

REFERENCE: BP11.R004

PROJECT: SF-850062

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.	BP11.R004	1	12

**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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS 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.

**ROADWAY**  
**SUBSURFACE INVESTIGATION**

COUNTY SURRY  
PROJECT DESCRIPTION REPLACE BRIDGE NO. 062 ON  
SR 1350 (RED BRUSH ROAD) OVER STEWARTS  
CREEK

**INVENTORY**

**CONTENTS**

LINE	STATION	PLAN	PROFILE
-L-	12+50 - 20+20	4	N/A
-Y-	10+85 - 13+00	4	N/A

**CROSS SECTIONS**

LINE	STATION	SHEETS
-L-	14+00 - 20+00	5-10

**APPENDIX**

DESCRIPTION	SHEETS
LAB SUMMARY	II-12

PERSONNEL

CG2 EXPLORATION

S. N. PATTERSON, GIT

F&R

INVESTIGATED BY CG2, PLLC

DRAWN BY S. N. PATTERSON, GIT

CHECKED BY M. BREWER, PE

SUBMITTED BY CG2, PLLC

DATE OCTOBER 2022

Prepared in the Office of:  
 **CAROLINAS  
GEOTECHNICAL  
GROUP**  
2400 CROWNPOINT EXECUTIVE DRIVE  
SUITE 800  
CHARLOTTE, NC 28227  
(980) 339-8684



DocuSigned by:  
D. Matthew Brewer 11/4/2022  
386429C0A4C1462 SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

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

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS									
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, 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>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.            AQUIFER - A WATER BEARING FORMATION OR STRATA.            ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.            ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.            ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.            CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.            COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.            CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.            DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.            DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.            DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.            FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.            FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.            FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND 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 (ROD) - 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 (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.            TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERED ROCK (WR)										NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.									
<p>GENERAL CLASS. GRANULAR MATERIALS (&lt;= 35% PASSING #200) SILT-CLAY MATERIALS (&gt; 35% PASSING #200) ORGANIC MATERIALS</p>										<p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>CRYSTALLINE ROCK (CR)</p>										<p>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>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>MINORAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>NON-CRYSTALLINE ROCK (NCR)</p>										<p>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>SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE</p>										<p>LL &lt; 31 LL = 31 - 50 LL &gt; 50</p>										<p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>									
CONSISTENCY OR DENSENESS										PERCENTAGE OF MATERIAL										WEATHERING										GROUND WATER									
<p>PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT<sup>2</sup>)</p>										<p>ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL</p>										<p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p>										<p>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p>									
<p>GENERALY GRANULAR MATERIAL (NON-COHESSIVE)</p>										<p>TRACE OF ORGANIC MATTER 2 - 3% LITTLE ORGANIC MATTER 3 - 5% MODERATELY ORGANIC 5 - 10% HIGHLY ORGANIC &gt; 10%</p>										<p>VERY SLIGHT (IV SLI) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p>										<p>STATIC WATER LEVEL AFTER 24 HOURS</p>									
<p>GENERALY SILT-CLAY MATERIAL (COHESIVE)</p>										<p>SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</p>										<p>SLIGHT (SLI) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p>										<p>SPRING OR SEEP</p>									
<p>RECOMMENDATION SYMBOLS</p>										<p>MISCELLANEOUS SYMBOLS</p>										<p>MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p>										<p>UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p>									
<p>TEXTURE OR GRAIN SIZE</p>										<p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY</p>										<p>SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</p>										<p>SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p>									
<p>U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.75 2.00 0.42 0.25 0.075 0.053</p>										<p>SOIL MOISTURE - CORRELATION OF TERMS</p>										<p>VERY SEVERE (IV SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</p>										<p>COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>									
<p>GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3</p>										<p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p>										<p>MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</p>										<p>FRACURE SPACING BEDDING</p>									
<p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p>										<p>PLASTICITY</p>										<p>VERY COMPLETE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</p>										<p>VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET</p>									
<p>PLASTICITY PLASTIC RANGE (PI) LIQUID LIMIT PLASTIC LIMIT OPTIMUM MOISTURE SHRINKAGE LIMIT</p>										<p>PLASTICITY INDEX (PI) DRY STRENGTH</p>										<p>MODERATELY COMPLETE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</p>										<p>WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET</p>									
<p>PLASTICITY INDEX (PI) DRY STRENGTH</p>										<p>COLOR</p>										<p>COMPLETE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</p>										<p>MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET</p>									
<p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>EQUIPMENT USED ON SUBJECT PROJECT</p>										<p>INDURATION</p>										<p>VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED &lt; 0.008 FEET</p>									
<p>DRILL UNITS: CME-45C CME-55 CME-550 VANE SHEAR TEST PORTABLE HOIST DIEDRICH D-50 MOBILE B-29</p>										<p>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</p>										<p>HAMMER TYPE: AUTOMATIC MANUAL CORE SIZE: B H N HAND TOOLS: POST HOLE DIGGER HAND AUGER SOUNDING ROD VANE SHEAR TEST</p>										<p>FRAGILE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>									
<p>ELEVATION: FEET</p>										<p>NOTES: ROADWAY DESIGN FILES &amp; LOCATION SURVEY PROVIDED BY TGS ENGINEERS F.I.A.D. = FILLED IMMEDIATELY AFTER DRILLING LOCATION DATA &amp; SUBSURFACE CONDITIONS FOR EB1-A (B-I) OBTAINED FROM "STRUCTURE SUBSURFACE INVESTIGATION" PREPARED BY F&amp;R, INC. DATED APRIL 20, 2016.</p>										<p>DATE: 8-15-14</p>										<p></p>									

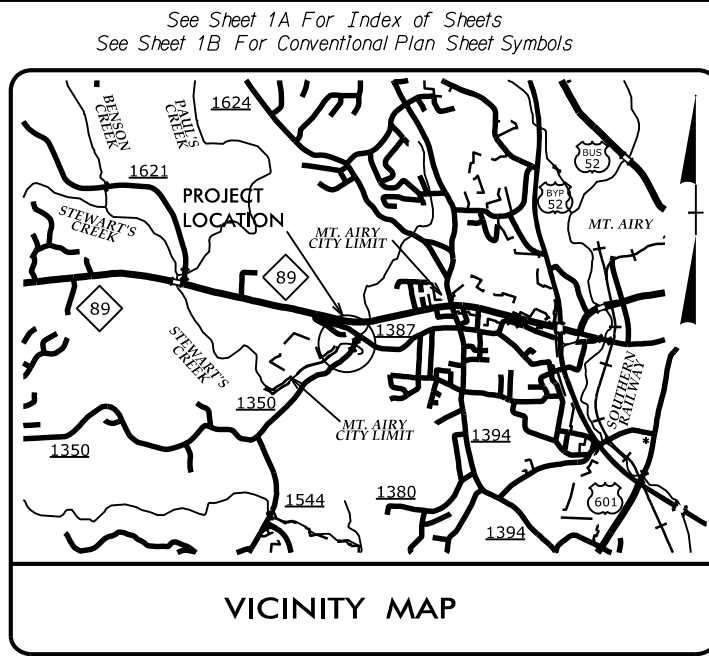
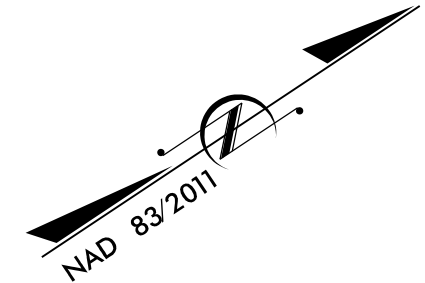
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BP11.R004	3	12
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
BP11.R004.1	N/A	PE	
BP11.R004.2	N/A	ROW,UTIL.	
BP11.R004.3	N/A	CONST.	

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

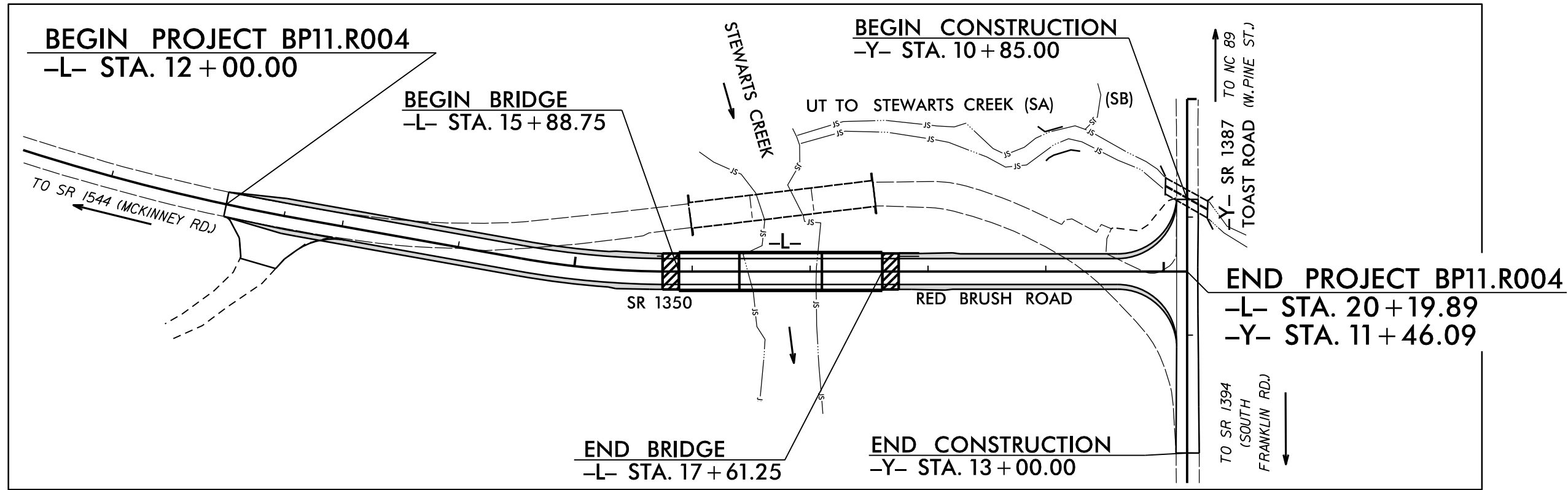
**SURRY COUNTY**

LOCATION: BRIDGE #850062 ON SR 1350 (RED BRUSH RD.)  
OVER STEWARTS CREEK

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



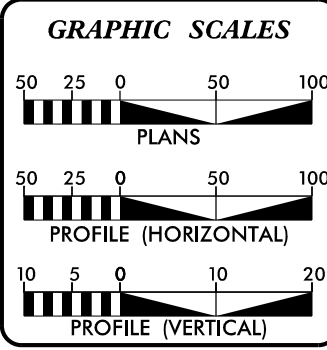
**TIP PROJECT: BP11.R004**



CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II  
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES

**INCOMPLETE PLANS**  
DO NOT USE FOR R/W ACQUISITION  
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

**CONTRACT:**



**DESIGN DATA**

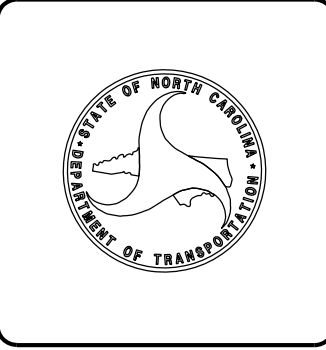
ADT 2023	= 2,393
ADT 2045	= 2,979
K	= - %
D	= - %
T	= 7 % *
V	= 40 MPH
* TTST = 3% DUAL 4%	
FUNC CLASS = MAJOR COLLECTOR REGIONAL TIER	

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT BP11.R004	= 0.122 MILES
LENGTH STRUCTURE TIP PROJECT BP11.R004	= 0.033 MILES
TOTAL LENGTH TIP PROJECT BP11.R004	= 0.155 MILES

NCDOT CONTACT: JOE LAWS, PE	
PLANS PREPARED BY: TGS ENGINEERS 201 W. MARION ST STE 200 SHELBY, NC 28150 PH (704) 476-0003 CORP. LICENSE NO. C-0275	PLANS PREPARED FOR: NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION II 801 Statesville Rd North Wilkesboro, NC 28659
RIGHT OF WAY DATE: MARCH 2022	JIMMY L. TERRY, PE PROJECT ENGINEER
LETTING DATE: APRIL 2023	AUSTIN R. TURNER, PE PROJECT DESIGN ENGINEER
2018 STANDARD SPECIFICATIONS	

HYDRAULICS ENGINEER	
SIGNATURE: _____	P.E.
ROADWAY DESIGN ENGINEER	
SIGNATURE: _____	P.E.



31-OCT-2022 13:31 C:\Users\jmbrower\OneDrive - Carolinas Geotechnical Group, PLLC\Projects\0086 - Div. II Bridges\Surry 62\_CADD\_CEO\TECH\PlanProf\Surry 62\_Rdy\_tsh.dgn \$\$\$USERNAME\$\$\$

10/31/2022

STATE PROJECT: BP11.R004  
 TIP NO.: SF-850062  
 I.D. NO.: 850062  
 COUNTY: Surry  
 DESCRIPTION: Bridge No. 62 on SR 1350 (Red Brush Road) over Stewarts Creek

SUBJECT: Geotechnical Roadway Inventory Report

### PROJECT DESCRIPTION

Based on a review of the plans provided to us by TGS, we understand this project consists of a bridge replacement and roadway realignment of SR 1350 (Red Brush Road) over Stewarts Creek. The realignment of SR 1350 begins approximately 389 feet west of the proposed bridge over Stewarts Creek and ends approximately 259 feet east of the proposed bridge. The project is approximately 0.155 miles in length, measured along -L- (SR 1350) from Station 12+00 to 20+20. The proposed construction consists of a new bridge, roadway improvements, and associated drainage. The following alignments are included as part of this investigation:

<u>Alignment</u>	<u>Stations</u>
-L- (SR 1350)	12+00 to 20+20
-Y-	10+85 to 13+00

The following cut slopes oriented 1.5:1 (H:V) are included as part of this investigation:

<u>Stations (Alignment)</u>	<u>Offset</u>
17+75 to 19+25 (-L-)	RT

The provided roadway plans generally indicate fill on the order of 4 to 7 feet are planned along the alignment from -L- Stations 14+00 to 15+50. Cuts on the order of 7 to 29 feet are planned along -L- at Station 16+00 and from Stations 17+75 to 19+25. Additional sliver cuts and fills are shown on the plans at other locations.

The geotechnical field investigation was conducted by CG2 during the period of June and July 2022. A subcontracted drilling crew was used to drill and sample each of the seven (7) borings included in this report. The drill rigs utilized were a truck-mounted Mobile B-29 and a track-mounted Diedrich D-50 both equipped with an automatic hammer. Standard Penetration Tests (SPT) were performed at selected depths within each boring. Representative soil samples were collected for visual-manual classification in the field and evaluated in the office by a staff geologist under the supervision of a licensed engineer or geologist. Selected soil samples were submitted for laboratory analysis by an approved NCDOT M&T testing facility. Subsurface conditions shown in boring EB1-A (B-1) were obtained from "Structure Subsurface Investigation," prepared by F&R Inc. dated April 20, 2016. The referenced report was provided to us by the NCDOT Geotechnical Engineering Unit.

### PHYSIOGRAGHY AND GEOLOGY

The project corridor is located within the Piedmont Physiographic Province (Piedmont) of North Carolina. The Piedmont generally consists of hills and ridges which are intertwined with an established system of draws and streams. The Piedmont is predominately underlain by igneous and metamorphic rock.

The USGS 1975 'Geologic Map of the East Half of the Winston-Salem Quadrangle, North Carolina-Virginia,' published by Espenshade et al., 1975, shows the project area is within the Spruce Pine Plutonic Group, of the Blue Ridge Belt. Rocks from this Group are generally comprised of intrusive igneous plutonic rock including Biotite-Muscovite Granodiorite and Quartz Monzonite rock. Rock encountered during the investigation was classified as Granodiorite.

Within the project alignment, much of the bedrock is overlain by near-surface material consisting of residual and alluvial soils. Residual soils are derived from in situ chemical and physical weathering of the rock in the area and vary in thickness. The residual soils in this region are typically finer grained with a higher clay content near the surface due to advanced weathering, and typically become coarser grained with increasing depth as the degree of weathering decreases. As the degree of weathering decreases, the residual soils generally retain the overall appearance and fabric of the parent rock (sometimes referred to as "saprolite"). The boundary between soil and rock is not always sharply defined. A transitional zone termed "weathered rock" is often found overlying the parent bedrock. Weathered rock is defined as material requiring 100 blows with less than one foot of penetration from the SPT hammer.

Alluvial soils are transported and deposited by water and are naturally variable in character, consistency/density, and often contain organic materials. Alluvial soil deposits of varying age were observed within the project alignment in low lying areas adjacent to Stewarts Creek and were encountered within borings performed for the roadway investigation.

### Soil Properties

Soils and rock encountered during the roadway investigation include roadway embankment, artificial fill, alluvial soils, residual soils, and weathered rock.

Roadway Embankment soils are similar in nature to residual soils and may be derived from nearby sources. Roadway embankment soils were encountered in borings EB1-A (B-1), EB1-B and L\_B-1 during the roadway investigation due to the presence of state-maintained roadways and previous bridge structure, which was demolished. This material generally consists of very loose to very dense gravel (A-1-a), sand (A-3), and soft to medium stiff clayey, sandy silt (A-4), and moderately plastic sandy, silty clay (A-7-5), with trace organics and gravel.

Artificial Fill soils are materials that have been moved and/or placed by man or mechanical means. Artificial fill soils were encountered in L\_B-4. The artificial fill soils generally consist of very soft to soft, silty, sandy clay (A-6) and silty clay (A-7-5), with trace gravel and contained a petroleum odor.

Alluvial soils were observed in proximity to Stewarts creek and were encountered in Borings EB1-A (B-1) and EB1-B. The alluvial soils generally consist of medium dense sandy gravel (A-1-a).

Residual soils were encountered in Borings EB1-A (B-1), EB1-B, EB2-A, EB2-B, L\_B-2, and L\_B-3. The residual soils generally consist of loose to very dense silty sand (A-2-4). Trace mica and rock fragments were encountered intermittently within the residual soils.

Weathered rock was encountered along the project corridor within Borings EB1-A (B-1), EB1-B, EB2-A, EB2-B and L\_B-2. The weathered rock consisted of Granodiorite. The weathered rock was encountered at depths ranging from approximately 3.7 to 34.8 feet below existing grades near the proposed bridge end bents and along the project corridor.

#### Groundwater

Groundwater measurements were taken during June and July 2022. Groundwater measurements were attempted at the completion of drilling in each boring, at which time groundwater was encountered in borings EB1-A (B-1), EB1-B, EB2-A, and EB2-B at depths ranging from approximately 19.0 to 23.0 feet below the existing grades. Subsequent groundwater measurements were attempted after at least 24 hours following the completion of drilling in each boring. At the time of subsequent water level measurements groundwater was encountered in borings EB1-A (B-1), EB1-B, EB2-A, and EB2-B at depths ranging from 19.0 to 22.8 feet below existing grades. The remaining borings were recorded as dry at the bottom of the boring cylinder. The soils encountered were generally described as moist to wet above and below groundwater elevation.

Water Wells: There are several residences near the project site which could indicate that water wells may be present. Water wells were not observed within the proposed construction corridor. However, wells may be encountered that were not observed during our field services.

#### Areas of Special Geotechnical Interest

The following borehole locations encountered very soft to soft or very loose to loose soils which have the potential to cause embankment stability and/or long-term settlement problems:

<u>Alignment</u>	<u>Stations</u>	<u>Offsets (ft)</u>
-L-	14+14	11 RT
-L-	15+89	19 RT
-L-	17+64	15 LT
-L-	18+59	6 RT
-L-	19+77	24 LT

Highly Plastic Clays: Highly plastic soils (PI > 25) were not encountered in borings of the project.

Shallow groundwater was not encountered within 3 feet of the existing ground. In addition, shallow groundwater was not encountered within 6 feet of proposed subgrade.

Crystalline rock was not encountered above or within 6 feet of proposed grade.

Rock Outcrops: Rock outcrops were exposed within the proposed project corridor and generally consist of weathered saprolitic Granodiorite at the following locations:

<u>Alignment</u>	<u>Stations</u>	<u>Offsets</u>
-L-	17+73 to 19+15	RT &LT

#### Geotechnical Testing

Three split spoon samples were selected for laboratory testing including Atterberg limits, grain size distribution analysis with hydrometer, and natural moisture. No thin-wall Shelby tube samples or bulk samples were collected during the investigation.

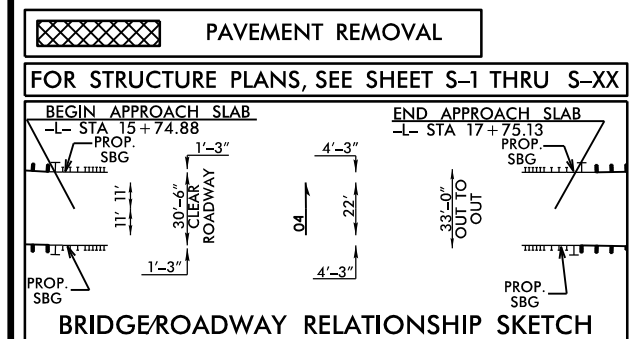
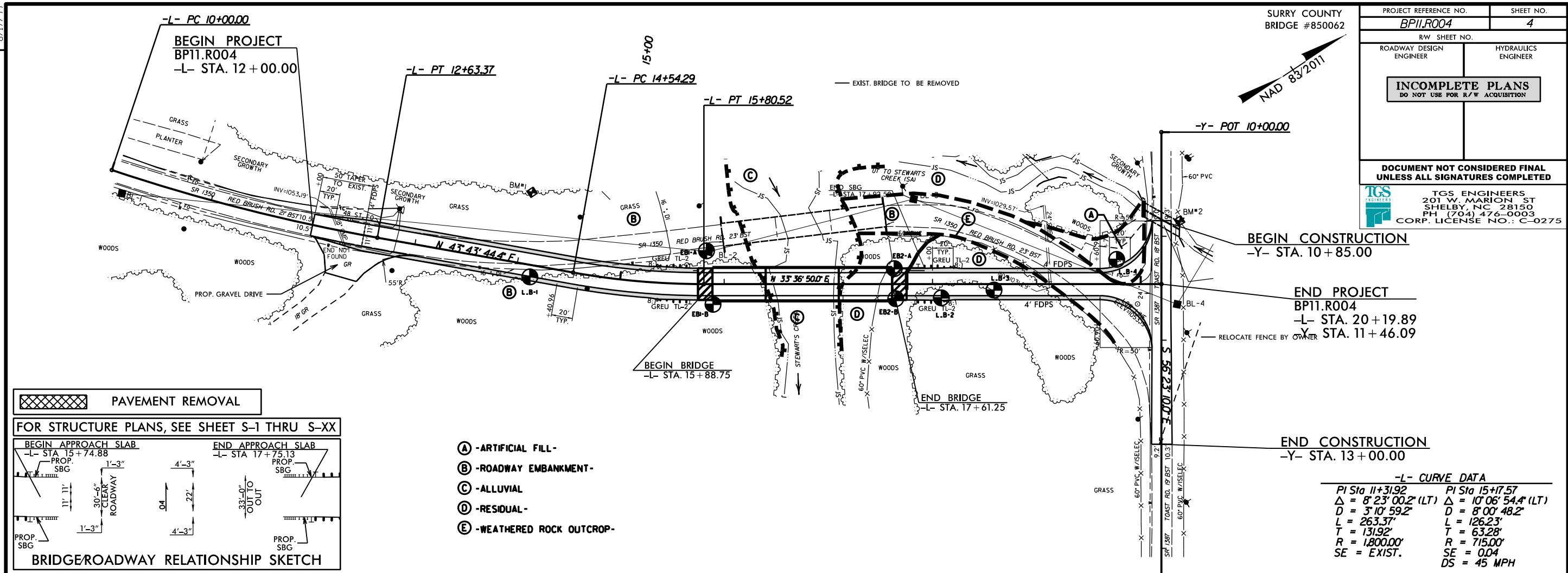
Sincerely,  
Carolinan Geotechnical Group, PLLC

DocuSigned by:  
*D. Matthew Brewer*  
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D. Matthew Brewer, PE  
Senior Project Engineer

PROJECT REFERENCE NO. <b>BPI1.R004</b>	SHEET NO. <b>4</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

**TGS ENGINEERS**  
201 W. MARION ST  
SHELBY, NC 28150  
PH: (704) 476-0003  
CORP. LICENSE NO.: C-0275



- (A) -ARTIFICIAL FILL-
- (B) -ROADWAY EMBANKMENT-
- (C) -ALLUVIAL
- (D) -RESIDUAL-
- (E) -WEATHERED ROCK OUTCROP-

**-L- CURVE DATA**

PI Sta 11+31.92	PI Sta 15+17.57
$\Delta = 8^{\circ}23'00.2''$ (LT)	$\Delta = 10^{\circ}06'54.4''$ (LT)
D = 3'10'59.2"	D = 8'00'48.2"
L = 263.37'	L = 126.23'
T = 131.92'	T = 63.28'
R = 1,800.00'	R = 715.00'
SE = EXIST.	SE = 0.04
	DS = 45 MPH

**BRIDGE HYDRAULIC DATA**

DESIGN DISCHARGE	= 8600	CFS
DESIGN FREQUENCY	= 50	YRS
DESIGN HW ELEVATION	= 1034.8	FT
BASE DISCHARGE	= 10000	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 1036.0	FT
OVERTOPPING DISCHARGE	= 8600	CFS
OVERTOPPING FREQUENCY	= 50	YRS
OVERTOPPING ELEVATION	= 1034.8	FT

\* OVERTOPPING ELEV. REPRESENTS LOWEST EDGE OF PROPOSED (SR 1350) & EXISTING (SR1387) PAVEMENT, WHICH OCCURS @ -L- STA. 20+00 LT.

DATE OF SURVEY = 9/27/2021

W.S. ELEVATION AT DATE OF SURVEY = 1020 FT

**PIPE HYDRAULIC DATA**

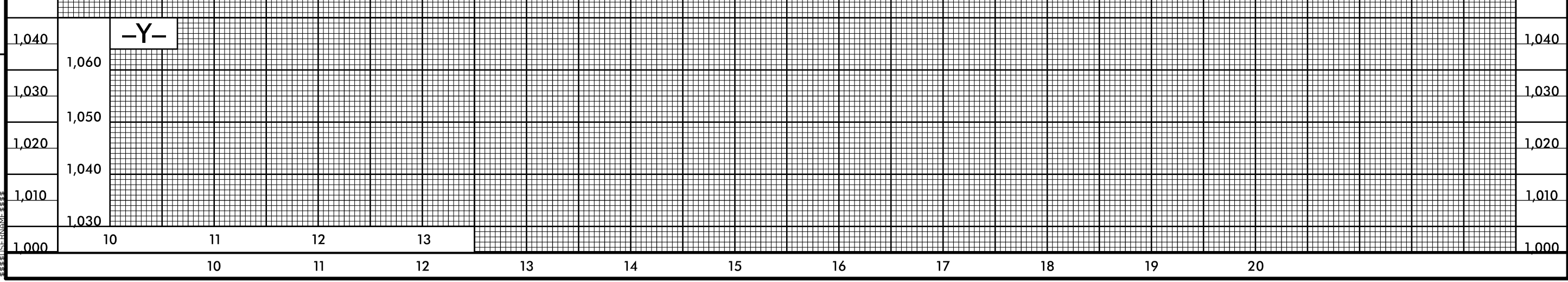
0401 -L- STA. 12+33

DRAINAGE AREA	= 1.3	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 4J	CFS
DESIGN HW ELEVATION	= 1054J	FT
100 YEAR DISCHARGE	= 4.4	CFS
100 YEAR HW ELEVATION	= 1054J	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= N/A	CFS
OVERTOPPING ELEVATION	= 1055.3	FT

**PIPE HYDRAULIC DATA**

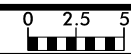
0404 -L- STA. 19+27

DRAINAGE AREA	= 45	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 14	CFS
DESIGN HW ELEVATION	= 1033.8	FT
100 YEAR DISCHARGE	= 15	CFS
100 YEAR HW ELEVATION	= 1033.9	FT
OVERTOPPING FREQUENCY	= 500+	YRS
OVERTOPPING DISCHARGE	= N/A	CFS
OVERTOPPING ELEVATION	= 1035.5	FT



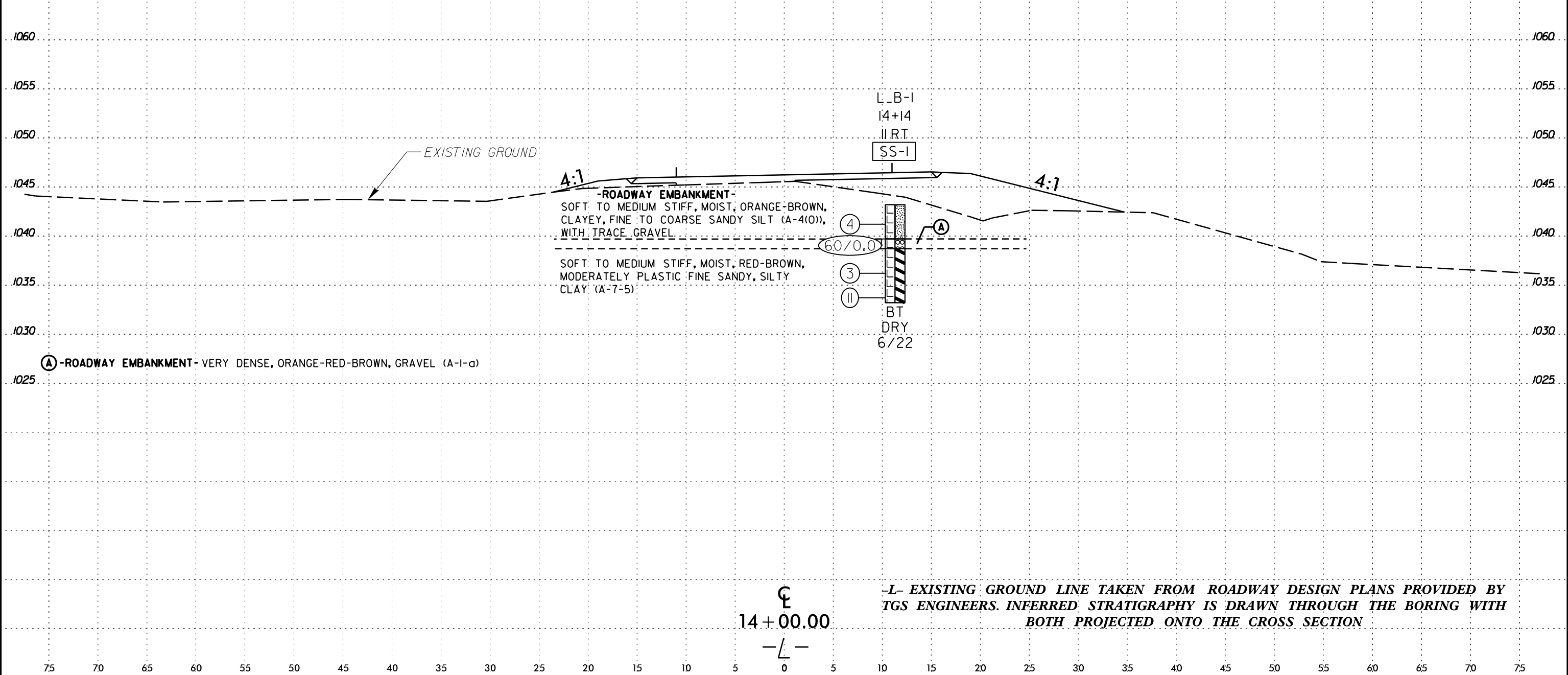
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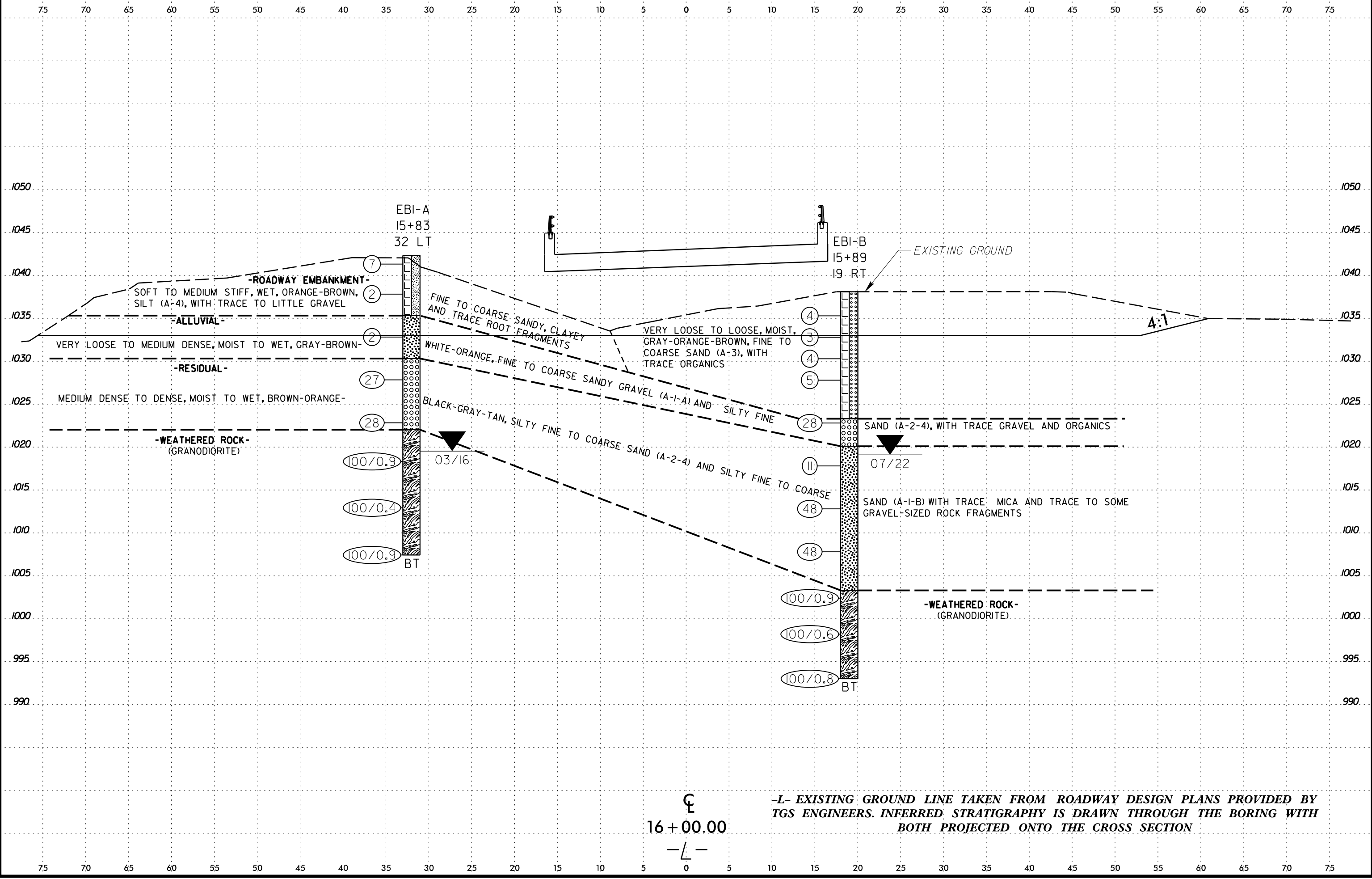
<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	11' RT	14+14 -L-	1.0 - 2.5'	A-4(0)	28	9	36	27	24	13	88	67	37	14	-



-L- EXISTING GROUND LINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS ENGINEERS. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

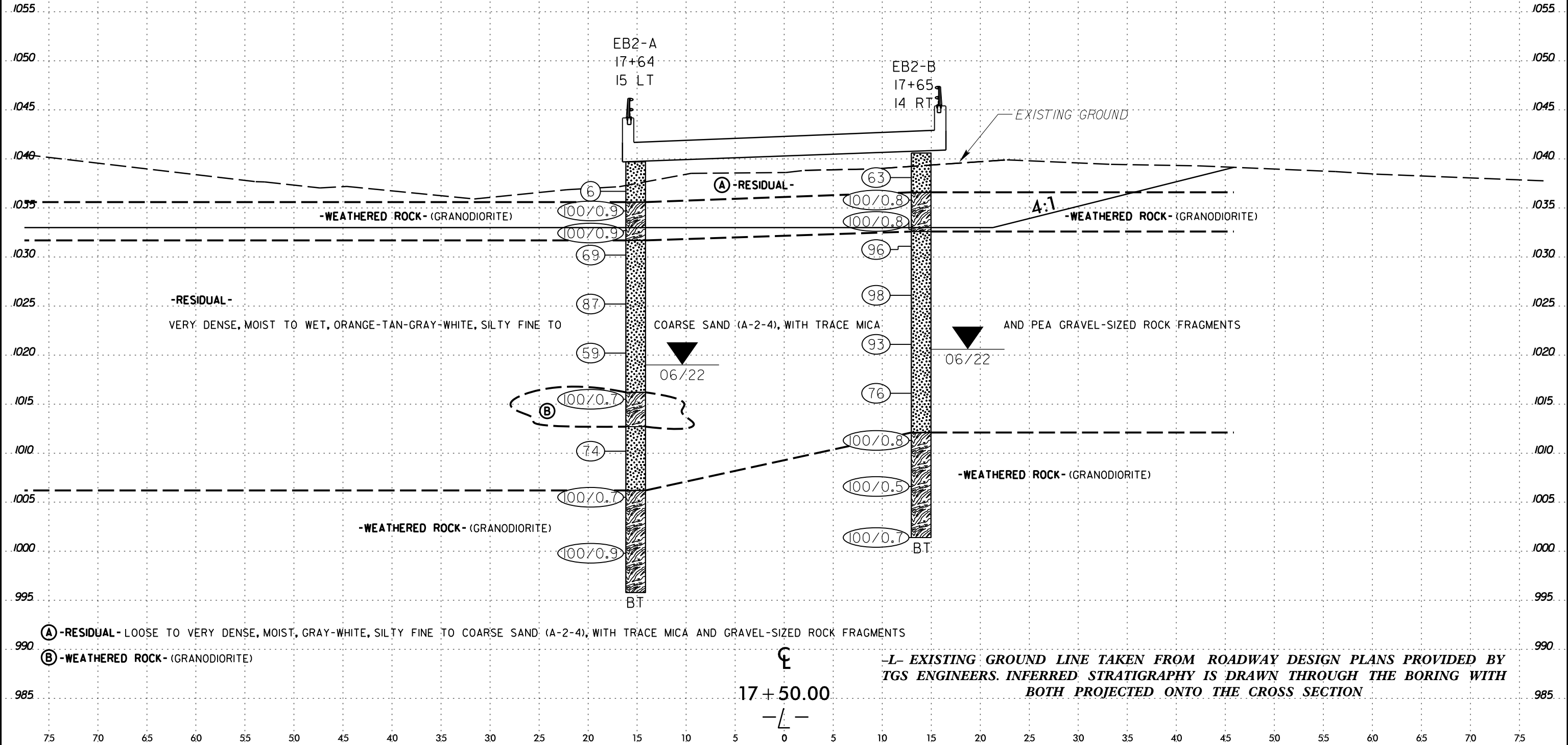
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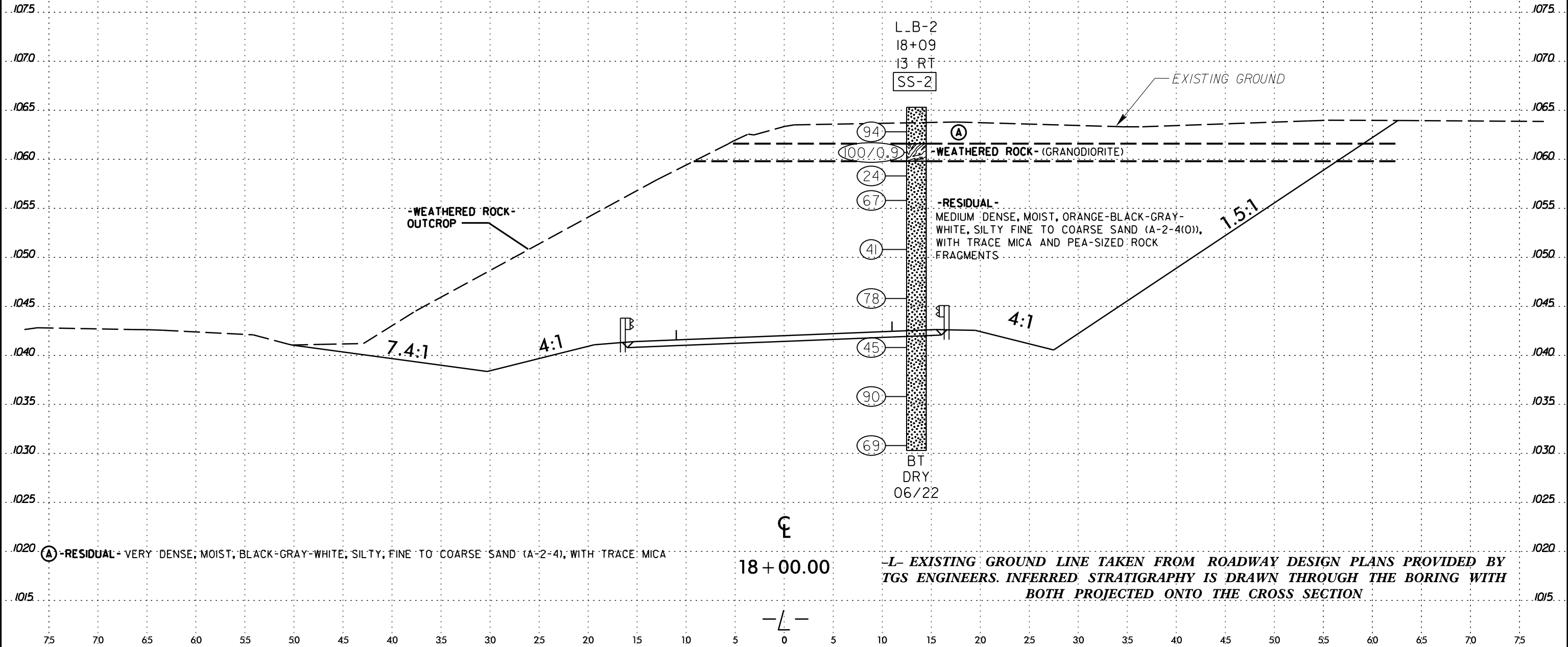


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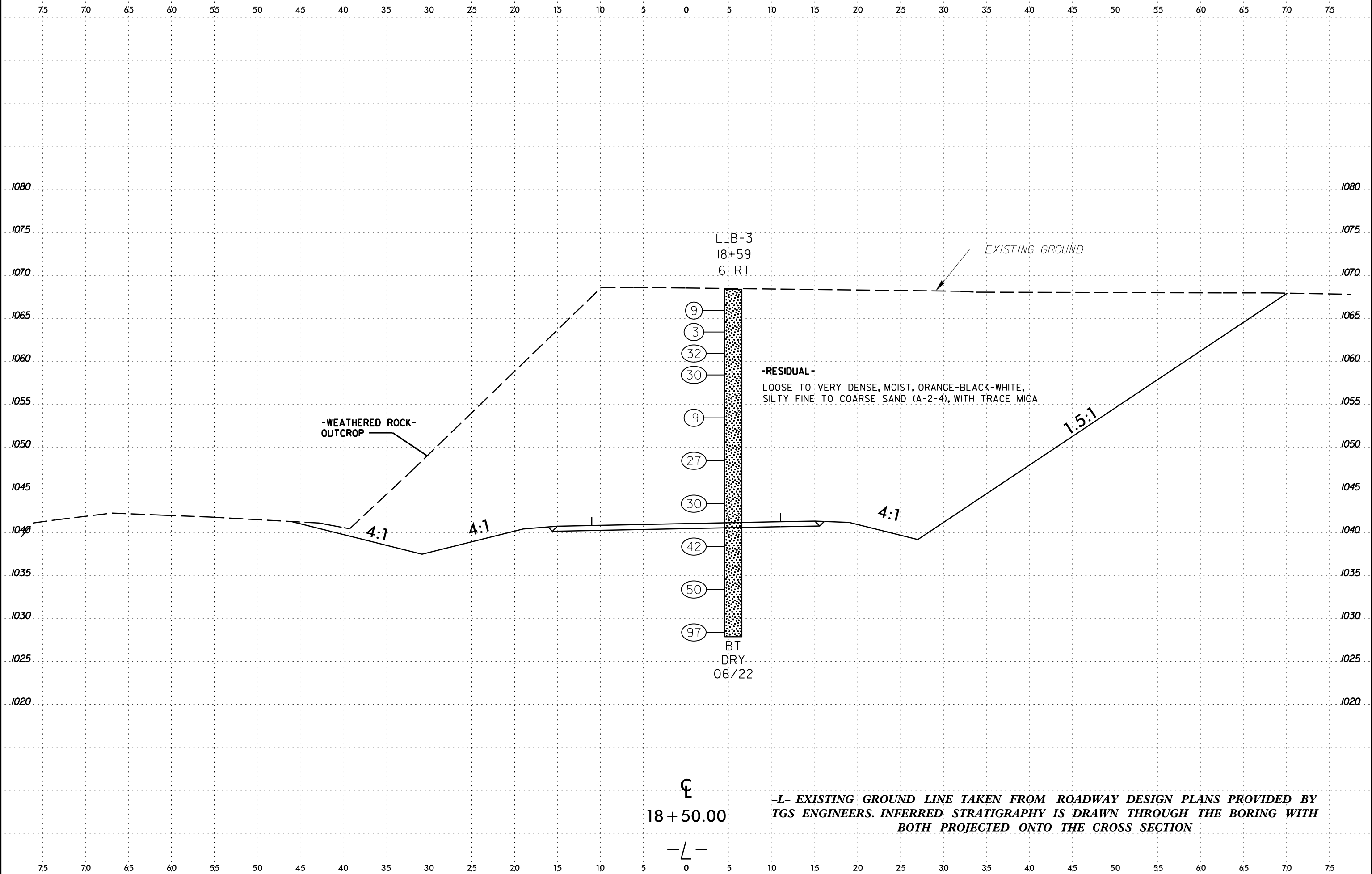
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<b>SOIL TEST RESULTS</b>															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-2	13' RT	18+09 -L-	6.0 - 7.5'	A-2-4(0)	29	0	42	33	14	11	95	67	29	10	-



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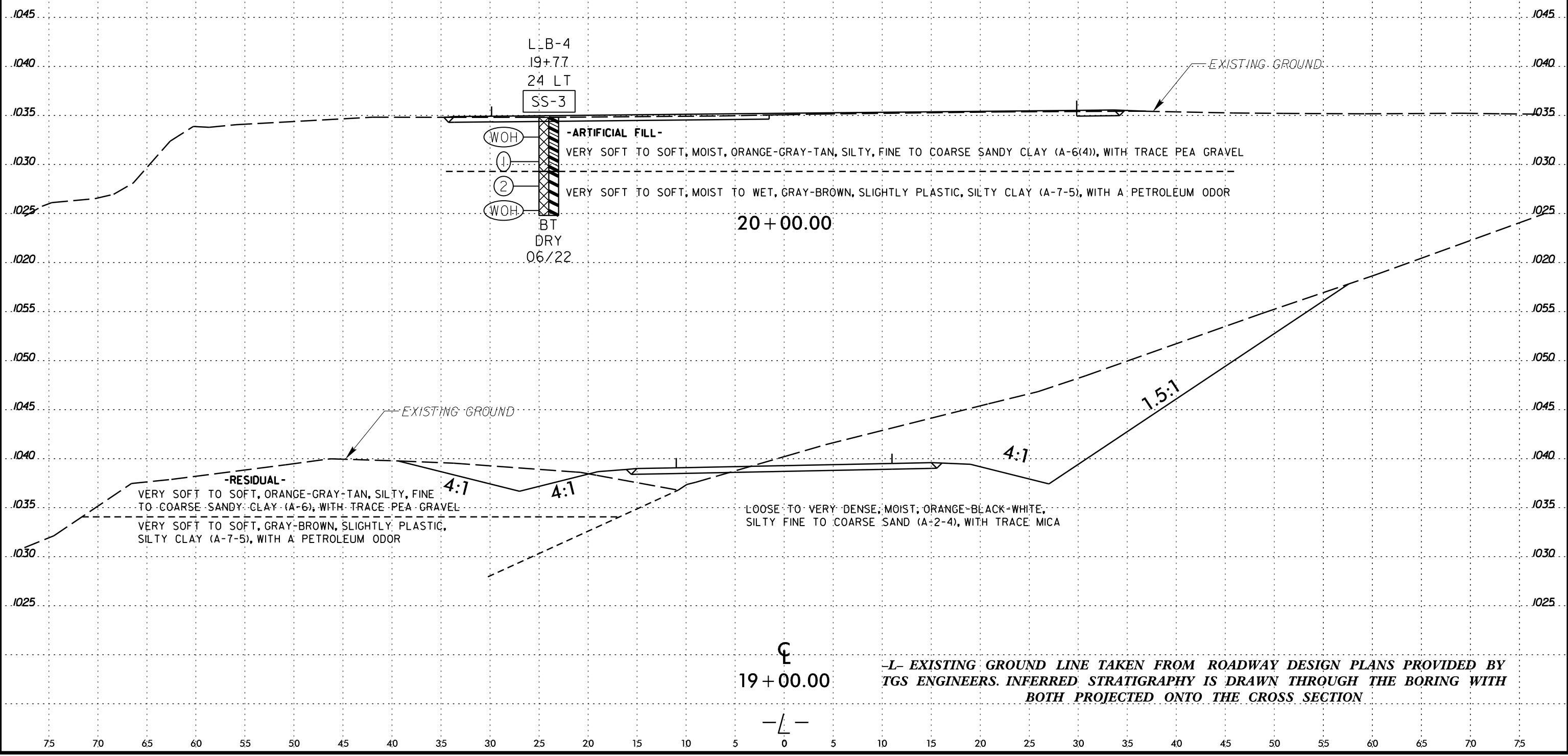


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# SOIL TEST RESULTS

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-3	24' LT	19+77 -L-	1.0 - 2.5'	A-6(4)	40	14	31	23	13	33	97	75	49	21	-



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENGINEERING UNIT  
SUBSURFACE INVESTIGATION  
APPENDIX A  
SOIL TEST RESULTS

REFERENCE: BP11.R004

PROJECT: SF-850062

*Prepared in the Office of:*

FALCON ENGINEERING  
CARY, NC  
NCDOT LAB CERT. NO. 105-0803

**LAB RESULTS****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-1	11' RT	14+14 -L-	1.0 - 2.5'	A-4(0)	28	9	36	27	24	13	88	67	37	14	-
SS-2	13' RT	18+09 -L-	6.0 - 7.5'	A-2-4(0)	29	0	42	33	14	11	95	67	29	10	-
SS-3	24' LT	19+77 -L-	1.0 - 2.5'	A-6(4)	40	14	31	23	13	33	97	75	49	21	-

LAB TESTING PERFORMED BY NCDOT LAB CERT NO. 105-0803