

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C. | 33484.1.1 (B-4131) | 1 | 15 |

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 33484.1.1 (B-4131) F.A. PROJ. BRZ-3394(1)
COUNTY GUILFORD
PROJECT DESCRIPTION BRIDGE NO. 11 ON -L- (SR 3394) OVER
BIG ALAMANCE CREEK

CONTENTS

| <u>SHEET</u> | <u>DESCRIPTION</u> |
|--------------|------------------------------|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | GEOTECHNICAL REPORT |
| 4 | SITE PLAN |
| 5-6 | PROFILE(S) |
| 7 | CROSS SECTION(S) |
| 8-11 | BORE LOG(S) & CORE REPORT(S) |
| 12 | SOIL TEST RESULTS |
| 13 | SCOUR REPORT |
| 14 | CORE PHOTOGRAPH(S) |
| 15 | SITE PHOTOGRAPH(S) |

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 (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-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 INTERPRETATIONS 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 HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS 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.

PROJECT: 33484.1.1 ID: B-4131

PERSONNEL

HRC

DWD

OBO

INVESTIGATED BY K. B. MILLER

CHECKED BY O. B. OTT

SUBMITTED BY N. T. ROBERSON

DATE JUNE 2006



DRAWN BY: W. D. FIELDS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.

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

PROJECT REFERENCE NO. 33484.1.I (B-4131) SHEET NO. 2 OF 15

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

| SOIL DESCRIPTION | | GRADATION | | ROCK DESCRIPTION | | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HARD PLASTIC, A-7-6</p> | | <p>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) DAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> | | <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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 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:</p> | | <p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. ADUIFIER - 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, 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 DISLODGED 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 INTRODUCED 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 (IN 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 (SCREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - 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.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (<= 35% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="4">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th></th> <th></th> <th></th> </tr> <tr> <th>SYMBOL</th> <td></td> </tr> <tr> <th>% PASSING</th> <td>50 MX 30 MX 15 MX</td> <td>50 MX 25 MX</td> <td>50 MX 10 MX</td> <td>35 MX 10 MX</td> <td>35 MX 10 MX</td> <td>35 MX 10 MX</td> <td>35 MX 10 MX</td> <td>40 MX 10 MX</td> </tr> <tr> <th>LIQUID LIMIT</th> <td>6 MX</td> <td>NP</td> <td>10 MX 10 MX</td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>4 MX</td> <td>8 MX</td> <td>12 MX</td> <td>16 MX</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td>STONE FRAGS. GRAVEL, AND SAND</td> <td>FINE SAND</td> <td>SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS</td> <td>CLAYEY SOILS</td> <td>GRANULAR SOILS</td> <td>SILT-CLAY SOILS</td> <td>MUCK, PEAT</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>GENERAL RATING AS A SUBGRADE</th> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td>UNSATURABLE</td> <td></td> <td></td> </tr> </table> | | GENERAL CLASS. | GRANULAR MATERIALS (<= 35% PASSING #200) | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | | | GROUP CLASS. | A-1 | A-3 | A-2 | A-4 | A-5 | A-6 | A-7 | A-1, A-2 | A-4, A-5 | A-6, A-7 | | | | SYMBOL | | | | | | | | | | | | | | % PASSING | 50 MX 30 MX 15 MX | 50 MX 25 MX | 50 MX 10 MX | 35 MX 10 MX | 35 MX 10 MX | 35 MX 10 MX | 35 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | LIQUID LIMIT | 6 MX | NP | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | GROUP INDEX | 0 | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | SILTY SOILS | CLAYEY SOILS | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT | | | | | | GENERAL RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSATURABLE | | | <p>MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> | | <p>WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SLI) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI) - 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 CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN 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 WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) - 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 AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) - 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 TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> VERY SEVERE (V SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> COMPLETE - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIXES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p> | | <p>COMPRESSION</p> <p>SLIGHTLY COMPRESSIBLE - LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE - LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE - LIQUID LIMIT GREATER THAN 50</p> | |
| GENERAL CLASS. | GRANULAR MATERIALS (<= 35% PASSING #200) | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | ORGANIC MATERIALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP CLASS. | A-1 | A-3 | A-2 | A-4 | A-5 | A-6 | A-7 | A-1, A-2 | A-4, A-5 | A-6, A-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % PASSING | 50 MX 30 MX 15 MX | 50 MX 25 MX | 50 MX 10 MX | 35 MX 10 MX | 35 MX 10 MX | 35 MX 10 MX | 35 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | 40 MX 10 MX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LIQUID LIMIT | 6 MX | NP | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | 10 MX 10 MX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP INDEX | 0 | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | 16 MX | 16 MX | 16 MX | 16 MX | 16 MX | 16 MX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL, AND SAND | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | SILTY SOILS | CLAYEY SOILS | GRANULAR SOILS | SILT-CLAY SOILS | MUCK, PEAT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERAL RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | | FAIR TO POOR | | | | FAIR TO POOR | POOR | UNSATURABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>PERCENTAGE OF MATERIAL</p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY</td> </tr> </table> | | ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | HIGHLY ORGANIC | >10% | >20% | HIGHLY | <p>GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ORGANIC MATERIAL | GRANULAR SOILS | SILT - CLAY SOILS | OTHER MATERIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HIGHLY ORGANIC | >10% | >20% | HIGHLY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>CONSISTENCY OR DENSENESS</p> <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR PENETRATION RESISTANCE</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td><4 4 TO 10 10 TO 30 30 TO 50 >50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td><2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30</td> <td><0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4</td> </tr> </table> | | PRIMARY SOIL TYPE | COMPACTNESS OR PENETRATION RESISTANCE | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | <4 4 TO 10 10 TO 30 30 TO 50 >50 | N/A | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | <2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30 | <0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4 | <p>MISCELLANEOUS SYMBOLS</p> <p> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES SOUNDING ROD</p> <p> TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION SPT N-VALUE SPT REFUSAL</p> <p>SAMPLE DESIGNATIONS S - BULK SAMPLE SS - SPLIT SPOON SAMPLE ST - SHELBY TUBE SAMPLE RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL SAMPLE CBR - CALIFORNIA BEARING RATIO SAMPLE</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRIMARY SOIL TYPE | COMPACTNESS OR PENETRATION RESISTANCE | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | <4 4 TO 10 10 TO 30 30 TO 50 >50 | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | <2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30 | <0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>TEXTURE OR GRAIN SIZE</p> <table border="1"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> </table> <table border="1"> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CSE, SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td>MM 305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> <td></td> </tr> <tr> <td>IN. 12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE, SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) | MM 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | | IN. 12 | 3 | | | | | | <p>ABBREVIATIONS</p> <table border="1"> <tr> <td>AR - AUGER REFUSAL</td> <td>HL - HIGHLY</td> <td>W - MOISTURE CONTENT</td> </tr> <tr> <td>BT - BORING TERMINATED</td> <td>MED. - MEDIUM</td> <td>V - VERY</td> </tr> <tr> <td>CL - CLAY</td> <td>MICA - MICACEOUS</td> <td>VST - VANE SHEAR TEST</td> </tr> <tr> <td>CPT - CONE PENETRATION TEST</td> <td>MOD. - MODERATELY</td> <td>WEA. - WEATHERED</td> </tr> <tr> <td>CSE - COARSE</td> <td>NP - NON PLASTIC</td> <td>W - UNIT WEIGHT</td> </tr> <tr> <td>DMT - DILATOMETER TEST</td> <td>ORG. - ORGANIC</td> <td>W_d - DRY UNIT WEIGHT</td> </tr> <tr> <td>DPT - DYNAMIC PENETRATION TEST</td> <td>PMT - PRESSUREMETER TEST</td> <td></td> </tr> <tr> <td>F - VOID RATIO</td> <td>SAP. - SAPROLITIC</td> <td></td> </tr> <tr> <td>FOSS. - FOSSILIFEROUS</td> <td>SD. - SAND, SANDY</td> <td></td> </tr> <tr> <td>FRAC. - FRACTURED, FRACTURES</td> <td>SL. - SILT, SILTY</td> <td></td> </tr> <tr> <td>FRAGS. - FRAGMENTS</td> <td>SLI. - SLIGHTLY</td> <td></td> </tr> <tr> <td></td> <td>TCR - TRICONE REFUSAL</td> <td></td> </tr> </table> | | AR - AUGER REFUSAL | HL - HIGHLY | W - MOISTURE CONTENT | BT - BORING TERMINATED | MED. - MEDIUM | V - VERY | CL - CLAY | MICA - MICACEOUS | VST - VANE SHEAR TEST | CPT - CONE PENETRATION TEST | MOD. - MODERATELY | WEA. - WEATHERED | CSE - COARSE | NP - NON PLASTIC | W - UNIT WEIGHT | DMT - DILATOMETER TEST | ORG. - ORGANIC | W _d - DRY UNIT WEIGHT | DPT - DYNAMIC PENETRATION TEST | PMT - PRESSUREMETER TEST | | F - VOID RATIO | SAP. - SAPROLITIC | | FOSS. - FOSSILIFEROUS | SD. - SAND, SANDY | | FRAC. - FRACTURED, FRACTURES | SL. - SILT, SILTY | | FRAGS. - FRAGMENTS | SLI. - SLIGHTLY | | | TCR - TRICONE REFUSAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CSE, SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MM 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IN. 12 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AR - AUGER REFUSAL | HL - HIGHLY | W - MOISTURE CONTENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BT - BORING TERMINATED | MED. - MEDIUM | V - VERY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CL - CLAY | MICA - MICACEOUS | VST - VANE SHEAR TEST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CPT - CONE PENETRATION TEST | MOD. - MODERATELY | WEA. - WEATHERED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CSE - COARSE | NP - NON PLASTIC | W - UNIT WEIGHT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMT - DILATOMETER TEST | ORG. - ORGANIC | W _d - DRY UNIT WEIGHT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DPT - DYNAMIC PENETRATION TEST | PMT - PRESSUREMETER TEST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F - VOID RATIO | SAP. - SAPROLITIC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FOSS. - FOSSILIFEROUS | SD. - SAND, SANDY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRAC. - FRACTURED, FRACTURES | SL. - SILT, SILTY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRAGS. - FRAGMENTS | SLI. - SLIGHTLY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TCR - TRICONE REFUSAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td rowspan="2">LL - LIQUID LIMIT PL - PLASTIC LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td rowspan="2">OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> | | SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | LL - LIQUID LIMIT PL - PLASTIC LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | <p>EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1"> <tr> <td> <p>DRILL UNITS:</p> <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> <input type="checkbox"/> </td> <td> <p>ADVANCING TOOLS:</p> <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG.-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG.-CARB. <input checked="" type="checkbox"/> CORE BIT <input type="checkbox"/> </td> <td> <p>HAMMER TYPE:</p> <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <p>CORE SIZE:</p> <input type="checkbox"/> B <input checked="" type="checkbox"/> N X <input type="checkbox"/> H <p>HAND TOOLS:</p> <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> </td> </tr> </table> | | <p>DRILL UNITS:</p> <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> <input type="checkbox"/> | <p>ADVANCING TOOLS:</p> <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG.-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG.-CARB. <input checked="" type="checkbox"/> CORE BIT <input type="checkbox"/> | <p>HAMMER TYPE:</p> <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <p>CORE SIZE:</p> <input type="checkbox"/> B <input checked="" type="checkbox"/> N X <input type="checkbox"/> H <p>HAND TOOLS:</p> <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LL - LIQUID LIMIT PL - PLASTIC LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>DRILL UNITS:</p> <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> <input type="checkbox"/> | <p>ADVANCING TOOLS:</p> <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG.-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG.-CARB. <input checked="" type="checkbox"/> CORE BIT <input type="checkbox"/> | <p>HAMMER TYPE:</p> <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL <p>CORE SIZE:</p> <input type="checkbox"/> B <input checked="" type="checkbox"/> N X <input type="checkbox"/> H <p>HAND TOOLS:</p> <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>PLASTICITY</p> <table border="1"> <tr> <th>NONPLASTIC</th> <th>LOW PLASTICITY</th> <th>MED. PLASTICITY</th> <th>HIGH PLASTICITY</th> </tr> <tr> <td>0-5</td> <td>6-15</td> <td>16-25</td> <td>26 OR MORE</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>COLOR</p> <p>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.</p> | | NONPLASTIC | LOW PLASTICITY | MED. PLASTICITY | HIGH PLASTICITY | 0-5 | 6-15 | 16-25 | 26 OR MORE | | | | | | | | | <p>FRACTURE SPACING</p> <table border="1"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>> 4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> <p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1"> <tr> <td>FRIABLE</td> <td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td> </tr> <tr> <td>MODERATELY INDURATED</td> <td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td> </tr> <tr> <td>INDURATED</td> <td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td> <td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </table> | | TERM | SPACING | TERM | THICKNESS | VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | > 4 FEET | WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | CLOSE | 0.16 TO 1 FEET | VERY THINLY BEDDED | 0.03 - 0.16 FEET | VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | THINLY LAMINATED | < 0.008 FEET | FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NONPLASTIC | LOW PLASTICITY | MED. PLASTICITY | HIGH PLASTICITY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0-5 | 6-15 | 16-25 | 26 OR MORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| TERM | SPACING | TERM | THICKNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | > 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLOSE | 0.16 TO 1 FEET | VERY THINLY BEDDED | 0.03 - 0.16 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | THINLY LAMINATED | < 0.008 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRIABLE | RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>SOIL MOISTURE - CORRELATION OF TERMS</p> <p>LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</p> | | <p>ROCK HARDNESS</p> <p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT - CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT - CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>TEXTURE OR GRAIN SIZE</p> <p>U.S. STD. SIEVE SIZE OPENING (MM): 4, 10, 40, 60, 200, 270 Corresponding values: 4.76, 2.00, 0.42, 0.25, 0.075, 0.053</p> | | <p>FRACTURE SPACING</p> <p>VERY WIDE: MORE THAN 10 FEET WIDE: 3 TO 10 FEET MODERATELY CLOSE: 1 TO 3 FEET CLOSE: 0.16 TO 1 FEET VERY CLOSE: LESS THAN 0.16 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>PLASTICITY</p> <p>NONPLASTIC: 0-5 LOW PLASTICITY: 6-15 MED. PLASTICITY: 16-25 HIGH PLASTICITY: 26 OR MORE</p> | | <p>FRACTURE SPACING</p> <p>VERY THICKLY BEDDED: > 4 FEET THICKLY BEDDED: 1.5 - 4 FEET THINLY BEDDED: 0.16 - 1.5 FEET VERY THINLY BEDDED: 0.03 - 0.16 FEET THICKLY LAMINATED: 0.008 - 0.03 FEET THINLY LAMINATED: < 0.008 FEET</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p><</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 22, 2006

STATE PROJECT: 33484.1.1 B-4131
FEDERAL PROJECT: BRZ-3394(1)
COUNTY: Guilford

DESCRIPTION: Bridge No. 11 on -L- (SR 3394) Over Big Alamance Creek

SUBJECT: Geotechnical Report – Structure Inventory

Site Description

The proposed structure is comprised of a 110 feet long single span. The project is located near the Guilford-Randolph County line approximately three miles north of the town of Climax. The proposed bridge is on a 90° skew and will replace the existing structure in place. A temporary on-site structure will be used to detour traffic during construction.

During the month of March 2006, borings were advanced via wash drilling using a CME-550 drill machine equipped with an automatic hammer. Two Standard Penetration Tests borings were performed at each end bent location. All borings were advanced to crystalline rock. Representative soil samples were collected for visual classification in the field and for laboratory analysis by the Materials and Tests Unit. One rock core was recovered at End Bent 1 using a NWD-4 core barrel. Two rock core samples were submitted to the Materials and Tests Unit for analysis.

Physiography and Geology

The project is located in rolling terrain within the Piedmont Physiographic Province. The area is rural with mostly single family dwellings on private lots. The site encompasses an area of the Carolina Slate Belt containing metamorphosed granitic rocks ranging in age from Late Proterozoic to Late Cambrian. Rock outcrops are visible in the end slope at End Bent 1.

Soil Properties

Soils encountered at the project site include roadway embankment materials, alluvial sediments and residual soils.

Roadway Embankment material was encountered at End Bent 2 along the existing alignment. This material consists of 10 or more feet of soft to stiff, clayey sandy silt (A-4).

Alluvial soils at the site are composed of approximately 8 feet of loose, silty sand (A-2-4) at End Bent 2 on -L- and 5 to 8 feet of medium stiff to stiff, clayey/sandy silt (A-4) along the -DET- alignment.

Residual soils primarily consist of 2 to 8 feet of soft to very stiff, sandy silt (A-4) and approximately 2 feet of dense, coarse sand (A-1-b).

Rock Properties

Weathered metagranite was encountered along both the -L- and -DET- alignments at elevations 630.0 to 646.5 feet and ranging in thickness from 0.2 to 4.5 feet.

Crystalline rock, metagranite, outcrops in the end slope at End Bent 1 and is present in all borings. The elevation of crystalline rock ranges from 629.5 to 646.0 feet with the shallowest occurrence being at EB1-A on -L-. A core boring was performed at EB1-A to evaluate rock type and competency. Core Recovery (REC) ranges from 68% to 100% with an average of 86%. Rock Quality Designation (RQD) ranges from 52% to 100% with an average of 74%. A severely weathered zone was noted in the core from elevation 634.7 to 636.7 feet. Testing by the Materials and Tests of the metagranite shows compressive strengths from 8.23 ksi to 8.89 ksi and a unit weight ranging from 155.7 lb/ft³ to 176.5 lb/ft³. More detailed descriptions may be found in the Core Boring Report.

Groundwater

Groundwater at the site was measured at elevations 635.5 to 636.9 feet at the time of the investigation. The surface water of Big Alamance Creek was noted at elevation 636.4 feet in March 2006.

Notice

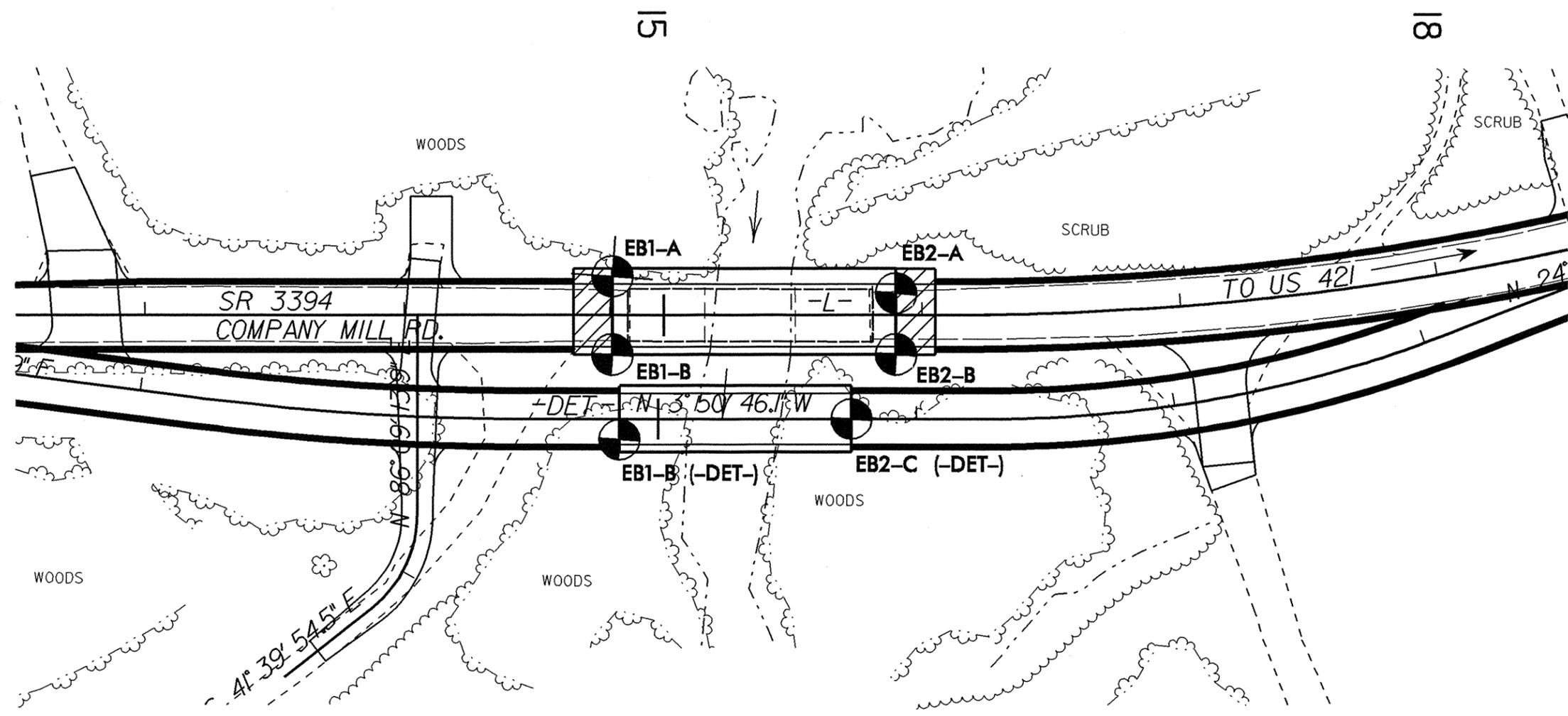
This report is based on the bent locations provided in the memo "Request for Foundation Recommendations" and the Preliminary General Drawing dated February 6, 2006 and the Bridge Survey and Hydraulic Design Report dated November 22, 2005. If significant changes are made in the design, or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

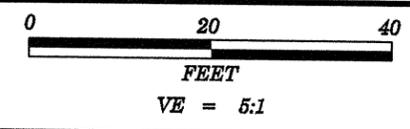
Prepared by:

Kevin B. Miller, LG
Project Geological Engineer

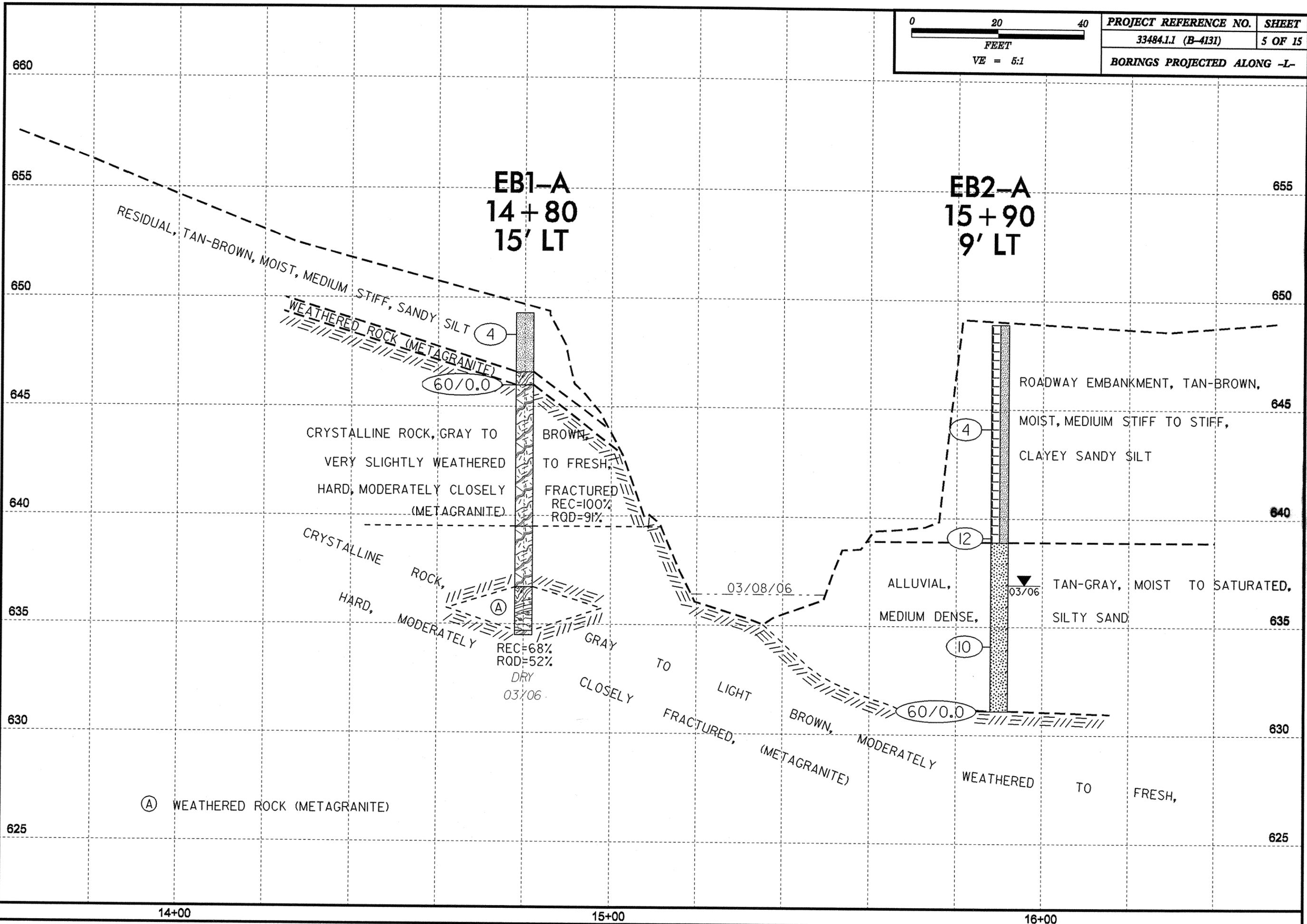
| | |
|-----------------------------------------|---------|
| PROJECT REFERENCE NO. | SHEET |
| 33484.1.1 (B-4131) | 4 OF 15 |
| | |
| <p style="text-align: center;">FEET</p> | |

TEST SITE PLAN





| | |
|-----------------------------|---------|
| PROJECT REFERENCE NO. | SHEET |
| 33484.1.1 (B-4131) | 5 OF 15 |
| BORINGS PROJECTED ALONG -L- | |



EB1-A
14 + 80
15' LT

EB2-A
15 + 90
9' LT

RESIDUAL, TAN-BROWN, MOIST, MEDIUM STIFF, SANDY SILT

WEATHERED ROCK (METAGRANITE)
 60/0.0

CRYSTALLINE ROCK, GRAY TO BROWN, VERY SLIGHTLY WEATHERED TO FRESH, HARD, MODERATELY CLOSELY FRACTURED (METAGRANITE)
 REC=100%
 RQD=91%

CRYSTALLINE ROCK, HARD, MODERATELY WEATHERED, GRAY TO LIGHT BROWN, MODERATELY WEATHERED TO FRESH, DRY
 REC=68%
 RQD=52%
 03/06

ROADWAY EMBANKMENT, TAN-BROWN, MOIST, MEDIUM STIFF TO STIFF, CLAYEY SANDY SILT

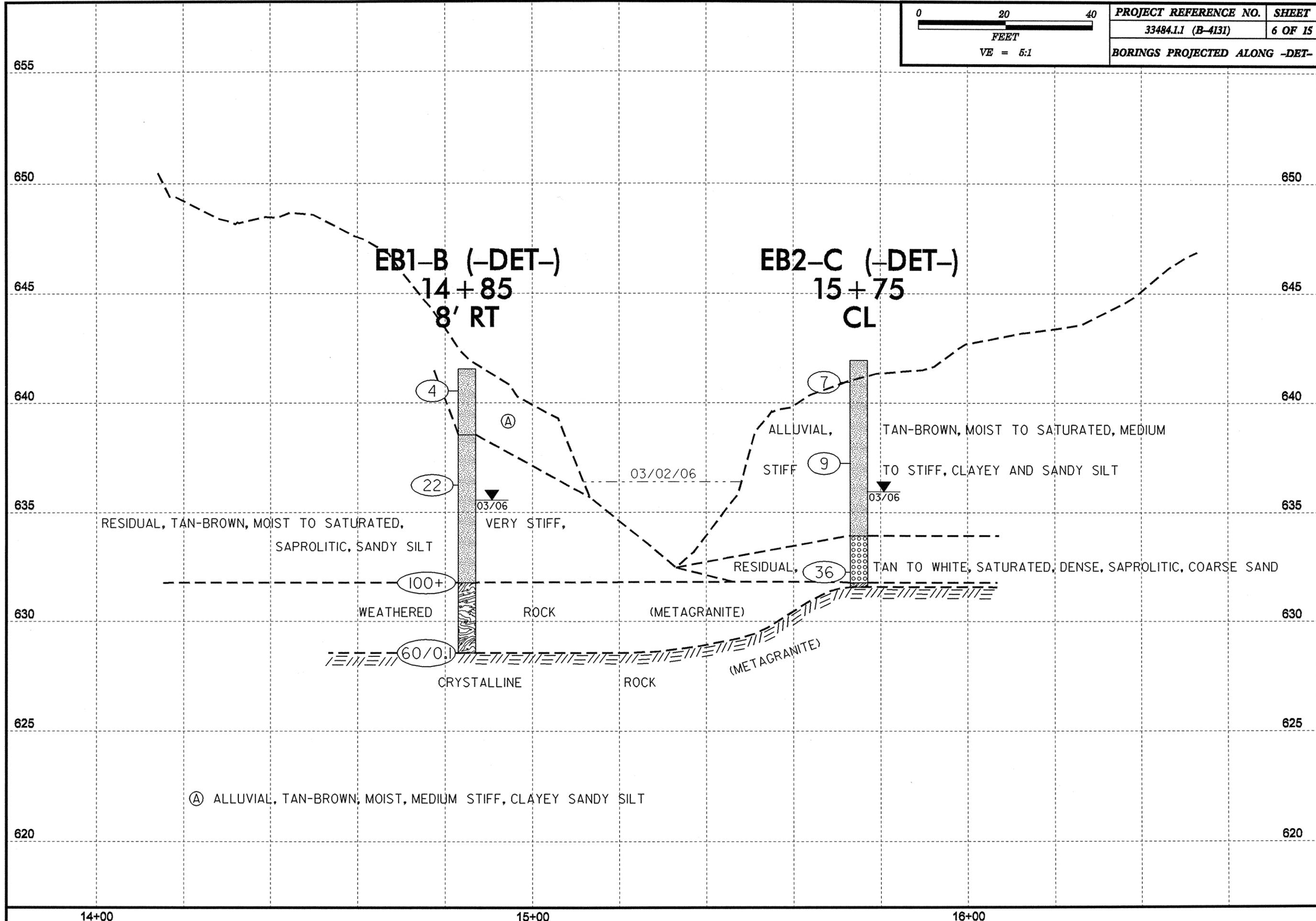
ALLUVIAL, MEDIUM DENSE, TAN-GRAY, MOIST TO SATURATED, SILTY SAND

(A) WEATHERED ROCK (METAGRANITE)

14+00

15+00

16+00



EB1-B (-DET-)
14+85
8' RT

EB2-C (-DET-)
15+75
CL

RESIDUAL, TAN-BROWN, MOIST TO SATURATED, SAPROLITIC, SANDY SILT

ALLUVIAL, TAN-BROWN, MOIST TO SATURATED, MEDIUM STIFF TO STIFF, CLAYEY AND SANDY SILT

RESIDUAL, TAN TO WHITE, SATURATED, DENSE, SAPROLITIC, COARSE SAND

WEATHERED ROCK (METAGRANITE)

CRYSTALLINE ROCK (METAGRANITE)

(A) ALLUVIAL, TAN-BROWN, MOIST, MEDIUM STIFF, CLAYEY SANDY SILT

655
650
645
640
635
630
625
620

650
645
640
635
630
625
620

14+00

15+00

16+00

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

| | | | |
|-------------------------------------------------------------------------|--------------------------|--------------------------|-----------------------|
| PROJECT NO. 33484.1.1 | ID. B-4131 | COUNTY GUILFORD | GEOLOGIST O. B. OTI |
| SITE DESCRIPTION BRIDGE NO. 11 ON -L- (SR 3394) OVER BIG ALAMANCE CREEK | | | GROUND WATER |
| BORING NO. EBI-A | BORING LOCATION 14+80 | OFFSET 15' LT | ALIGNMENT -L- |
| COLLAR ELEVATION 649.3' | NORTHING 803207 | EASTING 1792641 | 0 HR. N/A |
| TOTAL DEPTH 14.8' | | | 24 HR. DRY |
| DRILL MACHINE CME-550 | | DRILL METHOD WASH BORING | HAMMER TYPE AUTOMATIC |
| START DATE 03/08/06 | COMPLETION DATE 03/08/06 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 3.3' |

| ELEV. (FT.) | DEPTH (FT.) | BLOW COUNT | | | PEN. (FT.) | BLOWS PER FOOT | | | | | SAMPLE NUMBER | LOG | SOIL AND ROCK DESCRIPTION | |
|-------------|-------------|------------|-----|-----|------------|----------------|----|----|----|-----|---------------|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| | | 0.5 | 0.5 | 0.5 | | 0 | 25 | 50 | 75 | 100 | | | | |
| 649.3 | 0.0 | 1 | 2 | 2 | 1.0 | | | | | | | | | RESIDUAL, TAN-BROWN, SANDY SILT |
| 645.0 | 3.3 | 60 | | | 0.0 | | | | | | | | | WEATHERED ROCK (METAGRANITE) |
| 640.0 | | | | | | | | | | | | | | CRYSTALLINE ROCK, GRAY TO BROWN, VERY SLIGHTLY WEATHERED TO FRESH, HARD, MODERATELY CLOSELY FRACTURED (METAGRANITE) REC=100% ROD=91% |
| 635.0 | | | | | | | | | | | | | | CRYSTALLINE ROCK, GRAY TO LIGHT BROWN, MODERATELY WEATHERED TO FRESH, HARD, MODERATELY CLOSELY FRACTURED (METAGRANITE) REC=68% ROD=52% |
| 630.0 | | | | | | | | | | | | | | WEATHERED ROCK (METAGRANITE) |
| 625.0 | | | | | | | | | | | | | | CRYSTALLINE ROCK (METAGRANITE) |
| 620.0 | | | | | | | | | | | | | | |
| 615.0 | | | | | | | | | | | | | | |
| 610.0 | | | | | | | | | | | | | | |
| 605.0 | | | | | | | | | | | | | | |
| 600.0 | | | | | | | | | | | | | | |
| 595.0 | | | | | | | | | | | | | | |
| 590.0 | | | | | | | | | | | | | | |
| 585.0 | | | | | | | | | | | | | | |
| 580.0 | | | | | | | | | | | | | | |
| 575.0 | | | | | | | | | | | | | | |
| 570.0 | | | | | | | | | | | | | | |

CORING TERMINATED AT ELEV. 634.5 FEET IN CRYSTALLINE ROCK (METAGRANITE)

CORE BORING REPORT

PROJECT: 33484.1.1 ID: B-4131 COUNTY: GUILFORD BORING NO: EB1-A
 DESCRIPTION: BRIDGE NO. 11 ON -L- (SR 3394) OVER BIG ALAMANCE CREEK

LOCATION OF BORING: -L-, 14+80, 15' LT COMPLETION DATE: 3/8/06

COLLAR or GROUND ELEVATION: 649.3 ft CORE SIZE: NXWL GEOLOGIST: O. B. OTI

CORE EQUIPMENT: CME-550, N-CASING, NXWL CORE BARREL DRILLER: H. R. CONLEY

| ELEV (ft) | DEPTH (ft) | DRILL RATE (min/ft) | RUN (ft) | REC (ft) (%) | RQD (ft) (%) | SAMPLE NUMBER | FIELD CLASSIFICATION and REMARKS |
|-----------|------------|---------------------|----------|--------------|--------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 646.0 | 3.3 | 1:05 | 1.5 | 1.5 (100%) | 0.9 (60%) | | White to gray, v. slightly weathered to fresh, hard, mod. closely fractured, metagranite 1 joint @ 40deg. and 1 horizontal |
| | | 0:12 | | | | | |
| 644.5 | 4.8 | | 5.0 | 5.0 (100%) | 5.0 (100%) | RS-1 | White to gray, v. slightly weathered to fresh, hard, mod. closely fractured, metagranite 1 joint @ 80 deg. and 1 @ 60 deg. |
| 644.5 | 4.8 | 1:20 | | | | | |
| | | 0:55 | | | | | |
| | | 1:23 | | | | | |
| 639.5 | 9.8 | 1:26 | 5.0 | 3.4 (68%) | 2.6 (52%) | RS-2 | Gray to light brown, mod. weathered to fresh, hard, mod. closely fractured, metagranite 1 joint @ 40 deg. and 1 @ 60 deg. From 12.6' to 14.6' v. severely weathered |
| 639.5 | 9.8 | 1:45 | | | | | |
| | | 1:30 | | | | | |
| | | 1:23 | | | | | |
| 634.5 | 14.8 | 1:09 | | | | | |
| | | 1:25 | | | | | |

BOREHOLE TERMINATED AT ELEVATION OF 634.5 FEET, IN ROCK.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
 GEOTECHNICAL UNIT BORING LOG

SHEET 11 OF 15

| | | | |
|------------------------------------------------------------------------|--------------------------|--------------------------|-----------------------|
| PROJECT NO. 33484.1.1 | ID. B-4131 | COUNTY GUILFORD | GEOLOGIST O. B. OTI |
| SITE DESCRIPTION BRIDGE NO. 110N -L- (SR 3394) OVER BIG ALAMANCE CREEK | | | GROUND WATER |
| BORING NO. EBI-B | BORING LOCATION 14+85 | OFFSET 8' RT | ALIGNMENT -DET- |
| COLLAR ELEVATION 641.6' | NORTHING 803214 | EASTING 1792704 | 24 HR. 6.0' |
| TOTAL DEPTH 13.0' | DRILL MACHINE CME-550 | DRILL METHOD WASH BORING | HAMMER TYPE AUTOMATIC |
| START DATE 03/02/06 | COMPLETION DATE 03/02/06 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 13.0' |

| ELEV. (FT.) | DEPTH (FT.) | BLOW COUNT | | | PEN. (FT.) | BLOWS PER FOOT | | | | SAMPLE NUMBER | MOI. | LOG | SOIL AND ROCK DESCRIPTION |
|-------------------------------------------------------------------|-------------|------------|------|------|------------|----------------|----|----|----|---------------|------|-----|---------------------------------------------|
| | | 0.5' | 1.0' | 1.5' | | 0 | 25 | 50 | 75 | | | | |
| 641.6 | 0.0 | 3 | 2 | 2 | 1.0 | | | | | | | | |
| 640.0 | 4.3 | 3 | 7 | 15 | 1.0 | | | | | SS-3 | | | ALLUVIAL, TAN-BROWN, CLAYEY SANDY SILT |
| 635.0 | 9.3 | 100 | | | 0.5 | | | | | | | | RESIDUAL, TAN-BROWN, SAPROLITIC, SANDY SILT |
| 630.0 | 12.9 | 60 | | | 0.1 | | | | | | | | WEATHERED ROCK (METAGRANITE) |
| SPT REFUSAL AT ELEV. 628.6 FEET IN CRYSTALLINE ROCK (METAGRANITE) | | | | | | | | | | | | | |

| | | | |
|------------------------------------------------------------------------|--------------------------|--------------------------|-----------------------|
| PROJECT NO. 33484.1.1 | ID. B-4131 | COUNTY GUILFORD | GEOLOGIST O. B. OTI |
| SITE DESCRIPTION BRIDGE NO. 110N -L- (SR 3394) OVER BIG ALAMANCE CREEK | | | GROUND WATER |
| BORING NO. EB2-C | BORING LOCATION 15+75 | OFFSET CL | ALIGNMENT -DET- |
| COLLAR ELEVATION 642.0' | NORTHING 803303 | EASTING 1792690 | 24 HR. 6.0' |
| TOTAL DEPTH 10.4' | DRILL MACHINE CME-550 | DRILL METHOD WASH BORING | HAMMER TYPE AUTOMATIC |
| START DATE 03/01/06 | COMPLETION DATE 03/02/06 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 10.2' |

| ELEV. (FT.) | DEPTH (FT.) | BLOW COUNT | | | PEN. (FT.) | BLOWS PER FOOT | | | | SAMPLE NUMBER | MOI. | LOG | SOIL AND ROCK DESCRIPTION |
|-------------------------------------------------------------------------------|-------------|------------|------|------|------------|----------------|----|----|----|---------------|------|-----|-------------------------------------------------|
| | | 0.5' | 1.0' | 1.5' | | 0 | 25 | 50 | 75 | | | | |
| 642.0 | 0.0 | 1 | 2 | 5 | 1.0 | | | | | | | | |
| 640.0 | 3.7 | 1 | 3 | 6 | 1.0 | | | | | SS-1 | | | ALLUVIAL, TAN-BROWN, CLAYEY AND SANDY SILT |
| 635.0 | 8.7 | 27 | 13 | 23 | 1.0 | | | | | SS-2 | | | RESIDUAL, TAN TO WHITE, COARSE SAND, SAPROLITIC |
| 630.0 | | | | | | | | | | | | | CRYSTALLINE ROCK (METAGRANITE) |
| CASING ADVANCER REFUSAL AT ELEV. 631.6 FEET IN CRYSTALLINE ROCK (METAGRANITE) | | | | | | | | | | | | | |

EB1-A -L-

| SOIL TEST RESULTS | | | | | | | | | | | | | | | |
|-------------------|--------|---------|----------------|---------------|------|------|-------------|--------|------|------|--------------------|----|-----|------------|-----------|
| SAMPLE NO. | OFFSET | STATION | DEPTH INTERVAL | AASHTO CLASS. | L.L. | P.I. | % BY WEIGHT | | | | % PASSING (SIEVES) | | | % MOISTURE | % ORGANIC |
| | | | | | | | C.SAND | F.SAND | SILT | CLAY | 10 | 40 | 200 | | |
| SS-6 | 15 LT | 14+80 | 0.0-1.5 | A-4(0) | 27 | 4 | 40.2 | 24.3 | 23.3 | 12.1 | 92 | 65 | 39 | - | - |

EB2-A -L-

| SOIL TEST RESULTS | | | | | | | | | | | | | | | |
|-------------------|--------|---------|----------------|---------------|------|------|-------------|--------|------|------|--------------------|----|-----|------------|-----------|
| SAMPLE NO. | OFFSET | STATION | DEPTH INTERVAL | AASHTO CLASS. | L.L. | P.I. | % BY WEIGHT | | | | % PASSING (SIEVES) | | | % MOISTURE | % ORGANIC |
| | | | | | | | C.SAND | F.SAND | SILT | CLAY | 10 | 40 | 200 | | |
| SS-4 | 8.5 LT | 15+90 | 3.8-5.3 | A-4(3) | 33 | 9 | 26.6 | 21.9 | 29.4 | 22.1 | 97 | 79 | 56 | - | - |
| SS-5 | 8.5 LT | 15+90 | 13.8-15.3 | A-2-4(0) | 20 | NP | 23.1 | 49.1 | 19.7 | 8.0 | 100 | 92 | 35 | - | - |

EB1-A -L-

| ROCK TEST RESULTS | | | | | | | |
|-------------------|--------|---------|----------------|-------------|----------------------------|--------------------------------|-------------------------|
| SAMPLE NO. | OFFSET | STATION | DEPTH INTERVAL | ROCK TYPE | UNIT WT LB/FT ³ | UNCONFINED COMP. STRENGTH, KSI | SECTION MOD. @ 40% MPSI |
| RS-1 | 15 LT | 14+80 | 4.8-5.4 | METAGRANITE | 155.7 | 8.89 | 2.59 |
| RS-2 | 15 LT | 14+80 | 9.8-10.4 | METAGRANITE | 176.5 | 8.23 | 2.17 |

EB1-B -DET-

| SOIL TEST RESULTS | | | | | | | | | | | | | | | |
|-------------------|--------|---------|----------------|---------------|------|------|-------------|--------|------|------|--------------------|----|-----|------------|-----------|
| SAMPLE NO. | OFFSET | STATION | DEPTH INTERVAL | AASHTO CLASS. | L.L. | P.I. | % BY WEIGHT | | | | % PASSING (SIEVES) | | | % MOISTURE | % ORGANIC |
| | | | | | | | C.SAND | F.SAND | SILT | CLAY | 10 | 40 | 200 | | |
| SS-3 | 8'RT | 15+75 | 4.3-5.8 | A-4(1) | 34 | 7 | 34.6 | 23.7 | 25.6 | 16.1 | 100 | 76 | 48 | - | - |

EB2-C -DET-

| SOIL TEST RESULTS | | | | | | | | | | | | | | | |
|-------------------|--------|---------|----------------|---------------|------|------|-------------|--------|------|------|--------------------|----|-----|------------|-----------|
| SAMPLE NO. | OFFSET | STATION | DEPTH INTERVAL | AASHTO CLASS. | L.L. | P.I. | % BY WEIGHT | | | | % PASSING (SIEVES) | | | % MOISTURE | % ORGANIC |
| | | | | | | | C.SAND | F.SAND | SILT | CLAY | 10 | 40 | 200 | | |
| SS-1 | CL | 15+75 | 3.7-5.2 | A-4(0) | 27 | 5 | 34.6 | 21.9 | 23.3 | 20.1 | 95 | 72 | 45 | - | - |
| SS-2 | CL | 15+75 | 8.7-10.2 | A-1-b(0) | 20 | NP | 64.2 | 21.5 | 10.3 | 4.0 | 93 | 47 | 17 | - | - |



**FIELD
SCOUR REPORT**

WBS: 33484.1.1 TIP: B-4131 COUNTY: GUILFORD

DESCRIPTION(1): BRIDGE NO. 11 ON -L- (SR 3393) OVER BIG ALAMANCE CREEK

EXISTING BRIDGE

Information from: Field Inspection Microfilm _____ (reel _____ pos: _____)
Other (explain) Bridge Survey and Hydraulic Design Report

Bridge No.: 11 Length: 97 Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2
Foundation Type: Unknown (Massive Concrete Substructure)

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: Apparent storm water erosion along end bent 1

Interior Bents: None noted

Channel Bed: None noted

Channel Bank: None noted

EXISTING SCOUR PROTECTION

Type(3): End Bent 1- Unprotected end slope (Rock Outcrop), End Bent 2- Rock masonry

Extent(4): End Bent 2- Approximately 5' outside of edge of bridge

Effectiveness(5): Appears satisfactory

Obstructions(6): Rock dam 150' upstream

INSTRUCTIONS

- 1 Describe the specific site's location, including route number and body of water crossed.
- 2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
- 3 Note existing scour protection (e.g. rip rap).
- 4 Describe extent of existing scour protection.
- 5 Describe whether or not the scour protection appears to be working.
- 6 Note obstructions such as dams, fallen trees, debris at bents, etc.
- 7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
- 8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
- 9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
- 10 Determine the approximate floodplain width from field observation or a topographic map.
- 11 Describe the material covering the floodplain (e.g. grass, trees, crops).
- 12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
- 13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
- 14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoretical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

DESIGN INFORMATION

Channel Bed Material(7): Alluvial, Tan-Brown, Saturated, Sand with some gravel and cobbles

Channel Bank Material(8): (SS-1) Alluvial, Tan-Brown, Moist, Med. Stiff to Stiff, Clayey and Sandy Silt
(SS-3) Residual, Tan-Brown, Moi. to Wet, V. Stiff, Saprolitic, Sandy Silt

Channel Bank Cover(9): Grass, Trees and Scrub

Floodplain Width(10): Approximately 500'

Floodplain Cover(11): Grass and Trees

Stream is(12): Aggrading _____ Degrading Static _____

Channel Migration Tendency(13): Slight tendency to the southwest

Observations and Other Comments: N/A

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

| BENTS | | | | | | | | | | |
|--------------|--|--|--|--|--|--|--|--|--|--|
| N/A | | | | | | | | | | |
| N/A | | | | | | | | | | |
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Comparison of DSE to Hydraulics Unit theoretical scour:
No scour is anticipated beyond the end bents. The Geotechnical Engineering Unit agrees with the predicted scour in the Bridge Survey and Hydraulic Design Report dated 11/22/2005.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

| | | | | | | | | | | |
|-------------|--|--|--|--|--|--|--|--|--|--|
| Bed or Bank | | | | | | | | | | |
| Sample No. | | | | | | | | | | |
| Retained #4 | | | | | | | | | | |
| Passed #10 | | | | | | | | | | |
| Passed #40 | | | | | | | | | | |
| Passed #200 | | | | | | | | | | |
| Coarse Sand | | | | | | | | | | |
| Fine Sand | | | | | | | | | | |
| Silt | | | | | | | | | | |
| Clay | | | | | | | | | | |
| LL | | | | | | | | | | |
| PI | | | | | | | | | | |
| AASHTO | | | | | | | | | | |
| Station | | | | | | | | | | |
| Offset | | | | | | | | | | |
| Depth | | | | | | | | | | |

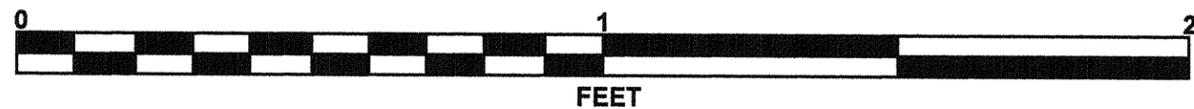
See Sheet 12, "Soil Test Results", for samples: SS-1, SS-3

Reported by:
Kevin B. Miller, LG
Project Geological Engineer

Date: 8/2/2006

CORE PHOTOGRAPHS

EB1-A
BOX 1 of 2: 3.3 - 9.8 FEET



EB1-A
BOX 2 of 2: 9.8 - 14.8 FEET



SITE PHOTOGRAPH

Bridge No. 11 on -L- (SR 3394) Over Big Alamance Creek



Looking North Towards End Bent 2