

**STATE PROJECT:** 33375.1.1 (B-4007)  
**FA. PROJECT:** BRSTP -18(8)  
**COUNTY:** Alleghany  
**DESCRIPTION:** Bridge No. 38 and Detour Bridge over Crab Creek on NC 18  
**SUBJECT:** Report of Structure Subsurface Investigations

Engineering Consulting Services, Ltd. has completed the authorized geotechnical investigations for the above referenced project in Alleghany County, North Carolina. The purpose of this exploration was to investigate the subsurface conditions at each of the proposed bridge bent locations.

**1.0 SITE DESCRIPTION**

The project site is located in Alleghany County at the approximate location shown on the Site Location Map (Drawing No. 1) located in this report. The site for the proposed project is located at Bridge No. 38 over Crab Creek on NC 18 between SR 1440 and SR 1450. The site topography is rolling terrain including a mountain stream, flood plain, cultivated fields, and residential properties. The existing ground cover consists of riparian trees on stream banks, fallow farm land and a tree farm.

**2.0 PROJECT DESCRIPTION**

Information for the proposed structures was obtained from Preliminary General Drawings, dated June 24, 2004, and the Bridge Survey & Hydraulic Design Reports, dated October 10, 2004. The proposed replacement bridge will be a two span structure, 165 feet in length and 32 feet wide. A skew angle of 120° 00' 00" is proposed for all bents. Slope inclinations of 1.5:1(H:V) with rip rap or concrete protection are proposed for each end bent. The proposed detour bridge will be a single span structure, 123 feet in length and 28 feet wide. A skew angle of 130° 00' 00" is proposed for all bents.

The Preliminary General Drawings are in English units with feet (ft) as the primary unit of length. All distances and elevations in this report are feet unless noted otherwise.

**3.0 SCOPE OF INVESTIGATION**

**3.1 FIELD TESTING**

The subsurface exploration was conducted on June 8 through June 10, 2005. The exploration for the replacement bridge consisted of six (6) soil test borings and two (2) cored offset borings. The exploration for the detour bridge consisted of four (4) soil test borings. The soil test borings were advanced with a CME-550X ATV drilling machine utilizing hollow stem auger and rotary drilling techniques and using a 140 pound automatic hammer to perform the Standard Penetration Tests.

Standard Penetration Tests were performed in general accordance with NCDOT guidelines. In conjunction with testing, split-barrel soil samples were recovered for visual classification and laboratory testing.

For the replacement bridge three borings were extended below auger refusal and SPT refusal depths and two borings were offset to obtain weathered rock and rock core samples of the underlying bedrock. The core samples were nominally 2.5 inches in diameter and were obtained using HQ size drilling techniques. The core samples were returned to our laboratory for visual classification and testing.

Using existing site features and bench marks established by the NCDOT, the borings were surveyed for elevation and location by personnel from ECS. As-drilled boring locations are shown on the Boring Location Diagram (Drawing No. 2 included in this report).

**3.2 LABORATORY TESTING**

Laboratory testing was performed on seven (12) representative split-barrel samples to aid in the assessment of AASHTO soil classification and to provide data for evaluation of engineering properties. The laboratory testing consisted of natural moisture content determinations, Atterberg Limits testing, and grain size analysis with hydrometer. Rock core specimens were obtained for unconfined compressive strength testing. Laboratory tests were performed in general accordance with AASHTO and NCDOT specifications. The results of the laboratory tests are included in this report.

**3.3 GEOLOGY**

The project site is located in the Mountain Physiographic Province of North Carolina. According to the 1985 Geologic Map of North Carolina, the site is located in an area consisting of Muscovite and Biotite Gneiss of the Blue Ridge Belt dating from Proterozoic ages. The overlying residual soils are the product of the physical and chemical weathering of the underlying bedrock. Floodplain deposits are recent alluvium sands of Quaternary age. Based on the rock core specimens obtained at the site the rock type consisted of a Muscovite and Biotite Gneiss. The cored rock Recovery and Rock Quality Designation (RQD) data indicated consistent, good and competent bedrock conditions.

Large rock outcrops were observed in the creek channel and within the slope along NC 18 immediately south of the bridge. The bedrock within the channel at the bridge indicated water eroded surfaces with some foliation overprinting. The rock outcrop in the slope was massive and well foliated. Dip and dip direction measurements were obtained from the rock outcrop in the slope. The measurements indicated dip values between 45 and 55 degrees to the southeast and dip directions of between 130 to 135 degrees.

**3.4 FOUNDATION MATERIALS**

Foundation materials at the end bents and interior bent locations include fill, alluvium, residual soil, weathered rock, and rock.