



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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STATE PROJECT NO: 8.2761001 (32971.1.1) (B-3266)
COUNTY: Wilkes
DESCRIPTION: Bridge No. 264 on SR 1567 over North Fork Reddies River
SUBJECT: Geotechnical Report – Foundation Investigation

Site Description

This project is located in northern Wilkes County on Vannoy Road (SR 1567), approximately 18 kilometers north of the intersection of NC 16 and US 421. The site is a few miles downstream from where the headwaters of the Reddies River rise on the steep east front of the Blue Ridge escarpment. The area is rural and primarily woodland, with widely scattered farms and residential sites along the valley floor.

The North Fork of the Reddies River at this site is a swift, turbulent stream about 10 meters wide, flowing on a bed of coarse sand, gravel, cobbles, and boulders. The floodplain varies in width from about 30 meters at the site of the existing bridge to about 70 meters where the new bridge is to be built. A lawn and driveway lie on the floodplain on the north side of the river. The floodplain on the south side is a grassy field with a few large trees.

The proposed new bridge is to be built on new alignment -L- approximately 20 meters downstream of the existing structure. Plans call for a cored slab structure 58 meters long and approximately 10.3 meters wide, standing about 3.5 meters above the river channel. It is to be constructed on a skew of 120 degrees, in 3 spans of 15 meters each and 1 span of 13 meters.

The Geotechnical Engineering Unit conducted a foundation investigation in October and November, 2003. A boring made in December, 2002 was incorporated in this study. Two borings were made at each proposed bent using CME-550 and CME-45 power drilling machines. Rock was cored at 5 borings at interior bents, and the hard rock line was found in 3 other borings. Two borings were terminated without reaching hard rock. Borings were advanced with the use of a variety of drilling tools, including 8-inch hollow stem augers, an NX casing advancer, and NXWL diamond bit coring equipment. Standard Penetration Tests (SPT's) were done at all borings. Ten soil samples representing all strata were submitted to a DOT laboratory for quality testing, and 8 rock core samples were submitted for strength testing.

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Soil and Rock Materials

Soil and rock materials at all bents are composed of approximately 2 to 3 meters of alluvial sand and gravel overlying saprolite, weathered rock, and hard rock. The alluvial gravel contains abundant, very hard, rounded quartz cobbles and boulders up to about a foot thick. Saprolite varies in thickness from about 0.5 meters to 5.5 meters. It is composed in all cases of silty sand (A-2-4, A-2-5) with variable amounts of mica. The saprolite is succeeded downward by weathered rock that varies in thickness from about 0.2 meters to almost 5 meters.

The transition from weathered rock to hard rock is not sharp. The weathered rock typically includes ledges or lenses of hard rock that could be penetrated with the casing advancer. The hard rock likewise includes layers or lenses of softer material that was not recovered in coring. For example, a 4-meter cored interval at B1-A had only 37 percent recovery. That interval has been labeled as weathered rock with hard rock seams. A 5.4 meter cored interval at B1-B with 55 percent recovery has been labeled as hard rock with weathered rock seams.

The bedrock at this site is primarily biotite gneiss metagreywacke of the Alligator Back Formation (Zabg on the Geologic Map of North Carolina, 1985), with granite sills that are in most cases a half meter or less in thickness. Granite is the predominant lithology in only one boring. Small beds of mica schist and chlorite-amphibole gneiss are interlayered within the biotite gneiss. Rock quality is generally very poor to fair. Consistently fair quality rock is not to be found within 8 to 12 meters of the ground surface, and good quality rock is rare.

End Bent One (EB1)

This bent is located on the floodplain approximately 15 meters north of the riverbank, where a driveway crosses a lawn. A boring on the Left Side was offset 7 meters forward in order to avoid damage to the driveway. Borings on the Left and Right Sides were similar in results. About 2.5 meters of alluvial, loose sand and gravel was found overlying deep, sandy saprolite. Weathered rock was encountered at depths of 8.0 to 8.5 meters below ground surface. The boring on the Left Side (EB1-A) was terminated on hard rock at a depth of 8.4 meters. The boring on the Right Side (EB1-B) was terminated at 9.2 meters without reaching hard rock.

Bent One (B1)

This bent is located on the north bank of the river. Borings on both sides of this bent found approximately 2 meters of alluvial sand and bouldery gravel overlying saprolite, weathered rock and hard rock. The saprolite was 2.2 to 2.7 meters thick, of medium dense, silty sand.

Weathered rock was encountered at 4.25 meters on the Left Side (B1-A), and coring was begun on hard rock at 4.66 meters. Coring from 4.66 meters to 8.88 meters recovered only 37 percent hard rock, of very poor quality. Rock quality was very poor to poor from 8.88 meters to 13.76 meters and very good from 13.76 meters to termination at 15.26 meters.

Weathered rock was found at 4.68 meters on the Right Side (B1-B), and hard rock was found at 5.68 meters. Coring from 5.68 meters to 11.19 meters recovered only 55 percent hard rock of