STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-590165	1	20

PROJECT: BP10.R013.1 REFERENCE: SF-590165

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

SITE DESCRIPTION BRIDGE NO. 165 ON SR 5469 (SHOPTON RD.) OVER COFFEY CREEK

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3	SITE PLAN
4-6	CROSS SECTIONS
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20	SITE PHOTOGRAPH(S)

PERSONNEL

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INVESTIGATED BY J.E. BEVERLY

DRAWN BY J.E. BEVERLY

CHECKED BY C.R. LAVENDER III

SUBMITTED BY K.B. MILLER

DATE SEPTEMBER 2021

CAUTION NOTICE

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2. 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.

NORTH CAROLINA LICENSED SEAL 2029 GEOLOGIST KEVIN BENNETT MILLER

DocuSigned by:

11/1/2021

SIGNATURE DATE

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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
SF-590165	2

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

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 (≤ 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-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
MATERIAL PASSING #40 LL	—		—	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PI	6 MX		NP	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 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. 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 ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	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: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

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

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
- PW 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
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW 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_d - 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
- [X] CME-550X
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B _____
- [ ] -H _____
- [X] -NQ _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
SF-590165	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

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 YEILD 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.

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. 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 PEICES 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.

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.

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 ORIG;NAL POSITION AND DISLODGED 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 (RQD) - 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 (SRQD) - 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.

BENCH MARK: BM #1: STA 20+17.29, 81.78' RT, BENCH TIE SPIKE IN 15" PINE
N 519944.80, E 1422914.32
ELEVATION: 613.0 FEET

NOTES:

FIAD= FILLED IMMEDIATELY AFTER DRILLING

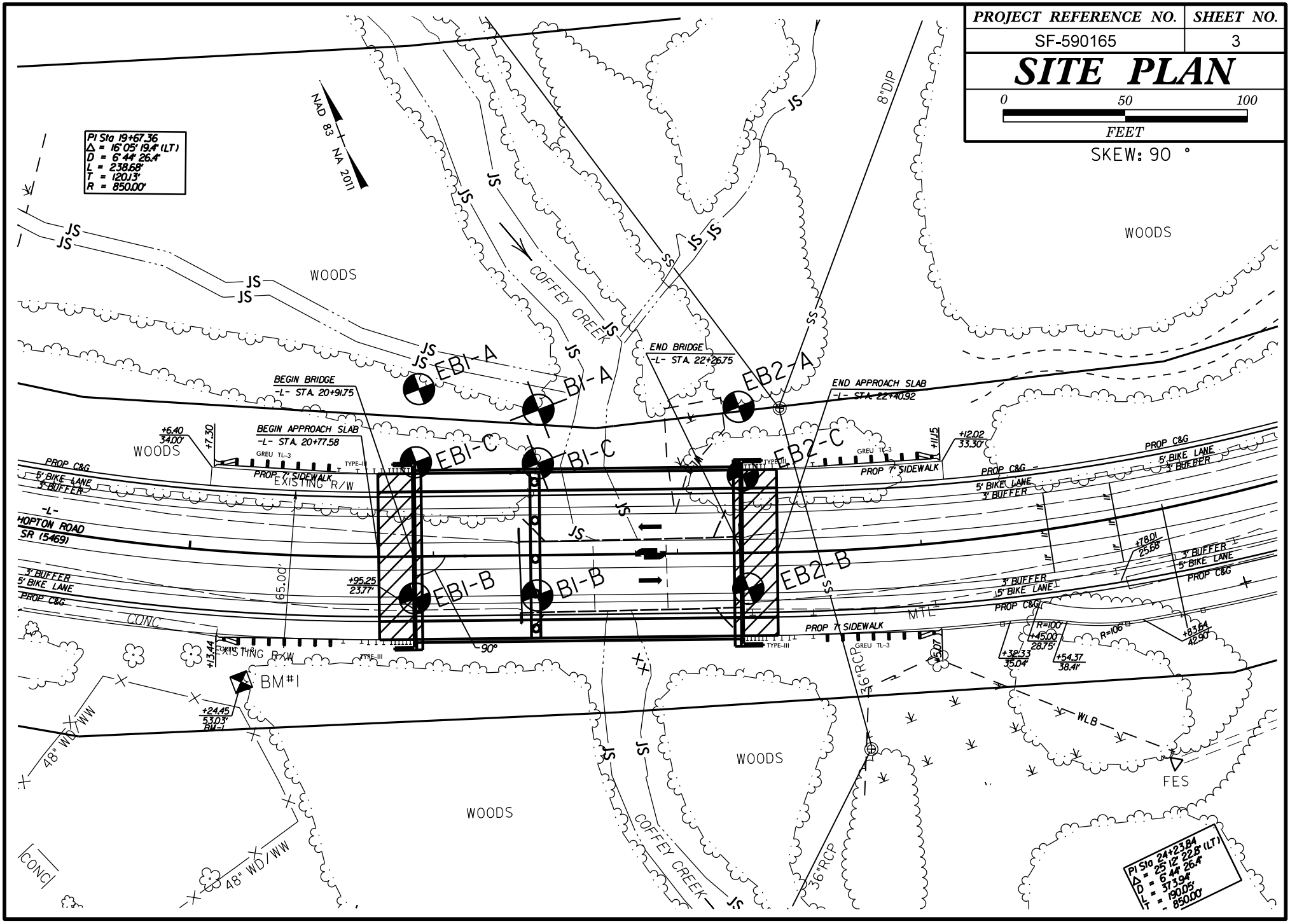
DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
SF-590165	3

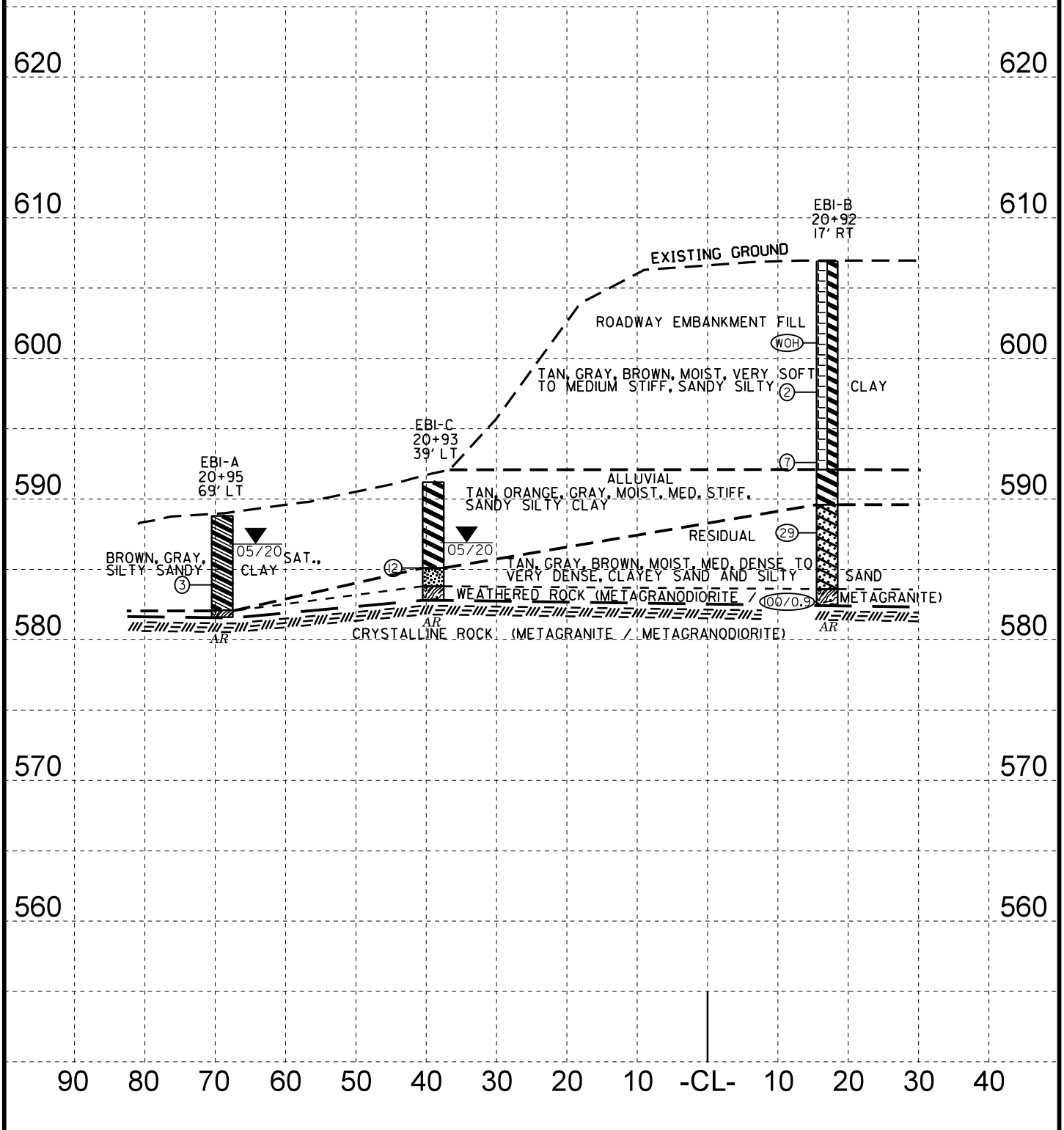
SITE PLAN

0 50 100
FEET

SKEW: 90 °



PROJECT REFERENCE NO.	SHEET NO.
SF-590165	4

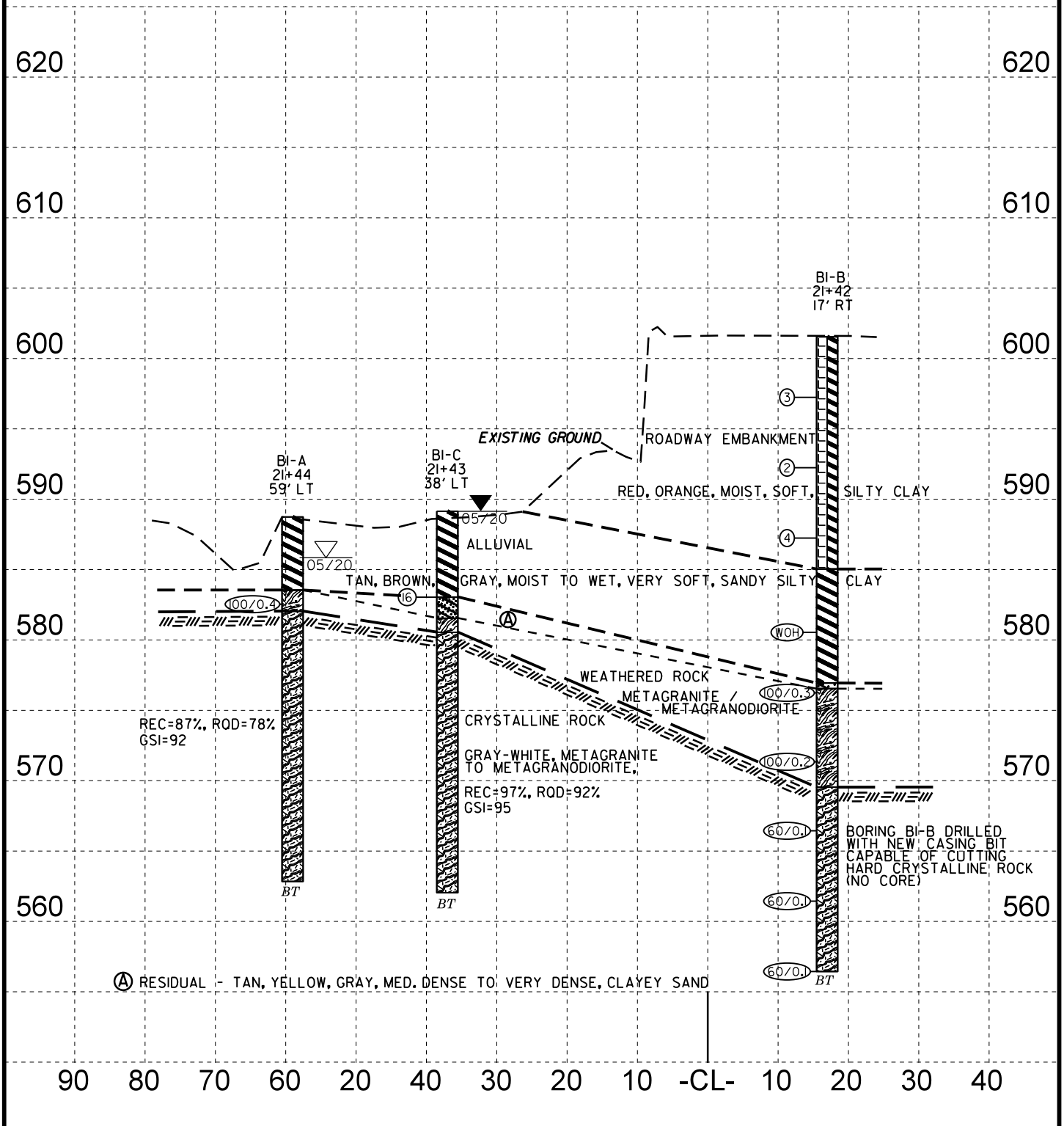


HORIZ. SCALE (FEET) 0 20 40

VE = 2:1

SECTION THRU EB1 (STA. 20+91.75)

PROJECT REFERENCE NO.	SHEET NO.
SF-590165	5



HORIZ. SCALE (FEET) 0 20 40

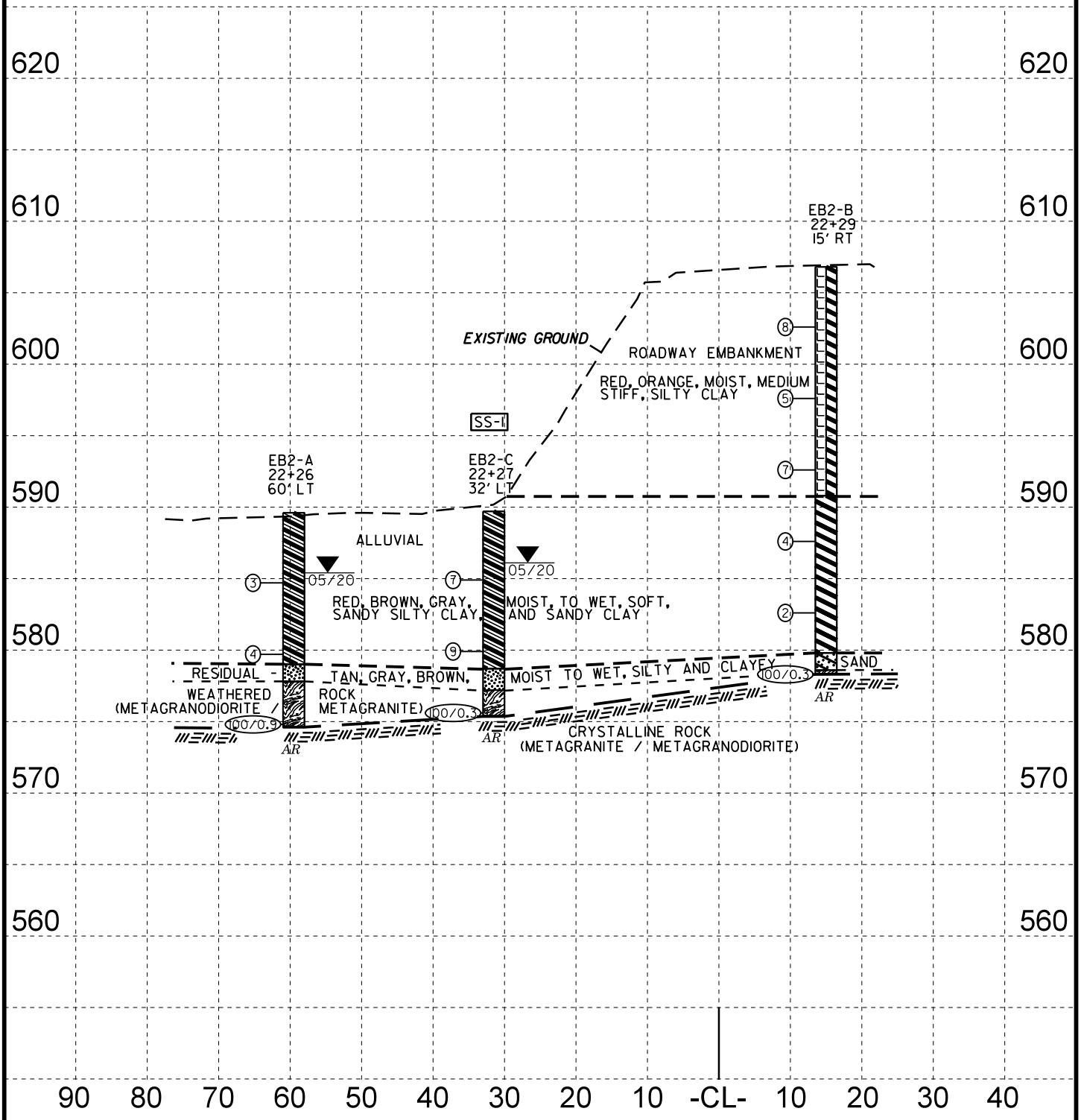
VE = 2:1

SECTION THRU BENT 1 (STA. 21+41.75)

PROJECT REFERENCE NO.	SHEET NO.
SF-590165	6

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	5.0' LT	22+22	3.8-5.3'	A-6(9)	39	14	9.6	26.1	30.1	34.1	100	96	71		



HORIZ. SCALE (FEET) 0 20 40

VE = 2:1

SECTION THRU EB2 (STA. 22+26.75)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 20+95	**OFFSET** 69 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 588.8 ft	**TOTAL DEPTH** 7.2 ft	**NORTHING** 520,031	**EASTING** 1,423,025	**24 HR.** 2.0
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/11/20	**COMP. DATE** 05/11/20	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
590										588.8 GROUND SURFACE	0.0
585	584.9	3.9	1	2	1	3		Sat.		**ALLUVIAL** BROWN, GRAY, SATURATED, SILTY SANDY CLAY	
										582.1	6.7
										581.6 **WEATHERED ROCK** (METAGRANODIORITE / METAGRANITE)	7.2

Boring Terminated by Auger Refusal at Elevation 581.6 ft on Crystalline Rock (Metagranodiorite / Metagranite)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 20+93	**OFFSET** 39 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 591.2 ft	**TOTAL DEPTH** 8.4 ft	**NORTHING** 520,004	**EASTING** 1,423,013	**24 HR.** 4.3
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/11/20	**COMP. DATE** 05/11/20	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)		DEPTH (ft)
595												
										591.2	GROUND SURFACE	0.0
590											**ALLUVIAL** TAN-ORANGE, WET, SANDY SILTY CLAY	
	586.1	5.1										
585			4	5	7	12		M		585.1		6.1
										583.8	**RESIDUAL** BROWN, GRAY, MOIST, SILTY SAND	7.4
										582.8	**WEATHERED ROCK** (METAGRANODIORITE / METAGRANITE)	8.4

Boring Terminated by Auger Refusal at Elevation 582.8 ft on Crystalline Rock (Metagranodiorite / Metagranite)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+92	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 606.9 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 519,916	**EASTING** 1,422,993	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 08/11/21	**COMP. DATE** 08/11/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
610											
										606.9 GROUND SURFACE	0.0
605										**ROADWAY EMBANKMENT** TAN, GRAY, BROWN, MOIST, VERY SOFT TO MEDIUM STIFF, SANDY SILTY CLAY	
	602.1	4.8	WOH	WOH	WOH	0		M			
600											
	598.6	8.3	WOH	WOH	2	2		M			
595											
	593.6	13.3	2	2	5	7		M		592.1	14.8
590										**ALLUVIAL** GRAY, MOIST, MED. STIFF, SANDY SILTY CLAY	
	588.6	18.3	15	12	17	29		M		589.6 **RESIDUAL** TAN, GRAY, BROWN, MOIST, MED. DENSE TO VERY DENSE, CLAYEY SAND	17.3
585											
	583.6	23.3	35	65/0.4		100/0.9				583.6	23.3
										582.4 **WEATHERED ROCK** GRAY, BLACK, WHITE, WEATHERED METAGRANITE / METAGRANODIORITE	24.5

Boring Terminated by Auger Refusal at Elevation 582.4 ft on Crystalline Rock (Metagranodiorite / Metagranite)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 21+44	**OFFSET** 59 ft LT	**ALIGNMENT** -L-
COLLAR ELEV. 588.7 ft	**TOTAL DEPTH** 25.9 ft	**NORTHING** 520,006	**EASTING** 1,423,068
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ Core	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/12/20	**COMP. DATE** 05/12/20	**SURFACE WATER DEPTH** N/A

GROUND WTR (ft)	
0 HR.	2.9
24 HR.	FIAD

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
590											
										588.7 GROUND SURFACE	0.0
585										**ALLUVIAL** TAN, BROWN, GRAY, SANDY SILTY CLAY	
	583.5	5.2	100/0.4			100/0.4				583.5	5.2
580										582.0 **WEATHERED ROCK** (METAGRANODIORITE / METAGRANITE)	6.7
										CRYSTALLINE ROCK GRAY-WHITE, METAGRANODIORITE TO METAGRANITE, REC=87%, RQD=78% GSI=92	
575											
570											
565											
										562.8	25.9
										Boring Terminated at Elevation 562.8 ft in Crystalline Rock (Metagranodiorite / Metagranite)	

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 17BP.10.R.138	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 21+44	**OFFSET** 59 ft LT	**ALIGNMENT** -L-	**0 HR.** 2.9
COLLAR ELEV. 588.7 ft	**TOTAL DEPTH** 25.9 ft	**NORTHING** 520,006	**EASTING** 1,423,068	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ Core	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/12/20	**COMP. DATE** 05/12/20	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ	**TOTAL RUN** 19.2 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))
582											Begin Coring @ 6.7 ft
	582.0	6.7	4.2		(1.9) 45%	(0.8) 19%		(16.7) 87%	(14.9) 78%		582.0 / 6.7 **CRYSTALLINE ROCK** GRAY-WHITE, VERY SLIGHTLY WEATHERED TO FRESH, VERY HARD, METAGRANODIORITE TO METAGRANITE, WITH VERY CLOSE TO WIDE FRACTURE SPACING GSI=92
580	577.8	10.9	5.0		(5.0) 100%	(4.9) 98%					
575	572.8	15.9	5.0		(5.0) 100%	(4.5) 90%					
570	567.8	20.9	5.0		(4.8) 96%	(4.7) 94%					
565	562.8	25.9									562.8 / 25.9 Boring Terminated at Elevation 562.8 ft in Crystalline Rock (Metagranodiorite / Metagranite)

CORE PHOTOGRAPHS:
Bridge No. 165 on SR 5469 (Shopton Rd.) over Coffey Creek
B1-A: -L- Station 21+44, 59’ LT

Begin Core 6.7 feet

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End Core 25.9 feet

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 21+43	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** 3.7
COLLAR ELEV. 589.1 ft	**TOTAL DEPTH** 27.1 ft	**NORTHING** 519,985	**EASTING** 1,423,060	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ Core	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/11/20	**COMP. DATE** 05/11/20	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
590										589.1 GROUND SURFACE	0.0
585	584.0	5.1	3	5	11	16				**ALLUVIAL** TAN, BROWN, GRAY, SANDY SILTY CLAY	
										583.0	6.1
										581.5 **RESIDUAL** TAN, YELLOW, GRAY, CLAYEY SAND	7.6
580										580.5 **WEATHERED ROCK** (METAGRANITE / METAGRANODIORITE)	8.6
575										**CRYSTALLINE ROCK** GRAY-WHITE, METAGRANITE TO METAGRANODIORITE, REC=97%, RQD=92% GSI=95	
570											
565											
										562.0	27.1
										Boring Terminated at Elevation 562.0 ft in Crystalline Rock (Metagranodiorite / Metagranite)	

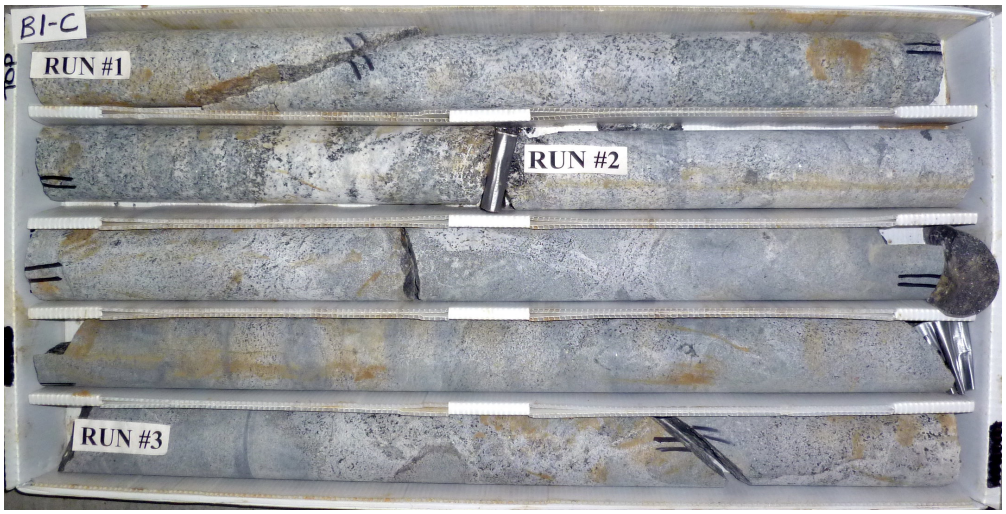
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 17BP.10.R.138	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 21+43	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** 3.7
COLLAR ELEV. 589.1 ft	**TOTAL DEPTH** 27.1 ft	**NORTHING** 519,985	**EASTING** 1,423,060	**24 HR.** 0.0
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ Core	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/11/20	**COMP. DATE** 05/11/20	**SURFACE WATER DEPTH** N/A
CORE SIZE NQ	**TOTAL RUN** 18.5 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))
580.5											Begin Coring @ 8.6 ft
580	580.5	8.6	3.2		(2.9) 91%	(2.9) 91%		(18.0) 97%	(17.1) 92%		580.5 / 8.6 **CRYSTALLINE ROCK** GRAY-WHITE, VERY SLIGHTLY WEATHERED TO FRESH, VERY HARD, METAGRANODIORITE TO METAGRANITE, WITH CLOSE TO WIDE FRACTURE SPACING GSI=95
	577.3	11.8	5.0		(4.8) 96%	(4.4) 88%					
575	572.3	16.8	5.0		(5.0) 100%	(4.6) 92%					
570	567.3	21.8	5.3		(5.3) 100%	(5.2) 98%					
565	562.0	27.1									562.0 / 27.1 Boring Terminated at Elevation 562.0 ft in Crystalline Rock (Metagranodiorite / Metagranite)

CORE PHOTOGRAPHS:
Bridge No. 165 on SR 5469 (Shopton Rd.) over Coffey Creek
B1-C: -L- Station 21+43, 38 ft LT

Begin Core 8.6 feet



0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

End Core 27.1 feet

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 21+42	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 601.5 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 519,935	**EASTING** 1,423,040	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 08/12/21	**COMP. DATE** 08/12/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
605											
										601.5 GROUND SURFACE	0.0
600										**ROADWAY EMBANKMENT** RED, ORANGE, MOIST, SOFT, SILTY CLAY	
	598.2	3.3	1	2	1	3		M			
595											
	593.2	8.3	2	1	1	2		M			
590											
	588.2	13.3	2	2	2	4		M			
585										585.0	16.5
										ALLUVIAL GRAY, WET, VERY SOFT, SANDY SILTY CLAY	
	581.5	20.0	WOH	WOH	WOH	0		W			
580											
	576.5	25.0	100/0.3			100/0.3				576.9	24.6
575										576.5 **RESIDUAL** TAN, GRAY, MOIST, VERY DENSE, CLAYEY SAND	25.0
	571.5	30.0	100/0.2			100/0.2				**WEATHERED ROCK** GRAY, BLACK, WHITE, WEATHERED METAGRANITE / METAGRANODIORITE	
570										569.5	32.0
	566.5	35.0	60/0.1			60/0.1				**CRYSTALLINE ROCK** GRAY, WHITE, BLACK, VERY HARD, METAGRANITE / METAGRANODIORITE	
565										NOTE: THIS BORING DRILLED WITH NEW CASING BIT CAPABLE OF CUTTING HARD CRYSTALLINE ROCK (NO CORE)	
	561.5	40.0	60/0.1			60/0.1					
560											
	556.5	45.0	60/0.1			60/0.1				556.4	45.1
										Boring Terminated at Elevation 556.4 ft in Crystalline Rock (Metagranodiorite / Metagranite)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 22+26	**OFFSET** 60 ft LT	**ALIGNMENT** -L-	**0 HR.** 6.2
COLLAR ELEV. 589.6 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 519,978	**EASTING** 1,423,145	**24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/06/20	**COMP. DATE** 05/06/20	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
590										589.6 GROUND SURFACE	0.0
585	585.7	3.9	2	1	2	3		M		**ALLUVIAL** RED, BROWN, GRAY, MOIST, TO WET, SANDY SILTY CLAY	
580	580.7	8.9	1	2	2	4		W		579.0	10.6
										577.8 **RESIDUAL** GRAY, WHITE, MOIST, CLAYEY SILTY SAND WITH SOME MICA	11.8
575	575.7	13.9	13	87/0.4		100/0.9				574.6 **WEATHERED ROCK** (METAGRANODIORITE / METAGRANITE)	15.0

Boring Terminated by Auger Refusal at Elevation 574.6 ft on Crystalline Rock (Metagranodiorite / Metagranite)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 22+27	**OFFSET** 32 ft LT	**ALIGNMENT** -L-	**0 HR.** 6.0
COLLAR ELEV. 589.7 ft	**TOTAL DEPTH** 14.3 ft	**NORTHING** 519,951	**EASTING** 1,423,137	**24 HR.** 3.6
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 05/06/20	**COMP. DATE** 05/06/20	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
590										589.7 GROUND SURFACE	0.0
585	585.9	3.8	2	3	4	7	SS-1	M		**ALLUVIAL** RED, BROWN, GRAY, MOIST, SANDY SILTY CLAY	
580	580.9	8.8	3	3	6	9		W		578.7	11.0
	575.9	13.8	100/0.3			100/0.3				577.2 **RESIDUAL** GRAY, MOIST TO WET, CLAYEY SILTY SAND	12.5
										575.4 **WEATHERED ROCK** (METAGRANODIORITE / METAGRANITE)	14.3

Boring Terminated by Auger Refusal at Elevation 575.4 ft on Crystalline Rock (Metagranodiorite / Metagranite)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 22+29	**OFFSET** 15 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 606.8 ft	**TOTAL DEPTH** 28.5 ft	**NORTHING** 519,907	**EASTING** 1,423,122	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550X 89% 12/16/2019		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic
DRILLER B.E. Foster	**START DATE** 08/11/21	**COMP. DATE** 08/11/21	**SURFACE WATER DEPTH** N/A

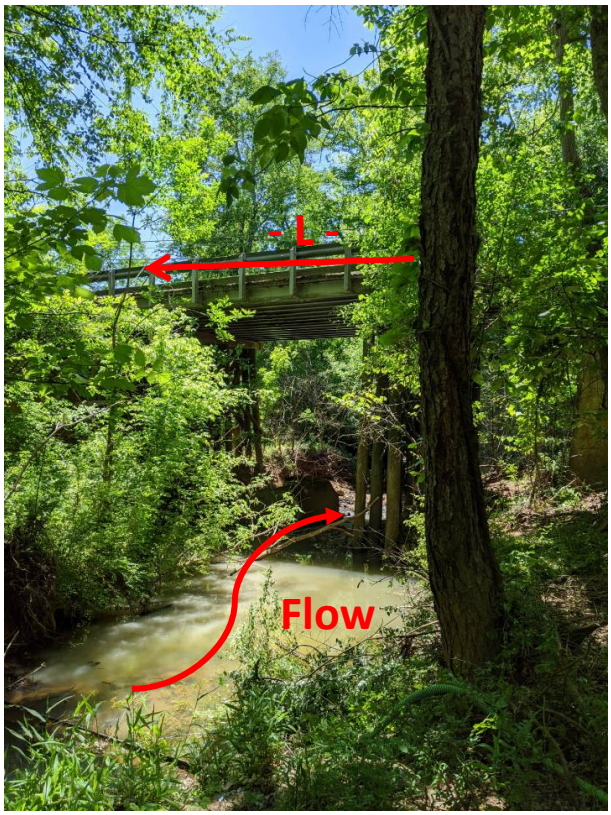
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
610											
										606.8 GROUND SURFACE	0.0
605										**ROADWAY EMBANKMENT** RED, ORANGE, MOIST, MEDIUM STIFF, SILTY CLAY	
	603.6	3.2	5	4	4	8		M			
600											
	598.6	8.2	2	3	2	5		M			
595											
	593.6	13.2	6	3	4	7		M			
590										590.8	16.0
	588.6	18.2	2	2	2	4		M		**ALLUVIAL** GRAY, MOIST, SOFT, SANDY SILTY CLAY	
585											
	583.6	23.2	1	1	1	2					
580										579.8	27.0
	578.6	28.2	100/0.3			100/0.3				578.6 **RESIDUAL** TAN, GRAY, BROWN, MOIST, STIFF TO HARD, SILTY CLAYEY SAND	28.2
										578.3 **WEATHERED ROCK** WEATHERED METAGRANITE / METAGRANODIORITE	28.5

Boring Terminated by Auger Refusal at Elevation 578.3 ft on Crystalline Rock (Metagranodiorite / Metagranite)

Bridge No. 165 on SR 5469 (Shopton Rd.) over Coffey Creek

SITE PHOTOGRAPHS

Photograph No. 1: View looking EB1 to EB2



Photograph No. 2: View looking downstream

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

December 1, 2021

MEMORANDUM TO:	Brett D. Canipe, PE Division Engineer
ATTENTION:	Luther G. Haywood, PE or Division Bridge Program Manager
FROM:	John L. Pilipchuk, L.G., P.E. State Geotechnical Engineer
STATE PROJECT:	BP10.R013.1 (SF-590165)
COUNTY:	MECKLENBURG
DESCRIPTION:	Replace Bridge No. 165 on SR 5469 (Shopton Rd) over Coffey Creek
SUBJECT:	Water Line Subsurface Investigation

DocuSigned by:
John L. Pilipchuk
52C44B94B8BE444...

DS
ENW

The Geotechnical Engineering Unit the following report for the above referenced project:

- ☐ Roadway Subsurface Investigation (# Of Pages) pages
- ☐ Geotechnical Report - Recommendations (# Of Pages) pages
- ☐ Structure Inventory (# Of Pages) pages
- ☐ Foundation Design Recommendation (# Of Pages) pages
- ☐ Design Calculations (# Of Pages) pages
- ☐ Special Provisions (# Of Pages) pages
- ☒ Water Line Subsurface Investigation Report (5) pages

Please call Kevin B. Miller, PG at 980-258-6409 if there are any questions concerning this memorandum.

DS
KBM

Attachment

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH, NC 27699-1589

Telephone: (919) 707-6850
Customer Service: 1-877-368-4968

Website: www.ncdot.gov

Location:
1020 BIRCH RIDGE DRIVE
RALEIGH, NC 27610

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BP10.R013.1	1	5

REFERENCE: BP10.R013.1

PROJECT: SF-590165

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG

PROJECT DESCRIPTION REPLACE BRIDGE NO. 165 ON SR 5469 (SHOPTON ROAD) OVER COFFEY CREEK

SITE DESCRIPTION WATERLINE BORINGS

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	BORE LOGS

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:
1. 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.
2. 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

J.K. STICKNEY

C. ODOM

L. ARD

INVESTIGATED BY J.E. BEVERLY

DRAWN BY CAROLINAS GEOTECHNICAL GROUP

CHECKED BY K.B. MILLER

SUBMITTED BY K. B. MILLER

DATE NOVEMBER 2021

CADD Work Prepared in the Office of:

CAROLINAS GEOTECHNICAL GROUP
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CHARLOTTE, NC 28227
(980) 339-8684

NORTH CAROLINA LICENSED SEAL 2029 GEOLOGIST KEVIN BENNETT MILLER

DocuSigned by:

Dec 1, 2021

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SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BP10.R013.1	2

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 (≤ 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-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
MATERIAL PASSING #40 LL	—		—	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PI	6 MX		NP	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 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. 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 ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

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

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	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: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

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

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
- PW 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
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW 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_d - 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-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D50
- [ ] _____

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

HAMMER TYPE:
- [X] 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 YEILD 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.

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. 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 PEICES 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.

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.

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 DISLODGED 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 (RQD) - 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 (SRQD) - 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.

BENCH MARK: N/A

ELEVATION: - FEET

NOTES:

BORING LOCATION AND ELEVATION SURVEY PERFORMED BY TGS . ENGINEERS DATED 11/12/2021

ROADWAY DESIGN FILES PROVIDED BY NCDOT DATED 4/02/2020

DATE: 8-15-14

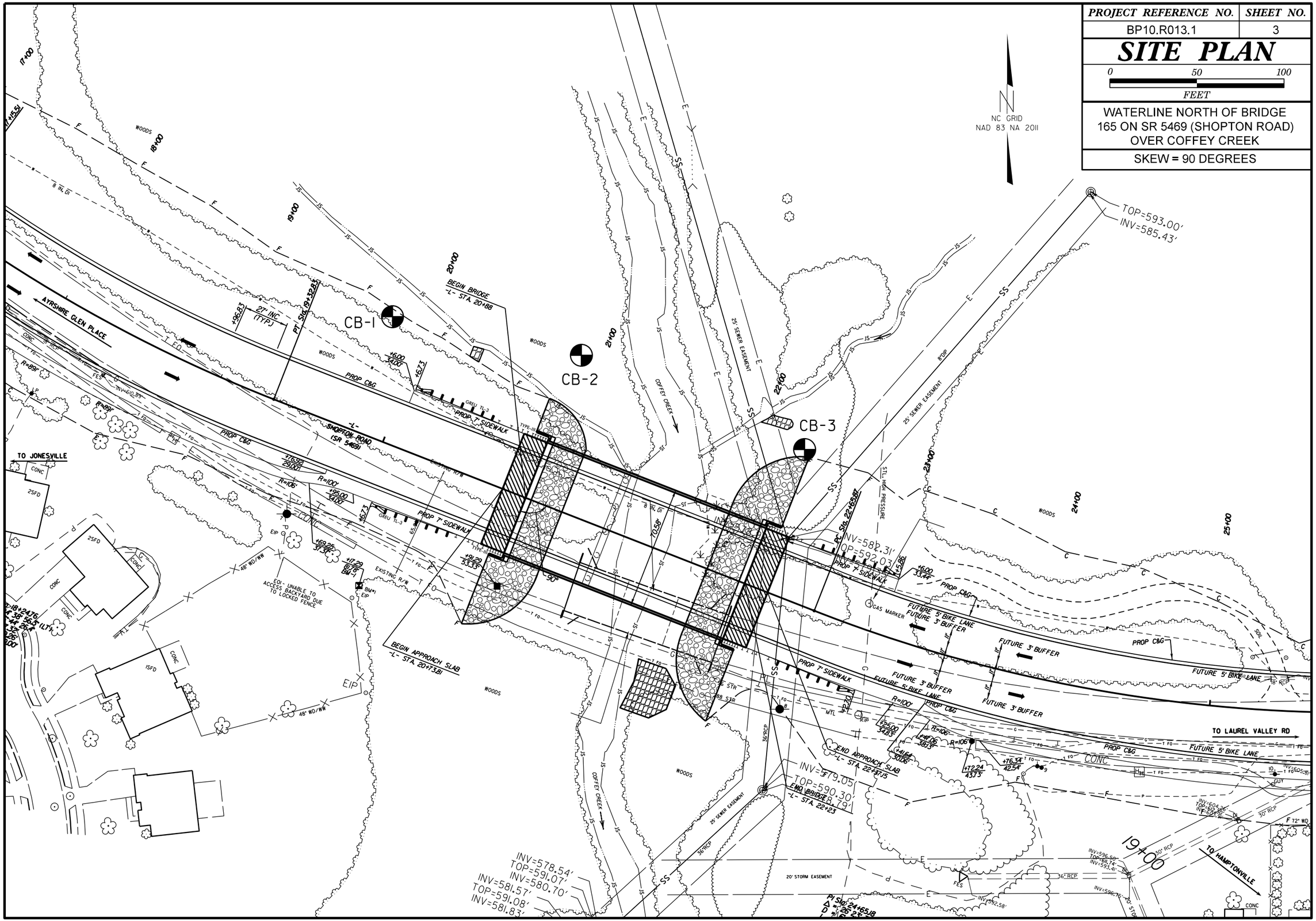
PROJECT REFERENCE NO.	SHEET NO.
BP10.R013.1	3

SITE PLAN

0 50 100
FEET

WATERLINE NORTH OF BRIDGE
165 ON SR 5469 (SHOPTON ROAD)
OVER COFFEY CREEK

SKEW = 90 DEGREES



GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Water Line North of Bridge 165 on SR 5469 over Coffey Creek			**GROUND WTR (ft)**
BORING NO. CB-1	**STATION** 19+79	**OFFSET** 69 ft LT	**ALIGNMENT** L	**0 HR.** 9.7
COLLAR ELEV. 590.0 ft	**TOTAL DEPTH** 11.5 ft	**NORTHING** 520,099	**EASTING** 1,422,934	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76% 06/14/2021		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 11/04/21	**COMP. DATE** 11/04/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
590										590.0 GROUND SURFACE	0.0
585	585.7	4.3	1	0	1	1		M		**ALLUVIAL** Very Loose, Gray-Brown, Clayey, Silty Fine SAND (A-2-6)	
580	580.7	9.3	3	9	12	21		M		580.7	9.3
										578.6 **RESIDUAL** Medium Dense, Gray-White, Clayey, Silty Fine SAND (A-2-6)	11.4
										578.5 **WEATHERED ROCK** Gray-Green, (METAGRANITE / METAGRANODIORITE)	11.5

Boring Terminated by Auger Refusal at Elevation 578.5 ft On Crystalline Rock (METAGRANITE / METAGRANODIORITE)

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Water Line North of Bridge 165 on SR 5469 over Coffey Creek			**GROUND WTR (ft)**
BORING NO. CB-2	**STATION** 20+88	**OFFSET** 88 ft LT	**ALIGNMENT** L	**0 HR.** 5.0
COLLAR ELEV. 589.3 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 520,077	**EASTING** 1,423,042	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76% 06/14/2021		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 11/04/21	**COMP. DATE** 11/04/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
590										589.3 GROUND SURFACE	0.0
585	585.3	4.0	2	1	2	3		M		**ALLUVIAL** Very Loose, Gray-Brown, Clayey, Silty Fine SAND (A-2-6)	
										582.3 Soft, Gray, Silty CLAY (A-7)	7.0
580	580.3	9.0	2	3	97/0.01	100/0.6				579.8	9.5
										579.3 **WEATHERED ROCK** Gray-Green, (METAGRANITE / METAGRANODIORITE)	10.0

Boring Terminated by Auger Refusal at Elevation 579.3 ft On Crystalline Rock (METAGRANITE / METAGRANODIORITE)

NCDOT BORE DOUBLE SF-590165_GEO_BRDG_WATERLINE_BL.GPJ NC_DOT.GDT 11/14/21

GEOTECHNICAL BORING REPORT
BORE LOG

WBS BP10.R013.1	**TIP** SF-590165	**COUNTY** MECKLENBURG	**GEOLOGIST** Stickney, J. K.
SITE DESCRIPTION Replace Water Line North of Bridge 165 on SR 5469 over Coffey Creek			**GROUND WTR (ft)**
BORING NO. CB-3	**STATION** 22+27	**OFFSET** 84 ft LT	**ALIGNMENT** L	**0 HR.** 9.5
COLLAR ELEV. 590.5 ft	**TOTAL DEPTH** 14.8 ft	**NORTHING** 520,005	**EASTING** 1,423,216	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 76% 06/14/2021		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER C. Odom	**START DATE** 11/04/21	**COMP. DATE** 11/04/21	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
595											
590										590.5 GROUND SURFACE	0.0
	586.5	4.0	1	1	2	3		M		**ALLUVIAL** Very Loose, Gray, Clayey, Silty Fine SAND (A-2-6)	
585											
	581.5	9.0	No Drive	No Drive	No Drive			M			
580										578.5	12.0
	576.5	14.0	50	50/0.3		100/0.8				**WEATHERED ROCK** Gray-Green, (METAGRANITE / METAGRANODIORITE) 575.7	14.8
										Boring Terminated at Elevation 575.7 ft In Weathered Rock (METAGRANITE / METAGRANODIORITE)	