

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.	R-5911	1	16

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NOTES:

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- 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

E. SUSANTO

INVESTIGATED BY ECS SOUTHEAST, LLP

DRAWN BY K. DE MONTBRUN, P.E.

CHECKED BY M. WALKO, P.E.

SUBMITTED BY ECS SOUTHEAST, LLP

DATE AUGUST 2021

Prepared in the Office of:



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ENGINEERING
FIRM # F-1078



DocuSigned by:

Kelly De Montbrun 8/27/2021

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DATE

DOCUMENT NOT CONSIDERED FINAL
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CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	10+00 TO 20+39	4	N/A
-Y2-	11+75 TO 12+41	4	N/A

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	10+00 TO 20+39	5-10
-Y2-	11+75 TO 12+41	11

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY TEST RESULTS	12-14

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY AVERY
PROJECT DESCRIPTION US 19E AND NC 194 (ELK
PARK HWY) IMPROVEMENTS

INVENTORY

REFERENCE: R-5911

PROJECT: N/A

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

SUBSURFACE INVESTIGATION

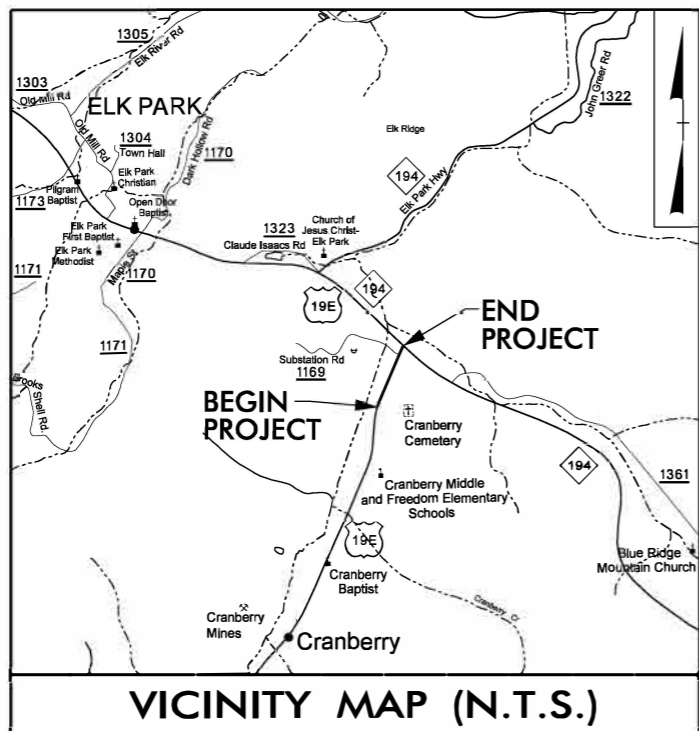
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS							
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, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i>				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.				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:				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 DISLOGGED 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.							
SOIL LEGEND AND AASHTO CLASSIFICATION				ANGULARITY OF GRAINS				CRYSTALLINE ROCK (CR)				NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.							
GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS				THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.				FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.				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.							
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.				MINERALOGICAL COMPOSITION				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.							
COMPRESSIBILITY				PERCENTAGE OF MATERIAL				WEATHERING				WEATHERED ROCK (WR)							
SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50				ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE				FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE 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. SEVERE 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 > 100 BPF. VERY SEVERE 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 < 100 BPF. 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.				SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50				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.			
GROUND WATER				MISCELLANEOUS SYMBOLS				ROCK HARDNESS				UNDERCUT							
WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP				ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY				DIP & DIP DIRECTION OF ROCK STRUCTURES SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE				UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK							
TEXTURE OR GRAIN SIZE				RECOMMENDATION SYMBOLS				ABBREVIATIONS				UNDERCUT							
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053				UNDERCUT UNCLASSIFIED EXCAVATION - UNACCEPTABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK				AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HL - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED UNIT WEIGHT DRY UNIT WEIGHT				Boulder (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)							
SOIL MOISTURE - CORRELATION OF TERMS				SOIL MOISTURE SCALE (ATTERBERG LIMITS)				SOIL MOISTURE SCALE (ATTERBERG LIMITS)				SOIL MOISTURE SCALE (ATTERBERG LIMITS)							
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION				SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION							
LL - LIQUID LIMIT PL - PLASTIC LIMIT OM - OPTIMUM MOISTURE SHRINKAGE LIMIT				SATURATED (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE				SATURATED (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE				SATURATED (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE							
PLASTICITY				EQUIPMENT USED ON SUBJECT PROJECT				FRACTURE SPACING				BEDDING							
NON PLASTIC 0-5 SLIGHTLY PLASTIC 6-15 MODERATELY PLASTIC 16-25 HIGHLY PLASTIC 26 OR MORE				DRILL UNITS: CME-45C, CME-55, CME-550, VANE SHEAR TEST, PORTABLE HOIST 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 HAMMER TYPE: AUTOMATIC, MANUAL CORE SIZE: B, H, N HAND TOOLS: POST HOLE DIGGER, HAND AUGER, SOUNDING ROD, VANE SHEAR TEST				TERM SPACING MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET				TERM THICKNESS 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, < 0.008 FEET							
COLOR				INDURATION				FRACTURE SPACING				BEDDING							
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.				FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF 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.				TERM SPACING MORE THAN 10 FEET, 3 TO 10 FEET, 1 TO 3 FEET, 0.16 TO 1 FOOT, LESS THAN 0.16 FEET				TERM THICKNESS 4 FEET, 1.5 - 4 FEET, 0.16 - 1.5 FEET, 0.03 - 0.16 FEET, 0.008 - 0.03 FEET, < 0.008 FEET							

05/08/99

TIP PROJECT: R-5911

See Sheet 1A For Index of Sheets



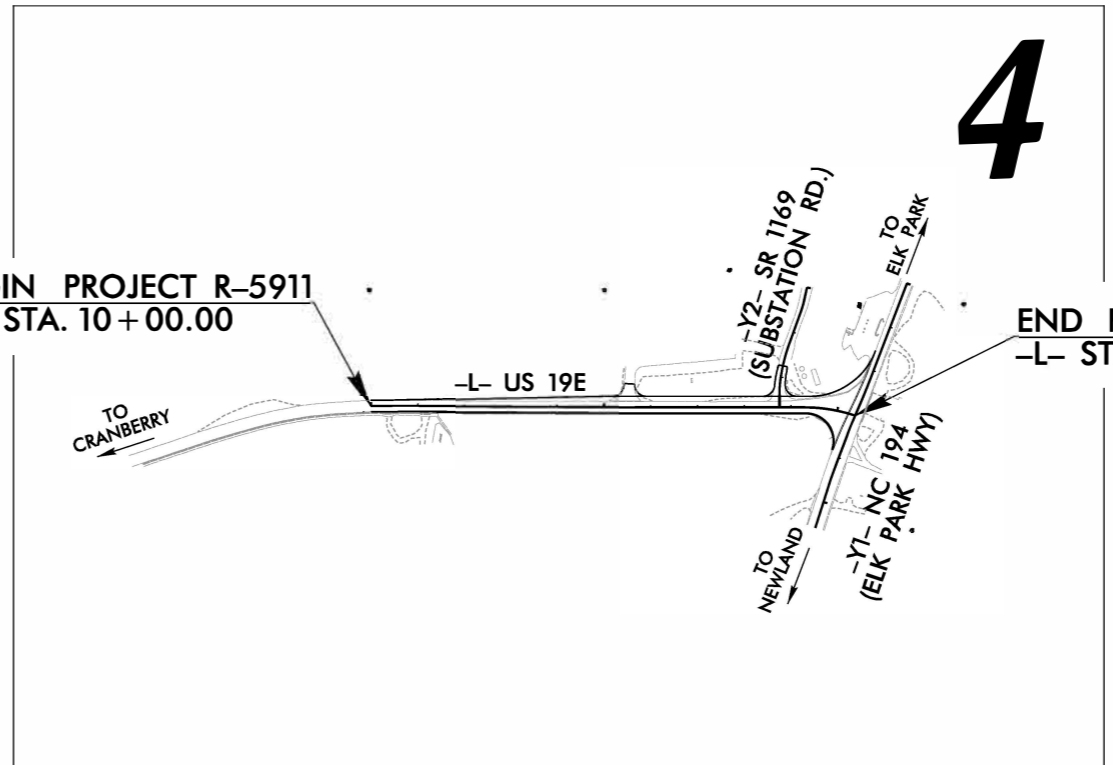
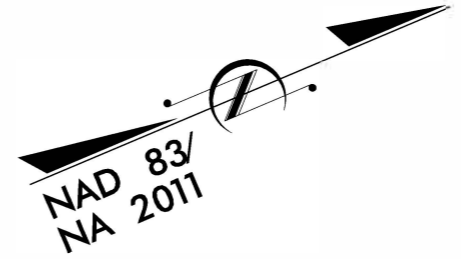
VICINITY MAP (N.T.S.)

25% PLANS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
AVERY COUNTY

LOCATION: US 19E AND NC 194 ELK PARK HWY
TYPE OF WORK: GRADING, PAVING, DRAINAGE, CURB & GUTTER AND SIDEWALK

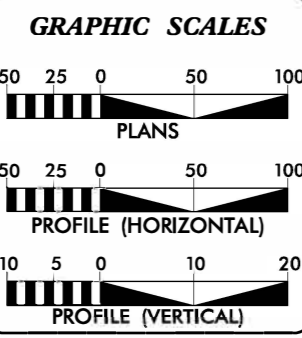
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5911	3	16
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
48466.1.1	0019064	PE	



4

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
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



DESIGN DATA

ADT 2021 =	3,000
ADT 2041 =	3,900
T =	6%
V =	45
TTST =	3%
DUALS =	3%
DESIGN SPEED =	50 MPH
FUNC CLASS =	COLLECTOR
REGIONAL TIER	

PROJECT LENGTH

LENGTH OF ROADWAY PROJECT R-5911 =	0.197 MI
TOTAL LENGTH OF PROJECT R-5911 =	0.197 MI

Prepared In the Office of:
VAUGHN & MELTON
1800-E Associates Lane
CHARLOTTE NC, 28217
FOR THE NORTH CAROLINA DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS	JOHN LANSFORD, PE PROJECT ENGINEER
RIGHT OF WAY DATE: FEBRUARY 15, 2022	DAVID DAVES PROJECT DESIGN ENGINEER
LETTING DATE: MARCH 17, 2022	NC DOT CONTACT:

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



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User:amfitzpatrick



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August 27, 2021

WBS NO: N/A
TIP NO: R-5911
COUNTY: Avery
DESCRIPTION: US 19E and NC 194 (Elk Park Hwy) Improvements

SUBJECT: Geotechnical Report – Inventory

Project Description

The project consists of widening US 19E to include a new turning lane along its approach to the intersection of US 19E and NC 194 (Elk Park Hwy) in Avery County, North Carolina. Improvements include widening and resurfacing US 19E (-L-) and resurfacing SR 1169/Substation Road (-Y2-). US 19E will be widened along its approach to NC 194 (Elk Park Hwy) to accommodate a new 12-foot wide turning lane with a taper. The project is approximately 1,040 linear feet in length, measured along the US 19E (-L-) alignment.

At the beginning of the project, the proposed road grade along the -L- alignment centerline begins at approximate elevation 3,093 feet and slopes downward to a low elevation of approximately 3,080 feet in at the end of the project near Station 20+39. Soils encountered in the proposed construction areas generally consisted of roadway embankment underlain by alluvial and residual soils. Mass grading will generally be limited to the widened areas with cut depths on the order of approximately 2 feet or less and fill heights on the order of 4 feet or less.

The following roads are included as part of this exploration:

<u>Line</u>	<u>Road Name</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	US 19E	10+00 to 20+39	LT to RT
-Y2-	SR 1169/Substation Road	11+75 to 12+41	LT to RT

A geotechnical field investigation was performed by ECS in July 2021. During this time period, a total of six (6) hand auger borings supplemented with Dynamic Cone Penetrometer (DCP) tests were performed along the -L- alignment within the proposed widened areas. Representative soil samples were collected for visual classification in the field and for analysis by ECS's testing laboratory.

Physiography and Geology

In accordance with the Geologic Map of North Carolina, 1985, the project corridor is located in the Blue Ridge Physiographic Province of North Carolina. The eastern Blue Ridge consists of a variety of igneous and high-grade metamorphic rocks, including numerous granite bodies. The metamorphic rocks were originally part of the Precambrian basement, as were the volcanic and sedimentary rock laid down as the proto-Atlantic Ocean began to close during the early Paleozoic era. Migmatites, rocks with both metamorphic and igneous characteristics, make up other eastern Blue Ridge rocks and reveal the very high temperatures reached by these rocks during mountain uplift. The soils in the Blue Ridge Province typically consist of residuum (weathered in-place soils) derived from the parent bedrock, alluvium in the valleys, and sometimes colluvium draping the hillsides.

Soil Properties

Soils within the area of this project have been divided into three categories: roadway embankment, alluvial, and residual soils.

Roadway Embankment: Roadway Embankment (R.E.) soils generally consist medium stiff to stiff fine to coarse sandy silt (A-4) with trace amounts of organics and gravel. The roadway embankment extends to depths ranging from approximately 1.5 to 2.0 feet below existing grades. Laboratory testing of the roadway embankment soils indicated Plasticity Indices (PI's) ranging from 5 to 6 for the silty (A-4) soils.

Alluvial Soils: Alluvial soils generally consist of soft fine to coarse sandy clay (A-6) and soft to stiff fine to coarse sandy silt (A-4). Laboratory testing of the alluvial soils indicated a Plasticity Index (PI) of 11 for the clayey (A-6) soil.

Residual Soils: Residual soils throughout the project corridor are derived from the weathering of the underlying parent bedrock. A majority of the residual soils encountered generally consisted of medium stiff to stiff fine to coarse sandy silt (A-4), medium stiff clayey silt (A-5), and medium stiff fine to coarse sandy clay (A-6). Laboratory testing of the residual soils indicated a Plasticity Index (PI) of 9 for the silty (A-4) soils, a PI of 13 for the clayey (A-6) soils.

Groundwater Properties

Groundwater levels were measured in the borings both immediately after drilling (0-hr reading). At the time of drilling, water was encountered in 2 borings at depths ranging from approximately 3.3 to 5.5 feet below existing grades, which corresponds to elevations ranging from 3,078.6 feet to 3,073.0 feet. The remaining borings were dry when groundwater readings were taken. Due to the proximity to the existing roadway, the borings were filled in after augering, making stabilized (24-hr) water readings unobtainable. The recovered soil samples were generally described as moist above the groundwater level and moist to saturated below the groundwater level

Areas of Special Geotechnical Interest

- 1) Soft/Very Loose Soils: The following areas contain relatively soft or very loose soils that have the potential for subgrade instability, embankment stability or long-term settlement problems during construction:

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	16+75 to 18+75	LT
-Y2-	11+75 to 12+41	RT

- 2) High Groundwater: Groundwater was encountered within six feet of the proposed subgrade at the following locations. This has the potential to cause subgrade instability and/or constructability issues.

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	12+75 to 14+75	LT
-L-	16+75 to 18+75	LT

- 3) Hand Auger Refusal: The following areas encountered hand auger refusal above or within 6 feet of proposed subgrade. Hand auger refusal could indicate areas of rocky embankment fill, hard or dense residual soils layers, weathered rock or crystalline rock.

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	10+75 to 12+75	LT
-L-	14+75 to 16+75	LT
-L-	18+75 to 20+39	LT

-L- CURVE DATA

PI Sta 10+67.22 Δ = 0° 47' 19.9" (RT) D = 2' 36' 15.7" L = 30.29' T = 15.15' R = 2,200.00' RUNOFF = 96' S.E. = 0.04%	PI Sta 15+46.26 Δ = 0° 12' 41.6" (LT) D = 0' 31' 15.7" L = 40.61' T = 20.31' R = 11,000.00' RUNOFF = 96' S.E. = 0.04%	PI Sta 19+85.22 Δ = 18° 45' 51.0" (RT) D = 17' 12' 21.4" L = 109.06' T = 55.02' R = 333.00' RUNOFF = 96' S.E. = 0.04%
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-Y1- CURVE DATA

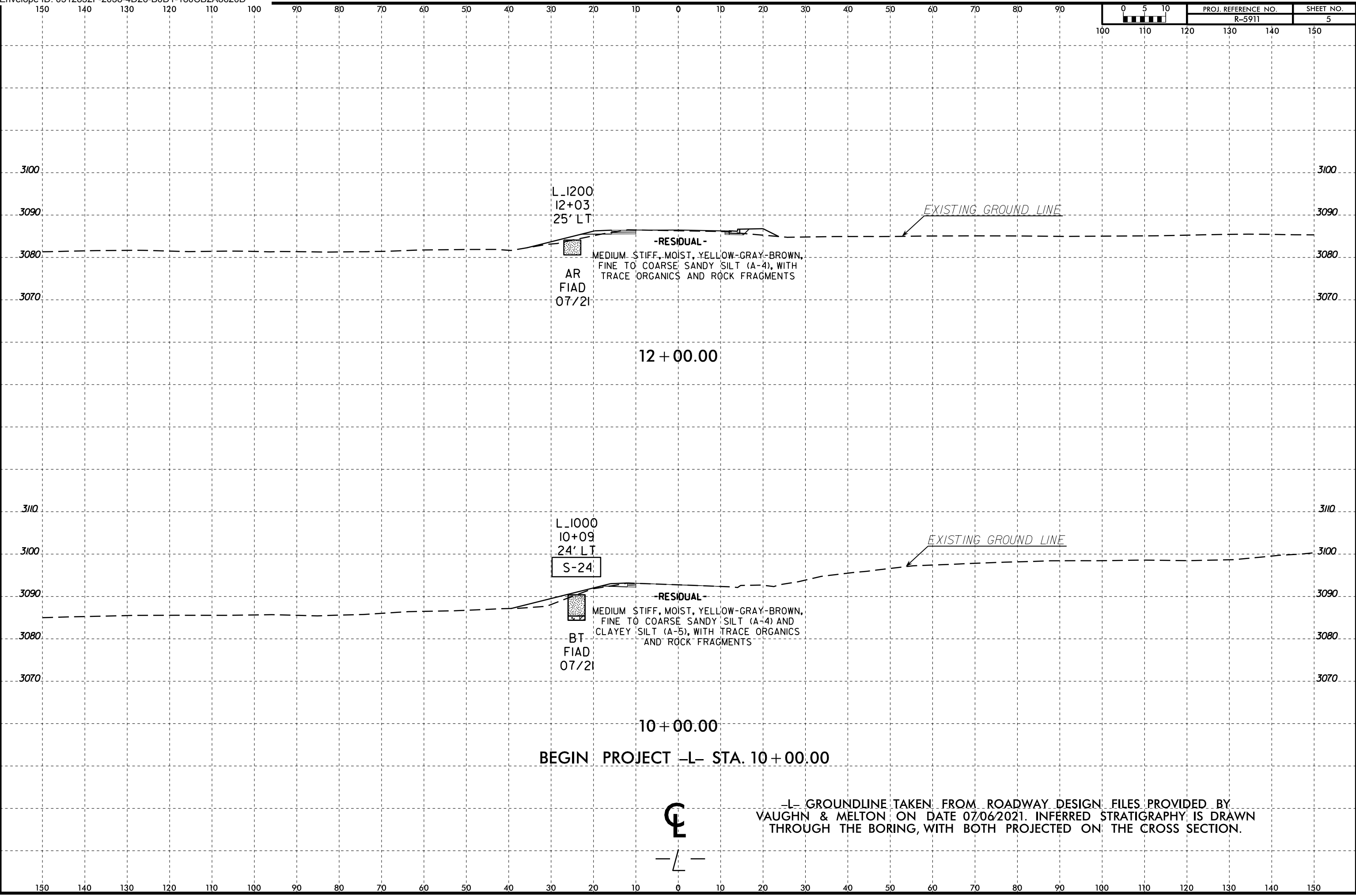
PI Sta 12+45.41 Δ = 2° 25' 52.4" (RT) D = 2' 57' 56.2" L = 81.98' T = 41.00' R = 1,932.00'	PI Sta 13+31.15 Δ = 2° 38' 00.3" (LT) D = 7' 48' 21.5" L = 33.74' T = 16.87' R = 734.00'	PI Sta 14+31.38 Δ = 2° 45' 52.0" (LT) D = 7' 40' 49.4" L = 35.99' T = 18.00' R = 746.00'
---	---	---

-Y2- CURVE DATA

PI Sta 10+40.18 Δ = 7° 28' 59.9" (RT) D = 28' 38' 52.4" L = 26.12' T = 13.08' R = 200.00'	PI Sta 11+53.28 Δ = 8° 56' 34.7" (LT) D = 14' 19' 26.2" L = 62.43' T = 31.28' R = 400.00'	PI Sta 12+13.48 Δ = 10° 59' 27.5" (LT) D = 22' 38' 47.6" L = 48.53' T = 24.34' R = 253.00'
--	--	---



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\$\$\$\$SERIALNAME\$\$\$\$



L_I200
12+03
25' LT

AR
FIAD
07/21

-RESIDUAL-
MEDIUM STIFF, MOIST, YELLOW-GRAY-BROWN,
FINE TO COARSE SANDY SILT (A-4), WITH
TRACE ORGANICS AND ROCK FRAGMENTS

12 + 00.00

L_I000
10+09
24' LT

S-24

BT
FIAD
07/21

-RESIDUAL-
MEDIUM STIFF, MOIST, YELLOW-GRAY-BROWN,
FINE TO COARSE SANDY SILT (A-4) AND
CLAYEY SILT (A-5), WITH TRACE ORGANICS
AND ROCK FRAGMENTS

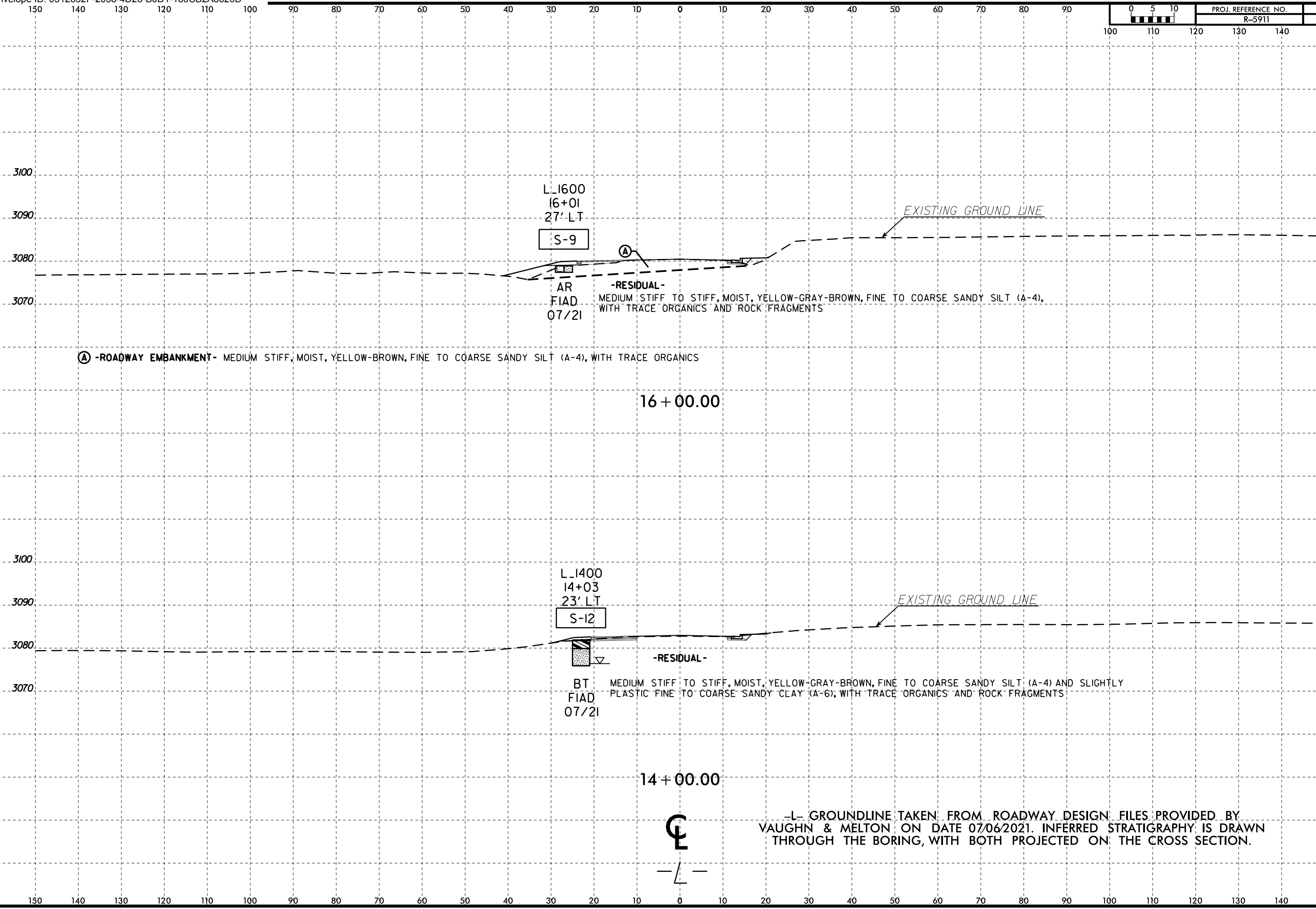
10 + 00.00

BEGIN PROJECT -L- STA. 10 + 00.00



-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY VAUGHN & MELTON ON DATE 07/06/2021. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

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\$\$\$\$SERIAL\$\$\$\$



L_1600
16+01
27' LT
S-9

AR
FIAD
07/21

-RESIDUAL-
MEDIUM STIFF TO STIFF, MOIST, YELLOW-GRAY-BROWN, FINE TO COARSE SANDY SILT (A-4),
WITH TRACE ORGANICS AND ROCK FRAGMENTS

Ⓐ -ROADWAY EMBANKMENT- MEDIUM STIFF, MOIST, YELLOW-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE ORGANICS

16 + 00.00

L_1400
14+03
23' LT
S-12

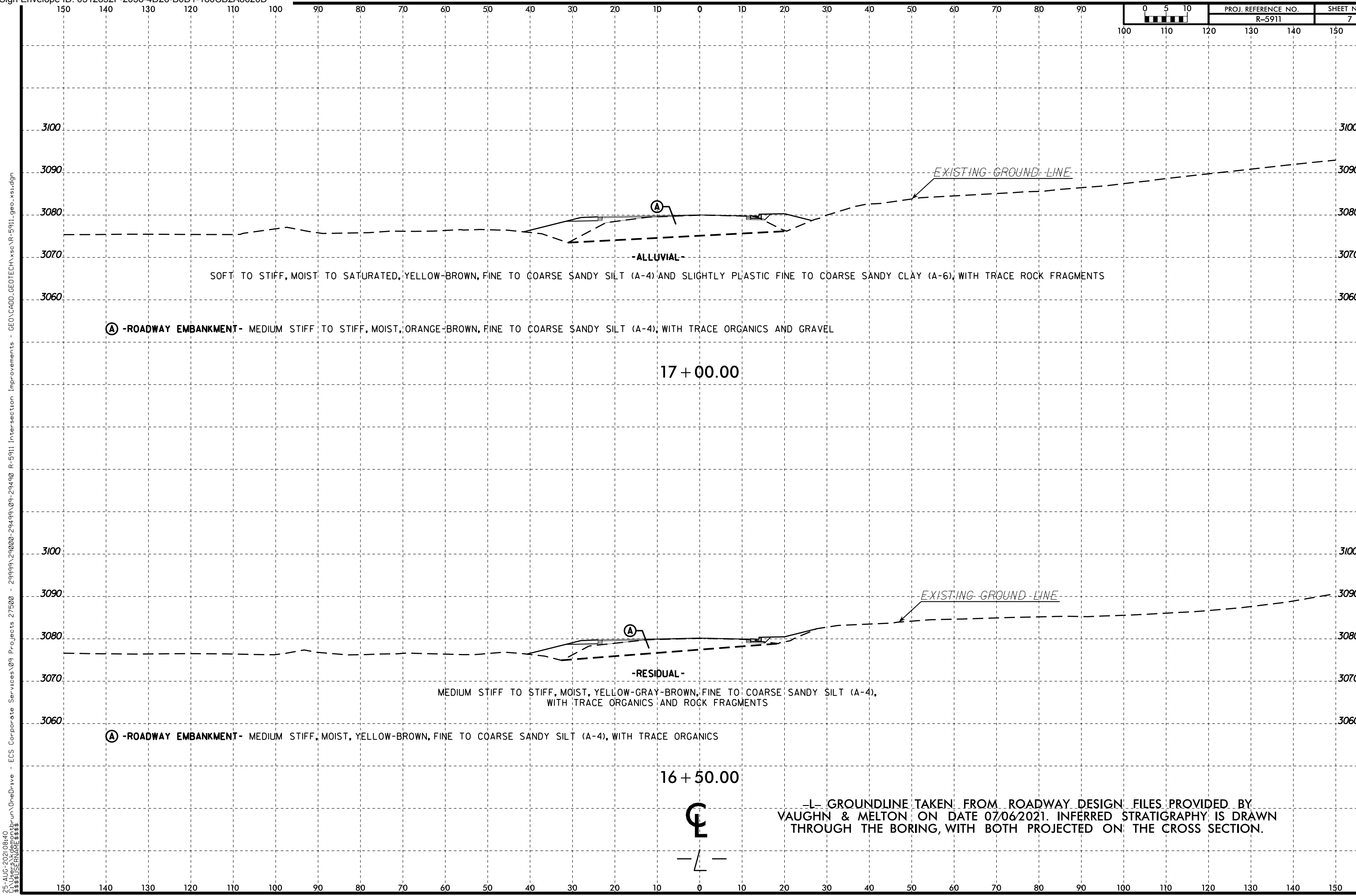
BT
FIAD
07/21

-RESIDUAL-
MEDIUM STIFF TO STIFF, MOIST, YELLOW-GRAY-BROWN, FINE TO COARSE SANDY SILT (A-4) AND SLIGHTLY
PLASTIC FINE TO COARSE SANDY CLAY (A-6), WITH TRACE ORGANICS AND ROCK FRAGMENTS

14 + 00.00

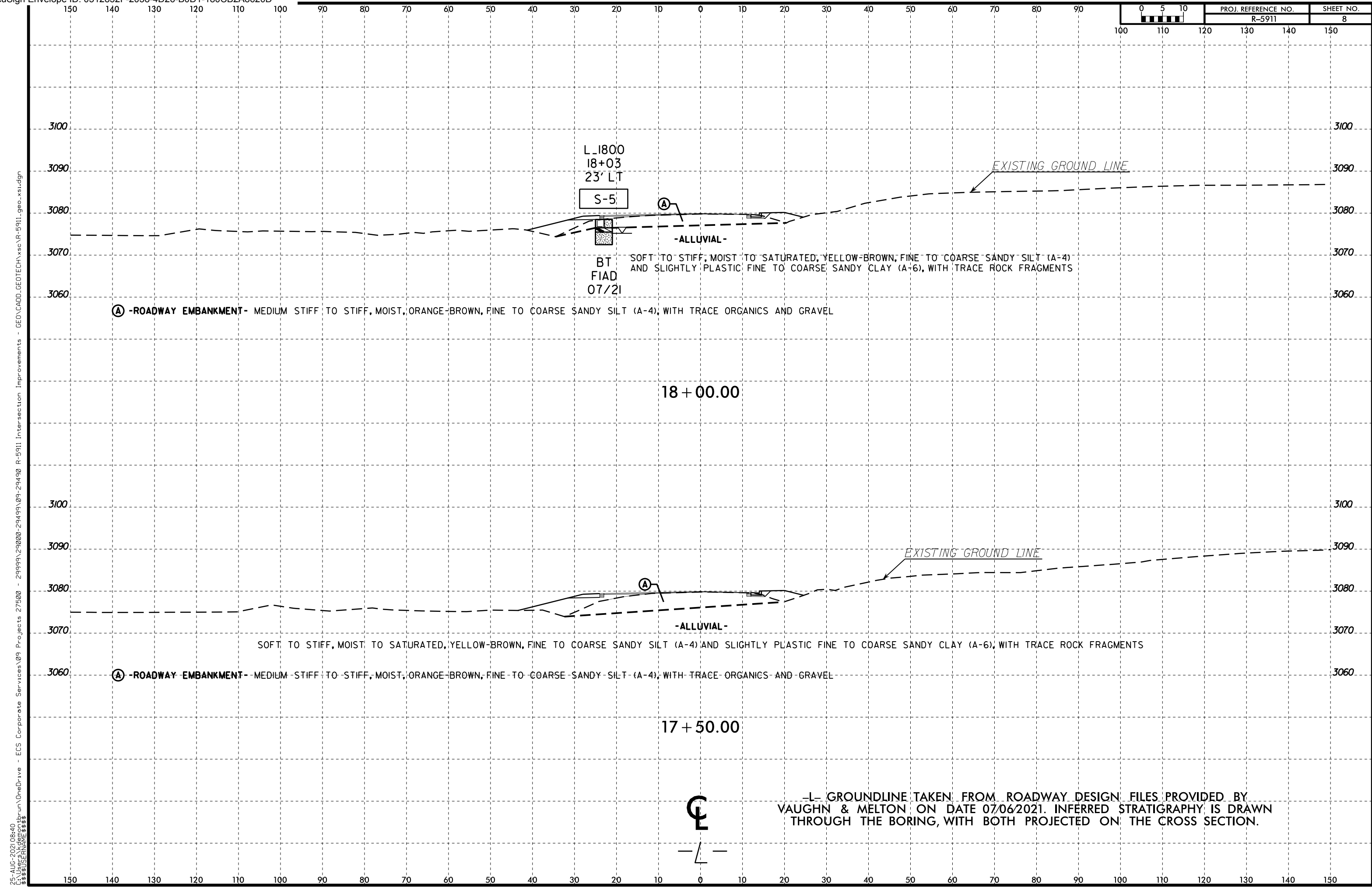


-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY VAUGHN & MELTON ON DATE 07/06/2021. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.



-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY VAUGHN & MELTON ON DATE 07/06/2021. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

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 \$\$\$\$SERIALNAME\$\$\$\$



L 1800
18+03
23' LT

S-5

BT
FIAD
07/21

-ALLUVIAL-

SOFT TO STIFF, MOIST TO SATURATED, YELLOW-BROWN, FINE TO COARSE SANDY SILT (A-4) AND SLIGHTLY PLASTIC FINE TO COARSE SANDY CLAY (A-6), WITH TRACE ROCK FRAGMENTS

(A) -ROADWAY EMBANKMENT- MEDIUM STIFF TO STIFF, MOIST, ORANGE-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE ORGANICS AND GRAVEL

18 + 00.00

EXISTING GROUND LINE

(A)

-ALLUVIAL-

SOFT TO STIFF, MOIST TO SATURATED, YELLOW-BROWN, FINE TO COARSE SANDY SILT (A-4) AND SLIGHTLY PLASTIC FINE TO COARSE SANDY CLAY (A-6), WITH TRACE ROCK FRAGMENTS

(A) -ROADWAY EMBANKMENT- MEDIUM STIFF TO STIFF, MOIST, ORANGE-BROWN, FINE TO COARSE SANDY SILT (A-4), WITH TRACE ORGANICS AND GRAVEL

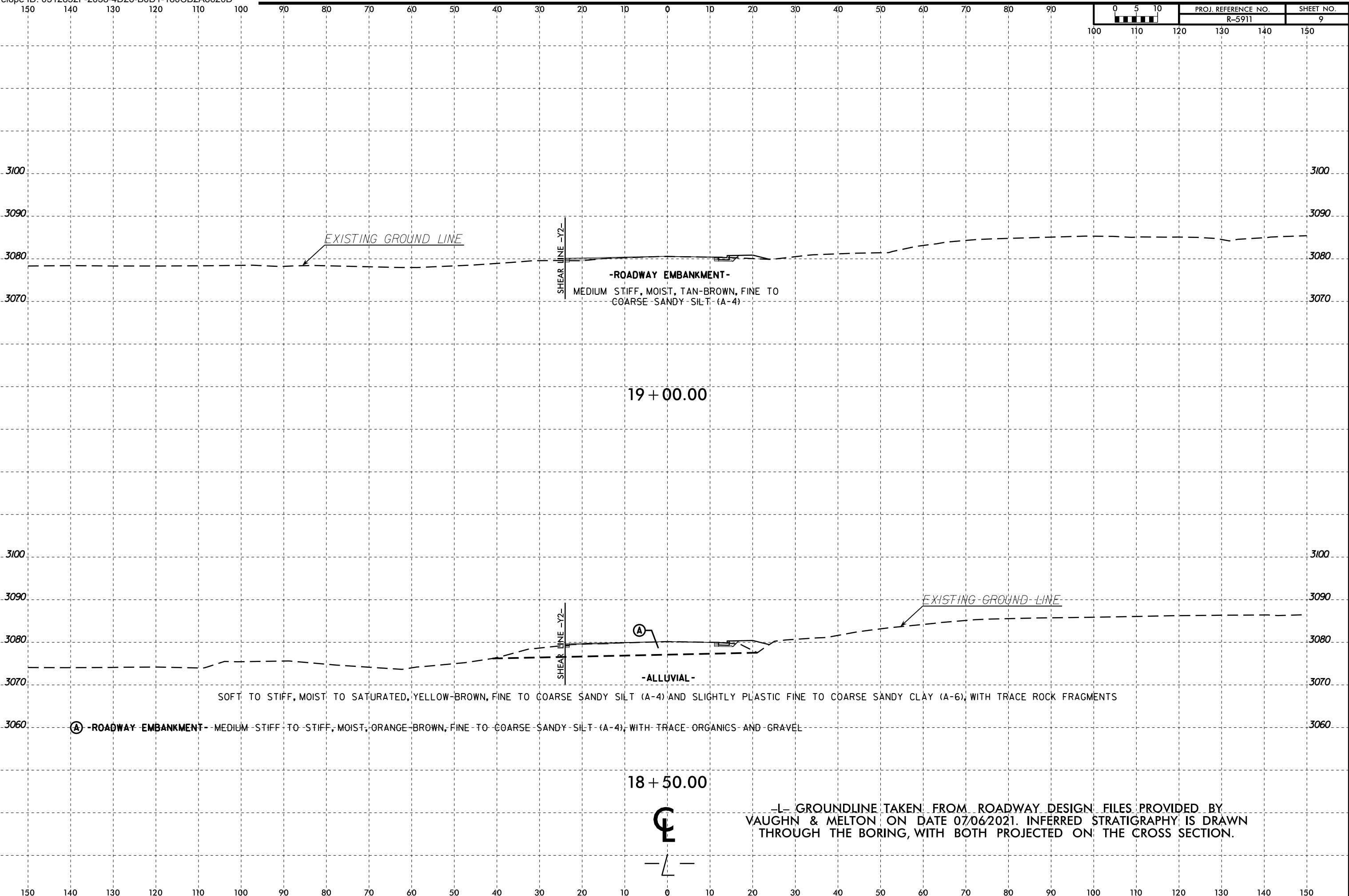
17 + 50.00

EXISTING GROUND LINE



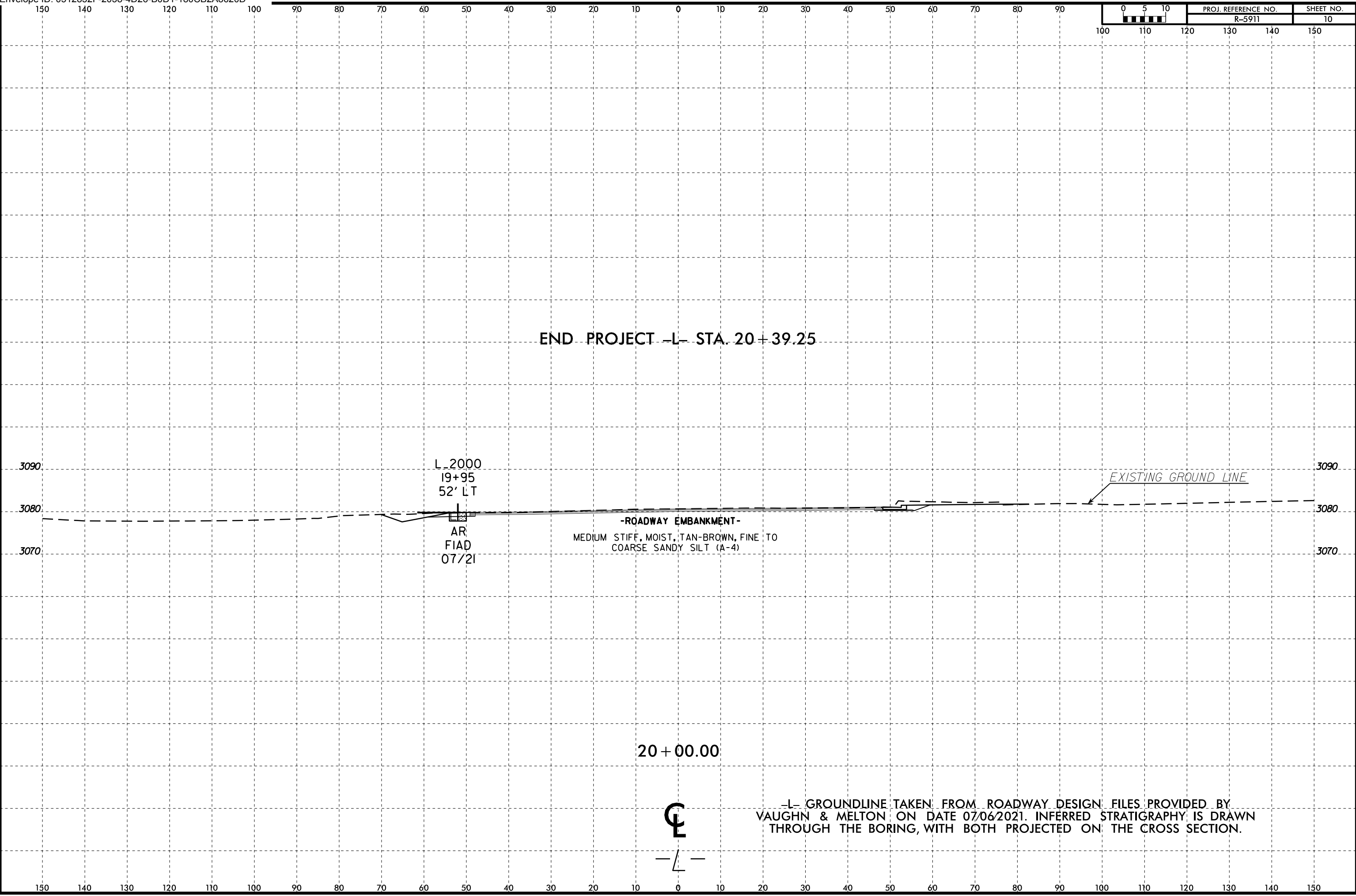
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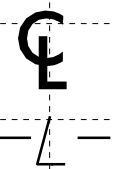
END PROJECT -L- STA. 20+39.25

L_2000
19+95
52' LT
AR
FIAD
07/21

-ROADWAY EMBANKMENT-
MEDIUM STIFF, MOIST, TAN-BROWN, FINE TO
COARSE SANDY SILT (A-4)

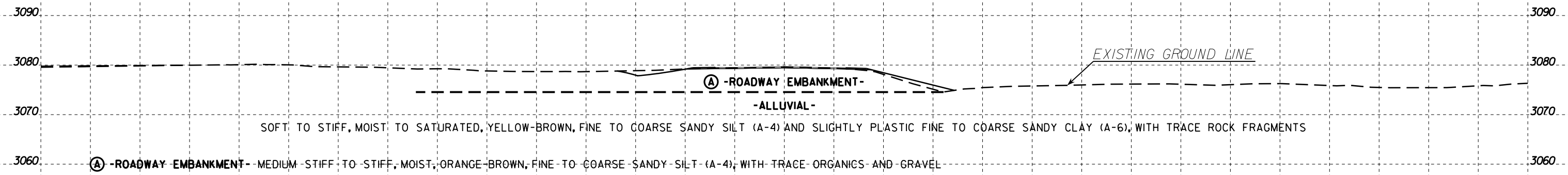
EXISTING GROUND LINE

20 + 00.00

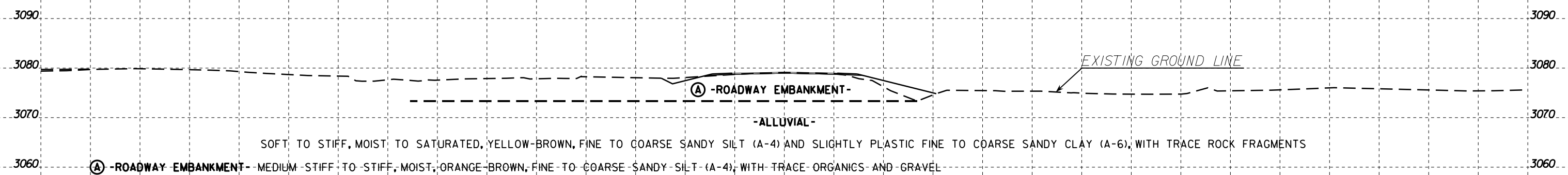


-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY
VAUGHN & MELTON ON DATE 07/06/2021. INFERRED STRATIGRAPHY IS DRAWN
THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

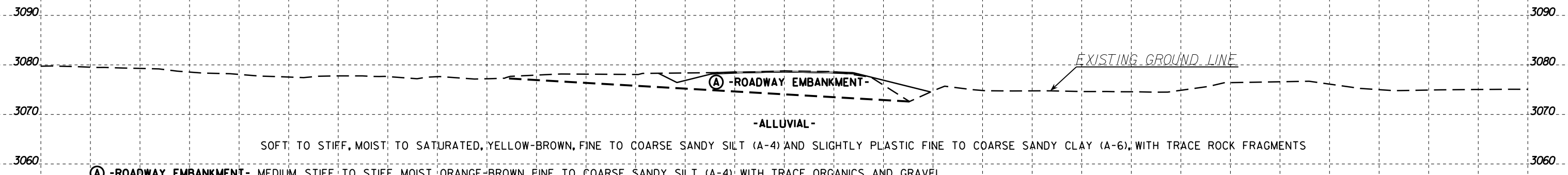
END CONSTRUCTION -Y2- STA. 12 + 40.71



12 + 25.00



12 + 00.00



11 + 75.00

BEGIN CONSTRUCTION -Y2- STA. 11 + 75.00

-Y2- GROUNDLINE TAKEN FROM ROADWAY DESIGN FILES PROVIDED BY VAUGHN & MELTON ON DATE 07/06/2021. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE CROSS SECTION.

CL
-Y2-

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REFERENCE: R-5911

PROJECT: N/A

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

SUBSURFACE INVESTIGATION

***APPENDIX A
LABORATORY TEST RESULTS***

SOIL TEST RESULTS

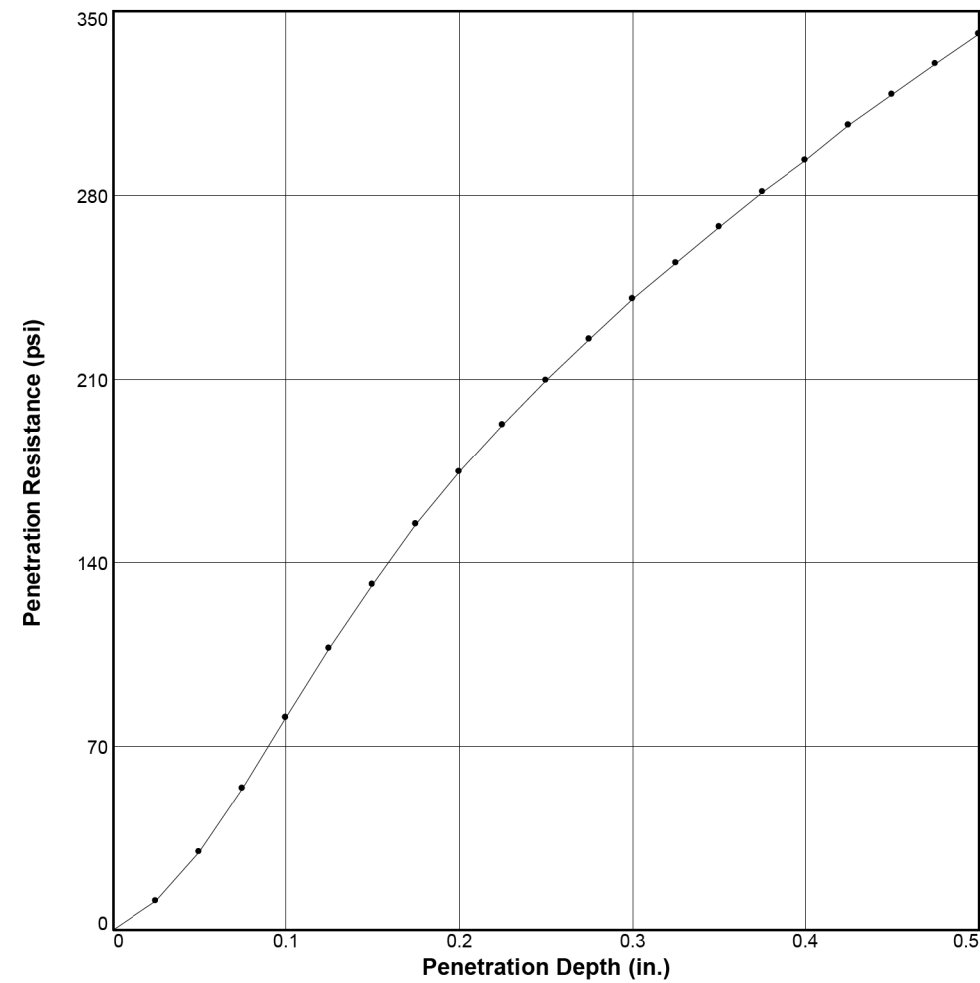
BORING NO.	SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
								C. SAND	F. SAND	SILT	CLAY	10	40	200		
L_1000	S-24	24' LT	10+09	3.0-4.0'	A-4(3)	38	9	29.2	16.4	32.3	22.1	87.6	68.2	51.2	24.9	-
L_1400	S-12	23' LT	14+03	1.0-2.0'	A-6(8)	40	13	21.6	14.0	28.4	36.0	97.2	82.6	65.7	26.8	-
L_1600	S-9	27' LT	16+01	0.0-1.0'	A-4(0)	30	6	31.2	21.0	22.0	25.8	82.7	63.0	44.2	24.7	-
L_1800	S-5	23' LT	18+03	2.0-3.0'	A-6(5)	36	11	22.0	16.4	31.8	29.8	92.6	78.8	60.6	26.9	-
L_2000	CBR-1	52' LT	19+95	0.0-2.0'	A-4(0)	33	5	44.6	14.9	33.0	7.5	89.5	58.0	39.2	22.8	-

LAB TECHNICIAN: C. RUPERT

NCDOT CERTIFICATION NO. 112-01-1003

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicative of apparently identical samples.

BEARING RATIO TEST REPORT ASTM D1883-14



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	111.0	101.8	15.6	109.8	100.7	16.5	10.8	12.9	0.026	10	1.1
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Light Brown Fine to Coarse Sandy Silt (A-4(0))		109.0	15.9	33	5

Project No: 09:29490
Project: R-5911
Sample Number: L_2000 **Depth:** 0-2
Date: 08/23/2021

ECS SOUTHEAST, LLP
 1812 Center Park Drive, Suite D Phone: (704) 525-5152
 Charlotte, NC 28217 Fax: (704) 357-0023

Test Description/Remarks:

Figure _____