



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PAT MCCRORY
GOVERNOR

ANTHONY J. TATA
SECRETARY

January 14, 2015

MEMORANDUM TO: Joey Hopkins, P.E.
Division 5 Engineer

ATTENTION: Lisa B. Gilchrist, E.I.
Division Bridge Program Manager

FROM: Kyung (K. J.) Kim, Ph.D., P.E. *KJK*
Eastern Regional Geotechnical Manager

STATE PROJECT: 17BP.5.R.57 (BMU-380025)
FEDERAL PROJECT: N/A
COUNTY: Granville

DESCRIPTION: Bridge No. 25 on SR 1710 (Lawrence Road) over Smith Creek
Between SR 1709 and SR 1711

SUBJECT: Bridge Foundation Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and has prepared the foundation design recommendations for the above structure and presents the following project data:

- Bridge Inventory (8) pages
- Foundation Design Recommendations (3) pages
- Design Calculations () pages
- Special Provisions () pages

Please call Nadia Al-Dhalimy, P.E. or Chris Kreider, P.E. at (919) 662-4710 if there are any questions concerning this memorandum.

KJK/CAK/NAA

MAILING ADDRESS:
EASTERN REGIONAL OFFICE
GEOTECHNICAL ENGINEERING UNIT
1570 MAIL SERVICE CENTER
RALEIGH NC 27699-1570

TELEPHONE: 919-662-4710
FAX: 919-662-3095

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
3301 JONES SAUSAGE RD., SUITE 100
GARNER, NC 27529-9489

FOUNDATION RECOMMENDATIONS

PROJECT 17BP.5.R.57

DESCRIPTION Bridge No. 25 on SR 1710 Over

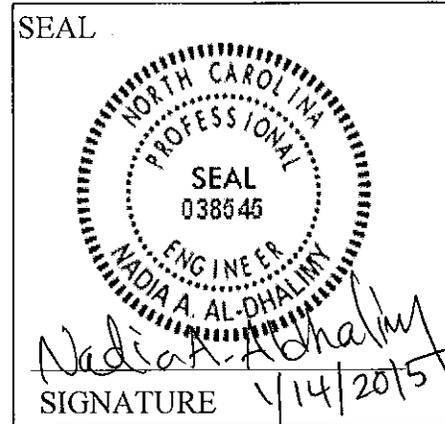
T.I.P. NO. BMU-380025

Smith Creek between SR 1709 and SR 1711

COUNTY Granville

STATION 15+45.50 -L-

	INITIALS	DATE
DESIGN	NAA	1/14/2015
CHECK	<i>JLK</i>	<i>1/14/2015</i>
APPROVAL		



BENT NO.	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT 1	15+09.20 -L-	Cap on HP 12 x 53 Steel Piles	85 Tons/Pile	Bottom of Cap Elevation = 312 ft. ± Estimated Pile Length = 15 ft. ± Number of Piles = 7
END BENT 2	15+81.80 -L-	Cap on HP 12 x 53 Steel Piles	85 Tons/Pile	Bottom of Cap Elevation = 312 ft. ± Estimated Pile Length = 20 ft. ± Number of Piles = 7

COMMENTS & NOTES (See Following Page)

FOUNDATION RECOMMENDATION NOTES ON PLANS

1. FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.
2. PILES AT END BENT NO. 1 AND END BENT NO. 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 85 TONS PER PILE.
3. DRIVE PILES AT END BENT NO. 1 AND END BENT NO. 2 TO A REQUIRED DRIVING RESISTANCE OF 145 TONS PER PILE.
4. STEEL H-PILE POINTS ARE REQUIRED FOR STEEL H-PILES AT END BENT NO. 1 AND END BENT NO. 2. FOR STEEL PILE POINTS, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.

FOUNDATION RECOMMENDATION COMMENTS

1. 1.5:1 (H:V) SLOPES FOR END BENTS WITH SLOPE PROTECTION TO BERM ARE OK.
2. NO WAITING PERIOD IS REQUIRED BEFORE BEGINNING ANY WORK FOR END BENT CONSTRUCTION AFTER COMPLETION OF THE EMBANKMENT AT EACH END BENT.
3. USE REINFORCED BRIDGE APPROACH FILL DETAILS AT BOTH END BENTS.

PILE PAY ITEMS

(Revised 8/15/12)

WBS ELEMENT 17BP.5.R.57

TIP NO. BMU-380025

COUNTY Granville

STATION 15+45.50 -L-

DATE 1/14/2015

DESIGNED BY NAA

CHECKED BY KJK

DESCRIPTION Bridge No. 25 on SR 1710 over Smith Creek
Between SR 1709 and SR 1711

NUMBER OF BENTS WITH PILES _____

NUMBER OF PILES PER BENT _____

NUMBER OF END BENTS WITH PILES _____

NUMBER OF PILES PER END BENT _____

Only required for "Predrilling
for Piles" & "Pile
Excavation" pay items

Bent # or End Bent #	PILE PAY ITEM QUANTITIES						PDA Testing (per each)
	Steel Pile Points (yes/no)	Pipe Pile Plates (yes/no/maybe)	Predrilling For Piles (per linear ft)	Pile Redrives (per each)	Pile Excavation (per linear ft)		
					In Soil	Not In Soil	
End Bent #1	yes						X
End Bent #2	yes						
TOTALS			0	0	0	0	0

Notes:
 Blanks or "no" represent quantity of zero.

If steel pile points are required, calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

If pipe pile plates are or may be required, calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

Show quantity of "PDA Testing" on the plans as total only.

If quantity of "PDA Testing" is 3 or less, reference "Pile Driving Criteria" provision in PDA notes on plans and include "Pile Driving Criteria" provision in the contract.

PROJECT: 17BP.5.R.57 REFERENCE: 380025

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	380025	1	8

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4	PROFILE(S)
5	CROSS SECTION(S)
6-7	BORE LOG(S)
8	SITE PHOTOGRAPH(S)

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY GRANVILLE
PROJECT DESCRIPTION BRIDGE NO. 25 ON -L-
(SR 1710) OVER SMITH CREEK AT STA. 15+45.5

CAUTION NOTICE

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

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

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

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

PERSONNEL

O. B. OTI

D. G. PINTER

T. T. WALKER

INVESTIGATED BY J. L. PEDRO

DRAWN BY T. T. WALKER

CHECKED BY N. T. ROBERSON

SUBMITTED BY N. T. ROBERSON

DATE JANUARY 2015

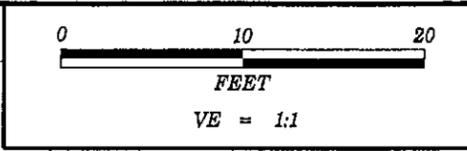


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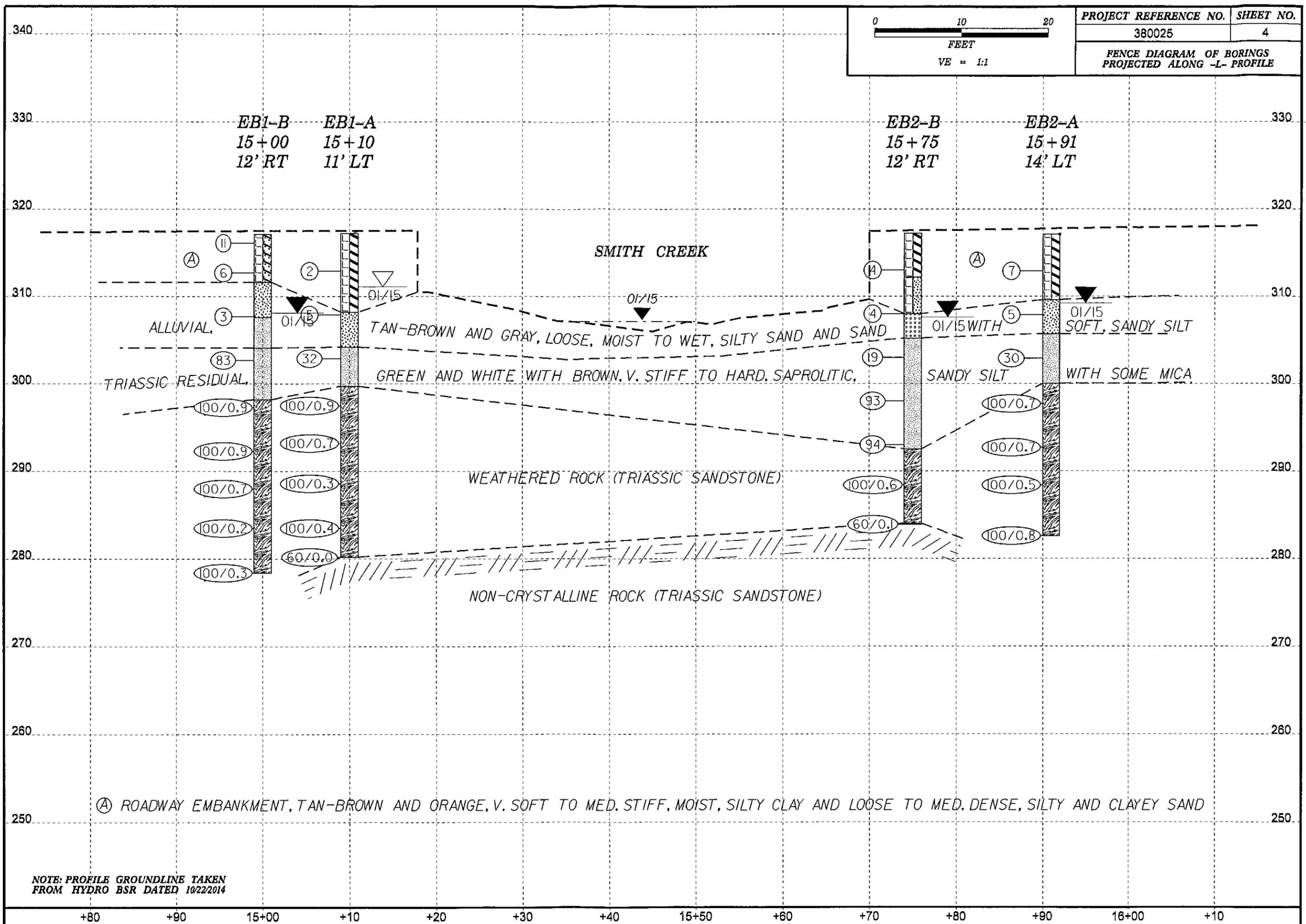
DATE

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

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																																	
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 60 BLOWS PER FOOT IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND 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 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. BENCH MARK: TBM 1, -L- Stg. 20+73.3, 30.5' RT, RR SPIKE SET IN 18" HICKORY ELEVATION: 334.97 FEET</p>																																																																																																																																																																																	
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1-a</th> <th>A-1-b</th> <th>A-3</th> <th>A-2</th> <th>A-2-4</th> <th>A-2-5</th> <th>A-2-6</th> <th>A-2-7</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th>PT-5</th> <th>PT-6</th> </tr> <tr> <th>GROUP CLASS.</th> <td colspan="2">A-1</td> <td colspan="2">A-2</td> <td colspan="2">A-3</td> <td colspan="2">A-4</td> <td colspan="2">A-5</td> <td colspan="2">A-6</td> <td colspan="2">A-7</td> <td colspan="2">A-1, A-2</td> <td colspan="2">A-3</td> </tr> <tr> <th>SYMBOL</th> <td colspan="2">[Symbol]</td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td colspan="2">50 30 15</td> </tr> <tr> <th>MATERIAL PASSING #10 #40 #200</th> <td colspan="2">[Symbol]</td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="2">0</td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">STONE FRAGS. GRAVEL, 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">GRANULAR SOILS</td> <td colspan="2">SILT-CLAY SOILS</td> <td colspan="2">MUCK, PEAT</td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td colspan="2">FAIR TO POOR</td> <td colspan="2">POOR</td> <td colspan="2">UNSATURABLE</td> <td colspan="2"></td> <td colspan="2"></td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)							ORGANIC MATERIALS		A-1-a	A-1-b	A-3	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	PT-5	PT-6	GROUP CLASS.	A-1		A-2		A-3		A-4		A-5		A-6		A-7		A-1, A-2		A-3		SYMBOL	[Symbol]		% PASSING #10 #40 #200	50 30 15		50 30 15		50 30 15		50 30 15		50 30 15		50 30 15		50 30 15		50 30 15		50 30 15		MATERIAL PASSING #10 #40 #200	[Symbol]		GROUP INDEX	0		0		0		0		0		0		0		0		0		USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		GRANULAR SOILS		SILT-CLAY SOILS		MUCK, PEAT		GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR		POOR		UNSATURABLE						<p>ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUND, OR ROUNDED.</p>										<p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CPI)</p>										<p>WEATHERING</p> <p>FRESH</p> <p>VERY SLIGHT (V SL)</p> <p>SLIGHT (SL)</p> <p>MODERATE (MOD)</p> <p>MODERATELY SEVERE (MOD. SEV)</p> <p>SEVERE (SEV)</p> <p>VERY SEVERE (V SEV)</p> <p>COMPLETE</p>																																									
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<p>COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>FRACTURE SPACING</p> <p>TERM</p> <p>VERY WIDE</p> <p>WIDE</p> <p>MODERATELY CLOSE</p> <p>CLOSE</p> <p>VERY CLOSE</p> <p>SPACING</p> <p>MORE THAN 10 FEET</p> <p>3 TO 10 FEET</p> <p>1 TO 3 FEET</p> <p>0.16 TO 1 FOOT</p> <p>LESS THAN 0.16 FEET</p>										<p>BEDDING</p> <p>TERM</p> <p>VERY THICK BEDDED</p> <p>THICKLY BEDDED</p> <p>THINLY BEDDED</p> <p>VERY THINLY BEDDED</p> <p>THICKLY LAMINATED</p> <p>THINLY LAMINATED</p> <p>THICKNESS</p> <p>4 FEET</p> <p>1.5 - 4 FEET</p> <p>0.16 - 1.5 FEET</p> <p>0.03 - 0.15 FEET</p> <p>0.008 - 0.03 FEET</p> <p>< 0.008 FEET</p>																																																																																																																																																																																											
<p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE</p> <p>MODERATELY INDURATED</p> <p>INDURATED</p> <p>EXTREMELY INDURATED</p> <p>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p>NOTES:</p> <p>TOP OF RAIL, AT EB1 STA. 15+18, OFFSET - 13.5' RT, ELEV. = 319.7'</p> <p>TOP OF RAIL, AT EB2 STA. 15+68, OFFSET - 13.5' RT, ELEV. = 319.7'</p>																																																																																																																																																																																																					

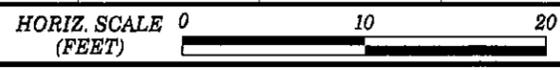
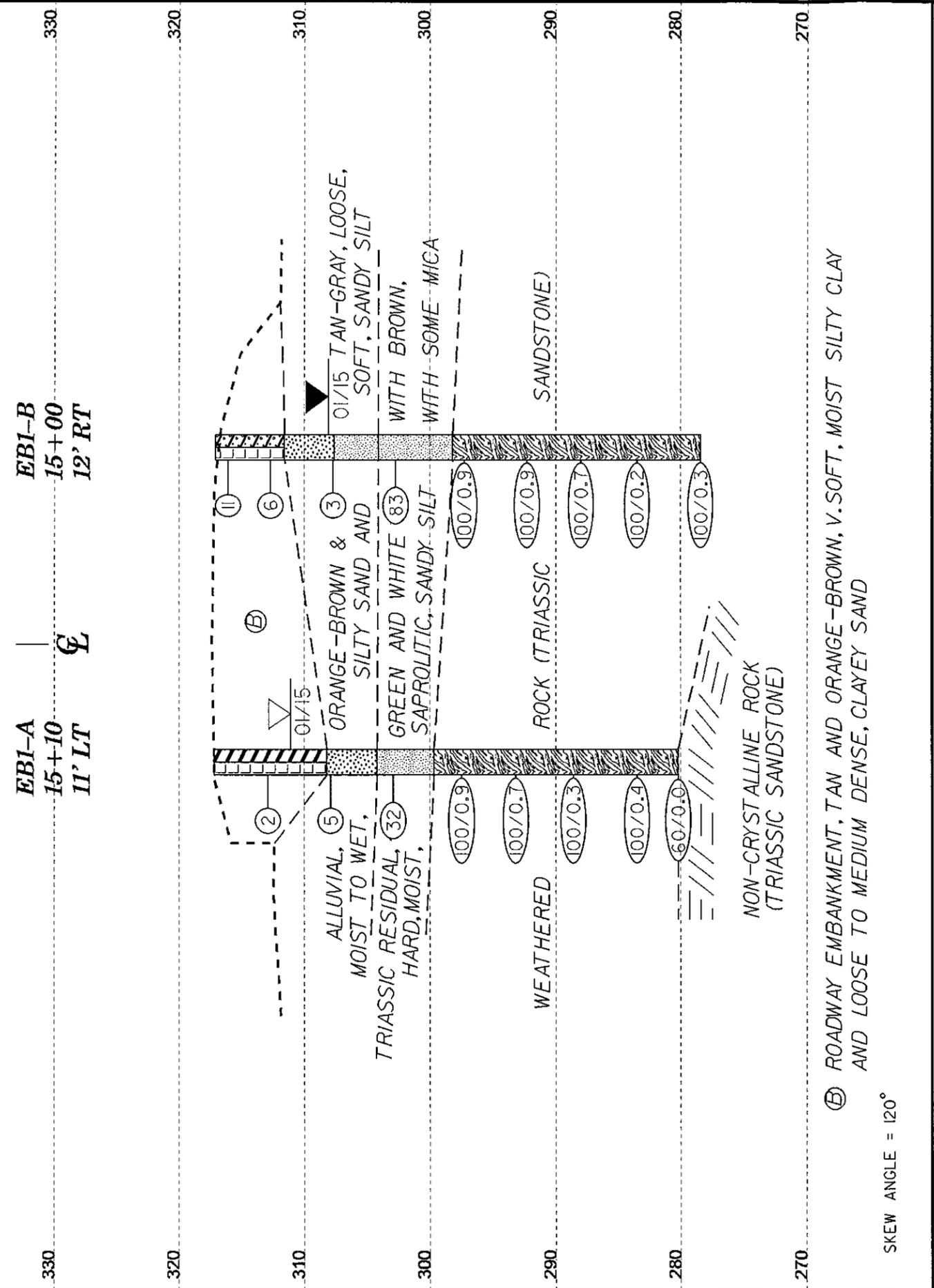


PROJECT REFERENCE NO.	SHEET NO.
380025	4
FENCE DIAGRAM OF BORINGS PROJECTED ALONG -L- PROFILE	



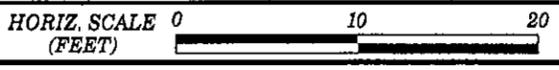
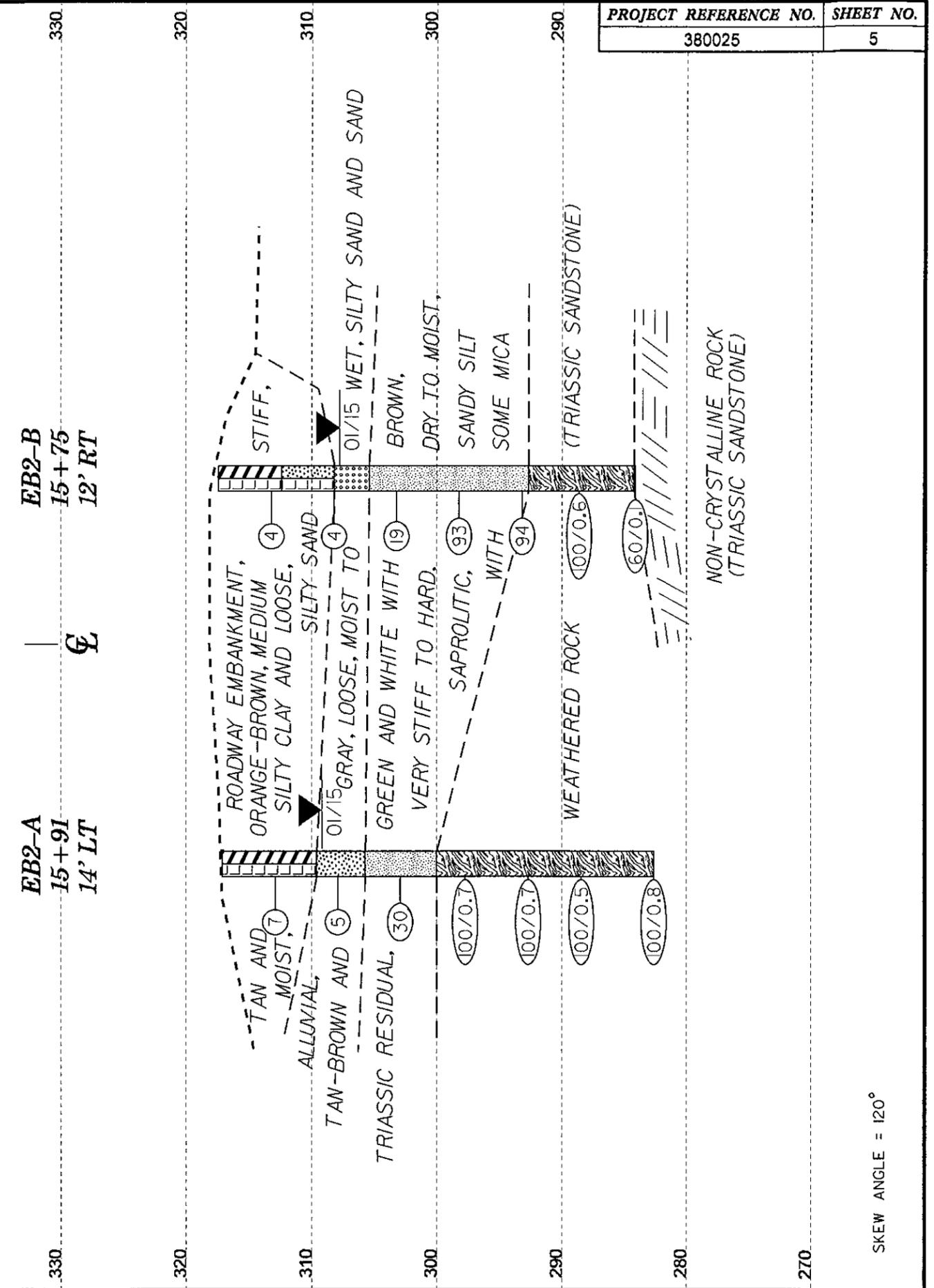
Ⓐ ROADWAY EMBANKMENT, TAN-BROWN AND ORANGE, V. SOFT TO MED. STIFF, MOIST, SILTY CLAY AND LOOSE TO MED. DENSE, SILTY AND CLAYEY SAND

NOTE: PROFILE GROUNDLINE TAKEN FROM HYDRO BSR DATED 10/22/2014



VE = 1:1

CROSS SECTION THROUGH END BENT 1



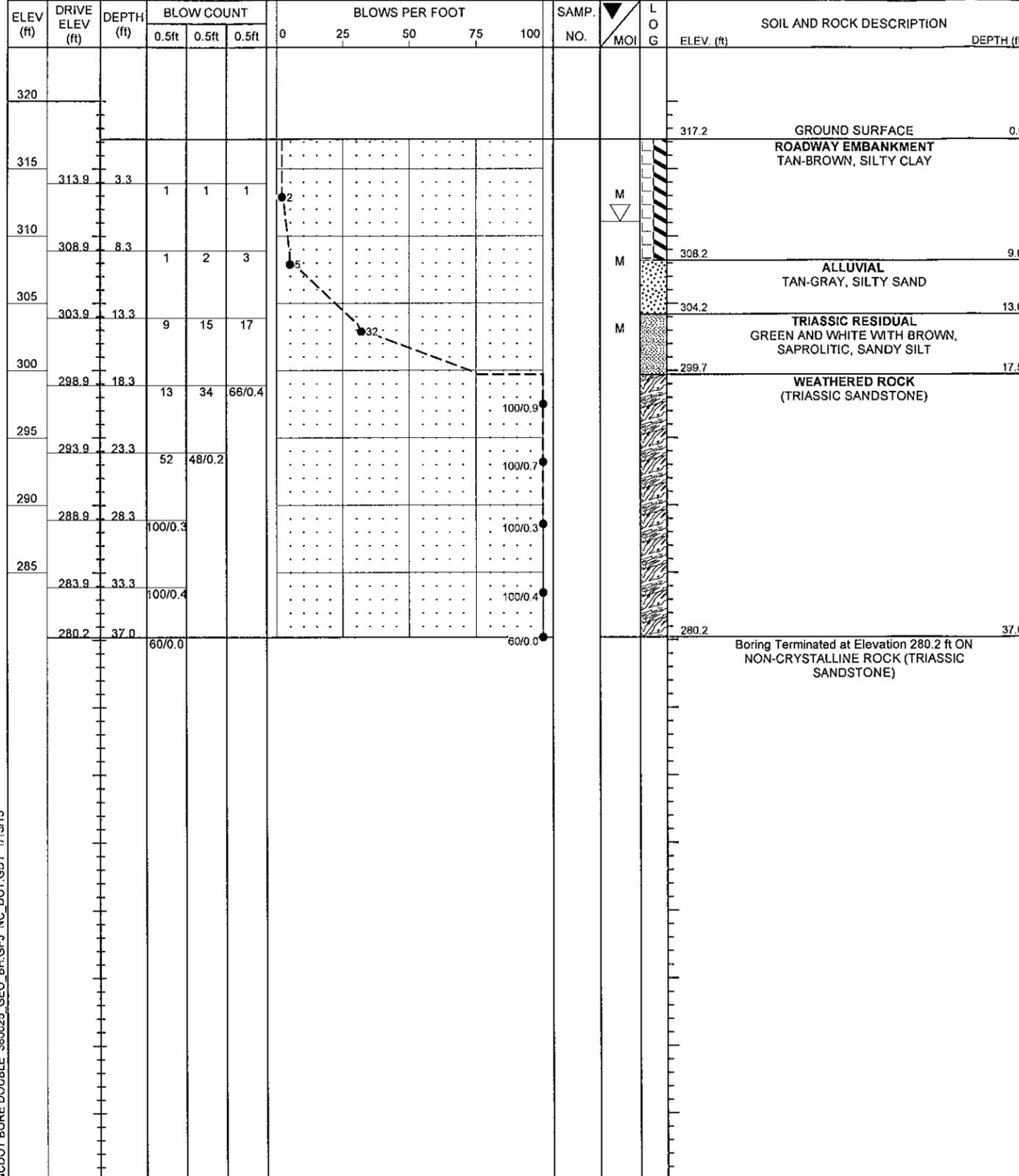
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CROSS SECTION THROUGH END BENT 2

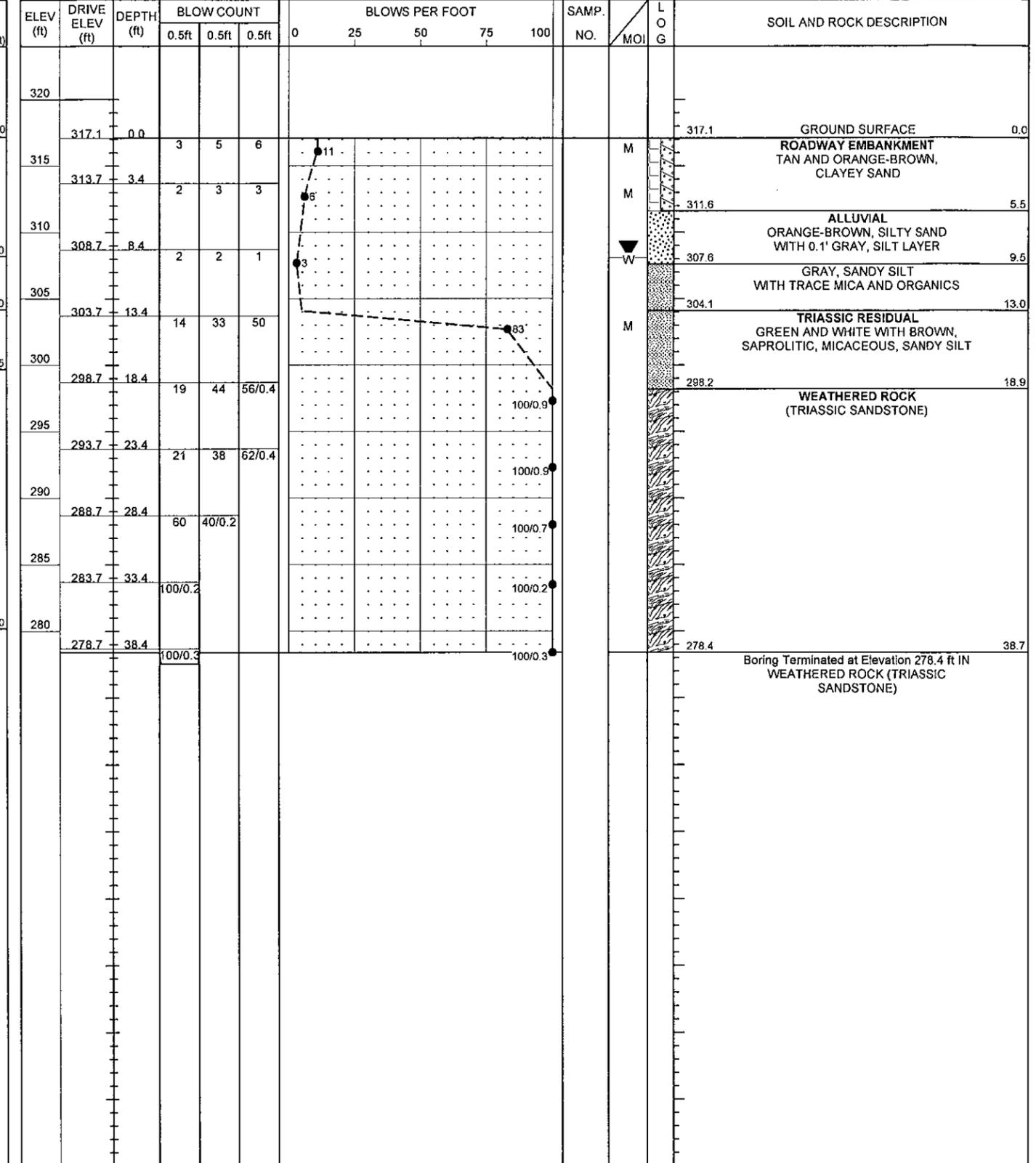


NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.5.R.57	TIP 380025	COUNTY GRANVILLE	GEOLOGIST Oti, O. B.
SITE DESCRIPTION BRIDGE NO. 25 ON -L- (SR 1710) OVER SMITH CREEK			GROUND WTR (ft)
BORING NO. EB1-A	STATION 15+10	OFFSET 11 ft LT	ALIGNMENT -L-
COLLAR ELEV. 317.2 ft	TOTAL DEPTH 37.0 ft	NORTHING 851,358	EASTING 2,117,462
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 92% 07/12/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Pinter, D. G.	START DATE 01/07/15	COMP. DATE 01/08/15	SURFACE WATER DEPTH N/A



WBS 17BP.5.R.57	TIP 380025	COUNTY GRANVILLE	GEOLOGIST Pedro, J. L.
SITE DESCRIPTION BRIDGE NO. 25 ON -L- (SR 1710) OVER SMITH CREEK			GROUND WTR (ft)
BORING NO. EB1-B	STATION 15+00	OFFSET 12 ft RT	ALIGNMENT -L-
COLLAR ELEV. 317.1 ft	TOTAL DEPTH 38.7 ft	NORTHING 851,354	EASTING 2,117,437
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 92% 07/12/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Pinter, D. G.	START DATE 01/06/15	COMP. DATE 01/06/15	SURFACE WATER DEPTH N/A

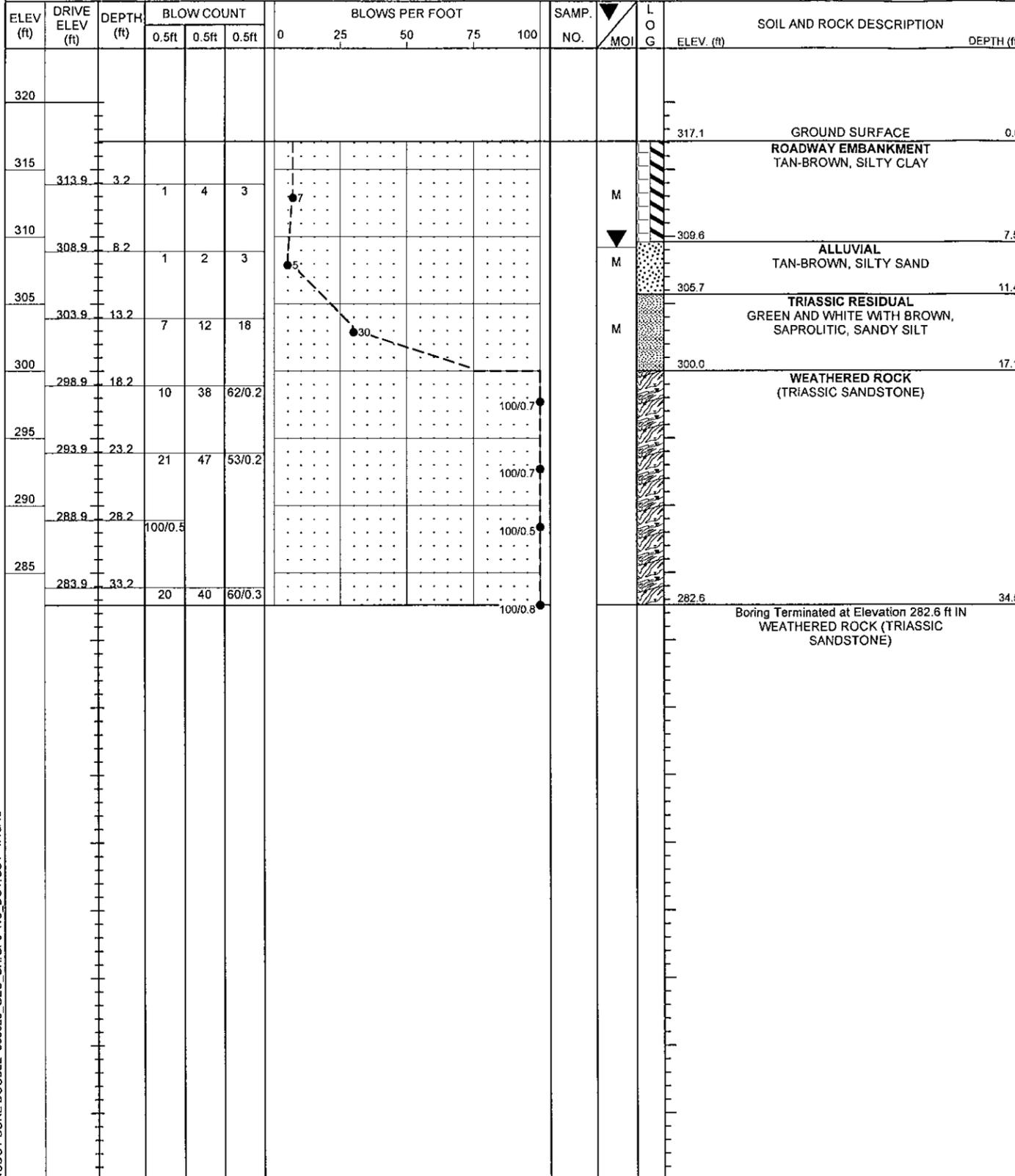


NCDOT BORE DOUBLE 380025 GEO_BH.GPJ NC_DOT_GDT 1/13/15

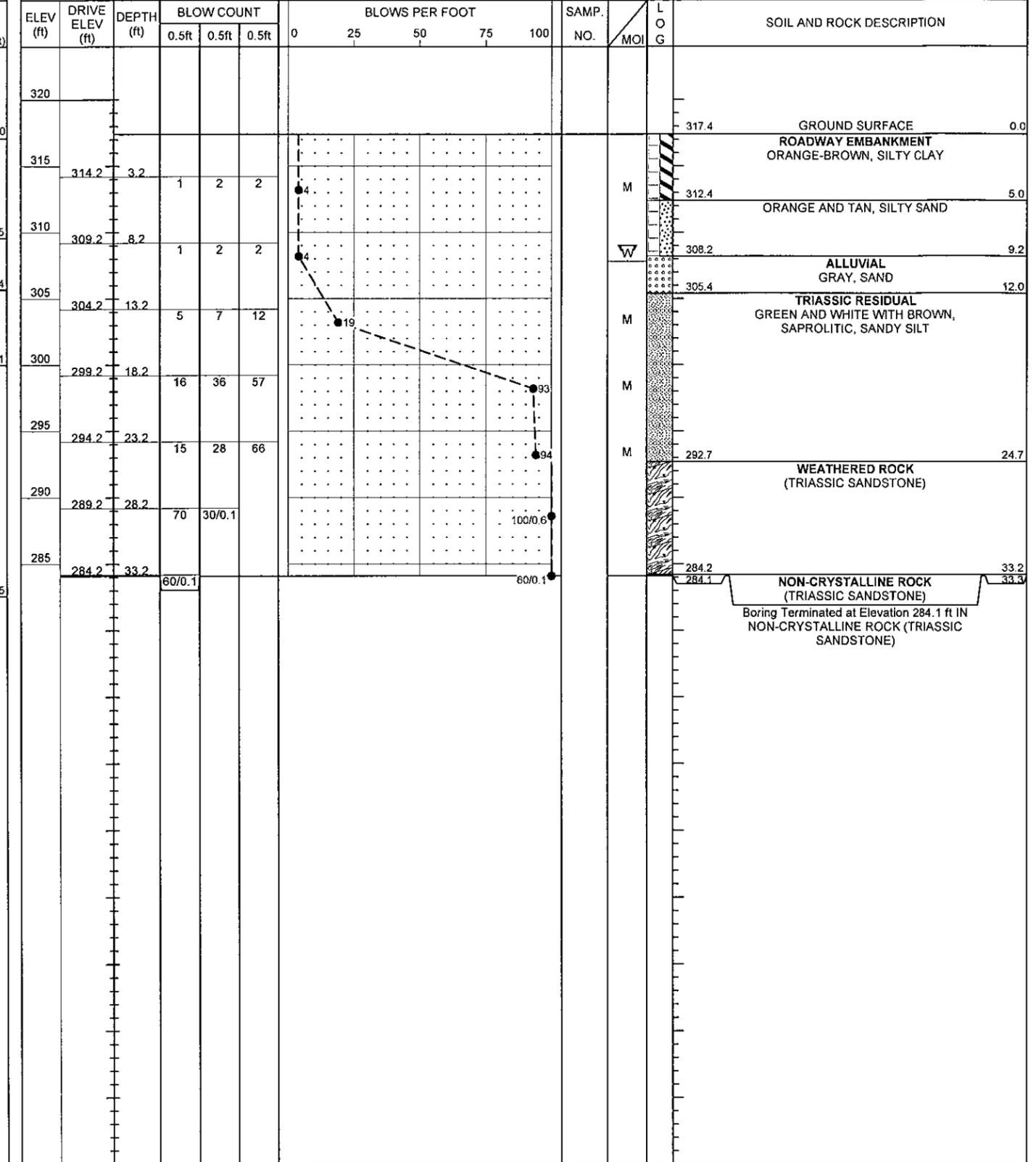


NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 17BP.5.R.57	TIP 380025	COUNTY GRANVILLE	GEOLOGIST Oti, O. B.
SITE DESCRIPTION BRIDGE NO. 25 ON -L- (SR 1710) OVER SMITH CREEK			GROUND WTR (ft)
BORING NO. EB2-A	STATION 15+91	OFFSET 14 ft LT	ALIGNMENT -L-
COLLAR ELEV. 317.1 ft	TOTAL DEPTH 34.5 ft	NORTHING 851,290	EASTING 2,117,507
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 92% 07/12/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Pinter, D. G.	START DATE 01/07/15	COMP. DATE 01/07/15	SURFACE WATER DEPTH N/A



WBS 17BP.5.R.57	TIP 380025	COUNTY GRANVILLE	GEOLOGIST Pedro, J. L.
SITE DESCRIPTION BRIDGE NO. 25 ON -L- (SR 1710) OVER SMITH CREEK			GROUND WTR (ft)
BORING NO. EB2-B	STATION 15+75	OFFSET 12 ft RT	ALIGNMENT -L-
COLLAR ELEV. 317.4 ft	TOTAL DEPTH 33.3 ft	NORTHING 851,290	EASTING 2,117,476
DRILL RIG/HAMMER EFF./DATE RFO0074 CME-55 92% 07/12/2011		DRILL METHOD H.S. Augers	HAMMER TYPE Automatic
DRILLER Pinter, D. G.	START DATE 01/06/15	COMP. DATE 01/06/15	SURFACE WATER DEPTH N/A



NCDOT BORE DOUBLE 380025 GEO. BH.GPJ NC_DOT.GDT 1/13/15

SITE PHOTOGRAPH

Bridge No. 25 on -L- (SR 1710) over Smith Creek



Looking East towards End Bent 2