Ö REFERENCE

**CONTENTS** 

**DESCRIPTION** 

LEGEND (SOIL & ROCK)

TITLE SHEET

SITE PLAN

BORE LOGS

PROFILE

SHEET NO.

5-11

#### STATE OF NORTH CAROLINA

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

## **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY WASHINGTON

PROJECT DESCRIPTION BRIDGE NO. 11 ON -L- (NC 308) OVER MACKEY'S CREEK

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5601	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 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 SORINGS 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 INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS,

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, 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 HINSELF 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.

PERSONNEL J.K. CRENSHAW

R.E. SMITH D.G. PINTER

J.M. EDMONDSON

D.N. ARGENBRIGHT

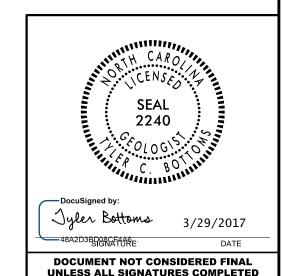
T.C. BOTTOMS

INVESTIGATED BY \_\_T.C. BOTTOMS

DRAWN BY \_T.C. BOTTOMS

SUBMITTED BY <u>D.N.</u> ARGENBRIGHT

DATE MARCH 2017



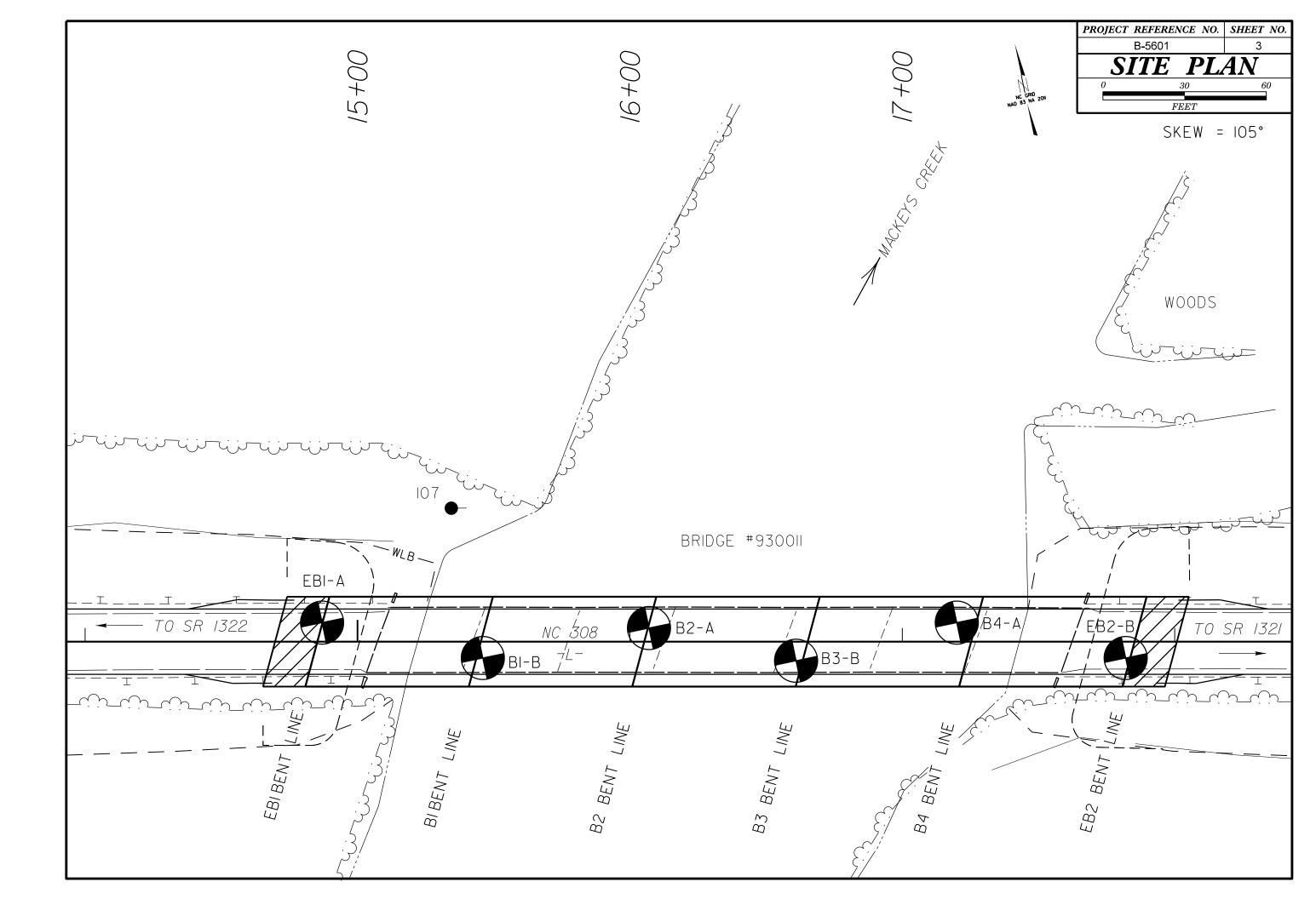
PROJECT REFERENCE NO. SHEET NO. 2

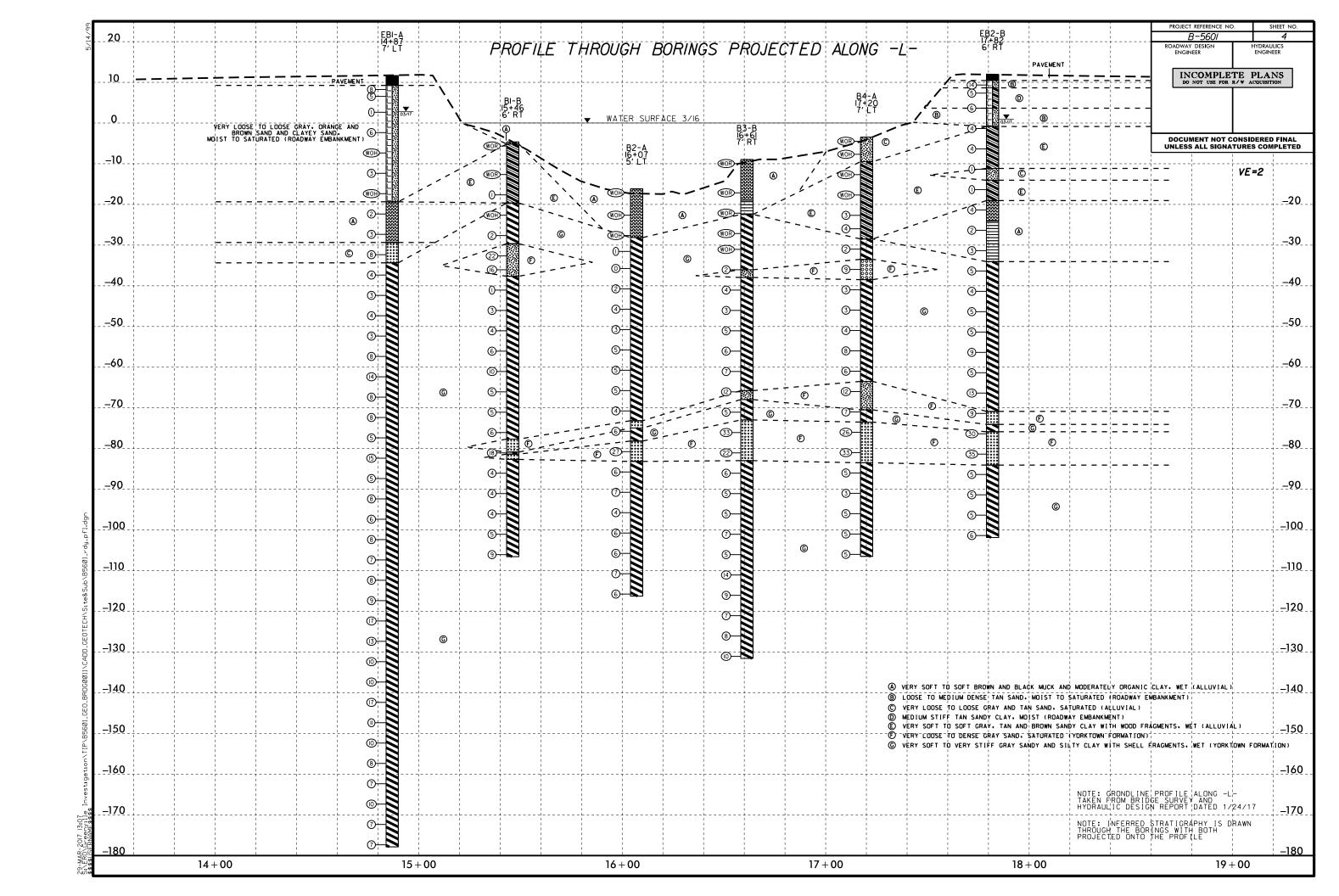
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

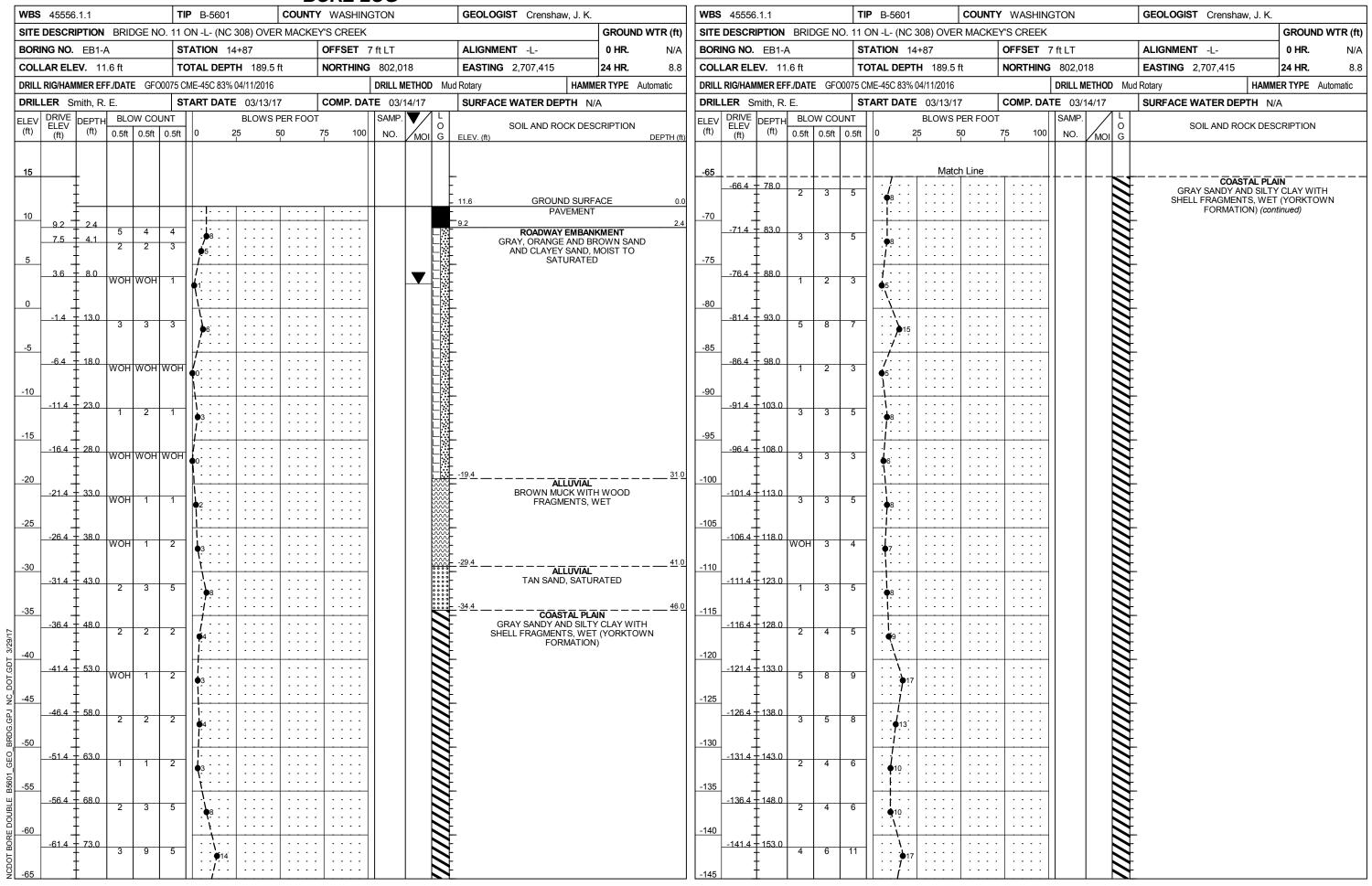
# SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 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.	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:	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, <u>SUBANGULAR, SUBROUNDED</u> , OR <u>ROUNDED</u> .	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 OPCOMIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE CRYSTALLINE CRYSTALLINE	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
CLASS. (\$ 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. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
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 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 0000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
7. PASSING	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 SIL1- MUCK,	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
#40 38 MX 58 MX 51 MN PEAT SOILS SOILS SOILS SOILS SOILS SOILS	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.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 48 MX 41 MN	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,	<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 LITILE UR 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.
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. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER		(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND 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 PAIR TO POOR UNSUITABLE	<u> </u>	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.
AS SUBLINIALE PUUN	SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS ≤ LL - 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	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
DANCE OF STANDARD DANCE OF UNCONFINED	miscellaneous stribuls	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 (IN-VALUE) (TONS/FT <sup>2</sup> )	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 SINDICATOR	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. <u>LENS</u> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GENERALLY LOOSE 4 TO 10	SOIL SYMBOL DOT ONT TEST BORING SECTE 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 10 TO 30 N/A  MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER	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		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 OF AN INTERVENING IMPERVIOUS STRATUM.
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. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 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 TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (RQD) - 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	TTTTT ALLUVIAL SOIL BOUNDARY ALLUVIAL SOIL BOUNDARY PIEZOMETER INSTALLATION - SPT N-VALUE	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 RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4		ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270  OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.  HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	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 ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER	ABBREVIATIONS	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 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 (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.
	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 _ 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.
RANCE - WET - (W) SEMISULID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES  TCR - TRICONE REFUSAL  RT - RECOMPACTED TRIAXIAL  FRAGS FRAGMENTS  Δ - MOISTURE CONTENT  CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: B560I-2
(PI) PL _ PLASTIC LIMITATTAIN OPTIMUM MOISTURE	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	N 802075.0080 E 2707201.1380
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: 7.90 FEET
SL SHRINKAGE LIMIT	DRILL UNITS:  ADVANCING TOOLS:  HAMMER TYPE:  X CME-45C  CLAY BITS  X AUTOMATIC  MANUAL	MODERATELY CLOSE	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO	6. CONTINUOUS ELICHT AUGER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
ATTAIN OPTIMUM MOISTURE		THINLY LAMINATED < 0.008 FEET  INDURATION	
PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
PLASTICITY INDEX (PI) DRY STRENGTH  NON PLASTIC 0-5 VERY LOW	CME-550 HARD FACED FINGER BITS TUNGCARBIDE INSERTS	RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST Y CASING WY ADVANCER HAND TOOLS:	GENILE BLUW BY HAMMER DISINIEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH	POSTABLE DIGGER	MODERATELY INDURATED  GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR	TRICONS CARD HAND HOURN	CRAING ARE DISCIPLE TO SERARATE WITH STEEL PROPE.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT SOUNDING ROD VANE SHEAR TEST	INDURATED DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	X DRAG BIT	EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE 0 IE 14
		SAMPLE BREAKS ALMUSS UKAINS.	DATE: 8-15-14

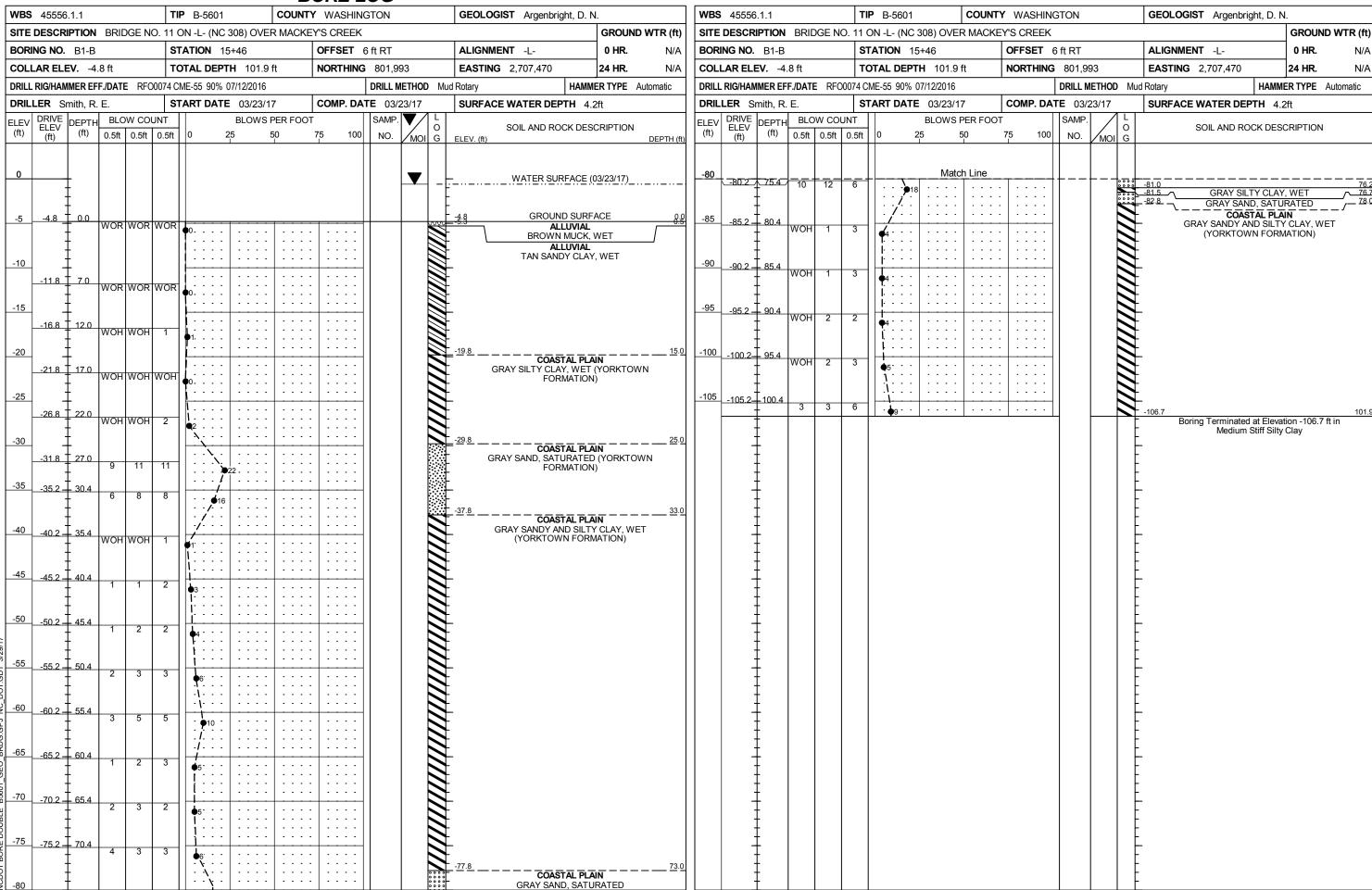




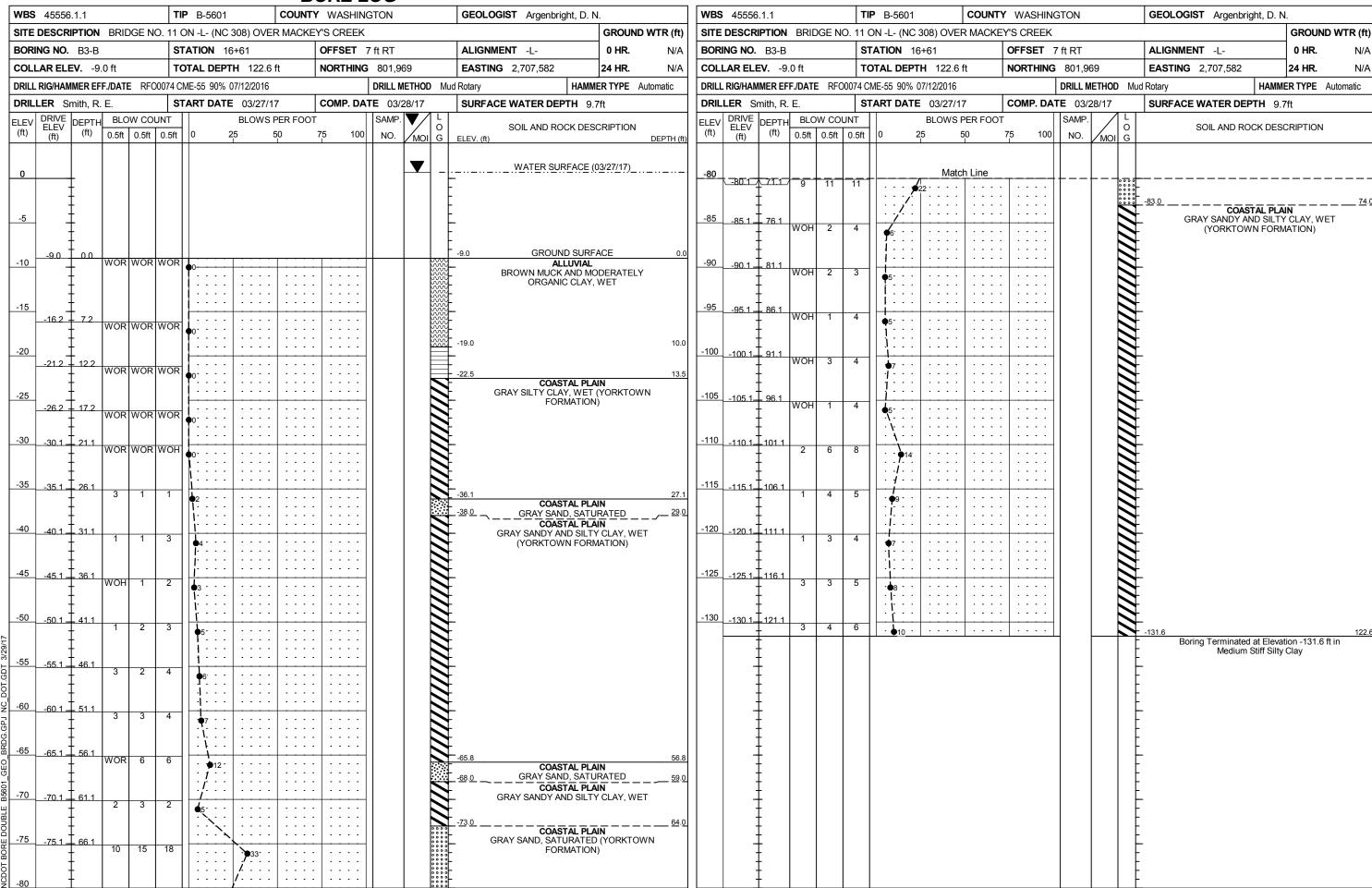


								<u>ORE L</u>	<u>UG</u>					
WBS	45556	5.1.1			TI	<b>P</b> B-5601	COUNT	Y WASHING	STON			GEOLOGIST Crenshaw, J. K.	_	
SITE	DESCR	IPTION	BRII	OGE N	O. 11 (	ON -L- (NC 308) OVE	R MACKE	Y'S CREEK					GROUN	ND WTR (ft
BORI	ING NO.	EB1-/	4		S	<b>FATION</b> 14+87		OFFSET 7	ft LT			ALIGNMENT -L-	0 HR.	N/A
COLI	LAR ELE	<b>EV</b> . 11	.6 ft		TO	OTAL DEPTH 189.5	ft	NORTHING	802,0	18		<b>EASTING</b> 2,707,415	24 HR.	8.8
DRILL	. RIG/HAM	IMER EF	F./DAT	E GFO	00075 C	ME-45C 83% 04/11/2016			DRILL N	IETHOD	Mud	l Rotary HAMN	IER TYPE	Automatic
DRIL	LER St		E.		S	TART DATE 03/13/1	7	COMP. DAT	<b>FE</b> 03/	14/17		SURFACE WATER DEPTH N	/A	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	<b>-</b>	0.5ft			PER FOOT 50	75 100	SAMP.	'/	L O G	SOIL AND ROCK DES	CRIPTION	I DEPTH (
-145		L		<u> </u>		Matc	h Line							
-150	146.4 - - - - -	<del> </del>  -  -	3	3	8	• • • • • • • • • • • • • • • • • • •						COASTAL PLA GRAY SANDY AND SILT SHELL FRAGMENTS, WE' FORMATION) (con	Y CLAY W T (YORKT)	ITH OWN
-155	-151.4 - - - - -	163.0	2	3	7	• • • • • • • • • • • • • • • • • • •								
-160	156.4 - - - - -	168.0	2	3	5									
-165	-161.4 - - - -	173.0	WOH	2	5	• • • • • • • • • • • • • • • • • • •								
-170	-166.4 - - - -	178.0	2	3	7	10								
-175	-171.4 - - - - -	183.0	WOH	1	6	• <del>•</del> 7 · · · · · · · · · · · · · · · · · · ·								
	-176.4 -	188.0	1	2	5	•7					3	-177.9		189
												Boring Terminated at Eleva Medium Stiff Silty Medium Stiff Silty  .	auon -177.S	חו אינ

SHEET 6 OF 11



WR	455	56 1 1			TIP B-	5601	I		Y WASH				GEOL OG	IST Argent	oright D N			WRS	45556	1 1			TID	B-5601		COLIN	TY WASHII	NGTON		GEOL	OGIST Arger	hright D N	
			BRIDG						EY'S CREE				OLOLOG	Algenia	origini, D. N		O WTR (ft)	-			BRIDG	SE NO			308) 0\/F		EY'S CREE			OLOL	OOIOI Aigei	ibrigrit, D. IV	GROUND WTR (
		D. B2-A				ON 16+		· WIAOIL	OFFSET				ALIGNME	=NT _I _		0 HR.	N/A		NG NO.		DIVIDO	JE NO.		TION 16			OFFSET			ALIGN	IMENT -L-		O HR. N
		LEV1					100.1 f	f+	NORTHI					2,707,532		24 HR.	N/A		AR ELE		2 ft		+	AL DEPT		1 ft	NORTHIN		002		NG 2,707,53	.2	24 HR. N
			F./DATE					it	NORTHI		. METHOD			2,707,332		ER TYPE /						DECOU		E-55 90% (			NOKITHIN	-	METHOD Mu		2,707,50		ER TYPE Automatic
		Smith, R.					03/20/17	7	COMP. I					E WATER D			Automatic		LER Si			KF000	_	RT DATE			COMP. D				ACE WATER		
ELE\							03/20/17 BLOWS P				3/21/17 P. <b>V</b> /		SURFAC	EWAIERD	EPIN 15	.111.						/ COLIN		KIDAIE		PER FOO		SAMP		SUKF	ACE WATER	JEPIN 15	. 1π
(ft)	ELE\ (ft)	(ft)	0.5ft 0	0.5ft 0.5	ft 0	25		50		00 NO	17	O E	I E\/ (#\	SOIL AND F	ROCK DESC	CRIPTION	DEPTH (ft)	ELEV (ft)	DRIVE ELEV (ft)	(ft)	0.5ft (	0.5ft 0.	).5ft	0 2	5	50	75 10	11	MOI G		SOIL AND	ROCK DESC	CRIPTION
	( )										T WICH		LL V. (II)				DEI III (II)		( )										7 WOI C				
0																		-80							Mat	ch Line							
		7												WATER.S	URFACE (C	03/20/17)_					<del>-</del> 8-†	14	13		27		.	<del>  </del> -				DASTAL PLA	N (YORKTOWN
		‡										-							-					/					0000	- - <u>83.2</u>	FORM	ATION) (cont	inued)6
-5		‡										-						-85	-84.8	68.6	WOH	3	3	/				-		- -	<b>GRAY SILTY</b>	DASTAL PLA CLAY, WET (	YORKTOWN
		‡										-							-					<b>●</b> 6						-	F	ORMATION	)
-10		‡										-						-90	-89.8	736				1:::						- -			
10		‡																	-	- 70.0	WOH	3	4	7				1		-			
		‡										-							-					1				1 1		<b>-</b> -			
-15		‡											16.2	CDOL	JND SURFA	۸۵۶	0.0		-94.8	78.6	WOH	1	3	1						- 			
	-16.2	0.0	WOH W	лон wo	H 0-					-     -		×××/	16.2		ALLUVIAL		0.0		-			·		<b>♦</b> 4						- -			
20		‡				: : :						****		BLAC	K MUCK, W	VET		100	-99.8	936				1						- -			
-20	-21 7	+ 5.5								-		****						-100	-99.0	- 00.0	1	2	4	6						-			
	-21.1	1 3.3	WOH W	лон wo	H <b>∳</b> ₀:					:		*****							-					1:::				11		<b>-</b> -			
-25		‡								-		****						-105	-104.8	88.6	2	3	3	· · ·						- -			
	-26.7	10.5	WOH W	/OH WO	밁!:					:		****							-		_	٠	١	<b>\Phi</b> 6						- -			
		‡	""	7011	0.					-		₩ <u>-</u> 2	28.2	<del>co</del>	ASTAL PLA	<u> </u>	12.0		400.0	<u> </u>				1:::				1 1		-			
-30	-30.6	14.4	1	1 0	<b>┤├</b>								G	RAY SILTY CI FO	LAY, WET ( DRMATION)	(YORKTOV I)	VN	-110	-109.8_	93.6	2	3	4	<b>●</b> 7		<del>                                     </del>		+		-			
		<u> </u>	'		1.					.						,			-					:::::						<b>-</b>			
-35	-34.8	18.6			IJĿ.													-115	-114.8	98.6				1						-			
		1	1	0 0	•0.					.									<u> </u>		2	3	3	<b>♦</b> 6				Ц		116.3	Boring Termina	ated at Flevat	ion -116 3 ft in
		<u> </u>								-									-											<u>-</u>	Medi	um Stiff Silty	Clay
-40	-39.8	23.6	1	1 1															_	-										_			
		Ŧ							.	.									-	F										-			
-45	-44.8	28.6								1 1									-	F										-			
		Ŧ	1	2 2	4					-		1							-	F										<del>-</del>			
		Ŧ			-					:									-	F										- -			
-50	-49.8	33.6	2	1 2						-									_	F										- -			
3/17		Ŧ			1.					:									-	F										-			
65/E -55	54.8	38.6			!;					:									-											<del>-</del> -			
109.	J	7	2	3 2	•5					-									-											-			
DOT		‡																	-											-			
ပ <u>္</u> -60	-59.8	43.6	2	2 3						-									_	‡										- -			
.GPJ		‡			[ ]					:									-	‡										- -			
-65	-64 9	48.6			111														-	‡										<del>-</del> -			
<u> </u>	-04.8	+ 40.0	1	2 3	<b></b> 5	5				:		1							-	‡										<del>-</del>			
7 19		‡								:									-	<u> </u>										- -			
-70	-69.8	53.6		2 2	<u> </u>				-	<u>.                                    </u>									-											- -			
BLE		‡		2   2	• 4					:									-	<u> </u>										- -			
00		† <b></b> .			$ \cdot $							-7	73.2	<del>c</del> o	ASTAL PLA	<u></u> – – –	57.0		-											<b>-</b>			
- <u>75</u>	74.8	58.6	3	3 3								-7	75.0	GRAY SA	AND, SATU	IRATED	58.8		_	<u> </u>									[	-			
OT B		†				X			.	:		<b>1</b> -7	78.2		SILTY CLAY		62.0		-	<u> </u>									[	<b>-</b> -			
OS -80	-79.8	T 63.6				`\				-		0000							=	<u> </u>										=,			



BORE LOG		1		
WBS         45556.1.1         TIP         B-5601         COUNTY         WASHINGTON	GEOLOGIST Argenbright, D. N.		TIP B-5601 COUNTY WASHINGTON	GEOLOGIST Argenbright, D. N.
SITE DESCRIPTION BRIDGE NO. 11 ON -L- (NC 308) OVER MACKEY'S CREEK	GROUND WTR (ft)	SITE DESCRIPTION BRIDGE NO. 11	ON -L- (NC 308) OVER MACKEY'S CREEK	GROUND WTR (ft)
BORING NO. B4-A STATION 17+20 OFFSET 7 ft LT	ALIGNMENT -L- 0 HR. N/A	BORING NO. B4-A	STATION 17+20 OFFSET 7 ft LT	ALIGNMENT -L- 0 HR. N/A
COLLAR ELEV3.5 ft         TOTAL DEPTH         103.0 ft         NORTHING         801,971	<b>EASTING</b> 2,707,643 <b>24 HR.</b> N/A	COLLAR ELEV3.5 ft	OTAL DEPTH 103.0 ft NORTHING 801,97	1 <b>EASTING</b> 2,707,643 <b>24 HR.</b> N/A
DRILL RIG/HAMMER EFF./DATE RF00074 CME-55 90% 07/12/2016 DRILL METHO	Mud Rotary HAMMER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE RF00074 (	CME-55 90% 07/12/2016 DRILL ME	ETHOD Mud Rotary HAMMER TYPE Automatic
DRILLER         Smith, R. E.         START DATE         03/21/17         COMP. DATE         03/22/17	SURFACE WATER DEPTH 3.3ft		START DATE 03/21/17 COMP. DATE 03/2	2/17 SURFACE WATER DEPTH 3.3ft
ELEV (ft)   DRIVE   DEPTH   BLOW COUNT   BLOWS PER FOOT   SAMP.   WITH COUNT   COUNT	C SOIL AND ROCK DESCRIPTION G ELEV. (ft) DEPTH (ft)	ELEV CRIT CRIT CRIT CRIT CRIT CRIT CRIT CRIT	BLOWS PER FOOT SAMP.  0 25 50 75 100 NO.	L O SOIL AND ROCK DESCRIPTION G
	WATER SURFACE (03/21/17)	-80 <u>-800 76.5 13 16 17</u>	Match Line	COASTAL PLAIN GRAY SAND, SATURATED (YORKTOWN FORMATION) (continued)
-5 -3.5 + 0.0   WOR WOR WOR   WOR	3.5 GROUND SURFACE 0.0	<del> </del>		COASTAL PLAIN
-6.7 † 3.2 WOH WOH WOH OIL	TAN SAND, SATURATED	0 -90 -90.0 86.5 WOH WOH 3	φ5····································	GRAY SILTY CLAY, WET (YORKTOWN FORMATION)
-11.7 8.2 WOH WOH WOH O	TAN AND GRAY SANDY CLAY WITH WOOD FRAGMENTS, WET	-95 -95.0 91.5 WOH 1 4	\$5	
-20 -21.7 18.2 2 1 2 3 3		-100 -100.0 96.5 WOH 1 4	<b>6</b> 5	
-25 -25.0 21.5 1 3 1 4 · · · · · · · · · · · · · · · · · ·		-105 -105.0 101.5 1 2 3	<b>4</b> 5- · · · · · · · · · · · · · · · · · · ·	106.5 103.0  - Boring Terminated at Elevation -106.5 ft in Medium Stiff Silty Clay
-30 -30.0	GRAY SILTY CLAY, WET (YORKTOWN FORMATION)  - 33.5  - COASTAL PLAIN			
-40 -40.0 36.5 4 4 4 3	GRAY SAND, SATURATED (YORKTOWN FORMATION)  COASTAL PLAIN GRAY SILTY CLAY, WET (YORKTOWN			
-45   -45.0   41.5   1   1   2     •3 · · · · · · · · · · · · · · · · · ·	FORMATION)			
-50 -50.0 46.5				
-55 -55.0 51.5 2 3 5				
2 -60 -60.0 56.5 1 3 3 •6· · · · · · · · · · · · · · · · · · ·	63.5			
20 -65 -65.0 -61.5 4 5 7 - 12···································	GRAY SAND, SATURATED (YORKTOWN FORMATION)			<del> </del>
8 -70 -70.0 66.5 3 3 4 7 7 · · · · · · · · · · · · · · · · ·	-70.5 67.0  - COASTAL PLAIN - GRAY SILTY CLAY, WET -73.5 70.0  COASTAL PLAIN GRAY SAND, SATURATED (YORKTOWN	1		
80 -80 -80 -80 -80 -80 -80 -80 -80 -80 -	FORMATION)			

