

REFERENCE: B-5541

PROJECT: 55041

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-6	CROSS SECTIONS
7-10	BORE LOGS

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY HAYWOOD
PROJECT DESCRIPTION REPLACE BRIDGE #236 ON I-40
OVER SR 1513 (THICKETY RD)

SITE DESCRIPTION _____

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	55041	1	10

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


CD JOHNSON

DO CHEEK

CJ COFFEY

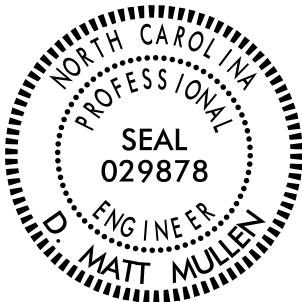
INVESTIGATED BY DM MULLEN

DRAWN BY DMM

CHECKED BY JCK 

SUBMITTED BY JCK

DATE 27/2022



DocuSigned by:
 02/07/2022

180098D3CD5440C...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS ($\leq 35\%$ PASSING #200)						SILT-CLAY MATERIALS ($> 35\%$ PASSING #200)						ORGANIC MATERIALS					
GROUP CLASS.	A-1		A-3		A-2		A-4		A-5		A-6		A-7		A-1, A-2		A-4, A-5	
SYMBOL	A-1-a		A-1-b		A-2-4		A-2-5		A-2-6		A-2-7		A-4		A-5		A-6	
% PASSING #10 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX		51 MN 10 MX		35 MX 35 MX		35 MX 35 MX		35 MX 35 MX		36 MN 36 MN		36 MN 36 MN		36 MN 36 MN	
MATERIAL PASSING #40 LL PI	— 6 MX		— NP		40 MX 41 MN 10 MX		41 MN 40 MX 11 MN		41 MN 40 MX 11 MN		40 MX 41 MN 11 MN		40 MX 41 MN 11 MN		40 MX 41 MN 11 MN		40 MX 41 MN 11 MN	
GROUP INDEX	0		0		0		4 MX		8 MX		12 MX		16 MX		NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. OF GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS							
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR						FAIR TO POOR		POOR		UNSUITABLE	

PI OF A-7-5 SUBGROUP IS \leq 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. 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.

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 WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LL $<$ 31
MODERATELY COMPRESSIBLE LL = 31 - 50
HIGHLY COMPRESSIBLE LL $>$ 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%
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

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

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
HL - 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
% - UNIT WEIGHT
%g - 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 MOIST
☐ _____
☐ _____

ADVANCING TOOLS:
☐ CLAY BITS
☐ 6" CONTINUOUS FLIGHT AUGER
☒ 8" HOLLOW AUGERS
☐ HARD FACED FINGER BITS
☐ TUNG-CARBIDE INSERTS
☐ CASING ☐ W/ ADVANCER
☐ TRICONE _____ * STEEL TEETH
☐ TRICONE _____ * TUNG.-CARB.
☐ CORE BIT
☐ _____

HAMMER TYPE:
☒ AUTOMATIC ☐ MANUAL
CORE SIZE:
☐ -B _____ ☐ -H _____
☐ -N _____
HAND TOOLS:
☐ POST HOLE DIGGER
☐ HAND AUGER
☐ SOUNDING ROD
☐ VANE SHEAR TEST
☐ _____

ROCK DESCRIPTION

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:

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 (CP)

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 SLI.)
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 (SLI.)
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. *IF TESTED, WOULD YIELD SPT REFUSAL*

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. *IF TESTED, WOULD YIELD SPT N VALUES $>$ 100 BPF*

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. *IF TESTED, WOULD YIELD SPT N VALUES $<$ 100 BPF*

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.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - 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.

ARTESIAN - 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.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (ROD) - 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.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - 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.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - 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 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SROD) - 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.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

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 FOOT
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	0.008 - 0.03 FEET
THINLY LAMINATED	$<$ 0.008 FEET

INDURATION

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.

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	MM IN.	305 12	75 3	2.0	0.25	0.05	0.005

CONSISTENCY OR DENSENESS

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	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.

BENCH MARK: N/A ALL ELEVATIONS FROM TIN

ELEVATION: N/A FEET

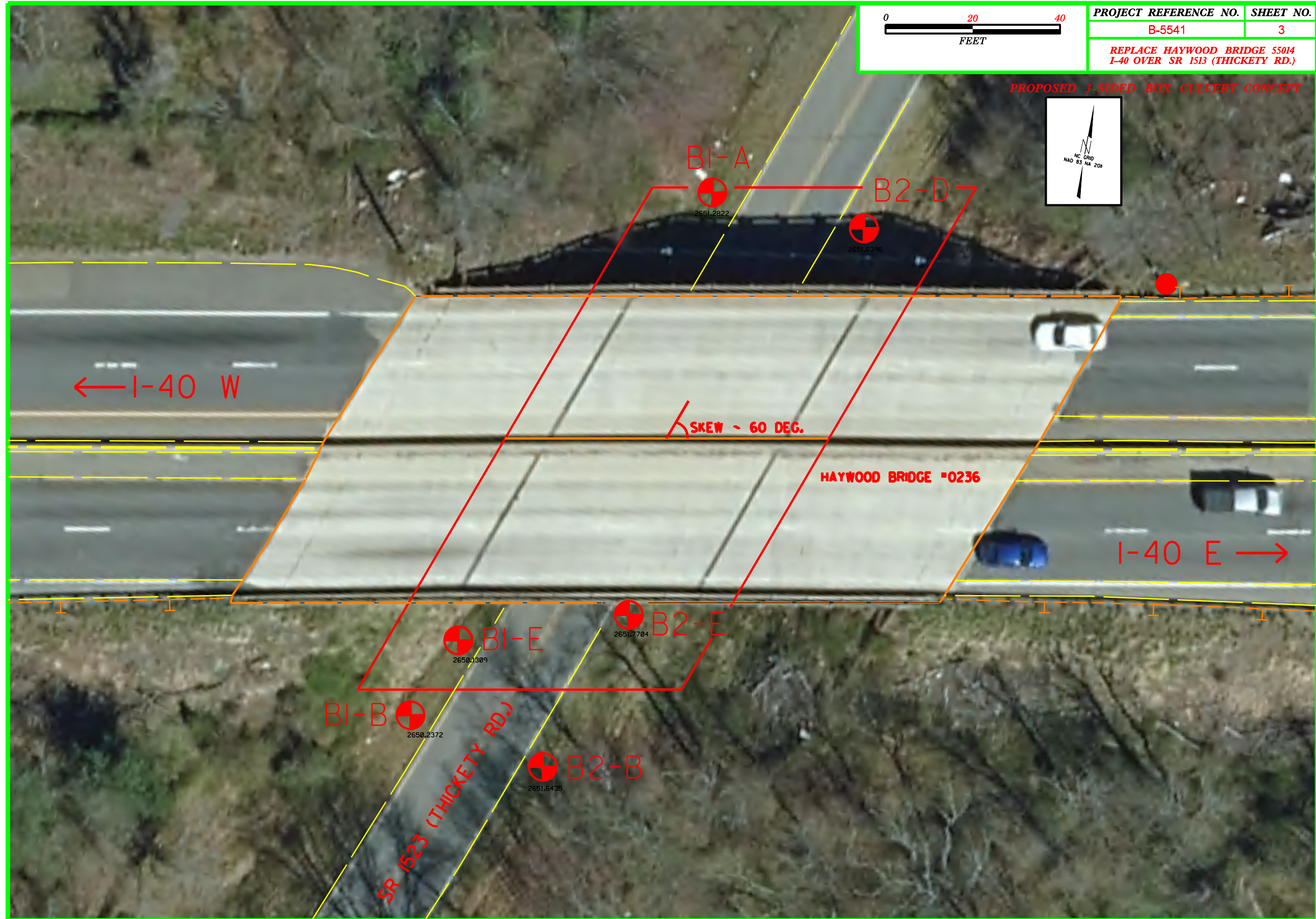
NOTES:

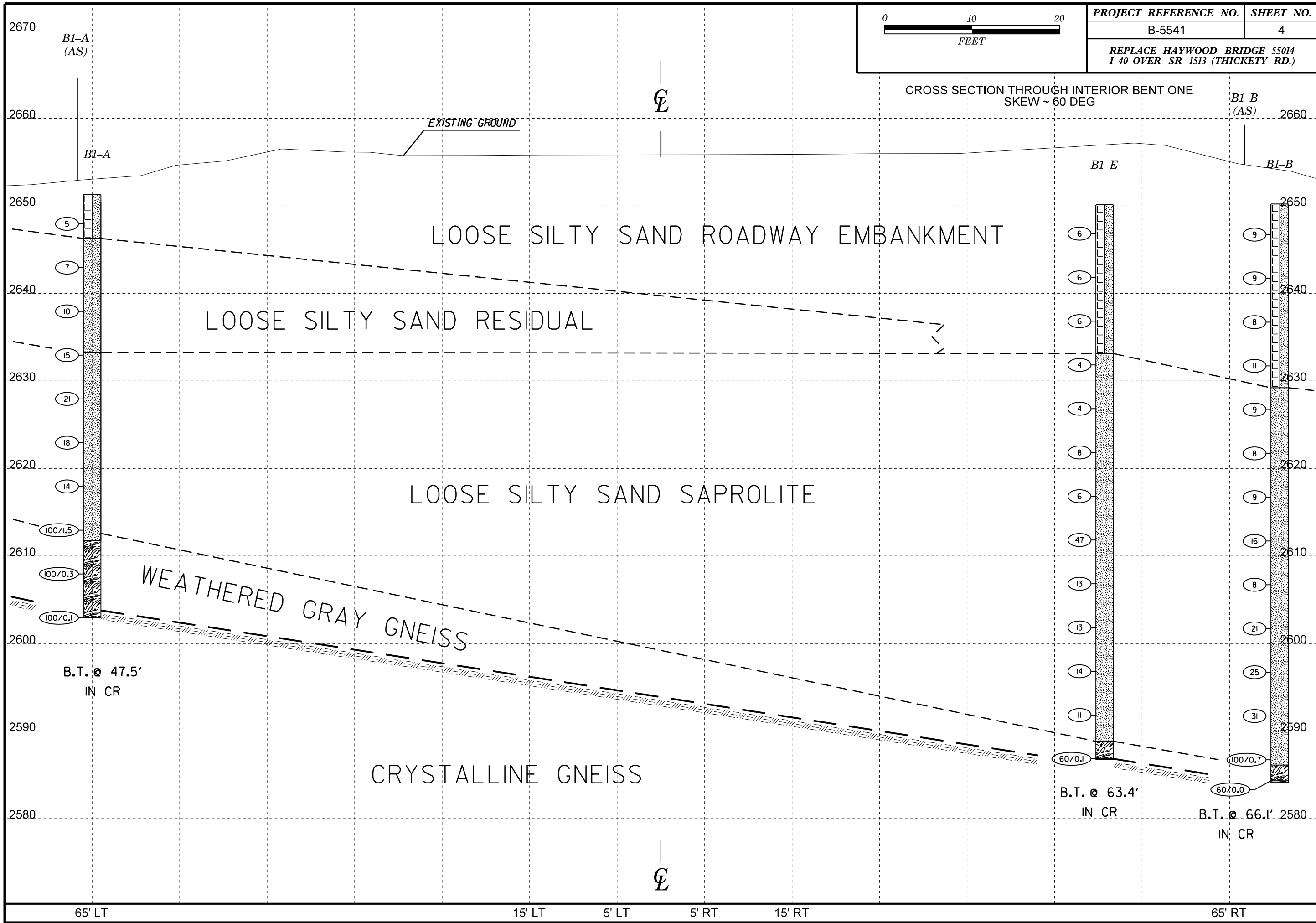
DATE: 8-15-14



PROJECT REFERENCE NO.	SHEET NO.
B-5541	3
REPLACE HAYWOOD BRIDGE 55014 I-40 OVER SR 1513 (THICKETY RD.)	

PROPOSED 3-SIDED BOX CULVERT CONCEPT





2670

2660

2650

2640

2630

2620

2610

2600

2590

2580

100' LT

90' LT

80' LT

70' LT

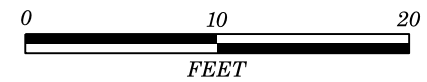
60' LT

50' LT

40' LT

30' LT

20' LT



PROJECT REFERENCE NO.	SHEET NO.
B-5541	5
REPLACE HAYWOOD BRIDGE 55014 I-40 OVER SR 1513 (THICKETY RD.)	

B2-A
(AS)

CROSS SECTION THROUGH INTERIOR BENT TWO
SKEW ~60 DEG.

EXISTING GROUND

B2-D

LOOSE SILTY SAND
ROADWAY EMBANKMENT

LOOSE SILTY SAND RESIDUAL

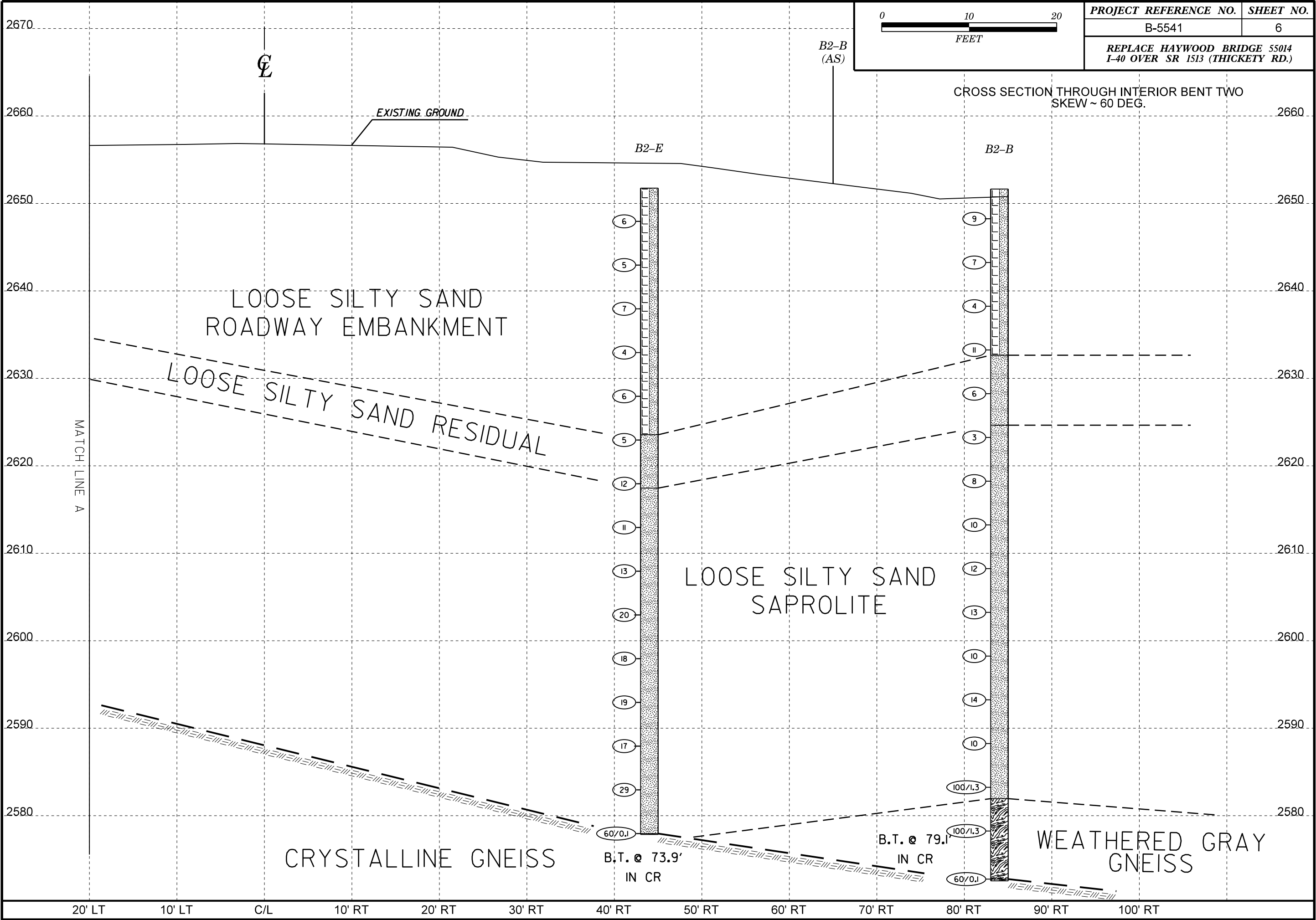
LOOSE SILTY
SAND SAPROLITE

WEATHERED GRAY GNEISS

B.T. @ 51.9'
IN CR

CRYSTALLINE GNEISS

MATCH LINE A



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 55041.1.1				TIP B-5541		COUNTY HAYWOOD		GEOLOGIST Johnson, C. D.								
SITE DESCRIPTION N/A										GROUND WTR (ft)						
BORING NO. B1-A		STATION N/A		OFFSET N/A		ALIGNMENT N/A		0 HR. Dry								
COLLAR ELEV. 2,651.3 ft		TOTAL DEPTH 47.6 ft		NORTHING 677,404		EASTING 844,445		24 HR. 19.5 Caved								
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019					DRILL METHOD H.S. Augers			HAMMER TYPE Automatic								
DRILLER Cheek, D. O.			START DATE 12/02/21		COMP. DATE 12/02/21		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						
2655																
2650														2,651.3	GROUND SURFACE	0.0
2645	2,648.8	2.5	1	3	2							M		2,646.3	ROADWAY EMBANKMENT Red brown, Slightly micaceous, clayey silty SAND with few gravels	5.0
2640	2,643.8	7.5	2	4	3							M			RESIDUAL Red brown, Slightly micaceous, clayey silty SAND with few gravels	
2635	2,638.8	12.5	2	4	6							M				
2630	2,633.8	17.5	3	7	8									2,633.3	SAPROLITE Orange brown, Clayey sandy SILT with med rock fragments and Manganese oxide seams throughout	18.0
2625	2,628.8	22.5	3	10	11							M				
2620	2,623.8	27.5	4	8	10							M				
2615	2,618.8	32.5	4	7	7											
2610	2,613.8	37.5	19	35	65/0.3									2,612.6	WEATHERED ROCK Weathered gray gneiss	38.7
2605					100/0.3											
					100/0.1									2,603.8	CRYSTALLINE ROCK Gray gniess Boring Terminated BY AUGER REFUSAL at Elevation 2,603.7 ft IN	47.5

WBS 55041.1.1				TIP B-5541		COUNTY HAYWOOD		GEOLOGIST Johnson, C. D.							
SITE DESCRIPTION N/A								GROUND WTR (ft)							
BORING NO. B1-B				STATION N/A		OFFSET N/A		ALIGNMENT N/A		0 HR. Dry					
COLLAR ELEV. 2,650.2 ft				TOTAL DEPTH 66.1 ft		NORTHING 677,274		EASTING 844,399		24 HR. Caved					
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER Cheek, D. O.				START DATE 12/03/21		COMP. DATE 12/03/21		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		MOI		ELEV. (ft)	
2655															
2650														2,650.2	GROUND SURFACE 0.0
2645	2,646.7	3.5	2	4	5	9									ROADWAY EMBANKMENT Red brown, slightly micaceous, clayey sandy silt with gravels
2640	2,641.7	8.5	2	3	6	9									
2635	2,636.7	13.5	2	3	5	8									
2630	2,631.7	18.5	4	4	7	11								2,629.2	21.0
2625	2,626.7	23.5	2	4	5	9									SAPROLITE Brown, slightly micaceous sandy SILT with a trace of clay and a few rock fragments
2620	2,621.7	28.5	1	4	4	8									
2615	2,616.7	33.5	3	4	5	9									
2610	2,611.7	38.5	3	8	8	16									
2605	2,606.7	43.5	2	4	4	8									
2600	2,601.7	48.5	2	7	14	21									
2595	2,596.7	53.5	7	6	19	25									
2590	2,591.7	58.5	7	13	18	31									
2585	2,586.7	63.5	34	66/0.2										2,586.1	64.1
	2,584.1	66.1	60/0.0											2,584.3	65.9
														2,584.1	66.1
															WEATHERED ROCK Weathered dark gray gneiss
															CRYSTALLINE ROCK Gray gneiss
															Boring Terminated BY AUGER REFUSAL at Elevation 2,584.1 ft IN

NCDOT BORE DOUBLE B5541_GEO_BRDG_HAYWOOD_55041.GPJ NC_DOT.GDT 12/25/22

WBS 55041.1.1		TIP B-5541		COUNTY HAYWOOD		GEOLOGIST Johnson, C. D.						
SITE DESCRIPTION N/A							GROUND WTR (ft)					
BORING NO. B1-E		STATION N/A		OFFSET N/A		ALIGNMENT N/A	0 HR. N/A					
COLLAR ELEV. 2,650.1 ft		TOTAL DEPTH 63.4 ft		NORTHING 677,292		EASTING 844,406	24 HR. 27.1 Caved					
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic						
DRILLER Cheek, D. O.		START DATE 12/02/21		COMP. DATE 12/02/21		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		
2655												
2650												
2645	2,646.8	3.3	1	3	3	6						2,650.1 GROUND SURFACE 0.0
2640	2,641.3	8.8	2	3	3	6						ROADWAY EMBANKMENT Red brown, micaceous, clayey sandy SILT with gravels
2635	2,636.8	13.3	2	3	3	6						
2630	2,631.8	18.3	2	2	2	4						2,633.1 SAPROLITE 17.0 White gray, kaolinized, very micaceous clayey sandy SILT with mica and weathered rock fragments
2625	2,626.8	23.3	woh	2	2	4						
2620	2,621.8	28.3	woh	4	4	5						
2615	2,616.8	33.3	woh	2	4	6						
2610	2,611.8	38.3	32	21	26	47						
2605	2,606.8	43.3	7	6	7	13						
2600	2,601.8	48.3	3	6	7	13						
2595	2,596.8	53.3	4	6	8	14						
2590	2,591.8	58.3	3	5	6	11						
	2,586.8	63.3	60/0.1									2,588.8 WEATHERED ROCK 61.3 2,586.8 WEATHERED gray schist 63.3 2,586.7 CRYSTALLINE ROCK 63.4 Crystalline gray schist Boring Terminated BY AUGER REFUSAL at Elevation 2,586.7 ft IN

WBS 55041.1.1			TIP B-5541			COUNTY HAYWOOD			GEOLOGIST Johnson, C. D.					
SITE DESCRIPTION N/A								GROUND WTR (ft)						
BORING NO. B-2B			STATION N/A			OFFSET N/A			ALIGNMENT N/A		0 HR. N/A			
COLLAR ELEV. 2,651.6 ft			TOTAL DEPTH 79.1 ft			NORTHING 677,268			EASTING 844,431		24 HR. 12.0 Dry			
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER Cheek, D. O.			START DATE 12/01/21			COMP. DATE 12/01/21			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				
2655														
2650														2,651.6 GROUND SURFACE 0.0
2645	2,647.6	4.0	2	4	5									ROADWAY EMBANKMENT Red brown, slightly micaceous, clayey sandy SILT with a few gravels
2640	2,642.6	9.0	2	3	4									
2635	2,637.6	14.0	woh	2	2									
2630	2,632.6	19.0	4	6	5									2,632.6 19.0
2625	2,627.6	24.0	1	2	4									RESIDUAL Red brown to white tan, coarse clayey sandy SILT with clay layers to fine clay silty sand layers with a few gravels
2620	2,622.6	29.0	woh	1	2									2,624.6 27.0
2615	2,617.6	34.0	2	3	5									SAPROLITE Gray brown orange, micaceous, clayey SILT
2610	2,612.6	39.0	3	4	6									
2605	2,607.6	44.0	1	3	9									
2600	2,602.6	49.0	3	5	8									
2595	2,597.6	54.0	2	4	6									
2590	2,592.6	59.0	woh	4	10									
2585	2,587.6	64.0	2	4	6									
2580	2,582.6	69.0	15	85/0.3										2,581.9 69.7
2575	2,577.6	74.0	25	75/0.3										WEATHERED ROCK Weathered gray gneiss

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 55041.1.1			TIP B-5541			COUNTY HAYWOOD			GEOLOGIST Johnson, C. D.					
SITE DESCRIPTION N/A									GROUND WTR (ft)					
BORING NO. B-2B			STATION N/A			OFFSET N/A			ALIGNMENT N/A					
COLLAR ELEV. 2,651.6 ft			TOTAL DEPTH 79.1 ft			NORTHING 677,268			EASTING 844,431					
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER Cheek, D. O.			START DATE 12/01/21			COMP. DATE 12/01/21			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)
2575							Match Line							
	2,572.6	79.0											2,572.7	78.9
			60/0.1										2,572.5	79.1
CRYSTALLINE ROCK Gray gneiss Boring Terminated BY AUGER REFUSAL at Elevation 2,572.5 ft IN														

WBS 55041.1.1			TIP B-5541			COUNTY HAYWOOD			GEOLOGIST Johnson, C. D.				
SITE DESCRIPTION N/A									GROUND WTR (ft)				
BORING NO. B2-D			STATION N/A			OFFSET N/A			ALIGNMENT N/A				
COLLAR ELEV. 2,651.6 ft			TOTAL DEPTH 51.9 ft			NORTHING 677,402			EASTING 844,480				
									0 HR. 28.0				
									24 HR. 25.6				
DRILL RIG/HAMMER EFF./DATE AFC8963 CME-550X 94% 04/08/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic				
DRILLER Cheek, D. O.			START DATE 12/02/21			COMP. DATE 12/02/21			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			
2655													GROUND SURFACE 0.0
2650	2,648.2	3.4	2	3	5								
2645	2,643.2	8.4	3	5	7								ROADWAY EMBANKMENT Red brown, micaceous, clayey sandy SILT with a few gravels
2640	2,638.2	13.4	1	1	2								
2635	2,633.2	18.4	1	2	1								RESIDUAL Orange brown, gray mottled, clayey silty SAND with mica
2630	2,628.2	23.4	2	4	4								
2625	2,623.2	28.4	3	5	7								SAPROLITE Dark brown, Slightly micaceous sandy SILT with clay and a few weathered rock fragments
2620	2,618.2	33.4	3	6	12								
2615	2,613.2	38.4	5	12	16								WEATHERED ROCK Weathered gray gneiss
2610	2,608.2	43.4	8	13	17								
2605	2,603.2	48.4	16	30	30								CRYSTALLINE ROCK Gray gneiss Boring Terminated BY AUGER REFUSAL at Elevation 2,599.7 ft IN
2600	2,599.7	51.9											
		60/0.0											

WBS 55041.1.1						TIP B-5541			COUNTY HAYWOOD			GEOLOGIST Johnson, C. D.				
SITE DESCRIPTION N/A												GROUND WTR (ft)				
BORING NO. B2-E			STATION N/A			OFFSET N/A			ALIGNMENT N/A			0 HR. 4.7 Caved				
COLLAR ELEV. 2,651.8 ft			TOTAL DEPTH 73.9 ft			NORTHING 677,305			EASTING 844,444			24 HR. FIAD				
DRILL RIG/HAMMER EFF./DATE AFC8963 CME-550X 94% 04/08/2019									DRILL METHOD H.S. Augers			HAMMER TYPE Automatic				
DRILLER Cheek, D. O.			START DATE 12/01/21			COMP. DATE 12/01/21			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)	
2655																
2650																
2645	2,648.0	3.8	2	2	4	•6									2,651.8	GROUND SURFACE
2640	2,643.0	8.8	1	2	3	•5										
2635	2,638.0	13.8	1	3	4	•7										
2630	2,633.0	18.8	1	2	2	•4										
2625	2,628.0	23.8	2	2	4	•6										
2620	2,623.0	28.8	1	2	3	•5									2,623.6	RESIDUAL
2615	2,618.0	33.8	2	6	6	•12									2,617.5	SAPROLITE
2610	2,613.0	38.8	3	4	7	•11										
2605	2,608.0	43.8	5	7	6	•13										
2600	2,603.0	48.8	5	7	13	•20										
2595	2,598.0	53.8	3	6	12	•18										
2590	2,593.0	58.8	3	7	12	•19										
2585	2,588.0	63.8	6	6	11	•17										
2580	2,583.0	68.8	7	13	16	•29										
	2,578.0	73.8													2,578.0	CRYSTALLINE ROCK
		60/0.1													2,577.9	Crystalline gray gneiss
															73.8	
															73.9	

[illegible]