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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5722	1	19

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY ROCKINGHAM  
PROJECT DESCRIPTION BRIDGE NO. 277 ON SR 1169  
(ISLAND DRIVE) OVER BIG BEAVER ISLAND  
CREEK

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
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3	SITE PLAN
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14-15	CORE PHOTOGRAPHS
16	SITE PHOTOGRAPHS

PERSONNEL  
TRIGON  
GOODNIGHT, D.G.  
KLEINFELDER

INVESTIGATED BY GOODNIGHT, D.G.  
DRAWN BY CROCKETT, S.C.  
CHECKED BY HAMM, J.R.  
SUBMITTED BY FALCON ENG.  
DATE MARCH 2022

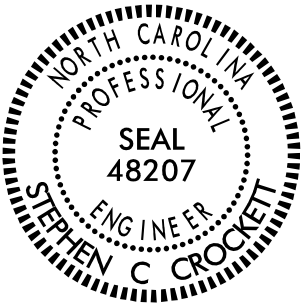
CAUTION NOTICE

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.

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DocuSigned by:  
Stephen Crockett 3/21/2022  
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SIGNATURE DATE

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REFERENCE: 45678.1.1

PROJECT: B-5722

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT  
**SUBSURFACE INVESTIGATION**  
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS  
(PAGE 1 OF 2)

SOIL DESCRIPTION										GRADATION									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS									
THE ANGULARITY OF ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.										MINERALOGICAL COMPOSITION									
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										COMPRESSIBILITY									
SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE										LL < 31 LL = 31 - 50 LL > 50									
PERCENTAGE OF MATERIAL										ORGANIC MATERIAL TRACE OF ORGANIC MATTER LITTLE ORGANIC MATTER MODERATELY ORGANIC HIGHLY ORGANIC									
GRANULAR SOILS SILT - CLAY SOILS MUCK, PEAT										GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE LITTLE SOME HIGHLY									
GROUND WATER										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP									
MISCELLANEOUS SYMBOLS										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY									
DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION										SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE									
RECOMMENDATION SYMBOLS										UNDERCUT SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL									
ABBREVIATIONS										AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS - FOSSILIFEROUS FRAC - FRACTURED, FRACTURES FRAGS - FRAGMENTS HI - HIGHLY MED - MEDIUM MICA - MICACEOUS MOD - MODERATELY NP - NON PLASTIC ORG - ORGANIC PMT - PRESSUREMETER TEST SAP - SAPROLITIC SD - SAND, SANDY SL - SILT, SILTY SLI - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA - WEATHERED γ - UNIT WEIGHT γ <sub>d</sub> - DRY UNIT WEIGHT									
SAMPLE ABBREVIATIONS										S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO									
EQUIPMENT USED ON SUBJECT PROJECT										DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST MOBILE B-57 ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG-CARBIDE INSERTS CASING TRICONE TRICONE CORE BIT HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B H N Q HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST									
PLASTICITY										PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC									
COLOR										DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.									

PROJECT REFERENCE NO.	SHEET NO.
B-5722	2A

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**  
**SUBSURFACE INVESTIGATION**  
**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**  
**(PAGE 2 OF 2)**

ROCK DESCRIPTION		TERMS AND DEFINITIONS	
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:		<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
<b>WEATHERING</b>			
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.		
VERY SLIGHT (V SL.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.		
SLIGHT (SL.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.		
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.		
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>		
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</u>		
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>		
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.		
<b>ROCK HARDNESS</b>			
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.		
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.		
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.		
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.		
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.		
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.		
<b>FRACTURE SPACING</b>		<b>BEDDING</b>	
TERM	SPACING	TERM	THICKNESS
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET
		THINLY LAMINATED	< 0.008 FEET
<b>INDURATION</b>			
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.			
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.		
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.		
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.		
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.		
		BENCH MARK: BL-4 (968,387 FT N, 1,709,778 FT E)	
		ELEVATION: 611.79 FEET	
		<b>NOTES:</b>	
		FIAD - FILLED IMMEDIATELY AFTER DRILLING	
		TOP OF BRIDGE RAIL ELEVATIONS	
		EB1 DOWNSTREAM - 614.7 FT	
		EB2 DOWNSTREAM - 614.6 FT	
		DATE: 8-15-14	

**B-5722**

**2B**

**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 (PAGE 1 OF 2)**

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

GEOLOGICAL STRENGTH INDEX (GSI) FOR  
JOINTED ROCKS (Hoek and Marinos, 2000)

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.

## STRUCTURE

## SURFACE CONDITIONS

**VERY GOOD**  
Very rough, fresh unweathered surfaces

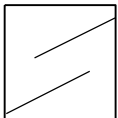
**GOOD**  
Rough, slightly weathered, iron stained surfaces

**FAIR** Smooth, moderately weathered and altered surfaces

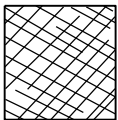
POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

**VERY POOR**  
Slickensided, highly weathered surfaces  
with soft clay coatings or fillings

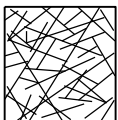
DECREASING SURFACE QUALITY →



INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



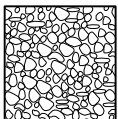
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



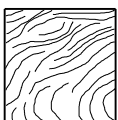
VERY BLOCKY - interlocked,  
partially disturbed mass with  
multi-faceted angular blocks  
formed by 4 or more joint sets



BLOCKY/DISTURBED/SEAMY -  
folded with angular blocks  
formed by many intersecting  
discontinuity sets. Persistence  
of bedding planes or schistosity



DISINTEGRATED - poorly inter-  
locked, heavily broken rock mass  
with mixture of angular and  
rounded rock pieces



LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

⇐ DECREASING INTERLOCKING OF ROCK PIECES

90

80

70

60

50

/

20

10

N/A

N/A

N/A

N/A

B-5722

2C

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
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SUBSURFACE INVESTIGATION

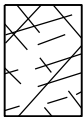
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES  
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)

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

GSI FOR HETEROGENEOUS ROCK MASSES SUCH  
AS FLYSCH (Marinos, P and Hoek E., 2000)

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.

COMPOSITION AND STRUCTURE



**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.



**B. Sandstone with thin inter-layers of siltstone**



**C. Sandstone and siltstone in similar amounts**



**D. Siltstone or silty shale with sandstone layers**



**E. Weak siltstone or clayey shale with sandstone layers**

**C, D, E, and G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H**.



**F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure**



**G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers**



**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.**

➡ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF  
DISCONTINUITIES  
(Predominantly bedding planes)

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, slicken-  
sided or highly weathered surfaces  
with soft clay coatings or fillings

70

60

A

50

B

40

C

D

E

30

F

20

G

10

H



<b>WBS</b> 45678.1.1						<b>TIP</b> B-5722						<b>COUNTY</b> ROCKINGHAM						<b>GEOLOGIST</b> Johnson, B.							
<b>SITE DESCRIPTION</b> Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek																		<b>GROUND WTR (ft)</b>							
<b>BORING NO.</b> EB1-A						<b>STATION</b> 14+66						<b>OFFSET</b> 9 ft LT						<b>ALIGNMENT</b> -L-						<b>0 HR.</b> Dry	
<b>COLLAR ELEV.</b> 612.1 ft						<b>TOTAL DEPTH</b> 26.1 ft						<b>NORTHING</b> 968,262						<b>EASTING</b> 1,709,719						<b>24 HR.</b> FIAD	
<b>DRILL RIG/HAMMER EFF./DATE</b> TRI8016 MOBILE B-57 90% 02/22/2016												<b>DRILL METHOD</b> H.S. Augers						<b>HAMMER TYPE</b> Automatic							
<b>DRILLER</b> Estep, E.						<b>START DATE</b> 05/27/16						<b>COMP. DATE</b> 05/27/16						<b>SURFACE WATER DEPTH</b> 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)										
615																									
610	611.1	1.0	2	1	2									M	612.1	GROUND SURFACE	0.0								
	608.6	3.5	2	1	2													M	606.1	ROADWAY EMBANKMENT Red-Orange, Fine Sandy CLAY					
605														M											
	603.6	8.5	1	1	2													M		Dark Brown, Fine Sandy, Silty CLAY with Trace Gravel	6.0				
600														M											
	598.6	13.5	1	2	1													M							
595														M											
	593.6	18.5	1	2	3													M	594.1	ALLUVIAL	18.0				
590														M		Dark Brown, Silty, Fine to Coarse SAND	21.0								
	588.6	23.5	100/0.3																WEATHERED ROCK						
	586.1	26.0	60/0.1												Dark Red TRIASSIC MUDSTONE										
															586.1	NON-CRYSTALLINE ROCK	26.0								
															586.0	Dark Red TRIASSIC MUDSTONE	26.1								
																	Boring Terminated with Standard Penetration Test Refusal at Elevation 586.0 ft in NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE								
																	Notes:								
																	Topsoil (0.0 ft to 0.4ft) ABC Stone (0.4 ft to 1.0 ft)								

NCDOT BORE SINGLE B5722 GEO DBINV 0277 GINT.GPJ NC DOT.GDT 6/14/16



BORE LOG

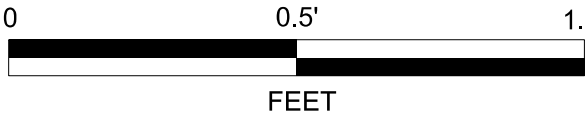
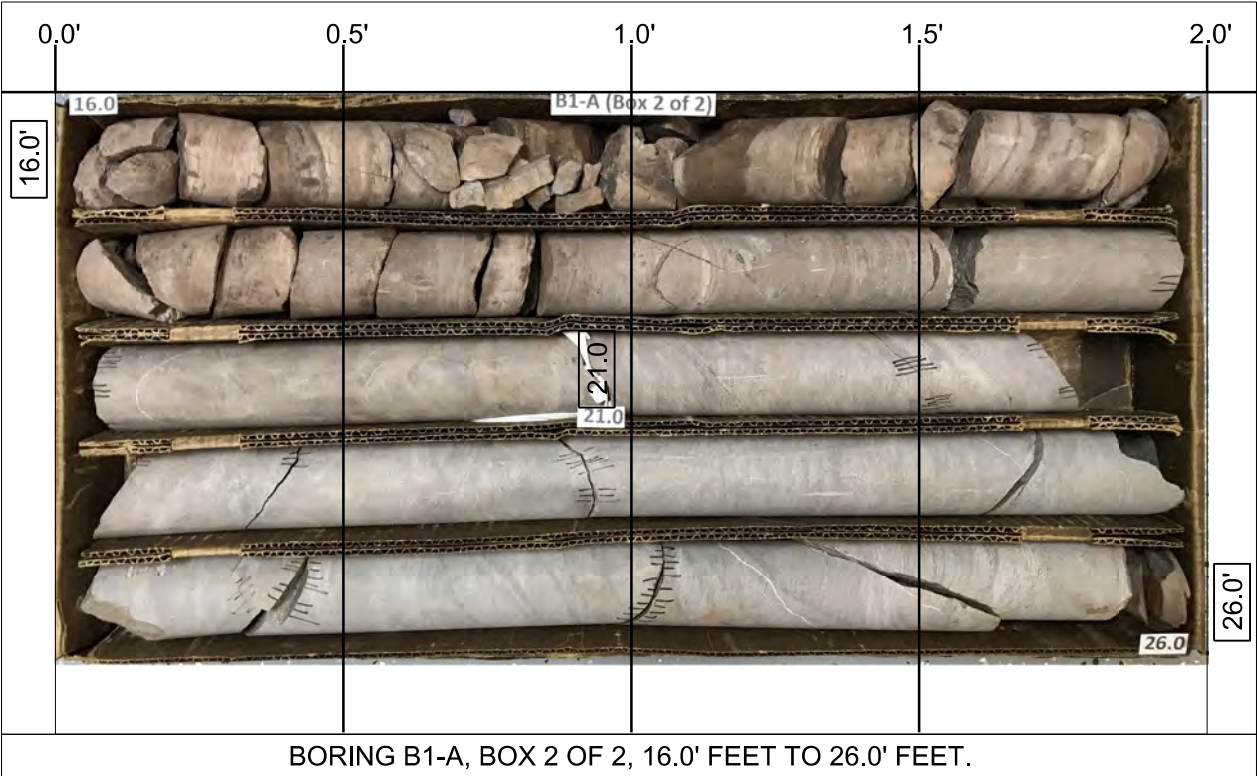
WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST Johnson, B.							
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek									GROUND WTR (ft)							
BORING NO. EB1-B			STATION 14+59			OFFSET 9 ft RT			ALIGNMENT -L-			0 HR. Dry				
COLLAR ELEV. 612.2 ft			TOTAL DEPTH 23.6 ft			NORTHING 968,247			EASTING 1,709,731			24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Estep, E.			START DATE 05/27/16			COMP. DATE 05/27/16			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				ELEV. (ft)		
615																
610	611.2	1.0	5	3	2	5							M	611.2	GROUND SURFACE	0.0
	608.7	3.5	2	1	2	3							M	611.2	Asphalt (0.0 ft to 0.7 ft) ABC Stone (0.7 ft to 1.0 ft)	1.0
605															ROADWAY EMBANKMENT	
	603.7	8.5	1	3	2	5							M	605.2	Red to Red-Orange, Fine Sandy CLAY with Some Gravel	
600															Brown-Red, Fine to Coarse Sandy, Silty CLAY	7.0
	598.7	13.5	1	1	2	3							M			
595																
	593.7	18.5	1	1	2	3							M	593.2	ALLUVIAL	19.0
590															Dark Brown, Silty, Fine to Coarse SAND	
	588.7	23.5											M	588.7	NON-CRYSTALLINE ROCK	23.5
		60/0.1								60/0.1				588.6	Dark Red TRIASSIC MUDSTONE	23.6
															Boring Terminated with Standard Penetration Test Refusal at Elevation 588.6 ft in NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE	

NCDOT BORE SINGLE B5722 GEO\_DBINV\_0277\_GINT.GPJ NC\_DOT.GDT 6/14/16

WBS 45678.1.1		TIP B-5722		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D.J.							
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Dr.) Over Big Beaver Island Creek							GROUND WTR (ft)						
BORING NO. B1-A		STATION 15+60		OFFSET 32 ft LT		ALIGNMENT -L-		0 HR. N/A					
COLLAR ELEV. 594.0 ft		TOTAL DEPTH 26.0 ft		NORTHING 968,355		EASTING 1,709,745		24 HR. 1.9					
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 97% 03/22/2019				DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER Estep, J. E.		START DATE 04/15/20		COMP. DATE 04/15/20		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)
595													
	593.0	1.0	WOH	1	WOH								594.0 GROUND SURFACE 0.0
590	590.5	3.5	14	11	25								ALLUVIAL TAN, VERY LOOSE, F. SAND (A-3) 591.0 3.0
	588.0	6.0	60/0.0										RESIDUAL BROWN, DENSE, F. TO CSE. SAND (A-1-a) WITH SOME ROCK FRAGMENTS 588.7 5.3
585													WEATHERED ROCK RED-BROWN, TRIASSIC SILTSTONE 588.0 6.0
													NON-CRYSTALLINE ROCK RED-BROWN, TRIASSIC SILTSTONE
580													
575													574.2 19.8
													NON-CRYSTALLINE ROCK GRAY, TRIASSIC SANDSTONE
570													
													568.0 26.0
													Boring Terminated at Elevation 568.0 ft IN NON-CRYSTALLINE ROCK: TRIASSIC SANDSTONE

WBS 45678.1.1						TIP B-5722				COUNTY ROCKINGHAM				GEOLOGIST GOODNIGHT, D.J.					
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Dr.) Over Big Beaver Island Creek														GROUND WTR (ft)					
BORING NO. B1-A						STATION 15+60				OFFSET 32 ft LT				ALIGNMENT -L-				0 HR. N/A	
COLLAR ELEV. 594.0 ft						TOTAL DEPTH 26.0 ft				NORTHING 968,355				EASTING 1,709,745				24 HR. 1.9	
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 97% 03/22/2019										DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER Estep, J. E.						START DATE 04/15/20				COMP. DATE 04/15/20				SURFACE WATER DEPTH N/A					
CORE SIZE NQ2						TOTAL RUN 20.0 ft													
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %		RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %		RQD (ft) %	L O G	DESCRIPTION AND REMARKS				DEPTH (ft)		
588													Begin Coring @ 6.0 ft						
585	588.0	6.0	5.0	6:15/1.0 3:23/1.0 9:47/1.0 4:01/1.0 6:30/1.0	(4.2) 84%	(1.0) 20%			(12.8) 93%	(4.8) 35%			NON-CRYSTALLINE ROCK RED-BROWN, SLIGHTLY TO VERY SLIGHTLY WEATHERED, MODERATELY HARD TO HARD, MODERATELY CLOSE TO CLOSELY FRACTURED, TRIASSIC SILTSTONE (STONEVILLE FM.)				6.0		
580	583.0	11.0	5.0	4:01/1.0 6:30/1.0 4:33/1.0 4:47/1.0 5:01/1.0 6:30/1.0 7:03/1.0	(4.9) 98%	(3.0) 60%													
575	578.0	16.0	5.0	4:33/1.0 4:06/1.0 3:59/1.0 4:35/1.0 5:55/1.0	(4.9) 98%	(2.0) 40%													
570	573.0	21.0	5.0	3:53/1.0 4:06/1.0 3:59/1.0 4:35/1.0 5:55/1.0 4:45/1.0 4:56/1.0 6:25/1.0 4:41/1.0 5:05/1.0	(4.9) 98%	(2.0) 40%			(6.2) 100%	(6.1) 98%			NON-CRYSTALLINE ROCK GRAY, VERY SLIGHTLY WEATHERED, HARD TO VERY HARD, MODERATELY CLOSE TO CLOSELY FRACTURED, TRIASSIC SANDSTONE (STONEVILLE FM.)				19.8		
	568.0	26.0											Boring Terminated at Elevation 568.0 ft IN NON-CRYSTALLINE ROCK: TRIASSIC SANDSTONE				26.0		

NC DOT CORE SINGLE R5722 BORINGS.GPJ NC DOT.GDT 7/28/21



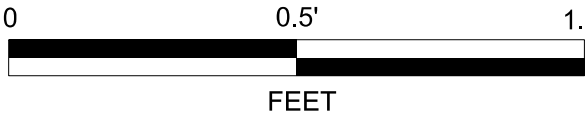
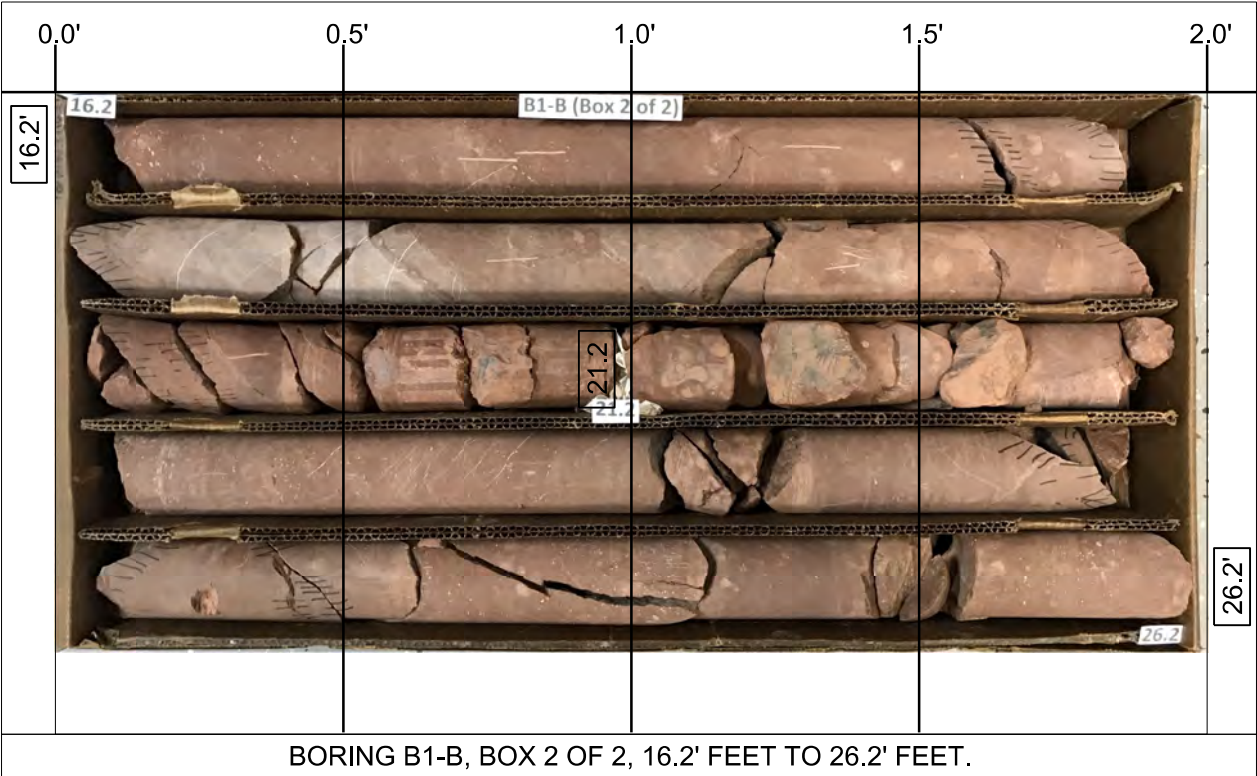
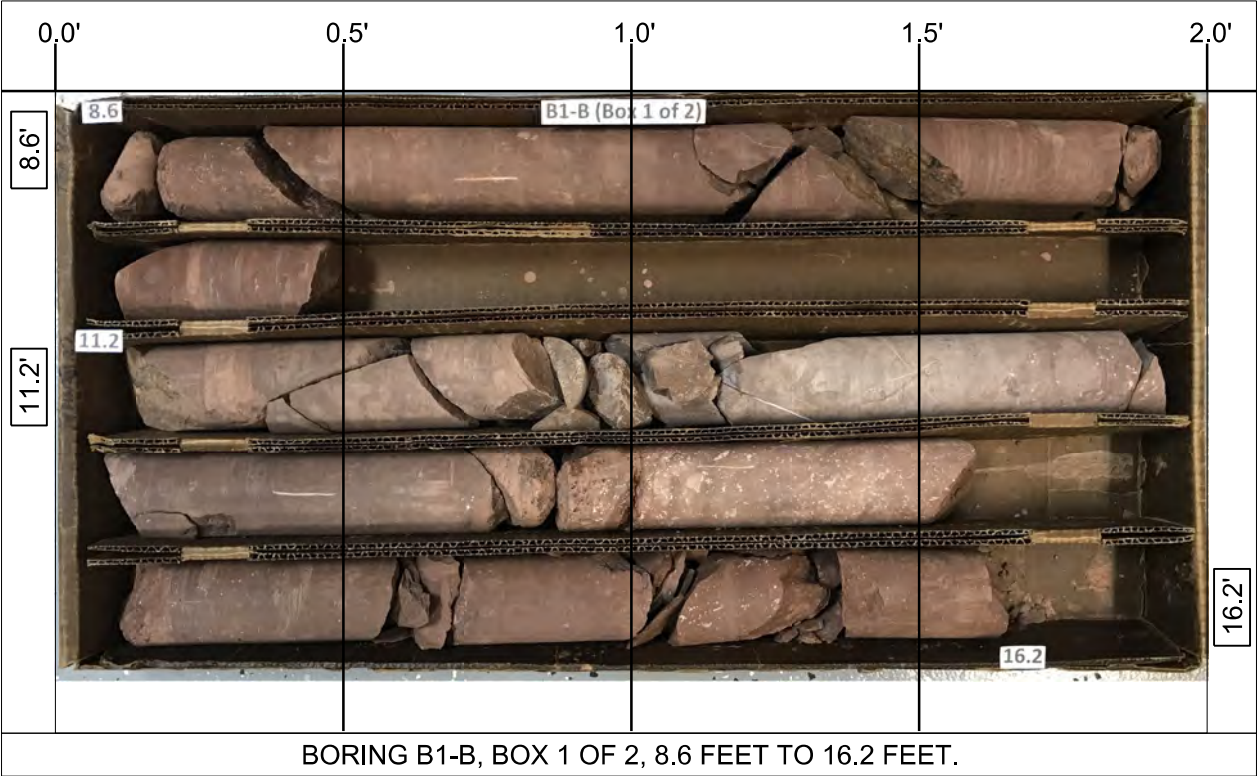
BORE LOG

WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST GOODNIGHT, D.J.					
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Dr.) Over Big Beaver Island Creek									GROUND WTR (ft)					
BORING NO. B1-B			STATION 15+64			OFFSET 17 ft RT			ALIGNMENT -L-			0 HR. 2.2		
COLLAR ELEV. 594.5 ft			TOTAL DEPTH 26.2 ft			NORTHING 968,334			EASTING 1,709,790			24 HR. FIAD		
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 97% 03/22/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER Estep, J. E.			START DATE 04/16/20			COMP. DATE 04/16/20			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		MOI		ELEV. (ft) DEPTH (ft)
595	594.5	0.0	1	WOH	1									594.5 GROUND SURFACE 0.0
590	591.0	3.5	16	19	25							▽		591.5 TAN-BROWN, VERY LOOSE, SILTY SAND (A-2-4) 3.0
	588.5	6.0	100/0.3									W		589.0 RESIDUAL BROWN, DENSE, SILTY SAND (A-2-4) WITH SOME ROCK FRAGMENTS 5.5
585	586.0	8.5	60/0.1											585.9 WEATHERED ROCK RED-BROWN, TRIASSIC MUDSTONE 8.6
580														NON-CRYSTALLINE ROCK RED-BROWN, TRIASSIC MUDSTONE
575														
570														
														568.3 Boring Terminated at Elevation 568.3 ft IN NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE 26.2

WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST GOODNIGHT, D.J.		
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Dr.) Over Big Beaver Island Creek								GROUND WTR (ft)			
BORING NO. B1-B			STATION 15+64			OFFSET 17 ft RT		ALIGNMENT -L-		0 HR. 2.2	
COLLAR ELEV. 594.5 ft			TOTAL DEPTH 26.2 ft			NORTHING 968,334		EASTING 1,709,790		24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 97% 03/22/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic		
DRILLER Estep, J. E.			START DATE 04/16/20			COMP. DATE 04/16/20		SURFACE WATER DEPTH N/A			
CORE SIZE NQ2			TOTAL RUN 17.6 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft) %	RQD (ft) %	LOG	DESCRIPTION AND REMARKS
585.9											
585	585.9	8.6	2.6	2:37/0.6 4:38/1.0 5:10/1.0	(2.2) 85%	(1.7) 65%		(16.5) 94%	(10.7) 61%		Begin Coring @ 8.6 ft
	583.3	11.2		3:53/1.0 4:00/1.0 4:18/1.0 5:51/1.0 5:13/1.0	(4.9) 98%	(2.9) 58%					NON-CRYSTALLINE ROCK
580			5.0								RED-BROWN, SLIGHTLY TO VERY SLIGHTLY WEATHERED, MODERATELY HARD TO HARD, MODERATELY CLOSE TO CLOSELY FRACTURED, TRIASSIC MUDSTONE (STONEVILLE FM.)
	578.3	16.2									
			5.0	5:05/1.0 5:35/1.0 4:17/1.0 5:03/1.0 10:32/1.0	(4.6) 92%	(3.6) 72%					
575											
	573.3	21.2									
			5.0	7:29/1.0 4:14/1.0 4:22/1.0 5:26/1.0 4:33/1.0	(4.8) 96%	(2.5) 50%					
570											
	568.3	26.2									Boring Terminated at Elevation 568.3 ft IN NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE

NC DOT CORE SINGLE R5722 BORINGS.GPJ NC DOT.GDT 7/28/21





BORE LOG

WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST Johnson, B.							
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek									GROUND WTR (ft)							
BORING NO. EB2-A			STATION 16+03			OFFSET 7 ft LT			ALIGNMENT -L-			0 HR. Dry				
COLLAR ELEV. 612.3 ft			TOTAL DEPTH 23.6 ft			NORTHING 968,384			EASTING 1,709,788			24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER Estep, E.			START DATE 05/27/16			COMP. DATE 05/27/16			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				ELEV. (ft)		
615																
610	611.3	1.0												612.3	GROUND SURFACE	0.0
	608.8	3.5	4	3	3									611.3	Asphalt (0.0 ft to 0.3 ft) ABC Stone (0.3 ft to 1.0 ft)	1.0
605			2	2	3										ROADWAY EMBANKMENT	
	603.8	8.5												606.3	Brown-Red, Fine Sandy SILT	
600			2	2	1										Brown-Red, Fine Sandy CLAY	6.0
	598.8	13.5	WOH	1	2											
595														596.3		16.0
	593.8	18.5	2	3	2										ALLUVIAL	
590															Dark Brown, Silty, Fine to Coarse SAND	
	588.8	23.5												588.8		23.5
		60/0.1								60/0.1				588.7	NON-CRYSTALLINE ROCK	23.6
															Dark Red TRIASSIC MUDSTONE	
															Boring Terminated with Standard Penetration Test Refusal at Elevation 588.7 ft in NON-CRYSTALLINE ROCK: TRIASSIC MUDSTONE	

NCDOT BORE SINGLE B5722 GEO\_DBINV\_0277\_GINT.GPJ NC\_DOT.GDT 6/14/16



BORE LOG

WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST Johnson, B.						
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek									GROUND WTR (ft)						
BORING NO. EB2-B			STATION 16+07			OFFSET 10 ft RT			ALIGNMENT -L-			0 HR. Dry			
COLLAR ELEV. 612.3 ft			TOTAL DEPTH 26.1 ft			NORTHING 968,375			EASTING 1,709,805			24 HR. FIAD			
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER Estep, E.			START DATE 05/27/16			COMP. DATE 05/27/16			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)
615															
610	611.3	1.0	7	5	2	7								612.3 GROUND SURFACE 0.0	
	608.8	3.5	2	2	3	5								611.3 Asphalt (0.0 ft to 0.4 ft) ABC Stone (0.4 ft to 1.0 ft) 1.0	
605														ROADWAY EMBANKMENT	
	603.8	8.5	2	2	1	3								Red-Orange, Fine Sandy CLAY	
600															
	598.8	13.5	1	0	1	1								600.3 12.0	
595														ALLUVIAL	
	593.8	18.5	2	2	1	3								Dark Brown, Fine Sandy, Silty CLAY with Trace Gravel	
590														595.3 17.0	
	588.8	23.5	100/0.3											Dark Brown, Silty, Fine to Coarse SAND	
	586.2	26.1	60/0.0											591.3 21.0	
														WEATHERED ROCK	
														Dark Red TRIASSIC MUDSTONE	
														586.3 26.0	
														586.2 26.1	
														NON-CRYSTALLINE ROCK	
														Dark Red TRIASSIC MUDSTONE	
														Boring Terminated with Standard	
														Penetration Test Refusal at Elevation 586.2	
														ft on NON-CRYSTALLINE ROCK: TRIASSIC	
														MUDSTONE	

NCDOT BORE SINGLE B5722 GEO\_DBINV\_0277\_GINT.GPJ NC\_DOT.GDT 6/14/16

BORE LOG

WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST Wells, T.					
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek								GROUND WTR (ft)						
BORING NO. LDET_EB1			STATION 14+86			OFFSET 38 ft RT			ALIGNMENT -L-					
COLLAR ELEV. 593.6 ft			TOTAL DEPTH 8.5 ft			NORTHING 968,239			EASTING 1,709,779					
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER Estep, E.			START DATE 05/31/16			COMP. DATE 05/31/16			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	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)
595														
	593.6	0.0	1	2	3								593.6	0.0
												M	GROUND SURFACE	
590	590.1	3.5	1	2	5								590.6	3.0
													Brown, Silty, Coarse to Fine SAND	
													Gray and Brown, Coarse to Fine SAND	
													586.6	7.0
	585.1	8.5	60/0.0			60/0.0							585.1	8.5
													WEATHERED ROCK	
													TRIASSIC MUDSTONE	
													Boring Terminated with Standard	
													Penetration Test Refusal at Elevation 585.1	
													ft on NON-CRYSTALLINE ROCK: TRIASSIC	
													MUDSTONE	

NCDOT BORE SINGLE B5722 GEO\_DBINV\_0277\_GINT.GPJ NC\_DOT.GDT 6/14/16

WBS 45678.1.1			TIP B-5722			COUNTY ROCKINGHAM			GEOLOGIST Wells, T.					
SITE DESCRIPTION Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek								GROUND WTR (ft)						
BORING NO. LDET_EB2			STATION 15+95			OFFSET 51 ft RT		ALIGNMENT -L-		0 HR. 9.9				
COLLAR ELEV. 597.6 ft			TOTAL DEPTH 18.3 ft			NORTHING 968,344		EASTING 1,709,835		24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 90% 02/22/2016						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER Estep, E.			START DATE 05/31/16			COMP. DATE 05/31/16			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				
600														
	597.6	0.0	4	4	4	3							597.6	GROUND SURFACE 0.0
595	594.6	3.0	3	4	4	3							595.1	ARTIFICIAL FILL 2.5 Brown, Coarse to Fine Sandy SILT
						3								ALLUVIAL
590	589.6	8.0	8	54	46/0.3	3							589.1	Brown, Silty, Coarse to Fine SAND
														WEATHERED ROCK
585	584.6	13.0	100/0.5							100/0.8				TRIASSIC SANDSTONE
580	579.6	18.0	100/0.3							100/0.5				
													579.3	18.3
														Boring Terminated at Elevation 579.3 ft in WEATHERED ROCK:

NC DOT BORE SINGLE B5722\_GEO\_DBINV\_0277\_GINT.GPJ NC\_DOT.GDT 6/14/16

**45678.1.1 (B-5722) Bridge No. 277 on SR 1169 (Island Drive) over Big Beaver Island Creek**

**SITE PHOTOGRAPHS**



View Looking Upstation from End Bent No. 1



Profile of Bridge Looking West from End Bent No. 2