

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-4707	1	12

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

**STRUCTURE  
SUBSURFACE INVESTIGATION**

COUNTY GUILFORD  
 PROJECT DESCRIPTION US 29 AND SR 4771 (REEDY FORK PARKWAY) INTERCHANGE IMPROVEMENTS; IMPROVE ROADWAY, MODIFY INTERCHANGE AND REPLACE BRIDGE 360  
 SITE DESCRIPTION BRIDGE NO. 360 ON SR 4771 (REEDY FORK PARKWAY) OVER US 29 BETWEEN SR 2526 AND SR 2790

**CONTENTS**

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2	LEGEND (SOIL & ROCK)
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8-12	BORE LOG(S)

**REFERENCE: R-4707**

**PROJECT: 36599**

**CAUTION NOTICE**

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
  - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

J. HOWARD

M. LEAR

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INVESTIGATED BY WOOD E&IS

DRAWN BY R. RAHIE

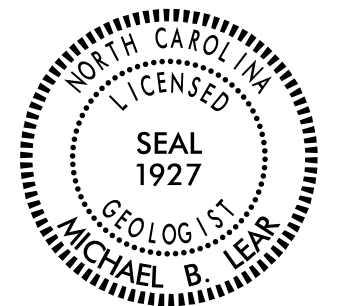
CHECKED BY S. JOHNSON

SUBMITTED BY M. LEAR

DATE APRIL, 2019

**wood.**

WOOD E&IS, Inc.  
4021 STIRRUP CREEK DRIVE, SUITE 100  
DURHAM, NORTH CAROLINA 27703  
(919) 381-9900



DocuSigned by:

*Michael B. Lear*

4/16/2019

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SIGNATURE

DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

GRADATION
WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.
ANGULARITY OF GRAINS
THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.
MINERALOGICAL COMPOSITION
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.
COMPRESSIBILITY
SLIGHTLY COMPRESSIBLE LL < 31
MODERATELY COMPRESSIBLE LL = 31 - 50
HIGHLY COMPRESSIBLE LL > 50
PERCENTAGE OF MATERIAL
ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL
TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%
LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%
MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%
HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE
GROUND WATER
WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
STATIC WATER LEVEL AFTER 24 HOURS
PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
SPRING OR SEEP

ROCK DESCRIPTION
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:
WEATHERED ROCK (WR) NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP) COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.
WEATHERING
FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD.SEV) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL
SEVERE (SEV) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF
VERY SEVERE (V SEV) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF
COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

TERMS AND DEFINITIONS
ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
AQUIFER - A WATER BEARING FORMATION OR STRATA.
ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOGED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MOTTLED (MOT) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
SAPROLITE (SAP) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
BENCH MARK: ELEVATIONS DETERMINED FROM PROVIDED ELECTRONIC FILES (r4707\_is\_tin\_i8053i.tin) ELEVATION: N/A FEET

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-4, A-5 A-6, A-7
SYMBOL
% PASSING
#10 #40 #200
MATERIAL PASSING #40 LL PI
GROUP INDEX
USUAL TYPES OF MAJOR MATERIALS
GEN. RATING AS SUBGRADE
EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE

MISCELLANEOUS SYMBOLS
ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
SOIL SYMBOL
ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
INFERRED SOIL BOUNDARY
INFERRED ROCK LINE
ALLUVIAL SOIL BOUNDARY
DIP & DIP DIRECTION OF ROCK STRUCTURES
TEST BORING
AUGER BORING
CORE BORING
MONITORING WELL
PIEZOMETER INSTALLATION
SLOPE INDICATOR INSTALLATION
CONE PENETROMETER TEST
SOUNDING ROD
TEST BORING WITH CORE
SPT N-VALUE

RECOMMENDATION SYMBOLS
UNDERCUT
SHALLOW UNDERCUT
UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

TEXTURE OR GRAIN SIZE
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270
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

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
gamma - UNIT WEIGHT
gamma\_d - DRY UNIT WEIGHT
SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

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.

FRACURE 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

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
WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE
DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

EQUIPMENT USED ON SUBJECT PROJECT
DRILL UNITS: CME-45C, CME-55, CME-550, VANE SHEAR TEST, PORTABLE HOIST
ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 8" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE 3" STEEL TEETH, TRICONE TUNG-CARB. CORE BIT
HAMMER TYPE: AUTOMATIC, MANUAL
CORE SIZE: B, H, N
HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST

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.

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.

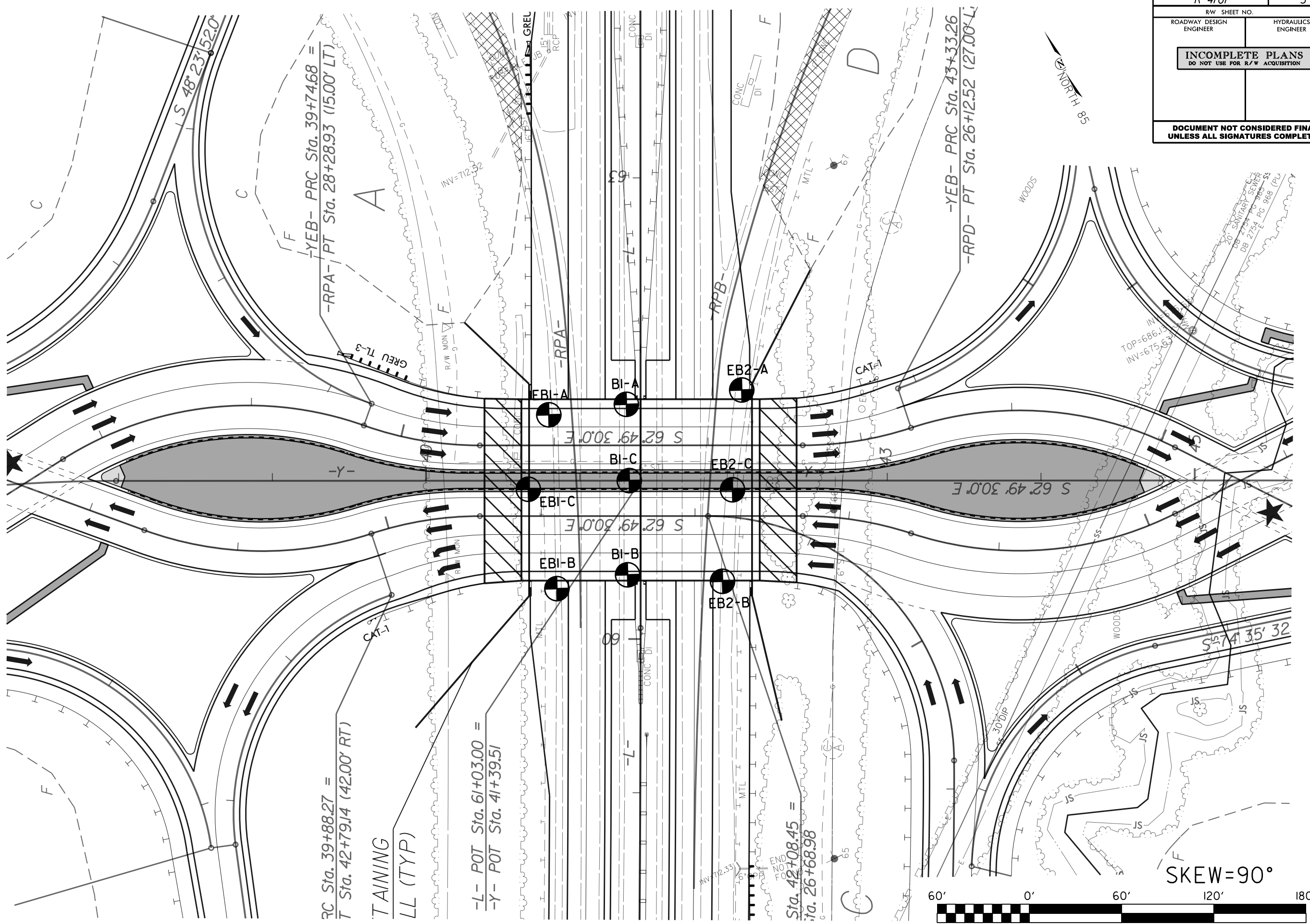
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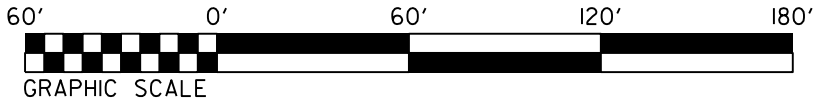
NOTES:
FIAD - FILLED IMMEDIATELY AFTER DRILLING
DATE: 8-15-14

PROJECT REFERENCE NO. <b>R-4707</b>	SHEET NO. <b>3</b>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	



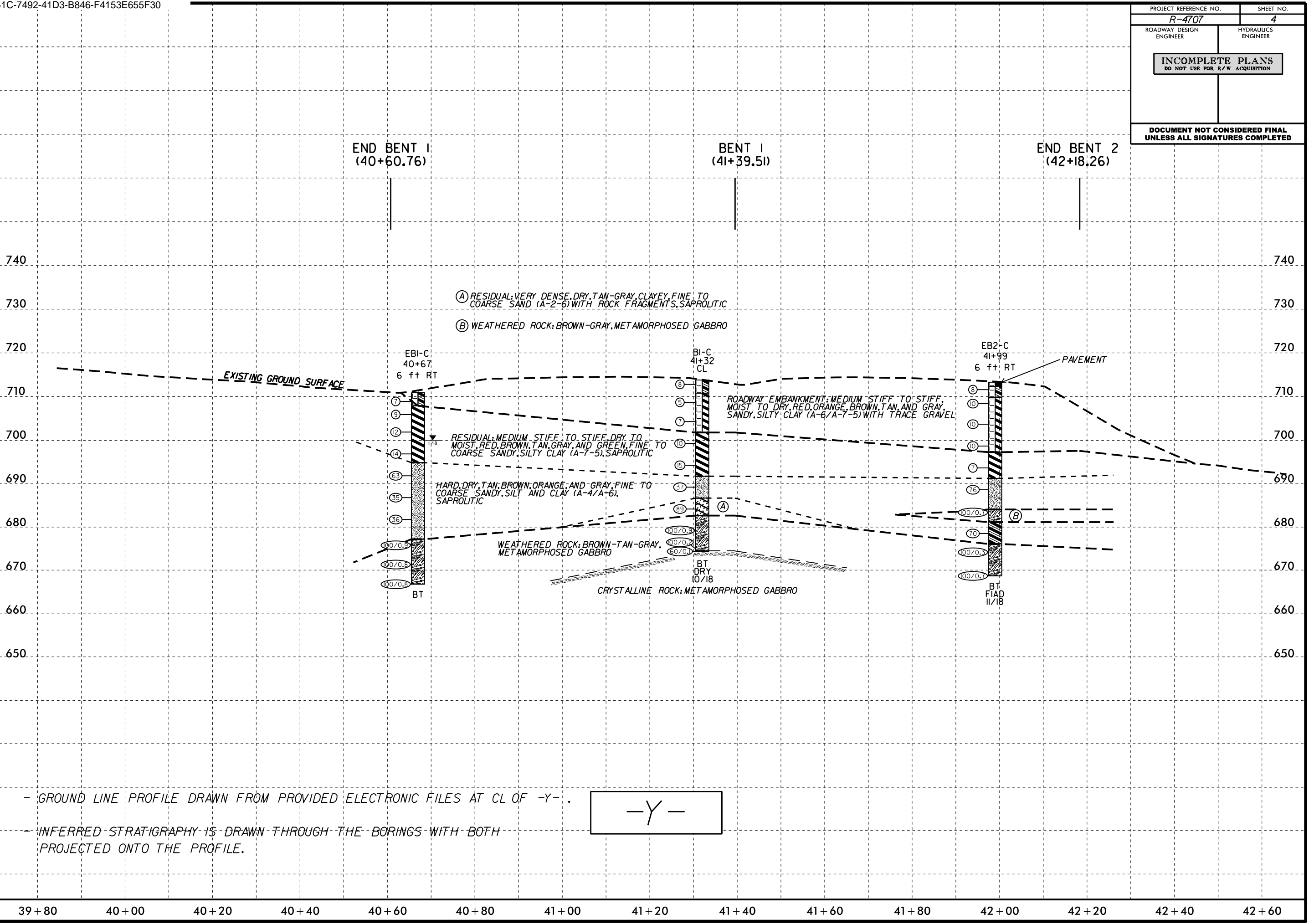
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**SKEW=90°**

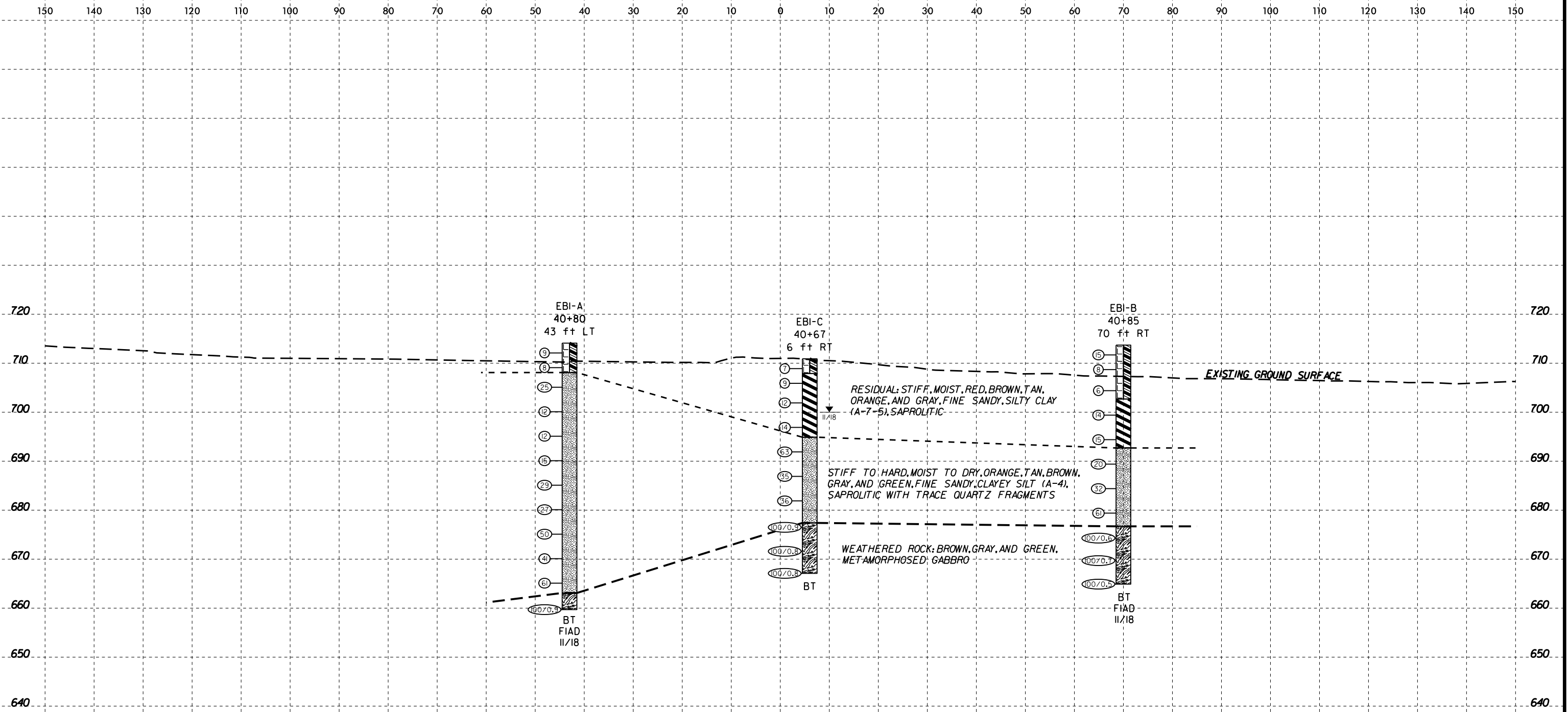


PROJECT REFERENCE NO. <b>R-4707</b>	SHEET NO. <b>4</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	

5/28/18  
08-APR-2019 15:32  
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39+80    40+00    40+20    40+40    40+60    40+80    41+00    41+20    41+40    41+60    41+80    42+00    42+20    42+40    42+60

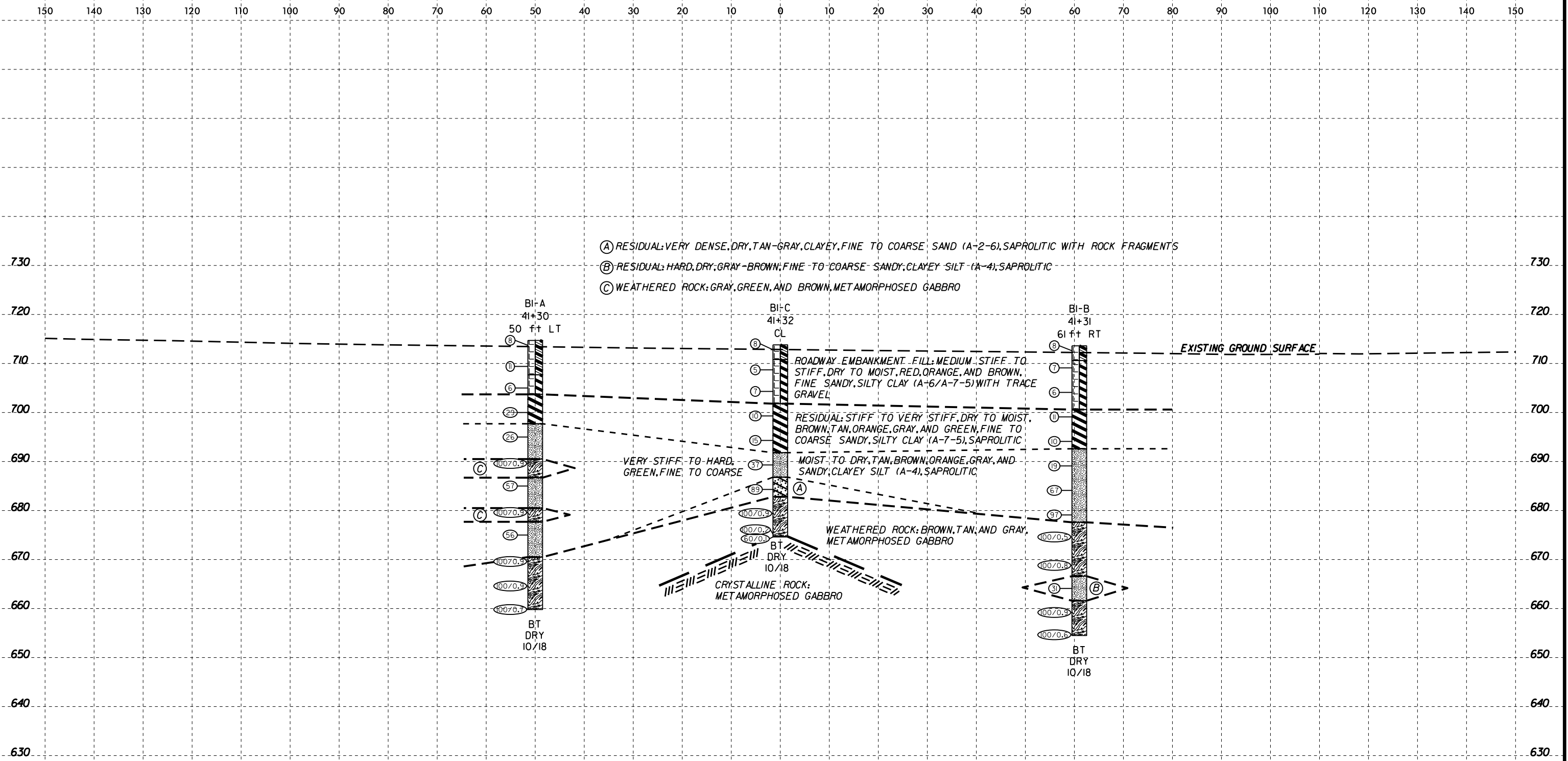


### CROSS SECTION ALONG END BENT I (STATION 40+60.76)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

-Y-

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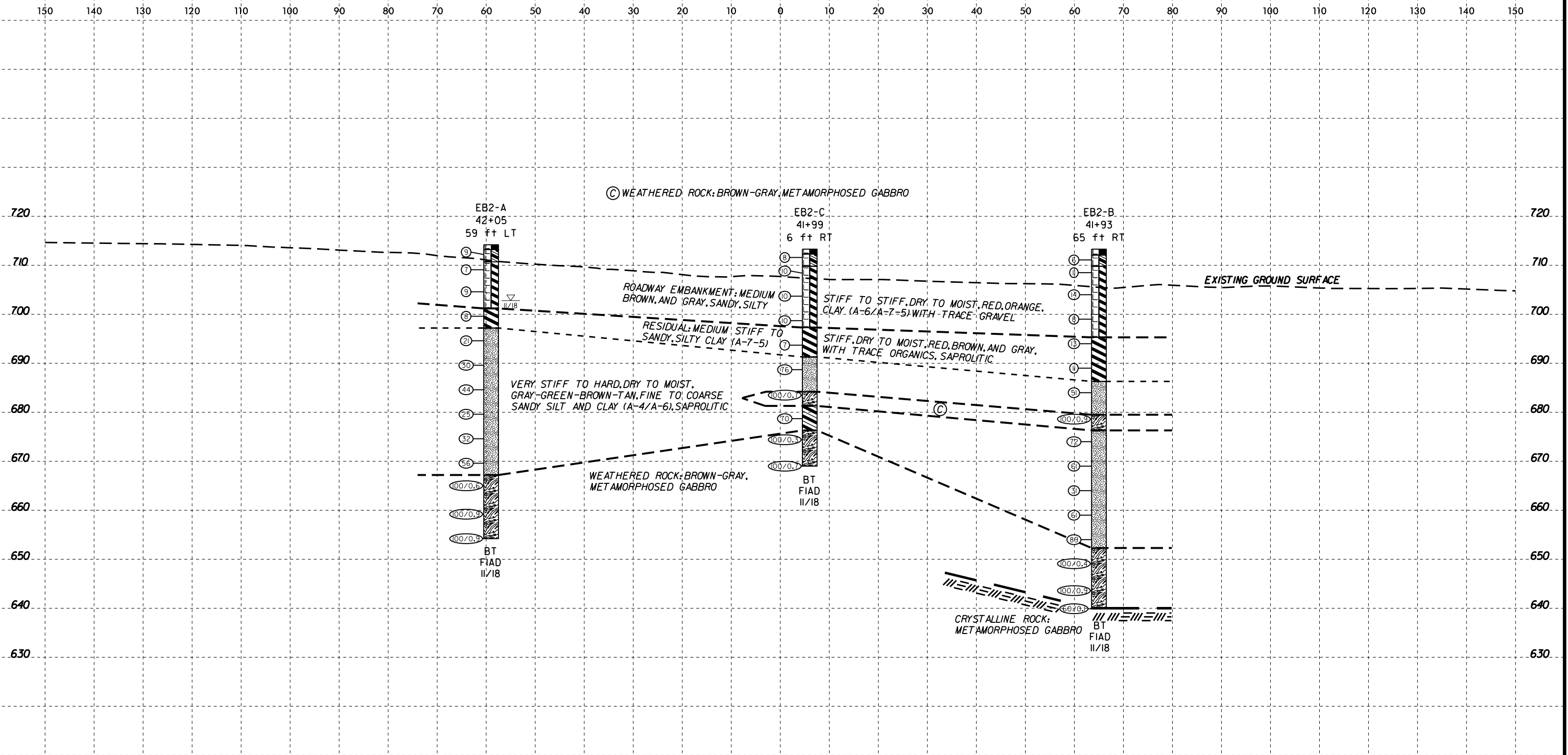
### CROSS SECTION ALONG BENT I (STATION 41+39.51)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.

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

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### CROSS SECTION ALONG END BENT 2 (STATION 42+18.26)

- GROUND LINE CROSS SECTION DRAWN FROM PROVIDED ELECTRONIC FILES ALONG LINE OF BENT, SKEW 90°.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

-Y-

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# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST M. Lear										
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790							GROUND WTR (ft)									
BORING NO. EB1-A		STATION 40+80		OFFSET 43 ft LT		ALIGNMENT -Y-										
COLLAR ELEV. 714.1 ft		TOTAL DEPTH 54.4 ft		NORTHING 882,802		EASTING 1,789,365										
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER S. Hardee		START DATE 11/14/18		COMP. DATE 11/14/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715														714.1	GROUND SURFACE	0.0
	713.1	1.0	6	4	5								M	711.1	ROADWAY EMBANKMENT Stiff, moist, tan-red-brown, silty CLAY (A-6) with trace gravel	3.0
710	710.1	4.0	3	3	5								M	707.1	RESIDUAL Stiff, moist, red-orange-tan, silty CLAY (A-7-5), Saprolitic	7.0
	706.1	8.0	6	11	14								M		Stiff to hard, moist to dry, orange-tan-brown-green, fine sandy, clayey SILT (A-4), Saprolitic	
705	701.1	13.0	5	6	6								M			
700	696.1	18.0	3	5	7								M			
695	691.1	23.0	4	6	9								M			
690	686.1	28.0	9	11	18								M			
685	681.1	33.0	14	12	15								M			
680	676.1	38.0	20	23	27								D			
675	671.1	43.0	10	18	23								D			
670	666.1	48.0	13	24	37								D			
665	661.1	53.0	30	46	54/0.4								D			
660														663.1	WEATHERED ROCK Brown, METAMORPHOSED GABBRO	51.0
														659.7	Boring Terminated at Elevation 659.7 ft in Weathered Rock: METAMORPHOSED GABBRO	54.4

NCDOT BORE DOUBLE R-4707\_GEO\_BRIDGE\_GINT LOGS.GPJ\_NC\_DOT.GDT 4/8/19

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST M. Lear										
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790							GROUND WTR (ft)									
BORING NO. EB1-C		STATION 40+67		OFFSET 6 ft RT		ALIGNMENT -Y-										
COLLAR ELEV. 710.9 ft		TOTAL DEPTH 43.8 ft		NORTHING 882,765		EASTING 1,789,331										
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER S. Hardee		START DATE 11/12/18		COMP. DATE 11/12/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715														710.9	GROUND SURFACE	0.0
	709.9	1.0	3	3	4								M	707.9	ROADWAY EMBANKMENT Medium stiff, moist, red-brown, silty CLAY (A-6) with trace gravel	3.0
710	706.9	4.0	1	4	5								M		RESIDUAL Stiff, moist, red-brown to tan-brown, fine sandy, silty CLAY (A-7-5), Saprolitic	
	702.9	8.0	5	5	7								M			
705	697.9	13.0	3	4	10								M			
700	692.9	18.0	20	26	37								D			
695	687.9	23.0	9	15	20								D			
690	682.9	28.0	12	15	21								D			
685	677.9	33.0	33	47	53/0.4								D			
680	672.9	38.0	23	37	63/0.3								D			
675	667.9	43.0	42	58/0.3									D			
670														667.4	WEATHERED ROCK Brown-gray, METAMORPHOSED GABBRO	33.5
														667.1	Boring Terminated at Elevation 667.1 ft in Weathered Rock: METAMORPHOSED GABBRO	43.8



# GEOTECHNICAL BORING REPORT BORE LOG

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST M. Lear										
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790						GROUND WTR (ft)										
BORING NO. EB1-B		STATION 40+85		OFFSET 70 ft RT		ALIGNMENT -Y-										
COLLAR ELEV. 713.7 ft		TOTAL DEPTH 48.8 ft		NORTHING 882,699		EASTING 1,789,318										
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER S. Hardee		START DATE 11/14/18		COMP. DATE 11/14/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715																713.7
	712.7	1.0	2	9	6											
710	709.7	4.0	2	4	4											
	705.4	8.3	2	3	3											
705	704.4	8.3	2	3	3											
	700.4	13.3	3	6	8											
700	695.4	18.3	3	5	10											
695	690.4	23.3	10	10	10											
690	685.4	28.3	9	14	18											
685	680.4	33.3	12	23	38											
680	675.4	38.3	18	60	40/0.1											
675	670.4	43.3	63	37/0.2												
670	665.4	48.3	100/0.5													
665																
																664.9

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST J. Howard										
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790						GROUND WTR (ft)										
BORING NO. B1-A		STATION 41+30		OFFSET 50 ft LT		ALIGNMENT -Y-										
COLLAR ELEV. 714.7 ft		TOTAL DEPTH 54.9 ft		NORTHING 882,785		EASTING 1,789,413										
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER S. Hardee		START DATE 10/30/18		COMP. DATE 10/30/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715	714.7	0.0	2	3	5											714.7
	710.4	4.3	2	4	7											
710	706.0	8.7	2	3	3											
	701.0	13.7	5	11	18											
705	696.0	18.7	9	11	15											
700	691.0	23.7	43	56	44/0.4											
695	686.0	28.7	21	28	29											
690	681.0	33.7	15	43	57/0.4											
685	676.0	38.7	18	28	28											
680	671.0	43.7	35	50	50/0.4											
675	666.0	48.7	23	25	75/0.4											
670	661.0	53.7	19	64	36/0.2											
665																
660																

NCDOT BORE DOUBLE R-4707\_GEO\_BRDGE\_GINT LOGS.GPJ NC\_DOT.GDT 4/8/19

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST J. Howard	
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790							GROUND WTR (ft)
BORING NO. B1-C		STATION 41+32		OFFSET CL		ALIGNMENT -Y-	
COLLAR ELEV. 713.8 ft		TOTAL DEPTH 39.2 ft		NORTHING 882,740		EASTING 1,789,392	
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic			
DRILLER S. Hardee		START DATE 10/30/18		COMP. DATE 10/30/18		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715	713.8	0.0	2	3	5									713.8	0.0	GROUND SURFACE
710	709.7	4.1	2	2	3									710.8	3.0	ROADWAY EMBANKMENT Medium stiff, moist, brown-orange, fine sandy, silty CLAY (A-6) with trace gravel
705	705.3	8.5	2	3	4									701.8	12.0	RESIDUAL Medium stiff, moist, brown-orange to red-brown, fine sandy, silty CLAY (A-7-5)
700	700.3	13.5	2	4	6									691.8	22.0	RESIDUAL Stiff, moist, brown-gray-green-tan, fine to coarse sandy, silty CLAY (A-7-5) with trace rock fragments, Saprolitic
695	695.3	18.5	3	6	9									691.8	22.0	Hard, dry, orange-gray, fine sandy, clayey SILT (A-4), Saprolitic
690	690.3	23.5	11	16	21									686.8	27.0	Very dense, dry, tan-gray, clayey, fine to coarse SAND (A-2-6) with rock fragments, Saprolitic
685	685.3	28.5	29	34	55									682.8	31.0	WEATHERED ROCK Tan-gray, METAMORPHOSED GABBRO
680	680.3	33.5	22	78/0.4										674.7	39.1	CRYSTALLINE ROCK METAMORPHOSED GABBRO
675	675.3	38.5	100/0.2											674.6	39.2	Boring Terminated with Standard Penetration Test Refusal at Elevation 674.6 ft in Crystalline Rock: METAMORPHOSED GABBRO

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST J. Howard	
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790							GROUND WTR (ft)
BORING NO. B1-B		STATION 41+31		OFFSET 61 ft RT		ALIGNMENT -Y-	
COLLAR ELEV. 713.6 ft		TOTAL DEPTH 59.1 ft		NORTHING 882,686		EASTING 1,789,363	
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic			
DRILLER S. Hardee		START DATE 10/31/18		COMP. DATE 10/31/18		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715	713.6	0.0	2	4	4									713.6	0.0	GROUND SURFACE
710	710.1	3.5	3	3	4									710.6	3.0	ROADWAY EMBANKMENT Medium stiff, moist, brown-red, fine sandy, silty CLAY (A-6) with trace gravel
705	705.1	8.5	1	3	3									700.6	13.0	RESIDUAL Medium stiff, moist, red-brown, fine sandy, silty CLAY (A-7-5) with trace gravel
700	700.1	13.5	3	4	7									692.6	21.0	RESIDUAL Stiff, moist, brown, silty CLAY (A-7-5), Saprolitic
695	695.1	18.5	3	4	6									692.6	21.0	Very stiff to hard, moist to dry, tan, gray, brown, and green, fine sandy, clayey SILT (A-4), Saprolitic
690	690.1	23.5	5	8	11									677.6	36.0	WEATHERED ROCK Gray-tan-brown, METAMORPHOSED GABBRO
685	685.1	28.5	16	24	43									666.6	47.0	RESIDUAL Hard, dry, gray-brown, fine to coarse sandy, clayey SILT (A-4), Saprolitic
680	680.1	33.5	24	35	62									661.6	52.0	WEATHERED ROCK Tan-gray-brown, METAMORPHOSED GABBRO
675	675.1	38.5	100/0.5											654.5	59.1	Boring Terminated at Elevation 654.5 ft in Weathered Rock: METAMORPHOSED GABBRO
670	670.1	43.5	21	51	49/0.3											
665	665.1	48.5	10	12	19											
660	660.1	53.5	37	63/0.4												
655	655.1	58.5	60	40/0.1												

NCDOT BORE DOUBLE R-4707\_GEO\_BRDGE\_GINT LOGS.GPJ NC\_DOT.GDT 4/8/19



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST J.Howard										
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 41+93		OFFSET 65 ft RT		ALIGNMENT -Y-										
COLLAR ELEV. 713.3 ft		TOTAL DEPTH 73.4 ft		NORTHING 882,654		EASTING 1,789,416										
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic												
DRILLER S. Hardee		START DATE 10/31/18		COMP. DATE 10/31/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
715																
	712.1	1.2	2	3	3										713.3	0.0
	712.1	1.2													712.1	1.2
	709.5	3.8	4	4	7										709.8	3.5
	705.0	8.3	5	6	8											
	705.0	8.3														
	700.0	13.3	2	3	5											
	695.0	18.3	5	6	7										695.3	18.0
	695.0	18.3														
	690.0	23.3	2	4	7											
	690.0	23.3														
	685.0	28.3	12	18	33										686.3	27.0
	685.0	28.3														
	680.0	33.3	21	40	60/0.4										679.5	33.8
	680.0	33.3														
	675.0	38.3	21	28	44										676.3	37.0
	675.0	38.3														
	670.0	43.3	29	24	37											
	670.0	43.3														
	665.0	48.3	10	13	18											
	665.0	48.3														
	660.0	53.3	30	36	25											
	660.0	53.3														
	655.0	58.3	20	37	52											
	655.0	58.3														
	650.0	63.3	31	69/0.4											652.3	61.0
	650.0	63.3														
	645.0	68.3	40	50	50/0.4											
	645.0	68.3														
	640.0	73.3													640.0	73.3
	640.0	73.3	60/0.1												639.9	73.4

WBS 36599.1.5		TIP R-4707		COUNTY GUILFORD		GEOLOGIST J.Howard										
SITE DESCRIPTION Bridge On SR 4771 (Reedy Fork Parkway) Over US 29 Between SR 2526 and SR 2790							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 41+93		OFFSET 65 ft RT		ALIGNMENT -Y-										
COLLAR ELEV. 713.3 ft		TOTAL DEPTH 73.4 ft		NORTHING 882,654		EASTING 1,789,416										
DRILL RIG/HAMMER EFF./DATE SME9403 CME-550X 91% 02/02/2018		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic												
DRILLER S. Hardee		START DATE 10/31/18		COMP. DATE 10/31/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
635																

NCDOT BORE DOUBLE R-4707\_GEO\_BRDGE\_GINT LOGS.GPJ\_NC\_DOT.GDT 4/8/19