

REFERENCE: SF-890048

PROJECT: 41350

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>PROFILE</u>
-L-	12+20-18+00	4	5

CROSS SECTIONS

<u>LINE</u>	<u>STATION</u>	<u>SHEETS</u>
-L-	12+50-17+50	6-11

APPENDICES

<u>APPENDIX</u>	<u>TITLE</u>	<u>SHEETS</u>
A	BORE LOGS	13
B	LABORATORY TEST RESULTS	15-16

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

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY UNION
PROJECT DESCRIPTION BRIDGE NO. 048 OVER WATER
BRANCH ON SR 1714 (BURNSVILLE ROAD)

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-890048	1	19

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.

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- 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

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C. OSBORNE

S. WERLEY, P.G.

INVESTIGATED BY ECS SOUTHEAST, LLP

DRAWN BY A. SUTTLE, P.G.

CHECKED BY M. WALKO, P.E.

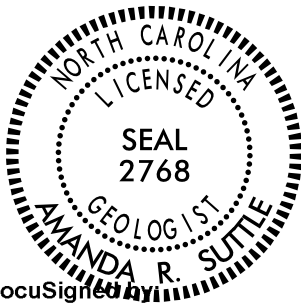
SUBMITTED BY ECS SOUTHEAST, LLP

DATE DECEMBER 2022



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Amanda R. Suttle

399DBE42874A494...

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									
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 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>										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 DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.									
SOIL LEGEND AND AASHTO CLASSIFICATION										MINERALOGICAL COMPOSITION										WEATHERING																			
GENERAL CLASS.										MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										FRESH																			
GROUP CLASS.										COMPRESSIBILITY										VERY SLIGHT (V SL.)																			
SYMBOL										PERCENTAGE OF MATERIAL										SLIGHT (SL.)																			
Z PASSING #10 #40 #200										GROUND WATER										MODERATE (MOD.)																			
MATERIAL PASSING #40 LL PI										MISCELLANEOUS SYMBOLS										SEVERE (MOD. SEV.)																			
GROUP INDEX										RECOMMENDATION SYMBOLS										SEVERE (SEV.)																			
USUAL TYPES OF MAJOR MATERIALS										ABBREVIATIONS										VERY SEVERE (V SEV.)																			
GEN. RATING AS SUBGRADE										EQUIPMENT USED ON SUBJECT PROJECT										COMPLETE																			
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																				ROCK HARDNESS																			
CONSISTENCY OR DENSENESS																				VERY HARD																			
PRIMARY SOIL TYPE																				HARD																			
COMPACTNESS OR CONSISTENCY																				MODERATELY HARD																			
RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)																				MEDIUM HARD																			
RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																				SOFT																			
GENERAL																				VERY SOFT																			
GRANULAR MATERIAL (NON-COHESIVE)																				SOFT																			
SILT-CLAY MATERIAL (COHESIVE)																				MEDIUM STIFF																			
																				STIFF																			
																				VERY STIFF																			
																				HARD																			
TEXTURE OR GRAIN SIZE																				BEDDING																			
U.S. STD. SIEVE SIZE OPENING (MM)																				FRACTURE SPACING																			
BOULDER (BLDR.)																				TERM																			
COBBLE (COB.)																				SPACING																			
GRAVEL (GR.)																				VERY WIDE																			
COARSE SAND (CSE. SD.)																				WIDE																			
FINE SAND (F. SD.)																				MODERATELY CLOSE																			
SILT (SL.)																				CLOSE																			
CLAY (CL.)																				VERY CLOSE																			
GRAIN SIZE																				THICKNESS																			
305 12																				VERY THICKLY BEDDED																			
75 3																				THICKLY BEDDED																			
2.0																				THINLY BEDDED																			
0.25																				VERY THINLY BEDDED																			
0.05																				THICKLY LAMINATED																			
0.005																				THINLY LAMINATED																			
SOIL MOISTURE - CORRELATION OF TERMS																				INDURATION																			
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																				FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.																			
FIELD MOISTURE DESCRIPTION																				FRIABLE																			
GUIDE FOR FIELD MOISTURE DESCRIPTION																				MODERATELY INDURATED																			
- SATURATED - (SAT.)																				INDURATED																			
- WET - (W)																				EXTREMELY INDURATED																			
- MOIST - (M)																																							
- DRY - (D)																																							
PLASTICITY																																							
PLASTICITY INDEX (PI)																																							
NON PLASTIC																																							
SLIGHTLY PLASTIC																																							
MODERATELY PLASTIC																																							
HIGHLY PLASTIC																																							
COLOR																																							
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.																																							

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES
FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR
JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

SURFACE CONDITIONS

VERY GOOD
Very rough, fresh unweathered surfaces

GOOD
Rough, slightly weathered, iron stained surfaces

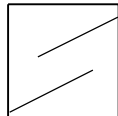
FAIR
Smooth, moderately weathered and altered surfaces

POOR
Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

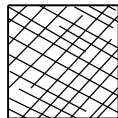
VERY POOR
Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ➡

STRUCTURE



INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



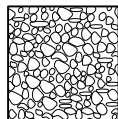
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



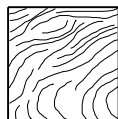
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets



BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity



DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces



LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES
⇩

90

80

70

60

50

40

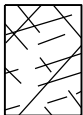
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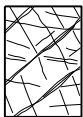
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N/A

N/A



A. Thick bedded, very blocky sandstone
The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.



B. Sandstone with thin inter-layers of siltstone



C. Sandstone and siltstone in similar amounts



D. Siltstone or silty shale with sandstone layers



E. Weak siltstone or clayey shale with sandstone layers

C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H**.



F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure



G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers



H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.

➡ Means deformation after tectonic disturbance

SURFACE CONDITIONS OF
DISCONTINUITIES
(Predominantly bedding planes)

VERY GOOD - Very Rough, fresh unweathered surfaces

GOOD - Rough, slightly weathered surfaces

FAIR - Smooth, moderately weathered and altered surfaces

POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments

VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

COMPOSITION AND STRUCTURE

70

60

50

40

30

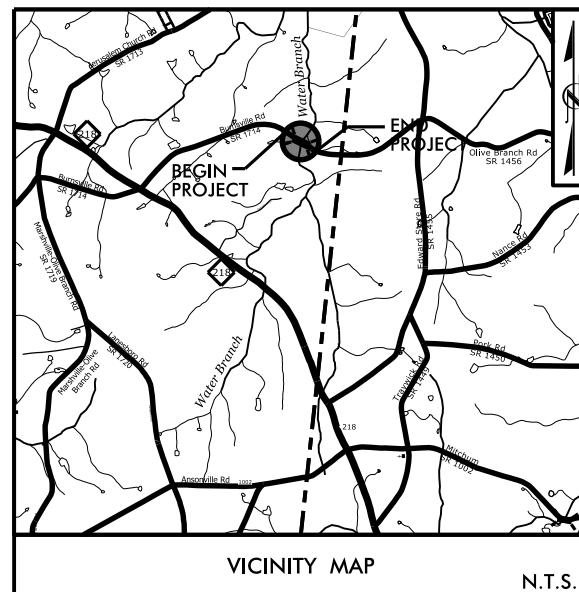
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PROJECT WBS: BPI0.R023.3

CONTRACT:

See Sheet 1A For Index of Sheets
See Sheet 1B For Standard Symbology Sheet



PRELIMINARY PLANS

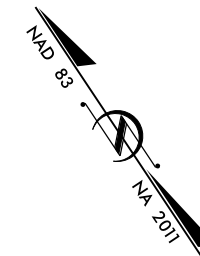
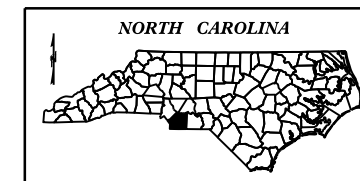
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

UNION COUNTY

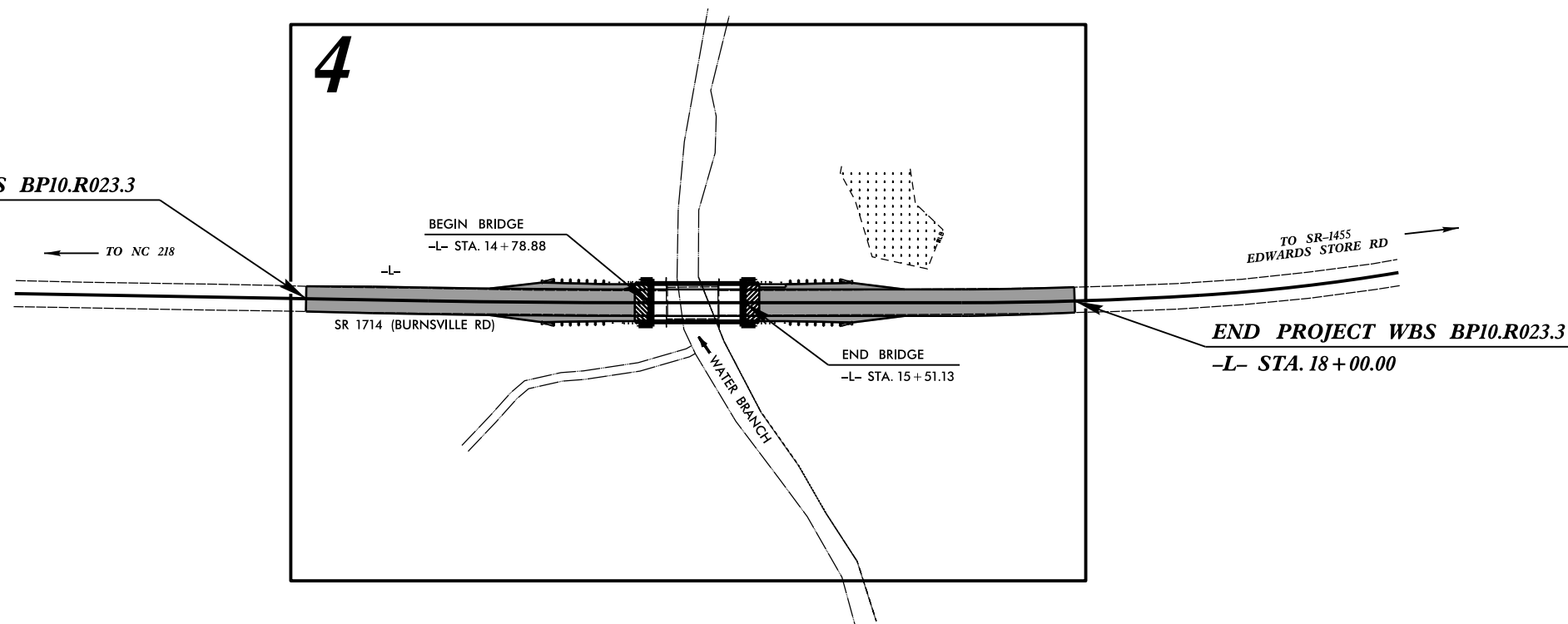
**LOCATION: BRIDGE #48 OVER WATER BRANCH
ON SR 1714 (BURNSVILLE RD)**

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

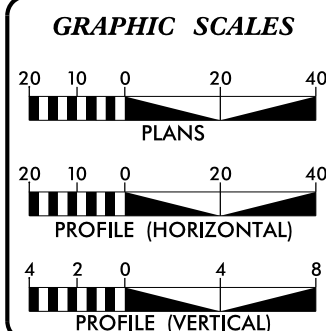
STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEET
N.C.	BP10.R023.3		3	19
STATE PROJ.NO.		F.A. PROJ.NO.	DESCRIPTION	
BP10.R023.1		N/A	P.E.	



BEGIN PROJECT WBS BP10.R023.3
-L- STA. 12+20.00



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



DESIGN DATA

ADT 2015 = 380
ADT 2025 = 760
DHV = N/A
D = N/A
T = 6%
V = 55 MPH
FUNC. CLASSIFICATION:
LOCAL
SUB REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY PROJECT WBS BP10.R023.3 = 0.096 MILES
 LENGTH OF STRUCTURE PROJECT WBS BP10.R023.3 = 0.014 MILES
 TOTAL LENGTH OF PROJECT WBS BP10.R023.3 = 0.110 MILES

NCDOT CONTACT: GARLAND HAYWOOD, PE
Division Bridge Manager

PLANS PREPARED FOR THE NCDOT BY:



STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
NC License Number F-0991

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JANUARY 18, 2023

LETTING DATE:
JULY 17, 2024

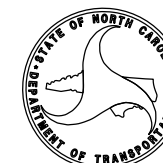
NIKKI T. HONEYCUTT, PE
PROJECT ENGINEER

STEPHEN L. SAUCIER
PROJECT DESIGNER

**HYDRAULICS
ENGINEER**

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

SIGNATURE: _____ *P.E.*





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December 27, 2022

WBS NO: BP10.R023.1
TIP NO: SF-890049
PROJECT ID: 42350
COUNTY: Union
DESCRIPTION: Bridge No. 48 over Water Branch on SR 1714 (Burnsville Road)

SUBJECT: Geotechnical Report – Inventory

Project Description

The project consists of replacing Bridge 48 located along SR 1714 (Burnsville Road) in Union County, North Carolina. Based on the information provided, the exiting structure will be replaced with a single-span, 70-foot long, cored slab bridge and include roadway improvements along the bridge approaches. The project begins at approximate Station 12+20 and ends at approximate Station 18+00 for an overall length of 580 linear feet. Based on the cross sections, final subgrade elevations will be raised several feet along the roadway alignment as well as widening performed to accommodate the new roadway section. Mass grading will typically consist of maximum cut and fill depths on the order of 5 feet or less.

A geotechnical field investigation was performed by ECS in November 2022. During this time period, a total of seven (7) standard penetration test (SPT) borings and three (3) rock sounding borings were advanced using a CME-75 drill rig equipped with an automatic hammer. Representative soil samples were collected for visual classification in the field and for analysis by ECS’s testing laboratory. Additionally, one bulk sample was collected from auger cuttings in a proposed cut area and used for standard Proctor and California Bearing Ratio (CBR) testing.

The following roadway alignments were investigated. Subsurface plans, profile and cross sections of this alignment are included in this report.

Line	Station (±)
-L- (SR 1714 / Burnsville Rd)	12+20 to 18+00

In addition to the roadway alignment listed above, the replacement of the existing single span bridge with a new single span bridge between Station 14+79 and 15+51 was included in this exploration.

Physiography and Geology

The project site is located in the Piedmont Physiographic Province. Specifically, the alignment is located within the Cid Formation (CAZmd). The predominant rock types in this area are Metamudstone and Meta-Argillite, described as thinly to thickly bedded and interlayered with metasandstone and metaconglomerate rock. The virgin soils are the residual product of in-place chemical weathering of rock that was similar to the rock presently underlying the site.

Soil Properties

Soils within the project limits have been divided into two categories: roadway embankment and residual soils.

Roadway Embankment: Roadway Embankment (R.E.) soils extend to depths up to approximately 18 feet below existing grades and generally consist of very dense sandy gravel (A-1-a); medium stiff to hard, sandy/clayey silt (A-4/A-5), and stiff, slightly plastic, sandy clay (A-6). Varying amounts of gravel were encountered throughout the roadway embankment and evidence of boulder fill was observed within the roadway embankment at the bridge abutments. Laboratory testing of the roadway embankment soils indicated a Plasticity Index (PI) of 12 for the clayey (A-6) soils.

Residual Soils: Residual soils encountered throughout the project corridor are derived from the weathering of the underlying parent bedrock. A majority of the residual soils encountered generally consist of medium dense to very dense sandy gravel (A-1-b) and very stiff to hard sandy silt (A-4). Trace to little amounts of rock fragments were encountered throughout the residual soils. Laboratory testing of the Residual soils indicated a PI of 8 for the silty (A-4) soils.

Rock Properties

Weathered Rock: The top of the weathered rock varied along the project corridor and was encountered at depths ranging from approximately 2.5 to 22.8 feet below the existing ground surface; corresponding to elevations ranging from approximately 333.6 feet to 365.8 feet. The weathered rock encountered generally consists of Meta-Argillite.

Non-Crystalline Rock: The top of the non-crystalline rock encountered in this investigation varied significantly along the corridor and was encountered at depths ranging from approximately 2.8 to 28.0 feet below the existing ground surface, corresponding to elevations ranging from approximately 328.2 feet to 365.0 feet. The non-crystalline rock encountered consists of Meta-Argillite.

Groundwater Properties

At the time of drilling, groundwater was encountered in one of the borings at a depth of approximately 27.2 feet below the existing ground surface, corresponding to elevation 329.2 feet. The majority of the borings were drilled within the existing travel lanes and needed to be filled immediately after drilling for safety reasons. Where stabilized water readings were attempted, groundwater was not encountered. The recovered soil samples were generally described as moist to the explored depths of this investigation.

Areas of Special Geotechnical Interest

- 1) Boulder Fill: The following areas encountered roadway embankment with boulder fill that may impact construction. In this area, auger refusal with the drilling equipment was encountered within the roadway embankment and boulders were observed behind the existing bridge abutment.

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	15+51 to 16+25	LT to RT

- 2) Shallow Rock: The following areas were found to contain Rock within 6 feet of proposed subgrade:

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	12+25 to 14+75	LT to RT

Bulk Samples

Bulk soil samples were obtained at the following locations and were used for standard Proctor and California Bearing Ratio (CBR) testing.

<u>Sample</u>	<u>Line</u>	<u>Station (±)</u>	<u>Offset</u>	<u>Depth (ft)</u>
BULK-1	-L-	13+52	15' LT	1.0 – 3.5

Respectively Submitted,

DocuSigned by:

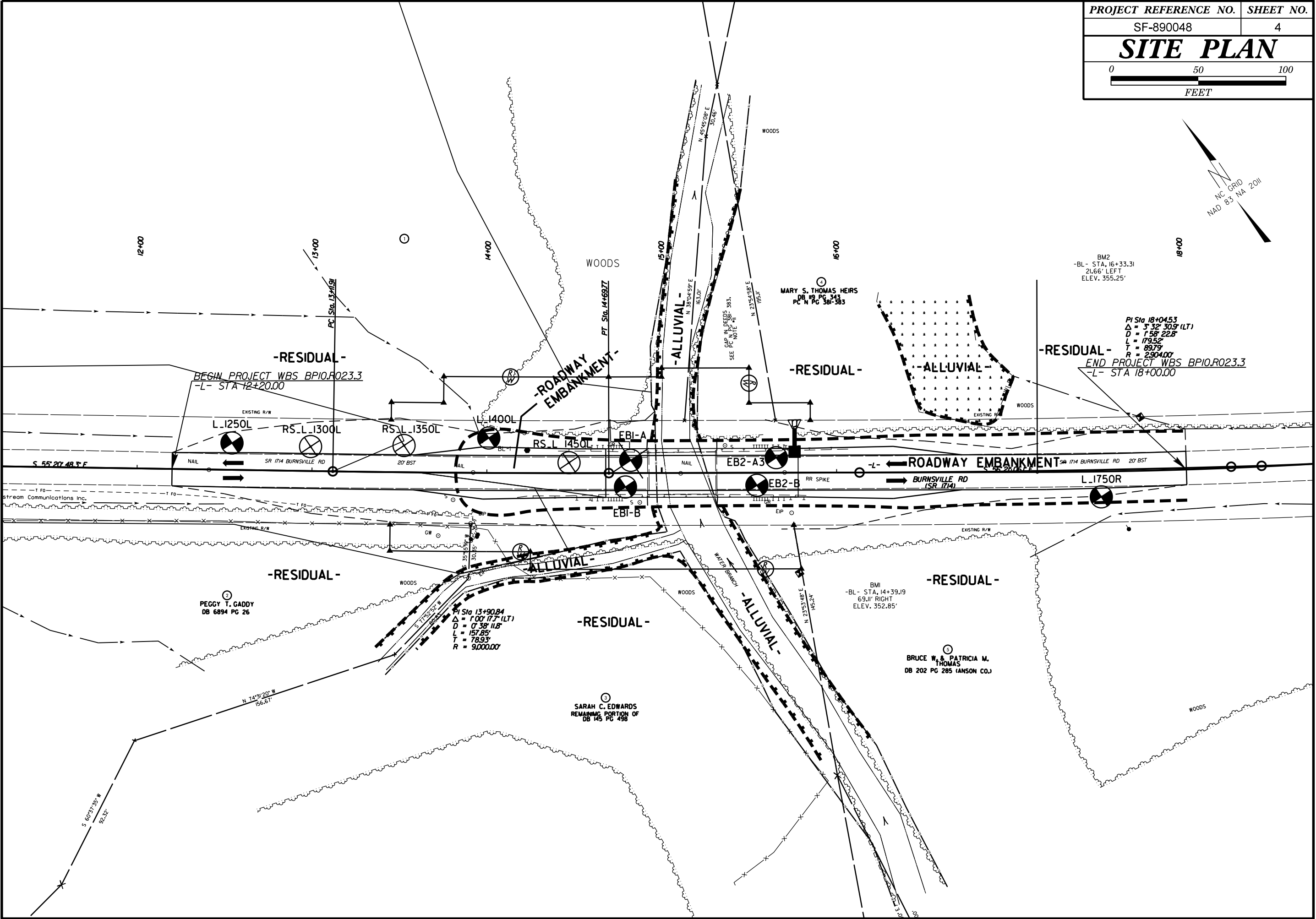
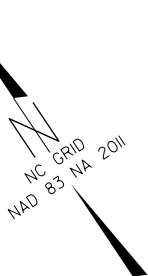


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Kelly N. de Montbrun, P.E.
Senior Project Engineer

DocuSigned by:



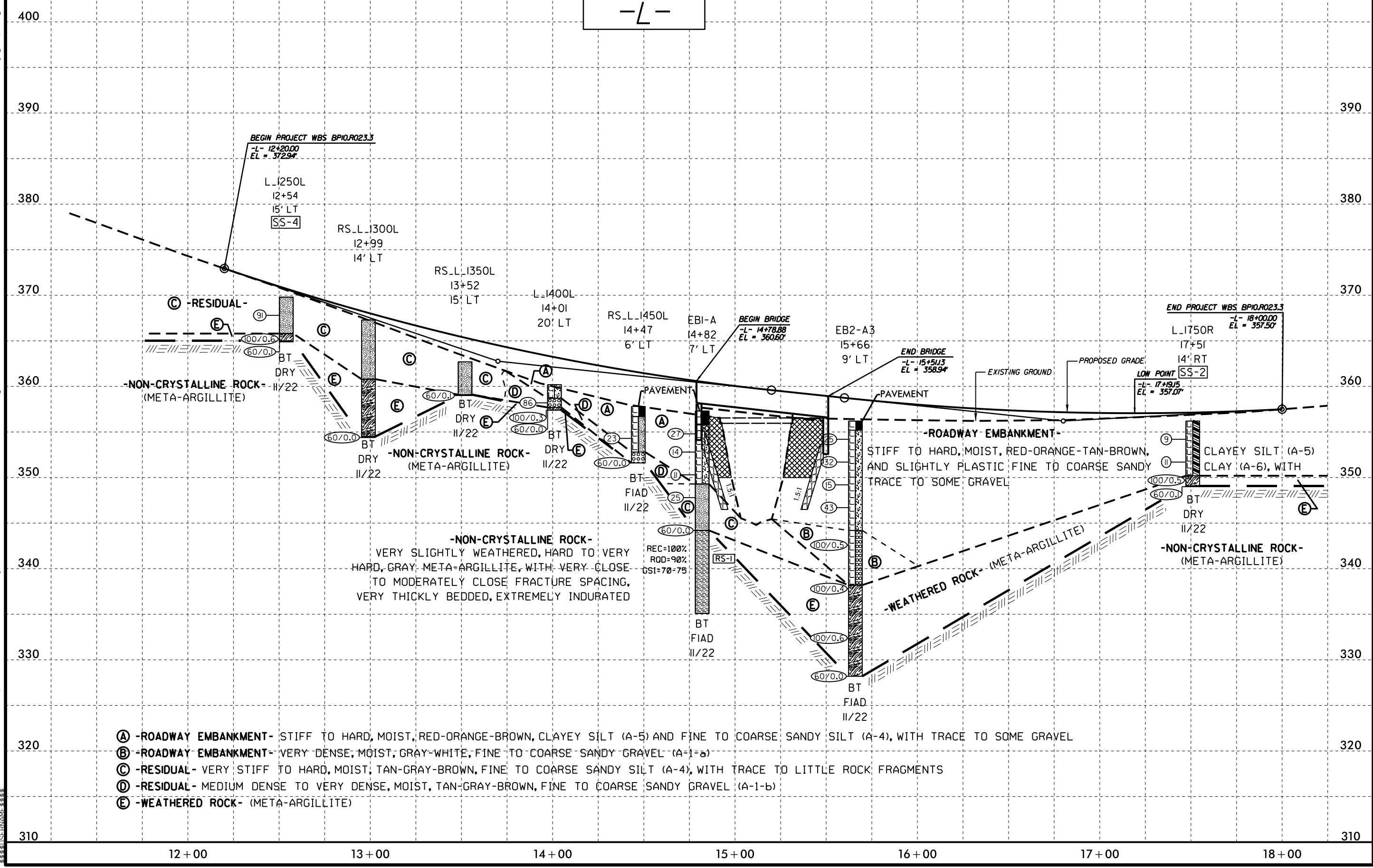
78222AC7F82F4D7...
Michael J. Walko, P.E.
Principal Engineer



5/14/199
13-DEC-2022 10:41
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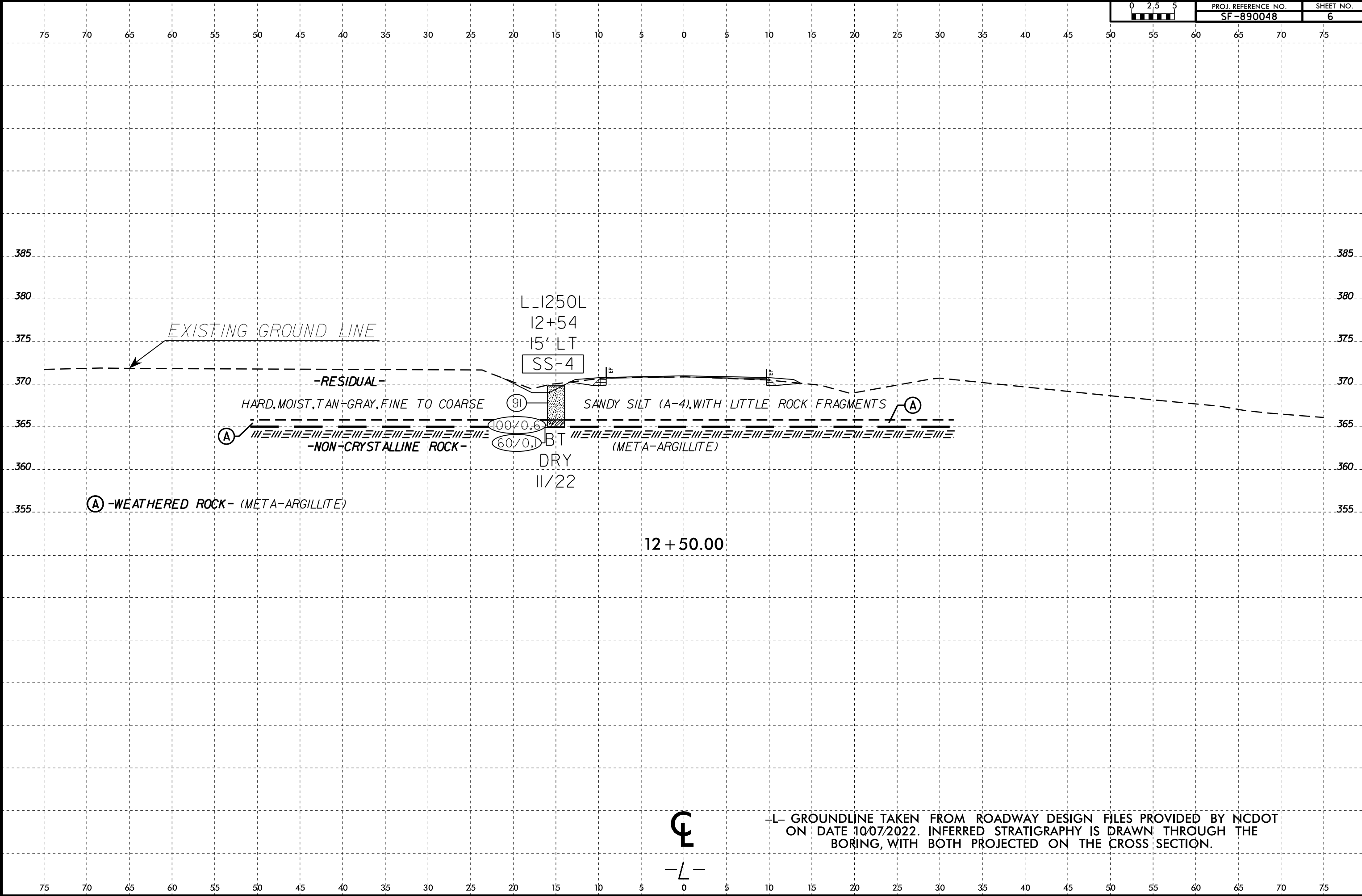
-L- PROFILE ALONG EXISTING GROUND LINE FROM ROADWAY DESIGN FILES PROVIDED BY NCDOT ON 10/7/2022. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING PROJECTED ON THE PROFILE.

-L-

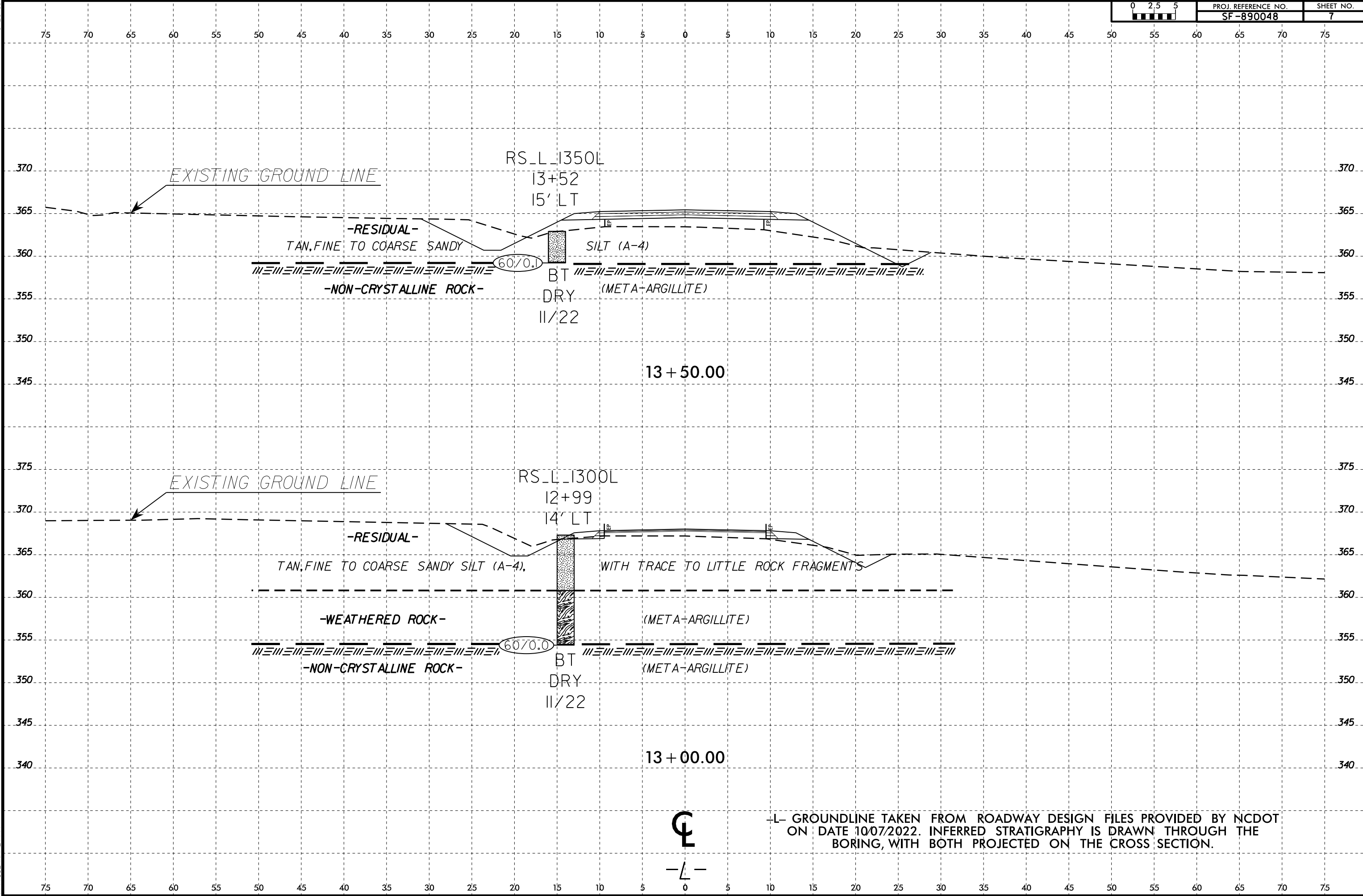


6/23/16

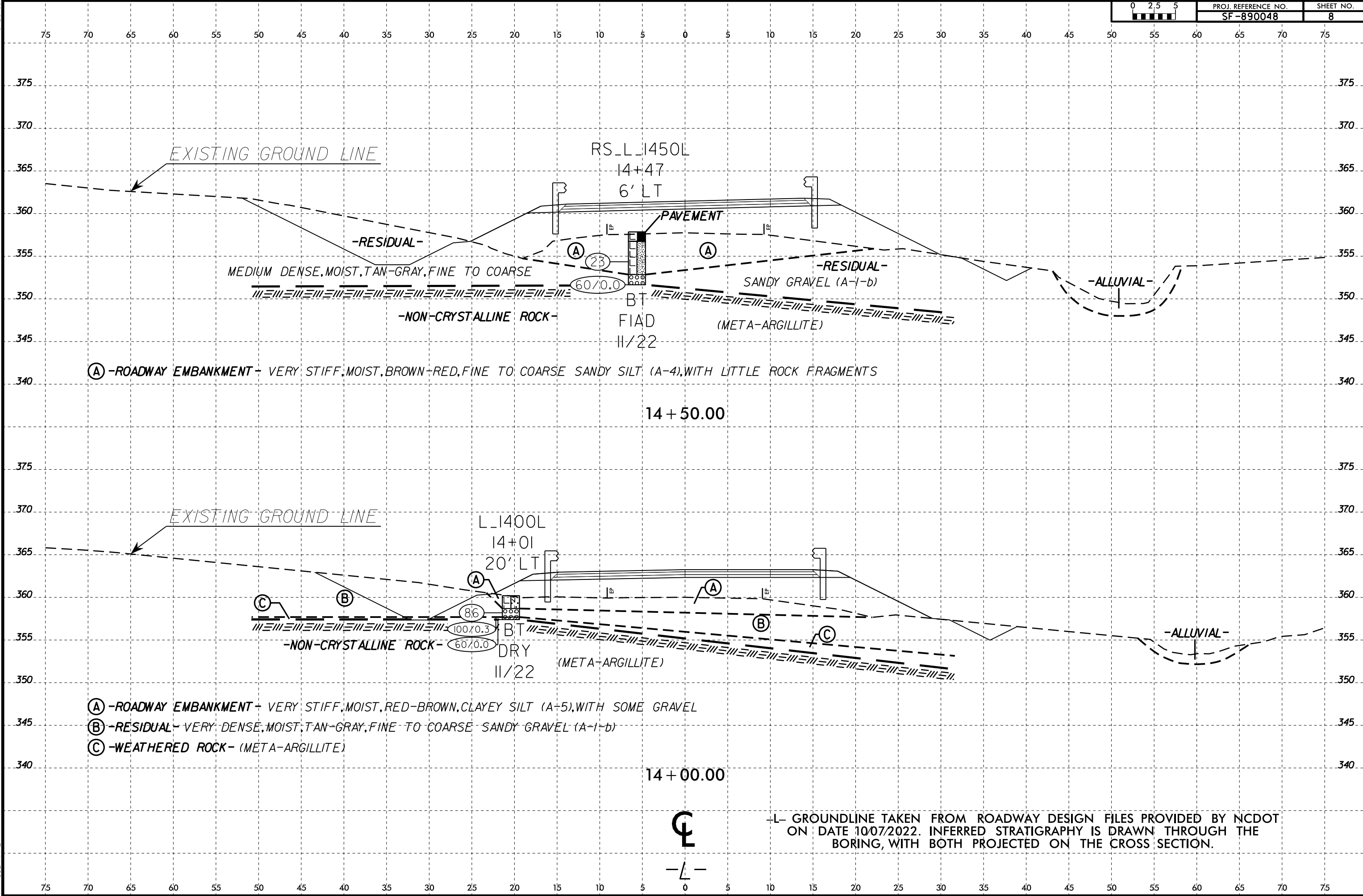
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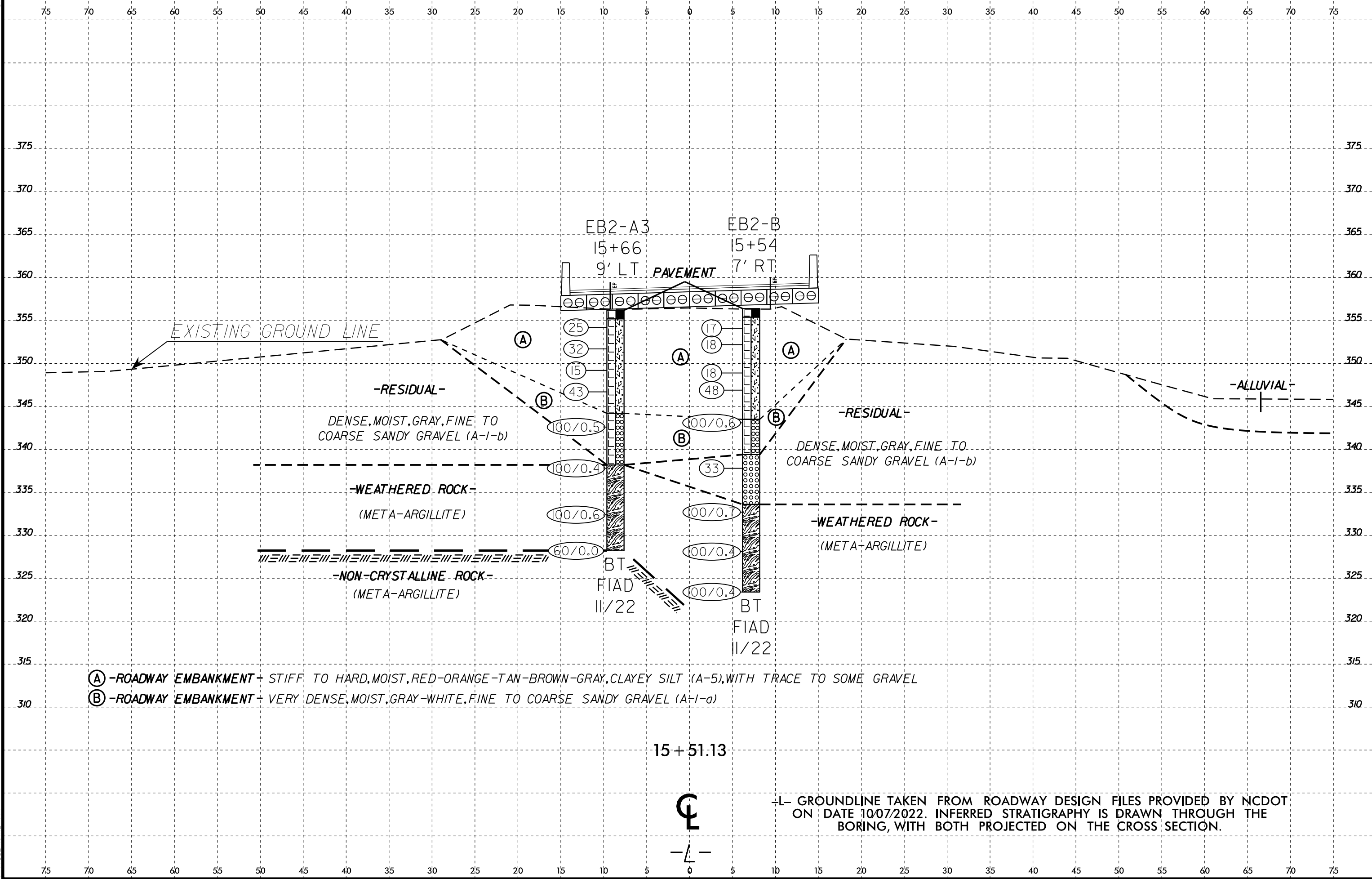


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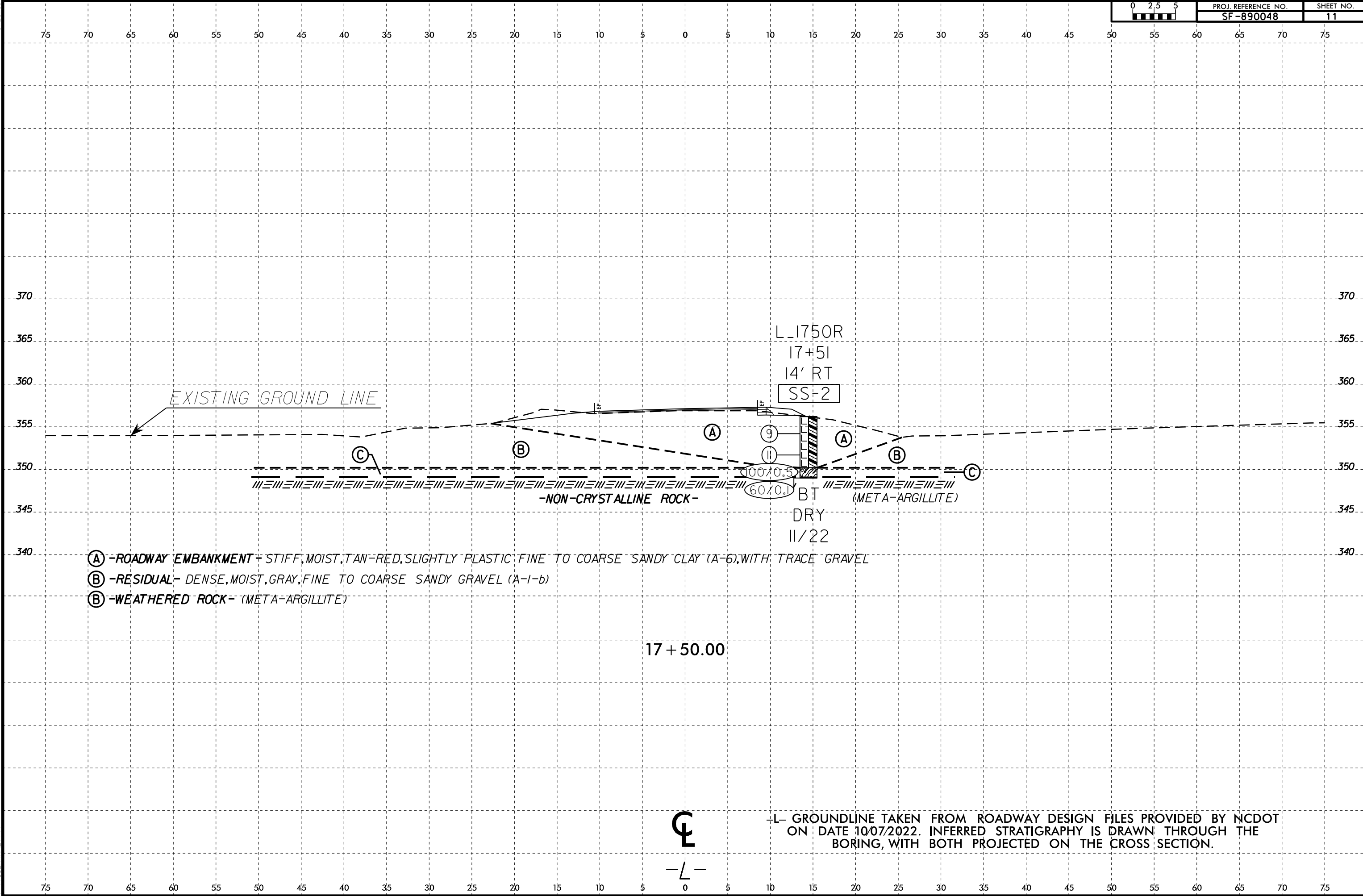




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PROJECT: 41350

REFERENCE: SF-890048

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
BORE LOGS

PROJECT REFERENCE NO.

SF-890048

SHEET NO.

12



Prepared in the Office of:

ECS SOUTHEAST, LLP
1812 CENTER PARK DRIVE, SUITE D
CHARLOTTE, NC 28217
(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1078

NC DOT BORE DOUBLE R023 GEO_GTM.GPJ NC_DOT.GDT 12/12/22

WBS BP10.R023.1				TIP SF-890048				COUNTY UNION				GEOLOGIST A. Suttle					
SITE DESCRIPTION Bridge No. 48 over Water Branch on SR 1714 (Burnsville Road)												GROUND WTR (ft)					
BORING NO. EB2-A2				STATION 15+61				OFFSET 9 ft LT				ALIGNMENT -L-				0 HR. Dry	
COLLAR ELEV. 356.3 ft				TOTAL DEPTH 11.3 ft				NORTHING 495,065				EASTING 1,613,505				24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE ECS6727 CME 75 92% 07/21/2022								DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER C. Osborne				START DATE 11/18/22				COMP. DATE 11/18/22				SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
360																	
355	355.3	1.0	8	14	18									356.3 GROUND SURFACE 0.0			
350	352.8	3.5	9	11	15							M		355.4 ROADWAY EMBANKMENT 0.9			
	350.3	6.0	10	6	5							M		Asphalt (0.3'), Gravel (0.6')			
	347.8	8.5	9	7	7							M		Stiff to Hard, Tan-Red-Orange-Gray-Brown, Clayey SILT (A-5), with trace to little gravel			
345	345.0	11.3	60/0.0			60/0.0						M		345.0 11.3			
												Boring Terminated with Standard Penetration Test Refusal at Elevation 345.0 ft In Roadway Embankment (POSSIBLE BOULDER FILL)					
												1.) Boring Offset 8' Upstation from EB2-A					

PROJECT: 41350

REFERENCE: SF-890048

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX B
LABORATORY TEST RESULTS
SOIL TESTS FOR QUALITY

PROJECT REFERENCE NO.

SF-890048

SHEET NO.

14



Prepared in the Office of:

ECS SOUTHEAST, LLP
1812 CENTER PARK DRIVE, SUITE D
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(704) 525-5152 [PHONE]
(704) 357-0023 [FAX]
NC REGISTERED
ENGINEERING
FIRM # F-1078

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_1250L	SS-4	15' LT	12+54 -L-	1.0-2.5	A-4(1)	33	8	49.6	5.0	27.5	17.9	68.4	52.7	47.0	9.8	-
L_1750R	SS-2	14' RT	17+51 -L-	3.5-5.0	A-6(5)	37	12	37.8	6.8	25.4	30.0	72.7	63.9	58.4	20.3	-
RS_L_1350L	BULK-1	15' LT	13+52 -L-	1.0-3.5	A-6(11)	39	12	7.8	9.0	55.7	27.5	98.5	94.7	85.2	29.4	-

LAB TECHNICIAN: AMANDA SUTTLE, P.G.

NCDOT CERTIFICATION NO. 112-09-1003

