

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34497.1.2	1	17

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

PROJ. REFERENCE NO. 34497.1.2 (R-2707A) F.A. PROJ. NHF-74(14)  
COUNTY CLEVELAND  
PROJECT DESCRIPTION US 74 (SHELBY BYPASS) FROM WEST OF  
SR 1167 (PEACHTREE RD.) TO EAST OF SR 1315 (PLATO LEE RD.)  
SITE DESCRIPTION BRIDGE 452 OVER US 74 AT STATION 37+77.92  
ON -RAMPB- BETWEEN SR 1318 AND SR 1162

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**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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 (ON-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 THIS 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.

**PROJECT: 34497.1.2 ID: R-2707A**

PERSONNEL

- J. Howard
- J. Honeycutt
- D. White
- O. Smith

INVESTIGATED BY MACTEC

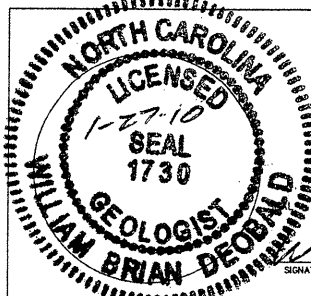
CHECKED BY M. Lear

SUBMITTED BY B. Deobald

DATE 12/11/09

REVISION 01/26/10

Regional  
Geotechnical Design  
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MACTEC NC LICENSE F-0653

DRAWN BY: R. RAHIE

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

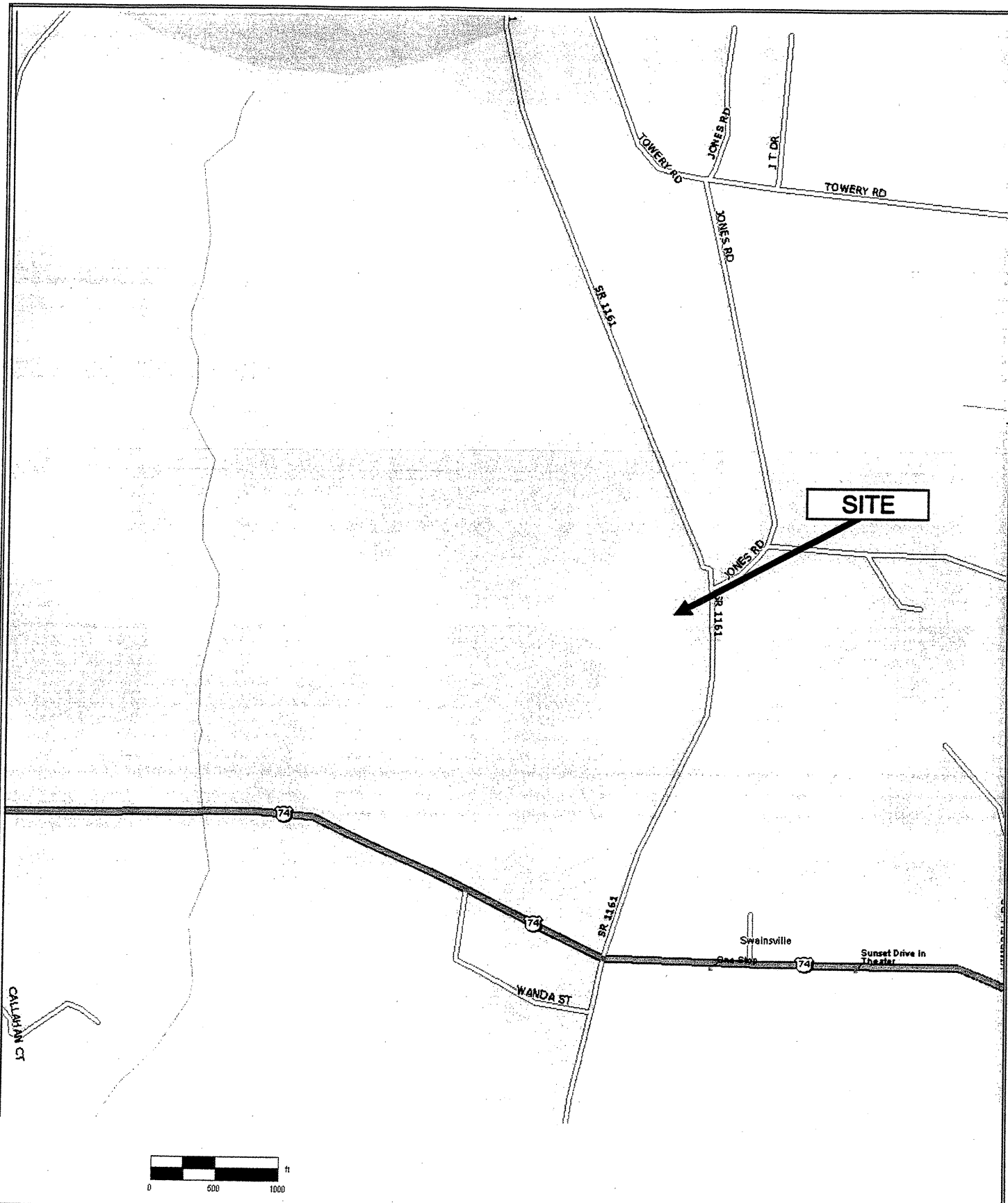
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**

PROJECT REFERENCE NO. 34497.1.2	SHEET NO. 2
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**SUBSURFACE INVESTIGATION**

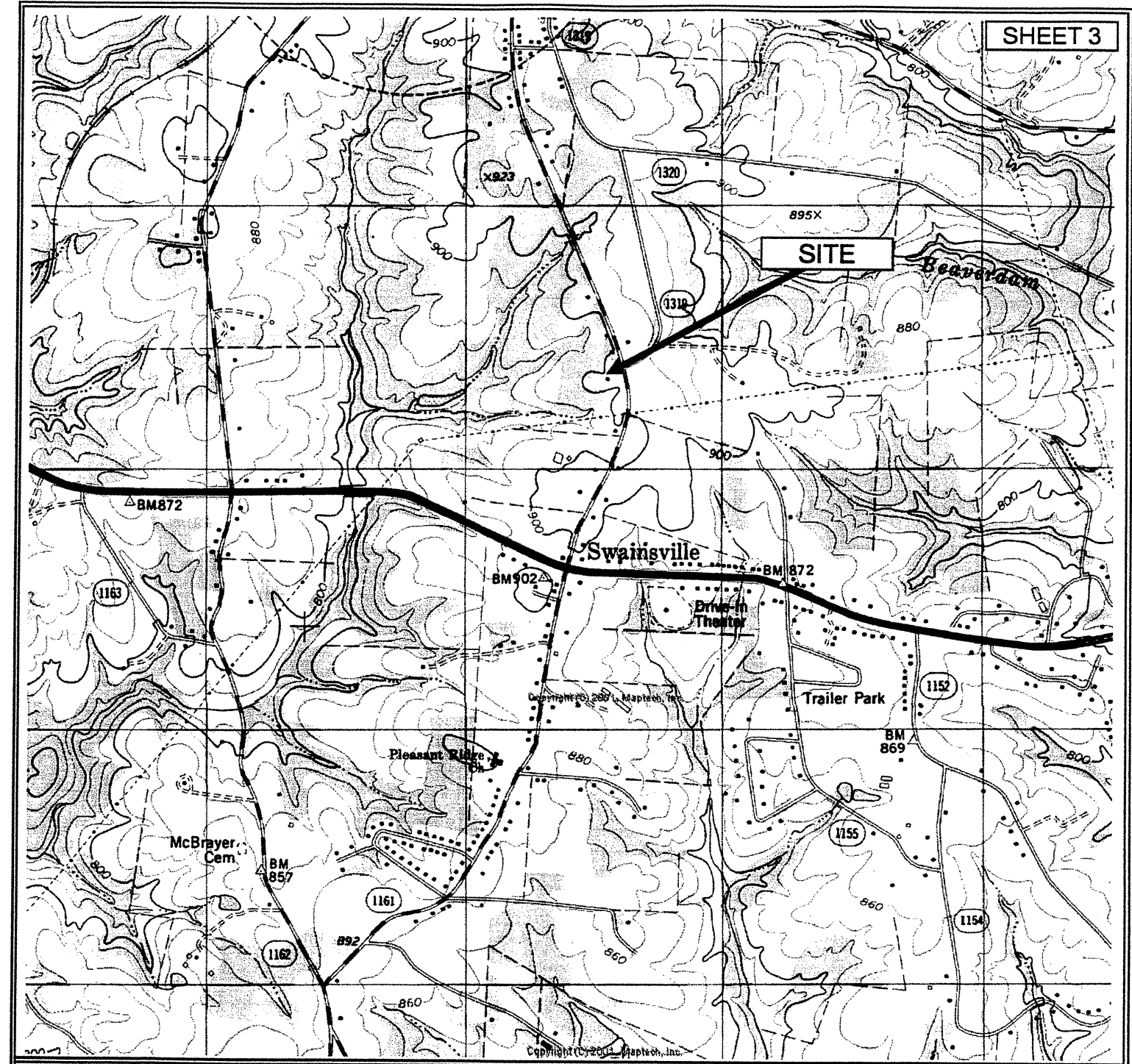
**SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS**

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <b>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</b>	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.  ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  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-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 (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - A FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b> GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-4, A-5, A-6, A-7 SYMBOL	<b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.  <b>COMPRESSIBILITY</b> SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE  LIQUID LIMIT LESS THAN 31 LIQUID LIMIT EQUAL TO 31-50 LIQUID LIMIT GREATER THAN 50  <b>PERCENTAGE OF MATERIAL</b> 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	<b>WEATHERING</b> FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. 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. 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. 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, YIELDS SPT N VALUES &gt; 100 BPF</i> VERY SEVERE (V SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. FABRIC MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	<b>GROUND WATER</b> 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  <b>MISCELLANEOUS SYMBOLS</b> 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
<b>CONSISTENCY OR DENSENESS</b> PRIMARY SOIL TYPE COMPACTNESS OR RESISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> ) GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE <4 4 TO 10 10 TO 30 30 TO 50 >50 N/A GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD <2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30 <0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4	<b>TEXTURE OR GRAIN SIZE</b> 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 BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.) GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL MOISTURE - CORRELATION OF TERMS</b> SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL - LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PL - PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE OM - OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL - SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	<b>ABBREVIATIONS</b> 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 HL - 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 W - UNIT WEIGHT W <sub>d</sub> - DRY UNIT WEIGHT  SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL RATIO CBR - CALIFORNIA BEARING RATIO	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>PLASTICITY</b> NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM HIGH	<b>EQUIPMENT USED ON SUBJECT PROJECT</b> DRILL UNITS: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST <input checked="" type="checkbox"/> CEM-55LC ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input 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 checked="" type="checkbox"/> TRICONE 2 7/8" STEEL TEETH <input type="checkbox"/> TRICONE - " TUNG-CARB. <input type="checkbox"/> CORE BIT <input type="checkbox"/> HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL CORE SIZE: <input type="checkbox"/> B- <input type="checkbox"/> N- <input type="checkbox"/> H- 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"/>	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>COLOR</b> 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.	<b>FRACITURE SPACING</b> TERM SPACING VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FEET	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	<b>BEDDING</b> 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	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	<b>INDURATION</b> FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	<b>BENCH MARK: BL-58 (SET BY NCDOT PERS)</b> <b>AT -BL- 48+34.62</b> <b>ELEVATION: 910.16 FT.</b>	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRODUCED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	<b>NOTES:</b> FIAD - FILLED IMMEDIATELY AFTER DRILLING	<b>ROCK HARDNESS</b> 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.	<b>ROCK QUALITY DESIGNATION (RQD)</b>



 <small>MACTEC ENGINEERING AND CONSULTING, INC. RALEIGH, NORTH CAROLINA</small>	<b>SITE LOCATION MAP</b>		
	BRIDGE 452 OVER US 74 AT STA. 37+77.92 ON -RAMP B-, BETWEEN SR 1318 & 1162 NCDOT PROJ. NO. 34497.1.2 (R-2707A) CLEVELAND COUNTY, NORTH CAROLINA		
	DRAWN: JPH APPROVAL: <i>JPH</i> REVISED: 1/2010	DATE: 12/2009 SCALE: 1"=12,000' JOB No: 6468-09-2534	FIGURE          <b>1</b>

REFERENCE: MAPTECH TERRAIN NAVIGATOR



**SHELBY, N.C.**

BOILING SPRINGS NORTH QUADRANGLE  
N3515-W81377.5  
1982  
DMA 4654 | SE-SERIES V842

CONTOUR INTERVAL 20 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

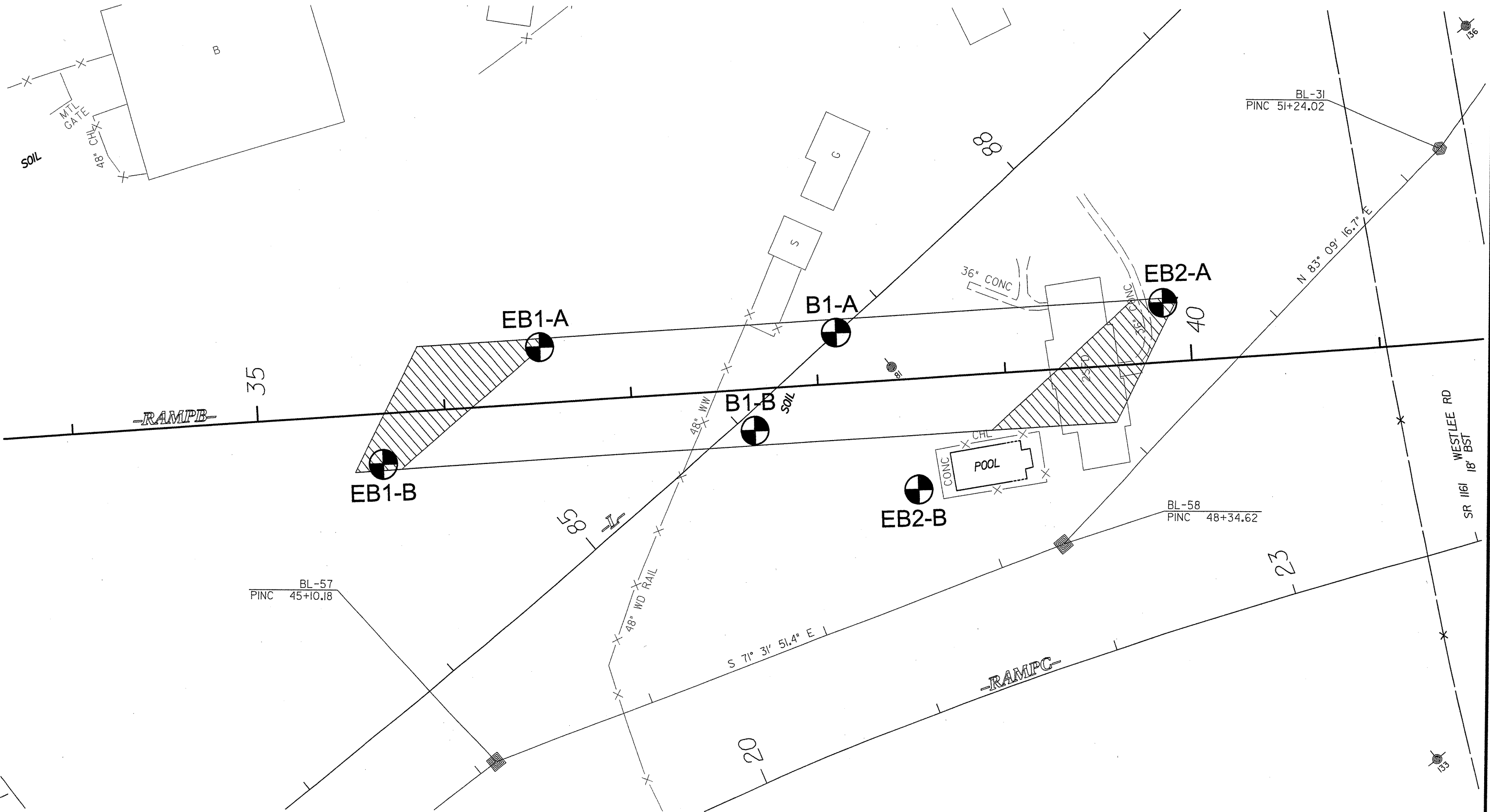
GRAPHIC SCALE FEET

2000 1000 0 2000 4000

NOTE: SITE LOCATION IS APPROXIMATE

**MACTEC**  
MACTEC ENGINEERING AND CONSULTING, INC.  
RALEIGH, NORTH CAROLINA

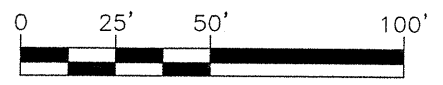
<b>TOPOGRAPHIC SITE MAP</b>		
BRIDGE 452 OVER US 74 AT STA. 37+77.92 ON -RAMP B-, BETWEEN SR 1318 & SR 1162 NCDOT PROJ. NO. 34497.1.2 (R-2707A) CLEVELAND COUNTY, NORTH CAROLINA		
DRAWN: JPH APPROVAL: <i>JPH</i> REVISED: 1/2010	DATE: December 2009 SCALE: 1: 24000 JOB: 6468-09-2534	DRAWING          <b>2</b>



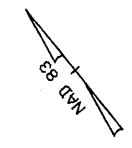
BL-57  
PINC 45+10.18

BL-58  
PINC 48+34.62

BL-31  
PINC 51+24.02

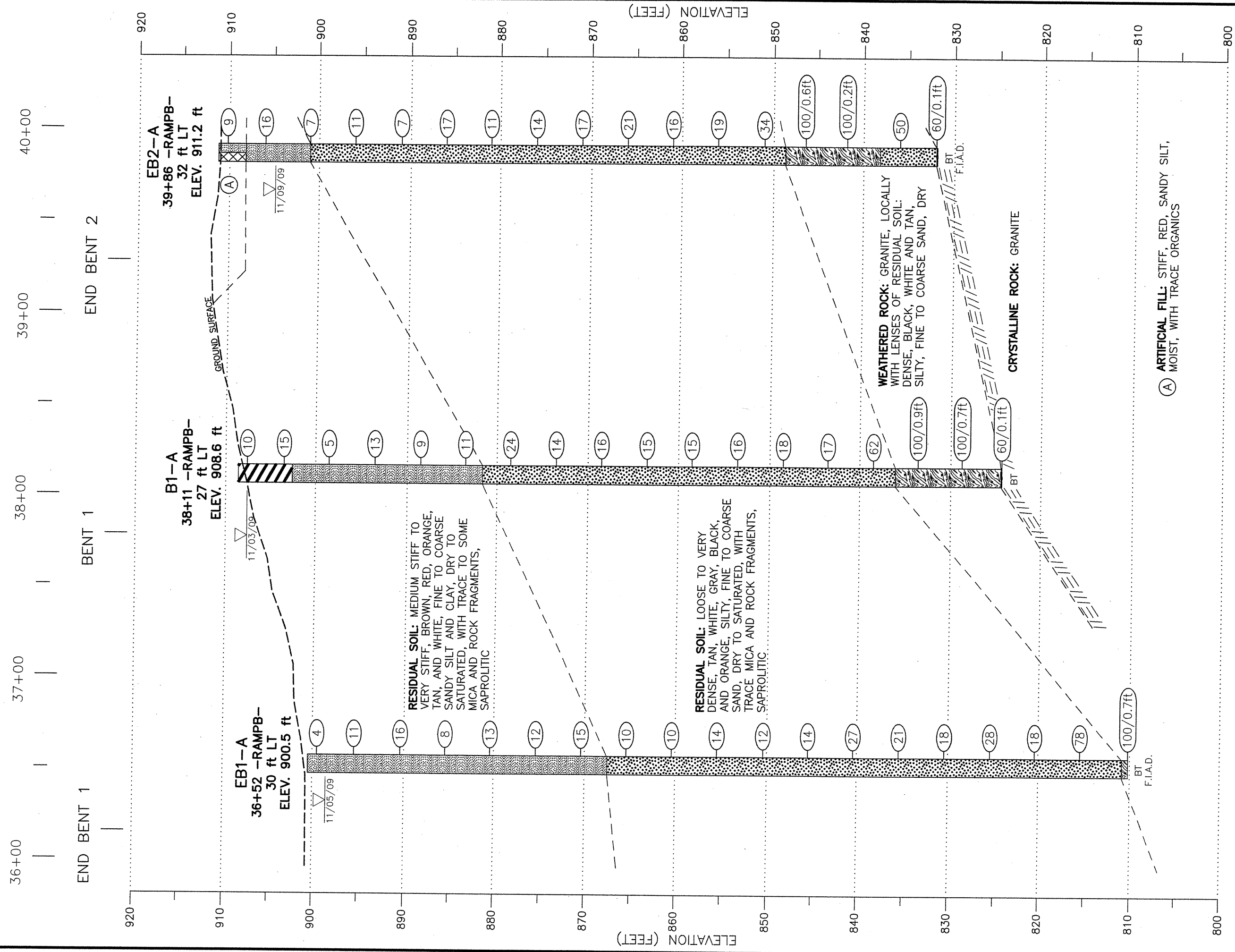


SCALE (FEET)  
1" : 50'



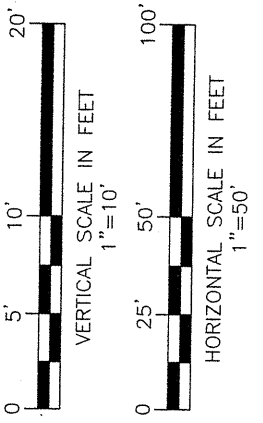
**BORING LOCATION PLAN**  
 BRIDGE 452 OVER US 74 AT STA. 37+77.92 ON -RAMPB-  
 BETWEEN SR 1318 & SR 1162  
 NCDOT PROJECT NO. 34497.1.2 (R-2707A)  
 F.A. No. NHF-74(14)  
 CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING AND CONSULTING, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE: 12/11/09
01/26/10	DFT CHECK:	W.B.D.	JOB : 6468-09-2534
	ENG CHECK:	M.B.L.	DWG: 3



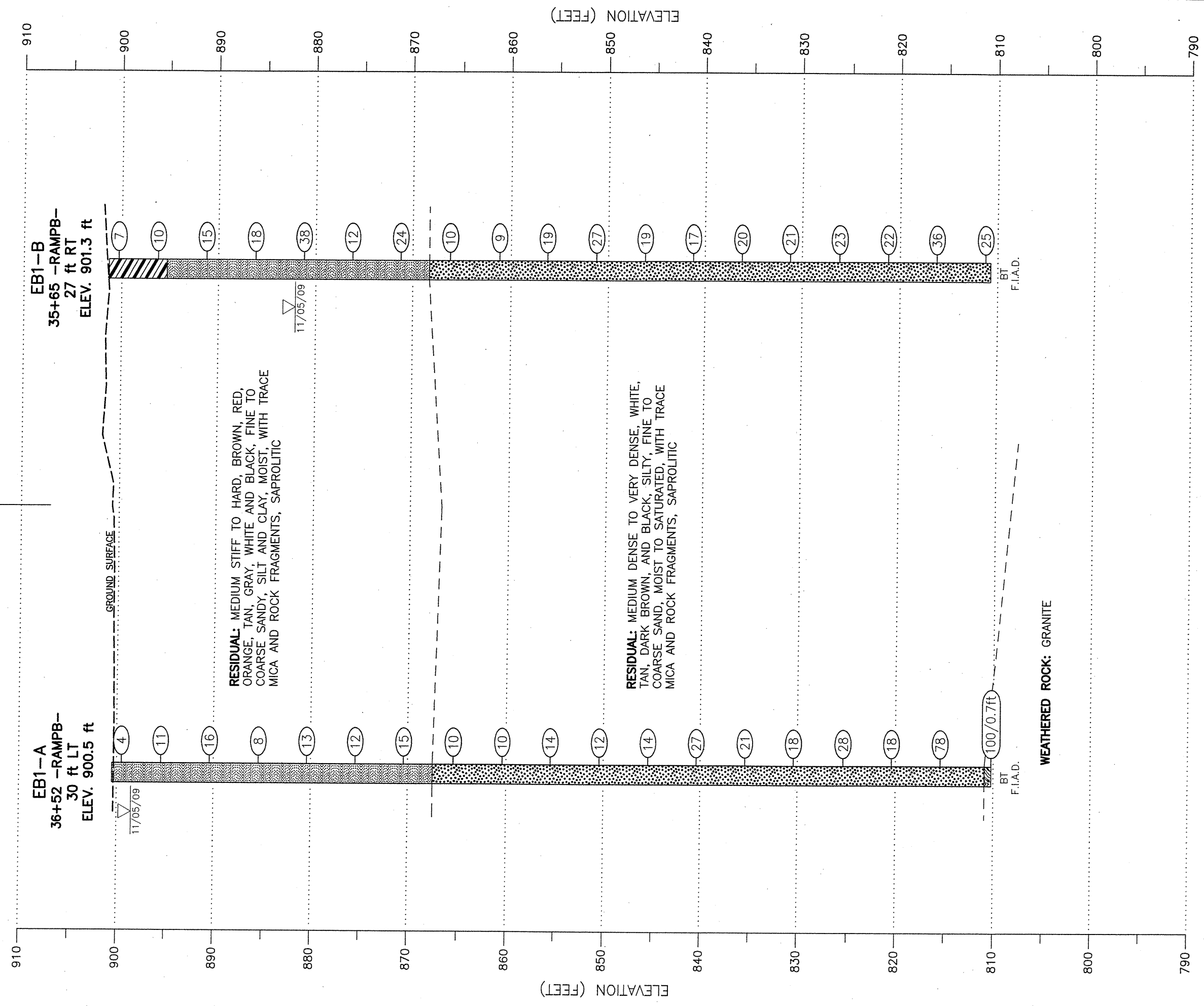
- GROUND LINE PROFILE SURVEYED BY MACTEC ALONG CL OF -RAMPB- ON 10/22/09.

- INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

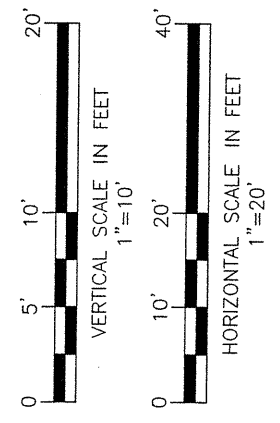


PROFILE ALONG CL OF -RAMPB- BRIDGE 452 OVER US 74 AT STA 37+77.92 ON -RAMPB- BETWEEN SR 1318 & SR 1162  
 NCDOT PROJECT NO. 34497.1.2 (R-2707A)  
 F.A. No. NHF-74(14)  
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MACTEC ENGINEERING & CONSULTING, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE: 12/11/09
01/26/10	DFT CHECK:	W.B.D.	JOB: 6468-09-2534
	ENG CHECK:	M.B.L.	DWG: 4



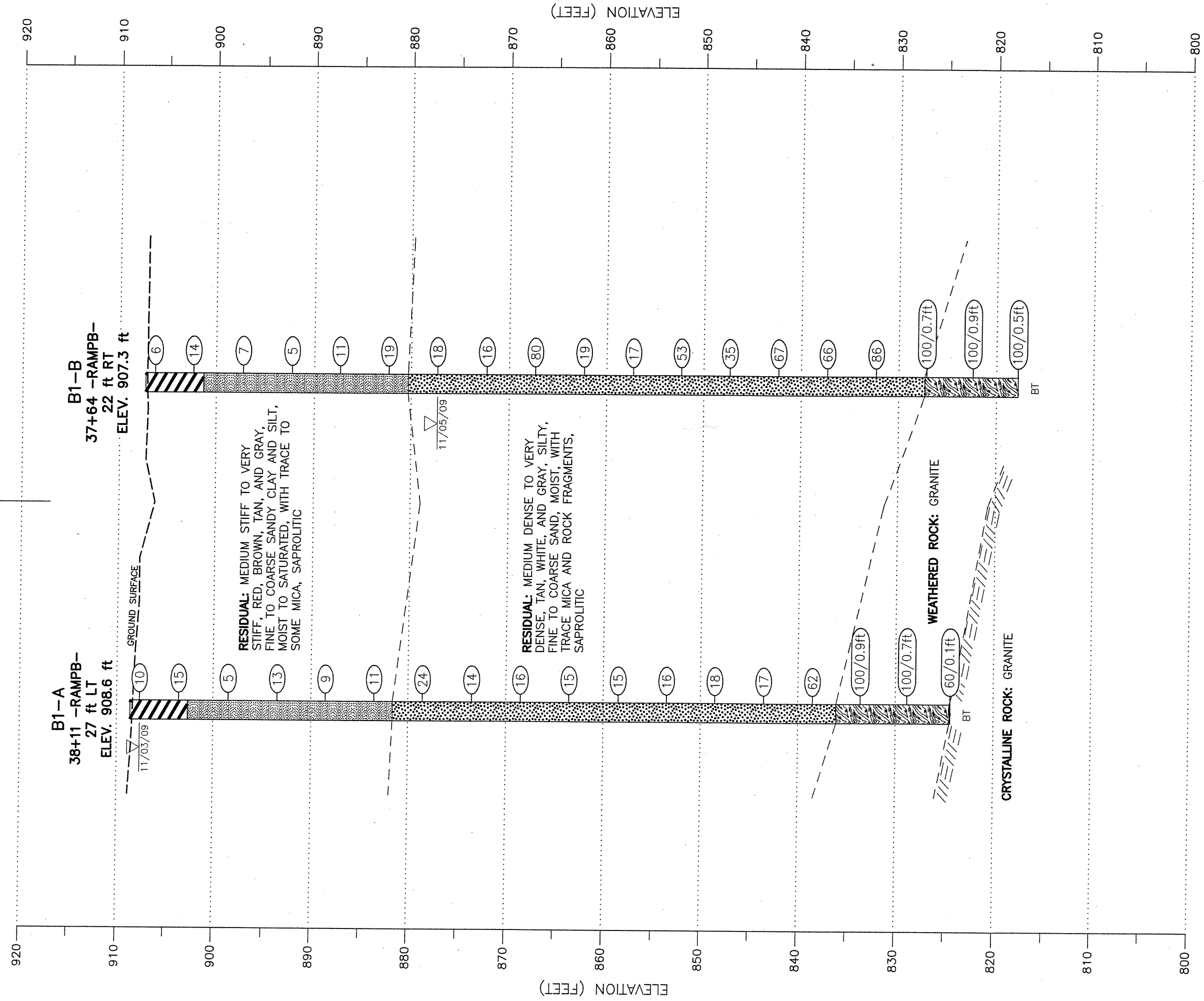
- GROUND LINE PROFILE SURVEYED BY MACTEC ON 10/22/2009.  
 - INFERRED STRATIGRAPHY IS DRAWN AT THE BENT LINE WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.



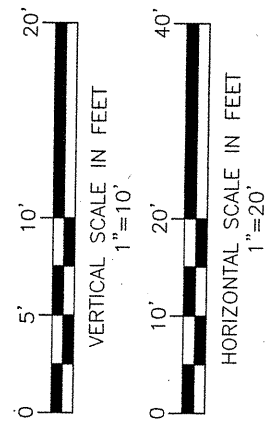
CROSS SECTION ALONG END BENT 1  
 BRIDGE 452 OVER US 74 AT STA. 37+77.92 ON -RAMPB-  
 BETWEEN SR 1318 & SR 1162  
 NCDOT PROJECT NO. 34497.1.2 (R-2707A)  
 F.A. No. NHF-74(14)  
 CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.  
 RALEIGH, NORTH CAROLINA

REVISIONS	DRAWN:	R.R.	DATE:
01/26/10	DFT CHECK:	W.B.D.	JOB: 6468-09-2534
	ENG CHECK:	M.B.L.	DWG: 5



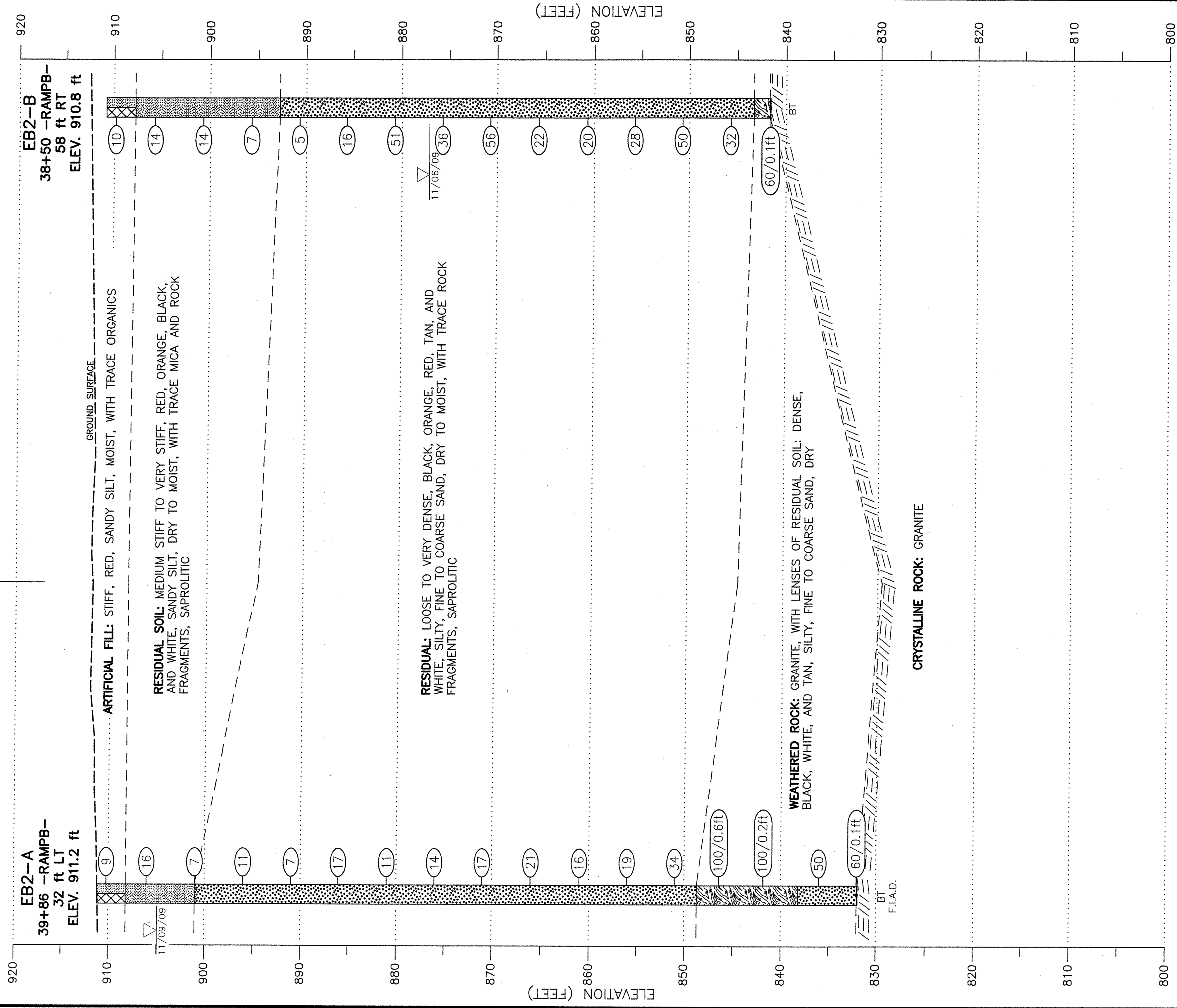
- GROUND LINE PROFILE SURVEYED BY MACTEC ON 10/22/2009.  
 - INFERRED STRATIGRAPHY IS DRAWN AT THE BENT LINE WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.



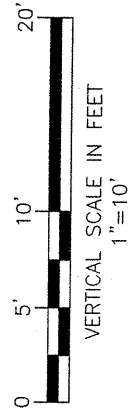
CROSS SECTION ALONG BENT 1  
 BRIDGE 452 OVER US 74 AT STA. 37+77.92 ON -RAMPB-  
 BETWEEN SR 1318 & SR 1162  
 NCDOT PROJECT NO. 34497.1.2 (R-2707A)  
 F.A. No. NHF-74(14)  
 CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC. RALEIGH, NORTH CAROLINA			
REVISIONS	DRAWN:	R.R.	DATE: 12/11/09
01/26/10	DFT CHECK:	W.B.D.	JOB: 6488-09-2534
	ENG CHECK:	M.B.L.	DWG: 6

♀



- GROUND LINE PROFILE SURVEYED BY MACTEC ON 10/22/2009.  
 - INFERRED STRATIGRAPHY IS DRAWN AT THE BENT LINE WITH THE BORINGS PROJECTED ONTO THE CROSS SECTION.



CROSS SECTION ALONG END BENT 2  
 BRIDGE 452 OVER US 74 AT STA. 37+77.92 ON -RAMPB-  
 BETWEEN SR 1318 & SR 1162  
 NCDOT PROJECT NO. 34497.1.2 (R-2707A)  
 F.A. No. NHF-74(14)  
 CLEVELAND COUNTY, NORTH CAROLINA

MACTEC ENGINEERING & CONSULTING, INC.  
 RALEIGH, NORTH CAROLINA

REVISIONS	R.R.	DATE:
01/26/10	W.B.D.	12/11/09
ENG CHECK:	M.B.L.	JOB: 6468-09-2534
		DWG: 7



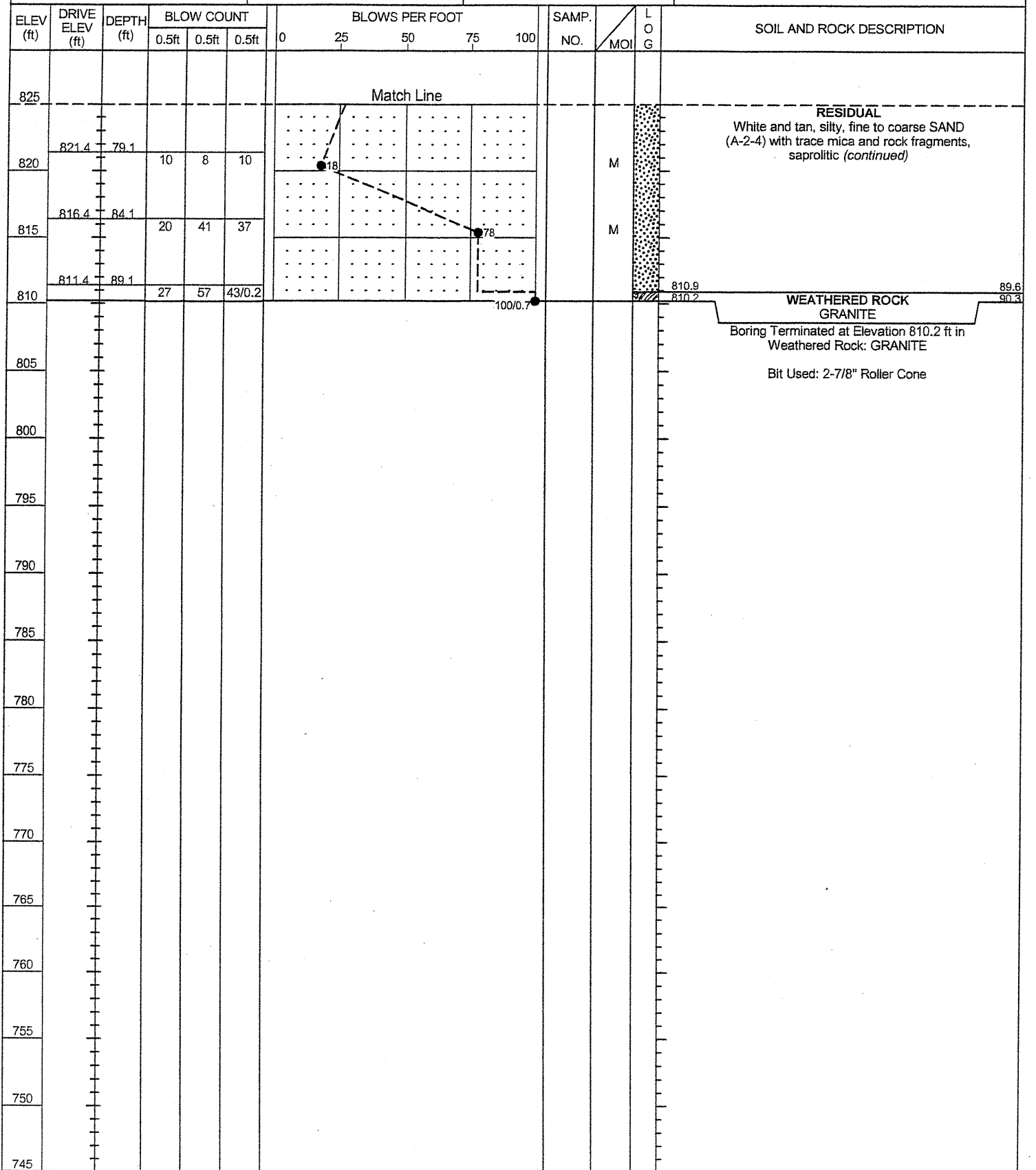
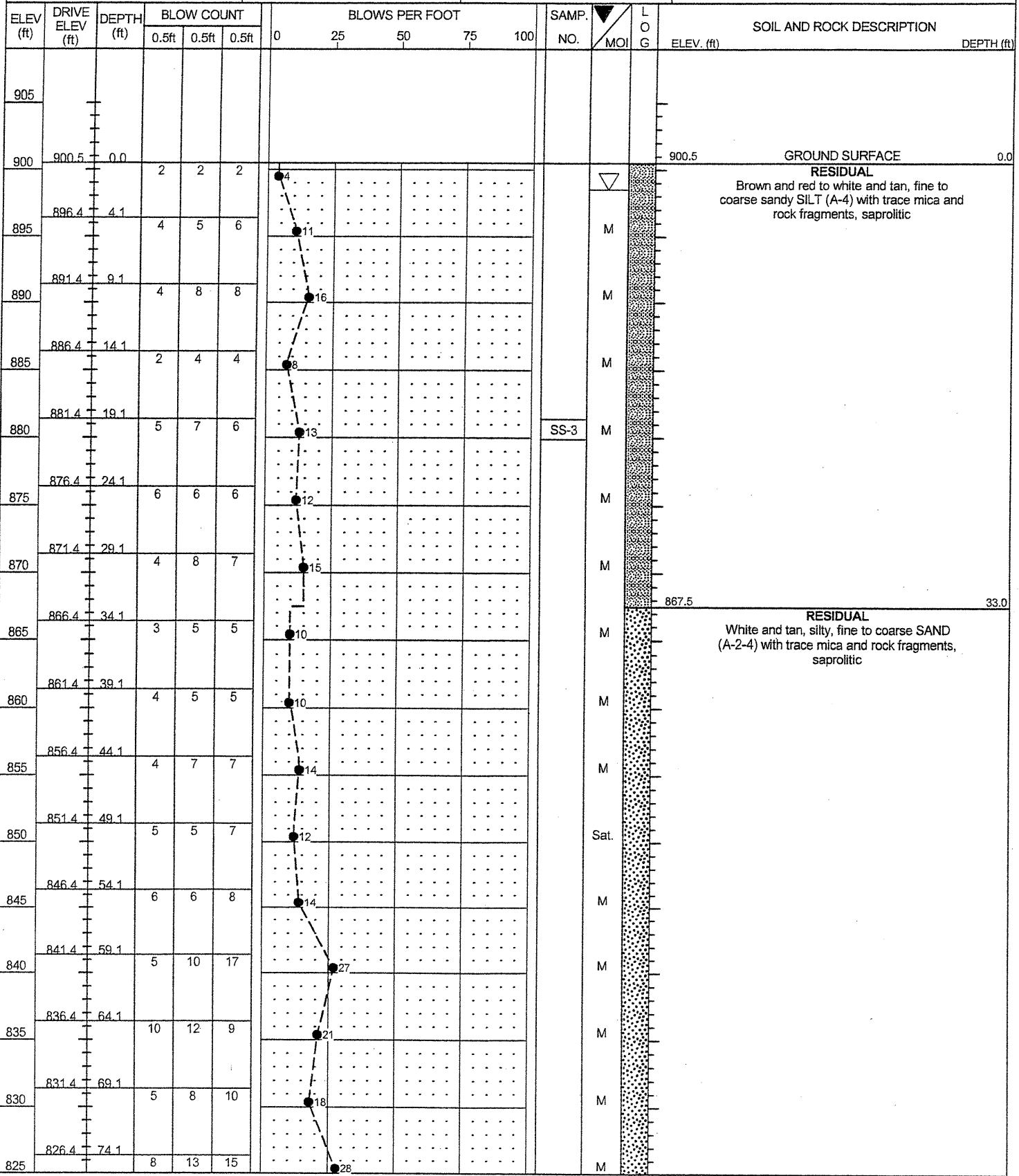


# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Honeycutt
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 2.0
BORING NO. EB1-A	STATION 36+52	OFFSET 30 ft LT	ALIGNMENT -RAMPB-
COLLAR ELEV. 900.5 ft	TOTAL DEPTH 90.3 ft	NORTHING 573,604	EASTING 1,207,731
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/05/09	COMP. DATE 11/05/09	SURFACE WATER DEPTH N/A

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Honeycutt
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 2.0
BORING NO. EB1-A	STATION 36+52	OFFSET 30 ft LT	ALIGNMENT -RAMPB-
COLLAR ELEV. 900.5 ft	TOTAL DEPTH 90.3 ft	NORTHING 573,604	EASTING 1,207,731
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/05/09	COMP. DATE 11/05/09	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE R-2707A BRIDGE 452.GPJ NC\_DOT.GDT 1/26/10

GROUND SURFACE 900.5

RESIDUAL  
Brown and red to white and tan, fine to coarse sandy SILT (A-4) with trace mica and rock fragments, saprolitic

RESIDUAL  
White and tan, silty, fine to coarse SAND (A-2-4) with trace mica and rock fragments, saprolitic

Match Line

RESIDUAL  
White and tan, silty, fine to coarse SAND (A-2-4) with trace mica and rock fragments, saprolitic (continued)

WEATHERED ROCK  
GRANITE  
Boring Terminated at Elevation 810.2 ft in Weathered Rock: GRANITE  
Bit Used: 2-7/8" Roller Cone

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 19.2
BOHRING NO. EB1-B	STATION 35+65	OFFSET 27 ft RT	ALIGNMENT -RAMPB-
COLLAR ELEV. 901.3 ft	TOTAL DEPTH 90.6 ft	NORTHING 573,610	EASTING 1,207,628
DRILL MACHINE CME 55LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER D. White	START DATE 11/05/09	COMP. DATE 11/05/09	SURFACE WATER DEPTH N/A

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 19.2
BOHRING NO. EB1-B	STATION 35+65	OFFSET 27 ft RT	ALIGNMENT -RAMPB-
COLLAR ELEV. 901.3 ft	TOTAL DEPTH 90.6 ft	NORTHING 573,610	EASTING 1,207,628
DRILL MACHINE CME 55LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER D. White	START DATE 11/05/09	COMP. DATE 11/05/09	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
905																
901.3	901.3	0.0												GROUND SURFACE	901.3	0.0
897.2	897.2	4.1	1	3	4								M	RESIDUAL Red to red-orange, sandy, silty CLAY (A-6), saprolitic		
892.2	892.2	9.1	3	4	6								M	RESIDUAL Red, gray, orange, and black, sandy SILT (A-4) with trace mica, saprolitic		
887.2	887.2	14.1	3	7	8								M			
882.2	882.2	19.1	3	8	10								M			
877.2	877.2	24.1	10	17	21								M			
872.2	872.2	29.1	6	6	6								M			
867.2	867.2	34.1	6	6	6								M			
862.2	862.2	39.1	14	14	10								M			
857.2	857.2	44.1	3	5	5								M	RESIDUAL Tan, white, dark brown, and black, silty, fine to coarse SAND (A-2-4) with trace mica, saprolitic	868.3	33.0
852.2	852.2	49.1	2	4	5								W			
847.2	847.2	54.1	6	10	9								W			
842.2	842.2	59.1	7	12	15								W			
837.2	837.2	64.1	7	9	10								W			
832.2	832.2	69.1	7	7	10								W			
827.2	827.2	74.1	7	10	13								W			
825													M			

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
825																
822.2	822.2	79.1	11	11	11									Match Line		
817.2	817.2	84.1	21	22	14								M	RESIDUAL Tan, white, dark brown, and black, silty, fine to coarse SAND (A-2-4) with trace mica, saprolitic (continued)		
812.2	812.2	89.1	11	11	14								M			
810.7													M	Boring Terminated at Elevation 810.7 ft in Residual: Medium dense, silty, fine to coarse SAND (A-2-4)	810.7	90.6
805														Bit Used: 2-7/8" Roller Cone		
800																
795																
790																
785																
780																
775																
770																
765																
760																
755																
750																
745																

NCDOT BORE DOUBLE R-2707A BRIDGE 452.GPJ NC\_DOT.GDT 1/28/10



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Honeycutt
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 1.0
BORING NO. B1-A	STATION 38+11	OFFSET 27 ft LT	ALIGNMENT -RAMPB-
COLLAR ELEV. 908.6 ft	TOTAL DEPTH 84.2 ft	NORTHING 573,509	EASTING 1,207,858
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/03/09	COMP. DATE 11/03/09	SURFACE WATER DEPTH N/A

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Honeycutt
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 1.0
BORING NO. B1-A	STATION 38+11	OFFSET 27 ft LT	ALIGNMENT -RAMPB-
COLLAR ELEV. 908.6 ft	TOTAL DEPTH 84.2 ft	NORTHING 573,509	EASTING 1,207,858
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/03/09	COMP. DATE 11/03/09	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				
910	908.6	0.0											GROUND SURFACE	0.0
905	904.5	4.1	3	6	4								RESIDUAL Red, sandy, silty CLAY (A-7-6)	
900	899.5	9.1	4	6	9								RESIDUAL Red to red and tan, fine to coarse sandy SILT (A-4) with trace to some mica, saprolitic	6.0
895	894.5	14.1	4	2	3									
890	889.5	19.1	3	4	9									
885	884.5	24.1	4	4	5									
880	879.5	29.1	4	5	6									
875	874.5	34.1	7	11	13								RESIDUAL Tan, white and gray, silty, fine to coarse SAND (A-2-4) with trace mica and rock fragments, saprolitic	27.0
870	869.5	39.1	6	7	7									
865	864.5	44.1	8	8	8									
860	859.5	49.1	8	8	7									
855	854.5	54.1	6	7	8									
850	849.5	59.1	7	7	9									
845	844.5	64.1	12	10	8									
840	839.5	69.1	6	8	9									
835	834.5	74.1	9	22	40									
830	834.5	74.1	49	51/0.4									WEATHERED ROCK GRANITE	72.5

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				
830	829.5	79.1	30	70/0.2									Match Line	
825	824.5	84.1											WEATHERED ROCK GRANITE (continued)	
820	824.5	84.1											CRYSTALLINE ROCK GRANITE	84.1
815													Boring Terminated with Standard Penetration Test Refusal at Elevation 824.4 ft in Crystalline Rock: GRANITE	
810													Bit Used: 2-7/8" Roller Cone	
805														
800														
795														
790														
785														
780														
775														
770														
765														
760														
755														
750														

NCDOT BORE DOUBLE R-2707A BRIDGE 452.GPJ NC\_DOT.GDT 1/26/10



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Honeycutt
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 1.0
BORING NO. B1-B	STATION 37+64	OFFSET 22 ft RT	ALIGNMENT -RAMPB-
COLLAR ELEV. 907.3 ft	TOTAL DEPTH 89.5 ft	NORTHING 573,497	EASTING 1,207,792
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/04/09	COMP. DATE 11/04/09	SURFACE WATER DEPTH N/A

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Honeycutt
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 1.0
BORING NO. B1-B	STATION 37+64	OFFSET 22 ft RT	ALIGNMENT -RAMPB-
COLLAR ELEV. 907.3 ft	TOTAL DEPTH 89.5 ft	NORTHING 573,497	EASTING 1,207,792
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/04/09	COMP. DATE 11/04/09	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75					
910														
907.3	907.3	0.0											GROUND SURFACE	0.0
905			4	4	2								RESIDUAL Red and brown, fine to coarse sandy, silty CLAY (A-7-6)	
903.3	903.3	4.0	6	7	7									
900													RESIDUAL Red, tan and gray, fine to coarse sandy SILT (A-4) with trace mica, saprolitic	6.0
898.3	898.3	9.0	3	4	3									
895														
893.3	893.3	14.0	3	3	2									
890														
888.3	888.3	19.0	5	6	5									
885														
883.3	883.3	24.0	6	9	10									
880													RESIDUAL Tan, white, silty, fine to coarse SAND (A-2-4) with trace mica, saprolitic	27.0
878.3	878.3	29.0	8	9	9									
875														
873.3	873.3	34.0	6	8	8									
870														
868.3	868.3	39.0	13	30	50									
865														
863.3	863.3	44.0	8	10	9									
860														
858.3	858.3	49.0	5	7	10									
855														
853.3	853.3	54.0	13	21	32									
850														
848.3	848.3	59.0	14	17	18									
845														
843.3	843.3	64.0	33	34	33									
840														
838.3	838.3	69.0	19	32	34									
835														
833.3	833.3	74.0	32	46	40									
830														

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75					
830														
828.3	828.3	79.0	26	50	50/0.2								Match Line	
825														
823.3	823.3	84.0	46	54/0.4										
820														
818.3	818.3	89.0	94	6/0.0										
815														
810														
805														
800														
795														
790														
785														
780														
775														
770														
765														
760														
755														
750														

NCDOT BORE DOUBLE R-2707A BRIDGE 452.GPJ NC\_DOT.GDT 1/26/10

Boring Terminated at Elevation 817.8 ft in Weathered Rock: GRANITE  
 Bit Used: 2-7/8" Roller Cone  
 Note: Boring offset from proposed location approximately 15' southeast due to fence and treeline.

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 6.3 24 HR. FIAD
BORING NO. EB2-A	STATION 39+86	OFFSET 32 ft LT	ALIGNMENT -RAMPB-
COLLAR ELEV. 911.2 ft	TOTAL DEPTH 79.3 ft	NORTHING 573,410	EASTING 1,208,003
DRILL MACHINE CME 55LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER D. White	START DATE 11/09/09	COMP. DATE 11/09/09	SURFACE WATER DEPTH N/A

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 6.3 24 HR. FIAD
BORING NO. EB2-A	STATION 39+86	OFFSET 32 ft LT	ALIGNMENT -RAMPB-
COLLAR ELEV. 911.2 ft	TOTAL DEPTH 79.3 ft	NORTHING 573,410	EASTING 1,208,003
DRILL MACHINE CME 55LC	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER D. White	START DATE 11/09/09	COMP. DATE 11/09/09	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					
915															
910	911.2	0.0												GROUND SURFACE	0.0
			3	3	6									ARTIFICIAL FILL	
	907.0	4.2												Red, sandy, SILT (A-4) with trace organics	3.0
905			5	7	9									RESIDUAL	
	902.0	9.2												Red, orange, sandy SILT (A-4) with trace mica and rock fragments, saprolitic	
900			5	4	3									RESIDUAL	
	897.0	14.2												Black, orange, tan to white, silty, fine to coarse SAND (A-2-4) with trace rock fragments, saprolitic	10.2
895			3	5	6										
	892.0	19.2													
890			3	4	3										
	887.0	24.2													
885			9	8	9										
	882.0	29.2													
880			7	5	6										
	877.0	34.2													
875			6	7	7										
	872.0	39.2													
870			7	8	9										
	867.0	44.2													
865			8	11	10										
	862.0	49.2													
860			8	8	8										
	857.0	54.2													
855			9	8	11										
	852.0	59.2													
850			11	16	18										
	847.0	64.2													
845			70	30/0.1											
	842.0	69.2													
840			100/0.2												
	837.0	74.2													
835			29	30	20										

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					
835															
														Match Line	
	832.0	79.2													
830			60/0.1											CRYSTALLINE ROCK	
														GRANITE	
														Boring Terminated with Standard Penetration Test Refusal at Elevation 831.9 ft in Crystalline Rock: GRANITE	
														Bit Used: 2-7/8" Roller Cone	
														Note: Boring offset from proposed location approximately 15' southeast due concrete walkway.	
825															
820															
815															
810															
805															
800															
795															
790															
785															
780															
775															
770															
765															
760															
755															

NCDOT BORE DOUBLE R-2707A BRIDGE 452.GPJ NC\_DOT.GDT 1/26/10



**NCDOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 33.7
BORING NO. EB2-B	STATION 38+50	OFFSET 58 ft RT	ALIGNMENT -RAMPB-
COLLAR ELEV. 910.8 ft	TOTAL DEPTH 69.2 ft	NORTHING 573,417	EASTING 1,207,840
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/06/09	COMP. DATE 11/06/09	SURFACE WATER DEPTH N/A

PROJECT NO. 34497.1.2	ID. R-2707A	COUNTY Cleveland	GEOLOGIST J. Howard
SITE DESCRIPTION Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, between SR 1318 & SR 1162 (MACTEC 6468092534)			GROUND WTR (ft) 0 HR. 33.7
BORING NO. EB2-B	STATION 38+50	OFFSET 58 ft RT	ALIGNMENT -RAMPB-
COLLAR ELEV. 910.8 ft	TOTAL DEPTH 69.2 ft	NORTHING 573,417	EASTING 1,207,840
DRILL MACHINE CME 55LC		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER D. White	START DATE 11/06/09	COMP. DATE 11/06/09	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				
915														
910	910.8	0.0	4	5	5								GROUND SURFACE	0.0
905	906.7	4.1	4	7	7								ARTIFICIAL FILL Red, sandy, SILT (A-4) with trace organics	3.0
900	901.7	9.1	7	8	6								RESIDUAL Red, black, white, sandy SILT (A-4) with trace rock fragments, saprolitic	
895	896.7	14.1	4	4	3									
890	891.7	19.1	2	2	3								RESIDUAL Black, white, tan, to red, fine to coarse SAND (A-2-4) with trace rock fragments, saprolitic	18.0
885	886.7	24.1	9	8	8									
880	881.7	29.1	19	24	27									
875	876.7	34.1	11	18	18									
870	871.7	39.1	17	20	36									
865	866.7	44.1	3	11	11									
860	861.7	49.1	8	10	10									
855	856.7	54.1	17	15	13									
850	851.7	59.1	14	18	32									
845	846.7	64.1	11	18	14									
840	841.7	69.1												

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				
835													Match Line	
830														
825														
820														
815														
810														
805														
800														
795														
790														
785														
780														
775														
770														
765														
760														
755														

Bit Used: 2-7/8" Roller Cone  
Note: Boring offset from proposed location approximately 50' west due to large tree and swimming pool.

NCDOT BORE DOUBLE R-2707A BRIDGE 452.GPJ NC\_DOT.GOT 1/26/10

843.3 WEATHERED ROCK GRANITE 67.5  
841.7 CRYSTALLINE ROCK GRANITE 69.1  
841.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 841.6 ft in Crystalline Rock: GRANITE 69.2



**MACTEC ENGINEERING AND CONSULTING, INC.**  
 3301 ATLANTIC AVENUE  
 RALEIGH, NORTH CAROLINA 27604

**N.C.D.O.T./AASHTO CLASSIFICATIONS**

**REPORT ON SAMPLES OF: SOILS FOR QUALITY**

MACTEC PROJ.: Bridge 452 over US 74 at sta. 37+77.92 on -RAMPB-, between SR 1318 & SR1162 (6468092534)  
 NCDOT PROJ. NO.: 34497.1.2 (R-2707A) COUNTY: CLEVELAND OWNER: N.C.D.O.T.  
 DATE SAMPLED: NOVEMBER 2009 RECEIVED: 11/23/2009 REPORTED BY: MACTEC  
 SAMPLED FROM: B1-B, EB2-B, EB1-A  
 SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

**TEST RESULTS**

Lab Sample No.		SS-1	SS-2	SS-3		
Retained No. 4 Sieve (%)		0.5	1.5	0.0		
Passing No. 10 Sieve (%)		92.5	95.3	99.8		
Passing No. 40 Sieve (%)		69.1	75.2	88.3		
Passing No. 200 Sieve (%)		42.4	40.8	70.4		

**MINUS 2.00mm FRACTION**

SOIL MORTAR - 100%						
Coarse Sand (%)		34.3	33.6	17.9		
Fine Sand (%)		25.9	28.8	15.0		
Silt (%)		22.4	12.7	21.1		
Clay (%)		17.4	25.0	45.9		

Moisture Content (%)		23.2	11.2	ND		
Liquid Limit, L.L.		45	20	34		
Plasticity Index, P.I.		21	8	3		
AASHTO Classification		A-7-6(5)	A-4(0)	A-4(2)		
Organic Content (%)		ND	ND	ND		

Boring No.		B1-B	EB2-B	EB1-A		
Station		37+64	38+50	36+52		
Offset		22 RT	58 RT	30 LT		
Alignment		-RAMPB-	-RAMPB-	-RAMPB-		
Depth (FT)	From	0.0	0.0	19.1		
	to	1.5	1.5	20.6		

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-03-0705

*CS* 1/26/10  
 Signature

Site Photos  
MACTEC Proj. No. 6468-09-2534



View looking up station along the CL of -RAMPB- from End Bent 1

Bridge 452 over US 74 at sta. 37+77.92 on -Ramp B-, Between SR 1318 & SR 1162  
NCDOT Proj. No. 34497.1.2 (R-2707A)



View looking down station along the CL of -RAMPB- from End Bent 2

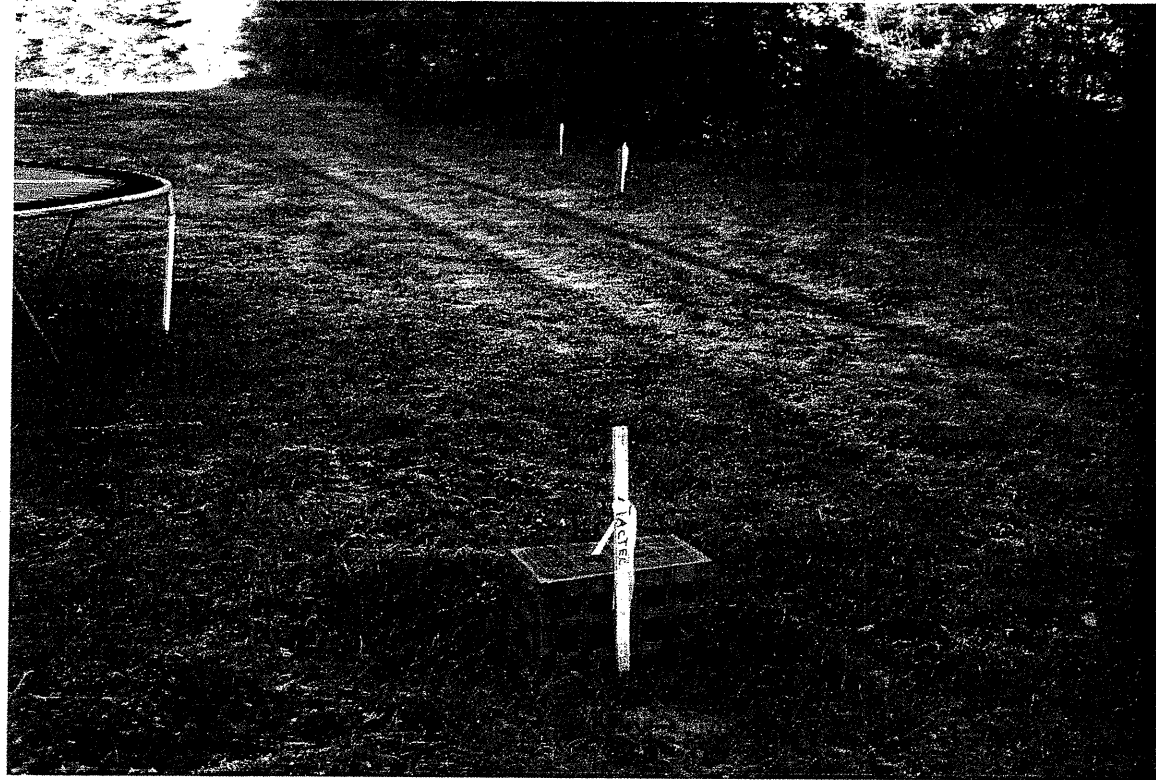


View looking up station along the CL of -RAMPB- from Bent 1

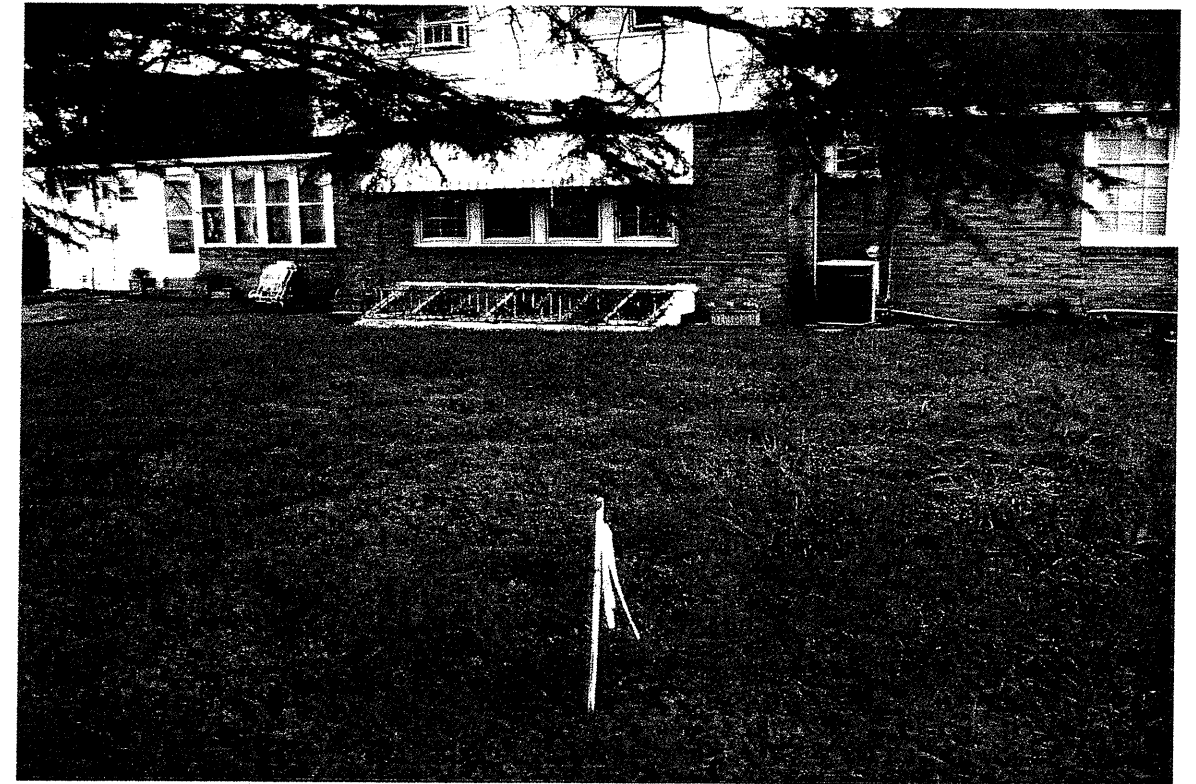


View along End Bent 1 from EB1-A





*View along Bent 1 from B1-A*



*View along End Bent 2 from Proposed EB2-B*



*View along End Bent 2 from EB2-A*



*View along End Bent 2 from Drilled EB2-B*

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

**CONTENTS**

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
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4	PROFILE
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8-9	BORE LOGS
10	SOIL TEST RESULTS

PROJ. REFERENCE NO. 34497.1.3 (R-2707A) F.A. PROJ. NHF-74(14)  
 COUNTY CLEVELAND  
 PROJECT DESCRIPTION US 74 (SHELBY BYPASS) FROM WEST  
OF SR 1162 (PEACHTREE ROAD) TO WEST OF SR 1313  
(WASHBURN SWITCH ROAD)  
 SITE DESCRIPTION BRIDGE ON -Y2- (STATION 22+03.06) OVER  
-L- (US 74, STATION 43+66.99)

**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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

**PROJECT: 34497.1.3 ID: R-2707A**

**PERSONNEL**

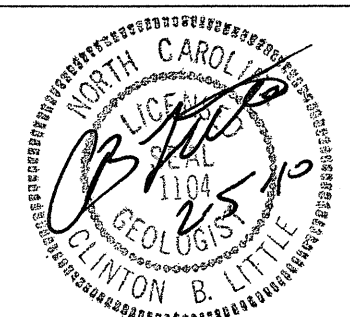
R. W. TODD  
M. L. SMITH  
A. C. SMITH

INVESTIGATED BY J. P. ROGERS

CHECKED BY C. B. LITTLE

SUBMITTED BY C. B. LITTLE

DATE JANUARY 2010



DRAWN BY: C. E. BURRIS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

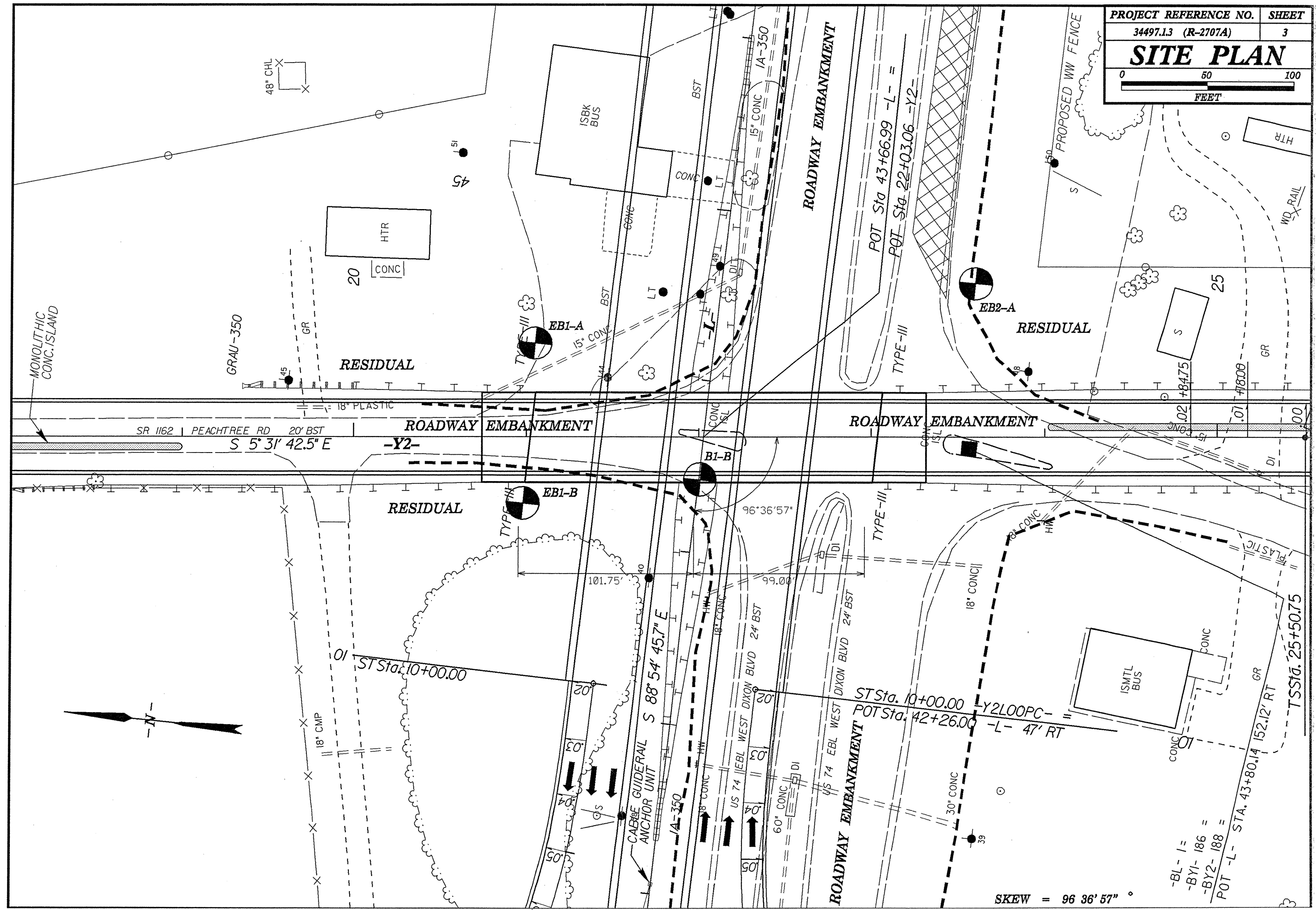
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. 34497.13 (R-2707A)	SHEET NO. 2
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## SUBSURFACE INVESTIGATION

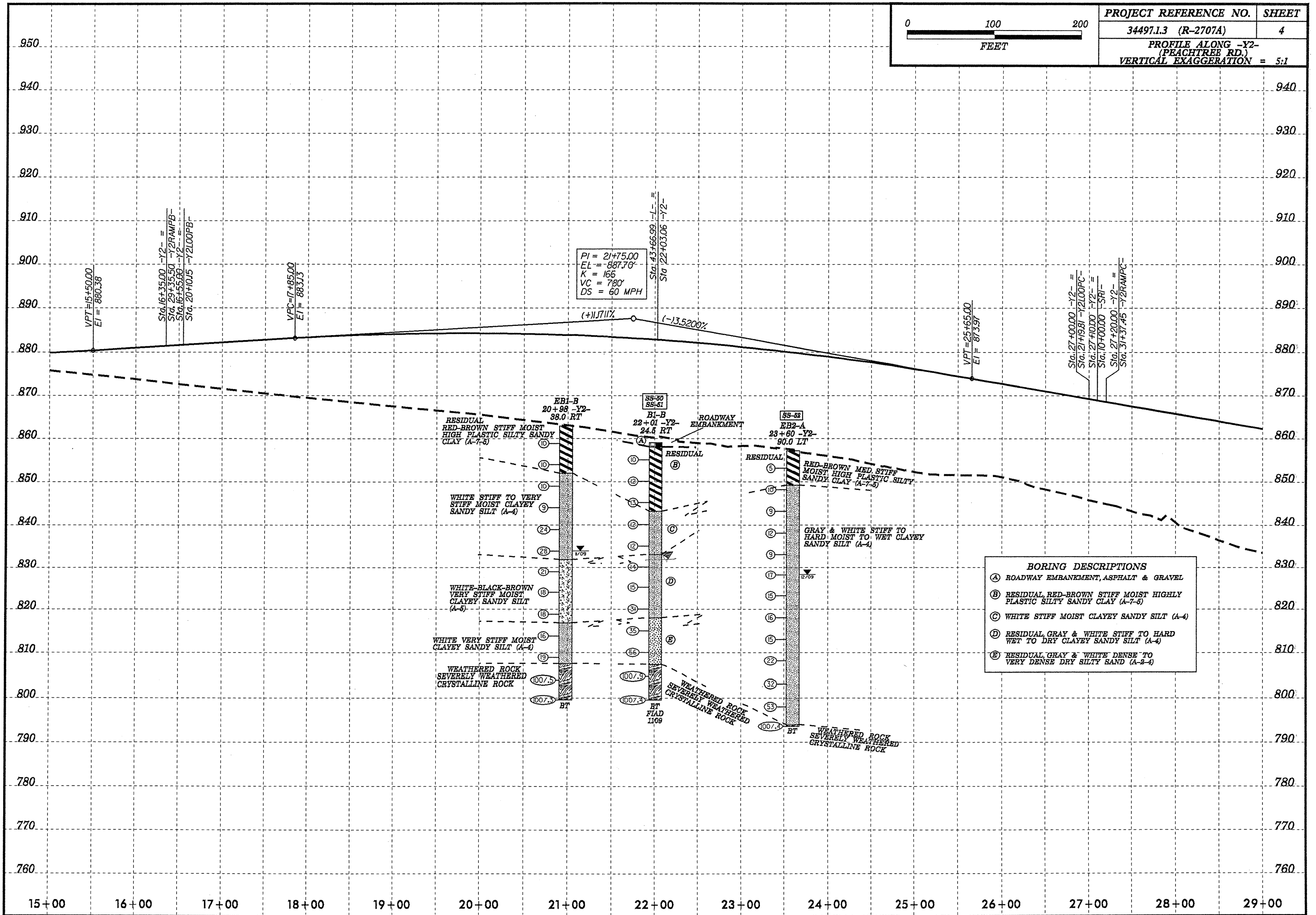
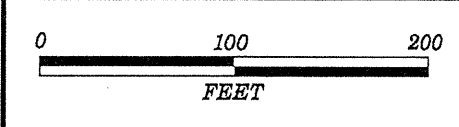
### SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																																											
<p>SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i></p>		<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p style="text-align: center;"><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM.)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - 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. <b>STRATA CORE RECOVERY (SREC)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																											
<p style="text-align: center;"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="2">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="2">SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1</td> <td>A-3</td> <td>A-2</td> <td>A-4</td> <td>A-5</td> <td>A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>5</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS, GRAVEL, AND SAND</td> <td>FINE SAND</td> <td>SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS</td> <td>CLAYEY SOILS</td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> </tr> <tr> <td>GEN. 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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;"><b>COMPRESSIBILITY</b></p> <p>SLIGHTLY COMPRESSIBLE      LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE      LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE      LIQUID LIMIT GREATER THAN 50</p> <p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> </table> <p style="text-align: center;"><b>GROUND WATER</b></p> <p> 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</p>		ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p style="text-align: center;"><b>WEATHERING</b></p> <p>FRESH      ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V 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. 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. 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, YIELDS SPT N VALUES &gt; 100 BPF.</i> VERY SEVERE (V SEV.)      ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 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>	
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<p style="text-align: center;"><b>COLOR</b></p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>		<p style="text-align: center;"><b>FRACTURE SPACING</b></p> <p>FRIBLAE      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 style="text-align: center;"><b>NOTES:</b></p> <p>BENCH MARK: -BL-1 = -BY1- 186 = -BY2- 188 -L- STA.43+80.14 IS2.I2' RT ELEVATION: 857.78 FT.</p>																																																																																	

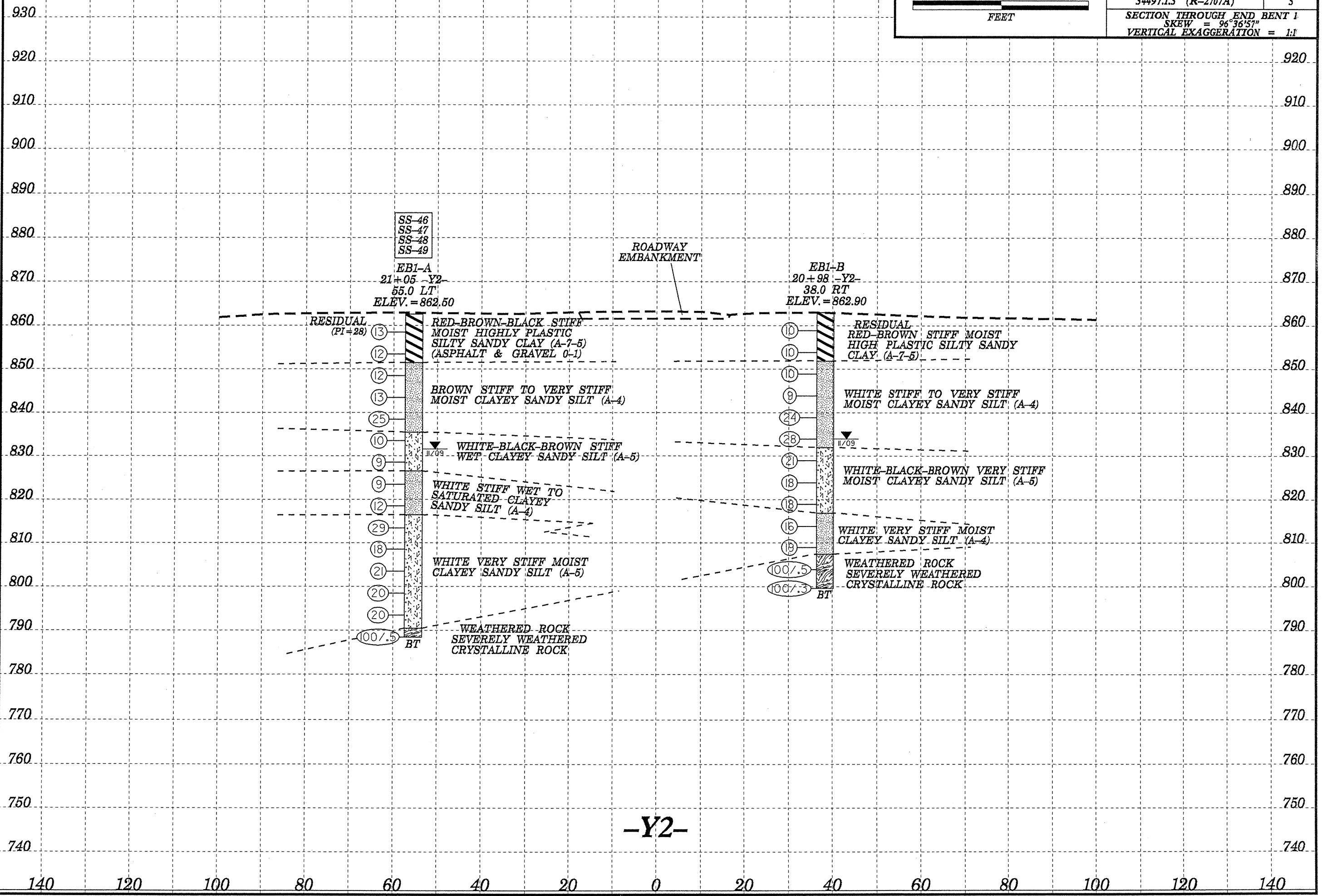
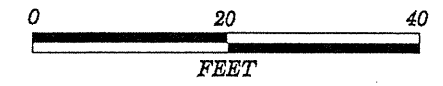


-BL- I =  
 -BY1- 186 =  
 -BY2- 188 =  
 POT -L- STA. 43+80.14 152.12' RT  
 TSS Sta. 25+50.75

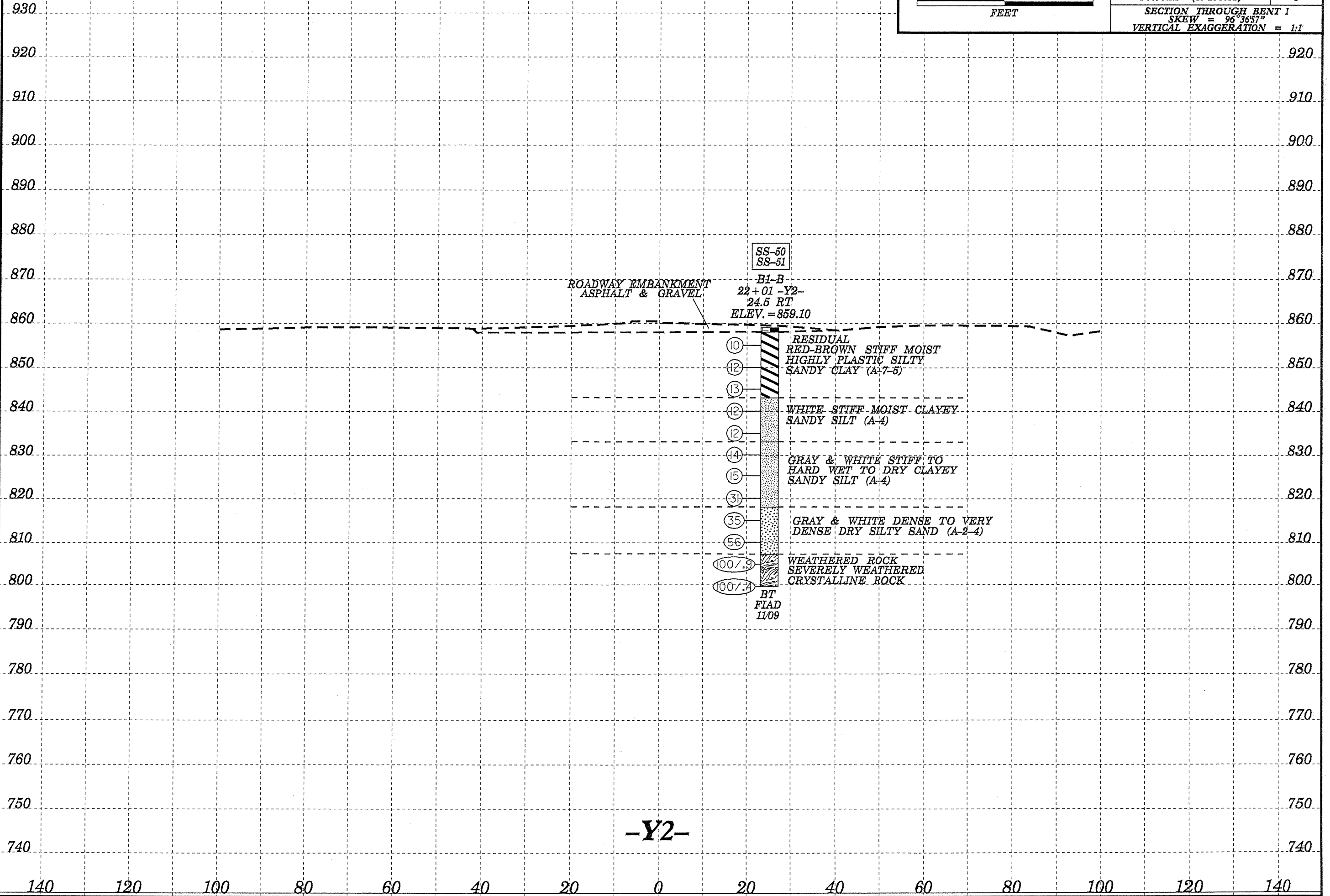
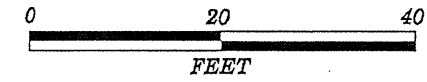
SKEW = 96 36' 57" °



BORING DESCRIPTIONS	
(A)	ROADWAY EMBANKMENT, ASPHALT & GRAVEL
(B)	RESIDUAL, RED-BROWN STIFF MOIST HIGHLY PLASTIC SILTY SANDY CLAY (A-7-5)
(C)	WHITE STIFF MOIST CLAYEY SANDY SILT (A-4)
(D)	RESIDUAL GRAY & WHITE STIFF TO HARD WET TO DRY CLAYEY SANDY SILT (A-4)
(E)	RESIDUAL GRAY & WHITE DENSE TO VERY DENSE DRY SILTY SAND (A-2-4)



-Y2-



ROADWAY EMBANKMENT  
ASPHALT & GRAVEL

SS-50  
SS-51  
B1-B  
22+01 -Y2-  
24.5 RT  
ELEV. = 859.10

- (10)
- (12)
- (13)
- (12)
- (12)
- (14)
- (15)
- (31)
- (35)
- (56)
- (100/9)
- (100/4)

RESIDUAL  
RED-BROWN STIFF MOIST  
HIGHLY PLASTIC SILTY  
SANDY CLAY (A-7-5)

WHITE STIFF MOIST CLAYEY  
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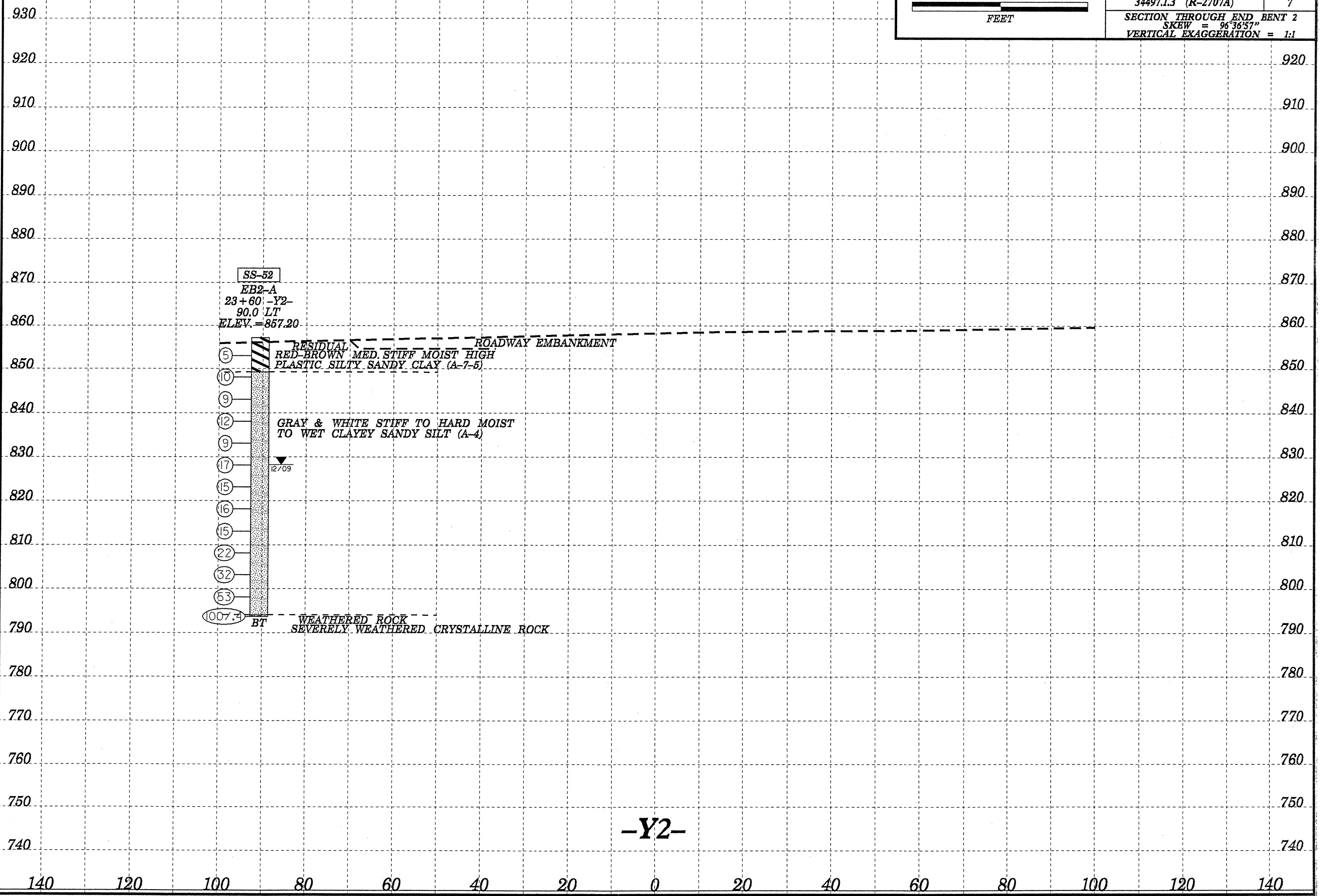
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GRAY & WHITE DENSE TO VERY  
DENSE DRY SILTY SAND (A-2-4)

WEATHERED ROCK  
SEVERELY WEATHERED  
CRYSTALLINE ROCK

BT  
FIAD  
11/09

-Y2-



SS-52  
EB2-A  
23+60'-Y2-  
90.0 LT  
ELEV. = 857.20

RESIDUAL ROADWAY EMBANKMENT  
RED-BROWN MED. STIFF MOIST HIGH  
PLASTIC SILTY SANDY CLAY (A-7-5)

GRAY & WHITE STIFF TO HARD MOIST  
TO WET CLAYEY SANDY SILT (A-4)

WEATHERED ROCK  
SEVERELY WEATHERED CRYSTALLINE ROCK

BT

12709

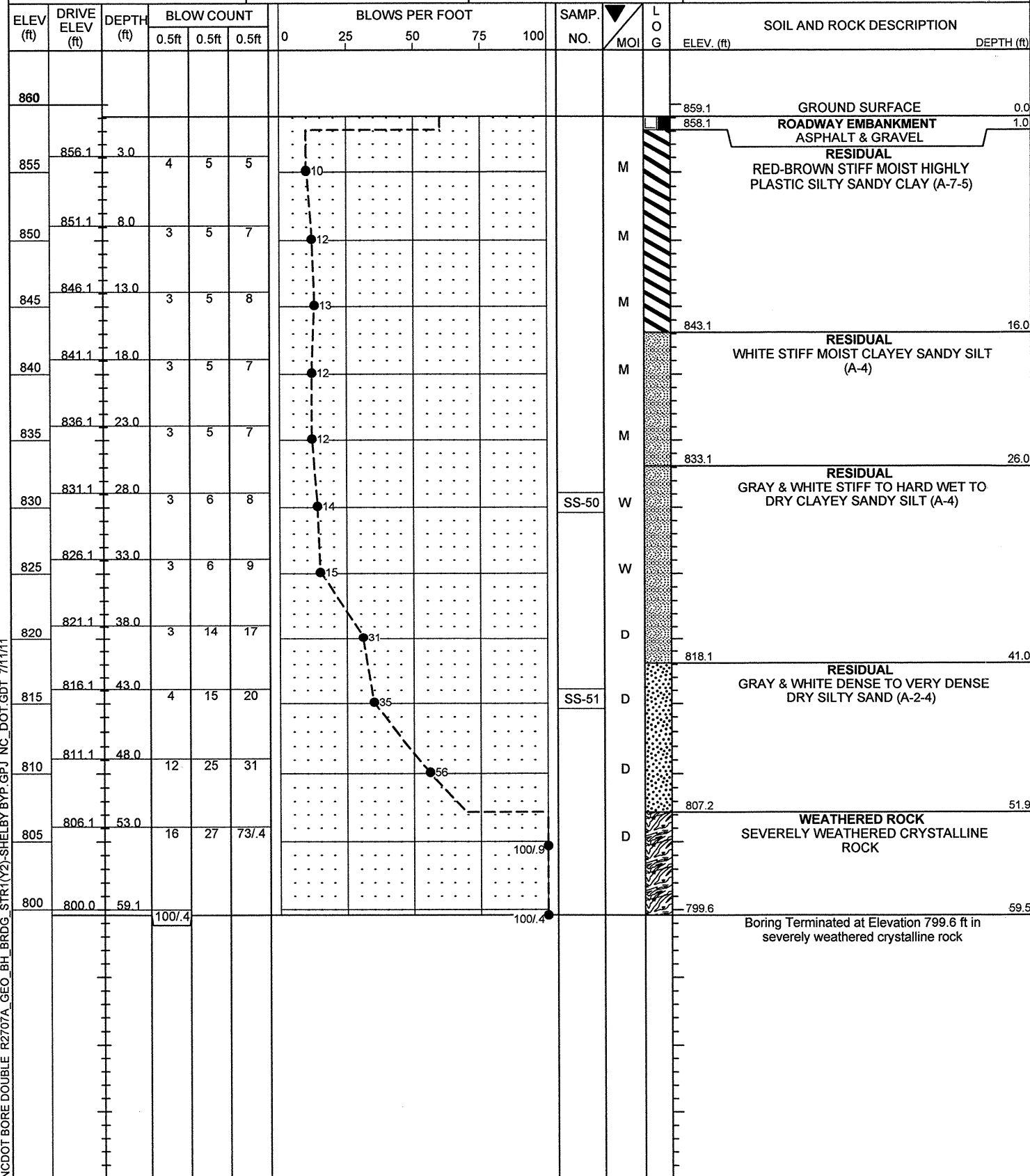
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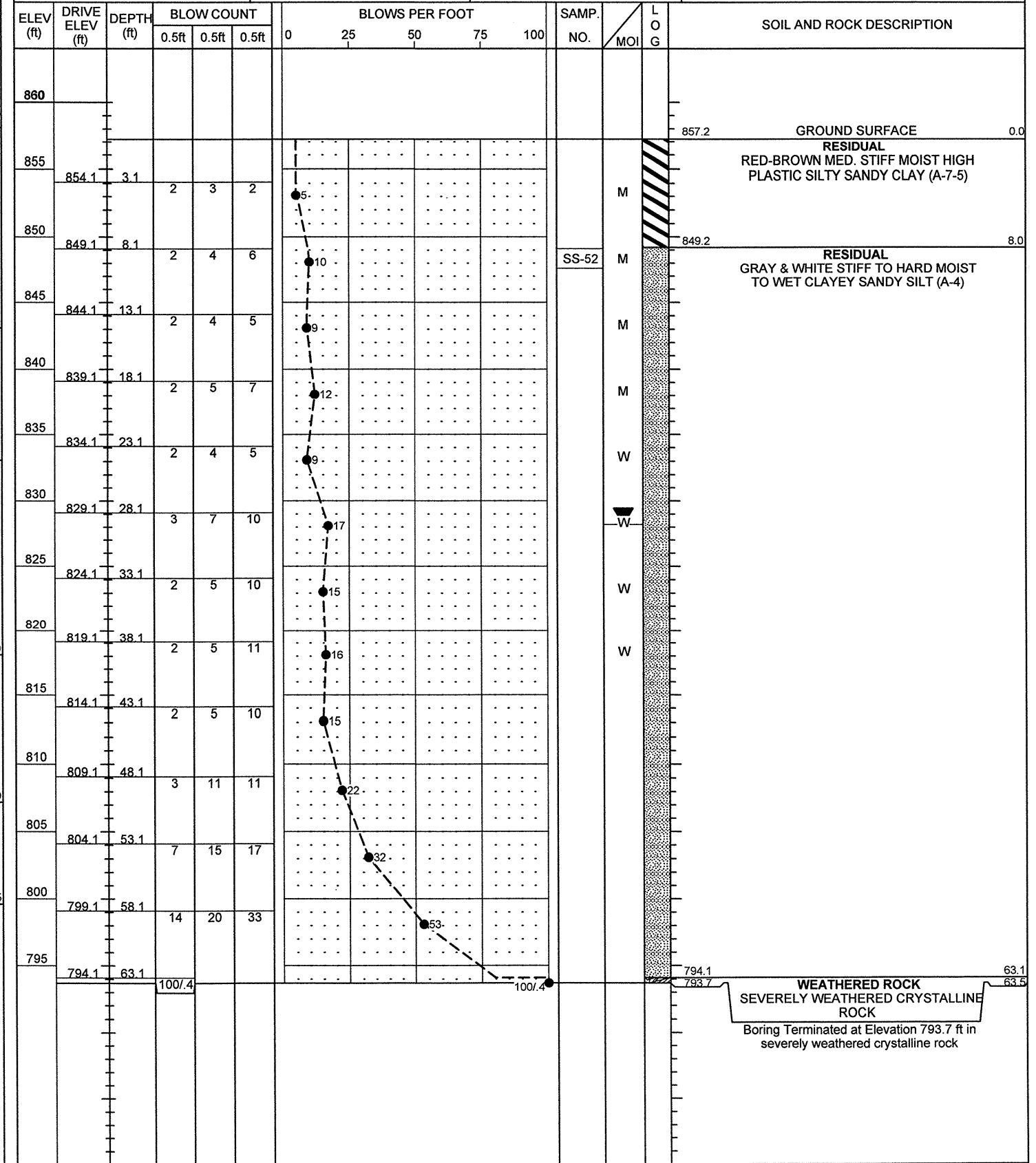


**NC DOT GEOTECHNICAL ENGINEERING UNIT**  
**BORELOG REPORT**

WBS 34497.1.3	TIP R-2707A	COUNTY CLEVELAND	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE OVER US 74 ON SR 1162 BETWEEN SR 1318 & SR 1168			GROUND WTR (ft)
BORING NO. B1-B	STATION 22+01	OFFSET 25 ft RT	ALIGNMENT -Y2-
COLLAR ELEV. 859.1 ft	TOTAL DEPTH 59.5 ft	NORTHING 573,574	EASTING 1,203,530
DRILL RIG/HAMMER EFF./DATE CME-550X		DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic
DRILLER Smith, M. L.	START DATE 11/19/09	COMP. DATE 11/19/09	SURFACE WATER DEPTH N/A



WBS 34497.1.3	TIP R-2707A	COUNTY CLEVELAND	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE OVER US 74 ON SR 1162 BETWEEN SR 1318 & SR 1168			GROUND WTR (ft)
BORING NO. EB2-A	STATION 23+60	OFFSET 90 ft LT	ALIGNMENT -Y2-
COLLAR ELEV. 857.2 ft	TOTAL DEPTH 63.5 ft	NORTHING 573,426	EASTING 1,203,659
DRILL RIG/HAMMER EFF./DATE CME-550X		DRILL METHOD NW Casing w/ Advancer	HAMMER TYPE Automatic
DRILLER Smith, M. L.	START DATE 11/30/09	COMP. DATE 11/30/09	SURFACE WATER DEPTH N/A



NC DOT BORE DOUBLE R2707A\_GEO\_BH\_BRDG\_STR1(Y2)-SHELBY BYP.GPJ NC\_DOT\_GDT\_7/11/11

TEST RESULTS

PROJECT: 34497.1.3 R-2707A

COUNTY: CLEVELAND

SITE DESCRIPTION: BRIDGE OVER US 74 (SHELBY BYP) ON SR 1162 (PEACHTREE RD) BETWEEN SR 1318 & SR 1168

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
								C. SAND	F. SAND	SILT	CLAY	10	40	200				
<b>EB1-A</b>																		
SS-46	55.0 LT	21+05	3.00-4.50	A-7-5(22)	13	60	28	17.1	11.9	14.5	56.5	100	88	74				
SS-47	55.0 LT	21+05	23.00-24.50	A-4(3)	25	35	8	16.3	34.7	30.8	18.1	100	91	60				
SS-48	55.0 LT	21+05	28.00-29.50	A-5(0)	10	42	NP	28.2	38.3	17.3	16.1	97	81	40				
SS-49	55.0 LT	21+05	38.00-39.50	A-4(0)	9	31	3	41.7	23.4	16.7	18.1	98	69	39				
<b>B1-B</b>																		
SS-50	24.5 RT	22+01	28.00-29.50	A-4(0)	14	37	4	21.3	37.9	30.7	10.1	95	82	48				
SS-51	24.5 RT	22+01	43.00-44.50	A-2-4(0)	35	27	NP	48.3	27.8	15.8	8.1	100	66	29				
<b>EB2-A</b>																		
SS-52	90.0 LT	23+60	8.10-9.60	A-4(0)	10	35	3	26.6	38.7	24.7	10.1	99	85	42				

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34497.1.3 (R-2707A)	1	12

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

**STRUCTURE**  
**SUBSURFACE INVESTIGATION**

**CONTENTS**

<u>SHEET</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5-7	CROSS SECTION(S)
8-II	BORE LOG & CORE REPORT(S)
12	SOIL TEST RESULTS

PROJ. REFERENCE NO. 34497.1.3 (R-2707A) F.A. PROJ. NHF-74(76)  
COUNTY CLEVELAND  
PROJECT DESCRIPTION SHELBY - US 74 BYPASS FROM WEST OF SR 1162 (PEACHTREE RD) TO EAST OF SR 1315 (PLATO LEE RD)  
SITE DESCRIPTION BRIDGE 453 OVER US 74 ON SR 1318 BETWEEN SR 1315 & SR 1161

**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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

**PROJECT: 34497.1.3 ID: R-2707A**

**PERSONNEL**

R.W. TODD

M.L. SMITH

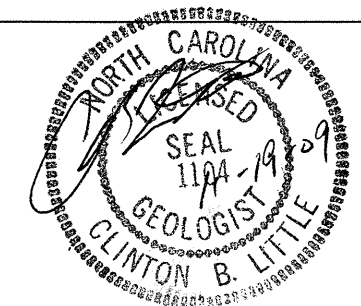
A.C. SMITH

INVESTIGATED BY J.P. ROGERS

CHECKED BY C.B. LITTLE

SUBMITTED BY C.B. LITTLE

DATE OCTOBER 2009



DRAWN BY: J.P. ROGERS

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

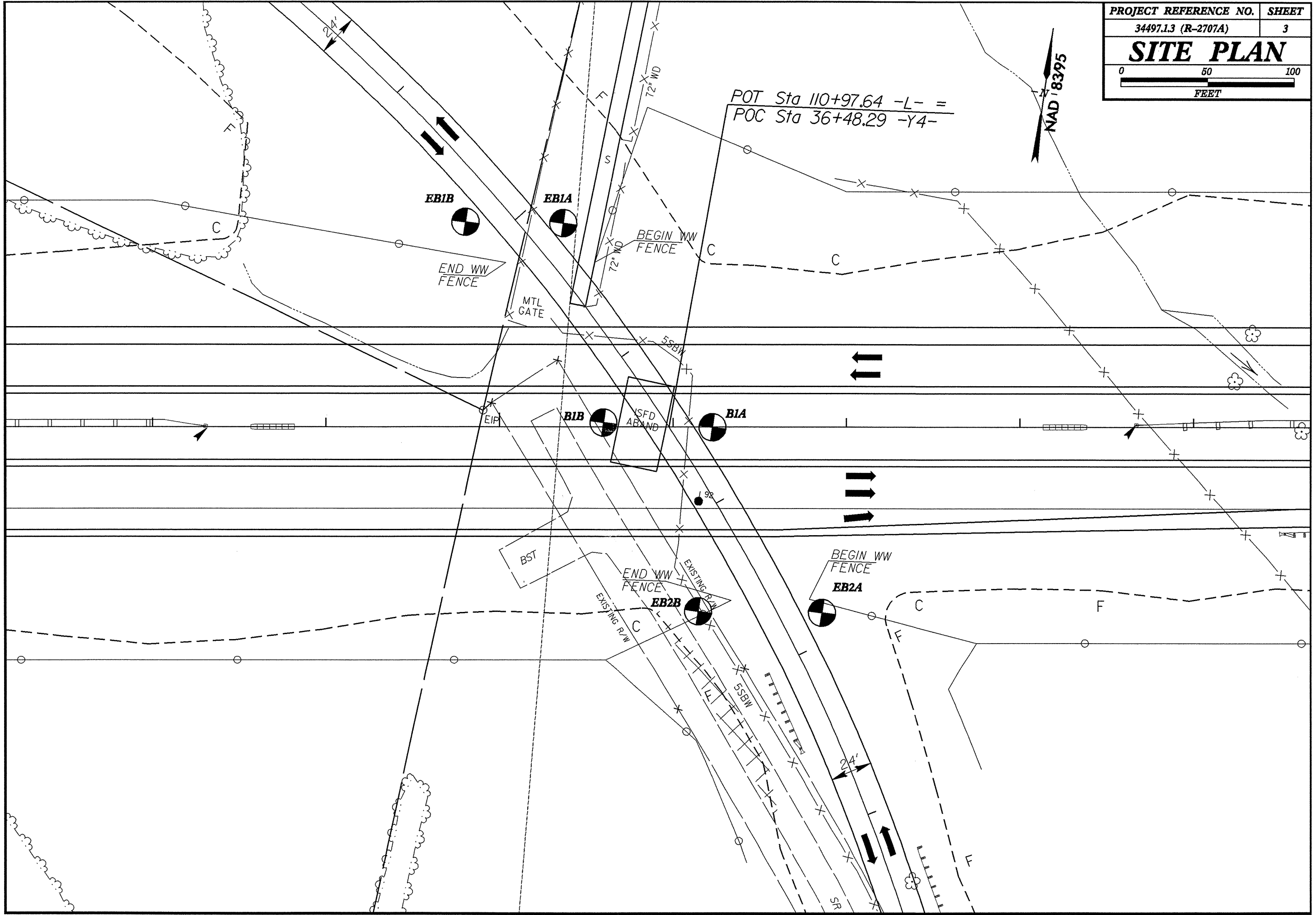
**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**GEOTECHNICAL ENGINEERING UNIT**

PROJECT REFERENCE NO. 34497.1.3 (R-2707A)	SHEET NO. 2
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**SUBSURFACE INVESTIGATION**

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

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																								
<p>SOIL IS CONSIDERED TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p align="center"><i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGH PLASTIC, A-7-6</i></p>		<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.            UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)            GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p align="center"><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.            ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>		<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.  <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA.  <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.  <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.  <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.  <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.  <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.  <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.  <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.  <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.  <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.  <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.  <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.  <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL.  <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.  <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.  <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.  <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.  <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.  <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.  <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.  <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.  <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p>																																								
<p align="center"><b>SOIL LEGEND AND AASHTO CLASSIFICATION</b></p> <table border="1"> <tr> <th>GENERAL CLASS.</th> <th>GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th>SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</th> <th>ORGANIC MATERIALS</th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1, A-3, A-2</td> <td>A-4, A-5, A-6, A-7</td> <td>A-4, A-5, A-6, A-7</td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>10, 40, 200</td> <td>10, 40, 200</td> <td>10, 40, 200</td> </tr> <tr> <td>LIQUID LIMIT PLASTIC INDEX</td> <td>6, NP</td> <td>10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100</td> <td>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> </tr> <tr> <td>GROUP INDEX</td> <td>0</td> <td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100</td> <td>HIGHLY ORGANIC SOILS</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS, GRAVEL, SAND</td> <td>FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND</td> <td>SILTY SOILS, CLAYEY SOILS</td> </tr> <tr> <td>GENERATING AS A SUBGRADE</td> <td>EXCELLENT TO GOOD</td> <td>FAIR TO POOR</td> <td>FAIR TO POOR, UNSUITABLE</td> </tr> </table> <p align="center">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS &gt; LL - 30</p>		GENERAL CLASS.	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ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p>		<p align="center"><b>WEATHERING</b></p> <p>FRESH: ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>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.</p> <p>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.</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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></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. <i>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</i></p> <p>VERY SEVERE (V SEV.): ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</i></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>										
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<p align="center"><b>COMPRESSION</b></p> <p>SLIGHTLY COMPRESSIBLE: LIQUID LIMIT LESS THAN 31            MODERATELY COMPRESSIBLE: LIQUID LIMIT EQUAL TO 31-50            HIGHLY COMPRESSIBLE: LIQUID LIMIT GREATER THAN 50</p>		<p align="center"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt;10%</td> <td>&gt;20%</td> <td>HIGHLY</td> </tr> </table>		ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY	<p align="center"><b>GROUND WATER</b></p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p>																						
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<p align="center"><b>CONSISTENCY OR DENSENESS</b></p> <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE</td> <td>&lt;4, 4 TO 10, 10 TO 30, 30 TO 50, &gt;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>&lt;2, 2 TO 4, 4 TO 8, 8 TO 15, 15 TO 30, &gt;30</td> <td>&lt;0.25, 0.25 TO 1.0, 0.5 TO 1.5, 1 TO 2, 2 TO 4, &gt;4</td> </tr> </table>		PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE, 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 1.0, 0.5 TO 1.5, 1 TO 2, 2 TO 4, >4	<p align="center"><b>MISCELLANEOUS SYMBOLS</b></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 &amp; DIP DIRECTION OF ROCK STRUCTURES</p> <p> SPT 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>																																
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POT Sta 110+97.64 -L- =  
 POC Sta 36+48.29 -Y4-

NAD 8395

EBIB

EBIA

END WW FENCE

MTL GATE

BEGIN WW FENCE

BIB

BIA

SFD ABAND

BST

END WW FENCE

EB2B

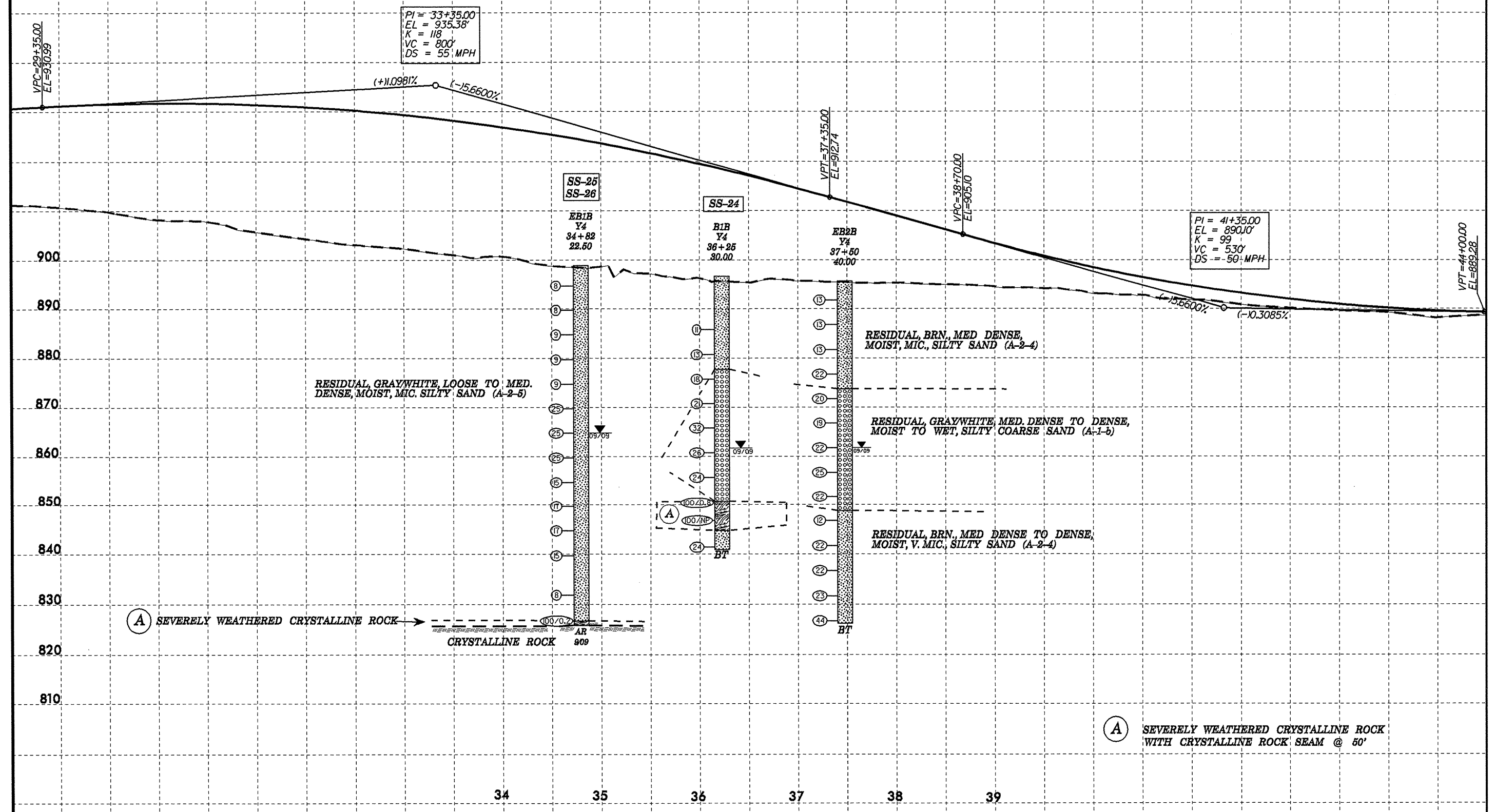
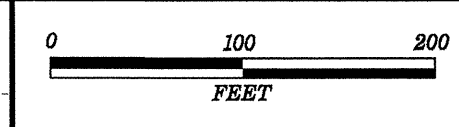
BEGIN WW FENCE

EB2A

24'

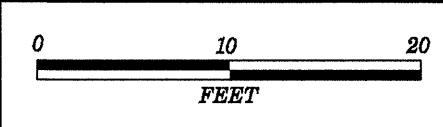
24'

SR



34                      35                      36                      37                      38                      39

(A) SEVERELY WEATHERED CRYSTALLINE ROCK WITH CRYSTALLINE ROCK SEAM @ 50'



<b>PROJECT REFERENCE NO.</b>	<b>SHEET</b>
34497.1.3 (R2707A)	5
SECTION THRU END BENT ONE	
35+01.79 -Y4-	
SKEW - 130 DEGREES, 12' 43"	

SS-25

SS-26

EB1A  
Y4  
35+19.00 R 1  
-20.0000  
897.5000

EB1B  
Y4  
34+82  
22.50  
898.90

895

895

885

885

RESIDUAL, BRN., LOOSE TO DENSE,  
MOIST TO WET, MIC. SILTY SAND (A-2-5)

875

875

RESIDUAL, GRAY/WHITE, LOOSE TO MED.  
DENSE, MOIST, MIC. SILTY SAND (A-2-5)

865

865

09/09

09/09

855

855

845

845

835

835

RESIDUAL, GRAY/WHITE, MED. DENSE,  
MOIST, SILTY COARSE SAND (A-1-b)

825

825

SEVERELY WEATHERED CRYSTALLINE ROCK

RESIDUAL, BRN., MED. DENSE, MOIST,  
MIC, SILTY SAND (A-2-5)

CRYSTALLINE ROCK

815

815

60

50

40

30

20

10

0

10

20

30

40

50

60

6

8

12

18

12

10

31

18

15

14

18

28

28

100/1.0

20

BT

8

8

9

9

9

25

25

25

15

17

17

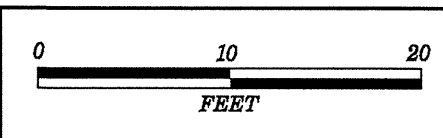
15

8

100/0.2

AR



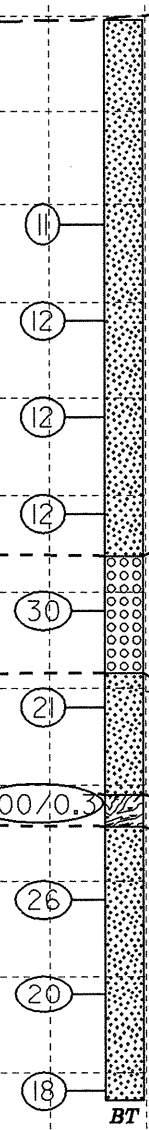


PROJECT REFERENCE NO.	SHEET
34497.1.3 (R2707A)	6
SECTION THRU BENT ONE	
36+48.29 -Y4-	
SKEW - 123 DEGREES, 13' 01"	

895  
885  
875  
865  
855  
845  
835  
825

SS-22  
SS-23

B1A  
Y4  
36+62  
-21.00  
894.80



RESIDUAL, BRN., MED. DENSE, MOIST,  
SLI MIC., SILTY SAND (A-2-5)

RESIDUAL, GRAY, MED. DENSE, MOIST TO  
WET, V. MIC., SILTY COARSE SAND (A-1-B)

RESIDUAL, BRN., DENSE, WET, MIC., SILTY SAND (A-2-5)

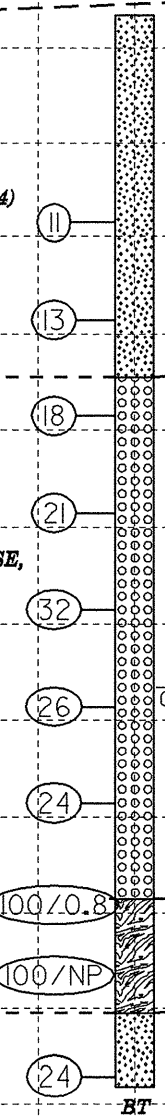
SEVERELY WEATHERED  
CRYSTALLINE ROCK

RESIDUAL, BRN., MED. DENSE, MOIST TO  
WET, SLI MIC., SILTY SAND (A-2-5)

- 11
- 12
- 12
- 12
- 30
- 21
- 100/0.3
- 26
- 20
- 18
- BT

SS-24

B1B  
Y4  
36+25  
30.00  
896.70



RESIDUAL, BRN., MED. DENSE,  
MOIST, MIC., SILTY SAND (A-2-4)

RESIDUAL, GRAY/WHITE, MED. DENSE TO DENSE,  
MOIST TO WET, SILTY COARSE SAND (A-1-b)

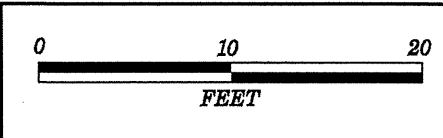
SEVERELY WEATHERED  
CRYSTALLINE ROCK  
W/CRYSTALLINE ROCK  
SEAM @ 60'

RESIDUAL, BRN., MED. DENSE,  
MOIST, MIC., SILTY SAND (A-2-4)

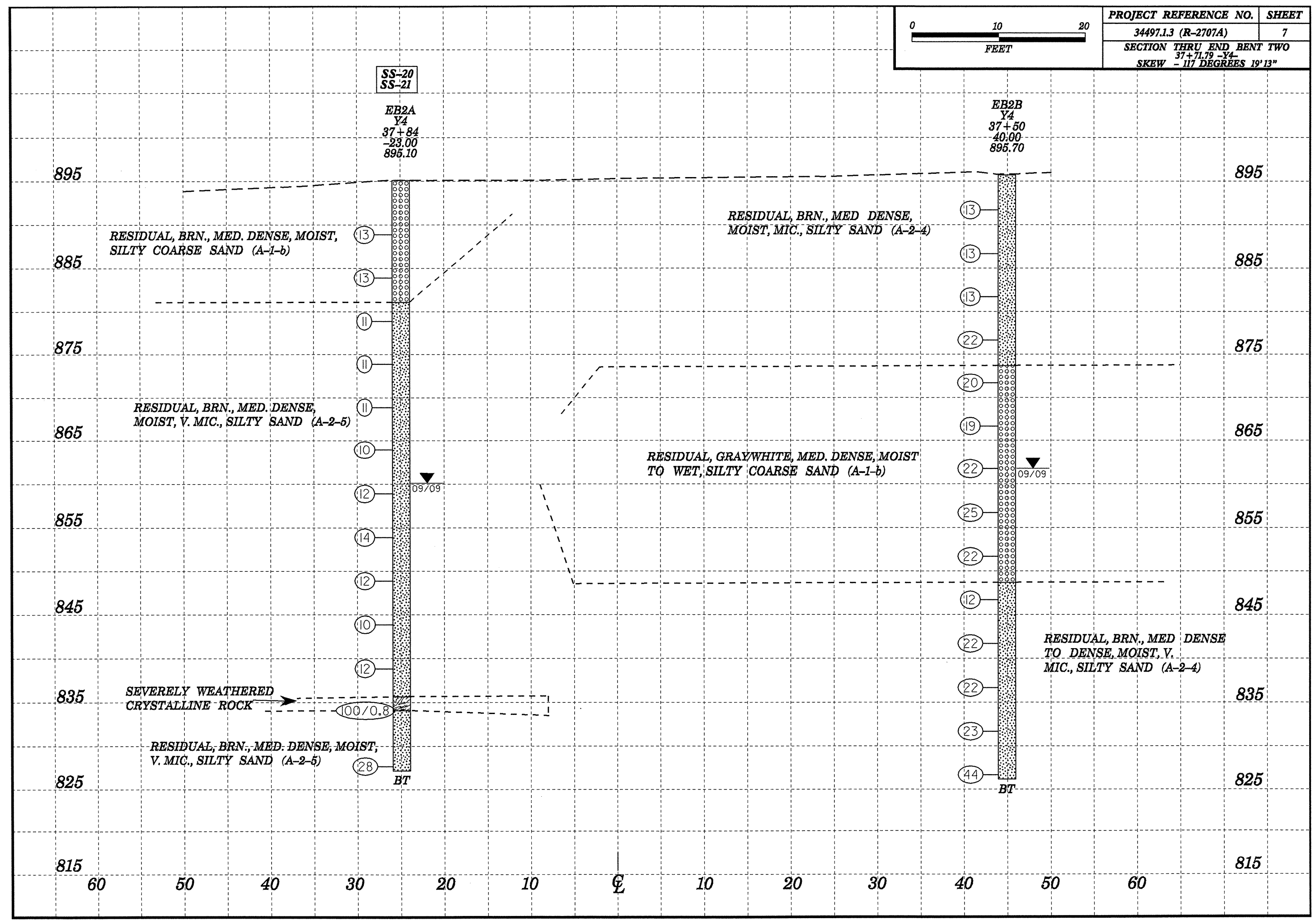
- 11
- 13
- 18
- 21
- 32
- 26
- 24
- 100/0.8
- 100/NP
- 24
- BT

895  
885  
875  
865  
855  
845  
835  
825

60 50 40 30 20 10 0 10 20 30 40 50 60



PROJECT REFERENCE NO.	SHEET
34497.1.3 (R-2707A)	7
SECTION THRU END BENT TWO	
37+71.79 -Y4-	
SKEW - 117 DEGREES 19'13"	





PROJECT NO. 34497.1.3		ID. R2707A		COUNTY CLEVELAND		GEOLOGIST Todd, R. W.										
SITE DESCRIPTION BRIDGE NO. 453 OVER US 74 ON SR 1318 BETWEEN SR 1315 & SR 1161.							GROUND WTR (ft)									
BORING NO. EB1B		STATION 34+82		OFFSET 23ft RT		ALIGNMENT Y4										
COLLAR ELEV. 898.9 ft		TOTAL DEPTH 73.1 ft		NORTHING 573,920		EASTING 1,210,130										
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT			HAMMER TYPE Automatic											
START DATE 09/15/09		COMP. DATE 09/16/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 73.1 ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
900															898.9	0.0
895	895.7	3.2	2	4	4								SS-25	M	RESIDUAL GRAY/WHITE, LOOSE TO MED. DENSE, MOIST, MIC. SILTY SAND (A-2-5)	
890	890.7	8.2	3	3	5								M	M		
885	885.7	13.2	3	4	5								M	M		
880	880.7	18.2	3	4	5								M	M		
875	875.7	23.2	4	4	5								M	M		
870	870.7	28.2	5	11	14								SS-26	M		
865	865.7	33.2	6	10	15								M	M		
860	860.7	38.2	6	10	15								M	M		
855	855.7	43.2	5	7	8								M	M		
850	850.7	48.2	6	7	10								M	M		
845	845.7	53.2	4	6	11								M	M		
840	840.7	58.2	2	5	10								M	M		
835	832.9	66.0	3	3	5								M	M		
830	827.7	71.2	3	13	100/2								M	M		
825													M	M	826.7	72.2
820															825.8	73.1

WEATHERED ROCK  
SEVERELY WEATHERED CRYSTALLINE ROCK  
Boring Terminated with Casing Advancer Refusal at Elevation 825.8 ft CRYSTALLINE ROCK

PROJECT NO. 34497.1.3		ID. R2707A		COUNTY CLEVELAND		GEOLOGIST Todd, R. W.										
SITE DESCRIPTION BRIDGE NO. 453 OVER US 74 ON SR 1318 BETWEEN SR 1315 & SR 1161.							GROUND WTR (ft)									
BORING NO. B1A		STATION 36+62		OFFSET 21ft LT		ALIGNMENT Y4										
COLLAR ELEV. 894.8 ft		TOTAL DEPTH 56.3 ft		NORTHING 573,824		EASTING 1,210,288										
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT			HAMMER TYPE Automatic											
START DATE 09/11/09		COMP. DATE 09/11/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
895															894.8	0.0
890															GROUND SURFACE BRN., MED. DENSE, MOIST, SLI. MIC., SILTY SAND (A-2-5).	
885	885.0	9.8	4	5	6								SS-22	M		
880	880.0	14.8	3	5	7								M	M		
875	875.0	19.8	2	5	7								M	M		
870	870.0	24.8	3	5	7								M	M		
865	865.0	29.8	2	16	14								SS-23	M	RESIDUAL GRAY, MED. DENSE, MOIST TO WET, V. MIC., SILTY COARSE SAND (A-1-B).	28.0
860	860.0	34.8	4	9	12								W	W	RESIDUAL BRN., DENSE, WET, MIC., SILTY SAND (A-2-5).	34.0
855	855.0	39.8	4	100/0.3									W	W	WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	40.3
850	850.0	44.8	4	12	14								W	W	RESIDUAL BRN., MED. DENSE, MOIST TO WET, SLI. MIC., SILTY SAND (A-2-5).	42.0
845	845.0	49.8	2	11	9								M	M		
840	840.0	54.8	3	7	11								M	M		
835															Boring Terminated at Elevation 838.5 ft BRN., MED. DENSE, MOIST, V. MIC., SILTY SAND (A-2-5)	56.3
830																
825																
820																
815																

NCDOT BORE SINGLE R2707A\_GEO\_Y4\_BH.GPJ\_NC\_DOT.GDT\_10/22/09

NCDOT BORE SINGLE R2707A\_GEO\_Y4\_BH.GPJ\_NC\_DOT.GDT\_10/22/09

PROJECT NO. 34497.1.3		ID. R2707A		COUNTY CLEVELAND		GEOLOGIST Todd, R. W.													
SITE DESCRIPTION BRIDGE NO. 453 OVER US 74 ON SR 1318 BETWEEN SR 1315 & SR 1161.							GROUND WTR (ft)												
BORING NO. B1B		STATION 36+25		OFFSET 30ft RT		ALIGNMENT Y4													
COLLAR ELEV. 896.7 ft		TOTAL DEPTH 55.8 ft		NORTHING 573,818		EASTING 1,210,226													
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic															
START DATE 09/15/09		COMP. DATE 09/15/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A													
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT				BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100									
900																	896.7	GROUND SURFACE	0.0
895																		RESIDUAL BRN., MED. DENSE, MOIST, MIC., SILTY SAND (A-2-4)	
890																			
885	886.7	10.0	2	4	7														
880	881.7	15.0	2	6	7														
875	876.7	20.0	6	10	8														
870	871.7	25.0	10	10	11														
865	866.7	30.0	11	16	16														
860	861.7	35.0	8	12	14														
855	856.7	40.0	5	9	15														
850	851.7	45.0	5	11	100/3														
845	846.7	50.0	100/NP																
840	842.4	54.3	5	12	12														
835																			
830																			
825																			
820																			

NCDOT BORE SINGLE R2707A\_GEO\_Y4\_BH.GPJ NC DOT.GDT 10/22/09

PROJECT NO. 34497.1.3		ID. R2707A		COUNTY CLEVELAND		GEOLOGIST Todd, R. W.													
SITE DESCRIPTION BRIDGE NO. 453 OVER US 74 ON SR 1318 BETWEEN SR 1315 & SR 1161.							GROUND WTR (ft)												
BORING NO. EB2A		STATION 37+84		OFFSET 23ft LT		ALIGNMENT Y4													
COLLAR ELEV. 895.1 ft		TOTAL DEPTH 67.9 ft		NORTHING 573,728		EASTING 1,210,366													
DRILL MACHINE CME-550X		DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic															
START DATE 09/09/09		COMP. DATE 09/09/09		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A													
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)				
			0.5ft	0.5ft	0.5ft	0	25	50	75	100									
900																	895.1	GROUND SURFACE	0.0
895																		RESIDUAL BRN., MED. DENSE, MOIST, SILTY COARSE SAND (A-1-b)	
890	889.9	5.2	5	6	7														
885	884.9	10.2	5	6	7														
880	879.9	15.2	4	5	6														
875	874.9	20.2	3	4	7														
870	869.9	25.2	4	5	6														
865	864.9	30.2	6	4	6														
860	859.9	35.2	5	5	7														
855	854.9	40.2	4	5	9														
850	849.9	45.2	4	5	7														
845	844.9	50.2	3	4	6														
840	839.9	55.2	4	5	7														
835	834.9	60.2	65	35/3															
830	828.7	66.4	5	12	16														
825																			
820																			

NCDOT BORE SINGLE R2707A\_GEO\_Y4\_BH.GPJ NC DOT.GDT 10/22/09



# NCDOT GEOTECHNICAL ENGINEERING UNIT

## BORELOG REPORT

SHEET

11/12

PROJECT NO. 34497.1.3	ID. R2707A	COUNTY CLEVELAND	GEOLOGIST Todd, R. W.
SITE DESCRIPTION BRIDGE NO. 453 OVER US 74 ON SR 1318 BETWEEN SR 1315 & SR 1161.			GROUND WTR (ft)
BORING NO. EB2B	STATION 37+50	OFFSET 40ft RT	ALIGNMENT Y4
COLLAR ELEV. 895.7 ft	TOTAL DEPTH 69.5 ft	NORTHING 573,718	EASTING 1,210,295
DRILL MACHINE CME-550X	DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic	
START DATE 09/29/09	COMP. DATE 09/29/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
900															
895													895.7	GROUND SURFACE	0.0
890	892.7	3.0	5	6	7	13						M		RESIDUAL BRN., MED DENSE, MOIST, MIC., SILTY SAND (A-2-4)	
885	887.7	8.0	4	5	8	13						M			
880	882.7	13.0	4	5	8	13						M			
875	877.7	18.0	4	4	18	22						M			
870	872.7	23.0	5	9	11	20						M	873.7	RESIDUAL GRAY/WHITE, MED. DENSE, MOIST TO WET, SILTY COARSE SAND (A-1-b)	22.0
865	867.7	28.0	5	9	10	19						M			
860	862.7	33.0	5	10	12	22						W			
855	857.7	38.0	9	12	13	25						W			
850	852.7	43.0	8	10	12	22						W			
845	847.7	48.0	1	4	8	12						M	848.7	RESIDUAL BRN., MED DENSE TO DENSE, MOIST, V. MIC., SILTY SAND (A-2-4)	47.0
840	842.7	53.0	8	10	12	22						M			
835	837.7	58.0	5	10	12	22						M			
830	832.7	63.0	5	10	13	23						M			
825	827.7	68.0	12	18	26	44						M	826.2	Boring Terminated at Elevation 826.2 ft BRN., DENSE, MOIST, SILTY SAND (A-2-5)	69.5
820															

NCDOT BORE SINGLE R2707A GEO\_Y4\_BH.GPJ NC\_DOT.GDT 10/15/09

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

T. I. P. No. R-2707A

REPORT ON SAMPLES OF SOILS FOR QUALITY

Project 34497.1.3 County CLEVELAND Owner \_\_\_\_\_  
 Date: Sampled 9/9/09 Received 9/22/09 Reported 10/2/09  
 Sampled from BRIDGE By JP ROGERS  
 Submitted by N WAINAINA 1995 Standard Specifications

759159 TO 759165  
 10/6/09

TEST RESULTS

Proj. Sample No.	SS-20	SS-21	SS-22	SS-23	SS-24	SS-25
Lab. Sample No.	759159	759160	759161	759162	759163	759164
Retained #4 Sieve %	5	-	-	11	2	-
Passing #10 Sieve %	76	100	100	70	82	100
Passing #40 Sieve %	46	93	94	43	46	81
Passing #200 Sieve %	21	29	33	13	23	18

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	51.6	24.9	26.3	54.7	54.3	44.0
Fine Sand Ret - #270 %	25.4	53.7	47.3	29.8	21.5	42.1
Silt 0.05 - 0.005 mm %	12.9	15.3	15.2	9.4	16.1	11.9
Clay < 0.005 mm %	10.1	6.1	11.1	6.1	8.1	2.0
Passing #40 Sieve %	-	-	-	-	-	-
Passing #200 Sieve %	-	-	-	-	-	-

L. L.	32	49	36	40	33	55
P. I.	NP	NP	NP	NP	3	NP
AASHTO Classification	A-1-b(0)	A-2-5(0)	A-2-4(0)	A-1-b(0)	A-1-b(0)	A-2-5(0)
Station						
OFFSET	Y4	Y4	Y4	Y4	Y4	Y4
LOCATION	EB2-A	EB2-A	B1-A	B1-A	B1-B	EB1-A
Depth (Ft)	5.20	15.20	9.80	29.80	20.00	3.20
to	6.70	16.70	11.30	31.30	21.50	4.70

cc: J P ROGERS  
 Soils File

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAY  
 MATERIALS & TESTS UNIT  
 SOILS LABORATORY

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 Submitted by N WAINAINA 1995 Standard Specifications

759159 TO 759165  
 10/6/09

TEST RESULTS

Proj. Sample No.	SS-26					
Lab. Sample No.	759165					
Retained #4 Sieve %	3					
Passing #10 Sieve %	83					
Passing #40 Sieve %	60					
Passing #200 Sieve %	13					

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	49.8					
Fine Sand Ret - #270 %	38.7					
Silt 0.05 - 0.005 mm %	7.4					
Clay < 0.005 mm %	4.1					
Passing #40 Sieve %	-					
Passing #200 Sieve %	-					

L. L.	49					
P. I.	NP					
AASHTO Classification	A-2-5(0)					
Station						
OFFSET	Y4					
LOCATION	EB1-B					
Depth (Ft)	28.20					
to	29.70					