### NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

### DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

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## SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS					
SOIL DESCRIPTION	GRADATION			DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER	WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE OF		ROCK LINE INDICATES THE LEVEL AT WHICH NON-C	WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED OASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.
30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE; CONSISTENCY, COLOR,	GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.		IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION	SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE	AQUIFER - A WATER BEARING FORMATION OR STRATA.  ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND TY, ERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	ANGULARITY OF GRAINS		OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLO	WS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE
VERY STIFF, GRAY SILTY CUY, NOST WITH INTERBEDDED FINE SAND UN'ERS, NIGHY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; AND SUBROUNDED, OR ROUNDED.	NGULAR, SUBANGULAR,	WEATHERED ROCK (WR) NON-COASTAL F	PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS	PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION			SE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS CLASS. (.95% PASSING *200) (.95% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DETTHEY ARE CONSIDERED OF SIGNIFICANCE.	ESCRIPTIONS WHENEVER		SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	CALCAREOUS (CALC.) - SOILS WHICH 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	COMPRESSIBILITY		NON COVETALLINE FINE TO COARS	E GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CLASS. A-1-0 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7-5 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS TH		INCLUDES PHYL	ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE LITE, SLATE, SANDSTONE, 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.
SYMBOL 000000000000000000000000000000000000	MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER		CEDIMENTARY COT DECICAL	SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
% PASSING S0 MX GRANULAR SILT- MUCK,	PERCENTAGE OF MATERIAL		ROCK (CP) SHELL BEDS, ET	EATHERING	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
* 40   30 MX 50 MX 51 MN	30.23	MATERIAL		DINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH,
12 m/ks m/m m/s m/s m/s m/s m/s m/s m/s m/s m/	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE	1 - 10% 10 - 20%	HAMMER IF CRYSTALLINE.		FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES
LIQUID LIMIT 40 MX41 MN 40 MX41 MN 40 MX 41 MN 40 MX41 MN SOILS WITH PLASTIC INDEX 6 MX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 11 MN 11 MN LITTLE OR UTGULY	MODERATELY ORGANIC         5 - 10%         12 - 20%         SOME           HIGHLY ORGANIC         >10%         >20%         HIGHLY	20 - 35%		IED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
CROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC	GROUND WATER	33% HAD HOUVE	OF A CRYSTALLINE NATURE.		FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL
USUAL TYPES STONE FRAGS, FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC SOILS	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLIN	NG.		IED AND DISCOLORATION EXTENDS INTO ROCK UP TO AY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
OF MAJOR GRAVEL AND SAND SAND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS.			CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
GEN. RATING AS A EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABLE	$ abla_{ extstyle{PW}} $ PERCHED WATER, SATURATED ZONE OR WATER BEARING STR	1	(MOD.) GRANITOID ROCKS, MOST FELDSPARS AR	DISCOLORATION AND WEATHERING EFFECTS. IN BE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
SUBGRADE	SPRING OR SEEPAGE		DULL SOUND UNDER HAMMER BLOWS AN WITH FRESH ROCK.	ID SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
P.I. OF A-7-5 ≤ L.L 30 : P.I. OF A-7-6 > L.L 30	3			OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
CONSISTENCY OR DENSENESS  RANGE OF TRANSPORT THE COMPACTNESS OR RANGE OF UNCONFINED COMPACTNESS OR COMPACTNESS	MISCELLANEOUS SYMBOLS		(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLO	W KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH OGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD ORAINAGE.
PRIMARY SOIL TYPE COMPACINESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH (k·value) (k·v/m²)	ROADWAY EMBANKMENT WITH SOIL DESCRIPTION  ST CPT DPT ONT TEST BORING VST PART	SAMPLE DESIGNATIONS	IF TESTED, WOULD YIELD SPT REFUSAL		PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN
GENERALLY VERY LOOSE (4	ALICER BORING	i	(SEV.) IN STRENGTH TO STRONG SOIL. IN GRA	OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED INITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME	INTERVENING IMPERVIOUS STRATUM.  RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
GRANULAR MEDIUM DENSE 4 TO 10 N/A MATERIAL	ARTIFICIAL FILL OTHER THAN SS	S- SPLIT SPOON	EXTENT. SOME FRAGMENTS OF STRONG  IF TESTED, YIELDS SPT N VALUES > 16		ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF
(NON-COHESIVE)  DENSE 30 TO 50 VERY DENSE >50	ROADWAY EMBANKMENTS - CORE BORING	SAMPLE	VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED	O OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	ROCK SEGMENTS EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF CORE RUN
VERY SOFT <2 <25	INFERRED SOIL BOUNDARIES MONITORING WELL	T- SHELBY TUBE SAMPLE	(V. SEV.) THE MASS IS EFFECTIVELY REDUCED T SAPROLITE IS AN EXAMPLE OF ROCK W	O SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING EATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE	SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
GENERALLY SOFT 2 TO 4 25 TO 50 SILT-CLAY MEDIUM STIFF 4 TO 8 50 TO 100		RS- ROCK SAMPLE		STED, YIELDS SPT N VALUES < 100 BLOWS PER 30 cm.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN
MATERIAL STIFF 8 TO 15 100 TO 200	TTTTT ALLUVIAL SOIL BOUNDARY	RI- RECOMPACTED		NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
(COHESIVE) VERY STIFF 15 TO 30 200 TO 400 HARD >30 >400	25/025 DIP/DIP DIRECTION OF SLOPE INDICATOR INSTALLATION CO	TRIAXIAL SAMPLE  CBR - CBR SAMPLE	ALSO AN EXAMPLE.		SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR
TEXTURE OR GRAIN SIZE	ROCK STRUCTURES  — SPT N-VALUE	- CON SAME		K HARDNESS	SLIP PLANE.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	SOUNDING ROD     REF— SPT REFUSAL		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SEVERAL HARD BLOWS OF THE GEOLOG	SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES GISTS PICK.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH
OPENING (MM) 4.76 2.0 0.42 0.25 0.075 0.053	ABBREVIATIONS			K ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 BLOWS.
BOULDER	AR - AUGER REFUSAL PMT - PRESSUREMETER	TEST	TO DETACH HAND SPECIMEN.  MODERATELY CAN BE SCRATCHED BY KNIFE OR PICE	K. GOUGES OR GROOVES TO 6 mm DEEP CAN BE	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
GRAIN MM 305 75 2,0 0.25 0.05 0.005	BT - BORING TERMINATED SD SAND, SANDY CL CLAY SL SILT, SILTY			LOGISTS PICK. HAND SPECIMENS CAN BE DETACHED	STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY:
SIZE IN. 12' 3'	CPT - CONE PENETRATION TEST SLI SLIGHTLY CSE COARSE TCR - TRICONE REFUSA	^1		EP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
SOIL MOISTURE - CORRELATION OF TERMS	DMT - DILATOMETER TEST	۹۵.		TO PIECES 25 mm MAXIMUM SIZE BY HARD BLOWS OF THE	TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	e - VOID RATIO 7d - DRY UNIT WEIGH		SOFT CAN BE GROVED OR GOUGED READILY	BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	DENCH MADIC
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	F FINE W - MOISTURE CONTENT FOSS FOSSILIFEROUS V VERY	IT	FROM CHIPS TO SEVERAL CENTIMETER PIECES CAN BE BROKEN BY FINGER PI	RS IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN RESSURE.	BENCH MARK:
(SAT.) FROM BELOW THE GROUND WATER TABLE	FRAC FRACTURED VST - VANE SHEAR TES	ST		EXCAVATED READILY WITH POINT OF PICK, PIECES 25 mm	ELEVATION:
PLASTIC SEMISOLIDA PEGLIDES DEVING TO	MED MEDIUM		SOFT OR MORE IN THICKNESS CAN BE BROKE FINGERNAIL.	EN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	NOTES:
RANGE - WET - (W) SEMISOLIDI REGULRES DATING TO ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJE	CT	FRACTURE SPACING	BEDDING	
	DATE ON 15:	MER TYPE:	TERM SPACING VERY WIDE MORE THAN 3 m	TERM THICKNESS  VERY THICKLY BEDDED > 1 m	
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	MOBILE 8- 47	AUTOMATIC MANUAL	WIDE 1 TO 3 m	THICKLY BEDDED 0.5 - 1 m THINLY BEDDED 0.05 - 0.5 m	
REQUIRES ADDITIONAL WATER TO		E SIZE:	MODERATELY CLOSE 30 TO 100 cm CLOSE 5 TO 30 cm	VERY THINLY BEDDED 10 - 50 mm	
- DRY - (D) ATTAIN OPTIMUM MOISTURE		-8	VERY CLOSE LESS THAN 5 cm	THICKLY LAMINATED 2.5 - 10 mm THINLY LAMINATED < 2.5 mm	
PLASTICITY	<b>-</b>	-N		DURATION	
PLASTICITY INDEX (PI) DRY STRENGTH		<b>}</b> '	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENI	NG OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NONPLASTIC         0-5         VERY LOW           LOW PLASTICITY         6-15         SLIGHT	CME-550	-H		G WITH FINGER FREES NUMEROUS GRAINS: BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	I HAND	D TOOLS: POST HOLE DIGGER	MODERATELY INDURATED GRAINS	CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE:	
COLOR	TRICONE DE TING-CARR	HAND AUGER	BREAKS	EASILY WHEN HIT WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY)	OTHER CORE BIT	SOUNDING ROD		ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; JLT TO BREAK WITH HAMMER.	•
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	OTHER OTHER CONTINOUS	VANE SHEAR TEST	EXTREMELY INDURATED SHARP	HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
	FLIGHT AUGER X	OTHER PROBE ROD		E BREAKS ACROSS GRAINS.	