

NOTE: SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE	XSECT
-L-	12+00.00 - 18+00.00	4	-	5-12

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

ROADWAY
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 38551.1.1 (B-4780) F.A. PROJ. BRZ-1111(8)
 COUNTY Montgomery
 PROJECT DESCRIPTION Bridge No. 22 on SR 1111 over Richland Creek

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	38551.1.1 (B-4780)	1	15
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
38551.1.1	BRZ-1111(8)	P.E.	
		RW & UTIL.	

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 1919 707-6850. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

CONTRACT: ID: B-4780

PERSONNEL

D. Racey

S. Davis

D. Jenks

INVESTIGATED BY F&R, Inc.

CHECKED BY P. Alton, P.E.

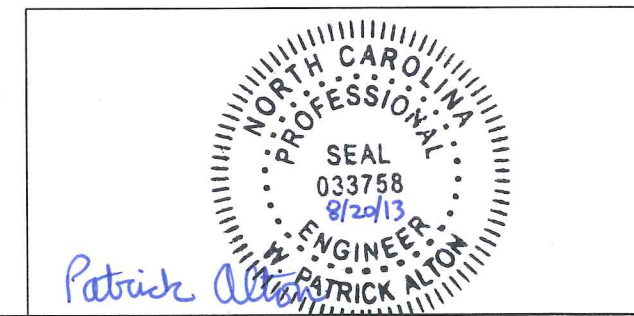
SUBMITTED BY F&R, Inc.

DATE 8/13

DRAWN BY: D. Racey

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - 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.



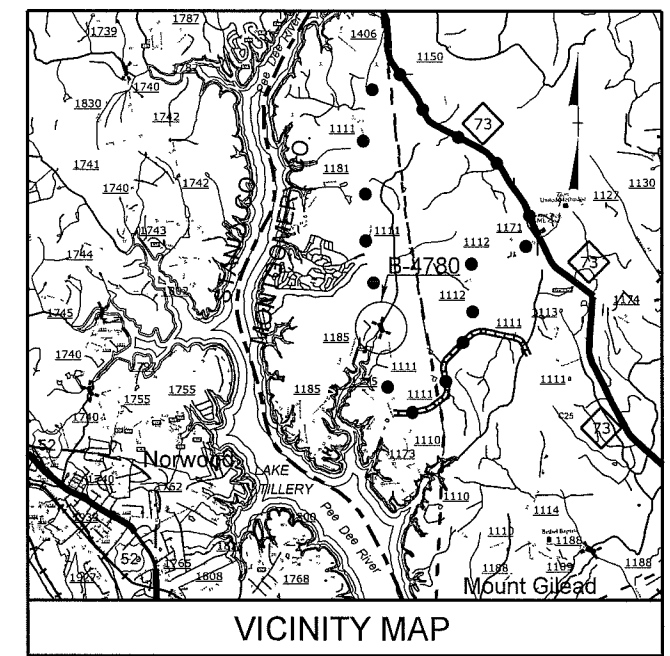
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4780	2A	15
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
38551.1.1	BRZ-1111(8)	PE	

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

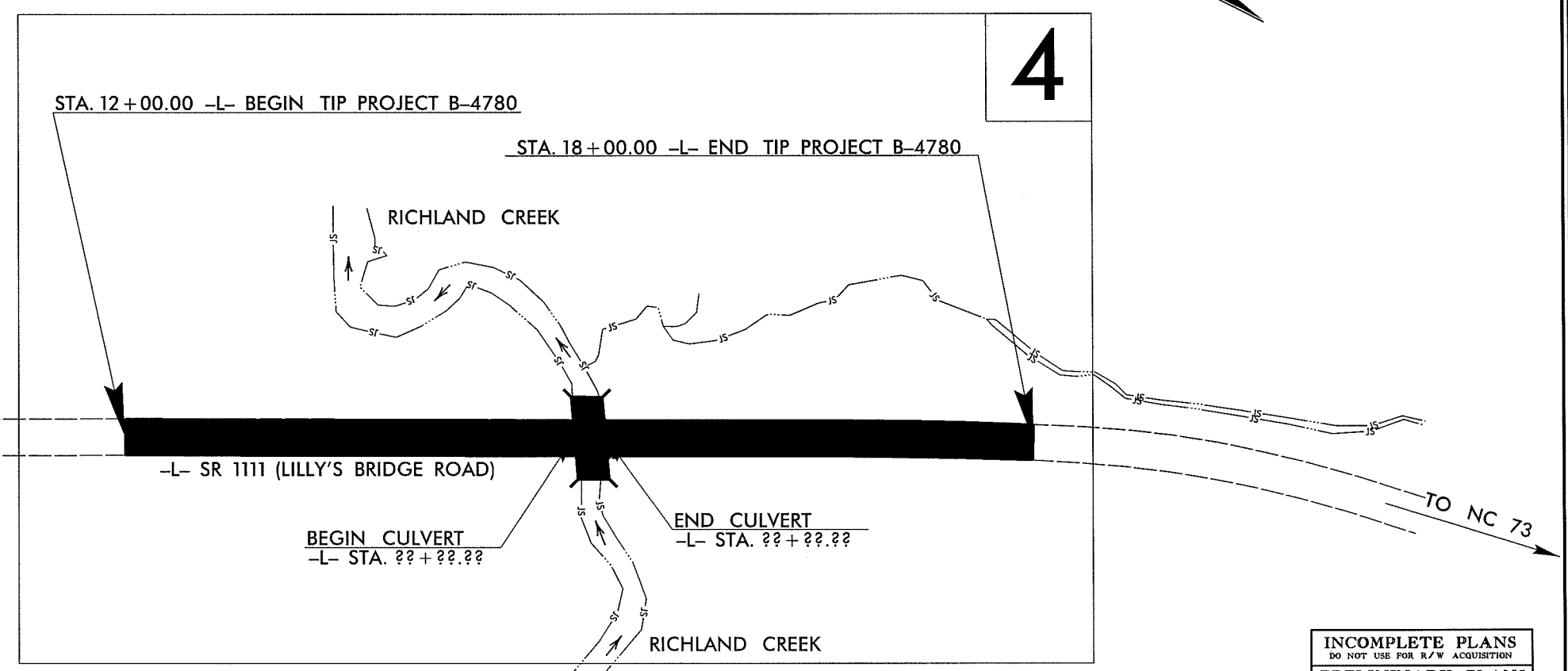
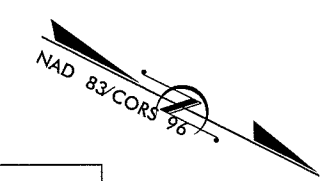
MONTGOMERY COUNTY

LOCATION: BRIDGE NO. 22 ON SR 1111 (LILLY'S BRIDGE ROAD)
OVER RICHLAND CREEK.

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND CULVERT.

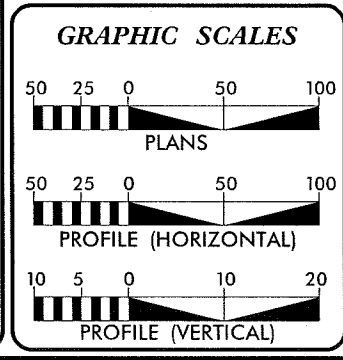


TIP PROJECT: B-4780



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

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



DESIGN DATA

ADT 2015	=	1310
ADT 2035	=	2000
DHV	=	8 %
D	=	60 %
T	=	11 % *
V	=	55 MPH
* TTST	=	3% DUAL = 8%
FUNC CLASS	=	RURAL LOCAL
"SUBREGIONAL TIER"		

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-4780	=	?.??? MILES
LENGTH STRUCTURE TIP PROJECT B-4780	=	?.??? MILES
TOTAL LENGTH OF TIP PROJECT B-4780	=	0.114 MILES

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JUNE 20, 2014

LETTING DATE: JULY 21, 2015

JAMES A. SPEER, PE
PROJECT ENGINEER

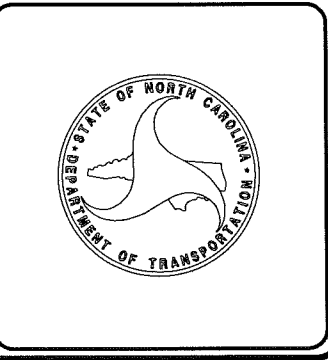
DANIEL W. GARDNER, JR., PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

SIGNATURE: _____ P.E.



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CONTRACT:



August 20, 2013

State Project No.: 38551.1.1
TIP No.: B-4780
F.A. Number: BRZ-1111(8)
County: Montgomery
Description: Bridge No. 22 on SR 1111 (Lillys Bridge Road) over Richland Creek

SUBJECT: Geotechnical Report – Inventory

Project Description

This project involves the replacement of Bridge No. 22 on SR 1111 (Lillys Bridge Road) over Richland Creek in Mount Gilead, Montgomery County, North Carolina. The bridge is proposed to be replaced with a culvert and will require a slight widening of Lillys Bridge Road (-L-) for a distance of approximately 600 feet (0.11 miles). The project begins approximately 300 feet south of the existing bridge and ends approximately 300 feet north of the existing bridge. The existing bridge is a single-span, approximately 30-foot long, and is constructed with reinforced concrete abutments, steel girders, and a timber deck. Specific information regarding the proposed culvert is unavailable at this time. The roadway generally extends through wooded property that contains a few widely-spaced residences north and south of the site.

The geotechnical field investigation was performed on July 16th of 2013. During this time period, a total of four (4) shallow hand auger borings were advanced to depths ranging from 2.0 to 4.3 feet. The hand auger borings were advanced using a 3-inch diameter bucket auger. In addition, ½-inch diameter steel sounding rods (bridge rods) were driven adjacent to each hand auger boring and were driven to depths ranging from 3.6 to 4.9 feet. Representative soil samples were collected from the auger bucket for visual classification in the field and for analysis by F&R’s testing laboratory.

In addition to the above investigation, two soil test borings (B-1 & B-2) were performed by NCDOT to be included in the PDEA report. Borings B-1 and B-2 were advanced using hollow-stem augers to depths of 17.5 and 14.3 feet, respectively, where auger refusal was encountered. Standard penetration testing was performed with a CME-550X drill rig using an automatic hammer.

The following alignment was investigated:

<u>Line</u>	<u>Station(±)</u>
-L-	12+00 to 18+00

Areas of Special Geotechnical Interest

1) Non-Crystalline Rock: The following areas were found to contain non-crystalline rock above or within six feet of the proposed grade and will likely require ripping or blasting for removal:

<u>Line</u>	<u>Station (±)</u>
-L-	12+75 to 14+00, left
-L-	16+25 to 17+75, right

2) Alluvial Soils: The following areas contain relatively soft and wet soils that have the potential for subgrade problems during construction. In addition, these soils are cohesive, which may cause embankment instability or long-term settlement problems.

<u>Line</u>	<u>Station (±)</u>
-L-	12+75 to 15+25, left & right

Physiography and Geology

The project is located in the Carolina Slate Belt of the Piedmont physiographic province of North Carolina. More specifically, it is located in an area mapped as Metamudstone and Meta-Argillite of the Tillery Formation (CZmd₁). Weathered rock fragments recovered from our borings exhibited the characteristics of meta-argillite. The in-situ soils are the residual product of in-place chemical weathering of rock that was similar to the rock presently underlying the site.

The existing road generally runs south to north. The existing ground surface along the centerline of the proposed road generally slopes downward from an elevation of ±293 feet at the beginning of the project to an elevation of ±288 feet near the existing bridge. The ground surface then generally slopes upward to an elevation of ±292 feet at the end of the project.

Based on review of the cross sections provided, the typical existing roadway section through approximate -L- station 16+00 consists of embankment on the left and right. Beyond -L- station 16+00 and extending to the end of the project, the typical existing roadway section consists of embankment on the left and cut on the right. Existing cuts and fills generally appear to be on the order of approximately 10 feet and less. The existing cut slopes are typically 2:1 (H:V) or flatter while the existing fill slopes are typically 1.5:1 (H:V) or flatter).

Generally, only sliver fills are proposed with a thickness of 1 to 4 feet, except at the proposed culvert where the proposed embankment height reaches approximately 9 feet. Proposed cut depths are less than approximately 7 feet.

Richland Creek generally traverses the site in a west to east direction running beneath Bridge 22 on Lillys Bridge Road at approximate -L- station 15+10. During our field investigation, we observed boulders and/or rock outcrops within the existing cut slope approximately from -L- station 16+50 to 17+75 and have indicated the general area on the plan view sheet.

Soils Properties

The subsurface conditions discussed below and those shown on the attached drawings, represent an estimate of the subsurface conditions based on interpretation of the boring data using normally-accepted geotechnical engineering judgments. The transitions between different soil strata are usually less distinct than those shown on the profile. Sometimes the relatively small sample obtained in the field is insufficient to definitively describe the origin of the subsurface material. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

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

Artificial Fill: Artificial fill was not encountered in any of the borings; however, based on our site observations, artificial fill is likely present on the left side of the road approximately from -L- station 16+00 to 18+00.

Roadway Embankment Fill: Roadway embankment fill was encountered in borings B-1 and B-2 and extended to a depth of approximately 8.5 feet at each boring. The fill was described as moist, stiff, tan, sandy, silty CLAY (A-6).

Alluvial Soil: Alluvial soils were encountered in all borings except boring L_1700R. The alluvial soils were encountered at the ground surface of borings L_1350L, L_1495L, and L_1520R and extended to depths of approximately 2.0, 3.5, and 4.5 feet, respectively. At borings B-1 and B-2, the alluvial soils were encountered below the roadway embankment fill and extended to depths of 12.5 and 11.6 feet, respectively. These soils were generally described as moist to saturated, very soft to stiff, red, brown, and gray, sandy and clayey SILT (A-4) and sandy and silty CLAY (A-6 & A-7) containing trace organic matter. The tested clayey SILT (A-4) had a plasticity index of 8% and a water content of 27%. The tested silty CLAY (A-7-5) had a plasticity index of 20% and a water content of 62%.

Residual Soil: Residual soils were encountered below the alluvial soils at borings L_1350L and B-1 and at the ground surface of boring L_1700R. The residual soils extended to depths of 2.5, 14.8, and 3.5 feet, respectively. These soils were generally described as dry to saturated, stiff to hard, red, brown, and gray sandy SILT (A-4) and silty CLAY (A-6). The tested silty CLAY had a plasticity index of 11% and a water content of 23%.

Rock Properties

Weathered Rock (WR) was encountered in all of the borings. The depth to weathered rock ranged from 2.5 to 14.8 feet and elevations ranging from 272.6 to 294.4 feet. The Preliminary Explanatory Text for the 1985 Geologic Map of North Carolina states that the Tillery Formation is composed of a laminated siltstone.

Non-Crystalline Rock (NCR) was encountered in all of the borings as indicated by sounding rod refusal at the hand auger borings or by auger refusal at the SPT borings. The NCR was encountered at depths ranging from approximately 3.5 to 17.5 feet, or elevations ranging from approximately 269.9 to 293.1 feet. Refusal is a designation applied to any material that cannot be penetrated by the sounding rod or soil auger, and is typically caused by encountering boulders, hard rock lenses/ledges or bedrock. The nature of the materials causing refusal was not explored in these borings, but is anticipated to represent NCR.

Groundwater Properties

Groundwater measurements were attempted in borings L_1495L, L_1520R, B-1, and B-2 immediately after completion, and all borings were backfilled immediately after completion. Groundwater was encountered immediately after drilling in borings L_1495L and L_1520R at depths of 3.5 and 3.6 feet, respectively. No groundwater was encountered immediately after drilling in borings B-1 and B-2.

Culvert at -L- Station 15+07

Based on the preliminary roadway plans, an approximately 20-foot wide and 56-foot long culvert is proposed for the -L- alignment at the crossing of Richland Creek approximately at station 15+07. No additional information about the proposed culvert is available. Soil test borings performed in the vicinity of the culvert encountered approximately 3.1 to 4.5 feet of alluvial soils consisting of very soft to stiff clayey SILT (A-4) and soft to stiff silty CLAY (A-7).

We appreciate the opportunity to work with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,
FROEHLING & ROBERTSON, INC.

Patrick Alton
 W. Patrick Alton, P.E.
 Geotechnical Engineer



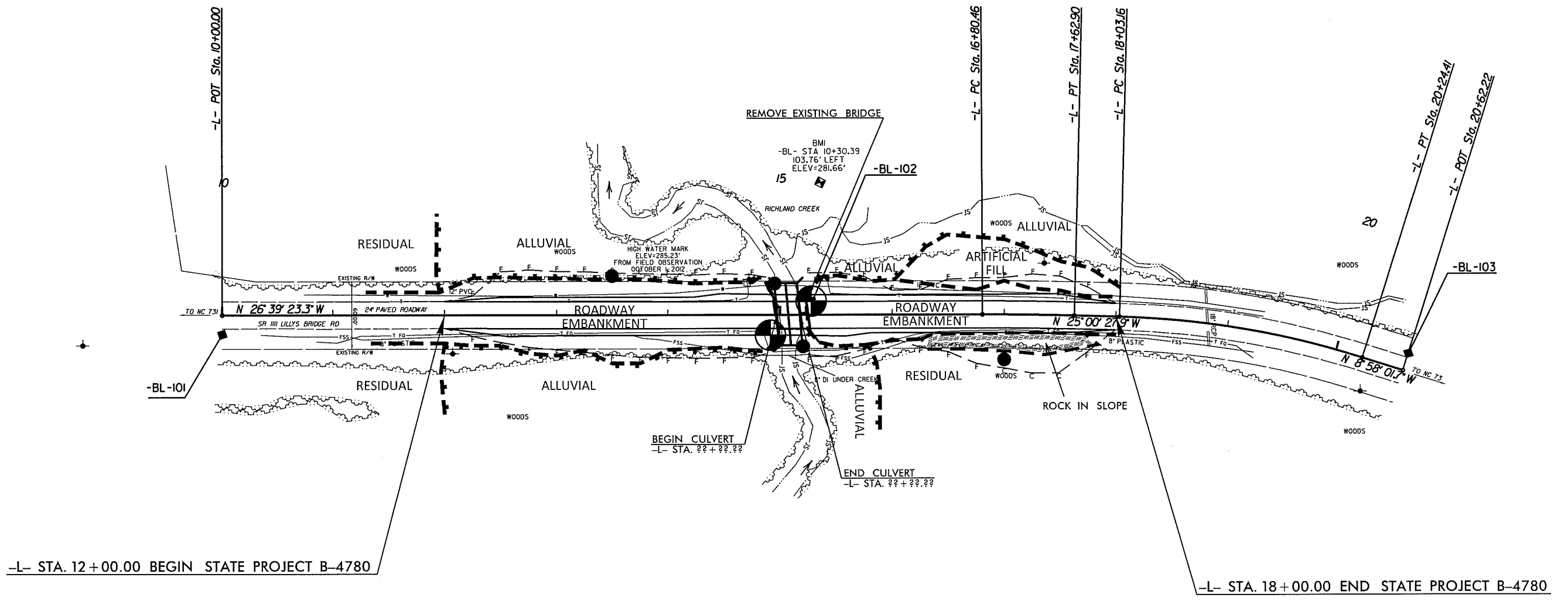
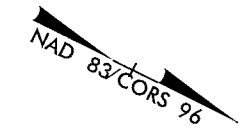
Daniel K. Schaefer
 Daniel K. Schaefer, P.E.
 Raleigh Branch Manager

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Project AT 66800

-L-	
PI Sta 17+21.68	PI Sta 19+14.51
$\Delta = 1^{\circ} 38' 55.4" (RT)$	$\Delta = 16^{\circ} 02' 26.3" (RT)$
$D = 2^{\circ} 00' 00.0"$	$D = 7^{\circ} 15' 00.0"$
$L = 82.44'$	$L = 221.25'$
$T = 41.22'$	$T = 111.35'$
$R = 2,864.79'$	$R = 790.29'$

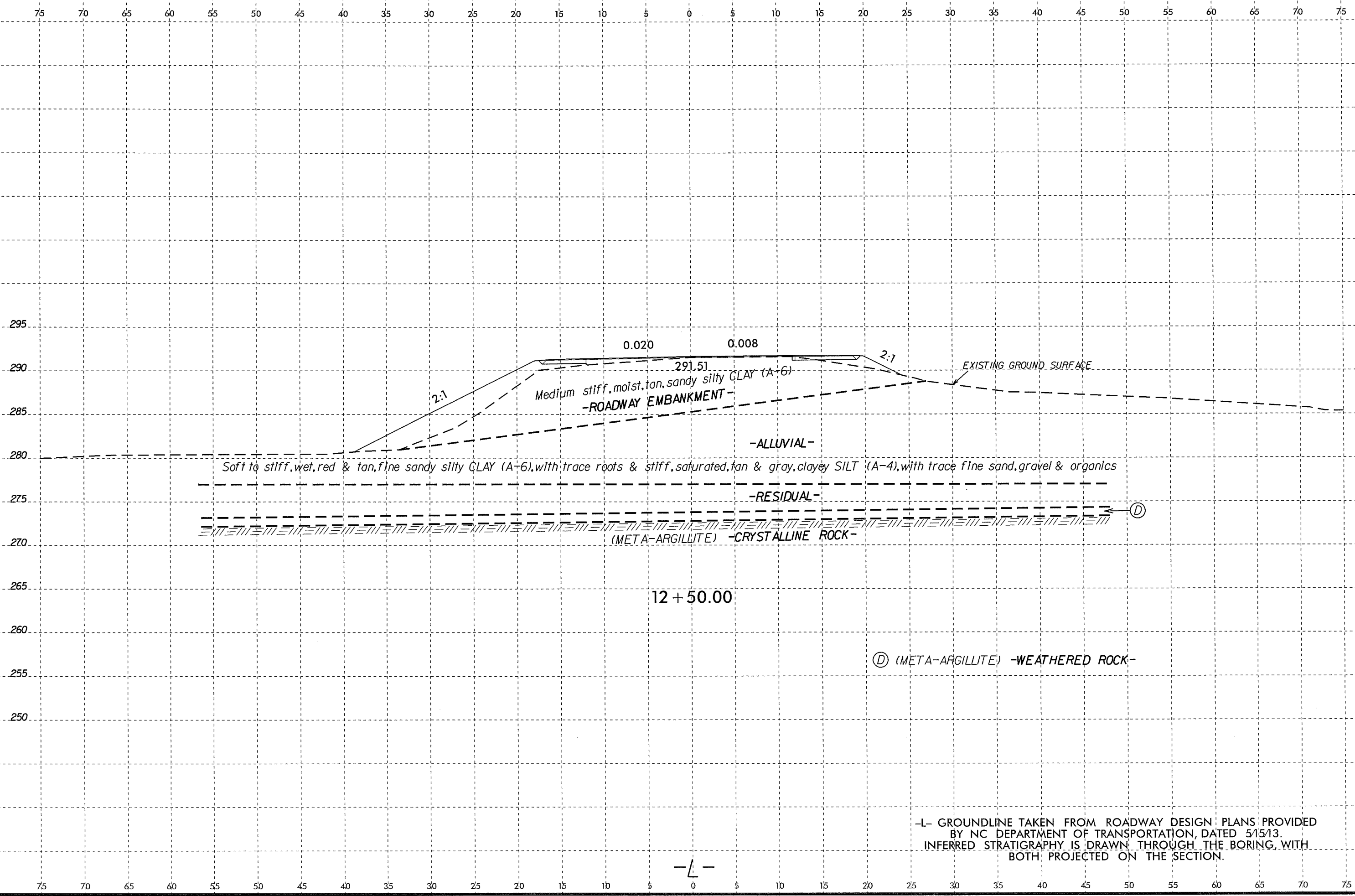
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RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



-L- STA. 12+00.00 BEGIN STATE PROJECT B-4780

-L- STA. 18+00.00 END STATE PROJECT B-4780

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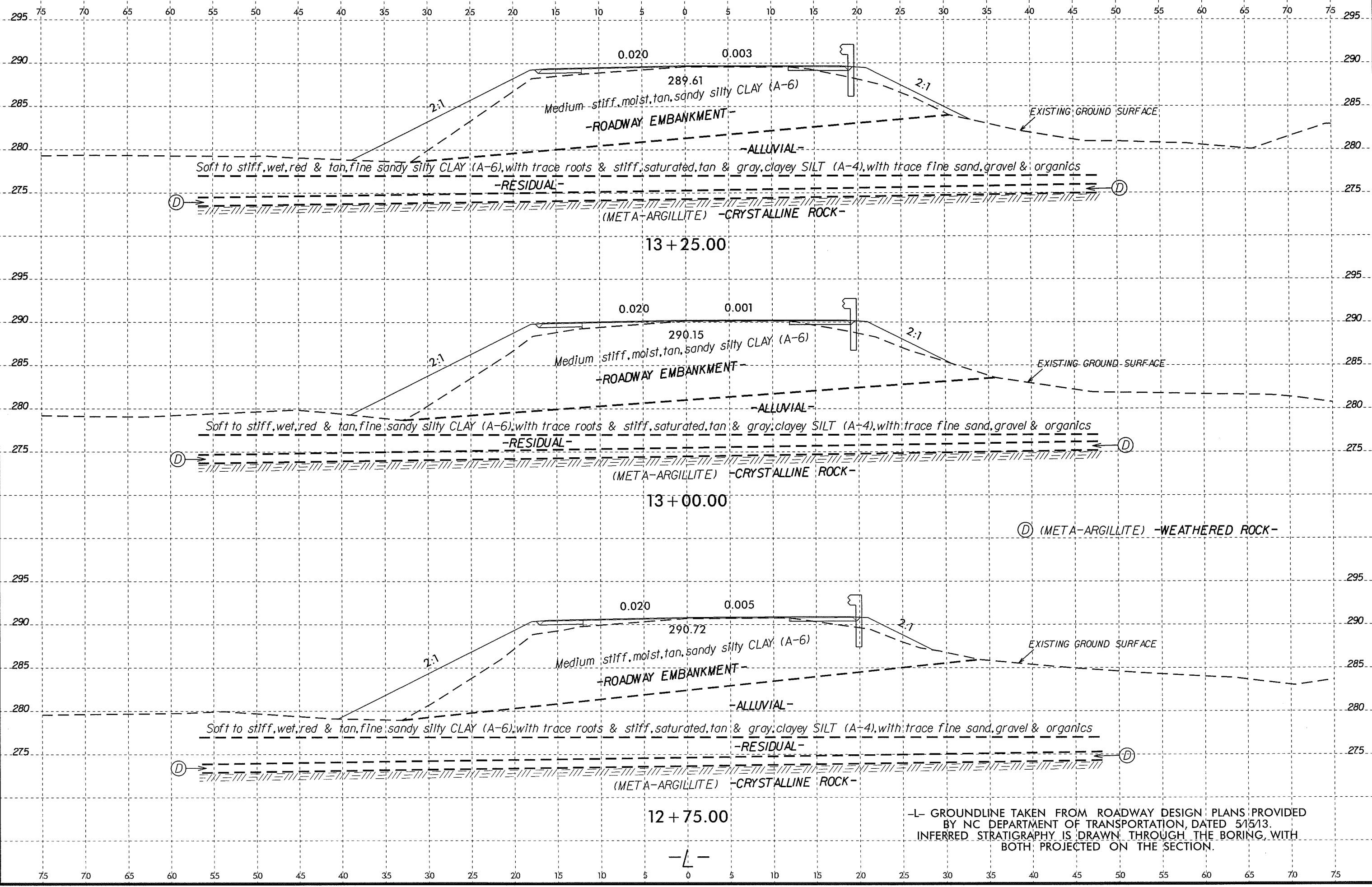


-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NC DEPARTMENT OF TRANSPORTATION, DATED 5/15/13. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.

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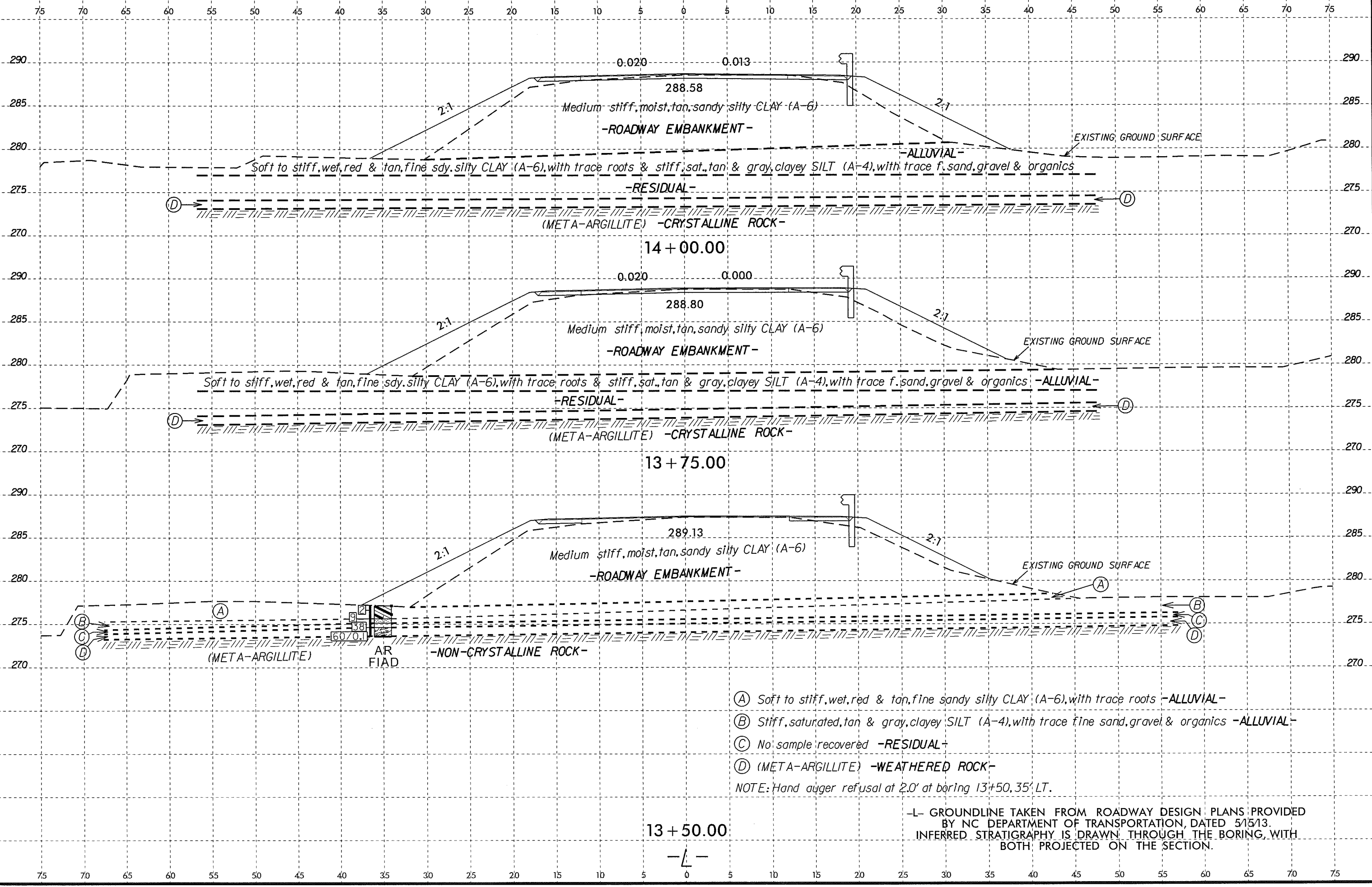
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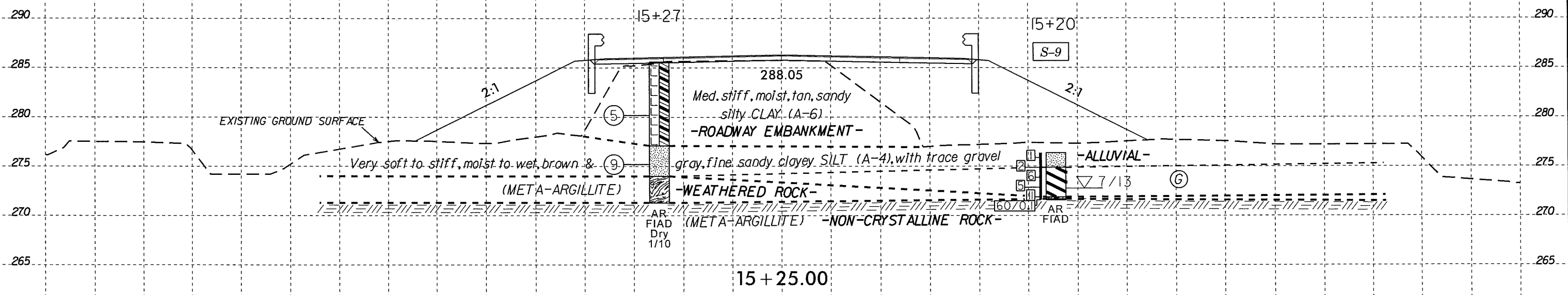
-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NC DEPARTMENT OF TRANSPORTATION, DATED 5/15/13. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.



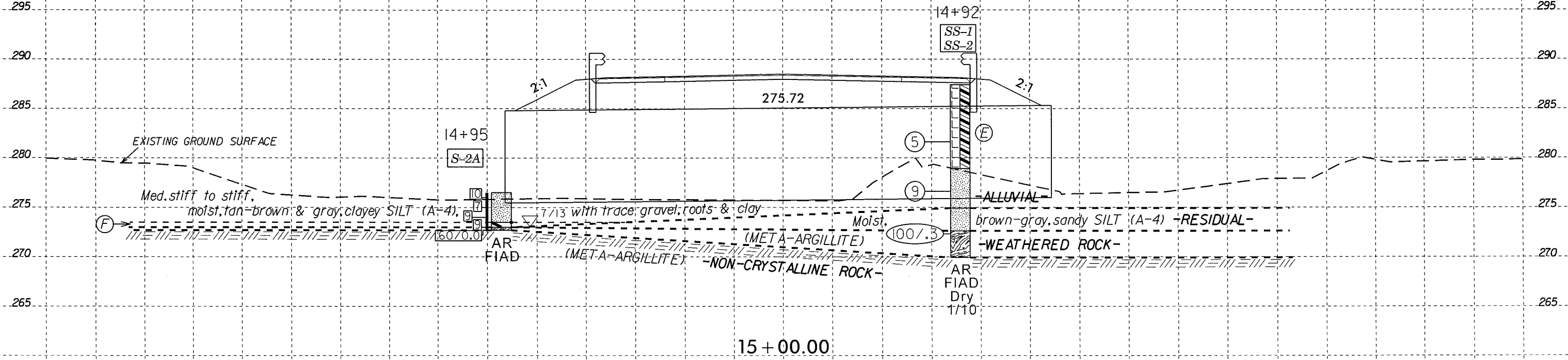
- (A) Soft to stiff, wet, red & tan, fine sandy silty CLAY (A-6), with trace roots -ALLUVIAL-
 - (B) Stiff, saturated, tan & gray, clayey SILT (A-4), with trace fine sand, gravel & organics -ALLUVIAL-
 - (C) No sample recovered -RESIDUAL-
 - (D) (META-ARGILLITE) -WEATHERED ROCK-
- NOTE: Hand auger refusal at 2.0' at boring 13+50, 35' LT.

-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NC DEPARTMENT OF TRANSPORTATION, DATED 5/15/13. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.

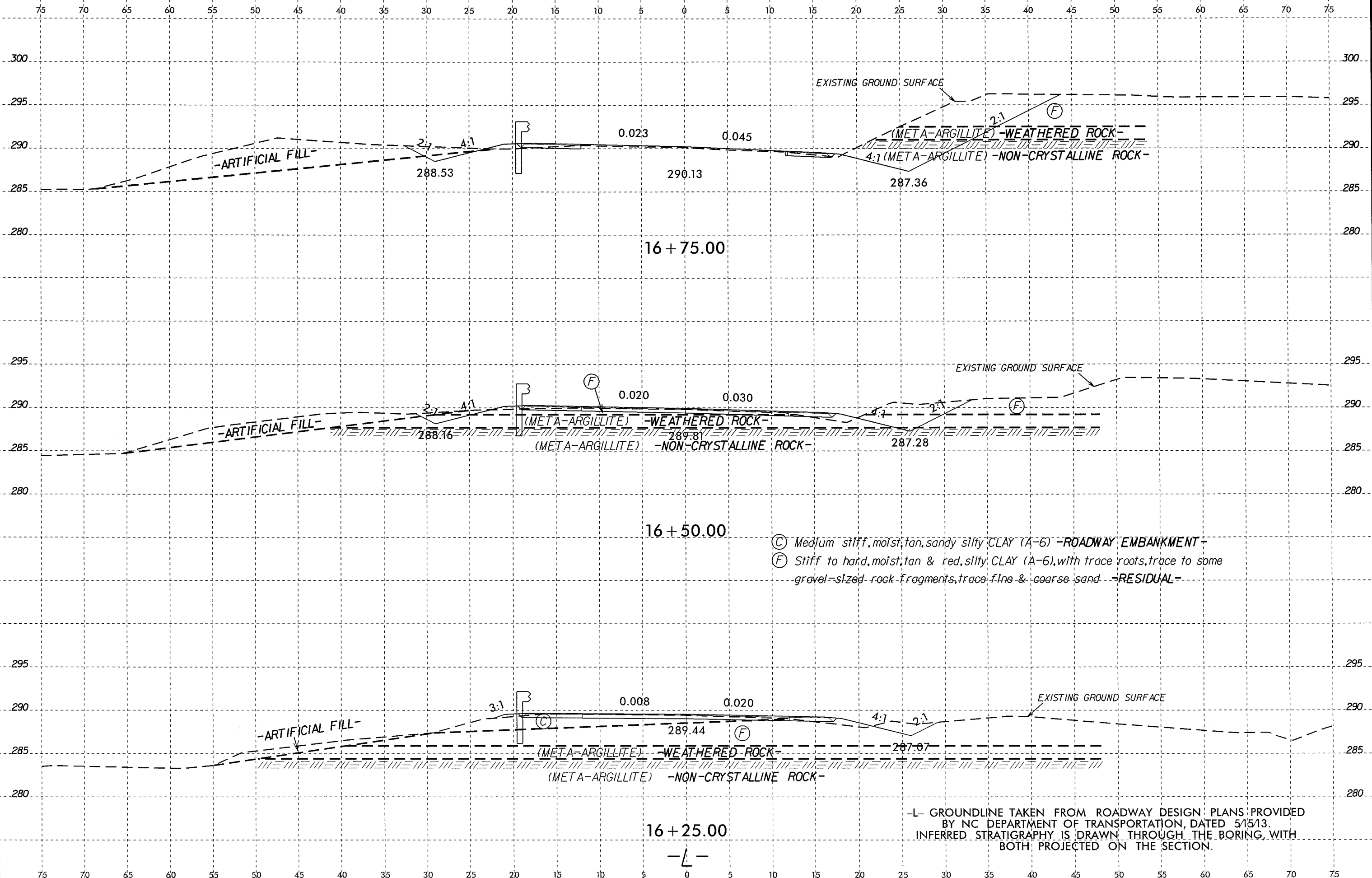
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-1	18' RT.	14+92	5.3'-6.3'	A-6(10)	38	13	13.9	7.9	35.9	42.3	95.0	86.0	76.0	NT	NT
SS-2	18' RT.	14+92	10.3'-11.3'	A-4(2)	30	7	29.0	8.5	30.2	32.3	88.0	67.1	56.4	NT	NT
S-2A	29' LT.	14+95	1.3'-3.0'	A-4(8)	36	8	4.4	3.0	51.3	41.3	98.7	95.9	92.3	27.3	NT
S-9	28' RT.	15+20	1.5'-4.2'	A-7-5(23)	53	20	4.3	2.9	35.6	57.2	98.8	96.1	92.4	61.5	NT



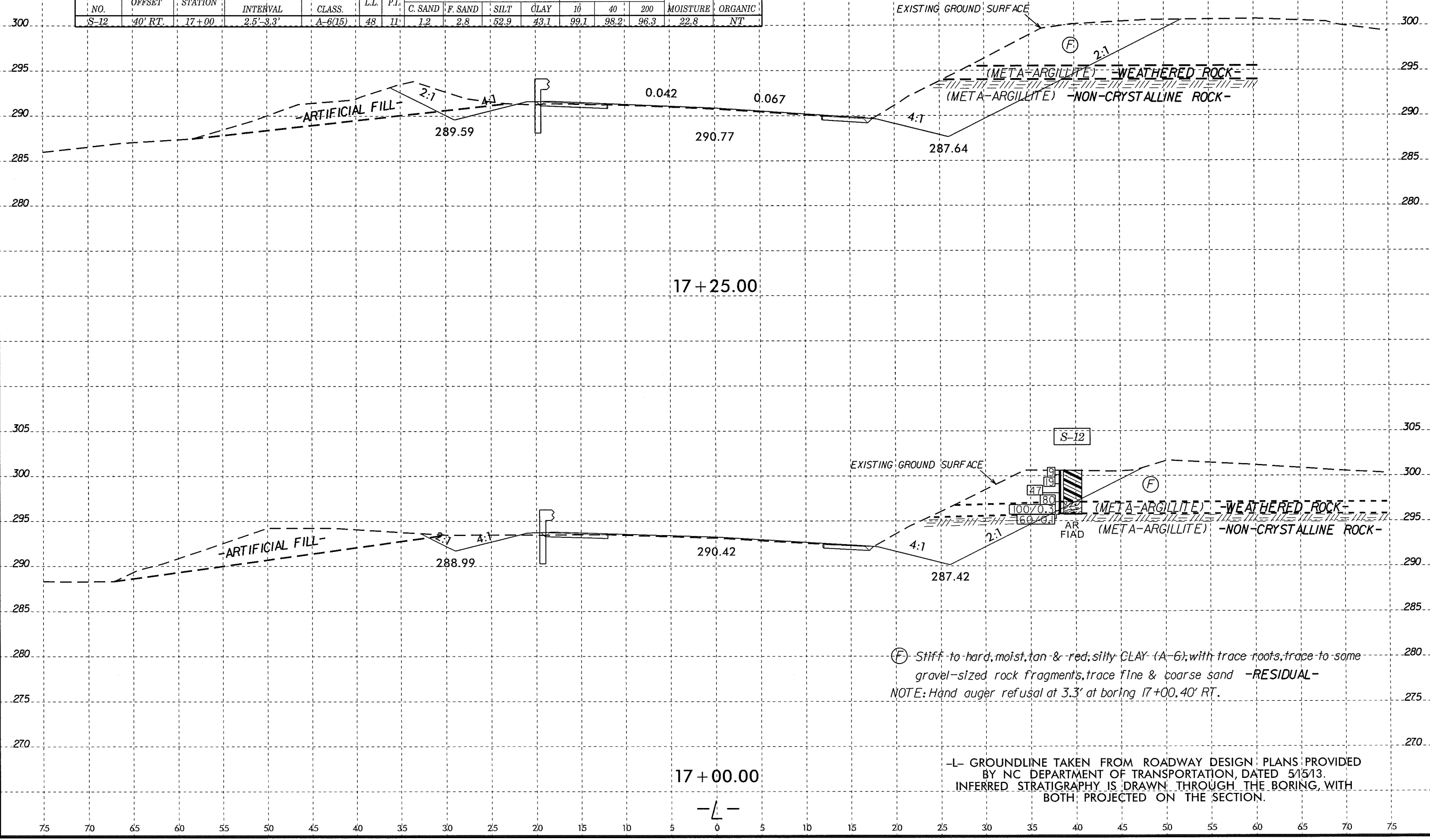
- (E) Medium stiff, moist, tan, sandy silty CLAY (A-6) -ROADWAY EMBANKMENT-
 - (F) Stiff, wet, tan & gray, silty CLAY (A-7-5), with trace fine sand, gravel & roots -ALLUVIAL-
 - (G) Soft to stiff, saturated, tan & dark gray, silty CLAY (A-7-5), with trace fine & coarse sand, gravel & organics -ALLUVIAL-
- NOTE: Hand auger refusal at 4.3' at boring, 15+20, 28' RT.



-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NC DEPARTMENT OF TRANSPORTATION, DATED 5/15/13. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.



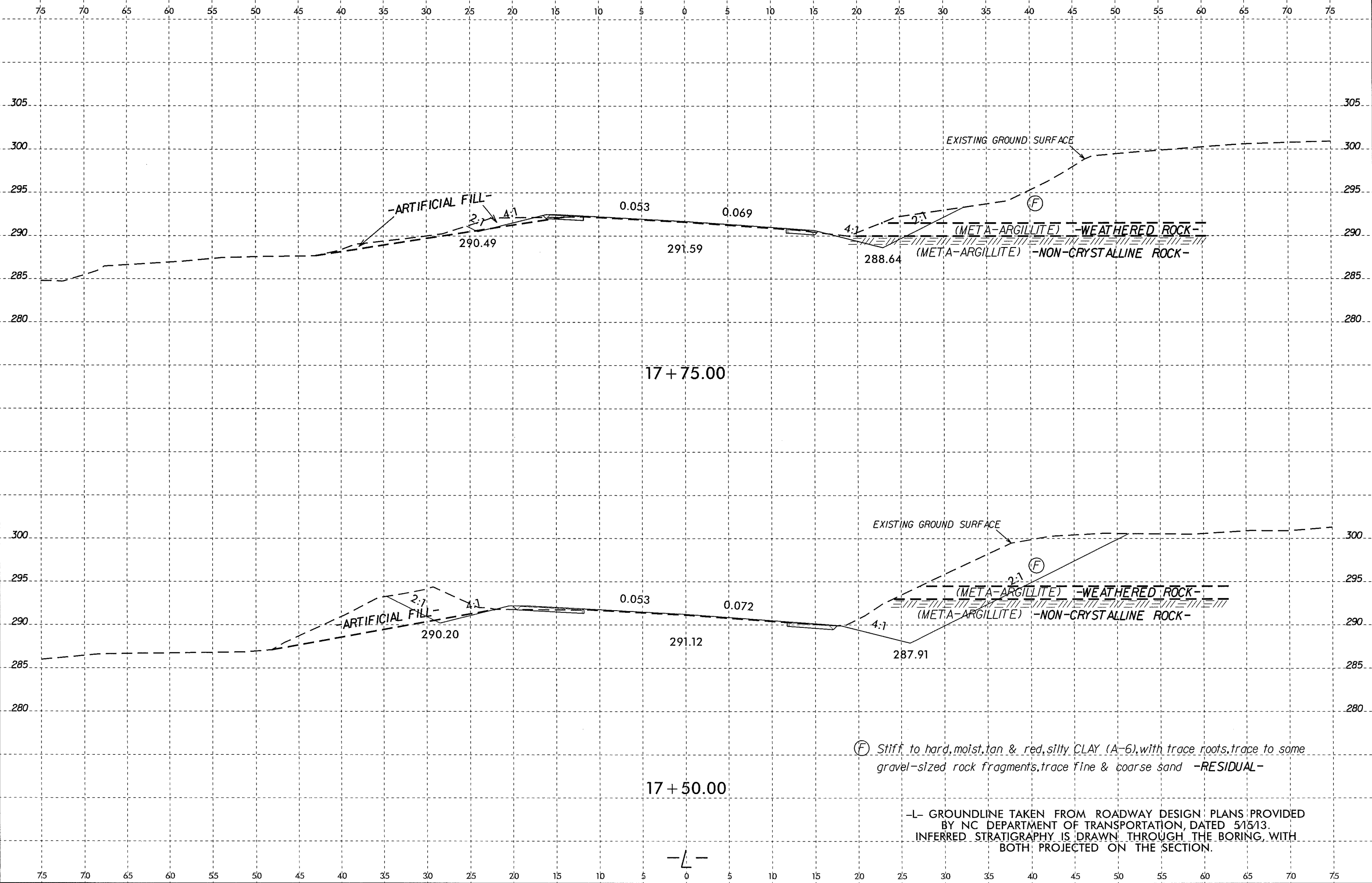
SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
S-12	40' RT.	17+00	2.5'-3.3'	A-6(15)	48	11	1.2	2.8	52.9	43.1	99.1	98.2	96.3	22.8	NT



(F) Stiff to hard, moist, tan & red, silty CLAY (A-6), with trace roots, trace to some gravel-sized rock fragments, trace fine & coarse sand -RESIDUAL-
 NOTE: Hand auger refusal at 3.3' at boring 17+00, 40' RT.

-L- GROUNDLINE TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY NC DEPARTMENT OF TRANSPORTATION, DATED 5/15/13. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.

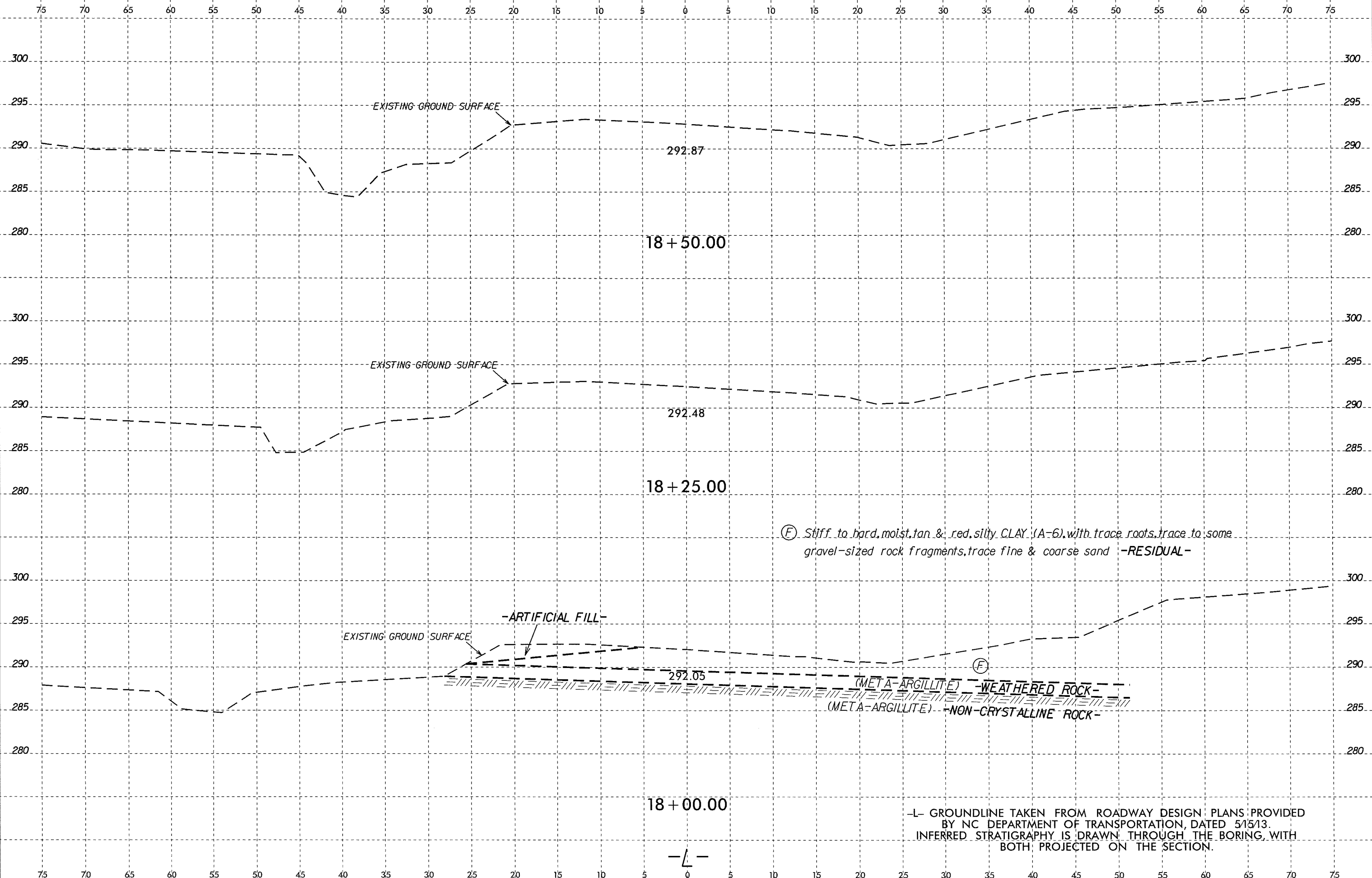
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8/23/99



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