

WBS ELEMENT (TIP): 33410.1.1 (B-4044)

FEDERAL PROJECT: BRZ-1515(2)

COUNTY: Burke

DESCRIPTION: Bridge No. 4 over Smokey Creek on SR 1515

SUBJECT: Geotechnical Report of Subsurface Exploration

Project Description:

Geoscience Group, Inc. (Geoscience) has completed the authorized geotechnical investigation for the above referenced project in Burke County, North Carolina. The bridge will be located in northeastern Burke County, north of Drexel. More precisely, the bridge will be located just north of the existing SR 1515 crossing of Smokey Creek. A Site Vicinity Map is included in the following pages. The project will consist of the construction of a three-span, concrete girder bridge with an overall length of 180 feet, a width of 33 feet and a skew angle of 90°. Fill depths of 20 to 30 feet are proposed at end bent-1 and end bent-2, respectively. Grading is not proposed at the interior bents. The 1.5H:1V end bent slopes are to be protected with rip rap.

The purpose of this exploration was to investigate the subsurface conditions at the proposed bridge bent locations. The subsurface exploration was conducted between February 9 and 11, 2005. This exploration consisted of the execution of eight (8) soil test borings. Using the surveyed points provided by NCDOT, the actual boring locations were measured for location using a tape measure and approximate right angles. Using an NCDOT provided benchmark, the boring locations were surveyed for elevation by Geoscience personnel. Drilled boring locations are shown on the Boring Identification Diagram included in the following pages.

The soil test borings were advanced using a CME 550x drilling machine utilizing hollow-stem auger and rotary drilling techniques. In each boring, Standard Penetration tests were performed in general accordance with NCDOT guidelines. In conjunction with this testing, split-barrel soil samples were recovered for visual classification in the field. The split-barrel soil samples were returned to our laboratory for testing. Water for drilling purposes was obtained from Smokey Creek. Drilling mud slurry was not utilized during the investigation. Core samples of the underlying crystalline rock were obtained from four (4) of the borings. The core samples were obtained using an HQ wireline barrel. The core samples were returned to our laboratory for review and classification as well as laboratory testing.

Laboratory testing was performed on representative split-barrel samples to aid in the assessment of AASHTO soil classification and to refine data for evaluation of engineering properties. The laboratory

testing consisted of natural moisture content determinations, Atterberg Limits tests, and grain size analyses with hydrometer. The soil laboratory tests performed were in general accordance with AASHTO and NCDOT specifications. Rock core specimens were selected for laboratory testing of unconfined compressive strength in general accordance with ASTM Method D 2938. The results of the soil laboratory tests and a rock core test summary are included in the following pages. Complete rock core testing results are provided in Appendix C under separate cover.

Physiography and Geology:

The project site is located in the Inner Piedmont Belt of the Piedmont Physiographic Province of North Carolina. According to the 1985 Geologic Map of North Carolina, the site is located in an area consisting of metamorphosed granitic rock of Cambrian to Ordovician in age. An area containing biotite gneiss of Late Proterozoic to Cambrian in age is present in the vicinity of the subject site. The core samples obtained on-site consist of metamorphosed granite and biotite gneiss. The overlying soils are the residual product of the physical and chemical weathering of the underlying bedrock. Site topography slopes downward from the east and west towards Smokey Creek.

Foundation Materials:

The foundation materials encountered at the site consist of alluvium, residual soils, weathered rock, and crystalline rock. Subsurface conditions will be described across the site.

With the exceptions of along end bent-1 and at EB2-A, alluvial soil is present at the ground surface along each bent. The alluvial soil consists of wet to saturated, very loose and loose silty coarse to fine sand and micaceous silty fine sand (A-2-4), and saturated very soft and soft micaceous fine sandy clayey silt (A-5). Blow counts range between weight-of-hammer and 5 bpf.

Residual soil is present below the alluvium along bent-1 and is present from the ground surface along end bent-1 and at EB2-A. The residual soil consists of moist and wet, loose to very dense silty fine sand, micaceous silty fine sand, and silty coarse to fine sand with rock fragments (A-2-4). Blow counts in the residual soils range between 7 and 90 bpf.

Weathered rock is present below the residual soil along end bent-1 and bent-1. The top of weathered rock elevation ranges between 1012 and 1004 feet. The weathered rock generally consists of grey-black weathered biotite gneiss. Weathered rock was not cored for the project.

Crystalline rock is present in each boring. We would consider the crystalline rock line to range between 1019 and 1000 feet at the interior bents. The majority of the crystalline rock consists of slightly and very slightly weathered, hard and very hard metamorphosed granite and biotite gneiss with moderately close and wide fracture spacing. Recovery of the crystalline rock ranges between 92 and 100 percent. The RQD values measured for the crystalline rock range between 38 and 100 percent. The lower value corresponds to a 2.3-foot zone at the top of the crystalline rock in B1-B. Four specimens were tested for unconfined compressive strength. The specimen conditions range between slightly weathered, hard to very slightly weathered, very hard metamorphosed granite and biotite gneiss. The unconfined compressive strength of the specimens range between 5,160 and 13,250 psi. Each of the borings was terminated in or on crystalline rock.