## NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION GRADATION ROCK DESCRIPTION TERMS AND DEFINITIONS HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, 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 QLA IPOOT PER 60 BLOWS, IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE WELL GRADED- INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO 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 ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 1206, ASTM D-1586), SOIL GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE ANGULARITY OF GRAINS CONSISTENCY, COLOR, TEXTURE, MOISTURE, AGAITO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: BOCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. SUBANGULAR, SUBROUNDED, OR ROUNDED. NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-1 ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL SOIL LEGEND AND AASHTO CLASSIFICATION MINERALOGICAL COMPOSITION FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THA AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE CRYSTALLINE ROCK (CR) NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS GROUND SURFACE. GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS WOULD YIELD SPT REFUSAL IF TESTED, ROCK TYPE INCLUDES GRANITE. ORGANIC MATERIALS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. GNEISS, GABBRO, SCHIST, ETC. (\$5% PASSING #200 >85% PASSING #200 CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN A-1, A-2 A-4, A-5 NON-CRYSTALLINE GROUP A-1 A-3 A-4 | A-5 | A-6 | A-7 COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED, ROCK TYPE A-6. A-7 SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50 INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD CLASS. 4-2-44-2-54-2-64-2 A-3 OASTAL PLAIN <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SYMBOL EDIMENTARY ROCK HIGHLY COMPRESSIBLE SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC PERCENTAGE OF MATERIAL PASSING SILT-WEATHERING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT MUCK. \* 10 RANULA ROCKS OR CUTS MASSIVE ROCK. ORGANIC MATERIAL OTHER MATERIAL SOILS SOILS SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS LINDER SOILS FRESH DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE 115 MX 25 MX 100 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 \* 200 RACE OF ORGANIC MATTER TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 57 5 - 12% LITTLE 10 - 20% 40 MX41 MN 40 MX41 MN 40 MX 41 MN 40 MX41 MN ODERATELY ORGANIC VERY SLIGHT ROCK GENERALLY FRESH. JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IE OPEN DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF SOME 20 - 35% ASTIC INDEX 6 MX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF V. SLI.) LITTLE OR HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE HIGHL' OF A CRYSTALLINE NATURE. MODERATE GROUP INDEX 0 0 8 MX 12 MX 16 MX No MX 0 4 MX GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE AMOUNTS OF USUAL TYPES STONE FRAGS. FINE ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SOILS. IDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. 1 INCH. OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR STLTY OR CLAYEY CLAYEY ORGANIC (SLI.) GRAVEL AND OF MAJOR MATTER CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. SOILS SAND GRAVEL AND SAND SOILS STATIC WATER LEVEL AFTER 24 HOURS. MATERIAL S SAND SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN MODERATE FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM GEN. RATING  $\nabla_{PW}$ GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA (LGOM) RENT MATERIAL AS A EXCELLENT TO GOOD FAIR TO POOR POOR DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED POOR SUBGRADE FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY OW-SPRING OR SEEPAGE WITH FRESH ROCK. P.I. OF A-7-5 < I.I. - 30 : P.I. OF A-7-6 > I.I. - 30 MODERATELY ALL ROCK EXCEPT OUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH CONSISTENCY OR DENSENESS MISCELLANEOUS SYMBOLS FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN SEVERE MOD. SEV.) RANGE OF UNCONFINED AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK. COMPACTNESS OR PT DHT TEST BORING COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>) ROADWAY EMBANKMENT PRIMARY SOIL TYPE IF TESTED, WOULD YIELD SPT REFUSAL ENETRATION RESISTENCE SAMPLE JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. CONSISTENCY WITH SOIL DESCRIPTION (N-VALUE) SEVERE ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME  $\oplus$ GENERALLY AUGER BORING S- BULK SAMPLE LOOSE 4 TO 10 EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. GRANUL AF MEDIUM DENSE N/A IF TESTED, YIELDS SPT N VALUES > 100 BPF \_ENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. ARTIFICIAL FILL OTHER THAN SS- SPLIT SPOON CORE BORING DENSE 30 TO 50 SAMPLE MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN VERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BU (NON-COHESIVE) VERY DENSE ST- SHELBY TUBE THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. V. SEV.) INFERRED SOIL BOUNDARIES VERY SOFT <sup>1</sup>24 SAMPLE. REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN <0.25 MONITORING WELL VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF GENERALLY TERVENING IMPERVIOUS STRATUM. 0.25 TO 0.5 PIJEIJS INFERRED ROCK LINE RS- ROCK SAMPLE PIEZOMETER MEDIUM STIFF SILT-CLAY 4 TO 8 0.5 TO 1 Δ ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. INSTALLATION RT- RECOMPACTED MATERIAL 1 TO 2 TTTT ALLUVIAL SOIL BOUNDARY SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS VERY STIFF 15 TO 30 TRIAXIAL SAMPLE ROCK DIALITY DESIGNATION (R.O.D.) - A MEASURE OF ROCK DUALITY DESCRIBED BY TOTAL LENGTH OF (COHESTVÉ) SLOPE INDICATOR OCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND DIP/DIP DIRECTION OF INSTALLATION CBR - CBR SAMPLE ROCK HARDNESS EXPRESSED AS A PERCENTAGE. TEXTURE OR GRAIN SIZE - SPT N-VALUE SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES REF- SPT REFUSAL U.S. STD. SIEVE SIZE SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. 4.76 DPENING (MM) 0.42 0.25 0.075 SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED **ABBREVIATIONS** RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS COARSE FINE GRAVEL. BOULDER COBBLE SILI CLAY SAND AR - AUGER REFUSAL PMT - PRESSUREMETER TEST (COB.) (SL.) MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (CL. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR BORING TERMINATED SD. - SAND, SANDY HARD EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED CI - CI AY CI - CII T CII TY GRAIN MM 2.0 0.25 0.05 0.009 BY MODERATE BLOWS. 305 75 CPT - CONE PENETRATION TEST SLI. - SLIGHTLY SIZE STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. MEDIUN CSE. - COARSE TCR - TRICONE REFLISAL A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH - DILATOMETER TEST HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE SOIL MOISTURE - CORRELATION OF TERMS A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION  $\gamma$  - UNIT WEIGHT POINT OF A GEOLOGISTS PICK. DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE FIELD MOISTURE 7 - DRY UNIT WEIGHT WITH 60 BLOWS. GUIDE FOR FIELD MOISTURE DESCRIPTION VOID RATIO SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS <u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. W - MOISTURE CONTENT F. - FINE FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN FOSS. - FOSSILIFEROUS PIECES CAN BE BROKEN BY FINGER PRESSURE. SATURATED USUALLY LIQUID: VERY WET. USUALLY FRAC. - FRACTURED VST - VANE SHEAR TEST STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: FROM BELOW THE GROUND WATER TABLE (SAT.) CAN BE CARVED WITH KNIFF, CAN BE EXCAVATED READILY WITH POINT OF PICK PIECES 1 INCH FRAGS. - FRAGMENTS OTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 10 CENTIMETERS DIVIDED LIQUID LIMI OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY MED. - MEDIUM BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE PLASTIC FINGERNAII SEMISOLID: REQUIRES DRYING TO RANGE TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER - WET - (W) EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING BEDDING ATTAIN OPTIMUM MOISTURE (PI) PLASTIC LIMIT THICKNESS TERM TERM BENCH MARK: T-6 STA. 12+25.60 -T- REBAR & CAP SET SPACING HAMMER TYPE: DRILL UNITS: ADVANCING TOOLS VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE AUTOMATIC X MANUAL OPTIMUM MOISTURE 15 - 4 FEET THICKLY BEDDED CLAY BITS 3 TO 10 FEET MOBILE B-ELEVATION: 534.80' 0.16 - 1.5 FEET SHRINKAGE LIMIT THINLY BEDDED MODERATELY CLOSE 1 TO 3 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET K 6 CONTINUOUS FLIGHT AUGER CORE SIZE: REQUIRES ADDITIONAL WATER TO NOTES: THICKLY LAMINATED 0.008 - 0.03 FFFT - DRY - (D) BK-51 ATTAIN OPTIMUM MOISTURE VERY CLOSE LESS THAN 0.16 FEFT 8\* HOLLOW AUGERS HINLY LAMINATED |-B\_\_\_ INDURATION **PLASTICITY** HARD FACED FINGER BITS CME-45 X -N Q2 FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI) DRY STRENGTH TUNG.-CARBIDE INSERTS П-н\_ NONPLASTIC VERY LOW CME-550 RUBBING WITH FINGER FREES NUMEROUS GRAINS; 0-5 FRIABLE X CASING W/ ADVANCER LOW PLASTICITY SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE HAND TOOLS: MEDIUM MED. PLASTICITY 16-25 PORTABLE HOIST TRICONE STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: POST HOLE DIGGER HIGH PLASTICITY HIGH MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER. TRICONE \* TUNG.-CARB. HAND AUGER COLOR X OTHER RC TRACK GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE: INDURATED  $\overline{X}$  core bit SOUNDING ROD DIFFICULT TO BREAK WITH HAMMER. DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YEL-BRN, BLUE-GRAY VANE SHEAR TEST OTHER SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. OTHER EXTREMELY INDURATED OTHER SAMPLE BREAKS ACROSS GRAINS. REVISED 09/15/00