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REFERENCE: I-4729A

PROJECT: N/A

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY POLK  
 PROJECT DESCRIPTION REALIGNMENT OF I-26 AND  
US 74 INTERCHANGE NORTH OF NC 108  
 SITE DESCRIPTION BRIDGE OVER RAMP  
(-E CONN REV-) ON RAMP (-RP E-) BETWEEN I-26  
AND US 74

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4729A	1	9

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

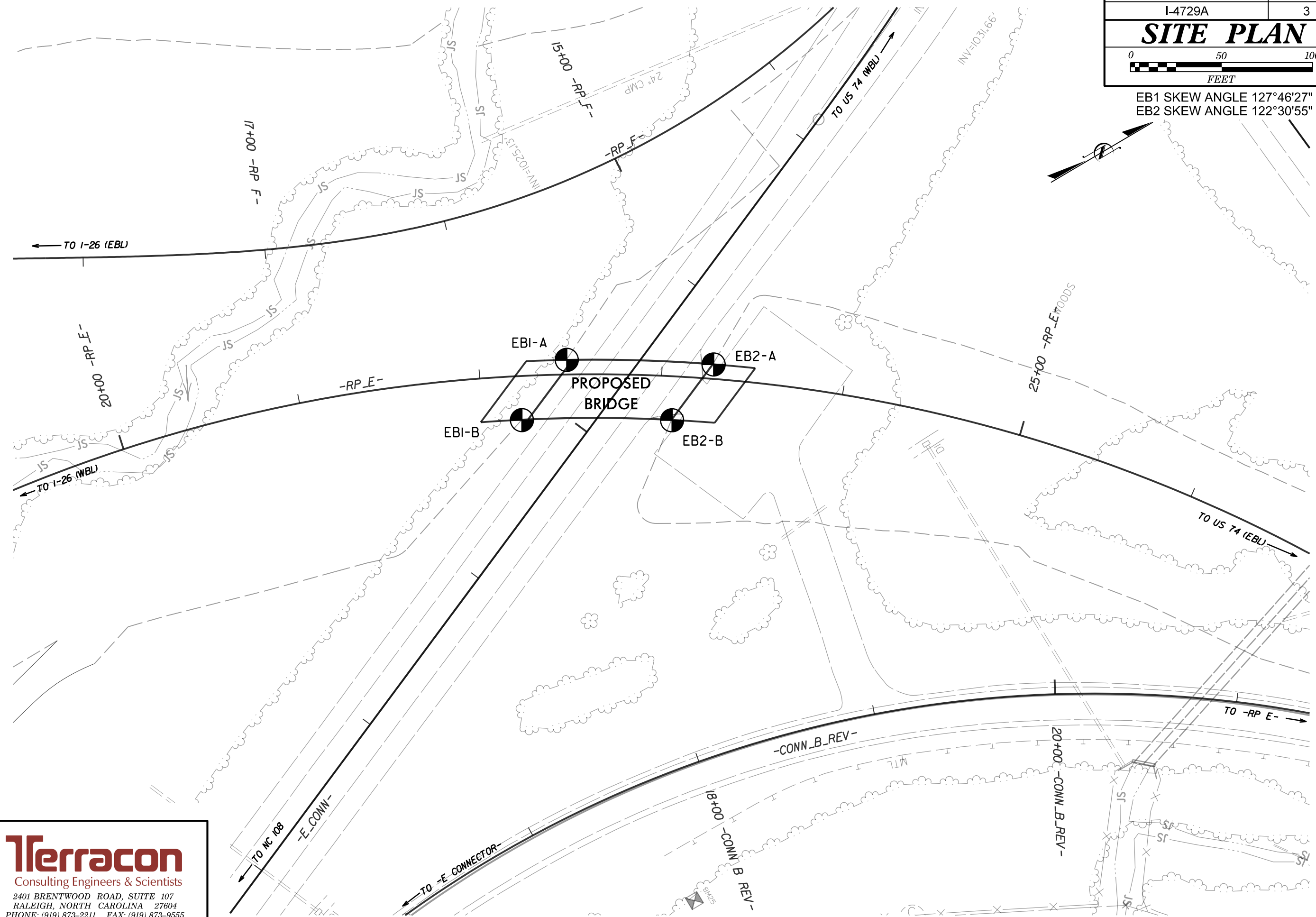
## SUBSURFACE INVESTIGATION

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

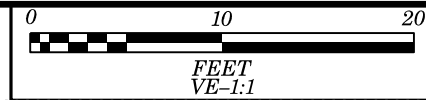
| SOIL DESCRIPTION   
   
  |   |   |  |                       |  |  |                |             |                       | GRADATION  |  |  |   |  |  |  |   |   |  | ROCK DESCRIPTION   |  |  |                       |  |  |                       |                  |                    |                  | TERMS AND DEFINITIONS  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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<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 206, 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><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.<br/><b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.<br/><b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>  |  |  |   |  |  |  |   |   |  | <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> |  |  |                       |  |  |                       |                  |                    |                  | <p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.<br/><b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.<br/><b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.<br/><b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.<br/><b>ARTESIAN</b> - 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.<br/><b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.<br/><b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.<br/><b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.<br/><b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.<br/><b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.<br/><b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.<br/><b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.<br/><b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.<br/><b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.<br/><b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.<br/><b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.<br/><b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.<br/><b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.<br/><b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.<br/><b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.<br/><b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.<br/><b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.<br/><b>ROCK QUALITY DESIGNATION (ROD)</b> - 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.<br/><b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.<br/><b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.<br/><b>SLICKENISE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.<br/><b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.<br/><b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.<br/><b>STRATA ROCK QUALITY DESIGNATION (SROD)</b> - 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.<br/><b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 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></th> </tr> <tr> <th>GROUP CLASS.</th> <td>A-1-a</td><td>A-1-b</td><td>A-2</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></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> </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>36 MN 36 MN</td><td>36 MN 36 MN</td><td>36 MN 36 MN</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td>-</td><td>-</td><td>40 MX 10 MX</td><td>41 MN 10 MX</td><td>40 MX 11 MN</td><td>41 MN 11 MN</td><td>40 MX 11 MN</td><td>41 MN 11 MN</td><td>40 MX 11 MN</td><td>41 MN 11 MN</td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>GROUP INDEX</th> <td>0</td><td>0</td><td>0</td><td>4 MX</td><td>8 MX</td><td>12 MX</td><td>16 MX</td><td>NO MX</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></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></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="5">EXCELLENT TO GOOD</td><td colspan="5">FAIR TO POOR</td><td>FAIR TO POOR</td><td>POOR</td><td>UNSATURABLE</td><td></td><td></td><td></td> </tr> <tr> <td colspan="10">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS &gt; LL - 30</td> <td colspan="10"></td> <td colspan="10"></td> </tr> <tr> <td colspan="10"> <p><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; text-align: center;"> <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/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE<br/>LOOSE<br/>MEDIUM DENSE<br/>DENSE<br/>VERY DENSE</td> <td>&lt; 4<br/>4 TO 10<br/>10 TO 30<br/>30 TO 50<br/>&gt; 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT<br/>SOFT<br/>MEDIUM STIFF<br/>STIFF<br/>VERY STIFF<br/>HARD</td> <td>&lt; 2<br/>2 TO 4<br/>4 TO 8<br/>8 TO 15<br/>15 TO 30<br/>&gt; 30</td> <td>&lt; 0.25<br/>0.25 TO 0.5<br/>0.5 TO 1.0<br/>1 TO 2<br/>2 TO 4<br/>&gt; 4</td> </tr> </table> </td> <td colspan="10"> <p><b>MISCELLANEOUS SYMBOLS</b></p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>TEST BORING</td> <td></td> <td>CONE PENETROMETER TEST</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>AUGER BORING</td> <td></td> <td>SOUNDING ROD</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>CORE BORING</td> <td></td> <td>MONITORING WELL</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> <td></td> <td>TEST BORING WITH CORE</td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td>SPT N-VALUE</td> <td></td> <td></td> </tr> </table> </td> <td colspan="10"> <p><b>ROCK HARDNESS</b></p> <table border="1" style="width: 100%;"> <tr> <td>VERY HARD</td> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</td> </tr> <tr> <td>HARD</td> <td>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</td> </tr> <tr> <td>MODERATELY HARD</td> <td>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.</td> </tr> <tr> <td>MEDIUM HARD</td> <td>CAN BE GROUDED 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.</td> </tr> <tr> <td>SOFT</td> <td>CAN BE GROUDED 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.</td> </tr> <tr> <td>VERY SOFT</td> <td>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.</td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p><b>TEXTURE OR GRAIN SIZE</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <td>4</td><td>10</td><td>40</td><td>60</td><td>200</td><td>270</td> </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> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>COBBLE (COB.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>GRAVEL (GR.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>COARSE SAND (CSE. SD.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>FINE SAND (F SD.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>SILT (SL.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>CLAY (CL.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>GRAIN SIZE</th> <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> <th></th> <td>IN. 12</td><td>3</td><td></td><td></td><td></td><td></td> </tr> </table> </td> <td colspan="10"> <p><b>RECOMMENDATION SYMBOLS</b></p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td></td> <td>SHALLOW UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> <td></td> </tr> </table> </td> <td colspan="10"> <p><b>ABBREVIATIONS</b></p> <table border="1" style="width: 100%;"> <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> <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> <td>VST - VANE SHEAR TEST</td> <td>WEA. - WEATHERED</td> <td>UNIT WEIGHT</td> <td>DRY UNIT WEIGHT</td> </tr> <tr> <td colspan="10"></td> <td colspan="10"> <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/>SS - SPLIT SPOON<br/>ST - SHELBY TUBE<br/>RS - ROCK<br/>RT - RECOMPACTED TRIAXIAL<br/>CBR - CALIFORNIA BEARING RATIO</p> </td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p><b>SOIL MOISTURE - CORRELATION OF TERMS</b></p> <table border="1" style="width: 100%;"> <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>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</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> <td colspan="10"> <p><b>EQUIPMENT USED ON SUBJECT PROJECT</b></p> <table border="1" style="width: 100%;"> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input checked="" type="checkbox"/> AUTOMATIC</td> <td><input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td colspan="2">CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> 8" HOLLOW AUGERS</td> <td><input type="checkbox"/> -B</td> <td><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 type="checkbox"/> -N</td> <td></td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td colspan="2">HAND
TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> D-50 (TER346)</td> <td><input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE *STEEL TEETH</td> <td><input type="checkbox"/> HAND AUGER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE *TUNG-CARB.</td> <td><input type="checkbox"/> SOUNDING ROD</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> 3/4" HOLLOW STEM AUGER</td> <td></td> <td></td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p><b>PLASTICITY</b></p> <table border="1" style="width: 100%;"> <tr> <th>NON PLASTIC</th> <th>SLIGHTLY PLASTIC</th> <th>MODERATELY PLASTIC</th> <th>HIGHLY PLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table> </td> <td colspan="10"> <p><b>FRACTURE SPACING</b></p> <table border="1" style="width: 100%;"> <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> </td> </tr> <tr> <td colspan="10"> <p><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p> </td> <td colspan="10"> <p><b>BEDDING</b></p> <table border="1" style="width: 100%;"> <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>&lt; 0.008 FEET</td> </tr> </table> </td> </tr> <tr> <td colspan="10"> <p><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1" style="width: 100%;"> <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> </td> <td colspan="10"> <p><b>FRAC. 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                        | A-3                             | A-4, A-5                        | A-6, A-7  |             | GROUP CLASS. | A-1-a                            | 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                                  |       | 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     | 36 MN 36 MN   | 36 MN 36 MN | 36 MN 36 MN  |      |   |           |  |  |  |  | MATERIAL PASSING #40 LL PI | - | - | 40 MX 10 MX | 41 MN 10 MX | 40 MX 11 MN | 41 MN 11 MN | 40 MX 11 MN                                | 41 MN 11 MN | 40 MX 11 MN  | 41 MN 11 MN |                  |  |  |  |  |   | GROUP INDEX | 0 | 0 | 0 | 4 MX | 8 MX | 12 MX | 16 MX | NO MX |                    |                        |           |                             |              |                        |                                |                | 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 |  |   |  | PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <p><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; text-align: center;"> <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/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE<br/>LOOSE<br/>MEDIUM DENSE<br/>DENSE<br/>VERY DENSE</td> <td>&lt; 4<br/>4 TO 10<br/>10 TO 30<br/>30 TO 50<br/>&gt; 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT<br/>SOFT<br/>MEDIUM STIFF<br/>STIFF<br/>VERY STIFF<br/>HARD</td> <td>&lt; 2<br/>2 TO 4<br/>4 TO 8<br/>8 TO 15<br/>15 TO 30<br/>&gt; 30</td> <td>&lt; 0.25<br/>0.25 TO 0.5<br/>0.5 TO 1.0<br/>1 TO 2<br/>2 TO 4<br/>&gt; 4</td> </tr> </table> |  |  |  |  |  |  |  |  |  | PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> ) | GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE | < 4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>> 50 | N/A | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | < 2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>> 30 | < 0.25<br>0.25 TO 0.5<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>> 4 | <p><b>MISCELLANEOUS SYMBOLS</b></p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>TEST BORING</td> <td></td> <td>CONE PENETROMETER TEST</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>AUGER BORING</td> <td></td> <td>SOUNDING ROD</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>CORE BORING</td> <td></td> <td>MONITORING WELL</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> <td></td> <td>TEST BORING WITH CORE</td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td>SPT N-VALUE</td> <td></td> <td></td> </tr> </table> |  |  |  |  |  |  |  |  |  |  | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION |  | DIP & DIP DIRECTION OF ROCK STRUCTURES |  | SLOPE INDICATOR INSTALLATION |  | SOIL SYMBOL |  | TEST BORING |  | CONE PENETROMETER TEST |  | ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT |  | AUGER BORING |  | SOUNDING ROD |  | INFERRED SOIL BOUNDARY |  | CORE BORING |  | MONITORING WELL |  | INFERRED ROCK LINE |  | PIEZOMETER INSTALLATION |  | TEST BORING WITH CORE |  | ALLUVIAL SOIL BOUNDARY |  | SPT N-VALUE |  |  | <p><b>ROCK HARDNESS</b></p> <table border="1" style="width: 100%;"> <tr> <td>VERY HARD</td> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. 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SD.) |  |  |  |  |  |  | FINE SAND (F SD.) |  |  |  |  |  |  | SILT (SL.) |  |  |  |  |  |  | CLAY (CL.) |  |  |  |  |  |  | GRAIN SIZE | MM 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 |  | IN. 12 | 3 |  |  |  |  | <p><b>RECOMMENDATION SYMBOLS</b></p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td></td> <td>SHALLOW UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> <td></td> </tr> </table> |  |  |  |  |  |  |  |  |  |  | UNDERCUT |  | UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE |  | UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL |  | SHALLOW UNDERCUT |  | UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK |  |  | <p><b>ABBREVIATIONS</b></p> <table border="1" style="width: 100%;"> <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> <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> <td>VST - VANE SHEAR TEST</td> <td>WEA. - WEATHERED</td> <td>UNIT WEIGHT</td> <td>DRY UNIT WEIGHT</td> </tr> <tr> <td colspan="10"></td> <td colspan="10"> <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/>SS - SPLIT SPOON<br/>ST - SHELBY TUBE<br/>RS - ROCK<br/>RT - RECOMPACTED TRIAXIAL<br/>CBR - CALIFORNIA BEARING RATIO</p> </td> </tr> </table> |  |  |  |  |  |  |  |  |  | AR - AUGER REFUSAL | BT - BORING TERMINATED | CL - CLAY | CPT - CONE PENETRATION TEST | CSE - COARSE | DMT - DILATOMETER TEST | DPT - DYNAMIC PENETRATION TEST | e - VOID RATIO | F - FINE | FOSS. - FOSSILIFEROUS | FRAC. - FRACTURED, FRACTURES | FRAGS. - FRAGMENTS | HI. - HIGHLY | MED. - MEDIUM | MICA. - MICACEOUS | MOD. - MODERATELY | NP - NON PLASTIC | ORG. - ORGANIC | PMT - PRESSUREMETER TEST | SAP. - SAPROLITIC | SD. - SAND, SANDY | SL. - SILT, SILTY | SLI. - SLIGHTLY | TCR - TRICONE REFUSAL | w - MOISTURE CONTENT | V - VERY | VST - VANE SHEAR TEST | WEA. - WEATHERED | UNIT WEIGHT | DRY UNIT WEIGHT |  |  |  |  |  |  |  |  |  |  | <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/>SS - SPLIT SPOON<br/>ST - SHELBY TUBE<br/>RS - ROCK<br/>RT - RECOMPACTED TRIAXIAL<br/>CBR - CALIFORNIA BEARING RATIO</p> |  |  |  |  |  |  |  |  |  | <p><b>SOIL MOISTURE - CORRELATION OF TERMS</b></p> <table border="1" style="width: 100%;"> <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>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</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> |  |  |  |  |  |  |  |  |  | SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | LL - LIQUID LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | PLASTIC RANGE (PI) | - WET - (W) | SEMISOLID; 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 | <p><b>EQUIPMENT USED ON SUBJECT PROJECT</b></p> <table border="1" style="width: 100%;"> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input checked="" type="checkbox"/> AUTOMATIC</td> <td><input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td colspan="2">CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> 8" HOLLOW AUGERS</td> <td><input type="checkbox"/> -B</td> <td><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 type="checkbox"/> -N</td> <td></td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td colspan="2">HAND TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> D-50 (TER346)</td> <td><input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE *STEEL TEETH</td> <td><input type="checkbox"/> HAND AUGER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE *TUNG-CARB.</td> <td><input type="checkbox"/> SOUNDING ROD</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> 3/4" HOLLOW STEM AUGER</td> <td></td> <td></td> </tr> </table> |  |  |  |  |  |  |  |  |  | <input type="checkbox"/> CME-45C | <input type="checkbox"/> CLAY BITS | <input checked="" type="checkbox"/> AUTOMATIC | <input type="checkbox"/> MANUAL | <input type="checkbox"/> CME-55 | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER | CORE SIZE: |  | <input type="checkbox"/> CME-550 | <input type="checkbox"/> 8" HOLLOW AUGERS | <input type="checkbox"/> -B | <input type="checkbox"/> -H | <input type="checkbox"/> VANE SHEAR TEST | <input type="checkbox"/> HARD FACED FINGER BITS | <input type="checkbox"/> -N |  | <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG-CARBIDE INSERTS | HAND TOOLS: |  | <input checked="" type="checkbox"/> D-50 (TER346) | <input type="checkbox"/> CASING
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MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <table border="1" style="width: 100%;"> <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>&lt; 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><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1" style="width: 100%;"> <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. | MODERATELY INDURATED | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | INDURATED | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | EXTREMELY INDURATED | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | <p><b>FRAC. 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SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY
BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |  |  |  |  |  | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED,</p> |  |  |  |  |  |  |  |  |  |
| GENERAL CLASS.   
   
  | GRANULAR MATERIALS (≤ 35% PASSING #200)   |   |  |                       |  | SILT-CLAY MATERIALS (> 35% PASSING #200) |                |             |                       |  | ORGANIC MATERIALS  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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  | 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   |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| GROUP CLASS.   
   
  | A-1-a   | 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   |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| % 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                              | 36 MN 36 MN    | 36 MN 36 MN | 36 MN 36 MN           |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| MATERIAL PASSING #40 LL PI   
   
  | -   | -   | 40 MX 10 MX  | 41 MN 10 MX           | 40 MX 11 MN  | 41 MN 11 MN                              | 40 MX 11 MN    | 41 MN 11 MN | 40 MX 11 MN           | 41 MN 11 MN  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| GROUP INDEX  
   
  | 0   | 0   | 0  | 4 MX                  | 8 MX   | 12 MX                                    | 16 MX          | NO MX       |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 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   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30  
   
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| <p><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; text-align: center;"> <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/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE<br/>LOOSE<br/>MEDIUM DENSE<br/>DENSE<br/>VERY DENSE</td> <td>&lt; 4<br/>4 TO 10<br/>10 TO 30<br/>30 TO 50<br/>&gt; 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT<br/>SOFT<br/>MEDIUM STIFF<br/>STIFF<br/>VERY STIFF<br/>HARD</td> <td>&lt; 2<br/>2 TO 4<br/>4 TO 8<br/>8 TO 15<br/>15 TO 30<br/>&gt; 30</td> <td>&lt; 0.25<br/>0.25 TO 0.5<br/>0.5 TO 1.0<br/>1 TO 2<br/>2 TO 4<br/>&gt; 4</td> </tr> </table>   
   
  |   |   |  |                       |  |  |                |             |                       | PRIMARY SOIL TYPE  | COMPACTNESS OR CONSISTENCY   | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )                          | GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE                         | < 4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>> 50 | N/A   | GENERALLY SILT-CLAY MATERIAL (COHESIVE)   | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD | < 2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>> 30   | < 0.25<br>0.25 TO 0.5<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>> 4 | <p><b>MISCELLANEOUS SYMBOLS</b></p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>TEST BORING</td> <td></td> <td>CONE PENETROMETER TEST</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>AUGER BORING</td> <td></td> <td>SOUNDING ROD</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>CORE BORING</td> <td></td> <td>MONITORING WELL</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> <td></td> <td>TEST BORING WITH CORE</td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td>SPT N-VALUE</td> <td></td> <td></td> </tr> </table> |                       |  |  |                       |                  |                    |                  |  |                   |                  | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION |     | DIP & DIP DIRECTION OF ROCK STRUCTURES |                                    | SLOPE INDICATOR INSTALLATION    
             |                                 | SOIL SYMBOL                     |   | TEST BORING |              | CONE PENETROMETER TEST           |   | ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT |                             | AUGER BORING                             |   | SOUNDING ROD                |      | INFERRED SOIL BOUNDARY                  |   | CORE BORING       |          | MONITORING WELL                                   |  | INFERRED ROCK LINE                        |       | PIEZOMETER INSTALLATION |   | TEST BORING WITH CORE               |  | ALLUVIAL SOIL BOUNDARY |  | SPT N-VALUE                           |            |  | <p><b>ROCK HARDNESS</b></p> <table border="1" style="width: 100%;"> <tr> <td>VERY HARD</td> <td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</td> </tr> <tr> <td>HARD</td> <td>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</td> </tr> <tr> <td>MODERATELY HARD</td> <td>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.</td> </tr> <tr> <td>MEDIUM HARD</td> <td>CAN BE GROUDED 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.</td> </tr> <tr> <td>SOFT</td> <td>CAN BE GROUDED 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.</td> </tr> <tr> <td>VERY SOFT</td> <td>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.</td> </tr> </table> |  |  |  |  |            |        |    |                        |                   | VERY HARD   | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. | HARD        | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. | MODERATELY HARD | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. | MEDIUM HARD | CAN BE GROUDED 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 GROUDED 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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| PRIMARY SOIL TYPE  
   
  | COMPACTNESS OR CONSISTENCY  | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)                  | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> ) |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| GENERALLY GRANULAR MATERIAL (NON-COHESIVE)   
   
  | VERY LOOSE<br>LOOSE<br>MEDIUM DENSE<br>DENSE<br>VERY DENSE  | < 4<br>4 TO 10<br>10 TO 30<br>30 TO 50<br>> 50                      | N/A  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| GENERALLY SILT-CLAY MATERIAL (COHESIVE)  
   
  | VERY SOFT<br>SOFT<br>MEDIUM STIFF<br>STIFF<br>VERY STIFF<br>HARD  | < 2<br>2 TO 4<br>4 TO 8<br>8 TO 15<br>15 TO 30<br>> 30              | < 0.25<br>0.25 TO 0.5<br>0.5 TO 1.0<br>1 TO 2<br>2 TO 4<br>> 4   |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION   |   | DIP & DIP DIRECTION OF ROCK STRUCTURES                           |                       | SLOPE INDICATOR INSTALLATION   |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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  | SOIL SYMBOL   |   | TEST BORING  |                       | CONE PENETROMETER TEST   |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  | ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT  |   | AUGER BORING   |                       | SOUNDING ROD   |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  | INFERRED SOIL BOUNDARY  |   | CORE BORING  |                       | MONITORING WELL  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  | INFERRED ROCK LINE  |   | PIEZOMETER INSTALLATION  |                       | TEST BORING WITH CORE  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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  | ALLUVIAL SOIL BOUNDARY  |   | SPT N-VALUE  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
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| VERY HARD  
   
  | CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| HARD   
   
  | CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MODERATELY HARD  
   
  | CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.                               |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| MEDIUM HARD  
   
  | CAN BE GROUDED 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.            |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| SOFT   
   
  | CAN BE GROUDED 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><b>TEXTURE OR GRAIN SIZE</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <td>4</td><td>10</td><td>40</td><td>60</td><td>200</td><td>270</td> </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> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>COBBLE (COB.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>GRAVEL (GR.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>COARSE SAND (CSE. SD.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>FINE SAND (F SD.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>SILT (SL.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>CLAY (CL.)</th> <td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>GRAIN SIZE</th> <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> <th></th> <td>IN. 12</td><td>3</td><td></td><td></td><td></td><td></td> </tr> </table>   
   
  |   |   |  |                       |  |  |                |             |                       | U.S. STD. SIEVE SIZE OPENING (MM)  | 4  | 10   | 40  | 60   | 200  | 270  |   | 4.75  | 2.00   | 0.42   | 0.25   | 0.075  | 0.053                 | BOULDER (BLDR.)                                      |  |                       |                  |                    |                  |  | COBBLE (COB.)     |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             | GRAVEL (GR.)                    |                                 |   |             |              |                                  |   | COARSE SAND (CSE. SD.)                             |                             |  |   |                             |      |   | FINE SAND (F SD.)                             |                   |          |   |  |   |       | SILT (SL.)              |   |                                     |  |                        |  |                                       | CLAY (CL.) |  |  |  |  |  |  | GRAIN SIZE | MM 305 | 75 | 2.0                    | 0.25              | 0.05        | 0.005   |             | IN. 12  | 3               |   |             |  |      | <p><b>RECOMMENDATION SYMBOLS</b></p> <table border="1" style="width: 100%;"> <tr> <td></td> <td>UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</td> </tr> <tr> <td></td> <td>SHALLOW UNDERCUT</td> <td></td> <td>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</td> <td></td> <td></td> </tr> </table> |           |  |  |  |  |                            |   |   |             |             | UNDERCUT    |             | UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE |             | UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL |             | SHALLOW UNDERCUT |  | UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK |  |  | <p><b>ABBREVIATIONS</b></p> <table border="1" style="width: 100%;"> <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> <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> <td>VST - VANE SHEAR TEST</td> <td>WEA. - WEATHERED</td> <td>UNIT WEIGHT</td> <td>DRY UNIT WEIGHT</td> </tr> <tr> <td colspan="10"></td> <td colspan="10"> <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/>SS - SPLIT SPOON<br/>ST - SHELBY TUBE<br/>RS - ROCK<br/>RT - RECOMPACTED TRIAXIAL<br/>CBR - CALIFORNIA BEARING RATIO</p> </td> </tr> </table> |             |   |   |   |      |      |       |       |       | AR - AUGER REFUSAL | BT - BORING TERMINATED | CL - CLAY | CPT - CONE PENETRATION TEST | CSE - COARSE | DMT - DILATOMETER TEST | DPT - DYNAMIC PENETRATION TEST | e - VOID RATIO | F - FINE                       | FOSS. - FOSSILIFEROUS         | FRAC. - FRACTURED, FRACTURES | FRAGS. - FRAGMENTS              | HI. - HIGHLY | MED. - MEDIUM | MICA. - MICACEOUS | MOD. - MODERATELY | NP - NON PLASTIC | ORG. - ORGANIC | PMT - PRESSUREMETER TEST | SAP. - SAPROLITIC | SD. - SAND, SANDY | SL. - SILT, SILTY | SLI. - SLIGHTLY | TCR - TRICONE REFUSAL | w - MOISTURE CONTENT | V - VERY                | VST - VANE SHEAR TEST | WEA. - WEATHERED | UNIT WEIGHT | DRY UNIT WEIGHT |  |              |  |  |  |  |              |      |             |  | <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/>SS - SPLIT SPOON<br/>ST - SHELBY TUBE<br/>RS - ROCK<br/>RT - RECOMPACTED TRIAXIAL<br/>CBR - CALIFORNIA BEARING RATIO</p> |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| U.S. STD. SIEVE SIZE OPENING (MM)  
   
  | 4   | 10  | 40   | 60                    | 200  | 270                                      |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | 4.75  | 2.00  | 0.42   | 0.25                  | 0.075  | 0.053                                    |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| BOULDER (BLDR.)  
   
  |   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| GRAVEL (GR.)   
   
  |   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| COARSE SAND (CSE. SD.)   
   
  |   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| FINE SAND (F SD.)  
   
  |   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
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| SILT (SL.)   
   
  |   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| CLAY (CL.)   
   
  |   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| GRAIN SIZE   
   
  | MM 305  | 75  | 2.0  | 0.25                  | 0.05   | 0.005                                    |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
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  | IN. 12  | 3   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | UNDERCUT  |   | UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE                       |                       | UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  | SHALLOW UNDERCUT  |   | UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK             |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| AR - AUGER REFUSAL   
   
  | BT - BORING TERMINATED  | CL - CLAY   | CPT - CONE PENETRATION TEST                                      | CSE - COARSE          | DMT - DILATOMETER TEST   | DPT - DYNAMIC PENETRATION TEST           | e - VOID RATIO | F - FINE    | FOSS. - FOSSILIFEROUS | FRAC. - FRACTURED, FRACTURES   | FRAGS. - FRAGMENTS   | HI. - HIGHLY                                       | MED. - MEDIUM   | MICA. - MICACEOUS                          | MOD. - MODERATELY  | NP - NON PLASTIC                               | ORG. - ORGANIC  | PMT - PRESSUREMETER TEST  | SAP. - SAPROLITIC  | SD. - SAND, SANDY  | SL. - SILT, SILTY  | SLI. - SLIGHTLY  | TCR - TRICONE REFUSAL | w - MOISTURE CONTENT                                 | V - VERY   | VST - VANE SHEAR TEST | WEA. - WEATHERED | UNIT WEIGHT        | DRY UNIT WEIGHT  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  |   |   |  |                       |  |  |                |             |                       | <p><b>SAMPLE ABBREVIATIONS</b></p> <p>S - BULK<br/>SS - SPLIT SPOON<br/>ST - SHELBY TUBE<br/>RS - ROCK<br/>RT - RECOMPACTED TRIAXIAL<br/>CBR - CALIFORNIA BEARING RATIO</p>  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p><b>SOIL MOISTURE - CORRELATION OF TERMS</b></p> <table border="1" style="width: 100%;"> <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>PLASTIC RANGE (PI)</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</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>  
   
  |   |   |  |                       |  |  |                |             |                       | SOIL MOISTURE SCALE (ATTERBERG LIMITS)   | FIELD MOISTURE DESCRIPTION   | GUIDE FOR FIELD MOISTURE DESCRIPTION               | LL - LIQUID LIMIT   | - SATURATED - (SAT.)                       | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE                | PLASTIC RANGE (PI)                             | - WET - (W)   | SEMISOLID; 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 | <p><b>EQUIPMENT USED ON SUBJECT PROJECT</b></p> <table border="1" style="width: 100%;"> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input checked="" type="checkbox"/> AUTOMATIC</td> <td><input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td colspan="2">CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> 8" HOLLOW AUGERS</td> <td><input type="checkbox"/> -B</td> <td><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 type="checkbox"/> -N</td> <td></td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td colspan="2">HAND TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> D-50 (TER346)</td> <td><input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE *STEEL TEETH</td> <td><input type="checkbox"/> HAND AUGER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE *TUNG-CARB.</td> <td><input type="checkbox"/> SOUNDING ROD</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> 3/4" HOLLOW STEM AUGER</td> <td></td> <td></td> </tr> </table> |                       |                  |                    |                  |  |                   |                  |   |     | <input type="checkbox"/> CME-45C       | <input type="checkbox"/> CLAY BITS | <input checked=""
type="checkbox"/> AUTOMATIC | <input type="checkbox"/> MANUAL | <input type="checkbox"/> CME-55 | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER   | CORE SIZE:  |              | <input type="checkbox"/> CME-550 | <input type="checkbox"/> 8" HOLLOW AUGERS | <input type="checkbox"/> -B                        | <input type="checkbox"/> -H | <input type="checkbox"/> VANE SHEAR TEST | <input type="checkbox"/> HARD FACED FINGER BITS | <input type="checkbox"/> -N |      | <input type="checkbox"/> PORTABLE HOIST | <input type="checkbox"/> TUNG-CARBIDE INSERTS | HAND TOOLS:       |          | <input checked="" type="checkbox"/> D-50 (TER346) | <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER | <input type="checkbox"/> POST HOLE DIGGER |       |                         | <input type="checkbox"/> TRICONE *STEEL TEETH | <input type="checkbox"/> HAND AUGER |  |                        | <input type="checkbox"/> TRICONE *TUNG-CARB. | <input type="checkbox"/> SOUNDING ROD |            |  | <input type="checkbox"/> CORE BIT  | <input type="checkbox"/> VANE SHEAR TEST |  |  | <input checked="" type="checkbox"/> 3/4" HOLLOW STEM AUGER |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |   
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| SOIL MOISTURE SCALE (ATTERBERG LIMITS)   
   
  | FIELD MOISTURE DESCRIPTION  | GUIDE FOR FIELD MOISTURE DESCRIPTION                                |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| LL - LIQUID LIMIT  
   
  | - SATURATED - (SAT.)  | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| PLASTIC RANGE (PI)   
   
  | - WET - (W)   | SEMISOLID; 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                |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <input type="checkbox"/> CME-45C   
   
  | <input type="checkbox"/> CLAY BITS  | <input checked="" type="checkbox"/> AUTOMATIC                       | <input type="checkbox"/> MANUAL                                  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| <input type="checkbox"/> CME-55  
   
  | <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER   | CORE SIZE:  |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| <input type="checkbox"/> CME-550   
   
  | <input type="checkbox"/> 8" HOLLOW AUGERS   | <input type="checkbox"/> -B   | <input type="checkbox"/> -H                                      |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <input type="checkbox"/> VANE SHEAR TEST   
   
  | <input type="checkbox"/> HARD FACED FINGER BITS   | <input type="checkbox"/> -N   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <input type="checkbox"/> PORTABLE HOIST  
   
  | <input type="checkbox"/> TUNG-CARBIDE INSERTS   | HAND TOOLS:   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| <input checked="" type="checkbox"/> D-50 (TER346)  
   
  | <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER  | <input type="checkbox"/> POST HOLE DIGGER                           |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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|  
   
  | <input type="checkbox"/> TRICONE *STEEL TEETH   | <input type="checkbox"/> HAND AUGER                                 |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  | <input type="checkbox"/> TRICONE *TUNG-CARB.  | <input type="checkbox"/> SOUNDING ROD                               |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | <input type="checkbox"/> CORE BIT   | <input type="checkbox"/> VANE SHEAR TEST                            |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | <input checked="" type="checkbox"/> 3/4" HOLLOW STEM AUGER  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p><b>PLASTICITY</b></p> <table border="1" style="width: 100%;"> <tr> <th>NON PLASTIC</th> <th>SLIGHTLY PLASTIC</th> <th>MODERATELY PLASTIC</th> <th>HIGHLY PLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table>   
   
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             | 26 OR MORE                      | HIGH                            | <p><b>FRACTURE SPACING</b></p> <table border="1" style="width: 100%;"> <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                 |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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  |   |   |  | 0-5                   | VERY LOW   |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  |   |   |  | 6-15                  | SLIGHT   |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  |   |   |  | 16-25                 | MEDIUM   |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | SPACING   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | MORE THAN 10 FEET   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | 3 TO 10 FEET  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| MODERATELY CLOSE   
   
  | 1 TO 3 FEET   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| CLOSE  
   
  | 0.16 TO 1 FOOT  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| VERY CLOSE   
   
  | LESS THAN 0.16 FEET   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>  
   
  |   |   |  |                       |  |  |                |             |                       | <p><b>BEDDING</b></p> <table border="1" style="width: 100%;"> <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>&lt; 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                                  |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | THICKNESS   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | 4 FEET  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| THICKLY BEDDED   
   
  | 1.5 - 4 FEET  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
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| THINLY BEDDED  
   
  | 0.16 - 1.5 FEET   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| VERY THINLY BEDDED   
   
  | 0.03 - 0.16 FEET  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| THICKLY LAMINATED  
   
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| THINLY LAMINATED   
   
  | < 0.008 FEET  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1" style="width: 100%;"> <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. | MODERATELY INDURATED                               | GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. | INDURATED                                  | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. | EXTREMELY INDURATED                            | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p> |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  | GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.  |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| EXTREMELY INDURATED  
   
  | SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.   |   |  |                       |  |  |                |             |                       |  |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>  
   
  |   |   |  |                       |  |  |                |             |                       | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p>   |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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  |   |   |  |                       |  |  |                |             |                       | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p>   |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
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| <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>  
   
  |   |   |  |                       |  |  |                |             |                       | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED</p> <p>THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p>   |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
             |                                 |                                 |   |             |              |                                  |   |  |                             |  |   |                             |      |   |   |                   |          |   |  |   |       |                         |   |                                     |  |                        |  |                                       |            |  |  |  |  |  |  |            |        |    |                        |                   |             |   |             |   |                 |   |             |  |      |   |           |  |  |  |  |                            |   |   |             |             |             |             |  |             |  |             |                  |  |  |  |  |   |             |   |   |   |      |      |       |       |       |                    |                        |           |                             |              |                        |                                |                |                                |                               |                              |                                 |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |                         |                       |                  |             |                 |  |              |  |  |  |  |              |      |             |  |   |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                   |                            |  |  |  |  |  |     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |                              |  |             |  |             |  |                        |  |  |  |              |  |              |  |                        |  |             |  |                 |  |                    |  |                         |  |                       |  |                        |  |             |  |  |  
   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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| <p><b>FRAC. SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE</p> <p>SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>  
   
  |   |   |  |                       |  |  |                |             |                       | <p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED,</p>   |  |  |   |  |  |  |   |   |  |  |  |  |                       |  |  |                       |                  |                    |                  |  |                   |                  |   |     |  |                                    | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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   |  |  |  |  |  |  |  |  |  |           |   |      |   |                 |   |             |  |      |   |           |  |  |  |  |  |  |  |  |  |  |  |                                   |   |    |    |    |     |     |  |      |      |      |      |       |       |                 |  |  |  |  |  |  |               |  |  |  |  |  |  |              |  |  |  |  |  |  |                        |  |  |  |  |  |  |                   |  |  |  |  |  |  |            |  |  |  |  |  |  |            |  |  |  |  |  |  |            |        |    |     |      |      |       |  |        |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |          |  |  |  |  |  |                  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                    |                        |           |                             |              |                        |                                |                |          |                       |                              |                    |              |               |                   |                   |                  |                |                          |                   |                   |                   |                 |                       |                      |          |                       |                  |             |                 |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |                            |                                      |                   |                      |   |                    |             |   |                       |               |                                    |                      |             |  |  |  |  |  |  |  |  |  |  |  |                                  |                                    |   |                                 |                                 |   |            |  |                                  |   |                             |                             |  |   |                             |  |   |   |             |  |   |   
                  |   |  |  |   |                                     |  |  |  |                                       |  |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |             |                  |                    |                |                       |              |  |  |  |  |     |          |  |  |  |  |      |        |  |  |  |  |       |        |  |  |  |  |            |      |   |  |  |  |  |  |  |  |  |  |      |         |           |                   |      |              |                  |             |       |                |            |                     |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |           |                     |        |                |              |               |                 |                    |                  |                   |                   |                  |              |   |  |  |  |  |  |  |  |  |  |         |  |                      |   |           |  |                     |   |   |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  
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PROJECT REFERENCE NO.	SHEET NO.
I-4729A	3
<b>SITE PLAN</b>	

EB1 SKEW ANGLE 127°46'27"  
 EB2 SKEW ANGLE 122°30'55"



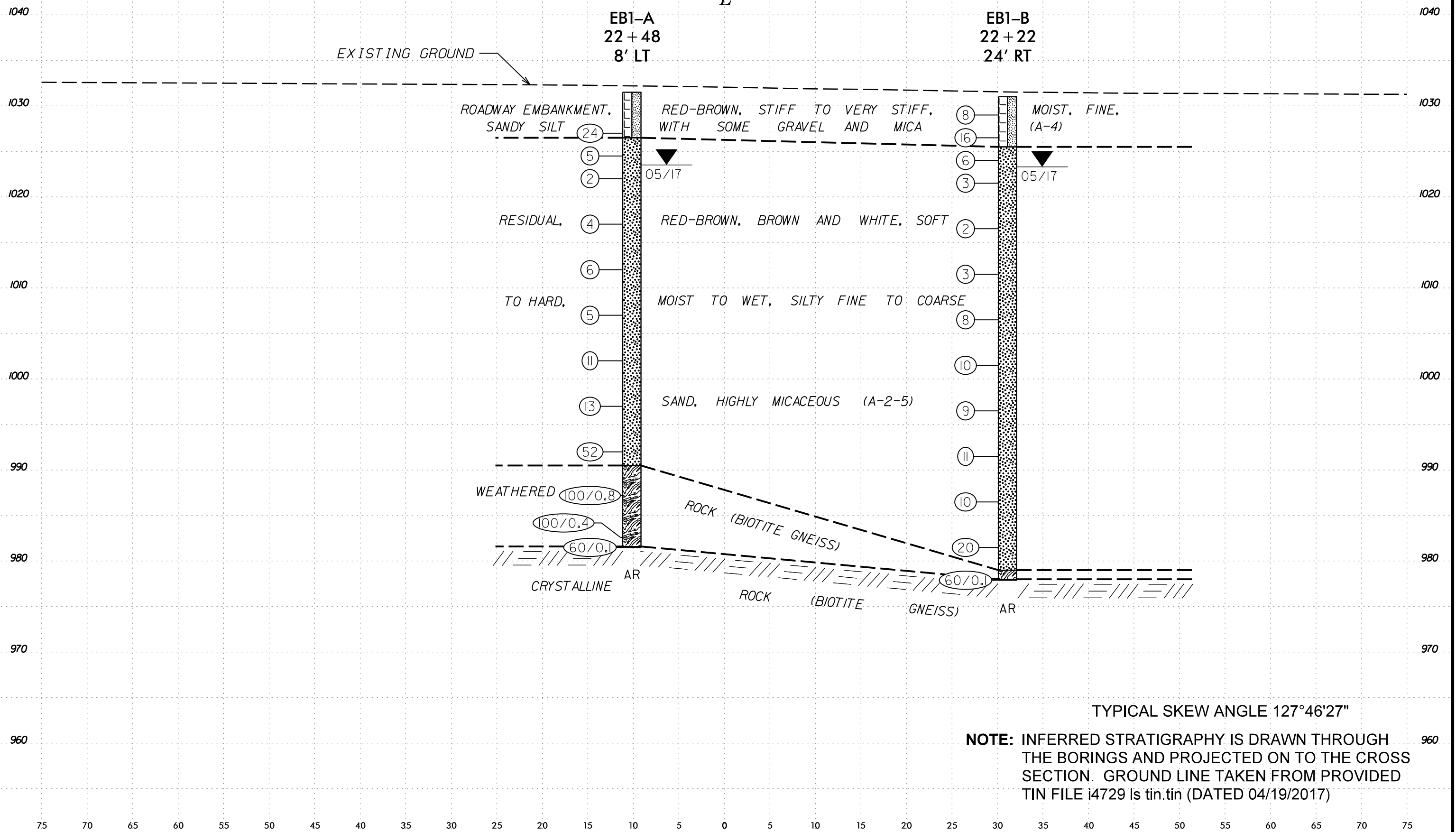
**Terracon**  
 Consulting Engineers & Scientists  
 2401 BRENTWOOD ROAD, SUITE 107  
 RALEIGH, NORTH CAROLINA 27604  
 PHONE: (919) 873-2211 FAX: (919) 873-9555  
 NC REGISTERED FIRM: F-0869



PROJECT REFERENCE NO.	SHEET NO.
L-4729A	4

**Terracon**  
 Consulting Engineers & Scientists  
 2401 BRENTWOOD ROAD, SUITE 107  
 RALEIGH, NORTH CAROLINA 27604  
 PHONE: (919) 873-2211 FAX: (919) 873-9555  
 NC REGISTERED FIRM: P-0869

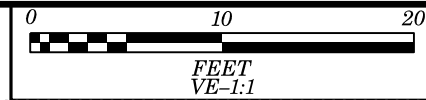
### CROSS SECTION THROUGH END BENT 1 AT STA. 22 + 45 -RP\_E-



TYPICAL SKEW ANGLE 127°46'27"

**NOTE:** INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE i4729 ls tin.tin (DATED 04/19/2017)

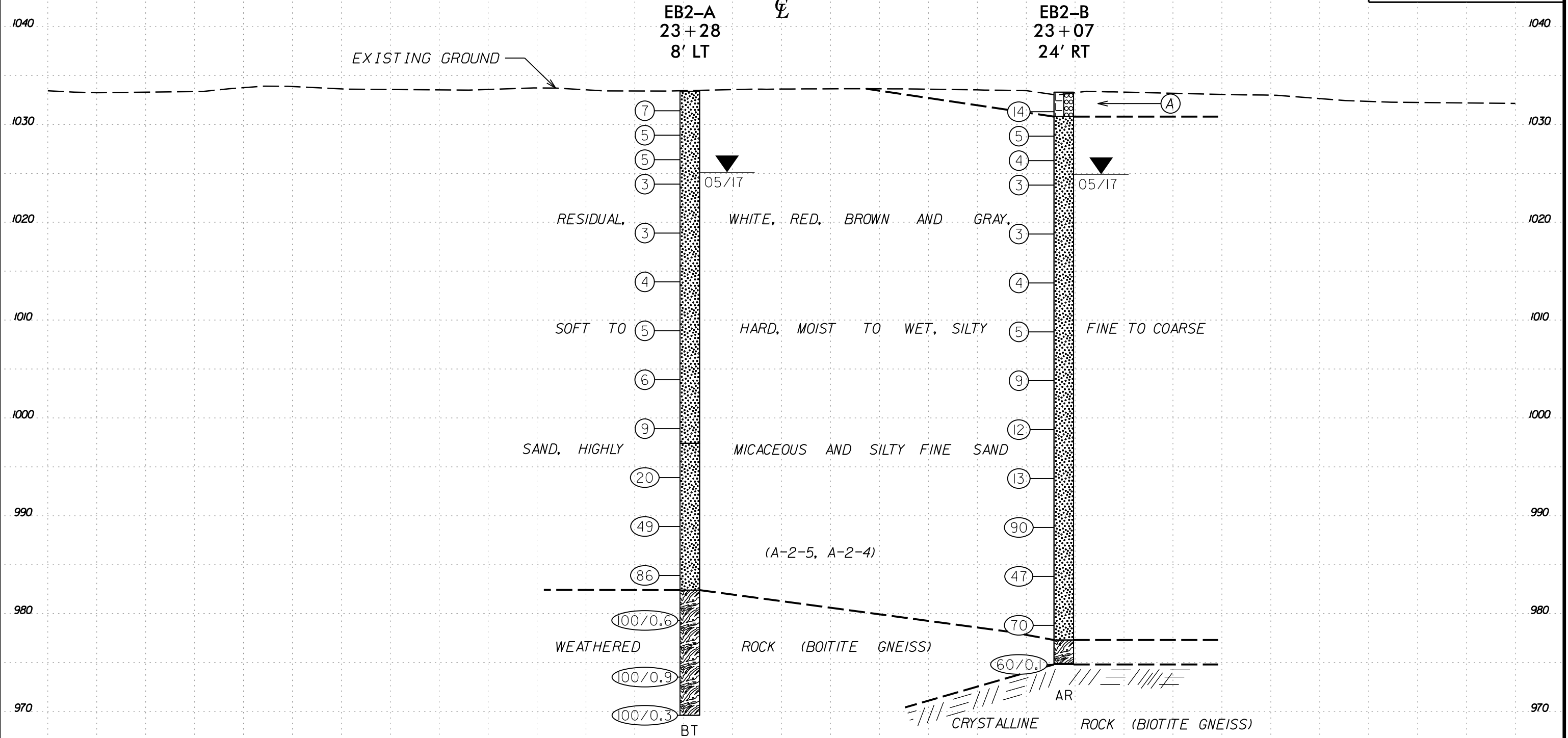




PROJECT REFERENCE NO.	SHEET NO.
L-4729A	5

**Terracon**  
 Consulting Engineers & Scientists  
 2401 BRENTWOOD ROAD, SUITE 107  
 RALEIGH, NORTH CAROLINA 27604  
 PHONE: (919) 873-2211 FAX: (919) 873-9555  
 NC REGISTERED FIRM: P-0869

### CROSS SECTION THROUGH END BENT 2 AT STA. 23+22 -RP\_E-



(A) ROADWAY EMBANKMENT, DARK GRAY, MEDIUM DENSE, MOIST, SILTY FINE TO COARSE SAND WITH SOME GRAVEL (A-1-b)

TYPICAL SKEW ANGLE 122°30'55"

**NOTE:** INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE i4729\_ls\_tin.tin (DATED 04/19/2017)



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 70175072		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.										
SITE DESCRIPTION BRIDGE OVER RAMP (-E_CONN_REV-) ON RAMP (-RP_E-) BETWEEN I-26 AND U.S. 74							GROUND WTR (ft)									
BORING NO. EB1-A RPE		STATION 22+48		OFFSET 8 ft LT		ALIGNMENT -RPE-										
COLLAR ELEV. 1,031.5 ft		TOTAL DEPTH 50.0 ft		NORTHING 561,397		EASTING 1,042,632										
						0 HR.	8.2									
						24 HR.	8.0									
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER EKLUND, M. A.		START DATE 05/18/17		COMP. DATE 05/18/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1035																
1030	1,028.0	3.5	22	14	10										1,031.5	GROUND SURFACE
	1,025.5	6.0	3	2	3										1,026.5	ROADWAY EMBANKMENT RED-BROWN, FINE SANDY SILT WITH SOME GRAVEL
1025	1,023.0	8.5	2	1	1											RESIDUAL RED-BROWN, BROWN AND WHITE, SILTY FINE TO COARSE SAND, HIGHLY MICACEOUS
1020	1,018.0	13.5	2	2	2											
1015	1,013.0	18.5	2	3	3											
1010	1,008.0	23.5	2	2	3											
1005	1,003.0	28.5	3	4	7											
1000	998.0	33.5	4	5	8											
995	993.0	38.5	6	13	39											
990	988.0	43.5	49	51/0.3											990.5	WEATHERED ROCK (BIOTITE GNEISS)
985	983.0	48.5														
	981.6	49.9													981.6	CRYSTALLINE ROCK (BIOTITE GNEISS)
		60/0.1													981.5	Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 981.5 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

WBS 70175072		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.										
SITE DESCRIPTION BRIDGE OVER RAMP (-E_CONN_REV-) ON RAMP (-RP_E-) BETWEEN I-26 AND U.S. 74							GROUND WTR (ft)									
BORING NO. EB1-B RPE		STATION 22+22		OFFSET 24 ft RT		ALIGNMENT -RPE-										
COLLAR ELEV. 1,031.0 ft		TOTAL DEPTH 53.1 ft		NORTHING 561,359		EASTING 1,042,648										
						0 HR.	8.0									
						24 HR.	7.7									
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER EKLUND, M. A.		START DATE 05/17/17		COMP. DATE 05/17/17		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
1035																
1030	1,030.0	1.0	3	3	5										1,031.0	GROUND SURFACE
	1,027.5	3.5	29	10	6										1,025.5	ROADWAY EMBANKMENT RED-BROWN, FINE SANDY SILT, WITH SOME MICA
1025	1,025.0	6.0	3	3	3											RESIDUAL RED-BROWN, BROWN AND WHITE, SILTY FINE TO COARSE SAND, HIGHLY MICACEOUS
1020	1,022.5	8.5	1	2	1											
1015	1,017.5	13.5	1	1	1											
1010	1,012.5	18.5	1	2	1											
1005	1,007.5	23.5	2	3	5											
1000	1,002.5	28.5	4	4	6											
995	997.5	33.5	3	4	5											
990	992.5	38.5	3	4	7											
985	987.5	43.5	3	4	6											
980	982.5	48.5	8	9	11											
	978.0	53.0													979.0	WEATHERED ROCK (BIOTITE GNEISS)
		60/0.1													978.0	CRYSTALLINE ROCK (BIOTITE GNEISS)
															977.9	Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 977.9 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

NCDOT BORE DOUBLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT.GDT 6/16/17



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 70175072		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.								
SITE DESCRIPTION BRIDGE OVER RAMP (-E_CONN_REV-) ON RAMP (-RP_E-) BETWEEN I-26 AND U.S. 74							GROUND WTR (ft)							
BORING NO. EB2-A RPE		STATION 23+28		OFFSET 8 ft LT		ALIGNMENT -RPE-								
COLLAR ELEV. 1,033.4 ft		TOTAL DEPTH 63.8 ft		NORTHING 561,465		EASTING 1,042,675								
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER EKLUND, M. A.		START DATE 05/16/17		COMP. DATE 05/16/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1035														1,033.4 GROUND SURFACE 0.0
	1,032.4	1.0	2	3	4								M	RESIDUAL WHITE AND RED TO BROWN, SILTY FINE TO COARSE SAND, HIGHLY MICACEOUS
1030	1,029.9	3.5	2	2	3								M	
	1,027.4	6.0	3	2	3								M	
1025	1,024.9	8.5	1	1	2								W	
1020	1,019.9	13.5	1	1	2								W	
1015	1,014.9	18.5	2	1	3								W	
1010	1,009.9	23.5	2	2	3								W	
1005	1,004.9	28.5	WOH	3	3								W	
1000	999.9	33.5	3	4	5								W	
995	994.9	38.5	8	9	11								W	
990	989.9	43.5	13	20	29								W	
985	984.9	48.5	14	45	41								W	
980	979.9	53.5	77	23/0.1									W	
975	974.9	58.5	48	32	68/0.4								W	
970	969.9	63.5	100/0.3										W	
														Boring Terminated at Elevation 969.6 ft IN WEATHERED ROCK (BIOTITE GNEISS)

WBS 70175072		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.								
SITE DESCRIPTION BRIDGE OVER RAMP (-E_CONN_REV-) ON RAMP (-RP_E-) BETWEEN I-26 AND U.S. 74							GROUND WTR (ft)							
BORING NO. EB2-B RPE		STATION 23+07		OFFSET 24 ft RT		ALIGNMENT -RPE-								
COLLAR ELEV. 1,033.3 ft		TOTAL DEPTH 58.5 ft		NORTHING 561,430		EASTING 1,042,690								
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic										
DRILLER EKLUND, M. A.		START DATE 05/16/17		COMP. DATE 05/16/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1035														1,033.3 GROUND SURFACE 0.0
	1,032.3	1.0	6	9	5								M	ROADWAY EMBANKMENT DARK GRAY, SILTY FINE TO COARSE SAND WITH SOME GRAVEL
1030	1,029.8	3.5	4	3	2								M	
	1,027.3	6.0	2	2	2								M	
1025	1,024.8	8.5	2	1	2								W	
1020	1,019.8	13.5	1	1	2								W	
1015	1,014.8	18.5	1	2	2								W	
1010	1,009.8	23.5	1	2	3								W	
1005	1,004.8	28.5	3	4	5								W	
1000	999.8	33.5	5	5	7								W	
995	994.8	38.5	4	5	8								W	
990	989.8	43.5	22	47	43								W	
985	984.8	48.5	16	19	28								W	
980	979.8	53.5	23	30	40								W	
975	974.9	58.4	60/0.1										W	
														977.3 WEATHERED ROCK (BIOTITE GNEISS) 56.0
														974.9 WEATHERED ROCK (BIOTITE GNEISS) 58.4
														974.8 CRYSTALLINE ROCK (BIOTITE GNEISS) 58.5
														Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 974.8 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS)

NCDOT BORE DOUBLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT.GDT 6/16/17







**SITE PHOTOGRAPHS**

**REALIGNMENT OF I-26 AND US 74 INTERCHANGE NORTH OF NC 108 - BRIDGE OVER RAMP (-E\_CONN\_REV-) ON RAMP (-RP\_E-) BETWEEN I-26 AND US 74**



PHOTOGRAPH NO. 1: SOUTH APPROACH TO END BENT NO. 1 ON -RP\_E- ALIGNMENT, LOOKING NORTH



PHOTOGRAPH NO. 3: ON -E\_CONN\_REV-ALIGNMENT RIGHT SHOULDER, NORTH OF -RP\_E- ALIGNMENT, LOOKING SOUTH



PHOTOGRAPH NO. 2: ON -E\_CONN\_REV-ALIGNMENT LEFT SHOULDER, SOUTH OF -RP\_E- ALIGNMENT, LOOKING NORTH



PHOTOGRAPH NO. 4: NORTH APPROACH TO END BENT NO.2 ON -RP\_E- ALIGNMENT, LOOKING SOUTH



REFERENCE: I-4729A

PROJECT: 34243.1.2

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY POLK  
 PROJECT DESCRIPTION REALIGNMENT OF I-26 AND  
US 74 INTERCHANGE NORTH OF NC 108

SITE DESCRIPTION BRIDGE OVER I-26 (-EL-)  
ON RAMP (-RP F-) BETWEEN US 74 AND I-26

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-6	CROSS SECTIONS
7-11	BORE LOGS, CORE LOG AND CORE PHOTOGRAPHS
12-13	SOIL TEST RESULTS AND CORE SAMPLE RESULTS
14	SITE PHOTOGRAPHS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4729A	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

RIGGS, A. F.

WERITZ, M. A.

EKLUND, M. A.

STUDNICKY, R. T.

McMILLIAN, M. F.

INVESTIGATED BY TERRACON CONSULTANTS

DRAWN BY FIELDS, W. D.

CHECKED BY RIGGS, A. F.

SUBMITTED BY TERRACON CONSULTANTS

DATE AUGUST 2017

**Terracon**  
 Consulting Engineers & Scientists

2401 BRENTWOOD ROAD, SUITE 107  
 RALEIGH, NORTH CAROLINA 27604  
 PHONE: (919) 873-2211 FAX: (919) 873-9555  
 NC REGISTERED FIRM: F-0869



DocuSigned by:  
Andrew Nash 8/10/2017  
 671DA68582E048E9 SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED**

# 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 206, 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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</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>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. 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, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE 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 BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																		
<p><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (&lt;= 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-2</th><th>A-3</th><th>A-4</th><th>A-5</th> <th>A-6</th><th>A-7</th><th>A-8</th><th>A-9</th><th>A-10</th> <th>A-11</th><th>A-12</th><th>A-13</th><th>A-14</th><th>A-15</th> <th>A-16</th><th>A-17</th><th>A-18</th><th>A-19</th><th>A-20</th> </tr> <tr> <td>GROUP CLASS.</td> <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-8</td><td>A-9</td><td>A-10</td><td>A-11</td><td>A-12</td><td>A-13</td><td>A-14</td><td>A-15</td><td>A-16</td><td>A-17</td> </tr> <tr> <td>SYMBOL</td> <td colspan="5">[Pattern]</td><td colspan="5">[Pattern]</td><td colspan="5">[Pattern]</td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	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-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	SYMBOL	[Pattern]					[Pattern]					[Pattern]					<p><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p><b>WEATHERED ROCK (WR)</b></p> <p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p>										<p><b>CRYSTALLINE ROCK (CR)</b></p> <p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p>									
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<p><b>MINERALOGICAL COMPOSITION</b></p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p><b>COMPRESSION</b></p> <p>SLIGHTLY COMPRESSIBLE LL &lt; 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL &gt; 50</p>										<p><b>NON-CRYSTALLINE ROCK (NCR)</b></p> <p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>										<p><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b></p> <p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																																																																																		
<p><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; text-align: center;"> <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>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY 35% AND ABOVE</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	<p><b>GROUND WATER</b></p> <p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▽ PW STATIC WATER LEVEL AFTER 24 HOURS ▽ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA ○ SPRING OR SEEP</p>										<p><b>WEATHERING</b></p> <p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V SL) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SL) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>																																																																								
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<p><b>COLOR</b></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>										<p><b>INDURATION</b></p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																																																																																																						
<p><b>FRACURE SPACING</b></p> <p>TERM: VERY WIDE, WIDE, MODERATELY CLOSE, CLOSE, VERY CLOSE SPACING: MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET</p>										<p><b>BEDDING</b></p> <p>TERM: VERY THICKLY BEDDED, THICKLY BEDDED, THINLY BEDDED, VERY THINLY BEDDED, THICKLY LAMINATED, THINLY LAMINATED THICKNESS: 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, &lt; 0.008 FEET</p>																																																																																																						
<p><b>NOTES:</b></p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p>										<p><b>BENCH MARK:</b> BL-6; N: 561,029, E: 1,04,206.8 STA. 66+44.64 ELEVATION: 1063.27 FEET</p>																																																																																																						

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

# SUBSURFACE INVESTIGATION

**SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES  
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS**

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

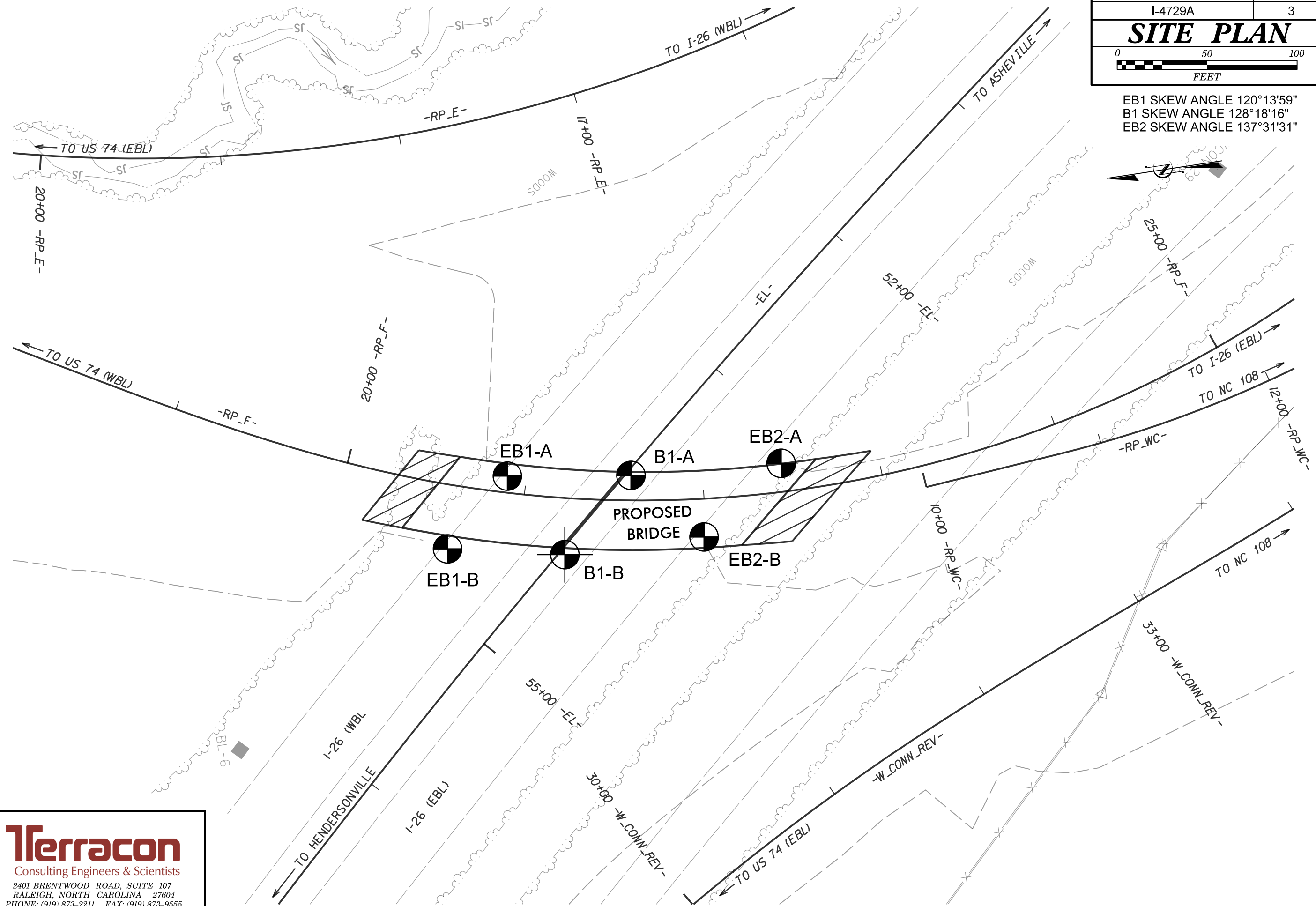
AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

<p><b>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</b></p> <p>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.</p>		SURFACE CONDITIONS					<p><b>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</b></p> <p>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</p>						
		VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings							
<b>STRUCTURE</b>		DECREASING SURFACE QUALITY →					<b>COMPOSITION AND STRUCTURE</b>						
<p> INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</p> <p> BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</p> <p> VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</p> <p> BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</p> <p> DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</p> <p> LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</p>	DECREASING INTERLOCKING OF ROCK PIECES ⇓	90	80	70	60	50	40	30	20	10	N/A	N/A	<p> <b>A.</b> Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.</p> <p> <b>B.</b> Sandstone with thin inter-layers of siltstone</p> <p> <b>C.</b> Sandstone and siltstone in similar amounts</p> <p> <b>D.</b> Siltstone or silty shale with sandstone layers</p> <p> <b>E.</b> Weak siltstone or clayey shale with sandstone layers</p> <p><b>C, D, E, and G</b> - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to <b>F</b> and <b>H</b>.</p> <p> <b>F.</b> Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</p> <p> <b>G.</b> Undisturbed silty or clayey shale with or without a few very thin sandstone layers</p> <p> <b>H.</b> Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.</p> <p>→ Means deformation after tectonic disturbance</p>
		VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings							
		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)											

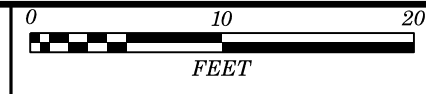


PROJECT REFERENCE NO.	SHEET NO.
I-4729A	3
<b>SITE PLAN</b>	
 0 50 100 FEET	

EB1 SKEW ANGLE 120°13'59"  
 B1 SKEW ANGLE 128°18'16"  
 EB2 SKEW ANGLE 137°31'31"



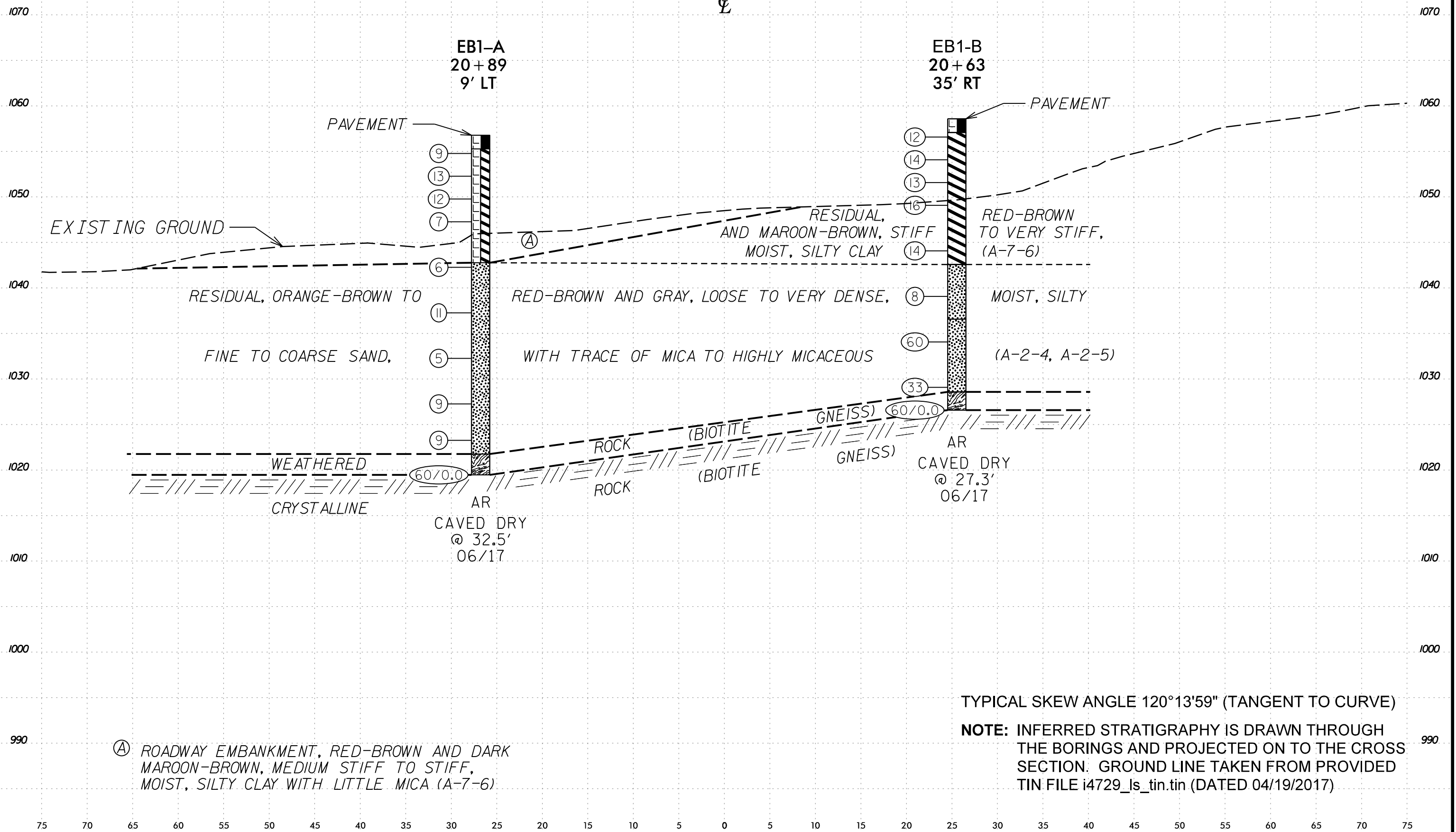
**Terracon**  
 Consulting Engineers & Scientists  
 2401 BRENTWOOD ROAD, SUITE 107  
 RALEIGH, NORTH CAROLINA 27604  
 PHONE: (919) 873-2211 FAX: (919) 873-9555  
 NC REGISTERED FIRM: F-0869



PROJECT REFERENCE NO.	SHEET NO.
I-4729	4

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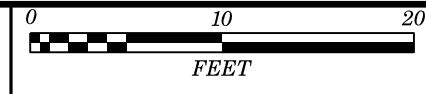
### CROSS SECTION THROUGH END BENT 1 AT STA. 20+52 -RP\_F-



Ⓐ ROADWAY EMBANKMENT, RED-BROWN AND DARK MAROON-BROWN, MEDIUM STIFF TO STIFF, MOIST, SILTY CLAY WITH LITTLE MICA (A-7-6)

TYPICAL SKEW ANGLE 120°13'59" (TANGENT TO CURVE)

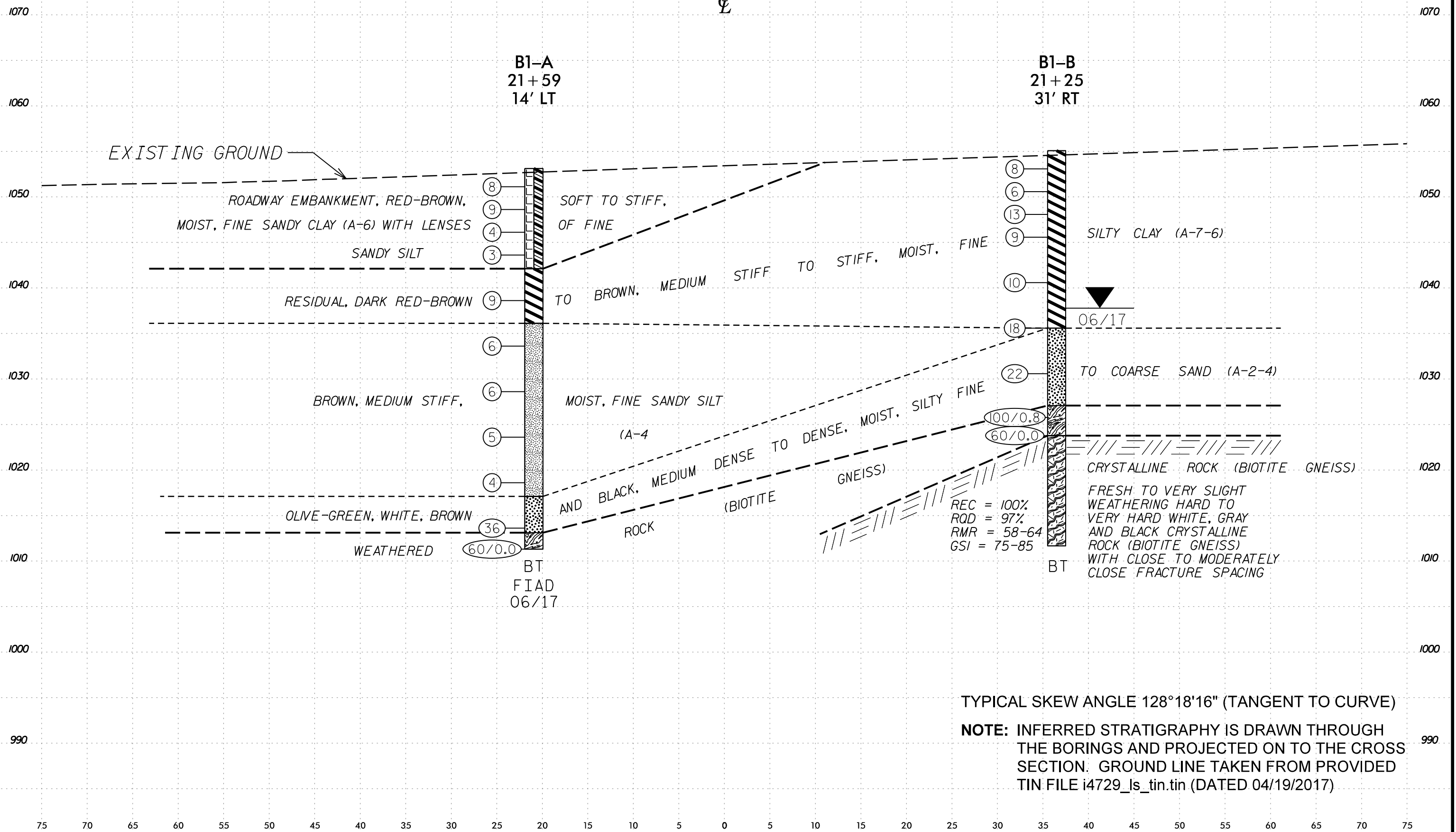
**NOTE:** INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE i4729\_ls\_tin.tin (DATED 04/19/2017)



PROJECT REFERENCE NO.	SHEET NO.
I-4729	5

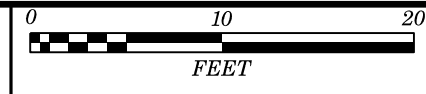
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 NC REGISTERED FIRM: P-0869

### CROSS SECTION THROUGH BENT 1 AT STA. 21+43 -RP\_F-



TYPICAL SKEW ANGLE 128°18'16" (TANGENT TO CURVE)

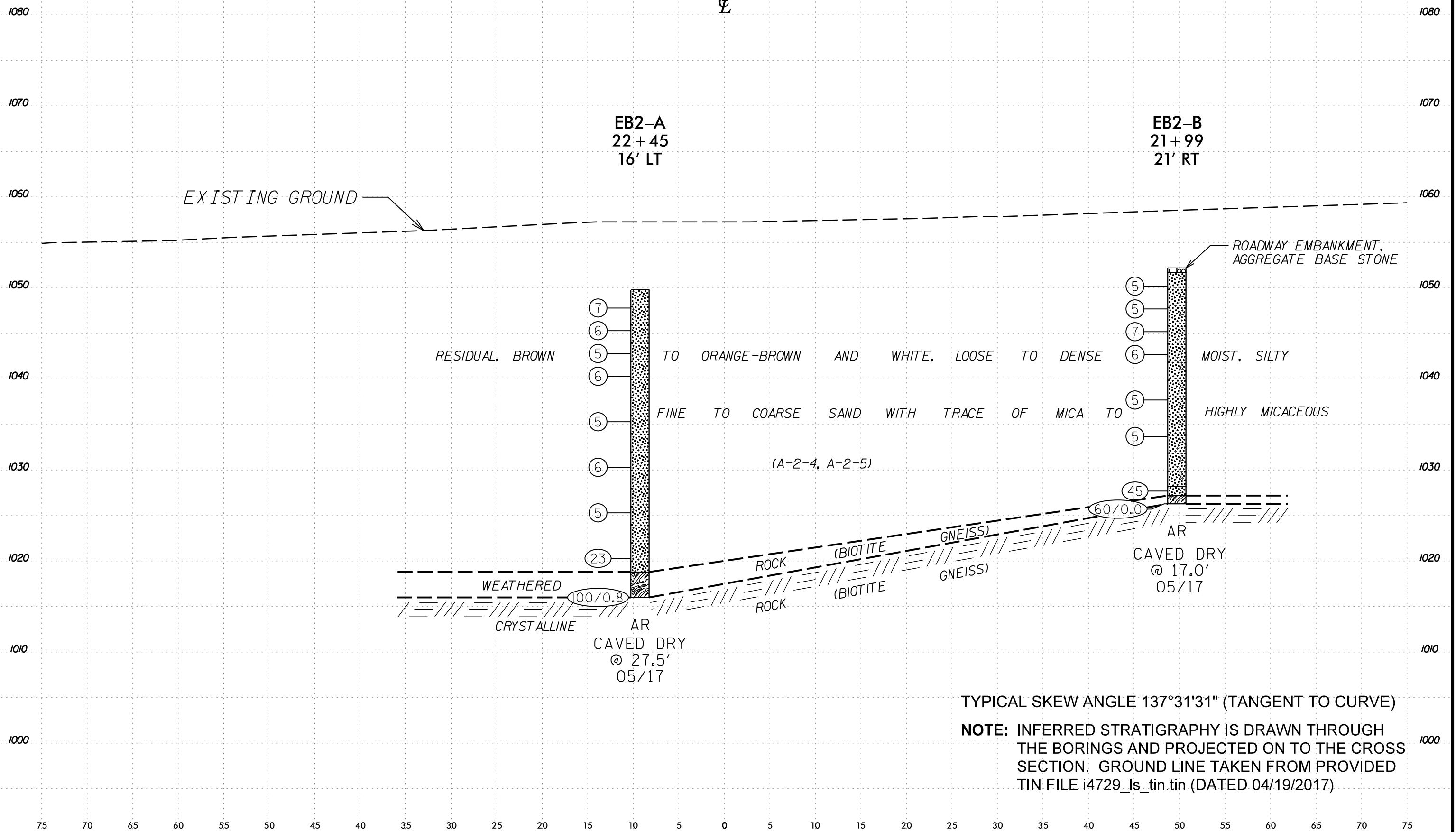
**NOTE:** INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE i4729\_ls\_tin.tin (DATED 04/19/2017)



PROJECT REFERENCE NO.	SHEET NO.
I-4729	6

**Terracon**  
 Consulting Engineers & Scientists  
 2401 BRENTWOOD ROAD, SUITE 107  
 RALEIGH, NORTH CAROLINA 27604  
 PHONE: (919) 873-2211 FAX: (919) 873-9555  
 NC REGISTERED FIRM: P-0869

### CROSS SECTION THROUGH END BENT 2 AT STA. 22+47 -RP\_F-



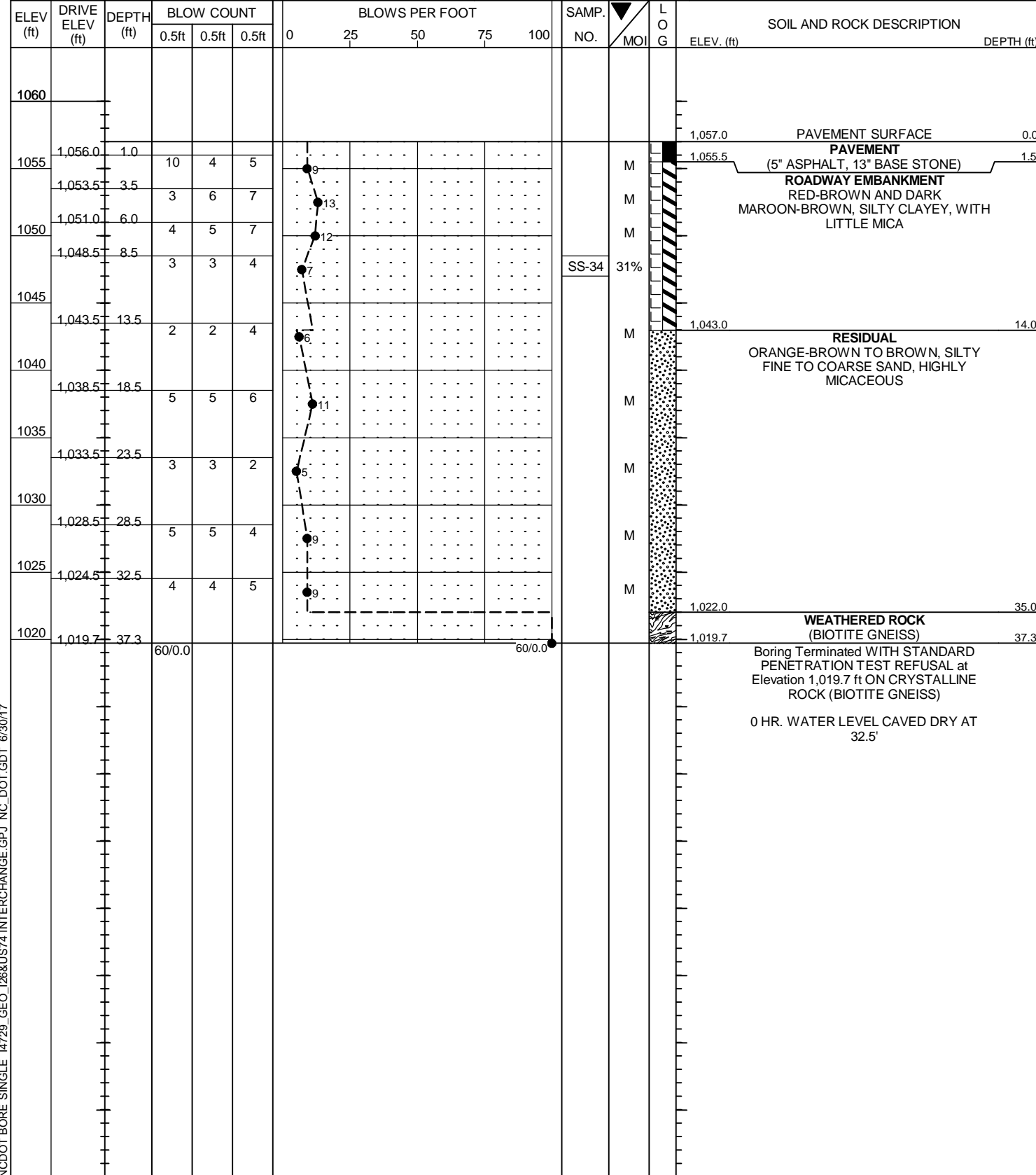
TYPICAL SKEW ANGLE 137°31'31" (TANGENT TO CURVE)

**NOTE:** INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ON TO THE CROSS SECTION. GROUND LINE TAKEN FROM PROVIDED TIN FILE i4729\_ls\_tin.tin (DATED 04/19/2017)



# GEOTECHNICAL BORING REPORT BORE LOG

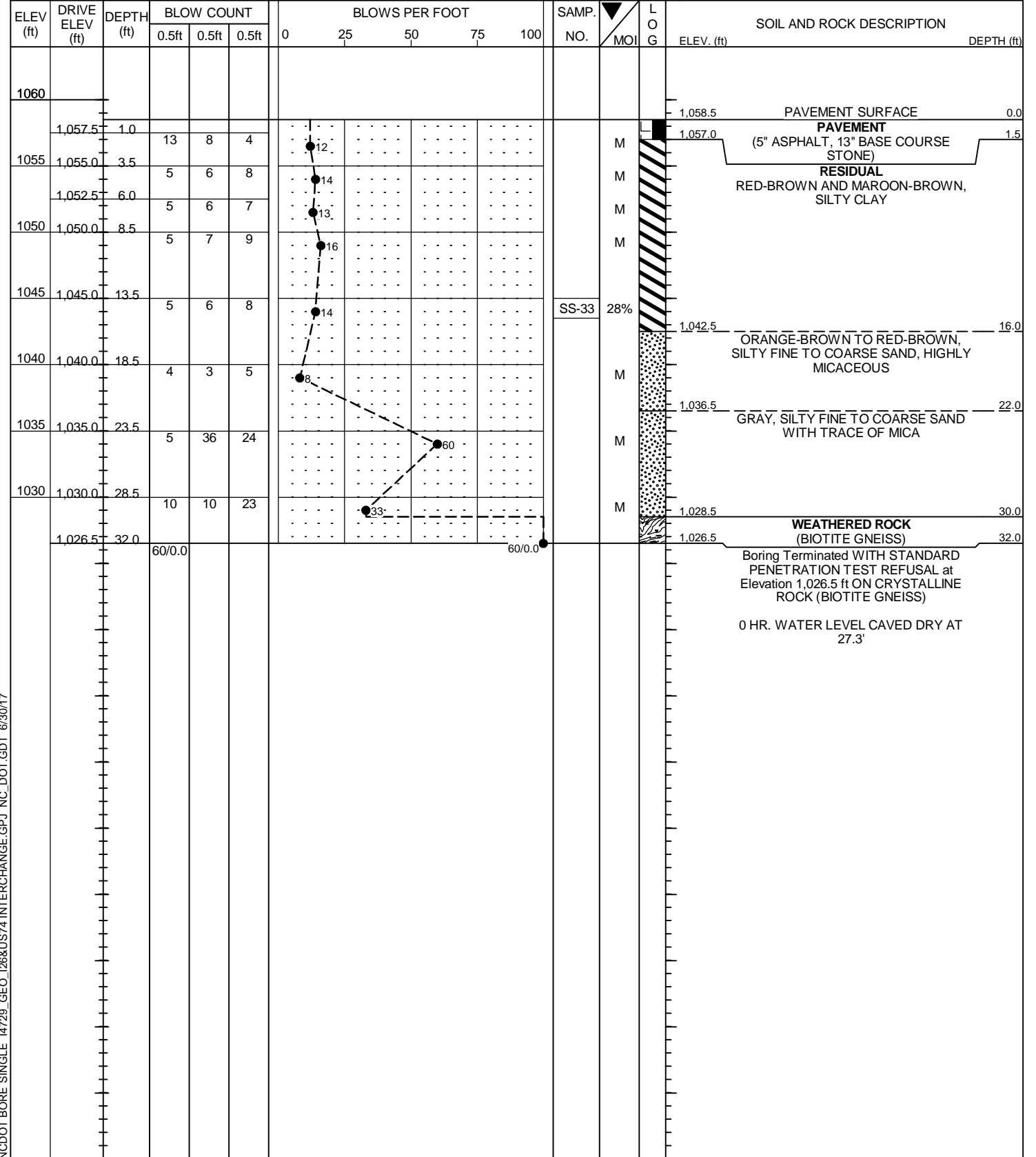
<b>WBS</b> 34243.1.2		<b>TIP</b> I-4729A		<b>COUNTY</b> POLK		<b>GEOLOGIST</b> WERITZ, M. A.	
<b>SITE DESCRIPTION</b> BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB1-A RPF		<b>STATION</b> 20+89		<b>OFFSET</b> 9 ft LT		<b>ALIGNMENT</b> -RPF-	
<b>COLLAR ELEV.</b> 1,057.0 ft		<b>TOTAL DEPTH</b> 37.3 ft		<b>NORTHING</b> 560,933		<b>EASTING</b> 1,042,335	
						<b>0 HR.</b> Caved	
						<b>24 HR.</b> FIAD	
<b>DRILL RIG/HAMMER EFF./DATE</b> TER346 DIEDRICH D-50 90% 03/10/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic	
<b>DRILLER</b> EKLUND, M. A.		<b>START DATE</b> 06/06/17		<b>COMP. DATE</b> 06/06/17		<b>SURFACE WATER DEPTH</b> N/A	



NCDOT BORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT\_GDT 6/30/17

# GEOTECHNICAL BORING REPORT BORE LOG

<b>WBS</b> 34243.1.2		<b>TIP</b> I-4729A		<b>COUNTY</b> POLK		<b>GEOLOGIST</b> WERITZ, M. A.	
<b>SITE DESCRIPTION</b> BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							<b>GROUND WTR (ft)</b>
<b>BORING NO.</b> EB1-B RPF		<b>STATION</b> 20+63		<b>OFFSET</b> 35 ft RT		<b>ALIGNMENT</b> -RPF-	
<b>COLLAR ELEV.</b> 1,058.5 ft		<b>TOTAL DEPTH</b> 32.0 ft		<b>NORTHING</b> 560,972		<b>EASTING</b> 1,042,300	
						<b>0 HR.</b> Caved	
						<b>24 HR.</b> FIAD	
<b>DRILL RIG/HAMMER EFF./DATE</b> TER346 DIEDRICH D-50 90% 03/10/2017				<b>DRILL METHOD</b> H.S. Augers		<b>HAMMER TYPE</b> Automatic	
<b>DRILLER</b> EKLUND, M. A.		<b>START DATE</b> 06/06/17		<b>COMP. DATE</b> 06/06/17		<b>SURFACE WATER DEPTH</b> N/A	



NCDOT BORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT\_GDT 6/30/17



<b>WBS</b> 34243.1.2		<b>TIP</b> I-4729A		<b>COUNTY</b> POLK		<b>GEOLOGIST</b> WERITZ, M. A.									
<b>SITE DESCRIPTION</b> BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							<b>GROUND WTR (ft)</b>								
<b>BORING NO.</b> B1-A RPF		<b>STATION</b> 21+59		<b>OFFSET</b> 14 ft LT		<b>ALIGNMENT</b> -RPF-									
<b>COLLAR ELEV.</b> 1,053.2 ft		<b>TOTAL DEPTH</b> 41.8 ft		<b>NORTHING</b> 560,865		<b>EASTING</b> 1,042,325									
<b>DRILL RIG/HAMMER EFF./DATE</b> TER346 DIEDRICH D-50 90% 03/10/2017				<b>DRILL METHOD</b> Wash Boring		<b>HAMMER TYPE</b> Automatic									
<b>DRILLER</b> EKLUND, M. A.		<b>START DATE</b> 06/02/17		<b>COMP. DATE</b> 06/02/17		<b>SURFACE WATER DEPTH</b> N/A									
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					
1055															
	1,052.2	1.0													1,053.2
1050	1,049.7	3.5	4	4	4	8									
	1,047.2	6.0	3	5	4	9									
1045	1,044.7	8.5	2	2	2	4									
	1,042.2		2	1	2	3									1,042.2
1040	1,039.7	13.5	3	4	5	9									
	1,036.2		3	3	3	6									1,036.2
1035	1,034.7	18.5	5	3	3	6									
	1,029.7	23.5	3	3	3	6									
1025	1,024.7	28.5	2	2	3	5									
	1,019.7	33.5	2	1	3	4									
1015	1,014.7	38.5	3	9	27	4									
	1,011.4	41.8													
			60/0.0												60/0.0

NCDOT BORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT\_GDT 6/30/17



# GEOTECHNICAL BORING REPORT

## BORE LOG

# GEOTECHNICAL BORING REPORT

## CORE LOG

WBS 34243.1.2		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.									
SITE DESCRIPTION BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							GROUND WTR (ft)								
BORING NO. B1-B RPF		STATION 21+25		OFFSET 31 ft RT		ALIGNMENT -RPF-									
COLLAR ELEV. 1,055.3 ft		TOTAL DEPTH 43.4 ft		NORTHING 560,908		EASTING 1,042,287									
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD Wash Boring		HAMMER TYPE Automatic											
DRILLER EKLUND, M. A.		START DATE 06/01/17		COMP. DATE 06/02/17		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1060															
1055	1,054.3	1.0												1,055.3	0.0
1050	1,051.8	3.5	3	4	4							SS-30	27%		
1045	1,046.8	8.5	4	4	5										
1040	1,041.8	13.5	3	4	6										
1035	1,036.8	18.5	3	6	12									1,035.8	19.5
1030	1,031.8	23.5	4	8	14										
1025	1,026.8	28.5	28	72/0.3										1,027.3	28.0
1020	1,024.0	31.3	60/0.0											1,024.0	31.3
1015														1,011.9	43.4
Boring Terminated at Elevation 1,011.9 ft IN CRYSTALLINE ROCK ((BIOTITE GNEISS)) 1) Advanced 2-15/16 Tricone to 31.3' 2) Advanced NW Casing to 31.3', Total 33.0' 3) Creek Water Used for Drilling Fluid 4) Advanced NQ2 Core From 31.3' to 43.4'															

WBS N/A		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.						
SITE DESCRIPTION BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							GROUND WTR (ft)					
BORING NO. B1-B RPF		STATION 21+25		OFFSET 31 ft RT		ALIGNMENT -RPF-						
COLLAR ELEV. 1,055.3 ft		TOTAL DEPTH 43.4 ft		NORTHING 560,908		EASTING 1,042,287						
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD Wash Boring		HAMMER TYPE Automatic								
DRILLER EKLUND, M. A.		START DATE 06/01/17		COMP. DATE 06/02/17		SURFACE WATER DEPTH N/A						
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
					REC. (%)	RQD (%)		REC. (%)	RQD (%)			
1024.02												
1020	1,024.0	31.3	3.5	2:45/1.0 2:37/1.0 2:47/1.0 1:25/0.5	(3.5) 100%	(3.1) 89%		(12.1) 100%	(11.7) 97%		Begin Coring @ 31.3 ft <b>CRYSTALLINE ROCK</b> FRESH TO VERY SLIGHT WEATHERING HARD TO MODERATELY HARD	31.3
1015	1,020.5	34.8	4.8	1:55/1.0 2:05/1.0 2:01/1.0 1:50/1.0 1:30/0.8	(4.8) 100%	(4.8) 100%					WHITE, GRAY AND BLACK CRYSTALLINE ROCK (BIOTITE GNEISS) CLOSE TO MODERATELY CLOSE FRACTURE SPACING WITH 10 JOINTS AT 15°-20° RMR= 58-64 GSI= 75-85	
	1,015.7	39.6	3.8	2:36/1.0 2:30/1.0 2:40/1.0 1:54/0.8	(3.8) 100%	(3.8) 100%						
	1,011.9	43.4									Boring Terminated at Elevation 1,011.9 ft IN CRYSTALLINE ROCK ((BIOTITE GNEISS))  1) Advanced 2-15/16 Tricone to 31.3' 2) Advanced NW Casing to 31.3', Total 33.0' 3) Creek Water Used for Drilling Fluid 4) Advanced NQ2 Core From 31.3' to 43.4'	43.4

NCDOT BORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT\_GDT 6/30/17

NCDOT CORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT\_GDT 6/30/17

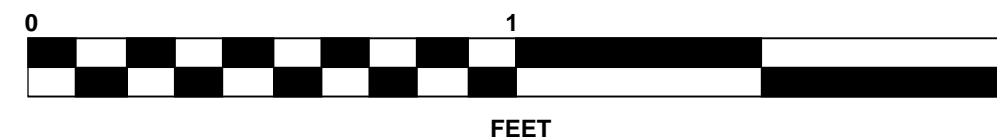
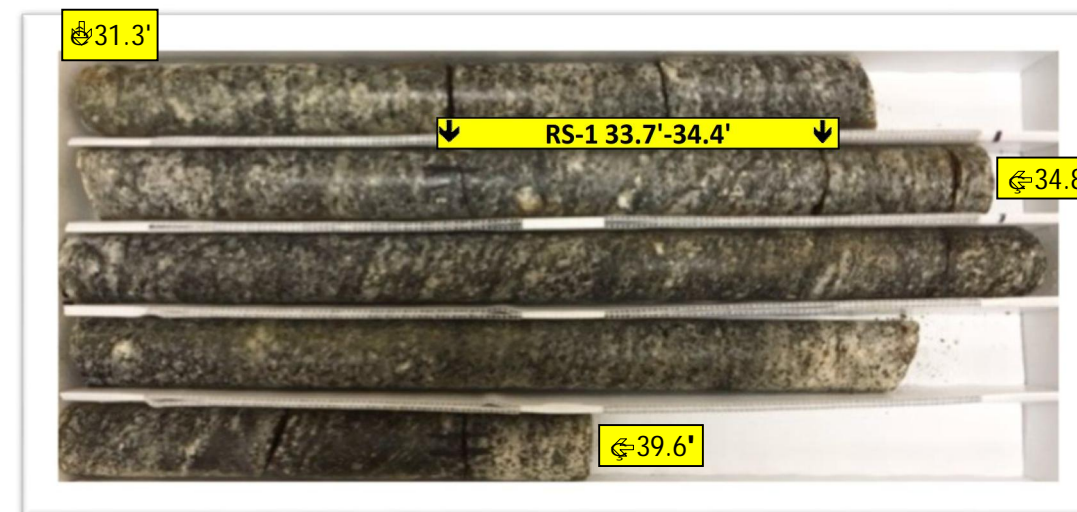
34243.1.2 (I-4729A)

BRIDGE OVER I-26 (-EL-) ON RAMP (-RP\_F-) BETWEEN US-74 AND I-26

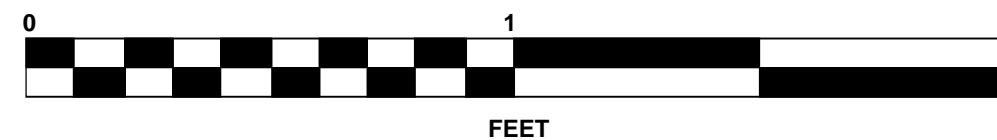
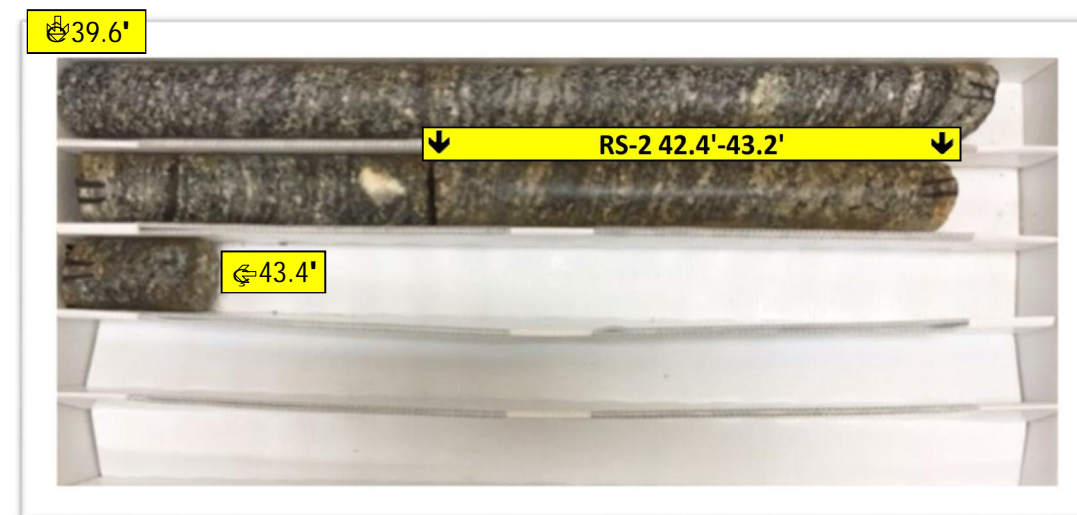
### CORE PHOTOGRAPHS

#### B1-B

BOX 1: 31.3-39.6 FEET



BOX 2: 39.6-43.4 FEET





# GEOTECHNICAL BORING REPORT

## BORE LOG

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 34243.1.2		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.										
SITE DESCRIPTION BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							GROUND WTR (ft)									
BORING NO. EB2-A RPF		STATION 22+45		OFFSET 16 ft LT		ALIGNMENT -RPF-										
COLLAR ELEV. 1,049.8 ft		TOTAL DEPTH 33.8 ft		NORTHING 560,781		EASTING 1,042,319										
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER EKLUND, M. A.		START DATE 05/31/17		COMP. DATE 05/31/17		SURFACE WATER DEPTH N/A										
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						
1050														1,049.8	GROUND SURFACE	0.0
	1,048.8	1.0	3	3	4								M		RESIDUAL BROWN, SILTY FINE SAND, HIGHLY MICACEOUS	
1045	1,046.3	3.5	3	3	3								M			
	1,043.8	6.0	3	2	3								M			
1040	1,041.3	8.5	3	3	3								M			
	1,036.3	13.5	3	2	3								M			
1035	1,031.3	18.5	3	3	3								M			
1030	1,026.3	23.5	4	2	3								M			
1025	1,021.3	28.5	8	12	11								M			
1020	1,016.8	33.0	22	78/0.3									M			
	1,016.0	33.8											M			WEATHERED ROCK (BIOTITE GNEISS)
															WEATHERED ROCK (BIOTITE GNEISS)	31.0
															Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,016.0 ft ON CRYSTALLINE ROCK (BIOTITE GNEISS)	
															24 HR. WATER LEVEL CAVED DRY AT 27.5'	

WBS 34243.1.2		TIP I-4729A		COUNTY POLK		GEOLOGIST WERITZ, M. A.											
SITE DESCRIPTION BRIDGE OVER I-26 (-EL-) ON RAMP (-RP_F-) BETWEEN U.S. 74 AND I-26							GROUND WTR (ft)										
BORING NO. EB2-B RPF		STATION 21+99		OFFSET 21 ft RT		ALIGNMENT -RPF-											
COLLAR ELEV. 1,052.8 ft		TOTAL DEPTH 25.9 ft		NORTHING 560,830		EASTING 1,042,300											
DRILL RIG/HAMMER EFF./DATE TER346 DIEDRICH D-50 90% 03/10/2017		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic													
DRILLER EKLUND, M. A.		START DATE 05/31/17		COMP. DATE 05/31/17		SURFACE WATER DEPTH N/A											
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							
1055																	
	1,051.8	1.0	3	2	3								M		ROADWAY EMBANKMENT AGGREGATE BASE COURSE STONE RESIDUAL BROWN TO ORANGE-BROWN, SILTY FINE SAND, HIGHLY MICACEOUS		
1050	1,049.3	3.5	3	2	3								M				
	1,046.8	6.0	4	4	3								M				
1045	1,044.3	8.5	4	3	3								M				
	1,039.3	13.5	3	3	2								M				
1040	1,035.3	17.5	3	2	3								M				
1035	1,029.3	23.5	7	11	34								M				
1030	1,026.9	25.9											M				
																WHITE, GRAY AND BLACK, SILTY FINE TO COARSE SAND WITH TRAE OF MICA	24.0
																WEATHERED ROCK (BIOTITE GNEISS)	25.0
															Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 1,026.9 ft ON CRYSTALLINE ROCK (BIOTITE GNEISS)	25.9	
															24 HR. WATER LEVEL CAVED DRY AT 17.0'		

NCDOT BORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT.GDT 6/30/17

NCDOT BORE SINGLE I4729\_GEO\_I26&US74 INTERCHANGE.GPJ NC\_DOT.GDT 6/30/17





## UNCONFINED COMPRESSION (ASTM D7012 Method C)

Project: 34243.1.2 (1-4729A)  
 Description: BRIDGE OVER I-26 (-EL-) ON RAMP (-RP\_F-) BETWEEN US-74 AND I-26  
 County: POLK COUNTY, NORTH CAROLINA  
 F. A. ID No.: N/A

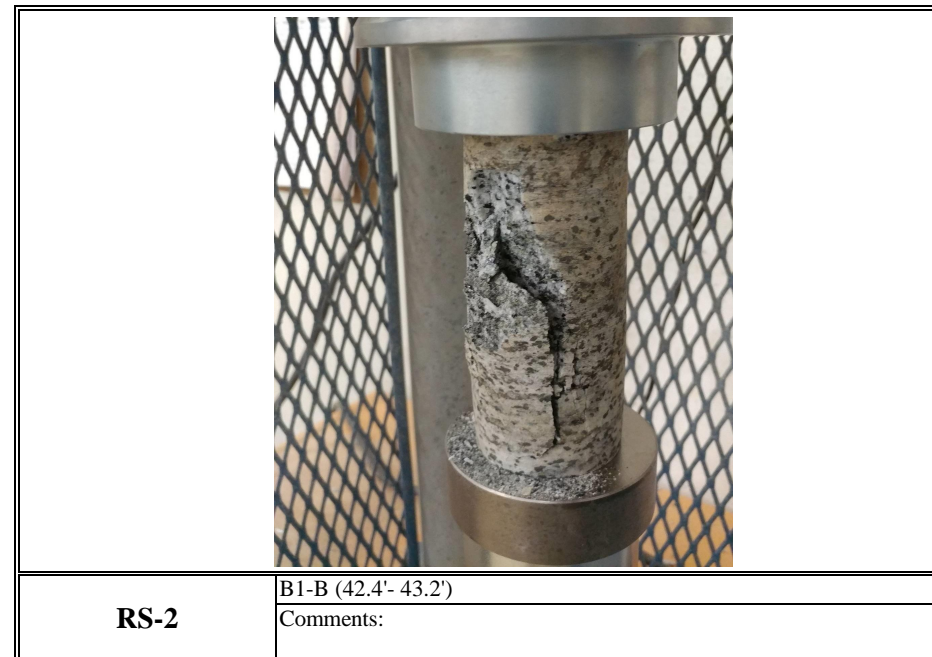
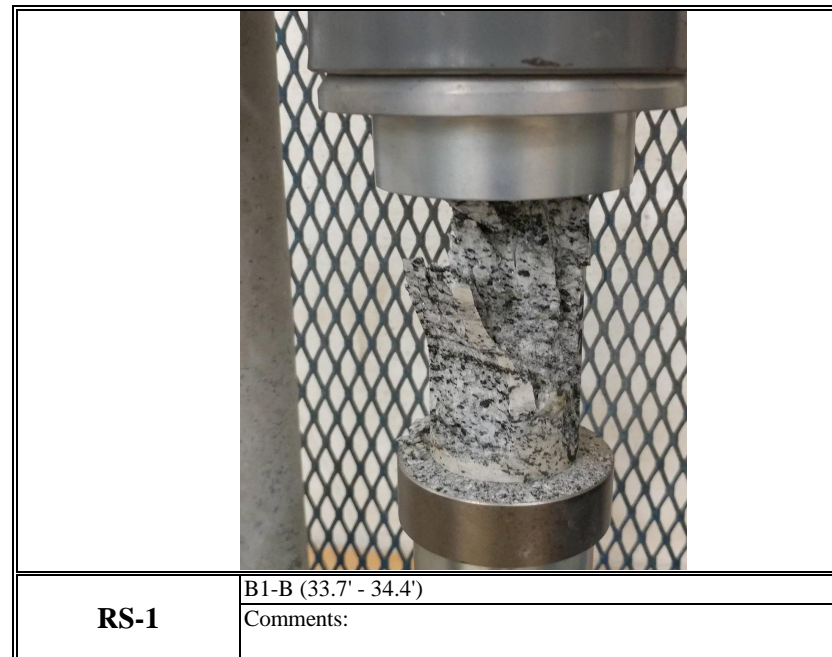
TERRACON Project No.: 70175072  
 Tested By: SFS (Geotechnics)  
 Reviewed By: GEM (Geotechnic)  
 Report Date: JUNE 27, 2017



Boring No.	Sample Id	Depth (ft)	Dimensions, in.		Specific Gravity	Area (in <sup>2</sup> )	Unit Weight (lbs/ft <sup>3</sup> )	Loading Rate (lb/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)	Rock Type (GSI*)
			Length	Diameter								
B1-B	RS-1	33.7 - 34.4	4.12	1.99	2.77	3.11	172.0	139	22,035	7,100	0.10	Biotite Gneiss (75-85)
B1-B	RS-2	42.4 - 43.2	4.70	1.98	2.82	3.09	174.0	150	28,315	9,170	0.07	

NOTES: \*GEOLOGIC STRENGTH INDEX  
 Effective (as received) unit weight  
 Loading rates were selected to target reaching failure between 2 and 15 minutes.

ASTM D4543-08 *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."





34243.1.2 (I-4729A)  
SITE PHOTOGRAPHS

REALIGNMENT OF I-26 AND US 74 INTERCHANGE NORTH OF NC 108 - BRIDGE OVER I-26 (-EL-) ON RAMP (-RP\_F-) BETWEEN US-74 AND I-26



PHOTOGRAPH NO. 1: NORTH APPROACH TO END BENT NO. 1 ON -RP\_F- ALIGNMENT, LOOKING SOUTH



PHOTOGRAPH NO. 3: ON I-26 (EBL) -EL- ALIGNMENT OUTSIDE SHOULDER, WEST OF -RP\_F- ALIGNMENT, LOOKING EAST



PHOTOGRAPH NO. 2: ON I-26 (WBL) -EL- ALIGNMENT OUTSIDE SHOULDER, EAST OF -RP\_F- ALIGNMENT, LOOKING WEST



PHOTOGRAPH NO. 4: SOUTH APPROACH TO END BENT NO. 2 ON -RP\_F- ALIGNMENT, LOOKING NORTH



REFERENCE: I-4729AA

PROJECT: N/A

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

COUNTY POLK  
 PROJECT DESCRIPTION REALIGNMENT OF I-26 AND  
US 74 INTERCHANGE NORTH OF NC 108  
IN COLUMBUS, NORTH CAROLINA  
 SITE DESCRIPTION CULVERT AT STA. 20+89 -RP E-  
AND STA. 16+47 -RP F-

**CONTENTS**

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-6	BORE LOGS
7	LABORATORY SAMPLE RESULTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4729A	1	7

**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:
- 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.
  - 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.

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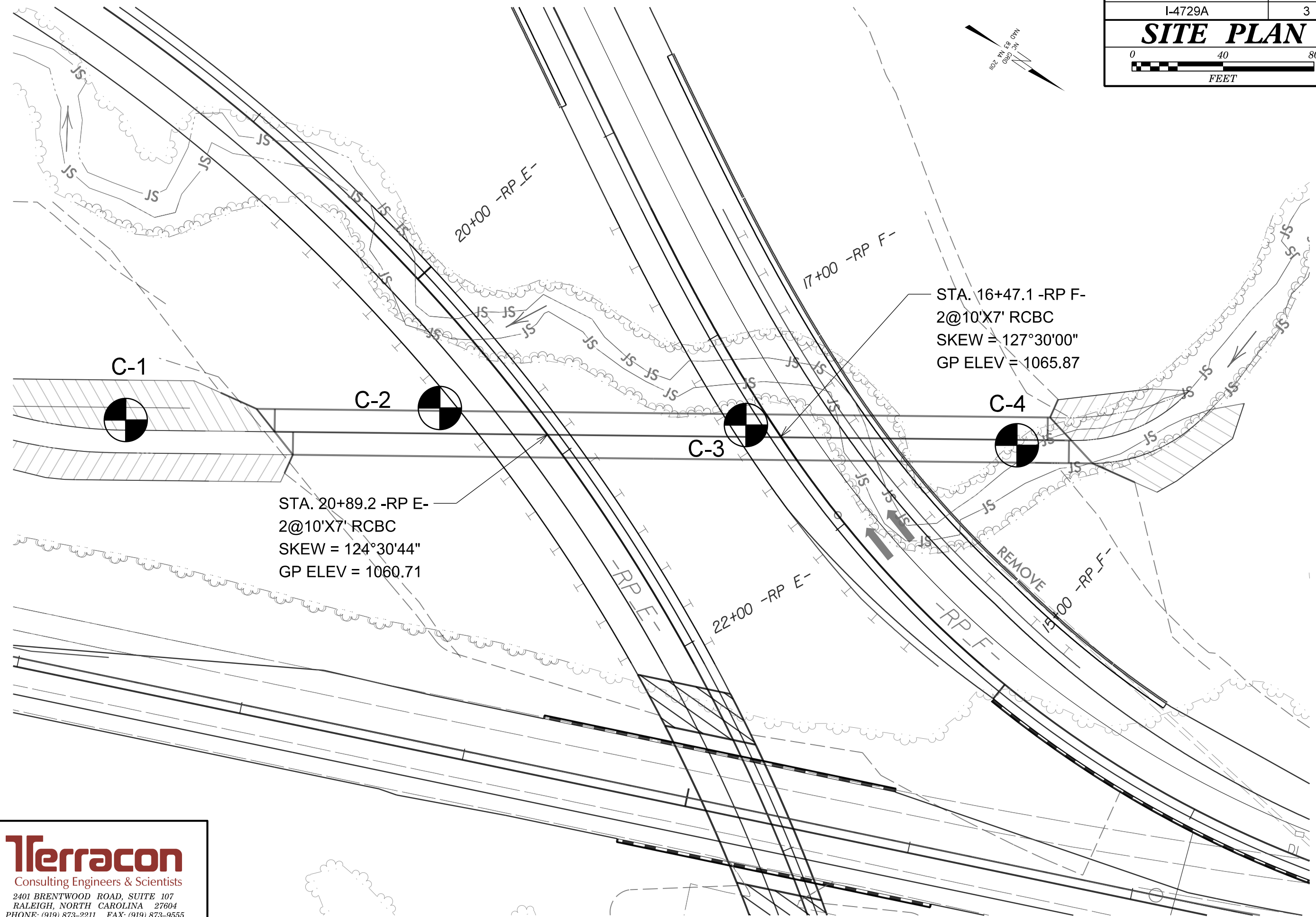
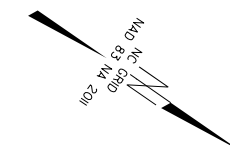
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Andrew Nash 8/10/2017  
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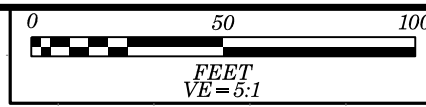




PROJECT REFERENCE NO.	SHEET NO.
I-4729A	3
<b>SITE PLAN</b>	
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PROJECT REFERENCE NO. I-4729A	SHEET NO. 4
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