

REFERENCE: BR-0041

PROJECT: 67041

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.	BR-0041	1	41

CONTENTS

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>XSC</u>	<u>PROFILE</u>
-L-	16+00.00 to 42+00.00	4-5	6-22	-
-Y-	15+00.00 to 26+00.00	5	23-30	-
-YI-	11+00.00 to 12+49.26	4	31-32	-
-RPA-	12+50.00 to 13+85.28	5	33	-
-RPB-	15+00.00 to 16+69.85	5	34-35	-
-RPC-	12+20.00 to 13+94.24	5	36-37	-
-RPD-	11+70.00 to 14+12.70	5	38-39	-

APPENDICES

<u>APPENDIX</u>	<u>TITLE</u>	<u>SHEETS</u>
A	LABORATORY TESTS RESULTS SUMMARY	40-41

ROADWAY SUBSURFACE INVESTIGATION

COUNTY ROCKINGHAM
PROJECT DESCRIPTION BRIDGE 780001 ON SR 2817
(BARNES STREET) OVER US 29

INVENTORY

CAUTION NOTICE

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

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

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

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

PERSONNEL

P.M. WEAVER

C.R. PASTRANA

A. ROSEMAN

Trigon Exploration, LLC

CG2 Explotation, LLC

INVESTIGATED BY ESP Associates, INC.

DRAWN BY C.R. PASTRANA

CHECKED BY P.M. WEAVER

SUBMITTED BY ESP Associates, INC.

DATE April 2022

ESP ASSOCIATES, INC.
7011 ALBERT PICK RD
SUITE E
GREENSBORO, NC 27409
WWW.ESPASSOCIATES.COM



DocuSigned by:
Paul Weaver 04/14/2022
01847D3738AD49C SIGNATURE DATE

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

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

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																												
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p>										<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND 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 (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																												
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERED ROCK (WR)										CRYSTALLINE ROCK (CR)																																																																												
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<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																																																																												
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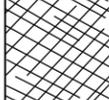
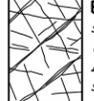
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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)		SURFACE CONDITIONS					GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)		SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)					
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.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	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.		VERY GOOD	GOOD	FAIR	POOR	VERY POOR	
STRUCTURE		DECREASING SURFACE QUALITY →					COMPOSITION AND STRUCTURE							
	INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A		70						
	BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets	80					<i>A. Thick bedded, very blocky sandstone</i> 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.	60	A					
	VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		70							50				
	BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity		60				<i>B. Sandstone with thin inter-layers of siltstone</i>				40			
	DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces			50			<i>C. Sandstone and siltstone in similar amounts</i>					30		
	LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes				40		<i>D. Siltstone or silty shale with sandstone layers</i>						20	
					30		<i>E. Weak siltstone or clayey shale with sandstone layers</i>							10
					20		<i>F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure</i>							
					10		<i>G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers</i>							
		N/A	N/A				<i>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.</i>							

→ Means deformation after tectonic disturbance

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CONTRACT: BR-0041

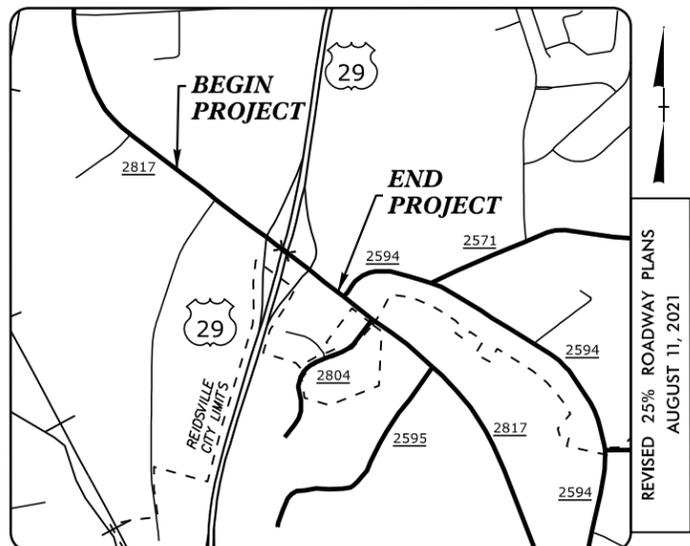
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ROCKINGHAM COUNTY

LOCATION: BRIDGE 780001 ON SR 2817 (BARNES ST)
OVER US 29

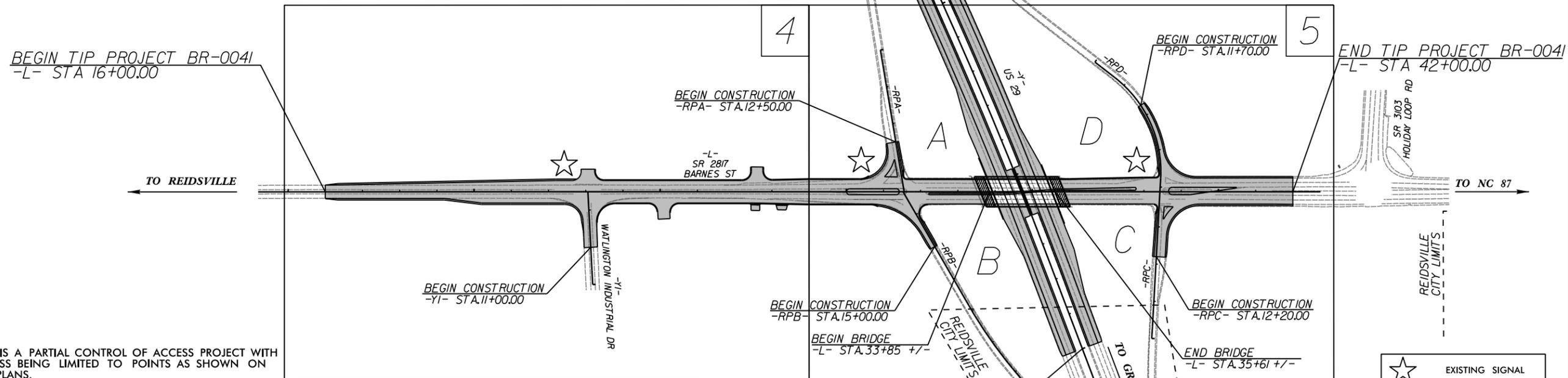
TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0041	3	41
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
67041.1.1		PE	



VICINITY MAP

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols
NOT TO SCALE

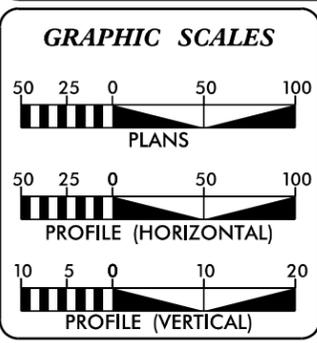


THIS IS A PARTIAL CONTROL OF ACCESS PROJECT WITH ACCESS BEING LIMITED TO POINTS AS SHOWN ON THE PLANS.

CLEARING ON THE PROJECT SHALL BE TO THE LIMITS ESTABLISHED USING METHOD _____.

A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF REIDSVILLE.

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



DESIGN DATA

ADT 2023 =	13,174
ADT 2043 =	15,087
K =	8 %
D =	55 %
T =	6 % *
V =	50 MPH
* TTST =	4% DUAL 2%
FUNC CLASS =	PRINCIPAL ARTERIAL REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT BR-0041 =	0.459 MI
LENGTH STRUCTURE TIP PROJECT BR-0041 =	0.033 MI
TOTAL LENGTH TIP PROJECT BR-0041 =	0.492 MI

Prepared in the Office of:

AECOM
NC FIRM LICENSE No: F-0342
5438 Wade Park Blvd, Suite 200
Raleigh, NC 27607
(919) 854-6200 - (919) 854-6259(FAX)

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JUNE 15, 2022

LETTING DATE: APRIL 18, 2023

GREGORY COLS, P.E.
PROJECT ENGINEER

TIMOTHY KLOTZ, P.E.
PROJECT DESIGN ENGINEER

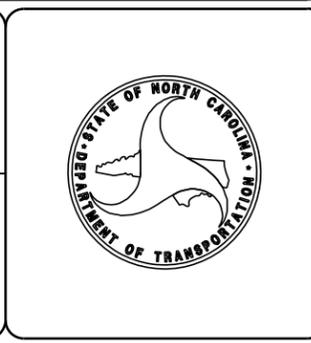
DAVID STUTTS, P.E.
NCDOT PROJECT ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



April 7, 2022

STATE PROJECT NO.: 67041.1.1
 TIP: BR-0041
 COUNTY: Rockingham
 DESCRIPTION: Bridge No. 780001 on SR 2817 (Barnes Street) over US 29
 SUBJECT: Geotechnical Report – Roadway Inventory

Project Description

This proposed project is located in Reidsville, North Carolina. The project begins at -L- Station 16+00.00 and continues to -L-Station 42+00.00. The total length of the project is 0.492 miles. The existing -L- west of the -Y- (US 29) bridge within the project corridor is generally a three-lane road while the existing -L- east of -Y- bridge within the project corridor is generally a three-lane road to -RPD- and -RPD- and a four to six-lane road east of -RPC- and -RPD-. The project area is commercial.

The proposed project construction consists of the following:

- Widening of -L- to five lanes west of the US 29 bridge
- The installation of curb and gutter along both sides of -L- west of the US 29 bridge and from the east end of the US 29 bridge to the -RPC- and -RPD- intersections on the east side of the US 29 bridge
- The replacement of the existing bridge on -L- over -Y- with a new bridge 179.0 feet in length and 83.6 feet in width (out to out)
- The construction of new approaches to the new bridge
- The construction of MSE retaining walls along each end bent of the new bridge with lengths of 222.33 feet (Wall No. 1) and 210.17 feet (Wall No. 2) and maximum wall heights of 28.66 feet (Wall No. 1) and 26.39 feet (Wall No. 2)
- Widening of the existing shoulder along -Y- in the vicinity of the bridge
- Improvements to existing street, ramps, and driveway intersections

The proposed maximum new embankment fill heights are approximately 14 feet. The maximum cuts proposed for the project are approximately 14 feet.

The drainage along the project is generally handled by side ditches.

The intersections along the project are as follows:

- -L- and Watlington Industrial Drive (-Y1-)
- -L- and Ramp A (-RPA-)
- -L- and Ramp B (-RPB-)
- -L- and Ramp C (-RPC-)
- -L- and Ramp D (-RPD-)

This geotechnical investigation was confined to the areas of proposed construction.

Initial site scoping was performed on January 26, 2022. The field investigation was performed from January 31, 2022 to March 15, 2022. Standard Penetration Test borings were advanced with a CME 55 drill machine and a

Diedrich D-50 drilling machine equipped with an automatic hammer. Eight borings were performed via hand auger due to underground and overhead utility concerns. Representative soil samples were collected for visual classification in the field and for laboratory analyses.

The following alignments were investigated. Subsurface cross sections of these alignments, as well as a subsurface profile for -L-, are included in this report:

Alignment	Station (±)
-L-	16+00.00 to 42+00.00
-Y-	15+00.00 to 26+00.00
-Y1-	11+00.00 to 12+49.26
-RPA-	12+50.00 to 13+85.28
-RPB-	15+00.00 to 16+69.85
-RPC-	12+20.00 to 13+94.24
-RPD	11+70.00 to 14+12.70

Physiography and Geography

The project corridor is located in the Milton Belt of the Piedmont physiographic province. “The Milton Belt is characterized by strongly foliated gneiss and schist, commonly with compositional layering and having felsic composition; quartzite, calc-silicate gneiss, and marble are minor units” (*The Geology of the Carolinas*, Horton and Zullo, 1991). Gneiss and schist of the Milton belt may overlie mafic intrusive rocks of the Charlotte Belt along part of the boundary with the Charlotte Belt. Sillimanite and kyanite zones of regional metamorphism comprise the majority of the Milton Belt and the eastern boundary with the Carolina Slate Belt is a lithologic discontinuity with locally sheared rocks indicating that the boundary may be a fault zone. Existing evidence suggest that the rocks of the Milton Belt are mainly Precambrian in age with metamorphosis and deformation occurring during the early to middle Paleozoic. According to the Geologic Map of North Carolina, 1985, the rock underlying the project corridor consists of biotite gneiss and schist which is inequigranular and magacrystic with abundant potassic feldspar and garnet, and that it is interlayered and gradational with calc-silicate rock, sillimanite-mica schist, mica schist, and amphibolite with small masses of granitic rock. The rock cored for two of the bridge borings classifies as Biotite Gneiss with some Granitic Rock.

The topography along the project corridor generally consists of gently rolling hills. The roadway along Barnes Street (-L-) slopes up from each end of the project to the bridge over US 29 with elevations ranging from approximately 795 feet (MSL) to approximately 819 feet (MSL), while the roadway along US 29 (-Y-) slopes down from south to north with elevations ranging from approximately 795 feet (MSL) to approximately 778 feet (MSL).

Soil Properties

Soils encountered within this project area have been divided into three categories: roadway embankment, residual soils, and weathered rock.

The roadway embankment ranges in thickness from less than 4 feet to approximately 12 feet. The roadway embankment soils encountered consist of stiff to very stiff sandy silt (A-4) and silty clay (A-7-5) and of loose to medium dense gravel and sand (A-1-a) and silty sand (A-2-4). The plasticity index in the lab test performed on a sample of cohesive roadway embankment material was 21.

Residual soils were encountered in all of the borings drilled for this project. The residual soils consist of loose to very dense silty sand (A-2-4) and of very soft to hard, sandy silt (A-4), clayey silt (A-5), sandy clay (A-6), and silty clay (A-7-5 and A-7-6). Plasticities within the cohesive residual soils range from slightly plastic to highly plastic with laboratory plasticity index results ranging from 6 to 37.

Weathered rock classified as Granitic Rock and Biotite Gneiss was encountered underlying the residual soils within the depths explored in 5 of the borings drilled as part of the bridge investigation. The top of the weathered rock was encountered at depths ranging from 4.0 feet to 37.4 feet below the existing ground surface and at elevations ranging from 785.7 feet to 763.2 feet above sea level.

Rock Properties

Crystalline rock classified as Biotite Gneiss with Granitic Rock was encountered underlying the weathered rock in 6 borings and directly underlying the residual soil in 9 borings drilled as part of the bridge investigation. The depth to the top of the crystalline rock ranged from 2.1 feet to 43.5 feet and at elevations ranging from 787.5 feet to 749.1 feet above sea level. It should be noted that the shallow weathered rock/rock was encountered under the existing bridge over US 29 in the area of the proposed left side of End Bent 1 and Bent 1. The crystalline rock was not encountered at depths that should affect project roadway construction based on the 25 percent project plans.

Groundwater Properties

Groundwater data was collected in February 2022. Twenty-four-hour ground water depths ranged from 0.0 (after 2 days of heavy rain at the project site) to 29.4 feet below the existing ground surface, and groundwater elevations ranged from 790.7 to 771.1 feet above sea level. It should be noted that groundwater generally slopes to the north across the site with an approximate elevation of 780 feet ±2 feet (MSL) in the vicinity of the bridge. Groundwater was encountered within 6 feet of the proposed grade in two roadway borings, L_1727 and EB1-B.

Areas of Special Geotechnical Interest

1) The following area contains loose sands within 3 feet of the proposed grade or at the base of proposed embankments which have the potential to cause embankment, subgrade, and/or slope stability problems during construction:

Alignment	STA (±) to STA (±)	Offset (±)
-L-	16+25 to 18+75	50' left to 20' left

2) The following area contains wet to saturated soils within 3 feet of the proposed grade or at the base of proposed embankments which have the potential to cause embankment, subgrade, and/or slope stability problems during construction:

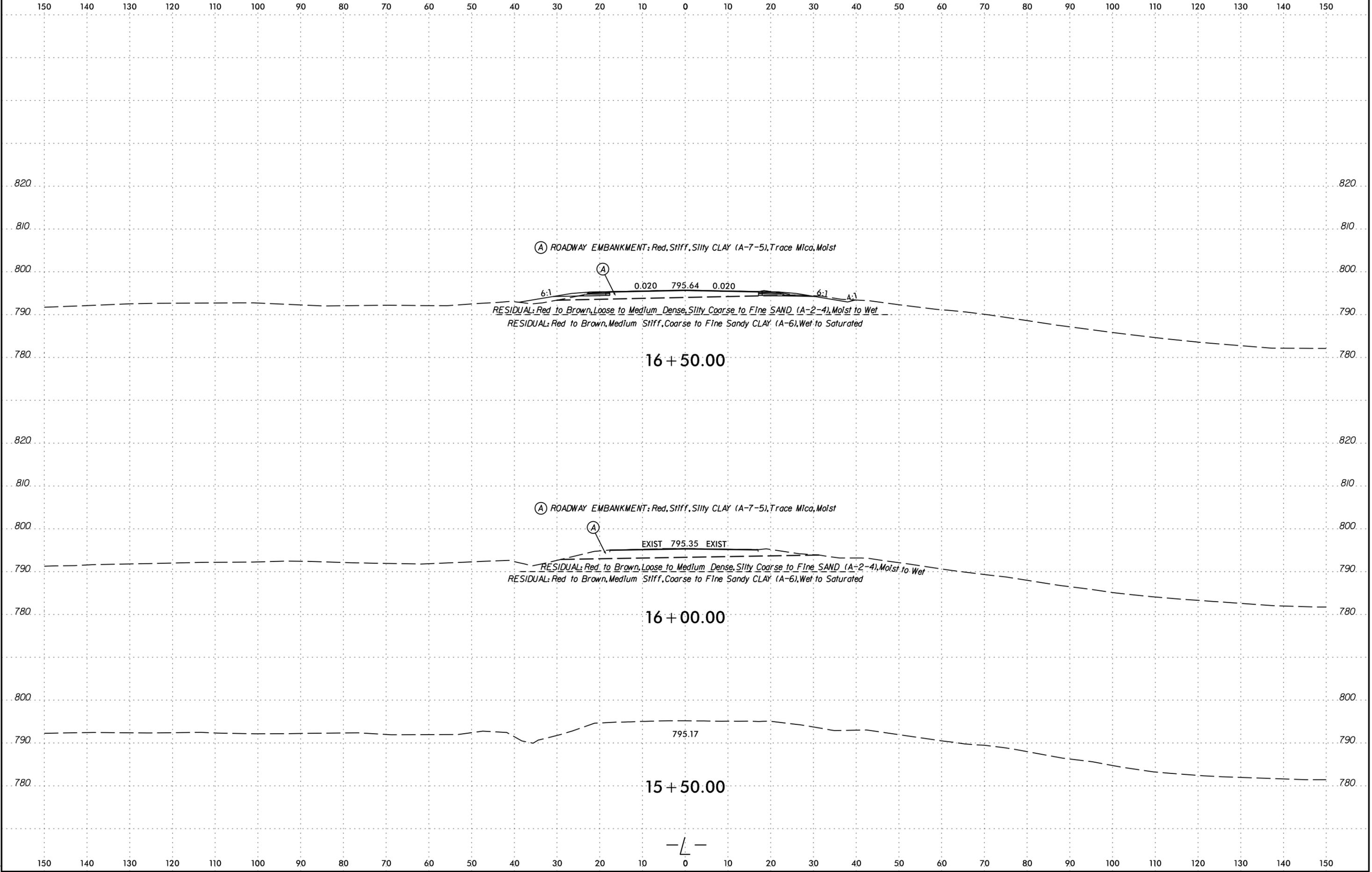
Alignment	STA (±) to STA (±)	Offset (±)
-L-	16+25 to 18+75	50' left to 20' left
-Y -	19+25 to 19+75	80' left to 50' left

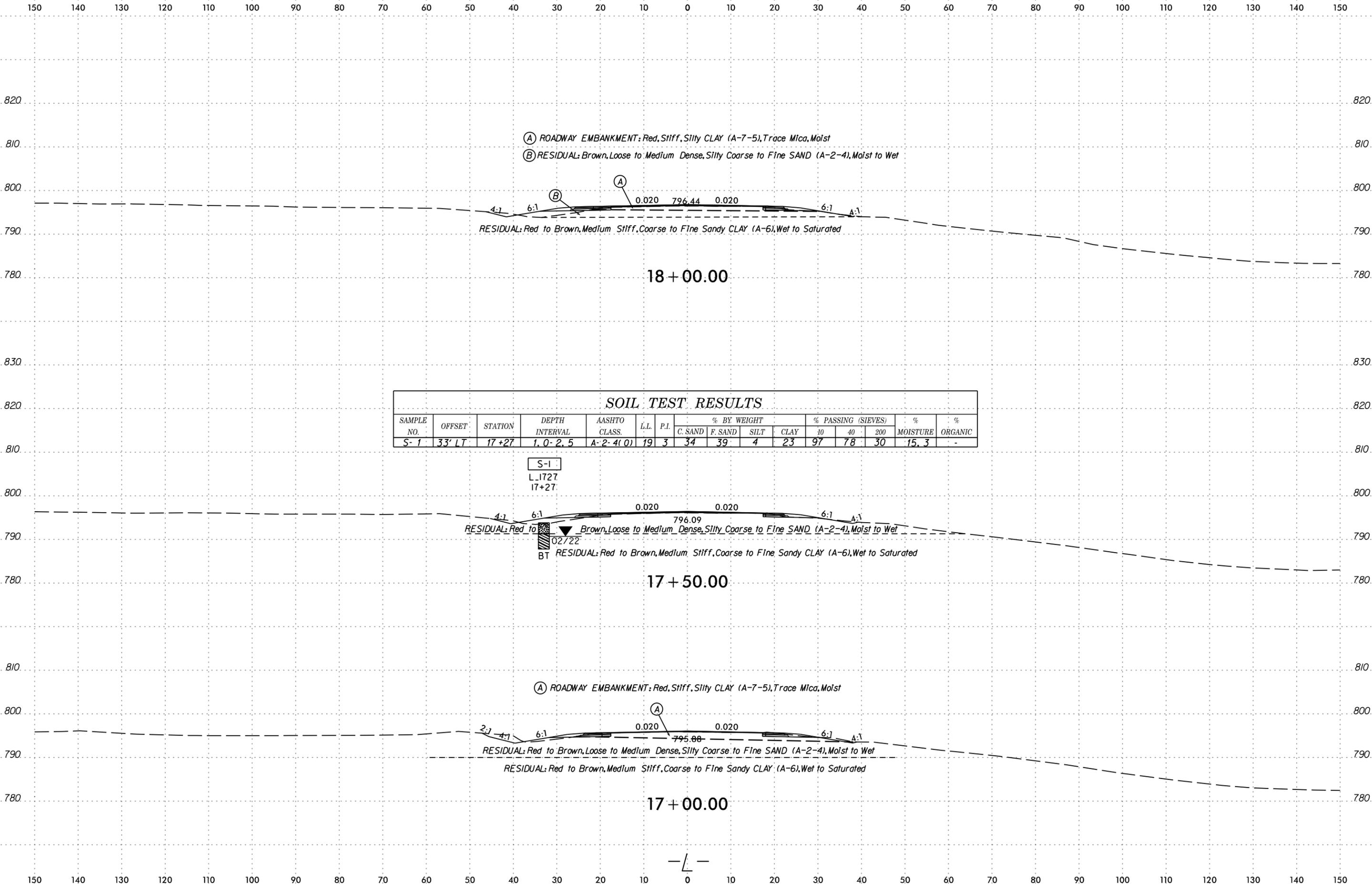
3) The following areas contain soils with plasticity indexes greater than 25, liquid limits greater than 70, and/or percent passing the no. 200 sieve greater than 70 within 3 feet of the proposed grade or within cut areas which have the potential to cause embankment, subgrade, and/or slope stability problems during construction:

Alignment	STA (±) to STA (±)	Offset (±)
-L-	18+75 to 24+75	Across extents of construction
-L-	29+75 to 32+25	Across extents of construction
-Y-	17+25 to 18+75	Across extents of construction
-RPB-	15+25 to 16+16	42' left to 75' left

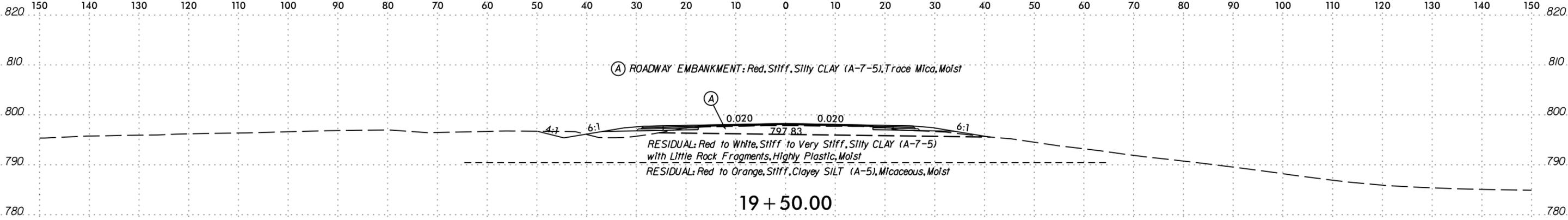
Water Wells

No water wells were identified within or adjacent to the proposed right-of-way on the plans provided to ESP or by ESP personnel in the field.

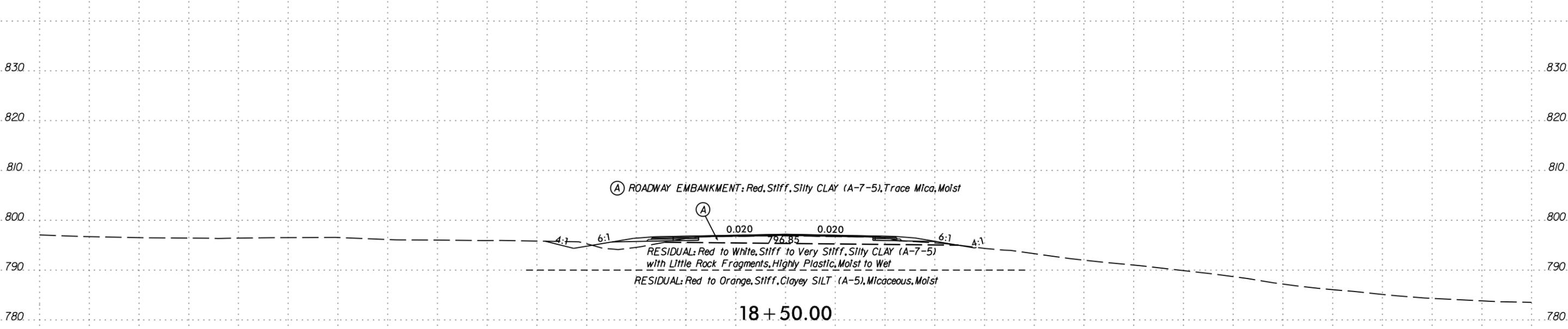
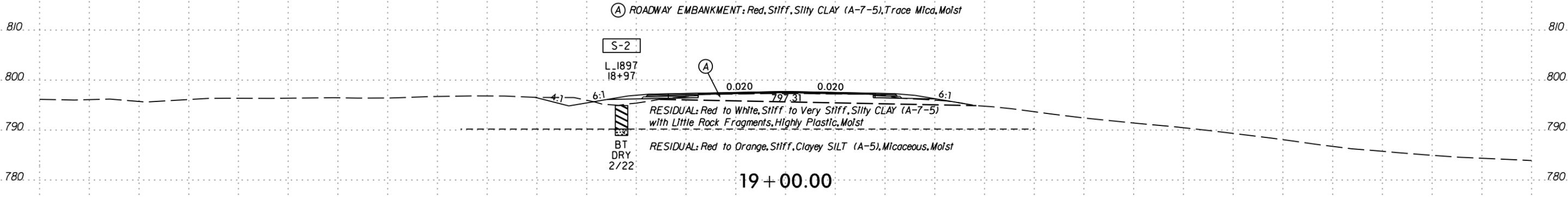


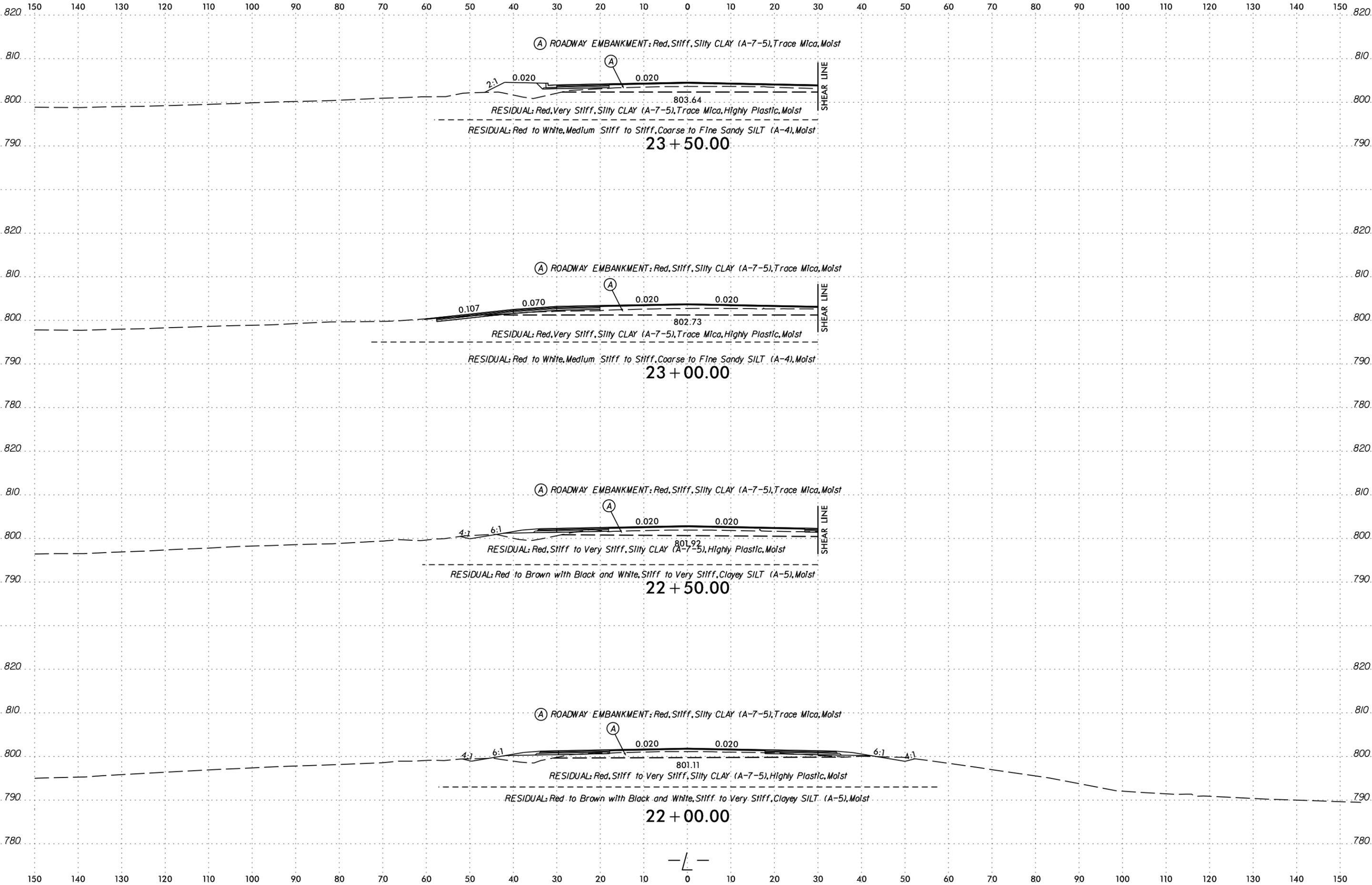


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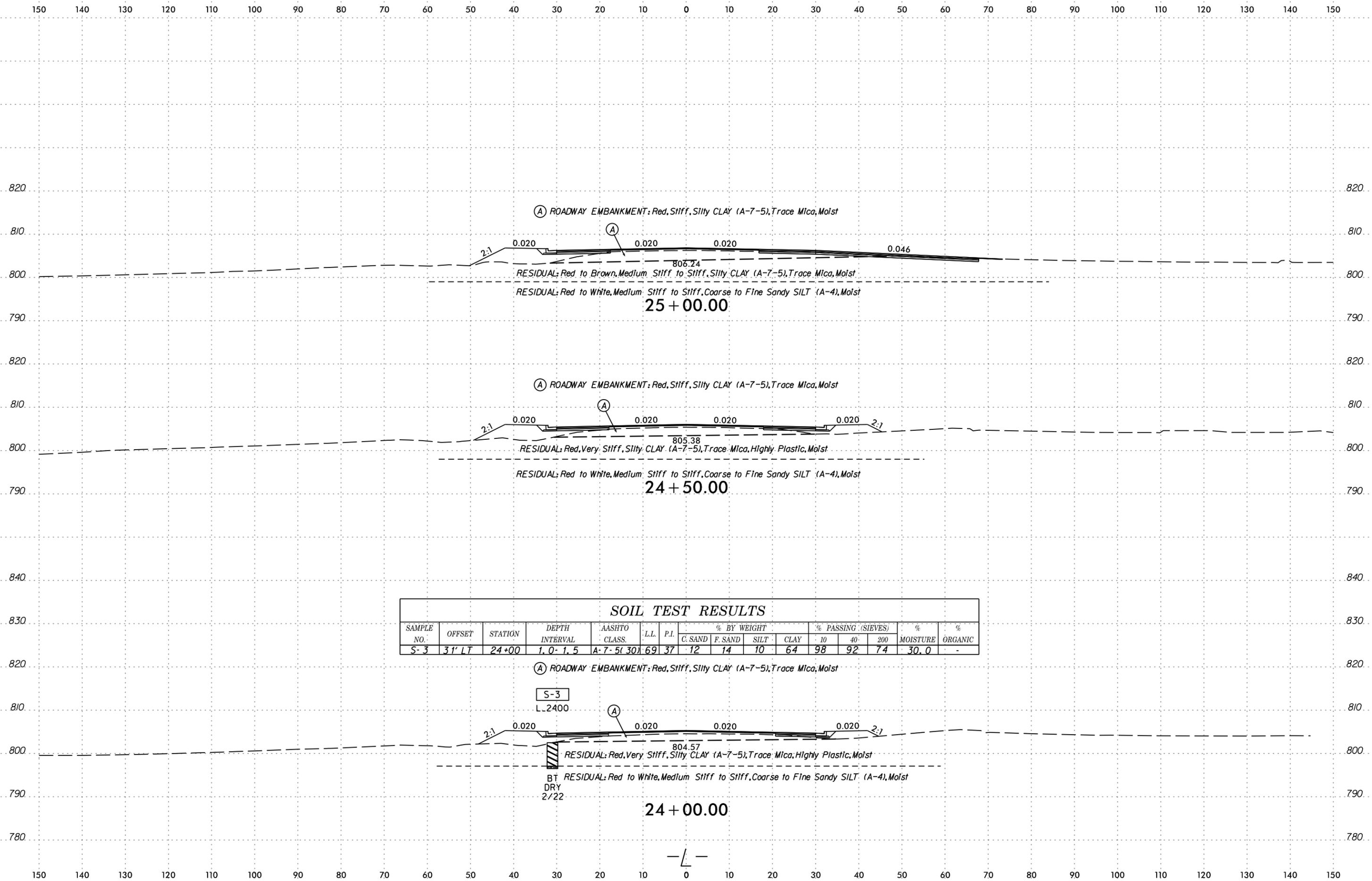


SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-2	33' LT	18+97	1.0-2.0	A-7-5(11)	60	26	24	16	13	47	84	70	52	21.7	-



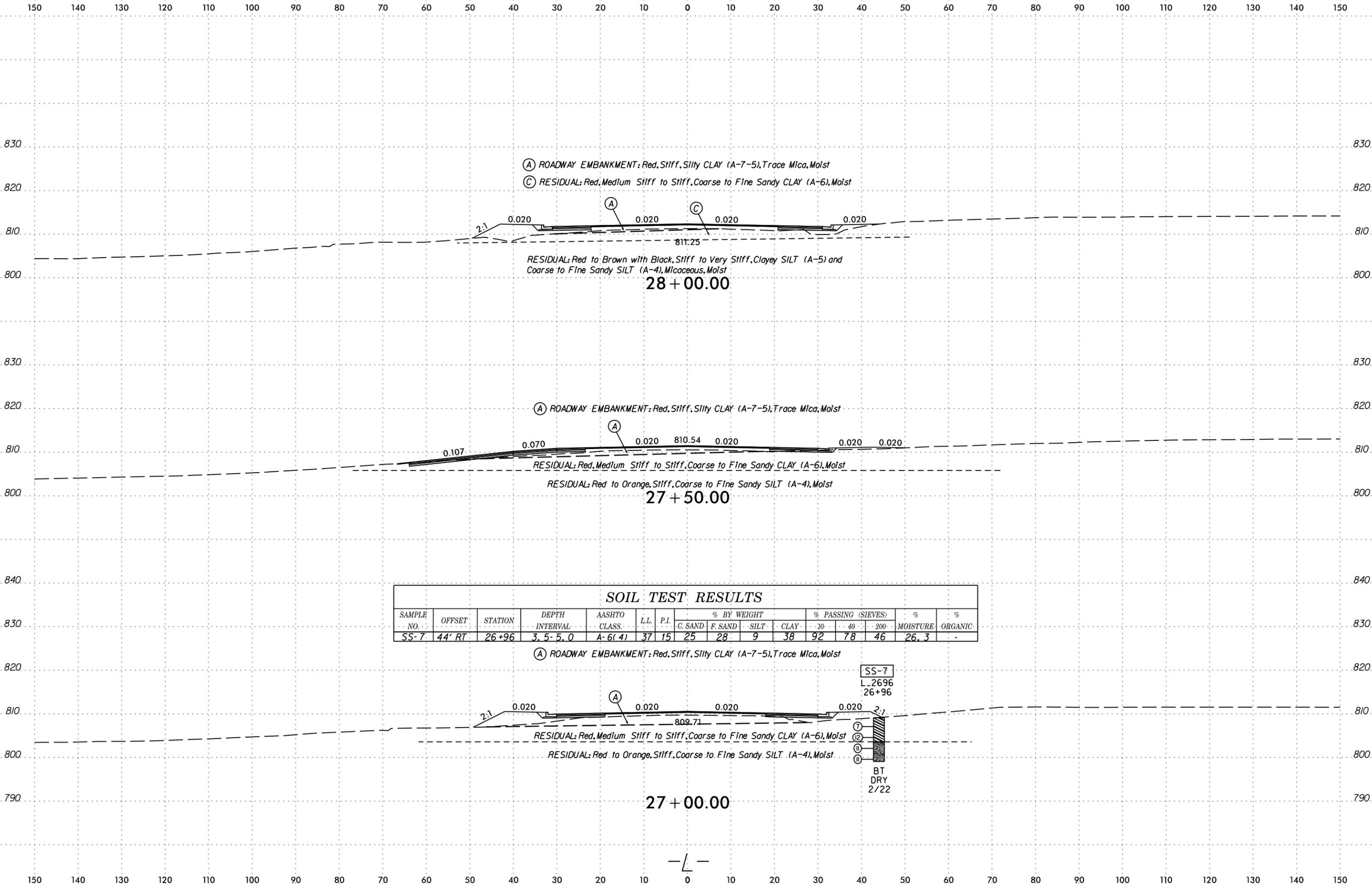


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SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							C. SAND	F. SAND	SILT	CLAY	10	40	200			
S-3	3' LT	24+00	1.0 - 1.5	A-7-5(30)	69	37	12	14	10	64	98	92	74	30.0	-	

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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-7	44' RT	26+96	3.5-5.0	A-6(4)	37	15	25	28	9	38	92	78	46	26.3	-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

850 850

840 840

SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							C. SAND	F. SAND	SILT	CLAY	#10	#40	#200			
SS-5	82' LT	16+01	3.5-5.0	A-7-5(37)	77	32	5	6	14	75	99	95	90	31.5	-	

NOTE: STATION AND OFFSET REFER TO RPB ALIGNMENT

830 830

820 820

810 810

800 800

790 790

830 830

820 820

810 810

800 800

840 840

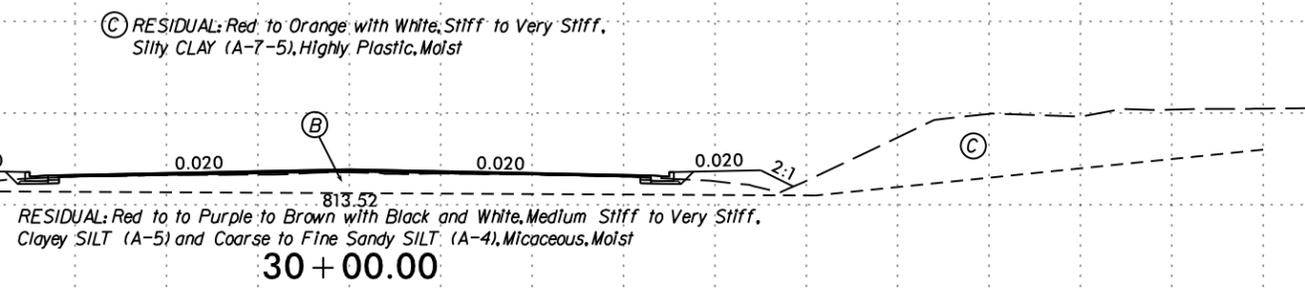
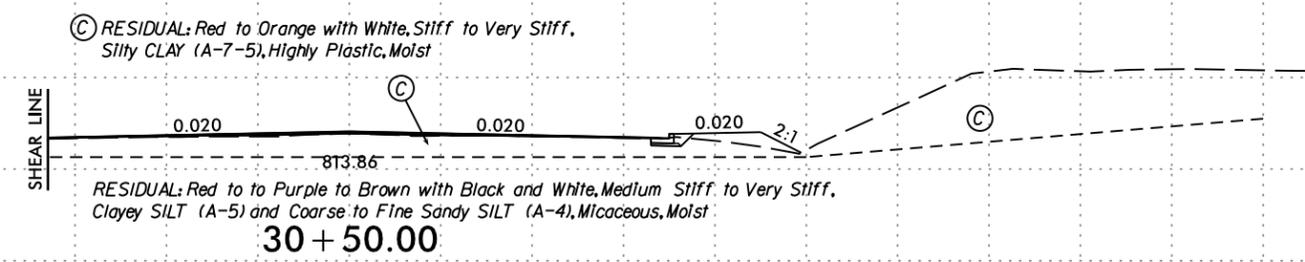
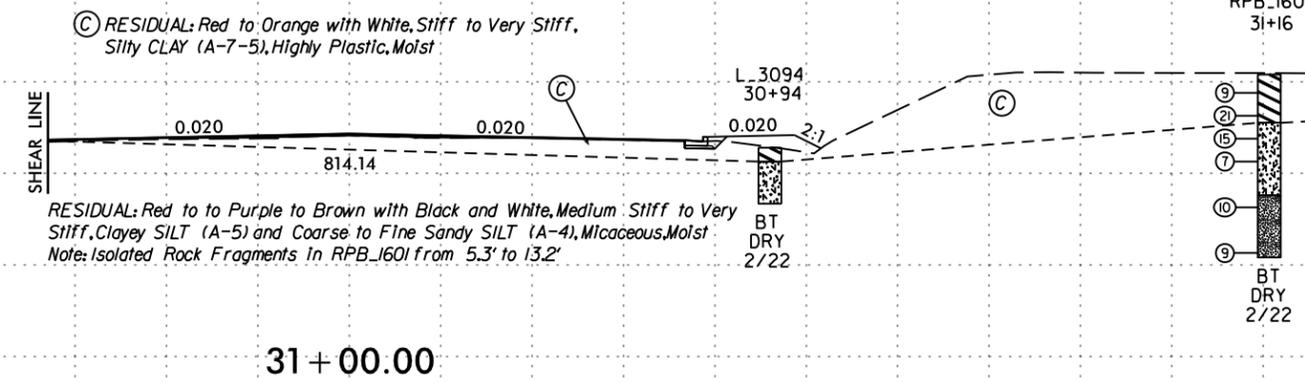
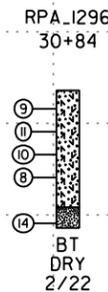
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820 820

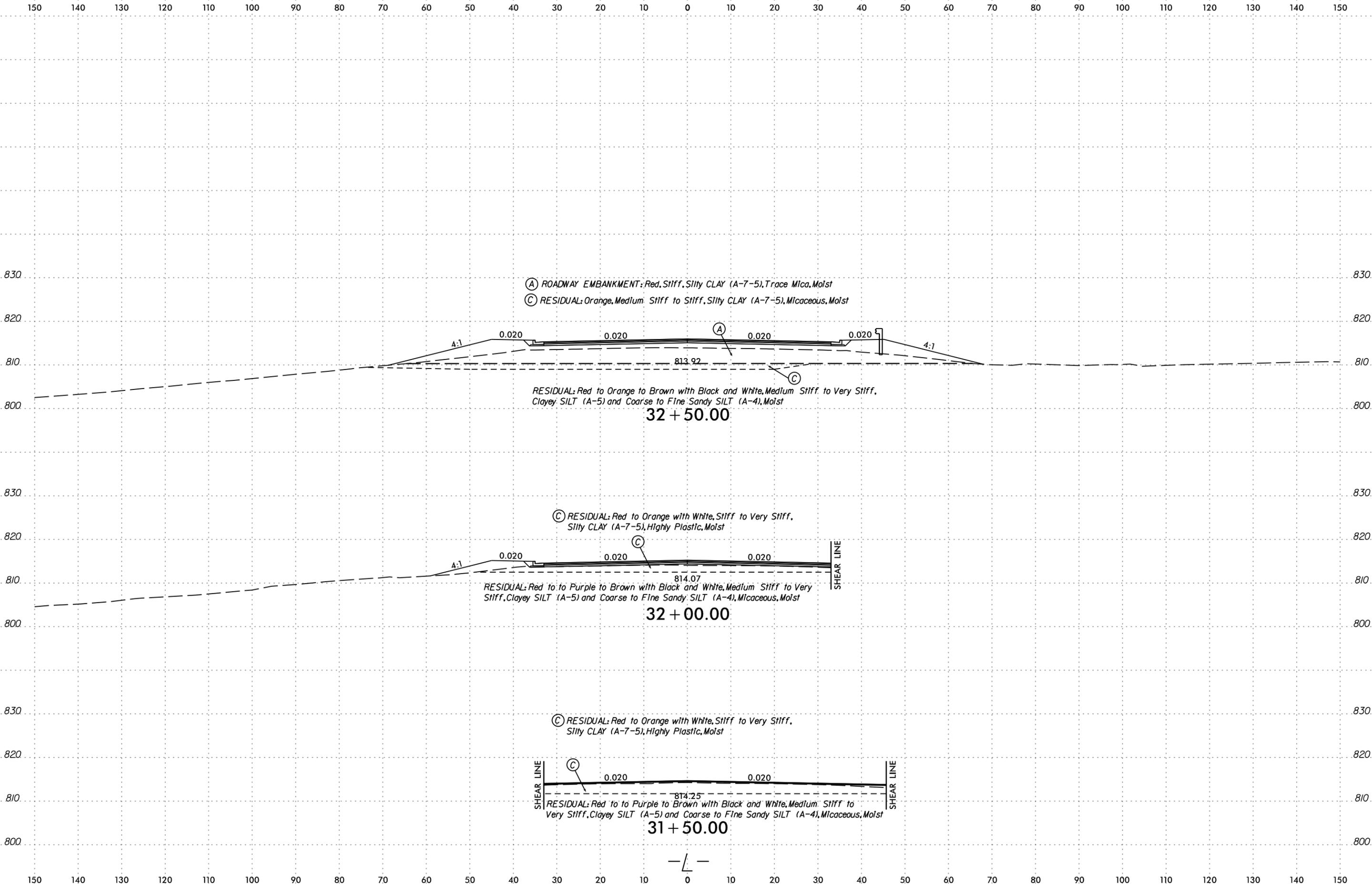
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800 800

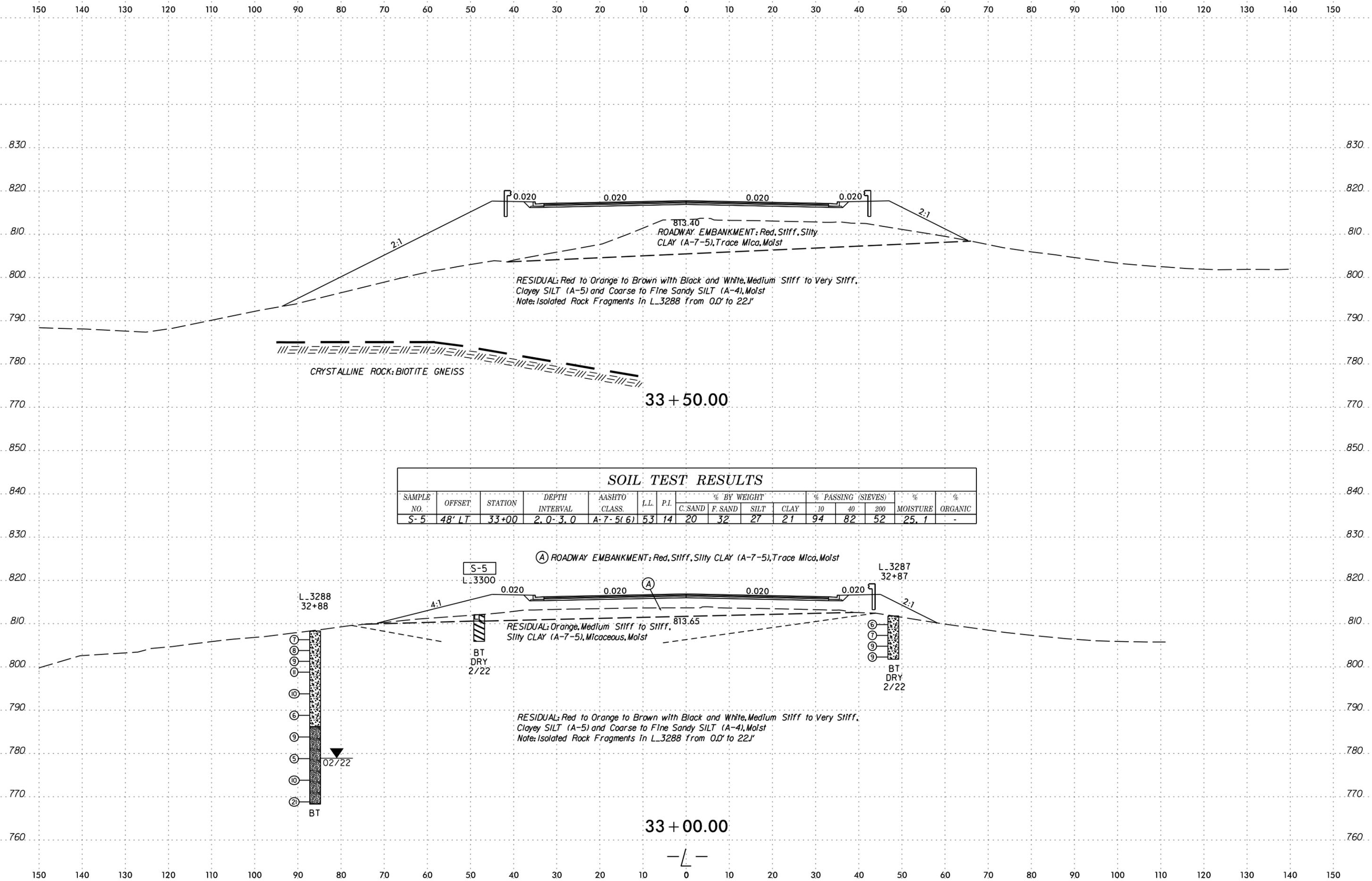
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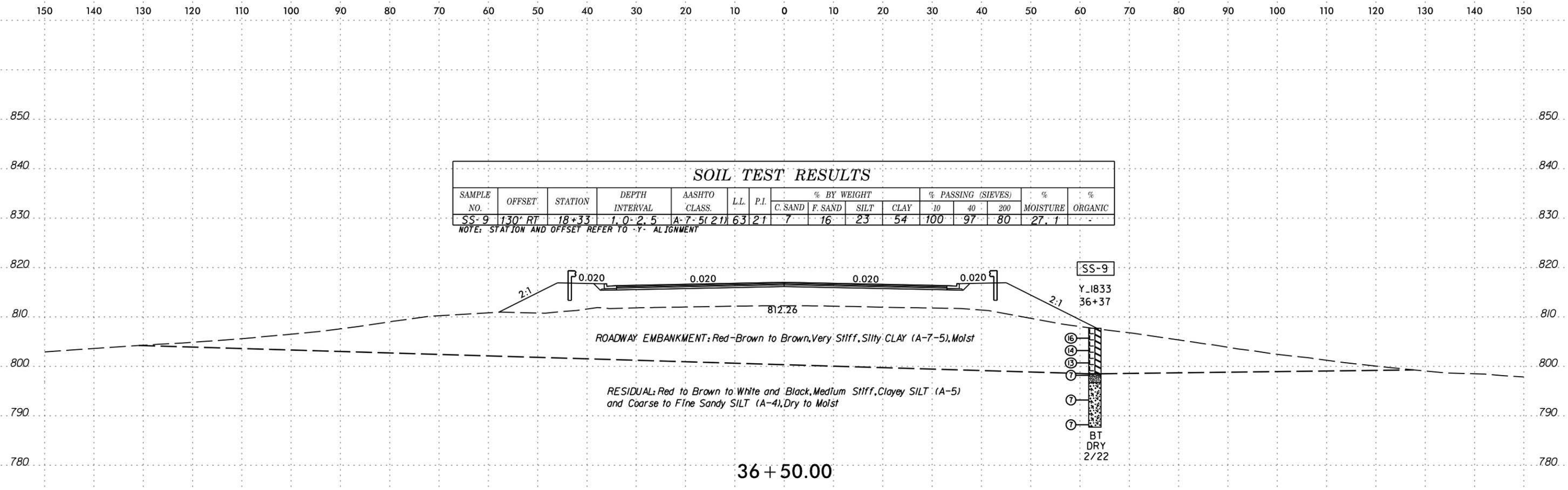
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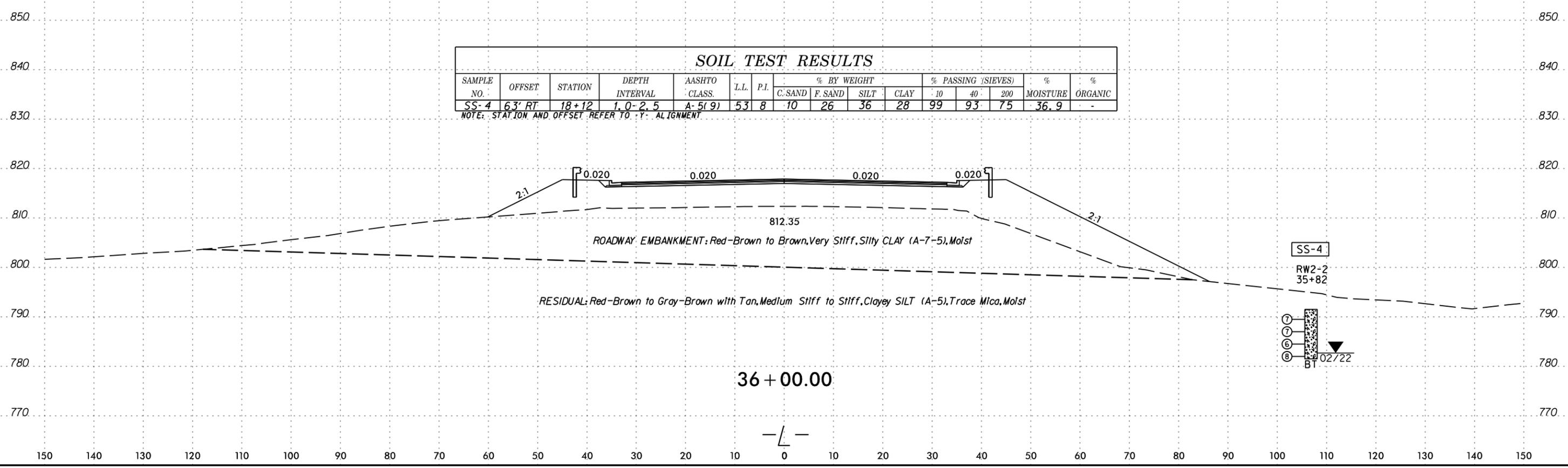


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SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-9	130' RT	18+33	1.0-2.5	A-7-5(21)	63	21	7	16	23	54	100	97	80	27.1	-

NOTE: STATION AND OFFSET REFER TO -Y- ALIGNMENT



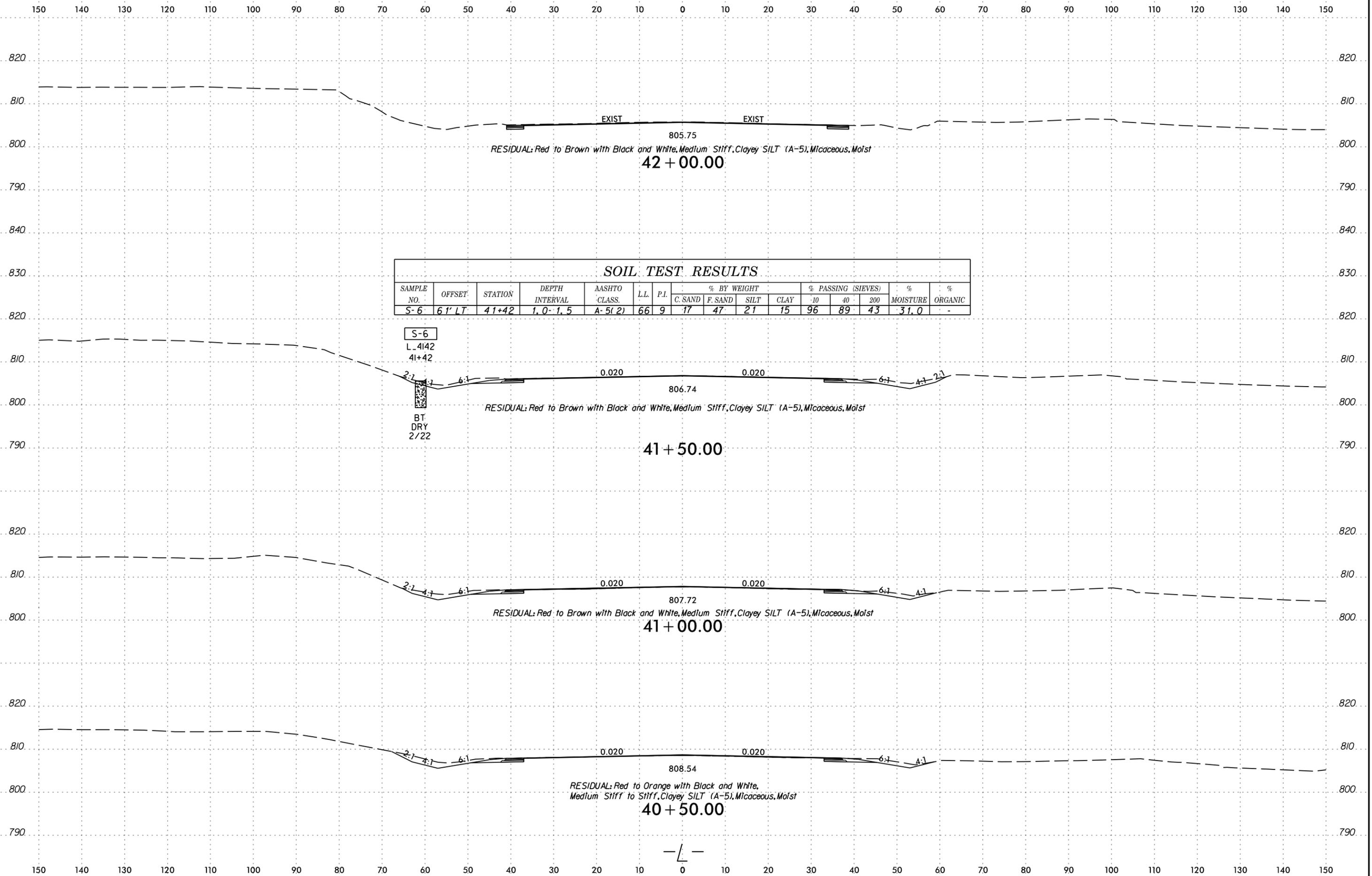
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							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-4	63' RT	18+12	1.0-2.5	A-5(9)	53	8	10	26	36	28	99	93	75	36.9	-

NOTE: STATION AND OFFSET REFER TO -Y- ALIGNMENT

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SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	#10	#40	#200		
S-6	6' LT	41+42	1.0-1.5	A-5(2)	66	9	17	47	21	15	96	89	43	31.0	-

S-6
L 4142
41+42

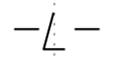
BT
DRY
2/22

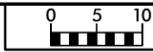
EXIST
805.75
RESIDUAL: Red to Brown with Black and White, Medium Stiff, Clayey SILT (A-5), Micaceous, Moist
42 + 00.00

0.020
806.74
RESIDUAL: Red to Brown with Black and White, Medium Stiff, Clayey SILT (A-5), Micaceous, Moist
41 + 50.00

0.020
807.72
RESIDUAL: Red to Brown with Black and White, Medium Stiff, Clayey SILT (A-5), Micaceous, Moist
41 + 00.00

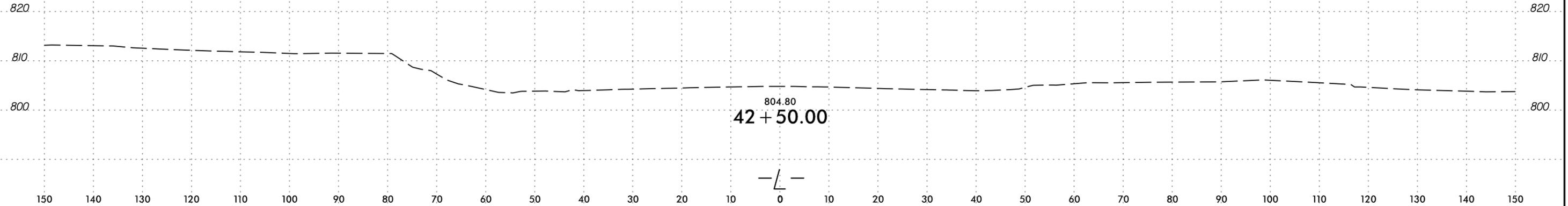
0.020
808.54
RESIDUAL: Red to Orange with Black and White, Medium Stiff to Stiff, Clayey SILT (A-5), Micaceous, Moist
40 + 50.00

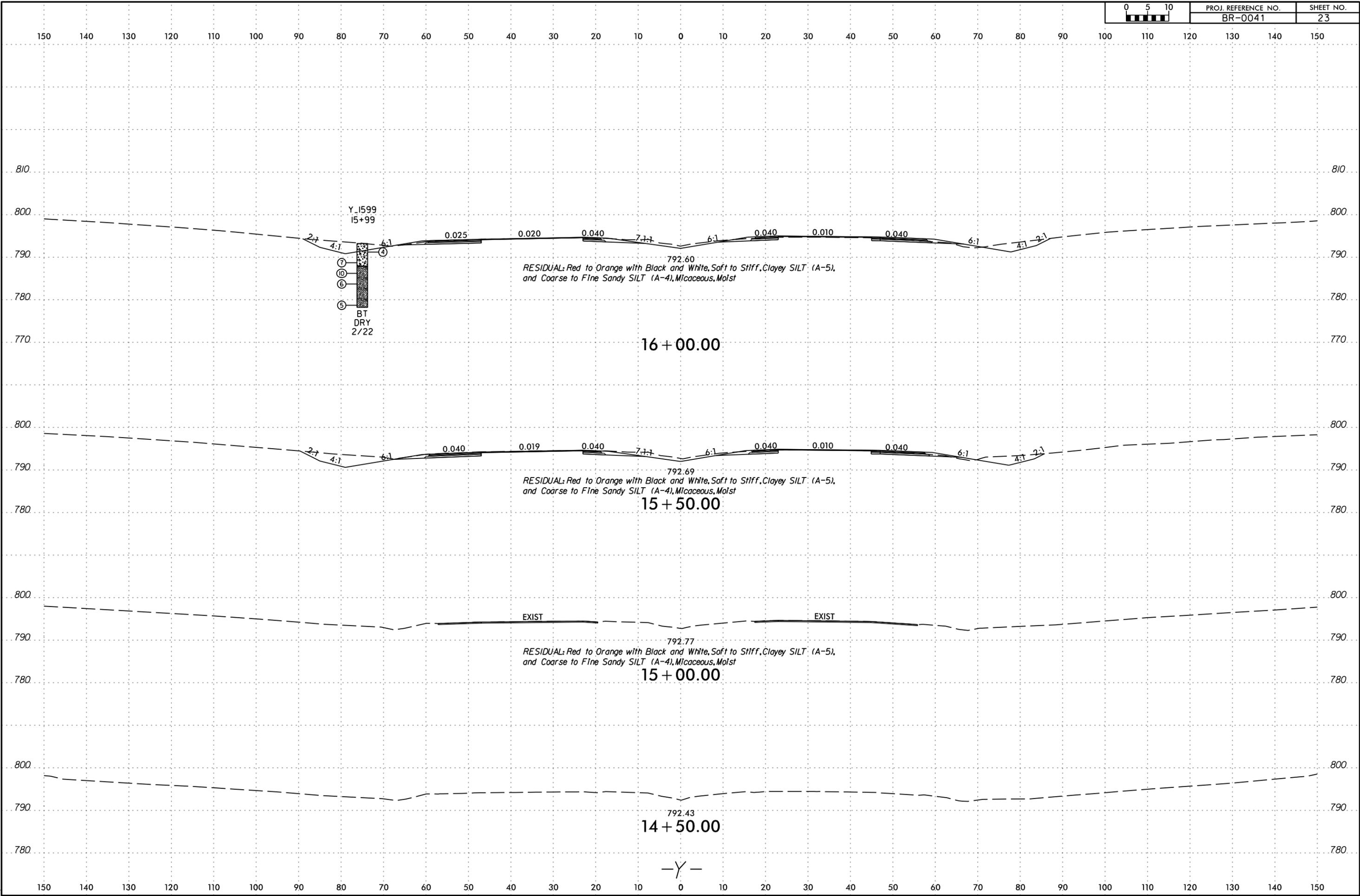




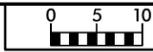
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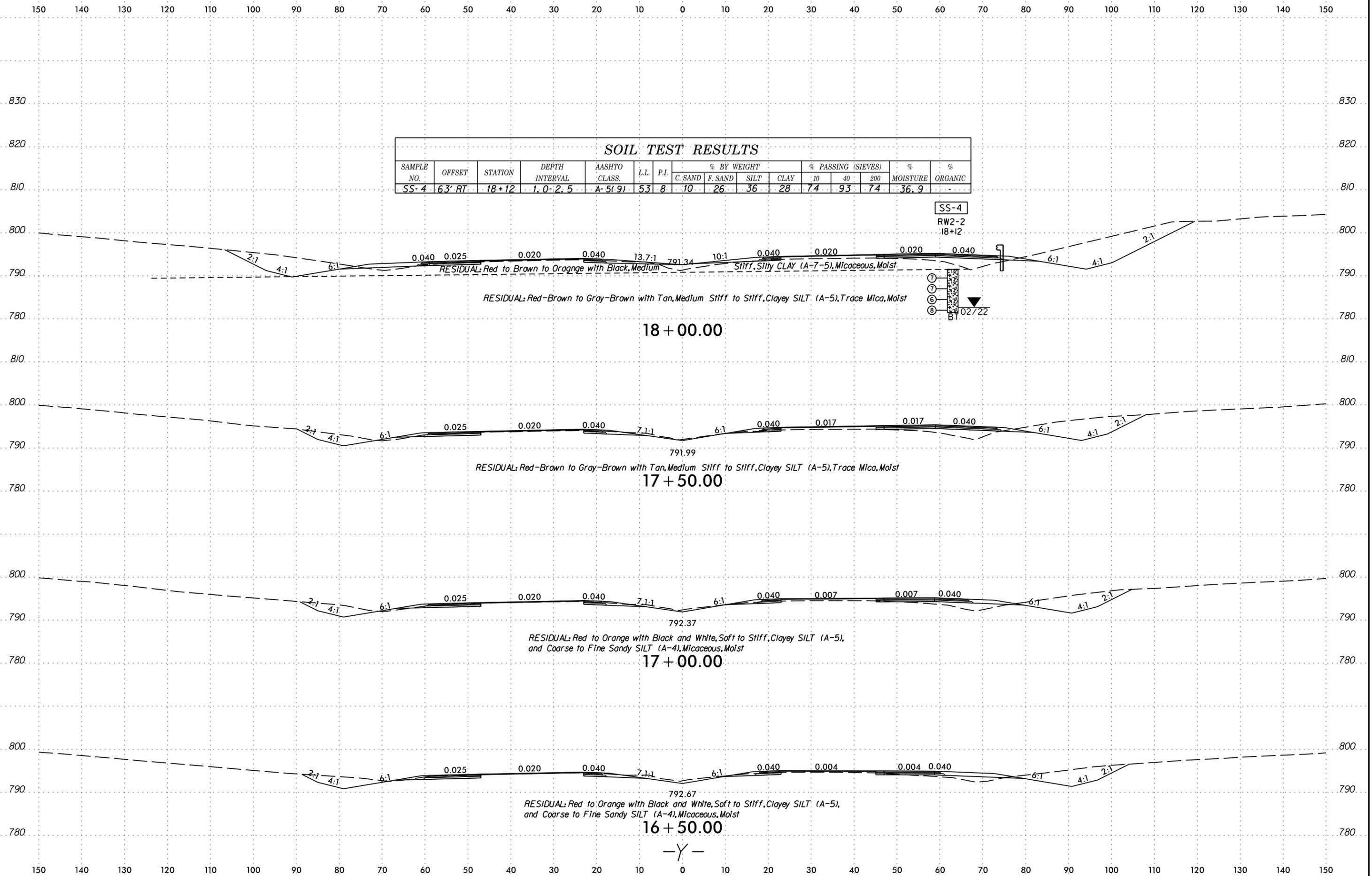




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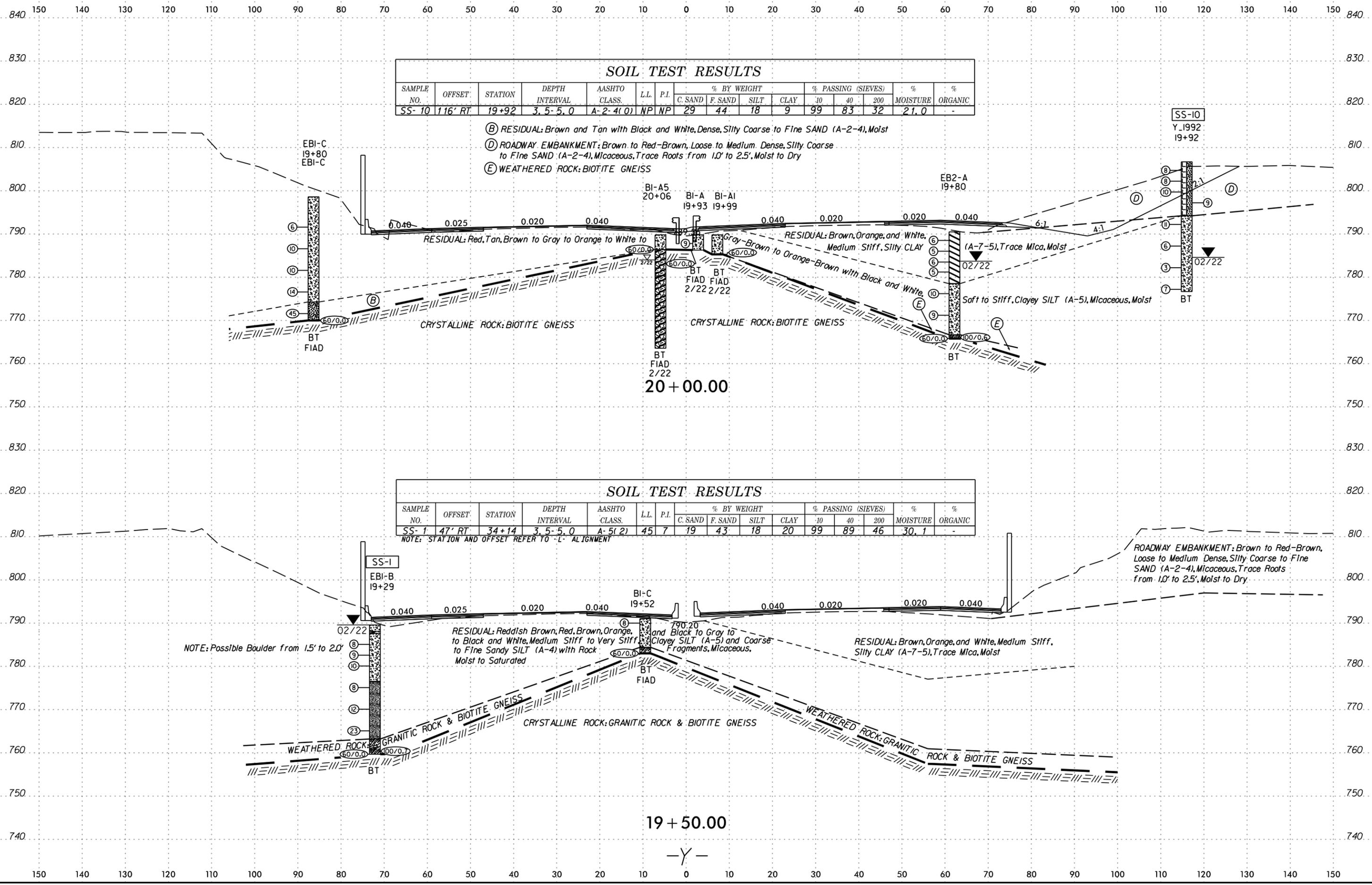


SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-4	6.3' RT	18+12	1.0-2.5	A-5(9)	53	8	10	26	36	28	74	93	74	36.9	-



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6/23/16
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SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	#10	#40	#200		
SS-10	116' RT	19+92	3.5-5.0	A-2-4(0)	NP	NP	29	44	18	9	99	83	32	21.0	-

- (B) RESIDUAL: Brown and Tan with Black and White, Dense, Silty Coarse to Fine SAND (A-2-4), Moist
- (D) ROADWAY EMBANKMENT: Brown to Red-Brown, Loose to Medium Dense, Silty Coarse to Fine SAND (A-2-4), Micaceous, Trace Roots from 1.0' to 2.5', Moist to Dry
- (E) WEATHERED ROCK: BIOTITE GNEISS

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	#10	#40	#200		
SS-1	47' RT	34+14	3.5-5.0	A-5(2)	45	7	19	43	18	20	99	89	46	30.1	-

NOTE: STATION AND OFFSET REFER TO 'L' ALIGNMENT

ROADWAY EMBANKMENT: Brown to Red-Brown, Loose to Medium Dense, Silty Coarse to Fine SAND (A-2-4), Micaceous, Trace Roots from 1.0' to 2.5', Moist to Dry.

NOTE: Possible Boulder from 1.5' to 2.0'

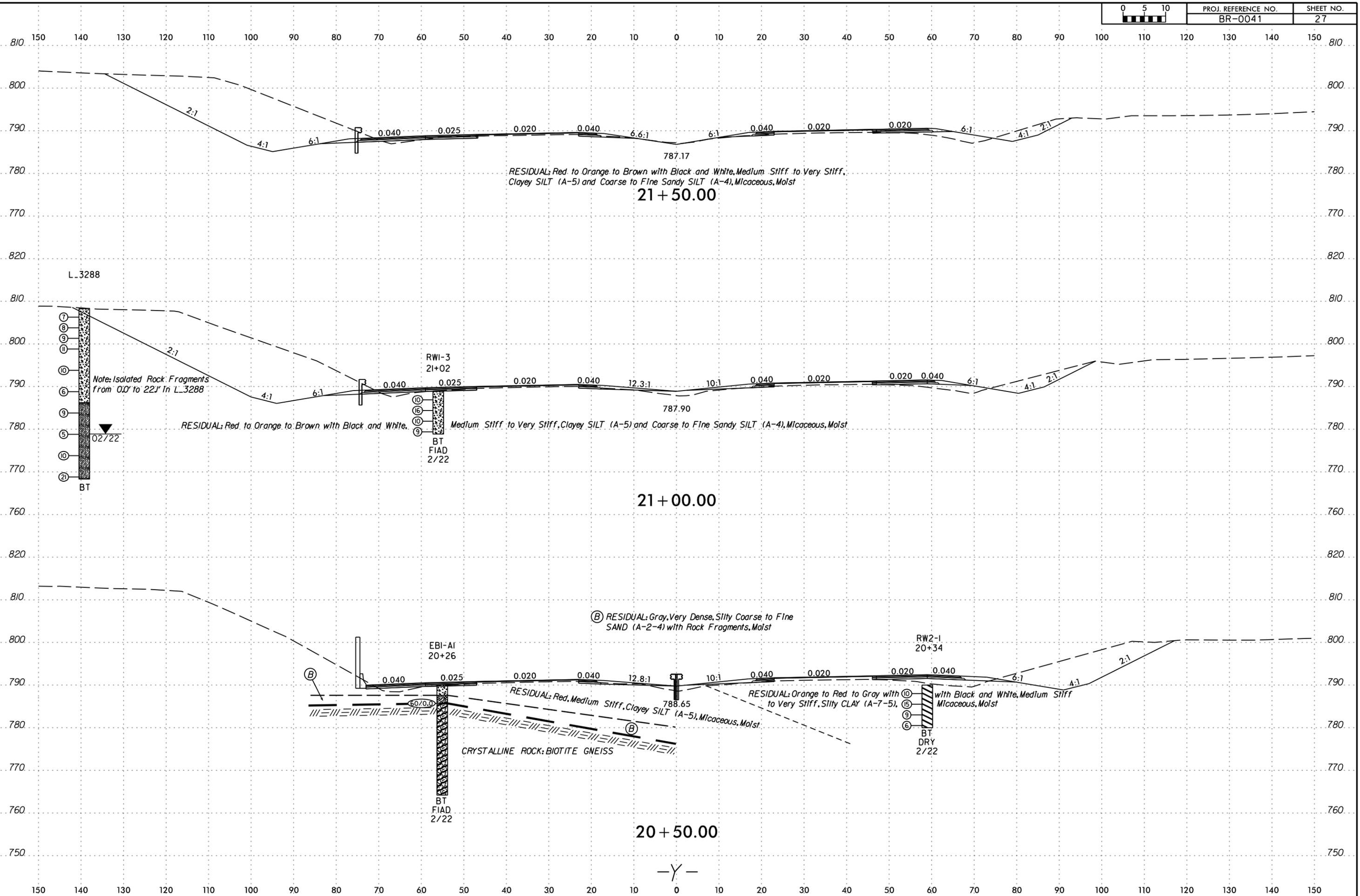
19 + 50.00
-Y-

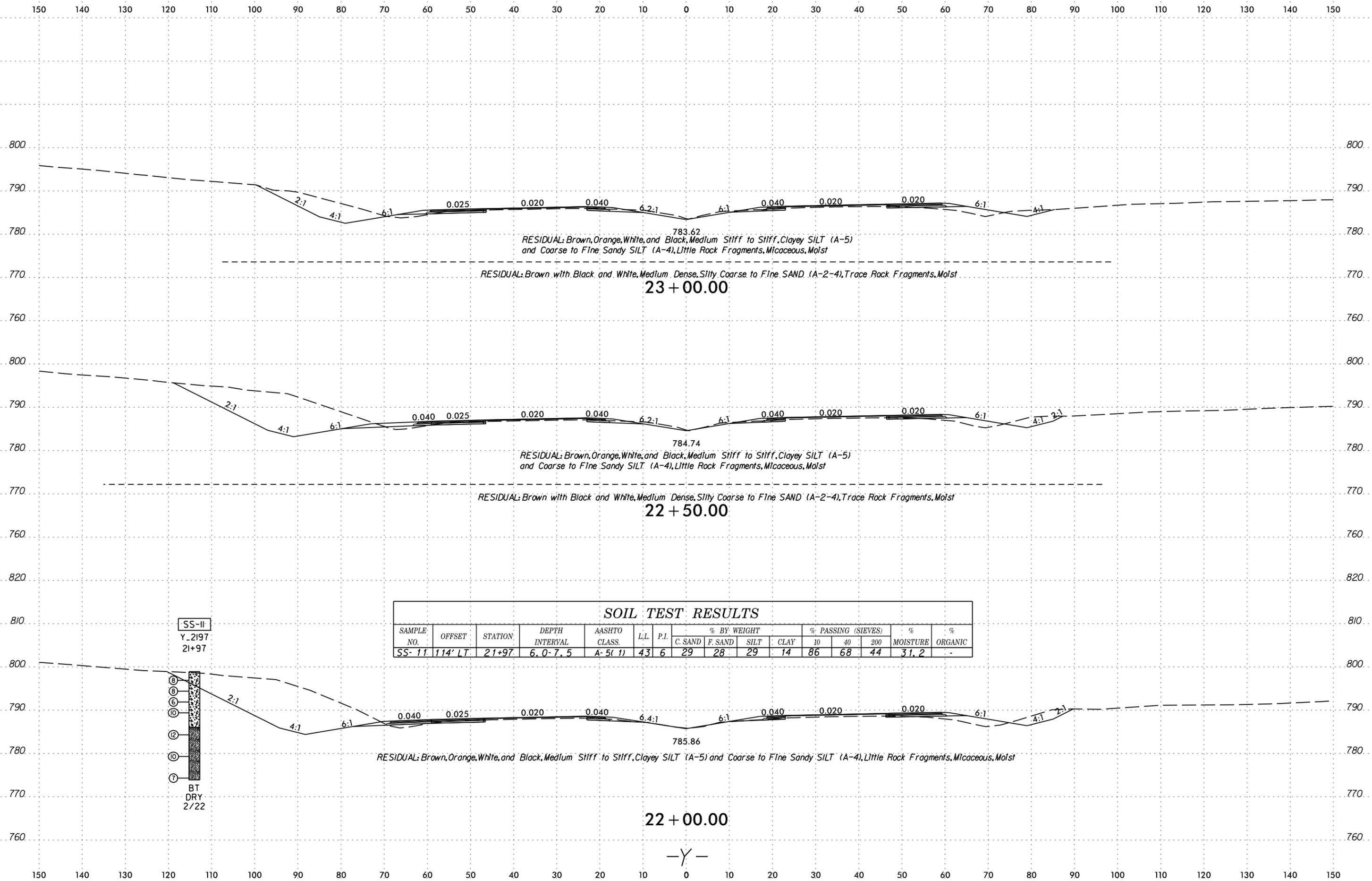
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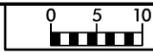
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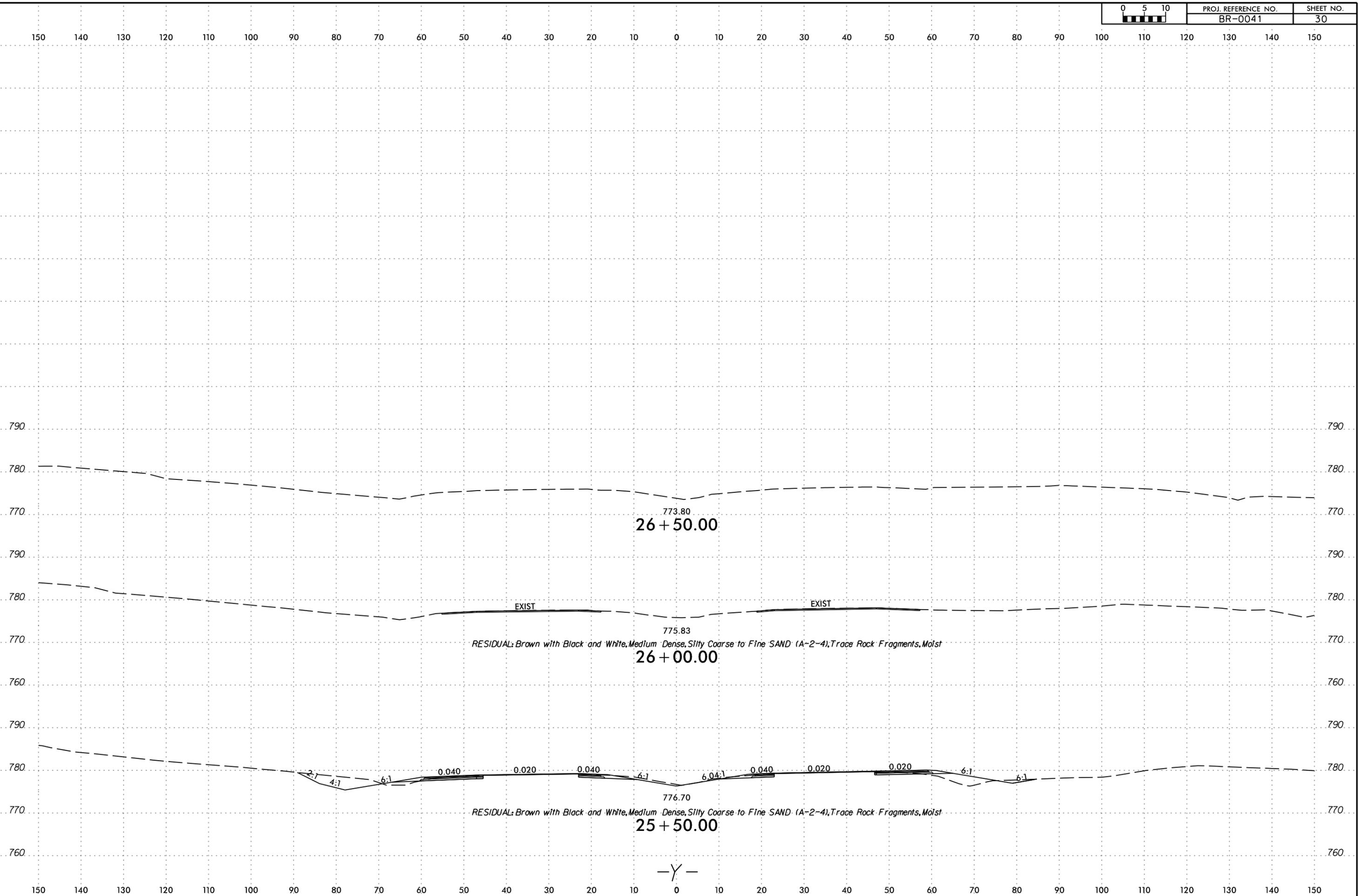




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150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

790 780 770 760 790 780 770 760 790 780 770 760

773.80
26 + 50.00

EXIST

EXIST

775.83
26 + 00.00

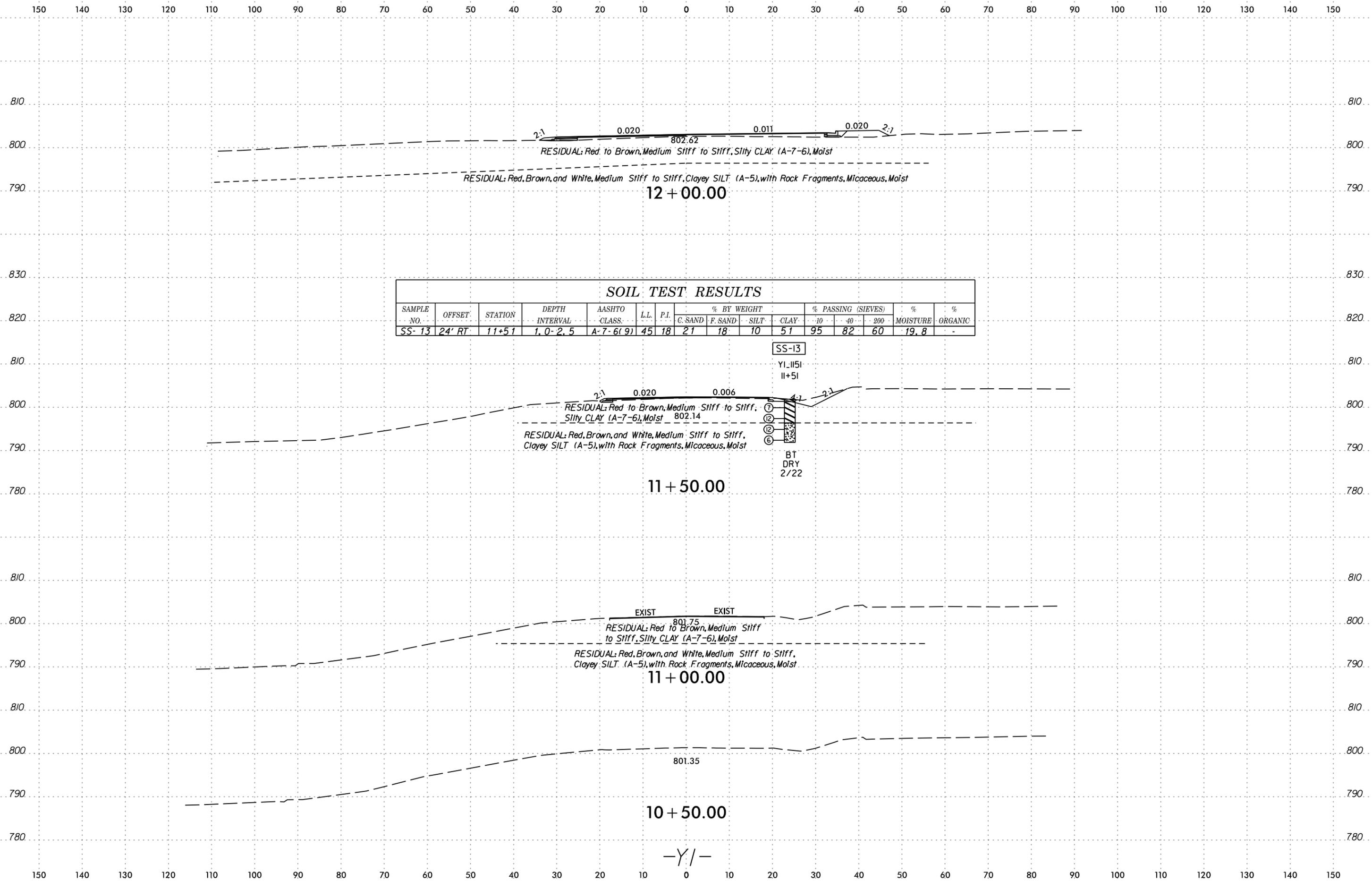
RESIDUAL: Brown with Black and White, Medium Dense, Silty Coarse to Fine SAND (A-2-4), Trace Rock Fragments, Moist

776.70
25 + 50.00

RESIDUAL: Brown with Black and White, Medium Dense, Silty Coarse to Fine SAND (A-2-4), Trace Rock Fragments, Moist

-Y-

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150



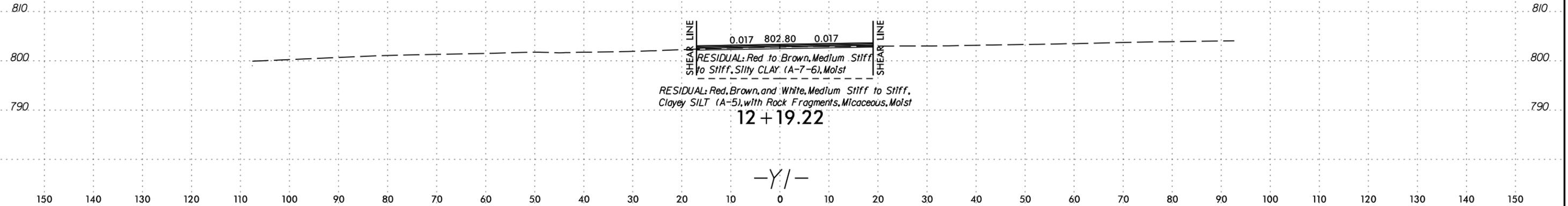
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	#10	#40	#200		
SS-13	24' RT	11+51	1.0-2.5	A-7-6(9)	45	18	21	18	10	51	95	82	60	19.8	-

SS-13
 YI-1151
 11+51
 BT
 DRY
 2/22



150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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820 820

810 810

800 800

830 830

820 820

810 810

800 800

790 790

820 820

810 810

800 800

820 820

810 810

800 800

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

0.010

813.58
RESIDUAL: Red to Brown with Black and White, Medium Stiff to Stiff,
Clayey SILT (A-5) and Coarse to Fine Sandy SILT (A-4), Micaceous, Moist

13 + 50.00

0.020

812.07
RESIDUAL: Red to Brown with Black and White, Medium Stiff to Stiff,
Clayey SILT (A-5) and Coarse to Fine Sandy SILT (A-4), Micaceous, Moist

13 + 00.00

EXIST

809.86
RESIDUAL: Red to Brown with Black and White, Medium Stiff to Stiff,
Clayey SILT (A-5) and Coarse to Fine Sandy SILT (A-4), Micaceous, Moist

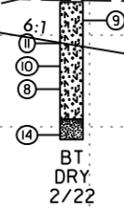
12 + 50.00

806.92

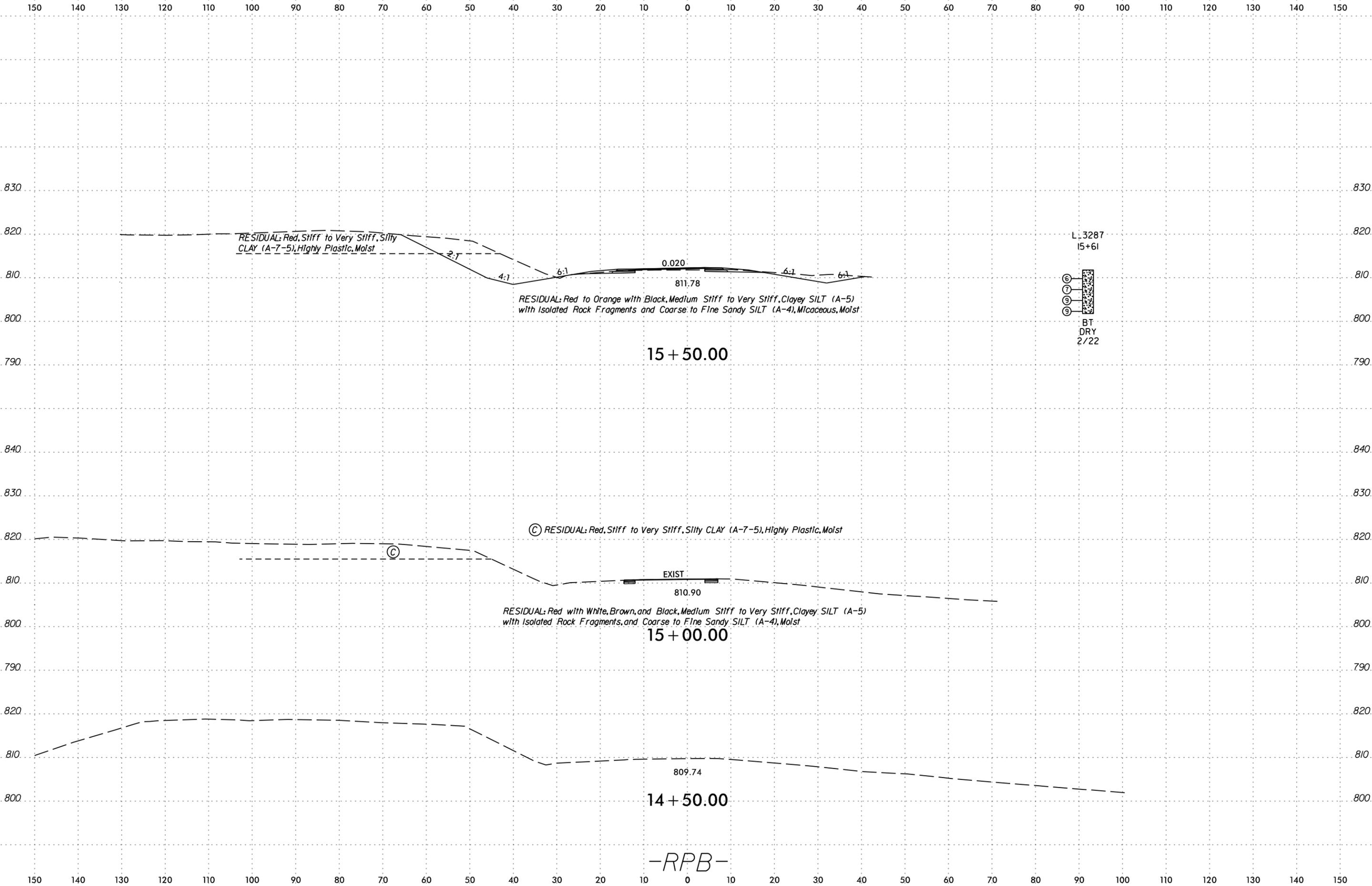
12 + 00.00

-RPA-

RPA 1296
12+96



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RESIDUAL: Red, Stiff to Very Stiff, Silty CLAY (A-7-5), Highly Plastic, Moist

RESIDUAL: Red to Orange with Black, Medium Stiff to Very Stiff, Clayey SILT (A-5) with Isolated Rock Fragments and Coarse to Fine Sandy SILT (A-4), Micaceous, Moist

15 + 50.00

RESIDUAL: Red, Stiff to Very Stiff, Silty CLAY (A-7-5), Highly Plastic, Moist

EXIST
810.90

RESIDUAL: Red with White, Brown, and Black, Medium Stiff to Very Stiff, Clayey SILT (A-5) with Isolated Rock Fragments, and Coarse to Fine Sandy SILT (A-4), Moist

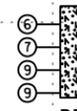
15 + 00.00

809.74

14 + 50.00

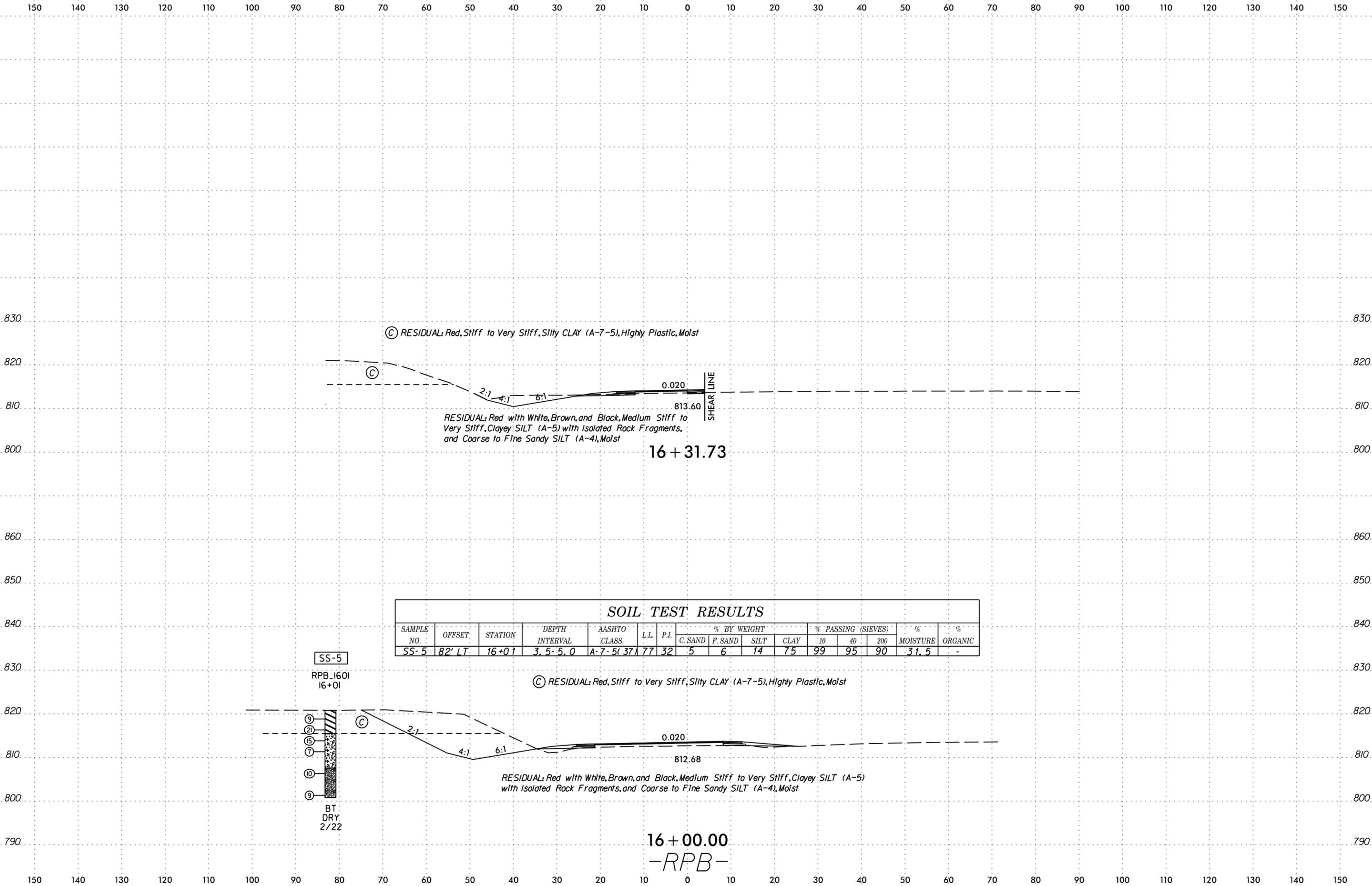
-RPB-

L 3287
15+61



BT
DRY
2/22

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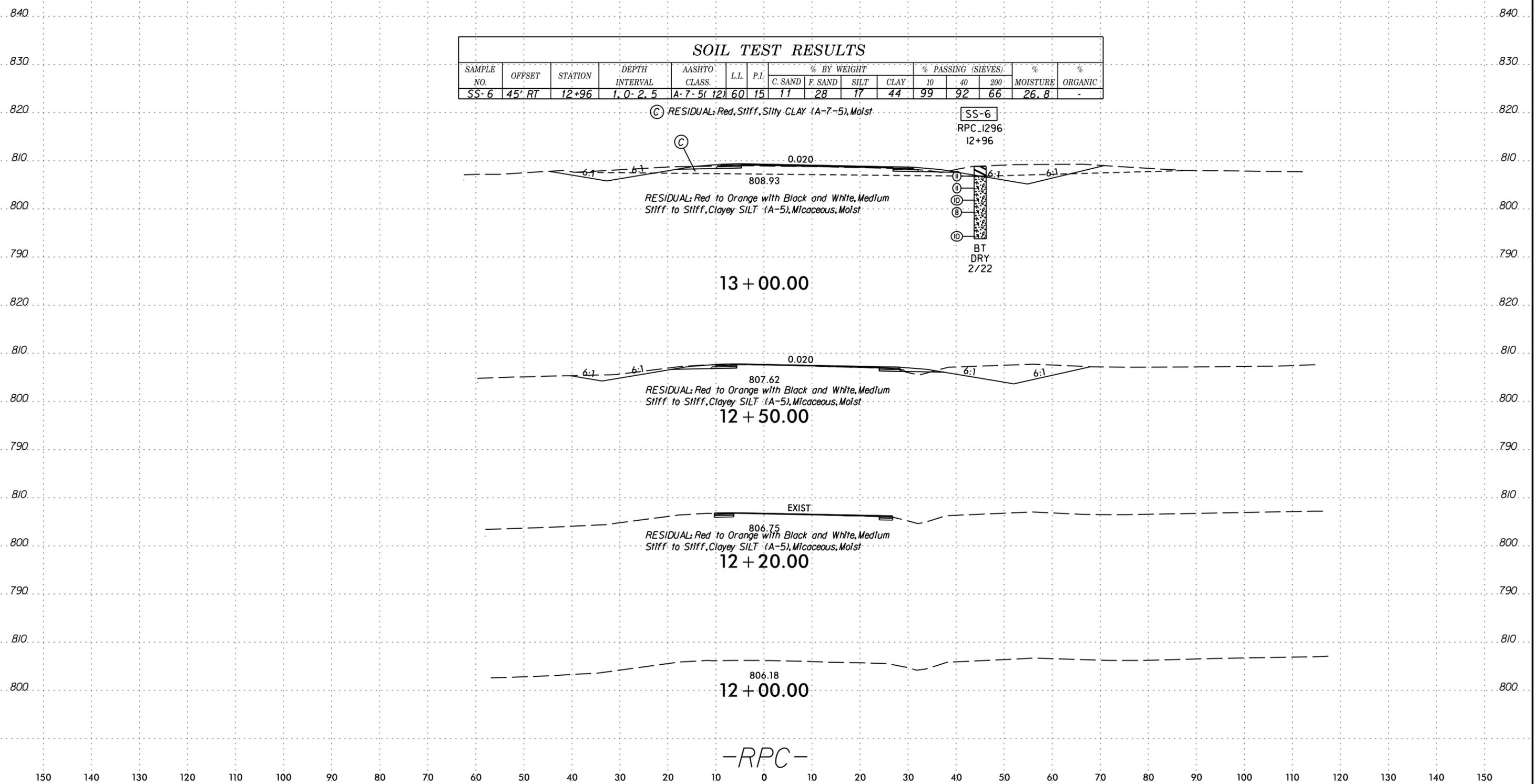


SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	#10	#40	#200		
SS-5	82' LT	16+01	3.5-5.0	A-7-5(37)	77	32	5	6	14	75	99	95	90	31.5	-

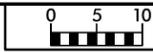
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SOIL TEST RESULTS																
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC	
							C. SAND	F. SAND	SILT	CLAY	10	40	200			
SS-6	45' RT	12+96	1.0-2.5	A-7-5(12)	60	15	11	28	17	44	99	92	66	26.8	-	

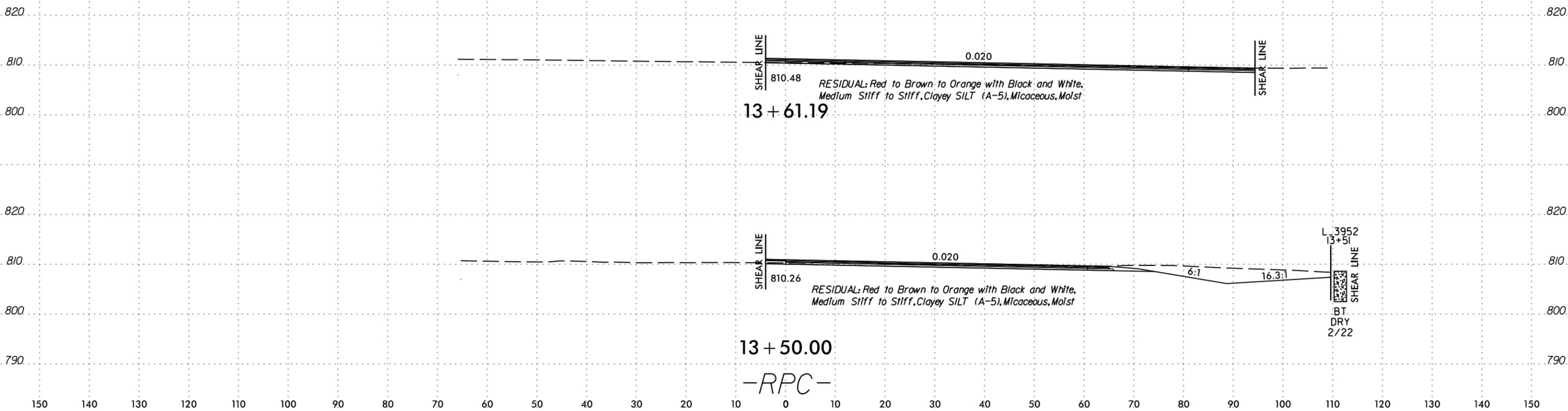


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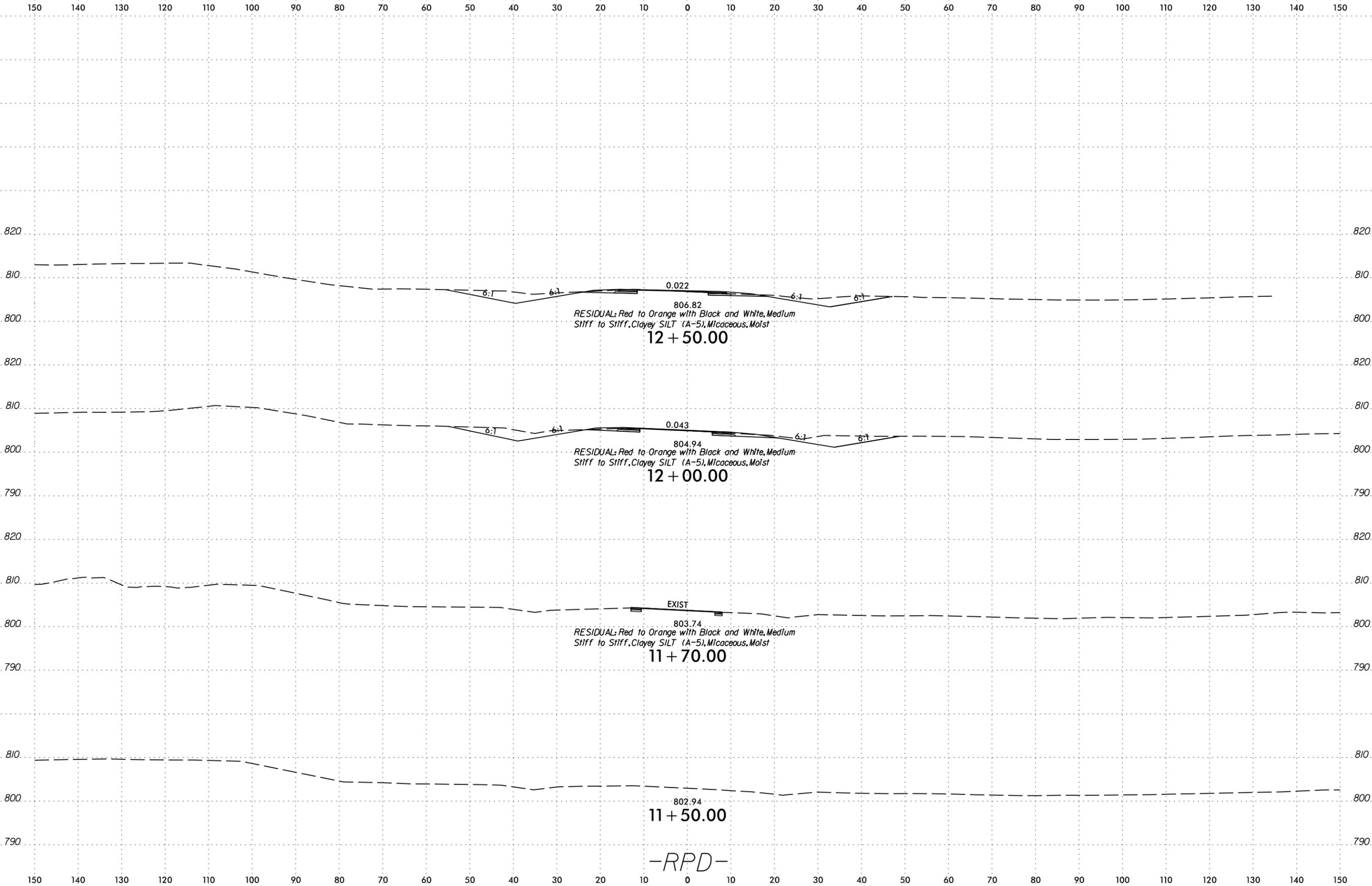
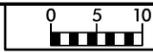


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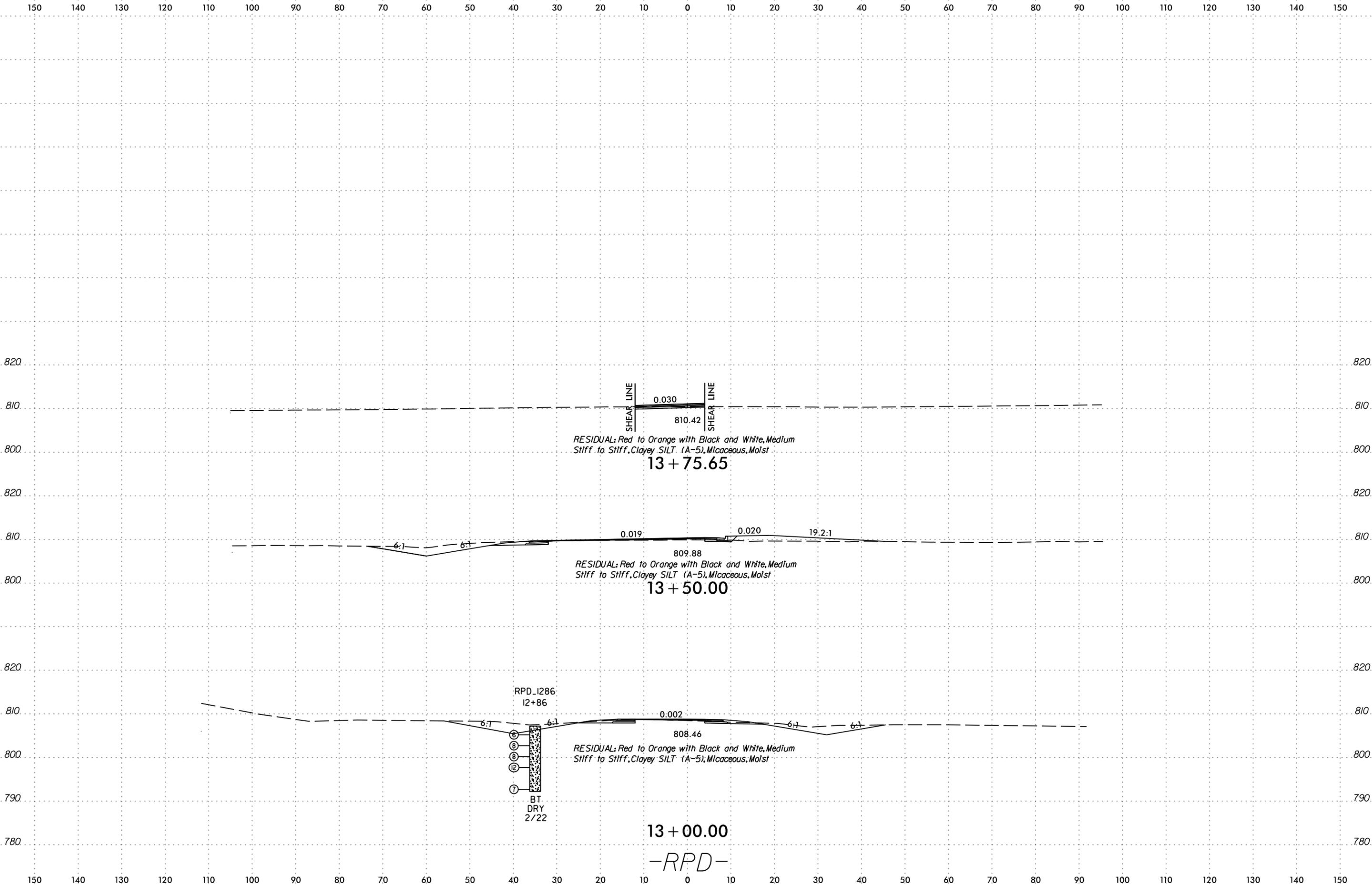
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-RPC-



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-RPD-

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
APPENDIX A
LABORATORY TESTS RESULTS SUMMARY

REFERENCE: BR-0041

PROJECT: 67041

SOILS LABORATORY TESTS RESULTS

WBS NO.: 67041.1.1

TIP NO.: BR-0041

COUNTY: Rockingham

SITE DESCRIPTION: Bridge No. 780001 on SR 2817 (Barnes Street) Over US 29

BORING NO.	SAMPLE NO.	BORING LOCATION	DEPTH INTERVAL (FT)	AASHTO CLASS	N	L.L	P.I.	% BY WEIGHT				% PASSING SIEVES			% MOISTURE	% ORGANIC
								CSE. SAND	F. SAND	SILT	CLAY	10	40	200		
EB1_B	SS-1	-L- STA. 34+14, 47' RT	3.5-5.0	A-5 (2)	8	45	7	19	43	18	20	99	89	46	30.1	-
EB2_B	SS-2	-L- STA. 35+44, 43' RT	1.0-2.5	A-7-5 (5)	7	52	11	20	31	18	31	96	85	52	24.7	-
RW1_1	SS-3	-Y- STA. 18+64, 69' LT	1.0-2.5	A-7-5 (10)	5	56	14	17	22	20	41	95	86	63	40.0	-
RW2_2	SS-4	-Y- STA. 18+12, 63' RT	1.0-2.5	A-5 (9)	7	53	8	10	26	36	28	99	93	74	36.9	-
RPB_1601	SS-5	-RPB- STA. 16+01, 82' LT	3.5-5.0	A-7-5 (37)	21	77	32	5	6	14	75	99	95	90	31.5	-
RPC_1296	SS-6	-RPC- STA. 12+96, 45' RT	1.0-2.5	A-7-5 (12)	11	60	15	11	28	17	44	99	92	66	26.8	-
L_1727	S-1	-L- STA. 17+27, 33' LT	1.5-2.5	A-2-4 (0)	N/A	19	3	34	39	4	23	97	78	30	15.3	-
L_1897	S-2	-L- STA. 18+97, 33' LT	1.0-2.0	A-7-5 (11)	N/A	60	26	24	16	13	47	84	70	52	21.7	-
L_2400	S-3	-L- STA. 24+00, 31' LT	1.0-1.5	A-7-5 (30)	N/A	69	37	12	14	10	64	98	92	74	30.0	-
L_2551	S-4	-L- STA. 25+51, 33' LT	1.0-1.5	A-7-5 (14)	N/A	59	20	19	18	19	44	99	86	66	15.8	-
L_2696	SS-7	-L- STA. 26+96, 44' RT	3.5-5.0	A-6 (4)	12	37	15	25	28	9	38	92	78	46	26.3	-
L_2890	SS-8	-L- STA. 28+90, 31' LT	1.0-2.5	A-1-a (0)	14	22	5	33	36	15	16	30	24	11	11.4	-
L_3300	S-5	-L- STA. 33+00, 48' LT	2.0-3.0	A-7-5 (6)	N/A	53	14	20	32	27	21	94	82	52	25.1	-
L_4142	S-6	-L- STA. 41+42, 61' LT	1.0-1.5	A-5 (2)	N/A	66	9	17	47	21	15	96	89	43	31.0	-
Y_1833	SS-9	-Y- STA. 18+33, 130' RT	1.0-2.5	A-7-5 (21)	16	63	21	7	16	23	54	100	97	80	27.1	-
Y_1992	SS-10	-Y- STA. 19+92, 116' RT	3.5-5.0	A-2-4 (0)	8	NP	NP	29	44	18	9	99	83	32	21.0	-
Y_2197	SS-11	-Y- STA. 21+97, 114' LT	6.0-7.5	A-5 (1)	6	43	6	29	28	29	14	86	68	44	31.2	-
Y_2404	SS-12	-Y- STA. 24+04, 73' RT	8.5-10.0	A-2-4 (0)	12	NP	NP	24	52	15	9	99	88	33	24.2	-
Y1_1151	SS-13	-Y1- STA. 11+51, 24' RT	1.0-2.5	A-7-6 (9)	7	45	18	21	18	10	51	95	82	60	19.8	-



 Certification No. 144-02-0718