STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2579AB	1	20

REFERENCE: U-2579AB

PROJECT: 34839

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *FORSYTH*

PROJECT DESCRIPTION *WINSTON-SALEM BELTWAY FROM US 421 /I-40 BUS TO I-40*

SITE DESCRIPTION *BRIDGE NO. 723 ON SR 4315 (KERNERSVILLE RD) OVER WINSTON-SALEM NORTHERN BELTWAY*

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PERSONNEL

P. CARY

GET PERSONNEL

INVESTIGATED BY *RK&K, LLP*

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DATE *MAY 2019*

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PROJECT REFERENCE NO.	SHEET NO.
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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

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

	GRANULAR SOILS	SILT - CLAY SOILS
ORGANIC MATERIAL		
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	> 10%	> 20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
HIGHLY	35% AND ABOVE

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] CME-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 _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

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

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

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

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

BENCH MARK: N/A

ELEVATION: N/A FEET

NOTES:

FIAD = FILLED IMMEDIATELY AFTER DRILLING

BORING COLLAR ELEVATIONS DETERMINED USING SURVEY-GRADE GPS

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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

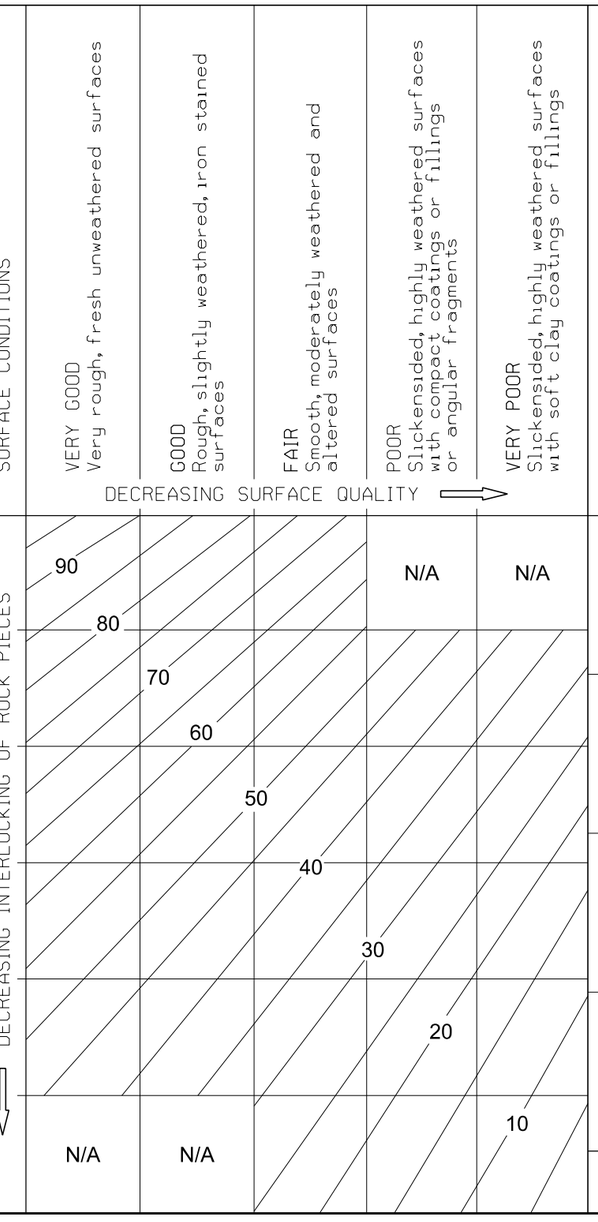
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

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

STRUCTURE

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

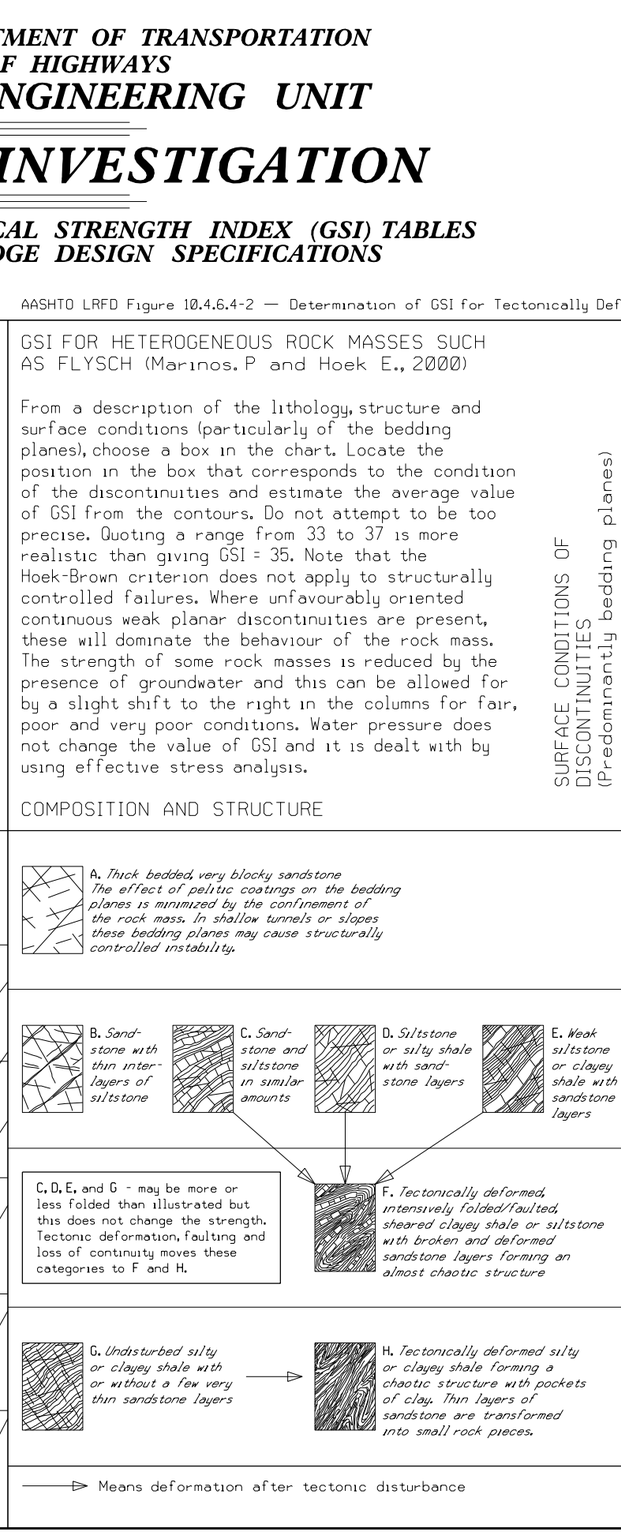


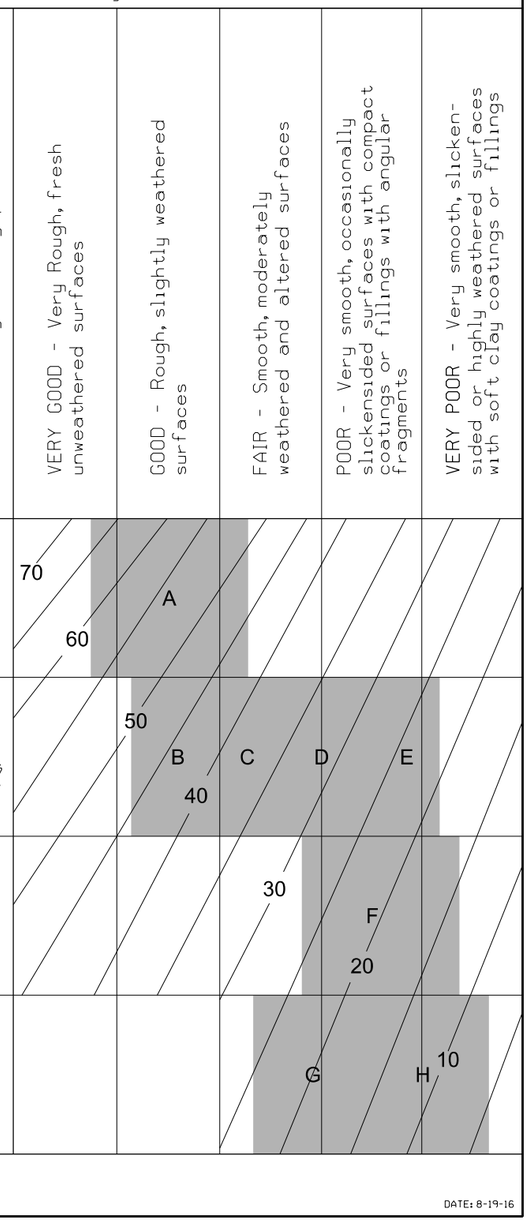
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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

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

COMPOSITION AND STRUCTURE





DATE: 8-19-16

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

SITE PLAN

0 60 120

FEET

N

EBI-RWA

BI-A

EB2-RWA

BI-E

EB2-A

EBI-A

BI-C

EBI-C

EB2-C

BI-C (II)

BRIDGE No.723

EBI-B

BI-D

EB2-B

BI-B

EBI-RWB

EB2-RWB

725

-Y4-

-Y4EB-

-Y4WB-

23

52

24

25

35

20

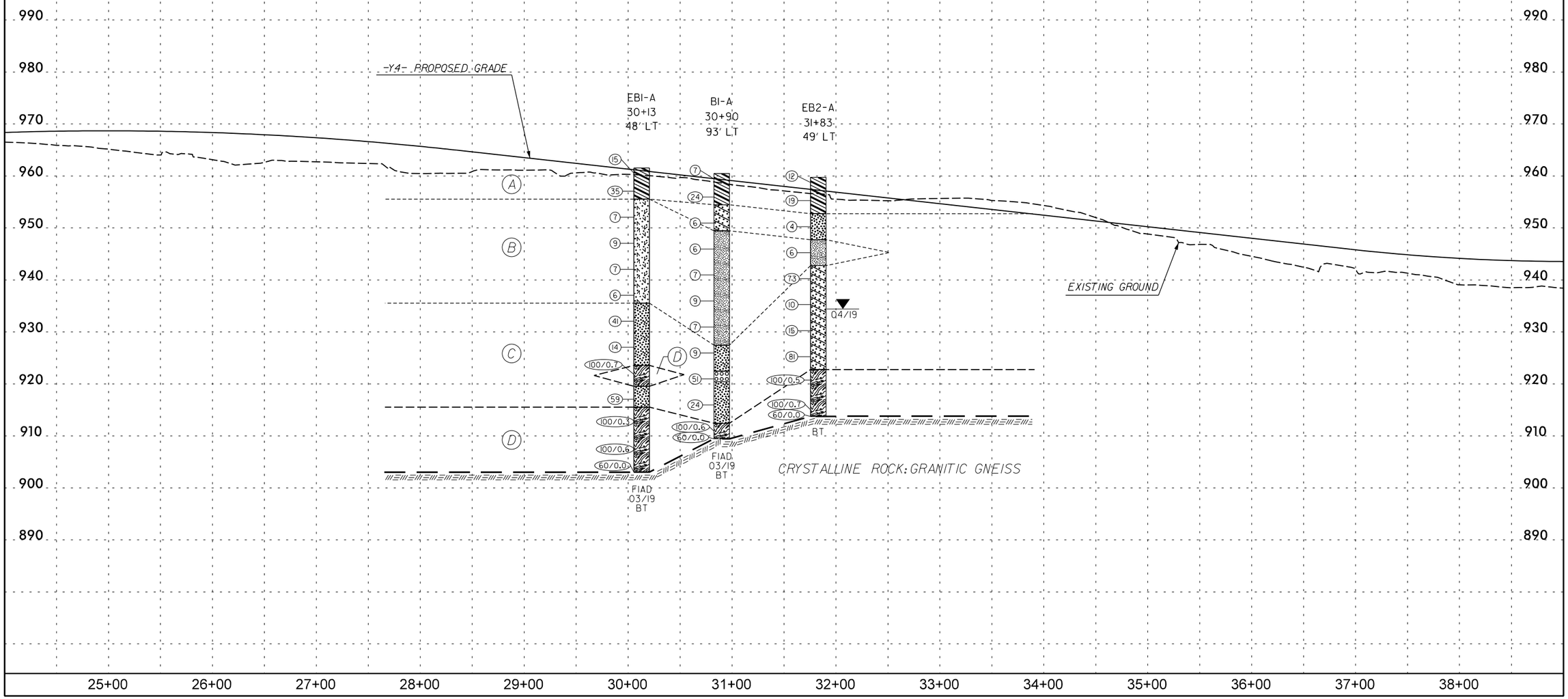
0	100	200
FEET		

VE = 5:1

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

PROFILE ALONG -Y4EB-

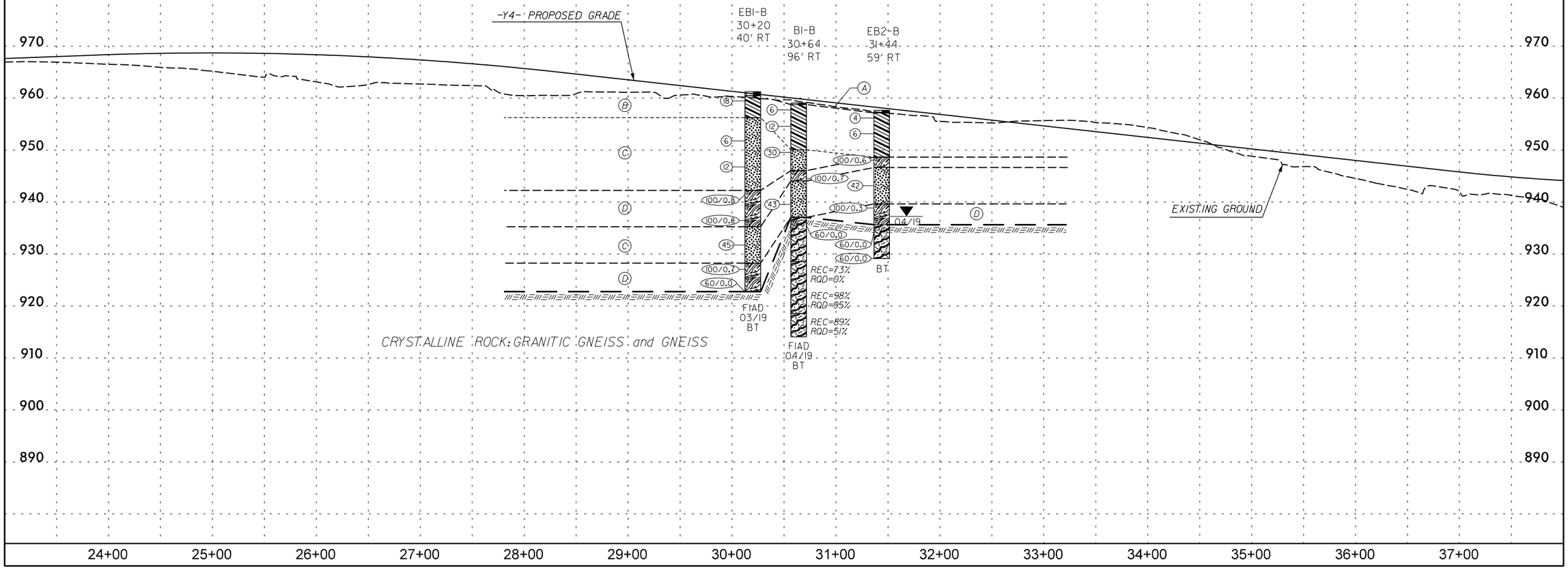
(A) RESIDUAL: Red, medium stiff to hard, silty CLAY and sandy CLAY (A-6), trace mica
(B) RESIDUAL: Orange to brown-red to brown-gray, medium stiff to stiff, sandy SILT and sandy clayey SILT (A-4, A-5), trace mica to moderately micaceous, saprolitic
(C) RESIDUAL: Brown-red to brown to gray-white, loose to very dense, silty fine to coarse SAND (A-2-4, A-2-6) and sandy GRAVEL (A-1-b), trace to some rock fragments, trace mica
(D) WEATHERED ROCK: GRANITIC GNEISS



PROJECT REFERENCE NO.	SHEET NO.
U-2579AB	5
PROFILE ALONG -Y4WB-	

0 100 200
FEET
VE = 5:1

(A) PAVEMENT
(B) RESIDUAL: Red-brown to red, medium stiff to very stiff, silty CLAY and sandy CLAY (A-6)
(C) RESIDUAL: White-red to red-brown to gray, loose to dense, silty fine to coarse SAND (A-2-4), trace mica
(D) WEATHERED ROCK: GRANITIC GNEISS



6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	U-2579AB	6

(A) PAVEMENT
(B) RESIDUAL: Red, medium stiff to hard, silty sandy CLAY and sandy silty CLAY (A-6, A-7-5)
(C) RESIDUAL: Red to red-brown to brown-gray-white, medium stiff to very stiff, sandy clayey SILT, clayey sandy SILT, and fine to coarse sandy SILT (A-4, A-5), trace mica to moderately micaceous, saprolitic
(D) RESIDUAL: Red to brown to gray, loose to dense, silty fine to coarse SAND and clayey fine to coarse SAND (A-2-4, A-2-5, A-2-6), trace mica to moderately micaceous, trace rock fragments, saprolitic
(E) WEATHERED ROCK: GRANITIC GNEISS

EBI-RWA 30+24 135' LT
EBI-A 30+13 48' LT
EBI-C 30+06 10' LT
EBI-B 30+20 40' RT
EBI-RWB 30+03 129' RT

FIAD 03/19 BT

CRYSTALLINE ROCK: GRANITIC GNEISS

NOTE: GROUNDLINE PROFILE TAKEN FROM TIN FILE ALONG LINE OF BENT, SKEW APPROXIMATELY 101°

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

CROSS SECTION ALONG END BENT 1 (STA. 29+86)

5/20/2019
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FKeagle

6/23/16

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

0 5 10

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

1010
1000
990
980
970
960
950
940
930
920
910
900

(A) RESIDUAL: Red to red-brown, medium stiff to hard, sandy and silty CLAY (A-6, A-7-6), trace mica

(B) RESIDUAL: White to brown to red to gray, loose to very dense, silty fine to coarse SAND (A-2-4, A-2-5, A-2-6) and sandy GRAVEL (A-1-b), trace mica to moderately micaceous, trace rock fragments, saprolitic

(C) RESIDUAL: Brown-red to brown-gray to orange, medium stiff to stiff, clayey fine sandy SILT (A-5) and sandy SILT (A-4), trace mica to moderately micaceous, saprolitic

(D) WEATHERED ROCK: GRANITIC GNEISS with layers of crystalline GRANITIC GNEISS

BI-A
30+90
93' LT

BI-E
30+74
57' LT

BI-C
30+74
21' LT

BI-C (II)
30+71
11' LT

BI-D
30+67
36' RT

BI-B
30+64
96' RT

BI-A	BI-E	BI-C	BI-C (II)	BI-D	BI-B
7	12	12		36	6
24	23	24			12
6	18	6		7	30
6	10	9		11	100/0.7
7	8	6	19	60/0.0	43
9	10	100/0.3	100/0.3	100/0.7	
7	13	60/0.0	60/0.0	60/0.1	60/0.0
9	10				
5	7				
24	100/1.0				
100/0.6	60/0.0				
60/0.0					
FIAD 03/19 BT	FIAD 05/19 BT	FIAD 03/19 BT	FIAD 04/19 BT	FIAD 03/19 BT	FIAD 04/19 BT

REC=52%
RQD=43%

REC=48%
RQD=10%

REC=94%
RQD=71%

REC=73%
RQD=0%

REC=98%
RQD=95%

REC=89%
RQD=51%

CRYSTALLINE ROCK: GRANITIC GNEISS and GNEISS

NOTE: GROUNDLINE PROFILE TAKEN FROM TIN FILE ALONG LINE OF BENT, SKEW APPROXIMATELY 101°

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

CROSS SECTION ALONG BENT 1 (STA. 30+68)

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6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	U-2579AB	8

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

1000 990 980 970 960 950 940 930 920 910 900 890

(A) RESIDUAL: Red, medium stiff to hard, sandy silty CLAY and silty sandy CLAY (A-6, A-7-5), trace mica

(B) RESIDUAL: Orange to red to brown-tan-white, medium stiff to very stiff, fine to coarse sandy SILT (A-4, A-5), trace mica to moderately micaceous, saprolitic

(C) RESIDUAL: Red to brown to gray to white, loose to very dense, silty fine to coarse SAND (A-2-4, A-2-5, A-2-6), trace mica, trace rock fragments, saprolitic

(D) WEATHERED ROCK: GRANITIC GNEISS

EB2-RWA
31+71
120' LT

7 18 8 9 8 8 10 11 10 13 13 100/0.3 100/0.7 100/0.5

FIAD
03/19
BT

EB2-A
31+83
49' LT

12 19 4 6 73 10 15 81 100/0.5 100/0.7 60/0.0

04/19

BT

EB2-C
31+57
10' LT

6 38 6 28 27 100/0.4 60/0.0

DRY
04/19
BT

EB2-B
31+44
59' RT

4 6 100/0.6 42 100/0.3 60/0.0 60/0.0

04/19

BT

EB2-RWB
31+22
124' RT

5 3 13 48 100/0.8 60/0.0 60/0.0

04/19

BT

CRYSTALLINE ROCK: GRANITIC GNEISS

NOTE: GROUNDLINE PROFILE TAKEN FROM TIN FILE ALONG LINE OF BENT, SKEW APPROXIMATELY 101°

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

CROSS SECTION ALONG END BENT 2 (STA. 31+50)

5/20/2019
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Pl key

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB1-RWA	**STATION** 30+24	**OFFSET** 135 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 959.1 ft	**TOTAL DEPTH** 60.0 ft	**NORTHING** 854,574	**EASTING** 1,663,695	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/26/19	**COMP. DATE** 03/26/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
960											
	959.1	0.0	3	4	5	9		M		959.1 GROUND SURFACE	0.0
955	955.6	3.5	9	10	10	20		M		**RESIDUAL** Red, silty sandy CLAY (A-7-5)	
										956.1 Red, clayey sandy SILT (A-5)	3.0
950	950.6	8.5	4	3	7	10		W		952.1 Red to red-brown to brown-gray-white, fine to coarse sandy SILT (A-4), trace mica to moderately micaceous, saprolitic	7.0
945	945.6	13.5	3	4	7	11		W			
940	940.6	18.5	4	6	9	15		W			
935	935.6	23.5	4	3	5	8		W			
930	930.6	28.5	3	5	15	20		W			
925	925.6	33.5	5	11	12	23		W			
920	920.6	38.5	3	3	3	6		W			
915	915.6	43.5	4	8	11	19		W		915.1 Red-gray-brown, silty SAND (A-2-4), saprolitic	44.0
910	910.6	48.5	5	6	9	15		W			
905	905.6	53.5	7	7	10	17		W			
900	900.6	58.5	9	100/0.8		100/0.8				900.1 **WEATHERED ROCK** GRANITIC GNEISS	59.0
	899.1	60.0	60/0.0			60/0.0				899.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 899.1 ft on Crystalline Rock: GRANITIC GNEISS	60.0

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 30+13	**OFFSET** 48 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 961.6 ft	**TOTAL DEPTH** 58.5 ft	**NORTHING** 854,491	**EASTING** 1,663,719	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/29/19	**COMP. DATE** 03/29/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
965											
	961.6	0.0	9	7	8	15		M		961.6 GROUND SURFACE	0.0
960	958.1	3.5	14	23	12	35		M		**RESIDUAL** Red, sandy CLAY (A-6)	
955	953.1	8.5	3	3	4	7		M		955.6 Red-brown to red-white, sandy clayey SILT (A-5), trace to little mica	6.0
950	948.1	13.5	4	4	5	9		M			
945	943.1	18.5	3	3	4	7		W			
940	938.1	23.5	4	2	4	6		W			
935	933.1	28.5	6	21	20	41		W		935.6 Light gray, silty fine SAND (A-2-4), trace rock fragments	26.0
930	928.1	33.5	4	6	8	14		W			
925	923.1	38.5	12	100/0.7		100/0.7		W		923.6 **WEATHERED ROCK** GRANITIC GNEISS	38.0
920	918.1	43.5	30	40	19	59		Sat		919.6 **RESIDUAL** Dark gray, silty fine to coarse SAND (A-2-4)	42.0
915	913.1	48.5	100/0.3			100/0.3				915.6 **WEATHERED ROCK** GRANITIC GNEISS	46.0
910	908.1	53.5	100/0.6			100/0.6					
905	903.1	58.5	60/0.0			60/0.0				903.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 903.1 ft on Crystalline Rock: GRANITIC GNEISS	58.5

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 30+06	**OFFSET** 10 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 961.6 ft	**TOTAL DEPTH** 34.7 ft	**NORTHING** 854,453	**EASTING** 1,663,728	**24 HR.** 26.2
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/28/19	**COMP. DATE** 03/28/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										961.6 GROUND SURFACE	0.0
	961.6	0.0	3	6	6	12		M		**RESIDUAL** Red, sandy CLAY (A-6)	
	958.1	3.5	9	9	10	19		M			
	953.1	8.5	3	4	4	8		W		954.6 Brown-red to gray, silty SAND (A-2-5), moderately micaceous, saprolitic	7.0
	948.1	13.5	3	3	3	6		W			
	943.1	18.5	100/0.7			100/0.7				943.6 **WEATHERED ROCK** GRANITIC GNEISS	18.0
	938.1	23.5	100/0.8			100/0.8					
	933.1	28.5	11	100/1.0		100/1.0					
	929.1	32.5	14	100/0.7		100/0.7				926.9 Boring Terminated at Elevation 926.9 ft in Weathered Rock: GRANITIC GNEISS	34.7

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 30+20	**OFFSET** 40 ft RT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 961.3 ft	**TOTAL DEPTH** 38.5 ft	**NORTHING** 854,413	**EASTING** 1,663,761	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/27/19	**COMP. DATE** 03/27/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										961.3 GROUND SURFACE	0.0
	960.5	0.8	7	8	10	18		W		960.5 **ROADWAY EMBANKMENT** Pavement	0.8
										RESIDUAL Red, silty sandy CLAY (A-6)	
	952.8	8.5	3	2	4	6		W		956.3 Red-brown to gray-brown-white, silty SAND (A-2-4), trace mica	5.0
	947.8	13.5	5	4	8	12		W			
	942.8	18.5	34	100/0.8		100/0.8				942.3 **WEATHERED ROCK** GRANITIC GNEISS	19.0
	937.8	23.5	14	100/0.8		100/0.8					
	932.8	28.5	39	30	15	45		Sat		935.3 **RESIDUAL** Gray, silty SAND (A-2-4)	26.0
	927.8	33.5	100/0.7			100/0.7				928.3 **WEATHERED ROCK** GRANITIC GNEISS	33.0
	922.8	38.5	60/0.0			60/0.0				922.8 Boring Terminated with Standard Penetration Test Refusal at Elevation 922.8 ft on Crystalline Rock: GRANITIC GNEISS	38.5

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB1-RWB	**STATION** 30+03	**OFFSET** 129 ft RT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 960.8 ft	**TOTAL DEPTH** 34.0 ft	**NORTHING** 854,325	**EASTING** 1,663,782	**24 HR.** 23.5
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/29/19	**COMP. DATE** 03/29/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
965											
960	960.3	0.5	2	2	3	5 21		M		960.8 GROUND SURFACE	0.0
										960.3 **ROADWAY EMBANKMENT** Pavement	0.5
	957.3	3.5	6	9	12			M		**RESIDUAL** Red, sandy silty CLAY (A-6)	
955										954.8	6.0
	952.3	8.5	4	6	8	14		W		Red to pink to brown-red, sandy clayey SILT (A-5), some mica to moderately micaceous, saprolitic	
950											
	947.3	13.5	3	4	7	11		W			
945											
	942.3	18.5	4	4	6	10		W			
940										939.8	21.0
	937.3	23.5	6	14	11	25		W		Brown-red-gray, silty clayey fine to coarse SAND (A-2-6)	
935											
	932.3	28.5	100/0.9			100/0.9				932.8	28.0
930										**WEATHERED ROCK** GRANITIC GNEISS	
	927.3	33.5	60/0.0			60/0.0				927.8	33.0
	926.8	34.0	60/0.0							926.8 **CRYSTALLINE ROCK** GRANITIC GNEISS	34.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 926.8 ft in Crystalline Rock: GRANITIC GNEISS	

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 30+90	**OFFSET** 93 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 960.5 ft	**TOTAL DEPTH** 51.0 ft	**NORTHING** 854,563	**EASTING** 1,663,772	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/26/19	**COMP. DATE** 03/26/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
965											
960	960.5	0.0	3	3	4	7 24		M		960.5 GROUND SURFACE	0.0
										RESIDUAL Red, silty CLAY (A-6), trace mica	
	957.0	3.5	9	12	12			W		954.5	6.0
955										Brown, silty fine to coarse SAND (A-2-6)	
	952.0	8.5	2	3	3	6		W			
950										949.5	11.0
	947.0	13.5	4	2	4	6		W		Brown-red to brown-gray, sandy SILT (A-4), little mica to moderately micaceous, saprolitic	
945											
	942.0	18.5	3	2	5	7		W			
940											
	937.0	23.5	4	4	5	9		W			
935											
	932.0	28.5	2	3	4	7		W			
930											
	927.0	33.5	3	3	6	9		W		927.5	33.0
925										Gray-white, silty SAND (A-2-4)	
	922.0	38.5	20	26	25	51		W		922.5	38.0
920										Gray-white, sandy GRAVEL (A-1-b)	
	917.0	43.5	22	11	13	24		W		920.5	40.0
915										Gray, silty coarse SAND (A-2-4), some rock fragments	
	912.0	48.5	100/0.6			100/0.6				912.5	48.0
910	909.5	51.0	60/0.0			60/0.0				**WEATHERED ROCK** GRANITIC GNEISS	
										909.5	51.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 909.5 ft on Crystalline Rock: GRANITIC GNEISS	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-E	**STATION** 30+74	**OFFSET** 57 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 961.9 ft	**TOTAL DEPTH** 50.0 ft	**NORTHING** 854,523	**EASTING** 1,663,772	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TER373 DIEDRICH D-50 99% 03/24/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER J. Turney	**START DATE** 05/16/19	**COMP. DATE** 05/16/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
965										
	961.9	0.0								961.9 / 0.0 GROUND SURFACE
	961.4	0.5								**ARTIFICIAL FILL** GRAVEL
960	958.4	3.5	6	5	7	12		M		958.9 / 3.0 **RESIDUAL** Red, silty CLAY (A-7-6)
			8	9	14	23		M		Red to brown-red to orange, clayey fine sandy SILT (A-5), trace mica, saprolitic
955	953.4	8.5	5	8	10	18				
950	948.4	13.5	3	4	6	10				
945	943.4	18.5	2	3	5	8				940.9 / 21.0 Brown, fine sandy SILT (A-4), little mica, saprolitic
940	938.4	23.5	4	4	6	10				
935	933.4	28.5	4	6	7	13				
930	928.4	33.5	3	4	6	10				
925	923.4	38.5	2	3	4	7				925.9 / 36.0 Tan, silty fine SAND (A-2-5)
920	918.4	43.5	12	88/0.5		100/1.0				917.9 / 44.0 **WEATHERED ROCK** GRANITIC GNEISS
915	911.9	50.0	60/0.0			60/0.0				912.4 / 49.5 911.9 / 50.0 **CRYSTALLINE ROCK** GRANITIC GNEISS Boring Terminated with Standard Penetration Test Refusal at Elevation 911.9 ft in Crystalline Rock: GRANITIC GNEISS

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 30+74	**OFFSET** 21 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 961.3 ft	**TOTAL DEPTH** 28.2 ft	**NORTHING** 854,491	**EASTING** 1,663,786	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/28/19	**COMP. DATE** 03/28/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
965										
	961.3	0.0								961.3 / 0.0 GROUND SURFACE
960	957.8	3.5	9	5	7	12		M		**RESIDUAL** Red, sandy CLAY (A-6)
			9	12	12	24		M		
955	952.8	8.5	4	3	3	6		W		954.3 / 7.0 Brown-red-gray, silty SAND (A-2-5)
950	947.8	13.5	4	4	5	9		W		949.3 / 12.0 Brown-red, sandy SILT (A-4), some mica, saprolitic
945	942.8	18.5	2	3	3	6		W		944.3 / 17.0 Gray-brown, silty SAND (A-2-5), moderately micaceous, saprolitic
940	937.8	23.5	100/0.3			100/0.3				939.3 / 22.0 **WEATHERED ROCK** GRANITIC GNEISS
935	933.1	28.2	60/0.0			60/0.0				933.1 / 28.2 Boring Terminated with Standard Penetration Test Refusal at Elevation 933.1 ft on Crystalline Rock: GRANITIC GNEISS

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-C (II)	**STATION** 30+71	**OFFSET** 11 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 960.7 ft	**TOTAL DEPTH** 50.5 ft	**NORTHING** 854,481	**EASTING** 1,663,788	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 04/02/19	**COMP. DATE** 04/02/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										960.7	0.0
										GROUND SURFACE	
										RESIDUAL Red, sandy CLAY (A-6)	
										953.7	7.0
										Brown-red-gray, silty SAND (A-2-5)	
										948.7	12.0
										Brown-red, sandy SILT (A-4)	
	942.7	18.0	4	3	16	19		W		942.7	18.0
										RESIDUAL Dark gray, silty SAND (A-2-4), trace mica, saprolitic	
	937.7	23.0								938.7	22.0
	936.2	24.5	100/0.3			100/0.3				**WEATHERED ROCK** GRANITIC GNEISS	24.0
			60/0.0			60/0.0				**CRYSTALLINE ROCK** GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close to very close fracture spacing REC=63% RQD=38%	
										930.2	30.5
										GRANITIC GNEISS, slightly to moderately weathered, hard to medium hard, close to very close fracture spacing REC=48% RQD=10%	
										919.2	41.5
										GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close fracture spacing REC=94% RQD=71%	
										910.2	50.5
										Boring Terminated at Elevation 910.2 ft in Crystalline Rock: GRANITIC GNEISS	

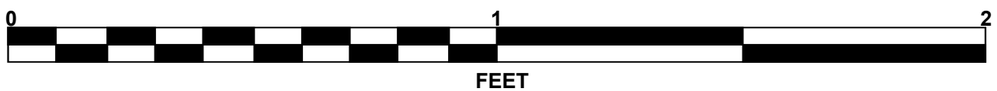
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-C (II)	**STATION** 30+71	**OFFSET** 11 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 960.7 ft	**TOTAL DEPTH** 50.5 ft	**NORTHING** 854,481	**EASTING** 1,663,788	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 04/02/19	**COMP. DATE** 04/02/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 26.0 ft			

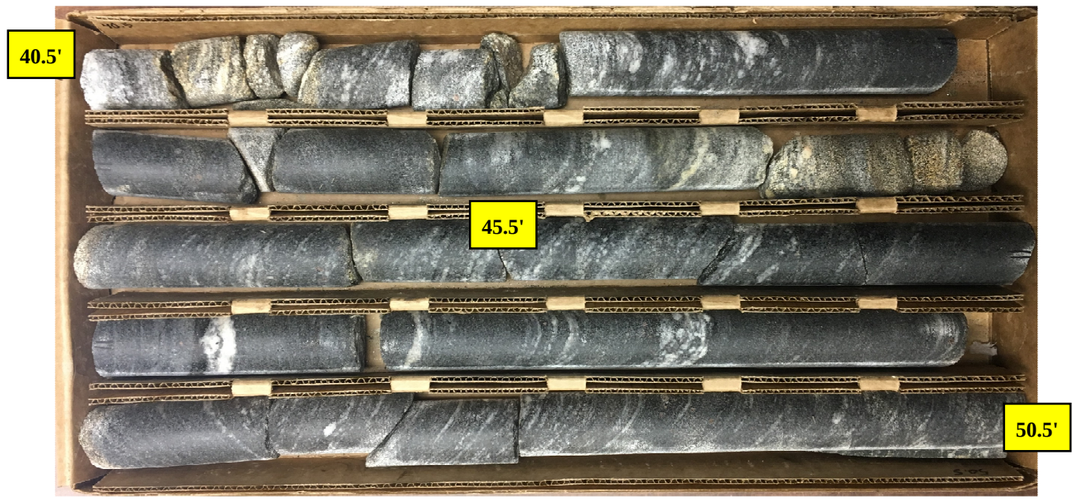
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
936.19											Begin Coring @ 24.5 ft	
935	936.2	24.5	1.0	*N=60/0.0*	(0.8)	(0.8)					**CRYSTALLINE ROCK** GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close to very close fracture spacing *(continued)*	
	935.2	25.5	5.0	2:15/1.0 2:18/1.0 0:47/1.0 0:07/1.0 0:12/1.0	83% (2.3) 47%	75% (1.8) 35%						
930	930.2	30.5	5.0	0:47/1.0 0:45/1.0 0:18/1.0 0:24/1.0 0:24/1.0	(0.8) 17%	(0.0) 0%		(5.3) 48%	(1.1) 10%		930.2	30.5
925	925.2	35.5	5.0	0:43/1.0 1:13/1.0 1:00/1.0 1:54/1.0 2:08/1.0	(3.3) 67%	(0.4) 8%					GRANITIC GNEISS, slightly to moderately weathered, hard to medium hard, close to very close fracture spacing	
920	920.2	40.5	5.0	2:25/1.0 2:18/1.0 2:49/1.0 2:16/1.0 2:26/1.0	(4.7) 93%	(2.8) 56%		(8.5) 94%	(6.4) 71%		919.2	41.5
915	915.2	45.5	5.0	2:45/1.0 2:16/1.0 2:24/1.0 2:37/1.0 2:23/1.0	(5.0) 100%	(3.3) 66%					GRANITIC GNEISS, very slight to slightly weathered, very hard to hard, close fracture spacing	
	910.2	50.5									910.2	50.5
											Boring Terminated at Elevation 910.2 ft in Crystalline Rock: GRANITIC GNEISS	

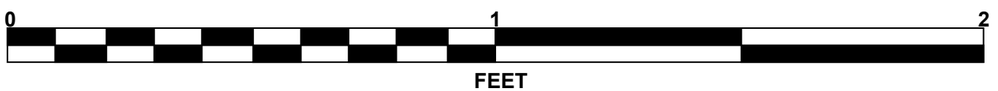
CORE PHOTOGRAPHS

B1-C (II)
BOX 1 OF 2: 24.5 - 40.5 FEET



B1-C (II)
BOX 2 OF 2: 40.5 - 50.5 FEET





GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-D	**STATION** 30+67	**OFFSET** 36 ft RT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 960.3 ft	**TOTAL DEPTH** 28.6 ft	**NORTHING** 854,436	**EASTING** 1,663,802	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/27/19	**COMP. DATE** 03/27/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
965											
960	959.5	0.8	11	16	20	36		M		960.3 GROUND SURFACE	0.0
										959.5 **ROADWAY EMBANKMENT** Pavement	0.8
955										**RESIDUAL** Red, sandy silty CLAY (A-6)	
	951.8	8.5	3	3	4	7		W		955.3 Red to gray, silty SAND (A-2-5)	5.0
950											
	946.8	13.5	5	4	7	11		W			
945											
	941.8	18.5	60/0.0			60/0.0				942.3 **CRYSTALLINE ROCK** GRANITIC GNEISS	18.0
940										940.3 **WEATHERED ROCK** GRANITIC GNEISS	20.0
	936.8	23.5	100/0.7			100/0.7					
935											
	931.8	28.5	60/0.1			60/0.1				931.8 **CRYSTALLINE ROCK** GRANITIC GNEISS	28.5
										931.7 Boring Terminated with Standard Penetration Test Refusal at Elevation 931.7 ft in Crystalline Rock: GRANITIC GNEISS	28.6

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 30+64	**OFFSET** 96 ft RT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 959.1 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 854,379	**EASTING** 1,663,824	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 04/02/19	**COMP. DATE** 04/02/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
960											
	958.8	0.3	3	2	4	6		M		959.1 GROUND SURFACE	0.0
955	955.6	3.5	3	5	7	12		W		958.8 **ROADWAY EMBANKMENT** Pavement	0.3
										RESIDUAL Red-brown, sandy CLAY (A-6)	
950	950.6	8.5	5	17	13	30		W		950.1 White-red, silty fine to coarse SAND (A-2-4)	9.0
	945.6	13.5	100/0.7			100/0.7				946.1 **WEATHERED ROCK** 944.1 GRANITIC GNEISS	13.0 15.0
945										**RESIDUAL** White-tan, silty coarse SAND (A-2-4)	
940	940.6	18.5	11	22	21	43		W		937.1 **CRYSTALLINE ROCK** GRANITIC GNEISS, moderately weathered, moderately hard to hard, close to very close fracture spacing REC=73% RQD=0%	22.0
	935.6	23.5	60/0.0			60/0.0				928.6 GNEISS, fresh to very slighty weathered, hard, wide to close fracture spacing REC=98% RQD=95%	30.5
935											
930											
925											
920										918.6 GNEISS, fresh to very slighty weathered, hard, close fracture spacing REC=89% RQD=51%	40.5
915										914.1 Boring Terminated at Elevation 914.1 ft in Crystalline Rock: GNEISS	45.0

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 30+64	**OFFSET** 96 ft RT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 959.1 ft	**TOTAL DEPTH** 45.0 ft	**NORTHING** 854,379	**EASTING** 1,663,824	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 04/02/19	**COMP. DATE** 04/02/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ	**TOTAL RUN** 21.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
935.58											Begin Coring @ 23.5 ft
935	935.6	23.5	2.0	*N=60/0.0* 5:38/1.0 1:52/1.0	(1.5) 75%	(0.0) 0%					**CRYSTALLINE ROCK** GRANITIC GNEISS, moderately weathered, moderately hard to hard, close to very close fracture spacing *(continued)*
	933.6	25.5									
930			5.0	1:54/1.0 1:36/1.0 0:54/1.0 1:34/1.0 2:39/1.0	(3.6) 72%	(0.0) 0%					
	928.6	30.5									ELEV. (ft) 928.6 DEPTH (ft) 30.5
925			5.0	0:52/1.0 1:00/1.0 1:19/1.0 4:01/1.0 2:21/1.0	(4.8) 96%	(4.5) 90%		(9.8) 98%	(9.5) 95%		GNEISS, fresh to very slighty weathered, hard, wide to close fracture spacing
	923.6	35.5									
920			5.0	1:22/1.0 1:56/1.0 2:09/1.0 2:46/1.0 3:00/1.0	(5.0) 100%	(5.0) 100%					
	918.6	40.5									ELEV. (ft) 918.6 DEPTH (ft) 40.5
915			4.5	3:49/1.0 3:32/1.0 2:06/1.0 2:31/1.0 1:30/0.5	(4.0) 89%	(2.3) 51%		(4.0) 89%	(2.3) 51%		GNEISS, fresh to very slighty weathered, hard, close fracture spacing
	914.1	45.0									ELEV. (ft) 914.1 DEPTH (ft) 45.0
											Boring Terminated at Elevation 914.1 ft in Crystalline Rock: GNEISS

CORE PHOTOGRAPHS

B1-B
BOX 1 OF 2: 23.5 - 33.5 FEET

0 1 2
FEET

B1-B
BOX 2 OF 2: 33.5 - 45.0 FEET

0 1 2
FEET

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB2-RWA	**STATION** 31+71	**OFFSET** 120 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 959.8 ft	**TOTAL DEPTH** 64.0 ft	**NORTHING** 854,620	**EASTING** 1,663,835	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/26/19	**COMP. DATE** 03/26/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
960											
	959.8	0.0	2	3	4	7 18		M		959.8 GROUND SURFACE	0.0
										RESIDUAL Red, silty CLAY (A-7-5), trace mica	
	956.3	3.5								956.8	3.0
955			10	9	9			M		Red to brown-orange-white, fine sandy SILT (A-5), some mica to moderately micaceous	
	951.3	8.5									
950			3	3	5	8		M			
	946.3	13.5									
945			4	4	5	9		M			
	941.3	18.5									
940			3	4	4	8		M			
	936.3	23.5									
935			4	3	5	8		M			
	931.3	28.5								932.8	27.0
930			7	5	5	10		W		Brown-red-white, silty coarse SAND (A-2-4)	
	926.3	33.5								927.8	32.0
925			3	5	6	11		W		Brown to brown-tan-white, fine to coarse sandy SILT (A-5), trace mica to moderately micaceous, saprolitic	
	921.3	38.5									
920			4	4	6	10		W			
	916.3	43.5									
915			15	6	7	13		W			
	911.3	48.5									
910			4	4	9	13		W			
	906.3	53.5	100/0.3			100/0.3				906.8	53.0
905										**WEATHERED ROCK** GRANITIC GNEISS	
	901.3	58.5	100/0.7			100/0.7					
900											
	896.3	63.5	100/0.5			100/0.5				895.8	64.0
										Boring Terminated at Elevation 895.8 ft in Weathered Rock: GRANITIC GNEISS	

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 31+83	**OFFSET** 49 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 959.8 ft	**TOTAL DEPTH** 46.0 ft	**NORTHING** 854,560	**EASTING** 1,663,875	**24 HR.** 25.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/28/19	**COMP. DATE** 03/28/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
960											
	959.8	0.0	4	4	8	12 19		M		959.8 GROUND SURFACE	0.0
										RESIDUAL Red, silty sandy CLAY (A-6)	
	956.3	3.5								952.8	7.0
955			9	10	9			W		Brown-red, silty SAND (A-2-4)	
	951.3	8.5									
950			3	1	3	4		W			
	946.3	13.5								947.8	12.0
945			2	3	3	6		W		Orange, sandy SILT (A-4)	
	941.3	18.5									
940			10	8	65	73		W			
	936.3	23.5								942.8	17.0
935			9	5	5	10		W		Gray to brown-red to dark gray, silty fine to coarse SAND (A-2-6), trace mica	
	931.3	28.5									
930			6	5	10	15		W			
	926.3	33.5									
925			35	33	48	81		W			
	921.3	38.5	100/0.5			100/0.5				922.8	37.0
920										**WEATHERED ROCK** GRANITIC GNEISS	
	916.3	43.5									
915			26	100/0.7		100/0.7					
	913.8	46.0	60/0.0			60/0.0				913.8	46.0
										Boring Terminated with Standard Penetration Test Refusal at Elevation 913.8 ft on Crystalline Rock: GRANITIC GNEISS	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB2-C	**STATION** 31+57	**OFFSET** 10 ft LT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 958.9 ft	**TOTAL DEPTH** 28.0 ft	**NORTHING** 854,514	**EASTING** 1,663,867	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 03/28/19	**COMP. DATE** 03/28/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION / ELEV. (ft)	DEPTH (ft)
960											
	958.9	0.0	5	3	3	6		M		958.9 GROUND SURFACE	0.0
955	955.4	3.5	21	18	20	38		W		**RESIDUAL** Red, sandy silty CLAY (A-6)	
	950.4	8.5	3	2	4	6		W		951.9	7.0
950										Red-black to brown-gray, silty SAND (A-2-6), trace mica, trace rock fragments, saprolitic	
	945.4	13.5	9	9	19	28		W			
945											
	940.4	18.5	5	5	22	27		W		936.9	22.0
940										**WEATHERED ROCK** GRANITIC GNEISS	
	935.4	23.5	100/0.4			100/0.4					
935											
	930.9	28.0	60/0.0			60/0.0				930.9	28.0
930										Boring Terminated with Standard Penetration Test Refusal at Elevation 930.9 ft on Crystalline Rock: GRANITIC GNEISS	

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 31+44	**OFFSET** 59 ft RT	**ALIGNMENT** Y4	**0 HR.** N/A
COLLAR ELEV. 957.7 ft	**TOTAL DEPTH** 28.5 ft	**NORTHING** 854,446	**EASTING** 1,663,882	**24 HR.** 20.4
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER T. Donahue	**START DATE** 04/01/19	**COMP. DATE** 04/01/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION / ELEV. (ft)	DEPTH (ft)
960											
	957.2	0.5	3	2	2	4		M		957.7 GROUND SURFACE	0.0
955	954.2	3.5	3	3	3	6		W		957.2 **ROADWAY EMBANKMENT** Pavement	0.5
	949.2	8.5	6	100/0.6		100/0.6				**RESIDUAL** Red, sandy CLAY (A-6)	
950								W		948.7	9.0
	944.2	13.5	18	26	16	42				**WEATHERED ROCK** GRANITIC GNEISS	
945										946.7	11.0
	939.2	18.5	100/0.3			100/0.3		W		**RESIDUAL** Dark gray, silty SAND (A-2-4)	
940										939.7	18.0
	934.2	23.5	60/0.0			60/0.0				**WEATHERED ROCK** GRANITIC GNEISS	
935										935.7	22.0
	929.2	28.5	60/0.0							**CRYSTALLINE ROCK** GRANITIC GNEISS	
930										929.2	28.5
										Boring Terminated with Standard Penetration Test Refusal at Elevation 929.2 ft in Crystalline Rock: GRANITIC GNEISS	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34839.1.8	**TIP** U-2579AB	**COUNTY** FORSYTH	**GEOLOGIST** P. Cary	
SITE DESCRIPTION Bridge No. 723 on SR 4315 over Winston-Salem Northern Beltway				**GROUND WTR (ft)**
BORING NO. EB2-RWB	**STATION** 31+22	**OFFSET** 124 ft RT	**ALIGNMENT** Y4	**0 HR.** 17
COLLAR ELEV. 957.4 ft	**TOTAL DEPTH** 28.5 ft	**NORTHING** 854,377	**EASTING** 1,663,888	**24 HR.** 22.1
DRILL RIG/HAMMER EFF./DATE GET0674 CME-45C 93% 03/22/2018		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER T. Donahue	**START DATE** 04/01/19	**COMP. DATE** 04/01/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
960											
	956.9	0.5	3	3	2	5		M		957.4 GROUND SURFACE	0.0
955										956.9 **ROADWAY EMBANKMENT** Pavement	0.5
	953.9	3.5	1	2	1	3		W		**RESIDUAL** Red, sandy CLAY (A-6), trace mica	
950											
	948.9	8.5	5	6	7	13		W			
945										946.4	11.0
	943.9	13.5	14	16	32	48		W		Red-white, silty coarse SAND (A-2-4), trace rock fragments, saprolitic	
940											
	938.9	18.5	100/0.8			100/0.8				939.4 **WEATHERED ROCK** GRANITIC GNEISS	18.0
935											
	933.9	23.5	60/0.0			60/0.0				934.4 **CRYSTALLINE ROCK** GRANITIC GNEISS	23.0
930											
	928.9	28.5	60/0.0			60/0.0				928.9 Boring Terminated with Standard Penetration Test Refusal at Elevation 928.9 ft in Crystalline Rock: GRANITIC GNEISS	28.5