

REFERENCE: R-2707C

PROJECT: 34497

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

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C. | R-2707C | 1 | 21 |

CONTENTS

| SHEET NO. | DESCRIPTION |
|-----------|------------------------------|
| 1 | TITLE SHEET |
| 2 | LEGEND |
| 3 | SITE PLAN |
| 4 | PROFILE(S) |
| 5-7 | CROSS SECTION(S) |
| 8-18 | BORE LOG(S) & CORE REPORT(S) |
| 19-20 | CORE PHOTOGRAPH(S) |
| 21 | SITE PHOTOGRAPH(S) |

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CLEVELAND
PROJECT DESCRIPTION US 74 BYPASS FROM EAST OF NC 226 TO EAST OF NC 150

SITE DESCRIPTION BRIDGE NO. 471 ON -Y9- (NC 18) OVER -L- (US 74 BYPASS)

CAUTION NOTICE

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

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

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

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

B. SMITH, PG

B. WORLEY, PG

J. BARE

T. BRIGMAN

INVESTIGATED BY B. SMITH, PG

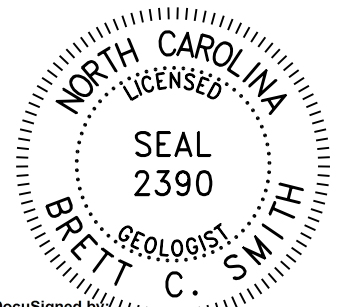
DRAWN BY B. SMITH, PG & B. WORLEY, PG

CHECKED BY B. WORLEY, PG

Summit Design and Engineering, PLLC

SUBMITTED BY Summit Design and Engineering, PLLC

DATE MAY, 2015



DocuSigned by:
Brett C. Smith

BE61A49304C542E...

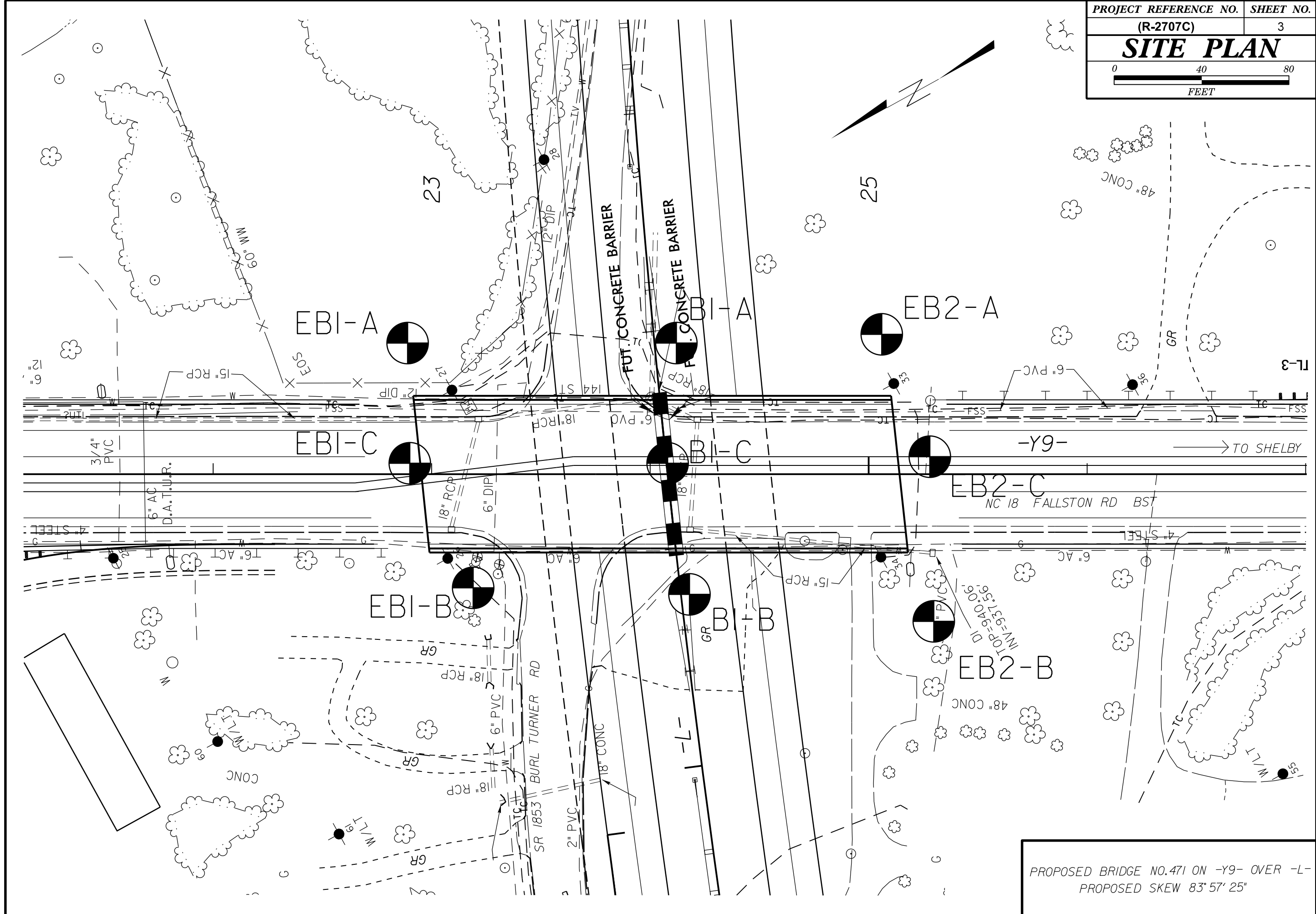
12/1/2015

SIGNATURE

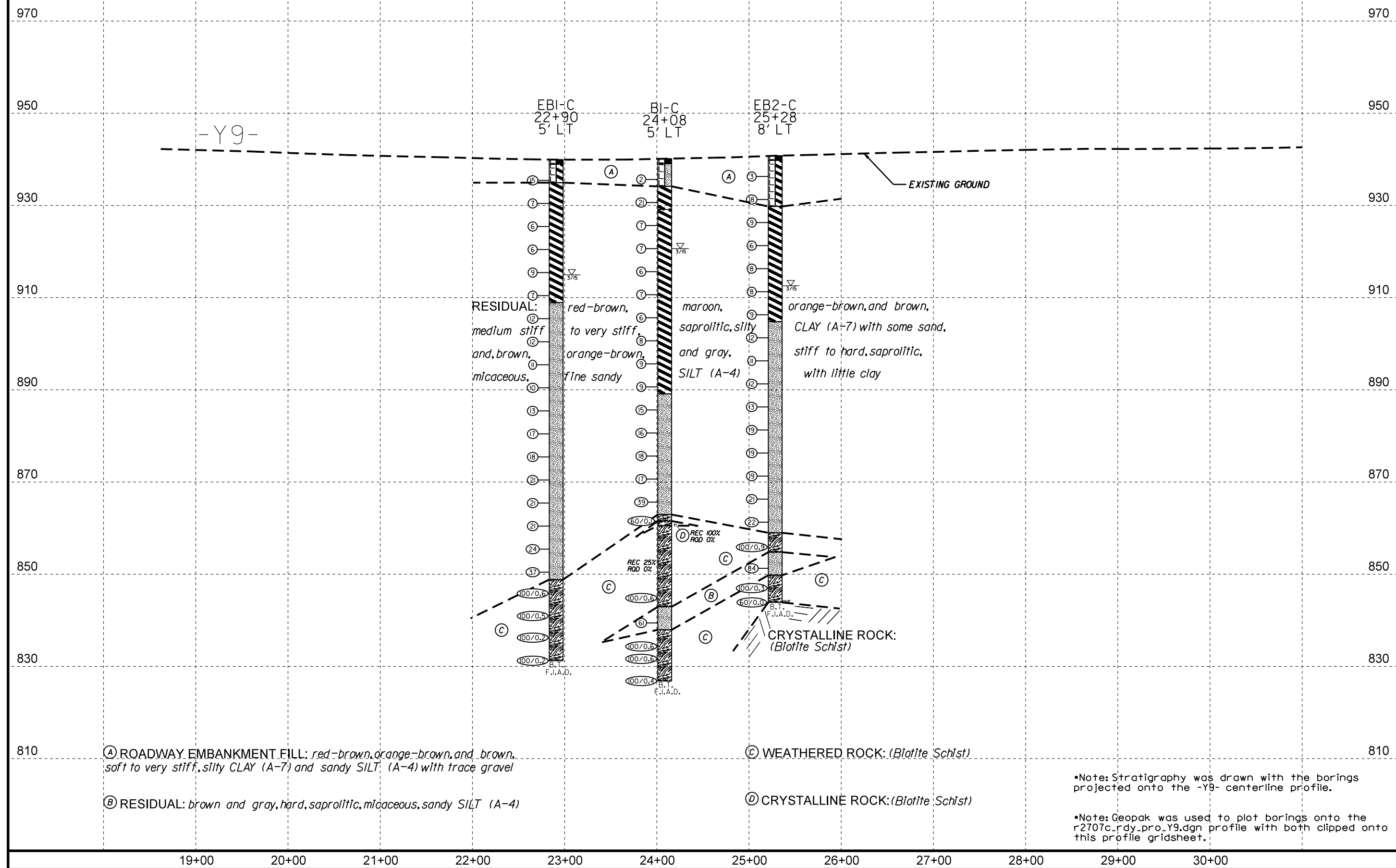
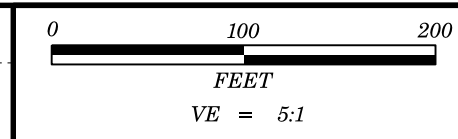
DATE

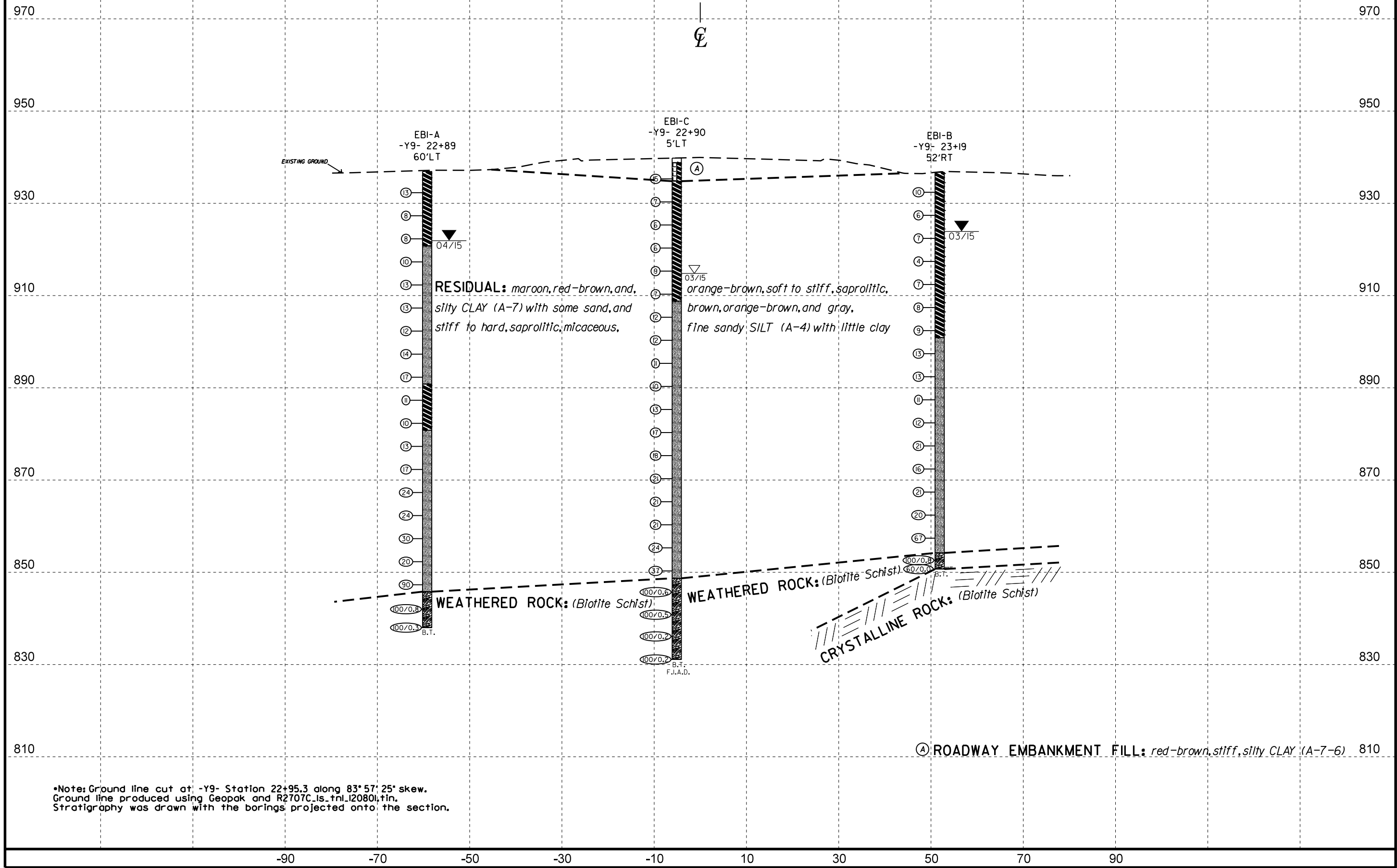
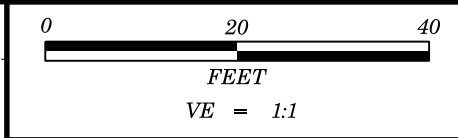
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

| SOIL DESCRIPTION | | | GRADATION | | | ROCK DESCRIPTION | | | TERMS AND DEFINITIONS | | |
|---|--|--|--|--|--|---|--|--|---|--|--|
| <p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</p> | | | <p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> | | | <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> | | | <p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (ROQ) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SRC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | ANGULARITY OF GRAINS | | | WEATHERED ROCK (WR) | | | <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p> | | |
| <p>GENERAL CLASS. GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS</p> <p>GROUP CLASS. A-1, A-1-b, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7</p> <p>SYMBOL</p> <p>% PASSING #10, #40, #200</p> <p>MATERIAL PASSING #40 LL, PI</p> <p>GROUP INDEX</p> <p>USUAL TYPES OF MAJOR MATERIALS</p> <p>GEN. RATING AS SUBGRADE</p> | | | <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> <p style="text-align: center;">MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;">COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p> <p style="text-align: center;">PERCENTAGE OF MATERIAL</p> <p>ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE</p> <p style="text-align: center;">GROUND WATER</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 style="text-align: center;">WEATHERING</p> <p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V SLI.) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SLI.) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>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.</p> <p>MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF.</p> <p>SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF.</p> <p>VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF.</p> <p>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> | | | | | |
| CONSISTENCY OR DENSITY | | | MISCELLANEOUS SYMBOLS | | | RECOMMENDATION SYMBOLS | | | <p style="text-align: center;">ROCK HARDNESS</p> <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD CAN BE GROVED 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.</p> <p>SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.</p> | | |
| <p>PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</p> <p>GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE < 4, 4 TO 10, 10 TO 30, 30 TO 50, > 50 N/A</p> <p>GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD < 2, 2 TO 4, 4 TO 8, 8 TO 15, 15 TO 30, > 30 < 0.25, 0.25 TO 0.5, 0.5 TO 1.0, 1 TO 2, 2 TO 4, > 4</p> | | | <p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p>SOIL SYMBOL</p> <p>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p>INFERRED SOIL BOUNDARY</p> <p>INFERRED ROCK LINE</p> <p>ALLUVIAL SOIL BOUNDARY</p> <p>DIP & DIP DIRECTION OF ROCK STRUCTURES</p> <p>SPT DMT VST PMT TEST BORING</p> <p>AUGER BORING</p> <p>CORE BORING</p> <p>MONITORING WELL</p> <p>PIEZOMETER INSTALLATION</p> <p>SLOPE INDICATOR INSTALLATION</p> <p>CONE PENETROMETER TEST</p> <p>SOUNDING ROD</p> <p>TEST BORING WITH CORE</p> <p>SPT N-VALUE</p> | | | <p>UNDERCUT EXCAVATION</p> <p>SHALLOW UNDERCUT</p> <p>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</p> <p>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> <p>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p> | | | | | |
| TEXTURE OR GRAIN SIZE | | | ABBREVIATIONS | | | <p style="text-align: center;">EQUIPMENT USED ON SUBJECT PROJECT</p> <p>DRILL UNITS: CME-45C, CME-55, CME-550, VANE SHEAR TEST, PORTABLE HOIST, DIEDRICH D-50</p> <p>ADVANCING TOOLS: CLAY BITS, 6" CONTINUOUS FLIGHT AUGER, 6" HOLLOW AUGERS, HARD FACED FINGER BITS, TUNG-CARBIDE INSERTS, CASING w/ ADVANCER, TRICONE * STEEL TEETH, TRICONE 3" * TUNG-CARB., CORE BIT</p> <p>HAMMER TYPE: AUTOMATIC, MANUAL</p> <p>CORE SIZE: B, H, N Q2</p> <p>HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST</p> | | | | | |
| <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>BOULDER (BLDR.), COBBLE (COB.), GRAVEL (GR.), COARSE SAND (CSE. SD.), FINE SAND (F SD.), SILT (SL.), CLAY (CL.)</p> <p>GRAIN SIZE MM 305, 75, 2.0, 0.25, 0.05, 0.005 IN. 12, 3</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. - SAPROLITE SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY</p> <p>VST - VANE SHEAR TEST WEA. - WEATHERED UNIT WEIGHT 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 | | | <p style="text-align: center;">FRACTURE SPACING</p> <p>TERM SPACING</p> <p>VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FOOT VERY CLOSE LESS THAN 0.16 FEET</p> <p style="text-align: center;">BEDDING</p> <p>TERM THICKNESS</p> <p>VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET</p> | | | | | | | | |
| <p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p> <p>LIQUID LIMIT (LL) LIQUID LIMIT (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</p> <p>PLASTIC RANGE (PI) PLASTIC LIMIT (PL) - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</p> <p>OPTIMUM MOISTURE SHRINKAGE LIMIT (OM, SL) - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE</p> <p>- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</p> | | | | | | | | | | | |
| PLASTICITY | | | <p style="text-align: center;">INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p> | | | | | | | | |
| <p>NON PLASTIC PLASTICITY INDEX (PI) DRY STRENGTH</p> <p>SLIGHTLY PLASTIC 0-5 VERY LOW MODERATELY PLASTIC 6-15 SLIGHT HIGHLY PLASTIC 16-25 MEDIUM 26 OR MORE HIGH</p> | | | | | | | | | | | |
| COLOR | | | <p>DESCRIPTORS 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>DESCRIPTORS 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> | | | | | | | | | | | |

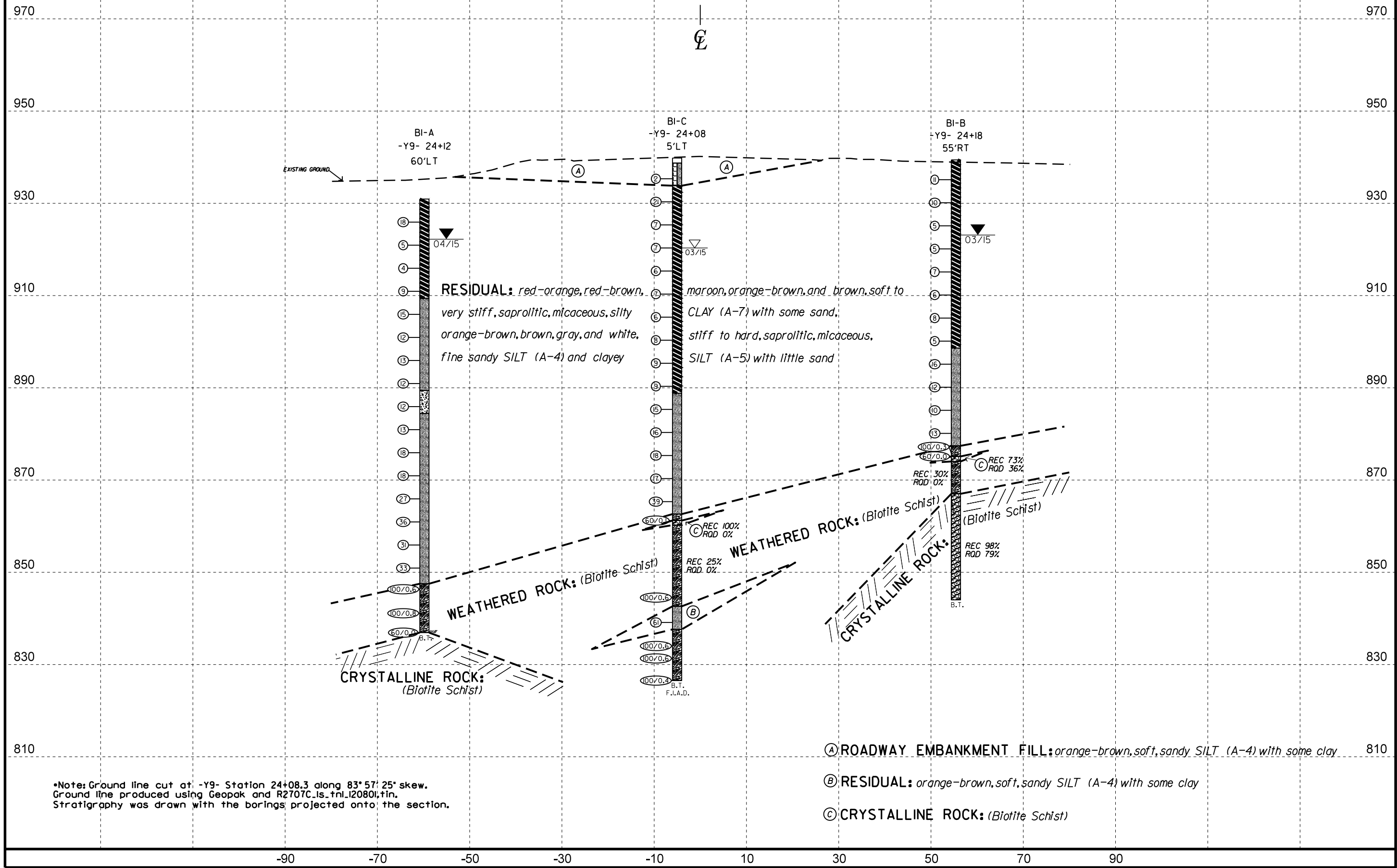
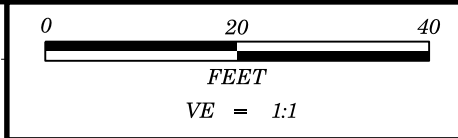


PROPOSED BRIDGE NO.471 ON -Y9- OVER -L-
 PROPOSED SKEW 83° 57' 25"



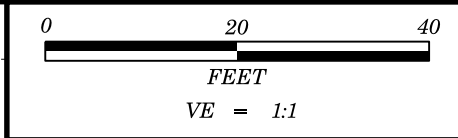


*Note: Ground line cut at -Y9- Station 22+95.3 along 83° 57' 25" skew.
Ground line produced using Geopak and R2707C_Is.tbl.120801.tin.
Stratigraphy was drawn with the borings projected onto the section.

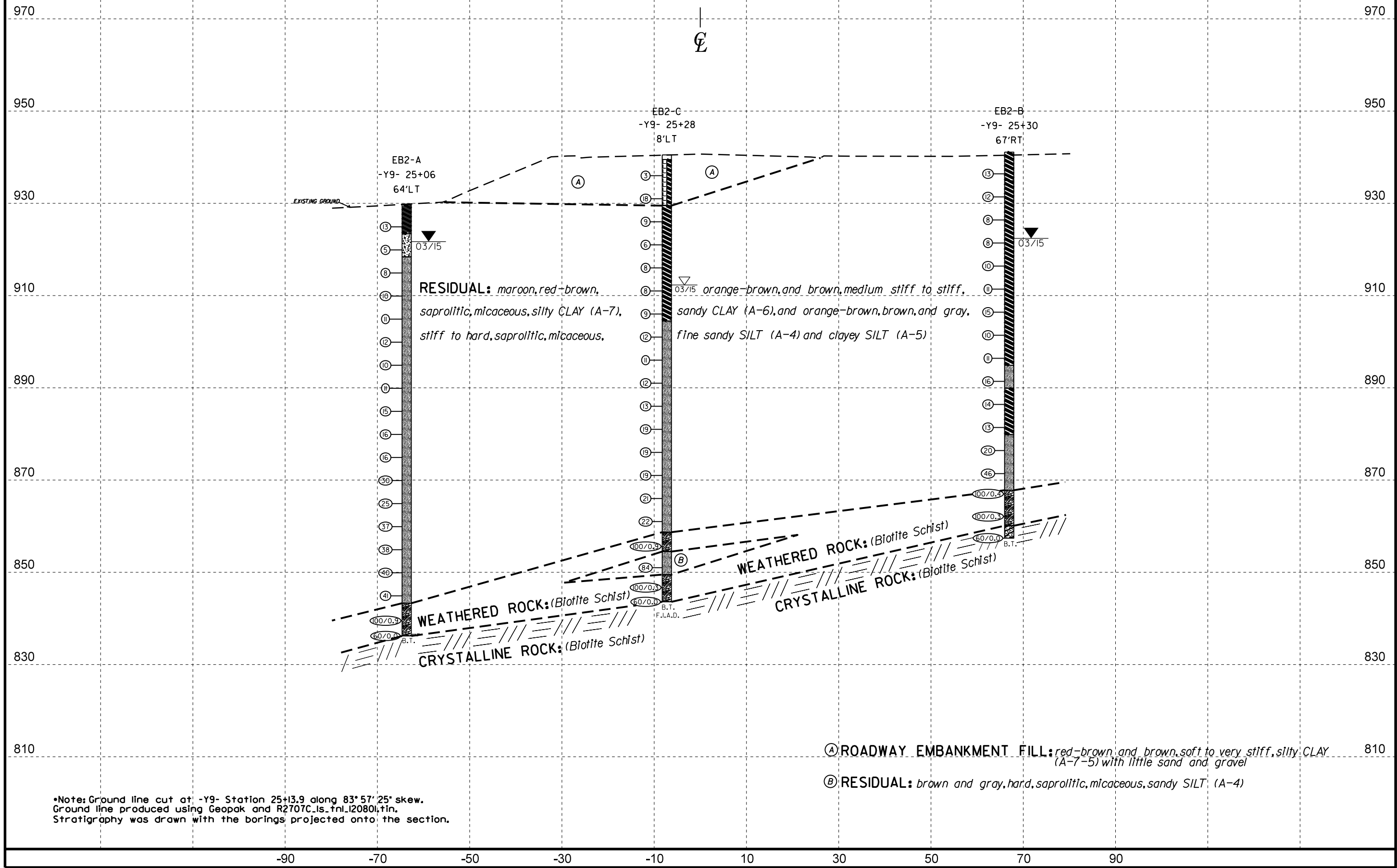


•Note: Ground line cut at -Y9- Station 24+08.3 along 83° 57' 25" skew.
 Ground line produced using Geopak and R2707C_Is.tnl.120801.tin.
 Stratigraphy was drawn with the borings projected onto the section.

- Ⓐ ROADWAY EMBANKMENT FILL: orange-brown, soft, sandy SILT (A-4) with some clay
- Ⓑ RESIDUAL: orange-brown, soft, sandy SILT (A-4) with some clay
- Ⓒ CRYSTALLINE ROCK: (Biotite Schist)



| | |
|---------------------------------|-------|
| PROJECT REFERENCE NO. | SHEET |
| (R-2707C) | 7 |
| BRIDGE 471 | |
| END BENT 2 Cross Section | |



•Note: Ground line cut at -Y9- Station 25+13.9 along 83°57'25" skew.
 Ground line produced using Geopak and R2707C.ls.tbl.120801.tin.
 Stratigraphy was drawn with the borings projected onto the section.

- Ⓐ ROADWAY EMBANKMENT FILL: red-brown and brown, soft to very stiff, silty CLAY (A-7-5) with little sand and gravel
- Ⓑ RESIDUAL: brown and gray, hard, saprolitic, micaceous, sandy SILT (A-4)

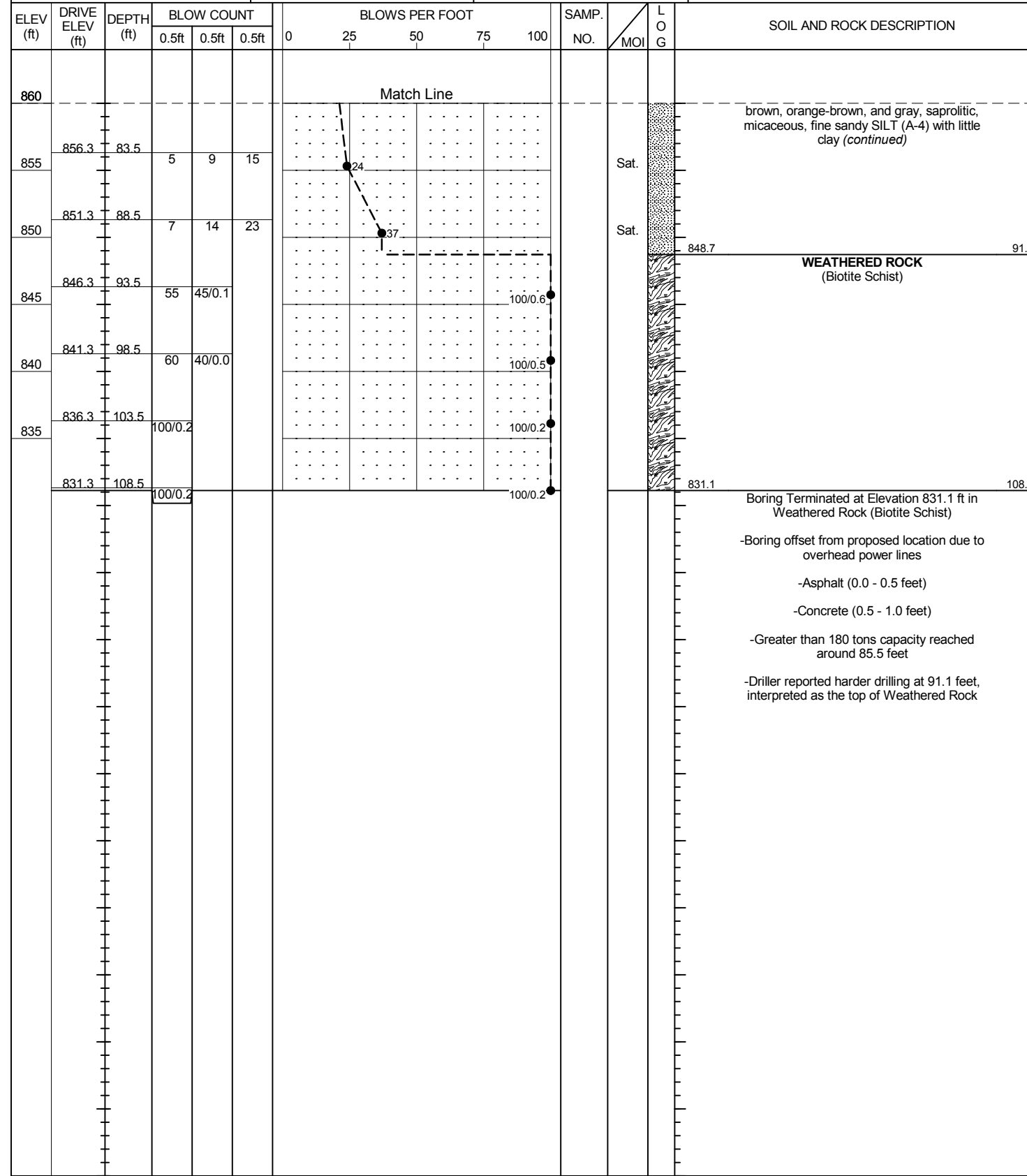
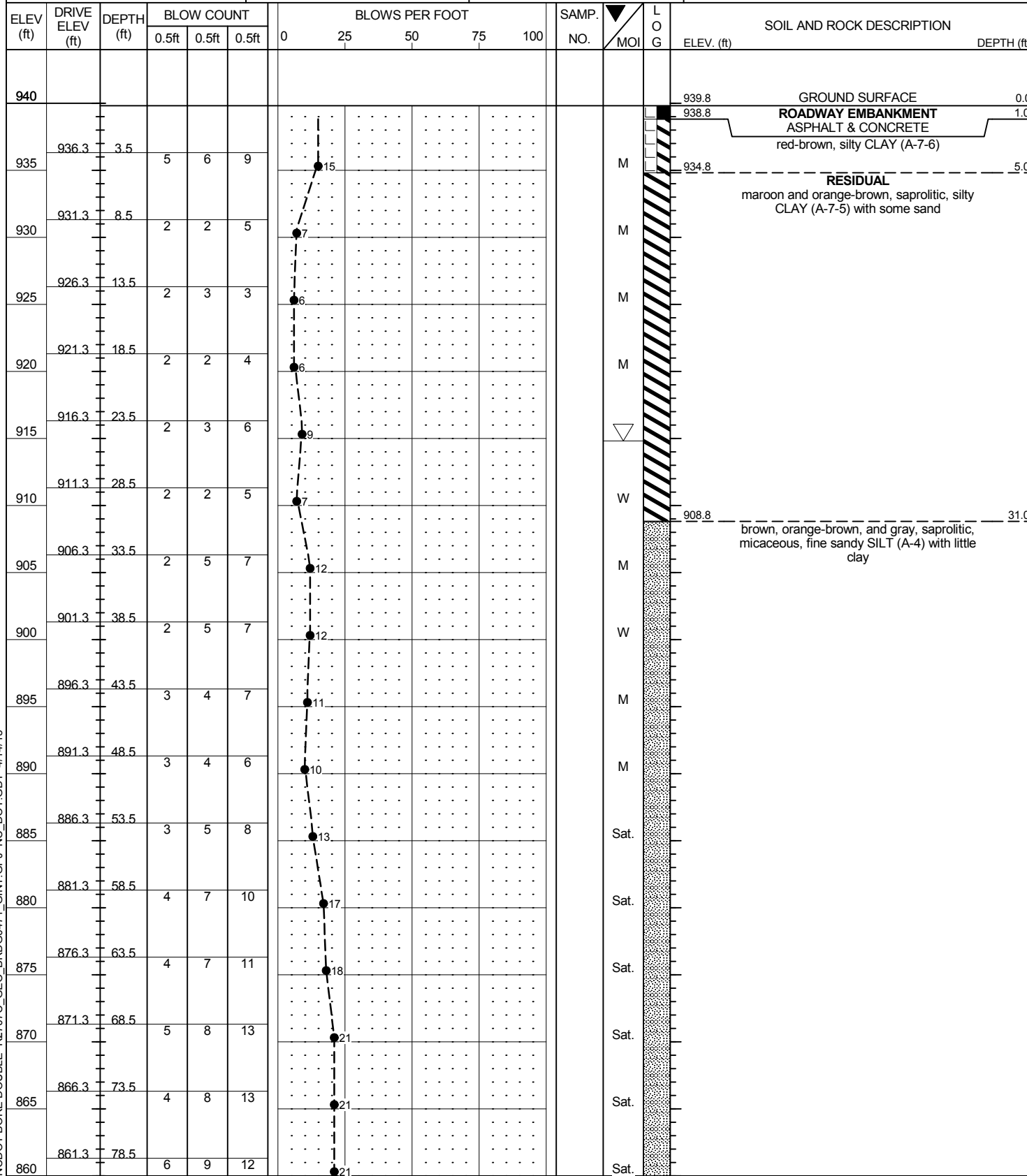


NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

| | | | |
|--|----------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. EB1-C | STATION 22+90 | OFFSET 5 ft LT | ALIGNMENT -Y9- |
| COLLAR ELEV. 939.8 ft | TOTAL DEPTH 108.7 ft | NORTHING 582,989 | EASTING 1,250,783 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/26/15 | COMP. DATE 03/26/15 | SURFACE WATER DEPTH N/A |

| | | | |
|--|----------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. EB1-C | STATION 22+90 | OFFSET 5 ft LT | ALIGNMENT -Y9- |
| COLLAR ELEV. 939.8 ft | TOTAL DEPTH 108.7 ft | NORTHING 582,989 | EASTING 1,250,783 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/26/15 | COMP. DATE 03/26/15 | SURFACE WATER DEPTH N/A |



NCDOT BORE DOUBLE R2707C_GEO_BRD0471_GINT.GPJ NC_DOT.GDT 4/14/15



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

| | | | |
|---|-----------------------------|--|--------------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. B1-C | STATION 24+08 | OFFSET 5 ft LT | ALIGNMENT -Y9- |
| COLLAR ELEV. 939.8 ft | TOTAL DEPTH 113.3 ft | NORTHING 582,886 | EASTING 1,250,726 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD NW Casing W/SPT & Core | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/24/15 | COMP. DATE 03/25/15 | SURFACE WATER DEPTH N/A |
| CORE SIZE NQ2 | | TOTAL RUN 12.0 ft | |

| ELEV (ft) | RUN ELEV (ft) | DEPTH (ft) | RUN (ft) | DRILL RATE (Min/ft) | RUN | | SAMP. NO. | STRATA | | LOG | DESCRIPTION AND REMARKS | DEPTH (ft) |
|-----------|---------------|------------|----------|--|---------------------|-------------------|-----------|----------------------|-------------------|-----|---|------------|
| | | | | | REC. (ft) % | RQD (ft) % | | REC. (ft) % | RQD (ft) % | | | |
| 861.24 | | | | | | | | | | | Begin Coring @ 78.6 ft | |
| 860 | 861.2 | 78.6 | 2.0 | 1:56/1.0 | (1.2) | (0.0) | | (1.0) | (0.0) | | CRYSTALLINE ROCK gray and brown, moderate severe weathering, moderate to medium hard, close fracture spacing, BIOTITE SCHIST | 78.6 |
| | 859.2 | 80.6 | 5.0 | 1:15/1.0 1:11/1.0 1:26/1.0 1:37/1.0 1:22/1.0 1:40/1.0 | 60% (1.4) 28% | 0% (0.0) 0% | | 100% (2.8) 16% | 0% (0.0) 0% | | | 860.2 |
| 855 | 854.2 | 85.6 | 5.0 | 1:37/1.0 1:33/1.0 1:09/1.0 1:24/1.0 1:28/1.0 | (1.2) 24% | (0.0) 0% | | | | | WEATHERED ROCK brown, severely weathered, medium hard to soft, close fracture spacing, BIOTITE SCHIST | |
| 850 | 849.2 | 90.6 | | | | | | | | | | |
| 845 | | | | N=100/0.6 | | | | | | | | |
| 840 | | | | N=61 | | | | | | | RESIDUAL brown and gray, saprolitic, micaceous, sandy SILT (A-4) with little clay | 97.2 |
| 835 | | | | N=100/0.6 | | | | | | | WEATHERED ROCK (Biotite Schist) | 102.2 |
| 830 | | | | N=100/0.6 | | | | | | | | |
| | | | | N=100/0.4 | | | | | | | | |
| | | | | | | | | | | | Boring Terminated at Elevation 826.5 ft in Weathered Rock (Biotite Schist) | 113.3 |
| | | | | | | | | | | | -Asphalt (0.0 - 0.5 feet) -Concrete (0.5 - 1.1 feet) | |
| | | | | | | | | | | | -Harder drilling at 77.2 feet was interpreted as the top of Weathered Rock -Resumed SPT drilling with NW Casing Advancer at 90.6 feet due to less than 25% core recovery -Switched to mud rotary drilling at 104.7 feet when we ran out of casing | |

NCDOT CORE DOUBLE R2707C_GEO_BRDG0471_GINT.GPJ NC_DOT_GDT 4/14/15



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

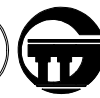
| | | | |
|--|---------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. B1-B | STATION 24+18 | OFFSET 55 ft RT | ALIGNMENT -Y9- |
| COLLAR ELEV. 939.4 ft | TOTAL DEPTH 95.4 ft | NORTHING 582,906 | EASTING 1,250,668 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD Core Boring | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/16/15 | COMP. DATE 03/18/15 | SURFACE WATER DEPTH N/A |

| | | | |
|--|---------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. B1-B | STATION 24+18 | OFFSET 55 ft RT | ALIGNMENT -Y9- |
| COLLAR ELEV. 939.4 ft | TOTAL DEPTH 95.4 ft | NORTHING 582,906 | EASTING 1,250,668 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD Core Boring | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/16/15 | COMP. DATE 03/18/15 | 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 | | | | |
| 940 | | | | | | | | | | | | | GROUND SURFACE | 0.0 |
| 935 | 936.1 | 3.3 | 4 | 4 | 7 | | | | | | | M | RESIDUAL red-brown, silty CLAY (A-7-6) with little fine sand | |
| 930 | 931.1 | 8.3 | 3 | 4 | 6 | | | | | | | M | red-brown, orange-brown, and brown, saprolitic, silty CLAY (A-7-5) with some sand | 5.8 |
| 925 | 926.1 | 13.3 | 2 | 2 | 3 | | | | | | | M | | |
| 920 | 921.1 | 18.3 | 1 | 2 | 3 | | | | | | | W | | |
| 915 | 916.1 | 23.3 | 2 | 3 | 4 | | | | | | | W | | |
| 910 | 911.1 | 28.3 | 2 | 2 | 4 | | | | | | | W | | |
| 905 | 906.1 | 33.3 | 2 | 3 | 5 | | | | | | | W | | |
| 900 | 901.1 | 38.3 | 2 | 2 | 3 | | | | | | | Sat. | | |
| 895 | 896.1 | 43.3 | 4 | 5 | 11 | | | | | | | Sat. | light brown, orange-brown, and gray, saprolitic, micaceous, fine sandy SILT (A-4) with little clay | 40.8 |
| 890 | 891.1 | 48.3 | 3 | 5 | 7 | | | | | | | Sat. | | |
| 885 | 886.1 | 53.3 | 3 | 4 | 6 | | | | | | | Sat. | | |
| 880 | 881.1 | 58.3 | 4 | 6 | 7 | | | | | | | Sat. | | |
| 875 | 876.1 875.1 | 63.3 64.3 | 100/0.3 60/0.0 | | | | | | | | | | WEATHERED ROCK (Biotite Schist) | 62.0 |
| | | | | | | | | | | | | | CRYSTALLINE ROCK (Biotite Schist) | 64.3 |
| | | | | | | | | | | | | | WEATHERED ROCK (Biotite Schist) | 65.4 |
| 870 | | | | | | | | | | | | | | |
| 865 | | | | | | | | | | | | | CRYSTALLINE ROCK (Biotite Schist) | 72.4 |
| 860 | | | | | | | | | | | | | | |

| 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 | | | | |
| 860 | | | | | | | | | | | | | Match Line | |
| 855 | | | | | | | | | | | | | CRYSTALLINE ROCK (Biotite Schist) (continued) | |
| 850 | | | | | | | | | | | | Loss of return water flow | | |
| 845 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | 844.0 |
| Boring Terminated at Elevation 844.0 ft in Crystalline Rock (Biotite Schist) | | | | | | | | | | | | | | |
| -Boring offset from proposed location due to underground utility conflict | | | | | | | | | | | | | | |
| -Harder drilling at 62.0 feet was interpreted as the top of Weathered Rock | | | | | | | | | | | | | | |
| -Auger refusal at 64.3 feet | | | | | | | | | | | | | | |

NCDOT BORE DOUBLE R2707C_GEO_BRD0471_GINT.GPJ NC_DOT.GDT 4/14/15



NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

| WBS 34497.1.2 | | TIP R-2707C | | COUNTY CLEVELAND | | GEOLOGIST Smith, B. | | | | | |
|--|---------------|---------------------|----------|--------------------------|-----------------|-------------------------|------------------------|--------------------|------------|-----|--|
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | | | | | GROUND WTR (ft) | | | | |
| BORING NO. B1-B | | STATION 24+18 | | OFFSET 55 ft RT | | ALIGNMENT -Y9- | 0 HR. N/A | | | | |
| COLLAR ELEV. 939.4 ft | | TOTAL DEPTH 95.4 ft | | NORTHING 582,906 | | EASTING 1,250,668 | 24 HR. 16.3 | | | | |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | | | DRILL METHOD Core Boring | | HAMMER TYPE Automatic | | | | | |
| DRILLER Bare, J. | | START DATE 03/16/15 | | COMP. DATE 03/18/15 | | SURFACE WATER DEPTH N/A | | | | | |
| CORE SIZE NQ2 | | TOTAL RUN 31.1 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 |
| 875.1 | 874.0 | 64.3 | 1.1 | N=60/0.0 | (0.8) | (0.4) | | (0.8) | (0.4) | | Begin Coring @ 64.3 ft |
| | | | 5.0 | 3:00/1.1 | 73% | 36% | | 73% | 36% | | CRYSTALLINE ROCK gray and orange-brown, moderate severe weathering, hard to moderately hard, close fracture spacing, BIOTITE SCHIST |
| 870 | | | | 1:40/1.0 | (1.6) | (0.0) | | (2.1) | (0.0) | | WEATHERED ROCK orange-brown, dark gray, and black, severely weathered, medium hard to soft, very close to close fracture spacing, BIOTITE SCHIST |
| | 869.0 | 70.4 | | 1:38/1.0 | 32% | 0% | | 30% | 0% | | |
| | | | 5.0 | 1:29/1.0 | (4.3) | (1.6) | | (22.6) | (18.1) | | CRYSTALLINE ROCK light to dark gray, white, and dark green, fresh to very slightly weathered, very hard to hard, moderately close to close fracture spacing, BIOTITE SCHIST. |
| 865 | | | | 1:20/1.0 | 86% | 32% | | 98% | 79% | | |
| | 864.0 | 75.4 | | 1:33/1.0 | (5.0) | (3.3) | | | | | |
| | | | 5.0 | 1:30/1.0 | 100% | 66% | | | | | |
| 860 | | | | 1:38/1.0 | (4.8) | (4.7) | | | | | |
| | 859.0 | 80.4 | | 1:27/1.0 | 96% | 94% | | | | | |
| | | | 5.0 | 1:54/1.0 | (4.8) | (4.5) | | | | | |
| 855 | | | | 1:57/1.0 | 96% | 90% | | | | | |
| | 854.0 | 85.4 | | 1:59/1.0 | (5.0) | (4.0) | | | | | |
| | | | 5.0 | 1:42/1.0 | 100% | 80% | | | | | |
| 850 | | | | 1:53/1.0 | (4.8) | (4.5) | | | | | |
| | 849.0 | 90.4 | | 1:48/1.0 | (4.8) | (4.5) | | | | | |
| | | | 5.0 | 2:09/1.0 | 96% | 90% | | | | | |
| 845 | | | | 2:27/1.0 | (4.8) | (4.5) | | | | | |
| | 844.0 | 95.4 | | 2:01/1.0 | 96% | 90% | | | | | |
| | | | | 2:28/1.0 | | | | | | | |
| | | | | 2:04/1.0 | | | | | | | |
| | | | | 2:20/1.0 | | | | | | | |
| | | | | 2:43/1.0 | | | | | | | |
| | | | | 2:39/1.0 | | | | | | | |
| | | | | 2:02/1.0 | | | | | | | |
| | | | | 2:09/1.0 | | | | | | | |
| | | | | 2:19/1.0 | | | | | | | |
| | | | | | | | | | | | Boring Terminated at Elevation 844.0 ft in Crystalline Rock (Biotite Schist) |
| | | | | | | | | | | | -Boring offset from proposed location due to underground utility conflict |
| | | | | | | | | | | | -Harder drilling at 62.0 feet was interpreted as the top of Weathered Rock |
| | | | | | | | | | | | -Auger refusal at 64.3 feet |



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

| | | | |
|--|---------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. EB2-A | STATION 25+06 | OFFSET 64 ft LT | ALIGNMENT -Y9- |
| COLLAR ELEV. 929.7 ft | TOTAL DEPTH 93.5 ft | NORTHING 582,772 | EASTING 1,250,730 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/30/15 | COMP. DATE 03/30/15 | SURFACE WATER DEPTH N/A |

| | | | |
|--|---------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. EB2-A | STATION 25+06 | OFFSET 64 ft LT | ALIGNMENT -Y9- |
| COLLAR ELEV. 929.7 ft | TOTAL DEPTH 93.5 ft | NORTHING 582,772 | EASTING 1,250,730 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/30/15 | COMP. DATE 03/30/15 | 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 | | | | |
| 930 | | | | | | | | | | | | | GROUND SURFACE | 0.0 |
| 925 | 925.9 | 3.8 | 4 | 6 | 7 | | | | | | | M | RESIDUAL orange-brown and tan-brown, sandy CLAY (A-6) | |
| 920 | 920.9 | 8.8 | 2 | 2 | 3 | | | | | | | M | orange-brown and tan-brown, clayey SILT (A-5) with little fine sand | 6.3 |
| 915 | 915.9 | 13.8 | 2 | 3 | 5 | | | | | | | M | orange-brown and brown, saprolitic, micaceous, fine sandy SILT (A-4) with little clay | 11.3 |
| 910 | 910.9 | 18.8 | 2 | 4 | 6 | | | | | | | M | | |
| 905 | 905.9 | 23.8 | 2 | 4 | 7 | | | | | | | M | | |
| 900 | 900.9 | 28.8 | 3 | 5 | 7 | | | | | | | W | | |
| 895 | 895.9 | 33.8 | 3 | 4 | 6 | | | | | | | W | | |
| 890 | 890.9 | 38.8 | 3 | 4 | 7 | | | | | | | W | | |
| 885 | 885.9 | 43.8 | 3 | 6 | 9 | | | | | | | W | | |
| 880 | 880.9 | 48.8 | 3 | 6 | 10 | | | | | | | W | | |
| 875 | 875.9 | 53.8 | 4 | 6 | 10 | | | | | | | Sat. | | |
| 870 | 870.9 | 58.8 | 8 | 11 | 19 | | | | | | | Sat. | | |
| 865 | 865.9 | 63.8 | 6 | 10 | 15 | | | | | | | Sat. | | |
| 860 | 860.9 | 68.8 | 6 | 15 | 22 | | | | | | | Sat. | | |
| 855 | 855.9 | 73.8 | 10 | 15 | 23 | | | | | | | Sat. | | |
| 850 | 850.9 | 78.8 | 8 | 16 | 24 | | | | | | | Sat. | | |

| 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 | | | | |
| 850 | | | | | | | | | | | | | | |
| 845 | 845.9 | 83.8 | 10 | 19 | 22 | | | | | | | Sat. | orange-brown and brown, saprolitic, micaceous, fine sandy SILT (A-4) with little clay (continued) | |
| 840 | 840.9 | 88.8 | 32 | 40 | 60/0.4 | | | | | | | Sat. | WEATHERED ROCK (Biotite Schist) | 86.4 |
| | 836.2 | 93.5 | 60/0.0 | | | | | | | | | | CRYSTALLINE ROCK (Biotite Schist) | 93.5 |

NCDOT BORE DOUBLE R2707C_GEO_BRD0471_GINT.GPJ NC_DOT.GDT 4/14/15

Boring Terminated with Standard Penetration Test Refusal at Elevation 836.2 ft on Crystalline Rock (Biotite Schist)

- Boring offset due to overhead power lines
- Greater than 180 tons bearing capacity reached around 71.3 feet
- Harder drilling at 86.4 feet was interpreted as the top of Weathered Rock
- Auger refusal at 93.5 feet



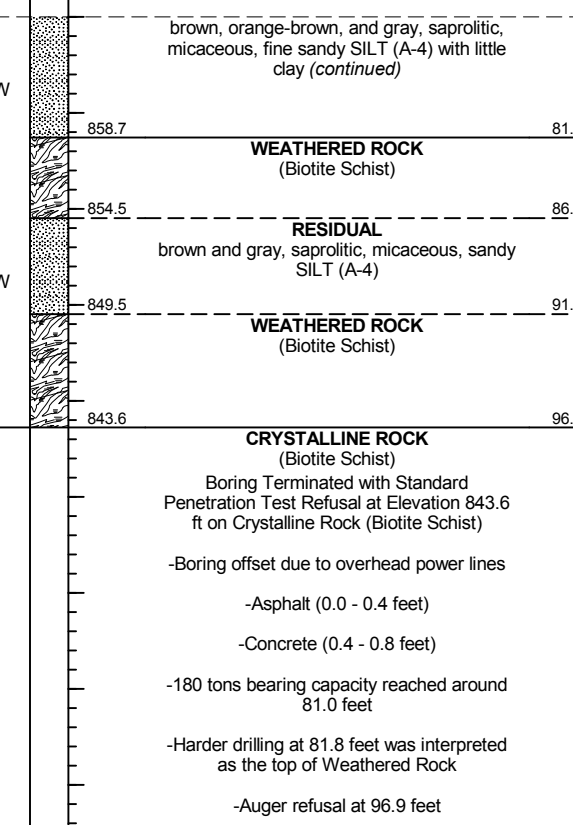
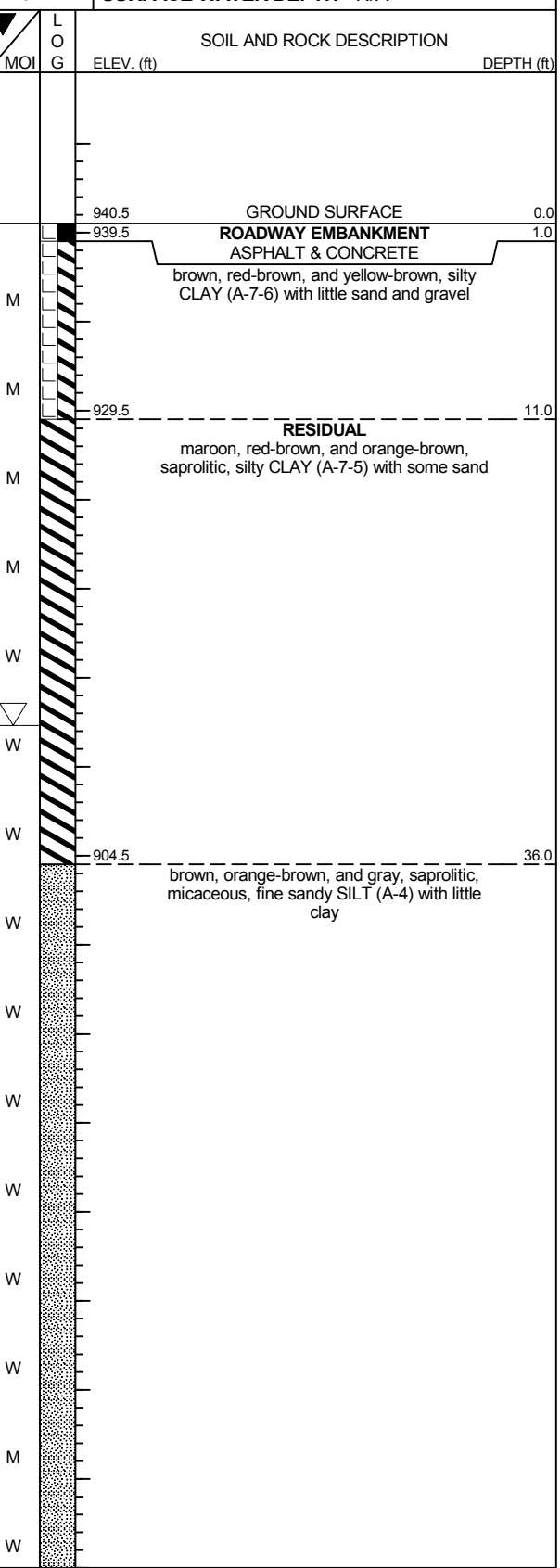
NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

| WBS 34497.1.2 | | TIP R-2707C | | COUNTY CLEVELAND | | GEOLOGIST Smith, B. | | | | | | | | | | |
|--|-----------------|---------------------|------------|--------------------------|-------|-------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|--|--|
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB2-C | | STATION 25+28 | | OFFSET 8 ft LT | | ALIGNMENT -Y9- | | | | | | | | | | |
| COLLAR ELEV. 940.5 ft | | TOTAL DEPTH 96.9 ft | | NORTHING 582,780 | | EASTING 1,250,670 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Bare, J. | | START DATE 03/23/15 | | COMP. DATE 03/23/15 | | 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 | | | | | | |
| 945 | | | | | | | | | | | | | | | | |
| 940 | | | | | | | | | | | | | | | | |
| 937.0 | | 3.5 | 2 | 2 | 1 | | | | | | | | | | | |
| 935 | | | | | | | | | | | | | | | | |
| 932.0 | | 8.5 | 5 | 7 | 11 | | | | | | | | | | | |
| 930 | | | | | | | | | | | | | | | | |
| 927.0 | | 13.5 | 2 | 4 | 5 | | | | | | | | | | | |
| 925 | | | | | | | | | | | | | | | | |
| 922.0 | | 18.5 | 2 | 2 | 4 | | | | | | | | | | | |
| 920 | | | | | | | | | | | | | | | | |
| 917.0 | | 23.5 | 2 | 3 | 5 | | | | | | | | | | | |
| 915 | | | | | | | | | | | | | | | | |
| 912.0 | | 28.5 | 2 | 3 | 5 | | | | | | | | | | | |
| 910 | | | | | | | | | | | | | | | | |
| 907.0 | | 33.5 | 2 | 5 | 4 | | | | | | | | | | | |
| 905 | | | | | | | | | | | | | | | | |
| 902.0 | | 38.5 | 3 | 5 | 7 | | | | | | | | | | | |
| 900 | | | | | | | | | | | | | | | | |
| 897.0 | | 43.5 | 3 | 5 | 6 | | | | | | | | | | | |
| 895 | | | | | | | | | | | | | | | | |
| 892.0 | | 48.5 | 2 | 5 | 7 | | | | | | | | | | | |
| 890 | | | | | | | | | | | | | | | | |
| 887.0 | | 53.5 | 4 | 5 | 8 | | | | | | | | | | | |
| 885 | | | | | | | | | | | | | | | | |
| 882.0 | | 58.5 | 5 | 7 | 12 | | | | | | | | | | | |
| 880 | | | | | | | | | | | | | | | | |
| 877.0 | | 63.5 | 5 | 8 | 11 | | | | | | | | | | | |
| 875 | | | | | | | | | | | | | | | | |
| 872.0 | | 68.5 | 4 | 8 | 11 | | | | | | | | | | | |
| 870 | | | | | | | | | | | | | | | | |
| 867.0 | | 73.5 | 5 | 9 | 12 | | | | | | | | | | | |
| 865 | | | | | | | | | | | | | | | | |

| WBS 34497.1.2 | | TIP R-2707C | | COUNTY CLEVELAND | | GEOLOGIST Smith, B. | | | | | | | | | | |
|--|-----------------|---------------------|------------|--------------------------|--------|-------------------------|-----------------|----|----|-----|-----------|-----|---------------------------|------------|--|--|
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | | | | | GROUND WTR (ft) | | | | | | | | | |
| BORING NO. EB2-C | | STATION 25+28 | | OFFSET 8 ft LT | | ALIGNMENT -Y9- | | | | | | | | | | |
| COLLAR ELEV. 940.5 ft | | TOTAL DEPTH 96.9 ft | | NORTHING 582,780 | | EASTING 1,250,670 | | | | | | | | | | |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | | | DRILL METHOD H.S. Augers | | HAMMER TYPE Automatic | | | | | | | | | | |
| DRILLER Bare, J. | | START DATE 03/23/15 | | COMP. DATE 03/23/15 | | 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 | | | | | | |
| 865 | | | | | | | | | | | | | | | | |
| 862.0 | | 78.5 | 4 | 8 | 14 | | | | | | | | | | | |
| 860 | | | | | | | | | | | | | | | | |
| 857.0 | | 83.5 | 49 | 40 | 60/0.4 | | | | | | | | | | | |
| 855 | | | | | | | | | | | | | | | | |
| 852.0 | | 88.5 | 24 | 34 | 50 | | | | | | | | | | | |
| 850 | | | | | | | | | | | | | | | | |
| 847.0 | | 93.5 | 100/0.3 | | | | | | | | | | | | | |
| 845 | | | | | | | | | | | | | | | | |
| 843.6 | | 96.9 | 60/0.0 | | | | | | | | | | | | | |

NCDOT BORE DOUBLE R2707C_GEO_BRD0471_GINT.GPJ NC_DOT.GDT 4/14/15





NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

| | | | |
|--|---------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. EB2-B | STATION 25+30 | OFFSET 67 ft RT | ALIGNMENT -Y9- |
| COLLAR ELEV. 941.1 ft | TOTAL DEPTH 83.7 ft | NORTHING 582,814 | EASTING 1,250,604 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/12/15 | COMP. DATE 03/12/15 | SURFACE WATER DEPTH N/A |

| | | | |
|--|---------------------|--------------------------|-------------------------|
| WBS 34497.1.2 | TIP R-2707C | COUNTY CLEVELAND | GEOLOGIST Smith, B. |
| SITE DESCRIPTION Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass) | | | GROUND WTR (ft) |
| BORING NO. EB2-B | STATION 25+30 | OFFSET 67 ft RT | ALIGNMENT -Y9- |
| COLLAR ELEV. 941.1 ft | TOTAL DEPTH 83.7 ft | NORTHING 582,814 | EASTING 1,250,604 |
| DRILL RIG/HAMMER EFF./DATE SUM0093 DIEDRICH D-50 86% 10/10/2014 | | DRILL METHOD H.S. Augers | HAMMER TYPE Automatic |
| DRILLER Bare, J. | START DATE 03/12/15 | COMP. DATE 03/12/15 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG MOI | LOG SOIL AND ROCK DESCRIPTION | DEPTH (ft) |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|---------|--|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | |
| 945 | | | | | | | | | | | | | | |
| 940 | | | | | | | | | | | | | GROUND SURFACE | 0.0 |
| 935 | 937.4 | 3.7 | 2 | 5 | 8 | | | | | | 13 | M | RESIDUAL red-brown, silty CLAY (A-7-6) with little fine sand | |
| 930 | 932.4 | 8.7 | 3 | 5 | 7 | | | | | | 12 | D | red-brown, orange-brown, and brown, saprolitic, micaceous, silty CLAY (A-7-5) with some sand | 6.2 |
| 925 | 927.4 | 13.7 | 2 | 3 | 5 | | | | | | 8 | M | | |
| 920 | 922.4 | 18.7 | 2 | 3 | 5 | | | | | | 9 | M | | |
| 915 | 917.4 | 23.7 | 3 | 4 | 6 | | | | | | 10 | M | | |
| 910 | 912.4 | 28.7 | 3 | 4 | 7 | | | | | | 11 | M | | |
| 905 | 907.4 | 33.7 | 4 | 6 | 9 | | | | | | 15 | W | | |
| 900 | 902.4 | 38.7 | 3 | 4 | 6 | | | | | | 10 | M | | |
| 895 | 897.4 | 43.7 | 3 | 4 | 7 | | | | | | 11 | W | | |
| 890 | 892.4 | 48.7 | 3 | 7 | 9 | | | | | | 16 | W | tan-brown and white, saprolitic, micaceous, fine sandy SILT (A-4) with little clay | 46.2 |
| 885 | 887.4 | 53.7 | 3 | 6 | 8 | | | | | | 14 | W | red-brown and orange-brown, saprolitic, micaceous, silty CLAY (A-7-5) with some sand | 51.2 |
| 880 | 882.4 | 58.7 | 3 | 5 | 8 | | | | | | 13 | M | | |
| 875 | 877.4 | 63.7 | 9 | 9 | 11 | | | | | | 20 | M | brown, orange-brown, and white, saprolitic, micaceous, fine sandy SILT (A-4) with trace clay | 61.2 |
| 870 | 872.4 | 68.7 | 10 | 19 | 27 | | | | | | 46 | Sat. | | |
| 865 | 867.4 | 73.7 | 100/0.4 | | | | | | | | | | WEATHERED ROCK (Biotite Schist) | 73.3 |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG MOI | LOG SOIL AND ROCK DESCRIPTION | DEPTH (ft) |
|-----------|-----------------|------------|------------|-------|-------|----------------|----|----|----|-----|-----------|---------|---|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | |
| 865 | | | | | | | | | | | | | Match Line | |
| 860 | 862.4 | 78.7 | 100/0.3 | | | | | | | | | | WEATHERED ROCK (Biotite Schist) (continued) | |
| | 860.1 | | | | | | | | | | | | CRYSTALLINE ROCK (Biotite Schist) | 81.0 |
| | 857.4 | 83.7 | 60/0.0 | | | | | | | | | | Boring Terminated with Standard Penetration Test Refusal at Elevation 857.4 ft in Crystalline Rock (Biotite Schist) | 83.7 |

-Boring offset from proposed location due to overhead powerlines.

-Greater than 180 tons bearing capacity reached with SPT at 68.7 feet.

-Harder drilling reported at 73.3 feet was interpreted as the top of Weathered Rock.

-Very hard drilling and significant rig chatter reported around around 81.0 feet, this was interpreted as the top of Crystalline Rock.

-Augers were reported to be very close to refusal 81.0 - 83.7 feet, but were able to slowly advance through the Crystalline Rock.

NCDOT BORE DOUBLE R2707C_GEO_BRD0471_GINT.GPJ_NC_DOT.GDT 4/14/15

CORE PHOTOGRAPHS

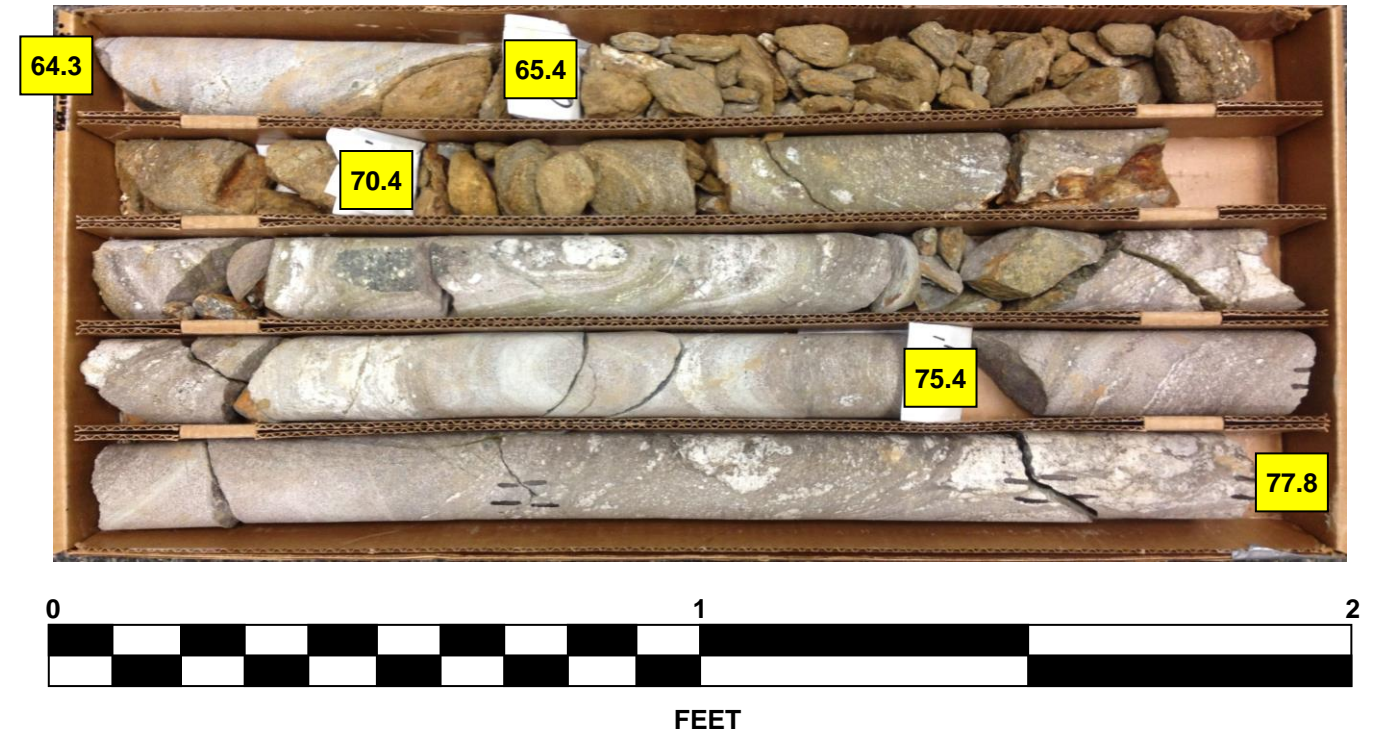
B1-C

BOX 1 of 1: 78.6 - 90.6 FEET



B1-B

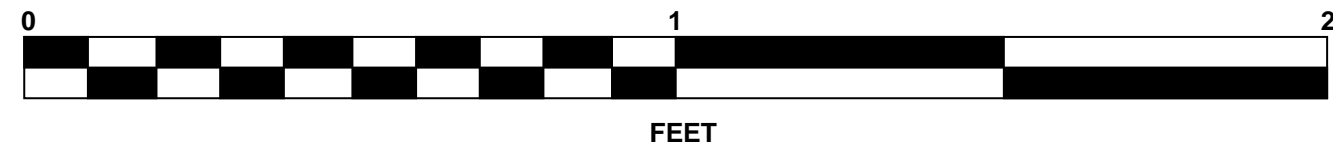
BOX 1 of 3: 64.3 - 77.8 FEET



CORE PHOTOGRAPHS

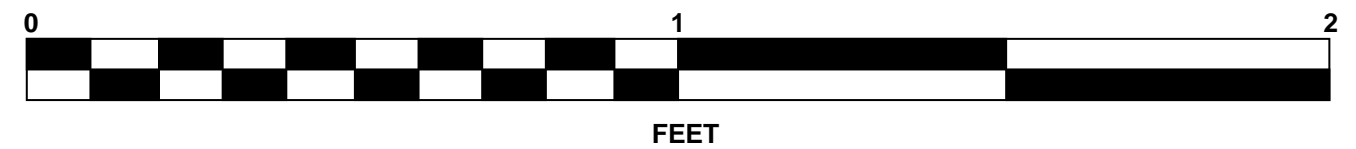
B1-B

BOX 2 of 3: 77.8 - 86.8 FEET



B1-B

BOX 3 of 3: 86.8 - 95.4 FEET



SITE PHOTOGRAPHS
Bridge No. 471 on -Y9- (NC 18) over -L- (US 74 Shelby Bypass)



Standing at the centerline of -Y9- at End Bent 2 looking North



Standing at the centerline of -Y9- at End Bent 1 looking South