW04	341429	2490024	11.9
BldgH19_MW05	341392	2490027	11.4
BldgH19_MW06	341401	2490043	11.6
BldgH19_MW07	341371	2490017	10.7
BldgH19_MW11	341301	2490071	10.5
BldgH19_MW13	341385	2490037	10.9
BldgH28_MW08 AKA HA03	341527	2490477	12.1
BldgH28_MW09 AKA HA02	341529	2490493	12.2
BldgH28_MW10 AKA HA01	341561	2490515	11.6
BldgH30_MW01	341377	2491946	8.3
BldgH30_MW02	341366	2491926	9.2
BldgH30_MW03	341399	2491927	5.0

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
BldgH30_MW05	341373	2491944	9.2
BldgH30_MW06	341426	2491897	2.7
BldgH30_MW07	341400	2491884	4.0
BldgH30_MW08	341431	2491898	2.6
BldgH30_MW09	341434	2491922	2.5
BldgH30_MW10	341436	2491950	2.3
BldgH30_MW11	341421	2491975	2.7
BldgH30_PW04	341406	2491927	0.3
BldgHP100_PZ01	340621	2494486	18.8
BldgHP100_PZ02	340628	2494505	19.1
BldgHP100_PZ03	340634	2494524	18.9
BldgHP100_PZ04	340652	2494525	18.8
BldgHP100_PZ05	340659	2494492	18.9
BldgHP100_PZ06	340642	2494472	18.8
BldgHP100_PZ07	340629	2494481	18.8
BldgHP100_PZ08	340621	2494470	18.9
BldgHP250_MW01	338414	2494164	20.2
BldgPP3311_TW01	343669	2492022	9.0
BldgPP3322_TW01	344028	2491217	7.0
BldgPP3332_TW01	344011	2490780	14.3
BldgPP3340_TW01	344078	2491071	13.5
BldgPP3354_TW01	344390	2490701	12.7
BldgPT5_MW01	342236	2499221	25.7
BldgPT5_MW02	342160	2499259	25.3
BldgPT5_MW03	342350	2499284	24.4
BldgPT5_MW04	342285	2499240	12.3
BldgPT5_MW05	342184	2499052	16.0
BldgPT5_MW06	342304	2499366	25.1
BldgPT5_MW07	342275	2499130	25.1
BldgPT5_MW08	342233	2499388	16.6
BldgPT5_MW09	342317	2499204	24.5
BldgPT5_MW10	342343	2499368	24.9
BldgPT5_MW11	342233	2499068	15.9
BldgPT5_MW12	3422250	2499304	25.3
BldgPT5_MW13	342354	2499285	10.9
BldgPT5_MW14	342288	2499241	16.6
BldgPT5_MW15	342181	2499046	16.9
BldgPT5_MW16	342238	2499230	25.3
BldgPT5_MW17	342220	2499186	17.3
BldgPT5_MW18	342245	2499233	17.1
BldgPT37_MW01	343290	2497150	21.1
BldgS688_MW01	331689	2499543	9.3
BldgS1856_MW01	335826	2499479	22.0
BldgS1856_MW02	335815	2499459	22.3
BldgS1856_MW03	335783	2499527	21.5
BldgS1856_MW04	335777	2499501	21.8
BldgS1856_MW05	335772	2499562	21.3
BldgS1856_MW06	335746	2499539	22.2
BldgS1856_MW07	335753	2499626	20.8
BldgS1856_MW08	335705	2499580	22.8
BldgS1856_MW09	335713	2499668	21.6
BldgS1856_MW10	335684	2499625	22.2
BldgS1856_MW11	335663	2499692	22.9
BldgS1856_MW12	335657	2499666	23.0
G-BP08	345989	2504914	38.0
G-BP09	346651	2505516	39.6
G-MW01	347001	2504808	35.9
G-MW02	345631	2503937	27.7
G-MW03	347850	2504348	29.0
G-MW05	347274	2506033	35.3
G-MW06	346261	2505757	37.4
G-MW09	346832	2503699	42.9
HP-557	Redacted	Redacted	34.8
HP-584	Redacted	Redacted	38.0
HP-585	Redacted	Redacted	undefined
HP-595	Redacted	Redacted	undefined
HP-596	Redacted	Redacted	44.3
HP-607 (new)	Redacted	Redacted	31.1
HP-611 (old)	350816	2495437	31.0
HP-611 (new)	Redacted	Redacted	40.0
HP-612 (old)	352428	2496995	31.8
HP-613	352946	2499350	17.7
HP-614 (new)	Redacted	Redacted	37.1
HP-619 (new)	Redacted	Redacted	38.3
HP-621 (new)	Redacted	Redacted	40.9
HP-623	350823	2495593	29.8
HP-627 (new)	Redacted	Redacted	34.2
HP-628 (new)	331932	2508385	23.6
HP-637	342990	2501856	33.1
HP-638	333067	2502563	25.9
HP-640	Redacted	Redacted	29.5
HP-641	Redacted	Redacted	36.2

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
HP-649	354769	2508706	37.9
HP-650	Redacted	Redacted	37.4
HP-651	348083	2503829	30.1
HP-652	Redacted	Redacted	26.9
HP-655	332690	2505472	25.8
HP-660	339652	2499482	23.8
HP-661	Redacted	Redacted	29.0
HP-662	Redacted	Redacted	13.7
HP-663	Redacted	Redacted	28.0
HP-708	Redacted	Redacted	39.8
HP-709	Redacted	Redacted	28.0
HP-710	Redacted	Redacted	32.1
HP-711	Redacted	Redacted	34.9
HPFF_MW01	340257	2501610	missing
HPFF_MW02	340199	2501767	25.5
HPFF_MW03	340020	2502168	24.8
HPFF_MW04	339386	2501999	27.0
HPFF_MW05	339612	2501160	23.4
HPFF_MW06	339891	2502015	28.4
HPFF_MW07	340211	2501550	19.4
HPFF_MW08	339789	2501730	32.5
HPFF_MW09	339614	2501162	22.6
HPFF_MW10	339828	2501690	29.4
HPFF_MW11	339809	2501708	29.1
HPFF_MW12	339867	2501359	undefined
HPFF_MW13	340106	2500518	undefined
HPFF_MW14	339850	2501344	undefined
HPFF_MW15	339659	2501560	27.4
HPFF_MW16	340056	2500995	27.2
HPFF_MW17	339858	2501207	27.6
HPFF_MW18	339779	2500856	26.1
HPFF_MW20	339934	2502088	28.3
HPFF_MW21	340069	2501314	22.4
HPFF_MW22	340042	2501490	22.3
HPFF_MW23	339929	2501093	23.1
HPFF_MW24	339901	2501117	30.4
HPFF_MW25	339823	2501146	30.4
HPFF_MW26	339647	2501002	30.9
HPFF_MW27	340011	2500932	30.0
HPFF_MW28	339720	2501282	26.7
HPFF_MW29	339656	2501478	27.5
HPFF_MW30	339554	2501472	26.3
HPFF_MW31	339288	2501158	28.0
HPFF_MW32	339169	2501038	28.7
HPFF_MW33	339024	2500863	30.3
HPFF_MW34	339220	2500685	25.3
HPFF_MW35	339385	2500872	26.0
HPFF_MW36	339593	2500732	25.9
HPFF_MW37	339386	2500484	25.5
HPFF_MW38	339662	2502012	26.9
HPFF_MW39	340219	2500180	24.2
HPFF_MW40	339443	2501509	27.4
HPFF_MW41	339300	2501450	28.6
HPFF_MW42	339297	2501352	27.2
HPFF_MW43	339657	2499441	22.6
HPFF_MW44	339663	2499432	22.6
HPFF_MW45	340193	2500149	25.0
HPFF_MW46	340216	2500150	25.1
HPFF_MW47	340208	2500129	25.0
HPFF_MW48	340727	2500616	23.5
HPFF_MW49	340709	2500603	17.9
HPFF_MW50	340730	2500598	18.6
HPFF_MW51	340629	2500855	27.8
HPFF_MW52	340580	2501196	missing
HPFF_MW53	340585	2501197	27.9
HPFF_MW54	340581	2501190	missing
HPFF_MW55	340583	2501202	28
HPFF_MW56	340102	2500510	26.4
HPFF_MW57	339369	2500476	26.0
HPFF_MW58	339890	2500999	26.3
HPFF_MW59	340220	2501522	28.0
HPFF_MW60	339869	2501342	27.4
HPFF_MW61	339887	2501360	27.5
HPFF_MW62	339476	2501269	27.4
HPFF_MW63	339021	2500874	27.7
HPFF_MW64	339668	2501566	28.1
HPFF_MW65	339743	2501580	30.1
HPFF_MW66	339379	2501437	27.5
HPFF_MW67	339384	2501436	27.0
HPFF_MW68	339441	2501492	27.2
HPFF_MW69	339650	2501863	29.5
HPFF_MW70	339398	2501988	30.8

Table B9. Altitude at the top of the Brewster Boulevard upper aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above NGVD 29
	North	East	
HPFF_MW71	339389	2501979	30.7
HPFF_MW72	339378	2501447	28.0
HPFF_MW74	340383	2499681	24.4
HPFF_MW75	339802	2501429	22.4
HPFF_MW76	339379	2499879	23.2
HPFF_MW77	338886	2501330	29.3
MRFF_MW01	340119	2502204	29.1
MRFF_MW02	340125	2502230	28.7
T-1	355030	2507870	32.1
T-2	340590	2503410	29.4
T-3	347040	2503650	35.5
T-4	345730	2503610	29.1
T-5	343450	2503360	19.3
T-6	344770	2505310	33.5
T-7	349685	2500628	25.5
T-8	328600	2499550	6.4
T-22	307804	2515050	22.8
TanksS889&S891_MW01	350341	2501011	23.0
TanksS889&S891_MW02	350209	2501001	22.0
TanksS889&S891_MW03	350282	2501097	22.3
TanksS889&S891_MW04	350110	2501069	20.6
TanksS889&S891_MW05	350022	2501033	20.1
TanksS889&S891_MW06	350070	2501178	18.5
TanksS889&S891_MW07	349988	2501137	17.1
X24S2X	346842	2495677	24.9

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #206, #216, #258, #273, #331, #345, #417, #1272, #1505, #1524, #1700, #1747, #1977, #2032, #2304, #3061, #3165, #3188

Leaking Underground Storage Tank Program files #36, #45, #49, #59, #63, #64, #76, #78, #79, #86, #99, #116, #120, #130, #139, #155, #156, #163, #180, #187, #195, #200, #208, #227, #230, #261, #263, #276, #345, #359, #368, #370, #374, #377, #390, #392, #408, #410, #418, #450, #456, #457, #465, #485, #528, #532, #539, #543, #548, #672, #676, #693, #715, #716, #724, #747, #750, #755, #756, #758, #761, #204079-FC40-3_ROF, #204100-MRFF, #Soil_Contamination_Report_Bldg_820_6-05[1]

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

ATEC Environmental Consultants, Inc. 1992ac

Baker Environmental, Inc. 1993de, 1995ac, 1996aef, 1998bcd, 2001b

Catlin Engineers and Scientists 1998b, 1999ab, 2000, 2002abcdef, 2003ac, 2005ab

Dewberry and Davis 1992

Duke Engineering and Services, Inc. 1998

Environmental Science and Engineering, Inc. 1988, 1992

Geophex, Ltd. 2002

Groundwater Technology Government Services, Inc. 1993cd

Haliburton NUS 1992ac

Law Engineering, Inc. 1994b, 1995ab, 1996b

Law Engineering and Environmental Services, Inc. 1996cde, 1997bcde, 1998a, 2000abcde, 2002ab

O'Brien and Gere Engineers, Inc. 1988, 1992a

OHM Remediation Services Corp. 2000, 2001b, 2002a

R.E. Wright Associates, Inc. 1994cdefghi

R.E. Wright Environmental, Inc. 1995abd

Richard Catlin and Associates, Inc. 1995cd, 1996bde, 1997ab, 1998b, 2001

Shaw Environmental, Inc. 2005

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
01-GW07	332234	2501551	missing
01-GW08	332716	2501579	missing
01-GW09	333130	2501612	1.9
01-GW10	333867	2502095	missing
01-GW11	334163	2502775	missing
01-GW12	334048	2503302	missing
01-GW13	332899	2503901	8.3
01-GW14	334048	2503302	missing
01-GW16	332660	2501994	missing
01-GW16DW	332642	2501970	missing
01-GW17	333651	2502776	missing
01-GW17DW	333674	2502775	undefined
03-MW01	352563	2500000	undefined
03-MW02	352823	2500068	undefined
03-MW02DW	352801	2500072	10.2
03-MW02IW	352813	2500068	15.5
03-MW03	353411	2499911	undefined
03-MW04	352927	2499859	missing
03-MW05	352639	2499963	missing
03-MW06	352246	2500114	6.9
03-MW07	352902	2500267	18.0
03-MW08	353356	2500064	13.1
03-MW09	353376	2500187	17.5
03-MW10	352883	2500432	18.9
03-MW11	352531	2499898	missing
03-MW11IW	352544	2499897	missing
03-MW12	353025	2499695	15.2
03-MW13	352933	2499347	8.8
06-GW01	348127	2503343	missing
06-GW01D	348137	2503363	18.8
06-GW01DA	348320	2503384	17.7
06-GW02	347214	2503751	missing
06-GW02D	347220	2503760	undefined
06-GW03	347739	2502666	missing
06-GW03D	347811	2504501	18.2
06-GW04	346437	2502778	missing
06-GW05	346233	2502452	missing
06-GW06	345360	2502750	missing
06-GW07	344414	2502106	missing
06-GW07D	344336	2502082	undefined
06-GW08	344392	2502799	missing
06-GW11	347504	2502329	15.9
06-GW12	344362	2502314	undefined/ missing
06-GW13	344366	2502549	undefined/ missing
06-GW14	344589	2502928	undefined/ missing
06-GW15	347784	2503211	undefined
06-GW15D	347767	2503174	undefined
06-GW16	346496	2502546	undefined/ missing
06-GW17	345001	2503233	undefined/ missing
06-GW18	345731	2503377	undefined/ missing
06-GW19	346289	2503020	undefined/ missing
06-GW20	346519	2502192	undefined/ missing
06-GW21	346816	2501743	undefined/ missing
06-GW22	345993	2502502	undefined/ missing
06-GW23	346993	2502738	undefined/ missing
06-GW25	346792	2503435	undefined/ missing
06-GW26	347656	2501883	undefined/ missing
06-GW27D	348316	2502449	undefined
06-GW28D	348677	2502849	undefined/ missing
06-GW28S	348623	2502900	undefined/ missing
06-GW30	349553	2503728	9.9
06-GW31	347162	2502005	undefined/ missing
06-GW32	348840	2502690	undefined/ missing
06-GW33	348457	2503167	undefined/ missing
06-GW34	348434	2503483	undefined/ missing
06-GW35D	349394	2501254	12.0

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
06-GW36D	350271	2502282	undefined
06-GW37D	348037	2501703	undefined
09-GW04	342217	2503183	9.8
09-GW05	343113	2502785	9.0
09-GW06	343041	2502726	13.1
09-GW07D	343333	2502729	undefined
09-GW07S	343321	2502750	undefined
09-GW08	343070	2502890	8.4
10-MW4	346037	2500627	5.1
10-MW8	345608	2500261	7.4
22-MW09	339154	2501436	17.3
22-MW11	340014	2501237	undefined
22-MW12	340158	2501386	8.4
22-MW13	340281	2501716	undefined
22-MW14	339578	2501217	undefined
22-MW15	339367	2501442	undefined
22-MW16	339916	2501576	12.9
22-MW17	339717	2501638	undefined
22-MW18	339635	2501874	undefined
22-MW19	339838	2502137	undefind
22-MW20	340181	2501167	undefined
28-GW01	331849	2498323	–4.2
28-GW01DW	331870	2498323	undefined
28-GW05	331719	2499911	2.6
28-GW06	332194	2498094	4.2
28-GW07	331751	2499119	undefined
28-GW07DW	331745	2499147	undefined
28-GW08	332239	2499096	missing
28-GW09DW	332857	2498262	undefined
74-GW03A	353878	2501115	16.4
74-GW06	353337	2501567	missing
74-GW08	352836	2502538	missing
78-642-1	339211	2504048	undefined
78-642-2	338741	2504161	undefined
78Bldg902_P-1	341270	2502816	15
78Bldg902_P-2	341240	2502892	undefined
78Bldg902_RW-1	341293	2502855	undefined
78-GW01	337222	2499145	16.6
78-GW02	337018	2499576	16.0
78-GW03	336765	2499494	15.7
78-GW04	337457	2499549	15.1
78-GW05	338211	2499027	12.5
78-GW06	338641	2498839	6.5
78-GW07	338538	2499392	missing
78-GW08	338709	2499778	11.6
78-GW09-1	337998	2499701	missing
78-GW09-2	337995	2499690	undefined
78-GW09-3	337995	2499836	undefined
78-GW10	338309	2500046	12.0
78-GW11	337865	2500178	missing
78-GW12	338457	2500632	missing
78-GW13	339567	2499458	undefined
78-GW14	339391	2499956	16.1
78-GW15	339109	2500535	missing
78-GW16	339006	2501332	11.2
78-GW17-1	339371	2500975	missing
78-GW17-2	339198	2501229	undefined
78-GW17-3	339236	2501288	10
78-GW18	339766	2500665	missing
78-GW19	340220	2500628	undefined
78-GW20	340704	2500752	8.8
78-GW21	339539	2502400	17.4
78-GW22	340395	2502740	16.5
78-GW23	340686	2502468	missing
78-GW24-1	341181	2502845	16.8
78-GW24-2	341169	2502808	undefined
78-GW24-3	341153	2502785	undefined
78-GW25	340951	2503205	16.4
78-GW26	342950	2501860	18.6
78-GW29	335465	2499141	missing
78-GW32-3	339474	2501278	19
78-GW40	340651	2502400	17.3
78-GW41	340991	2502751	missing
78-GW42	337497	2499302	16.0
82-MW03	348220	2502375	undefined/ missing
88-EX01	339427	2496473	5.6
88-EX02	339440	2496476	5.6
88-EX03	339451	2496479	6.2
88-EX04	339420	2496500	4.6

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
88-EX04R	339420	2496500	5.9
88-EX05	339428	2496504	4.7
88-EX06	339438	2496505	5.8
88-HC01	339411	2496484	4.9
88-HC02	339454	2496495	6.6
88-IN01	339422	2496487	6.0
88-IN02	339435	2496489	6.8
88-IN03	339444	2496492	6.8
88-IW01	339428	2496495	7.0
88-MW01	339268	2496740	5.3
88-MW02DW	339364	2496466	1.6
88-MW03DW	339508	2496540	9.5
88-MW04DW	339090	2496474	9.0
88-MW05DW	339601	2496397	6.7
88-MW06IW	339340	2496286	missing
88-MW07IW	339945	2496042	–4.8
88-MW08IW	339572	2495868	missing
88-MW09IW	339080	2496132	missing
88-RW01	339435	2496475	6.9
88-RW02	339430	2496488	6.7
88-RW04	339417	2496511	5.4
88-TW04IW	339352	2496459	8.5
88-TW05IW	339228	2496433	missing
88-TW08IW	339541	2496376	4.7
88-TW19IW	339577	2495861	missing
88-TW20IW	339130	2496170	9.0
88-TW21IW	339325	2496100	3.8
88-TW22IW	339596	2496140	missing
88-TW23IW	339760	2496365	9.0
88-TW24IW	339820	2496110	4.2
88-TW25IW	340078	2496390	undefined/ missing
88-TW26IW	339700	2496690	11.8
88-TW27IW	339576	2495960	undefined/ missing
88-TW28IW	339700	2496000	undefined/ missing
88-WP01AQT	339439	2496484	6.1
88-WP02AQT	339440	2496485	6.6
BA-145	307550	2515500	–41
Bldg20-MW01	337456	2496374	10.5
Bldg21_DW01	332689	2498546	2.9
Bldg21_DW02	332686	2498564	3.1
Bldg21_DW03	332644	2498579	–2.4
Bldg21_DW04	332600	2498520	–6.6
Bldg21_MW01	332635	2498568	–6.6
Bldg21_MW02	332659	2498558	–10.6
Bldg21_MW03	332667	2498643	0
Bldg21_MW04	332621	2498600	–1.8
Bldg21_MW05	332668	2498494	–1.1
Bldg21_MW06	332644	2498507	0.4
Bldg21_MW07	332695	2498510	missing
Bldg21_MW08	332700	2498534	1.6
Bldg21_MW09	332682	2498606	–4.4
Bldg21_RW01	332659	2498573	–2.2
Bldg24_MW01	341481	2493819	8.1
Bldg61_MW01	339284	2497384	12.9
Bldg61_MW02	339300	2497373	13.2
Bldg61_MW03	339317	2497402	11.2
Bldg311_MW01	336170	2496433	12.0
Bldg331_MW01	335906	2496507	2.9
Bldg331_MW02	335956	2496560	5.6
Bldg331_MW03	335995	2496595	6.7
Bldg331_MW04	336012	2496628	7.3
Bldg331_MW05	336065	2496646	10.4
Bldg331_MW06	336049	2496609	11.3
Bldg331_MW07	336093	2496580	12.8
Bldg331_MW08	335988	2496442	missing
Bldg331_MW09	336038	2496514	10.2
Bldg331_MW10	336064	2496542	9.3
Bldg331_MW11	335960	2496474	7.5
Bldg331_MW12	335968	2496619	7.5
Bldg331_MW13	336060	2496650	10.4
Bldg331_MW14	335991	2496590	8.9
Bldg331_MW15	335911	2496513	3.8
Bldg331_PW16	336065	2496598	11.8
Bldg820_MW02	349804	2494711	13.6
Bldg820_MW03	349773	2494676	16.8
Bldg820_MW04	349794	2494639	undefined
Bldg820_MW05	349848	2494580	missing
Bldg820_MW06	349724	2494733	20.7

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg820_MW07	349549	2494901	18.1
Bldg820_MW08	349545	2494901	18.2
Bldg820_MW09	349798	2494713	missing
Bldg820_ MW09D	349790	2494709	missing
Bldg820_MW10	349615	2494623	21.6
Bldg820_MW11	349886	2494705	missing
Bldg820_MW12	349729	2494666	missing
Bldg820_MW13	349724	2494778	missing
Bldg820_MW14	349894	2494889	missing
Bldg820_MW15	350068	2494638	missing
Bldg820_MW16	349785	2494489	17.2
Bldg820_MW17	349785	2494495	21.4
Bldg820_MW18	349626	2494497	missing
Bldg820_MW19	349622	2494493	missing
Bldg820_MW20	349434	2494602	missing
Bldg820_MW21	349431	2494608	missing
Bldg820_MW22	349326	2494768	missing
Bldg820_MW23	349320	2494766	20.4
Bldg820_MW24	349311	2494966	17.8
Bldg820_MW28	349989	2494414	missing
Bldg820_MW29	349872	2494841	18.4
Bldg820_MW30	350142	2494819	undefined
Bldg820_MW31	350163	2494600	22.1
Bldg820_MW32	350090	2494399	21.7
Bldg820_MW33	349872	2494365	21.7
Bldg820_MW34	349929	2494460	23.0
Bldg820_PW01	349750	2494725	missing
Bldg900_MW01	340573	2502732	17.0
Bldg900_MW02	340481	2502441	17.0
Bldg1115_MW01	339765	2500525	undefined
Bldg1115_MW02	339872	2500370	undefined
Bldg1115_MW03	339713	2500787	undefined
Bldg1115_MW04	340266	2500465	14.5
Bldg1115_MW05	340058	2500823	16.1
Bldg1115_MW06	340097	2500518	15.8
Bldg1115_MW07	339897	2501006	undefined
Bldg1115_MW08	340151	2500439	15.9
Bldg1115_MW09	340432	2500868	undefined
Bldg1115_MW10	340074	2500690	undefined
Bldg1115_MW11	340000	2500606	missing
Bldg1115_MW12	340172	2500846	17.1
Bldg1115_MW13	340077	2500689	undefined
Bldg1115_MW14	340002	2500600	18.1
Bldg1115_MW15	340176	2500843	15.6
Bldg1115_MW16	340128	2500697	16.9
Bldg1115_MW17	340247	2500467	undefined
Bldg1115_MW18	340143	2501041	10.7
Bldg1115_MW19	339902	2501013	missing
Bldg1115_MW20	339715	2500794	missing
Bldg1115_MW21	339867	2500374	missing
Bldg1115_MW22	340244	2500473	15.1
Bldg1115_MW23	340138	2501039	missing
Bldg1115_MW24	339864	2500373	missing
Bldg1115_MW25	340077	2500691	undefined
Bldg1450_MW01	337070	2501301	missing
Bldg1450_MW02	337128	2501307	missing
Bldg1450_MW03	337131	2501303	missing
Bldg1450_MW04	337086	2501243	missing
Bldg1450_MW05	337009	2501298	15.8
Bldg1450_MW06	337060	2501360	missing
Bldg1450_MW08	337210	2501305	8.4
Bldg1502_MW01 (2001)	338081	2499813	missing
Bldg1502_MW02 (2001)	337953	2499669	missing
Bldg1502_MW04	338386	2499999	missing
Bldg1601_DP14	338089	2499647	missing
Bldg1601_DP15	338119	2499628	missing
Bldg1601_DP16	338112	2499588	missing
Bldg1607_MW01	337695	2499646	missing
Bldg1607_MW02	337686	2499624	14.0
Bldg1607_MW03	337707	2499620	missing
Bldg1613_AS11	338545	2498958	11.2
Bldg1613_AS14	338632	2498859	missing
Bldg1613_MW01	338784	2498912	10.7
Bldg1613_MW02	338741	2499189	missing
Bldg1613_MW03	338527	2499193	15.6
Bldg1613_MW04	338469	2498825	14.2
Bldg1613_MW05	338586	2498741	12.8
Bldg1613_MW06	338725	2498789	missing

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg1613_MW07	338880	2499335	missing
Bldg1613_MW08	338340	2498661	17.1
Bldg1613_MW09	338328	2498928	8.9
Bldg1613_MW10	338636	2499029	missing
Bldg1613_MW11	338558	2498839	15.3
Bldg1613_MW12	338372	2499092	missing
Bldg1613_MW13	338878	2499321	11.1
Bldg1613_MW14	338641	2499026	missing
Bldg1613_MW15	338637	2498630	17.2
Bldg1613_MW16	338641	2499026	missing
Bldg1804_DMW13	335657	2499674	10.3
Bldg1817_MW01	334946	2499993	7.4
Bldg1854_DP01	334730	2500901	5.9
Bldg1854_DP02	334665	2500941	1.7
Bldg1854_DP03	334661	2500879	5.0
Bldg1854_DP04	334709	2500869	4.3
Bldg1854_DP08	334703	2500939	7.5
Bldg1854_DP10	334608	2500931	4.8
Bldg1854_DP11	334559	2500924	1.6
Bldg1854_DP12	334752	2500943	4.6
Bldg1854_DP13	334685	2501050	11.4
Bldg1854_DP16	334564	2501088	1.6
Bldg1854_MW01	334686	2500938	2.6
Bldg1854_MW02	334642	2500891	0.9
Bldg1854_MW03	334667	2500826	2.9
Bldg1854_MW05	334784	2500969	8.3
Bldg1854_MW06	334681	2500965	2.6
Bldg1854_MW07	334692	2500856	missing
Bldg1854_MW08	334659	2501165	0.5
Bldg1880_MW01	335334	2499167	missing
Bldg1880_MW02	335354	2499123	missing
Bldg1880_MW03	335328	2499165	missing
Bldg1880_MW04	335349	2499333	missing
Bldg1880_MW05	335344	2499327	missing
Bldg1880_MW06	335286	2499202	missing
Bldg1880_MW07	335336	2499239	missing
Bldg1880_TW08	335430	2499295	18.3
BldgFC102_MW01 (March 1993)	333444	2503463	missing
BldgFC102_MW02 (March 1993)	333494	2503444	missing
BldgFC102_MW03 (March 1993)	333490	2503479	missing
BldgFC201E_E01	333362	2504283	missing
BldgFC201E_E02	333346	2504294	missing
BldgFC201E_E03	333340	2504280	missing
BldgFC201E_MW04	333321	2504238	missing
BldgFC201E_MW05	333306	2504366	missing
BldgFC201E_MW06	333367	2504322	missing
BldgFC201E_MW07	333411	2504321	missing
BldgFC201E_MW08	333406	2504266	missing
BldgFC201E_MW09	333413	2504206	missing
BldgFC201E_MW11	333574	2504263	missing
BldgFC201E_MW12	333549	2504390	missing
BldgFC201E_MW13	333406	2504482	missing
BldgFC201E_MW14	333201	2504297	missing
BldgFC201E_MW15	333275	2504170	missing
BldgFC201E_MW16	333448	2504132	missing
BldgFC201E_PW01	333374	2504284	missing
BldgFC251_MW01 (1994)	332552	2504401	missing
BldgFC251_MW01 (1995)	332319	2504263	missing
BldgFC251_MW02 (1994)	332509	2504382	missing
BldgFC251_MW02 (1995)	332610	2504385	missing
BldgFC251_MW03 (1994)	332540	2504365	missing
BldgFC251_MW03 (1995)	332428	2504557	missing
BldgFC251_MW04	332711	2504348	missing
BldgFC251_MW05	332473	2504236	missing

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
BldgFC251_MW06	332312	2504275	missing
BldgFC251_MW07	332541	2504350	missing
BldgFC251_MW08	332529	2504359	missing
BldgFC263_MW01	332081	2504450	missing
BldgFC263_MW02	332010	2504811	missing
BldgFC263_MW03	331892	2504581	missing
BldgFC263_MW04	332117	2504737	missing
BldgFC263_MW05	331786	2504800	missing
BldgFC263_MW07	331841	2504506	7.4
BldgFC263_MW08	332002	2504462	6.1
BldgFC263_MW09	332015	2504334	missing
BldgFC263_MW10	331901	2504931	missing
BldgFC263_MW11	332006	2504753	missing
BldgFC263_MW12	331928	2504678	missing
BldgFC263_MW13	331706	2504639	–0.2
BldgFC263_MW14	332124	2504732	missing
BldgFC263_MW15	331932	2504684	missing
BldgFC263_MW16	331940	2504681	missing
BldgH19_MW04	341429	2490024	missing
BldgH19_MW11	341301	2490071	4.4
BldgH19_MW13	341385	2490037	2.4
BldgH30_MW01	341377	2491946	–1.2
BldgH30_MW02	341366	2491926	–0.3
BldgH30_MW03	341399	2491927	–3.0
BldgH30_MW05	341373	2491944	–2.8
BldgH30_MW06	341426	2491897	–2.3
BldgH30_MW07	341400	2491884	–5.6
BldgH30_MW08	341431	2491898	–4.9
BldgH30_MW09	341434	2491922	–3.5
BldgH30_MW10	341436	2491950	–2.4
BldgH30_MW11	341421	2491975	–3.3
BldgH30_PW04	341406	2491927	–3.7
BldgHP100_PZ01	340621	2494486	8.8
BldgHP100_PZ02	340628	2494505	10.1
BldgHP100_PZ03	340634	2494524	8.9
BldgHP250_MW01	338414	2494164	15.2
BldgPP3332_TW01	344011	2490780	4.3
BldgPP3340_TW01	344078	2491071	3.5
BldgPP3354_TW01	344390	2490701	2.7
BldgPT5_MW07	342275	2499130	6.1
BldgPT5_MW08	342233	2499388	6.5
BldgPT5_MW09	342317	2499204	5.5
BldgPT5_MW12	3422250	2499304	6.3
BldgPT5_MW13	342354	2499285	missing
BldgPT5_MW14	342288	2499241	missing
BldgPT5_MW15	342181	2499046	missing
BldgPT5_MW16	342238	2499230	6.3
BldgPT5_MW17	342220	2499186	7.3
BldgPT37_MW01	343290	2497150	undefined
BldgS1856_MW04	335777	2499501	10.9
BldgS1856_MW05	335772	2499562	10.4
BldgS1856_MW06	335746	2499539	12.2
BldgS1856_MW07	335753	2499626	10.5
BldgS1856_MW08	335705	2499580	11.8
BldgS1856_MW09	335713	2499668	11.6
BldgS1856_MW10	335684	2499625	11.7
G-BP08	345989	2504914	undefined/ missing
G-BP09	346651	2505516	undefined/ missing
G-MW01	347001	2504808	undefined/ missing
G-MW02	345631	2503937	undefined/ missing
G-MW03	347850	2504348	undefined/ missing
G-MW05	347274	2506033	undefined/ missing
G-MW06	346261	2505757	20.4
G-MW09	346832	2503699	undefined/ missing
HP-557	Redacted	Redacted	undefined
HP-584	Redacted	Redacted	undefined
HP-585	Redacted	Redacted	–22
HP-595	Redacted	Redacted	undefined
HP-596	Redacted	Redacted	–26
HP-607 (new)	Redacted	Redacted	23
HP-611 (old)	350816	2495437	undefined
HP-611 (new)	Redacted	Redacted	undefined
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
HP-614 (new)	Redacted	Redacted	undefined/ missing
HP-619 (new)	Redacted	Redacted	undefined/ missing
HP-621 (new)	Redacted	Redacted	undefined
HP-623	350823	2495593	undefined
HP-627 (new)	Redacted	Redacted	undefined
HP-628	331932	2508385	missing
HP-637	342990	2501856	17
HP-638	333067	2502563	undefined/ missing
HP-640	Redacted	Redacted	–8
HP-641	Redacted	Redacted	undefined
HP-647	Redacted	Redacted	undefined
HP-649	354860	2508630	26
HP-650	Redacted	Redacted	31
HP-651	348083	2503829	undefined/ missing
HP-652	Redacted	Redacted	–2
HP-655	332690	2505472	missing
HP-660	339652	2499482	undefined/ missing
HP-661	Redacted	Redacted	–13
HP-662	Redacted	Redacted	–16
HP-663	Redacted	Redacted	17
HP-708	Redacted	Redacted	10
HP-709	Redacted	Redacted	20
HP-710	Redacted	Redacted	missing
HP-711	Redacted	Redacted	26
HPFF_MW01	340257	2501610	undefined
HPFF_MW02	340199	2501767	undefined
HPFF_MW03	340020	2502168	missing
HPFF_MW04	339386	2501999	missing
HPFF_MW05	339612	2501160	missing
HPFF_MW06	339891	2502015	missing
HPFF_MW07	340211	2501550	missing
HPFF_MW08	339789	2501730	20.0
HPFF_MW09	339614	2501162	13.2
HPFF_MW10	339828	2501690	undefined
HPFF_MW11	339809	2501708	17.1
HPFF_MW12	339867	2501359	15.7
HPFF_MW13	340106	2500518	16.1
HPFF_MW14	339850	2501344	undefined
HPFF_MW15	339659	2501560	undefined
HPFF_MW16	340056	2500995	undefined
HPFF_MW17	339858	2501207	undefined
HPFF_MW18	339779	2500856	undefined
HPFF_MW20	339934	2502088	undefined
HPFF_MW21	340069	2501314	undefined
HPFF_MW22	340042	2501490	undefined
HPFF_MW23	339929	2501093	14.1
HPFF_MW24	339901	2501117	missing
HPFF_MW25	339823	2501146	18.9
HPFF_MW26	339647	2501002	missing
HPFF_MW27	340011	2500932	20.5
HPFF_MW28	339720	2501282	undefined
HPFF_MW29	339656	2501478	undefined
HPFF_MW35	339385	2500872	missing
HPFF_MW37	339386	2500484	15.8
HPFF_MW38	339662	2502012	18.9
HPFF_MW39	340219	2500180	16.2
HPFF_MW43	339657	2499441	13.6
HPFF_MW44	339663	2499432	13.6
HPFF_MW45	340193	2500149	undefined
HPFF_MW46	340216	2500150	16.2
HPFF_MW47	340208	2500129	15.5
HPFF_MW48	340727	2500616	undefined
HPFF_MW49	340709	2500603	undefined
HPFF_MW50	340730	2500598	undefined
HPFF_MW51	340629	2500855	undefined
HPFF_MW52	340580	2501196	19.0
HPFF_MW53	340585	2501197	18.9
HPFF_MW54	340581	2501190	undefined
HPFF_MW55	340583	2501202	19.0
HPFF_MW56	340102	2500510	17.9
HPFF_MW57	339369	2500476	undefined
HPFF_MW58	339890	2500999	undefined
HPFF_MW59	340220	2501522	undefined
HPFF_MW60	339869	2501342	missing
HPFF_MW61	339887	2501360	undefined
HPFF_MW62	339476	2501269	14.4

Table B10. Altitude at the top of the Brewster Boulevard upper confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
HPFF_MW63	339021	2500874	undefined
HPFF_MW64	339668	2501566	19.6
HPFF_MW65	339743	2501580	undefined
HPFF_MW66	339379	2501437	8.5
HPFF_MW67	339384	2501436	undefined
HPFF_MW68	339441	2501492	missing
HPFF_MW69	339650	2501863	undefined
HPFF_MW70	339398	2501988	undefined
HPFF_MW71	339389	2501979	undefined
HPFF_MW72	339378	2501447	12.0
HPFF_MW74	340383	2499681	14.4
HPFF_MW75	339802	2501429	missing
HPFF_MW76	339379	2499879	5.2
HPFF_MW77	338886	2501330	missing
T-1	355030	2507870	22
T-2	340590	2503410	15
T-3	347040	2503650	18
T-4	345730	2503610	13
T-5	343450	2503360	4
T-6	344770	2505310	8
T-7	349685	2500628	16
T-8	328600	2499550	–4
T-22	307804	2515050	–41
TanksS889&S891_MW01	350341	2501011	14.5
TanksS889&S891_MW02	350209	2501001	undefined
TanksS889&S891_MW03	350282	2501097	undefined
TanksS889&S891_MW04	350110	2501069	undefined
TanksS889&S891_MW05	350022	2501033	undefined
TanksS889&S891_MW06	350070	2501178	10.5
TanksS889&S891_MW07	349988	2501137	undefined
X24S2X	346842	2495677	undefined

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #206, #216, #258, #273, #331, #345, #417, #1272, #1505, #1524, #1700, #1747, #1977, #2032, #2304, #3061, #3188

Leaking Underground Storage Tank Program files #36, #45, #49, #63, #64, #78, #79, #86, #99, #130, #139, #156, #163, #187, #195, #200, #208, #227, #230, #261, #263, #276, #368, #370, #374, #377, #390, #408, #410, #418, #450, #456, #457, #528, #532, #539, #543, #548, #672, #676, #693, #715, #716, #724, #747, #750, #755, #756, #758, #761, #Soil_Contamination_Report_Bldg_820_6-05[1]

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

ATEC Environmental Consultants, Inc. 1992ac

Baker Environmental, Inc. 1993de, 1995ac, 1996aef, 1998bcd, 2001b

Catlin Engineers and Scientists 1998b, 1999a, 2000, 2002adef, 2003c

Dewberry and Davis 1992

Duke Engineering and Services, Inc. 1998

Environmental Science and Engineering, Inc. 1988, 1992

Geophex, Ltd. 2002

Groundwater Technology Government Services, Inc. 1993cd

Haliburton NUS 1992a

Law Engineering, Inc. 1994b, 1995ab, 1996b

Law Engineering and Environmental Services, Inc. 1996cde, 1997bce, 1998a, 2000abc, 2002ab

O'Brien and Gere Engineers, Inc. 1988, 1992a

OHM Remediation Services Corp. 2000, 2001b, 2002a

R.E. Wright Associates, Inc. 1994cdgi

R.E. Wright Environmental, Inc. 1995abd

Richard Catlin and Associates, Inc. 1995cd, 1996bde, 1997ab, 1998b, 2001

Shaw Environmental, Inc. 2005

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
01-GW08	332716	2501579	undefined
01-GW09	333130	2501612	–2.1
01-GW10	333867	2502095	undefined
01-GW11	334163	2502775	undefined
01-GW13	332899	2503901	5.3
01-GW14	334048	2503302	undefined
01-GW16	332660	2501994	undefined
01-GW16DW	332642	2501970	undefined
01-GW17	333651	2502776	undefined
01-GW17DW	333674	2502775	–0.9
02-GW03D	356275	2498552	33.1
02-GW12D	356325	2498488	31.5
03-MW02DW	352801	2500072	8.2
03-MW02IW	352813	2500068	9.5
03-MW04	352927	2499859	undefined
03-MW05	352639	2499963	undefined
03-MW11	352531	2499898	undefined
03-MW11IW	352544	2499897	undefined
03-MW12	353025	2499695	13.2
06-GW01	348127	2503343	undefined
06-GW01D	348137	2503363	7.8
06-GW01DA	348320	2503384	13.7
06-GW02	347214	2503751	undefined
06-GW02D	347220	2503760	8.1
06-GW03	347739	2502666	undefined
06-GW03D	347811	2504501	8.2
06-GW04	346437	2502778	undefined
06-GW05	346233	2502452	undefined
06-GW06	345360	2502750	undefined
06-GW07	344414	2502106	undefined
06-GW07D	344336	2502082	undefined
06-GW08	344392	2502799	undefined
06-GW09	343675	2502352	16.6
06-GW10	343645	2502726	15.9
06-GW11	347504	2502329	undefined
06-GW14	344589	2502928	undefined
06-GW15	347784	2503211	13.0
06-GW15D	347767	2503174	undefined
06-GW16	346496	2502546	undefined
06-GW19	346289	2503020	undefined
06-GW20	346519	2502192	undefined
06-GW21	346816	2501743	undefined
06-GW22	345993	2502502	undefined
06-GW23	346993	2502738	undefined
06-GW25	346792	2503435	undefined
06-GW26	347656	2501883	undefined
06-GW27D	348316	2502449	1.5
06-GW28D	348677	2502849	undefined
06-GW28S	348623	2502900	undefined
06-GW30	349553	2503728	4.9
06-GW30D	349532	2503730	9.9
06-GW31	347162	2502005	undefined
06-GW32	348840	2502690	undefined
06-GW33	348457	2503167	undefined
06-GW34	348434	2503483	undefined
06-GW35D	349394	2501254	5.0
06-GW36D	350271	2502282	undefined
06-GW37D	348037	2501703	undefined
06-GW43DW	347960	2501527	8.9
09-GW06	343041	2502726	10.2
09-GW07D	343333	2502729	undefined
09-GW07S	343321	2502750	undefined
22-MW09	339154	2501436	12.8
22-MW11	340014	2501237	undefined
22-MW12	340158	2501386	6.4
22-MW13	340281	2501716	undefined
22-MW14	339578	2501217	undefined
22-MW15	339367	2501442	undefined
22-MW16	339951	2501560	7.4
22-MW17	339717	2501638	undefined
22-MW18	339635	2501874	undefined
22-MW19	339838	2502137	undefined
22-MW20	340181	2501167	undefined
28-GW01	331849	2498323	–8.2
28-GW01DW	331870	2498323	undefined
28-GW05	331719	2499911	–1.4
28-GW06	332194	2498094	1.2
28-GW07	331751	2499119	undefined
28-GW07DW	331745	2499147	undefined
28-GW08	332239	2499096	undefined

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
28-GW09DW	332857	2498262	undefined
74-GW06	353337	2501567	undefined
74-GW08	352836	2502538	undefined
78-642-1	339211	2504048	1
78-642-2	338741	2504161	undefined
78Bldg902_P-1	341270	2502816	5.1
78Bldg902_P-2	341240	2502892	undefined
78Bldg902_RW-1	341293	2502855	undefined
78-GW01	337222	2499145	6.6
78-GW02	337018	2499576	9.5
78-GW03	336765	2499494	9.9
78-GW05	338211	2499027	6.0
78-GW07	338538	2499392	undefined
78-GW08	338709	2499778	6.6
78-GW09-1	337998	2499701	undefined
78-GW09-2	337995	2499690	undefined
78-GW09-3	337995	2499836	undefined
78-GW10	338309	2500046	7.0
78-GW11	337865	2500178	undefined
78-GW12	338457	2500632	undefined
78-GW13	339567	2499458	9.6
78-GW14	339391	2499956	6.1
78-GW15	339109	2500535	undefined
78-GW16	339006	2501332	6.2
78-GW17-1	339371	2500975	undefined
78-GW17-2	339198	2501229	undefined
78-GW17-3	339236	2501288	4
78-GW18	339766	2500665	undefined
78-GW20	340704	2500752	3.8
78-GW21	339539	2502400	12.4
78-GW22	340395	2502740	undefined
78-GW23	340686	2502468	undefined
78-GW24-1	341181	2502845	undefined
78-GW24-2	341169	2502808	undefined
78-GW24-3	341153	2502785	undefined
78-GW25	340951	2503205	11.4
78-GW26	342950	2501860	8.6
78-GW29	335465	2499141	undefined
78-GW32-3	339474	2501278	15
78-GW40	340651	2502400	10.3
78-GW41	340991	2502751	undefined
78-GW42	337497	2499302	10.0
80-MW01	356371	2485201	15.7
80-MW02	356456	2485245	17.2
80-MW08	356233	2484893	15.0
82-MW01	348523	2502130	6.1
82-MW02	349073	2503529	3.7
82-MW03	348220	2502375	undefined
84-MW15 (Baker)	361296	2495541	21.8
84-MW16 (Baker	361519	2495466	20.1
84-MW17 (Baker)	361448	2495309	16.5
84-MW18 (Baker)	361204	2495590	22.8
84-MW19 (Baker)	361296	2495251	18.3
84-MW20 (Baker)	361584	2495131	8.6
84-MW21 (Baker)	361258	2495406	21.4
84-MW22 (Baker)	361414	2495374	19.9
84-MW23 (Baker)	361951	2494960	5.3
88-MW02DW	339364	2496466	–1.4
88-MW03DW	339508	2496540	6.3
88-MW04DW	339090	2496474	7.0
88-MW05DW	339601	2496397	1.7
88-MW06IW	339340	2496286	undefined
88-MW07IW	339945	2496042	–13.8
88-MW08IW	339572	2495868	undefined
88-MW09IW	339080	2496132	undefined
88-TW04IW	339352	2496459	–4.5
88-TW05IW	339228	2496433	undefined
88-TW08IW	339541	2496376	–6.3
88-TW19IW	339577	2495861	undefined
88-TW20IW	339130	2496170	1.0
88-TW21IW	339325	2496100	1.8
88-TW22IW	339596	2496140	missing
88-TW23IW	339760	2496365	8.0
88-TW24IW	339820	2496110	undefined
88-TW25IW	340078	2496390	1.7
88-TW26IW	339700	2496690	9.2
88-TW27IW	339576	2495960	undefined
88-TW28IW	339700	2496000	undefined
BA-145	307550	2515500	–61
Bldg21_DW01	332689	2498546	–13.6

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg21_DW02	332686	2498564	–8.9
Bldg21_DW03	332644	2498579	–12.9
Bldg21_DW04	332600	2498520	–11.1
Bldg21_RW01	332659	2498573	–13.2
Bldg24_MW01	341481	2493819	–0.6
Bldg30_TMW11	341150	2492453	17.1
Bldg33_MW01	359184	2497668	27.5
Bldg33_MW02	359166	2497669	27.7
Bldg33_MW03	359160	2497651	24.8
Bldg33_MW04	359188	2497697	26.5
Bldg33_MW05	359194	2497631	26.0
Bldg33_MW06	359273	2497742	26.2
Bldg33_MW07	359256	2497618	23.0
Bldg33_MW08	359327	2497618	26.0
Bldg33_MW09	359322	2497612	26.3
Bldg33_MW10	359188	2497704	25.5
Bldg33_MW11	359234	2497649	27.7
Bldg45_MW01 (ATEC)	361246	2495574	24.0
Bldg45_MW02 (ATEC)	361260	2495563	23.1
Bldg45_MW03 (ATEC)	361269	2495590	20.8
Bldg45_MW04 (Law)	361145	2495545	24.6
Bldg45_MW05 (Law)	361406	2495558	19.5
Bldg45_MW06 (Law)	361360	2495631	20.5
Bldg45_MW07 (Law)	361308	2495583	19.8
Bldg45_MW08 (Law)	361356	2495636	20.5
Bldg45_MW09 (Law)	361312	2495579	20.1
Bldg45_MW10 (Law)	361308	2495552	21.3
Bldg45_PW01 (Law)	361295	2495567	19.9
Bldg45_MW01 (Wright)	361298	2495380	12.4
Bldg45_MW02 (Wright)	361281	2495372	16.2
Bldg45_MW03 (Wright)	361294	2495483	18.1
Bldg45_MW04 (Wright)	361339	2495184	16.2
Bldg45_MW05 (Wright)	361313	2495287	19.1
Bldg311_MW01	336170	2496433	6.0
Bldg331_MW01	335906	2496507	1.9
Bldg331_MW02	335956	2496560	3.6
Bldg331_MW03	335995	2496595	1.7
Bldg331_MW04	336012	2496628	2.3
Bldg331_MW05	336065	2496646	8.0
Bldg331_MW06	336049	2496609	6.3
Bldg331_MW07	336093	2496580	9.3
Bldg331_MW08	335988	2496442	undefined
Bldg331_MW09	336038	2496514	3.7
Bldg331_MW10	336064	2496542	3.6
Bldg331_MW11	335960	2496474	3.0
Bldg331_MW12	335968	2496619	5.5
Bldg331_MW13	336060	2496650	3.7
Bldg331_MW14	335991	2496590	6.6
Bldg331_MW15	335911	2496513	2.3
Bldg331_PW16	336065	2496598	6.1
Bldg645_DP01	356410	2497084	27.3
Bldg645_DP02	356221	2496992	27.1
Bldg645_DP03	356130	2497027	28.2
Bldg645_DP04	356198	2497078	27.6
Bldg645_DP05	356109	2497154	29.3
Bldg645_MW01	356452	2497349	26.5
Bldg645_MW02	356436	2497363	27.2
Bldg645_MW03	356458	2497372	27.5
Bldg645_MW04	356535	2497267	23.0
Bldg645_MW05	356621	2497448	27.8
Bldg645_MW06	356462	2497593	30.3
Bldg645_MW07	356192	2497267	28.4
Bldg645_MW08	356542	2497397	25.7
Bldg645_MW09	346464	2497375	28.2
Bldg645_MW10	356193	2497271	28.5
Bldg645_MW11	356536	2497400	27.8
Bldg645_MW12	356469	2497374	28.3
Bldg645_MW13	356534	2497400	27.9

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg645_MW14	356192	2497263	28.7
Bldg645_MW15	356445	2497372	27.3
Bldg645_MW16	356255	2497229	28.7
Bldg645_MW17	356418	2497205	28.0
Bldg645_MW18	356462	2497584	28.7
Bldg645_MW21	356530	2497270	23.2
Bldg645_MW22	356450	2497412	29.0
Bldg645_MW23	356453	2497413	28.8
Bldg645_MW24	356418	2497260	26.0
Bldg645_MW25	356405	2497348	26.2
Bldg645_MW26	356309	2497438	27.8
Bldg645_MW27	356328	2497664	31.1
Bldg645_MW28	356538	2497414	28.2
Bldg645_MW29	356533	2497577	27.2
Bldg645_MW30	356479	2497692	30.1
Bldg645_MW31	356470	2497589	29.7
Bldg645_MW32	356213	2497539	30.3
Bldg645_MW35	356308	2497433	27.6
Bldg645_MW36	356622	2497721	22.8
Bldg645_MW37	356262	2497758	31.9
Bldg728_ MW01D,S	341354	2492589	2.3
Bldg728_ MW02D,S	341281	2492570	3.4
Bldg728_ MW03D,S	341220	2492496	3.1
Bldg728_ MW04D,S	341255	2492533	2.8
Bldg728_ MW05D,S	341202	2492591	undefined
Bldg728_ MW06D,S	341326	2492497	4.8
Bldg728_ MW07D,S	341385	2492506	undefined
Bldg820_MW02	349804	2494711	undefined
Bldg820_MW03	349773	2494676	10.6
Bldg820_MW04	349794	2494639	undefined
Bldg820_MW05	349848	2494580	undefined
Bldg820_MW06	349724	2494733	20.2
Bldg820_MW07	349549	2494901	16.1
Bldg820_MW08	349545	2494901	17.2
Bldg820_MW09	349798	2494713	undefined
Bldg820_MW09D	349790	2494709	undefined
Bldg820_MW10	349615	2494623	16.6
Bldg820_MW11	349886	2494705	18.1
Bldg820_MW12	349729	2494666	undefined
Bldg820_MW13	349724	2494778	undefined
Bldg820_MW14	349894	2494889	undefined
Bldg820_MW15	350068	2494638	undefined
Bldg820_MW16	349785	2494489	11.5
Bldg820_MW17	349785	2494495	20.6
Bldg820_MW18	349626	2494497	undefined
Bldg820_MW19	349622	2494493	undefined
Bldg820_MW20	349434	2494602	undefined
Bldg820_MW21	349431	2494608	undefined
Bldg820_MW22	349326	2494768	undefined
Bldg820_MW23	349320	2494766	16.4
Bldg820_MW24	349311	2494966	14.4
Bldg820_MW25	349307	2494961	undefined
Bldg820_MW26	349754	2494849	12.7
Bldg820_MW28	349989	2494414	undefined
Bldg820_MW29	349872	2494841	13.4
Bldg820_MW30	350142	2494819	undefined
Bldg820_MW31	350163	2494600	20.1
Bldg820_MW32	350090	2494399	19.7
Bldg820_MW33	349872	2494365	19.2
Bldg820_MW34	349929	2494460	19.0
Bldg820_PW01	349750	2494725	undefined
Bldg900_MW01	340573	2502732	12.5
Bldg1115_MW01	339765	2500525	10.2
Bldg1115_MW02	339872	2500370	10.2
Bldg1115_MW03	339713	2500787	10.7
Bldg1115_MW05	340058	2500823	11.1
Bldg1115_MW06	340097	2500518	10.8
Bldg1115_MW07	339897	2501006	10.8
Bldg1115_MW09	340432	2500868	8.5
Bldg1115_MW10	340074	2500690	10.6
Bldg1115_MW11	340000	2500606	8.6
Bldg1115_MW12	340172	2500846	14.6
Bldg1115_MW13	340077	2500689	13.1
Bldg1115_MW14	340002	2500600	14.6
Bldg1115_MW15	340176	2500843	13.1

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg1115_MW16	340128	2500697	9.9
Bldg1115_MW17	340247	2500467	undefined
Bldg1115_MW18	340143	2501041	8.2
Bldg1115_MW19	339902	2501013	11.4
Bldg1115_MW20	339715	2500794	12.6
Bldg1115_MW21	339867	2500374	10.0
Bldg1115_MW22	340244	2500473	6.1
Bldg1115_MW23	340138	2501039	14.5
Bldg1115_MW24	339864	2500373	9.5
Bldg1115_MW25	340077	2500691	11.8
Bldg1450_MW01	337070	2501301	undefined
Bldg1450_MW02	337128	2501307	undefined
Bldg1450_MW03	337131	2501303	undefined
Bldg1450_MW04	337086	2501243	undefined
Bldg1450_MW05	337009	2501298	11.9
Bldg1450_MW06	337060	2501360	undefined
Bldg1613_AS11	338545	2498958	1.2
Bldg1613_AS14	338632	2498859	undefined
Bldg1613_MW01	338784	2498912	5.9
Bldg1613_MW02	338741	2499189	undefined
Bldg1613_MW03	338527	2499193	10.9
Bldg1613_MW04	338469	2498825	9.3
Bldg1613_MW06	338725	2498789	undefined
Bldg1613_MW07	338880	2499335	undefined
Bldg1613_MW10	338636	2499029	undefined
Bldg1613_MW11	338558	2498839	5.1
Bldg1613_MW13	338878	2499321	4.8
Bldg1613_MW14	338641	2499026	undefined
Bldg1613_MW15	338350	2498652	6.0
Bldg1613_MW16	338641	2499026	undefined
Bldg1804_DMW13	335657	2499674	3.3
Bldg1854_DP13	334685	2501050	8.4
Bldg1854_DP14	334707	2501166	9.5
Bldg1854_DP15	334841	2501108	9.7
Bldg1854_MW02	334642	2500891	–2.6
Bldg1854_MW06	334681	2500965	–7.4
Bldg1854_MW07	334692	2500856	undefined
Bldg1854_MW08	334659	2501165	–2.0
Bldg1880_MW01	335334	2499167	undefined
Bldg1880_MW02	335354	2499123	undefined
Bldg1880_MW03	335328	2499165	undefined
Bldg1880_MW04	335349	2499333	undefined
Bldg1880_MW05	335344	2499327	undefined
Bldg1880_MW06	335286	2499202	undefined
Bldg1880_MW07	335336	2499239	undefined
Bldg1880_TW08	335430	2499295	8.3
Bldg1919_MW01	345830	2490240	12.8
Bldg1919_MW02	345835	2490258	12.9
Bldg1919_MW03	345830	2490249	12.8
Bldg1932_MW01	356041	2485062	13.8
Bldg1932_MW02	356036	2485035	16.0
Bldg1932_MW03	356058	2485041	15.6
BldgFC201E_E01	333362	2504283	undefined
BldgFC201E_E02	333346	2504294	undefined
BldgFC201E_E03	333340	2504280	undefined
BldgFC201E_MW10	333405	2504271	undefined
BldgFC201E_PW01	333374	2504284	undefined
BldgFC251_MW06	332312	2504275	undefined
BldgFC251_MW07	332541	2504350	undefined
BldgFC251_MW08	332529	2504359	undefined
BldgFC263_MW07	331841	2504506	2.4
BldgFC263_MW08	332002	2504462	1.1
BldgFC263_MW13	331706	2504639	–5.2
BldgFC263_MW14	332124	2504732	undefined
BldgH19_MW11	341301	2490071	–2.5
BldgH19_MW13	341385	2490037	–2.1
BldgH30_MW05	341373	2491944	undefined
BldgH30_MW06	341426	2491897	undefined
BldgH30_MW12	341382	2491928	1.1
BldgHP100_PZ01	340621	2494486	3.8
BldgHP100_PZ02	340628	2494505	7.1
BldgHP100_PZ03	340634	2494524	7.9
BldgLCH4015_MW01	359418	2498763	32.8
BldgLCH4015_MW02	359406	2498671	31.6
BldgLCH4015_MW03	359316	2498658	31.2
BldgLCH4015_MW04	359298	2498767	33.4

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
BldgLCH4015_MW05	359470	2498579	33.1
BldgLCH4015_MW06	359579	2498605	31.7
BldgLCH4015_MW07	359549	2498885	32.1
BldgLCH4015_MW11	359683	2498682	31.5
BldgLCH4015_MW12	359763	2498768	32.1
BldgLCH4015_MW13	359756	2498774	32.2
BldgLCH4015_MW14	359689	2498847	31.8
BldgLCH4015_MW15	359622	2498955	31.7
BldgLCH4015_MW16	359441	2498871	33.1
BldgLCH4015_MW17	359374	2498810	32.3
BldgLCH4015_MW18	359524	2498761	32.5
BldgLCH4015_MW19	359521	2498765	32.4
BldgLCH4015_MW20	359411	2498673	31.9
BldgLCH4022_MW01	359847	2498526	31.8
BldgLCH4022_MW02	359827	2498510	31.9
BldgLCH4022_MW03	359824	2498525	31.7
BldgLCH4022_MW04	359825	2498706	29.2
BldgLCH4022_MW05	359833	2498371	27.2
BldgLCH4022_MW06	359726	2498559	29.2
BldgLCH4022_MW07	359984	2498557	27.9
BldgLCH4022_MW08	359922	2498488	28.6
BldgLCH4022_MW09	359925	2498599	29.5
BldgLCH4022_MW10	359799	2498612	29.9
BldgLCH4022_MW11	359866	2498460	26.5
BldgLCH4022_MW12	359874	2498506	29.4
BldgLCH4022_MW13	359949	2498544	28.8
BldgLCH4022_MW14	359920	2498533	29.7
BldgLCH4022_MW15	359795	2498485	29.6
BldgLCH4022_MW16	359917	2498537	31.7
BldgLCH4022_MW17	359824	2498514	31.3
BldgLCH4022_MW18	359798	2498481	31.6
BldgLCH4022_MW19	359849	2498517	30.2
BldgNH100_MW01	358424	2493669	22.8
BldgNH100_MW02	358461	2493712	22.9
BldgNH100_MW03	358408	2493727	24.6
BldgNH118_MW01	358124	2494384	17.0
BldgPT5_MW13	342354	2499285	undefined
BldgPT5_MW14	342288	2499241	undefined
BldgPT5_MW15	342181	2499046	undefined
BldgPT5_MW16	342238	2499230	1.8
BldgS2633_MW01	351494	2487697	5.0
BldgS2633_MW04	351528	2487724	5.7
BldgS2633_MW05	351483	2487671	3.4
BldgS2633_MW06DW	351498	2487694	4.8
BldgS2633_PZ01	351483	2487712	5.7
BldgS2633_PZ02	351482	2487699	2.9
BldgS2633_PZ03	351502	2487689	6.5
BldgS2633_PZ04	351517	2487688	6.4
BldgSLCH4019_MW01	360087	2498990	31.9
BldgSLCH4019_MW02	360107	2498984	31.8
BldgSLCH4019_MW03	360111	2499009	31.9

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
BldgSLCH4019_MW04	360151	2499082	31.0
BldgSLCH4019_MW05	360040	2498817	32.1
BldgSLCH4019_MW06	359958	2498865	32.9
BldgSLCH4019_MW07	360037	2498994	31.8
BldgSLCH4019_MW08	360166	2498907	31.6
BldgSLCH4019_MW09	360144	2499093	31.0
BldgSLCH4019_MW10	360034	2498812	32.0
G-BP08	345989	2504914	undefined
G-BP09	346651	2505516	undefined
G-MW01	347001	2504808	undefined
G-MW02	345631	2503937	undefined
G-MW03	347850	2504348	undefined
G-MW05	347274	2506033	undefined
G-MW06	346261	2505757	16.4
G-MW09	346832	2503699	undefined
HP-37	341418	2489651	9
HP-557	Redacted	Redacted	undefined
HP-584	Redacted	Redacted	26
HP-585	Redacted	Redacted	–50
HP-595	Redacted	Redacted	undefined
HP-596	Redacted	Redacted	–41
HP-607 (new)	Redacted	Redacted	undefined
HP-611 (old)	350816	2495437	undefined
HP-611 (new)	Redacted	Redacted	undefined
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	undefined
HP-616	354772	2498638	33.3
HP-619 (new)	Redacted	Redacted	undefined
HP-621 (old)	355383	2504816	40.8
HP-621 (new)	Redacted	Redacted	undefined
HP-622	Redacted	Redacted	31.1
HP-623	350823	2495593	undefined
HP-627 (new)	Redacted	Redacted	undefined
HP-628 (new)	331932	2508385	undefined
HP-629 (new)	355226	2504808	41.2
HP-637	342990	2501856	8
HP-638	333067	2502563	undefined
HP-640	Redacted	Redacted	–30
HP-641	Redacted	Redacted	undefined
HP-643	356093	2494391	29.0
HP-645	356438	2497358	27.4
HP-646	Redacted	Redacted	29.5
HP-647	Redacted	Redacted	30.3
HP-648	Redacted	Redacted	undefined
HP-649	354769	2508707	12
HP-650	Redacted	Redacted	21
HP-651	348083	2503829	undefined
HP-652	Redacted	Redacted	–11
HP-655	332690	2505472	–15
HP-660	339652	2499482	undefined
HP-661	Redacted	Redacted	–22
HP-662	Redacted	Redacted	–25
HP-663	Redacted	Redacted	6
HP-698	Redacted	Redacted	23
HP-699	Redacted	Redacted	23
HP-700	355278	2488526	23
HP-701	Redacted	Redacted	undefined
HP-703	Redacted	Redacted	29.5
HP-704	Redacted	Redacted	undefined
HP-705	Redacted	Redacted	undefined
HP-708	Redacted	Redacted	0
HP-709	Redacted	Redacted	10
HP-710	Redacted	Redacted	undefined
HP-711	Redacted	Redacted	15
HPFF_MW01	340257	2501610	13.5
HPFF_MW02	340199	2501767	14.5
HPFF_MW03	340020	2502168	13.8
HPFF_MW04	339386	2501999	undefined
HPFF_MW05	339612	2501160	16.4
HPFF_MW06	339891	2502015	undefined
HPFF_MW07	340211	2501550	undefined

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
HPFF_MW08	339789	2501730	15.0
HPFF_MW09	339614	2501162	8.2
HPFF_MW10	339828	2501690	undefined
HPFF_MW11	339809	2501708	9.1
HPFF_MW12	339867	2501359	6.7
HPFF_MW13	340106	2500518	11.1
HPFF_MW16	340056	2500995	12.2
HPFF_MW43	339657	2499441	8.6
HPFF_MW44	339663	2499432	8.6
HPFF_MW45	340193	2500149	9.0
HPFF_MW46	340216	2500150	9.1
HPFF_MW47	340208	2500129	8.5
HPFF_MW48	340727	2500616	undefined
HPFF_MW49	340709	2500603	9.9
HPFF_MW50	340730	2500598	undefined
HPFF_MW51	340629	2500855	undefined
HPFF_MW52	340580	2501196	7.0
HPFF_MW53	340585	2501197	6.9
HPFF_MW54	340581	2501190	undefined
HPFF_MW55	340583	2501202	7.0
HPFF_MW56	340102	2500510	12.9
HPFF_MW57	339369	2500476	undefined
HPFF_MW58	339890	2500999	5.8
HPFF_MW59	340220	2501522	10.0
HPFF_MW60	339869	2501342	8.4
HPFF_MW61	339887	2501360	undefined
HPFF_MW62	339476	2501269	9.4
HPFF_MW63	339021	2500874	undefined
HPFF_MW64	339668	2501566	14.6
HPFF_MW65	339743	2501580	9.1
HPFF_MW66	339379	2501437	1.5
HPFF_MW67	339384	2501436	undefined
HPFF_MW68	339441	2501492	undefined
HPFF_MW69	339650	2501863	14.4
HPFF_MW70	339398	2501988	12.3
HPFF_MW71	339389	2501979	12.2
HPFF_MW72	339378	2501447	10.0
HPFF_MW74	340383	2499681	4.4
HPFF_MW75	339802	2501429	undefined
HPFF_MW76	339379	2499879	0.2
HPFF_MW77	338886	2501330	undefined
LCH-4009	Redacted	Redacted	undefined
ON-T2-87	353878	2487495	21.4
R Well	353534	2484804	20.4
S190A	353875	2487604	21.4
T-1	355030	2507870	12
T-2	340590	2503410	7
T-3	347040	2503650	10
T-4	345730	2503610	3
T-5	343450	2503360	–4
T-6	344770	2505310	–1
T-7	349685	2500628	2
T-8	328600	2499550	–14
T-22	307804	2515050	–61
Tank_S781_MW02	361436	2495348	17.7
Tank_S781_MW04	361430	2495235	14.9
Tank_S781_MW06	361589	2495398	16.0
Tank_S781_MW08	361717	2495105	7.1
Tank_S781_MW10	361217	2494823	10.6
Tank_S781_MW12	361168	2495225	16.3
Tank_S781_MW14	361610	2494936	5.9
TanksS889&S891_MW01	350341	2501011	4.5
TanksS889&S891_MW02	350209	2501001	3.0
TanksS889&S891_MW03	350282	2501097	4.3
TanksS889&S891_MW04	350110	2501069	undefined
TanksS889&S891_MW05	350022	2501033	undefined
TanksS889&S891_MW06	350070	2501178	0.5
TanksS889&S891_MW07	349988	2501137	undefined
X24A	364575	2499259	32.0
X24S2X	346842	2495677	undefined

Table B11. Altitude at the top of the Brewster Boulevard lower aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #90, #206, #216, #258, #269, #273, #329, #331, #345, #417, #737, #1272, #1503, #1505, #1524, #1700, #1706, #1722, #1747, #1774, #1977, #2032, #3165, #3269

Leaking Underground Storage Tank Program files #45, #59, #63, #64, #67, #76, #78, #86, #99, #139, #145, #152, #155, #156, #158, #187, #200, #230, #237, #246, #276, #345, #354, #370, #374, #377, #390, #392, #408, #410, #418, #450, #456, #457, #485, #508, #528, #532, #539, #543, #548, #672, #676, #693, #710, #715, #716, #717, #719, #728, #730, #735, #747, #750, #758, #761, #1994_REW_FiveWellSiteCheck, #2008ROF_Final, #645_Addl_SiteAssess, #Soil_Contamination_Report_Bldg_820_6-05[1]

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

ATEC Environmental Consultants, Inc. 1992ab

Baker Environmental, Inc. 1993def, 1995acd, 1996aefg, 1997b, 1998bd, 2002b

Catlin Engineers and Scientists 1998ab, 2000, 2002a, 2003bc, 2008

Dewberry and Davis 1992

Environmental Science and Engineering, Inc. 1988, 1992

Geophex, Ltd. 2002

Groundwater Technology Government Services, Inc. 1993ce

Haliburton NUS 1992abc

Law Engineering, Inc. 1994ab, 1995ab, 1996ab

Law Engineering and Environmental Services, Inc. 1996bcde, 1997bce, 1998ab 2000acde, 2002ab

O'Brien and Gere Engineers, Inc. 1988, 1992ab

OHM Remediation Services Corp. 2000, 2001b, 2002a

Osage of Virginia, 2008

R.E. Wright Associates, Inc. 1994abcdegi

R.E. Environmental, Inc. 1995c

Richard Catlin and Associates, Inc. 1995abcd, 1996abcde, 1997b, 1998b, 2001

Shaw Environmental, Inc. 2005

Versar, Inc. 1992

Table B12. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
01-GW16DW	332642	2501970	–44.2
01-GW17DW	333674	2502775	undefined
02-GW03D	356275	2498552	18.1
02-GW12D	356325	2498488	18.7
03-MW02DW	352801	2500072	undefined
03-MW02IW	352813	2500068	undefined
03-MW11	352531	2499898	0.7
03-MW11IW	352544	2499897	–1.7
06-GW01D	348137	2503363	–13.2
06-GW01DA	348320	2503384	–21.4
06-GW02D	347220	2503760	–19.9
06-GW03D	347811	2504501	undefined
06-GW07D	344336	2502082	undefined
06-GW27D	348316	2502449	undefined
06-GW28D	348677	2502849	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
06-GW37D	348037	2501703	undefined
06-GW43DW	347960	2501527	undefined
09-GW07D	343333	2502729	–23.4
28-GW01DW	331870	2498323	undefined
28-GW07DW	331745	2499147	undefined
28-GW09DW	332857	2498262	undefined
78-642-1	339211	2504048	–27
78-642-2	338741	2504161	–28
78-GW09-2	337995	2499690	undefined
78-GW09-3	337981	2499832	undefined
78-GW17-2	339200	2501228	undefined
78-GW17-3	339236	2501288	undefined
78-GW24-2	341169	2502808	undefined
78-GW24-3	341153	2502785	undefined
78-GW32-3	339474	2501278	–25
80-MW01	356371	2485201	undefined/ missing
80-MW02	356456	2485245	undefined/ missing
80-MW03IW	355988	2485152	11.4
80-MW04	356067	2484971	8.7
80-MW05	356293	2485251	13.2
80-MW06	356415	2485411	12.1
80-MW07	355886	2485254	11.2
80-MW08	356233	2484893	7.0
82-MW03	348220	2502375	undefined
84-MW16 (Baker)	361519	2495466	undefined/ missing
84-MW17 (Baker)	361448	2495309	undefined/ missing
84-MW19 (Baker)	361296	2495251	undefined/ missing
84-MW20 (Baker)	361584	2495131	undefined/ missing
84-MW21 (Baker)	361258	2495406	undefined/ missing
84-MW22 (Baker)	361414	2495374	undefined/ missing
84-MW23 (Baker)	361951	2494960	undefined
88-MW02DW	339364	2496466	–33.4
88-MW03DW	339508	2496540	undefined
88-MW04DW	339090	2496474	undefined
88-MW05DW	339601	2496397	–28.3
88-TW04IW	339352	2496459	undefined/ missing
88-TW05IW	339228	2496433	undefined
BA-145	307550	2515500	–106
Bldg33_MW01	359184	2497668	20.0
Bldg33_MW02	359166	2497669	20.2
Bldg33_MW03	359160	2497651	19.8
Bldg33_MW04	359188	2497697	16.5
Bldg33_MW05	359194	2497631	22.0
Bldg33_MW06	359273	2497742	undefined/ missing
Bldg33_MW07	359256	2497618	undefined/ missing
Bldg33_MW08	359327	2497618	undefined/ missing
Bldg33_MW09	359322	2497612	13.3
Bldg33_MW10	359188	2497704	17.5
Bldg33_MW11	359234	2497649	18.7
Bldg45_MW01 (ATEC)	361246	2495574	12.0
Bldg45_MW02 (ATEC)	361260	2495563	11.1

Table B12. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg45_MW03 (ATEC)	361269	2495590	missing
Bldg45_MW04 (Law)	361145	2495545	missing
Bldg45_MW05 (Law)	361406	2495558	5.0
Bldg45_MW06 (Law)	361360	2495631	7.0
Bldg45_MW07 (Law)	361308	2495583	11.3
Bldg45_MW08 (Law)	361356	2495636	7.0
Bldg45_MW09 (Law)	361312	2495579	11.6
Bldg45_MW10 (Law)	361308	2495552	missing
Bldg45_PW01 (Law)	361295	2495567	6.4
Bldg45_MW01 (Wright)	361298	2495380	undefined/ missing
Bldg45_MW02 (Wright)	361281	2495372	undefined/ missing
Bldg45_MW03 (Wright)	361294	2495483	undefined/ missing
Bldg45_MW04 (Wright)	361339	2495184	undefined/ missing
Bldg45_MW05 (Wright)	361313	2495287	undefined/ missing
Bldg645_DP01	356410	2497084	19.3
Bldg645_DP02	356221	2496992	20.1
Bldg645_DP03	356130	2497027	20.2
Bldg645_DP04	356198	2497078	22.1
Bldg645_DP05	356109	2497154	19.3
Bldg645_MW01	356452	2497349	16.5
Bldg645_MW02	356436	2497363	19.2
Bldg645_MW03	356458	2497372	undefined
Bldg645_MW04	356535	2497267	undefined
Bldg645_MW05	356621	2497448	17.8
Bldg645_MW06	356462	2497593	undefined
Bldg645_MW07	356192	2497267	undefined
Bldg645_MW08	356542	2497397	17.7
Bldg645_MW09	346464	2497375	20.7
Bldg645_MW10	356193	2497271	18.5
Bldg645_MW11	356536	2497400	undefined
Bldg645_MW12	356469	2497374	18.3
Bldg645_MW13	356534	2497400	undefined
Bldg645_MW14	356192	2497263	undefined
Bldg645_MW15	356445	2497372	10.3
Bldg645_MW16	356255	2497229	undefined
Bldg645_MW17	356418	2497205	undefined
Bldg645_MW18	356462	2497584	19.7
Bldg645_MW21	356530	2497270	missing
Bldg645_MW22	356450	2497412	15.0
Bldg645_MW23	356453	2497413	16.8
Bldg645_MW24	356418	2497260	18.0
Bldg645_MW25	356405	2497348	18.2
Bldg645_MW26	356309	2497438	19.8
Bldg645_MW27	356328	2497664	23.1
Bldg645_MW28	356538	2497414	19.2
Bldg645_MW29	356533	2497577	18.2
Bldg645_MW30	356479	2497692	21.1
Bldg645_MW31	356470	2497589	20.7
Bldg645_MW32	356213	2497539	17.3
Bldg645_MW35	356308	2497433	19.6
Bldg645_MW36	356622	2497721	missing
Bldg645_MW37	356262	2497758	17.9
Bldg728_MW01D,S	341354	2492589	undefined
Bldg728_MW02D,S	341281	2492570	undefined
Bldg728_MW05D,S	341202	2492591	–19.0
Bldg728_MW06D,S	341326	2492497	–13.7
Bldg728_MW07D,S	341385	2492506	–15.7
Bldg820_MW06	349724	2494733	5.2
Bldg820_MW07	349549	2494901	undefined
Bldg820_MW09	349798	2494713	4.7
Bldg820_MW12	349729	2494666	5.9
Bldg820_MW17	349785	2494495	6.8
Bldg820_MW18	349626	2494497	missing
Bldg820_MW19	349622	2494493	undefined
Bldg820_MW21	349431	2494608	undefined
Bldg820_MW23	349320	2494766	undefined
Bldg820_MW28	349989	2494414	–0.2
Bldg820_MW29	349872	2494841	–0.6
Bldg820_MW30	350142	2494819	undefined

Table B12. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg820_MW31	350163	2494600	4.2
Bldg820_MW32	350090	2494399	undefined
Bldg820_MW33	349872	2494365	undefined
Bldg820_MW34	349929	2494460	5.0
Bldg820_PW01	349750	2494725	undefined
Bldg900_MW01	340573	2502732	–18.5
Bldg1115_MW22	340244	2500473	–30.9
Bldg1115_MW23	340138	2501039	–33.1
Bldg1115_MW24	339864	2500373	–30.1
Bldg1115_MW25	340077	2500691	–27.2
BldgH19_MW11	341301	2490071	missing
BldgH19_MW13	341385	2490037	missing
BldgLCH4015_MW01	359418	2498763	24.3
BldgLCH4015_MW02	359406	2498671	23.6
BldgLCH4015_MW03	359316	2498658	22.7
BldgLCH4015_MW04	359298	2498767	24.4
BldgLCH4015_MW05	359470	2498579	24.3
BldgLCH4015_MW06	359579	2498605	21.2
BldgLCH4015_MW07	359549	2498885	21.1
BldgLCH4015_MW11	359683	2498682	28.0
BldgLCH4015_MW12	359763	2498768	22.1
BldgLCH4015_MW13	359756	2498774	23.7
BldgLCH4015_MW14	359689	2498847	21.8
BldgLCH4015_MW15	359622	2498955	23.2
BldgLCH4015_MW16	359441	2498871	22.1
BldgLCH4015_MW17	359374	2498810	22.3
BldgLCH4015_MW18	359524	2498761	24.0
BldgLCH4015_MW19	359521	2498765	missing
BldgLCH4015_MW20	359411	2498673	missing
BldgLCH4022_HP01	359828	2498515	22.0
BldgLCH4022_MW01	359847	2498526	missing
BldgLCH4022_MW02	359827	2498510	19.4
BldgLCH4022_MW03	359824	2498525	22.7
BldgLCH4022_MW04	359825	2498706	21.2
BldgLCH4022_MW05	359833	2498371	19.2
BldgLCH4022_MW06	359726	2498559	21.2
BldgLCH4022_MW07	359984	2498557	19.9
BldgLCH4022_MW08	359922	2498488	20.6
BldgLCH4022_MW09	359925	2498599	21.5
BldgLCH4022_MW10	359799	2498612	21.9
BldgLCH4022_MW11	359866	2498460	18.5
BldgLCH4022_MW12	359874	2498506	21.4
BldgLCH4022_MW13	359949	2498544	20.8
BldgLCH4022_MW14	359920	2498533	21.7
BldgLCH4022_MW15	359795	2498485	21.6
BldgLCH4022_MW16	359917	2498537	21.2
BldgLCH4022_MW17	359824	2498514	23.3
BldgLCH4022_MW18	359798	2498481	20.6
BldgLCH4022_MW19	359849	2498517	22.2
BldgNH100_MW01	358424	2493669	13.8
BldgNH100_MW02	358461	2493712	undefined
BldgNH100_MW03	358408	2493727	15.6

Table B12. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
BldgNH118_MW01	358124	2494384	5.0
BldgS2633_MW01	351494	2487697	undefined
BldgS2633_MW02	351528	2487691	3.4
BldgS2633_MW03	351471	2487728	undefined
BldgS2633_MW04	351528	2487724	–4.3
BldgS2633_MW05	351483	2487671	–1.6
BldgS2633_MW06DW	351498	2487694	–5.2
BldgS2633_PZ01	351483	2487712	–4.3
BldgS2633_PZ02	351482	2487699	undefined
BldgS2633_PZ03	351502	2487689	–3.5
BldgS2633_PZ04	351517	2487688	–3.6
BldgSLCH4019_MW01	360087	2498990	undefined
BldgSLCH4019_MW02	360107	2498984	undefined
BldgSLCH4019_MW03	360111	2499009	undefined
BldgSLCH4019_MW04	360151	2499082	undefined
BldgSLCH4019_MW05	360040	2498817	22.1
BldgSLCH4019_MW06	359958	2498865	22.9
BldgSLCH4019_MW07	360037	2498994	22.3
BldgSLCH4019_MW08	360166	2498907	20.6
BldgSLCH4019_MW09	360144	2499093	21.0
BldgSLCH4019_MW10	360034	2498812	18.0
HP-37	341418	2489651	–1.0
HP-557	Redacted	Redacted	undefined
HP-584	Redacted	Redacted	3
HP-585	Redacted	Redacted	–97
HP-595	Redacted	Redacted	–93
HP-596	Redacted	Redacted	–116
HP-607 (new)	Redacted	Redacted	undefined
HP-611 (old)	350816	2495437	–2
HP-611 (new)	Redacted	Redacted	undefined
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	–5
HP-614 (old)	353455	2494270	11
HP-614 (new)	Redacted	Redacted	undefined
HP-616	354772	2498638	19
HP-619 (new)	Redacted	Redacted	undefined
HP-621 (old)	355383	2504816	–4
HP-621 (new)	Redacted	Redacted	7
HP-622	Redacted	Redacted	undefined
HP-623	350823	2495593	undefined
HP-627 (new)	Redacted	Redacted	undefined
HP-628 (new)	331932	2508385	–52
HP-629 (new)	355226	2504808	–2
HP-637	342990	2501856	–9
HP-638	333067	2502563	–46
HP-640	Redacted	Redacted	–50
HP-641	Redacted	Redacted	–4
HP-643	356093	2494391	13
HP-645	356438	2497358	17
HP-646	Redacted	Redacted	18
HP-647	Redacted	Redacted	missing
HP-648	Redacted	Redacted	1
HP-649	354769	2508706	0
HP-650	Redacted	Redacted	9
HP-651	348083	2503829	–20
HP-652	Redacted	Redacted	missing
HP-655	332690	2505472	–50
HP-660	339652	2499482	–24
HP-661	Redacted	Redacted	–40
HP-662	Redacted	Redacted	–51
HP-663	Redacted	Redacted	–11
HP-698	Redacted	Redacted	7
HP-699	Redacted	Redacted	6
HP-700	355278	2488526	11
HP-701	Redacted	Redacted	undefined
HP-703	Redacted	Redacted	14
HP-704	Redacted	Redacted	missing
HP-705	Redacted	Redacted	missing
HP-708	Redacted	Redacted	–14
HP-709	Redacted	Redacted	–4
HP-710	Redacted	Redacted	missing

Table B12. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
HP-711	Redacted	Redacted	–11
HPFF_MW09	339614	2501162	–20.8
HPFF_MW10	339828	2501690	undefined
HPFF_MW11	339809	2501708	–18.9
HPFF_MW12	339867	2501359	–13.3
HPFF_MW13	340106	2500518	–18.9
HPFF_MW43	339657	2499441	undefined
HPFF_MW45	340193	2500149	–23.0
HPFF_MW46	340216	2500150	–22.9
HPFF_MW47	340208	2500129	undefined
HPFF_MW49	340709	2500603	undefined
HPFF_MW52	340580	2501196	undefined
HPFF_MW56	340102	2500510	undefined
HPFF_MW60	339869	2501342	–27.6
HPFF_MW62	339476	2501269	–30.6
HPFF_MW65	339743	2501580	–29.0
HPFF_MW67	339384	2501436	undefined
HPFF_MW71	339389	2501979	undefined
HPFF_MW74	340383	2499681	undefined/ missing
HPFF_MW75	339802	2501429	undefined/ missing
LCH-4009	Redacted	Redacted	undefined
ON-T2-87	353878	2487495	5
R Well	353534	2484804	–6
S190A	353875	2487604	6
T-1	355030	2507870	–2
T-2	340590	2503410	–15
T-3	347040	2503650	–26
T-4	345730	2503610	–23
T-5	343450	2503360	–15
T-6	344770	2505310	–28
T-7	349685	2500628	–10
T-8	328600	2499550	–62
T-22	307804	2515050	–95
Tank_S781_MW02	361436	2495348	undefined
Tank_S781_MW04	361430	2495235	undefined
Tank_S781_MW06	361589	2495398	undefined
Tank_S781_MW08	361717	2495105	undefined
Tank_S781_MW10	361217	2494823	undefined
Tank_S781_MW12	361168	2495225	7.3
Tank_S781_MW14	361610	2494936	undefined
X24A	364575	2499259	undefined
X24S2X	347721	2495523	undefined

Table B12. Altitude at the top of the Brewster Boulevard lower confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #206, #258, #269, #329, #737, #1272, #1505, #1700, #1706, #1722, #1747, #1774, #2032, #3165, #3269, #3276

Leaking Underground Storage Tank Program files #59, #67, #145, #152, #237, #246, #345, #346, #354, #370, #374, #408, #410, #450, #508, #543, #676, #710, #716, #717, #719, #728, #730, #1994_REW_FiveWellSiteCheck, #2008ROF_Final, #645_Addl_SiteAssess

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

ATEC Environmental Consultants, Inc. 1992b

Baker Environmental, Inc. 1993d, 1995cd, 1996aefg, 1997b, 1998b

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Dewberry and Davis 1992

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Groundwater Technology Government Services, Inc. 1993e

Haliburton NUS 1992bc

Law Engineering, Inc. 1994a, 1995a, 1996a

Law Engineering and Environmental Services, Inc. 1996bf, 1997be, 1998b

O'Brien and Gere Engineers, Inc. 1992b

OHM Remediation Services Corp. 2001b

Osage of Virginia 2008

R.E. Wright Associates, Inc. 1994abci

R.E. Wright Environmental, Inc. 1995c

Richard Catlin and Associates, Inc. 1995ab, 1996a, 1998b

Versar, Inc. 1992

Table B13. Altitude at the top of the Tarawa Terrace aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
01-GW16DW	332642	2501970	undefined
01-GW17DW	333674	2502775	undefined
02-GW03D	356275	2498552	13.1
02-GW12D	356325	2498488	12.5
03-MW2IW	352813	2500068	undefined
03-MW2DW	352801	2500072	undefined
03-MW11IW	352544	2499897	–4.7
06-GW01D	348137	2503363	–22.7
06-GW01DA	348320	2503384	–27.3
06-GW02D	347220	2503760	–35.9
06-GW03D	347811	2504501	undefined
06-GW07D	344336	2502082	undefined
06-GW27D	348316	2502449	–23.0
06-GW28D	348677	2502849	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
06-GW37D	348037	2501703	–20.0
06-GW43DW	347960	2501527	undefined
09-GW07D	343333	2502729	–28.4
28-GW01DW	331870	2498323	undefined
28-GW07DW	331745	2499147	undefined
28-GW09DW	332857	2498262	undefined
78-642-1	339211	2504048	–37
78-642-2	338741	2504161	–38
78-GW09-2	337995	2499690	undefined
78-GW09-3	337981	2499832	–35
78-GW17-2	339200	2501228	undefined
78-GW17-3	339236	2501288	–39
78-GW24-2	341169	2502808	–34
78-GW24-3	341153	2502785	–37
78-GW32-3	339474	2501278	–32
80-MW01	356371	2485201	undefined
80-MW02	356456	2485245	undefined
80-MW03IW	355988	2485152	4.4
80-MW04	356067	2484971	3.2
80-MW05	356293	2485251	6.7
80-MW06	356415	2485411	8.1
80-MW07	355886	2485254	7.2
80-MW08	356233	2484893	0.5
84-MW16	361519	2495466	undefined
84-MW17	361448	2495309	undefined
84-MW19	361296	2495251	undefined
84-MW20	361584	2495131	undefined
84-MW21	361258	2495406	undefined
84-MW22	361414	2495374	undefined
84-MW23	361951	2494960	undefined
88-MW02DW	339364	2496466	–40.4
88-MW03DW	339508	2496540	undefined
88-MW04DW	339090	2496474	–33.0
88-MW05DW	339601	2496397	–35.3
88-TW04IW	339352	2496459	undefined
88-TW05IW	339228	2496433	undefined
BA-145	307550	2515500	–134
Bldg33_MW09	359322	2497612	7.8
Bldg33_MW10	359188	2497704	7.0
Bldg33_MW11	359234	2497649	7.7
Bldg45_MW05 (Law)	361406	2495558	3.0
Bldg45_MW06 (Law)	361360	2495631	0.5
Bldg45_MW07 (Law)	361308	2495583	1.3
Bldg45_MW08 (Law)	361356	2495636	0.5
Bldg45_MW09 (Law)	361312	2495579	1.6
Bldg45_PW01 (Law)	361295	2495567	–4.1
Bldg645_DP01	356410	2497084	9.3
Bldg645_DP02	356221	2496992	10.1
Bldg645_DP03	356130	2497027	11.2
Bldg645_DP04	356198	2497078	10.6
Bldg645_DP05	356109	2497154	7.8
Bldg645_MW01	356452	2497349	8.0
Bldg645_MW02	356436	2497363	8.7
Bldg645_MW05	356621	2497448	12.8
Bldg645_MW06	356462	2497593	5.3
Bldg645_MW07	356192	2497267	undefined
Bldg645_MW08	356542	2497397	2.7
Bldg645_MW09	346464	2497375	5.7

Table B13. Altitude at the top of the Tarawa Terrace aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
Bldg645_MW10	356193	2497271	12.8
Bldg645_MW11	356536	2497400	13.8
Bldg645_MW12	356469	2497374	6.3
Bldg645_MW13	356534	2497400	13.9
Bldg645_MW14	356192	2497263	12.7
Bldg645_MW15	356445	2497372	6.3
Bldg645_MW16	356255	2497229	10.7
Bldg645_MW17	356418	2497205	9.0
Bldg645_MW18	356462	2497584	14.7
Bldg645_MW21	356530	2497270	undefined
Bldg645_MW22	356450	2497412	5.0
Bldg645_MW23	356453	2497413	3.8
Bldg645_MW24	356418	2497260	8.0
Bldg645_MW25	356405	2497348	8.2
Bldg645_MW26	356309	2497438	4.8
Bldg645_MW27	356328	2497664	8.1
Bldg645_MW28	356538	2497414	4.2
Bldg645_MW29	356533	2497577	3.2
Bldg645_MW30	356479	2497692	4.1
Bldg645_MW31	356470	2497589	3.7
Bldg645_MW32	356213	2497539	undefined
Bldg645_MW35	356308	2497433	4.6
Bldg645_MW36	356622	2497721	4.8
Bldg645_MW37	356262	2497758	2.9
Bldg728_MW01D,S	341354	2492589	–26.2
Bldg820_MW07	349549	2494901	undefined
Bldg820_MW09	349798	2494713	6.2
Bldg820_MW17	349785	2494495	2.4
Bldg820_MW19	349622	2494493	undefined
Bldg820_MW21	349431	2494608	undefined
Bldg820_MW23	349320	2494766	undefined
Bldg820_MW28	349989	2494414	–5.2
Bldg820_MW29	349872	2494841	–7.6
Bldg820_MW30	350142	2494819	1.2
Bldg820_MW31	350163	2494600	2.6
Bldg820_MW32	350090	2494399	1.7
Bldg820_MW33	349872	2494365	3.7
Bldg820_MW34	349929	2494460	2.0
Bldg820_PW01	349750	2494725	undefined
BldgH19_MW11	341301	2490071	undefined
BldgH19_MW13	341385	2490037	undefined
BldgLCH4015_MW13	359756	2498774	18.7
BldgLCH4022_HP01	359828	2498515	12.5
BldgLCH4022_MW01	359847	2498526	undefined
BldgLCH4022_MW02	359827	2498510	12.9
BldgLCH4022_MW03	359824	2498525	12.7
BldgLCH4022_MW16	359917	2498537	9.2
BldgNH100_MW01	358424	2493669	8.8
BldgNH100_MW02	358461	2493712	undefined
BldgNH100_MW03	358408	2493727	9.6
BldgS2633_MW06DW	351500	2487673	–15.2
BldgSLCH4019_MW04	360151	2499082	10.9
BldgSLCH4019_MW10	360034	2498812	11.5
HP-557	Redacted	Redacted	–25
HP-584	Redacted	Redacted	–16
HP-585	Redacted	Redacted	–129
HP-595	Redacted	Redacted	–120
HP-607 (new)	Redacted	Redacted	undefined
HP-611 (old)	350816	2495437	–9
HP-611 (new)	Redacted	Redacted	undefined
HP-612 (old)	352428	2496995	–5
HP-613	352946	2499350	–11
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	undefined
HP-616	354772	2498638	undefined
HP-619 (new)	Redacted	Redacted	undefined
HP-621 (old)	355383	2504816	–9
HP-621 (new)	Redacted	Redacted	–11
HP-622	Redacted	Redacted	undefined

Table B13. Altitude at the top of the Tarawa Terrace aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet above and below NGVD 29
	North	East	
HP-623	350823	2495593	undefined
HP-627 (new)	Redacted	Redacted	undefined
HP-628 (new)	331932	2508385	–58
HP-629 (new)	355226	2504808	–10
HP-637	342990	2501856	–27
HP-638	333067	2502563	–57
HP-640	Redacted	Redacted	–70
HP-641	Redacted	Redacted	–18
HP-643	356093	2494391	3
HP-645	356438	2497358	3
HP-646	Redacted	Redacted	4
HP-647	Redacted	Redacted	undefined
HP-648	Redacted	Redacted	–11
HP-649	354769	2508706	–9
HP-650	Redacted	Redacted	–9
HP-651	348083	2503829	–30
HP-652	Redacted	Redacted	undefined
HP-655	332690	2505472	–80
HP-660	339652	2499482	–31
HP-661	Redacted	Redacted	–58
HP-662	Redacted	Redacted	–66
HP-663	Redacted	Redacted	–22
HP-698	Redacted	Redacted	1
HP-699	Redacted	Redacted	0
HP-700	355278	2488526	–3
HP-701	Redacted	Redacted	–10
HP-703	Redacted	Redacted	8
HP-704	Redacted	Redacted	undefined
HP-705	Redacted	Redacted	undefined
HP-708	Redacted	Redacted	–30
HP-709	Redacted	Redacted	–12
HP-710	Redacted	Redacted	undefined
HP-711	Redacted	Redacted	–23
HPFF_MW10	339828	2501690	undefined
HPFF_MW11	339809	2501708	–30.9
HPFF_MW12	339867	2501359	–28.3
HPFF_MW13	340106	2500518	undefined
HPFF_MW43	339657	2499441	undefined
HPFF_MW45	340193	2500149	–28.0
HPFF_MW46	340216	2500150	–27.9
HPFF_MW49	340709	2500603	undefined
HPFF_MW52	340580	2501196	undefined
HPFF_MW56	340102	2500510	undefined
HPFF_MW60	339869	2501342	–32.6
HPFF_MW62	339476	2501269	–35.6
HPFF_MW65	339743	2501580	–34.0
HPFF_MW67	339384	2501436	undefined
HPFF_MW71	339389	2501979	undefined
HPFF_MW74	340383	2499681	undefined
HPFF_MW75	339802	2501429	–30.6
LCH-4009	Redacted	Redacted	undefined
M-628	362735	2479434	19
ON-T-2-87	353878	2487495	–3
R Well	353534	2484804	–18
S190A	353875	2487604	–3
T-1	355030	2507870	–14
T-2	340590	2503410	–37
T-3	347040	2503650	–30
T-4	345730	2503610	–33
T-5	343450	2503360	–25
T-6	344770	2505310	–32
T-7	349685	2500628	–18
T-8	328600	2499550	–91
T-22	307804	2515040	–115
TT-67	362730	2490160	undefined
Tank_S781_MW02	361436	2495348	undefined
Tank_S781_MW04	361430	2495235	undefined
Tank_S781_MW06	361589	2495398	undefined
Tank_S781_MW08	361717	2495105	undefined
Tank_S781_MW10	361217	2494823	undefined
Tank_S781_MW12	361168	2495225	1.3
Tank_S781_MW14	361610	2494936	undefined
X24A	364575	2499259	undefined
X24S2X	347721	2495523	undefined

Table B13. Altitude at the top of the Tarawa Terrace aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #206, #258, #269, #329, #737, #1272, #1505, #1700, #1706, #1722, #1747, #1774, #2032, #3269, #3276

Leaking Underground Storage Tank Program files #67, #145, #152, #237, #246, #346, #354, #370, #374, #450, #508, #543, #676, #710, #717, #719, #728, #645_Addl_SiteAssess

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d, 1995cd, 1996aefg, 1997b, 1998b

Baker Environmental, Inc. and CH2M Hill, Inc. 2001, 2002b

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Dewberry and Davis 1992

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Geophex, Ltd. 2002

Groundwater Technology Government Services, Inc. 1993e

Haliburton NUS 1992b

Law Engineering, Inc. 1994a, 1995a, 1996a

Law Engineering and Environmental Services, Inc. 1996bf, 1997e, 1998b

O'Brien and Gere Engineers, Inc. 1992b

OHM Remediation Services Corp. 2001b

R.E. Wright Associates, Inc. 1994b

R.E. Wright Environmental, Inc. 1995c

Richard Catlin and Associates, Inc. 1995ab, 1996a

Versar, Inc. 1992

Table B14. Altitude at the top of the Upper Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
02-GW03D	356275	2498552	undefined
03-MW02DW	352801	2500072	undefined
06-GW01D	348137	2503363	undefined/ missing
06-GW01DA	348320	2503384	undefined
06-GW02D	347220	2503760	–75.9
06-GW03D	347811	2504501	undefined
06-GW07D	344336	2502082	undefined
06-GW27D	348316	2502449	undefined
06-GW28D	348677	2502849	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
06-GW37D	348037	2501703	undefined
06-GW43DW	347960	2501527	undefined
09-GW07D	343333	2502729	undefined
28-GW01DW	331870	2498323	undefined
28-GW07DW	331745	2499147	undefined
28-GW09DW	332857	2498262	undefined
78_642-1	339211	2504048	–60
78_642-2	338741	2504161	undefined
78-GW09-3	337981	2499832	undefined
78-GW17-3	339236	2501288	undefined
78-GW24-3	341153	2502785	undefined
78-GW32-3	339474	2501278	–59
80-MW03IW	355988	2485152	–8.0
88-MW02DW	339364	2496466	–61.4
88-MW04DW	339090	2496474	–57.0
88-MW05DW	339601	2496397	–55.3
BA-145	307550	2515500	–221
Bldg645_MW15	356445	2497372	–29.7
Bldg645_MW16	356255	2497229	–36.3
Bldg645_MW17	356418	2497205	–24.0
Bldg645_MW18	356462	2497584	–22.3
Bldg645_MW21	356530	2497270	missing
Bldg645_MW22	356450	2497412	–25.9
Bldg645_MW26	356309	2497438	missing
Bldg645_MW27	356328	2497664	missing
Bldg645_MW28	356538	2497414	missing
Bldg645_MW29	356533	2497577	missing
Bldg645_MW30	356479	2497692	missing
Bldg645_MW31	356470	2497589	missing
Bldg645_MW32	356213	2497539	missing
Bldg645_MW35	356308	2497433	missing
Bldg645_MW36	356622	2497721	missing
Bldg645_MW37	356262	2497758	missing
HP-37	341418	2489651	undefined
HP-557	Redacted	Redacted	undefined
HP-584	Redacted	Redacted	–66
HP-585	Redacted	Redacted	–220
HP-595	Redacted	Redacted	–215
HP-607 (new)	Redacted	Redacted	–29
HP-611 (old)	350816	2495437	undefined
HP-611 (new)	Redacted	Redacted	undefined
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	–38.6
HP-614 (new)	Redacted	Redacted	–46
HP-616	354772	2498638	undefined
HP-619 (new)	Redacted	Redacted	–47
HP-621 (new)	Redacted	Redacted	–49
HP-622	Redacted	Redacted	–44
HP-623	350823	2495593	–51
HP-627 (new)	Redacted	Redacted	undefined
HP-628 (new)	331932	2508385	–121
HP-629 (new)	355226	2504808	–49
HP-637	342990	2501856	–42
HP-638	333067	2502563	–110
HP-640	Redacted	Redacted	missing
HP-641	Redacted	Redacted	–52
HP-643	356093	2494391	–25
HP-645	356438	2497358	–31
HP-646	Redacted	Redacted	–30
HP-647	Redacted	Redacted	–42
HP-648	Redacted	Redacted	–37
HP-649	354769	2508706	–36
HP-650	Redacted	Redacted	–45
HP-651	348083	2503829	–62
HP-652	Redacted	Redacted	missing
HP-655	332690	2505472	–120
HP-660	339652	2499482	–57
HP-661	Redacted	Redacted	–128

Table B14. Altitude at the top of the Upper Castle Hayne confining unit Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
HP-662	Redacted	Redacted	–152
HP-663	Redacted	Redacted	–42
HP-698	Redacted	Redacted	missing
HP-699	Redacted	Redacted	missing
HP-700	355278	2488526	–27
HP-701	Redacted	Redacted	–19
HP-703	Redacted	Redacted	–22
HP-704	Redacted	Redacted	–28
HP-705	Redacted	Redacted	–45
HP-708	Redacted	Redacted	–54
HP-709	Redacted	Redacted	–42
HP-710	Redacted	Redacted	missing
HP-711	Redacted	Redacted	–59
HPFF_MW11	339813	2501698	undefined
HPFF_MW12	339867	2501359	–51.3
HPFF_MW13	340106	2500493	undefined
HPFF_MW46	340216	2500150	undefined
HPFF_MW52	340562	2501208	undefined
HPFF_MW56	340073	2500523	undefined
HPFF_MW60	339869	2501342	–52.6
HPFF_MW62	339461	2501257	undefined
LCH-4009	Redacted	Redacted	–44
M-628	362735	2479434	–9
ON-T-2-87	353878	2487495	–11
R Well	353534	2484804	undefined
S190A	353875	2487604	–11
T-1	355030	2507870	–38
T-2	340590	2503410	–58
T-3	347040	2503650	–62
T-4	345730	2503610	–54
T-5	343450	2503360	–52
T-6	344770	2505310	–54
T7	349685	2500628	–56
T-8	328600	2499550	–128
TT-67	362730	2490160	undefined
X24A	364575	2499259	–41
X24S2X	347721	2495523	undefined

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #206, #258, #273, #1272, #1273, #1505, #1722, #2032, #3276

Leaking Underground Storage Tank Program files #370, #450, #676

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d, 1994b, 1995cd, 1996a, 1998b

Baker Environmental, Inc. and CH2M Hill, Inc. 2001

Catlin Engineers and Scientists 2002a

Environmental Science and Engineering, Inc. 1988, 1992

Geophex, Ltd. 2002

OHM Remediation Services Corp. 2001b

Table B15. Altitude at the top of the Upper Castle Hayne aquifer–River Bend unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
02-GW03D	356275	2498552	undefined
03-MW02DW	352801	2500072	undefined
06-GW01D	348137	2503363	–77.2
06-GW01DA	348320	2503384	–76.3
06-GW02D	347220	2503760	–79.9
06-GW03D	347811	2504501	undefined
06-GW07D	344336	2502082	–72.6
06-GW27D	348316	2502449	–77.5
06-GW28D	348677	2502849	–77.9
06-GW30D	349532	2503730	–76.1
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
06-GW37D	348037	2501703	undefined
06-GW43DW	347960	2501527	undefined
09-GW07D	343333	2502729	–69.4
28-GW01DW	331870	2498323	undefined
28-GW07DW	331745	2499147	undefined
28-GW09DW	332857	2498262	undefined
78_642-1	339211	2504048	–81
78_642-2	338741	2504161	undefined
78-GW09-3	337981	2499832	undefined
78-GW17-3	339236	2501288	undefined
78-GW24-3	341153	2502785	–74
78-GW32-3	339474	2501278	–87
80-MW03IW	355988	2485152	undefined
BA-145	307550	2515500	–257
Bldg645_MW15	356445	2497372	–37.7
Bldg645_MW16	356255	2497229	–42.3
Bldg645_MW17	356418	2497205	–29.0
Bldg645_MW18	356462	2497584	–29.3
Bldg645_MW21	356530	2497270	–41.8
Bldg645_MW22	356450	2497412	–35.9
Bldg645_MW26	356309	2497438	undefined
Bldg645_MW27	356328	2497664	undefined
Bldg645_MW28	356538	2497414	–49.8
Bldg645_MW29	356533	2497577	–50.8
Bldg645_MW30	356479	2497692	–47.9
Bldg645_MW31	356470	2497589	–49.3
Bldg645_MW32	356213	2497539	undefined
Bldg645_MW35	356308	2497433	–51.4
Bldg645_MW36	356622	2497721	–45.2
Bldg645_MW37	356262	2497758	undefined
Bldg820_MW09D	349790	2494709	–53.0
HP-37	341418	2489651	–83
HP-557	Redacted	Redacted	–90
HP-584	Redacted	Redacted	–80
HP-585	Redacted	Redacted	–250
HP-607 (new)	Redacted	Redacted	–53
HP-611 (old)	350816	2495437	–55
HP-611 (new)	Redacted	Redacted	–82
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	–80
HP-616	354772	2498638	–54
HP-619 (new)	Redacted	Redacted	–76
HP-621 (new)	Redacted	Redacted	–70
HP-622	Redacted	Redacted	–55
HP-623	350823	2495593	–64
HP-627 (new)	Redacted	Redacted	–81
HP-628 (new)	Redacted	Redacted	undefined
HP-629 (new)	355226	2504808	–73
HP-637	342990	2501856	–57
HP-638	333067	2502563	–127
HP-640	Redacted	Redacted	undefined
HP-641	Redacted	Redacted	–76
HP-643	356093	2494391	–45
HP-645	356438	2497358	–45
HP-646	Redacted	Redacted	–45
HP-647	Redacted	Redacted	–60
HP-648	Redacted	Redacted	–69
HP-649	354769	2508706	–68
HP-650	Redacted	Redacted	–83
HP-651	348083	2503829	–82
HP-652	Redacted	Redacted	undefined
HP-655	332690	2505472	–142
HP-660	339652	2499482	–84
HP-661	Redacted	Redacted	–151
HP-662	Redacted	Redacted	–166
HP-663	Redacted	Redacted	–82
HP-698	Redacted	Redacted	undefined

Table B15. Altitude at the top of the Upper Castle Hayne aquifer–River Bend unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
HP-699	Redacted	Redacted	undefined
HP-700	355278	2488526	–37
HP-701	Redacted	Redacted	–33
HP-703	Redacted	Redacted	–46
HP-704	Redacted	Redacted	–48
HP-705	Redacted	Redacted	–65
HP-708	Redacted	Redacted	–82
HP-709	Redacted	Redacted	–72
HP-710	Redacted	Redacted	undefined
HP-711	Redacted	Redacted	–89
HPFF_MW46	340216	2500150	undefined
HPFF_MW52	340562	2501208	undefined
HPFF_MW56	340073	2500523	undefined
HPFF_MW60	339869	2501342	–80.6
HPFF_MW62	339461	2501257	undefined
LCH-4009	Redacted	Redacted	–53
M-628	362735	2479434	–21
ON-T-2-87	353878	2487495	–27
R Well	353534	2484804	undefined
S190A	353875	2487604	–27
T-1	355030	2507870	–72
T-2	340590	2503410	–77
T-3	347040	2503650	–80
T-4	345730	2503610	–79
T-5	343450	2503360	–71
T-6	344770	2505310	–80
T-7	349685	2500628	–70
T-8	328600	2499550	–154
TT-67	362730	2490160	undefined
X24A	364575	2499259	–52
X24S2X	347721	2495523	undefined

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations. See Figure B3 for underground and above-ground storage tank site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #206, #258, #273, #1272, #1273, #1505, #1722, #3276

Leaking Underground Storage Tank Program files #370, #450, #528, #676

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d, 1994b, 1995cd, 1996a

Baker Environmental, Inc. and CH2M Hill, Inc. 2001,

Catlin Engineers and Scientists 2002a

Environmental Science and Engineering, Inc. 1988, 1992

Geophex, Ltd. 2002

OHM Remediation Services Corp. 2001b, 2002a

Table B16. Altitude at the top of the Local confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
06-GW01DA	348320	2503384	undefined
06-GW03D	347811	2504501	undefined
06-GW15D	347767	2503174	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
78_642-1	339211	2504048	missing
78_642-2	338741	2504161	undefined
78-GW09-3	337981	2499832	–115
78-GW24-3	341153	2502785	–109
78-GW32-3	339474	2501278	–113
HP-557	Redacted	Redacted	undefined
HP-584	Redacted	Redacted	–114
HP-607 (new)	Redacted	Redacted	undefined/ missing
HP-611 (old)	350816	2495437	undefined
HP-611 (new)	Redacted	Redacted	–125
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	–98
HP-616	354772	2498638	undefined
HP-619 (new)	Redacted	Redacted	–95
HP-621 (new)	Redacted	Redacted	–95
HP-622	Redacted	Redacted	missing
HP-623	350823	2495593	missing
HP-627 (new)	Redacted	Redacted	–97
HP-629 (new)	355226	2504808	–95
HP-637	342990	2501856	–81
HP-638	333067	2502563	–172
HP-641	Redacted	Redacted	–112
HP-643	356093	2494391	–83
HP-645	356438	2497358	–75
HP-646	Redacted	Redacted	–70
HP-647	Redacted	Redacted	–90
HP-648	Redacted	Redacted	–95
HP-649	354769	2508706	–98
HP-650	Redacted	Redacted	missing
HP-651	348083	2503829	missing
HP-652	Redacted	Redacted	missing
HP-660	339652	2499482	–114
HP-661	Redacted	Redacted	–221
HP-663	Redacted	Redacted	missing
HP-698	Redacted	Redacted	–69
HP-699	Redacted	Redacted	–73
HP-700	355278	2488526	missing
HP-701	Redacted	Redacted	missing
HP-703	Redacted	Redacted	–72
HP-704	Redacted	Redacted	–78
HP-705	Redacted	Redacted	missing
HP-708	Redacted	Redacted	–100
HP-709	Redacted	Redacted	missing
HP-710	Redacted	Redacted	missing
HP-711	Redacted	Redacted	–109
LCH-4009	Redacted	Redacted	–89
M-628	362735	2479434	–37
ON-T-2-87	353878	2487495	–83
S190A	353875	2487604	–87
T-1	355030	2507870	–100
T-2	340590	2503410	–111
T-3	347040	2503650	missing
T-4	345730	2503610	missing
T-5	343450	2503360	missing
T-6	344770	2505310	–100
T-7	349685	2500628	missing
T-8	328600	2499550	–197
TT-67	362730	2490160	–32
X24A	364575	2499259	–88
X24S2X	347721	2495523	undefined

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record files #258, #1272

Leaking Underground Storage Tank Program files #450, #676

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d

Environmental Science and Engineering, Inc. 1988

Geophex, Ltd. 2002

OHM Remediation Services Corp. 2001b

Table B17. Altitude at the top of the Upper Castle Hayne aquifer–Lower unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929; CU, confining unit]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
06-GW01DA	348320	2503384	undefined
06-GW03D	347811	2504501	undefined
06-GW15D	347767	2503174	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
78_642-1	339211	2504048	–121
78_642-2	338741	2504161	undefined
HP-557	Redacted	Redacted	undefined
HP-584	Redacted	Redacted	–126
HP-607 (new)	Redacted	Redacted	undefined
HP-611 (old)	350816	2495437	undefined
HP-611 (new)	Redacted	Redacted	undefined
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	–121
HP-616	354772	2498638	undefined
HP-619 (new)	Redacted	Redacted	–105
HP-621 (new)	Redacted	Redacted	–103
HP-622	Redacted	Redacted	Local CU missing
HP-623	350823	2495593	Local CU missing
HP-627 (new)	Redacted	Redacted	–109
HP-629 (new)	355226	2504808	–112
HP-637	342990	2501856	–102
HP-641	Redacted	Redacted	–122
HP-643	356093	2494391	–101
HP-645	356438	2497358	–91
HP-646	Redacted	Redacted	–86
HP-647	Redacted	Redacted	–106
HP-648	Redacted	Redacted	–107
HP-649	354769	2508706	–112
HP-650	Redacted	Redacted	Local CU missing
HP-651	348083	2503829	Local CU missing
HP-652	Redacted	Redacted	Local CU missing
HP-660	339652	2499482	–134
HP-663	Redacted	Redacted	Local CU missing
HP-698	Redacted	Redacted	–81
HP-699	Redacted	Redacted	–83
HP-700	355278	2488526	Local CU missing
HP-701	Redacted	Redacted	Local CU missing
HP-703	Redacted	Redacted	–80
HP-704	Redacted	Redacted	–84
HP-705	Redacted	Redacted	Local CU missing
HP-708	Redacted	Redacted	–112
HP-709	Redacted	Redacted	Local CU missing
HP-710	Redacted	Redacted	Local CU missing
HP-711	Redacted	Redacted	–123
LCH-4009	Redacted	Redacted	–97
M-268	362735	2479434	–51
ON-T-2-87	353878	2487495	–100
S190A	353875	2487604	–102
T-1	355030	2507870	–112
T-2	340590	2503410	–125
T-3	347040	2503650	Local CU missing
T-4	345730	2503610	Local CU missing
T-5	343450	2503360	Local CU missing
T-6	344770	2505310	–109
T-7	349685	2500628	Local CU missing
T-8	328600	2499550	–210
TT-67	362730	2490160	–46
X24A	364575	2499259	–102
X24S2X	347721	2495523	Local CU missing

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record file #1272

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d

Table B18. Altitude at the top of the Middle Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
06-GW01DA	348320	2503384	–133
06-GW03D	347811	2504501	undefined
06-GW15D	347767	2503174	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
78_642-1	339211	2504048	–141
78_642-2	338741	2504161	undefined
HP-557	Redacted	Redacted	–130
HP-607 (new)	Redacted	Redacted	–112
HP-611 (old)	350816	2495437	undefined
HP-611 (new)	Redacted	Redacted	–170
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	–139
HP-616	354772	2498638	–139
HP-619 (new)	Redacted	Redacted	–125
HP-621 (new)	Redacted	Redacted	–126
HP-622	Redacted	Redacted	–104
HP-623	350823	2495593	–116
HP-627 (new)	Redacted	Redacted	–127
HP-629 (new)	355226	2504808	–129
HP-637	342990	2501856	–130
HP-641	Redacted	Redacted	–132
HP-643	356093	2494391	–121
HP-645	356438	2497358	–123
HP-646	Redacted	Redacted	–120
HP-647	Redacted	Redacted	–124
HP-648	Redacted	Redacted	–125
HP-649	354769	2508706	–126
HP-650	Redacted	Redacted	–149
HP-651	348083	2503829	–130
HP-652	Redacted	Redacted	–155
HP-660	339652	2499482	–164
HP-663	Redacted	Redacted	–144
HP-698	Redacted	Redacted	–129
HP-699	Redacted	Redacted	–123
HP-700	355278	2488526	–121
HP-701	Redacted	Redacted	–119
HP-703	Redacted	Redacted	–114
HP-704	Redacted	Redacted	–102
HP-705	Redacted	Redacted	–121
HP-708	Redacted	Redacted	–144
HP-709	Redacted	Redacted	–138
HP-710	Redacted	Redacted	–130
HP-711	Redacted	Redacted	–139
LCH-4009	Redacted	Redacted	–108
M-628	362735	2479434	–77
ON-T-2-87	353878	2487495	–115
S190A	353875	2487604	–115
T-1	355030	2507870	–126
T-2	340590	2503410	–151
T-3	347040	2503650	–128
T-4	345730	2503610	–131
T-5	343450	2503360	–129
T-6	344770	2505310	–130
T-7	349685	2500628	–120
T-8	328600	2499550	–226
TT-67	362730	2490160	–66
X24A	364575	2499259	–112
X24S2X	347721	2495523	–131

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record file #1272

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d

Table B19. Altitude at the top of the Middle Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
06-GW01DA	348320	2503384	undefined
06-GW03D	347811	2504501	undefined
06-GW30D	349532	2503730	undefined
06-GW35D	349394	2501254	undefined
06-GW36D	350271	2502282	undefined
78_642-1	339211	2504048	–157
78_642-2	338741	2504161	undefined
HP-557	Redacted	Redacted	–159
HP-584	Redacted	Redacted	–166
HP-607 (new)	Redacted	Redacted	–127
HP-611 (old)	350816	2495437	undefined
HP-612 (old)	352428	2496995	undefined
HP-613	352946	2499350	undefined
HP-614 (old)	353455	2494270	undefined
HP-614 (new)	Redacted	Redacted	–162
HP-619 (new)	Redacted	Redacted	–145
HP-621 (new)	Redacted	Redacted	–147
HP-622	Redacted	Redacted	–119
HP-623	350823	2495593	–134
HP-627 (new)	Redacted	Redacted	–148
HP-629 (new)	355226	2504808	–147
HP-643	356093	2494391	–141
HP-645	356438	2497358	–135
HP-646	Redacted	Redacted	–138
HP-647	Redacted	Redacted	–138
HP-648	Redacted	Redacted	–139
HP-649	354769	2508706	–136
HP-651	348083	2503829	–157
HP-652	Redacted	Redacted	–167
HP-663	Redacted	Redacted	–162
HP-699	Redacted	Redacted	–147
HP-700	355278	2488526	–141
HP-703	Redacted	Redacted	–136
HP-704	Redacted	Redacted	–128
HP-708	Redacted	Redacted	–168
HP-709	Redacted	Redacted	–154
HP-710	Redacted	Redacted	–146
HP-711	Redacted	Redacted	–155
LCH-4009	Redacted	Redacted	–122
M-628	362735	2479434	–93
ON-T-2-87	353878	2487495	–129
S190A	353875	2487604	–129
T-1	355030	2507870	–138
T-2	340590	2503410	–165
T-3	347040	2503650	–144
T-4	345730	2503610	–151
T-5	343450	2503360	–156
T-6	344770	2505310	–151
T-7	349685	2500628	–134
T-8	328600	2499550	–239
TT-67	362730	2490160	–88
X24A	364575	2499259	–121
X24S2X	347721	2495523	–153

[1] See Plate B1 for supply-well site and test-boring locations. See Figure B2 for Installation Restoration Program site locations

[2] Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

CERCLA Administrative Record file #1272

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Baker Environmental, Inc. 1993d

Table B20. Altitude at the top of the Lower Castle Hayne confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
HP-614 (new)	Redacted	Redacted	–270
HP-621 (new)	Redacted	Redacted	–252
HP-623	350823	2495593	–220
HP-627 (new)	Redacted	Redacted	–238
HP-643	356093	2494391	–211
HP-645	356438	2497358	–227
HP-646	Redacted	Redacted	–220
HP-647	Redacted	Redacted	–230
HP-648	Redacted	Redacted	–261
HP-649	354769	2508706	–250
HP-652	Redacted	Redacted	–251
HP-699	Redacted	Redacted	–223
HP-704	Redacted	Redacted	–190
LCH-4009	Redacted	Redacted	–200
M-628	362735	2479434	–135
ON-T-2-87	353878	2487495	–197
S190A	353875	2487604	–199
T-1	355030	2507870	–251
T-8	328600	2499550	–326
TT-67	362730	2490160	–156
X24A	364575	2499259	undefined
X24S2X	347721	2495523	–221

[1]See Plate B1 for supply-well and test-boring locations

[2]Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Table B21. Altitude at the top of the Lower Castle Hayne aquifer, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
HP-614 (new)	Redacted	Redacted	–288
LCH-4009	Redacted	Redacted	–220
M-628	362735	2479434	–165
T-1	355030	2507870	–281
T-8	328600	2499550	–364
X24A	364575	2499259	undefined
X24S2X	347721	2495523	–239

[1]See Plate B1 for supply-well and test-boring locations

[2]Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Table B22. Altitude at the top of the Beaufort confining unit, Hadnot Point–Holcomb Boulevard study area and vicinity, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[NGVD, National Geodetic Vertical Datum of 1929]

Site name[1]	Location coordinates[2]		Unit altitude, in feet below NGVD 29
	North	East	
M-628	362735	2479434	–211
T-1	355030	2507870	–365
T-8	328600	2499550	–450
T-12	355830	2476550	–237
X24A	364575	2499259	–238
X24S2X	347721	2495523	–312

[1]See Plate B1 for supply-well and test-boring locations

[2]Location coordinates are North Carolina State Plane coordinates, North American Datum of 1983

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, U.S. Marine Corps Base Camp Lejeune, North Carolina, and North Carolina Department of Environment and Natural Resources

Table B23. Hydraulic characteristics of geohydrologic units determined at Installation Restoration Program sites within the Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Specific yield, dimensionless	Leakance factor, dimensionless
03-MW02IW	TTAQ	[4]4.1	—	—	—	—
		[3]4.0	—	—	—	—
03-MW05	BBUCU, BBLAQ	[4]6.1	—	—	—	—
03-MW06	BBUAQ, BBUCU, BBLAQ	[4]0.6	—	—	—	—
03-MW07	BBUAQ	[4]6.1	—	—	—	—
03-MW08	BBUAQ, BBUCU	[4]3.0	—	—	—	—
06-GW01D	UCHRBU		[6]645	0.0021	—	r/B=0.393
06-GW02S	BBUAQ, BBUCU, BBLAQ	[2]0.7	—	—	—	—
06-GW34	BBUCU(?), BBLAQ	—	[9]420	0.0012	0.007	β=0.040
22-RW01	BBUAQ, BBUCU, BBLAQ	[8]3.4	—	—	—	—
22-RW02	BBUAQ, BBUCU, BBLAQ	[8]3.1	—	—	—	—
74-GW03A	BBUAQ	[4]0.6	—	—	—	—
74-GW06	BBUAQ, BBUCU	[4]6.3	—	—	—	—
74-GW08	BBUAQ, BBUCU	[4]3.5	—	—	—	—
78-642-1	UCHRBU&LU	—	[10]1,340	0.00062	—	—
	Local CU	—	[7]1,250	0.00060	—	r/B=0.08
	MCHCU	—	[5]1,350	0.00052	—	—
		—	[11]1,230	—	—	—
78-642-2	UCHRBU&LU	—	[10]1,642	0.0013	—	—
	Local CU	—	[12]1,500	0.0012	—	r/B=0.134
	MCHCU	—	[5]1,760	0.0010	—	—
		—	[11]1,690	—	—	—
78-Bldg902_P-2	BBUAQ, BBUCU	—	[9]22	0.00063	0.012	β=0.12
78-Bldg902_RW-1	BBUAQ, BBUCU	2.3	[5]34	—	—	—
78-GW32-2	TTAQ	—	[7]870	0.0058	—	r/B=0.50
78-GW32-2	TTAQ	—	[7]290	0.0021	—	r/B=1.61
78-GW32-3	UCHRBU	—	[10]1,380	0.0027	—	—
80-MW03IW	UCHRBU	[3]1.6	—	—	—	—
80-MW04	BBLCU, TTAQ	[3]1.7	—	—	—	—
80-MW06	BBLCU, TTAQ	[4]0.4	—	—	—	—
80-MW07	BBLCU, TTAQ	[4]7.8	—	—	—	—

Table B23. Hydraulic characteristics of geohydrologic units determined at Installation Restoration Program sites within the Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Specific yield, dimensionless	Leakance factor, dimensionless
82-DP01	TTAQ	23	[7]1,690	0.009	—	—
82-DP02	TTAQ	16	[7]1,200	0.008	—	—
			[7]1,070	0.01	—	—
82-DRW01	TTCU(?), UCHRBU	18	[5]1,560	—	—	—
82-SP01	BBLAQ	—	[9]250	0.006	0.14	β=0.13
82-SP02	BBLAQ	—	[6]387	0.026		r/B=2.70
82-SP03	BBLAQ	—	[9]560	0.003	0.01	β=0.203
84-MW16 (Baker)	TTAQ	[4]1.0	—	—	—	—
84-MW17 (Baker)	BBLAQ, TTAQ	[4]9.6	—	—	—	—
84-MW18 (Baker)	BBLAQ	[4]0.8	—	—	—	—
84-MW19 (Baker)	BBLAQ, BBLCU, TTAQ	[4]0.5	—	—	—	—
84-MW20 (Baker)	BBLAQ, BBLCU, TTAQ	[4]6.6	—	—	—	—
84-MW23 (Baker)	BBLAQ, BBLCU, TTAQ	[4]2.2	—	—	—	—
88-MW02	BBUAQ, BBLAQ, BBLAQ	[4]9.2	—	—	—	—
88-MW03DW	TTAQ	[3]6.2	—	—	—	—
		[3]4.0	—	—	—	—
88-MW03IW	BBLAQ	[4]6.8	—	—	—	—
88-MW04	BBUAQ, BBUCU, BBLAQ	[4]16	—	—	—	—
88-MW04IW	BBLAQ	[3]59	—	—	—	—
		[4]65	—	—	—	—
88-MW05	BBUAQ, BBUCU, BBLAQ	[4]0.8	—	—	—	—
88-MW07	BBUAQ, BBUCU, BBLAQ	[4]30	—	—	—	—
88-MW07IW	BBLAQ	[3]52	—	—	—	—
		[4]61	—	—	—	—
88-MW09	BBUAQ, BBUCU, BBLAQ	[4]0.4	—	—	—	—
88-MW09IW	BBLAQ	[3]84	—	—	—	—
		[4]87	—	—	—	—
88-RW01	BBUAQ	—	[9]9.8	0.0011	0.014	β=0.51
88-TW02	BBUAQ	—	[9]24	0.0025	0.005	β=0.47

Table B23. Hydraulic characteristics of geohydrologic units determined at Installation Restoration Program sites within the Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Specific yield, dimensionless	Leakance factor, dimensionless
G-BP07	BBLAQ (?)	[2]0.9	—	—	—	—
G-BP10	BBLAQ (?)	[2]1.0	—	—	—	—
G-MW03S	BBUCU. BBLAQ (?)	[2]0.5	—	—	—	—
G-MW04	BBUCU, BBLAQ (?)	[2]0.7	—	—	—	—
G-MW06	BBUAQ, BBUCU	[2]1.5	—	—	—	—
G-MW07	BBUAQ, BBUCU	[2]1.1	—	—	—	—
G-MW08	BBUAQ, BBUCU	[2]0.6	—	—	—	—
G-MW09	BBUAQ	[2]3.0	—	—	—	—

[1]See Plate B1 for locations

Test method for horizontal hydraulic conductivity and transmissivity:

[2] Bouwer and Rice 1976

[3] Falling-Head—Bouwer and Rice 1976

[4] Rising-Head—Bouwer and Rice 1976

[5] Cooper and Jacob 1946

[6] Hantush 1964

[7] Hantush and Jacob 1955

[8] Hvorslev 1951

[9] Neuman 1972

[10] Theis 1935

[11] Theis—Recovery 1935

[12] Walton 1962

Data sources:

CERCLA Administrative Record files #258, #345, #382, #1503, #1524, #1698, #1700, #2013, #2032, #3269

Leaking Underground Storage Tank Program file #418

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Baker Environmental, Inc. 1993f, 1995a, 1996be, 1998ab

Baker Environmental, Inc. and CH2M Hill, Inc. 2002b

Catlin Engineers and Scientists 2003c

Dewberry and Davis 1992

Environmental Science and Engineering, Inc. 1988

O'Brien and Gere Engineers, Inc. 1990

Table B24. Hydraulic characteristics of geohydrologic units determined at Leaking Underground Storage Tank Program sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; TTAQ, Tarawa Terrace aquifer; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Specific yield, dimensionless	Leakance factor, dimensionless
Bldg21_DW03	BBLAQ	[4]1.1	—	—	—	—
		—	[8]280	0.012	—	r/B=0.288
		[3]5.8	—	—	—	—
Bldg21_MW07	BBUAQ	[3]0.1	—	—	—	—
Bldg21_MW09	BBUAQ, BBUCU	[4]0.2	—	—	—	—
Bldg33_MW01	BBLAQ	—	[10]23	0.003	0.01	β=0.709
Bldg33_MW02	BBLAQ	—	[10]32	0.00012	0.0073	β=2.77
Bldg33_MW03	BBLAQ	—	[10]11	0.0041	0.019	β=0.208
Bldg33_MW11	BBLAQ	2.8	[6]20	—	—	—
Bldg45_MW03 (ATEC)	BBLAQ, BBLCU, TTAQ	—	[10]4.1	0.00013	0.0400	β=1.093
Bldg45_MW10 (Law)	BBLAQ, BBLCU, TTAQ	—	[10]140	0.0012	0.017	β=3.08
Bldg331_MW07	BBUAQ	—	[10]420	—	—	—
Bldg331_PW16	BBLAQ	20	[6]400	—	—	—
Bldg645_MW05	BBLAQ	[9]5.7	—	—	—	—
Bldg645_MW06	BBLAQ	[9]10	—	—	—	—
Bldg645_MW09	TTAQ	[9]3.3	—	—	—	—
Bldg820_MW06	BBLAQ	34	[10]510	0.00088	0.01	β=0.008
Bldg820_PW01	BBLAQ, TTAQ	9.6	[6]190	—	—	—
Bldg1115_MW07	BBUAQ	—	[11]3,850	0.0067	—	—
Bldg1115_MW16	BBLAQ	9.3	[6]350	—	—	—
Bldg1115_MW19	BBLAQ, BBLCU	—	[11]440	0.01	—	—
Bldg1613_MW01	BBUAQ	[2]1.6	—	—	—	—
Bldg1613_MW02	BBUAQ	[2]13	—	—	—	—
Bldg1613_MW08	BBUAQ	[2]22	—	—	—	—
Bldg1856_MW02	BBUAQ	[2]6.3	—	—	—	—
Bldg1856_MW07	BBUAQ	[2]3.1	—	—	—	—
Bldg1856_MW12	BBUAQ	[2]7.9	—	—	—	—
BldgFC201E_PW01	BBUAQ	18	[6]440	—	—	—
BldgFC201E_MW10	BBLAQ	—	[10]83 [8]180	0.0030 0.0041	0.2200 —	β=0.523 r/B=0.728
BldgFC251_MW08	BBUAQ, BBUCU, BBLAQ	21	[6]510	—	—	—
BldgFC263_MW16	BBUAQ, BBLAQ	[6]8.1	—	—	—	—
BldgH28_MW03	BBLAQ	[4]3.1	—	—	—	—
		[3]2.2	—	—	—	—

Table B24. Hydraulic characteristics of geohydrologic units determined at Leaking Underground Storage Tank Program sites, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUAQ, Brewster Boulevard upper aquifer; BBUCU, Brewster Boulevard upper confining unit; TTAQ, Tarawa Terrace aquifer; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Specific yield, dimensionless	Leakance factor, dimensionless
BldgH28_MW05	BBLAQ	[4]2.7	—	—	—	—
		[3]0.6	—	—	—	—
BldgH30_MW03	BBLAQ	—	[10]26	0.011	0.0840	β=0.114
BldgH30_MW10	BBLAQ	—	[10]36	0.00065	0.0043	β=0.344
BldgLCH4022_ MW01	BBLAQ	—	[11]38	0.0013	—	—
		[9]4.9	—	—	—	—
BldgLCH4022_ MW06	BBLAQ	[9]3.2	—	—	—	—
BldgLCH4022_ MW07	BBLAQ	[9]3.9	—	—	—	—
BldgLCH4022_ MW19	BBLAQ	5.2	[6]83	—	—	—
BldgS2633_ MW04	BBLCU	[2]0.5	—	—	—	—
BldgS2633_ MW05	BBLCU	[2]1.4	—	—	—	—
HPFF_MW75	TTAQ	27	[5]800	—	—	—

[1] See Plate B1 for locations

Test method for horizontal hydraulic conductivity and transmissivity:

[2] Bouwer and Rice 1976

[3] Falling Head—Bouwer and Rice 1976

[4] Rising Head—Bouwer and Rice 1976

[5] Cooper and Jacob 1946

[6] Distance-Drawdown—Halford and Kuniansky 2002

[7] Hantush 1964

[8] Hantush and Jacob 1955

[9] Hvorslev 1951

[10] Neuman 1972

[11] Theis 1935

Data sources:

Leaking Underground Storage Tank Program files #45, #63, #67, #139, #152, #200, #276, #377, #418, #508, #543, #548, #571, #717, #758, #1994_Law_SiteAssessment

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Baker Environmental, Inc. 1993e, 1994a

Baker Environmental, Inc. and CH2M Hill, Inc. 2002b

Catlin Engineers and Scientists 1998a, 2003c

Law Engineering, Inc. 1995a, 1996ab

Law Engineering and Environmental Services, Inc. 1996c

Richard Catlin and Associates, Inc. 1995abcd, 1996be, 2001

Table B25. Hydraulic characteristics of geohydrologic units and skin factor determined at supply wells, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHCU, Upper Castle Hayne confining unit; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Leakance factor, dimensionless	Skin factor, dimensionless[2]
HP-557	UCHLU, MCHAQ	18	2,180[3]	—	—	—
HP-558	UCHLU, MCHCU, MCHAQ	13	1,690[3]	—	—	—
HP-584	MCHAQ	20	1,950[3]	—	—	—
		33	3,260[5]	—	—	–0.6
HP-585	BBUCU, BBLAQ	64	2,550[3]	—	—	—
HP-595	TTAQ	15	1,340[3]	—	—	—
		7.9	710[3]	—	—	—
		7.8	700[5]	—	—	5.0
HP-596	BBLAQ	34	2,730[3]	—	—	—
	BBLCU	23	1,850[3]	—	—	—
	TTAQ	14	1,150[5]	—	—	7.0
		24	1,930[3]	—	—	—
HP-602	TTAQ	8.9	930[5]	—	—	0.3
	TTCU	6.5	690[5]	—	—	–0.6
	UCHRBU&LU			—	—	—
	Local CU			—	—	—
HP-603	TTAQ, TTCU,	17	2,250[5]	—	—	–0.2
	UCHRBU&LU,			—	—	—
	MCHAQ			—	—	—
HP-606	TTAQ	19	2,430[5]	—	—	—
	UCHRBU&LU			—	—	—
	MCHAQ			—	—	—
HP-607 (new)	UCHRBU&LU	34	2,920[3]	—	—	—
	MCHAQ	21	1,810[3]	—	—	—
		15	1,250[5]	—	—	–0.7
HP-608	TTAQ, TTCU,	34	3,380[5]	—	—	–0.3
	UCHRBU&LU			—	—	—
HP-609	BBLAQ, TTAQ	11	910[5]	—	—	–0.4
HP-610	TTAQ	19	2,310[5]	—	—	–0.3
	UCHRBU&LU	14	1,870[3]	—	—	—
	MCHAQ			—	—	—
HP-611 (new)	UCHRBU&LU,	12	1,100[3]	—	—	—
	Local CU, MCHCU			—	—	—
HP-612 (new)	UCHRBU&LU	24	1,900[3]	—	—	—
	Local CU	14	1,160[3]	—	—	—
	MCHCU	14	1,150[5]	—	—	8.0
		11	860[3]	—	—	—

Table B25. Hydraulic characteristics of geohydrologic units and skin factor determined at supply wells, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHCU, Upper Castle Hayne confining unit; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Leakance factor, dimensionless	Skin factor, dimensionless[2]
HP-613	TTAQ	30	2,680[5]	—	—	−0.4
	UCHRBU&LU			—	—	—
HP-614 (new)	UCHRBU&LU	25	1,500[3]	—	—	—
	Local CU	28	1,670[3]	—	—	—
HP-616	UCHRBU&LU	31	2,340[5]	—	—	—
	MCHAQ	33	2,520[5]	—	—	—
HP-617 (new)	MCHAQ	29	1,470[3]	—	—	—
HP-619 (new)	UCHRBU&LU	27	2,070[3]	—	—	—
	Local CU			—	—	—
HP-620	TTAQ, karst	510	4,080[5]	—	—	—
HP-621 (old)	TTAQ	62	1,240[5]	—	—	—
HP-621 (new)	UCHRBU&LU	26	1,310[5]	—	—	9.0
		57	2,860[3]	—	—	—
HP-622	UCHRBU	17	2,060[3]	—	—	—
	MCHAQ	12	1,470[5]	—	—	−0.7
		16	1,970[3]	—	—	—
		18	1,870[5]	—	—	0.2
HP-623	TTAQ	20	2,600[3]	—	—	—
	UCHRBU&LU	26	3,450[3]	—	—	—
	Local CU	18	2,750[5]	—	—	—
	MCHAQ			—	—	—
HP-627 (old)	BBLAQ, BBLCU, TTAQ	18	1,690[5]	—	—	−0.6
HP-627 (new)	UCHRBU&LU	60	3,390[3]	—	—	—
	MCHCU	35	2,080[3]	—	—	—
		40	2,670[5]	—	—	3.0
HP-628 (new)	BBLAQ, TTAQ	25	2,100[3]	—	—	—
HP-629 (new)	TTAQ	10	1,690[3]	—	—	—
	UCHRBU&LU	10	1,700[3]	—	—	—
HP-633	TTAQ	48	7,200[5]	—	—	5.0
	UCHRBU&LU	17	2,610[5]	—	—	—
	MCHAQ			—	—	—
HP-634	TTAQ	13	1,740[5]	—	—	0.4
	TTCU	12	1,650[5]	—	—	0.2
	UCHRBU&LU			—	—	—
	Local CU			—	—	—

Table B25. Hydraulic characteristics of geohydrologic units and skin factor determined at supply wells, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHCU, Upper Castle Hayne confining unit; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Leakance factor, dimensionless	Skin factor, dimensionless[2]
HP-635	TTAQ	9.9	1,260[5]	—	—	–0.4
	UCHRBU&LU			—	—	—
	MCHCU, MCHAQ			—	—	—
HP-636	TTCU	22	2,620[5]	—	—	0.3
	UCHRBU&LU			—	—	—
	MCHCU, MCHAQ			—	—	—
HP-637	UCHRBU&LU	6.2	760[5]	—	—	–0.4
	MCHAQ	6.7	810[5]	—	—	–0.7
HP-638	TTAQ, UCHRBU	19	1,740[5]	—	—	8.0
HP-641	TTCU	49	2,920[5]	—	—	3.0
	UCHRBU&LU			—	—	—
HP-642	UCHRBU&LU	20	910[4]	—	—	—
	Local CU	4.4	370[5]	—	—	–0.7
	MCHCU, MCHAQ			—	—	—
HP-643	UCHRBU&LU	10	2,030[5]	—	—	–0.7
	LCHAQ			—	—	—
HP-644	UCHRBU, LCHAQ	10	1,790[5]	—	—	—
HP-645	UCHRBU&LU	14	2,410[5]	—	—	—
	MCHAQ			—	—	—
HP-646	UCHRBU, MCHAQ, LCHCU (?)	21	3,800[5]	—	—	–0.4
HP-647	UCHRBU, MCHAQ	26	2,890[5]	—	—	—
HP-648	UCHRBU	6.2	950[5]	—	—	–0.4
	MCHAQ	7.4	1,140[5]	—	—	—
HP-649	UCHRBU&LU	12	1,760[5]	—	—	1.0
	MCHAQ			—	—	—
HP-650	UCHRBU&LU	39	1,780[5]	—	—	3.0
HP-651	UCHRBU&LU	14	960[5]	—	—	0.7
	MCHAQ	20	1,380[5]	—	—	1.0
		18	1,210[5]	—	—	—
HP-652	UCHRBU&LU	62	3,640[5]	—	—	20
HP-653	UCHRBU&LU	42	3,360[5]	—	—	—
	MCHCU	9.9	2,090[3]	—	—	—
HP-654	TTAQ	19	2,120[5]	—	—	—
	UCHRBU, MCHAQ	23	2,490[3]	—	—	—

Table B25. Hydraulic characteristics of geohydrologic units and skin factor determined at supply wells, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHCU, Upper Castle Hayne confining unit; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Leakance factor, dimensionless	Skin factor, dimensionless[2]
HP-655	TTAQ (?)	34	1,720[5]	—	—	—
	UCHRBU (?)			—	—	—
HP-660	TTCU	4.6	420[3]	—	—	—
	UCHRBU&LU			—	—	—
HP-661	BBLAQ	15	1,260[3]	—	—	—
	TTAQ	15	1,290[3]			—
HP-662	TTAQ	15	1,650[3]	—	—	—
	UCHRBU&LU			—	—	—
HP-663	UCHRBU&LU	30	1,480[3]	—	—	—
	Local CU	25	1,240[3]	—	—	—
		23	1,130[5]	—	—	−0.2
HP-698	UCHRBU&LU	20	980[5]	—	—	—
	Local CU	18	910[3]	—	—	—
HP-699	UCHRBU&LU	40	1,980[3]	—	—	—
	Local CU	24	1,360[3]	—	—	—
		45	2,540[5]	—	—	5.0
HP-700	UCHRBU&LU	23	1,580[3]	—	—	—
		26	1,830[5]	—	—	0.0
HP-701	UCHRBU&LU	72	3,620[5]	—	—	—
		61	3,050[3]	—	—	—
HP-703	UCHRBU&LU	23	1,170[3]	—	—	—
		79	4,030[3]	—	—	—
		60	3,040[5]	—	—	1.0
HP-704	UCHRBU&LU	43	2,130[3]	—	—	—
	Local CU	36	1,780[3]	—	—	—
HP-705	UCHRBU&LU	56	3,120[5]	—	—	0.4
	Local CU	35	1,990[3]	—	—	—
		36	2,000[3]	—	—	—
HP-706	UCHRBU&LU	12	790[3]	—	—	—
	Local CU	12	740[3]	—	—	—
HP-707	UCHRBU&LU	28	1,680[5]	—	—	1.0
	Local CU	11	650[3]	—	—	—
HP-708	UCHRBU&LU	33	1,670[5]	—	—	7.0
	Local CU	39	1,970[3]	—	—	—
		54	2,720[3]	—	—	—

Table B25. Hydraulic characteristics of geohydrologic units and skin factor determined at supply wells, Hadnot Point–Holcomb Boulevard study area, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[BBLAQ, Brewster Boulevard lower aquifer; BBLCU, Brewster Boulevard lower confining unit; BBUCU, Brewster Boulevard upper confining unit; Local CU, Local confining unit; MCHAQ, Middle Castle Hayne aquifer; MCHCU, Middle Castle Hayne confining unit; TTAQ, Tarawa Terrace aquifer; UCHCU, Upper Castle Hayne confining unit; UCHLU, Upper Castle Hayne aquifer–Lower unit; UCHRBU, Upper Castle Hayne aquifer–River Bend unit; UCHRBU&LU, Upper Castle Hayne aquifer–River Bend and Lower units; karst, a zone of relatively high hydraulic conductivity indicated on driller's logs by the loss of drilling fluids at a certain depth or a sudden drop of the drill stem during drilling; —, not calculated; leakance factor: r—radial distance from pumped well to observation well and B—thickness of a confining unit (Hantush method); β factor (Neuman method)]

Site name[1]	Contributing aquifer or confining unit	Horizontal hydraulic conductivity, in feet per day	Transmissivity, in feet squared per day	Storativity, dimensionless	Leakance factor, dimensionless	Skin factor, dimensionless[2]
HP-708 observation well #1A	UCHRBU (?)	37	2,280[6]	0.00023	r/B = 0.0627	—
HP-708 observation well #2	UCHRBU (?)	40	2,490[6]	0.00020	r/B = 0.0347	—
HP-709	UCHRBU&LU	30	1,920[3]	—	—	—
	Local CU	28	1,850[3]	—	—	—
		17	1,090[5]	—	—	–0.2
HP-710	UCHRBU&LU	16	1,120[3]	—	—	—
		18	1,280[3]	—	—	—
		26	1,830[5]	—	—	2.0
HP-711	TTCU	13	1,190[3]	—	—	—
	UCHRBU	25	2,260[3]	—	—	—
		18	1,650[5]	—	—	–0.6
HP-5186	UCHRBU&LU	42	3,140[5]	—	—	0.3
LCH-4007	TTAQ, TTCU, UCHRBU&LU, Local CU, MCHCU	10	1,280[3]	—	—	—
LCH-4009	UCHRBU	19	1,040[3]	—	—	—
	Local CU	51	2,770[5]	—	—	–0.2
S190A	UCHRBU, Local CU	30	1,200[3]	—	—	—

[1] See Plate B1 for locations

[2] Step-Drawdown—Halford and Kuniansky 2002

Test method for horizontal hydraulic conductivity and transmissivity:

[3] Cooper and Jacob 1946

[4] Distance-Drawdown—Halford and Kuniansky 2002

[5] Step-Drawdown—Halford and Kuniansky 2002

[6] Hantush and Jacob 1955

[7] Theis 1935

[8] Walton 1962

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Appendix B1. Tables B1.1–B1.63

Table B1.1. Description of cuttings collected during drilling at borehole T-1, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Plate B1 for location; location coordinates are North 355030 and East 2507870, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 32.1 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Cuttings description
0–7	Yellow clay, medium hard
7–12	Blue clay, fairly soft
12–22	White sand, washed down
22–32	Gray sand, washed down
32–41	Gray sand, washed down
41–52	“Shellrock,” not too hard
52–62	“Shellrock,” not too hard
62–67	“Shellrock,” not too hard
67–77	Fine- to medium-grain pepper sand, washed
77–87	Fine- to medium-grain pepper sand, washed
87–97	Fine- to medium-grain pepper sand, washed
97–105	Fine to medium sandy clay, streaks of shellrock
105–115	“Shellrock” and sand, soft
115–127	“Shellrock” and sand, soft
127–137	Sand and soft “shellrock,” trace of clay
137–147	Sand and soft “shellrock,” trace of clay
147–158	Medium soft “shellrock” and sand
158–167	Medium soft clay and “rock”
167–177	Loose fine sand to medium sand, washed from 172 to 177 feet
177–187	Fine to medium gray sand, washed down
187–197	Fine to medium gray sand, washed down
197–207	Fine to medium gray sand, washed down, hole taking water
207–217	Fine to medium gray sand, washed down, hole taking water
217–227	Fine to medium gray sand, washed down, hole taking water
227–237	Fine to medium gray soft sand, washed down, hole taking water
237–247	Clay and some soft “rock”
247–260	Soft sandy clay
260–270	Fine pepper sand, washed a little
270–277	Fine pepper sand, washed a little
277–286	Greenish sand, soft
286–296	Soft sandy clay, streaks of soft “rock”
296–305	Soft sandy clay, streaks of soft “rock”
305–311	Sandy clay, medium hard
311–322	“Shellrock” and sand, hard streaks
322–332	“Shellrock” and sand, hard streaks
332–338	Sand with streaks of shellrock
338–352	Sandy clay, medium soft
352–362	Sandy clay, medium soft
362–372	Clay and “rock” in streaks, medium hard
372–382	Sandy clay with streaks of “rock”
382–392	Sand and streaks of “rock,” hard
392–402	Sand and streaks of “rock,” hard
402–412	Sand and streaks of “rock,” hard
412–417	Soft fine to medium sand, washed from 408 to 417 feet
417–427	Soft fine to medium sand and streaks of “rock”
427–437	Medium sand and “rock” in streaks, washed a little
437–447	Medium sand and “rock” in streaks, washed a little
447–458	Sandy clay and hard “rock” in streaks
458–468	Hard sandy clay
468–477	Medium soft sandy clay

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Table B1.2. Description of cuttings collected during drilling at borehole T-4, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Plate B1 for location; location coordinates are North 345730 and East 2503610, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 29.1 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Cuttings description
0–10	Loose sand, yellow
10–20	Loose sand, white
20–30	Loose white sand
30–40	White sand, tight
40–52	White sand, tight
52–62	Sand clay and shell, tight
62–66	Shell and sand, hard
66–72	Loose brown sand
72–82	Loose brown sand
82–92	Loose sand
92–102	Loose sand
102–112	Fine gray sand and shells, tight
112–122	Sand and shell, loose
122–134	“Shellrock,” soft
134–142	“Shellrock,” hard
142–148	“Shellrock,” hard
148–158	“Shellrock,” and sand, alternately hard and soft
158–168	“Shellrock,” and sand, alternately hard and soft
168–178	“Shellrock,” and sand, alternately hard and soft
178–188	Loose sand
188–218	Loose sand
218–228	Sand and shells, tight, streaks clay
228–240	Sandy clay and shells, tight
240–254	Sand and shells
254–262	Clay, hard

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Table B1.3. Description of cuttings collected during drilling at borehole T-7, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Plate B1 for location; location coordinates are North 349685 and East 2500628, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.5 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Cuttings description
0–5	Gray sandy clay
5–10	Medium white sand
10–32	Blue to black clay, trace of wood
32–39	Medium light gray sand
39–43	Gray sandy clay with shell fragments
43–50	Shells and gray sand
50–60	Medium white sand
60–80	Medium to fine light-gray sand
80–95	Fine light-gray sand
95–120	Medium gray sand and streaks of “shellrock”
120–126	Loose shells and medium sand
126–129	“Shellrock”
129–152	Medium gray sand and streaks of “shellrock”
152–154	Fine gray sand
154–170	Medium gray sand and loose shells
170–182	Fine gray sand and loose shells
182–194	Medium gray sand and streak of “shellrock”
194–214	Fine gray sand
214–225	Fine gray sand and clay

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Table B1.4. Description of cuttings collected during drilling at borehole T-8, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Plate B1 for location; location coordinates are North 328600 and East 2499550, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 6.4 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Cuttings description
0–12	Soft yellow sand
12–20	Sand and clay mixed, not very hard
20–27	Clay, medium soft
27–37	Loose sand and shells, tight streaks, washed down in places
37–46	Loose sand and shells, tight streaks, washed down in places
46–57	Loose sand and some “shellrock”
57–63	Soft “shellrock” and sand, tight in places
63–69	Soft “shellrock” and sand, tight in places
69–77	Soft “shellrock” and coarse sand, hard last 3 feet
77–86	“Shellrock,” varying degrees of hardness
86–96	“Shellrock,” varying degrees of hardness, also some very fine sand
96–102	“Shellrock” and fine loose sand
102–110	“Shellrock” and fine loose sand
110–119	Sand and steaks of “shellrock,” washed down in places
119–127	Sand and steaks of “shellrock,” washed down in places
127–137	Sand and steaks of “shellrock,” washed down in places
137–147	“Shellrock” and sand in streaks, loose, medium sand
147–157	“Shellrock” and sand in streaks, loose, medium sand, predominantly sand
157–167	Fine sand, some “rock,” tight
167–177	Loose sand and “shellrock”
177–187	Loose fine sand and “shellrock”
187–197	Loose fine sand and “shellrock”
197–202	Loose fine sand and “shellrock”
202–212	Fine to medium sand and “rock” in streaks
212–218	Fine to medium sand and “rock” in streaks
218–227	Fine sandy clay, little “rock,” soft
227–237	Fine sandy clay, little “rock,” soft
237–247	Fine sandy clay, little “rock,” soft
247–257	Clay and trace of fine sand, medium soft
257–267	Greenish tinted clay, not very hard
267–277	Greenish tinted clay, not very hard
277–287	Greenish tinted clay, not very hard
287–293	Greenish tinted clay, not very hard
293–305	Medium hard clay and some “rock”
305–315	“Shellrock,” hard in streaks at 305 and 307 feet
315–327	“Shellrock,” hard in streaks at 324 and 326 feet
327–336	Sand and medium hard streaks of “shellrock”
336–346	Sand and “shellrock,” soft
346–352	Sand and “shellrock,” soft
352–358	Soft black clay
358–368	Soft black clay and streaks of hard “rock”
368–377	Soft black clay and streaks of hard “rock”
377–387	Hard black clay and streaks of hard “rock”
387–397	Hard black clay and streaks of hard “rock”
397–405	Hard black clay and streaks of hard “rock,” trace of sand
405–415	Hard black clay and streaks of hard “rock,” trace of sand
415–427	Medium sand and sandstone, hard streaks but washed down in places
427–437	Medium sandy clay and sandstone, mostly hard
437–447	Medium sandy clay and sandstone, mostly hard
447–456	Sandy clay and streaks of “rock,” medium hardness
456–466	Soft sandy clay
466–477	Loose very fine sand
477–487	Loose very fine sand and trace of clay
487–497	Loose very fine sand and trace of clay
497–502	Loose very fine sand and trace of clay

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Table B1.5. Description of cuttings collected during drilling at borehole T-12, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Plate B1 for location; location coordinates are North 355830 and East 2476550, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 6.6 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Cuttings description
0–3	Top soil, sand, soft
3–4	Sandy clay, medium soft
4–12	Clay, medium hard
12–27	Medium sand, brown, soft, 2 feet of blue clay 18–20 feet
27–39	Medium sand, gray, washed, tight at 35 feet
39–52	“Shellrock,” soft
52–65	“Shellrock” and sand in streaks
65–77	“Shellrock” and sand in streaks, streaks of “shellrock,” hard
77–87	Sand and “shellrock” in streaks
87–102	“Shellrock,” soft
102–114	Clay, gray, soft, hard place at 116 feet, “rock”
114–127	Clay, gray, soft; two streaks of “rock”
127–139	Fine sandy clay with streaks of “rock”
139–152	Fine sandy clay with streaks of “rock”
152–165	Greenish clay, soft
165–177	Sandy clay, soft
177–188	Sandy clay, soft, mostly fine sand
188–202	Fine sand and “shellrock” in streaks, hard 188–191 feet
202–217	Soft “shellrock” and sand in streaks
217–227	Hard “shellrock” and medium to fine sand, in streaks
227–238	“Shellrock” and fine sand
238–252	Hard “shellrock” and sand in streaks, hard at 243 feet
252–267	Fine sand and streaks of “rock,” 1 hour and 45 minutes to drill
267–277	Fine sand and streaks of “rock,” hole drank some water
277–289	Fine sand and streaks of “rock,” 2.5 hours to drill 25 feet
289–302	Fine sand and streaks of “rock”
302–315	Sand, clay, and “rock” in streaks, 1 hour and 15 minutes to drill
315–327	Sand, clay, and “rock” in streaks, 1 hour and 15 minutes to drill
327–339	Clay, real soft
339–352	Clay, real soft

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina, and U.S. Marine Corps Base Camp Lejeune, North Carolina

Table B1.6. Description of cores collected during drilling at Installation Restoration Program Site 1 (Figure B2), monitor well 01-GW16DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C2, for monitor-well location; location coordinates are North 332642 and East 2501970, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 20.8 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010; *(cemented matrix?)*, italics are author's annotation]

Depth below land surface, in feet	Core description
0–1	Silty sand, fine grained, brown to tan, very dense
1–11	Sand, fine grained with trace silt, brown to brownish orange, loose to medium dense
11–17	Sand, fine grained with trace silt, yellowish brown with orange to tan to dark brown to brown, medium dense
20–22	Sand, fine grained with trace silt, light brown, loose
25–27	Sand, fine grained with trace silt, light brown, medium dense
30–32	Sand, fine to medium grained with trace silt, light green with orange (oxidation), loose
35–37	Sand, fine to medium grained with trace silt, brown with orange (oxidation), medium dense
40–42	Sand, fine grained with some medium sand and trace silt, light brown, medium dense
45–47	Sand, fine to medium grained with trace silt and some shell material, light brown and white, dense
50–52	Sand, fine to medium grained with trace silt, gray, dense
55–57	Sand, fine to medium grained with trace silt and shell fragments, brown and white, very dense
60–62	Sand, fine to medium with trace silt and shell material, fragments, dark green and white, very dense
65–67	Silty sand, fine grained with some clay, light green to green, dense to hard
70–72	Sand, fine grained with trace silt and some shell material, fragments, green to white, dense
75–77	Sand, fine grained with trace silt, green, very dense
80–82	Sand, fine grained with trace silt, green, very dense
85–87	No recovery *(cemented matrix?)*
90–92	Sand, fine grained with trace silt and shell fragments, green to white to gray
95–97	No recovery *(cemented matrix?)*
100–102	Sand, fine grained with trace silt and shell fragments (0 to 0.1 foot). Fossiliferous limestone (0.1 to 0.2 foot; Castle Hayne Formation). Sand, fine grained with trace silt and shell fragments. Micrite is cement (matrix only). Light green and white, dense
105–107	Sand, fine to medium grained with trace silt and shell fragments, green and white, dense
110–112	Sand, fine grained with trace silt and shell fragments, green and white, dense
115–117	Sand, fine grained with trace silt and some shell fragments, greenish gray and white, dense
120–122	Sand, fine grained with trace silt and shell fragments, green and white, dense

Data sources:

CERCLA Administrative Record file #1505

Baker Environmental, Inc. 1995c

Faye et al. 2010

Table B1.7. Description of cores collected during drilling at Installation Restoration Program Site 1 (Figure B2), monitor well 01-GW17DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C2 for monitor-well location; location coordinates are North 333674 and East 2502775, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 19.1 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010; *(formation unstable?)*, italics are author's annotation]

Depth below land surface, in feet	Core description
0–1	Silty sand, fine grained with trace gravel, brown, very loose
1–3	Sand, fine grained with trace silt and gravel, brown
3–11	Sand, fine grained with trace silt and some clay, light gray to light brown, loose to medium stiff
11–13	Sand, fine grained with trace silt, light brown
15–17	Sand, fine to medium grained with trace silt and some silty clay, brown to grayish green, loose to medium stiff
20–22	No recovery *(formation unstable?)*
25–27	Fossiliferous limestone with shell fragments and micrite cement acting as matrix only, gray and white, medium dense
30–32	No sampling due to instability of formation during drilling
37–39	Sand fine grained with trace silt and shell fragments, brown, very dense
45–47	Sand, fine to medium grained with trace silt, gray, very dense
50–52	Sand, fine to medium grained with trace silt and shell fragments. Micrite cement is matrix (bottom half of sample only)
55–57	Sand, fine to medium grained with trace silt, gray, very dense
60–62	Sand, fine to medium grained with trace silt, greenish gray, very dense
65–67	Sand, fine to medium grained with trace silt and shell fragments, greenish gray, very dense
70–72	Sand, fine to medium grained with trace silt and shell fragments, greenish gray, very dense
75–77	Sand, fine grained with trace silt and shell fragment(*s*), greenish gray to gray, very dense
80–82	Sand, fine grained with trace silt and shell fragments, greenish gray to gray, very dense
85–87	Sand, fine grained with trace silt, greenish gray, very dense
90–92	Sand, fine grained with trace silt, greenish gray, very dense
95–97	Sand, fine to medium grained with trace silt and shell fragments, gray, very dense
100–102	Sand, fine grained with trace silt and shell fragments. Micrite is cement acting as matrix. Light green and white, very dense
105–107	Sand, fine grained with trace silt and shell fragments (0 to 0.1 foot). Fossiliferous limestone (0.1 to 0.2 foot; Castle Hayne Formation). Sand fine grained with trace silt and shell fragments, greenish gray and white
110–112	Sand, fine grained with trace silt and shell fragments, greenish gray and white, very dense
115–117	Sand, fine to medium grained with trace silt and shell fragments, greenish gray and white, very dense

Data sources:

CERCLA Administrative Record file #1505

Baker Environmental, Inc. 1995c

Faye et al. 2010

Table B1.8. Description of cores collected during drilling at Installation Restoration Program Site 2 (Figure B2), monitor well 02-GW03DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C3, for monitor-well location; location coordinates are North 356275 and East 2498552, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 33.1 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–2	3-inch top soil, clay, trace fine sand, very stiff
2–4	Silt, trace clay, little sand-fine, gray, loose
4–6	Silt and clay, trace sand-fine, gray, medium dense
10–12	Silt and sand-fine, gray, loose
15–17	Clay, gray, soft
20–22	3-inch sand, fine, gray, 1-inch fine sand, white, medium dense
22–24	Sand, fine, trace silt, gray, medium dense
24–26	1-inch limestone gravel-fine, gray, sand-fine, some silt, gray, medium dense
26–28	Clay, gray, stiff, 6-inch sand, fine, some clay, gray
28–30	Sand, fine, and clay, gray, stiff
35–37	Sand, fine, little silt, gray, medium dense
40–42	Sand, fine, little silt, gray, dense
45–47	Sand, fine, little silt, gray, medium dense
50–52	Sand, fine, little silt, very dense, gray
55–57	Sand, fine, little silt, very dense, gray
60–62	Sand, fine, little silt, gray, very dense
65–67	Sand, fine, very dense
70–72	Sand, fine, little silt, very dense, green
75–77	Sand, fine and silt, trace clay, green, loose
80–82	Sand, fine and silt, loose, green
85–87	Sand, fine and silt, trace clay, green
90–92	Sand, fine and silt and clay, green, very dense
95–97	Sand, fine, limestone fragments white, lime mud, very dense

Data sources:

CERCLA Administrative Record file #1706

Baker Environmental, Inc. 1996g

Faye et al. 2010

Table B1.9. Description of cores collected during drilling at Installation Restoration Program Site 2 (Figure B2), monitor well 02-GW03IW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C3, for monitor-well location; location coordinates are North 356271 and East 2498535, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 32.8 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Core description
40–42	Light gray, fine grained, sand, trace silt, dense
42–44	Same material, “loose”
44–46	Light gray, fine grained, sand with little silt, medium dense
46–48	Light gray, fine grained, sand, with trace silt, very dense
48–50	Same as above (46–48 feet)
50–52	Light gray, fine grained, sand, very dense
52–54	Same as above (50–52 feet)
54–56	No recovery, very dense
56–58	Light gray, fine grained, sand, very dense
58–60	Light gray, fine grained, sand, very dense
60–62	Light gray, fine grained, sand with trace silt, dense
62–64	Light gray, fine grained, sand with trace silt, very dense
64–66	Light gray, fine grained, sand
66–68	Light gray, fine grained, sand, very dense
68–70	Light gray, fine grained, sand, very dense

Data sources;

CERCLA Administrative Record file #1774

Baker Environmental, Inc. 1997b

Faye et al. 2010

Table B1.10. Description of cores collected during drilling at Installation Restoration Program Site 2 (Figure B2), monitor well 02-GW12, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C3, for monitor-well location; location coordinates are North 356375 and East 2498488, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 31.5 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
1–3	Dark gray to black, fine grained, sand, some silt, loose
3–5	Very loose, black, fine grained, sand and silt
5–7	Very loose, black, fine grained, sand and silt
7–9	Black, fine-grained sand, light gray, fine grained, sand with little silt
9–11	Loose, light gray, fine grained, sand
11–13	Loose, light gray, fine grained, sand, change to light gray silt, trace clay
13–15	Very soft, light gray silt, trace clay
15–17	Same silt to 16 feet, then change to silt and fine-grained sand
17–19	Light gray, fine grained, sand and silt
19–21	Very light gray to white, variegated, fine grained, sand
21–23	Light gray to white, fine grained, sand
23–25	Same material as above, slightly coarser
25–27	Light gray, fine to medium grain, sand to silt, somewhat coarser
27–29	Fine to medium grain, sand to silt, starting to take on silty, greener color
29–30	Fine to medium grain, sand to silt, light green to gray

Data sources:

CERCLA Administrative Record file #1774

Baker Environmental, Inc. 1997b

Faye et al. 2010

Table B1.11. Description of cores collected during drilling at Installation Restoration Program Site 3 (Figure B2), monitor well 03-MW02DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C4, for monitor-well location; location coordinates are North 352801 and East 2500072, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 32.2 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–3	Silty sand, fine grained, trace clay, dark grayish brown, very loose to medium dense
3–22	Sand, fine grained, trace silt, trace clay, dark brownish gray to buff light gray, medium dense to loose
22–24	Silty clay, dark greenish gray, soft to very soft
24–26	Sand, fine grained, trace silt, some to little clay, gray to greenish gray to dark greenish gray, very dense to loose to medium dense
30–32	Same as above (24–26 feet)
35–37	Same as above (24–26 feet)
40–42	Same as above (24–26 feet)
45–47	Same as above (24–26 feet)
50–52	Sand, fine grained, trace silt, trace to little shell fragments, dark greenish gray to gray to white, dense to very dense
55–57	Same as above (50–52 feet)
60–62	Same as above (50–52 feet)
65–67	Same as above (50–52 feet)
70–72	Same as above (50–52 feet)
75–77	Same as above (50–52 feet)
80–82	Sand, fine to medium grained, trace silt, trace shell fragments, dark greenish gray to gray to white, very dense
85–87	Same as above (80–82 feet)
92–94	Sand and silt, fine grained, little clay, trace shell fragments, dark green, dense
99–100	Shell fragments, some silt, little clay, gray, very dense
101–102	Silt, some shell fragments, little to some clay, gray, hard
104–106	Sand and silt, little to some clay, trace shell fragments, taupe, hard
109–111	Same as above (104–106 feet)
114–116	Shell fragments, little silt and clay, gray, very dense
119–121	Same as above (114–116 feet)
124–126	Sand, fine to medium grained, little silt, trace shell fragments and clay, dark gray, dense to very dense
129–130	Same as above (124–126 feet)
134–135	Same as above (124–126 feet)

Data sources:

CERCLA Administrative Record file #206

Baker Environmental, Inc. 1996a

Faye et al. 2010

Table B1.12. Description of cores collected during drilling at Installation Restoration Program Site 3 (Figure B2), monitor well 03-MW11IW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C4, for monitor-well location; location coordinates are North 352544 and East 2499897, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 30.3 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–3	Silty sand, fine grained, dark, grayish brown, medium dense
3–5	Silty clay, little fine grained, dark brown to yellowish brown, medium stiff
5–14	Sand, fine grained, trace silt, trace clay, dark gray to brown, medium dense to loose
20–22	Same as above (5–14 feet)
25–27	Same as above (5–14 feet)
30–32	Sand, fine to medium grained, trace silt, light gray, medium dense
32–34	Silty clay, with fine to coarse-grained sand, trace fine gravel, light gray, soft to very loose
36–38	Sand, fine to medium grained, trace silt, light gray to light greenish gray, loose to medium dense to very dense
38–40	Same as above (36–38 feet)
45–47	Same as above (36–38 feet)
50–52	Sand, fine to medium grained, trace silt, trace shell fragments at 65–67 feet, gray to white to greenish gray, dense to medium dense to very dense
55–57	Same as above (50–52 feet)
60–62	Same as above (50–52 feet)
65–67	Same as above (50–52 feet)
70–72	Same as above (50–52 feet)
75–77	Same as above (50–52 feet)
80–82	Sand, fine to medium grained, trace silt, dark greenish gray, very dense
85–87	Same as above (80–82 feet)

Data sources:

CERCLA Administrative Record file #1700

Baker Environmental, Inc. 1996e

Faye et al. 2010

Table B1.13. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW01D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 348137 and East 2503363, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 32.8 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
12.0–12.5	Sand, fine, some silt, brown, medium dense, mottled orange
12.5–13.5	Clay, some sand, fine, gray
13.5–14.0	Sand, fine, little silt, medium dense, brown
16.0–18.0	Four inches sand, fine, trace silt, light gray, loose, sand, fine, little silt, dark brown with white streaks
18.0–19.0	Sand, fine, little silt, dark brown, loose
19.0–20.5	Silt, trace sand, fine, dark brown, medium dense
20.5–22.0	Sand, fine, trace silt, white
25.0–27.0	Two inches clay, trace sand, fine, gray, medium dense, sand, fine, trace silt, brown, medium dense
30.0–32.0	Sand, fine, trace silt, green, loose
35.0–37.0	Sand, fine, trace silt, gray, very dense
40.0–42.0	Sand, fine, little silt, light gray to green, medium dense
45.0–46.5	Sand, fine, some silt, little clay, gray, dense
46.5–47.0	Limestone fragments/mud, some sand, fine, some shell fragments
50.0–52.0	Sand, fine, and silt, some clay, blue gray, medium dense
55.0–55.5	Sand, fine, and silt, little clay, blue gray, medium dense, split-spoon refusal
55.5–56.0	Limestone fragments white
60.0–62.0	Sand, fine, little silt, trace limestone fragments, gray, very dense
65.0–67.0	Sandy limestone fragments, some silt, gray, very dense, split-spoon refusal
70.0–72.0	Limestone fragments, trace shell fragments, trace silt, gray, very dense, split-spoon refusal
75.0–77.0	Sand, fine, some silt, trace shell fragments, gray, very dense
80.0–82.0	Sand, fine, little silt, trace shell fragments, gray, very dense, split-spoon refusal
85.0–87.0	Sand, fine, little silt, trace shell fragments, gray, very dense, split-spoon refusal
90.0–92.0	Sand, fine, some silt, trace shell fragments, gray, very dense, split-spoon refusal
95.0–97.0	Sand, fine, little silt, little limestone fragments, trace shell fragments, gray, very dense, split spoon refusal
100.0–102.0	Sand, fine, little silt, trace shell fragments, gray, very dense, no recovery on first attempt to sample, split-spoon sample
105.0–107.0	Sand, fine, some silt, trace clay, trace shell fragments, gray, very dense, split-spoon refusal
110.0–112.0	Limestone fragments/limey mud, trace shell fragments, white, very dense
115.0–117.0	Limey mud, some clay, trace silt, trace shell fragments, white, very dense, split-spoon refusal

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.14. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW01DA, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 348320 and East 2503384, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 32.7 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010; *(cavernous limestone?)*, italics are author's annotation]

Depth below land surface, in feet	Core description
0–0.5	Four inches top soil, sand, fine to coarse, trace organics, black
0.5–3.5	Sand, fine to coarse, trace silt, gray, medium dense
3.5–6.0	Sand, fine to medium, trace silt, light tan brown, mottled, loose to medium dense
6.0–8.0	Same as above
8.0–10.0	Same as above
10.0–12.0	Sand, fine to medium, trace silt, light tan brown, mottled, loose to medium dense
14.0–15.0	Sand, fine to medium, clayey, rust brown
15.0–17.0	Clay, fine to medium, sandy, trace sand at 16 feet, black, soft
20.0–22.0	Sand, fine to medium, trace silt, light gray, medium dense
25.0–27.0	Sand, fine to coarse, gray clay lenses, tan, dense, tan, mottled, rusty at 27 feet
30.0–32.0	Sand, fine to medium, clay lenses, tan, rust, mottled, medium dense
35.0–37.0	Sand, fine to coarse, trace silt, rust orange
40.0–42.0	Sand, fine to coarse, trace silt, 1 inch black, silty clay layer at 40 feet, black to dark gray, medium dense
45.0–47.0	Sand, fine to coarse, trace silt, trace clay at 45.8 feet, 3 inches gray, fine to coarse, sandy, clay layer at 46 feet, black, loose
50.0–51.0	Sand, fine to medium, trace silt, clay, shells, dark gray, very dense
55.0–57.0	Clay, fine to coarse, sandy, trace shells, gray, stiff
60.0–62.0	Sand, fine to coarse, trace fine to coarse gravel-sized cemented sandy shells, trace silt, shells, gray, loose
65.0–67.0	Sand, fine to coarse, gravel, fine, trace silt, shells, fine to gravel-sized cemented sand, gray, very dense
70.0–71.0	Sand, fine to coarse, trace shell fragments, gray, very dense
75.0–76.0	Sand, fine to coarse, trace shell fragments, gray, very dense
80.0–81.0	Same as above
85.0–87.0	Sand, fine to coarse, some shells, trace silt, gray, dense
90.0–90.5	Sand, fine to coarse, trace shells, silt, gray, very dense
95.0–95.9	Sand, fine to coarse, trace shells, silt, gray, very dense
100.0–101.0	Sand, fine to coarse, trace shells, silt, gray, very dense
105.0–105.9	Sand, fine to coarse, some silt, trace clay, gray-green, very dense
110.0–110.5	Sand, fine to medium, trace clay, gray-green, very dense
115.0–116.0	Clay, fine to coarse, sandy, trace shells, medium brown, very dense
116.0–116.9	Sand, fine to coarse, some clay, trace silt, shells, medium brown, very dense
120.0–122.0	Same as above
125.0–126.5	Sand, medium to coarse, trace silt, green, very dense
127.0	Ground surface caved—loss of circulation *(cavernous limestone?)*
130.0–132.0	Sand, medium to coarse, trace silt, shells, green-gray, very dense
135.0–137.0	Sand, medium to coarse, trace silt, shells, green, dense
140.0–141.0	Sand, medium to coarse, some shells, gray, very dense
145.0–146.5	Sand, fine to coarse, trace silt, fine to coarse gravel-sized cement sand/shells, gray, very dense
150.0–150.8	Sand, fine to coarse and fine to coarse gravel-sized cemented sand, trace shells, gray, very dense
155.0–157.0	Sand, fine to coarse and fine to coarse gravel-sized cemented sand, trace shells, gray, very dense
165.0–166.5	Sand, fine to medium, trace silt, clay, shells, green-gray, very dense
175.0–176.5	Sand, fine to medium, trace silt, clay, shells, green-gray, very dense
185.0–186.0	Sand, fine to medium, trace silt, clay, shells, green-gray, very dense
195.0–197.0	Sand, fine to coarse and gravel fine to coarse, trace clay, silt, shells, gray, dense
205.0–205.8	Sand, fine to medium, trace silt, clay, shells, gray-green, very dense
215.0–215.5	Sand, fine to medium, some silt, trace clay, gray-green, very dense
225.0–226.5	Sand, fine to medium, silty, trace clay, gray, very dense
235.0–236.5	Clay, fine, sandy, gray, hard

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.15. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-MW03D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 347811 and East 2504501, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 34.2 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–2.0	Two-inch black top soil at surface, sand, fine to medium, trace clay, silt, rust colored, mottled at 1.5 feet, tan, loose
2.0–4.0	Sand, fine to medium, trace silt, light gray, medium dense
4.0–6.0	Sand, fine to coarse, trace silt, light gray, medium dense
6.0–8.0	Sand, fine to coarse, trace silt, light gray, medium dense
10.0–12.0	Sand, fine to coarse, trace silt, light gray, medium dense
15.0–17.0	Sand, fine to medium, some clay, trace silt, dark gray, soft
20.0–22.0	Interlayered dark gray clay, trace fine sand with dark gray sand, fine to medium, some clay, soft
25.0–27.0	Same as above, two silty, fine sand lenses at approximately 25.5 feet, dark gray, medium stiff
30.0–31.5	Sand, fine to coarse, trace silt, light gray, dense
35.0–36.5	Sand, fine to medium, trace silt, medium gray, dense
40.0–41.5	Sand, fine to medium, trace silt, medium gray, dense, trace clay, medium gray, dense
45.0–46.5	Same as above, thin approximately 1/8-inch green silty clay lenses, medium gray, very dense
50.0–51.5	Same as above, dark gray, medium dense
55.0–56.5	Sand, fine to coarse, clayey, trace shells, medium gray, very dense
60.0–60.8	Sand, fine to coarse and gravel, fine to coarse (dolomite), trace dolomitized shells, silt, gray, very dense, split-spoon refusal
65.0–66.5	Sand, fine to coarse, trace shells, silt, gray, dense
70.0–71.5	Sand, fine to coarse, trace shells, silt, gray, dense
75.0–75.5	Sand, fine to coarse, trace shells, silt, gray, dense
85.0–86.5	Sand, fine to coarse, and gravel, fine, trace shells, silt, clay, gray, dense
90.0–90.8	Sand, fine to coarse, trace silt and shells, gray, very dense
95.0–95.5	Sand, fine to coarse, trace silt and shells, gray, very dense
100.0–101.0	Sand, fine to coarse, trace silt and shells, gray, very dense
105.0–106.4	Sand, fine to medium, trace silt, clay, and shells, gray, very dense
110.0–111.5	Sand, fine to coarse, trace gravel, fine, dolomitized shells, silt, clay, gray, very dense
115.0–116.5	Sand, fine to coarse, trace gravel, fine, dolomitized shells, silt, clay, gray, very dense, some gravel, fine, light gray, dense
120.0–121.5	Sand, fine to coarse, gravel, fine to coarse, trace fossils, silt, clay, dolomitized shells, light gray, dense
125.0–126.5	Sand, fine to coarse, some silt, trace shells, green-gray, very dense
130.0–131.5	Sand, fine to coarse, some shells, trace silt, dolomitized shells, green-gray, very dense
140.0–140.8	Sand, fine to coarse, trace shells, silt, gray, very dense, split-spoon refusal
150.0–150.5	Sand, fine to coarse, trace shells, silt, fine to coarse gravel-sized cemented sand and shells, dolomitized shells, gray, very dense
160.0–160.9	Sand, fine to medium, trace silt, shells, green-gray, very dense
170.0–170.8	Sand, fine to coarse, trace shells, silt, gray, very dense, split-spoon refusal
180.0–181.3	Sand, fine to medium, trace silt, clay, shells, green-gray, very dense, split-spoon refusal
190.0–190.8	Sand, fine to medium, trace fine to coarse gravel-sized limestone, “fragmenting,” silt, green-gray, very dense, split-spoon refusal
200.0–201.5	Sand, fine to medium, some silt, green-gray, very dense

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.16. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW15D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 347767 and East 2503174, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.2 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Sand, fine to coarse, trace silt, trace organics 0–6 inches, brown loose
4.0–6.0	Sand, fine to coarse, brown sand, fine to coarse, trace silt, dark brown, medium dense
10.0–12.0	Sand, fine, some silt, brown, medium dense, mottled orange
12.0–14.0	Sand, fine, little silt, medium dense, brown
20.0–22.0	Two-inch sand, fine to coarse, trace white coarse sand layer at 20 feet, rust brown, 5-inch clayey fine to coarse sand layer at 20.5 feet, black; sand, fine to coarse, trace silt, tan, loose
25.0–27.0	Four-inch clayey, fine to coarse, sand layer at 25 feet, black; sand, fine to coarse, rusty, medium dense
30.0–32.0	Sand, fine to coarse, rusty brown, medium dense
35.0–37.0	Sand, fine to coarse, rusty brown, dense
40.0–42.0	Sand, fine to coarse, trace silt, rusty brown to mottled tan, medium dense
45.0–47.0	Sand, fine to coarse, trace silt, dark gray, medium dense; bottom 8-inch sand, fine to medium, trace clay, silt, dark gray
50.0–52.0	Sand, fine to coarse, trace silt, tan, medium dense; sand, fine to coarse, trace silt, gray
110.0–112.0	Sand, fine to coarse and gravel, fine, trace silt, clay; dolomitized shells, fine to coarse gravel-sized cemented sand, gray, very dense
115.0–117.0	Sand, fine to coarse, some fine gravel, trace clay, silt; dolomitized shells, gray, medium dense
120.0–122.0	Sand, fine to coarse, trace shells, clay, fine to coarse gravel size; cemented sand, gray/green, dense
130.0–132.0	Sand, fine to coarse, trace shells, clay, fine to coarse gravel size; cemented sand, green, dense
140.0–141.4	Sand, medium to coarse, trace silt, shells; cemented sand, fragmentary, green/gray, very dense
150.0–150.8	Sand, medium to coarse, trace silt, shells; cemented sand, fragmentary, green/gray, very dense
155.8–156.4	Sand, medium to coarse, trace silt, shells; cemented sand, fragmentary, some silt, green/gray, very dense

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.17. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW30DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 349532 and East 2503730, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 9.9 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Sand, fine to medium, trace silt, tan, loose
2.0–4.0	Sand, fine to coarse, fine gravel, light gray, medium dense
4.0–6.0	Six inches tan, fine to medium sand at 4.5–5.0 feet, sand, fine to coarse, trace clay, black, loose
6.0–8.0	Sand, coarse, trace of fine to medium sand, light tan, medium dense
8.0–10.0	Sand, fine to coarse, trace silt, clayey sand layer at 9.5 feet, light gray, medium dense
15.0–16.5	Sand, fine to coarse and fine to coarse gravel and rock fragments, trace silt, gray, very dense
20.0–21.5	Sand, fine to coarse, trace silt, gray, very dense
25.0–25.7	Sand, fine to coarse, trace silt, gray, very dense, split-spoon refusal
30.0–30.9	Sand, fine to medium, trace silt, silt, gray, very dense
35.0–35.9	Sand, fine to coarse, trace silt, fine gravel, shells, gray, very dense, split-spoon refusal
40.0–40.8	Sand, fine to coarse, trace silt, shells, gray, very dense, split-spoon refusal
45.0–45.75	Sand, fine to coarse, trace silt, shells, gray, very dense, split-spoon refusal
50.0–50.4	Sand, fine to coarse, trace silt, shells, gray, very dense split-spoon refusal
55.0–55.4	Sand, fine to coarse, trace clay, silt, shells, gray, very dense, split-spoon refusal
60.0–61.4	Sand, fine to coarse, trace clay, silt, shells, gray, very dense, split-spoon refusal
65.0–65.2	Sand, fine to coarse, trace silt, shells, gray, very dense, split-spoon refusal
70.0–71.2	Sand, fine to coarse, trace silt, clay, shells, gray, very dense, split-spoon refusal
75.0–75.2	Sand, fine to coarse, trace clay, silt, shells, gray, very dense, split-spoon refusal
80.0–80.4	Sand fine to coarse, trace clay, silt, shells, gray, very dense, split-spoon refusal
85.0–86.3	Sand, fine to coarse and fine to coarse gravel (limestone fragments), some clay, trace silt, shells, gray, very dense
90.0–91.2	Sand, fine to coarse and fine to coarse gravel (limestone fragments), some clay, trace silt, shells, gray, very dense, split-spoon refusal
95.0– 96.2	Sand, fine to coarse and fine to coarse gravel (limestone fragments), some clay, trace silt, shells, gray, very dense, split-spoon refusal
100.0–101.5	Sand, fine to coarse and fine to coarse gravel (limestone fragments), some clay, trace silt, shells, gray, very dense, split-spoon refusal
105.0–106.4	Sand, fine to coarse, some silt, trace clay, shells, gray, very dense, split-spoon refusal
110.0–111.3	Sand, fine to coarse, some silt, trace fine to coarse gravel, shells, gray, very dense, 3 inches dark gray to black coarse sand, trace shells 111–111.3 feet
115.0–115.5	Sand fine to coarse, gray, very dense
120.0–120.5	Same as above (115.0–115.5)
130.0–130.2	Same as above (115.0–115.5), split-spoon refusal
140.0–140.4	Sand, fine to coarse, trace clay, fine gravel, shells, gray-green, very dense, split-spoon refusal
150.0–151.3	Sand, fine to coarse, trace silt, shells, brown-green, very dense, split-spoon refusal
160.0–161.5	Sand, fine to coarse, trace silt, shells, brown-green, very dense, split-spoon refusal

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.18. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW35D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 349394 and East 2501254, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 12.0 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Sand, fine to medium, trace silt, clay, brown, medium dense, 6-inch black, clayey, sand layer 1.5 to 2.0 feet
2.0–4.0	Sand, fine to coarse, sandy, brown-gray mottled, soft
6.0–8.0	Sand, fine and silt, trace clay, dark gray, loose
10.0–12.0	Clay, fine to coarse sand, black, soft. Sand, fine to coarse, trace silt, gray, medium dense
15.0–17.0	Sand, fine to coarse, trace silt, gray, medium dense; 8 inches sand, fine to medium, some clay layer at 17.3 feet, gray
20.0–22.0	Same as above ? (15.0–17.0 feet)
25.0–27.0	Sand, fine to coarse, clayey, trace shells, gray
27.0–29.0	Sand, fine to coarse, clayey, trace shells, silt, fine gravel, gray, dense
30.0–32.0	Sand, fine to coarse and fine gravel, trace silt, shells, gray, very dense
35.0–35.5	Same as above? (30.0–32.0 feet)
40.0–42.0	Sand, fine to coarse, trace silt, shells, gray, very dense
45.0–45.4	Sand, fine to coarse, trace silt, shells, gray, very dense, split-spoon refusal
50.0–50.5	Sand, fine to coarse, trace silt, shells, gray, very dense, split-spoon refusal
55.0–55.4	Same as above (50.0–50.5 feet)
60.0–62.0	Sand, fine to coarse, some shells, trace fine gravel, silt, gray, very dense
65.0–65.5	Sand, fine to coarse, trace silt, shells, gray, very dense
75.0–75.4	Sand, fine to coarse, trace silt, gray, very dense
80.0–80.8	Sand, fine to coarse, trace silt, shells, some shells at 80.5 feet, gray, very dense
85.0–87.0	Sand, fine to coarse and dolomitized shells, trace silt, clay, gray, very dense
90.0–91.8	Sand, fine to coarse, some clay, trace fine gravel, silt, dolomitized shells, gray, very dense, split-spoon refusal
95.0–96.5	Sand, fine to coarse, some clay, trace fine gravel, silt, dolomitized shells, gray, dense
100.0–101.5	Sand, fine to coarse, some clay, trace fine gravel, silt, dolomitized shells, gray, medium dense
105.0–106.5	Sand, fine to coarse, trace clay, silt, shells, gray-brown, dense
110.0–111.5	Sand, fine to coarse, some fine gravel, trace clay, silt, shells, gray, very dense
115.0–115.5	Sand, fine to coarse, trace fine gravel, trace clay, silt, shells, gray, very dense
120.0–120.9	Sand, fine to coarse, trace silt, shells, gray, very dense
125.0–125.8	Sand, fine to coarse, trace silt, shells, gray, very dense
130.0–130.4	Sand, fine coarse, trace silt, shells, gray, very dense
140.0–141.5	Sand, fine to coarse, trace silt, brown-green, very dense
150.0–151.0	Sand, fine to coarse, some silt, brown-green, very dense
160.0–161.5	Sand, fine to coarse, trace silt, clay, green, dense
170.0–170.6	Sand, fine to coarse, trace silt, clay, green, very dense, split-spoon refusal
180.0–181.5	Sand, fine to medium, trace silt, clay, green, very dense
200.0–201.0	Sand, fine to medium, trace silt, clay, green, very dense

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.19. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW36D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 350271 and East 2502282, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 15.6 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Sand, fine to medium, trace silt, brown, loose
2.0–4.0	Four inches sand, fine to medium, trace silt, layer at 2 feet, gray, loose
4.0–6.0	Sand, fine to medium, trace silt
6.0–8.0	Light gray with iron staining at 7 feet, loose
10.0–12.0	Sand, fine to medium, trace silt, tan to brown, mottled, loose
15.0–17.0	Sand, fine to coarse, brown, medium dense, 4 inches sand, fine to medium, trace silt, layer at 15.5 feet, light gray
20.0–21.0	Sand, fine to coarse, calcium carbonate cemented, trace fossils, shells, gray, very dense
25.0–26.5	Sand, fine to coarse, trace silt, medium gray, medium dense, 4 inch silty clay layer at 26 feet, gray
30.0–31.5	Sand, fine to coarse, some clay, trace shells, gray, medium dense
35.0–36.4	Sand, fine to coarse and dolomitized shells, some fine to coarse gravel-sized cemented sand and fossils, trace silt, gray, very dense
40.0–41.0	Sand, fine to coarse and dolomitized shells, some fine to coarse gravel-sized cemented sand and fossils, trace silt, gray, very dense
45.0–46.0	Sand, fine to coarse, some shells, trace silt, gray, very dense
50.0–51.0	Sand, fine to coarse, trace shells, gray, very dense
55.0–55.8	No recovery
60.0–60.9	Sand, fine to coarse, trace shells, gray, very dense
65.0–66.4	Sand, fine to coarse, trace fine to coarse gravel, silt, shells, gray, very dense
70.0–70.8	No recovery
75.0–76.0	Sand, fine to coarse, trace shells, gray, very dense
80.0–81.0	No recovery
85.0–86.5	Sand, fine to coarse, trace shells, silt, clay, gray, dense
90.0–91.0	Sand, fine to coarse and gravel, fine, trace silt, clay, shells, dolomitized shells, gray, dense
95.0–96.5	Sand, fine to coarse and gravel, fine, trace silt, clay, shells, dolomitized shells, gray, dense
100.0–101.5	Sand, fine to coarse, trace fine gravel, shells, silt, clay, gray, dense
105.0–106.5	Sand, fine to coarse and gravel, fine, some shells, silt, gray, dense
110.0–111.5	No recovery
115.0–116.5	Sand, fine to coarse, trace fine gravel, silt, clay, dolomitized shells, gray, very dense
120.0–120.5	Sand, fine to coarse and gravel, fine to coarse, trace fossils, silt, clay, dolomitized shells, light gray, dense
130.0–130.5	Sand, fine to coarse, some shells, trace silt, dolomitized shells, green-gray, very dense
140.0–140.5	Sand, fine to coarse, trace shells, silt, gray, very dense
150.0–151.5	Sand, fine to coarse, trace shells, silt, fine to coarse gravel-sized cemented sand and shells, dolomitized shells, gray, very dense
160.0–161.5	Sand, fine to medium, trace silt, shells, green-gray, very dense
170.0–171.5	Sand, fine to medium, trace silt, shells, clay, green-gray, very dense
180.0–181.5	Sand, fine to medium, trace silt, shells, clay, green-gray, very dense
190.0–191.5	Sand, fine to medium, trace silt, shells, clay, green-gray, very dense
200.0–201.5	Sand, fine to medium, clayey silt, green, very dense

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.20. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW37DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 348037 and East 2501703, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 14.0 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Sand, fine to coarse, tan to brown, loose
2.0–4.0	Same as above (0.0–2.0 feet)
4.0–6.0	Same as above (0.0–2.0 feet), mottled rust at 5.5 feet
6.0–8.0	Sand, fine to coarse, trace silt, light tan to white, medium dense
10.0–12.0	Sand, fine to coarse, trace silt, light tan to white, loose, dense
15.0–17.0	Sand, fine to coarse, trace silt, light gray, medium dense
20.0–21.5	Sand, coarse, gray, medium dense
25.0–27.0	Sand, fine to coarse, trace silt, black, medium dense
30.0–32.0	Sand, fine to coarse, some silt, black, loose, 3 inches black fine to coarse sand, clay, trace silt, shell at 31.7 feet
35.0–37.0	Sand, fine to coarse and gravel, fine, trace silt, shells, gray, very dense
40.0–41.9	Sand, fine to coarse, trace fine gravel, silt, shells, clay, very dense, split-spoon refusal
45.0–46.5	Sand, fine to coarse, trace fine gravel, silt, shells, clay, gray, very dense
50.0–50.5	Sand, fine to coarse, trace silt, shells, gray, very dense
55.0–55.4	Sand, fine to coarse, some silt, trace silt, gray, very dense
60.0–60.4	Sand, fine to coarse, some silt, medium gray, very dense
65.0–66.5	Sand, fine to medium, trace shells, clay, silt, medium gray, very dense
70.0–70.7	Sand, fine to coarse, trace silt, clay, shells, gray, very dense, split-spoon refusal
75.0–75.8	Sand, fine to coarse, trace silt, shells, gray-green, very dense, split-spoon refusal
80.0–80.9	Sand, fine to coarse, trace silt, shells, gray-green, very dense, split-spoon refusal
85.0–86.5	No recovery
110.0–111.5	Sand, fine to coarse and gravel, fine, trace silt, clay, dolomitized shells, gray, very dense

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

CH2M Hill, Inc. 2000

Table B1.21. Description of cores collected during drilling at Installation Restoration Program Site 6 (Figure B2), monitor well 06-GW43DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C5, for monitor-well location; location coordinates are North 347960 and East 2501527, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 8.6 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Core description
5.0–7.0	Fine sand, trace silt, very loose, very dark gray
12.5–12.7	Fine sand, trace silt, loose, orangish brown
12.7–14.5	Fine sand, trace silt, loose, light gray
17.5–19.5	Fine sand, trace silt, loose, light gray, orange staining
22.5–24.5	Fine sand, trace clay, loose, dark gray
27.5– 28.4	Fine sand, trace clay, loose, greenish gray
28.4–29.5	Fine sand, trace clay, medium dense, greenish gray, shell fragments
32.5–34.5	Fine sand, trace silt, loose, greenish gray
37.5–39.5	Fine sand, trace silt, medium dense, gray, shell fragments, fossiliferous sand, fragments
42.5–44.5	Fine sand, trace silt, dense, gray, small shell fragments
47.5–49.5	Fine sand, trace silt, very dense, light bluish gray, small shell fragments
52.5–54.5	Fine sand, trace silt, very dense, greenish gray, small shell fragments
57.5–59.5	Fine sand, trace silt, very dense, gray, small shell fragments
62.5–64.5	Fine sand, trace silt, very dense, gray, small shell fragments
67.5–69.5	Fine sand, trace silt, very dense, gray, small shell fragments
72.5–74.5	Fine sand, trace silt, very dense, gray, small shell fragments
77.5–79.5	Fine sand, trace silt, very dense, gray, small shell fragments
82.5–83.4	Fine sand, trace silt, very dense, gray, small shell fragments
83.4–84.5	Fine sand, trace silt, some fine gravel, very dense, light gray
87.5–89.5	Fine sand, trace silt, trace fine gravel, dense, light gray, small shell fragments

Data sources:

CERCLA Administrative Record file #3276

Baker Environmental, Inc. and CH2M Hill, Inc. 2001

Faye et al. 2010

Table B1.22. Description of cores collected during drilling at Installation Restoration Program Site 9 (Figure B2), monitor well 09-GW07D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C6, for monitor-well location; location coordinates are North 343333 and East 2502729, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 26.6 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
8.0–10.0	Sand, fine and silt, yellow, medium dense
10.0–12.0	Sand, fine and silt, yellow to gray, medium dense
15.0–17.0	Sand, fine, trace silt, shell fragments, white, dense
20.0–21.0	Twelve inches sand, fine, some clay, trace silt, gray, medium dense
21.0–22.0	Eight inches sand, fine, little clay, trace silt, trace shell fragments, gray
25.0–27.0	Sand, fine, trace silt, trace clay, gray, medium dense
30.0–32.0	Sand, fine, little silt, trace clay, gray, medium dense
35.0–37.0	Sand, fine, little silt, gray-green, medium dense
40.0–42.0	Sand, fine, trace silt, gray, medium dense
45.0–47.0	Sand, fine, little to some silt, gray, dense
50.0–51.0	Silt, some clay, little sand, fine, green-gray, very dense
55.0–57.0	Sand, fine and silt, green-gray, very dense
60.0–62.0	Sand, fine, little silt, trace clay, green-gray, dense
65.0–67.0	Sand, fine, little silt, trace shell fragments, green-gray, very dense, split-spoon refusal
70.0–72.0	Sand, fine, some silt, little shell fragments, green-gray, very dense
75.0–77.0	Sand, fine, little silt, little shell fragments, green-gray, very dense, split-spoon refusal
80.0–82.0	Sand, fine, little silt, little shell fragments, green-gray, very dense, split-spoon refusal
85.0–87.0	Sand, fine, some silt, little shell fragments, green-gray, very dense, split-spoon refusal
90.0–92.0	Sand, fine, some silt, trace shell fragments. green-gray, very dense, split-spoon refusal
95.0–96.0	Sand, fine, some silt, trace shell fragments, green-gray, very dense, split-spoon refusal
96.0–96.5	Six inches limestone fragments and shell fragments, some fine sand
96.5–99.0	Limestone fragments, some shell fragments and sand, fine, gray, very dense, split-spoon refusal
102.0–104.0	Limestone fragments, some clay, trace shell fragments, gray, dense
107.0–109.0	Sand, fine, some silt, trace shell fragments, gray, dense, split-spoon refusal

Data sources:

CERCLA Administrative Record file #1272

Baker Environmental, Inc. 1993d

Faye et al. 2010

Table B1.23. Description of cores collected during drilling at Installation Restoration Program Site 28 (Figure B2), monitor well 28-GW01DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C11, for monitor-well location; location coordinates are North 331870 and East 2498323, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 5.5 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–1	Silty sand, fine grained, brown to gray, very loose
1–3	Sand, fine grained with silt and fill material, brownish red to black brown, dense
10–12	Sand, fine grained with silt and little clay, greenish gray to brown, loose to soft
15–17	Sand, fine grained with trace silt, greenish gray to brown, loose
20–22	Sand, fine grained with trace silt, gray to brown, loose
25–27	Sand, fine grained with trace silt (0–0.4 foot), gravel, coarse grained (0.4–1.0 foot), brown, medium dense, oxidation (orange) bottom half of sample only
30–32	Sand, fine to medium grained with trace silt and shell material, brown and white, medium dense
35–37	Sand, fine to medium grained with trace silt and shell material, brown to white, dense
40–42	Sand, fine to medium grained with trace silt and shell material, brown to white, dense
45–47	Sand, fine to medium grained with trace silt and micrite (acting as matrix), light gray, dense
50–52	Sand, fine to medium grained with trace silt and micrite (acting as matrix), light gray, very dense
55–57	Sand, fine to medium grained with trace silt and micrite (acting as matrix), bottom half of sample only, light gray, medium dense
60–62	Sand, fine to medium grained with trace silt and micrite (acting as matrix), light gray, dense
70–72	Sand, fine grained with trace silt, greenish gray, very dense
75–77	Sand, fine grained with trace silt and shell fragments, greenish gray to white, very dense
80–82	Sand, fine grained with trace silt and shell material, light gray, very dense
85–87	Sand, fine grained with trace silt, greenish gray, very dense
90–92	Sand, fine grained with trace silt, greenish gray, very dense
95–97	Sand, fine grained with trace silt, greenish gray, very dense
100–102	Sand, fine to medium, with micrite cement, light greenish gray, dense
105–107	Sand, fine to medium grained with micrite cement, light greenish gray, dense
110–112	Sand, fine grained with trace silt (0–0.8 foot), gray to light green, very dense
115–117	Sand, fine grained with trace silt and shell material, greenish gray, very dense
120–122	No recovery
125–127	No recovery
130–132	No recovery

Data sources:

CERCLA Administrative Record file #1505

Baker Environmental, Inc. 1995c

Faye et al. 2010

Table B1.24. Description of cores collected during drilling at Installation Restoration Program Site 28 (Figure B2), monitor well 28-GW07DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C11, for monitor-well location; location coordinates are North 331745 and East 2499147, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 3.6 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–1	Sand, fine grained, trace silt, light brown
1–3	Sand, fine grained, little silt, brown, medium dense
3–5	No recovery
5–7	Silt, organic, dark brown, loose
10–12	Silt, organic, dark brown, very loose
15–17	No recovery
17–19	Silty clay, trace fine sand, gray, soft
20–22	Silty clay, trace to some sand, trace gravel, gray and brown
25–27	Sand, fine to medium grained, trace silt, trace clay, dark gray, very stiff
30–32	Sand, fine to coarse grained, little silt, dark gray, medium dense
35–37	Sand, fine to medium grained with clay and organic material, dark gray, dense to stiff
40–42	Sand, fine to medium grained, dark gray to orangish brown, loose
45–47	Sand, fine to medium grained with shell material (0.7–0.8 foot only), brown and white, dense
50–52	Sand, fine to medium grained, brown, dense
60–62	Sand, fine to medium grained, with silt and little shell material, brown to white, dense
65–67	Sand, fine grained, brown, dense
70–72	Sand, fine grained with trace silt, greenish gray, dense
75–77	Sand, fine grained with trace silt and shell material, greenish gray to white, dense
80–82	Sand, fine to medium grained with trace silt and shell material, micrite is cement acting as matrix, greenish gray, dense
85–87	Sand, fine grained with trace silt and shell material, greenish gray to white, very dense
90–92	Sand, fine grained with trace silt and shell material, greenish gray and white, very dense
95–97	Sand, fine to medium grained with trace silt and shell fragments, greenish gray and white, very dense
100–102	Sand, fine grained with trace silt (0 to 1.0 foot), fossiliferous limestone (1.0–1.1 feet), sand, fine grained with trace silt and shell fragments, light greenish gray and white, very dense
105–107	Sand, fine grained with trace silt and shell material, light greenish gray and white, very dense
110–112	Sand, fine grained with trace silt and shell material, light greenish gray and white, very dense
115–117	Sand, fine grained with trace silt, greenish gray, dense
120–122	No recovery
125–127	No recovery
130–132	Sand, fine grained with trace silt, greenish gray, very dense

Data sources:

CERCLA Administrative Record file #1505

Baker Environmental, Inc. 1995c

Faye et al. 2010

Table B1.25. Description of cores collected during drilling at Installation Restoration Program Site 28 (Figure B2), monitor well 28-GW09DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C11, for monitor-well location; location coordinates are North 332857 and East 2498262, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 4.5 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–2	Silty sand, fine grained, brown, dense
2–4	Sand, fine grained with trace silt, brown, medium dense
9–11	Sand, fine grained with trace silt, gray, medium dense, oxidation streaks (orange)
14–16	Silty clay (0–1.4 feet) and sand, fine grained (1.4 –1.6 feet), organic material (peat) (1.6 feet only), gray to dark brown, soft to medium dense
19–21	Sand, fine grained with trace silt, brown to yellowish brown, very dense
24–26	Sand, fine grained with trace silt, brown to yellowish brown, very dense
29–31	Sand, fine to medium grained with trace silt and gravel, brown, very dense
34–36	Sand, fine to medium grained with trace silt organic material (0.7 foot), brown to yellowish brown, very dense
39–41	Sand, fine to medium grained with trace silt, brown to yellowish brown, very dense
44–46	Sand, fine to medium grained with trace silt, fine gravel (1.1–1.2 feet), brown, very dense
49–51	Sand, fine to medium grained with trace fine gravel (1.0–1.1 feet), brown, very dense
54–56	Sand, fine to medium grained with trace fine gravel, brown, very dense
59–61	Sand, fine grained with trace silt, green, very dense
64–66	Sand, fine grained with trace silt, green, very dense
69–71	Sand, fine grained with trace silt, green, very dense
74–76	Sand, fine grained with trace silt, gray to light green, very dense
78–81	Sand, fine grained with trace silt and shell fragments, gray to light green, very dense
84–86	Sand, fine grained trace silt, light green, very dense
89–91	Sand, fine grained with trace silt, light green, very dense
94–96	Sand, fine grained with trace silt, gray to light green, fossiliferous limestone, very dense
99–101	Sand, fine to medium grained with trace shell material and micrite cement, light green, very dense
104–106	Sand, fine to medium grained with trace shell material and micrite cement, light green, very dense
109–111	Sand, fine grained with trace silt, light green to gray, very dense
114–116	Sand, fine grained with trace silt, greenish gray, very dense
119–121	Sand, fine grained with trace silt, greenish gray, very dense
124–126	Sand, fine grained with trace silt, greenish gray, very dense

Data sources:

CERCLA Administrative Record file #1505

Baker Environmental, Inc. 1995c

Faye et al. 2010

Table B1.26. Description of cuttings collected during drilling at Installation Restoration Program Site 78 (Figure B2), monitor well 78-GW09-3, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C14, for monitor-well location; location coordinates are North 337995 and East 2499836, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 24.8 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Cuttings description
0–15	Silty sand with 50 percent clay throughout, fine grained, top 4 inches road fill
15–20	Silty clayey sand, fine to medium grained
20–25	Silty sand, fine to medium grained (more fines than sand), clay layers
25–30	Silty sand, angular, medium grained, little to no clay
30–35	Sand, fine grained, with clay
35–40	Sand, fine grained with clay layers, 10 percent medium grained
40–45	Same as above
45–50	Sand, fine to medium grained, little to no clay
50–55	Sandy marl, sand fine to medium grained, 50 percent cemented clastics, lots of shells
55–60	Cemented clastics, less sand than at 50–55 feet
60–65	Silty sand, medium grained, little cement
65–70	Silty sand, fine grained, some rock, shells
70–75	Rock and shells, little to no sand or fines
75–80	Silty sand, medium grained, shells, lots of fossils (teeth)
80–85	Sand, medium grained with shells, 20 percent cemented clastics, some clay throughout
85–90	Sand, fine to medium grained, more shells and more cemented clastics than at 80–85 feet
90–95	Cemented clastics, little to no fines and sand, lots of shells
95–100	Same as above
100–105	Same as 90–95 feet, less shells more sand
105–110	Silty sand, medium grained with shells
110–120	Silty sand, fine to medium grained
120–125	Same as 110–120 feet
125–130	Same as 110–120 feet
130–135	Silty sand, medium grained with some cemented clastics
135–140	Sand, fine grained and shells, some medium to coarse sand
140–145	Silty clayey sand, medium grained with no shells
145–150	Silty clayey sand, fine to medium grained

Data sources:

CERCLA Administrative Record file #258

Environmental Science and Engineering, Inc. 1988

Faye et al. 2010

Table B1.27. Description of cuttings collected during drilling at Installation Restoration Program Site 78 (Figure B2), monitor well 78-GW17-3, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Monitor-well location not shown; location coordinates are North 339236 and East 2501288, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 29.5 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Cuttings description
0–5	Silty clayey sand, fine grained, much organic matter
5–10	Sandy clay, fine grained, silty, dark brown to black
10–15	Same as above (5–10 feet)
15–20	Silty sand, fine to medium grained, some clay upper part, pebbles, well rounded, (part of description is illegible)
20–25	Silty clayey sand, medium grained, little to no coarse sand, organic matter 24–25 feet
25–30	Silty sand, fine grained, some medium to coarse grained material
30–35	Silty sand with clay layers, fine to medium grained, (part of description is illegible)
35–40	Clay peds, light gray, with well rounded pebbles, (part of description is illegible)
40–45	Silty sand, medium grained
45–50	Silty sand with clay layers, medium grained, little to no coarse material
50–55	Silty sand, fine to medium grained
55–60	Silty sand, fine grained to 58 feet; at 58 feet, sand, coarse grained, shells, semi-cemented clastics
60–65	Cemented clastics
65–70	Cemented clastics, less dense after 68 feet, lots of shells, rock 64 to 70 feet
70–75	Silty sand, medium to coarse grained, (part of description is illegible)
75–80	Silty sand, fine grained
80–85	Silty sand, fine grained
85–90	Silty sand, fine grained, with light clay peds
90–95	Coarse sand and shells with some well-rounded pebbles and clay peds
95–97	Rock layer, hard
97–100	Silty sand, medium grained, some coarse sand and pebbles
100–105	Silty sand and shells, medium grained, some cemented clastics at bottom
105–110	Cemented clastics with shells and coarse sand
110–115	Same as above (105–110 feet)
115–120	Cemented clastics with sand and shells, little to no fines
120–125	Same as above (115–120 feet)
125–130	Silty sand, fine to medium grained
130–135	Same as above (125–130 feet)
135–140	Same as above (125–130 feet)
140–145	Silty sand, fine grained
145–150	Silty sand, fine grained

Data sources:

CERCLA Administrative Record file #258

Environmental Science and Engineering, Inc. 1988

Faye et al. 2010

Table B1.28. Description of cuttings collected during drilling at Installation Restoration Program Site 78 (Figure B2), monitor well 78-GW24-3, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C14, for monitor-well location; location coordinates are North 341153 and East 2502785, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 30.6 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Cuttings description
0–10	Silty sand with organic matter top 5 feet, some clay layers, fine grained
10–15	Silty sand, organic clay throughout, fine grained
15–20	Silty sand with coarse sand and pebbles bottom 3 feet, fine to medium grained
20–30	Coarse sand top 5 feet, silty clayey sand, fine grained
30–35	Silty sand, fine grained
35–40	Silty sand with clay layers, medium grained (clay, brown with coarse sand)
40–50	Same as above (35–40 feet), little to no coarse material
50–60	Silty sand, medium to coarse grained, rock at 58 feet (cemented clastics and shells)
60–68	Silty sand, fine to medium grained, coarse sand well rounded and small shells
68–70	Cemented clastics, limestone and shells, very hard
70–75	Rock (uncemented clastics), shells and coarse sand (well rounded), silty sand, fine grained with less rock and shells (74–75 feet)
75–80	Silty sand with yellow clay peds, fine grained, less than 10 percent coarse sand
80–85	Silty sand, fine grained, soft rock layer (83–84 feet)
85–90	Silty sand with small shells and rounded pebbles, fine to coarse grained
90–95	Silty sand with more shells and pebbles, medium to coarse grained
95–100	Same as above (90–95 feet)
100–103	Silty sand, fine grained
103–104	Solid cemented layer
104–105	Silty sand, fine grained
105–110	Silty sand with shells and rock fragments, very fine to fine grained
110–115	Silty sand with cemented clastics and shells, fine to coarse grained, angular, clean
115–120	Sand with 50 percent gray cemented clastics and fossils, shells, medium grained
120–125	Same as above (115–120 feet)
125–130	Silty sand with lots of shells and fossils, medium to coarse grained, rounded
130–135	Same as above (125–130 feet)
135–140	Silty sand with cemented clastics loosely (illegible) and shells, medium grained, angular
140–145	Silty sand with less shells and rocks, fine to medium grained, not much coarse sand
145–150	Same as above (140–145 feet)
150–155	Silty sand with little shell and rock, fine to medium grained

Data sources:
CERCLA Administrative Record file #258
Environmental Science and Engineering, Inc. 1988
Faye et al. 2010

Table B1.29. Description of cuttings collected during drilling at Installation Restoration Program Site 78 (Figure B2), monitor well 78-GW32-3, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C14, for monitor-well location; location coordinates are North 338983 and East 2500417, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.3 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Cuttings description
10–15	Clayey silty sand with minor peat seams (less than 5 inches), brown, gray
15–20	Same as above, peat top 7 inches
20–25	Silty sand, little clay, upper 7 inches, silty clayey sand, dense, gray, lower 7 inches
25–30	Silty sandy clay, fine to medium grained, gray
30–35	Same as above (25–30 feet)
35–40	Same as above (25–30 feet) with wood chips, light brown
40–50	Same as above (25–30 feet) with wood chips, orange brown
50–55	Silty clayey sand, some shell fragments, gray
55–60	Silty sand, fine to medium grained, some shell fragments, little clay, trace organic matter, gray
60–65	Silty clayey sand, some limestone fragments, gray
65–70	Silty sand, fine to medium grained, some shell fragments, some organic material, gray, limestone fragments lower half
70–75	Shelly limestone, silty sand, fine to medium grained, gray
75–80	Same as above (70–75 feet)
80–85	Same as above (70–75 feet)
85–90	Silty sand, fine to medium grained, trace shell fragments, gray
90–95	Silty sand, fine to medium grained, gray
95–100	Same as above (90–95 feet), trace shell fragments, gray
100–105	No samples
105–110	Silty sand, fine to medium grained, dense, some limestone fragments, blue-gray
110–115	Same as above (105–110 feet), some shell fragments, light gray-tan
115–120	Same as above (110–115 feet)
120–125	Same as above (110–115 feet)
125–130	Same as above (110–115 feet), gray-tan
130–135	Same as above (110–115 feet), gray
135–140	Same as above (110–115 feet)
140–145	Same as above (110–115 feet), light gray, shelly limestone fragments lower 6 inches
145–150	Silty sand, fine to medium grained, trace shell fragments, gray

Data sources:
Leaking Underground Storage Tank Program file #676
OHM Remediation Services Corp. 2001b
Faye et al. 2010

Table B1.30. Description of cuttings collected during drilling at Installation Restoration Program Site 78 (Figure B2), monitor well 78-GW642-1, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Plate B1 for monitor-well location (well labeled as HP-642-1); location coordinates are North 339211 and East 2504048, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 28.9 feet (National Geodetic Vertical Datum of 1929) estimated from digital elevation model]

Depth below land surface, in feet	Cuttings description
0–5	Silty sand, fine grained, (30 percent fines), abundant organic material
5–10	Silty clayey sand, sand is fine grained, clay very abundant, tan, loss of organics
10–15	Silty sandy clay, tan, sand is fine grained, much more clay than at 5–10 feet
15–20	Very silty clay, blue-gray, little to no sand
20–25	Same as above (10–15 feet)
25–30	Very silty sandy clay, sand is fine grained, less clay than at 20–25 feet
30–35	Very sandy silty clay
35–40	Very clayey silty sand, sand is fine grained, coarse sand content is less than 10 percent
40–45	Silty clayey sand, sand is fine grained, 10 percent coarse material
45–50	Silty sand, sand is very fine grained, 30 percent coarse material
50–60	Very silty sand, sand is fine grained, 30 percent shells and cemented clastics 70 percent
60–70	Very silty sand, sand is very fine grained, 50 percent shells and cemented clastics 50 percent, clay content is less than 10 percent, silt/sand equals 50 percent
70–80	Very silty sand, sand is very fine grained, 60 percent shells and cemented clastics 30 percent; sand, coarse grained, rounded 10 percent, silt/sand equals 50 percent
80–100	Same as above (70–80 feet)
100–125	Very silty shelly sand, sand is very fine grained, clay content is 10–20 percent, coarse sand content is 10 percent, fine material is gray
125–150	Same as above (100–125 feet)
150–175	Shelly mud sand with clay sand is fine grained, fine material is gray-blue, coarse sand content is 10 percent
175–200	Sand with shells and some clay, sand is very fine grained, fines are blue-gray, less shells than at 150–175 feet

Data sources:

Well data files of U.S. Geological Survey, Raleigh, North Carolina

Faye et al. 2010

Table B1.31. Description of cores collected during drilling at Installation Restoration Program Site 80 (Figure B2), monitor well 80-MW03IW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C19, for monitor-well location; location coordinates are North 355988 and East 2485152, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 14.4 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–3	Silty sand, little clay, sand is fine grained, very loose to medium dense, dark brown
3–7	Silty clay, little to some sand, sand is fine grained, loose to medium dense, brown to black
7–10	Silty clay, trace sand, sand is fine grained, stiff to medium stiff, light gray
10–11	Silty sand, little clay, sand is fine grained, loose, brown
11–15	Sand, fine to medium grained, silt, little to trace, trace of clay 11–13 feet, medium dense/dense/very dense/loose, light gray/light brown
18–20	Same as above (11–15 feet)
23–25	Same as above (11–15 feet)
28–30	Same as above (11–15 feet)
33–35	Same as above (11–15 feet)
38–40	Same as above (11–15 feet)
43–45	Same as above (11–15 feet)
48–50	Same as above (11–15 feet)
53–55	Sand, fine grained, trace silt, trace shell fragments, medium dense/dense/very dense, light grayish green
58–60	Same as above (53–55 feet)
63–65	Same as above (53–55 feet)
68–70	Same as above (53–55 feet)

Data sources:

CERCLA Administrative Record file #1722

Baker Environmental, Inc. 1995d

Faye et al. 2010

Table B1.32. Description of cores collected during drilling at Installation Restoration Program Site 88 (Figure B2), monitor well 88-MW02DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C26, for monitor-well location; location coordinates are North 339364 and East 2496466, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 26.6 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Silt, trace fine sand, black, medium dense
2.0–4.0	Same as above, loose
4.0–6.0	Same as above (0–2 feet), loose
6.0–8.0	Same as above (0–2 feet), some fine sand, black, loose
8.0–10.0	Fine sand, little silt, gray, very loose
10.0–12.0	Same as above (10–12 feet), very loose
12.0–14.0	Same as above (10–12 feet), some silt, brown, very loose
14.0–16.0	Same as above (10–12 feet), gray
16.0–18.0	Same as above (10–12 feet)
18.0–20.0	Silt, trace clay, dark gray, soft
20.0–22.0	Same as above (18–20 feet)
22.0–23.0	No sample
23.0–25.0	Same as above (18–20 feet), trace clay
25.0–27.0	Clay, trace silt, black, soft
27.0–28.0	No sample
28.0–30.0	Silt and fine sand, black, loose
31.0–33.0	Fine sand, little silt, black, medium density
33.0–35.0	Same as above (31–33 feet), gray
35.0–37.0	Same as above (31–33 feet)
37.0–38.0	No sample
38.0–40.0	Same as above (31–33 feet), trace silt, gray, loose
40.0–42.0	Same as above (31–33 feet)
42.0–43.0	No sample
43.0–45.0	Same as above (31–33 feet), light gray, very loose
45.0–47.0	Same as above (31–33 feet), gray, loose
47.0–48.0	No sample
48.0–50.0	Same as above (31–33 feet)
50.0–52.0	Same as above (31–33 feet)
52.0–53.0	No sample
53.0–55.0	Same as above (31–33 feet), trace silt and shell fragments, gray, very dense
55.0–57.0	Same as above (31–33 feet), little silt and shell fragments, gray, very dense
57.0–60.0	No sample, 0.5 foot of sample (58–58.5 feet), no description
60.0–62.0	Fine sand and silt, trace shell and fossil fragments, gray, dense
62.0–63.0	No sample
63.0–65.0	Silt, trace fine sand, gray, very dense
65.0–67.0	Fine sand and silt, dark brown, very dense
67.0–68.0	No sample
68.0–70.0	Same as above (65–67 feet), gray, very dense
70.0–71.5	Same as above (65–67 feet)
71.5–73.0	No sample
73.0–75.0	Same as above (65–67 feet), brown
75.0–76.5	Same as above (65–67 feet)
76.5–78.0	No sample
78.0–80.0	Same as above (65–67 feet)
80.0–81.8	Same as above (65–67 feet)
81.8–83.0	No sample
83.0–85.0	Same as above (65–67 feet), gray, dense
85.0–87.0	Same as above (65–67 feet), very dense
87.0–88.0	No sample
88.0–88.8	Same as above (65–67 feet), fossil fragment, some silt, gray, very dense
88.8–90.0	No sample
90.0–92.0	Fine sand and silt, gray, very dense
92.0–94.0	Same as above (90–92 feet)
94.0–95.0	No sample
95.0–96.5	Same as above (90–92 feet)
96.5–100.0	No sample

Data sources:

CERCLA Administrative Record file #2032

Baker Environmental, Inc. 1998b

Faye et al. 2010

Table B1.33. Description of cores collected during drilling at Installation Restoration Program Site 88 (Figure B2), monitor well 88-MW03DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C26, for monitor-well location; location coordinates are North 339508 and East 2496540, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.9 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–0.5	No sample
0.5–2.0	Fine sand, some silt, little clay, loose, dark brown
2.0–4.0	Same as above (0.5–2.0 feet), little silt, trace clay, very loose, dark brown
4.0–6.0	Same as above (0.5–2.0 feet), light gray, loose
6.0–8.0	Same as above (0.5–2.0 feet), medium dense
8.0–10.0	Same as above (0.5–2.0 feet), gray with iron stains
10.0–12.0	Same as above (0.5–2.0 feet), little silt and clay, dark gray, very loose
12.0–14.0	Same as above (0.5–2.0 feet), medium dense
14.0–16.0	Same as above (0.5–2.0 feet), little silt, trace clay, dark gray, loose
16.0–18.0	Silt, some clay, trace to little fine sand, dark reddish-brown
18.0–19.3	Same as above (16.0–18.0 feet)
19.3–22.0	Fine sand, some silt, trace to little clay, dark reddish-brown
22.0–23.0	No sample
23.0–25.0	Same as above (19.3–22.0 feet), some silt, little clay, gray, very loose, layered
25.0–27.0	Same as above (19.3–22.0 feet), some silt, little clay, gray, loose
27.0–28.0	No sample
28.0–30.0	Same as above (19.3–22.0 feet), little silt, trace clay, gray, loose
30.0–32.0	Same as above (19.3–22.0 feet)
32.0–33.0	No sample
33.0–35.0	Same as above (19.3–22.0 feet)
35.0–37.0	Same as above (19.3–22.0 feet)
37.0–38.0	No sample
38.0–40.0	Same as above (19.3–22.0 feet)
40.0–42.0	Same as above (19.3–22.0 feet), some silt, trace clay and shell fragments, gray, loose
42.0–43.0	No sample
43.0–45.0	Same as above (19.3–22.0 feet), little silt, shell and fossil fragments, gray, dense
45.0–47.0	Same as above (19.3–22.0 feet), little silt, trace clay and shell and fossil fragments, gray, very dense
47.0–48.0	No sample
48.0–50.0	Fine to medium sand, trace shell fragments, silt and clay, gray, very dense
50.0–52.0	Fine sand, little silt, gray, dense
52.0–53.0	No sample
53.0–55.0	Same as above (50.0–52.0 feet)
55.0–57.0	Same as above (50.0–52.0 feet), very dense
57.0–58.0	No sample
58.0–60.0	Same as above (50.0–52.0 feet), dense
60.0–62.0	Same as above (50.0–52.0 feet), some shell and fossil fragments, little silt, gray, very dense
62.0–63.0	No sample
63.0–65.0	Same as above (50.0–52.0 feet), little silt, dark gray, dense
65.0–66.7	Same as above (50.0–52.0 feet)
66.7–68.0	No sample
68.0–69.2	Same as above (50.0–52.0 feet), little silt, trace shell fragments, dark gray, very dense
71.0–73.0	Same as above (50.0–52.0 feet)
73.0–75.0	Same as above (50.0–52.0 feet)
75.0–76.5	Same as above (50.0–52.0 feet), little silt, trace shell fragments, olive green, very dense
76.5–78.0	No sample
78.0–80.0	Same as above (50.0–52.0 feet), little silt, trace shell fragments, olive green, very dense
80.0–81.5	Same as above (50.0–52.0 feet), little shell and fossil fragments and silt, olive green, very dense
81.5–83.0	No sample
83.0–85.0	Same as above (50.0–52.0 feet), little silt, trace shell fragments, olive green, very dense

Data sources:

CERCLA Administrative Record file #2032

Baker Environmental, Inc. 1998b

Faye et al. 2010

Table B1.34. Description of cores collected during drilling at Installation Restoration Program Site 88 (Figure B2), monitor well 88-MW04DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C26, for monitor-well location; location coordinates are North 339090 and East 2496474, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.0 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0.0–2.0	Fine sand and silt, gray, loose
2.0–4.0	Same as above, black, very loose
4.0–6.0	Fine sand, trace silt, light gray, loose
6.0–8.0	Same as above (4.0–6.0 feet)
8.0–10.0	Same as above (4.0–6.0 feet), medium dense
10.0–12.0	Same as above (4.0–6.0 feet)
12.0–14.0	Same as above (4.0–6.0 feet), little silt, light gray, loose
14.0–16.0	Clay, little fine sand, gray, loose
16.0–18.0	Clay and silt, little fine sand, gray, loose
18.0–20.0	Fine sand, little silt, gray, medium dense
20.0–22.0	Same as above (18.0–20.0 feet), little silt, trace clay, medium dense
22.0–23.0	No sample
23.0–25.0	Same as above (18.0–20.0 feet), little silt, gray, loose
25.0–27.0	Same as above (18.0–20.0 feet)
27.0–28.0	No sample
28.0–30.0	Same as above (18.0–20.0 feet), very loose
30.0–32.0	Same as above (18.0–20.0 feet), trace silt, gray, very loose
32.0–33.0	No sample
33.0–35.0	Same as above (18.0–20.0 feet)
35.0–37.0	Same as above (18.0–20.0 feet), loose
37.0–38.0	No sample
38.0–40.0	Same as above (18.0–20.0 feet), medium dense
40.0–42.0	Same as above (18.0–20.0 feet)
42.0–43.0	No sample
43.0–45.0	Same as above (18.0–20.0 feet)
45.0–47.0	Same as above (18.0–20.0 feet)
47.0–48.0	No sample
48.0–50.0	Same as above (18.0–20.0 feet)
50.0–52.0	Same as above (18.0–20.0 feet), little silt, light brown, medium dense
52.0–53.0	No sample
53.0–55.0	Same as above (18.0–20.0 feet), trace silt, brown, very dense
55.0–57.0	Same as above (18.0–20.0 feet)
57.0–58.0	No sample
58.0–60.0	Fine to medium sand, shell fragments, gray, medium dense
60.0–62.0	Same as above (18.0–20.0 feet)
62.0–63.0	No sample
63.0–65.0	Fine sand, little silt, trace shell fragments, light brown, very dense
65.0–67.0	Same as above (63.0–65.0 feet), little silt, brown to gray, very dense
67.0–68.0	No sample
68.0–69.7	Same as above (63.0–65.0 feet), some silt, gray, very dense
69.7–71.3	Same as above (63.0–65.0 feet)
71.3–72.0	No sample
72.0–73.3	Same as above (63.0–65.0 feet), some silt, trace shell fragments, gray, very dense
73.3–75.0	No sample
75.0–77.0	Silt, little fine sand, trace shell fragments, gray/green, dense
77.0–78.0	No sample
78.0–80.0	Fine sand and silt, trace shell fragments, gray/green, dense
80.0–81.3	Same as above (78.0–80.0 feet)
81.3–82.0	No sample
82.0–84.0	Silt, some fine sand, trace shell fragments, gray/green, very dense
84.0–85.0	No sample

Data sources:

CERCLA Administrative Record file #2032

Baker Environmental, Inc. 1998b

Faye et al. 2010

Table B1.35. Description of cores collected during drilling at Installation Restoration Program Site 88 (Figure B2), monitor well 88-MW05DW, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[See Faye et al. 2010, Figure C26, for monitor-well location; location coordinates are North 339601 and East 2496397, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 24.7 feet (National Geodetic Vertical Datum of 1929) from Faye et al. 2010]

Depth below land surface, in feet	Core description
0–2	Silt and fine sand, black, loose
2–4	Same as above, brown
4–6	Same as above (0–2 feet)
6–8	Same as above (0–2 feet)
8–10	Same as above (0–2 feet), brown, loose
10–12	Same as above (0–2 feet)
12–14	Same as above (0–2 feet), gray, medium dense
14–16	Silt, some fine sand, gray, medium dense
16–18	Same as above (14–16 feet), loose
18–20	Same as above (14–16 feet), trace clay, dark gray, very soft
20–22	Same as above (14–16 feet), trace clay, dark gray, soft
22–23	No sample
23–25	Fine sand and silt, dark gray, loose
25–27	Fine sand, some silt, gray/green, medium density
27–28	No sample
28–30	Same as above (25–27 feet), green
30–32	Same as above (25–27 feet), little silt, green, medium density
32–33	No sample
33–35	Same as above (25–27 feet)
35–37	Same as above (25–27 feet), very loose
37–38	No sample
38–40	Same as above (25–27 feet)
40–42	Same as above (25–27 feet), gray, loose
42–43	No sample
43–45	Same as above (25–27 feet), little silt, trace fossil fragments, light gray, medium density
47–48	No sample
48–50	Same as above (25–27 feet), little silt, trace shell fragments, green, dense
50–51	Same as above (25–27 feet)
52–53	No sample
53–55	Silt, some fine sand, trace shell fragments, gray, very dense
55–57	Fine sand and silt, trace fossil fragments, gray, dense
57–58	No sample
58–60	Silt, some fine sand, gray, very dense
60–62	Same as above (58–60 feet), some fine sand, trace shell fragments, gray, very dense
62–63	No sample
63–65	Same as above (58–60 feet), some fine sand, gray, very dense
65–67	Same as above (58–60 feet), little fine sand, gray, very dense
67–68	No sample
68–70	Same as above (58–60 feet), with fine sand, gray, very dense
70–72	Same as above (58–60 feet)
72–73	No sample
73–75	Same as above (58–60 feet), little fine sand, gray
75–77	Same as above (58–60 feet), little shell fragments, trace fine sand, gray
77–78	No sample
78–80	Silt and fine sand, trace shell fragments, gray
82–84	Same as above (78–80 feet)
84–87	No sample

Data sources:

CERCLA Administrative Record file #2032

Baker Environmental, Inc. 1998b

Faye et al. 2010

Table B1.36. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW15, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356445 and East 2497372, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.3 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
2–4	Clayey sand to sandy clay, very fine to fine grained, poor to moderately sorted, yellowish-brown
5–7	Silty clay, trace fine sands, very cohesive, moderate plasticity, yellowish brown
10–12	Silty clay, trace fine sands, very cohesive, moderate plasticity, mottled, yellowish-brown
15–17	Silty clay, trace fine sands, gray-brown; sand, fine to medium grained, well-sorted, light gray-white
20–21	Sandy clay with fine sands, moderately sorted, very cohesive, moderate plasticity, dark gray
21–22	Sand, fine to medium grained, moderately poor to moderately sorted, yellowish orange
25–27	Sand, very fine to medium grained, poorly sorted, greenish-gray, low to moderate permeability
30–32	Sand, fine to medium grained, moderate to well sorted, light gray with black speckles, moderate to high permeability
35–37	Same as above (30–32 feet)
40–42	Same as above (30–32 feet)
45–47	Same as above (30–32 feet), gray with black speckles
50–52	Same as above (45–47 feet)
55–57	Same as above (45–47 feet)
60–62	Sand, fine to medium grained, moderate to well sorted, numerous angular limestone fragments, gray with black speckles, moderate to high permeability
65–67	Sandy limestone, poorly sorted, clay matrix, 4–6 inch sand layers, fine to medium grained, poor to moderately sorted, milky gray
70–72	Same as above (65–67 feet)
75–77	Same as above (65–67 feet) with increasing sand layers
80–82	Sand, fine to medium grained, consolidated with numerous limestone fragments, poorly sorted, gray

Data sources:

Leaking Underground Storage Tank Program file #717

Richard Catlin and Associates, Inc. 1995a

Table B1.37. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW16, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356255 and East 2497229, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 28.7 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
2.0–4.0	Silty sand, very fine to medium fine grained, poorly sorted, semi-cohesive, light gray-brown, no plasticity
5.0–7.0	Clay to silty clay, very fine grained, moderate to well sorted, very cohesive, orange brown, moderate to moderate/high plasticity
10.0–12.0	Clay with minor silts, very fine grained, moderate to well sorted, very cohesive, olive-gray, moderate to high plasticity
15.0–17.0	Sandy clay with 20 percent medium sands, olive-gray
20.0–22.0	Sand, medium to coarse grained, moderate to well sorted, well rounded, light olive-gray, high permeability
25.0–27.0	Sand with minor small limestone fragments, fine to medium grained, moderate to well sorted, calcareous, glauconitic, light milky gray to gray-green
30.0–32.0	Sand, fine to coarse grained, very sandy limestone to calcareous sands, angular black sand grains throughout, poorly sorted, light milky gray-white
35.0–37.0	Gravel, sand, and silt, calcareous silts, angular sands and gravels, moderate to poorly sorted, olive-gray
40.0–42.0	Same as above (35.0–37.0 feet)
45.0–47.0	Sand, medium grained, moderate to well sorted, tight light gray with black specks, high permeability
50.0–52.0	Sand with 2-inch lenses of gravelly sand at 51.0–51.5 feet (limestone fragments), medium grained, light gray with black specks
55.0–57.0	Sand with trace silt and trace gravels, fine to medium grained, moderate to well sorted, light gray with black specks, high permeability
60.0–62.0	Sandy limestone, milky-gray with moderate to poorly consolidated sand layers throughout, poor to moderately sorted, gray with black specks
65.0–67.0	Same as above (60.0–62.0 feet)
71.0–73.0	Limestone, fossiliferous, abundant pelecypod molds, sandy, moderately consolidated, light gray
73.5–79.0	Sand with silty clay stringers, fine grained, fine black grains throughout, no significant limestone layers, poorly sorted, green-gray
79.0–80.0	Sand, fine to medium grained, consolidated, numerous limestone fragments, possibly very sandy limestone, moderately sorted, gray

Data sources:

Leaking Underground Storage Tank Program file #710

Richard Catlin and Associates, Inc. 1996a

Table B1.38. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645–MW17, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356418 and East 2497205, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 28.0 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
2.0–4.0	Sand with minor silts, very fine to fine grained, poorly sorted light brown
5.0–7.0	Sandy silt, moderately sorted, semi-cohesive, low plasticity, mottled, yellow-orange and light gray brown
10.0–12.0	Sandy clay, moderately sorted, cohesive, moderate plasticity, yellow-orange and light gray brown, low permeability
15.0–17.0	Sandy clay, very fine to medium grained, cohesive, low plasticity, gray
20.0–21.0	Sand, medium grained, well sorted, well rounded, light gray-white; gravelly sand, 3-inch layer, well rounded, light gray-white
21.2–22.0	Sand with minor clays, very fine to medium grained, poorly sorted, light gray
25.0–27.0	Gravelly sand with moderate silts, calcareous silts, very poorly sorted, well rounded quartz and angular to sub-angular limestone fragments, light milky gray
30.0–32.0	Sand, fine to medium grained, well sorted, light gray-brown, high permeability
35.0–37.0	Same as above (30.0–32.0 feet)
40.0–42.0	Gravelly sand, fine to coarse grained, calcareous, numerous angular limestone fragments, poorly sorted, light gray-white
45.0–47.0	Sand, fine to medium grained, tight black speckles throughout, moderate to well sorted, light brown-gray
50.0–52.0	Same as above (45.0–47.0 feet)
55.0–57.0	Clayey sand, fine to medium grained, poorly sorted, gray-brown
57.0–70.0	Limestone at 58 feet below land surface, fossiliferous, sandy with 6 inch to 1 foot sand layers throughout, moderate consolidation, light gray
70.0–80.0	Limestone at 73 feet below land surface, fossiliferous, sand, fine to medium grained, dark gray, moderate consolidation, light gray, poorly sorted

Data sources:

Leaking Underground Storage Tank Program file #710

Richard Catlin and Associates, Inc. 1996a

Table B1.39. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW18, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356462 and East 2497584, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 29.7 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
2–4	Sandy silt, poorly sorted, brown
5–7	Clay, cohesive with high plasticity, light gray
10–12	Clay, cohesive with high plasticity and interbedded sand, light gray
15–17	Sand, medium grained, well sorted, light tan to brown, high permeability
20–22	Same as above (15–17 feet)
25–27	Same as above (15–17 feet)
30–32	Same as above (15–17 feet)
35–37	Same as above (15–17 feet)
40–42	Gravelly sand, numerous limestone fragments, calcareous, poorly sorted, weathered limestone, light gray
45–47	Sand, fine to medium grained, well sorted with black specks throughout, light brown to gray
50–52	Same as above (45–47 feet)
55–57	Clayey sand, fine to medium grained, poorly sorted, gray brown
57–58	Same as above (55–57 feet)
58–59	Limestone
59–73	Limestone, interbedded with poorly consolidated sand layers
73–74	Limestone
74–80	Limestone, interbedded with poorly consolidated sand layers

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.40. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW26, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356309 and East 2497438, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.8 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
0–2	Silty sand with trace silt, very fine grained, dark brown to tan
3–5	Silty clayey sand, very fine to fine grained, tan
8–10	Clay with moderate stiffness and high plasticity, mottled, light orange/brown
13–15	Same as above (8–10 feet) gray
18–20	Sandy clay to clayey sand, very fine to fine grained, interbedded, light gray
23–25	Silty sand, very fine to fine grained with some clay, light gray
28–30	Sand, very fine to fine grained, well sorted, greenish gray
33–35	Same as above (28–30 feet)
38–40	Same as above (28–30 feet)
43–45	Same as above (28–30 feet) with trace white, highly weathered, shell fragments
48–50	Same as above (43–45 feet)
53–55	Same as above (43–45 feet)
58–60	Same as above (43–45 feet)
63–65	Same as above (43–45 feet)
68–70	Same as above (43–45 feet) with white, highly weathered, shell fragments, olive
73–75	Same as above (68–70 feet)
78–80	Same as above (68–70 feet)

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.41. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW28, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356538 and East 2497414, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 28.2 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
4–6	Clay with moderate stiffness and medium plasticity, mottled, orange/brown to gray
9–11	Same as above
14–16	Sand with trace silt, very fine grained, gray
19–21	Clayey sand, very fine to fine grained, light gray
24–26	Sand with trace silt, very fine to fine grained, light gray
29–31	Sand, very fine to fine grained, well sorted, gray
34–36	Same as above (29–31 feet)
39–41	Same as above (29–31 feet)
44–46	Same as above (29–31 feet)
49–51	Same as above (29–31 feet) with trace coarse, white, quartzite grains
54–56	Same as above (29–31 feet) with greenish gray banding up to 2 inches thick
59–61	Same as above (29–31 feet) with greenish gray banding up to 0.5 inch thick
64–66	Sand with trace silt, very fine to fine grained, dark gray to greenish gray
69–71	Silty to clayey sand, very fine grained with highly weathered, white shell fragments up to 0.5 inch in diameter, olive
74–78	Same as above (69–71 feet)
78–80	Silty to clayey sand, coarse to gravel size, poorly lithified, calcareous fragments, poorly sorted, light gray; limestone, highly weathered

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.42. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW30, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356479 and East 2497692, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 30.1 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
0–2	Sand, very fine to fine grained, well sorted, light gray
4–6	Silty sandy clay, very fine to fine grained, medium plasticity, tan
9–11	Silty clay, high plasticity, tan to gray
14–16	Sand, very fine to fine grained, well sorted, tan
19–21	Sand with clay layers, very fine to fine grained, well sorted, gray
24–26	Same as above (19–21 feet)
29–31	Silty sand, very fine to fine grained, green
34–36	Sand, very fine to fine grained, well sorted, green/gray
39–41	Sand, very fine to fine grained, well sorted, green
44–46	Same as above (39–41 feet)
49–51	Same as above (39–41 feet)
54–56	Same as above (39–41 feet)
59–61	Same as above (39–41 feet)
64–66	Same as above (39–41 feet)
69–71	Silty sand, very fine to fine grained, trace shell fragments, green
74–78	Silty/clay sand with trace shell fragments, very fine grained, green
78–80	Silty sandy weathered limestone, very fine to coarse grained, light green

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.43. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW31, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356470 and East 2497589, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 29.7 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
0–61	Same descriptions as borehole UST-Bldg645-GW30
64–66	No return
69–71	Silty sand, very fine to fine grained with trace shell fragments, green
74–76	Same as above (69–71 feet)
79–81	Silty sand, very fine to coarse grained, weathered limestone, light green
84–86	Same as above (79–81 feet), white
89–91	Same as above (84–86 feet)
94–96	Silty sand, very fine to fine grained, limestone material, light gray
99–101	Same as above (94–96 feet)

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.44. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW32, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356218 and East 2497539, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 30.3 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
3.0–5.0	Clayey sand, fine grained, tan to light brown
8.0–10.0	Same as above
13.0–15.0	Silty clay, low to medium plasticity, light gray
18.0–20.0	Sand, medium grained, well sorted, tan to light gray
23.0–25.0	Sand, medium to coarse grained, medium gray
28.0–30.0	Same as above (23.0–25.0 feet)
33.0–35.0	Sand, medium grained, well sorted, gray
38.0–40.0	Sand with silt and limestone fragments, coarse grained, medium grained
41.0–43.0	Limestone (driller's note)
43.0–45.0	Sand with limestone and shell fragments, medium to coarse grained, very poorly sorted, medium gray
48.0–50.0	Same as above (43.0–45.0 feet) with smaller and less shell and limestone fragments
53.0–53.8	Same as above (48.0–50.0 feet)
58.0–59.4	Same as above (48.0–50.0 feet)
63.0–63.8	Same as above (48.0–50.0 feet)
68.0–70.0	Sand with trace silt, medium grained, gray to dark gray
73.0–75.0	Sand with trace silt, medium grained, dark gray
78.0–80.0	Sand with trace silt/clay, fine grained, medium gray

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.45. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW35, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356308 and East 2497433, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.6 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
0–2	Silty sand with trace silt, very fine grained, dark brown to tan
3–5	Silty clayey sand, very fine to fine grained, tan
8–10	Clay with moderate stiffness and high plasticity, mottled, light orange/brown
13–15	Same as above (8–10 feet), gray
18–20	Sandy clay to clayey sand, very fine to fine grained, interbedded, light gray
23–25	Silty sand with some clay, very fine to fine grained, light gray
28–30	Sand, very fine to fine grained, well sorted, greenish gray
33–35	Same as above (28–30 feet)
38–40	Same as above (28–30 feet)
43–45	Same as above (28–30 feet) with trace white, highly weathered, shell fragments
48–50	Same as above (28–30 feet)
53–55	Same as above (28–30 feet)
58–60	Same as above (28–30 feet)
63–65	Same as above (28–30 feet)
68–70	Same as above (28–30 feet) with white, highly weathered, shell fragments, olive
73–75	Same as above (28–30 feet), olive
79–81	Silty sand with limestone fragments and trace clay, coarse grained, well graded, light gray
84–86	Sand grading to clayey sand, fine to coarse grained, light gray
89–94	Sand with trace clayey sand and limestone, fine to coarse grained, gray
94–96	Sand with shell fragments and limestone, coarse grained, light gray
99–101	Limestone and sand, coarse grained with abundant shell fragments, gray
104–106	Same as above (99–101)

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.46. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW36, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356622 and East 2497721, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 32.8 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
3–5	Silty sandy clay, very fine grained, low plasticity, mottled, gray to light brown
8–10	Silty clay, low plasticity, mottled, gray
13–15	Sand, very fine to fine grained, well sorted, tan
18–20	Sand, fine to coarse grained, trace silt, trace interlayered gray sandy clay to clayey sand, poorly sorted, dark gray
23–25	Silty to clayey sand, very fine to fine grained, moderate sorting, loose, olive
28–30	Silty sand, very fine to fine grained, same as above but low clay content, loose, olive
33–35	Sand, very fine grained, trace silt, dense, well sorted, greenish-gray
38–40	Sand, very fine grained, trace silt, interlayered gray clay, greenish-gray
43–45	Sand, very fine grained, trace silt, dense, well sorted, greenish-gray
48–50	Same as above (43–45 feet), decreasing silt content with depth
53–55	Same as above (43–45 feet), very dense, well sorted
58–60	Same as above (43–45 feet)
63–65	Same as above (43–45 feet), very dense
68–70	Silty to clayey sand, very fine grained, high component of fines (almost a silt), loose, greenish-gray
73–75	No sample
78–79	Silty to clayey sand with poorly indurated limestone fragments, fine grained, interlayered, greenish-gray
79–80	Limestone gravels, rock fragments, poorly sorted

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.47. Description of cores collected during drilling at Underground Storage Tank Program Site Building 645 (Figure B3), monitor well Bldg645_MW37, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 356262 and East 2497758, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 31.9 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Catlin Engineers and Scientists 2008). Altitudes converted from NAVD 88 to NGVD 29 using a factor of 1.05 feet]

Depth below land surface, in feet	Core description
4.0–6.0	Sand with some clayey sand, fine grained, gray
9.0–11.0	Clay with high plasticity, very soft, gray
14.0–16.0	Same as above (9.0–11.0 feet)
19.0–19.8	Same as above (9.0–11.0 feet)
19.8–21.0	Sand, fine grained, gray
24.0–26.0	Sandy clay to clayey sand, some high plasticity clay, gray
29.0–29.5	Sand, fine grained, clayey, gray
29.5–31.0	Sand, fine grained, gray
34.0–36.0	Sand, fine grained, uniform, dense
39.0–40.5	Same as above (34.0–36.0 feet)
44.0–46.0	Same as above (34.0–36.0 feet) with a 2-inch-thick layer of coarse grained shelly sand, gap graded
49.0–51.0	Sand, fine grained with layers of very fine to coarse grained shelly sand, gray, gap graded
54.0–55.0	Same as above (49.0–51.0 feet)
59.0–61.0	Same as above (49.0–51.0 feet)
64.0–66.0	Sand, fine grained, uniform, very dense, gray
69.0–71.0	Same as above (64.0–66.0 feet), dark gray
71.0–80.0	Same as above (64.0–66.0 feet) with shell fragments

Data sources:

Leaking Underground Storage Tank Program file #645_Addl_SiteAssess

Catlin Engineers and Scientists 2008

Table B1.48. Description of cores collected during drilling at Underground Storage Tank Program Site Building 820 (Figure B3), monitor well Bldg820_MW09D, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 349790 and East 2494709, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 33.0 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007b)]

Depth below land surface, in feet	Cuttings/core description
0–10	Silty sand, fine grained, well sorted, subrounded, brown-tan
10–20	Clayey silty sand, fine grained, moderate sorting, subrounded, red-brown
20–30	Sand, medium grained, well sorted, subangular to subrounded, red-brown
30–40	Same as above (20–30 feet)
40–50	Same as above (20–30 feet)
50–60	Silty sand, fine grained, moderate sorting, subrounded, red-brown
60–70	Same as above (50–60 feet)
70–80	No description
80–86	No description
86–90	Fossilliferous limestone, abundant shell fragments, poorly sorted, light gray

Data sources:

Leaking Underground Storage Tank Program file #528

OHM Remediation Services Corp. 2002a

Table B1.49. Description of cores collected during drilling at Underground Storage Tank Program Site Building 1115 (Figure B3), monitor well Bldg1115_MW21, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339867 and East 2500374, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 26.0 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.33–2.5	Sandy silt, very fine to medium grained, moderately sorted, semi-cohesive, tight, orange-brown to tan
2.5–5.0	Same as above
5.0–7.5	Silty sand, very fine to medium grained, poorly sorted, semi-cohesive, moderate plasticity, dark gray
7.5–8.5	Same as above (5.0–7.5 feet)
8.5–10.0	Sand, moderate to well sorted, light gray, high permeability
10.0–12.5	Same as above (8.5–10.0 feet)
12.5–13.5	Same as above (8.5–10.0 feet)
13.5–15.0	Clayey sand, very fine to medium grained, cohesive, firm, low to no plasticity, light gray
15.0–16.0	Same as above (13.5–15.0 feet)
16.0–17.5	Sand, medium to coarse grained, well sorted, light gray, high permeability
17.5–20.0	Sand, fine grained, minor fines, moderately well sorted, tan-brown
20.0–22.5	Sand, very fine to fine grained, moderate fines, moderately sorted, tan-brown to light green-gray
22.5–25.0	Same as above (20.0–22.5 feet) tan-brown
25.0–26.0	Sand, very fine to fine grained, moderate fines, moderately sorted, tan-brown
26.0–27.5	Sand, fine grained, minor fines, moderately well sorted, tan-brown
27.5–30.0	Same as above (26.0–27.5 feet)
30.0–31.5	Same as above (26.0–27.5 feet)
31.5–32.5	Sand with sandy clay lenses, very fine to fine grained, moderate to poorly sorted, tan-brown
32.5–34.5	Same as above (31.5–32.5 feet)
34.5–35.0	Sand, fine to medium grained, moderately well sorted, gray
35.0–37.5	Sand, medium grained, well sorted, gray, high permeability
37.5–40.0	Same as above (35.0–37.5 feet)
40.0–42.0	Sand, medium grained, well sorted, clean, gray, high permeability
50.0–52.0	Sand, minor clay lenses, well sorted, gray with black speckles
52.0–56.0	Clayey sand, very fine to coarse grained, numerous shell fragments, poorly sorted, gray and tan-brown, minor tan-brown sandy limestone fragments
56.0–60.0	Very sandy fossiliferous limestone with interbedded sandy clay with numerous shell fragments throughout, poorly consolidated and moderately consolidated, layers alternating with clay layers
60.0–62.0	Sandy fossiliferous limestone well consolidated, gray-brown
62.0–70.0	Interbedded weathered sandy with shelly fossiliferous limestone, sandy/shelly clay and shell hash, very poorly sorted, poorly consolidated, gray-brown
70.0–74.0	Fossiliferous limestone, very sandy with minor clay lenses and shell hash, poorly consolidated, light gray-brown
74.0–80.0	Sand, thin clay layers, minor shell hash, moderately well sorted, gray

Data sources:

Leaking Underground Storage Tank Program file #408

Richard Catlin and Associates, Inc. 1998b

Table B1.50. Description of cores collected during drilling at Underground Storage Tank Program Site Building 1115 (Figure B3), monitor well Bldg1115_MW22, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340244 and East 2500473, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 24.1 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.0–2.5	Silty sand, very fine to fine grained, poorly sorted, dark brown
2.5–5.0	Silty sand, very fine to fine grained, moderate to poorly sorted, dark brown
5.0–7.5	Clayey silt with trace very fine to fine grained sand, moderate to poorly sorted, loose, elastic, dark gray
10.0–12.5	Same as above (5.0–7.5 feet)
12.5–15.0	Same as above (5.0–7.5 feet)
15.0–17.5	Same as above (5.0–7.5 feet)
17.5–20.0	Same as above (5.0–7.5 feet)
20.0–22.5	Same as above (5.0–7.5 feet)
22.5–24.0	Same as above (5.0–7.5 feet)
24.0–25.0	Silt with peat, dark brown
25.0–27.5	Same as above (24.0–25.0 feet)
27.5–30.0	Same as above (24.0–25.0 feet)
30.0–32.5	Peat with minor silts and sands, dark brown
32.5–35.0	Sand, fine to medium grained, trace peat packets, moderately to poorly sorted, gray
35.0–37.5	Sand, medium grained, moderately well to well sorted, gray
37.5–40.0	Same as above (35.0–37.5 feet)
40.0–42.0	Sand, medium to fine grained, moderate to well sorted, moderate to high permeability, gray
42.0–47.0	Sand, fine grained, well sorted, high permeability, dark gray
47.0–52.0	Same as above (42.0–47.0 feet), cuttings description
52.0–57.0	Sand, fine to medium grained with trace clay, moderately well sorted, dark gray
57.0–70.0	Same as above (52.0–57.0 feet)
70.0–76.0	Sand, medium grained with trace to minor coarse grains, thin clay lenses and phosphatic fine sands and shell fragments, light gray with black speckles
76.0–80.0	Silty sand, very fine to fine grained, moderately sorted with clay lenses and phosphatic fine sand, light gray to gray

Data sources:

Leaking Underground Storage Tank Program file #410

Richard Catlin and Associates, Inc. 1998a

Table B1.51. Description of cores collected during drilling at Underground Storage Tank Program Site Building 1115 (Figure B3), monitor well Bldg1115_MW23, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340138 and East 2501039, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 24.5 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.0–2.5	Sand, very fine to fine grained, moderately sorted, yellowish orange
2.5–5.0	Sand, very fine to fine grained, moderately sorted with trace fines, semi-cohesive, mottled, yellowish orange and brown
5.0–7.5	Silty sand, very fine to medium grained, poorly sorted, mottled, yellowish orange and light gray
7.5–10.0	Same as above (5.0–7.5 feet)
10.0–12.5	Sand, fine to medium grained, moderately to poorly sorted, gray
12.5–14.0	Sand, very fine to medium grained, poorly sorted with minor clay, loose, gray
14.0–15.0	Sandy clay, medium grained, moderately sorted, soft with moderate plasticity, gray
15.0–16.5	Same as above (14.0–15.0 feet)
16.5–17.0	Sand, medium grained, moderately well sorted, brown
17.0–17.5	Sandy peat, medium grained, firm, dark brown
17.5–20.0	Peat with minor medium grained sands, firm, dark brown
20.0–22.5	Sand, fine to medium grained, moderately well sorted, gray brown, high permeability
22.5–25.0	Sand, fine to medium grained, well sorted with high permeability, light gray
25.0–27.5	Sand, fine grained, well sorted with high permeability, greenish gray
27.5–30.0	Same as above (25.0–27.5 feet)
30.0–32.5	Sand, very fine to fine grained, moderately well sorted with moderately high permeability, light gray
32.5–35.0	Sand, fine to medium grained, moderately well sorted with moderately high permeability, light gray
35.0–37.5	Sand, medium grained, well sorted with abundant echinoderm spines and other fossil fragments, high permeability, light gray
37.5–40.0	No samples
40.0–42.5	Sand, very fine to medium grained, moderately sorted with weathered limestone fragments, gray
42.5–45.0	No samples
45.0–47.0	Sandy limestone with fine-grained sands and silts, poorly indurated, tan brown
47.0–50.0	No samples
50.0–52.0	Same as above (47.0–50.0 feet)
52.0–64.0	No samples
64.0–70.0	Sandy limestone, numerous shell fragments with interbedded clay lenses, well indurated, buff tan
70.0–74.0	Sand, fine grained, well sorted with minor shell fragments, tight, green gray
74.0–80.0	Same as above (70.0–74.0 feet)

Data sources:

Leaking Underground Storage Tank Program file #450

Geophex, Ltd. 2002

Table B1.52. Description of cores collected during drilling at Underground Storage Tank Program Site Building 1115 (Figure B3), monitor well Bldg1115_MW24, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339864 and East 2500373, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.9 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.3–2.5	Sandy silt, very fine to medium grained, moderately sorted and semi-cohesive, mottled, orange brown to tan
2.5–5.0	Same as above
5.0–7.5	Silty sand, very fine to medium grained, poorly sorted, dark gray
7.5–8.5	Same as above (5.0–7.5 feet)
8.5–10.0	Sand, medium to well sorted, light gray, high permeability
10.0–12.5	Same as above (8.5–10.0 feet)
12.5–13.0	Same as above (8.5–10.0 feet)
13.5–15.0	Clayey sand, very fine to medium grained, poorly sorted, nonplastic, light gray
15.0–16.0	Same as above (13.5–15.0 feet)
16.0–17.5	Sand, medium to coarse grained, moderately well sorted with moderately high permeability, light gray
17.5–20.0	Sand, fine grained, moderately well sorted with minor fines, tan brown
20.0–22.5	Sand, very fine to fine grained, moderately sorted with moderate fines, tan brown to light green gray
22.5–25.0	Sand, very fine to fine grained, moderately well sorted with minor fines, tan brown
25.0–26.0	Same as above (22.5–25.0 feet)
26.0–27.5	Sand, fine grained, moderately well sorted with minor fines, tan brown
27.5–30.0	Same as above (26.0–27.5 feet)
30.0–31.5	Same as above (26.0–27.5 feet)
31.5–32.5	Sand with sandy clay lenses throughout, very fine to fine grained, moderately to poorly sorted, tan brown
32.5–34.5	Same as above (31.5–32.5 feet)
34.5–35.0	Sand, fine to medium grained, moderately well sorted, gray
35.0–37.5	Sand, medium grained, well sorted, gray, high permeability
37.5–40.0	Same as above (35.0–37.5 feet)
40.0–42.0	Same as above (35.0–37.5 feet)
42.0–45.0	No samples
45.0–47.0	Sand, medium to fine grained, moderately well sorted, gray with black speckles
47.0–50.0	No samples
50.0–52.0	Sand, fine grained, trace thin clay stringers, well sorted, gray with black speckles
52.0–56.0	Clayey sand, very fine to coarse grained, numerous shell fragments and sandy limestone fragments, poorly sorted, gray
56.0–60.0	Very sandy limestone, poorly to moderately indurated with lenses of sandy clay with shell fragments throughout, gray and tan brown
60.0–62.0	Fossiliferous sandy limestone, well indurated, gray brown
62.0–70.0	Fossiliferous limestone, weathered sandy/shelly, interbedded with sandy/shelly clay, poorly sorted and indurated, gray brown
70.0–74.0	Fossiliferous limestone, very sandy with minor clay lenses and shell hash, poorly indurated, light gray brown
74.0–80.0	Sand, fine to medium grained, moderately well sorted with clay stringers and trace shell hash, gray

Data sources:

Leaking Underground Storage Tank Program file #450

Geophex, Ltd. 2002

Table B1.53. Description of cores collected during drilling at Underground Storage Tank Program Site Building 1115 (Figure B3), monitor well Bldg1115_MW25, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340077 and East 2500691, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.8 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.0–2.5	Clayey silt and minor very fine to coarse sand, poorly sorted, light orange to brown
2.5–5.0	Sandy clay, very fine to fine grained with medium-grained sand lenses, poorly sorted, buff orange to light gray
5.0–7.5	Sandy silt, poorly sorted with minor clay, cohesive and elastic, light greenish gray to tan
7.5–10.0	Sandy silt, very fine to fine grained, very poorly sorted, cohesive and elastic, gray
10.0–12.5	Clayey silt with trace very fine-grained sand, cohesive and plastic, gray to dark gray
12.5–14.0	Silty sand, very fine to fine grained, loose, gray
14.0–15.0	Sand, medium grained, moderately poorly sorted, gray
15.0–17.5	Sand, medium grained, moderately well sorted, gray, high permeability
17.5–20.0	Same as above (15.0–17.5 feet)
20.0–22.0	Same as above (15.0–17.5 feet)
22.0–22.5	Silty peat, dense, dark brown
22.5–23.5	Sand, medium grained, moderately sorted
23.5–25.0	Peat, dark brown
25.0–27.5	Silty peat, dense, dark brown
27.5–28.5	Silty clay, cohesive and plastic, dark gray
28.5–30.0	Sand, medium fine to medium grained, moderately sorted with moderate permeability, dark to light gray
30.0–32.5	Sand, medium grained, moderately well to well sorted with moderate high to high permeability, light gray
32.5–35.0	Same as above (30.0–32.5 feet)
35.0–37.5	Sand, medium to medium coarse grained, moderately well to well sorted with moderate high to high permeability, light gray
37.5–40.0	Sand, coarse to medium coarse grained, moderately well to well sorted with moderate high to high permeability, light gray
40.0–45.0	No samples
45.0–47.0	Sand, fine to medium grained, moderately poorly sorted with minor calcareous fragments, moderate to low permeability, dark gray
47.0–50.0	No samples
50.0–52.0	Sand, fine to medium grained, moderately poorly sorted with calcareous fragments and silt increasing with depth, moderate to low permeability, dark gray
52.0–53.0	Sand with minor clay, sandy clay lenses throughout, moderately sorted, gray brown
53.0–54.0	Very sandy limestone, interbedded sandy clay, poorly indurated, light gray brown
54.0–58.0	Fossiliferous sandy limestone, thin sandy clay lenses, moderately to moderately well indurated, tan gray
58.0–70.0	Fossiliferous limestone, 6-inch-thick sandy clay layers throughout, well indurated
70.0–72.0	Sandy fossiliferous limestone, well indurated with minor clay lenses, light gray brown
72.0–74.0	Sand, fine to medium grained, well sorted with minor shell fragments and coarse sands, light blue gray
76.0–80.0	Sand with minor clay stringers and shell fragments, moderately to poorly sorted, light gray

Data sources:

Leaking Underground Storage Tank Program file #408

Richard Catlin and Associates, Inc. 1998b

Table B1.54. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW43, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339657 and East 2499441, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 22.6 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0–2	Silty sand, very fine to fine grained, brown, tan and gray
4–6	Silty sandy clay, medium plasticity, tan/orange to gray
9–11	Silty clay with medium to high plasticity, gray and tan
14–16	Silty sand, very fine to fine grained with trace medium grains, gray to light gray
19–21	Same as above (14–16 feet)
24–26	Sand, very fine to fine grained with trace medium grains, well sorted, gray to olive gray
29–31	Silty sand with shell fragments, very fine to fine grained, olive green, weathered limestone
34–36	Same as above (29–31 feet), very fine- to medium-grained sand
39–41	Same as above (29–31 feet)
43–45	Same as above (29–31 feet)
48–50	Silty clayey sand with shell fragments, very fine to fine grained, green
53–55	Silty sand with shell fragments, very fine to fine grained, green
58–60	Same as above (53–55 feet)
63–65	Sand, very fine to fine grained, well sorted, green
68–70	Same as above (63–65 feet)
78–80	Same as above (63–65 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.55. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW46, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340216 and East 2500150, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 25.1 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0–2	Silty sand, very fine to fine grained, brown
4–6	Silty sandy clay, very fine to fine grained, tan and gray
9–11	Same as above (4–6 feet), medium plasticity
14–16	Same as above (4–6 feet)
19–21	Silty sand, very fine to medium grained, gray
24–26	Silty sand, very fine to medium grained, light gray
29–31	Sand, very fine to fine grained, well sorted, tan to gray
34–36	Silty sand, very fine to fine grained, brown
39–41	Same as above (34–36 feet), very fine to medium sands with trace gravels
43–45	Silty sand, very fine to medium grained, gray
48–50	Sandy clay with little shell fragments and low plasticity, gray
53–55	Clayey sand with little gravel and trace shell fragments, very fine to medium grained, gray
58–60	Sand with weathered limestone and shells in bottom 4 inches, very fine to medium grained, gray
63–65	Clayey sand, very fine to medium grained, gray
68–70	Same as above (63–65 feet)
78–80	Silty clayey sand with shell fragments, very fine to fine grained, green
88–90	Silty sand with cemented sands throughout, very fine to fine grained, green
98–100	Silty sand, very fine to fine grained, light green
108–110	Same as above (98–100 feet), light green and tan
118–120	Sand with trace silt and shell fragments, fine grained, well sorted, green tan gray
128–130	Same as above (118–120 feet)
138–140	Sand, very fine to medium grained, green and tan
148–150	Same as above (138–140 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.56. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW49, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340709 and East 2500603, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 23.9 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0–2	Silty sandy clay, very fine to fine grained, brown
4–6	Same as above, gray and brown
9–11	Silty sand, very fine to fine grained, gray
14–16	Sand, very fine to fine grained, well sorted, gray and brown
19–21	Same as above (14–16 feet)
24–26	Same as above (14–16 feet)
29–31	Sand, very fine to medium grained, well sorted, orange
34–36	Sand, very fine to medium grained, moderately sorted, gray and green
39–41	Silty sand with shell fragments, very fine to fine grained, weathered sandy limestone, green
42–44	Sand, very fine to fine grained, well sorted, gray
47–49	Highly weathered limestone, very fine to coarse sand, clayey, gray
52–54	Silty sand with shell fragments, very fine to fine grained, weathered sandy limestone, green
57–59	Sand with trace clay nodules and shell fragments, very fine to fine grained, gray
62–64	Same as above (57–59 feet)
67–69	Same as above (57–59 feet)
78–80	Same as above (57–59 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.57. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW52, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340580 and East 2501196, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 28.0 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
1.0–3.0	Silty sand, very fine to fine grained, brown and tan
4.0–6.0	Silty clay with high plasticity, gray and tan
9.0–11.0	Silty sandy clay with high plasticity, very fine- to fine-grained sand, gray
14.0–16.0	Same as above (9.0–11.0 feet)
19.0–21.0	Same as above (9.0–11.0 feet), sandy clay, very fine sand
24.0–26.0	Silty sandy clay, very fine- to fine-grained sand, brown and gray, peat (?)
29.0–31.0	Sand, very fine to fine grained, well sorted, gray
34.0–36.0	Same as above (29.0–31.0 feet), very fine to medium grained
39.0–41.0	Same as above (29.0–31.0 feet)
43.0–45.0	Silty sand with weathered limestone and cemented sand, very fine to fine grained, light green
48.0–50.0	Sand with a trace of silt, very fine grained, well sorted, green
53.0–55.0	Silty sand with cemented sands, very fine to medium grained, light green
56.0–58.0	Layers of cemented sands
58.5–59.0	Sandy limestone with shell fragments
59.0–63.0	No return—assumed to be sand
63.0–65.0	Sand with trace silt and shell fragments, very fine to fine grained, well sorted, green and gray
68.0–70.0	Same as above (63.0–65.0 feet) with shell fragments
78.0–80.0	Same as above (63.0–65.0 feet) with trace shell fragments
88.0–90.0	Silty sand with trace shell fragments, very fine to fine grained, green and tan
90.0–98.0	“Hitting thin hard cemented layers of sand”
98.0–100.0	Silty sand with cemented sands, very fine to medium grained, light green
108.0–110.0	Sand, fine grained, well sorted, light green
118.0–120.0	Sand with shell fragments, very fine to fine grained, moderately sorted, light green and tan
128.0–130.0	Same as above (118.0–120.0 feet) without shell fragments
138.0–140.0	Same as above (118.0–120.0 feet)
148.0–150.0	Same as above (118.0–120.0 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.58. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW56, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340102 and East 2500510, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 26.4 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.0–0.5	Silty sand, very fine to fine grained, moderately sorted, brown
0.5–2.0	Silty clayey sand, very fine to fine grained, tan
3.5–5.5	Silty clayey sand, very fine to fine grained, tan gray orange
8.5–10.5	Silty sandy clay, very fine to fine grained sand, very soft, tan gray orange
13.5–15.5	Sand, fine grained, well sorted, gray
18.5–20.5	Same as above (13.5–15.5 feet) with some silt
23.5–25.0	Sand, fine grained, well sorted, brown and gray
25.0–25.5	Sand, fine grained, well sorted, gray
28.5–30.5	Sand, very fine to fine grained, well sorted, gray
33.5–34.5	Same as above (28.5–30.5 feet)
34.5–35.5	Same as above (28.5–30.5 feet), light gray
38.5–40.5	Same as above (28.5–30.5 feet)
43.0–45.0	Sand, fine grained, well sorted, gray
48.0–50.0	Silty clayey sand, very fine to fine grained, dark gray
53.0–54.0	Same as above (48.0–50.0 feet)
54.0–58.0	"Rods fell from 54–58 feet below land surface. Possible very loose clayey sand/void"
58.0–58.5	Same as above (48.0–50.0 feet) with less clay
58.5–61.0	"Rods fell from 58.5–61 feet below land surface. Possible very loose clayey sand/void."
63.0–65.0	Silty sand, very fine to fine grained, light green
68.0–70.0	Sand, very fine to fine grained, well sorted, green
73.0–75.0	Same as above (68.0–70.0 feet)
78.0–80.0	Same as above (68.0–70.0 feet)
88.0–90.0	Silty clayey sand with shell fragments, very fine to fine grained, light green
93.0–95.0	"Hit hard thin layers of cemented sands with some weathered limestone"
98.0–100.0	Silty sand with cemented clusters of sand grading to a green well-sorted very fine- to fine-grained sand, very fine to fine grained, light green
108.0–110.0	Silty sand, very fine to fine grained, gray and green
118.0–120.0	Same as above (108.0–110.0 feet), green and tan
128.0–130.0	Same as above (108.0–110.0 feet) with trace shell fragments
138.0–140.0	Same as above (108.0–110.0 feet)
148.0–150.0	Same as above (108.0–110.0 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.59. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW59, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 340220 and East 2501522, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 28.0 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
1.0–3.0	Silty sand, very fine to fine grained, moderately sorted, brown
5.0–7.0	Silty sandy clay, very fine grained sand, tan gray orange
8.0–10.0	Silty sand, very fine grained, gray
13.0–15.0	Same as above (8.0–10.0 feet)
18.0–20.0	Sand with trace silt, very fine to fine grained, well sorted, brown and gray
23.0–25.0	Peat and silty clayey sand, very fine to fine grained sand, brown
28.0–30.0	Sand, fine grained, well sorted, gray
33.0–35.0	Same as above (28.0–30.0 feet) with some silt
38.0–40.0	Same as above (28.0–30.0 feet) with trace coarse-grained sand, dark green and gray
42.5–44.5	Sand with trace silt and gravels, fine grained, well sorted, dark green
44.5–45.5	"Hammer on last hit dropped approximately 1.0 foot. Possible void or very soft sediment"
47.5–49.5	Sand with trace medium-grained sand-size shell fragments, very fine to fine grained, well sorted, light green
49.5–52.5	"Drilled through thin layers of cemented sand throughout the 5-foot run"
52.5–54.5	Silty sand with medium-size shell fragments, very fine to fine grained, moderately sorted, green
57.5–58.5	Weathered limestone
58.5–59.0	Sandy limestone
59.0–59.5	Severely weathered limestone
62.5–64.5	Silty sand with cemented sands, very fine to fine grained, moderately sorted, light green
67.5–69.5	Sand, fine grained, well sorted, light green
73.0–75.0	Same as above (67.5–69.5 feet), green
78.0–80.0	Silty sand with trace sand-size shell fragments, very fine to fine grained, moderately sorted, green

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.60. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW60, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339869 and East 2501342, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.4 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.0–1.0	Gravel with very fine- to fine-grained sand
1.0–3.0	Sand, very fine to medium grained, well sorted, tan and brown
3.0–5.0	No sample
5.0–7.0	Silty sand, very fine to fine grained, gray
7.0–9.0	Same as above (5.0–7.0 feet)
9.0–11.0	Same as above (5.0–7.0 feet)
11.0–13.0	Same as above (5.0–7.0 feet)
13.0–15.0	Same as above (5.0–7.0 feet)
15.0–16.5	Same as above (5.0–7.0 feet)
16.5–17.0	Silty clayey sand, very fine to fine grained, gray
17.0–19.0	Same as above (16.5–17.0 feet)
19.0–21.0	Sand, very fine to fine grained, well sorted, gray
21.0–23.0	Sand, very fine to medium grained, moderately sorted, gray with brown staining
23.0–24.0	Same as above (21.0–23.0 feet)
24.0–25.0	Silty sand, very fine to fine grained, gray
25.0–27.0	Sand, fine grained, well sorted, gray
27.0–29.0	Same as above (25.0–27.0 feet)
29.0–31.0	Same as above (25.0–27.0 feet), gray and green
31.0–33.0	Same as above (29.0–31.0 feet), with increase in green color
33.0–35.0	Same as above (25.0–27.0 feet)
35.0–36.0	Same as above (25.0–27.0 feet)
36.0–37.0	Sand, very fine to medium grained, well sorted, tan and orange
37.0–39.0	Sand, very fine to medium grained, well sorted, gray with some tan and orange
39.0–40.0	Same as above (37.0–39.0 feet)
40.0–41.0	Sand, very fine grained, well sorted, tan and orange
41.0–42.5	Sand, very fine to fine grained, tan
42.5–43.0	Sand, very fine to fine grained, olive green with coarse shell fragments
43.0–44.0	Silty sand, very fine to fine grained, olive green
44.0–45.0	Silty sand, very fine to medium grained, with limestone fragments, olive green

Table B1.60. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW60, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[Location coordinates are North 339869 and East 2501342, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.4 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
45.0–47.0	Silty sand, very fine grained with coarse limestone fragments, olive green
47.0–49.0	Silty sand, very fine grained, olive green
49.0–51.0	Silty sandy limestone, weathered, very fine to coarse sand, 1–2-inch-thick lenses of indurated materials through interval, olive green
51.0–53.0	Silty sand, very fine grained, green
53.0–55.0	Same as above (51.0–53.0 feet) with shell fragments "Last 1 inch of spoon = shell fragments"
55.0–57.0	Silty sandy clay with coarse shell and limestone fragments, very fine-grained sand, green
57.0–60.0	Silty clayey sand with shell and limestone fragments, very fine to fine grained, green
60.0–65.0	Sandy limestone, fossiliferous, "4 feet of recovery from 5 feet core," gray
65.0–70.0	No sample, "Assumed to be green, well sorted fine sand"
70.0–72.0	Sand, fine grained, well sorted, green
72.0–74.0	Same as above (70.0–72.0 feet)
74.0–76.0	Same as above (70.0–72.0 feet)
76.0–78.0	Same as above (70.0–72.0 feet) with trace coarse shell fragments
78.0–80.0	Same as above (70.0–72.0 feet) with trace coarse shell fragments
80.0–82.0	Silty sand with trace medium shell fragments, very fine to fine grained, green
82.0–84.0	Same as above (80.0–82.0 feet) with increasing silt
84.0–86.0	Same as above (80.0–82.0 feet)
86.0–88.0	Same as above (80.0–82.0 feet)
88.0–90.0	Silty sand with shell fragments, very fine to fine grained, light green
90.0–92.0	Same as above (88.0–90.0 feet), green
92.0–94.0	Same as above (88.0–90.0 feet)
94.0–96.0	Same as above (88.0–90.0 feet)
96.0–98.0	Silty sand with shell and limestone fragments, very fine to fine grained, light green
98.0–100.0	Sandy limestone, severely weathered with shell fragments
100.0–102.0	Sandy limestone, severely weathered, very fine to medium sands with silty sands in last 4 inches of spoon, light green
102.0–104.0	Silty sand with trace shell fragments, very fine to fine grained
104.0–106.0	Same as above (102.0–104.0 feet) without shell fragments
106.0–108.0	Same as above (102.0–104.0 feet)
108.0–110.0	Sand with shell fragments, fine grained, well sorted, light green
110.0–112.0	Same as above (108.0–110.0 feet) without shell fragments
112.0–114.0	Silty sand, very fine to fine grained, light green and tan
114.0–116.0	Same as above (112.0–114.0 feet) with less silt
116.0–118.0	Same as above (112.0–114.0 feet) with trace shell fragments
118.0–120.0	Same as above (112.0–114.0 feet)
120.0–122.0	Sand, fine grained, well sorted, light green and tan
122.0–124.0	Same as above (120.0–122.0 feet)
124.0–126.0	Same as above (120.0–122.0 feet) with increasing green color
126.0–128.0	Same as above (120.0–122.0 feet)
128.0–130.0	Sand with trace shell fragments and silt, fine grained, green and tan
130.0–132.0	Silty sand with trace shell fragments, fine grained, green and tan
132.0–134.0	Same as above (130.0–132.0 feet)
134.0–135.0	Same as above (130.0–132.0 feet)
135.0–135.2	Same as above (130.0–132.0 feet) with thin clay lenses
135.2–136.0	Same as above (130.0–132.0 feet)
136.0–138.0	Same as above (130.0–132.0 feet)
138.0–140.0	Same as above (130.0–132.0 feet) with interbedded clay lenses
140.0–142.0	No sample
142.0–144.0	Silty sand with a fine- to coarse-grained sand layer with shell fragments from 142.2 to 142.4 feet, very fine to fine grained, green and olive green
144.0–146.0	Silty sand with trace shell fragments, "Layer of medium to coarse sand with coarse size shell fragments from 144.4 to 144.7 feet"
146.0–148.0	Silty sand, very fine to medium grained, green
148.0–150.0	Same as above (146.0–148.0 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.61. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW62, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339476 and East 2501269, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 27.4 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.0–2.0	Silty clayey sand, very fine to fine grained, tan and black
3.0–5.0	Silty sandy clay, very fine- to fine-grained sand, low to medium plasticity, brown
8.0–10.0	Silty sand, very fine to fine grained, gray
13.0–13.5	Silty clay (fat clay), gray
13.5–15.0	Silty sandy clay, very fine-grained sand (peat?), brown
18.0–20.0	Sand, very fine to fine grained, well sorted, gray
23.0–25.0	Silty sand with clayey layers, fine grained, gray
28.0–30.0	Sand, fine grained, well sorted, gray to dark gray
33.0–35.0	Same as above (28.0–30.0 feet)
38.0–40.0	Sand, very fine to medium grained, well sorted, gray
43.0–45.0	Silty sandy limestone, weathered, very fine to medium sand, green
48.0–50.0	Silty clayey sand with weathered limestone, very fine to medium grained, green
53.0–55.0	Silty sand with trace shell fragments, very fine to fine grained, green
58.0–60.0	Silty sandy clay with shell fragments, very fine- to medium-grained sand, green
63.0–65.0	Sand with trace shell fragments, very fine to fine grained, well sorted, green
68.0–70.0	Sand with trace silt, very fine to fine grained, well sorted, gray
73.0–75.0	Same as above (68.0–75.0 feet)
97.0–99.0	Silty sand with shell fragments, very fine to fine grained, moderately sorted, green
106.0–108.0	Same as above (97.0–99.0 feet)
118.0–120.0	Sand, fine grained, well sorted, light green
133.0–135.0	Same as above (118.0–120.0 feet)
143.0–145.0	Same as above (118.0–120.0 feet)
153.0–155.0	Same as above (118.0–120.0 feet)

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.62. Description of cores collected during drilling at Underground Storage Tank Program Site Hadnot Point Fuel Farm (Figure B3), monitor well HPFF_MW71, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339389 and East 2501979, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 30.7 feet (National Geodetic Vertical Datum of 1929) either reported directly in environmental reports or calculated using reported altitude at top of well casing and length of casing riser above or below ground surface (Shaw Environmental, Inc. 2007a)]

Depth below land surface, in feet	Core description
0.5–2.0	Silty clayey sand, very fine to fine grained, tan
3.5–5.5	Silty sand, very fine to fine grained, tan gray, orange
8.5–10.5	Same as above (3.5–5.5 feet) with increasing silt
13.5–15.5	Silty clayey sand, very fine to fine grained, light gray
18.5–20.5	Sand, very fine to fine grained, well sorted, light gray
23.5–25.5	Silty sand, very fine to fine grained, light gray
28.5–30.5	Same as above (23.5–25.5 feet) with clay layers
33.5–35.5	Silty sandy clay, very fine to fine grained sand, medium plasticity, grades to silty sand, very fine to medium grained, light gray tan orange
38.5–40.5	Sand with some silt, very fine to fine grained, tan orange, light gray
43.0–45.0	Sand, fine grained, well sorted, tan and orange
48.0–50.0	Sand with trace shell fragments and cemented sands, very fine grained, well sorted, green
53.0–55.0	Same as above (48.0–50.0 feet) with silt
58.0–60.0	Same as above (48.0–50.0 feet)
63.0–65.0	Silty sandy clay with trace shell fragments, medium plasticity, very fine-grained sand, green
68.0–69.0	Same as above (63.0–65.0 feet)
69.0–71.0	“Core run from 69.5–74.5 feet. Approximately 2-foot layer of limestone recovered”
71.0–74.5	“No return from core. Assumed to be very fine sand with trace shell fragments”
74.5–78.0	No sample
78.0–80.0	Sand with trace shell fragments, very fine grained, well sorted, light green

Data sources:

Leaking Underground Storage Tank Program file #370

Catlin Engineers and Scientists 2002a

Table B1.63. Description of cuttings and cores collected during drilling at the Bow-1 site, U.S. Marine Corps Base Camp Lejeune, North Carolina.

[Location coordinates are North 339869 and East 2501342, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 23.2 feet (National Geodetic Vertical Datum of 1929; Geophex, Ltd. 1994); <, less than]

Depth below land surface, in feet	Cuttings or core description
	Cuttings description
5.0–7.0	Silty clay, mottled gray yellow
10.0–12.0	Silty clay, mottled gray, bright reddish brown
15.0–17.0	Quartz sand, medium grained, very well sorted, very light gray
20.0–22.0	"Grading downward into medium gray carbonate-bearing quartz sand. Scattered gastropod and brachiopod casts. Sharp contact with bright-red iron-stained medium-coarse quartz sand with iron nodules"
25.0–27.0	"Tan, carbonate-bearing, phosphate-bearing, medium quartz sand. Scattered shell fragments and echinoid spines"
30.0–32.0	"Medium gray, carbonate- and phosphate-bearing, medium quartz sand. Scattered echinoid plates"
35.0–37.0	Same as above (30.0–32.0 feet)
	Core description
36.0–39.0	"Thin bed (< 1 foot) of medium gray carbonate- and phosphate-bearing quartz sand with abundant echinoid plates and other macrofossil fragments. The rest of this core is the same except that the fossils are more scattered"
39.0–40.0	Very fine carbonate/quartz sand, medium gray
40.0–41.0	"Four-inch thick tan bed with a dense accumulation of echinoid plates, with tan, carbonate-bearing medium quartz sand"
41.0–46.5	Quartz sand, medium grained, carbonate bearing, trace phosphate grains, medium gray
46.5–51.0	"Tan, silty carbonate/quartz, medium sand with abundant phosphatic and calcareous skeletal fragments (bones, shark teeth, bryozoans, pectins, and echinoids). Knots of indurated semi-indurated material"
51.0–55.5	Carbonate cemented, quartz and calcareous sandstone, indurated to semi-indurated, abundant shell fragments
56.0–57.5	Calcareous/quartz sand, scattered calcareous fossil fragments, medium gray
57.5–61.0	Quartz/calcareous sand, very fine grained, minor phosphate and/or heavy minerals, dark gray
61.0–61.1	Quartz/calcareous sand, very fine grained, abundant calcareous and phosphatic skeletal fragments, dark gray
61.1–71.0	"Dark greenish gray, quartz/calcareous very fine sand with trace of phosphate or heavy minerals sand. Grading downward into dark gray, quartz/calcareous silt with trace phosphate or heavy minerals. No visible bedding (massive)"
71.0–135.0	"Dark greenish gray, quartz/calcareous clayey silt with trace phosphate or heavy minerals. No visible bedding (massive). Occasional thin, light-colored lamination and dark gray burrows from 90 to 93 feet"
135.0–143.25	"Blebs of lighter silt in dark gray, quartz/calcareous silt. May be becoming finer downward"
143.25–145.0	"Grading downward into olive-gray, quartz/calcareous silt with wisps, laminations, and blebs of very light gray, which may be carbonate (?)"
145.0–148.0	"Olive-gray, quartz/calcareous silt with scattered sand to pebble-sized phosphate grains, increasing in abundance downward"
148.0	"Black, thin microsphorine crust"
148.0–149.0	"Cream-colored with minor glauconite, very porous, bryozoan biosparudite, indurated but slightly friable. Fossils coarsen downward"
149.0–150.0	"Deep green, glauconitic/iron phosphate (?) crust, grading downward into light gray bryozoan, gastropod-bearing, pelecypod-bearing biomicrudite with numerous vugs and porous zones"
150.0–156.5	"Light bluish-gray, dense, mold and cast, pelecypod-bearing biomicrudite"
156.5–157.0	"Light gray, hard, vuggy, mold and cast, bryozoan, pelecypod, biomicrudite with phosphate and glauconite grains"
157.0–161.0	"Driller estimates sand, no recovery"
161.0–166.0	Biomicrudite, interbedded, light gray, vuggy with pelecypods and a large whole irregular echinoid fossil alternating approximately 1-foot thick, gray lime mud intervals, poor recovery. "Porosity looks high."
166.0–171.5	Grading downward into light gray sandy semi-indurated micrite with minor glauconite, fossils not visible, low porosity
171.5–175.5	"Semi-indurated zone with interspersed bright green authigenic glauconite"
175.5–180.75	"Light gray-tan, slightly sandy bryozoan-bearing biomicrudite. Lime cement is semi-indurated but looks very tight. Porosity looks low"
180.75–191.0	"Light tan, slightly sandy, bryozoan biomicrite. Fossils are sparse and hard to see. Lime cement is semi-indurated but looks very tight. Porosity looks low. Chert horizon is to 2 inches at 186 feet"
191.0–204.0	"Light tan, slightly sandy, bryozoan-bearing biomicrudite. Fossils are sparse. Lime cement is semi-indurated but looks very tight. Porosity looks low"

Table B1.63. Description of cuttings and cores collected during drilling at the Bow-1 site, U.S. Marine Corps Base Camp Lejeune, North Carolina.—Continued

[Location coordinates are North 339869 and East 2501342, North Carolina State Plane Coordinates, North American Datum of 1983; land-surface altitude is 23.2 feet (National Geodetic Vertical Datum of 1929; Geophex, Ltd. 1994); <, less than]

Depth below land surface, in feet	Cuttings or core description
	Core description—Continued
204.0–206.0	"Same as above but grading downward into tan biomicrudite with glauconite-filled burrows. Porosity still low"
206.0–206.5	"Hard gray/bright green/dark brown biolithrudite with mixed phosphate/glauconite crust/clasts and encrusting bryozoans. Looks like diastemic surface. Porosity increasing dramatically from above"
206.5–211.0	"Light gray, molluscan biolithomicrudite. Very hard, moldic with numerous clasts and fragments of glauconite and phosphate pebbles. Porosity looks high"
211.0–215.5	"Friable molluscan hash biosparudite with abundant phosphate/glauconite grains grading downward into muddier matrix"
215.5–218.0	"Light greenish-gray, muddy molluscan hash biolithomicrudite with abundant glauconite and phosphate grains"
218.0–225.0	"Light greenish gray, vuggy, very hard molluscan biomicrudite. Porosity looks very high"
225.0–233.0	"Light gray, semi-indurated and friable bryozoan, molluscan biolithomicrudite. Porosity looks moderate"
233.0–251.0	"Light gray-greenish gray, well lithified molluscan biomicrudite grading downward into biosparudite. Porosity looks moderate"
251.0–260.0	"Light gray-light greenish gray, soft, muddy, very friable biolithomicrudite. Porosity looks moderate to low"
260.0–271.0	"Greenish gray, moderately well lithified molluscan bryozoan biosparudite. Glauconite and phosphate common. Porosity looks very high"
271.0–292.0	"Interbedded, light gray loose calcarenite/light gray muddy biomicrudite and moderately lithified molluscan mold biosparudite. Porosity looks very high"
292.0–301.0	"Light gray, muddy soft biolithomicrudite with abundant glauconite. Porosity looks moderately good"
301.0–318.0	"Same as above with alternating zones of greater mud content and lower porosity"
318.0–326.0	"Light gray, sandy/muddy biolithomicrudite with occasional glauconite pebbles and large whole oyster shells that look like original shell material. Produces a large gamma kick"
326.0	"Dark brownish gray, two inches thick chert horizon"
326.0–331.0	"Medium gray, friable, silty, pebbly sandy lime mud. No large fossils visible but common small trepestome (branching) bryozoans. Porosity looks moderately low. May be Pee Dee(?)"

Data sources:

Geophex, Ltd. 1994

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Analyses and Historical Reconstruction of Groundwater Flow, Contaminant Fate and Transport, and Distribution of Drinking Water Within the Service Areas of the Hadnot Point and Holcomb Boulevard Water Treatment Plants and Vicinities, U.S. Marine Corps Base Camp Lejeune, North Carolina—Chapter B: Geohydrologic Framework of the Brewster Boulevard and Castle Hayne Aquifer Systems and the Tarawa Terrace Aquifer