

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

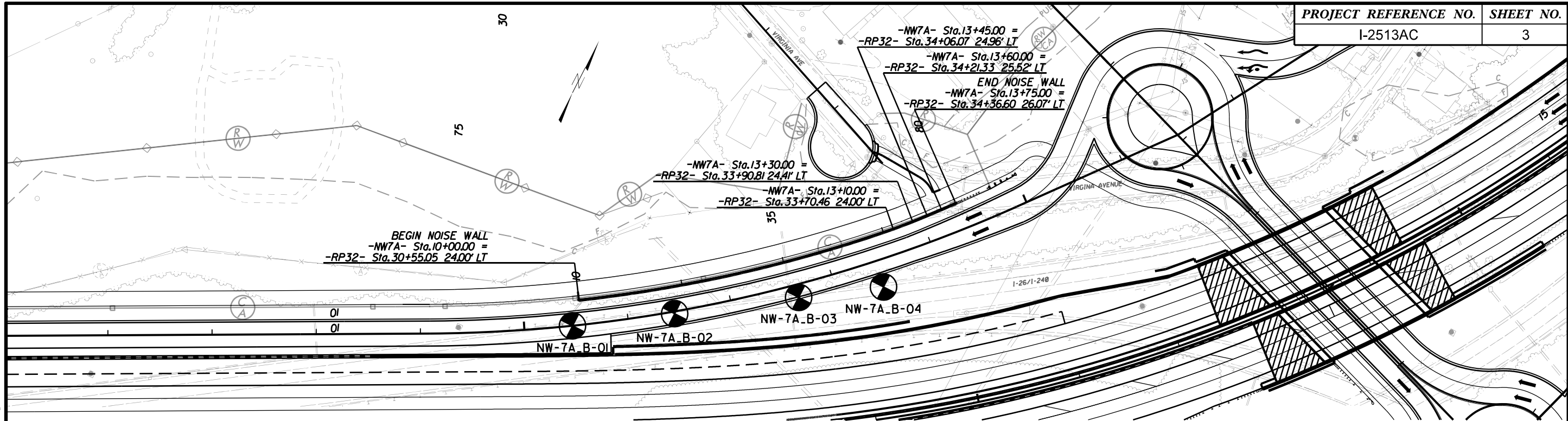
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

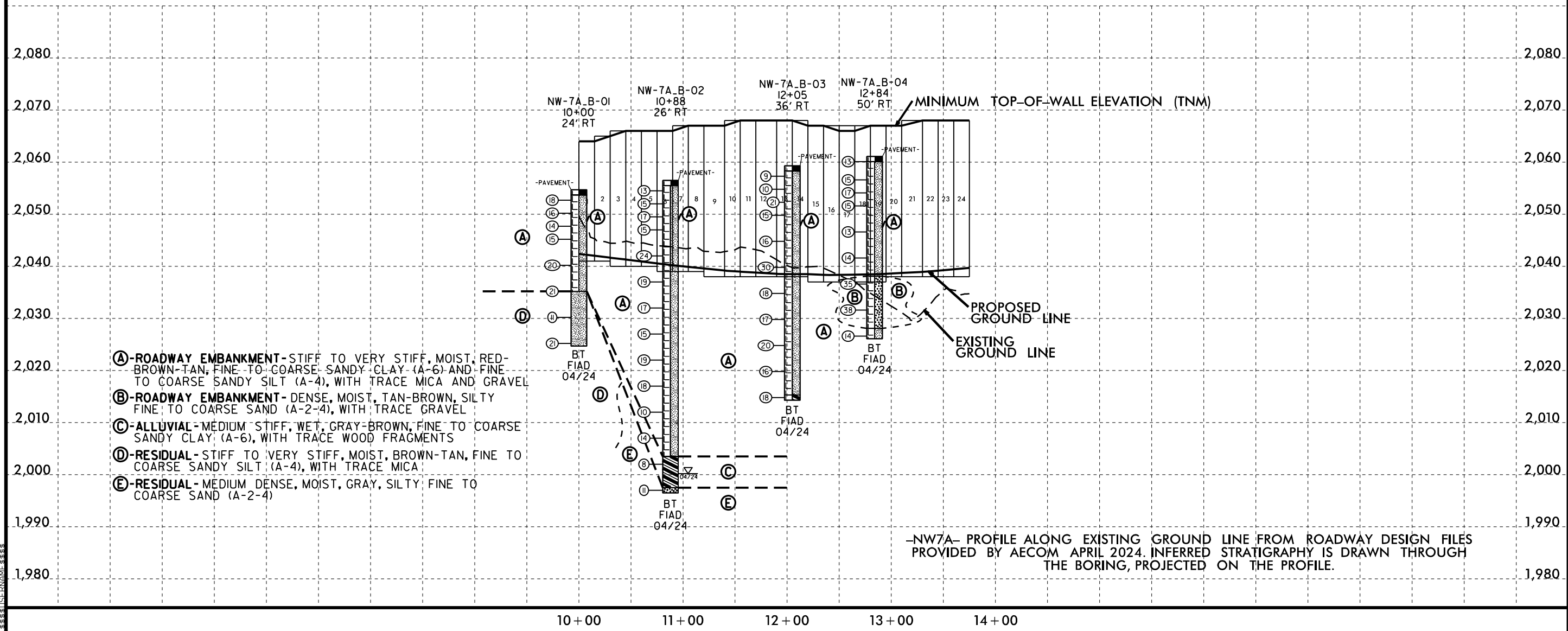
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>										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.										HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:										ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (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. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERING																			
GENERAL CLASS.										MINERALOGICAL COMPOSITION										CRYSTALLINE ROCK (CR)																			
GROUP CLASS.										COMPRESSIBILITY										NON-CRYSTALLINE ROCK (NCR)																			
SYMBOL										PERCENTAGE OF MATERIAL										COASTAL PLAIN SEDIMENTARY ROCK (CP)																			
% PASSING										GROUND WATER																													
MATERIAL PASSING #40										MISCELLANEOUS SYMBOLS										SEVERE (MOD. SEV.)																			
LL										RECOMMENDATION SYMBOLS										SEVERE (SEV.)																			
PI										ABBREVIATIONS										VERY HARD																			
GROUP INDEX																				HARD																			
USUAL TYPES OF MAJOR MATERIALS																				MODERATELY HARD																			
GEN. RATING AS SUBGRADE																				MEDIUM HARD																			
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																				SOFT																			
CONSISTENCY OR DENSENESS																				VERY CLOSE																			
PRIMARY SOIL TYPE																				CLOSE																			
COMPACTNESS OR CONSISTENCY																				MODERATELY CLOSE																			
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)																				WIDE																			
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																				VERY WIDE																			
GENERAL																																							
MATERIAL																																							
(NON-COHESIVE)																																							
GENERAL																																							
SILT-CLAY																																							
MATERIAL																																							
(COHESIVE)																																							
TEXTURE OR GRAIN SIZE																																							
U.S. STD. SIEVE SIZE OPENING (MM)																																							
BOULDER (BLDR.)																																							
COBBLE (COB.)																																							
GRAVEL (GR.)																																							
COARSE SAND (CSE. SD.)																																							
FINE SAND (F SD.)																																							
SILT (SL.)																																							
CLAY (CL.)																																							
GRAIN SIZE																																							
SOIL MOISTURE - CORRELATION OF TERMS																																							
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																																							
FIELD MOISTURE DESCRIPTION																																							
GUIDE FOR FIELD MOISTURE DESCRIPTION																																							
LL - LIQUID LIMIT																																							
PLASTIC RANGE (PI)																																							
PL - PLASTIC LIMIT																																							
OM - OPTIMUM MOISTURE SHRINKAGE LIMIT																																							
SL - SHRINKAGE LIMIT																																							
PLASTICITY																																							
NON PLASTIC																																							
SLIGHTLY PLASTIC																																							
MODERATELY PLASTIC																																							
HIGHLY PLASTIC																																							
COLOR																																							
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																																							



NOISE WALL -NW7A- STA 10+00.00 TO -NW7A- STA 13+75.00



NCDOT BORE DOUBLE I2513AC_GEO_GTM.GPJ NC_DOT.GDT 7/12/24

WBS 34165.1.13			TIP I-2513AC			COUNTY BUNCOMBE			GEOLOGIST A. Blackmore					
SITE DESCRIPTION I-26/I-40/I-240 Interchange to SR 3548 (Haywood Road)										GROUND WTR (ft)				
BORING NO. NW-7A_B-02			STATION 10+88			OFFSET 26 ft RT			ALIGNMENT -NW7A-			0 HR. 56.3		
COLLAR ELEV. 2,056.5 ft			TOTAL DEPTH 60.0 ft			NORTHING 680,525			EASTING 933,177			24 HR. FIAD		
DRILL RIG/HAMMER EFF./DATE ECS049 Diedrich D-70 94% 04/02/20204						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER C. Osborne			START DATE 04/17/24			COMP. DATE 04/17/24			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
2060														
2055	2,055.5	1.0												2,056.5 GROUND SURFACE 0.0
														2,055.5 ROADWAY EMBANKMENT 1.0
	2,053.0	3.5	5	6	7	13						M		Asphalt (0.7'), Stonebase (0.3') Stiff to Very Stiff, Brown-Tan, Fine to Coarse Sandy SILT (A-4), with trace mica
	2,050.5	6.0	5	6	9	15						M		
2050	2,048.0	8.5	8	9	8	17						M		
	2,046.0		6	7	8	15						M		
2045	2,043.0	13.5	7	9	15	24						M		
2040	2,038.0	18.5	8	9	10	19						M		
2035	2,033.0	23.5	5	7	10	17						M		
2030	2,028.0	28.5	6	6	9	15						M		
2025	2,023.0	33.5	7	9	10	19						M		
2020	2,018.0	38.5	5	8	10	18						M		
2015	2,013.0	43.5	4	5	5	10						M		
2010	2,008.0	48.5	5	6	8	14						M		
2005	2,003.0	53.5	4	4	4	8						W		
2000	1,998.0	58.5	7	6	5	11						M		
														2,003.5 ALLUVIAL 53.0
														Medium Stiff, Gray-Brown, Fine to Coarse Sandy CLAY (A-6), with trace wood fragments
														1,997.5 59.0
														1,996.5 RESIDUAL 60.0
														Medium Dense, Gray, Silty Fine to Coarse SAND (A-2-4)
														Boring Terminated at Elevation 1,996.5 ft In Residual Silty SAND (A-2-4)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34165.1.13			TIP I-2513AC			COUNTY BUNCOMBE			GEOLOGIST A. Blackmore						
SITE DESCRIPTION I-26/I-40/I-240 Interchange to SR 3548 (Haywood Road)									GROUND WTR (ft)						
BORING NO. NW-7A_B-03			STATION 12+05			OFFSET 36 ft RT			ALIGNMENT -NW7A-			0 HR. Dry			
COLLAR ELEV. 2,059.3 ft			TOTAL DEPTH 45.0 ft			NORTHING 680,593			EASTING 933,276			24 HR. FIAD			
DRILL RIG/HAMMER EFF./DATE ECS049 Diedrich D-70 94% 04/02/20204						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER C. Osborne			START DATE 04/17/24			COMP. DATE 04/17/24			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100		MOI		ELEV. (ft)	DEPTH (ft)
2060															
	2,058.3	1.0	4	5	4	9						M		2,059.3 GROUND SURFACE 0.0	2,058.3 ROADWAY EMBANKMENT 1.0
2055	2,055.8	3.5	5	5	5	10						M		Asphalt (0.7'), Stonebase (0.3')	
	2,053.3	6.0	8	14	7	21						M		Stiff to Very Stiff, Brown, Fine to Coarse Sandy SILT (A-4), with trace gravel and mica	
2050	2,050.8	8.5	7	7	8	15						M			
	2,045.8	13.5	7	7	9	16						M			
2045															
2040	2,040.8	18.5	11	13	17	30						M			
	2,035.8	23.5	14	7	11	18						M			
2035															
2030	2,030.8	28.5	7	7	10	17						M			
	2,025.8	33.5	10	10	10	20						M			
2025															
2020	2,020.8	38.5	8	9	7	16						M			
	2,015.8	43.5	11	9	9	18						M		2,015.3 44.0	2,014.3 45.0
2015														Very Stiff, Brown, Fine to Coarse Sandy CLAY (A-6)	
														Boring Terminated at Elevation 2,014.3 ft In Roadway Embankment Sandy CLAY (A-6)	

NCDOT BORE DOUBLE I2513AC_GEO_GTM.GPJ NC_DOT.GDT 7/12/24

WBS 34165.1.13		TIP I-2513AC		COUNTY BUNCOMBE		GEOLOGIST A. Blackmore							
SITE DESCRIPTION I-26/I-40/I-240 Interchange to SR 3548 (Haywood Road)								GROUND WTR (ft)					
BORING NO. NW-7A_B-04		STATION 12+84		OFFSET 50 ft RT		ALIGNMENT -NW7A-		0 HR. Dry					
COLLAR ELEV. 2,061.1 ft		TOTAL DEPTH 35.0 ft		NORTHING 680,639		EASTING 933,344		24 HR. FIAD					
DRILL RIG/HAMMER EFF./DATE ECS049 Diedrich D-70 94% 04/02/20204				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic							
DRILLER C. Osborne		START DATE 04/17/24		COMP. DATE 04/17/24		SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100	MOI		
2065													
2060	2,061.1	0.0	6	7	6								2,061.1 GROUND SURFACE 0.0
													2,060.1 ROADWAY EMBANKMENT 1.0
	2,057.6	3.5	6	6	9						M		Asphalt (0.7'), Stonebase (0.3')
	2,055.1	6.0	6	12	5						M		Stiff to Very Stiff, Brown, Fine to Coarse Sandy SILT (A-4)
2055	2,052.6	8.5	6	8	7						M		
											M		
2050	2,047.6	13.5	4	6	7						M		
2045	2,042.6	18.5	5	6	8						M		
2040	2,037.6	23.5	12	20	15						M		2,038.1 Dense, Tan-Brown, Silty Fine to Coarse SAND (A-2-4), with trace gravel 23.0
2035	2,032.6	28.5	19	26	12						M		
2030	2,027.6	33.5	9	8	6						M		2,028.1 Stiff, Brown, Fine to Coarse Sandy SILT (A-4) 33.0
													2,026.1 Boring Terminated at Elevation 2,026.1 ft In Roadway Embankment Sandy SILT (A-4) 35.0