

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 14SP.20441.1 F.A. PROJ. N/A  
COUNTY Haywood  
PROJECT DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road)  
over Big Creek

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**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 19191 707-6950. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

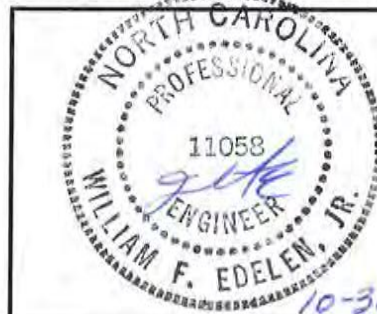
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND 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 THIS 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.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

DRAWN BY: M. Brewer, E.I. / W. Edelen, P.E.



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

**SOIL DESCRIPTION**

SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLES:  
*VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS				
	A-1	A-3	A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5						
GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5	A-7-6	A-7-8	A-1, A-2	A-4, A-5	A-6, A-7	
SYMBOL																
% PASSING	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	50 MX 30 MX 16 MX	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT	
LIQUID LIMIT	0 MX	NP	40 MX 10 MX	41 MX 10 MX	40 MX 11 MX	41 MX 11 MX	40 MX 10 MX	41 MX 10 MX	40 MX 11 MX	41 MX 11 MX	40 MX 10 MX	41 MX 11 MX	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER			HIGHLY ORGANIC SOILS
PLASTIC INDEX	0 MX	0	0	0	0	0	0	0	0	0	0	0				
GROUP INDEX	0	0	0	0	0	0	0	0	0	0	0	0				
USUAL TYPES OF MAJOR MATERIALS	STONE FRACS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS							
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR		FAIR TO POOR		POOR		UNSATURABLE			
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																

**GRADATION**

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.  
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)  
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

**ANGULARITY OF GRAINS**

THE ANGULARITY OR 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

**COMPRESSIBILITY**

SLIGHTLY COMPRESSIBLE  
MODERATELY COMPRESSIBLE  
HIGHLY COMPRESSIBLE

LIQUID LIMIT LESS THAN 31  
LIQUID LIMIT EQUAL TO 31-50  
LIQUID LIMIT GREATER THAN 50

**PERCENTAGE OF MATERIAL**

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	>10%	>20%	HIGHLY
			35% AND ABOVE

**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

**CONSISTENCY OR DENSENESS**

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	N/A
	DENSE	30 TO 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

**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
- SPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING W/ CORE
- SPT N-VALUE
- SPT REFUSAL

**TEXTURE OR GRAIN SIZE**

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.75	2.00	0.42	0.25	0.075	0.053
BOULDER (BLDR.)						
COBBLE (COB.)						
GRAVEL (GR.)						
COARSE SAND (CSE. SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						
GRAIN SIZE	305	75	2.0	0.25	0.05	0.005
	12	3				

**ABBREVIATIONS**

- AR - AUGER REFUSAL
  - BT - BORING TERMINATED
  - CL - CLAY
  - CPT - CONE PENETRATION TEST
  - CSE. - COARSE
  - CT - CORING TERMINATED
  - DMT - DILATOMETER TEST
  - DPT - DYNAMIC PENETRATION TEST
  - e - VOID RATIO
  - EMBANK. - EMBANKMENT
  - F - FINE
  - FOSS. - FOSSILIFEROUS
  - FRAC. - FRACTURED, FRACTURES
  - FRAGS. - FRAGMENTS
  - HL - HIGHLY
  - MED. - MEDIUM
  - MICA. - MICACEOUS
  - MOD. - MODERATELY
  - NP - NON PLASTIC
  - ORG. - ORGANIC
  - PMT - PRESSUREMETER TEST
  - SAP. - SAPROLITIC
  - SOY. - SANDY
  - SL. - SILT, SILTY
  - SLI. - SLIGHTLY
  - FOSS. - FOSSILIFEROUS
  - FRAC. - FRACTURED, FRACTURES
  - TCR - TRICONE REFUSAL
  - w - MOISTURE CONTENT
  - v - VERY
  - WEA. - WEATHERED
  - Z - 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

**SOIL MOISTURE - CORRELATION OF TERMS**

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL - PLASTIC LIMIT		
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID AT OR NEAR OPTIMUM MOISTURE
SL - SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

**PLASTICITY**

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	5-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

**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.





**EQUIPMENT USED ON SUBJECT PROJECT**

- | DRILL UNITS:                            | ADVANCING TOOLS:  | HAMMER TYPE:  |
|---|---|---|
| <input type="checkbox"/> MOBILE B-      | <input type="checkbox"/> CLAY BITS  | <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL |
| <input type="checkbox"/> BK-51          | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER                             | CORE SIZE:  |
| <input type="checkbox"/> CME-45C        | <input checked="" type="checkbox"/> 8" HOLLOW AUGERS                            | <input type="checkbox"/> -B   |
| <input type="checkbox"/> CME-75         | <input type="checkbox"/> HARD FACED FINGER BITS                                 | <input checked="" type="checkbox"/> -H Q2                                     |
| <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG.-CARBIDE INSERTS                                  | <input type="checkbox"/> -H   |
|   | <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | HAND TOOLS:   |
|   | <input type="checkbox"/> TRICONE _____ STEEL TEETH                              | <input type="checkbox"/> POST HOLE DIGGER                                     |
|   | <input type="checkbox"/> TRICONE _____ TUNG.-CARB.                              | <input type="checkbox"/> HAND AUGER   |
|   | <input checked="" type="checkbox"/> CORE BIT                                    | <input type="checkbox"/> SOUNDING ROD   |
|   |   | <input type="checkbox"/> VANE SHEAR TEST                                      |

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**ROCK DESCRIPTION**

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, 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 8.1 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:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CPS)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

**WEATHERING**

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 "CLINK" SOUND WHEN STRUCK. <i>IF TESTED WOULD YIELD SPT REFUSAL.</i>
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. <i>IF TESTED YIELDS SPT N VALUES &gt; 100 BPF.</i>
VERY SEVERE (V SEV)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED YIELDS SPT N VALUES &lt; 100 BPF.</i>
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.

**ROCK HARDNESS**

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. COUGES 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 COUGED 0.85 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 GROOVED OR COUGED 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 FINGER NAIL.

**FRACTURE SPACING**

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

**BEDDING**

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.000 - 0.03 FEET
THINLY LAMINATED	< 0.000 FEET

**INDURATION**

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE 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.

**TERMS AND DEFINITIONS**

<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
<b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.
<b>ARGILLACEOUS</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, 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 DISLOADED 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 (N 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 8.1 FOOT PER 60 BLOWS.
<b>STRATA CORE RECOVERY (SRC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
<b>STRATA ROCK QUALITY DESIGNATION (SRQD)</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.

**BENCH MARK:** Survey information provided by Vaughn & Melton, Inc.  
 BMI, N76R4, E783854 - RR Spike in root of 50' sycamore  
 ELEVATION: 1438.86 FT.

NOTES:



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SITE

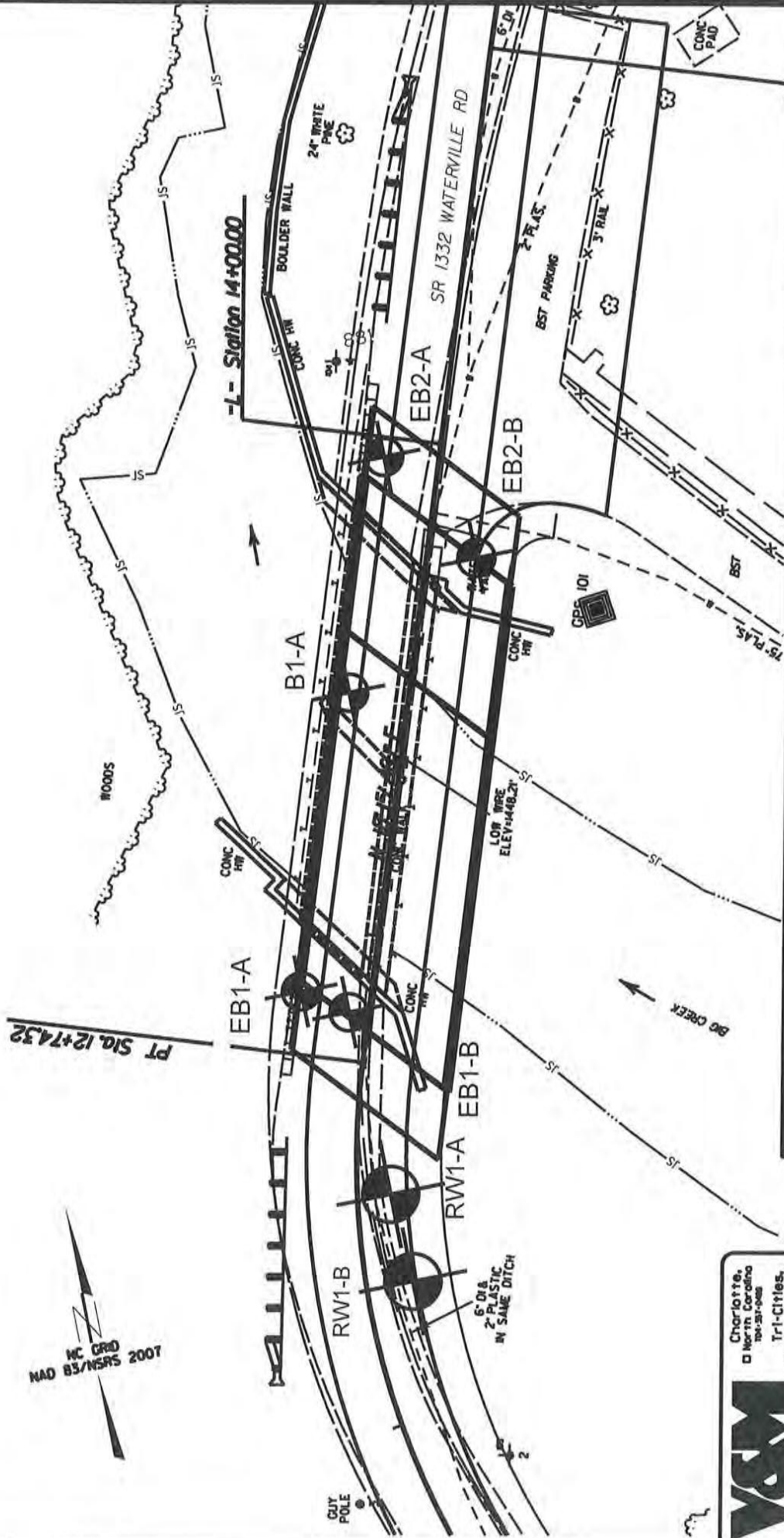
**SITE LOCATION PLAN**  
 Bridge No. 175 on SR 1332  
 (Waternville Road) over Big Creek

Scale: N.T.S. DR: DMB    CH: MJW    REV:

Prepared For:  
 NCDOT WBS No.: 14SP.20441.1



Froehling & Robertson, Inc.  
 2505 Hutchison-McDonald Road  
 Charlotte, North Carolina



**TEST SITE PLAN**

PROJECT REFERENCE NO.: 14SP.20441.1	F&R PROJECT NO.: 63R-3026-0175
I.D. NO.: N/A	F.A. PROJECT NO.: N/A
COUNTY: HAYWOOD	
PROJECT DESCRIPTION: Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek	
SITE DESCRIPTION: Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek	
DRAWN BY: M. Brewer, E.I.	CHECKED BY: M. Walko, P.E.
DATE: Dec 2013/REV: Oct 2016	SCALE: 1"=30'

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# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST M. Brewer					
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)				
BORING NO. EB1-A		STATION 12+87		OFFSET 14 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 1,434.6 ft		TOTAL DEPTH 36.0 ft		NORTHING 761,319		EASTING 783,773					
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/5/2012				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic					
DRILLER J. Fowler		START DATE 08/26/13		COMP. DATE 08/28/13		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 14.0 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	ROD (ft) %	REC. (ft) %	ROD (ft) %			
1412.6	1,412.6	22.0	5.0	N=60/0.0 5:11/1.0 4:17/1.0 4:37/1.0 4:58/1.0 3:49/1.0	(5.0) 100%	(4.6) 92%	(13.4) 96%	(12.4) 89%		Begin Coring @ 22.0 ft CRYSTALLINE ROCK Slightly weathered to fresh, dark gray, hard to very hard, (PIGEON SILTSTONE), with close fracture spacing.	22.0
1410	1,407.6	27.0	5.0	4:37/1.0 4:33/1.0 4:55/1.0 5:30/1.0 5:42/1.0	(5.0) 100%	(4.9) 98%					
1405	1,402.6	32.0	4.0	3:21/1.0 3:26/1.0 4:01/1.0 4:00/1.0	(3.4) 85%	(2.9) 73%					
1400	1,398.6	36.0									Boring Terminated at Elevation 1,398.6 ft IN CRYSTALLINE ROCK (PIGEON SILTSTONE)  1) Driller indicated auger refusal at 7.3' on Boulder fill.

NCDOT CORE SINGLE 63R-3026-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT\_GDT\_6/22/16







# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST M. Brewer					
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)				
BORING NO. EB1-B		STATION 12+84		OFFSET 4 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 1,434.5 ft		TOTAL DEPTH 32.0 ft		NORTHING 761,313		EASTING 783,781					
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/5/2012		DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic		0 HR. 15.8					
DRILLER J. Fowler		START DATE 08/28/13		COMP. DATE 08/30/13		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 10.0 ft									
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 (%)			
1412.5	1,412.5	22.0	5.0	N=60/0.0 5:18/1.0 5:15/1.0 4:00/1.0 4:13/1.0 4:36/1.0	(5.0) 100%	(4.6) 92%	(9.9) 99%	(9.4) 94%	[Pattern]	Begin Coring @ 22.0 ft CRYSTALLINE ROCK Slightly weathered to fresh, hard to very hard, dark gray (PIGEON SILTSTONE), with close fracture spacing.	22.0
1410	1,407.5	27.0	5.0	5:09/1.0 5:10/1.0 5:21/1.0 3:30/1.0 4:03/1.0	(4.9) 98%	(4.8) 96%			[Pattern]		
1405	1,402.5	32.0							[Pattern]	Boring Terminated at Elevation 1,402.5 ft IN CRYSTALLINE ROCK (PIGEON SILTSTONE)  1) Driller indicated auger refusal at 12.9' on Boulder fill.	32.0

NCDOT CORE SINGLE 63R-3026-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT.GDT 6/22/16



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 14SP.20441.1	TIP N/A	COUNTY HAYWOOD	GEOLOGIST M. Brewer
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek			GROUND WTR (ft)
BORING NO. B1-A	STATION 13+48	OFFSET 12 ft LT	ALIGNMENT -L-
COLLAR ELEV. 1,414.3 ft	TOTAL DEPTH 21.7 ft	NORTHING 761,377	EASTING 783,794
DRILL RIG/HAMMER EFF. DATE F&R4637 CME-75 86% 10/5/2012		DRILL METHOD NW Casing W/SPT & Core	HAMMER TYPE Automatic
DRILLER J. Fowler	START DATE 09/30/13	COMP. DATE 10/01/13	SURFACE WATER DEPTH 2.3ft

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				
1415	1,414.3	0.0										WATER SURFACE (09/30/13)	
					60/0.0				60/0.0			GROUND SURFACE	0.0
1410												COLLUVIAL Intermittent Cobbles & Boulders.	
1405												CRYSTALLINE ROCK Dark gray, (PIGEON SILTSTONE).	5.9
1400													
1395													
													1,392.6
												Boring Terminated at Elevation 1,392.6 ft IN CRYSTALLINE ROCK (PIGEON SILTSTONE)	21.7
												Began Coring at 0.7' after seating Casing in Colluvial Boulders	

NCDOT BORE SINGLE 63R-3025-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT\_GDT 6/22/16



# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST M. Brewer					
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)				
BORING NO. B1-A		STATION 13+48		OFFSET 12 ft LT		ALIGNMENT -L-	0 HR. N/A				
COLLAR ELEV. 1,414.3 ft		TOTAL DEPTH 21.7 ft		NORTHING 761,377		EASTING 783,794	24 HR. N/A				
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/5/2012				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic					
DRILLER J. Fowler		START DATE 09/30/13		COMP. DATE 10/01/13		SURFACE WATER DEPTH 2.3ft					
CORE SIZE NQ2		TOTAL RUN 21.7 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	ROD (%)	REC. (%)	ROD (%)			
1414.3										Ground Surface	
	1,414.3	0.0	4.7	N=60/0.0 NA/0.7 15:47/1.0 3:38/1.0 6:20/1.0 8:16/1.0	(3.7) 79%	(2.5) 53%	(4.9) 83%	(3.6) 61%	COLLUVIAL	Intermittent Cobbles and Boulders, (CONGLOMERATE).	
	1,409.6	4.7							COLLUVIAL	Intermittent Cobbles and Boulders, (CONGLOMERATE).	
			5.0	11:26/1.0 3:43/1.0 4:42/1.0 5:07/1.0 5:06/1.0	(5.0) 100%	(4.7) 94%	(15.8) 100%	(14.1) 89%	CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	5.9
	1,404.6	9.7							CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
			5.0	4:18/1.0 4:24/1.0 4:03/1.0 3:43/1.0 3:38/1.0	(5.0) 100%	(3.5) 70%			CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
	1,399.6	14.7							CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
			5.0	3:33/1.0 3:03/1.0 3:12/1.0 3:41/1.0 3:25/1.0	(5.0) 100%	(5.0) 100%			CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
	1,394.6	19.7							CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
			2.0	3:41/1.0 3:28/1.0	(2.0) 100%	(2.0) 100%			CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
	1,392.6	21.7							CRYSTALLINE ROCK	Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	21.7
Boring Terminated at Elevation 1,392.6 ft IN CRYSTALLINE ROCK (PIGEON SILTSTONE)											
Began Coring at 0.7' after seating Casing in Colluvial Boulders											

NCDOT CORE SINGLE 63R-3026-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT.GDT 6/22/16



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 14SP.20441.1	TIP N/A	COUNTY HAYWOOD	GEOLOGIST M. Brewer
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek			GROUND WTR (ft)
BORING NO. EB2-A	STATION 13+96	OFFSET 11 ft LT	ALIGNMENT -L-
COLLAR ELEV. 1,431.1 ft	TOTAL DEPTH 21.5 ft	NORTHING 761,422	EASTING 783,810
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/5/2012		DRILL METHOD NW Casing W/SPT & Core	HAMMER TYPE Automatic
DRILLER J. Fowler	START DATE 10/03/13	COMP. DATE 10/04/13	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					
1435															
1430	1,430.3	0.8	15	18	20									1,431.1 GROUND SURFACE 0.0	
	1,427.6	3.5	11	6	9									1,430.3 Asphalt (0.3') and ABC Stone (0.5') 0.8	
1425	1,422.6	8.5	60/0.1											1,426.1 ROADWAY EMBANKMENT 5.0	
	1,417.6	13.5	28	42	58/0.1									Intermittent cobbles & boulders with brown and gray, fine to coarse sandy GRAVEL (A-1-a).	
1415	1,414.6	16.5	60/0.0											Boulder Fill	
														Advanced with NQ2 coring equipment.	
1410														1,414.6 CRYSTALLINE ROCK 16.5	
														Dark gray, (PIGEON SILTSTONE).	
														1,409.6 Boring Terminated at Elevation 1,409.6 ft IN 21.5	
														CRYSTALLINE ROCK (PIGEON SILTSTONE)	
														1) Driller indicated auger refusal at 5.0'	
														2) Driller indicated casing refusal at 14.6'	
														3) 0-hr. water level not measured due to coring method.	

NCDOT BORE SINGLE 63R-3025-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT\_GDT 6/22/16



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## CORE BORING REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST M. Brewer					
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)				
BORING NO. EB2-A		STATION 13+96		OFFSET 11 ft LT		ALIGNMENT -L-					
COLLAR ELEV. 1,431.1 ft		TOTAL DEPTH 21.5 ft		NORTHING 761,422		EASTING 783,810					
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/5/2012				DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic					
DRILLER J. Fowler		START DATE 10/03/13		COMP. DATE 10/04/13		SURFACE WATER DEPTH N/A					
CORE SIZE NQ2		TOTAL RUN 6.9 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	ROD (ft) %	SAMP. NO.	REC. (ft) %			
1416.5										Begin Coring @ 14.6 ft	
1415	1,416.5	14.6	3.9	6:57/1.0 3:19/1.0 N=60/0.0 7:47/1.0 6:33/0.9	(3.9) 100%	(2.2) 56%	(1.9) 100%	(1.0) 53%	[Symbol]	Boulder Fill	16.5
	1,412.6	18.5					(5.0) 100%	(3.0) 60%	[Symbol]	CRYSTALLINE ROCK Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close fracture spacing.	
1410	1,409.6	21.5	3.0	5:18/1.0 5:11/1.0 5:30/1.0	(3.0) 100%	(1.8) 60%			[Symbol]	Boring Terminated at Elevation 1,409.6 ft IN CRYSTALLINE ROCK (PIGEON SILTSTONE)	21.5
<p style="margin: 0;">1) Driller indicated auger refusal at 5.0'</p> <p style="margin: 0;">2) Driller indicated casing refusal at 14.6'</p> <p style="margin: 0;">3) 0-hr. water level not measured due to coring method.</p>											

NCDOT CORE SINGLE 63R-3026-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT.GDT 6/22/16





# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST M. Brewer					
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)				
BORING NO. EB2-B		STATION 13+78		OFFSET 10 ft RT		ALIGNMENT -L-					
COLLAR ELEV. 1,430.4 ft		TOTAL DEPTH 34.0 ft		NORTHING 761,398		EASTING 783,824					
DRILL RIG/HAMMER EFF./DATE F&R4637 CME-75 86% 10/5/2012		DRILL METHOD NW Casing W/SPT & Core		HAMMER TYPE Automatic		0 HR. 16.5					
DRILLER J. Fowler		START DATE 08/30/13		COMP. DATE 10/03/13		24 HR. FIAD					
CORE SIZE NQ2		TOTAL RUN 14.0 ft		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. (ft) %	ROD (ft) %	SAMP. NO.	REC. (ft) %			
1419.4											
	1,410.4	20.0	4.0	4:01/1.0 6:11/1.0	(4.0) 100%	(2.1) 53%	(13.7) 98%	(9.2) 66%		Begin Coring @ 20.0 ft CRYSTALLINE ROCK Slightly weathered to fresh, hard to very hard, dark gray, (PIGEON SILTSTONE), with close, very close, and moderately close fracture spacing.	20.0
	1,406.4	24.0	5.0	7:02/1.0 6:32/1.0							
1405				3:52/1.0 3:20/1.0	(4.7) 94%	(2.4) 48%					
	1,401.4	29.0	5.0	4:53/1.0 4:04/1.0 4:07/1.0							
1400				3:36/1.0 3:20/1.0	(5.0) 100%	(4.7) 94%					
	1,396.4	34.0		2:40/1.0 3:19/1.0 3:36/1.0						Boring Terminated at Elevation 1,396.4 ft IN CRYSTALLINE ROCK (PIGEON SILTSTONE)	34.0
<p style="text-align: center;">1) Driller indicated auger refusal at 2.0'. 2) Driller indicated casing refusal at 20.0'.</p>											

NCDOT CORE SINGLE 63R-3026-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT.GDT 6/22/16





# Bridge No. 430175 on SR 1332 (Waterville Road)

## CORE PHOTOGRAPHS: EB1-A: Station 12+87, 14' LT

Begin Run 1  
22.0 feet

Begin Run 2  
27.0 feet



31.3 Feet



Begin Run 3  
32.0 feet

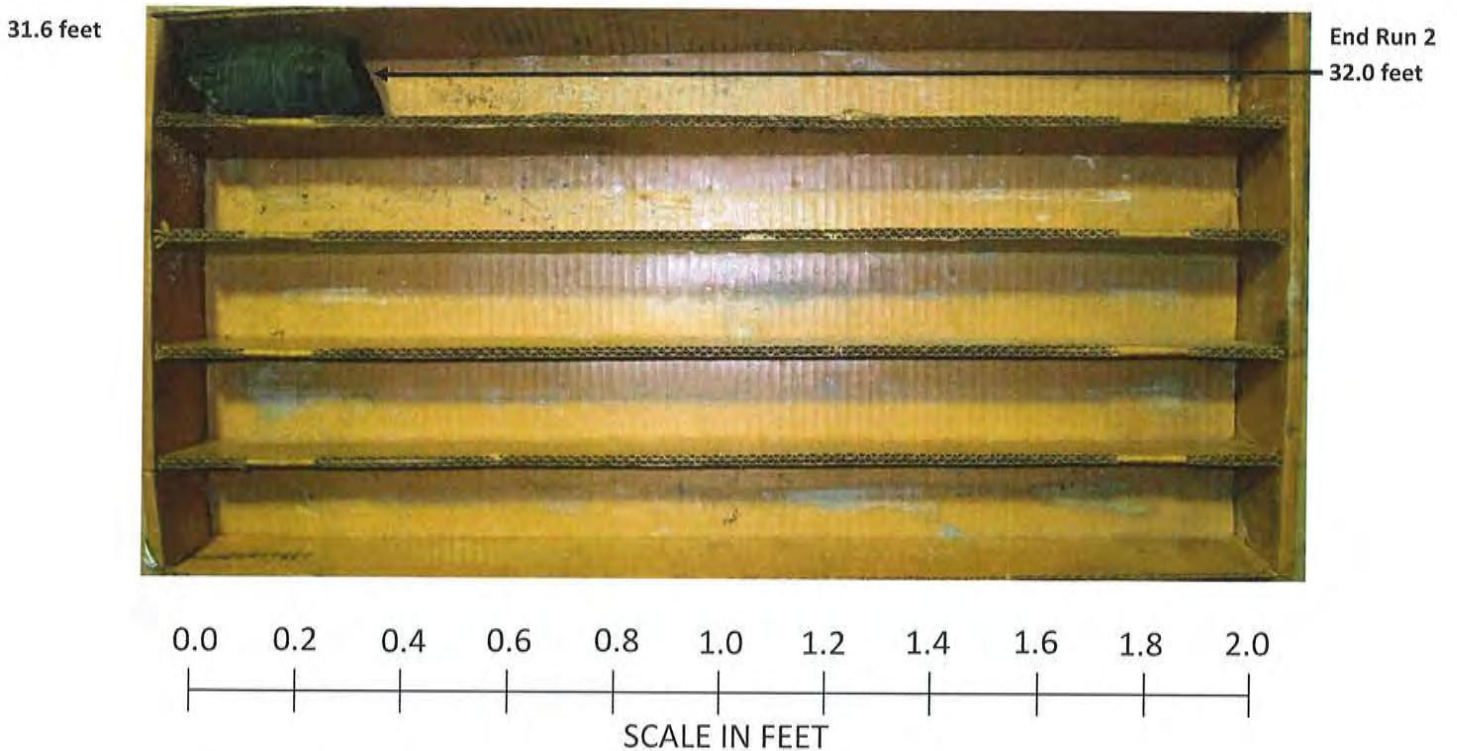
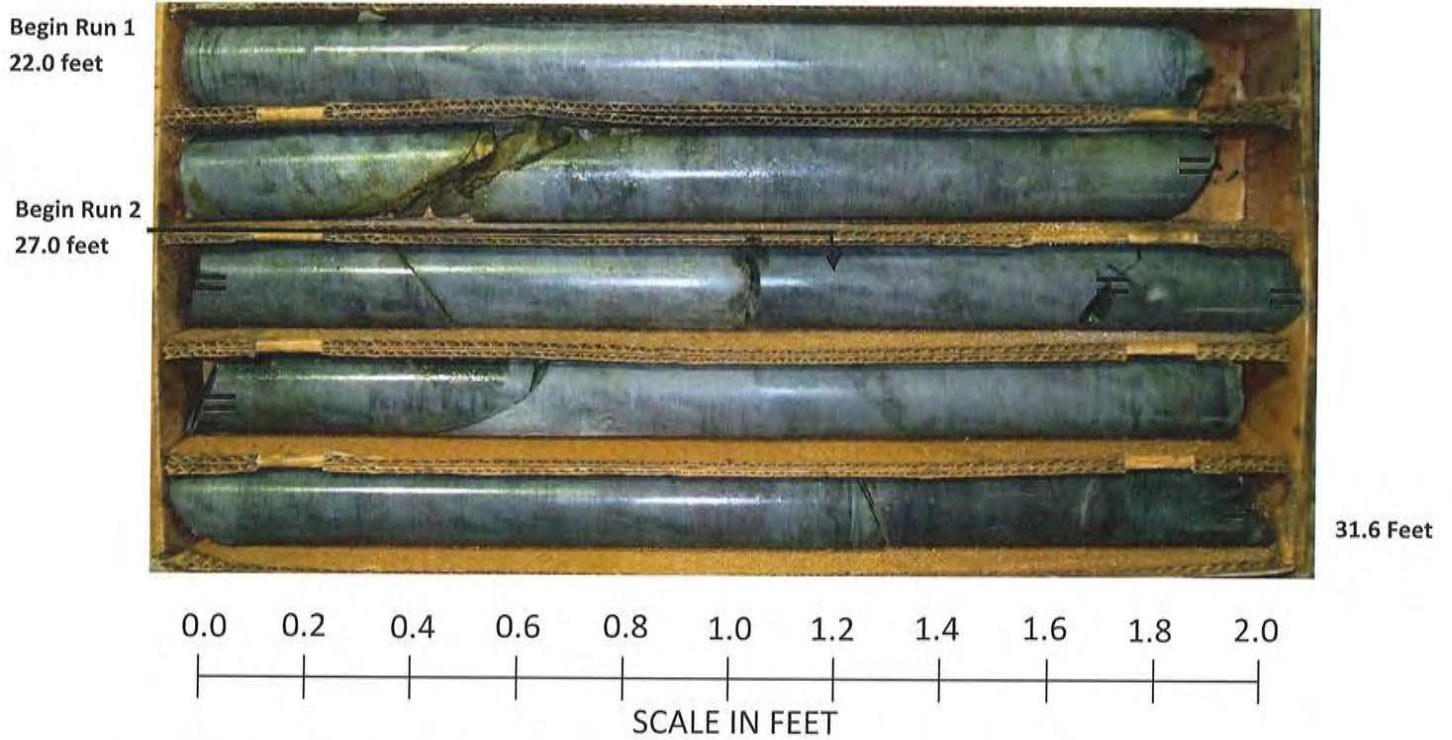


End Run 3  
35.0 feet





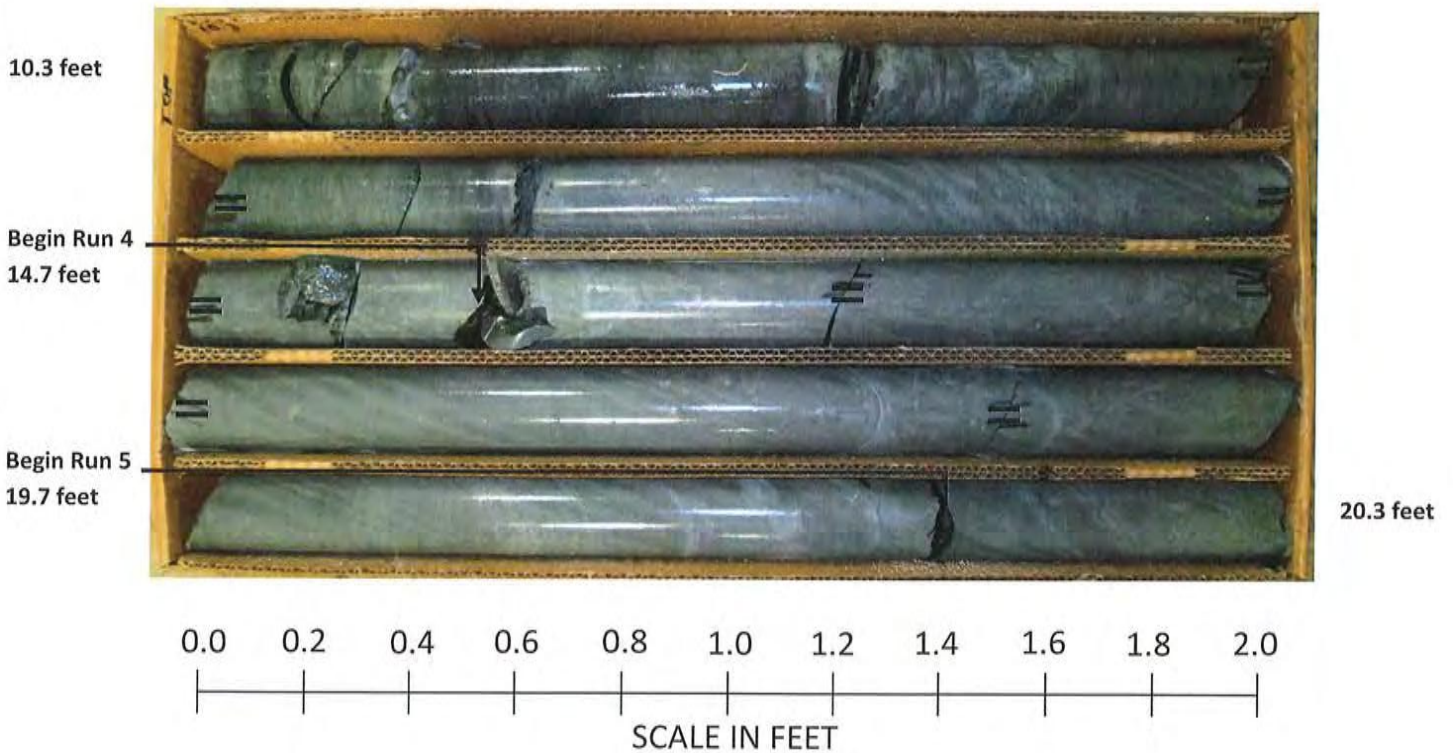
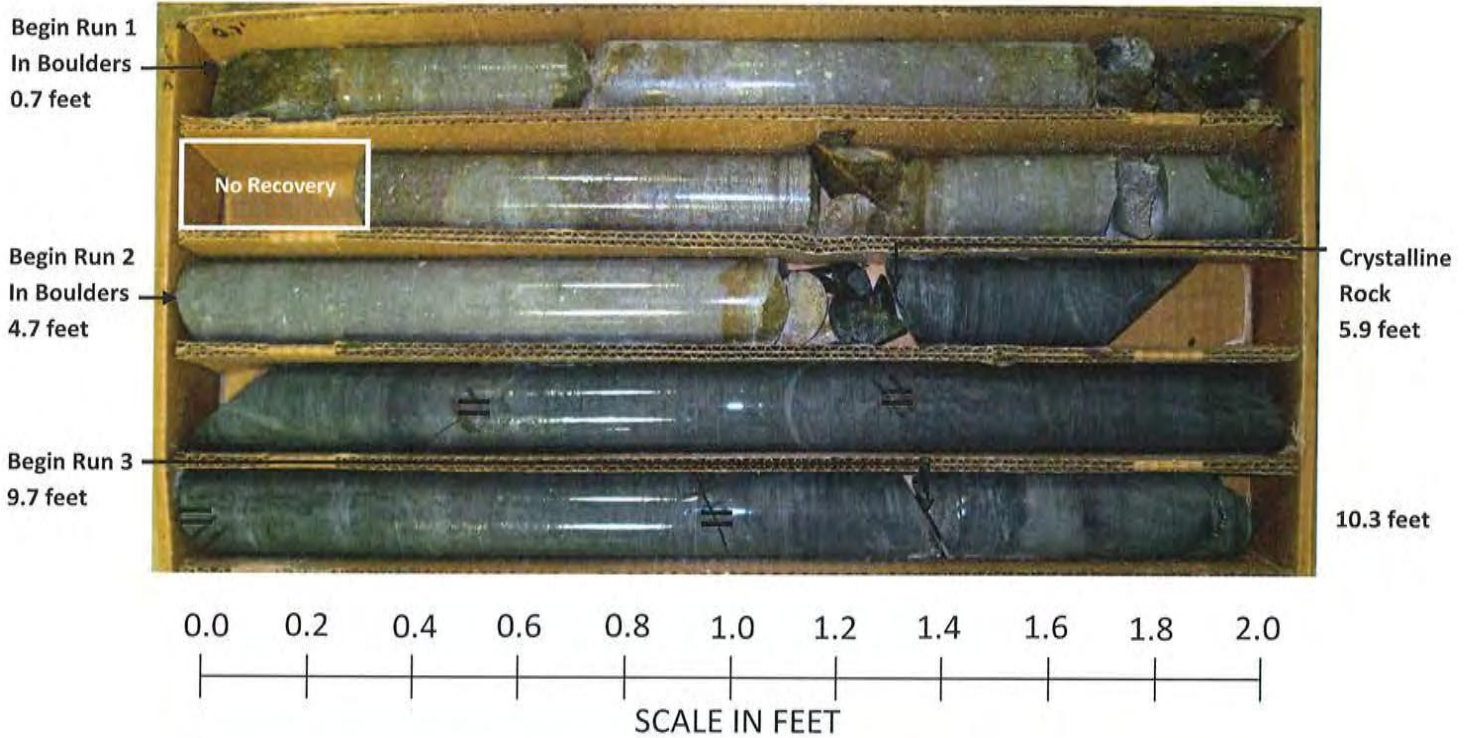
# Bridge No. 430175 on SR 1332 (Waterville Road) CORE PHOTOGRAPHS: EB1-B: Station 12+84, 4' LT





# Bridge No. 430175 on SR 1332 (Waterville Road)

## CORE PHOTOGRAPHS: B1-A: Station 13+48, 12' LT





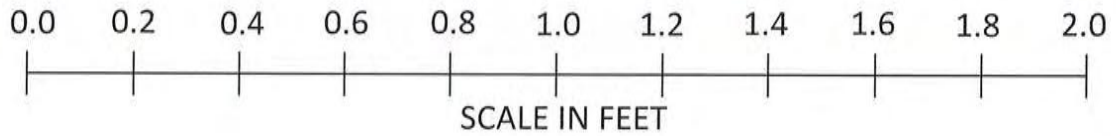
# Bridge No. 430175 on SR 1332 (Waterville Road)

## CORE PHOTOGRAPHS: B1-A: Station 13+48, 12' LT

20.3 feet

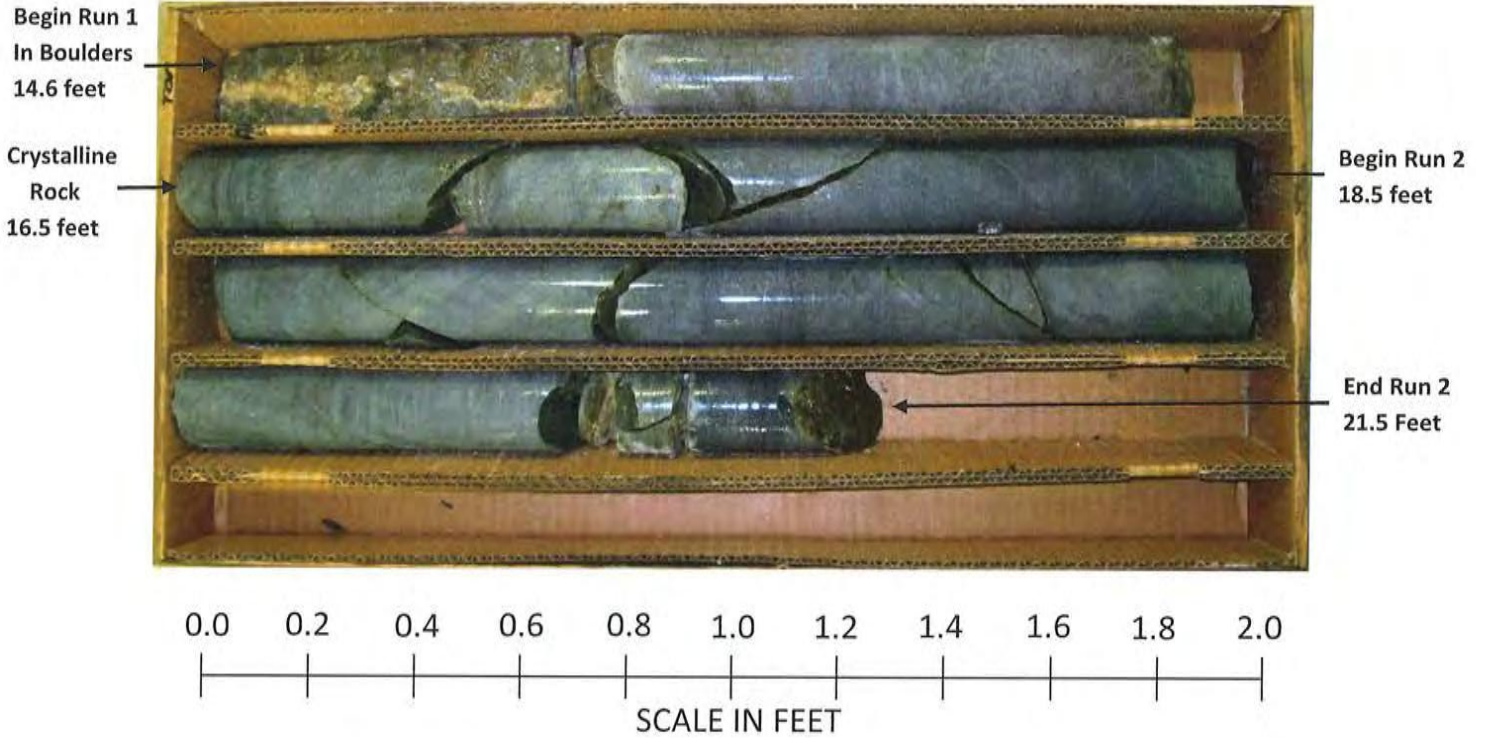


End Run 5  
21.7 feet



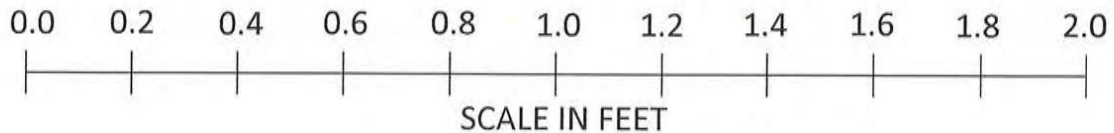


# Bridge No. 430175 on SR 1332 (Waterville Road) CORE PHOTOGRAPHS: EB2-A: Station 13+96, 11' LT





# Bridge No. 430175 on SR 1332 (Waterville Road) CORE PHOTOGRAPHS: EB2-B: Station 13+78, 10' RT





# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST P. Fahey										
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)									
BORING NO. RW1-A		STATION 12+43		OFFSET 7 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 1,434.4 ft		TOTAL DEPTH 2.0 ft		NORTHING 761,275		EASTING 783,784										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 85.5% 11/20/2015		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER C. Boyce		START DATE 10/24/16		COMP. DATE 10/24/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)		
1435	1432.4	2.0														



NCDOT BORE SINGLE 63R-3025-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT.GDT 10/31/16



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

WBS 14SP.20441.1		TIP N/A		COUNTY HAYWOOD		GEOLOGIST P. Fahey										
SITE DESCRIPTION Bridge No. 175 on SR 1332 (Waterville Road) over Big Creek							GROUND WTR (ft)									
BORING NO. RW1-B		STATION 12+29		OFFSET 9 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 1,435.0 ft		TOTAL DEPTH 12.5 ft		NORTHING 761,252		EASTING 783,786										
DRILL RIG/HAMMER EFF./DATE F&R3763 CME-550X 85.5% 11/20/2015				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER C. Boyce		START DATE 10/24/16		COMP. DATE 10/24/16		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)		
1435														1,435.0	0.0	GROUND SURFACE
														1,434.8	0.2	Asphalt Pavement
														1,434.0	1.0	Aggregate Base Stone
1430																ARTIFICIAL FILL
																Boulder Fill
1425	1,425.0	10.0												1,425.0	10.0	ALLUVIAL
	1,422.5	12.5	22	18	12									1,423.5	11.5	Brown, Silty, Fine SAND with rock fragments
														1,422.5	12.5	WEATHERED ROCK
																Brown Rock Fragments
																Boring Terminated at Elevation 1,422.5 ft ON
																CRYSTALLINE ROCK (PIGEON SILTSTONE)

NCDOT BORE SINGLE 63R-3028-0175 DIV. 14 BRIDGE 175.GPJ NC\_DOT.GDT 10/31/16