

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34542.1.1 (R-3421C)	1	7

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

STRUCTURE
SUBSURFACE INVESTIGATION

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PROJ. REFERENCE NO. 34542.1.1 (R-3421C) F.A. PROJ. NHF-220(4)
COUNTY RICHMOND
PROJECT DESCRIPTION US 220 BYPASS FROM 0.2 MILES SW OF
SR 1304 (HARRINGTON RD.) TO US 220 BUS /US BYPASS
SITE DESCRIPTION BRIDGE #233 ON -Y8REV- (STA. 33+03.99
TO STA. 35+16.99) OVER -L- (STA. 378+94.34)

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1919 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: 34542.1.1
ID: R-3421C

PERSONNEL

C. C. MURRAY

J. E. ESTEP

M. R. MOORE

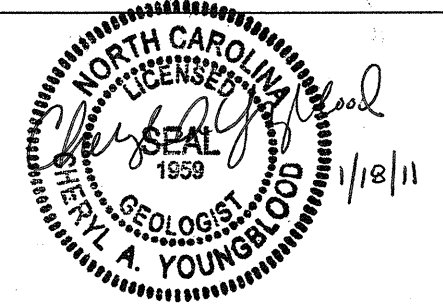
J. E. ROLFSMEYER

INVESTIGATED BY C. A. YOUNGBLOOD

CHECKED BY K. B. MILLER

SUBMITTED BY K. B. MILLER

DATE JANUARY, 2011



DRAWN BY: J. E. ROLFSMEYER

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.

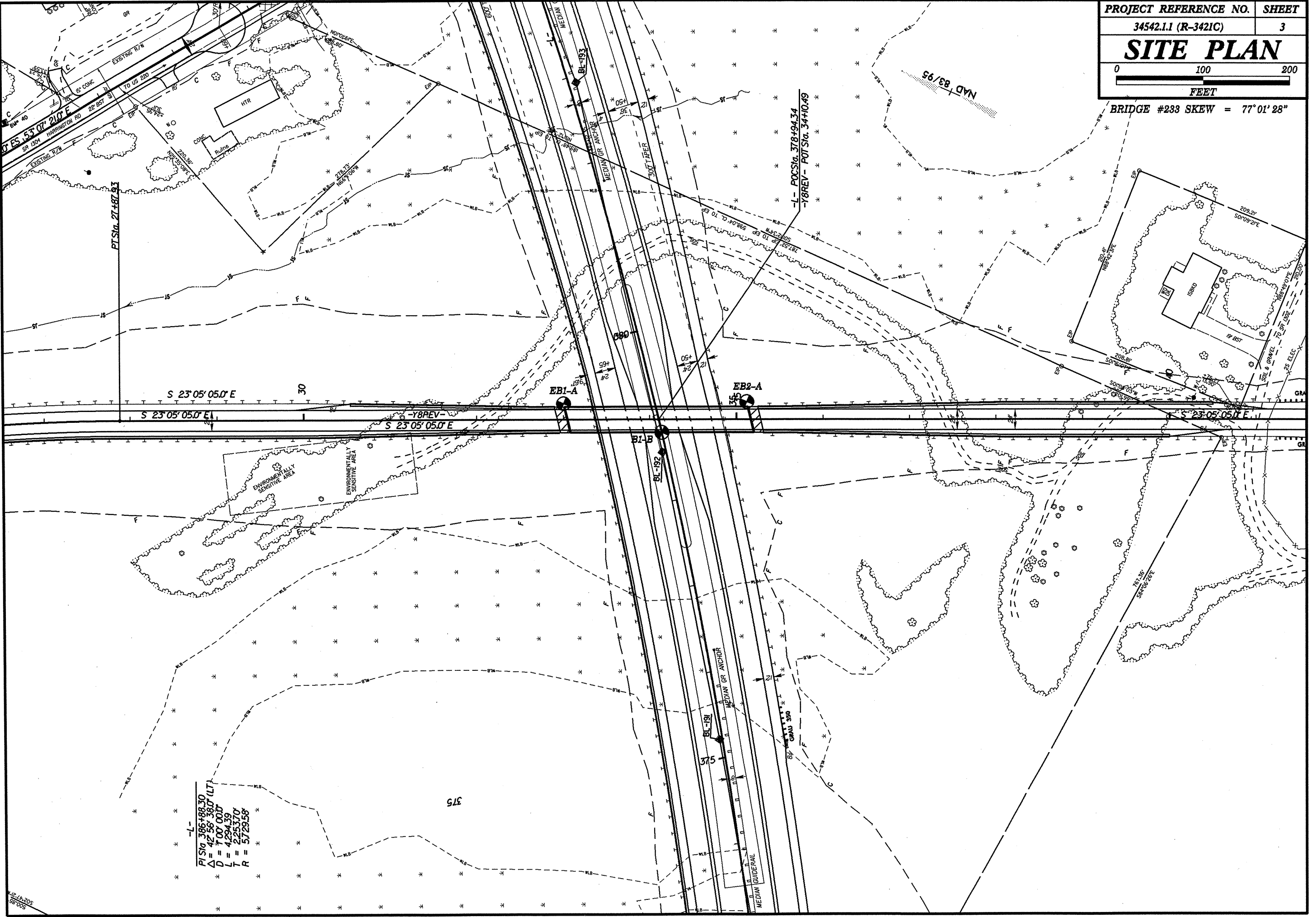
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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 (ASHTO T208, 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><i>VERY STIFF, GRAULY 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>ANGULARITY OF GRAINS</p> <p>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>.</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>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (< 36% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 36% PASSING #200)</th> <th colspan="3">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th colspan="2">A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th></th> <th></th> <th></th> </tr> <tr> <th>GROUP CLASS.</th> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td>A-4-1</td> <td>A-4-2</td> <td>A-4-3</td> <td>A-4-4</td> <td>A-4-5</td> <td>A-4-6</td> <td>A-4-7</td> <td>A-5-1</td> <td>A-5-2</td> <td>A-5-3</td> <td>A-6-1</td> <td>A-6-2</td> <td>A-6-3</td> <td>A-7-1</td> <td>A-7-2</td> <td>A-7-3</td> </tr> <tr> <th>SYMBOL</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>% PASSING</th> <td colspan="2">50 MX</td> <td colspan="2">30 MX 50 MX 50 MN</td> <td colspan="2">35 MX 35 MX 35 MX 35 MX</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> </tr> <tr> <th>LIQUID LIMIT</th> <td colspan="2">6 MX</td> <td colspan="2">NP</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> <td colspan="2">40 MX 41 MN</td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="2">0</td> <td colspan="2">0</td> <td colspan="2">0</td> <td colspan="2">4 MX</td> <td colspan="2">8 MX 12 MX 16 MX</td> <td colspan="2">No MX</td> <td colspan="2">No MX</td> <td colspan="2">No MX</td> <td colspan="2">No MX</td> <td colspan="2">No MX</td> <td colspan="2">No MX</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">STONE FRAGS. GRAVEL AND SAND</td> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="2">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="2">HIGHLY ORGANIC SOILS</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <th>GEN. RATING AS A SUBGRADE</th> <td colspan="7">EXCELLENT TO GOOD</td> <td colspan="7">FAIR TO POOR</td> <td colspan="3">FAIR TO POOR</td> <td colspan="3">POOR</td> <td colspan="3">UNSATURABLE</td> </tr> <tr> <td colspan="23">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30</td> </tr> <tr> <td colspan="3"> <p>CONSISTENCY OR DENSENESS</p> <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table> </td> <td colspan="3"> <p>MISCELLANEOUS SYMBOLS</p> <table border="1"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>TEST BORING</td> </tr> <tr> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>AUGER BORING</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>CORE BORING</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>MONITORING WELL</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>CONE PENETROMETER TEST</td> </tr> <tr> <td></td> <td></td> <td></td> <td>SOUNDING ROD</td> </tr> </table> </td> </tr> <tr> <td colspan="3"> <p>TEXTURE OR GRAIN SIZE</p> <table border="1"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CSE. SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td>MM 305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> <td></td> </tr> <tr> <td>IN. 12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> </td> <td colspan="3"> <p>ABBREVIATIONS</p> <table border="1"> <tr> <td>AR - AUGER REFUSAL</td> <td>MED. - MEDIUM MICA - MICACEOUS</td> <td>VST - VANE SHEAR TEST</td> </tr> <tr> <td>BT - BORING TERMINATED</td> <td>MOD. - MODERATELY NP - NON PLASTIC</td> <td>WEA. - WEATHERED</td> </tr> <tr> <td>CL - CLAY</td> <td>ORG. - ORGANIC</td> <td>WT - UNIT WEIGHT</td> </tr> <tr> <td>CPT - CONE PENETRATION TEST</td> <td>PMT - PRESSUREMETER TEST</td> <td>W - DRY UNIT WEIGHT</td> </tr> <tr> <td>CSE - COARSE</td> <td>SAP. - SAPROLITIC</td> <td></td> </tr> <tr> <td>DMT - DILATOMETER TEST</td> <td>SD. - SAND, SANDY</td> <td></td> </tr> <tr> <td>DPT - DYNAMIC PENETRATION TEST</td> <td>SL. - SILT, SILTY</td> <td></td> </tr> <tr> <td>o - VOID RATIO</td> <td>SLI. - SLIGHTLY</td> <td></td> </tr> <tr> <td>F - FINE</td> <td>SS - SAND, SANDY</td> <td></td> </tr> <tr> <td>FOSS. - FOSSILIFEROUS</td> <td>STR. - STRIATED</td> <td></td> </tr> <tr> <td>FRAC. - FRACTURED, FRACTURES</td> <td>TRC. - TRICONE REFUSAL</td> <td></td> </tr> <tr> <td>FRAGS. - FRAGMENTS</td> <td>W - MOISTURE CONTENT</td> <td></td> </tr> <tr> <td>HI. - HIGHLY</td> <td>V - VERY</td> <td></td> </tr> </table> </td> </tr> <tr> <td colspan="3"> <p>SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL</td> <td>LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> </tr> <tr> <td>PL</td> <td>PLASTIC LIMIT</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>OM</td> <td>OPTIMUM MOISTURE</td> <td>- WET - (W)</td> </tr> <tr> <td>SL</td> <td>SHRINKAGE LIMIT</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td></td> <td></td> <td>- MOIST - (M)</td> </tr> <tr> <td></td> <td></td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td></td> <td></td> <td>- DRY - (D)</td> </tr> <tr> <td></td> <td></td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> </td> <td colspan="3"> <p>EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1"> <tr> <th>DRILL UNITS:</th> <th>ADVANCING TOOLS:</th> <th>HAMMER TYPE:</th> </tr> <tr> <td><input type="checkbox"/> MOBILE B-</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> BK-51</td> <td><input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td></td> </tr> <tr> <td><input type="checkbox"/> CME-45C</td> <td><input type="checkbox"/> 8" HOLLOW AUGERS</td> <td></td> </tr> <tr> <td><input type="checkbox"/> CME-550</td> <td><input type="checkbox"/> HARD FACED FINGER BITS</td> <td></td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> TRICONE _____ STEEL TEETH</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> TRICONE 2 15/16" TUNG-CARB.</td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> CORE BIT</td> <td></td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> DRAG BIT</td> <td></td> </tr> </table> </td> </tr> <tr> <td colspan="3"> <p>PLASTICITY</p> <table border="1"> <tr> <th>NONPLASTIC</th> <th>LOW PLASTICITY</th> <th>MED. PLASTICITY</th> <th>HIGH PLASTICITY</th> </tr> <tr> <td></td> <td>0-5</td> <td>6-15</td> <td>16-25</td> </tr> <tr> <td></td> <td></td> <td>26 OR MORE</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td>26 OR MORE</td> </tr> </table> </td> <td colspan="3"> <p>FRACTURE SPACING</p> <table border="1"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table> </td> </tr> <tr> <td colspan="3"> <p>COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. 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RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR							FAIR TO POOR			POOR			UNSATURABLE			PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																							<p>CONSISTENCY OR DENSENESS</p> <table border="1"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table>			PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A	GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4	<p>MISCELLANEOUS SYMBOLS</p> <table border="1"> <tr> <td></td> <td>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td></td> <td>TEST BORING</td> </tr> <tr> <td></td> <td>SOIL SYMBOL</td> <td></td> <td>AUGER BORING</td> </tr> <tr> <td></td> <td>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td></td> <td>CORE BORING</td> </tr> <tr> <td></td> <td>INFERRED SOIL BOUNDARY</td> <td></td> <td>MONITORING WELL</td> </tr> <tr> <td></td> <td>INFERRED ROCK LINE</td> <td></td> <td>PIEZOMETER INSTALLATION</td> </tr> <tr> <td></td> <td>ALLUVIAL SOIL BOUNDARY</td> <td></td> <td>SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td></td> <td>DIP & DIP DIRECTION OF ROCK STRUCTURES</td> <td></td> <td>CONE PENETROMETER TEST</td> </tr> <tr> <td></td> <td></td> <td></td> <td>SOUNDING ROD</td> </tr> </table>				ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION		TEST BORING		SOIL SYMBOL		AUGER BORING		ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT		CORE BORING		INFERRED SOIL BOUNDARY		MONITORING WELL		INFERRED ROCK LINE		PIEZOMETER INSTALLATION		ALLUVIAL SOIL BOUNDARY		SLOPE INDICATOR INSTALLATION		DIP & DIP DIRECTION OF ROCK STRUCTURES		CONE PENETROMETER TEST				SOUNDING ROD	<p>TEXTURE OR GRAIN SIZE</p> <table border="1"> <tr> <th>U.S. STD. 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ARE USED TO DESCRIBE APPEARANCE.</p>			<p>BEDDING</p> <table border="1"> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td> <td>> 4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table>			TERM	THICKNESS	VERY THICKLY BEDDED	> 4 FEET	THICKLY BEDDED	1.5 - 4 FEET	THINLY BEDDED	0.16 - 1.5 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	THINLY LAMINATED	< 0.008 FEET	<p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1"> <tr> <td>FRIABLE</td> <td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td> </tr> <tr> <td>MODERATELY INDURATED</td> <td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td> </tr> <tr> <td>INDURATED</td> <td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td> </tr> <tr> <td>EXTREMELY INDURATED</td> <td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td> </tr> </table>			FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	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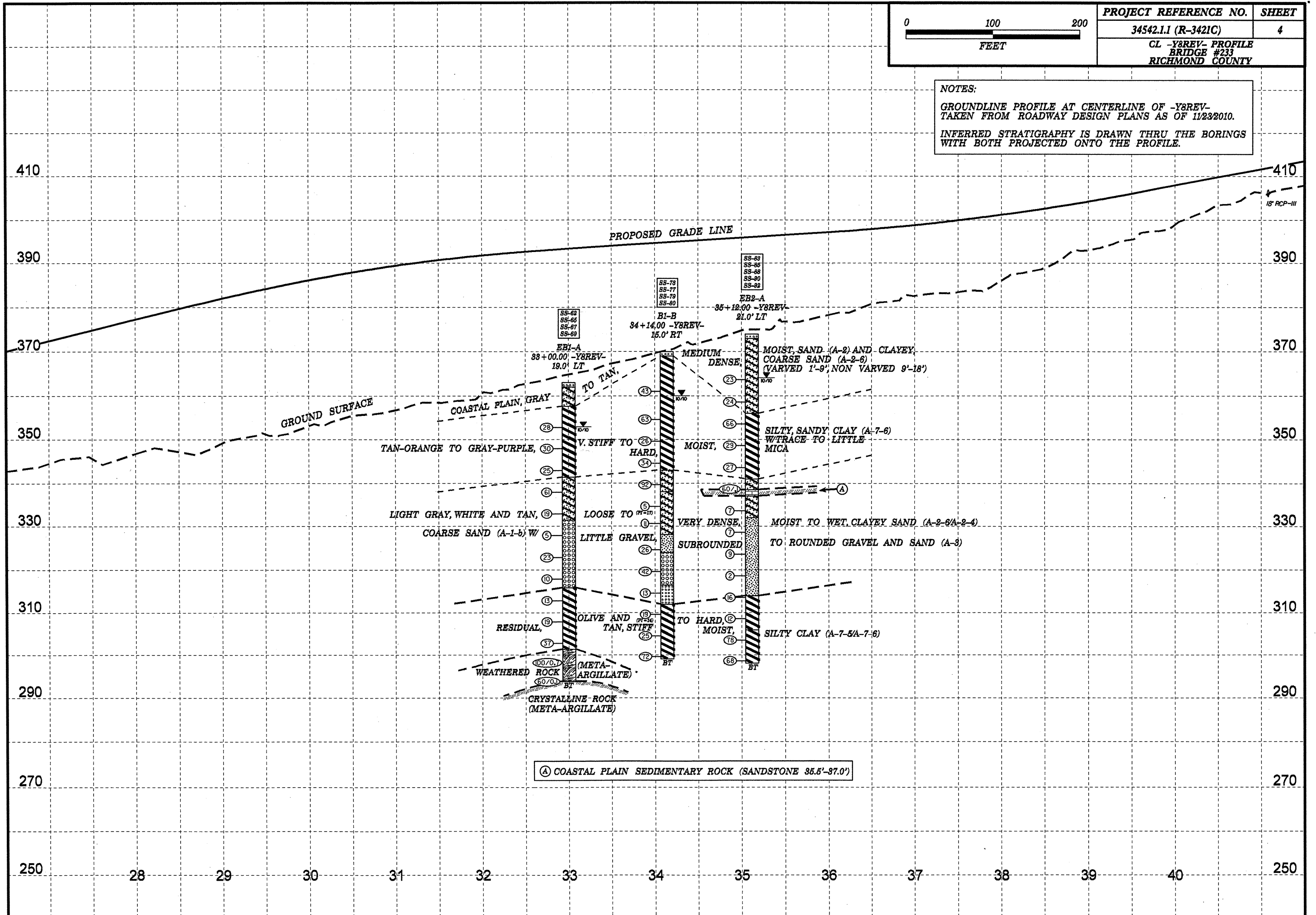


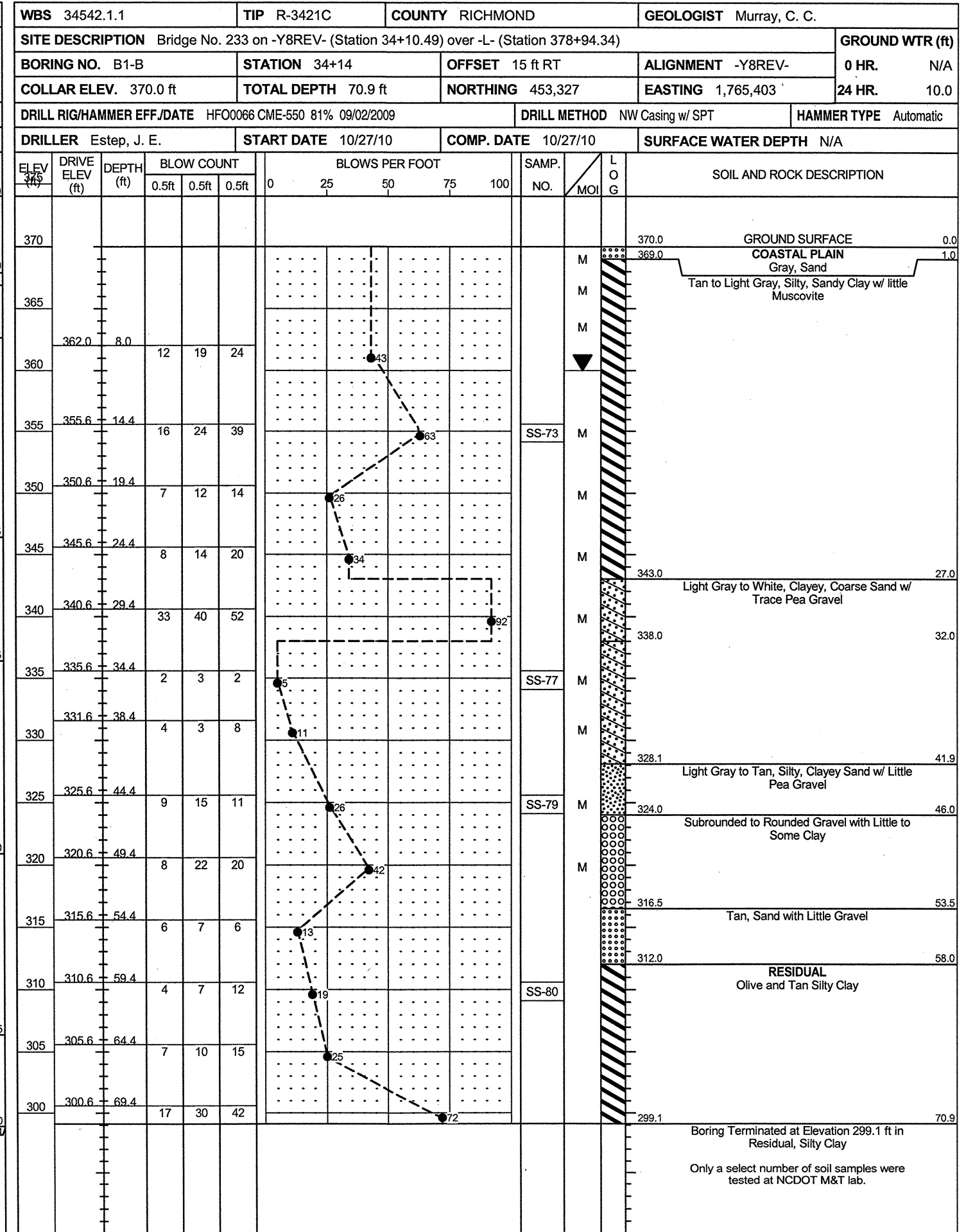
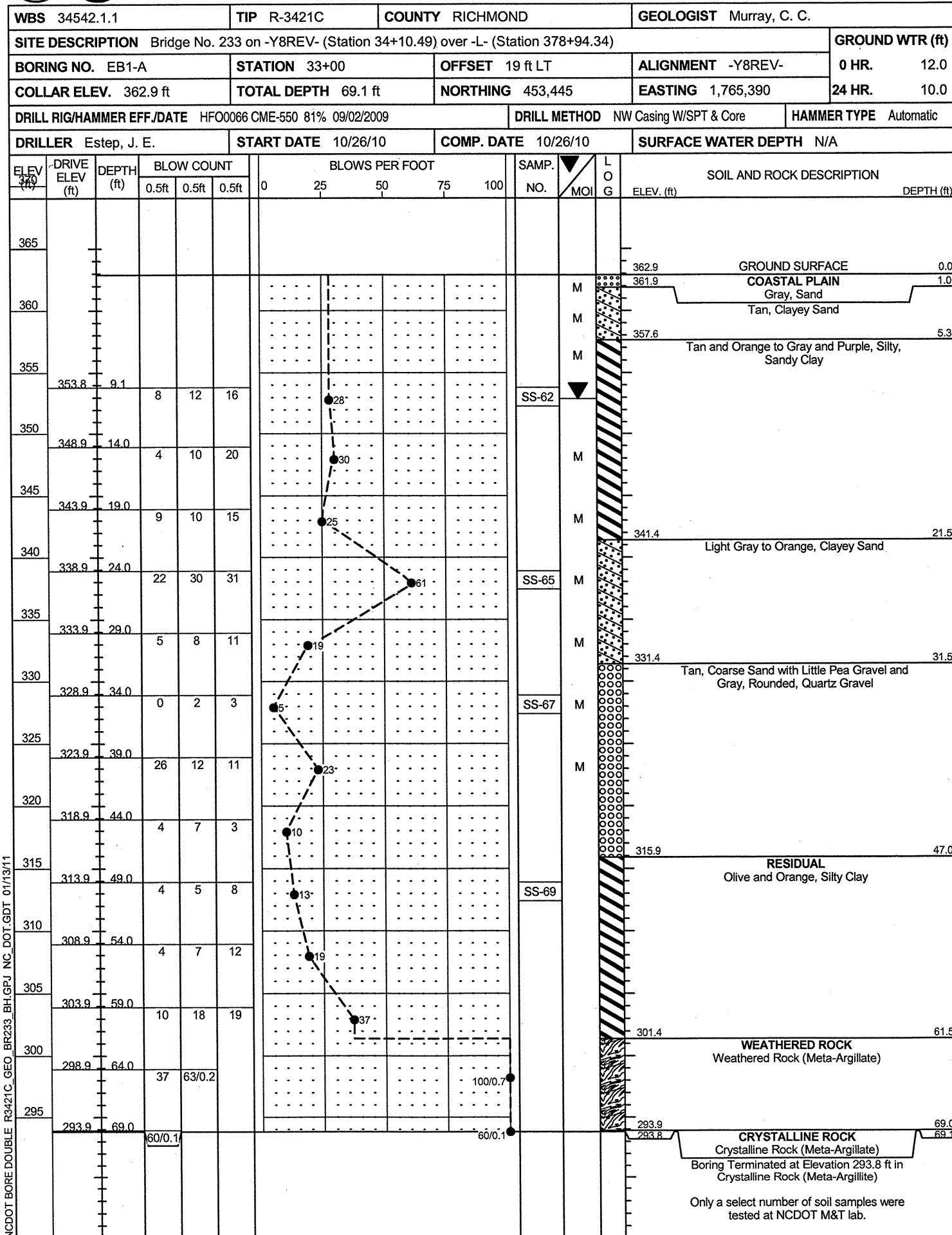
-L-
 P/SIN 386+88.30
 $\Delta = 42.56$ 38.0' (LT)
 $D = 100$ 0.00'
 $L = 4294.39$
 $T = 225.370$
 $R = 5729.58$

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NOTES:
 GROUNDLINE PROFILE AT CENTERLINE OF -Y8REV-
 TAKEN FROM ROADWAY DESIGN PLANS AS OF 11/23/2010.
 INFERRED STRATIGRAPHY IS DRAWN THRU THE BORINGS
 WITH BOTH PROJECTED ONTO THE PROFILE.





NCDOT BORE DOUBLE R3421C_GEO_BR233_BH.GPJ_NC_DOT_GDT 01/13/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34542.1.1		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST Murray, C. C.										
SITE DESCRIPTION Bridge No. 233 on -Y8REV- (Station 34+10.49) over -L- (Station 378+94.34)							GROUND WTR (ft)									
BORING NO. EB2-A		STATION 35+12		OFFSET 21 ft LT		ALIGNMENT -Y8REV-										
COLLAR ELEV. 374.0 ft		TOTAL DEPTH 75.9 ft		NORTHING 453,251		EASTING 1,765,475										
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009			DRILL METHOD NW Casing w/ SPT		HAMMER TYPE Automatic											
DRILLER Estep, J. E.		START DATE 10/28/10		COMP. DATE 10/28/10		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
375																
370																
365	364.6	9.4														
360	359.6	14.4														
355	354.6	19.4														
350	349.6	24.4														
345	344.6	29.4														
340	339.6	34.4														
335	334.6	39.4														
330	329.6	44.4														
325	324.6	49.4														
320	319.6	54.4														
315	314.6	59.4														
310	309.6	64.4														
305	304.6	69.4														
	299.6	74.4														

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285																
280																
275																
270																
265																
260																
255																
250																
245																
240																
235																
230																
225																

NCDOT BORE DOUBLE R3421C_GEO_BR233_BH.GPJ NC_DOT_GDT 01/13/11

Only a select number of soil samples were tested at NCDOT M&T lab.

TEST RESULTS

PROJECT: 34542.1.1 (R-3421C)

COUNTY: RICHMOND

SITE DESCRIPTION: BRIDGE #233 ON -Y8REV- (STA. 33+03.99 TO STA. 35+16.99) OVER -L- (STA. 378+94.34)

SHEET

7

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	LL	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
								C. SAND	F. SAND	SILT	CLAY	10	40	200				
EB1-A																		
SS-62	19' LT	33+00 -Y8REV-	9.1-10.6	A-7-6(8)	28	52	29	43	11	1.8	44.2	97	72	45	N/A	N/A	N/A	N/A
SS-65	19' LT	33+00 -Y8REV-	24.0-25.5	A-2-7(4)	61	62	38	66.7	3.6	1.6	28.1	98	46	30	N/A	N/A	N/A	N/A
SS-67	19' LT	33+00 -Y8REV-	34.0-35.5	A-1-b(0)	5	24	6	71.1	11.4	6.4	11	73	35	14	N/A	N/A	N/A	N/A
SS-69	19' LT	33+00 -Y8REV-	49.0-50.5	A-7-5(64)	13	90	55	2.4	4.2	35.1	58.2	100	98	96	N/A	N/A	N/A	N/A
B1-B																		
SS-73	15' RT	34+14 -Y8REV-	14.4-15.9	A-7-6(8)	63	45	26	38.7	15.2	5	41.2	99	81	47	N/A	N/A	N/A	N/A
SS-77	15' RT	34+14 -Y8REV-	34.4-35.9	A-2-6(0)	5	35	17	69.1	8.2	3.6	19.1	94	42	22	N/A	N/A	N/A	N/A
SS-79	15' RT	34+14 -Y8REV-	44.4-45.9	A-2-4(0)	26	26	8	61.8	14.1	9	15.1	94	52	25	N/A	N/A	N/A	N/A
SS-80	15' RT	34+14 -Y8REV-	59.4-60.9	A-7-5(16)	19	45	14	1	24.1	52.8	22.1	100	99	91	N/A	N/A	N/A	N/A
EB2-A																		
SS-83	21' LT	35+12 -Y8REV-	9.4-10.9	A-2-6(0)	23	33	14	62.1	16.2	2.6	19.1	98	57	22	N/A	N/A	N/A	N/A
SS-85	21' LT	35+12 -Y8REV-	19.4-20.9	A-7-6(5)	66	43	23	42.8	16.2	5.9	35.1	99	75	42	N/A	N/A	N/A	N/A
SS-88	21' LT	35+12 -Y8REV-	34.4-35.4	A-2-6(0)	92	29	14	55.6	18.7	1.6	24.1	97	62	26	N/A	N/A	N/A	N/A
SS-90	21' LT	35+12 -Y8REV-	44.4-45.9	A-2-4(0)	7	26	8	66.6	14.3	4.1	15.1	77	40	16	N/A	N/A	N/A	N/A
SS-92	21' LT	35+12 -Y8REV-	59.4-60.9	A-7-6(27)	16	51	27	2	15.9	48	34.1	99	97	90	N/A	N/A	N/A	N/A

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34542.1.1 (R-3421C)	1	10

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

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10	SOIL TEST RESULTS

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34542.1.1 (R-3421C) F.A. PROJ. NHF-220(4)
COUNTY RICHMOND
PROJECT DESCRIPTION US 220 BYPASS FROM 0.2 MILES SW OF
SR 1304 (HARRINGTON RD.) TO US 220 BUS /US BYPASS
INTERCHANGE, SOUTH OF ELLERBE
SITE DESCRIPTION BRIDGE NO. 234 ON -Y9SBL- (STATION 29+73.05)
OVER -L- (STATION 395+64.54)

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.

PERSONNEL

C. C. MURRAY

M. R. MOORE

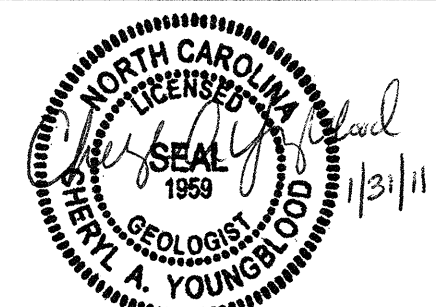
J. E. ESTEP

INVESTIGATED BY C. A. YOUNGBLOOD

CHECKED BY K. B. MILLER

SUBMITTED BY K. B. MILLER

DATE JANUARY 2011



PROJECT: 34542.1.1 ID: R-3421C

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 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

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO. 34542.IJ (R-342IC)	SHEET NO. 2
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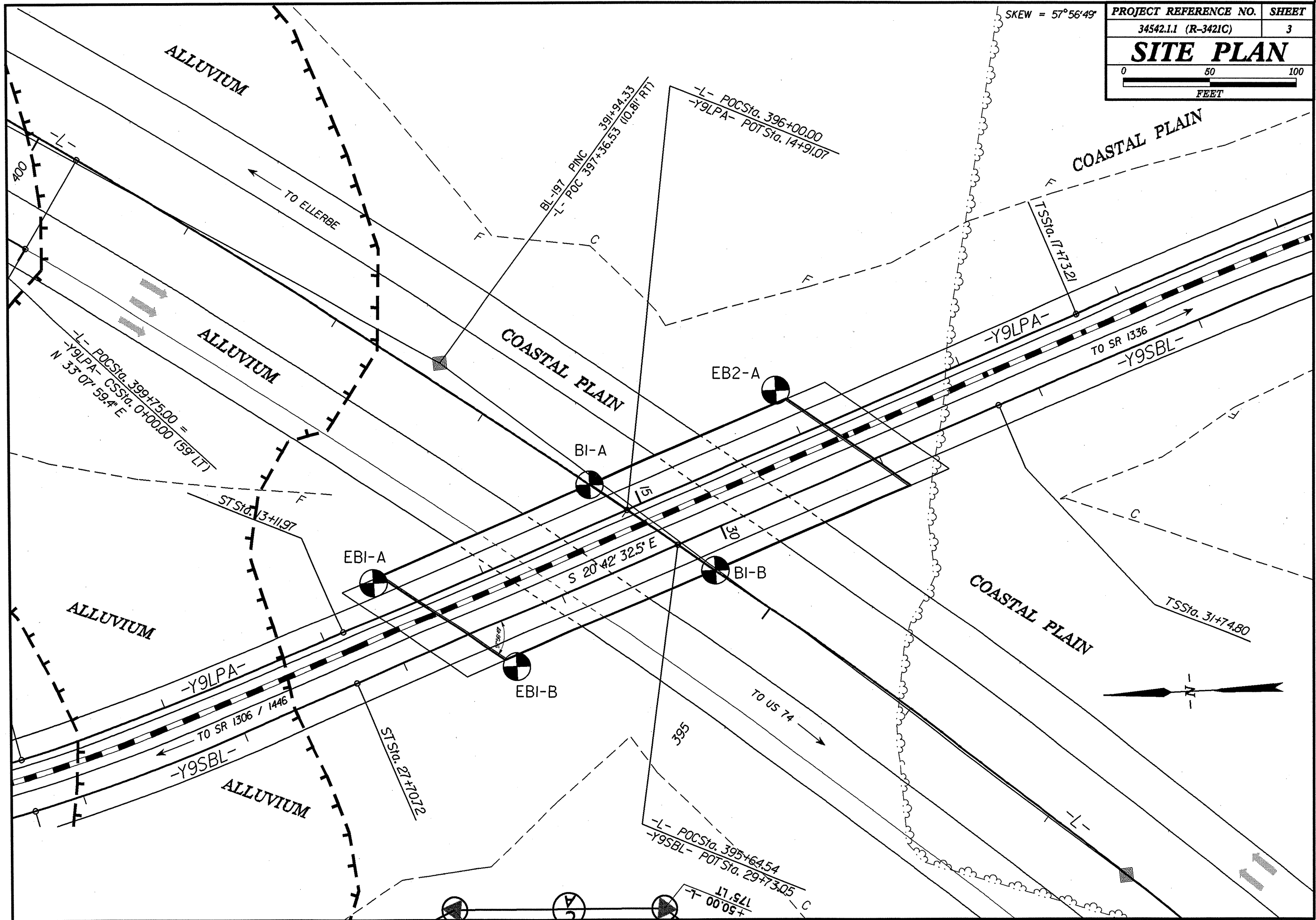
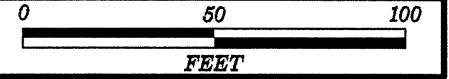
SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS							
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T208, 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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERSEDED FINE SAND LAYERS, HEAVY PLASTIC, A-7-6</i>				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: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.				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.				ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SCRC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.							
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION				WEATHERING											
GENERAL CLASS. GRANULAR MATERIALS (< 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS				MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.				FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.											
GROUP CLASS. A-1, A-3, A-2, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7				COMPRESSIBILITY				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.											
SYMBOL				SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50				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.											
% PASSING				PERCENTAGE OF MATERIAL				MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL.											
LIQUID LIMIT PLASTIC INDEX				ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL				SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, YIELDS SPT N VALUES > 100 BPF.											
GROUP INDEX				GROUND WATER				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. IF TESTED, YIELDS SPT N VALUES < 100 BPF.											
USUAL TYPES OF MAJOR MATERIALS				WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING				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.											
GEN. RATING AS A SUBGRADE				STATIC WATER LEVEL AFTER 24 HOURS				ROCK HARDNESS											
EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR POOR UNSUITABLE				PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA				VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.											
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30				SPRING OR SEEP				HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.											
CONSISTENCY OR DENSENESS				MISCELLANEOUS SYMBOLS				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.											
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)				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				TEST BORING WITH CORE AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD				SEVERE TO VERY SEVERE (SEV. TO V SEV.)							
GENERAL GRANULAR MATERIAL (NON-COHESIVE)				ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION				SPT N-VALUE											
GENERAL SILT-CLAY MATERIAL (COHESIVE)				ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT				SPT REFUSAL											
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE				INFERRED SOIL BOUNDARY				SPT REFUSAL											
VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD				INFERRED ROCK LINE				SPT REFUSAL											
2 < 4 4 TO 10 10 TO 30 30 TO 50 > 50				ALLUVIAL SOIL BOUNDARY				SPT REFUSAL											
2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30				DIP & DIP DIRECTION OF ROCK STRUCTURES				SPT REFUSAL											
0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 > 4				DIP & DIP DIRECTION OF ROCK STRUCTURES				SPT REFUSAL											
TEXTURE OR GRAIN SIZE				ABBREVIATIONS				FRACTURE SPACING				BEDDING							
U.S. STD. SIEVE SIZE OPENING (MM)				AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS - FOSSILIFEROUS FRAC - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY				MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT v - VERY				VST - VANE SHEAR TEST WEA. - WEATHERED W - UNIT WEIGHT W _d - DRY UNIT WEIGHT				TERM SPACING THICKNESS 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 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			
BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)				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 _d - DRY UNIT WEIGHT				TERM SPACING THICKNESS 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 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							
GRAIN SIZE				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 _d - DRY UNIT WEIGHT				TERM SPACING THICKNESS 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 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							
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION											
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST				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.											
SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE				ADVANCING TOOLS: CLAY BITS 6" CONTINUOUS FLIGHT AUGER 8" HOLLOW AUGERS HARD FACED FINGER BITS TUNG.-CARBIDE INSERTS CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT				HAMMER TYPE: AUTOMATIC MANUAL											
WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE				MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST				CORE SIZE: B N H											
MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT				HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST											
DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
PLASTICITY				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST															
PLASTICITY INDEX (PI) DRY STRENGTH				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
NONPLASTIC 0-5 VERY LOW				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
LOW PLASTICITY 6-15 SLIGHT				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
MED. PLASTICITY 16-25 MEDIUM				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
HIGH PLASTICITY 26 OR MORE HIGH				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
COLOR				DRILL UNITS: MOBILE B- BK-51 CME-45C CME-550 PORTABLE HOIST															
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.				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT															
				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT								BENCH MARK: BL-197 STA. 391+94.33 N 454632.8720 E 1766715.5870 ELEVATION: 385.65 FT.							
				CASING w/ ADVANCER TRICONE * STEEL TEETH TRICONE * TUNG.-CARB. CORE BIT CARBIDE INSERT DRAG BIT								NOTES:							

SKEW = 57°56'49"

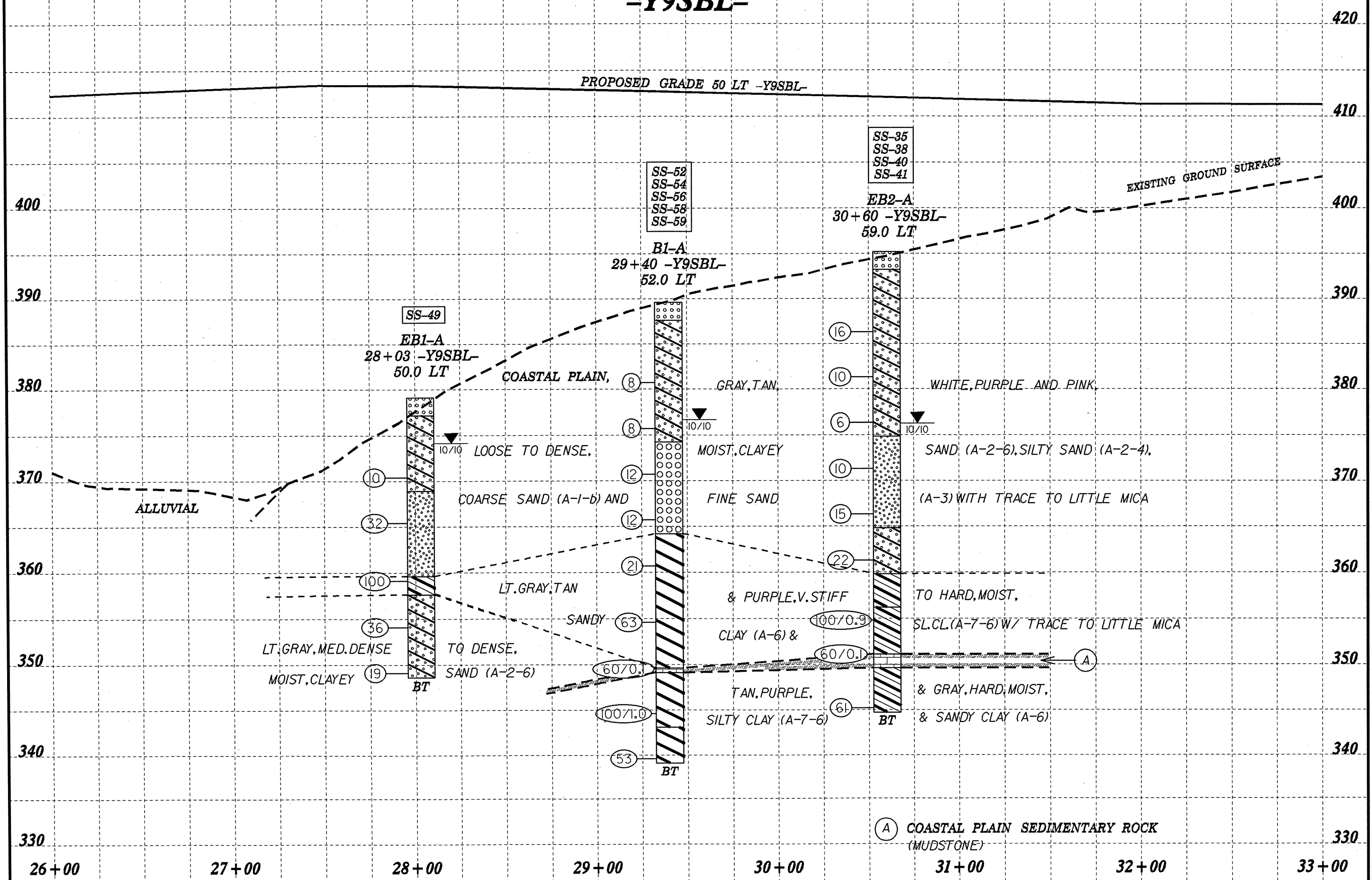
PROJECT REFERENCE NO. SHEET

34542.1.1 (R-3421C) 3

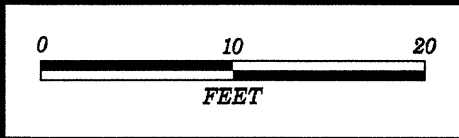
SITE PLAN



-Y9SBL-

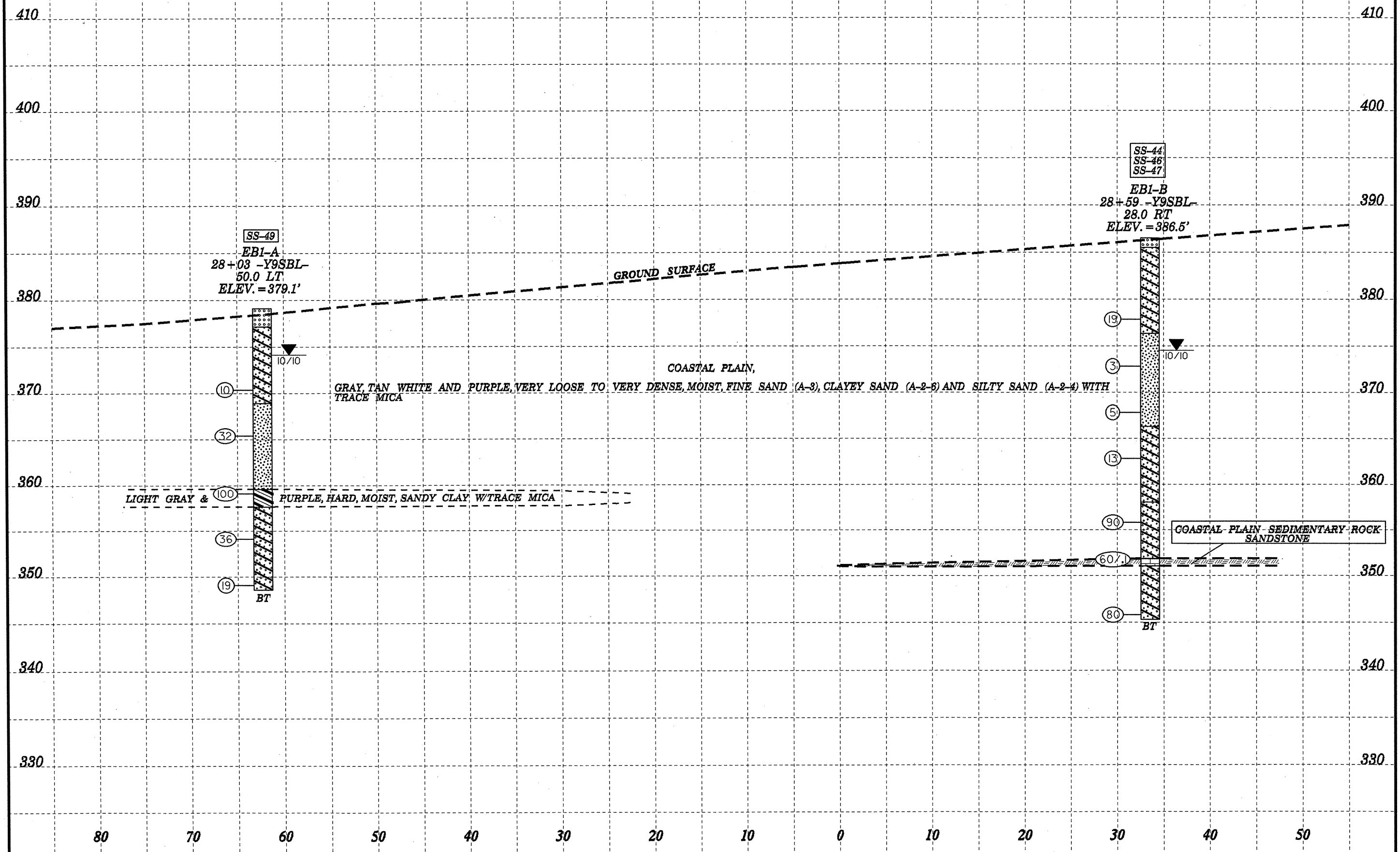


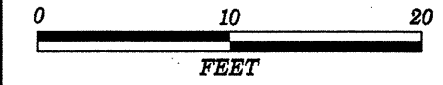
(A) COASTAL PLAIN SEDIMENTARY ROCK (MUDSTONE)



PROJECT REFERENCE NO.	SHEET
34542.1.1 (R-3421C)	5
SECTION THROUGH END BENT 1 STA. 28+40.55 - Y9SBL- SKEW = 57° 56' 49"	

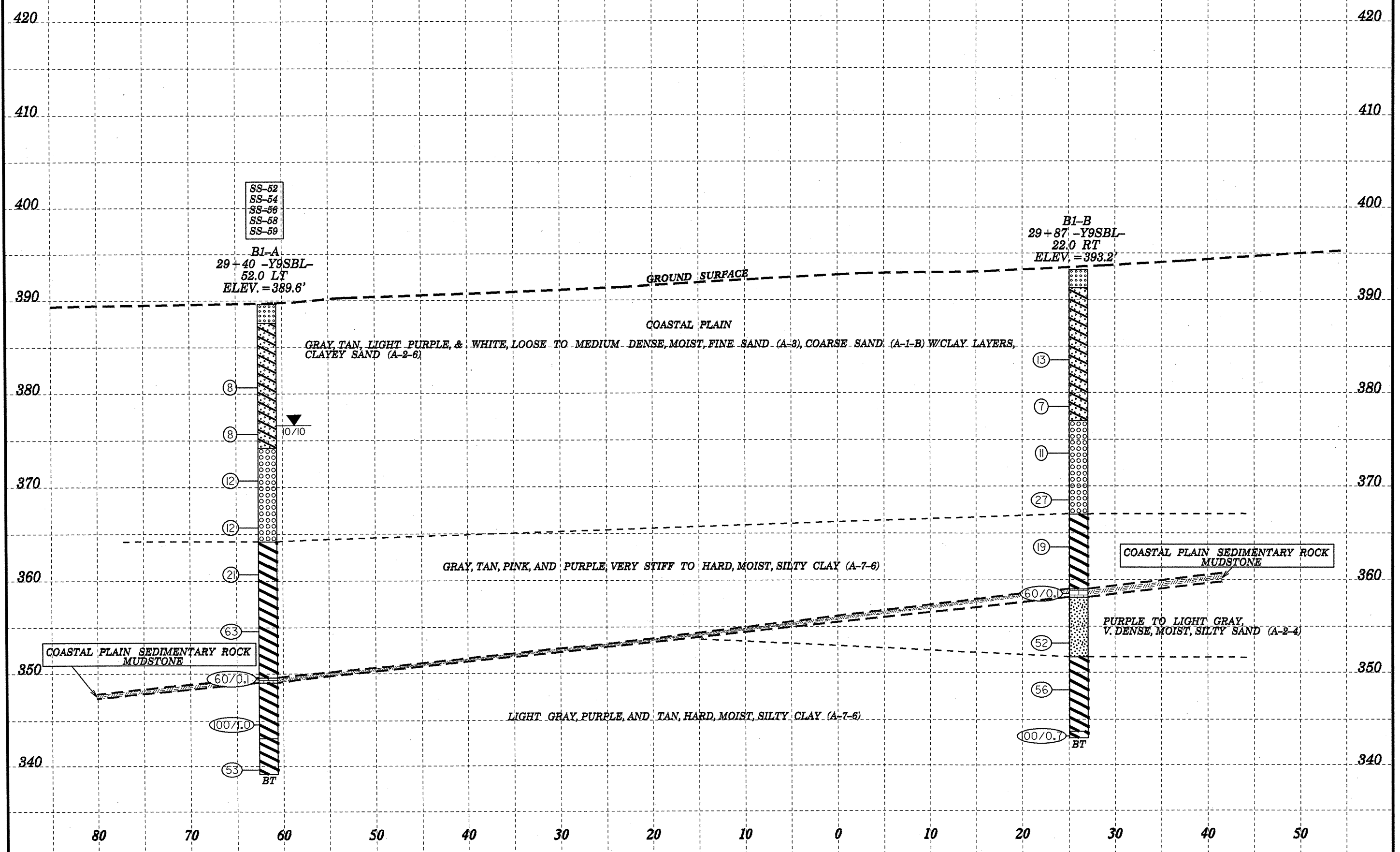
-Y9SBL-





PROJECT REFERENCE NO.	SHEET
34542.1.1 (R-3421C)	6
SECTION THROUGH BENT 1	
STA. 29+73.05 -Y9SBL-	
SKEW=57°56'49"	

-Y9SBL-



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

WBS 34542.1.1	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION Bridge No. 234 on -Y9SBL (Sta. 29+73.05) Over -L- (Sta. 395+64.54)			GROUND WTR (ft)
BORING NO. EB1-A	STATION 28+03	OFFSET 50 ft LT	ALIGNMENT -Y9- SBL
COLLAR ELEV. 379.1 ft	TOTAL DEPTH 30.5 ft	NORTHING 454,677	EASTING 1,766,591
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009			DRILL METHOD NW Casing w/ SPT
DRILLER Estep, J. E.			HAMMER TYPE Automatic
START DATE 10/14/10	COMP. DATE 10/14/10	SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
380													GROUND SURFACE	0.0
375												M	COASTAL PLAIN Gray, Sand	2.0
													Tan and White, Clayey Sand	
370	371.4	7.7	4	5	5							M		
													White and Purple, Silty Sand w/Trace Mica	10.2
365	366.4	12.7	8	14	18							M		
													Light Gray and Purple, Sandy Clay w/Trace Mica	19.5
360	360.1	19.0	16	43	57							SS-49 M	Light Gray, Clayey Sand w/Trace Mica	21.5
355	355.1	24.0	18	18	18							M		
350	350.1	29.0	5	7	12							M		
													Boring Terminated at Elevation 348.6 ft in Clayey Sand	30.5
Only a select number of soil samples were tested at NCDOT M&T lab.														

WBS 34542.1.1	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION Bridge No. 234 on -Y9SBL (Sta. 29+73.05) Over -L- (Sta. 395+64.54)			GROUND WTR (ft)
BORING NO. EB1-B	STATION 28+59	OFFSET 28 ft RT	ALIGNMENT -Y9- SBL
COLLAR ELEV. 386.5 ft	TOTAL DEPTH 41.2 ft	NORTHING 454,597	EASTING 1,766,538
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009			DRILL METHOD NW Casing w/ SPT
DRILLER Estep, J. E.			HAMMER TYPE Automatic
START DATE 10/14/10	COMP. DATE 10/14/10	SURFACE WATER DEPTH N/A	

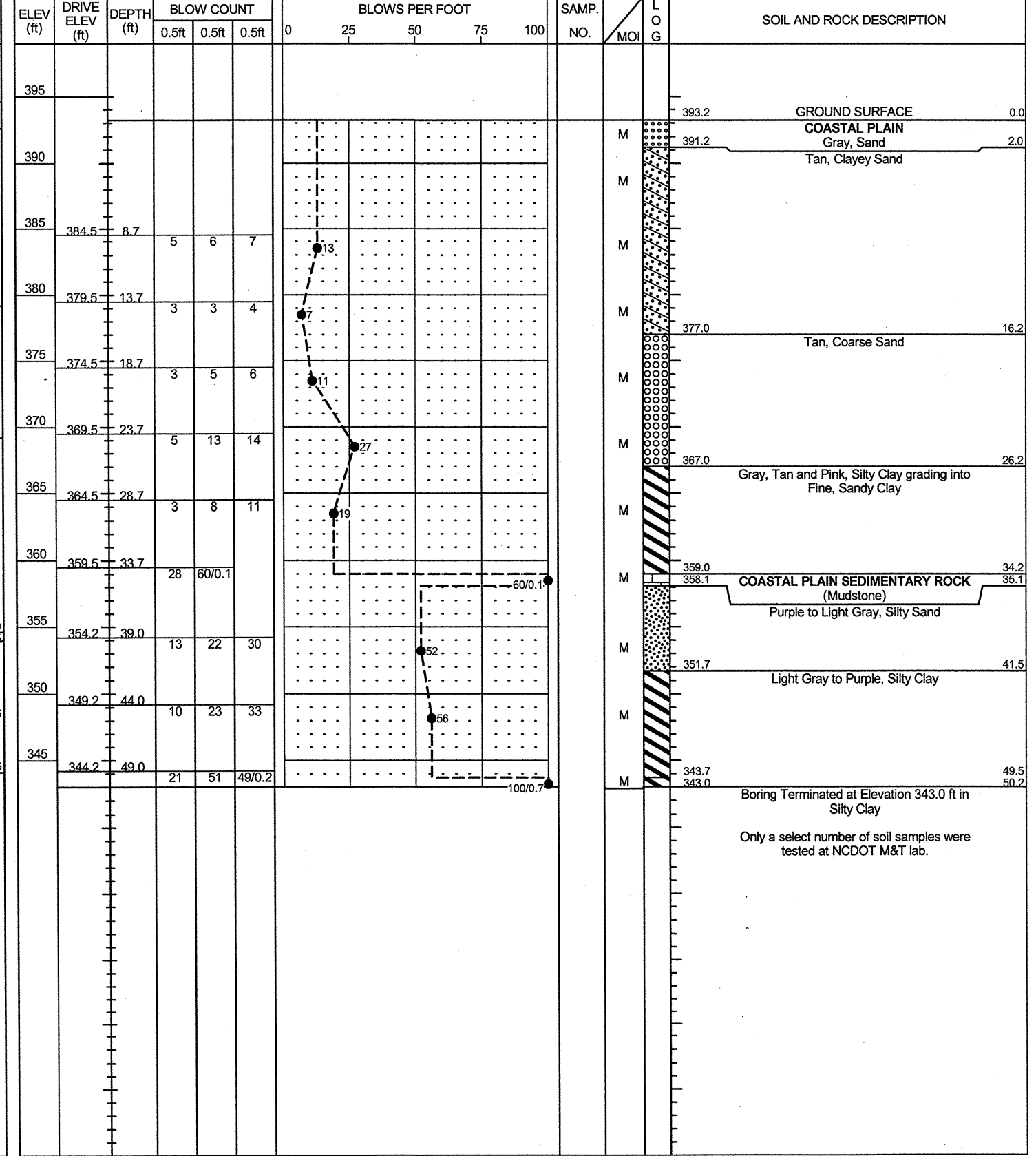
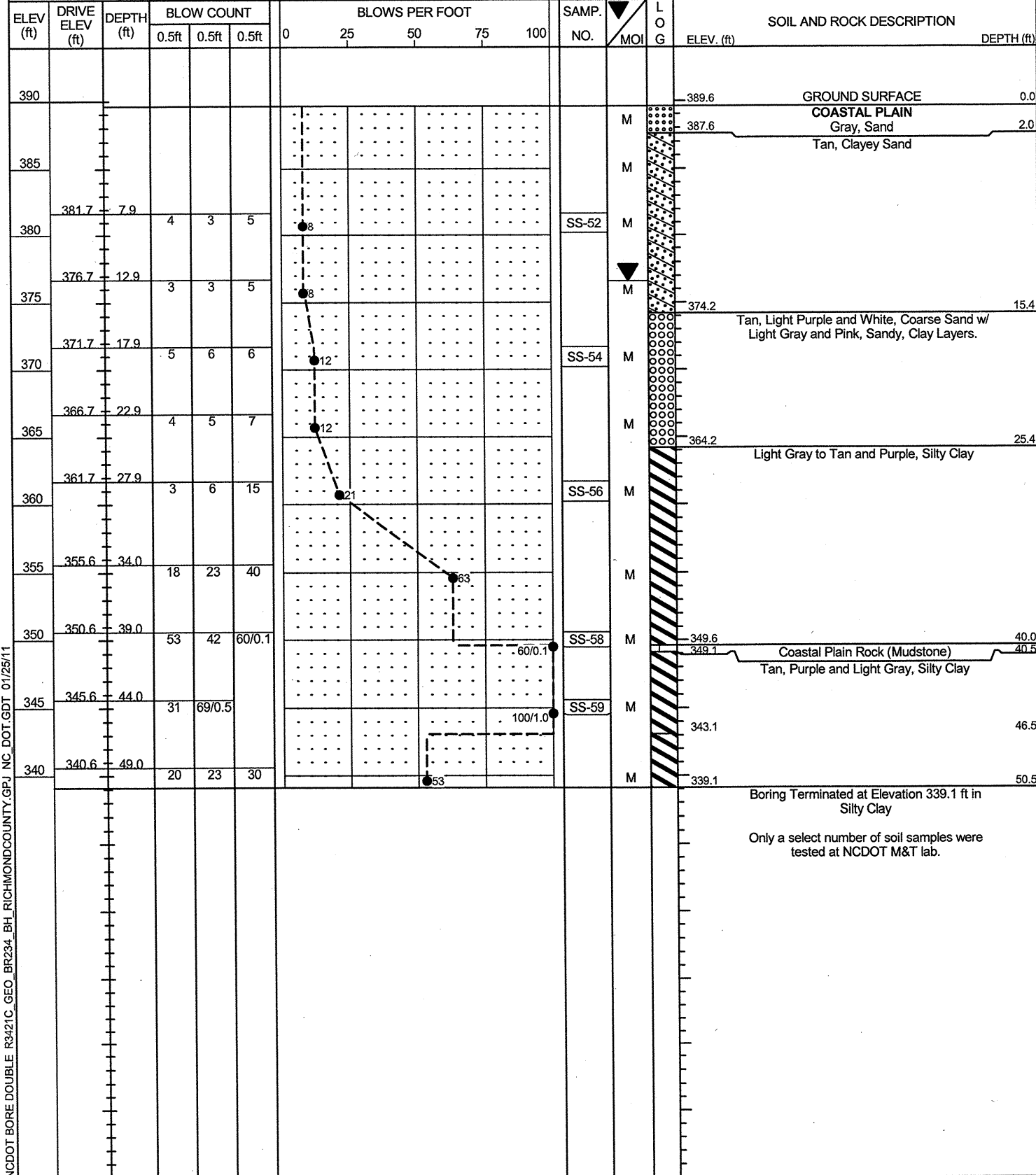
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
390													GROUND SURFACE	0.0
385												M	COASTAL PLAIN Gray, Sand	1.0
													Tan and White, Clayey Sand	
380	378.8	7.7	8	8	11							M		
													White, Silty Sand	10.2
375	373.8	12.7	2	2	1							SS-44 M		
												M		
370	368.8	17.7	1	3	2							M		
													Tan and Purple to Gray, Clayey, Fine to Coarse Sand	20.2
365	363.8	22.7	4	5	8							SS-46 M		
												M		
360	356.8	29.7	18	36	54							SS-47 M		
350	351.8	34.7	60	0.1								M	COASTAL PLAIN SEDIMENTARY ROCK (Sandstone)	34.7
													COASTAL PLAIN Gray, Clayey, Coarse Sand w/Trace Mica	35.5
	346.8	39.7	7	31	49							M		41.2
													Boring Terminated at Elevation 345.3 ft in Clayey Sand	
Only a select number of soil samples were tested at NCDOT M&T lab.														

NCDOT BORE DOUBLE R3421C_GEO_BR234_BH_RICHMONDCOUNTY.GPJ_NC_DOT.GDT 01/25/11

NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

Table with project details for Boring B1-A: WBS 34542.1.1, TIP R-3421C, COUNTY RICHMOND, GEOLOGIST Murray, C. C. Includes site description, boring info, collar elev, and drill parameters.

Table with project details for Boring B1-B: WBS 34542.1.1, TIP R-3421C, COUNTY RICHMOND, GEOLOGIST Murray, C. C. Includes site description, boring info, collar elev, and drill parameters.



NCDOT BORE DOUBLE R3421C_GEO_BR234_BH_RICHMONDCOUNTY.GPJ NC_DOT.GDT 01/25/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34542.1.1	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST Murray, C. C.
SITE DESCRIPTION Bridge No. 234 on -Y9SBL (Sta. 29+73.05) Over -L- (Sta. 395+64.54)			GROUND WTR (ft)
BORING NO. EB2-A	STATION 30+60	OFFSET 59 ft LT	ALIGNMENT -Y9- SBL
COLLAR ELEV. 395.2 ft	TOTAL DEPTH 50.5 ft	NORTHING 454,440	EASTING 1,766,691
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009		DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic
DRILLER Estep, J. E.	START DATE 10/13/10	COMP. DATE 10/13/10	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		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
400																
395															395.2	GROUND SURFACE
															393.2	COASTAL PLAIN Gray, Sand
390																Tan and White, Clayey Sand
385																
380																
375																
370																
365																
360																
355																
350																
345																

NCDOT BORE DOUBLE R3421C_GEO_BR234_BH_RICHMONDCOUNTY.GPJ NC_DOT.GDT 01/25/11

Boring Terminated at Elevation 344.7 ft in Sandy Clay
 Only a select number of soil samples were tested at NCDOT M&T lab.

TEST RESULTS

PROJECT: 34542.1.1 (R-3421C)

COUNTY: Richmond

SITE DESCRIPTION: Bridge No. 234 on -Y9SBL- (Sta. 29+73.05) Over -L- (Sta. 395+64.54)

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				
EB1-A																		
SS-49	50.0 LT	28+03	19.0-20.5	A-6(15)	100	38	20	12.4	9.5	19.2	58.9	99	91	80				
EB1-B																		
SS-44	28.0 RT	28+59	12.7-14.2	A-2-4(0)	3	23	3	61.8	20.8	3.1	14.2	95	64	17				
SS-46	28.0 RT	28+59	22.7-24.2	A-2-6(1)	13	40	21	65.4	9.8	0.4	24.4	88	43	23				
SS-47	28.0 RT	28+59	29.7-31.2	A-2-6(1)	90	25	13	34.1	33.3	6.2	26.4	95	77	35				
B1-A																		
SS-52	52.0 LT	29+40	7.9-9.4	A-2-6(2)	8	39	19	39.4	24.4	3.8	32.5	88	61	33				
SS-54	52.0 LT	29+40	17.9-19.4	A-1-b(0)	12	24	6	73.4	11.4	2.0	13.2	89	39	14				
SS-56	52.0 LT	29+40	27.9-29.4	A-7-6(29)	21	55	29	7.1	5.7	10.1	77.2	100	98	89				
SS-58	52.0 LT	29+40	39.0-40.1	A-2-4(0)	100/6	20	NP	69.3	19.4	0.1	11.2	96	58	11				
SS-59	52.0 LT	29+40	44.0-45.0	A-7-6(17)	100	50	32	23.4	15.0	12.9	48.7	95	80	61				
EB2-A																		
SS-35	59.0 LT	30+60	7.9-9.4	A-2-6(0)	16	37	16	66.7	10.3	1.7	21.3	93	39	22				
SS-38	59.0 LT	30+60	22.9-24.4	A-2-4(0)	10	26	7	72.1	12.2	1.5	14.2	91	45	15				
SS-40	59.0 LT	30+60	32.9-34.4	A-2-6(0)	22	31	13	61.0	15.5	3.1	20.3	93	53	23				
SS-41	59.0 LT	30+60	39.0-39.9	A-6(8)	100/9	33	17	17.7	20.5	13.1	48.7	99	88	65				

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

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34542.1.1 (R-3421C) F.A. PROJ. NHF-220(4)

COUNTY RICHMOND

PROJECT DESCRIPTION US 220 BYPASS FROM 0.2 MILES SW OF
SR 1304 (HARRINGTON RD.) TO US 220 BUS /US BYPASS

SITE DESCRIPTION BRIDGE NO. 235 ON -Y10- (STATION 33+07.10)
OVER -L- (STATION 456+99.33)

CONTENTS

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE
5-6	CROSS SECTIONS
7-9	BORE LOGS
10	SOIL TEST RESULTS

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: 34542.1.1 ID: R-3421C

PERSONNEL

C. C. MURRAY

M. R. MOORE

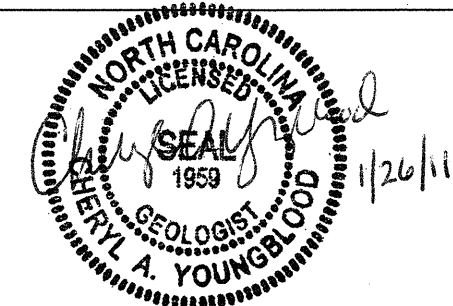
J. E. ESTEP

INVESTIGATED BY C. A. YOUNGBLOOD

CHECKED BY K. B. MILLER

SUBMITTED BY K. B. MILLER

DATE JANUARY 2011



DRAWN BY: J. K. McClure /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

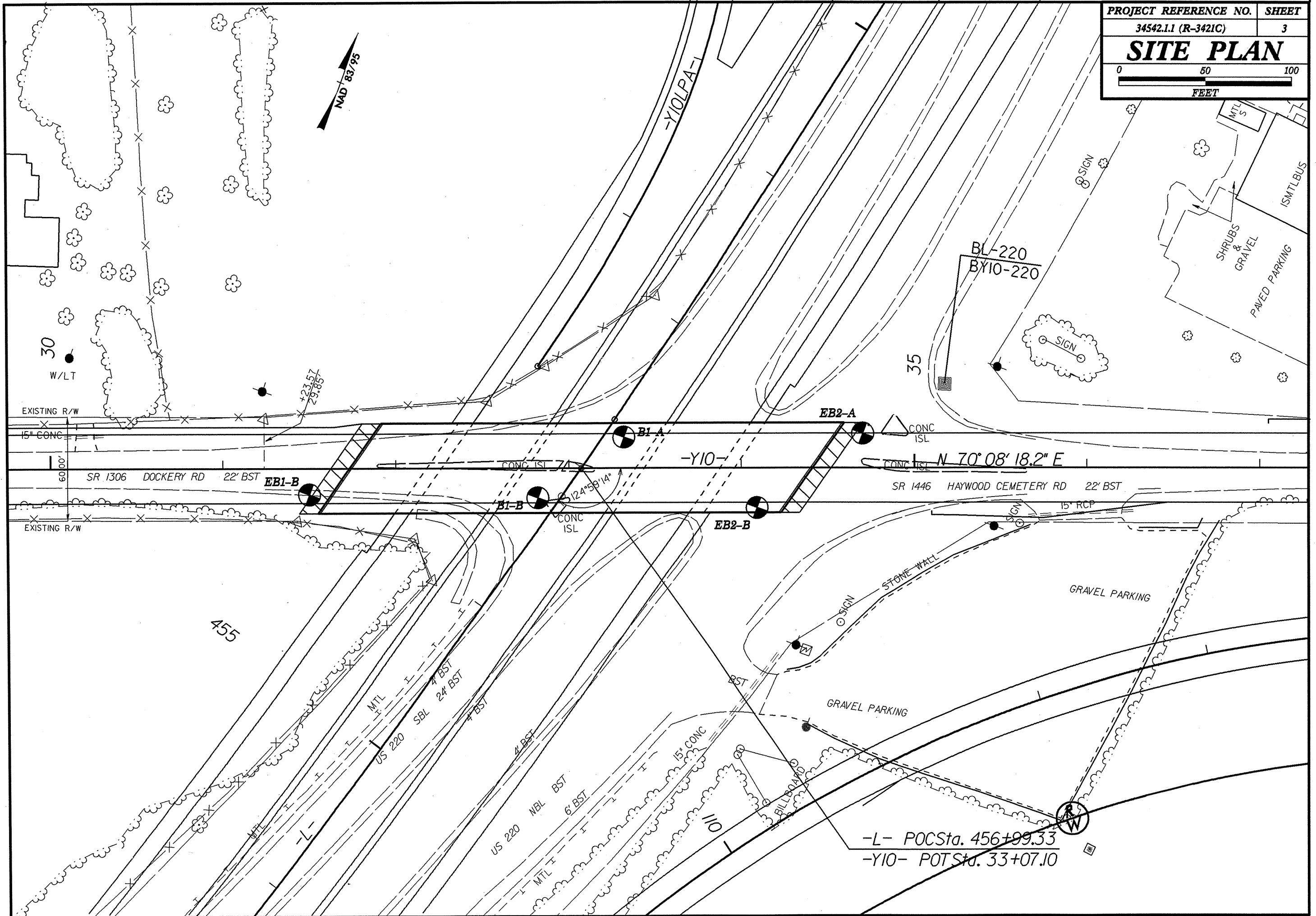
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO.
34542.II (R-342IC)

SHEET NO.
2

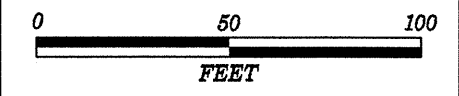
SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																																										
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>		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.		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:		ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOOD - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. 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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 > 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 < 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>		<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. 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<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>																																																																																



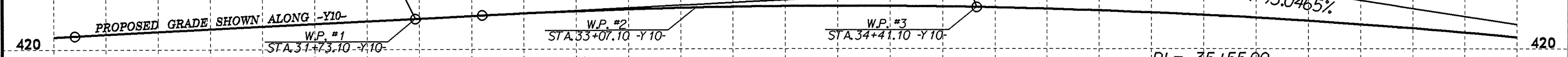
-Y10-

END BRIDGE
-Y10- STA. 34+41.10

BEGIN BRIDGE
-Y10- STA. 31+73.10



PROJECT REFERENCE NO.	SHEET
34542.1.1 (R-3421C)	4
Profile -Y10- 20.0 ft Bridge 235 over SR 1306/SR 1446 between SR 1305 and SR 1445	



SS-989 SS-993
SS-990 SS-994
SS-991 SS-995
SS-992 SS-996

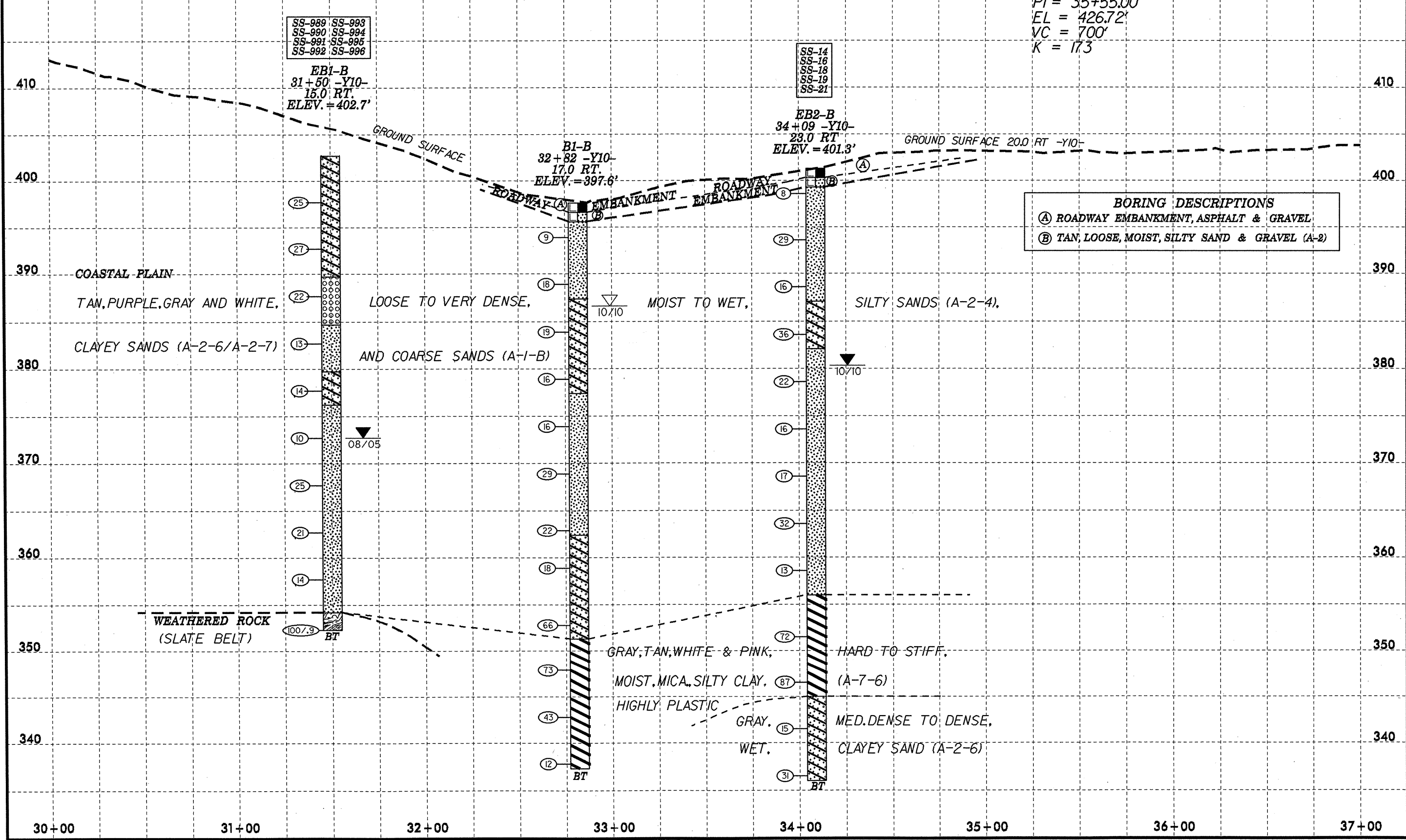
EB1-B
31+50 -Y10-
15.0 RT.
ELEV. = 402.7'

SS-14
SS-16
SS-18
SS-19
SS-21

EB2-B
34+09 -Y10-
23.0 RT.
ELEV. = 401.3'

B1-B
32+82 -Y10-
17.0 RT.
ELEV. = 397.6'

BORING DESCRIPTIONS	
(A)	ROADWAY EMBANKMENT, ASPHALT & GRAVEL
(B)	TAN, LOOSE, MOIST, SILTY SAND & GRAVEL (A-2)



COASTAL FLAIN
TAN, PURPLE, GRAY AND WHITE,
CLAYEY SANDS (A-2-6/A-2-7)

LOOSE TO VERY DENSE,
AND COARSE SANDS (A-1-B)

MOIST TO WET,

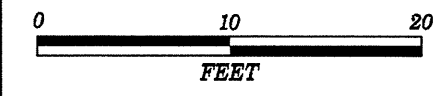
SILTY SANDS (A-2-4).

GRAY, TAN, WHITE & PINK,
MOIST, MICA, SILTY CLAY,
HIGHLY PLASTIC

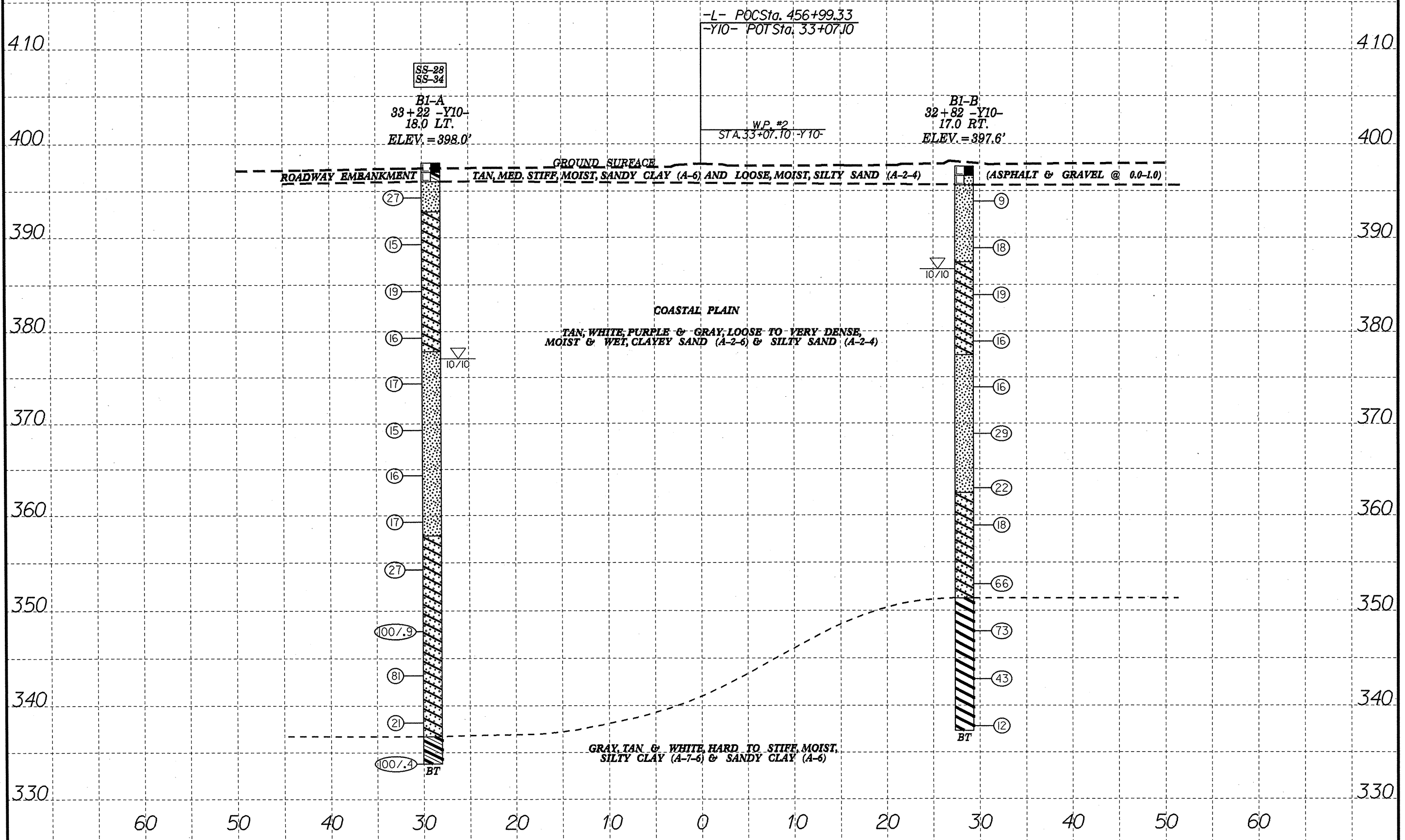
HARD TO STIFF,
(A-7-6)
MED. DENSE TO DENSE,
CLAYEY SAND (A-2-6)

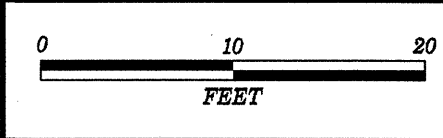
WEATHERED ROCK
(SLATE BELT)

30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00

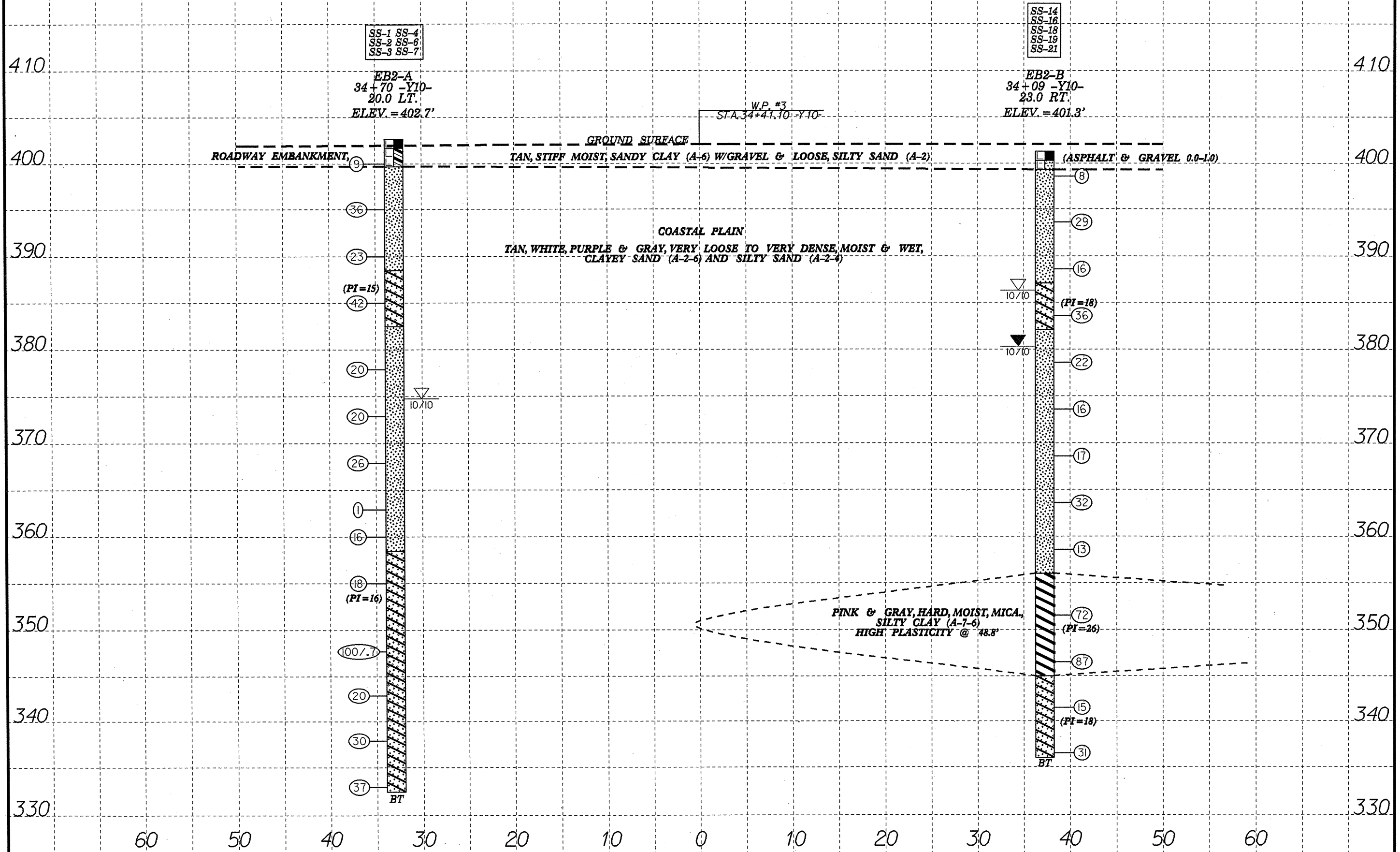


PROJECT REFERENCE NO.	SHEET
34542.1.1 (R-3421C)	5
Section Thru Bent One Sta. 33+07.10 -Y10- Skew = 124°59'14"	



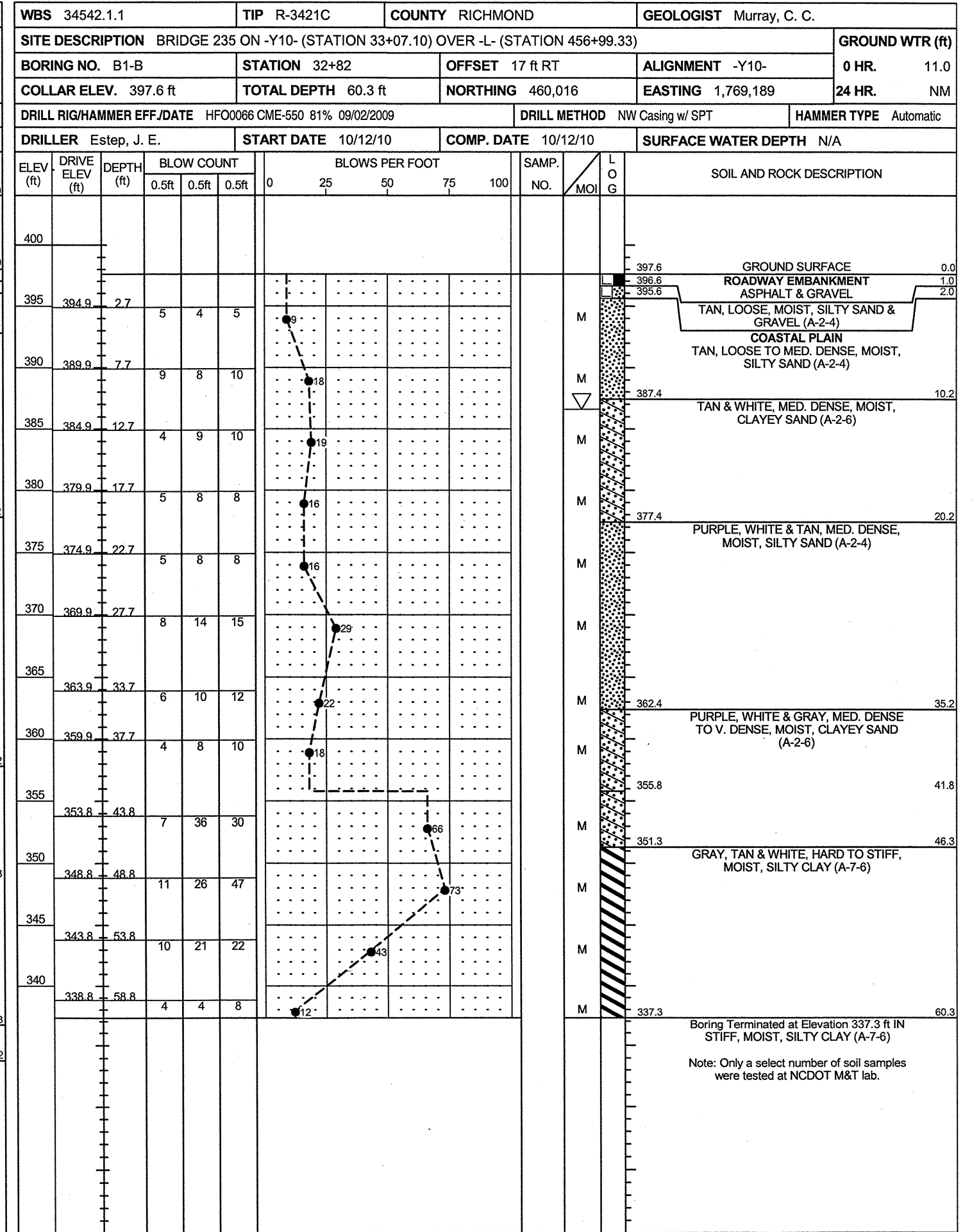
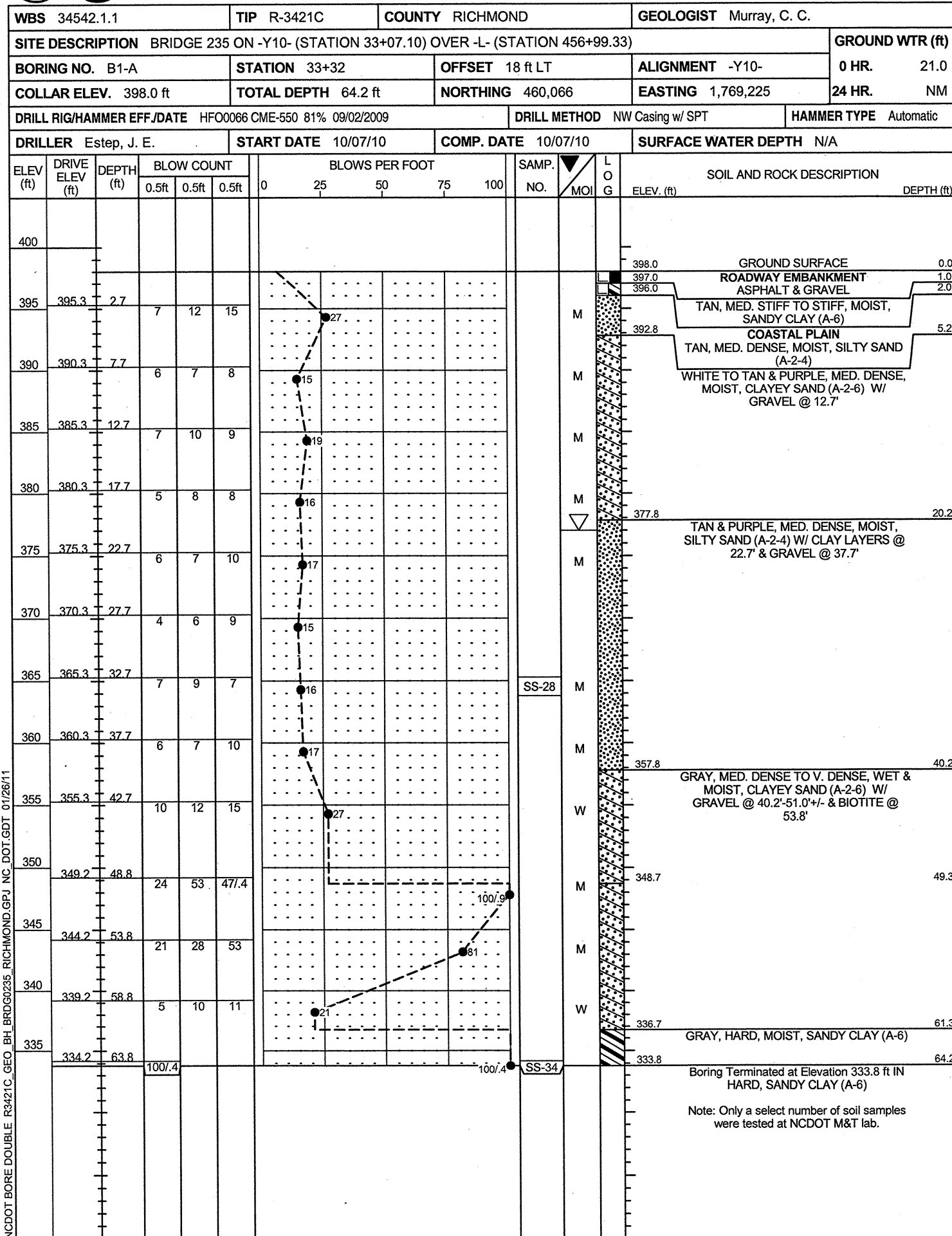


PROJECT REFERENCE NO.	SHEET
34542.1.1 (R-3421C)	6
Section Thru EndBent Two Sta. 34+41.10 -Y10- Screw = 124°59'14"	

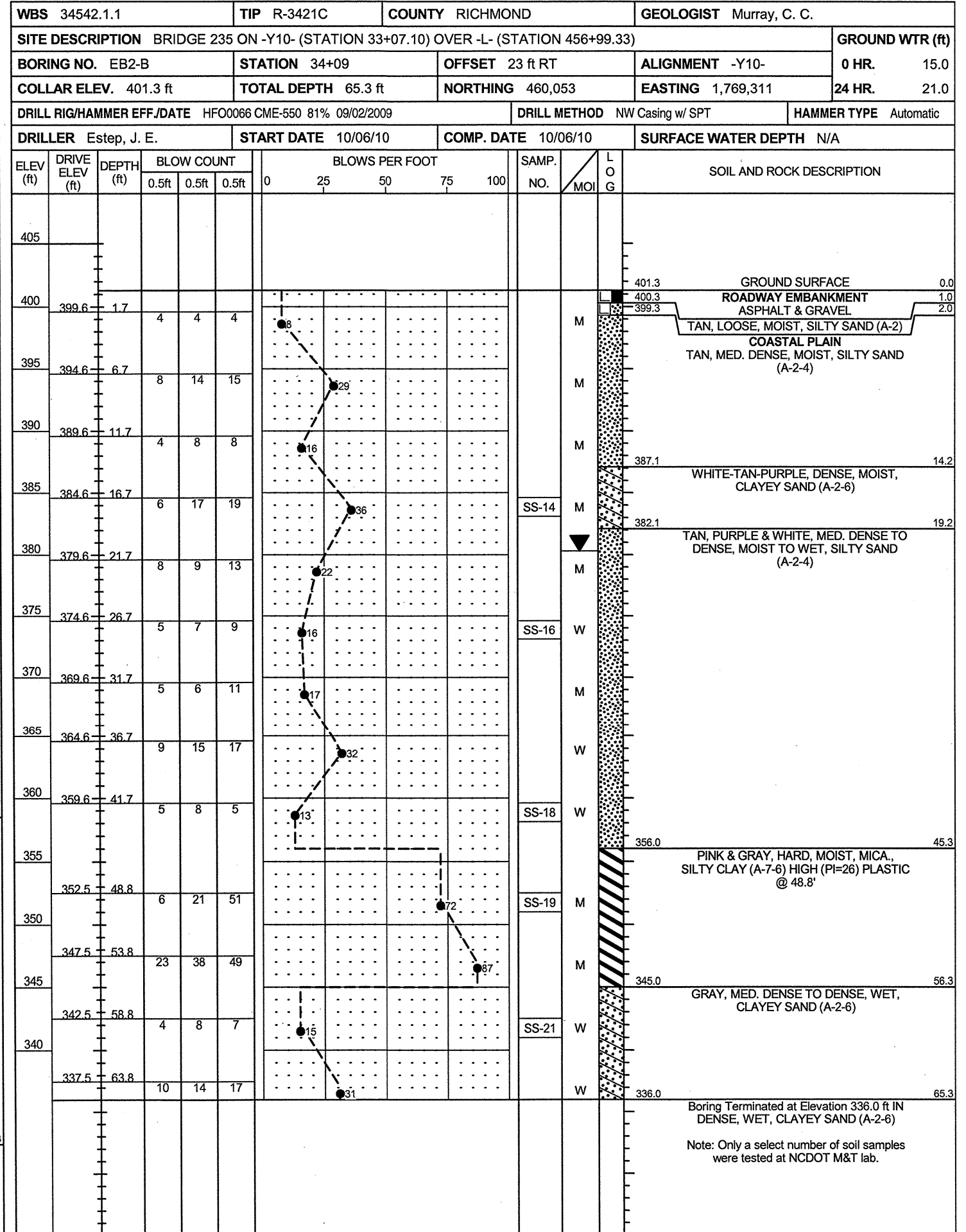
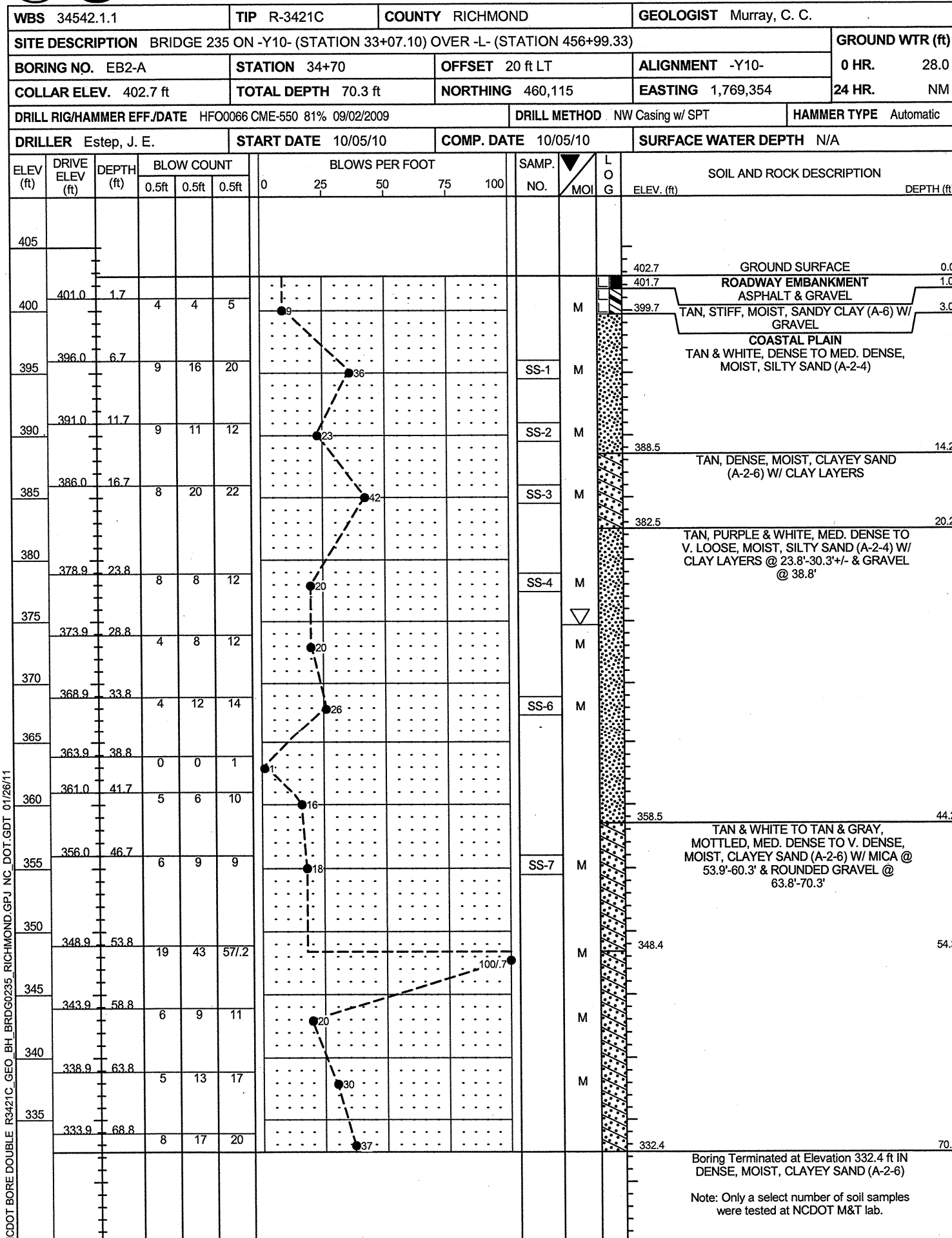


WBS 34542.1.1		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST Murray, C. C.								
SITE DESCRIPTION BRIDGE 235 ON -Y10- (STATION 33+07.10) OVER -L- (STATION 456+99.33)							GROUND WTR (ft)							
BORING NO. EB1-B		STATION 31+50		OFFSET 15 ft RT		ALIGNMENT -Y10-								
COLLAR ELEV. 402.7 ft		TOTAL DEPTH 50.4 ft		NORTHING 459,973		EASTING 1,769,065								
DRILL RIG/HAMMER EFF./DATE HFO0066 CME-550 81% 09/02/2009				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic								
DRILLER Estep, J. E.		START DATE 08/30/05		COMP. DATE 08/30/05		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
405														402.7 GROUND SURFACE 0.0
400	398.7	4.0	8	11	14						SS-989	M		COASTAL PLAIN ORANGE, MED. DENSE, MOIST, MED. (PI=20) TO HIGH (PI=28) PLASTIC, CLAYEY SAND (A-2-7)
395	393.7	9.0	11	13	14						SS-990	M		
390	388.7	14.0	8	10	12						SS-991	M		389.7 WHITE & TAN, MOT., MED. DENSE, MOIST, SLI. MICA., CLAYEY SAND (A-1-B) 13.0
385	383.7	19.0	5	6	7						SS-992	M		384.7 WHITE & PURPLE, MED. DENSE, MOIST, CLAYEY SAND (A-2-4) 18.0
380	378.7	24.0	4	7	7						SS-993	W		379.7 WHITE, PURPLE & GRAY, LAYERED MED. DENSE, WET, MICA. LOW (PI=13) PLASTIC, CLAYEY SAND (A-2-6) 23.0
375	373.7	29.0	4	5	5						SS-994	▼		376.2 WHITE, PURPLE & GRAY, LAYERED MED. DENSE, WET TO SAT., CLAYEY SAND (A-2-4) 26.5
370	368.7	34.0	4	9	16						SS-995	Sat.		
365	363.7	39.0	7	9	12							Sat.		
360	358.7	44.0	5	5	9						SS-996	Sat.		
355	353.7	49.0	25	50	50/4							M		354.2 WEATHERED ROCK (SLATE BELT) 48.5 352.3 WEATHERED ROCK (SLATE BELT) 50.4
														Boring Terminated at Elevation 352.3 ft IN WEATHERED ROCK (SLATE BELT) NOTE: BORING OBTAINED FROM THE R-3421C ROADWAY PROJECT. BORING Y10-3150R.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT



NCDOT BORE DOUBLE R3421C_GEO_BH_BRD0235_RICHMOND.GPJ NC_DOT_GDT_01/26/11



NCDOT BORE DOUBLE R3421C_GEO_BH_BRD0235_RICHMOND.GPJ NC DOT.GDT 01/26/11

TEST RESULTS

PROJECT: 34542.1.1 (R-3421C)

COUNTY: RICHMOND

SITE DESCRIPTION: BRDGE NO. 235 OVER US 220 BYPASS ON SR 1306 / SR 1446 BETWEEN SR 1305 AND SR 1445

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				
EB1-B																		
SS-989	15.0 RT	31+50	4.00-5.50	A-2-7(1)	25	44	20	72.6	8.0	2.1	17.2	96	38	20				
SS-990	15.0 RT	31+50	9.00-10.50	A-2-7(1)	27	51	28	71.3	10.5	2.9	15.2	96	36	19				
SS-991	15.0 RT	31+50	14.00-15.50	A-1(b)	22	27	6	78.4	8.1	1.3	12.2	95	33	14				
SS-992	15.0 RT	31+50	19.00-20.50	A-2-4(0)	13	24	NP	45.8	34.8	5.2	14.2	95	67	22				
SS-993	15.0 RT	31+50	24.00-25.50	A-2-6(0)	14	34	13	63.7	9.5	7.5	19.3	87	45	26				
SS-994	15.0 RT	31+50	29.00-30.50	A-2-4(0)	10	30	10	57.0	21.1	6.7	15.2	96	63	22				
SS-995	15.0 RT	31+50	34.00-35.50	A-2-4(0)	25	30	8	75.6	8.0	2.2	14.2	94	40	16				
SS-996	15.0 RT	31+50	44.0-45.50	A-2-4(0)	14	26	7	73.6	9.9	4.3	12.2	94	46	16				
B1-A																		
SS-28	18.0 LT	33+32	32.70-34.20	A-2-4(0)	16	25	3	56.8	22.8	3.2	17.1	99	65	21				
SS-34	18.0 LT	33+32	63.80-64.20	A-6(2)	100	29	17	40.3	23.1	12.4	24.1	93	73	37				
EB2-B																		
SS-14	23.0 RT	34+09	16.70-18.20	A-2-6(1)	36	36	18	59.9	15.4	0.6	24.1	94	62	24				
SS-16	23.0 RT	34+09	26.70-28.20	A-2-4(0)	16	26	5	68.0	14.8	4.1	13.1	100	54	18				
SS-18	23.0 RT	34+09	41.70-43.20	A-2-4(0)	13	19	NP	63.8	25.9	2.3	8.0	96	54	13				
SS-19	23.0 RT	34+09	48.80-50.30	A-7-6(10)	72	47	26	32.2	14.7	2.8	50.3	98	77	53				
SS-21	23.0 RT	34+09	58.80-60.30	A-2-6(1)	15	32	18	63.8	9.3	2.8	24.1	94	54	26				
EB2-A																		
SS-1	20.0 LT	34+70	6.70-8.20	A-2-4(0)	36	23	5	64.4	16.0	3.5	16.1	99	60	21				
SS-2	20.0 LT	34+70	11.70-13.20	A-2-4(0)	23	26	6	65.6	14.6	4.7	15.1	99	59	21				
SS-3	20.0 LT	34+70	16.70-18.20	A-2-6(1)	42	32	15	44.4	23.0	4.2	28.3	92	63	33				
SS-4	20.0 LT	34+70	23.80-25.30	A-2-4(0)	20	30	8	34.2	41.3	7.3	17.1	98	77	26				
SS-6	20.0 LT	34+70	33.80-35.30	A-2-4(0)	26	27	NP	56.1	25.4	5.4	13.1	98	71	19				
SS-7	20.0 LT	34+70	46.70-48.20	A-2-6(1)	18	34	16	40.6	26.4	2.8	30.2	97	70	33				

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	NCDOT DIVISION OF HIGHWAYS GEOTECHNICAL UNIT SOIL AND ROCK LEGEND, TERMS, AND ABBREVIATIONS
3-4	STRUCTURE SUBSURFACE INVESTIGATION REPORT SITE PLANS WITH BORING LOCATIONS WALL ENVELOPES WTH BORING DATA
5-15	BORING LOGS

PROJ. REFERENCE NO. 34542.1.2 (R-3421C) F.A. PROJ. NHF-220(8)
COUNTY RICHMOND
PROJECT DESCRIPTION I-73/74 FROM 0.2 MILES SOUTHWEST OF
SR 1304 (HARRINGTON RD) TO I-73/74 INTERCHANGE SOUTH
OF ELLERBE
SITE DESCRIPTION NOISEWALL -NW1- FROM -L- STA 545+93.58,
125.00 ft LT TO -L- STA 565+47.81, 235.63 ft LT

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

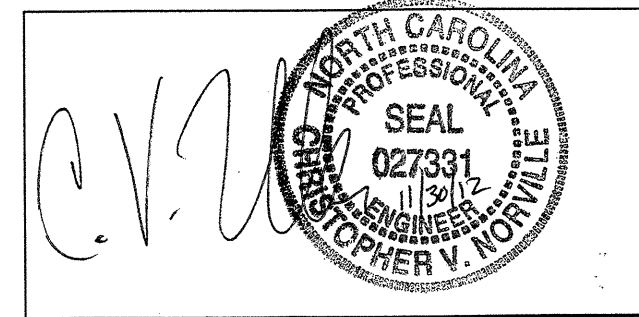
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE, THE LABORATORY SAMPLE DATA AND 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: 34542.1.2 ID: R-3421C

PERSONNEL
C. V. NORVILLE
M. BAHIRADHAN
J. R. HAMM
T. E. EVANS
M.A.D.

INVESTIGATED BY T. E. EVANS
CHECKED BY C. V. NORVILLE
SUBMITTED BY FALCON ENG
DATE NOVEMBER 2012



DRAWN BY: T. E. EVANS

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

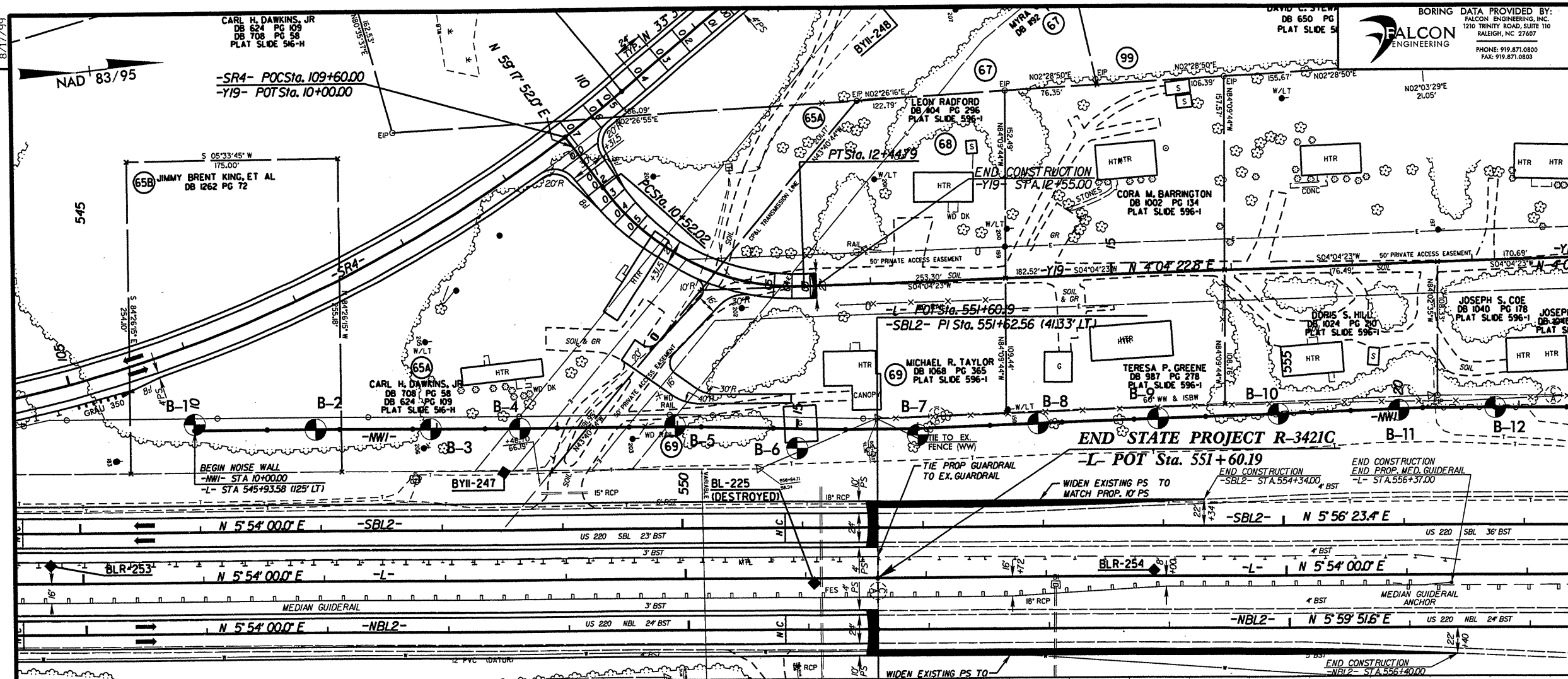
SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

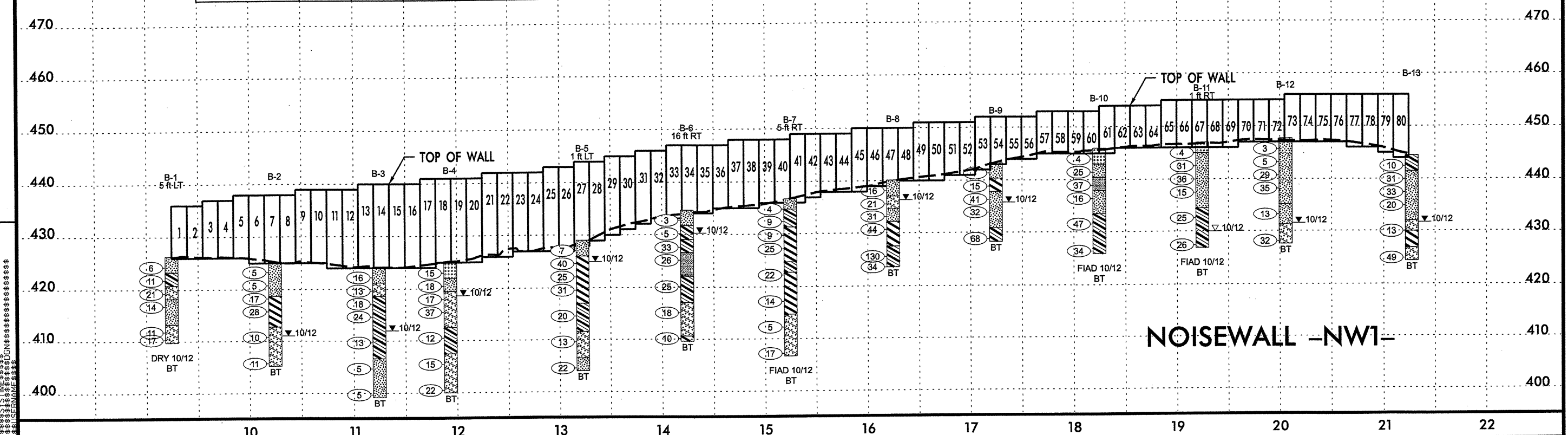
PROJECT REFERENCE NO. 34542.1.2 (R-3421C) SHEET NO. 2

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 SMALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										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.										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:										ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING										ROCK HARDNESS									
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.										SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.									
GROUP CLASS. A-1-a, A-1-b, A-2, A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-1, A-2, A-3, A-4, A-5, A-6, A-7										COMPRESSIBILITY										VERY SLIGHT (V SLI.)										VERY HARD									
SYMBOL										SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50										MODERATE (MOD.)										HARD									
% PASSING #10, #40, #200										PERCENTAGE OF MATERIAL										SEVERE (SEV.)										MODERATELY HARD									
LIQUID LIMIT PLASTIC INDEX										GROUND WATER										VERY SEVERE (V SEV.)										SOFT									
GROUP INDEX										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING										COMPLETE										VERY SOFT									
USUAL TYPES OF MAJOR MATERIALS										STATIC WATER LEVEL AFTER 24 HOURS										ROCK HARDNESS										SLIGHT (SLI.)									
GEN. RATING AS A SUBGRADE										PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA										ROCK HARDNESS										MODERATE (MOD.)									
EXCELLENT TO GOOD										SPRING OR SEEP										ROCK HARDNESS										MODERATELY SEVERE (MOD. SEV.)									
FAIR TO POOR										MISCELLANEOUS SYMBOLS										ROCK HARDNESS										MODERATELY HARD									
POOR										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION										ROCK HARDNESS										HARD									
UNSATURABLE										SOIL SYMBOL										ROCK HARDNESS										MODERATELY HARD									
PI OF A-7-5 SUBGROUP IS <= LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30										ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT										ROCK HARDNESS										MODERATELY HARD									
CONSISTENCY OR DENSENESS										INFERRED SOIL BOUNDARY										ROCK HARDNESS										MODERATELY HARD									
PRIMARY SOIL TYPE										INFERRED ROCK LINE										ROCK HARDNESS										MODERATELY HARD									
COMPACTNESS OR CONSISTENCY										ALLUVIAL SOIL BOUNDARY										ROCK HARDNESS										MODERATELY HARD									
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)										DIP & DIP DIRECTION OF ROCK STRUCTURES										ROCK HARDNESS										MODERATELY HARD									
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/F ²)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
GENERALY GRANULAR MATERIAL (NON-COHESIVE)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
GENERALY SILT-CLAY MATERIAL (COHESIVE)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
TEXTURE OR GRAIN SIZE										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
U.S. STD. SIEVE SIZE										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
BOULDER (BLDR.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
COBBLE (COB.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
GRAVEL (GR.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
COARSE SAND (CSE. SD.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
FINE SAND (F SD.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
SILT (SL.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
CLAY (CL.)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
GRAIN SIZE										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
SOIL MOISTURE - CORRELATION OF TERMS										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
SOIL MOISTURE SCALE (ATTERBERG LIMITS)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
FIELD MOISTURE DESCRIPTION										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
GUIDE FOR FIELD MOISTURE DESCRIPTION										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
LL - LIQUID LIMIT										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
PL - PLASTIC LIMIT										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
OM - OPTIMUM MOISTURE										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
SL - SHRINKAGE LIMIT										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
PLASTICITY										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
PLASTICITY INDEX (PI)										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
DRY STRENGTH										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
NONPLASTIC										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
LOW PLASTICITY										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
MED. PLASTICITY										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
HIGH PLASTICITY										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
COLOR										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									
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.										SOUNDING ROD										ROCK HARDNESS										MODERATELY HARD									

BORING DATA PROVIDED BY:
FALCON ENGINEERING
 1210 TRINITY ROAD, SUITE 110
 RALEIGH, NC 27607
 PHONE: 919.871.0800
 FAX: 919.871.0803



-NWI- DESIGN DATA																					
PANEL NUMBER:	1-2	3-4	5-8	9-12	13-16	17-20	21-24	25-26	27-28	29-30	31-32	33-36	37-40	41-44	45-48	49-52	53-56	57-60	61-64	65-72	73-80
TOP ELEVATION:	436.00'	437.00'	438.00'	439.00'	440.00'	441.00'	442.00'	443.00'	444.00'	445.00'	446.00'	447.00'	448.00'	449.00'	450.00'	451.00'	452.00'	453.00'	454.00'	455.00'	456.00'
LENGTH:	30.00'	30.00'	60.00'	60.00'	60.00'	60.00'	60.00'	30.00'	30.00'	30.00'	30.00'	60.00'	60.00'	60.00'	60.00'	60.00'	60.00'	60.00'	60.00'	120.00'	120.00'

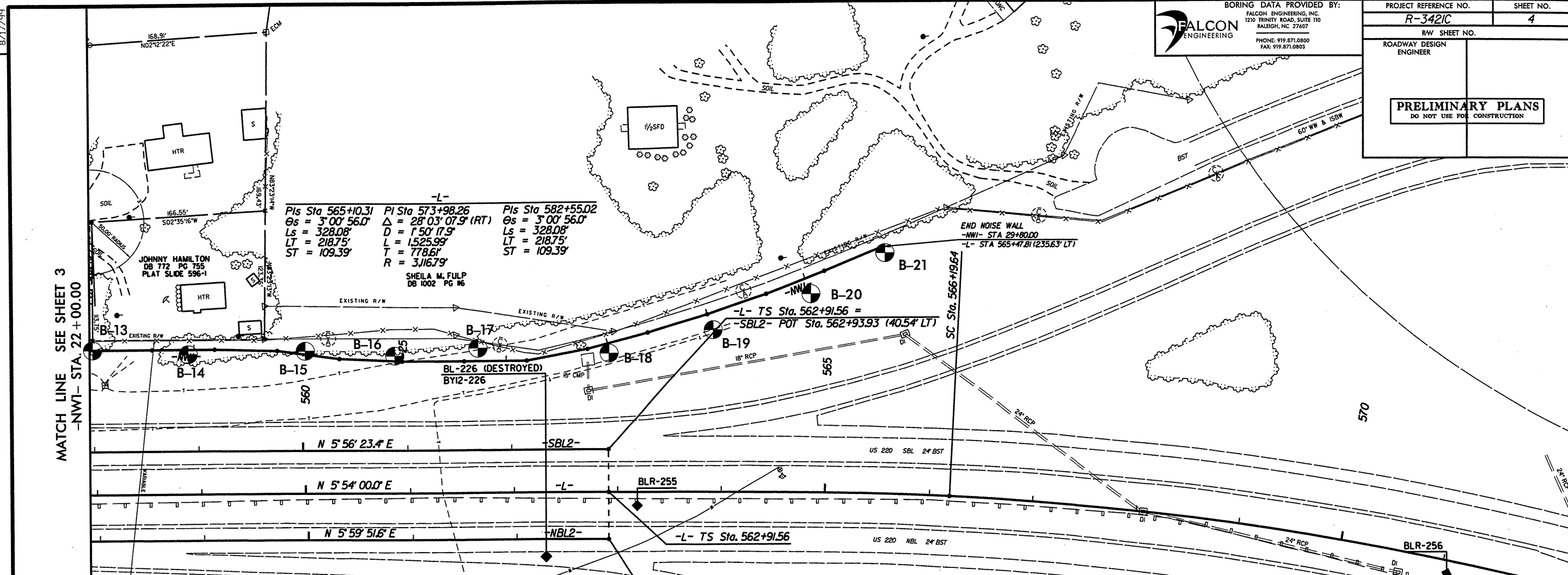


NOISEWALL -NWI-

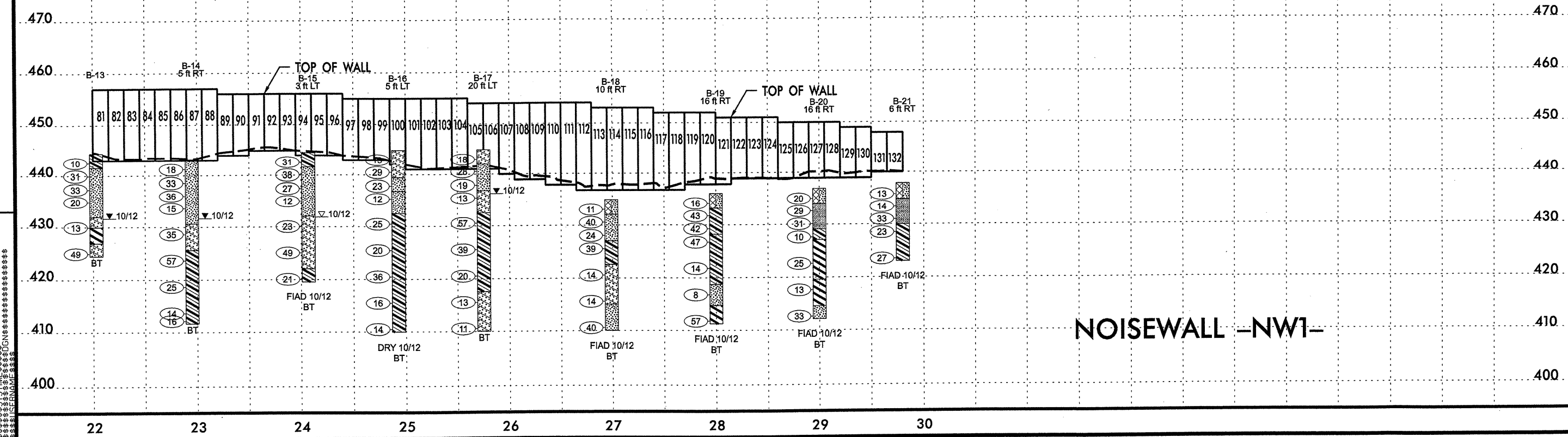
MATCH LINE SEE SHEET 4
-NWI- STA. 22 + 00.00

REVISIONS

8/17/99



-NW1- DESIGN DATA										
PANEL NUMBER:	81-88	89-96	97-104	105-112	113-116	117-120	121-124	125-128	129-130	131-132
TOP ELEVATION:	457.00'	456.00'	455.00'	454.00'	453.00'	452.00'	451.00'	450.00'	449.00'	448.00'
LENGTH:	120.00'	120.00'	120.00'	120.00'	60.00'	60.00'	60.00'	60.00'	30.00'	30.00'



NOISEWALL -NW1-

REVISIONS

8/17/99

MATCH LINE SEE SHEET 3
 -NW1- STA. 22+00.00

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-1	STATION 10+00	OFFSET 5 ft LT	ALIGNMENT -NW1- 0 HR. Dry
COLLAR ELEV. 426.3 ft	TOTAL DEPTH 16.5 ft	NORTHING 468,916	EASTING 1,769,719 24 HR. Dry
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/08/12	COMP. DATE 10/08/12	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				
430														
425	425.3	1.0	3	3	3								UNDIVIDED COASTAL PLAIN BROWN AND TAN, SILTY SAND (A-2-4)	3.0
	422.8	3.5	3	4	7								BROWN GRAY AND TAN, F. SANDY CLAY (A-6)	5.5
420	420.3	6.0	6	11	10								COASTAL PLAIN RED GRAY AND TAN, CLAYEY SAND (A-2-6) (MIDDENDORF FORMATION)	8.0
	417.8	8.5	6	6	8								RED GRAY AND TAN, SILTY AND CLAYEY SAND (A-2-4, A-2-6) (MIDDENDORF FORMATION)	13.0
415	412.8	13.5	5	5	6									
410	411.3	15.0	6	8	9									
													Boring Terminated at Elevation 409.8 ft in COASTAL PLAIN: Silty Sand.	16.5

WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-2	STATION 11+00	OFFSET CL	ALIGNMENT -NW1- 0 HR. N/A
COLLAR ELEV. 425.3 ft	TOTAL DEPTH 20.0 ft	NORTHING 469,014	EASTING 1,769,734 24 HR. 14.2
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/08/12	COMP. DATE 10/08/12	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				
430														
425	425.3	1.0	2	2	3								UNDIVIDED COASTAL PLAIN TAN AND GRAY, SILTY SAND (A-2-4)	3.0
	421.8	3.5	2	3	2									
420	419.3	6.0	2	6	11								COASTAL PLAIN TAN RED AND GRAY, F. SILTY CLAY (A-7) (MIDDENDORF FORMATION)	6.5
	416.8	8.5	8	12	16									
415	411.8	13.5	4	4	6								TAN AND GRAY, CLAYEY SAND (A-2-6) W/ CSE. SAND LAYERS (MIDDENDORF FORMATION)	12.5
410	406.8	18.5	4	6	5									
													Boring Terminated at Elevation 405.3 ft in COASTAL PLAIN: Clayey Sand.	20.0

NCDOT BORE DOUBLE R3421C GEO_SWAL001_GINTBORINGLOGS.GPJ NC_DOT.GDT 11/30/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-3	STATION 12+00	OFFSET CL	ALIGNMENT -NW1-
COLLAR ELEV. 424.2 ft	TOTAL DEPTH 25.0 ft	NORTHING 469,109	EASTING 1,769,744
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/08/12	COMP. DATE 10/08/12	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				
425													424.2 GROUND SURFACE 0.0	
	423.2	1.0	6	7	9							M	UNDIVIDED COASTAL PLAIN TAN AND GRAY, SILTY SAND (A-2-4)	
	420.7	3.5	8	8	5							M	TAN AND GRAY, CLAYEY SAND (A-2-6)	3.0
	418.2	6.0	6	9	9							W	COASTAL PLAIN RED GRAY AND TAN, SANDY CLAY (A-6) (MIDDENDORF FORMATION)	5.5
	415.7	8.5	8	10	14							W		
	410.7	13.5	5	5	8							W		
	405.7	18.5	4	3	2							W	GRAY AND TAN, SILTY CSE. SAND (A-2-4) W/ GRAVEL (MIDDENDORF FORMATION)	17.5
	400.7	23.5	2	3	2							W		

Boring Terminated at Elevation 399.2 ft in COASTAL PLAIN: Silty Cse. Sand.

WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-4	STATION 12+69	OFFSET CL	ALIGNMENT -NW1-
COLLAR ELEV. 425.0 ft	TOTAL DEPTH 25.0 ft	NORTHING 469,183	EASTING 1,769,752
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/09/12	COMP. DATE 10/09/12	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				
430													425.0 GROUND SURFACE 0.0	
	425.0	0.0										D	UNDIVIDED COASTAL PLAIN GRAY AND TAN, SLI. SILTY SAND (A-3)	
	422.0	3.0										D	BROWN AND TAN, SILTY SAND (A-2-4)	3.0
	419.5	5.5										M	ORANGE GRAY AND TAN, CLAYEY SAND (A-2-6) W/ GRAVEL	5.5
	412.5	12.5										M	COASTAL PLAIN RED GRAY AND TAN, F. SANDY CLAY (A-6) (MIDDENDORF FORMATION)	12.5
	407.5	17.5										M	GRAY AND TAN, SILTY CLAYEY SAND (A-2-6) (MIDDENDORF FORMATION)	17.5
	400.0	25.0										M		

Boring Terminated at Elevation 400.0 ft in COASTAL PLAIN: Silty Clayey Sand.

NCDOT BORE DOUBLE R3421C GEO_SWAL0001_GINTBORINGLOGS.GPJ NC_DOT.GDT 11/30/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS										
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)									
BORING NO. B-5		STATION 13+98		OFFSET 1 ft LT		ALIGNMENT -NW1-										
COLLAR ELEV. 429.1 ft		TOTAL DEPTH 25.0 ft		NORTHING 469,311		EASTING 1,769,764										
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER M. COOGIN		START DATE 10/09/12		COMP. DATE 10/09/12		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						
430														429.1	GROUND SURFACE	0.0
	428.1	1.0	3	3	4								D	UNDIVIDED COASTAL PLAIN BROWN AND TAN, SLI. SILTY SAND (A-2-4) W/ ROOTS	3.0	
425	425.6	3.5	7	18	22								D	COASTAL PLAIN RED GRAY AND TAN, F. SANDY CLAY (A-7) (MIDDENDORF FORMATION)		
	423.1	6.0	7	11	14								D			
420	420.6	8.5	7	17	14								M			
	415.6	13.5	8	9	11								M	RED GRAY AND TAN, F. SANDY CLAY (A-6) W/ GRAVEL AND CSE. SAND (MIDDENDORF FORMATION)	12.0	
415	410.6	18.5	5	5	8								M	GRAY TAN AND RED, SILTY AND CLAYEY SAND (A-2-4, A-2-6) W/ GRAVEL (MIDDENDORF FORMATION)	17.5	
410	405.6	23.5	4	10	12								M		22.5	
405													M		25.0	
Boring Terminated at Elevation 404.1 ft in COASTAL PLAIN: Clayey Sand.																

WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS										
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)									
BORING NO. B-6		STATION 15+00		OFFSET 16 ft RT		ALIGNMENT -NW1-										
COLLAR ELEV. 434.6 ft		TOTAL DEPTH 25.0 ft		NORTHING 469,410		EASTING 1,769,793										
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER M. COOGIN		START DATE 10/09/12		COMP. DATE 10/09/12		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						
435														434.6	GROUND SURFACE	0.0
	433.6	1.0	3	1	2								D	UNDIVIDED COASTAL PLAIN BROWN AND TAN, SILTY SAND (A-2-4) W/ ROOTS	3.0	
430	431.1	3.5	1	2	3								D	TAN, SANDY CLAY (A-6) W/ GRAVEL	5.5	
	428.6	6.0	7	14	19								M	COASTAL PLAIN RED GRAY AND TAN, CSE. SANDY CLAY (A-6) W/ GRAVEL (MIDDENDORF FORMATION)	8.0	
425	426.1	8.5	6	10	16								D	GRAY AND TAN, CSE. SANDY SILT (A-4) W/ GRAVEL (MIDDENDORF FORMATION)	12.5	
	421.1	13.5	5	13	12								M	GRAY AND TAN, SANDY CLAY (A-6) W/ GRAVEL (MIDDENDORF FORMATION)	17.5	
420	416.1	18.5	6	8	10								M		24.0	
415	411.1	23.5	3	5	5								M	GRAY AND TAN, SILTY CLAY (A-7) W/ CSE. SAND LAYERS (MIDDENDORF FORMATION)	25.0	
410													M			
Boring Terminated at Elevation 409.6 ft in COASTAL PLAIN: Silty Clay.																

NCDOT BORE DOUBLE R3421C_GEO_SWAL0001_GINTBORINGLOGS.GPJ NC_DOT_GDT 11/30/12

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WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-7	STATION 16+00	OFFSET 5 ft RT	ALIGNMENT -NW1-
COLLAR ELEV. 436.7 ft	TOTAL DEPTH 30.0 ft	NORTHING 469,511	EASTING 1,769,794
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/09/12	COMP. DATE 10/09/12	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					
440													436.7 GROUND SURFACE 0.0		
435	435.7	1.0	4	3	4							D	UNDIVIDED COASTAL PLAIN		
	433.2	3.5	5	5	9							M	BROWN AND TAN, SILTY SAND (A-2-4) W/ GRAVEL	2.0	
	430.7	6.0	14	12	9							D	ORANGE AND TAN, F. SANDY CLAY (A-6) W/ GRAVEL	5.5	
430	428.2	8.5	13	15	25							D	COASTAL PLAIN		
	423.2	13.5	10	13	22							D	RED GRAY AND TAN, F. SANDY CLAY (A-7) W/ SAND LAYERS (MIDDENDORF FORMATION)		
425	418.2	18.5	7	9	14							M	GRAY AND TAN, FN. SANDY CLAY (A-6) W/ GRAVEL (MIDDENDORF FORMATION)	12.0	
	413.2	23.5	4	5	5							M	GRAY AND PURPLE, F. SANDY CLAY (A-7) W/ GRAVEL LAYERS (MIDDENDORF FORMATION)	14.0	
420	408.2	28.5	10	12	17							M	YELLOW TAN AND ORANGE, CLAYEY SAND (A-2-6) W/ GRAVEL (MIDDENDORF FORMATION)	22.0	
415												W			
410												W			
														406.7 Boring Terminated at Elevation 406.7 ft in COASTAL PLAIN: Clayey Sand.	30.0

NCDOT BORE DOUBLE R3421C_GEO_SWAL0001_GINTBORINGLOGS.GPJ_NC_DOT.GDT_11/30/12

WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-8	STATION 17+00	OFFSET CL	ALIGNMENT -NW1-
COLLAR ELEV. 440.1 ft	TOTAL DEPTH 16.5 ft	NORTHING 469,611	EASTING 1,769,795
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD Wash Boring	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/09/12	COMP. DATE 10/09/12	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					
445													440.1 GROUND SURFACE 0.0		
440	439.1	1.0	9	9	7							D	UNDIVIDED COASTAL PLAIN		
	436.6	3.5	8	9	12							D	YELLOW AND TAN, CLAYEY SILTY SAND (A-2-4) W/ GRAVEL	3.0	
435	434.1	6.0	7	15	16							M	YELLOW GRAY AND TAN, CLAYEY SAND (A-2-6) W/ GRAVEL	5.5	
	431.6	8.5	9	16	28							D	COASTAL PLAIN		
430	426.6	13.5	9	13	17							M	RED BROWN AND TAN, CLAYEY SILTY SAND (A-2-4) W/ GRAVEL (MIDDENDORF FORMATION)	8.0	
	425.1	15.0	17	17	17							D	RED GRAY AND TAN, F. SANDY CLAY (A-7) W/ GRAVEL (MIDDENDORF FORMATION)	12.5	
425												M	GRAY AND TAN, SANDY CLAY (A-6) W/ GRAVEL (MIDDENDORF FORMATION)	16.5	
												M			
														Boring Terminated at Elevation 423.6 ft in COASTAL PLAIN: Sandy Clay.	

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WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS										
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)									
BORING NO. B-9		STATION 18+00		OFFSET CL		ALIGNMENT -NW1-										
COLLAR ELEV. 443.4 ft		TOTAL DEPTH 15.0 ft		NORTHING 469,711		EASTING 1,769,802										
DRILL RIG/HAMMER EFF./DATE MAD5003 D-25 73% 05/03/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER M. COOGIN		START DATE 10/09/12		COMP. DATE 10/09/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
445															443.4	0.0
	442.4	1.0	3	3	4									W	UNDIVIDED COASTAL PLAIN GRAY AND TAN, SILTY SAND (A-2-4) W/ GRAVEL	3.0
440	439.9	3.5	5	7	8									D	COASTAL PLAIN RED GRAY AND TAN, F. SANDY CLAY (A-6) W/ GRAVEL (MIDDENDORF FORMATION)	5.5
	437.4	6.0	16	18	23									W	RED GRAY AND YELLOW, SILTY MED. TO CSE SAND (A-2-4) W/ GRAVEL (MIDDENDORF FORMATION)	12.5
435	434.9	8.5	17	17	15										GRAY RED AND TAN, CLAYEY SAND (A-2-6) W/ GRAVEL (MIDDENDORF FORMATION)	15.0
430	429.9	13.5	18	29	39									D	Boring Terminated at Elevation 428.4 ft in COASTAL PLAIN: Clayey Sand.	

WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS										
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)									
BORING NO. B-10		STATION 19+00		OFFSET CL		ALIGNMENT -NW1-										
COLLAR ELEV. 446.0 ft		TOTAL DEPTH 20.0 ft		NORTHING 469,811		EASTING 1,769,809										
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER M. COOGIN		START DATE 10/12/12		COMP. DATE 10/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
450															446.0	0.0
	445.0	1.0	3	2	2									D	UNDIVIDED COASTAL PLAIN BROWN AND TAN, SLI. SILTY POORLY-GRADED SAND (A-3)	3.0
440	442.5	3.5	10	11	14									M	COASTAL PLAIN ORANGE TAN AND GRAY, SILTY SAND (A-2-4) (MIDDENDORF FORMATION)	5.5
	440.0	6.0	15	17	20									M	ORANGE BROWN AND TAN, F. SANDY SILT (A-4) (MIDDENDORF FORMATION)	8.0
	437.5	8.5	7	8	8									M	RED TAN AND GRAY, SILTY F. SAND (A-2-4) W/ GRAY SILT LAYER, GRAVEL (MIDDENDORF FORMATION)	12.5
435	432.5	13.5	5	13	34									D	GRAY RED AND TAN, F. SANDY CLAY (A-6) W/ TRACE TO LITTLE MICA, GRAVEL LAYERS, CSE. SAND LAYERS (MIDDENDORF FORMATION)	15.0
430	427.5	18.5	8	16	18									D	Boring Terminated at Elevation 426.0 ft in COASTAL PLAIN: F. Sandy Clay.	20.0

NCDOT BORE DOUBLE R3421C_GEO_SIVAL001_GINTBORINGLOGS.GPJ NC_DOT_GDT 11/30/12

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WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-11	STATION 20+00	OFFSET 1 ft RT	ALIGNMENT -NW1-
COLLAR ELEV. 447.0 ft	TOTAL DEPTH 20.0 ft	NORTHING 469,911	EASTING 1,769,816
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/12/12	COMP. DATE 10/12/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
450													GROUND SURFACE 447.0 0.0	
445	446.0	1.0		1	2	2							D	UNDIVIDED COASTAL PLAIN TAN, SLI. SILTY SAND (A-3) 445.0 2.0
	443.5	3.5		14	14	17							M	RED AND TAN, SILTY MED. TO CSE. SAND (A-2-4) W/ GRAVEL
440	441.0	6.0		11	19	17							M	
	438.5	8.5		6	8	7							D	
435	433.5	13.5		5	8	17							M	COASTAL PLAIN 434.5 12.5
	428.5	18.5		9	11	15							M	GRAY AND PURPLE, F. SANDY CLAY (A-6) W/ GRAVEL AND CSE. SAND (MIDDENDORF FORMATION)
430														Boring Terminated at Elevation 427.0 ft in COASTAL PLAIN: F. Sandy Clay.

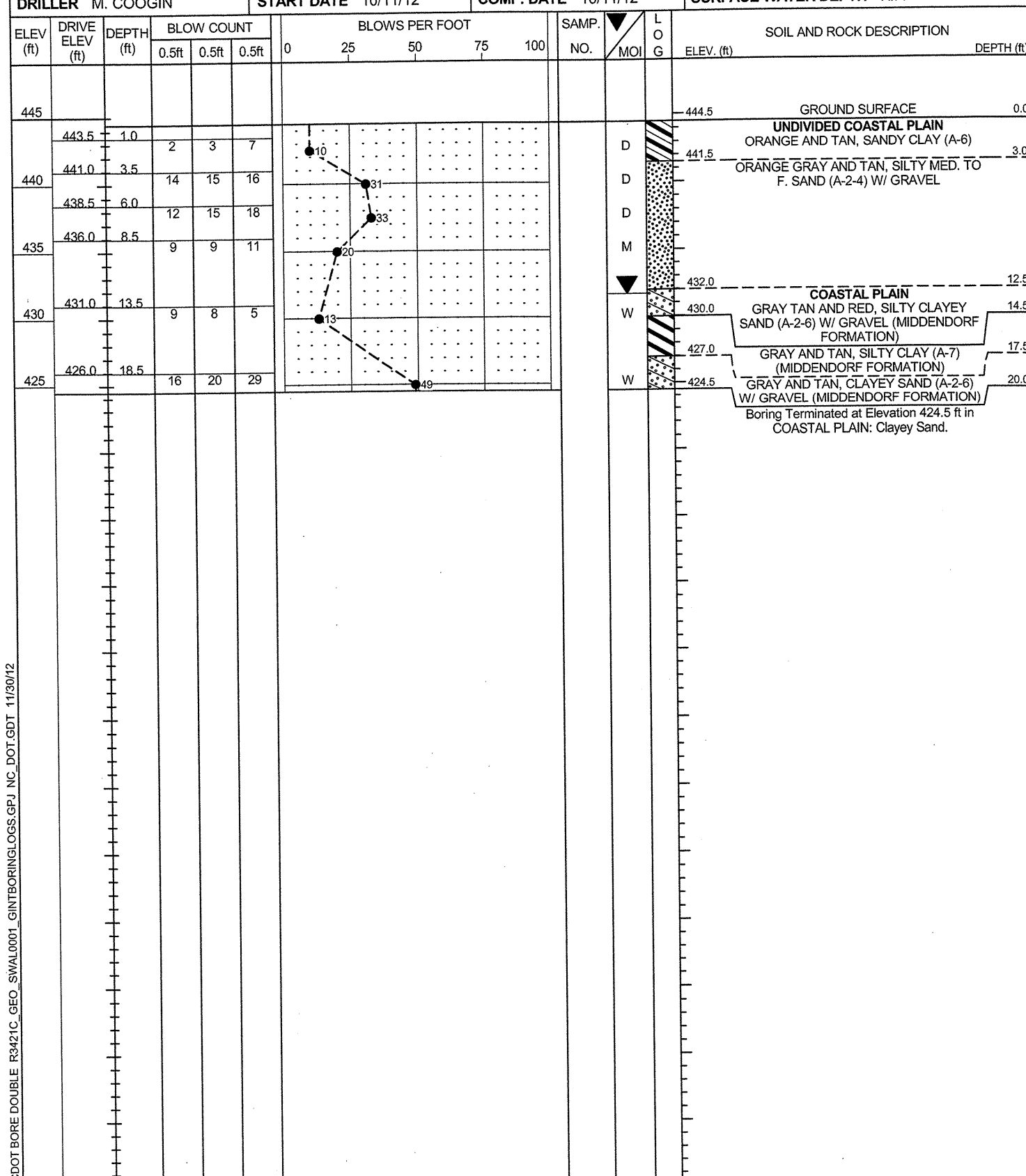
WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft)
BORING NO. B-12	STATION 20+81	OFFSET CL	ALIGNMENT -NW1-
COLLAR ELEV. 447.7 ft	TOTAL DEPTH 20.0 ft	NORTHING 469,991	EASTING 1,769,823
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/10/12	COMP. DATE 10/11/12	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
450													GROUND SURFACE 447.7 0.0	
445	446.7	1.0		2	1	2							D	UNDIVIDED COASTAL PLAIN TAN AND ORANGE, SILTY SAND (A-2-4) W/ GRAVEL
	444.2	3.5		2	2	3							M	
440	441.7	6.0		12	14	15							D	
	439.2	8.5		14	15	20							M	
435	434.2	13.5		6	6	7							M	COASTAL PLAIN 435.2 12.5
	429.2	18.5		4	8	24							W	RED TAN AND GRAY, SILTY F. SAND AND CLAYEY SAND (A-2-4, A-2-6) W/ GRAVEL (MIDDENDORF FORMATION) 431.2 16.5
430														Boring Terminated at Elevation 427.7 ft in COASTAL PLAIN: Clayey Sand.

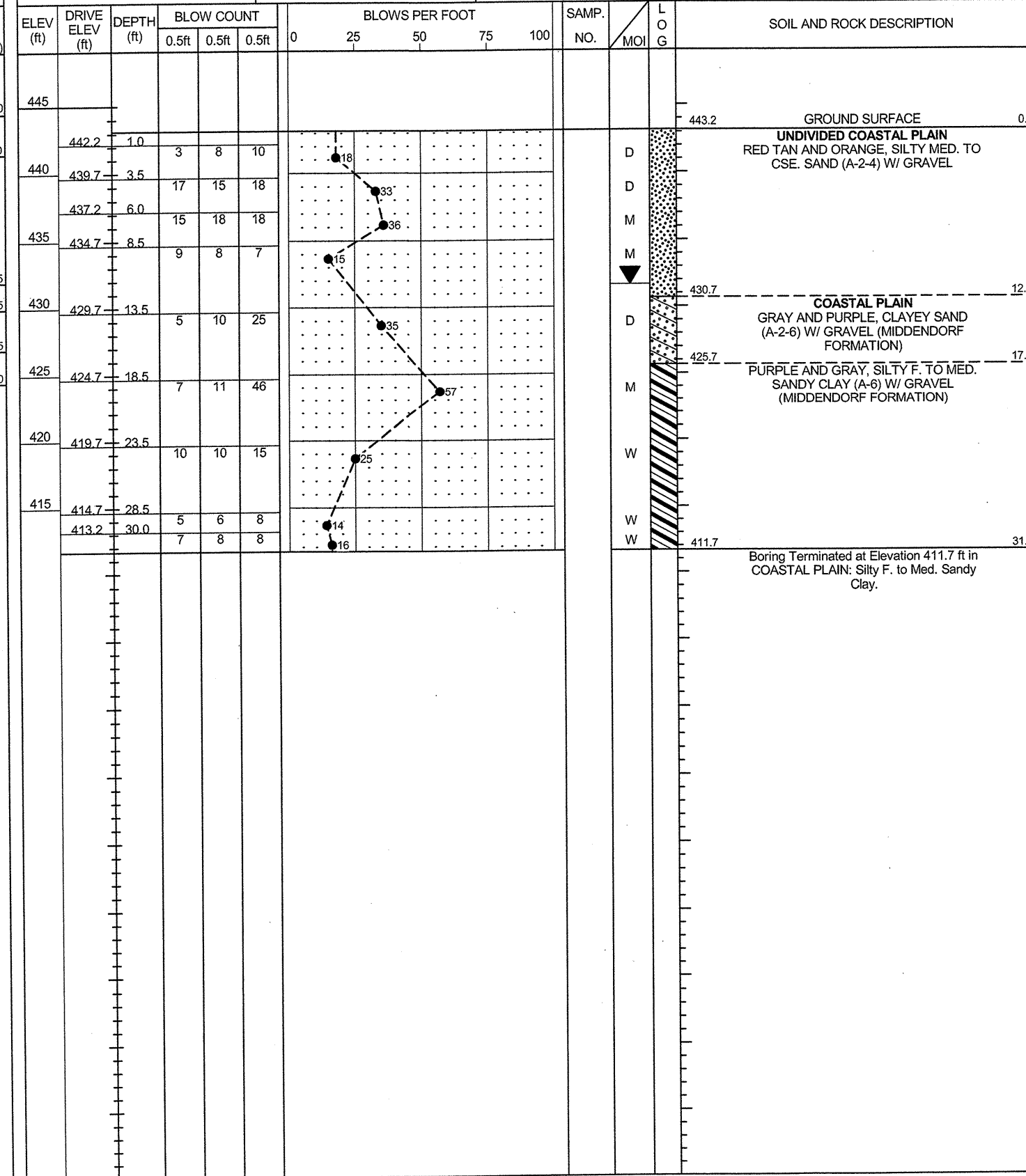
NCDOT BORE DOUBLE R3421C_GEO_SWAL001_GINTBORINGLOGS.GPJ_NC_DOT.GDT_11/30/12

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BORELOG REPORT

WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft) 0 HR. Caved 24 HR. 12.8
BORING NO. B-13	STATION 22+03	OFFSET CL	ALIGNMENT -NW1-
COLLAR ELEV. 444.5 ft	TOTAL DEPTH 20.0 ft	NORTHING 470,113	EASTING 1,769,835
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/11/12	COMP. DATE 10/11/12	SURFACE WATER DEPTH N/A



WBS 34542.1.2	TIP R-3421C	COUNTY RICHMOND	GEOLOGIST T. EVANS
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe			GROUND WTR (ft) 0 HR. Caved 24 HR. 11.5
BORING NO. B-14	STATION 22+95	OFFSET 5 ft RT	ALIGNMENT -NW1-
COLLAR ELEV. 443.2 ft	TOTAL DEPTH 31.5 ft	NORTHING 470,203	EASTING 1,769,849
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER M. COOGIN	START DATE 10/11/12	COMP. DATE 10/11/12	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE R3421C_GEO_SWAL0001_GINTBORINGLOGS.GPJ NC_DOT.GDT 11/30/12



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WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS										
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe						GROUND WTR (ft)										
BORING NO. B-15		STATION 24+07		OFFSET 3 ft LT		ALIGNMENT -NW1-										
COLLAR ELEV. 444.6 ft		TOTAL DEPTH 25.0 ft		NORTHING 470,315		EASTING 1,769,858										
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER M. COOGIN		START DATE 10/12/12		COMP. DATE 10/12/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
445																444.6
	443.6	1.0	3	14	17											441.6
	441.1	3.5	10	20	18											432.1
440	438.6	6.0	15	14	13											422.1
	436.1	8.5	6	6	6											419.6
435	431.1	13.5	4	12	11											
	426.1	18.5	12	26	23											
430	421.1	23.5	6	8	13											
425																
420																

WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS										
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe						GROUND WTR (ft)										
BORING NO. B-16		STATION 24+93		OFFSET 5 ft LT		ALIGNMENT -NW1-										
COLLAR ELEV. 445.0 ft		TOTAL DEPTH 35.0 ft		NORTHING 470,399		EASTING 1,769,871										
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic												
DRILLER M. COOGIN		START DATE 10/11/12		COMP. DATE 10/11/12		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
445																445.0
	444.0	1.0	10	3	10											439.5
	441.5	3.5	10	13	16											437.0
440	439.0	6.0	11	12	11											432.5
	436.5	8.5	6	6	6											
435	431.5	13.5	3	8	17											
	426.5	18.5	3	7	13											
430	421.5	23.5	10	15	21											
	416.5	28.5	6	7	9											
425	411.5	33.5	4	6	8											
420																
415																
410																

NCDOT BORE DOUBLE R3421C.GEO_SVAL001_GINTBORINGLOGS.GPJ_NC_DOT.GDT_11/30/12

NCDOT GEOTECHNICAL ENGINEERING UNIT
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WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS											
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)										
BORING NO. B-17		STATION 25+75		OFFSET 20 ft LT		ALIGNMENT -NW1-											
COLLAR ELEV. 445.1 ft		TOTAL DEPTH 35.0 ft		NORTHING 470,480		EASTING 1,769,873											
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD Mud Rotary		HAMMER TYPE Automatic													
DRILLER M. COOGIN		START DATE 10/11/12		COMP. DATE 10/11/12		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
450																	
445	444.1	1.0	6	6	12										445.1	0.0	GROUND SURFACE
	441.6	3.5	8	14	14										442.1	3.0	UNDIVIDED COASTAL PLAIN RED GRAY AND TAN, CLAYEY SAND (A-2-6)
440	439.1	6.0	7	10	9										442.1	3.0	RED GRAY AND TAN, SLI. SILTY SAND (A-2-4) W/ GRAVEL
	436.6	8.5	6	6	7										437.1	8.0	COASTAL PLAIN PURPLE AND GRAY, CLAYEY SAND (A-2-6) W/ GRAVEL (MIDDENDORF FORMATION)
435	431.6	13.5	11	22	35										432.6	12.5	GRAY TAN BROWN AND PURPLE, F. SANDY CLAY (A-6) W/ GRAVEL, FAT CLAY LAYERS (MIDDENDORF FORMATION)
	426.6	18.5	7	18	21										426.6	18.5	
425	421.6	23.5	5	8	12										417.6	27.5	TAN AND GRAY, CLAYEY SAND (A-2-6) (MIDDENDORF FORMATION)
420	416.6	28.5	5	6	7										410.1	35.0	Boring Terminated at Elevation 410.1 ft in COASTAL PLAIN: Clayey Sand.
415	411.6	33.5	4	6	5												

WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS											
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)										
BORING NO. B-18		STATION 26+99		OFFSET 10 ft RT		ALIGNMENT -NW1-											
COLLAR ELEV. 435.1 ft		TOTAL DEPTH 25.0 ft		NORTHING 470,605		EASTING 1,769,891											
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011		DRILL METHOD H.S. Augers		HAMMER TYPE Automatic													
DRILLER M. COOGIN		START DATE 10/12/12		COMP. DATE 10/12/12		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
440																	
435	434.1	1.0	5	6	5										435.1	0.0	GROUND SURFACE
	431.6	3.5	16	15	25										432.1	3.0	ARTIFICIAL FILL TAN AND BROWN, SILTY SAND (A-2-4) W/ GRAVEL
430	429.1	6.0	8	11	13										432.1	3.0	UNDIVIDED COASTAL PLAIN GRAY AND TAN, SILTY SAND (A-2-4) W/ GRAVEL, TRACE MICA
	426.6	8.5	11	16	23										427.1	8.0	COASTAL PLAIN GRAY PURPLE AND TAN, F. SANDY CLAY (A-6) W/ GRAVEL (MIDDENDORF FORMATION)
425	421.6	13.5	4	6	8										422.6	12.5	TAN GRAY AND YELLOW, CLAYEY AND SILTY SAND (A-2-6) W/ GRAVEL (MIDDENDORF FORMATION)
420	416.6	18.5	4	6	8										415.1	20.0	
415	411.6	23.5	20	17	23										410.1	25.0	Boring Terminated at Elevation 410.1 ft in COASTAL PLAIN: Clayey Silty Sand.

NCDOT BORE DOUBLE R3421C_GEO_SWAL0001_GINTBORINGLOGS.GPJ NC_DOT_GDT 11/30/12

WBS 34542.1.2		TIP R-3421C		COUNTY RICHMOND		GEOLOGIST T. EVANS								
SITE DESCRIPTION I-73/74 from 0.2 miles southwest of SR 1304 (Harrington Rd) to I-73/74 Interchange south of Ellerbe							GROUND WTR (ft)							
BORING NO. B-21		STATION 29+80		OFFSET 6 ft RT		ALIGNMENT -NW1-								
COLLAR ELEV. 438.0 ft		TOTAL DEPTH 15.0 ft		NORTHING 470,879		EASTING 1,769,825								
DRILL RIG/HAMMER EFF./DATE MAD2544 CME 45 77% 3/31/2011				DRILL METHOD H.S. Augers		HAMMER TYPE Automatic								
DRILLER M. COOGIN		START DATE 10/12/12		COMP. DATE 10/12/12		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
440														438.0 GROUND SURFACE 0.0
	437.0	1.0	3	7	6	13						M	ARTIFICIAL FILL RED GRAY AND TAN, SILTY SAND (A-2-4) W/ GRAVEL, TRACE ORGANICS	3.0
435	434.5	3.5	3	5	9	14						M	COASTAL PLAIN GRAY TAN AND PURPLE, F. SANDY SILT (A-4) W/ TRACE MICA (MIDDENDORF FORMATION)	
	432.0	6.0	7	13	20	33						D		8.0
430	429.5	8.5	6	11	12	23						D	GRAY AND TAN, F. TO CSE. SANDY CLAY (A-6) W/ TRACE MICA, GRAVEL (MIDDENDORF FORMATION)	
	424.5	13.5	10	12	15	27						M		15.0
Boring Terminated at Elevation 423.0 ft in COASTAL PLAIN: F.-Cse. Sandy Clay.														