

REFERENCE: W-5704E

PROJECT: 44850

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.	W-5704E	1	17

**CONTENTS**

LINE	STATION	PLAN	PROFILE
-L-	13+00.00 to 91+65.66	4-9	10-12
-Y7-	10+00.00 to 24+37.97	5	13
-Y8-	10+00.00 to 21+31.71	6	13

# ROADWAY SUBSURFACE INVESTIGATION

COUNTY JOHNSTON  
PROJECT DESCRIPTION WIDEN SR 1700 (COVERED  
BRIDGE RD.) FROM EAST OF SR 1003 BUFFALO RD.)  
TO WEST OF SR 2685 (HELENA LN.)

**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.

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- 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

S. WOODS

M. DURWAY

INVESTIGATED BY M.A. ARNOLD

DRAWN BY T.T. WALKER

CHECKED BY R. RIVENBARK

SUBMITTED BY R. RIVENBARK

DATE JUNE 2018

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**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, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	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:  WEATHERED ROCK (WR)  NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.  CRYSTALLINE ROCK (CR)  FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.  NON-CRYSTALLINE ROCK (NCR)  FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLITE, SLATE, SANDSTONE, ETC.  COASTAL PLAIN SEDIMENTARY ROCK (CP)  COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.	<b>ALLUVIUM (ALLUV.)</b> - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. <b>AQUIFER</b> - A WATER BEARING FORMATION OR STRATA. <b>ARENACEOUS</b> - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. <b>ARGILLACEOUS</b> - 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. <b>ARTESIAN</b> - 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. <b>CALCAREOUS (CALC.)</b> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. <b>COLLUVIUM</b> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. <b>CORE RECOVERY (REC.)</b> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. <b>DIKE</b> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. <b>DIP</b> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. <b>DIP DIRECTION (DIP AZIMUTH)</b> - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. <b>FAULT</b> - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. <b>FISSILE</b> - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. <b>FLOAT</b> - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. <b>FLOOD PLAIN (FP)</b> - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. <b>FORMATION (FM)</b> - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. <b>JOINT</b> - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. <b>LEDGE</b> - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. <b>LENS</b> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. <b>MOTTLED (MOT.)</b> - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <b>PERCHED WATER</b> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <b>RESIDUAL (RES.) SOIL</b> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. <b>ROCK QUALITY DESIGNATION (RQD)</b> - 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. <b>SAPROLITE (SAP.)</b> - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. <b>SILL</b> - 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. <b>SLICKENSIDE</b> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. <b>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)</b> - NUMBER OF BLOWS IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. <b>STRATA CORE RECOVERY (SREC.)</b> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. <b>STRATA ROCK QUALITY DESIGNATION (SRQD)</b> - 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. <b>TOPSOIL (TS.)</b> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
<b>SOIL LEGEND AND AASHTO CLASSIFICATION</b>	<b>ANGULARITY OF GRAINS</b> THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	<b>WEATHERING</b> FRESH VERY SLIGHT (V SLI.) SLIGHT (SLI.) MODERATE (MOD.) MODERATELY SEVERE (MOD. SEV.) SEVERE (SEV.) VERY SEVERE (V SEV.) COMPLETE	<b>MINERALOGICAL COMPOSITION</b> MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.
<b>COMPRESSION</b> SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	<b>PERCENTAGE OF MATERIAL</b>	<b>GROUND WATER</b> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP	<b>COMPRESSIBILITY</b>
<b>GRADATION</b> GENERAL CLASS. GRANULAR MATERIALS (<= 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS	<b>COMPRESSION</b> SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	<b>ROCK HARDNESS</b> VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	<b>CONSISTENCY OR DENSENESS</b>
<b>TEXTURE OR GRAIN SIZE</b>	<b>RECOMMENDATION SYMBOLS</b>	<b>ROCK HARDNESS</b> VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	<b>CONSISTENCY OR DENSENESS</b>
<b>SOIL MOISTURE - CORRELATION OF TERMS</b>	<b>ABBREVIATIONS</b>	<b>ROCK HARDNESS</b> VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	<b>CONSISTENCY OR DENSENESS</b>
<b>PLASTICITY</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	<b>ROCK HARDNESS</b> VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	<b>CONSISTENCY OR DENSENESS</b>
<b>COLOR</b>	<b>EQUIPMENT USED ON SUBJECT PROJECT</b>	<b>ROCK HARDNESS</b> VERY HARD HARD MODERATELY HARD MEDIUM HARD SOFT VERY SOFT	<b>CONSISTENCY OR DENSENESS</b>

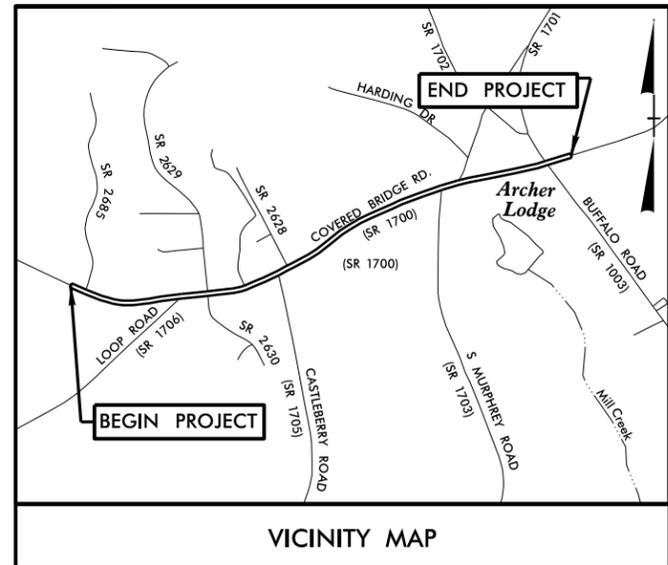
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5704E	3	17
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
44850.1.5	HSIP-1700(020)	PE	

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# JOHNSTON COUNTY

LOCATION: SR 1700 (COVERED BRIDGE ROAD) FROM  
SR 2685 (HELENA LANE) TO SR 1003 (BUFFALO ROAD)

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



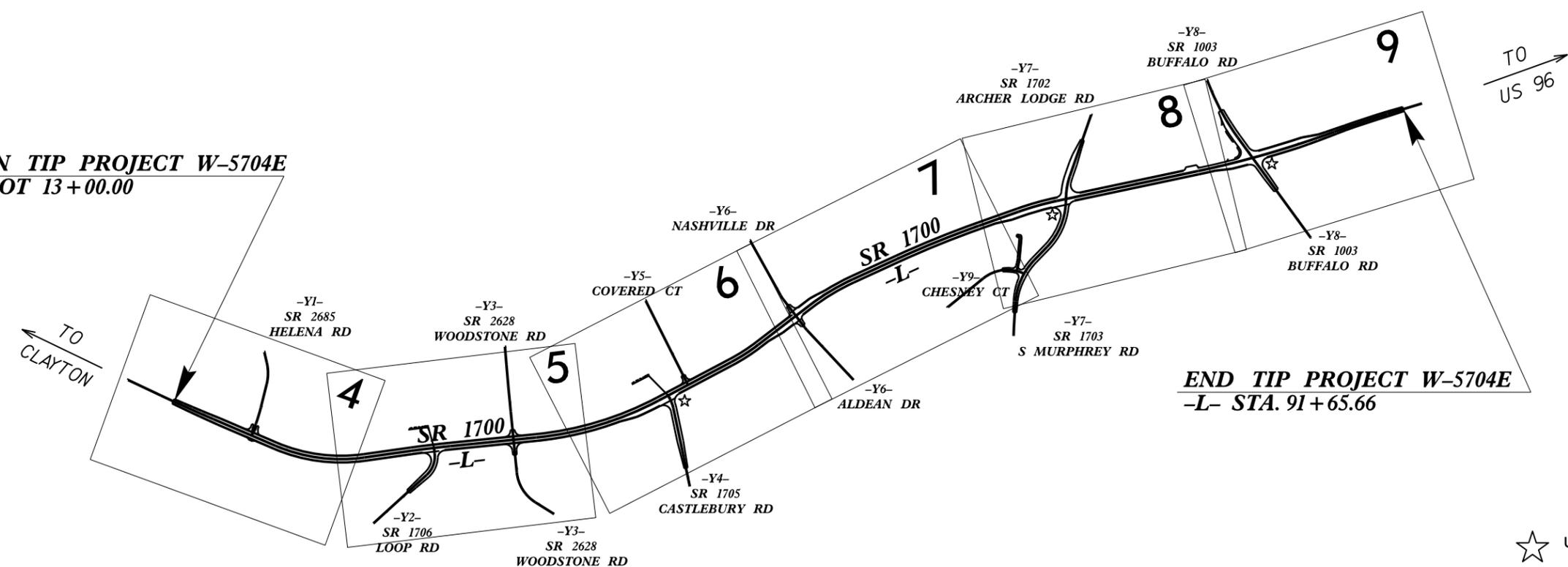
NAD 83 NSRS 2007

CONTRACT: 700016596 TIP PROJECT: W-5704E

CONTRACT: 700016596 TIP PROJECT: W-5704E

BEGIN TIP PROJECT W-5704E  
-L- POT 13+00.00

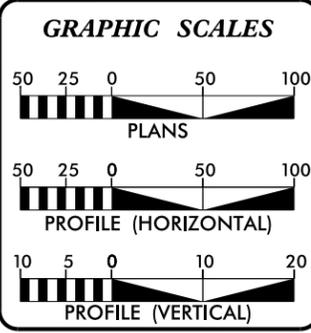
END TIP PROJECT W-5704E  
-L- STA. 91+65.66



DESIGN EXCEPTION REQUIRED FOR SHOULDER WIDTH.  
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD \_\_\_\_.  
THIS PROJECT IS WITHIN THE ARCHERS LODGE MUNICIPAL BOUNDARY.  
THIS IS NOT A CONTROLLED ACCESS PROJECT.

★ UPGRADE EXISTING OR NEW SIGNAL

**INCOMPLETE PLANS**  
DO NOT USE FOR R/W ACQUISITION  
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UNLESS ALL SIGNATURES COMPLETED



**DESIGN DATA**

ADT 2020 =	12,350
ADT 2040 =	18,400
K =	10 %
D =	65 %
T =	7 % *
V =	50 MPH
* TTST =	1%+DUAL 6%
FUNC CLASS =	MAJOR COLLECTOR REGIONAL TIER

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT W-5704E	=	1.490 mile
TOTAL LENGTH TIP PROJECT W-5704E	=	1.490 mile
LENGTH OF PROJECT BASED ON -L-		

Prepared For:  
**DIVISION OF HIGHWAYS**  
1000 Birch Ridge Dr., Raleigh NC, 27610

By:  
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PH (919) 773-8887  
CORP. LICENSE NO.: C-0275

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: AUGUST 2018

LETTING DATE: AUGUST 2020

**NYA BOAYUE, PE**  
PROJECT ENGINEER

**TRAVIS COOK, EI**  
PROJECT DESIGN ENGINEER

**ADDISON GAINAY, PE**  
NCDOT CONTACT

**HYDRAULICS ENGINEER**

SIGNATURE: \_\_\_\_\_ P.E.

**ROADWAY DESIGN ENGINEER**

SIGNATURE: \_\_\_\_\_ P.E.



05-JUN-2018 11:47 T:\Projects\6616596\6616596-0351\TGS Engineers-SR 1700 Covered Bridge Rd Johnston County\W5704E\_GEO\_RDWY\CADD\_GEOTECH\PlanProf\W-5704E\_RDY\_TSH.DGN Walker AT 66026102



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June 5, 2018

State Project No.: 44850.1.5  
 TIP No.: W-5704E  
 F.A. Number: HSIP-1700 (020)  
 County: Johnston  
 Description: Widen SR 1700 (Covered Bridge Road) From East of SR-1003 (Buffalo Road) to West of SR-2685 (Helena Lane)  
 F&R Report No.: 66V-0351

**SUBJECT: Geotechnical Report – Inventory**

**Project Description**

This project involves the widening of SR 1700 (Covered Bridge Road) in Johnston County, North Carolina. SR 1700 will be widened from one lane in each direction to a new typical section having three 12-foot lanes and two 4-foot paved shoulders. The project also includes installing two signals (one at the intersection with Buffalo Road and the other at the intersection with Archer Lodge Road, realigning SR 1703 (S Murphrey Road), and flattening the curve of SR 1700 to improve safety. The widening begins approximately 500 feet west of Helena Lane and ends approximately 500 feet east of Buffalo Road, approximately 1.5 miles total. The subject portion of SR 1700 generally extends through a mixture of small homes and agricultural properties.

The geotechnical field investigation was performed in April of 2018. During this time period, a total of 42 hand auger borings (HA-1 to HA-40, and HA-42 to HA-43) were drilled. Boring HA-41 was not drilled due to utility conflicts. Representative soil samples were collected from the hand auger cuttings for visual classification in the field and for analysis by F&R’s testing laboratory. The existing asphalt was also sampled at 3 locations to determine representative pavement thickness only.

The following alignments were investigated within the approximate limits specified:

<u>Alignment</u>	<u>Station (±)</u>
-L-	14+00 to 86+00
-Y7-	15+00 to 20+00
-Y8-	13+00 to 16+00

**Areas of Special Geotechnical Interest**

1) Wet or Saturated Soils: The following areas contain wet or saturated soils that have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	20+50 to 21+50, right
-L-	24+50 to 25+50, right
-L-	37+50 to 38+50, left
-L-	51+50 to 52+50, right
-L-	57+50 to 58+50, right
-L-	64+50 to 65+50, right
-L-	74+00 to 75+00, right

2) Cohesive Soils: The following areas contain cohesive soils (silts and clays) at existing subgrade in fill areas or at/near proposed subgrade that have the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	14+50 to 18+00
-L-	27+00 to 28+00, right
-L-	29+50 to 38+50
-L-	43+00 to 45+50, right
-L-	47+50 to 48+50, right
-L-	51+50 to 54+00
-L-	60+50 to 61+50, right
-L-	68+50 to 69+50, right
-L-	74+00 to 79+50, right
-L-	82+50 to 85+50, right
-Y7-	16+50 to 19+50
-Y8-	13+00 to 14+00, left

- 3) Highly Plastic Soils: The following areas of unclassified excavation contain soils with plasticity indices of 26 through 35:

<u>Alignment</u>	<u>Station (±)</u>
-L-	43+00 to 44+00, right
-L-	57+50 to 58+50, right

- 4) Groundwater: The following areas exhibited groundwater within six feet of the proposed grade:

<u>Alignment</u>	<u>Station (±)</u>
-L-	14+00 to 70+00

The following areas exhibited groundwater within three feet of existing grade, which has the potential to cause subgrade problems during construction:

<u>Alignment</u>	<u>Station (±)</u>
-L-	15+50 to 18+00
-L-	20+50 to 38+50
-L-	41+50 to 48+50
-L-	51+50 to 58+50
-L-	60+50 to 65+50, right

- 5) Cultivated Soil: The following location is a cultivated agricultural field. Soils at this location have the potential to be highly variable, which could cause subgrade problems during construction if undetected pockets of organics or soft/loose soils are present.

<u>Alignment</u>	<u>Station (±)</u>
-Y7-	15+70 to 20+25

**Physiography and Geology**

The existing road in the area of this project generally runs in an east to west direction, primarily through residential areas and some agricultural properties. The existing ground surface along the centerline of the proposed road generally stays within a ten foot elevation change (EL ±327 to EL ±338) for the majority of the project (-L- station 13+50 to 85+50). From -L- station 85+50 the ground surface slopes downward from an elevation (EL) of ±327 to EL ±310 at the end of the project (-L- station 91+50). The highest existing ground surface elevation on the project exists from -L- station 30+00 to 34+50 with an elevation of EL

±338. The lowest existing ground surface elevation on the project exists at -L- station 91+50 with an elevation of EL ±310.

The surface water across the project is ultimately drained by the Neuse River (approximately 3 miles southwest of the project) or its tributary Buffalo Creek (approximately 1 mile east). Since neither the Neuse River nor any of its tributaries exist within the project limits, no structures (bridges, culvert extensions, etc.) are proposed.

Based upon the provided cross sections, cuts and fills for the road widening appear to be minimal, with the average cut or fill being 1 to 3 feet. Areas of larger cuts and fills (3 to 6 feet) occur throughout the project limits where new ditch lines are being created and where a right turn lane is being added between -L- stations 70+00 and 82+00 along with the new -Y7- intersection.

The project site is geologically located near the border of the Piedmont and Coastal Plain physiographic provinces of North Carolina. The boundary between the Piedmont and Coastal Plain is the Fall Zone. This zone represents the elevation break between the resistant rocks of the Piedmont and the more easily eroded sediments of the Coastal Plain. Because this site is located at the border of two distinct geologic settings, determination of the soil origins (*i.e.*, coastal plain vs. piedmont residual) based on visual classification of a relatively small sample is subjective. All samples within the project limits were classified as cultivated soil or coastal plain; however, based on the above information F&R cannot rule out the presence of piedmont residual soils underneath the coastal plain soils. Consequently, the project is located within an area mapped as foliated to massive granitic rock (PPmg) and terrace deposits and upland sediment (Tt).

**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 hand auger 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 hand auger samples are representative of the subsurface conditions at the hand auger locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

The majority of the soils encountered on this project were coastal plain (CP) soils. Coastal plain soils were encountered below topsoil at all hand auger locations. The coastal plain soils were typically described as moist to saturated, silty and clayey SAND (A-2-4 & A-2-6) and sandy CLAY (A-6 & A-7). Thirteen (13) samples were lab tested and 8 samples were determined to be sandy CLAY (A-6 & A-7-6), with plasticity indexes ranging from 16 to 27 and water contents ranging from 4 to 30%. One (1) sample was determined

to be a clayey SAND (A-2-7), with a plasticity index of 33 and water content of 20%. The remaining four (4) samples were determined to be silty SAND (A-2-4)- two of the samples had plasticity indexes of 7 and the other two were determined to be non-plastic (NP). The water contents of these samples ranged from 8 to 15%.

Cultivated coastal plain soils were observed along -Y7- from station 15+70 to 20+25. These soils were encountered in two (2) hand augers and appeared to be associated with an existing agricultural field.

**Groundwater Properties**

Generally, groundwater measurements were attempted in a majority of the hand auger borings along the project. Nine (9) hand auger borings were backfilled immediately upon their completion. Groundwater was observed at the termination of the hand auger in 24 borings at depths ranging from 1.8 to 5.5 feet. Stabilized groundwater was encountered in 30 hand augers at depths ranging from 0.9 to 4.9 feet. Stabilized groundwater was not encountered in the remaining borings. The recovered soil samples were generally described as moist above the groundwater level and wet or saturated below the groundwater level. It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report.

**Pavement Cores**

As requested, F&R extracted three pavement cores from the existing SR 1700 (Covered Bridge Road) to investigate the thickness of the existing pavement. These cores were taken at -L- stations 21+95 RT LN, 62+00 LT LN, and 74+00 LT LN. The pavement thickness at these locations ranged from 5.5 to 6 inches. A pavement core photo document is attached to this report. Further investigation or testing of the existing subgrade was beyond our scope of work.

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.**

Meredith Arnold  
 Staff Geologist

J. Russell Rivenbark, P.E.  
 Geotechnical Project Manager

**Appendix A**

**Bulk Samples**

The following bulk samples were obtained and transported to our laboratory for potential testing to determine the engineering properties of the soil:

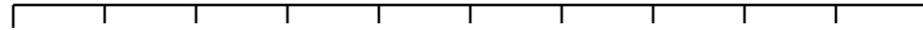
Sample No.	Boring No.	Line	Station	Offset	Depth (ft.)	Test(s) Performed
CBR-1	HA-31	-Y7-	17+00	CL	0.0-2.0	California Bearing Ratio, Standard Proctor
CBR-2	HA-37	-L-	78+00	15' RT	0.0-2.0	California Bearing Ratio, Standard Proctor
CBR-3	HA-3	-L-	17+50	15' LT	0.0-2.0	California Bearing Ratio, Standard Proctor



**PAVEMENT CORE PHOTOGRAPHS**  
**Tip No. W-5704 | WBS No. 44850.1.5**  
**Johnston County, NC**



0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0



SCALE IN FEET



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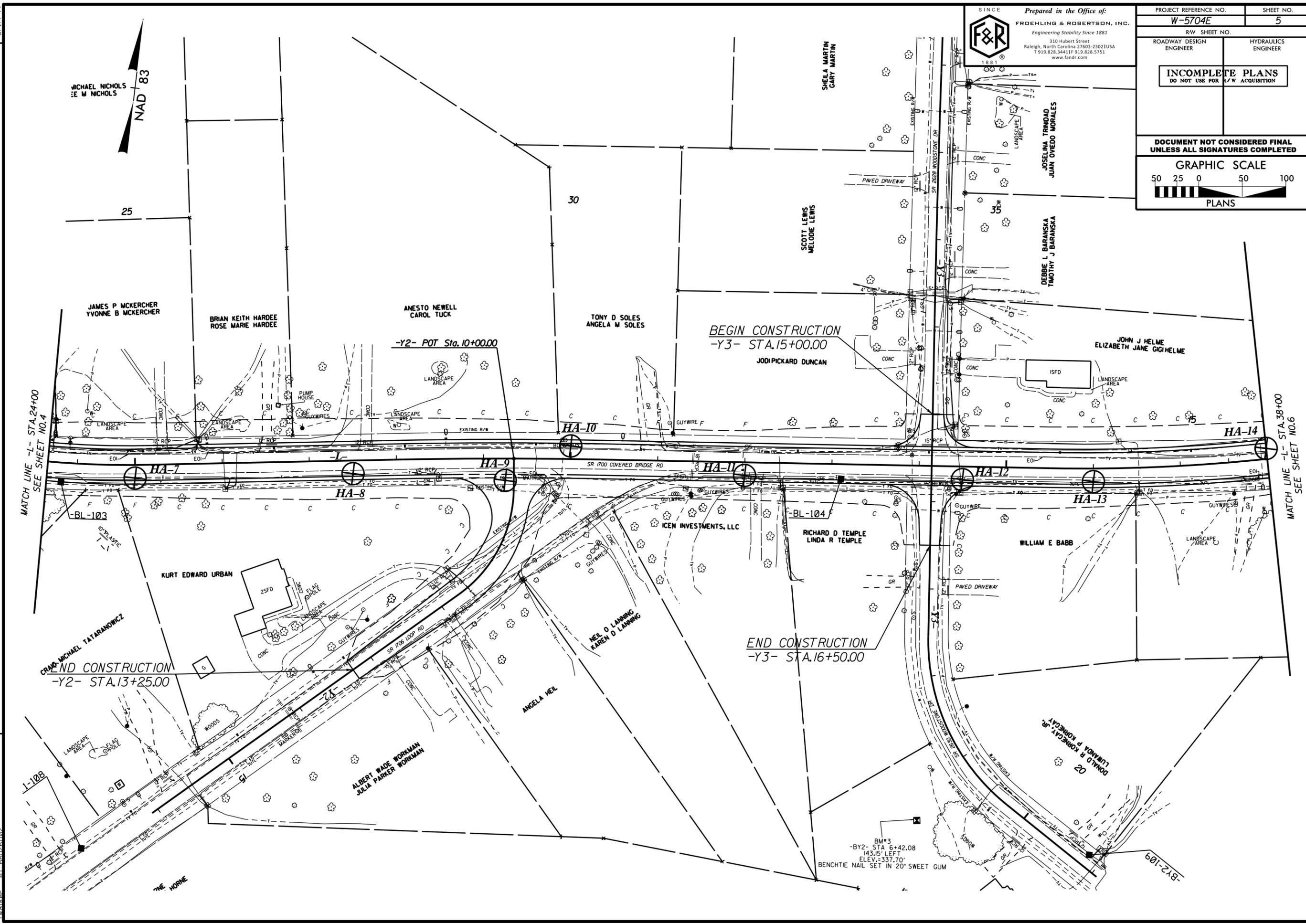
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MICHAEL NICHOLS  
E M NICHOLS

NAD 83

SINCE Prepared in the Office of:  
**F&R**  
 FROEHLING & ROBERTSON, INC.  
 Engineering Stability Since 1881  
 310 Hubert Street  
 Raleigh, North Carolina 27603-2302 USA  
 T 919.828.3441 F 919.828.5751  
 www.fandri.com

PROJECT REFERENCE NO. <b>W-5704E</b>	SHEET NO. <b>5</b>
R/W SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	ENGINEER
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<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	
<b>GRAPHIC SCALE</b>	
50 25 0 50 100	
PLANS	



REVISIONS

MATCH LINE -L- STA.24+00  
SEE SHEET NO.4

MATCH LINE -L- STA.38+00  
SEE SHEET NO.6



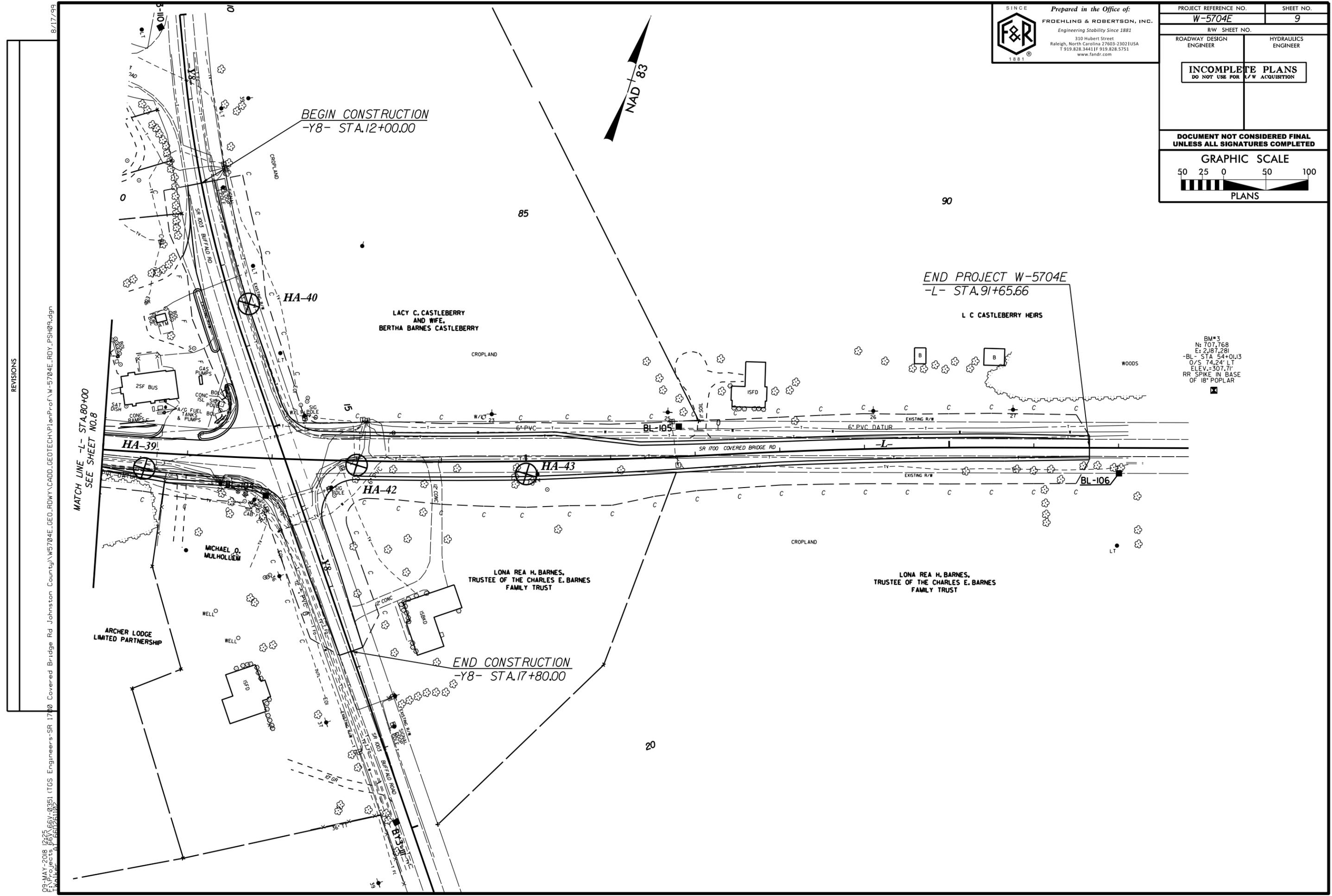




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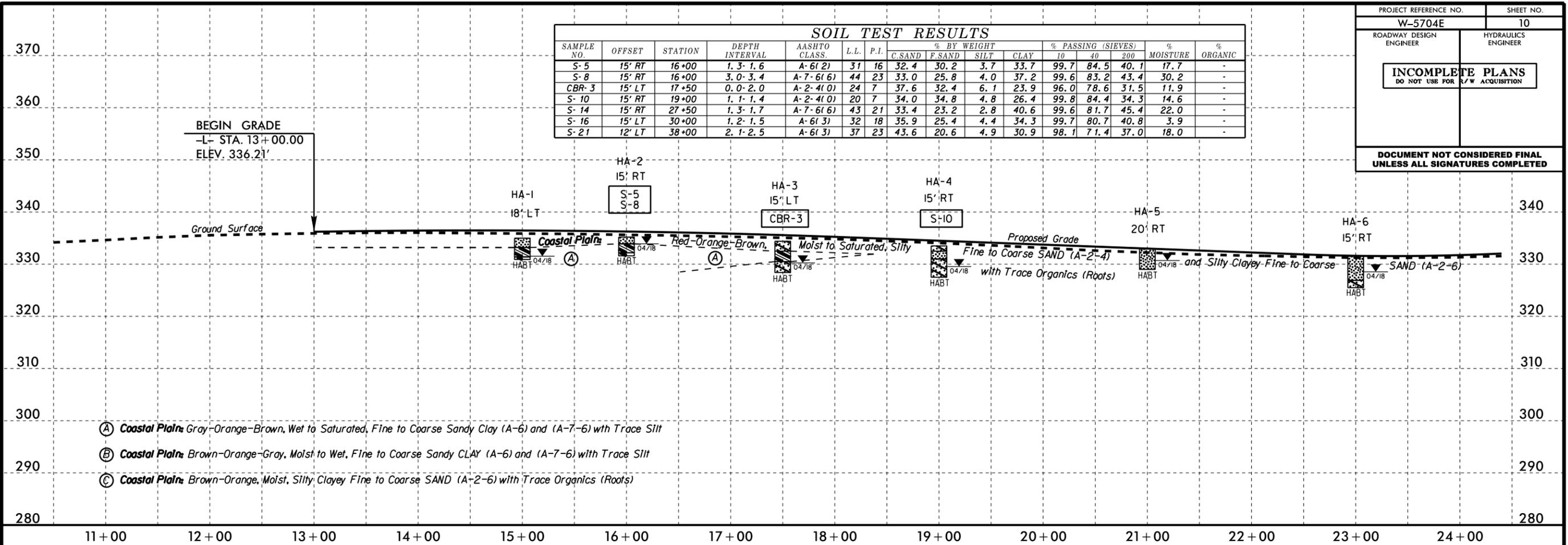
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GRAPHIC SCALE	
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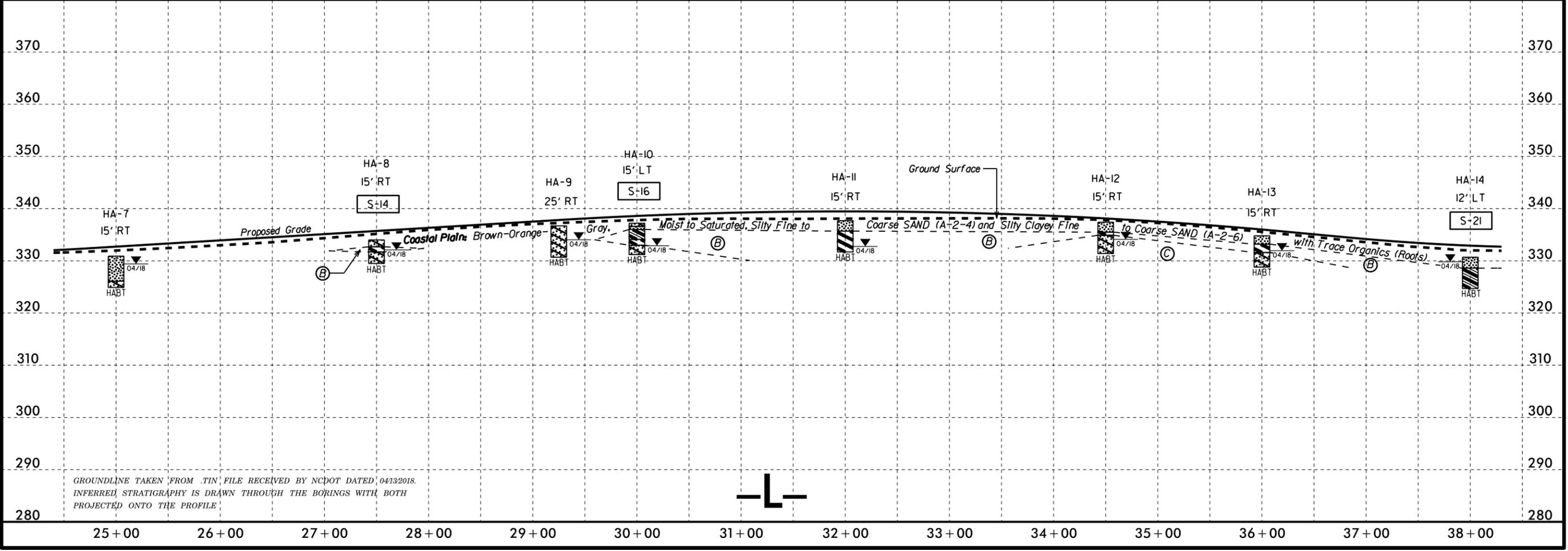
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 E: 2,187.281  
 -BL- STA 54+01.3  
 O/S 74.24' LT  
 ELEV. = 307.71'  
 RR SPIKE IN BASE  
 OF 18" POPLAR

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 8/17/99  
 REVISIONS  
 MATCH LINE -L- STA. 80+00  
 SEE SHEET NO. 8

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-5	15' RT	16+00	1.3- 1.6	A-6(2)	31	16	32.4	30.2	3.7	33.7	99.7	84.5	40.1	17.7	-
S-8	15' RT	16+00	3.0- 3.4	A-7-6(6)	44	23	33.0	25.8	4.0	37.2	99.6	83.2	43.4	30.2	-
CBR-3	15' LT	17+50	0.0- 2.0	A-2-4(0)	24	7	37.6	32.4	6.1	23.9	96.0	78.6	31.5	11.9	-
S-10	15' RT	19+00	1.1- 1.4	A-2-4(0)	20	7	34.0	34.8	4.8	26.4	99.8	84.4	34.3	14.6	-
S-14	15' RT	27+50	1.3- 1.7	A-7-6(6)	43	21	33.4	23.2	2.8	40.6	99.6	81.7	45.4	22.0	-
S-16	15' LT	30+00	1.2- 1.5	A-6(3)	32	18	35.9	25.4	4.4	34.3	99.7	80.7	40.8	3.9	-
S-21	12' LT	38+00	2.1- 2.5	A-6(3)	37	23	43.6	20.6	4.9	30.9	98.1	71.4	37.0	18.0	-

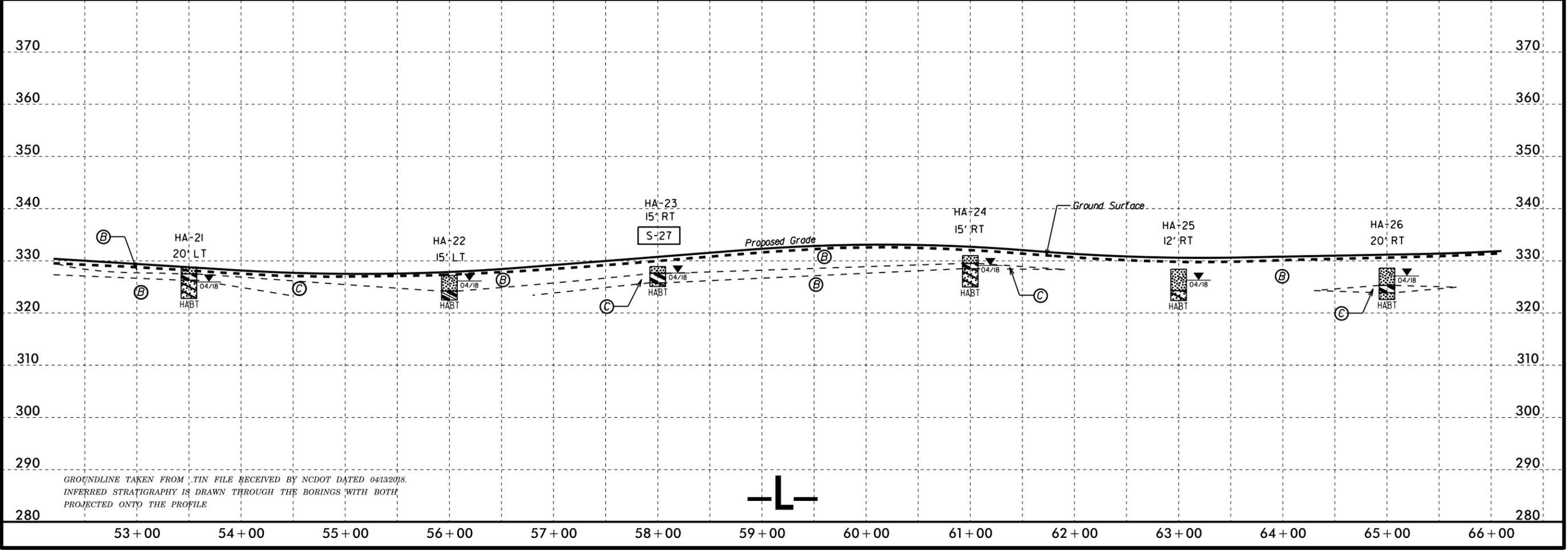
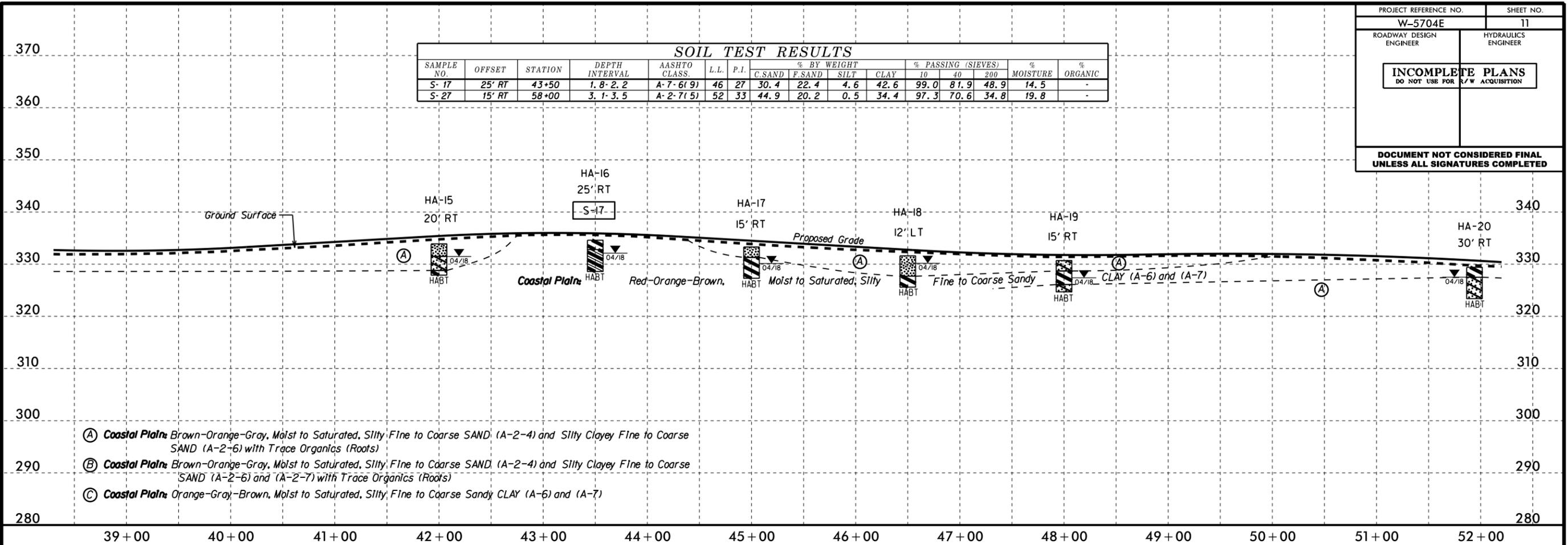


- (A) Coastal Plains Gray-Orange-Brown, Wet to Saturated, Fine to Coarse Sandy Clay (A-6) and (A-7-6) with Trace Silt
- (B) Coastal Plains Brown-Orange-Gray, Moist to Wet, Fine to Coarse Sandy CLAY (A-6) and (A-7-6) with Trace Silt
- (C) Coastal Plains Brown-Orange, Moist, Silty Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots)



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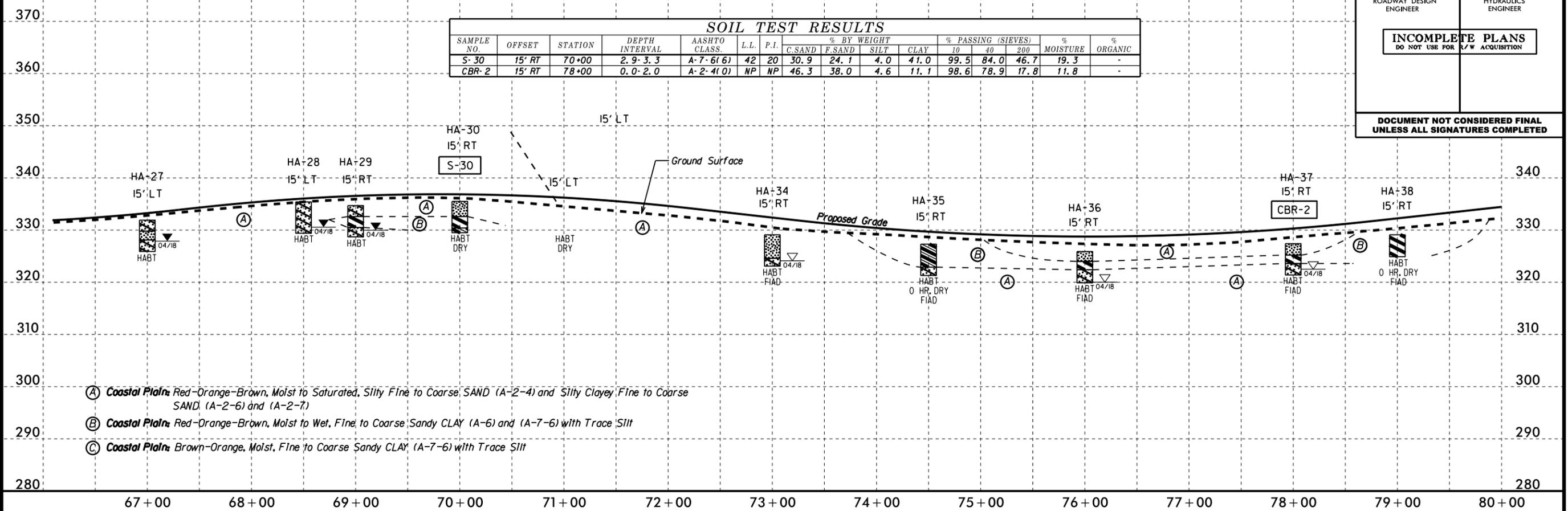
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							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-17	25' RT	43+50	1.8-2.2	A-7-6(9)	46	27	30.4	22.4	4.6	42.6	99.0	81.9	48.9	14.5	-
S-27	15' RT	58+00	3.1-3.5	A-2-7(5)	52	33	44.9	20.2	0.5	34.4	97.3	70.6	34.8	19.8	-



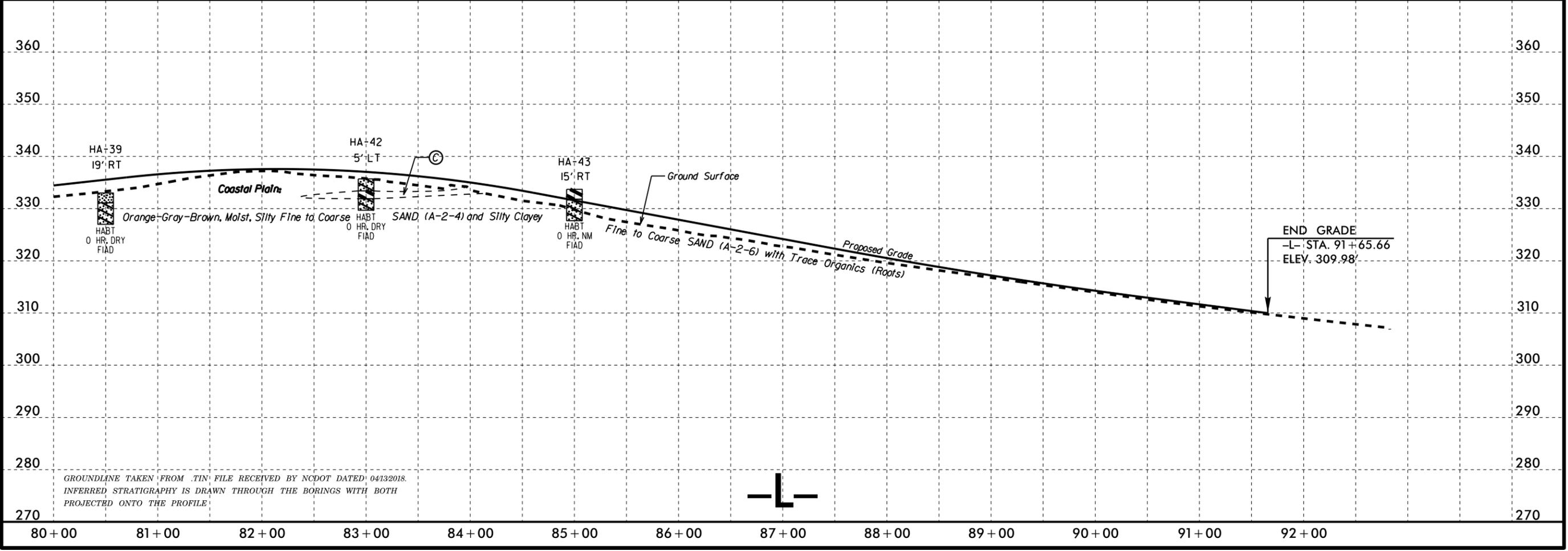
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SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
S-30	15' RT	70+00	2.9-3.3	A-7-6(6)	42	20	30.9	24.1	4.0	41.0	99.5	84.0	46.7	19.3	-
CBR-2	15' RT	78+00	0.0-2.0	A-2-4(0)	NP	NP	46.3	38.0	4.6	11.1	98.6	78.9	17.8	11.8	-



- Ⓐ Coastal Plains: Red-Orange-Brown, Moist to Saturated, Silty Fine to Coarse SAND (A-2-4) and Silty Clayey Fine to Coarse SAND (A-2-6) and (A-2-7)
- Ⓑ Coastal Plains: Red-Orange-Brown, Moist to Wet, Fine to Coarse Sandy CLAY (A-6) and (A-7-6) with Trace Silt
- Ⓒ Coastal Plains: Brown-Orange, Moist, Fine to Coarse Sandy CLAY (A-7-6) with Trace Silt

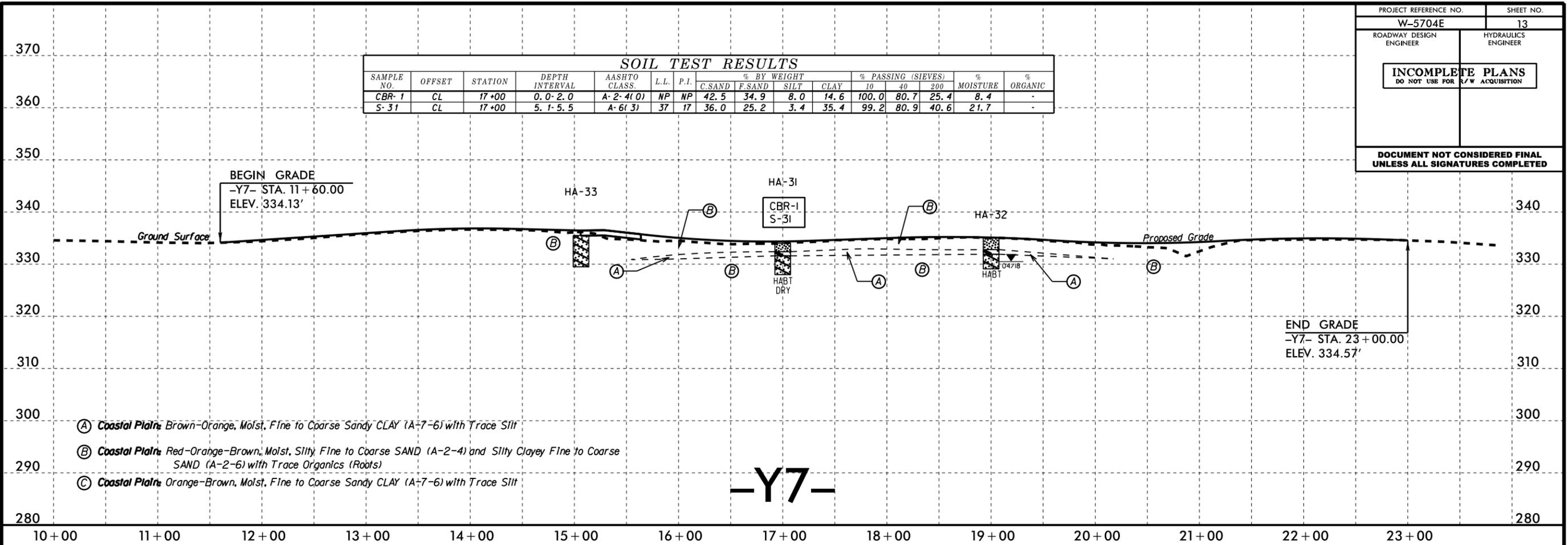


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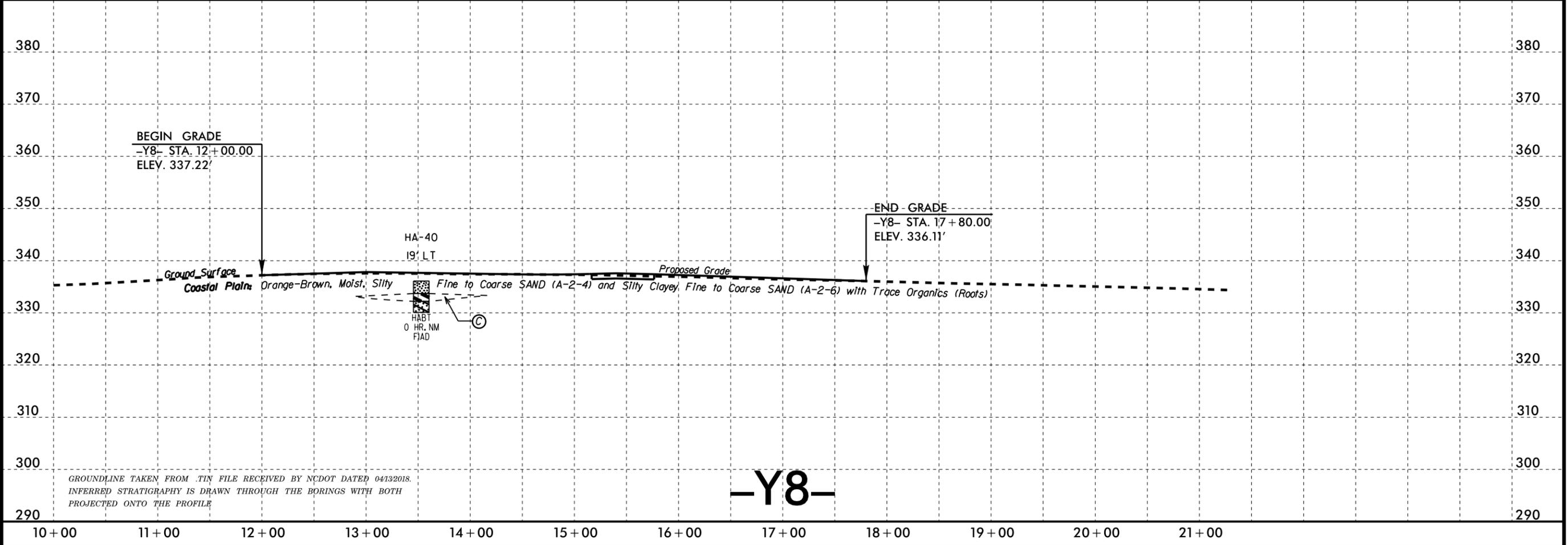


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SOIL TEST RESULTS															
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							C.SAND	F.SAND	SILT	CLAY	10	40	200		
CBR-1	CL	17+00	0.0-2.0	A-2-4(0)	NP	NP	42.5	34.9	8.0	14.6	100.0	80.7	25.4	8.4	-
S-31	CL	17+00	5.1-5.5	A-6(3)	37	17	36.0	25.2	3.4	35.4	99.2	80.9	40.6	21.7	-



-Y7-



-Y8-

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