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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	67032	1	13

REFERENCE: 67032

PROJECT: BR-0032

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MADISON

PROJECT DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC 209 OVER MEADOW FORK CREEK

SITE DESCRIPTION

CONTENTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

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

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PERSONNEL

CD JOHNSON

DO CHEEK

CJ COFFEY

INVESTIGATED BY DMM

DRAWN BY DMM

CHECKED BY JCK

SUBMITTED BY JCK

DATE 6/4/2021

NORTH CAROLINA PROFESSIONAL SEAL 029878 ENGINEER D MATT MULLEN

DocuSigned by:
D Matt Mullen 6/11/2021
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SIGNATURE DATE

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PROJECT REFERENCE NO.	SHEET NO.
67032	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:
- [ ] 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:
- [ ] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: N/A
BORING ELEVATIONS ARE DERIVED FROM BRO032_LS_TNL.TIN
ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
67032	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

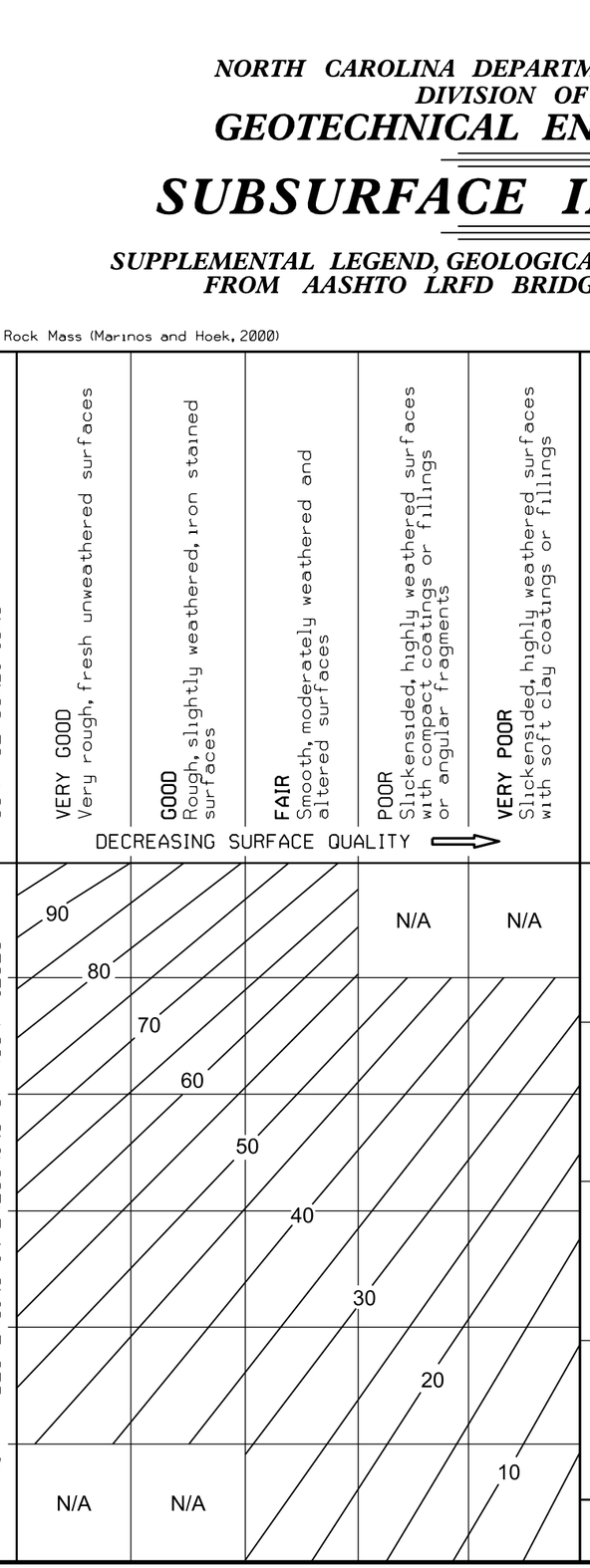
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

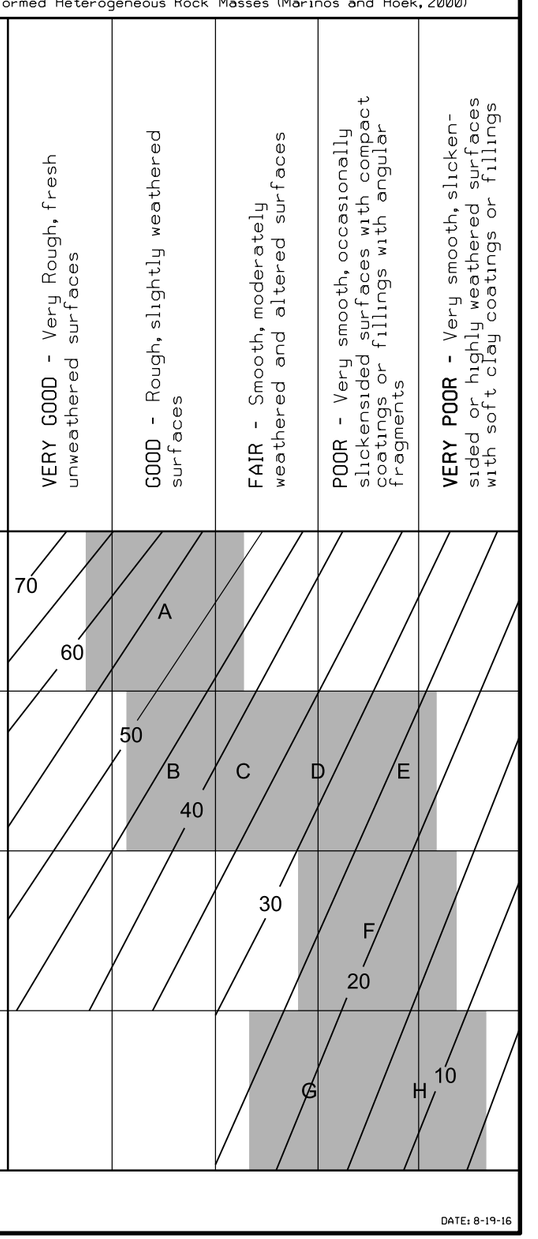


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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.
BR-0032	3

SITE PLAN

0 20 40
FEET

SPRING CREEK

NC 209
TO HOT SPRINGS

TO TRUST

MADISON 0084

EB1-A
EB1-B
B1-B
B1-C
EB2-A
EB2-B

MEADOW FORK
CREEK

13+00

14+00

PROJECT REFERENCE NO.	SHEET NO.
67032	4

REPLACE MADISON BRIDGE #560084
ON NC 209 OVER MEADOW FORK CREEK

0 10 20
FEET
VE = 1H : 1V

BORINGS ARE PROJECTED ONTO END BENT ONE
SKEW = 120 DEG.

EB1–A
AS
C/L
–L–
EB1–B
AS
EB1–A
AD
EB1–B
AD
EB1–A
13+18
12.3' LT
EB1–B
12+96
14' RT
EXISTING GROUND
1890
1880
1870
1860
1850
1840
1830
1820
1810
6
10
12
26
60/0.0
4
3
11
60/0.0
A
B
B.T. @
24.8 IN
C.R.
B.T.@
20.1 IN
C.R.
CRYSTALLINE ROCK:
PINK GRAY GRANITE
A ROADWAY EMBANKMENT:
A–2 BROWN SANDY SILT
WITH BOULDERS
B ALLUVIUM: BROWN SANDY SILT
W/PEBBLES AND A FEW
ROCK FRAGMENTS
55 45 35 25' 15' 5' LT C/L 5' RT 15' RT 25 35 45

0	10	20

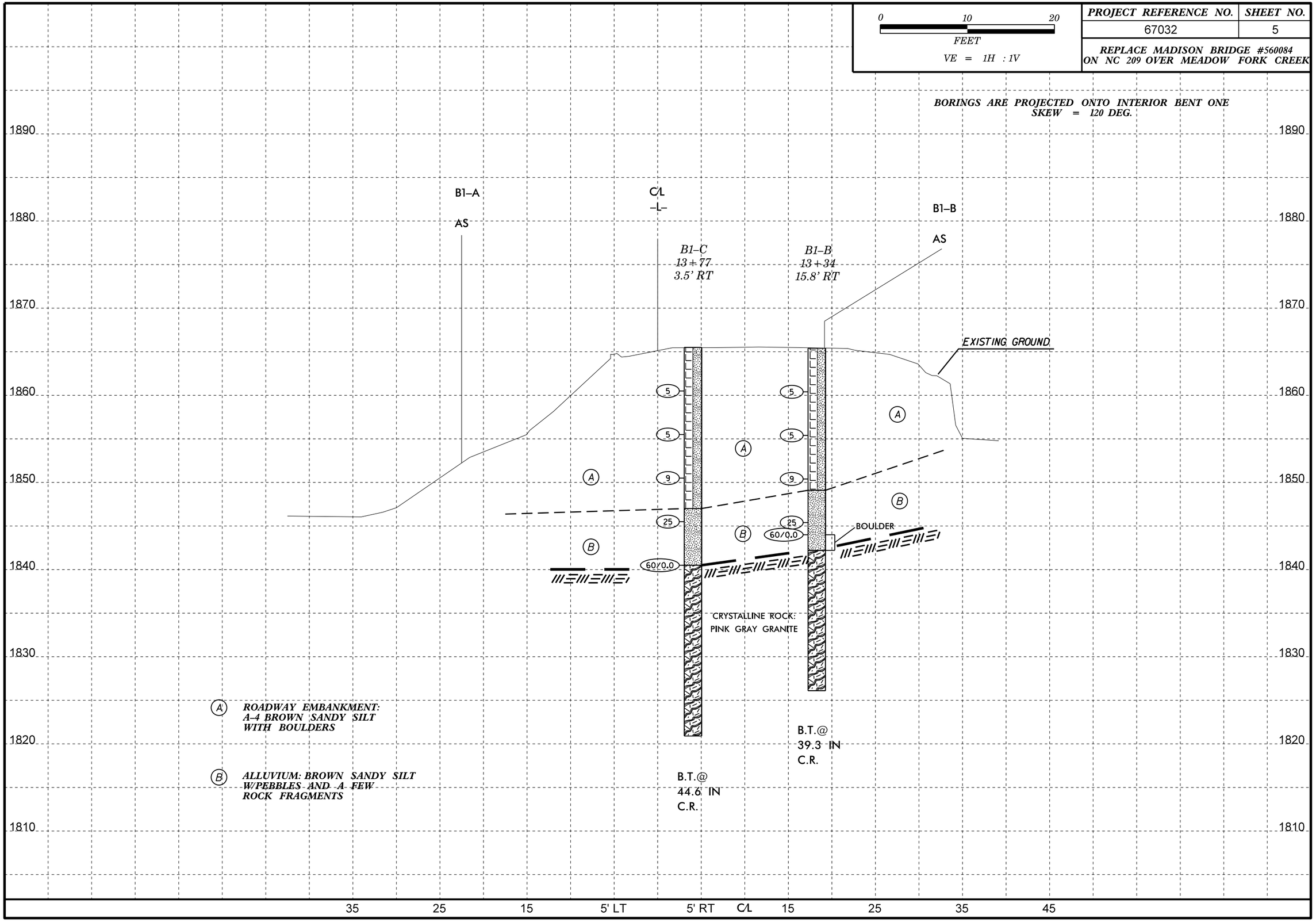
FEET

VE = 1H : 1V

PROJECT REFERENCE NO.	SHEET NO.
67032	5

REPLACE MADISON BRIDGE #560084
ON NC 209 OVER MEADOW FORK CREEK

BORINGS ARE PROJECTED ONTO INTERIOR BENT ONE
SKEW = 120 DEG.



A ROADWAY EMBANKMENT: A–4 BROWN SANDY SILT WITH BOULDERS

B ALLUVIUM: BROWN SANDY SILT W/PEBBLES AND A FEW ROCK FRAGMENTS

0	10	20

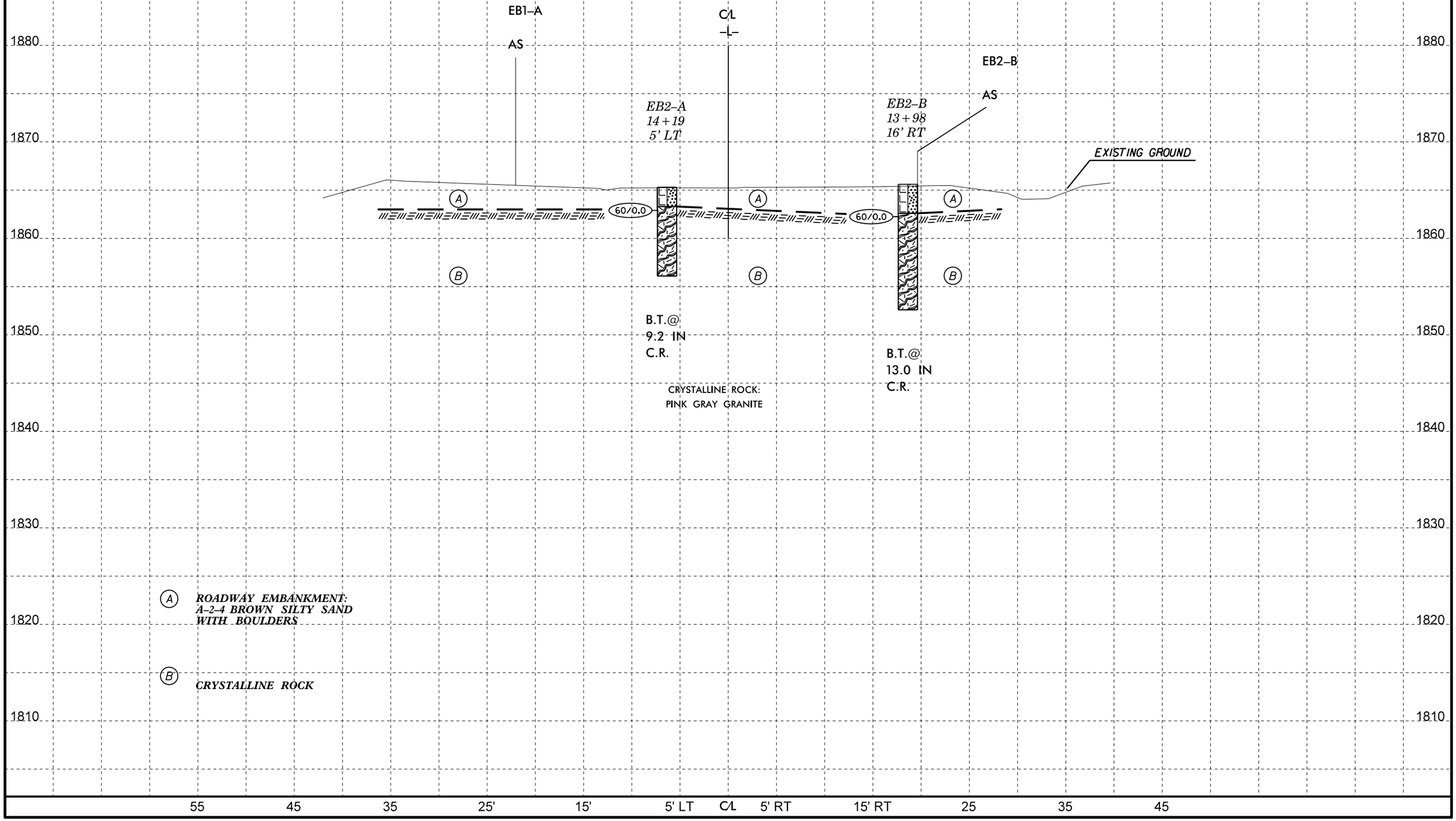
FEET

VE = 1H : 1V

PROJECT REFERENCE NO.	SHEET NO.
67032	6

REPLACE MADISON BRIDGE #560084
ON NC 209 OVER MEADOW FORK CREEK

BORINGS ARE PROJECTED ONTO END BENT TWO
SKEW = 120 DEG.



(A) *ROADWAY EMBANKMENT: A–2–4 BROWN SILTY SAND WITH BOULDERS*

(B) *CRYSTALLINE ROCK*

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC-209 OVER MEADOW FORK CREEK				**GROUND WTR (ft)**
BORING NO. EB-1A	**STATION** 13+18	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,864.8 ft	**TOTAL DEPTH** 24.8 ft	**NORTHING** 779,592	**EASTING** 855,522	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 05/06/21	**COMP. DATE** 05/06/21	**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)
1865												
										GROUND SURFACE	1,864.8	0.0
										ROADWAY EMBANKMENT A-2 BOULDERS/FILL TO 14.0' THEN BROWN SANDY-SILT w/GRVLS&RK FRAGS		
1860	1,860.0	4.8	2	2	4	6		M				
1855	1,855.0	9.8	2	2	8	10		M				
1850	1,850.0	14.8	3	6	6	12		M				
1845	1,845.0	19.8	31	12	14	26		M			1,845.8	19.0
										ALLUVIAL BROWN, SANDY-SILT w/PEBBLES, FEW RK FRAGS	1,843.0	21.8
	1,840.0	24.8	60/0.0			60/0.0				**CRYSTALLINE ROCK** PINK-GREY CRYSTALLINE ROCK (GRANITE)	1,840.0	24.8
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,840.0 ft IN CRYSTALLINE ROCK		

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC-209 OVER MEADOW FORK CREEK				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 12+96	**OFFSET** 14 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,865.8 ft	**TOTAL DEPTH** 20.1 ft	**NORTHING** 779,578	**EASTING** 855,499	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE AFO8963 CME-550X 94% 04/08/2019		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Cheek, D. O.	**START DATE** 05/07/21	**COMP. DATE** 05/07/21	**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)
1870												
										GROUND SURFACE	1,865.8	0.0
1865										**ROADWAY EMBANKMENT** BROWN, SANDY-SILT w/TR CLAY, FEW GRAVELS/RK FRAGS T/O		
1860	1,860.7	5.1	1	2	2	4		M				
1855	1,855.7	10.1	2	1	2	3		M				
1850	1,850.7	15.1	8	5	6	11		M			1,849.6	16.2
										ALLUVIAL BROWN, SANDY-SILT w/PEBBLES/GRAVELS	1,846.7	19.1
	1,845.7	20.1	60/0.0			60/0.0				**CRYSTALLINE ROCK** PINK-GREY CRYSTALLINE ROCK (GRANITE)	1,845.7	20.1
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,845.7 ft IN CRYSTALLINE ROCK		

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC-209 OVER MEADOW FORK CREEK				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 13+77	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,865.5 ft	**TOTAL DEPTH** 44.6 ft	**NORTHING** 779,562	**EASTING** 855,535	**24 HR.** Dry
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** 05/06/21	**COMP. DATE** 05/06/21	**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
1870										
1865										1,865.5 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT BROWN, SANDY-SILT w/BOULDERS, GRAVELS, COBBLES
1860	1,860.5	5.0	2	32	NO DRIVE			M		
1855	1,855.5	10.0	2	2	3	5		M		
1850	1,850.5	15.0	2	2	2	4		M		
1845	1,845.5	20.0	7	11	7	18		M		1,847.0 18.5 **ALLUVIAL** RED-BROWN, SANDY-SILT w/PEBBLES, GRAVELS, FEW COBBLES
1840	1,840.5	25.0	60/0.0			60/0.0				1,840.5 25.0 **CRYSTALLINE ROCK** PINK-GREY CRYSTALLINE ROCK (GRANITE)
1835										21.4-24.3 GSI = 75
1830										24.3-29.3 GSI = 70
1825										29.3-34.3 GSI = 80
										34.3-39.3 GSI = 70
										1,820.9 44.6 Boring Terminated at Elevation 1,820.9 ft IN CRYSTALLINE ROCK

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC-209 OVER MEADOW FORK CREEK				**GROUND WTR (ft)**
BORING NO. B1-C	**STATION** 13+77	**OFFSET** 4 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,865.5 ft	**TOTAL DEPTH** 44.6 ft	**NORTHING** 779,562	**EASTING** 855,535	**24 HR.** Dry
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** 05/06/21	**COMP. DATE** 05/06/21	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 18.6 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
1839.48											Begin Coring @ 26.0 ft
	1,839.5	26.0	3.6	2:37/1.6 1:16/1.0 2:32/1.0	(2.8) 78%	(0.4) 11%					**CRYSTALLINE ROCK** *(continued)*
1835	1,835.9	29.6	5.0	2:42/1.0 1:15/1.0 2:07/1.0 1:22/1.0 1:18/1.0	(5.0) 100%	(3.6) 72%					
1830	1,830.9	34.6	5.0	1:31/1.0 1:37/1.0 2:06/1.0 2:10/1.0 4:43/1.0	(4.9) 98%	(1.8) 36%					
1825	1,825.9	39.6	5.0	2:59/1.0 4:24/1.0 5:19/1.0 12:02/1.0 31:25/1.0	(4.9) 98%	(4.9) 98%					1,820.9 44.6 Boring Terminated at Elevation 1,820.9 ft IN CRYSTALLINE ROCK
	1,820.9	44.6									

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.
SITE DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC-209 OVER MEADOW FORK CREEK			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 13+34	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,865.4 ft	**TOTAL DEPTH** 39.3 ft	**NORTHING** 779,562	**EASTING** 855,515	**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** 05/07/21	**COMP. DATE** 05/07/21	**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)
1870											
1865										1,865.4 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT BROWN-GREY, SANDY-SILT w/GRAVELS	
1860	1,860.4	5.0	2	2	3	5		M			
1855	1,855.4	10.0	1	2	3	5		M			
1850	1,850.4	15.0	3	3	6	9		M		1,849.1	16.3
										ALLUVIAL BROWN, SANDY-SILT w/PEBBLES, GRAVELS, FEW RK FRAGS AND A BOULDER FROM 21.4' - 23.2'	
1845	1,845.4	20.0									
1840	1,844.0	21.4	12 60/0.0	13	12	25 60/0.0		M		1,842.2	23.2
										CRYSTALLINE ROCK PINK-GREY CRYSTALLINE ROCK (GRANITE)	
1835											
1830										1,826.1	39.3
										Boring Terminated at Elevation 1,826.1 ft IN CRYSTALLINE ROCK	

NCDOT BORE DOUBLE BR0032_GEO_BRDG84_MADISON_BH.GPJ NC_DOT.GDT 6/4/21

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Johnson, C. D.
SITE DESCRIPTION REPLACE BRIDGE NO. 560084 ON NC-209 OVER MEADOW FORK CREEK			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 13+34	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** FIAD
COLLAR ELEV. 1,865.4 ft	**TOTAL DEPTH** 39.3 ft	**NORTHING** 779,562	**EASTING** 855,515	**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** 05/07/21	**COMP. DATE** 05/07/21	**SURFACE WATER DEPTH** N/A
CORE SIZE NXWL	**TOTAL RUN** 17.9 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
1844.04											Begin Coring @ 21.4 ft	
	1,844.0	21.4	2.9	*N=60/0.0* 2:11/0.9 1:43/1.0 2:23/1.0	(2.3 79%	BOULDER TO 23.2'					**ALLUVIAL** *(continued)*	
	1,841.1	24.3									1,842.2	23.2
1840			5.0	2:25/1.0 2:25/1.0 1:51/1.0 1:16/1.0 1:44/1.0	(5.3) 106%	(4.5) 90%					**CRYSTALLINE ROCK**	
	1,836.1	29.3										
1835			5.0	2:15/1.0 2:15/1.0 2:42/1.0 3:01/1.0 3:01/1.0	(4.8) 96%	(4.2) 84%						
	1,831.1	34.3										
1830			5.0	3:07/1.0 3:06/1.0 2:10/1.0 2:10/1.0 3:17/1.0	(5.1) 102%	(4.3) 86%						
	1,826.1	39.3									1,826.1	39.3
											Boring Terminated at Elevation 1,826.1 ft IN CRYSTALLINE ROCK	

NCDOT CORE DOUBLE BR0032_GEO_BRDG84_MADISON_BH.GPJ NC_DOT.GDT 6/4/21

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+19	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,865.8 ft	**TOTAL DEPTH** 9.2 ft	**NORTHING** 779,519	**EASTING** 855,608	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 01/25/19	**COMP. DATE** 01/25/19	**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)
1870											
1865										1,865.8 GROUND SURFACE	0.0
	1,863.4	2.4								**ROADWAY EMBANKMENT** 1,863.8 tan and gray, silty SAND (A-2-4) with some gravel, cobbles, and boulders 1,863.4	2.0 2.4
			60/0.0			60/0.0				**CRYSTALLINE ROCK** (Meta-Granite)	
1860										**CRYSTALLINE ROCK** (Meta-Granite) REC: 94% RQD: 43% GSI: 65-75 1,856.6	9.2
										Boring Terminated at Elevation 1,856.6 ft in Crystalline Rock (Meta-Granite)	

- Equivalent boring to L_1419 from Roadway Investigation.
- Casing advancer refusal and begin core at 2.4 feet.

NCDOT BORE DOUBLE BR0032_GEO_BRDG560084_GINT_SUMMIT.GPJ NC_DOT.GDT 6/10/21

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 14+19	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,865.8 ft	**TOTAL DEPTH** 9.2 ft	**NORTHING** 779,519	**EASTING** 855,608	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 01/25/19	**COMP. DATE** 01/25/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 6.8 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)
1863.4											Continued from previous page	
	1,863.4	2.4	1.8	*N=60/0.0*	(1.5)	(1.0)		(6.4)	(2.9)		1,863.4 **CRYSTALLINE ROCK**	2.4
	1,861.6	4.2		5:53/0.8	83%	56%		94%	43%		pink, gray, white, and black, moderate to very slight weathering, moderately	
1860			5.0	6:45/1.0							hard to very hard, close fracture spacing, METAMORPHOSED GRANITE	
				9:27/1.0	(4.9)	(1.9)					(Meta-Granite). GSI: 65-75	
				6:44/1.0	98%	38%						
				6:02/1.0								
				3:20/1.0								
	1,856.6	9.2		7:18/1.0							1,856.6	9.2
											Boring Terminated at Elevation 1,856.6 ft in Crystalline Rock (Meta-Granite)	

- Equivalent boring to L_1419 from Roadway Investigation.
- Casing advancer refusal and begin core at 2.4 feet.

NCDOT CORE DOUBLE BR0032_GEO_BRDG560084_GINT_SUMMIT.GPJ NC_DOT.GDT 6/10/21

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 13+98	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,865.7 ft	**TOTAL DEPTH** 13.0 ft	**NORTHING** 779,512	**EASTING** 855,578	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 01/31/19	**COMP. DATE** 01/31/19	**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
										ELEV. (ft) DEPTH (ft)
1870										
1865										1,865.7 GROUND SURFACE 0.0
	1,862.0	3.7	60/0.0			60/0.0				**ROADWAY EMBANKMENT** tan, silty SAND (A-2-4) with some gravel, cobbles, and boulders 1,862.7 3.0
1860										1,862.0 3.7 **CRYSTALLINE ROCK** (Meta-Granite)
										CRYSTALLINE ROCK (Meta-Granite) REC: 90% RQD: 29% GSI: 60-70
1855										1,852.7 13.0
										Boring Terminated at Elevation 1,852.7 ft in Crystalline Rock (Meta-Granite) - Equivalent boring to L_1398 from the Roadway Investigation. - Casing advancer refusal and begin core at 3.7 feet.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 13+98	**OFFSET** 16 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,865.7 ft	**TOTAL DEPTH** 13.0 ft	**NORTHING** 779,512	**EASTING** 855,578	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 01/31/19	**COMP. DATE** 01/31/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 9.3 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
1862											Continued from previous page
	1,862.0	3.7	1.3	*N=60/0.0*	(1.0)	(0.4)		(8.4)	(2.7)		1,862.0 3.7 **CRYSTALLINE ROCK** pink, gray, black, and white, moderate severe to slight weathering, medium hard to very hard, close fracture spacing, METAMORPHOSED GRANITE (Meta-Granite). GSI: 60-70
1860	1,860.7	5.0	5.0	3:11/1.3	77%	31%		90%	29%		
				2:02/1.0							
				2:31/1.0	(4.8)	(1.2)					
				3:09/1.0	96%	24%					
	1,855.7	10.0		3:40/1.0							
1855				3:23/1.0							
			3.0	2:28/1.0	(2.6)	(1.1)					
				3:35/1.0	87%	37%					
	1,852.7	13.0		4:07/1.0							1,852.7 13.0
											Boring Terminated at Elevation 1,852.7 ft in Crystalline Rock (Meta-Granite) - Equivalent boring to L_1398 from the Roadway Investigation. - Casing advancer refusal and begin core at 3.7 feet.

CORE PHOTOGRAPHS

B1-C

BOXES 1 & 2: 25.0 - 44.6 FEET

RUN 1: 26.0-29.6
GSI: 70

RUN 2: 29.6-34.6
GSI: 85

RUN 3: 34.6-39.6
GSI: 75

RUN 4: 39.6-44.6
GSI: 90

0 1 2
FEET

B1-B

BOXES 1 & 2: 11.8 - 32.3 FEET

RUN 1: 21.4-24.3
GSI: 75 (BOULDER)

RUN 2: 24.3-29.3
GSI: 70

RUN 3: 29.3-34.3
GSI: 80

RUN 4: 34.3-39.3
GSI: 70

0 1 2
FEET

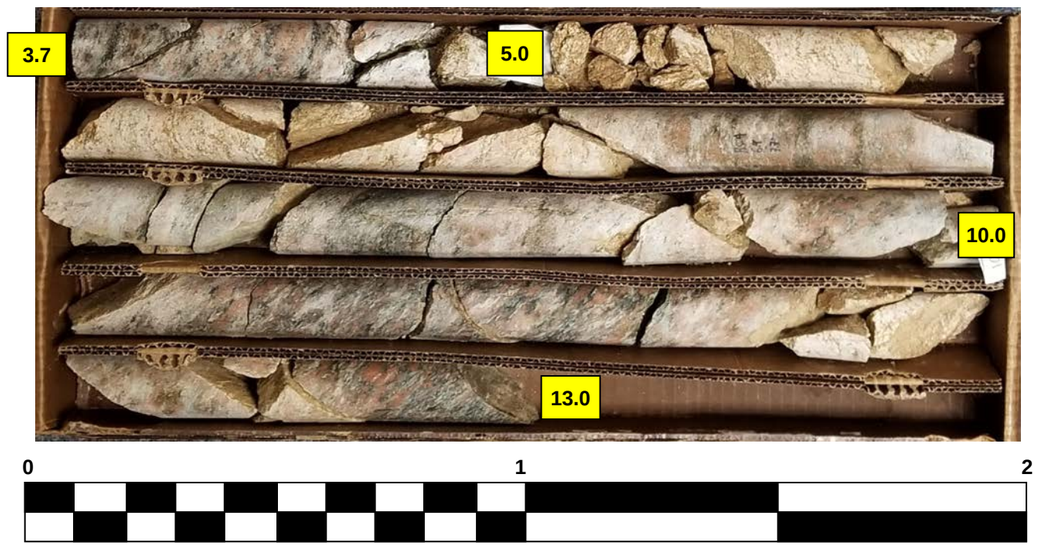
CORE PHOTOGRAPHS

EB2-B

24.4 - 29.6 FEET

EB2-B_ALT

3.7 - 13.0 FEET



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0032	1	20

REFERENCE: BR-0032

PROJECT: 67032

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *MADISON*

PROJECT DESCRIPTION *REPLACE BRIDGE NO. 560084 ON NC 209 OVER MEADOW FORK CREEK*

SITE DESCRIPTION *RETAINING WALL 1*

CONTENTS

CAUTION NOTICE

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

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

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

PERSONNEL

B. SMITH, PG

A. GROSS, GIT

L. GONZALEZ

D. SUTTON

INVESTIGATED BY *B. SMITH, PG*

DRAWN BY *B. SMITH, PG*

CHECKED BY *B. WORLEY, PG*

SUBMITTED BY *B. SMITH, PG*

DATE *JUNE, 2019*

Prepared in the Office of:

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NORTH CAROLINA LICENSED SEAL 2390 GEOLOGIST BRETT C. SMITH

DocuSigned by:

SIGNATURE 6/20/2019 DATE

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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BR-0032	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:
- [ ] CME-45C
- [X] CME-550X
- [ ] 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.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q2

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [X] 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:

ELEVATION: FEET

NOTES:

Elevations were obtained from BR0032_ls_tnl.tin (file dated 8/28/18).

FIAD = Filled Immediateley After Drilling

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
BR-0032	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

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

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

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

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

STRUCTURE

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

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

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

DECREASING SURFACE QUALITY ⇨

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

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

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

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

COMPOSITION AND STRUCTURE

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

→ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

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

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

DATE: 8-19-16

PROJECT REFERENCE NO.	SHEET NO.
BR-0032	3

SITE PLAN

0 30 60
FEET

BEGIN RETAINING WALL -L- STA. 10+00.00 (19.5' LT)

END RETAINING WALL -L- STA. 11+75.00 (19.5' LT)

10+00

11+00

12+00

13+00

ALLUVIAL

SPRING CREEK

BLUFF

WOODS LINE

SOIL

NC 209

NC 209 19' RST

48" MTL

RS-1

RS-2

RS-3

RS-4

RS-5

10+40 9' LT

11+08 9' LT

11+65 8' LT

WEATHERED ROCK

CRYSTALLINE ROCK

NC GRID NAD 83 NA 2011

-L- ROADWAY EMBANKMENT

CONC HEADWALL

40" MTL

CONC PAD 48" ROCK

CONC PAD

BL-4

GR

0	10	20

FEET

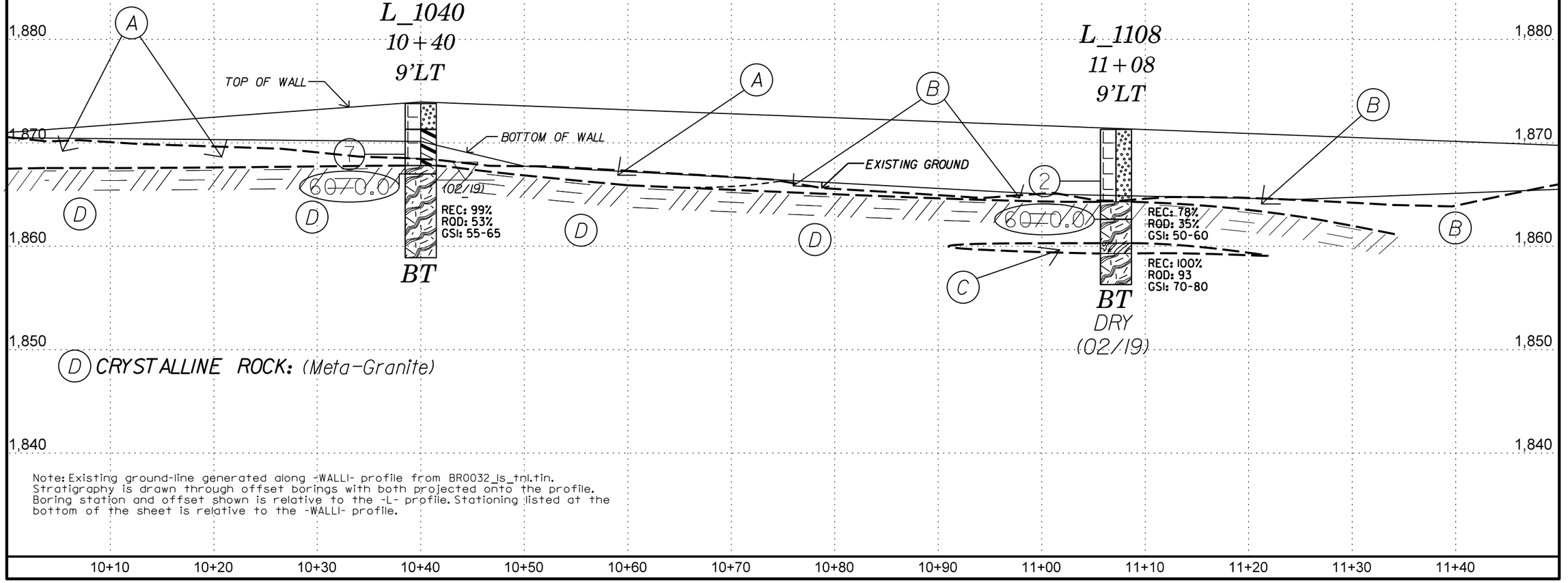
VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
BR-0032	4
-WALLI- PROFILE	

(A) **ROADWAY EMBANKMENT:** tan, wet, medium stiff, sandy CLAY (A-6) with trace organics

(B) **ROADWAY EMBANKMENT:** tan and brown, moist to wet, very loose to medium dense, silty SAND (A-2-4) with some gravel, cobbles, and boulders

(C) **WEATHERED ROCK:** (Meta-Granite)



Note: Existing ground-line generated along -WALLI- profile from BR0032_ls_tnl.tin. Stratigraphy is drawn through offset borings with both projected onto the profile. Boring station and offset shown is relative to the -L- profile. Stationing listed at the bottom of the sheet is relative to the -WALLI- profile.

0	10	20

FEET

VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
BR-0032	5

-WALL1- PROFILE

(A) ROADWAY EMBANKMENT: tan and brown, moist to wet, very loose to medium dense, silty SAND (A-2-4) with some gravel, cobbles, and boulders

1,890

1,880

L_1165
11+65
8'LT

1,870

12
A 7
9

TOP OF WALL
EXISTING GROUND
BOTTOM OF WALL
A

1,860

BT
DRY
(01/19)

1,850

1,840

Note: Existing ground-line generated along -WALL1- profile from BR0032_ls_tn1.tin.
Stratigraphy is drawn through offset borings with both projected onto the profile.
Boring station and offset shown is relative to the -L- profile. Stationing listed at the bottom of the sheet is relative to the -WALL1- profile.

11+60 11+70 11+80

PROJ. REFERENCE NO.	SHEET NO.
BR-0032	6

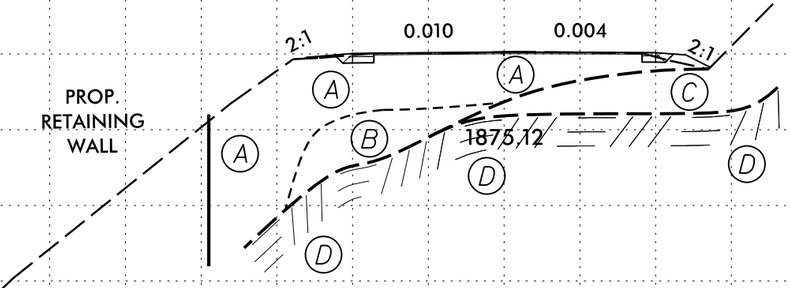
0 2.5 5

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

1910 1905 1900 1895 1890 1885 1880 1875 1870 1865 1860 1855 1850 1845 1840

Ⓐ **ROADWAY EMBANKMENT:** tan, moist, loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders

Ⓑ **ROADWAY EMBANKMENT:** tan, wet, medium stiff, sandy CLAY (A-6) with trace organics



Note: Weathered Rock was not encountered at this location during the investigation but is believed to be present in this slope based on field observations.

Ⓒ **WEATHERED ROCK:** (Meta-Granite)

Ⓓ **CRYSTALLINE ROCK:** (Meta-Granite)

10+00.00

—L—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0032	7

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

1905 1900 1895 1890 1885 1880 1875 1870 1865 1860 1855 1850 1845 1840

Ⓐ **ROADWAY EMBANKMENT:** *tan, moist, loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders*

Ⓑ **ROADWAY EMBANKMENT:** *tan, wet, medium stiff, sandy CLAY (A-6) with trace organics*

Note: Rod Sounding "RS-1" was used in the interpretation of the Crystalline Rock line. Rod Sounding Logs can be found in "Bore Log(s) & Core Report(s)" Section of this report.

PROP. RETAINING WALL

1:1

0.010

0.000

2:1

Note: Weathered Rock was not encountered at this location during the investigation but is believed to be present in this slope based on field observations.

Ⓐ Ⓑ Ⓒ Ⓓ

1874.60

Ⓒ **WEATHERED ROCK:** *(Meta-Granite)*

Ⓓ **CRYSTALLINE ROCK:** *(Meta-Granite)*

10+25.00

—L—

PROJ. REFERENCE NO.	SHEET NO.
BR-0032	8

0 2.5 5

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

1905 1900 1895 1890 1885 1880 1875 1870 1865 1860 1855 1850 1845 1840

Ⓐ **ROADWAY EMBANKMENT:** *tan, moist, loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders*

Ⓑ **ROADWAY EMBANKMENT:** *tan, wet, medium stiff, sandy CLAY (A-6) with trace organics*

L_1040
10+40
9'LT

0.010 0.007 2:1

PROP. RETAINING WALL

7
60/0.0

873.87
(02/19)

BT

Note: Rod Sounding "RS-2" was used in the interpretation of the Crystalline Rock line. Rod Sounding Logs can be found in "Bore Log(s) & Core Report(s)" Section of this report.

Note: Weathered Rock was not encountered at this location during the investigation but is believed to be present in this slope based on field observations.

Ⓒ **WEATHERED ROCK:** *(Meta-Granite)*

Ⓓ **CRYSTALLINE ROCK:** *(Meta-Granite)*

10+50.00
—L—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0032	9

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

1905 1900 1895 1890 1885 1880 1875 1870 1865 1860 1855 1850 1845 1840

(A) **ROADWAY EMBANKMENT:** *tan-brown, moist, very loose to loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders*

(B) **ROADWAY EMBANKMENT:** *tan, wet, medium stiff, sandy CLAY (A-6) with trace organics*

PROP. RETAINING WALL

0.020 0.020 2:1

Note: Rod Sounding "RS-3" was used in the interpretation of the Crystalline Rock line. Rod Sounding Logs can be found in "Bore Log(s) & Core Report(s)" Section of this report.

1873.10

Note: Weathered Rock was not encountered at this location during the investigation but is believed to be present in this slope based on field observations.

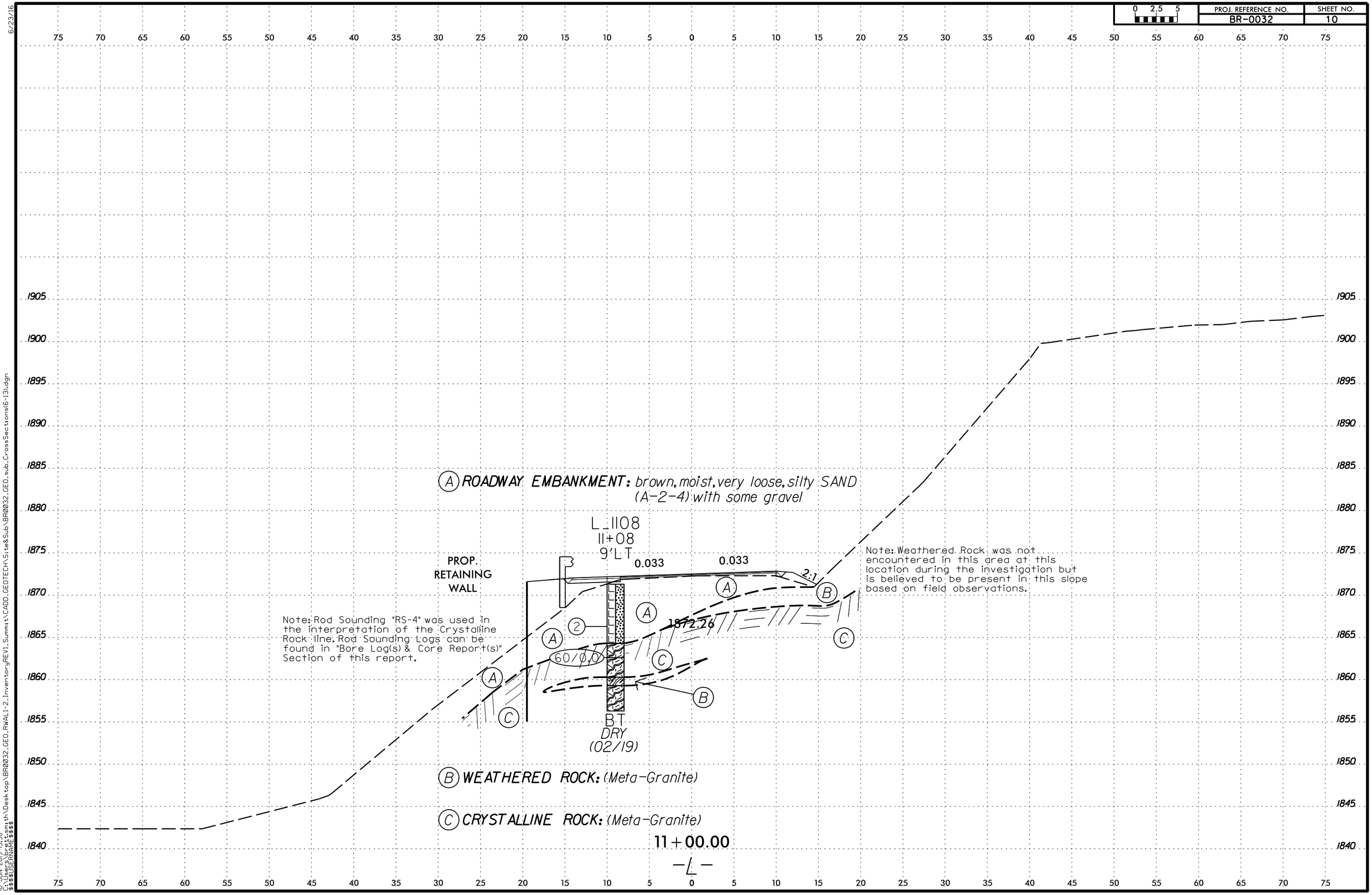
(C) **WEATHERED ROCK:** *(Meta-Granite)*

(D) **CRYSTALLINE ROCK:** *(Meta-Granite)*

10+75.00

—L—

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0032	10



0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0032	11

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

1905 1900 1895 1890 1885 1880 1875 1870 1865 1860 1855 1850 1845 1840

(A) **ROADWAY EMBANKMENT:** brown, moist, very loose, silty SAND (A-2-4) with some gravel

PROP. RETAINING WALL

0.040 0.040 2:1

Note: Rod Sounding "RS-5" was used in the interpretation of the Crystalline Rock line. Rod Sounding Logs can be found in "Bore Log(s) & Core Report(s)" Section of this report.

Note: Weathered Rock was not encountered in this area at this location during the investigation but is believed to be present in this slope based on field observations.

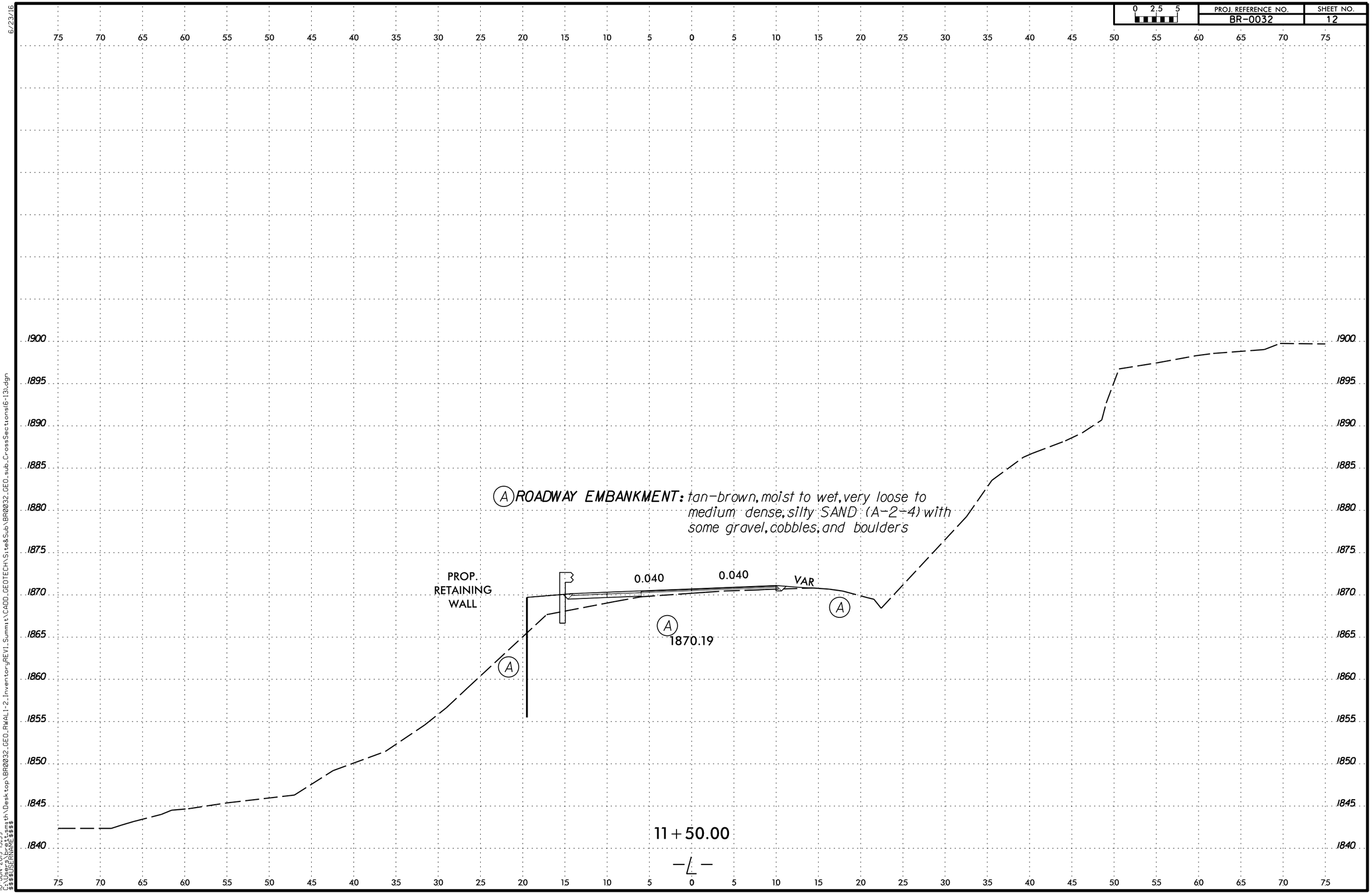
1871.22

(B) **WEATHERED ROCK:** (Meta-Granite)

(C) **CRYSTALLINE ROCK:** (Meta-Granite)

11+25.00

—L—



0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BR-0032	13

6/23/16

10-JUN-2019 15:40
C:\Users\$$$$USERNAME$$$$\Desktop\BR0032_GEO_RWAL1-2_InventoryREV1_Summit\CADD_GEOTECH\Site&Sub\BR0032_GEO_sub_CrossSections(6-13).dgn

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

1895 1890 1885 1880 1875 1870 1865 1860 1855 1850 1845 1840

Ⓐ ROADWAY EMBANKMENT: tan, moist to wet, loose to medium dense, silty SAND (A-2-4) with some gravel, cobbles, and boulders

L_1165
11+65
8'LT

PROP. RETAINING WALL

0.040

0.040

VAR

—L—
EOT

H2

7

Ⓐ

9

BT
DRY
(01/19)

1869.21

11+75.00

—L—

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. L_1040	**STATION** 10+40	**OFFSET** 9 ft LT	**ALIGNMENT** -L-	**0 HR.** 7.4
COLLAR ELEV. 1,873.8 ft	**TOTAL DEPTH** 14.9 ft	**NORTHING** 779,800	**EASTING** 855,370	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 02/01/19	**COMP. DATE** 02/01/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
1875										ELEV. (ft) / DEPTH (ft)
										1,873.8 — GROUND SURFACE — 0.0
										ROADWAY EMBANKMENT
1870	1,869.9	3.9	2	1	6	7		W		tan, silty SAND (A-2-4) with some gravel, cobbles, and boulders — 1,871.3 — 2.5
										tan, sandy CLAY (A-6) with trace organics
	1,867.0	6.8	60/0.0			60/0.0				1,867.8 — 6.0
1865										1,867.0 — **CRYSTALLINE ROCK** (Meta-Granite) — 6.8
										CRYSTALLINE ROCK (Meta-Granite) REC: 99% RQD: 53% GSI: 55-65
1860										1,858.9 — 14.9
										Boring Terminated at Elevation 1,858.9 ft in Crystalline Rock (Meta-Granite)
										- Casing advancer refusal and begin core at 6.8 feet.

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. L_1040	**STATION** 10+40	**OFFSET** 9 ft LT	**ALIGNMENT** -L-	**0 HR.** 7.4
COLLAR ELEV. 1,873.8 ft	**TOTAL DEPTH** 14.9 ft	**NORTHING** 779,800	**EASTING** 855,370	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 02/01/19	**COMP. DATE** 02/01/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 8.1 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
1867.05											ELEV. (ft) / DEPTH (ft)
											Begin Coring @ 6.8 ft
1865	1,867.0	6.8	3.1	*N=60/0.0*	(3.0)	(1.4)		(8.0)	(4.3)		1,867.0 — **CRYSTALLINE ROCK** — 6.8
				3:42/1.0	97%	45%		99%	53%		gray, pink, and white, moderate to moderately severe weathering, medium
	1,863.9	9.9		3:52/1.0							hard to hard, close fracture spacing, METAMORPHOSED GRANITE
				3:09/1.1							(Meta-Granite). GSI: 55-65
			5.0	2:45/1.0	(5.0)	(2.9)					
1860				2:50/1.0	100%	58%					
				3:14/1.0							
	1,858.9	14.9		3:20/1.0							1,858.9 — 14.9
				4:05/1.0							Boring Terminated at Elevation 1,858.9 ft in Crystalline Rock (Meta-Granite)
											- Casing advancer refusal and begin core at 6.8 feet.

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. L_1108	**STATION** 11+08	**OFFSET** 9 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,871.3 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 779,739	**EASTING** 855,399	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 02/01/19	**COMP. DATE** 02/01/19	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
1875											
										1,871.3 GROUND SURFACE	0.0
1870										**ROADWAY EMBANKMENT** brown, silty SAND (A-2-4) with some gravel	
	1,867.3	4.0	1	1	1	2		M			
1865										1,864.3	7.0
	1,862.6	8.7	60/0.0			60/0.0				**CRYSTALLINE ROCK** (Meta-Granite) 1,862.6	8.7
1860										**CRYSTALLINE ROCK** (Meta-Granite) 1,860.3	11.0
										REC: 78% RQD: 35% GSI: 50-60 1,859.3	12.0
										WEATHERED ROCK (Meta-Granite) 1,856.3	15.0
										CRYSTALLINE ROCK (Meta-Granite) REC: 100% RQD: 93% GSI: 70-80	
										Boring Terminated at Elevation 1,856.3 ft in Crystalline Rock (Meta-Granite)	
										- Casing advancer refusal and begin core at 8.7 feet.	

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. L_1108	**STATION** 11+08	**OFFSET** 9 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,871.3 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 779,739	**EASTING** 855,399	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 02/01/19	**COMP. DATE** 02/01/19	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 6.3 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
1862.61											Begin Coring @ 8.7 ft	
	1,862.6	8.7	1.3	*N=60/0.0*	(0.8)	(0.4)		(1.8)	(0.8)		1,862.6 **CRYSTALLINE ROCK**	8.7
	1,861.3	10.0	5.0	4:21/1.3	62%	31%		78%	35%		1,860.3 brown, pink, and gray, moderate to moderately severe weathering, close	11.0
1860				2:29/1.0							fracture spacing, moderately hard, METAMORPHOSED GRANITE	
				1:36/1.0	(4.3)	(2.6)					1,859.3 (Meta-Granite). GSI: 50-60	12.0
				3:15/1.0	86%	52%		(3.0)	(2.8)		**WEATHERED ROCK**	
				3:46/1.0				100%	93%		(Meta-Granite)	
	1,856.3	15.0		4:59/1.0							1,856.3	15.0
											CRYSTALLINE ROCK pink, gray, black, and white, slight weathering, hard, moderately close fracture spacing, METAMORPHOSED GRANITE (Meta-Granite). GSI: 70-80	
											Boring Terminated at Elevation 1,856.3 ft in Crystalline Rock (Meta-Granite)	
											- Casing advancer refusal and begin core at 8.7 feet.	

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. L_1165	**STATION** 11+65	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 1,868.7 ft	**TOTAL DEPTH** 9.9 ft	**NORTHING** 779,690	**EASTING** 855,426	**24 HR.** Caved
DRILL RIG/HAMMER EFF./DATE SUM3123 CME-550X 90% 11/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Gonzalez, L.	**START DATE** 01/23/19	**COMP. DATE** 01/23/19	**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
1870										ELEV. (ft) DEPTH (ft)
	1,868.7	0.0	3	7	5	12		M		1,868.7 GROUND SURFACE 0.0
1865	1,865.3	3.4	4	4	3	7		M		**ROADWAY EMBANKMENT** tan, silty SAND (A-2-4) with some gravel, cobbles, and boulders
1860	1,860.3	8.4	5	2	7	9		W		1,858.8 9.9
										Boring Terminated at Elevation 1,858.8 ft in Roadway Embankment (silty SAND) - Boring offset from proposed location due to overhead power lines.

NCDOT BORE SINGLE BR0032_GEO_RWAL1_GINT_SUMMIT.GPJ NC_DOT.GDT 6/17/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. RS-1	**STATION** 10+25	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,869.1 ft	**TOTAL DEPTH** 8.0 ft	**NORTHING** 779,818	**EASTING** 855,373	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Rod Sounding	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 03/12/19	**COMP. DATE** 03/12/19	**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
1870										ELEV. (ft) DEPTH (ft)
			1	1		2 11 12				1,869.1 GROUND SURFACE 0.0
1865			5	6		6				**ROADWAY EMBANKMENT** tan, moist, loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders
			8	4		3				
			3	3		8 18				
			2	1		5				1,861.1 8.0
			3	5						Boring Terminated at Elevation 1,861.1 ft in Roadway Embankment (silty SAND)
			10	8						
			3	2						

NCDOT BORE SINGLE BR0032_GEO_RWAL1_GINT_SUMMIT.GPJ NC_DOT.GDT 6/17/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. RS-2	**STATION** 10+50	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,867.3 ft	**TOTAL DEPTH** 6.5 ft	**NORTHING** 779,795	**EASTING** 855,384	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Rod Sounding	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 03/12/19	**COMP. DATE** 03/12/19	**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
1870										ELEV. (ft) DEPTH (ft)
										1,867.3 GROUND SURFACE 0.0
1865			0	1		1				**ROADWAY EMBANKMENT**
			0	1		1				tan, moist, loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders
			1	1		2				
			1	2		3				
			2	2		4				
			3	3		6				
			3	50/0.0		50/0.0				1,860.8 6.5
										CRYSTALLINE ROCK
										(Meta-Granite)
										Boring Terminated at Elevation 1,860.8 ft on Crystalline Rock (Meta-Granite)
										- Rod sounding refusal at 6.5 feet was interpreted as a refusal on Crystalline Rock. However, it should be noted that it is possible that the refusal was a result of a boulder within the Roadway Embankment.

NCDOT BORE SINGLE BR0032_GEO_RWAL1_GINT_SUMMIT.GPJ NC_DOT.GDT 6/17/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. RS-3	**STATION** 10+75	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,865.9 ft	**TOTAL DEPTH** 8.0 ft	**NORTHING** 779,773	**EASTING** 855,394	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Rod Sounding	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 03/12/19	**COMP. DATE** 03/12/19	**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
1870										ELEV. (ft) DEPTH (ft)
										1,865.9 GROUND SURFACE 0.0
1865			1	1		2				**ROADWAY EMBANKMENT**
			1	1		2				tan-brown, moist, very loose to loose, silty SAND (A-2-4) with some gravel, cobbles, and boulders
			5	10		15				
1860			10	8		18				
			3	4		7				
			3	2		5				
			3	3		6				
			1	1		2				1,857.9 8.0
										Boring Terminated at Elevation 1,857.9 ft in Roadway Embankment (silty SAND)

NCDOT BORE SINGLE BR0032_GEO_RWAL1_GINT_SUMMIT.GPJ NC_DOT.GDT 6/17/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. RS-4	**STATION** 11+00	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,864.7 ft	**TOTAL DEPTH** 3.5 ft	**NORTHING** 779,751	**EASTING** 855,405	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Rod Sounding	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 03/12/19	**COMP. DATE** 03/12/19	**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
1865										ELEV. (ft) DEPTH (ft)
			1	1		2				1,864.7 GROUND SURFACE 0.0
			1	1		2				**ROADWAY EMBANKMENT**
			1	3		4				brown, moist, very loose, silty SAND (A-2-4) with some gravel
			10	50/0.0		50/0.0				1,861.2 3.5
										CRYSTALLINE ROCK (Meta-Granite) Boring Terminated at Elevation 1,861.2 ft on Crystalline Rock (Meta-Granite) - Rod sounding refusal at 3.5 feet was interpreted as a refusal on Crystalline Rock. However, it should be noted that it is possible that the refusal was a result of a boulder within the Roadway Embankment.

NCDOT BORE SINGLE BR0032_GEO_RWAL1_GINT_SUMMIT.GPJ NC_DOT.GDT 6/17/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 67032.1.1	**TIP** BR-0032	**COUNTY** MADISON	**GEOLOGIST** Gross, A.	
SITE DESCRIPTION Replace Bridge No. 560084 on NC 209 over Meadow Fork Creek				**GROUND WTR (ft)**
BORING NO. RS-5	**STATION** 11+25	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 1,864.1 ft	**TOTAL DEPTH** 3.5 ft	**NORTHING** 779,729	**EASTING** 855,416	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE N/A		**DRILL METHOD** Rod Sounding	**HAMMER TYPE** N/A	
DRILLER N/A	**START DATE** 03/12/19	**COMP. DATE** 03/12/19	**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
1865										ELEV. (ft) DEPTH (ft)
			1	1		2				1,864.1 GROUND SURFACE 0.0
			4	10		14				**ROADWAY EMBANKMENT**
			15	19		34				brown, moist, very loose, silty SAND (A-2-4) with some gravel
			6	50/0.0		50/0.0				1,860.6 3.5
										CRYSTALLINE ROCK (Meta-Granite) Boring Terminated at Elevation 1,860.6 ft on Crystalline Rock (Meta-Granite) - Rod sounding refusal at 3.5 feet was interpreted as a refusal on Crystalline Rock. However, it should be noted that it is possible that the refusal was a result of a boulder within the Roadway Embankment.

NCDOT BORE SINGLE BR0032_GEO_RWAL1_GINT_SUMMIT.GPJ NC_DOT.GDT 6/17/19

CORE PHOTOGRAPHS

L_1040

6.8 - 14.9 FEET

L_1108

8.7 - 15.0 FEET