STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34845.1.1 (U-2707)	1	15

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34845.1.1 (U-2707) F.A. PROJ. STP-3000(1)

COUNTY FORSYTH

PROJECT DESCRIPTION CLEMMONS - (SR3000 (IDOLS ROAD)) FROM (SR2999 (HAMPTON ROAD)) TO (US-158 (CLEMMONS ROAD))

SITE DESCRIPTION BRIDGE NO. 109 ON -Y- (SR2999 (HAMPTON ROAD)) OVER NORFOLK SOUTHERN RAILROAD

INVENTORY

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

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UN-PLACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

J. WILLIAMSON

B. RATTI

C. ODEM

J. JACKSON

INVESTIGATED BY S&ME, INC.

CHECKED BY A.F. RIGGS, JR.

SUBMITTED BY S&ME, INC.

DATE MAY 2012

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ARTHUR F. RIGGS, JR.

PROJECT: 34845.1.1

ID: U-2707

DRAWN BY: B. RATTI

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

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT REFERENCE NO.	SHEET NO.
34845.1.1 (U-2707)	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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	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	
CLASS.	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
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0	4 MX			8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A 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 0.50 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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY), MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

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

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

ABBREVIATIONS

AR - AUGER REFUSAL	MED. - MEDIUM	VST - VANE SHEAR TEST
BT - BORING TERMINATED	MICA. - MICACEOUS	WEA. - WEATHERED
CL. - CLAY	MOD. - MODERATELY	γ - UNIT WEIGHT
CPT - CONE PENETRATION TEST	NP - NON PLASTIC	γ_d - DRY UNIT WEIGHT
CSE. - COARSE	ORG. - ORGANIC	
DMT - DILATOMETER TEST	PMT - PRESSUREMETER TEST	SAMPLE ABBREVIATIONS
DPT - DYNAMIC PENETRATION TEST	SAP. - SAPROLITIC	S - BULK
e - VOID RATIO	SD. - SAND, SANDY	SS - SPLIT SPOON
F - FINE	SL. - SILT, SILTY	ST - SHELBY TUBE
FOSS. - FOSSILIFEROUS	SLI. - SLIGHTLY	RS - ROCK
FRAC. - FRACTURED, FRACTURES	TCR - TRICONE REFUSAL	RT - RECOMPACTED TRIAXIAL
FRAGS. - FRAGMENTS	w - MOISTURE CONTENT	CBR - CALIFORNIA BEARING RATIO
HI. - HIGHLY	V - VERY	

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [X] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [X] 3-¼" H.S.A.

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

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, 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.

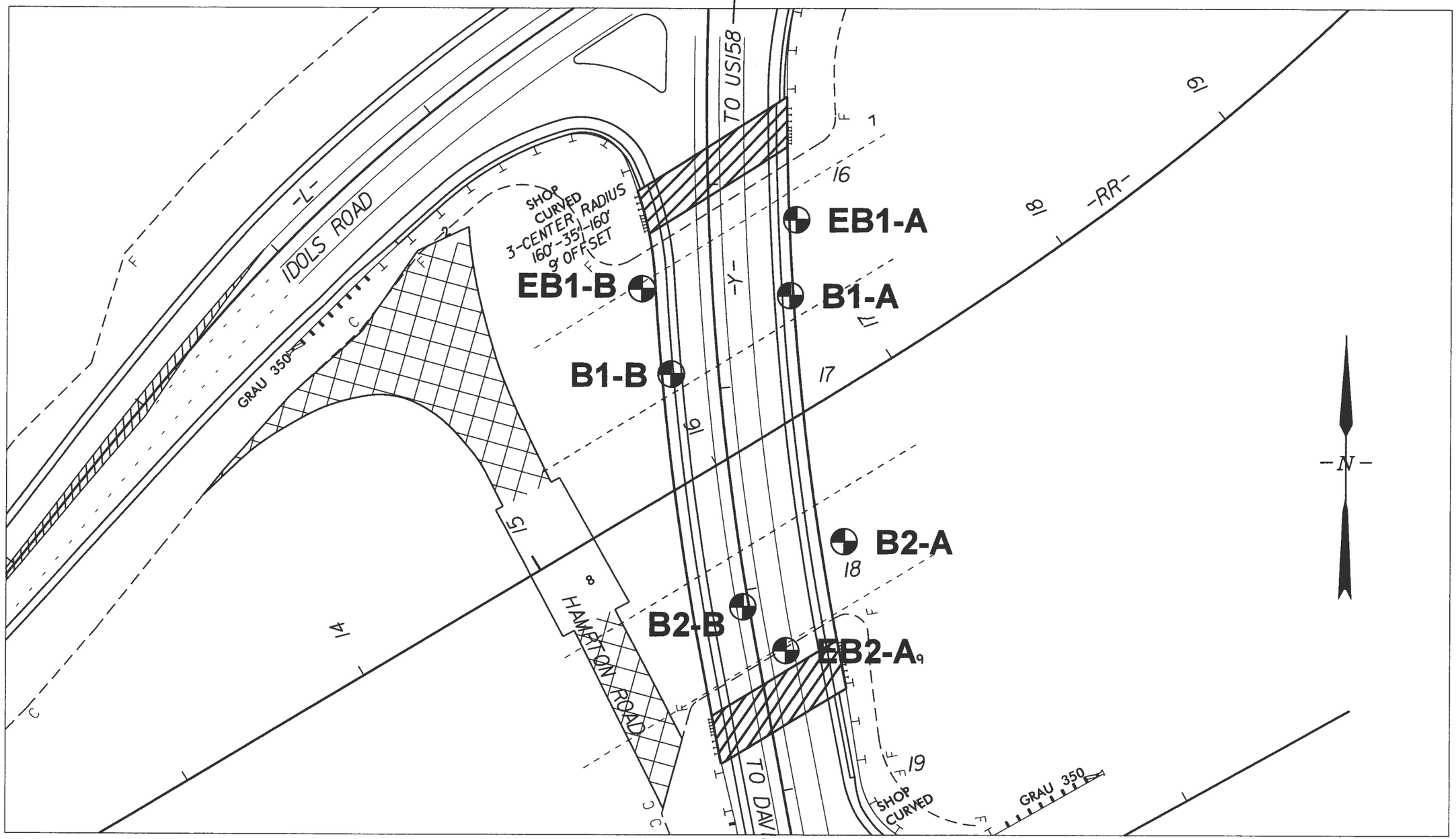
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: NCDOT TRAVERSE STATION REBAR AND CAP
STAMPED (BYI-33) LOCATED AT STA 96+63.39, -BL-
N 822249 E 1594531.4 ELEVATION: 829.60 FT.

NOTES:

REVISED 09/23/09



SKEW ANGLE:

END BENT 1	61d 03m 44s
BENT 1	63d 28m 25s
BENT 2	67d 06m 31s
END BENT 2	69d 08m 51s

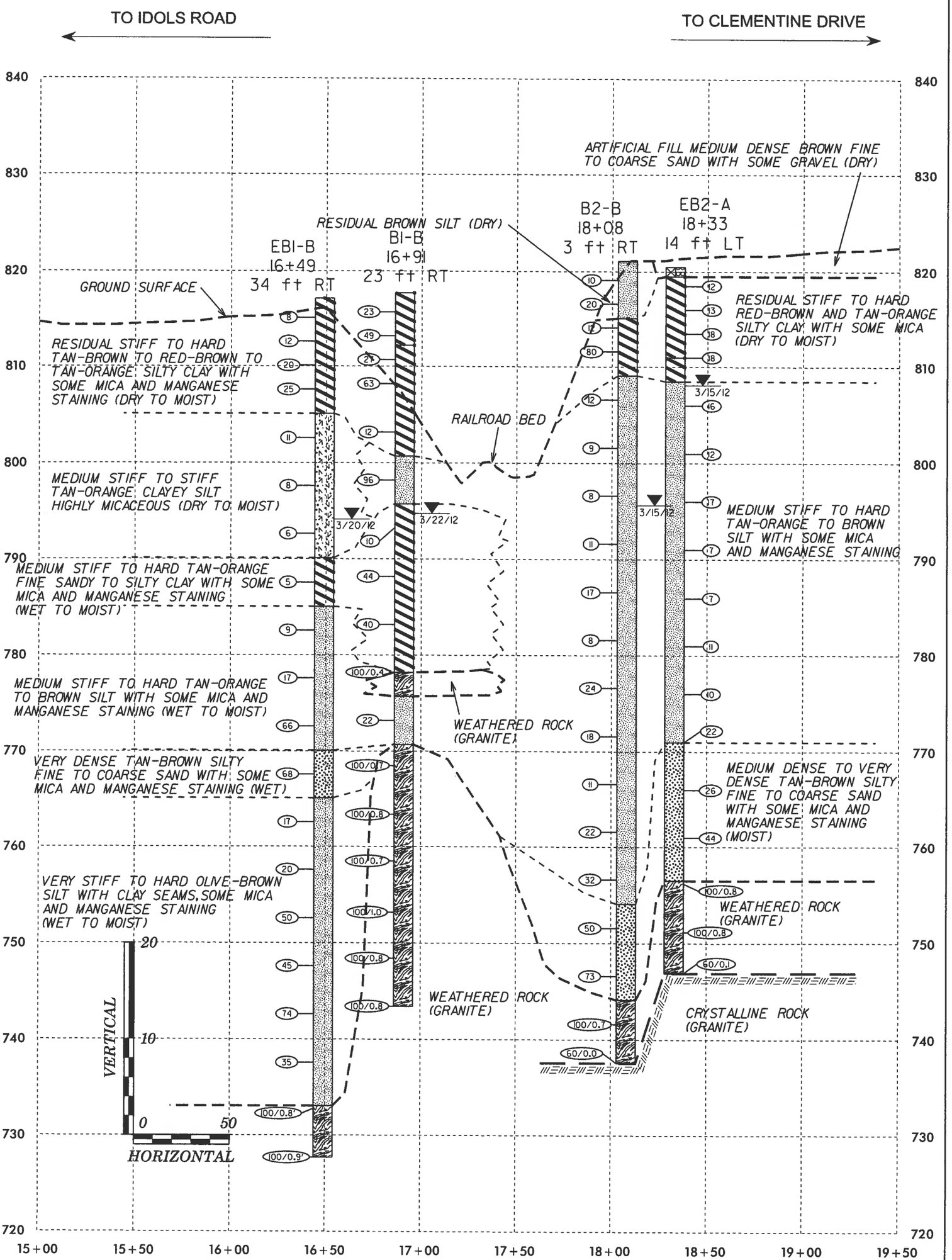
SCALE: 1" = 50'	APPROVED BY: AFR		
DATE: APRIL 2012	DRAWN BY: BTR		
JOB NO:	SHEET: 3		

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

BORING LOCATION PLAN

BRIDGE NO. 109 ON -Y- (SR2999 (HAMPTON ROAD))
OVER NORFOLK SOUTHERN RAILROAD
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

GENERALIZED SUBSURFACE PROFILE ALONG -Y-



NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE PROFILE. GROUND LINE AND -Y- PROFILE TAKEN FROM ROADWAY DESIGN PLANS AS OF APRIL 2012.

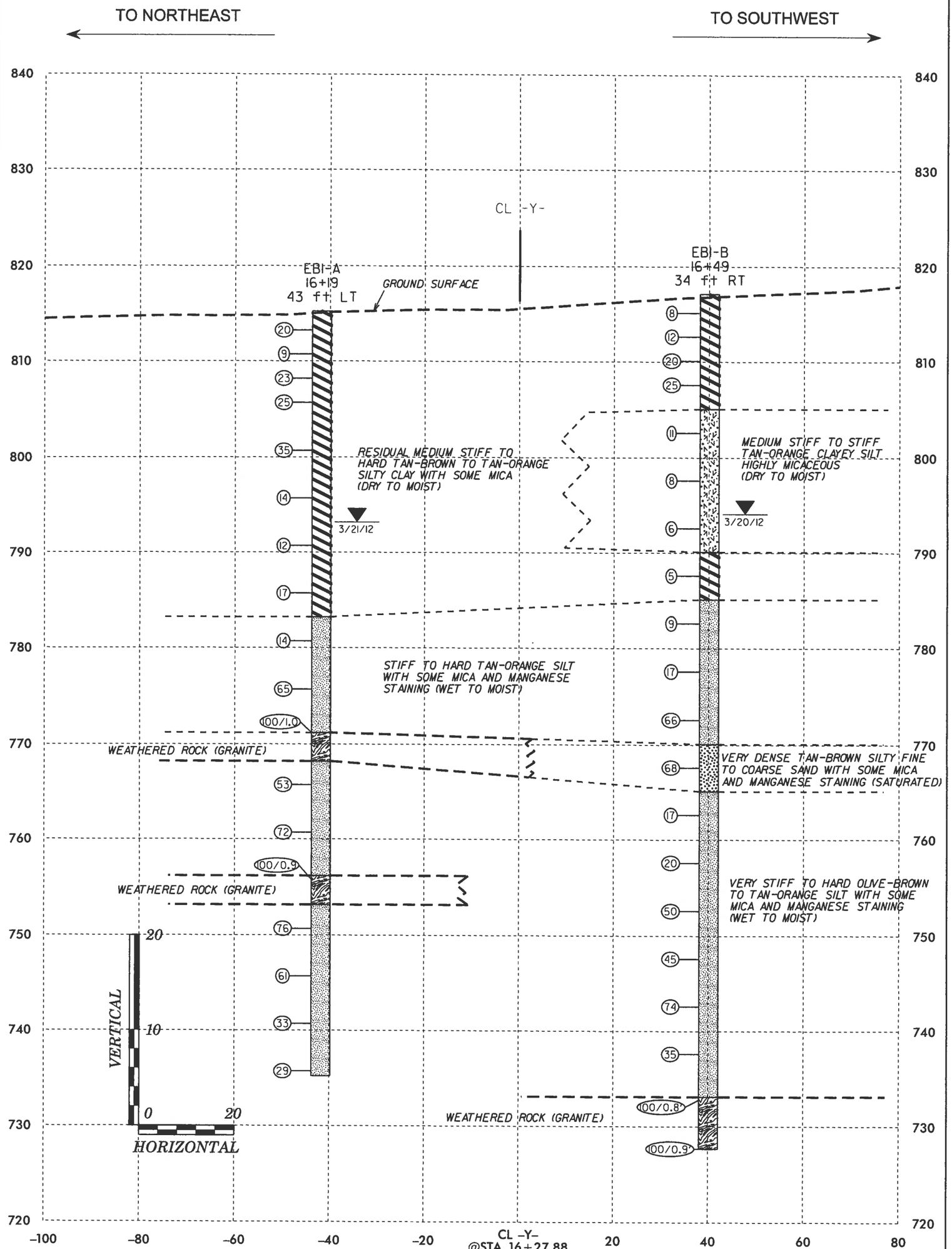
GENERALIZED SUBSURFACE PROFILE ALONG -Y-

BRIDGE NO. 109 ON -Y- (SR2999 (HAMPTON ROAD))
OVER NORFOLK SOUTHERN RAILROAD
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

SCALE: VERT. 1" = 10' HOR. 1" = 50'	APPROVED BY: AFR
DATE: APRIL 2012	DRAWN BY: BTR
JOB NO:	SHEET: 4

GENERALIZED SUBSURFACE CROSS SECTION (XS) THROUGH END BENT 1



NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTIONS.
GROUND LINE AND CROSS SECTION TAKEN FROM ROADWAY DESIGN PLANS AS OF APRIL 2012.

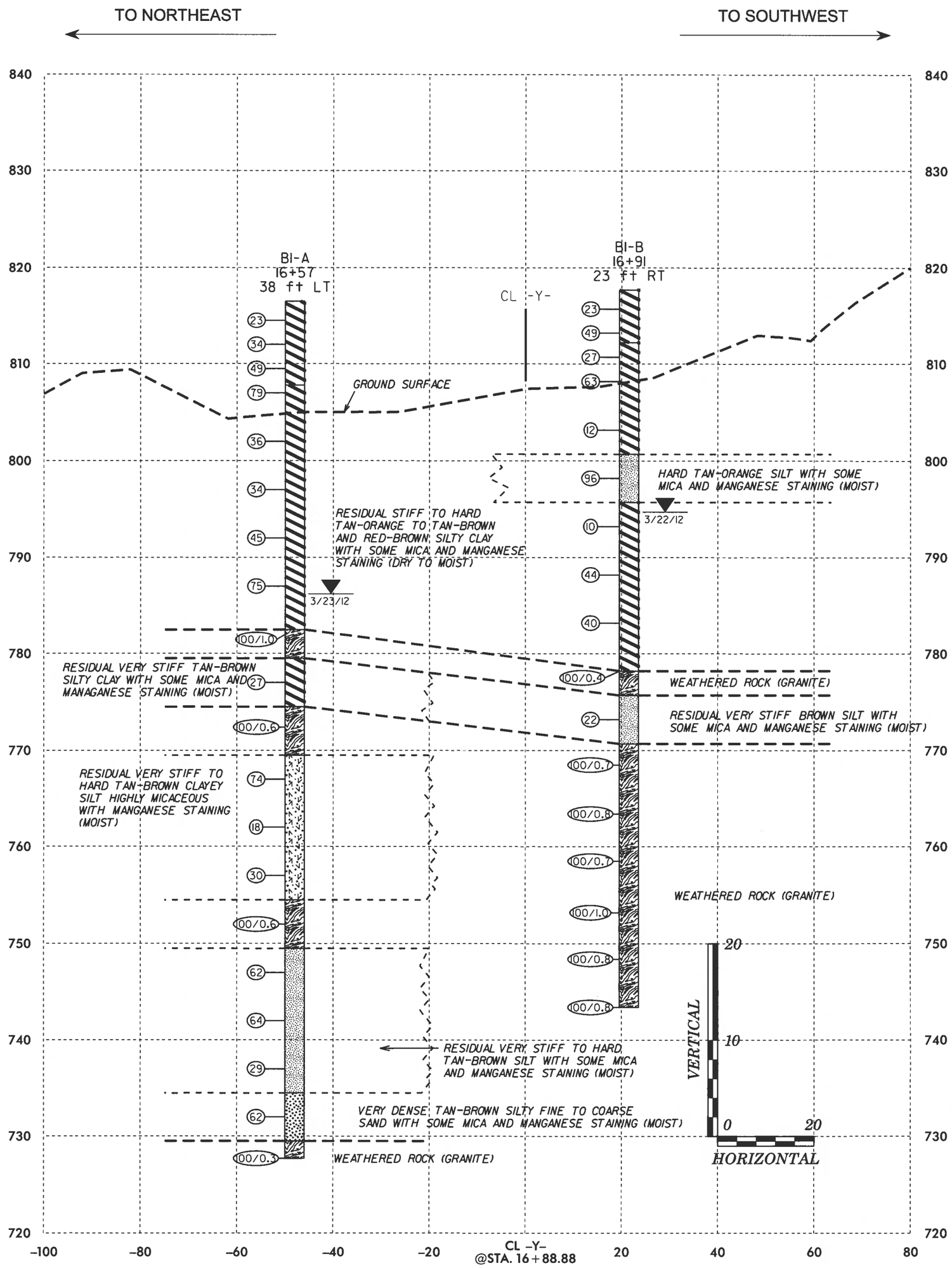
GENERALIZED SUBSURFACE XS THROUGH END BENT 1

BRIDGE NO. 109 ON -Y- (SR2999 (HAMPTON ROAD))
OVER NORFOLK SOUTHERN RAILROAD
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
DATE: APRIL 2012	DRAWN BY: BTR
JOB NO:	SHEET: 5

GENERALIZED SUBSURFACE CROSS SECTION (XS) THROUGH INTERIOR BENT 1



NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTIONS.
GROUND LINE AND CROSS SECTION TAKEN FROM ROADWAY DESIGN PLANS AS OF APRIL 2012.

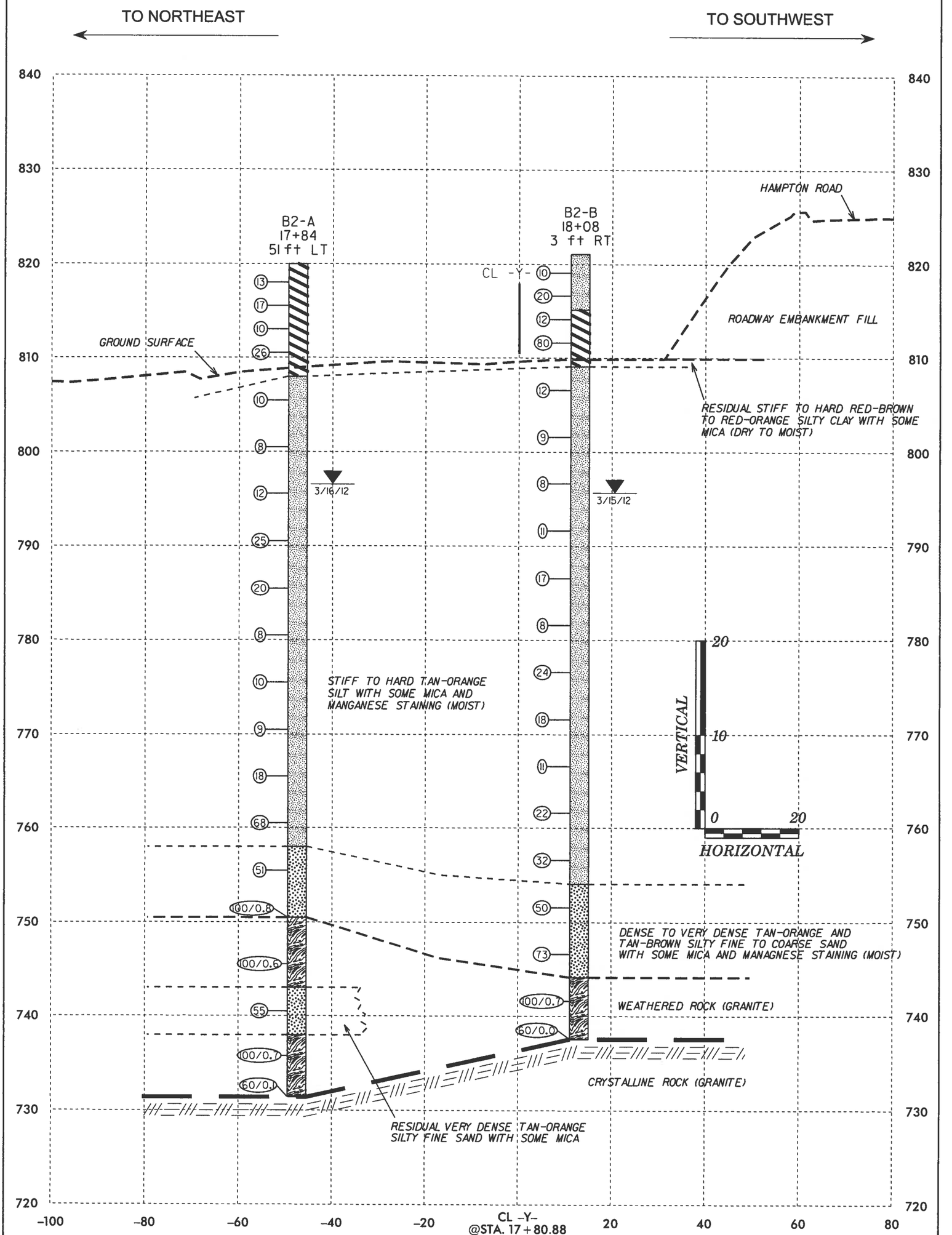
GENERALIZED SUBSURFACE XS THROUGH INT. BENT 1

BRIDGE NO. 109 ON -Y- (SR2999 (HAMPTON ROAD))
OVER NORFOLK SOUTHERN RAILROAD
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
DATE: APRIL 2012	DRAWN BY: BTR
JOB NO:	SHEET: 6

GENERALIZED SUBSURFACE CROSS SECTION (XS) THROUGH INTERIOR BENT 2



NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTIONS.
GROUND LINE AND CROSS SECTION TAKEN FROM ROADWAY DESIGN PLANS AS OF APRIL 2012.

GENERALIZED SUBSURFACE XS THROUGH INT. BENT 2

BRIDGE NO. 109 ON -Y- (SR2999 (HAMPTON ROAD))
OVER NORFOLK SOUTHERN RAILROAD
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
DATE: APRIL 2012	DRAWN BY: BTR
JOB NO:	SHEET: 7

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 16+19	**OFFSET** 43 ft LT	**ALIGNMENT** -Y-	**0 HR.** 67.0
COLLAR ELEV. 815.2 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 823,149	**EASTING** 1,594,303	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/19/12	**COMP. DATE** 03/20/12	**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))
820										
815										815.2 / 0.0 GROUND SURFACE **RESIDUAL** Tan-Orange Silty CLAY with Some Mica
	814.2	1.0	4	10	10	20		D		
	811.7	3.5	4	4	5	9		D		
810	809.2	6.0	7	12	11	23		D		
	806.7	8.5	5	12	13	25		D		
805	801.7	13.5	8	16	19	35		M		
800	796.7	18.5	3	6	8	14		M		
795	791.7	23.5	4	6	6	12		M		
790	786.7	28.5	3	8	9	17		M		
785	781.7	33.5	4	6	8	14		M		
780	776.7	38.5	17	32	33	65		M		
775	771.7	43.5	24	76/0.5		100/1.0		M		771.2 / 44.0 **WEATHERED ROCK** (Granite)
770	766.7	48.5	7	21	32	53		M		768.2 / 47.0 **RESIDUAL** Tan-Orange Fine Sandy SILT with some Mica and Manganese Staining
765	761.7	53.5	16	34	38	72		M		
760	756.7	58.5	25	75/0.4		100/0.9		M		756.2 / 59.0 **WEATHERED ROCK** (Granite)
755	751.7	63.5	31	32	44	76		M		753.2 / 62.0 **RESIDUAL** Tan-Orange Fine Sandy SILT with some Mica and Manganese Staining
750	746.7	68.5	25	23	38	61		M		
745	741.7	73.5	16	16	17	33		M		
740										

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 16+19	**OFFSET** 43 ft LT	**ALIGNMENT** -Y-	**0 HR.** 67.0
COLLAR ELEV. 815.2 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 823,149	**EASTING** 1,594,303	**24 HR.** 22.0
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/19/12	**COMP. DATE** 03/20/12	**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
740						Match Line				
	736.7	78.5	11	13	16	29		M		735.2 / 80.0 **RESIDUAL** Tan-Orange Fine Sandy SILT with some Mica and Manganese Staining *(continued)* Boring Terminated at Elevation 735.2 ft in Very Stiff Silt with some Mica

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 16+49	**OFFSET** 34 ft RT	**ALIGNMENT** -Y- — **0 HR.** 36.0
COLLAR ELEV. 817.1 ft	**TOTAL DEPTH** 89.4 ft	**NORTHING** 823,116	**EASTING** 1,594,227 — **24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Odom,C.	**START DATE** 03/16/12	**COMP. DATE** 03/19/12	**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)
820										
	817.1	0.0								817.1 GROUND SURFACE 0.0
										RESIDUAL
815	816.1	1.0	7	4	4	8		D		Tan-Brown Silty CLAY with Some Mica
	813.6	3.5	6	5	7	12		D		
810	811.1	6.0	6	10	10	20		D		
	808.6	8.5	8	10	15	25		D		
805										805.1 12.0
	803.6	13.5	6	5	6	11		D		Tan-Orange Clayey SILT Highly Micaceous
800										
	798.6	18.5	4	4	4	8		M		
795										
	793.6	23.5	3	3	3	6		M		
790										790.1 27.0
	788.6	28.5	2	2	3	5		W		Tan-Orange Silty CLAY with Some Mica and Manganese Staining
785										785.1 32.0
	783.6	33.5	3	4	5	9		W		Tan-Orange Fine Sandy SILT with Some Mica and Manganese Staining
780										
	778.6	38.5	5	8	9	17		W		
775										
	773.6	43.5	5	26	40	66		M		
770										770.1 47.0
	768.6	48.5	17	35	33	68		Sat.		Tan-Brown Silty Fine to Coarse SAND with Some Mica and Manganese Staining
765										765.1 52.0
	763.6	53.5	6	6	11	17		W		Olive-Brown Fine Sandy SILT with Clay Seams, Some Mica and Manganese Staining
760										
	758.6	58.5	12	10	10	20		M		
755										
	753.6	63.5	19	24	26	50		M		
750										
	748.6	68.5	15	20	25	45		M		
745										
	743.6	73.5	15	24	50	74		M		
740										

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 16+49	**OFFSET** 34 ft RT	**ALIGNMENT** -Y- — **0 HR.** 36.0
COLLAR ELEV. 817.1 ft	**TOTAL DEPTH** 89.4 ft	**NORTHING** 823,116	**EASTING** 1,594,227 — **24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER Odom,C.	**START DATE** 03/16/12	**COMP. DATE** 03/19/12	**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
740						Match Line				
	738.6	78.5	10	14	21	35		M		Olive-Brown Fine Sandy SILT with Clay Seams, Some Mica and Manganese Staining *(continued)*
735										
	733.6	83.5	35	54	46/0.3	100/0.8				733.1 84.0
730										**WEATHERED ROCK** (Granite)
	728.6	88.5	51	49/0.4		100/0.9				727.7 89.4
										Boring Terminated at Elevation 727.7 ft in Weathered Rock (Granite)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 16+57	**OFFSET** 38 ft LT	**ALIGNMENT** -Y-	**0 HR.** N/M
COLLAR ELEV. 816.5 ft	**TOTAL DEPTH** 88.8 ft	**NORTHING** 823,109	**EASTING** 1,594,262	**24 HR.** 30.3
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/21/12	**COMP. DATE** 03/22/12	**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)
820											
										816.5	0.0
										GROUND SURFACE	
815	815.5	1.0	12	9	14	23		D		**RESIDUAL** Tan-Orange and Brown Silty CLAY	
	813.0	3.5									
810	810.5	6.0	13	17	17	34		D			
	808.0	8.5	17	24	25	49		D			
805			36	38	41	79		D		807.8	8.7
	803.0	13.5	7	17	19					Tan-Brown Silty CLAY with Some Mica and Manganese Staining	
800						36		M			
	798.0	18.5	11	16	18	34					
795	793.0	23.5	11	21	24	47		M			
790											
	788.0	28.5	25	22	53	75					
785											
	783.0	33.5	28	49	51/0.5	100/1.0					
780											
	778.0	38.5	10	12	15	27		M			
775											
	773.0	43.5	85	15/0.1		100/0.6					
770											
	768.0	48.5	21	38	36	74		M			
765											
	763.0	53.5	5	6	12	18		M			
760											
	758.0	58.5	10	12	18	30		M			
755											
	753.0	63.5	21	68	32/0.1	100/0.6					
750											
	748.0	68.5	12	26	36	62		M			
745											
	743.0	73.5	25	35	29	64		M			
740											
										782.5	34.0
										WEATHERED ROCK (Granite)	
										779.5	37.0
										RESIDUAL Tan-Brown Silty CLAY with Some Mica and Manganese Staining	
										774.5	42.0
										WEATHERED ROCK (Granite)	
										769.5	47.0
										RESIDUAL Tan-Brown Clayey SILT Highly Micaceous with Manganese Staining	
										754.5	62.0
										WEATHERED ROCK (Granite)	
										749.5	67.0
										RESIDUAL Tan-Brown Fine Sandy SILT with Some Mica and Manganese Staining	

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 16+57	**OFFSET** 38 ft LT	**ALIGNMENT** -Y-	**0 HR.** N/M
COLLAR ELEV. 816.5 ft	**TOTAL DEPTH** 88.8 ft	**NORTHING** 823,109	**EASTING** 1,594,262	**24 HR.** 30.3
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/21/12	**COMP. DATE** 03/22/12	**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
740						Match Line				
	738.0	78.5	7	11	18	29		M		**RESIDUAL** Tan-Brown Fine Sandy SILT with Some Mica and Manganese Staining *(continued)*
735										734.5 82.0
	733.0	83.5	16	28	34	62		M		Tan-Brown Silty Fine to Coarse SAND with Some Mica and Manganese Staining
730										729.5 87.0
	728.0	88.5	100/0.3			100/0.3				**WEATHERED ROCK** (Granite) 727.7 88.8
										Boring Terminated at Elevation 727.7 ft in Weathered Rock (Granite)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 16+91	**OFFSET** 23 ft RT	**ALIGNMENT** -Y-	**0 HR.** N/A
COLLAR ELEV. 817.7 ft	**TOTAL DEPTH** 74.3 ft	**NORTHING** 823,074	**EASTING** 1,594,242	**24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/20/12	**COMP. DATE** 03/21/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
830											
825											
820											
	816.7	1.0								817.7 GROUND SURFACE	0.0
815			9	11	12	23		D		**RESIDUAL** Tan-Brown and Red-Brown Silty CLAY	
	814.2	3.5									
	811.7	6.0	18	19	30	49		D		812.2	5.5
810			10	12	15	27		D		Tan-Orange Silty CLAY with Some Mica and Manganese Staining	
	809.2	8.5									
			23	29	34	63		D			
805											
	804.2	13.5									
			3	5	7	12		M			
800										800.7	17.0
	799.2	18.5								Tan-Orange Fine Sandy SILT with Some Mica and Manganese Staining	
			15	28	68	96		M			
795										795.7	22.0
	794.2	23.5								Tan-Orange Silty CLAY with Some Mica and Manganese Staining	
			3	4	6	10		W			
790											
	789.2	28.5									
			8	17	27	44		M			
785											
	784.2	33.5									
			8	15	25	40		M			
780											
	779.2	38.5									
			12	38	62/0.4	100/0.4				778.2	39.5
775										**WEATHERED ROCK** (Granite)	
	774.2	43.5								775.7	42.0
			4	10	12	22		M		**RESIDUAL** Brown Fine Sandy SILT with Some Mica and Manganese Staining	
770										770.7	47.0
	769.2	48.5								**WEATHERED ROCK** (Granite)	
			52	48/0.2		100/0.7					
765											
	764.2	53.5									
			19	81/0.3		100/0.8					
760											
	759.2	58.5									
			51	49/0.2		100/0.7					
755											
	754.2	63.5									
			52	48/0.5		100/1.0					
750											

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 16+91	**OFFSET** 23 ft RT	**ALIGNMENT** -Y-	**0 HR.** N/A
COLLAR ELEV. 817.7 ft	**TOTAL DEPTH** 74.3 ft	**NORTHING** 823,074	**EASTING** 1,594,242	**24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/20/12	**COMP. DATE** 03/21/12	**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
750						Match Line				
	749.2	68.5	30	70/0.3		100/0.8				**WEATHERED ROCK** (Granite) *(continued)*
745										
	744.2	73.5	48	52/0.3		100/0.8				743.4 74.3
										Boring Terminated at Elevation 743.4 ft in Weathered Rock (Granite)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 17+84	**OFFSET** 51 ft LT	**ALIGNMENT** -Y-	**0 HR.** N/A
COLLAR ELEV. 820.0 ft	**TOTAL DEPTH** 88.6 ft	**NORTHING** 822,983	**EASTING** 1,594,276	**24 HR.** 23.5
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/15/12	**COMP. DATE** 03/15/12	**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))
820										820.0 GROUND SURFACE 0.0
	819.0	1.0	4	5	8	13 17		D		**RESIDUAL** Red-Brown and Red-Orange Silty CLAY with Some Mica
815	816.5	3.5	7	8	9			D		
	814.0	6.0	5	4	6	10		D		
	811.5	8.5	8	9	17	26		D		
810										808.0 12.0
	806.5	13.5	3	4	6	10		M		Tan-Orange Fine Sandy SILT with Some Mica and Manganese Staining
805										
	801.5	18.5	9	3	5	8		M		
800										
	796.5	23.5	4	4	8	12		M		
795										
	791.5	28.5	9	12	13	25		M		
790										
	786.5	33.5	5	8	12	20		M		
785										
	781.5	38.5	2	3	5	8		M		
780										
	776.5	43.5	3	4	6	10		M		
775										
	771.5	48.5	2	4	5	9		M		
770										
	766.5	53.5	3	5	13	18		M		
765										
	761.5	58.5	14	25	43	68		M		
760										
	756.5	63.5	13	18	33	51		M		
755										
	751.5	68.5	22	35	65/0.3	100/0.8		M		
750										
	746.5	73.5	21	42	58/0.1	100/0.6		M		
745										
	741.5	78.5	25	23	32	55		M		758.0 62.0 Tan-Orange Silty Fine SAND with Some Mica and Manganese Staining
740										750.5 69.5 **WEATHERED ROCK** (Granite)
										743.0 77.0 **RESIDUAL** Tan-Orange Silty Fine SAND with Some Mica

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 17+84	**OFFSET** 51 ft LT	**ALIGNMENT** -Y-	**0 HR.** N/A
COLLAR ELEV. 820.0 ft	**TOTAL DEPTH** 88.6 ft	**NORTHING** 822,983	**EASTING** 1,594,276	**24 HR.** 23.5
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/15/12	**COMP. DATE** 03/15/12	**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
740						Match Line				
	736.5	83.5	83	17/0.2		100/0.7				738.0 82.0 **WEATHERED ROCK** (Granite)
735										
	731.5	88.5	60/0.1			60/0.1				731.5 88.5 **CRYSTALLINE ROCK** (Granite) 731.4 88.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 731.4 ft in Crystalline Rock (Granite)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 18+08	**OFFSET** 3 ft RT	**ALIGNMENT** -Y-	**0 HR.** 33.0
COLLAR ELEV. 821.1 ft	**TOTAL DEPTH** 83.5 ft	**NORTHING** 822,959	**EASTING** 1,594,277	**24 HR.** 25.5
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/13/12	**COMP. DATE** 03/14/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
825										
820	820.1	1.0	5	4	6	10		D		821.1 0.0 GROUND SURFACE **RESIDUAL** Brown Clayey SILT
	817.6	3.5	6	10	10	20		D		
815	815.1	6.0	4	5	7	12		M		815.1 6.0 Red-Brown Silty CLAY
	812.6	8.5	14	44	36	80		M		
810	807.6	13.5	5	5	7	12		M		809.1 12.0 Tan-Orange Fine Sandy SILT with Some Mica and Manganese Staining
805	802.6	18.5	3	4	5	9		M		
800	797.6	23.5	2	3	5	8		M		
795	792.6	28.5	4	4	7	11		M		
790	787.6	33.5	5	5	12	17		M		
785	782.6	38.5	2	4	4	8		M		
780	777.6	43.5	7	8	16	24		M		
775	772.6	48.5	3	7	11	18		W		
770	767.6	53.5	3	5	6	11		W		
765	762.6	58.5	6	10	12	22		M		
760	757.6	63.5	8	12	20	32		M		
755	752.6	68.5	15	21	29	50		M		754.1 67.0 Tan-Brown Silty Fine to Coarse SAND with Some Mica and Manganese Staining
750	747.6	73.5	35	41	32	73		M		
745										

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 18+08	**OFFSET** 3 ft RT	**ALIGNMENT** -Y-	**0 HR.** 33.0
COLLAR ELEV. 821.1 ft	**TOTAL DEPTH** 83.5 ft	**NORTHING** 822,959	**EASTING** 1,594,277	**24 HR.** 25.5
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/13/12	**COMP. DATE** 03/14/12	**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
745						Match Line				
740	742.6	78.5	60	40/0.2		100/0.7				744.1 77.0 **WEATHERED ROCK** (Granite)
	737.6	83.5	60/0.0			60/0.0				737.6 83.5 Boring Terminated with Standard Penetration Test Refusal at Elevation 737.6 ft on Crystalline Rock (Granite)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Williamson, J.	
SITE DESCRIPTION Bridge No. 109 on (SR 2999 (Hampton Road)) over Norfolk Southern Railroad				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 18+33	**OFFSET** 14 ft LT	**ALIGNMENT** -Y-	**0 HR.** Dry
COLLAR ELEV. 820.5 ft	**TOTAL DEPTH** 73.6 ft	**NORTHING** 822,938	**EASTING** 1,594,298	**24 HR.** 12.4
DRILL RIG/HAMMER EFF./DATE SME R-5 BK-51 78% 06/06/2010		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Odom,C.	**START DATE** 03/14/12	**COMP. DATE** 03/14/12	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
830											
825											
820										820.5 GROUND SURFACE	0.0
	819.5	1.0								819.5 **ARTIFICIAL FILL** Brown Silty Fine to Coarse SAND with Some Gravel	1.0
	817.0	3.5	6	5	7	12		D		**RESIDUAL** Red Silty CLAY with Some Mica	
815	814.5	6.0	6	6	7	13		D			
	812.0	8.5	5	7	11	18		D			
810			5	7	11	18		D		811.0 Tan-Orange Silty CLAY	9.5
	807.0	13.5								808.5 Tan-Orange Fine Sandy SILT with Some Mica and Manganese Staining	12.0
805			5	7	9	16		D			
	802.0	18.5									
800			4	5	7	12		M			
	797.0	23.5									
795			6	6	11	17		M			
	792.0	28.5									
790			2	3	4	7		W			
	787.0	33.5									
785			2	3	4	7		W			
	782.0	38.5									
780			3	5	6	11		W			
	777.0	43.5									
775			2	4	6	10		W			
	772.0	48.5									
770			6	10	12	22		M		771.0 Tan-Brown Silty Fine to Coarse SAND with Some Mica and Manganese Staining	49.5
	767.0	53.5									
765			5	10	16	26		M			
	762.0	58.5									
760			12	20	24	44		M			
	757.0	63.5								756.5 **WEATHERED ROCK** (Granite)	64.0
755			32	68/0.3		100/0.8					
	752.0	68.5									
750			61	39/0.3		100/0.8					

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
750						Match Line				
	747.0	73.5	60/0.1			60/0.1				**WEATHERED ROCK** (Granite) *(continued)*
	746.9									**CRYSTALLINE ROCK** (Granite) 73.6
										Boring Terminated with Standard Penetration Test Refusal at Elevation 746.9 ft in Crystalline Rock (Granite)

Photograph No. 1: This photograph was taken right of the center line of –Y- alignment, looking East along the railroad tracks.

Photograph No.2: This photograph was taken from the right side of the –Y- alignment looking East across proposed Interior Bent No. 2.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34845.1.1 (U-2707)	1	37

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *34845.1.1 (U-2707)* F.A. PROJ. *STP-3000(1)*

COUNTY *FORSYTH*

PROJECT DESCRIPTION *CLEMMONS – (SR3000 (IDOLS ROAD EXTENSION)) FROM (SR2999 (HAMPTON ROAD)) TO US-158 (CLEMMONS ROAD)*

SITE DESCRIPTION *BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK*

INVENTORY

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

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

J. BRANDSEN

E. MAYR

B. RATTI

M.B. MOSELEY

M.G. MOSELEY

INVESTIGATED BY *S&ME, INC.*

CHECKED BY *A.F. RIGGS, JR.*

SUBMITTED BY *S&ME, INC.*

DATE *JUNE 2012*

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ASHLEY F. RIGGS, JR. 6/4/12

PROJECT: 34845.1.1

ID: U-2707

DRAWN BY: *B. RATTI*

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

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PROJECT REFERENCE NO.	SHEET NO.
34845.1.1 (U-2707)	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 TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A 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/FT²)
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 0.50 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		
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE		
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY), MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

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

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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:
- [ ] MOBILE B-__
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [X] Diedrich D-50
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [X] TRICONE 2 15/16" TUNG.-CARB.
- [ ] CORE BIT
- [X] 3-1/4" H.S.A.

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

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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 (CPI)	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 FELOSPARS 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

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, 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 (D)P 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: NCDOT TRAVERSE STATION REBAR AND CAP (SEE BELOW)

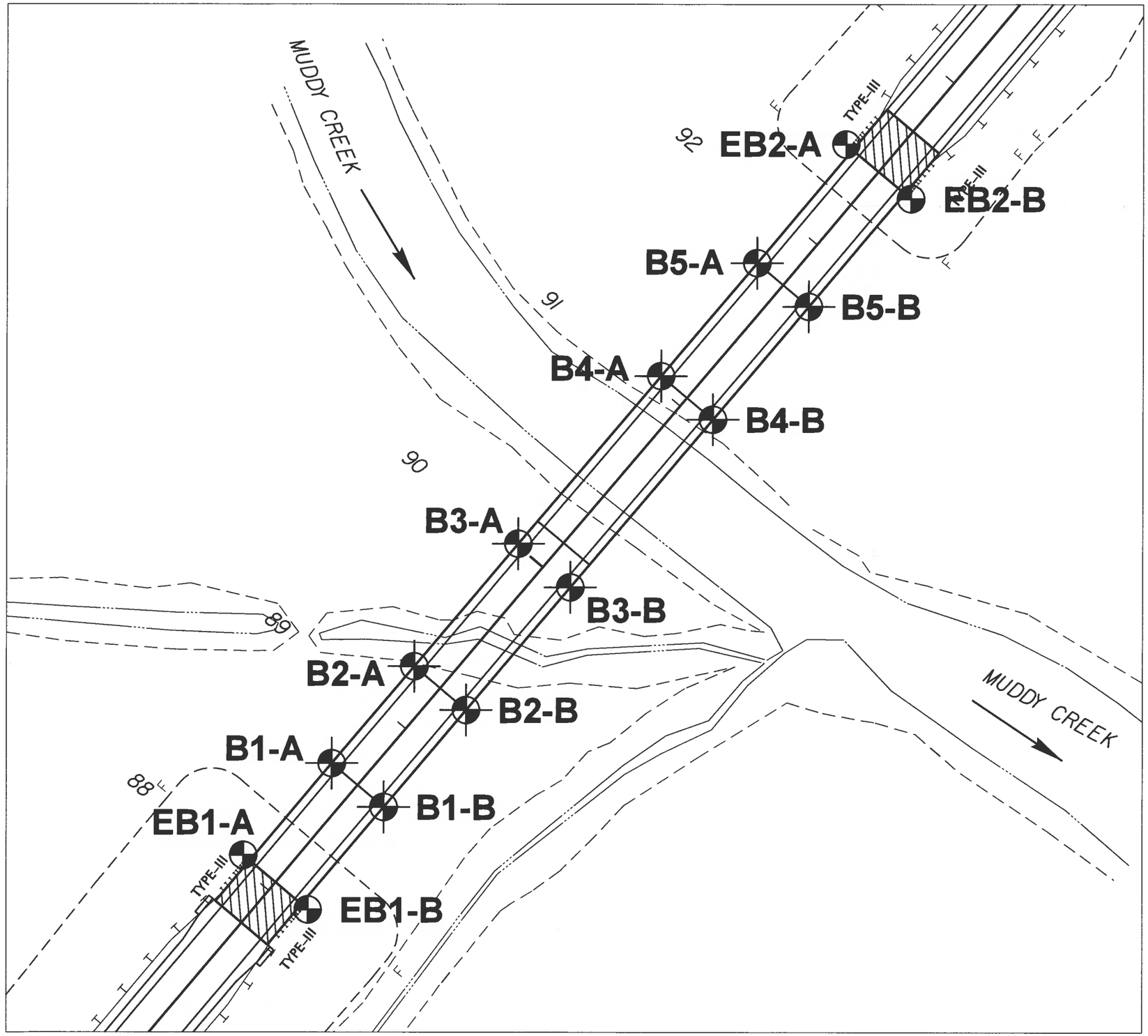
ELEVATION: _____ FT.

NOTES:
FIAD - FILLED IN AFTER DRILLING

NCDOT TRAVERSE STATION REBAR AND CAP:
(BL-24) LOCATED AT STA 90+05.76 22.15' RT -L-
N 827577 E 1599302 ELEV 698.79
(BL-25) LOCATED AT STA 94+16.45 35.36' RT -L-
N 827882 E 1599576 ELEV 705.52

ST-1 — SHELBY TUBE

REVISED 09/23/09



N

0 50 100

FEET

SKEW ANGLE FOR BENTS 90° TYPICAL

BORING LOCATION PLAN

BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION))
OVER MUDDY CREEK
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

SCALE: 1" = 50'	APPROVED BY: ARF
DATE: MAY 2012	DRAWN BY: BTR
JOB NO:	SHEET: 3

TO HAMPTON ROAD

GENERALIZED SUBSURFACE PROFILE ALONG -L-

TO US-158

A) ALLUVIAL MEDIUM STIFF TO VERY STIFF BROWN TAN-ORANGE AND TAN-GRAY COURSE TO FINE SANDY SILTY CLAY (MOIST)

B) ALLUVIAL MEDIUM STIFF TO VERY STIFF TAN TO ORANGE CLAYEY FINE SAND WITH TRACE OF SILT (MOIST TO SAT.)

C) ALLUVIAL VERY LOOSE TO MEDIUM DENSE TAN, GRAY AND BROWN SILTY FINE TO COARSE SAND WITH SOME CLAY AND TRACE OF WOOD FRAGMENTS, GRAVEL AND MICA (MOIST TO SAT.)

720
710
700
690
680
670
660
650
640
630

GROUND SURFACE

EB1-A
88+05
20 ft LT

B1-A
88+65
16 ft LT

B2-A
89+25
16 ft LT

B3-A
90+01
16 ft LT

B4-A
91+05
16 ft LT

B5-A
91+75
16 ft LT

EB2-A
92+45
20 ft LT

ST-1

VERY LOOSE GRAY FINE TO COARSE SAND WITH TRACE OF SILT (SAT.)

RESIDUAL VERY DENSE BLACK-GREEN SILTY FINE SAND (MOIST)

RESIDUAL MEDIUM DENSE TO VERY DENSE GREEN-BLACK, BROWN-GREEN GRAY AND ORANGE SILTY COARSE TO FINE SAND (MOIST)

WEATHERED ROCK (META-DIORITE)

CRYSTALLINE ROCK MODERATE SEVERELY WEATHERED MEDIUM HARD BLACK-GRAY (META-DIORITE) VERY CLOSE FRACTURE SPACING

REC=35% RQD=11%
REC=0% RQD=0%
REC=89% RQD=59%
REC=96% RQD=70%
REC=64% RQD=39%
REC=100% RQD=96%
REC=79% RQD=49%
REC=99% RQD=83%
REC=73% RQD=31%
REC=94% RQD=84%

679.9' 10/2/03

VERTICAL 20 10 0
HORIZONTAL 50

CRYSTALLINE ROCK MODERATE TO VERY SLIGHTLY WEATHERED MEDIUM HARD TO HARD BLACK-GRAY (META-DIORITE) VERY CLOSE TO MODERATELY CLOSE FRACTION SPACING RMR=46

CRYSTALLINE ROCK VERY SLIGHTLY TO FRESHLY WEATHERED HARD TO VERY HARD BLACK-GRAY (META-DIORITE) CLOSE TO MODERATELY CLOSE FRACTURE SPACING RMR=50 TO 58

BT
FIAD BT

NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE PROFILE. GROUND LINE AND -L- PROFILE TAKEN FROM ROADWAY DESIGN PLANS AS OF APRIL 2012.

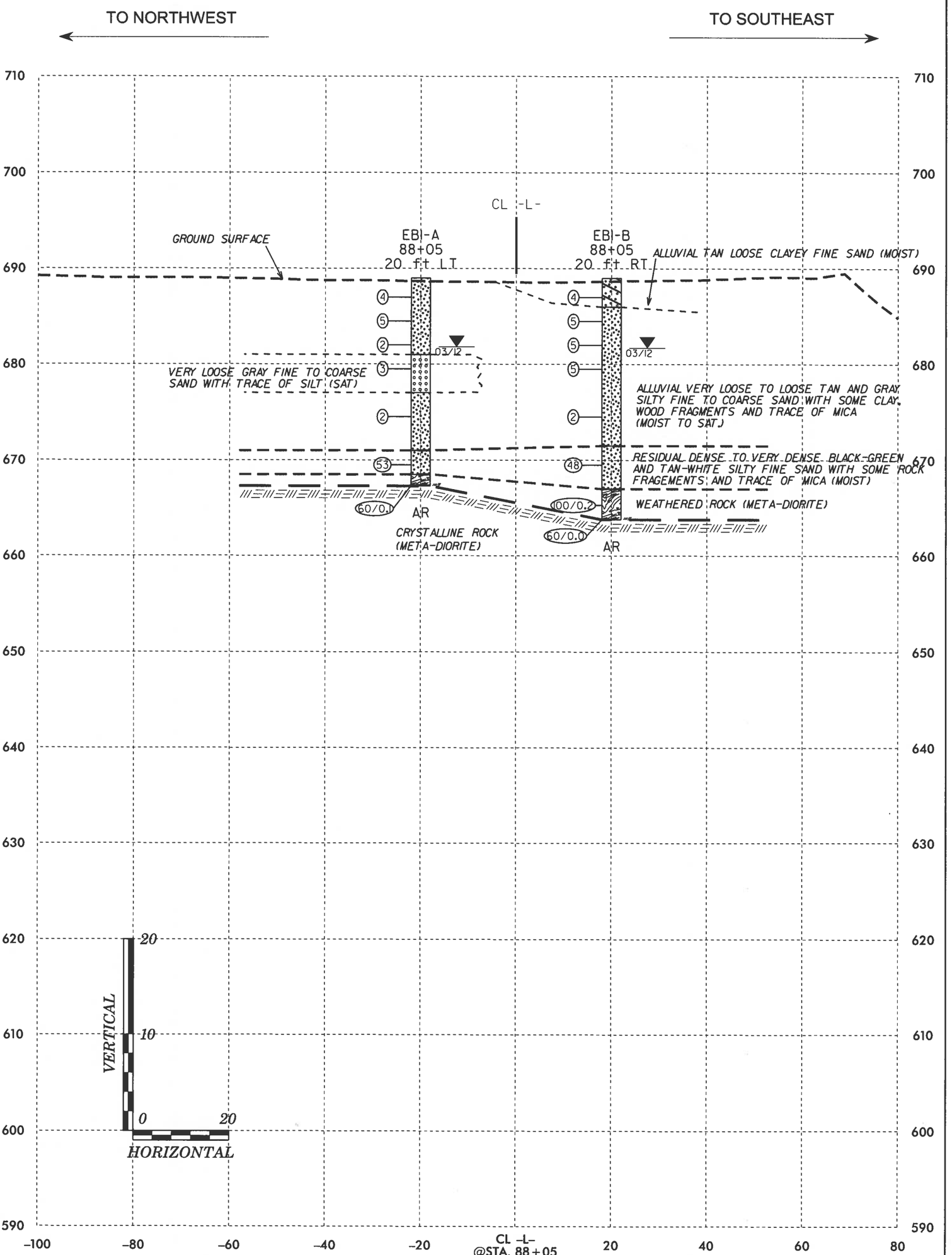
87+00 87+50 88+00 88+50 89+00 89+50 90+00 90+50 91+00 91+50 92+00 92+50 93+00

SCALE: VERT. 1" = 10' HOR. 1" = 50'
APPROVED BY: AFR
DRAWN BY: BTR
DATE: MAY 2012
SHEET: 4
JOB NO:

S&ME
WWW.SMEINC.COM
NC ENGINEER LICENSE #F-0176
3201 SPRING FOREST RD, RALEIGH, NC 27616

GENERALIZED SUBSURFACE PROFILE ALONG -L-
BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK
STATE PROJ NO. 34845.1.1 TIP NO. U-2707
FEDERAL I.D. NO. STP-3000(1)
FORSYTH COUNTY, NORTH CAROLINA

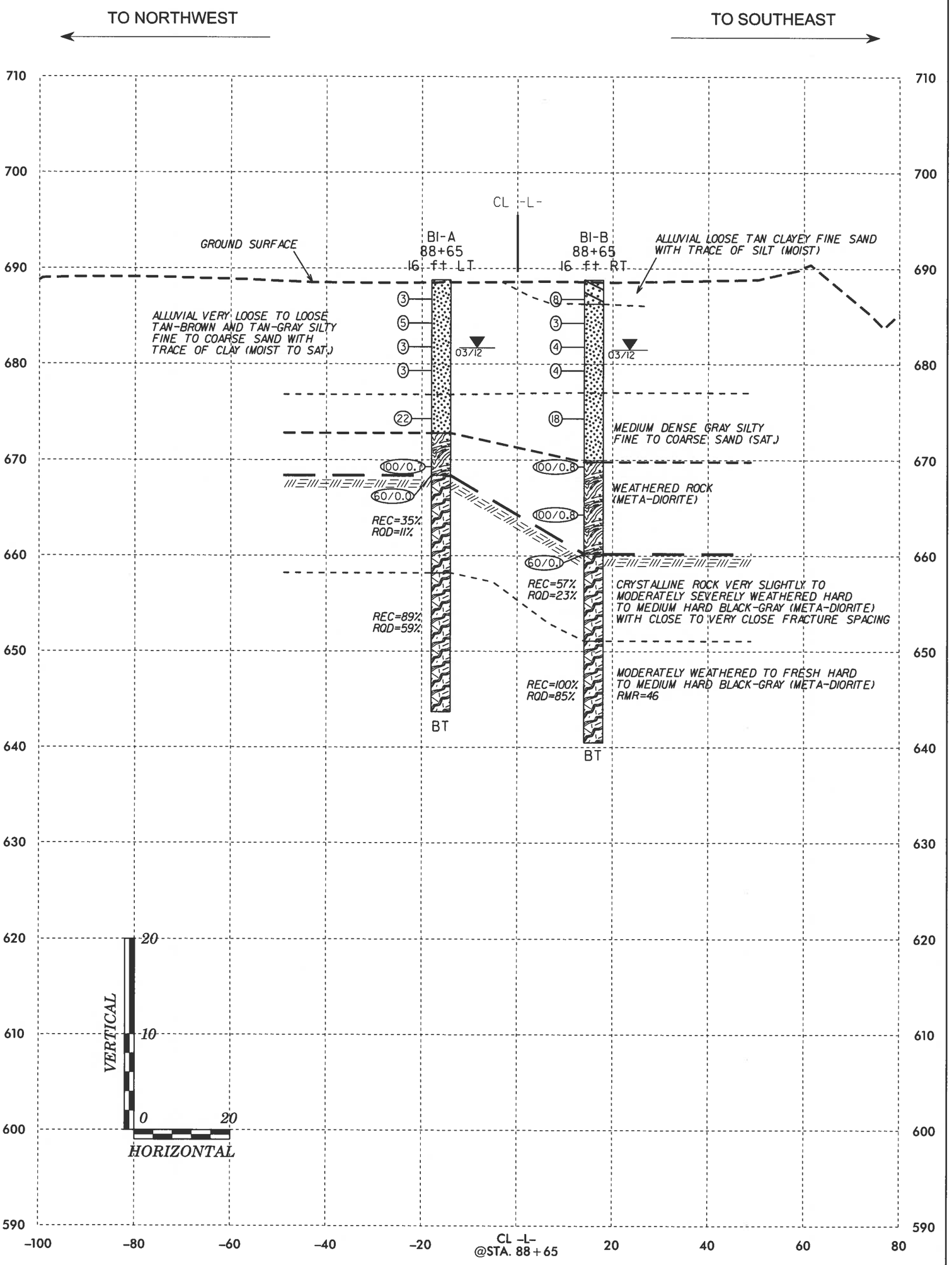
CROSS SECTION THROUGH END BENT 1



NOTE:
GROUND LINE TAKEN FROM TIN FILE "u2707_ls_tin_110418.dgn"

CROSS SECTION THROUGH END BENT 1 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 5

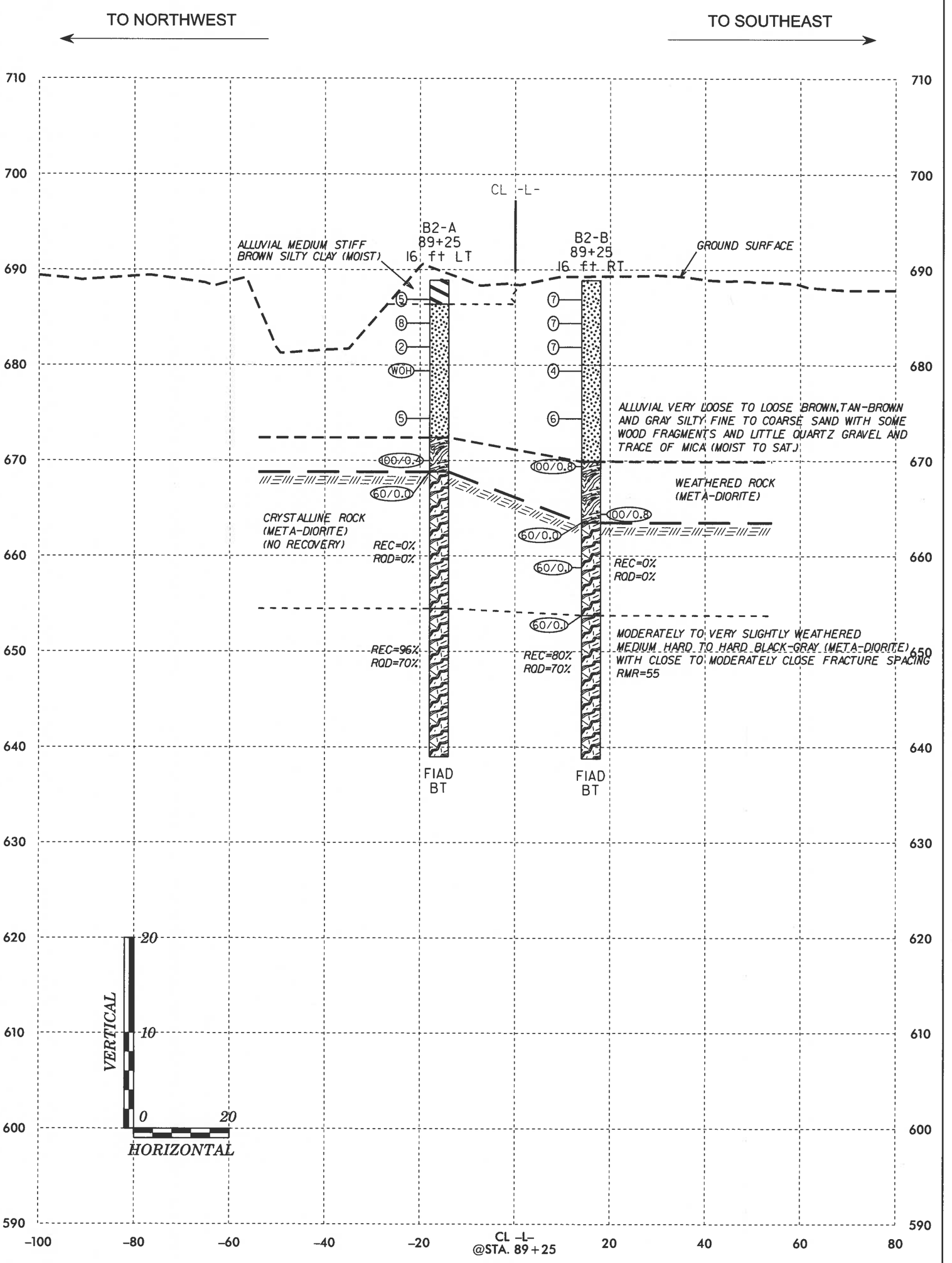
CROSS SECTION THROUGH INTERIOR BENT 1



NOTE:
GROUND LINE TAKEN FROM TIN FILE "u2707_ls_tin_110418.dgn"

CROSS SECTION THROUGH INTERIOR BENT 1 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 6

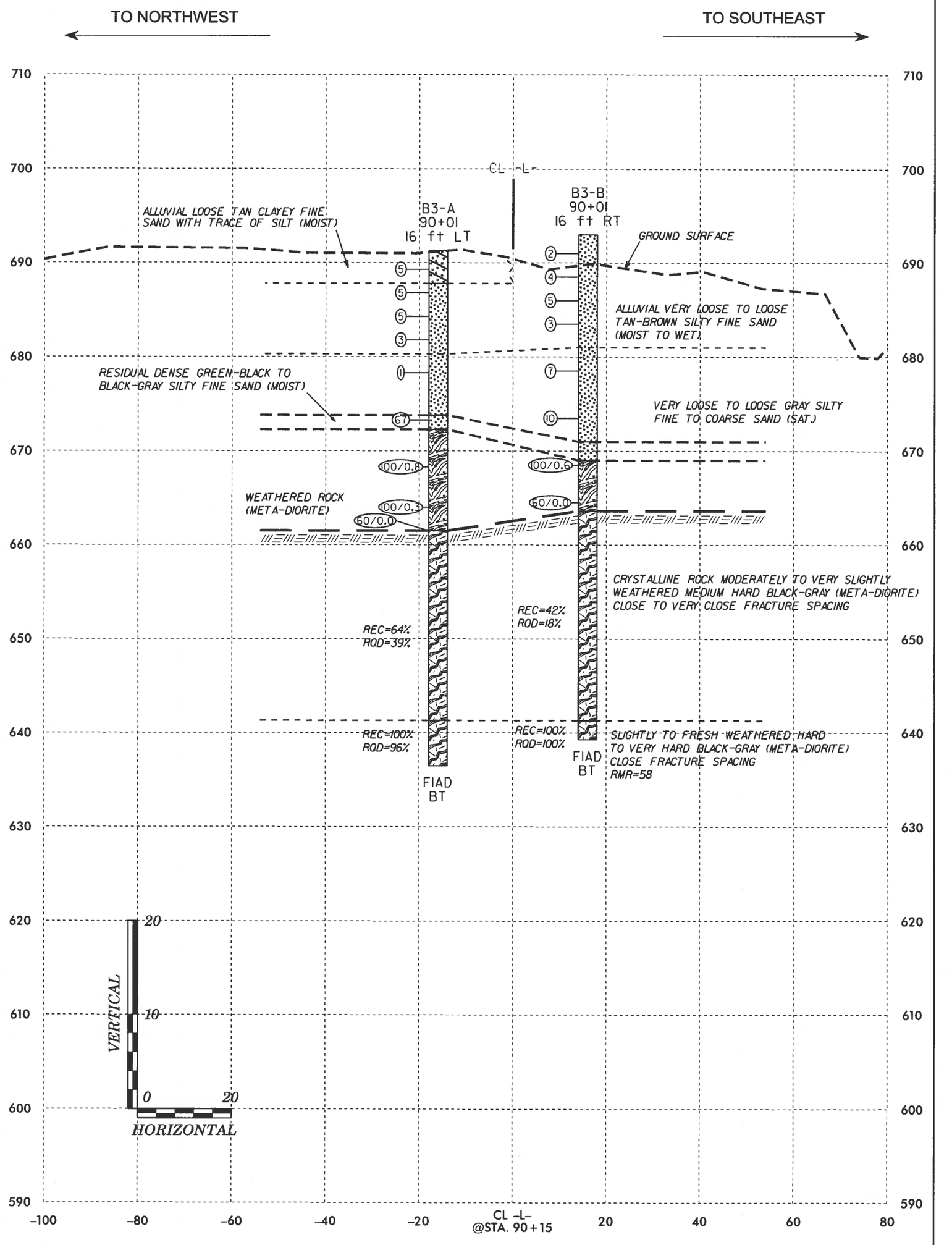
CROSS SECTION THROUGH INTERIOR BENT 2



NOTE:
GROUND LINE TAKEN FROM TIN FILE "u2707_ls_tin_110418.dgn"

CROSS SECTION THROUGH INTERIOR BENT 2 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 7

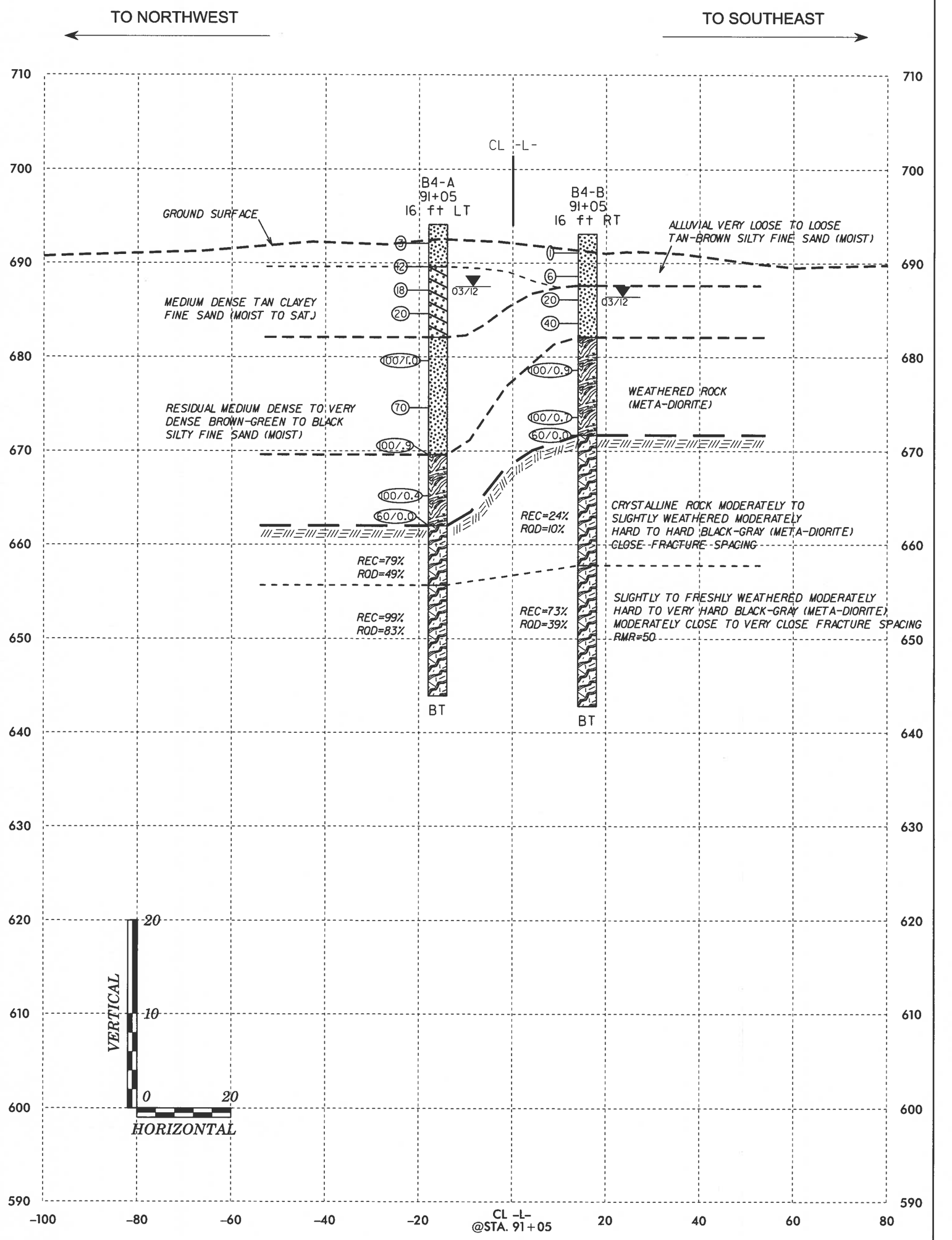
CROSS SECTION THROUGH INTERIOR BENT 3



NOTES:
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE CROSS SECTION. GROUND LINE AND -L- CROSS SECTION TAKEN FROM TIN FILE "u2707_ls_tin_110418.dgn"

CROSS SECTION THROUGH INTERIOR BENT 3 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 8

CROSS SECTION THROUGH INTERIOR BENT 4



NOTE:
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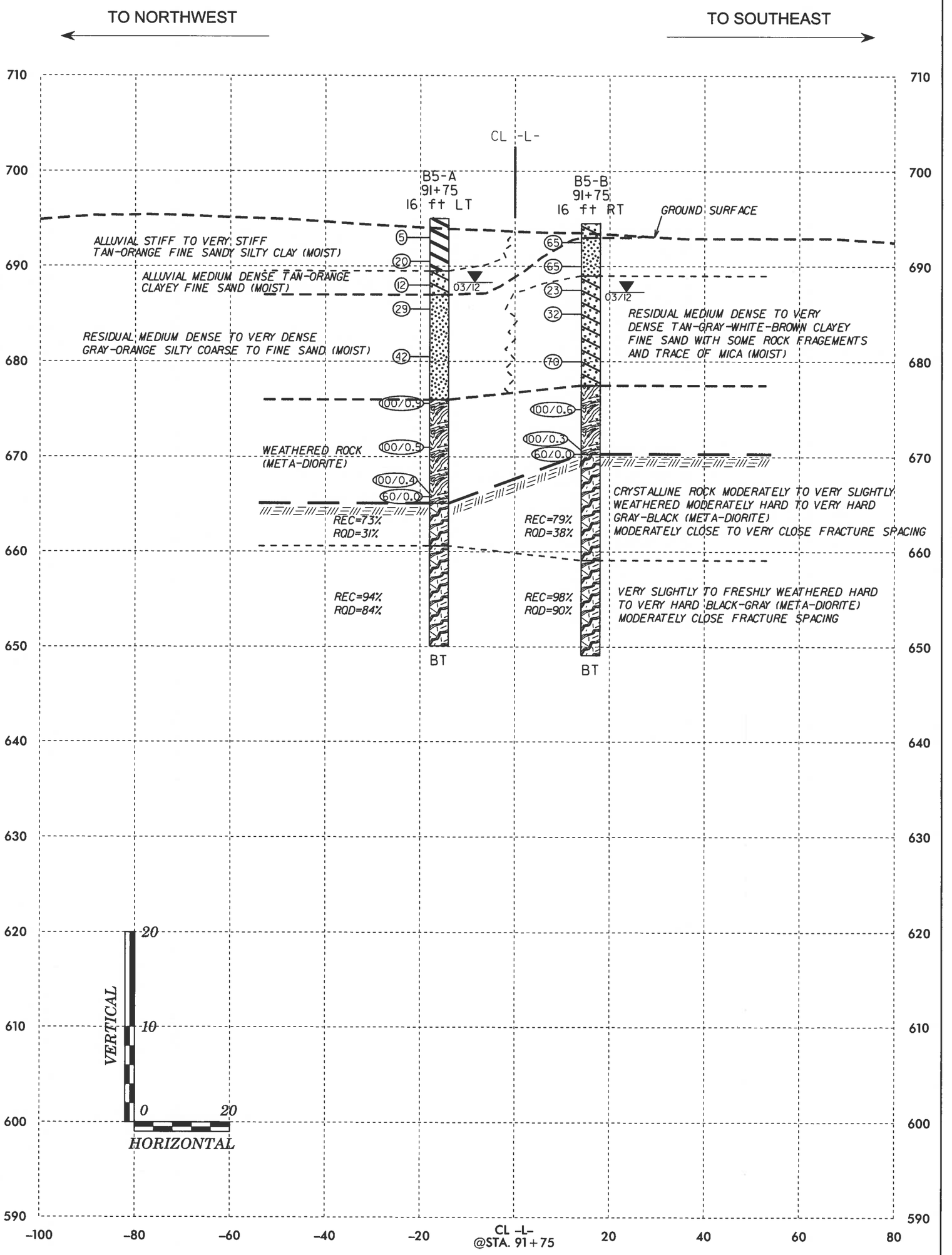
CROSS SECTION THROUGH INTERIOR BENT 4 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 9

CROSS SECTION THROUGH INTERIOR BENT 5



NOTE:
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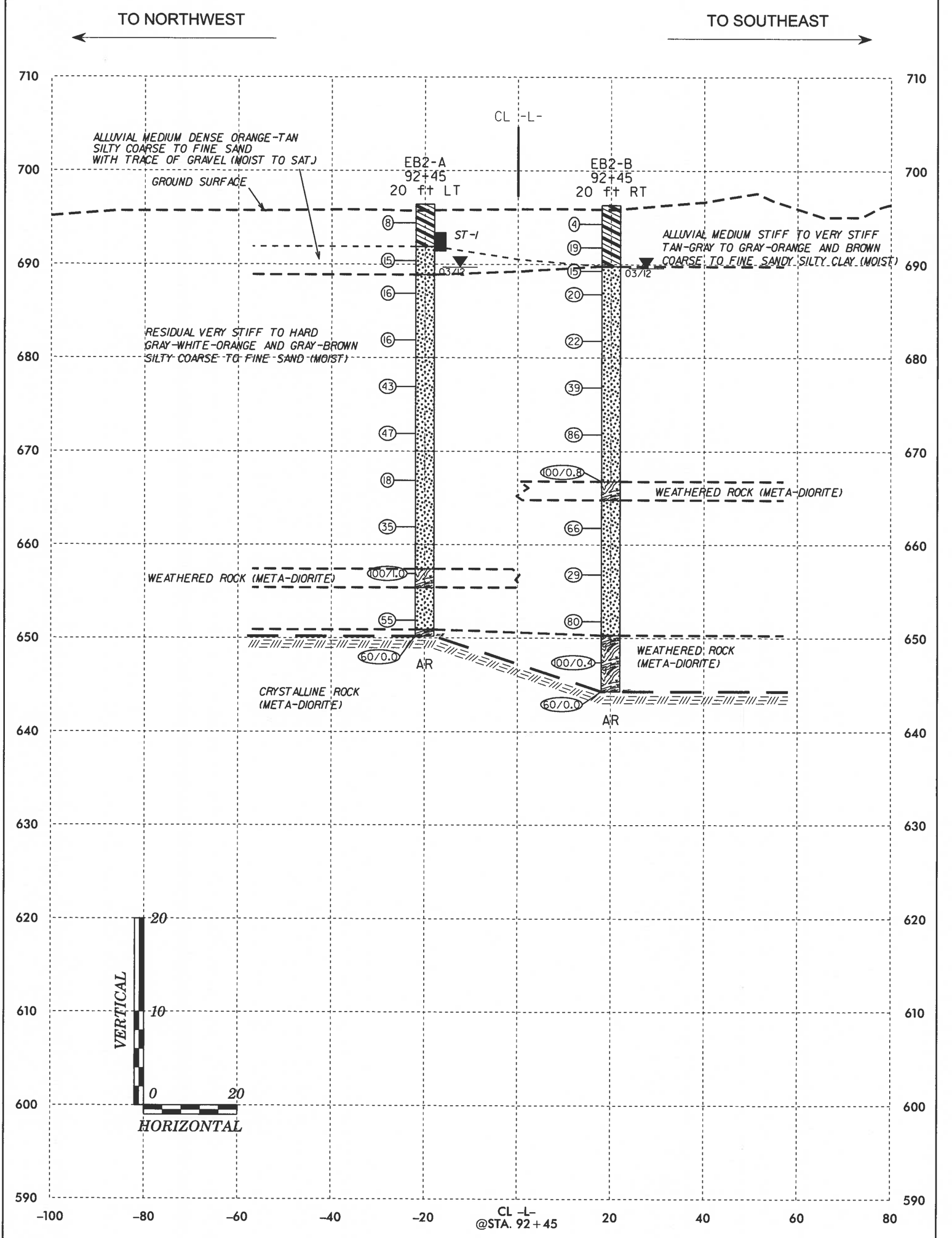
CROSS SECTION THROUGH INTERIOR BENT 5 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 10

CROSS SECTION THROUGH END BENT 2



NOTE:
GROUND LINE TAKEN FROM TIN FILE "u2707_ls_tin_110418.dgn"

CROSS SECTION THROUGH END BENT 2 BRIDGE NO. 656 ON -L- (SR3000 (IDOLS ROAD EXTENSION)) OVER MUDDY CREEK STATE PROJ NO. 34845.1.1 TIP NO. U-2707 FEDERAL I.D. NO. STP-3000(1) FORSYTH COUNTY, NORTH CAROLINA	S&ME WWW.SMEINC.COM NC ENGINEER LICENSE #F-0176 3201 SPRING FOREST RD, RALEIGH, NC 27616	SCALE: VERT. 1" = 10' HOR. 1" = 20'	APPROVED BY: AFR
		DATE: MAY 2012	DRAWN BY: BTR
		JOB NO:	SHEET: 11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 88+05	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 689.0 ft	**TOTAL DEPTH** 21.7 ft	**NORTHING** 827,450	**EASTING** 1,599,140	**24 HR.** 7.2
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/23/12	**COMP. DATE** 03/23/12	**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)
690										689.0 GROUND SURFACE	0.0
	688.0	1.0	2	2	2	4		M		**ALLUVIAL** Tan and Gray Silty Fine SAND with Some Clay	
685	685.5	3.5	1	2	3	5		M			
	683.0	6.0	1	1	1	2				681.0 Gray Fine to Coarse SAND with Trace of Silt	8.0
680	680.5	8.5	2	1	2	3		Sat.			
	675.5	13.5	1	1	1	2		Sat.		677.0 Gray Silty Fine SAND	12.0
675										671.0	18.0
670	670.5	18.5	17	26	27	53		M		**RESIDUAL** Black-Green Silty Fine SAND	
	667.4	21.6	60/0.1			60/0.1				668.5	20.5
										667.4 **WEATHERED ROCK** (Metadiorite)	21.6
										667.3 **CRYSTALLINE ROCK** (Metadiorite)	21.7
										Boring Terminated with Standard Penetration Test Refusal at Elevation 667.3 ft in Crystalline Rock (Meta-diorite)	

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 88+05	**OFFSET** 20 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 689.0 ft	**TOTAL DEPTH** 25.2 ft	**NORTHING** 827,425	**EASTING** 1,599,171	**24 HR.** 7.3
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/23/12	**COMP. DATE** 03/23/12	**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	
690										689.0 GROUND SURFACE	0.0
	688.0	1.0	2	2	2	4		M		**ALLUVIAL** Tan Clayey Fine SAND	
685	685.5	3.5	1	2	3	5		M		686.0 Tan and Gray Silty Fine to Coarse SAND with Some Wood Fragments and Trace of Mica	3.0
	683.0	6.0	1	2	3	5					
680	680.5	8.5	2	2	3	5		Sat.			
	675.5	13.5	1	1	1	2		Sat.			
675										671.5	17.5
670	670.5	18.5	13	23	25	48		M		**RESIDUAL** Tan-White Silty Fine SAND with Some Rock Fragments and Trace of Mica	
										667.0	22.0
665	665.5	23.5	100/0.2			100/0.2				**WEATHERED ROCK** (Metadiorite)	
	663.8	25.2	60/0.0			60/0.0				663.8	25.2
										Boring Terminated with Standard Penetration Test Refusal at Elevation 663.8 ft on Crystalline Rock (Meta-diorite)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 88+65	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.8 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 827,494	**EASTING** 1,599,182	**24 HR.** 7.1
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/29/12	**COMP. DATE** 03/30/12	**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)
690										
	688.8	0.0								GROUND SURFACE
	687.8	1.0								**ALLUVIAL** Tan-Brown and Tan-Gray Silty Fine to Coarse SAND with Trace of Clay
685	685.3	3.5	2	1	2	3		W		
	682.8	6.0	2	2	3	5		W		
680	680.3	8.5	1	1	2	3		Sat.		
675	675.3	13.5	1	1	2	3				
670	670.3	18.5	1	15	7	22		Sat.		
	672.8	16.0								**WEATHERED ROCK** (Meta-diorite)
	668.4	20.4	48	77	33/0.2	100/0.7				**CRYSTALLINE ROCK** (Meta-diorite)
665			60/0.0			60/0.0				
660										
655										
650							RS-1			
645										
	658.2	30.6								(Meta-diorite)
	643.7	45.1								Boring Terminated at Elevation 643.7 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 20.4 Feet.
2) Advanced 2-15/16" Tricone to 20.4 Feet.
3) Advanced N Casing to 20.4 ft, 22.0 ft total used.
4) Advanced NQ Core From 20.4 to 45.1 ft.

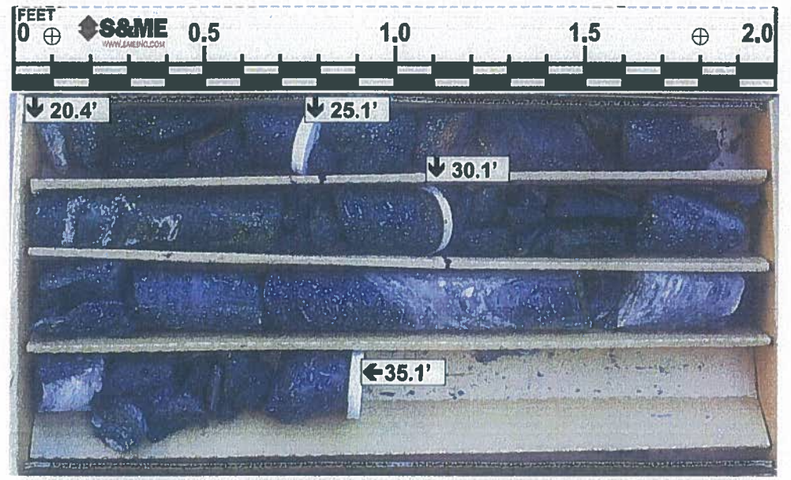
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 88+65	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.8 ft	**TOTAL DEPTH** 45.1 ft	**NORTHING** 827,494	**EASTING** 1,599,182	**24 HR.** 7.1
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/29/12	**COMP. DATE** 03/30/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 24.7 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)
668.4											Begin Coring @ 20.4 ft
	668.4	20.4	4.7	N=60/0.0 0:10/0.7 1:00/1.0 1:00/1.0 1:00/1.0 1:00/1.0	(0.8) 17%	(0.0) 0%		(3.6) 35%	(1.1) 11%		668.4 **CRYSTALLINE ROCK** 20.4 Moderate Severely Weathered Medium Hard Black-Gray (Meta-diorite) with Very Close Fracture Spacing with 1 joint @ 25° and 3 joints at 50 to 60°
665	663.7	25.1	5.0	1:00/1.0 1:00/1.0 1:00/1.0 1:00/1.0 1:00/1.0	(2.3) 46%	(1.1) 22%					
660	658.7	30.1	5.0	1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0	(3.7) 74%	(1.2) 24%		(12.9) 89%	(8.6) 59%		658.2 30.6 Very Slightly to Moderately Weathered Medium Hard to Hard Black-Gray (Meta-diorite) with Close to Very Close Fracture Spacing with 4 joints @ 15 to 30°, 6 joints @ 60 to 75°, and 8 joints @ 90° qu=1288 KSF Axial R1=7, R2=13, R3=10, R4=12, R5=4 RMR=46 Rock Type E
655	653.7	35.1	5.0	1:35/1.0 1:35/1.0 1:35/1.0 1:35/1.0 1:35/1.0	(4.7) 94%	(3.4) 68%	RS-1				
650	648.7	40.1	5.0	1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0	(5.0) 100%	(4.0) 80%					
645	643.7	45.1									643.7 45.1 Boring Terminated at Elevation 643.7 ft in Crystalline Rock (Meta-diorite)

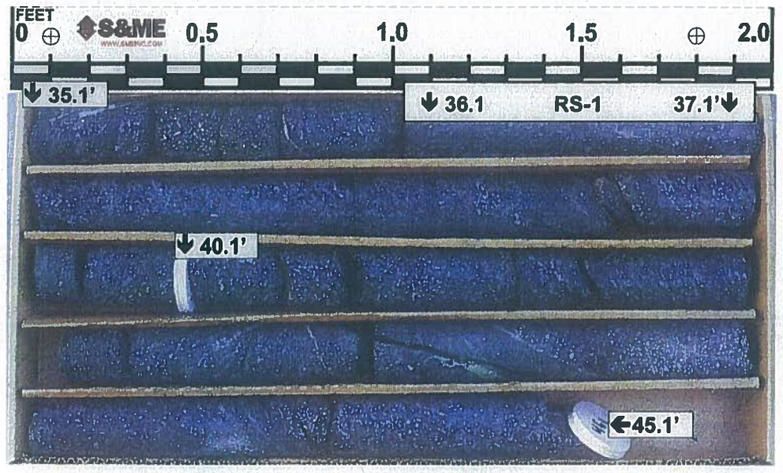
1) Advanced 3-1/4" HSA to 20.4 Feet.
2) Advanced 2-15/16" Tricone to 20.4 Feet.
3) Advanced N Casing to 20.4 ft, 22.0 ft total used.
4) Advanced NQ Core From 20.4 to 45.1 ft.

*Project No.:*34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B1-A
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller:* M. Moseley
Collar Elev.: 688.8 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 643.7 ft.	*Total Depth:* 45.1 ft.	*Total Run:* 24.7 ft.	*Date*: 3/30/12



Box 1 of 2

Top of Box @ 20.4 feet; Bottom of Box @ 35.1 feet



Box 2 of 2

Top of Box @ 35.1 feet; Bottom of Box @ 45.1 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 88+65	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.8 ft	**TOTAL DEPTH** 48.3 ft	**NORTHING** 827,473	**EASTING** 1,599,206	**24 HR.** 7.3
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/27/12	**COMP. DATE** 03/28/12	**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)
690										688.8 / 0.0 GROUND SURFACE
	687.8	1.0								**ALLUVIAL**
685	685.3	3.5	2	4	4	8		M		Tan Clayey Fine SAND with Trace Silt 686.3 / 2.5
	682.8	6.0	1	2	1	3		M		Tan-Brown and Gray Silty Fine to Coarse SAND
680	680.3	8.5	1	1	3	4				
675	675.3	13.5	2	2	2	4		Sat.		
670	670.3	18.5	2	6	12	18		Sat.		669.8 / 19.0 **WEATHERED ROCK** (Meta-diorite)
665	665.3	23.5	20	49	51/0.3	100/0.8				
660	660.3	28.5	40	53	47/0.3	100/0.8				660.2 / 28.6 **CRYSTALLINE ROCK** (Meta-diorite)
655			60/0.1			60/0.1				651.1 / 37.7 (Meta-diorite)
650										640.5 / 48.3 Boring Terminated at Elevation 640.5 ft in Crystalline Rock (Meta-diorite)
645										1) Advanced 3-1/4" HSA to 28.5 Feet. 2) Advanced 2-15/16" Tricone to 28.6 Feet. 3) Advanced N Casing to 28.6 ft, 32.0 ft total used. 4) Advanced NQ Core from 28.6 to 48.3 ft.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

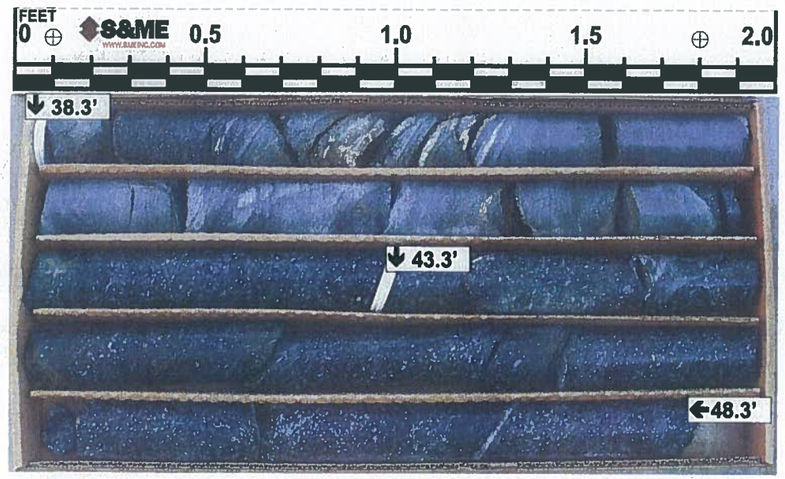
WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 88+65	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.8 ft	**TOTAL DEPTH** 48.3 ft	**NORTHING** 827,473	**EASTING** 1,599,206	**24 HR.** 7.3
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/27/12	**COMP. DATE** 03/28/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 19.7 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)
660.2											Begin Coring @ 28.6 ft
	660.2	28.6	4.7	1:35/0.7 1:35/1.0 1:35/1.0 1:35/1.0 1:35/1.0	(3.0) 64%	(1.7) 36%		(5.2) 57%	(2.1) 23%		660.2 / 28.6 **CRYSTALLINE ROCK** Very Slight to Moderate Severely Weathered Hard to Medium Hard Black-Gray (Meta-diorite) with Close Fracture Spacing with 3 joints @ 20 to 25°, 2 joint @ 40°,1 @ 60°, 7 joints @ 90°
655	655.5	33.3	5.0	1:40/1.0 1:40/1.0 1:40/1.0 1:40/1.0 1:40/1.0	(2.8) 56%	(1.0) 20%					
650	650.5	38.3	5.0	2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0	(5.0) 100%	(4.6) 92%		(10.6) 100%	(9.0) 85%		651.1 / 37.7 Fresh to Very Slightly Weathered Hard Black-Gray (Meta-diorite) with Close to Moderately Close Fracture Spacing with 7 joints @ 90° and 6 joints @ 60°
645	645.5	43.3	5.0	2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0	(5.0) 100%	(3.8) 76%					
	640.5	48.3									640.5 / 48.3 Boring Terminated at Elevation 640.5 ft in Crystalline Rock (Meta-diorite) 1) Advanced 3-1/4" HSA to 28.5 Feet. 2) Advanced 2-15/16" Tricone to 28.6 Feet. 3) Advanced N Casing to 28.6 ft, 32.0 ft total used. 4) Advanced NQ Core from 28.6 to 48.3 ft.

Project No.:34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B1-B
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 688.8 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 640.5 ft.	*Total Depth:* 48.3 ft.	*Total Run:* 19.7 ft.	*Date*: 3/28/12

Box 1 of 2

Top of Box @ 28.6 feet; Bottom of Box @ 38.3 feet



Box 2 of 2

Top of Box @ 38.3 feet; Bottom of Box @ 48.3 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 89+25	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.9 ft	**TOTAL DEPTH** 49.9 ft	**NORTHING** 827,540	**EASTING** 1,599,220	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 04/02/12	**COMP. DATE** 04/03/12	**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)
690										688.9 GROUND SURFACE	0.0
	687.9	1.0								**ALLUVIAL**	
685	685.4	3.5	1	2	3	5		M		Brown Silty CLAY	
	682.9	6.0	2	4	4	8		M		686.4	2.5
680	680.4	8.5	1	1	1	2		Sat.		Tan-Brown and Gray Silty Fine to Coarse SAND with Trace of Mica	
			1	WOH	WOH	0		Sat.			
675	675.4	13.5	2	2	3	5		Sat.			
670	670.4	18.5								672.4	16.5
	668.8	20.1	100/0.4			100/0.4				**WEATHERED ROCK** (Meta-diorite)	
665			60/0.0			60/0.0				668.8	20.1
										CRYSTALLINE ROCK (Meta-diorite)	
660											
655										654.5 (Meta-diorite)	34.4
650											
645											
640										639.0	49.9

Boring Terminated at Elevation 639.0 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 20.1 Feet.
2) Advanced 2-15/16" Tricone to 20.1 Feet.
3) Advanced N Casing to 20.1 ft, 22.0 ft total used.
4) Advanced NQ Core from 20.1 to 49.9 ft.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

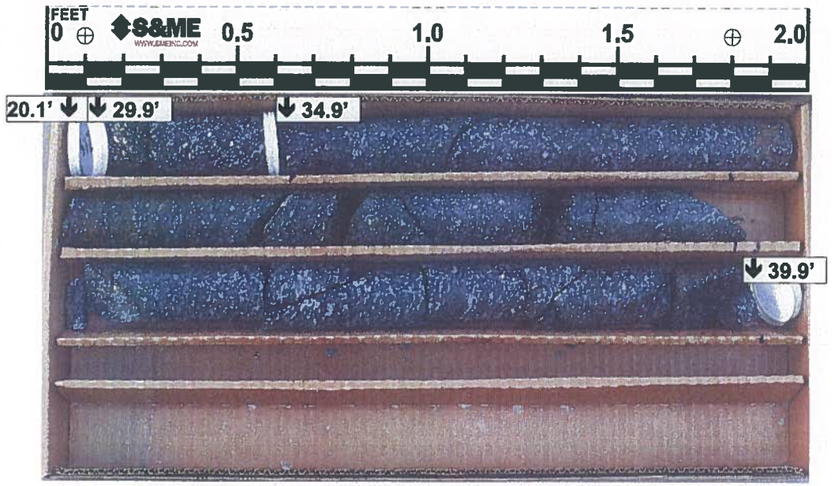
WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 89+25	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.9 ft	**TOTAL DEPTH** 49.9 ft	**NORTHING** 827,540	**EASTING** 1,599,220	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 04/02/12	**COMP. DATE** 04/03/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 29.8 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)
668.8											Begin Coring @ 20.1 ft	
	668.8	20.1	4.8	*N=60/0.0* 0:30/0.8 0:45/1.0 0:45/1.0 0:45/1.0 0:45/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%	(0.0) 0%		668.8 **CRYSTALLINE ROCK** No Recovery	20.1
665	664.0	24.9	5.0	0:30/1.0 0:30/1.0 0:30/1.0 0:30/1.0 0:30/1.0	(0.0) 0%	(0.0) 0%						
660	659.0	29.9	5.0	0:30/1.0 0:30/1.0 0:30/1.0 0:30/1.0 0:30/1.0	(0.5) 10%	(0.3) 6%						
655	654.0	34.9	5.0	1:55/1.0 1:55/1.0 1:55/1.0 1:55/1.0 1:55/1.0	(4.6) 92%	(3.3) 66%		(14.9) 96%	(10.8) 70%		654.5 Moderate to Very Slightly Weathered Medium Hard to Hard Black-Gray (Meta-diorite) with Close to Moderately Close Fracture Spacing with 4 joints @ 50 to 60°, 4 @ 60 to 70° and 11 joints @ 90°	34.4
650	649.0	39.9	5.0	2:30/1.0 2:30/1.0 2:30/1.0 2:30/1.0 2:30/1.0	(4.8) 96%	(3.0) 60%						
645	644.0	44.9	5.0	4:30/1.0 4:30/1.0 4:30/1.0 4:30/1.0 4:30/1.0	(5.0) 100%	(4.2) 84%						
640	639.0	49.9									639.0	49.9

Boring Terminated at Elevation 639.0 ft in Crystalline Rock (Meta-diorite)

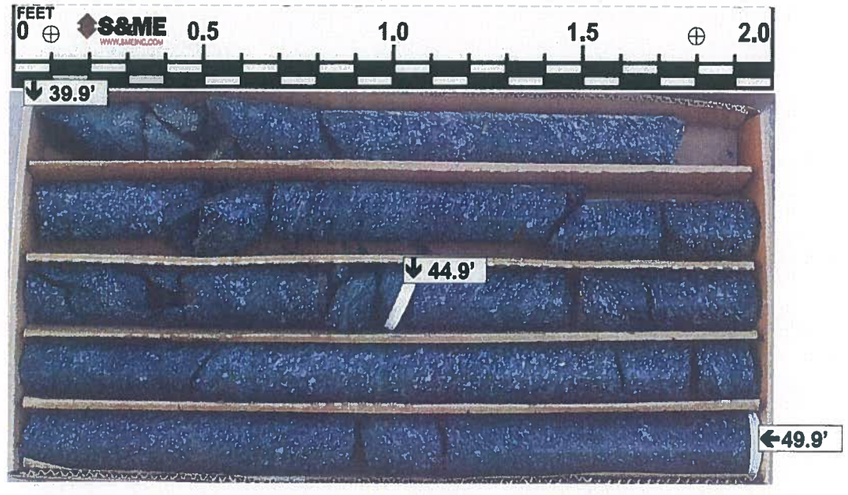
1) Advanced 3-1/4" HSA to 20.1 Feet.
2) Advanced 2-15/16" Tricone to 20.1 Feet.
3) Advanced N Casing to 20.1 ft, 22.0 ft total used.
4) Advanced NQ Core from 20.1 to 49.9 ft.

Project No.:34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B2-A
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 688.9 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 639.0 ft.	*Total Depth:* 49.9 ft.	*Total Run:* 29.8 ft.	*Date*: 4/03/12



Box 1 of 2

Top of Box @ 20.1 feet; Bottom of Box @ 39.9 feet



Box 2 of 2

Top of Box @ 39.9 feet; Bottom of Box @ 49.9 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 89+25	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.9 ft	**TOTAL DEPTH** 50.1 ft	**NORTHING** 827,519	**EASTING** 1,599,245	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 04/03/12	**COMP. DATE** 04/03/12	**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)
690										688.9 / 0.0 GROUND SURFACE
	687.9	1.0								**ALLUVIAL**
			4	4	3	7		M		Brown and Gray Silty Fine to Coarse SAND
685	685.4	3.5								with Some Wood Fragments and Little
			4	3	4	7		M		Quartz Gravel
	682.9	6.0								
			3	3	4	7		Sat.		
680	680.4	8.5								
			1	1	3	4		Sat.		
675	675.4	13.5								
			3	2	4	6		Sat.		
670	670.4	18.5								669.9 / 19.0
			23	35	65/0.3	100/0.8				**WEATHERED ROCK**
665	665.4	23.5								(Meta-diorite)
	663.5	25.4	56	49	51/0.3	100/0.8				663.5 / 25.4
			60/0.0			60/0.0				**CRYSTALLINE ROCK**
660										(Meta-diorite)
	658.8	30.1	60/0.1			60/0.1				
655	653.8	35.1	60/0.1			60/0.1	RS-2			653.8 / 35.1 (Meta-diorite)
650										
645										
640										638.8 / 50.1

Boring Terminated at Elevation 638.8 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 23.5 Feet.
2) Advanced 2-15/16" Tricone to 25.4 Feet.
3) Advanced N Casing to 25.4 ft, 27.0 ft total used.
4) Advanced NQ Core from 25.4 to 50.1 ft.

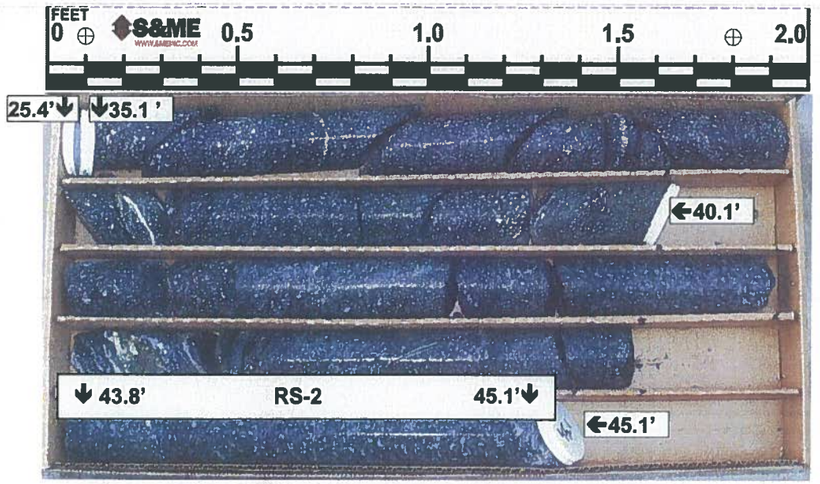
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 89+25	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 688.9 ft	**TOTAL DEPTH** 50.1 ft	**NORTHING** 827,519	**EASTING** 1,599,245	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 04/03/12	**COMP. DATE** 04/03/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 24.7 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)
663.5											Begin Coring @ 25.4 ft
	663.5	25.4	4.7	*N=60/0.0* 0:30/0.7 0:35/1.0 0:35/1.0 0:35/1.0 0:35/1.0	(0.0) 0%	(0.0) 0%		(0.0) 0%	(0.0) 0%		663.5 / 25.4 **CRYSTALLINE ROCK** No Recovery
660	658.8	30.1	5.0	*N=60/0.1* 0:45/1.0 0:45/1.0 0:45/1.0 0:45/1.0 0:45/1.0	(0.0) 0%	(0.0) 0%					
655	653.8	35.1	5.0	*N=60/0.1* 0:50/1.0 1:35/1.0 1:35/1.0 1:35/1.0 1:35/1.0	(3.5) 70%	(2.9) 58%		(13.5) 90%	(10.7) 71%		653.8 / 35.1 Very Slight to Moderately Weathered Hard to Moderately Hard Black-Gray (Meta-diorite) with Close to Moderately Close Fracture Spacing with 2 joints @ 50°, 3 joints @ 60 to 70°, 5 joints @ 70 to 80°, 8 joints @ 90° qu=2515 KSF Axial R1=12, R2=17, R3=10, R4=12, R5=4 RMR=55 Rock Type E
650	648.8	40.1	5.0	2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0	(5.0) 100%	(3.9) 78%					
645	643.8	45.1	5.0	2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0	(5.0) 100%	(3.9) 78%	RS-2				
640	638.8	50.1									638.8 / 50.1 Boring Terminated at Elevation 638.8 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 23.5 Feet.
2) Advanced 2-15/16" Tricone to 25.4 Feet.
3) Advanced N Casing to 25.4 ft, 27.0 ft total used.
4) Advanced NQ Core from 25.4 to 50.1 ft.

Project No.: 34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B2-B
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 688.9 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 638.8 ft.	*Total Depth:* 50.1 ft.	*Total Run:* 24.7 ft.	*Date*: 4/03/12



Box 1 of 2

Top of Box @ 25.4 feet; Bottom of Box @ 45.1 feet

Box 2 of 2

Top of Box @ 45.1 feet; Bottom of Box @ 50.1 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 90+01	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 691.3 ft	**TOTAL DEPTH** 54.8 ft	**NORTHING** 827,598	**EASTING** 1,599,269	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/29/12	**COMP. DATE** 03/29/12	**SURFACE WATER DEPTH** N/A	

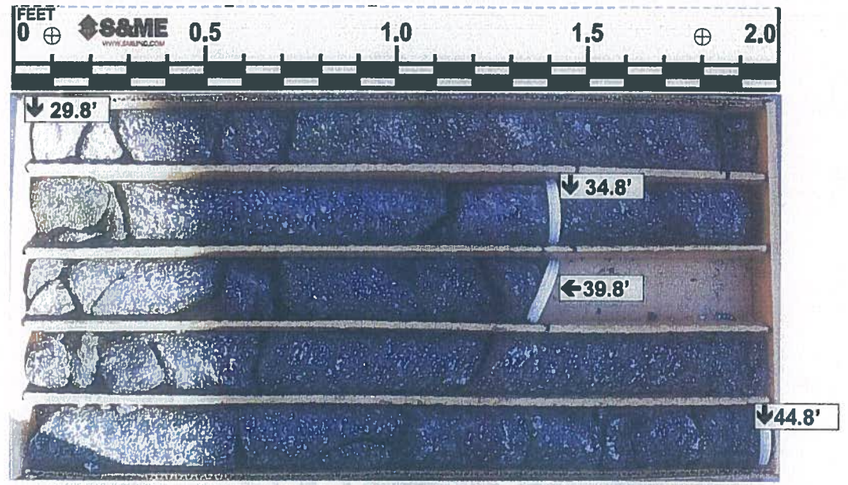
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
695										
690	690.3	1.0	1	2	3	5		M		691.3 GROUND SURFACE 0.0 **ALLUVIAL** Tan Clayey Fine SAND with Trace of SILT
	687.8	3.5	2	2	3	5		M		687.8 3.5 Tan-Brown and Gray Silty Fine to Coarse SAND
685	685.3	6.0	2	2	3	5		M		
	682.8	8.5	2	1	2	3		W		
680	679.3	12.0	1	WOH	1	1		Sat.		
675	674.3	17.0	4	16	51	67		M		673.8 17.5 672.3 19.0 **RESIDUAL** Green-Black Silty Fine SAND **WEATHERED ROCK** (Meta-diorite)
670	669.3	22.0	47	49	51/0.3	100/0.8				
665	664.3	27.0	100/0.3			100/0.3				
	661.5	29.8	60/0.0			60/0.0				661.5 29.8 **CRYSTALLINE ROCK** (Meta-diorite)
660										
655										
650										
645										
640							RS-3			641.3 50.0 (Meta-diorite) 636.5 54.8 Boring Terminated at Elevation 636.5 ft in Crystalline Rock (Meta-diorite) 1) Advanced 3-1/4" HSA to 29.8 Feet. 2) Advanced 2-15/16" Tricone to 29.8 Feet. 3) Advanced N Casing to 29.8 ft, 32.0 ft total used. 4) Advanced NQ Core From 29.8 to 54.8 ft.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 90+01	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 691.3 ft	**TOTAL DEPTH** 54.8 ft	**NORTHING** 827,598	**EASTING** 1,599,269	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/29/12	**COMP. DATE** 03/29/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 25.0 ft			

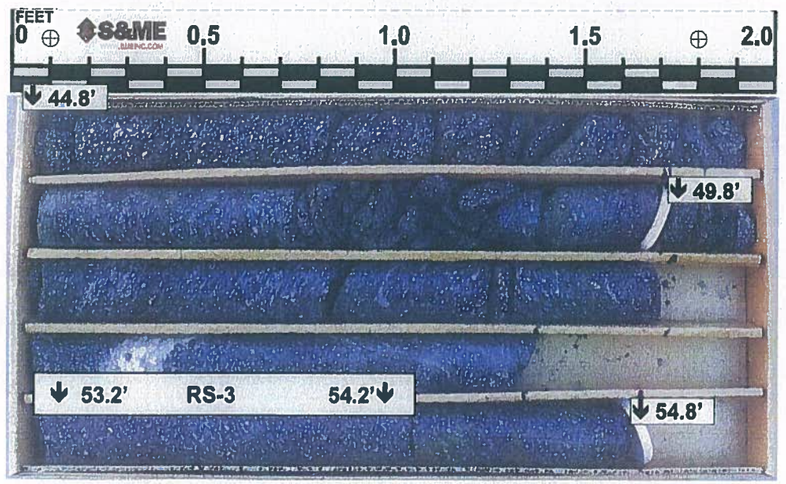
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
661.5											ELEV. (ft) DEPTH (ft) Begin Coring @ 29.8 ft
660	661.5	29.8	5.0	N=60/0.0 1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0	(3.3) 66%	(2.3) 46%		(12.9) 64%	(7.9) 39%		661.5 29.8 **CRYSTALLINE ROCK** Very Slight to Moderately Weathered Hard to Medium Hard Black-Gray (Meta-diorite) with Close Fracture Spacing Moderately Severely Weathered between 48.9' to 49.8' with 1 Joint @ 50°, 3 joints @ 60° and 19 joints @ 75 to 90°
	656.5	34.8									
655			5.0	1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0	(1.8) 36%	(1.0) 20%					
	651.5	39.8									
650			5.0	1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0	(4.0) 80%	(2.8) 56%					
	646.5	44.8									
645			5.0	1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0	(3.6) 72%	(1.8) 36%					
	641.5	49.8									641.3 50.0
640			5.0	1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0	(5.0) 100%	(4.6) 92%		(4.8) 100%	(4.6) 96%		Very Slight to Freshly Weathered Hard to Very Hard Black-Gray (Meta-diorite) with Close Fracture Spacing with 2 joints @ 90° qu=2425 KSF Axial R1=12, R2=20, R3=10, R4=12, R5=4 RMR=58 Rock Type E
	636.5	54.8					RS-3				636.5 54.8 Boring Terminated at Elevation 636.5 ft in Crystalline Rock (Meta-diorite) 1) Advanced 3-1/4" HSA to 29.8 Feet. 2) Advanced 2-15/16" Tricone to 29.8 Feet. 3) Advanced N Casing to 29.8 ft, 32.0 ft total used. 4) Advanced NQ Core From 29.8 to 54.8 ft.

Project No.:34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B3-A
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller:* M. Moseley
Collar Elev.: 691.3 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 636.5 ft.	*Total Depth:* 54.8 ft.	*Total Run:* 25.0 ft.	*Date*: 3/29/12



Box 1 of 2

Top of Box @ 29.8 feet; Bottom of Box @ 44.8 feet



Box 2 of 2

Top of Box @ 44.8 feet; Bottom of Box @ 54.8 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 90+01	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 693.0 ft	**TOTAL DEPTH** 53.7 ft	**NORTHING** 827,577	**EASTING** 1,599,294	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/28/12	**COMP. DATE** 03/28/12	**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)
695										693.0 GROUND SURFACE 0.0
	692.0	1.0	1	1	1	2		M		**ALLUVIAL** Tan-Brown and Gray Silty Fine to Coarse SAND
690	689.5	3.5	1	2	2	4		M		
	687.0	6.0	2	3	2	5		M		
685	684.5	8.5	2	1	2	3		M		
680	679.5	13.5	1	3	4	7		Sat.		
675	674.5	18.5	1	2	8	10		Sat.		671.0 22.0 **RESIDUAL** 669.0 Black-Gray Silty Fine SAND 24.0
670	669.5	23.5	19	80	20/0.1	100/0.6				**WEATHERED ROCK** (Meta-diorite)
665	664.5	28.5	60/0.0			60/0.0				663.6 29.4 **CRYSTALLINE ROCK** (Meta-diorite)
660										
655										
650										
645										
640										641.3 51.7 (Meta-diorite) 639.3 53.7 Boring Terminated at Elevation 639.3 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 28.5 Feet.
2) Advanced 2-15/16" Tricone to 29.4 Feet.
3) Advanced N Casing to 29.4 ft, 32.0 ft total used.
4) Advanced NQ Core From 29.4 to 53.7 ft.

NCDOT BORE DOUBLE U2707_GEO_BRDG0656_GINT.GPJ NC_DOT.GDT 5/29/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

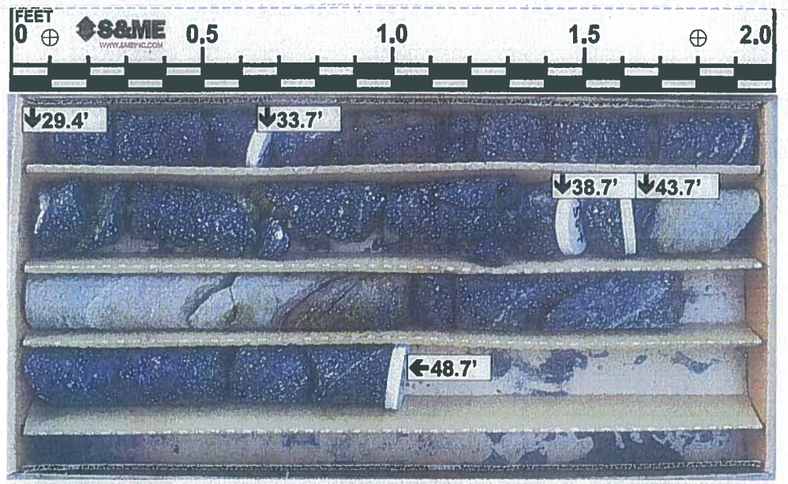
WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 90+01	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 693.0 ft	**TOTAL DEPTH** 53.7 ft	**NORTHING** 827,577	**EASTING** 1,599,294	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/28/12	**COMP. DATE** 03/28/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 24.3 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
663.6											ELEV. (ft) DEPTH (ft)
	663.6	29.4	4.3	1:00/1.0 1:00/1.0 1:00/1.0 1:00/1.0	(0.7) 16%	(0.0) 0%		(9.4) 42%	(4.1) 18%		Begin Coring @ 29.4 ft
660	659.3	33.7	5.0	0:25/0.3 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0	(2.8) 56%	(1.0) 20%					663.6 **CRYSTALLINE ROCK** Moderate to Very Slightly Weathered Moderately Hard to Hard Black-Gray (Meta-diorite) with Close to Very Close Fracture Spacing with 6 joints @ 30 to 40°, 11 joints @ 80 to 90° 29.4
655	654.3	38.7	5.0	1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0 1:30/1.0	(0.3) 6%	(0.0) 0%					
650	649.3	43.7	5.0	1:30/1.0 1:00/1.0 1:35/1.0 1:00/1.0 1:00/1.0	(3.1) 62%	(1.5) 30%					
645	644.3	48.7	5.0	2:10/1.0 2:10/1.0 2:10/1.0 2:10/1.0 2:10/1.0	(4.5) 90%	(3.6) 72%					
640	639.3	53.7						(2.0) 100%	(2.0) 100%		641.3 51.7 Very Slight to Slightly Weathered Hard to Very Hard Black-Gray (Meta-diorite) with Close Fracture Spacing with 1 joint @ 10°, 2 joints @ 70° and 1 joint @ 90° 639.3 53.7 Boring Terminated at Elevation 639.3 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 28.5 Feet.
2) Advanced 2-15/16" Tricone to 29.4 Feet.
3) Advanced N Casing to 29.4 ft, 32.0 ft total used.
4) Advanced NQ Core From 29.4 to 53.7 ft.

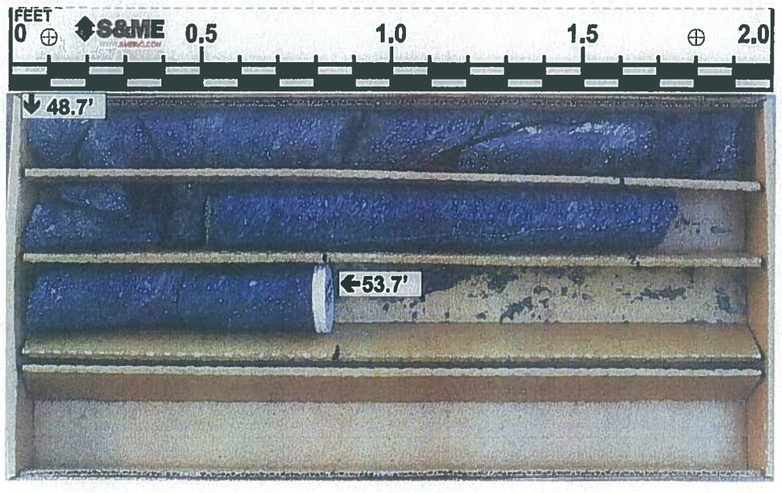
NCDOT CORE SINGLE U2707_GEO_BRDG0656_GINT.GPJ NC_DOT.GDT 5/29/12

Project No. 34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B3-B
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 693.0 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 639.3 ft.	*Total Depth:* 53.7 ft.	*Total Run:* 24.3 ft.	*Date*: 3/28/12



Box 1 of 2

Top of Box @ 29.4 feet; Bottom of Box @ 48.7 feet



Box 2 of 2

Top of Box @ 48.7 feet; Bottom of Box @ 53.7 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 91+05	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 694.1 ft	**TOTAL DEPTH** 50.2 ft	**NORTHING** 827,677	**EASTING** 1,599,336	**24 HR.** 6.6
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/21/12	**COMP. DATE** 03/21/12	**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)
695										694.1 GROUND SURFACE	0.0
	693.1	1.0	1	1	2	3		M		**ALLUVIAL** Tan Silty Fine SAND	
690	690.6	3.5	3	5	7	12		M		689.6 Tan Clayey Fine SAND	4.5
	688.1	6.0	5	7	11	18					
685	685.6	8.5	7	10	10	20		Sat.		682.1 **RESIDUAL** Brown-Green Silty Fine SAND	12.0
680	680.6	13.5	25	55	45	100/1.0		M			
675	675.6	18.5	8	29	41	70		M			
670	670.6	23.5	14	20	80/0.4	100/.9				669.6 **WEATHERED ROCK** (Meta-diorite)	24.5
665	665.6	28.5	100/0.4			100/0.4					
	662.0	32.1	60/0.0			60/0.0				662.0 **CRYSTALLINE ROCK** (Meta-diorite)	32.1
660											
655							RS-4			655.7 (Meta-diorite)	38.4
650											
645										643.9	50.2

Boring Terminated at Elevation 643.9 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 32.1 Feet.
2) Advanced 2-15/16" Tricone to 32.1 Feet.
3) Advanced N Casing to 32.0 ft, 33.0 ft total used.
4) Advanced NQ Core From 32.1 to 50.2 ft.

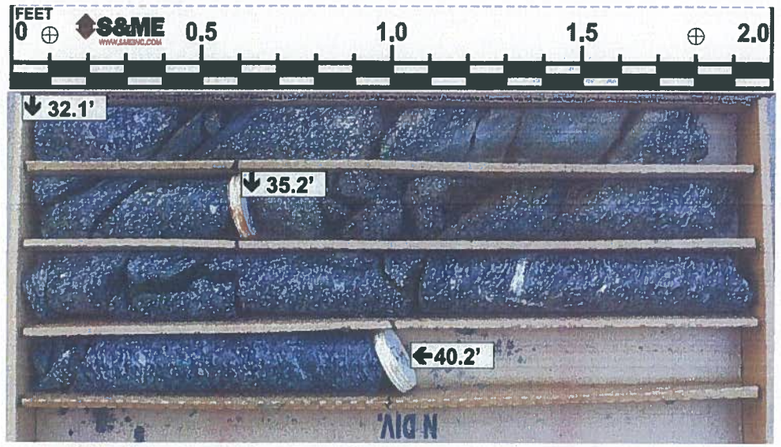
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 91+05	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 694.1 ft	**TOTAL DEPTH** 50.2 ft	**NORTHING** 827,677	**EASTING** 1,599,336	**24 HR.** 6.6
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/21/12	**COMP. DATE** 03/21/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 18.1 ft			

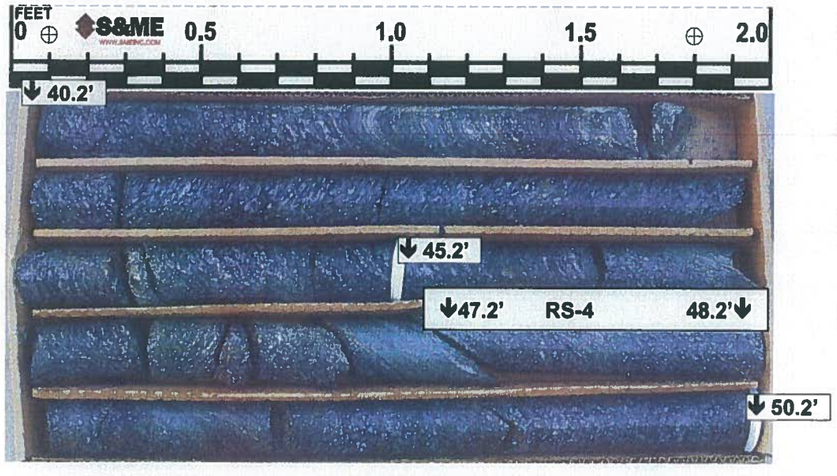
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
662											Begin Coring @ 32.1 ft	
660	662.0	32.1	3.1	N=60/0.0 0:15/0.1 1:05/1.0	(2.4) 77%	(1.3) 42%		(5.0) 79%	(3.1) 49%		662.0 **CRYSTALLINE ROCK** Moderately to Slightly Weathered Moderately Hard to Hard Black-Gray (Meta-diorite) with Close Fracture Spacing with 3 joints @ 70° & 4 joints @ 40 to 50°	32.1
	658.9	35.2	5.0	1:05/1.0 1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0	(4.4) 88%	(3.6) 72%						
655	653.9	40.2	5.0	1:15/1.0 1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0	(4.9) 98%	(4.0) 80%		(11.7) 99%	(9.8) 83%		655.7 Very Slight to Freshly Weathered Hard to Very Hard Black-Gray (Meta-diorite) with Close to Moderately Close Fracture Spacing with 1 joint @50°, 5 joints @ 60 to 70°, 9 @ 80 to 90° qu=2128 KSF Axial R1=7, R2=17, R3=10, R4=12, R5=4 RMR=50 Rock Type E	38.4
650	648.9	45.2	5.0	1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0	(5.0) 100%	(4.0) 80%	RS-4					
645	643.9	50.2									643.9 Boring Terminated at Elevation 643.9 ft in Crystalline Rock (Meta-diorite)	50.2

1) Advanced 3-1/4" HSA to 32.1 Feet.
2) Advanced 2-15/16" Tricone to 32.1 Feet.
3) Advanced N Casing to 32.0 ft, 33.0 ft total used.
4) Advanced NQ Core From 32.1 to 50.2 ft.

Project No.:34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B4-A
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 694.1 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 643.9 ft.	*Total Depth:* 54.8 ft.	*Total Run:* 18.1 ft.	*Date:* 3/21/12



Box 1 of 2
Top of Box @ 32.1 feet; Bottom of Box @ 40.2 feet



Box 2 of 2
Top of Box @ 40.2 feet; Bottom of Box @ 50.2 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 91+05	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 693.1 ft	**TOTAL DEPTH** 50.3 ft	**NORTHING** 827,657	**EASTING** 1,599,361	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/21/12	**COMP. DATE** 03/22/12	**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	L O G	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
695										693.1 GROUND SURFACE	0.0
	692.1	1.0	1	WOH	1	1		M		**ALLUVIAL** Tan-Brown Silty Fine SAND	
690	689.6	3.5	2	2	4	6		M		687.6	5.5
	687.1	6.0	6	8	12	20				**RESIDUAL** Brown-Green-Black Silty Fine SAND	
685	684.6	8.5	6	16	24	40		M		682.1	11.0
680	679.6	13.5	48	50	50/0.4	100/0.9				**WEATHERED ROCK** (Meta-diorite)	
675	674.6	18.5	52	74	26/0.2	100/0.7				671.7	21.4
670	671.7	21.4	60/0.0			60/0.0				**CRYSTALLINE ROCK** (Meta-diorite)	
665											
660										657.8 (Meta-diorite)	35.3
655											
650											
645										642.8	50.3

Boring Terminated at Elevation 642.8 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 21.4 Feet.
2) Advanced 2-15/16" Tricone to 21.4 Feet.
3) Advanced N Casing to 21.4 ft, 22.0 ft total used.
4) Advanced NQ Core From 21.4 to 50.3 ft.

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

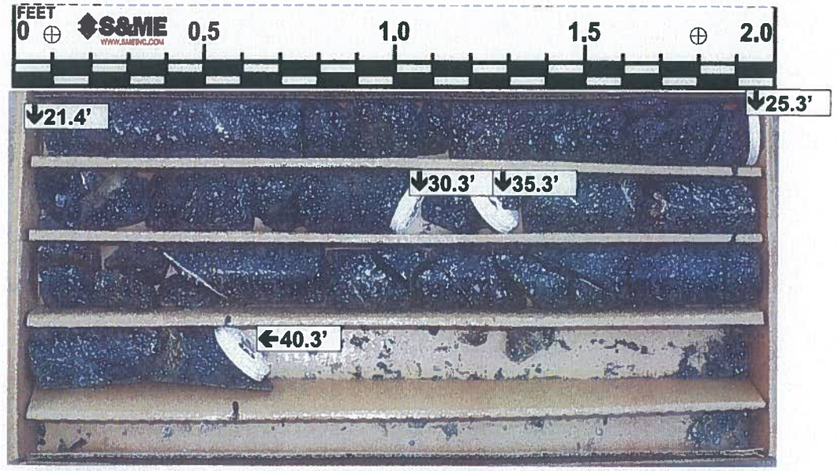
WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 91+05	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 693.1 ft	**TOTAL DEPTH** 50.3 ft	**NORTHING** 827,657	**EASTING** 1,599,361	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/21/12	**COMP. DATE** 03/22/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 28.9 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) %	L O G	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
671.7											Begin Coring @ 21.4 ft	
670	671.7	21.4	3.9	N=60/0.0 0:30/0.9 1:00/1.0 1:00/1.0 1:00/1.0	(2.0) 51%	(1.0) 26%		(3.3) 24%	(1.4) 10%		671.7 **CRYSTALLINE ROCK** Moderate to Slightly Weathered Moderately Hard to Hard Black-Gray (Meta-diorite) with Close Fracture Spacing with 1 joint @ 50°,1 joint @ 70° and 3 joints @ 80 to 90°	21.4
	667.8	25.3	5.0	0:45/1.0 0:45/1.0 0:45/1.0 0:45/1.0 0:45/1.0	(1.0) 20%	(0.4) 8%						
665	662.8	30.3	5.0	0:30/1.0 0:30/1.0 0:30/1.0 0:30/1.0 0:30/1.0	(0.3) 6%	(0.0) 0%						
660	657.8	35.3	5.0	1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0	(3.3) 66%	(1.9) 38%		(10.9) 73%	(5.8) 39%		657.8 Slightly to Very Slightly Weathered Moderately Hard to Hard Black-Gray (Meta-diorite) with Very Close to Close Fracture Spacing Quartzite Between 45.4' and 46.6' with 4 joints @40°, 3 joints @ 55 to 60° and 10 joints @ 80 to 90°	35.3
655	652.8	40.3	5.0	2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0 2:00/1.0	(3.8) 76%	(2.0) 40%						
650	647.8	45.3	5.0	1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0 1:45/1.0	(3.8) 76%	(1.9) 38%						
645	642.8	50.3									642.8	50.3

Boring Terminated at Elevation 642.8 ft in Crystalline Rock (Meta-diorite)

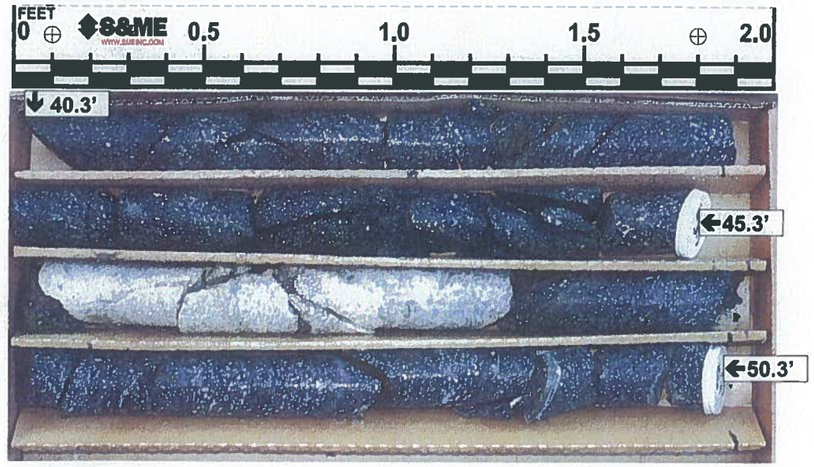
1) Advanced 3-1/4" HSA to 21.4 Feet.
2) Advanced 2-15/16" Tricone to 21.4 Feet.
3) Advanced N Casing to 21.4 ft, 22.0 ft total used.
4) Advanced NQ Core From 21.4 to 50.3 ft.

Project No.: 34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B4-B
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 693.1 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 642.8 ft.	*Total Depth:* 50.3 ft.	*Total Run:* 28.9 ft.	*Date*: 3/22/12



Box 1 of 2

Top of Box @ 21.4 feet; Bottom of Box @ 40.3 feet



Box 2 of 2

Top of Box @ 40.3 feet; Bottom of Box @ 50.3 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek			**GROUND WTR (ft)**
BORING NO. B5-A	**STATION** 91+75	**OFFSET** 16 ft LT	**ALIGNMENT** -L- **0 HR.** N/A
COLLAR ELEV. 695.0 ft	**TOTAL DEPTH** 44.9 ft	**NORTHING** 827,731	**EASTING** 1,599,382 **24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic
DRILLER Moseley, M.	**START DATE** 03/15/12	**COMP. DATE** 03/19/12	**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)
695										695.0 GROUND SURFACE 0.0
	694.0	1.0								**ALLUVIAL**
	691.5	3.5	3	2	3	5 20		M		Tan-Orange Fine Sandy Silty CLAY
690	689.0	6.0	5	8	12	12		M		689.5 5.5
	686.5	8.5	5	6	6					Tan-Orange Clayey Fine SAND
685			15	16	13	29		M		687.0 8.0
	681.5	13.5								**RESIDUAL**
680			11	15	27	42		M		Gray-Orange Silty Coarse to Fine SAND
	676.5	18.5								676.0 19.0
675			40	60/0.4		100/0.9				**WEATHERED ROCK**
	671.5	23.5	100/0.5			100/0.5				(Meta-diorite)
670										
	666.5	28.5								
	665.8	29.2	100/0.4			100/0.4				665.1 29.9
665			60/0.0			60/0.0				**CRYSTALLINE ROCK**
										(Meta-diorite)
660										660.6 34.4
										(Meta-diorite)
655										
										650.1 44.9
										Boring Terminated at Elevation 650.1 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 29.2 Feet.
2) Advanced 2-15/16" Tricone to 29.9 Feet.
3) Advanced N Casing to 30.0, 32.0 ft total used.
4) Advanced NQ CoreFrom 29.9 to 44.9 ft.

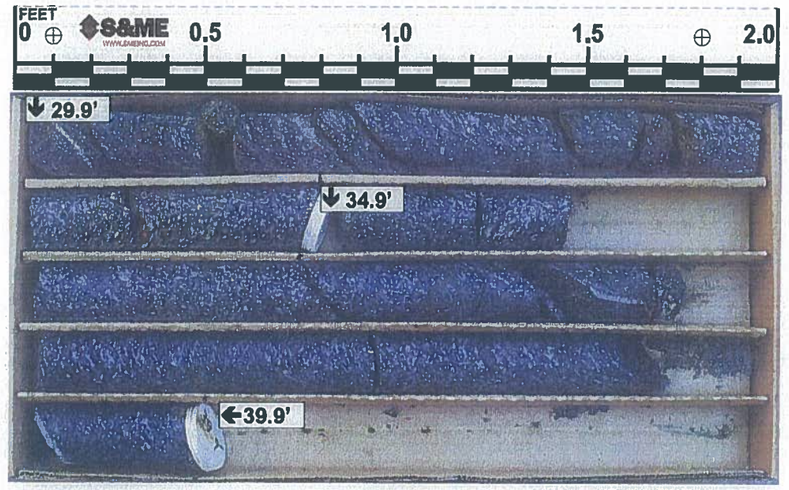
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B5-A	**STATION** 91+75	**OFFSET** 16 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 695.0 ft	**TOTAL DEPTH** 44.9 ft	**NORTHING** 827,731	**EASTING** 1,599,382	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring		**HAMMER TYPE** Automatic
DRILLER Moseley, M.	**START DATE** 03/15/12	**COMP. DATE** 03/19/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 15.0 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)
											Begin Coring @ 29.9 ft
	665.1	29.9	5.0	1:05/1.0	(3.0)	(1.0)		(3.3)	(1.4)		665.1 **CRYSTALLINE ROCK** 29.9
				1:05/1.0	60%	20%		73%	31%		Slight to Very Slightly Weathered
				1:05/1.0							Hard Gray-Black
				1:05/1.0							(Meta-diorite) with Close to Moderately Close Fracture Spacing
660	660.1	34.9		1:05/1.0							660.6 with 4 joints @ 60 to 70° and 1 joint @ 90° 34.4
			5.0	1:20/1.0	(4.5)	(3.9)		(9.9)	(8.8)		Very Slightly to Freshly Weathered
				1:20/1.0	90%	78%		94%	84%		Very Hard Gray-Black
				1:20/1.0							(Meta-diorite) with Moderately Close Fracture Spacing
				1:20/1.0							with 1 joint @ 30°, 2 joints @ 50° and 5 joints @ 90°
655	655.1	39.9		1:20/1.0							
			5.0	1:55/1.0	(4.9)	(4.4)					
				1:55/1.0	98%	88%					
				1:55/1.0							
				1:55/1.0							
	650.1	44.9		1:55/1.0							650.1 44.9
											Boring Terminated at Elevation 650.1 ft in Crystalline Rock (Meta-diorite)

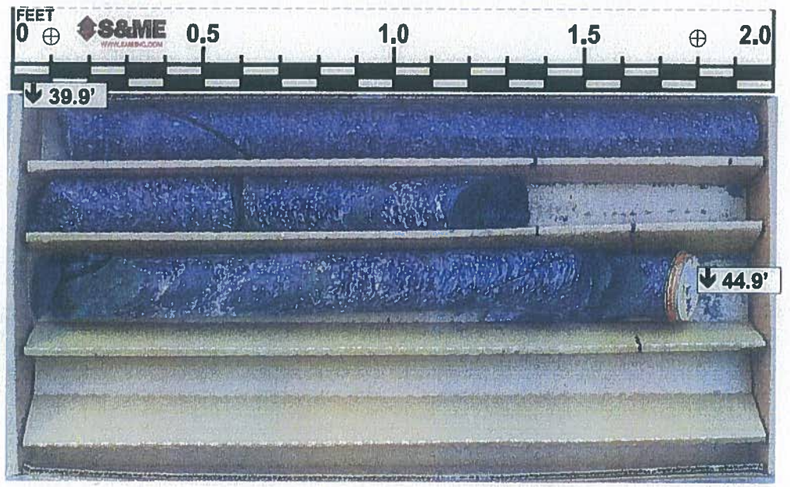
1) Advanced 3-1/4" HSA to 29.2 Feet.
2) Advanced 2-15/16" Tricone to 29.9 Feet.
3) Advanced N Casing to 30.0, 32.0 ft total used.
4) Advanced NQ CoreFrom 29.9 to 44.9 ft.

Project No.:34845.1.1	*ID No.*: U-2707	*Location: Clemmons, NC*	*Boring No.*: B5-A
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 695.0 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 650.1 ft.	*Total Depth:* 54.8 ft.	*Total Run:* 44.9 ft.	*Date*: 3/15/12



Box 1 of 2

Top of Box @ 29.9 feet; Bottom of Box @ 39.9 feet



Box 2 of 2

Top of Box @ 39.9 feet; Bottom of Box @ 44.9 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. B5-B	**STATION** 91+75	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 694.5 ft	**TOTAL DEPTH** 45.4 ft	**NORTHING** 827,710	**EASTING** 1,599,406	**24 HR.** 7.2
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/20/12	**COMP. DATE** 03/21/12	**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)
695										694.5 / 0.0 GROUND SURFACE
	693.5	1.0	4	25	40			M		693.0 / 1.5 ALLUVIAL: Tan-Orange Clayey Fine SAND
690	691.0	3.5	23	33	32	65 65		M		RESIDUAL: Gray-White-Tan Silty Fine SAND
	688.5	6.0	7	9	14	23				689.0 / 5.5 Tan-Gray-White-Brown Clayey Fine SAND with Some Rock Fragments and Trace of Mica
685	686.0	8.5	18	20	12	32		M		
	681.0	13.5	14	23	47	70		M		
680										677.5 / 17.0 WEATHERED ROCK (Meta-diorite)
675	676.0	18.5	50	88	12/0.1	100/0.6				
	671.0	23.5								
670	670.3	24.2	100/0.3			100/0.3				670.3 / 24.2 CRYSTALLINE ROCK (Meta-diorite)
			60/0.0			60/0.0				
665										
660										659.1 / 35.4 (Meta-diorite)
655										
650										649.1 / 45.4 Boring Terminated at Elevation 649.1 ft in Crystalline Rock (Meta-diorite)

1) Advanced 3-1/4" HSA to 24.2 Feet.
2) Advanced 2-15/16" Tricone to 24.2 Feet.
3) Advanced N Casing to 24.2 ft, 25.0 ft total used.
4) Advanced NQ Core From 24.2to 45.4 ft.

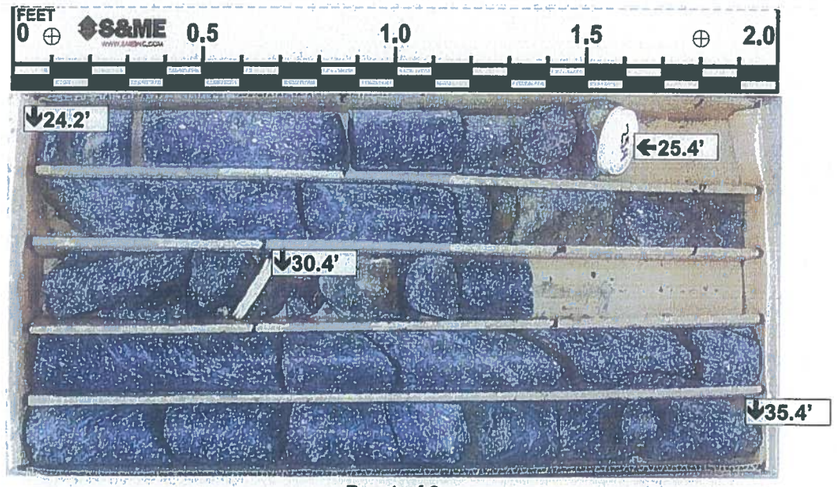
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek			**GROUND WTR (ft)**
BORING NO. B5-B	**STATION** 91+75	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 694.5 ft	**TOTAL DEPTH** 45.4 ft	**NORTHING** 827,710	**EASTING** 1,599,406	**24 HR.** 7.2
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** SPT Core Boring	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/20/12	**COMP. DATE** 03/21/12	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 21.2 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft) / DEPTH (ft)
679.3											Begin Coring @ 24.2 ft
	670.3	24.2	1.2	N=60/0.0	(0.6) 50%	(0.8) 67%		(8.8) 79%	(4.2) 38%		670.3 / 24.2 CRYSTALLINE ROCK: Moderately to Very Slightly Weathered Moderately Hard to Hard Black-Gray (Meta-diorite) with Moderately Close To Very Close Fracture Spacing with 1 joint @ 30°, 4 joint @ 50 to 60°, 15 joints @ 80 to 90°
	669.1	25.4	5.0	0:15/0.2 1:10/1.0 1:10/1.0 1:10/1.0 1:10/1.0 1:10/1.0 1:10/1.0	(3.4) 68%	(1.5) 30%					
665	664.1	30.4	5.0	1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0 1:15/1.0	(4.8) 96%	(1.9) 38%					
660	659.1	35.4	5.0	2:05/1.0 2:15/1.0 1:15/1.0 2:30/1.0 2:30/1.0	(4.8) 96%	(4.3) 86%		(9.8) 98%	(9.0) 90%		659.1 / 35.4 Very Slightly to Freshly Weathered Hard to Very Hard Black-Gray (Meta-diorite) with Moderately Close Fracture Spacing with 2 joints @ 30 to 40°, 1 joint @ 60°, 5 joints @ 90°
655	654.1	40.4	5.0	2:05/1.0 2:05/1.0 2:05/1.0 2:05/1.0 2:05/1.0	(5.0) 100%	(4.7) 94%					
650	649.1	45.4									649.1 / 45.4 Boring Terminated at Elevation 649.1 ft in Crystalline Rock (Meta-diorite)

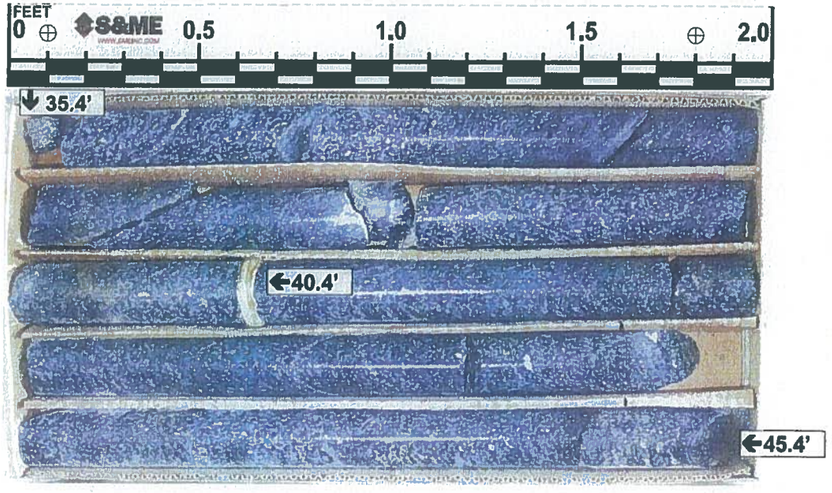
1) Advanced 3-1/4" HSA to 24.2 Feet.
2) Advanced 2-15/16" Tricone to 24.2 Feet.
3) Advanced N Casing to 24.2 ft, 25.0 ft total used.
4) Advanced NQ Core From 24.2to 45.4 ft.

Project No.: 34845.1.1	*ID No.:* U-2707	*Location: Clemmons, NC*	*Boring No.:* B5-B
Site Description: Bridge No. 656 on SR 3000 (Idols Road) over Muddy Creek			*Driller*: M. Moseley
Collar Elev.: 694.5 ft.	*Core Size:* NQ	*Equipment:* D-50	*Geologist*: J. Brandsen
Elev. at T.D.: 649.1 ft.	*Total Depth:* 45.4 ft.	*Total Run:* 21.2 ft.	*Date*: 3/20/12



Box 1 of 2

Top of Box @ 24.2 feet; Bottom of Box @ 35.4 feet



Box 2 of 2

Top of Box @ 35.4 feet; Bottom of Box @ 45.4 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 92+45	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** 11.3 Caved
COLLAR ELEV. 696.4 ft	**TOTAL DEPTH** 46.2 ft	**NORTHING** 827,787	**EASTING** 1,599,424	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/15/12	**COMP. DATE** 03/15/12	**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))
700										
695	695.4	1.0								696.4 GROUND SURFACE 0.0
			2	3	5	8		M		**ALLUVIAL** Tan-Gray Coarse to Fine Sandy Silty CLAY
	691.4	5.0						19%		691.9 4.5
690			8	7	8	15				Orange-Tan Silty Coarse to Fine SAND with Trace of Fine Gravel
	687.9	8.5								688.9 7.5
685			7	7	9	16		M		**RESIDUAL** Gray-White-Orange Silty Fine SAND
	682.9	13.5								
680			5	6	10	16		M		
	677.9	18.5								
675			13	20	23	43		M		
	672.9	23.5								
670			12	23	24	47		M		
	667.9	28.5								
665			5	6	12	18		M		
	662.9	33.5								
660			10	13	22	35		M		
	657.9	38.5								657.4 39.0
655			25	75/0.5		100/1.0		M		**WEATHERED ROCK** (Meta-diorite)
	652.9	43.5								655.4 41.0
			22	24	31	55		M		**RESIDUAL** Gray-Tan-White Silty Fine SAND
	650.2	46.2								650.9 45.5
			60/0.0			60/0.0				650.2 46.2 **WEATHERED ROCK** (Meta-diorite)
										Boring Terminated with Standard Penetration Test Refusal at Elevation 650.2 ft on Crystalline Rock (Meta-diorite)

Other Samples:
ST-1 (3.0 - 5.0)

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Brandsen, J.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Road) Over Muddy Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 92+45	**OFFSET** 20 ft RT	**ALIGNMENT** -L-	**0 HR.** 14.0 Caved
COLLAR ELEV. 696.3 ft	**TOTAL DEPTH** 52.0 ft	**NORTHING** 827,761	**EASTING** 1,599,454	**24 HR.** 6.7
DRILL RIG/HAMMER EFF./DATE SME R-2 DIEDRICH D-50 87% 6/2/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Moseley, M.	**START DATE** 03/14/12	**COMP. DATE** 03/14/12	**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))
700										
695	695.3	1.0								696.3 GROUND SURFACE 0.0
			2	2	2	4		M		**ALLUVIAL** Gray-Orange-Brown Coarse to Fine Sandy Silty CLAY
	692.8	3.5						M		689.8 6.5
690	690.3	6.0	7	9	10	19				**RESIDUAL** Gray-Brown Silty Coarse to Fine SAND
			6	7	8	15				
685	687.8	8.5	7	9	11	20		M		
	682.8	13.5								
680			6	8	14	22		M		
	677.8	18.5								
675			11	17	22	39		M		
	672.8	23.5								
670			18	24	62	86		M		
	667.8	28.5								
665			21	52	48/0.3	100/0.8		M		
	662.8	33.5								
660			20	25	41	66		M		
	657.8	38.5								
655			17	15	14	29		W		
	652.8	43.5								
			16	24	56	80		M		666.8 29.5 **WEATHERED ROCK** (Meta-diorite)
650	647.8	48.5	100/0.4			100/0.4				664.8 31.5 **RESIDUAL** Gray-Tan-White Silty Fine to Coarse SAND
645	644.3	52.0	60/0.0			60/0.0				650.3 46.0 **WEATHERED ROCK** (Meta-diorite)
										644.3 52.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 644.3 ft on Crystalline Rock (Meta-diorite)

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME

Quality Assurance

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

S&ME Project #:	1051-12-089B	Date Report:	4/13/2012
State Project No.:	34845.1.1 County: Forsyth	Date Tested:	4/11 - 4/13/12
Federal ID No.:	STP-3000(1) TIP No. U-2707		
Project Name:	Bridge No.656 on -L- SR 3000 (Idols Road) over Muddy Creek		
Client Name:	NCDOT Client Address: Raleigh, North Carolina		

Boring No.	Sample No.	Sample Depth (ft)	AASHTO Classification	Total % Passing Sieve #					Total Mortar Fraction (%)				LL	PL	PI	Organic Content %	Moisture Content %
				10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay					
EB2-A	ST-1	3 - 5 ft.	A-6 (13)	100	99	97	68.8	56.8	3	40	18	39	39	18	21	ND	19.4

References / Comments / Deviations: ND=Not Detemined.

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

AASHTO T89: Determining the Liquid Limit of Soils

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

AASHTO T265: Laboratory Determination of Moisture Content of Soils

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

Mal Krajan, ET		104-01-0703	Abner F. Riggs, Jr., P.E.	Senior Engineer
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

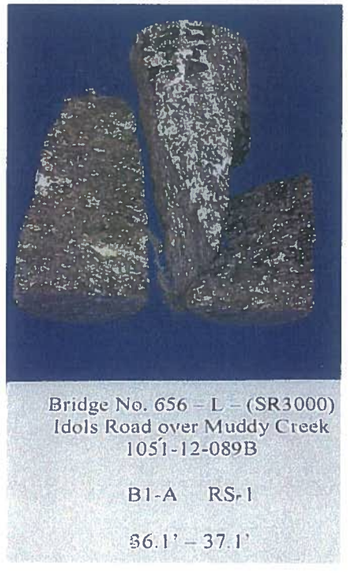
UNCONFINED COMPRESSION
(ASTM D7012 Method C)

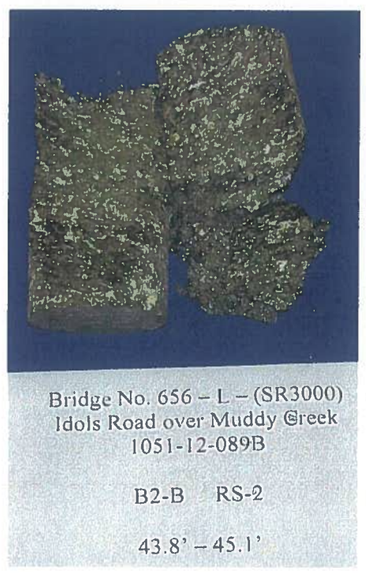
S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Project: 34845.1.1, TIP No. U-2707
Description: Bridge No. 656 on - L - (SR3000) Idols Road over Muddy Creek
County: Forsyth County, North Carolina
Federal ID No.: STP-3000(1)
S&ME Job No.: 1051-12-089B
Date: 4/13/2012
Tested By: Jason B. Burgess
Rock Type: Meta-diorite

Sample No.	Boring Location	Depth (ft)	Specimen Dimension, in.		Area (in^2)	Bulk Density (lb/ft^3)	Loading Rate (psi/sec)	Max. Load (lb)	Strength (psi)	Moisture (%)
			Length	Diameter						
RS-1	B1-A	36.1 - 37.1	4.35	1.98	3.08	181.3	94	27,550	8,945	0.1
RS-2	B2-B	43.8 - 45.1	4.35	1.97	3.05	182.9	89	53,260	17,462	0.1

NOTES: Bulk Density includes any moisture that is within the specimen.





UNCONFINED COMPRESSION
(ASTM D7012 Method C)

S&ME

S&ME, Inc. - Knoxville 1413 Topside Road, Louisville, TN 37777

Project: 34845.1.1, TIP No. U-2707
Description: Bridge No. 656 on - L - (SR3000) Idols Road over Muddy Creek
County: Forsyth County, North Carolina
Federal ID No.: STP-3000(1)
S&ME Job No.: 1051-12-089B
Date: 4/13/2012
Tested By: Jason B. Burgess
Rock Type: Meta-diorite

Sample No.	Boring Location	Depth (ft)	Specimen Dimension, in.		Area (in^2)	Bulk Density (lb/ft^3)	Loading Rate (psi/sec)	Max. Load (lb)	Strength (psi)	Moisture (%)
			Length	Diameter						
RS-3	B3-A	53.2 - 55.2	4.39	1.99	3.11	182.3	94	52,380	16,842	0.1
RS-4	B4-A	47.2 - 48.2	4.27	1.98	3.08	177.1	92	45,510	14,776	0.1

NOTES: Bulk Density includes any moisture that is within the specimen.

Bridge No. 656 – L – (SR3000)
Idols Road over Muddy Creek
1051-12-089B

B3-A RS-3

53.2' – 55.2'

Bridge No. 656 – L – (SR300
Idols Road over Muddy Creek
1051-12-089B

B3-A RS-3

53.2' – 55.2'

Bridge No. 656 – L – (SR3000)
Idols Road over Muddy Creek
1051-12-089B

B4-A RS-4

47.2' – 48.2'

Bridge No. 656 – L – (SR3000)
Idols Road over Muddy Creek
1051-12-089B

B4-A RS-4

47.2' – 48.2'

Photograph No. 1: This photograph was taken from the South approach along the centerline of the –L- alignment looking Northeast.

Photograph No. 2: This photograph was taken from the North approach along the centerline of the –L- alignment looking Southwest.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2707	1	5

REFERENCE: U-2707

PROJECT: 34845

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *Forsyth*

PROJECT DESCRIPTION *Bridge No. 656 on SR 3000 (Idols Rd.) over Muddy Creek*

SITE DESCRIPTION

ADDENDUM

CONTENTS

PERSONNEL

J.K. Stickney

C.L. Smith

M.R. Moore

INVESTIGATED BY *J.E. Beverly*

DRAWN BY *J.E. Beverly*

CHECKED BY *C.B. Little*

SUBMITTED BY *C.B. Little*

DATE *September 2015*

CAUTION NOTICE

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2. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

NORTH CAROLINA LICENSED SEAL 1104 GEOLOGIST CLINTON B. LITTLE

DocuSigned by:
Clinton B. Little
930443D5AC8E452...

9/29/2015

SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
U-2707	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #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 RESISTANCE (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) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

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

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT 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
- [ ] CME-55
- [X] 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
- [ ] _____

PROJECT REFERENCE NO.	SHEET NO.
U-2707	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 2 OF 2)

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

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

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

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

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

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

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

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

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

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

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

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

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

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR 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 AND LOCATIONS SURVEYED BY DIVISION 9 LOCATION AND SURVEYS UNIT

ELEVATION: FEET

NOTES:

SOIL STRATIGRAPHY IS THROUGH THE BORINGS FOR CROSS SECTIONS

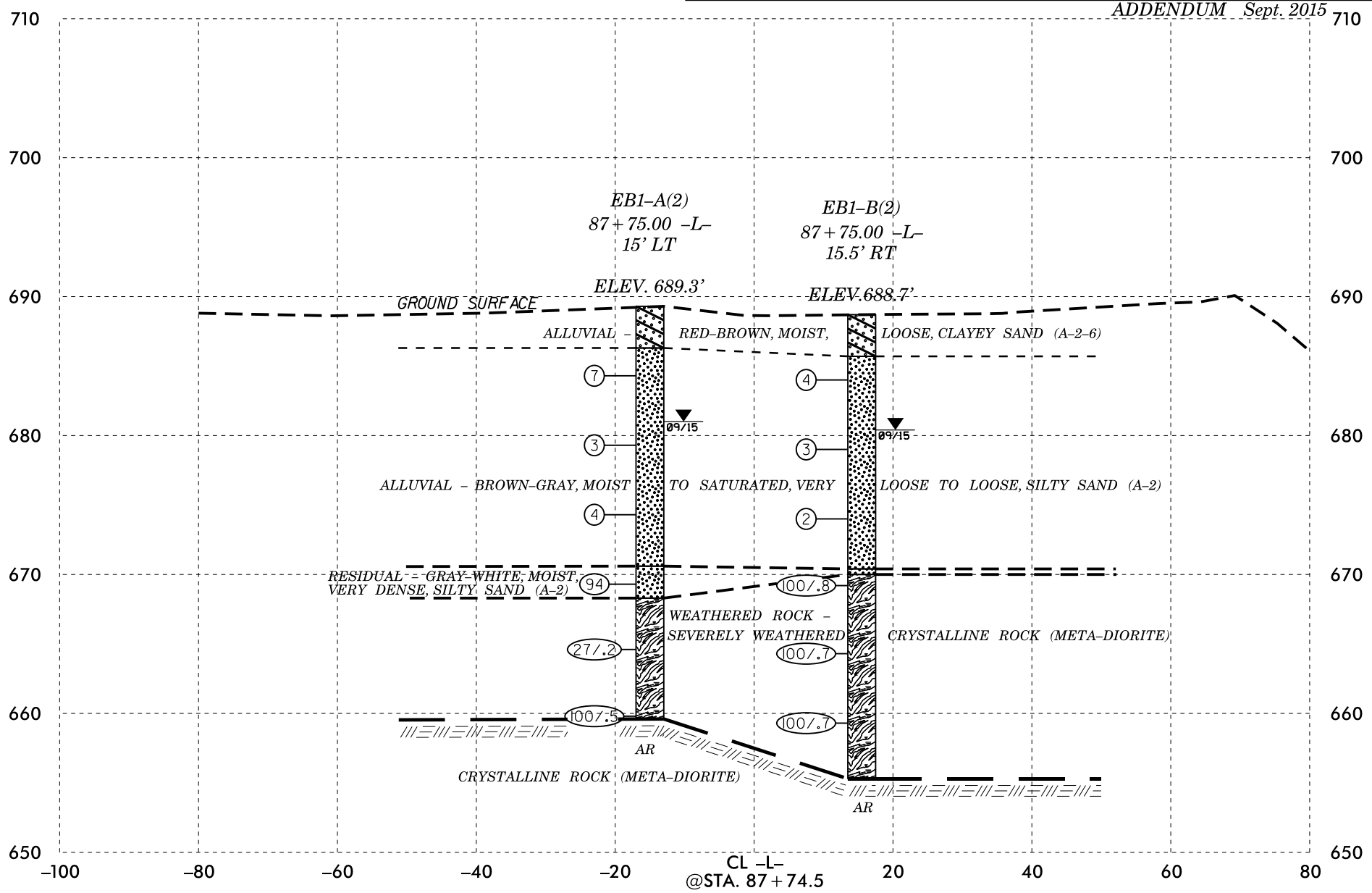
DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
34845.1.1 (U-2707)	3

SECTION THROUGH END BENT ONE
STA. 87+74.5 –L–
SKEW=90 Deg.

0 20 40
FEET
VE = 2:1

ADDENDUM Sept. 2015



NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Rd.) over Muddy Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 87+75	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 8.4
COLLAR ELEV. 689.3 ft	**TOTAL DEPTH** 29.7 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** 8.3
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 88% 03/19/2014		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Smith, Chad	**START DATE** 09/16/15	**COMP. DATE** 09/16/15	**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)
690										689.3 GROUND SURFACE	0.0
										ALLUVIAL RED-BROWN, MOIST, LOOSE, CLAYEY SAND (A-2-6)	
685	685.3	4.0	4	4	3	7		M		686.3	3.0
										ALLUVIAL BROWN-GRAY, MOIST TO SATURATED, VERY LOOSE TO LOOSE, SILTY SAND (A-2)	
680	680.3	9.0	3	2	1	3		Sat.			
675	675.3	14.0	5	3	1	4		Sat.		670.6	18.7
670	670.3	19.0	27	32	62	94		M		**RESIDUAL** GRAY-WHITE, MOIST, VERY DENSE, SILTY SAND (A-2) 668.3	21.0
665	665.3	24.0	73	27/.2						**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK (META-DIORITE)	
660	660.3	29.0	100/.5			100/.5				659.6	29.7
										Boring Terminated by Auger Refusal at Elevation 659.6 ft On Crystalline Rock (Meta-Diorite)	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34845.1.1	**TIP** U-2707	**COUNTY** FORSYTH	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge No. 656 on SR 3000 (Idols Rd.) over Muddy Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 87+75	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** 8.0
COLLAR ELEV. 688.7 ft	**TOTAL DEPTH** 33.4 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** 8.3
DRILL RIG/HAMMER EFF./DATE HFO0072 CME-550 88% 03/19/2014		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Smith, Chad	**START DATE** 09/16/15	**COMP. DATE** 09/16/15	**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)
690										
										688.7 GROUND SURFACE 0.0
										ALLUVIAL RED-BROWN, MOIST, LOOSE, CLAYEY SAND (A-2-6)
685	685.0	3.7								685.7 3.0
			3	2	2	4		M		**ALLUVIAL** BROWN-GRAY, MOIST TO SATURATED, VERY LOOSE, SILTY SAND (A-2)
680	680.0	8.7								
			2	1	2	3		Sat.		
675	675.0	13.7								
			2	1	1	2		Sat.		
670	670.0	18.7								670.4 18.3
			40	60/.3		100/.8		M		670.0 18.7 **RESIDUAL** GRAY-WHITE, MOIST, VERY DENSE, SILTY SAND (A-2)
665	665.0	23.7								**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK (META-DIORITE)
			12	36	64/.2	100/.7				
660	660.0	28.7								
			35	65/.2		100/.7				655.3 33.4
										Boring Terminated by Auger Refusal at Elevation 655.3 ft On Crystalline Rock (Meta-Diorite)