

REFERENCE: BR-0002

PROJECT: 67002

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

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| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
| N.C. | BR-0002 | 1 | 18 |

STRUCTURE
SUBSURFACE INVESTIGATION

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COUNTY ASHE
PROJECT DESCRIPTION REPLACE BRIDGE #8 ON NC 194
OVER NORTH FORK NEW RIVER

SITE DESCRIPTION _____

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 1919 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.

PERSONNEL

C.D. JOHNSON

D.O. CHEEK

C.J. COFFEY

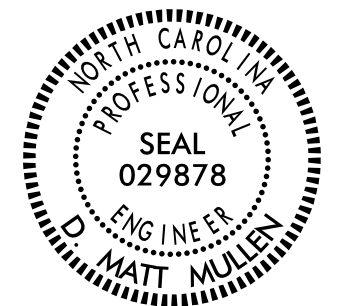
INVESTIGATED BY D.M. MULLEN

DRAWN BY DMM

CHECKED BY J.C. KUHNE

SUBMITTED BY JCK

DATE 8/2/2019



DocuSigned by:
D Matt Mullen 8/2/2019
18909BD3CD5740C 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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></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 (RQD) - 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 (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (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> | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | ANGULARITY OF GRAINS | | | | | | | | | | WEATHERED ROCK (WR) | | | | | | | | | | CRYSTALLINE ROCK (CR) | | | | | | | | | |
| <p>GENERAL CLASS. GRANULAR MATERIALS (≤ 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS</p> | | | | | | | | | | <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> | | | | | | | | | | <p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</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> | | | | | | | | | |
| MINERALOGICAL COMPOSITION | | | | | | | | | | COMPRESSION | | | | | | | | | | NON-CRYSTALLINE ROCK (NCR) | | | | | | | | | | COASTAL PLAIN SEDIMENTARY ROCK (CP) | | | | | | | | | |
| <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> | | | | | | | | | | <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</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>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p> | | | | | | | | | |
| PERCENTAGE OF MATERIAL | | | | | | | | | | GROUND WATER | | | | | | | | | | WEATHERING | | | | | | | | | | MISCELLANEOUS SYMBOLS | | | | | | | | | |
| <p>ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL</p> <p>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> | | | | | | | | | | <p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▽ STATIC WATER LEVEL AFTER 24 HOURS ▽PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA ○ SPRING OR SEEP</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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> 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. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p> | | | | | | | | | | <p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY</p> <p>DIP & DIP DIRECTION OF ROCK STRUCTURES SPT DMT VST PMT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION</p> <p>SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE</p> | | | | | | | | | |
| TEXTURE OR GRAIN SIZE | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | ABBREVIATIONS | | | | | | | | | |
| <p>U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053</p> | | | | | | | | | | <p>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> | | | | | | | | | | <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | | | | | | | | | | <p>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</p> <p>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</p> <p>VST - VANE SHEAR TEST WEA. - WEATHERED γ_s - UNIT WEIGHT γ_d - DRY UNIT WEIGHT</p> <p>SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p> | | | | | | | | | |
| SOIL MOISTURE - CORRELATION OF TERMS | | | | | | | | | | EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | FRACTURE SPACING | | | | | | | | | | BEDDING | | | | | | | | | |
| <p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p> <p>LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</p> <p>- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</p> | | | | | | | | | | <p>DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST</p> <p>ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input checked="" type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG-CARB. <input type="checkbox"/> CORE BIT</p> <p>HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE: <input type="checkbox"/> -B <input type="checkbox"/> -H <input checked="" type="checkbox"/> -N XWL</p> <p>HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST</p> | | | | | | | | | | <p>TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET</p> | | | | | | | | | | <p>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> | | | | | | | | | |
| PLASTICITY | | | | | | | | | | INDURATION | | | | | | | | | | FRAC. SPACING | | | | | | | | | | BEDDING | | | | | | | | | |
| <p>NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH</p> | | | | | | | | | | <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p> | | | | | | | | | | <p>FRAC. SPACING</p> | | | | | | | | | | <p>BEDDING</p> | | | | | | | | | |
| COLOR | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | ABBREVIATIONS | | | | | | | | | |
| <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>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> | | | | | | | | | | <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | | | | | | | | | | <p>SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p> | | | | | | | | | |
| TEXTURE OR GRAIN SIZE | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | ABBREVIATIONS | | | | | | | | | |
| <p>U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053</p> | | | | | | | | | | <p>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> | | | | | | | | | | <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | | | | | | | | | | <p>SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p> | | | | | | | | | |
| SOIL MOISTURE - CORRELATION OF TERMS | | | | | | | | | | EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | FRACTURE SPACING | | | | | | | | | | BEDDING | | | | | | | | | |
| <p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p> <p>LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</p> <p>- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</p> | | | | | | | | | | <p>DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST</p> <p>ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input checked="" type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE * STEEL TEETH <input type="checkbox"/> TRICONE * TUNG-CARB. <input type="checkbox"/> CORE BIT</p> <p>HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE: <input type="checkbox"/> -B <input type="checkbox"/> -H <input checked="" type="checkbox"/> -N XWL</p> <p>HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST</p> | | | | | | | | | | <p>TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET</p> | | | | | | | | | | <p>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> | | | | | | | | | |
| PLASTICITY | | | | | | | | | | INDURATION | | | | | | | | | | FRAC. SPACING | | | | | | | | | | BEDDING | | | | | | | | | |
| <p>NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH</p> | | | | | | | | | | <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p> | | | | | | | | | | <p>FRAC. SPACING</p> | | | | | | | | | | <p>BEDDING</p> | | | | | | | | | |
| COLOR | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | ABBREVIATIONS | | | | | | | | | |
| <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>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> | | | | | | | | | | <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | | | | | | | | | | <p>SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p> | | | | | | | | | |

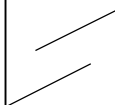
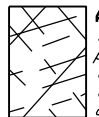
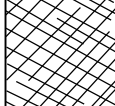
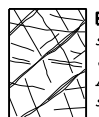





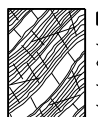


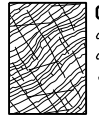

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

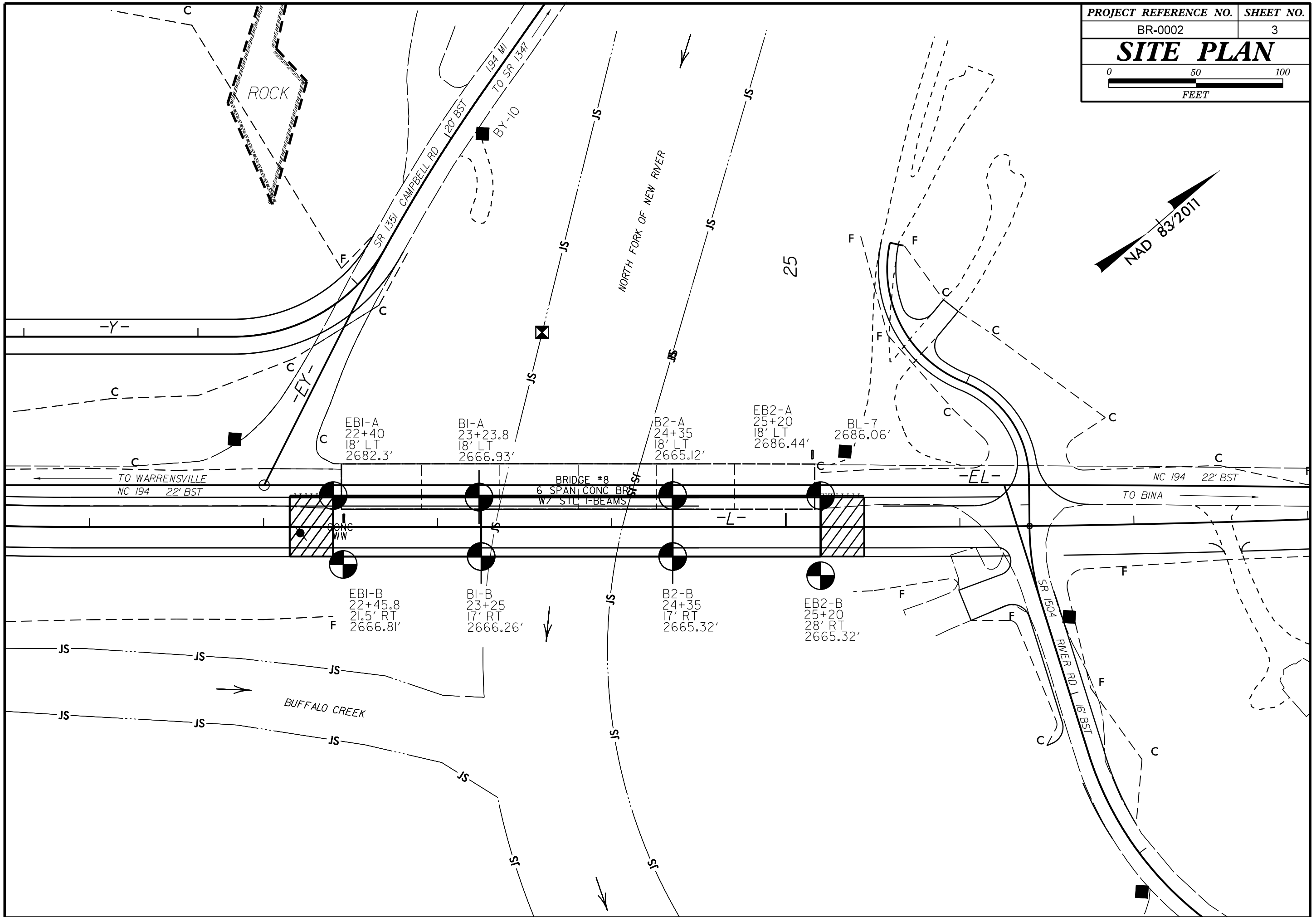
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

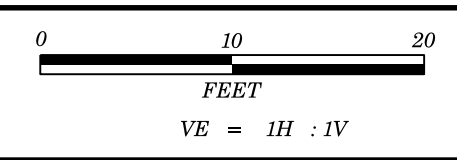
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

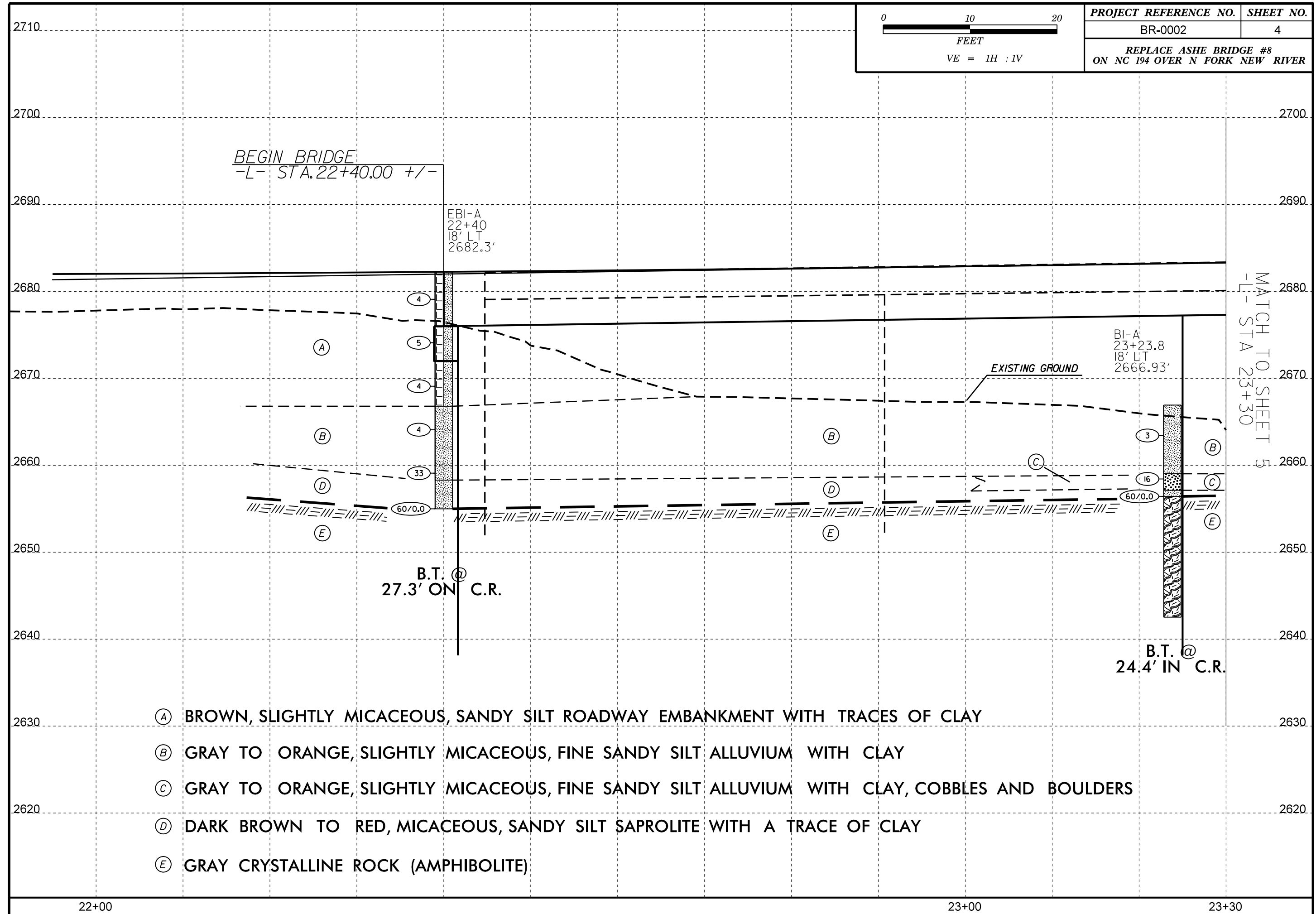
| GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) | | SURFACE CONDITIONS | | | | | GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000) | | SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes) | | | | | |
|--|--|------------------------------|------|------|------|-----------|---|---|---|------|------|------|-----------|----|
| 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. | | VERY GOOD | GOOD | FAIR | POOR | VERY POOR | 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. | | VERY GOOD | GOOD | FAIR | POOR | VERY POOR | |
| STRUCTURE | | DECREASING SURFACE QUALITY → | | | | | COMPOSITION AND STRUCTURE | | | | | | | |
|  | INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities | 90 | | | | N/A | N/A |  | A. 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. | 70 | | | | |
|  | BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets | 80 | 70 | | | | |  | B. Sandstone with thin inter-layers of siltstone | 60 | 50 | | | |
|  | VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets | | 60 | 50 | | | |  | C. Sandstone and siltstone in similar amounts | | 40 | | | |
|  | BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity | | | 40 | | | |  | D. Siltstone or silty shale with sandstone layers | | | 30 | | |
|  | DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces | | | | 30 | | |  | E. Weak siltstone or clayey shale with sandstone layers | | | | 20 | |
|  | LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes | N/A | N/A | | | 20 | |  | F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure | | | | | 10 |
| | | | | | | 10 | |  | G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers | | | | | |
| | | | | | | | |  | H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces. | | | | | |
| | | | | | | | | | | | | | | |

→ Means deformation after tectonic disturbance





| | |
|---|------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| BR-0002 | 4 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N FORK NEW RIVER | |



BEGIN BRIDGE
-L- STA. 22+40.00 +/-

EBI-A
22+40
18' LT
2682.3'

BI-A
23+23.8
18' LT
2666.93'

EXISTING GROUND

MATCH TO SHEET 5
-L- STA 23+30

B.T. @
27.3' ON C.R.

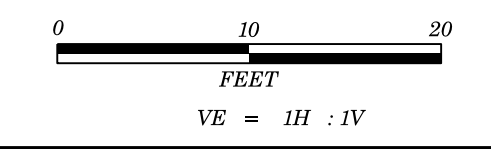
B.T. @
24.4' IN C.R.

- (A) BROWN, SLIGHTLY MICACEOUS, SANDY SILT ROADWAY EMBANKMENT WITH TRACES OF CLAY
- (B) GRAY TO ORANGE, SLIGHTLY MICACEOUS, FINE SANDY SILT ALLUVIUM WITH CLAY
- (C) GRAY TO ORANGE, SLIGHTLY MICACEOUS, FINE SANDY SILT ALLUVIUM WITH CLAY, COBBLES AND BOULDERS
- (D) DARK BROWN TO RED, MICACEOUS, SANDY SILT SAPROLITE WITH A TRACE OF CLAY
- (E) GRAY CRYSTALLINE ROCK (AMPHIBOLITE)

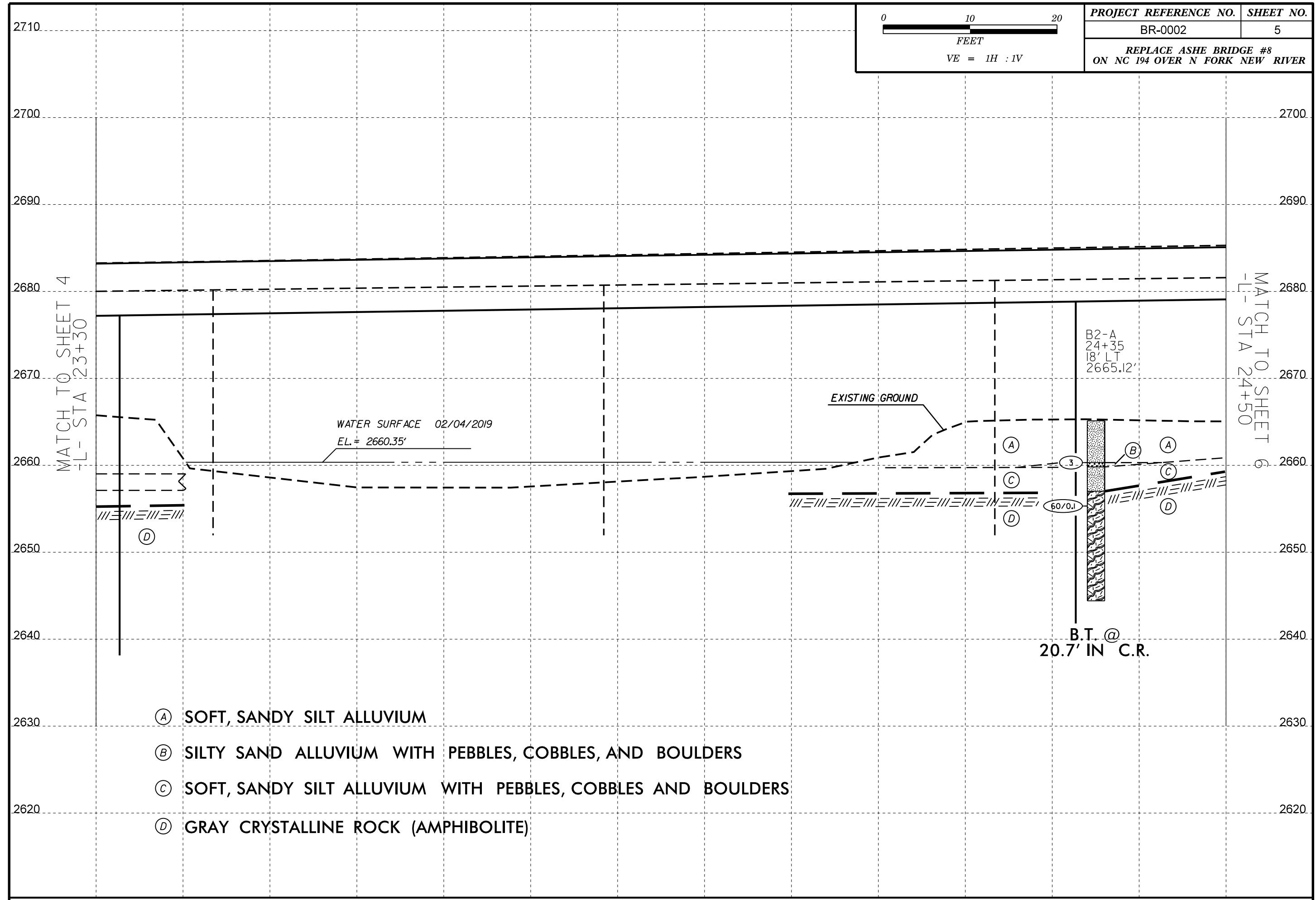
22+00

23+00

23+30



| | |
|---|------------------|
| PROJECT REFERENCE NO. | SHEET NO. |
| BR-0002 | 5 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N FORK NEW RIVER | |

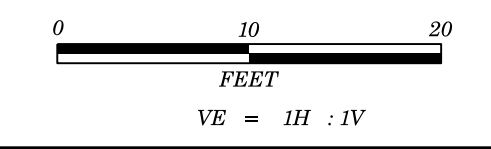


- Ⓐ SOFT, SANDY SILT ALLUVIUM
- Ⓑ SILTY SAND ALLUVIUM WITH PEBBLES, COBBLES, AND BOULDERS
- Ⓒ SOFT, SANDY SILT ALLUVIUM WITH PEBBLES, COBBLES AND BOULDERS
- Ⓓ GRAY CRYSTALLINE ROCK (AMPHIBOLITE)

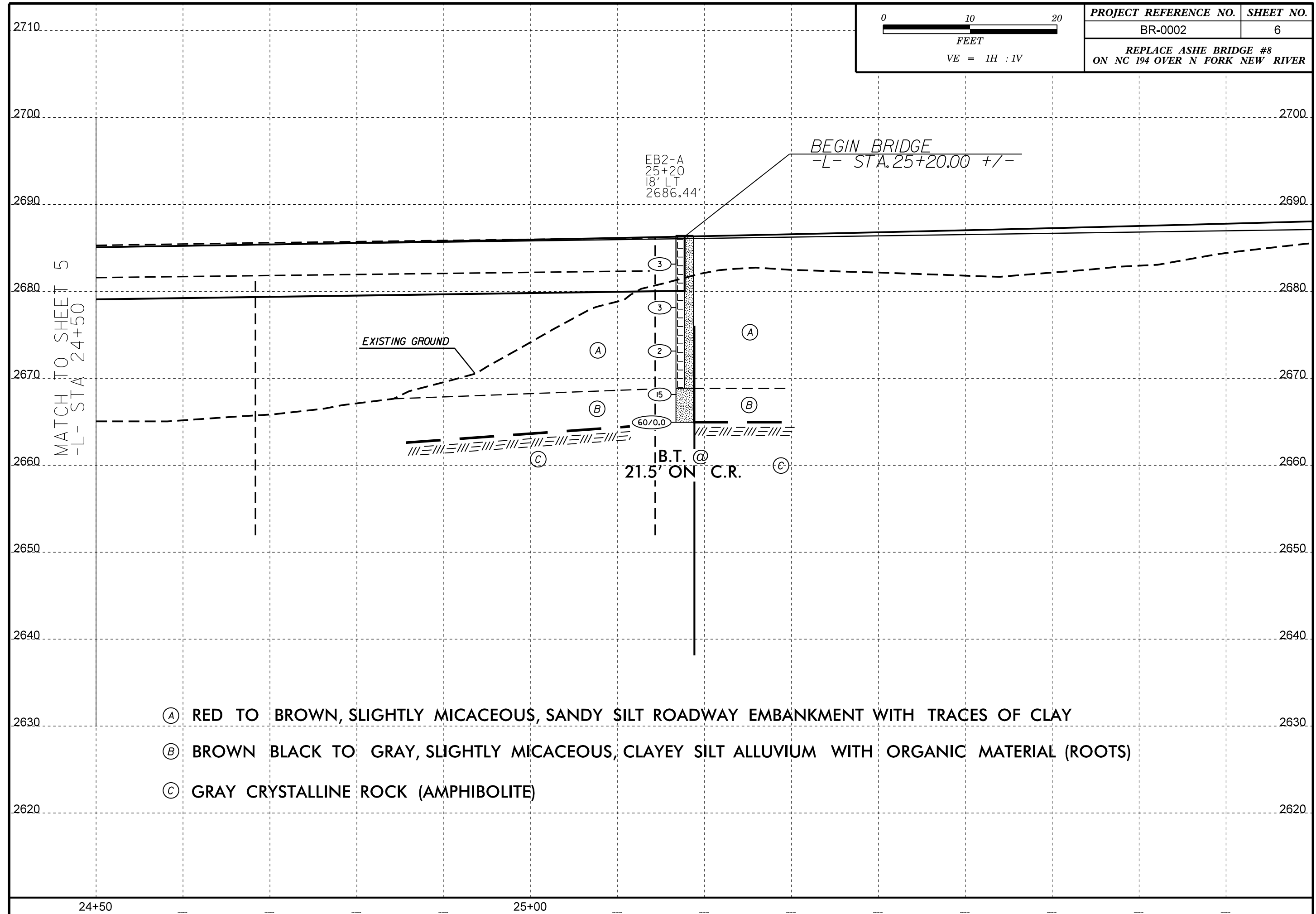
23+30

24+00

24+50



| PROJECT REFERENCE NO. | SHEET NO. |
|---|-----------|
| BR-0002 | 6 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N FORK NEW RIVER | |



EB2-A
25+20
18' LT
2686.44'

BEGIN BRIDGE
-L- STA. 25+20.00 +/-

MATCH TO SHEET 5
-L- STA 24+50

EXISTING GROUND

(A)

(A)

(B)

(B)

(C)

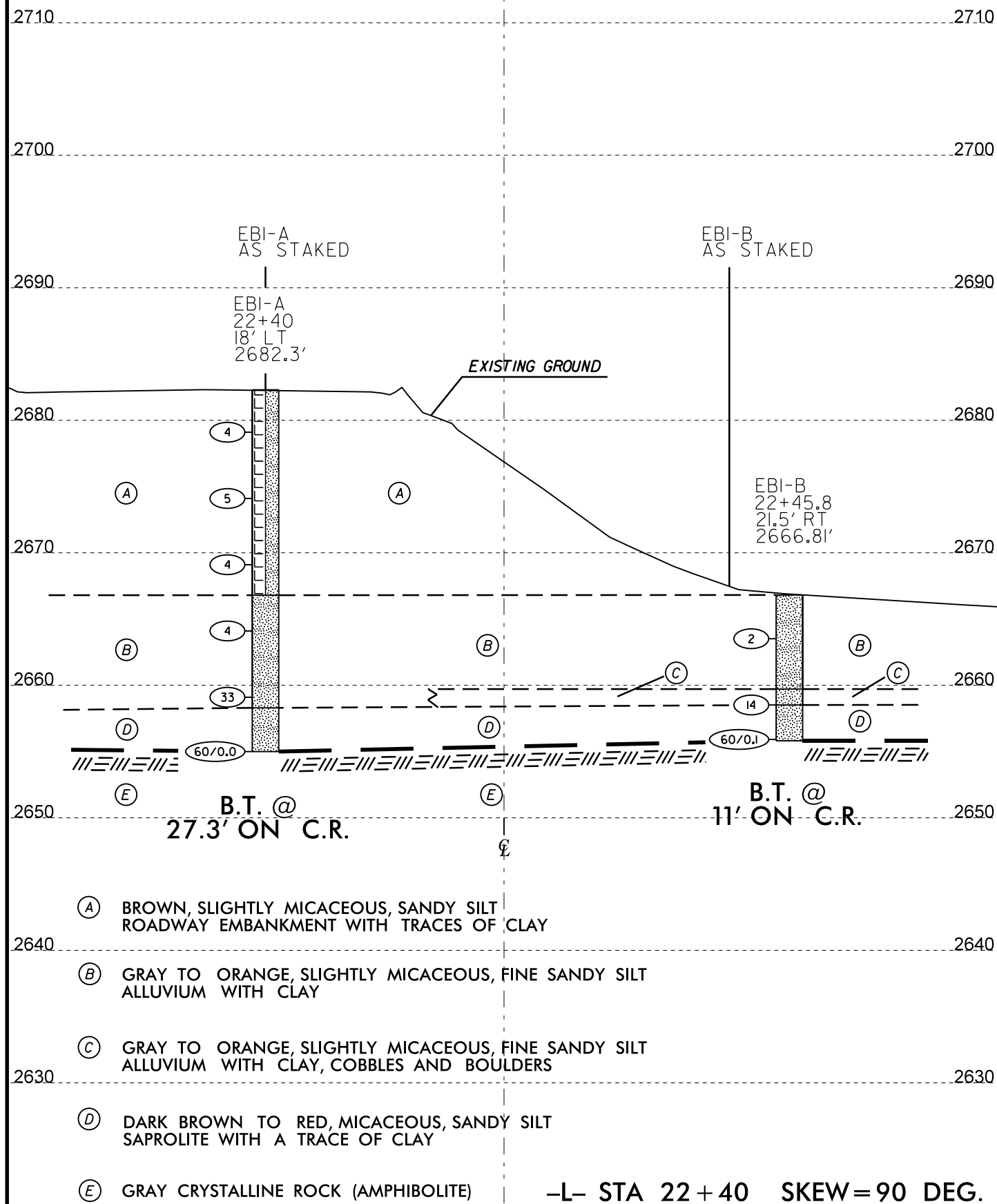
(C)

B.T. @
21.5' ON C.R.

- (A) RED TO BROWN, SLIGHTLY MICACEOUS, SANDY SILT ROADWAY EMBANKMENT WITH TRACES OF CLAY
- (B) BROWN BLACK TO GRAY, SLIGHTLY MICACEOUS, CLAYEY SILT ALLUVIUM WITH ORGANIC MATERIAL (ROOTS)
- (C) GRAY CRYSTALLINE ROCK (AMPHIBOLITE)

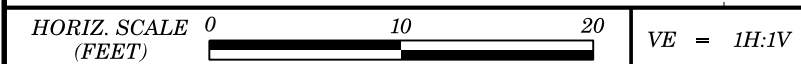
24+50

25+00

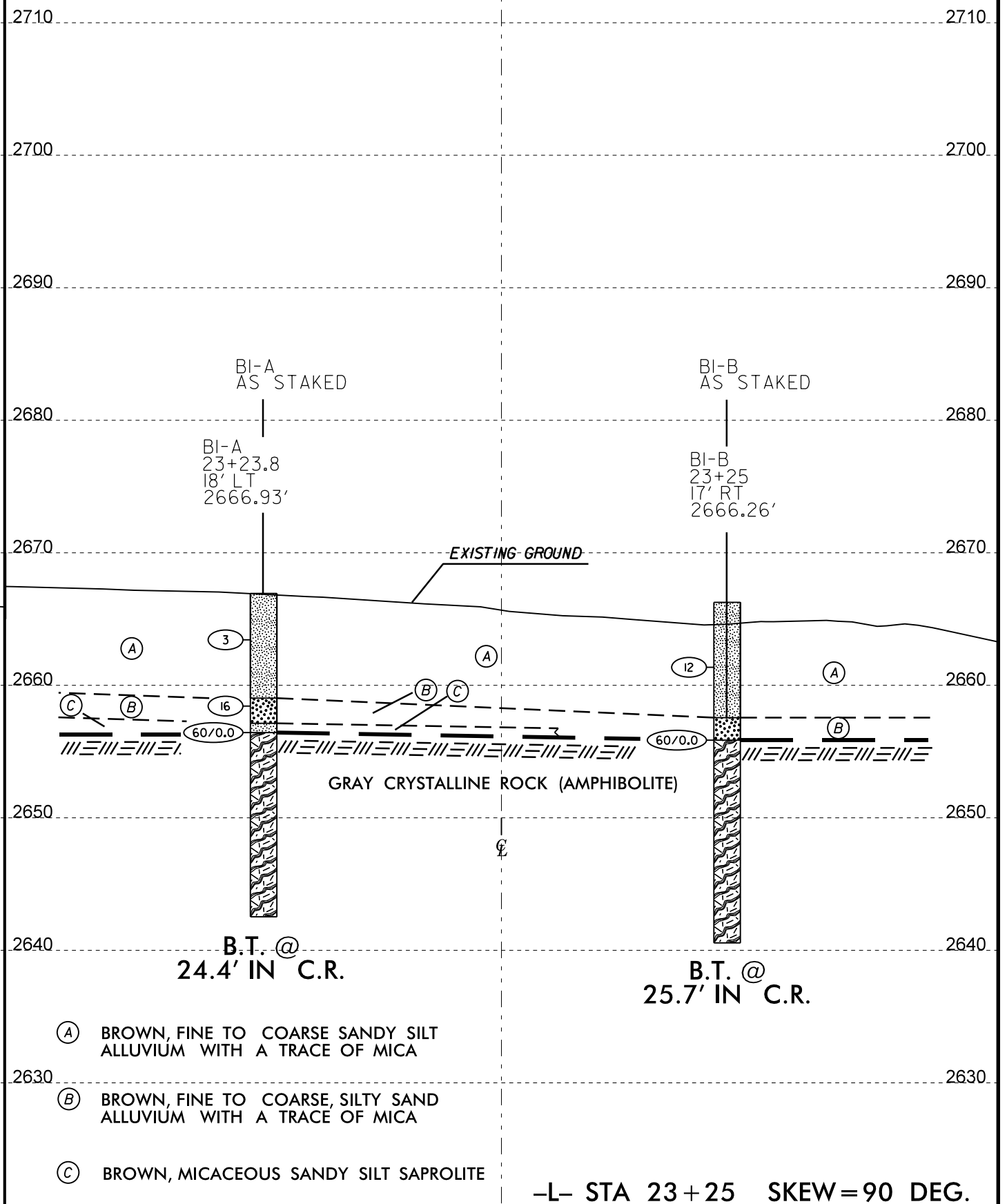


- (A) BROWN, SLIGHTLY MICACEOUS, SANDY SILT ROADWAY EMBANKMENT WITH TRACES OF CLAY
- (B) GRAY TO ORANGE, SLIGHTLY MICACEOUS, FINE SANDY SILT ALLUVIUM WITH CLAY
- (C) GRAY TO ORANGE, SLIGHTLY MICACEOUS, FINE SANDY SILT ALLUVIUM WITH CLAY, COBBLES AND BOULDERS
- (D) DARK BROWN TO RED, MICACEOUS, SANDY SILT SAPROLITE WITH A TRACE OF CLAY
- (E) GRAY CRYSTALLINE ROCK (AMPHIBOLITE)

-L- STA 22 + 40 SKEW = 90 DEG.

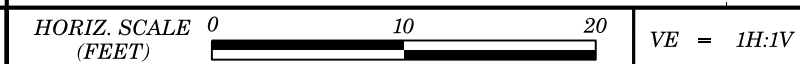


SECTION ALONG EBI

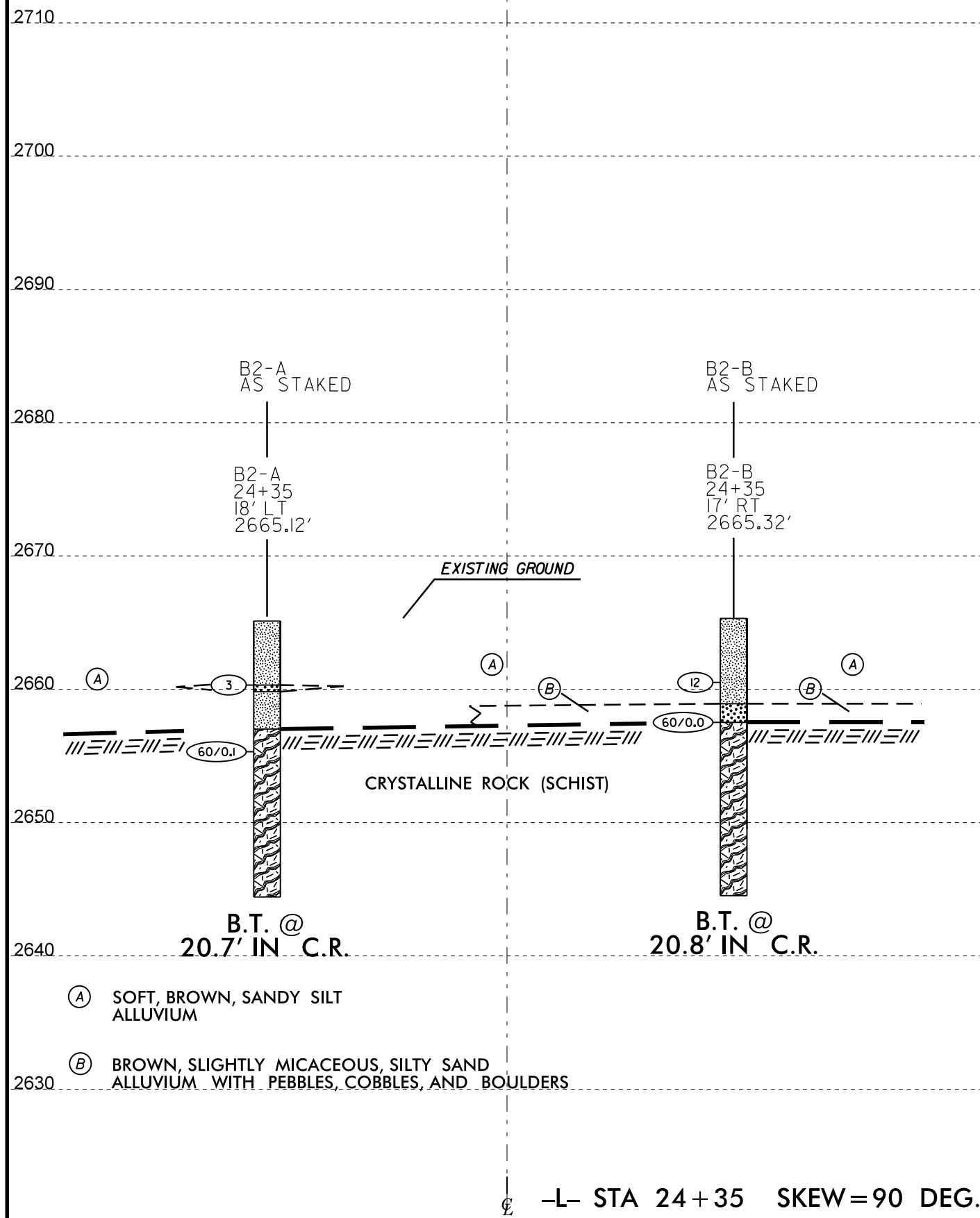


- (A) BROWN, FINE TO COARSE SANDY SILT ALLUVIUM WITH A TRACE OF MICA
- (B) BROWN, FINE TO COARSE, SILTY SAND ALLUVIUM WITH A TRACE OF MICA
- (C) BROWN, MICACEOUS SANDY SILT SAPROLITE

-L- STA 23 + 25 SKEW = 90 DEG.

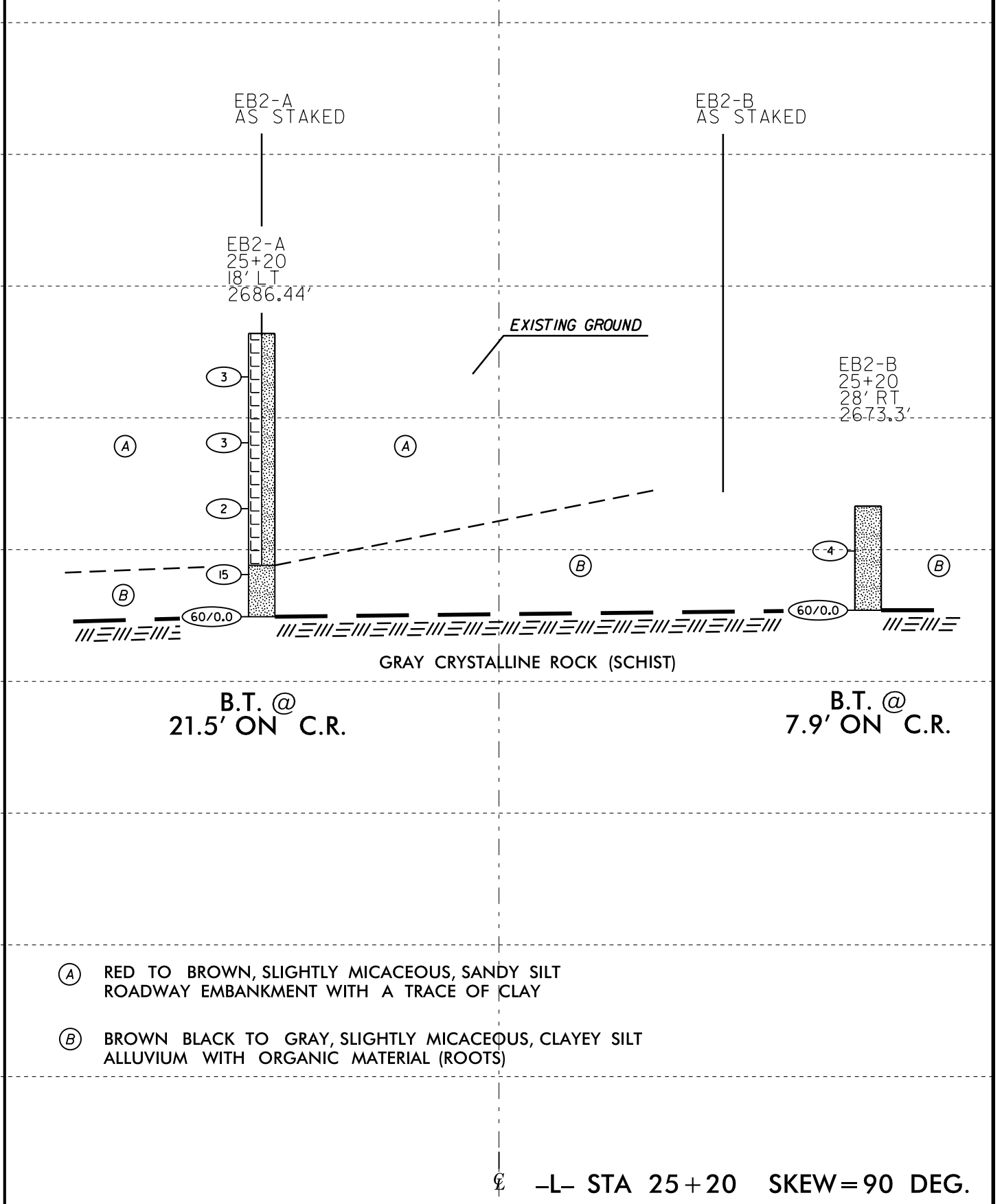


SECTION ALONG BI



HORIZ. SCALE 0 10 20 (FEET) VE = 1H:1V

SECTION ALONG B2



HORIZ. SCALE 0 10 20 (FEET) VE = 1H:1V

SECTION ALONG EB2

- (A) SOFT, BROWN, SANDY SILT ALLUVIUM
- (B) BROWN, SLIGHTLY MICACEOUS, SILTY SAND ALLUVIUM WITH PEBBLES, COBBLES, AND BOULDERS

- (A) RED TO BROWN, SLIGHTLY MICACEOUS, SANDY SILT ROADWAY EMBANKMENT WITH A TRACE OF CLAY
- (B) BROWN BLACK TO GRAY, SLIGHTLY MICACEOUS, CLAYEY SILT ALLUVIUM WITH ORGANIC MATERIAL (ROOTS)

GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|---|-----------------|---------------------|------------|--------------------------|-------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|-----|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. EB1-A | | STATION 22+40 | | OFFSET 18 ft LT | | ALIGNMENT L | | | | | | | | | |
| | | | | | | 0 HR. | 15.0 | | | | | | | | |
| COLLAR ELEV. 2,682.3 ft | | TOTAL DEPTH 27.3 ft | | NORTHING 997,900 | | EASTING 1,261,495 | | | | | | | | | |
| | | | | | | 24 HR. | FIAD | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | |
| 2685 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2,682.3 | 0.0 |
| | | | | | | | | | | | | | | | |
| 2680 | 2,679.1 | 3.2 | | | | | | | | | | | | | |
| | | | 2 | 2 | 2 | | | | | | | | | | |
| 2675 | 2,674.1 | 8.2 | | | | | | | | | | | | | |
| | | | 1 | 2 | 3 | | | | | | | | | | |
| 2670 | 2,669.1 | 13.2 | | | | | | | | | | | | | |
| | | | 1 | 2 | 2 | | | | | | | | | | |
| 2665 | 2,664.1 | 18.2 | | | | | | | | | | | | | |
| | | | 2 | 2 | 2 | | | | | | | | | | |
| 2660 | 2,659.1 | 23.2 | | | | | | | | | | | | | |
| | | | 4 | 13 | 20 | | | | | | | | | | |
| 2655 | 2,655.0 | 27.3 | | | | | | | | | | | | | |
| | | | 60/0.0 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|---|-----------------|---------------------|------------|--------------------------|-------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|-----|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. EB1-B | | STATION 22+46 | | OFFSET 22 ft RT | | ALIGNMENT L | | | | | | | | | |
| | | | | | | 0 HR. | N/A | | | | | | | | |
| COLLAR ELEV. 2,673.3 ft | | TOTAL DEPTH 11.0 ft | | NORTHING 997,879 | | EASTING 1,261,529 | | | | | | | | | |
| | | | | | | 24 HR. | 4.2 | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | 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 | | | | | |
| 2675 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2,673.3 | 0.0 |
| | | | | | | | | | | | | | | | |
| 2670 | 2,670.0 | 3.3 | | | | | | | | | | | | | |
| | | | 1 | 1 | 1 | | | | | | | | | | |
| 2665 | 2,665.0 | 8.3 | | | | | | | | | | | | | |
| | | | 12 | 7 | 7 | | | | | | | | | | |
| | 2,662.4 | 10.9 | | | | | | | | | | | | | |
| | | | 60/0.1 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE BR0002_BRDG0008_ASHE_BOREHOLES.GPJ NC_DOT.GDT 7/19/19

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | |
|---|-----------------|-------------------------------------|------------|-----------------------|-------|--------------------------|-----------------|----|----|-----------|-----|---|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | |
| BORING NO. B1-B | | STATION 23+25 | | OFFSET 17 ft RT | | ALIGNMENT L | | | | | | |
| COLLAR ELEV. 2,666.3 ft | | TOTAL DEPTH 25.7 ft | | NORTHING 997,942 | | EASTING 1,261,577 | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFG6744 CME - 45C 92% 07/31/2017 | | DRILL METHOD NW Casing W/SPT & Core | | HAMMER TYPE Automatic | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | 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 | | | |
| 2670 | | | | | | | | | | | | |
| 2665 | | | | | | | | | | | | 2,666.3 GROUND SURFACE 0.0 |
| 2660 | 2,661.4 | 4.9 | 2 | 2 | 10 | | | | | | | ALLUVIAL Brown, slightly micaceous sandy silt with pebbles and rock fragments |
| 2655 | 2,655.9 | 10.4 | 60/0.0 | | | | | | | | | 2,657.6 8.7 2,655.9 10.4 ALLUVIAL Brown, slightly micaceous silty sand with pebbles, cobbles, boulders CRYSTALLINE ROCK |
| 2650 | | | | | | | | | | | | |
| 2645 | | | | | | | | | | | | Boring Terminated at Elevation 2,640.6 ft IN CRYSTALLINE ROCK (SCHIST) |

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | |
|--|---------------|-------------------------------------|-------------------|-----------------------|-----------------|--------------------------|-----------------|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) |
| BORING NO. B1-B | | STATION 23+25 | | OFFSET 17 ft RT | | ALIGNMENT L | |
| COLLAR ELEV. 2,666.3 ft | | TOTAL DEPTH 25.7 ft | | NORTHING 997,942 | | EASTING 1,261,577 | |
| DRILL RIG/HAMMER EFF./DATE AFG6744 CME - 45C 92% 07/31/2017 | | DRILL METHOD NW Casing W/SPT & Core | | HAMMER TYPE Automatic | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | SURFACE WATER DEPTH N/A | |
| CORE SIZE n x w l | | | TOTAL RUN 15.3 ft | | | | |
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RQD (ft) % | SAMP. NO. |
| 2655.86 | | | | | | | |
| 2655 | 2,655.9 | 10.4 | 5.3 | N=60/0.0 | (4.8) 91% | (4.2) 79% | |
| 2650 | 2,650.6 | 15.7 | 5.0 | | (5.0) 100% | (4.7) 94% | |
| 2645 | 2,645.6 | 20.7 | 5.0 | | (5.0) 100% | (4.9) 98% | |
| | 2,640.6 | 25.7 | | | | | |
| DESCRIPTION AND REMARKS | | | | | | | |
| Begin Coring @ 10.4 ft | | | | | | | |
| CRYSTALLINE ROCK | | | | | | | |
| GSI 80 - 90 | | | | | | | |
| Boring Terminated at Elevation 2,640.6 ft IN CRYSTALLINE ROCK (SCHIST) | | | | | | | |

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|--|-----------------|---------------------|------------|------------------------------------|-------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|-----|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. B2-A | | STATION 24+35 | | OFFSET 18 ft LT | | ALIGNMENT L | | | | | | | | | |
| COLLAR ELEV. 2,665.1 ft | | TOTAL DEPTH 20.7 ft | | NORTHING 998,048 | | EASTING 1,261,623 | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | | DRILL METHOD NW Casing WSPT & Core | | HAMMER TYPE Automatic | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | 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 | | | | | |
| 2670 | | | | | | | | | | | | | | | |
| 2665 | | | | | | | | | | | | | | 2,665.1 | 0.0 |
| 2660 | 2,660.3 | 4.8 | | | | | | | | | | | | 2,660.3 | 4.8 |
| | | | 50 | 2 | 1 | | | | | | | | | 2,659.8 | 5.3 |
| 2655 | 2,655.3 | 9.8 | | | | | | | | | | | | 2,657.0 | 8.1 |
| | | | 60/0.1 | | | | | | | | | | | | |
| 2650 | | | | | | | | | | | | | | | |
| 2645 | | | | | | | | | | | | | | | |
| Boring Terminated at Elevation 2,644.4 ft IN CRYSTALLINE ROCK (SCHIST) | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE BR0002_BRDG0008_ASHE_BOREHOLES.GPJ NC_DOT.GDT 7/19/19

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | |
|---|---------------|---------------------|-------------------|------------------------------------|-------------|--------------------------|-----------------|-------------|------------|-----|-------------------------|------------|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | |
| BORING NO. B2-A | | STATION 24+35 | | OFFSET 18 ft LT | | ALIGNMENT L | | | | | | |
| COLLAR ELEV. 2,665.1 ft | | TOTAL DEPTH 20.7 ft | | NORTHING 998,048 | | EASTING 1,261,623 | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | | DRILL METHOD NW Casing WSPT & Core | | HAMMER TYPE Automatic | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | SURFACE WATER DEPTH N/A | | | | | | |
| CORE SIZE n x w l | | | TOTAL RUN 11.4 ft | | | | | | | | | |
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN | | SAMP. NO. | STRATA | | LOG | DESCRIPTION AND REMARKS | DEPTH (ft) |
| | | | | | REC. (ft) % | RQD (ft) % | | REC. (ft) % | RQD (ft) % | | | |
| 2655.82 | | | | | | | | | | | | |
| 2655 | 2,655.8 | 9.3 | 1.4 | | (1.2) 86% | (1.2) 86% | | | | | | |
| | 2,654.4 | 10.7 | 5.0 | N=60/0.1 | (5.0) 100% | (4.5) 90% | | | | | | |
| 2650 | 2,649.4 | 15.7 | 5.0 | | (4.9) 98% | (4.9) 98% | | | | | | |
| 2645 | 2,644.4 | 20.7 | | | | | | | | | GSI 80 - 90 | |
| Continued from previous page | | | | | | | | | | | | |

NCDOT BORE DOUBLE BR0002_BRDG0008_ASHE_BOREHOLES.GPJ NC_DOT.GDT 7/19/19

GEOTECHNICAL BORING REPORT BORE LOG

GEOTECHNICAL BORING REPORT CORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | |
|---|-----------------|-------------------------------------|------------|-----------------------|-------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|---|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | | | |
| BORING NO. B2-B | | STATION 24+35 | | OFFSET 17 ft RT | | ALIGNMENT L | | | | | | | | |
| COLLAR ELEV. 2,665.3 ft | | TOTAL DEPTH 20.8 ft | | NORTHING 998,025 | | EASTING 1,261,649 | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | DRILL METHOD NW Casing W/SPT & Core | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | 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 | | | | |
| 2670 | | | | | | | | | | | | | | |
| 2665 | | | | | | | | | | | | | | 2,665.3 GROUND SURFACE 0.0 |
| 2660 | 2,660.5 | 4.8 | 4 | 6 | 9 | | | | | | | | | ALLUVIAL Brown, sandy silt with mica and a trace of clay |
| 2655 | 2,657.5 | 7.8 | 60/0.0 | | | | | | | | | | | 2,658.9 6.4 2,657.5 7.8 ALLUVIAL Brown, silty sand with cobbles and boulders CRYSTALLINE ROCK |
| 2650 | | | | | | | | | | | | | | |
| 2645 | | | | | | | | | | | | | | Boring Terminated at Elevation 2,644.5 ft IN CRYSTALLINE ROCK (SCHIST) |

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | |
|---|---------------|-------------------------------------|-------------------|-----------------------|-----------------|--------------------------|-----------------|--------------------|------------|-----|--|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | |
| BORING NO. B2-B | | STATION 24+35 | | OFFSET 17 ft RT | | ALIGNMENT L | | | | | |
| COLLAR ELEV. 2,665.3 ft | | TOTAL DEPTH 20.8 ft | | NORTHING 998,025 | | EASTING 1,261,649 | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | DRILL METHOD NW Casing W/SPT & Core | | HAMMER TYPE Automatic | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | SURFACE WATER DEPTH N/A | | | | | |
| CORE SIZE n x w l | | | TOTAL RUN 13.0 ft | | | | | | | | |
| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN REC. (ft) % | RQD (ft) % | SAMP. NO. | STRATA REC. (ft) % | RQD (ft) % | LOG | DESCRIPTION AND REMARKS |
| 2657.52 | 2,657.5 | 7.8 | 3.0 | | (2.9) 97% | (2.9) 97% | | | | | Continued from previous page CRYSTALLINE ROCK |
| 2655 | 2,654.5 | 10.8 | 5.0 | | (4.9) 98% | (4.7) 94% | | | | | 2,657.5 7.8 |
| 2650 | 2,649.5 | 15.8 | 5.0 | | (4.5) 90% | (4.1) 82% | | | | | GSI 80 - 90 |
| 2645 | 2,644.5 | 20.8 | | | | | | | | | Boring Terminated at Elevation 2,644.5 ft IN CRYSTALLINE ROCK (SCHIST) |

GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | | |
|--|-----------------|---------------------|--------------------------|---------------------|-------|--------------------------|-----------------|----|----|-----|-----------|---------|-------|---------------------------|------------|---------|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB2-A | | STATION 25+20 | | OFFSET 18 ft LT | | ALIGNMENT L | | | | | | | | | | |
| COLLAR ELEV. 2,686.4 ft | | TOTAL DEPTH 21.5 ft | | NORTHING 998,112 | | EASTING 1,261,678 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD H.S. Augers | | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | SURFACE WATER DEPTH N/A | | | | | | | | | | |
| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG MOI | LOG G | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | | |
| 2690 | | | | | | | | | | | | | | | | |
| 2685 | 2,683.1 | 3.3 | 1 | 1 | 2 | | | | | | | | | | | 2,686.4 |
| GROUND SURFACE 0.0 | | | | | | | | | | | | | | | | |
| ROADWAY EMBANKMENT RED-BROWN, SL MIC, CL-SND-SLT | | | | | | | | | | | | | | | | |
| 2680 | 2,678.1 | 8.3 | 1 | 1 | 2 | | | | | | | | | | | |
| 2675 | 2,673.1 | 13.3 | 1 | 1 | 1 | | | | | | | | | | | |
| 2670 | 2,668.1 | 18.3 | 4 | 7 | 8 | | | | | | | | | | | 2,668.8 |
| 2665 | 2,664.9 | 21.5 | | | | | | | | | | | | | | 2,664.9 |
| ALLUVIAL BRN-BLACK TO GREY, SL MIC, CL-SLT w/ORGX (ROOTS) 17.6 | | | | | | | | | | | | | | | | |
| CRYSTALLINE ROCK BROWN CRYSTALLINE ROCK (SCHIST) Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,664.9 ft ON CRYSTALLINE ROCK (SCHIST) 21.5 | | | | | | | | | | | | | | | | |

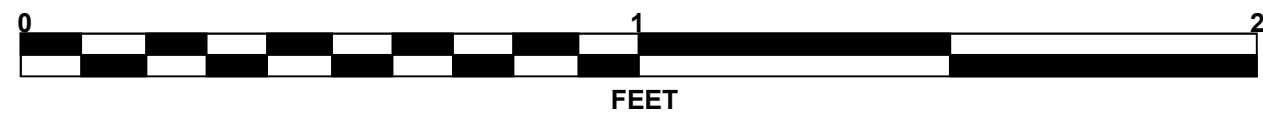
| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | | |
|---|-----------------|---------------------|--------------------------|---------------------|-------|--------------------------|-----------------|----|----|-----|-----------|---------|-------|---------------------------|------------|---------|
| SITE DESCRIPTION BRIDGE #8 ON NC194 OVER NORTH FORK NEW RIVER | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB2-B | | STATION 25+20 | | OFFSET 28 ft RT | | ALIGNMENT L | | | | | | | | | | |
| COLLAR ELEV. 2,673.3 ft | | TOTAL DEPTH 7.9 ft | | NORTHING 998,082 | | EASTING 1,261,713 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD H.S. Augers | | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/30/19 | | COMP. DATE 05/30/19 | | SURFACE WATER DEPTH N/A | | | | | | | | | | |
| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG MOI | LOG G | SOIL AND ROCK DESCRIPTION | DEPTH (ft) | |
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | | | |
| 2675 | | | | | | | | | | | | | | | | |
| GROUND SURFACE 0.0 | | | | | | | | | | | | | | | | |
| ALLUVIAL LT BROWN, SL MIC, CL-SND-SLT HARDER BEGIN 6.6'-7.7' | | | | | | | | | | | | | | | | |
| 2670 | 2,669.9 | 3.4 | 3 | 1 | 3 | | | | | | | | | | | 2,673.3 |
| CRYSTALLINE ROCK BROWN CRYSTALLINE ROCK (SCHIST) Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,665.4 ft ON CRYSTALLINE ROCK (SCHIST) 7.9 | | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE BR0002_BRDG0008_ASH_BOREHOLES.GPJ NC_DOT_GDT 7/19/19

CORE PHOTOGRAPHS

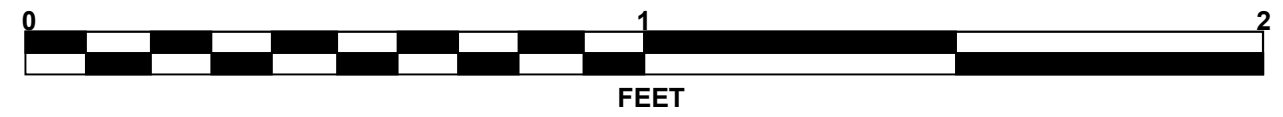
B1-A

BOX 1 OF 2: 10.5 - 19.4 FEET
GSI 80 - 90



B1-A

BOX 2 OF 2: 19.4 - 24.4 FEET
GSI 80 - 90



CORE PHOTOGRAPHS

B1-B

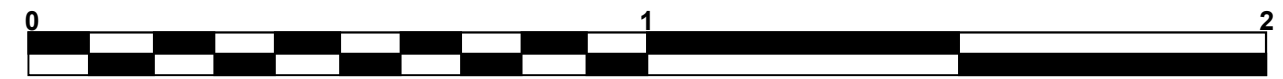
BOX 1 OF 2: 10.4 - 20.2 FEET
GSI 80 - 90



FEET

B1-B

BOX 2 OF 2: 20.2 - 25.7 FEET
GSI 80 - 90



FEET

CORE PHOTOGRAPHS

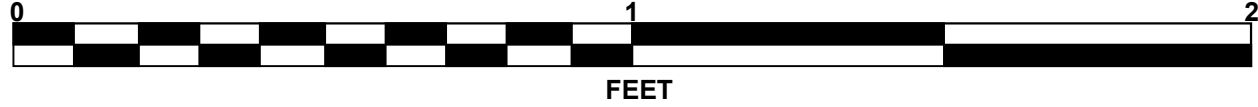
B2-A

BOX 1 OF 2: 9.3 - 17.5 FEET
GSI 80 - 90



B2-A

BOX 2 OF 2: 17.5 - 20.7 FEET
GSI 80 - 90



CORE PHOTOGRAPHS

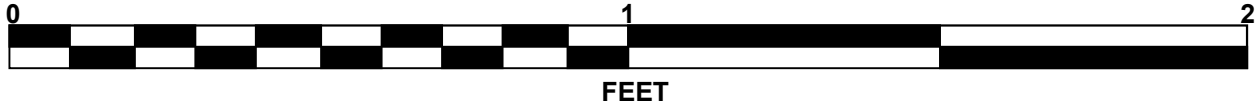
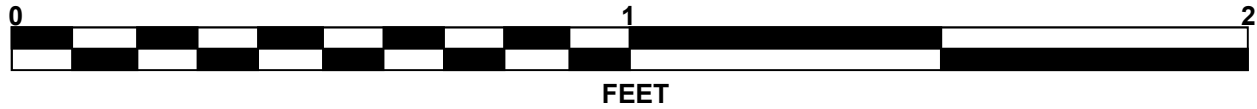
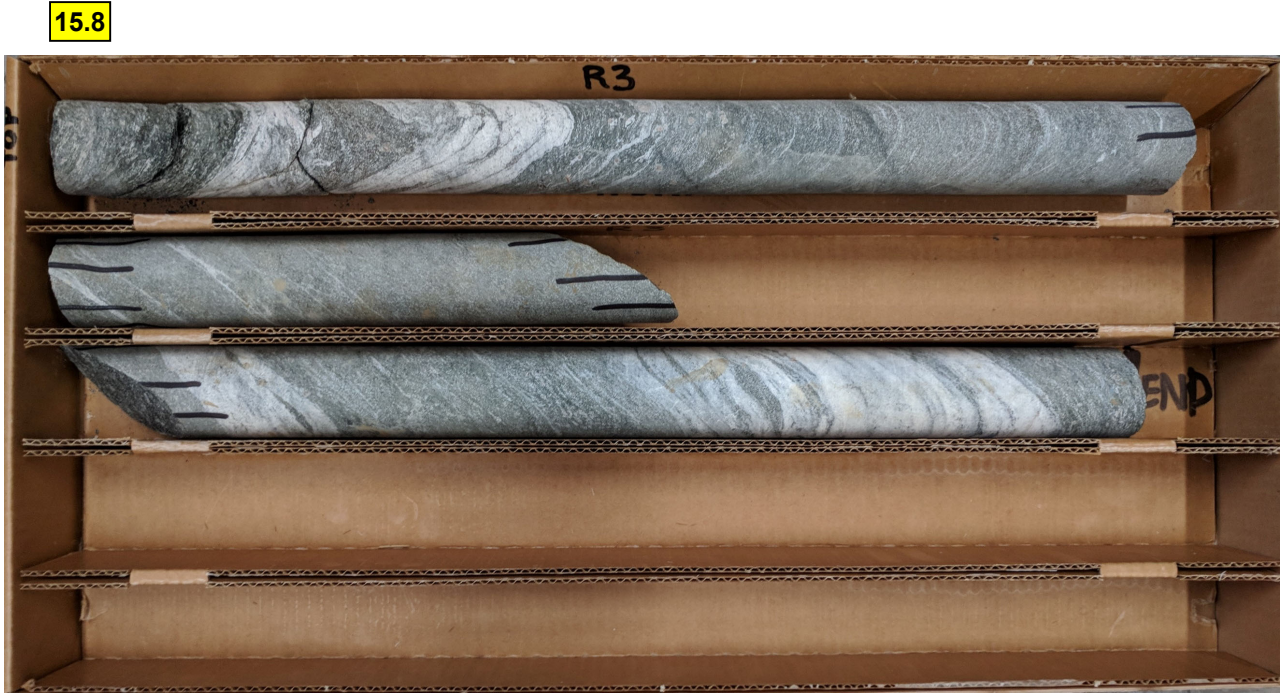
B2-B

BOX 1 OF 2: 7.8 - 15.8 FEET
GSI 80 - 90



B2-B

BOX 2 OF 2: 15.8 - 20.8 FEET
GSI 80 - 90



REFERENCE: BR-0002

PROJECT: 67002.1.1

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

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C. | 67002.1.1 | 1 | 15 |

CONTENTS

| SHEET NO. | DESCRIPTION |
|-----------|----------------------|
| 1 | TITLE SHEET |
| 2 | LEGEND (SOIL & ROCK) |
| 3 | SITE PLAN |
| 4-7 | PROFILES |
| 8-12 | CROSS SECTIONS |
| 13-15 | BORE LOGS |

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY ASHE
PROJECT DESCRIPTION REPLACE ASHE BRIDGE #8
ON NC 194 OVER NORTH FORK OF NEW RIVER

SITE DESCRIPTION RETAINING WALL #1
-L- STA 15+00 - 20+00 OFFSET 26.5' RT

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 1919 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

C.D. JOHNSON

D.O. CHEEK

C.J. COFFEY

INVESTIGATED BY D.M. MULLEN

DRAWN BY D.M.M.

CHECKED BY J.C. KUHNE

SUBMITTED BY J.C. KUHNE































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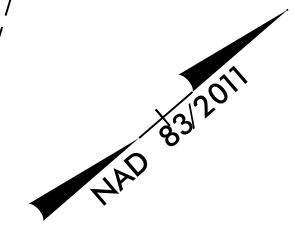
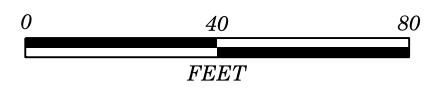


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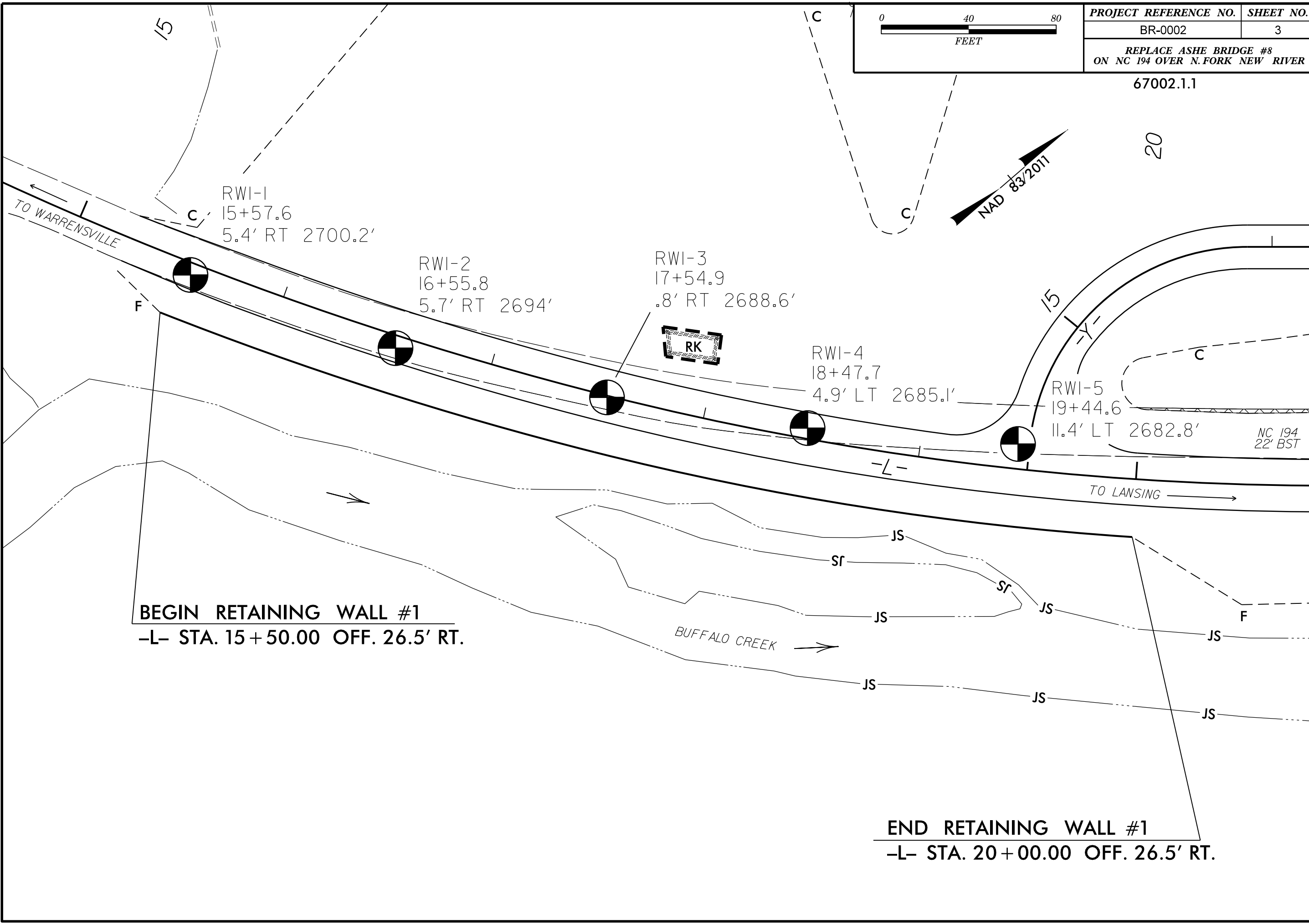
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

| SOIL DESCRIPTION | | | | | | | | | | GRADATION | | | | | | | | | | ROCK DESCRIPTION | | | | | | | | | | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|---|--|------|-------|-------|-------|--|--|---|----------------------------|--|--|---|---|--|---|---|--|---|--|--|--|--|---|--|--|--|--|--|--|--|------------|--|---|----|-----|------|------|-------|--|-----|----|---|---|--|--|--|---|--|--|--|--|--|--|--|--|--|------|---------|------|-----------|-----------|-------------------|---------------------|--------|------|--------------|----------------|--------------|------------------|-------------|---------------|-----------------|-------|----------------|--------------------|------------------|------------|---------------------|-------------------|-------------------|--|--|------------------|--------------|
| 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> | | | | | | | | | | 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. | | | | | | | | | | 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: | | | | | | | | | | 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 (RQD) - 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 (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED. | | | | | | | | | | WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. | | | | | | | | | | CRSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE. | | | | | | | | | | NON-CRYSTALLINE ROCK (NCR)  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. | | | | | | | | | | COASTAL PLAIN SEDIMENTARY ROCK (CPS)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMPRESSIONIBILITY SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50 | | | | | | | | | | PERCENTAGE OF MATERIAL | | | | | | | | | | WEATHERING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ORGANIC MATERIAL TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC > 10% | | | | | | | | | | SILT - CLAY SOILS 3 - 5% 5 - 12% 12 - 20% > 20% | | | | | | | | | | OTHER MATERIAL TRACE 1 - 10% LITTLE 10 - 20% SOME 20 - 35% HIGHLY 35% AND ABOVE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUND WATER | | | | | | | | | |  WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING  STATIC WATER LEVEL AFTER 24 HOURS  PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA  SPRING OR SEEP | | | | | | | | | | 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> 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. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSISTENCY OR DENSENESS | | | | | | | | | | MISCELLANEOUS SYMBOLS | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table> | | | | | | | | | | PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | GENERALLY GRANULAR MATERIAL (NON-COHESSIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | < 4 4 TO 10 10 TO 30 30 TO 50 > 50 | N/A | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | < 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30 | < 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4 |  ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION  SOIL SYMBOL  ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT  INFERRED SOIL BOUNDARY  INFERRED ROCK LINE  ALLUVIAL SOIL BOUNDARY  DIP & DIP DIRECTION OF ROCK STRUCTURES  SPT TEST BORING  AUGER BORING  CORE BORING  MONITORING WELL  PIEZOMETER INSTALLATION  SLOPE INDICATOR INSTALLATION  CONE PENETROMETER TEST  SOUNDING ROD  TEST BORING WITH CORE  SPT N-VALUE | | | | | | | | | | VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERALLY GRANULAR MATERIAL (NON-COHESSIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | < 4 4 TO 10 10 TO 30 30 TO 50 > 50 | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | < 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30 | < 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TEXTURE OR GRAIN SIZE | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | ABBREVIATIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> </table> | | | | | | | | | | U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 |  UNDERCUT  SHALLOW UNDERCUT  UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE  UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK  UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL | | | | | | | | | | AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - COARSE 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 %g - DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U.S. STD. SIEVE SIZE OPENING (MM) | 4 | 10 | 40 | 60 | 200 | 270 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL MOISTURE - CORRELATION OF TERMS | | | | | | | | | | TEXTURE OR GRAIN SIZE | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td rowspan="2">LL - LIQUID LIMIT PL - PLASTIC LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td rowspan="2">OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> | | | | | | | | | | SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | LL - LIQUID LIMIT PL - PLASTIC LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | <table border="1"> <tr> <th>GRAIN SIZE</th> <th>MM</th> <th>305</th> <th>75</th> <th>2.0</th> <th>0.25</th> <th>0.05</th> <th>0.005</th> </tr> <tr> <td></td> <td>IN.</td> <td>12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | | | | | | GRAIN SIZE | MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | | IN. | 12 | 3 | | | | | <table border="1"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> | | | | | | | | | | TERM | SPACING | TERM | THICKNESS | VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | 4 FEET | WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | CLOSE | 0.16 TO 1 FOOT | VERY THINLY BEDDED | 0.03 - 0.16 FEET | VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | THINLY LAMINATED | < 0.008 FEET |
| SOIL MOISTURE SCALE (ATTERBERG LIMITS) | FIELD MOISTURE DESCRIPTION | GUIDE FOR FIELD MOISTURE DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LL - LIQUID LIMIT PL - PLASTIC LIMIT | - SATURATED - (SAT.) | USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - WET - (W) | SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OM - OPTIMUM MOISTURE SL - SHRINKAGE LIMIT | - MOIST - (M) | SOLID; AT OR NEAR OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - DRY - (D) | REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRAIN SIZE | MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | IN. | 12 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TERM | SPACING | TERM | THICKNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLOSE | 0.16 TO 1 FOOT | VERY THINLY BEDDED | 0.03 - 0.16 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | THINLY LAMINATED | < 0.008 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PLASTICITY | | | | | | | | | | EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | INDURATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <th>NON PLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td></td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table> | | | | | | | | | | NON PLASTIC | PLASTICITY INDEX (PI) | DRY STRENGTH | | 0-5 | VERY LOW | SLIGHTLY PLASTIC | 6-15 | SLIGHT | MODERATELY PLASTIC | 16-25 | MEDIUM | HIGHLY PLASTIC | 26 OR MORE | HIGH | DRILL UNITS: <input checked="" type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | | | | | | | | | | ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input checked="" type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE _____ * STEEL TEETH <input type="checkbox"/> TRICONE _____ * TUNG-CARB. <input type="checkbox"/> CORE BIT <input type="checkbox"/> | | | | | | | | | | HAMMER TYPE: <input type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input checked="" type="checkbox"/> -N XWL _____ HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NON PLASTIC | PLASTICITY INDEX (PI) | DRY STRENGTH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0-5 | VERY LOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLIGHTLY PLASTIC | 6-15 | SLIGHT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY PLASTIC | 16-25 | MEDIUM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HIGHLY PLASTIC | 26 OR MORE | HIGH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COLOR | | | | | | | | | | FRACATURE SPACING | | | | | | | | | | INDURATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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. | | | | | | | | | | 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 | | | | | | | | | | FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | BENCH MARK: N/A ELEVATION DERIVED FROM DTM | | | | | | | | | | ELEVATION: FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | NOTES: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



67002.1.1

20



RWI-1
15+57.6
5.4' RT 2700.2'

RWI-2
16+55.8
5.7' RT 2694'

RWI-3
17+54.9
.8' RT 2688.6'

RWI-4
18+47.7
4.9' LT 2685.1'

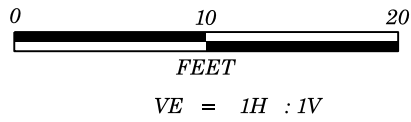
RWI-5
19+44.6
11.4' LT 2682.8'



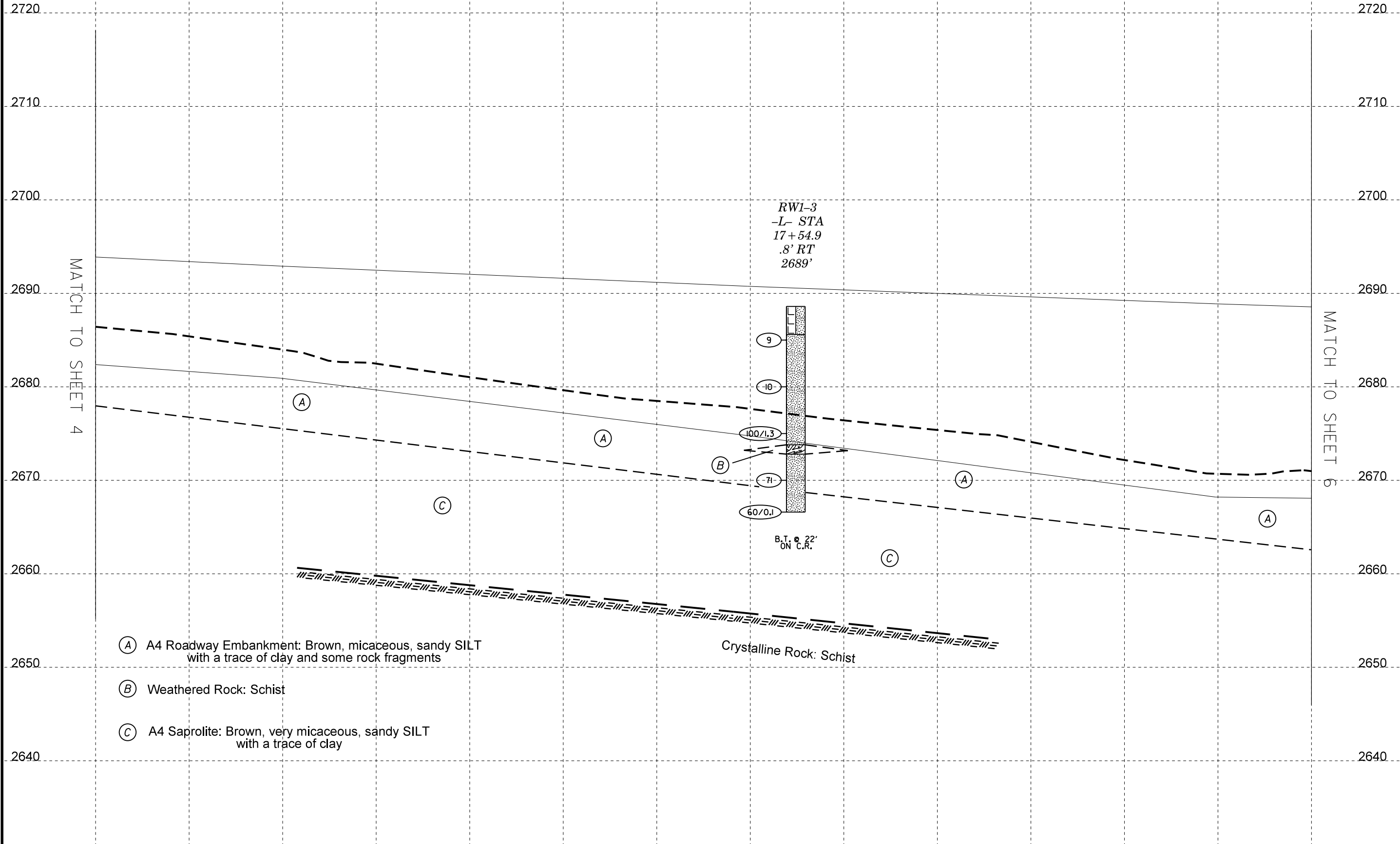
BEGIN RETAINING WALL #1
-L- STA. 15+50.00 OFF. 26.5' RT.

END RETAINING WALL #1
-L- STA. 20+00.00 OFF. 26.5' RT.

NC 194
22' BST



RETAINING WALL
-L+ STA 15+50 - 16+80



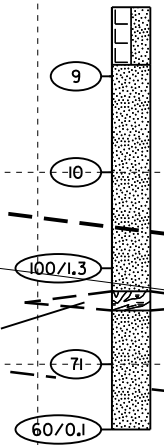
2720
2710
2700
2690
2680
2670
2660
2650
2640

2720
2710
2700
2690
2680
2670
2660
2650
2640

MATCH TO SHEET 4

MATCH TO SHEET 6

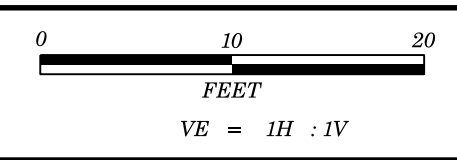
RW1-3
-L- STA
17+54.9
.8' RT
2689'



B.T. @ 22'
ON C.R.

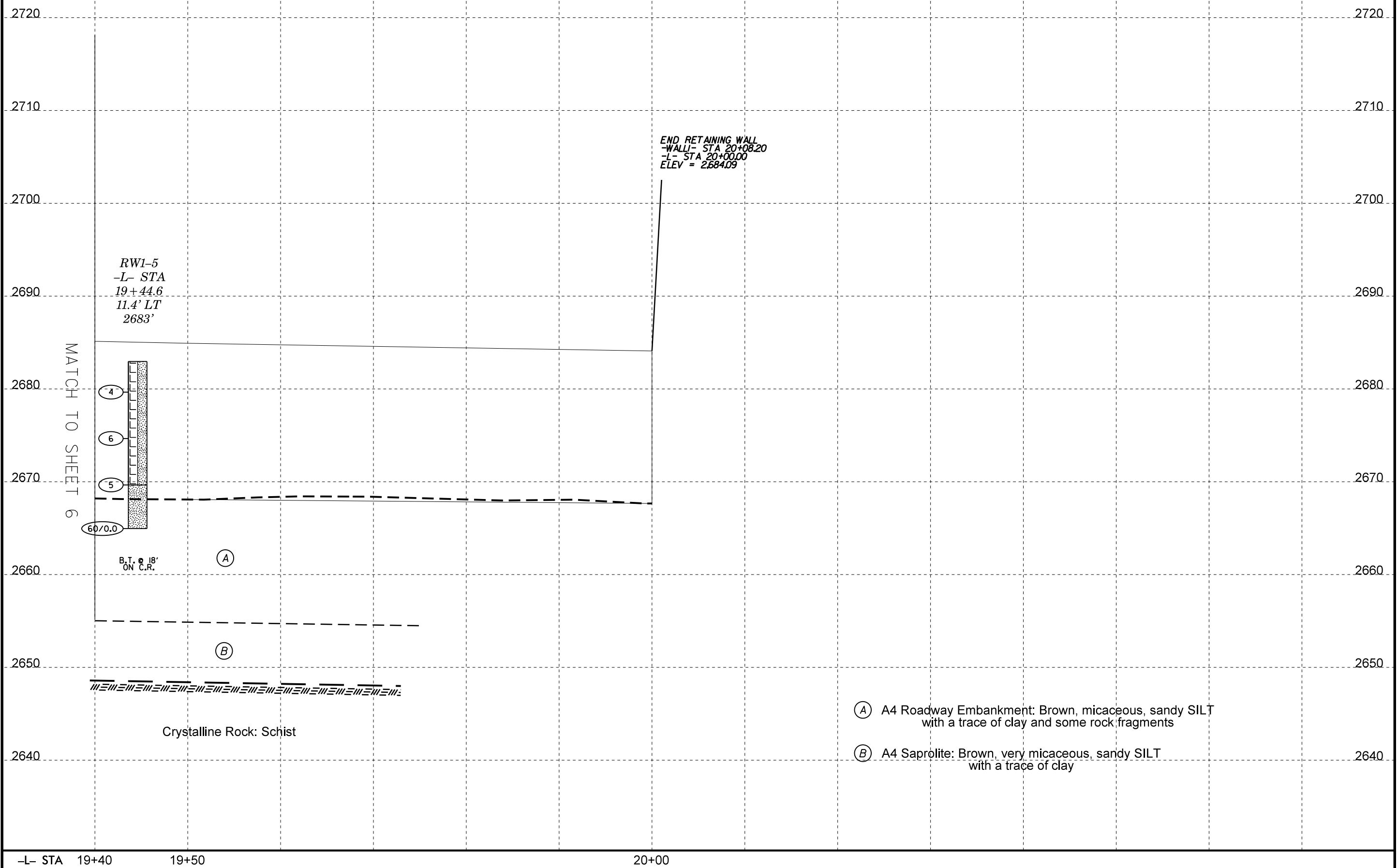
- (A) A4 Roadway Embankment: Brown, micaceous, sandy SILT with a trace of clay and some rock fragments
- (B) Weathered Rock: Schist
- (C) A4 Saprolite: Brown, very micaceous, sandy SILT with a trace of clay

Crystalline Rock: Schist



| PROJECT REFERENCE NO. | SHEET NO. |
|--|-----------|
| BR-0002 | 7 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N. FORK NEW RIVER | |

RETAINING WALL
-L+ STA 15+50 - 16+80



MATCH TO SHEET 6

RW1-5
-L- STA
19+44.6
11.4' LT
2683'

END RETAINING WALL
- WALL - STA 20+08.20
-L- STA 20+00.00
ELEV = 2684.09

60/0.0

B.T. @ 18'
ON C.R.

(A)

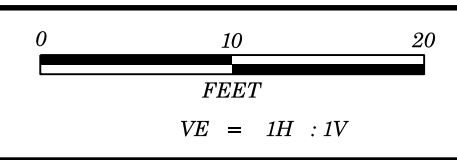
(B)



Crystalline Rock: Schist

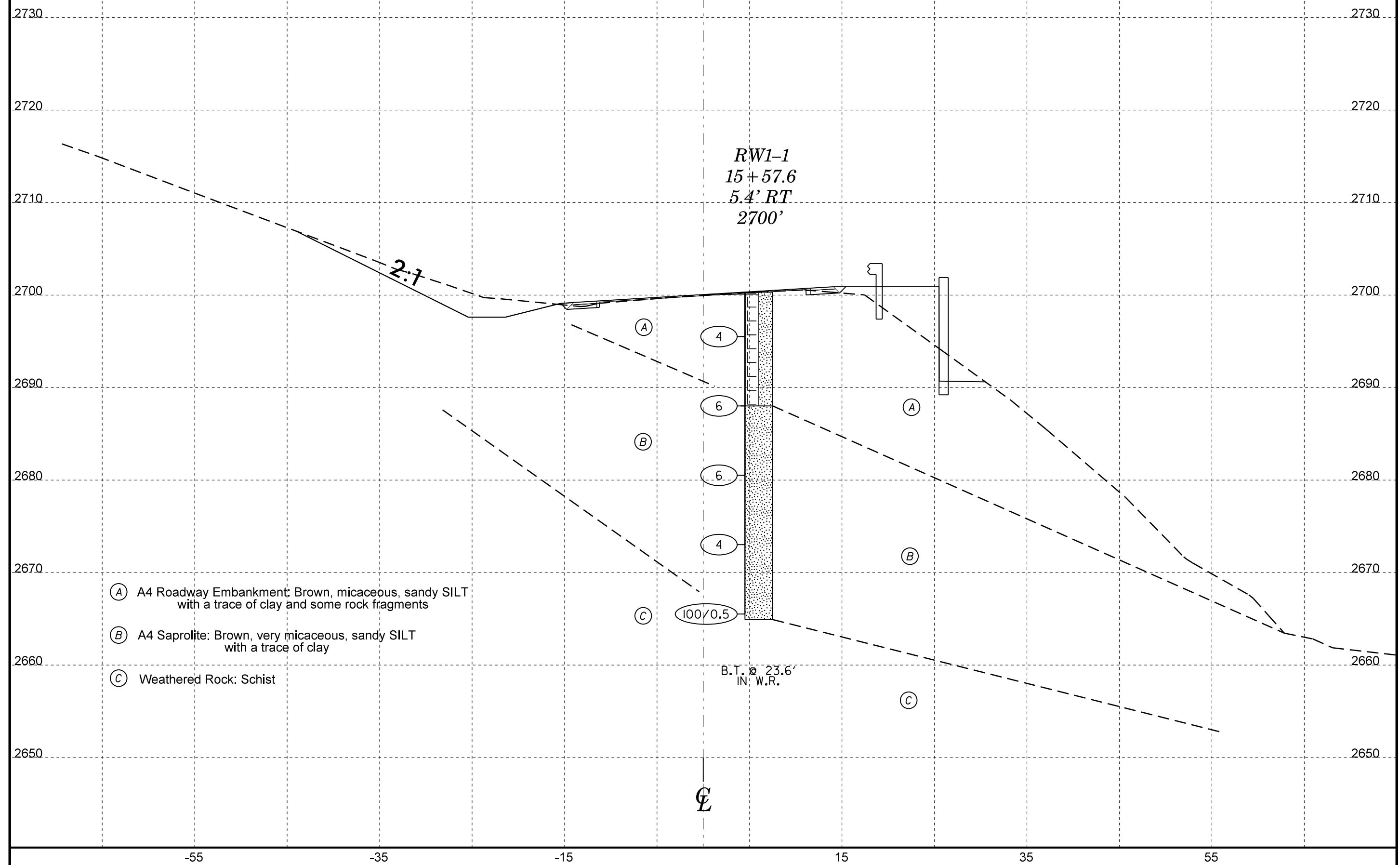
(A) A4 Roadway Embankment: Brown, micaceous, sandy SILT with a trace of clay and some rock fragments

(B) A4 Saprolite: Brown, very micaceous, sandy SILT with a trace of clay



| PROJECT REFERENCE NO. | SHEET NO. |
|--|-----------|
| BR-0002 | 8 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N. FORK NEW RIVER | |

CROSS SECTION: -L- STA 15+50

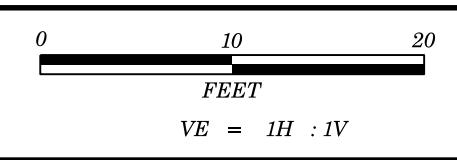


- (A) A4 Roadway Embankment: Brown, micaceous, sandy SILT with a trace of clay and some rock fragments
- (B) A4 Saprolite: Brown, very micaceous, sandy SILT with a trace of clay
- (C) Weathered Rock: Schist

- (4)
- (6)
- (6)
- (4)
- (100/0.5)

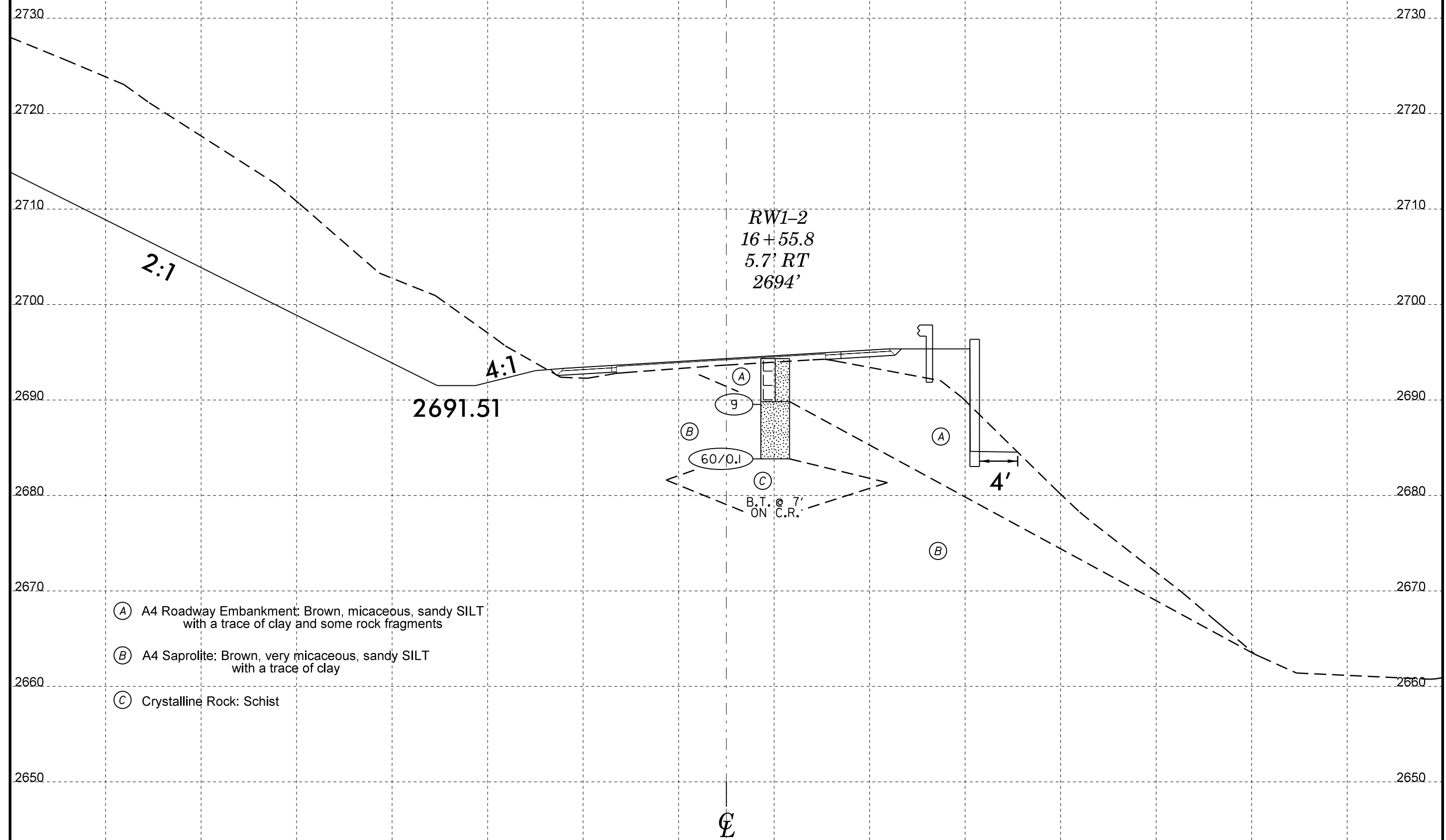
- (A)
- (B)
- (C)

- (A)
- (B)
- (C)

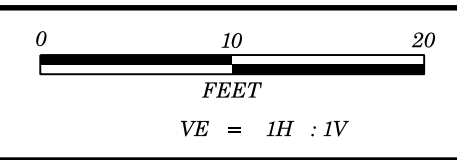


| PROJECT REFERENCE NO. | SHEET NO. |
|--|-----------|
| BR-0002 | 9 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N. FORK NEW RIVER | |

CROSS SECTION: -L- STA 16+50

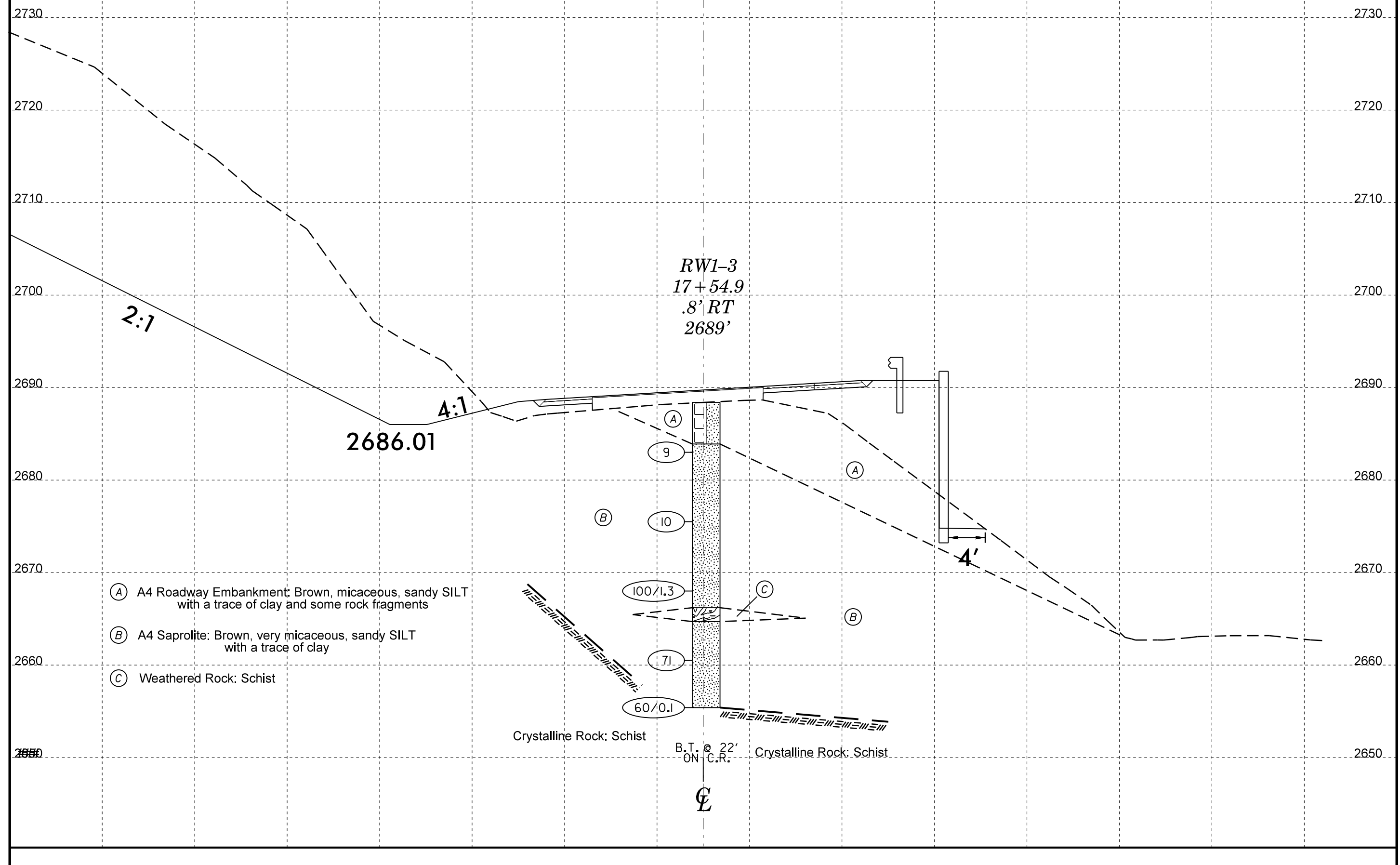


- (A) A4 Roadway Embankment: Brown, micaceous, sandy SILT with a trace of clay and some rock fragments
- (B) A4 Saprolite: Brown, very micaceous, sandy SILT with a trace of clay
- (C) Crystalline Rock: Schist



| PROJECT REFERENCE NO. | SHEET NO. |
|--|-----------|
| BR-0002 | 10 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N. FORK NEW RIVER | |

CROSS SECTION: -L- STA 17+50

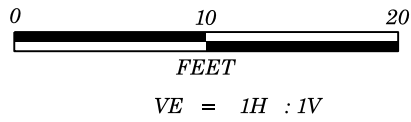


- (A) A4 Roadway Embankment: Brown, micaceous, sandy SILT with a trace of clay and some rock fragments
- (B) A4 Saprolite: Brown, very micaceous, sandy SILT with a trace of clay
- (C) Weathered Rock: Schist

Crystalline Rock: Schist

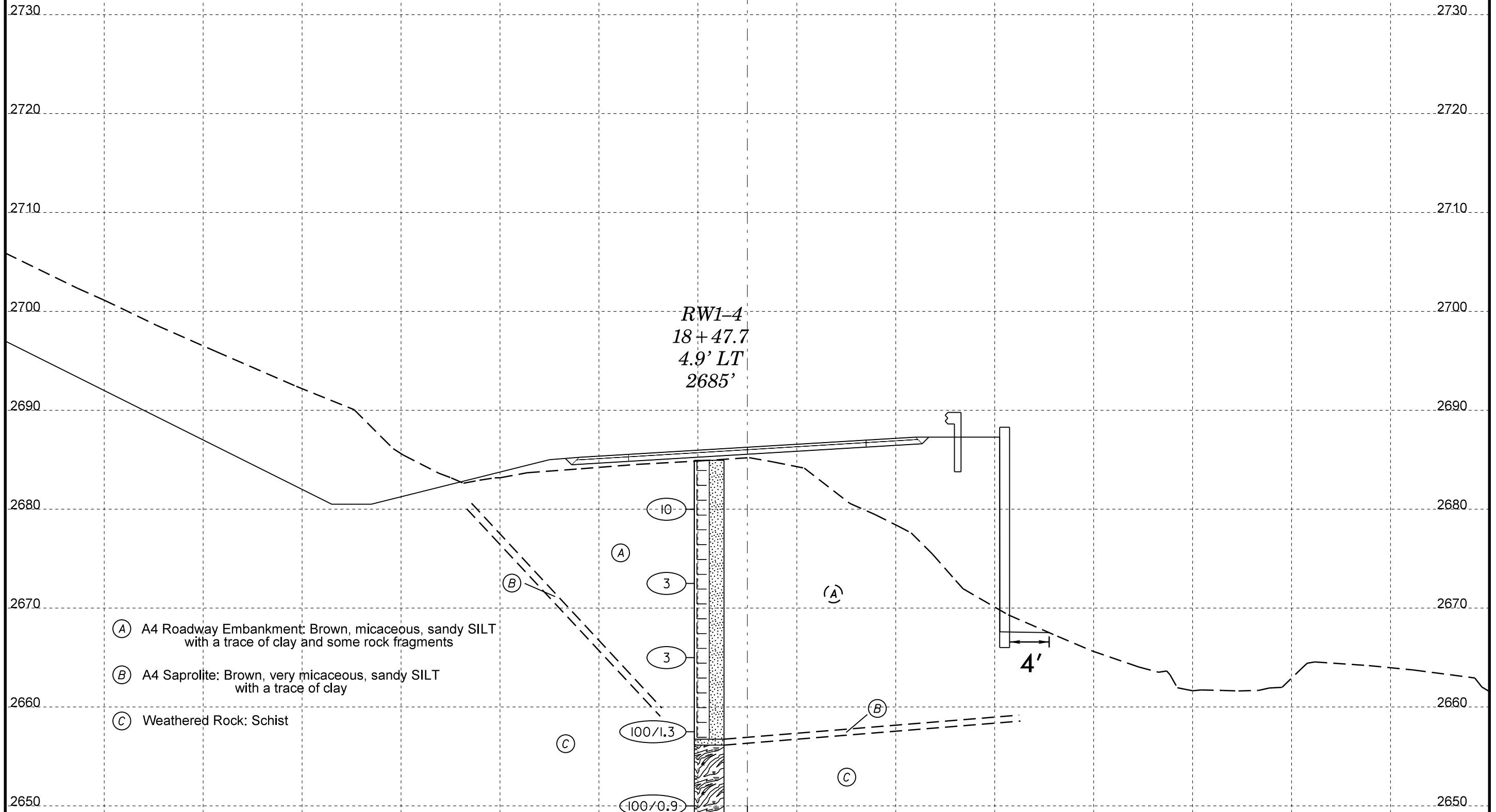
B.T. @ 22'
ON C.R.

Crystalline Rock: Schist



| PROJECT REFERENCE NO. | SHEET NO. |
|--|-----------|
| BR-0002 | 11 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N. FORK NEW RIVER | |

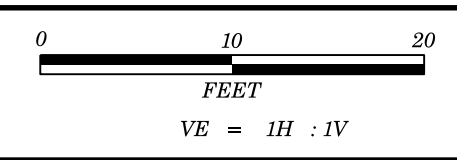
CROSS SECTION: -L- STA 18+50



- (A) A4 Roadway Embankment: Brown, micaceous, sandy SILT with a trace of clay and some rock fragments
- (B) A4 Saprolite: Brown, very micaceous, sandy SILT with a trace of clay
- (C) Weathered Rock: Schist

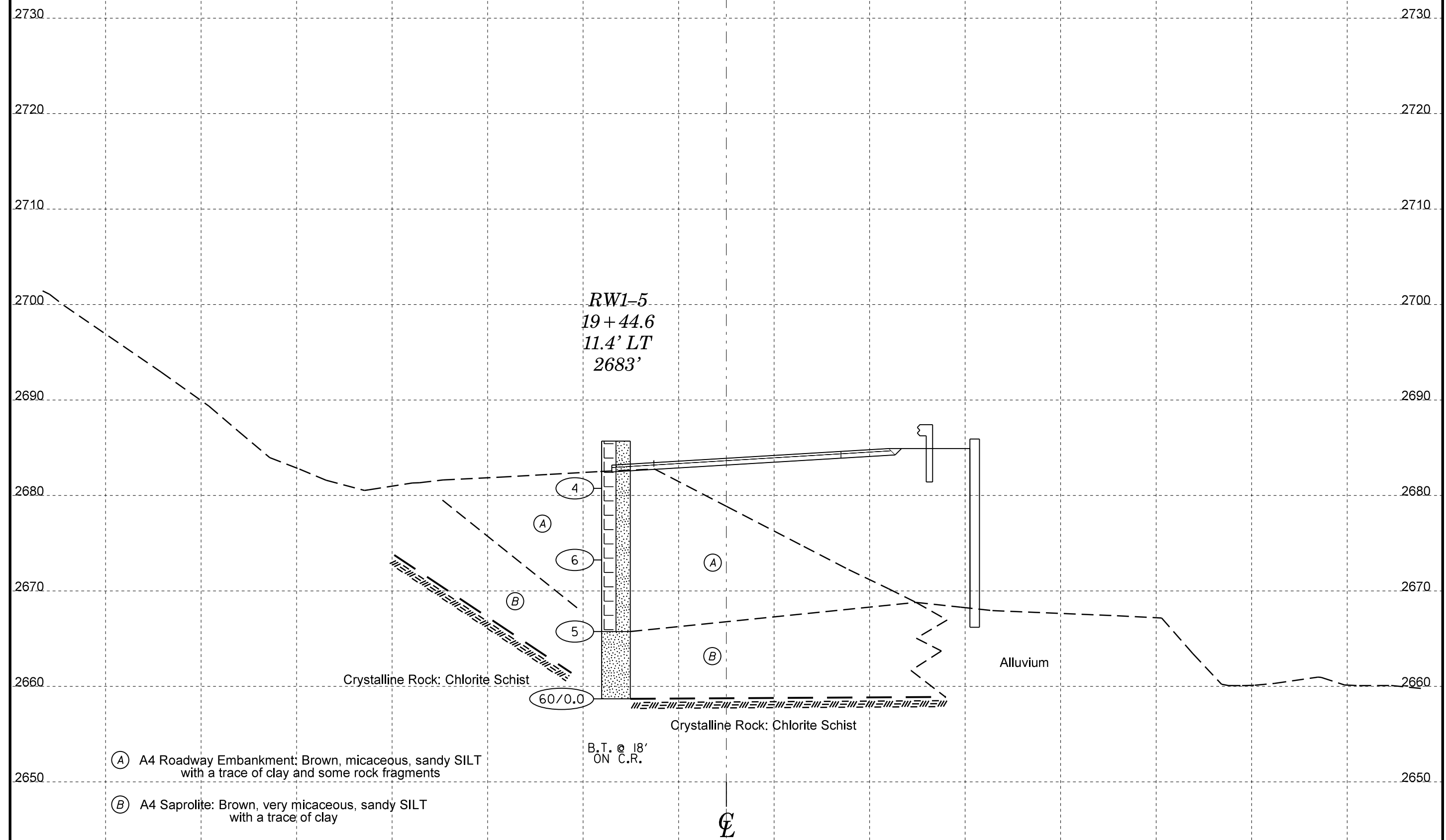
RW1-4
18+47.7
4.9' LT
2685'

B.T. © 24
IN W.R.



| PROJECT REFERENCE NO. | SHEET NO. |
|--|-----------|
| BR-0002 | 12 |
| REPLACE ASHE BRIDGE #8 ON NC 194 OVER N. FORK NEW RIVER | |

CROSS SECTION: -L- STA 19+50



GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|--|-----------------|---------------------|--------------------------|---------------------|-----------------------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|--|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. RW1-1 | | STATION 15+52 | | OFFSET 6 ft RT | | ALIGNMENT L | | | | | | | | | |
| COLLAR ELEV. 2,700.2 ft | | TOTAL DEPTH 23.7 ft | | NORTHING 997,440 | | EASTING 1,260,993 | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | |
| 2705 | | | | | | | | | | | | | | | |
| 2700 | | | | | | | | | | | | | | | |
| | 2,697.0 | 3.2 | | | | | | | | | | | | | |
| 2695 | | | | | | | | | | | | | | | |
| | 2,692.0 | 8.2 | | | | | | | | | | | | | |
| 2690 | | | | | | | | | | | | | | | |
| | 2,687.0 | 13.2 | | | | | | | | | | | | | |
| 2685 | | | | | | | | | | | | | | | |
| | 2,682.0 | 18.2 | | | | | | | | | | | | | |
| 2680 | | | | | | | | | | | | | | | |
| | 2,677.0 | 23.2 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|--|-----------------|---------------------|--------------------------|---------------------|-----------------------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|--|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. RW1-2 | | STATION 16+50 | | OFFSET 5 ft RT | | ALIGNMENT L | | | | | | | | | |
| COLLAR ELEV. 2,694.0 ft | | TOTAL DEPTH 7.1 ft | | NORTHING 997,489 | | EASTING 1,261,077 | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | |
| 2695 | | | | | | | | | | | | | | | |
| | 2,694.0 | | | | | | | | | | | | | | |
| | 2,691.0 | | | | | | | | | | | | | | |
| 2690 | | | | | | | | | | | | | | | |
| | 2,690.8 | 3.2 | | | | | | | | | | | | | |
| | 2,687.0 | 7.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE BR0002_RW1_ASHE_BOREHOLES_GPJ_NC_DOT.GDT 6/6/19

GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | | |
|--|-----------------|---------------------|------------|---------------------|-------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|------|---|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. RW1-5 | | STATION 19+35 | | OFFSET 4 ft LT | | ALIGNMENT L | | | | | | | | | | |
| COLLAR ELEV. 2,682.8 ft | | TOTAL DEPTH 18.0 ft | | NORTHING 997,672 | | EASTING 1,261,295 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | | DRILL METHOD N/A | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | ELEV. (ft) | DEPTH (ft) | | |
| 2685 | | | | | | | | | | | | | | 2,682.8 | 0.0 | GROUND SURFACE |
| 2680 | 2,679.5 | 3.3 | 2 | 2 | 2 | | | | | | | | | | | ROADWAY EMBANKMENT Brown micaceous sandy SILT with a trace of clay, roots, and a few gravels |
| 2675 | 2,674.5 | 8.3 | 1 | 2 | 4 | | | | | | | | | | | |
| 2670 | 2,669.5 | 13.3 | 1 | 2 | 3 | | | | | | | | | 2,669.5 | 13.3 | SAPROLITE Brown gray, micaceous clayey silt with some rock fragments |
| 2665 | 2,664.8 | 18.0 | 60/0.0 | | | | | | | | | | | 2,664.8 | 18.0 | CRYSTALLINE ROCK Crystalline chlorite schist Boring Terminated at Elevation 2,664.8 ft ON CR |

NCDOT BORE DOUBLE BR0002_RW1_ASHE_BOREHOLES_GPJ_NC_DOT.GDT 6/6/19



March 24, 2020

Mr. John Pilipchuk, LG, PE and Ms. Christina Bruinsma, PG
Geotechnical Engineering Unit
North Carolina Department of Transportation
1020 Birch Ridge Drive
Raleigh, NC 27610

RE: REPORT ON GEOPHYSICAL STUDY
Proposed Retaining Wall Location by Buffalo Creek, Warrensville, NC
ESP Project No. GR22.323

WBS Number: 67002.1.1
TIP Number: BR-0002
Project ID: 35254
County: ASHE
Description: Replace Bridge No. 040008 over North Fork New River on NC194
Site Description: Retaining Wall, -L- Sta. 15+00 to 20+00

Dear Mr. Pilipchuk and Ms. Bruinsma:

ESP Associates, Inc. (ESP) is pleased to submit this report on our geophysical study of the subject site. This work was performed in accordance with your Request for Proposal dated February 12, 2020 and our cost proposal dated February 21, 2020. The Notice to Proceed (NTP) was received on February 27, 2020.

We appreciate the opportunity to assist you during this phase of the project. If you should have any questions concerning this report, or if we may be of further assistance, please contact us.

Sincerely,

ESP Associates, Inc.

Edward D. Billington, PG
Senior Geologist/Geophysicist
EDB/PMW/JS



4/2/2020

DocuSigned by:

7402544DC92F4E0...

not considered Final unless all signatures are completed

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ATTACHMENTS

| | |
|--------------|---|
| Attachment A | Soil Test Boring Logs Provided by the NCDOT |
| Attachment B | Final Survey Report |

1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) is planning to replace Bridge No. 040008 over the North Fork New River on NC194 (Figure 1). The project will require realignment of the two-lane highway from NW School Road to the bridge, and the construction of a retaining wall next to Buffalo Creek. The retaining wall is planned to be approximately 500 feet long, extending from -L- Sta. 15+00 to 20+00. Since the planned location of the retaining wall was too steep to allow drilling to explore for bedrock depths, the NCDOT requested that ESP perform a geophysical investigation to assess the approximate depth to bedrock. Based on the 1985 Geologic Map of North Carolina, the bedrock at the site is identified as an amphibolite (Zata), described as equigranular, massive to well foliated, interlayered, rarely discordant, metamorphosed intrusive to extrusive mafic rock; may include metasedimentary rock.

2.0 SITE OBSERVATIONS

ESP performed a site visit with NCDOT personnel on February 5, 2020 to assess the feasibility of performing work on the slope. The slope distance from the guard rail to the creek appeared to range from about 40 to 75 feet. In some places, the slope appeared to be approximately 1H:1V. There was a narrow strip of grass between the edge of pavement and the guard rail and occasionally a narrow soil bench on the slope side of the guard rail. The upper part of the slope was fairly open with tall grass and briars while the lower part of the slope was lightly wooded with briars. Boulders and some apparent rock outcrops were visible on the lower slope and at the creek level.

3.0 FIELD METHODS

ESP performed field work at the planned retaining wall location on March 3 through 6, and on March 9, 2020. The work consisted of seismic refraction data collection on March 3 through 5, driving “bridge rods” on March 6, and surveying the location of stakes for the seismic lines and bridge rod locations on March 9. Photographs of the site and of the seismic data collection are shown on Figure 2.

3.1 Seismic Refraction

ESP collected seismic refraction data along 6 lines: Line 1 was located along the approximate planned retaining wall location, and Lines 2 through 6 were oriented down the slope starting at the edge of pavement (Figure 3). The work was performed by Edward Billington, PG, Ryan Pastrana, GIT, and Chase Hallenbeck of ESP.

The seismic data were collected using a 24-channel system consisting of a Geode seismograph, 8Hz geophones spaced 5 feet apart, and a 16-pound sledgehammer striking a steel plate on the ground as the energy source. Four 115-foot long arrays using 24 geophones were employed for Line 1. Due to the length of the slope, 9 to 10 geophones were used for the slope lines with array lengths of 40 to 45 feet. Some lines or portion of lines required hand clearing. Noise from passing

vehicles affected the data although we tried to not collect data when cars and trucks were passing. Due to the steepness of the slope, the personnel working on the slope used a safety rope to help prevent falls. Wooden stakes were placed at 50-foot intervals along Line 1, and at the top, bottom, and significant slope changes on Lines 2, 3, 4, 5, and 6.

3.2 Bridge Rods

ESP drove bridge rods at the intersections of Line 1 with Lines 2, 3, 5, and 6 on March 6 (Figure 3). The slope at Line 4 was too steep for driving rods. The work consisted of driving 5-foot long half-inch steel rods with a 16-pound slide hammer approximately vertically down into the ground until refusal. Couplers were used when more than one rod was needed. Refusal was defined as 100 blows with less than an inch penetration. Notes were recorded as to the relative softness or hardness of the materials that were driven through with the rods. Wooden stakes were placed to mark the location of the rod drives.

3.3 Location Surveys

On March 9, ESP surveyed the locations and elevations of the wooden stakes placed to mark the seismic line locations and rod drives. The work was performed by a 3-person survey crew utilizing conventional survey equipment. The surveyed points were added to the MicroStation site plan and used to draw the approximate location of the seismic lines and rod drives (Figure 3). More information regarding the survey task is provided in the final survey report (Attachment B).

4.0 DATA ANALYSIS

4.1 Seismic Refraction Velocity Models

The processing steps for the seismic refraction data analysis consisted of assigning geometry, picking the arrival times of refracted energy at each geophone (first breaks), creating an elevation model from the survey point data, then performing a tomographic inversion of the arrival time data to develop a compressional wave velocity model for each line (Figures 4 and 5). The velocities are presented in feet per second (ft/s).

4.2 Bridge Rods and Soil Test Borings Data

The bridge rod and soil test boring data are listed in Table 1 and are superimposed on the velocity models on Figures 4 and 5. The soil test borings were performed by the NCDOT prior to ESP's work on this project (Attachment A).

4.3 Location Survey Data

The results of the location surveys were added to the MicroStation site plan on Figure 3.

5.0 DISCUSSION OF RESULTS

The velocity models were correlated with the rod drives to assess the approximate depth to weathered rock and to crystalline rock. Based on this evaluation, we made the following generalized definitions.

| Compressional Wave Velocity (ft/s) | Corresponding Material Type ¹ |
|------------------------------------|--|
| Less than 3500 | Fill and Residual Soil |
| 3500 to 7500 | Weathered Rock, WR |
| 7500 or more ² | Crystalline Rock, CR |

¹Material type as categorized by the NCDOT GEU; see Figure 6.

²7500 ft/s is the approximate limit of rippability for metamorphic rock (Handbook of Ripping, February 2000, 12th Edition, Caterpillar Inc., Peoria, IL).

The velocity model for Line 1 indicates that the depth to weathered rock is approximately 20 feet from STA 15+00 to 17+00. After STA 17+00, the depth to weathered rock decreases to 10 feet or less. At rod drive BR-01 on the alluvial bench, the material was soft until almost refusal at 4.7 feet below ground surface (bgs). Based on the seismic velocities, it appears that BR-01 refused on crystalline rock, so there appears to be little to no weathered rock in the vicinity of BR-01; this would be expected for an alluvial stream bank where the stream had previously scoured down to bedrock.

Due to the slope distance from the guard rail to the creek, the length of the arrays for Lines 2 through 6 were too short to obtain sufficient refracted arrivals from crystalline rock, resulting in velocity models that probably do not represent the true velocity structure of the subsurface. Although there is not a satisfactory match between the velocity model for Line 1 and the models for Lines 2 through 6 where they intersect, the models for Lines 2 through 6 do indicate that the depth to weathered rock decreases from STA 15+00 to STA 20+00, supporting the interpretation of Line 1, and they show a reasonable correlation with the adjacent RW1 soil test borings.

6.0 LIMITATIONS

These services have been provided to the NCDOT in accordance with generally accepted guidelines for performing geophysical surveys. It is recognized that the results of geophysical surveys are non-unique and subject to interpretation. Further, the seismic refraction method is an averaging technique; it is likely that there are bedrock highs and lows that are not imaged by this method.

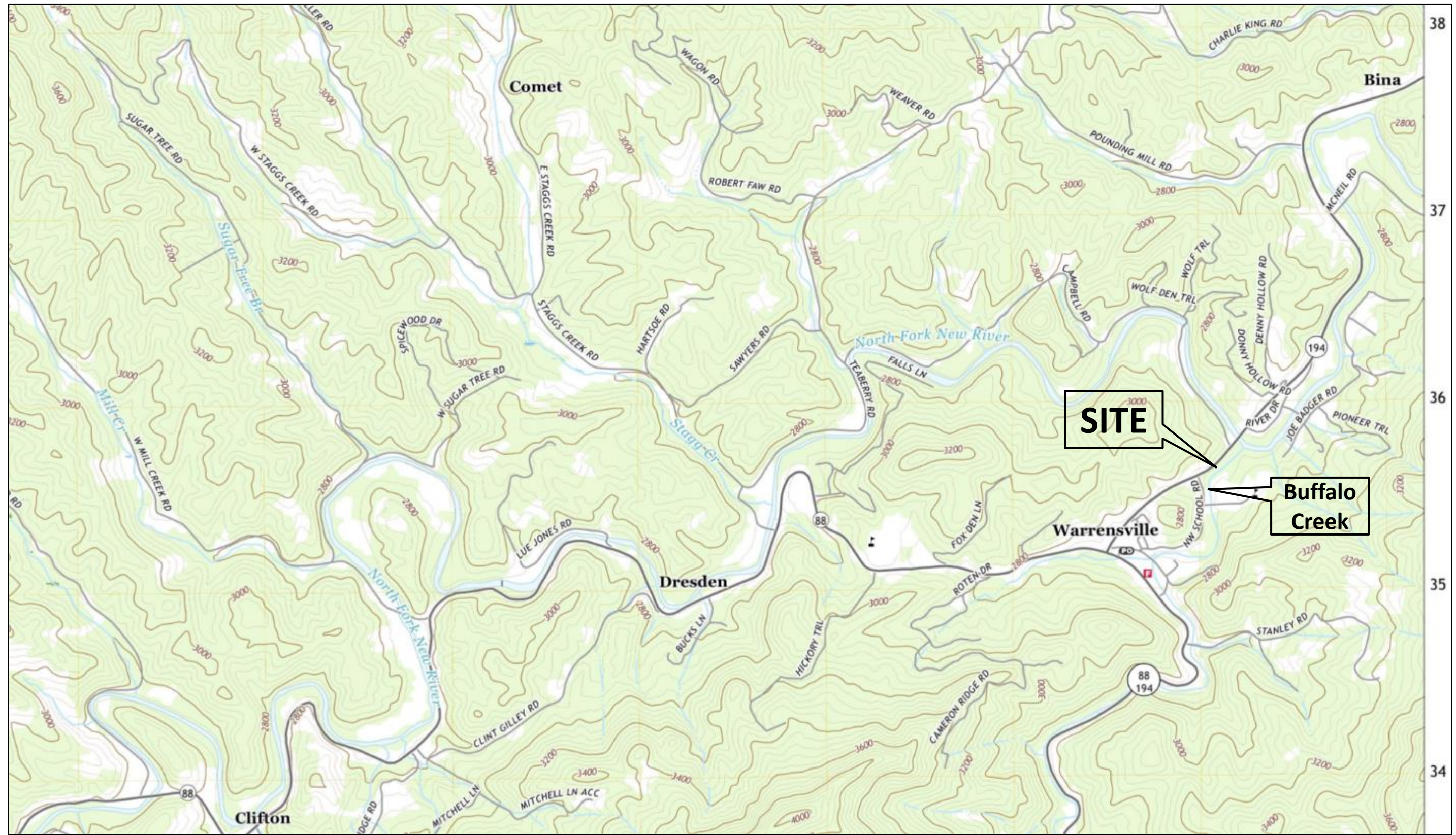
TABLES

**TABLE 1
BRIDGE ROD AND BORING INFORMATION**

| Bridge Rod or Boring* | Station & Offset (-WALL1-) | Location on Seismic Line (Line, Station) | Refusal Depth (feet bgs) | Comments |
|------------------------------|---------------------------------------|--|---------------------------------|---|
| BR-01 | 19+55 1' LT | Intersection of Line 1 and Line 2; Line 1 458' | 4.7 | 0.0' – 4.5' - Soft 4.5' – 4.7' - Firm |
| BR-02 | 18+51 1' RT | Intersection of Line 1 and Line 3; Line 1, 353' | 8.3 | 0.0' – 6.1' - Soft 6.1' – 8.3' - Firm |
| BR-03 | 18+50 8' RT | Line 3, 40' | 6.7 | 0.0' – 5.5' - Soft 5.5' – 6.7' - Firm |
| BR-04 | 16+59 3' LT | Line 5, 15' | 16.7 | 0.0' – 13.2' - Soft 13.2' – 16.7' - Firm |
| BR-05 | 15+51 7' LT | Line 6, 10' | 21.8 | 0.0' – 11.9' - Soft 11.9' – 16.3' - Firm 16.3' – 21.8' - Hard |
| RW1-1* | 15+56 21' LT | Near start of Line 6 | - | Weathered Rock from 23.2' - 23.7' Boring Terminated in Weathered Rock |
| RW1-2* | 16+58 21' LT | Near start of Line 5 | 7.1 | Boring Terminated on Crystalline Rock (probable boulder, not bedrock) |
| RW1-3* | 17+58 26' LT | Near start of Line 4 | 22.0 | Weathered Rock and Hard Silt (N=71) from 14.8' - 22.0' Boring Terminated on Crystalline Rock |
| RW1-4* | 18+53 31' LT | Near start of Line 3 | - | Weathered Rock from 19.2' - 24.0' Boring Terminated in Weathered Rock |
| RW1-5* | 19+52 38' LT | Near start of Line 2 | 18.0 | Boring Terminated on Crystalline Rock |

*Borings completed prior to ESP's work. Boring data provided by NCDOT.

FIGURES



From: USGS US Topo 7.5 - minute map for WARRENSVILLE, NC, Date: 2019, Original Scale: 1:24,000

| | |
|-------------|----------|
| PROJECT NO. | GR22.323 |
| SCALE | AS SHOWN |
| DATE | 3/17/20 |
| BY | EDB |

FIGURE 1
SITE VICINITY MAP

BR-0002, REPLACE BRIDGE NO. 040008 OVER NORTH FORK NEW RIVER ON NC194, RETAINING WALL -L- STA. 15+00 TO 20+00



ESP Associates, Inc.
7011 Albert Pick Rd.,
Suite E
Greensboro, NC 27409
336.334.7724
www.espassociates.com



A. Photograph of site, looking downstream (northeast).



B. Photograph of site, looking upstream (southwest).



C. Photograph of seismic line being set up on slope.



D. Photograph of seismic refraction data collection with sledgehammer source.

| | |
|-------------|----------|
| PROJECT NO. | GR22.323 |
| SCALE | N/A |
| DATE | 3/17/20 |
| BY | EDB |

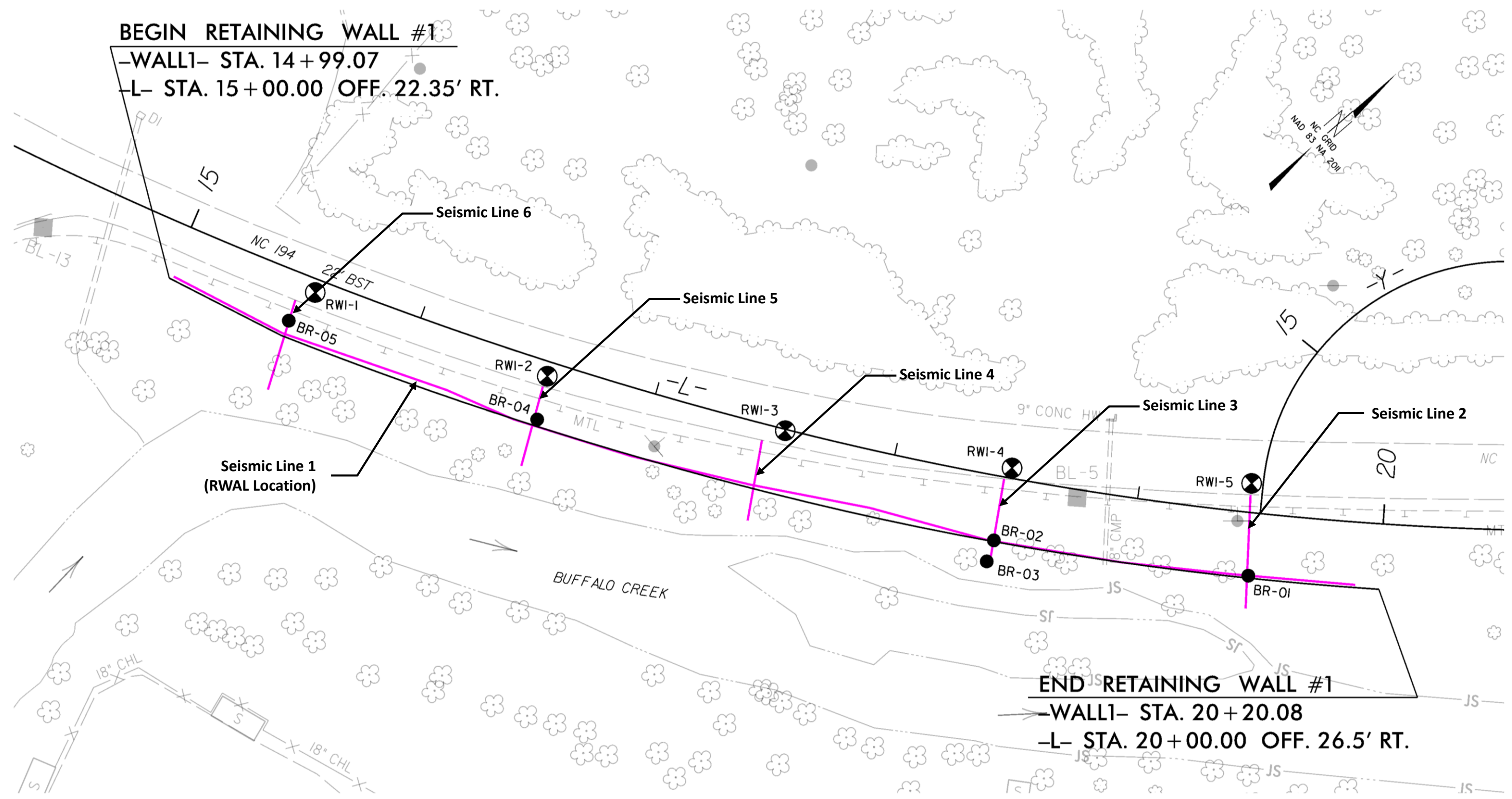
FIGURE 2
DATA COLLECTION PHOTOGRAPHS
 BR-0002, REPLACE BRIDGE NO. 040008 OVER NORTH FORK NEW RIVER ON NC194, RETAINING WALL -L- STA. 15+00 TO 20+00



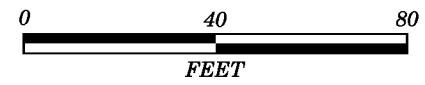
ESP Associates, Inc.
 7011 Albert Pick Rd.,
 Suite E
 Greensboro, NC 27409
 336.334.7724
 www.espassociates.com

BEGIN RETAINING WALL #1
 -WALL1- STA. 14+99.07
 -L- STA. 15+00.00 OFF. 22.35' RT.

END RETAINING WALL #1
 -WALL1- STA. 20+20.08
 -L- STA. 20+00.00 OFF. 26.5' RT.



| Explanation | |
|-------------|--------------------------------------|
| | Seismic refraction line |
| | BR-01 Bridge rod location and number |



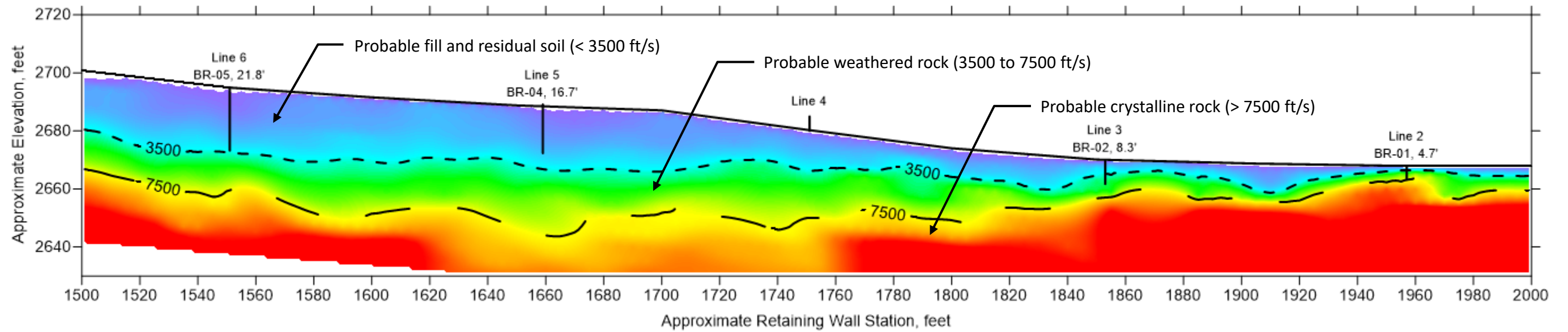
| | |
|-------------|----------|
| PROJECT NO. | GR22.323 |
| SCALE | AS SHOWN |
| DATE | 3/17/20 |
| BY | EDB |

| |
|--|
| FIGURE 3 |
| SITE PLAN WITH SEISMIC LINE LOCATIONS |
| BR-0002, REPLACE BRIDGE NO. 040008 OVER NORTH FORK NEW RIVER ON NC194, RETAINING WALL -L- STA. 15+00 TO 20+00 |

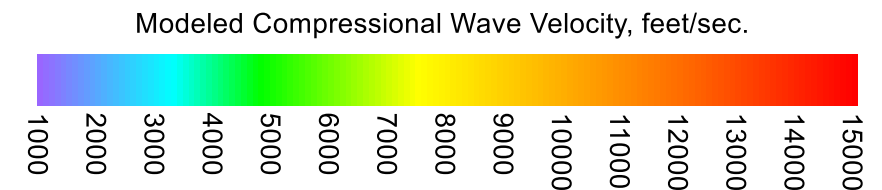



ESP Associates, Inc.
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 Suite E
 Greensboro, NC 27409
 336.334.7724
 www.espassociates.com

SEISMIC LINE 1 VELOCITY MODEL

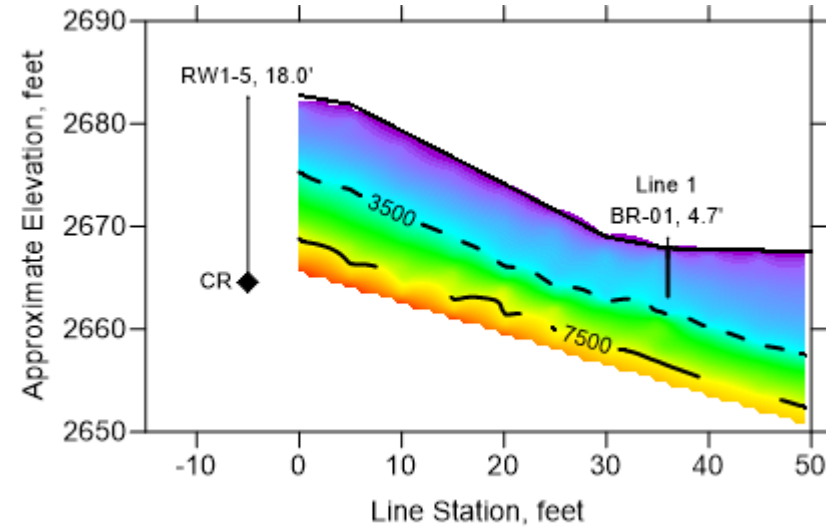


| Explanation | |
|-------------|--|
| Line 2 | Intersecting seismic line number and location |
| + | |
| BR01, 4.7' | Bridge rod number, refusal depth, and location |
| | |

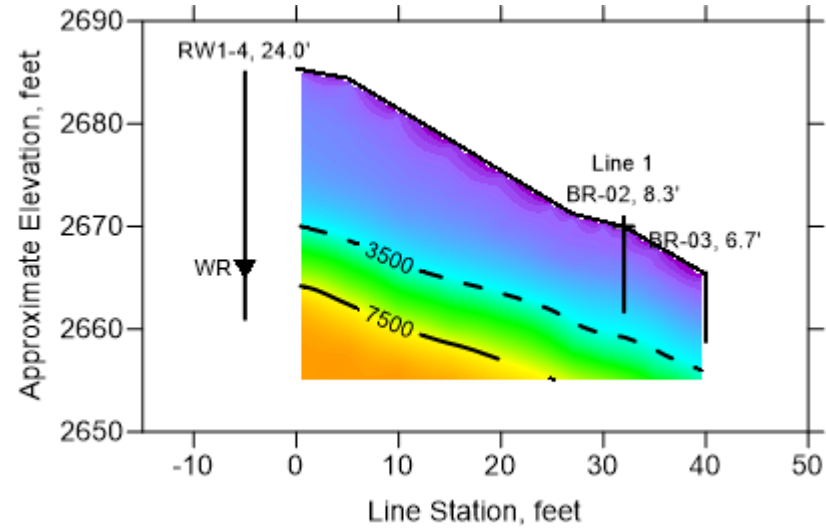


| | | | |
|-------------------------|--|---|--|
| PROJECT NO. GR22.323 | FIGURE 4 SEISMIC LINE 1 VELOCITY MODEL |  | ESP Associates, Inc. |
| SCALE AS SHOWN | | | 7011 Albert Pick Rd., Suite E Greensboro, NC 27409 |
| DATE 3/17/20 | BR-0002, REPLACE BRIDGE NO. 040008 OVER NORTH FORK NEW RIVER ON NC194, RETAINING WALL -L- STA. 15+00 TO 20+00 | | 336.334.7724 |
| BY EDB | | | www.espassociates.com |

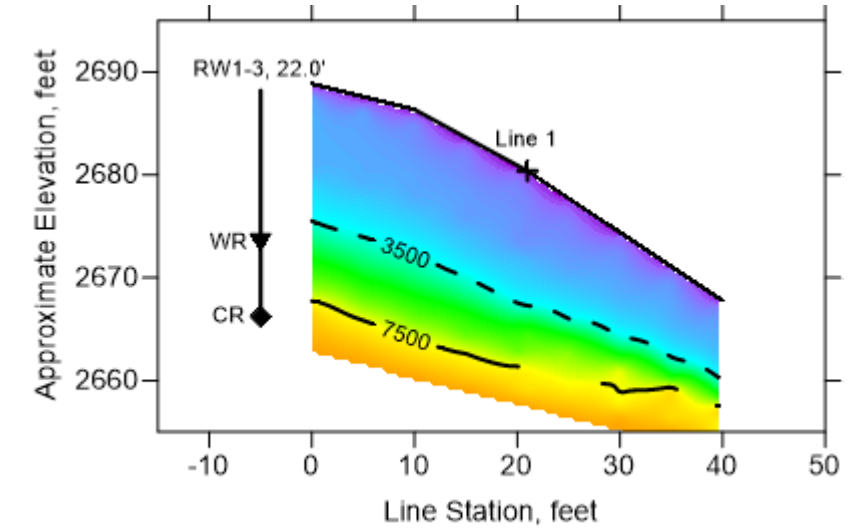
SEISMIC LINE 2 VELOCITY MODEL



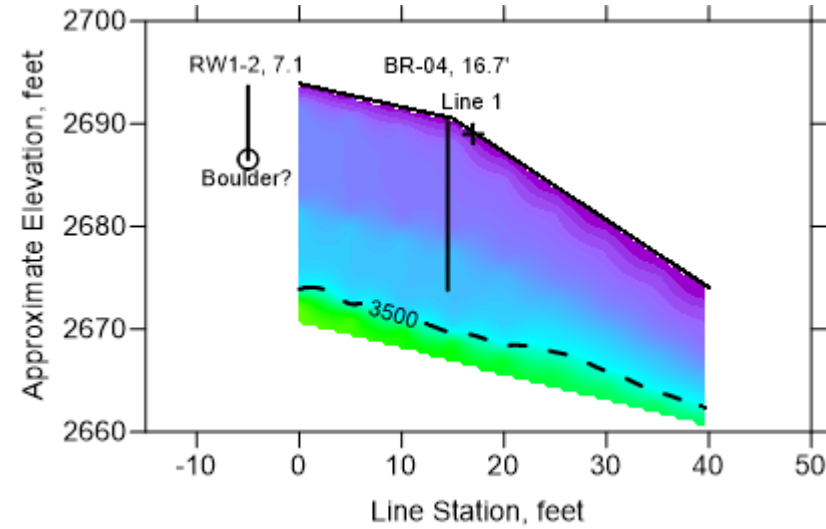
SEISMIC LINE 3 VELOCITY MODEL



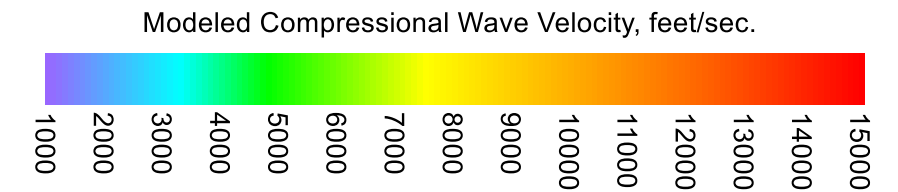
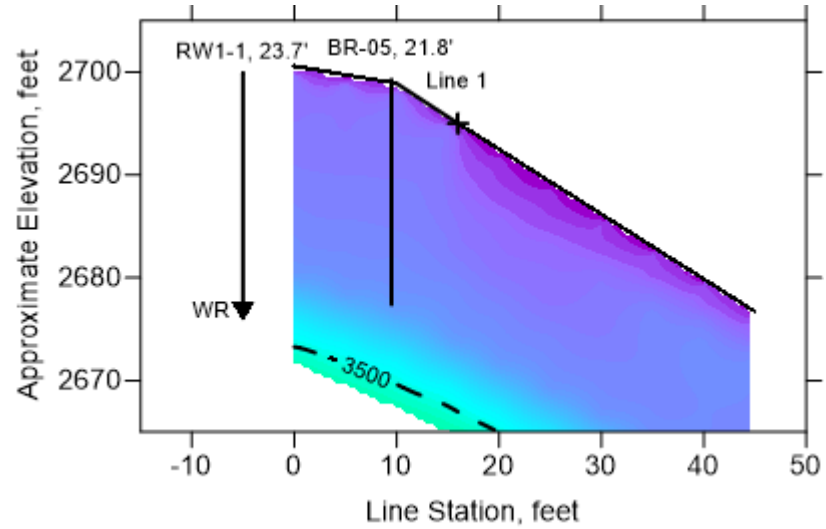
SEISMIC LINE 4 VELOCITY MODEL



SEISMIC LINE 5 VELOCITY MODEL



SEISMIC LINE 6 VELOCITY MODEL



Explanation

- Line 2
+ Intersecting seismic line number and location
- BR01, 4.7'
| Bridge rod number, refusal depth, and location
- RW1-1, 23.7'
| Boring designation, termination depth, location, and top of weathered rock or crystalline rock
- WR ▼ WR = weathered rock, CR = crystalline rock
- CR ◆

| | |
|-------------|----------|
| PROJECT NO. | GR22.323 |
| SCALE | AS SHOWN |
| DATE | 3/17/20 |
| BY | EDB |

| |
|--|
| FIGURE 5 |
| SEISMIC LINES 2 THROUGH 6 VELOCITY MODELS |
| BR-0002, REPLACE BRIDGE NO. 040008 OVER NORTH FORK NEW RIVER ON NC194, RETAINING WALL -L- STA. 15+00 TO 20+00 |



ESP Associates, Inc.
7011 Albert Pick Rd., Suite E
Greensboro, NC 27409
336.334.7724
www.espassociates.com

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

| SOIL DESCRIPTION | | | | | | | | | | GRADATION | | | | | | | | | | ROCK DESCRIPTION | | | | | | | | | | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i> | | | | | | | | | | 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. | | | | | | | | | | 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: | | | | | | | | | | 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 (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | ANGULARITY OF GRAINS | | | | | | | | | | WEATHERED ROCK (WR) | | | | | | | | | | NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MINERALOGICAL COMPOSITION | | | | | | | | | | CRYSTALLINE ROCK (CR) | | | | | | | | | | FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC. | | | | | | | | | | NON-COASTAL PLAIN SEDIMENTARY ROCK (NCR) | | | | | | | | | | 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMPRESSION | | | | | | | | | | NON-CRYSTALLINE ROCK (NCR) | | | | | | | | | | COASTAL PLAIN SEDIMENTARY ROCK (CP) | | | | | | | | | | COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PERCENTAGE OF MATERIAL | | | | | | | | | | WEATHERING | | | | | | | | | | FRESH | | | | | | | | | | ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUND WATER | | | | | | | | | | VERY SLIGHT (IV SL.) | | | | | | | | | | SLIGHT (SL.) | | | | | | | | | | MODERATE (MOD.) | | | | | | | | | | MODERATELY SEVERE (MOD. SEV.) | | | | | | | | | | SEVERE (SEV.) | | | | | | | | | | VERY SEVERE (IV SEV.) | | | | | | | | | | COMPLETE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISCELLANEOUS SYMBOLS | | | | | | | | | | ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION | | | | | | | | | | SOIL SYMBOL | | | | | | | | | | ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT | | | | | | | | | | INFERRED SOIL BOUNDARY | | | | | | | | | | INFERRED ROCK LINE | | | | | | | | | | ALLUVIAL SOIL BOUNDARY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RECOMMENDATION SYMBOLS | | | | | | | | | | UNDERCUT | | | | | | | | | | SHALLOW UNDERCUT | | | | | | | | | | UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE | | | | | | | | | | UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK | | | | | | | | | | UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ABBREVIATIONS | | | | | | | | | | 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 | | | | | | | | | |
| TEXTURE OR GRAIN SIZE | | | | | | | | | | U.S. STD. SIEVE SIZE OPENING (MM) | | | | | | | | | | BOULDER (BLDR.) | | | | | | | | | | COBBLE (COB.) | | | | | | | | | | GRAVEL (GR.) | | | | | | | | | | COARSE SAND (CS. SD.) | | | | | | | | | | FINE SAND (F SD.) | | | | | | | | | | SILT (SL.) | | | | | | | | | | CLAY (CL.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL MOISTURE - CORRELATION OF TERMS | | | | | | | | | | SOIL MOISTURE SCALE (ATTERBERG LIMITS) | | | | | | | | | | FIELD MOISTURE DESCRIPTION | | | | | | | | | | GUIDE FOR FIELD MOISTURE DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PLASTICITY | | | | | | | | | | NON PLASTIC | | | | | | | | | | SLIGHTLY PLASTIC | | | | | | | | | | MODERATELY PLASTIC | | | | | | | | | | HIGHLY PLASTIC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COLOR | | | | | | | | | | 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | DRILL UNITS: | | | | | | | | | | ADVANCING TOOLS: | | | | | | | | | | HAMMER TYPE: | | | | | | | | | | CORE SIZE: | | | | | | | | | | HAND TOOLS: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRACURE SPACING | | | | | | | | | | TERMINAL | | | | | | | | | | SPACING | | | | | | | | | | BEDDING | | | | | | | | | | TERM | | | | | | | | | | THICKNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INDURATION | | | | | | | | | | FRIBLE | | | | | | | | | | MODERATELY INDURATED | | | | | | | | | | INDURATED | | | | | | | | | | EXTREMELY INDURATED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BENCH MARK: | | | | | | | | | | ELEVATION: | | | | | | | | | | FEET | | | | | | | | | | NOTES: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ATTACHMENT A
SOIL TEST BORING LOGS PROVIDED BY THE NCDOT

GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|--|-----------------|---------------------|--------------------------|---------------------|-----------------------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|--|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. RW1-1 | | STATION 15+52 | | OFFSET 6 ft RT | | ALIGNMENT L | | | | | | | | | |
| COLLAR ELEV. 2,700.2 ft | | TOTAL DEPTH 23.7 ft | | NORTHING 997,440 | | EASTING 1,260,993 | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | |
| 2705 | | | | | | | | | | | | | | | |
| 2700 | | | | | | | | | | | | | | | |
| | 2,697.0 | 3.2 | | | | | | | | | | | | | |
| 2695 | | | | | | | | | | | | | | | |
| | 2,692.0 | 8.2 | | | | | | | | | | | | | |
| 2690 | | | | | | | | | | | | | | | |
| | 2,687.0 | 13.2 | | | | | | | | | | | | | |
| 2685 | | | | | | | | | | | | | | | |
| | 2,682.0 | 18.2 | | | | | | | | | | | | | |
| 2680 | | | | | | | | | | | | | | | |
| | 2,677.0 | 23.2 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | |
|--|-----------------|---------------------|--------------------------|---------------------|-----------------------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|--|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | |
| BORING NO. RW1-2 | | STATION 16+50 | | OFFSET 5 ft RT | | ALIGNMENT L | | | | | | | | | |
| COLLAR ELEV. 2,694.0 ft | | TOTAL DEPTH 7.1 ft | | NORTHING 997,489 | | EASTING 1,261,077 | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | |
| 2695 | | | | | | | | | | | | | | | |
| | 2,694.0 | | | | | | | | | | | | | | |
| | 2,691.0 | | | | | | | | | | | | | | |
| 2690 | | | | | | | | | | | | | | | |
| | 2,690.8 | 3.2 | | | | | | | | | | | | | |
| | 2,687.0 | 7.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE BR0002_RW1_ASHE_BOREHOLES_GPJ_NC_DOT.GDT 6/6/19

GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | | |
|--|-----------------|---------------------|------------------|---------------------|-----------------------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|------|--|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. RW1-3 | | STATION 17+47 | | OFFSET 0 ft RT | | ALIGNMENT L | | | | | | | | | | |
| COLLAR ELEV. 2,688.6 ft | | TOTAL DEPTH 22.0 ft | | NORTHING 997,545 | | EASTING 1,261,157 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD N/A | | HAMMER TYPE Automatic | | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | | |
| 2690 | | | | | | | | | | | | | | 2,688.6 | 0.0 | GROUND SURFACE |
| | | | | | | | | | | | | | | 2,685.6 | 3.0 | ROADWAY EMBANKMENT Roadway embankment |
| 2685 | 2,685.0 | 3.6 | 2 | 3 | 6 | | | | | | | | | | | SAPROLITE Brown-white-gray, micaceous sandy SILT with rock fragments |
| 2680 | 2,680.0 | 8.6 | 3 | 4 | 6 | | | | | | | | | | | |
| 2675 | 2,675.0 | 13.6 | 8 | 11 | 89/0.3 | | | | | | | | | | | |
| 2670 | 2,670.0 | 18.6 | 17 | 24 | 47 | | | | | | | | | 2,673.8 | 14.8 | WEATHERED ROCK Weathered rock (schist) |
| | | | | | | | | | | | | | | 2,672.8 | 15.8 | SAPROLITE Brown-white-gray, micaceous sandy SILT with rock fragments |
| | 2,666.7 | 21.9 | | | | | | | | | | | | 2,666.6 | 22.0 | CRYSTALLINE ROCK Crystalline rock (schist) Boring Terminated at Elevation 2,666.6 ft ON CR |

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | | | |
|--|-----------------|---------------------|------------------|---------------------|-----------------------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|------|---|--|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | | | |
| BORING NO. RW1-4 | | STATION 18+44 | | OFFSET 4 ft LT | | ALIGNMENT L | | | | | | | | | | | |
| COLLAR ELEV. 2,685.1 ft | | TOTAL DEPTH 24.0 ft | | NORTHING 997,608 | | EASTING 1,261,232 | | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | DRILL METHOD N/A | | HAMMER TYPE Automatic | | | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | | | | | |
| 2690 | | | | | | | | | | | | | | | | 2,685.1 | 0.0 |
| | | | | | | | | | | | | | | | | | ROADWAY EMBANKMENT Red brown clayey slightly micaceous SILT with rock fragments and roots |
| 2685 | | | | | | | | | | | | | | | | | |
| 2680 | 2,681.8 | 3.3 | 7 | 6 | 4 | | | | | | | | | | | | |
| 2675 | 2,676.8 | 8.3 | 1 | 1 | 2 | | | | | | | | | | | | |
| 2670 | 2,671.8 | 13.3 | 1 | 2 | 1 | | | | | | | | | | | | |
| 2665 | 2,666.8 | 18.3 | 5 | 41 | 59/0.3 | | | | | | | | | | | | |
| | 2,661.8 | 23.3 | 39 | 61/0.4 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 2,666.3 | 18.8 | SAPROLITE Brown micaceous clayey SILT | |
| | | | | | | | | | | | | | | 2,665.9 | 19.2 | WEATHERED ROCK Weathered schist with MnO seams | |
| | | | | | | | | | | | | | | 2,661.1 | 24.0 | Boring Terminated at Elevation 2,661.1 ft IN WR | |

NCDOT BORE DOUBLE BR0002_RW1_ASHE_BOREHOLES_GPJ_NC_DOT.GDT 6/6/19

GEOTECHNICAL BORING REPORT

BORE LOG

| WBS 67002.1.1 | | TIP BR-0002 | | COUNTY ASHE | | GEOLOGIST Johnson, C. D. | | | | | | | | | | |
|--|-----------------|---------------------|------------|---------------------|-------|--------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|------|---|
| SITE DESCRIPTION BORING IN EXISTING PAVEMENT NC194 FOR PROPOSED RWAL | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. RW1-5 | | STATION 19+35 | | OFFSET 4 ft LT | | ALIGNMENT L | | | | | | | | | | |
| COLLAR ELEV. 2,682.8 ft | | TOTAL DEPTH 18.0 ft | | NORTHING 997,672 | | EASTING 1,261,295 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017 | | | | DRILL METHOD N/A | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Cheek, D. O. | | START DATE 05/29/19 | | COMP. DATE 05/29/19 | | 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 | | | ELEV. (ft) | DEPTH (ft) | | |
| 2685 | | | | | | | | | | | | | | 2,682.8 | 0.0 | GROUND SURFACE |
| 2680 | 2,679.5 | 3.3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | ROADWAY EMBANKMENT Brown micaceous sandy SILT with a trace of clay, roots, and a few gravels |
| 2675 | 2,674.5 | 8.3 | 1 | 2 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| 2670 | 2,669.5 | 13.3 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2,669.5 | 13.3 | SAPROLITE Brown gray, micaceous clayey silt with some rock fragments |
| 2665 | 2,664.8 | 18.0 | 60 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2,664.8 | 18.0 | CRYSTALLINE ROCK Crystalline chlorite schist Boring Terminated at Elevation 2,664.8 ft ON CR |

NCDOT BORE DOUBLE BR0002_RW1_ASHE_BOREHOLES_GPJ_NC_DOT.GDT 6/6/19

ATTACHMENT B
FINAL SURVEY REPORT (ESP)



March 17, 2020

ESP Associates, Inc.
7011 Albert Pick Road, Suite E
Greensboro, NC 27409

FINAL SURVEY REPORT

March 17th, 2020

TIP# BR-0002

PROJECT DESCRIPTION:

Replace Bridge 040008 over North Fork New River on NC 194
Retaining Wall -L- Sta. 15+00 to 20+00- Retaining Wall Geophysical Survey

PROJECT NUMBER: 35254

COUNTY: Ashe

L&S #: 67002.1.1

CONSULTANT: ESP Associates, Inc.
7011 Albert Pick Road Suite E, Greensboro, N.C. 27409
Contact: John P. Scoville III, PLS, CFS

DATE OF SURVEY: 3-9-2020 through 3-10-2020

DATUM DESCRIPTION:

The following Datum Description was supplied by the NCDOT as developed by others.

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE
NAD 83 NSRS (2011) NORTH CAROLINA STATE PLANE GRID COORDINATES
ESTABLISHED BY NCDOT FOR MONUMENT "R5832-BL 43" WITH GRID COORDINATES OF:

NORTHING: 996047.666 (s FT) EASTING: 1259229.395 (s FT)

THE AVERAGE COMBINED FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS:
0.99997244

ALL LINEAR DISTANCES ARE LOCALIZED HORIZONTAL DISTANCES. THE VERTICAL DATUM
FOR THIS PROJECT IS NAVD 88

ESP Associates, Inc.
7011 Albert Pick Road, Suite E
Greensboro, NC 27409

PROJECT LIMITS:

- The limits for this project were supplied by NCDOT to ESP geophysical group and defined as the extents of the proposed retaining wall from -L- Sta. 15+00 to Sta. 20+00 26.5' right to include the existing roadway and down existing slope to Buffalo creek.

BASELINE FILE:

- Project Control for Baselines was supplied by NCDOT in filename BR0002_ncdot_fs.dgn.

SAFETY:

- ESP survey personnel conducted a PRE JOB Briefing to go over safety concerns at a location outside of traffic concerns adjacent to the project. Signing positions were determined as well as a discussion of proposed procedures and project objectives.
- ESP set signs out at both ends of the work area along highway 194 as well at intersecting New School Road and Cambell Road
- ESP utilized a 3 man crew to accomplish the work along the existing guardrail while one man acted as flagger/lookout for the operation.
- The work plan went well and the work was accomplished accordingly.

DTM DATA:

The project was laid out by the ESP Geophysical group as part of their work in collecting geophysical data in the area of the proposed retaining wall.

ESP's survey group identified several baseline monuments in the vicinity of the project and verified the relationship of the baseline monuments with each other both horizontally and vertically to ensure the data being utilized was correct. Utilizing conventional survey equipment, ESP verified the points being utilized, established additional control points along the existing guardrail and located the following items to aid the geophysical survey for the project.

- Existing borings in the pavement RW1-1 through RW 1-5
- Bridge Rods- BR-01 through BR-05
- EP points at assumed zero station of cross section lines 1 through 5 as established by the geophysical layout.
- Downslope locations of slope breaks and other points as established by the geophysical layout.

Baseline monuments and additional control points were surveyed to a horizontal and vertical accuracy of +/- 0.01'. Borings, rod locations, slope breaks and other points were surveyed to a horizontal and vertical accuracy of +/- 0.10'

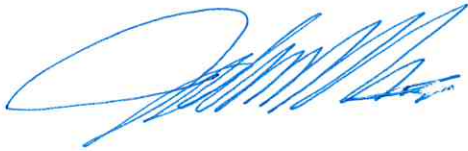
THE FOLLOWING FILES WERE TRANSMITTED TO ESP GEOPHYSICAL GROUP:

- GR22.323 TASK 2 ALL.CSV

This csv file contains all of the coordinates established from the survey of the above listed items and including the NCDOT baseline monuments utilized and verified in the survey process.

Completed by: John P. Scoville III, PLS
March 17th, 2020

Sincerely,
ESP Associates, Inc.



John P. Scoville III, PLS, CFS
Survey Manager

