

PROJECT: 33794.1.1 ID: B-4610

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| CONTENTS: | |
| Title Sheet | Sheet 1 |
| NCDOT Geotechnical Unit Soil and Rock Classification Sheet | Sheet 2 |
| Site Vicinity Map | Sheet 3 |
| Boring Location Plan | Sheet 4 |
| Generalized Subsurface Profile 12.0' RT. of -L- | Sheet 5 |
| Generalized Subsurface Cross Section Through End Bent No.1 | Sheet 6 |
| Generalized Subsurface Cross Section Through Interior Bent No.1 | Sheet 7 |
| Generalized Subsurface Cross Section Through Interior Bent No.2 | Sheet 8 |
| Generalized Subsurface Cross Section Through End Bent No.2 | Sheet 9 |
| Test Boring Logs Core Reports Core Photographs | Sheets 10 - 16 |
| Summary of Laboratory Test Data | Sheet 17 |
| Summary of Rock Core Test Results | Sheet 18 |
| Field Scour Report (Performed September 11, 2009) | Sheet 19 |
| Grain Size Curves | Sheets 20 - 22 |
| Site Photographs | Sheets 23 - 25 |

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 33794.1.1 I.D. NO. B-4610
 F.A. PROJECT BRZ-1518(2)
 COUNTY RANDOLPH
 PROJECT DESCRIPTION BRIDGE No. 73
OVER LAKE LUCAS ON SR 1518

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|-----------------|-----------------------------|-------------|--------------|
| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
| N.C. | B-4610 | 1 | 25 |
| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION | |
| 33794.1.1 | BRZ-1518(2) | P.E. | |
| | | CONST. | |

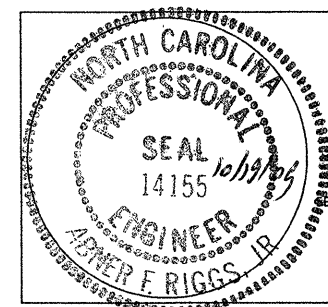
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GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (UN-PLACED) 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.

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INVESTIGATED BY S&ME, INC. PERSONNEL A. RIGGS
 CHECKED BY A.F. RIGGS, JR. N. BRADLEY
 SUBMITTED BY S&ME, INC. J. WHITE
 DATE OCTOBER 2, 2009 S. LOW
P. PHELPS
T. PEREZ



Adner F. Riggs, Jr.
SIGNATURE

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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.

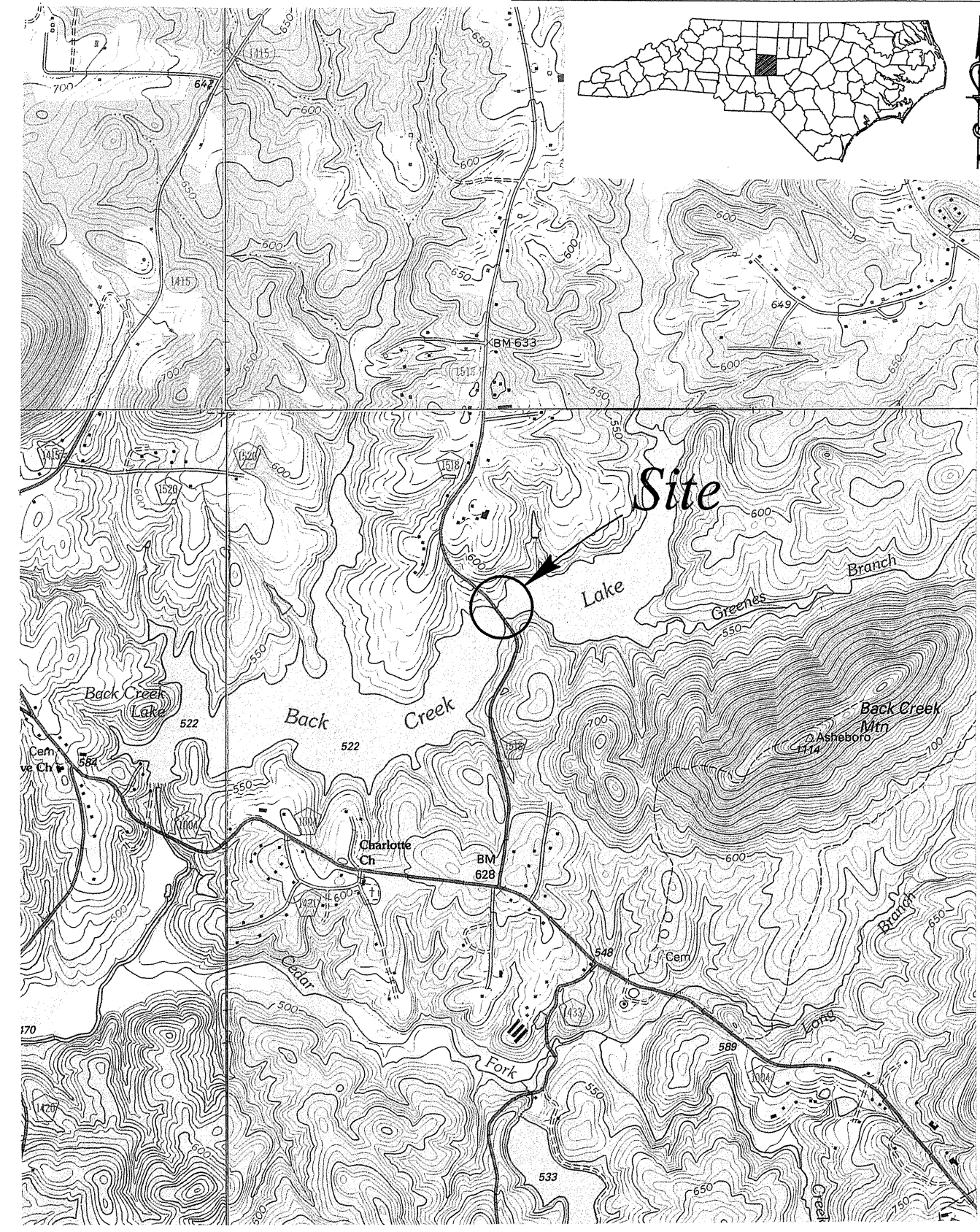
DRAWN BY: T. PEREZ

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

| SOIL DESCRIPTION | | | | | | | | | | GRADATION | | | | | | | | | | ROCK DESCRIPTION | | | | | | | | | | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 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: VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 | | | | | | | | | | 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) GAP-GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES. THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. | | | | | | | | | | 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 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: | | | | | | | | | | ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, 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 WHICH 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 SLICES 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. 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 EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH 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, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS. STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | MINERALOGICAL COMPOSITION | | | | | | | | | | WEATHERING | | | | | | | | | | MISCELLANEOUS SYMBOLS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="4">GRANULAR MATERIALS (>5% PASSING #200)</th> <th colspan="4">SILT-CLAY MATERIALS (>85% PASSING #200)</th> <th colspan="2">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-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> </tr> <tr> <th>SYMBOL</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>% PASSING</th> <td>50 MX 10 40 200</td> <td>30 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> <td>35 MX 10 40 200</td> </tr> <tr> <th>LIQUID LIMIT</th> <td>6 MX</td> <td>N.P.</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> <td>40 MX 10 40 200</td> </tr> <tr> <th>PLASTIC INDEX</th> <td>0</td> <td>0</td> <td>4 MX</td> <td>8 MX</td> <td>12 MX</td> <td>16 MX</td> <td>20 MX</td> <td>24 MX</td> <td>28 MX</td> <td>32 MX</td> <td>36 MX</td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</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 colspan="2">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="4">HIGHLY ORGANIC SOILS</td> </tr> <tr> <th>GEN. RATING AS A SUBGRADE</th> <td colspan="3">EXCELLENT TO GOOD</td> <td colspan="3">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td colspan="3">UNSUITABLE</td> </tr> </table> | | | | | | | | | | GENERAL CLASS. | GRANULAR MATERIALS (>5% PASSING #200) | | | | SILT-CLAY MATERIALS (>85% 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-3 | A-4, A-5 | A-6, A-7 | SYMBOL | | | | | | | | | | | | % PASSING | 50 MX 10 40 200 | 30 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | LIQUID LIMIT | 6 MX | N.P. | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | PLASTIC INDEX | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | 20 MX | 24 MX | 28 MX | 32 MX | 36 MX | GROUP INDEX | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | USUAL TYPES OF MAJOR MATERIALS | STONE FRAGS. GRAVEL AND SAND | FINE SAND | SILTY OR CLAYEY GRAVEL AND SAND | SILTY SOILS | CLAYEY SOILS | SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER | | HIGHLY ORGANIC SOILS | | | | GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | FAIR TO POOR | | | FAIR TO POOR | POOR | UNSUITABLE | | | MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. | | | | | | | | | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4">COMPRESSIBILITY</th> </tr> <tr> <td>SLIGHTLY COMPRESSIBLE</td> <td>LIQUID LIMIT LESS THAN 30</td> <td colspan="2"></td> </tr> <tr> <td>MODERATELY COMPRESSIBLE</td> <td>LIQUID LIMIT 31-50</td> <td colspan="2"></td> </tr> <tr> <td>HIGHLY COMPRESSIBLE</td> <td>LIQUID LIMIT GREATER THAN 50</td> <td colspan="2"></td> </tr> <tr> <th colspan="4">PERCENTAGE OF MATERIAL</th> </tr> <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 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </table> | | | | | | | | | | COMPRESSIBILITY | | | | SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 30 | | | MODERATELY COMPRESSIBLE | LIQUID LIMIT 31-50 | | | HIGHLY COMPRESSIBLE | LIQUID LIMIT GREATER THAN 50 | | | PERCENTAGE OF MATERIAL | | | | ORGANIC MATERIAL | GRANULAR SOILS | SILT-CLAY SOILS | OTHER MATERIAL | TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE 1 - 10% | LITTLE ORGANIC MATTER | 3 - 5% | 5 - 12% | LITTLE 10 - 20% | MODERATELY ORGANIC | 5 - 10% | 12 - 20% | SOME 20 - 35% | HIGHLY ORGANIC | >10% | >20% | HIGHLY 35% AND ABOVE | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">GROUND WATER</th> </tr> <tr> <td></td> <td>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.</td> </tr> <tr> <td></td> <td>STATIC WATER LEVEL AFTER 24 HOURS.</td> </tr> <tr> <td></td> <td>PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA</td> </tr> <tr> <td></td> <td>SPRING OR SEEPAGE</td> </tr> </table> | | | | | | | | | | GROUND WATER | | | WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. | | STATIC WATER LEVEL AFTER 24 HOURS. | | PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA | | SPRING OR SEEPAGE | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">CONSISTENCY OR DENSENESS</th> </tr> <tr> <th>PRIMARY SOIL TYPE</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> </tr> <tr> <td></td> <td>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</td> </tr> <tr> <td></td> <td><0.25 0.25 TO 0.5 0.5 TO 1 1 TO 2 2 TO 4 >4</td> </tr> </table> | | | | | | | | | | CONSISTENCY OR DENSENESS | | PRIMARY SOIL TYPE | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | | <0.25 0.25 TO 0.5 0.5 TO 1 1 TO 2 2 TO 4 >4 | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">TEXTURE OR GRAIN SIZE</th> </tr> <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>2.0</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <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>GRAIN SIZE MM 305 IN. 12"</td> <td>75 3"</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> <td></td> </tr> </table> | | | | | | | | | | TEXTURE OR GRAIN SIZE | | U.S. STD. 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PLASTICITY</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>HIGH</td> </tr> <tr> <th colspan="2">COLOR</th> </tr> <tr> <td colspan="2">DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</td> </tr> </table> | | | | | | | | | | PLASTICITY | | NONPLASTIC | DRY STRENGTH | LOW PLASTICITY | VERY LOW | MED. PLASTICITY | SLIGHT | HIGH PLASTICITY | MEDIUM | | HIGH | COLOR | | DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. 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| GROUP CLASS. | A-1 | A-3 | A-2 | A-4 | A-5 | A-6 | A-7 | A-1, A-2 | A-3 | A-4, A-5 | A-6, A-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % PASSING | 50 MX 10 40 200 | 30 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | 35 MX 10 40 200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LIQUID LIMIT | 6 MX | N.P. | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | 40 MX 10 40 200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PLASTIC INDEX | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | 20 MX | 24 MX | 28 MX | 32 MX | 36 MX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| GEN. RATING AS A SUBGRADE | EXCELLENT TO GOOD | | | FAIR TO POOR | | | FAIR TO POOR | POOR | UNSUITABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMPRESSIBILITY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLIGHTLY COMPRESSIBLE | LIQUID LIMIT LESS THAN 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY COMPRESSIBLE | LIQUID LIMIT 31-50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| PERCENTAGE OF MATERIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| TRACE OF ORGANIC MATTER | 2 - 3% | 3 - 5% | TRACE 1 - 10% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | <0.25 0.25 TO 0.5 0.5 TO 1 1 TO 2 2 TO 4 >4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4.76 | 2.0 | 0.42 | 0.25 | 0.075 | 0.053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| PL - PLASTIC LIMIT | - WET - (W) | SEMI-SOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OM - OPTIMUM MOISTURE | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SL - SHRINKAGE LIMIT | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INDURATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BENCH MARK: BL-103 NCDOT Traverse Station Rebar & Cap Stamped 'BL-103' Located at Station -BL- 15+57.74 | | ELEVATION: 532.28' | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NOTES: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | SPT LAB SAMPLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | SHELBY TUBE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| ID | STATE PROJECT NO. | SHEET NO. | TOTAL SHEETS |
|--------|-------------------|-----------|--------------|
| B-4610 | 33794.1.1 | 3 | 25 |



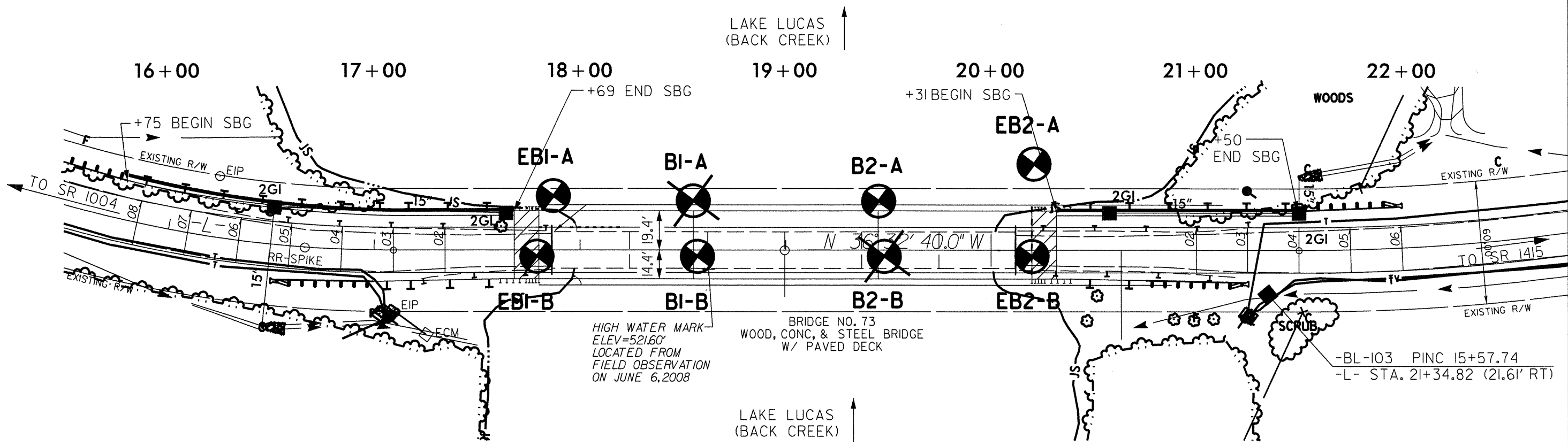
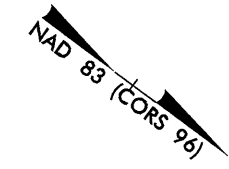
S:\PROJECTS\2009\09-2017\GEOTECH\CADD\B-46 10 -SITE\VIC

| | |
|-------------|--------------|
| SCALE: | 1:24,000 |
| CHECKED BY: | AFR |
| DRAWN BY: | TRP |
| DATE: | OCTOBER 2009 |
| JOB NO. | 105 1-09-207 |

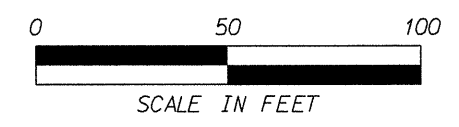


SITE VICINITY MAP
 BRIDGE No. 73 OVER LAKE LUCAS
 ON SR 15 18
 STATE PROJECT NO. 33794.1.1 TIP NO. B-46 10
 FEDERAL I.D. NO. BRZ- 15 18(2)
 RANDOLPH COUNTY, NORTH CAROLINA

S:\PROJECTS\2009\09-207\GEOTECH DOT\CADD\B-46 10 SITE PLAN.DGN



BENCHMARK:
 -BL-103 NCDOT TRAVERSE STATION REBAR & CAP STAMPED "BL-103"
 LOCATED AT STATION -BL- 15+57.74
 ELEV. 532.28'
 SKEW ANGLE FOR BENTS 90° 00' 00" (TYPICAL)



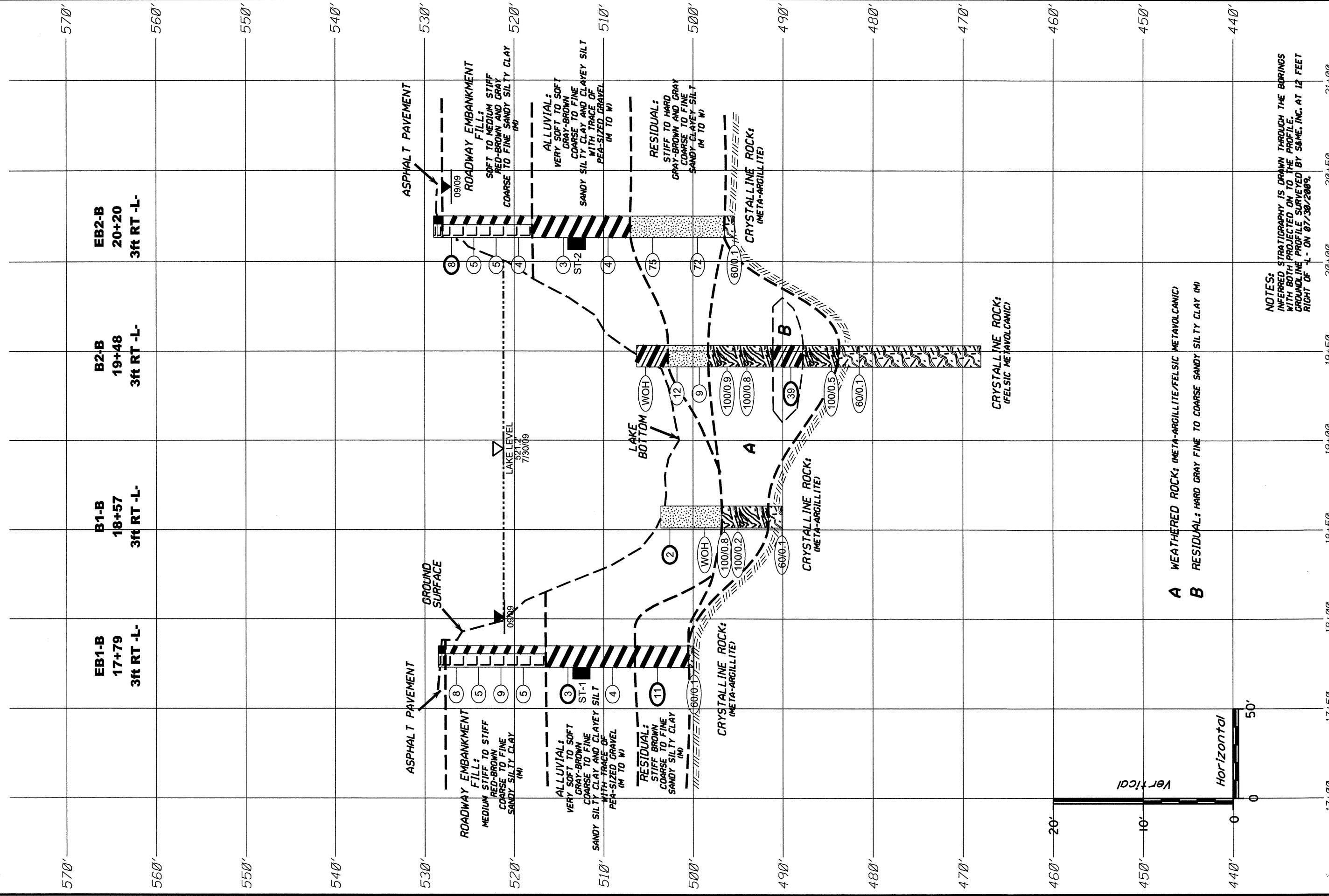
| | | | |
|----------|--------------|--------------|-----|
| SCALE: | 1" = 50' | APPROVED BY: | AFR |
| DATE: | OCTOBER 2009 | DRAWN BY: | TRP |
| JOB NO.: | 1051-09-207 | SHEET | 4 |



BORING LOCATION PLAN
 REPLACEMENT OF BRIDGE No. 73
 OVER LAKE LUCAS ON SR 1518
 STATE PROJECT No. 33794.1.1 FEDERAL I.D. BRZ-1518(2)
 RANDOLPH COUNTY, NORTH CAROLINA

TIP No. B-46 10

TO SR 1004 GENERALIZED SUBSURFACE PROFILE 12.0' RIGHT OF -L- TO SR 1415



NOTES:
 INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ON TO THE PROFILE.
 GROUNDLINE PROFILE SURVEYED BY S&ME, INC. AT 12 FEET RIGHT OF -L- ON 07/30/2009.

GENERALIZED SUBSURFACE PROFILE 12' RIGHT OF -L-

REPLACEMENT OF BRIDGE No. 73 OVER LAKE LUCAS ON SR 1518
 STATE PROJECT No. 33794.1.1 FEDERAL I.D. BRZ-15.18(2)
 RANDOLPH COUNTY, NORTH CAROLINA

TIP No. B-46.10

S&ME
 ENVIRONMENTAL SERVICES
 ENGINEERING TESTING

SCALE: (V) 1" = 10'
 (H) 1" = 50'

DATE: OCTOBER 2009

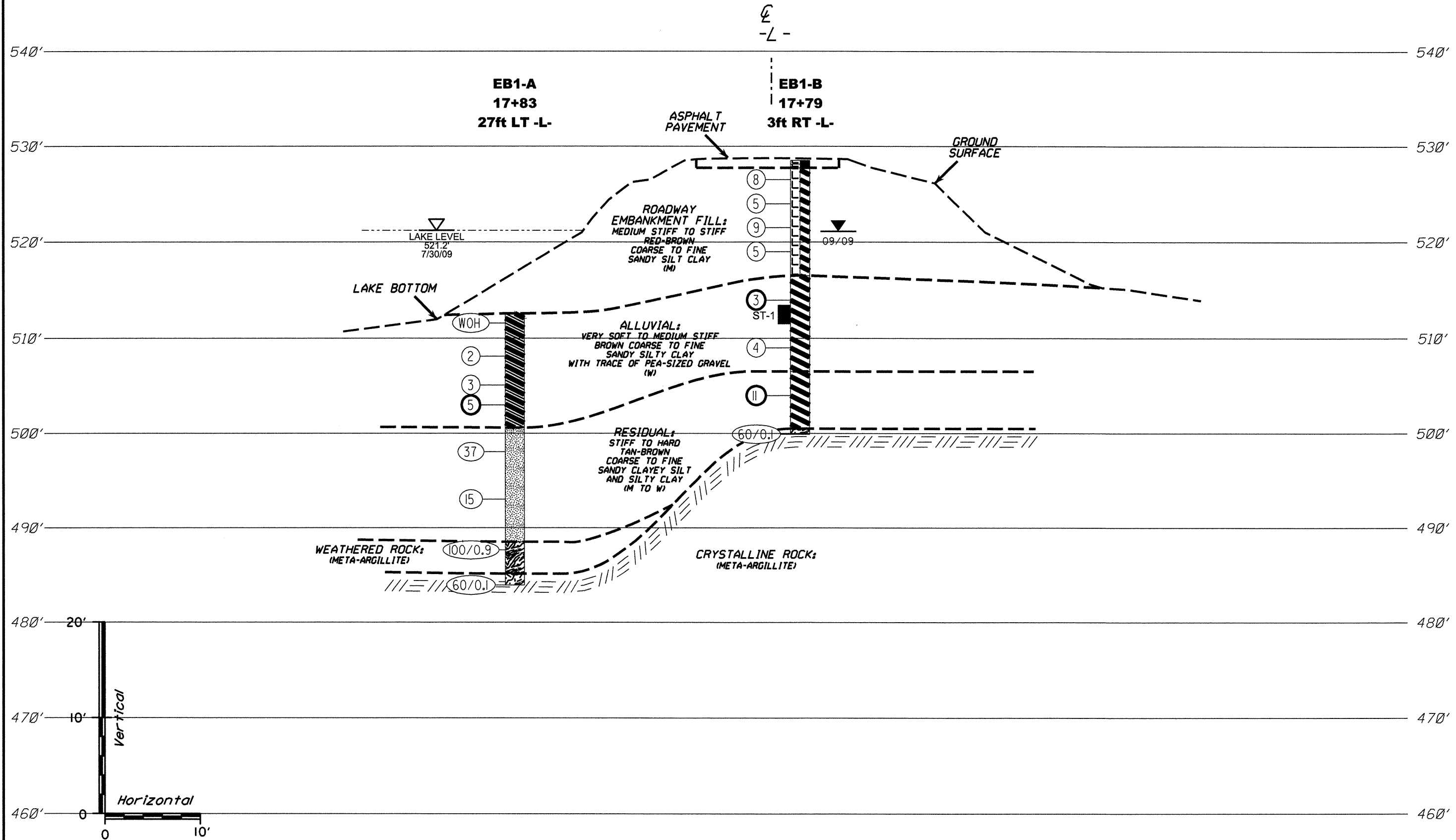
JOB NO: 1051-09-207

APPROVED BY: AFR

DRAWN BY: TRP

SHEET 5

GENERALIZED SUBSURFACE CROSS SECTION THROUGH END BENT No.1



NOTES:
GROUNDLINE AT CROSS SECTION TAKEN FROM
ROADWAY DESIGN PLANS AS OF 07/9/2009.

| | |
|--------------|------------------------------|
| APPROVED BY: | AFR |
| SCALE: | (V) 1" = 10' (H) 1" = 10' |
| DATE: | OCTOBER 2009 |
| JOB NO.: | 105 1-09-207 |
| DRAWN BY: | TRP |
| SHEET | 6 |

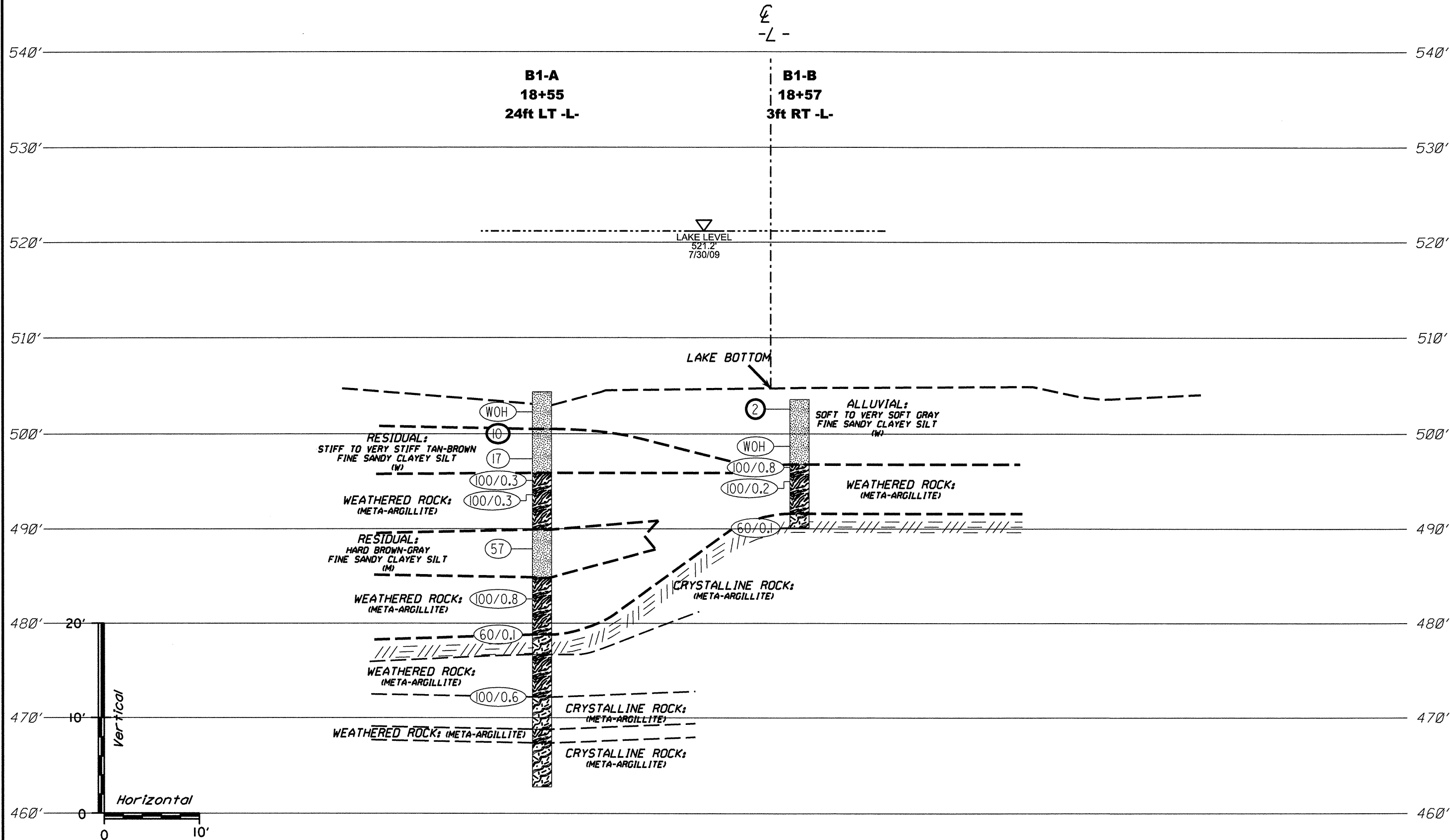
S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH END BENT No.1
REPLACEMENT OF BRIDGE No. 73
OVER LAKE LUCAS ON SR 1518
STATE PROJECT No. 33794-1-1, FEDERAL ID. BRZ-1518(2)
RANDOLPH COUNTY, NORTH CAROLINA

TIP No. B-4610

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GENERALIZED SUBSURFACE CROSS SECTION THROUGH INTERIOR BENT No.1



NOTES:
GROUNDLINE AT CROSS SECTION TAKEN FROM
ROADWAY DESIGN PLANS AS OF 07/9/2009.

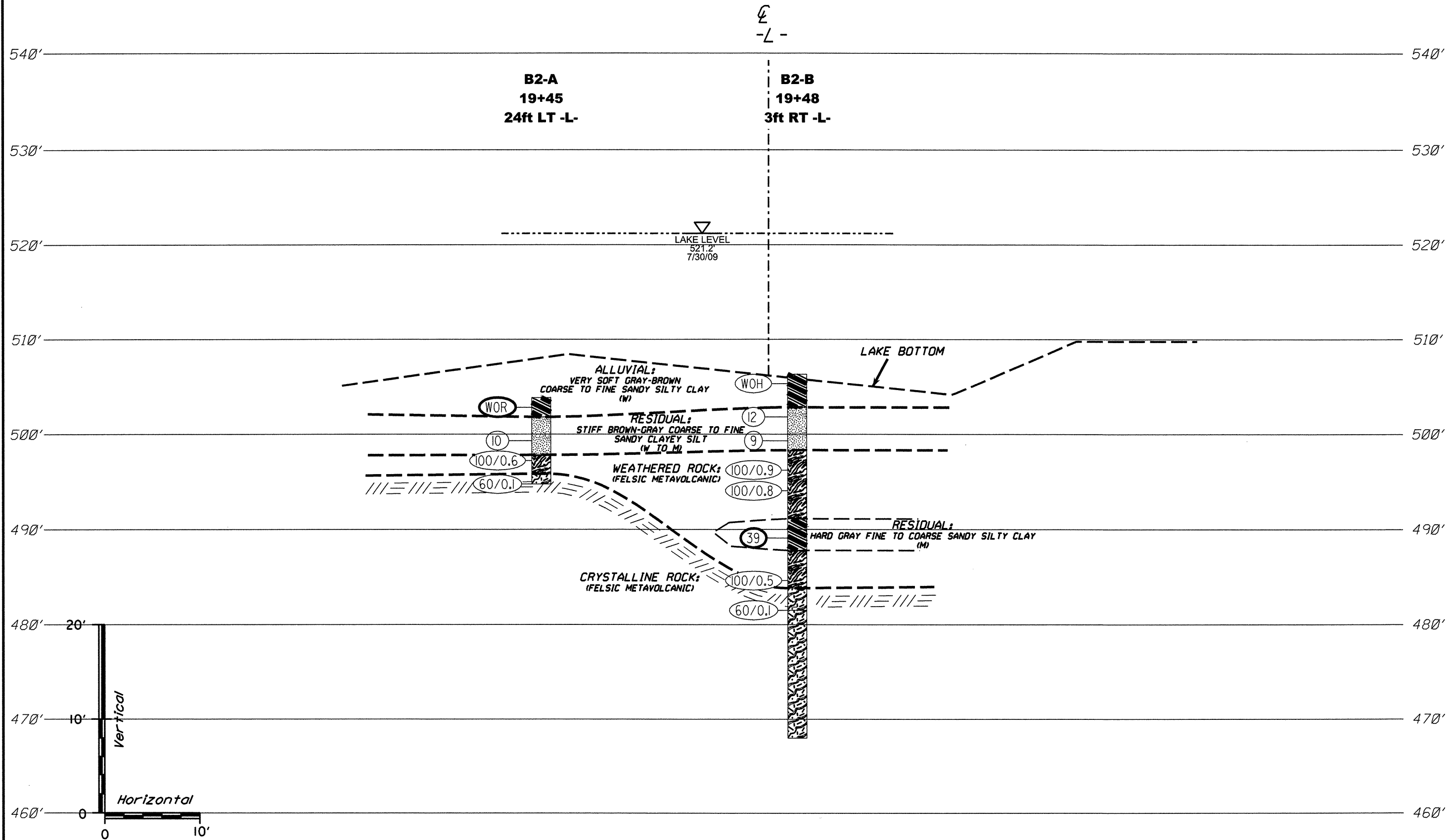
| | | | |
|---------|------------------------------|--------------|-----|
| SCALE: | (V) 1" = 10' (H) 1" = 10' | APPROVED BY: | AFR |
| DATE: | OCTOBER 2009 | DRAWN BY: | TRP |
| JOB NO. | 105 1-09-207 | SHEET | 7 |



GENERALIZED SUBSURFACE CROSS SECTION
THROUGH INTERIOR BENT No. 1
REPLACEMENT OF BRIDGE No. 73
OVER LAKE LUCAS ON SR 1518
STATE PROJECT No. 33794.1.1 FEDERAL I.D. BRZ-1518(2)
RANDOLPH COUNTY, NORTH CAROLINA
TIP No. B-4610

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GENERALIZED SUBSURFACE CROSS SECTION THROUGH INTERIOR BENT No. 2



NOTES:
GROUNDLINE AT CROSS SECTION TAKEN FROM
ROADWAY DESIGN PLANS AS OF 07/9/2009.

| | |
|--------------|--------------|
| APPROVED BY: | AFR |
| DRAWN BY: | TRP |
| DATE: | OCTOBER 2009 |
| JOB NO.: | 105 1-09-207 |
| SHEET | 8 |

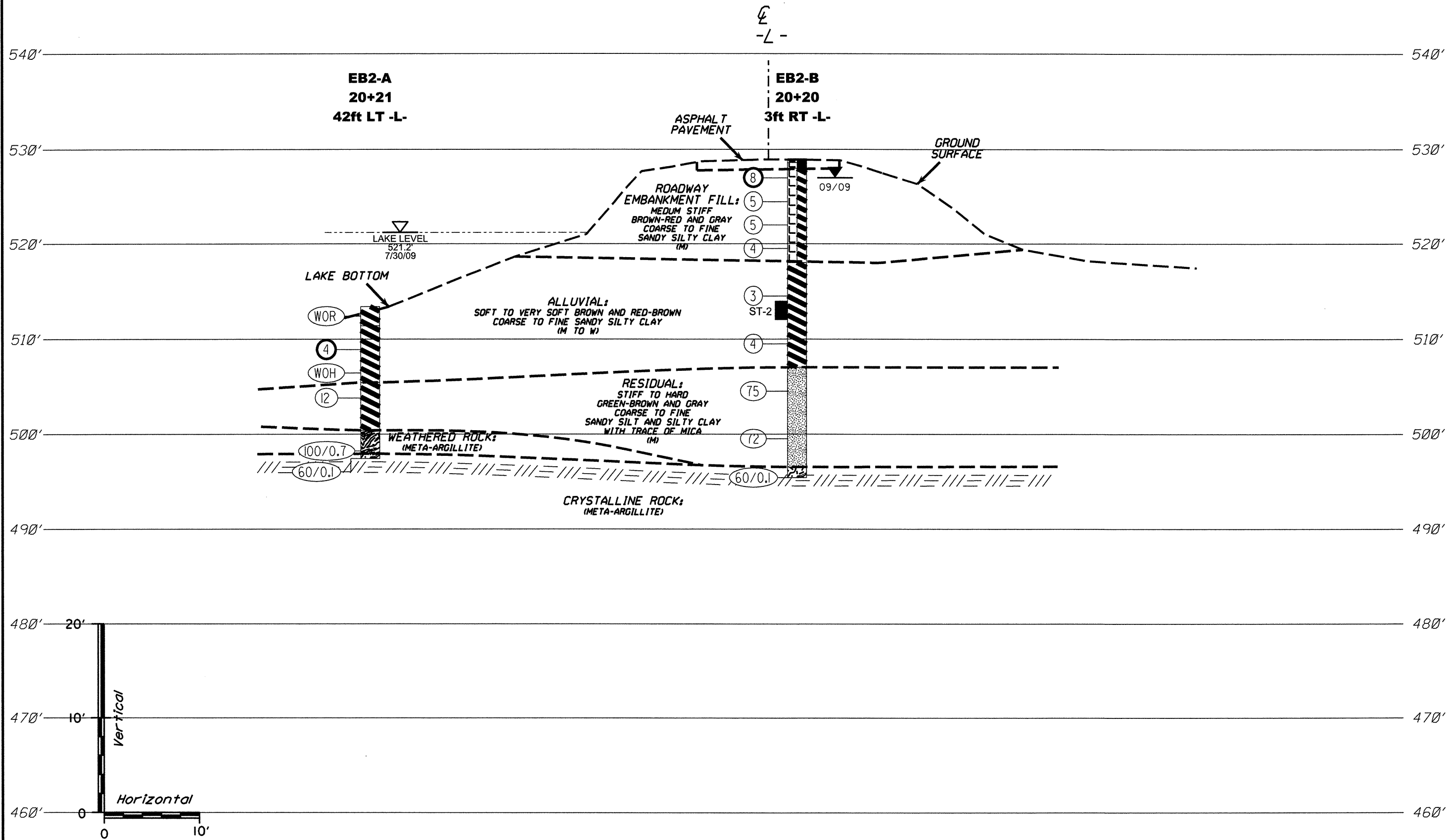
SCALE: (V) 1" = 10'
(H) 1" = 10'

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING - TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH INTERIOR BENT No. 2
REPLACEMENT OF BRIDGE No. 73
OVER LAKE LUCAS ON SR 1518
STATE PROJECT No. 33794.1.1 FEDERAL I.D. BR2-1518(2)
RANDOLPH COUNTY, NORTH CAROLINA

TIP No. B-4610

GENERALIZED SUBSURFACE CROSS SECTION THROUGH END BENT No. 2



NOTES:
GROUNDLINE AT CROSS SECTION TAKEN FROM
ROADWAY DESIGN PLANS AS OF 07/9/2009.

| | |
|-------------------------------------|--------------------|
| APPROVED BY: AFR | |
| DRAWN BY: TRP | |
| SCALE: (V) 1" = 10' (H) 1" = 10' | DATE: OCTOBER 2009 |
| JOB NO. 1051-09-207 | SHEET 9 |



GENERALIZED SUBSURFACE CROSS SECTION
THROUGH END BENT No. 2
REPLACEMENT OF BRIDGE No. 73
OVER LAKE LUCAS ON SR 1518
STATE PROJECT No. 33794.1.1 FEDERAL I.D. BRZ-1518(2)
RANDOLPH COUNTY, NORTH CAROLINA

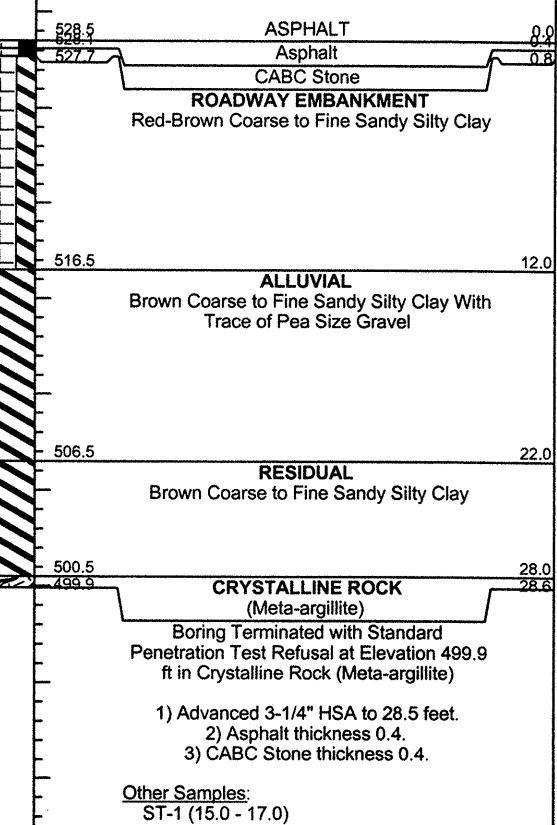
S:\PROJECTS\2009\09-207\GEOTECH DOT\CADD\B-46 IO PROFILE.DGN



| PROJECT NO. 33794.1.1 | | ID. B-4610 | | COUNTY Randolph | | GEOLOGIST N. Bradley | | | | | | | | | | |
|---|-----------------|---|------------|---------------------------|-----------------------|-----------------------|-----------------|----|----|-----|-----------|---------|-----|---------------------------|------------|-----|
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB1-A | | STATION 17+83 | | OFFSET 27ft LT | | ALIGNMENT -L- | | | | | | | | | | |
| COLLAR ELEV. 512.6 ft | | TOTAL DEPTH 28.7 ft | | NORTHING 726,027 | | EASTING 1,744,370 | | | | | | | | | | |
| DRILL MACHINE CME-45C | | DRILL METHOD NW Casing/2-15/16" Tricone | | | HAMMER TYPE Automatic | | | | | | | | | | | |
| START DATE 09/09/09 | | COMP. DATE 09/09/09 | | SURFACE WATER DEPTH 8.6ft | | DEPTH TO ROCK 27.5 ft | | | | | | | | | | |
| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG MOI | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | | |
| 525 | | | | | | | | | | | | | | | | |
| 520 | | | | | | | | | | | | | | | | |
| 515 | | | | | | | | | | | | | | | | |
| 512.6 | 512.6 | 0.0 | | | | | | | | | | | | | | 0.0 |
| 510 | 509.1 | 3.5 | WOH | WOH | WOH | | | | | | | | | | | |
| 505 | 506.1 | 6.5 | WOH | 1 | 1 | | | | | | | | | | | |
| 505 | 504.0 | 8.6 | 1 | 2 | 1 | | | | | | | | | | | |
| 500 | 504.0 | 8.6 | WOH | 2 | 3 | | | | | | | | | | | |
| 500 | 499.0 | 13.6 | | | | | | | | | | | | | | |
| 495 | 499.0 | 13.6 | 13 | 18 | 19 | | | | | | | | | | | |
| 495 | 494.0 | 18.6 | 5 | 7 | 8 | | | | | | | | | | | |
| 490 | 489.0 | 23.6 | | | | | | | | | | | | | | |
| 485 | 489.0 | 23.6 | 30 | 52 | 48/0.4 | | | | | | | | | | | |
| 485 | 484.0 | 28.6 | | | | | | | | | | | | | | |
| 480 | 484.0 | 28.6 | 60/0.1 | | | | | | | | | | | | | |
| 475 | | | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | | | |
| 465 | | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | | |
| 455 | | | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | | | |
| 445 | | | | | | | | | | | | | | | | |

| PROJECT NO. 33794.1.1 | | ID. B-4610 | | COUNTY Randolph | | GEOLOGIST N. Bradley | | | | | | | | | | |
|---|-----------------|-------------------------|------------|-------------------------|-----------------------|-----------------------|-----------------|----|----|-----|-----------|---------|-----|---------------------------|------------|--|
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB1-B | | STATION 17+79 | | OFFSET 3ft RT | | ALIGNMENT -L- | | | | | | | | | | |
| COLLAR ELEV. 528.5 ft | | TOTAL DEPTH 28.6 ft | | NORTHING 726,038 | | EASTING 1,744,398 | | | | | | | | | | |
| DRILL MACHINE CME-750 | | DRILL METHOD 3-1/4" HSA | | | HAMMER TYPE Automatic | | | | | | | | | | | |
| START DATE 09/01/09 | | COMP. DATE 09/01/09 | | SURFACE WATER DEPTH N/A | | DEPTH TO ROCK 28.0 ft | | | | | | | | | | |
| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG MOI | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | | |
| 530 | | | | | | | | | | | | | | | | |
| 527.5 | 527.5 | 1.0 | | | | | | | | | | | | | | |
| 525 | 525.0 | 3.5 | 3 | 4 | 4 | | | | | | | | | | | |
| 520 | 522.5 | 6.0 | 2 | 2 | 3 | | | | | | | | | | | |
| 520 | 520.0 | 8.5 | 2 | 4 | 5 | | | | | | | | | | | |
| 515 | 515.0 | 13.5 | 2 | 3 | 2 | | | | | | | | | | | |
| 510 | 510.0 | 18.5 | 1 | 2 | 1 | | | | | | | | | | | |
| 505 | 505.0 | 23.5 | 1 | 2 | 2 | | | | | | | | | | | |
| 500 | 500.0 | 28.5 | 3 | 5 | 6 | | | | | | | | | | | |
| 495 | 500.0 | 28.5 | 60/0.1 | | | | | | | | | | | | | |
| 490 | | | | | | | | | | | | | | | | |
| 485 | | | | | | | | | | | | | | | | |
| 480 | | | | | | | | | | | | | | | | |
| 475 | | | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | | | |
| 465 | | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | | |
| 455 | | | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | | | |
| 445 | | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE B-4610207D.GPJ NC_DOT_GDT 10/27/09



- Boring Terminated with Standard Penetration Test Refusal at Elevation 483.9 ft in Crystalline Rock (Meta-argillite)
- 1) Advanced NW casing to 8.6 feet (20.4 feet total).
 - 2) Water depth 8.6 feet.
 - 3) Top of collar to mudline 9.8 feet.
 - 4) Advanced 2-15/16" Tricone to 28.6 feet.
 - 5) Lake water used as drilling fluid.

- 1) Advanced 3-1/4" HSA to 28.5 feet.
2) Asphalt thickness 0.4.
3) CABC Stone thickness 0.4.
- Other Samples:
ST-1 (15.0 - 17.0)

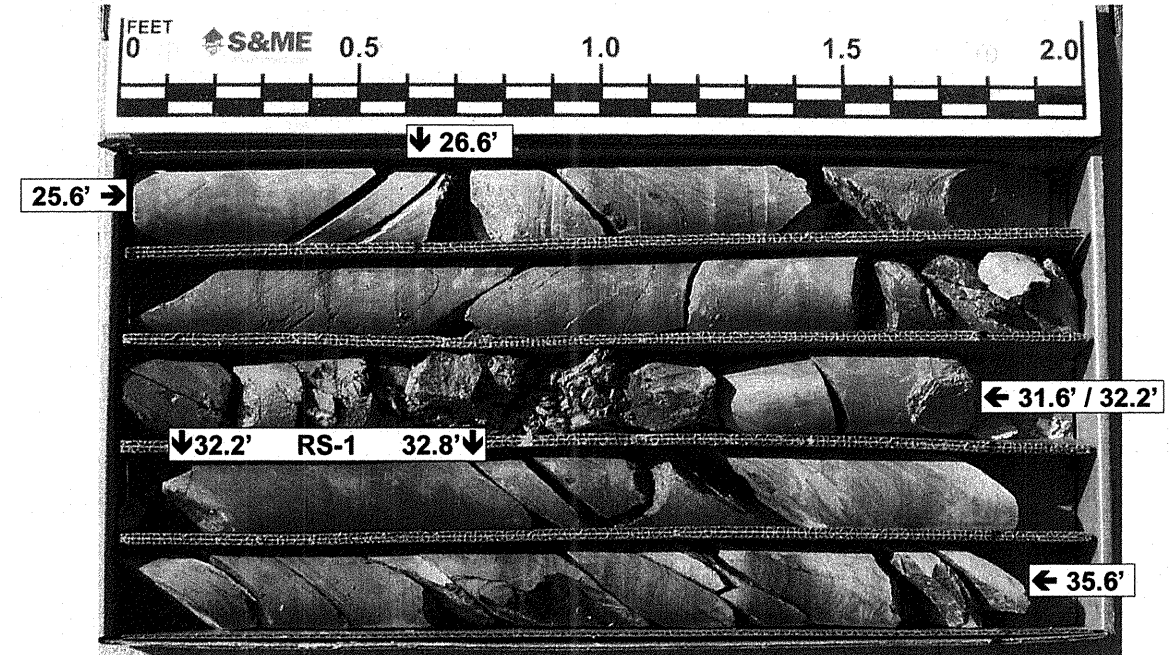
| PROJECT NO. 33794.1.1 | | ID. B-4610 | | COUNTY Randolph | | GEOLOGIST N. Bradley | | | | | |
|---|---------------|---|----------|----------------------------|----------|-----------------------|-----------------|---------|----------------|--|------------|
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | | | | | GROUND WTR (ft) | | | | |
| BORING NO. B1-A | | STATION 18+55 | | OFFSET 24ft LT | | ALIGNMENT -L- | | | | | |
| COLLAR ELEV. 504.4 ft | | TOTAL DEPTH 41.6 ft | | NORTHING 726,083 | | EASTING 1,744,332 | | | | | |
| DRILL MACHINE CME-45C | | DRILL METHOD NW Casing/2-15/16" Tricone/NWD4 Core | | | | HAMMER TYPE Automatic | | | | | |
| START DATE 09/10/09 | | COMP. DATE 09/10/09 | | SURFACE WATER DEPTH 16.8ft | | DEPTH TO ROCK 25.6 ft | | | | | |
| CORE SIZE NWD4 | | TOTAL RUN 15.4 ft | | DRILLER J. White | | | | | | | |
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN | | STRATA | | LOG | DESCRIPTION AND REMARKS | DEPTH (ft) |
| | | | | | REC. (%) | RQD (%) | REC. (%) | RQD (%) | | | |
| 478.8 | 478.8 | 25.6 | 1.0 | 2:30/1.0 | (0.6) | (0.4) | (2.0) | (1.4) | 478.8 476.7 | Begin Coring @ 25.6 ft CRYSTALLINE ROCK Hard to Moderately Hard Moderate to Moderately Severely Weathered Gray Meta-argillite with Close Fracture Spacing, 3 joints @ 40-50° | 25.6 |
| 477.8 | 477.8 | 28.8 | 5.0 | 2:30/1.0 | 60% | 40% | 95% | 67% | | | 27.7 |
| 475 | | | | 2:30/1.0 | (4.8) | (1.5) | (4.6) | N/A | 472.2 | WEATHERED ROCK (Meta-argillite) | 32.2 |
| | | | | 2:45/1.0 | 96% | 30% | 88% | | | | 32.2 |
| 470 | | | 4.4 | 2:30/1.0 | (4.1) | (1.2) | (3.4) | (0.6) | 468.8 467.4 | CRYSTALLINE ROCK Hard to Moderately Hard Moderately to Slightly Weathered Gray Meta-argillite with Close to Very Close Fracture Spacing, 10 joints @ 40-50° | 35.6 |
| | | | | 3:00/1.0 | 93% | 27% | 100% | 18% | | | 35.6 |
| 465 | | | 5.0 | 2:30/1.0 | (4.6) | (2.4) | (1.0) | N/A | 462.8 | WEATHERED ROCK (Meta-argillite) | 37.0 |
| | | | | 4:00/1.0 | 92% | 48% | 71% | | | | 37.0 |
| 460 | | | | 2:30/1.0 | (3.1) | (1.8) | (3.1) | (1.8) | 462.8 | CRYSTALLINE ROCK Hard to Moderately Hard Moderately Weathered Gray Meta-argillite with a Moderately Severely Weathered Seam from 38.0-38.5 feet Close to Very Close Fracture Spacing, 9 joints @ 40-50°, 1 joint @ 70° | 41.6 |
| | | | | 2:45/1.0 | 92% | 48% | 67% | 39% | | | 41.6 |
| 455 | | | | 2:45/1.0 | | | | | | | |
| 450 | | | | | | | | | | | |
| 445 | | | | | | | | | | | |
| 440 | | | | | | | | | | | |
| 435 | | | | | | | | | | | |
| 430 | | | | | | | | | | | |
| 425 | | | | | | | | | | | |
| 420 | | | | | | | | | | | |
| 415 | | | | | | | | | | | |
| 410 | | | | | | | | | | | |
| 405 | | | | | | | | | | | |
| 400 | | | | | | | | | | | |

KSF Axial=31.7
R1=0, R2=8, R3=10, R4=6, R5=0
RMR=24
Rock Type E

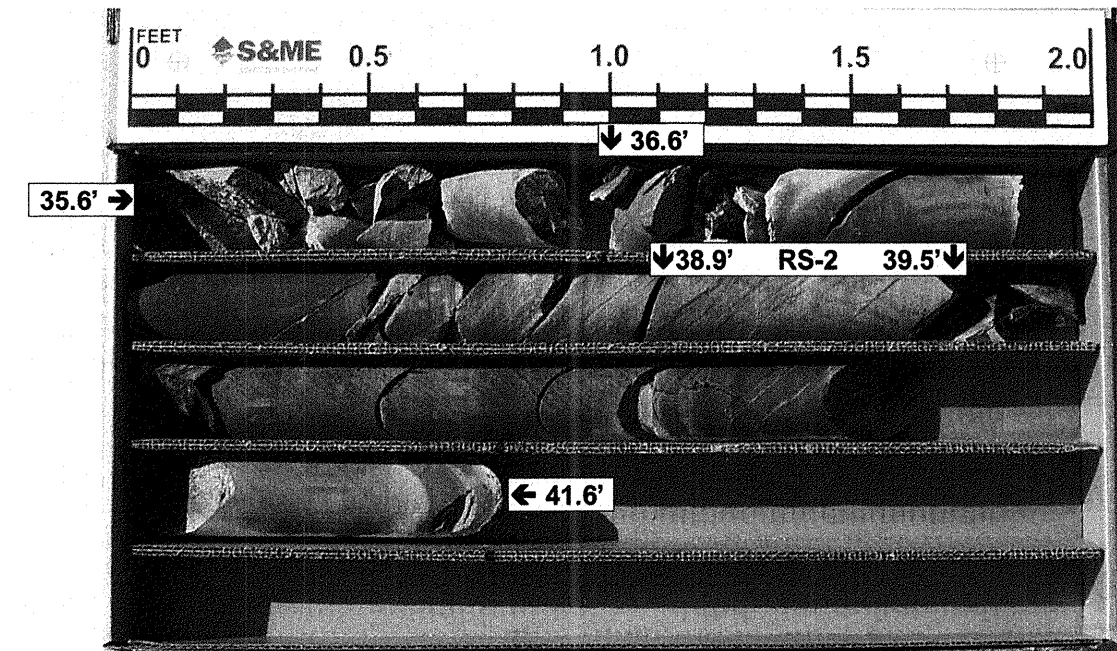
Boring Terminated at Elevation 462.8 ft in Crystalline Rock (Meta-argillite)

- Advanced NW casing to 25.5 feet (45.4 feet total).
- Advanced 2-15/16" Tricone to 25.5 feet.
- Advanced NWD4 core barrel from 25.6 to 41.6 feet.
- Lake water used as drilling fluid.
- Top of collar to mudline 17.8 feet.

| | | | |
|---|-----------------------|------------------------------|-----------------------|
| Project No.: 1051-09-207 | ID No.: B-4610 | Location: Randolph Co., N.C. | Boring No.: B1-A |
| Site Description: Replacement of Bridge No. 73 over Lake Lucas on SR 1518 | | | Driller: J. White |
| Collar Elev.: 504.4 ft. | Core Size: NWD4 | Equipment: CME-45C | Geologist: N. Bradley |
| Elev. at T.D.: 462.8 ft. | Total Depth: 41.6 ft. | Total Run: 15.4 ft. | Date: 9/10/09 |



Box 1 of 2
Top of Box @ 25.6 feet; Bottom of Box @ 35.6 feet



Box 2 of 2
Top of Box @ 35.6 feet; Bottom of Box @ 41.6 feet



| | | | |
|---|---|----------------------------|-----------------------|
| PROJECT NO. 33794.1.1 | ID. B-4610 | COUNTY Randolph | GEOLOGIST N. Bradley |
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | GROUND WTR (ft) |
| BORING NO. B1-B | STATION 18+57 | OFFSET 3ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 503.6 ft | TOTAL DEPTH 13.5 ft | NORTHING 726,101 | EASTING 1,744,352 |
| DRILL MACHINE CME-750 | DRILL METHOD NW Casing/2-15/16" Tricone | HAMMER TYPE Automatic | |
| START DATE 09/02/09 | COMP. DATE 09/02/09 | SURFACE WATER DEPTH 17.7ft | DEPTH TO ROCK 12.0 ft |

| | | | |
|---|---|----------------------------|----------------------|
| PROJECT NO. 33794.1.1 | ID. B-4610 | COUNTY Randolph | GEOLOGIST N. Bradley |
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | GROUND WTR (ft) |
| BORING NO. B2-A | STATION 19+45 | OFFSET 24ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 503.8 ft | TOTAL DEPTH 9.1 ft | NORTHING 726,156 | EASTING 1,744,278 |
| DRILL MACHINE CME-45C | DRILL METHOD NW Casing/2-15/16" Tricone | HAMMER TYPE Automatic | |
| START DATE 09/10/09 | COMP. DATE 09/10/09 | SURFACE WATER DEPTH 17.4ft | DEPTH TO ROCK 8.0 ft |

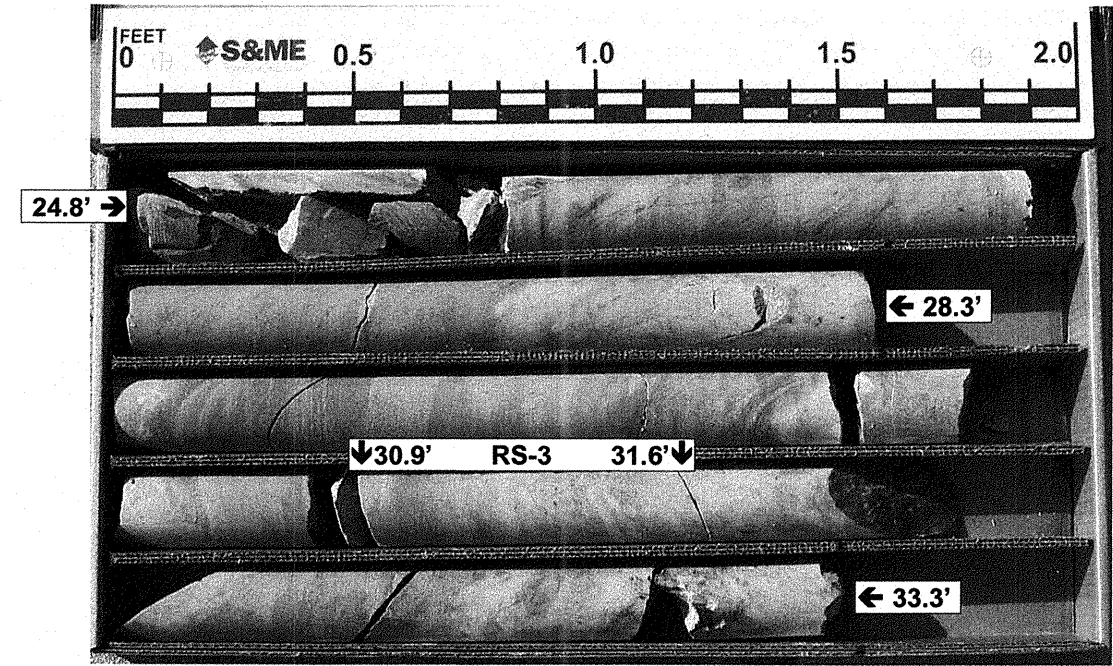
| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) |
|-----------|-----------------|------------|------------|-------|--------|----------------|----|----|----|-----|-----------|-----|---|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | |
| 525 | | | | | | | | | | | | | | |
| 520 | | | | | | | | | | | | | | |
| 515 | | | | | | | | | | | | | | |
| 510 | | | | | | | | | | | | | | |
| 505 | | | | | | | | | | | | | | |
| 503.6 | 503.6 | 0.0 | | | | | | | | | | | GROUND SURFACE | 0.0 |
| 500 | 499.7 | 3.9 | 1 | 1 | 1 | | | | | | SS-5 | W | ALLUVIAL Gray Fine Sandy Clayey Silt | |
| 497.8 | 497.8 | 5.8 | WOH | WOH | WOH | | | | | | | W | | |
| 495 | 495.2 | 8.4 | 3 | 20 | 80/0.3 | | | | | | | | WEATHERED ROCK (Meta-argillite) | 6.8 |
| 490 | 490.2 | 13.4 | | | | | | | | | | | CRYSTALLINE ROCK (Meta-argillite) | 13.5 |
| 485 | | | | | | | | | | | | | Boring Terminated with Standard Penetration Test Refusal at Elevation 490.1 ft in Crystalline Rock (Meta-argillite) | |
| 480 | | | | | | | | | | | | | 1) Advanced NW casing to 8.4 (total 35.4 feet). 2) Advanced 2-15/16" Tricone to 13.4 feet. 3) Lake water used for drilling. 4) Bridge deck to mudline 25.2 feet. | |
| 475 | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | |
| 465 | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | |
| 455 | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | |
| 445 | | | | | | | | | | | | | | |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) |
|-----------|-----------------|------------|------------|--------|-------|----------------|----|----|----|-----|-----------|-----|--|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | |
| 525 | | | | | | | | | | | | | | |
| 520 | | | | | | | | | | | | | | |
| 515 | | | | | | | | | | | | | | |
| 510 | | | | | | | | | | | | | | |
| 505 | | | | | | | | | | | | | | |
| 503.8 | 503.8 | 0.0 | | | | | | | | | | | GROUND SURFACE | 0.0 |
| 500 | 500.3 | 3.5 | | | | | | | | | SS-6 | W | ALLUVIAL Brown Coarse to Fine Sandy Silty Clay | 2.0 |
| 497.8 | 497.8 | 6.0 | 4 | 4 | 6 | | | | | | | W | RESIDUAL Brown Gray Fine Sandy Clayey Silt | 6.0 |
| 495 | 494.8 | 9.0 | 81 | 19/0.1 | | | | | | | | | WEATHERED ROCK (Felsic Metavolcanic) | 8.0 |
| 490 | 490.2 | 13.4 | | | | | | | | | | | CRYSTALLINE ROCK (Felsic Metavolcanic) | 9.1 |
| 485 | | | | | | | | | | | | | Boring Terminated with Standard Penetration Test Refusal at Elevation 494.7 ft in Crystalline Rock (Felsic Metavolcanic) | |
| 480 | | | | | | | | | | | | | 1) Advanced NW casing to 6.0 feet (25.4 feet total). 2) Advanced 2-15/16" Tricone to 9.0 feet. 3) Top of Collar to Mudline 18.4 feet. 4) Lake water used as drilling fluid. | |
| 475 | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | |
| 465 | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | |
| 455 | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | |
| 445 | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE B-4610207D.GPJ NC_DOT_GDT_10/28/09

| PROJECT NO. 33794.1.1 | | ID. B-4610 | | COUNTY Randolph | | GEOLOGIST N. Bradley | | | | | |
|---|---------------|---|----------|----------------------------|-------------|-----------------------|-----------------|------------|------------------|---|------------|
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | | | | | GROUND WTR (ft) | | | | |
| BORING NO. B2-B | | STATION 19+48 | | OFFSET 3ft RT | | ALIGNMENT -L- | | | | | |
| COLLAR ELEV. 506.3 ft | | TOTAL DEPTH 38.3 ft | | NORTHING 726,174 | | EASTING 1,744,298 | | | | | |
| DRILL MACHINE CME-750 | | DRILL METHOD NW Casing/2-15/16" Tricone/NWD4 Core | | | | HAMMER TYPE Automatic | | | | | |
| START DATE 09/02/09 | | COMP. DATE 09/02/09 | | SURFACE WATER DEPTH 15.0ft | | DEPTH TO ROCK 22.5 ft | | | | | |
| CORE SIZE NWD4 | | TOTAL RUN 13.5 ft | | DRILLER J. White | | | | | | | |
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN | | STRATA | | L O G | DESCRIPTION AND REMARKS | DEPTH (ft) |
| | | | | | REC. (ft) % | RQD (ft) % | REC. (ft) % | RQD (ft) % | | | |
| 481.5 | 481.5 | 24.8 | 3.5 | 5:30/1.0 | (3.3) | (3.1) | (13.0) | (11.7) | CRYSTALLINE ROCK | Hard to Moderately Hard Fresh to Very Slightly Weathered Green-Gray Felsic Metavolcanic With Moderately Close to Close Fracture Spacing | 24.8 |
| 480 | 481.5 | 24.8 | 3.5 | 5:30/1.0 | 94% | 89% | 96% | 87% | | | |
| 478.0 | 478.0 | 28.3 | 5.0 | 2:30/1.0 | | | | | | | |
| 475 | 478.0 | 28.3 | 5.0 | 1:30/0.5 | (4.7) | (4.0) | | | | | |
| 473.0 | 473.0 | 33.3 | 5.0 | 4:00/1.0 | 94% | 80% | | | RS-3 | KSF Axial=4619.5 R1=15, R2=17, R3=20, R4=20, R5=0 RMR=72 Rock Type E | |
| 470 | 473.0 | 33.3 | 5.0 | 4:30/1.0 | | | | | | | |
| 468.0 | 468.0 | 38.3 | 5.0 | 5:00/1.0 | (5.0) | (4.6) | | | | | |
| 465 | | | | 6:00/1.0 | 100% | 92% | | | | Boring Terminated at Elevation 468.0 ft in Crystalline Rock (Felsic Metavolcanic) | |
| 460 | | | | 6:30/1.0 | | | | | | 1) Advanced NW casing to 26.0 feet (total 50.4 feet). 2) Bridge deck to mudline 22.5 feet. 3) Advanced 2-15/16" Tricone to 24.7 feet. 4) Advanced NWD4 Core Barrel from 24.8 to 38.3 feet. 5) Lake water used for drilling. | |
| 455 | | | | 4:00/1.0 | | | | | | | |
| 450 | | | | 5:00/1.0 | | | | | | | |
| 445 | | | | | | | | | | | |
| 440 | | | | | | | | | | | |
| 435 | | | | | | | | | | | |
| 430 | | | | | | | | | | | |
| 425 | | | | | | | | | | | |
| 420 | | | | | | | | | | | |
| 415 | | | | | | | | | | | |
| 410 | | | | | | | | | | | |
| 405 | | | | | | | | | | | |

| | | | |
|---|-----------------------|------------------------------|-----------------------|
| Project No.: 1051-09-207 | ID No.: B-4610 | Location: Randolph Co., N.C. | Boring No.: B2-B |
| Site Description: Replacement of Bridge No. 73 over Lake Lucas on SR 1518 | | | Driller: J. White |
| Collar Elev.: 506.3 ft. | Core Size: NWD4 | Equipment: CME-750 | Geologist: N. Bradley |
| Elev. at T.D.: 468.0 ft. | Total Depth: 38.3 ft. | Total Run: 13.5 ft. | Date: 9/2/09 |



Box 1 of 2
 Top of Box @ 24.8 feet; Bottom of Box @ 33.3 feet



Box 2 of 2
 Top of Box @ 33.3 feet; Bottom of Box @ 38.3 feet

NCDOT CORE SINGLE B-4610207D.GPJ NC_DOT.GDT 10/29/09



| | | | |
|---|---|---------------------------|-----------------------|
| PROJECT NO. 33794.1.1 | ID. B-4610 | COUNTY Randolph | GEOLOGIST N. Bradley |
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | |
| BORING NO. EB2-A | STATION 20+21 | OFFSET 42ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 513.4 ft | TOTAL DEPTH 16.0 ft | NORTHING 726,206 | EASTING 1,744,218 |
| DRILL MACHINE CME-45C | DRILL METHOD NW Casing/2-15/16" Tricone | HAMMER TYPE Automatic | |
| START DATE 09/09/09 | COMP. DATE 09/09/09 | SURFACE WATER DEPTH 7.8ft | DEPTH TO ROCK 15.5 ft |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|-----|---------------------------|------------|---|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | |
| 525 | | | | | | | | | | | | | | | |
| 520 | | | | | | | | | | | | | | | |
| 515 | | | | | | | | | | | | | | | |
| 513.4 | 513.4 | 0.0 | | | | | | | | | | | | 513.4 | GROUND SURFACE |
| 510 | 509.9 | 3.5 | WOR | WOR | WOR | | | | | | | | W | 511.4 | ALLUVIAL Brown Coarse to Fine Sandy Silty Clay |
| 505 | 507.4 | 6.0 | | | | | | | | | | | W | 505.4 | RESIDUAL Brown Coarse to Fine Sandy Silty Clay |
| 500 | 504.8 | 8.6 | WOH | WOH | WOH | | | | | | | | M | 500.4 | WEATHERED ROCK (Meta-argillite) |
| 495 | 498.9 | 14.5 | | | | | | | | | | | | 497.9 | CRYSTALLINE ROCK (Meta-argillite) |
| 490 | 497.5 | 15.9 | | | | | | | | | | | | 497.4 | CRYSTALLINE ROCK (Meta-argillite) |
| 485 | | | | | | | | | | | | | | | |
| 480 | | | | | | | | | | | | | | | |
| 475 | | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | | |
| 465 | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | |
| 455 | | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | | |
| 445 | | | | | | | | | | | | | | | |

| | | | |
|---|-------------------------|-------------------------|-----------------------|
| PROJECT NO. 33794.1.1 | ID. B-4610 | COUNTY Randolph | GEOLOGIST N. Bradley |
| SITE DESCRIPTION Bridge No. 73 over Lake Lucas on S.R. 1518 | | | |
| BORING NO. EB2-B | STATION 20+20 | OFFSET 3ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 529.0 ft | TOTAL DEPTH 33.6 ft | NORTHING 726,232 | EASTING 1,744,255 |
| DRILL MACHINE CME-750 | DRILL METHOD 3-1/4" HSA | HAMMER TYPE Automatic | |
| START DATE 09/01/09 | COMP. DATE 09/01/09 | SURFACE WATER DEPTH N/A | DEPTH TO ROCK 32.5 ft |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|-----|---------------------------|------------|--|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | |
| 530 | | | | | | | | | | | | | | | |
| 528.0 | 528.0 | 1.0 | | | | | | | | | | | | 528.0 | ASPHALT |
| 525 | 525.5 | 3.5 | | | | | | | | | | | | 528.0 | ROADWAY EMBANKMENT CABC Stone |
| 520 | 523.0 | 6.0 | | | | | | | | | | | | 518.0 | ALLUVIAL Brown Coarse to Fine Sandy Silty Clay |
| 515 | 520.5 | 8.5 | | | | | | | | | | | | 511.0 | ALLUVIAL Brown Coarse to Fine Sandy Silty Clay With Trace of Pea Size Gravel |
| 510 | 515.5 | 13.5 | | | | | | | | | | | | 507.0 | RESIDUAL Green-Brown and Gray Fine Sandy Silt With Trace of Mica |
| 505 | 510.5 | 18.5 | | | | | | | | | | | | 507.0 | RESIDUAL Green-Brown and Gray Fine Sandy Silt With Trace of Mica |
| 500 | 505.5 | 23.5 | | | | | | | | | | | | 507.0 | RESIDUAL Green-Brown and Gray Fine Sandy Silt With Trace of Mica |
| 495 | 500.5 | 28.5 | | | | | | | | | | | | 507.0 | RESIDUAL Green-Brown and Gray Fine Sandy Silt With Trace of Mica |
| 490 | 495.5 | 33.5 | | | | | | | | | | | | 495.5 | CRYSTALLINE ROCK (Meta-argillite) |
| 485 | | | | | | | | | | | | | | 495.4 | CRYSTALLINE ROCK (Meta-argillite) |
| 480 | | | | | | | | | | | | | | | |
| 475 | | | | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | | | | |
| 465 | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | |
| 455 | | | | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | | | | |
| 445 | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE B-4610207D.GPJ NC_DOT.GDT 10/27/09

- 1) Advanced NW casing to 6.0 feet (15.4 feet total).
- 2) Top of collar to mudline 8.8 feet.
- 3) Advanced 2-15/16" Tricone to 15.9 feet.
- 4) Water depth 7.8 feet.
- 5) Lake water used as drilling fluid.

Other Samples:
ST-2 (15.0 - 17.0)

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation



| | | | |
|--------------------|---|----------------|--------------------|
| S&ME Project #: | 1051-09-207 | Test Date(s): | 09/04 - 09/25/2009 |
| State Project No.: | 33794.1.1 | County: | Randolph |
| Federal ID No.: | BRZ-1518(12) | TIP No. B-4610 | Report Date: |
| Project Name: | Bridge No. 73 over Lake Lucas on SR1518 | | |
| Client Name: | NCDOT | | |
| Client Address: | Raleigh, North Carolina | | |

| Boring No. | Sample No. | Sample Depth (feet) | AASHTO Classification | Total % Passing | | | | | Total Mortar Fraction | | | | LL | PL | PI | Moisture Content % |
|------------|------------|---------------------|-----------------------|-----------------|-----|----|------|------|-----------------------|-----------|------|------|----|----|----|--------------------|
| | | | | Sieve # | | | | | Coarse Sand | Fine Sand | Silt | Clay | | | | |
| | | | | 10 | 40 | 60 | 200 | 270 | | | | | | | | |
| EB1-A | SS-1 | 8.6 - 10.1 | A-6 (17) | 100 | 99 | 98 | 95.1 | 92.4 | 2 | 6 | 56 | 36 | 39 | 22 | 17 | ND |
| EB1-B | SS-2 | 13.5-15.0 | A-7-5 (18) | 100 | 99 | 99 | 92.3 | 90.0 | 1 | 9 | 58 | 32 | 46 | 30 | 16 | ND |
| EB1-B | ST-1 | 15.0 - 17.0 | A-7-6 (24) | 100 | 98 | 96 | 86.8 | 84.2 | 4 | 12 | 40 | 44 | 53 | 29 | 24 | 35 |
| EB1-B | SS-3 | 23.5 - 25.0 | A-7-6 (16) | 100 | 99 | 99 | 95.8 | 95.0 | 1 | 4 | 59 | 36 | 42 | 28 | 14 | ND |
| B1-A | SS-4 | 3.4 - 4.9 | A-4 (7) | 100 | 100 | 99 | 90.7 | 84.6 | 1 | 14 | 58 | 27 | 29 | 20 | 9 | ND |
| B1-B | SS-5 | 0.0 - 1.5 | A-4 (7) | 100 | 99 | 98 | 87.2 | 82.5 | 2 | 16 | 54 | 28 | 30 | 21 | 9 | ND |
| B2-A | SS-6 | 0.0 - 1.5 | A-6 (9) | 99 | 97 | 94 | 85.9 | 81.7 | 5 | 13 | 56 | 26 | 33 | 22 | 11 | ND |
| B2-B | SS-7 | 16.2 - 17.7 | A-6 (12) | 99 | 87 | 84 | 78.3 | 76.6 | 15 | 8 | 48 | 29 | 37 | 21 | 16 | ND |
| EB2-A | SS-8 | 3.5 - 5.0 | A-7-6 (26) | 98 | 95 | 94 | 91.3 | 90.0 | 4 | 4 | 40 | 52 | 48 | 21 | 27 | ND |
| EB2-B | SS-9 | 1.0-2.5 | A-7-5 (15) | 100 | 96 | 94 | 88.4 | 87.1 | 6 | 7 | 63 | 24 | 45 | 31 | 14 | 26.8 |
| EB2-B | ST-2 | 15.0 - 17.0 | A-7-6 (24) | 95 | 93 | 91 | 86.9 | 85.1 | 4 | 6 | 43 | 47 | 50 | 24 | 26 | 33.4 |

Notes: ND=Not Determined.

References:

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, AET

Technician Name:

104-01-0703

Certification #

Abner F. Riggs, Jr., P.E.

Technical Responsibility:

Senior Engineer

Position

PROJECT: 33794.1.1 (B-4610)

Description: Replacement of Bridge No. 73 Over Lake Lucas on S.R. 1518

COUNTY: Randolph, N.C.

F.A. No.: BRZ-1518(2)

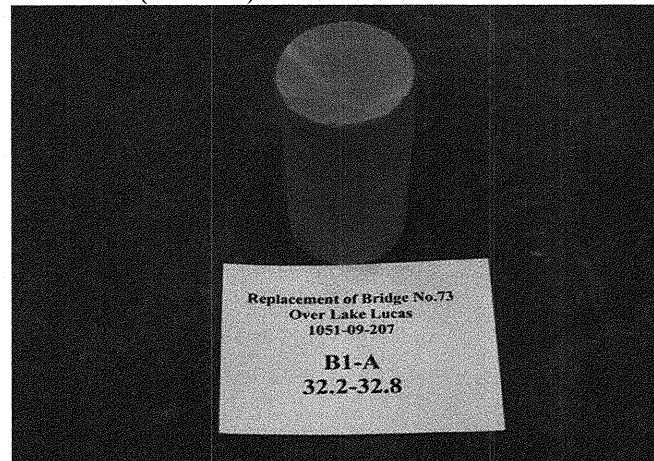
JOB No.: 1051-09-207

Date: 9/29/2009

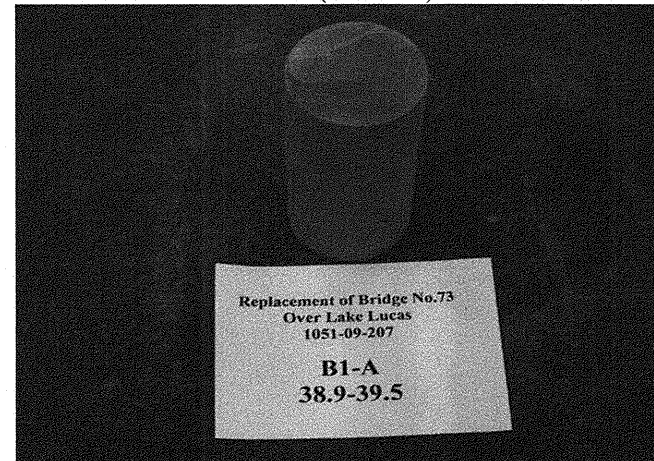
Tested by: Jeff Webb

| Sample No. | Boring Location | Depth (ft) | Rock Type | Run RQD | Specimen Dimension, in. | | Area (in ²) | Unit Wt. (lb/ft ³) | Loading Rate (psi/min) | Max. Load (lb) | Strength (psi) | Moisture (%) |
|------------|-----------------|-------------|---------------------|---------|-------------------------|----------|-------------------------|--------------------------------|------------------------|----------------|----------------|--------------|
| | | | | | Length | Diameter | | | | | | |
| RS-1 | B1-A | 32.2 - 32.8 | Meta-Argillite | 27% | 4.38 | 2.03 | 3.24 | 157.7 | 204 | 1,380 | 426 | 1.8 |
| RS-2 | B1-A | 38.9 - 39.5 | Meta-Argillite | 48% | 4.00 | 2.04 | 3.27 | 166.7 | 97 | 720 | 220 | 0.7 |
| RS-3 | B2-B | 30.9 - 31.6 | Felsic Metavolcanic | 80% | 4.31 | 2.04 | 3.27 | 173.5 | 2,319 | 104,900 | 32,080 | 0.1 |

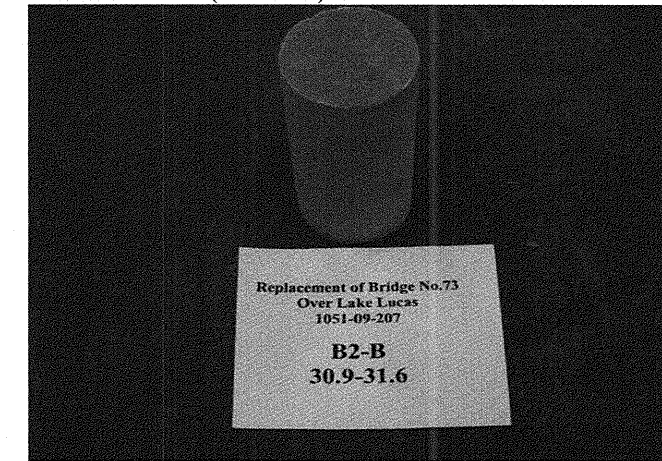
B1-A (32.2 - 32.8) Before Test



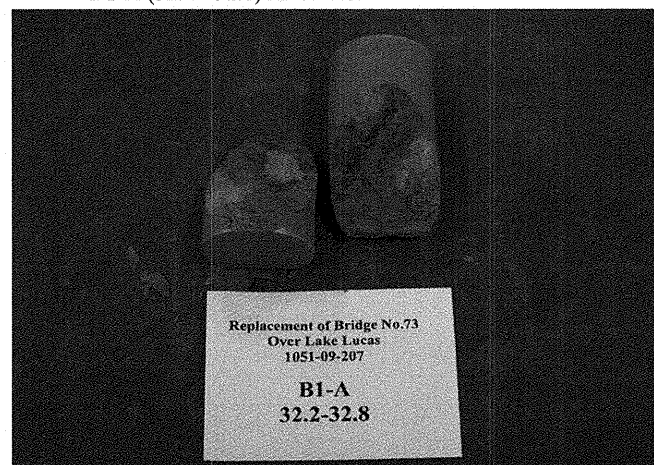
B1-A (38.9 - 39.5) Before Test



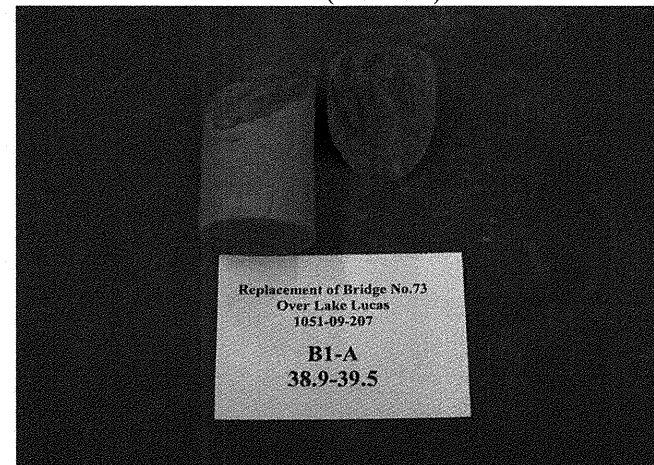
B2-B (30.9 - 31.6) Before Test



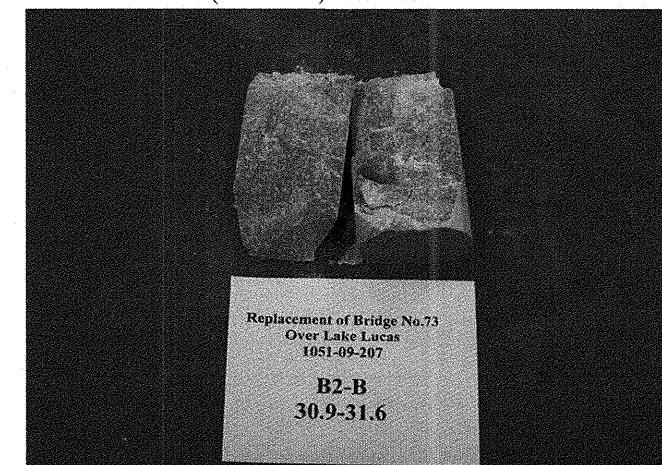
B1-A (32.2 - 32.8) After Test



B1-A (38.9 - 39.5) After Test



B2-B (30.9 - 31.6) After Test





**FIELD
SCOUR REPORT**

WBS: 33794.1.1 TIP: B-4610 COUNTY: Randolph

DESCRIPTION(1): Bridge No. 73 over Lake Lucas on S.R. 1518

EXISTING BRIDGE

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

Bridge No.: 73 Length: 226 FT Total Bents: 7 Bents in Channel: 5 Bents in Floodplain: 2
Foundation Type: Concrete Piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed

Interior Bents: None observed

Channel Bed: None observed

Channel Bank: None observed

EXISTING SCOUR PROTECTION

Type(3): Rock with mortar between some of the rocks

Extent(4): Past concrete wingwalls along both sides of causeway at bridge approaches

Effectiveness(5): Adequate

Obstructions(6): None observed

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): Brown Coarse to Fine Sandy Silty Clay A-6(17), A-6(9) & Gray Fine Sandy Clayey Silt A-4(7)

Channel Bank Material(8): Brown Coarse to Fine Sandy Silty Clay A-7-6(16), Tan-Brown Fine Sandy Clayey Silt A-4(7) & Brown-Red & Gray Coarse to Fine Sandy Silty Clay A-7-5(24)

Channel Bank Cover(9): Brush and trees

Floodplain Width(10): Approximately 100 feet south and approximately 150 north of bridge

Floodplain Cover(11): Hardwood trees and brush

Stream is(12): Aggrading _____ Degrading _____ Static

Channel Migration Tendency(13): None

Observations and Other Comments: Bridge over existing lake. Overhead utilities on east side of bridge

Reported by: *Abner Riggs*

Abner Riggs, PE.

Date: 10/29/09

DESIGN SCOUR ELEVATIONS(14)

Feet Meters _____

BENTS

| | B1 | B2 | B3 | B4 | | | | | | |
|--|-------|-------|----|----|--|--|--|--|--|--|
| | 501.9 | 503.7 | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

Comparison of DSE to Hydraulics Unit theoretical scour:
Geotechnical Engineering Unit agrees with the Hydraulic Unit's theoretical scour elevations.

DSE determined by: *Cheryl A. Youngblood*

Cheryl A. Youngblood, LG

Date: 10/30/09

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

| Bed or Bank | Bed | Bank | Bank | Bed | Bed | Bank |
|-------------|------------|-------------|-----------|-----------|-----------|-----------|
| Sample No. | SS-1 | SS-3 | SS-4 | SS-5 | SS-6 | SS-9 |
| Retained #4 | 0% | 0% | 0% | 0% | 0% | 0% |
| Passed #10 | 100% | 100% | 100% | 100% | 99% | 100% |
| Passed #40 | 99% | 99% | 100% | 99% | 97% | 96% |
| Passed #200 | 95.10% | 95.80% | 90.70% | 87.20% | 85.90% | 88.40% |
| Coarse Sand | 2% | 1% | 1% | 2% | 5% | 6% |
| Fine Sand | 6% | 4% | 14% | 16% | 13% | 7% |
| Silt | 56% | 59% | 58% | 54% | 56% | 63% |
| Clay | 36% | 36% | 27% | 28% | 26% | 24% |
| LL | 39 | 42 | 29 | 30 | 33 | 45 |
| PI | 17 | 14 | 9 | 9 | 11 | 14 |
| AASHTO | A-6 | A-7-6 | A-4 | A-4 | A-6 | A-7-5 |
| Station | 17+83 | 17+79 | 18+55 | 18+57 | 19+45 | 20+20 |
| Offset | 27' LT | 3' RT | 24' LT | 3' RT | 24' LT | 3' RT |
| Depth | 8.6'-10.1' | 23.5'-25.0' | 3.4'-4.9' | 0.0'-1.5' | 0.0'-1.5' | 1.0'-2.5' |

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



S&ME Project #: **1051-09-207**
 Project Name: **Bridge 73 over Lake Lucas on SR1518 Randolph Co.**
 Client Name: **NCDOT**
 Client Address: **Raleigh, North Carolina**
 State Project #: **33794.1.1**

Report Date: **9/17/2009**
 Test Date(s): **09/14 - 09/16/2009**

S&ME Project #: **1051-09-207**
 Project Name: **Bridge 73 over Lake Lucas on SR1518 Randolph Co.**
 Client Name: **NCDOT**
 Client Address: **Raleigh, North Carolina**
 State Project #: **33794.1.1**

Report Date: **9/11/2009**
 Test Date(s): **09/04 - 09/10/2009**

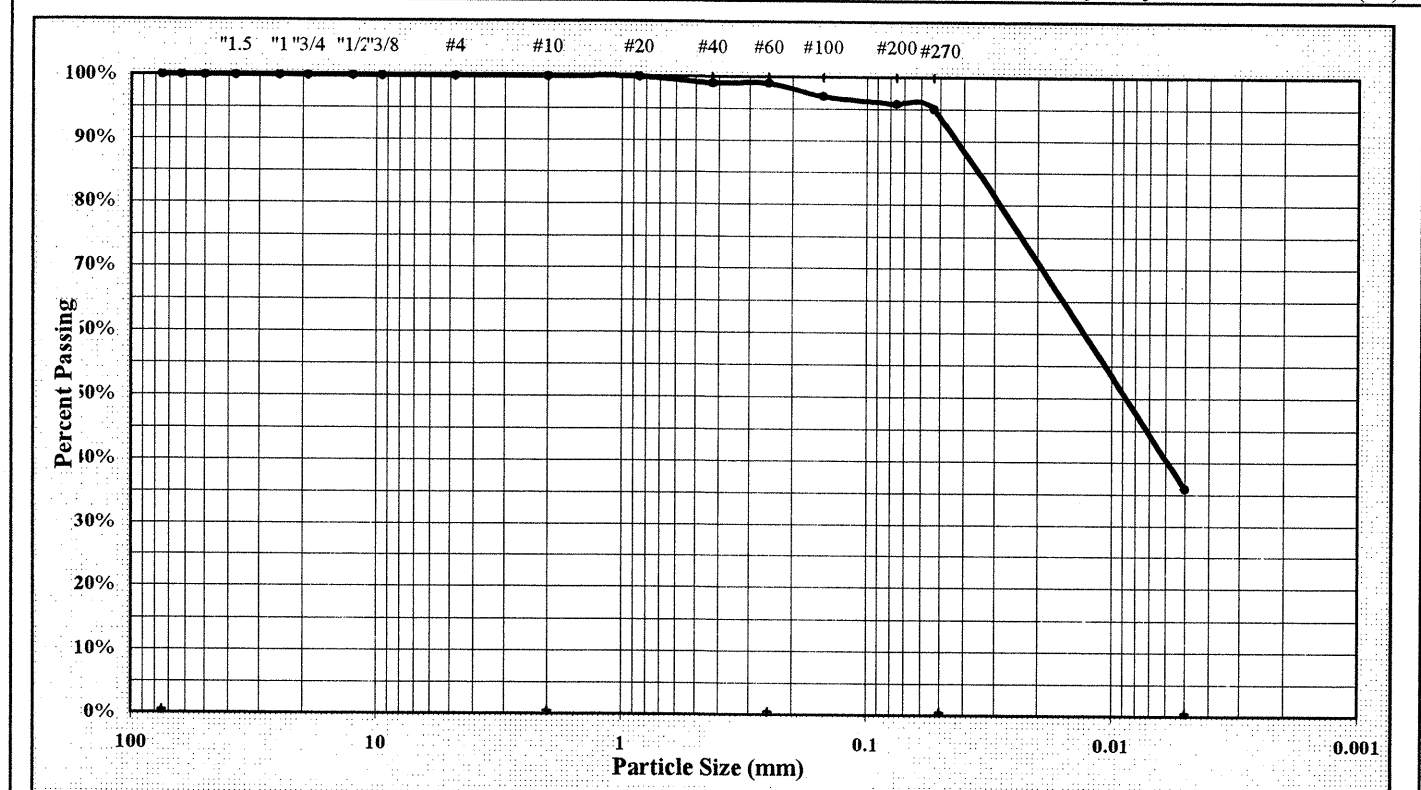
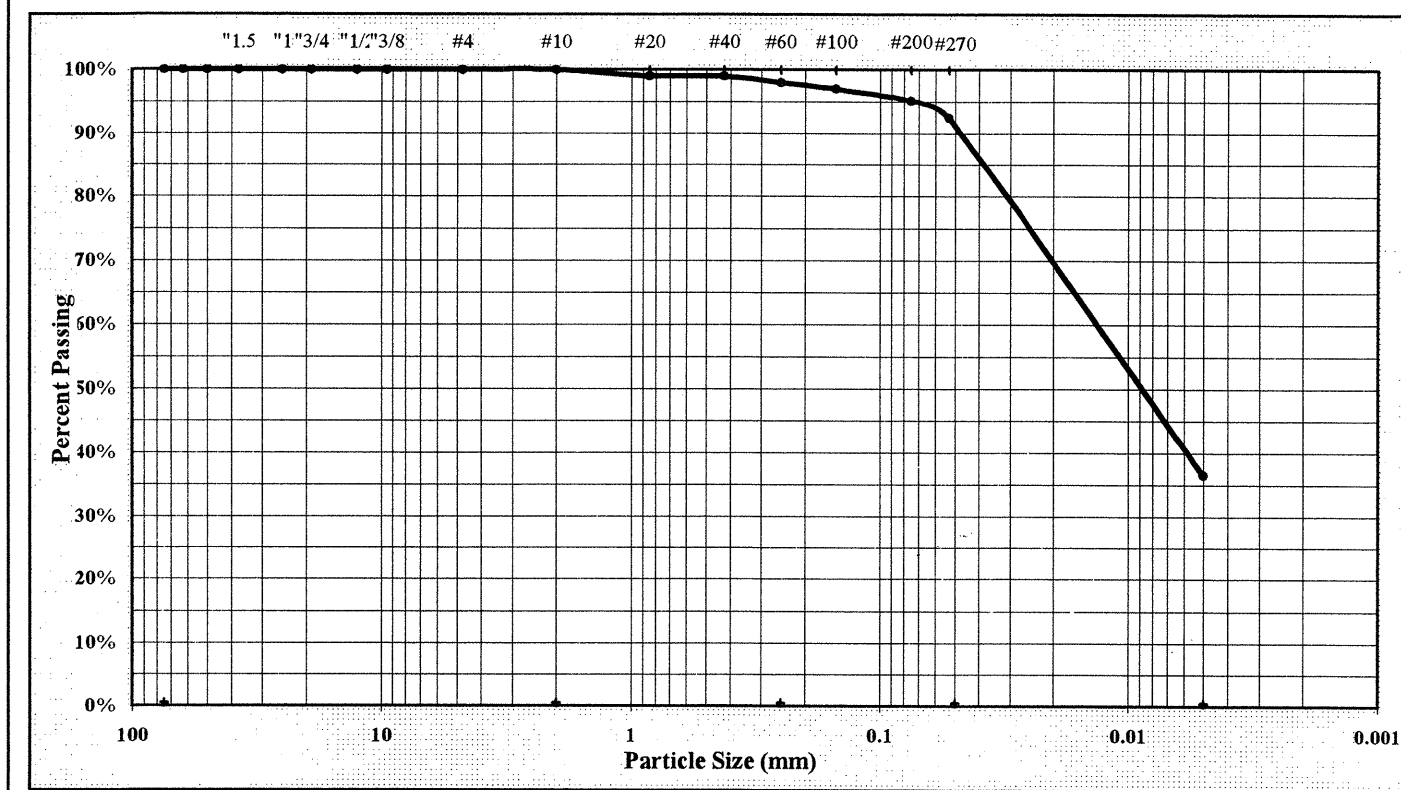
Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



Boring #: **EB1-A** Sample #: **SS-1** Sample Date: **09/09 - 09/11/2009**
 Location: **17+83** Offset: **27' LT** Depth (ft): **8.6' - 10.1'**
 Sample Description: **Brown Coarse to Fine Sandy Silty CLAY A-6 (17)**

Boring #: **EB1-B** Sample #: **SS-3** Sample Date: **09/01 - 09/03/2009**
 Location: **17+79 -L-** Offset: **3' RT** Depth (ft): **23.5' - 25.0'**
 Sample Description: **Brown Coarse to Fine Sandy Silty CLAY A-7-6 (16)**



| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm | | |
|---------------------------|-------------------------|------------------|-------------------------|----------------|-------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm | | |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm | | |
| Maximum Particle Size | #4 | Coarse Sand | 2% | Silt | 56% |
| Gravel | 0% | Fine Sand | 6% | Clay | 36% |
| Apparent Relative Density | | Moisture Content | | % Passing #200 | 95.1% |
| Liquid Limit | 39 | Plastic Limit | 22 | Plastic Index | 17 |

| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm | | |
|---------------------------|-------------------------|------------------|-------------------------|----------------|-------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm | | |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm | | |
| Maximum Particle Size | #10 | Coarse Sand | 1% | Silt | 59% |
| Gravel | 0% | Fine Sand | 4% | Clay | 36% |
| Apparent Relative Density | | Moisture Content | | % Passing #200 | 95.8% |
| Liquid Limit | 42 | Plastic Limit | 28 | Plastic Index | 14 |

Soil Mortar (-#10 Sieve)

Soil Mortar (-#10 Sieve)

Coarse Sand 2% Fine Sand 6% Silt 56% Clay 36%

Description of Sand & Gravel Particles: Rounded Angular Hard & Durable Soft Weathered & Friable

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

Coarse Sand 1% Fine Sand 4% Silt 59% Clay 36%

Description of Sand & Gravel Particles: Rounded Angular Hard & Durable Soft Weathered & Friable

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
 AASHTO T89: Determining the Liquid Limit of Soils
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
 AASHTO T89: Determining the Liquid Limit of Soils
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technician Name: Mal Krajan

104-01-0703
 Certification #

 Signature

Laboratory Manager

Technical Responsibility: Mal Krajan

Technician Name: Mal Krajan

104-01-0703
 Certification #

 Signature

Laboratory Manager

Technical Responsibility: Mal Krajan

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



S&ME Project #: **1051-09-207**
 Project Name: **Bridge 73 over Lake Lucas on SR1518 Randolph Co.**
 Client Name: **NCDOT**
 Client Address: **Raleigh, North Carolina**
 State Project #: **33794.1.1** F.A. Project No: **BRZ-1518(2)**

Report Date: **9/17/2009**
 Test Date(s): **09/14 - 09/16/2009**

S&ME Project #: **1051-09-207**
 Project Name: **Bridge 73 over Lake Lucas on SR1518 Randolph Co.**
 Client Name: **NCDOT**
 Client Address: **Raleigh, North Carolina**
 State Project #: **33794.1.1** F.A. Project No: **BRZ-1518(2)**

Report Date: **9/25/2009**
 Test Date(s): **9/24 - 9/25/09**

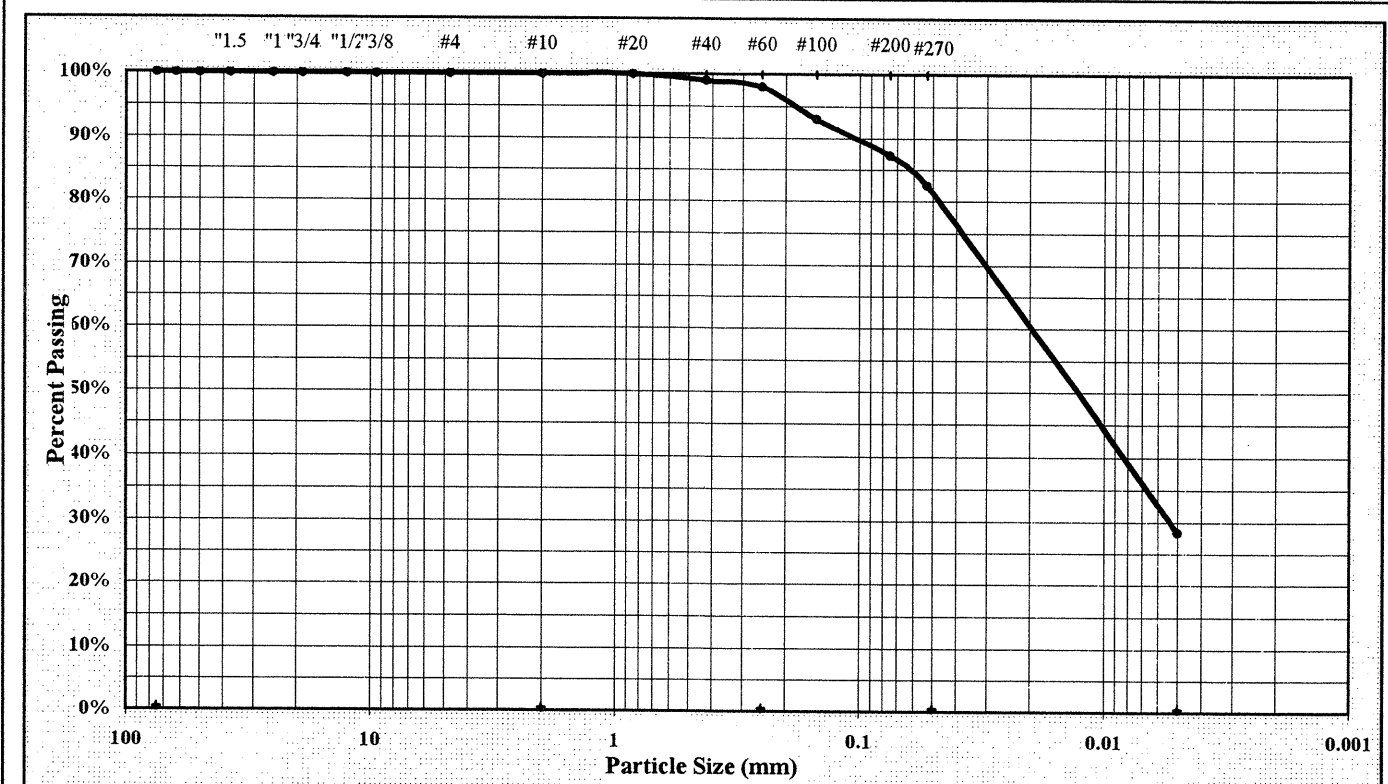
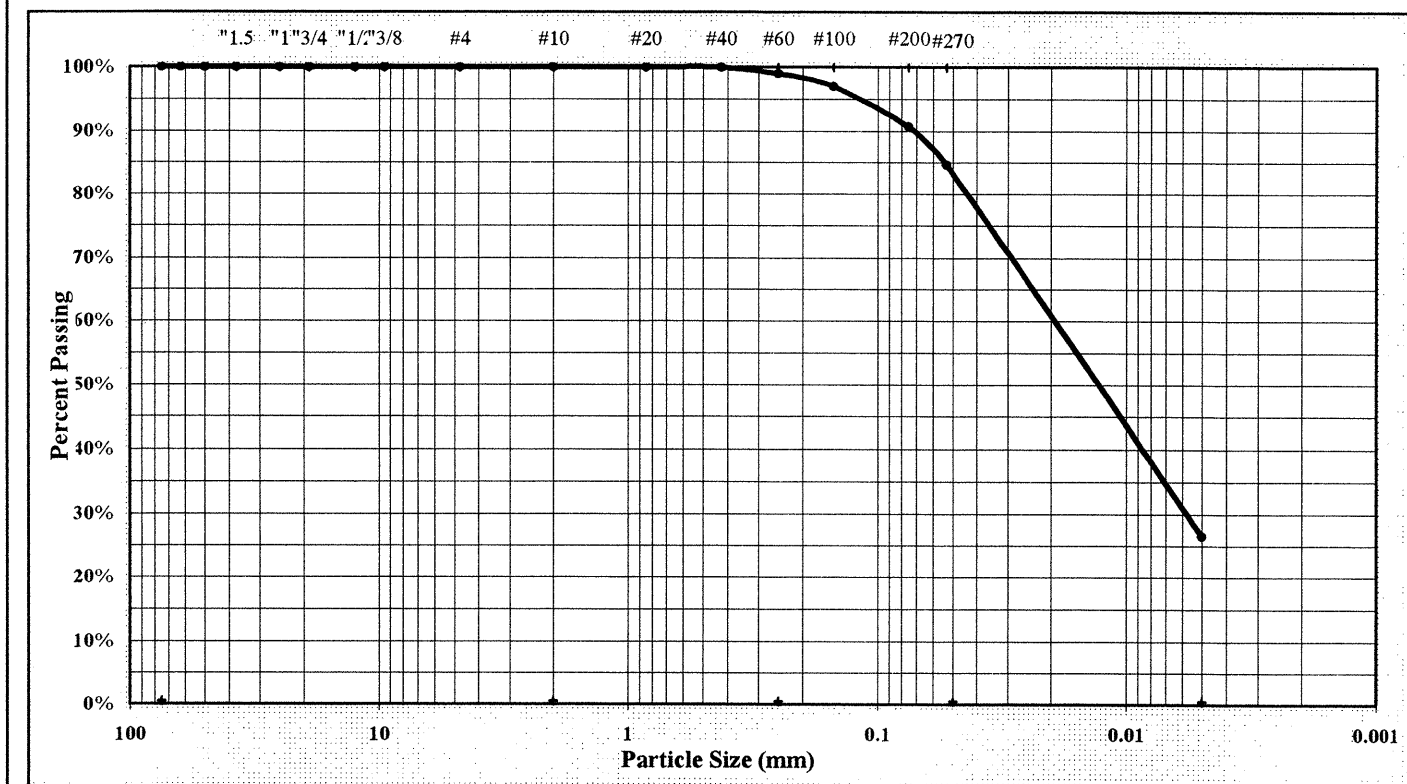


Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

Boring #: **B1-A** Sample #: **SS-4** Sample Date: **09/09 - 09/11/2009**
 Location: **18+55 -L-** Offset: **24' LT** Depth (ft): **3.4' - 4.9'**
 Sample Description: **Tan Brown Fine Sandy Clayey SILT A-4 (7)**

Boring #: **B1-B** Sample #: **SS-5** Sample Date: **9/2/09**
 Location: **18+57 -L-** Offset: **3' RT** Depth (ft): **0.0-1.5**
 Sample Description: **Gray Fine Sandy Clayey SILT A-4 (7)**



| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm | |
|---------------------|-------------------------|-----------|-------------------------|--|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm | |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm | |

| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm | |
|---------------------|-------------------------|-----------|-------------------------|--|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm | |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm | |

| | | | | | |
|---------------------------|-----|------------------|-----|----------------|-------|
| Maximum Particle Size | #10 | Coarse Sand | 1% | Silt | 58% |
| Gravel | 0% | Fine Sand | 14% | Clay | 27% |
| Apparent Relative Density | | Moisture Content | | % Passing #200 | 90.7% |
| Liquid Limit | 29 | Plastic Limit | 20 | Plastic Index | 9 |

| | | | | | |
|---------------------------|----|------------------|-----|----------------|-------|
| Maximum Particle Size | #4 | Coarse Sand | 2% | Silt | 54% |
| Gravel | 0% | Fine Sand | 16% | Clay | 28% |
| Apparent Relative Density | | Moisture Content | | % Passing #200 | 87.2% |
| Liquid Limit | 30 | Plastic Limit | 21 | Plastic Index | 9 |

Soil Mortar (-#10 Sieve)

Coarse Sand 1% Fine Sand 14% Silt 58% Clay 27%

Soil Mortar (-#10 Sieve)

Coarse Sand 2% Fine Sand 16% Silt 54% Clay 28%

Description of Sand & Gravel Particles: Rounded Angular Hard & Durable Soft Weathered & Friable Description of Sand & Gravel Particles: Rounded Angular Hard & Durable Soft Weathered & Friable

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT AASHTO T265: Laboratory Determination of Moisture Content of Soils
 AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test AASHTO T89: Determining the Liquid Limit of Soils
 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technician Name: Mal Krajan 104-01-0703
 Certification #
 Technical Responsibility: Mal Krajan Signature

Laboratory Manager
 Signature

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Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



S&ME Project #: **1051-09-207**
 Project Name: **Bridge 73 over Lake Lucas on SR1518 Randolph Co.**
 Client Name: **NCDOT**
 Client Address: **Raleigh, North Carolina**
 State Project #: **33794.1.1** F.A. Project No: **BRZ-1518(2)**

Report Date: **9/25/2009**
 Test Date(s): **9/24 - 9/25/09**

TIP NO: **B-4610**

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT



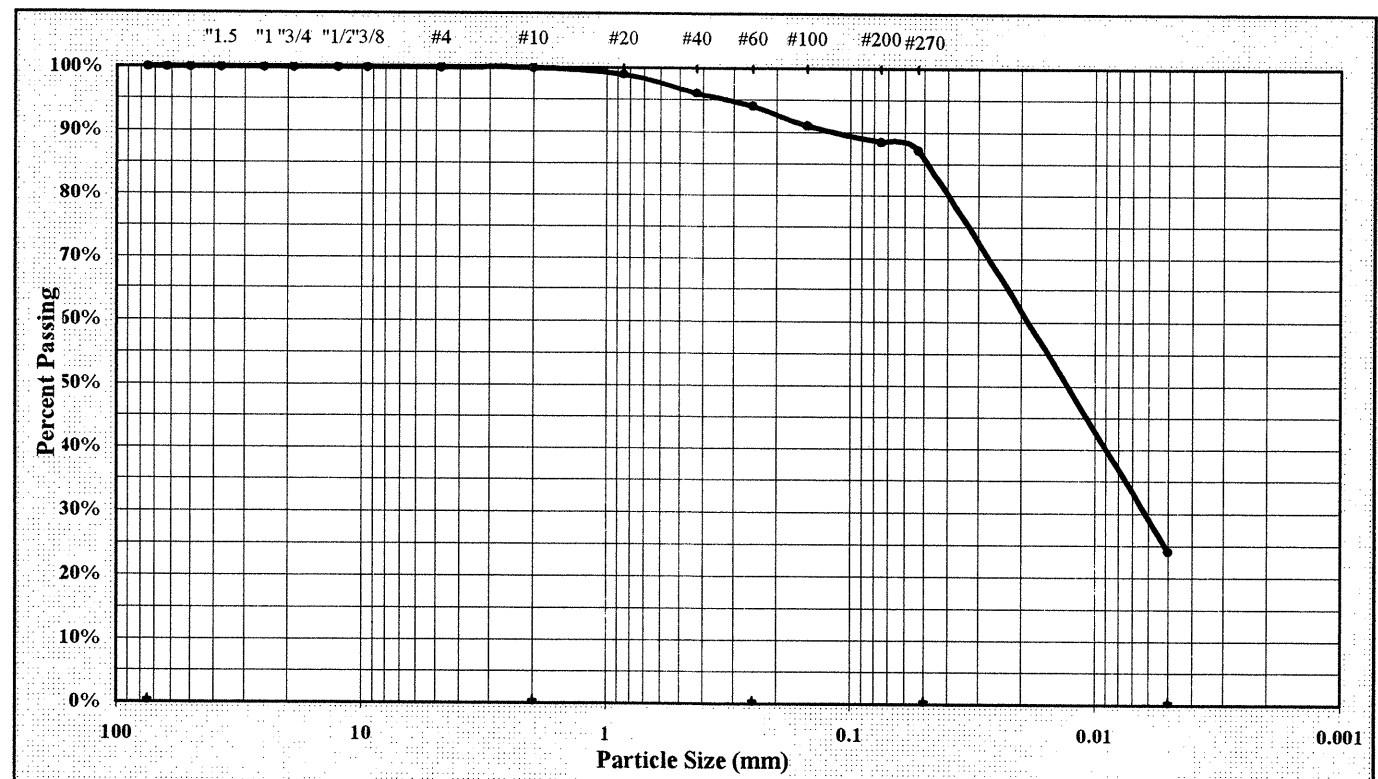
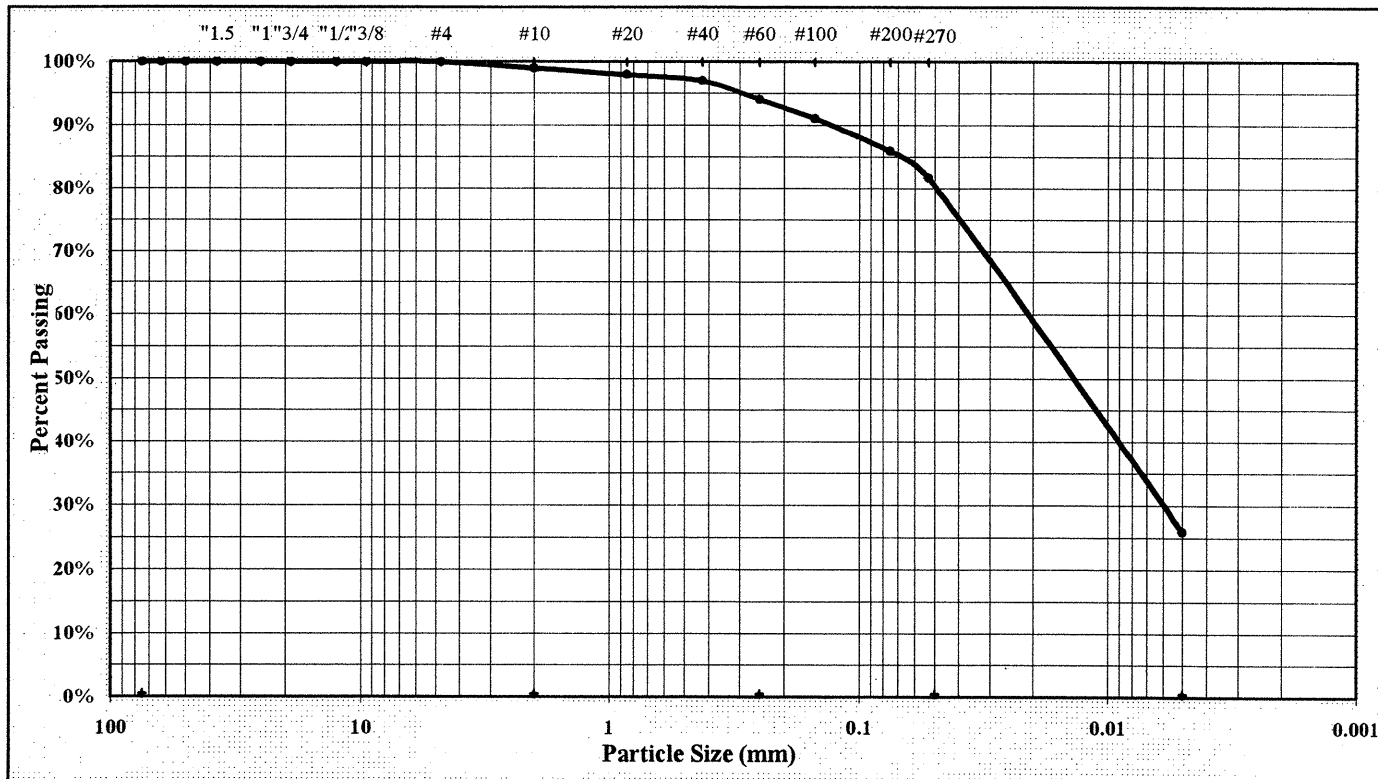
S&ME Project #: **1051-09-207**
 Project Name: **Bridge 73 over Lake Lucas on SR1518 Randolph Co.**
 Client Name: **NCDOT**
 Client Address: **Raleigh, North Carolina**
 State Project #: **33794.1.1** F.A. Project No: **BRZ-1518(2)**

Report Date: **9/11/2009**
 Test Date(s): **09/04 - 09/10/2009**

TIP NO: **B-4610**

Boring #: **B2-A** Sample #: **SS-6** Sample Date: **9/2/09**
 Location: **19+45 -L-** Offset: **24' LT** Depth (ft): **0.0 - 1.5 ft.**
 Sample Description: **Brown Coarse to Fine Sandy Silty CLAY A-6 (9)**

Boring #: **EB2-B** Sample #: **SS-9** Sample Date: **09/01 - 09/03/2009**
 Location: **20+20 -L-** Offset: **3' RT** Depth (ft): **1.0' - 2.5'**
 Sample Description: **Brown-Red Coarse to Fine Sandy Silty CLAY A-7-5 (15)**



| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm |
|---------------------|-------------------------|-----------|-------------------------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm |

| As Defined by NCDOT | | Fine Sand | < 0.25 mm and > 0.05 mm |
|---------------------|-------------------------|-----------|-------------------------|
| Gravel | < 75 mm and > 2.00 mm | Silt | < 0.05 and > 0.005 mm |
| Coarse Sand | < 2.00 mm and > 0.25 mm | Clay | < 0.005 mm |

Maximum Particle Size **#4** Coarse Sand **5%** Silt **56%**
 Gravel **1%** Fine Sand **12%** Clay **26%**
 Apparent Relative Density Moisture Content % Passing #200 **85.9%**
 Liquid Limit **33** Plastic Limit **22** Plastic Index **11**

Maximum Particle Size **#4** Coarse Sand **6%** Silt **63%**
 Gravel **0%** Fine Sand **7%** Clay **24%**
 Apparent Relative Density Moisture Content % Passing #200 **88.4%**
 Liquid Limit **45** Plastic Limit **31** Plastic Index **14**

Soil Mortar (-#10 Sieve)

Coarse Sand **5%** Fine Sand **13%** Silt **56%** Clay **26%**

Soil Mortar (-#10 Sieve)

Coarse Sand **6%** Fine Sand **7%** Silt **63%** Clay **24%**

Description of Sand & Gravel Particles: Rounded Angular Hard & Durable Soft Weathered & Friable

Mechanical Stirring Apparatus (A) Length of Dispersion Period: **1 min.** Dispersing Agent: **Sodium Hexametaphosphate: 40 g./Liter**

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT AASHTO T265: Laboratory Determination of Moisture Content of Soils
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 AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technician Name: Mal Krajan

104-01-0703
 Certification #

Laboratory Manager
 Signature

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PHOTOGRAPHIC RECORD
Replacement of Bridge No. 73 Over Lake Lucas on SR 1518



Photograph No. 1:
This photograph was taken from the south approach, along the centerline of the -L- alignment, looking northwest.



Photograph No. 3:
This photograph was taken from the centerline of the -L- alignment, looking east, across End Bent No. 1.



Photograph No. 2:
This photograph was taken from the centerline of the -L- alignment, looking west, across proposed End Bent No. 1.

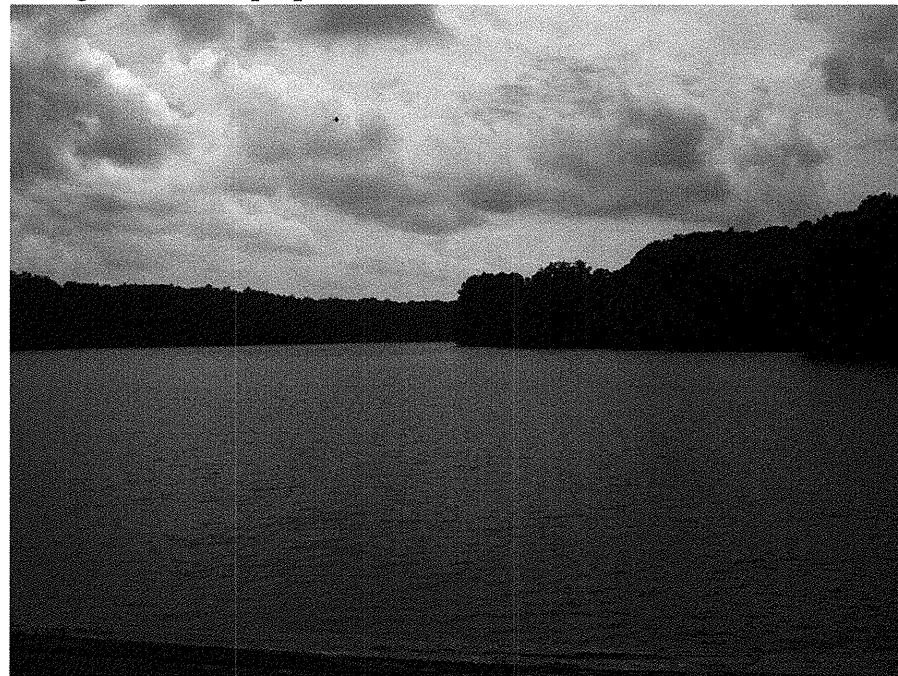


Photograph No. 4:
This photograph was taken from the centerline of the -L- alignment, looking west, across proposed Interior Bent No. 1.

PHOTOGRAPHIC RECORD
Replacement of Bridge No. 73 Over Lake Lucas on SR 1518



Photograph No. 5:
This photograph was taken from the centerline of the -L- alignment, looking east, across proposed Interior Bent No. 1.



Photograph No. 6:
This photograph was taken from the existing bridge, looking west (downstream).



Photograph No. 7:
This photograph was taken from the existing bridge, looking east (upstream).



Photograph No. 8:
This photograph was taken from the centerline of the -L- alignment, looking west, across proposed Interior Bent No. 2.

PHOTOGRAPHIC RECORD
Replacement of Bridge No. 73 Over Lake Lucas on SR 1518



Photograph No. 9:
This photograph was taken from the centerline of the -L- alignment, looking east, across proposed Interior Bent No. 2.



Photograph No. 11:
This photograph was taken from the centerline of the -L- alignment, looking east, across proposed End Bent No. 2.



Photograph No. 10:
This photograph was taken from the centerline of the -L- alignment, looking west, across proposed End Bent No. 2.



Photograph No. 12:
This photograph was taken from the north approach, along the centerline of the -L- alignment, looking southeast.