NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF ENERGY, MINERAL, AND LAND RESOURCES
WILLAM E. TOBY VINSON, JR., DIRECTOR
DWAIN MICHAEL VEACH, STATE GEOLOGIST

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NORTH CAROLINA GEOLOGICAL SURVEY
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OVERVIEW

This map is a work in progress and will be revised upon completion of the Rocky Mount 100K sheet. Farmville 7.5 Minute Quadrangle is one of four 7.5 minute quadrangles ranked highest priority for detailed, 3D subsurface mapping on NC's Coastal Plain. The 4-quad area includes Falkland, Farmville, Walstonburg and Fountain quadrangles. The 4-quads straddle the Surry Paleoshoreline complex and are key to defining Early Pleistocene stratigraphic units that mantle vast areas of NC's Coastal Plain. The 4-quad area is also included in the 16 quads in the Rocky Mount 100K sheet, the subject of an FY23 STATEMAP deliverable.

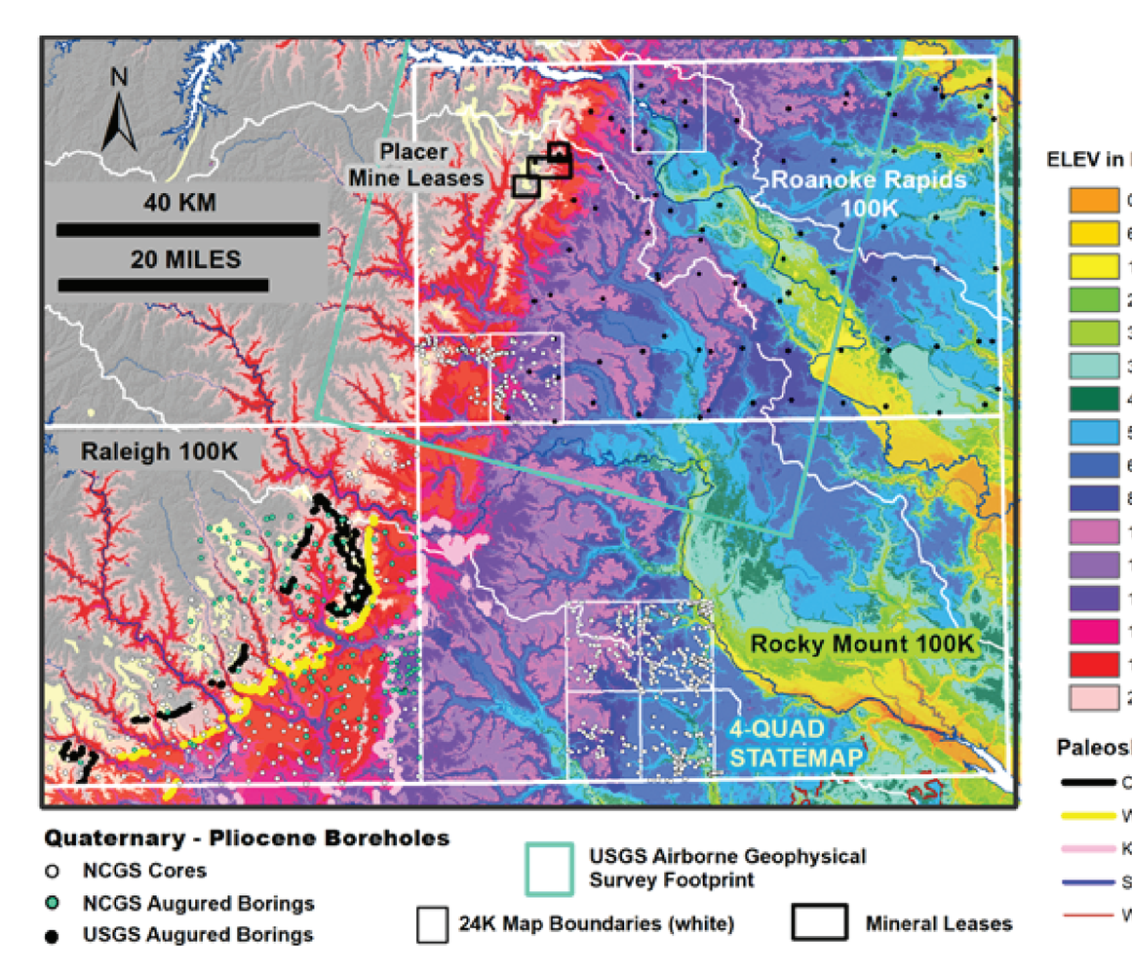


Figure 1. LiDAR basemap above shows distribution of major terraces and paleoshorelines (from Daniels and Kane, 2001; terminology from Daniels and others, 1984)), and the position of detailed study areas that included cores to define stratigraphic units. The Surry paleoshoreline separates the Sunderland terrace (purple) from the Wicomico terrace (dark blue). The Kenly paleoshoreline (pink) follows the boundary between the Sunderland (purple) and Coharie (red) terraces. The Bacons Castle formation forms the surficial unit west of the Surry paleoshoreline in Virginia (Mixon and others, 1989). Other Early Pleistocene units associated with the Surry paleoshoreline (Mison and others, 1989) are the Moorings unit (barrier island) embedded in the paleoshoreline locally, and downstepping units, the Windsor and Charles City formations, east of the paleoshoreline. The Bacon's Castle or its NC equivalent pinches out at the toe of the Kenly paleoshoreline, as demonstrated by NCGS data collected in Drake and Red Oak quadrangles for EARTH MRI mapping.

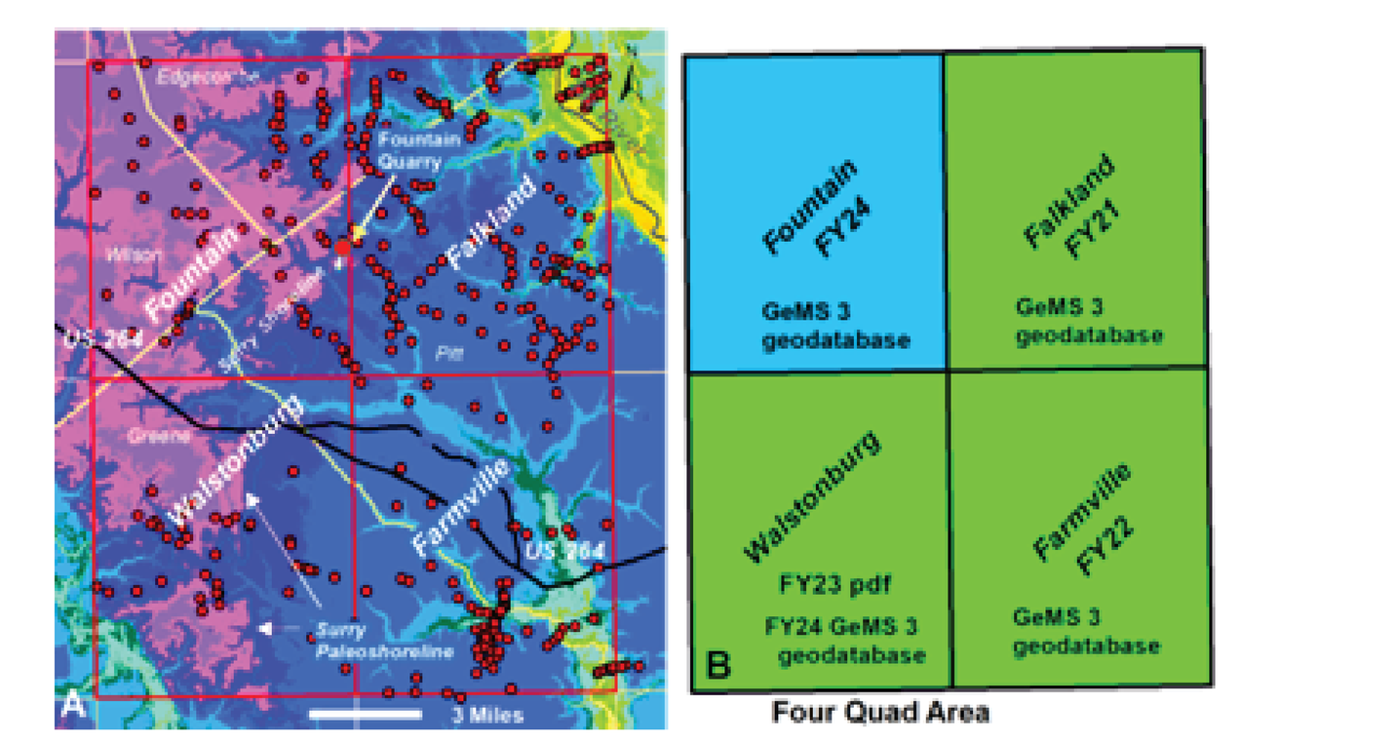


Figure 2. A. FY23 Data distribution (cores) in 4-quad area (Farmville, Fountain, Falkland, Walstonburg) that includes the Early Pleistocene Surry Paleoshoreline. Here, the USGS' 3D subsurface mapping method was applied (Newell and Dejong, 2011; Hughes, 2010). Basemap is LidAR (color ramps on elevation: pink and purple > 30 m; blues, greens yellow < 30 m). The US 64/264 transportation corridor and county boundaries are shown. B. Recent SM deliverables.

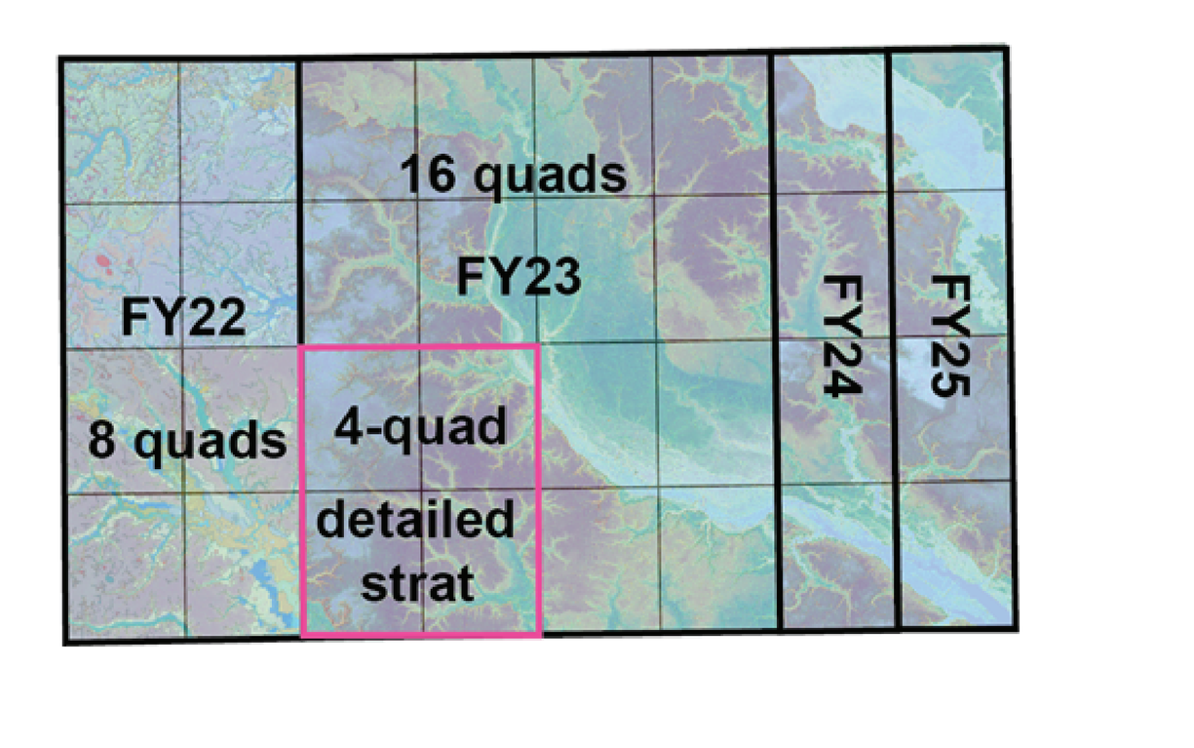


Figure 3. Export from ArcGIS Pro ™ of Rocky Mount 100K map showing 2004 QL2 LiDAR data (source, USGS recompiled into four quadrangle tiles for ease of use) and areas of study over four STATEMAP cycles. Note that the four-quad detailed study quadrangle maps are included in the Rocky Mount sheet. Stratigraphic data collected over many STATEMAP cycles will be utilized to define stratigraphic units for interstate correlation purposes and form the basis for future three-dimensional compilations of Quaternary facies.

The 4-quad area was justified for detailed mapping for two reasons:

Science Justification: Despite wide use, sequence stratigraphy is not yet included in stratigraphic codes (Catuneanu and others, 2009). The 4-quad area which includes the Surry paleoshoreline, is useful for integrating sequence stratigraphy, and stratigraphic nomenclature for the Pliocene and Early Pleistocene section. Science questions are: What is the sequence stratigraphic framework of Early Pleistocene strata near the Surry paleoshoreline? How do these units relate to global coastal onlap cycles, marine isotope stages, systems tracts, parasequences, and relict geomorphic features? Ideas tested are that the Surry shoreline marks the transition from normal to forced regression, and that each allo-unit is a chronostratigraphic slab (Pattison, 2010). Recent Sr 87/86 isotope dates on fossils place the base of the Quaternary here as Calabrian, correlating with MIS 63 (Farrell and Thornton, 2020; Wehmiller et al, 2012).

Characterizing Facies-Controlled Economically Valuable Placers: In Coastal Depositional Systems, heavy minerals commonly occur in shoreface, ebb-tidal delta, beach ridge accretion plains, and other fine-grained sand and heterolithic (interlayered sand and mud) facies. Distribution of these facies is predictable along ancient shorelines, but requires 3D subsurface analysis to identify, confirm, and quantify their thickness, extent and economic value. NCGS is currently mapping these facies near the Surry and older paleoshorelines in the Fall Zone (EARTH MRI), along-strike or near new mine leases.

DATSETS UTILIZED – TO INTERPRET GEOMORPHOLOGY

Geologic maps of the Coastal Plain are historically based on morphostratigraphic units interpreted from non-standardized (sources)—low-resolution, 2 m, 5 ft and 10 ft contour intervals depicted on 7.5-minute topographic quadrangles. The landform elements in the current map, defined as Digital Map Units (DMUs), were interpreted from high-resolution LiDAR basemaps. This 4-quad area is also a component of the Rocky Mount 100K sheet, that will contribute to a revised geomorphic model of Coastal Plain evolution based on landform elements interpreted from LiDAR.

LiDAR origin: 2004 LiDAR (original source 20 ft DEMs from NC Flood Plain Mapping Program), Q2, 10ft DEMs downloaded from the USGS website and reprojected as STATE PLANE NAD 83 meters. Landform elements were interpreted from hillshade, slope and contour lines (1 m, 0.5 m and 0.25 m) derived from the elevation grids and orthoimages (county) dated circa 2011 (these best matched the 2004 LiDAR data). More recent QL1 LiDAR data was constantly undergoing updating for the area. For a standardized unchanging dataset, the QL2 2004 data was chosen.

Prior to the late-stage (2022) download of LiDAR from the USGS website, NCGS staff (Farrell and Amy Keyworth) processed and tiled the 20 DEMS from the NC Flood Plain Mapping Program in house. It is confirmed that the contour lines in both data sets (10FT DEMs from USGS versus 20FT DEMs from NC) are exactly the same, although tiled differently.

The map shown here includes components (contour lines, roads, geography, etc) of a geopdf (NC_Farmville_20130502_TM_geo) downloaded from the USGS website. This was edited in Adobe Acrobat Pro and then georeferenced using Global Mapper 13 and added to an ARC GIS map. Polygon shapefiles depicting DMUs and core locations were draped over the geopdf and made 40% transparent. Contours shown are 5 ft contours that are unrelated to the LiDAR contours used to interpret the landform elements.

BACKGROUND

In the 4-quad area, NCGS collected subsurface data incrementally over many STATEMAP cycles. Coring was expensive and NCGS did not own a Geoprobe rig until 2016. To date, 4617 ft of shallow core were collected at 97 borehole locations. The coring methods included: vibracoring, Geoprobing, split-spoon coring, and wireline/mud-rotary drilling. The highest quality data for the shallow subsurface was collected with the NCGS's Geoprobe. Other methods (wireline/mud-rotary) could recover the deeper, more consolidated older section, but commonly lost the shallow Quaternary stratigraphy due to shallow overpressure zones (heaving sands). Natural gamma logs were collected at boreholes drilled by the NC DENR DEQ. Temporary wells were installed in open boreholes: these were cased with PVC, logged, and uninstalled and plugged after collection of the natural gamma log. (Geoprobe, Inc. does not have a downhole tool for logging natural gamma emissions).

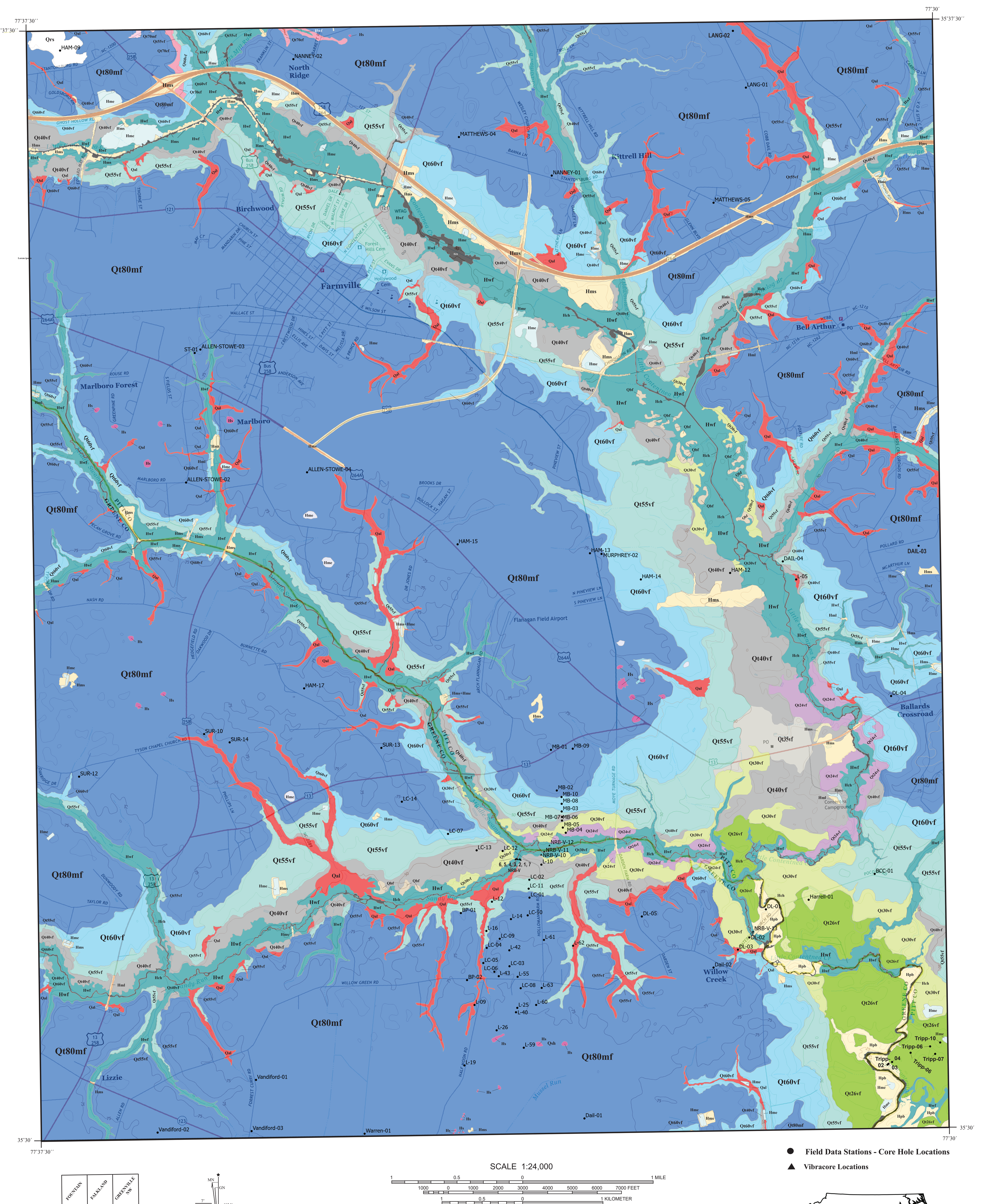
FUTURE WORK

Over the FY21-FY24 STATEMAP funding cycles, maps for the four quads will be completed as stand-alone deliverables. In FY25, all four quads will be completed along with revised GeMS geodatabases for each map. Once the four-quads are completed, the stratigraphic data will be compiled into a 3D database (future STATEMAP Proposal). These cores and the 3D distribution of sedimentary facies and bounding surfaces will ultimately be used to define new formalized stratigraphic units, in conjunction with the interstate correlation activities funded by the USGS for the NC/VA Coastal Plain. For the current map product, the landform elements depicted are informal units, that are an intermediate step to grouping these, integrating with the subsurface analysis to define new formal units. Subsurface data will be shown in future versions of this map as the DMUs are updated, and stratigraphic units are proposed for NC's stratigraphy. As mapping proceeds from west to east across the Rocky Mount 100K sheet, the morphostratigraphic model will be revised to accommodate new data.

CONTRIBUTERS

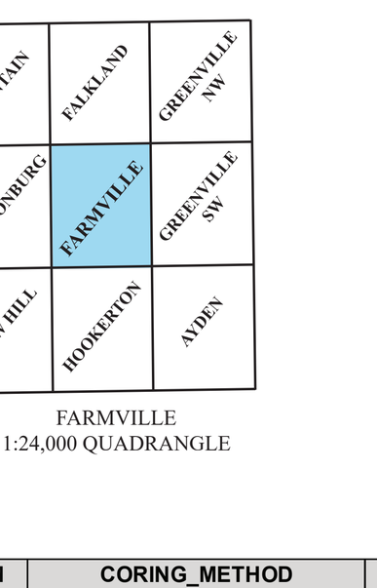
Erik D. Thornton was the principal collaborator with respect to running the drilling operation in the 4-quad area. Amy Keyworth was a major contributor with respect to compiling stratigraphic data for the EPA funded subsurface studies and processing and tiling LiDAR in house during early phases of this mapping. Other NCGS geologists who assisted with field work include: Katie Cummings, Colby Brown, Calley Anthony, McKenzie Hamilton, Stalin Rosero, Kevin Smith, Walt Haven, Bob Brooks, Sean Groom and Laura DeMoe. Dennis Foyles drilled the Geoprobe cores.

The late H.E. Mew, Jr. of the Division of Water Quality was instrumental in including NCGS as a partner in a joint federal-state collaboration (NC DWQ /USGS/EPA/NCGS) funded by the EPA's 319H grant program to map shallow aquifers and confining units and integrate these studies with groundwater monitoring and water quality studies. This permitted collection of deep cores (wireline/mud rotary) with downhole natural gamma logs. Timothy Spruill and Doug Smith of the U.S. Geological Survey also participated in the field work.

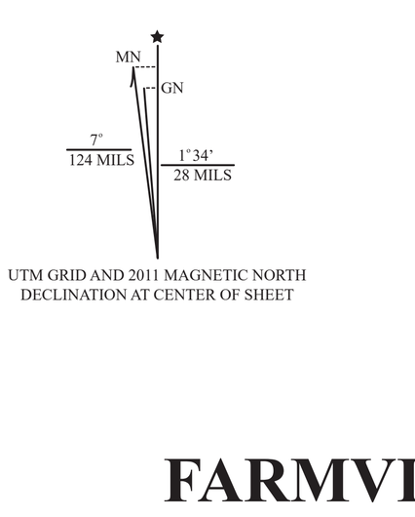


Field Data Stations - Core Hole Locations

Vibracore Locations



FARMVILLE
1:24,000 QUADRANGLE

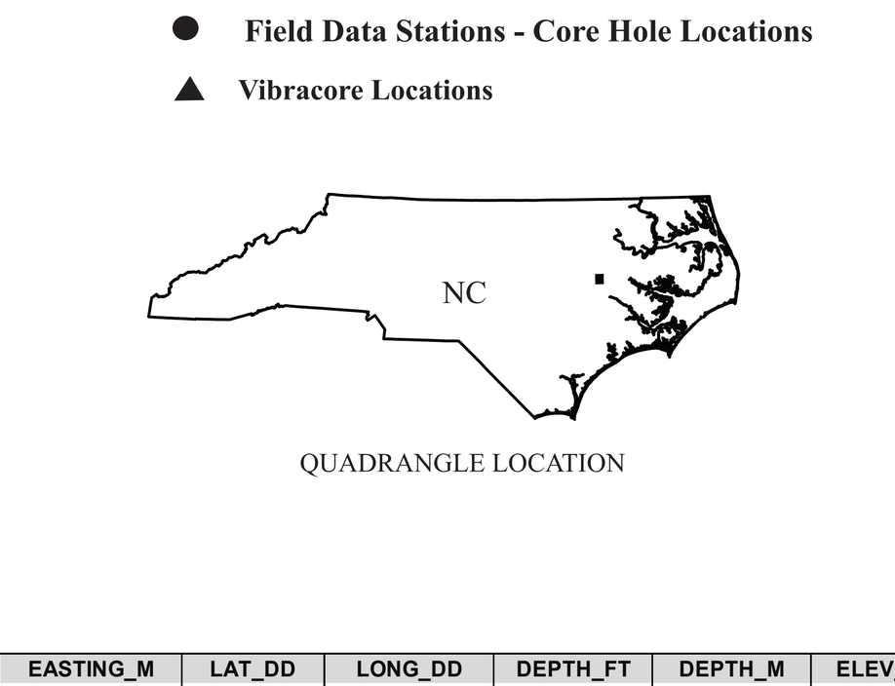


UTM GRID AND 2011 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24,000

1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1983



QUADRANGLE LOCATION

SURFICIAL GEOLOGIC MAP UNITS/GEOMORPHIC LANDFORM ELEMENTS

HOLOCENE LANDFORM ELEMENTS

Hme — **Hme** Man-Made Excavation – Man-made excavations mainly include ponds and lagoons that are typically, but not always, infilled with water; associated with spoil heaps, dams and mining operations.

Hms — **Hms** Man-Made Earthen Structures – include spoil piles from mining and dredging operations, dams associated with ponds and lagoons, roadways that include causeways through wetlands, and major 4-lane highways. May be associated with ponds or a series of ponds/lagoons. Unspecified modified land.

Hch — **Hch** Stream Channel – Natural stream and river channels.

Hwf — **Hwf** Wetland Flat (Holocene) – Vegetated wetland flat at base of incised valleys; commonly with an anastomosed channel network activated during flood stage. Hwf is the main component of the active flood plain. The wetland flat may be drained by a single main channel, which is commonly trenched and straightened by human activity. Locally or seasonally, Hwf may exhibit lacustrine conditions. Basal quartz sand fines up into organic-rich sand and mud. Deposits are typically less than 3 m thick. Flat is typically flanked by colluvium, alluvial fan, and partly buried channel belts. It is incised into pre-existing deposits, and may be separated in stepwise fashion from other active or inactive wetland flats. Upstream, especially in first order streams, the flat narrows and is replaced by undifferentiated Quaternary alluvium. In the current map extent, the wetland flat rises in elevation across the Coastal Plain in drainages from about 8 to 23 m. It is intermittently replaced by Hpb, the Holocene point bar complex.

Hpb — **Hpb** Point bar complex (Holocene) – A Holocene point bar complex occurs intermittently along drainages rising in elevation from about 8 - 11 m from downstream to upstream across the map extent (Farmville 7.5 minute quadrangle). It is part of the active floodplain and is slightly incised into older, higher major point bar complexes (1-2 meters difference in elevation). Along the drainage, it may be replaced by the wetland flat (Hwf).

Hs — **Hs** Sinkhole (Holocene) – Sinkholes are ovate depressions that form when underlying carbonate-rich units dissolve and collapse. These are part of the geologically active landscape. These may be associated with incipient Carolina Bay formation, and may act as conduits for degassing and dewatering of underlying units. Some sinkholes may have formed prior to the Holocene.

UNDIFFERENTIATED HOLOCENE/PLEISTOCENE LANDFORM ELEMENTS

Qal — **Qal** Undifferentiated Quaternary alluvium – Qal is here specifically defined as valley-fill alluvium, colluvium, feeder channels and alluvial fans that are upstream components of the currently active landscape (Holocene depositional system). In many cases, sediment may be Pleistocene or Pliocene in age. Typically, Qal occurs upstream or updrainage from the Holocene wetland flat (Hwf, Hwf2). It typically includes first order streams and their included colluvium. It is not flat, but may have an irregular surface. Surfaces of some colluvial deposits and alluvial fans are concave downward. Incised feeder channels typically lead down slope from sediment sources to fan sinks.

Qrs — **Qrs** Remobilized sand – Remobilized sand refers to sands that through a variety of processes now form topographic highs in otherwise, low-standing, flat landscapes. Qrs map units may help identify rims affiliated with Carolina Bays, high-standing dunes along paleoshorelines, or undifferentiated high-standing sand accumulations. An alternative interpretation is that, in certain cases, these are erosion resistant remnants of the older, higher landform elements that are mud-dominated, rather than sand dominated. This can only be resolved by direct drilling into the features.

Qbf — **Qbf** Barforms – Transverse or attached barforms; postdate the Hwf and incised valley terraces; may be remnants of point bars that are undergoing burial by the modern wetland flat. May have formed as transverse bars in response to major flood events that infilled the local basin.

QUATERNARY VALLEY FILL TERRACES

Qt24vf — **Qt24vf** Pleistocene valley fill terrace at 12.5-10.75 m; predates Holocene meander belt complex; postdates and truncates valley fill terrace sets Qt35vf, Qt30vf and Qt26vf. May be downstepping from Q26vf, the major point bar complex.

Qt26vf — **Qt26vf** Pleistocene valley fill terrace at 12-11 m; major point bar complex. Upward fining channel belt sands, abandoned channels, oxbox lakes, and associated wetland flats. In core holes, unit is typically less than 4 m thick.

Qt30vf — **Qt30vf** Pleistocene valley fill terrace a 15-12 m; fluvial to possibly estuarine; varies from a flat to a point bar complex. Predates Q26vf, the major point bar complex.

Qt35vf — **Qt35vf** Pleistocene valley fill terrace at 19 – 13 m in Farmville; 21-11 m where first mapped along Otter Creek in Falkland 7.5-minute quadrangle. Upstream, this unit is incised into Qt55vf; in downstream confluence areas it tends to converge in elevation with Qt55vf, so that these landform elements are difficult to separate geomorphically.

Qt40vf — **Qt40vf** Pleistocene valley fill terrace at 14-15 m, that is intermediate in elevation between Qt55vf and Qt35vf; marks zone of convergence of several valley fill terrace systems. Mostly observed in Falkland 7.5 minute quadrangle.

QUATERNARY MARINE/ESTUARINE TERRACES

Qt55vf — **Qt55vf** Pleistocene valley fill at 21-14 m. Flat estuarine terrace. In upvalley areas, Qt60vf downsteps into Qt55vf; in downstream areas, Qt55vf forms a broader, flat surface to elevations of 14 m; the two landform elements (Qt60vf and Qt55vf) are closely related. It is likely Early Pleistocene, forming during falling stages in sea level.

Qt60vf — **Qt60vf** Pleistocene valley fill at 22-18 m. Unit forms an estuarine terrace that has downstepped from Qt80mf, the principal marine flat. Qt60vf is closely associated with and downsteps into Qt55 vf. It is likely Early Pleistocene, forming during falling stages in sea level.

Qt70ef — **Qt70ef** Pleistocene estuarine flat and incipient valley fill colluvium at 23.5-21.5 m; postdates Qt70mf (in Falkland quadrangle) but is closely related to it; unit includes major colluvial 'event' that includes slope failures, fan and colluvial deposits, and extensive remobilized sands that outline Carolina Bays, and especially impacts Qt70mf. Unit clearly demarcates the incised valley incision event. It is likely Early Pleistocene, forming during falling stages in sea level.

Qt70mf — **Qt70mf** Pleistocene marine and estuarine flats at ~25-22 m. Slightly incised into Qt80mf in the incipient Otter Creek incised valley. Down valley, the estuarine component of terrace system merges with the marine flat along the open paleoshoreline. This unit may be grouped with Qt90mf and Qt80mf, but does exhibit downstepping, especially in the incipient incised valley. Limited in area in Farmville. It is likely Early Pleistocene, forming during falling stages in sea level.

Qt80mf — **Qt80mf** Pleistocene marine flat at 25.5 to 24 m; this flat is locally separated from landward Qt90mf (in Falkland 7.5 minute quadrangle) by a subtle step in topography, but is underlain by the same geologic unit as Q90mf. This landform element helps demonstrate the early stages of incised valley formation (Otter Creek incised valley in Falkland) during the falling stage in sea level from the Qt90s event. Early Pleistocene, falling stage marine ramp.

Figure 4. The diagram below shows the relationship between surface elevation and the various formations defined in the Coastal Plain Map of Virginia (Mixon et al., 1989). The diagram does not incorporate revisions to the Quaternary proposed by Gibbard et. al. (2010). The goal of future STATEMAP proposals is to compiled the 3D stratigraphy from the coreholes and use this information to develop up to date descriptions of the Quaternary section, and propose new formation names based on this information.

Series	Subseries, Stages	Age (MA)	Alloformations and Extent: Virginia Coastal Plain, Berquist, 2007, pers. comm. Revised after Mixon et al, 1989 — Formations	Members	Virginia Map Extent, Geomorphic Features — Elevation - Surface: Ft	Meters	Scarp Toe "Highstand"
Holocene							
Pleistocene	Late	0.12	Tabb Fm	Poquoson Mbr. Lynnhaven Mbr. Sedgefield Mbr.	6 -10 ft 10 -18 ft 18 -28 ft	1.8 - 3.3 m 3.3 - 5.5 m 5.5 - 8.5 m	10 ft/ 3.3 m 18 ft/ 5.5 m 28 ft/8.5 m
			Shirley Fm		28 - 48 ft	8.5 - 14.6 m	48 ft/14.6 m
	Middle	0.78	Chuckatuck Fm		48 - 55 ft	14.6 - 16.8 m	55 ft/16.8 m
	Early		Charles City Fm		55 - 70 ft	16.8 - 21.3 m	70 ft/21.3 m
			Windsor Fm		70 - 95 ft	21.3 - 29.0 m	95 ft/29.0 m
		1.80	Moorings Unit	barrier/beach backbarrier	95 - 125 ft 95? - 115 ft	29.0 - 38.1 m 29.0? - 35.0 m	115 ft/35 m 115 ft/35 m
Pliocene			Bacons Castle Fm	Barhamsville Varina Grove	115 - 170 ft	35.0 - 51.8 m	170 ft/51.8 m
			Chowan River Fm				

FARMVILLE CORE DATA

NCGS_STD_ID	HOLE_ID	DRILL_DATE	PI	GEO_IN_FIELD	COUNTY	NORTHING_M	EASTING_M	LAT_DD	LONG_DD	DEPTH_FT	DEPTH_M	ELEV_FT	ELEV_M	CORING_METHOD	DRILLERS	PHOTOS	GAMMA
GR-1998-001-00	L-05	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197284.4200	740018.2200	35.562000	-77.519900	33.00	10.06	73.20	22.31	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-002-00	L-09	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196684.0500	739745.2900	35.514600	-77.565100	48.00	14.63	75.70	23.07	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-003-00	L-10	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	198442.6500	740579.5800	35.530300	-77.555600	52.80	16.09	47.10	14.36	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-004-00	L-12	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197977.5800	739963.4300	35.526200	-77.562500	63.40	19.32	65.10	19.84	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-005-00	L-14	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197764.3500	740200.1200	35.524200	-77.559900	68.00	20.73	73.10	22.28	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-006-00	L-16	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197611.6100	739897.2800	35.522900	-77.563300	64.20	19.57	55.70	16.98	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-007-00	L-19	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	195928.4900	739623.8900	35.507800	-77.566600	68.00	20.73	79.30	24.17	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-008-00	L-25	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196648.3700	740283.1800	35.514200	-77.559200	95.20	29.02	76.40	23.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-009-00	L-26	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196369.6400	740019.7400	35.511700	-77.562100	74.00	22.56	79.70	24.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-010-00	L-40	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196600.5900	740266.0100	35.513700	-77.559400	59.00	17.98	76.40	23.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-011-00	L-42	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197373.0300	740181.0200	35.520700	-77.560200	83.00	25.30	76.70	23.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-012-00	L-43	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197048.8700	740049.0100	35.517800	-77.561700	78.00	23.77	74.80	22.80	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-013-00	L-55	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197039.6300	740287.2100	35.517700	-77.559100	70.00	21.34	77.50	23.62	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-015-00	NRB-V-01	9/22/1999	K. Farrell	K.Farrell, H.E.Mew, T.Spruill (USGS)	Greene	198513.5834	740314.2787	35.530975	-77.558538	10.04	3.06	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-001-00	LC-01	10/4/1999	K. Farrell	K.Farrell	Greene	198031.9000	740431.5000	35.526600	-77.557300	40.00	12.19	72.50	22.10	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-002-00	LC-02	10/4/1999	K. Farrell	K.Farrell	Greene	198246.6700	740432.8300	35.528600	-77.557300	75.00	22.86	61.60	18.78	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-003-00	LC-03	10/11/1999	K. Farrell	K.Farrell, W.Haven	Greene	197174.3500	740183.2400	35.518900	-77.560200	53.30	16.25	76.70	23.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-004-00	LC-04	10/13/1999	K. Farrell	K.Farrell	Greene	197405.7400	739895.0300	35.521000	-77.563300	65.00	19.81	69.50	21.18	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-005-00	LC-05	10/18/1999	K. Farrell	K.Farrell	Greene	197209.3700	739855.4500	35.519300	-77.563800	67.10	20.45	72.80	22.19	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-006-00	LC-06	10/19/1999	K. Farrell	K.Farrell	Greene	197104.2300	739992.0600	35.518300	-77.562300	79.00	24.08	76.70	23.38	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-007-00	LC-07	10/21/1999	K. Farrell	K.Farrell	Greene	198829.4500	739414.4400	35.533900	-77.568400	69.00	21.03	67.80	20.67	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-008-00	LC-08	10/25/1999	K. Farrell	K.Farrell	Greene	196898.8600	740323.2500	35.516400	-77.558700	85.00	25.91	76.40	23.29	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-009-00	LC-09	10/27/1999	K. Farrell	K.Farrell	Greene	197513.1900	740057.3100	35.522000	-77.561500	78.00	23.77	75.60	23.04	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-010-00	LC-10	10/28/1999	K. Farrell	K.Farrell	Greene	197802.1000	740410.9700	35.524600	-77.557600	84.00	25.60	74.60	22.74	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-013-00	LC-13	11/9/1999	K. Farrell	K.Farrell	Greene	198619.9800	739773.8900	35.532000	-77.564500	54.00	16.46	48.40	14.75	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-016-00	NRB-V-02	11/20/1999	K. Farrell	K.Farrell, K.Smith	Greene	198511.0850	740305.5344	35.530953	-77.558635	13.32	4.06	39.17	11.94	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-017-00	NRB-V-03	11/20/1999	K. Farrell	K.Farrell, K.Smith	Greene	198512.3342	740284.2981	35.530967	-77.558869	11.94	3.64	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-018-00	NRB-V-04	11/22/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198514.9888	740276.0222	35.530992	-77.558959	11.65	3.55	39.17	11.94	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-019-00	NRB-V-05	11/22/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198516.8626	740269.4639	35.531010	-77.559031	12.34	3.76	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-020-00	NRB-V-06	11/23/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198512.3342	740256.8158	35.530971	-77.559172	10.70	3.26	38.75	11.81	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-021-00	NRB-V-07	11/23/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198504.8391	740323.0231	35.530895	-77.558443	5.64	1.72	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-011-00	LC-11	12/7/1999	K. Farrell	K.Farrell	Greene	198138.1300	740421.0000	35.527600	-77.557400	46.00	14.02	63.70	19.42	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-012-00	LC-12	12/8/1999	K. Farrell	K.Farrell, K. Smith	Greene	198610.3800	740097.8800	35.531900	-77.560900	59.00	17.98	45.80	13.96	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-014-00	LC-14	12/15/1999	K. Farrell	K.Farrell	Greene	199224.9100	738836.1700	35.537600	-77.574700	74.00	22.56	75.50	23.01	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-2000-001-00	L-59	11/20/2000	K. Farrell	K.Farrell, R.Brooks	Greene	196149.8400	740360.8500	35.509700	-77.558400	68.00	20.73	80.70	24.60	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-2000-002-00	L-60	11/21/2000	K. Farrell	K.Farrell, R.Brooks	Greene	196688.3400	740515.7500	35.514500	-77.556600	34.00	10.36	72.00	21.95	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	NO
GR-2002-004-00	L-61	6/10/2002	K. Farrell	K.Farrell	Greene	197503.4300	740616.8400	35.521800	-77.555400	78.40	23.90	75.50	23.01	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-2002-005-00	L-62	6/10/2002	K. Farrell	K.Farrell, R.Brooks	Greene	197429.5900	740976.4800	35.521100	-77.551400	84.50	25.76	59.20	18.04	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-2002-006-00	L-63	6/19/2002	K. Farrell	K.Farrell, L.DeMoe	Greene	196899.1900	740581.6800	35.516400	-77.555800	88.00	26.82	76.50	23.32	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
PT-2002-001-00	BCC-01	11/21/2002	K. Farrell	K.Farrell, D.Smith (USGS)	Pitt	198321.2896	744749.7402	35.528700	-77.509700	56.00	17.07	50.85	15.50	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-001-00	MB-01	1/12/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199875.5560	740696.9200	35.543214	-77.554059	77.00	23.47	75.30	22.95	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-002-00	MB-02	1/13/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199366.3530	740776.8860	35.538619	-77.553328	47.00	14.33	72.60	22.13	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-003-00	MB-03	1/13/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199100.9240	740835.1670	35.536248	-77.552691	42.00	12.80	60.00	18.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-004-00	MB-04	1/14/2004	K. Farrell	K.Farrell, S.Groom	Pitt	198835.3630	740884.3840	35.533848	-77.552177	47.00	14.33	43.90	13.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-005-00	MB-05	1/14/2004	K. Farrell	K.Farrell, S.Groom	Pitt	198901.3900	740847.1450	35.534433	-77.552579	27.00	8.23	46.30	14.11	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-006-00	MB-06	1/15/2004	K. Farrell	K.Farrell, S.Groom	Pitt	198989.9980	740836.7840	35.535224	-77.552669	22.00	6.71	47.30	14.42	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-007-00	MB-07	1/15/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199034.3680	740836.1370	35.535629	-77.552670	22.00	6.71	54.30	16.55	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-008-00	MB-08	1/15/2004	K. Farrell	K.Farrell, S.Groom	Pitt	221386.5410	740510.2330	35.537116	-77.552691	32.00	9.75	65.60	19.99	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-009-00	MB-09	2/9/2004	K. Farrell	S.Groom	Pitt	199890.6140	740968.7410	35.543290	-77.551052	52.00	15.85	68.70	20.94	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES

NCGS_STD_ID	HOLE_ID	DRILL_DATE	PI	GEO_IN_FIELD	COUNTY	NORTHING_M	EASTING_M	LAT_DD	LONG_DD	DEPTH_FT	DEPTH_M	ELEV_FT	ELEV_M	CORING_METHOD	DRILLERS	PHOTOS	GAMMA
GR-1998-001-00	L-05	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197284.4200	740018.2200	35.562000	-77.519900	33.00	10.06	73.20	22.31	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-002-00	L-09	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196684.0500	739745.2900	35.514600	-77.565100	48.00	14.63	75.70	23.07	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-003-00	L-10	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	198442.6500	740579.5800	35.530300	-77.555600	52.80	16.09	47.10	14.36	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-004-00	L-12	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197977.5800	739963.4300	35.526200	-77.562500	63.40	19.32	65.10	19.84	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-005-00	L-14	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197764.3500	740200.1200	35.524200	-77.559900	68.00	20.73	73.10	22.28	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-006-00	L-16	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197611.6100	739897.2800	35.522900	-77.563300	64.20	19.57	55.70	16.98	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-007-00	L-19	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	195928.4900	739623.8900	35.507800	-77.566600	68.00	20.73	79.30	24.17	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-008-00	L-25	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196648.3700	740283.1800	35.514200	-77.559200	95.20	29.02	76.40	23.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-009-00	L-26	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196369.6400	740019.7400	35.511700	-77.562100	74.00	22.56	79.70	24.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-010-00	L-40	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	196600.5900	740266.0100	35.513700	-77.559400	59.00	17.98	76.40	23.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-011-00	L-42	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197373.0300	740181.0200	35.520700	-77.560200	83.00	25.30	76.70	23.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-012-00	L-43	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197048.8700	740049.0100	35.517800	-77.561700	78.00	23.77	74.80	22.80	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1998-013-00	L-55	12/12/1998	K. Farrell	H.E. Mew, Jr. (DWQ)	Greene	197039.6300	740287.2100	35.517700	-77.559100	70.00	21.34	77.50	23.62	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-015-00	NRB-V-01	9/22/1999	K. Farrell	K.Farrell, H.E.Mew, T.Spruill (USGS)	Greene	198513.5834	740314.2787	35.530975	-77.558538	10.04	3.06	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-001-00	LC-01	10/4/1999	K. Farrell	K.Farrell	Greene	198031.9000	740431.5000	35.526600	-77.557300	40.00	12.19	72.50	22.10	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-002-00	LC-02	10/4/1999	K. Farrell	K.Farrell	Greene	198246.6700	740432.8300	35.528600	-77.557300	75.00	22.86	61.60	18.78	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-003-00	LC-03	10/11/1999	K. Farrell	K.Farrell, W.Haven	Greene	197174.3500	740183.2400	35.518900	-77.560200	53.30	16.25	76.70	23.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-004-00	LC-04	10/13/1999	K. Farrell	K.Farrell	Greene	197405.7400	739895.0300	35.521000	-77.563300	65.00	19.81	69.50	21.18	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-005-00	LC-05	10/18/1999	K. Farrell	K.Farrell	Greene	197209.3700	739855.4500	35.519300	-77.563800	67.10	20.45	72.80	22.19	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-006-00	LC-06	10/19/1999	K. Farrell	K.Farrell	Greene	197104.2300	739992.0600	35.518300	-77.562300	79.00	24.08	76.70	23.38	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-007-00	LC-07	10/21/1999	K. Farrell	K.Farrell	Greene	198829.4500	739414.4400	35.533900	-77.568400	69.00	21.03	67.80	20.67	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-008-00	LC-08	10/25/1999	K. Farrell	K.Farrell	Greene	196898.8600	740323.2500	35.516400	-77.558700	85.00	25.91	76.40	23.29	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-009-00	LC-09	10/27/1999	K. Farrell	K.Farrell	Greene	197513.1900	740057.3100	35.522000	-77.561500	78.00	23.77	75.60	23.04	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-010-00	LC-10	10/28/1999	K. Farrell	K.Farrell	Greene	197802.1000	740410.9700	35.524600	-77.557600	84.00	25.60	74.60	22.74	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-013-00	LC-13	11/9/1999	K. Farrell	K.Farrell	Greene	198619.9800	739773.8900	35.532000	-77.564500	54.00	16.46	48.40	14.75	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-016-00	NRB-V-02	11/20/1999	K. Farrell	K.Farrell, K.Smith	Greene	198511.0850	740305.5344	35.530953	-77.558635	13.32	4.06	39.17	11.94	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-017-00	NRB-V-03	11/20/1999	K. Farrell	K.Farrell, K.Smith	Greene	198512.3342	740284.2981	35.530967	-77.558869	11.94	3.64	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-018-00	NRB-V-04	11/22/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198514.9888	740276.0222	35.530992	-77.558959	11.65	3.55	39.17	11.94	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-019-00	NRB-V-05	11/22/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198516.8626	740269.4639	35.531010	-77.559031	12.34	3.76	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-020-00	NRB-V-06	11/23/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198512.3342	740256.8158	35.530971	-77.559172	10.70	3.26	38.75	11.81	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-021-00	NRB-V-07	11/23/1999	K. Farrell	K.Farrell, W.Haven, K.Smith	Greene	198504.8391	740323.0231	35.530895	-77.558443	5.64	1.72	40.50	12.34	Vibracore	NCGS	ARCHIVAL	NO
GR-1999-011-00	LC-11	12/7/1999	K. Farrell	K.Farrell	Greene	198138.1300	740421.0000	35.527600	-77.557400	46.00	14.02	63.70	19.42	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-012-00	LC-12	12/8/1999	K. Farrell	K.Farrell, K. Smith	Greene	198610.3800	740097.8800	35.531900	-77.560900	59.00	17.98	45.80	13.96	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-1999-014-00	LC-14	12/15/1999	K. Farrell	K.Farrell	Greene	199224.9100	738836.1700	35.537600	-77.574700	74.00	22.56	75.50	23.01	Split Spoon or Wireline	NC-DENR DWQ	ARCHIVAL	YES
GR-2000-001-00	L-59	11/20/2000	K. Farrell	K.Farrell, R.Brooks	Greene	196149.8400	740360.8500	35.509700	-77.558400	68.00	20.73	80.70	24.60	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
GR-2000-002-00	L-60	11/21/2000	K. Farrell	K.Farrell, R.Brooks	Greene	196688.3400	740515.7500	35.514500	-77.556600	34.00	10.36	72.00	21.95	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	NO
GR-2002-004-00	L-61	6/10/2002	K. Farrell	K.Farrell	Greene	197503.4300	740616.8400	35.521800	-77.555400	78.40	23.90	75.50	23.01	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-2002-005-00	L-62	6/10/2002	K. Farrell	K.Farrell, R.Brooks	Greene	197429.5900	740976.4800	35.521100	-77.551400	84.50	25.76	59.20	18.04	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
GR-2002-006-00	L-63	6/19/2002	K. Farrell	K.Farrell, L.DeMoe	Greene	196899.1900	740581.6800	35.516400	-77.555800	88.00	26.82	76.50	23.32	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
PT-2002-001-00	BCC-01	11/21/2002	K. Farrell	K.Farrell, D.Smith (USGS)	Pitt	198321.2896	744749.7402	35.528700	-77.509700	56.00	17.07	50.85	15.50	Wireline - Mud Rotary	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-001-00	MB-01	1/12/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199875.5560	740696.9200	35.543214	-77.554059	77.00	23.47	75.30	22.95	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-002-00	MB-02	1/13/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199366.3530	740776.8860	35.538619	-77.553328	47.00	14.33	72.60	22.13	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-003-00	MB-03	1/13/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199100.9240	740835.1670	35.536248	-77.552691	42.00	12.80	60.00	18.29	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-004-00	MB-04	1/14/2004	K. Farrell	K.Farrell, S.Groom	Pitt	198835.3630	740884.3840	35.533848	-77.552177	47.00	14.33	43.90	13.38	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-005-00	MB-05	1/14/2004	K. Farrell	K.Farrell, S.Groom	Pitt	198901.3900	740847.1450	35.534433	-77.552579	27.00	8.23	46.30	14.11	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-006-00	MB-06	1/15/2004	K. Farrell	K.Farrell, S.Groom	Pitt	198989.9980	740836.7840	35.535224	-77.552669	22.00	6.71	47.30	14.42	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-007-00	MB-07	1/15/2004	K. Farrell	K.Farrell, S.Groom	Pitt	199034.3680	740836.1370	35.535629	-77.552670	22.00	6.71	54.30	16.55	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-008-00	MB-08	1/15/2004	K. Farrell	K.Farrell, S.Groom	Pitt	221386.5410	740510.2330	35.537116	-77.552691	32.00	9.75	65.60	19.99	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES
PT-2004-009-00	MB-09	2/9/2004	K. Farrell	S.Groom	Pitt	199890.6140	740968.7410	35.543290	-77.551052	52.00	15.85	68.70	20.94	Split Spoon	NC-DENR DWQ	ARCHIVAL	YES

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MAP OF GEOMORPHIC LANDFORM ELEMENTS IN THE FARMVILLE 7.5-MINUTE QUADRANGLE, NORTH CAROLINA

By
Kathleen M. Farrell, Erik D. Thornton, and Amy J. Keyworth

Map preparation, digital cartography and editing by Kathleen M. Farrell
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