This electronic collection of documents is provided for the convenience of the user and is Not a Certified Document –

The documents contained herein were originally issued and sealed by the individuals whose names and license numbers appear on each page, on the dates appearing with their signature on that page.

This file or an individual page shall not be considered a certified document.

REFERENCE

CONTENTS

DESCRIPTION

LEGEND (SOIL & ROCK)

TITLE SHEET

CROSS SECTIONS

SITE PLAN

BORELOGS

SHEET NO.

4-5

36030

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY	BUNCO	MBE						
ROJECT	DESCRI	PTION.	<i>I</i> –47	700A	TWIN	BRIDGES	ON	<i>I</i> –26
OVER	GLENN	BRIL	OGE	RD.				
SITE DES	SCRIPTION	١						

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I4700A 100069 & 100070	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 1919) 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 (INP-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESTREAD OF THE DESCRIPTION OF THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NDICATED 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.

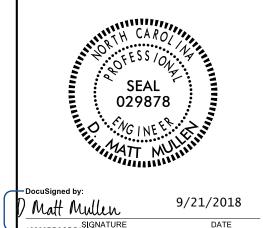
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION OF HIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS 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 OF AN PREADON RESULTING FROM THE ACTUAL CONDITIONS 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.

 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.

	M. ARNOLD
	S. WOODS
	W. HAMRICK
	N. CONSIGLI
	S. DAVIS
	J. HOYLE
INVESTIGATED	BY <i>DMM</i>
DRAWN BY	
CHECKED BY _	l ki
SUBMITTED BY	(
DATE 9/20/2	



SIGNATURE

DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED**

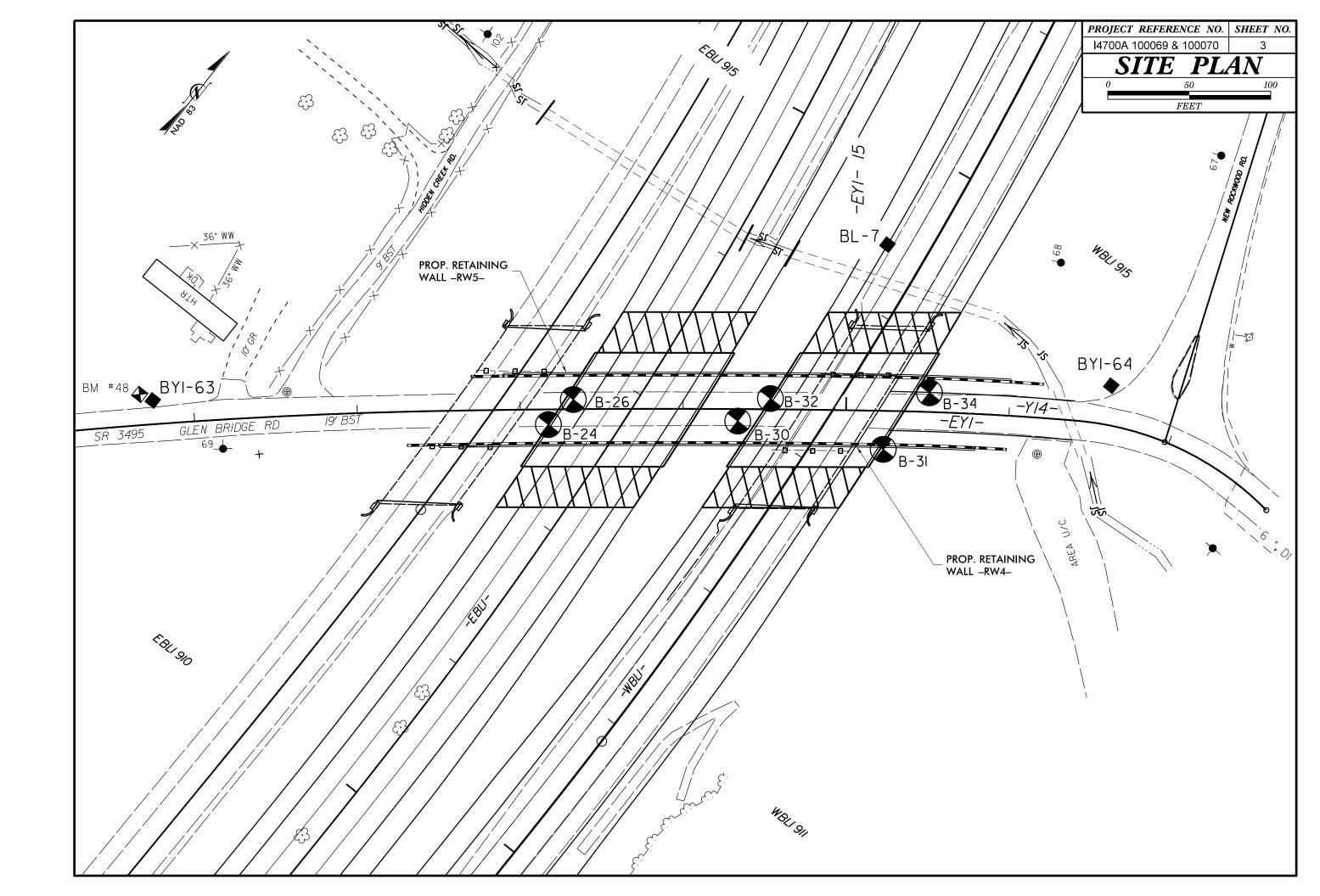
PROJECT REFERENCE NO.	SHEET NO.			
I4700A 100069 & 100070	2			

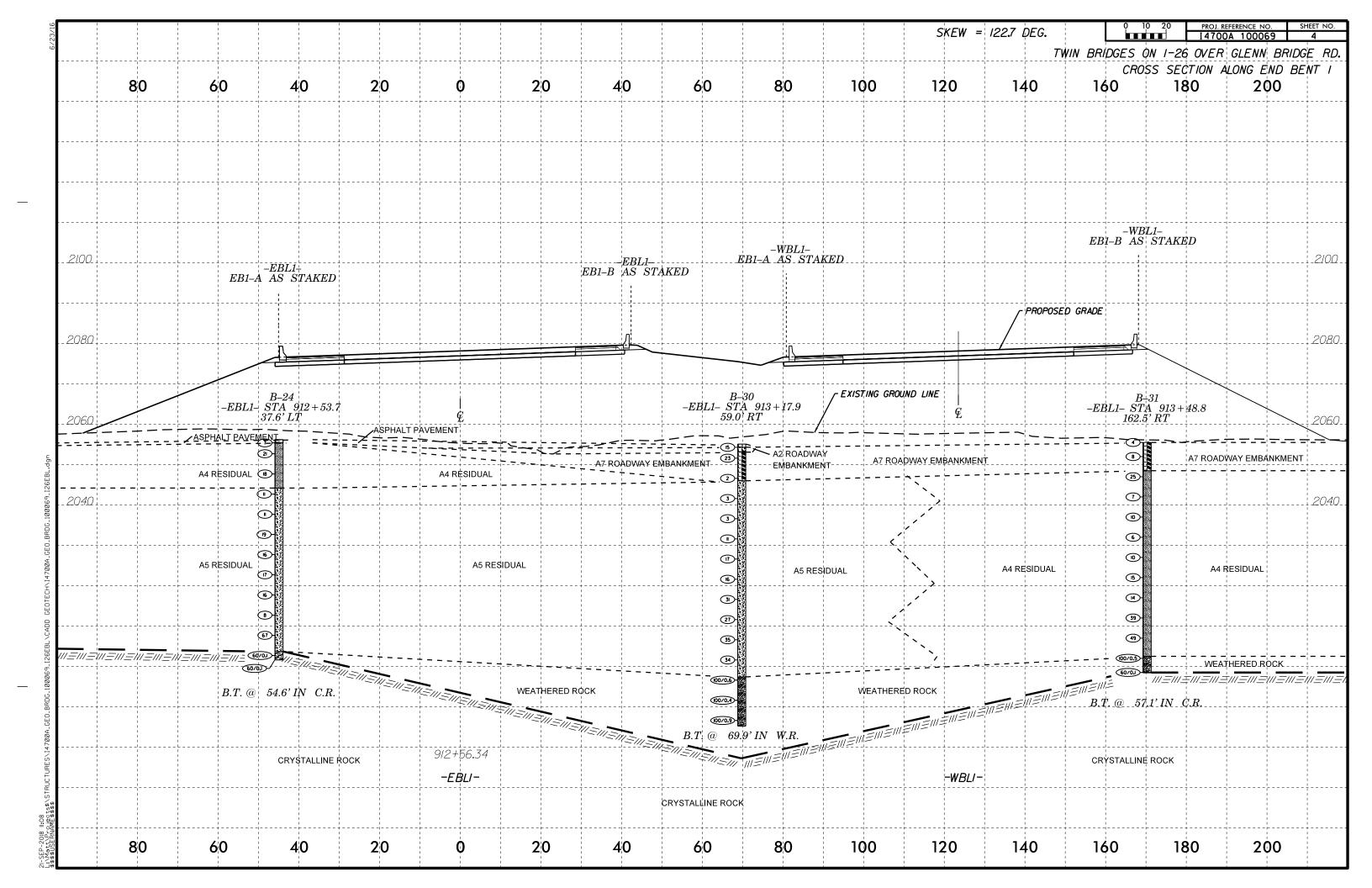
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

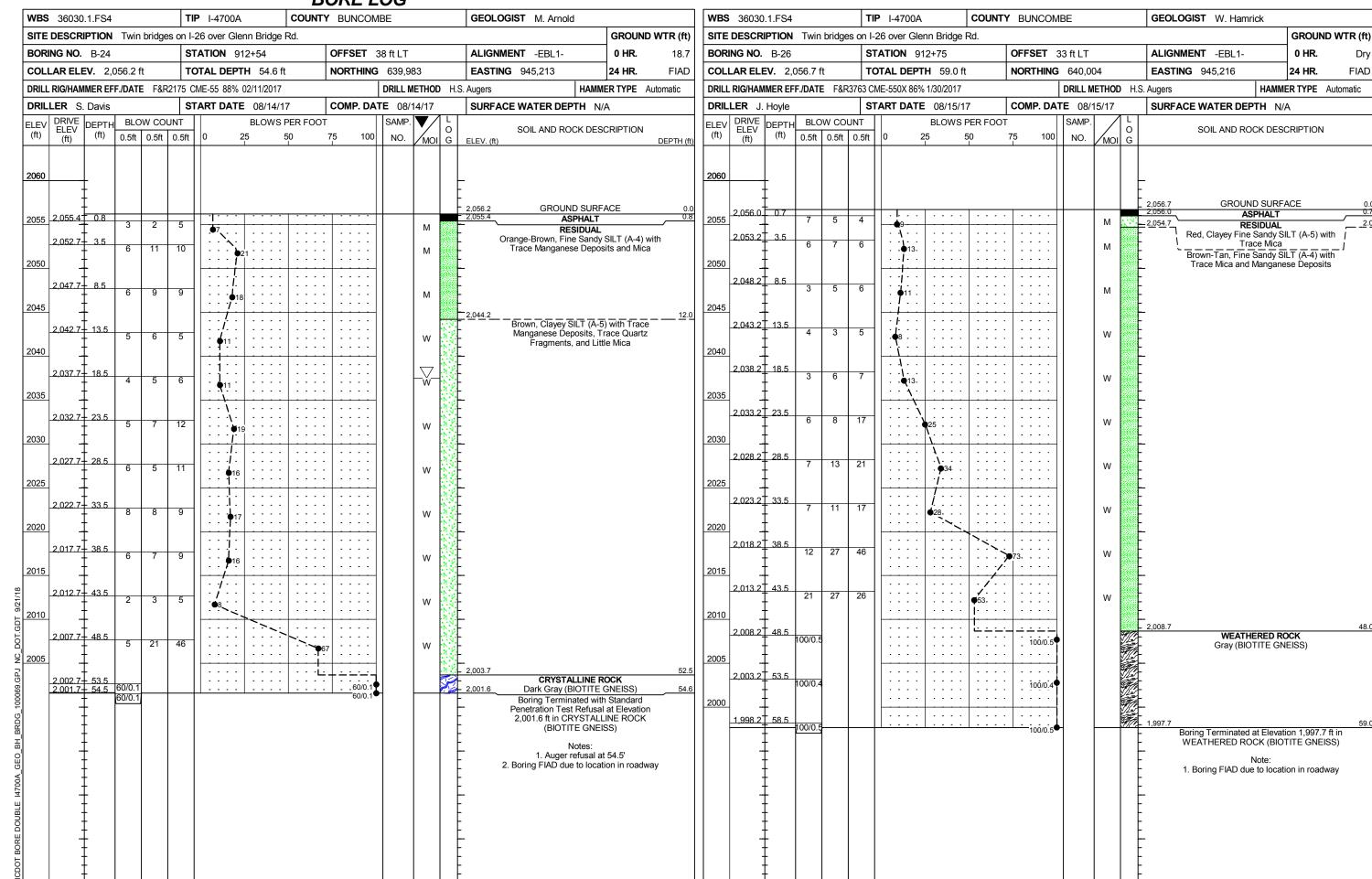
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

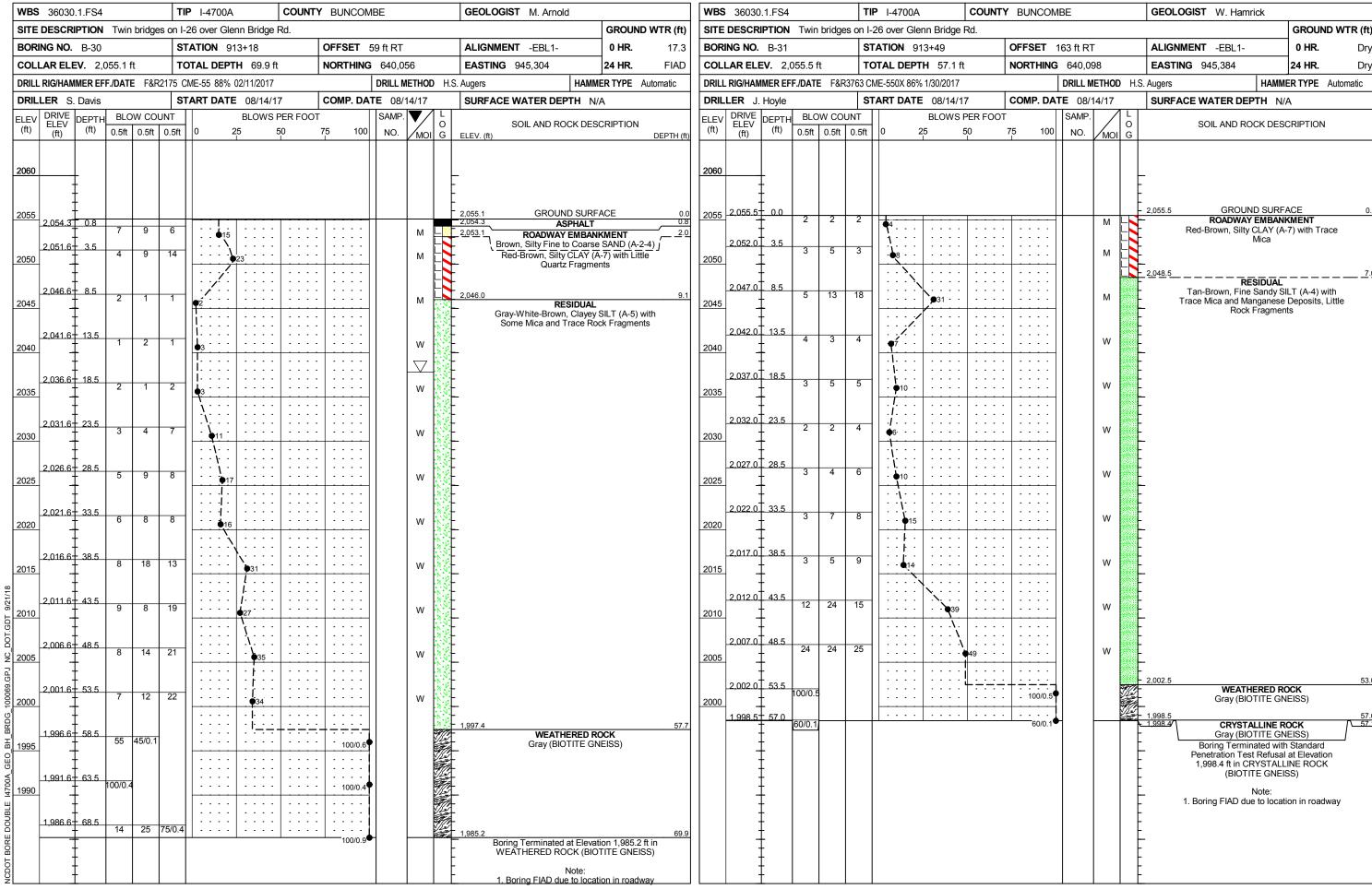
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	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	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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,	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
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	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
CENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, CRYSTALLINE ROCK (CR)	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.	UNEISS, CHEBRO, SCHIST, ETC.	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-7-5 A-3 A-6, A-7	COMPRESSIBILITY	BOOK (NICE) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7. PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
"10 50 MX GRANULAR SILI- MUCK,	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 MN PEAT SOILS SOILS PEAT SOILS SOIL	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.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% 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,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
LL - - 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN LITTLE OR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
CROLIP INDEX A A A AMY 8 MY 12 MY 16 MY NO MY AMOLINTS OF ORGANIC	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
USUAL TYPES STONE FRACS ORGANIC SUILS	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL, AND SAND GADE SAND SAND SOND SONS SONS	STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SANU	✓ 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	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABL		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
P1 OF A-7-5 SUBGROUP IS ≤ LL - 30 ; P1 OF A-7-6 SUBGROUP IS > LL - 30	— ○ SPRING OR SEEP	WITH FRESH ROCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED	TT 25,425	(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 CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/02/5 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE (4	SPT C SLODE INDICATOR	SEVERE 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	ITS LATERAL EXTENT.
GRANII AP LOOSE 4 TO 10	SOIL SYMBOL OPT DAT TEST BORING INSTALLATION	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. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL MEDIUM DENSE 10/10/30/ N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT THOUGH BURNING TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	── INFERRED SOIL BOUNDARY ————————————————————————————————————	(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 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	WITH CORE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	→ → → → → ← → ← → ← ← ← ← ← ← ← ← ← ← ←	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
U.S. STD. SIEVE SIZE 4 10 40 60 200 270		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	UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNDERCUT UNDERCUT UNDERCUT UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCA	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOLI MOISTURE SCALE FIELD MOISTURE	CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_d - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	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 PLASTIC SEMISOLID; REQUIRES DRYING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: BL-8 N 640855.4117 E 945125.7609
(P]) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	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	EQUIPMENT USED ON SUBJECT PROJECT	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 2058.70 FEET
SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN OPTIMUM MOISTURE	CME-55 CME-55 CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	1
PLASTICITY	X 8" HOLLOW AUGERS	INDURATION	1
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC Ø-5 VERY LOW	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND TOOLS:	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
		1	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	CASING W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	CASING W/ ADVANCER PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MUDERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH COLOR	CASING W/ ADVANCER POST HOLE DIGGER PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER TRICONE TUNG,-CARB, SOUNDING ROD	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	CASING W/ ADVANCER PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MUDERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:	DATE: 8-15-1

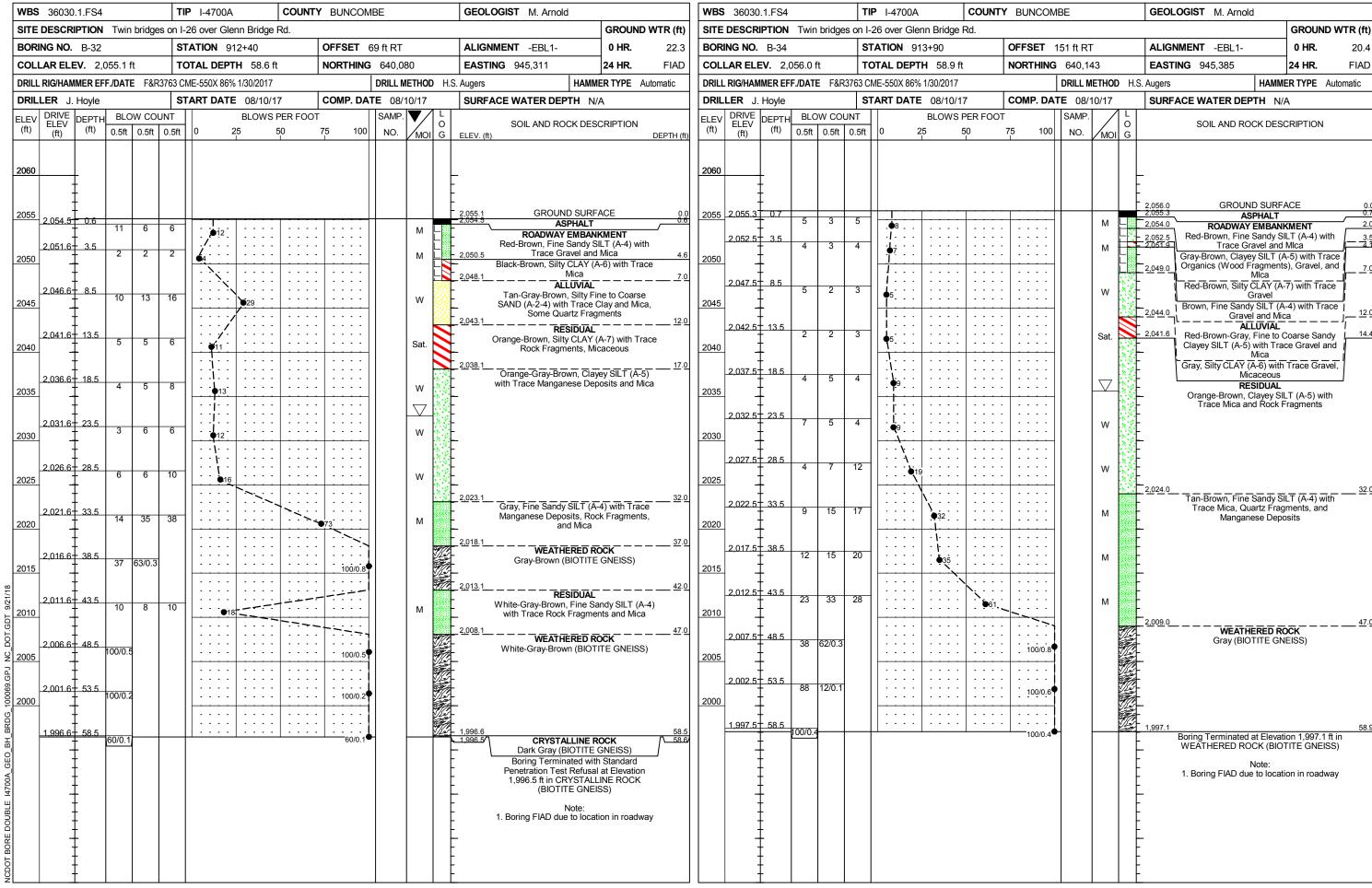






Dry





REFERENCE

36030

STATE OF NORTH CAROLINA

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

CONTENTS

SHEET NO. **DESCRIPTION** TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN 4-6 CROSS SECTIONS BORE LOGS

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE
PROJECT DESCRIPTION 1-4700A 1-26
SITE DESCRIPTION
BRIDGE NO. 157 ON 1-26 OVER BILTMORE
FARMS ROAD

STATE	STATE PROJECT	REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	36030	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 (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 LIKEN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESTREY DATA THE VIEW OF THE STANDARD TEST METHOD. THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY YARY 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 DIES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS FOR THE THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

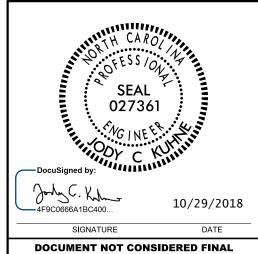
- NOTES:

 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.

 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.

F&R CONSULTANTS D. RACEY M. ARNOLD S. DAVIS NCDOT GEU J. KUHNE INVESTIGATED BY J. KUHNE DRAWN BY DM MULLEN CHECKED BY J. KUHNE SUBMITTED BY DATE .

PERSONNEL



UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO. SHEET NO.

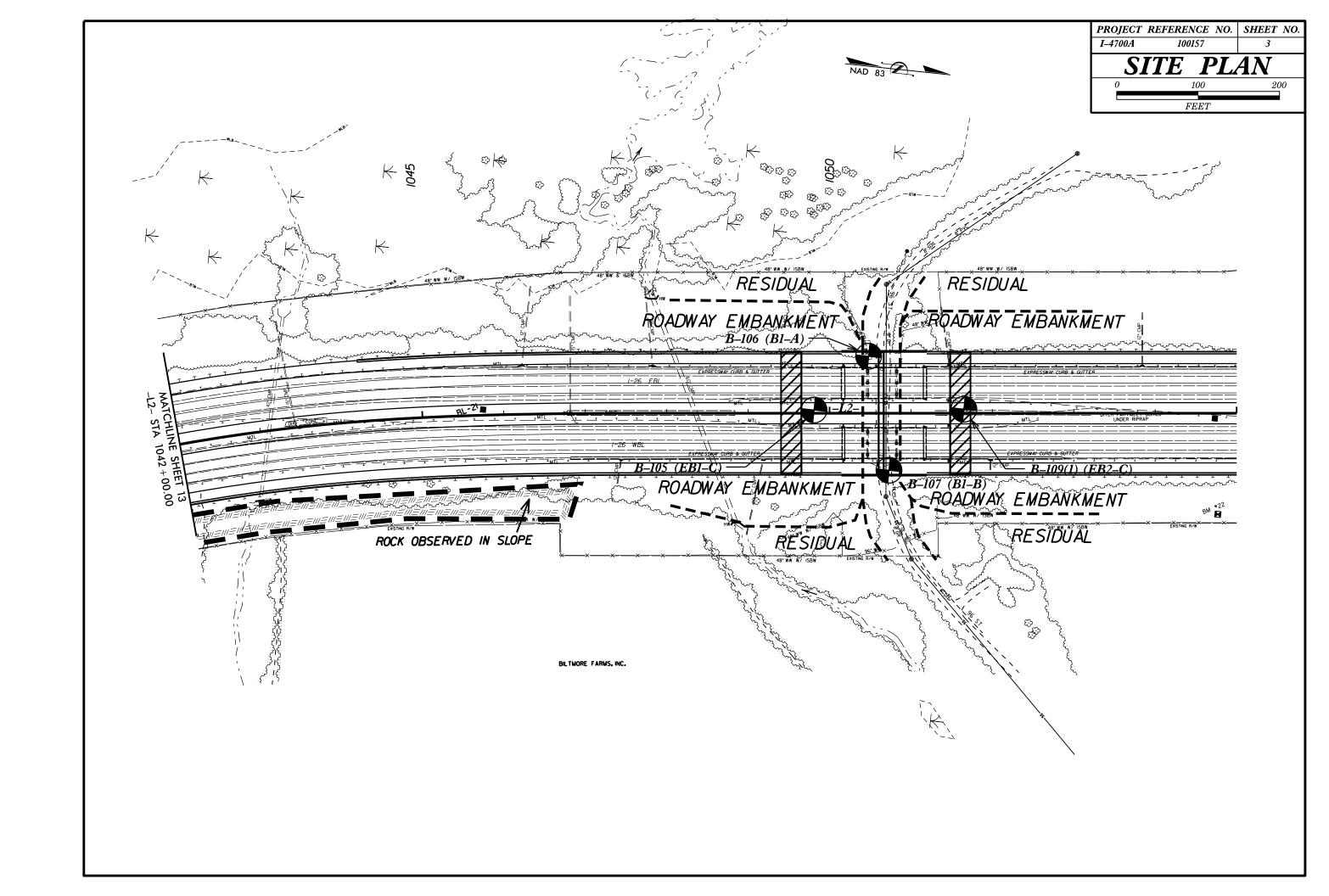
1–4700A 100157 2

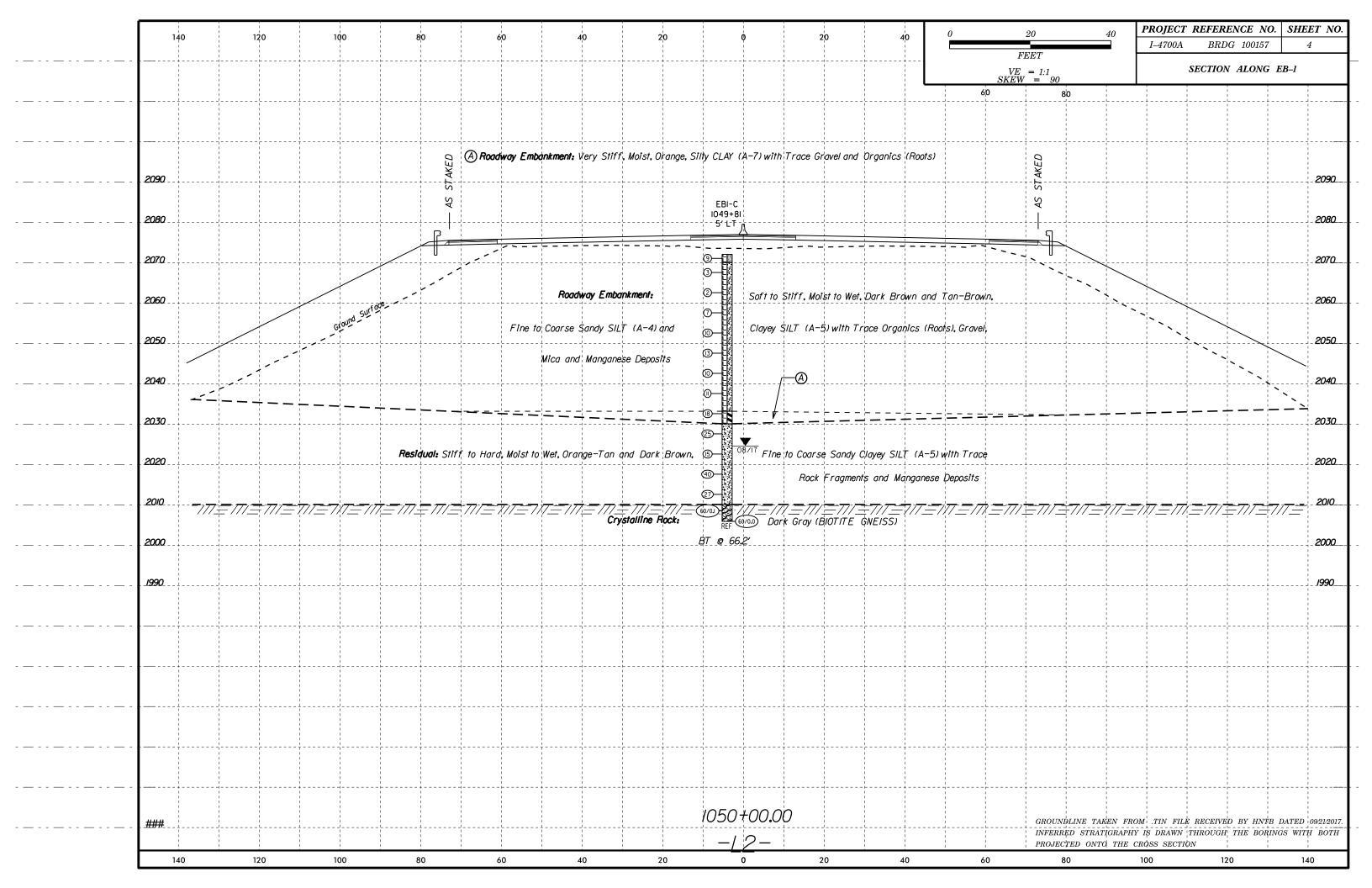
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

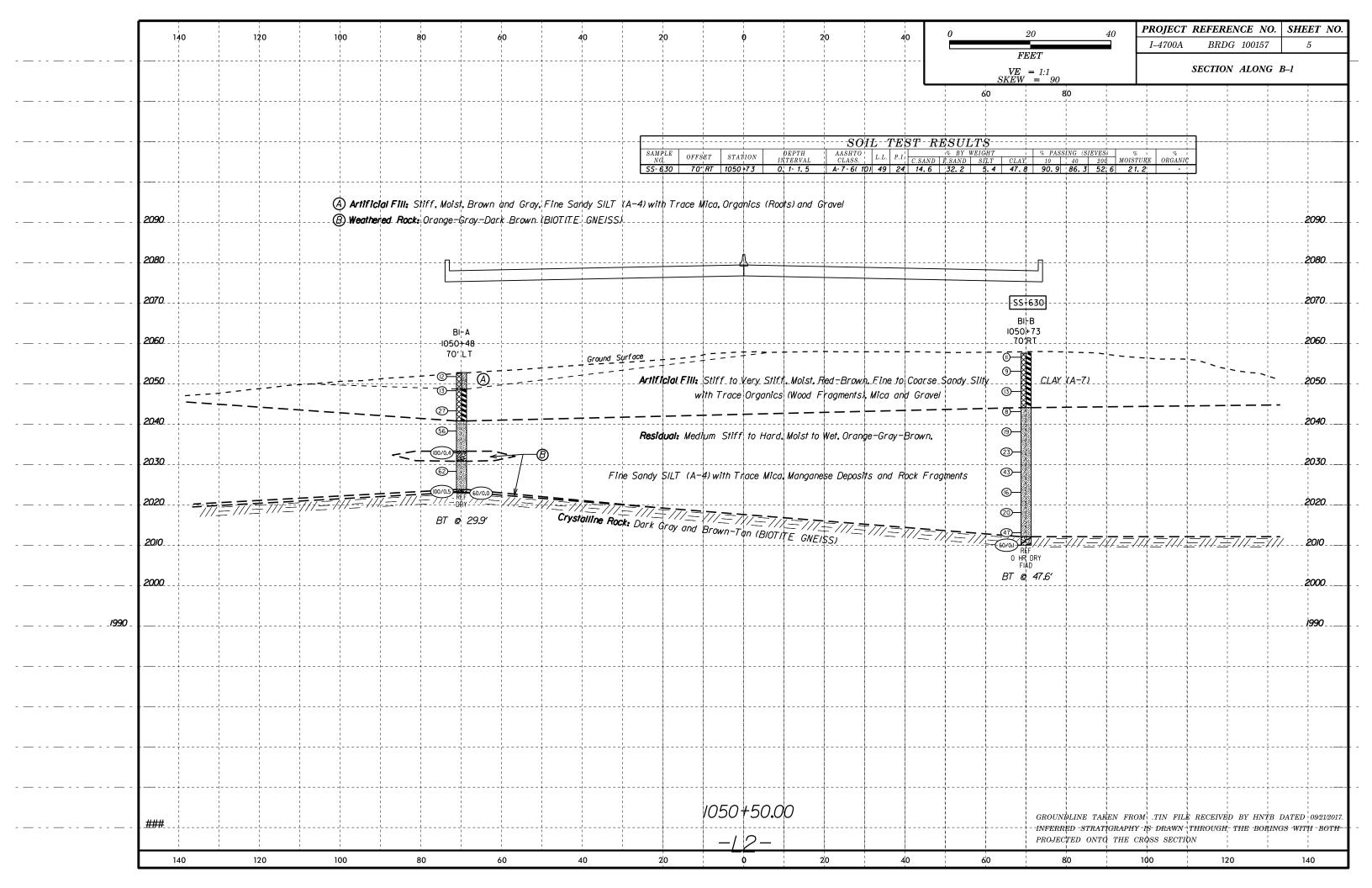
SUBSURFACE INVESTIGATION

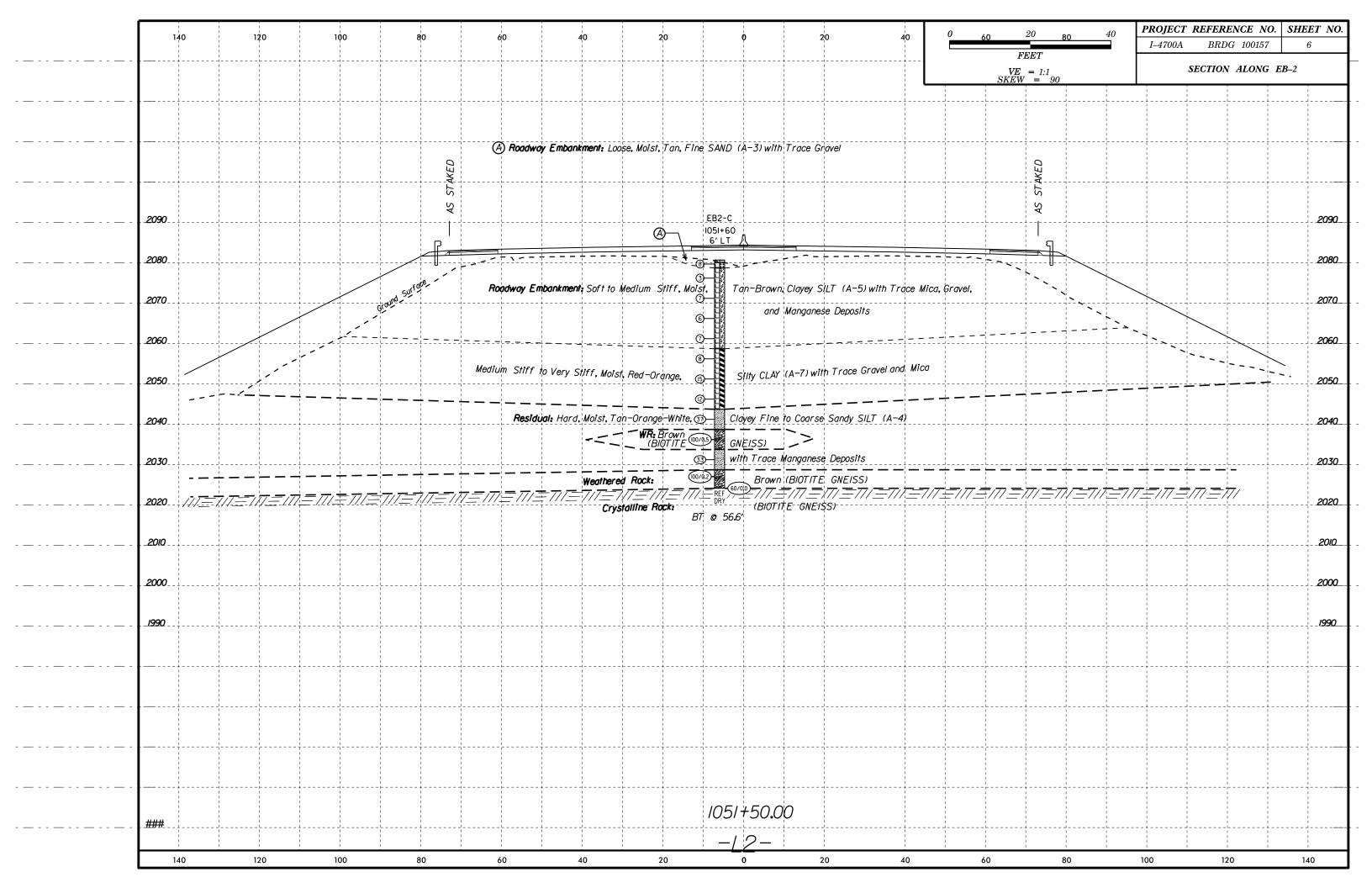
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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 0.1 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 SAND 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 NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
LLASS. (\$ 35% PASSING "200) (> 35% PASSING "200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	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 CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-2-4 A-3-4 A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL COCCOCOCCOCCOCCOCCOCCOCCOCCOCCOCCOCCOCC	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7. PASSING GRANULAR SILT- GRANULAR CLAY MUCK.	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC.	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
*40 30 MX 50 MX 51 MN PEAT PEAT POILS SOILS SOILS SOILS PEAT PE	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	WEATHERING	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
PASSING *40	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% 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.	HORIZONTAL.
LL - - 40 MX 41 MN 4	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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.
GROUP INDEX A A A AMX 8 MX 12 MX 16 MX NO MX AMDINTS OF ORGANIC	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
USUAL TYPES STONE FRACS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(SLI,) 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
CEN DATING	→ PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED 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 - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	-	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
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.	FIELD. <u>JOINT</u> - 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 (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 4 TO 10	SOIL SYMBOL SOIL SYMBOL SUPE 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.
MEDIUM DENSE 10 TO 30 N/A	M	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETRUMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	— INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	(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 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MAN MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BFF</u> COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	WITH CORE	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 ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTTT ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY INSTALLATION SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	UNSUITHBLE WHOTE LEADS HOUSE THREE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - SSED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. 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 OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS.	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
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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 I 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	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7/d - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION SOIL MOISTURE SCALE FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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 (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
(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 I 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 FRACT - FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK:
(PI) PL PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATIONS FROM PROJECT TIN
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
SL SHRINKAGE LIMIT	CME-45C CLAY BITS AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS ELICHT AUCER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	
	X CME-55 X 8" HOLLOW AUGERS CORE SIZE: -BH	THINLY LAMINATED < 0.008 FEET INDURATION	
PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	GENILE BLUW BY HAMMER DISINIEGRATES SAMPLE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH 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;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
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: 8-15-14
		SHIFTEL DILEND MUNUSS UNHING.	DAIE: 8-13-14









TIP I-4700A COUNTY BUNCOMBE **WBS** 36030.1.FS4 **GEOLOGIST** S. Woods SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37) **GROUND WTR (ft) STATION** 1049+81 OFFSET 4 ft LT ALIGNMENT -L2-BORING NO. EB1-C 0 HR. 47.4 COLLAR ELEV. 2,072.1 ft TOTAL DEPTH 66.2 ft **NORTHING** 652,272 **EASTING** 939,692 24 HR. 47.5 **DRILL RIG/HAMMER EFF./DATE** F&R2175 CME-55 88% 02/11/2017 HAMMER TYPE Automatic **DRILL METHOD** H.S. Augers **DRILLER** S. Davis **START DATE** 08/29/17 COMP. DATE 08/29/17 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH BLOW COUNT **BLOWS PER FOOT** SAMP. SOIL AND ROCK DESCRIPTION (ft) 0.5ft 0.5ft 0.5ft 75 100 NO. MOI G ELEV. (ft) GROUND SURFACE 2,072.1 ROADWAY EMBANKMENT 2070 Dark Brown, Fine to Coarse Sandy SILT (A-4) with Trace Organics (Roots), Gravel / 2,068.6 and Mica Tan-Brown, Clayey SILT (A-5) with Trace М Manganese Deposits and Mica 2065 2,063.6 8.5 WOH W 2060 2,058.6 W 2055 2,053.6 5 W 2050 2.048.6+ 23.5 Μ 2045 2,043.6 28.5 M 2040 2,038.6+ 33.5 М 2035 2.033.6+ 38.5 M Orange, Silty CLAY (A-7) with Trace Gravel and Organics (Roots) 2030 RESIDUAL 2,028.6 Orange-Tan and Dark Brown, Fine to Coarse Sandy Clayey SILT (A-5) with Trace 12 14 M Rock Fragments and Manganese Deposits 2025 V 2 023 6+ W 2020 2,018.6 53.5 16 24 W 监 2015 2,013.6 + 58.5 27 13 W 2010 Ogg CRYSTALLINE ROCK 2,008.6+ 63.5 - - 60/0.1 (BIOTITE GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 2,005.9 ft in CRYSTALLINE ROCK (BIOTITE GNEISS) 1. Auger refusal at 66.2'

							<u>B</u>	ORE L	UG			.		
WBS	36030	.1.FS4			TI	IP I-4700A	COUNT	Y BUNCOM	BE			GEOLOGIST M. Arnold		
SITE	DESCR	IPTION	I-26	from N	lear N	C 280 (Exit 40) to Nea	r NC 146	(Exit 37)				_	GROUNE	WTR (ft)
BOR	ING NO.	B1-A			S	TATION 1050+48		OFFSET 7	70 ft LT			ALIGNMENT -L2-	0 HR. Dry	
COL	LAR ELI	EV . 2,0	052.8 1	ft	T	OTAL DEPTH 29.9	ŧ	NORTHING	652,33	32		EASTING 939,619	24 HR.	Dry
DRILL	. RIG/HAN	IMER EF	F./DATI	E F&F	R2175 (CME-55 88% 02/11/2017			DRILL M	ETHO) H.S	5. Augers HAM	MER TYPE /	Automatic
DRIL	LER S	. Davis			S.	TART DATE 08/26/	17	COMP. DA	TE 08/2	6/17		SURFACE WATER DEPTH	√A	
ELEV	DRIVE ELEV	DEPTH	BLC	w co	UNT	BLOWS	PER FOOT	Г	SAMP.	$\overline{ullet}/$	LO	SOIL AND ROCK DE	SCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	/MOI		ELEV. (ft)	OOM TION	DEPTH (ft)
2055												_		
	2,052.8-	0.0										2,052.8 GROUND SUR	FACE	0.0
	-,		3	7	5	12:				М		ARTIFICIAL I Brown and Gray, Fine S		4)
2050	2,049.3	3.5	6	6	7		 					with Trace Mica, Organi 2,048.7 Gravel		
	-	ł	6	6	′	13.		.		М		Brown, Fine Sandy Silty		ith
2045	-	Ŧ										Trace Organics (Wood F and Grave		ica
	2,044.3	8.5	7	12	15	27				М		-		
	-	Ŧ										2,040.8		12.0
2040	2.039.3	13.5										RESIDUA		
	,000.0	-	10	28	28] :::::	5 6			М		Gray-Brown, Fine Sandy Trace Quartz Fragme	SILT (A-4) wints, Mica and	ith
2035	:	‡					: : } :	:				Manganese De	posits	
2035	2,034.3	18.5	7	19	100/0.4	<u> </u>								19.5
	-	‡	′	"	100/0] : : : : : : : :		100/0.4				WEATHERED	ROCK	
030	-										97.5	2,030.8 RESIDUA		
	2,029.3	23.5	11	17	45	1 :::: ::::	.062			М		Orange-Gray-Brown, Fine with Trace Mica and Man	Sandy SILT (A-4) sits
		ł					1	`\::::			-		gaooo	
2025	2,024.3	28.5		100/0			+	+				_ 		29.0
	2,022 9	29.9	8 60/0.0	100/0.5				100/0.5	4		38778	2,023.8 2,023.1 2,022.9 WEATHERED 2,022.9 Orange-Dark Brown (BIO		29.7
	-	Ŧ	00,0.0					00/0.0				CRYSTALLINE	ROCK	3)]
	-	‡										Dark Gray (BIOTITE Boring Terminated w		
	:	‡										Penetration Test Refus 2,022.9 ft in CRYSTA	al at Elevatior	
	_	‡										(BIOTITE GNI	EISS)	
	-	‡										Note: 1. Auger refusal		
	:	<u> </u>										1. Auger refusal	at 29.9'	
	-	<u> </u>										-		
	-	Ŧ												
	:	ļ												
	-	‡										-		
	:	‡												
		<u> </u>												
	-	Ŧ										- ·		
	-	‡												
	_	‡										-		
	-	ţ												
	:	ł									E			
	_	-										_		
	-	Ŧ												
	:	‡												
	-	‡										-		
	-	ţ												
	-	ł												
	-	Ŧ										<u>-</u>		
	-	‡												
	-	t									1 -			

							<u>D</u>	ORE L	UG				
WBS	36030).1.FS4			TI	I P I-4700A	COUNT	Y BUNCOM	BE			GEOLOGIST W. Hamrick	
SITE	DESCR	IPTION	I-26	from N	lear N	C 280 (Exit 40) to Near	NC 146 ((Exit 37)					GROUND WTR (ft)
30RII	NG NO.	B1-B			s	TATION 1050+73		OFFSET 7	0 ft RT			ALIGNMENT -L2-	0 HR. Dry
COLL	AR ELI	EV. 2,	057.6	ft	To	OTAL DEPTH 47.6 ft	:	NORTHING	652,37	'2		EASTING 939,756	24 HR. FIAD
						:ME-550X 86% 1/30/2017			DRILL M) HS	Augers HAMM	LER TYPE Automatic
	ER J.		1.,07.1			TART DATE 08/24/1	7	COMP. DAT			7 11.0	SURFACE WATER DEPTH N/A	
	DRIVE	 	I DL	ow co		T T	PER FOOT	l	SAMP.	4/1/	1 L T	SURFACE WATER DEPTH N/	A
(ft)	ELEV (ft)	DEPTH (ft)	0.5ft		_	 	50 	75 100	NO.	MOI	0	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH (ft)
060	2.057.6											- 2,057.6 GROUND SURF.	ACE 0.0
	2,057.0	- 0.0	3	5	6	11			SS-630	21%		ARTIFICIAL FII	LL
055	2.054.1	3.5				-;;	ļ · · · ·	+				Red, Fine to Coarse Sand (A-7-6) with Trace	
		- 0.0	4	5	4	. • • • •				M			
050	-	‡				:\::: ::::							
050	2,049.1	8.5	<u> </u>			- 1		 				_	
		+	4	6	′	13				М			
045	-	Ŧ											
	2,044.1	13.5	3	4	4	. <i>j</i>				М		2,044.1 RESIDUAL	13.5
		‡				: • : : : : : : : : : : : : : : :				IVI		Orange-Brown, Fine Sandy	SILT (A-4) with
040	-	‡										Trace Mica, Manganese E Rock Fragmen	deposits, and ts
ŀ	2,039.1	18.5 1	7	9	10					М	₩ t		
	-	Ŧ									F		
035	2.034.1	22.5										-	
-	<u>2,034.1.</u>	23.5	17	15	8	23				М			
	-	t									₩t		
030	2.029.1	28.5						+			F	_	
	-,020.1	20.0	10	28	15	1	3			M	I I		
	-	‡				:::: ::/:::							
025	2,024.1	33.5				 /	 	 			l t	<u>-</u>	
		+	5	7	9	16 •16				W	-		
020	-	Ŧ				::::\: ::::	: : : :				F		
.020	2,019.1	38.5	8	9	11							-	
		‡	°	"	''	20				М	B t		
015	-	+				📐					-		
	2,014.1	43.5	23	17	30					М	F	-	
		Ŧ				::::1	 					2,012.1 CRYSTALLINE R	45.5
010	2,010.1	47.5	60/0.1				1	60/0.1			7	2,010.0 Brown-Tan (BIOTITE	GNEISS) 47.6
	-	‡	00/0.	ή				55/0.1				Boring Terminated with Penetration Test Refusal	at Elevation
	-	ŧ										2,010.0 ft in CRYSTALL (BIOTITE GNEI	INE ROCK
	_	+									F	-	JO,
		Ŧ										Note: 1. Auger refusal at	: 47.5'
	-	‡											
	-	‡										=	
	-	+									F		
	-	Ŧ									F		
	-	Ŧ										-	
		‡											
	=	t										_	
	-	Ŧ									F	-	
	-	‡											
	_	‡										-	
	-	±											
	-	Ŧ									F		
	-	t											

	<i>B</i>	ORE LOG		
WBS 36030.1.FS4	TIP I-4700A COUNT	BUNCOMBE	GEOLOGIST S.Woods	
SITE DESCRIPTION I-26 from Nea	ar NC 280 (Exit 40) to Near NC 146	Exit 37)		GROUND WTR (ft)
BORING NO. EB2-C	STATION 1051+60	OFFSET 6 ft LT	ALIGNMENT -L2-	0 HR. Dry
COLLAR ELEV. 2,080.7 ft	TOTAL DEPTH 56.6 ft	NORTHING 652,450	EASTING 939,671	24 HR. Dry
DRILL RIG/HAMMER EFF./DATE F&R21	75 CME-55 88% 02/11/2017	DRILL METHOD H.S.	Augers HAMME	R TYPE Automatic
DRILLER S. Davis	START DATE 08/28/17	COMP. DATE 08/28/17	SURFACE WATER DEPTH N/A	\
ELEV DRIVE DEPTH BLOW COUN	BLOWS PER FOO	SAMP. V L	SOIL AND ROCK DESC	CRIPTION
(ft) (ft) (ft) 0.5ft 0.5ft 0	0.5ft 0 25 50	75 100 No /	ELEV. (ft)	DEPTH (ft)
2085				
2080 2,080.7 0.0 2 4		1 500	2,080.7 GROUND SURFA 2,080.0 ROADWAY FMBANK	
2 4	4		2,078.7 Dark Brown, Clayey Fine to	Coarse Sandy2.0
2,077.2 3.5 3 1	$\frac{1}{2} \left \int_{\Gamma_0}^{\Gamma_0} \cdots \left $		SILT (A-4) with Trace Orga Mica, and Grave	el `
2075	73		Tan, Fine SAND (A-3) with Tan-Brown, Clayey SILT (A-	Trace Gravel
2.072.2 8.5			Gravel, Mica and Mangane	
2070 4 3	4 7	: : : : M M		
+				
2,067.2 13.5 4 3	${3}$			
2065	9 6			
2.062.2 18.5				
2060	4	: : : : M M		
+	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		2,058.7	22.0
2,057.2 23.5 3 4	$\frac{1}{4}$	· · · · ·	Red-Orange, Silty CLAY (A- Gravel and Mica	
2055		· · · · ·		
2.052.2 28.5				
2050 6 7	8 15	: : : : M M M		
+				
2,047.2 33.5 5 5		· · · · ·		
2045	. • 12	<u> </u>		
2.042.2			2,043.7 RESIDUAL	37.0
2040	15 37.	:::: M	Tan-Orange-White, Clayey F Sandy SILT (A-4) with Trace	e Manganese
+			2,038.7 Deposits	42.0
2,037.2 43.5 14 100/0.5			WEATHERED RO Brown (BIOTITE GN	
2035		100/0.5	0.000 7	47.0
2.032.2 48.5		+÷÷÷:-:-	Z,033.7 Tan-Orange-White, Clayey F	
2030 16 18	15	: : : : M _	Sandy SILT (A-4) with Trace Deposits	e ivianganese
 			2,028.7	<u>52.0</u>
2,027.2 53.5 100/0.2		100/0.2	WEATHERED RO Brown (BIOTITE GN	
2 024 1 56 6			2,024.1	56.6
60/0.0		60/0.0	Boring Terminated with Penetration Test Refusal a	Standard
			2,024.1 ft on CRYSTALLI (BIOTITE GNEIS	INE ROCK
			(BIOTTE GNEIS	.~,
		‡	1. Auger refusal at	56.6'
		‡		
		‡		

4700B REFERENCE **CONTENTS**

DESCRIPTION

LEGEND (SOIL & ROCK)

SUPPLEMENTAL LEGEND (GSI)

BORE LOGS & CORE REPORTS

TITLE SHEET

SITE PLAN CROSS SECTIONS

SHEET NO.

2A

8 - II

12 - 22

36030

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE
PROJECT DESCRIPTION
WIDENING OF I-26 FROM .3 MI
SOUTH OF NC 280 TO .5 MISOUTH OF NC 191
SITE DESCRIPTION BRIDGE 100211
BRIDGE NO. 211 OVER THE FRENCH BROAD RIVER

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700 36030	1	22

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 LIKEN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESTREY DATA THE VIEW OF THE STANDARD TEST METHOD. THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY YARY 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 DIES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS FOR THE 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.

 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.

CD JOHNSON CJ COFFEY DO CHEEK INVESTIGATED BY ____JC_KUHNE DRAWN BY ____JC_KUHNE CHECKED BY _ SUBMITTED BY JC KUHNE

PERSONNEL



DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED**

PROJECT REFERENCE NO. SHEET NO.

I-4700B 36030 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 DI586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	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 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	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
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (≤35% PASSING "2000) (>35% PASSING "2000) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	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. COMPRESSIBILITY	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-7-6 A-7-7 A-7-6 A-7-6 A-7-7 A-7-6 A-7-7 A-7-6 A-7-6 A-7-7 A-7-6 A-7-6 A-7-7 A-7-6 A-7-6 A-7-7 A-7-6	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) SEDIMENTARY HUCK THAT WOULD YELD SPI 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 0000 80000 0000 0000 0000 0000 0000 0	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.
■10 50 MX GRANULAR SILI- MUCK.	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 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.
MATERIAL DACCING MO	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%, LITTLE ORGANIC MATTER 3 - 5%, 5 - 12%, LITTLE 10 - 20%.	HAMMER IF CRYSTALLINE.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 L 48 MX 41 MN 48 MX 11 MN	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	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 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.
GROUP INDEX 0 0 0 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.
OF MAIOR CRAYEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(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.
MATERIALS SAND SANU GHAVEL AND SANU SUILS SUILS	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED 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 - 30 :PI OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	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 COMPACTATION OF THE PROPERTY OF THE	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 CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE / 4	SOIL SYMBOL SOIL SYMBOL SPI OM TEST BORING SLOPE INDICATOR NOTAL AT AT A TOP	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	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GENERALLY LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A	VST PMT INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50 (NON-COHESIVE) VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER 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	— INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING. SAPPOLITE 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 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MW MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	TIME THE SOLL BOUNDARY A PIEZOMETER INSTALLATION SPI N-VALUE	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.	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 RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4 TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	USED IN THE TOP 3 FEET OF	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.
BOULDER COBBLE (COB.) GRAYEL (GR.) COARSE SAND SAND (SL.) SILT (CLAY (CL.) (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (F SD.)	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - EMBANKMENT OR BACKFILL ABBRE VIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	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
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE CHARGE TO SEE THE A MOISTURE OF SCALES OF THE A MOISTURE OF THE A MOIST	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATEO - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	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
	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	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 w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: FROM XSC AND EXISTING BRIDGE DECK ELEVATIONS
(P) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	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	EQUIPMENT USED ON SUBJECT PROJECT ORILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
SL _ SHRINKAGE LIMIT	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 ATTAIN OPTIMUM MOISTURE	G* CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	
PLASTICITY	X 8" HOLLOW AUGERSH	INDURATION	
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS:	
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST X TUNGCARBIDE INSERTS HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	POSTABLE HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TOUGHT TOUGHT	COMING ADE DISEIGN T TO CEPADATE WITH CTEEL DOODS.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT SOUNDING ROD VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER,	
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

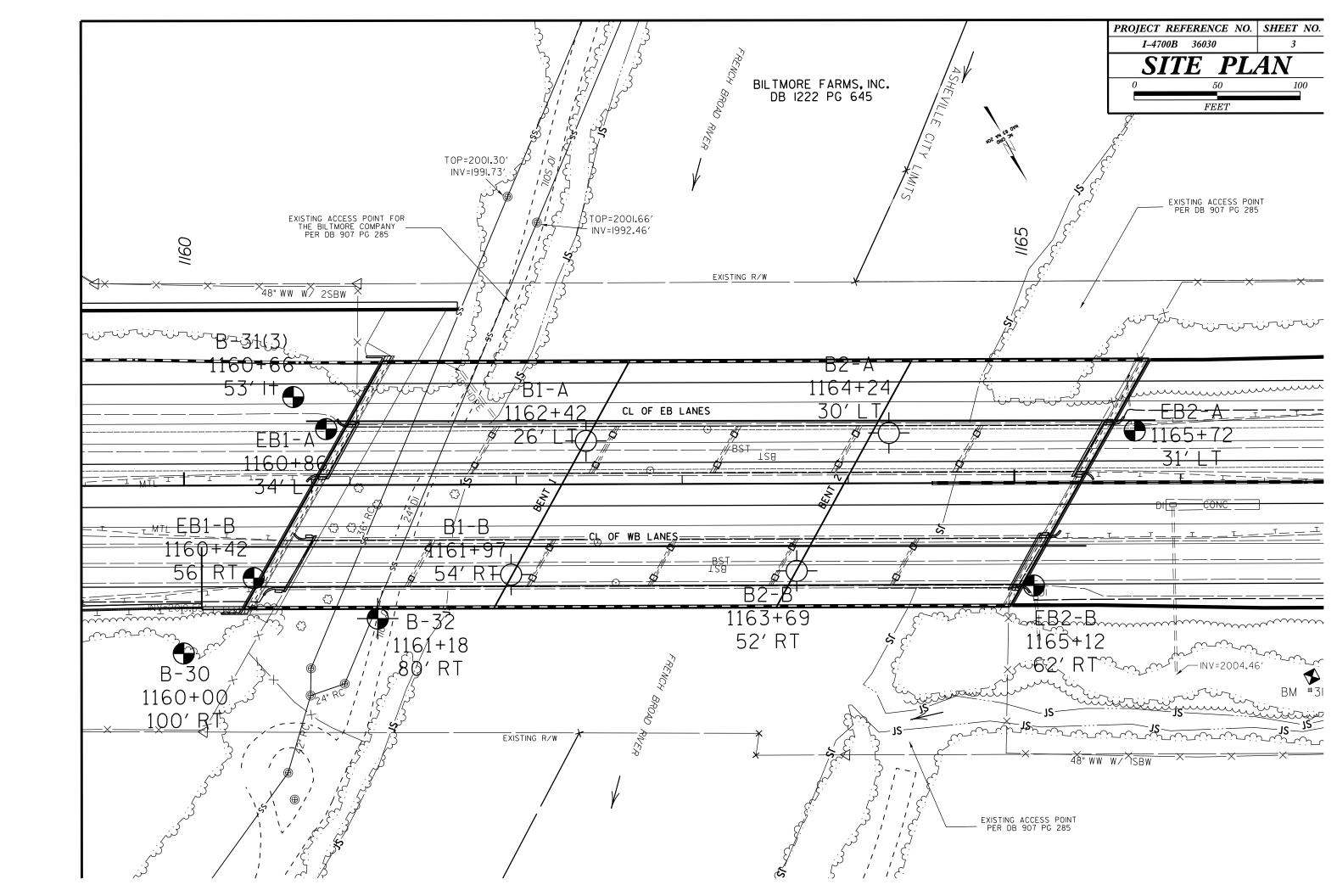
PROJECT REFE	RENCE NO.	SHEET NO.
4700B	36030	2A

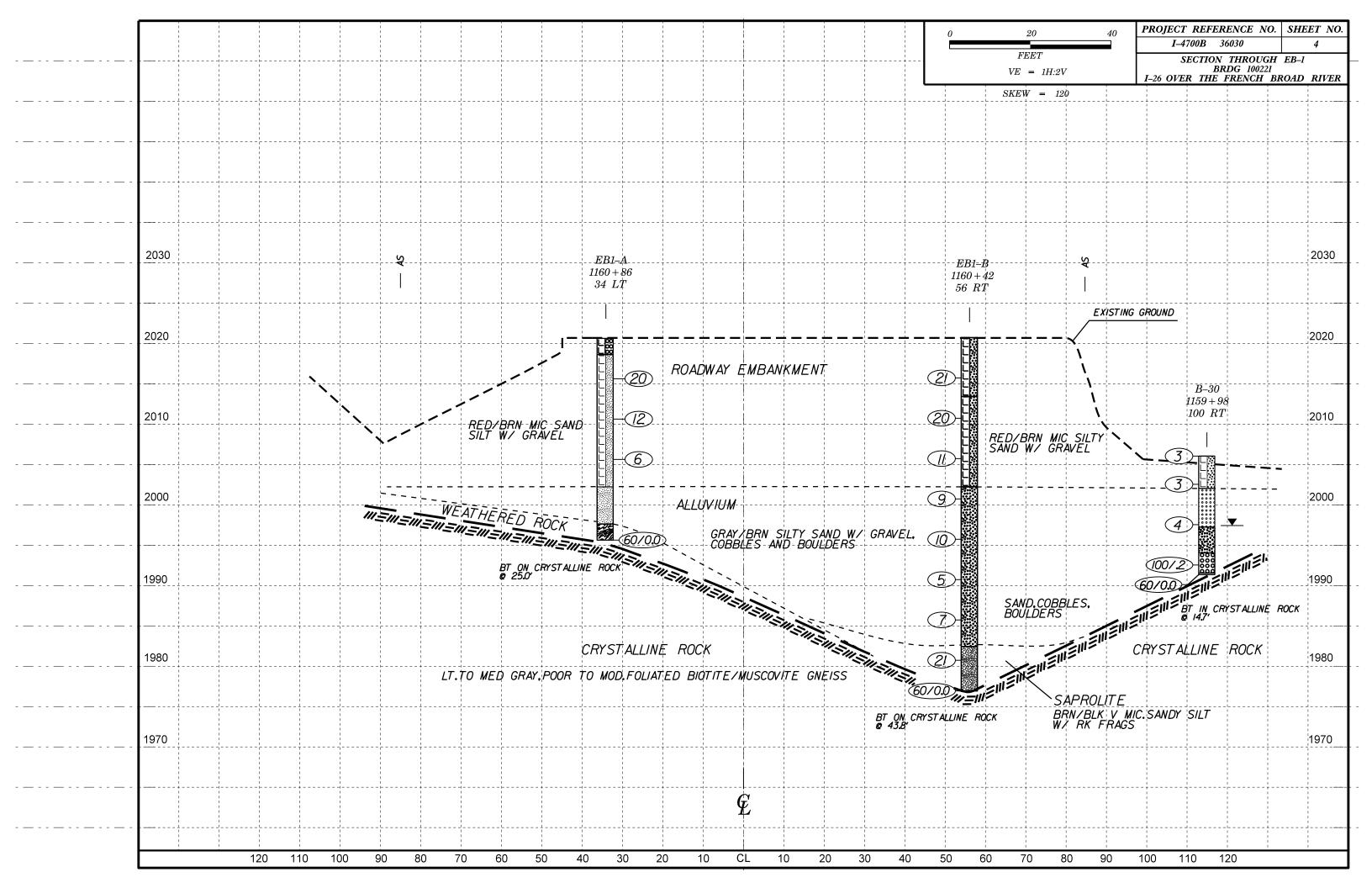
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

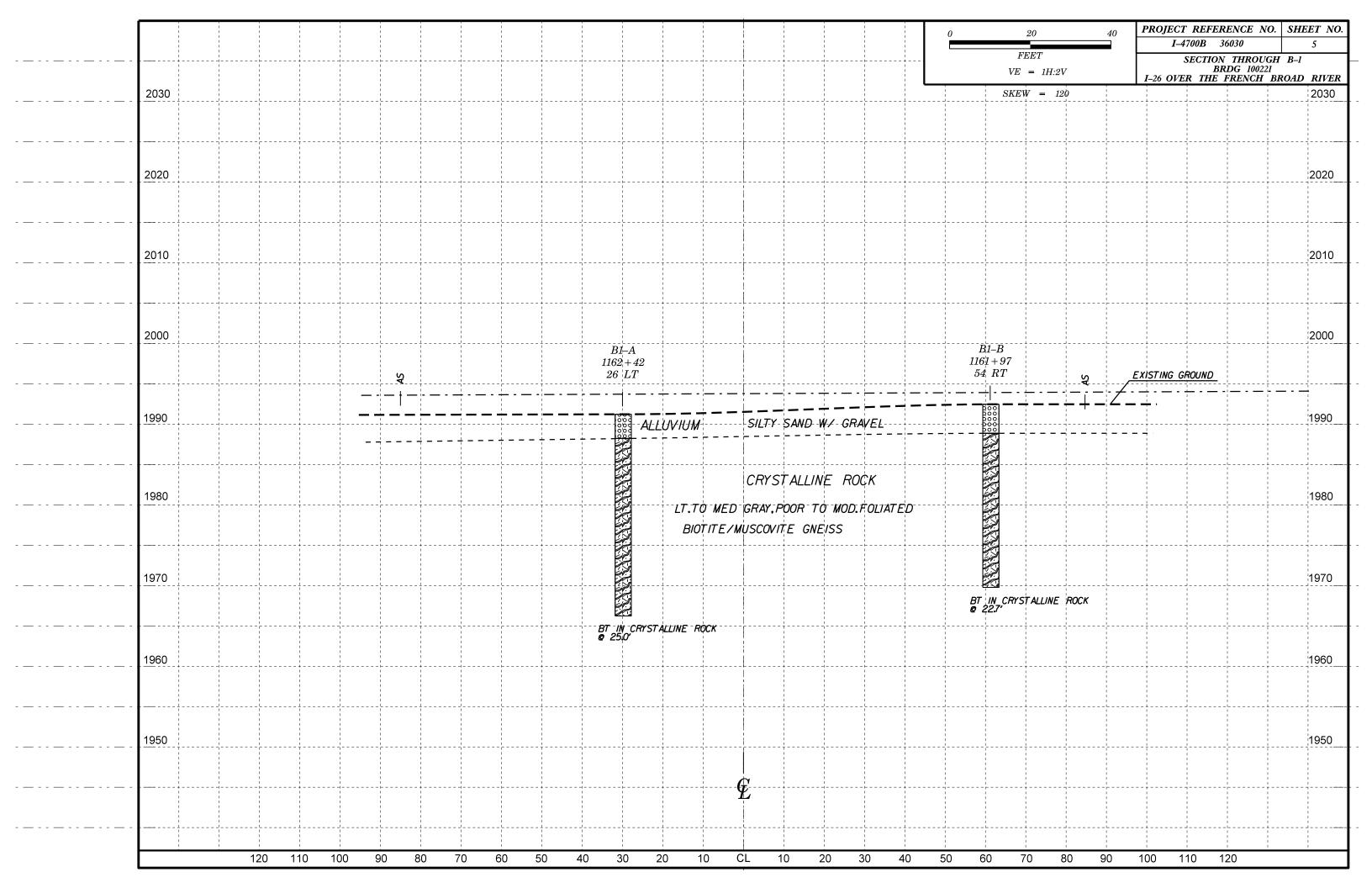
SUBSURFACE INVESTIGATION

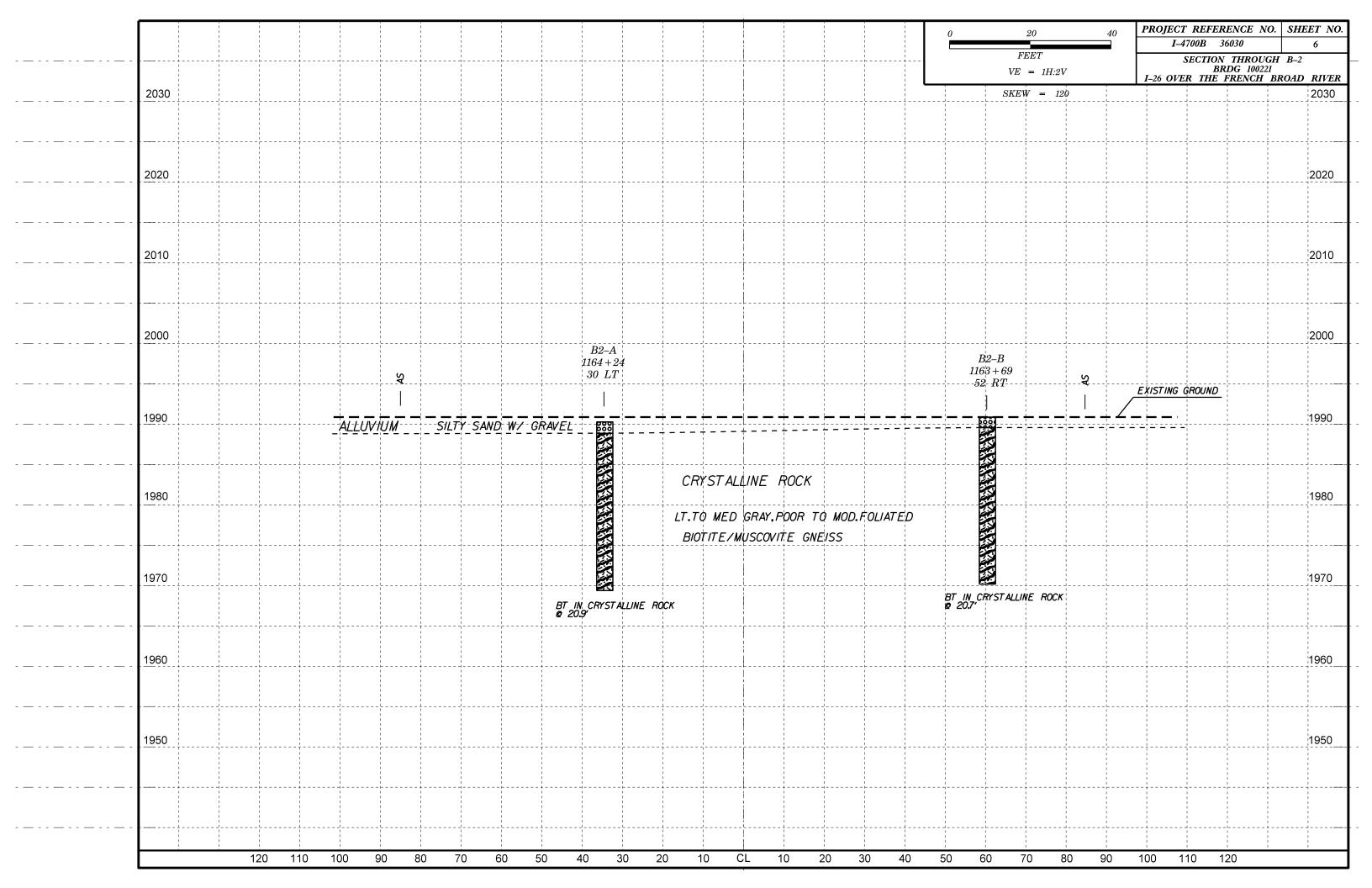
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES

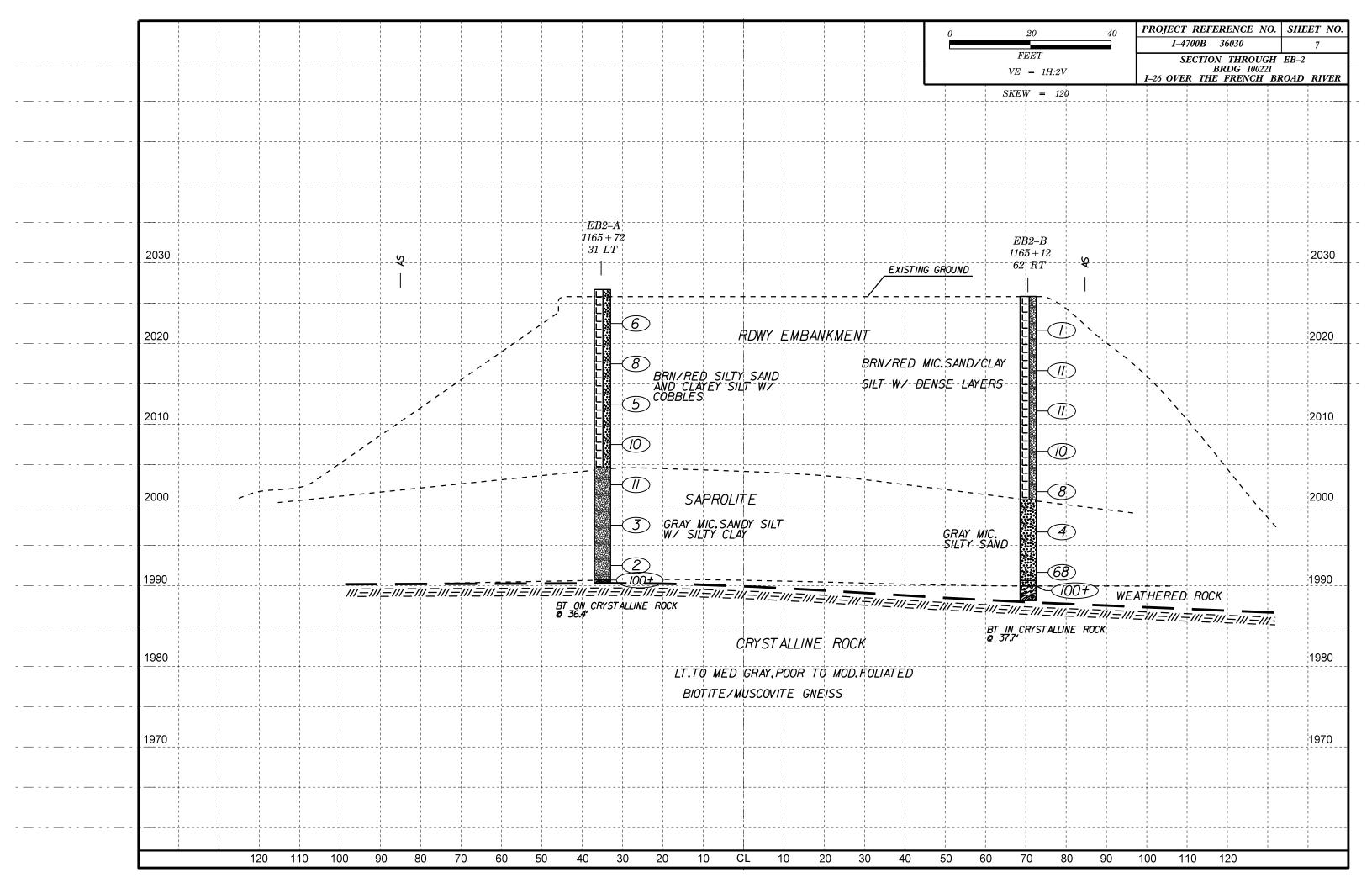
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000) AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000) GEOLOGICAL STRENGTH INDEX (GSI) FOR GSI FOR HETEROGENEOUS ROCK MASSES SUCH JOINTED ROCKS (Hoek and Marinos, 2000) faces AS FLYSCH (Marinos. P and Hoek E., 2000) stained From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to From a description of the lithology, structure and POOR - Very smooth, slicken-l or highly weathered surfaces soft clay coatings or fillings smooth, occasionally surfaces with compaci fillings with angular weathered surings or fillings ts surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the planes) be too precise. Quoting a range from 33 to 37 is more realistic than stating that position in the box that corresponds to the condition weathered there of the discontinuities and estimate the average value GSI = 35. Note that the table does not of GSI from the contours. Do not attempt to be too eď, apply to structurally controlled failures. Where weak planar structural planes are ighly weat coatings precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the weather slightly present in an unfavorable orientation SURFACE CONDITIONS (DISCONTINUITIES (Predominantly beddir Hoek-Brown criterion does not apply to structurally with respect to the excavation face. highly coatin agment these will dominate the rock mass controlled failures. Where unfavourably oriented behaviour. The shear strength of surfaces continuous weak planar discontinuities are present, POOR kensided, hig soft clay d Smooth, red and in rocks that are prone to deterioration slightly es these will dominate the behaviour of the rock mass. POOR Slickensided, h with compact o Rough, as a result of changes in moisture POOR - Very s slickensided coatings or f fragments G00D -thered The strength of some rock masses is reduced by the content will be reduced if water is **6000** rough, 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 th, r ed GOOD - F surfaces FAIR - 8 the right may be made for wet conditions. GOOD Rough, s surface poor and very poor conditions. Water pressure does VERY I sided with s VERY Slicke With s VERY Very FAIR Smoot alter Water pressure is dealt with by effective not change the value of GSI and it is dealt with by stress analysis. using effective stress analysis. STRUCTURE DECREASING SURFACE QUALITY COMPOSITION AND STRUCTURE INTACT OR MASSIVE - intact A. Thick bedded, very blocky sandstone 90 rock specimens or massive in 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 80 controlled instability. 60 BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets 50 C. Sand-D. Siltstone E. Weak 60 siltstone stone with stone and or silty shale С thin inter siltstone with sandor clayey /B shale with lauers of in similar stone lauers VERY BLOCKY - interlocked, amounts sands tone siltstone 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. sheared clayey shale or siltstone formed by many intersecting Tectonic deformation, faulting and with broken and deformed CREASING loss of continuity moves these discontinuity sets. Persistence sandstone layers forming an 30 categories to F and H. of bedding planes or schistosity lmost chaotic structure 20 DISINTEGRATED - poorly interlocked, heavily broken rock mass 20 G. Undisturbed silty H. Tectonically deformed silty with mixture of angular and or clayey shale with or clayey shale forming a 10 rounded rock pieces or without a few very chaotic structure with pockets of clay. Thin layers of thin sandstone layers sandstone are transformed into small rock pieces. 10 LAMINATED/SHEARED - Lack of blockiness due to close spacing N/A N/A → Means deformation after tectonic disturbance of weak schistosity or shear planes

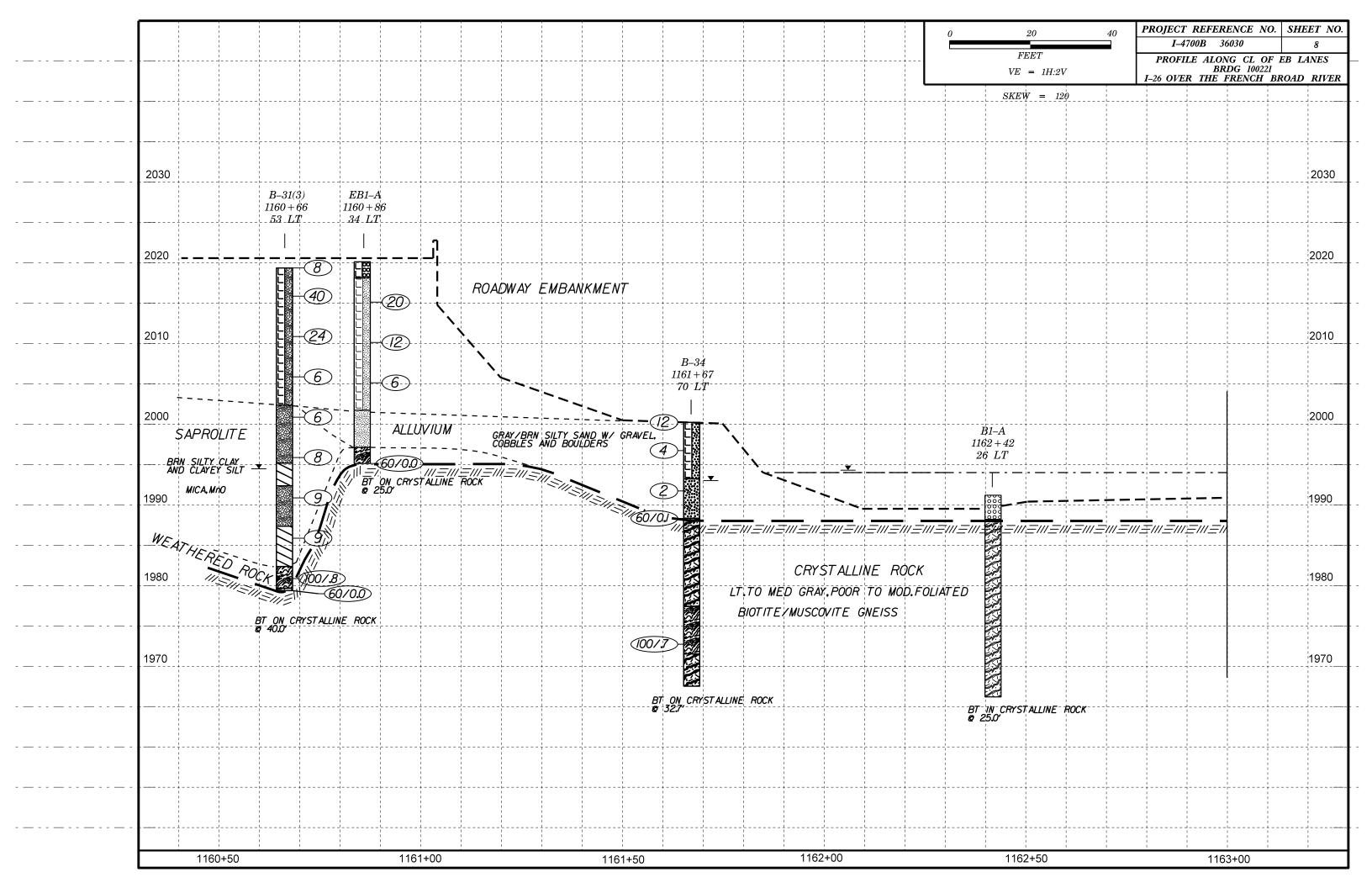


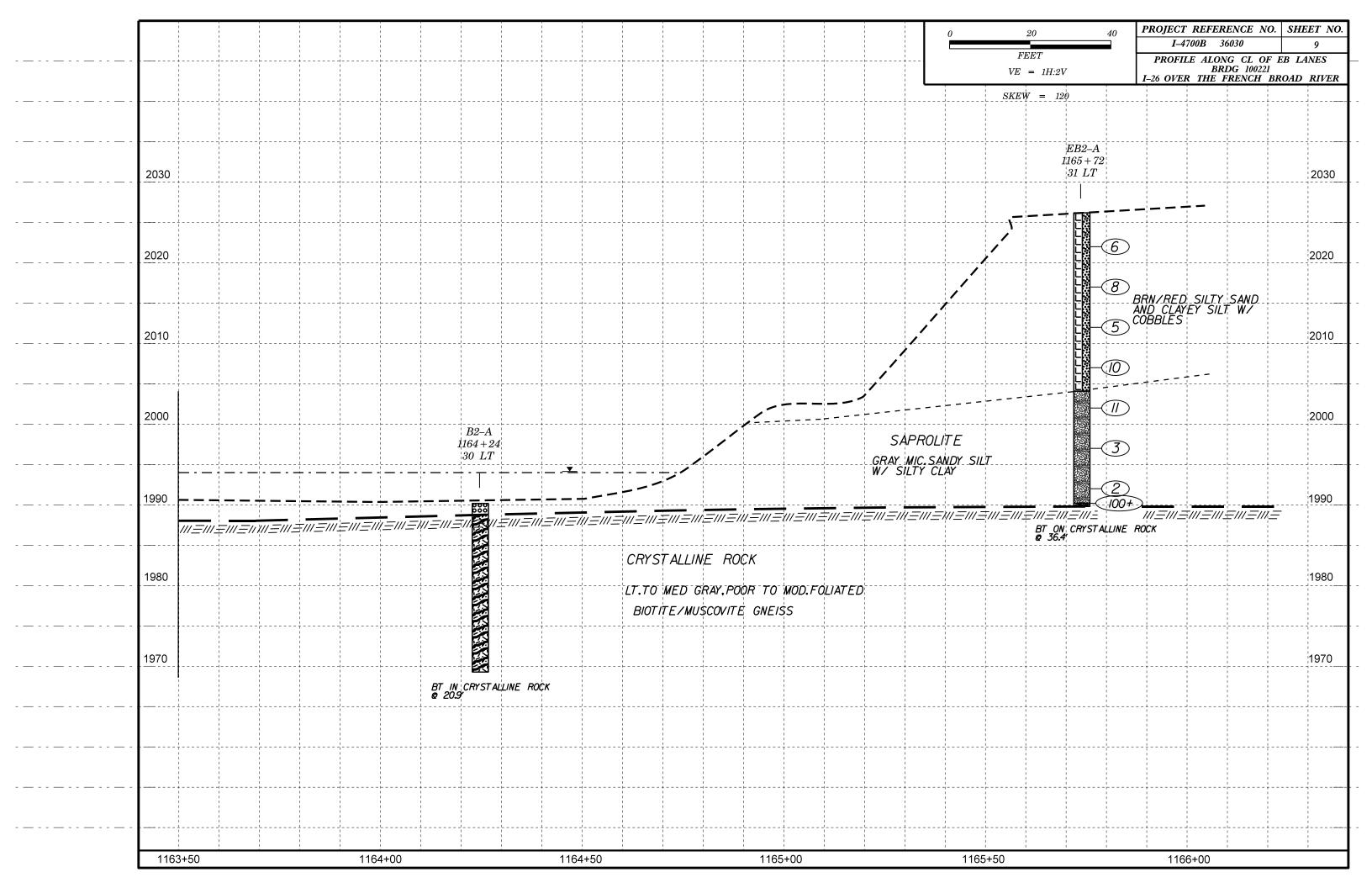


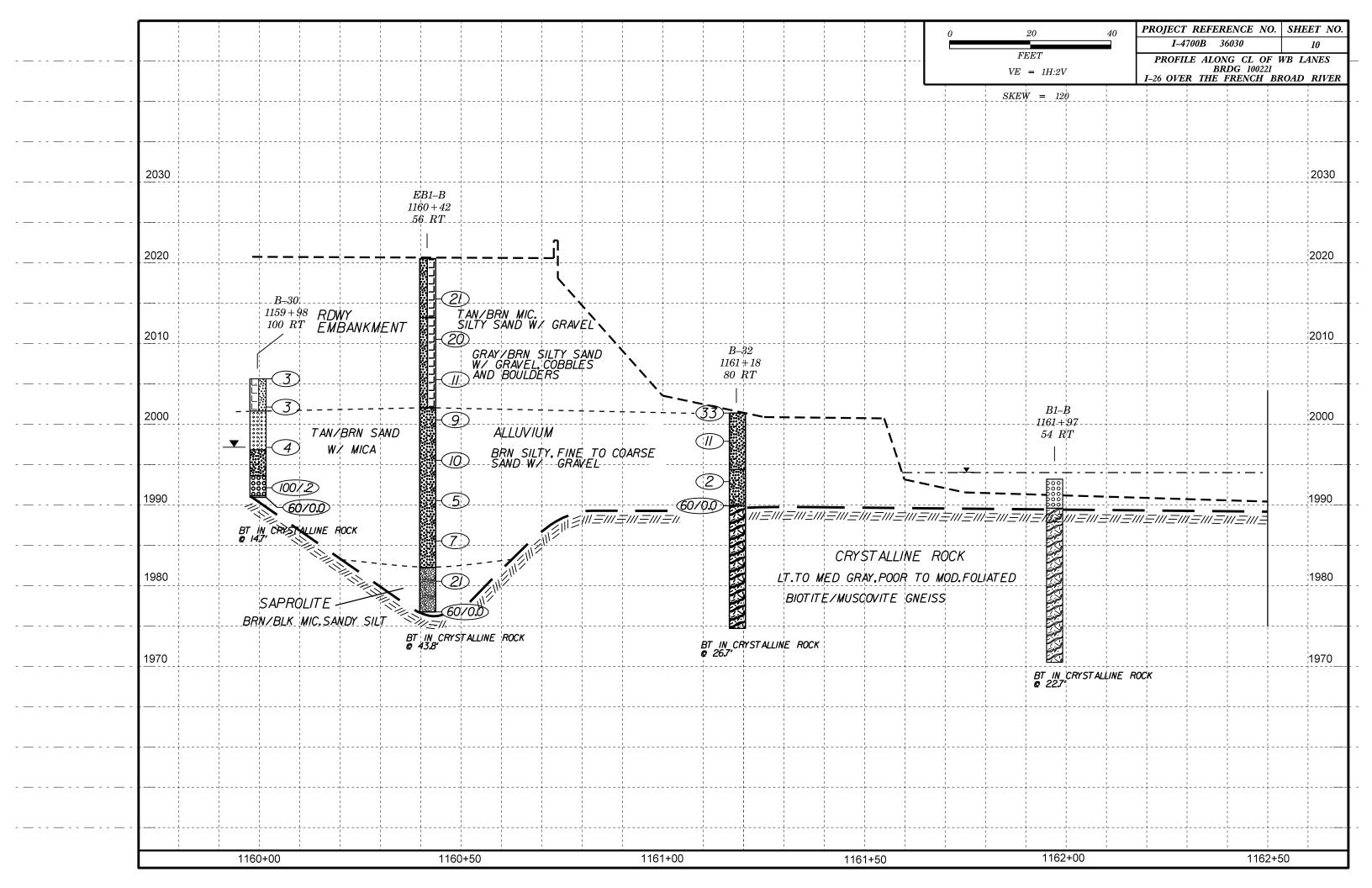


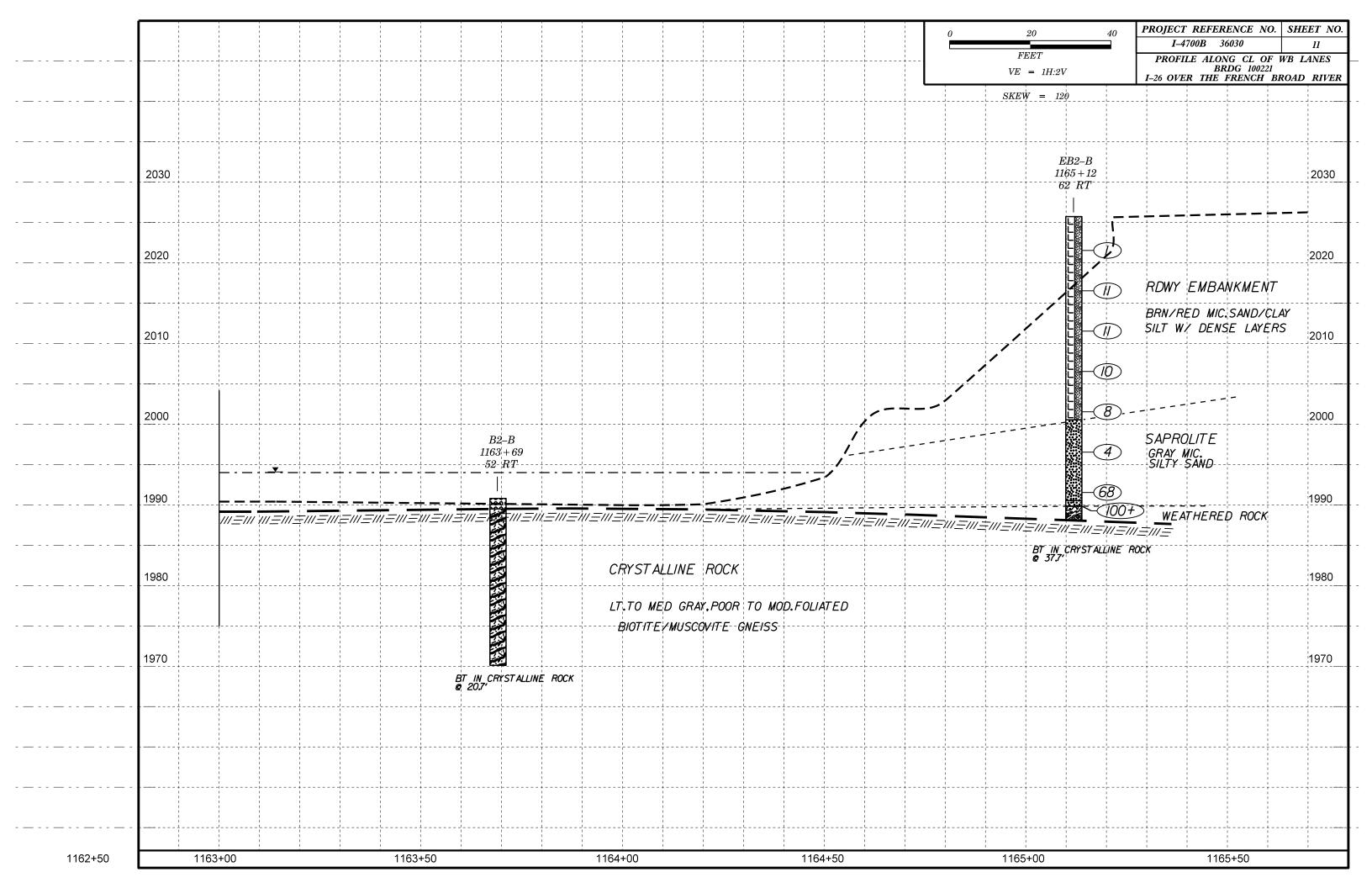












SHEET 12

GEOTECHNICAL BORING REPORT BORE LOG GEOTECHNICAL BORING REPORT BORE LOG

										B	ORE	: L	UG																							UKE
								Y BUNCOMBE GEOLOGIST							ST M. Arnold					WI	38	36030	.1.1			Т	TIP I-4700B CC				OUNTY	INTY BUNCO				
SITE [DESCR	IPTION	I-26	from n	ear N	C 146 (E	Exit 37	7) to ne	ar NC	191 (Exit 33)										GROU	ND W	R (ft)	SIT	ΈD	ESCR	PTION	REF	PLACE	BRID	GES (J211/02	214 ON	I-26 C)VER F	RENCH
BORIN	NG NO.	B-31	(3) (El	31-A (3	3)) S	TATION	l 11	60+66			OFFSI	ET 5	3 ft LT			ALIC	SNME	NT -L3	-		0 HR.		34.2	ВС	RIN	G NO.	EB1-	Α		s	TATI	ON 11	60+86			OFFSET
COLL	AR ELI	EV. 2,	019.6	ft	Т	OTAL D	EPTI	H 40.	0 ft		NORTI	HING	660,6	81		EAS	TING	933,683	3		24 HR.		25.1	CC	LLA	R ELE	V. 2,	020.9	ft	Т	OTAL	L DEPT	H 25.	.0 ft		NORTHI
ORILL I	RIG/HAN	MER EF	F./DAT	E F&F	R2175 (CME-55 8	38% 0	2/11/20	17		•		DRILL I	NETHO	D H	.S. Augers	5		l l	HAMM	R TYPE	Auton	natic	DR	LL R	IG/HAN	MER EI	F./DAT	E AF	O8963 (CME-5	50X 77%	6 07/31/	2017		
DRILL	ER S	. Davis			s	TART D	ATE	08/2	4/17		СОМР	DAT	E 08/	24/17		SUR	FACE	WATER	DEPTI	H N//	4			DF	ILLE	ER C	neek, E). O.		s	TAR	T DATE	10/0	6/18		COMP. I
LEV	DRIVE ELEV	DEPTH	BLC	ow co	UNT			BLOW	S PE	R F00	Γ		SAMP					SOIL AN		(DES(PIPTIO	N		ELE	:v ı	ORIVE ELEV	DEPTH	_	ow co				BLOV	√S PER	R FOOT	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	5	50		75 	100	NO.	МО		ELEV.	(ft)	COILTU	D 11001	· DEO)		PTH (ft)	(ft	<u> </u>	(ft)	(ft)	0.5ft	0.5ft	0.5ft	10	2	25	50		75 1
020	2,019.6															2,019.6		GR	ROUND		ACE		0.0	202	25	_	_									
ľ	-,010.0	† °.0	5	3	5	8.	$\cdot \cdot $		-	·		: :		M		2,018.6 -	<u> </u>	ROAD	ABC S		MENT		1.0			-	-									
015	2,016.1	3.5	6	30	10	::		\. <u>`</u>	-	 				_M	7.7	- - 2,015.6 2,014.9	Red	d-Brown, (Clayey S Mica and	SILT (A	-5) with ⁻	Trace	4.0	202	20	-										
7.10	-	‡						.,/.	40					l IVI	7	-	Bro	wn, Fine t		e SAN) with	4.7			-	Ξ.]				
	2.011.1	8.5						7::				: :				<u>2,012.6</u>	Re	d-Brown, (Clayey S	SILT (A		Trace	<u> 7.0</u>		2	-015.9,	- - 5.0							.		
010	-	1 0.5	37	17	7	1		24——	-					М		2,010.0) \ Ta	n, Fine to	Mica and Coarse	d Grave SAND	<u>el</u>) (A-1-b)	 with	9.6	201	5	-0.010.	- 3.0	4	8	12	1	2	0			
		Ŧ				::,	;/.									-	L_Re	ed-Brown,	Some Fine Sa		LT (A-4)	with				-						/.				
005	2,006.1	13.5	4	3	3	://			-					M		-			Mica an					201	0 2	,010.9	10.0	6	6	6	łĿ	. <i>j</i>	ļ : : :			: : :
	-	Ŧ				1			•					"	Ę	-							47.0			-						1				
	2.001.1	18.5				[:										<u>- 2,002.6</u> -			RESIL	DUAL	4):41- 7		<u> 17.0</u>		2	.005.9	_ - 15.0					/				
2000	_	F	3	2	4	6-			-			_		W		-	Bro	wn, Fine Mica an	Sandy S d Manga	anese	Deposits	race		200)5	_	_	2	3	3	1	6	 			
		Ŧ														E										-	-				<u>i</u>			.		
1995	1,996.1	23.5	4	1	7	- 1.										1,995.4		wn, Fine S	Condu C	1 4 3/ / 4	C) with	Trans	24.2	200	0 2	.000.9 -	20.0	NO			<u> </u>		ļ		· · ·	
		ł				: [:										_ _ 1,992.6		wn, rine s	Mic Mic		-6) WIIII	Trace	27.0			-	_	DRIVE			F		<u> </u>		 - -	· · ·
	1,991.1	28.5				: t			-			-			7	F 1,002.0	i	range-Tan (A-5) witl	i-Brown,	Fine S	Sandy Cla	ayey	_ =		1	,995 9.	- - 25 0				<u> :</u>		<u> </u>	<u> </u>	 	60/0
990	_	<u> </u>	4	3	6	9-			-					W	N N	-	OILI	(7 t 0) With	Depo		ina mang	garicoc				-	-	60/0.0)							60/0
		<u> </u>				<u>: </u>				 					1.0	<u>- 1,987.6</u>	<u></u>	rk Brown,	Silty CL	<u>AY</u> (A-	7) with T	race	32.0			-	_									
985	1,986.1 <u>.</u> -	33.5	3	4	5	9.			-	 				Sat.		_		Mic	a and Co	oarse s	Sánd					_	-									
		‡						· ·		÷÷-:		· ·				- - 1,982.6	6						37.0			-	-									
1000	1,981.1		144	56/0.3	1		: :		-	 						F			ATHER n (BIOTI							-	-									
960	1,979.6	40.0	60/0.0			 	• •		-		100	0/0.8 8	1		9671	1,979.9 1,979.6	'n		YSTALL				39.7 40.0			-	-									
		‡														ļ.	Щ	Boring To		ed with	Standar			12/27/18		-	-									
	-	‡														Ė		enetration 1,979.6 ft	in CRYS	STALL	INE ROC					-	_									
		‡														ļ.		(B	SIOTITE		SS)			L.GDT		-	_									
		Ŧ														F		1. A	No uger refi	ite: usal at	40.0'			DOT.		-										
	-	Ŧ														F			-					NC C		-	_									
		Ŧ														F								BOREHOLES.GPJ		-										
	-	Ŧ														F								10LE		-										
		Ŧ														F								ORE		-	_									
		Ŧ														E										-	_									
		Ī														E								11-02		-	_									
		ł														Ŀ								BRDG0211-0214		-	_									
	-	<u> </u>														-								BRI		-	-									
		‡														<u> </u>								GEO		-	-									
	-	‡														L								14700		-	-									
		‡														<u> </u>										-	-									
		‡														E								SINGLE		-	-									
	-	‡														<u> </u>								BORE		-	-									
		‡														<u> </u>								ІСДОТ В		-	-									
		+														F								NCD		-	-									

												KE L	<u>.U</u> G											
WBS	36030).1.1			TI	I P 1-4	700B			COUNT	Y B	JNCOM	1BE			GEOLO	OGIST Johnso	n, C. D.						
SITE	DESCR	IPTION	REP	LACE	BRIDO	GES 0	211/02	214 ON	I-26	OVER	FREN	NCH BR	OAD R	VER			GRO							
BOR	ING NO.	EB1-A	4		S ⁻	TATIO	N 11	160+86			OFI	SET	34 ft LT			ALIGN	MENT -L-		0 HR.	N/A				
COL	LAR ELE	EV . 2,0	020.91	ft	T	OTAL	DEPT	H 25.	0 ft		NO	RTHING	660,7	707		EASTIN	NG 933,675		24 HR.	FIAD				
DRILL	. RIG/HAM	IMER EF	F./DATI	E AFC	8963 C	ME-55	0X 77%	% 07/31/	2017				DRILL	METHO) N	W Casing w/ SPT HAMMER TYPE Automat								
DRIL	LER CI	heek, D	. O.		S	TART	DATE	10/0	6/18		co	MP. DA	TE 10	/06/18		SURFA	CE WATER D	EPTH N/	A					
ELEV	DRIVE ELEV	DEPTH	BLC	w co	JNT			BLOW	/S PE	R FOO	T		SAMP	. 🔻	L	<u> </u>	SOIL AND F	OCK DES	CDIDTION					
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	25	50		75	100	NO.	MO		ELEV. (ft)	OOIL/WD1			DEPTH (ft)				
2025		L														L								
	-	ł														E								
	-	-														2,020.9	GROU	JND SURF.	ACE	0.0				
2020	_	-				 —					- -							Y EMBAN	KMENT					
	-	Ŧ													_	-	ROADWA	Y EMBAN	KMENT	,				
2015	2,015.9	5.0	4	8	12	:::	· ·				: :			١.,		-	RED-BROV CLAY-SAND-SI	LT W/GRA	VELS; SON	1E				
_010	_	‡	"	0	12		,	0			: :			M		Ε	ORGA	NIC MATE	RIAL					
	-	‡					: /:			: : :	: :					-								
2010	2,010.9	10.0	6	6	6		. / d 12				<u>: :</u>			М		Ĺ								
	-	<u> </u>				:;	į : :				: :				L	<u> </u>								
	2,005.9-	15.0]] :/					: :					Ė								
2005	_	<u> </u>	2	3	3	6		 	_		+			М	L	F								
	-	-				}					. .					- 2,002.5		ALLIN/IAI		18.4				
2000	2,000.9	20.0	NO					: : :	-		: :					F	,	ALLUVIAL						
	-	F	DRIVE								: :					1,997.9				23.0				
	1 995 9-	1 05 0				-		 -	-†		- -					1,995.9		HERED RO		25.0				
	1,995 9-	- /5 U	60/0.0								- -	60/0.0	4		aran a	1,990.9	CRYS'	MICA SCH FALLINE R	OCK	25.0				
	-	‡														ļ	GREY Boring Termin	MICA SCH		,				
	-	‡														-	PENETRATION 1,995	ON TEST F	REFUSAL at					
	_	<u> </u>														-	Elevation 1,990	ROCK	TISTALLIN					
	-	<u> </u>														L								
	-	Ł														L								
	-	1														E								
	-	F														F								
	_	F														E								
	-	Ŧ														F								
	-	Ŧ														F								
	-	ļ														-								
	-	‡														ļ								
	-	‡														_								
	-	‡														L								
	-	t														-								
	_	ŀ														E								
	-	+														E								
	-	ł														E								
	-	F														F								
	-	Ŧ														F								
	-	‡														Ļ.								
	-	‡														ţ								
	_	‡														ţ								
	-	t														F								
	-	<u> </u>														E								
	1 -	t	I	I	l	1							1	1	1	F								

SHEET 13

GEOTECHNICAL BORING REPORT BORE LOG

									KE L						
NBS	36030	.1.1			TI	IP I-4700B	COUN	TY BU	JNCOM	BE			GEOLOGIST Johnson, C. D.		
SITE	DESCR	IPTION	REP	LACE	BRIDO	GES 0211/02	214 ON I-26 OVEF	RFREN	ICH BR	OAD RI\	/ER			GROUND WTR	(ft)
RORII	NG NO.	FR1-I			S	TATION 11	60+42	OFF	SET 5	S6 ff RT			ALIGNMENT -L-	-	、, N/A
				r.	-			+			20			+	
	AR ELE					OTAL DEPT		NOF	RIHING	660,76			EASTING 933,755		IAD
RILL	RIG/HAN	IMER EF	F./DATI	E AFC)8963 C	ME-550X 77%	6 07/31/2017			DRILL M	ETHO) NW	Casing w/ SPT HAMN	IER TYPE Automatic	ic
DRILL	LER C	heek, D	. O.		S	TART DATE	10/07/18	CON	IP. DA	Γ E 10/0	07/18		SURFACE WATER DEPTH N	/A	
LEV	DRIVE ELEV	DEPTH	BLC	W CO	UNT		BLOWS PER FOO	T		SAMP.	lacksquare		SOIL AND ROCK DES	CRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	5 50	75	100	NO.	MOI	1 1	ELEV. (ft)	DEPTI	ГН (f
025															
	-	Ī										l F	•		
	-	‡											2,021.0 GROUND SURF	ACE	0
020	-	_											ROADWAY EMBAN		
	-	+						- -					2,018.8 ASPHALT/CONCRETE ROADWAY EMBAN		2.
	2.016.0	5.0				::::							TAN TO RED-BROWN, SI	MICACEOUS,	
015	-	J.U	16	12	9	2	1	<u>: :</u>			М		SILT-SAND W/GRAVI FRAGMENT		
	-	‡				::::;							.2 <u>,013.7</u>	ERS	
	2.011.0	10.0				• • • •		- -				-			
010		-	12	10	10	2	0				М				
	-	‡				::;/:									
	2,006.0	15.0	L .	L .] ::/::			: : :						
005	-	+	4	4	7	11		- -			М	<u> </u>	•		
	-	Ī											2,002.5		18
	2,001.0	20.0			_	:;::							ALLUVIAL GREY TO BROWN COAR	SE SILT-SAND	
000	-	t	5	4	5	9	 	:			M	_	W/COBBLES, GRAVELS, F		
	-	-				-		. .				-	MATERIAL		
995	1,996.0	25.0	5	5	5	: :::					١.,	_			
993	-	‡	"	3		10					M	_	•		
	-	ł				:/: : :		: :				_			
990	1,991.0	30.0	2	2	3	1 1 1 1 1 1 1 1 1		- -			М	Ξ			
	-	-	-			φ5					'''	-	•		
	-	‡				}::::						1			
985	1,986.0.	35.0	5	4	3						М	-			
	-	F									'''		1,983.8 1,982.7 IN/OUT BOULD		37 38
		ļ.,,				::\:::						F	SAPROLITE		
980	1,981.0	40.0	13	12	9	2	· · · · · · ·				М		BROWN-BLACK-GOLD, \ SAND-SILT W/ROCK F		
	-	ł				[[::::]]						ŀ			
ŀ	1,977 2	43.8	60/0.0			11		<u>. L.</u>	60/0.0	-			1,977.2 CRYSTALLINE F		43.
	_	‡											GREY MICA SC	HIST	
	-	‡											Boring Terminated WITH PENETRATION TEST		
	-	ł										ΙĿ	Elevation 1,977.2 ft ON C ROCK	RYSTALLINE	
	_	-										l F	·		
	-	‡													
	-	ţ										l Ŀ			
	-	+										 	-		
	-	Ī										l F			
	-	‡													
	-	t										l b			
	-	+										l F			
	-	Ī													
	-	‡													
	-	+										l F			
	-	‡													
	-	‡											•		
	-	+										l F			
	_	+	I	1	I	I				1	ı	ı F			
	-	- - - - - - -										-			

WBS 36030.1.FS3 TIP I-4700B COUNTY BUNCOMBE GEOLOGIST M. Arnold																	
WBS	TI	P I-4	700B		(COUNT	ГҮ В	UNCO	ИΒ	E	_		GEOLOGIST M. Arnold				
SITE	DESCRI	PTION	I-26 f	rom nea	ır NC	146	(Exit 3	37) to n	ear N	C 191	(Exit 3	33)					GROUND WTR (ft)
BORI	NG NO.	B-30	(EB1-B		S	TATIC	N 1	060+00)		OF	FSET	10	00 ft RT			ALIGNMENT -L3- 0 HR. 11.6
COLI	AR ELE	V. 2.0	005.6 f	t	T	OTAL	DEPT	TH 14.	7 ft		NO	RTHING	3	660.78	5		EASTING 933,810 24 HR. 8.8
	. RIG/HAM												_			HS	S. Augers HAMMER TYPE Automatic
			1./0/11		1			08/2			<u></u>	MP. DA				11.0	SURFACE WATER DEPTH N/A
—	LER S. DRIVE		DI O	W COLIN		IAKI	DATE			-D FOC		WIF. DA	_		Z/ 1/	L	SURFACE WATER DEPTH N/A
ELEV (ft)	ELEV (ft)	DEPTH (ft)	<u> </u>	0.5ft 0).5ft	0	2	BLOV 25	50 50	R FOC	75 	100	11	SAMP. NO.	MOI	0	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft
2010	-	- - -														-	-
2005	2,005.6-	- - 0.0 -	WOH	2	1	3		ļ					H		М	[- 2,005.6 GROUND SURFACE 0.0 - ROADWAY EMBANKMENT
	2,002.1	- - 3.5					· · ·										Brown, Silty Fine SAND (A-2-4) with Trace Organics (Roots) and Mica 4.0
2000	-	- -	1	1	2	• 3					<u> </u>				М	0000	ALLUVIAL Tan-Brown, Fine SAND (A-3) with Trace
	- 1.997.1	- 0.5													lacksquare	0000	Mica
1995	1,997.1_	8.5 -	3	2	2	4			-	: : :	: :	: : :			_M_	_	. 1,996.8 8.6 - ALLUVIAL Dark Brown, Silty Fine to Coarse SAND
	-	- - 		,		i. I.										000_	Lack Blown, Silly Fille to Coalise SAND Lack Hown, Silly Fill
	1,992.1_ 1,990.9_	14 7	15 60/0.0	22 10	0/0.2	l Ŀ				· · ·		 -100/0.2		-			1,991.1 Orange-Brown, Fine to Coarse SAND 14.9 (A-1-b) with Trace Mica, Little Rounded 14.3
	-	- -	00/0.0									60/0.0				E	Gravel WEATHERED ROCK
	-	- -														F	Dark Gray (BIOTITE GNEISS) Boring Terminated with Standard
	-	-		,												F	 Penetration Test Refusal at Elevation 1,990.9 ft on CRYSTALLINE ROCK
	-	-														F	(BIOTITE GNEISS)
	_	-														E	Note: 1. Auger refusal at 14.7'
	-	- - -														E	
	-	-														E	_
	-	-		,													
	-	- -		,												F	
	-	-														F	- ·
	_	- -														E	•
	-	- -														E	- -
	-	- -														E	
	_	-														E	_
	-	-														E	
		-														E	
	-	-														E	
	-	-														E	•
	-	-														F	•
	-	-														E	-
]	- -														E	
		-															_
	-	- -															
	-	-														<u> </u>	_
	-	-															
	-	-															
	-	-															<u>-</u> -
	-	-															
	-	-															

		ORE LUG												
WBS 36030.1.1		Y BUNCOMBE	GEOLOGIST Johnson, C. D.	T	l	36030.1.1			-4700B			Y BUNCOMBE	GEOLOGIST Johnson, C. D	
SITE DESCRIPTION REPLACE BE			T	GROUND WTR (ft)							VER	FRENCH BROAD RIVER	T	GROUND WTR (f
BORING NO. B1-A	STATION 1162+42	OFFSET 26 ft LT	ALIGNMENT -L-	0 HR . N/A	l -	NG NO. B1-E			ION 1161+9			OFFSET 54 ft RT	ALIGNMENT -L-	0 HR. N/
COLLAR ELEV. 1,991.2 ft	TOTAL DEPTH 25.0 ft	NORTHING 660,787	EASTING 933,540	24 HR. FIAD	l	LAR ELEV. 1			L DEPTH 22			NORTHING 660,837	EASTING 933,618	24 HR. FIAI
DRILL RIG/HAMMER EFF./DATE AFO89		DRILL METHOD NW	 	IER TYPE Automatic	l		FF./DATE AFO8					 	<u> </u>	MMER TYPE Automatic
DRILLER Cheek, D. O.	START DATE 10/06/18	COMP. DATE 10/06/18	SURFACE WATER DEPTH N/	'A	l	LER Cheek, I			T DATE 10/0			COMP. DATE 10/07/18	SURFACE WATER DEPTH	N/A
CORE SIZE NXWL	TOTAL RUN 23.0 ft					E SIZE NXWI			L RUN 22.7		ΔΤΔ			
ELEV RUN ELEV (ft) DEPTH RUN RATE (Min/ft)	RUN SAMP. REC. RQD REC. RQD NO. (ft) (ft) (ft) % %	-	DESCRIPTION AND REMARKS		ELEV (ft)	LLLV /ft/	RUN DRILL RATE	REC.	RQD SAMP.	STR REC. (ft) %	RQD (ft)	0	DESCRIPTION AND REMARKS	
	% % %	G ELEV. (ft)		DEPTH (ft)		(14)	(ft) (Min/ft) %'	%	%	%	G		
1988.2 3.0 3.0	(2.2) (1.3) 73% 43%	1,988.2	Begin Coring @ 3.0 ft CRYSTALLINE ROCK	3.0	1988.8	1,988.8 3.6	2.7	(2.5)	(1.9)			_ 1,988.8	Begin Coring @ 3.6 ft CRYSTALLINE ROCK	3
1985 1,985.2 6.0					4005	1,986.1 6.3	-	(2.5) 93%						
5.0	(4.8) (4.2) 96% 84%				1985	+	5.0	(5.0) 100%	(5.0) 100%					
‡						1 004 4 14 0								
1980 1,980.2 11.0 5.0	(4.4) (3.1)				1980	1,981.1 11.3	5.0	(5.0)	(4.5)					
‡	(4.4) (3.1) 88% 62%					<u> </u>		100%	90%					
1,976.2 15.0 1975 1,975.2 16.0 5.0	(4.4) (3.1)					1,976.1 16.3		(7.5)	(7.2)					
† †	(4.4) (3.1) 88% 62%				1975	+	5.0	(5.0) 100%	(5.0) 100%					
1,971.2 20.0						+								
1970 5.0	(4.4) (4.4) 88% 88%				1970	1,971.1 21.3	5.0	(4.6) 92%	(4.2)			1,969.7		22
‡						1	1	92%	84%			- Boring Termi	nated at Elevation 1,969.7 ft IN CRYST	ALLINE ROCK
1,966.2		1,966.2 Boring Terminate	ed at Elevation 1,966.2 ft IN CRYSTAL	LINE ROCK		1,966.1 26.3								
1 1 7 1 1		F				+						-		
‡						<u> </u>								
‡						1						<u> </u>		
‡						<u> </u>								
‡						1						<u> </u>		
						+						-		
‡						\pm								
‡		-				\pm								
						Ŧ						F		
8						Ŧ						 		
12/27/18		-				-						 -		
						Ŧ						 		
<u> </u>						Ŧ						 		
						Ŧ						F		
						Ŧ						F		
† EBC						1						 		
욃 ‡						‡								
						‡								
† 1514						†								
[2] ±						‡								
		-				‡						-		
ä						‡								
		<u> </u>				‡								
100						†								
		<u> </u>				‡								
		F				‡								
						‡								
ŏ						<u> </u>								
ğ †		<u> </u>				<u></u>								

B1-A

BOX 1 OF 3: 3.0 - 12.5 FEET

GSI = 65 TO 75

B1-A

BOXES 2 OF 3: 12.5.5 - 23.5

FEET

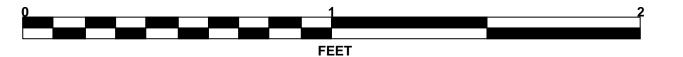
GSI = 70 TO 80

NOTE: Bit wear from 1,969' to 1963.5'. Bit changed at 1963.5









B1-ABOX 3 OF 3: 23.5 - 25.0 FEET





B1-BBOX 1 OF 3: 3.6 - 12.6 FEET

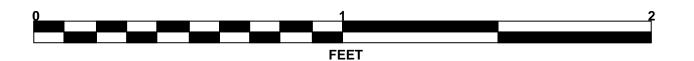
GSI = 45 TO 55 TO DEPTH 1973.8' GSI = 70 TO 80 TO DEPTH 1968.8'

B1-BBOX 2 OF 3: 12.6 - 21.3 FEET

GSI = 80 TO 90 DEPTHS 1968.8 TO 1958.8



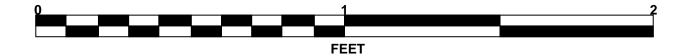






B1-BBOX 3 OF 3: 21.3 - 26.3 FEET





		CORE LOG										
WBS 36030.1.1	TIP I-4700B CO I	UNTY BUNCOMBE	GEOLOGIST Stickney, J. K.		WBS 36030.1.1		TIP 1-47	00B	COUNT	Y BUNCOMBE	GEOLOGIST Stickney, J	. K.
SITE DESCRIPTION REPLACE BE	RIDGES 0211/0214 ON I-26 OV	/ER FRENCH BROAD RIVER		GROUND WTR (ft)	SITE DESCRIPTIO	N REPLACE E	RIDGES 02	11/0214 ON	I-26 OVER	FRENCH BROAD RIVER		GROUND WTR (ft)
BORING NO. B2-A	STATION 1164+24	OFFSET 30 ft LT	ALIGNMENT -L-	0 HR. N/A	BORING NO. B2-	3	STATION	l 1163+69		OFFSET 52 ft RT	ALIGNMENT -L-	0 HR . N/A
COLLAR ELEV. 1,990.0 ft	TOTAL DEPTH 20.9 ft	NORTHING 660,869	EASTING 933,377	24 HR. FIAD	COLLAR ELEV.	,990.9 ft	TOTAL D	EPTH 20.7	ft	NORTHING 660,916	EASTING 933,465	24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE HFOOD	072 CME-550X 90% 05/23/2017	DRILL METHOD	NW Casing w/ Core HAMN	IER TYPE Automatic	DRILL RIG/HAMMER I	FF./DATE HFO	072 CME-550>	(90% 05/23/2	2017	DRILL METHOD	NW Casing w/ Core	HAMMER TYPE Automatic
DRILLER Smith, C. L.	START DATE 10/06/18	COMP. DATE 10/06/18	SURFACE WATER DEPTH N	/A	DRILLER Smith,	C. L.	START D	ATE 10/07	/18	COMP. DATE 10/07/18	SURFACE WATER DEPT	H N/A
CORE SIZE NXWL	TOTAL RUN 19.5 ft				CORE SIZE NXW			UN 19.4 ft				
$\begin{array}{c cccc} ELEV & RUN \\ (ft) & ELEV \\ (ft) & (ft) & (ft) \end{array} \begin{array}{c cccc} DEPTH & RUN \\ (ft) & (ft) & RATE \\ (Min/ft) & (ft) & (ft) & (ft) & (ft) \\ \end{array}$	RUN SAMP. REC. F NO. (ft) % % NO.	TA L RQD O (ft) G ELEV. (ft)	DESCRIPTION AND REMARKS	DEPTH (ft)	ELEV RUN ELEV (ft)	H RUN DRILL (ft) DRILL (Min/ft	REC. RQI	SAMP. NO.	STRATA REC. RQD (ft) (ft) %	L O G	DESCRIPTION AND REMARKS	
1988.6			Begin Coring @ 1.4 ft		1989.6						Begin Coring @ 1.3 ft	
1,988.6	(4.4) (3.5) 98% 78%	1,988.6	CRYSTALLINE ROCK	1.4	1,989.64 1.3	4.4 00:30/0	.4 98% 73%	2)		1,989.6	CRYSTALLINE ROCK	1.3
1 11984 11 5 9 1 12/40/10					1985 1,985.2 5.7	00:30/0 1:41/1. 1:08/1. 1:06/1.	0000					
5.0 1:31/1.0	(4.8) (4.7)				+	5.0 1:53/1.	0 (5.0) (5.0 0 100% 100)) %				
1:56/1.0					‡	2:18/1.	0					
1,979.1 10.9 2:01/1.0 5.0 1:22/1.0					1980 1,980.2 10.7	1:55/1. 1:28/1.	0	-				
1:20/1.0	100% 92%				‡	1:22/1.	0					
1975					1975 1,975.2 15.7	1:18/1. 1:46/1.	0 0 0 (5.0) (5.0					
5.0 1:12/1.0 1:12/1.0 1:24/1.0	(4.9) (4.8) 98% 96%				T 7	I I 1:20/1.	0 1100%1100))				
1 1970 1 1:17/1.0					‡	1:16/1.	0					
1,969.1 20.9 1:23/1.0		1,969.1 Boring Termin	ated at Elevation 1,969.1 ft IN CRYSTAL	LINE ROCK	1,970.2 20.7	5.0	0 (4.8) (4.1 96% 82%			1,970.2 Boring Teri	minated at Elevation 1,970.2 ft IN CR	20.7 YSTALLINE ROCK
1 1 7 1 1							96% 82%	6		F		
+		[-			1,965.2 25.7					F		
		[l l Ŧ					1 E		
		E								F		
		E								[-		
		[E		
+		[-			1 1 1					[
		 								1 F		
1 1 ± 1 1		<u>E</u>								[
		F								[-		
<u>∞</u>		 								F		
NC_DOT.GDT 12/27/18		 								F		
		 								F		
		F								F		
		F								 -		
		[E		
		[-								E		
		 								1 F		
R		F								F		
T 1		F								 		
[2] 1 12		F								F		
§		-										
		F								1 F		
5		F								F		
74		F			1 1 7					F		
		F			‡					F		
		F			‡							
K I <t< td=""><td></td><td> F</td><td></td><td></td><td> ‡</td><td></td><td></td><td></td><td></td><td> F</td><td></td><td></td></t<>		F			‡					F		
					‡							
										<u> </u>		

CORE PHOTOGRAPHS

B2-ABOX 1 OF 2: 1.4 - 10.9 FEET

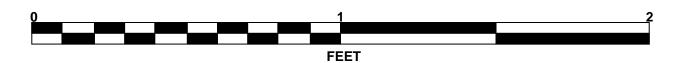
B2-ABOX 2 OF 2: 10.9 - 20.9 FEET

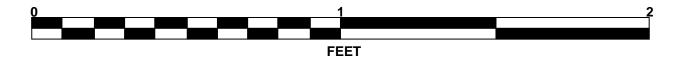
GSI = 65 TO 75



GSI = 65 TO 75





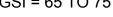


CORE PHOTOGRAPHS

B2-B **BOX 1 OF 2: 1.3 - 10.7 FEET**

B2-B BOX 2 OF 2: 10.7 - 20.7 FEET

GSI = 65 TO 75

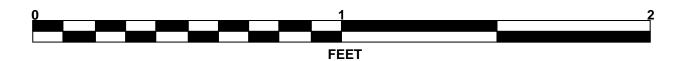


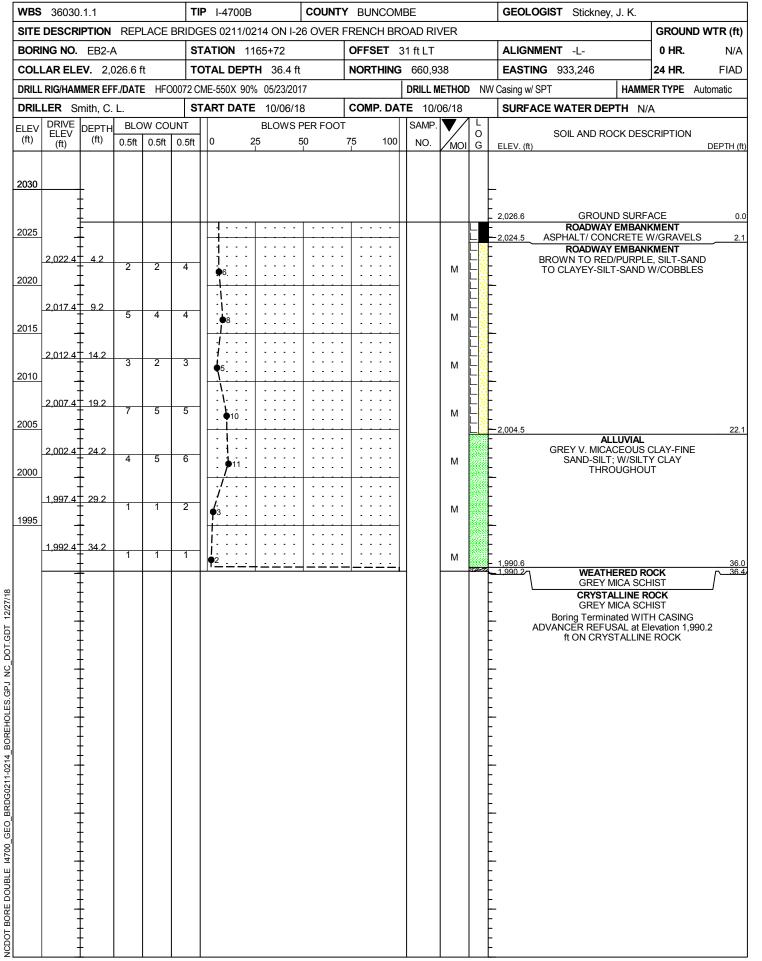


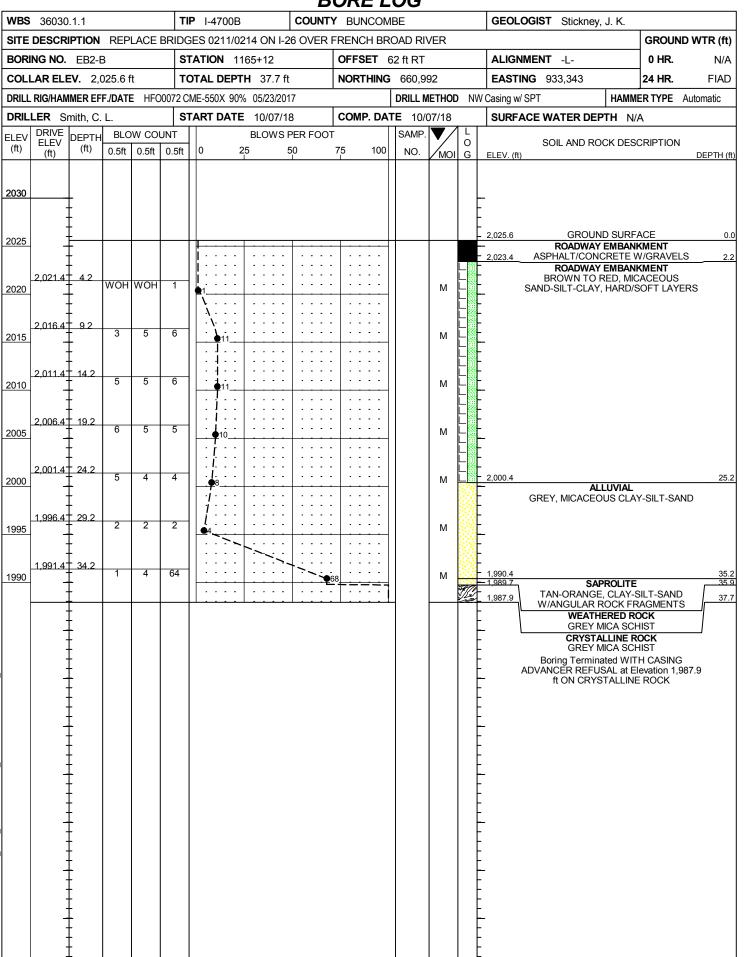
GSI = 65 TO 75











REFERENCE

36030

STATE OF NORTH CAROLINA

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

CONTENTS

SHEET NO. **DESCRIPTION** TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN BORE LOGS

STRUCTURE SUBSURFACE INVESTIGATION

ROJECT DESCRIPTION <u>EXTEND CULVERT 1000</u> <u>-SBL- STA</u> 888+31.84 <u>-NBL- STA</u> 887+89.2 I-26 OVER TRIBUTARY OF FRENCH BROAD
I-26 OVER TRIBUTARY OF FRENCH BROAD
SITE DESCRIPTION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	36030	1	5

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 1919) 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 DESCREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTICATIONS ARE AS RECORDED AT THE TIME OF THE INVESTICATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

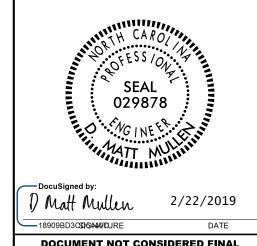
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS 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.

 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.

S. WOODS N. CONSIGLI S. DAVIS C. BOYCE INVESTIGATED BY <u>D. MULLEN</u> DRAWN BY _D. MULLEN __ DS CHECKED BY J. KUHNE



DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED**

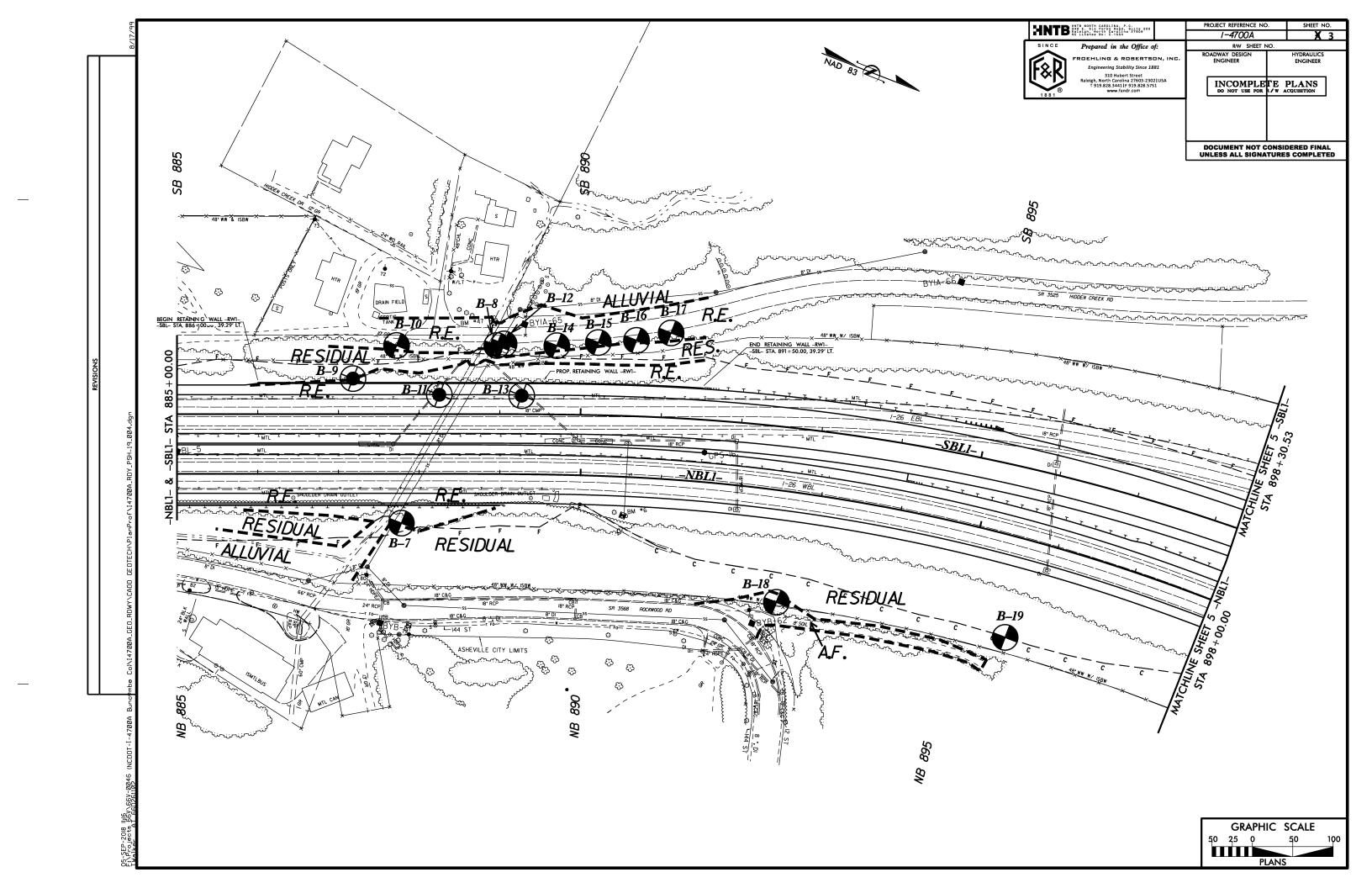
PROJECT REFERENCE NO. SHEET NO. 2

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.	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 DI586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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,	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
VERY STIFF.GRAY.SILTY CLAY.MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED VIOLEN NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.	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
CENEDAL CDANIII AD MATEDIAL C CILTCLAY MATEDIAL C	MINERALOGICAL COMPOSITION	THE 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.	ROCK (CP) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	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-CRYSTALLINE 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-7-5 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 000000000000000000000000000000000000	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
7. PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY MUCK, ** *40 30 MX 50 MX 51 MN SOILS CRAY PEAT	PERCENTAGE OF MATERIAL	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL DASCRIPS 440	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 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 50ILS WITH LITTLE OR	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	<u>DIP DIRECTION (DIP AZIMUTH)</u> - 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 MODERATE ORGANIC	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 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.
OF MAIOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	▼ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(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.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 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. RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABL	PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(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 POUR	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 \(\lefta \text{LI - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30} \)		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 RANGE OF STANDARD RANGE OF UNCONFINED	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 COMPACINESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
(N-VALUE) (TUNS/FT-)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	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	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4 4 4 4 4 4 4 4 4 4	SOIL SYMBOL SOIL SYMBOL SLOPE INDICATOR INSTALLATION	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.
MATERIAL MEDIUM DENSE 10/10/30/ N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT THOUGH BURNING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	→ INFERRED SOIL BOUNDARY → CORE BORING ■ SOUNDING ROD	(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 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	WITH CURE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	***** ALLUVIAL SOIL BOUNDARY \(\triangle \tri	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	XX UNDERCUT // UNCLASSIFIED EXCAVATION - TAN UNCLASSIFIED EXCAVATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (CSE. 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 OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION SOLDE FOR FIELD MOISTONE BESCHIFTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	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
LL _ LIOUID LIMIT	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	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 SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PLASTIC LIMIT	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING TERM SPACING TERM THICKNESS	BENCH MARK: N/A ELEVATIONS DERIVED FROM PROJECT DTM
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: FEET
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	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	
SL _ SHRINKAGE LIMIT	CLAY BITS AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6 CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	
PLASTICITY	X CME-55 X 8' HOLLOW AUGERS CORE SIZE: -H	INDURATION	1
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	GENILE BLOW BY HAMMER DISTNIEGRATES SAMPLE.	
HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	HAND AUGER	CRAINS ARE DISCISLED TO SERARATE WITH STEEL PROPE.	
DECEMBRIANCE MAY THE LIBE COLOR OF COLOR CAMPINATIONS (TAN DES VELLO), DOCUMENTARIO	CORE BIT SOUNDING ROD VANE SHEAR TEST	INDURATED 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.	VANE SHEAK TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1



		ORE LUG								_							
WBS 36030		TY BUNCOMBE	GEOLOGIST N. Consigli		WBS				TIP I-4700		TY BUNCO				SIST N. Consi		
		<u> </u>	<u> </u>	GROUND WTR (ft)					r NC 280 (Exit 40) to I	Near NC		-	CUL				
BORING NO. B-7	STATION 887+78	OFFSET 61 ft RT	ALIGNMENT -NBL1-	0 HR . Dry		IG NO . B-8			STATION 888+96		OFFSET	85 ft LT			ENT -SBL1-	0 H	
COLLAR ELEV. 2,084.7 ft	TOTAL DEPTH 15.0 ft	NORTHING 637,595		24 HR. 8.7	COLLA	AR ELEV.	2,076.2 ft	t 1	TOTAL DEPTH 15.0	ft	NORTHIN				945,362	24 H	R. 10.
DRILL RIG/HAMMER EFF./DATE F&	R3763 CME-550X 86% 1/30/2017	DRILL METHOD	H.S. Augers HAMMI	ER TYPE Automatic	DRILL R	RIG/HAMMER	EFF./DAT	E F&R376	3 CME-550X 86% 1/30/20	117		DRILL ME	THOD	H.S. Augers		HAMMER TY	PE Automatic
DRILLER C. Boyce	START DATE 07/27/17	COMP. DATE 07/27/17	SURFACE WATER DEPTH N/	A		ER C. Boy			START DATE 07/27/		COMP. DA				E WATER DEP	PTH N/A	
ELEV (ft) $\begin{array}{c} DRIVE \\ ELEV \\ (ft) \end{array}$ $\begin{array}{c} DEPTH \\ (ft) \end{array}$ $\begin{array}{c} BLOW COU \\ 0.5ft \end{array}$ $\begin{array}{c} O.5ft \\ O.5ft \end{array}$		OT SAMP. L O NO. MOI G		CRIPTION	ELEV E	DRIVE DEPT (ft)	O.5ft	0.5ft 0.5ft	→	50 50	T 75 100	SAMP. NO.		O G ELEV. (ft)	SOIL AND RO	OCK DESCRIPTI	ON DEPTH
2085 2,084.7 0.0 2 2 2 2 2 2 2 2 2	3		2,084.7 GROUND SURFA ROADWAY EMBANI 2,082.7 Brown, Fine Sandy SILT (A- Organics (Roots) and RESIDUAL Red-Brown, Fine Sandy CLA Trace Mica, Highly Fine Sandy SILT (A- Trac	KMENT 4) with Trace2.0 Gravel / VY (A-7-6) with	2075	2,076.2 0.0	4	3 2		· · · · ·		-	M L	2,076.2	ROADWAY	ID SURFACE FEMBANKMEN Se Sandy SILT (A-4) with
2,076.2 8.5 3 3	1		2,077.7 Frace Mica, Fighly F Gray-Brown, Fine to Coarse (A-4) with Trace Mica, Rock F Manganese Depo	e Sandy SILT Fragments, and sits	2070	2,072.7 3.5	1	1 2				-	M L	2,069.2	ALI Gray, Fine to Coar	el, Highly Plastic	: — — — —
2070 4 5	12		2,069.7 Boring Terminated at Elevation SILT (RESIDUA Note: 0.0-0.2' = SURFICIAL ORG	on 2,069.7 ft in L)	2065	2,062.7 13.5	5 2	3 5	• • • • • • • • • • • • • • • • • • •				М	2,061.2 wi	RESTOWN-Gray, Fine Solith Trace Mica and	nd Manganese D	epòsits
	PROPOSED CULVERT EXINVERT ELEVATION OF III 2075.92'					*****			PROPOSED CULV INVERT ELEVATIO 2068.26'						SILI (f	RESIDUAL)	

							B	ORE LO	JĠ				
WBS	3603	0			TI	P I-4700	COUNT	Y BUNCON	ИВЕ			GEOLOGIST S. Woods	
SITE	DESCI	RIPTION	N 1-26	from	Near	NC 280 (Exi	40) to Near NC 1	46 (Exit 37)	EXTEN	D CUL	VER	T-TRIBUTARY OF FR. BROAD	GROUND WTR (ft)
BOR	ING NO	. B-12			S	TATION 88	9+05	OFFSET 8	37 ft LT			ALIGNMENT -SBL1-	0 HR. Dry
COLI	LAR EL	EV. 2,0	075.81	ft	TO	OTAL DEPTH	1 20.0 ft	NORTHING	637,6	33		EASTING 945,357	24 HR. 7.0
DRILL	RIG/HA	MMER E	FF./DA	TE F8	R2175	CME-55 88%	02/11/2017		DRILL N	1ETHO	D H.	S. Augers HAMN	MER TYPE Automatic
DRIL	LER S	. Davis			S	TART DATE	09/06/17	COMP. DA	TE 09/	06/17		SURFACE WATER DEPTH N	I/A
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	0.5ft	UNT 0.5ft	0 25	BLOWS PER FOOT	75 100	SAMP.	MOI	L O G	SOIL AND ROCK DES	CRIPTION DEPTH (fl
2080		<u> </u>										-	
2075	2,075.8	0.0	1	7	8	15		<u> </u>		M		2,075.8 GROUND SURF — ROADWAY EMBAN 2,073.8 Red-Brown, Clayey Fine to	IKMENT
070	2,072.3	3.5	3	2	2	• • 4				M		(A-2-6) with Trace Organic Mica, Some Gra Dark Gray, Fine Sandy Silty	cs (Roots) and avel CLAY (A-7) with
	2,067.3	8.5	1	1	2					W		2,068.8 Trace Mica and Organ ALLUVIAL Gray, Fine Sandy Clayey S Trace Mica	
065	2,062.3	13.5	2	3	3	1					Λ.Υ.Υ. Σ.Υ.Υ.		12
060] -	40.5	2	3	3	6				W	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Trace Manganese Deposits Micaceous	s, Trace Mica to
	2,057.3	18.5	1	4	3	7				W	, , , , , , , , , , , , , , , , , , ,	. 2,055.8 Boring Terminated at Eleva SILT (RESIDU.	
	-					2068.26'	EVATION OF OU						

SHEET

REFERENCE

CONTENTS

DESCRIPTION

LEGEND (SOIL & ROCK)

TITLE SHEET

SITE PLAN

BORE LOGS

SHEET NO.

36030

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION I-4700A I-26 FROM 0.3 MI. EAST OF NC 280 (AIRPORT RD.) TO 0.5 MI EAST OF NC 191 (BREVARD RD.)

SITE DESCRIPTION <u>EXTEND</u> CULVERT 100101 -SBL- STA 984+42.13 -NBL- STA 984+16.39 I-26 OVER POWELL CREEK AND DUKE ENERGY CAR TUNNEL UNDER I-26 AT -NBL- STA 983

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAI SHEET
N.C.	36030	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 707-6550. 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 STIU (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 NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MOY LAW CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS 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 OF 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.

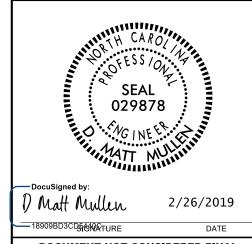
- NOTES:

 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.

 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.

W. HAMRICK D. AIELLO J. HOYLE INVESTIGATED BY __D. MULLEN DRAWN BY D. MULLEN CHECKED BY _J. KUHNE SUBMITTED BY _D. MULLEN DATE 2.25.2019

PERSONNEL



DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED**

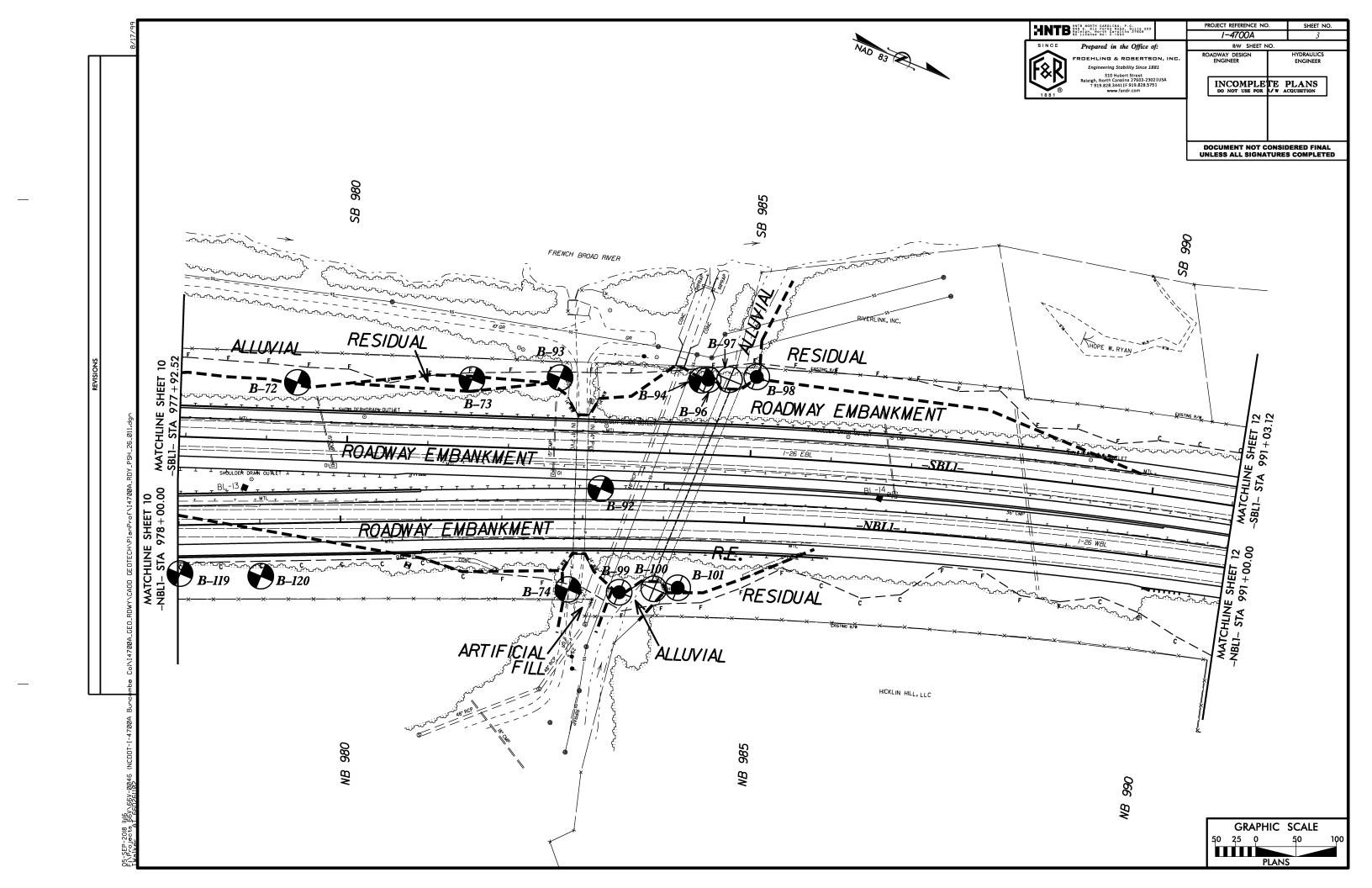
PROJECT REFERENCE NO. SHEET NO. 2

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 ELIGHT POWER AUGER AND VIELD LESS THAN 100 BLOWS PER FOOT	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	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 DIS86). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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,	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
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC,A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CONTROL OF THE PROPERTY	MINERALOGICAL COMPOSITION	ROCK (WR) 100 BLOWS PER FOOT IF TESTED. FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	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
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	ROCK (CP) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	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.	UNEISS, CHEBRO, SCRIST, ETC.	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-7-5 A-3 A-6, A-7	COMPRESSIBILITY	BOOK (NICE) SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	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
7. PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY MUCK, CLAY SOILS SOILS 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	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.
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.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 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 LITTLE UK HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOULS	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. FINF 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 GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	lacktriangle Static water level after 24 Hours	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
CEN PATING	<u> </u>	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITAB	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED 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 - 30 :PI OF A-7-6 SUBGROUP IS > LL - 30		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 (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 < 4 LOOSE 4 TO 10	SOIL SYMBOL STORT 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.
MATERIAL MEDIUM DENSE 10 TO 30 N/A	Min	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
DENSE 30 TO 50	THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER 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	— INFERRED SOIL BOUNDARY — 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	MW C TEST BODING	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 0.5 TO 1.0 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 (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4	→ PIEZOMETER OF 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 TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
		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 OPENING (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.
BUOLDER CUBBLE GRAVEL SAND SAND (SL) (CL)		MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(CSE, SDI) (F SDI)	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 0.005 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS 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
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY 7 - 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
SOU MOISTURE SCALE FIELD MOISTURE	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{\sf d}$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u>	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	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 PLASTIC SEMISOLID; REQUIRES DRYING TO	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 S - WEI - (W) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS ω - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: N/A ELEVATIONS DERIVED FROM PROJECT DTM
" " PL L _ PLASTIC LIMIT	HI HIGHLY V - VERY RATIO	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	EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
SL _ SHRINKAGE LIMIT	DRILL ONITS: HOUVINGING TOOLS: HARMINER TIPE: CME-45C CLAY BITS X AUTOMATIC MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO	C. CONTINUOUS ELICHT AUGER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN OPTIMUM MOISTURE	X CME-55	THINLY LAMINATED < 0.008 FEET INDURATION	-
PLASTICITY		INDUKATIUN FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	1
PLASTICITY INDEX (PI) DRY STRENGTH	L_ CME-550	DIRDING WITH FINGED EDEES NUMEDOUS COAINS.	
NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST TUNG,-CARBIDE INSERTS HAND TOOLS:	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	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 X HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE	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).	CORE BIT VANE SHEAR TEST	CHARD HAMMED DI CHE DECITION TO DOEAN CAMDIE.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHAMP HAMMER BLOWS REGULARD TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-1-
	• '	•	•



	BORE LOG						
WBS 36030	TIP I-4700A COUNTY BUNCOMBE	GEOLOGIST W. Hamrick		WBS 36030	TIP I-4700A COUN	TY BUNCOMBE	GEOLOGIST W. Hamrick
SITE DESCRIPTION I-26 from N	ear NC 280 (Exit 40) to Near NC 146 (Exit 37) EXTE	ND CULVERT AND TUNNEL STA 983-984	GROUND WTR (ft)	SITE DESCRIPTION I-26 from Ne	ear NC 280 (Exit 40) to Near NC	146 (Exit 37) EXTEND CULV	YERT AND TUNNEL STA 983-984 GROUND WTR (ft)
BORING NO. B-74	STATION 982+82 OFFSET 87 ft R	ALIGNMENT -NBL1-	0 HR. Dry	BORING NO. B-93	STATION 982+61	OFFSET 90 ft RT	ALIGNMENT -NBL1- 0 HR. N/A
COLLAR ELEV. 2,040.5 ft	TOTAL DEPTH 11.0 ft NORTHING 646,	370 EASTING 942,449	24 HR . Dry	COLLAR ELEV. 2,030.4 ft	TOTAL DEPTH 4.0 ft	NORTHING 646,431	EASTING 942,427 24 HR. N/A
DRILL RIG/HAMMER EFF./DATE F&F	R3495 CME-55 85% 01/30/2017 DRILL	METHOD H.S. Augers HAMM	MER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD	Hand Auger HAMMER TYPE N/A
DRILLER D. Aiello	START DATE 08/01/17 COMP. DATE 08	/01/17 SURFACE WATER DEPTH N	I/A	DRILLER J. Hoyle	START DATE 08/23/17	COMP. DATE 08/23/17	SURFACE WATER DEPTH N/A
ELEV DRIVE DEPTH BLOW COUL	NT BLOWS PER FOOT SAMP	SOIL AND ROCK DES	CODIDITION	ELEV DRIVE DEPTH BLOW COUN	IT BLOWS PER FOO	OT SAMP.	L SOIL AND ROCK DESCRIPTION
(ft) ELEV (ft) 0.5ft 0.5ft	0.5ft 0 25 50 75 100 NO.	MOI G ELEV. (ft)	DEPTH (ft)	(ft) ELEV (ft) 0.5ft 0.5ft 0	0.5ft 0 25 50	75 100 NO. MOI	
2045				2035			
							F
		- 2,040.5 GROUND SURF	EACE 0.0				- 2,030.4 GROUND SURFACE 0.0
2040 2,040.5 0.0 3 4	3 7	M ARTIFICIAL F	ILL	2030			- 2,030.4 GROUND SURFACE 0.0
2.037.0 3.5		Brown, Fine Sandy SILT (/ Mica and Gra					
2035	4 17	M S F					
T I I		2,033.5 RESIDUAL		1 1 7 1 1			F
2,032.0 8.5 23 20		Brown, Fine Sandy SILT (A-4) with Trace				
2030 2,029.5 11.0	60/0.0	M = 2,030.5 Mica and Little Rock F					_
+ 60/0.0	00/0.0	Gray (BIOTITE GN Boring Terminated with					
		Penetration Test Refusa 2,029.5 ft in CRYSTALLINE	al at Elevation				
		- 2,029.3 It III CRYSTALLINE GNEISS)	ROCK (BIOTTE				F
		Notes:					
‡		- 1) 0.0-0.1' = SURFICIAL O	RGANIC SOILS at 11.0'				-
							-
							- -
	INVERT ELEVATION OF PROPOSED	‡			INVERT ELEVATION OF PRO	DOSED	-
	CULVERT EXTENSION INLET: 2025.34'				CULVERT EXTENSION INLET		_
	INVERT ELEVATION OF PROPOSED				INVERT ELEVATION OF PRO	POSED	
	CULVERT EXTENSION OUTLET: 2023.27'				CULVERT EXTENSION OUTLI	ET: 2023.27'	_
+	INVERT ELEVATION OF PROPOSED CAR TUNNEL EXTENSION INLET: ~2040'			+	INVERT ELEVATION OF PRO	POSED CAR	_
±	INVERT ELEVATION OF PROPOSED CAR	1 1			TUNNEL EXTENSION INLET:	~2040'	_
1 1 1 1	TUNNEL EXTENSION OUTLET: ~2030.4'	1			INVERT ELEVATION OF PROI		<u>-</u>
					TORNEL EXTENSION OUTEL	1. 2000.4	-
		F					
6 +		 					-
7722		F					-
		F					
		1 F					F
2							
							_
							-
		‡					-
<u> </u>				‡			<u> </u>
							ţ
							ţ
He He He He He He He He							<u> </u>
							Ŀ
		 					-

BORE L	LUG				
WBS 36030 TIP I-4700A COUNTY BUNCOI	DMBE GEOLOGIST W. Hamrick	WBS 36030	TIP I-4700A COUN	TY BUNCOMBE	GEOLOGIST W. Hamrick
SITE DESCRIPTION I-26 from Near NC 280 (Exit 40) to Near NC 146 (Exit 37)) EXTEND CULVERT AND TUNNEL STA 983-984 GROUND WTR (ft)	SITE DESCRIPTION I-26 from Ne	ear NC 280 (Exit 40) to Near NC	146 (Exit 37) EXTEND CULV	VERT AND TUNNEL STA 983-984 GROUND WTR (ft)
BORING NO. B-94 STATION 984+36 OFFSET	92 ft LT ALIGNMENT -SBL1- 0 HR . 8.7	BORING NO. B-96	STATION 984+44	OFFSET 93 ft LT	ALIGNMENT -SBL1- 0 HR. N/A
COLLAR ELEV. 2,032.1 ft TOTAL DEPTH 17.5 ft NORTHING	NG 646,424 EASTING 942,146 24 HR. 8.8	COLLAR ELEV. 2,031.4 ft	TOTAL DEPTH 4.0 ft	NORTHING 646,431	EASTING 942,143 24 HR. N/A
DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 85% 01/30/2017		DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD	
					
DDIVE	SAMP V L	ELEV DRIVE DEPTU BLOW COLIN			L
BORING NO. B-94 STATION 984+36 OFFSET COLLAR ELEV. 2,032.1 ft TOTAL DEPTH 17.5 ft NORTHING DRILL RIG/HAMMER EFF./DATE F&R3495 CME-55 85% 01/30/2017	92 ft LT ALIGNMENT -SBL1- O HR. 8.7 NG 646,424 EASTING 942,146 DRILL METHOD H.S. Augers HAMMER TYPE Automatic SATE 08/01/17 SURFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION NO. MOI G ELEV. (ft) PROADWAY EMBANKMENT Brown, Fine Sandy SILT (A-4) with Trace Mica, Manganese Deposits, Organics (Roots), and Gravel W 2,032.1 Black, Silty CLAY (A-6) with Trace Organics (Roots) Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica and Gravel		STATION 984+44 TOTAL DEPTH 4.0 ft	OFFSET 93 ft LT NORTHING 646,431 COMP. DATE 08/23/17 T75 100 NO. MOI POSED ET: 2025.34' POSED CAR POSED CAR POSED CAR	ALIGNMENT -SBL1-
CDOT BORE DOUBLE 14700A_GEO_BH_KUWY.GFJ_NI					

N/A

N/A

GROUND WTR (ft)

WD0 00000		TV PUNCOMPE	OFOLOGIOT W. I	¬ г	DO 000	200	1_	NB 147004	TV DUM:00:	MDE		OFOLOGIST 111 11	
		ITY BUNCOMBE	GEOLOGIST W. Hamrick	_	BS 360				TY BUNCOI		ID OH! \ \(\(\text{T} \)	GEOLOGIST W. Hamrick	CDOUND 455
SITE DESCRIPTION I-26 from Near BORING NO. B-97		<u>'</u>	T AND TUNNEL STA 983-984 GROUND WTR (1 ALIGNMENT -SBL1- 0 HR. N/	´		IO. B-98		NC 280 (Exit 40) to Near NC 1 STATION 985+03	OFFSET			ALIGNMENT -SBL1-	GROUND WTR 0 HR.
			EASTING 942,133 24 HR. N/			ELEV. 2,029.5 ft		OTAL DEPTH 4.0 ft	NORTHING			EASTING 942,117	24 HR.
DRILL RIG/HAMMER EFF./DATE N/A	T BLOWS PER FOOT SAMP.		<u> </u>			HAMMER EFF./DATE		CIALDEI III T.VIL	HORTHING		METHOD H		JER TYPE N/A
	START DATE 08/23/17	COMP. DATE 08/23/17	SURFACE WATER DEPTH N/A	$\dashv \vdash$		J. Hoyle		START DATE 08/23/17	COMP. DA			SURFACE WATER DEPTH N	
ELEV DRIVE DEPTH BLOW COUNT	TT	OT SAMP V L					V COUNT	BLOWS PER FOC		SAMP.		1	
(ft) ELEV (ft) 0.5ft 0.5ft 0.5ft	t 0 25 50	75 100 NO. MOI G	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH		t) ELE	(ft) 0.5ft (0 25 50	75 100	NO.	MOI G	SOIL AND ROCK DES	CRIPTION
2030			-2,029.2 GROUND SURFACE	203	30							-2,029.5 GROUND SURF	ACE
	 		ALLUVIAL	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		<u> </u>						- ALLUVIAL - Soft, Tan-Brown, Fine Sar	
			Tan-Brown, Fine to Coarse Sandy SILT (A-4) 2,025.7 with Trace Mica	3.5		‡						- 2,025.5	idy OILT (7(4)
			Boring Terminated at Elevation 2,025.7 ft in SILT (ALLUVIAL)			‡			•			Boring Terminated at Elevat	ion 2,025.5 ft in
			,			‡						-	_,
			_			‡						- -	
						‡						<u>-</u> -	
						‡						-	
			-			‡						_ •	
						‡						. •	
			_			‡						• -	
						‡						- -	
						‡						- -	
			-			†						- -	
						‡						.	
			-			-						_	
	INVERT ELEVATION OF PROF	DOSED				I		INVERT ELEVATION OF PRO	POSED			- -	
	CULVERT EXTENSION INLET:		_			<u> </u>		CULVERT EXTENSION INLET				- - -	
	INVERT ELEVATION OF PROF	POSED				±		INVERT ELEVATION OF PROI				<u>.</u>	
	CULVERT EXTENSION OUTLE	ET: 2023.27'				‡		CULVERT EXTENSION OUTLI				.	
‡	INVERT ELEVATION OF PROF		-			‡		INVERT ELEVATION OF PROI TUNNEL EXTENSION INLET:				- -	
						‡		INVERT ELEVATION OF PRO				- -	
	INVERT ELEVATION OF PROF		_			‡		TUNNEL EXTENSION OUTLE				<u>-</u>	
						‡						- -	
						‡						- -	
61/9			-			‡						- -	
						‡						- -	
			_			‡						- -	
						‡						- -	
						‡						. -	
5 - 1 1 1 1 1 1 1 1			-			‡						_ -	
						‡						. •	
· 하			-			‡						• -	
						‡						. •	
4						‡						• •	
#			-			†						<u>-</u> -	
						‡						- -	
			-			‡						- -	
						‡						- -	
						‡						- -	
<u> </u>	1							1					

									В	ORE	L	JG																													
WBS	36030				TIP	I-4700A	١	CC	YTNUC	/ BUNG	COME	3E			GE	OLOG	IST W	. Hamri	ick			W	3S 3	6030				TIF	P I-4700A		COUNT	ry BUNCO	OMBE			GEOLO	GIST \	W. Hamı	rick		
SITE	DESCR	PTION	I-26 f	rom Ne	ar NC	280 (Exi	it 40) to	Near l	NC 14	6 (Exit 3	37) E	XTEN	D CU	ILVE	RT AN	D TUI	NNEL S	TA 983-	-984	GROU	ND WTR (f) SIT	E DE	SCRIP	TION	I-26 fr	rom N	lear N	NC 280 (Exit	40) to Ne	ear NC 1	46 (Exit 37)	EXTE	ND CUL	VERT	AND TU	JNNEL S	STA 983	-984	GROUNI	WTR (ft)
BORI	NG NO.	B-99			STA	ION 9	83+48			OFFSE	T 90	ft RT			ALI	GNME	NT -N	BL1-		0 HR.	N/A	ВС	RING	NO.	B-100			ST	TATION 983	3+90		OFFSET	85 ft R	Т		ALIGNN	VENT -	NBL1-		0 HR.	N/A
COLL	AR ELE	V. 2,03	30.4 ft		тот	AL DEPT	TH 4.0) ft		NORTH	IING	646,4	31		EAS	STING	942,4	27		24 HR.	N/A	CC	LLAR	ELEV.	2,02	5.7 ft		тс	OTAL DEPTH	2.5 ft		NORTHIN	IG 646	,468		EASTIN	IG 942	,408		24 HR.	N/A
DRILL	RIG/HAN	IMER EF	F./DATI	E N/A	•				·			ORILL N	ЛЕТНО	DD H	land Aug	ger			HAMM	ER TYPE	N/A	DR	LL RIG	HAMM/	ER EFF	./DATE	E N/A						DRILL	. METHOD	D Har	nd Auger			HAMME	R TYPE	N/A
DRILI	ER J.	Hoyle			STA	RT DATE	E 08/2	23/17		COMP.	DATE	= 08/2	23/17		SUI	RFACI	E WATE	R DEP	TH N/	/A		DR	ILLEF	R J. H	oyle			ST	TART DATE	08/23/1	7	COMP. D	ATE 08	3/23/17		SURFA	CE WAT	ER DEP	TH N/A	١	
ELEV	DRIVE	DEPTH	BLOV	V COUN			BLOV	NS PER	FOOT			SAMP.	V /	L			COIL A	ND DOO	N DEC	CRIPTION	.1	ELE	V DR	IVE EV DE	PTH_	BLOW	/ COUN	NT		BLOWS	PER FOO	T T	SAME	P. ▼ /	L	1	2011		01/ 0500	DIDTION	
(ft)	ELEV (ft)		0.5ft	0.5ft 0.	5ft C	2	25 	50		75 <i>′</i>	100	NO.	МО	I G	ELEV.	(ft)	SOIL A	IND ROC	N DESC	SKIPTIOI	N DEPTH	/ft	EL	EV ft)	(ft) C).5ft (0.5ft (0.5ft	0 25		50	75 10	0 NO.		O G	ELEV. (ft)	SOIL	AND RO	CK DESC	RIPTION	DEPTH (ft
2035																						203	0																		
	- 1	.													-							1 -50														•					
	1	.													-		_							‡														ODOLINI	D OUDEA	> =	
2030	- 1	-	-		╌										- 2,030. - 2,029.			ROUND			1	0 202	5	‡			_					-			-	2,025.7		ALI	D SURFA L UVIAL		0.0
	‡	.						.			1 1				-	Sof	t, Red-Bro	own, Silty			Trace			‡				-							-	2,023.2	Soft, Bro		to Coarse h Trace M	Sandy SIL ca	T 2.5
	‡	.			\perp						•				- 2,026. -	4	Soft, Brow	n, Fine S	Sandy S	ILT (A-4)	with	0		‡												E	Boring Ter	rminated a	at Elevatio	n 2,023.2 f	t in
	-	-													_	Bo	ring Term SILT (R		e Mica t Elevati	ion 2,026				+											▎▐	•		•)	
	1	.													_		SĬLT (R	OADWA'	Y EMBA	ANKMEN	Γ)			İ											l E		1. l	r Hand Aug	Note: er Refusa	at 2.5'	
		.													Ŀ									+											<u> </u>						
	+	.													-									Ŧ											ΙF						
		.													F									Ŧ											F						
		-													F									‡											F						
	- 1														-									‡																	
	1	.				VERT EL JLVERT									-									‡					INVERT ELEV												
	1	.				VERT EL	ΕVΔΤΙΟ			SED					-									‡											-	-					
	‡	.								: 2023.27'	·				_									‡					INVERT ELEV												
		·				VERT EL	EVATIO	ON OF F	PROPO	SED CAF	۱ ۱				_									1					INVERT ELE	/ATION (OSED CAP			ΙĿ						
	1	.				JNNEL E									-									İ					TUNNEL EXT						<u> </u>						
	1	.								SED CAF	٦				_									1					INVERT ELE	VATION (OF PROP	OSED CAR			<u> </u>						
	+	-			T	JNNEL E	XTENSI	ION OU	TLET: ^	~2030.4'					L									Ŧ					TUNNEL EXT	ENSION	OUTLET:	~2030.4'			ΙF	-					
	+	.													-									Ŧ											F						
															F									Ŧ											F						
	7														F									‡												•					
	1	.													-									‡																	
		.													Ė									‡											▎▐						
	‡														-									‡																	
	‡	.													_									‡																	
5/19	‡	-													-									†											-	•					
2/2	‡	.													-									‡																	
GD.		·													Ŀ									1											lĿ						
DO	1	.													-									ł											l E						
N N	}	.													E									+											<u> </u>						
.GP.	+	-													L									Ŧ											ΙF	-					
															F									Ŧ											F						
HA I															F									Ŧ																	
	7	.													F									‡											F						
98	‡														F									‡																	
1470	‡	-													Ė									‡											<u> </u>						
BLE	‡	:													<u> </u>									‡																	
	1														<u> </u>									‡											<u> </u>						
SE	-	-													_									\pm											<u> </u>	•					
OT B	}														E									Ŧ											F						
QCD NCD		.													}									Ŧ											F						

WBS											<u>UG</u>					
	36030)			TI	P I-4700	A	COUN	TY BUN	ICON	IBE			GEOLOGIST W. Hamrick		
SITE	DESCR	IPTION	I-26	from 1	Near N	NC 280 (E	xit 40) to	Near NC 1	146 (Exit	37) E	EXTEN	CUL	VER1	AND TUNNEL STA 983-984	GROUND WI	R (ft)
BOR					ALIGNMENT -NBL1-	0 HR.	N/A									
COL	LAR ELI	EV. 2,0	32.3 1	ft	т	OTAL DEF	PTH 4.0	ft	NORT	HING	646,4	94		EASTING 942,395	24 HR.	N/A
DRIL	L RIG/HAI	MMER EI	FF./DA	TE N/	<u> </u>						DRILL N	IETHO	D Ha	nd Auger/Sounding Rod HAMI	MER TYPE N/A	
DRIL	LER J	Hovle			S	TART DAT	E 08/23	3/17	COMF		E 08/2			SURFACE WATER DEPTH N	/A	
ELEV (ft)	DDI\/E	DEPTH (ft)	BLO 0.5ft	0.5ft		0		/S PER FOO		100	SAMP.	МОІ	L O G	SOIL AND ROCK DES		
2035	-	-											-	2,032.3 GROUND SURF		0.0
2030	<u>.</u>	† - -												ROADWAY EMBAN Soft, Brown-Tan, Fine Sand Trace Mica 2,028.3	SILT (A-4) with	4.0
						INVERT I CULVER INVERT I TUNNEL	ELEVATION TEXTENSI ELEVATION EXTENSI ELEVATION EXTENSI ELEVATION EXTENSI ELEVATION ELE	ON OF PROFISION OF PROFISION OF PROFISION OF PROFISION OF PROFISION OF PROFISION OUTLET	POSED: 2025.34' POSED ET: 2023.2' POSED C2040'	1 AR AR				Boring Terminated at Eleva SILT (ROADWAY EMB Note: Sounding rod pushed to 5.0' to refusal at 6.0'. 11bpf r 5.0'-6.0'.	ANKMENT) then hammered	4.0

SHEET 8

CONTENTS 4400C SHEET NO. REFERENCE 4 3

PROIE

7-9

DESCRIPTION

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

CROSS SECTION(S)

TITLE SHEET

BORE LOG(S) SOIL TEST RESULTS

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION <u>I-26 FROM US 25 BUSINESS</u> (EXIT 44) TO NEAR NC 280 (EXIT 40)

SITE DESCRIPTION RETAINING WALL 0 ON -Y13RPC-FROM 11+25 TO 16+25, 27.5' RIGHT

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4400C	1	10

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 NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

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

NOTES:

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.

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.

S. WOODS S. DAVIS T. BEARD INVESTIGATED BY $F \otimes R$, Inc.DRAWN BY _T.T. WALKER CHECKED BY _D. RACEY SUBMITTED BY P. ALTON, P.E. DATE JANUARY 2019

PERSONNEL



Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street Raleigh, North Carolina 27603-2302 | USA T 919.828.3441 | F 919.828.5751

HILLIAM CARO RTH CAROL SEAL 033758 A TRICK MAIN

1/29/2019 alrucos

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

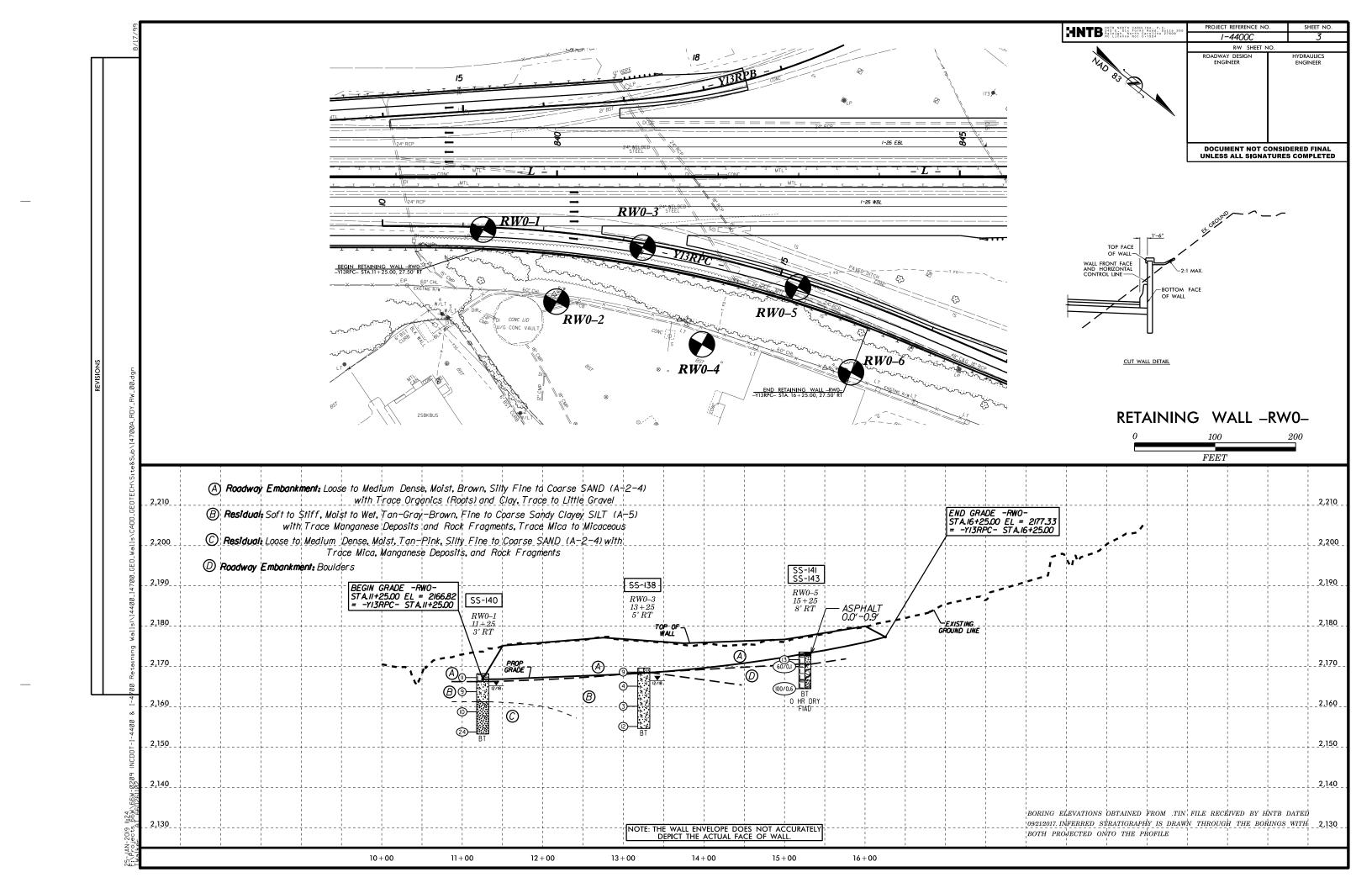
PROJECT REPERENCE NO.	SHEET NO.
I–4400C	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

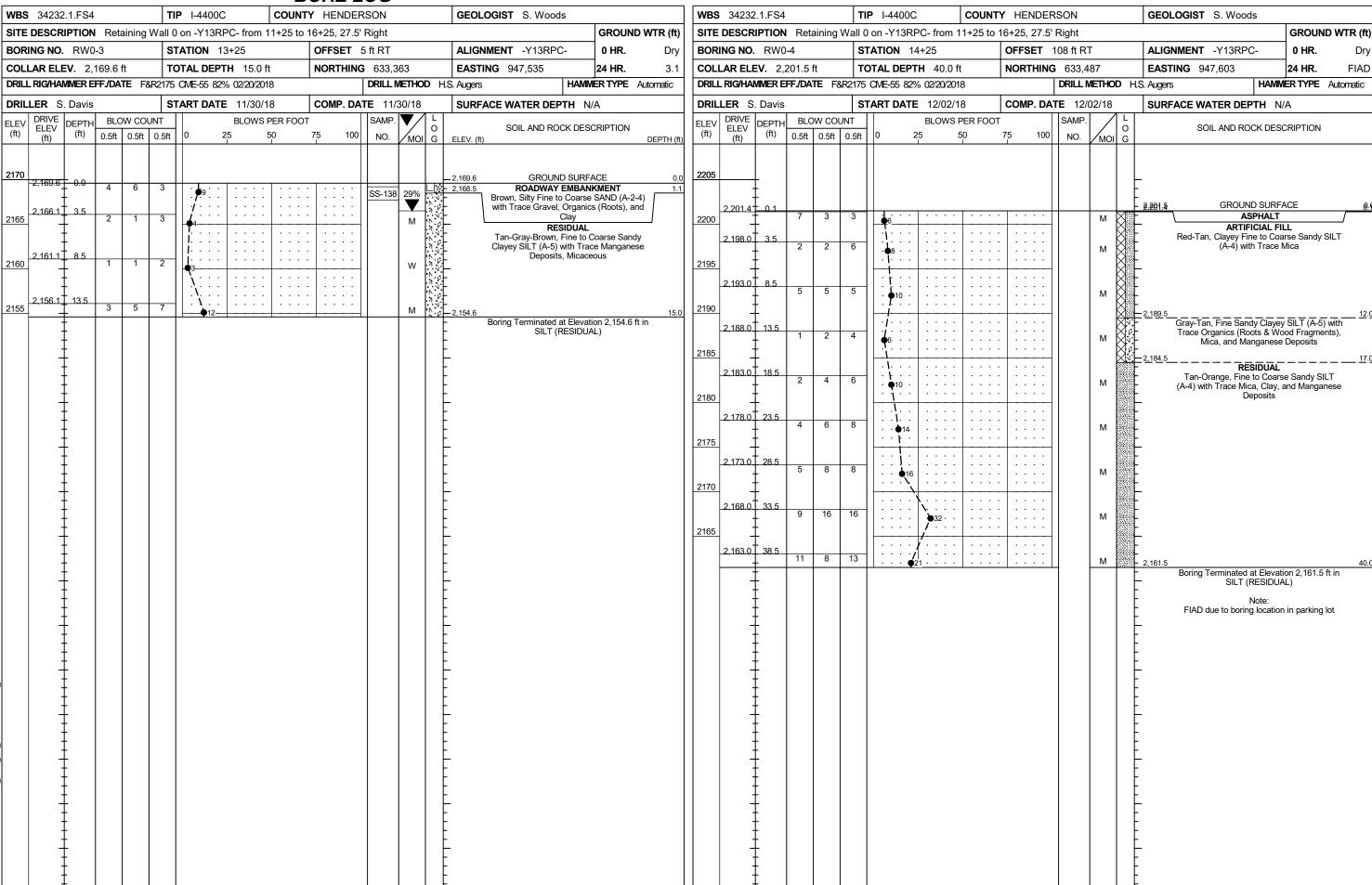
SUBSURFACE INVESTIGATION

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.	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.	ALLUYIUM (ALLUY.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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.SULTY CLAY.MOIST WITH INTERBEDDED FINE SAND 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 VILLY NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENEDAL COANILAD MATERIAL C CILT. CLAY MATERIAL C	MINERALOGICAL COMPOSITION	EINE TO COARSE CRAIN ICNICALS 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, GREISS, 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. COMPRESSIBILITY	NON CRYSTALLING FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
00000000000000000000000000000000000000	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 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 − 50	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
PASSING GRANULAR SILT-MUCK,	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*18 58 MX 58 MX 51 MN 55 MX 55 MN 55	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
אויין 25 אוי	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 140	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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 IW MX IW MX II MN IW MX IW MX II MN II MN MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX 0 0 4 MX 8 MX 12 MX 16 MX NU MX AMUUNIS UF SOILS		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	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 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, RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	<u>√PW</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(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. FLOOD PLAIN (FP) - LAND BORDERING A STREAM. BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
AS SUBGRADE P1 OF A-7-5 SUBGROUP IS ≤ LL - 30 ; P1 OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK.	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	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PANCE OF STANDARD PANCE OF UNICONETNED	CT	(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 CONSISTENCY PENETRATION RESISTENCE (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE 4	SPT C CLORE 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 KAQLINIZED	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANII AR LOOSE 4 TO 10	SOIL SYMBOL SYMBOL STATEST BORING SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	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.
(NON-COHESIVE) VERY DENSE > 50	TITLE TONDWHITE EMBHINAMENT TO TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	— INFERRED SOIL BOUNDARY — CORE BORING ■ SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>	OF AN INTERVENING IMPERVIOUS STRATUM,
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MW MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	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
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	A DIE ZOMETED	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY ☐ INSTALLATION SPT N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION -	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	ICCO UNSUITABLE WASTE ICCO AN THE TOP 2 EFET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - SSED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. 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 OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN Ø.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION (ATTERBERG LIMITS) DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON 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	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.
LL _ LIOUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	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 \(\omega \) - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: N/A
PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	DENCH MIHRK; IV A
- MOIST - (M) COLIDATION NEAR ORTIMIN 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: N/A FEET
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
PEOLITICE ADDITIONAL MATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
- DRY - (D) ATTAIN OPTIMUM MOISTURE	X CME-55 G* CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X 8" HOLLOW AUGERS	INDURATION	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FROM HNTB ON 9/21/2017
NON PLASTIC 0-5 VERY LOW	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND TOOLS:	RUBBING WITH FINGER FREES NUMEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	CASING W/ ADVANCER HAND TOULS:	CDAING CAN BE CERARATED FROM CAMPLE WITH CIFEL BRORE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED ORANGE 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;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	lo ō ŏ	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14
	. – – – – – – – – – – – – – – – – – – –		52.0.15



WBS 34232.1.FS4		TY HENDERSON	GEOLOGIST S. Woods	WBS 34232.1.FS4	TIP 1-4400C CO	DUNTY HENDERSON	GEOLOGIST S. Woods
SITE DESCRIPTION Retaining Wa			GROUND WTR (ft	+	Retaining Wall 0 on -Y13RPC- from 11+2		GROUND WTR (1
	STATION 11+25	OFFSET 3 ft RT	ALIGNMENT -Y13RPC- 0 HR. Dry		 	OFFSET 86 ft RT	ALIGNMENT -Y13RPC- 0 HR. DI
COLLAR ELEV. 2,168.2 ft	TOTAL DEPTH 15.0 ft	NORTHING 633,180	EASTING 947,613 24 HR. 3.0	COLLAR ELEV. 2,1	91.1 ft TOTAL DEPTH 35.0 ft	NORTHING 633,303	EASTING 947,646 24 HR . FIA
DRILL RIG/HAMMER EFF/DATE F&R2	175 CME-55 82% 02/20/2018	DRILL METHOD H	S. Augers HAMMER TYPE Automatic	DRILL RIG/HAMMER EF	F-/DATE F&R2175 CME-55 82% 02/20/2018	DRILL METHOD	H.S. Augers HAMMER TYPE Automatic
DRILLER S. Davis	START DATE 12/01/18	COMP. DATE 12/01/18	SURFACE WATER DEPTH N/A	DRILLER S. Davis	START DATE 12/02/18	COMP. DATE 12/02/18	SURFACE WATER DEPTH N/A
ELEV (ft) DRIVE (LEV (ft) 0.5ft 0.5ft 0.5ft 0.5ft	I	75 100 SAMP. V L O NO. MOI G	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)	ELEV DRIVE ELEV (ft) DEPTH (ft)	BLOW COUNT BLOWS PER 0.5ft 0.5ft 0 25 50	FOOT SAMP. L O NO. MOI G	
	6	MOI G MOI G MOI G MOI G SS-140 21%	2,168.2 GROUND SURFACE 0 ROADWAY EMBANKMENT 2,166.2 Brown, Silty Fine to Coarse SAND (A-2-4) 2. with Trace Organics (Roots) and Little Gravely RESIDUAL Tan, Fine to Coarse Sandy Clayey SILT (A-5) with Trace Mica, Manganese Deposits, and Rock Fragments Tan-Pink, Silty Fine to Coarse SAND (A-2-4) with Trace Mica, Manganese Deposits, and Rock Fragments Rock Fragments	2195 2195 2190 2,190.9 0.2 2,187.6 3.5 2185 2,182.6 8.5	9 5 4 2 1 1 1 1 2 3 5 6 3 5 6 3 5 5 6 3 5 5 6	75 100	GROUND SURFACE
CDOT BORE DOUBLE 1400C_GEO_BH_WALLS.GPJ NC_DOT.GDT 1/25/19							



		BORE LOG											
WBS 34232.1.FS4	TIP I-4400C COUN	ITY HENDERSON	GEOLOGIST S. Woods		WBS 34232	.1.FS4	T	TIP I-4400C	COUNTY HEND	DERSON	GE	OLOGIST S. Woods	
SITE DESCRIPTION Retaining V	Vall 0 on -Y13RPC- from 11+25 to	o 16+25, 27.5' Right		GROUND WTR (ft)	SITE DESCRI	PTION Retain	ning Wall (0 on -Y13RPC- from	11+25 to 16+25, 2	7.5' Right			GROUND WTR (ft)
BORING NO. RW0-5	STATION 15+25	OFFSET 8 ft RT	ALIGNMENT -Y13RPC-	0 HR. Dry	BORING NO.	RW0-6	S	STATION 16+25	OFFSE [*]	T 86 ft RT	AL	IGNMENT -Y13RPC-	0 HR. Dry
COLLAR ELEV. 2,173.6 ft	TOTAL DEPTH 9.1 ft	NORTHING 633,556	EASTING 947,483	24 HR. FIAD	COLLAR ELE	V. 2,202.9 ft	T	OTAL DEPTH 35.0 f	t NORTH	ING 633,665	EA	STING 947,542	24 HR. Dry
DRILL RIG/HAMMER EFF/DATE F&F	22175 CME-55 82% 02/20/2018	DRILL METHOD H	S. Augers HAMIN	MER TYPE Automatic	DRILL RIG/HAN	MER EFF/DATE	F&R2175	5 CME-55 82% 02/20/20	18	DRILL MET	THOD H.S. Aug	gers HA	AMMER TYPE Automatic
DRILLER S. Davis	START DATE 12/01/18	COMP. DATE 12/01/18	SURFACE WATER DEPTH N	I/A	DRILLER S.	Davis	S	START DATE 12/02/1	18 COMP .	DATE 12/02/	18 SU	RFACE WATER DEPTH	N/A
ELEV Cft) DEPTH BLOW COUL		OT SAMP. V L O NO. MOI G	SOIL AND ROCK DES	CCRIPTION DEPTH (ft)	ELEV CHICKET		/ COUNT 0.5ft 0.5ft	-	PER FOOT 50 75 1	SAMP.	MOI G	SOIL AND ROCK [DESCRIPTION
2175	7	M	2,173.6 GROUND SURF 2,172.7 ASPHALT ROADWAY EMBAN Brown, Silty Fine to Coarse with Little Gra BOULDER 2,166.6 BOULDER -2,164.5 Boring Terminated at Elevar BOULDER (ROADWAY EMBAN Note: FIAD due to boring location	0.9 IKMENT SAND (A-2-4) , 3.0 vel 7.0 9.1 tion 2,164.5 ft in MBANKMENT)	2205 2,202.9 2200 2,199.4 2195 2,194.4 2180 2,189.4 2180 2,179.4 2175 2,174.4	- 3.5	2 2 5 5 5 1 2 2 2 5 8 7 10 8 8 8	10		SS-143 28	V 2,195	ARTIFICIA Red-Tan, Fine Sandy SI Mica, Clay, Mangane Organics (I Gray-Tan, Fine Sandy CI Trace Organics (Red Orange-Brown, Silty Fine with Trace Organics (F	L FILL LT (A-4) with Trace se Deposits, and Roots)
NCDOT BORE DOUBLE 14400C_GEO_BH_WALLS.GPJ NC_DOT.GDT 1/25/19					2170	33.5	4 6	10 · · · · · · · · · · · · · · · · · · ·		·	M 1 1 2,167	Tan-Orange, Fine to Co SILT (A-5) with Trace M	ica and Manganese its 35.0 evation 2,167.9 ft in

North Carolina Department of Transportation Division of Highways Materials and Test Unit Soils Laboratory

T.I.P. ID NO.: I-4400C

DESCRIPTION: Retaining Wall 0 on -Y13RPC- from 11+25 to 16+25, 27.5' Right

REPORT ON SAMPLES OF: SOIL FOR QUALITY

 WBS No.:
 34232.1.FS4
 COUNTY:
 Henderson

 DATE SAMPLED:
 12/18
 RECEIVED:
 12/18

 SAMPLED FROM:
 -Y13RPC REPORTED:
 12/18

 SUBMITTED BY:
 D. Racey
 D. Council Cert No. 101-02-0603

TEST RESULTS

PROJ. SAMPLE NO.	SS-140	SS-138	SS-141	SS-143				
BORING NO.	RW0-1	RW0-3	RW0-6	RW0-6				
Retained #4 Sieve %	2.1	0.0	0.0	3.7				
Passing #10 Sieve %	85.1	100.0	98.3	96.2				
Passing #40 Sieve %	62.4	97.6	87.9	92.3				
Passing #200 Sieve %	34.7	51.7	46.8	62.0				

SOIL MORTAR - 100%								
Coarse Sand Ret - #60 %	38.9	16.0	24.1	12.9				
Fine Sand Ret - #270 %	26.9	40.3	36.0	25.7				
Silt 0.053 - 0.010 mm %	18.9	30.5	21.2	14.2				
Clay < 0.010 mm %	15.3	13.2	18.7	47.2				
L.L.	39	41	39	38				
P.L.	36	40	34	24				
P.I.	3	1	5	14				
AASHTO Classification	A-2-4 (0)	A-5 (0)	A-4 (1)	A-6 (7)				
Station	11+25	13+25	16+25	16+25				
Offset	3' RT	5' RT	86' RT	86' RT				
Depth (ft)	8.5	1.1	0.0	13.5				
to	10.0	1.5	1.5	15.0				
Alignment	-Y13RPC-	-Y13RPC-	-Y13RPC-	-Y13RPC-				
Moisture Content (%)	21.4	29.4	20.4	24.7				
Organic Content (%)	NT	NT	NT	NT				

NP = Not plastic

NT = Not tested

ND = Not Determined

CL = Centerline

W.P. Alton, P.E.

Soils Engineer

4700A

CONTENTS

DESCRIPTION

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

CROSS SECTION(S)

TITLE SHEET

BORE LOG(S) SOIL TEST RESULTS

SHEET NO.

4-5

6-10

REFERENCE

6030 3 **PROJEC**

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION <u>I-26 FROM NEAR NC 280</u> (EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 3 ON -EBL-FROM 886+00 TO 891+50, 39.29' LEFT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	11

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 NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 (INP-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 NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE TOTAL WITH THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

NOTES:

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.

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

C. BOYCE	T. SHARPE
J. HOYLE	S. DAVIS
	D. AIELLO
	M. RENZA
	D. RACEY
	N. CONSIGLI
	S. WOODS
	INVESTIGATED BY F&R, Inc.
	DRAWN BY
	CHECKED BYD. RACEY
	SUBMITTED BY P. ALTON, P.E.
	DATE NOVEMBER 2018



033758 ATRICK MINI atrice (lton 11/26/2018

> **DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

Prepared in the Office of: FROEHLING & ROBERTSON, INC. Engineering Stability Since 1881 310 Hubert Street Raleigh, North Carolina 27603-2302 | USA T 919.828.3441 | F 919.828.5751

RTH CAROLL

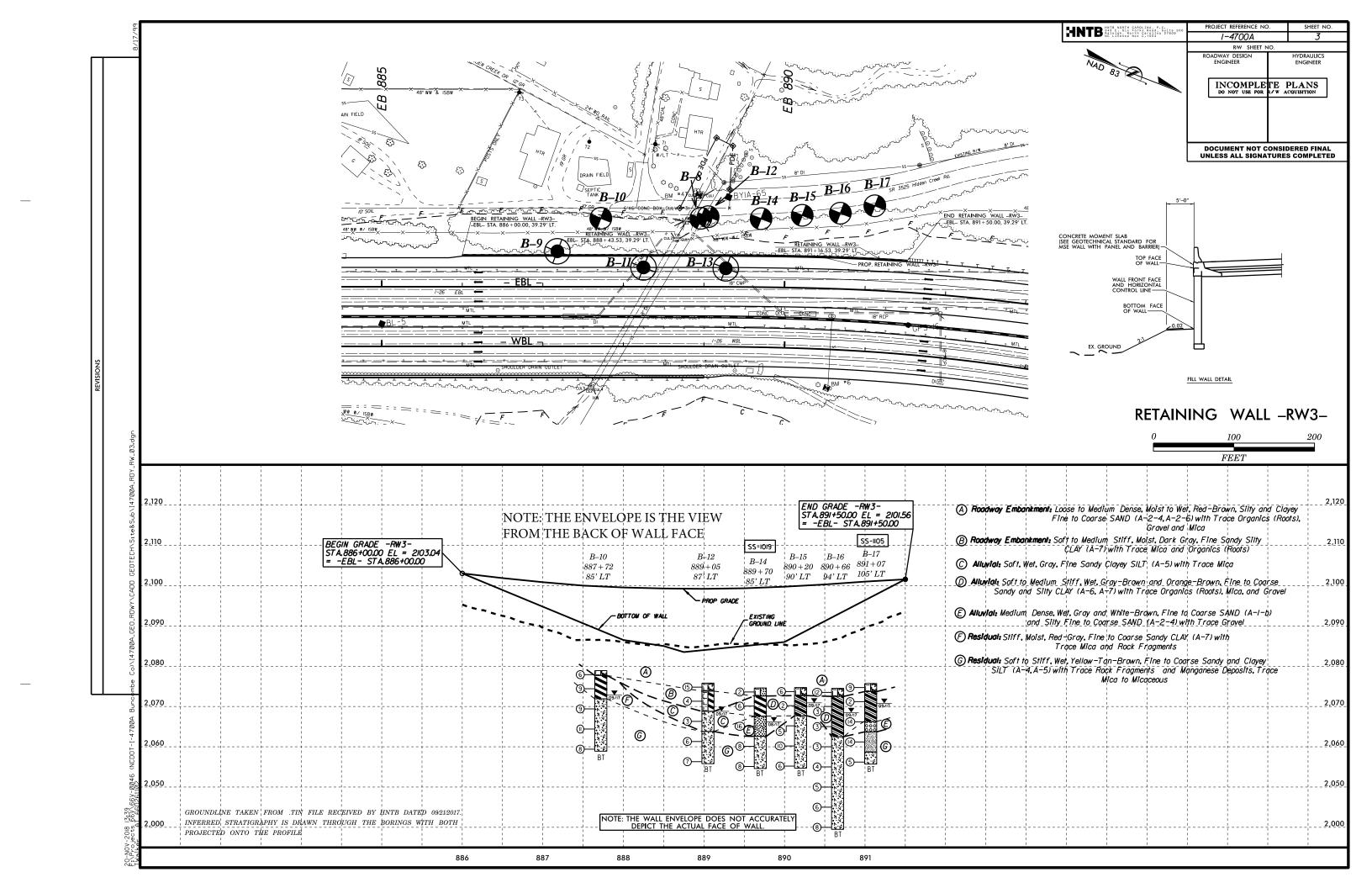
PROJECT REFERENCE NO. 2 I-4700A

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 208, ASTM D1586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, ASSHOL CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANDOT LAST PLASTICITY, ETC. FOR EXAMPLE,	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 Ø.I 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:	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
VERY STIFF,GRAY,SILTY CLAY,MOIST WITH INTERBEDDED FINE SAND LAYERS,HIGHLY PLASTIC.A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL CLASS. GRANULAR MATERIALS (≤ 35%, PASSING *200) SILT-CLAY MATERIALS (> 35%, PASSING *200) ORGANIC MATERIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	ROCK (WR) 100 BLOWS PER FOOT IF TESTED. CRYSTALLINE ROCK (CR) FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD VIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, CRYSTAC ROCK (CR)	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.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-1, A-2 A-3 A-6, A-7	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK (NCR) COASTAL PLAIN COASTAL PLAIN SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTOKE, SANDSTONE, CEMENTED	COLLUYIUM - 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 DIVIDE
7. PASSING "10 50 MX GRANULAR SILT-CLAY MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC. WEATHERING	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
*40 30 MX 50 MX 51 MN PEAT ** *200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 56 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.	
MATERIAL PASSING *40 SOILS WITH	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. NO DISCOURTED TO BE THE HORIZONTAL TRACE OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN LITTLE OR HIGHLY PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN MODERATE OCCUMENT	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	(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. FINE SHITY OR CLAYEY SHITY CLAYEY MATTER	₩ATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) I 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.
OF MAJOR GRAVEL AND SAND GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS CENTERIALS SAND CRAVEL AND SAND GRAVEL AND SAND SOILS SOILS	▼ STATIC WATER LEVEL AFTER 24 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	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR POOR UNSUITABLE	SPRING OR SEEP	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED 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 - 30 :PI OF A-7-6 SUBGROUP IS > LL - 30 CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL	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
CONSISTENCY (N-YALUE) (TONS/FT ²) GENERALLY VERY LOOSE 4 4	WITH SOIL DESCRIPTION → OF ROCK STRUCTURES SOIL SYMBOL → SPT DATE HOLICATOR SOIL SYMBOL → SPT DATE HOLICATOR SPT DATE HOLICATOR SOIL SYMBOL → SPT DATE HOLICATOR SOIL SYMBOL → SPT DATE HOLICATOR	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	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
CENERALL LOOSE 4 TO 10	ARTIFICIAL FILL (AF) OTHER AUGER PORING CONE PENETROMETER	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 56 VERY DENSE > 56 VERY SOFT < 2 < 0.25	THAN ROADWAY EMBANKMENT TEST INFERRED SOIL BOUNDARY	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE 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	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	MW TEST POPING	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 0.5 TO 1.0	INFERRED ROCK LINE MONITORING WELL WITH CORE INSTALLATION SPT N-VALUE	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 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 RUM AND EXPRESSED AS A PERCENTAGE.
HARD	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PAREN
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	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 COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNDERCUT UNDERCUT UNCLASSIFIED EXCAVATION - 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, COUGES 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.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 SOIL MOISTURE - CORRELATION OF TERMS	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 - DRY UNIT WEIGHT	MEDIUM 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	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 SO: 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 (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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 (SAT.) FROM BELOW THE GROUND WATER TABLE	OPT - DYNAMIC PENETRATION TEST	PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	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 B THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMISULIDI REUDIRES DATING TO ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK: N/A
	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: N/A 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	NOTES:
REQUIRES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN OPTIMUM MOISTURE	X CME-55 G* CONTINUOUS FLIGHT AUGER CORE SIZE: X 8* HOLLOW AUGERS -BH	THINLY LAMINATED < 0.008 FEET INDURATION	=HAND AUGER BORING WITH SOUNDING ROD
PLASTICITY NOTICE OF CONCENTRATE	.	INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	HABT= HAND AUGER BORING TERMINATED FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC Ø-5 VERY LOW	TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING WY ADVANCER HAND TOOLS:	GENILE BLUW BY HAMMER DISINIEGRATES SAMPLE.	FROM HNTB ON 9/21/2017
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH X HAND AUGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	X CME-550X TRICONE TUNGCARB. X 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.	CORE BIT VANE SHEAR TEST	UIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-



SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50 BORING NO. B-8 STATION 888+96 C COLLAR ELEV. 2,076.2 ft TOTAL DEPTH 15.0 ft N DRILL RIG/HAMMER EFF/DATE F&R3763 CWE-550X 86% 1/30/2017 DRILLER C. Boyce START DATE 07/27/17 C ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOOT	0, 39.29' Left OFFSET 85 ft LT NORTHING 637,625 DRILL METHOD H.S.	GEOLOGIST N. Consigli ALIGNMENT -EBL1- 0 HR. Dry EASTING 945,362 24 HR. 10.2 Augers HAMMER TYPE Automatic SURFACE WATER DEPTH N/A	BORING NO. B-9 COLLAR ELEV. 2,088.2 ft DRILL RIG/HAMMER EFF/DATE N/A		.eft	GEOLOGIST S. Woods GROUND WTR (f ALIGNMENT -EBL-
BORING NO. B-8	OFFSET 85 ft LT NORTHING 637,625 DRILL METHOD H.S. COMP. DATE 07/27/17 SAMP. L 0	ALIGNMENT -EBL1- 0 HR. Dry EASTING 945,362 24 HR. 10.2 Augers HAMMER TYPE Automatic	BORING NO. B-9 COLLAR ELEV. 2,088.2 ft DRILL RIG/HAMMER EFF/DATE N/A	STATION 887+18 OFFSET TOTAL DEPTH 2.4 ft NORTHIN	44 ft LT G 637,474	ALIGNMENT -EBL-
COLLAR ELEV. 2,076.2 ft	DRILL METHOD H.S.	EASTING 945,362 24 HR. 10.2 Augers HAMMER TYPE Automatic	COLLAR ELEV. 2,088.2 ft DRILL RIG/HAMMER EFF/DATE N/A	TOTAL DEPTH 2.4 ft NORTHIN	G 637,474	EASTING 945,465 24 HR . N/A
DRILL RIG/HAMMER EFF/DATE F&R3763 CME-550X 86% 1/30/2017 DRILLER C. Boyce START DATE 07/27/17 C ELEV (ft) DEPTH (ft) BLOW COUNT (ft) 0 25 50 75	DRILL METHOD H.S. COMP. DATE 07/27/17 SAMP. V L	Augers HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF/DATE N/A			
DRILLER C. Boyce START DATE 07/27/17 C ELEV (ft) DEPTH (ft) BLOW COUNT (ft) BLOWS PER FOOT 0.5ft 0 25 50 75	COMP. DATE 07/27/17 SAMP. L 0				DRILL METHOD H	land Auger HAMMER TYPE N/A
ELEV (ft) DEPTH BLOW COUNT BLOWS PER FOOT	SAMP. V L	SURFACE WATER DEPTH N/A	DDULED DAGETE		-	
(ii) (ft) (iii) 0.5ft 0.5ft 0.5ft 0 25 50 75			DRILLER D.Aiello		ATE 08/14/17	SURFACE WATER DEPTH N/A
		SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft	DRIVE DEPTH BLOW COURT Court	I	SAMP. CONDITION ON SOIL AND ROCK DESCRIPTION	
2075 2076 2 0.0 4 3 2 2070 2070 2077 8.5 2 1 2 2065 2065 2062 7 13.5 2 3 5	M M	2,076.2 GROUND SURFACE 0.0 ROADWAY EMBANKMENT 2,074.2 Brown, Fine to Coarse Sandy SILT (A-4) with 2.0 Trace Organics (Roots) and Gravel Red-Brown, Fine Sandy CLAY (A-7-6) with Trace Gravel, Highly Plastic 2,069.2 ALLUVIAL Gray, Fine to Coarse Sandy Clayey SILT (A-5) RESIDUAL RESIDUAL	2090	0.5ft 0 25 50 75 100	M M	2,088.2 GROUND SURFACE RESIDUAL 2,085.8 (A-4) with Trace Rock Fragments and Organics (Roots) Boring Terminated at Elevation 2,085.8 ft in SILT (RESIDUAL) Note: Hand Auger Refusal at 2.4'. Sounding rod pushed to 1.2', then hammered to refusal at 7.1'

		BORE LOG			. —									
WBS 36030.1.FS4 TIP I-4700A COUNTY BUNCOMBE GEOLOGIST S. Woods			┨ ├──	S 36030.1.F				TY BUNCOMBE			GEOLOGIST S. Woods			
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 3					SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to								GROUND WTR (ft)	
BORING NO. B-10	STATION 887+72	OFFSET 85 ft LT	ALIGNMENT -EBL-	0 HR. 16.0	I -	RING NO. B-			ATION 888+25	OFFSET			ALIGNMENT -EBL-	0 HR . N/A
COLLAR ELEV. 2,078.9 ft	TOTAL DEPTH 20.0 ft	NORTHING 637,509	EASTING 945,407	24 HR. 6.1		LAR ELEV.			TAL DEPTH 1.7 ft	NORTHIN			EASTING 945,445	24 HR . N/A
DRILL RIG/HAMMER EFF./DATE	F&R2175 CME-55 88% 02/11/2017	DRILL METHOD	H.S. Augers HAMN	MER TYPE Automatic	DRIL	L RIG/HAMMER	REFF./DATE N/	Α			DRILL	METHOD	Hand Auger HAM	IMERTYPE N/A
DRILLER S. Davis	START DATE 09/06/17	COMP. DATE 09/06/17	SURFACE WATER DEPTH N	I/A	DRII	LLER D. Aie			ART DATE 08/14/17	COMP. DA			SURFACE WATER DEPTH	N/A
ELEV (ft) DEPTH BLOW C (ft) (ft) 0.5ft 0.5	I I	75 100 NO. MOI	SOIL AND ROCK DES	CCRIPTION DEPTH (ft)	ELEV (ft)	/ DRIVE ELEV (ft)	BLOW COU 0.5ft 0.5ft		BLOWS PER FOO 0 25 50	T 75 100	SAMF NO.	1 / 10		SCRIPTION
2,078.9 0.0	3 4	M	2,078.9 GROUND SURF		-								_	
	1 10 10 10 10 10 10 10 10 10 10 10 10 10		Brown, Clayey Fine SAND (A Gravel, Organics (Roots	A-2-6) with Trace	1					.			2,096.6 GROUND SUR 2,095.6 ROADWAY EMBA	
2075 2,075.4 3.5 4 4			RESIDUAL Red-Gray, Fine to Coarse Sa		2095	\					4	W	PO 2,095.6 ROADWAY EMBA Soft, Dark Brown, Fine to SILT (A-4) with Trace Orga	Coarse Sandy
			with Trace Mica and Roc	ck Fragments									Gravel	
2070 2,070.4 8.5		.	Tan-Brown, Clayey SILT (A	A-5) with Trace anese Deposits.		1 ±							Loose, Brown, Fine to Coal with Trace Gr	avel
2 4	5	W	Micaceous	,,		<u> </u>							Boring Terminated at Eleva SAND (ROADWAY EM	ation 2,094.9 ft in IBANKMENT)
						1 1							Note:	,
2065 2,065.4 13.5 3 5			.v.			 							Hand Auger Refusal at 1.7	7'. Sounding rod
						1							termination at	
2060 2,060.4 18.5						 							-	
3 5	3 8	W ?!		20.0 tion 2 058 9 ft in	4	Ŧ							-	
			SILT (RESIDUA	AL)		 							-	
			Note: - 0.0'-0.2' = SURFICIAL OR	ICANIC COIL C		‡							F	
			- 0.0-0.2 = SURFICIAL OR	GANIC SOILS									-	
			-			‡							F	
			-			‡							-	
			F			‡							F	
			<u> </u>			‡							-	
			ļ.			‡							-	
			ļ.			‡								
			-			‡							-	
			-			‡							‡	
			-			‡							<u> </u>	
<u>,</u>			-			‡							‡	
			-			‡							‡	
			-			‡							-	
			-			‡							ţ	
			_			‡							_	
			-			‡								
						‡							<u> </u>	
			-			‡							-	
			_			‡							_	
			ţ			‡							<u> </u>	
			<u> </u>			‡							ţ	
			-			 							-	
			F			 							E	
			-										-	
			F			‡							F	
[F			‡							F	
			r			†	1						T	

BORE LOG									
WBS 36030.1.FS4	TIP I-4700A COUN	ITY BUNCOMBE	GEOLOGIST S. Woods		WBS 36030.1.FS4	TIP I-4700A COUN	NTY BUNCOMBE	GEOLOGIST S. Woods	
SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left			GROUND WTR (ft)	SITE DESCRIPTION Retaining	g Wall 3 on EBL from 886+00 to 89	1+50, 39.29' Left		GROUND WTR (ft)	
BORING NO. B-12	STATION 889+05	OFFSET 87 ft LT	ALIGNMENT -EBL-	0 HR . Dry	BORING NO. B-13	STATION 889+27	OFFSET 23 ft LT	ALIGNMENT -EBL-	0 HR. N/A
COLLAR ELEV. 2,075.8 ft	TOTAL DEPTH 20.0 ft	NORTHING 637,633	EASTING 945,357	24 HR. 7.0	COLLAR ELEV. 2,095.5 ft	TOTAL DEPTH 2.8 ft	NORTHING 637,676	EASTING 945,409	24 HR. N/A
DRILL RIG/HAMMER EFF./DATE F&R	2175 CME-55 88% 02/11/2017	DRILL METHOD H	.S. Augers HAMN	MER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE	VA .	DRILL METHOD	D Hand Auger HAMI	MERTYPE N/A
DRILLER S. Davis	START DATE 09/06/17	COMP. DATE 09/06/17	SURFACE WATER DEPTH N	/A	DRILLER D. Aiello	START DATE 08/14/17	COMP. DATE 08/14/17	SURFACE WATER DEPTH N	I/A
ELEV (ft) DRIVE ELEV (ft) DEPTH BLOW COUNTY (ft) 0.5ft 0.5ft 0		75 100 NO. MOI G	SOIL AND ROCK DES	CRIPTION DEPTH (ft)	ELEV CHARACTER SHOW COUNTY (ft) DEPTH (FT) D	_ 	OT SAMP. NO. MOI	L O SOIL AND ROCK DES	CRIPTION
2080				ACF 0.0	2100			CDOUND CUID	TACE OF
	8	M		KMENT	2095			- 2,095.5 GROUND SURF ROADWAY EMBAN Soft, Orange-Brown, Claye	IKMENT
2,072.3 3.5 3 2	2		 Mica, Some Gra 	avel /				Sandy SILT (A-4) with Tr (Roots) and Mica, Trace to	ace Organics o Little Gravel
2070	 		Dark Gray, Fine Sandy Silty 2,068.8 Trace Mica and Organi	CLAY (A-7) with ics (Roots) 7.0				Boring Terminated at Eleva SILT (ROADWAY EMB	tion 2,092.7 ft in ANKMENT)
	j	· · · · ·	ALLUVIAL Gray, Fine Sandy Clayey S Trace Mica	SILT (A-5) with				L Note: Hand Auger Refusal at 2.8	'. Sounding rod
2065	1			12.0				pushed to 1.0', then hamme 6.9'.	ered to refusal at
2,062.3 13.5 2 3	3 6	· · · · ·	 Yellow-Tan-Brown, Clayey Trace Manganese Deposits 	, Trace Mica to					
2,057.37 18.5	1	1 1 1 PN -1	— Micaceous -					-	
	3 7	w		20.0 ion 2,055.8 ft in				- -	
			- SILT (RESIDU)					<u>-</u>	
			- - -					Ē	
			- - -					-	
			- -					-	
			- -					-	
			- -					-	
			- -					<u> </u>	
			- -					Ę.	
			- -					ļ.	
			_ -					-	
9/18			- -					ţ	
11/2			- -					<u>L</u>	
			<u>-</u> -					t	
			<u>-</u>					Ł	
			- -					F	
			- -					-	
			- -					F	
			- -					F	
			. -					ţ	
			- -					Ł	
			- -					Ł	
			- -					-	
$\left \begin{array}{cccccccccccccccccccccccccccccccccccc$			- -		‡			F	
			- -					-	
			- -					ţ	
			<u>_</u> -		‡			-	
			- -					ţ	
			-					<u> </u>	

2075 2,074.6 0.0 1 1 1 1 1	BORE LOG						
BORING NO. B-14 STATION 889-70 OFFSET 85 ft.T ALIGNMENT -EBL- 0 HR. 12 2 COLLAR ELEV. 2,074.6 ft TOTAL DEPTH 20.0 ft NORTHING 637,695 EASTING 945,335 24 HR. 8.4 COLLAR ELEV. 2,074.7 ft TOTAL DEPTH 20.0 ft NORTHING 637,695 EASTING 945,335 24 HR. 8.4 COLLAR ELEV. 2,074.7 ft TOTAL DEPTH 20.0 ft NORTHING 637,741 DRILL METHOD 15 DRILL METH	WBS 36030.1.FS4 TIP I-4700A COUNTY BUNCOMBE					GEOLOGIST S. Woods	
COLLAR ELEV. 2,074.6 ft TOTAL DEPTH 20.0 ft NORTHING 637.695	SITE DESCRIPTION Retaining Wall 3 on EBL from 886+00 to 891+50, 39.29' Left	GROUND WTR (ft)	SITE DESCRIPTION Retaining W	/all 3 on EBL from 886+00 to 891+	50, 39.29' Left	GROUND WTR (ft)	
DRILL RIGHAMMER EFF/DATE F8R2/75 CVE-55 80% (02/11/2017 DRILL METHOD HS Augers HAMMER TYPE Automatic SURFACE WATER DEPTH N/A	BORING NO. B-14 STATION 889+70 OFFSET 85 ft LT	ALIGNMENT -EBL- 0 HR. 12.2	BORING NO. B-15	STATION 890+20	OFFSET 90 ft LT	ALIGNMENT -EBL- 0 HR. Dry	
DRILLER D. Aiello		1,111			· ·	EASTING 945,313 24 HR. 3.8	
DRIVE CHI CH	DRILL RIG/HAMMER EFF/DATE F&R5785 CME-55 80% 02/11/2017 DRILL METHO	H.S. Augers HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF/DATE F&R	2175 CME-55 88% 02/11/2017	DRILL METHOD -	I.S. Augers HAMMER TYPE Automatic	
City City		SURFACE WATER DEPTH N/A		START DATE 09/06/17	COMP. DATE 09/06/17	SURFACE WATER DEPTH N/A	
2070 2071 1 3.5 2 3 3 3 6 8 2072 6 (A.2-4) with Trace Organics (Roots), Mica, and Gravel ALLUWIAL 2.065 6 11 5 4 3 5 2 3 5 8 W 2.2054 6 8 8 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10	LEEV ELEV Delivery Leev Lee	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)	(ft) ELEV (ft)	I		SOIL AND ROCK DESCRIPTION	
DOUBLE 14700A GEO BH RDWW WALLGPU NG	2075 2,074.6	2,074.6 GROUND SURFACE 0.0 ROADWAY EMBANKMENT Dark Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots), Mica, and Gravel ALLUVIAL Orange-Brown, Fine to Coarse Sandy Silty CLAY (A-7) with Trace Mica, Gravel, and Organics (Roots) Gray, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel 2,062.6 RESIDUAL Tan-Brown, Clayey SILT (A-5) with Trace Mica and Manganese Deposits RESIDUAL Department of the property of t	2075 2,074.7 2,071.2 3.5 1 2,066.2 8.5 2 3 2,066.2 18.5	4	W W W W W W W W W W		

	BORE									
WBS 36030.1.FS4	TIP I-4700A COUNTY BUNG	ICOMBE GE	OLOGIST S. Woods		WBS 36030.1.FS4		TIP I-4700A COUN	TY BUNCOMBE	GEOLOGIST S. Woods	
SITE DESCRIPTION Retaining Wal	II 3 on EBL from 886+00 to 891+50, 39.29	9' Left	GF	ROUND WTR (ft)	SITE DESCRIPTION	Retaining V	Wall 3 on EBL from 886+00 to 891	+50, 39.29' Left		GROUND WTR (ft)
BORING NO. B-16	STATION 890+66 OFFSE	ET 94 ft LT AL	IGNMENT -EBL- 0	HR. 12.9	BORING NO. B-17		STATION 891+07	OFFSET 105 ft LT	ALIGNMENT -EBL-	0 HR. 14.7
COLLAR ELEV. 2,074.5 ft	TOTAL DEPTH 35.0 ft NORTH	,			COLLAR ELEV. 2,		TOTAL DEPTH 20.0 ft	NORTHING 637,821	EASTING 945,269	24 HR. 4.9
DRILL RIG/HAMMER EFF./DATE F&R21	75 CME-55 88% 02/11/2017	DRILL METHOD H.S. Aug	gers HAMMER T	TYPE Automatic	DRILL RIG/HAMMER E	FF./DATE F&F	R2175 CME-55 88% 02/11/2017	DRILL METHOL	D H.S. Augers HAMI	MER TYPE Automatic
DRILLER S. Davis	START DATE 09/06/17 COMP.	. DATE 09/06/17 SU	RFACE WATER DEPTH N/A		DRILLER S. Davis		START DATE 09/06/17	COMP. DATE 09/06/17	SURFACE WATER DEPTH	1/A
DRILLER S. Davis	BLOWS PER FOOT 0 25 50 75	100 SAMP.	SOIL AND ROCK DESCRIP J. (ft) GROUND SURFACE ROADWAY EMBANKME Red-Brown, Clayey Fine to Coar (A-2-6) with Trace Gravel and C (Roots) ALLUVIAL Gray-Brown, Fine to Coarse Sa CLAY (A-6) with Trace Organics Mica, and Gravel	DEPTH (ft) E 0.0 ENT arse SAND 2.0 Organics andy Sitty es (Roots),	ELEV (ft) DRIVE (ELEV (ft) DEPTH (ft) 2080 2,075.7 - 0.0 2,072.2 3.5 2070 2,067.2 8.5	BLOW COUNT 0.5ft 0	INT BLOWS PER FOO	T SAMP. NO. MOI NO. SS-1105 27%	SOIL AND ROCK DESCRIPTION OF SOIL AND ROCK DE	FACE 0.0 NKMENT D Coarse SAND 2.0 I and Organics
2,061.0 13.5 1 1 2 2,056.0 18.5 2 1 3 2,051.0 23.5 2 2 3 2,045 2,046.0 28.5 2 2 4 2,040 2,041.0 33.5 2 3 5		W	RESIDUAL Tan-Brown, Fine to Coarse Sand SILT (A-5) with Trace Mica and N Deposits	ndy Clayey Manganese	2,062 2 13.5		10 114	· · · · · · · · · · · · · · · · · · ·	2,066.3 White-Brown, Fine to Coars with Trace Gra Pellow-Brown, Fine to Coars (A-4) with Trace Mica and I (A-4) with Trace Mica and I (B-4) with Trace Mica and Rock Fra Pellow-Brown, Clayey SILT Mica and Rock Fra SILT (RESIDU Note: 0.0-0.1' = SURFICIAL OF	12.0 12.0
NCDOT BORE DOUBLE 14700A_GEO_BH_RDWY WALL.GPJ NC_DOT.GDT 11/20/18			Boring Terminated at Elevation 2, SILT (RESIDUAL) Note: 0.0-0.3' = SURFICIAL ORGANI							

North Carolina Department of Transportation Division of Highways Materials and Test Unit Soils Laboratory

T.I.P. ID NO.: I-4700A

DESCRIPTION: Retaining Wall 3 on -EBL- from 886+00 to 891+50, 39.29' Left

REPORT ON SAMPLES OF: SOIL FOR QUALITY

 WBS No.:
 36030.1.FS4
 COUNTY:
 Buncombe

 DATE SAMPLED:
 8/17 & 9/17
 RECEIVED:
 8/17

 SAMPLED FROM:
 -EBL REPORTED:
 9/17

 SUBMITTED BY:
 D. Racey
 D. Jenks

 Cert No. 101-02-0603
 Cert No. 101-02-0603

TEST RESULTS

				IESIKI	:50L15				
PROJ. SAMPLE NO.	SS-1019	SS-1105						T	
BORING NO.	B-14	B-17							
Retained #4 Sieve %	8.9	1.4							
Passing #10 Sieve %	87.6	98.1							
Passing #40 Sieve %	72.6	91.9							
Passing #200 Sieve %	34.6	66.5							
SOIL MORTAR - 100%									
Coarse Sand Ret - #60 %	30.5	12.9							
Fine Sand Ret - #270 %	36.4	24.1							

Coarse Sand Ret - #60 %	30.5	12.9						
Fine Sand Ret - #270 %	36.4	24.1						
Silt 0.053 - 0.010 mm %	17.0	20.8						
Clay < 0.010 mm %	16.1	42.2						
L.L.	34	36						
P.L.	NP	22						
P.I.	NP	14						
AASHTO Classification	A-2-4(0)	A-6(8)						
Station	889+70	891+07						
Offset	85' LT.	105' LT.						
Depth (ft)	0.1	3.5						
to	1.5	5.0						
Alignment	-EBL-	-EBL-						
Moisture Content (%)	24.9	27.0						
Organic Content (%)	NT	NT						

NP = Not plastic

NT = Not tested

ND = Not Determined

CL = Centerline

W.P. Alton, P.E.

CONTENTS 7004 SHEET NO. 4-7 4 REFERENCE 6031 3

PROIE

DESCRIPTION

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

TITLE SHEET

BORE LOG(S) SOIL TEST RESULTS STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION <u>I-26 FROM NEAR NC 280</u> (EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 4 ON -Y14-FROM 12+50 TO 15+80, 21.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	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 NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARLY 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 NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

NOTES:

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.

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 J. HOYLE S. WOODS T. LUCAS M. ARNOLD W. HAMRICK S. DAVIS T. SHARPE T. BEARD INVESTIGATED BY $_F&R, Inc.$ DRAWN BY _T.T. WALKER CHECKED BY _D. RACEY SUBMITTED BY P. ALTON, P.E. DATE JANUARY 2019

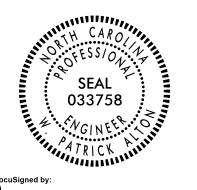


Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street Raleigh, North Carolina 27603-2302 | USA T 919.828.3441 | F 919.828.5751



Patruck Octor -A270EF78ASDF447

1/23/2019

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO. SHEET NO.

1–4700A

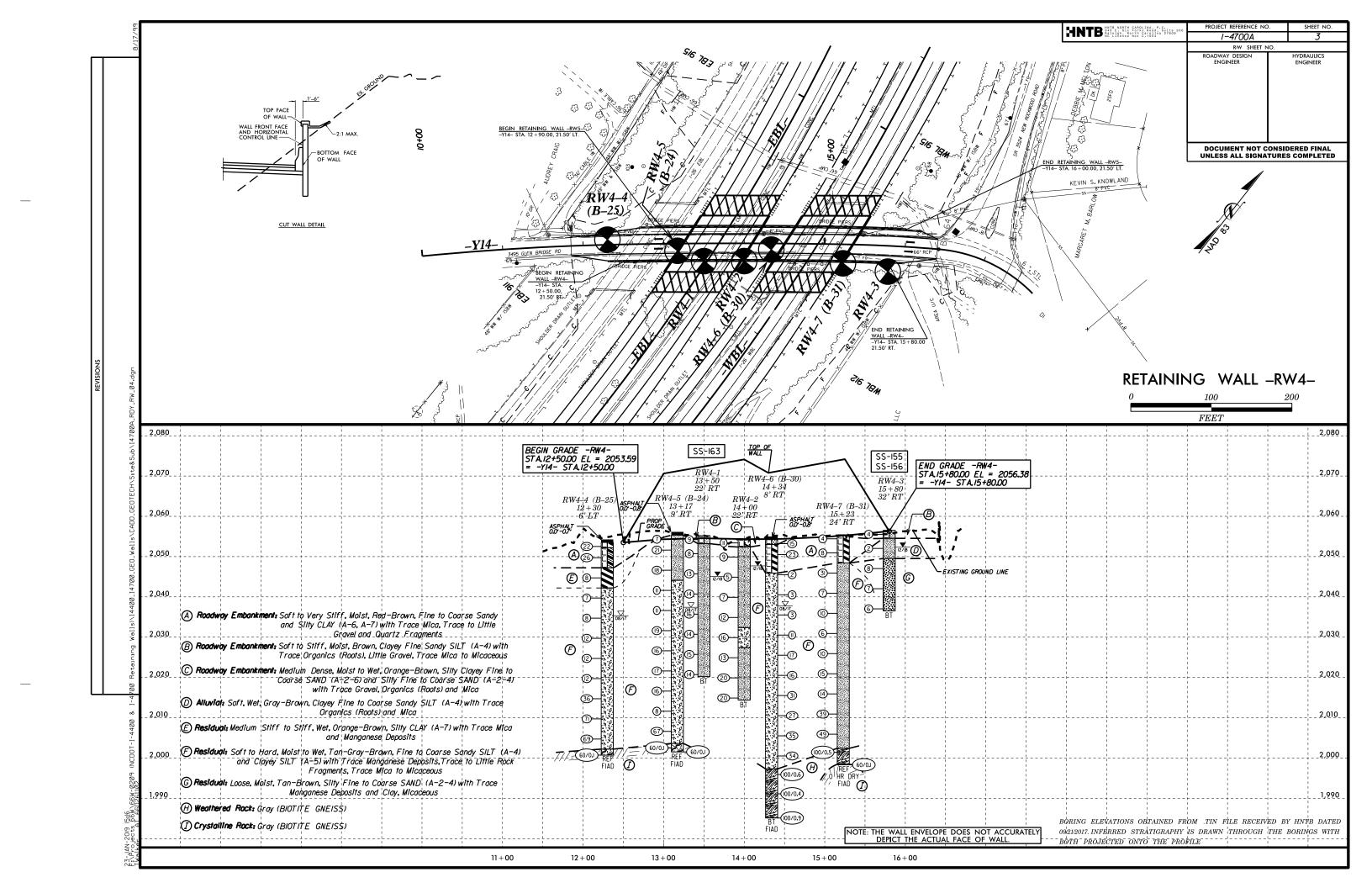
2

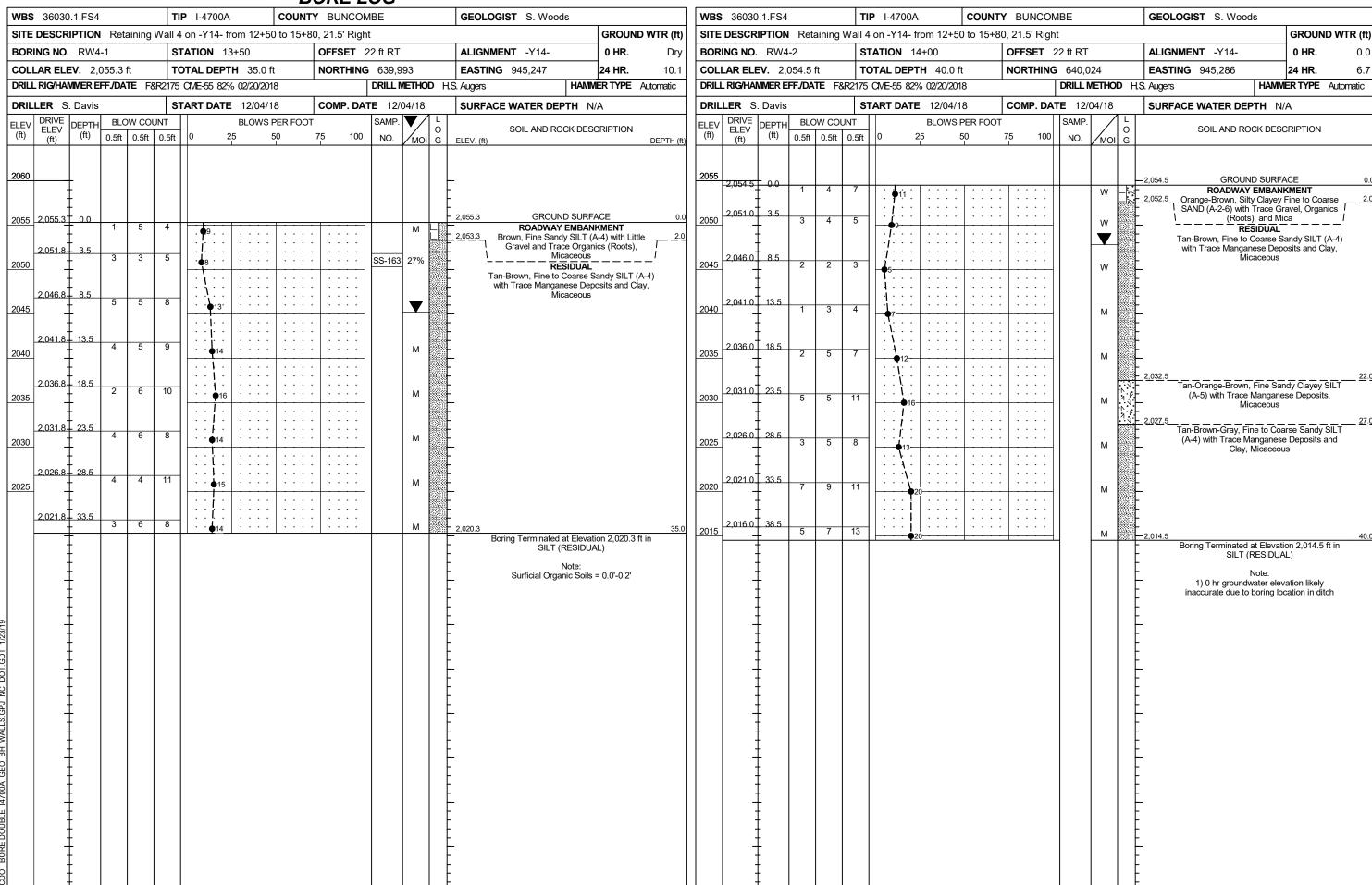
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

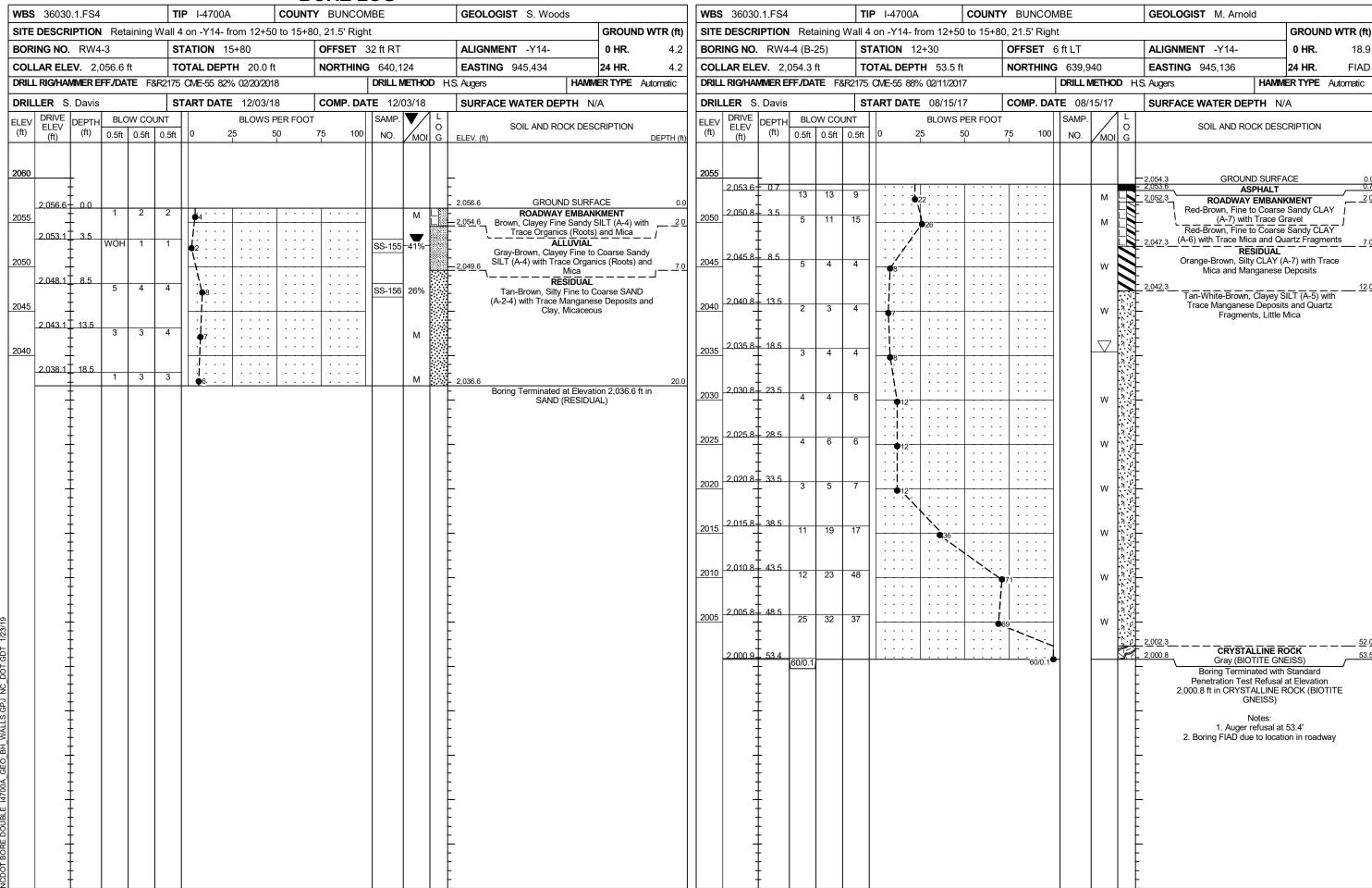
SUBSURFACE INVESTIGATION

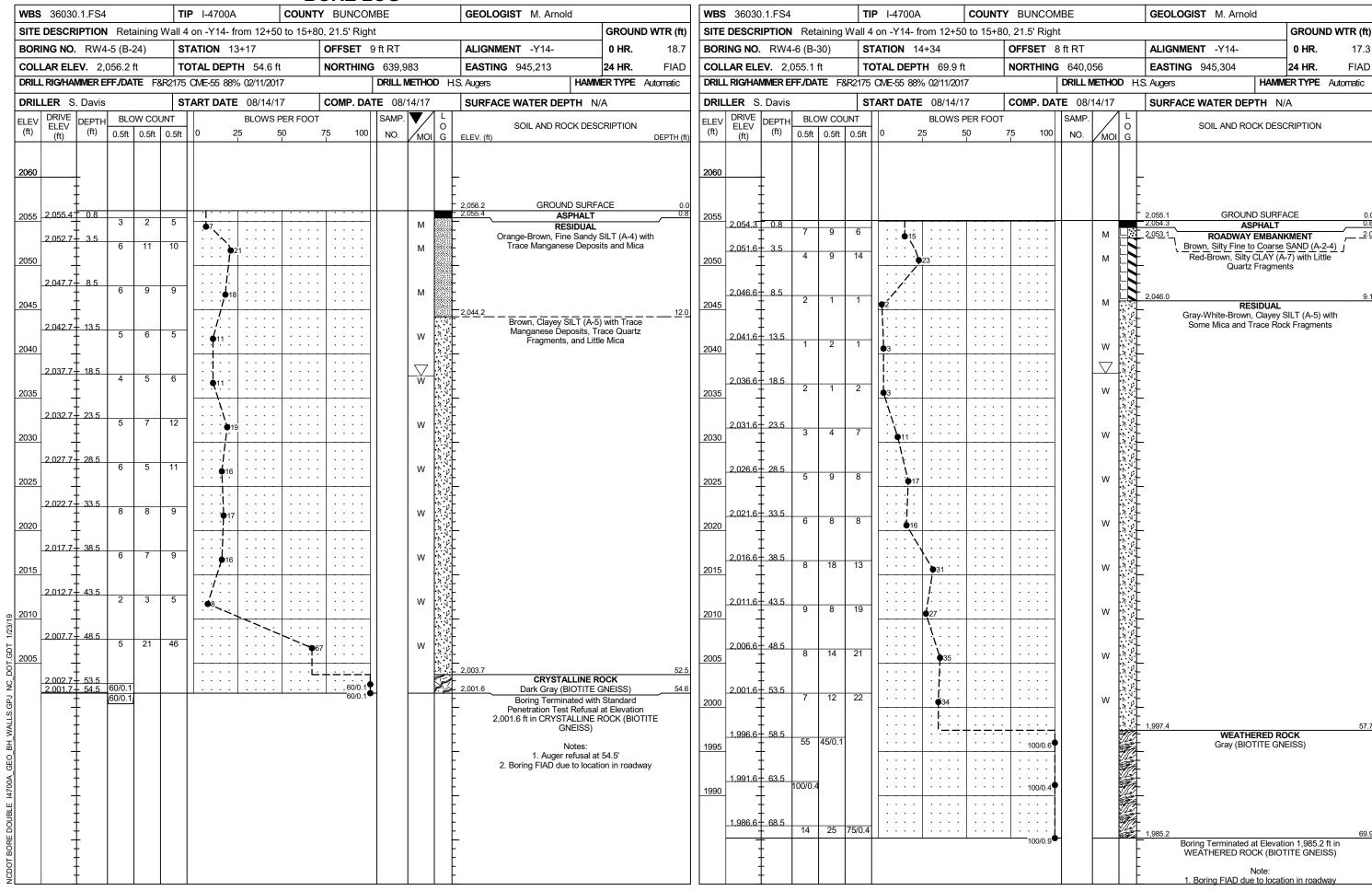
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

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.	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.	ALLUYIUM (ALLUY.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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.SULTY CLAY.MOIST WITH INTERBEDDED FINE SAND 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 VILLY NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENEDAL COANILAD MATERIAL C CILIT CLAY MATERIAL C	MINERALOGICAL COMPOSITION	EINE TO COARSE CRAIN ICNICALS 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, GREISS, 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. COMPRESSIBILITY	NON CRYSTALLING FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
00000000000000000000000000000000000000	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 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 − 50	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
PASSING GRANULAR SILT-MUCK,	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*18 58 MX 58 MX 51 MN 55 MX 55 MN 55	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
אויין 25 אוי	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 140	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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 IW MX IW MX II MN IW MX IW MX II MN II MN MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX 0 0 4 MX 8 MX 12 MX 16 MX NU MX AMUUNIS UF SOILS		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	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 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, RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	<u>√PW</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(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. FLOOD PLAIN (FP) - LAND BORDERING A STREAM. BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
AS SUBGRADE P1 OF A-7-5 SUBGROUP IS ≤ LL - 30 ; P1 OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK.	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	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PANCE OF STANDARD PANCE OF UNICONETNED	CT	(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 CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (IV-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE 4	SPT C CLORE 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 KAQLINIZED	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANII AR LOOSE 4 TO 10	SOIL SYMBOL SYMBOL STATEST BORING SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	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.
(NON-COHESIVE) VERY DENSE > 50	TITLE TONDWHITE EMBHINAMENT TO TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	— INFERRED SOIL BOUNDARY — CORE BORING ■ SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>	OF AN INTERVENING IMPERVIOUS STRATUM,
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MW MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	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
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	A DIE ZOMETED	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY ☐ INSTALLATION SPT N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION -	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	ICCO UNSUITABLE WASTE ICCO AN THE TOP 2 EFET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - SSED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. 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 OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN Ø.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION (ATTERBERG LIMITS) DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON 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	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.
LL _ LIOUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	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 \(\omega \) - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: N/A
PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	DENCH MIHRK; IV A
- MOIST - (M) COLIDAT OR NEAR ORTIMIN 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: N/A FEET
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
PEOLITICE ADDITIONAL MATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
- DRY - (D) ATTAIN OPTIMUM MOISTURE	X CME-55 G* CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X 8" HOLLOW AUGERS	INDURATION	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FROM HNTB ON 9/21/2017
NON PLASTIC 0-5 VERY LOW	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND TOOLS:	RUBBING WITH FINGER FREES NUMEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	CASING W/ ADVANCER HAND TOULS:	CDAING CAN BE CERARATED FROM CAMPLE WITH CIFEL BRORE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED ORANGE 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;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	lo ō ŏ	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14
	. – – – – – – – – – – – – – – – – – – –		52.0.15









	23/19
	NCDOT BORE DOUBLE 14700A_GEO_BH_WALLS.GPJ NC_DOT.GDT 1/23/19
	NCDOT BORE DOUBLE 14

SHEET 7

							BC	DRE L	OG				
WBS	36030.1.	FS4			TI	I P I-4700A	COUNTY	BUNCOM	IBE			GEOLOGIST W. Hamrick	
SITE	DESCRIPT	ION	Reta	aining	Wall 4	4 on -Y14- from 12+5	0 to 15+80,	21.5' Right	t				GROUND WTR (ft)
BOR	ING NO. F	RW4-	-7 (B-3	31)	S	TATION 15+23		OFFSET 2	4 ft RT			ALIGNMENT -Y14-	0 HR . Dry
	LAR ELEV.					OTAL DEPTH 57.1 f	I .	NORTHING	,			EASTING 945,384	24 HR. Dry
DRILI	L RIG/HAMME	ER EF	FF./DA	TE F8	3R3763	CME-550X 86% 1/30/201	7		DRILL N	IETHO	D H.S	S. Augers HAMM	ER TYPE Automatic
DRIL	LER J. Ho	oyle			S	TART DATE 08/14/1	7	COMP. DAT	TE 08/1	14/17		SURFACE WATER DEPTH N/	A
ELEV	F F	PTH		W CO		4	PER FOOT		SAMP.	lacktriangledown/	LO	SOIL AND ROCK DESC	CRIPTION
(ft)	(ft)	ft)	0.5ft	0.5ft	0.5ft	0 25	50 7	5 100	NO.	/MOI	G	ELEV. (ft)	DEPTH (fi
2060	+										-	-	
2055	2.055.5 + 0	0 0									Ė	2,055.5 GROUND SURFA	ICE 0.
2055	1		2	2	2	4	::::	:::::		М		ROADWAY EMBANI Red-Brown, Silty CLAY (A-7)	
	2,052.0	3.5]						. 100 2.0, Cy 02 ()	
2050	‡		3	5	3	8				М		_	
						:::::							
	2,047.0	3.5	5	13	18					М	<u> </u>	Tan-Brown, Fine Sandy Sll Trace Mica and Manganese	_T (A-4) with
2045	+						 				<u> </u>	- Rock Fragment	
	2,042.0 1;	3.5				:::/: ::::					E		
2040	1 1		4	3	4	• • • • • • • • • • • • • • • • • • • •				W	E	_	
	1 1					:\: : : : : : :					E		
	2,037.0	8.5	3	5	5	10		: : : :		w	E E		
2035	+					 					_	-	
	2.032.0	3.5									F		
2030	Ŧ		2	2	4	6	: : : :			W	F		
	1 Ŧ					1	1				F	-	
	2,027.0 2	8.5	3	4	6	: [: : : : : : : : : : : : : : : : :		: : : :		w	F		
2025	‡					10 - 10				**	F	-	
	2.022.0	3.5				::'\:: ::::					F		
2020	+	0.0	3	7	8	15				W	F		
	1 Ŧ										F	-	
	2,017.0	8.5	3	5	9					W	F		
2015	‡		-			14				VV	-	-	
	2.012.0 4:	3.5									, t		
2010	2,012.01 4.	3.3	12	24	15	39				W	#		
	1 7										F	-	
2005	2,007.0 4	8.5	24	24	25	: : : : : : : \				w	F		
2005	‡				20		49			VV	#	-	
ı	2.002.0	3.5					L:::::	<u> </u>				2,002.5	53.0
2000	2,002.0 1 3.	3.5	100/0.5					. 100/0.5				WEATHERED RO Gray (BIOTITE GNI	
2000	1,998.5 + 5	7.0										- 1,998.5 -1,998.4/\ CRYSTALLINE RO	57.0 OCK \57.0
1	‡	١	60/0.1					60/0.1			-	Gray (BIOTITE GNI	EISS)
1	‡										F	Boring Terminated with Penetration Test Refusal	Standard at Elevation
ı	‡											1,998.4 ft in CRYSTALLINE F GNEISS)	
	‡											_ Note:	
	‡											1. Boring FIAD due to location	on in roadway
	‡												
	‡											_	
	‡												
	‡												
						I.			1				

North Carolina Department of Transportation Division of Highways Materials and Test Unit Soils Laboratory

T.I.P. ID NO.: I-4700A

DESCRIPTION: Retaining Wall 4 on -Y14- from 12+50 to 15+80, 21.5' Right

REPORT ON SAMPLES OF: SOIL FOR QUALITY

 WBS No.:
 36030.1.FS4
 COUNTY:
 Buncombe

 DATE SAMPLED:
 12/18
 RECEIVED:
 12/18

 SAMPLED FROM:
 -Y14 REPORTED:
 12/18

 SUBMITTED BY:
 D. Racey
 D. Council Cert No. 101-02-0603

TEST RESULTS

PROJ. SAMPLE NO.	SS-163	SS-155	SS-156				
BORING NO.	RW4-1	RW4-3	RW4-3				
Retained #4 Sieve %	0.0	0.0	0.0				
Passing #10 Sieve %	100.0	100.0	100.0				
Passing #40 Sieve %	90.8	98.4	92.8				
Passing #200 Sieve %	36.1	56.0	34.5				

SOIL MORTAR - 100%							
Coarse Sand Ret - #60 %	23.0	5.8	18.8				
Fine Sand Ret - #270 %	56.0	48.2	59.3				
Silt 0.053 - 0.010 mm %	11.6	25.0	14.8				
Clay < 0.010 mm %	9.4	21.0	7.1				
L.L.	NP	35	NP				
P.L.	NP	32	NP				
P.I.	NP	3	NP				
AASHTO Classification	A-4 (0)	A-4 (1)	A-2-4 (0)				
Station	13+50	15+80	15+80				
Offset	22' RT	32' RT	32' RT				
Depth (ft)	3.5	3.5	8.5				
to	5.0	5.0	10.0				
Alignment	-Y14-	-Y14-	-Y14-				
Moisture Content (%)	26.9	41.2	25.5				
Organic Content (%)	NT	NT	NT				

NP = Not plastic

NT = Not tested

ND = Not Determined

CL = Centerline

W.P. Alton, P.E.

Soils Engineer

CONTENTS 4700A SHEET NO. 6-9 REFERENCE 6031

3

PROIE

DESCRIPTION

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

TITLE SHEET

CROSS SECTION

BORE LOG(S) SOIL TEST RESULTS STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION <u>I-26 FROM NEAR NC 280</u> (EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 5 ON -Y14-FROM 12+90 TO 16+00, 21.5' LEFT

STATE	STATE PROJECT REPERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	10

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 NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 INN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INN-RENET IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS NDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

NOTES:

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.

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 J. HOYLE S. WOODS T. LUCAS M. ARNOLD W. HAMRICK S. DAVIS T. SHARPE T. BEARD INVESTIGATED BY $_F&R, Inc.$ DRAWN BY _T.T. WALKER CHECKED BY _D. RACEY SUBMITTED BY P. ALTON, P.E. DATE JANUARY 2019



Prepared in the Office of:

FROEHLING & ROBERTSON, INC. Engineering Stability Since 1881

310 Hubert Street Raleigh, North Carolina 27603-2302 | USA T 919.828.3441 | F 919.828.5751



-A270FF78A6DF442

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REPERENCE NO. SHEET NO.

1–4700A

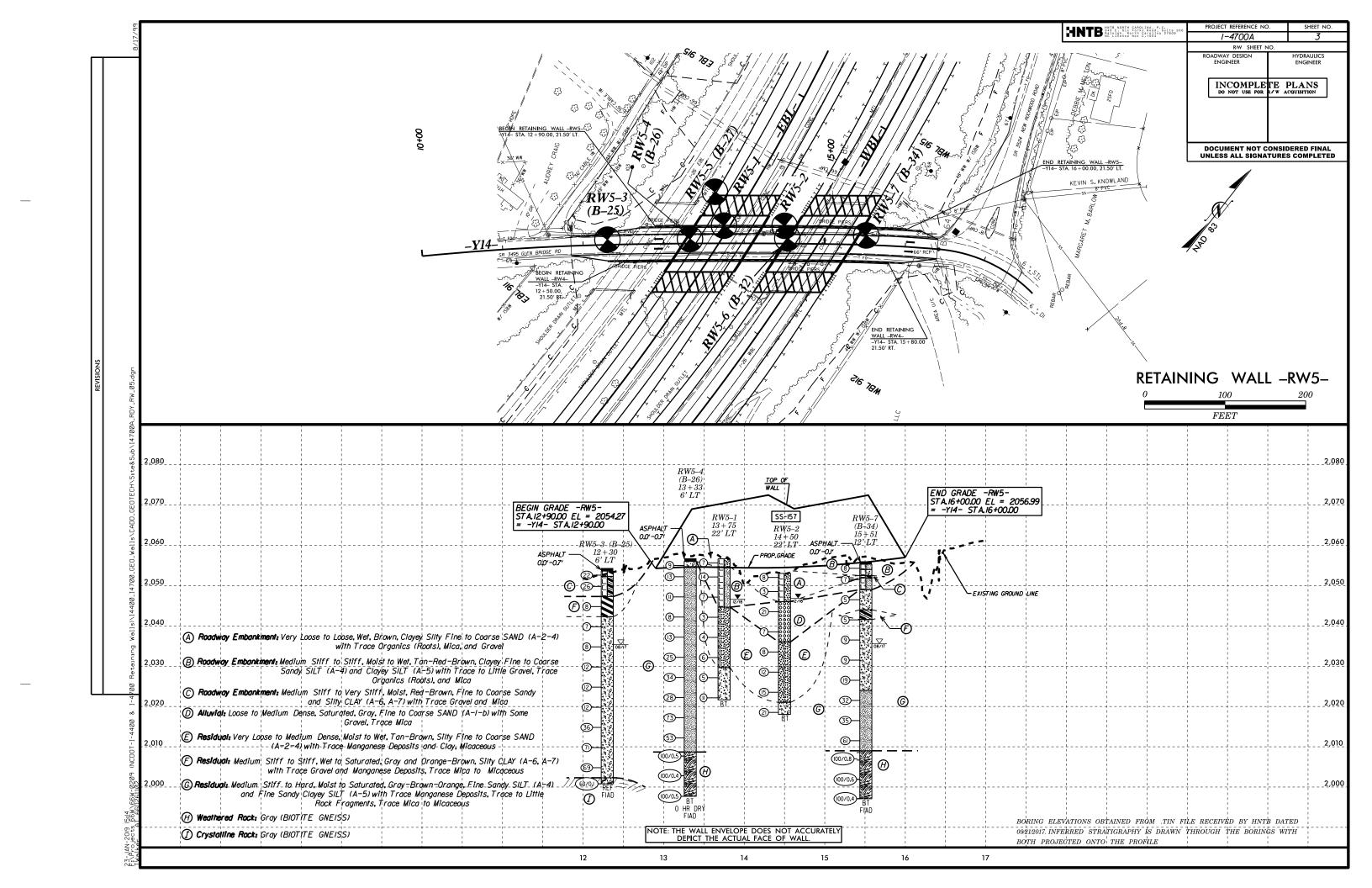
2

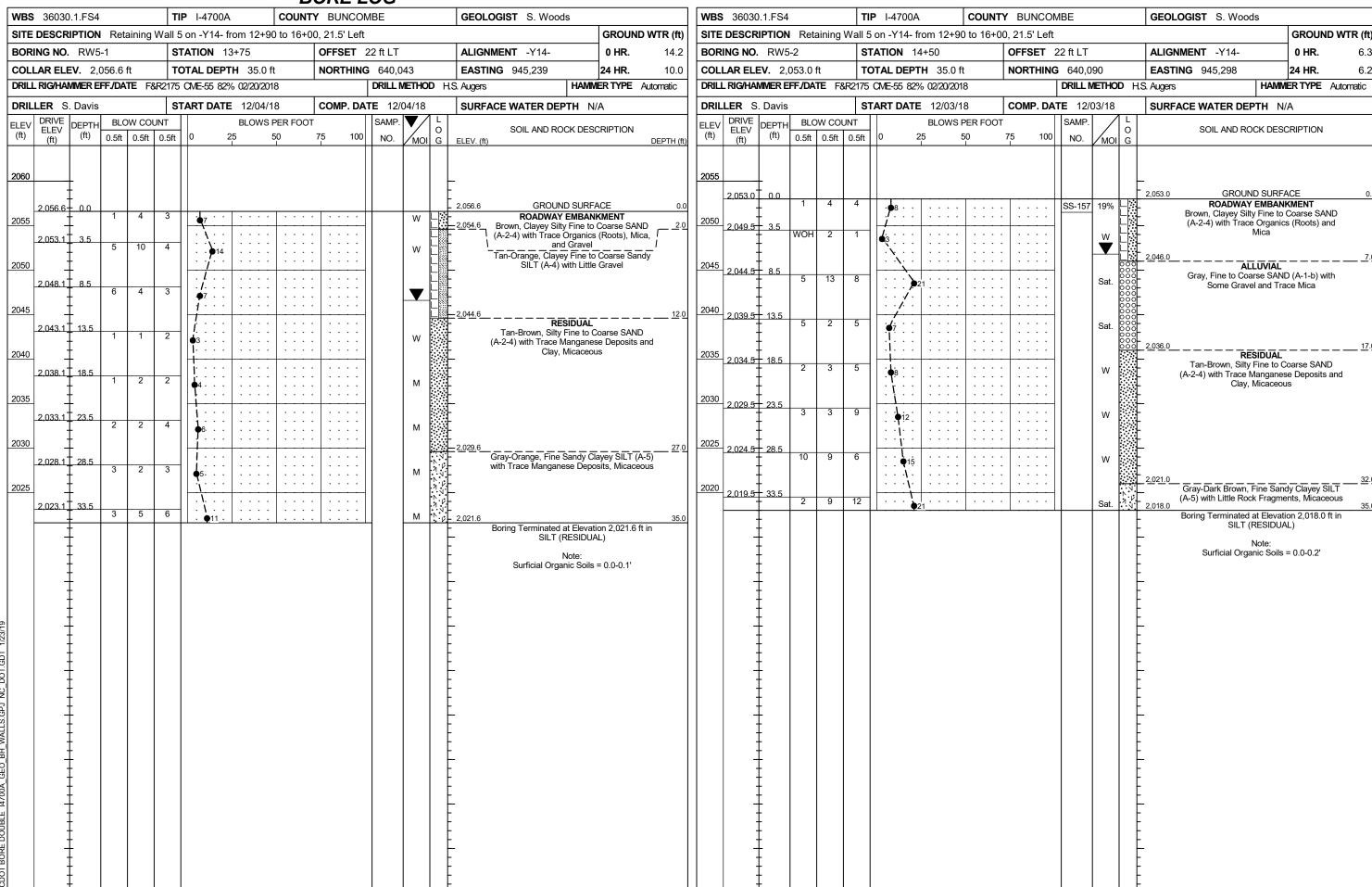
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

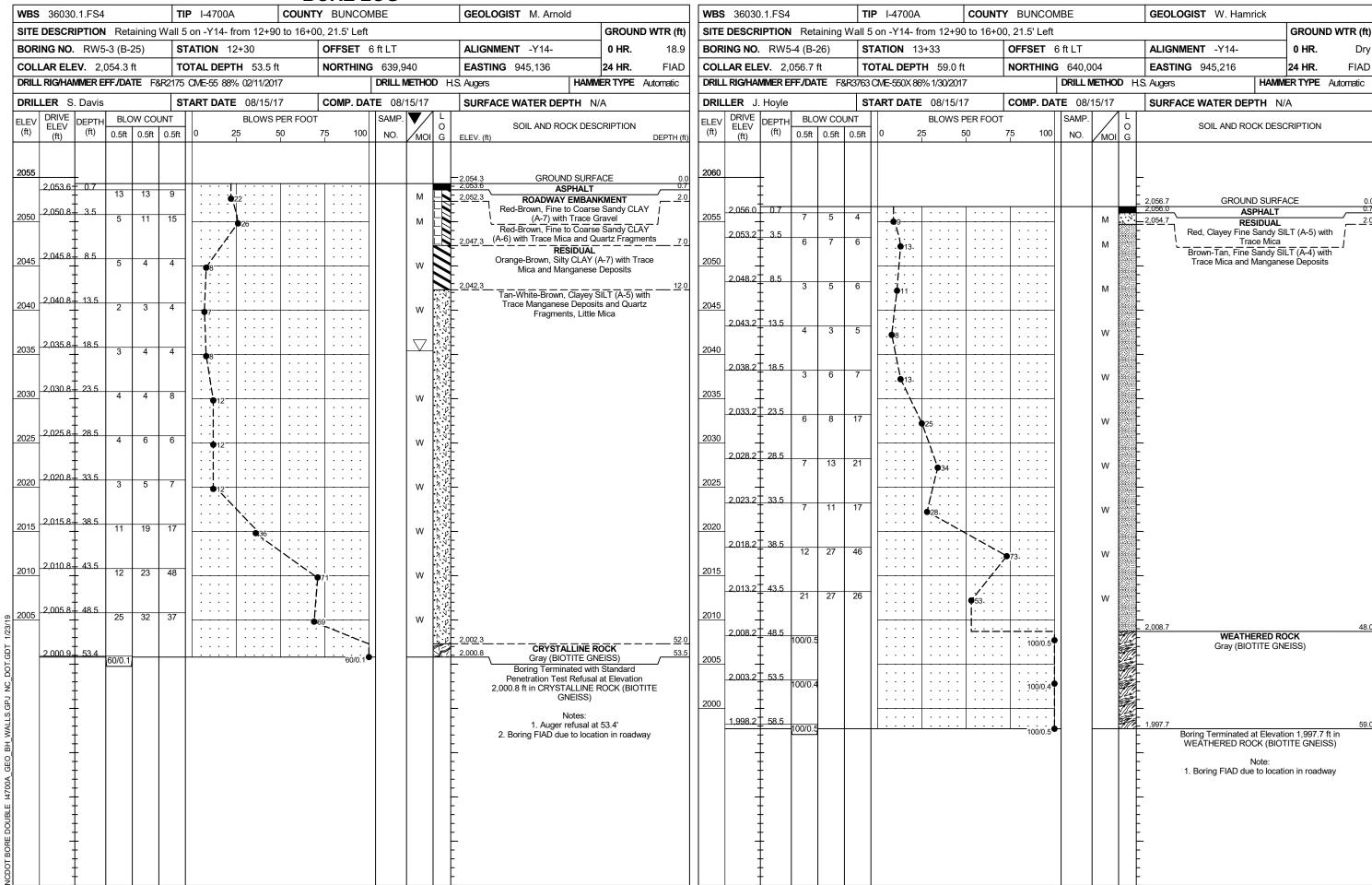
SUBSURFACE INVESTIGATION

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.	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	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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.SULTY CLAY.MOIST WITH INTERBEDDED FINE SAND 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 VILLY NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENEDAL COANILAD MATERIAL C CILIT CLAY MATERIAL C	MINERALOGICAL COMPOSITION	EINE TO COARSE CRAIN ICNICALS 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, GREISS, 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. COMPRESSIBILITY	NON CRYSTALLING FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
00000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 − 50	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
PASSING GRANULAR SILT-MUCK,	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*18 58 MX 58 MX 51 MN 55 MX 55 MN 55	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
אויין 25 אוי	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL - - 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN UITTE OR	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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 LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
PI 6 MX NP IW MX IW MX II MN II MN IW MX II MN II MN II MN MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
BRUUP INUEX 0 0 0 4 MX 8 MX 12 MX 16 MX NU MX AMUUNIS UF SOILS		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	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TYPES STONE FRAGS. OF MAJOR GRAVEL, AND CAND CAND CAND CAND CAND CAND CAND	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS 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 GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABL	<u>√PW</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM. BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	→ SPRING OR SEEP	WITH FRESH ROCK.	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	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PANCE OF STANDARD PANCE OF UNICONETNED		(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 CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH (IV-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/825 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE 4	SPT C CLOSE 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 KAQLINIZED	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANII AR LOOSE 4 TO 10	SOIL SYMBOL SYMBOL STATEST BORING SLOPE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED. WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL MEDIUM DENSE 10 TO 30 N/A	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.
(NON-COHESIVE) VERY DENSE > 50	THE TOPONE CHORICAL CONTRACTOR OF TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	— INFERRED SOIL BOUNDARY — CORE BORING ■ SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>	OF AN INTERVENING IMPERVIOUS STRATUM,
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MW MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	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
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	A RIEZOMETER	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY ☐ INSTALLATION SPT N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION -	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	ICCO UNSUITABLE WASTE ICCO TAN THE TOP 2 FEFT OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - SEED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. 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 OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION CATTERBERG LIMITS) DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON 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	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.
LL _ LIOUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	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 W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: N/A
PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	DENCH MIHRK; IV A
- MOIST - (M) COLIDAT OR NEAR ORTIMIN 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: N/A FEET
OMOPTIMUM_MOISTURE SLSHRINKAGE_LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
REQUIRES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
- DRY - (D) ATTAIN OPTIMUM MOISTURE	X CME-55 G' CONTINUOUS FLIGHT AUGER CORE SIZE:	THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X 8" HOLLOW AUGERS	INDURATION	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FROM HNTB ON 9/21/2017
NON PLASTIC 0-5 VERY LOW	VANE SHEAR TEST TUNG,-CARBIDE INSERTS HAND TOOLS:	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	CASING W/ ADVANCER HAND TOULS:	CDAING CAN BE CERARATED FROM CAMPLE WITH CIFEL BRORE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED SCHMISS CHILD SEPARATED FROM SHIPE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNGCARB. X SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
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: 8-15-14
	. – – – – – – – – – – – – – – – – – – –		52.0.15







35.0

FIAD

GROUND WTR (ft)

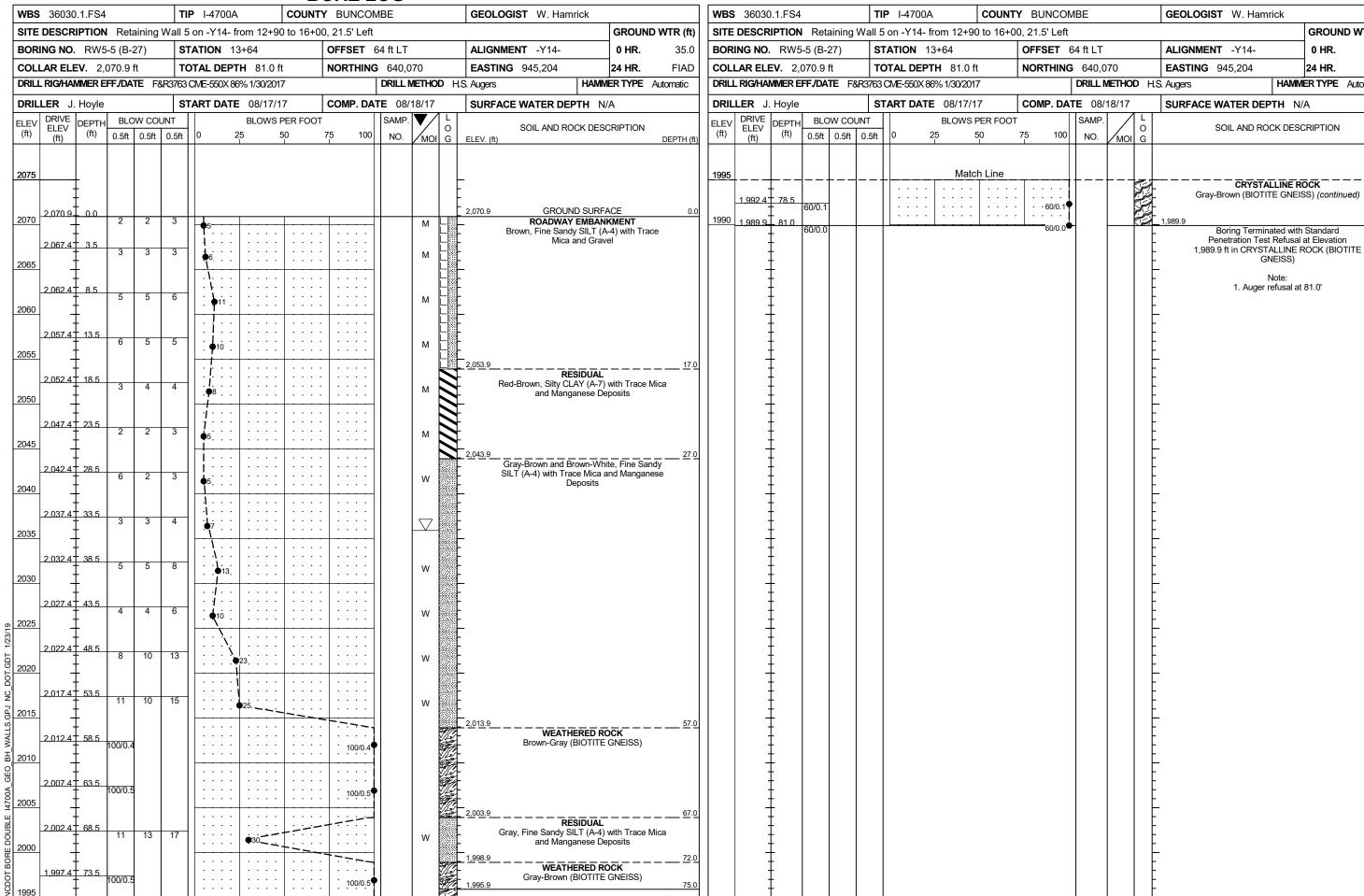
0 HR.

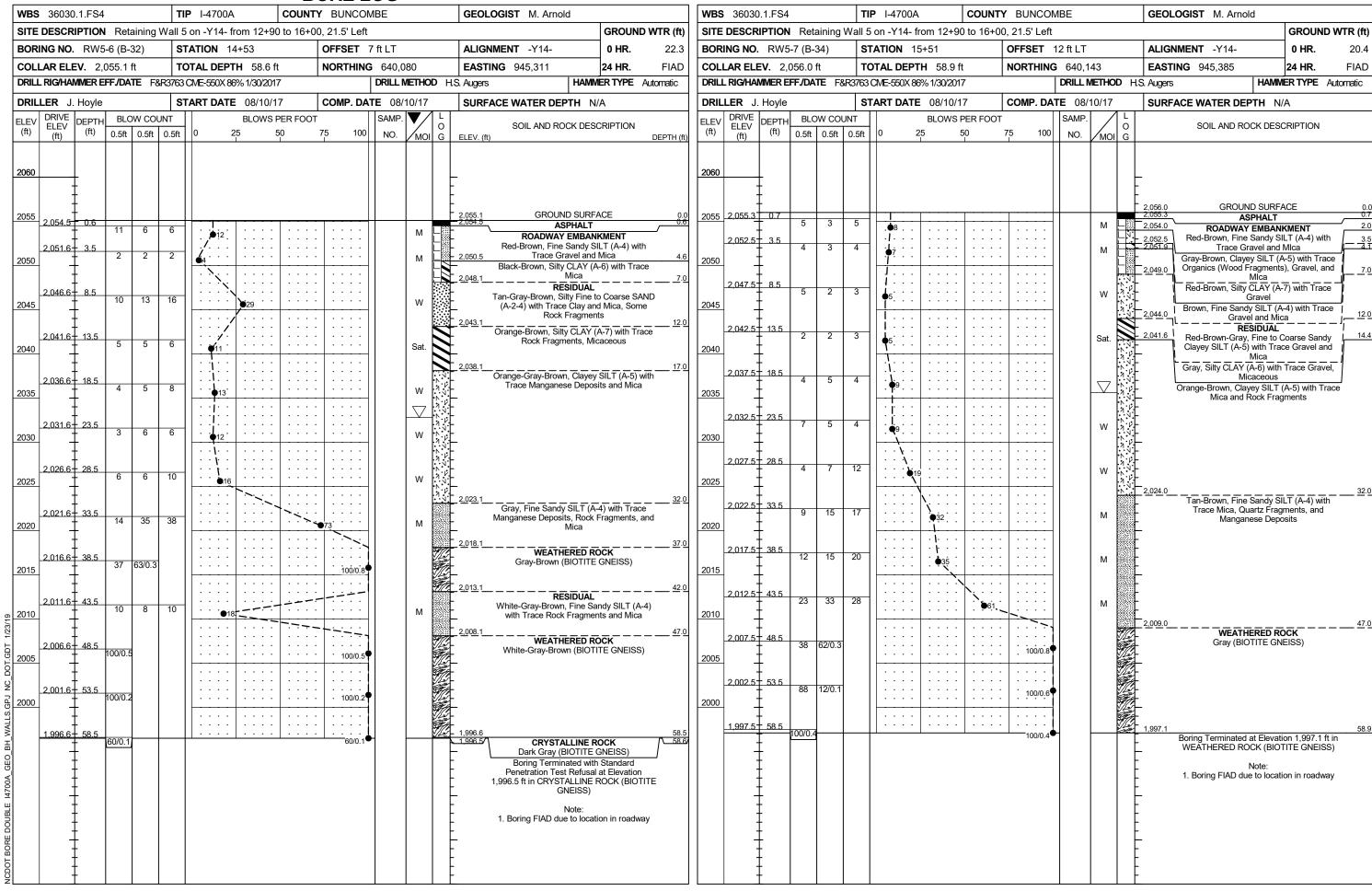
24 HR.

GNEISS)

Note:

HAMMER TYPE Automatic





North Carolina Department of Transportation Division of Highways Materials and Test Unit Soils Laboratory

T.I.P. ID NO.: I-4700A

DESCRIPTION: Retaining Wall 5 on -Y14- from 12+90 to 16+00, 21.5' Left

REPORT ON SAMPLES OF: SOIL FOR QUALITY

WBS No.: 36030.	1.FS4	COUNTY:	Buncombe
DATE SAMPLED: 12/18		RECEIVED:	12/18
SAMPLED FROM: -Y14-		REPORTED:	12/18
SUBMITTED BY: D. Race	ey	BY:	D. Council
			Cert No. 101-02-0603

TEST RESULTS

PROJ. SAMPLE NO.	SS-157					
BORING NO.	RW5-2					
Retained #4 Sieve %	14.4					
Passing #10 Sieve %	81.0					
Passing #40 Sieve %	75.6					
Passing #200 Sieve %	32.6					

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	11.4					
Fine Sand Ret - #270 %	56.3					
Silt 0.053 - 0.010 mm %	11.4					
Clay < 0.010 mm %	20.9					
L.L.	29					
P.L.	26					
P.I.	3					
AASHTO Classification	A-2-4 (0)					
Station	14+50					
Offset	22' LT					
Depth (ft)	0.2					
to	1.5					
Alignment	-Y14-					
Moisture Content (%)	19.2					
Organic Content (%)	NT	 			 	

NP = Not plastic

NT = Not tested

ND = Not Determined

CL = Centerline

W.P. Alton, P.E.

Soils Engineer

CONTENTS 7004 SHEET NO. 4 REFERENCE 6030 3 **PROIEC**

4-6

DESCRIPTION

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

TITLE SHEET

BORE LOG(S)

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION <u>I-26 FROM NEAR NC 280</u> (EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION RETAINING WALL 6 ON -WBL-FROM 918 + 25 TO 923 + 75, 39.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	6

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 NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 (INP-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 NIDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE TOORDITORS THE ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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

NOTES:

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.

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 D. RACEY

C. BOYCE J. HOYLE

N. CONSIGLI

INVESTIGATED BY F&R, Inc.

DRAWN BY _T.T. WALKER

CHECKED BY _D. RACEY

SUBMITTED BY P. ALTON, P.E.

DATE NOVEMBER 2018



Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street Raleigh, North Carolina 27603-2302 | USA T 919.828.3441 | F 919.828.5751



11/26/2018 - A270EF78A@PGAAATURE

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

PROJECT REPERENCE NO. SHEET NO.

1–4700A

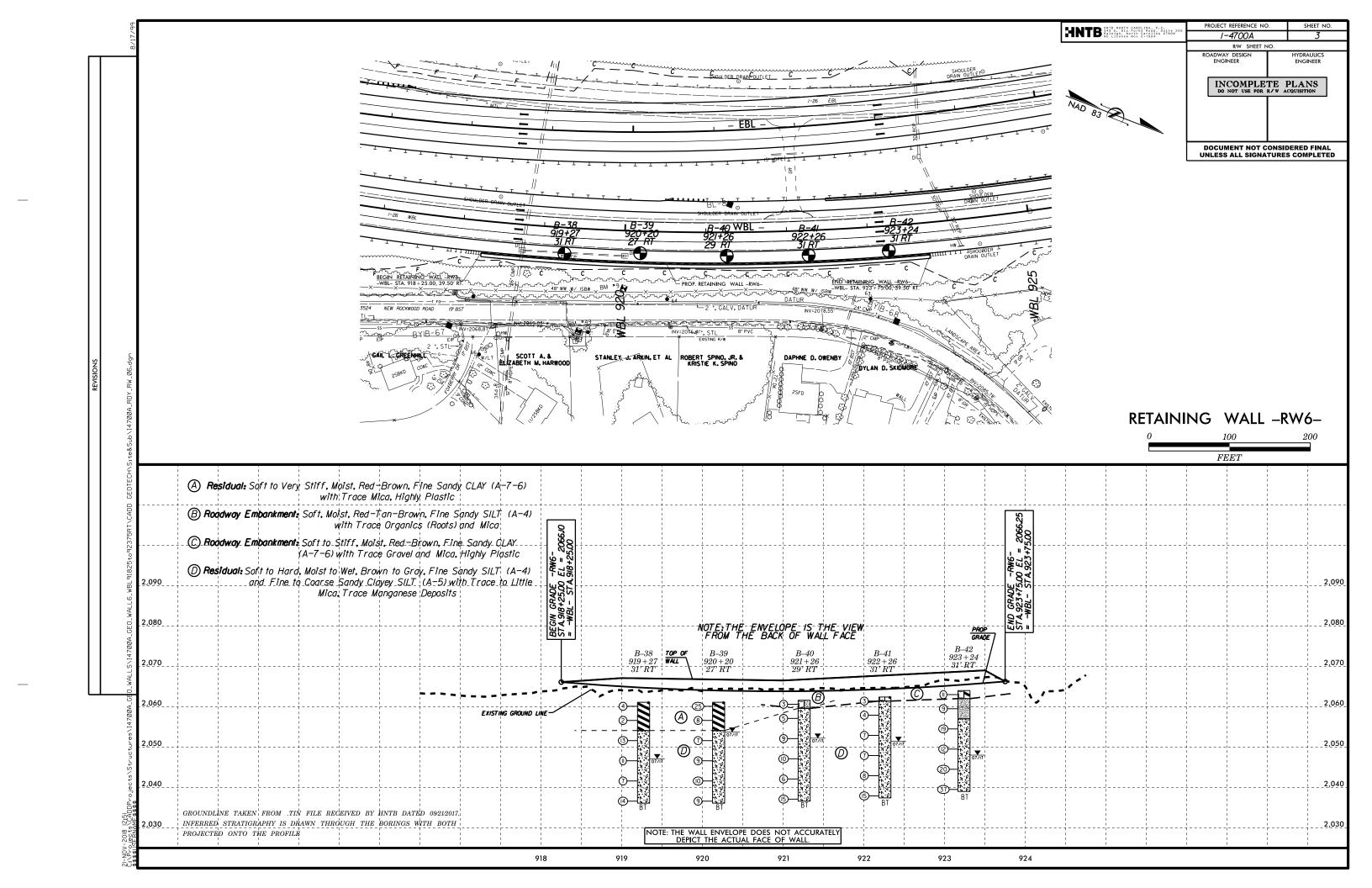
2

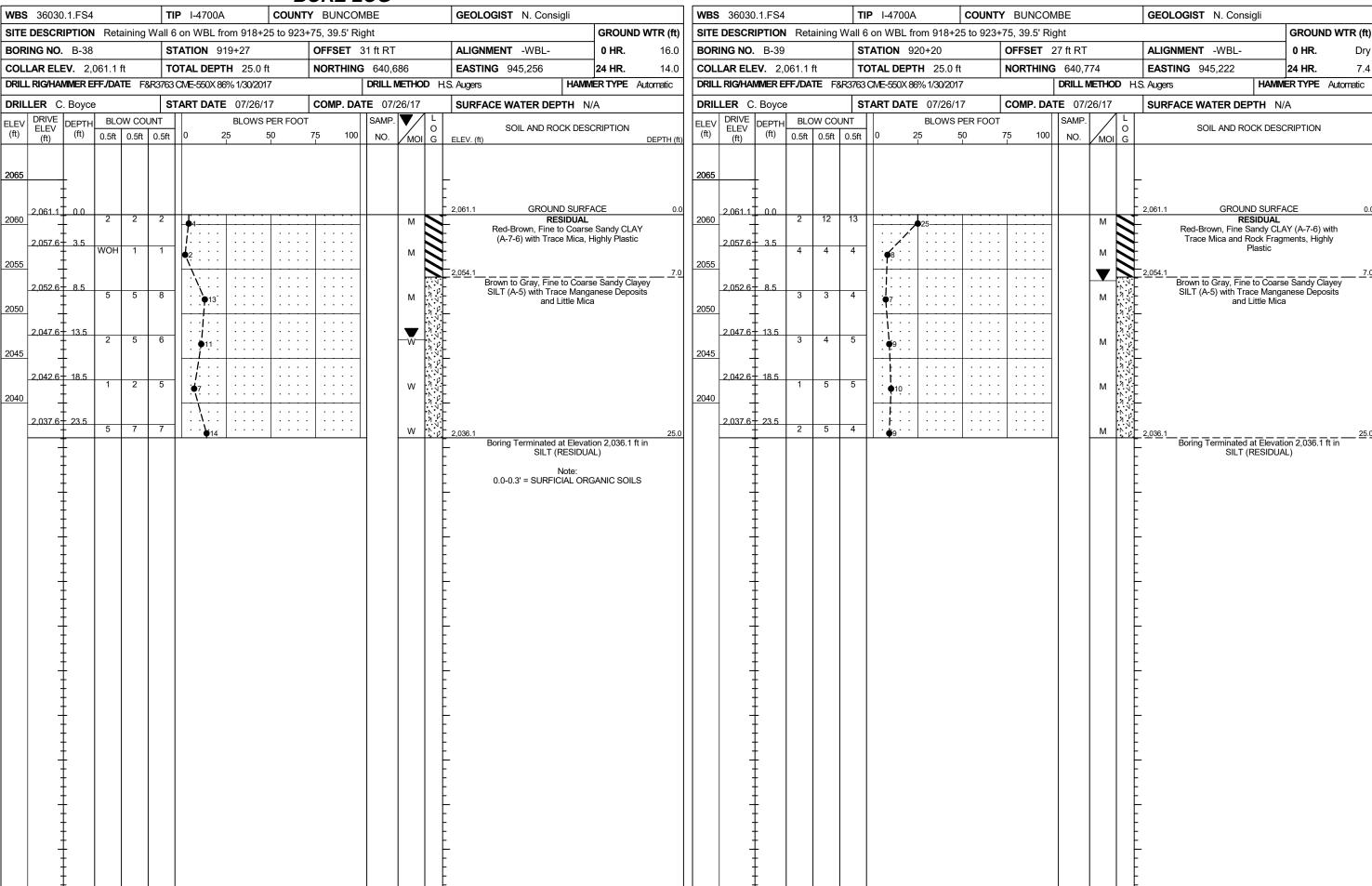
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

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.	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.	ALLUYIUM (ALLUY.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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.SULTY CLAY.MOIST WITH INTERBEDDED FINE SAND 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 /// NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENEDAL COANILIAD MATERIAL C CLITTCLAY MATERIAL C	MINERALOGICAL COMPOSITION	EINE TO COARSE CRAIN ICNICALS 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, GREISS, 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. COMPRESSIBILITY	NON CRYSTALLING FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
00000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 - 50	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
PASSING GRANULAR SILT-MUCK,	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*18 58 MX 55 MX 55 MX 55 MN 55	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
אויין סל איין סל אויין סל איין איין סל אויין איין איין איין איין איין איין איי	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL.
LL - 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 10 TITLE OR	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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 LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
PI 6 MX NP IW MX IW MX II MN IW MX IW MX II MN II MN MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NU MX AMUUNIS UF SOILS		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	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MATTER STUNE FRAUS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM. BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	- SPRING OR SEEP	WITH FRESH ROCK.	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	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
DANCE OF CTANDARD DANCE OF LINCOMETRIED	FT	(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 COMPSISTENCY PENETRATION RESISTENCE (IV-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE 4	SPT CLOBE 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 KAQLINIZED	ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANII AR LOOSE 4 TO 10	SOIL SYMBOL SOIL SYMBOL SINSTALLATION SOURCE INDICATOR INSTALLATION	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL MEDIUM DENSE 10 10 30 N/A	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER THAN ROADWAY EMBANKMENT AUGER BORING TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THE TOMOWAT EMPHINAMENT TO 1531	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5	- INFERRED SOIL BOUNDARY - CORE BORING SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>	OF AN INTERVENING IMPERVIOUS STRATUM,
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MN MONITORING WELL TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	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
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	A RIEZOMETER	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4	→ SPT N-VALUE	ROCK HARDNESS	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION -	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	ISON NOTIFIED IS HILLET HOLDE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - SSED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. 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 OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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 I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	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
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION (ATTERBERG LIMITS) DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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.
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON 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	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.
LL _ LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	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 W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: N/A
(PI) PL _ PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	DENCH MIHRK; IV A
- MOIST - (M) COLID. AT OR NEAR ORTIMIN MOISTING	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: N/A FEET
OM _ OPTIMUM MOISTURE SL _ SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	NOTES:
REQUIRES ADDITIONAL WATER TO	CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
- DRY - (D) ATTAIN OPTIMUM MOISTURE	CME-55 CORE SIZE:	THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X 8'HOLLOW AUGERS	INDURATION	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FROM HNTB ON 9/21/2017
NON PLASTIC Ø-5 VERY LOW	VANE SHEAR TEST TUNGCARBIDE INSERTS HAND TOOLS:	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	CASING W/ ADVANCER HAND TOULS:	CDAING CAN BE CERARATED FROM CAMPLE WITH CIFEL BRORE.	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED SCHMISS CHILD SEPARATED FROM SHIPE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNG,-CARB, COUNTRING POR	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	X CME-550X SOUNDING ROD VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
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: 8-15-14
		STATE STEELS HONOUS ONEMOS	DHTE: 0-15-14





									BORE	<u>LOG</u>	<u> </u>																			
WB	S 360	30.1.FS	64		TI	P I-4700/	Α	COUN	TY BUNC	OMBE			GEOLOGIST N.	Consigli		WE	35 36030.1.	FS4		TI	P I-4700A	1	COUNTY	Y BUNCO	MBE			GEOLOGIST N.	Consigli	
SIT	E DESC	RIPTIC	DN Re	taining	Wall 6	on WBL f	rom 918+	25 to 923	3+75, 39.5'						GROUND WTR (ft)	SIT	TE DESCRIPT	ΓΙΟΝ	Retaining	g Wall 6	on WBL fr	om 918+	25 to 923+	·75, 39.5' R	ight					GROUND WTR (f
во	RING N	O. B-4	10		S	ATION 9	21+26		OFFSET	29 ft R	T.		ALIGNMENT -W	BL-	0 HR. 9.8	ВС	RING NO.	3-41		S1	TATION 9	22+26		OFFSET	31 ft R1	Γ		ALIGNMENT -W	3L-	0 HR. 17.
CO	LAR E	LEV.	2,061.6	6 ft	TO	TAL DEP	TH 25.0	ft	NORTHI				EASTING 945,18		24 HR. 9.4		LLAR ELEV.				OTAL DEPT			NORTHING				EASTING 945,15		24 HR. 11.
DRI	L RIG/H	IAMMER	EFF./D	ATE F	&R3763	CME-550X 8	86% 1/30/20	17		DRIL	METH	OD H	I.S. Augers	HAMIN	MER TYPE Automatic	DR	ILL RIG/HAMM	ER EFI	F./DATE F	F&R3763	CME-550X 86	6% 1/30/20	117		DRILL	METHO	DD H.S	S. Augers	HAMI	WER TYPE Automatic
DR		C. Boy	ce		S	ART DAT	E 07/26/	17	COMP. D	ATE 0	7/26/1	7	SURFACE WATE	R DEPTH N	I/A	DR	RILLER C.B	oyce		ST	TART DATE	07/26/	′17	COMP. DA	TE 07	//26/17		SURFACE WATER	R DEPTH N	I/A
ELE'		DEPT (ft)		.OW CO		0		PER FOO	T 75 10	SAM NO	-1'/	L O OI G		ND ROCK DES	SCRIPTION DEPTH (fi	ELE (ft)	DRIVE DE ELEV (ft)		BLOW CO		0 2		PER FOOT 50	75 100	SAMP NO.	1 /	L O G	SOIL AN	ID ROCK DES	SCRIPTION
206	5	1											_			206	65										_	-		
2060	2,058.	.1 3.5	1	1 2	2	\$3 · · · · · · · · · · · · · · · · · · ·					M	 	- ROA - 2,059.6 Red-Brown t - (A-4) with Tr	ace Organics (F	NKMENT Fine Sandy SILT2.0 Roots) and Mica /	206	2,058.9		1 1	2	\$3					M		2,061.4 ROAI Red-Brown, Trac	e Mica, Highly RESIDUAL Fine to Coar	AY (A-7-6) with
2055	2,053	+ .1 8.5	4	4	5	9					M-	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	SILT (A-5) W and 	ith Trace Mang d Trace to Little	se Sandy Clayey ganese Deposits e Mica	205	2,053.9	8.5	3 3	4	7 · · · · · · · · · · · · · · · · · · ·					M	 	-	and Little Mid	ca
2050	2,048	1 13.5	5 4	4	6						М	77.77.77				204	2,048.9 1		2 4	3	• • • • • • • • • • • • • • • • • • •					М	27. 27. 27. 27. 27. 27.	-		
2040		.1 18.5	1	2	4	./ •6					М	77 77 77 77 77 77	- - - -			204	2,043.9 1		3 3	5	**************************************					М	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	-		
	2,038.	.1 23.5	4	7	8	• 15					М	トカフ	- 2,036.6 - Boring Termi	inated at Eleval SILT (RESIDU	25.0 tion 2,036.6 ft in AL)		+		4 7	8	· · • • 15	1111				M	7	2,037.4 Boring Termi	SILT (RESIDU	25 tion 2,037.4 ft in AL)
NCDOT BORE DOUBLE 14700A_GEO_BH_RDWY WALL.GPJ NC_DOT.GDT 11/20/18		+											- -	Note:	RGANIC SOILS													0.0-0.2' = \$	Note: URFICIAL OR	GANIC SOILS



SHEET 6

										D	<u>Ur</u>	KE L	. <u>OG</u>							
WBS	36030).1.FS4			TI	IP I-4	700A		С	OUNT	Y B	UNCO	MBE			GEOLOG	IST N. Con	sigli		
SITE	DESCR	IPTION	I Ret	aining	Wall 6	on W	BL fro	m 918-	+25 t	to 923-	+75, 3	39.5' R	ight						GROUNI	D WTR (ft)
BOR	ING NO.	B-42	2		S	TATIO	N 923	3+24			OFF	SET	31 ft RT	-		ALIGNME	NT -WBL-		0 HR.	Dry
COLI	LAR ELE	EV. 2,	064.0	ft	T	OTAL	DEPTH	1 25.0) ft		NO	RTHING	G 641,0	059		EASTING	945,108		24 HR.	16.0
DRILL	RIG/HAI	VIMER E	FF./DA	TE F	&R3763	CME-5	50X 86%	% 1/30/20	017				DRILL	METHO	DD H	I.S. Augers		HAMIV	ER TYPE	Automatic
DRIL	LER C	. Boyce	е		S	TART	DATE	07/26	/17		COI	MP. DA	TE 07/	/26/17		SURFACE	WATER DE	EPTH N	/A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft		0	25		S PEF	R FOOT	75	100	SAMP. NO.	17	L O II G	ELEV. (ft)	SOIL AND R	OCK DES	CRIPTION	DEPTH (ft)
2065	2,064.0 - - 2,060.5	-	3 4	4	7 5	. !	11		-					M		_ _	ROADWA ed-Brown, Fine Trace Gra	avel, Highly ESIDUAL	KMENT AY (A-7-6) v Plastic	j
2055	2,055.5 - - - - - -	- - - - - - - -	5	7	12		. • 19		-		-			М	フンスンフ	2,057.0 Bro	wn to Gray, Fir .T (A-5) with Tr	race Mica ne to Coars	se Sandy Cla	
2050	2,050.5 - - - - -	13.5	5	6	6		12 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							M	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	-				
2045	2,045.5- - - - -		4	7	13									М	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	<u>-</u> - - -				
2040	2,040.5	23.5	11	15	22			37			-			М	7 V	2,039.0 Bo	ring Terminate SILT	d at Elevati (RESIDUA		25.0 ft in
																- 0	.0-0.2' = SURF	Note: FICIAL ORG	GANIC SOIL	.s

REFERENCE

CONTENTS

DESCRIPTION

SITE PLAN & PROFILE

TITLE SHEET

LEGEND (SOIL)

CROSS SECTIONS

SHEET NO.

36030

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY			BU	NCOM	BE_						
PROJECT	DESC	RIPTI	ON		-26	FR	OM	NEAF	R NO	C-280	
				NC-146							
SITE DES	CRIPT	ION _	_ R	ETAININ	IG W	ALL	_ 07	AL(DNG	-WBL	-
			0	-WBL-	STA	's	948-	-75	to.	950+	00_
_											

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	6

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 1919) 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 (INPICALE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE DESTREED HAVE EVELS OR SOIL MOISTURE CONDITIONS NDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS NOWN AND VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERRETATIONS 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.

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

	LINSONNEL
INVESTIGATED	BY DC ELLIOTT
DRAWN BYI	OC ELLIOTT
CHECKED BY _	JC KUHNE
	JC KUHNE
DATE	
DA . L	

DEDCANNEL



DOCUMENT NOT CONSIDERED FINAL **UNLESS ALL SIGNATURES COMPLETED**

PROJECT REFERENCE NO. SHEET NO.

1–4700A

2

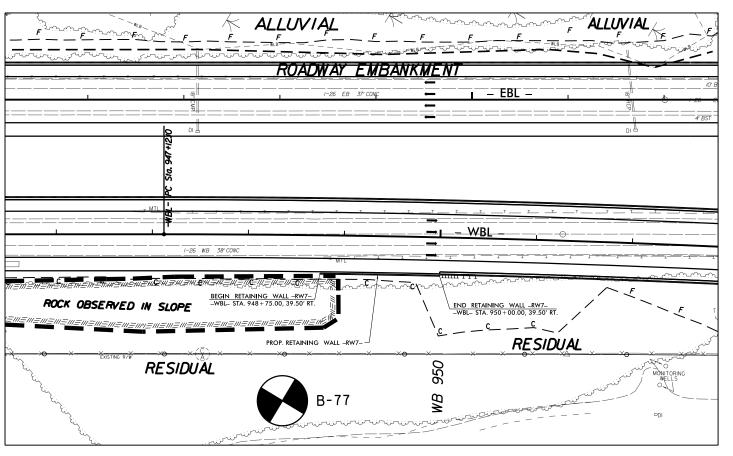
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

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	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <u>UNIFORMLY GRADED</u> - 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 DI586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	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 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEDUS - 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 SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	WEATHERED WALLEY DIVIDED HIS POLLOWS:	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.	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE CRYSTALLINE WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) CROUP 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.	GNEISS, GABBRO, SCHIST, ETC.	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-0 A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-7-6 A-7 A-7-6 A	COMPRESSIBILITY	NON-CRYSTALLINE ROCK (NCR) FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD STO REFUSAL IF TESTED. ROCK (NCR)	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 0000d0000d Symbol Symbo	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.
7. PASSING	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED CP) SHELL BEDS, ETC.	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.
*10 50 MX GRANULAR SIL1 MUCK, ** *40 30 MX 50 MX 51 MN 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.
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.	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN LITTLE OR	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 12 MX 10 MX 11 MN 11 MN MODERATE OPPOSITE	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,
GROUP INDEX W W 4 MX 8 MX 12 MX 16 MX NU MX AMUUN 15 UF SOILS	GROUND WATER	SLIGHT 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	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
USUAL TITES STUME FRADS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	▼ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS 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 GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN. RATING AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	<u>√PW</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK. 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
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELO.
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES 'CLUNK' SOUND WHEN STRUCK, IF TESTED, WOULD YIELD SPT REFUSAL	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
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	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL Set ont 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.
MEDIUM DENSE 10 TO 30 N/A	M	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING CONE PENETROMETER TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	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	— INFERRED SOIL BOUNDARY — CORE BORING SOUNDING ROD	(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	INFERRED ROCK LINE MW MONITORING WELL TEST BORING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BFF</u> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES,) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK,
MATERIAL STIFF 8 TO 15 1 TO 2	DIE TOMETED WITH CURE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIF	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	SHALLOW USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	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 MICACEOUS WEA WEATHERED	BY MODERATE BLOWS. 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 CAUSE FOR EXECUTION OF TERMS	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) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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 (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
(SAT.) FROM BELOW THE GROUND WATER TABLE LL LIQUID LIMIT	F - FINE SL 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	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLIDA PEDILIPES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE (P) PL PLASTIC LIMIT	FRAGS FRAGMENTS	FRACTURE SPACING BEDDING	BENCH MARK:
	EQUIPMENT USED ON SUBJECT PROJECT	TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: FEET
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE	
SL SHRINKAGE LIMIT	CME-45C CLAY BITS AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6 CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	
PLASTICITY	CME-55 CORE SIZE: -B -H	INDURATION]
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS N-N	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS; FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS: CASING POST HOLE DIGGER	COATING CAN DE CEDADATED FROM CAMBLE MITH CTEEL DOOR	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH HAND AUGER	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONE TUNGCARB. SOUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
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: 8-15-14
	• '	•	•

PROJECT REFERENCE NO. TOP FACE OF WALL CUT WALL DETAIL RETAINING WALL -RW7-2,100 2,090 2,080 2,060 2,050 2,040 2,030



PRELIMINARY RETAINING WALL ENVELOPE
APPROXIMATE WALL FACE AREA = 552 SF

TOP OF WALL

 $\begin{array}{c} PROFILE\\ ALONG & -WBL-39.50 \ FEET \\ H.V. \ 1.5 \end{array}$

NOTE: THE WALL ENVELOPE DOES NOT ACCURATELY DEPICT THE ACTUAL FACE OF WALL.

950 + 00

951+00

EXISTING GROUND

947 + 00

-PROP-GRADE

948 + 00

2,100

2,090

2,080

2,070

2,060

2,050

2,030



CONTENTS :700A SHEET NO. 4 REFERENCE 6030 3

PROIEC

3-4

DESCRIPTION

LEGEND (SOIL & ROCK)

SITE PLAN & PROFILE

TITLE SHEET

BORE LOG(S)

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY BUNCOMBE

PROJECT DESCRIPTION <u>I-26 FROM NEAR NC 280</u> (EXIT 40) TO NEAR NC 146 (EXIT 37)

SITE DESCRIPTION <u>RETAINING WALL</u> 8 ON -WBL-FROM 960+00 TO 975+00, 39.5' RIGHT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4700A	1	9

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 NSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-680. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

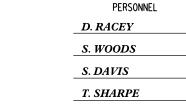
CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND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

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

- NOTES:

 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.

 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.



INVESTIGATED BY $_F&R, Inc.$

DRAWN BY _T.T. WALKER

CHECKED BY _D. RACEY

SUBMITTED BY P. ALTON, P.E.

DATE NOVEMBER 2018



Prepared in the Office of:

FROEHLING & ROBERTSON, INC.

Engineering Stability Since 1881

310 Hubert Street Raleigh, North Carolina 27603-2302 | USA T 919.828.3441 | F 919.828.5751

HILLIAM CARO RTH CAROLL SEAL A TRICK MAIN

(Uton 1/26/2018

=A270EF78A6DF442 SIGNATURE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REPERENCE NO. SHEET NO.

1–4700A

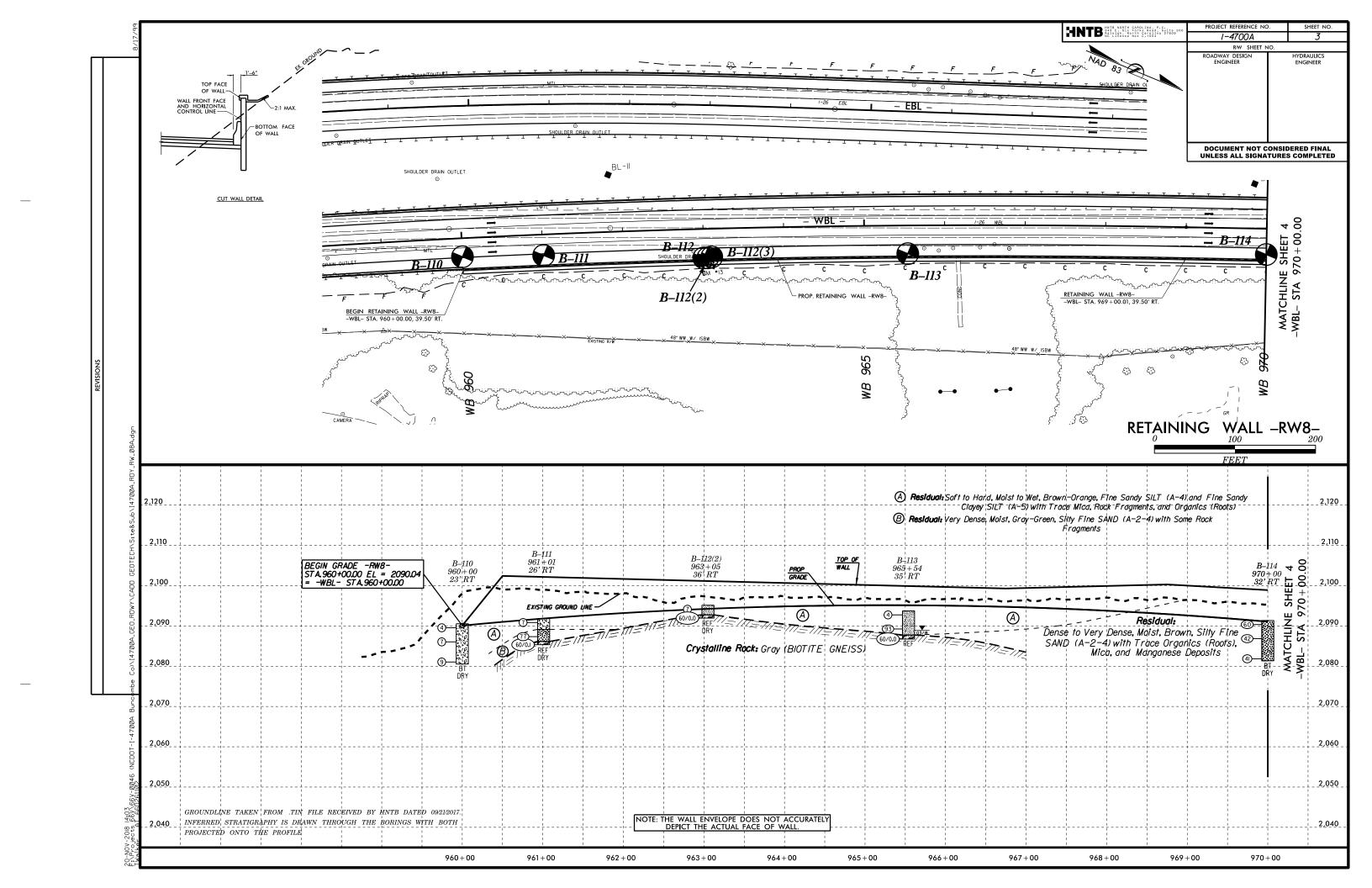
2

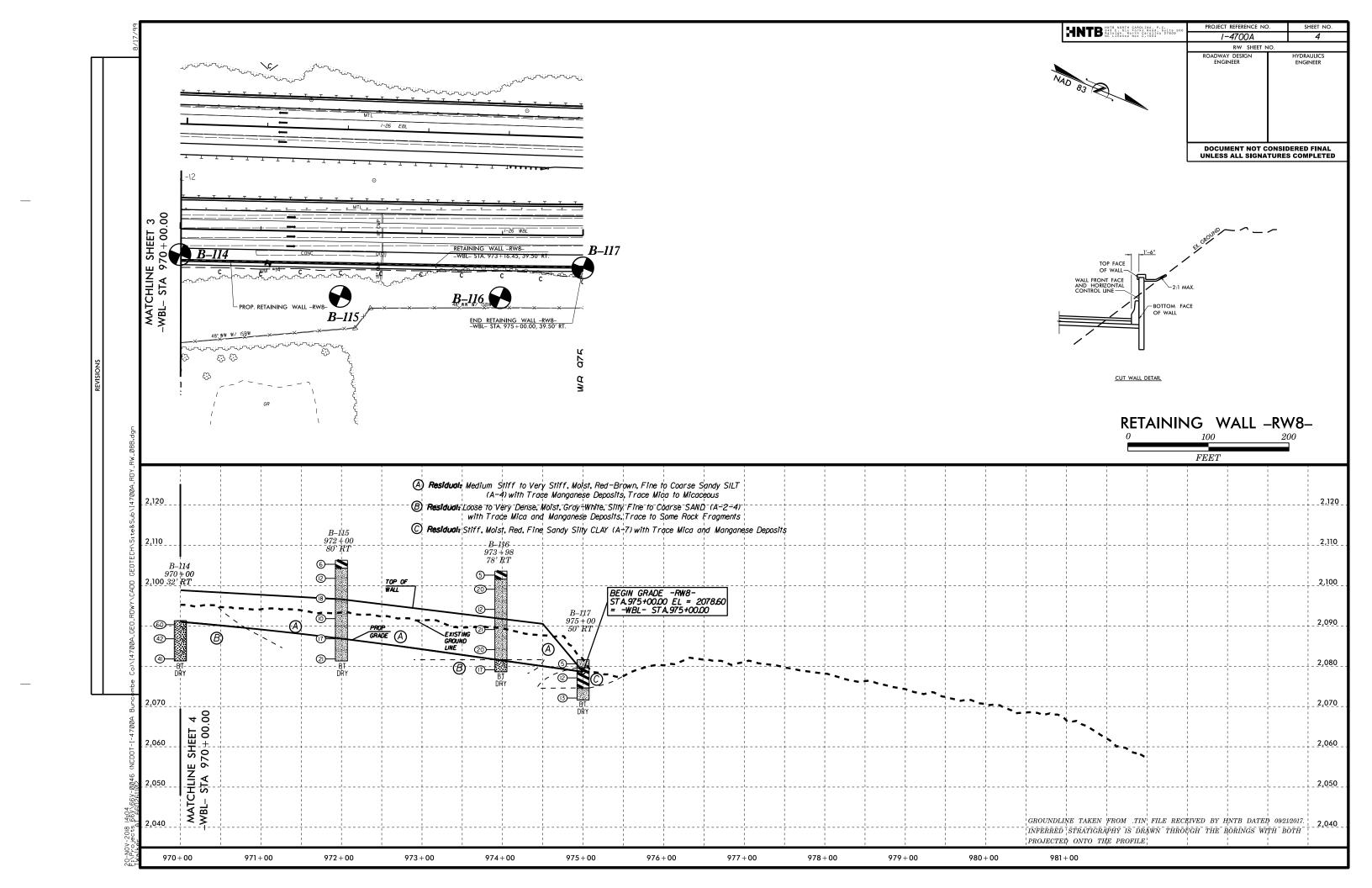
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

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.	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	<u>UNIFORMLY GRADED</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <u>GAP-GRADED</u> - 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 0.1 FOOT PER 60	<u>AQUIFER</u> - 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	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN 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.SULTY CLAY.MOIST WITH INTERBEDDED FINE SAND 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 /// NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
CENEDAL COANILAD MATERIAL C CLITTCLAY MATERIAL C	MINERALOGICAL COMPOSITION	FINE 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 VIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GREISS, 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. COMPRESSIBILITY	NON CRYSTALLING FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
00000000000000000000000000000000000000	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 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LL = 31 - 50	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
PASSING GRANULAR SILT- MUCK,	HIGHLY COMPRESSIBLE LL > 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*18 58 MX 58 MX 51 MN	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
צוויו של צוויי של צווייי של צוויי של צוויי של צוויי של צוויי של צוויי של צוויי של צווייי של צוויי של צוויי של צוויי של צוויי של צוויי של צוויי של צווייי של צוויי של צוויי של צוויי של צוויי של צוויי של צוויי של צווייי של צוויי של צוויי של צוויי של צוויי של צוויי של צוויי של צווייי של צוויי של צוויי של צוויי של צוויי של צוויי של צוויי של צווייי של צוויי של צוויי של צוויי של צוויי של צוויי של צוויי של צווייי של צוויי של צווייי של צווייי של צוויי של צווייי של צוויייי של צווייי של צווייי של צווייי של צווייי של צוויייי של צוויייייי של	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	HORIZONTAL.
LL 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 10 MX 11 MN 11 THE OR	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(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 MODERATE ORGANIC	GROUND WATER	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
GROUP INDEX W W 4 MX 8 MX 12 MX 16 MX NU MX AMUUNIS UF SOILS		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	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR GRAVEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 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. RATING AS CHURCAST EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	<u>∨PW</u> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(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 P1 OF A-7-5 SUBGROUP IS ≤ LL - 30 :P1 OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK.	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	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
PANCE OF STANDARD PANCE OF UNCONFINED		(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 CONSISTENCY PENETRATION RESISTENCE (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE < 4	SPT SPT SPT STORE 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	ITS LATERAL EXTENT.
GRANII AR LOOSE 4 TO 10	SOIL SYMBOL STATEST BORING STOPE INSTALLATION	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. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING CONE PENETROMETER	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT TEST	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	— INFERRED SOIL BOUNDARY — CORE BORING ● SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i>	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE MN MONITORING WELL TEST BORING	COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	A DIEZOMETED	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	INSTALLATION SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION -	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	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	ICCD IN THE TOP 2 CECT OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - COSED IN THE TOP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(BLDR.) (COB.) (GR.) (GSE. 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 OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - 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	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
SOIL MOISTURE - CORRELATION OF TERMS	L CPT - CONE PENETRATION TEST NP - NON PLASTIC $\dot{\gamma}_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
(HITEROENG CHMITS) DESCRIPTION	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON 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	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.
LL _ LIQUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
PLASTIC SEMISOLID; REQUIRES DRYING TO ATTAIN CONTINUE MOISTING	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	
(PI) PL _ PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: N/A
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: N/A 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	
DECLUDES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REGULTES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6° CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD= FILLED IMMEDIATELY AFTER DRILLING
PLASTICITY	X CME-55 CORE SIZE: CORE SIZE: -H	INDURATION	BORING ELEVATIONS OBTAINED FROM .TIN FILE RECEIVED
PLASTICITY INDEX (PI) DRY STRENGTH	CME-550 HARD FACED FINGER BITS	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FROM HNTB ON 9/21/2017
NON PLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	VANE SHEAR TEST CASING W/ ADVANCER HAND TOOLS:	GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
HIGHLY PLASTIC 26 OR MORE HIGH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TOUGHT TOUGHT	CRAINS ARE DISEISUET TO SERARATE WITH STEEL PROPE.	
		INDURATED 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.	CORE BIT VANE SHEAR TEST	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14





)KI																								1												
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975-									GEOLOGIST S. Woods				- MED (5)		WBS								NTY BUNCOMBE				GEOLOGIST S. Woods																					
							GROUND WTR (ft)				` '				1			75+50, 39.5' Right OFFSET 26 ft RT				ALIGNMENT -WBL-				GROUND WTR (1																						
						_																	_	HR.		Dry						-	ATION				-				-						HR.	Dry
	LLAR						OTAL I					NORT	HING							943,27	73	LILABA	24 I	HR. YPE		Dry	COLL						ON TE				NC	RTHIN						943,23			4 HR.	Dry
				T./DA	IE F		CME-5										H.S	6. Augers						TPE /	Automa	itic	DRILL				IE F&											6. Augers					TYPE A	utomatic
	LLER			DI O	W 00		TART I					COMF	P. DA		19. T		1 1	SURF	ACE	WATE	R DEF	TH I	N/A				DRILL				W 001		ART D					MP. D	ATE (718 //	$\overline{+}$	SURF	FACE \	WATER	R DEPT	Γ H N/A		
(11)	(11))	EPTH (ft)		0.5ft	0.5ft	0	25		S PER F 50		75 	100			моі	0	ELEV. (f		SOIL A	ND RO	CK DE	SCRIP ⁻	TION	DEPT	TH (ft)	(it)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	W COL		0	25 		PER FC	75 	100		 MOI	O G			SOIL AN	ND ROC	K DESCR	PTION	
2095	2,09	0.5		1 4	1 3	3	•4 . 1 :										7. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	2,090.5	Bro	wn-Ora	RE:	D SUR SIDUAI ne San h Trace	L	yey SIL ⁻	Г	0.0	2090	2,091.8- - 2,088.3	-	1 25	2 45		7					7	\dashv	M .		2,091.8 2,089.1 2,086.1	Brow Roo Gray	vn, Claye ck Fragr y-Green, Soi	RESI ey SILT (ments, a , Silty Fii me Rock	ind Organ ne SAND k Fragmei	Trace Mica cs (Roots) (A-2-4) with	_/
2085		2.0	8.5		4		•7 •1• •1• •1• •••				· · · · · · · · · · · · · · · · · · ·					М .		2,080.5								10.0		2.085.4 - - - -	6.4 - -	60/0.1				•	• • •	• •	.	60/0.1			-	2,086.1 2,085.3	Pe	Gra Boring T	RYSTALI by (BIOTI Ferminat on Test F CRYSTAL	LINE ROO ITE GNE! ted with S Refusal at LLINE RO	SS) andard	<u></u>
		Ŧ								•							F		Borin	g Termi	inated a	at Eleva RESIDU	ation 2, JAL)	080.5 f	in			_	-												F				GNE	EISS)	`	
		‡ ‡															<u> </u>		0.0	-0.1' = \$	I SURFIC	Note: CIAL OF	RGANI	C SOIL	S			- -															1. 0.0	0'-0.3' = 2. <i>F</i>	SURFIC	ote: CIAL ORG efusal at 6	ANIC SOIL .4'	S
		Ī																										-																				
		+															-											- - - -	-												-							
		+															-											- - - -	-												-							
		† †															-											- - - -	-												-							
<u>o</u>		‡															-											- - - -	- - -												-							
		‡															-											- - -													-							
N Car		‡															-											- - -													-							
KDWY WALL.		- - - - - - - - - -															<u> </u>											- - -													<u> </u>							
4 GEO BH		Ī															E											-													<u>-</u>							
JOBLE 14700.		<u> </u>																										-	-												-							
יי ייייייייייייייייייייייייייייייייייי		† †															-											-	-												-							

	BORE L	.OG										
WBS 36030.1.FS4 TIP I	-4700A COUNTY BUNCOM	MBE	GEOLOGIST S. Woods		WBS 36030.1	1.FS4	TIP I-4700A	COUNTY	BUNCON	1BE	GEOLOGIST S. Woo	ods
SITE DESCRIPTION Retaining Wall 8 on	WBL from 960+00 to 975+50, 39.5' Ri	ight		GROUND WTR (ft)	SITE DESCRIF	PTION Retaini	ng Wall 8 on WBL from 96	0+00 to 975+5	50, 39.5' Riç	ght		GROUND WTR (ft)
BORING NO. B-112(1) STATI	ION 963+00 OFFSET	36 ft RT	ALIGNMENT -WBL-	0 HR . Dry	BORING NO.	B-112(2)	STATION 963+05		OFFSET 3	36 ft RT	ALIGNMENT -WBL-	0 HR. Dry
COLLAR ELEV. 2,095.2 ft TOTAL	L DEPTH 4.3 ft NORTHING	G 644,520	EASTING 943,160	24 HR. Dry	COLLAR ELEV	/. 2,095.1 ft	TOTAL DEPTH 3.	2 ft 1	NORTHING	644,525	EASTING 943,158	24 HR. Dry
DRILL RIG/HAMMER EFF/DATE F&R2175 CME	E-55 82% 02/20/2018	DRILL METHOD H.S	S. Augers HAMN	MER TYPE Automatic	DRILL RIG/HAM	MER EFF./DATE	F&R2175 CME-55 82% 02/2)/2018		DRILL METHOD	H.S. Augers	HAMMER TYPE Automatic
DRILLER S. Davis STAR	T DATE 03/27/18 COMP. DA	TE 03/27/18	SURFACE WATER DEPTH N	I/A	DRILLER S. I		START DATE 03/	27/18	COMP. DA	FE 03/27/18	SURFACE WATER DE	EPTH N/A
ELEV (ft) DEPTH (ft) DEPTH (ft) 0.5ft 0.5ft 0.5ft 0 2100 2095 2,095.2 0.0 2 4 5	BLOWS PER FOOT 25 50 75 100		SOIL AND ROCK DES	CCRIPTION DEPTH (ft) CACE 0.0	ELEV DRIVE ELEV (ft)	(T) 0.5ft 0.8	5ft 0.5ft 0 25		75 100	SAMP. LO O O O O O O O O O O O O O O O O O O	SOIL AND R	OCK DESCRIPTION ND SURFACE 0.6 ESIDUAL
‡ :			Brown, Fine Sandy SILT (A Mica, Rock Fragments, and C CRYSTALLINE R (BIOTITE GNE) Boring Terminated at Elevat CRYSTALLINE ROCK (BIOTITE GNE) Note: 1. 0.0'-0.1'= SURFICIAL OF 2. Auger Refusal a 3. Offset to B-112(2) due to a Crooked	Organics (Roots) ROCK 4.3 ISS) 5 tion 2,090.9 ft in DTITE GNEISS) RGANIC SOILS at 4.3'	2.091.9		\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \		60/0.0		2.092.7 Brown, Fine San. 2.091.9 Mica, Rock Fragme CRYST Boring Termi Penetration Te 2,091.9 ft in CRYS 1. 0.0'-0.1' = SUR 2. Auge	ESIDUAL dy SILT (A-4) with Trace ents, and Organics (Roots) ALLINE ROCK y (GNEISS) inated with Standard st Refusal at Elevation TALLINE ROCK (BIOTITE GNEISS) Notes: FICIAL ORGANIC SOILS r Refusal at 3.2' (3) due to Shallow Refusal

BORE LOG						
WBS 36030.1.FS4 TIP I-4700A COUNTY BUNCOMBE	GEOLOGIST S. Woods		WBS 36030.1.FS4	TIP I-4700A COUN	NTY BUNCOMBE	GEOLOGIST S. Woods
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right	GRO	OUND WTR (ft)	SITE DESCRIPTION Retaining	Wall 8 on WBL from 960+00 to 97	5+50, 39.5' Right	GROUND WTR (ft)
BORING NO. B-112(3) STATION 963+10 OFFSET 35 ft RT	ALIGNMENT -WBL- 0 HF	IR . Dry	BORING NO. B-113	STATION 965+54	OFFSET 35 ft RT	ALIGNMENT -WBL- 0 HR. Dry
		·				
	,	· .				
DDN/F	SURFACE WATER DEPTH N/A		DDIVE			L SURFACE WATER DEPTH N/A
BORING NO. B-112(3)	ALIGNMENT -WBL- EASTING 943,155 Augers HAMMER TYI SURFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION	HR. Dry HR. Dry YPE Automatic TION DEPTH (ft) 0.0 th Trace 2.1 cs (Roots) dard evation ROCK		STATION 965+54 TOTAL DEPTH 7.0 ft RR2175 CME-55 82% 02/20/2018 START DATE 03/27/18 UNT BLOWS PER FOO 0.5ft 0 25 50	OFFSET 35 ft RT NORTHING 644,752 DRILL METHOD COMP. DATE 03/27/18 OT 75 100 NO. MOI M	ALIGNMENT -WBL-
MW. WALLGED I						<u>-</u>
©E DOUBIE 14700A_GEO_BH_KI						

BORE LOG			
WBS 36030.1.FS4 TIP I-4700A COUNTY BUNCOMBE	GEOLOGIST S. Woods		UNTY BUNCOMBE GEOLOGIST S. Woods
SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right	GROUND WTR		
BORING NO. B-114 STATION 970+00 OFFSET 32 ft RT	ALIGNMENT -WBL- 0 HR.	BORING NO. B-115 STATION 972+00	OFFSET 80 ft RT ALIGNMENT -WBL- 0 HR. Dry
COLLAR ELEV. 2,091.3 ft TOTAL DEPTH 10.0 ft NORTHING 645,164	EASTING 942,889 24 HR. D		NORTHING 645,368 EASTING 942,861 24 HR. Dry
DRILL RIG/HAMMER EFF/DATE F&R2175 CIVE-55 82% 02/20/2018 DRILL METHOD	H.S. Augers HAMMER TYPE Automati	DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 82% 02/20/2018	DRILL METHOD H.S. Augers HAMMER TYPE Automatic
DRILLERS. DavisSTART DATE03/27/18COMP. DATE03/27/18	SURFACE WATER DEPTH N/A	DRILLER S. Davis START DATE 03/28/17	COMP. DATE 03/28/17 SURFACE WATER DEPTH N/A
	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTI		FOOT SAMP. L O SOIL AND ROCK DESCRIPTION MOI G
2090 2090 2,091.3	2,091.3 GROUND SURFACE RESIDUAL Brown, Silty Fine SAND (A-2-4) with Trace Organics (Roots), Mica, and Manganese Deposits 2,081.3 Boring Terminated at Elevation 2,081.3 ft in SAND (RESIDUAL) Note: 1. 0.0'-0.3' = SURFICIAL ORGANIC SOILS	2100 2100 2100 2,102.8	M 2,106.3 GROUND SURFACE 0 RESIDUAL 2,104.3 Red, Fine Sandy Sitty CLAY (A-7) with Trace 2 Organics (Roots) and Mica Red-Brown, Fine Sandy SILT (A-4) with Trace Manganese Deposits, Micaceous M M M M M M M M M M M M M M M M M M M
NODOT BORE DOUBLE M700A, GEO, BH RDWY WALL, GRU NC, DOT GOT 11/2016		2,082.8 - 23.5	M 2,081.3 25 Boring Terminated at Elevation 2,081.3 ft in SILT (RESIDUAL)

SITE DESCRIPTION Retaining Wall 8 on WBL from 960+00 to 975+50, 39.5' Right	SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION B1.6 GROUND SURFACE 0 RESIDUAL 79.6 Brown, Clayey Fine Sandy SILT (A-4) with 17 Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
BORING NO. B-116 STATION 973+98 OFFSET 78 ft RT ALIGNMENT -WBL- O HR. Dry	ASTING 942,713 QHR. Dry QGES HAMMER TYPE Automatic URFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION 31.6 GROUND SURFACE RESIDUAL Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
COLLAR ELEV. 2,103.6 ft TOTAL DEPTH 25.0 ft NORTHING 645,552 EASTING 942,786 24 HR. Dry DRILL RIGHAMMER EFF, DATE F8R2175 CME-65 82% 02/20/2018 DRILL METHOD H.S. Augers HAMMER TYPE Automatic DRILL RIGHAMMER EFF, DATE F8R2175 CME-65 82% 02/20/2018 DRILL METHOD H.S. Augers DRILLER S. Davis START DATE 03/28/18 COMP. DATE 03/28/18 SURFACE WATER DEPTH N/A ELEV (II) DRIVE (III) DR	ASTING 942,713 24 HR. Dry Jugers HAMMER TYPE Automatic URFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION 31.6 GROUND SURFACE 0 RESIDUAL Trace Organics (Roots) Red, Fine Sandy Silty (LAY (A-7) with Trace Mica and Manganese Deposits
DRILL RIGHAMMER EFF/DATE F8R2175 CME-55 82% 02/20/2018 DRILL METHOD H.S. Augers	INGERS HAMMER TYPE Automatic URFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION 31.6 GROUND SURFACE 0 RESIDUAL Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
DRILLER S. Davis START DATE 03/28/18 COMP. DATE 03/28/18 SURFACE WATER DEPTH N/A	SOIL AND ROCK DESCRIPTION SOIL AND ROCK DESCRIPTION 31.6 GROUND SURFACE 0 RESIDUAL Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
DRIVE DEPTH BLOW COUNT BLOWS PER FOOT SAMP NO. MOI G ELEV. (ft) DEPTH (ft)	SOIL AND ROCK DESCRIPTION 31.6 GROUND SURFACE 0 RESIDUAL Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
Companies Comp	B1.6 GROUND SURFACE 0 RESIDUAL 79.6 Brown, Clayey Fine Sandy SILT (A-4) with2. Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
2.103.6	RESIDUAL RESIDUAL Brown, Clayey Fine Sandy SILT (A-4) with2 Trace Organics (Roots) Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
and Manganese Deposits and Manganese Deposits and Manganese Deposits M 2075 2073.1 8.5 4 6 7	Red, Fine Sandy Silty CLAY (A-7) with Trace Mica and Manganese Deposits
	Brown, Fine Sandy SILT (A-4) with Trace
2090 2,090.1 13.5 6 9 12 •21 M	IVIICA ALIU IVIALIUALIESE DEDUSIIS
2085 2,085.1 18.5 3 9 11 • 200 M	
2080 2,080.1 23.5 White-Brown, Sitty Fine SAND (A-2-4) M 2,078.6 Sand (RESIDUAL)	
1.0.0-0.1- SURRICAL ORGANIC SOILS 1.0.0-0.1- SURRI	