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S X REFERENCE

CONTENTS

DESCRIPTION

LEGEND (SOIL & ROCK)

SUPPLEMENTAL LEGEND (GSI)

RETAINING WALL ENVELOPES SOIL TEST RESULTS

TITLE SHEET

SHEET NO.

2A

5019

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY _**DAVIDSON**

PROJECT DESCRIPTION US 29/US 70/BUSINESS 85 AT SR 1798 (OLD GREENSBORO ROAD) CONVERT AT-GRADE INTERSECTION TO INTERCHANGE SITE DESCRIPTION RWAL 1: LEFT OF -L- STA. 49+50 RWAL 2: RIGHT OF -L- STA. 50+00RWAL 3: RIGHT OF -L- STA. 62+00 RWAL 4: LEFT OF -L- STA. 69 + 50

STATE	STATE PROJECT REFERENCE NO.	SHRET NO.	TOTAL SHEETS
N.C.	R-5737	1	8

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 (1991) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

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

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N. D. MOHS, LG

W. M. JOHNSON, LG

T. C. MCILROY

SUMMIT

INVESTIGATED BY N.D. MOHS, LG

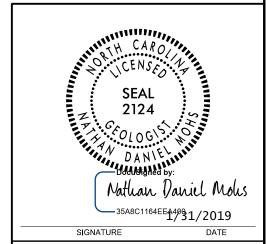
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CHECKED BY M. D. VALIQUETTE, PE

SUBMITTED BY N. D. MOHS, LG

DATE JANUARY 2019





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PROJECT REFERENCE NO. SHEET NO. 2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
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	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,	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,	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN Ø.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAWD LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED VIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENEDAL CRANIII AR MATERIAL C CTI T_CL AV MATERIAL C	MINERALOGICAL COMPOSITION	EINE TO COARSE CRAIN ICNEOUS AND METAMORPHIC POCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (≤35% PASSING *200) (>35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	NON-COVETAL THE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-3 A-6, A-7	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 0000d00000	MODERATELY COMPRESSIBLE LL = 31 - 5Ø	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
X PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED (CP) SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY MUCK, SOILS CLAY PEAT	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	HORIZONTAL.
PASSING *40	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITILL W HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAYEL, AND SAND SAND GRAVEL AND SAND SOILS SOILS	▼ STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN BATTING FAIR TO	<u> </u>	(MOD.) 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	PARENT MATERIAL,
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 3Ø; PI OF A-7-6 SUBGROUP IS > LL - 3Ø		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK,	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
CONSISTENCY CONSISTENCY (N-VALUE) (TONS/FT ²)	☐ ☐ WITH SOIL DESCRIPTION → OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL SPT Det DMT TEST BORING SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
LOOSE	I 图	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
(NON-COHESIVE) DENSE 3Ø TO 5Ø VERY DENSE > 5Ø	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	CORE BORING SOUNDING ROD	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	TECT DODING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 Ø.5 TO 1.Ø MATERIAL STIFF 8 TO 15 1 TO 2	INFERRED ROCK LINE MONITORING WELL WITH CORE	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	ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 3Ø 2 TO 4	ALLUVIAL SOIL BOUNDARY \triangle PIEZOMETER INSTALLATION SPT N-VALUE	ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4		ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 DPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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
COARSE FINE	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY	UNDERCOT LESS HOCEF THELE DEGRAPHONELE ROCK	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO Ø.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(CSE, SU,) (F SU,)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEDUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
	CL CLAY MOD MODERATELY γ - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE COURSE SO STEED MOISTURE DECOMPTION	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 _d - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
(ATTERBERG LIMITS) ATTERBERG LIMITS) (ATTERBERG LIMITS) (ATTERBERG LIMITS) (ATTERBERG LIMITS) (ATTERBERG LIMITS) (ATTERBERG LIMITS) (ATTERBERG LIMITS)	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u>	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	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	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
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMISOLID; REGULAES DRYING TO	FRAGS FRAGMENTS ω - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK; BL-14 N:770576,7719 E:1648819,8899
(PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 738.56 FEET
SL _ SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN Ø.16 FEET THICKLY LAMINATED Ø.008 - 0.03 FEET	FIAD = FILLED IMMEDIATELY AFTER DRILLING
ATTAIN OPTIMUM MUISTURE	CME-55 G' CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	RE = ROADWAY EMBANKMENT OTHER BORING ELEVATIONS TAKEN FROM .TIN FILE
PLASTICITY	X 8' HOLLOW AUGERS	INDURATION	R5737_LS_TIN_20180501.TIN DATED 8/23/2018
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 X HARD FACED FINGER BITS X -N Q	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS:	
NON PLASTIC Ø-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST UNGCARBIDE INSERTS HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE,	
MODERATELY PLASTIC 16-25 MEDIUM	X CASING W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE'STEEL TEETH HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE' TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	X CORE BIT VANE SHEAR TEST	CHARP HAMMER RIGHT FOR REAK CAMPLE.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1-
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ROJECT REFERENCE NO.	SHRET NO.
R-5737	2A

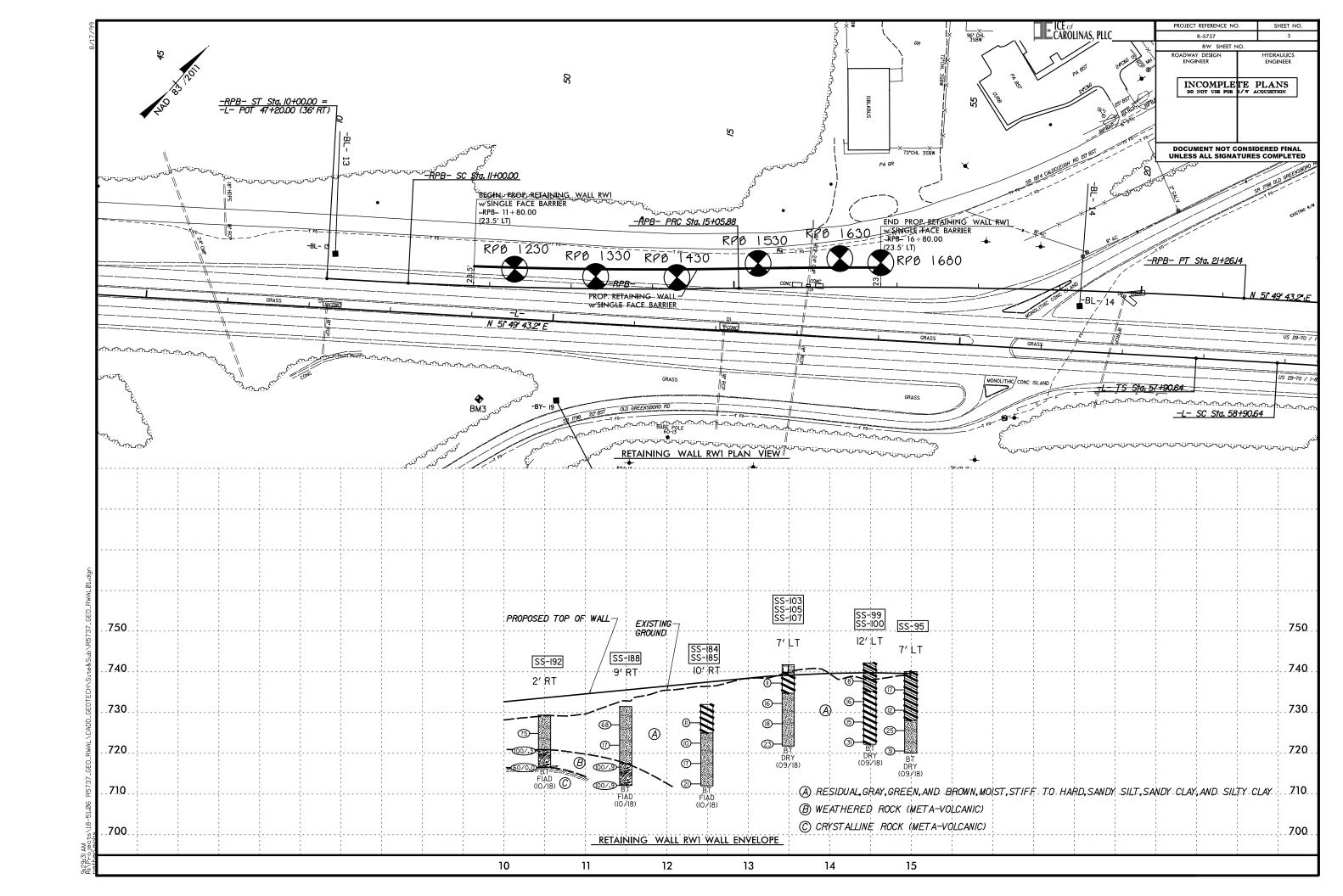
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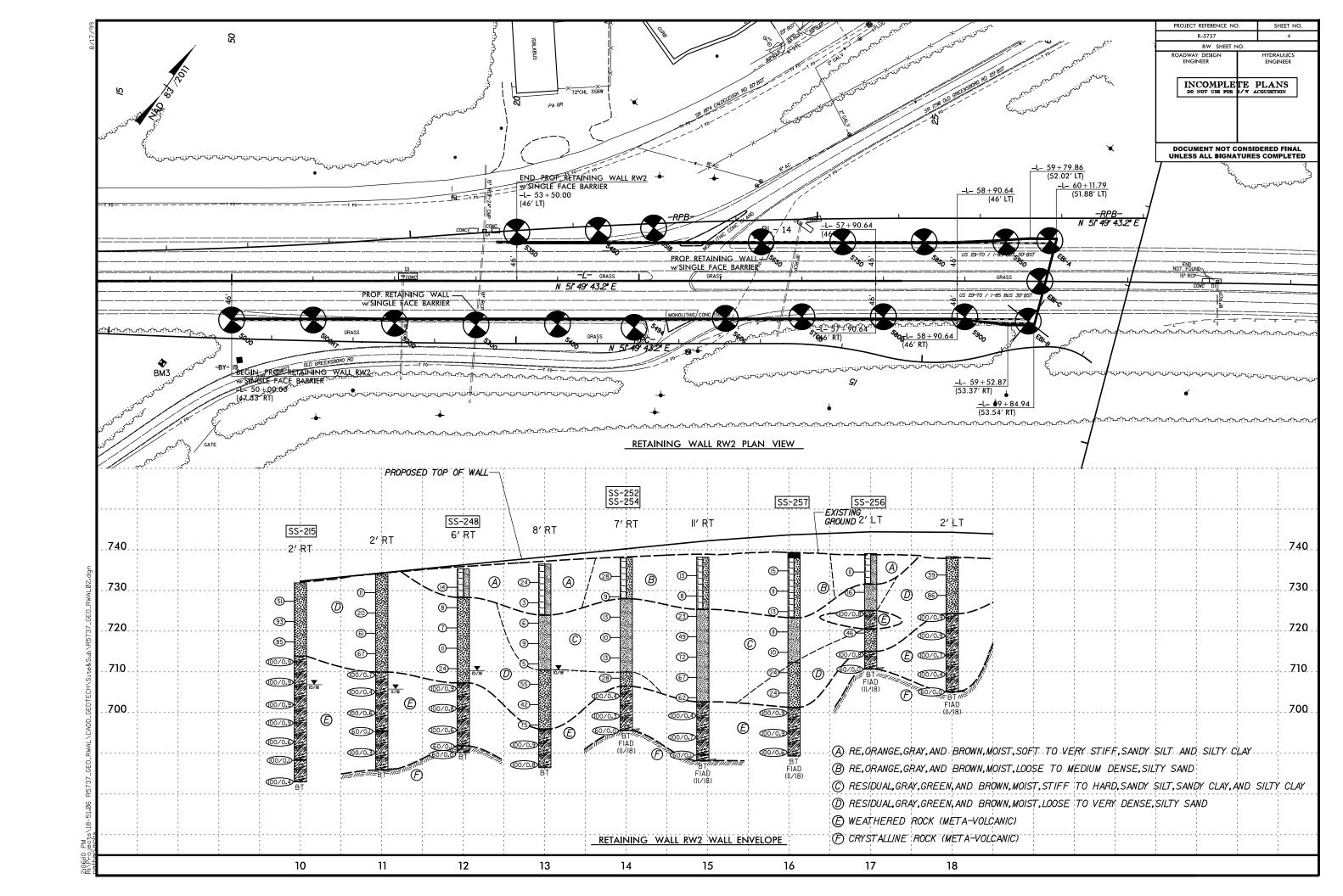
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

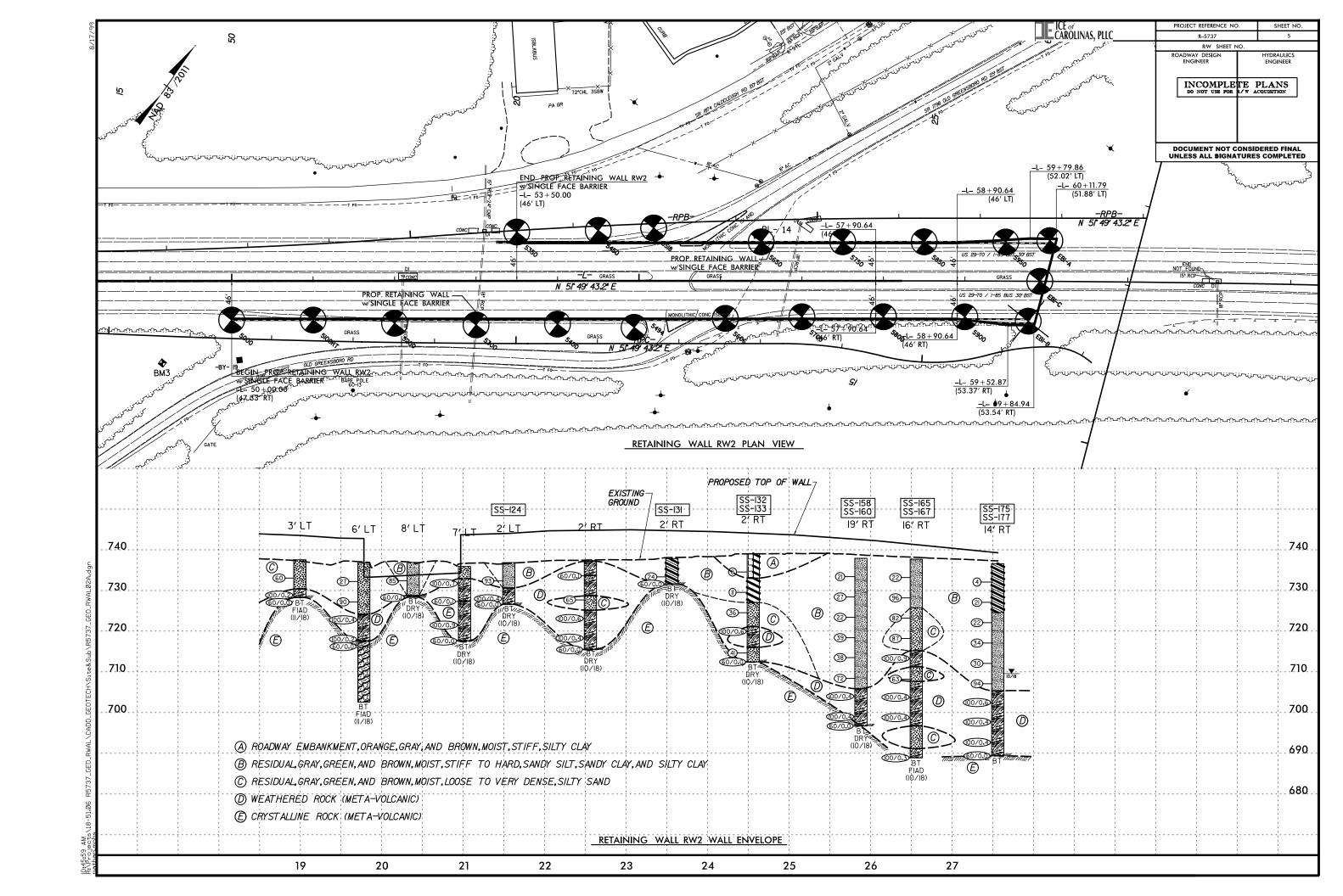
SUBSURFACE INVESTIGATION

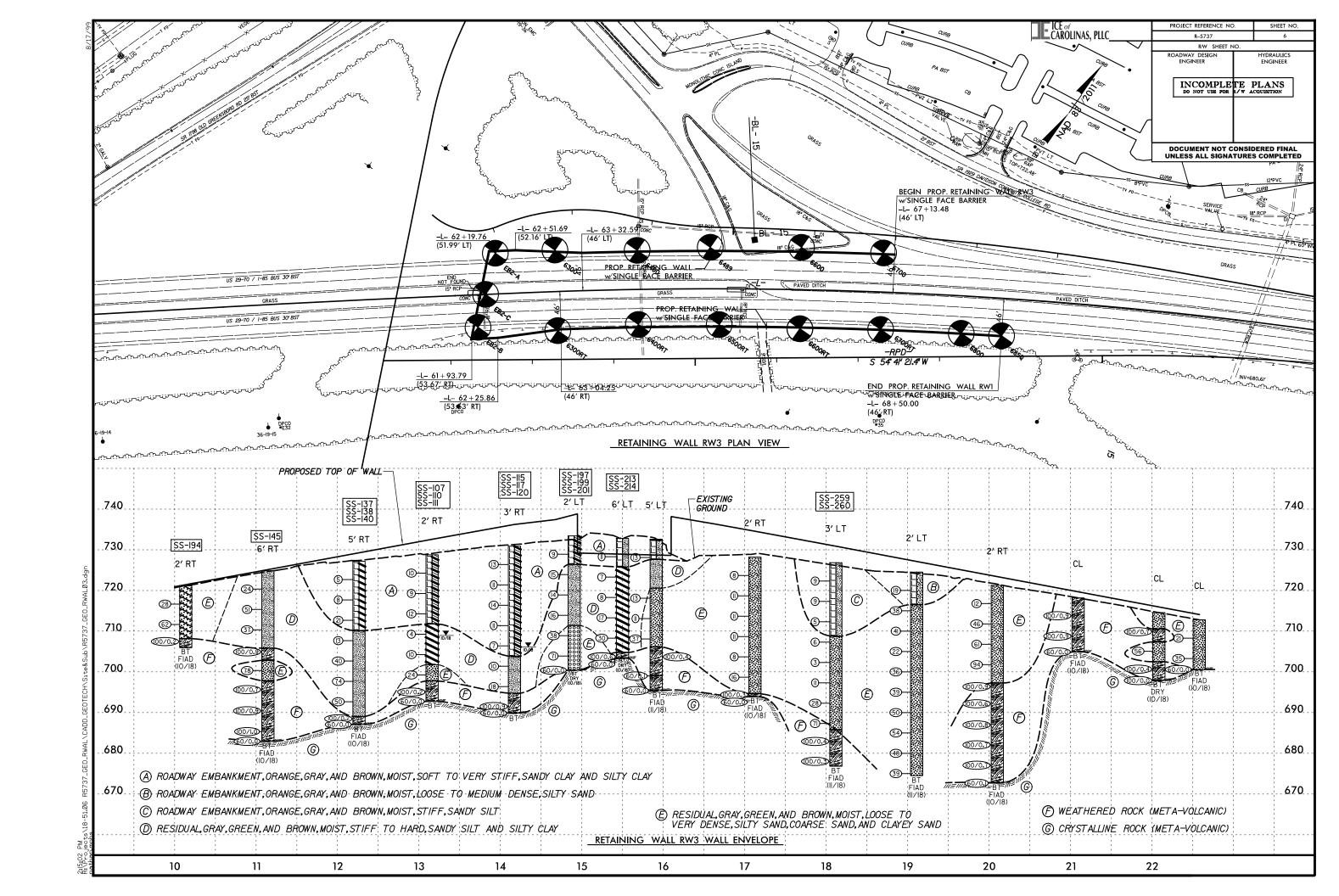
SUPPLEMENTAL LEGEND GEOLOGICAL STRENGTH INDEX (GSI) TARLES

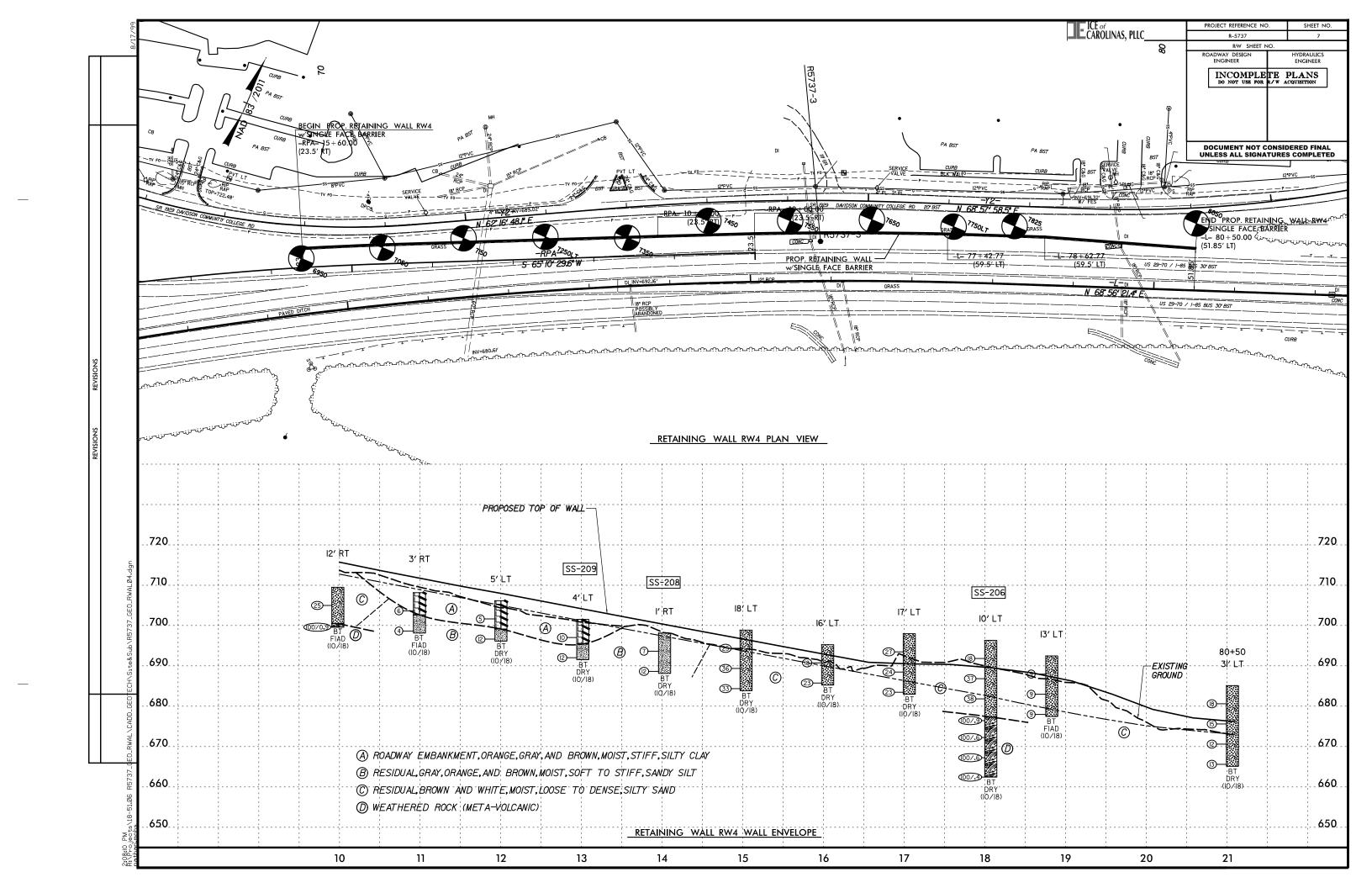
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Join	nted Ro	ock Mass (Marinos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marınos, 2000)		s p		0 0 0	8 0	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marınos, P and Hoek E., 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.	SURFACE CONDITIONS	VERY GOOD Very rough, fresh unweathered surfaces GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surf with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	Erom 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 pox 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 abbly 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 particle of the rock masses are presented of the 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 particle of the 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 particle of the 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 particle of the 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 particle of the 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 particle of the 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 and the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair and the presence of groundwater and this can be allowed for the rock masses. NEEAY COOD - New A could be a continuous was present to the presence of groundwater and the condition of the rock masses are present. NEEAY COOD - New A could be a cou
STRUCTURE		DECREASING S	JRFACE QU	ALITY =	>	COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked un-	 PIECES 	90 80 70		N/A	N/A	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. A. Thick bedded, very blocky sandstone To A
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks	OCKING OF ROCK	60	50			B. Sand- stone with stone with thin inter- layers of siltstone amounts D. Siltstone or silty shale with sand- stone layers stone layers amounts B. Weak siltstone or clayey shale with sandstone layers
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	INTERL		40	30		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.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces	 			20		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 sandstoneared sandstoneared unto small reck suggest
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	∜	N/A N/A			/ ¹⁰ /	Sandstone are transformed into small rock pieces. → Means deformation after tectonic disturbance











LABORATORY TESTING SUMMARY

PROJECT NUMBER:	50195.1.1	TIP:	R-5737	COUNTY:	Davidson

DESCRIPTION: US 29/US 70/Business 85 at SR 1798

			011	Depth	4401170				% by W	/eight		%	%	Passing (siev	ves)		0/
Sample No.	Alignment	Station	Offset (feet)	Interval (feet)	AASHTO Class.	L.L.	P.I.	Coarse Sand	Fine Sand	Silt	Clay	Retained #4 Sieve	#10	#40	#200	% Moisture	% Organic
SS-215	-L-	50+00	48' RT	3.5 - 5.0	A-4 (0)	30	8	35.0	30.9	2.0	32.1	0	96	70	40		
SS-248	-L-	52+00	52' RT	13.5 -15.0	A-7-6 (12)	41	22	14.8	29.0	27.8	28.4	0	97	87	64		
SS-175	-L-	53+50	60' LT	3.5 - 5.0	A-6 (4)	34	18	26.0	31.3	24.2	18.5	2	89	73	44	20.3	
SS-177	-L-	53+50	60' LT	13.5 - 15.0	A-4 (0)	24	0	18.8	51.2	23.6	6.4	0	100	92	40	10.9	
SS-252	-L-	54+00	53' RT	3.5 - 5.0	A-4 (1)	30	10	28.4	32.7	22.0	16.9	0	95	76	44	9.3	
SS-254	-L-	54+00	53' RT	13.5 - 15.0	A-7-6 (26)	55	31	3.9	23.4	28.8	43.9	0	100	98	80	29.5	
SS-165	-L-	54+50	62' LT	3.5 - 5.0	A-4 (0)	29	4	18.2	48.8	24.0	9.0	0	100	90	44	10.0	
SS-167	-L-	54+50	62' LT	13.5 - 15.0	A-2-4 (0)	25	4	40.0	34.2	18.8	7.0	0	93	66	31	6.3	
SS-158	-L-	55+18	65' LT	8.5 - 10.0	A-4 (0)	34	6	39.5	26.7	23.2	10.6	0	100	70	40	14.6	
SS-160	-L-	55+18	65' LT	18.5 - 20.0	A-4 (0)	28	4	22.4	43.0	27.7	6.9	0	99	88	44	11.5	
SS-257	-L-	56+06	46' RT	18.5 - 20.0	A-7-6 (65)	98	69	7.1	12.2	14.2	66.5	0	100	96	84	37.6	
SS-132	-L-	56+50	48' LT	3.5 - 5.0	A-7-6 (10)	41	24	20.6	25.5	20.2	33.7	1	91	78	55	19.9	
SS-133	-L-	56+50	48' LT	8.5 - 10.0	A-7-6 (17)	51	30	11.9	31.7	25.4	31.0	0	100	93	64	26.0	
SS-256	-L-	57+00	44' RT	3.5 - 5.0	A-4 (0)	28	9	35.8	32.9	20.0	11.3	0	98	72	38	9.8	
SS-131	-L-	57+50	48' LT	3.5 - 5.0	A-6 (4)	37	13	18.5	37.0	24.7	19.8	1	92	81	51	16.6	
SS-124	-L-	59+50	48' LT	3.5 - 5.0	A-4 (0)	22	0	17.8	51.3	24.8	6.1	0	100	91	42	21.1	
SS-115	-L-	63+00	51' LT	3.5 - 5	A-6 (6)	34	18	18.3	37.5	24.9	19.3	1	96	86	51	37.6	
SS-117	-L-	63+00	51' LT	13.5 - 15.0	A-6 (6)	31	16	20.1	26.5	25.5	27.9	1	94	80	56	28.1	
SS-120	-L-	63+00	51' LT	28.5 - 30.0	A-4 (0)	35	6	27.6	42.8	23.6	6.0	0	98	82	38	38.6	
SS-107	-L-	64+00	48' LT	3.5 - 5.0	A-6 (3)	34	15	20.7	38.7	23.2	17.4	1	94	82	46	29.8	
SS-110	-L-	64+00	48' LT	18.5 - 20.0	A-7-6 (11)	43	26	17.8	24.8	24.4	33.0	2	90	78	57	34.7	
SS-111	-L-	64+00	48' LT	23.5 - 25.0	A-7-6 (50)	84	57	5.2	19.1	19.0	56.7	1	99	96	80	55.3	
SS-259	-L-	64+00	43' RT	3.5 - 5.0	A-4 (1)	32	10	28.7	36.6	19.7	15.0	3	90	73	39		
SS-260	-L-	64+00	43' RT	23.5 - 25.0	A-4 (0)	20	NP	19.6	37.5	26.3	16.6	1	95	82	50		
SS-137	-L-	64+89	51' LT	3.5 - 5.0	A-7-6 (12)	44	24	12.8	33.8	28.4	25.0	1	98	90	61	23.9	
SS-138	-L-	64+89	51' LT	8.5 - 10.0	A-7-6 (11)	45	24	16.5	30.1	23.7	29.7	2	95	84	57	22.7	
SS-140	-L-	64+89	51' LT	18.5 - 20.0	A-4 (0)	31	7	20.7	48.0	22.1	9.2	0	97	88	39	18.7	
SS-145	-L-	66+00	52' LT	3.5 - 5.0	A-4 (2)	34	6	9.6	48.6	33.1	8.7	0	100	97	56	14.3	
SS-194	-L-	67+00	48' RT	3.5 - 5.0	A-2-6 (0)	38	17	49.6	19.2	17.0	14.2	14	73	43	26	13.1	
SS-209	-L-	72+50	67' LT	3.5 - 5.0	A-7-6 (26)	58	33	5.8	23.3	22.9	48.0	0	100	97	76	30.0	
SS-208	-L-	73+50	CL	3.5 - 5.0	A-4 (1)	33	6	16.2	46.5	28.6	8.7	0	100	94	47	16.3	
SS-206	-L-	77+50	75' LT	3.5 - 5.0	A-2-4 (0)	32	5	36.8	30.8	23.6	8.8	0	89	65	35	12.2	
SS-192	-RPB-	12+30	8' RT	3.5 - 5.0	A-4 (0)	23	0	12.0	50.7	28.6	8.7	0	100	95	51	8.0	
SS-188	-RPB-	13+30	15' LT	3.5 - 5.0	A-4 (0)	23	0	15.5	46.0	30.8	7.7	0	100	92	51	7.1	
SS-184	-RPB-	14+30	14' LT	3.5 - 5.0	A-7-6 (19)	51	26	6.3	28.0	31.4	34.3	0	100	98	73	30.5	
SS-185	-RPB-	14+30	14' LT	8.5 - 10.0	A-4 (3)	38	9	9.7	49.4	27.9	13.0	0	100	97	52	15.8	
S-107	-RPB-	15+30	30' LT	0.0 - 1.5	A-4 (1)	26	8	11.9	40.7	31.0	16.4	9	82	78	49	10.6	
SS-103	-RPB-	15+30	30' LT	3.5 - 10.0	A-7-6 (15)	47	27	13.2	30.5	29.6	26.7	0	99	93	64	27.5	
SS-105	-RPB-	15+30	30' LT	13.5 - 15.0	A-4 (0)	30	4	19.2	48.8	22.6	9.4	0	100	90	43	15.4	
SS-99	-RPB-	16+30	35' LT	3.5 - 5.0	A-6 (3)	33	17	31.7	26.9	12.7	28.7	1	88	67	41	18.6	
SS-100	-RPB-	16+30	35' LT	8.5 - 10.0	A-7-6 (11)	45	19	7.7	39.7	33.4	19.2	0	100	97	65	25.2	
SS-95	-RPB-	16+80	30' LT	3.5 - 5.0	A-6 (12)	40	21	8.5	36.6	32.4	22.5	0	100	96	65	23.0	

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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY _**DAVIDSON**

PROJECT DESCRIPTION US 29/US 70/BUSINESS 85 AT SR 1798 (OLD GREENSBORO ROAD) CONVERT AT-GRADE INTERSECTION TO INTERCHANGE SITE DESCRIPTION BRIDGE NOS. 575 AND 576 ON US29/US 70/BUSINESS 85 (-L-) OVER -Y1STATE PROJECT REFERENCE NO. 21 R = 5737

CAUTION NOTICE

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

N. D. MOHS, LG

W. M. JOHNSON, LG

T. C. MCILROY

SUMMIT

INVESTIGATED BY N.D. MOHS, LG

DRAWN BY S.G. THOMSON, PE

CHECKED BY M. D. VALIQUETTE, PE

SUBMITTED BY N. D. MOHS, LG

DATE JANUARY 2019

CAROLINAS, PLLC



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

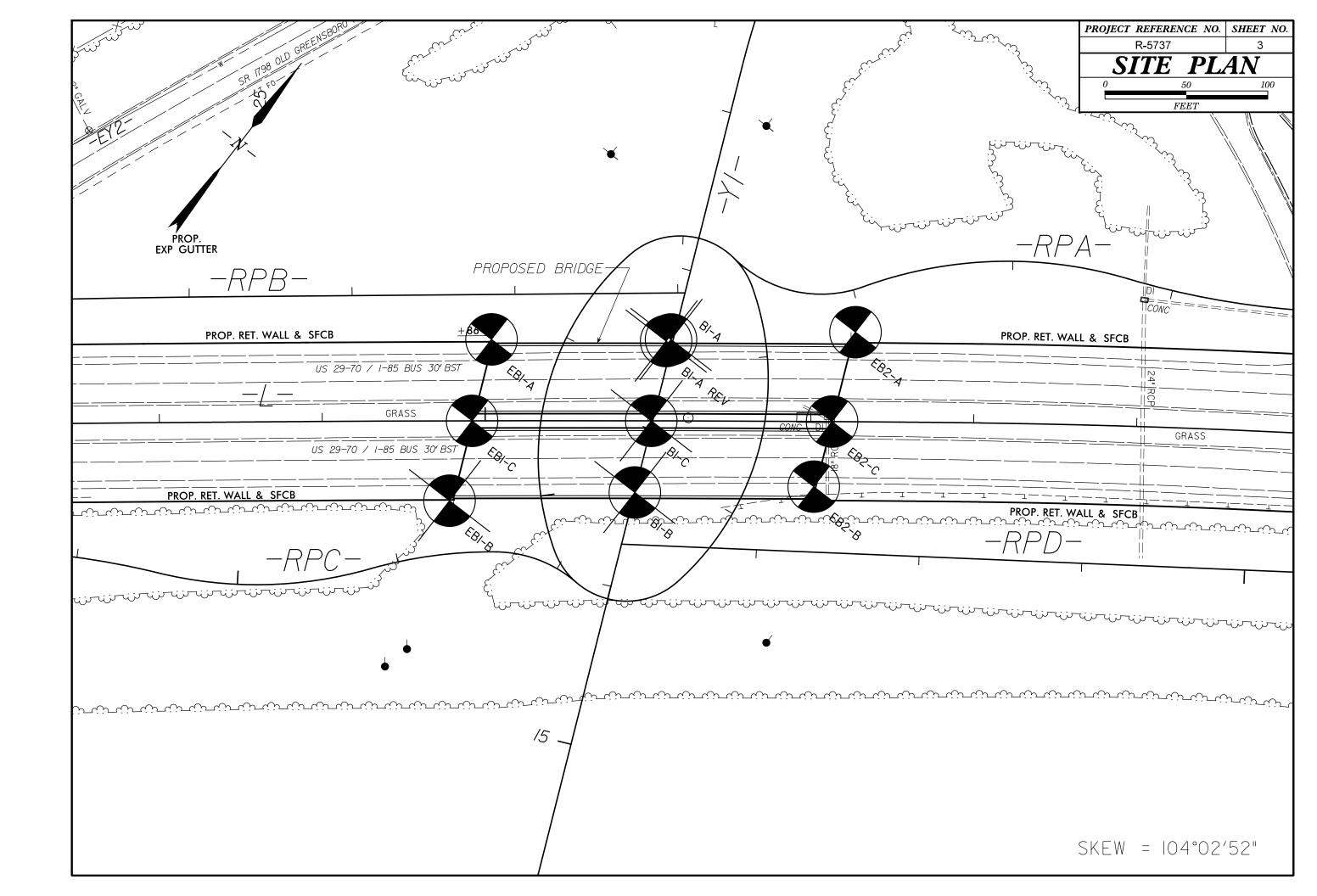
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 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	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	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 ØLIFOOT 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:	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.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERREDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	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
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (\leq 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	CRYSTALLINE ROCK (CR) FINE TO CDARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 B-2-6 A-2-7 B-2-7 B-2-6 A-2-7 B-2-7 B-2-7 B-2-7 B-2-	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LL < 31	NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	<u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SEDIMENTARY ROCK SEDIMENTARY ROCK SEMENTED SEDIMENTARY ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SEDIMENTED	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.
*48 38 MX 50 MX 51 MN	GRANULAR SILT - CLAY	WEATHERING	<u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
MATERIAL PASSING #40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	$\overline{ ext{DIP}}$ - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LL - 48 MX 41 MN LITTLE OR PI 6 MX NP 18 MX 18 MX 11 MN 11 MN 18 MX 18 MX 11 MN 11 MN 11 MN MODERATE ORGANIC	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE GROUND WATER	(V SLI,) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	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
USUAL TYPES STONE FRAGS. OF MATTER OF MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS GEN. RATING LO CURPORTE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	▼ STATIC WATER LEVEL AFTER <u>24</u> HOURS ▼PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	MODERATE 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 SHORTH AS COMPARED	$\overline{\text{FLOAT}}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
PI OF A-7-5 SUBGROUP IS ≤ LL - 3Ø ;PI OF A-7-6 SUBGROUP IS > LL - 3Ø	→ SPRING OR SEEP	WITH FRESH ROCK. MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	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
CONSISTENCY OR DENSENESS RANGE OF STANDARD PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH PENETRATION RESISTENCE COMPRESSIVE STRENGTH	MISCELLANEOUS SYMBOLS The roadway embankment (re) 25/825 dip & dip direction	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT. REFUSAL	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
CENERALLY VERY LOOSE < 4	WITH SOIL DESCRIPTION → OF ROCK STRUCTURES SPI SYMBOL SOIL SYMBOL SLOPE INDICATOR SPI DATE THAT TEST RORING SLOPE INDICATOR	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	LEDS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
CRANULAR LOOSE 4 TO 10	ARTIFICIAL FILL (AF) OTHER ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER TEST TEST	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERY SOFT < 2 < 0.25	INFERRED SOIL BOUNDARY	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINDR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YELD SPT N VALUES < 100 BPF	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM OF AN INTERVENING IMPERVIOUS STRATUM OF A STREET OF
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0 MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	MONITORING WELL TEST BORING WITH CORE PIEZOMETER	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	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - 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
HARD > 3Ø > 4	INSTALLATION — 371 N-VHLUE	ALSO AN EXAMPLE. ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS XX UNCLASSIFIED EXCAVATION - XX UNCLASSIFIED EXCAVATION - XX UNCLASSIFIED EXCAVATION - XX XX XX XX XX XX XX	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053 BOULDER COBRLE CRAVEL COARSE FINE SLIT CLAY	UNDERCUT UNDITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE UNDERCUT UNDERCUT UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (SE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW. BY MODERATE BLOWS.	<u>SLICKENSIDE</u> - 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
GRAIN MM 305 75 2.0 0.25 0.05 0.005	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY γ - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_d - DRY UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	STHOUGHD FEATURE IN ISSUE TO THE INTUIN RESISTING RESISTING NOMBER OF DELWAS IN OR BFF/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.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	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.	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LTQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE LL LIQUID LIMIT	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	STRATA ROCK QUALITY DESIGNATION (SROD) - 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.
PLASTIC SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS ω - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK; BL-14 N:770576.7719 E:1648819.8899
(PI) PL PLASTIC LIMIT	HI HIGHLY V - VERY RATIO EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: 738.56 FEET NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	CME-55 6° CONTINUOUS FLIGHT AUGER CORE SIZE:	CLOSE Ø.16 TO 1 FOOT VERY THINLY BEDDED Ø.03 - Ø.16 FEET VERY CLOSE LESS THAN Ø.16 FEET THICKLY LAMINATED Ø.008 - Ø.03 FEET THINLY LAMINATED < Ø.008 FEET	FIAD = FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY		INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 8-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	X CME-550 X HARD FACED FINGER BITS X N Q HAND TOOLS:	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMBEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	CASING W/ ADVANCER PORTABLE HOIST TRICONE STEEL TEETH PORTABLE HOIST HAND AUGER TRICONE HOIST HAND AUGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
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.	X CORE BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14

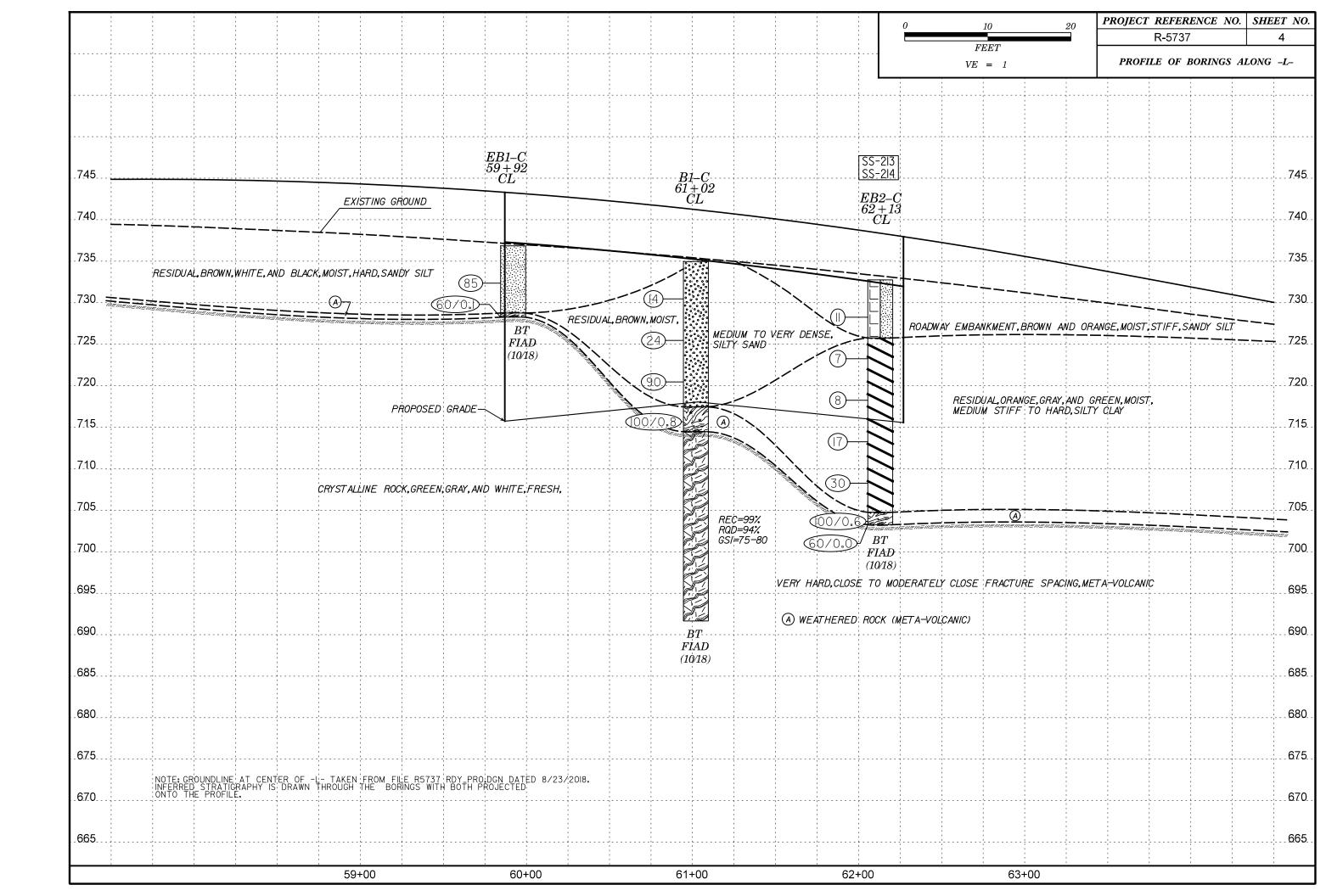
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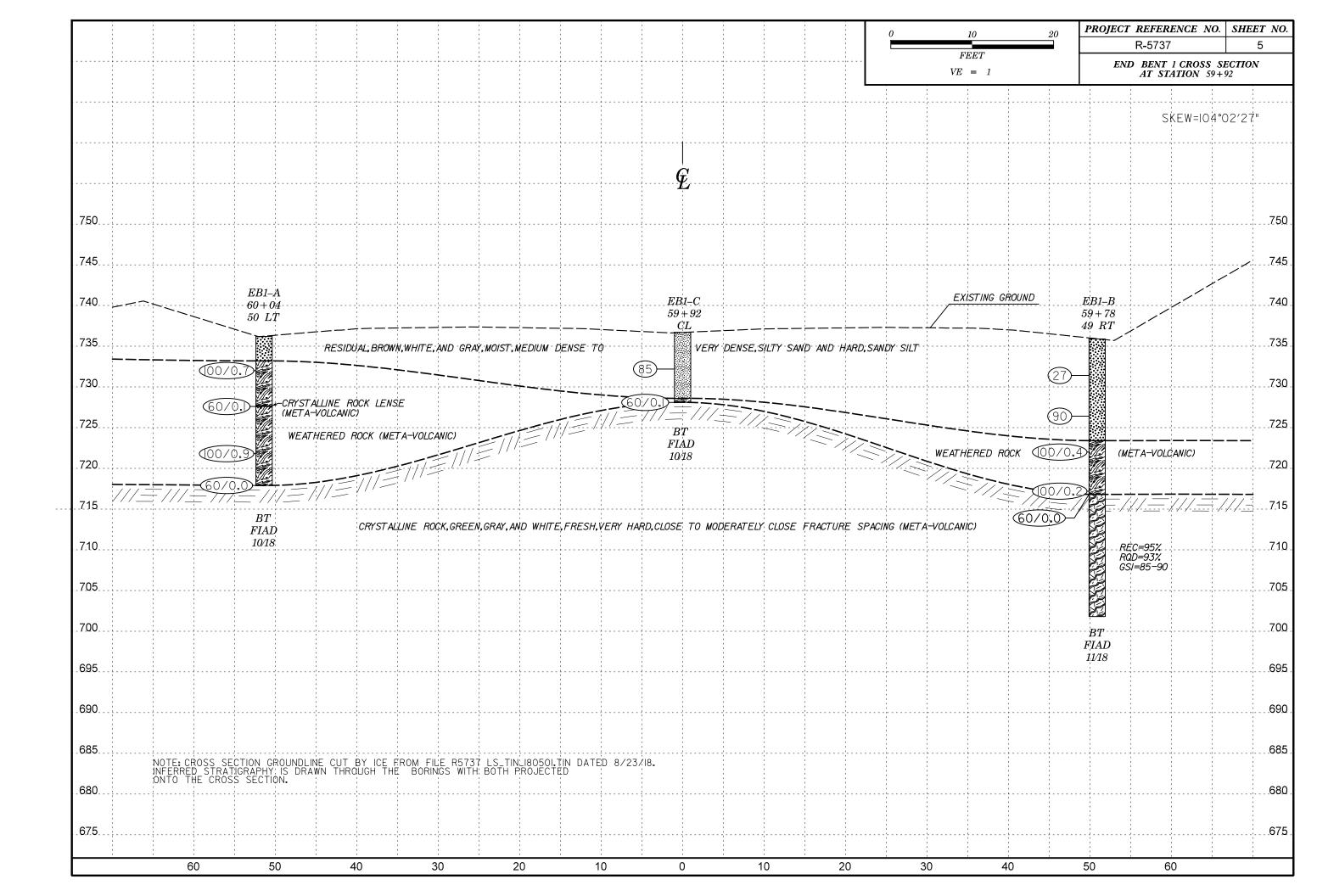
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

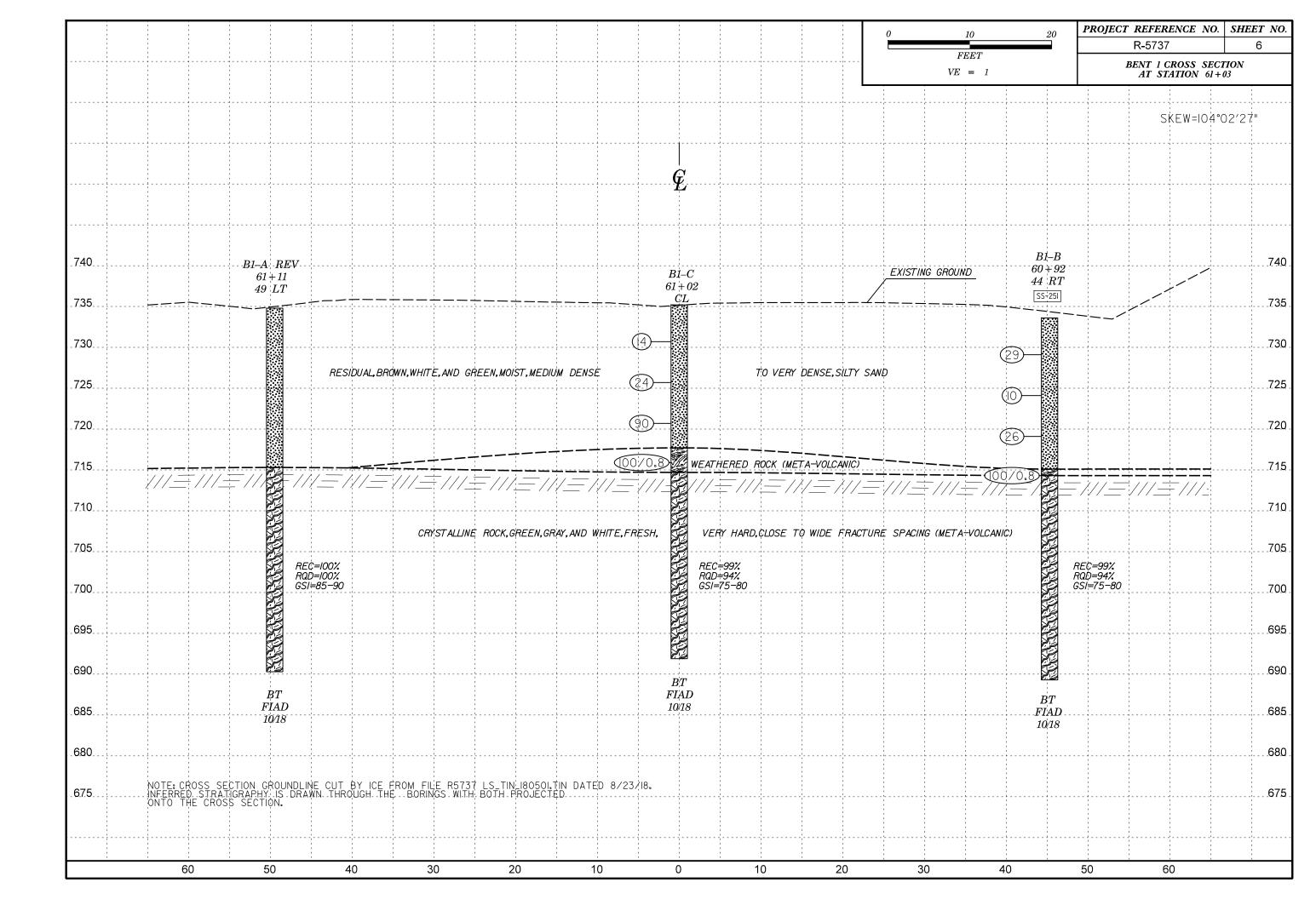
SUBSURFACE INVESTIGATION

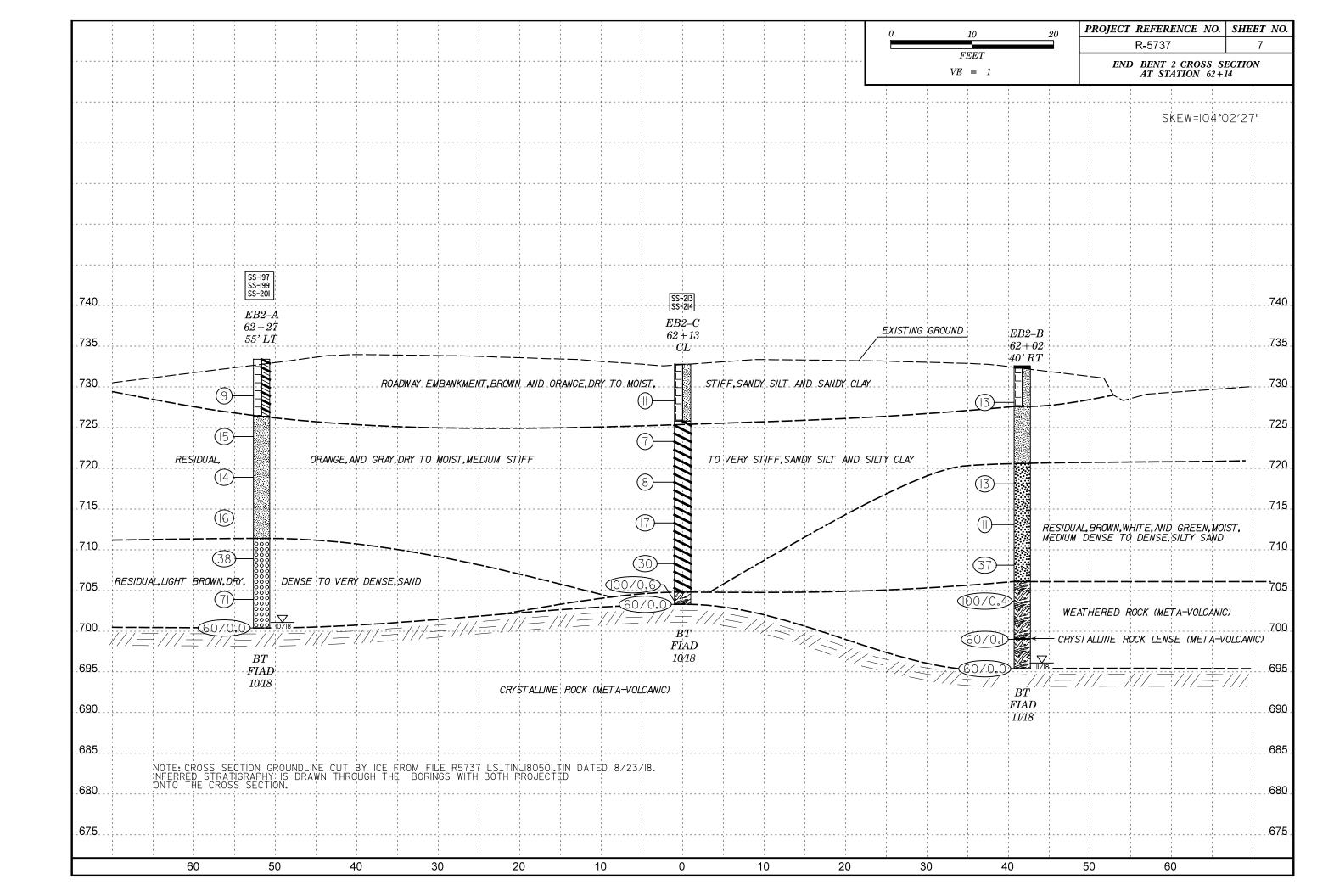
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000) AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000) GEOLOGICAL STRENGTH INDEX (GSI) FOR GSI FOR HETEROGENEOUS ROCK MASSES SUCH POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments JOINTED ROCKS (Hoek and Marinos, 2000) AS FLYSCH (Marinos. P and Hoek E., 2000) ed surfa fillings From a description of the lithology, structure and From the lithology, structure and surface POOR - Very smooth, slicken-or highly weathered surfaces soft clay coatings or fillings occasionally ss with compac with angular conditions of the discontinuities, estimate the average value of GSI. Do not try to surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the planes) be too precise. Quoting a range from 33 Rough, slightly weather s ф Ф position in the box that corresponds to the condition to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too ed, precise. Quoting a range from 33 to 37 is more bedding Where weak planar structural planes are weather realistic than giving GSI = 35. Note that the present in an unfavorable orientation SURFACE CONDITIONS (DISCONTINUITIES (Predominantly beddir Hoek-Brown criterion does not apply to structurally with respect to the excavation face, CONDITIONS these will dominate the rock mass controlled failures. Where unfavourably oriented behaviour. The shear strength of surfaces continuous weak planar discontinuities are present, soft clay Smooth, red and in rocks that are prone to deterioration slightly v es these will dominate the behaviour of the rock mass. as a result of changes in moisture The strength of some rock masses is reduced by the content will be reduced if water is **6000** rough, GOOD there presence of groundwater and this can be allowed for present. When working with rocks in the by a slight shift to the right in the columns for fair, fair to very poor categories, a shift to SURFACE th, r ığ the right may be made for wet conditions. GOOD Rough, s surface poor and very poor conditions. Water pressure does **VERY** Slick(with s GOOD surfa FAIR weath VERY FAIR Smoodalter VERY Water pressure is dealt with by effective not change the value of GSI and it is dealt with by Very stress analysis. using effective stress analysis. DECREASING SURFACE QUALITY STRUCTURE COMPOSITION AND STRUCTURE INTACT OR MASSIVE - intact A. Thick bedded, very blocky sandstone rock specimens or massive in .90 N/A N/A The effect of pelitic coatings on the bedding planes is minimized by the confinement of situ rock with few widely spaced PIECES discontinuities the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability. 60 BLOCKY - well interlocked undisturbed rock mass consisting ROCK of cubical blocks formed by three 50 intersecting discontinuity sets D. Siltstone 60 or silty shale stone with stone and siltstone Ы thin inter siltstone with sandor clayey С layers of ın sımılar stone layers shale with VERY BLOCKY - interlocked, OCKING mounts sandstone 40 partially disturbed mass with 50 multi-faceted angular blocks formed by 4 or more joint sets INTERL C. D. E. and G - may be more or F. Tectonically deformed, BLOCKY/DISTURBED/SEAMY -30 less folded than illustrated but intensively folded/faulted, folded with angular blocks this does not change the strength. heared clayey shale or siltstone formed by many intersecting Tectonic deformation, faulting and with broken and deformed DECREASING loss of continuity moves these discontinuity sets. Persistence sandstone layers forming an 30 categories to F and H. of bedding planes or schistosity Imost chaotic structure 20 DISINTEGRATED - poorly inter-locked, heavily broken rock mass 20 G. Undisturbed silty H. Tectonically deformed silty with mixture of angular and or clayey shale forming a or clayey shale with rounded rock pieces or without a few veru chaotic structure with pockets thin sandstone layers of clay. Thin layers of andstone are transformed nto small rock pieces. 10 LAMINATED/SHEARED - Lack of N/A blockiness due to close spacing N/A → Means deformation after tectonic disturbance of weak schistosity or shear planes











MD0 504																		
WBS 501	95.1.1			TI	P R-5	737		COUNT	Y DA	VIDSO	ON			GEOLOGI	ST M. Johi	nson		
SITE DESC	CRIPTIO	N Brid	dge on	US 29)/US 70	/Busi	ness 85	(-L-) ove	r -Y1-					•			GROUN	ID WTR (ft)
BORING N	IO. EB1	-A		S	TATION	60+	- 04		OFFS	ET 5	0 ft LT			ALIGNME	NT -L-		0 HR.	Dry
COLLAR E	LEV . 7	35.9 ft		т	OTAL D	EPTH	l 18.3 f	t	NORT	THING	770,7	94		EASTING	1,649,107		24 HR.	FIAD
COLLAR ELEV. 735.9 ft TOTAL DEPTH 18.3 ft NORTHING 770,794 EASTING 1,649,107 24 HR. FI/IDRILL RIG/HAMMER EFF./DATE SUMMIT CME-550X 92% 10/30/2018 DRILL METHOD H.S. Augers HAMMER TYPE Automatic		Automatic																
DRILLER	Contrac	t Drille	r	S	TART D	ATE	10/15/1	8	сомі	P. DA	ΓΕ 10/	15/18		SURFACE	WATER DE	PTH N	/A	
(ft) ELE	۷ امر ^ب	' —			0					100		'/	0		SOIL AND RO	OCK DES	CRIPTION	I DEPTH (ft
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735	-						1							735.9			ACE	0.0
	Ŧ						1							732.9			nd	3.0
732.	4 T 3.5	62	38/0.2		: :			1		00/0.7								
730	Ŧ					-+								_	(10101	a volcani	0)	
727.	4 7 8.5	00/0.4			: :				.	$\cdot \cdot \downarrow$				727.4	051/05			8.8
725	Ŧ	60/0.1			: :										(Met	a-Volcani	c)	\8.1
	Ŧ																	
722.	4 † 13.5 †	54	46/0.4							[(-,	
720	‡									00/0.9				-				
717.	6 † 18.3	100/0.0			1						1							18.
	+-													-				

SHEET 8

WBS 50195.1.1 COUNTY DAVIDSON **GEOLOGIST** M. Johnson **TIP** R-5737 SITE DESCRIPTION Bridge on US 29/US 70/Business 85 (-L-) over -Y1-GROUND WTR (ft) OFFSET 49 ft RT ALIGNMENT -L-**BORING NO.** EB1-B **STATION** 59+78 0 HR. N/A COLLAR ELEV. 736.7 ft TOTAL DEPTH 34.1 ft **NORTHING** 770,700 **EASTING** 1,649,147 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE SUMMIT CME-550X 92% 10/30/2018 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic **DRILLER** Contract Driller **START DATE** 11/01/18 COMP. DATE 11/01/18 **SURFACE WATER DEPTH N/A BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. MOI G ELEV. (ft) 740 **GROUND SURFACE** RESIDUAL 735 Brown, White, and Gray, Silty Sand 733.2 M 730 728 2 🕇 16 М 725 WEATHERED ROCK 723.2 13.5 100/0.4 100/0.4 (Meta-Volcanic) 720 CRYSTALLINE ROCK Green, Gray, and White, Fresh, Very Hard, 715 Close to Moderately Close Fracture Spacing, Meta-Volcanic REC=95% RQD=93% GSI=85-90 710 705 Boring Terminated at Elevation 702.6 ft in Crystalline Rock (Meta-Diorite)

GEOTECHNICAL BORING REPORT CORE LOG

WBS	5 50195.1	.1			TIP	R-573	37	С	OUNT	Υ	DAVIDSON		GEOLOGI	ST M. Johr	nson				
SITE	DESCRIP	PTION	I Brid	ge on US	29/U	S 70/E	Business	85 (-L-) ove	r -Y1	-					GROUI	ND WTR (f		
BOR	RING NO.	EB1-l	В		STA	TION	59+78			OF	FSET 49 f	t RT	ALIGNMEI	NT -L-		0 HR.	N/A		
COL	LAR ELEV	/. 73	6.7 ft		TOT	AL DE	PTH 34	.1 ft		NC	RTHING 7	70,700	EASTING	1,649,147		24 HR.	FIAD		
DRIL	L RIG/HAMM	IER EF	F./DA	TE SUMM	ЛІТ СМ	E-550X	92% 10/30)/2018			DR	ILL METHOD N	NW Casing W/SP	Γ & Core	HAMM	ER TYPE	Automatic		
DRII	LER Con	tract	Driller		STA	RT DA	TE 11/0	1/18		CC	MP. DATE	11/01/18	SURFACE	WATER D	EPTH N	'A			
COF	RE SIZE N	Q					N 15.0 f												
ELEV (ft)		EPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. REC. I ROD O DESCRIPTION AND REMARKS										DEPTH (ft)		
717.6													Begin Corir	ng @ 19.1 ft					
715 710	717.6 - 1		5.0	2:03/1.0 1:36/1.0 1:17/1.0 3:36/1.0 5:54/1.0 5:24/1.0 7:28/1.0 4:29/1.0	(5.0) 100%	(4.0) 80% (5.0) 100%		95%	(14.0) 93%		- 717.6 - (Green, Gray, and	White, Fresh, V Fracture Spacii REC RQI	LLINE ROCK ery Hard, Clo ng, Meta-Vold C=95% D=93% =85-90	se to Mod	derately C	19. lose		
705	707.6 - 2	29.1 34.1	5.0	3:32/1.0 5:49/1.0 3:04/1.0 1:59/1.0 5:21/1.0 6:29/1.0 15:31/1.0	(5.0) 100%	(5.0) 100%					702.6						34.		
											- Bc	oring Terminated	at Elevation 702	2.6 ft in Crysta	alline Rock	k (Meta-Di	orite)		

							B	ORE L	_OG				
WBS 50195.	1.1			TI	P R-5737		COUNT	Y DAVIDS	ON			GEOLOGIST M. Johnson	
SITE DESCRII	PTION	l Bric	lge on	US 29	9/US 70/Bus	siness 85 (-	L-) over	-Y1-					GROUND WTR (f
BORING NO.	EB1-	·C		S	FATION 59	+92		OFFSET	CL			ALIGNMENT -L-	0 HR. Dr
COLLAR ELE	V . 73	86.9 ft		TO	OTAL DEPT	H 8.6 ft		NORTHIN	G 770,7	' 48		EASTING 1,649,128	24 HR . FIAI
DRILL RIG/HAMI	MER E	FF./DA	TE SU	JMMIT (CME-550X 92%	10/30/2018			DRILL N	ЛЕТНО	D H.	S. Augers HAMN	MER TYPE Automatic
DRILLER Co	ntract	Drille	r	S	TART DATE	10/17/18		COMP. DA	TE 10/	17/18		SURFACE WATER DEPTH	I/A
ELEV DRIVE ELEV (ft)	DEPTH (ft)		0.5ft		0 2	BLOWS PE		75 100	SAMP. NO.	MOI	L O G	SOIL AND ROCK DES	SCRIPTION DEPTH
740											-		FACE (
735													
733.4	3.5	4	17	68				85		М		- - -	
730 + 728.4 +	8.5										an.		OCK
Ī		60/0.1						60/0.1		M		(Meta-Volcan	ic)
1												Boring Terminated wit Penetration Test Refusa 728.3 ft on Crystalline Roc	al at Elevation
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WBS	50195	5.1.1			TII	P R	-573	7			cou	NT	7 DA	VIDS	10	N			GEO	LOGI	ST N	Л. Joh	nnson] [
SITE	DESC	RIPTIO	N Bric	dge on	US 29	/US	70/B	usine	ess 8	35 (-	L-) o	ver	-Y1-											G	ROUND	WTR (ft	[
BOR	ING NO). B1-A	REV		ST	ATIO	NC	61+1	11				OFF	SET	49	ft LT			ALIG	NME	NT -	L-		0	HR.	N/A	
COL	LAR EL	. EV. 73	35.0 ft		TC	TAL	. DE	PTH	44.	5 ft			NOR	THIN	G	770,8	59		EAS	ΓING	1,64	9,192	2	24	HR.	FIAD	
DRILL	RIG/HAI	MMER E	FF./DA	TE SU	JMMIT (CME-5	50X	92% 1	10/30	/2018	3				1	ORILL N	METHO	D N	IW Casing	W/SP	T & Co	ore	НА	MMER	TYPE A	utomatic	1
DRIL	LER C	ontract	Drille	r	ST	ART	DA	TE	10/1:	2/18			CON	1P. D	١T	E 10/	12/18		SURI	ACE	WA	TER [DEPTH	l N/A			1 [
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)		W COL	UNT	0					ER FC	ОТ	75 	100	,	SAMP. NO.	_	L	ELEV. (f				ROCK D		PTION	DEPTH (ft	<u> </u>
735 730 725 720 715 710 705			60/0.0		0.5ft								75	100 		NO.	M		735.0	(C	ontinu	FROM Brown B	TALLIN d White	JE ROC , Fresh, g, Meta 0%	Sampling)	0.0 19.5	
																			- 690.5 690.5 690.5 690.5 690.5 690.5 - 69	Bori	ing Te Crys	rminat	ed at E Rock (I	levation Meta-D	690.5 ft iorite)	44.5	NCDOT CORE DOUBLE R5737_GEO_BRDG_BH.GPJ NC_DOT.GDT 1/24/19

GEOTECHNICAL BORING REPORT CORE LOG

									С	0	RE L	OG						
WBS	5 50195	.1.1			TIP	R-573	37	С	OUNT	Υ [DAVIDSO	N			GEOLOGIST M. John	son		
SITE	DESCR	IPTIO	N Brid	lge on US	29/U	S 70/E	Business	85 (-L-	-) ove	r -Y1	-						GROUI	ND WTR (ft)
BOR	RING NO	. B1-A	REV		STA	TION	61+11			OF	FSET 49	9 ft LT			ALIGNMENT -L-		0 HR.	N/A
COL	LAR ELI	EV. 73	35.0 ft		TOT	AL DE	PTH 44	.5 ft		NC	RTHING	770,85	9		EASTING 1,649,192		24 HR.	FIAD
DRIL	L RIG/HAN	/IMER E	FF./DA	TE SUM	MIT CM	E-550X	92% 10/30	0/2018				DRILL ME	THOD N	NW	Casing W/SPT & Core	HAMN	IER TYPE	Automatic
DRIL	LER C	ontract	Drille	r	STA	RT DA	TE 10/1	2/18		CC	MP. DAT	E 10/1	2/18		SURFACE WATER DE	PTH N	/A	
COR	RE SIZE	NQ			I		IN 25.0 f											
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	REC. (ft) %	RATA RQD (ft) %	L O G	ELEV. (ft)	ı		DE	SCRIPTION AND REMARI	KS .		DEPTH (ft)
745 <u>5</u> 5															Begin Coring @ 19.5 ft			
710	715.5	- - - 24.5 - -	5.0	N=60/0.0 2:50/1.0 2:00/1.0 1:55/1.0 2:05/1.0 1:17/1.0 1:52/1.0 1:50/1.0 1:45/1.0 1:45/1.0 2:05/1.0	100%	(5.0) 100%		(25.0) 100%	(25.0) 100%		715.5	Green	, Gray, an	nd W	CRYSTALLINE ROCK White, Fresh, Very Hard, Clo Meta-Volcanic REC=100% RQD=100% GSI=85-90	se Fract	ure Spacii	19.5
700	700.5 -	- - - - 34.5	5.0	2:05/1.0 1:40/1.0 2:05/1.0 2:30/1.0 2:15/1.0 2:53/1.0	100%	(5.0) 100% (5.0)	RS-1				- - - -							
695	695.5 -	- - - - 39.5	5.0	3:23/1.0 3:25/1.0 3:11/1.0 3:17/1.0 4:27/1.0	(5.0)	(5.0)					 - - -							
	690.5 -	- - - 44.5		2:59/1.0 2:42/1.0 2:58/1.0 3:19/1.0	100%	100%					- - - 690.5	Boring To	erminated	d at	Elevation 690.5 ft in Crystal	line Roc	k (Meta-Di	44.5 orite)

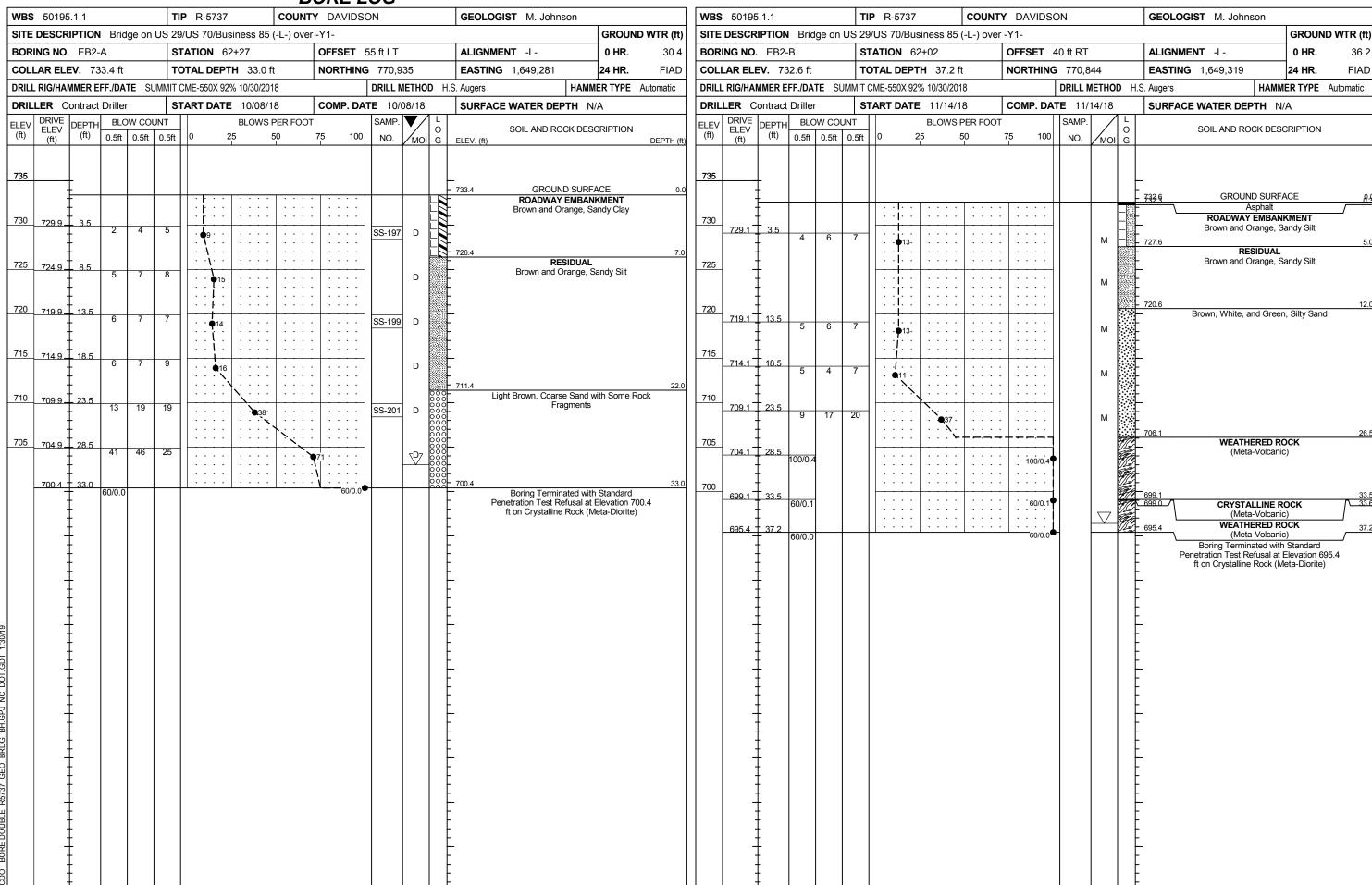
WBS 50195.1.1 COUNTY DAVIDSON **GEOLOGIST** M. Johnson **TIP** R-5737 SITE DESCRIPTION Bridge on US 29/US 70/Business 85 (-L-) over -Y1-GROUND WTR (ft) OFFSET 44 ft RT ALIGNMENT -L-BORING NO. B1-B STATION 60+92 0 HR. N/A COLLAR ELEV. 734.6 ft TOTAL DEPTH 44.3 ft **NORTHING** 770,774 **EASTING** 1,649,234 24 HR. FIAD DRILL RIG/HAMMER EFF./DATE SUMMIT CME-550X 92% 10/30/2018 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic **DRILLER** Contract Driller **START DATE** 10/31/18 COMP. DATE 10/31/18 **SURFACE WATER DEPTH N/A BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. ELEV. (ft) **GROUND SURFACE** RESIDUAL Brown, White, and Green, Silty Sand 730 SS-251 M М 721.1 <u>13.5</u> 13 13 720 Μ 716.1 T 18.5 715.3 T 19.3 28 72/0.3 WEATHERED ROCK -100/0.8 -60/0.0 (Meta-Volcanic) CRYSTALLINE ROCK Green, Gray, and White, Fresh, Very Hard, Close to Wide Fracture Spacing, 710 Meta-Volcanic RQD=94% GSI=75-80 705 RS-2 700 695 Boring Terminated at Elevation 690.3 ft in Crystalline Rock (Meta-Diorite)

GEOTECHNICAL BORING REPORT CORE LOG

									C	O	RE L	OG								
WBS	5019	5.1.1			TIP	R-573	37	С	OUNT	Υ [DAVIDSO	N			GEOLO	GIST	M. Joh	nson		
SITE	DESCI	RIPTIO	N Bric	lge on US	S 29/U	S 70/E	Business	85 (-L	-) ove	r -Y1	1-				•				GROUI	ND WTR (ft)
BOR	ING NO). B1-E	3		STA	TION	60+92			OF	FFSET 4	4 ft RT			ALIGNI	MENT	-L-		0 HR.	N/A
COL	LAR EL	EV. 73	34.6 ft		TOT	AL DE	PTH 44	.3 ft		NC	ORTHING	770,7	74		EASTIN	IG 1,6	649,234	ļ	24 HR.	FIAD
DRILL	RIG/HA	MMER E	FF./DA	TE SUMI	MIT CM	E-550X	92% 10/30)/2018		•		DRILL M	IETHOD	NW	Casing W	/SPT & 0	Core	HAMI	MER TYPE	Automatic
DRIL	LER C	Contract	Drille	r	STA	RT DA	TE 10/3	1/18		CC	OMP. DAT	E 10/3	31/18		SURFA	CE W	ATER C	DEPTH N	N/A	
COR	E SIZE	NQ			TOT	AL RU	N 25.0 f													
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	UN RQD (ft) %	SAMP. NO.	STR REC. (ft) %	RATA RQD (ft) %	L O G	ELEV. (ft)	ı		DE	ESCRIPTI	ON ANI) REMA	RKS		DEPTH (ft)
7 / 1/5 ₅ 3	745.0	40.0				ļ									Begin C	oring @	2 19.3	ft		
710	715.3	19.3 - - - - 24.3	5.0	2:37/1.0 2:00/1.0 2:47/1.0 2:26/1.0 2:35/1.0	100%	90%		99%	(23.4) 94%		715.3	Gree	en, Gray	, and \	White, Fre Spacin	sh, Ver	-Volcani 9%	Close to V	Vide Fractu	19.3 ire
	705.3	29.3	5.0	2:21/1.0 3:18/1.0 2:41/1.0 3:08/1.0 4:16/1.0		(4.2) 84%										GSI=75				
705	-	† - -	5.0	3:10/1.0 3:18/1.0 3:12/1.0 3:11/1.0	(5.0) 100%	(5.0) 100%	RS-2													
700	700.3	+	5.0	2:34/1.0 2:51/1.0 3:11/1.0 3:24/1.0 3:10/1.0		(5.0) 100%														
695	695.3	39.3	5.0	3:01/1.0 2:50/1.0 2:48/1.0 2:38/1.0 2:53/1.0		(4.7) 94%														
	690.3	44.3		3:06/1.0							690.3 - - -	Boring 7	Termina	ited at	Elevation	690.3 ft	in Crys	talline Ro	ck (Meta-D	44.3 iorite)
	-	 									<u>-</u> -									
	-										<u>-</u>									
	-	<u> </u>									- - -									
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	50195						P R-5737				Y DA\	/IDSC	N			GEOLOGIST M. Johnson		
				dge on	_		/US 70/Bus		5 (-L-) o	ver						_	GROUND W	TR (ft)
ORI	ING NO). B1-C	;		!	ST	ATION 61	+02			OFFS	ET C	L			ALIGNMENT -L-	0 HR.	Dry
OLI	LAR EL	.EV. 73	35.0 ft	t		то	TAL DEP	ΓH 43.3	3 ft		NORT	THING	770,8	15		EASTING 1,649,215	24 HR.	FIAD
RILL	RIG/HAI	MMER E	FF./D <i>F</i>	ATE S	UMMI	T C	ME-550X 92	% 10/30/	2018				DRILL N	ИЕТНО	D NV	N Casing W/SPT & Core HAMN	IER TYPE Auto	matic
RIL	LER C	ontract	Drille	er	;	ST	ART DATE	= 10/17	7/18		COME	P. DA	TE 10/	17/18		SURFACE WATER DEPTH N	I/A	
E۷	DRIVE ELEV	DEPTH	'	ow co		_			S PER F				SAMP.	lacksquare	L	SOIL AND ROCK DES	SCRIPTION	
t)	(ft)	(ft)	0.5ft	0.5ft	0.5f	ft	0 2	5 I	50		75 	100	NO.	<u>MOI</u>	G	ELEV. (ft)	Di	EPTH (ft)
35				+		-										735.0 GROUND SURF	ACE	0.0
		Ŧ									: :					Brown, Silty Sa		
0	731.5	3.5	1	6	8	┪					: :			М		•		
	-	Ŧ					/.									- ·		
	726.5 ·	8.5	9	14	10	_	: : : <i>i'</i>			: :	: :					•		
5_	=	Ŧ	9	11	13	`		24			+			M	LE	· =		
	704.5	10.5													E	•		
0	721.5	13.5	21	42	48	\dashv					+	 •90		М	F	•		
	-	Ŧ									1 : :	./.			Ε	- . 747 F		17.5
	716.5	18.5	41	59/0.3	5							. '				• 717.5 WEATHERED F		17.5
5_	-	Ŧ	41	39/0.3							10	00/0.8				-714.5 (Meta-Volcan	•	20.5
		Ŧ														Green, Grav, and White, Fr	esh. Verv Hard.	
)	-	1														Close to Moderately Close Spacing, Meta-Vo	olcanic	
		ł										: :				REC=99% RQD=94%		
	-	ł									: :					GSI=75-80		
5_	-	ł									+	-				-		
		Ī																
0	-	1														-		
		‡																
_	-	‡										: :						
5	-	‡									 					-		
		<u> </u>								: :		: :				691.7		43.3
	-	‡														Boring Terminated at Eleva Crystalline Rock (Me	ation 691.7 ft in ta-Diorite)	
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WPS	50195.1.1	1			TID	R-573	27				RE L				GEOL	UGIE.	T N4	lohn-	on		
	DESCRIPT		Rrid	ne on HIS) N			GEUL	JJIJ	ı IVI.	5011118	UII	GROU	ND WTR (
	NG NO. B		טווט	90 011 00			61+02	JJ (-L	, over	_	FSET (ALIGN	IMEN.	T -I -			0 HR.	Dr Dr
	AR ELEV.		5 O ft				PTH 43	3 ft		-	RTHING		815		EASTI			215		24 HR.	FIAI
	RIG/HAMME			TE SLIMA						110		DRILL		D NW	Casing V				намм		Automatic
	LER Contr						TE 10/1			CO	MP. DA				SURF						ratomatic
	SIZE NO		5111101				N 22.8 f			-		12 10	717710		OOK!		•AIL	IN DE	11111		
	RUN DE	PTH	DLIN	DRILL	Rl	JN	SAMP.	STR	ATA	L											
(ft)	FLEV IDE	ft)	(ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	NO.	REC. (ft) %	RQD (ft) %	O G	ELEV. (1	t)		DE	SCRIPT	TON A	ND RE	MARK	S		DEPTH
714.5															Begin (Coring	@ 20).5 ft			
710	711.0 24 711.0 24 706.5 28 701.7 33	1.0	3.54.54.85.0	2:31/0.5 1:44/1.0 1:50/1.0 1:46/1.0 1:47/1.0 1:58/1.0 1:58/1.0 1:20/0.5 1:39/1.0 1:48/1.0 2:01/1.0 1:58/0.8 2:06/1.0	(4.8) 100%	(2.4) 69% (4.5) 100% (4.8) 100%		100%	95%		- 714.5 - - - - - - - - - - -	Gree	n, Gray	, and W	CRY	STALI sh, Ve	INE R ry Hard g, Meta =99% =94%	OCK d, Close		derately Cl	ose 20
695	+	3.3	5.0	1:59/1.0 2:03/1.0 2:21/1.0 1:59/1.0 2:12/1.0 1:55/1.0 1:54/1.0	(5.0)	(5.0)					— - - - - -										
	691.7 43	3.3		2:01/1.0							- 691.7	Boring	Termin	ated at	Elevatio	n 691.7	7 ft in C	Crystall	ne Roc	k (Meta-Di	orite)



S 50195.1.1 TIP R-5737 COUNTY DAVIDSON GEOLOGIST M. Johnson
BORING NO. EB2-C STATION 62+13 OFFSET CL ALIGNMENT L- O HR. Dry
COLLAR ELEV. 732.8 ft
DRILL RIG/HAMMER EFF./DATE SUMMIT CME-550X 92% 10/30/2018 DRILL METHOD H.S. Augers HAMMER TYPE Automatic
DRILLER Contract Driller START DATE 10/18/17 COMP. DATE 10/18/18 SURFACE WATER DEPTH N/A
DRIVE City
DRIVE (ft) DRIVE (ft) DEPTH (ft) DEP
(ft) (ft) (ft) 0.5ft 0.5
735 729.3 3.5 4 5 6 711 3 4 77 8 9 117 SS-214 M
730 729.3 3.5 4 5 6 7 8 9
730 729.3 3.5 4 5 6 7 8 9
730 729.3 3.5 4 5 6 111.
725 724.3 8.5 1 3 4 5 6 7 8 9 117 SS-214 M
725
725
720 719.3 13.5 2 4 4 5 SS-213 M SS-213 M SS-214 M SS-214 M SS-214 M
720 719.3 13.5 2 4 4 7
720 719.3 13.5 2 4 4
715 714.3 18.5 7 8 9
715 714.3 18.5 7 8 9
715 714.3 18.5 7 8 9 17 SS-214 M
7 8 9 SS-214 M
$_{710}$ $_{1}$ $_{1}$ $_{1}$ $_{1}$ $_{2}$
710 700 3 + 23 5
11 12 18 1 : : : •30 : : : : : : M
705 704.8 28.
704.3 28.5 40 520.4
+ OVIO.5 Boring Terminated with Standard
+ Penetration Test Refusal at Elevation 703.3 ft on Crystalline Rock (Meta-Diorite)

‡

SHEET 15

			BURE	JUG									JUR	E LUG	
WBS 50195.1.1	Т	IP R-5737	COUNTY DAVIDS	ON		GEOLOGIST M. Johnson		WB	3S 50195.1.1	TIP R-	5737	coul	NTY DA	VIDSON	GEOLOG
SITE DESCRIPTION	Bridge on US 29	9/US 70/Business 85 (L-) over -Y1-				GROUND WTR (ft)	SITI	E DESCRIPTION Bridge on U	JS 29/US 7	0/Busine	ess 85 (-L-) ov	er -Y1-		
BORING NO. B1-A	s	TATION 61+14	OFFSET	50 ft LT		ALIGNMENT -L-	0 HR. N/A	ВОГ	RING NO. B1-A	STATIC	N 61+1	14	OFF	SET 50 ft LT	ALIGNM
COLLAR ELEV. 735.0	oft T	OTAL DEPTH 21.6 ft	NORTHIN	G 770,862		EASTING 1,649,194	24 HR. FIAD	COL	LLAR ELEV. 735.0 ft	TOTAL	DEPTH	21.6 ft	NOR	THING 770,862	EASTING
DRILL RIG/HAMMER EFF.	/DATE SUMMIT	CME-550X 92% 10/30/201	 3	DRILL METHOD	O NW	V Casing w/ Core HAMN	ER TYPE Automatic	DRIL	LL RIG/HAMMER EFF./DATE SUI	MMIT CME-5	50X 92% 1	10/30/2018		DRILL METHOD	
DRILLER Contract Dr		TART DATE 10/09/18		TE 10/09/18		SURFACE WATER DEPTH N		-	ILLER Contract Driller			10/09/18	CON	IP. DATE 10/09/18	SURFAC
	BLOW COUNT	BLOWS P		SAMP V	L	1		-	RE SIZE NQ	TOTAL					
(ft) ELEV (ft) 0.	.5ft 0.5ft 0.5ft	0 25 5	75 100	NO. MOI	O G	SOIL AND ROCK DES	CRIPTION DEPTH (ft)	ELEV					L		
								(ft)	ELEV (ft) (ft) RATE (Min/ft)	REC. RG (ft) (ft) (ft) (ft) (ft) (ft) (ft) (ft)	T) NC	MP. REC. RC O. (ft) (ft % %	G	ELEV. (ft)	DESCRIPTIO
735						735.0 GROUND SURF	ACE 0.0	718.9	.9						Begin Co
+					-	RESIDUAL Brown, Silty Sa			718.9 16.1 2.0 N=60/0 716.9 18.1 1:25/1.	(2.0) (2 0 100% 10 0 (3.5) (3 0 100% 10 0 5	.0)	(5.5) (5.5) 100% 100	5)	718.9 Green, Gray, and	CRYST
731.5 7 3.5	7 0 0] ::::::				,,,		715	3.5 1:33/1. 2:21/1.	0 (3.5) (3	.5)			2.22, 2.29, 22	Fracture Spa
730	7 8 9	17		D		-			713.4 + 21.6 1:28/1. 1:20/1.	0 100% 10	0%			713.4	RE RO G:
, ‡		::::::							T (1.2776.					\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
725 726.5 + 8.5	3 5 8	 .		D	-									Note: Coring Ter Boring Terminated	
, 723					:::: <u>-</u>	_								· ·	
721.5 + 13.5					::: <u>+</u>										
720	8 18 14	32		D	:::: <u> </u>	-							-		
718.9 16.1	/0.0	: : : : : : \				718.9 CRYSTALLINE I									
						Green, Gray, and White, Fr Close to Moderately Clo	se Fracture		<u> </u>						
715						Spacing, Meta-Vo	Icanic		1 1 1						
						713.4 REC=100% RQD=100% GSI=85-90	21.6		1 1				-		
					F		1 1		 				F		
					F	Note: Coring Terminated a to Mechanical Brea	kdown								
					F	Boring Terminated at Eleva Crystalline Rock (Mei	ation 713.4 ft in								
					F	-	a 2.6c,								
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<u> </u>								37_G							
						_		R573					-		
								BLE							
3					<u> </u>			DOUBLE							
1000 BORE DOUBLE RS/3/ GEO_BRUGE NC_DOUGE 7/24/18					E	-		CORE					<u> </u>		
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WBS	50195	.1.1			TIP	R-573	37	С	OUNT	Υ	AVIDSON	GEOLOGIST M. Johnson	
SITE	DESCR	IPTIO	N Brid	dge on US	S 29/U	S 70/E	Business	85 (-L	-) over	r -Y1			GROUND WTR
	ING NO.						61+14			_	SET 50 ft LT	ALIGNMENT -L-	O HR. N
COLI	LAR ELI	EV. 73	5.0 ft		тот	AL DE	PTH 21.	.6 ft		NC	RTHING 770,862	EASTING 1,649,194	
DRILL	. RIG/HAN	/IMER E	FF./DA	TE SUMI	MIT CM	E-550X	92% 10/30)/2018			DRILL METHOD NV	V Casing w/ Core HAN	IMER TYPE Automatic
DRIL	LER Co	ontract	Drille	r	STA	RT DA	TE 10/0	9/18		СС	/IP. DATE 10/09/18	SURFACE WATER DEPTH	
COR	E SIZE	NQ					N 5.5 ft						
ELEV	RUN	DEPTH	RUN	DRILL		JN RQD	SAMP.	STR REC.	ATA RQD	Ļ			
(ft)	ELEV (ft)	(ft)	(ft)	RATE (Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	O G	D ELEV. (ft)	ESCRIPTION AND REMARKS	DEPTH
718.9												Begin Coring @ 16.1 ft	
	718.9 716.9	_ 16.1 _ 18.1	2.0	N=60/0.0 1:25/1.0 1:33/1.0	(2.0) 100%	(2.0) 100%		(5.5) 100%	(5.5) 100%		718.9 Green, Gray, and V	CRYSTALLINE ROCK White, Fresh, Very Hard, Close to M	1 Ioderately Close
715	-	_	3.5	1:33/1.0 2:21/1.0	(3.5)	(3.5)			,.			Fracture Spacing, Meta-Volcanic REC=100%	,
	713.4	- - 21.6		2:21/1.0 1:28/1.0 1:20/1.0 1:21/0.5	100%	100%					713.4	RQD=100%	2
	1	-		1.2 170.0	1							GSI=85-90	
	- 1	-									Note: Coring Term Boring Terminated a	ninated at 21.6 Feet Due to Mechan t Elevation 713.4 ft in Crystalline Ro	nical Breakdown ock (Meta-Diorite)
	‡	_											
	Ħ	_											
	7	_									-		
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LABORATORY TESTING SUMMARY

PROJECT NUMBER:	50195.1.1	TIP:	R-5737	COUNTY:	Davidson

DESCRIPTION: Bridge on US 29/US 70/Business 85 (-L-) over -Y1-

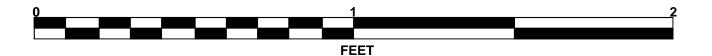
				011-11	Devil 1 devi el					% by W	/eight		%	% P	assing (sie	ves)		0/
Boring No.	Sample No.	Alignment	Station	Offset (feet)	Depth Interval (feet)	AASHTO Class.	L.L.	P.I.	Coarse Sand	Fine Sand	Silt	Clay	Retained #4 Sieve	#10	#40	#200	% Moisture	% Organic
B1-B	SS-251	-L-	60+92	44' RT	3.5 - 5.0	A-2-4 (0)	23	NP	53.5	26.1	9.6	10.8	1	90	52	22	8.1	
EB2-C	SS-213	-L-	62+13	CL	8.5 - 10.0	A-7-6 (41)	68	42	2.9	15.8	35.0	46.3	0	100	98	88	36.8	
EB2-C	SS-214	-L-	62+13	CL	18.5 - 20.0	A-4 (0)	29	2	6.7	55.6	27.0	10.7	0	100	98	52	14.3	
EB2-A	SS-197	-L-	62+27	50' LT	3.5 - 5.0	A-6 (9)	40	21	14.6	36.1	24.8	24.5	0	96	88	56	18.9	
EB2-A	SS-199	-L-	62+27	50' LT	13.5 - 15.0	A-4 (0)	29	0	7.2	53.4	25.7	13.7	0	100	98	51	12.7	
EB2-A	SS-201	-L-	62+27	50' LT	23.5 - 25.0	A-1-b (0)	21	0	54.0	28.4	10.7	6.9	3	82	49	18	4.8	

Boring No.	Sample No.	Alignment	Station	Offset (feet)	Depth (feet)	Rock Type	Geologic Map Unit	Run RQD %	Length (in)	Diameter (in)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)
B1-A_REV	RS-1	-L-	61+11	49' LT	29.5 - 30.0'	META-VOLCANIC	CZv	100%	3.88	1.97	179.7	13,930
B1-B	RS-2	-L-	60+92	44' RT	30.3 - 31.4'	META-VOLCANIC	CZv	100%	3.91	1.97	170.8	21,120

CORE PHOTOGRAPHS

EB1-BBOXES 1 & 2: 19.1 - 34.1 FEET





B1-CBOXES 1 - 3: 20.5 - 43.3 FEET



CORE PHOTOGRAPHS

B1-A_REV

BOXES 1 - 4: 19.5 - 44.5 FEET



CORE PHOTOGRAPHS

B1-BBOXES 1 - 3: 19.3 - 44.3 FEET



PROJECT NO.	SHEET NO.
R-5737	21

SITE PHOTOGRAPH



View looking north from End Bent 1