REFERENCE: B-5895

PROJECT: 48088

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5895	1	33

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MADISON

PROJECT DESCRIPTION REPLACE BRDG #0067 ON US-25/70 OVER THE FRENCH BROAD RIVER

CONTENTS

CAUTION NOTICE

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

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PERSONNEL

-NCDOT-

DC CHEEK

CJ COFFEY

CD JOHNSON

DC ELLIOTT

INVESTIGATED BY NCDOT GEU /DCE

DRAWN BY DC ELLIOTT

CHECKED BY JC KUHNE

SUBMITTED BY JC KUHNE

DATE

NORTH CAROLINA LICENSED SEAL 2376 GEOLOGIST D CLAYTON ELLIOTT

DocuSigned by:
D. Clayton Elliott
FD421F60CB0E40E...

10/26/2020

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-5895	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [X] 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
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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: MULTIPLE : SEE BELOW IN NOTES

ELEVATION: *see below* FEET

NOTES:

-BL-1- : N--801995.4316, E--867684.6623, ELEV=1333.17, -BL-STA 11+63.14

-BL-2- : N--801969.6447, E--868231.0760, ELEV=1343.52, -BL-STA 17+10.16

-BY-5- : N--801930.6311, E--868178.8087, ELEV=1317.72, -BY-STA 6+85.50

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-5895	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

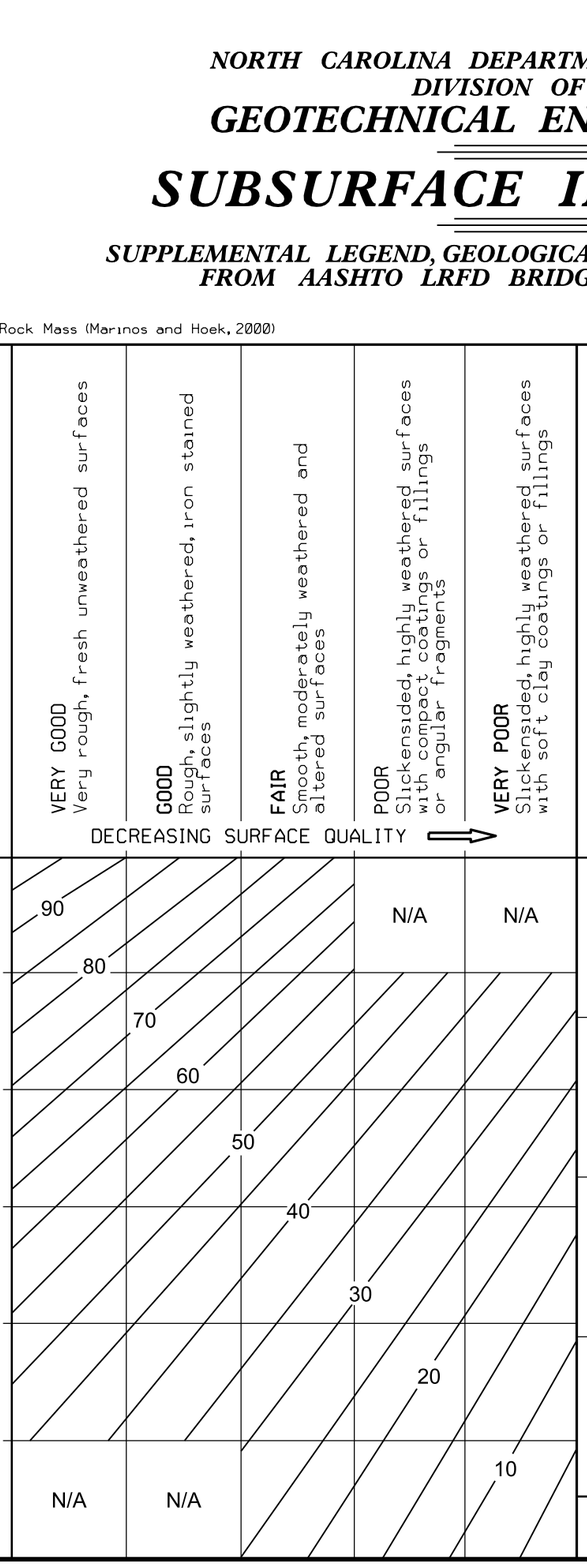
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

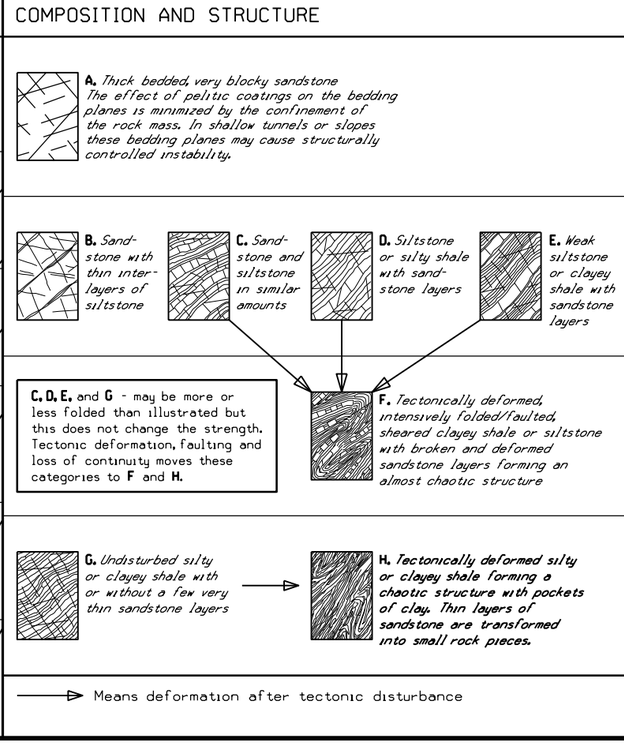


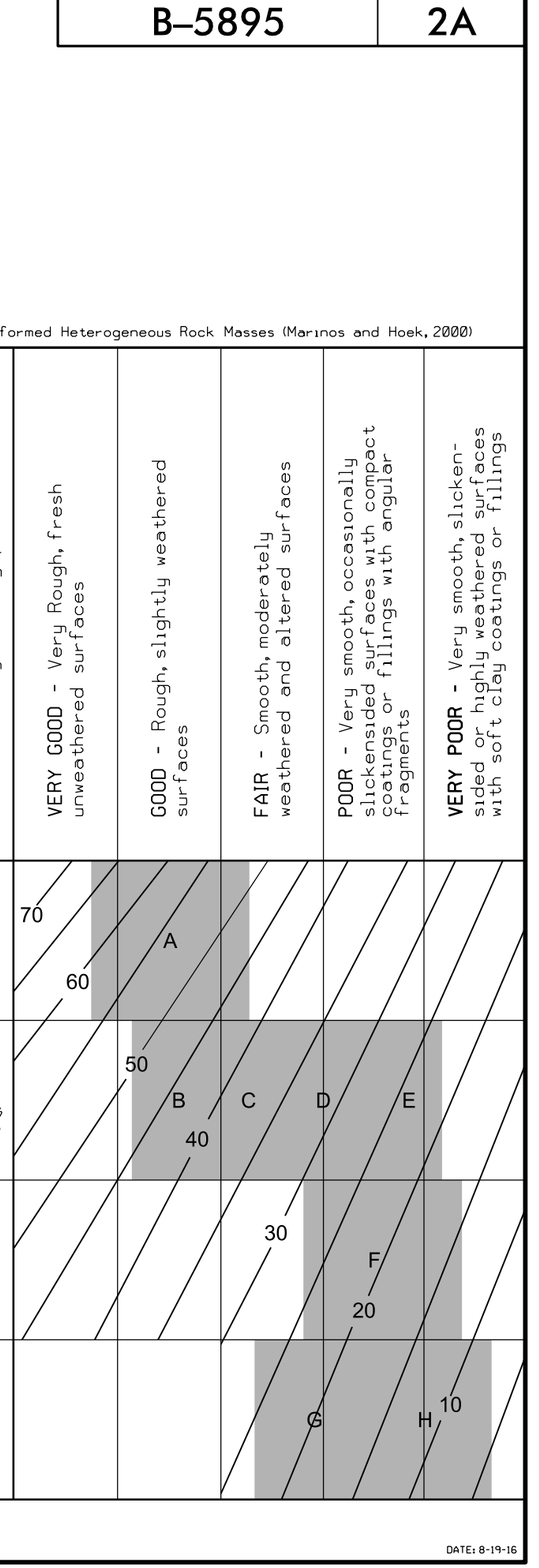
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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.
B-5895	3

SITE PLAN

0 50 100
FEET

SKEW : 65 DEGREES

NAD 83/NA 2011

FRENCH BROAD RIVER

SR 1304 RIVER ROAD

US-25/70 BRIDGE ST

BEGIN BRIDGE
-L- STA. 17+57.29

END BRIDGE
-L- STA. 23+20.45

EB1-C
17+57
0.0' CL

EB1-B
17+68
23' RT

B1-A
18+98
38' LT

B2-A
20+38
38' LT

B3-A
21+68
23' LT

B3-C
21+82
0.0' CL

B3-B
(ALT)
21+88
19' RT

B3-B
21+90
23' RT

EB2-A
23+13
34' LT

EB2-B
(RW-1)
23+12
35' RT

BRIDGE SEAT
1325.31'

BRIDGE SEAT
1325.96'

BRIDGE SEAT
1336.00'

BRIDGE SEAT
1336.13'

BL-1

BL-2

BY-4

BY-5

RETAINING WALL

RET WALL

SILVERMINE RD.

ISFD

2 SFD

S

ISFD & WD DECK

8" CLAY

BST

GR

FSS

SS

JS

W

17

20

22

PROJECT REFERENCE NO.	SHEET NO.
B-5895	4
–L– BRDG 0067 : STA 17+50 – 20+40	

0 20 40
FEET
VE = 1:1

A ARTIFICIAL FILL: LOOSE SANDY-SILT, w/ a little PEBBLES/GRAVELS/COBBLES & trace of ORG'S

B SAPROLITE: DENSE SANDY-SILT

EB1-C
17+57
@ CL, 0.0'

B1-A
18+98
38' RT

B2-A
20+38
38' RT

EXISTING GROUND

APPROX. WATER SURFACE 07/29/2019

ALLUVIUM: MED DENSE SILTY-SAND w/ COBBLES

ALLUVIUM: COURSE SAND w/ COBBLES/BOULDERS

ALLUVIUM: MED. DENSE to VERY DENSE SILTY, FINE-to-COURSE SAND, w/ GRAVELS & COBBLES/BOULDERS

NON-CRYSTALLINE ROCK: SHADY DOLOMITE

7
27
60/0.0
60/0.0
27
100/0.9
60/0.0
60/0.0

B.T.@ 21.6' IN NON-CRYSTALLINE ROCK

B.T.@ 35.9' IN NON-CRYSTALLINE ROCK

B.T.@ 33.6' IN NON-CRYSTALLINE ROCK

MATCH LINE 20+40

1,350 1,340 1,330 1,320 1,310 1,300 1,290 1,280 1,270 1,260 1,250 1,240 1,230 1,220 1,210 1,200

17+60 17+80 18+00 18+20 18+40 18+60 18+80 19+00 19+20 19+40 19+60 19+80 20+00 20+20 20+40

PROFILE ALONG –L–

PROJECT REFERENCE NO.	SHEET NO.
B-5895	5
–L– BRDG 0067 : STA 20+40 – 23+30	

0 20 40
FEET
VE = 1:1

A SAPROLITE: DENSE CLAYEY-SILT, w/ ROCK FRAGS

B WEATHERED ROCK: BLUE-GRAY SHADY DOLOMITE

C ROADWAY EMBANKMENT: SOFT SANDY-SILT, w/ trace CLAY & some COBBLES

EB2-A
23+13
34' RT

B3-A
21+68
23' LT

MATCH LINE 20+40

EXISTING GROUND

APPROX. WATER SURFACE 07/29/2019

ALLUVIUM: MED DENSE to VERY DENSE SILTY, FINE-to-COURSE SAND, w/ GRAVELS & COBBLES/BOULDERS

ALLUVIUM: SAND, GRAVELS, BOULDERS (AI)

ALLUVIUM: SANDY-SILT w/ PEBBLES; SANDY w/ GRAVELS, COBBLES at depth

NON-CRYSTALLINE ROCK w/ SEAMS of CLAY IN-FILL: SHADY DOLOMITE

NON-CRYSTALLINE ROCK w/ SEAMS of CLAY IN-FILL: SHADY DOLOMITE

B.T.@ 46.2' ON NON-CRYSTALLINE ROCK

B.T.@ 89.3' IN NON-CRYSTALLINE ROCK

PROFILE ALONG –L–

1,360 1,350 1,340 1,330 1,320 1,310 1,300 1,290 1,280 1,270 1,260 1,250 1,240 1,230 1,220 1,210 1,200

20+40 20+60 20+80 21+00 21+20 21+40 21+60 21+80 22+00 22+20 22+40 22+60 22+80 23+00 23+20

SKEW = 65 DEG.

A ROADWAY EMBANKMENT: LOOSE SILTY, FINE to COURSE SAND w/ a few PEBBLES/GRAVELS & trace of CLAY

B ARTIFICIAL FILL: LOOSE SANDY-SILT, w/ a little PEBBLES/GRAVELS/COBBLES & trace of ORG'S

AS-STAKED EB1-A

AS-STAKED EB1-B

EB1-C
17+57
@ CL, 0.0'

EB2-B
17+68
23' RT

EXISTING GROUND

ALLUVIUM: MED DENSE SILTY-SAND, w/ a little COBBLES

7

27

60/0.0

60/0.0

NON-CRYSTALLINE ROCK: SHADY DOLOMITE

B.T.@ 21.6' IN NON-CRYSTALLINE ROCK

5

100/0.8

100/0.7

WOR

100/0.8

60/0.0

ALLUVIUM: SANDY-SILT, w/ VARIABLE AMOUNTS of GRAVELS & COBBLES/BOULDERS

SEVERAL BOULDERS @ 8.0'-18.8'

WEATHERED ROCK

NON-CRYSTALLINE ROCK: SHADY DOLOMITE

B.T.@ 28.5' ON NON-CRYSTALLINE ROCK

SECTION THRU END BENT # 1

SKEW = 65 DEG.

℄

1350 1345 1340 1335 1330 1325 1320 1315 1310 1305 1300 1295 1290 1285 1280

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

6/23/16

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6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5895	7

SKEW = 65 DEG.

AS-STAKED B1-A

AS-STAKED B1-B

B1-A
18+98
38' RT

APPROX WATER SURFACE 07/29/2019

EXISTING GROUND

ALLUVIUM (Al)

ALLUVIUM: MED DENSE to VERY DENSE SILTY, FINE-to-COURSE SAND, w/ GRAVELS & COBBLES/BOULDERS

27

SAPROLITE: DENSE SANDY-SILT

100/0.9

60/0.0

NON-CRYSTALLINE ROCK: SHADY DOLOMITE

B.T.@ 35.9' IN NON-CRYSTALLINE ROCK

SECTION THRU BENT # 1

SKEW = 65 DEG.

℄

1330 1325 1320 1315 1310 1305 1300 1295 1290 1285 1280 1275 1270 1265 1260

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

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6/23/16

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	B-5895	8

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

SKEW = 65 DEG.

1335 1330 1325 1320 1315 1310 1305 1300 1295 1290 1285 1280 1275 1270 1265 1260

AS-STAKED
B2-A

AS-STAKED
B2-B

B2-A
20+38
38' RT

APPROX WATER SURFACE 07/29/2019

ALLUVIUM: MED DENSE to VERY DENSE
SILTY, FINE-to-COURSE SAND, w/ GRAVELS &
COBBLES/BOULDERS

60/0.0

NON-CRYSTALLINE ROCK:
SHADY DOLOMITE

B.T.@
33.6'
IN
NON-CRYSTALLINE
ROCK

SECTION THRU BENT # 2

SKEW = 65 DEG.

℄

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6/23/16

PROJ. REFERENCE NO.	SHEET NO.
B-5895	9

SKEW = 65 DEG

AS-STAKED B3-A

B3-A
21+68
23' LT

AS-STAKED B3-B

B3-B
(ALT)
21+88
19' RT

B3-C
21+82
0.0' CL

EXISTING GROUND

2.1'
9/30

1.9'
FIAD

ALLUVIUM: MED DENSE to DENSE SILTY, FINE-to-COURSE SAND, GRAVELS & COBLLES & BOULDERS (Al)

ALLUVIUM: MED DENSE to DENSE (Al)

ALLUVIUM: MED DENSE to DENSE SILTY, FINE-to-COURSE SAND, GRAVELS & COBLLES & BOULDERS (Al)

22 21 11 100/0.9 60/0.0

30 11 84 16 10 28 9 83 17 100/0.8 21 24 38 100/0.6

19 2 34 11 11 60/0.0

24.8' 60/0.0'

28.3' 60/0.0'

35.3' 36.3' 39.3' 41.3' 45.4' 46.3' 54.3' 55.8' 59.3' 62.8' 64.3' 65.3' 68.3' 71.8'

48.5' 70.2' 71.7' 74.4' 75.7'

35.9' 39.5' 40.5' 41.8' 43.4' 51.8' 55.2' 55.7' 59.8' 71.3' 74.8' 78.7'

MATCH LINE 1

MATCH LINE 2

MATCH LINE 3

30 25 LT 20 1240 1235 1230 1225 1220 1215

MATCH LINE 1

89.3'

B.T.@ 89.3' IN NON-CRYSTALLINE ROCK

10 5 LT 0 CL 5 RT 10 1235 1230 1225 1220 1215 1210 1205 1200 1195 1190 1185 1180

MATCH LINE 2

78.4' 80.2' 82.4' 86.8' 87.8' 99.4' 100.3' 108.5' 108.9' 111.4' 113.8' 114.8' 116.0' 117.1' 125.3' 127.4' 128.4' 129.8'

B.T.@ 129.8' IN NON-CRYSTALLINE ROCK

15 20 RT 25 1230 1225 1220 1215 1210 1205 1200 1195 1190 1185

MATCH LINE 3

85.1' 87.3' 90.1' 90.9' 107.5' 110.5' 119.8'

B.T.@ 119.8' IN NON-CRYSTALLINE ROCK

(A) SAPROLITE: STIFF to HARD SANDY-SILT w/ trace or a little CLAY, some ROCK FRAGMENTS

(B) WEATHERED ROCK: DARK GRAY/BLUISH-GRAY, RIBBONED

(C) RESIDUAL: IN-SITU, VERY SOFT to MED STIFF CLAY, w/ VARYING AMOUNTS of SILT, SAND, some ROCK FRAGMENTS

(D) NON-CRYSTALLINE ROCK: GRAY/BLUISH-GRAY, RIBBONED; FRACTURED (SHADY DOLOMITE)

SECTION THRU BENT # 3
SKEW = 65 DEG.

℄

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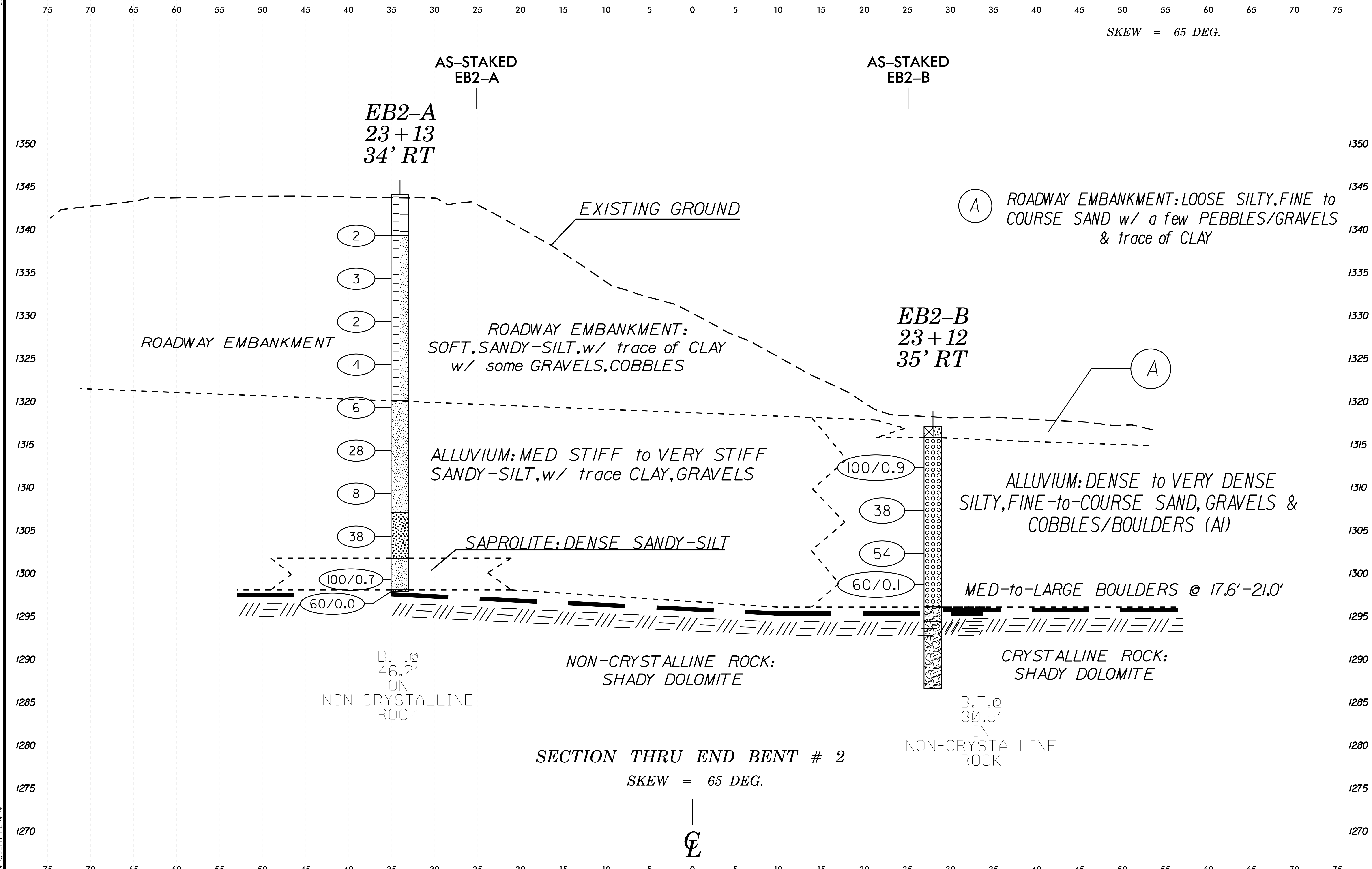
PROJ. REFERENCE NO.	SHEET NO.
B-5895	10



SECTION THRU END BENT # 2

SKEW = 65 DEG.

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB1-C	**STATION** 17+57	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,326.5 ft	**TOTAL DEPTH** 21.6 ft	**NORTHING** 801,970	**EASTING** 867,683	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 08/06/19	**COMP. DATE** 08/06/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1330											
										1,326.5 GROUND SURFACE	0.0
1325										**ARTIFICIAL FILL** BROWN, LOOSE, SANDY-SILT, w/ a lilte GRVLS, w/ trace of ORGANICS, PLANT MATERIALS	
										1,322.1	4.4
1320										**ALLUVIAL** BROWN/TAN, MED DENSE, SILTY-SAND, w/ COBBLES	
	1,316.5	10.0	2	3	4	7					
1315											
	1,311.5	15.0	14	15	12	27					
1310											
										1,308.2	18.3
	1,306.5	20.0	60/0.0			60/0.0				**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE)	
1305	1,304.9	21.6	60/0.0			60/0.0				1,304.9	21.6
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,304.9 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 17+68	**OFFSET** 23 ft RT	**ALIGNMENT** -L-	**0 HR.** 13.9
COLLAR ELEV. 1,323.5 ft	**TOTAL DEPTH** 28.5 ft	**NORTHING** 801,946	**EASTING** 867,691	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 08/02/19	**COMP. DATE** 08/02/19	**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
1325										
										1,323.5 GROUND SURFACE 0.0
1320										**ARTIFICIAL FILL**
										1,321.3 BROWN, LOOSE, SILTY-SAND, w/ trace of ORGANICS, PLANT MATERIALS 2.2
	1,318.5	5.0	1	2	3	5				**ALLUVIAL** BROWN/TAN, MED DENSE, FINE SANDY-SILT, w/ trace CLAY & GRVLS
1315										1,315.5 8.0
	1,313.5	10.0	4	8	92/0.3	100/0.8 BOULDERS				**ALLUVIAL** GRAY/GRAYISH-BLUE/TAN SANDY-SILT, w/ many PEBBLES/GRAVELS & COBBLE/BOULDER FRAGMENTS
1310										
	1,308.5	15.0	19	81/0.2		100/0.7 BOULDERS				
1305										1,304.7 18.8
	1,303.5	20.0	WOR	WOR	WOR	0				**ALLUVIAL** BROWN/TAN VERY SOFT, FINE-to-COURSE SAND, SILT w/ trace CLAY, trace of PEBBLES/GRAVELS
1300										1,297.4 26.1
	1,298.5	25.0	2	16	84/0.3	100/0.8				**WEATHERED ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE)
1295	1,295.0	28.5	60/0.0			60/0.0				1,295.0 28.5
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,295.0 ft ON NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 18+98	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,302.8 ft	**TOTAL DEPTH** 35.9 ft	**NORTHING** 801,992	**EASTING** 867,827	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/29/19	**COMP. DATE** 07/29/19	**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)
1305											
										1,302.8 GROUND SURFACE	0.0
1300										**ALLUVIAL** GRAY/BLUISH GRAY/BROWN, MED DENSE to DENSE, SILTY, FINE-to-COURSE SAND, GRAVELS/COBBLES & BOULDERS	
	1,296.5	6.3									
1295			3	5	22	27					
	1,291.5	11.3								1,292.4	10.4
1290			25	24	76/0.4	100/0.9 W.R. @ 12.7' 60/0.0				**SAPROLITE** BROWN/ORANGE, SANDY-SILT, w/ trace CLAY	
	1,289.7	13.1	60/0.0							1,290.1	12.7
										1,289.7	13.1
1285										**WEATHERED ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE)	
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE), **with ZONES OF CLAY IN-FILL, ROCK FRAGMENTS, THROUGH-OUT RECOVERY **	
1280											
1275											
1270										1,266.9	35.9
										Boring Terminated at Elevation 1,266.9 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)	

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 18+98	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,302.8 ft	**TOTAL DEPTH** 35.9 ft	**NORTHING** 801,992	**EASTING** 867,827	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/29/19	**COMP. DATE** 07/29/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 22.8 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)
1289.65											Continued from previous page	
	1,289.7	13.1	2.8	*N=60/0.0*	(1.2) 43%	(0.7) 25%					1,289.7 **NON-CRYSTALLINE ROCK**	13.1
	1,286.9	15.9		1:41/0.8 1:28/1.0 1:51/1.0		FRACTURED						
1285			5.0	2:13/1.0 1:21/1.0 2:02/1.0 0:51/1.0 1:23/1.0	(1.5) 30%	W.R. (0.8) 16%						
	1,281.9	20.9										
1280			5.0	1:44/1.0 1:28/1.0 NA/1.0 2:06/1.0 1:02/1.0	(2.5) 50%	(1.2) 24%					GSI : 10-20	
	1,276.9	25.9										
1275			5.0	0:32/1.0 0:45/1.0 1:37/1.0 1:29/1.0 2:31/1.0	(1.6) 32%	(1.1) 22%						
	1,271.9	30.9										
1270			5.0	1:27/1.0 NA/1.0 NA/1.0 NA/1.0 NA/1.0	(1.5) 30%	(0.0) 0%						
	1,266.9	35.9									1,266.9 Boring Terminated at Elevation 1,266.9 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)	35.9

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 20+38	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,303.0 ft	**TOTAL DEPTH** 33.6 ft	**NORTHING** 801,977	**EASTING** 867,966	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/30/19	**COMP. DATE** 07/30/19	**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	
1305										1,303.0 GROUND SURFACE	0.0
1300						BLDRS				1,301.7 **ALLUVIAL** BROWN/TAN/GRAY, LOOSE, SILTY, FINE-to-COURSE SAND, w/ trace of GRAVELS & COBBLES	1.3
1295						OUT BLDRS				1,299.0 **ALLUVIAL** GRAY/BLUISH GRAY/BROWN, SILTY, FINE-to-COURSE SAND, w/ several BOULDERS	4.0
	1,294.0	9.0	60/0.0			60/0.0 60/0.0 60/0.0				1,294.0 **ALLUVIAL** BROWN/TAN/GRAY, LOOSE, SILTY, FINE-to-COURSE SAND, w/ trace of GRAVELS & COBBLES	9.0
1290										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE), **with ZONES OF CLAY IN-FILL, ROCK FRAGMENTS, THROUGH-OUT RECOVERY **	
1285											
1280											
1275											
1270										1,269.4	33.6
										Boring Terminated at Elevation 1,269.4 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)	

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 20+38	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,303.0 ft	**TOTAL DEPTH** 33.6 ft	**NORTHING** 801,977	**EASTING** 867,966	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/30/19	**COMP. DATE** 07/30/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 23.9 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
1293.27											Continued from previous page
	1,293.3	9.7	3.9	2:22/0.9 1:58/1.0 1:24/1.0 3:26/1.0	(1.9) 49%	(1.2) 31%					**NON-CRYSTALLINE ROCK** *(continued)*
1290	1,289.4	13.6									
			5.0	1:53/1.0 2:10/1.0 1:44/1.0 1:43/1.0 2:32/1.0	(4.2) 84%	(2.4) 48%					
1285	1,284.4	18.6									
			5.0	1:08/1.0 1:06/1.0 2:29/1.0 1:26/1.0 2:49/1.0	(2.7) 54%	(1.4) 28%					
1280	1,279.4	23.6									GSI : 9.7' - 23.6' : 20 - 30 23.6' - 33.6' : 15 - 25 *w/ CLAY IN-FILL ZONES
			5.0	1:45/1.0 1:52/1.0 1:32/1.0 1:43/1.0 2:02/1.0	(3.0) 60%	(1.1) 22%					
1275	1,274.4	28.6									
			5.0	1:51/1.0 1:49/1.0 1:32/1.0 1:44/1.0 2:10/1.0	(4.0) 80%	(2.6) 52%					
1270	1,269.4	33.6								1,269.4	33.6
											Boring Terminated at Elevation 1,269.4 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 21+68	**OFFSET** 23 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,309.0 ft	**TOTAL DEPTH** 89.3 ft	**NORTHING** 801,947	**EASTING** 868,094	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/25/19	**COMP. DATE** 07/26/19	**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)
1310										1,309.0 GROUND SURFACE	0.0
										ALLUVIAL GRAY/BLUISH-GRAY/BROWN, MED DENSE, SILTY, FINE-to-COURSE SAND, GRAVELS/COBBLES & BOULDERS	
1305	1,304.2	4.8	5	7	15	22					
1300	1,299.2	9.8	24	9	12	21					
1295	1,294.2	14.8	8	5	6	11				1,291.3	17.7
1290	1,289.2	19.8								**SAPROLITE** BROWN/ORANGE, CLAYEY-SILT, w/ trace SAND & w/ ROCK FRAGS.	
			9	5	95/0.4	100/0.9				1,288.1	20.9
1285	1,284.2	24.8	60/0.0			60/0.0 : NCR @ 24.2'				**WEATHERED ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE)	
										1,284.8	24.2
1280										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE), **with ZONES OF CLAY IN-FILL, ROCK FRAGMENTS, THROUGH-OUT RECOVERY **	
1275										1,273.7	35.3
										RESIDUAL	
1270										1,272.7	36.3
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
1265										1,269.7	39.3
										RESIDUAL	
1260										1,267.7	41.3
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
1255										1,263.6	45.4
										RESIDUAL	
1250										1,262.7	46.3
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
1245										1,254.7	54.3
										RESIDUAL	
1240										1,253.2	55.8
										BROWN SOFT to MED STIFF CLAY	
1235										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
										1,249.7	59.3
1230										**RESIDUAL**	
										1,246.2	62.8
										NON-CRYSTALLINE ROCK	
										1,244.7	64.3
										RESIDUAL	
										1,243.7	65.3
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
										1,240.7	68.3
										RESIDUAL BROWN SOFT to MED STIFF CLAY	
										1,237.2	71.8
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED (DOLOMITE)	

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 21+68	**OFFSET** 23 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,309.0 ft	**TOTAL DEPTH** 89.3 ft	**NORTHING** 801,947	**EASTING** 868,094	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/25/19	**COMP. DATE** 07/26/19	**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
1230						Match Line				**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE) *(continued)*
1225										
1220										1,219.7 89.3
										Boring Terminated at Elevation 1,219.7 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 21+68	**OFFSET** 23 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,309.0 ft	**TOTAL DEPTH** 89.3 ft	**NORTHING** 801,947	**EASTING** 868,094	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core		**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 07/25/19	**COMP. DATE** 07/26/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 62.9 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS	ELEV. (ft)	DEPTH (ft)
1282.61											Continued from previous page		
1280	1,282.6	26.4	2.9	0:30/0.9 2:37/1.0 2:40/1.0	(1.5) 52%	(1.1) 38%					**NON-CRYSTALLINE ROCK** *(continued)*		
	1,279.7	29.3											
1275	1,274.7	34.3	5.0	1:35/1.0 2:54/1.0 2:04/1.0 1:14/1.0 2:04/1.0	(4.3) 86%	(3.8) 76%							
			5.0	0:45/1.0 1:22/1.0 NA/1.0 1:36/1.0 1:49/1.0	(2.9) 58%	(2.0) 40%						1,273.7 1,272.7	35.3 36.3
1270	1,269.7	39.3									**RESIDUAL** **NON-CRYSTALLINE ROCK**	1,269.7	39.3
1265	1,264.7	44.3	5.0	0:30/1.0 0:28/1.0 4:32/1.0 2:11/1.0 2:17/1.0	(2.0) 40%	(1.1) 22%					**RESIDUAL** **NON-CRYSTALLINE ROCK**	1,267.7	41.3
1260	1,259.7	49.3	5.0	1:57/1.0 0:21/1.0 1:00/1.0 1:32/1.0 1:58/1.0	(3.8) 76%	(2.7) 54%						1,263.6 1,262.7	45.4 46.3
			5.0	1:40/1.0 1:09/1.0 1:39/1.0 1:33/1.0 2:06/1.0	(4.1) 82%	(2.5) 50%					**RESIDUAL** **NON-CRYSTALLINE ROCK**		
1255	1,254.7	54.3										1,254.7	54.3
1250	1,249.7	59.3	5.0	NA/1.0 NA/1.0 NA/1.0 NA/1.0 NA/1.0	(2.3) 46%	(1.4) 28%					**RESIDUAL**	1,253.2	55.8
1245	1,244.7	64.3	5.0	NA/1.0 NA/1.0 NA/1.0 NA/1.0 NA/1.0	(1.4) 28%	(0.9) 18%					**NON-CRYSTALLINE ROCK** **RESIDUAL** **NON-CRYSTALLINE ROCK**	1,249.7 1,246.2 1,244.7	59.3 62.8 64.3
1240	1,239.7	69.3	5.0	4:02/1.0 1:47/1.0 1:41/1.0 0:25/1.0 0:49/1.0	(2.7) 54%	(1.8) 36%					**RESIDUAL** **NON-CRYSTALLINE ROCK**	1,243.7 1,240.7	65.3 68.3
1235	1,234.7	74.3	5.0	1:11/1.0 1:14/1.0 2:03/1.0 1:15/1.0 1:25/1.0	(3.4) 68%	(0.8) 16%					**RESIDUAL** **NON-CRYSTALLINE ROCK**	1,237.2	71.8
1230	1,229.7	79.3	5.0	1:35/1.0 3:45/1.0 1:56/1.0 1:34/1.0 2:14/1.0	(3.5) 70%	(2.7) 54%							
1225	1,224.7	84.3	5.0	1:54/1.0 2:49/1.0 2:24/1.0 1:46/1.0 2:56/1.0	(4.4) 88%	(3.9) 78%							
1220	1,219.7	89.3	5.0	2:43/1.0 3:09/1.0 1:23/1.0 1:49/1.0 1:35/1.0	(5.0) 100%	(4.7) 94%						1,219.7	89.3
											Boring Terminated at Elevation 1,219.7 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)		

GSI : 26.4' - 39.3' : 30-40
39.3' - 47.4' : 15-25 *CLAY IN-FILL 46.3' - 47.3'
47.4' - 52.5' : 30-40
52.5' - 54.3' : 45-55
54.3' - 75.0' : 10-15 *N.C.R. w/ SEVRL CLAY IN-FILL ZONES
75.0' - 89.3' : 40-50

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-C	**STATION** 21+82	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 129.8 ft	**NORTHING** 801,923	**EASTING** 868,105	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 09/25/20	**COMP. DATE** 09/28/20	**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)
1315										
1310										1,310.0 — GROUND SURFACE — 0.0
										ALLUVIAL BROWN/TAN MED./BLUISH-GRAY DENSE SILTY, FINE-to-COURSE SAND, w/ GRAVELS, & COBBLES, BOULDERS @ 3.1' & 5.7' : becomes A-4 dominant with depth
1305	1,305.5	4.5	14	15	15	30 ALLUV. BOULDERS		W		
1300	1,300.5	9.5	6	7	4	11		W		
1295	1,295.5	14.5	2	30	54	84		M		1,295.7 — 14.3 **SAPROLITE** BROWN/GRAY SANDY-SILT, w/ trace CLAY & some ROCK FRAGMENTS
1290	1,290.5	19.5	6	6	10	16		M		
1285	1,287.0	23.0	4	5	5	10 V. STIFF SAP w/ THIN W.R. LAYERS		M		
1280	1,280.5	29.5	1	11	17	28 W.R. SEAMS		M		
1275	1,275.5	34.5	2	4	5	9		M		
1270	1,270.5	39.5	17	20	63	SAPROLITE w/ W.R. SEAMS 83		M		
1265	1,265.5	44.5	25	7	10	17		M		1,261.5 — 48.5 **WEATHERED ROCK** DARK GRAY/BLUISH-GRAY, w/ trace CLAY IN-FILL & some ROCK FRAGMENTS
1260	1,260.5	49.5	37	63/0.3		W.R. 100/0.8				1,258.3 — 51.7 **SAPROLITE** BROWN/GRAY SANDY-SILT, w/ trace CLAY & some ROCK FRAGMENTS
1255	1,255.5	54.5	28	10	11	W.R. LEDGE 53.4'-54.1' 21		M		1,256.6 — 53.4 1,255.9 — 54.1 **WEATHERED ROCK** DARK GRAY/BLUISH-GRAY
1250	1,250.5	59.5	96	10	14	W.R. LEDGE 58.9'-60.3' 24		M		**SAPROLITE** 1,250.6 — BROWN/GRAY SANDY-SILT, w/ CLAY — 59.4 1,249.7 — 60.3 **WEATHERED ROCK** DARK GRAY/BLUISH-GRAY **SAPROLITE** BROWN/GRAY SANDY-SILT, w/ CLAY
1245	1,245.5	64.5	10	16	22	38 W.R.		M		1,243.6 — 66.4 **WEATHERED ROCK**
1240	1,240.5	69.5	53	47/.01		W.R. 100/0.6				1,241.2 — 68.8 1,240.6 — 69.4 **SAPROLITE** 1,239.8 — 70.2 **WEATHERED ROCK** 1,238.3 — 71.7 **NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE) 1,235.6 — 74.4
1235										

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-C	**STATION** 21+82	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 129.8 ft	**NORTHING** 801,923	**EASTING** 868,105	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 09/25/20	**COMP. DATE** 09/28/20	**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
1235						Match Line				1,234.3 — 75.7 **RESIDUAL** BROWN SOFT to MED STIFF CLAY 1,231.6 — 78.4 **NON-CRYSTALLINE ROCK** *(continued)*
1230										1,229.8 — 80.2 **RESIDUAL** 1,227.6 — 82.4 BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND, ROCK FRAGS
1225										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY 1,223.2 — 86.8 1,222.2 — 87.8 **RESIDUAL** BROWN VERY SOFT to MED STIFF CLAY
1220										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)
1215										
1210										1,210.6 — 99.4 1,209.7 — 100.3 **RESIDUAL** **NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)
1205										
1200										1,201.5 — 108.5 1,201.1 — 108.9 **RESIDUAL** **NON-CRYSTALLINE ROCK** 1,198.6 — GREY/BLUISH-GREY — 111.4
1195										**RESIDUAL** 1,196.2 — 113.8 1,195.2 — **NON-CRYSTALLINE ROCK** — 114.8 1,194.0 — **RESIDUAL** — 116.0 1,192.9 — **NON-CRYSTALLINE ROCK** — 117.1
1190										**RESIDUAL** BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND
1185										1,184.7 — 125.3 **NON-CRYSTALLINE ROCK** 1,182.6 — 127.4 1,181.6 — **RESIDUAL** — 128.4 1,180.2 — **NON-CRYSTALLINE ROCK** — 129.8 GREY/BLUISH-GREY FRACTURED (DOLOMITE) Boring Terminated at Elevation 1,180.2 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-C	**STATION** 21+82	**OFFSET** CL	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 129.8 ft	**NORTHING** 801,923	**EASTING** 868,105	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core		**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 09/25/20	**COMP. DATE** 09/28/20	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 59.6 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)
1239.84											Begin Coring @ 70.2 ft		
	1,239.8	70.2	4.6	0:35/0.6 0:59/1.0 0:48/1.0 0:09/1.0 1:04/1.0	(1.8) 39%	(0.0) 0%					**NON-CRYSTALLINE ROCK**	1,239.8	70.2
											RESIDUAL	1,238.3	71.7
1235	1,235.2	74.8										1,235.6	74.4
			5.0	1:32/1.0 0:24/1.0 0:12/1.0 1:25/1.0 3:13/1.0	(2.3) 46%	(1.7) 34%					**NON-CRYSTALLINE ROCK**	1,234.3	75.7
											RESIDUAL	1,231.6	78.4
1230	1,230.2	79.8									**NON-CRYSTALLINE ROCK**	1,229.8	80.2
			5.0	2:18/1.0 1:16/1.0 1:21/1.0 2:23/1.0 2:56/1.0	(3.6) 72%	(2.3) 46%					**RESIDUAL**	1,227.6	82.4
1225	1,225.2	84.8									**NON-CRYSTALLINE ROCK**		
			5.0	1:24/1.0 2:13/1.0 0:56/1.0 2:16/1.0 3:11/1.0	(4.4) 88%	(3.4) 68%						1,223.2	86.8
1220	1,220.2	89.8									**RESIDUAL** **NON-CRYSTALLINE ROCK**	1,222.2	87.8
			5.0	2:13/1.0 2:31/1.0 1:05/1.0 1:51/1.0 2:05/1.0	(4.8) 96%	(1.7) 34%							
1215	1,215.2	94.8											
			5.0	2:15/1.0 1:54/1.0 1:45/1.0 2:23/1.0 0:33/1.0	(4.4) 88%	(3.1) 62%						1,210.6	99.4
1210	1,210.2	99.8									**RESIDUAL**	1,209.7	100.3
			5.0	0:42/1.0 0:50/1.0 2:40/1.0 1:30/1.0 2:06/1.0	(3.5) 70%	(1.4) 28%					**NON-CRYSTALLINE ROCK**		
1205	1,205.2	104.8											
			5.0	2:11/1.0 2:01/1.0 1:15/1.0 2:11/1.0 1:30/1.0	(4.7) 94%	(2.9) 58%						1,201.5	108.5
1200	1,200.2	109.8									**RESIDUAL**	1,201.1	108.9
			5.0	3:24/1.0 0:47/1.0 0:03/1.0 0:08/1.0 2:26/1.0	(2.6) 52%	(1.0) 20%					**NON-CRYSTALLINE ROCK**	1,198.6	111.4
											RESIDUAL	1,196.2	113.8
1195	1,195.2	114.8									**NON-CRYSTALLINE ROCK**	1,195.2	114.8
			5.0	0:38/1.0 1:00/1.0 0:46/1.0 0:03/1.0 0:09/1.0	(0.9) 18%	(0.4) 8%					**RESIDUAL**	1,194.0	116.0
1190	1,190.2	119.8									**NON-CRYSTALLINE ROCK** **RESIDUAL**	1,192.9	117.1
			5.0	0:15/1.0 0:17/1.0 0:06/1.0 0:07/1.0 0:18/1.0	(0.0) 0%	(0.0) 0%							
1185	1,185.2	124.8										1,184.7	125.3
			5.0	0:07/1.0 1:02/1.0 1:27/1.0 1:49/1.0 1:56/1.0	(3.9) 78%	(2.5) 50%					**NON-CRYSTALLINE ROCK**	1,182.6	127.4
											RESIDUAL	1,181.6	128.4
	1,180.2	129.8									**NON-CRYSTALLINE ROCK**	1,180.2	129.8

Boring Terminated at Elevation 1,180.2 ft IN NON-CRYSTALLINE ROCK
(SHADY DOLOMITE)

GSI : 70.2' - 78.4' : 10-20 * w/ CLAY IN-FILL ZONES
78.4' - 95.8' : 30-40 * w/ CLAY IN-FILL ZONES
95.8' - 109.8' : 35-45
109.8' - 117.1' : 10-20 *LOW RECOVERY
117.1' - 125.3' : CLAY IN-FILL, NO RECOVERY
125.3' - 129.8' : 30-40

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-B (ALT.)	**STATION** 21+88	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** 1.9 FIAD
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 119.8 ft	**NORTHING** 801,903	**EASTING** 868,108	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 09/30/20	**COMP. DATE** 09/30/20	**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)
1310										1,310.0 GROUND SURFACE	0.0
						V. HARD ALLUV. BOULDER				**ALLUVIAL** BROWN/TAN MED./BLUISH-GRAY SOFT to V. STIFF, FINE-to-COURSE SANDY-SILT, w/ GRAVELS : COBBLES & BOULDERS @ 3.1' & 5.1' & 12.8'	
1305											
1300	1,299.9	10.1	17	7	12	19		W			
1295	1,294.9	15.1				ALLUV. COBBLES & BOULDERS					
			3	1	1	2		M			
1290	1,289.9	20.1				W.R.				1,291.6	18.4
	1,287.9	22.1	52	10	24	34		M		1,290.5 **WEATHERED ROCK** DARK GRAY/BLUISH-GRAY, w/ trace CLAY IN-FILL & some ROCK FRAGMENTS	19.5
1285	1,284.9	25.1	7	6	5	11		M		**SAPROLITE** BROWN/GRAY HARD becoming STIFF, SANDY-SILT, w/ trace CLAY & some ROCK FRAGMENTS (W.R. LAYERS)	
			1	2	9	11		M		1,282.0	28.0
	1,281.7	28.3				11 W.R. @ 28.0'				1,281.7 **WEATHERED ROCK** DARK GRAY/BLUISH-GRAY	28.3
1280			60/0.0			60/0.0				**CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
1275										1,274.1	35.9
										RESIDUAL BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND	
1270										1,270.5	39.5
										1,269.5 **CRYSTALLINE ROCK**	40.5
1265										1,268.2 **RESIDUAL**	41.8
										1,266.6 **CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)	43.4
1260										**RESIDUAL** BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND	
										1,258.2	51.8
1255										**CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
										1,254.8	55.2
1250										1,254.3 **RESIDUAL**	55.7
										CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
1245										1,250.2	59.8
										RESIDUAL BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND	
1240											
										1,238.7	71.3
1235										**CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)	
										1,235.2	74.8
1230										**RESIDUAL** BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND	
										1,231.3	78.7

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-B (ALT.)	**STATION** 21+88	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** 1.9 FIAD
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 119.8 ft	**NORTHING** 801,903	**EASTING** 868,108	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 09/30/20	**COMP. DATE** 09/30/20	**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
1230						Match Line				**CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE) *(continued)*
										1,224.9 **RESIDUAL** 85.1
1225										1,222.7 **CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE) 87.3
1220										1,219.9 90.1
										1,219.1 **RESIDUAL** 90.9
1215										**CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)
1210										
1205										
										1,202.5 **RESIDUAL** 107.5
1200										1,199.5 BROWN VERY SOFT to MED STIFF CLAY, w/ traces of SILT & SAND 110.5
1195										**CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED (DOLOMITE)
										1,190.2 119.8
										Boring Terminated at Elevation 1,190.2 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive			**GROUND WTR (ft)**
BORING NO. B3-B (ALT.)	**STATION** 21+88	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** 1.9 FIAD
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 119.8 ft	**NORTHING** 801,903	**EASTING** 868,108	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 09/30/20	**COMP. DATE** 09/30/20	**SURFACE WATER DEPTH** N/A
CORE SIZE NXWL	**TOTAL RUN** 91.5 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
1281.69											Begin Coring @ 28.3 ft
	1281.7	28.3	1.5	*N=60/0.0*	(1.5)	(0.5)					1,281.7 **CRYSTALLINE ROCK** 28.3
1280	1280.2	29.8		*2:51/1.5*	100%	33%					
			5.0	1:37/1.0	(4.7)	(2.7)					
				1:47/1.0							
				1:27/1.0	94%	54%					
				0:55/1.0							
1275	1275.2	34.8		1:49/1.0							
			5.0	1:25/1.0	(3.3)	(0.9)					
				0:15/1.0							
				0:15/1.0	66%	18%					
				0:15/1.0							
1270	1270.2	39.8		0:43/1.0							1,274.1 35.9
											RESIDUAL
			5.0	0:59/1.0	(2.3)	(1.5)					1,270.5 39.5
				0:09/1.0							1,269.5 **CRYSTALLINE ROCK** 40.5
				1:27/1.0	46%	30%					1,268.2 **RESIDUAL** 41.8
				0:48/1.0							1,266.6 **CRYSTALLINE ROCK** 43.4
1265	1265.2	44.8		0:26/1.0							**RESIDUAL**
			5.0	NA/1.0	(0.7)	(0.0)					
				0:18/1.0							
				0:17/1.0	14%	0%					
				0:31/1.0							
1260	1260.2	49.8		0:20/1.0							
			5.0	0:15/1.0	(1.5)	(0.7)					1,258.2 51.8
				0:11/1.0							**CRYSTALLINE ROCK**
				1:42/1.0	30%	14%					
				0:40/1.0							
1255	1255.2	54.8		1:12/1.0							1,254.8 55.2
			5.0	1:36/1.0	(4.5)	(0.4)					1,254.3 **RESIDUAL** 55.7
				1:55/1.0							**CRYSTALLINE ROCK**
				1:40/1.0	90%	8%					
				2:10/1.0							
1250	1250.2	59.8		0:10/1.0							1,250.2 59.8
			5.0	NA/1.0	(0.0)	(0.0)					**RESIDUAL**
				NA/1.0							
				NA/1.0	0%	0%					
				0:54/1.0							
1245	1245.2	64.8		0:02/1.0							
			5.0	0:09/1.0	(0.3)	(0.0)					
				0:58/1.0							
				0:16/1.0	6%	0%					
				0:07/1.0							
1240	1240.2	69.8		0:11/1.0							
			5.0	0:27/1.0	(3.5)	(0.4)					1,238.7 71.3
				0:47/1.0							**CRYSTALLINE ROCK**
				1:22/1.0	70%	8%					
				1:08/1.0							
1235	1235.2	74.8		2:09/1.0							1,235.2 74.8
			5.0	1:47/1.0	(1.1)	(0.4)					**RESIDUAL**
				2:18/1.0							
				2:51/1.0	22%	8%					
				2:21/1.0							1,231.3 78.7
1230	1230.2	79.8		NA/1.0							**CRYSTALLINE ROCK**
			5.0	NA/1.0	(1.9)	(0.9)					
				NA/1.0							
				NA/1.0	38%	18%					
				NA/1.0							
1225	1225.2	84.8		NA/1.0							1,224.9 85.1
			5.0	1:56/1.0	(4.2)	(1.0)					**RESIDUAL**
				1:38/1.0							1,222.7 87.3
				1:28/1.0	84%	20%					**CRYSTALLINE ROCK**
				1:10/1.0							
1220	1220.2	89.8		0:49/1.0							1,219.9 90.1
			5.0	1:47/1.0	(5.0)	(1.8)					1,219.1 **RESIDUAL** 90.9
				1:39/1.0							**CRYSTALLINE ROCK**
				2:08/1.0	100%	36%					
				2:15/1.0							
1215	1215.2	94.8		0:45/1.0							
			5.0	1:12/1.0	(4.4)	(2.8)					
				1:39/1.0							
				1:43/1.0	88%	56%					
				2:14/1.0							
1210	1210.2	99.8		2:06/1.0							
			5.0	1:09/1.0	(4.5)	(3.6)					
				1:22/1.0							
				1:50/1.0	90%	72%					
				1:52/1.0							
1205	1205.2	104.8		2:07/1.0							
			5.0	0:58/1.0	(2.6)	(2.6)					
				1:31/1.0							
				0:32/1.0	52%	52%					1,202.5 107.5

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive			**GROUND WTR (ft)**
BORING NO. B3-B (ALT.)	**STATION** 21+88	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** 1.9 FIAD
COLLAR ELEV. 1,310.0 ft	**TOTAL DEPTH** 119.8 ft	**NORTHING** 801,903	**EASTING** 868,108	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic
DRILLER Cheek, D. O.	**START DATE** 09/30/20	**COMP. DATE** 09/30/20	**SURFACE WATER DEPTH** N/A
CORE SIZE NXWL	**TOTAL RUN** 91.5 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
1201.69											ELEV. (ft) DEPTH (ft)
											Continued from previous page
1200	1200.2	109.8		0:07/1.0							**RESIDUAL** *(continued)*
				0:08/1.0							1,200.0 111.0
			5.0	0:06/1.0	(5.0)	(3.9)					**CRYSTALLINE ROCK**
				1:15/1.0	100%	78%					
				1:02/1.0							
				2:04/1.0							
1195	1195.2	114.8		1:42/1.0							
			5.0	1:02/1.0	(3.6)	(2.8)					
				1:50/1.0							
				0:24/1.0	72%	56%					
				0:50/1.0							
	1190.2	119.8		1:59/1.0							1,190.2 119.8
											Boring Terminated at Elevation 1,190.2 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GSI : 28.3' - 35.9' : 20-30
35.9' - 39.5' : CLAY IN-FILL, SOME RECOVERY
39.5 - 59.8' : 5-10 *MULTI ZONES OF CLAY
59.8' - 71.3' : CLAY IN-FILL, NO RECOVERY
71.3' - 90.9' : 15-20 *w/ CLAY IN-FILL ZONES,
90.9 - 107.5' : 30-40
107.5' - 111.0' : *CLAY IN-FILL, LITTLE RECOVERY
111.0' - 119.8' : 30-40

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 21+90	**OFFSET** 23 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 1,309.6 ft	**TOTAL DEPTH** 44.9 ft	**NORTHING** 801,899	**EASTING** 868,110	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/24/19	**COMP. DATE** 07/25/19	**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)
1310										1,309.6 GROUND SURFACE	0.0
						BLDRS				**ALLUVIAL** GRAY/BLUISH-GRAY/BROWN, MED DENSE to VERY DENSE, SILTY, FINE-to-COURSE SAND, GRAVELS/COBBLES & BOULDERS	
1305	1,304.6	5.0	72	28/0.3							
						100/0.8 BLDRS : BEGIN CORE @ 6.5'					
1300											
1295										1,294.7	14.9
										WEATHERED ROCK NO RECOVERY : ASSUMED DARK GRAY W.R.	
										1,292.8	16.8
1290										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY HIGHLY FRACTURED (DOLOMITE), **with ZONES OF CLAY IN-FILL, ROCK FRAGMENTS, THROUGH-OUT RECOVERY **	
										1,290.7	18.9
1285										**RESIDUAL** NO RECOVERY : CLAY IN-FILL MATERIALS	
										1,281.3	28.3
1280										**NON-CRYSTALLINE ROCK** GREY/BLUISH-GREY FRACTURED	
										1,279.7	29.9
										RESIDUAL NO RECOVERY : CLAY IN-FILL	
1275										1,277.7	31.9
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED	
										1,275.7	33.9
										RESIDUAL NO RECOVERY : CLAY IN-FILL	
1270										1,271.7	37.9
										NON-CRYSTALLINE ROCK GREY/BLUISH-GREY FRACTURED	
										1,268.7	40.9
										RESIDUAL NO RECOVERY : CLAY IN-FILL MATERIALS	
1265										1,264.7	44.9
										Boring Terminated at Elevation 1,264.7 ft IN RESIDUAL CLAY-INFILL MATERIALS (IN-SITU)	

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. B3-B	**STATION** 21+90	**OFFSET** 23 ft RT	**ALIGNMENT** -L-	**0 HR.** 0.8
COLLAR ELEV. 1,309.6 ft	**TOTAL DEPTH** 44.9 ft	**NORTHING** 801,899	**EASTING** 868,110	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/24/19	**COMP. DATE** 07/25/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 38.4 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)
1303.12											Continued from previous page	
	1,303.1	6.5	3.4	3:35/1.0 0:23/1.0 0:33/1.4	(0.8) 24%	(0.6) 18% BLDRS					**ALLUVIAL** *(continued)*	
1300	1,299.7	9.9										
			5.0	0:20/1.0 0:35/1.0 1:13/1.0 2:11/1.0 0:32/1.0	(0.9) 18%	(0.0) 0% BLDRS						
1295	1,294.7	14.9									1,294.7	14.9
			5.0	0:50/1.0 0:50/1.0 1:43/1.0 2:27/1.0 0:42/1.0	(2.1) 42%	(1.5) 30%					**WEATHERED ROCK**	
1290	1,289.7	19.9									1,292.8	16.8
											NON-CRYSTALLINE ROCK	
			5.0	0:55/1.0 0:09/1.0 0:35/1.0 0:20/1.0 0:32/1.0	(0.0) 0%	(0.0) 0%					1,290.7	18.9
1285	1,284.7	24.9									**RESIDUAL**	
			5.0	0:15/1.0 0:15/1.0 0:55/1.0 2:09/1.0 1:15/1.0	(1.6) 32%	(0.4) 8%						
1280	1,279.7	29.9									1,281.3	28.3
			5.0	0:18/1.0 0:14/1.0 2:16/1.0 1:10/1.0 0:07/1.0	(0.9) 18%	(0.0) 0%					**NON-CRYSTALLINE ROCK**	
1275	1,274.7	34.9									1,279.7	29.9
			5.0	0:16/1.0 0:14/1.0 0:17/1.0 1:42/1.0 1:05/1.0	(1.1) 22%	(0.0) 0%					**RESIDUAL**	
1270	1,269.7	39.9									1,277.7	31.9
			5.0	1:19/1.0 0:07/1.0 0:09/1.0 0:11/1.0 0:28/1.0	(0.4) 8%	(0.0) 0%					**NON-CRYSTALLINE ROCK**	
1265	1,264.7	44.9									1,275.7	33.9
											RESIDUAL	
											1,271.7	37.9
											NON-CRYSTALLINE ROCK	
											1,268.7	40.9
											RESIDUAL	
											1,264.7	44.9
											Boring Terminated at Elevation 1,264.7 ft IN RESIDUAL CLAY-INFILL MATERIALS (IN-SITU)	

GSI : 6.5; - 14.9' : ALLUVIUM
14.9' - 16.8' : WEATHERED ROCK, NO REC.
16.8' - 18.9' : 15-25
18.9' - 28.3' : CLAY IN-FILL, NO RECOVERY
28.3' - 44.9' : 10-15 (N.C.R. w/ CLAY IN-FILL)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 23+13	**OFFSET** 34 ft LT	**ALIGNMENT** -L-	**0 HR.** 12.9 FIAD
COLLAR ELEV. 1,344.4 ft	**TOTAL DEPTH** 46.2 ft	**NORTHING** 801,942	**EASTING** 868,239	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 07/31/19	**COMP. DATE** 07/31/19	**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
1345										1,344.4 GROUND SURFACE 0.0
1340	1,339.6	4.8								**ROADWAY EMBANKMENT** ASPHALTto 0.6' into ABC 1,339.6 4.8
1335	1,334.6	9.8	2	1	1	2				**ROADWAY EMBANKMENT** RED/BROWN/ORANGE, SOFT SANDY-SILT, w/ trace CLAY & some PEBBLES/GRAVELS & COBBLES
1330	1,329.6	14.8	1	1	2	3				
1325	1,324.6	19.8	2	1	1	2				
1320	1,319.6	24.8	2	2	2	4				1,320.4 24.0
1315	1,314.6	29.8	2	3	3	6				**ALLUVIAL** BROWN MED STIFF to VERY STIFF, SANDY-SILT, w/ trace CLAY, a few PEBBLES
1310	1,309.6	34.8	7	13	15	28				
1305	1,304.6	39.8	2	3	5	8				1,307.4 37.0
1300	1,299.6	44.8	7	24	14	38				**ALLUVIAL** GRAY/BLUISH GRAY, MED DENSE to DENSE, SILTY, FINE-to-COURSE SAND, GRAVELS/COBBLES
	1,298.2	46.2	8	54	46/0.2	100/0.7				1,302.1 42.3
			60/0.0			60/0.0				**SAPROLITE** RED/ORANGE/BROWN, DENSE, SANDY-SILT, w/ trace CLAY 1,298.4 46.0
										1,298.2 46.2
										WEATHERED ROCK GRAY/BLUISH-GRAY HIGHLY FRACTURED WR (DOLOMITE)
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,298.2 ft ON NON-CRYSTALLINE ROCK (SHADY DOLOMITE)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB2-B (RW-1)	**STATION** 23+12	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,317.5 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 801,874	**EASTING** 868,230	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/25/19	**COMP. DATE** 02/25/19	**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)
1320											
										1,317.5 GROUND SURFACE	0.0
										1,316.2 **ROADWAY EMBANKMENT** LOOSE SILTY, FINE-to-COURSE SAND w/ a few PEBBLES/GRAVELS	1.3
1315										**ALLUVIAL** DENSE to VERY DENSE SILTY, FINE-to-COURSE SANDY, GRAVELS, COBBLES & BOULDERS (A1)	
	1,312.7	4.8	16	84/0.4		BLDRS		D			
1310											
	1,307.7	9.8	20	15	23	38		M			
1305											
	1,302.7	14.8	5	26	28	54		M			
1300											
				60/0.1		60/0.1 BLDR					
1295										1,296.5	21.0
										NON-CRYSTALLINE ROCK SHADY DOLOMITE	
1290											
										1,287.0	30.5
										Boring Terminated at Elevation 1,287.0 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)	

NCDOT BORE DOUBLE B5895_BRDG0067_MADISON_BOREHOLES_UPDATED FALL 2020.GPJ NC_DOT.GDT 10/12/20

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB2-B (RW-1)	**STATION** 23+12	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,317.5 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 801,874	**EASTING** 868,230	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 77% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/25/19	**COMP. DATE** 02/25/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 12.1 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)
1299.1											Continued from previous page	
	1,299.1	18.4	2.1	2:45/1.0	(0.8)	(0.0)					**ALLUVIAL** *(continued)*	
	1,297.0	20.5		*N=60/0.1*	38%	0%					1,296.5	21.0
1295			5.0	*BLDR* 2:45/1.0	(4.6)	ALUV BLDRS					**NON-CRYSTALLINE ROCK**	
				2:50/1.1	92%							
				2:17/1.0		(4.2)						
				2:59/1.0		84%						
	1,292.0	25.5		1:59/1.0		N.C.R.					GSI : 18.4' - 21.0' : ALLUVIUM	
				1:50/1.0		@					21.0 - 30.5' : 35-45	
1290			5.0	1:55/1.0	(3.0)	21.0'						
				2:53/1.0	60%							
				1:17/1.0		(2.3)						
				1:27/1.0		46%						
	1,287.0	30.5		1:42/1.0							1,287.0	30.5
				1:34/1.0							Boring Terminated at Elevation 1,287.0 ft IN NON-CRYSTALLINE ROCK (SHADY DOLOMITE)	

NCDOT CORE DOUBLE B5895_BRDG0067_MADISON_BOREHOLES_UPDATED FALL 2020.GPJ NC_DOT.GDT 10/12/20

CORE PHOTOGRAPHS

B1-A

BOX 1 of 1 : 13.1 - 35.9 FEET

GEOLOGICAL STRENGTH INDEX: GSI
13.1' - 35.9' : 10 - 20

B2-A

BOX 1 of 2 : 9.7 - 23.6 FEET

GEOLOGICAL STRENGTH INDEX: GSI
9.7' - 23.6' : 20 - 30

CORE PHOTOGRAPHS

B2-A

BOX 2 of 2 : 23.6 - 33.6 FEET

GEOLOGICAL STRENGTH INDEX: GSI
23.6' - 33.6' : 15 - 25

CORE PHOTOGRAPHS

B3-A

BOX 1 of 5 : 26.4 - 39.3 FEET

GEOLOGICAL STRENGTH INDEX: GSI
26.4' - 39.3' : 35 - 45

B3-A

BOX 2 of 5 : 39.3 - 52.5 FEET

GEOLOGICAL STRENGTH INDEX: GSI
39.3' - 47.4' : 15 - 25 *CLAY IN-FILL 46.3'-47.3'
47.4' - 52.5' : 30 - 40

CORE PHOTOGRAPHS

B3-A

BOX 3 of 5 : 52.5 - 69.3 FEET

GEOLOGICAL STRENGTH INDEX: GSI
52.5' - 54.3' : 45 - 55
54.3' - 69.3' : 15 - 25*
***N.C.R. w/ CLAY IN-FILL ZONES**

B3-A

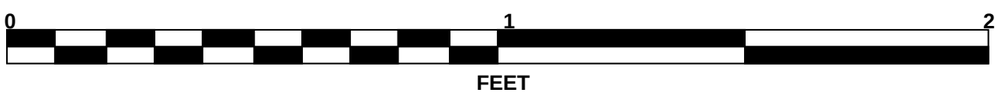
BOX 4 of 5 : 69.3 - 82.6 FEET

GEOLOGICAL STRENGTH INDEX: GSI
69.3' - 75.0' : 10 - 20 ***N.C.R. w/ CLAY IN-FILL ZONES**
75.0' - 82.6' : 40 - 50

CORE PHOTOGRAPHS

B3-A

BOX 5 of 5 : 82.6 - 89.3 FEET



GEOLOGICAL STRENGTH INDEX: GSI
82.6' - 89.3' : 40 - 50

CORE PHOTOGRAPHS

B3-C
BOX 1 of 4 : 70.2' - 85.9' FEET

GEOLOGICAL STRENGTH INDEX: GSI
70.2' - 78.4' : 10-20 *w/ CLAY IN-FILL ZONES
78.4' - 85.9' : 30-40 *w/ CLAY IN-FILL ZONES

B3-C
BOX 2 of 4 : 85.9' - 95.8' FEET

GEOLOGICAL STRENGTH INDEX: GSI
85.9' - 95.8' : 30-40 *w/ CLAY IN-FILL ZONES

CORE PHOTOGRAPHS

B3-C

BOX 3 of 4 : 95.8' - 107.2' FEET

0 1 2
FEET

GEOLOGICAL STRENGTH INDEX: GSI
95.8 - 107.2' : 35-45

B3-C

BOX 4 of 4 : 107.2' - 129.8' FEET

0 1 2
FEET

GEOLOGICAL STRENGTH INDEX: GSI
107.2' - 109.8' : 35-45
109.8' - 117.1' : 10-20 * LOW RECOVERY
117.1 - 125.3' : CLAY IN-FILL, NO RECOVERY (SOME FROM 124.8' to 125.3')
125.3' - 129.8' : 30-40

CORE PHOTOGRAPHS

B3-B ALT

BOX 1 of 6 : 28.3' - 39.8' FEET

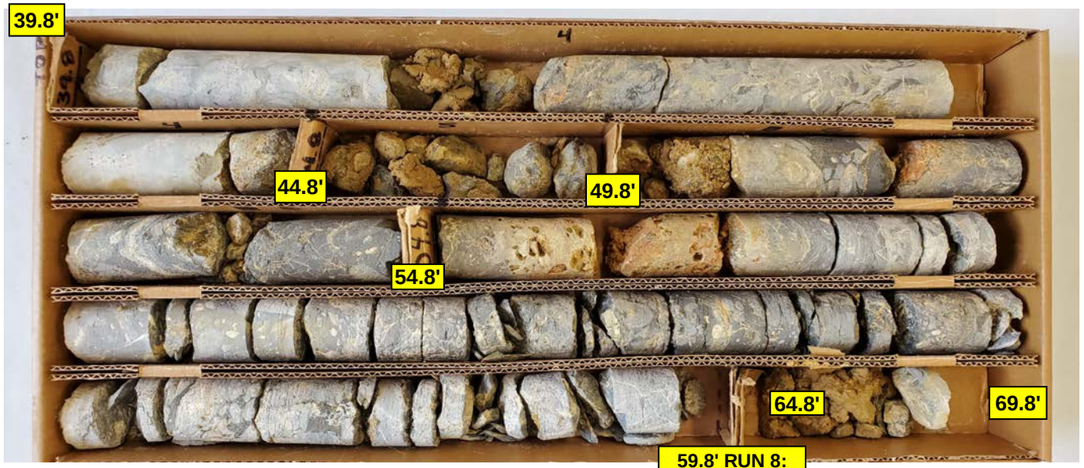
GEOLOGICAL STRENGTH INDEX: GSI

28.3' - 35.9' : 20-30

35.9' - 39.5' : CLAY IN-FILL, SOME RECOVERY

B3-B ALT

BOX 2 of 6 : 39.8' - 69.8'' FEET



GEOLOGICAL STRENGTH INDEX: GSI

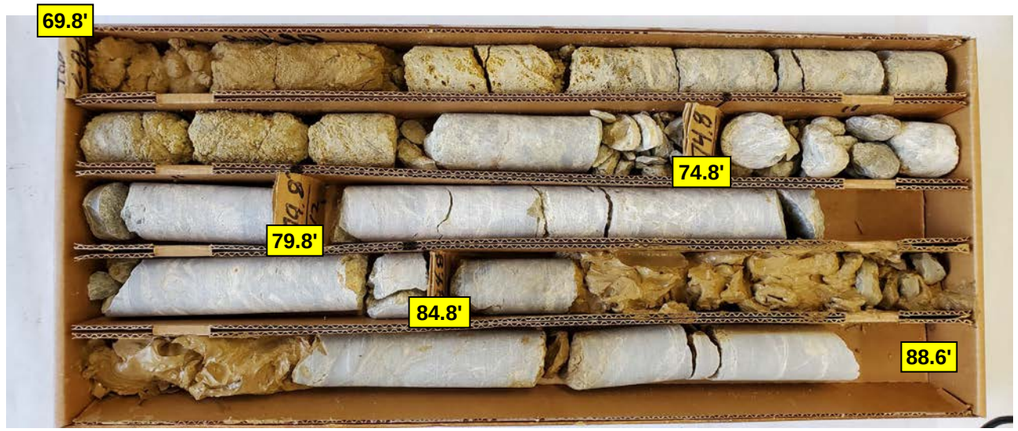
39.8' - 59.8' : 5-15 *ZONES OF FRACTURED N.C.R. w/ CLAY IN-FILL, LOW to MOD RECOVERY

59.8' - 69.8' : CLAY IN-FILL, NO RECOVERY (TRACE of REC. 64.8-69.8)

CORE PHOTOGRAPHS

B3-B ALT

BOX 3 of 6 : 69.8' - 88.6'' FEET



0 1 2

FEET

GEOLOGICAL STRENGTH INDEX: GSI

69.8' - 71.3' : CLAY IN-FILL, SOME RECOVERY

71.3' - 88.6' : 15-20 *w/ CLAY IN-FILL ZONES

B3-B ALT

BOX 4 of 6 : 88.6' - 98.6' FEET

0 1 2

FEET

GEOLOGICAL STRENGTH INDEX: GSI

88.6' - 90.9' : 15-20 *w/ CLAY IN-FILL ZONES

90.9' - 98.6' : 30-40

CORE PHOTOGRAPHS

B3-B ALT

BOX 5 of 6 : 98.6'- 110.4' FEET

0 1 2

FEET

GEOLOGICAL STRENGTH INDEX: GSI

98.6' - 107.5' : 30-40

107.5' - 110.4' : CLAY IN-FILL, SOME RECOVERY

B3-B ALT

BOX 6 of 6 : 110.4' - 119.8' FEET

0 1 2

FEET

GEOLOGICAL STRENGTH INDEX: GSI

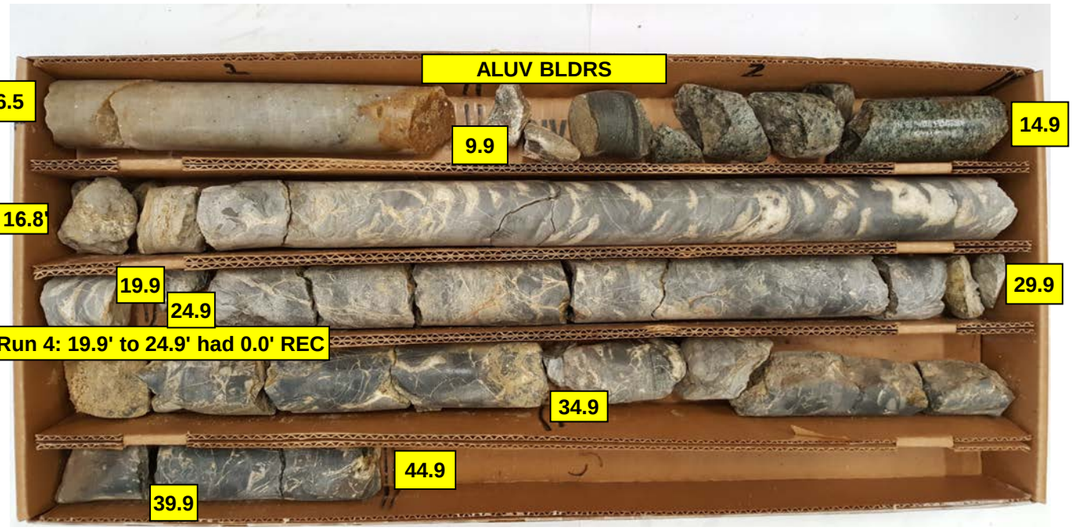
110.4' - 111.0' : CLAY IN-FILL

111.0' - 119.8' : 30-40

CORE PHOTOGRAPHS

B3-B

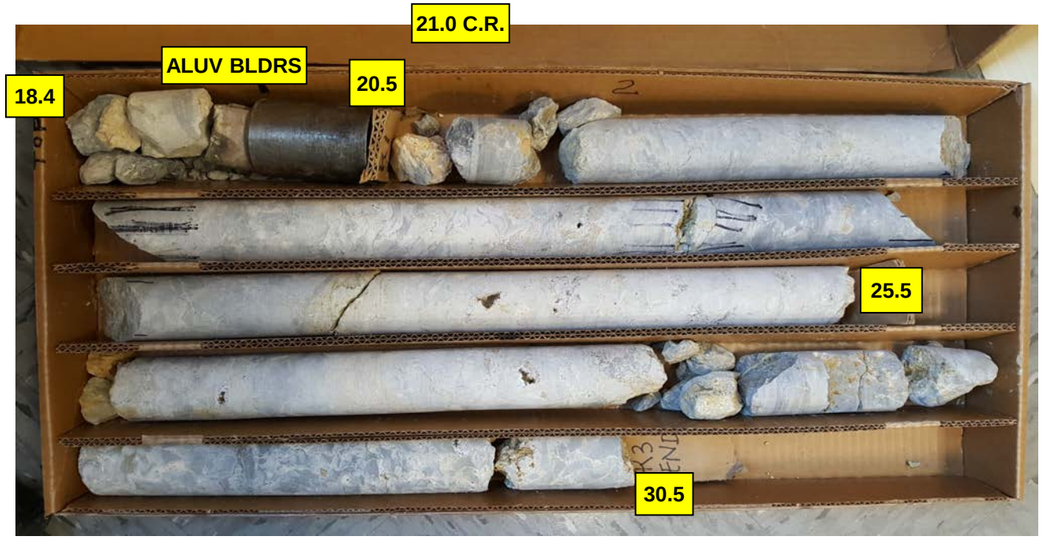
BOX 1 of 1 : 6.5 - 44.9 FEET



GEOLOGICAL STRENGTH INDEX: GSI
16.8' - 19.9' : 30 - 40
19.9' - 24.9' : Barrel had NO RECOVERY
24.9' - 44.9' : 10 - 15

EB2-B

BOX 1 of 1 : 18.4 - 30.5 FEET



GEOLOGICAL STRENGTH INDEX: GSI
21.0' - 30.5' : 45-55

REFERENCE: B-5895

PROJECT: 48088

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5895	1	9

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MADISON

PROJECT DESCRIPTION REPLACE BRIDGE # 0067 ON US-25/70 OVER FRENCH BROAD RIVER

SITE DESCRIPTION RETAINING WALL 1 STATION 23+90 TO 27+50 RT

CONTENTS

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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.

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NOTES:
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PERSONNEL

-NCDOT-

DC CHEEK

CJ COFFEY

CD JOHNSON

DC ELLIOTT

INVESTIGATED BY DC ELLIOTT

DRAWN BY DC ELLIOTT

CHECKED BY JC KUHNE

SUBMITTED BY JC KUHNE

DATE

NORTH CAROLINA LICENSED SEAL 2376 GEOLOGIST D CLAYTON ELLIOTT

DocuSigned by:
D. Clayton Elliott 6/4/2019
FD421F60GR0E40... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
B-5895	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

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

TEXTURE OR GRAIN SIZE

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

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [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
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: ELEVATIONS TAKEN FROM CROSS-SECTIONS, FROM FILE FROM NCDOT CONNECT: "B-5895 Electronic Files", "b5895_rdy_xsc"
ELEVATION: FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
B-5895	3

SITE PLAN

0 50 100
FEET

NAD 83/NSRS 2007

END BRIDGE
-L- STA. 23+17.09

-Y-POT Sta. 12+37.71

END CONSTRUCTION
-Y- STA 11+80.00

STAIRS–TRAIL

STAIRS–TRAIL

25

F F F F F F

F F F F F F

US 70/US 25

PC Sta. 27+93.51

EB2-B
(RW-1)
23+12
35' RT

RW-2
24+18
28' RT

RW-3
25+00
32' RT

-Y- POT Sta. 10+00.00=
-L- STA. 25+52.38

END TIP PROJECT B-5895
-L- STA 28+75.00
S 79° 50′ 52.45″ E

PROJECT REFERENCE NO.	SHEET NO.
B-5895	4

REPLACE BRDG No. 0067
ON US-27/70 over
FRENCH BROAD RIVER

0 50 100
FEET
VE = 5 : 1

APPROXIMATE WALL FACE AREA = 7280 SQ.FT.

-RW1- STA 14+57.89=
-L- STA. 27+50.00
ELEV 1367.67'

-RW1- STA 14+57.89=
-L- STA. 27+50.00
ELEV 1367.06'

TOP OF WALL

-RW1- 11+11.02=
-L- 24+00.00

-RW1- 12+09.33=
-L- 25+00.00

EXISTING GROUND

BOTTOM OF WALL

-RW1- 10+35.41=
-L- 23+23.28

BOTTOM OF CAP

RW-3
25+00
32' LT

EB2-B
(RW-1)
23+12
35' RT

RW-2
24+18
28' LT

-RW1- STA 10+00.00=
-L- STA. 22+90.32
ELEV 1319.16'

-RW1- STA 10+00.00=
-L- STA. 22+90.32
ELEV 1318.62'

ROADWAY EMBANKMENT: SANDY-SILT
w/ some GRAVELS, a few BOULDERS & trace CLAY

ALLUVIUM: LOOSE to MED DENSE
SILTY, FINE-to-COURSE SAND, w/ MICA, trace CLAY;
a few COBBLE/BOULDERS w/ depth

SAPROLITE: SOFT SILTY-CLAY (A-7-6),
a little SANDY, & w/ a few ROCK FRAGMENTS

CRYSTALLINE ROCK:
SHADY DOLOMITE

100/0.9
38
54
60/0.1

3
12
14
2
11

6
14
14
2

B.T.@ 30.5' IN CRYSTALLINE ROCK

B.T.@ 26.5' IN ALLUVIUM (AI)

B.T.@ 21.7' IN SAPROLITE

A ROADWAY EMBANKMENT: LOOSE SILTY-SAND
w/ a few PEBBLES & GRAVELS

B ROADWAY EMBANKMENT: SANDY-SILT
w/ some GRAVELS, a few BOULDERS & trace CLAY

C ALLUVIUM: LOOSE to VERY DENSE
SILTY, FINE-to-COURSE SAND, GRAVELS &
COBBLE/BOULDERS (AI)

WALL PROFILE ALONG -L-

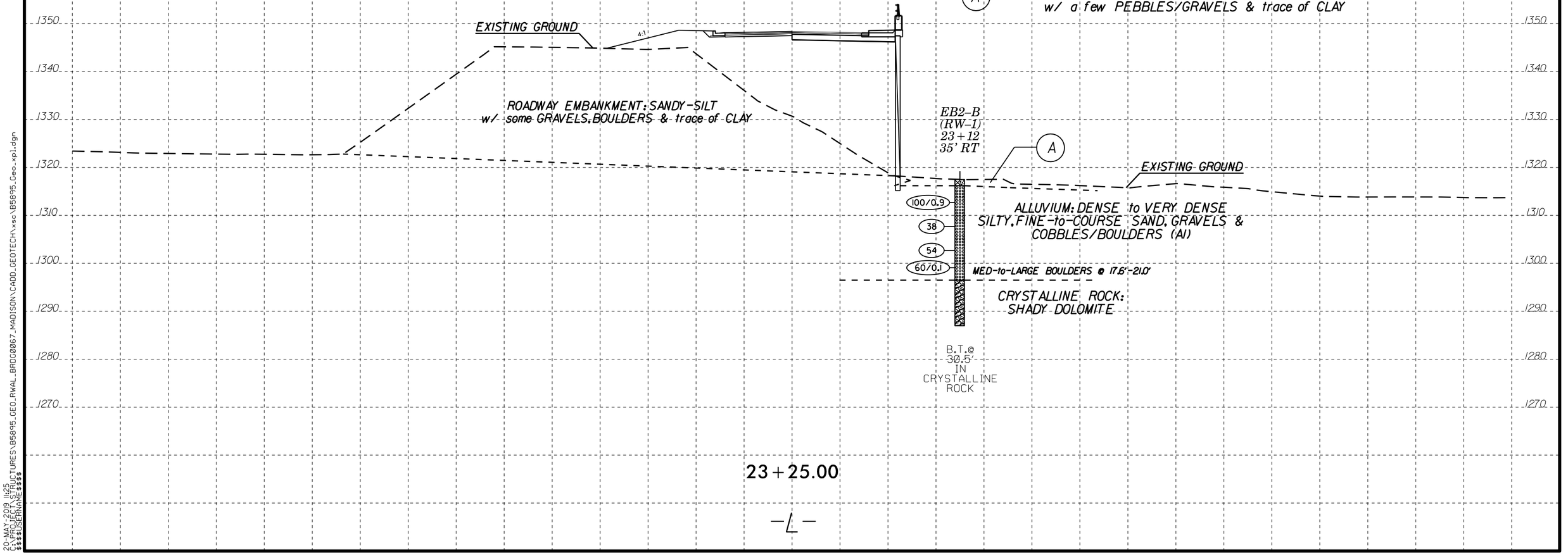
THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF THE WALL

1,360 1,350 1,340 1,330 1,320 1,310 1,300 1,290 1,280

22 23 24 25 26 27 28

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	B-5895	5



23+25.00

6/23/16

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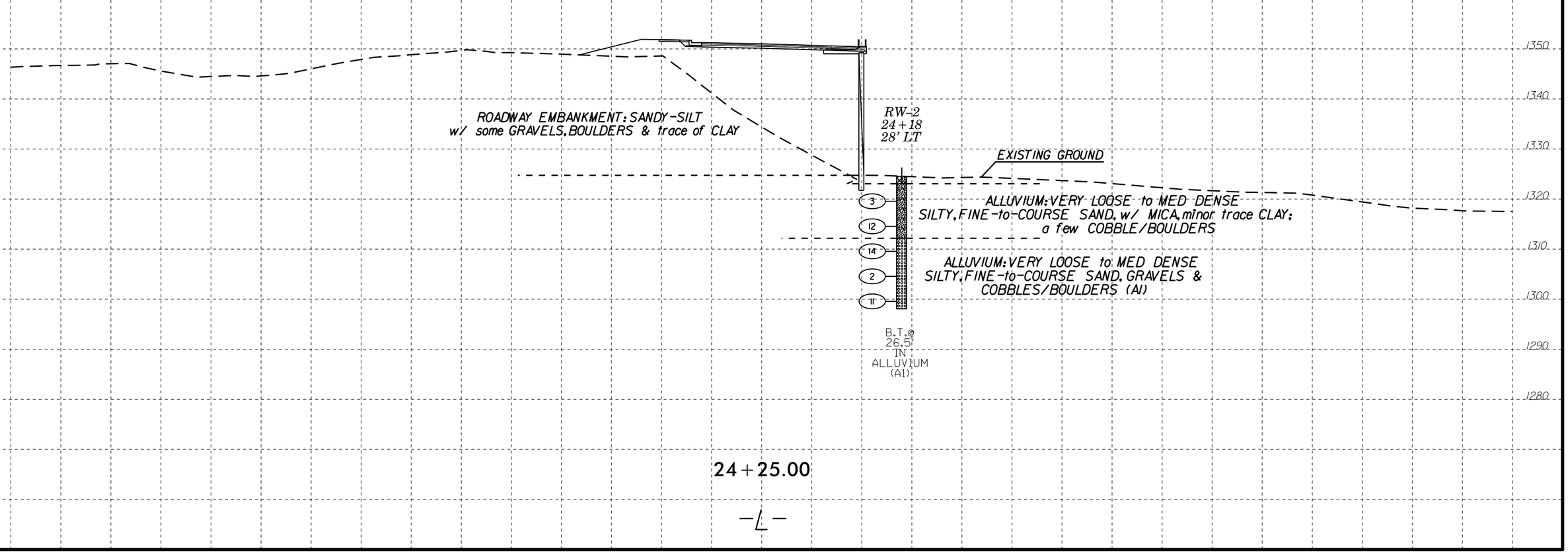
	B-5895	6



24+25.00

—L—

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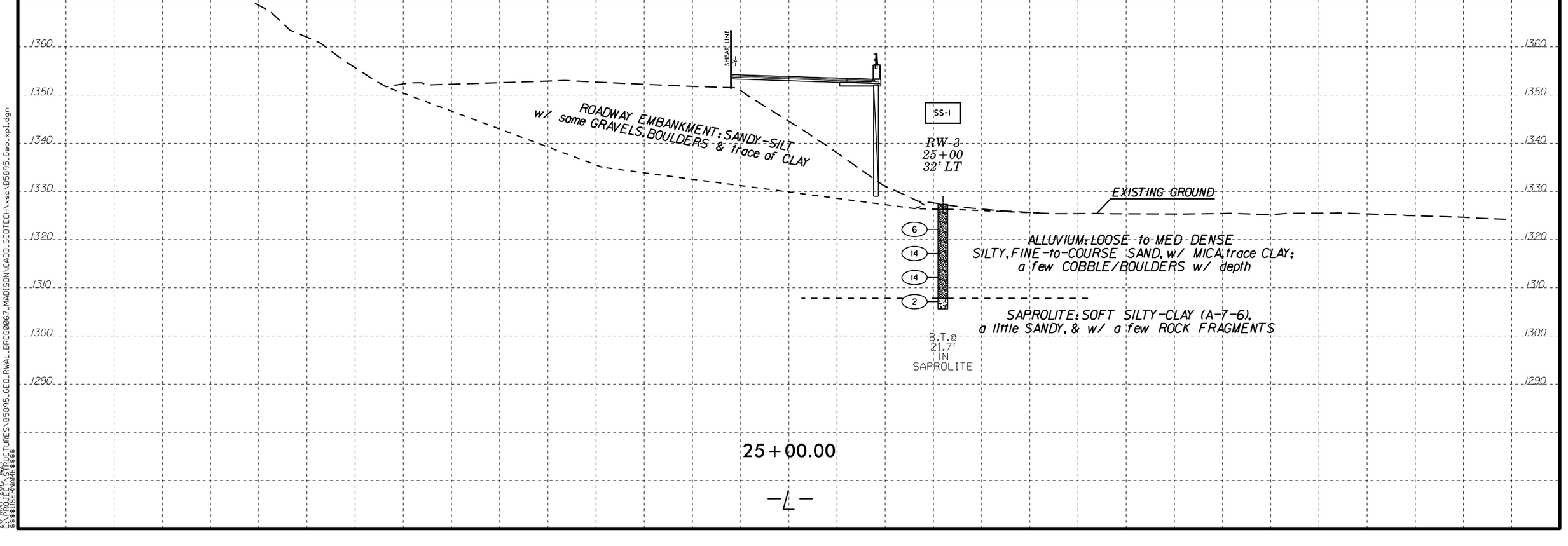
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	32.0' RT	25+00	20.2' - 21.7'	A-7-6(18)	53	29	9.1	10.3	27.6	53	99.8	95.4	80.6	NA	-



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB2-B (RW-1)	**STATION** 23+12	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,317.5 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 801,874	**EASTING** 868,230	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/25/19	**COMP. DATE** 02/25/19	**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
1320										ELEV. (ft) DEPTH (ft)
										1,317.5 GROUND SURFACE 0.0
1315										1,316.2 **ROADWAY EMBANKMENT** 1.3 LOOSE SILTY, FINE-to-COURSE SAND w/ a few PEBBLES/GRAVELS
	1,312.7	4.8	16	84/0.4		BLDRS		D		**ALLUVIAL** DENSE to VERY DENSE SILTY, FINE-to-COURSE SANDY, GRAVELS, COBBLES & BOULDERS (A1)
1310										
	1,307.7	9.8	20	15	23	38		M		
1305										
	1,302.7	14.8	5	26	28	54		M		
1300										
				60/0.1		60/0.1 BLDR				
1295										1,296.5 21.0
										CRYSTALLINE ROCK SHADY DOLOMITE
1290										
										1,287.0 30.5
										Boring Terminated at Elevation 1,287.0 ft IN CRYSTALLINE ROCK (SHADY DOLOMITE)

NCDOT BORE DOUBLE B5895_GEO_BRDG0067_MADISON_BOREHOLES.GPJ NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. EB2-B (RW-1)	**STATION** 23+12	**OFFSET** 35 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,317.5 ft	**TOTAL DEPTH** 30.5 ft	**NORTHING** 801,874	**EASTING** 868,229	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/25/19	**COMP. DATE** 02/25/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE N/A	**TOTAL RUN** 12.1 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
1299.1											ELEV. (ft) DEPTH (ft)
	1,299.1	18.4	2.1	2:45/1.0	(0.8)	(0.0)					Begin Coring @ 18.4 ft
	1,297.0	20.5		*N=60/0.1*	38%	0%					**ALLUVIAL** *(continued)*
1295			5.0	2:45/1.0	(4.6)	ALUV					1,296.5 21.0
				2:50/1.1	92%	BLDRS					**CRYSTALLINE ROCK**
				BLDR		(4.2)					
				2:17/1.0		84%					
				2:59/1.0		C.R.					
	1,292.0	25.5		1:59/1.0		@					
			5.0	1:50/1.0	(3.0)	21.0'					
1290				1:55/1.0	60%						
				2:53/1.0		(2.3)					
				1:17/1.0		46%					
				1:27/1.0							
	1,287.0	30.5		1:42/1.0							1,287.0 30.5
				1:34/1.0							Boring Terminated at Elevation 1,287.0 ft IN CRYSTALLINE ROCK (SHADY DOLOMITE)

GSI: 18.5' - 21.0': NA, ALUV BLDRS
21.0' - 30.5': 45-55

NCDOT CORE DOUBLE B5895_GEO_BRDG0067_MADISON_BOREHOLES.GPJ NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. RW-2	**STATION** 24+18	**OFFSET** 28 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,324.6 ft	**TOTAL DEPTH** 26.5 ft	**NORTHING** 801,867	**EASTING** 868,334	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/25/19	**COMP. DATE** 02/25/19	**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
1325										1,324.6 GROUND SURFACE 0.0
										1,323.1 **ARTIFICIAL FILL** LOOSE SILTY-SAND; PARKING AREA 1.5
1320	1,319.6	5.0	1	1	2	3		M		**ALLUVIAL** VERY LOOSE to MED DENSE BROWN/GREY SILTY, FINE to COURSE SAND, w/ MICA, trace CLAY; a few COBBLES/BOULDERS
1315	1,314.6	10.0	5	6	6	12		M		
1310	1,309.6	15.0	4	6	8	14		M		1,312.2 12.4 **ALLUVIAL** VERY LOOSE to MED DENSE BROWN/GREY SILTY, FINE to COURSE SAND, GRAVELS, COBBLES & BOULDERS (A1)
1305	1,304.6	20.0	1	1	1	2		M		
1300	1,299.6	25.0	8	6	5	11		M		1,298.1 26.5 Boring Terminated at Elevation 1,298.1 ft IN ALUVIUM (A1)

NCDOT BORE DOUBLE B5895_GEO_BRDG0067_MADISON_BOREHOLES.GPJ NC_DOT.GDT 5/20/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48088.1.1	**TIP** B-5895	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION Replace Bridge No. 67 on US 25/70 over French Broad River and PrivateDrive				**GROUND WTR (ft)**
BORING NO. RW-3	**STATION** 25+00	**OFFSET** 32 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,327.3 ft	**TOTAL DEPTH** 21.7 ft	**NORTHING** 801,846	**EASTING** 868,411	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 02/25/19	**COMP. DATE** 02/25/19	**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)
1330										1,327.3 GROUND SURFACE 0.0
										1,326.3 **ARTIFICIAL FILL** LOOSE SILTY-SAND; PARKING AREA 1.0
1325	1,322.1	5.2	3	4	2	6		M		**ALLUVIAL** VERY LOOSE to MED DENSE BROWN/GREY SILTY, FINE to COURSE SAND, w/ MICA, trace CLAY; a few COBBLES/BOULDERS increasing with depth
1320	1,317.1	10.2	7	7	7	14		M		
1315	1,312.1	15.2	6	8	6	14		M		
1310	1,307.1	20.2	1	1	1	2	SS-1	M		1,307.8 19.5 **SAPROLITE** 1,305.6 SOFT SILTY-CLAY, a little SANDY, & w/ a few ROCK FRAGMENTS present (A-7-6) 21.7 Boring Terminated at Elevation 1,305.6 ft IN SAPROLITE (A-7-6)

NCDOT BORE DOUBLE B5895_GEO_BRDG0067_MADISON_BOREHOLES.GPJ NC_DOT.GDT 5/20/19