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REFERENCE: B-4802

PROJECT: 38572

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY ROCKINGHAM
PROJECT DESCRIPTION REPLACE BRIDGE NO. 18 ON
SR 1002 OVER HAW RIVER

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4802	1	14

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
1. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 2. 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.

PERSONNEL

GOODNIGHT, D. J.

TRIGON EXP.

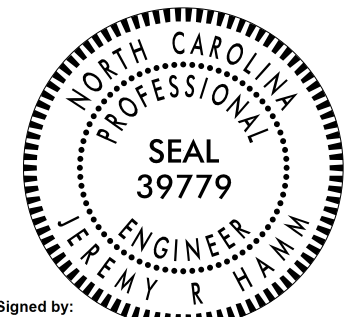
INVESTIGATED BY GOODNIGHT, D. J.

DRAWN BY HUNSBERGER, W. S.

CHECKED BY HAMM, J. R.

SUBMITTED BY FALCON

DATE SEPTEMBER 2017



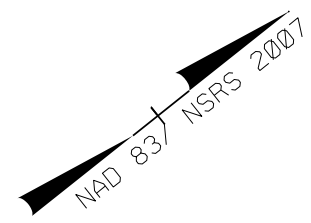
DocuSigned by:
Jeremy R. Hamm 9/18/2017

SIGNATURE DATE

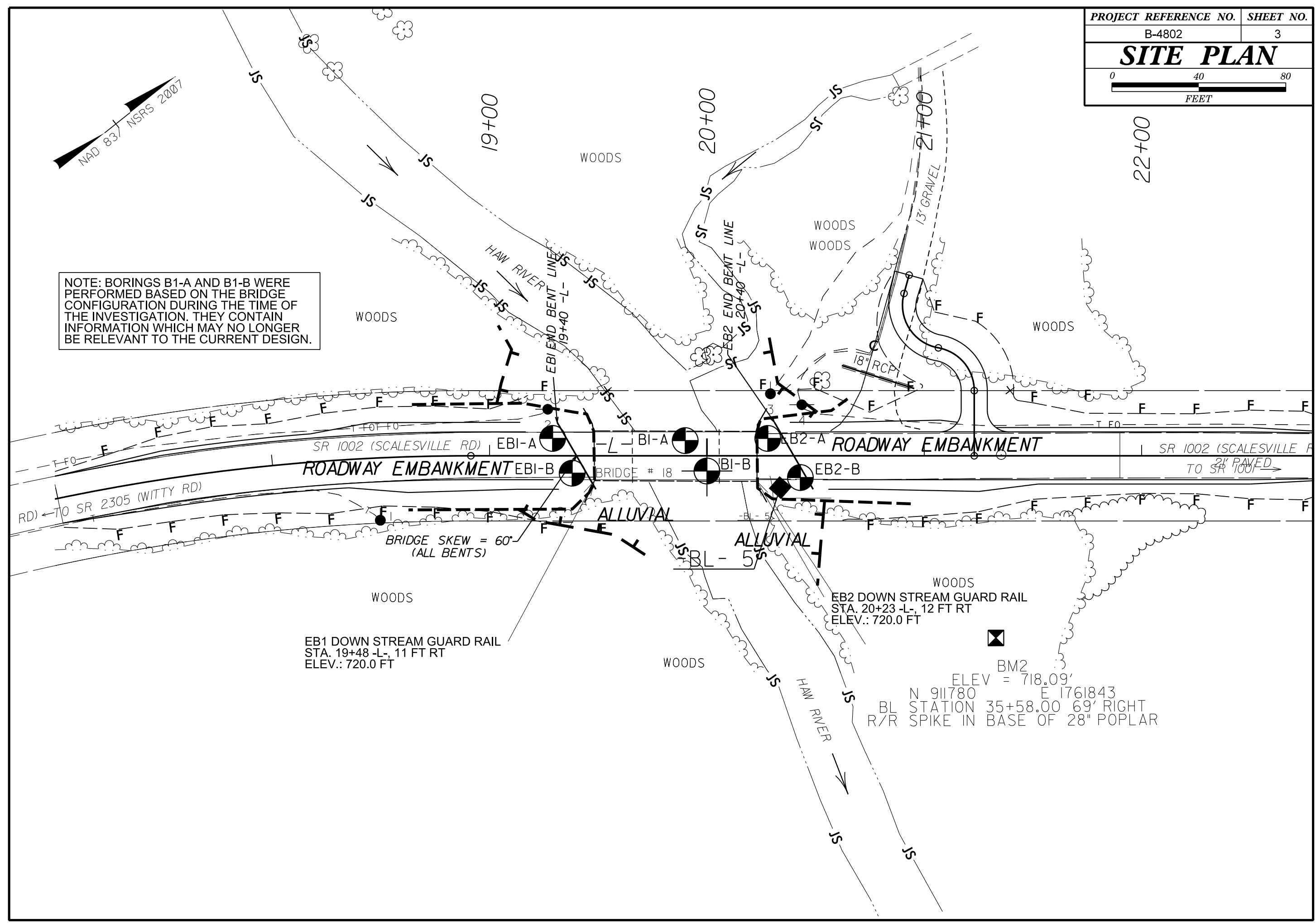
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**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
<p align="center">SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-1-b</th><th>A-2</th><th>A-2-4</th><th>A-2-5</th><th>A-2-6</th><th>A-2-7</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> <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>GROUP CLASS.</th> <td>A-1-a</td><td>A-1-b</td><td>A-2-4</td><td>A-2-5</td><td>A-2-6</td><td>A-2-7</td><td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td> </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> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td>50 MX 30 MX 15 MX</td><td>50 MX 25 MX</td><td>51 MN 10 MX</td><td>35 MX 35 MX</td><td>35 MX 35 MX</td><td>35 MX 35 MX</td><td>35 MX 35 MX</td> <td>36 MN 36 MN</td><td>36 MN 36 MN</td><td>36 MN 36 MN</td><td>36 MN 36 MN</td> <td>GRANULAR SOILS</td><td>SILT-CLAY SOILS</td><td>MUCK, PEAT</td> <td colspan="6"></td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="10"></td> <td colspan="5">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="5">HIGHLY ORGANIC SOILS</td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="10"></td> <td colspan="5">FAIR TO POOR</td> <td colspan="5">POOR</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="10">STONE FRAGS. GRAVEL, AND SAND</td> <td colspan="5">FINE SAND</td> <td colspan="5">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="5">SILTY SOILS</td> <td colspan="5">CLAYEY SOILS</td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="10">EXCELLENT TO GOOD</td> <td colspan="5">FAIR TO POOR</td> <td colspan="5">FAIR TO POOR</td> <td colspan="5">POOR</td> <td colspan="5">UNSATURABLE</td> </tr> <tr> <td colspan="40"> <p align="center">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p> </td> </tr> <tr> <td colspan="40"> <p align="center">CONSISTENCY OR DENSENESS</p> <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table> </td> </tr> <tr> <td colspan="40"> <p align="center">TEXTURE OR GRAIN SIZE</p> <table border="1"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th><th>10</th><th>40</th><th>60</th><th>200</th><th>270</th> </tr> <tr> <td></td> <td>4.75</td><td>2.00</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 (CS.E. SD.)</th><th>FINE SAND (F SD.)</th><th>SILT (SL.)</th><th>CLAY (CL.)</th> </tr> <tr> <td>GRAIN SIZE</td><td>MM 305</td><td>75</td><td>2.0</td><td>0.25</td><td>0.05</td><td>0.005</td> </tr> <tr> <td></td><td>IN. 12</td><td>3</td><td></td><td></td><td></td><td></td> </tr> </table> </td> </tr> <tr> <td colspan="40"> <p align="center">SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE SHRINKAGE LIMIT</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> </td> </tr> <tr> <td colspan="40"> <p align="center">PLASTICITY</p> <table border="1"> <tr> <th>NON PLASTIC</th><th>SLIGHTLY PLASTIC</th><th>MODERATELY PLASTIC</th><th>HIGHLY PLASTIC</th> </tr> <tr> <td>PLASTICITY INDEX (PI)</td><td>0-5</td><td>6-15</td><td>16-25</td> </tr> <tr> <td></td><td>DRY STRENGTH VERY LOW</td><td>SLIGHT</td><td>MEDIUM</td> </tr> <tr> <td></td><td></td><td>26 OR MORE</td><td>HIGH</td> </tr> </table> </td> </tr> <tr> <td colspan="40"> <p align="center">COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p> </td> </tr> <tr> <td colspan="10"> <p align="center">GRADATION</p> <p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> <p align="center">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> <p align="center">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p align="center">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p> <p align="center">PERCENTAGE OF MATERIAL</p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th><th>GRANULAR SOILS</th><th>SILT - CLAY SOILS</th><th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td><td>2 - 3%</td><td>3 - 5%</td><td>TRACE 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> <p align="center">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p align="center">MISCELLANEOUS SYMBOLS</p> <table border="1"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td>SOIL SYMBOL</td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td>INFERRED SOIL BOUNDARY</td> <td>INFERRED ROCK LINE</td> <td>ALLUVIAL SOIL BOUNDARY</td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td>SPT TEST BORING</td> <td>SLOPE INDICATOR INSTALLATION</td> <td>CONE PENETROMETER TEST</td> <td>SOUNDING ROD</td> <td>TEST BORING WITH CORE</td> <td>SPT N-VALUE</td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p align="center">RECOMMENDATION SYMBOLS</p> <table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>UNDERCUT EXCAVATION</td> <td>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p align="center">ABBREVIATIONS</p> <table border="1"> <tr> <td>AR - AUGER REFUSAL</td><td>BT - BORING TERMINATED</td><td>CL - CLAY</td><td>CPT - CONE PENETRATION TEST</td><td>CSE - COARSE</td><td>DMT - DILATOMETER TEST</td><td>DPT - DYNAMIC PENETRATION TEST</td><td>e - VOID RATIO</td><td>F - FINE</td><td>FOSS. - FOSSILIFEROUS</td><td>FRAC. - FRACTURED, FRACTURES</td><td>FRAGS. - FRAGMENTS</td><td>HI. - HIGHLY</td> </tr> <tr> <td>MED. - MEDIUM</td><td>MICA - MICACEOUS</td><td>MOD. - MODERATELY</td><td>NP - NON PLASTIC</td><td>ORG. - ORGANIC</td><td>PMT - PRESSUREMETER TEST</td><td>SAP. - SAPROLITIC</td><td>SD. - SAND, SANDY</td><td>SL. - SILT, SILTY</td><td>SLI. - SLIGHTLY</td><td>TCR - TRICONE REFUSAL</td><td>w - MOISTURE CONTENT</td><td>V - VERY</td> </tr> <tr> <td>VST - VANE SHEAR TEST</td><td>WEA. - WEATHERED</td><td>UNIT WEIGHT</td><td>DRY UNIT WEIGHT</td><td>SAMPLE ABBREVIATIONS</td><td>S - BULK</td><td>SS - SPLIT SPOON</td><td>ST - SHELBY TUBE</td><td>RS - ROCK</td><td>RT - RECOMPACTED TRIAXIAL</td><td>CBR - CALIFORNIA BEARING RATIO</td><td></td><td></td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p align="center">EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1"> <tr> <td>DRILL UNITS:</td><td>ADVANCING TOOLS:</td><td>HAMMER TYPE:</td> </tr> <tr> <td><input type="checkbox"/> CME-45C</td><td><input type="checkbox"/> CLAY BITS</td><td><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td><td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td><td>CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td><td><input checked="" type="checkbox"/> 8" HOLLOW AUGERS</td><td><input type="checkbox"/> -B <input type="checkbox"/> -H</td> </tr> <tr> <td><input type="checkbox"/> VANE SHEAR TEST</td><td><input type="checkbox"/> HARD FACED FINGER BITS</td><td><input checked="" type="checkbox"/> -N Q</td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td><td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td><td>HAND TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> CME-45</td><td><input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td><td><input type="checkbox"/> POST HOLE DIGGER</td> </tr> <tr> <td></td><td><input checked="" type="checkbox"/> TRICONE 2 1/16" STEEL TEETH</td><td><input type="checkbox"/> HAND AUGER</td> </tr> <tr> <td></td><td><input type="checkbox"/> TRICONE " TUNG-CARB.</td><td><input type="checkbox"/> SOUNDING ROD</td> </tr> <tr> <td></td><td><input checked="" type="checkbox"/> CORE BIT</td><td><input type="checkbox"/> VANE SHEAR TEST</td> </tr> <tr> <td></td><td></td><td></td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p align="center">ROCK HARDNESS</p> <table border="1"> <tr> <td>VERY HARD</td><td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. 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CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. 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GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS					A-1	A-1-b	A-2	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	SYMBOL																				% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	35 MX 35 MX	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	36 MN 36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT							MATERIAL PASSING #40 LL PI											SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER					HIGHLY ORGANIC SOILS					GROUP INDEX											FAIR TO POOR					POOR					USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND										FINE SAND					SILTY OR CLAYEY GRAVEL AND SAND					SILTY SOILS					CLAYEY SOILS					GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD										FAIR TO POOR					FAIR TO POOR					POOR					UNSATURABLE					<p align="center">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</p>																																								<p align="center">CONSISTENCY OR DENSENESS</p> <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table>																																								PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A	GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4	<p align="center">TEXTURE OR GRAIN SIZE</p> <table border="1"> <tr> <th>U.S. STD. 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ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p align="center">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p> <p align="center">PERCENTAGE OF MATERIAL</p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th><th>GRANULAR SOILS</th><th>SILT - CLAY SOILS</th><th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td><td>2 - 3%</td><td>3 - 5%</td><td>TRACE 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> <p align="center">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p align="center">MISCELLANEOUS SYMBOLS</p> <table border="1"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td>SOIL SYMBOL</td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td>INFERRED SOIL BOUNDARY</td> <td>INFERRED ROCK LINE</td> <td>ALLUVIAL SOIL BOUNDARY</td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td>SPT TEST BORING</td> <td>SLOPE INDICATOR INSTALLATION</td> <td>CONE PENETROMETER TEST</td> <td>SOUNDING ROD</td> <td>TEST BORING WITH CORE</td> <td>SPT N-VALUE</td> </tr> </table>										ORGANIC MATERIAL	GRANULAR SOILS	SILT - 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CAN BE SCRATCHED READILY BY FINGER NAIL.	<p align="center">FRACTURE SPACING</p> <table border="1"> <tr> <th>TERM</th><th>SPACING</th> </tr> <tr> <td>VERY WIDE</td><td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td><td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td><td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td><td>0.16 TO 1 FOOT</td> </tr> <tr> <td>VERY CLOSE</td><td>LESS THAN 0.16 FEET</td> </tr> </table>										TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FOOT	VERY CLOSE	LESS THAN 0.16 FEET	<p align="center">BEDDING</p> <table border="1"> <tr> <th>TERM</th><th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td><td>4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td><td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td><td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td><td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td><td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td><td>< 0.008 FEET</td> </tr> </table>										TERM	THICKNESS	VERY THICKLY BEDDED	4 FEET	THICKLY BEDDED	1.5 - 4 FEET	THINLY BEDDED	0.16 - 1.5 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	THINLY LAMINATED	< 0.008 FEET	<p align="center">INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1"> <tr> <td>FRIABLE</td><td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td> </tr> <tr> <td>MODERATELY INDURATED</td><td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td> </tr> <tr> <td>INDURATED</td><td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td><td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </table>										FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	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GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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<p align="center">GRADATION</p> <p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> <p align="center">ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> <p align="center">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p align="center">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p> <p align="center">PERCENTAGE OF MATERIAL</p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th><th>GRANULAR SOILS</th><th>SILT - CLAY SOILS</th><th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td><td>2 - 3%</td><td>3 - 5%</td><td>TRACE 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> <p align="center">GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p align="center">MISCELLANEOUS SYMBOLS</p> <table border="1"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td>SOIL SYMBOL</td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td>INFERRED SOIL BOUNDARY</td> <td>INFERRED ROCK LINE</td> <td>ALLUVIAL SOIL BOUNDARY</td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td>SPT TEST BORING</td> <td>SLOPE INDICATOR INSTALLATION</td> <td>CONE PENETROMETER TEST</td> <td>SOUNDING ROD</td> <td>TEST BORING WITH CORE</td> <td>SPT N-VALUE</td> </tr> </table>										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														ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	SOIL SYMBOL	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	INFERRED SOIL BOUNDARY	INFERRED ROCK LINE	ALLUVIAL SOIL BOUNDARY	DIP & DIP DIRECTION OF ROCK STRUCTURES	SPT TEST BORING	SLOPE INDICATOR INSTALLATION	CONE PENETROMETER TEST	SOUNDING ROD	TEST BORING WITH CORE	SPT N-VALUE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
SOFT	CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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<p align="center">BENCH MARK: BL-5, STA. 20+34.15 FT RT -L- 36" REBAR WITH ALUMINUM TRAVERSE CAP N: 911346.8988 E: 1761463.3621 ELEVATION: 716.34 FEET</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.



EB1 DOWN STREAM GUARD RAIL
 STA. 19+48 -L-, 11 FT RT
 ELEV.: 720.0 FT

EB2 DOWN STREAM GUARD RAIL
 STA. 20+23 -L-, 12 FT RT
 ELEV.: 720.0 FT

BM2
 ELEV = 718.09'
 N 911780 E 1761843
 BL STATION 35+58.00 69' RIGHT
 R/R SPIKE IN BASE OF 28" POPLAR

BRIDGE SKEW = 60°
 (ALL BENTS)

SR 1002 (SCALESVILLE RD) ROADWAY EMBANKMENT
 EB1-A BI-A EB2-A
 ROADWAY EMBANKMENT EB1-B BRIDGE # 18 BI-B EB2-B
 SR 1002 (SCALESVILLE RD) TO SR 1001

RD) ← TO SR 2305 (WITTY RD)

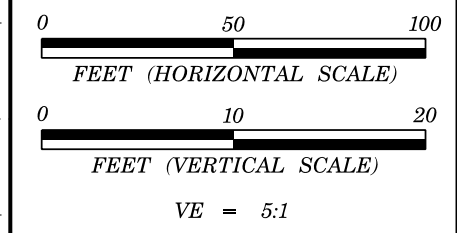
SR 1002 (SCALESVILLE RD) TO SR 1001

5/14/99

PROFILE THROUGH BORINGS PROJECTED ALONG -L-

-L-

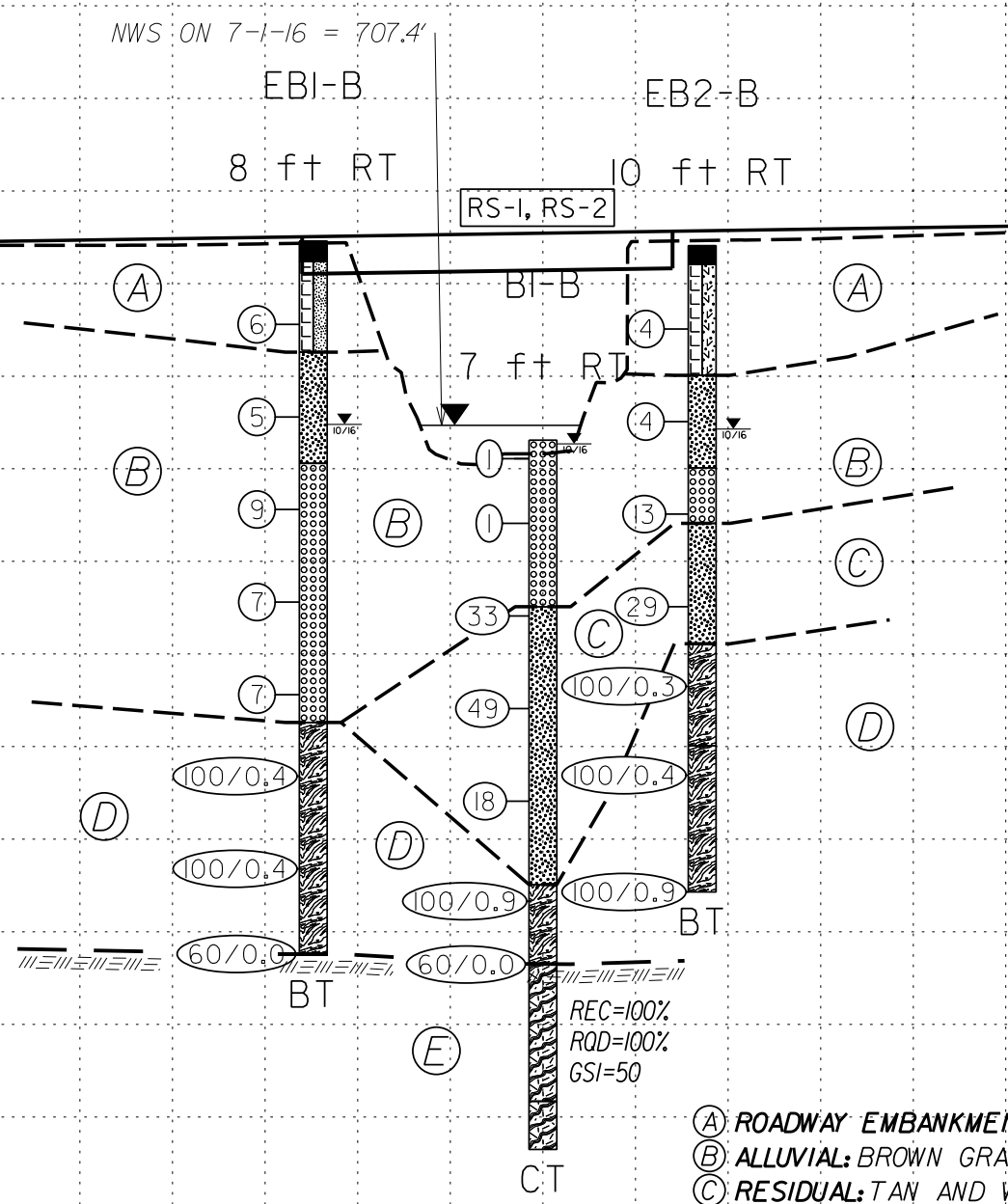
PROJECT REFERENCE NO. B-4802		SHEET NO. 4	
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED			



BEGIN GRADE -L- STA. 18+00.00
INCLUDES 1.25" OVERLAY
EL. = 717.17'

END GRADE -L- STA. 21+90.00
INCLUDES 1.25" OVERLAY
EL. = 718.34'

720
710
700
690
680
670



EXISTING GROUND SURFACE

- (A) ROADWAY EMBANKMENT: RED-BROWN AND TAN, MOIST, MED. STIFF, SANDY AND CLAYEY SILT
- (B) ALLUVIAL: BROWN GRAY AND TAN, MOIST TO SATURATED, VERY LOOSE TO MED. DENSE, SILTY SAND
- (C) RESIDUAL: TAN AND WHITE, MOIST, MED. DENSE TO DENSE, SILTY SAND
- (D) WEATHERED ROCK: TAN BROWN BLACK AND WHITE, GRANITE AND DIORITE
- (E) CRYSTALLINE ROCK: BLACK AND WHITE, DIORITE

NOTES:

- GROUNDLINE PROFILE OF -L- TAKEN FROM BRIDGE SURVEY AND HYDRAULIC DESIGN REPORT RECEIVED SEPTEMBER 2016.
- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.
- BRIDGE SKEW: 60 DEGREES
- REPLACE BRIDGE NO. 18 ON SR 1002 OVER HAW RIVER, ROCKINGHAM COUNTY

NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.

SEE SHEET 3 FOR PLAN VIEW

17+00 18+00 19+00 20+00 21+00 22+00 23+00

SYSTEMS TIME DESIGN CONSULTANTS
 11000 WOODBRIDGE BLVD
 SUITE 200
 WOODBRIDGE, VA 22191
 (703) 595-1100
 WWW.SYSTIMEDESIGN.COM

BENT 1

NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.

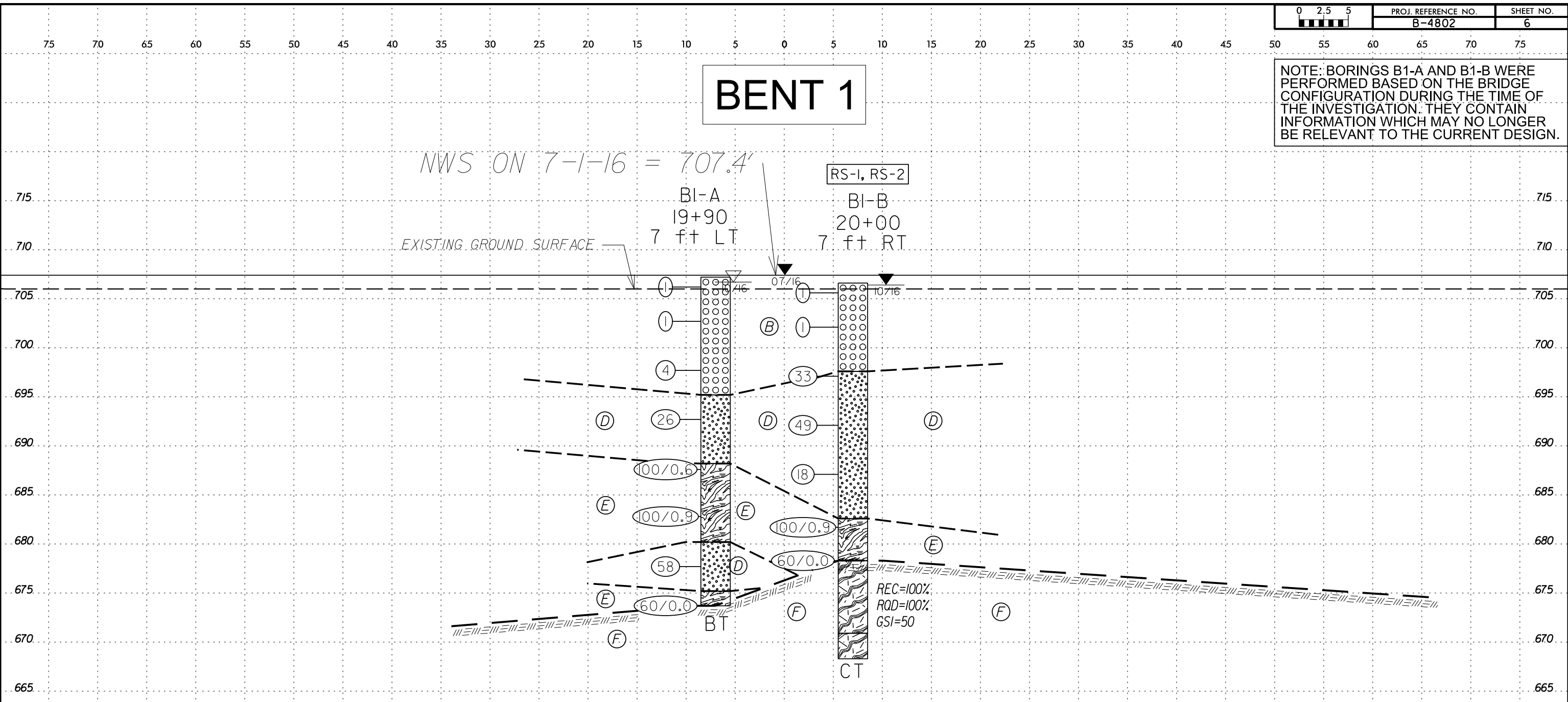
NWS ON 7-1-16 = 707.4'

BI-A
19+90
7 ft LT

BI-B
20+00
7 ft RT

RS-1, RS-2

EXISTING GROUND SURFACE



- (B) ALLUVIAL: TAN, WET TO SATURATED, V. LOOSE, F. TO CSE. SAND W/ GRAVEL
- (D) RESIDUAL: TAN AND WHITE, MOIST, MED. DENSE TO V. DENSE, SILTY SAND
- (E) WEATHERED ROCK: TAN AND WHITE, GRANITE AND BIOTITE GNEISS
- (F) CRYSTALLINE ROCK: BLACK AND WHITE, BIOTITE GNEISS

- NOTES:**
- GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA FROM ELECTRONIC FILES RECEIVED FROM NCDOT GEU DATED SEPTEMBER 2016.
 - INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROPOSED BENT CROSS SECTION.
 - BRIDGE SKEW: 60 DEGREES
 - REPLACE BRIDGE NO. 18 ON SR 1002 OVER HAW RIVER, ROCKINGHAM COUNTY, NC

19+95
-L-

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.									
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)								
BORING NO. EB1-A		STATION 19+29		OFFSET 8 ft LT		ALIGNMENT -L-									
COLLAR ELEV. 717.1 ft		TOTAL DEPTH 39.1 ft		NORTHING 911,675		EASTING 1,761,648									
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER EISTER, G.		START DATE 10/12/16		COMP. DATE 10/12/16		SURFACE WATER DEPTH N/A									
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					
720															
715	716.1	1.0	4	6	6								M	0.5' BITUMINOUS CONCRETE 0.3' AGGREGATE BASE COURSE	0.0 0.8
	713.6	3.5	3	4	6								M	ROADWAY EMBANKMENT BROWN, CSE. TO F. SANDY SILT (A-4) W/ TRACE GRAVEL	
710	711.1	6.0	2	5	5								M	ALLUVIAL BROWN AND TAN, SILTY CSE. TO F. SAND (A-2-4) W/ TRACE ORGANICS	5.5 8.0
	708.6	8.5	4	3	2								W	BROWN, SLI. SILTY F. TO CSE. SAND (A-1-b)	
705	703.6	13.5	3	3	2								W		
700	698.6	18.5	1	1	1								W	GRAY, F. SANDY SILT (A-4) W/ TRACE ORGANICS AND INTERMITTENT LENSES OF CSE. SAND	17.0
695	693.6	23.5	1	2	4								W	GRAY, F. TO CSE. SAND (A-1-b)	22.0
690	688.6	28.5	33	67/0.3									W	WEATHERED ROCK TAN-BROWN, MICACEOUS GRANITE	26.0
685	683.6	33.5	30	39	61/0.4								W		100/0.9
680	678.6	38.5	54	46/0.1									W		100/0.6
Boring Terminated at Elevation 678.0 ft in WR: GRANITE															

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.									
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)								
BORING NO. EB1-B		STATION 19+38		OFFSET 8 ft RT		ALIGNMENT -L-									
COLLAR ELEV. 717.3 ft		TOTAL DEPTH 38.5 ft		NORTHING 911,679		EASTING 1,761,665									
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER EISTER, G.		START DATE 10/12/16		COMP. DATE 10/12/16		SURFACE WATER DEPTH N/A									
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					
720															
715	717.3	0.0											M	0.8 BITUMINOUS CONCRETE 0.3 AGGREGATE BASE COURSE	0.0 1.1
	716.2	1.1											M	ROADWAY EMBANKMENT TAN-BROWN, SANDY SILT (A-4) W/ TRACE GRAVEL	
710	713.8	3.5	3	3	3								M	ALLUVIAL BROWN, SILTY CSE. TO F. SAND (A-2-4)	6.0
	708.8	8.5	2	2	3								W		
705	703.8	13.5	5	5	4								W	GRAY, F. TO CSE. SAND (A-1-b)	12.0
700	698.8	18.5	2	4	3								W		
695	693.8	23.5	4	4	3								W		
690	688.8	28.5	100/0.4										W	WEATHERED ROCK TAN, GRANITE	26.0
685	683.8	33.5	100/0.4										W		100/0.4
680	678.8	38.5	60/0.0										W		60/0.0
Boring Terminated with Standard Penetration Test Refusal at Elevation 678.8 ft on CR: GRANITE															

NCDOT BORE DOUBLE B4802_GEO_BORINGS.GPJ NC_DOT.GDT 11/10/16

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.										
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)									
BORING NO. B1-A		STATION 19+90		OFFSET 7 ft LT		ALIGNMENT -L-										
COLLAR ELEV. 707.2 ft		TOTAL DEPTH 33.5 ft		NORTHING 911,727		EASTING 1,761,683										
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic												
DRILLER EISTER, G.		START DATE 10/14/16		COMP. DATE 10/14/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
710																
	707.2	0.0	WOH	WOH	1									707.2	0.0	
705	703.7	3.5	5	1	0											
700	698.7	8.5	2	2	2											
695	693.7	13.5	9	13	13									695.2	12.0	
690	688.7	18.5	19	75	25/0.1									688.2	19.0	
685	683.7	23.5	23	77/0.4										680.2	27.0	
680	678.7	28.5	10	9	49									675.2	32.0	
675	673.7	33.5	60/0.0											673.7	33.5	

NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.

NCDOT BORE DOUBLE B4802_GEO_BORINGS.GPJ NC_DOT.GDT 11/10/16

GEOTECHNICAL BORING REPORT BORE LOG

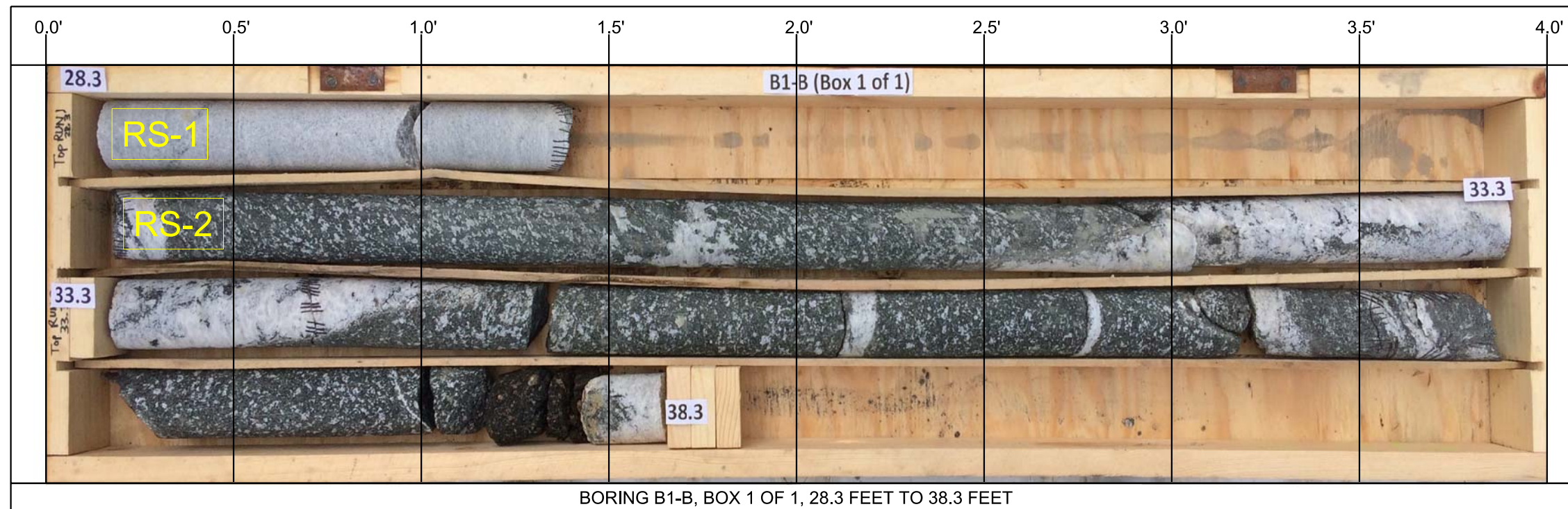
GEOTECHNICAL BORING REPORT CORE LOG

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.										
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)									
BORING NO. B1-B		STATION 20+00		OFFSET 7 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 706.6 ft		TOTAL DEPTH 38.3 ft		NORTHING 911,725		EASTING 1,761,698										
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic										
DRILLER EISTER, G.		START DATE 10/13/16		COMP. DATE 10/13/16		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
710																
	706.6	0.0		1	1	0									706.6	0.0
705																
	703.1	3.5		1	0	1										
700																
	698.1	8.5		3	12	21										
695																
	693.1	13.5		11	21	28										
690																
	688.1	18.5		20	12	6										
685																
	683.1	23.5		22	44	56/0.4										
680																
	678.3	28.3		60/0.0												
675																
670																

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.						
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)					
BORING NO. B1-B		STATION 20+00		OFFSET 7 ft RT		ALIGNMENT -L-						
COLLAR ELEV. 706.6 ft		TOTAL DEPTH 38.3 ft		NORTHING 911,725		EASTING 1,761,698						
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic						
DRILLER EISTER, G.		START DATE 10/13/16		COMP. DATE 10/13/16		SURFACE WATER DEPTH N/A						
CORE SIZE NQ		TOTAL RUN 10.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
678.3												
	678.3	28.3	5.0	6:35/1.0	(5.0)	(5.0)	RS-1	(7.4)	(7.4)		Begin Coring @ 28.3 ft	28.3
675				7:27/1.0	100%	100%	RS-2	100%	100%		CRYSTALLINE ROCK	
				7:30/1.0							BLACK AND WHITE, VERY SLIGHTLY WEATHERED TO FRESH, HARD TO VERY HARD, MODERATELY CLOSE TO WIDELY FRACTURED, BIOTITE GNEISS	
	673.3	33.3	5.0	8:19/1.0								
				9:12/1.0								
670				7:18/1.0	(4.9)	(4.2)					GSI = 50	35.7
				7:10/1.0	98%	84%					BLACK AND WHITE, SLIGHTLY TO VERY SLIGHTLY WEATHERED, MODERATELY HARD TO HARD, VERY CLOSE TO CLOSELY FRACTURED, BIOTITE GNEISS	
				6:32/1.0								
	668.3	38.3		4:55/1.0				(2.5)	(1.8)			
				6:56/1.0	96%	69%					GSI = 40	38.3
											Boring Terminated at Elevation 668.3 ft in CR: BIOTITE GNEISS	

NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.

NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.



NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.



FALCON ENGINEERING
 FALCON ENGINEERING, INC.
 1210 TRINITY ROAD, SUITE 110
 RALEIGH, NC 27607
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ROCK CORE PHOTOGRAPHS

REPLACE BRIDGE NO. 18 ON
 SR 1002 OVER HAW RIVER
 ROCKINGHAM COUNTY, NC
 WBS NO.: 38572.1.1 & TIP NO.: B-4802

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.											
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)										
BORING NO. EB2-A		STATION 20+28		OFFSET 8 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 717.3 ft		TOTAL DEPTH 26.3 ft		NORTHING 911,758		EASTING 1,761,703											
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic													
DRILLER EISTER, G.		START DATE 10/12/16		COMP. DATE 10/12/16		SURFACE WATER DEPTH N/A											
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							
720																	
715	713.8	3.5	1	2	1								M		717.3 0.0 716.3 1.0	0.8' BITUMINOUS CONCRETE 0.4' AGGREGATE BASE COURSE	
710	708.8	8.5	2	4	3								M		709.3 8.0	ROADWAY EMBANKMENT RED-BROWN, SANDY CLAYEY SILT (A-5) W/ TRACE GRAVEL AND MICA	
705	703.8	13.5	5	4	4								W		707.8 9.5	ALLUVIAL GRAY AND TAN, F. SANDY SILTY CLAY (A-7)	
700	698.8	18.5	24	55	40								W		705.3 12.0	BROWN, SLI. SILTY SAND (A-3)	
695	693.8	23.5	100/0.3												702.5 14.8	GRAY, F. TO CSE. SAND (A-1-b)	
	691.0	26.3	60/0.0												700.8 16.5	RESIDUAL GRAY, F. TO CSE. SAND (A-1-b) SAPROLITIC	
															696.8 20.5	BROWN, SILTY SAND (A-2-4) W/ TRACE MICA, SAPROLITIC	
															691.0 26.3	WEATHERED ROCK TAN AND BROWN, BIOTITE GNEISS	
																	Boring Terminated with Standard Penetration Test Refusal at Elevation 691.0 ft on CR: BIOTITE GNEISS

WBS 38572.1.1		TIP B-4802		COUNTY ROCKINGHAM		GEOLOGIST GOODNIGHT, D. J.										
SITE DESCRIPTION REPLACE BRIDGE 18 ON SR 1002 OVER HAW RIVER							GROUND WTR (ft)									
BORING NO. EB2-B		STATION 20+43		OFFSET 10 ft RT		ALIGNMENT -L-										
COLLAR ELEV. 717.1 ft		TOTAL DEPTH 34.9 ft		NORTHING 911,759		EASTING 1,761,727										
DRILL RIG/HAMMER EFF./DATE BRI0674 CME-45C 89% 05/04/2016		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic												
DRILLER EISTER, G.		START DATE 10/12/16		COMP. DATE 10/12/16		SURFACE WATER DEPTH N/A										
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						
720																
715	713.6	3.5	2	2	2								M		717.1 0.0 716.1 1.0	0.6' BITUMINOUS CONCRETE 0.4' AGGREGATE BASE COURSE
710	708.6	8.5	2	2	2								W		710.1 7.0	ROADWAY EMBANKMENT RED-BROWN, SANDY CLAYEY SILT (A-5) W/ TRACE GRAVEL
705	703.6	13.5	3	4	9								W		705.1 12.0	ALLUVIAL BROWN, SILTY SAND (A-2-4)
700	698.6	18.5	14	12	17								W		702.1 15.0	GRAY, F. TO CSE. SAND (A-1-b)
695	693.6	23.5	100/0.3												700.1 15.0	RESIDUAL TAN, SILTY CSE. TO F. SAND (A-2-4)
690	688.6	28.5	100/0.4												695.6 21.5	WEATHERED ROCK TAN, GRANITE
685	683.6	33.5	18	43	57/0.4										690.1 27.0	BROWN AND WHITE, BIOTITE GNEISS
															682.2 34.9	Boring Terminated at Elevation 682.2 ft in WR: BIOTITE GNEISS

NCDOT BORE DOUBLE B4802_GEO_BORINGS.GPJ NC_DOT.GDT 11/10/16

SUMMARY OF ROCK CORE TEST RESULTS



REPLACE BRIDGE NO. 18 ON SR 1002 OVER HAW RIVER

TIP NO.: B-4802

ROCKINGHAM COUNTY, NORTH CAROLINA

FALCON ENGINEERING, INC. PROJECT NO: G16052.00

NOTE: BORINGS B1-A AND B1-B WERE PERFORMED BASED ON THE BRIDGE CONFIGURATION DURING THE TIME OF THE INVESTIGATION. THEY CONTAIN INFORMATION WHICH MAY NO LONGER BE RELEVANT TO THE CURRENT DESIGN.

Sample No.	Boring	Station	Offset	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Young's Modulus (PSI)	Geological Strength Index (GSI)	Failure
RS-1	B1-B	20+00	7 ft RT	28.3-28.7	BIOTITE GNEISS	CZbg	100%	0.38	0.17	163.2	26,901	3,414,924	50	
RS-2	B1-B	20+00	7 ft RT	29.5-29.9	BIOTITE GNEISS	CZbg	100%	0.38	0.16	196.6	15,574	2,042,403	50	

SIGNATURE: Patrick Clark

NCDOT No.:

109-05-1003



LOOKING DOWNSTATION ALONG -L- FROM NEAR END BENT TWO



LOOKING UPSTATION ALONG -L- FROM NEAR END BENT ONE



LOOKING DOWNSTREAM FROM UNDERNEATH BRIDGE



EXISTING INTERIOR BENT, LOOKING UPSTREAM



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SITE PHOTOGRAPHS

REPLACE BRIDGE NO. 18 ON
SR 1002 OVER HAW RIVER
ROCKINGHAM COUNTY, NC
WBS NO.: 38572.1.1 & TIP NO.: B-4802