NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS SOIL DESCRIPTION ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED TERMS AND DEFINITIONS 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 POORLY GRADED) ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS THEN DUCK IS NOW-CORSTAL FURIN MATERIAL THAT WHEN IESTED, MODIE TIELD SFT REFUSAL, AND 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 ZONG WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND WHICH YIELDS LESS THAN AQUIFER - A WATER BEARING FORMATION OR STRATA. WHICH CAN BE PERINE INFILED WITH A CUNTINUOUS FLIGHT YOURK HOUSE, AIM WHICH TIELLS LESS THAN 100 BLOWS PER FOOT 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, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: AP-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. ANGULARITY OF GRAINS ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS: ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, THE ANGULARITY OR ROUNDNESS OF GOIL GRAINS ARE DESIGNATED BY THE TERMS; ANGULAR, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. WEATHERED SUBANGULAR, SUBROUNDED, OR ROUNDED. NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS VERY STIFF, GRAY SILTY CLAY, MOIST WITH UNTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-G <u>ARTESIAN</u> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IS IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE RUCK (MB) MINERALOGICAL COMPOSITION SOIL LEGEND AND AASHTO CLASSIFICATION FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, CRYSTALLINE ROCK (CR) MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. GROUND SURFACE. GENERAL GRANULAR MATERIALS STLT-CLAY MATERIALS ORGANIC MATERIALS GNEISS, GABBRO, SCHIST, ETC CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. CLASS. FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE NON-CRYSTALLINE ROCK (NCR) A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 COMPRESSIBILITY GROUP A-1 A-3 COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD CLASS. A-1-a A-1-b A-2-4A-2-5A-2-6A-2-7 A-3 SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 LIQUID LIMIT 31-50 LIQUID LIMIT GREATER THAN 50 MODERATELY COMPRESSIBLE COASTAL PLAIN SEDIMENTARY ROCK <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 SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. PERCENTAGE OF MATERIAL PASSING DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT WEATHERING SILT-CLAY ROCKS OR CUTS MASSIVE ROCK. ORGANIC MATERIAL OTHER MATERIAL PEAT 30 MX50 MX51 M NO. 40 SOILS SOILS SOILS ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER SDILS FRESH DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE NO. 200 15 MX 25 MX 10 M RACE OF ORGANIC MATTER 1 - 10% HAMMER IF CRYSTALLINE 5 - 12% LITTLE 10 - 20% 3 MX41 MN 40 MX41 MN 40 MX41 MN 40 MX41 MN ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF <u>DIP DIRECTION (DIP AZIMUTH) -</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. IDDERATELY ORGANIC 5 - 10% 12 - 20% SOME HIGHLY 20 - 35% 35% AND ABOVE PLASTIC INDEX N.P. 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN IGHLY ORGANIC >20% (V. SL).) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF LITTLE OR DE A CRYSTALLINE NATURE MODERATE GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO M GROUND WATER FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE 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 SOILS SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE USUAL TYPES STONE FRAGS. CLAYEY WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. SILTY OR CLAYEY ORGANIC (SLI.) GRAVEL AND SAND FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. OF MAJOR MATTER CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. **Y**___ GRAVEL AND SAND SOILS SOILS STATIC WATER LEVEL AFTER 24 HOURS. MATERIALS SAND MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING FEFFCTS. IN FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. GEN. RATING **∇PW** GRANITOID ROCKS, MOST FELOSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED FAIR TO PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA (MOD.) EXCELLENT TO GOOD FAIR TO POOR POOR NSUITABL FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM, SUBGRADE OM-WITH FRESH ROCK. SPRING OR SEEPAGE P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30 MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL 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. CONSISTENCY OR DENSENESS MISCELLANEOUS SYMBOLS RANGE OF LINCONFINED AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES CLUNK SOUND WHEN STRUCK. MOD, SEV.) COMPACTNESS OR CONSISTENCY ROADWAY EMBANKMENT DPT DHT TEST BORING PRIMARY SOIL TYPE IF TESTED, WOULD YIELD SPT REFUSAL JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. WITH SOIL DESCRIPTION DESIGNATIONS (N-VALUE) ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCE SEVERE LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. VERY LOOSE \oplus IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME AUGER BORING GENERALLY S- BULK SAMPLE EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. MEDIUM DENSE N/A LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. SS- SPLIT SPOON IF TESTED, YIELDS SPT N VALUES > 100 BPF 10 TO 30 ARTIFICIAL FILL OTHER THAN 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 FARRIC FLEMENTS ARE DISCERNIRLE BUT (NON-COHESIVE) VERY DENSE DILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. ST- SHELBY TUBE INFERRED SOIL BOUNDARIES PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN VERY SOFT **O REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR MONITORING WELL VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. IF TESTED, YIELDS SPT N VALUES < 100 BPF 2 TO 4 NTERVENING IMPERVIOUS STRATUM. 0.25 TO 0.5 RS- ROCK SAMPLE INFERRED ROCK LINE 0.5 TO 1 1 TO 2 2 TO 4 >4 PIEZOMETER MEDIUM STIFF SILT-CLAY 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, STIFF 8 TO 15 INSTALLATION RT- RECOMPACTED ALLUVIAL SOIL BOUNDARY SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS VERY STIFF HARD 15 TO 30 >30 ROCK QUALITY DESIGNATION (R.Q.D.) - 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 (COHESIVE SLOPE INDICATOR \bigcirc DIP/DIP DIRECTION OF CBR - CBR SAMPLE ROCK HARDNESS ROCK STRUCTURES 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 VERY HARD SOUNDING ROD U.S. STD. SIEVE SIZE REF- SPT REFUSAL SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK. <u>SILL</u> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND 0.42 0.25 CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO DETACH HAND SPECIMEN. TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS GRAVEL COBBLE BOULDER PMT - PRESSUREMETER TEST CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE (RLDR.) (COB.) (GR.) (SL.) (CL.) SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR BT - BORING TERMINATED SD. - SAND, SANDY EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK, HAND SPECIMENS CAN BE DETACHED SL. - SILT, SILTY SLI. - SLIGHTLY CL. - CLAY GRAIN MM 305 SIZE IN. 12" BY MODERATE BLOWS. 2.0 0.25 0.05 0.005 CPT - CONE PENETRATION TEST <u>STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) -</u> NUMBER OF BLOWS (N OR B.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CSE. - CDARSE TCR - TRICONE REFUSAL HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE DMT - DILATOMETER TEST SOIL MOISTURE - CORRELATION OF TERMS γ - unit weight A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION POINT OF A GEOLOGISTS PICK DPT - DYNAMIC PENETRATION TEST SOIL MOISTURE SCALE 7d - DRY UNIT WEIGHT WITH 60 BLOWS. GUIDE FOR FIELD MOISTURE DESCRIPTION CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS SOFT e - VOID RATIO STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. (ATTERBERG LIMITS) DESCRIPTION F. - FINE FOSS. - FOSSILIFEROUS w - MOISTURE CONTENT FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. V. - VERY USUALLY LIQUID: VERY WET, USUALLY - SATURATED STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: FRAC - FRACTURED VST - VANE SHEAR TEST CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH (SAT.) FROM BELOW THE GROUND WATER TABLE 10TAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EDUAL TO DR GREATER THAN 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. FRAGS. - FRAGMENTS LIQUID LIMIT SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY MED. - MEDIUM PLASTIC FINGERNAIL SEMISOLIDE BEOLIBES DRYING TO RANGE TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER EQUIPMENT USED ON SUBJECT PROJECT FRACTURE SPACING ATTAIN OPTIMUM MOISTURE (PI) PLASTIC LIMIT TERM THICKNESS BENCH MARK: TRAVERSE CAP "BL-3" AT -BL- STATION 3+98.87 CL TERM SPACING ADVANCING TOOLS: DRILL UNITS VERY THICKLY BEDDED > 4 FEET VERY WIDE MORE THAN 10 FEET X AUTOMATIC MANUAL THICKLY BEDDED - MDIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE 1.5 - 4 FEET OPTIMUM MOISTURE CLAY BITS 3 TO 10 FEET 1 TO 3 FEET ELEVATION: 271.21 FT 0.16 - 1.5 FEET MOBILE B-THINLY BEDDED SHRINKAGE LIMIT MODERATELY CLOSE VERY THINLY BEDDED 0.03 - 0.16 FEET 6° CONTINUOUS FLIGHT AUGER 016 TO 1 FEET CORE SIZE: REQUIRES ADDITIONAL WATER TO NOTES: THICKLY LAMINATED - DRY - (D) BK-51 VERY CLOSE LESS THAN 0.16 FEET ATTAIN OPTIMUM MOISTURE X 8 HOLLOW AUGERS THINLY LAMINATED < 0.008 FEET _____B____ PLASTICITY HARD FACED FINGER BITS X CME-450 ____-N_____ FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. PLASTICITY INDEX (PI DRY STRENGTH TUNG.-CARBIDE INSERTS -н____ RUBBING WITH FINGER FREES NUMEROUS GRAINS: NONPLASTIC VERY LOW CMF-550 0-5 FRIABLE X CASING W/ ADVANCER LOW PLASTICITY 6-15 SLIGHT GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE HAND TOOLS: MEDIUM PORTABLE HOIST X TRICONE_ STEEL TEETH GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: POST HOLE DIGGER MODERATELY INDURATED HIGH PLASTICITY 26 OR MORE RREAKS EASTLY WHEN HIT WITH HAMMER. HAND AUGER TRICONE OTHER. GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; SOLINDING ROD CORE BIT DIFFICULT TO BREAK WITH HAMMER. DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YEL-BRN, BLUE-GRAY) VANE SHEAR TEST OTHER X OTHER DRAG BIT MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE: OTHER

STATE PROJECT NO. SHEET NO. TOTAL SHEET

B-37Ø3