STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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STATE PROJECT: 34459.1.6 (R-2552C)
F.A. PROJECT: NHF-60-1(9)
COUNTY: Johnston

DESCRIPTION: US 70 (Clayton Bypass) from east of SR 1560 to US 70 east of Clayton

SUBJECT: Geotechnical Report – Foundation Investigation for Structure on -L2LT- (US 70 Bypass) over Little Creek at Sta. 109+56

Project Description

This project consists of a 144-meter long six span bridge to be constructed over Little Creek for the westbound lanes of the proposed Clayton Bypass. The new bridge will be constructed on a 90° skew. The project is located in rural, northern Johnston County.

The subsurface investigation was conducted during July and August of 2004 using a Mobile B-57 ATV mounted drill with a manual hammer. Standard Penetration Test borings were performed at each of the seven proposed bent locations. All borings were advanced until weathered rock, or hard rock, was encountered. Borings were advanced using hollow stem augers, N-casing, and/or rotary drilling. Seven of the sixteen borings were cored using either NWD4, or NQ, core equipment to recover hard rock samples. Representative soil samples were obtained for visual classification in the field and selected samples were sent to the Materials and Test Unit for laboratory analysis. Rock core samples were also sent to the Materials and Test Unit to determine Unit Weight, Compressive Strength, Young's Modulus, and Poisson's Ratio.

Physiography and Geology

The project is located in moderately hilly terrain at the eastern limits of the Piedmont Physiographic province. The area is located between Ranch Road (SR 1560) and Peele Road (SR 1571), in an area with scattered single-family homes, pastures, woods, and cultivated fields. The project site is heavily wooded on both sides of Little Creek. The hillside slopes adjacent to the Little Creek floodplain are fairly steep. The Little Creek channel meanders within a floodplain approximately 110 meters in width (see Sheet No.4).

Geologically, the project is located within the Raleigh Belt. Soils are derived from the weathering of the underlying bedrock, which includes metamorphosed granite and gabbro, and biotite schist.

Soil Properties

Soils encountered at the project site include alluvial and residual soils.

Alluvial soils were encountered at each interior bent location. The alluvial soils range from approximately 1.5 to 4.5 meters in thickness. The predominant alluvial soil is tan, brown, orange, and gray, loose, dry to wet, silty sand (AASHTO Classification of A-2-4) with lenses of quartz gravel. Approximately 2 meters of loose, clayey sand (A-2-6) is present at Bent 3. Alluvial soil at eastern edge of the floodplain (Bent 5) consists of orange and gray, very stiff, moist to wet, sandy silt (A-4). The alluvial soils overlie residual soil at each interior bent, except for the right side of Bent 4 where the alluvial soil lies directly on soft weathered rock.

Residual soils range from 2 to 12 meters in thickness. Three general soil types are present at the project site. These soil types are representative of the underlying bedrock from which they were derived. The most common residual soils were derived from the metamorphosed granite (meta-granite) bedrock and consist of loose to very dense silty sand (A-2-4) and coarse sand (A-2-4). These meta-granite-derived soils occur at Bents 2, 3, 4, and 5, and End Bent 2.

Residual soils derived from biotite schist occur at End Bent 1, Bent 1, and Bent 2. These soils are characterized by their silty nature and orange to greenish color. The most common soil in this group is orange, soft to stiff, moist to wet sandy silt (A-5). In addition to the silt, green, orange-brown, and white, medium stiff to hard, moist to wet, sandy clay and sandy silty clay (A-7-5 and A-7-6) occurs at End Bent 1, Bent 1, and Bent 2. Rock boulders are interspersed within the clay soil that occurs at the ground surface on the right side of End Bent 1.

The third type of residual soil occurs at End Bent 2. The thickness of this soil varies from 2 meters on the left side of the bent, to as much as 9 meters on the right side. This soil is derived from the underlying metamorphosed gabbro (meta-gabbro) bedrock and consists of red-orange, stiff to hard, dry to wet, silty clay and sandy silty clay (A-7-5). Soils derived from the meta-gabbro exhibit moderate to high plasticity indices. Meta-gabbro rock boulders are common in the surface soils across End Bent 2.

Rock Properties

The most common weathered rock type was derived from the underlying meta-granite and is generally sandy in composition. This sandy weathered rock is predominant at Bents 3, 4, and 5, and ranges in thickness from 2 to 8 meters. A second type of weathered rock is derived from schist. This green, micaceous silty, clayey, sandy weathered rock occurs at Bent 2.

Rock core was obtained from both the end, and interior, bents. At End Bent 1, rock core was retrieved from the EB1-B boring to confirm that the rock encountered was actually bedrock, as opposed to near-surface boulders. The rock at End Bent 1 consisted of fresh, slightly fractured to sound, meta-granite. Core was also retrieved from EB2-A to determine the nature of the shallow rock. This rock consists of green-gray, meta-gabbro with clay-filled joints and seams. The meta-gabbro is moderately weathered to fresh and slightly fractured to sound.

Core was retrieved from four of the five interior bents. Cores from Bents 1, 4, and 5 consisted of moderately severely to slightly weathered, extremely fractured to sound meta-granite. Overall core recovery in the meta-granite bedrock ranged from 34% to 100%. Rock Quality Designation (RQD) values ranged from 0% to 100%. Ultimate compressive strength of the meta-granite rock samples ranged from