

REFERENCE: HB-0004

PROJECT: 55041

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HB-0004	1	21

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SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-19	BORE LOGS, CORE REPORTS, & CORE PHOTOGRAPHS
20	LAB TEST RESULTS
21	SITE PHOTOGRAPHS

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY HAYWOOD
 PROJECT DESCRIPTION REPLACE BRIDGE 243 ON I-40
 SITE DESCRIPTION BRIDGE 243 ON I-40 OVER NC 215 (CHAMPION ROAD)

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

- P. GRAINGER
- N. YACOBI
- B. KEANEY
- K. WALKER
- M. MOSELEY
- C. BOWEN

INVESTIGATED BY P. GRAINGER
 DRAWN BY P. GRAINGER ds
 CHECKED BY K. BUSSEY KB
 SUBMITTED BY HDR
 DATE 3/4/2022



DocuSigned by:
Brian D. Keaney 03/14/2022
 79CD97E4882C436... SIGNATURE DATE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

Table with multiple columns: SOIL DESCRIPTION, GRADATION, ROCK DESCRIPTION, TERMS AND DEFINITIONS, SOIL LEGEND AND AASHTO CLASSIFICATION, MINERALOGICAL COMPOSITION, COMPRESSION, PERCENTAGE OF MATERIAL, GROUND WATER, MISCELLANEOUS SYMBOLS, RECOMMENDATION SYMBOLS, ABBREVIATIONS, SOIL MOISTURE - CORRELATION OF TERMS, PLASTICITY, COLOR, EQUIPMENT USED ON SUBJECT PROJECT, FRACTURE SPACING, BEDDING, INDURATION.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

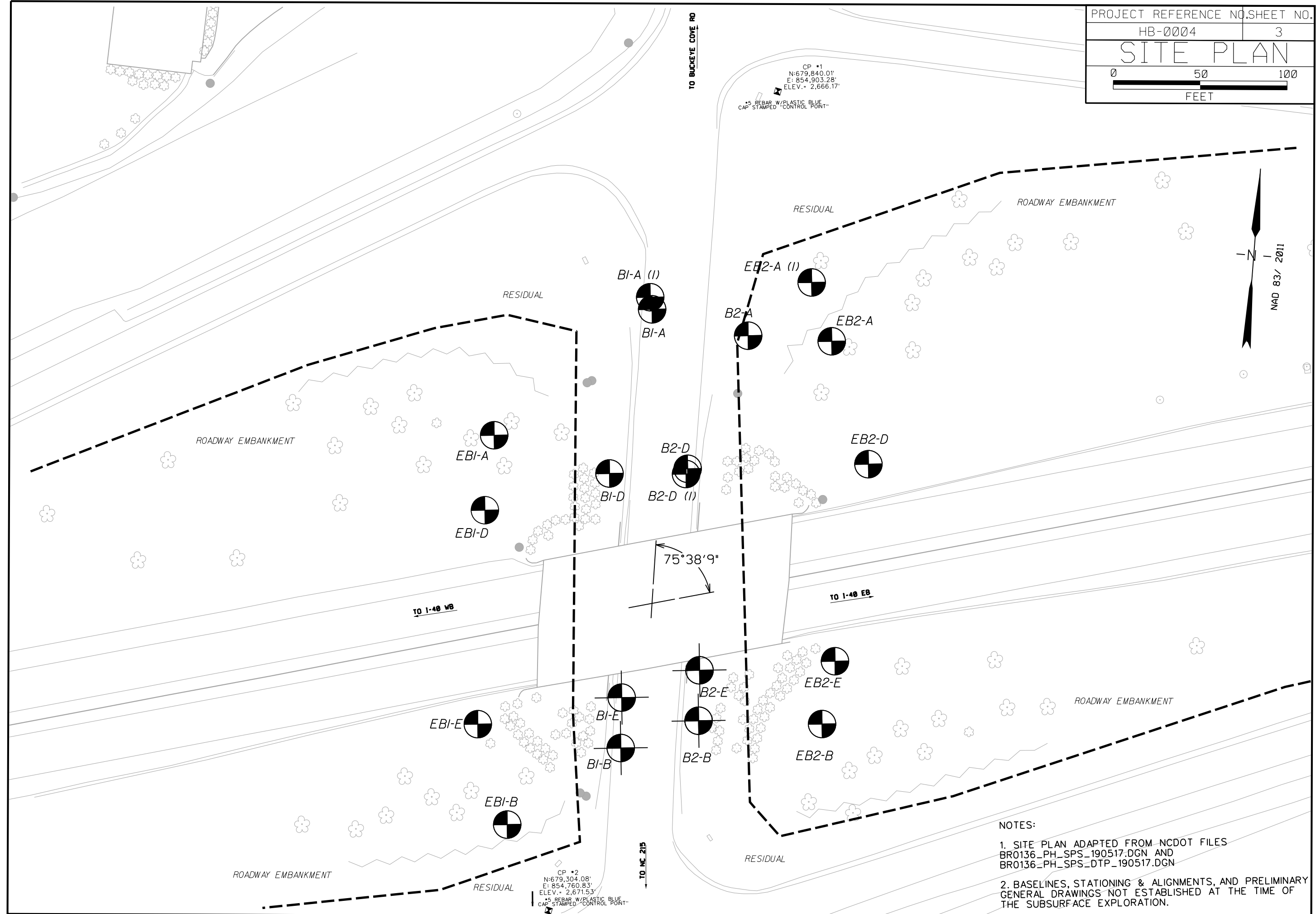
**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
 FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)				
From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE						
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities		90			N/A	N/A	A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.	70					
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		80					B. Sandstone with thin inter-layers of siltstone	60					
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets			70				C. Sandstone and siltstone in similar amounts		50				
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			60				D. Siltstone or silty shale with sandstone layers			40			
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				50			E. Weak siltstone or clayey shale with sandstone layers				30		
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes					40		F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure					20	
					30		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers						10
					20		H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.						
					10								
		N/A	N/A										

→ Means deformation after tectonic disturbance



NOTES:

1. SITE PLAN ADAPTED FROM NCDOT FILES BR0136_PH_SPS_190517.DGN AND BR0136_PH_SPS_DTP_190517.DGN
2. BASELINES, STATIONING & ALIGNMENTS, AND PRELIMINARY GENERAL DRAWINGS NOT ESTABLISHED AT THE TIME OF THE SUBSURFACE EXPLORATION.

**GEOTECHNICAL BORING REPORT
BORE LOG**

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO.	STATION		OFFSET		ALIGNMENT		0 HR.									
EB1-A	N/A		N/A		N/A		N/A									
COLLAR ELEV.	TOTAL DEPTH		NORTHING		EASTING		24 HR.									
2,674.7 ft	66.4 ft		679,648		854,728		FIAD									
DRILL RIG/HAMMER EFF./DATE			DRILL METHOD			HAMMER TYPE										
SUM3123 CME-550X 86% 11/18/2021			H.S. Augers			Automatic										
DRILLER		START DATE	COMP. DATE		SURFACE WATER DEPTH											
M. Moseley		01/27/22	01/27/22		N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2675														2,674.7	GROUND SURFACE	0.0
	2,673.7	1.0	4	5	4										ROADWAY EMBANKMENT	
	2,671.2	3.5	3	2	5										Loose to medium dense, red and brown, clayey SAND (A-2-6), trace rock fragments	
2670	2,668.7	6.0	4	4	7											
	2,666.7	8.0	5	6	7										RESIDUAL	8.0
2665	2,661.3	13.4	2	3	4										Medium stiff to stiff, red, brown, silty CLAY (A-7-5), micaceous, trace rock fragments	
2660	2,656.3	18.4	3	2	4											
2655	2,651.3	23.4	5	7	6											
2650	2,646.3	28.4	3	3	3											
2645	2,641.3	33.4	2	2	4											
2640	2,636.3	38.4	3	2	4											
2635	2,631.3	43.4	4	5	7											
2630	2,626.3	48.4	6	6	10											
2625	2,621.3	53.4	11	8	9											
2620	2,616.3	58.4	7	14	19											
2615	2,611.3	63.4														
2610	2,608.6	66.1														

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO.	STATION		OFFSET		ALIGNMENT		0 HR.									
EB1-B	N/A		N/A		N/A		22.8									
COLLAR ELEV.	TOTAL DEPTH		NORTHING		EASTING		24 HR.									
2,673.2 ft	32.3 ft		679,424		854,732		FIAD									
DRILL RIG/HAMMER EFF./DATE			DRILL METHOD			HAMMER TYPE										
SUM3123 CME-550X 86% 11/18/2021			H.S. Augers			Automatic										
DRILLER		START DATE	COMP. DATE		SURFACE WATER DEPTH											
M. Moseley		02/01/22	02/01/22		N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2675														2,673.2	GROUND SURFACE	0.0
	2,672.2	1.0	2	1	5										ROADWAY EMBANKMENT	
	2,669.7	3.5	2	3	4										Loose, red, brown, clayey SAND (A-2-7), micaceous, some rock fragments	3.0
2670	2,667.2	6.0	4	4	6										RESIDUAL	
	2,665.2	8.0	4	3	5										Medium stiff to stiff, red, brown, silty CLAY (A-7-5), micaceous	
2665	2,659.6	13.6	8	6	5											
2660	2,654.6	18.6	7	18	10											
2655	2,649.6	23.6	4	4	6											
2650	2,644.6	28.6	5	12	16											
2645	2,640.9	32.3														

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC DOT.GDT 3/3/22

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO. EB1-D		STATION N/A		OFFSET N/A		ALIGNMENT N/A										
COLLAR ELEV. 2,682.5 ft		TOTAL DEPTH 76.7 ft		NORTHING 679,605		EASTING 854,722										
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Moseley		START DATE 01/28/22		COMP. DATE 01/31/22		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2685																
2680	2,681.5	1.0	2	3	3											
	2,679.0	3.5	3	3	3											
2675	2,676.5	6.0	2	2	2											
	2,674.5	8.0	4	3	3											
2670	2,668.7	13.8	7	6	6											
2665	2,663.7	18.8	3	3	4											
2660	2,658.7	23.8	4	4	4											
2655	2,653.7	28.8	4	4	5											
2650	2,648.7	33.8	5	5	4											
2645	2,643.7	38.8	5	6	6											
2640	2,638.7	43.8	2	3	3											
2635	2,633.7	48.8	5	8	9											
2630	2,628.7	53.8	5	8	10											
2625	2,623.7	58.8	6	6	10											
2620	2,618.7	63.8	8	19	17											
2615	2,613.7	68.8	52	48/0.2												
2610	2,608.7	73.8	40	60/0.2												
	2,605.9	76.6														

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO. EB1-D		STATION N/A		OFFSET N/A		ALIGNMENT N/A										
COLLAR ELEV. 2,682.5 ft		TOTAL DEPTH 76.7 ft		NORTHING 679,605		EASTING 854,722										
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Moseley		START DATE 01/28/22		COMP. DATE 01/31/22		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2605																

Match Line

No recovery, METAGRANITE
Boring Terminated with Standard Penetration Test Refusal at Elevation 2,605.8 ft in Crystalline Rock
Rig chatter 65.3 to 68.8 ft bgs

2,605.9
2,605.8
CRYSTALLINE ROCK

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi											
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)										
BORING NO. EB1-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A											
COLLAR ELEV. 2,686.7 ft		TOTAL DEPTH 57.7 ft		NORTHING 679,482		EASTING 854,716											
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Moseley		START DATE 02/01/22		COMP. DATE 02/01/22		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)	DEPTH (ft)			
2690														2,686.7	0.0	GROUND SURFACE	
2685	2,685.7	1.0	3	3	2	5							D			ROADWAY EMBANKMENT	
	2,683.2	3.5	3	4	3	7							M			Loose, red, brown, clayey SAND (A-2-6)	
2680	2,680.7	6.0	2	1	2	3							M				
	2,678.7	8.0	2	2	4	6							W	2,678.2	8.5	Medium stiff, red, sandy SILT (A-5)	
2675																	
	2,672.8	13.9	4	3	6	9							M	2,673.7	13.0	Loose, red, brown, clayey SAND (A-2-6)	
2670																	
	2,667.8	18.9	3	4	7	11							M	2,668.7	18.0	RESIDUAL	
2665																	Medium stiff to very stiff, red, brown, silty CLAY (A-7-5), micaceous
	2,662.8	23.9	4	5	6	11							M				
2660																	
	2,657.8	28.9	3	4	3	7							M				
2655																	
	2,652.8	33.9	5	6	7	13							M				
2650																	
	2,647.8	38.9	4	7	8	15							M				
2645																	
	2,642.8	43.9	2	4	4	8							M	2,643.7	43.0	Medium stiff, dark gray, sandy SILT (A-5)	
2640																	
	2,637.8	48.9	8	7	7	14							M	2,638.7	48.0	Medium dense, brown, red, clayey SAND (A-2-7), micaceous, saprolitic	
2635																	
	2,632.8	53.9	7	9	14	23							W				
2630																	
	2,629.0	57.7	60/0.0			60/0.0								2,629.0	57.7	CRYSTALLINE ROCK	
																	No recovery, METAGRANITE Boring Terminated with Standard Penetration Test Refusal at Elevation 2,629.0 ft on Crystalline Rock

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1	TIP HB-0004	COUNTY HAYWOOD	GEOLOGIST P. Grainger
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215			GROUND WTR (ft)
BORING NO. B1-A	STATION N/A	OFFSET N/A	ALIGNMENT N/A
COLLAR ELEV. 2,669.1 ft	TOTAL DEPTH 63.1 ft	NORTHING 679,719	EASTING 854,820
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. Moseley	START DATE 02/07/22	COMP. DATE 02/07/22	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2670														2,669.1 GROUND SURFACE 0.0	
	2,668.1	1.0	9	7	4									2,668.4 0.7' PAVEMENT 0.7	
2665	2,665.4	3.7	6	5	5									2,666.1 ROADWAY EMBANKMENT 3.0	
	2,662.9	6.2	4	3	8									RESIDUAL	
2660	2,660.4	8.7	2	2	3									2,661.1 Medium dense, red, brown, clayey SAND (A-2-7), micaceous, trace rock fragments 8.0	
	2,656.0	13.1	2	2	3									Medium stiff to very stiff, gray, red, silty CLAY (A-7-5), micaceous, contains rock fragments (quartz), saprolitic	
2655															
2650	2,651.0	18.1	3	2	3										
2645	2,646.0	23.1	2	7	15										
2640	2,641.0	28.1	2	3	5										
2635	2,636.0	33.1	4	5	8										
2630	2,631.0	38.1	2	3	5										
2625	2,626.0	43.1	3	6	7										
2620	2,621.0	48.1	3	5	9										
2615	2,616.0	53.1	3	4	8										
2610	2,611.0	58.1	5	30	70									2,610.5 WEATHERED ROCK 58.6	
	2,606.8	62.3	90	10/0.0										Brown, gray, METAGRANITE	
	2,606.0	63.1	100/0.3											2,606.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,606.0 ft on Crystalline Rock 63.1	
			60/0.0											Hard drilling at 59.6 to 62.3' bgs Grinding at 62.1 ft bgs, Auger Refusal at 62.3 ft bgs	

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

GEOTECHNICAL BORING REPORT BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger											
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215						GROUND WTR (ft)											
BORING NO. B1-A (1)		STATION N/A		OFFSET N/A		ALIGNMENT N/A											
COLLAR ELEV. 2,669.0 ft		TOTAL DEPTH 95.3 ft		NORTHING 679,726		EASTING 854,819											
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Moseley		START DATE 02/08/22		COMP. DATE 02/08/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG G	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2670																	2,669.0 GROUND SURFACE 0.0
2665																	Offset 10' north of B1-A, augering to 73.8 ft bgs.
2660																	
2655																	
2650																	
2645																	
2640																	
2635																	
2630																	
2625																	
2620																	
2615																	
2610																	
2605																	
2600																	
2595	2,595.2	73.8		17	17	23											
2590	2,590.2	78.8															
															2,596.0		73.0
															RESIDUAL Hard, gray, orange, white, silty CLAY (A-7-5), micaceous, trace rock fragments		

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/2/22

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger											
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215						GROUND WTR (ft)											
BORING NO. B1-A (1)		STATION N/A		OFFSET N/A		ALIGNMENT N/A											
COLLAR ELEV. 2,669.0 ft		TOTAL DEPTH 95.3 ft		NORTHING 679,726		EASTING 854,819											
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic											
DRILLER M. Moseley		START DATE 02/08/22		COMP. DATE 02/08/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG G	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
2590			23	19	24												2590
2585	2,585.2	83.8		7	14	24											
2580	2,580.2	88.8		13	17	23											
2575	2,575.2	93.8		12	41	48											
															RESIDUAL Hard, gray, orange, white, silty CLAY (A-7-5), micaceous, trace rock fragments		
															2,573.7		95.3
															Boring Terminated at Elevation 2,573.7 ft in Silty Clay (A-7-5)		

Match Line

RESIDUAL
Hard, gray, orange, white, silty CLAY (A-7-5), micaceous, trace rock fragments (continued)

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. B1-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,672.2 ft		TOTAL DEPTH 33.4 ft		NORTHING 679,467		EASTING 854,798									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER M. Moseley		START DATE 02/10/22		COMP. DATE 02/10/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2675															
2670	2,671.2	1.0	8	5	6									2,672.2 GROUND SURFACE 0.0 2,671.4 0.8' Pavement 0.8	
	2,668.7	3.5	5	4	8									2,669.2 ROADWAY EMBANKMENT 3.0 Medium dense, brown clayey SAND (A-2-7), trace ABC stone, little recovery	
	2,666.2	6.0	3	4	7									RESIDUAL	
2665	2,663.7	8.5	4	4	4									Medium stiff to stiff, red, orange, white, silty CLAY (A-7-5)(6), micaceous, saprolitic, trace rock fragments (quartz)	
	2,658.8	13.4	8	4	5										
2655	2,653.8	18.4	26	43	49									2,653.8 Very dense, gray, black rock fragments (A-1-b) 18.4 2,653.3 Hard, brown, orange, silty CLAY (A-7-5), micaceous, saprolitic 18.9	
2650	2,648.8	23.4	100/0.4											2,649.2 WEATHERED ROCK 23.0 Gray, black METAGRANITE	
2645	2,644.8	27.4	60/0.0											2,644.8 CRYSTALLINE ROCK 27.4 No recovery, METAGRANITE	
2640														2,638.8 Boring Terminated at Elevation 2,638.8 ft in Crystalline Rock 33.4 Hard drilling at 19.9 - 23.4 ft bgs	

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger						
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)					
BORING NO. B1-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A						
COLLAR ELEV. 2,672.2 ft		TOTAL DEPTH 33.4 ft		NORTHING 679,467		EASTING 854,798						
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER M. Moseley		START DATE 02/10/22		COMP. DATE 02/10/22		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft)	RQD (%)		REC. (ft)	RQD (%)			
2644.8	2,644.8	27.4	1.0	2:02	(1.0)	(1.0)		(6.0)	(6.0)		Begin Coring @ 27.4 ft	
	2,643.8	28.4	5.0	2:17	100%	100%		100%	100%		CRYSTALLINE ROCK	27.4
2640	2,638.8	33.4		2:06 2:07 2:56 2:44	(5.0)	(5.0)					Gray, black, METAGRANITE with quartz veins, coarse-grained, moderately strong, fresh. From 28.4-33.4 ft: METAGRANITE with well distributed quartz and garnets.	
											GSI= 75 - 85	
											Boring Terminated at Elevation 2,638.8 ft in Crystalline Rock	
											Hard drilling at 19.9 - 23.4 ft bgs	

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO. B1-D		STATION N/A		OFFSET N/A		ALIGNMENT N/A										
COLLAR ELEV. 2,669.9 ft		TOTAL DEPTH 53.9 ft		NORTHING 679,625		EASTING 854,794										
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER M. Moseley		START DATE 01/25/22		COMP. DATE 01/27/22		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)	DEPTH (ft)		
2670														2,669.9	0.0	GROUND SURFACE
	2,668.9	1.0	2	3	4	7							D			ROADWAY EMBANKMENT Loose, brown, red, clayey SAND (A-2-6), fine to medium grained, nonplastic
	2,666.4	3.5	2	3	3	6							M			
2665	2,663.9	6.0	2	3	3	6							M	2,662.9	7.0	RESIDUAL Medium stiff to stiff, dark red, dark gray, brown, silty CLAY (A-7-5), trace medium sands, micaceous
	2,661.4	8.5	2	2	3	5							M			
2660	2,656.1	13.8	5	6	6	12							M			
2655	2,651.1	18.8	5	3	5	8							M			
2650	2,646.1	23.8	3	3	3	6							W			
2645	2,641.1	28.8	3	3	5	8							W			
2640	2,636.1	33.8	4	5	9	14							W			
2635	2,631.1	38.8	21	79/0.3										2,631.9	38.0	WEATHERED ROCK White, brown, QUARTZ
2630	2,626.1	43.8	100/0.4													
2625	2,621.1	48.8	62	48/0.1												
2620	2,616.1	53.8	100/0.1											2,616.0	53.9	Boring Terminated at Elevation 2,616.0 ft in Weathered Rock (Quartz)

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO. B1-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A										
COLLAR ELEV. 2,672.0 ft		TOTAL DEPTH 34.7 ft		NORTHING 679,496		EASTING 854,799										
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021		DRILL METHOD H.S. Augers/Mud Rotary		HAMMER TYPE Automatic												
DRILLER M. Moseley		START DATE 02/09/22		COMP. DATE 02/09/22		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2675																
2670	2,671.0	1.0	9	10	6								M	GROUND SURFACE 0.6' PAVEMENT	0.0	
	2,668.5	3.5	5	3	5								M	ROADWAY EMBANKMENT Medium stiff to very stiff, red, brown silty CLAY (A-7-5), micaceous, trace ABC stone	0.9	
2665	2,666.0	6.0	4	4	4								M	RESIDUAL Medium stiff, brown, red, gray, silty CLAY (A-7-5), micaceous	5.5	
	2,663.5	8.5	3	3	4								M			
2660	2,658.1	13.9	2	3	5								M			
2655	2,653.1	18.9	2	2	5								M			
2650	2,648.1	23.9	49	51/0.2									M			
2645	2,645.6	26.4	60/0.0											WEATHERED ROCK Brown, gray, orange, METAGRANITE	23.0	
														CRYSTALLINE ROCK No Recovery, METAGRANITE	26.4	
2640																
															Boring Terminated at Elevation 2,637.3 ft in Crystalline Rock	34.7
															Hard drilling at 26.0 - 26.4 ft bgs	

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger					
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)				
BORING NO. B1-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A					
COLLAR ELEV. 2,672.0 ft		TOTAL DEPTH 34.7 ft		NORTHING 679,496		EASTING 854,799					
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021		DRILL METHOD H.S. Augers/Mud Rotary		HAMMER TYPE Automatic							
DRILLER M. Moseley		START DATE 02/09/22		COMP. DATE 02/09/22		SURFACE WATER DEPTH N/A					
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)	REC. (%)	RQD (%)			
2645.6	2,645.6	26.4	4.3	2:20	(3.5)	(3.5)	(4.6)	(4.6)		Begin Coring @ 26.4 ft	26.4
				2:33	81%	81%	55%	55%		WEATHERED ROCK (continued)	
				2:20						CRYSTALLINE ROCK	
				2:30						Gray, black METAGRANITE, opaque, with quartzite, fresh, moderately hard. From 30.7 ft: Lost recovery, as remaining rock from Run 2 stuck down in borehole	
2640	2,641.3	30.7	4.0	1:12	(1.1)	(1.1)					
	2,637.3	34.7		2:51							
				2:29							
				2:43							

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi	
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)
BORING NO. B2-A		STATION N/A		OFFSET N/A		ALIGNMENT N/A	
COLLAR ELEV. 2,668.9 ft		TOTAL DEPTH 88.8 ft		NORTHING 679,703		EASTING 854,875	
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic	
DRILLER M. Moseley		START DATE 01/25/22		COMP. DATE 01/25/22		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2670														2,668.9	0.0	GROUND SURFACE
	2,667.9	1.0														ROADWAY EMBANKMENT
	2,665.4	3.5	3	5	5											Loose to medium dense, brown, fine to coarse grained, clayey SAND (A-2-7), micaceous
2665	2,662.9	6.0	3	3	3											
	2,660.4	8.5	2	2	3											RESIDUAL
2660	2,655.2	13.7	2	2	2											Medium stiff to very stiff, brown, red, black, silty CLAY (A-7-5)(6), fine to coarse grained, micaceous
	2,650.2	18.7	1	2	3											
2655	2,645.2	23.7	3	3	4											
	2,640.2	28.7	3	4	5											
2650	2,635.2	33.7	3	3	4											
	2,630.2	38.7	3	3	5											
2645	2,625.2	43.7	4	4	6											
	2,620.2	48.7	3	4	6											
2640	2,615.2	53.7	8	7	13											
	2,610.2	58.7	18	31	40											
2635	2,605.2	63.7	18	25	31											
	2,600.2	68.7	8	12	14											
2630	2,595.2	73.7	15	30	46											
	2,590.2	78.7														

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi	
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)
BORING NO. B2-A		STATION N/A		OFFSET N/A		ALIGNMENT N/A	
COLLAR ELEV. 2,668.9 ft		TOTAL DEPTH 88.8 ft		NORTHING 679,703		EASTING 854,875	
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic	
DRILLER M. Moseley		START DATE 01/25/22		COMP. DATE 01/25/22		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
2590																
		100/0.4														
2585	2,585.2	83.7														
	2,580.2	88.7														

Match Line

2,587.7 Brown and gray, METAGRANITE (continued) 81.2

WEATHERED ROCK
CRYSTALLINE ROCK
METAGRANITE

2,580.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,580.1 ft in Crystalline Rock 88.8

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. B2-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,670.2 ft		TOTAL DEPTH 31.6 ft		NORTHING 679,482		EASTING 854,843									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic									
DRILLER M. Moseley		START DATE 02/02/22		COMP. DATE 02/03/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2675															
2670	2,669.2	1.0												2,670.2	0.0
	2,667.2	3.0	2	2	3									2,667.2	3.0
2665	2,664.7	5.5	4	4	4										
	2,662.2	8.0	4	4	5										
2660			5	5	6										
	2,657.1	13.1													
2655			4	4	10										
	2,652.1	18.1	8	13	13										
2650															
	2,648.6	21.6	60/0.0											2,648.6	21.6
2645															
2640															

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi						
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)					
BORING NO. B2-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A						
COLLAR ELEV. 2,670.2 ft		TOTAL DEPTH 31.6 ft		NORTHING 679,482		EASTING 854,843						
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER M. Moseley		START DATE 02/02/22		COMP. DATE 02/03/22		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	TOTAL RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
2648.6	2,648.6	21.6	3.0	2:16 2:08 2:05	(2.5) 83%	(2.5) 83%		(8.8) 88%	(8.8) 88%		Begin Coring @ 21.6 ft	21.6
2645	2,645.6	24.6	5.0	2:15 2:19 2:03 1:59 2:11	(4.3) 86%	(4.3) 86%					Gray to dark gray METAGRANITE, with large white quartz bands, slightly weathered to fresh, hard, no fractures, garnets 2mm to 15mm, From 24.6 to 31.6 ft: Large quartz bands, abundant 2mm to 15 mm garnets.	
2640	2,640.6	29.6	2.0	2:28 2:41	(2.0) 100%	(2.0) 100%					GSI= 95-100	31.6
	2,638.6	31.6									Boring Terminated at Elevation 2,638.6 ft in Crystalline Rock	

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

GEOTECHNICAL BORING REPORT BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. B2-D		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,670.3 ft		TOTAL DEPTH 40.5 ft		NORTHING 679,627		EASTING 854,839									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER M. Moseley		START DATE 02/08/22		COMP. DATE 02/08/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2675															
2670	2,669.3	1.0	8	5	4								M	2,670.3 GROUND SURFACE 0.0	
													M	2,669.5 0.8' PAVEMENT 0.8	
	2,666.8	3.5	4	4	5								M	ROADWAY EMBANKMENT	
													M	Stiff, red, brown, silty CLAY (A-7-5), micaceous	
2665	2,664.3	6.0	3	5	5								M	2,664.8 RESIDUAL 5.5	
													M	Stiff, red, brown, orange silty CLAY (A-7-5), micaceous	
2660	2,661.8	8.5	3	3	5								M		
													M		
2655	2,656.3	14.0	3	3	4								M		
													M		
2650	2,651.3	19.0	2	3	9								W		
													W		
2645	2,646.3	24.0	4	7	5								W	2,647.3 23.0	
													W	Stiff to hard, red, brown, orange silty CLAY (A-7-5), micaceous, contains rock fragments	
2640	2,641.3	29.0	6	8	19								W		
													W		
2635	2,636.3	34.0	2	10	28								W		
													W		
2630	2,631.3	39.0	20	22	33								W	2,629.8 40.5	
														Boring Terminated at Elevation 2,629.8 ft in Silty Clay (A-7-5)	

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. B2-D (1)		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,670.4 ft		TOTAL DEPTH 54.1 ft		NORTHING 679,624		EASTING 854,838									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER M. Moseley		START DATE 02/09/22		COMP. DATE 02/09/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2675															
2670														2,670.4 GROUND SURFACE 0.0	
														Offset 3' south of B2-D, augering to 43.8 ft bgs.	
2665															
2660															
2655															
2650															
2645															
2640															
2635															
2630														2,632.4 38.0	
														WEATHERED ROCK	
														Brown, red, white, METAGRANITE	
2625	2,626.6	43.8	27	73/0.5										100/1.0	
2620	2,621.6	48.8	35	65/0.1										100/0.6	
	2,616.6	53.8	100/0.3											100/0.3	
														2,616.3 54.1	
														Boring Terminated at Elevation 2,616.3 ft in Weathered Rock (Metagranite)	
														Grinding and hard drilling 38.0 - 43.8 ft bgs	

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. B2-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,670.8 ft		TOTAL DEPTH 34.4 ft		NORTHING 679,511		EASTING 854,844									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER M. Moseley		START DATE 02/02/22		COMP. DATE 02/02/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2675															
2670	2,669.8	1.0	5	5	7									2,670.8	0.0
	2,667.3	3.5	3	3	3										
2665	2,664.8	6.0	3	3	5										
	2,662.3	8.5	3	4	7										
2660															
	2,657.2	13.6	9	12	10										
2655															
	2,652.2	18.6	8	6	6										
2650															
	2,647.2	23.6	100/0.4											2,648.8	22.0
2645															
	2,642.2	28.6	100/0.2											2,641.5	29.3
2640	2,641.7	29.1	100/0.2												
														2,636.4	34.4
Boring Terminated at Elevation 2,636.4 ft in Crystalline Rock															

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi					
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)				
BORING NO. B2-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A					
COLLAR ELEV. 2,670.8 ft		TOTAL DEPTH 34.4 ft		NORTHING 679,511		EASTING 854,844					
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER M. Moseley		START DATE 02/02/22		COMP. DATE 02/02/22		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 5.1 ft		DESCRIPTION AND REMARKS							
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC (ft) %	STRATA RQD (ft) %	LOG	DEPTH (ft)
2641.5	2,641.5	29.3	1.0	1:55	(0.5)	(0.0)		(1.6)	(0.8)		29.3
2640	2,640.5	30.3	4.1	3:50	50%	0%		31%	16%		29.3
				2:00	(1.1)	(0.8)					
				1:33	27%	20%					
				2:54							
	2,636.4	34.4									34.4
Begin Coring @ 29.3 ft CRYSTALLINE ROCK Dark gray to gray METAGRANITE, slightly weathered to fresh, moderately hard, close fracture spacing											
GSI= 75 - 80 Boring Terminated at Elevation 2,636.4 ft in Crystalline Rock											

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/1/22

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1	TIP HB-0004	COUNTY HAYWOOD	GEOLOGIST N. Yacobi
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215			GROUND WTR (ft)
BORING NO. EB2-A	STATION N/A	OFFSET N/A	ALIGNMENT N/A
COLLAR ELEV. 2,672.0 ft	TOTAL DEPTH 65.5 ft	NORTHING 679,699	EASTING 854,923
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. Moseley	START DATE 01/19/22	COMP. DATE 01/19/22	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						
2675																
	2,671.0	1.0												GROUND SURFACE	0.0	
	2,668.5	3.5	4	5	3								M	ROADWAY EMBANKMENT		
2670	2,666.0	6.0	5	5	5								D	Loose to medium dense, red and brown, fine grained, clayey SAND (A-2-6)		
	2,664.0	8.0											D			
2665			7	4	4								M	RESIDUAL	7.5	
			2	2	3									Medium stiff, gray and brown, silty CLAY (A-7-5), micaceous		
2660																
	2,658.0	14.0	2	2	3											
2655																
	2,653.0	19.0	2	2	4								W	Medium stiff to very stiff, red, brown, gray, silty CLAY (A-7-5), trace coarse sands and rock fragments, micaceous	17.5	
2650																
	2,648.0	24.0	4	5	5								W			
2645																
	2,643.0	29.0	4	7	10								W			
2640																
	2,638.0	34.0	9	27	31								W	Very dense, black and gray, clayey SAND (A-2-7), medium to coarse, micaceous, saprolitic	32.5	
2635																
	2,633.0	39.0	17	72	28								W	WEATHERED ROCK	38.0	
2630														Boulder, GRANITIC GNEISS	41.0	
	2,628.0	44.0	9	11	15								M	Medium dense to dense, brown and gray, clayey SAND (A-2-7), fine to coarse, micaceous, saprolitic		
2625																
	2,623.0	49.0	5	5	9								M			
2620																
	2,618.0	54.0	9	11	13								M			
2615																
	2,613.0	59.0	8	12	17								M			
2610																
	2,608.0	64.0	10	18	20								M			
														Boring Terminated at Elevation 2,606.5 ft in Silty Sand (A-2-7)	65.5	
														Boring Caved In, offset 15' north to resume boring.		

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

WBS 55041.1.1	TIP HB-0004	COUNTY HAYWOOD	GEOLOGIST N. Yacobi
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215			GROUND WTR (ft)
BORING NO. EB2-A (1)	STATION N/A	OFFSET N/A	ALIGNMENT N/A
COLLAR ELEV. 2,668.0 ft	TOTAL DEPTH 70.8 ft	NORTHING 679,733	EASTING 854,912
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021		DRILL METHOD H.S. Augers/Mud Rotary	HAMMER TYPE Automatic
DRILLER M. Moseley	START DATE 01/20/22	COMP. DATE 01/20/22	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						
2670																
														GROUND SURFACE	0.0	
2665														Offset 15' north of EB2-A, augering from 0 to 20 ft bgs.		
														Rotary wash from 20 to 60 ft bgs.		
2660														Resume sampling at 60 ft bgs.		
2655																
2650																
2645																
2640																
2635																
2630																
2625																
2620																
2615																
2610																
	2,608.0	60.0	22	29	71/0.4									WEATHERED ROCK	60.0	
2605														METAGRANITE		
	2,603.0	65.0	48	52/0.3												
2600																
	2,598.0	70.0	48	52/0.4												
														Boring Terminated at Elevation 2,597.2 ft in Weathered Rock	70.8	

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. EB2-B		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,685.8 ft		TOTAL DEPTH 22.2 ft		NORTHING 679,479		EASTING 854,914									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER M. Moseley		START DATE 02/02/22		COMP. DATE 02/02/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2690															
2685	2,684.8	1.0	4	4	4									2,685.8	GROUND SURFACE
	2,682.3	3.5	4	4	6									2,680.3	ROADWAY EMBANKMENT Loose, brown, clayey SAND (A-2-7)
2680	2,679.8	6.0	5	6	10									2,677.8	RESIDUAL Very stiff, brown, silty CLAY (A-7-5), micaceous
	2,677.8	8.0	8	10	39									2,672.8	Dense, brown to gray, SAND (A-1-b) with rock fragments
2675	2,672.6	13.2	4	4	6									2,672.8	Stiff, brown, silty CLAY (A-7-5), trace rock fragments
2670	2,667.6	18.2	8	4	7										
2665	2,663.6	22.2												2,663.6	CRYSTALLINE ROCK No recovery, METAGRANITE Boring Terminated with Standard Penetration Test Refusal at Elevation 2,663.6 ft on Crystalline Rock

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST P. Grainger									
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)								
BORING NO. EB2-D		STATION N/A		OFFSET N/A		ALIGNMENT N/A									
COLLAR ELEV. 2,689.8 ft		TOTAL DEPTH 39.0 ft		NORTHING 679,628		EASTING 854,943									
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021			DRILL METHOD H.S. Augers			HAMMER TYPE Automatic									
DRILLER M. Moseley		START DATE 02/14/22		COMP. DATE 02/14/22		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
2690															
	2,688.8	1.0	3	3	6									2,689.8	GROUND SURFACE
2685	2,686.3	3.5	2	2	2										ROADWAY EMBANKMENT Loose, brown, clayey SAND (A-2-7)(0), micaceous, trace rock fragments
	2,683.8	6.0	2	3	2										
2680	2,681.3	8.5	3	3	4									2,676.3	RESIDUAL Stiff to very stiff, brown, orange, gray, silty CLAY (A-7-5), micaceous, saprolitic, trace rock fragments
2675	2,675.8	14.0	4	5	8										
2670	2,670.8	19.0	6	9	12										
2665	2,665.8	24.0	5	4	6										
2660	2,660.8	29.0	9	10	11										
2655	2,655.8	34.0	7	11	15										
	2,650.8	39.0												2,650.8	CRYSTALLINE ROCK No recovery, METAGRANITE Boring Terminated with Standard Penetration Test Refusal at Elevation 2,650.8 ft on Crystalline Rock

NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1		TIP HB-0004		COUNTY HAYWOOD		GEOLOGIST N. Yacobi										
SITE DESCRIPTION Bridge No. 243 on I-40 over NC 215							GROUND WTR (ft)									
BORING NO. EB2-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A										
COLLAR ELEV. 2,690.4 ft		TOTAL DEPTH 36.4 ft		NORTHING 679,515		EASTING 854,922										
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 86% 11/18/2021				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER M. Moseley		START DATE 02/01/22		COMP. DATE 02/01/22		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)	DEPTH (ft)		
2695																
2690	2,689.4	1.0												2,690.4	0.0	GROUND SURFACE
	2,687.4	3.5	3	4	4	.....	.....	.....	.....	.....			M	2,687.4	3.0	ROADWAY EMBANKMENT Loose, red, brown, clayey SAND (A-2-6), some mica
2685	2,684.4	6.0	2	4	3	.....	.....	.....	.....	.....			M			Loose, brown, black, orange, clayey SAND (A-2-7), micaceous
	2,681.9	8.5	3	3	4	.....	.....	.....	.....	.....			M			
2680	2,676.9	13.5	3	4	5	.....	.....	.....	.....	.....			M			
	2,671.9	18.5	6	7	10	.....	.....	.....	.....	.....			D	2,677.4	13.0	RESIDUAL Stiff to hard, brown, silty CLAY (A-7-5)
2675	2,671.9	18.5	6	6	7	.....	.....	.....	.....	.....			D			
	2,666.9	23.5	16	21	27	.....	.....	.....	.....	.....			D			
2670	2,661.9	28.5	5	9	10	.....	.....	.....	.....	.....			D			
	2,656.9	33.5	66	34/0.1		.....	.....	.....	.....	.....			M	2,657.4	33.0	WEATHERED ROCK Gray, METAGRANITE
2665	2,654.1	36.3	60/0.1			.....	.....	.....	.....	.....				2,654.1	36.3	CRYSTALLINE ROCK No recovery, METAGRANITE
														2,654.0	36.4	Boring Terminated with Standard Penetration Test Refusal at Elevation 2,654.0 ft in Crystalline Rock

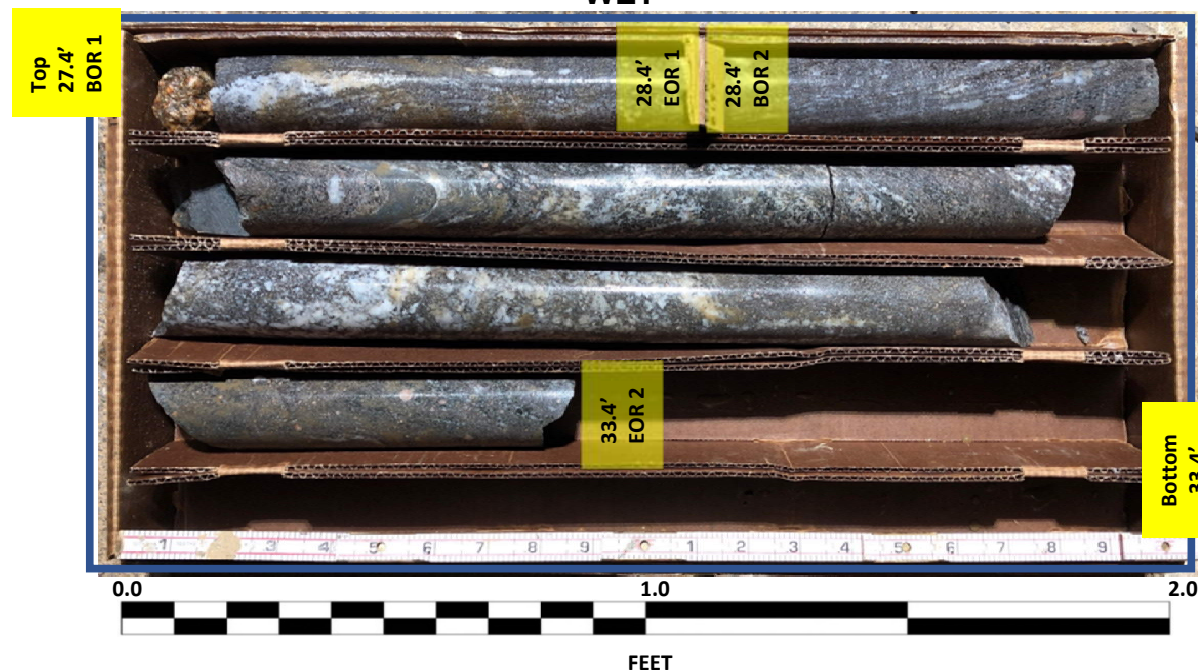
NCDOT BORE DOUBLE HB0004 GINT LOGS.GPJ NC_DOT.GDT 3/3/22

CORE PHOTOGRAPHIC RECORD

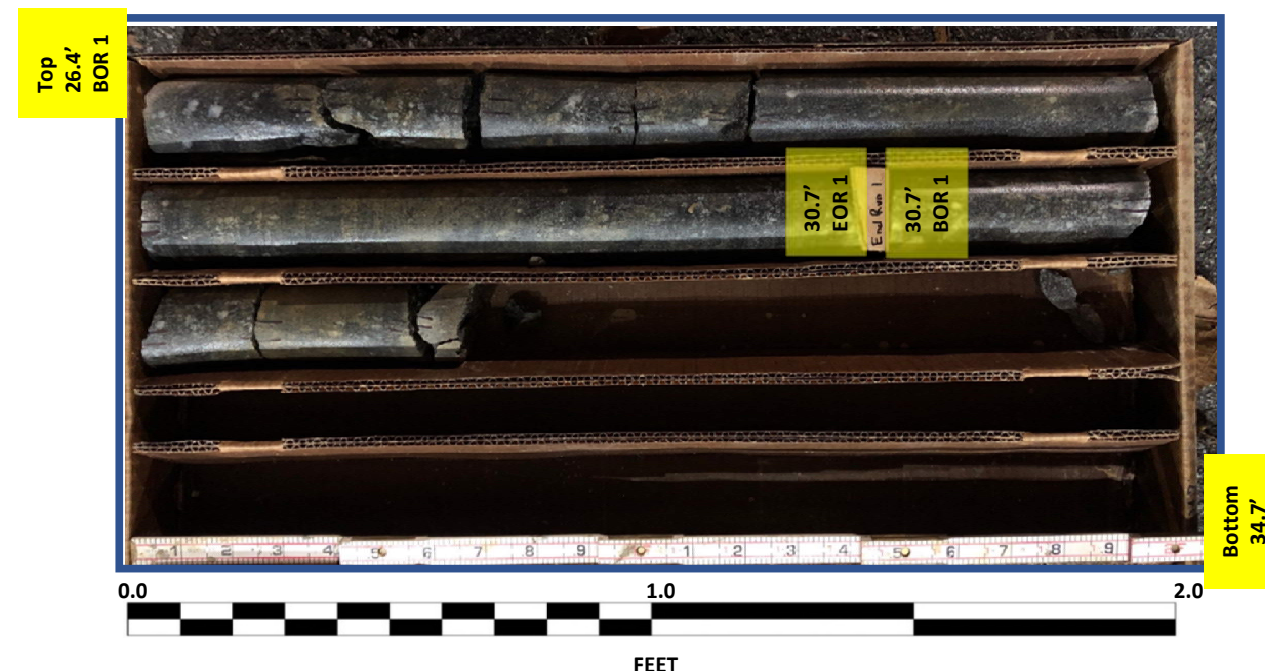
55041.1.1 (HB-0004)

Bridge No. 243 on I-40 over NC 215 (Champion Road)

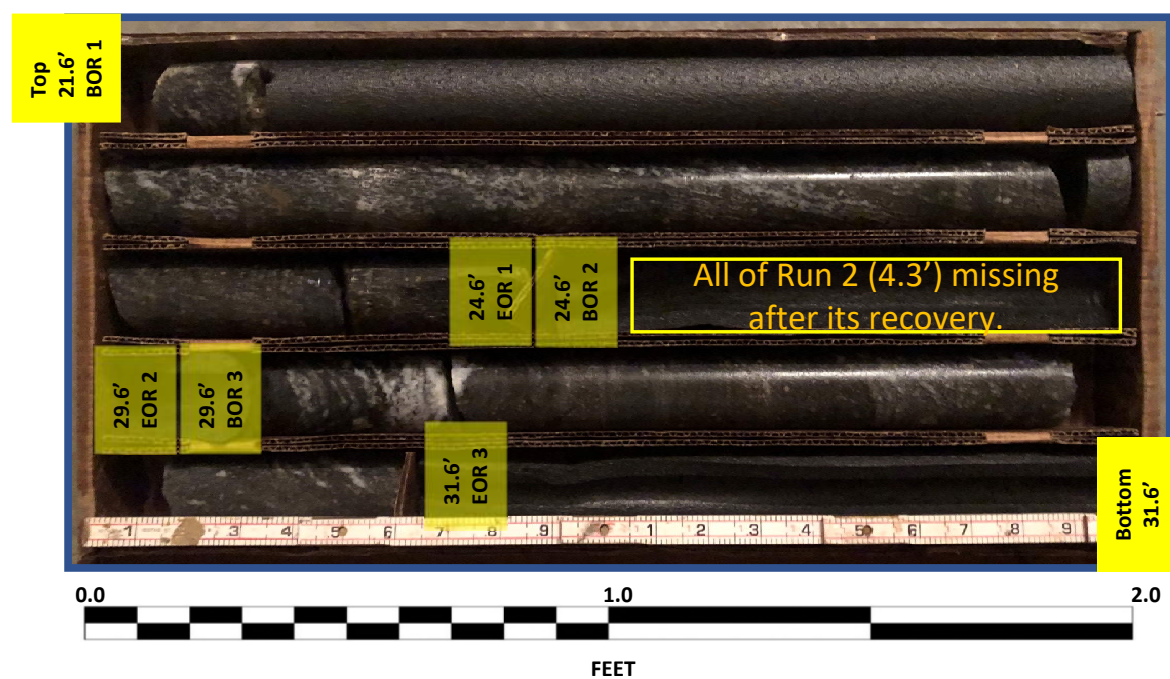
B1-B
Box 1 of 1: 27.4 – 33.4 FEET
WET



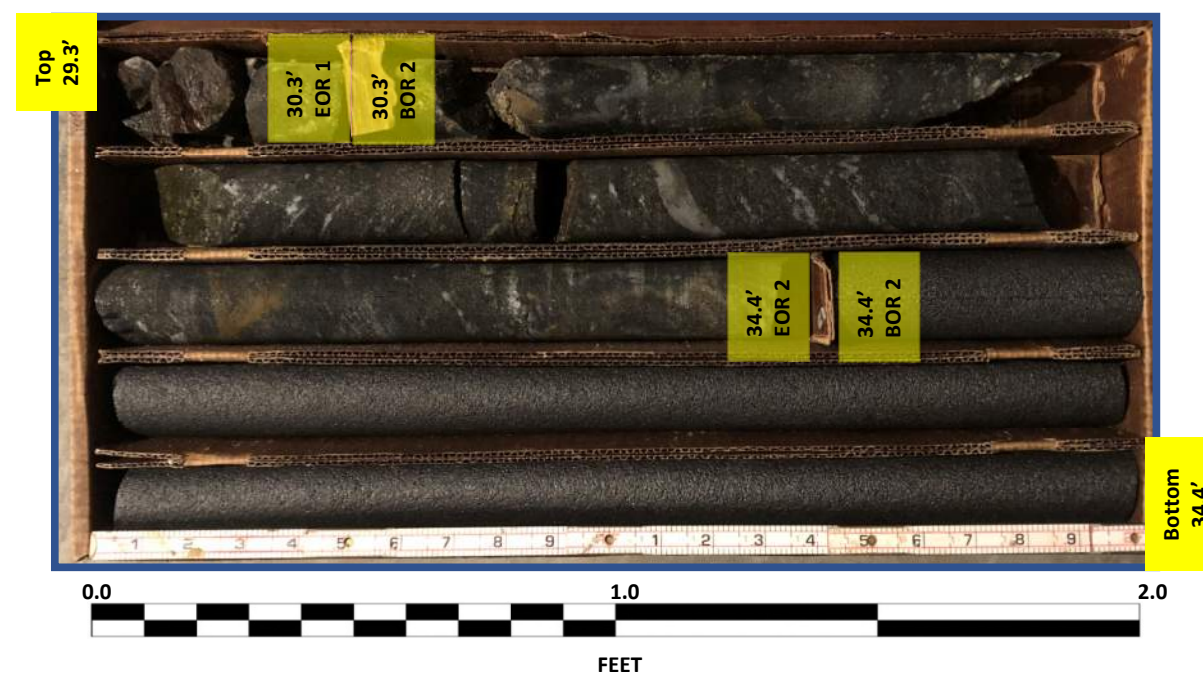
B1-E
Box 1 of 1: 26.4 – 34.7 FEET
WET



B-2B
Box 1 of 1: 21.6 – 31.6 FEET
WET



B-2E
Box 1 of 1: 29.3 – 34.4 FEET
WET



SOIL TEST RESULTS

HDR HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

SOIL TEST RESULTS

BORING NO.	SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
								C. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1-A	SS-9	N/A	N/A	33.4' - 34.9'	A-5(1)	46	3	23.4	29.4	34.0	13.2	97.1	84.4	51.4	54	-
EB1-B	SS-23	N/A	N/A	23.6' - 25.1'	A-2-6(1)	39	16	34.4	22.1	32.6	10.9	52.1	38.7	24.7	N/A	-
B1-B	SS-83	N/A	N/A	8.5' - 10.0'	A-7-5(6)	56	12	23.3	26.3	31.1	19.3	98.1	83.1	54.6	40	-
B2-A	SS-113	N/A	N/A	13.7' - 15.2'	A-7-5(6)	44	12	18.7	21.3	37.9	22.1	91.5	77.6	58.3	40	-
EB2-D	SS-185	N/A	N/A	8.5' - 10.0'	A-2-7(0)	43	12	38.5	28.7	20.1	12.7	85.1	63.4	29.7	N/A	-

Site Photographs



Photo 1: Looking South towards End Bent 1 and Bent 1



Photo 2: Looking North towards End Bent 2 and Bent 2



Photo 3: Looking East towards End Bent 2 and Bent 2 under Bridge 243



Photo 4: Looking southwest towards End Bent 1 and Bent 1 under Bridge 243

