



STEWART

September 11, 2017

STATE PROJECT: 38457.1.2 (B-4662)
COUNTY: Wake
DESCRIPTION: Bridge No. 196 on SR 2308 (Fowler Rd) over Moccasin Creek
SUBJECT: Geotechnical Report – Inventory

Project Description

This project consists of the construction of a new single-span bridge over Moccasin Creek. The project also includes improvements and partial realignment of the existing two-lane roadway (-L-). Roadway improvements will entail grade adjustment to the roadway and adjacent slopes/ditches with cuts and fill up to 8 feet and 4 feet, respectively.

The geotechnical fieldwork was conducted in August of 2017. The drilling activities were conducted by Catlin Engineers & Scientists based in Wilmington, North Carolina, and overseen by Stewart. A truck-mounted CME-45B drill machine with an automatic hammer was used during the subsurface exploration. In total, six soil test borings with Standard Penetration Tests (SPT) were performed at selected locations along the alignment to evaluate subsurface conditions. This included two borings at each end bent and two borings along the roadway portion of the project. Soil samples were collected and visually classified in the field by a geotechnical engineer from Stewart. No laboratory testing was performed.

The following alignment, totaling 0.26± miles was investigated:

Alignment

-L-

Stations

10+00 to 23+90.00

Physiography & Geology

The project is located in northern Wake County, at its border with Franklin County. The surrounding land is primarily wooded and swamp/marsh.

Geologically, the site is underlain by Raleigh Belt of the Piedmont Geologic Province of North Carolina. This area is characterized by foliated to massive granitic rock from the Pennsylvanian to Permian Period.

Soil Properties

Soils encountered at the site include roadway embankment, alluvial, and Piedmont residual soils. The roadway embankment consists of moist, loose to medium dense, silty sand (A-2-4). This material is associated with the construction of Fowler Rd. Alluvial soils related to Moccasin Creek were encountered at the bridge crossing. The alluvium consists of wet to saturated, very loose to loose, silty sand (A-2-4) and saturated, very soft to soft, sandy clay (A-6). The native residual soil consists of moist to wet, loose to medium dense, silty sand (A-2-4).

Rock Properties

Five of the six borings encountered granite at depths ranging from 6.3 to 14.8 feet below the existing ground surface. However, it is prudent to note that rock elevation can be very erratic, even over short distances, and it is not uncommon to find isolated rock pinnacles or outcrops in this area of Wake County. Granite in this area is very competent and difficult to excavate. Also, there is often a layer of weathered rock present between the bedrock and overlying soil, as was encountered in one of the bridge borings (EB1-A).

Groundwater

Groundwater was encountered in several borings along the proposed alignment. Depths to groundwater ranged from approximately 3 feet to 7.5 feet below the current ground surface. Groundwater may to impact construction of the new roadway alignment in cut between Sta. 20+75± and 22+25± -L-.

Areas of Special Geotechnical Interest

Rock – The following sections were found to contain rock above or within 6 feet of the proposed grade:

<u>Alignment</u>	<u>Stations</u>	<u>Offset (ft)</u>
-L-	20+75± to 22+75± -L-	25± ft LT to 30± ft RT

Prepared by,

9/14/2017



DocuSigned by:

A handwritten signature in blue ink, appearing to read "Donald W. Brown, Jr.", is positioned over the seal.

C06817F5F770411...

Donald W. Brown, Jr., P.E.
Sr. Geotechnical Engineer

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38457.1.2		TIP B-4662		COUNTY WAKE		GEOLOGIST C.T.Tang										
SITE DESCRIPTION Bridge No. 196 on SR 2308 (Fowler Rd.) over Moccasin Creek							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 16+22		OFFSET 12 ft LT		ALIGNMENT -L-	0 HR. N/A									
COLLAR ELEV. 281.1 ft		TOTAL DEPTH 8.4 ft		NORTHING 782,932		EASTING 2,197,737	24 HR. 5.5									
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 82% 04/15/2016				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic										
DRILLER T. Chalmers		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
285																
280	281.1	0.0	4	4	3	7							M		281.1	GROUND SURFACE 0.0
	277.1	4.0	2	1	99/0.2								Sat.		278.1	ROADWAY EMBANKMENT 3.0 Brown, Silty Sand
275	274.8	6.3													276.1	ALLUVIAL 5.0 Gray, Silty Sand
															274.8	WEATHERED ROCK 6.3 Tan and Black (Granite)
															272.7	CRYSTALLINE ROCK 8.4 Pink and Gray, Very Slightly Weathered, Hard, Granite with Close to Moderately Close Fracture [GSI=35-40] Boring Terminated at Elevation 272.7 ft In Crystalline Rock (Granite)

NCDOT BORE SINGLE B4662_GEO_BRDGG0196_BH.GPJ NC_DOT.GDT 09/11/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38457.1.2			TIP B-4662			COUNTY WAKE			GEOLOGIST C.T.Tang											
SITE DESCRIPTION Bridge No. 196 on SR 2308 (Fowler Rd.) over Moccasin Creek										GROUND WTR (ft)										
BORING NO. EB1-B			STATION 16+23			OFFSET 15 ft RT			ALIGNMENT -L-											
COLLAR ELEV. 279.9 ft			TOTAL DEPTH 14.9 ft			NORTHING 782,911			EASTING 2,197,754											
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 82% 04/15/2016						DRILL METHOD Mud Rotary			HAMMER TYPE Automatic											
DRILLER T. Chalmers			START DATE 08/25/17			COMP. DATE 08/25/17			SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)					
			0.5ft	0.5ft	0.5ft	0	25	50	75	100										
280	279.9	0.0	4	4	4									279.9	GROUND SURFACE	0.0				
275	275.9	4.0	1	WOH	1													M	ROADWAY EMBANKMENT Brown and Tan, Silty Sand	3.0
	272.6	7.3	3		4						5							Sat.	ALLUVIAL Gray, Silty Sand, with Some Wood Fragments, Coarse Sand and Trace Gravel	
270	267.6	12.3	3		2						6							Sat.		
	265.1	14.8	60/0.1								60/0.1								W	RESIDUAL Tan and Brown, Silty Sand
265	265.1	14.8	60/0.1			60/0.1									CRYSTALLINE ROCK (Granite)	14.9				

NCDOT BORE SINGLE B4662_GEO_BRDGG0196_BH.GPJ NC_DOT.GDT 09/11/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38457.1.2		TIP B-4662		COUNTY WAKE		GEOLOGIST C.T.Tang											
SITE DESCRIPTION Bridge No. 196 on SR 2308 (Fowler Rd.) over Moccasin Creek							GROUND WTR (ft)										
BORING NO. EB2-A		STATION 16+99		OFFSET 11 ft LT		ALIGNMENT -L-	0 HR. N/A										
COLLAR ELEV. 281.0 ft		TOTAL DEPTH 12.0 ft		NORTHING 782,979		EASTING 2,197,797	24 HR. 3.0										
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 82% 04/15/2016				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER T. Chalmers		START DATE N/A		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
285																	
280	281.0	0.0	5	5	3	● 3								281.0	0.0	GROUND SURFACE	
	277.1	3.9	2	1	2	● 3								278.5	2.5	ROADWAY EMBANKMENT Brown, Silty Sand	
275	272.5	8.5	WOH	WOH	3	● 3								274.0	7.0	ALLUVIAL Gray, Silty Sand, with Trace Gravel	
270	269.0	12.0	60/0.0			● 3								269.0	12.0	Dark Gray, Sandy Clay, with Wood Fragments	
						60/0.0 ●											Boring Terminated with Standard Penetration Test Refusal at Elevation 269.0 ft On Crystalline Rock (Granite)

NCDOT BORE SINGLE B4662_GEO_BRDGG0196_BH.GPJ NC_DOT.GDT 09/11/17

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38457.1.2	TIP B-4662	COUNTY WAKE	GEOLOGIST C.T.Tang
SITE DESCRIPTION Bridge No. 196 on SR 2308 (Fowler Rd.) over Moccasin Creek			GROUND WTR (ft)
BORING NO. EB2-B	STATION 16+99	OFFSET 13 ft RT	ALIGNMENT -L-
COLLAR ELEV. 281.4 ft	TOTAL DEPTH 19.0 ft	NORTHING 782,960	EASTING 2,197,812
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 82% 04/15/2016		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER T. Chalmers	START DATE 08/24/17	COMP. DATE 08/25/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
285															
280	281.4	0.0	2	3	2	5						M	GROUND SURFACE	0.0	
	277.4	4.0	3	1	2							W	ROADWAY EMBANKMENT Brown and Tan, Silty Sand	2.5	
275													ALLUVIAL Gray, Silty Sand		
	272.9	8.5	WOH	WOH	WOH							Sat.	Gray, Sandy Clay, with Wood Fragments	7.0	
270															
	267.9	13.5	14	60/0.0								W	RESIDUAL Tan and Brown, Silty Sand	12.0	
265													CRYSTALLINE ROCK Pink and Gray, Very Slightly Weathered, Hard, Granite with Close to Moderately Close Fracture [GSI=48-53]	14.0	
													Boring Terminated at Elevation 262.4 ft In Crystalline Rock (Granite)	19.0	

NCDOT BORE SINGLE B4662_GEO_BRDGG0196_BH.GPJ NC_DOT.GDT 09/11/17

GEOTECHNICAL BORING REPORT BORE LOG

WBS 38457.1.2		TIP B-4662		COUNTY WAKE			GEOLOGIST C.T.Tang										
SITE DESCRIPTION Bridge No. 196 on SR 2308 (Fowler Rd.) over Moccasin Creek								GROUND WTR (ft)									
BORING NO. RDWY-1		STATION 13+50		OFFSET 19 ft LT		ALIGNMENT -L-		0 HR. N/A									
COLLAR ELEV. 286.6 ft		TOTAL DEPTH 10.1 ft		NORTHING 782,766		EASTING 2,197,521		24 HR. 7.5									
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 82% 04/15/2016				DRILL METHOD Mud Rotary			HAMMER TYPE Automatic										
DRILLER T. Chalmers		START DATE 08/23/17		COMP. DATE 08/23/17		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)		
290																	
	286.6	0.0													286.6	GROUND SURFACE	0.0
285			7	9	5	14							M		284.1	ROADWAY EMBANKMENT Brown, Silty Sand	2.5
	282.6	4.0	2	3	2	5							W			RESIDUAL Brown and Tan, Silty Sand	
280																	
	278.0	8.6	3	3	4	7							W		276.5	Boring Terminated at Elevation 276.5 ft In Residual Soil	10.1

NCDOT BORE SINGLE B4662_GEO_BRDGG0196_BH.GPJ NC_DOT.GDT 09/11/17

GEOTECHNICAL BORING REPORT BORE LOG

WBS 38457.1.2	TIP B-4662	COUNTY WAKE	GEOLOGIST C.T.Tang
SITE DESCRIPTION Bridge No. 196 on SR 2308 (Fowler Rd.) over Moccasin Creek			GROUND WTR (ft)
BORING NO. RDWY-2	STATION 21+30	OFFSET 15 ft RT	ALIGNMENT -L-
COLLAR ELEV. 307.5 ft	TOTAL DEPTH 5.3 ft	NORTHING 783,355	EASTING 219,788
DRILL RIG/HAMMER EFF./DATE CAT1314 CME-45B 82% 04/15/2016		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER T. Chalmers	START DATE 08/24/17	COMP. DATE 08/24/17	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)
310														
307.5	307.5	0.0												GROUND SURFACE 0.0
305			2	2	3									RESIDUAL Brown and Black, Silty Sand
303.5	303.5	4.0												
302.2	302.2	5.3	17	81/0.1										WEATHERED ROCK Granite
		60/0.0												Boring Terminated with Standard Penetration Test Refusal at Elevation 302.2 ft On Crystalline Rock (Granite)

NCDOT BORE SINGLE B4662_GEO_BRDGG0196_BH.GPJ NC_DOT.GDT 09/11/17