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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AA	1	11

REFERENCE: U-2579AA

PROJECT: 34839

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY FORSYTH

PROJECT DESCRIPTION WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION (FUTURE I-74) FROM US 311 TO I-40

SITE DESCRIPTION BOX CULVERT @ -Y2- STA. 78+69 ON I-74/US 311 OVER SOUTH FORK MUDDY CREEK

CONTENTS

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.

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NOTES:
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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.

PERSONNEL

S&ME, Inc.

INVESTIGATED BY S&ME, Inc.

DRAWN BY J.R. SWARTLEY

CHECKED BY S.S. LANEY

SUBMITTED BY S.S. LANEY

DATE MARCH 2019

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4/19/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	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 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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
	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		
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PLASTIC RANGE (PI)		
PL — PLASTIC LIMIT		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT		
	- 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] CPT/DMT RIG
- [X] D-50

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: ELEVATIONS TAKEN FROM TIN FILE "U2579AA_ls_TIN.tin", DATED 02/15/2017

ELEVATION: N/A FEET

NOTES:

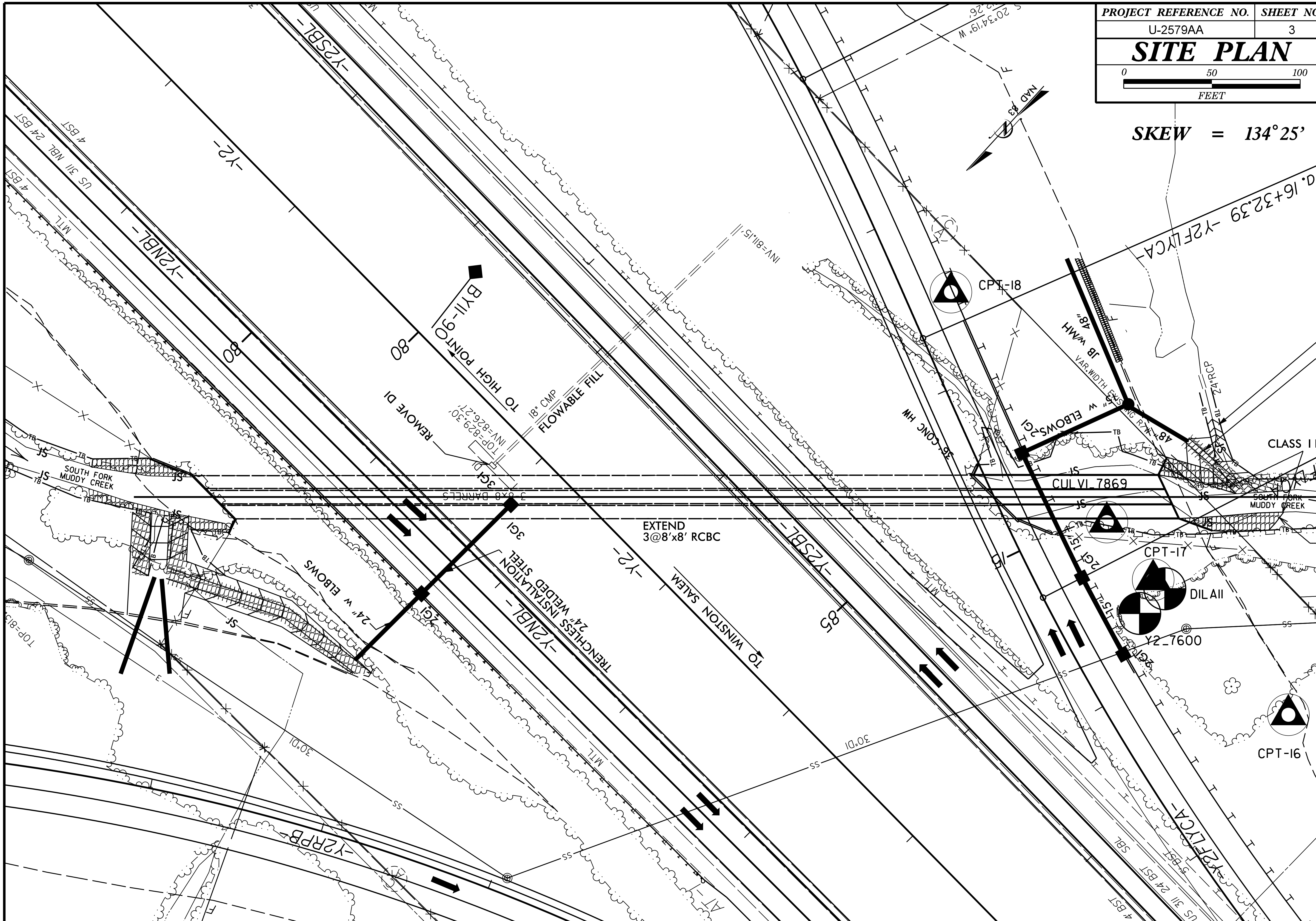
DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	3

SITE PLAN

0 50 100
FEET

SKEW = 134° 25'



-Y2-
-Y2NBL-
-Y2SBL-
-Y2RPB-
-Y2FLYCA-
Sta. 16+32.39 -Y2FLYCA-
US 311 NBL 24' BST
US 311 SBL 24' BST
4' BST
MTL
BY11-9
TO HIGH POINT
REMOVE DI
18" CMP
FLOWABLE FILL
3GI
2GI
24" w ELBOWS
TRENCHLESS INSTALLATION 24" WELDED STEEL
3 8x8 BARRELS
EXTEND 3@8'x8' RCBC
TO WINSTON SALEM
SOUTH FORK MUDDY CREEK
CULV1_7869
CPT-18
CPT-17
CPT-16
DIL A11
Y2_7600
JB w/MH 48"
36" CONC HW
VAR. WIDTH
24" RCP
CLASS I RI
NAD 83
30' DI
SS
80
85

5/14/99

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	4

0 100 200
FEET
VE = 5

PROFILE PROJECTED ALONG C.L. OF CULVERT

900 890 880 870 860 850 840 830 820 810 800 790 780 770 760 750 740 730 720 710 700

℄

–Y2– STA. 78 + 69
SKEW = 134°25' (EXISTING SKEW)
EXTEND EXISTING 3 @ 8'X8' RCBC
(NOT BURIED)

–Y2SBL–

–Y2FLYCA–
STA 15 + 34.67
GP ELEV = 842.7

–Y2NBL–

PROPOSED –Y2– ROADWAY SECTION
EXISTING –Y2– ROADWAY SECTION

Y2-7600
76+00
180' RT
-Y2-
SS-77
SS-78

PROP. 100 YR. ELEV. = 813.7'
PROP. 50 YR. ELEV. = 812.8

NWS ELEV. = 804.7

WSEL (9–20–2017) ELEV. = 803.7

RIGHT TOP OF BANK
LEFT TOP OF BANK
EXISTING STREAM BED

℄ ELEV. = 802.7
SLOPE = (–)0.458%

EXISTING CULVERT
3@ 8'X8' RCBC

PROP. CULVERT EXTENSTION

2.3:1 ALONG SKEW
2:1 NORMAL
(TYPICAL)

SLOPE = 1.1%

INLET
INV = 801.6

OUTLET
INV = 800.5

RIGHT TOP OF BANK
LEFT TOP OF BANK
EXISTING STREAM BED

(A) ALLUVIAL, ORANGE AND GRAY, MOIST TO WET, SOFT, SILTY CLAY

RESIDUAL, TAN, WHITE, BROWN AND BLACK, SATURATED, LOOSE TO VERY DENSE, SAPROLITIC, SAND AND SILTY SAND

4 3 A 10/17 34 10 11 25 22 19 99 83 51

BT

NOTE: EXISTING GROUND SURFACE PROFILE OF CULVERT CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'U2579AA_Is_TIN.tin' DATED 2/5/17. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

–550 –450 –350 –250 –150 –50 ℄ 50 150 250 350 450 550 650

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION FROM US 311 TO I-40				**GROUND WTR (ft)**
BORING NO. Y2_7600	**STATION** 76+00	**OFFSET** 180 ft RT	**ALIGNMENT** -Y2-	**0 HR.** 7.0
COLLAR ELEV. 807.1 ft	**TOTAL DEPTH** 50.7 ft	**NORTHING** 840,750	**EASTING** 1,659,208	**24 HR.** 4.9
DRILL RIG/HAMMER EFF./DATE SME254 D-50 XX% 10/20/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Messer, Allen	**START DATE** 10/12/17	**COMP. DATE** 10/12/17	**SURFACE WATER DEPTH** N/A	

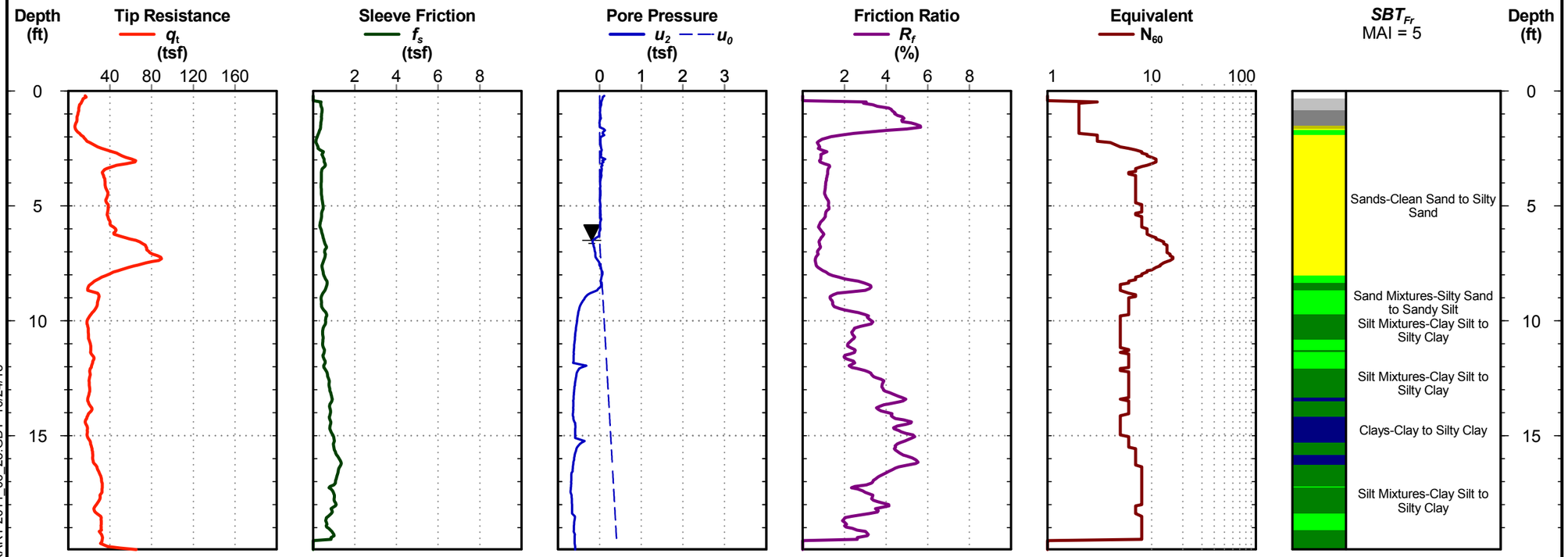
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
810											
	807.1	0.0	2	1	3	4		M		807.1 GROUND SURFACE	0.0
805										**ALLUVIAL** ORANGE AND GRAY, SILTY CLAY	
	802.9	4.2	1	1	2	3	SS-77				
800										799.6	7.5
	797.9	9.2	9	14	20	34		Sat.		**RESIDUAL** TAN, WHITE, BROWN AND BLACK, SAPROLITIC, SAND AND SILTY SAND	
795											
	792.9	14.2	4	5	5	10	SS-78	Sat.		794.6	12.5
790											
	787.9	19.2	3	4	7	11		Sat.			
785											
	782.9	24.2	3	8	17	25		Sat.			
780											
	777.9	29.2	6	8	14	22		Sat.			
775											
	772.9	34.2	4	8	11	19		Sat.			
770											
	767.9	39.2	13	33	66	99		Sat.			
765											
	762.9	44.2	33	43	40	83		Sat.			
760											
	757.9	49.2	16	26	25	51		Sat.		756.4	50.7
										Boring Terminated at Elevation 756.4 ft VERY DENSE SILTY SAND (RESIDUAL)	

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: Y2 - 75+00
Offset: 200 RT
Elevation: 808.2 ft
Date: Oct. 23, 2018
Estimated Water Depth: 6.5 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-16

Total Depth: 20.0 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

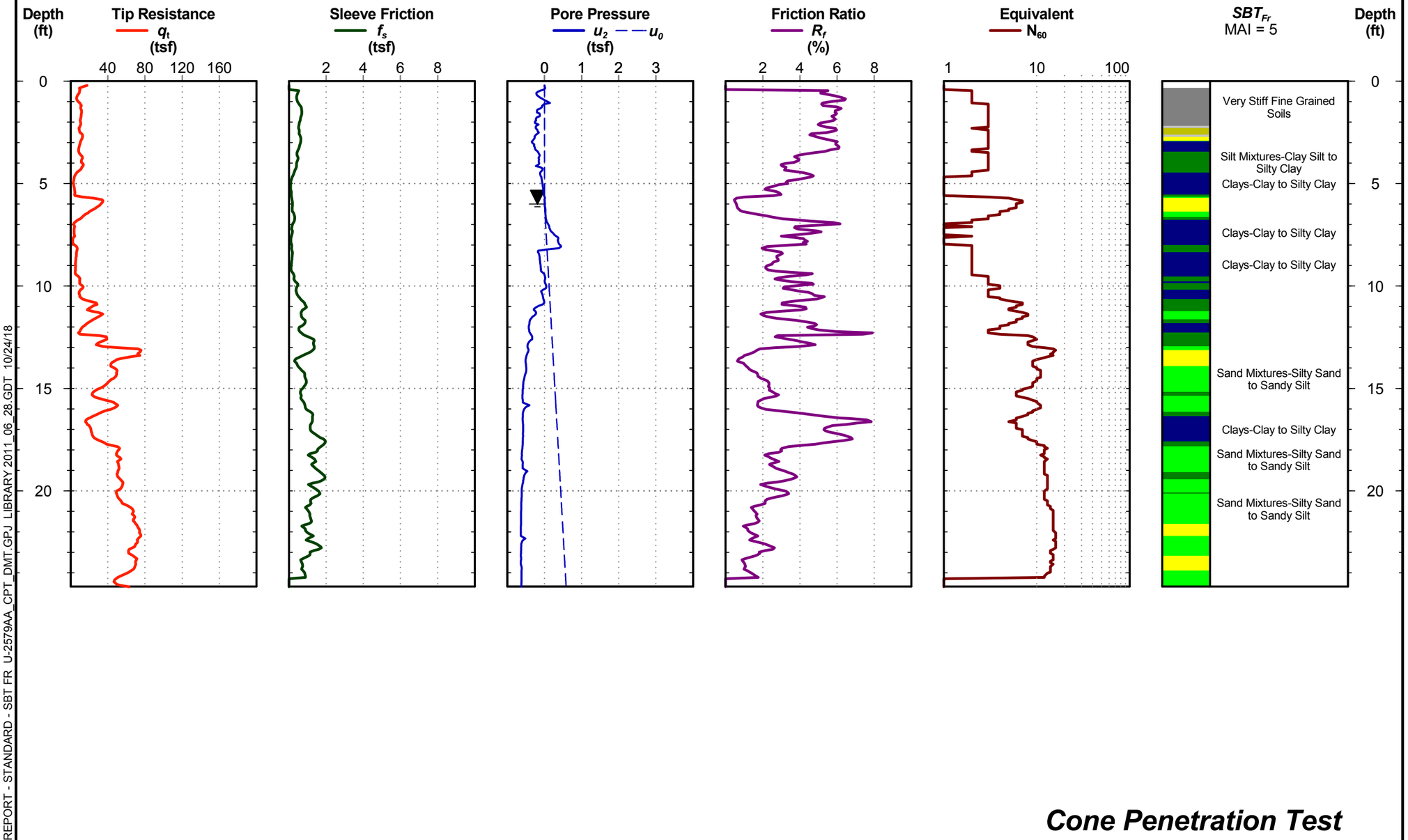
Electronic Filename: CPT-16(004)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: Y2FLYCA - 14+50
Offset: 60 RT
Elevation: 806.7 ft
Date: Oct. 23, 2018
Estimated Water Depth: 6 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-17

Total Depth: 24.7 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

Cone Penetration Test

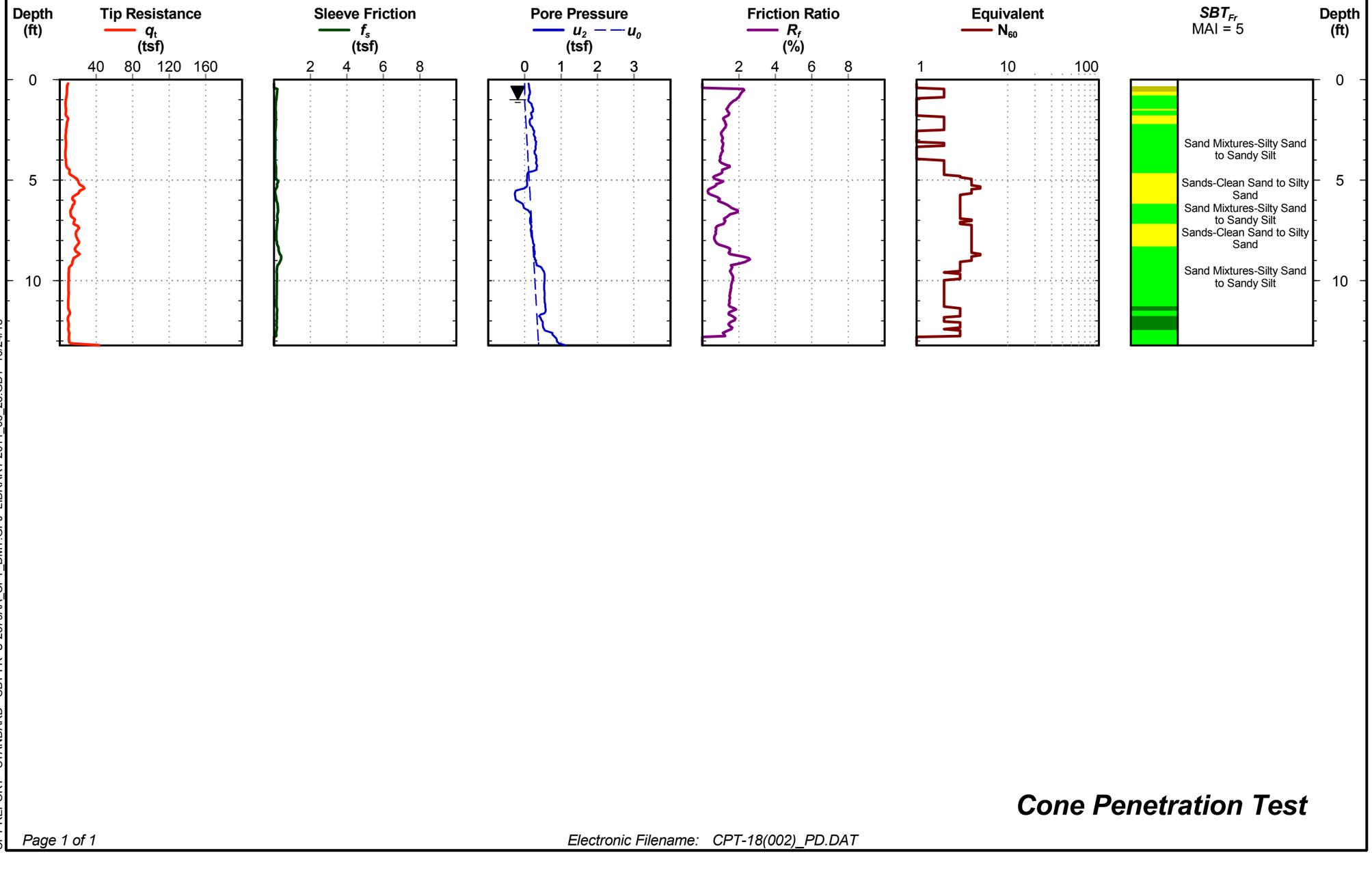
Electronic Filename: CPT-17(005)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: Y2FLYCA - 16+50
Offset: 25 RT
Elevation: 807.4
Date: Oct. 23, 2018
Estimated Water Depth: 1 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-18

Total Depth: 13.2 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

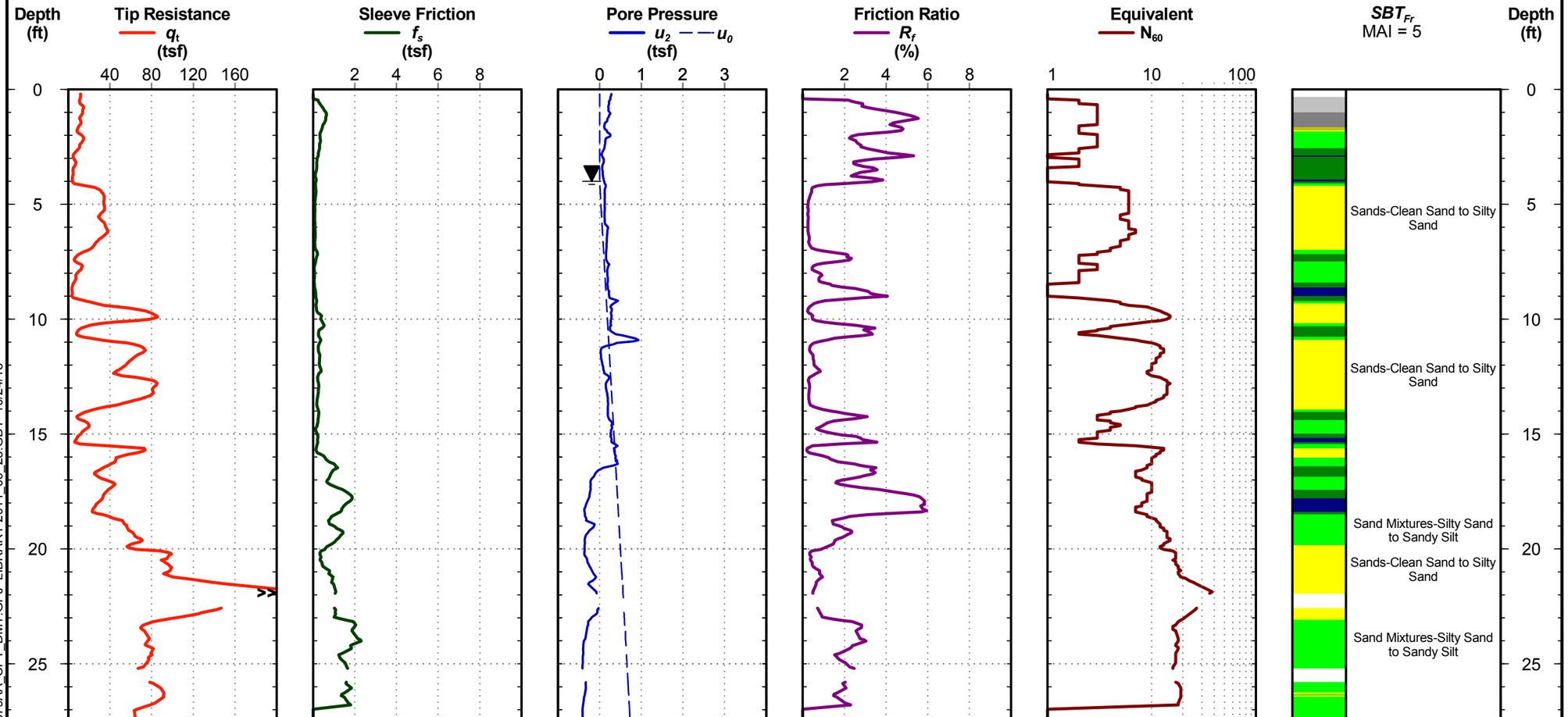
Electronic Filename: CPT-18(002)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: Y2 - 76+50
Offset: 203 RT
Elevation: 806.4 ft
Date: Oct. 23, 2018
Estimated Water Depth: 4 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CUL1_7869

Total Depth: 27.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

Cone Penetration Test

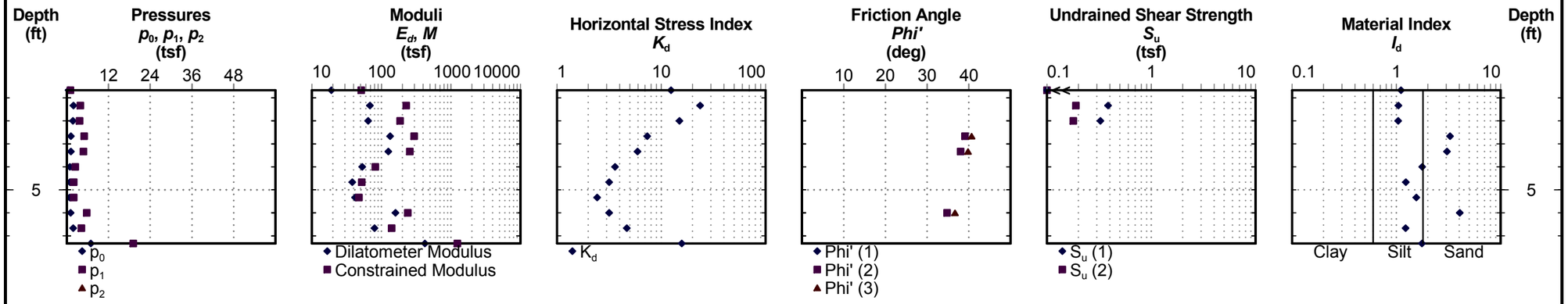
Electronic Filename: CUL1_7869(003)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: Y2 - 76+00
Offset: 200 RT
Elevation: 806.7 ft
Date: Oct. 23, 2018
Estimated Water Depth: 6 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: DILA11

Total Depth: 7.3 ft
Termination Criteria: Maximum Reaction Force
Membrane Type: soft



DMT REPORT - STANDARD U-2579AA_CPT_DMT.GPJ S&ME.GDT 10/24/18

Dilatometer Test

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-17-038			Date Report:	11/1/2017
State Project No.:	34839.1.7	County:	Forsyth	Date Tested:	10/31-11/1/17
Federal ID No.:	N/A	TIP No.:	U-2579AA		
Project Name:	Box Culvert @ -Y2- Sta. 78+69 on I-74/US 311 over South Fork Muddy Creek				
Client Name:	NCDOT GEU		Client Address: Raleigh, NC		

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
							10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay				
SS-77	76+00	180 RT	-Y2-	4.2-5.7	A-7-5	(17)	100	97	95	90	88	5	7	44	44	47	32	15	40.3
SS-78	76+00	180 RT	-Y2-	14.2-15.7	A-2-4	(0)	100	77	58	25	20	42	38	17	3	30	0	NP	28.3

References / Comments / Deviations: ND=Not Detemined. NP=Non-Plastic.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT — AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils — AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET		104-01-0703	Stewart S. Laney, PE	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

REFERENCE: U-2579AA

PROJECT: 34839

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AA	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *FORSYTH*

PROJECT DESCRIPTION *WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION (FUTURE I-74) FROM US 311 TO I-40*

SITE DESCRIPTION *BOX CULVERT @ -L- STA. 36+27.3 ON FUTURE I-74 OVER SOUTH FORK MUDDY CREEK*

CONTENTS

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:
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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.

PERSONNEL

S&ME, Inc.

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *S.S. LANEY*

DATE *MARCH 2019*

3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660

NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
919459487BA347...

4/19/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	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														
#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	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
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
	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 / CPT / 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] CPT/DMT RIG
- [X] D-50

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.
- [X] 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: ELEVATIONS TAKEN FROM TIN FILE "U2579AA_ls_TIN.tin", DATED 02/15/2017

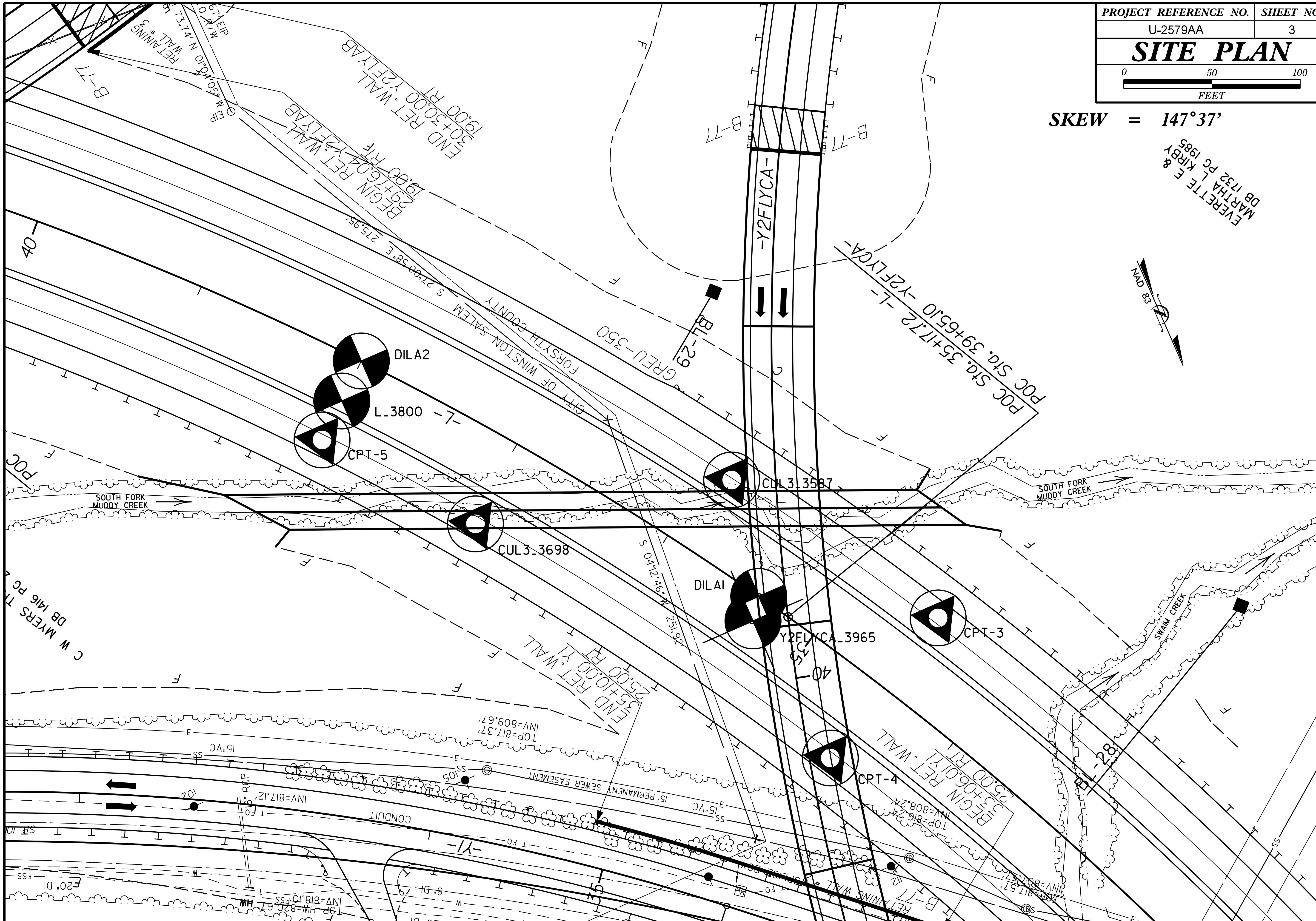
ELEVATION: N/A FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	3

SITE PLAN



5/14/99

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	4

PROFILE PROJECTED ALONG C.L. OF CULVERT

0 50 100
FEET
VE = 5

L_3800
38+00
25' LT
-L-
SS-129
SS-130
SS-132

Y2FLYCA_3965
39+65
20' RT
-Y2FLYCA-
SS-75
SS-76

-L- STA. 36+27.3
SKEW = 147°37' TAN TO CURVE
PROP. GRADE = 832.25'
2 @ 10' X 9' RCBC (BURIED 1 Ft.) WITH 6" BEVELED HEADWALLS
WITH 2 FT TALL SILLS IN RIGHTMOST BARREL LOOKING DOWNSTREAM

PROPOSED ROADWAY SECTION
2:1 NORMAL (TYPICAL)
2:1 NORMAL (TYPICAL)
PROP. 100 YR. ELEV. = 820.8
PROP. 50 YR. ELEV. = 820.4
PROPOSED STREAM BED (SLOPE = 0.3 %)
RIGHT TOP OF BANK
LEFT TOP OF BANK
24" CSP INV = 811.4
09/17
09/17
WSEL (9-20-2017) ELEV. = 811.4
NWS ELEV. = 812.9
INLET INV = 809.9
℄ ELEV. = 809.2'
SLOPE = 0.3%
OUTLET INV = 808.6
EXISTING STREAM BED
NATURAL GROUND ALONG ℄ OF PROPOSED CULVERT

ALLUVIAL, TAN, BROWN, ORANGE AND GRAY, MOIST TO WET,
GRAY, SAT., LOOSE, SAND
SOFT TO STIFF, SANDY CLAY AND SILTY CLAY
RESIDUAL, ORANGE AND GRAY, SAT., LOOSE,
WHITE, WET, SOFT, SAPROLITIC, SILTY CLAY AND SAPROLITIC, SAND
CLAYEY SILT
WEATHERED ROCK (BIOTITE GNEISS)
CRYSTALLINE ROCK (BIOTITE GNEISS)
100/0.3
100/0.7
BT
CT

NOTE: EXISTING GROUND SURFACE PROFILE OF CULVERT CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'U2579AA_ls_TIN.tin' DATED 2/5/17. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

850 840 830 820 810 800 790 780 770

-200 -150 -100 -50 ℄ 50 100 150 200

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** Butler, Lyndal	
SITE DESCRIPTION WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION FROM US 311 TO I-40				**GROUND WTR (ft)**
BORING NO. L_3800	**STATION** 38+00	**OFFSET** 25 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.0
COLLAR ELEV. 815.7 ft	**TOTAL DEPTH** 28.8 ft	**NORTHING** 841,303	**EASTING** 1,661,472	**24 HR.** 5.1
DRILL RIG/HAMMER EFF./DATE SME254 DIEDRICH D-50 78% 10/20/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Messer, Allen	**START DATE** 09/27/17	**COMP. DATE** 09/27/17	**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)
										815.7 GROUND SURFACE	0.0
	815.7	0.0	1	1	1	2	SS-129	M		**ALLUVIAL** TAN, BROWN, ORANGE AND GRAY, SILTY CLAY AND SANDY CLAY	
	812.2	3.5	3	5	6	11					
	808.7	7.0									
	807.2	8.5	1	1	4	5	SS-130	W			
	803.7	12.0								GRAY SAND	
	802.2	13.5	4	3	7	10		Sat.			
	797.2	18.5	2	0	1	1	SS-132	Sat.		796.2 **RESIDUAL** ORANGE AND WHITE, SAPROLITIC, SILTY CLAY	19.5
	792.2	23.5	1	2	2	4		Sat.		792.2 GRAY, SAPROLITIC, SAND	23.5
	788.7	27.0								788.7 **WEATHERED ROCK** (BIOTITE GNEISS)	27.0
	787.2	28.5	100/0.3			100/0.3				786.9 Boring Terminated at Elevation 786.9 ft IN WEATHERED ROCK (BIOTITE GNEISS)	28.8

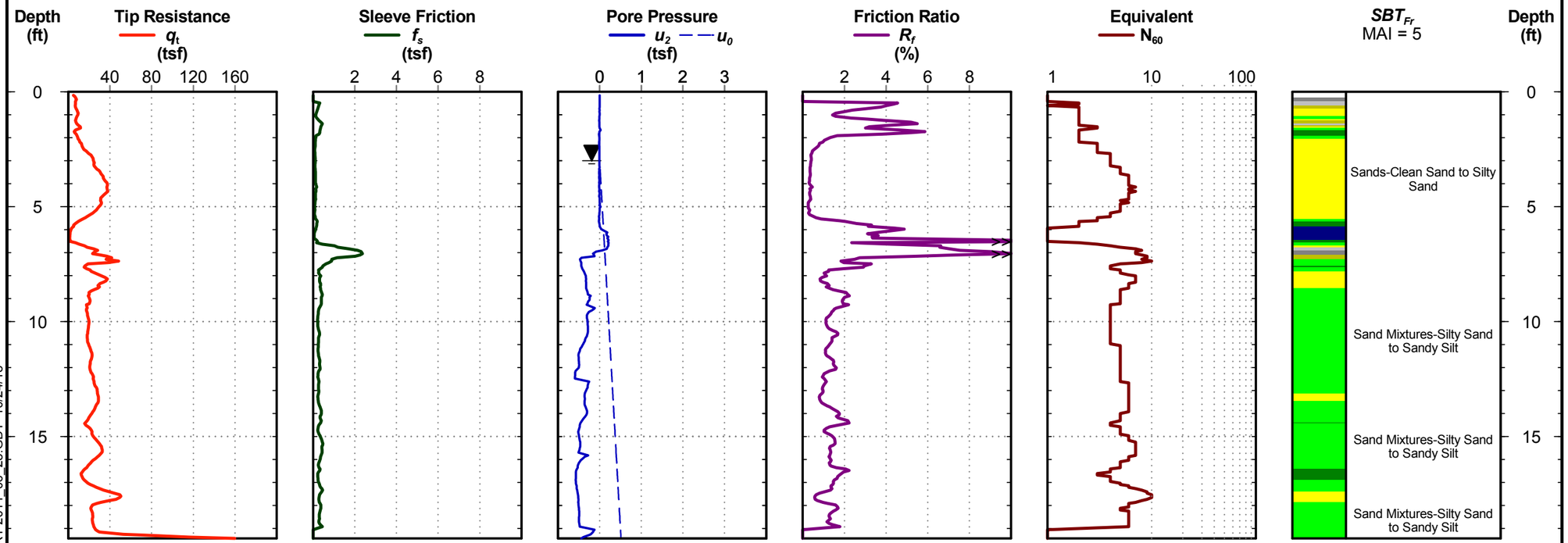
WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION FROM US 311 TO I-40				**GROUND WTR (ft)**
BORING NO. Y2FLYCA_3965	**STATION** 39+65	**OFFSET** 20 ft RT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** 4.0
COLLAR ELEV. 814.7 ft	**TOTAL DEPTH** 35.1 ft	**NORTHING** 841,511	**EASTING** 1,661,308	**24 HR.** 3.0
DRILL RIG/HAMMER EFF./DATE SME254 DIEDRICH D-50 78% 10/20/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Messer, Allen	**START DATE** 09/26/17	**COMP. DATE** 09/26/17	**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	
	814.7	0.0	1	2	3	5	SS-75	W		814.7 GROUND SURFACE	0.0
	810.5	4.2	1	1	1	2				**ALLUVIAL** BROWN AND GRAY, SILTY CLAY	
	805.5	9.2	1	1	1	2	SS-76	W			
	800.5	14.2	1	3	3	6		Sat.		799.3	15.4
	795.5	19.2	2	2	2	4		Sat.		**ALLUVIAL** GRAY SAND	
	790.5	24.2	27	33	67/0.2	100/0.7				794.5 **RESIDUAL** GRAY, TAN AND BLACK, SAPROLITIC, CLAYEY SILT	20.2
										791.2 **WEATHERED ROCK** (BIOTITE GNEISS)	23.5
										789.3 **CRYSTALLINE ROCK** GRAY, BLACK AND WHITE, WIDE FRACTURE SPACING, HARD, FRESH, BIOTITE GNEISS STRATA REC = 99% STRATA RQD = 94%	25.4
										779.6 Boring Terminated at Elevation 779.6 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)	35.1

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Sounding ID: CUL3_3587

Station: L - 35+87
Offset: 46 RT
Elevation: 814.6 ft
Date: Oct. 4, 2018
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/D. Watson
Total Depth: 19.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

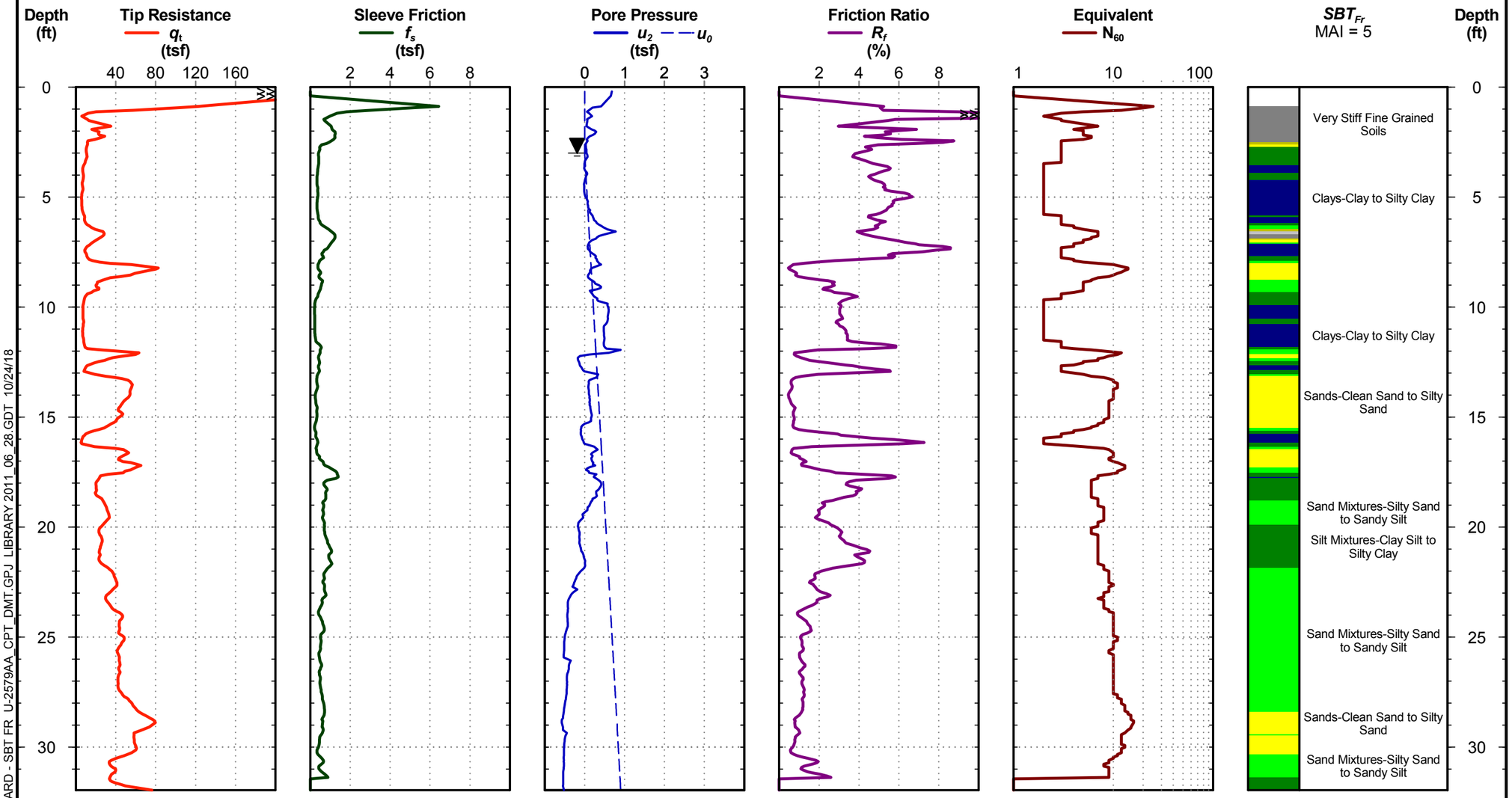
Electronic Filename: CUL3_3587(006)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 36+98
Offset: 51 LT
Elevation: 816.7 ft
Date: Oct. 4, 2018
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CUL3_3698

Total Depth: 32.0 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

Cone Penetration Test

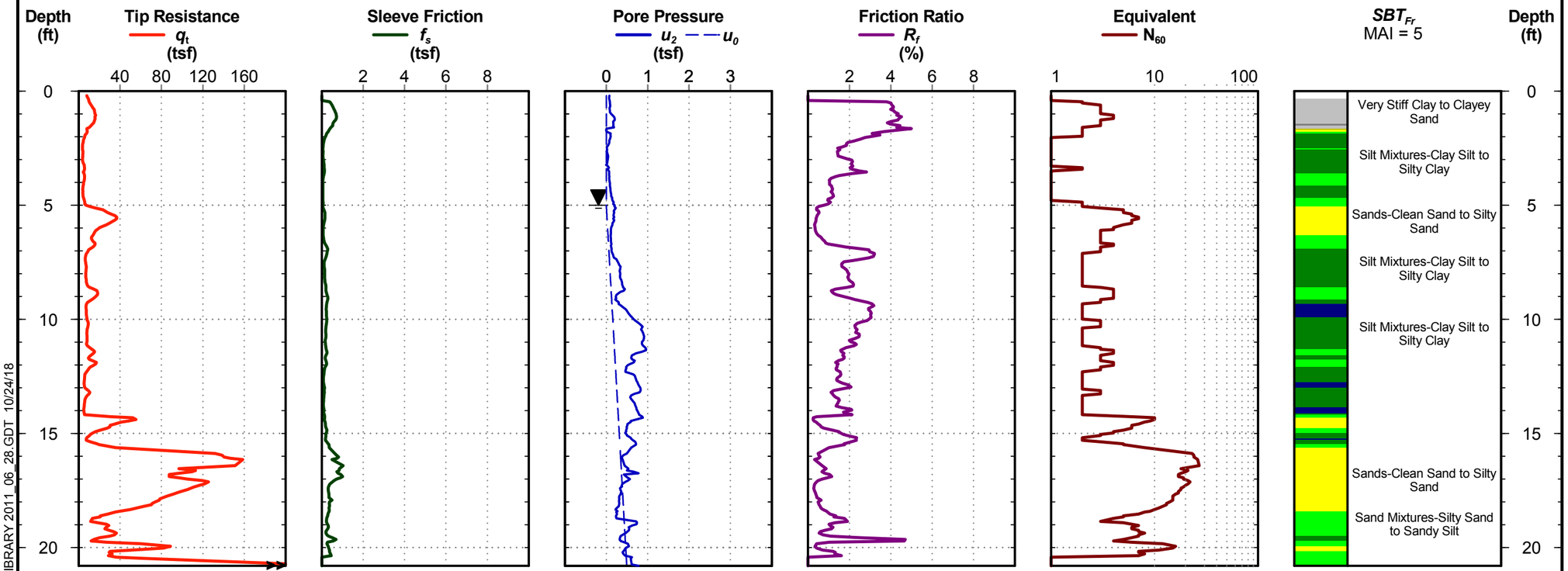
Electronic Filename: CUL3_3698(005)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 34+50
Offset: 50 RT
Elevation: 813.8 ft
Date: Oct. 5, 2018
Estimated Water Depth: 5 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-3

Total Depth: 20.8 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

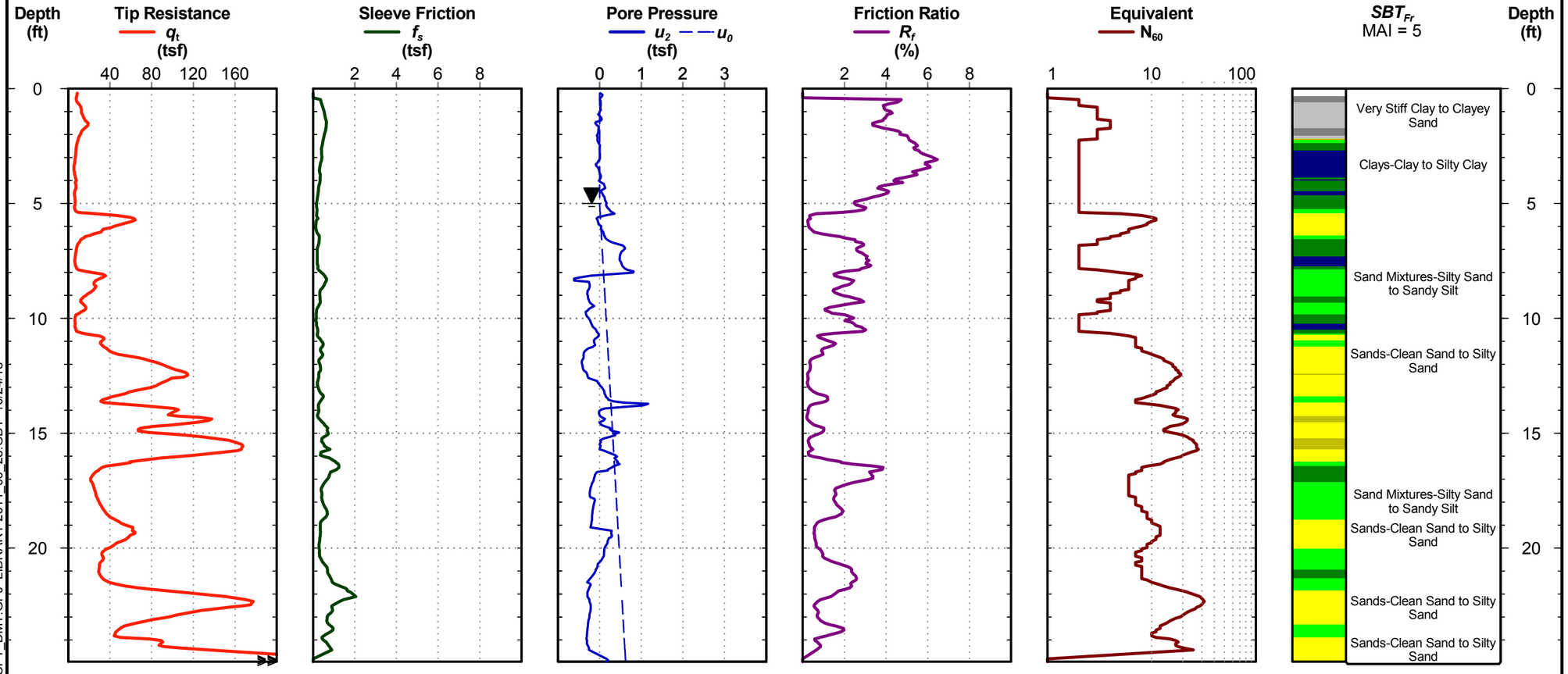
Electronic Filename: CPT-3(002)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 34+50
Offset: 50 LT
Elevation: 813.8 ft
Date: Oct. 5, 2018
Estimated Water Depth: 5 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-4

Total Depth: 24.9 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

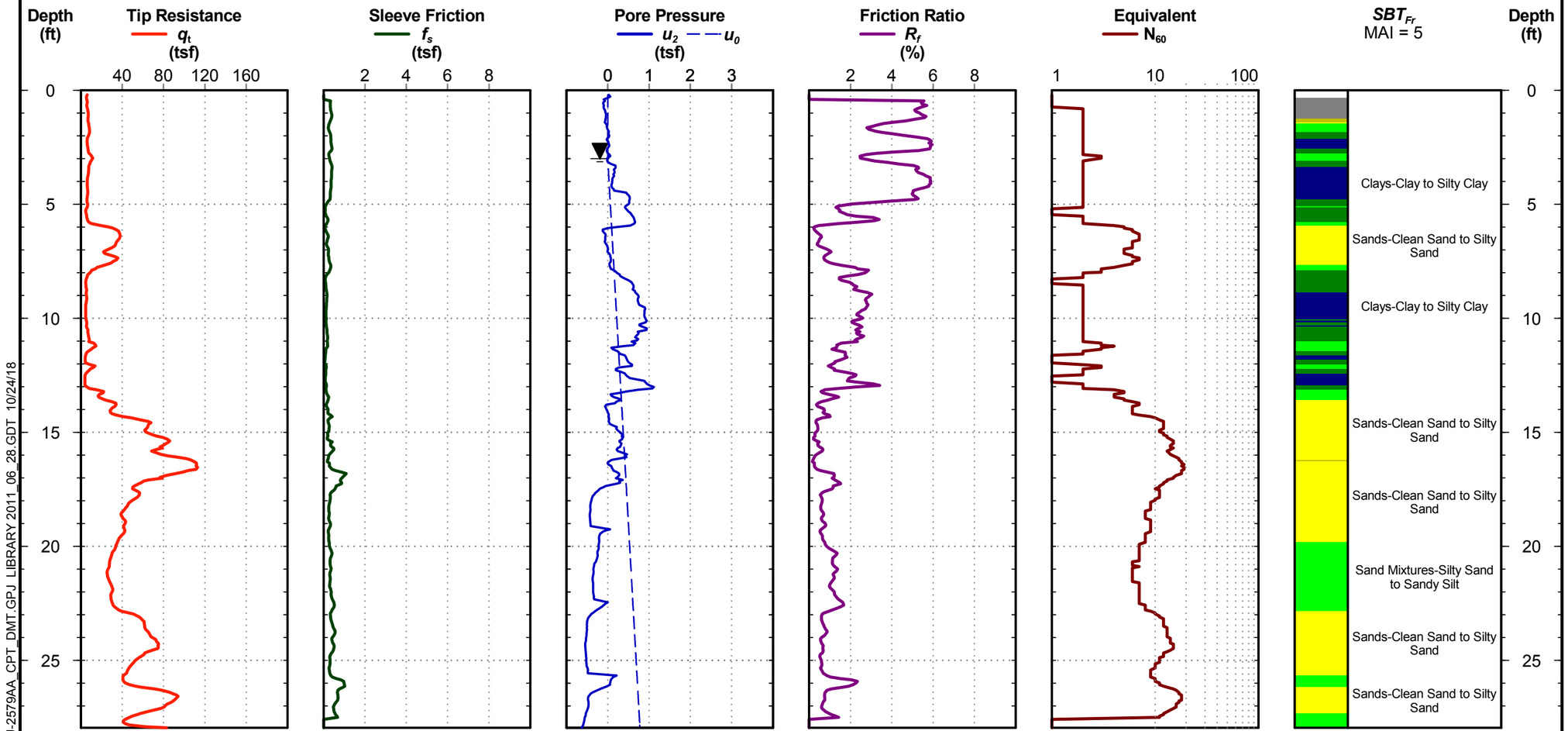
Electronic Filename: CPT-4(001)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 38+00
Offset: 50 LT
Elevation: 816.6 ft
Date: Oct. 4, 2018
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-5

Total Depth: 28.0 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

Cone Penetration Test

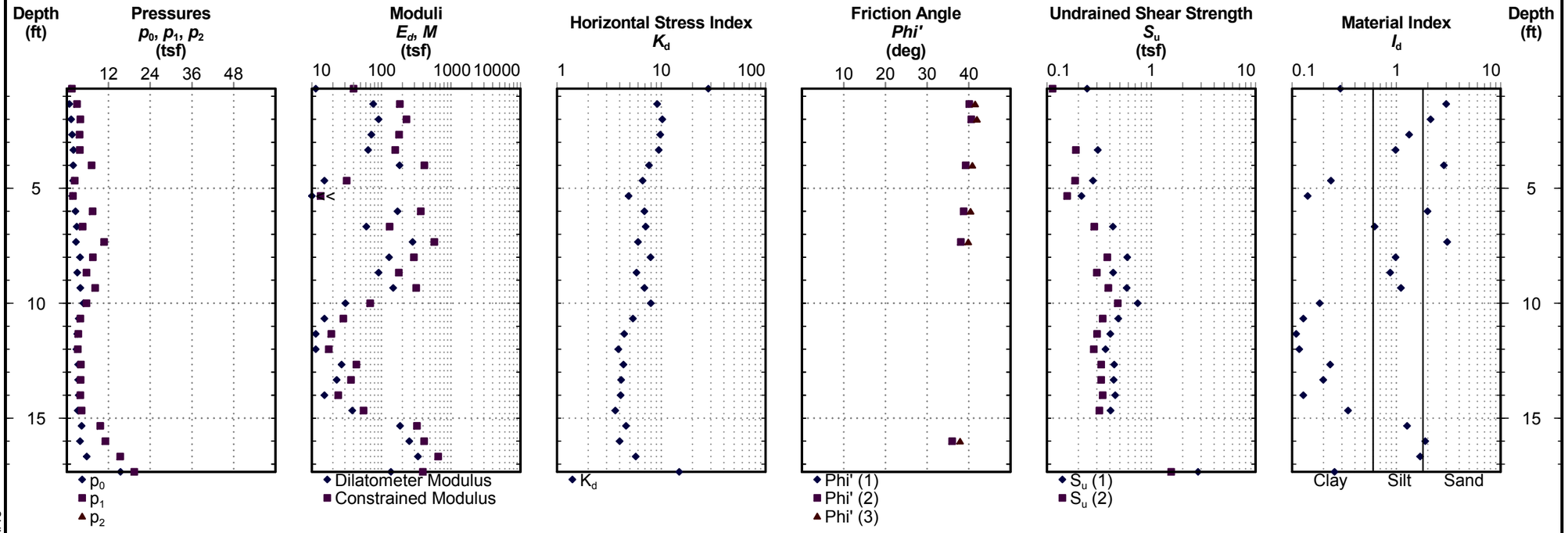
Electronic Filename: CPT-5(004)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 35+38
Offset: CL
Elevation: 815.6 ft
Date: Oct. 5, 2018
Estimated Water Depth: 6 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: DILA1

Total Depth: 17.3 ft
Termination Criteria: Maximum Reaction Force
Membrane Type: soft



DMT REPORT - STANDARD U-2579AA_CPT_DMT.GPJ S&ME.GDT 10/24/18

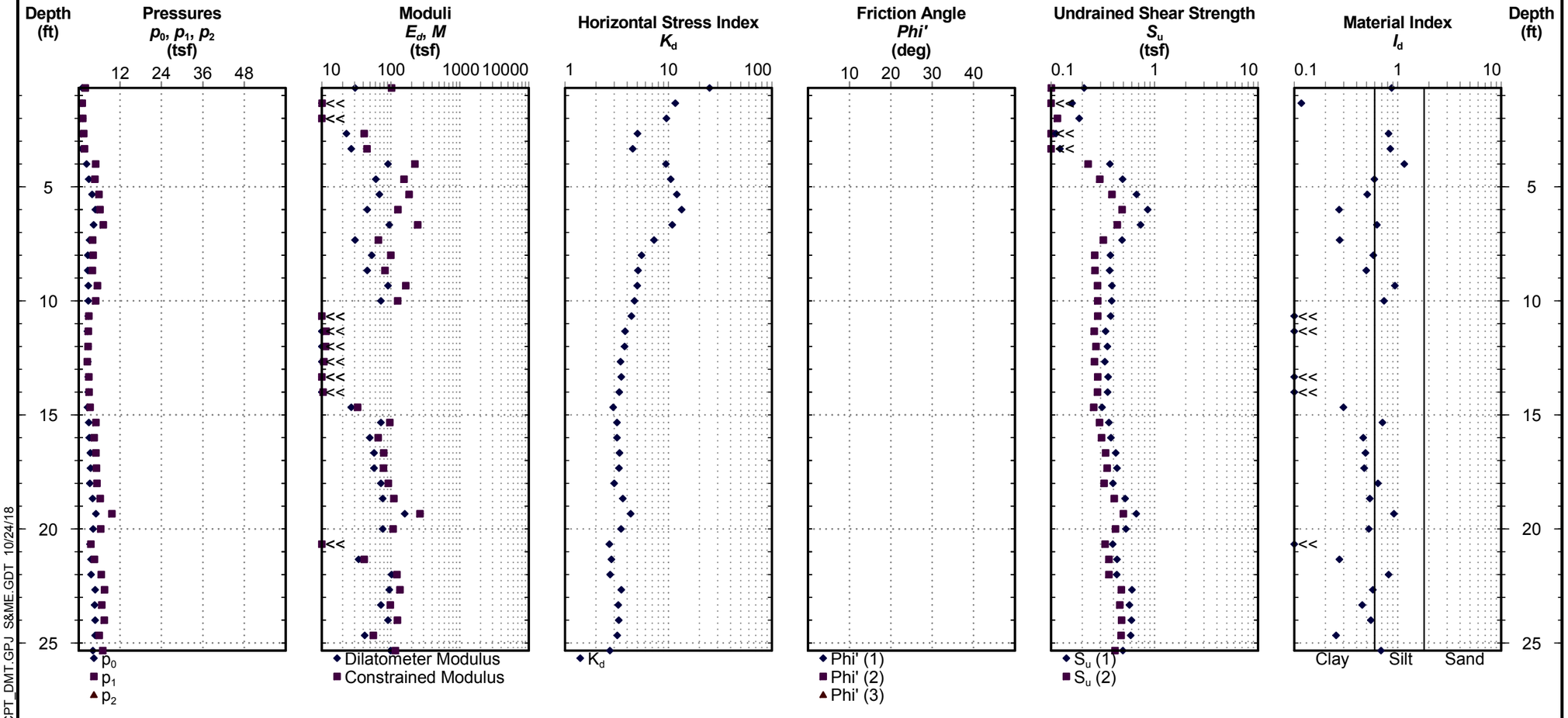
Dilatometer Test

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 38+00
Offset: CL
Elevation: 815.7 ft
Date: Oct. 5, 2018
Estimated Water Depth: 6 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: DILA2

Total Depth: 25.3 ft
Termination Criteria: Maximum Reaction Force
Membrane Type: soft



DMT REPORT - STANDARD U-2579AA_CPT_DMT.GPJ S&ME.GDT 10/24/18

Dilatometer Test

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-17-038		Date Report: 11/1/2017
State Project No.:	34839.1.7	County: Forsyth	Date Tested: 10/31-11/1/17
Federal ID No.:	N/A	TIP No.: U-2579AA	
Project Name:	Box Culvert @ -L- Sta. 36+27.3 on Future I-74 over South Fork Muddy Creek		
Client Name:	NCDOT GEU	Client Address: Raleigh, NC	

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
							10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay				
SS-75	39+65	20 RT	-Y2FLYCA-	0.0-1.5	A-7-5	(27)	100	99	99	94	89	1	10	43	46	58	36	22	32.8
SS-76	39+65	20 RT	-Y2FLYCA-	9.2-10.7	A-7-6	(18)	100	98	96	82	74	4	22	34	40	48	27	21	
SS-129	38+00	25 LT	-L-	0.0-1.5	A-7-5	(21)	100	99	99	87	78	1	21	42	36	61	44	17	46.9
SS-130	38+00	25 LT	-L-	8.5-10.0	A-7-5	(21)	100	92	84	66	62	16	23	26	35	40	23	17	
SS-132	38+00	25 LT	-L-	19.5-20.0	A-7-5	(2)	99	78	63	38	31	36	33	22	9	58	44	14	

References / Comments / Deviations: ND=Not Detemined. NP=Non-Plastic.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET		104-01-0703	Stewart S. Laney, PE	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AA	1	12

REFERENCE: U-2579AA

PROJECT: 34839

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *FORSYTH*

PROJECT DESCRIPTION *WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION (FUTURE I-74) FROM US 311 TO I-40*

SITE DESCRIPTION *BOX CULVERT @ -L- STA. 32+77.5 ON FUTURE I-74 OVER SWAIM CREEK*

CONTENTS

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.

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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

S&ME, Inc.

INVESTIGATED BY *S&ME, Inc.*

DRAWN BY *J.R. SWARTLEY*

CHECKED BY *S.S. LANEY*

SUBMITTED BY *S.S. LANEY*

DATE *MARCH 2019*

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NORTH CAROLINA LICENSED SEAL 2296 GEOLOGIST JARETT SWARTLEY

DocuSigned by:
919459487BA3471...

4/19/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	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 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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
	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		
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PLASTIC RANGE (PI)		
PL — PLASTIC LIMIT		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT		
	- 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] CPT/DMT RIG
- [X] CME-550X

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: ELEVATIONS TAKEN FROM TIN FILE "U2579AA_ls_TIN.tin", DATED 02/15/2017

ELEVATION: N/A FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	3

SITE PLAN

0 50 100
FEET

SKEW = 58°15'

POT Sta. 33+52.17 -Y1-
POC Sta. 41+55.50 -Y2FLYCA-

POC Sta. 35+17.72 -L-
POC Sta. 39+65.10 -Y2FLYCA-

BEGIN RET. WALL
33+06.01 -Y1-
25.00 RT -L-

RET. WALL #1

CPT-1

CPT-2

CPT-3

DILA1

CUL2_3262

CUL2_3298

YI_3300

YI_3069

B-77

B-28

U2579AA-3 (GPS)

SWAIM CREEK

SOUTH FORK MUDDY CREEK

30' SANITARY SEWER EASEMENT

36" CONC

12" RCP

8" DI

8" W

8" SS

15" PERMANENT

N 12°47'26" W
150.17'

N 12°48'37" W 524.37'

N 12°52'07" W
50.05'

EIP

-Y2FLYCA-

-Y1-

-L-

-L2FLYCA-

-L3-

-L4-

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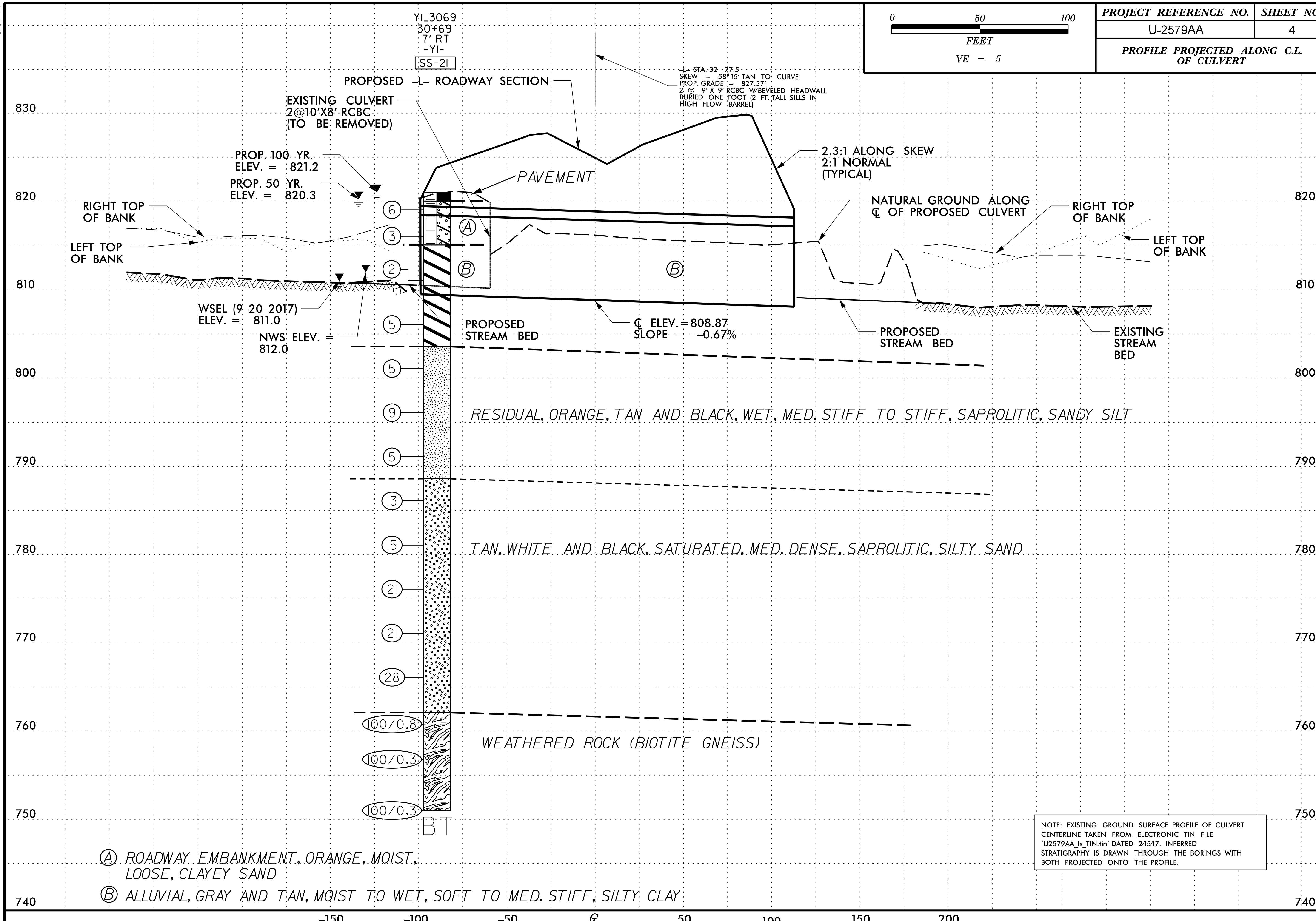
PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	4

PROFILE PROJECTED ALONG C.L. OF CULVERT



NOTE: EXISTING GROUND SURFACE PROFILE OF CULVERT CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'U2579AA_ls_TIN.tin' DATED 2/15/17. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION FROM US 311 TO I-40				**GROUND WTR (ft)**
BORING NO. Y1_3069	**STATION** 30+69	**OFFSET** 7 ft RT	**ALIGNMENT** -Y1-	**0 HR.** 7.0 Caved
COLLAR ELEV. 821.1 ft	**TOTAL DEPTH** 70.1 ft	**NORTHING** 841,885	**EASTING** 1,661,115	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME4323 CME-550X 73% 11/16/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Blizzard, Brandon	**START DATE** 10/03/17	**COMP. DATE** 10/03/17	**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)
										821.1 GROUND SURFACE	0.0
820	820.1	1.0	4	4	2	6				820.1 **ROADWAY EMBANKMENT** (PAVEMENT) ORANGE, CLAYEY SAND	1.0
	817.1	4.0	1	2	1	3				815.1 **ALLUVIAL** GRAY AND TAN, SILTY CLAY	6.0
815	812.1	9.0	1	0	2	2	SS-21				
810	807.1	14.0	1	2	3	5				803.6 **RESIDUAL** ORANGE, TAN AND BLACK, SAPROLITIC, SANDY SILT	17.5
805	802.1	19.0	1	2	3	5					
800	797.1	24.0	2	4	5	9					
795	792.1	29.0	2	2	3	5					
790	787.1	34.0	4	6	7	13				788.6 TAN, WHITE AND BLACK, SAPROLITIC, SILTY SAND	32.5
785	782.1	39.0	6	7	8	15					
780	777.1	44.0	5	7	14	21					
775	772.1	49.0	4	7	14	21					
770	767.1	54.0	5	8	20	28					
765	762.1	59.0	9	29	71/0.3	100/0.8				762.1 **WEATHERED ROCK** (BIOTITE GNEISS)	59.0
760	757.1	64.0	100/0.3			100/0.3					
755	751.3	69.8	100/0.3			100/0.3				751.0 Boring Terminated at Elevation 751.0 ft ON WEATHERED ROCK (BIOTITE GNEISS)	70.1

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** Swartley, J. R.	
SITE DESCRIPTION WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION FROM US 311 TO I-40				**GROUND WTR (ft)**
BORING NO. Y1_3300	**STATION** 33+00	**OFFSET** 5 ft RT	**ALIGNMENT** -Y1-	**0 HR.** 11.3
COLLAR ELEV. 821.4 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 841,734	**EASTING** 1,661,289	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME4323 CME-550X 73% 11/16/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Herd, Hobert	**START DATE** 09/28/17	**COMP. DATE** 09/28/17	**SURFACE WATER DEPTH** N/A	

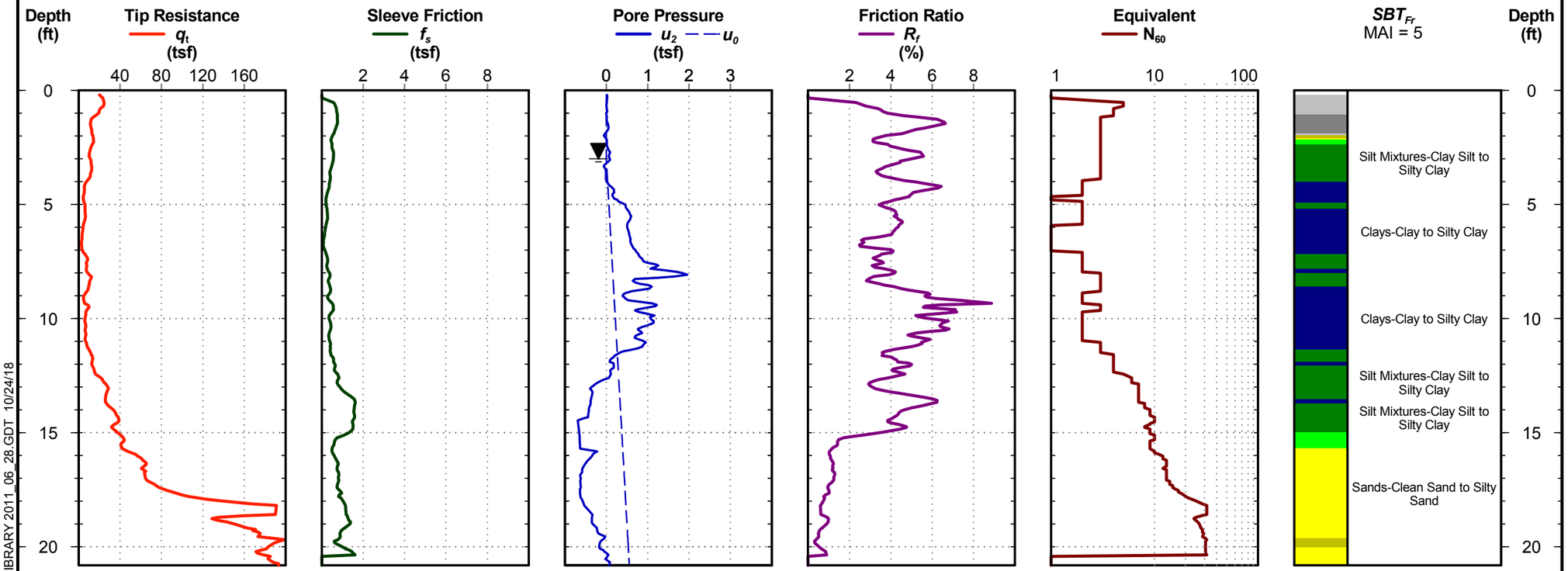
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
	821.4	0.0						M		821.4 GROUND SURFACE 0.0
820	818.0	3.4	4	6	6	12		M		819.4 **ROADWAY EMBANKMENT** ORANGE, CLAYEY SAND 2.0 ORANGE, SANDY SILT
815	813.0	8.4	2	2	3	5		W		815.4 **ALLUVIAL** BROWN, SILTY CLAY 6.0
810	808.0	13.4	2	1	2	3		Sat.		809.4 GRAY, COARSE SAND AND GRAVEL 12.0
805	803.0	18.4	3	5	1	6				804.9 **WEATHERED ROCK** (BIOTITE GNEISS) 16.5
	802.4	19.0	100/0.2			100/0.2				802.4 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 802.4 ft ON CRYSTALLINE ROCK (BIOTITE GNEISS) 19.0
			60/0.0			60/0.0				

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Sounding ID: CUL2_3262

Station: L - 32+62
Offset: 25 LT
Elevation: 816.5 ft
Date: Oct. 9, 2018
Estimated Water Depth: 3 ft
Rig/Operator: Marooka/D. Watson

Total Depth: 20.8 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

Cone Penetration Test

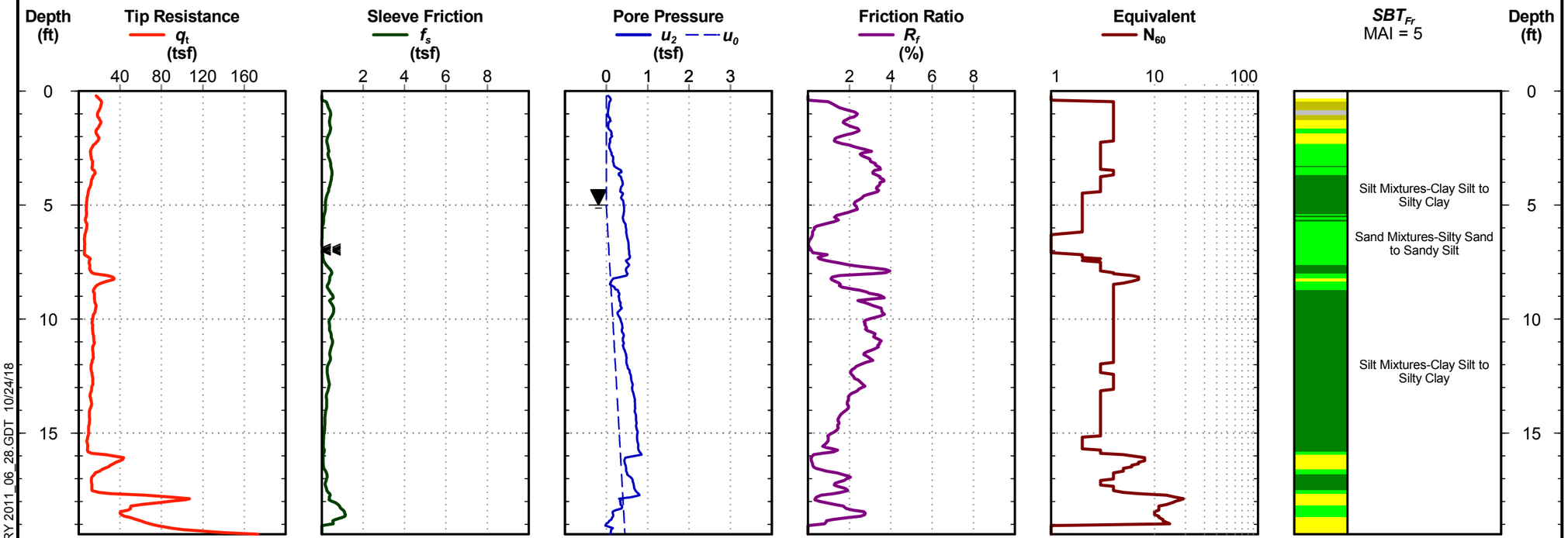
Electronic Filename: CUL2_3262(001)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 32+99
Offset: 35 RT
Elevation: 815.7 ft
Date: Oct. 5, 2018
Estimated Water Depth: 5 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CUL2_3298

Total Depth: 19.4 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

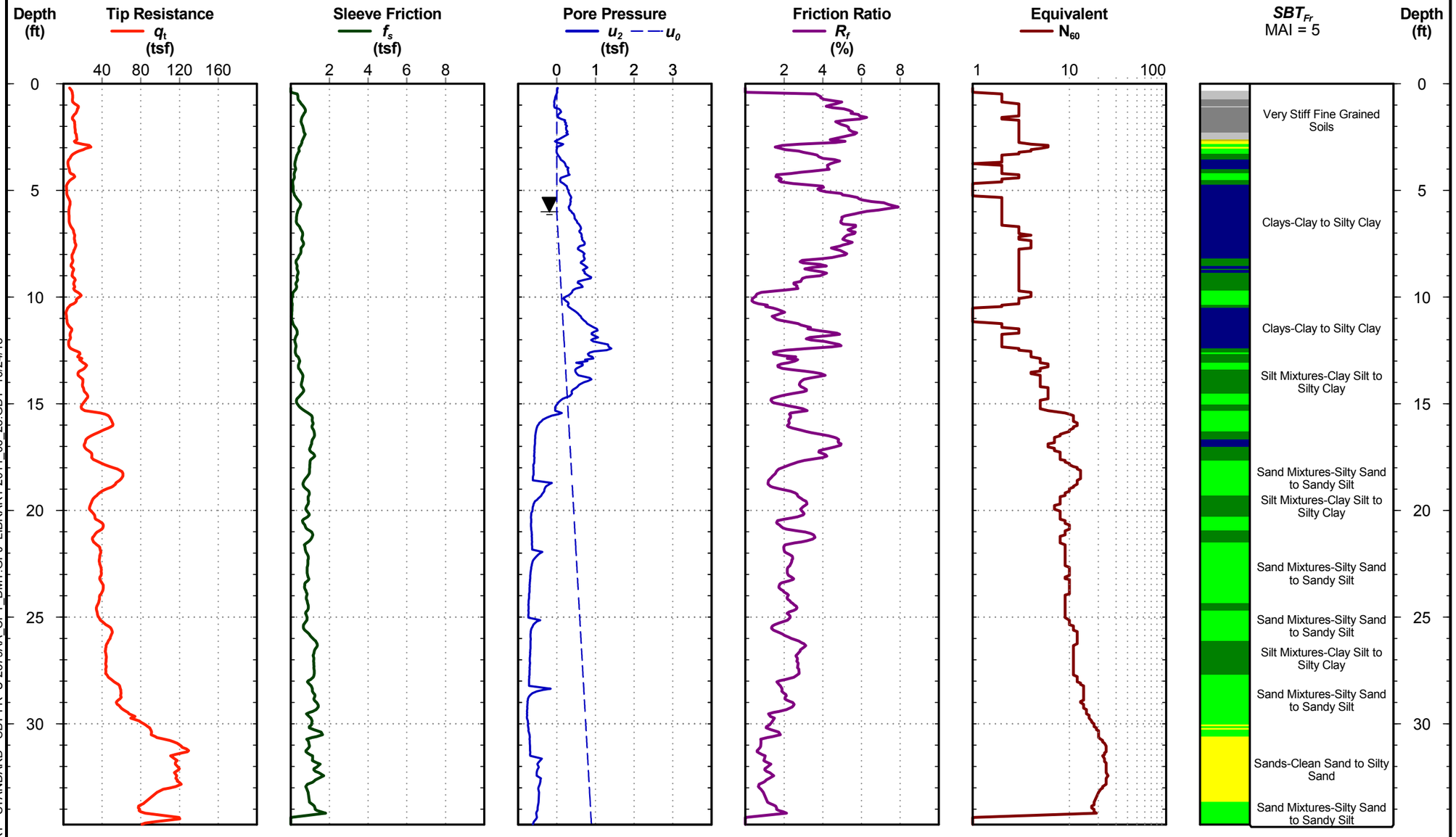
Electronic Filename: CUL2_3298(005)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 31+50
Offset: 50 RT
Elevation: 815.5 ft
Date: Oct. 9, 2018
Estimated Water Depth: 6 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-2

Total Depth: 34.7 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

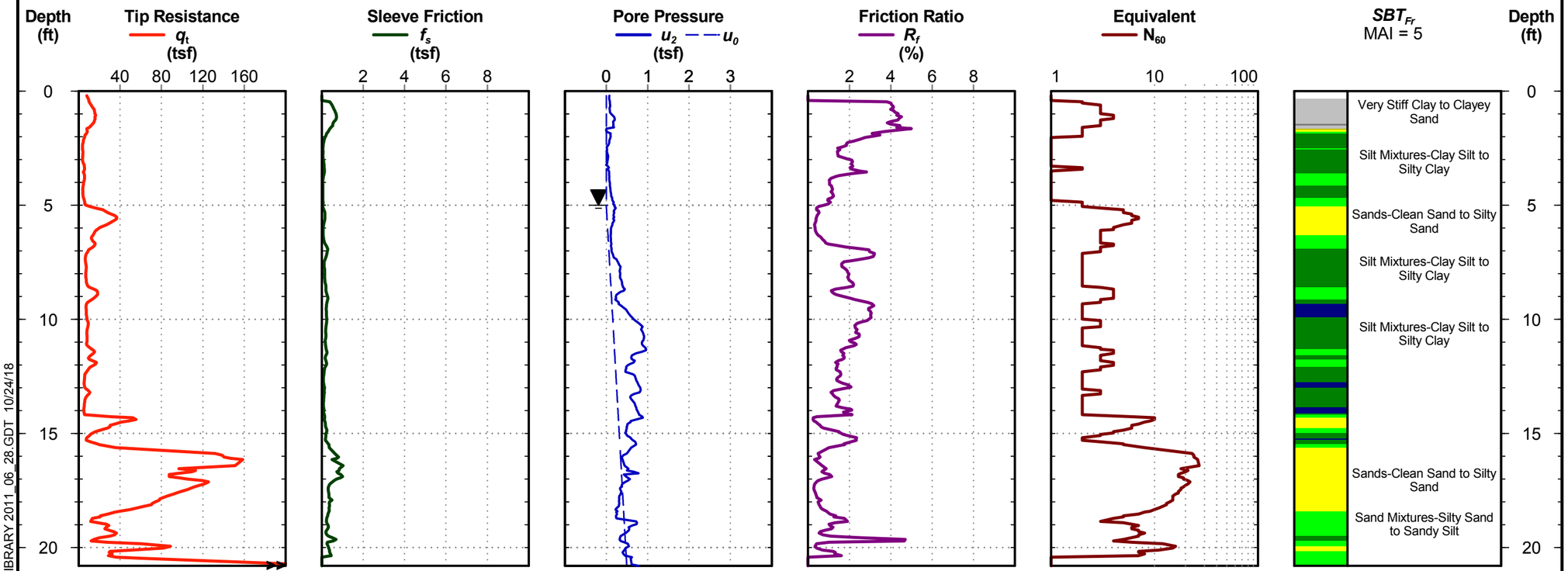
Electronic Filename: CPT-2(002)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 34+50
Offset: 50 RT
Elevation: 813.8 ft
Date: Oct. 5, 2018
Estimated Water Depth: 5 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-3

Total Depth: 20.8 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

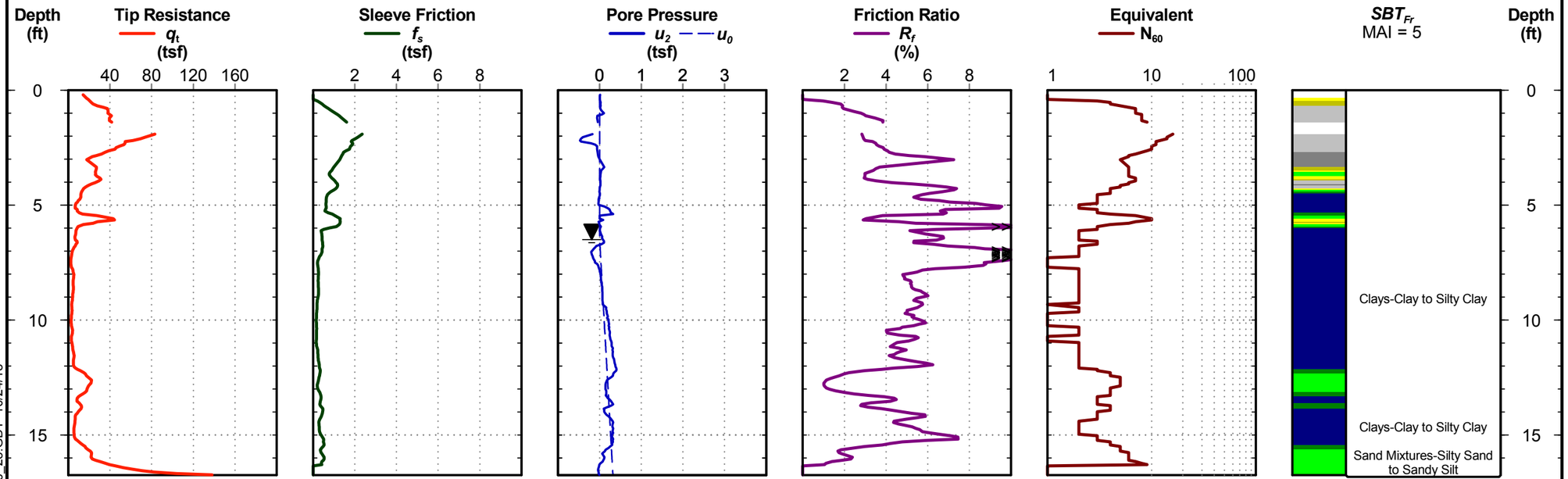
Electronic Filename: CPT-3(002)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: Y1 - 33+00
Offset: CL
Elevation: 821.1 ft
Date: Oct. 8, 2018
Estimated Water Depth: 6.5 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: CPT-11

Total Depth: 16.7 ft
Termination Criteria: Maximum Reaction Force
Cone Size: 1.75



Cone Penetration Test

CPT REPORT - STANDARD - SBT FR U-2579AA_CPT_DMT.GPJ LIBRARY 2011_06_28.GDT 10/24/18

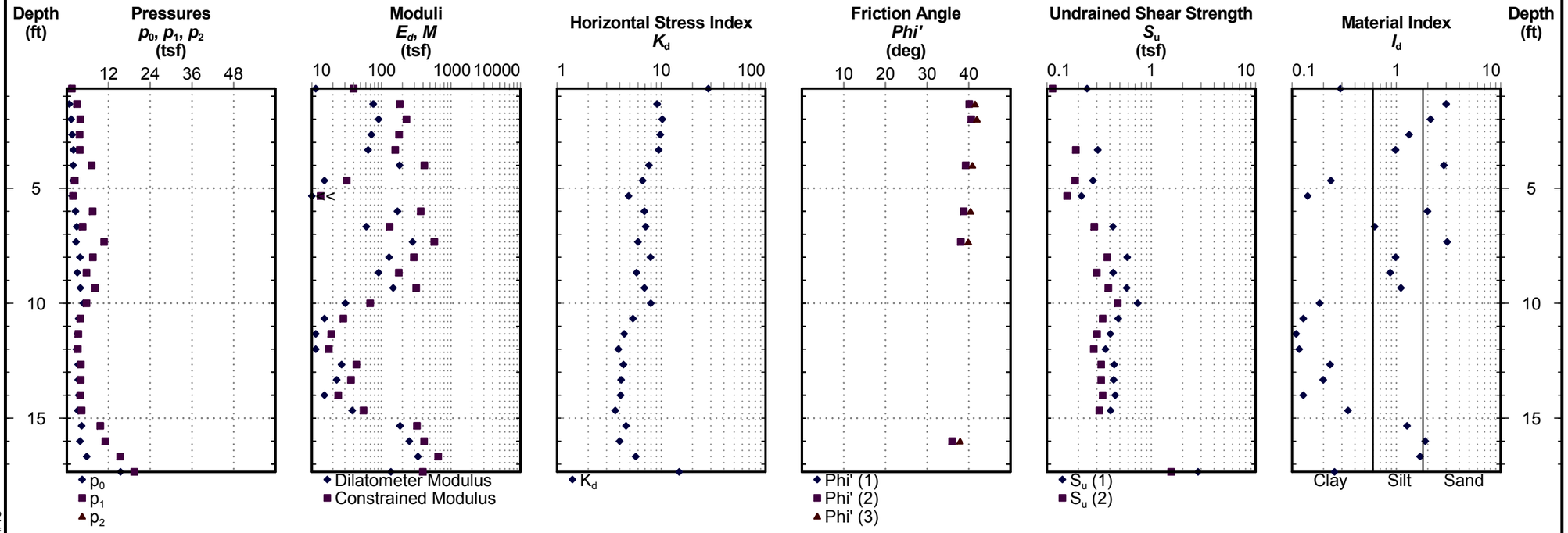
Electronic Filename: CPT-11(003)_PD.DAT

U2579AA WSNB
Winston-Salem, NC
S&ME Project No: 6235-17-038

Station: L - 35+38
Offset: CL
Elevation: 815.6 ft
Date: Oct. 5, 2018
Estimated Water Depth: 6 ft
Rig/Operator: Marooka/D. Watson

Sounding ID: DILA1

Total Depth: 17.3 ft
Termination Criteria: Maximum Reaction Force
Membrane Type: soft



DMT REPORT - STANDARD U-2579AA_CPT_DMT.GPJ S&ME.GDT 10/24/18

Dilatometer Test

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #:	6235-17-038			Date Report:	11/1/2017
State Project No.:	34839.1.7	County:	Forsyth	Date Tested:	10/31-11/1/17
Federal ID No.:	N/A	TIP No.:	U-2579AA		
Project Name:	Box Culvert @ -L- Sta. 32+77.5 on Future I-74 over Swaim Creek				
Client Name:	NCDOT GEU		Client Address: Raleigh, NC		

Sample No.	Station	Offset	Alignment	Sample Depth (ft)	AASHTO Classification		Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
							10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay				
SS-21	30+69	7 RT	-L-	9.0-10.5	A-7-6	(7)	98	78	70	53	52	29	18	19	34	41	22	19	39.4

References / Comments / Deviations: ND=Not Detemined. NP=Non-Plastic.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET		104-01-0703	Stewart S. Laney, PE	Project Manager
Technician Name:	Signature	Certification #	Technical Responsibility:	Position

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AA	1	11

REFERENCE: U-2579AA

PROJECT: 34839

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *FORSYTH*

PROJECT DESCRIPTION *BRIDGE NO. 395 & 396 ON US 311 (FUTURE I-74) OVER SR 2699*

CONTENTS

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

S. PAPKE

C. DRISCOLL

TRIGON EXPLORATION

INVESTIGATED BY *S. PAPKE*

DRAWN BY *C. DRISCOLL*

CHECKED BY *T. WELLS*

SUBMITTED BY *KLEINFELDER, INC*

DATE *APRIL 2019*

Prepared in the Office of:

KLEINFELDER
Bright People. Right Solutions.
7343 WEST FRIENDLY AVE.
GREENSBORO, NC 27410
NC FIRM LICENSE NO. F-1312

NORTH CAROLINA PROFESSIONAL SEAL 037998 ENGINEER THOMAS R. WELLS

Signed by:
Thomas R. Wells
7DA5D2D0518F4B0...

4/23/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	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													
#40	30 MX	50 MX	51 MN									GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#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 MX	11 MN	10 MX	10 MX	11 MX	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
	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, CPT, 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
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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
- [X] TRICONE 1-15/16" 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: SEE NOTES

ELEVATION: N/A FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

BY15-104 AT STA. 19+10.95 -Y2NBL- 158'LT (841,930 FT.N., 1,653,751 FT.E.)
ELEVATION: 789.85 FEET

U2579AA-11 AT STA. 23+80.13 -Y2NBL- 102'RT (841,521 FT.N., 1,654,095 FT.E.)
ELEVATION: 826.75 FEET

GRATE AT STA. 30+88.29 -Y2SBL- 97'RT (841,439 FT.N., 1,653,953 FT.E.)
ELEVATION: 801.95 FEET

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	3

SITE PLAN

0 50 100
FEET

BRIDGE NO.395 SKEW ANGLES
EB1: 53°51'78.66"
B1: 54°04'46.8"
B2: 54°29'39.0"
EB2: 54°43'30.1"

BRIDGE NO.396 SKEW ANGELS
EB1: 50°04'02.9"
B1: 50°22'11.4"
B2: 50°54'51.9"
EB2: 51°13'30.5"

NAD 83/NA 2011

BY15-104
42" RCP
CONC HW
SR 2699 COLE RD
EB1-A-NBL
B1-A-NBL
B2-A-NBL
B2-A2-NBL
-Y2NBL-
20+00
395
EB2-A-NBL
4-12x9 BARRELS
30"DI
-Y2-
20+00
FES
18" CMP
MTL
23+00
-Y2SBL-
-EY15-
29+00
DI
72" CONC
U2579AA-II (GPS)
25+00
EB1-B-SBL
EB2-B-SBL
B1-B-SBL
B2-B-SBL
396
12"DI
18" RCP
CONC DITCH
33+00
SS
JS
F
ST
W
T
I

PROFILE ALONG NBL 58' LT OF -Y2NBL-

0	50	100
FEET		

VE = 5:1

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	4

BRIDGE NO. 395 ON US 311 (-Y2NBL-)

(A) **ROADWAY EMBANKMENT:**
MOIST, MEDIUM STIFF TO HARD, BROWN, GRAY, AND ORANGE COARSE TO FINE SANDY SILT WITH LITTLE TO TRACE MICA AND TRACE CLAY SEAMS

(B) **ROADWAY EMBANKMENT:**
MOIST TO WET, LOOSE TO MEDIUM DENSE, LIGHT BROWN TO DARK GRAY TO ORANGE, SILTY COARSE TO FINE SAND WITH TRACE MICA, GRAVEL, AND CLAY SEAMS

(C) **ROADWAY EMBANKMENT:**
MOIST, STIFF, ORANGE, FINE SANDY CLAY

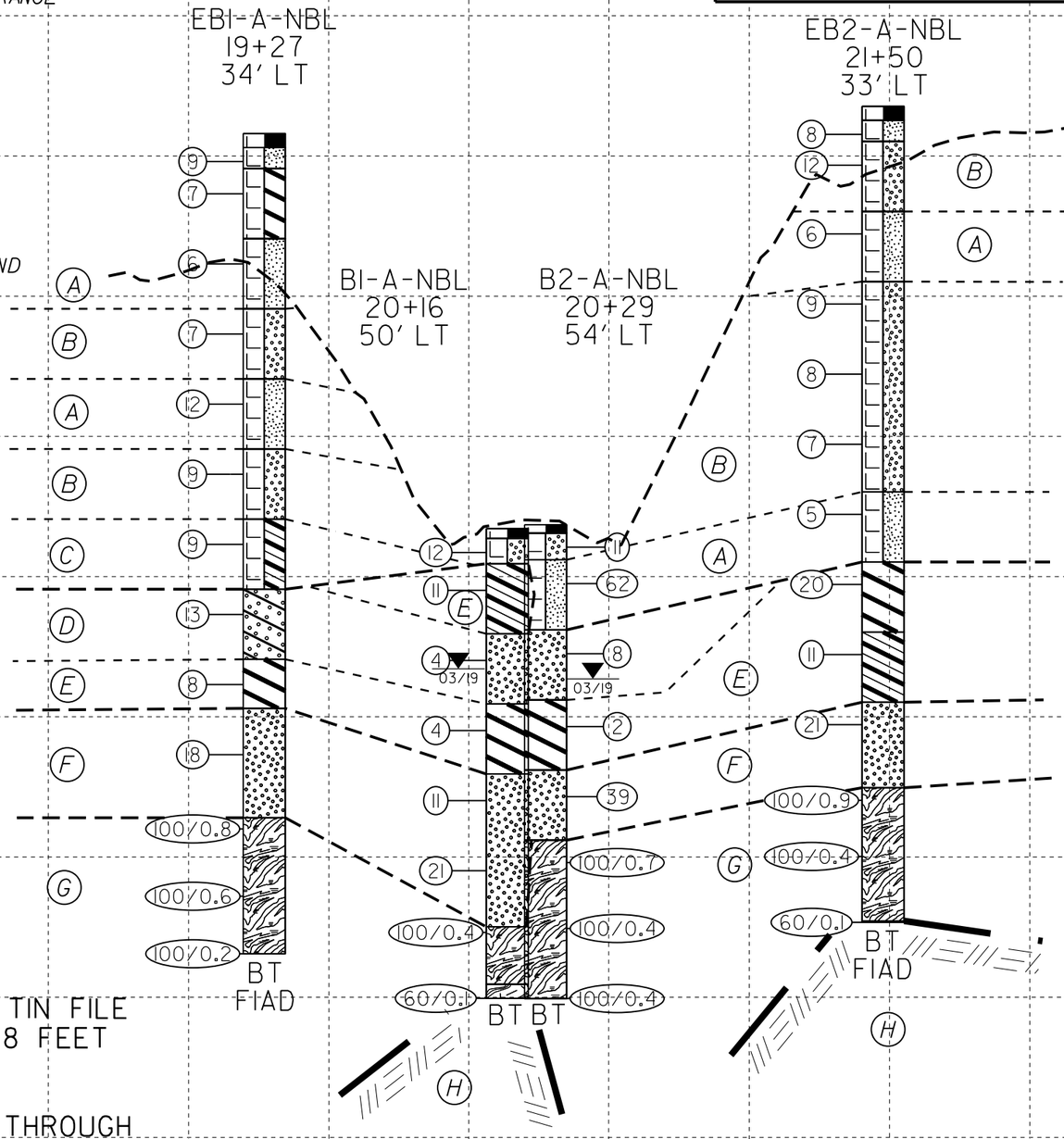
(D) **ALLUVIAL:**
MOIST TO WET, LOOSE TO MEDIUM DENSE, GRAY, CLAYEY FINE SAND TO SILTY FINE TO COARSE SAND WITH TRACE CLAY SEAMS

(E) **ALLUVIAL:**
MOIST, SOFT TO VERY STIFF, BLUE AND BROWN TO GRAY AND ORANGE, SILTY CLAY TO FINE SANDY CLAY WITH TRACE OF ORGANIC MATTER, MOTTLED

(F) **RESIDUAL:**
MOIST, MEDIUM DENSE TO DENSE, GRAY, BROWN, BLACK, AND WHITE, SILTY COARSE TO FINE SAND WITH SOME MICA

(G) **WEATHERED ROCK:**
WHITE, BROWN, ORANGE, BLACK, AND WHITE, BIOTITE GNEISS

(H) **CRYSTALLINE ROCK:**
BIOTITE GNEISS



NOTES:
GROUNDLINE TAKEN FROM PROJECT TIN FILE RECEIVED U2579AA_LS_TIN.TIN AT 58 FEET LEFT OF -Y2NBL-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILES

BORINGS S6_LL_EB2-A AND S6_LL_EB2-A2 COMBINED ON PROFILE FOR CLARITY

NOTES:
EB1 SKEW: 50°04'02.9" B1 SKEW: 50°22'11.4"
B2 SKEW: 50°54'51.9" EB2 SKEW: 51°13'30.5"

830 820 810 800 790 780 770 760 750 740

16+50 17+00 17+50 18+00 18+50 19+00 19+50 20+00 20+50 21+00 21+50 22+00 22+50 23+00

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	5

BRIDGE NO.396 ON US 311 (-Y2SBL-)

0 50 100
FEET
VE = 5:1

PROFILE ALONG SBL 63' RT OF -Y2SBL-

(A) **ROADWAY EMBANKMENT:** MOIST, VERY LOOSE TO MEDIUM DENSE, BROWN AND ORANGE, SILTY COARSE TO FINE SAND AND CLAYEY COARSE TO FINE SAND WITH TRACE MICA

(B) **ROADWAY EMBANKMENT:** MOIST, MEDIUM STIFF TO STIFF, GRAY, BROWN, RED, AND ORANGE, COARSE TO FINE SANDY CLAY, FINE SANDY SILT AND SILTY CLAY WITH TRACE MICA AND TRACE CLAY SEAMS

(C) **ALLUVIAL:** MOIST, SOFT TO VERY STIFF, GRAY, BROWN, ORANGE AND RED, COARSE TO FINE SANDY CLAY AND SILTY CLAY WITH TRACE OF ORGANIC MATTER AND TRACE MICA, MOTTLED

(D) **ALLUVIAL:** MOIST, MEDUIM DENSE, ORANGE AND RED, CLAYEY CORASE TO FINE SAND

(E) **RESIDUAL:** MOIST TO WET, LOOSE TO VERY DENSE, ORANGE, BLACK, WHITE, AND ORANGE-BROWN, SILTY SAND WITH TRACE TO HIGHLY MICA

(F) **RESIDUAL:** MOIST, MEDIUM STIFF, BROWN, COARSE TO FINE SANDY SILT WITH LITTLE MICA

(G) **WEATHERED ROCK:** BROWN, WHITE, ORANGE AND BLACK BIOTITE GNEISS

EB1-B-SBL 29+10 28' RT

B1-B-SBL 30+16 51' RT

B2-B-SBL 30+37 55' RT

EB2-B-SBL 31+17 28' RT

BT FIAD

NOTES:
GROUNDLINE TAKEN FROM PROJECT TIN FILE RECEIVED U2579AA_LS_TIN.TIN AT 63 FEET RIGHT OF -Y2SBL-

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILES

EB1 SKEW: 53°51'78.66" B1 SKEW: 54°04'46.8"
B2 SKEW: 54°29' 39.0" EB2 SKEW: 54° 43' 30.1"

840 830 820 810 800 790 780 770 760 750

26+50 27+00 27+50 28+00 28+50 29+00 29+50 30+00 30+50 31+00 31+50 32+00 32+50 33+00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. EB1-A-NBL	**STATION** 19+27	**OFFSET** 34 ft LT	**ALIGNMENT** -Y2NBL-	**0 HR.** N/A
COLLAR ELEV. 820.5 ft	**TOTAL DEPTH** 58.5 ft	**NORTHING** 841,810	**EASTING** 1,653,719	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/12/19	**COMP. DATE** 03/12/19	**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)
825										
820	819.5	1.0	7	4	5	9		M		820.5 — GROUND SURFACE — 0.0 819.5 — **ROADWAY EMBANKMENT** Asphalt and ABC Stone (0.0 - 1.0 Foot) — 1.0
	817.2	3.3	3	3	4	7		M		818.0 — Brown, Fine Sandy SILT with Little Mica Orange and Brown, Silty CLAY with Little Mica — 2.5
815										
	812.2	8.3	4	3	3	6		M		813.0 — Brown, Coarse to Fine Sandy SILT with Little Mica — 7.5
810										
	807.2	13.3	5	4	3	7		M		808.0 — Light Brown, Silty Coarse to Fine SAND — 12.5
805										
	802.2	18.3	2	5	7	12		M		803.0 — Coarse to Fine Sandy SILT with Little Mica and Trace Clay Seams — 17.5
800										
	797.2	23.3	4	4	5	9		M		798.0 — Dark Gray, Silty Coarse to Fine SAND with Trace Mica — 22.5
795										
	792.2	28.3	5	4	5	9		M		793.0 — Orange, Sandy CLAY — 27.5
790										
	787.2	33.3	4	6	7	13		M		788.0 — **ALLUVIAL** Gray, Clayey Fine SAND — 32.5
785										
	782.2	38.3	3	4	4	8		M		783.0 — Blue and Brown, Silty CLAY, Mottled — 37.5
780										
	777.2	43.3	6	8	10	18		W		779.5 — **RESIDUAL** Gray, Silty Fine to Coarse SAND — 41.0
775										
	772.2	48.3	14	40	60/0.3	100/0.8				771.7 — **WEATHERED ROCK** Black and White BIOTITE GNEISS — 48.8
770										
	767.2	53.3	16	80	20/0.1	100/0.6				
765										
	762.2	58.3	100/0.2			100/0.2				762.0 — Boring Terminated at Elevation 762.0 ft in WEATHERED ROCK: BIOTITE GNEISS — 58.5

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. B1-A-NBL	**STATION** 20+16	**OFFSET** 50 ft LT	**ALIGNMENT** -Y2NBL-	**0 HR.** 10.0
COLLAR ELEV. 792.4 ft	**TOTAL DEPTH** 33.5 ft	**NORTHING** 841,792	**EASTING** 1,653,807	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/18/19	**COMP. DATE** 03/18/19	**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
795										
	791.7	0.7	8	5	7	12		M		792.4 — GROUND SURFACE — 0.0 791.7 — **ROADWAY EMBANKMENT** Asphalt and ABC Stone (0.0 - 0.7 Foot) — 0.7
790	789.0	3.4	4	5	6	11		M		789.9 — Brown, Silty Coarse to Fine SAND — 2.5 **ALLUVIAL** Brown and Gray, Fine Sandy CLAY with Trace Mica
785										
	784.0	8.4	2	2	2	4		M		784.9 — Silty Fine to Coarse SAND with Trace Clay Seams — 7.5
780										
	779.0	13.4	1	2	2	4		M		779.9 — Gray and Brown, Silty CLAY with Trace of Organic Matter (Roots) — 12.5
775										
	774.0	18.4	6	7	4	11		M		774.9 — Gray, Silty Fine to Coarse SAND — 17.5
770										
	769.0	23.4	7	10	11	21		M		769.9 — **RESIDUAL** Brown, Black and White, Silty Coarse to Fine SAND — 22.5
765										
	764.0	28.4	100/0.4			100/0.4				764.9 — **WEATHERED ROCK** BIOTITE GNEISS — 27.5
760										
	759.0	33.4	60/0.1			60/0.1				759.0 — **CRYSTALLINE ROCK** BIOTITE GNEISS — 33.4 758.9 — 33.5 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 758.9 ft in CRYSTALLINE ROCK: BIOTITE GNEISS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. B2-A-NBL	**STATION** 20+29	**OFFSET** 54 ft LT	**ALIGNMENT** -Y2NBL-	**0 HR.** Caved
COLLAR ELEV. 792.7 ft	**TOTAL DEPTH** 13.4 ft	**NORTHING** 841,791	**EASTING** 1,653,821	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/18/19	**COMP. DATE** 03/18/19	**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)
795											
	792.1	0.6	13	5	6	11		W		792.7 GROUND SURFACE	0.0
790	789.5	3.2	4	5	57	62		M		792.1 **ROADWAY EMBANKMENT** Asphalt and ABC Stone (0.0 - 0.6 Foot)	0.6
										790.2 Brown, Silty Fine to Coarse SAND	2.5
785	784.5	8.2	15	5	3	8		W		Brown and Gray, Coarse to Fine Sandy SILT with Trace Mica	
										785.2 **ALLUVIAL** Silty, Fine to Coarse SAND with Trace Rubber Debris	7.5
780										780.2	12.5
										779.3 Gray, Silty CLAY with Trace of Organic Matter (Roots)	13.4
										Boring Terminated at Elevation 779.3 ft in ALLUVIAL: SILTY SAND	
										NOTE: Boring terminated due to loss of water during drilling. Boring was offset and redrilled as S6_LL_B2-A2.	

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. B2-A2-NBL	**STATION** 20+32	**OFFSET** 51 ft LT	**ALIGNMENT** -Y2NBL-	**0 HR.** 11.0
COLLAR ELEV. 792.7 ft	**TOTAL DEPTH** 33.8 ft	**NORTHING** 841,787	**EASTING** 1,653,822	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/18/19	**COMP. DATE** 03/18/19	**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
795										
										792.7 GROUND SURFACE 0.0
790										792.1 **ROADWAY EMBANKMENT** Asphalt and ABC Stone (0.0 - 0.6 Foot) 0.6
										790.2 Brown, Silty Fine to Coarse SAND 2.5
785										Brown and Gray, Coarse to Fine Sandy SILT with Trace Mica
										785.2 **ALLUVIAL** Silty, Fine to Coarse SAND with Trace Rubber Debris 7.5
780	779.3	13.4	1	1	1	2		M		780.2 12.5
										Gray, Silty CLAY with Trace of Organic Matter (Roots)
775	774.3	18.4	13	21	18	39		M		775.2 17.5
										RESIDUAL White and Gray, Silty Fine to Coarse SAND
770	769.3	23.4	60	40/0.2		100/0.7				770.2 22.5
										WEATHERED ROCK White, Brown, and Orange BIOTITE GNEISS
765	764.3	28.4	100/0.4			100/0.4				
760	759.3	33.4	100/0.4			100/0.4				758.9 33.8
										Boring Terminated at Elevation 758.9 ft in WEATHERED ROCK: BIOTITE GNEISS
										NOTE: Auger Probe From 0.0 - 13.4' bgs (See Boring S6_LL_B2-A for SPT Sampling)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. EB2-A-NBL	**STATION** 21+50	**OFFSET** 33 ft LT	**ALIGNMENT** -Y2NBL-	**0 HR.** N/A
COLLAR ELEV. 822.5 ft	**TOTAL DEPTH** 58.2 ft	**NORTHING** 841,727	**EASTING** 1,653,925	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/11/19	**COMP. DATE** 03/11/19	**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)
825										822.5 — 0.0 GROUND SURFACE
	821.5	1.0						M		821.5 — 1.0 **ROADWAY EMBANKMENT** Concrete (0.0 - 1.0 Foot)
820	819.3	3.2	5	4	4	8		M		820.0 — 2.5 Orange, Fine Sandy SILT with Trace Mica and Gravel Gray, Silty Coarse to Fine SAND with Trace Mica and Gravel
	814.4	8.1	4	6	6	12		M		815.0 — 7.5 Orange, Coarse to Fine Sandy SILT with Little Mica
815			3	3	3	6		M		
810	809.4	13.1	4	4	5	9		M		810.0 — 12.5 Orange to Gray, Silty Coarse to Fine SAND with Trace Mica, Gravel and Clay Seams
	804.4	18.1	3	4	4	8		M		
805										
800	799.4	23.1	2	3	4	7		M		
	794.4	28.1	2	2	3	5		M		795.0 — 27.5 Orange, Fine Sandy SILT with Little Mica
795										
790	789.4	33.1	4	8	12	20		M		790.0 — 32.5 **ALLUVIAL** Light Blue, Silty CLAY
	784.4	38.1	4	4	7	11		M		785.0 — 37.5 Gray and Orange, Fine Sandy CLAY
785										
780	779.4	43.1	14	11	10	21		M		780.0 — 42.5 **RESIDUAL** Brown and Black, Silty Coarse to Fine SAND with Some Mica
	774.4	48.1	33	62	38/0.4	100/0.9				773.9 — 48.6 **WEATHERED ROCK** Brown, Black, and White BIOTITE GNEISS
775										
770	769.4	53.1	100/0.4			100/0.4				
765	764.4	58.1	60/0.1			60/0.1				764.4 — 58.1 764.3 — 58.2 **CRYSTALLINE ROCK** BIOTITE GNEISS Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 764.3 ft in CRYSTALLINE ROCK: BIOTITE GNEISS

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. EB1-B-SBL	**STATION** 29+10	**OFFSET** 28 ft RT	**ALIGNMENT** -Y2SBL-	**0 HR.** N/A
COLLAR ELEV. 824.0 ft	**TOTAL DEPTH** 68.9 ft	**NORTHING** 841,561	**EASTING** 1,653,804	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/12/19	**COMP. DATE** 03/13/19	**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
825										824.0 — 0.0 GROUND SURFACE
	823.0	1.0						M		823.0 — 1.0 **ROADWAY EMBANKMENT** Concrete and ABC Stone (0.0 - 1.0 Foot)
820	820.6	3.4	8	6	8	14		M		Orange and Brown, Silty Coarse to Fine SAND with Trace Mica
	815.7	8.3	4	4	4	8		M		816.5 — 7.5 Orange to Brown, Coarse to Fine Sandy SILT with Trace Clay Seams
815			4	4	4	8		M		
810	810.7	13.3	3	3	4	7		M		811.5 — 12.5 Brown, Clayey Coarse to Fine SAND
	805.7	18.3	3	1	2	3		M		
805										806.5 — 17.5 Brown, Silty Coarse to Fine SAND with Trace Clay Seams
800	800.7	23.3	4	5	9	14		M		
	795.7	28.3	6	6	9	15		M		796.5 — 27.5 Gray to Orange, Coarse to Fine Sandy SILT with Trace Clay Seams
795										
790	790.7	33.3	3	3	5	8		M		791.5 — 32.5 **ALLUVIAL** Gray and Brown to Orange and Red, Fine Sandy CLAY with Trace of Organic Matter (Roots) and 2" Sand Seam, Mottled
785	785.7	38.3	3	3	5	8		M		
780	780.7	43.3	3	4	6	10		M		
775	775.7	48.3	13	13	8	21		M		776.5 — 47.5 **RESIDUAL** Orange and White, Silty Fine to Coarse SAND with Trace to Some Mica
770	770.7	53.3	15	30	48	78		M		
765	765.7	58.3	21	23	24	47		M		
760	760.7	63.3	27	73/0.2		100/0.7				761.5 — 62.5 **WEATHERED ROCK** Brown and White BIOTITE GNEISS
755	755.7	68.3	70	30/0.1		100/0.6				755.1 — 68.9 Boring Terminated at Elevation 755.1 ft in WEATHERED ROCK: BIOTITE GNEISS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. B1-B-SBL	**STATION** 30+16	**OFFSET** 51 ft RT	**ALIGNMENT** -Y2SBL-	**0 HR.** N/A
COLLAR ELEV. 800.5 ft	**TOTAL DEPTH** 48.6 ft	**NORTHING** 841,506	**EASTING** 1,653,898	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/19/19	**COMP. DATE** 03/19/19	**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)
805											
800	800.0	0.5	13	8	8	16		M		800.5 GROUND SURFACE	0.0
										800.0 **ROADWAY EMBANKMENT** Asphalt and ABC Stone (0.0 - 0.5 Foot)	0.5
	797.3	3.2	4	5	7	12		M		798.0 Orange and Gray, Coarse to Fine Sandy CLAY	2.5
795										**ALLUVIAL**	
	792.3	8.2	4	5	6	11		M		793.0 Orange and Red, Coarse to Fine Sandy CLAY	7.5
790										Orange and Gray, Clayey Coarse to Fine SAND	
	787.3	13.2	4	4	4	8		W		788.0 **RESIDUAL**	12.5
785										Orange, Black and White, Silty Coarse to Fine SAND	
	782.3	18.2	4	6	8	14		M			
780											
	777.3	23.2	6	7	9	16		M			
775											
	772.3	28.2	10	14	15	29		M			
770											
	767.3	33.2	25	37	40	77		M			
765											
	762.3	38.2	50	50/0.4		100/0.9				763.0 **WEATHERED ROCK**	37.5
760										Orange, Black and White BIOTITE GNEISS	
	757.3	43.2	25	50	50/0.1	100/0.6					
755											
	752.3	48.2	100/0.4			100/0.4				751.9 Boring Terminated at Elevation 751.9 ft in WEATHERED ROCK: BIOTITE GNEISS	48.6

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. B2-B-SBL	**STATION** 30+37	**OFFSET** 55 ft RT	**ALIGNMENT** -Y2SBL-	**0 HR.** 11.0
COLLAR ELEV. 801.0 ft	**TOTAL DEPTH** 43.8 ft	**NORTHING** 841,496	**EASTING** 1,653,917	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER R. Toothman	**START DATE** 03/14/19	**COMP. DATE** 03/14/19	**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
805										
800	800.4	0.6	7	6	7	13		M		801.0 GROUND SURFACE 0.0
										800.4 **ROADWAY EMBANKMENT** Asphalt and ABC Stone (0.0 - 0.6 Foot) 0.6
	797.6	3.4	3	6	6	12		M		**ALLUVIAL**
795										Brown, Orange and Gray, Coarse to Fine Sandy CLAY, Mottled
	792.6	8.4	3	4	5	9		M		
790										
	787.6	13.4	3	7	7	14		M		788.5 **RESIDUAL** 12.5
785										Orange to Brown, Silty Coarse to Fine SAND with Trace Mica
	782.6	18.4	2	5	9	14		M		
780										
	777.6	23.4	8	15	13	28		M		
775										
	772.6	28.4	14	20	31	51		M		
770										
	767.6	33.4	8	27	37	64		M		
765										
	762.6	38.4	37	60	40/0.2	100/0.7				762.1 **WEATHERED ROCK** 38.9
760										BIOTITE GNEISS
	757.6	43.4	100/0.4			100/0.4				757.2 Boring Terminated at Elevation 757.2 ft in WEATHERED ROCK: BIOTITE GNEISS 43.8

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** S. Papke	
SITE DESCRIPTION Bridge No. 395 & 396 on US-311 (Future I-74) over SR-2699				**GROUND WTR (ft)**
BORING NO. EB2-B-SBL	**STATION** 31+17	**OFFSET** 28 ft RT	**ALIGNMENT** -Y2SBL-	**0 HR.** N/A
COLLAR ELEV. 827.9 ft	**TOTAL DEPTH** 64.0 ft	**NORTHING** 841,497	**EASTING** 1,654,001	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER R. Toothman	**START DATE** 03/13/19	**COMP. DATE** 03/14/19	**SURFACE WATER DEPTH** N/A	

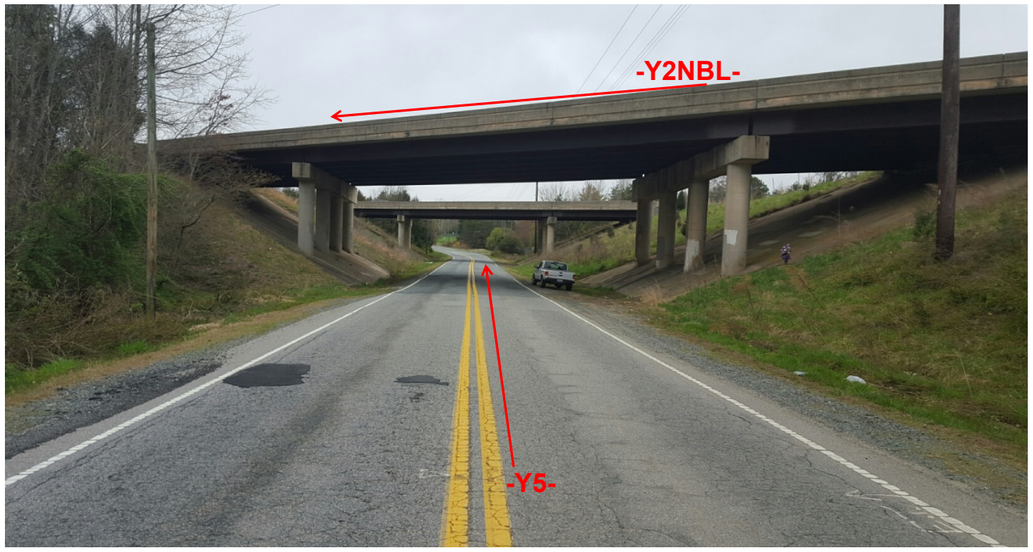
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
830											
	826.9	1.0	4	4	5	9		M		827.9 GROUND SURFACE	0.0
825	824.6	3.3	2	2	3	5		M		826.9 **ROADWAY EMBANKMENT**	1.0
										825.4 Asphalt and ABC Stone (0.0 - 1.0 Foot) / Orange, Coarse to Fine Sandy CLAY / Brown, Fine Sandy SILT with Trace Mica	2.5
820	819.7	8.2	3	5	6	11		M		821.9 Brown, Silty CLAY	6.0
										818.9 Brown, Fine Sandy SILT with Trace Mica	9.0
815	814.7	13.2	5	7	6	13		M		815.4 Brown, Silty Coarse to Fine SAND with Little Mica	12.5
810	809.7	18.2	3	4	4	8		M		810.4 Red and Brown, Fine Sandy CLAY	17.5
805	804.7	23.2	2	2	2	4		M		805.4 **ALLUVIAL** Brown, Gray and Orange, Fine Sandy CLAY with Trace Mica	22.5
800	799.7	28.2	4	4	6	10		M			
795	794.7	33.2	5	7	12	19		M		795.4 Light Gray, Silty Clay	32.5
790	789.7	38.2	2	3	3	6		M		790.4 **RESIDUAL** Brown, Coarse to Fine Sandy SILT with Little Mica	37.5
785	784.7	43.2	19	12	14	26		W		785.4 White to Brown and Black, Silty Fine to Coarse SAND with Little to Highly Mica	42.5
780	779.7	48.2	12	24	60	84		M			
775	774.7	53.2	44	34	45	79		M			
770	769.7	58.2	29	42	58/0.2	100/0.7				769.2 **WEATHERED ROCK** Black and White BIOTITE GNEISS	58.7
765	764.7	63.2	58	42/0.3		100/0.8				763.9 Boring Terminated at Elevation 763.9 ft in WEATHERED ROCK: BIOTITE GNEISS	64.0

NCDOT BORE DOUBLE U2579AA_GEO_BRDG_SITE6_GINT.GPJ NC_DOT.GDT 4/2/19

WBS NO.: 34839.1.7 - TIP NO.: U-2579AA
BRIDGE NO. 395 & 396 ON US 311 (FUTURE I-74) OVER SR 2699
SITE PHOTOGRAPHS

View Looking Southeast along -Y2NBL- from End Bent No. 1

View Looking Southeast along -Y2SBL- from End Bent No. 1



View Looking South along -Y5-

View Looking North along -Y5-

REFERENCE: U-2579AA

PROJECT: 34839

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AA	1	13

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *FORSYTH*

PROJECT DESCRIPTION *WINSTON-SALEM NORTHERN BELTWAY EASTERN SECTION (FUTURE I-74)*

FROM US 311 TO I-40

SITE DESCRIPTION *BRIDGE NO. 730 ON -Y2FLYCA- OVER US 311*

CONTENTS

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PERSONNEL

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P. DONNELLY

M. MAGNO

J. GARRICK

INVESTIGATED BY *ECS SOUTHEAST, LLP*

DRAWN BY *K. DE MONTBRUN, P.E.*

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FIRM # F-1078

NORTH CAROLINA PROFESSIONAL SEAL 026917 ENGINEER MICHAEL J. WALKO

DocuSigned by:
Michael J. Walko
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SIGNATURE

5/20/2019
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	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 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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
	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-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] DIEDRICH D-120
- [ ] _____

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: N/A FEET

NOTES:

EXISTING GROUND SURFACE INFORMATION PROVIDED BY NCDOT ON APRIL 22, 2019.

SURVEYED BORING LOCATIONS PROVIDED BY VAUGHN & MELTON ON APRIL 3, 2019.

DATE: 8-15-14

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NC REGISTERED
ENGINERING
FIRM # F-1078

PROJECT REFERENCE NO.	*SHEET NO.*
U-2579AA	3

SITE PLAN

0 *50* *100*
FEET

BRIDGE NO. 730 ON
-Y2FLYCA- OVER US 311
FROM US 311 TO I-40
BRIDGE SKEW = 43 DEGREES

-N-

TO FUTURE I-74

PIER PROTECTION

EB2-A

EB2-B

END BRIDGE NO.730
-Y2FLYCA- STA.33+46.60

TO RIDGEWOOD ROAD

-Y2NBL-

90+00

-Y2FLYAB-

35+00

B2-A

B2-B

-Y2-

90+00

BI-A

BI-B

30+00

10+00

-Y2RPC-

TO WALLBURGH ROAD

EBI-A

EBI-B

PIER PROTECTION

TO I-40

BEGIN BRIDGE NO.730
-Y2FLYCA- STA.28+73.60

5/14/99

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ENGINEERING
FIRM # P-1078

0 40 80

VE = 8:1

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	4

PROFILE BORINGS PROJECTED ON –Y2FLYCA– ALONG BRIDGE 730

–Y2FLYCA–

END BRIDGE –Y2FLYCA–
STA. 33+47 +/–

BEGIN BRIDGE –Y2FLYCA–
STA. 28+74 +/–

(+)3.4261%

(–)2.5231%

PI = 33+84.00
EL = 898.95'
VC = 1,000'
K = 168
Ds = 60MPH

EXISTING GROUND LINE

EBI-A
28+67
7' LT

BI-A
30+36
10' LT

B2-A
31+86
10' LT

EB2-A
33+39
11' LT

-ROADWAY EMBANKMENT-
VERY SOFT TO VERY STIFF, FINE TO COARSE SANDY SILT (A-5), WITH TRACE ORGANICS

MOIST, RED-ORANGE-BROWN, (A-4) AND CLAYEY SILT AND MICA

BLACK-GRAY-TAN, FINE TO MICA

COARSE SANDY SILT (A-4)

-RESIDUAL-
VERY SOFT TO VERY STIFF, MOIST, AND SILTY CLAY (A-7-5), LOOSE TO VERY DENSE, MOIST, TO LITTLE MICA

RED-WHITE-BROWN-ORANGE-WITH TRACE TO LITTLE

WHITE-BLACK-ORANGE

BROWN-TAN, SILTY FINE TO

COARSE SAND (A-2-4), WITH TRACE

Ⓑ -RESIDUAL-

-CRYSTALLINE ROCK-

-WEATHERED ROCK-

(GRANITIC ROCK)

BT

03/19

BT DRY 03/19

Ⓐ **-RESIDUAL-** LOOSE, MOIST, ORANGE-GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE ORGANICS AND MICA

Ⓑ **-RESIDUAL-** MEDIUM STIFF TO VERY STIFF, MOIST, WHITE-BLACK-BROWN-TAN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE MICA

–Y2FLYCA– PROFILE ALONG EXISTING GROUND LINE FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON FEBRUARY 18, 2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE PROFILE.

920 910 900 890 880 870 860 850 840 830 820 810 800 790 780 770

28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00

20-MAY-2019 15:25
S:\WRO\Harrisburg Investigation\TIP\U2579AA_GEO_BRDG0730_SITE2_FORSYTH\CADD_GEOTECH\Site&Sub\U-2579AA_GEO_prf_bridge730.dgn
$$$$USERNAME$$$$

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NC REGISTERED ENGINEERING FIRM # P-1078

VE = 1:1

PROJ. REFERENCE NO.	SHEET NO.
U-2579AA	5

BRIDGE NO. 730 END BENT 1
ON -Y2FLYCA- OVER US 311

EXISTING GROUND LINE

EBI-A
28+67
7' LT

EBI-B
28+74
15' RT

-ROADWAY EMBANKMENT-

VERY SOFT TO MEDIUM STIFF, MOIST, ORANGE-BROWN,
FINE TO COARSE SANDY SILT (A-4), WITH TRACE ORGANICS AND MICA

-RESIDUAL-

VERY SOFT TO VERY STIFF, MOIST, RED-ORANGE-WHITE-BROWN-
BLACK-GRAY-TAN,
FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE MICA

MEDIUM DENSE TO DENSE, MOIST, WHITE-GRAY-BLACK,
SILTY FINE TO
COARSE SAND (A-2-4), WITH TRACE TO LITTLE MICA

-CRYSTALLINE ROCK-

-WEATHERED ROCK- (GRANITIC ROCK)

(GRANITIC ROCK)

Ⓐ -RESIDUAL- STIFF, MOIST, WHITE-ORANGE-GRAY, FINE TO CORASE SANDY SILT (A-4), WITH SOME MICA

28+73.60
℄
-Y2FLYCA-

-Y2FLYCA- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON DATE 04/22/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

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NC REGISTERED ENGINEERING FIRM # P-1078

VE = 1:1

PROJ. REFERENCE NO.	SHEET NO.
U-2579AA	6

BRIDGE NO. 730 BENT 1
ON –Y2FLYCA– OVER US 311

BI-A
30+36
10' LT

BI-B
30+41
14' RT

EXISTING GROUND LINE

-ROADWAY EMBANKMENT-

MEDIUM STIFF TO VERY STIFF, MOIST, RED-BROWN-ORANGE-GRAY, FINE TO COARSE SANDY SILT (A-4) AND CLAYEY SILT (A-5), WITH TRACE ORGANICS AND MICA

-RESIDUAL-

VERY SOFT TO MEDIUM STIFF, MOIST, GRAY-ORANGE-BLACK-BROWN, SILTY CLAY (A-7-5) AND FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE MICA

MEDIUM DENSE, MOIST, WHITE-BLACK-ORANGE-TAN, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE MICA

-WEATHERED ROCK- (GRANITIC ROCK)

-CRYSTALLINE ROCK-

(GRANITIC ROCK)

BI-A		BI-B	
18		11	
16		12	
10	03/19	17	03/19
7		14	
5	Ⓐ	8	
2		6	
14		7	
11		7	
27		100/0.9	Ⓒ
17	Ⓑ	19	
20		100/0.8	
100/0.6	Ⓒ	60/0.0	B.T.
60/0.0	B.T.		

Ⓐ-RESIDUAL- LOOSE, MOIST, ORANGE-GRAY, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE ORGANICS AND MICA

Ⓑ-RESIDUAL- VERY STIFF, MOIST, WHITE-BLACK-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH LITTLE MICA

Ⓒ-WEATHERED ROCK- (GRANITIC ROCK)

30+50.60

℄
–Y2FLYCA–

–Y2FLYCA– GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON DATE 04/22/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

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NC REGISTERED ENGINEERING FIRM # P-1078

VE = 1:1

PROJ. REFERENCE NO.	SHEET NO.
U-2579AA	7

BRIDGE NO. 730 BENT 2
ON –Y2FLYCA– OVER US 311

B2-A
31+86
10' LT

B2-B
31+95
10' RT

EXISTING GROUND LINE

-RESIDUAL-
SOFT TO MEDIUM STIFF, MOIST, ORANGE-WHITE-BROWN-BLACK, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE MICA

B2-A: 4, 8, 8, 6 — 03/19 — 10, 12, 14, 18, 34, 26, 100/0.4, 100/0.8, 60/.01 — BT

B2-B: 5, 7, 6, 6, 5, 3, 3, 5, 21, 10, 34, 35, 100/0.7, 100/0.7, 100/0.8 — BT DRY 03/19

LOOSE TO DENSE, MOIST, ORANGE-BROWN-TAN-WHITE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE MICA

Ⓐ

-WEATHERED ROCK-
(GRANITIC ROCK)

-CRYSTALLINE ROCK-
(GRANITIC ROCK)

-WEATHERED ROCK-
(GRANITIC ROCK)

Ⓐ-RESIDUAL- STIFF, MOIST, ORANGE-BLACK-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH SOME MICA

31+94.60

℄
–Y2FLYCA–

–Y2FLYCA– GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON DATE 04/22/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

Prepared in the Office of:
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CHARLOTTE, NC 28217
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NC REGISTERED ENGINEERING FIRM # P-1078

VE = 1:1

PROJ. REFERENCE NO.	SHEET NO.
U-2579AA	8

BRIDGE NO. 730 END BENT 2 ON –Y2FLYCA– OVER US 311

EB2-A
33+39
11' LT

EB2-B
33+40
12' RT

EXISTING GROUND LINE

-RESIDUAL-

SOFT TO MEDIUM STIFF, MOIST, ORANGE-BLACK-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE MICA

LOOSE TO MEDIUM DENSE, MOIST, TAN-BROWN, SILTY FINE TO COARSE SAND (A-2-4), WITH LITTLE MICA

SOFT TO STIFF, MOIST, ORANGE-TAN-WHITE-BROWN-BLACK, FINE TO COARSE SANDY SILT (A-4), WITH TRACE TO LITTLE MICA

MEDIUM DENSE TO VERY DENSE, MOIST, TAN-BROWN-WHITE, SILTY FINE TO COARSE SAND (A-2-4), WITH TRACE TO LITTLE MICA

-WEATHERED ROCK-
(GRANITIC ROCK)

-CRYSTALLINE ROCK-
(GRANITIC ROCK)

EB2-A		EB2-B	
4		3	
4		9	
7		9	
5		8	
6		03/19	
13		3	
10		6	
8		7	
27		8	
25		7	
25		100/0.3	
32		100/0.6	
33		60/0.0	
41		BT	
50			
77			
BT			
DRY			
03/19			

33+46.60
℄
–Y2FLYCA–

–Y2FLYCA– GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON DATE 04/22/2019. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

6/23/16

17-MAY-2019 07:40
I:\GEOTECH\02-PROJECTS\13000-13900\13300\13384 - U-2579AA Bridge 730 on Y2FLYCA over US 311\CADD\GEOTECH\xsc\U-2579AA_GEO_XS1_Y2FLYCA.dgn
$$$$USERNAME$$$$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 28+67	**OFFSET** 7 ft LT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 847.1 ft	**TOTAL DEPTH** 40.5 ft	**NORTHING** 840,712	**EASTING** 1,660,593	**24 HR.** 13.1
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/05/19	**COMP. DATE** 03/05/19	**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)
850										
	847.1	0.0								847.1 GROUND SURFACE 0.0
845			1	2	2	4		M		**ROADWAY EMBANKMENT** Very Soft to Medium Stiff, Orange-Brown, Fine to Coarse Sandy SILT (A-4), with trace organics and mica
	843.6	3.5	3	3	2	5		M		
840	841.1	6.0	3	2	2	4		M		
	838.6	8.5	WOH	WOH	WOH	0		M		
835	833.6	13.5	WOH	1	1	2		M		834.1 13.0 **RESIDUAL** Very Soft to Very Stiff, White-Black-Gray-Tan-Orange, Fine to Coarse Sandy SILT (A-4), with trace to little mica
830	828.6	18.5	WOH	1	3	4		M		
825	823.6	23.5	2	5	3	8		M		
820	818.6	28.5	3	8	9	17		M		
815	813.6	33.5	4	11	10	21		M		814.1 33.0 Medium Dense to Dense, White-Black, Silty Fine to Coarse SAND (A-2-4), with trace mica
810	808.6	38.5	9	19	17	36		M		
	806.6	40.5	60/0.0			60/0.0		M		806.6 40.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 806.6 ft On Crystalline Rock (GRANITIC ROCK)

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 28+74	**OFFSET** 15 ft RT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 845.0 ft	**TOTAL DEPTH** 42.4 ft	**NORTHING** 840,695	**EASTING** 1,660,609	**24 HR.** 12.9
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/05/19	**COMP. DATE** 03/05/19	**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
845										845.0 GROUND SURFACE 0.0
	845.0	0.0	WOH	2	3	5		M		**RESIDUAL** Soft to Medium Stiff, Red-Tan-Brown-Black-Orange-Gray, Fine to Coarse Sandy SILT (A-4), with little mica
	842.0	3.0	1	2	1	3		M		
840	839.0	6.0	1	1	2	3		M		
	836.5	8.5	1	2	3	5		M		
835	831.5	13.5	1	2	3	5		M		
830	826.5	18.5	1	3	2	5		M		
825	821.5	23.5	6	15	18	33		M		822.0 23.0 Dense, White-Gray, Silty Fine to Coarse SAND (A-2-4), with trace mica
820	816.5	28.5	3	6	7	13		M		817.0 28.0 Stiff, White-Orange-Gray, Fine to Coarse Sandy SILT (A-4), with some mica
815	811.5	33.5	4	6	10	16		M		812.0 33.0 Medium Dense, White-Black-Gray, Silty Fine to Coarse SAND (A-2-4), with little mica
810	806.5	38.5	100/0.2			100/0.2		M		806.5 38.5 **WEATHERED ROCK** White-Gray (GRANITIC ROCK)
805	802.6	42.4	60/0.0			60/0.0		M		802.6 42.4 Boring Terminated with Standard Penetration Test Refusal at Elevation 802.6 ft On Crystalline Rock (GRANITIC ROCK)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 30+36	**OFFSET** 10 ft LT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 852.5 ft	**TOTAL DEPTH** 50.4 ft	**NORTHING** 840,797	**EASTING** 1,660,738	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/06/19	**COMP. DATE** 03/06/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
855										
	852.5	0.0	1	2	6	8		M		852.5 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** Medium Stiff to Very Stiff, Red-Brown, Fine to Coarse Sandy SILT (A-4), with trace mica
850	849.0	3.5	4	6	10	16		M		
	846.5	6.0	3	5	5	10		M		847.0 5.5 Medium Stiff to Stiff, Red-Brown-Orange, Clayey SILT (A-5), with trace organics and mica
845	844.0	8.5	2	3	4	7		M		
840	839.0	13.5	1	2	3	5		M		839.5 13.0 **RESIDUAL** Loose, Orange-Gray, Silty Fine to Coarse SAND (A-2-4), with trace organics and mica
835	834.0	18.5	WOH	WOH	2	2		M		834.5 18.0 Very Soft, Gray-Orange, Silty CLAY (A-7-5), with trace mica
830	829.0	23.5	3	5	9	14		M		829.5 23.0 Medium Dense, White-Black-Orange, Silty Fine to Coarse SAND (A-2-4), with trace to little mica
825	824.0	28.5	3	5	6	11		M		
820	819.0	33.5	7	12	15	27		M		
815	814.0	38.5	5	6	11	17		M		814.5 38.0 Very Stiff, White-Black-Brown, Fine to Coarse Sandy SILT (A-4), with little mica
810	809.0	43.5	5	9	11	20		M		
805	804.0	48.5	4	34	66/0.1	100/0.6		M		803.5 49.0 **WEATHERED ROCK** Orange-White-Brown (GRANITIC ROCK)
	802.1	50.4	60/0.0			60/0.0				802.1 50.4 Boring Terminated with Standard Penetration Test Refusal at Elevation 802.1 ft On Crystalline Rock (GRANITIC ROCK)

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 30+41	**OFFSET** 14 ft RT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 854.7 ft	**TOTAL DEPTH** 47.7 ft	**NORTHING** 840,780	**EASTING** 1,660,755	**24 HR.** 6.8
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/06/19	**COMP. DATE** 03/06/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
855										
	854.7	0.0	2	4	7	11		M		854.7 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** Stiff, Gray-Red-Brown, Fine to Coarse Sandy SILT (A-4)
850	851.2	3.5	4	6	6	12		M		
	848.7	6.0	6	7	10	17		M		849.2 5.5 Stiff to Very Stiff, Red-Orange-Brown, Clayey SILT (A-5), with trace mica
845	846.2	8.5	3	6	8	14		M		
840	841.2	13.5	1	4	4	8		M		841.7 13.0 **RESIDUAL** Medium Stiff, Gray-Orange, Silty CLAY (A-7-5), with trace mica
835	836.2	18.5	WOH	1	5	6		M		836.7 18.0 Medium Stiff, Gray-Orange, Silty CLAY (A-7-6), with trace mica
830	831.2	23.5	1	2	5	7		M		831.7 23.0 Medium Stiff, Orange-Black-Brown, Fine to Coarse Sandy SILT (A-4), with little mica
825	826.2	28.5	1	2	5	7		M		
820	821.2	33.5	5	20	80/0.4	100/0.9		M		820.7 34.0 **WEATHERED ROCK** Tan-White (GRANITIC ROCK)
815	816.2	38.5	6	9	10	19		M		816.7 38.0 **RESIDUAL** Medium Dense, Tan-White, Silty Fine to Coarse SAND (A-2-4), with little mica
810	811.2	43.5	35	65/0.3		100/0.8		M		811.2 43.5 **WEATHERED ROCK** Tan-White (GRANITIC ROCK)
	807.0	47.7	60/0.0			60/0.0				807.0 47.7 Boring Terminated with Standard Penetration Test Refusal at Elevation 807.0 ft On Crystalline Rock (GRANITIC ROCK)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 31+86	**OFFSET** 10 ft LT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 848.2 ft	**TOTAL DEPTH** 53.3 ft	**NORTHING** 840,885	**EASTING** 1,660,858	**24 HR.** 9.6
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/06/19	**COMP. DATE** 03/06/19	**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)
850	848.2	0.0								848.2 GROUND SURFACE 0.0
			WOH	1	3	4		M		**RESIDUAL** Soft to Medium Stiff, Orange-White-Brown, Fine to Coarse Sandy SILT (A-4), with little mica
845	844.7	3.5								
	842.2	6.0	2	3	5	8		M		
840	839.7	8.5	2	3	5	8		M		
			2	2	4	6		M		
835	834.7	13.5								835.2 13.0
			2	4	6	10		M		Loose to Dense, Orange-Brown-Tan-White, Silty Fine to Coarse SAND (A-2-4), with little mica
830	829.7	18.5								
			3	5	7	12		M		
825	824.7	23.5								
			4	5	9	14		M		
820	819.7	28.5								
			5	8	10	18		M		
815	814.7	33.5								
			7	12	22	34		M		
810	809.7	38.5								
			7	12	14	26		M		
805	804.7	43.5								804.7 43.5
			100/0.4			100/0.4				**WEATHERED ROCK** Gray-Tan (GRANITIC ROCK)
800	799.7	48.5								
			18	18	82/0.3	100/0.8				
795	795.0	53.2								795.0 53.2
			60/0.1			60/0.1				794.9 53.3 **CRYSTALLINE ROCK** Tan-White (GRANITIC ROCK) Boring Terminated with Standard Penetration Test Refusal at Elevation 794.9 ft In Crystalline Rock (GRANITIC ROCK)

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 31+95	**OFFSET** 10 ft RT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 850.2 ft	**TOTAL DEPTH** 64.8 ft	**NORTHING** 840,876	**EASTING** 1,660,877	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/07/19	**COMP. DATE** 03/07/19	**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
855										
850	850.2	0.0								850.2 GROUND SURFACE 0.0
			WOH	1	4	5		M		**RESIDUAL** Soft to Medium Stiff, Orange-Black-Brown, Fine to Coarse Sandy SILT (A-4), with trace to little mica
	846.7	3.5								
845	844.2	6.0	2	3	4	7		M		
	841.7	8.5	2	2	4	6		M		
840			1	3	3	6		M		
	836.7	13.5								
835			1	2	3	5		M		
	831.7	18.5								
830			1	1	2	3		M		
	826.7	23.5								
825			1	1	2	3		M		
	821.7	28.5								
820			1	1	4	5		M		
	816.7	33.5								
815			3	8	13	21		M		
	811.7	38.5								
810			2	3	7	10		M		
	806.7	43.5								
805			20	16	18	34		M		
	801.7	48.5								
800			13	15	20	35		M		
	796.7	53.5								796.2 54.0
795			25	72	28/0.2	100/0.7				**WEATHERED ROCK** Tan-White-Gray (GRANITIC ROCK)
	791.7	58.5								
790			61	39/0.2		100/0.7				
	786.7	63.5								
			19	30	72/0.3	100/0.8				785.4 64.8 Boring Terminated at Elevation 785.4 ft In Weathered Rock (GRANITIC ROCK)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 33+39	**OFFSET** 11 ft LT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 852.9 ft	**TOTAL DEPTH** 70.0 ft	**NORTHING** 840,989	**EASTING** 1,660,968	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/08/19	**COMP. DATE** 03/08/19	**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)
855										
	852.9	0.0								852.9 0.0 GROUND SURFACE
			1	1	3	4		M		**RESIDUAL** Soft to Medium Stiff, Orange-Black-Brown, Fine to Coarse Sandy SILT (A-4), with trace to little mica
850	849.4	3.5	1	2	2	4		M		
	846.9	6.0	1	3	4	7		M		
845	844.4	8.5	2	3	3	6		M		
			1	2	4	6		M		
840	839.4	13.5								
			4	6	7	13		M		
835	834.4	18.5								834.9 18.0 Medium Dense, Tan-Brown, Silty Fine to Coarse SAND (A-2-4), with little mica
			2	4	6	10		M		829.9 23.0 Medium Stiff to Stiff, Tan-White-Brown, Fine to Coarse Sandy SILT (A-4), with little mica
830	829.4	23.5								
	824.4	28.5	2	3	5	8		M		
825										
	819.4	33.5	5	9	18	27		M		819.9 33.0 Medium Dense to Very Dense, Tan-Brown-White, Silty Fine to Coarse SAND (A-2-4), with trace to little mica
820										
	814.4	38.5	6	11	14	25		M		
815										
	809.4	43.5	8	10	15	25		M		
810										
	804.4	48.5	6	12	20	32		M		
805										
	799.4	53.5	8	16	17	33		M		
800										
	794.4	58.5	10	15	26	41		M		
795										
	789.4	63.5	19	22	28	50		M		
790										
	784.4	68.5	26	37	40	77		M		782.9 70.0 Boring Terminated at Elevation 782.9 ft In Residual Silty SAND (A-2-4)
785										

WBS 34839.1.7	**TIP** U-2579AA	**COUNTY** FORSYTH	**GEOLOGIST** A. Suttle	
SITE DESCRIPTION Bridge No. 730 on -Y2FLYCA- over US 311 from US 311 to I-40				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 33+40	**OFFSET** 12 ft RT	**ALIGNMENT** -Y2FLYCA-	**0 HR.** N/A
COLLAR ELEV. 850.5 ft	**TOTAL DEPTH** 47.5 ft	**NORTHING** 840,974	**EASTING** 1,660,985	**24 HR.** 9.4
DRILL RIG/HAMMER EFF./DATE M&W029 Diedrich D-120 89% 09/07/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER G. Akins	**START DATE** 03/08/19	**COMP. DATE** 03/08/19	**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
855										
	850.5	0.0								850.5 GROUND SURFACE 0.0
			1	1	2	3		M		**RESIDUAL** Soft, Orange-Black-Brown, Fine to Coarse Sandy SILT (A-4), with trace mica
850	847.0	3.5								847.5 3.0
			2	3	6	9		M		Loose, Tan-Brown, Silty Fine to Coarse SAND (A-2-4), with little mica
845	844.5	6.0								
			3	4	5	9		M		
	842.0	8.5								
840			2	3	5	8		M		
	837.0	13.5								837.5 13.0
			1	1	2	3		M		Soft to Medium Stiff, Orange-Black-White-Brown, Fine to Coarse Sandy SILT (A-4), with trace to little mica
835	832.0	18.5								
			1	2	4	6		M		
830	827.0	23.5								
			1	3	4	7		M		
825	822.0	28.5								
			2	3	5	8		M		
820	817.0	33.5								
			1	2	5	7		M		
815	812.0	38.5								812.0 38.5
			100/0.3			100/0.3				**WEATHERED ROCK** Tan-Gray (GRANITIC ROCK)
810	807.0	43.5								
			11	81	19/0.1	100/0.6				
805	803.0	47.5								803.0 47.5
			60/0.0			60/0.0				Boring Terminated with Standard Penetration Test Refusal at Elevation 803.0 ft On Crystalline Rock (GRANITIC ROCK)

PROJECT REFERENCE NO.	SHEET NO.
U-2579AA	13

SITE PHOTOS

BRIDGE NO. 730 ON
-Y2FLYCA- OVER US 311

PHOTO 1: VIEW AT END BENT 1 LOOKING UPSTATION ALONG -Y2FLYCA- TOWARD EB-2

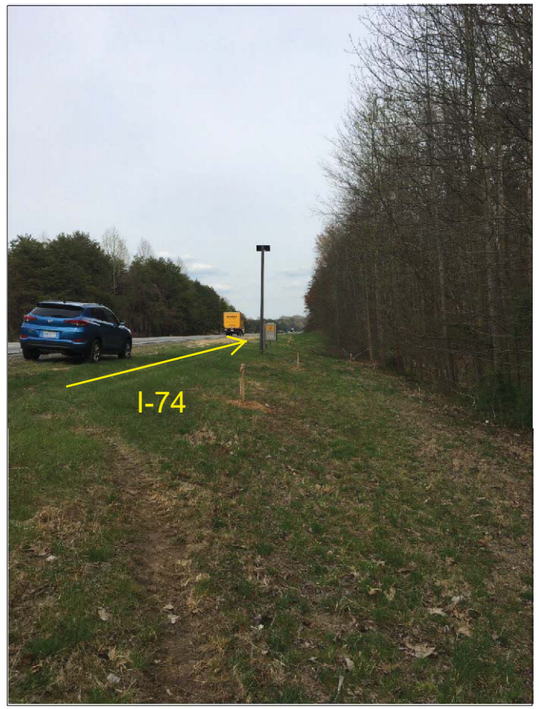

PHOTO 2: VIEW AT END BENT 1 LOOKING EAST ALONG -Y2- (EXISTING I-74)

PHOTO 3: VIEW AT END BENT 2 LOOKING DOWNSTATION ALONG -Y2FLYCA- TOWARD EB-1

PHOTO 4: VIEW AT END BENT 2 LOOKING WEST ALONG -Y2- (EXISTING I-74)