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REFERENCE: B-4961

PROJECT: 40152

SEE SHEET 3 FOR PLAN SHEET LAYOUT  
AT TIME OF INVESTIGATION

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4961	1	11

**CONTENTS**

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>
-L-	14+50.00-19+00.00	4
-Y-	10+00.00-11+66.46	4

**CROSS SECTIONS**

<u>LINE</u>	<u>STATION</u>	<u>SHEETS</u>
-L-	15+25.00-17+75.00	5-8
-Y-	10+50.00	9

**ROADWAY**  
**SUBSURFACE INVESTIGATION**

COUNTY Guilford  
PROJECT DESCRIPTION Bridge #208 on SR 3051 over  
Little Alamance Creek

**INVENTORY**

**CAUTION NOTICE**

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

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

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

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

PERSONNEL

D. Racey

S. Davis

J. Basham

D. Jenks

INVESTIGATED BY F&R, Inc.

DRAWN BY D. Racey

CHECKED BY P. Alton, PE

SUBMITTED BY F&R, Inc.

DATE December 2014



DocuSigned by:  
W. Patrick Alton  
A270EF78A6DF442... 12/31/2014

SIGNATURE DATE

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

SOIL DESCRIPTION		GRADATION		ROCK DESCRIPTION		TERMS AND DEFINITIONS																																																					
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (ASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>		<p><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <b>GAP-GRADED</b> - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> <p style="text-align: center;"><b>ANGULARITY OF GRAINS</b></p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: <u>ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</u></p>		<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> <p><b>WEATHERED ROCK (WR)</b>  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p> <p><b>CRYSTALLINE ROCK (CR)</b>  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p><b>NON-CRYSTALLINE ROCK (NCR)</b>  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p><b>COASTAL PLAIN SEDIMENTARY ROCK (CP)</b>  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>		<p><b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. <b>ARTESIAN</b> - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																					
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<p><b>GENERAL CLASS.</b></p> <p><b>GROUP CLASS.</b></p> <p><b>SYMBOL</b></p> <p><b>% PASSING #10 #40 #200</b></p> <p><b>MATERIAL PASSING #40 LL PI</b></p> <p><b>GROUP INDEX</b></p> <p><b>USUAL TYPES OF MAJOR MATERIALS</b></p> <p><b>GEN. RATING AS SUBGRADE</b></p>		<p><b>GRANULAR MATERIALS (&lt;= 35% PASSING #200)</b></p> <p><b>SILT-CLAY MATERIALS (&gt; 35% PASSING #200)</b></p> <p><b>ORGANIC MATERIALS</b></p> <p><b>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</b></p> <p style="text-align: center;"><b>COMPRESSIBILITY</b></p> <p>SLIGHTLY COMPRESSIBLE LL &lt; 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL &gt; 50</p> <p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> </thead> <tbody> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </tbody> </table> <p style="text-align: center;"><b>GROUND WATER</b></p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p style="text-align: center;"><b>MISCELLANEOUS SYMBOLS</b></p> <p> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p> SOIL SYMBOL</p> <p> ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p> INFERRED SOIL BOUNDARY</p> <p> INFERRED ROCK LINE</p> <p> ALLUVIAL SOIL BOUNDARY</p> <p> DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</p> <p> SPT, DMT, VST, PMT TEST BORING</p> <p> AUGER BORING</p> <p> CORE BORING</p> <p> MONITORING WELL</p> <p> PIEZOMETER INSTALLATION</p> <p> SLOPE INDICATOR INSTALLATION</p> <p> CONE PENETROMETER TEST</p> <p> SOUNDING ROD</p> <p> TEST BORING WITH CORE</p> <p> SPT N-VALUE</p>			GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%	HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE	<p><b>CONSISTENCY OR DENSENESS</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)</td> <td>VERY LOOSE</td> <td>&lt; 4</td> <td>N/A</td> </tr> <tr> <td>MEDIUM DENSE</td> <td>4 TO 10</td> <td></td> </tr> <tr> <td>DENSE</td> <td>10 TO 30</td> <td></td> </tr> <tr> <td rowspan="3">GENERALLY SILT-CLAY MATERIAL (COHESSIVE)</td> <td>VERY SOFT</td> <td>&lt; 2</td> <td>&lt; 0.25</td> </tr> <tr> <td>SOFT</td> <td>2 TO 4</td> <td>0.25 TO 0.5</td> </tr> <tr> <td>MEDIUM STIFF</td> <td>4 TO 8</td> <td>0.5 TO 1.0</td> </tr> <tr> <td rowspan="3"></td> <td>STIFF</td> <td>8 TO 15</td> <td>1 TO 2</td> </tr> <tr> <td>VERY STIFF</td> <td>15 TO 30</td> <td>2 TO 4</td> </tr> <tr> <td>HARD</td> <td>&gt; 30</td> <td>&gt; 4</td> </tr> </tbody> </table>		PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT <sup>2</sup> )	GENERALLY GRANULAR MATERIAL (NON-COHESSIVE)	VERY LOOSE	< 4	N/A	MEDIUM DENSE	4 TO 10		DENSE	10 TO 30		GENERALLY SILT-CLAY MATERIAL (COHESSIVE)	VERY SOFT	< 2	< 0.25	SOFT	2 TO 4	0.25 TO 0.5	MEDIUM STIFF	4 TO 8	0.5 TO 1.0		STIFF	8 TO 15	1 TO 2	VERY STIFF	15 TO 30	2 TO 4	HARD	> 30	> 4
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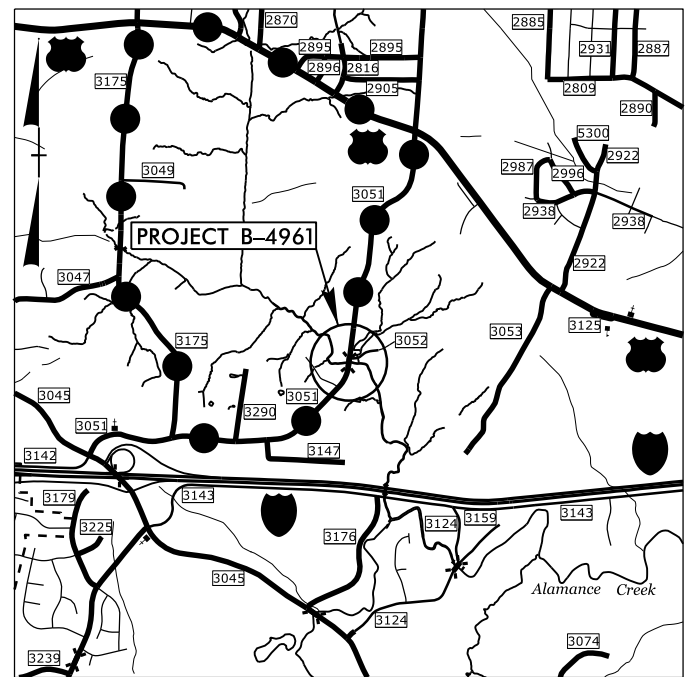
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4961	3	11
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
40152.1.1	BRZ-3051(1)	PE	

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**GUILFORD COUNTY**

LOCATION: BRIDGE NO. 208 ON SR 3051 (KNOX ROAD)  
OVER LITTLE ALAMANCE CREEK

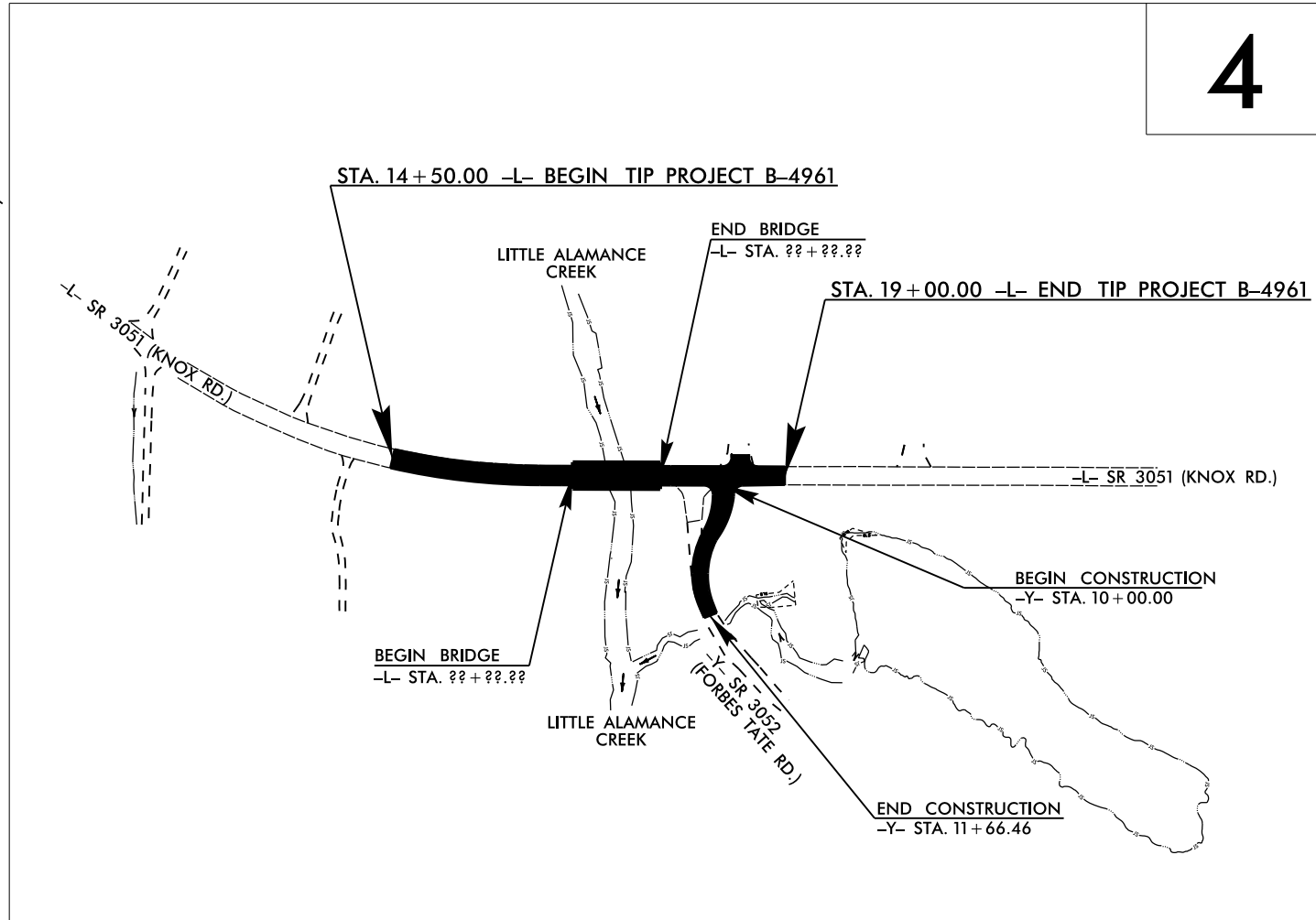
TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE



VICINITY MAP

● ● ● OFFSITE DETOUR

TO MT. HOPE  
CHURCH ROAD



4

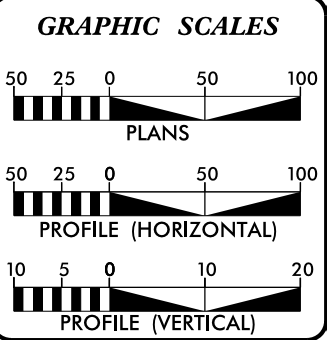
TO BURLINGTON RD.  
(HWY 70)

DESIGN EXCEPTION REQUIRED FOR SAG VERTICAL CURVES AND ASSOCIATED STOPPING SIGHT DISTANCES.  
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.  
CLEARING ON THIS PROJECT SHALL BE PREPARED TO THE LIMITS ESTABLISHED BY METHOD \_\_\_\_\_.

INCOMPLETE PLANS  
DO NOT USE FOR R/W ACQUISITION  
PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

CONTRACT: TIP PROJECT: B-4961

CONTRACT: TIP PROJECT: B-4961



**DESIGN DATA**

ADT 2016	=	2,080
ADT 2035	=	3,600
DHV	=	14 %
D	=	55 %
T	=	5 % *
V	=	55 MPH
* TTST	=	1% DUAL = 4%
FUNC CLASS	=	COLLECTOR
		"SUBREGIONAL TIER"

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT B-4961	=	????? MILES
LENGTH STRUCTURE TIP PROJECT B-4961	=	????? MILES
TOTAL LENGTH OF TIP PROJECT B-4961	=	0.085 MILES

Prepared in the Office of:  
**DIVISION OF HIGHWAYS**  
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
NOVEMBER 20, 2015

LETTING DATE:  
NOVEMBER 15, 2016

JAMES A. SPEER, PE  
PROJECT ENGINEER

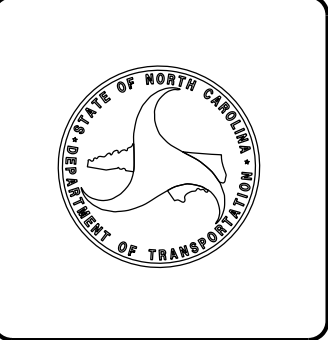
DANIEL W. GARDNER, JR., PE  
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: \_\_\_\_\_ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: \_\_\_\_\_ P.E.



19-DEC-2014 11:27 F:\Projects\665\665-0190 (NC001-B-4961)Guilford Co\ACADD\_GEO\TECH\PlanProf\B4961\_Rdy\_tsh.dgn dr acey AT 66CAD



December 19, 2014

State Project No.: 40152.1.1  
TIP No.: B-4961  
F.A. Number: BRZ-3051(1)  
County: Guilford  
Description: Bridge No. 208 on SR 3051 (Knox Road) over Little Alamance Creek

**SUBJECT: Geotechnical Report – Inventory**

Project Description

This project involves the replacement of Bridge No. 208 on SR 3051 (Knox Road) over Little Alamance Creek in Gibsonville, Guilford County, North Carolina. The bridge replacement will require a slight widening of Knox Road (-L-) for a distance of approximately 200 feet south and 130 feet north from each end of the proposed bridge or approximately 450 feet total. Forbes Tate Road (-Y-) currently intersects Knox Road at approximate -L- station 17+95, but will be realigned approximately 35 feet farther north of the proposed bridge, which will require approximately 154 feet of new alignment. The existing bridge is a 3-span, approximately 65-feet long, and is constructed with timber abutments and a timber deck. Specific information regarding the proposed bridge is unavailable at this time. The subject portion of the roadway generally extends through wooded property and pastures with widely-spaced residences.

The geotechnical field investigation was performed on September 9<sup>th</sup> of 2014. During this time period, a total of four (4) standard penetration test (SPT) borings were advanced with an ATV-mounted CME-55 drill rig with an automatic hammer. Representative soil samples were collected from the split spoon for visual classification in the field and for analysis by F&R’s testing laboratory.

The following alignments were investigated:

<u>Line</u>	<u>Station(±)</u>
-L-	14+50 to 19+00
-Y-	10+00 to 11+66.46

Areas of Special Geotechnical Interest

- 1) Artificial Fill: The following area contains artificial fill likely associated with previous utility installation through the area. These soils have the potential to be highly variable, which could cause subgrade problems during construction if undetected pockets of organics or soft/loose soils are present. In addition, some of these soils are cohesive, which may cause embankment instability or long-term settlement problems.

<u>Line</u>	<u>Station (±)</u>
-Y-	10+00 to 11+66.46

Physiography and Geology

The existing road generally runs south to north through a rural area consisting of widely-spaced single-family homes, open fields and agricultural land, and wooded/undeveloped areas. The existing ground surface along the centerline of the proposed road generally slopes downward from an elevation of ±630 feet at the beginning of the project to an elevation of ±621 feet near the existing bridge. The ground surface then generally slopes upward to an elevation of ±629 feet at the end of the project. The existing ground surface elevation along the creek is at an elevation of ±607 feet.

The surface water across the project is generally drained by Little Alamance Creek, which generally flows across the site in a west-to-east direction. The creek runs beneath Bridge 208 at approximate -L- station 17+10. During our field investigation, we observed numerous boulders and/or rock outcrops within the stream bottom. A pond, impounded by an earthen dam on its south side, is present approximately 200 feet north of the proposed bridge.

At the bridge end bents, existing fills appear to be on the order of approximately 10 feet and less. The existing cut and fill slopes are typically 2:1 (H:V) or flatter.

The project is located in the Piedmont Physiographic Province of North Carolina within the Carolina Slate Belt. More-specifically, it is located in an area mapped as metamorphosed granitic rock (CZg). Weathered rock fragments recovered from our borings and exposed boulders exhibits the characteristics of granitic rock. Soils weathered from the parent rock generally consist of silty, fine to coarse sands. The in-situ soils are the residual product of in-place chemical weathering of rock that was similar to the rock presently underlying the site.

### Soils Properties

The subsurface conditions discussed below and those shown on the attached drawings, represent an estimate of the subsurface conditions based on interpretation of the boring data using normally-accepted geotechnical engineering judgments. The transitions between different soil strata are usually less distinct than those shown on the profile. Sometimes the relatively small sample obtained in the field is insufficient to definitively describe the origin of the subsurface material. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Soils within the area of this project have been divided into five categories: organic topsoil, artificial fill, roadway embankment fill, alluvial soils, and residual soils.

**Root Mat/Organic Topsoil:** Root mat and organic topsoil was encountered at the surface of borings L\_1525L, L\_1650R, and L\_1775L and ranged in thickness from 0.2 to 0.3 feet (2 to 3.5 inches).

**Artificial Fill:** Artificial fill was encountered in boring Y\_1050 to a depth of approximately 5.8 feet and is likely associated with installation of the adjacent sewer line. The artificial fill was described as varying layers of moist to wet, loose, silty SAND (A-2-4) and sandy and silty CLAY (A-6 & A-7-6). The soil samples also contained trace organic matter.

**Roadway Embankment Fill:** Roadway embankment fill was encountered in borings L\_1650R and L\_1775L and extended to a depth of approximately 2 and 4.7 feet, respectively. The fill was described as moist, stiff to very stiff, sandy and silty CLAY (A-6 & A-7-6). The tested sandy CLAY (A-6) had a plasticity index of 14% and a water content of 18.2% while the tested silty CLAY (A-7-6) had a plasticity index of 22% and a water content of 22.6%.

**Alluvial Soil:** Alluvial soils were encountered below the roadway embankment fill in boring L\_1775L at a depth of 4.7 feet and extended to boring termination at a depth of 10 feet. These soils were generally described as wet, medium dense, silty SAND (A-2-4).

**Residual Soil:** Residual soils were encountered at the ground surface of boring L\_1525L and below the roadway embankment at boring L\_1650R at a depth of approximately 2 feet. The residual soils extended to depths of 10.8 and 8.0 feet, respectively. These soils were generally described as moist to wet, stiff, sandy SILT (A-4) and silty CLAY (A-7-6) and moist medium dense silty SAND (A-2-4). The tested silty CLAY (A-7-6) had a plasticity index of 20% and a water content of 19.8%.

### Rock Properties

Weathered Rock (WR) was only encountered in boring L\_1525L at a depth of 10.8 feet and an elevation of 617.3 feet. Crystalline Rock (CR) was encountered in borings L\_1525L, L\_1650R, and Y\_1050 as indicated by auger and SPT refusal. The CR was encountered at depths ranging from approximately 5.8 to 12.4 feet, or elevations ranging from approximately 611.8 to 615.7 feet. The rock consisted of brown, gray-tan, and black metamorphosed granitic rock. Refusal is a designation applied to any material that cannot be penetrated by the soil auger, and is typically caused by encountering boulders, hard rock lenses/ledges or bedrock. The nature of the materials causing refusal was not explored in these borings, but is anticipated to represent the CR level.

### Groundwater Properties

Groundwater measurements were collected in all borings immediately after completion of drilling and after a stabilization period of approximately 24 hours had elapsed. No groundwater was encountered. It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

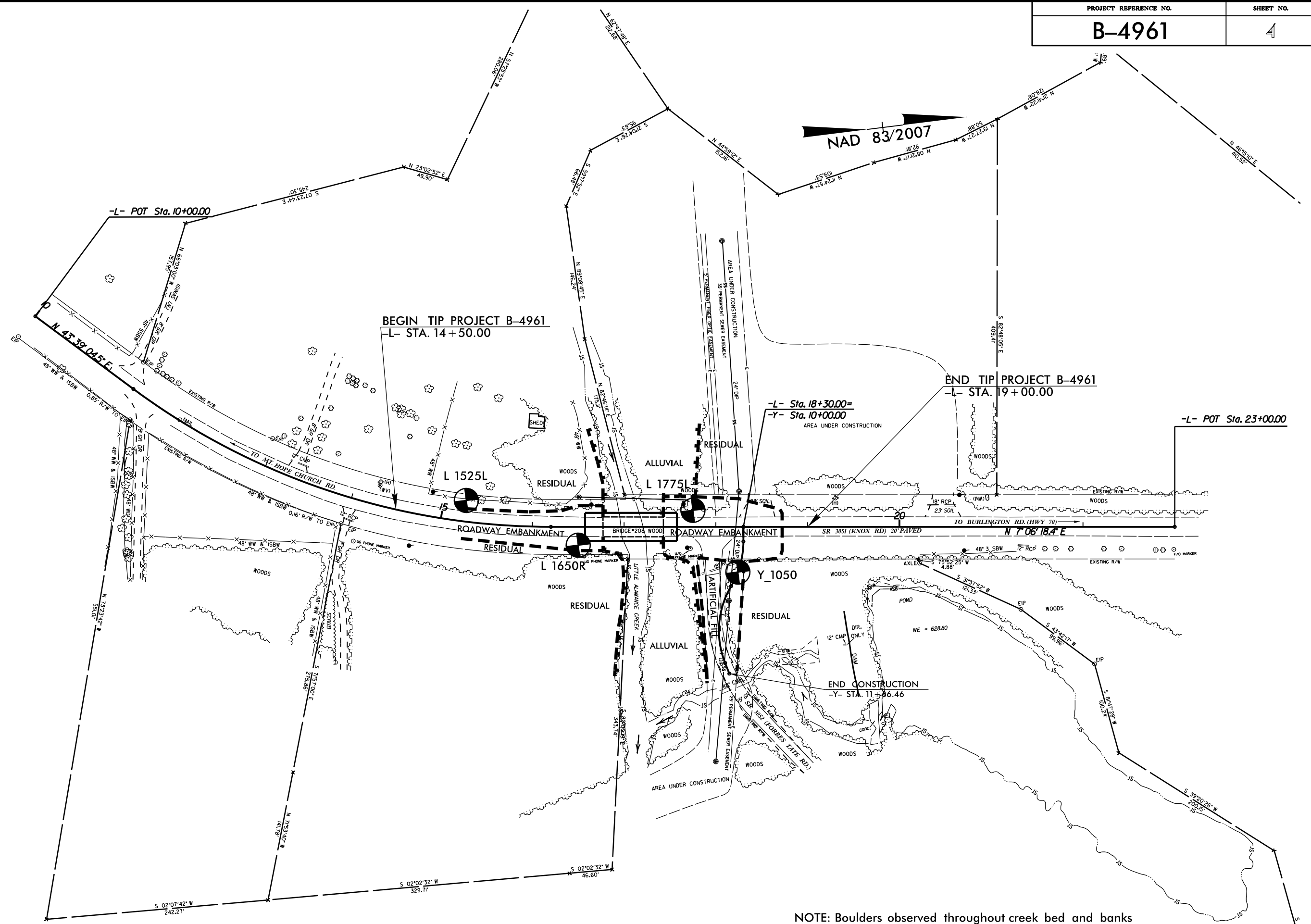
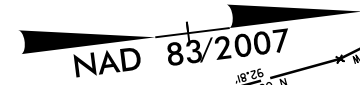
We appreciate the opportunity to work with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,  
**FROEHLING & ROBERTSON, INC.**

DocuSigned by:  
*W. Patrick Alton*  
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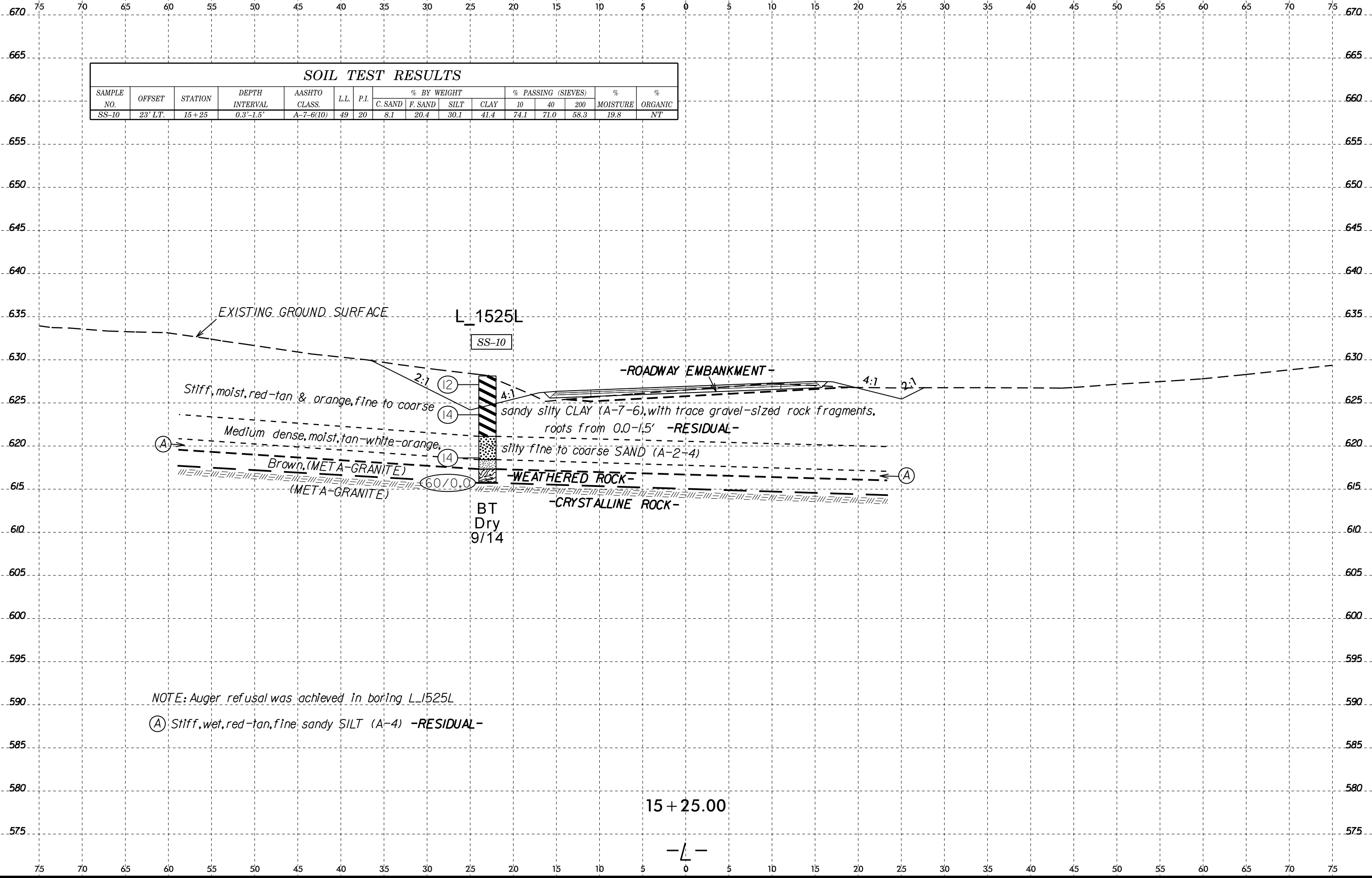
W. Patrick Alton, P.E.  
Geotechnical Services Manager

DocuSigned by:  
*Daniel K. Schaefer*  
6113E431716C478...  
Daniel K. Schaefer, P.E.  
Raleigh Branch Manager



NOTE: Boulders observed throughout creek bed and banks

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-10	23' LT.	15+25	0.3'-1.5'	A-7-6(10)	49	20	8.1	20.4	30.1	41.4	74.1	71.0	58.3	19.8	NT

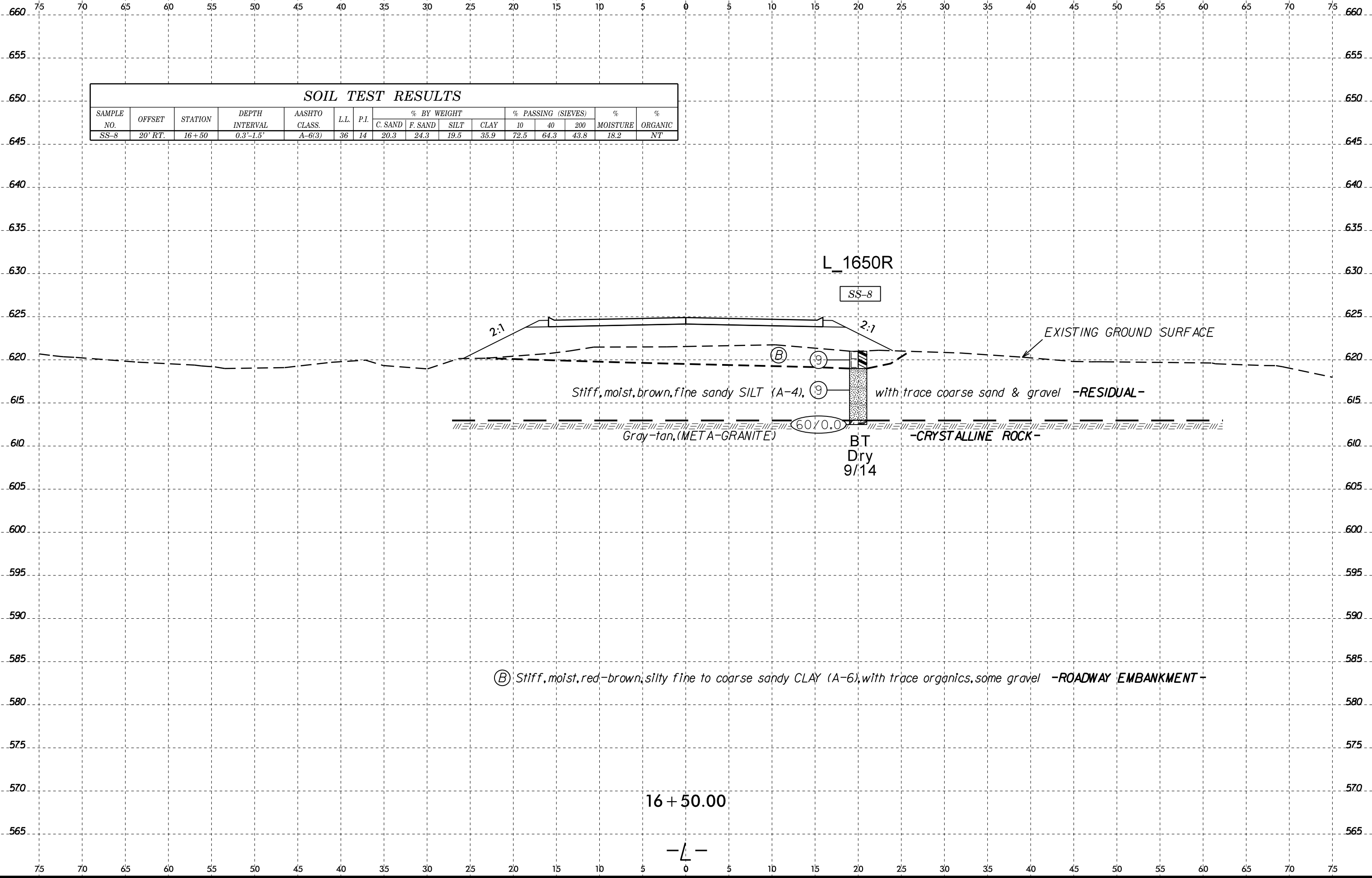


NOTE: Auger refusal was achieved in boring L\_1525L

(A) Stiff, wet, red-tan, fine sandy SILT (A-4) -RESIDUAL-



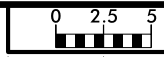
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							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-8	20' RT.	16+50	0.3'-1.5'	A-6(3)	36	14	20.3	24.3	19.5	35.9	72.5	64.3	43.8	18.2	NT



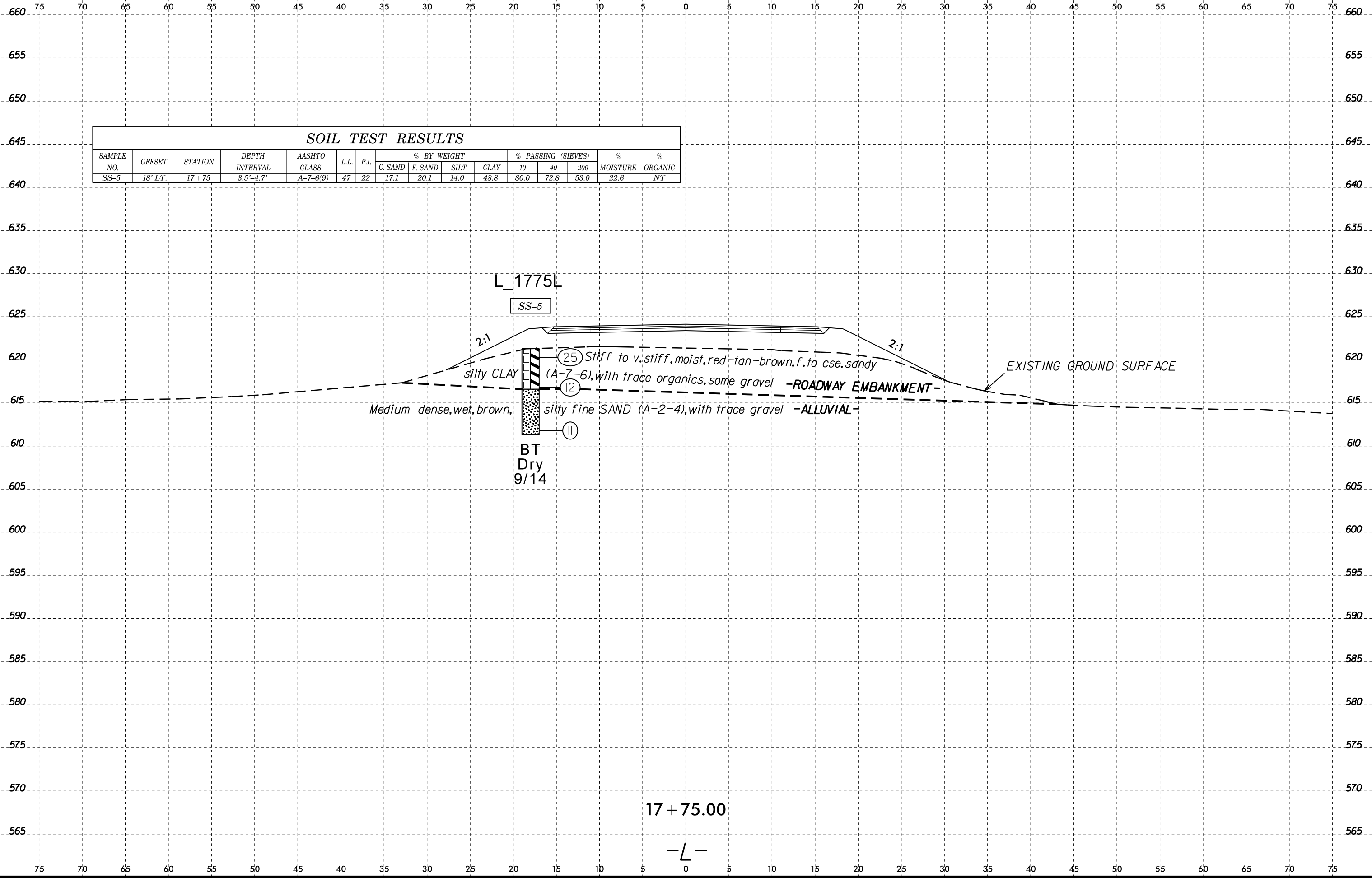
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16 + 50.00

-L-



SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-5	18' LT.	17+75	3.5'-4.7'	A-7-6(9)	47	22	17.1	20.1	14.0	48.8	80.0	72.8	53.0	22.6	NT



L\_1775L

SS-5

2:1

2:1

25

12

11

BT  
Dry  
9/14

silty CLAY

Stiff to v. stiff, moist, red-tan-brown, f. to cse. sandy (A-7-6), with trace organics, some gravel

Medium dense, wet, brown,

silty fine SAND (A-2-4), with trace gravel

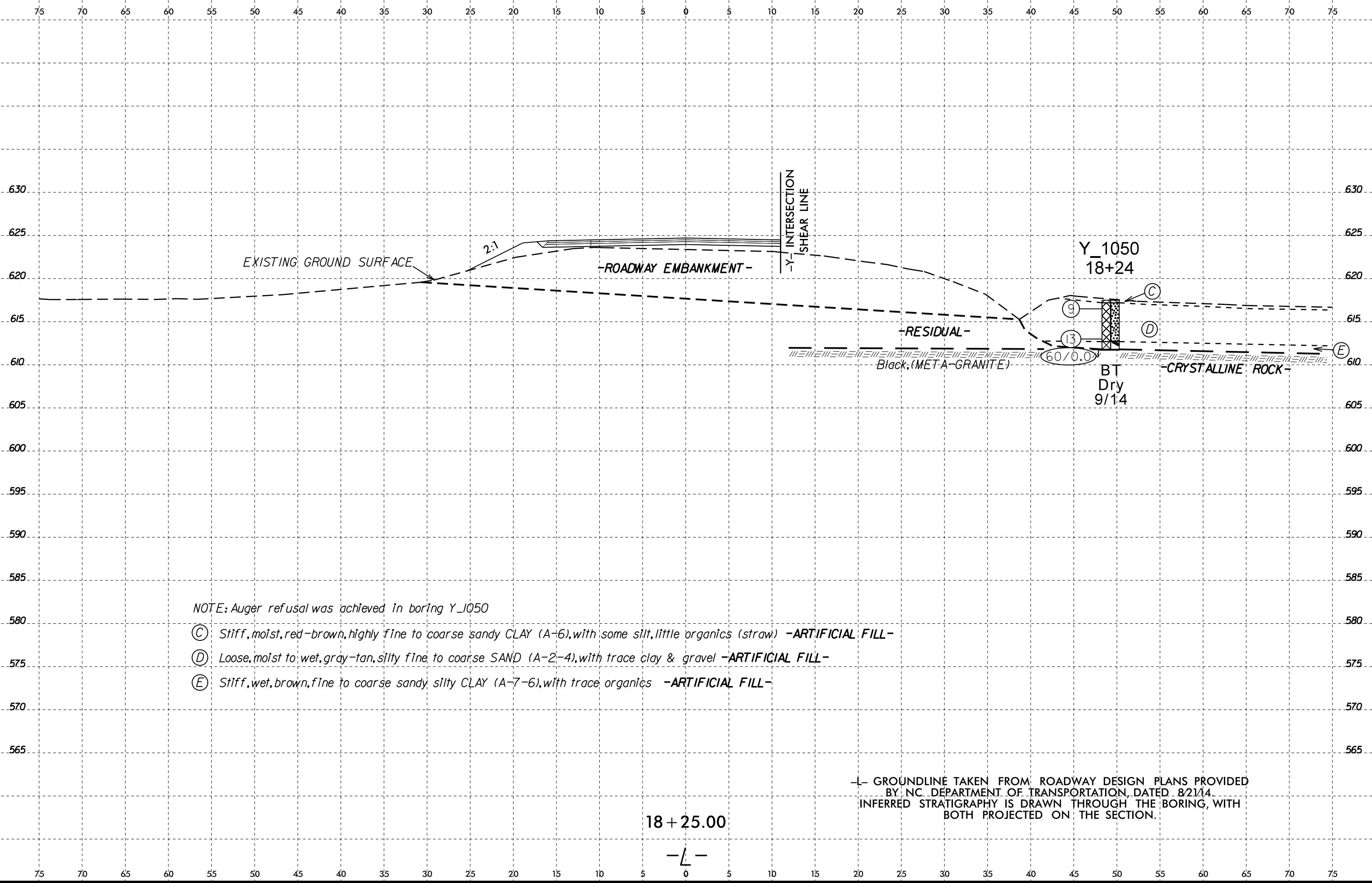
ROADWAY EMBANKMENT

ALLUVIAL

EXISTING GROUND SURFACE

17 + 75.00

-L-



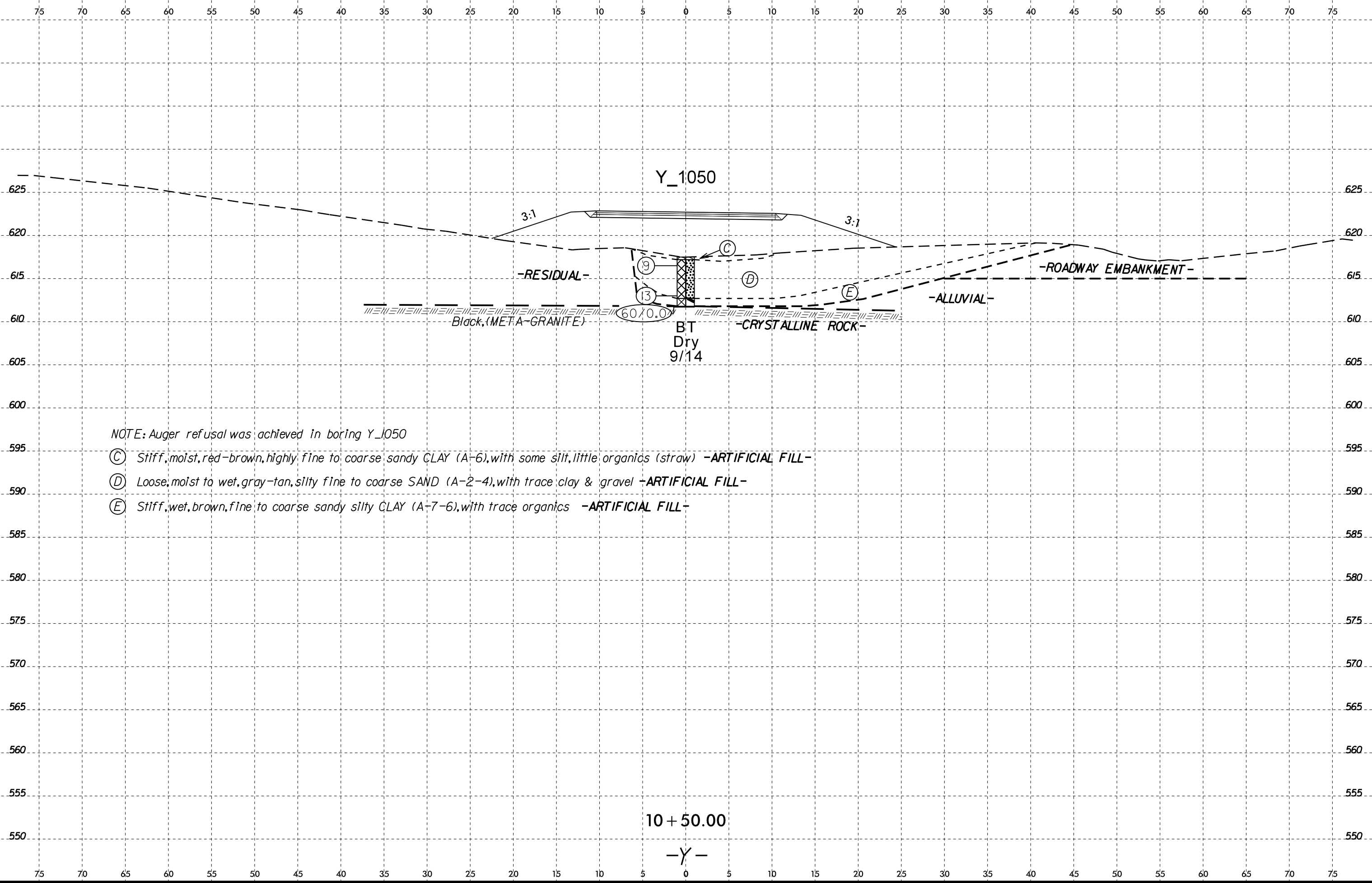
NOTE: Auger refusal was achieved in boring Y\_1050

- Ⓒ Stiff, moist, red-brown, highly fine to coarse sandy CLAY (A-6), with some silt, little organics (straw) -ARTIFICIAL FILL-
- Ⓓ Loose, moist to wet, gray-tan, silty fine to coarse SAND (A-2-4), with trace clay & gravel -ARTIFICIAL FILL-
- Ⓔ Stiff, wet, brown, fine to coarse sandy silty CLAY (A-7-6), with trace organics -ARTIFICIAL FILL-

-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NC DEPARTMENT OF TRANSPORTATION, DATED 8/21/14. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.

18 + 25.00

-L-



NOTE: Auger refusal was achieved in boring Y\_1050

- (C) Stiff, moist, red-brown, highly fine to coarse sandy CLAY (A-6), with some silt, little organics (straw) -ARTIFICIAL FILL-
- (D) Loose, moist to wet, gray-tan, silty fine to coarse SAND (A-2-4), with trace clay & gravel -ARTIFICIAL FILL-
- (E) Stiff, wet, brown, fine to coarse sandy silty CLAY (A-7-6), with trace organics -ARTIFICIAL FILL-

10 + 50.00

-Y-