

LITHOLOGIC DESCRIPTIONS OF TWO CORES AND GROUND-WATER-QUALITY DATA FROM FIVE COUNTIES IN THE NORTHEASTERN PART OF THE COASTAL PLAIN OF SOUTH CAROLINA, 1988 AND 1991

By W. Fred Falls

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CONVERSION FACTORS

Multiply	By	To obtain
foot (ft)	0.3048	meter

Water temperature in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) as follows:

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

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

Abbreviated water-quality units used in this report:

microsiemens per centimeter at 25 degrees Celsius = $\mu\text{S}/\text{cm}$ at 25 °C

micrograms per liter = $\mu\text{g}/\text{L}$

milligrams per liter = mg/L

Additional abbreviation:

millimeter (mm) used in tables 1 and 2 for description of grain size.

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ABSTRACT

This report presents data collected as part of a hydrologic investigation of Darlington, Dillon, Florence, Marion, and Marlboro Counties in the northeastern part of the Coastal Plain of South Carolina. These data include lithologic descriptions of sediment recovered from two continuously cored boreholes and water-quality results for samples collected from 17 existing wells. One continuously cored borehole was drilled near Lake Darpo in the northern part of Darlington County to a total depth of 447 feet below land surface. The other borehole was drilled in Lake City in the south-central part of Florence County to a total depth of 1,090 feet below land surface. Water-quality results presented in this report include specific conductance, dissolved oxygen, temperature, pH, alkalinity, major- and minor-ion chemistry, and hydrogen sulfide.

INTRODUCTION

Concerns among ground-water users about the quantity and quality of ground-water resources in the northeastern part of the Coastal Plain of South Carolina resulted in a hydrologic investigation by the U.S. Geological Survey (USGS) in cooperation with the South Carolina Water Resources Commission. This investigation included mud-rotary-wireline coring of two boreholes and analysis of water samples from 17 existing wells to obtain data about the hydrogeology, geochemistry, and water quality of the ground-water-flow system beneath Darlington, Dillon, Florence, Marion, and Marlboro Counties (figs. 1, 2, and 3).

Purpose and Scope

This report summarizes the results of a study to describe lithologic and water-quality data collected within a five-county study area. This report includes lithologic descriptions of cored sediments and geophysical logs of the boreholes located near Lake Darpo in Darlington County and Lake City in Florence County. Water-quality data in this report include field measurements and laboratory analyses of samples collected from 17 existing wells in the five-county study area in November 1988 and in April and May 1991.

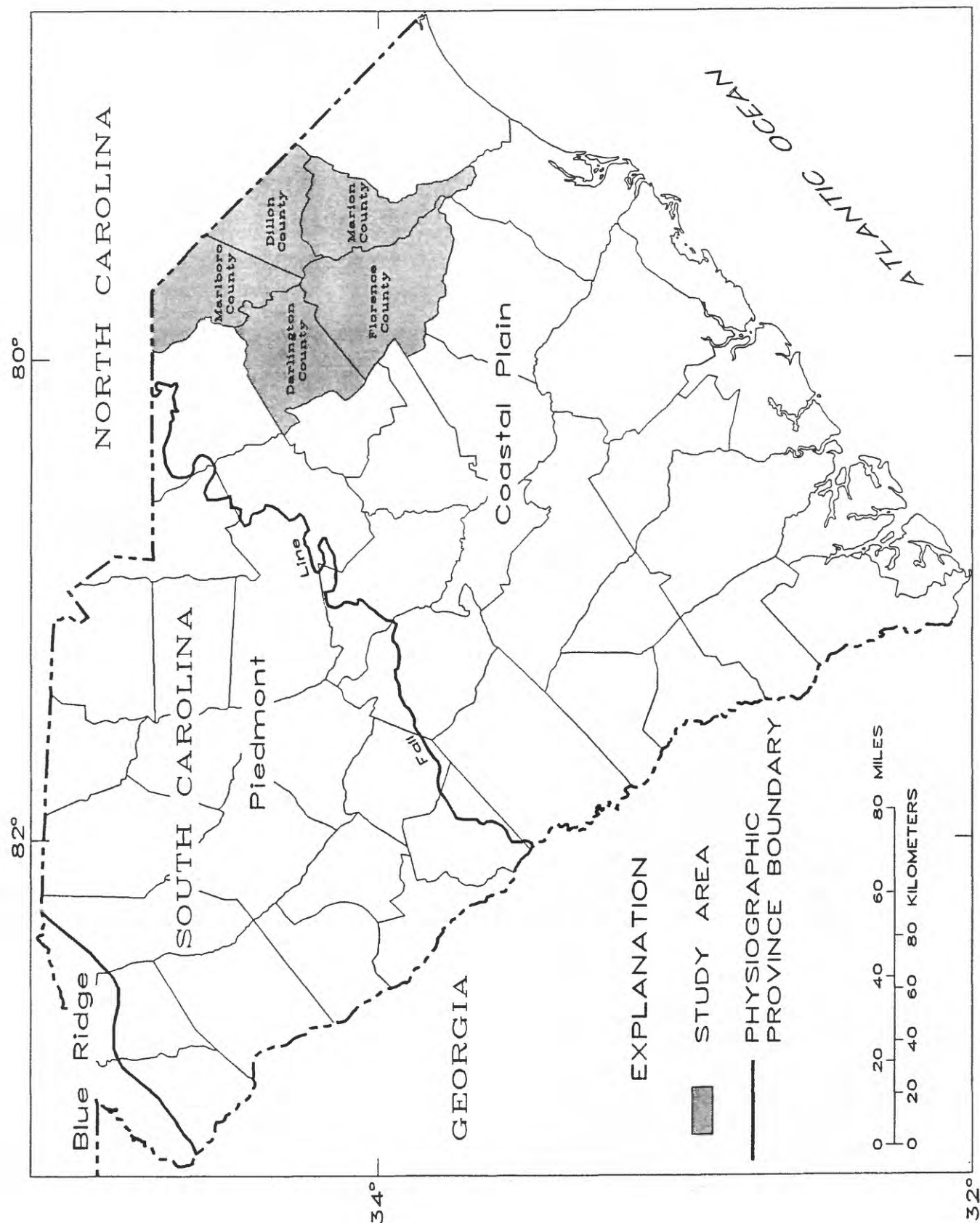


Figure 1.--Location of five-county study area and physiographic division of South Carolina into the Blue Ridge, Piedmont, and Coastal Plain Provinces.

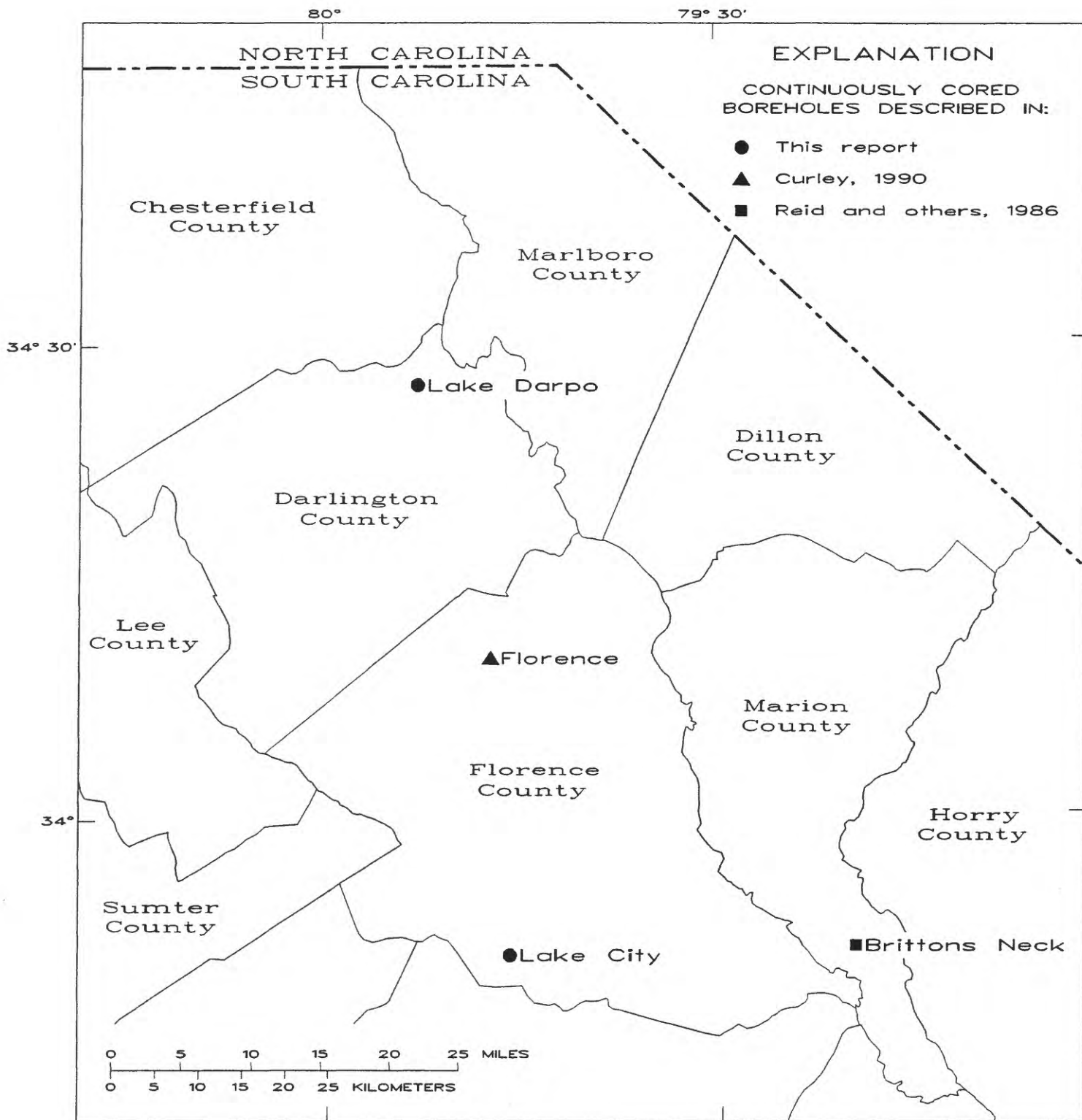


Figure 2.--Location of continuously cored boreholes in the study area.

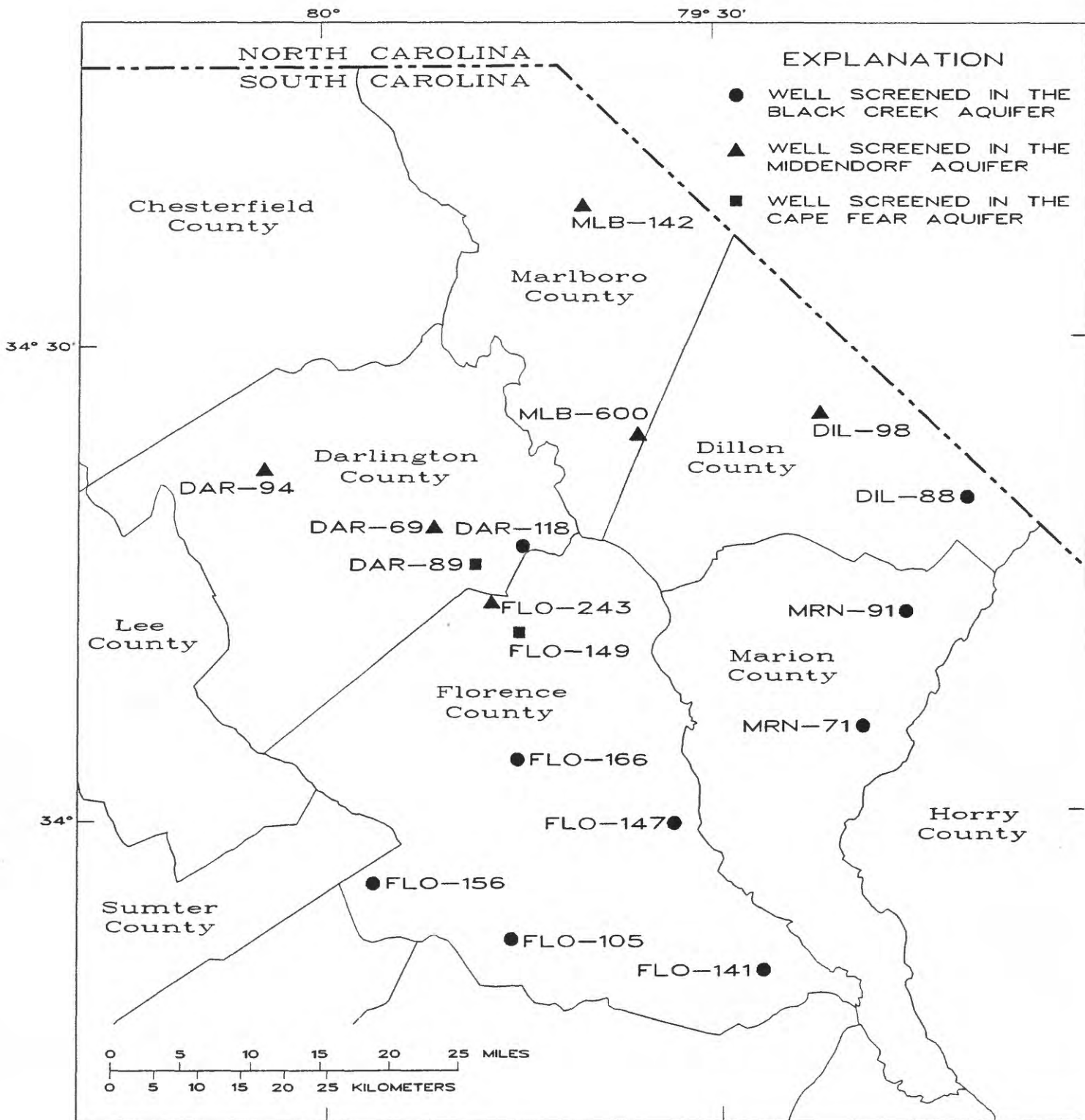


Figure 3.--Location of wells sampled for water-quality constituents.

Interpretation of contacts between geologic units and application of stratigraphic names to sediments recovered from the boreholes are not within the scope of this report. Specific contacts and names of hydrologic units also are not applied to illustrations in this report.

Description of Study Area

The five-county study area in this report includes Darlington, Dillon, Florence, Marion, and Marlboro Counties in the northeastern part of the Coastal Plain of South Carolina (fig. 1). Sediments beneath the study area are predominantly Late Cretaceous in age and compose the Black Creek, Middendorf, and Cape Fear aquifer systems as defined by Aucott and others (1987). The sediments predominantly consist of sand and clay, and include thin beds of carbonate-cemented sand and sandy carbonate in the upper part of the Late Cretaceous sediments in Marion County and the eastern part of Florence County (Woollen and Colquhoun, 1977; Reid and others, 1986; Owens, 1989). The Late Cretaceous sediments in the study area are typically overlain by sediments of Pliocene and Pleistocene age. The Pliocene and Pleistocene sediments have a cumulative thickness of less than 40 ft and compose a surficial aquifer across much of the study area. The total thickness of Late Cretaceous and younger sediments increases toward the coast, ranging from less than 400 ft in the northwestern part of the study area to 1,170 ft in a deep borehole at Brittons Neck in the southeastern part of the study area (Reid and others, 1986, (fig. 2).

Previous Studies

Reid and others (1986) described sediments recovered during the coring of a borehole to a depth of 1,170 ft below land surface near Brittons Neck in southern Marion County in 1985 (fig. 2) and included construction information and water-quality data for two monitoring wells installed at the Brittons Neck site. Water-quality data for the Brittons Neck monitoring wells also were reported in Lee (1984) as part of the Sand Aquifer Study of the Southeast Regional Aquifer System Analysis (RASA) program of the U.S. Geological Survey (Sun, 1986). Curley (1990) described sediments recovered from a continuously cored borehole in the city of Florence (fig. 2), and summarized existing water-quality and aquifer-test results for wells in the five-county study area.

Aucott and others (1987) defined a hydrogeologic framework for the five-county study area as part of the RASA program for South Carolina. Aucott and Speiran (1985a, 1985b) used water-level data from the five-county study area to map potentiometric surfaces (November 1982) for the Black Creek, Middendorf, and Cape Fear aquifers, and declines in the potentiometric surfaces for these three aquifers in response to development. Aucott (1988) further described the hydrologic characteristics of the Coastal Plain aquifers and developed a calibrated ground-water-flow model for the predevelopment ground-water-flow system of the Coastal Plain of South Carolina. Speiran and Aucott (in press) described geochemical processes between the sediment and water in the Black Creek, Middendorf, and Cape Fear aquifers.

Sediment cores and water-quality data presented in this report were used in several previously published reports to evaluate the effects of microbiological and geochemical processes on water quality in deep aquifer systems. Chapelle and Lovley (1990)

estimated rates of microbial metabolism in the Black Creek, Middendorf, and Cape Fear aquifer systems in the study area based on laboratory studies and geochemical modeling. McMahon and Chapelle (1991a) documented concentrations of acetate and formate in confining-bed porewaters recovered from the Lake City core. McMahon and Chapelle (1991b) investigated sources, sinks, and stable carbon isotopic composition of dissolved inorganic carbon in the Black Creek aquifer system. Chapelle and McMahon (1991) provided evidence that sulfate reduction is the principal electron-accepting process in the Black Creek aquifer system. McMahon and others (1992) described the role of microbial processes in linking sandstone diagenesis with organic-rich clays in the Black Creek aquifer system. Chapelle and Lovley (1992) proposed that competition for substrates between Fe (III)- and sulfate-reducing microorganisms is a mechanism for producing discrete zones of high-iron ground water in the Middendorf aquifer system.

Acknowledgments

The author wishes to thank the town of Lake City in Florence County, and the Darlington County Parks and Recreation Service for assistance in obtaining suitable sites for continuous wireline coring of deep boreholes. Appreciation also is extended to the following cities, towns, rural water-supply companies, industries, and government agencies for providing access to wells for the collection of water-quality samples: the cities and (or) towns of Lake View, Lake City, Pamplico, Olanta, Mullins, Darlington, Hartsville, Dillon, Florence, Bennettsville, and Lamar; Marco Water-Supply Company in Marion County; Trico Rural Water-Supply Company in Dillon County; Wellman Industries in Johnsonville; McCall Farms near Effingham; International Paper near Brownsville; Fiber Industries, Inc. near Darlington; and the U.S. Department of Agriculture.

LITHOLOGIC DESCRIPTIONS

Sediments from the Lake Darpo and Lake City boreholes were recovered with a mud-rotary wireline-coring technique. Each borehole was continuously cored through the entire sequence of Late Cretaceous and younger sediments and penetrated into pre-Cretaceous bedrock (figs. 4 and 5). The Lake Darpo borehole was drilled near Lake Darpo at lat 34°27'31"N. and long 79°52'48"W. in the northern part of Darlington County. Ground-surface altitude at the Lake Darpo site is about 172 ft above sea level. The Lake City borehole was drilled in Lake City at lat 33°51'20"N. and long 79°46'02"W. in the south-central part of Florence County. Ground-surface altitude at the Lake City site is about 75 ft above sea level. Ground-surface altitudes were determined from topographic maps. The cores provided representative sediment samples for the aquifers and confining beds. Sediments recovered from these two sites were boxed and stored at the South Carolina Geological Survey core storage facility in Columbia, S.C.

Lithologic descriptions of the Lake Darpo and Lake City cores are presented in tables 1 and 2, respectively (at end of report). Estimates of grain size, sorting, and angularity for framework grains, and of the amount and composition of minor sediment constituents, are based on visual examination of the cores. The classification of grain size

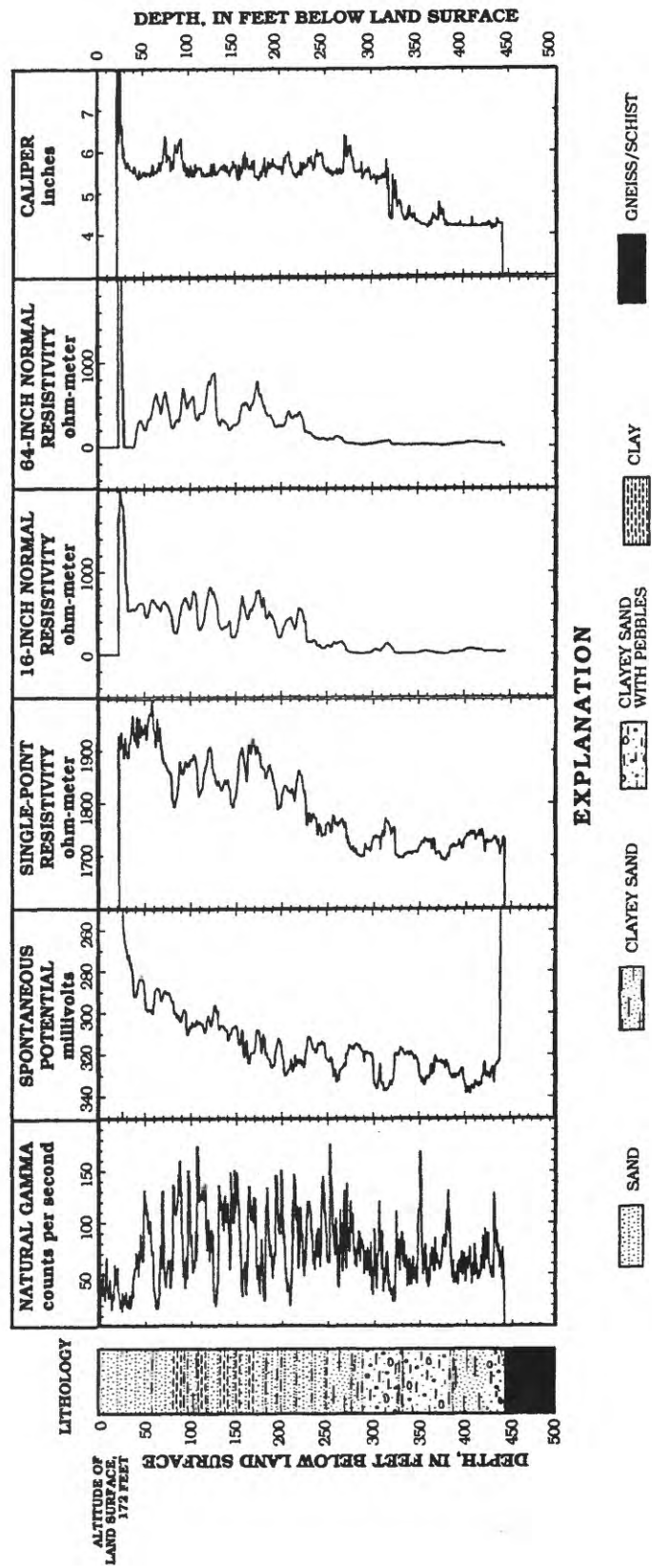


Figure 4.--Lithologic columnar section based on descriptions of cored sediments and geophysical logs of the Lake Darpo borehole, northern Darlington County.

is based on a standard grain-size scale (Wentworth, 1922). The Geological Society of America Rock Color Chart (1991) was used to identify the dominant color of a lithologic unit and the color of secondary amounts of mineral staining.

WATER-QUALITY ANALYSES

Seventeen wells in the study area were selected for collection of water samples (table 3). All wells were pumped for a minimum of one hour prior to sample collection. Specific conductance, dissolved oxygen, temperature, pH, and alkalinity were measured at each well site using standard water-quality-sampling techniques (Wood, 1976) (table 4). Water samples for all major- and minor-ion chemistry and hydrogen-sulfide analyses were collected using standard water-quality-sampling techniques (Skougstad and others, 1979), and were analyzed at the USGS Quality of Water Service Unit in Ocala, Fla. Results of the analyses are presented in table 5. Water samples for major- and minor-ion chemistry were processed through a 0.45 micron filter at each well site and results were reported as dissolved concentrations by the laboratory. Water samples for metals analyses were acidified with nitric acid to a pH of 2 or less. Water samples for hydrogen-sulfide analysis were not filtered, and were amended with one gram of zinc acetate, and reported as total sulfide concentrations. Mercuric chloride was added to water samples collected for nitrate and nitrite analyses to inhibit losses due to microbial metabolism or photosynthesis.

Aquifer assignments for well screens are based on the RASA for the South Carolina Coastal Plain (Aucott and others, 1987). All water-quality data presented are stored in the U.S. Geological Survey's National Water Data Storage and Retrieval System (WATSTORE).

Table 3.-- *Identification, location, and screened intervals of 17 wells in the study area selected for collection of water-quality samples, November 1988 and April and May 1991*

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; USDA, U.S. Department of Agriculture]

USGS county-well identification (fig. 3)	USGS site identification number	Description of locality	Altitude of land surface, in feet above sea level	Tops and bottoms of screened intervals, in feet below land surface
Black Creek Aquifer				
DAR-118	341716079444800	Darlington, USDA Peedee Station	126	100-110
DIL-88	341958079110000	Lake View, Old Kemper Road	100	230-240, 265-275
FLO-105	335220079455700	Lake City, Morris Street	78	152-157, 232-242, 271-276, 314-319, 349-354, 372-377, 397-402, 418-428
FLO-141	335010079264900	Johnsonville, Wellman Industries	55	240-275, 311-321, 370-400
FLO-147	335934079332800	Pamplico, 1st and Old River Road	85	210-230, 250-260, 270-300
FLO-156	335559079562300	Olanta, Avondale Street	100	175-185, 200-220
FLO-166	340345079452000	Effingham, McCall Farms	92	106-126
MRN-71	340534079190400	Raines, U.S. Highway 501	88	230-270, 280-290
MRN-91	341248079154400	Mullins, Dogwood Street	100	326-346

Table 3.--Identification, location, and screened intervals of 17 wells in the study area selected for collection of water-quality samples, November 1988 and April and May 1991 (Continued)

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; USDA, U.S. Department of Agriculture]

USGS county-well identification (fig. 3)	USGS site identification number	Description of locality	Altitude of land surface, in feet above sea level	Tops and bottoms of screened intervals, in feet below land surface
Middendorf aquifer				
DAR-69	341835079513600	Darlington, Hampton Street	105	180-195, 218-223, 228-238, 248-273, 290-305
DAR-94	342219080042400	Hartsville, 5th Street	216	214-224, 234-244, 248-268, 276-286, 296-306
DIL-98	342528079220308	Dillon, 1st and Jackson Avenue	120	200-210, 225-250, 275-285, 318-353
FLO-243	341345079471500	Florence, Lucas Street	131	325-425
MLB-142	343848079400200	Bennettville, Beauty Spot Road	185	60-70, 81-116, 125-160
MLB-600	342416079355801	Brownsville, International Paper	125	150-164, 170-180, 189-216, 220-240
Cape Fear aquifer				
DAR-89	341608079482700	Darlington, Fiber Industries, Inc.	133	530-550, 576-586, 604-624
¹ FLO-149	341148079450803	Florence, Ballard Street	140	450-465, 555-570, 640-650, 710-760

¹Screens in the Middendorf and Cape Fear aquifers from Aucott and others (1987).

Table 4.--Water-quality results determined in the field for water samples collected from 17 wells in the study area, November 1988 and April and May 1991

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; μ S/cm at 25 °C, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; °C, degrees Celsius; CaCO_3 , calcium carbonate; <, less than (the minimal detection limit of the analytical procedure in the field)]

USGS county-well identification (fig. 3)	Specific conductance (μ S/cm at 25 °C)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (standard units)	Alkalinity (mg/L as CaCO_3)
Black Creek aquifer					
DAR-118	46	7.8	19.4	5.95	15.3
DIL-88	162	<.2	20.5	7.15	75
FLO-105	140	<.2	20.3	8.88	72
FLO-141	393	<.2	20.2	9.20	192
FLO-147	141	<.2	20.1	8.71	66
FLO-156	142	<.2	19.5	7.61	58
FLO-166	131	<.2	20.4	6.68	53.5
MRN-71	990	<.2	21.2	7.90	440
MRN-91	172	<.2	21.8	7.35	87

Table 4.--Water-quality results determined in the field for water samples collected from 17 wells in the study area, November 1988 and April and May 1991 (Continued)

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; $\mu\text{S}/\text{cm}$ at 25 °C, microsiemens per centimeter at 25 degrees Celsius; mg/L , milligrams per liter; °C, degrees Celsius; CaCO_3 , calcium carbonate; <, less than (the minimal detection limit of the analytical procedure in the field)]

USGS county-well identification (fig. 3)	Specific conductance ($\mu\text{S}/\text{cm}$ at 25 °C)	Dissolved oxygen (mg/L)	Temperature (°C)	pH (standard units)	Alkalinity (mg/L as CaCO_3)
Middendorf aquifer					
DAR-69	38	4.9	18.7	5.88	11
DAR-94	12	8.1	19.2	4.98	.7
DIL-98	135	.3	19.7	6.73	68
FLO-243	43	<.2	21.2	6.01	10.3
MLB-142	50	7.8	18.5	4.73	2
MLB-600	67	<.2	19	6.26	32
Cape Fear aquifer					
DAR-89	257	<.2	22.6	6.86	61.5
¹ FLO-149	260	<.2	23	6.92	61

¹Screens in the Middendorf and Cape Fear aquifers from Aucott and others (1987).

Table 5.--Water-quality results determined in the laboratory for water samples collected from 17 wells in the study area, November 1988 and April and May 1991

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; mg/L, milligrams per liter; µg/L, micrograms per liter; ---, no data; <, less than (the minimal detection limit of the analytical procedure in the laboratory)]

USGS county-well identification (fig. 3)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Aluminum, dissolved (µg/L as Al)	Manganese, dissolved (µg/L as Mn)	Iron, dissolved (µg/L as Fe)
Black Creek aquifer							
DAR-118	5.7	1.7	2.2	2.3	<10	20	1,100
DIL-88	7.9	1.4	27	4.9	<10	30	200
FLO-105	2.3	.5	33	3.8	<10	10	10
FLO-141	1.2	.2	92	4.8	10	---	<10
FLO-147	.6	.1	34	2.9	<10	10	10
FLO-156	11	3.2	3.1	15	<10	---	220
FLO-166	8.9	4.2	4.5	7	<10	50	2,400
MRN-71	5.1	2.8	250	11	<10	30	30
MRN-91	1.6	.5	41	3.6	40	20	150

Table 5.--Water-quality results determined in the laboratory for water samples collected from 17 wells in the study area, November 1988 and April and May 1991 (Continued)

USGS county-well identification (fig. 3)	[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; mg/L, milligrams per liter; µg/L, micrograms per liter; ---, no data; <, less than (the minimal detection limit of the analytical procedure in the laboratory)]						
	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Aluminum, dissolved (µg/L as Al)	Manganese, dissolved (µg/L as Mn)	Iron, dissolved (µg/L as Fe)
Middendorf aquifer							
DAR-69	1.4	0.4	7	1.7	10	10	300
DAR-94	.5	.2	1.1	.6	10	10	10
DIL-98	1.6	1.5	27	4.9	10	20	700
FLO-243	.8	.8	3.9	4.3	10	10	640
MLB-142	1.1	.9	6.9	.9	30	30	20
MLB-600	2.2	1.3	10	3.9	10	70	2,200
Cape Fear aquifer							
DAR-89	8.3	4.8	32	9.5	10	150	1,800
¹ FLO-149	3.1	1.3	49	7	10	20	200

Table 5.--Water-quality results determined in the laboratory for water samples collected from 17 wells in the study area, November 1988 and April and May 1991--Continued

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; mg/L, milligrams per liter; µg/L, micrograms per liter; ---, no data; <, less than (the minimal detection limit of the analytical procedure of the laboratory)]

USGS county-well identification (fig. 3)	Silica, dissolved (mg/L as SiO ₂)	Fluoride, dissolved (mg/L as F)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO ₄)	Hydrogen sulfide, total (mg/L as sulfide)	Nitrate plus nitrite, dissolved (mg/L as N)
Black Creek aquifer						
DAR-118	33	0.3	4.1	8.4	---	<0.02
DIL-88	38	.4	3.4	3.3	---	<.02
FLO-105	28	.4	2.4	8	<1	.04
FLO-141	24	1.7	4.1	6.4	<1	---
FLO-147	30	.5	2.6	8.4	<1	<.02
FLO-156	39	.1	1.9	7.7	<1	---
FLO-166	39	.2	2.5	6.2	<1	<.02
MRN-71	30	1.6	82	14	.5	<.02
MRN-91	37	.8	5.7	2.5	1.1	<.02

Table 5.--Water-quality results determined in the laboratory for water samples collected from 17 wells in the study area, November 1988 and April and May 1991--Continued

[USGS, U.S. Geological Survey; DAR, Darlington; DIL, Dillon; FLO, Florence; MRN, Marion; MLB, Marlboro; mg/L, milligrams per liter; µg/L, micrograms per liter; ---, no data; <, less than (the minimal detection limit of the analytical procedure of the laboratory)]

USGS county-well identification (fig. 3)	Silica, dissolved (mg/L as SiO ₂)	Fluoride, dissolved (mg/L as F)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO ₄)	Hydrogen sulfide, total (mg/L as sulfide)	Nitrate plus nitrite, dissolved (mg/L as N)
Middendorf aquifer						
DAR-69	12	0.3	2.5	8.9	---	<0.02
DAR-94	9	<.1	1.4	1.4	---	<.02
DIL-98	27	.3	3.4	2.6	---	<.02
FLO-243	15	<.1	1.5	8.1	<.1	<.02
MLB-142	7.1	<.1	5.5	.1	---	3.8
MLB-600	13	.1	3.7	4	<.1	<.02
Cape Fear aquifer						
DAR-89	25	.4	30	20	1.3	<.02
¹ FLO-149	18	.3	39	13	<.1	<.02

¹Screens in the Middendorf and Cape Fear aquifers from Aucott and others (1987).

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Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
0 - 7	No recovery.
7 -10	Sand, dark yellowish orange (10YR6/6), fine- to medium-grained, moderately sorted, subangular, mica (1-2%), dark heavy minerals (<1%).
10 - 13	No recovery.
13 - 16	Sand, dark yellowish orange (10YR6/6) with moderate red (5R5/4) staining, fine- to medium-grained grading down to fine- to coarse-grained, poorly sorted, subangular to angular, mica (1-2%).
16 - 18	No recovery.
18 - 25	Sand, grayish orange (10YR7/4) with moderate red (5R5/4) staining, medium- to coarse-grained, moderately sorted, subangular to angular, lignite (<1%), dark heavy minerals (<1%).
25 - 30	No recovery.
30 - 33	Sand, grayish orange (10YR7/4), fine- to very coarse-grained, poorly sorted, subangular to angular, clayey sand at 33 feet.
33 - 40	No recovery.
40 - 41	Sand, pale yellowish orange (10YR8/6), medium- to coarse-grained, poorly sorted, subangular to angular, clay matrix (10%), sandy clay at 41 feet.
41 - 50	No recovery.
50 - 51	Sand, pale yellowish orange (10YR8/6), fine- to very coarse-grained, poorly sorted, subangular to angular, sharp lower contact.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
51 - 56	Clay, light gray (N7) with moderate red (5R5/4) staining, massive with sand-filled burrows or fractures at top, mica (1%), silt (<10%), dark heavy minerals (1%).
56 - 60	No recovery.
60 - 62	Sand, light gray (N7), fine- to medium-grained, moderately sorted, subangular, mica (1%), heavy minerals (1-2%) including garnet, monazite, and dark grains, a thin lamina of limonite-cemented sand at 62 feet.
62 - 70	No recovery.
70 - 81	Sand, light gray (N7) to yellowish gray (5Y8/1), fine- to very coarse-grained with granules (5%), pebbles (5-10%, 4-6 mm) above sharp lower contact at 81 feet, poorly to very poorly sorted, subangular, massive, clay matrix (5-10%), pyrite-cemented at 81 feet, heavy minerals (1-2%) including garnet and monazite, mica (1-2%), lignite (1%), sharp lower contact.
81 - 91	Clay, light gray (N7) to white (N9), massive, laminated from 83 to 84 feet, mottled below 86 feet, sharp lower contact.
91 - 96	Sand, light gray (N7), fine- to very coarse-grained, poorly sorted, subangular, massive, garnets (1%), mica (1%), sharp lower contact.
96 - 98	Clay, light gray (N7), massive, gradational lower contact.
98 - 99	Sand, very light gray (N8), fine-grained, well-sorted, subangular, clay matrix (25%), massive, gradational lower contact.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
99 -108	Sand, very light gray (N8) with moderate yellow (5Y7/6) staining, fine- to very coarse-grained, poorly sorted, subangular to angular, clay matrix (5-15%), massive, mica (1-2%), dark heavy minerals (1%), including garnet, thin (0.5 feet) bed of clay at 106 feet, sharp lower contact.
108 -117	Clay, very light gray (N8) with moderate yellow (5Y7/6) staining, massive with rooted to wavy-laminated texture at 114 feet, gradational lower contact.
117 -118	Sand, very light gray (N8) with moderate yellow (5Y7/6) staining, fine grained, well-sorted, subangular, massive, clay matrix (25%), gradational lower contact.
118 -125	Sand, very light gray (N8), fine-grained, well-sorted, subangular, clay matrix (5-10%), gradational lower contact.
125 -130	Sand, very light gray (N8) with light red (5R6/6) and moderate yellow (5Y7/6) staining, medium- to very coarse-grained, poorly sorted, subangular, massive to cross-bedded, dark heavy minerals (1%) including garnet, mica (1%), small iron concretions above sharp lower contact at 130 feet.
130 -141	Clay, very light gray (N8) to yellowish gray (5Y8/1) with moderate red (5R5/4) staining of fractures at top of clay, rooted pattern from 135 to 141 feet, silt (10%), sand (10%), gradational lower contact.
141 -142	Sand, very light gray (N8) to grayish yellow (5Y8/4), fine- to medium-grained, moderately sorted, clay matrix (25%), massive, gradational lower contact.
142 -145	Sand, very light gray (N8) to grayish yellow (5Y8/4), fine- to very coarse-grained, poorly sorted, subangular, massive, sharp lower contact.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
145 -155	Clay, medium gray (N5) with moderate red (5R5/4) staining at 145 feet, massive, silt (<10%), fine-grained sand (25%) at 153 feet, gradational lower contact.
155 -158	Sand, pinkish gray (5YR8/1), fine- to medium-grained, moderately sorted, subangular, clay matrix (5-10%), massive, mica (2%), sharp lower contact.
158 -164	Sand, medium gray (N5) to light gray (N7), fine- to medium-grained, moderately sorted, subangular, massive with thin laminae of olive gray (5Y4/1) clay at 162 feet, lignite (5%) and pyritized lignite fragments (2%), mica (1-2%, 1-2 mm), sharp lower contact.
164 -172	Clay, very light gray (N8) to light gray (N7) with moderate red (5R5/4) staining of rooted pattern at 167 feet, massive, sand (10%), silt (10%), lignite (1-2%), sharp lower contact.
172 -177	Sand, light gray (N7) to light olive gray (5Y6/1) with moderate yellow (5Y7/6) staining at 177 feet, fine- to medium-grained, moderately sorted, grades down to fine- to very coarse-grained, poorly sorted, subangular to angular, clay matrix (5-10%), massive, mica (1-2%), sharp lower contact.
177 -180	Clay, medium gray (N5), massive, silt (10%), sharp lower contact.
180 -182	Sand, light gray (N7), fine- to medium-grained, moderately sorted, subangular, mica (1-2%), massive with clay laminae at 181 feet, sharp lower contact.
182 -185	Clay, medium gray (N5) to light gray (N7) with moderate red (5R5/4) and moderate yellow (5Y7/6) staining, massive, fine- to medium-grained sand (25%) below 184 feet, small circular iron concretion at 185 feet, gradational lower contact.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
185 -193	Sand, yellowish gray (5Y7/2) to light gray (N7), fine- to very coarse-grained, granules at 190 and 191 feet, poorly to very poorly sorted, subangular, massive, mica (1-2%, 1-2 mm), heavy minerals (1%) including garnet and monazite, clay matrix (5-10%).
193 -195	No recovery.
195 -200	Clay, medium gray (N5) mottled with moderate yellow (5Y7/6) staining, massive, silt (10%), very fine-grained sand (20%), gradational lower contact.
200 -212	Sand, yellowish gray (5Y8/1) to very light gray (N8), fine- to medium-grained grading downward to fine- to very coarse-grained, poorly sorted, subangular, massive, mica (1-2%), heavy minerals (1%) including garnet and monazite, sharp lower contact.
212 -215	Clay, light bluish gray (5B7/1), massive with thin beds and laminae of very fine-grained sand, well-sorted, massive, mica (1-2%), sharp lower contact.
215 -217	Sand, very light gray (N8) to yellowish gray (5Y8/1), very fine-grained, well-sorted, subangular, clay matrix (5-10%), massive, mica (1-2%).
217 -220	No recovery.
220 -224	Sand, very light gray (N8) to yellowish gray (5Y8/1), fine-grained, well-sorted, and fine- to coarse-grained sand, poorly sorted, subangular, massive with thin clay beds and lignite at 221 and 222 feet, large piece of lignite and pyrite at 223 feet, mica (1-2%).
224 -228	No recovery.
228 -230	Clay, dark gray (N3), massive, fine-grained sand (10-25%), gradational lower contact.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
230 -239	Sand, medium gray (N5) to light gray (N7), fine- to medium-grained grading downward to fine- to very coarse-grained, moderately to poorly sorted, subangular, clay matrix (5-10%), massive with discontinuous clay laminae at 235 feet, mica (1-2%).
239 -240	No recovery.
240 -241	Clay, greenish gray (5GY6/1) to light olive gray (5Y6/1), mottled with dusky yellow (5Y6/4) and moderate red (5R4/6) staining, dense, waxy texture, sharp lower contact.
241 -245	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to very coarse-grained, poorly sorted, angular to subangular, clay laminae at 243 feet, clay matrix (10-20%), massive, feldspar (5%), dark heavy minerals (1%), sharp lower contact.
245 -249	Clay, medium gray (N5) to light brownish gray (5YR6/1), mottled with dusky yellow (5Y6/4) staining, dense, waxy, fine- to medium-grained sand at 247 feet, sharp lower contact.
249 -253	Sand, light gray (N7) to greenish gray (5GY6/1), fine- to coarse-grained, poorly sorted, subangular to angular, clay matrix (10-20%), massive, mica (1%), feldspar (5%), sharp lower contact.
253 -255	Clay, olive gray (5Y4/1) to greenish gray (5GY6/1) streaked and mottled with dusky red (5R3/4) staining, wavy-laminated, dense, waxy, fine- to coarse-grained sand (10-20%), sharp lower contact.
255 -274	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to coarse-grained, poorly sorted, angular to subangular, beds of medium gray (N5) clay at 256, 260, 261, 264, 265, and 271 feet, pyrite and lignite at 273 feet, sharp lower contact.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
274 -278	Clay, greenish gray (5GY6/1) to medium light gray (N6), very fine-grained sand (10-25%), wavy-laminated, mica (1%), feldspars (5%), gradational lower contact.
278 -285	Sand, medium light gray (N6) to light olive gray (5Y6/1) mottled with moderate red (5R4/6) staining, fine- to medium-grained, moderately sorted, subangular to angular, clay matrix (10-20%), mica (1%), feldspar (5%), sharp lower contact.
285 -289	Clay, greenish gray (5GY6/1) to light olive gray (5Y6/1) mottled with dusky yellow (5Y6/4) and moderate red (5R5/4) staining, dense, waxy, fine- to medium-grained sand, mica (1-2%), gradational lower contact.
289 -301	Sand, greenish gray (5GY6/1) mottled with dusky yellow (5Y6/4) and moderate red (5R5/4), fine- to very coarse-grained, granules and pebbles (5-10%, 2-6 mm) at 299 feet, poorly to very poorly sorted, subangular to angular, clay matrix (10-20%), massive, indurated at 294 and 300 feet, olive black (5Y2/1) clay at 291 and 292 feet.
301 -314	No recovery.
314 -324	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to very coarse-grained with granules and pebbles (10-40%, 2-20 mm), very poorly sorted, subangular to angular, pebbles of clear, smoky, red, and rutilated quartz, clay matrix (5-10%), massive with lignitic clay laminae at 322 and 323 feet, feldspar (5%),
324 -330	No recovery.
330 -332	Clay, yellowish gray (5Y7/2) to pale olive (10Y6/2) mottled in part with moderate reddish brown (10R4/6) staining, massive, silt (10%), very fine- to fine-grained sand (20-25%).
332 -335	No recovery.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
335 -344	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), very fine- to fine-grained grading down to fine- to very coarse-grained with granules and pebbles (5-20%, 2-15 mm), moderately to very poorly sorted, subangular to angular, clay matrix (10-20%), massive to laminated, silty clay clasts at 343 feet, pyrite-cemented sandstone clasts at 335 feet, feldspar (5%), thin clay bed at 344 feet.
344 -347	No recovery.
347 -360	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1) mottled with moderate reddish brown (10R4/6) staining, fine- to very coarse-grained, granules and pebbles (5-10%, 2-10 mm), poorly to very poorly sorted, subangular to angular, clay matrix (5-20%), cross-bedded, mica (2%), silty clay at 353 feet, lignite at 355 feet.
360 -370	No recovery.
370 -374	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to very coarse-grained, granules and pebbles (5-20%, 2-10 mm), moderately to very poorly sorted, subangular to angular, clay matrix (5-20%), massive with silty gray clay at 370 feet, sharp lower contact.
374 -381	Clay, grayish yellow (5Y8/4) to light olive brown (5Y5/6) mottled with dark reddish brown (10R3/4) staining, fine- to coarse-grained sand (10-15%).
381 -389	No recovery.
389 -393	Sand, light olive gray (5Y6/1), fine- to very coarse-grained, granules and pebbles (5%, 2-15 mm), moderately to very poorly sorted, subangular to angular, mica (2%), clay matrix (5-15%), olive gray (5Y3/2) clay at 392 feet.
393 -400	No recovery.

Table 1.--*Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued*

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
400 -404	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to very coarse-grained, pebbles (5%, 4-10 mm) at 402 feet, subangular to angular, moderately to poorly sorted, clay matrix (5-10%), massive, mica (1-2%), heavy minerals (1-2%) including monazite and garnet, feldspar (5%).
404 -410	No recovery.
410 -413	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to very coarse-grained, granules and pebbles (5%, 2-10 mm) at 413 feet, subangular to subrounded, clay matrix (15%), massive, mica (2%), large lignite fragment at 410 feet.
413 -420	No recovery.
420 -421	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to very coarse-grained with granules and pebbles (5-20%, 2-20 mm), very poorly sorted, subangular to subrounded, massive with a bed of light olive gray (5Y5/2) clay, mica (2%).
421 -425	No recovery.
425 -427	Sand, light olive gray (5Y6/1), fine- to very coarse-grained with granules and pebbles (5-10%, 2-40 mm), poorly to very poorly sorted, subrounded to angular, clay matrix (10-15%), cross-bedded, mica (2%).
427 -430	No recovery.
430 -431	Recovered subrounded granules and pebbles (2-6 mm) of smoky, clear, white, and rutilated quartz.
431 -435	No recovery.

Table 1.--Lithologic description of sediment recovered from a continuously cored borehole at Lake Darpo in northern Darlington County--Continued

[Note: the borehole is located at lat 34°27'31"N. and long 79°52'48"W. with a land surface altitude of 172 feet above sea level. All depths are reported in feet below land surface.
%, percent; <, less than; mm, millimeter]

Depths (feet)	Lithologic description
435 -437	Sand, light olive gray (5Y6/1), fine- to very coarse-grained with granules and pebbles (15-25%, 2-50 mm), very poorly sorted, angular to subrounded, clay matrix (15-25%), massive, clast of gneiss, subrounded pebbles.
437 -438	No recovery.
438 -447	Gneiss/schist with garnets, steeply inclined foliations, weathered cleavage surfaces.

Table 2.--*Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County*

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than; mm, millimeters]

Depths (feet)	Lithologic description
0 - 8	No recovery.
8 - 11	Sand, white (N9), fine- to coarse-grained, poorly sorted, subangular, clay matrix (20-25%), massive, gradational lower contact.
11 - 12	Sand, grayish yellow (5Y8/4), fine- to very coarse-grained, poorly sorted, subangular, massive.
12 - 14	No recovery.
14 - 16	Clay, light olive gray (5Y6/1) to yellowish gray (5Y8/1), massive, silt and very fine-grained sand (35%), sharp lower contact.
16 - 20	Sand, yellowish gray (5Y7/2), fine- to medium-grained, moderately sorted, subangular, massive, wood fragments, mica (1%), gradational lower contact.
20 - 24	Sand, yellowish gray (5Y8/1), medium- to coarse-grained, moderately sorted, subangular, massive, mica (1%).
24 - 30	No recovery.
30 - 47	Sand, olive gray (5Y4/1), fine-grained, well-sorted, subangular, clay matrix (5-10%), wavy-laminated to burrow-mottled.
47 - 50	No recovery.
50 - 57	Sand, olive gray (5Y4/1), fine-grained, well-sorted, subangular, clay matrix (15-20%), carbonate matrix (5-10%), wavy-laminated to burrow-mottled, clay beds and laminae (10-15%), glauconite (1%), pelecypods (5%), mica (1%).
57 - 60	No recovery.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
60 - 61	Sand, light bluish gray (5B7/1), very fine-grained, well-sorted, subangular, carbonate matrix (20-25%), massive to burrow-mottled, pelecypods (5-10%), glauconite (1%), lithified.
61 - 70	No recovery.
70 - 74	Clay, olive gray (5Y4/1), massive, fine-grained sand (25-35%), carbonate matrix (10-20%), pelecypods (5%), mica (1%), lignite (1%), sharp lower contact.
74 - 79	Sand, light olive gray (5Y6/1) to light bluish gray (5B7/1), very fine- to fine-grained, moderately sorted, subangular, clay matrix (25%), carbonate matrix (15%), massive to burrow-mottled, pelecypods (5%), lithified interval from 74 to 75 feet.
79 - 80	No recovery.
80 - 96	Sand, olive gray (5Y4/1) to light olive gray (5Y6/1) to light bluish gray (5B7/1), fine-grained, well-sorted, subangular to subrounded, carbonate matrix (10-15%), clay matrix (15-25%), whole and fragmented pelecypods (5%), lithified intervals from 89 to 90 feet and 95 to 96 feet.
96 - 100	No recovery.
100 - 106	Sand, light olive gray (5Y6/1) to light bluish gray (5B7/1), fine-grained, well-sorted, subangular to subrounded, clay matrix (15-20%), carbonate matrix (15%), massive, pelecypods (<5%), glauconite (1%), lithified interval from 102 to 103 feet.
106 - 110	No recovery.

Table 2.--*Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued*

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
110 - 112	Sand, light bluish gray (5B7/1), fine-grained, well-sorted, subangular to subrounded, carbonate matrix (35%), burrow-mottled, pelecypod (5-10%), glauconite (1%), lithified.
112 - 120	No recovery.
120 - 123	Sand, light olive gray (5Y6/1), fine-grained, well-sorted, subangular to subrounded, carbonate matrix (20%), clay matrix (15%), pelecypods (5-10%), glauconite (1%).
123 - 135	No recovery.
135 - 156	Clay, olive gray (5Y4/1), burrow-mottled to wavy-laminated, carbonate matrix (10-25%), fine-grained sand (10-15%), large fragment (50 mm) of pyritized lignite at 148 feet, irregularly shaped pyrite nodules from 145 to 148 feet, fossils include small pelecypods (5-10%) and benthic foraminifera (1%), sharp lower contact.
156 - 158	Sand, olive gray (5Y4/1), fine- to very coarse-grained with rounded granules and pebbles (1-2%, 2-8 mm) of phosphate, very poorly sorted, subangular to subrounded, clay matrix (10-15%), massive, fragmented pelecypods (5-10%), glauconite (1%), sharp lower contact.
158 - 183	Sand, light olive gray (5Y6/1) to light bluish gray (5B7/1), fine- to medium-grained, moderately sorted, carbonate matrix (10-15%), clay matrix (5%), burrow-mottled to massive, glauconite (1%), mica (1%), pelecypods (5-10%), lithified interval from 164 to 166 feet, no recovery from 166 to 170 feet, sharp lower contact.
183 - 196	Clay, olive gray (5Y4/1), well-laminated with laminae and thin beds of fine-grained sand (10%), carbonate matrix (5-10%), pelecypods (5%), glauconite (1-2%), sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
196 - 205	Sand, light olive gray (5Y6/1), fine- to medium-grained, moderately sorted, subangular to subrounded, clay matrix (5-10%), carbonate matrix (5-10%), massive with an olive black (5Y2/1) clay bed at 198 feet, pelecypods (5%), glauconite (2-3%), subrounded phosphate granules (2-3%) below 204 feet, a large pebble (20 mm) of phosphate at 199 feet, sharp lower contact.
205 - 219	Clay, olive gray (5Y4/1), massive to wavy-laminated with laminae and thin beds of very fine-grained sand, carbonate matrix (5-10%), glauconite (5%) in sand beds, fine-grained lignite (1%) observed on bedding surfaces, sharp lower contact.
219 - 222	Sand, light olive gray (5Y6/1), very fine-grained, well-sorted, subangular, clay matrix (5-10%), massive, carbonate matrix (10-15%), glauconite (2-3%), mica (1%), sharp lower contact.
222 - 229	Clay, olive gray (5Y4/1), wavy-laminated to burrow-mottled with laminae of very fine-grained sand (5-10%), pelecypods (5-10%), mica (2%), fine-grained lignite (1%), gradational lower contact.
229 - 239	Sand, light olive gray (5Y6/1), very fine-grained grading down to fine- to medium-grained, well-sorted to moderately sorted, subangular, clay matrix (5-10%), carbonate matrix (10-25%), burrow-mottled to massive, glauconite (1-2%), a large piece (30 mm) of lignite and an olive gray (5Y4/1) clay laminae at 237 feet, shark teeth and small phosphate granules (3-5%), pelecypods (5%).
239 - 242	No recovery.
242 - 244	Sand, light olive gray (5Y6/1), fine-grained, well-sorted, subangular, massive with a thin bed (0.3 feet) of olive gray (5Y4/1) clay, glauconite (3%), dark heavy minerals (1%), lignite (1%), mica (1%), sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
244 - 249	Clay, dark gray (N3) to olive gray (5Y4/1), wavy-laminated, pelecypods (5-15%), carbonate matrix (5-10%), mica (1%), lignite (1%).
249 - 254	No recovery.
254 - 265	Clay, olive gray (5Y4/1) to dark gray (N3), well-laminated, silt and very fine-grained sand (35%) below 264 feet, carbonate matrix (10%), pelecypods (5-10%), mica (1%), lignite (1%).
265 - 270	No recovery.
270 - 273	Sand, light olive gray (5Y6/1) to medium light gray (N6), very fine-grained, well-sorted, silty clay matrix (15-20%), carbonate matrix (5-10%), laminated to cross-bedded, pelecypods (10%), dark heavy minerals (1%), glauconite (1%), mica (2%), gradational lower contact.
273 - 283	Sand, light olive gray (5Y6/1) to medium light gray (N6), fine- to medium-grained, granules (2%) and pebbles (2%, 4-6 mm) of phosphate at 276 and 280 feet, moderately to poorly sorted, subangular to subrounded, massive, clay laminae from 282 to 283 feet, carbonate matrix (5-10%), clay matrix (5%), pelecypod fragments (5%), mica (1%).
283 - 285	No recovery.
285 - 306	Sand, greenish gray (5GY6/1) to light greenish gray (5GY8/1), fine- to medium-grained grading down fine-grained, moderately to well-sorted, subangular to subrounded, carbonate matrix (5%), laminated, lignitic clay laminae at 294 and 302 feet, glauconite (5-10%), mica (1-2%), pelecypods (<5%).
306 - 310	No recovery.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
310 - 316	Sand, greenish gray (5GY6/1) to dark greenish gray (5GY4/1), fine- to coarse-grained, pebbles (5%, 5-20 mm) of phosphate, poorly to very poorly sorted, subangular to subrounded, massive, a thin (0.3 feet) bed of olive black (5Y2/1) clay, glauconite (5-10%), lignite (10%).
316 - 320	No recovery.
320 - 327	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine-grained, well-sorted, subangular to subrounded, clay matrix (5-10%), massive, glauconite (10%), dark heavy minerals (1-2%), sharp lower contact.
327 - 375	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine-grained and fine- to medium-grained, moderately and well-sorted, subangular to subrounded, massive, interlaminated and interbedded with olive gray (5Y4/1) clay (20-50%), glauconite (5%), lignite (2%), dark heavy minerals (1%), mica (1%), no recovery from 359 to 360 feet and 369 to 370 feet.
375 - 380	No recovery.
380 - 395	Sand, greenish gray (5GY6/1) to light olive gray (5Y6/1), fine- to medium-grained, granules of phosphate (<1%), moderately sorted, subangular to subrounded, clay matrix (5-10%), glauconite (5-10%), mica (1%), no recovery from 384 to 390 feet, gradational lower contact.
395 - 397	Sand, greenish gray (5GY6/1), fine- to very coarse-grained, pebbles of phosphate (2-3%, 4-8 mm), very poorly sorted, massive, subangular, clay matrix (5-10%), lignite (2-3%), mica (1%), shark teeth.
397 - 400	No recovery.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
400 - 406	Sand, light greenish gray (5GY8/1) to light olive gray (5Y6/1), fine-grained with pebbles of phosphate (2%, 4-10 mm), well-sorted to poorly sorted, subangular to subrounded, massive with thin laminae of dark greenish gray (5GY4/1) clay (5-10%), glauconite (5%), mica (1-2%), lignite (2-3%), sharp lower contact.
406 - 414	Sand, light greenish gray (5GY8/1), fine- to very coarse-grained, poorly sorted, subangular, massive, lignitic (5-10%) clay laminae from 411 to 412 feet, glauconite (2-3%), mica (1%), no recovery from 408 to 410 feet.
414 - 420	No recovery.
420 - 424	Sand, light olive gray (5Y6/1), well-sorted, subangular, massive to laminated, a clay lamina at 423 feet, glauconite (1%), mica (1%).
424 - 430	No recovery.
430 - 452	Sand, light olive gray (5Y6/1), fine- to medium-grained and fine- to very coarse-grained, moderately to poorly sorted, subangular to subrounded, clay matrix (5-10%), massive, laminae and thin beds of clay at 434 and 446 feet, glauconite (0-1%), mica (1%), dark heavy minerals (1%), lignite and clay clasts at 443 feet, no recovery from 447 to 450 feet, sharp lower contact.
452 - 462	Sand, yellowish gray (5Y8/1), fine- to medium-grained, moderately sorted, subangular, laminated to massive, laminae of olive gray (5Y4/1) lignitic clay (10%), beds of olive gray (5Y4/1) clay from 453 to 455 feet and 461 to 462 feet, glauconite (0-1%), mica (1%), dark heavy minerals (1%), other heavy minerals (1%) include garnet and monazite, lignite (5%) in sand, sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
462 - 464	Sand, greenish gray (5GY6/1), fine- to very coarse-grained with granules (5%), very poorly sorted, subangular, massive with clay laminae, clay clasts (2-3%, 1-4 mm), dark heavy minerals (1%), sharp lower contact.
464 - 466	Clay, olive black (5Y2/1), well-laminated, laminae of fine- to medium-grained sand (10%), sharp lower contact.
466 - 476	Sand, light olive gray (5Y5/2), fine- to very coarse-grained, poorly sorted, subangular to subrounded, laminated to massive, clay laminae (5%), lignite (10-20%), dark heavy minerals (1%), mica (1%).
476 - 480	No recovery.
480 - 492	Sand, light olive gray (5Y6/1) to yellowish gray (5Y8/1), fine- to medium-grained, moderately sorted, subangular to subrounded, laminated to massive, a lamina of olive gray (5Y4/1) clay at 485 feet, lignite (1-5%), glauconite (<1%), dark heavy minerals (1%), mica (1%), sharp lower contact.
492 - 503	Clay, olive black (5Y2/1), laminated, laminae of fine- to medium-grained sand (5-10%), lignite (2-3%), mica (1-2%), dark heavy minerals (1-2%), sharp lower contact.
503 - 538	Sand, yellowish gray (5Y8/1), fine- to medium-grained, moderately sorted, subangular to subrounded, massive to cross-bedded, laminae of olive gray (5Y4/1) clay (10%) from 503 to 514 feet, lignite (2-5%), glauconite (1%), dark heavy minerals (1%), pyrite (1-2%), garnet (<1%), gradational lower contact.

Table 2.--*Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued*

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
538 - 543	Sand, light olive gray (5Y6/1), fine- to very coarse-grained, pebbles of chert (1-2%), very poorly sorted, subangular to subrounded, massive with laminae (5%) of olive gray (5Y4/1) to greenish gray (5GY6/1) clay, lignite fragments (2-5%, 1-20 mm), glauconite (<1%), dark heavy minerals (1%), sharp lower contact.
543 - 578	Sand, yellowish gray (5Y8/1) to light olive gray (5Y5/2), fine-grained and fine- to coarse-grained, well-sorted to poorly sorted, subangular to subrounded, massive, laminae and thin beds of olive black (5Y2/1) clay (10%), mica (2-3%), a large fragment of lignite (20 mm) at 547 feet, fine-grained lignite (1-2%).
578 - 580	No recovery.
580 - 584	Clay, olive black (5Y2/1), well-laminated, laminae of fine- to medium-grained sand (5%), sharp lower contact.
584 - 587	Sand, yellowish gray (5Y8/1), fine- to coarse-grained, poorly sorted, subangular to subrounded, massive, olive black (5Y2/1) clay laminae (20%), mica (1-2%), sharp lower contact.
587 - 590	Clay, olive black (5Y2/1), well-laminated, laminae of fine- to medium-grained sand (30%), sharp lower contact.
590 - 599	Sand, yellowish gray (5Y8/1), fine-grained, well-sorted, subangular to subrounded, laminated to burrow-mottled, laminae of olive black (5Y2/1) clay (30%), brown and black heavy minerals (1%), other heavy minerals include monazite (<1%) and garnet (<1%), mica (1-2%, 1 mm), glauconite (<1%), pyrite (1%), sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
599 - 641	Clay, light olive gray (5Y5/2) to olive gray (5Y4/1), well-laminated, very fine- to fine-grained sand (10-20%) in laminae and lenses, ripple-laminated and burrow-mottled textures observed in sand laminae, fine-grained lignite (1-2%), mica (1%, <1 mm), a bed of silica-cemented sand at 615 feet, nodules of pyrite at 631 feet, no recovery from 636 to 638 feet, sharp lower contact.
641 - 642	Sand, yellowish gray (5Y8/1), fine- to coarse-grained, poorly sorted, subangular to subrounded, massive, laminae of olive gray (5Y4/1) clay (5%), mica (1-2%, 1-2 mm), fragments of lignite and pyrite (5%, 5-20 mm), dark heavy minerals (1%).
642 - 650	No recovery.
650 - 671	Clay, pale olive (10Y6/2) to light olive gray (5Y6/1) to medium gray (N5), mottled (5%) with dusky yellow (5Y6/4) staining and silty (10-20%) from 662 to 671 feet, massive, dense, waxy, lignite fragments (10%) below 670 feet, mica (1%).
671 - 680	No recovery.
680 - 682	Sand, light gray (N7), fine- to coarse-grained, poorly sorted, subangular to angular, dense clay matrix (5-10%), massive, pyritized lignite (10%) at 682 feet, mica (1%), dark heavy minerals (1%).
682 - 691	No recovery.
691 - 704	Clay, light olive gray (5Y6/1) to pale olive (10Y6/2), root-like pattern (5%) of dusky yellow (5Y6/4) and moderate reddish brown (10R4/6) staining, massive, waxy, dense, sand (5-20%) below 702 feet, gradational lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

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Depths (feet)	Lithologic description
704 - 707	Sand, yellowish gray (5Y8/1), fine- to very coarse-grained, poorly sorted, subangular to angular, dense clay matrix (15-25%), massive, mica (1%), dark heavy minerals (1%), feldspar (5%), sharp lower contact.
707 - 710	Clay, yellowish gray (5Y8/1) to light olive gray (5Y6/1), massive, fine- to medium-grained sand (10-15%), gradational lower contact.
710 - 729	Sand, yellowish gray (5Y8/1) to pale olive (10Y6/2), fine- to medium-grained grading down to fine- to very coarse-grained, moderately to poorly sorted, subangular to angular, dense clay matrix (10-25%), massive, feldspar (5%), mica (1-2%, 1-2 mm), monazite (<1%), dark heavy minerals (1%) including garnet, sharp lower contact.
729 - 741	Clay, light gray (N7) with patchy staining of dusky yellow (5Y6/4) and moderate reddish orange (10R6/6), massive, dense, waxy, fine- to coarse-grained sand (10-20%), gradational lower contact.
741 - 750	Sand, light olive gray (5Y6/1) to very light gray (N8) with patchy staining of dusky yellow (5Y6/4) and moderate red (5R4/6), fine- to very coarse-grained, poorly sorted, subangular to angular, dense clay matrix (15-25%), massive with wispy clay laminae at 742 feet, mica (1%), feldspar (5%), sharp lower contact.
750 - 753	Clay, light gray (N7) with root-like pattern of dusky yellow (5Y6/4) and moderate red (5R4/6) staining, dense, waxy, gradational lower contact.
753 - 765	Sand, very light gray (N8) to light gray (N7) with moderate reddish brown (10R4/6) staining (5%), fine- to medium-grained grading down to fine- to very coarse-grained, moderately to poorly sorted, subangular to angular, dense clay matrix (10-25%), massive, feldspar (5-10%), mica (1%), heavy minerals (1%) including garnet, sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
765 - 786	Clay, light olive gray (5Y6/1) to pale olive (10Y6/2) mottled with dusky yellow (5Y6/4) and pale reddish brown (10R5/4) staining (5-10%), massive, dense, waxy, beds of fine- to very coarse-grained sand with granules and pebbles from 768 to 770 feet, 775 to 776 feet, 779 to 780 feet, and 784 to 786 feet, sharp lower contact.
786 - 799	Clay, yellowish gray (5Y7/2) mottled (10-20%) with dusky red (5R3/4) and dusky yellow (5Y6/4) staining, massive, dense, waxy, fine- to coarse-grained sand (25-35%), gradational lower contact.
799 - 800	Sand, yellowish gray (5Y7/2), fine to very coarse-grained with granules, very poorly sorted, subangular to angular, dense clay matrix, massive, mica (1%), dark heavy minerals (1%), sharp lower contact.
800 - 812	Clay, yellowish gray (5Y8/1) to light olive gray (5Y6/1), mottled with dusky yellow (5Y6/4) staining (5%), massive, dense, waxy, very fine- to fine-grained sand (20-30%), beds of fine- to very coarse-grained sand with granules from 802 to 805 feet and 807 to 812 feet, clay beds grade down into sand beds.
812 - 820	No recovery.
820 - 825	Sand, pale greenish yellow (10Y8/2) to yellowish gray (5Y8/1), mottled with moderate reddish orange (10R6/6), fine- to very coarse-grained with granules (5-10%), very poorly sorted, subangular to angular, dense clay matrix (15-25%), mica (1%, 1-2 mm), feldspar (5-10%).
825 - 830	No recovery.
830 - 844	Clay, light olive gray (5Y6/1) with patchy staining (5-10%) of moderate reddish brown (10R4/6) and dusky yellow (5Y6/4), massive to burrow-mottled, dense, waxy, very fine-grained sand (35%), gradational lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

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Depths (feet)	Lithologic description
844 - 850	No recovery.
850 - 871	Sand, pale olive (10Y6/2) to yellowish gray (5Y7/2), fine- to very coarse-grained with granules (5%), very poorly sorted, angular to subangular, dense clay matrix (10-15%), laminated to cross-bedded, irregularly laminated bed of medium gray (N5) clay 851 to 853 feet, feldspar (5-10%), mica (1-2%, 1-2 mm), monazite (<1%), laminae of dark heavy minerals (1%), sharp lower contact.
871 - 874	Clay, light olive gray (5Y6/1) to yellowish gray (5Y8/1) mottled (25%) with pale reddish brown (10R5/4) to dusky yellow (5Y6/4) staining, massive to burrow-mottled, fine- to medium-grained sand (10-15%) below 873 feet, gradational lower contact.
874 - 884	Sand, pale olive (10Y6/2) to yellowish gray (5Y7/2), fine- to medium-grained, moderately sorted, subangular, dense clay matrix (5-10%), laminated to cross-bedded, mica (1-2%, 1-2 mm), feldspar (5-10%), dark heavy minerals (1%), monazite (<1%).
884 - 890	No recovery.
890 - 891	Clay, medium light gray (N6), well-laminated, silt (10-20%), mica (2-3%, 1-2 mm), fine-grained lignite (1%), laminae of very fine-grained sand (20%).
891 - 899	No recovery.
899 - 906	Sand, pale greenish yellow (10Y8/2), fine- to very coarse-grained with granules (10%) below 904 feet, poorly to very poorly sorted, subangular, dense clay matrix (10-15%), feldspar (5-10%), sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

[Note: The borehole is located at lat 33°51'20"N. and long 79°46'02"W. with a land surface altitude of 75 feet above sea level. All depths are reported in feet below land surface. %, percent; <, less than]

Depths (feet)	Lithologic description
906 - 926	Clay, very light gray (N8) to light olive gray (5Y6/1) with patchy moderate reddish brown (10R4/6) and dusky yellow (5Y6/4) staining, massive, dense, waxy, silica-cemented fractures, fine- to coarse-grained sand (25-35%) below 924 feet, gradational lower contact.
926 - 941	Sand, pale olive (10Y6/2) to yellowish gray (5Y7/2) with patchy staining (5%) of dusky yellow (5Y6/4), fine- to very coarse-grained with granules (5%) and pebbles (10-25%, 4-8 mm), very poorly sorted, angular to subangular, dense clay matrix (10-15%), laminated to cross-bedded, mica (1-2%, 1-2 mm), sharp lower contact.
941 - 950	Clay, light olive gray (5Y6/1) to light brownish gray (5YR6/1) with patchy staining (10%) of pale red (5R6/2) and pale reddish purple (5RP6/2), massive, dense, waxy, silt and very fine-grained sand (20-30%), mica (1-2%, 1-2 mm), gradational lower contact.
950 - 953	Sand, yellowish gray (5Y7/2) to pale olive (10Y6/2), fine- to very coarse-grained with pebbles (5%, 4-8 mm), very poorly sorted, subangular to angular, dense clay matrix (10-15%), massive, mica (1-2%, <1 mm), feldspar (5-10%), sharp lower contact.
953 - 957	Clay, light olive gray (5Y6/1) mottled with moderate reddish brown (10R4/6) and pale greenish yellow (10Y8/2) staining, massive, dense, waxy, very fine-grained sand (20-35%), gradational lower contact.
957 - 977	Sand, yellowish gray (5Y7/2) to pale greenish yellow (10Y8/2), fine- to very coarse-grained with angular quartz and feldspar pebbles (5-10%, 4-15 mm) below 968 feet, very poorly sorted, angular to subangular, dense clay matrix (10-15%), massive to cross-bedded, mica (1-2%, 1-2 mm), feldspar (5-10%), sharp lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

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Depths (feet)	Lithologic description
977 - 980	Clay, light olive gray (5Y6/1) to yellow gray (5Y8/1) with patchy and root-like pattern of light olive brown (5Y5/6) and dusky red (5R3/4) staining (5-10%), massive, dense, waxy, silt and very fine-grained sand (20-35%), gradational lower contact.
980 -1,005	Sand, white (N9) to light gray (N7) with patches of dusky red (5R3/4) and dusky yellow (5Y6/4) staining (5%), fine- to very coarse-grained, granules (5%) and angular pebbles (10-15%, 4-10 mm) below 1,000 feet, poorly to very poorly sorted, subangular to angular, dense, clay matrix (15-35%), massive, dark heavy minerals (1%), mica (1-2%, 1 mm), sharp lower contact.
1,005-1,022	Clay, white (N9) with root-like and patchy patterns of dusky yellow (5Y6/4) and grayish orange (10YR7/4) staining, pale greenish yellow (10Y8/2) with pale reddish brown (10R5/4) staining (20%) below 1,012 feet, massive, dense, fine- to coarse-grained sand (20-30%), gradational lower contact.
1,022-1,030	Sand, pale olive (10Y6/2) to yellowish gray (5Y7/2) with dusky yellow (5Y6/4) staining (5%), fine- to medium-grained grading down to fine- to very coarse-grained with granules (5%) and pebbles (5%, 5-10 mm), moderately to very poorly sorted, subangular to angular, dense clay matrix (5-20%), massive, mica (1-2%, 1-2 mm), dark heavy minerals (1%), feldspar (5-10%), monazite (1%).
1,030-1,038	No recovery.
1,038-1,048	Clay, pale olive (10Y6/2) to light olive gray (5Y6/1) with pale reddish brown (10R5/4) staining above 1,046 feet, very fine- to fine-grained sand (20-35%), gradational lower contact.

Table 2.--Lithologic description of sediment recovered from a continuously cored borehole in Lake City in south-central Florence County--Continued

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Depths (feet)	Lithologic description
1,048-1,050	Sand, pale olive (10Y6/2), fine- to very coarse-grained, poorly sorted, angular to subangular, dense clay matrix (10-20%), massive, feldspar (5%), mica (1-2%, 1-2 mm), sharp lower contact.
1,050-1,060	Clay, pale olive (10Y6/2) with patchy dusky yellow (5Y6/4) and moderate red (5R5/4) staining, massive, dense, waxy, fine- to coarse-grained sand (10-25%), gradational lower contact.
1,060-1,062	Sand, pale olive (10Y6/2) with dusky yellow (5Y6/4) and moderate red (5R5/4) staining, medium- to coarse-grained, poorly sorted, subangular to angular, dense clay matrix (20-35%), massive, feldspar (5%), mica (1%).
1,062-1,075	No recovery.
1,075-1,076	Sand, yellowish gray (5Y7/2) with dusky red (5R3/4) and dusky yellow (5Y6/4), fine- to very coarse-grained with feldspar and quartz pebbles (10-15%), clasts of weathered basalt (5%, 5-20 mm), very poorly sorted, angular to subangular, mica (1-2%, 1-2 mm), feldspar (5-10%), sharp lower contact.
1,076-1,090	Basalt, weathered pale olive (10Y6/2), dark gray (N3) to black (N1) below 1,085 feet, poikilotopic with mineralized vesicles (3 mm in diameter), finely crystalline, massive.