

REFERENCE: B-5777

PROJECT: 45733

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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2A	SUPPLEMENTAL LEGEND, GSI TABLES
4-5	SITE PLAN

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<u>LINE</u>	<u>STATION</u>	<u>SHEETS</u>
-L-	I5+00-30+85	6-10
-RAB1-	II+00-I3+00	II
-RAB2-	II+00-I2+75	I2
-RPA-	I4+00	I3
-RPB-	I4+50	I4
-RPC-	I2+00-I4+00	I5
-RPD-	I5+00	I6

APPENDICES

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A	LABORATORY TEST RESULTS	I8

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

ROADWAY
SUBSURFACE INVESTIGATION

COUNTY DAVIDSON
PROJECT DESCRIPTION REPLACE BRIDGE NO. 58
ON NC 109 OVER US 64

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5777	1	

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.

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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

A. SUTTLE, P.G.

C. OSBORNE

INVESTIGATED BY ECS SOUTHEAST, LLP

DRAWN BY A. SUTTLE, P.G.

CHECKED BY M. MULLA, P.E.

SUBMITTED BY ECS SOUTHEAST, LLP

DATE JUNE 2024

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Amanda R. Suttle

06/12/2024

399DBE42977A784

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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 (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.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERING																			
GENERAL CLASS.										MINERALOGICAL COMPOSITION										CRYSTALLINE ROCK (CR)																			
GROUP CLASS.										COMPRESSIBILITY										NON-CRYSTALLINE ROCK (NCR)																			
SYMBOL										PERCENTAGE OF MATERIAL										COASTAL PLAIN SEDIMENTARY ROCK (CP)																			
%										GROUND WATER																													
MATERIAL PASSING #40 LL PI										MISCELLANEOUS SYMBOLS										SEVERE (MOD. SEV.)																			
GROUP INDEX										RECOMMENDATION SYMBOLS										SEVERE (SEV.)																			
USUAL TYPES OF MAJOR MATERIALS										ABBREVIATIONS										VERY SEVERE (IV 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																																							
CONSISTENCY OR DENSENESS																																							
PRIMARY SOIL TYPE																																							
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)																																							
GENERALLY SILT-CLAY MATERIAL (COHESIVE)																																							
TEXTURE OR GRAIN SIZE																																							
U.S. STD. SIEVE SIZE OPENING (MM)																																							
BOULDER (BLDR.)																																							
GRAIN SIZE																																							
SOIL MOISTURE - CORRELATION OF TERMS																																							
SOIL MOISTURE SCALE (ATTERBERG LIMITS)																																							
LL PLASTIC RANGE (PI)																																							
OM OPTIMUM MOISTURE SHRINKAGE LIMIT																																							
PLASTICITY																																							
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

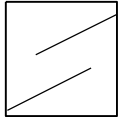
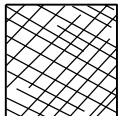
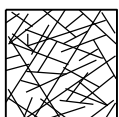

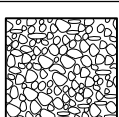
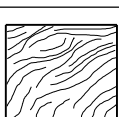
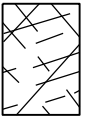


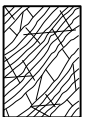
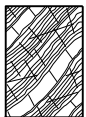



SUBSURFACE INVESTIGATION

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)

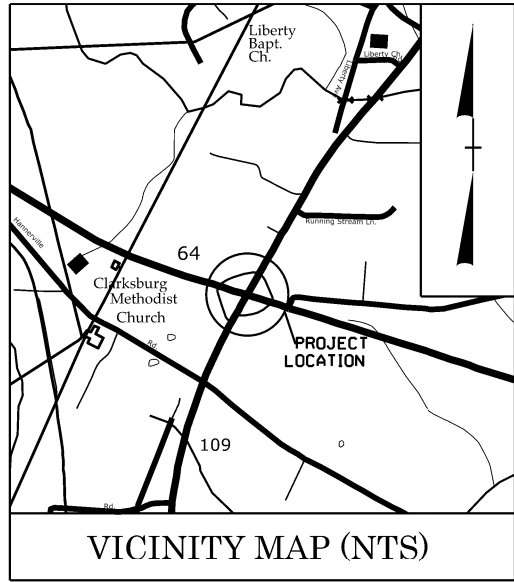
<div><div>GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)</div><div>From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that 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.</div></div>	<div><div>SURFACE CONDITIONS</div><div>VERY GOOD Very rough, fresh unweathered surfaces</div><div>GOOD Rough, slightly weathered, iron stained surfaces</div><div>FAIR Smooth, moderately weathered and altered surfaces</div><div>POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments</div><div>VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings</div></div>	<div><div>GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)</div><div>From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.</div></div>	<div><div>SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)</div><div>VERY GOOD - Very Rough, fresh unweathered surfaces</div><div>GOOD - Rough, slightly weathered surfaces</div><div>FAIR - Smooth, moderately weathered and altered surfaces</div><div>POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments</div><div>VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings</div></div>
<div><div>STRUCTURE</div><div><div>INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities</div><div>BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets</div><div>VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets</div><div>BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity</div><div>DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces</div><div>LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes</div></div></div>	<div><div>DECREASING INTERLOCKING OF ROCK PIECES</div><div>90</div><div>80</div><div>70</div><div>60</div><div>50</div><div>40</div><div>30</div><div>20</div><div>10</div><div>N/A</div><div>N/A</div></div>	<div><div>COMPOSITION AND STRUCTURE</div><div><div>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.</div><div><div>B. Sandstone with thin inter-layers of siltstone</div><div><div>C. Sandstone and siltstone in similar amounts</div><div><div>D. Siltstone or silty shale with sandstone layers</div><div><div>E. Weak siltstone or clayey shale with sandstone layers</div></div></div><div><div>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</div><div><div>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</div><div><div>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.</div></div></div><div><div>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.</div></div><div><div>➡ Means deformation after tectonic disturbance</div></div></div></div></div></div></div>	<div><div>70</div><div>60</div><div>50</div><div>40</div><div>30</div><div>20</div><div>10</div></div>

09/08/99

TIP PROJECT: B-5777

CONTRACT:

See Sheet 1A For Index of Sheets



VICINITY MAP (NTS)

30% PLANS

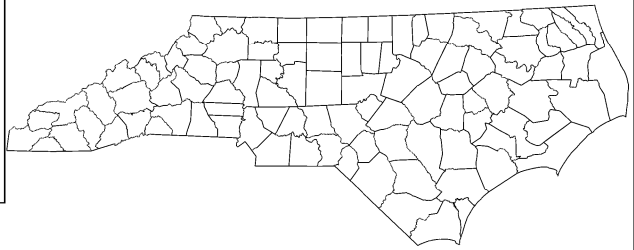
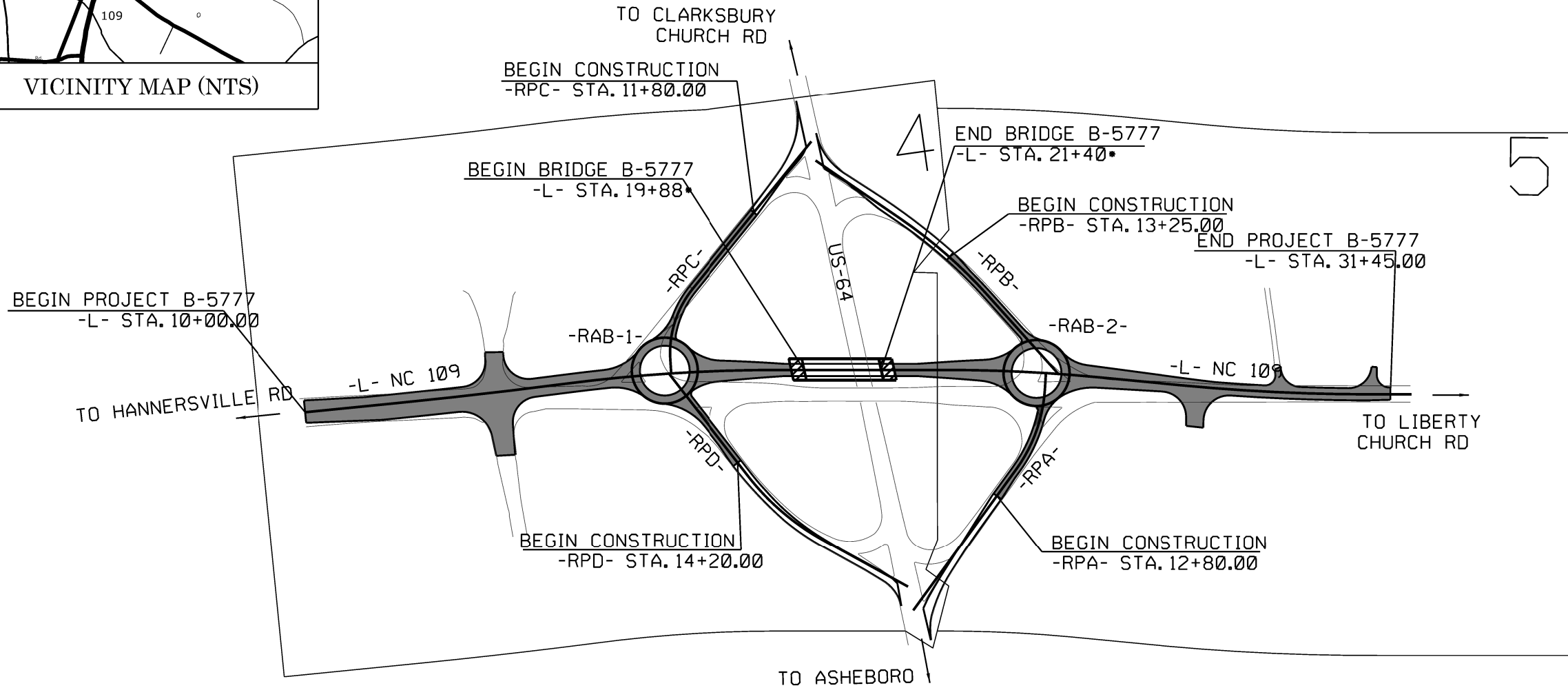
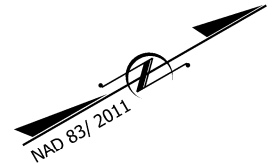
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

DAVIDSON COUNTY

LOCATION: *BRIDGE NO. 58 OVER US 64 ON NC 109*

TYPE OF WORK: *GRADING, PAVING, DRAINAGE, AND STRUCTURE (BRIDGE)*

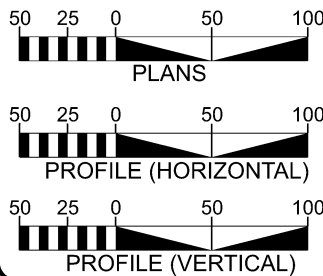
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5777	3	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
45733.1.1		PE	



THIS IS A PARTIAL CONTROLLED ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS SHOWN ON THE PLANS.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

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

GRAPHIC SCALES



DESIGN DATA

ADT 2025 = 11,800
ADT 2045 = 13,000
K = 9 %
D = 60 %
T = 3 %
V = 60 MPH
FUNC CLASS =
PRINCIPAL ARTERIAL

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-5777 0.377 MILES
LENGTH STRUCTURE TIP PROJECT B-5777 0.029 MILES
TOTAL LENGTH TIP PROJECT B-5777 0.406 MILES

PREPARED IN THE OFFICE OF:

RS&H

8521 SIX FORKS ROAD, SUITE 400
RALEIGH, NC 27615
NC FIRM LICENSE No: F-0493

FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
JANUARY 31, 2024

LETTING DATE:
JUNE 17, 2025

STEVEN SHUMAN, PE
PROJECT ENGINEER

DANA PACZEK, PE
PROJECT DESIGN ENGINEER

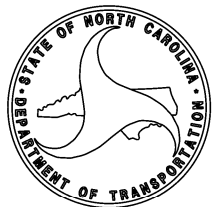
RYAN NEWCOMB, PE
NC DOT CONTACT

HYDRAULICS ENGINEER

SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: P.E.





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May 14, 2024

WBS NO: 45733.1.1
TIP NO: B-5777
PROJECT ID: 43907
COUNTY: Davidson
DESCRIPTION: Replace Bridge No. 58 on NC 109 over US 64

SUBJECT: Geotechnical Report – Inventory

Project Description

The project consists of the replacement of Bridge No. 58 on NC 109 over US 64 in Thomasville, Davidson County, North Carolina. As a part of the replacement, a portion of NC 109 (-L- alignment), from Station 10+00 to Station 31+45 for an overall length of 2,145 feet (0.406 miles) will be realigned to the northwest to incorporate the new bridge structure. Roadway improvements will be made to Ramp A (-RPA- alignment), Ramp B (-RPB- alignment), Ramp C (-RPC- alignment), and Ramp D (-RPD- alignment) as well as the addition of two (2) new roundabouts (-RAB1-, -RAB2-) where they intersect with NC 109.

A new 150-foot long, 2-span bridge will be constructed on NC 109 (-L- alignment) over US64. The bridge will be located on new alignment and will begin at Station 19+89 and end at Station 21+39. The new bridge will likely be founded on a deep foundation system consisting of driven steel piles at the end bents and spread footings at the interior bent. Mechanically Stabilized Earth (MSE) walls will be constructed at the bridge abutments.

The provided roadway plans generally indicate new maximum embankment fill heights of approximately 15 feet along the -L- and -RAB2- alignments, and maximum cut depths of approximately 3 feet along the -L- and -RPD- alignments. Slopes are planned to be oriented at a 2:1 (horizontal:vertical) geometry.

A geotechnical field investigation was performed by ECS between April 2024 and May 2024. During this time period, a total of twenty-three (23) standard penetration test (SPT) roadway/structure borings were advanced using a Diedrich D-70 drill rig equipped with an automatic hammer. Representative soil samples were collected for visual classification in the field and selected for laboratory analysis by ECS’s NCDOT approved testing laboratory.

The following alignments are included as a part of this investigation:

<u>Line</u>	<u>Station (±)</u>
-L- (NC 109)	10+00 to 31+45
-RPA-	10+26 to 15+46
-RPB-	10+00 to 16+40
-RPC-	10+00 to 15+50
-RPD-	10+00 to 16+42
-RAB1- (NC 109)	10+00 to 14+08
-RAB2- (NC 109)	10+00 to 14+08

Physiography and Geology

The site is located in the Carolina Slate Belt within the Piedmont Physiographic Province of North Carolina. In accordance with the Geologic Map of North Carolina, 1985, the predominant rock types under this site are mapped meta-argillite, interbedded with metasandstone, metaconglomerate and metavolcanic rock. Weathered rock and non-crystalline rock encountered during this investigation consists of Meta-Argillite. 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 area of this project have been divided into five categories: surficial materials (topsoil), roadway embankment, and residual soils.

Surficial Materials: The surficial organic soils (topsoil/rootmat) that were encountered ranged in thickness from approximately 0.1 to 0.6 feet.

Roadway Embankment: Roadway Embankment (R.E.) soils from the previous bridge construction are present throughout the project and generally consist of very dense, fine to coarse sandy gravel (a-1-b), medium dense, fine to coarse silty sand (A-2-4); medium stiff to hard, fine to coarse sandy/clayey silt (A-4, A-5); and stiff, slightly to highly plastic, sandy/silty clay (A-6, A-7-5/6). Varying amounts of gravel and asphalt were encountered throughout the roadway embankment soils. The roadway embankment extends to depths up to approximately 18.5 feet below existing grades. Laboratory testing of the Roadway Embankment soils indicated PI’s ranging from 5 to 9 for the silty (A-4) soils, and PI’s ranging from 12 to 30 for the clayey (A-7-5/6) soils.

Residual Soils: Residual soils were encountered throughout the project corridor are derived from the weathering of the underlying parent bedrock. The residual soils encountered generally consist of stiff to hard, fine to coarse sandy/clayey silt (A-4, A-5); and medium stiff to very stiff, slightly to moderately plastic,

sandy/silty clay (A-6, A-7-5). Varying amounts of rock fragments were encountered throughout the residual soils. Laboratory testing of the residual soils indicated a PI of 9 for the silty (A-4, A-5) soils, and PI's ranging from 15 to 23 for the clayey (A-6, A-7-5) soils.

Rock Properties

Weathered Rock: The top of the weathered rock varied significantly along the corridor and was encountered at depths ranging from approximately 0.0 to 18.5 feet below the existing ground surface; corresponding to elevations ranging from approximately 780.5 feet to 755.8 feet. The weathered rock encountered generally consists of Meta-Argillite.

Non-Crystalline Rock: The top of the crystalline rock varied significantly along the corridor and was encountered at depths ranging from approximately 2.4 to 38.6 feet below the existing ground surface; corresponding to elevations ranging from approximately 778.7 feet to 743.2 feet. The non-crystalline rock encountered generally consists of Meta-Argillite.

Groundwater Properties

At the time of drilling, Groundwater was encountered in one (1) boring at depth of approximately 36.3 feet below the existing ground surface; corresponding to an approximate elevation 745.6 feet. After a stabilization period of at least 24 hours, groundwater was encountered in three (3) borings at depths ranging from approximately 8.5 to 15.4 feet below the existing ground surface; corresponding to elevations ranging from approximately 768.7 to 762.1 feet. The recovered soil samples were generally described as moist above the groundwater level and moist below the groundwater level.

Areas of Special Geotechnical Interest

1) High Plasticity Soils: The following areas contain high plasticity soils with plasticity indices (PI's) in excess of 25. High plasticity soils have the potential to cause subgrade instability during construction, embankment stability or long term settlement problems.


<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-L-	26+50 to 28+00	LT

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

<u>Line</u>	<u>Station (±)</u>	<u>Offsets</u>
-RPC-	11+50 to 12+50	RT
-RPD-	14+25 to 15+50	RT

Respectfully Submitted,


DocuSigned by:



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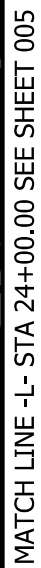
Amanda R. Suttle, P.G.
Project Geologist

DocuSigned by:

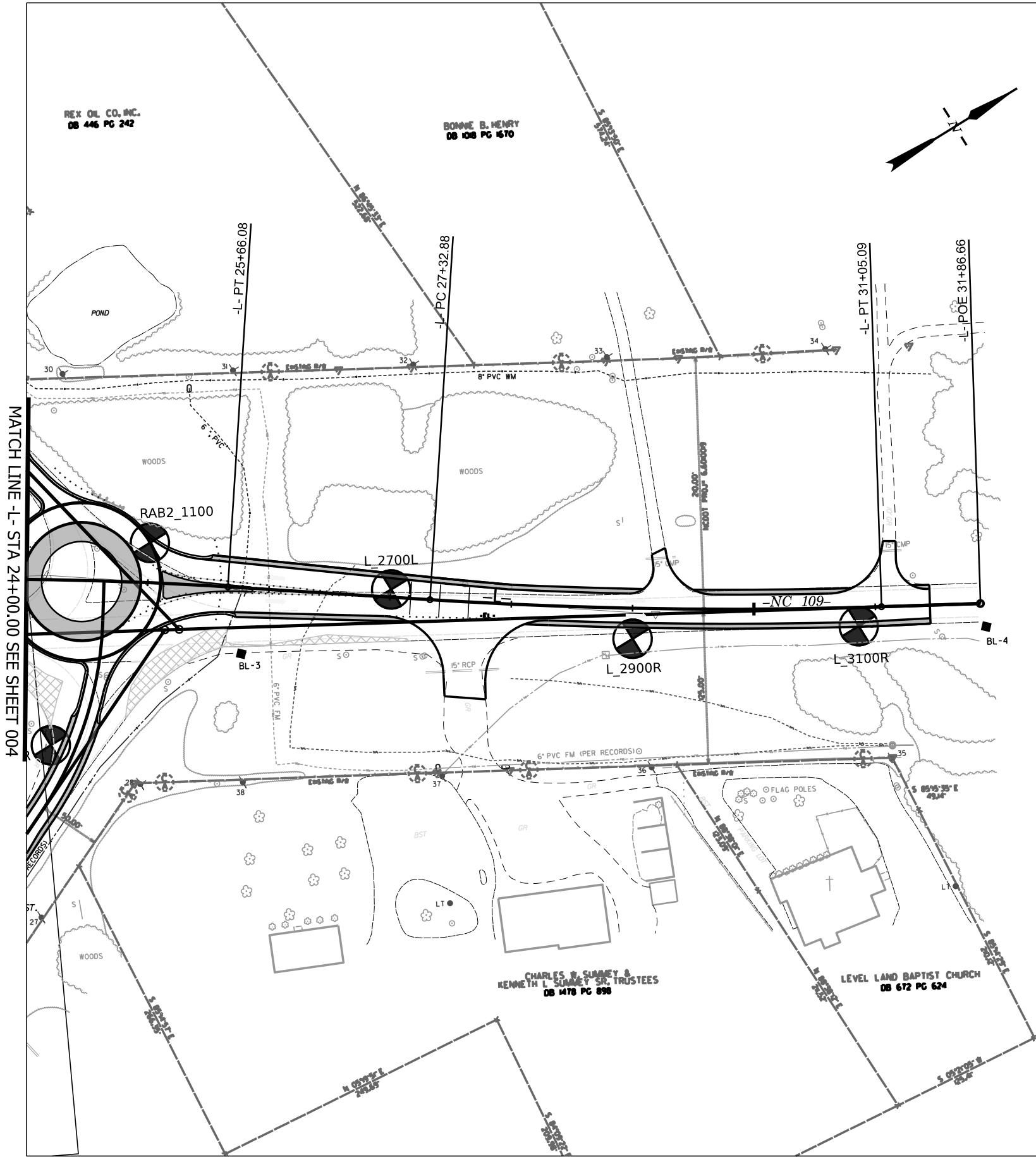


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Mohammed A. Mulla, P.E.
Principal Engineer



5/26/20



B-5777
GEO 005

NORTH CAROLINA
DEPARTMENT
OF TRANSPORTATION



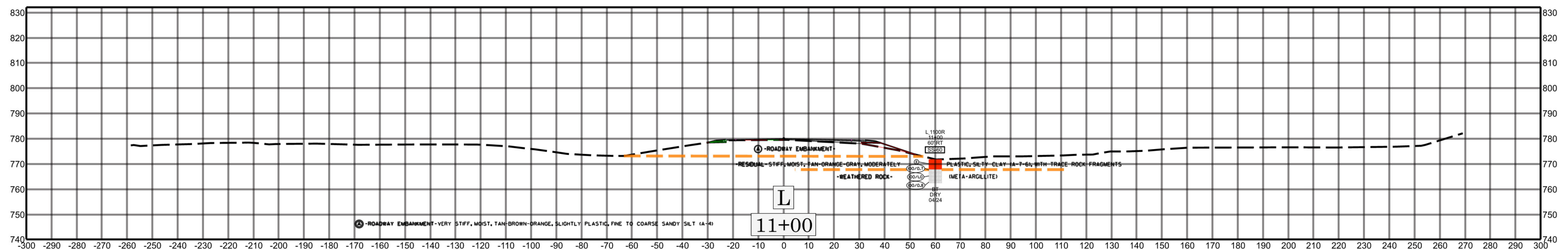
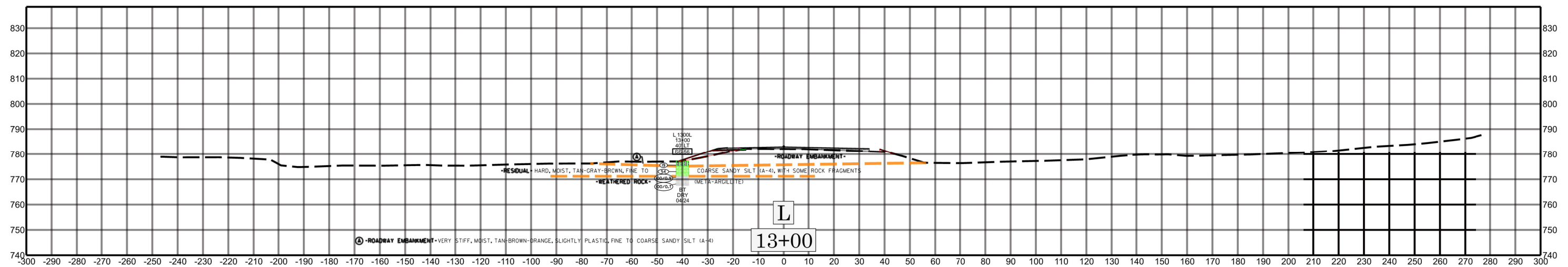
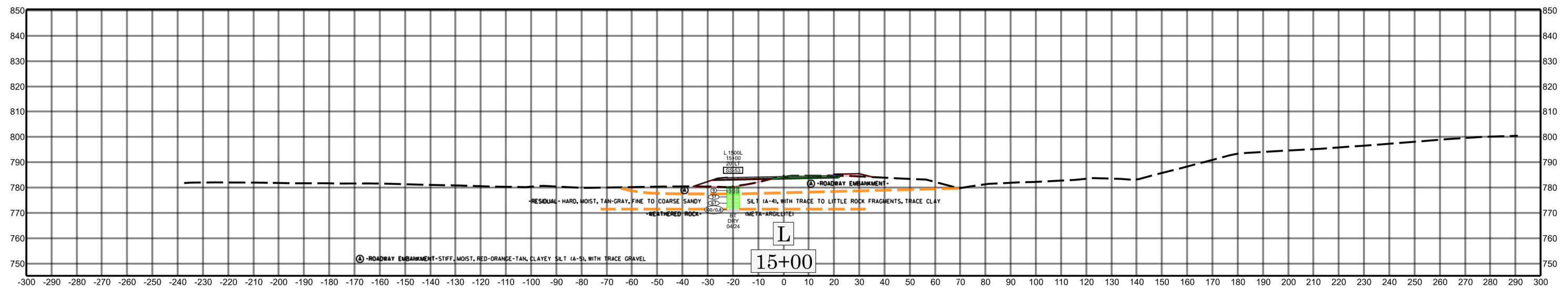
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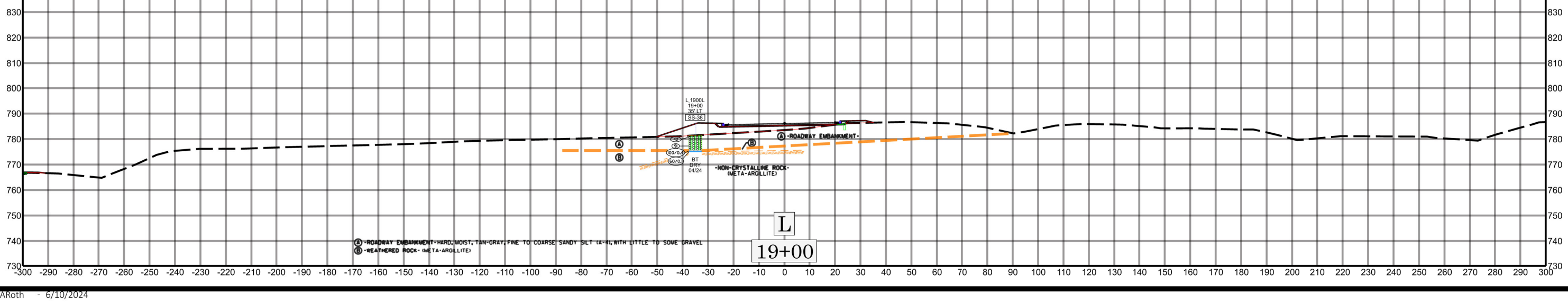
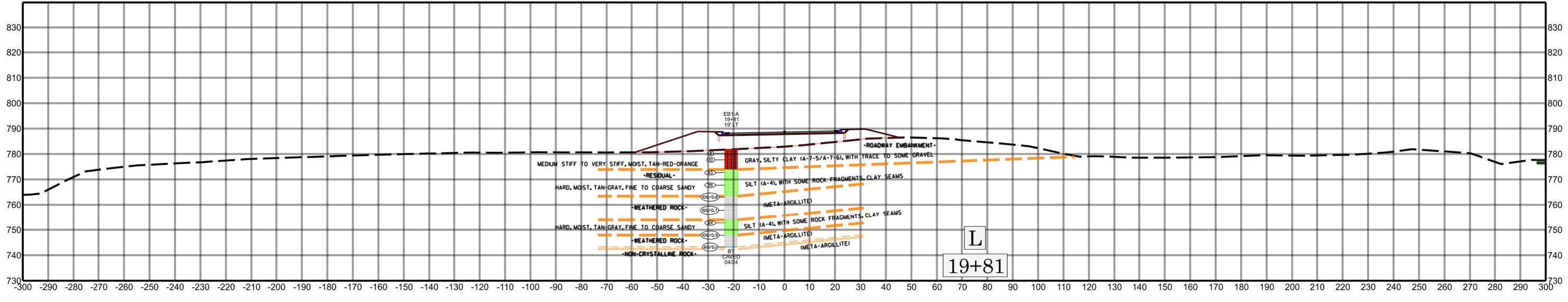
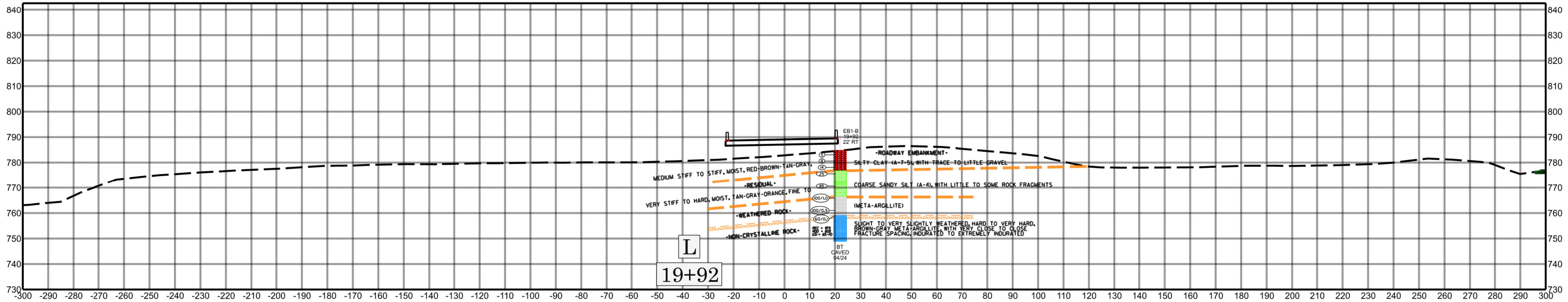


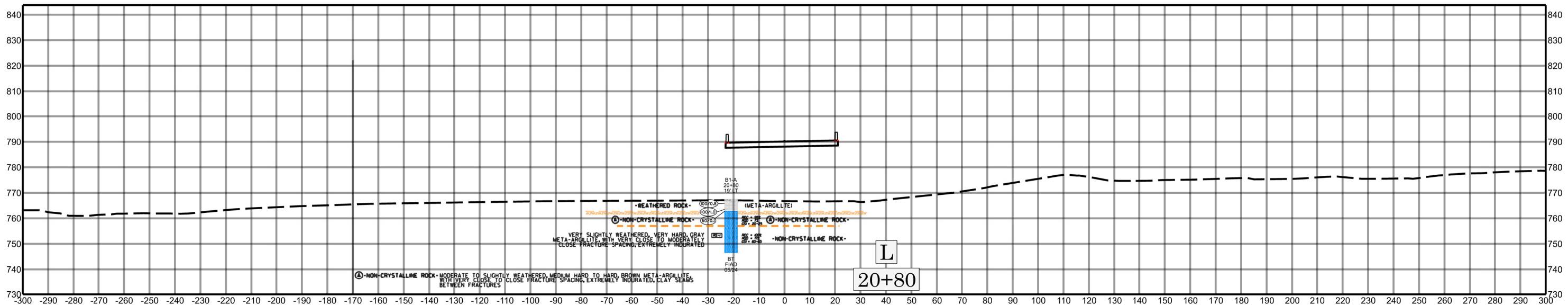
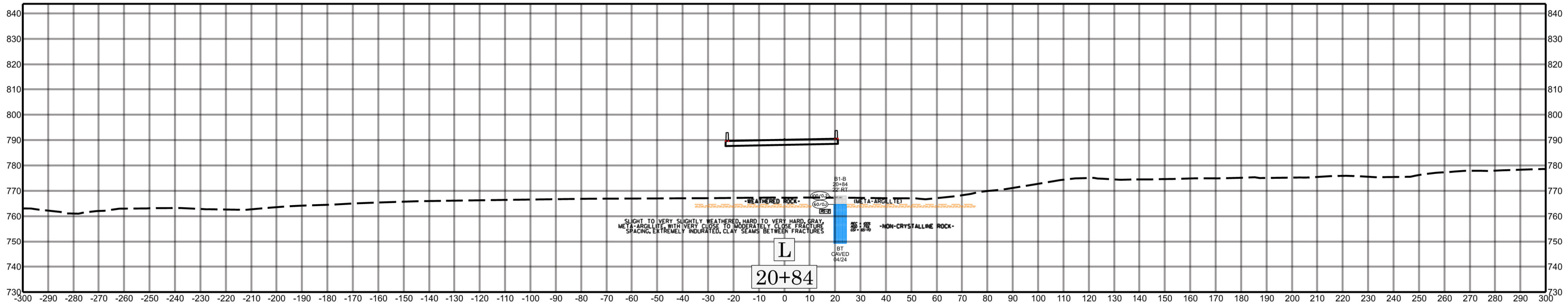
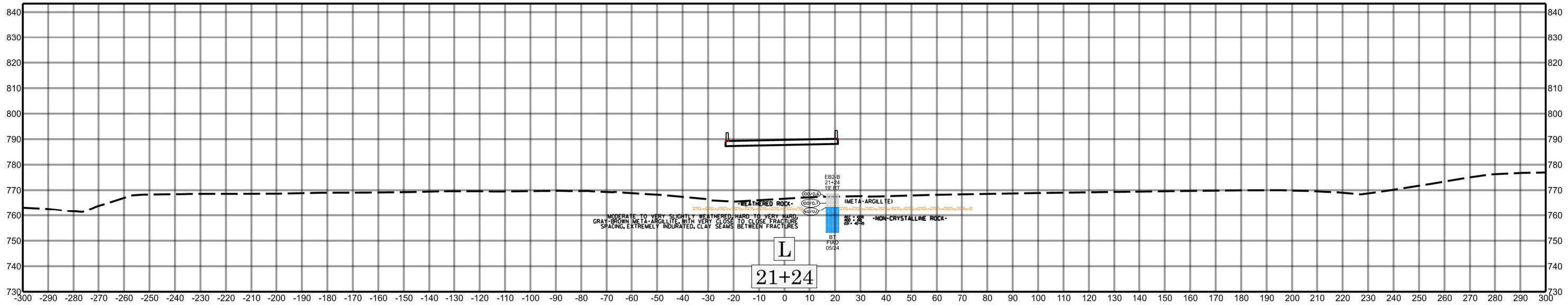
B-5777
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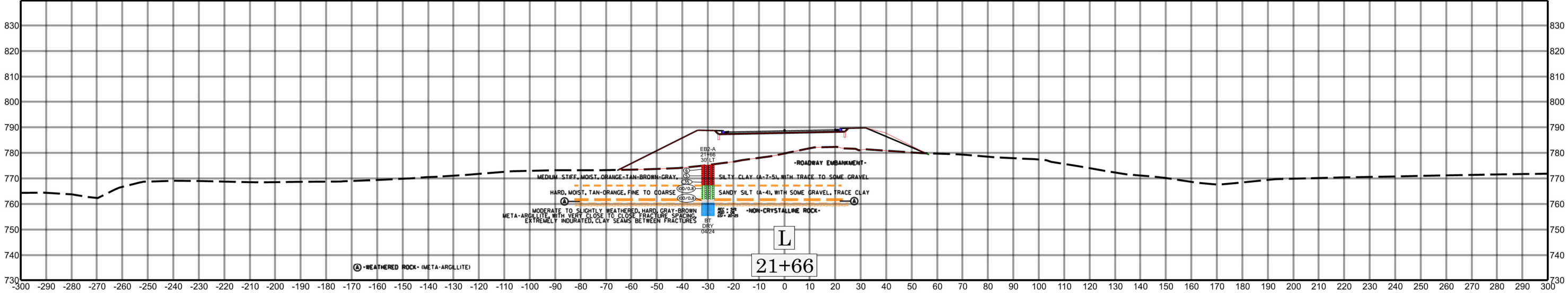
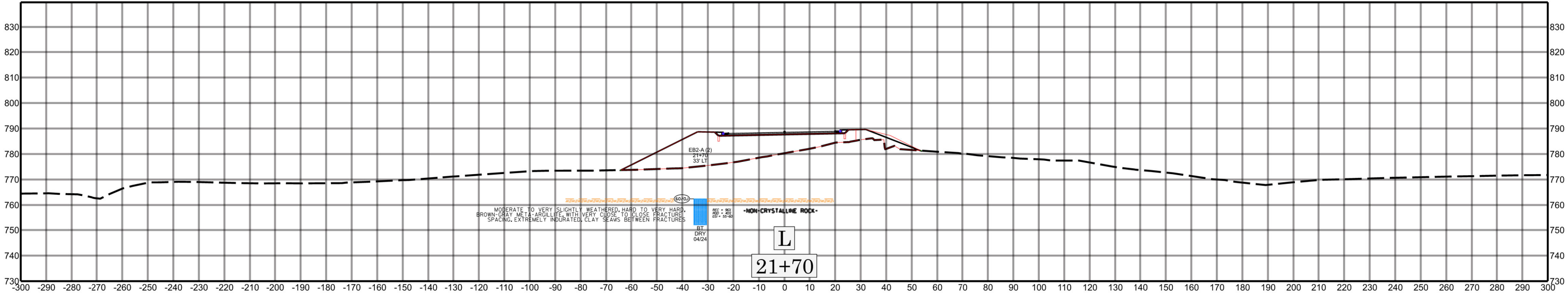
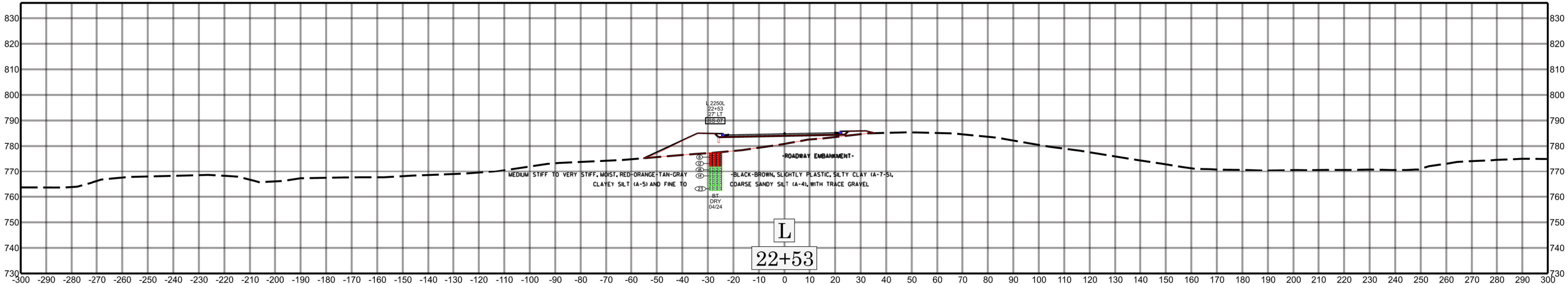
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UNIT

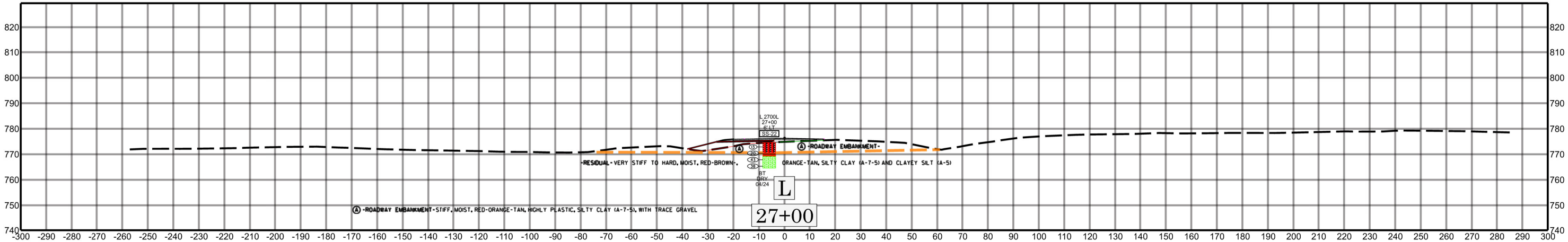
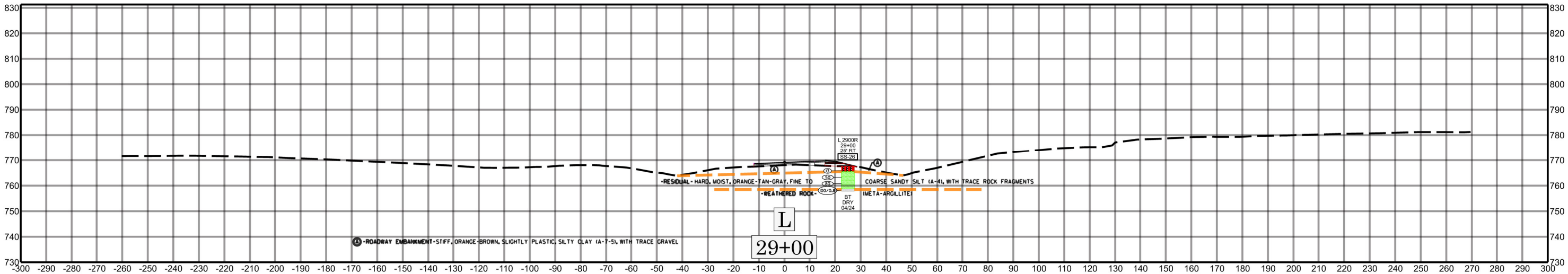
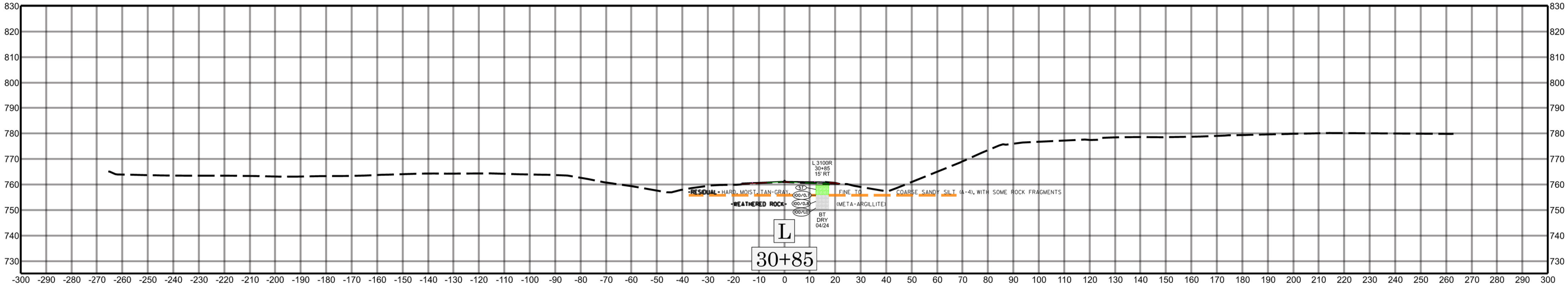
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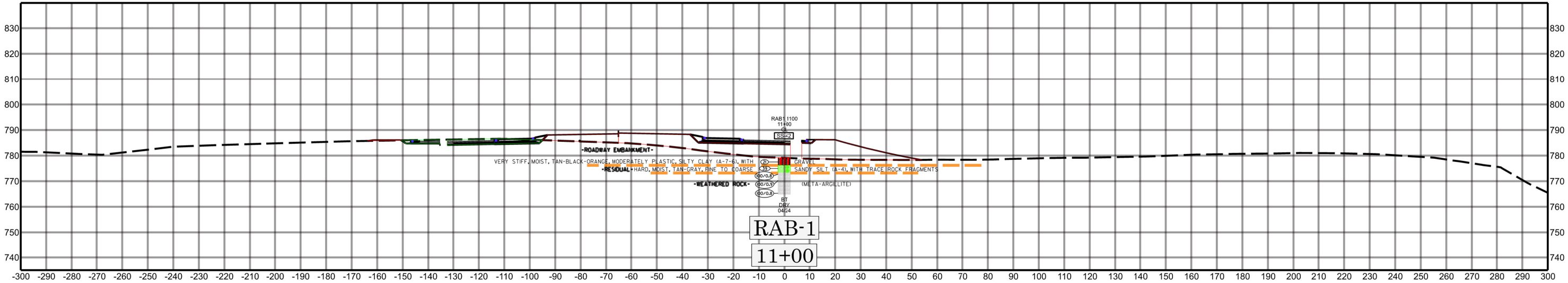
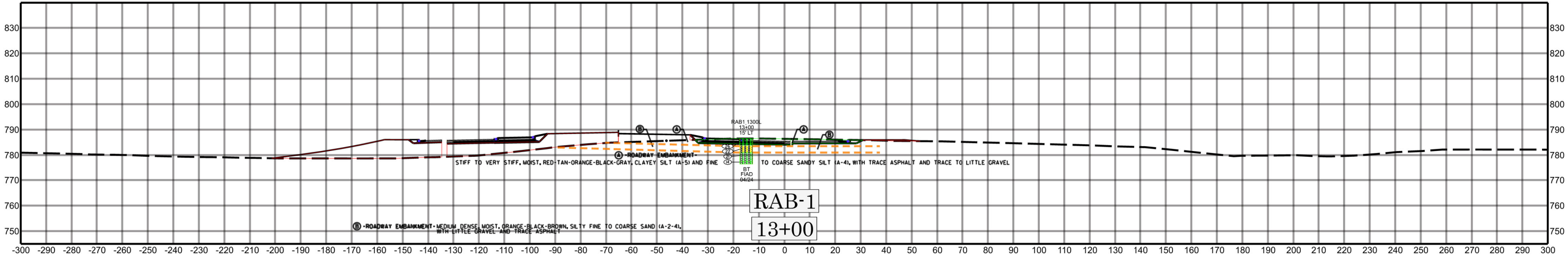


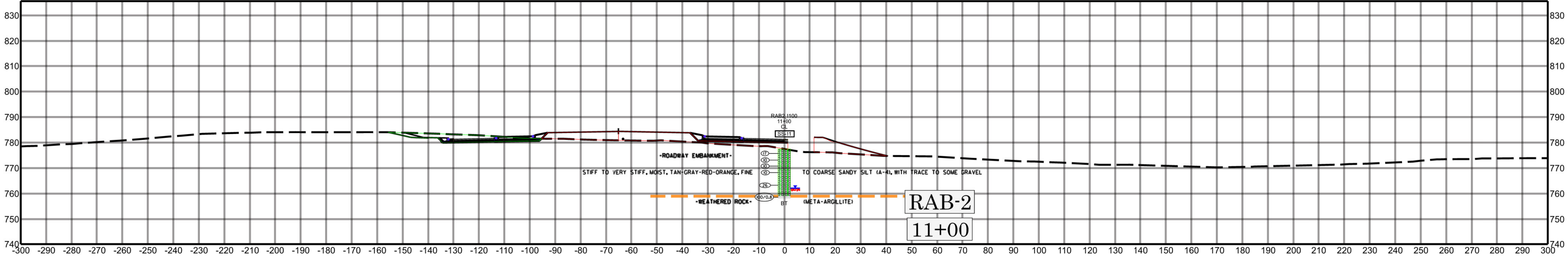
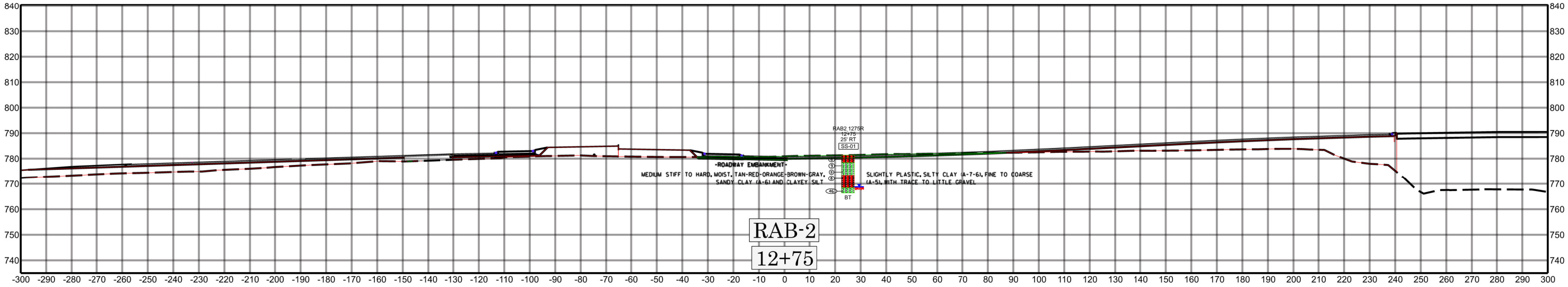


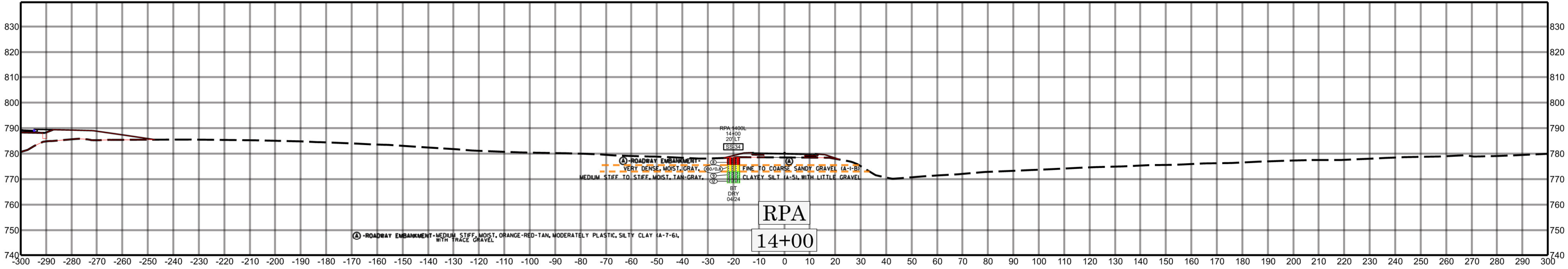






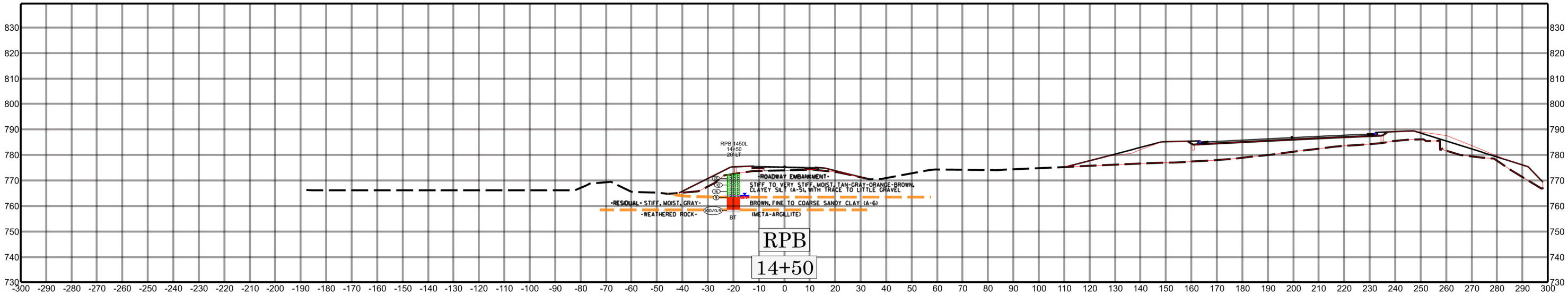


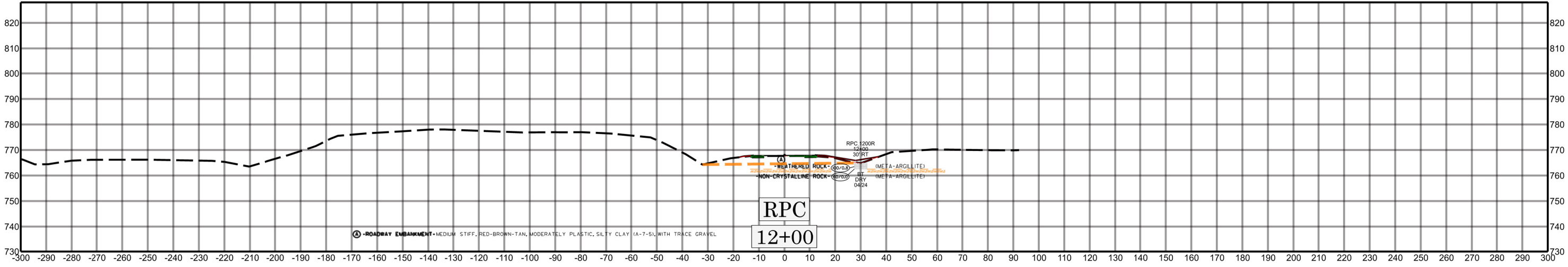
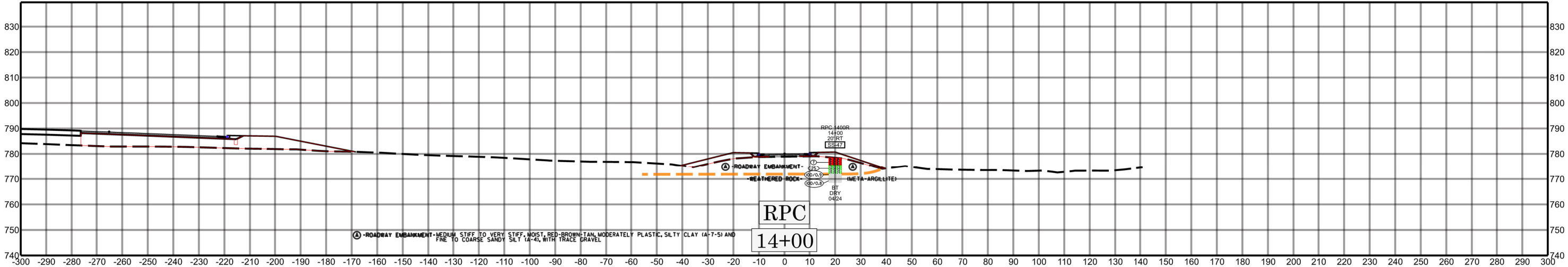




13 -RPA-



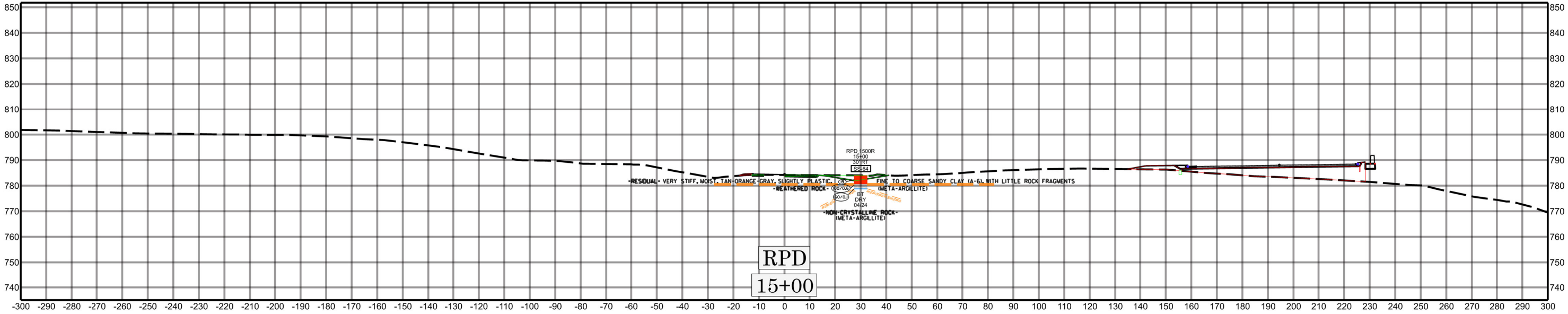




15 -RPC-



16 -ROD-



REFERENCE: B-5777

PROJECT: 45733

PROJECT REFERENCE NO.

SHEET NO.

B-5777

17

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

Prepared in the Office of:



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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_1100R	SS-60	60' RT	11+00 -L-	1.0-2.5	A-7-6(16)	51	23	28.3	2.2	25.2	44.3	80.3	72.8	70.0	11.3	-
L_1300L	SS-56	40' LT	13+00 -L-	1.0-2.5	A-4(9)	35	9	10.7	1.5	53.5	34.3	97.0	90.1	88.1	14.8	-
L_1500L	SS-53	20' LT	15+00 -L-	3.5-5.0	A-4(10)	37	9	3.6	0.9	72.0	23.5	99.8	96.9	95.5	12.1	-
L_1900L	SS-38	35' LT	19+00 -L-	1.0-2.5	A-4(2)	26	5	13.8	12.1	57.1	17.0	96.7	88.8	77.9	9.9	-
L_2250L	SS-07	27' LT	22+53 -L-	3.5-5.0	A-7-5(18)	46	15	3.1	1.1	48.8	47.0	99.3	97.4	96.1	25.1	-
L_2700L	SS-22	6' LT	27+00 -L-	1.0-2.5	A-7-5(36)	61	30	0.9	1.5	40.4	57.2	100.0	99.3	97.6	33.9	-
L_2900R	SS-26	25' RT	29+00 -L-	1.0-2.5	A-7-5(15)	42	12	1.4	0.9	62.5	35.2	99.5	98.9	97.9	18.2	-
RAB1_1100	SS-42	CL	11+00 -RAB1-	1.0-2.5	A-7-6(8)	41	17	36.6	6.7	29.8	26.9	97.6	67.3	57.9	14.7	-
RAB2_1100	SS-11	CL	11+00 -RAB2-	1.0-2.5	A-4(1)	32	9	48.1	6.6	23.1	22.2	86.6	56.2	46.2	10.4	-
RAB2_1275R	SS-01	25' RT	12+75 -RAB2-	1.0-2.5	A-7-6(10)	41	12	18.0	4.5	38.0	39.5	100.0	84.6	78.1	22.0	-
RPA_1400L	SS-34	20' LT	13+00 -RPA-	1.0-2.5	A-7-6(17)	43	16	6.2	1.6	53.3	38.9	98.5	94.5	92.6	17.6	-
RPC_1400R	SS-47	20' RT	14+00 -RPC-	1.0-2.5	A-7-5(19)	46	16	2.2	1.1	37.6	59.1	99.7	98.1	97.1	42.1	-
RPD_1500R	SS-64	30' RT	15+00 -RPD-	1.0-2.5	A-6(11)	36	15	13.5	14.0	47.6	24.9	97.1	89.2	78.1	15.5	-

LAB TECHNICIAN: AMANDA SUTTLE, P.G.

NCDOT CERTIFICATION NO. 112-09-1003