



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

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STATE PROJECT: 33243.1.1 (B-3703)  
FEDERAL PROJECT: BRZ-1404(2)  
COUNTY: Wake  
DESCRIPTION: Bridge No. 317 on -L- (SR 1404, Johnson Pond Road) over Middle Creek  
SUBJECT: Geotechnical Report - Bridge Foundation Investigation for Bridge No. 317 on -L- (SR 1404, Johnson Pond Road) over Middle Creek at -L- Station 18+17.85

**Project Description**

Project B-3703 provides for the replacement of an existing bridge on SR 1404 over Middle Creek, approximately 4.7 miles northeast of Fuquay-Varina. The replacement structure will be constructed along the existing alignment. It consists of three spans with an overall length of 147 feet. Bents are on a 90° skew. Traffic will be diverted to an offsite detour during construction of the proposed bridge.

The site was investigated in November and December 2003, using a CME-45C ATV drill machine with an automatic hammer. Borings were advanced through soil and weathered rock using hollow stem augers, N casing, a tricone bit, and a drag bit. Standard Penetration Tests were performed in all borings. Representative soil samples were submitted to the Materials and Tests Unit laboratory for analysis.

**Physiography and Geology**

The project is in flat to gently rolling terrain of the eastern Piedmont Physiographic Province. Surface water level in Middle Creek varied an estimated 2 feet during the investigation, related to rain events. Measured elevations ranged between 263.6 and 264.6 feet. Woodlands and wetlands surround the project. Schist of the Raleigh Belt underlies the area. Foundation materials at the site include roadway embankment, alluvial soils, residual soils, and weathered rock.

**Foundation Description**

**Soil Properties**

The four end bent borings penetrated 6.0 and 7.5 feet of embankment soils. These soils are soft to medium stiff, moist, moderately to highly plastic, silty clay (A-7-6). Their thickness is greater than the typical 3 to 4 foot height of the embankment above the floodplain. The greater thickness is attributed to the close proximity of the borings to the existing bridge's headwalls.

Alluvial soils were encountered in all borings. Borings for the end bents and for Bent 1 penetrated 3.8 to 8.9 feet of moist to wet, mostly very loose to medium dense sand (A-3, A-1-b) and clayey sand (A-2-6), with some gravel. Very soft, sandy silt is also present. Borings for Bent 2 were drilled in the creek. These borings penetrated 1.5 to 2.5 feet of medium dense, wet, gravelly sand (A-1-b).

Across the site, alluvial soils rest on residual soils. All residual soils are below the water table. These soils are mostly stiff to hard, saprolitic, slightly to highly plastic, silty clay (A-7-5, A-7-6). Sandy and clayey silt (A-4, A-5) are also present. Borings for Bent 1 terminated in residual soil without encountering weathered rock. Borings EB1-A, EB1-B, and B2-A also terminated in residual soil, but encountered weathered rock interlayered with the soil. In borings B2-B, EB2-A, and EB2-B residual soil grades with depth to weathered rock, with all three borings terminating in weathered rock.

**Rock Properties**

Weathered rock is present at all bents except Bent 1. Hard rock was not encountered. Split spoon samples of the weathered rock were well foliated and suggestive of schist as the parent rock. The samples could be easily broken and crumbled by hand.

**Groundwater**

Groundwater was encountered just below the top of the alluvial soil column, at elevations between 263.2 and 265.0 feet. Measured elevations for Middle Creek ranged between 263.6 and 264.6 feet. The similarity of groundwater elevations to the elevation of Middle Creek indicates that the alluvial soils are highly permeable. Groundwater elevation can therefore be expected to mimic the elevation of Middle Creek during construction.

**Notice**

This Geotechnical Engineering Unit foundation report is based on the Bridge Survey and Hydraulic Design Report for Middle Creek, dated February 2003. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Respectfully submitted,

A handwritten signature in black ink that reads "Steve P. Brown".

Steve P. Brown, LG  
Project Engineering Geologist