STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5711	1	4

REFERENCE: I-5711

PROJECT: 50401.1.FS1

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *ALAMANCE*

PROJECT DESCRIPTION *INTERCHANGE IMPROVEMENTS AT I-40/I-85 AND SR 1007 (MEBANE OAKS ROAD)*

SITE DESCRIPTION *RETAINING WALL NO. 1 (-WALL-) -L- STA. 34+82.39, 72.38' RT TO -L- STA. 36+04.76, 94.03' RT*

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

CAROLINA DRILLING

PAUL, A. S.

INVESTIGATED BY *PAUL, A. S.*

DRAWN BY *CROCKETT, S. C.*

CHECKED BY *HAMM, J. R.*

SUBMITTED BY *FALCON ENG.*

DATE *JUNE 2019*

NORTH CAROLINA PROFESSIONAL SEAL 39779 ENGINEER JEREMY R HAMM

DocuSigned by:
Jeremy R Hamm
ED7938089E22487...

6/27/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-5711	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		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
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:
- [X] CME-45
- [ ] 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
- [ ] 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:
BORING ELEVATIONS TAKEN FROM I5711_LS_TIN_171025.TIN DATED 10/25/17
ELEVATION: FEET

NOTES:

DATE: 1-XX-17

LOCHNER

H. W. LOCHNER, INC.
2840 PLAZA PLACE, SUITE 202
RALEIGH, NC 27612
(919)571-7111

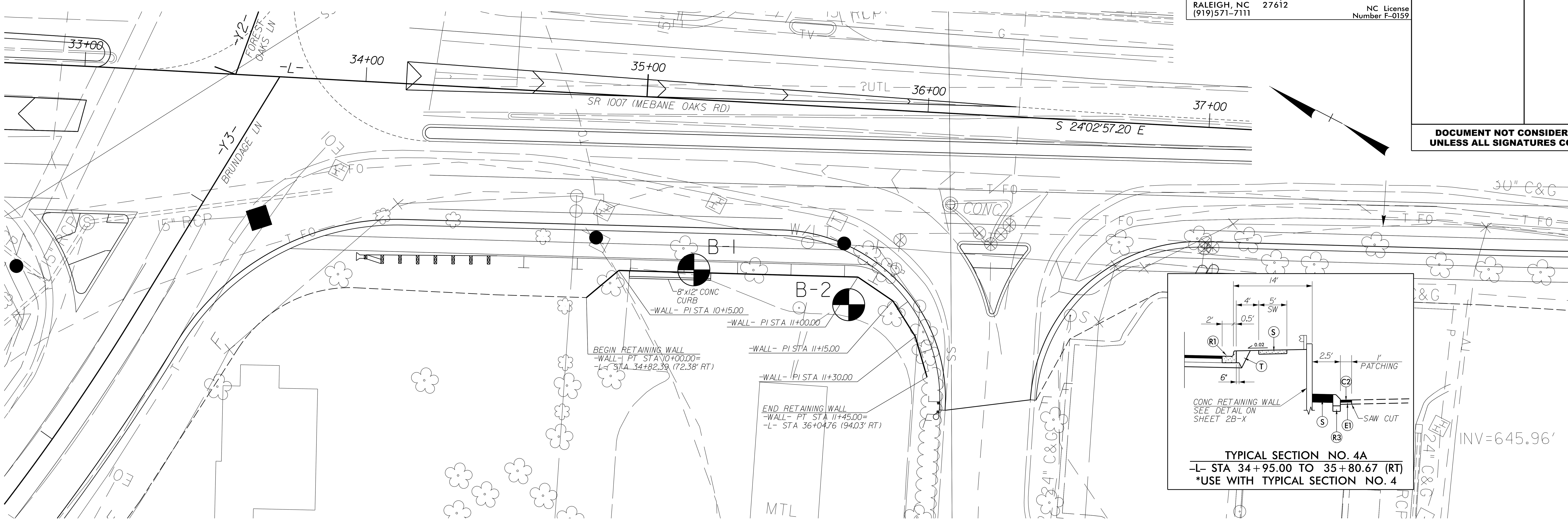
NC License Number F-0159

PROJECT REFERENCE NO.	SHEET NO.
I-5711	3
R/W SHEET NO.	

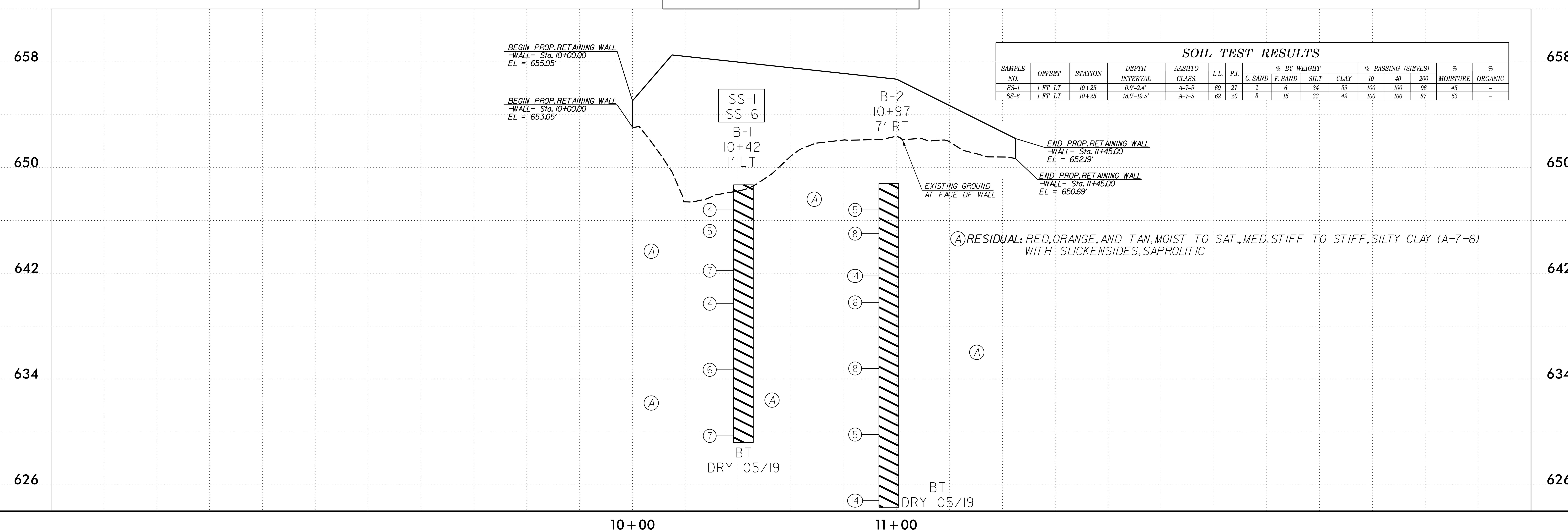
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS

8/17/99



WALL ENVELOPE



Ⓐ RESIDUAL: RED,ORANGE,AND TAN,MOIST TO SAT.,MED.STIFF TO STIFF,SILTY CLAY (A-7-6) WITH SLICKENSIDES,SAPROLITIC

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	1 FT LT	10+25	0.9'-2.4'	A-7-5	69	27	1	6	34	59	100	100	96	45	-
SS-6	1 FT LT	10+25	18.0'-19.5'	A-7-5	62	20	3	15	33	49	100	100	87	53	-

24-JUN-2019 09:11 NCDOT GEU I-5711 Retaining Wall\I5711_GEO_RWAL\CADD_GEOTECH\Site&Sub\I-5711_RWAL_PLN_03.dgn

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 50401.1.FS1	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** A. Paul	
SITE DESCRIPTION Interchange Improvements at I-40/I-85 and SR 1007 (Mebane Oaks Rd.)				**GROUND WTR (ft)**
BORING NO. B-1	**STATION** 10+42	**OFFSET** 1 ft LT	**ALIGNMENT** -WALL-	**0 HR.** Dry
COLLAR ELEV. 648.7 ft	**TOTAL DEPTH** 19.5 ft	**NORTHING** 844,152	**EASTING** 1,920,011	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 91% 02/22/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Radford	**START DATE** 05/07/19	**COMP. DATE** 05/07/19	**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 ELEV. (ft)	DEPTH (ft)
650										648.7 GROUND SURFACE	0.0
	647.8	0.9	1	2	2	4 6	SS-1	45%		**RESIDUAL** RED, ORANGE, AND TAN, SILTY CLAY (A-7-5) WITH MAGANESE OXIDE STAINING, SAPROLITIC	
645	646.2	2.5	1	2	3	5		M			
	643.2	5.5	2	3	4	7		M			
640	640.7	8.0	1	1	3	4		W			
635	635.7	13.0	1	3	3	6		W			
630	630.7	18.0	1	3	4	7	SS-6	53%		629.2 Boring Terminated at Elevation 629.2 ft IN RESIDUAL: SILTY CLAY	19.5

WBS 50401.1.FS1	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** A. Paul	
SITE DESCRIPTION Interchange Improvements at I-40/I-85 and SR 1007 (Mebane Oaks Rd.)				**GROUND WTR (ft)**
BORING NO. B-2	**STATION** 10+97	**OFFSET** 10 ft RT	**ALIGNMENT** -WALL-	**0 HR.** Dry
COLLAR ELEV. 648.8 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 844,097	**EASTING** 1,920,025	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 91% 02/22/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Radford	**START DATE** 05/07/19	**COMP. DATE** 05/07/19	**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
650										648.8 GROUND SURFACE 0.0
	647.8	1.0	2	2	3	5		M		**RESIDUAL** RED, ORANGE, AND TAN, SILTY CLAY (A-7-5) WITH MAGANESE OXIDE STAINING, SAPROLITIC
645	646.0	2.8	1	3	5	8		M		
	642.8	6.0	4	6	8	14		M		
640	640.8	8.0	2	2	4	6		W		
635	635.8	13.0	2	3	5	8		W		
630	630.8	18.0	1	1	4	5		Sat.		
625	625.8	23.0	2	6	8	14		Sat.		624.3 Boring Terminated at Elevation 624.3 ft IN RESIDUAL: SILTY CLAY 24.5

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-5711	1	29

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *ALAMANCE*

PROJECT DESCRIPTION *INTERCHANGE IMPROVEMENTS AT I-40/I-85 AND SR 1007 (MEBANE OAKS ROAD)*

SITE DESCRIPTION *BRIDGE NO. 177 ON MEBANE OAKS ROAD (-L-) OVER I-40/I-85 (-Y1-) BETWEEN SR 2033 (ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)*

REFERENCE: I-5711

PROJECT: 40501

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

TRIGON

WEIS, J.M.

CROCKETT, S.C.

LANE, R.W.

INVESTIGATED BY *WEIS, J.M.*

DRAWN BY *CROCKETT, S.C.*

CHECKED BY *HAMM, J.R.*

SUBMITTED BY *FALCON ENG.*

DATE *JANUARY 2019*

NORTH CAROLINA PROFESSIONAL SEAL 39779 ENGINEER JEREMY R HAMM

DocuSigned by:
Jeremy R Hamm 1/17/2019
ED7938089E22487...
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
I-5711	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 EXCAVATION
- 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-550X
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q

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: BM-2- BENCH TIE IN 18" OAK TREE
STATION -L- 24+03.55, 130.04' RT
N: 845117.3, E: 1919454.5 ELEVATION: 663.42 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-5711	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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

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

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

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

STRUCTURE

- INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities
- BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets
- VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets
- BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity
- DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces
- LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very rough, fresh unweathered surfaces	Rough, slightly weathered, iron stained surfaces	Smooth, moderately weathered and altered surfaces	Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

90			N/A	N/A
80				
70				
60				
50				
40				
30				
20				
10				
N/A	N/A			

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

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

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

- **A.** *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*
- **B.** *Sandstone with thin interlayers of siltstone*
- **C.** *Sandstone and siltstone in similar amounts*
- **D.** *Siltstone or silty shale with sandstone layers*
- **E.** *Weak siltstone or clayey shale with sandstone layers*
- **C, D, E,** and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.**
- **F.** *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*
- **G.** *Undisturbed silty or clayey shale with or without a few very thin sandstone layers* → **H.** ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***

→ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

70	A			
60				
50		B	C	D E
40				
30				F
20				
10			G	H

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
I-5711	3

0 40 80
FEET

NC GRID
NAD 83 NA 2011

24+00
25+00
26+00
27+00
28+00
29+00

END BENT #1 LL
STA. 25+98.31 (L)

BENT #1 LL
STA. 26+34.81 (L)

BENT #2 LL
STA. 27+09.56 (L)

BENT #3 LL
STA. 27+84.31 (L)

END BENT #2 LL
STA. 28+19.31 (L)

EB1-A
B1-A
B2-A
B3-A
EB2-A

-L-

BRIDGE #177

EB1-B
B1-B
B2-B
B3-B

END BENT #1 RL
STA. 25+92.95 (L)

BENT #1 RL
STA. 26+29.45 (L)

BENT #2 RL
STA. 27+04.20 (L)

BENT #3 RL
STA. 27+78.95 (L)

END BENT #2 RL
STA. 28+13.95 (L)

BM#2
-L- STA. 24+03.55
130.04' RIGHT
ELEV 663.42'

EIP

BRIDGE SKEW: 93°37'51"

0 100 200
FEET
VE = 5:1

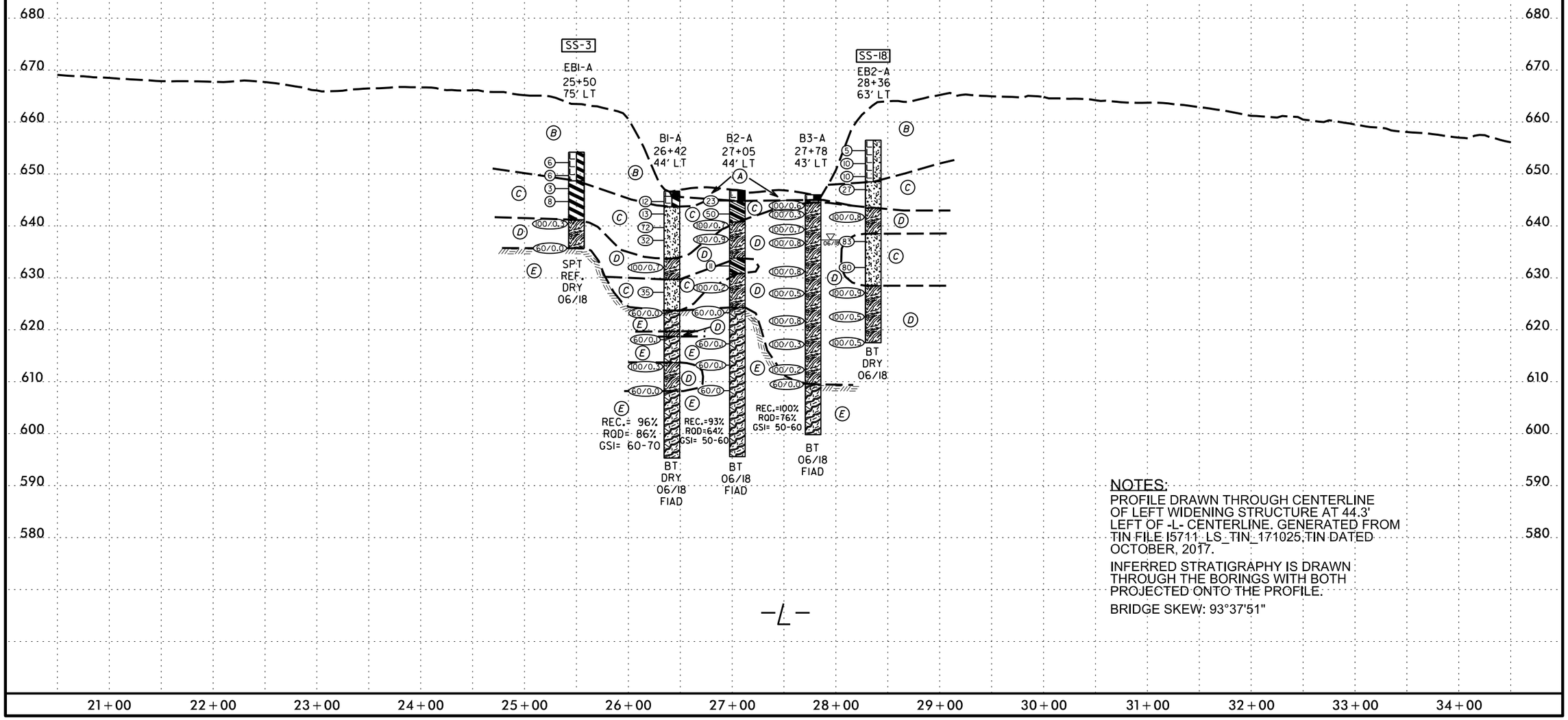
PROJECT REFERENCE NO.	SHEET NO.
I-5711	4

BRIDGE NO. 177 ON MEBANE OAKS ROAD OVER I-40/I-85 – LEFT WIDENING

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-3	75 FT LT	25+50	1.0'-2.5'	A-7-6	41	13	7	7	31	55	92	87	78	25	–
SS-18	63 FT LT	28+36	3.5'-5.0'	A-5	47	10	2	12	63	23	100	99	86	26	–

(A) **ROADWAY EMBANKMENT:** BITUMINOUS ASPHALT PAVEMENT AND AGGREGATE
(B) **ROADWAY EMBANKMENT:** BROWN, RED, AND TAN, MOIST TO WET, MED. STIFF TO STIFF, CLAYEY SILT AND SILTY CLAY (A-5, A-7) WITH TRACE GRAVEL
(C) **RESIDUAL:** BROWN, TAN, AND ORANGE, MOIST TO WET, SOFT TO HARD, CLAYEY SILT AND SANDY AND SILTY CLAY (A-5, A-6, A-7)
(D) **WEATHERED ROCK:** BROWN AND TAN, METAMORPHOSED ANDESITE
(E) **CRYSTALLINE ROCK:** GRAY AND GREEN, FRESH TO MOD. SEV. WEATHERING, SOFT TO VERY HARD, VERY CLOSE TO WIDELY FRACTURED, METAMORPHOSED ANDESITE



NOTES:
PROFILE DRAWN THROUGH CENTERLINE OF LEFT WIDENING STRUCTURE AT 44.3' LEFT OF -L- CENTERLINE. GENERATED FROM TIN FILE I5711_LS_TIN_171025.TIN DATED OCTOBER, 2017.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

BRIDGE SKEW: 93°37'51"

0 100 200
FEET
VE = 5:1

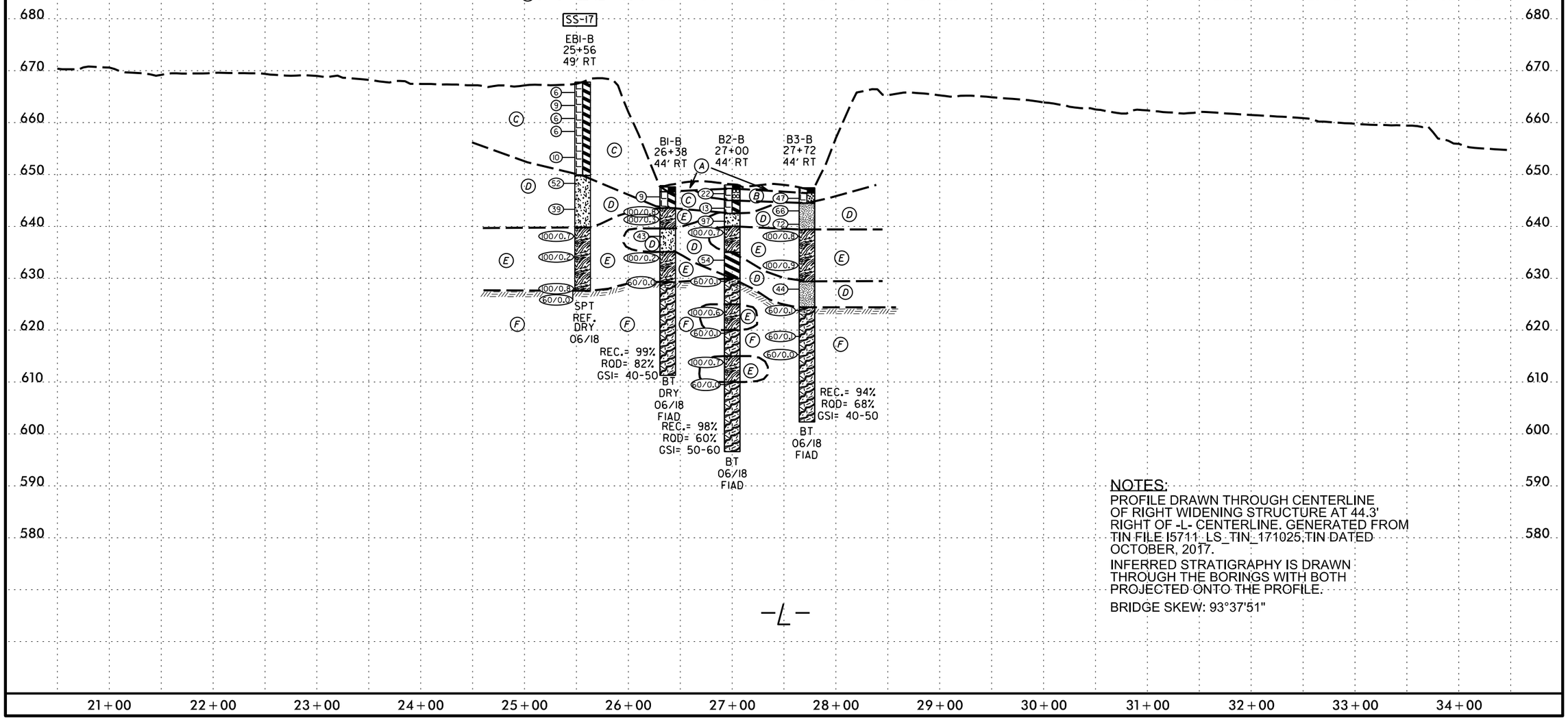
PROJECT REFERENCE NO.	SHEET NO.
I-5711	5

BRIDGE NO. 177 ON MEBANE OAKS ROAD OVER I-40/I-85 – RIGHT WIDENING

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-17	49' FT RT	25+56	1.0'-2.5'	A-7-6	42	14	12	8	31	49	92	83	72	20	-

(A) **ROADWAY EMBANKMENT:** BITUMINOUS ASPHALT PAVEMENT AND AGGREGATE
(B) **ROADWAY EMBANKMENT:** GRAY AND TAN, MOIST TO WET, MED. DENSE TO DENSE, SAND AND SILTY SAND (A-1-b, A-2-4) WITH GRAVEL
(C) **ROADWAY EMBANKMENT:** RED, TAN, AND BROWN, MOIST TO WET, MED. STIFF TO STIFF, SILTY CLAY (A-7-6) WITH TRACE GRAVEL
(D) **RESIDUAL:** TAN AND RED, DRY TO WET, HARD, SANDY SILT, CLAYEY SILT AND SILTY CLAY (A-4, A-5, A-7) WITH SOME ROCK FRAGMENTS
(E) **WEATHERED ROCK:** TAN AND GRAY, METAMORPHOSED ANDESITE
(F) **CRYSTALLINE ROCK:** GREEN AND GRAY, FRESH TO SLIGHTLY WEATHERED, MED. HARD TO VERY HARD, VERY CLOSE TO MOD. CLOSELY FRACTURED, METAMORPHOSED ANDESITE



NOTES:
PROFILE DRAWN THROUGH CENTERLINE OF RIGHT WIDENING STRUCTURE AT 44.3' RIGHT OF -L- CENTERLINE. GENERATED FROM TIN FILE I5711_LS_TIN_171025.TIN DATED OCTOBER, 2017.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

BRIDGE SKEW: 93°37'51"

8/23/9

145 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

0 20 40
FEET

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING (SIEVES) 10	40	200	% MOISTURE	% ORGANIC
SS-3	75 FT LT	25+50	1.0'-2.5'	A-7-6	41	13	7	7	31	55	92	87	78	25	-
SS-17	49 FT RT	25+56	1.0'-2.5'	A-7-6	42	14	12	8	31	49	92	83	72	20	-

700 690 680 670 660 650 640 630 620 610 600

SS-3
EBI-A
25+50
75' LT

SS-17
EBI-B
25+56
49' RT

ROADWAY EMBANKMENT: RED, TAN, AND BROWN, MOIST TO WET, MED. STIFF TO STIFF, SILTY CLAY (A-7)

RESIDUAL: BROWN AND TAN, DRY TO MOIST, SOFT TO HARD, CLAYEY SILT AND SILTY CLAY (A-5, A-7)

WEATHERED ROCK: TAN, METAMORPHOSED ANDESITE

CRYSTALLINE ROCK: TAN, METAMORPHOSED ANDESITE

SPT REF. DRY 06/18

SPT REF. DRY 06/18

END BENT #1
25+96.63

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM TIN FILE I5711_LS_TIN_171025 DATED MAY 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 93°37'51"

$DATE$

8/23/9

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	7

145 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

0 20 40
FEET

700 690 680 670 660 650 640 630 620 610 600

(A) **ROADWAY EMBANKMENT:** BITUMINOUS ASPHALT PAVEMENT AND AGGREGATE
(B) **ROADWAY EMBANKMENT:** TAN, MOIST TO WET, STIFF, SILTY CLAY (A-7)
(C) **RESIDUAL:** TAN, WET, STIFF TO HARD, CLAYEY SILT (A-5)
(D) **WEATHERED ROCK:** TAN, METAMORPHOSED ANDESITE

BI-A
26+42
44' LT

12
13
12
32
100/0.1
35
60/0.0
60/0.1
100/0.3
60/0.0

REC.=96%
ROD=86%
GSI= 60-70

BT
DRY
06/18
FIAD

BI-B
26+38
44' RT

9
100/0.8
100/0.3
43
100/0.2
60/0.0

REC.=99%
ROD=82%
GSI= 40-50

BT
DRY
06/18
FIAD

CRYSTALLINE ROCK: GREEN AND GRAY, FRESHLY TO SLIGHTLY WEATHERED, MOD. HARD TO VERY HARD, VERY CLOSELY TO WIDELY FRACTURED, METAMORPHOSED ANDESITE

BENT #1
26 + 32.15

$\mathbb{L}$

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM TIN FILE I5711_LS_TIN_171025 DATED MAY 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 93°37'51"

$DATE$

8/23/9

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	8

145 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

0 20 40
FEET

700 690 680 670 660 650 640 630 620 610 600

(A) **ROADWAY EMBANKMENT:** BITUMINOUS ASPHALT PAVEMENT AND AGGREGATE
(B) **ROADWAY EMBANKMENT:** GRAY, WET, MED. DENSE, SILTY SAND (A-2-4) WITH GRAVEL
(C) **ROADWAY EMBANKMENT:** TAN, WET, STIFF, SILTY CLAY (A-7) WITH TRACE GRAVEL
(D) **RESIDUAL:** TAN, ORANGE, AND BROWN, MOIST TO WET, STIFF TO HARD, CLAYEY SILT AND SANDY AND SILTY CLAY (A-5, A-6, A-7)
(E) **WEATHERED ROCK:** TAN, GREEN, AND GRAY, METAMORPHOSED ANDESITE

B2-A
27+05
44' LT

23 50 100/0.5 100/0.3 11 100/0.2 60/0 60/0.1 60/0.1 60/0

REC.=93%
RQD=64%
GSI= 50-60

BT
06/18
FIAD

B2-B
27+00
44' RT

22 13 97 100/0.7 54 60/0.1 100/0.6 60/0.1 100/0.7 60/0.0

REC.=98%
RQD=60%
GSI= 50-60

BT
06/18
FIAD

CRYSTALLINE ROCK: GREEN AND GRAY, FRESHLY TO SLIGHTLY WEATHERED, MOD. HARD TO VERY HARD, VERY CLOSELY TO MOD. CLOSELY FRACTURED, METAMORPHOSED ANDESITE

BENT #2
27+06.92

—℄—

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM TIN FILE I5711_LS_TIN_171025 DATED MAY 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 93°37'51"

$DATE$

8/23/9

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	9

0 20 40
FEET

Ⓐ **ROADWAY EMBANKMENT:** BITUMINOUS ASPHALT PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** GRAY AND TAN, MOIST, MED. DENSE, SILTY SAND (A-2-4)
Ⓒ **RESIDUAL:** GRAY AND TAN, MOIST, HARD, SANDY SILT (A-4) WITH TRACE ROCK FRAGMENTS
Ⓓ **RESIDUAL:** BROWN, MOIST, LOOSE, CLAYEY SAND (A-2-6)

WEATHERED ROCK: TAN AND BROWN, METAMORPHOSED ANDESITE

CRYSTALLINE ROCK: GREEN AND GRAY, FRESHLY TO MOD. SEVERELY WEATHERED, SOFT TO VERY HARD, VERY CLOSELY TO WIDELY FRACTURED, METAMORPHOSED ANDESITE

B3-A
27+78
43' LT

100/0.5
100/0.5
100/0.7
100/0.8
100/0.8
100/0.5
100/0.8
100/0.5
100/0.2
60/0.0

06/18

REC.=100%
RQD=76%
GSI= 50-60

BT
06/18
FIAD

B3-B
27+72
44' RT

47
66
72
100/0.8
100/0.9
44
60/0.0
60/0.0
60/0.0

REC.=94%
RQD=68%
GSI= 40-50

BT
06/18
FIAD

BENT #3
27+81.65

—℄—

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM TIN FILE I5711_LS_TIN_171025 DATED MAY 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 93°37'51"

$DATE$

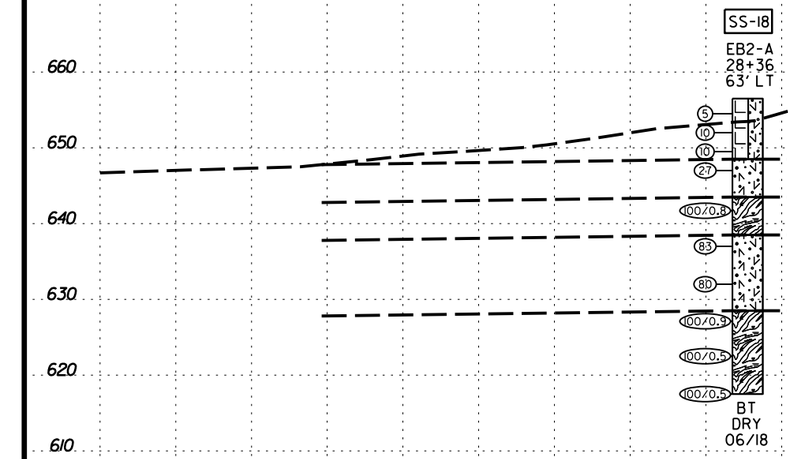
8/23/9

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	I-5711	10

0 20 40
FEET

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-18	63 FT LT	28+36	3.5'-5.0'	A-5	47	10	2	12	63	23	100	99	86	26	-



ROADWAY EMBANKMENT: TAN, MOIST, MED. STIFF TO STIFF, CLAYEY SILT (A-5)

RESIDUAL: TAN, MOIST, VERY STIFF, CLAYEY SILT (A-5)

WEATHERED ROCK: TAN, METAVOLCANIC ROCK

RESIDUAL: TAN, MOIST, HARD, CLAYEY SILT (A-5)

WEATHERED ROCK: TAN, METAMORPHOSED ANDESITE

145 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

700 690 680 670 660 650 640 630 620 610 600

END BENT #2
28+15.67

—L—

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM TIN FILE I5711_LS_TIN_171025 DATED MAY 2018.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

BRIDGE SKEW: 93°37'51"

$DATE$

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 25+50	**OFFSET** 75 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 654.2 ft	**TOTAL DEPTH** 18.5 ft	**NORTHING** 845,081	**EASTING** 1,919,704	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/11/18	**COMP. DATE** 06/11/18	**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)
655										654.2 0.0
	653.2	1.0	3	3	3	6 6	SS-3	25%		**ROADWAY EMBANKMENT** BROWN AND RED, SILTY CLAY (A-7-6) WITH TRACE GRAVEL
650	650.7	3.5	5	3	3			M		
	648.2	6.0	1	1	2	3		M		648.7 5.5 **RESIDUAL** BROWN AND TAN, SILTY CLAY (A-7)
645	645.7	8.5	3	3	5	8		M		
	640.7	13.5	100/0.3			100/0.3				641.2 13.0 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE
640	635.7	18.5	60/0.0			60/0.0				635.7 18.5 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 635.7 ft ON CR: METAVOLCANIC ROCK

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 25+56	**OFFSET** 49 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 667.8 ft	**TOTAL DEPTH** 40.2 ft	**NORTHING** 845,019	**EASTING** 1,919,596	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/11/18	**COMP. DATE** 06/11/18	**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)
670										667.8 0.0
	666.8	1.0	3	3	3	6	SS-17	20%		**ROADWAY EMBANKMENT** RED, TAN AND BROWN, SILTY CLAY (A-7-6) WITH TRACE GRAVEL
665	664.3	3.5	4	4	5	9		W		
	661.8	6.0	5	3	3	6		M		
660	659.3	8.5	3	3	3	6		M		
	654.3	13.5	3	4	6	10		M		649.8 18.0 **RESIDUAL** TAN, CLAYEY SILT (A-5)
655	649.3	18.5	16	25	27	52		M		
	644.3	23.5	21	21	18	39		D		
650	639.3	28.5	19	37	63/0.2	100/0.7				639.8 28.0 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE
645	634.3	33.5	100/0.2			100/0.2				
640	629.3	38.5	13	23	77/0.3	100/0.8				
	627.6	40.2	60/0.0			60/0.0				627.6 40.2 Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 627.6 ft ON CR: METAVOLCANIC ROCK

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 26+42	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 646.7 ft	**TOTAL DEPTH** 51.4 ft	**NORTHING** 844,984	**EASTING** 1,919,718	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/18/18	**COMP. DATE** 06/19/18	**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)
										646.7	0.0
	645.7	1.0	5	4	8	12		W		645.7 **ROADWAY EMBANKMENT** 1.0' BITUMINOUS CONCRETE	1.0
	643.3	3.4	7	6	7	13		W		643.7 TAN, SILTY CLAY (A-7) **RESIDUAL** TAN, CLAYEY SILT (A-5)	3.0
	640.7	6.0	6	24	48	72		W			
	638.2	8.5	14	18	14	32		W			
	633.2	13.5	22	31	69/0.2	100/0.7				633.7 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	13.0
	628.2	18.5	30	14	21	35		W		629.7 **RESIDUAL** TAN, CLAYEY SILT (A-5)	17.0
	623.2	23.5	60/0.0			60/0.0				623.7 **CRYSTALLINE ROCK** TAN, METAMORPHOSED ANDESITE	23.0
	618.2	28.5	60/0.1			60/0.1				619.7 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	27.0
	613.2	33.5	100/0.3			100/0.3				618.7 **CRYSTALLINE ROCK** TAN, METAMORPHOSED ANDESITE	28.0
	608.2	38.5	60/0.0			60/0.0				613.7 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	33.0
							RS-1			608.2 **CRYSTALLINE ROCK** LIGHT TO DARK GRAY, METAMORPHOSED ANDESITE	38.5
										595.3 Boring Terminated at Elevation 595.3 ft IN CR: METAMORPHOSED ANDESITE	51.4

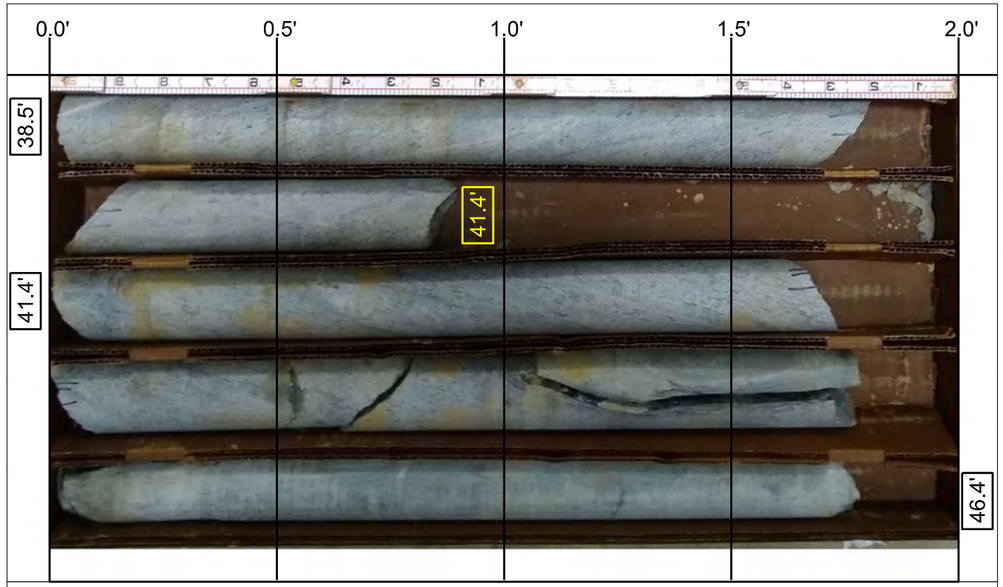
NCDOT BORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19

GEOTECHNICAL BORING REPORT
CORE LOG

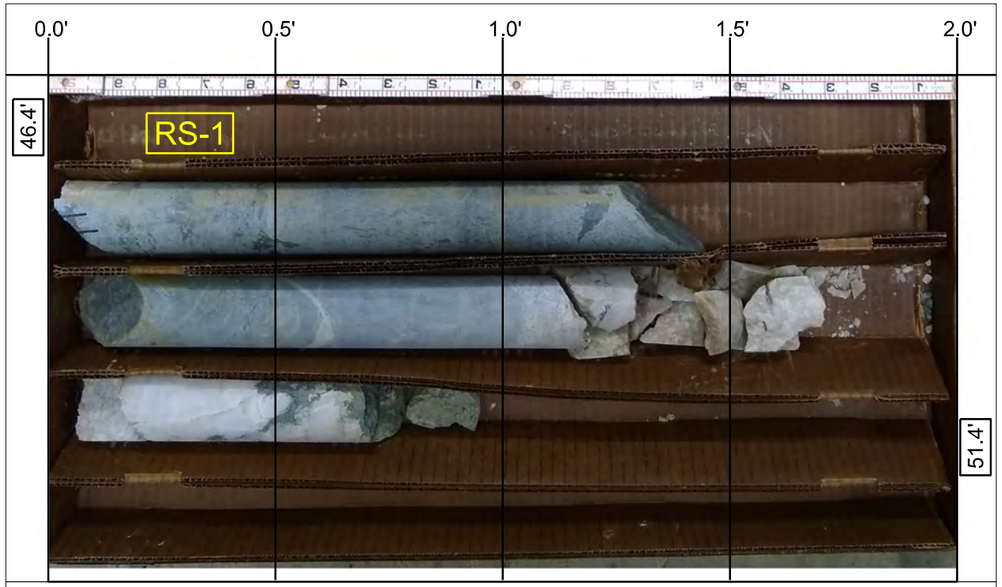
WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 26+42	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 646.7 ft	**TOTAL DEPTH** 51.4 ft	**NORTHING** 844,984	**EASTING** 1,919,718	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/18/18	**COMP. DATE** 06/19/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 12.9 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
608.2											Begin Coring @ 38.5 ft	
	608.2	38.5	2.9	3:43/0.9 3:41/1.0 3:59/1.0	(2.6) 88%	(2.6) 88%		(12.4) 96%	(11.1) 86%		608.2 **CRYSTALLINE ROCK** LIGHT TO DARK GRAY, SLIGHTLY TO FRESHLY WEATHERED, MODERATELY HARD TO VERY HARD, CLOSE TO WIDELY FRACTURED, METAMORPHOSED ANDESITE GSI = 60-70	38.5
605	605.3	41.4	5.0	3:09/1.0 3:08/1.0 4:10/1.0 4:20/1.0 4:10/1.0	(5.0) 100%	(4.2) 84%						
600	600.3	46.4	5.0	6:21/1.0 6:03/1.0 5:19/1.0 4:59/1.0 5:10/1.0	(4.8) 96%	(4.3) 86%	RS-1					
	595.3	51.4									595.3 Boring Terminated at Elevation 595.3 ft IN CR: METAMORPHOSED ANDESITE	51.4

NCDOT CORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19



BORING B1-A, BOX 1 OF 2, 38.5 FEET TO 46.4 FEET.



BORING B1-A, BOX 2 OF 2, 46.4 FEET TO 51.4 FEET.

NOTE: ROCK CORE TEST SAMPLES WERE REMOVED FROM CORE BOXES PRIOR TO TAKING PHOTOGRAPHS.

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00

GEOTECHNICAL BORING REPORT
BORE LOG

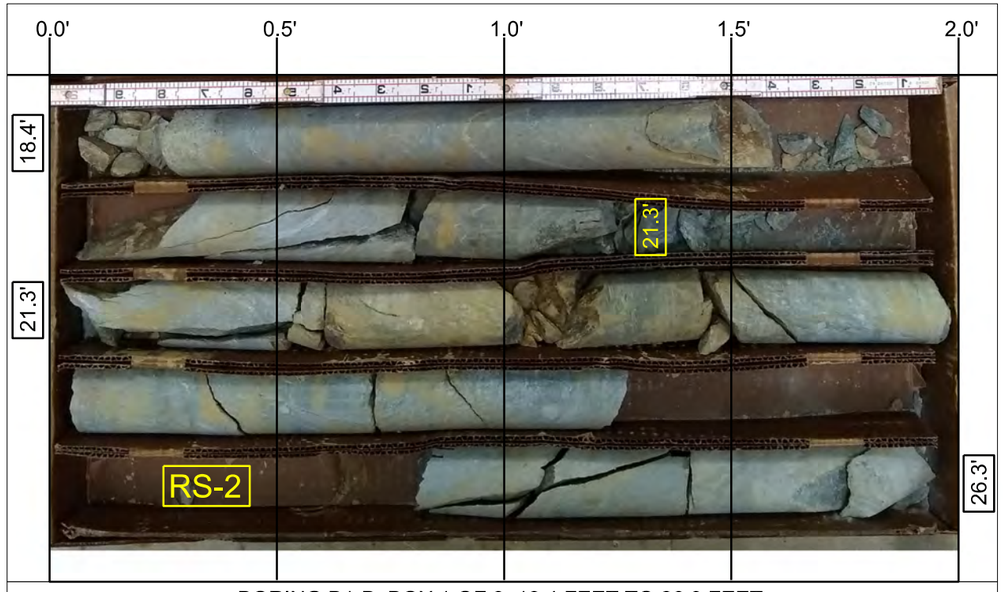
WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 26+38	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 647.6 ft	**TOTAL DEPTH** 36.3 ft	**NORTHING** 844,948	**EASTING** 1,919,638	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT5041 DIEDRICH D-50 92% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/19/18	**COMP. DATE** 06/21/18	**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)
650										647.6	0.0
	646.7	0.9	4	4	5	9		M		**ROADWAY EMBANKMENT** 0.9' BITUMINOUS CONCRETE	0.9
645	644.1	3.5								TAN, SILTY CLAY (A-7)	
			6	37	63/0.3	100/0.8 100/0.3				643.6	4.0
	641.6	6.0	100/0.3							**WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	
640	639.1	8.5								639.6	8.0
			22	14	29	43		W		**RESIDUAL** TAN, CLAYEY SILT (A-5) WITH SOME ROCK FRAGMENTS	
635	634.1	13.5								635.1	12.5
			100/0.2			100/0.2				**WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	
630	629.2	18.4								629.2	18.4
			60/0.0			60/0.0				**CRYSTALLINE ROCK** GREEN AND GRAY, METAMORPHOSED ANDESITE	
625							RS-2				
620											
615										611.3	36.3
										Boring Terminated at Elevation 611.3 ft IN CR: METAMORPHOSED ANDESITE	

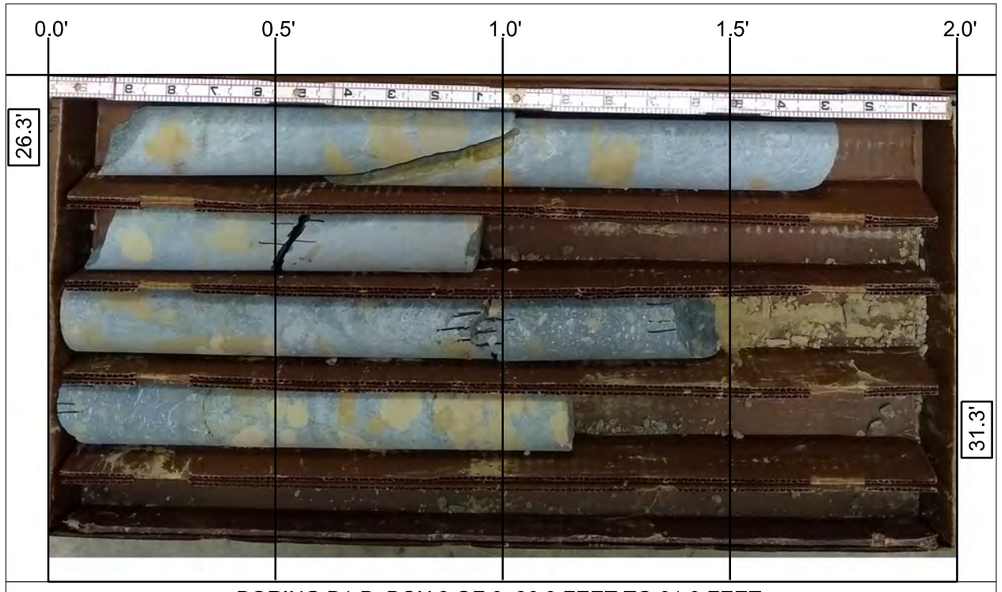
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 26+38	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 647.6 ft	**TOTAL DEPTH** 36.3 ft	**NORTHING** 844,948	**EASTING** 1,919,638	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE CAT5041 DIEDRICH D-50 92% 09/26/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/19/18	**COMP. DATE** 06/21/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 17.9 ft			

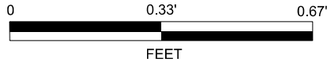
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
629.2											Begin Coring @ 18.4 ft	
	629.2	18.4	2.9	5:35/0.9 6:42/1.0 7:08/1.0	(2.7) 93%	(1.6) 55%		(17.7) 99%	(14.7) 82%		629.2 **CRYSTALLINE ROCK** GREEN AND GRAY, SLIGHTLY TO FRESHLY WEATHERED, MEDIUM HARD TO HARD, VERY CLOSELY TO WIDELY FRACTURED, METAMORPHOSED ANDESITE GSI = 40-50	18.4
	626.3	21.3										
625			5.0	7:05/1.0 4:19/1.0 5:06/1.0 5:22/1.0 4:52/1.0	(5.0) 100%	(4.2) 84%						
	621.3	26.3					RS-2					
620			5.0	6:56/1.0 5:56/1.0 4:51/1.0 4:34/1.0 4:57/1.0	(5.0) 100%	(5.0) 100%						
	616.3	31.3										
615			5.0	4:45/1.0 4:06/1.0 4:50/1.0 4:21/1.0 4:09/1.0	(5.0) 100%	(3.9) 78%						
	611.3	36.3									611.3 Boring Terminated at Elevation 611.3 ft IN CR: METAMORPHOSED ANDESITE	36.3



BORING B1-B, BOX 1 OF 3, 18.4 FEET TO 26.3 FEET.



BORING B1-B, BOX 2 OF 3, 26.3 FEET TO 31.3 FEET.

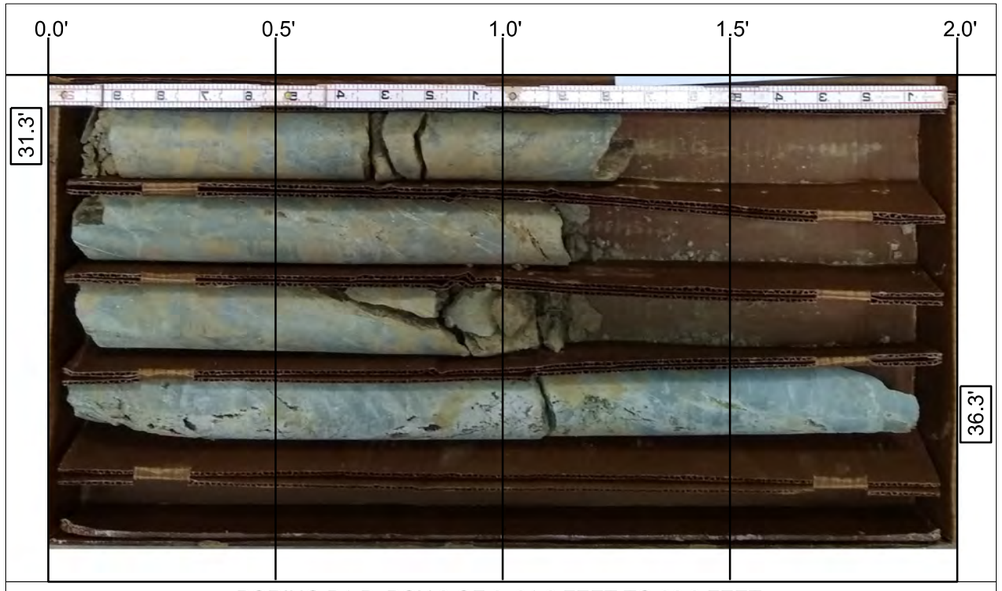


NOTE: ROCK CORE TEST SAMPLES WERE REMOVED FROM CORE BOXES PRIOR TO TAKING PHOTOGRAPHS.

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00



BORING B1-B, BOX 3 OF 3, 31.3 FEET TO 36.3 FEET.

0 0.33' 0.67'
FEET

FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** CROCKETT, S.C	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 27+05	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 646.8 ft	**TOTAL DEPTH** 51.2 ft	**NORTHING** 844,928	**EASTING** 1,919,747	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/24/18	**COMP. DATE** 06/26/18	**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)
										646.8	0.0
	645.8	1.0								**ROADWAY EMBANKMENT** 0.6' BITUMINOUS CONCRETE 1.4' AGGREGATE	
			25	15	8	23		M		644.8	2.0
	643.3	3.5								**RESIDUAL** ORANGE, SANDY CLAY (A-6)	
			3	22	28	50		M		640.8	6.0
	640.8	6.0								**WEATHERED ROCK** ORANGE AND BROWN, METAMORPHOSED ANDESITE	
			66	34/0.2		100/0.7					
	638.3	8.5									
			36	64/0.4		100/0.9					
	633.3	13.5								633.8	13.0
			6	5	6	11		M		**RESIDUAL** ORANGE AND BROWN, SANDY CLAY (A-6)	
										630.8	16.0
	628.3	18.5								**WEATHERED ROCK** ORANGE AND BROWN, METAMORPHOSED ANDESITE	
			100/0.2			100/0.2					
	623.3	23.5								624.3	22.5
			60/0			60/0.0				**CRYSTALLINE ROCK** GREEN AND GRAY, METAMORPHOSED ANDESITE	
	618.3	28.5									
			60/0.1			60/0.1					
	613.3	33.5									
			60/0.1			60/0.1					
	608.3	38.5								608.3	38.5
			60/0.0			60/0.0	RS-3			GREEN AND GRAY, METAMORPHOSED ANDESITE	
										595.6	51.2
										Boring Terminated at Elevation 595.6 ft IN CR: METAMORPHOSED ANDESITE	

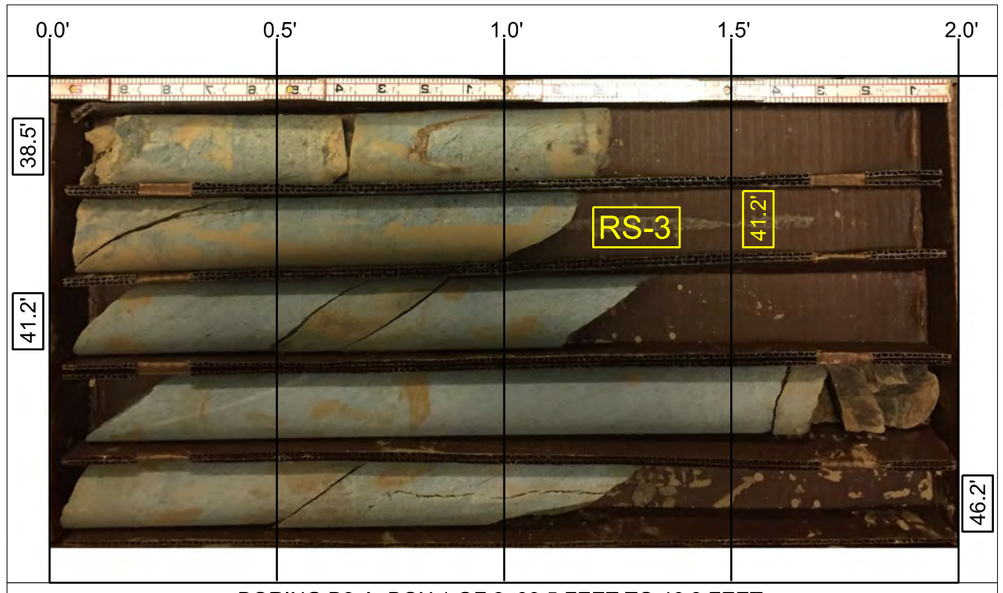
NCDOT BORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19

GEOTECHNICAL BORING REPORT
CORE LOG

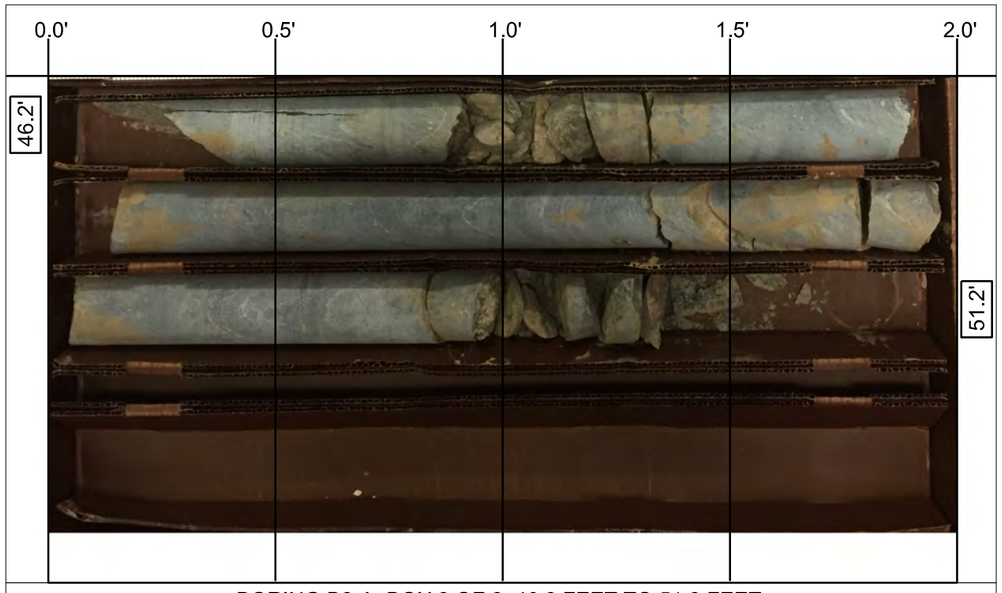
WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** CROCKETT, S.C	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 27+05	**OFFSET** 44 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 646.8 ft	**TOTAL DEPTH** 51.2 ft	**NORTHING** 844,928	**EASTING** 1,919,747	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/24/18	**COMP. DATE** 06/26/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 12.7 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
608.3											Begin Coring @ 38.5 ft	
	608.3	38.5	2.7	2:30/0.7 3:29/1.0 3:54/1.0	(2.4) 89%	(1.7) 63%		(11.8) 93%	(8.1) 64%		608.3 GREEN AND GRAY, VERY SLIGHTLY TO FRESHLY WEATHERED, MODERATELY TO VERY HARD, VERY CLOSE TO MODERATELY CLOSELY FRACTURED, METAMORPHOSED ANDESITE GSI = 50-60	38.5
605	605.6	41.2	5.0	3:39/1.0 4:59/1.0 4:44/1.0 5:05/1.0 5:28/1.0	(4.8) 96%	(3.3) 66%	RS-3					
600	600.6	46.2	5.0	4:45/1.0 4:06/1.0 4:36/1.0 4:38/1.0 3:38/1.0	(4.6) 92%	(3.1) 62%						
	595.6	51.2									595.6 Boring Terminated at Elevation 595.6 ft IN CR: METAMORPHOSED ANDESITE	51.2

NCDOT CORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19



BORING B2-A, BOX 1 OF 2, 38.5 FEET TO 46.2 FEET.



BORING B2-A, BOX 2 OF 2, 46.2 FEET TO 51.2 FEET.

NOTE: ROCK CORE TEST SAMPLES WERE REMOVED FROM CORE BOXES PRIOR TO TAKING PHOTOGRAPHS.

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00

GEOTECHNICAL BORING REPORT
BORE LOG

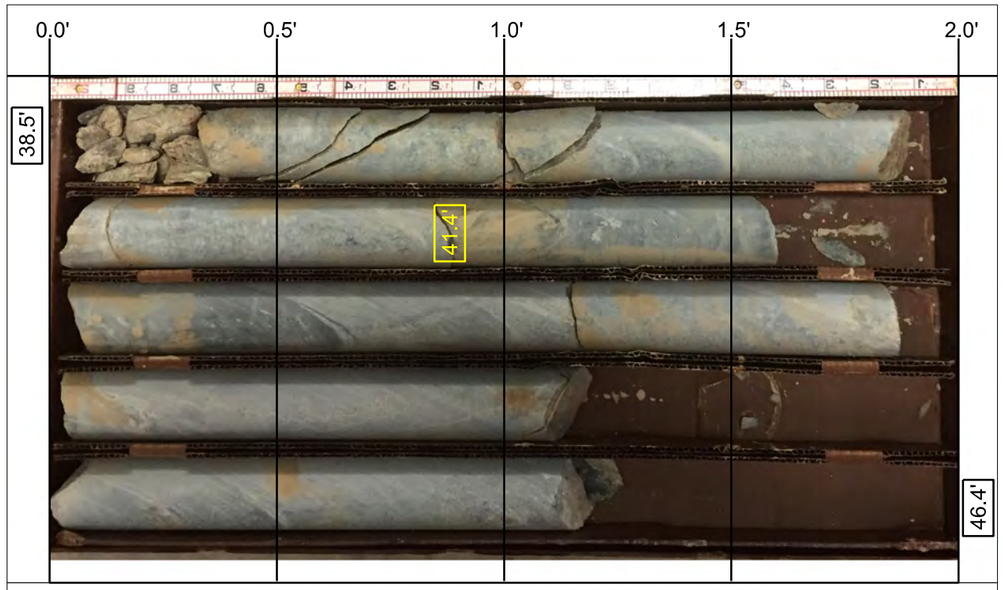
WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 27+00	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 648.0 ft	**TOTAL DEPTH** 51.4 ft	**NORTHING** 844,893	**EASTING** 1,919,666	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/21/18	**COMP. DATE** 06/22/18	**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)
650											
	647.3	0.7						W		648.0	0.0
			26	14	8	22				647.3 **ROADWAY EMBANKMENT** 0.7' BITUMINOUS CONCRETE	0.7
645	644.5	3.5						W		645.0 GRAY, SAND (A-1-b) WITH GRAVEL	3.0
			8	5	8	13				TAN, SILTY CLAY (A-7) WITH TRACE GRAVEL	
	642.0	6.0						W		642.5	5.5
			3	33	64	97				**RESIDUAL**	
640	639.5	8.5								TAN, CLAYEY SILT (A-5) 640.0	8.0
			45	55/0.2		100/0.7				**WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	
635	634.5	13.5								635.0	13.0
			10	13	41	54		W		**RESIDUAL** TAN AND RED, SILTY CLAY (A-7)	
630	629.5	18.5								630.0	18.0
			60/0.1			60/0.1				**CRYSTALLINE ROCK** TAN, METAMORPHOSED ANDESITE	
625	624.5	23.5								625.0	23.0
			13	36	64/0.1	100/0.6				**WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	
620	619.5	28.5								620.0	28.0
			60/0.1			60/0.1				**CRYSTALLINE ROCK** GREEN AND GRAY, METAMORPHOSED ANDESITE	
615	614.5	33.5								615.0	33.0
			29	71/0.2		100/0.7				**WEATHERED ROCK** GRAY AND TAN, METAMORPHOSED ANDESITE	
610	609.5	38.5								610.0	38.0
			60/0.0			60/0.0				609.5 **CRYSTALLINE ROCK** GREEN AND GREY, METAMORPHOSED ANDESITE	38.5
605										GREEN AND GREY, METAMORPHOSED ANDESITE	
600							RS-4				
										596.6	51.4
										Boring Terminated at Elevation 596.6 ft IN CR: METAMORPHOSED ANDESITE	

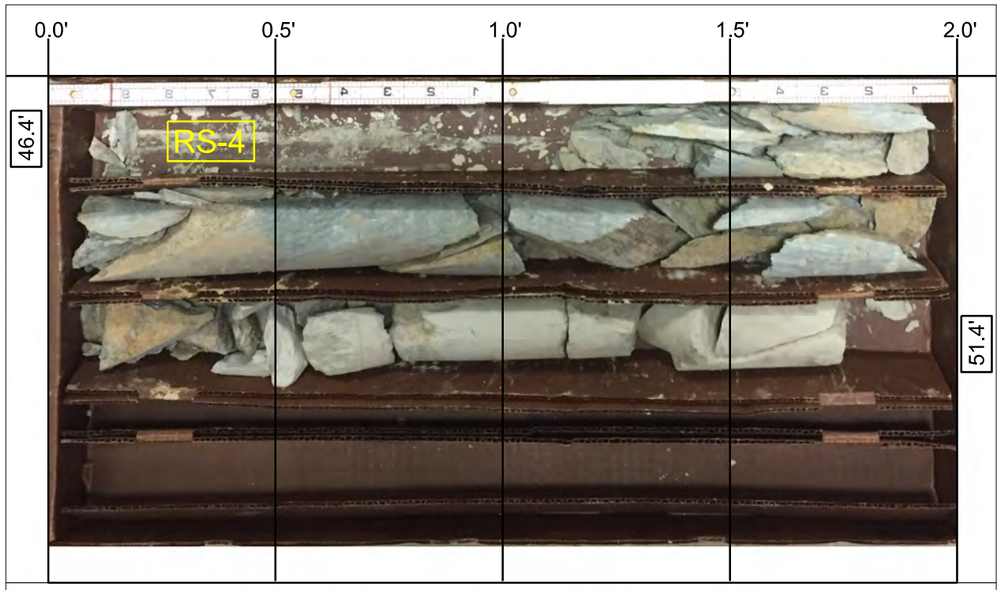
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 27+00	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 648.0 ft	**TOTAL DEPTH** 51.4 ft	**NORTHING** 844,893	**EASTING** 1,919,666	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/21/18	**COMP. DATE** 06/22/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 12.9 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
609.5											Begin Coring @ 38.5 ft	
	609.5	38.5	2.9	3:39/0.9 6:10/1.0 8:10/1.0	(2.8) 97%	(1.4) 48%		(12.7) 98%	(7.7) 60%		609.5 GREEN AND GREY, SLIGHTLY TO FRESHLY WEATHERED, MEDIUM HARD TO VERY HARD, VERY CLOSE TO MODERATELY CLOSELY FRACTURED, METAMORPHOSED ANDESITE GSI = 50-60	38.5
	606.6	41.4										
605			5.0	5:37/1.0 5:20/1.0 5:40/1.0 5:47/1.0 6:00/1.0	(4.9) 98%	(4.5) 90%						
	601.6	46.4										
600			5.0	6:36/1.0 5:16/1.0 5:03/1.0 5:10/1.0 4:37/1.0	(5.0) 100%	(1.8) 36%	RS-4					
	596.6	51.4									596.6	51.4
											Boring Terminated at Elevation 596.6 ft IN CR: METAMORPHOSED ANDESITE	



BORING B2-B, BOX 1 OF 2, 38.5 FEET TO 46.4 FEET.



BORING B2-B, BOX 2 OF 2, 46.4 FEET TO 51.4 FEET.

NOTE: ROCK CORE TEST SAMPLES WERE REMOVED FROM CORE BOXES PRIOR TO TAKING PHOTOGRAPHS.

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** CROCKETT, S.C	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 27+78	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.7
COLLAR ELEV. 646.0 ft	**TOTAL DEPTH** 46.2 ft	**NORTHING** 844,863	**EASTING** 1,919,780	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/28/18	**COMP. DATE** 06/29/18	**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)
650										
645	645.0	1.0	3	85	15/0.1	100/0.6				646.0 0.0 645.0 1.0 **ROADWAY EMBANKMENT** 1.0' BITUMINOUS CONCRETE
	642.5	3.5	100/0.3			100/0.3				644.5 1.5 **RESIDUAL** BROWN, CLAYEY SAND (A-2-6)
640	640.0	6.0	40	60/0.2		100/0.7				**WEATHERED ROCK** BROWN, METAMORPHOSED ANDESITE
	637.5	8.5	20	80/0.3		100/0.8				
635	632.5	13.5	30	42	58/0.3	100/0.8				
630	627.5	18.5	100/0.5			100/0.5				
625	622.5	23.5	57	43/0.3		100/0.8				
620	617.5	28.5	100/0.3			100/0.3				
615	612.5	33.5	100/0.2			100/0.2				
610	609.5	36.5	60/0.0			60/0.0				609.5 36.5 **CRYSTALLINE ROCK** GRAY, METAMORPHOSED ANDESITE
605										
600							RS-5			599.8 46.2 Boring Terminated at Elevation 599.8 ft IN CR: METAVOLCANIC ROCK

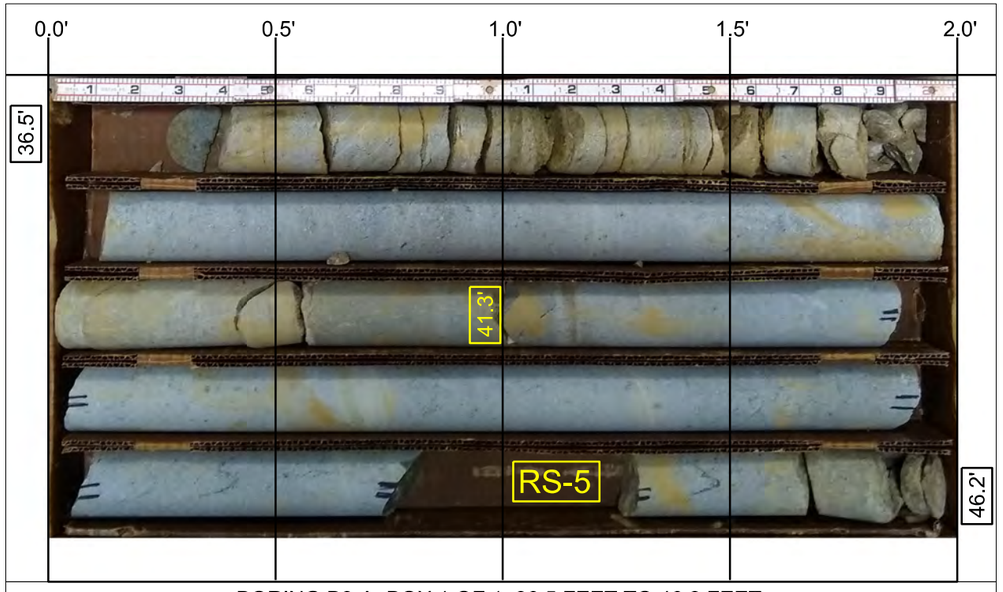
NCDOT BORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** CROCKETT, S.C	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 27+78	**OFFSET** 43 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.7
COLLAR ELEV. 646.0 ft	**TOTAL DEPTH** 46.2 ft	**NORTHING** 844,863	**EASTING** 1,919,780	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/28/18	**COMP. DATE** 06/29/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 9.7 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
609.5											Begin Coring @ 36.5 ft
	609.5	36.5	4.8	2.33/0.8 4:31/1.0 4:29/1.0 4:00/1.0 4:11/1.0	(4.8) 100%	(3.0) 63%		(9.7) 100%	(7.4) 76%		609.5 36.5 **CRYSTALLINE ROCK** GRAY, MODERATELY SEVERE TO FRESHLY WEATHERED, SOFT TO HARD, VERY CLOSE TO WIDELY FRACTURED, METAMORPHOSED ANDESITE GSI = 50-60
605	604.7	41.3	4.9	4:35/1.0 5:01/1.0 4:40/1.0 4:17/1.0 4:02/0.9	(4.9) 100%	(4.4) 90%					
600	599.8	46.2					RS-5				599.8 46.2 Boring Terminated at Elevation 599.8 ft IN CR: METAVOLCANIC ROCK

NCDOT CORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19



BORING B3-A, BOX 1 OF 1, 36.5 FEET TO 46.2 FEET.

0 0.33' 0.67'
FEET

NOTE: ROCK CORE TEST SAMPLES WERE REMOVED FROM CORE BOXES PRIOR TO TAKING PHOTOGRAPHS.

FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 27+72	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 647.4 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 844,829	**EASTING** 1,919,699	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/27/18	**COMP. DATE** 06/28/18	**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)
650										647.4	0.0
	646.4	1.0								**ROADWAY EMBANKMENT** 1.0' BITUMINOUS CONCRETE	646.4 1.0
645			4	11	36	47		M		645.0 GRAY AND TAN, SILTY SAND (A-2-4)	2.4
	644.0	3.4	7	24	42	66		M		**RESIDUAL** GRAY AND TAN, SANDY SILT (A-4)	
640	641.4	6.0	18	50	22	72		M		639.4	8.0
	638.9	8.5	7	93/0.3		100/0.8				**WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE	
635	633.9	13.5	17	16	84/0.4	100/0.9					
630	628.9	18.5	57	33	11	44		M		629.4 **RESIDUAL** TAN, FINE SANDY SILT (A-4) W/ TRACE ROCK FRAGMENTS	18.0
625	623.9	23.5	60/0.1			60/0.1				624.4 **CRYSTALLINE ROCK** GREEN AND GRAY, METAMORPHOSED ANDERSITE	23.0
620	618.9	28.5	60/0.1			60/0.1					
615	615.3	32.1	60/0.0			60/0.0	RS-6			615.3 GREEN AND GRAY, METAMORPHOSED ANDESITE	32.1
610											
605										602.3	45.1
										Boring Terminated at Elevation 602.3 ft IN CR: METAMORPHOSED ANDESITE	

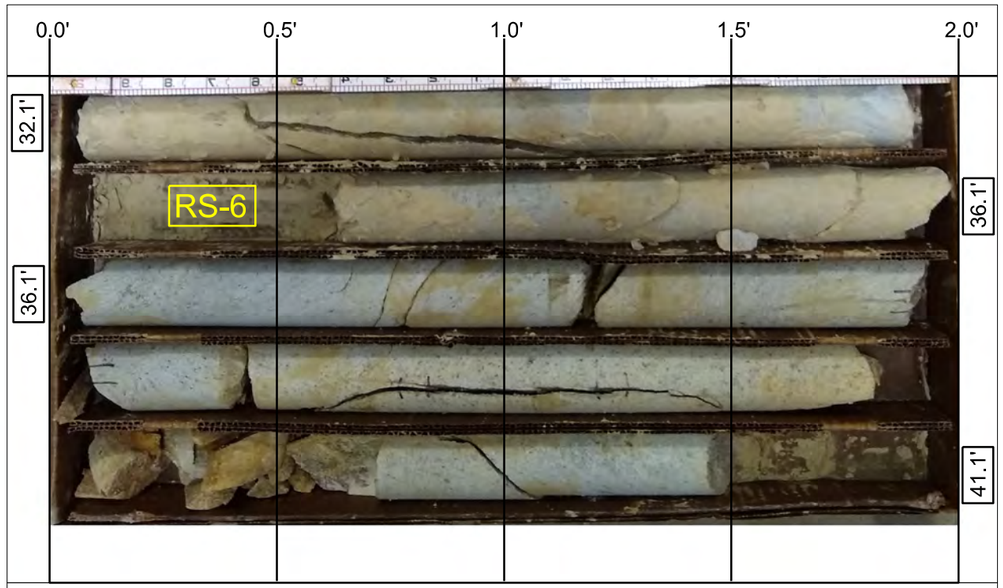
NCDOT BORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19

GEOTECHNICAL BORING REPORT
CORE LOG

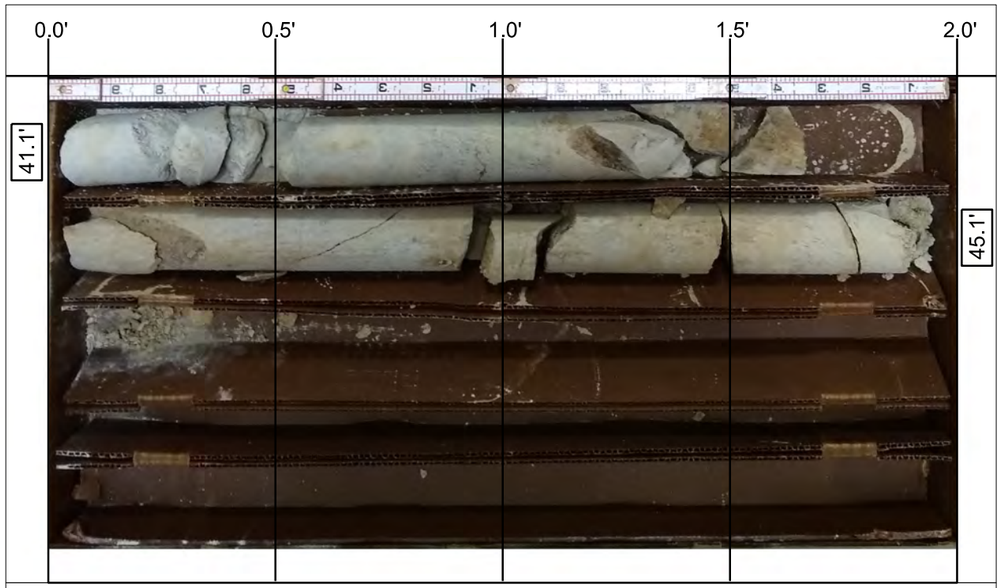
WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85			**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 27+72	**OFFSET** 44 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 647.4 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 844,829	**EASTING** 1,919,699	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/27/18	**COMP. DATE** 06/28/18	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 13.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
645.3											Begin Coring @ 32.1 ft	
615	615.3	32.1	4.0	3:33/1.0 3:41/1.0 3:24/1.0 4:32/1.0	(4.0) 100%	(2.8) 70%	RS-6	(12.2) 94%	(8.9) 68%		615.3 GREEN AND GRAY, SLIGHTLY TO FRESHLY WEATHERED, HARD TO VERY HARD, VERY CLOSELY TO MODERATELY CLOSELY FRACTURED, METAMORPHOSED ANDESITE GSI = 40-50	32.1
610	611.3	36.1	5.0	4:24/1.0 3:36/1.0 3:48/1.0 4:21/1.0 6:30/1.0	(4.7) 94%	(4.1) 82%						
605	606.3	41.1	4.0	3:19/1.0 4:45/1.0 4:40/1.0 5:55/1.0	(3.5) 88%	(2.0) 50%					602.3	45.1
	602.3	45.1									Boring Terminated at Elevation 602.3 ft IN CR: METAMORPHOSED ANDESITE	

NCDOT CORE SINGLE I-5711_GEO_BORINGS.GPJ NC_DOT.GDT 1/7/19



BORING B3-B, BOX 1 OF 2, 32.1 FEET TO 41.1 FEET.



BORING B3-B, BOX 2 OF 2, 41.1 FEET TO 46.1 FEET.

NOTE: ROCK CORE TEST SAMPLES WERE REMOVED FROM CORE BOXES PRIOR TO TAKING PHOTOGRAPHS.

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 177 ON MEBANE OAKS RD. (-L-)
OVER I-40/I-85 (-Y1-) BETWEEN SR 2033
(ARROWHEAD BLVD.) AND SR 2211 (WOODHAVEN DR.)
ALAMANCE COUNTY, NORTH CAROLINA
WBS: 40501 | TIP NO.:I-5711
FALCON PROJECT NO.: G17066.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 40501	**TIP** I-5711	**COUNTY** ALAMANCE	**GEOLOGIST** WEIS, J.M.	
SITE DESCRIPTION Bridge No. 177 on Mebane Oaks Rd. over I-40/I-85				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 28+36	**OFFSET** 63 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 656.5 ft	**TOTAL DEPTH** 39.0 ft	**NORTHING** 844,821	**EASTING** 1,919,824	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Toothman, Ronnie	**START DATE** 06/12/18	**COMP. DATE** 06/13/18	**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)
660										656.5 / 0.0
655	655.5	1.0	2	2	3	5		M		**ROADWAY EMBANKMENT** TAN, CLAYEY SILT (A-5) WITH TRACE QUARTZ FRAGMENTS
	653.0	3.5	2	4	6	10	SS-18	26%		
650	650.5	6.0	7	4	6	10		M		648.5 / 8.0
	648.0	8.5	8	11	16	27		M		**RESIDUAL** TAN, CLAYEY SILT (A-5)
645	643.0	13.5	22	44	56/0.3	100/0.8				643.5 / 13.0 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE
640	638.0	18.5	23	38	45	83		M		638.5 / 18.0 **RESIDUAL** TAN, CLAYEY SILT (A-5)
635	633.0	23.5	11	26	54	80		M		
630	628.0	28.5	26	74/0.4		100/0.9		M		628.5 / 28.0 **WEATHERED ROCK** TAN, METAMORPHOSED ANDESITE
625	623.0	33.5	88	12/0.0		100/0.5				
620	618.0	38.5	84	16/0.0		100/0.5				617.5 / 39.0 Boring Terminated at Elevation 617.5 ft IN WR: METAVOLCANIC ROCK

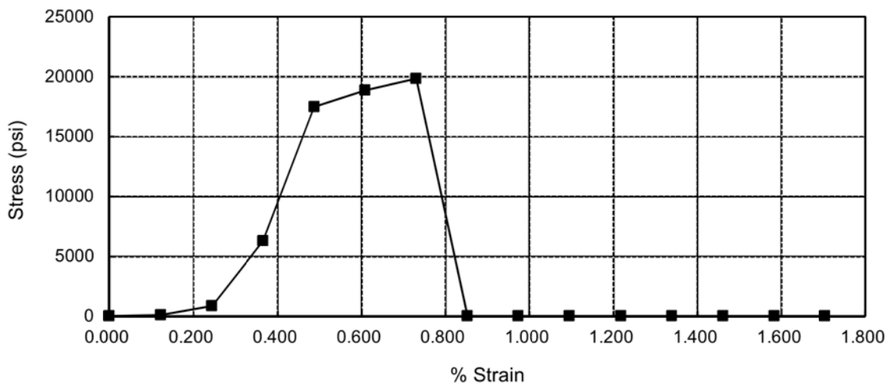
ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

Job No.:	G17066.00	Job Name:	I-5711 Interchange Improvement
Date:	8/8/2018	Sample No.:	RS-1
Boring No.:	B1-A	Depth (ft):	46.9-47.2
Description:			
			1728
Length (in.):	4.107	Volume (in^3):	12.65853758
Diameter (in.):	1.981	Volume (cf):	0.007325543
Area (sq. in.):	3.082	Unit Weight (pcf):	174.8037

Compressive Strength (psi): 19820

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.122	270	87.6	71,955
0.010	0.243	2640	856.5	351,779
0.015	0.365	19340	6274.8	1,718,031
0.020	0.487	53890	17484.3	3,590,410
0.025	0.609	58140	18863.2	3,098,852
0.030	0.730	61090	19820.3	2,713,406
0.035	0.852		0.0	0
0.040	0.974		0.0	0
0.045	1.096		0.0	0
0.050	1.217		0.0	0
0.055	1.339		0.0	0
0.060	1.461		0.0	0
0.065	1.583		0.0	0
0.070	1.704		0.0	0



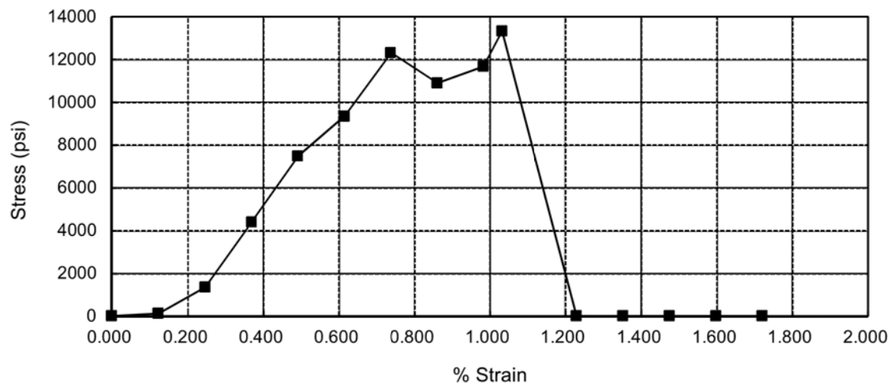
ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

Job No.:	G17066.00	Job Name:	I-5711 Interchange Improvement
Date:	8/8/2018	Sample No.:	RS-2
Boring No.:	B1-B	Depth (ft):	24.5-24.8
Description:			
			1728
Length (in.):	4.068	Volume (in^3):	12.53833233
Diameter (in.):	1.981	Volume (cf):	0.007255979
Area (sq. in.):	3.082	Unit Weight (pcf):	184.8812

Compressive Strength (psi): 13312

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.123	400	129.8	105,587
0.010	0.246	4190	1359.4	553,014
0.015	0.369	13560	4399.5	1,193,138
0.020	0.492	23020	7468.7	1,519,139
0.025	0.615	28760	9331.0	1,518,347
0.030	0.737	37910	12299.7	1,667,841
0.035	0.860	33560	10888.4	1,265,540
0.040	0.983	35940	11660.6	1,185,878
0.042	1.032	41030	13312.0	1,289,360
0.050	1.229		0.0	0
0.055	1.352		0.0	0
0.060	1.475		0.0	0
0.065	1.598		0.0	0
0.070	1.721		0.0	0



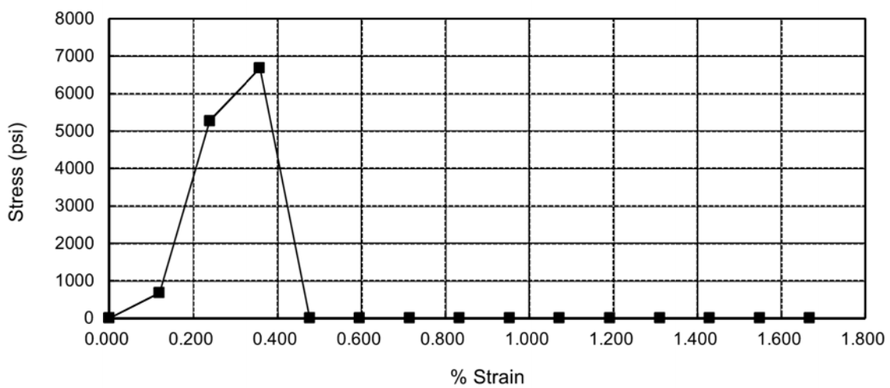
ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

Job No.:	G17066.00	Job Name:	I-5711 Interchange Improvements
Date:	8/8/2018	Sample No.:	RS-3
Boring No.:	B2-A	Depth (ft):	40.9-41.2
Description:			
			1728
Length (in.):	4.198	Volume (in^3):	12.91290346
Diameter (in.):	1.979	Volume (cf):	0.007472745
Area (sq. in.):	3.076	Unit Weight (pcf):	177.0452

Compressive Strength (psi): 6681

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.119	2100	682.7	573,205
0.010	0.238	16200	5266.6	2,210,935
0.015	0.357	20550	6680.8	1,869,741
0.020	0.476		0.0	0
0.025	0.596		0.0	0
0.030	0.715		0.0	0
0.035	0.834		0.0	0
0.040	0.953		0.0	0
0.045	1.072		0.0	0
0.050	1.191		0.0	0
0.055	1.310		0.0	0
0.060	1.429		0.0	0
0.065	1.548		0.0	0
0.070	1.667		0.0	0



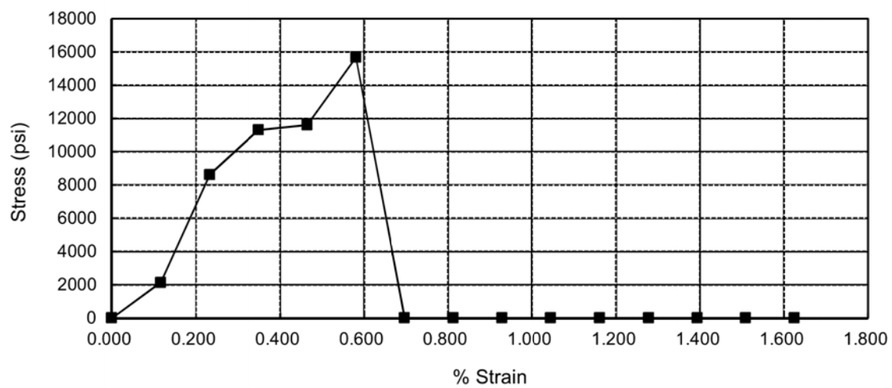
ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

Job No.:	G17066.00	Job Name:	I-5711 Interchange Improvements
Date:	8/8/2018	Sample No.:	RS-4
Boring No.:	B2-B	Depth (ft):	46.4-47.1
Description:			
			1728
Length (in.):	4.306	Volume (in^3):	13.28529515
Diameter (in.):	1.982	Volume (cf):	0.00768825
Area (sq. in.):	3.085	Unit Weight (pcf):	177.6654

Compressive Strength (psi): 15661

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.116	6570	2129.5	1,833,885
0.010	0.232	26540	8602.1	3,704,058
0.015	0.348	34890	11308.5	3,246,284
0.020	0.464	35810	11606.7	2,498,913
0.025	0.581	48320	15661.4	2,697,514
0.030	0.697		0.0	0
0.035	0.813		0.0	0
0.040	0.929		0.0	0
0.045	1.045		0.0	0
0.050	1.161		0.0	0
0.055	1.277		0.0	0
0.060	1.393		0.0	0
0.065	1.510		0.0	0
0.070	1.626		0.0	0



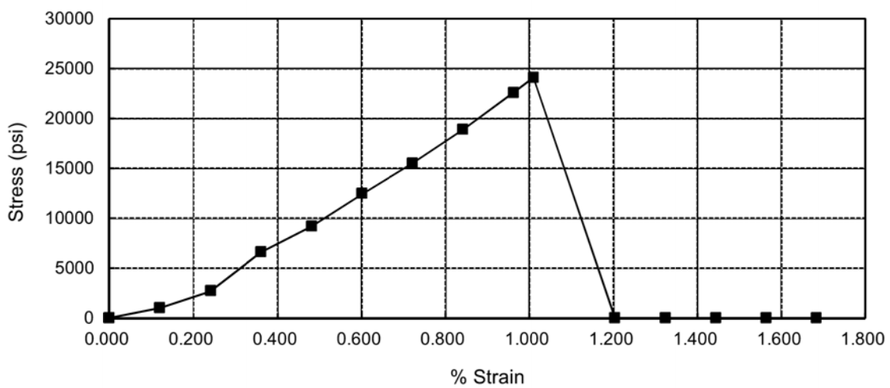
ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

Job No.:	G17066.00	Job Name:	I-5711 Interchange Improvements
Date:	8/8/2018	Sample No.:	RS-5
Boring No.:	B3-A	Depth (ft):	44.8-45.1
Description:			
			1728
Length (in.):	4.156	Volume (in^3):	12.80956469
Diameter (in.):	1.981	Volume (cf):	0.007412943
Area (sq. in.):	3.082	Unit Weight (pcf):	175.6749

Compressive Strength (psi): 24100

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.120	3140	1018.8	846,791
0.010	0.241	8390	2722.1	1,131,302
0.015	0.361	20430	6628.4	1,836,512
0.020	0.481	28340	9194.8	1,910,674
0.025	0.602	38410	12461.9	2,071,672
0.030	0.722	47780	15502.0	2,147,542
0.035	0.842	58210	18885.9	2,242,571
0.040	0.962	69660	22600.8	2,348,228
0.042	1.011	74280	24099.8	2,384,731
0.050	1.203		0.0	0
0.055	1.323		0.0	0
0.060	1.444		0.0	0
0.065	1.564		0.0	0
0.070	1.684		0.0	0



ROCK CORE UNIAXIAL COMPRESSIVE STRENGTH TEST

ASTM D-7012-10 METHOD C

SHEET 28

Job No.:	G17066.00	Job Name:	I-5711 Interchange Improvements
Date:	8/8/2018	Sample No.:	RS-6
Boring No.:	B3-B	Depth (ft):	34.1-34.4
Description:			
			1728
Length (in.):	4.038	Volume (in^3):	12.43330469
Diameter (in.):	1.980	Volume (cf):	0.007195199
Area (sq. in.):	3.079	Unit Weight (pcf):	168.3664

Compressive Strength (psi): 9175

Deflection (in.)	Strain (%)	Load (lbf)	Compressive Strength (psi)	Young's Modulus (psi)
0.000	0.000	0	0.0	
0.005	0.124	3310	1075.0	868,169
0.010	0.248	9140	2968.4	1,198,650
0.015	0.371	18790	6102.5	1,642,788
0.017	0.421	28250	9174.8	2,179,293
0.025	0.619		0.0	0
0.030	0.743		0.0	0
0.035	0.867		0.0	0
0.040	0.991		0.0	0
0.045	1.114		0.0	0
0.050	1.238		0.0	0
0.055	1.362		0.0	0
0.060	1.486		0.0	0
0.065	1.610		0.0	0
0.070	1.734		0.0	0