



July 3, 2019

TIP No.: R-3833C
WBS No.: 34554.1.3
County: Iredell

Project Description: Brawley School Road (SR 1100) From Talbert Road (SR 1116) to 1000' East of US 21

Subject: Roadway Recommendations

As authorized, Falcon Engineering, Inc. (Falcon) has completed the geotechnical subsurface investigation for the proposed roadway widening for Brawley School Road (SR 1100) from Talbert Road (SR 1116) to 1000' East of US 21 in Mooresville in Iredell County, North Carolina. This report includes roadway geotechnical recommendations for the preparation of final design, right of way plans, construction cost estimates, and construction procedures.

Recommendations and evaluations provided by Falcon are based on the information provided by STANTEC and established NCDOT standards. Modifications of our recommendations and evaluations may be required if there are changes to the design. Recommendations in this report are in part based on data obtained from soil borings. The nature and extent of variations between borings may not become evident until construction.

Our professional services for this project have been performed in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Falcon appreciates the opportunity to have provided you with geotechnical engineering services for this project. If you have any questions regarding this report, please contact our office.

Respectfully submitted:

FALCON ENGINEERING, INC.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



DocuSigned by:
W. Scott Hunsberger
5A469AC80FC746E3
7/3/2019

W. Scott Hunsberger, PE
Geotechnical Engineer

Jeremy R. Hamm, PE
Geotechnical Engineering Manager

TIP No.: R-3833C
WBS No.: 34554.1.3
COUNTY: Iredell
DESCRIPTION: Brawley School Road (SR 1100) From Talbert Road (SR 1116) to 1000' East of US 21
SUBJECT: Roadway Subsurface Investigation – Recommendations

Falcon has completed the subsurface investigation for this project and submits the following recommendations:

I. Slope/Embankment Stability

A. Slope Design

We recommend that all embankment and cut slopes be constructed at a ratio of 2:1 (H:V) or flatter.

B. Undercut for Embankment Stability

Soft surficial soils may be present in portions of the site where new embankments will be placed. These soils may not provide adequate stability for construction of embankments.

To assist in embankment stabilization in such locations, it is recommended that a quantity of **8,300 CY** of undercut be included in the contract as a contingency to be used at the discretion of the engineer.

C. Geotextile for Soil Stabilization

To aid in the placement of fill over unstable soil, it is recommended that a quantity of **8,300 SY** of Geotextile for Soil Stabilization be included in the contract as a contingency to be used in conjunction with the above referenced undercut at the discretion of the engineer.

II. Subgrade Stability

A. Subsurface Drainage – Subsurface Drain

Based on subsurface conditions and the condition of the existing road, we do not anticipate widespread subgrade stability issues due to groundwater. However, it is recommended that a quantity of **500 LF** of 6-inch perforated corrugated plastic pipe be included in the contract as a contingency to be used at the discretion of the Engineer. Construction of underdrains shall follow Standard Specifications, Section 815 “Subsurface Drainage”, and Roadway Standard Drawing 815.02 “Subsurface Drain”.

B. Grade Point Undercut

It is recommended that a quantity of **50 CY** of undercut be included in the contract for undercut at grade points.

C. Undercut for Subgrade Stability

It is recommended a quantity of **1,000 CY** of undercut be included in the contract as a contingency to be used at the discretion of the Engineer. Undercut of unstable soils should be

made to a depth of three feet, or to competent material, whichever is less, and to a width of one foot beyond edge of pavement or back of curb.

D. Geotextile for Soil Stabilization

The use of Geotextile for Soil Stabilization is anticipated in conjunction with Undercut for Subgrade Stabilization as discussed in Section II. B. It is recommended that a quantity of **1,000 SY** of Geotextile for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

E. Aggregate Subgrade

Moderate to high plasticity soils were encountered at proposed pavement subgrade in cut and near-grade construction areas at many locations throughout the project adjacent to existing pavements. We recommend aggregate subgrade be implemented to replace materials with a Plasticity Index (PI) greater than or equal to 36 from within 1.0 feet of pavement subgrade in these areas to avoid undermining existing pavements and allow for staging of construction and/or avoidance of utilities. Based on our subsurface investigation, aggregate subgrade is anticipated at the following locations.

Station	Offset
21+00 to 23+50, -L-	10 ft to 48 ft LT & 10 ft to 47 ft RT
71+25 to 72+25, -L-	17 ft to 28 ft LT & 3 ft to 19 ft RT
74+00 to 75+50, -L-	17 ft to 35 ft LT & 13 ft to 26 ft RT
19+25 to 25+00, -Y-	2 ft to 44 ft LT & 17 ft to 46 ft RT
15+00 to 17+50, -Y5-	9 ft to 42 ft LT & 9 ft to 50 ft RT

These areas are represented on the subsurface cross sections by a solid filled area. It is recommended that **1,550 CY** of Shallow Undercut, **3,450 Tons** of Class IV Subgrade Stabilization and **5,200 SY** of Geotextile for Soil Stabilization be included in the contract for the above listed areas. If highly plastic or otherwise unsuitable subgrades are present in other areas adjacent to existing pavements or above existing utilities, implement aggregate subgrade. To assist in subgrade stabilization in such locations, it is recommended that a quantity of **400 CY** of Shallow Undercut, **800 Tons** of Class IV Subgrade Stabilization and **1,200 SY** of Geotextile for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer. Aggregate Subgrade shall be performed in accordance with Section 505 of the Standard Specifications, to a depth of one foot and a width of one foot beyond edge of pavement or back of curb, as necessary.

III. Borrow Specifications

A. Disposal of Waste Materials

Waste Materials may be disposed of in non-structural areas, such as outside of the embankment slopes at the discretion of the engineer.

B. Common Borrow

Common borrow for embankment fill shall meet the Statewide Criteria outlined in the Standard Specification, Article 1018-2 (A).

C. Select Granular Material

Select granular material for embankment/backfill, geotextile for soil stabilization, or for fill in standing water shall meet the criteria outlined in the Standard Specifications, Article 1016-3, Class II and/or III. The select granular material should be placed to a height of 3 feet above geotextile for soil stabilization and/or water level.

It is recommended a quantity of **8,300 CY** of Select Granular Material be included in the contract as a contingency item for use in conjunction with Geotextile for Soil Stabilization in Section I, C or at the discretion of the Engineer. It is recommended a quantity of **1,000 CY** of Select Granular Material be included in the contract as a contingency item for use in conjunction with Geotextile for Soil Stabilization in Section II, D or at the discretion of the Engineer.

D. Shrinkage Factor

A shrinkage factor of **15 percent** is recommended to be used in the earthwork computations for this project.

IV. Miscellaneous**A. Reduction of Unclassified Excavation – Loss Due to Clearing and Grubbing**

It is recommended that Unclassified Excavation on the project be reduced by **600 CY** due to clearing and grubbing.

B. Reduction of Unclassified Excavation – Unsuitable Unclassified Excavation

Highly plastic soils are anticipated to be present in cut excavations from the following locations and we recommend unclassified excavation be reduced by the following amounts.

Station	Offset	Quantity (CY)
21+00 to 23+50, -L-	10 ft to 48 ft LT & 10 ft to 67 ft RT	600
71+25 to 72+25, -L-	17 ft to 19 ft LT & 8 ft to 10 ft RT	50
74+00 to 75+50, -L-	17 ft to 57 ft LT & 13 ft to 21 ft RT	200
19+25 to 25+00, -Y-	2 ft to 44 ft LT & 17 ft to 46 ft RT	250
15+00 to 17+50, -Y5-	9 ft to 42 ft LT & 9 ft to 50 ft RT	100

These areas are represented on the subsurface profiles and cross sections by a single hatch pattern.



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING UNIT

Summary of Quantities

WBS Number: 34554.1.3County: IredellProject Engineer: Hunsberger, W. S.TIP Number: R-3833CField Office: ConsultantProject Geologist: Lane, R.W.Description: Brawley School Road (SR 1100) From Talbert Road (SR 1116) to 1000' East of US 21

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
0036000000-E	Undercut Excavation	225 - Roadway Excavation	I. B	Contingency	N/A	N/A	8,300	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. B	Contingency	N/A	N/A	50	CY
0036000000-E	Undercut Excavation	225 - Roadway Excavation	II. C	Contingency	N/A	N/A	1,000	CY
Total Quantity of Undercut Excavation =							9,350	CY
0195000000-E	Select Granular Material	265 - Select Granular Material	III. C	Contingency	N/A	N/A	9,300	CY
Total Quantity of Select Granular Material =							9,300	CY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. C	Contingency	N/A	N/A	8,300	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. D	Contingency	N/A	N/A	1,000	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	-L-	21+00.00	23+50.00	1,450	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	-L-	71+25.00	72+25.00	200	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	-L-	74+00.00	75+50.00	550	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	-Y-	19+25.00	25+00.00	2,700	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	-Y5-	15+00.00	17+50.00	300	SY
0196000000-E	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. E	Contingency	N/A	N/A	1,200	SY
Total Quantity of Geotextile for Soil Stabilization =							15,700	SY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. E	-L-	21+00.00	23+50.00	450	CY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. E	-L-	71+25.00	72+25.00	50	CY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. E	-L-	74+00.00	75+50.00	150	CY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. E	-Y-	19+25.00	25+00.00	800	CY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. E	-Y5-	15+00.00	17+50.00	100	CY
1099500000-E	Shallow Undercut	505 - Aggregate Subgrade	II. E	Contingency	N/A	N/A	400	CY
Total Quantity of Shallow Undercut =							1,950	CY
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. E	-L-	21+00.00	23+50.00	1,000	TON
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. E	-L-	71+25.00	72+25.00	100	TON
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. E	-L-	74+00.00	75+50.00	350	TON
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. E	-Y-	19+25.00	25+00.00	1,800	TON
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. E	-Y5-	15+00.00	17+50.00	200	TON



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING UNIT

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Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
1099700000-E	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. E	Contingency	N/A	N/A	800	TON
Total Quantity of Class IV Subgrade Stabilization =							4,250	TON
2044000000-E	6" Perforated Subdrain Pipe	815 - Subsurface Drainage	II. A	Contingency	N/A	N/A	500	LF
Total Quantity of 6" Perforated Subdrain Pipe =							500	LF

These Items Only Impact Earthwork Totals								
N/A	Loss Due to Clearing & Grubbing	200 - Clearing and Grubbing	IV. A	N/A	N/A	N/A	600	CY
N/A	Shrinkage Factor	235 - Embankments	III. D	N/A	N/A	N/A	15	%
N/A	Unclassified Excavation - Unsuitable Waste	225 - Roadway Excavation	IV. B	N/A	N/A	N/A	1,200	CY

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.	R-3833C	1	12

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	21+00.00 - 23+50.00	4,5
-L-	71+00.00 - 72+00.00	6
-L-	74+00.00 - 75+50.00	7
-Y-	19+00.00 - 25+00.00	8-10
-Y5-	15+00.00 - 17+50.00	11,12

**ROADWAY
SUBSURFACE INVESTIGATION**

COUNTY IREDELL
PROJECT DESCRIPTION SR 1100 BRAWLEY SCHOOL
ROAD FROM SR 1116 TALBERT ROAD TO
1000' EAST OF US 21

RECOMMENDATIONS

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:
1. 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.
 2. 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

HPC

LANE, R.W.

INVESTIGATED BY FALCON ENG.

DRAWN BY HILL, M.J.

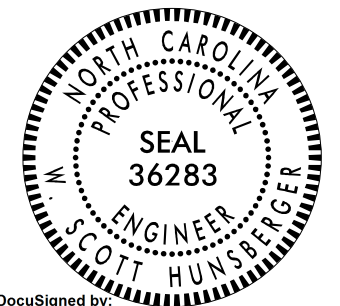
CHECKED BY HUNSBERGER, W.S.

SUBMITTED BY FALCON ENG.

DATE JUNE 2019

REFERENCE: R-3833C

PROJECT: 34554



DocuSigned by:

W. Scott Hunsberger

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SIGNATURE

DATE

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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																																																																																		
<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>																																																																																		
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th><th>A-2</th><th>A-3</th><th>A-4</th><th>A-5</th> <th>A-6</th><th>A-7</th><th>A-8</th><th>A-9</th><th>A-10</th> <th>A-11</th><th>A-12</th><th>A-13</th><th>A-14</th><th>A-15</th> <th>A-16</th><th>A-17</th><th>A-18</th><th>A-19</th><th>A-20</th> </tr> <tr> <th>GROUP CLASS.</th> <td>A-1-a</td><td>A-1-b</td><td>A-2-4</td><td>A-2-5</td><td>A-2-6</td><td>A-2-7</td><td>A-4</td><td>A-5</td><td>A-6</td><td>A-7</td> <td>A-1, A-2</td><td>A-3</td><td>A-4, A-5</td><td>A-6, A-7</td><td>A-8</td><td>A-9</td><td>A-10</td><td>A-11</td><td>A-12</td><td>A-13</td> </tr> <tr> <th>SYMBOL</th> <td colspan="5">[Pattern]</td><td colspan="5">[Pattern]</td><td colspan="5">[Pattern]</td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7	A-8	A-9	A-10	A-11	A-12	A-13	SYMBOL	[Pattern]					[Pattern]					[Pattern]					<p>ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>										<p>WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (IV SL.) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.</p> <p>SLIGHT (SL.) - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.</p> <p>MODERATE (MOD.) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.</p> <p>MODERATELY SEVERE (MOD. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i></p> <p>SEVERE (SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i></p> <p>VERY SEVERE (IV SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i></p> <p>COMPLETE - ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.</p>									
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<p>COLOR</p> <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-BROWN). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>FRACATURE SPACING</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>TERM</th> <th>SPACING</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> </tr> </table>										TERM	SPACING	VERY WIDE	MORE THAN 10 FEET	WIDE	3 TO 10 FEET	MODERATELY CLOSE	1 TO 3 FEET	CLOSE	0.16 TO 1 FOOT	VERY CLOSE	LESS THAN 0.16 FEET	<p>BEDDING</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table>										TERM	THICKNESS	VERY THICKLY BEDDED	4 FEET	THICKLY BEDDED	1.5 - 4 FEET	THINLY BEDDED	0.16 - 1.5 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	THINLY LAMINATED	< 0.008 FEET																																																									
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THINLY LAMINATED	< 0.008 FEET																																																																																																															
<p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p>BENCH MARK:</p> <p>BORING ELEVATIONS TAKEN FROM r3833c.lc.tn.l70727.tn DATED 7/27/2017 ELEVATION: FEET</p> <p>NOTES:</p> <p>FIAD - FILLED IMMEDIATELY AFTER DRILLING</p>																																																																																																						

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TIP PROJECT: R-3833C

CONTRACT: 34554

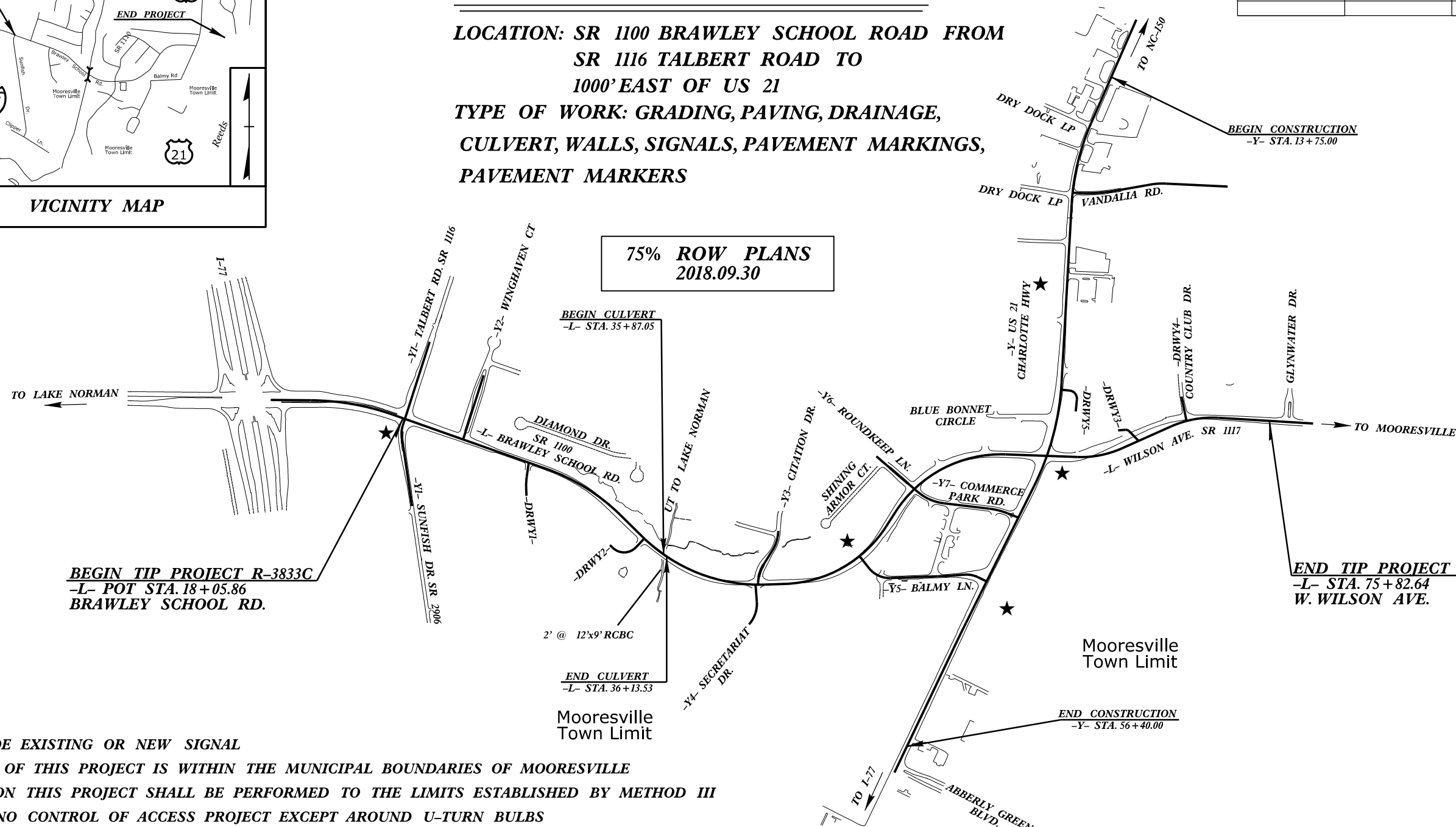
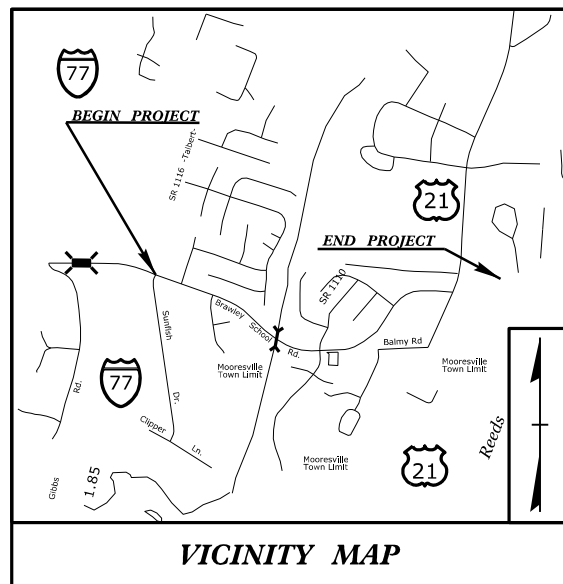
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

IREDELL COUNTY

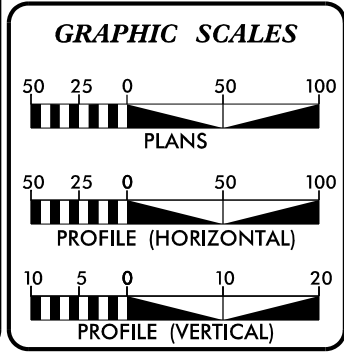
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SR 1116 TALBERT ROAD TO
1000' EAST OF US 21**

**TYPE OF WORK: GRADING, PAVING, DRAINAGE,
CULVERT, WALLS, SIGNALS, PAVEMENT MARKINGS,
PAVEMENT MARKERS**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3833C	3	12
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34554.1.FD1		P.E.	
34554.2.4		RW	
34554.2.5		UTIL	



★ UPGRADE EXISTING OR NEW SIGNAL
 A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF MOORESVILLE
 CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III
 THIS IS A NO CONTROL OF ACCESS PROJECT EXCEPT AROUND U-TURN BULBS



DESIGN DATA

ADT 2015 =	18500
ADT 2040 =	28200
K =	10 %
D =	55 %
T =	4 % *
V =	45 MPH
* TTST =	1% DUAL = 3%
FUNC CLASS =	MAJOR RURAL COLLECTOR

PROJECT LENGTH

ROADWAY LENGTH TIP PROJECT R-3833C =	1.090 miles
STRUCTURE LENGTH TIP PROJECT R-3833C =	0.005 miles
TOTAL LENGTH TIP PROJECT R-3833C =	1.094 miles

Prepared In The Office of:

Stantec
 Stantec Consulting Services Inc.
 801 Jones Franklin Road
 Suite 300
 Raleigh, NC 27606
 Tel. (919) 851-6866 Fax. (919) 851-7024
 www.stantec.com License No. F-0672

for the North Carolina Department of Transportation

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 30, 2018

LETTING DATE:
JUNE 16, 2020

STANTEC CONTACT:
A. DEAN SARVIS, P.E.
PROJECT ENGINEER

NC DOT DIVISION 12 CONTACT:
BRYAN SOWELL, PE
PROJECT MANAGER

HYDRAULICS ENGINEER

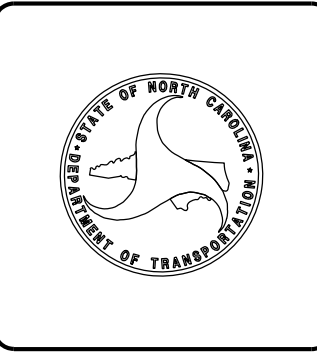
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UNLESS ALL SIGNATURES COMPLETED

SIGNATURE: _____ P.E.

ROADWAY DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

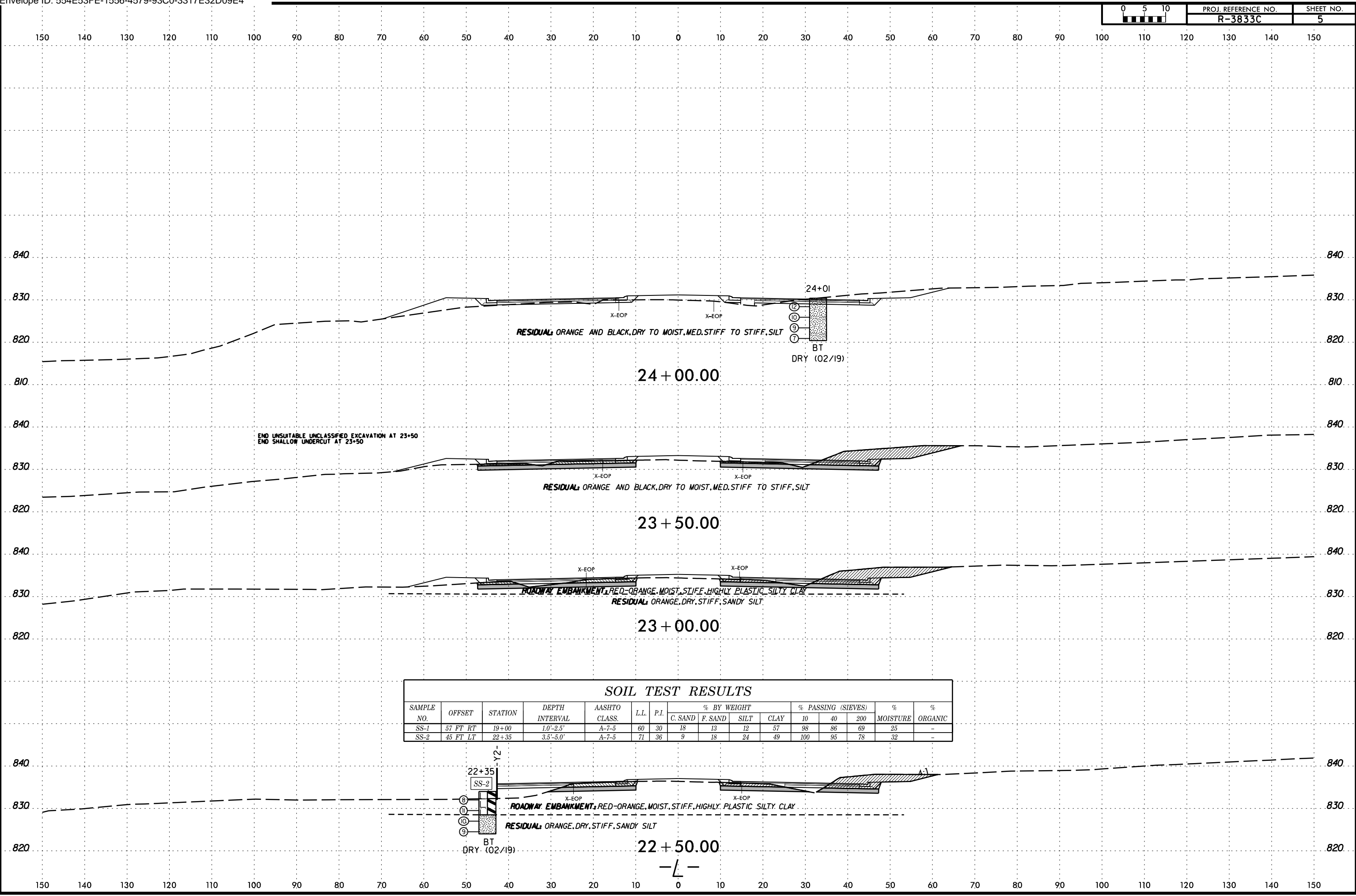
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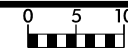
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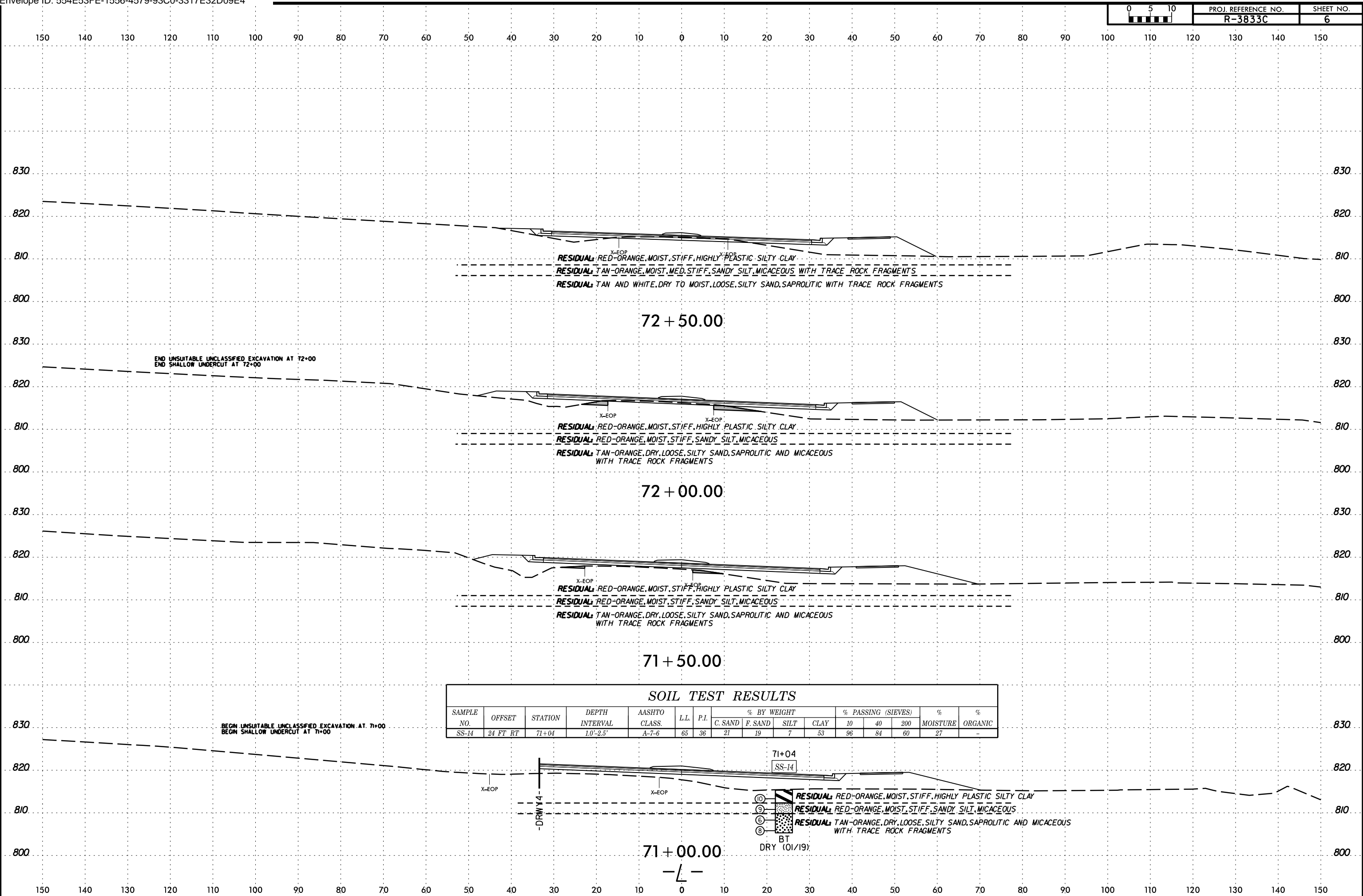
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 6/23/16



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	57 FT RT	19+00	1.0'-2.5'	A-7-5	60	30	18	13	12	57	98	86	69	25	-	
SS-2	45 FT LT	22+35	3.5'-5.0'	A-7-5	71	36	9	18	24	49	100	95	78	32	-	



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 6/23/16



END UNSUITABLE UNCLASSIFIED EXCAVATION AT 72+00
END SHALLOW UNDERCUT AT 72+00

BEGN UNSUITABLE UNCLASSIFIED EXCAVATION AT 71+00
BEGN SHALLOW UNDERCUT AT 71+00

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-14	24 FT RT	71+04	1.0'-2.5'	A-7-6	65	36	21	19	7	53	96	84	60	27	-	

71+04
SS-14

X-EOP

-DRY Y 4-

X-EOP

BT
DRY (01/19)

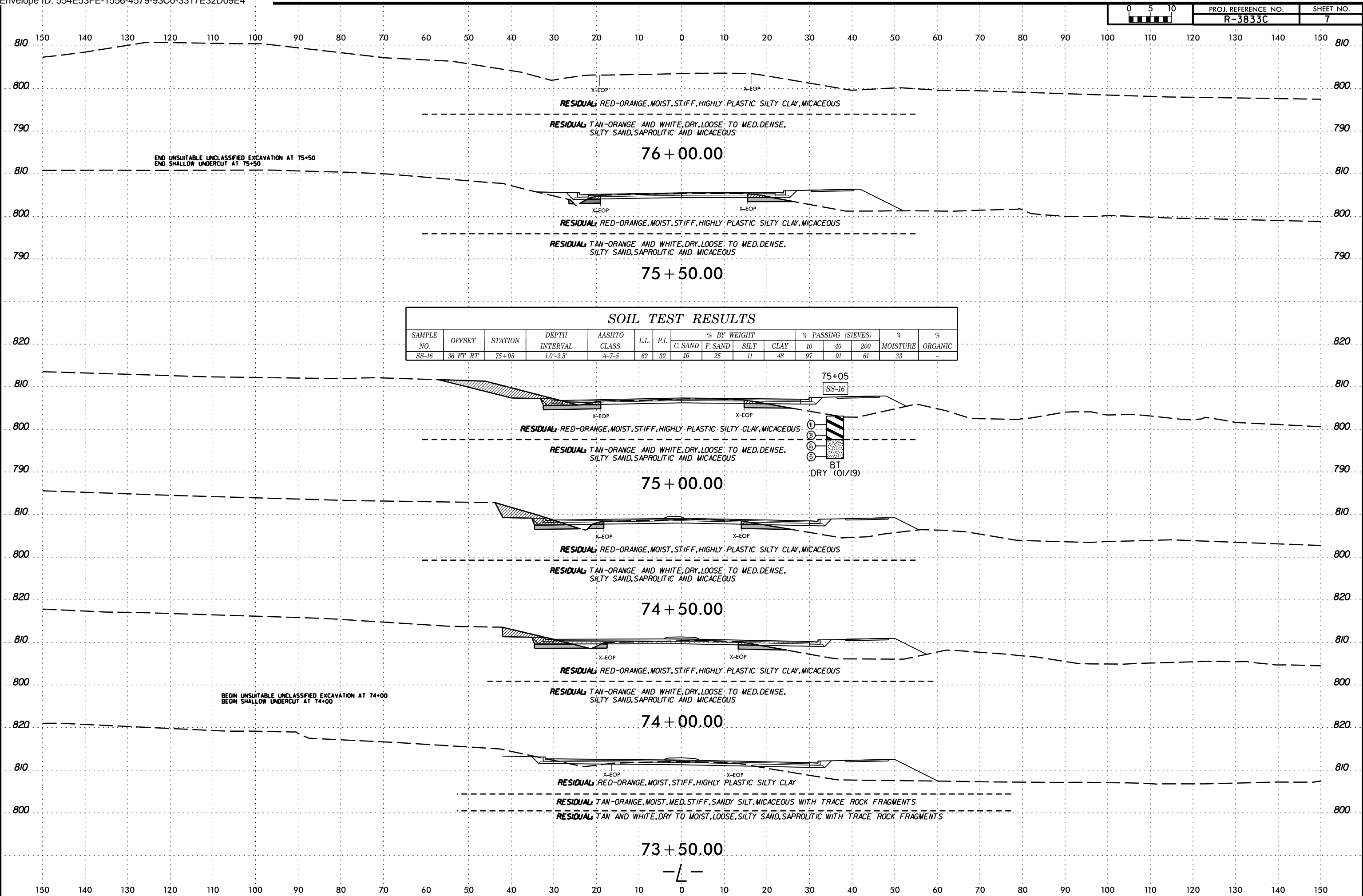
RESIDUAL: RED-ORANGE, MOIST, STIFF, HIGHLY PLASTIC SILTY CLAY

RESIDUAL: RED-ORANGE, MOIST, STIFF, SANDY SILT, MICACEOUS

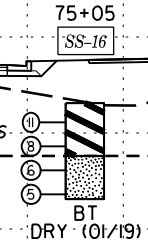
RESIDUAL: TAN-ORANGE, DRY, LOOSE, SILTY SAND, SAPROLITIC AND MICACEOUS WITH TRACE ROCK FRAGMENTS

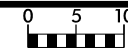


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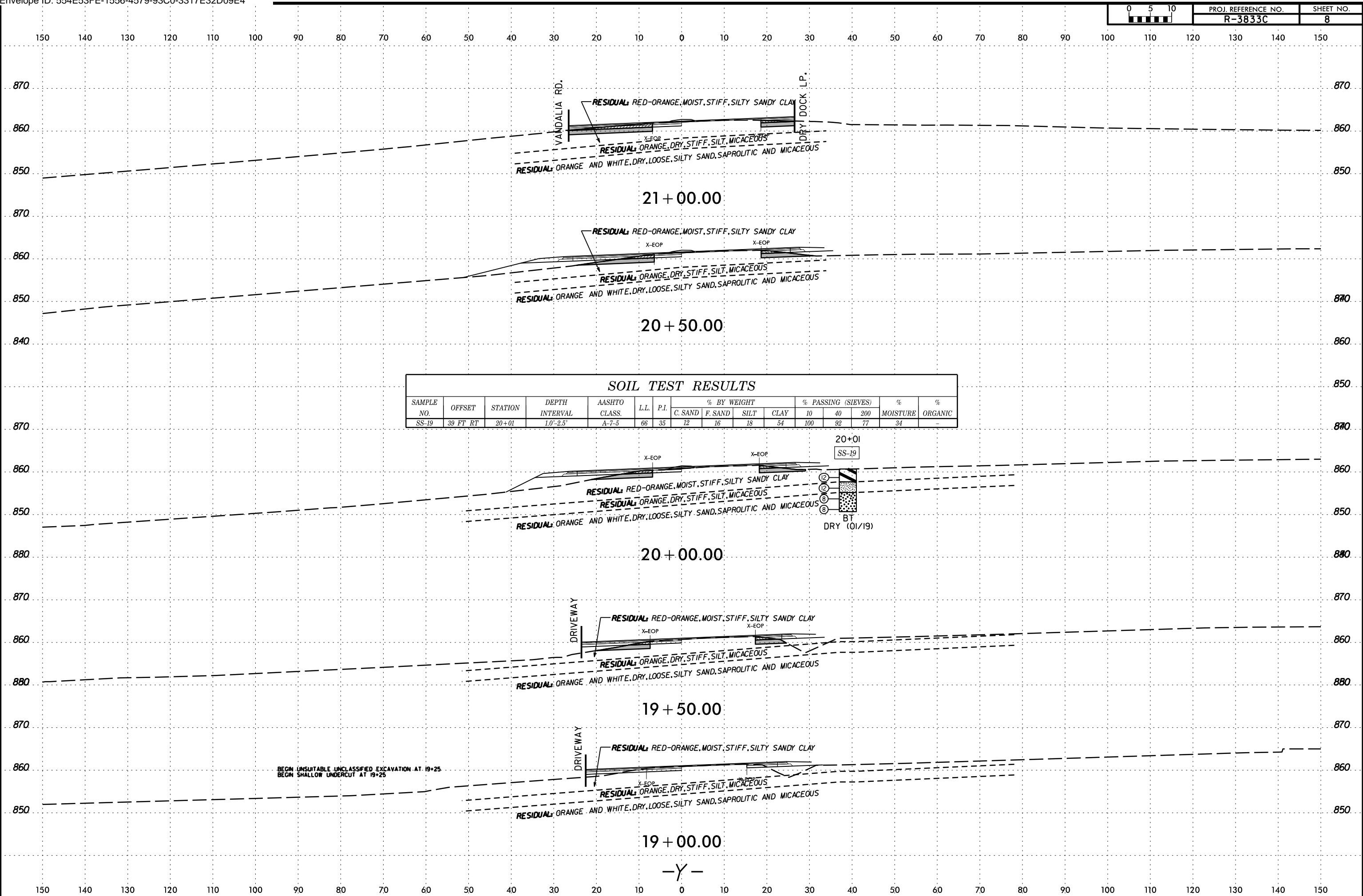


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							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-16	36 FT RT	75+05	1.0'-2.5'	A-7-5	62	32	16	25	11	48	97	91	61	33	-

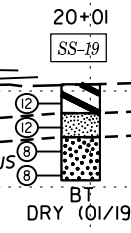




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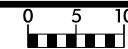


SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-19	39 FT RT	20+01	10'-2.5'	A-7-5	66	35	12	16	18	54	100	92	77	34	-



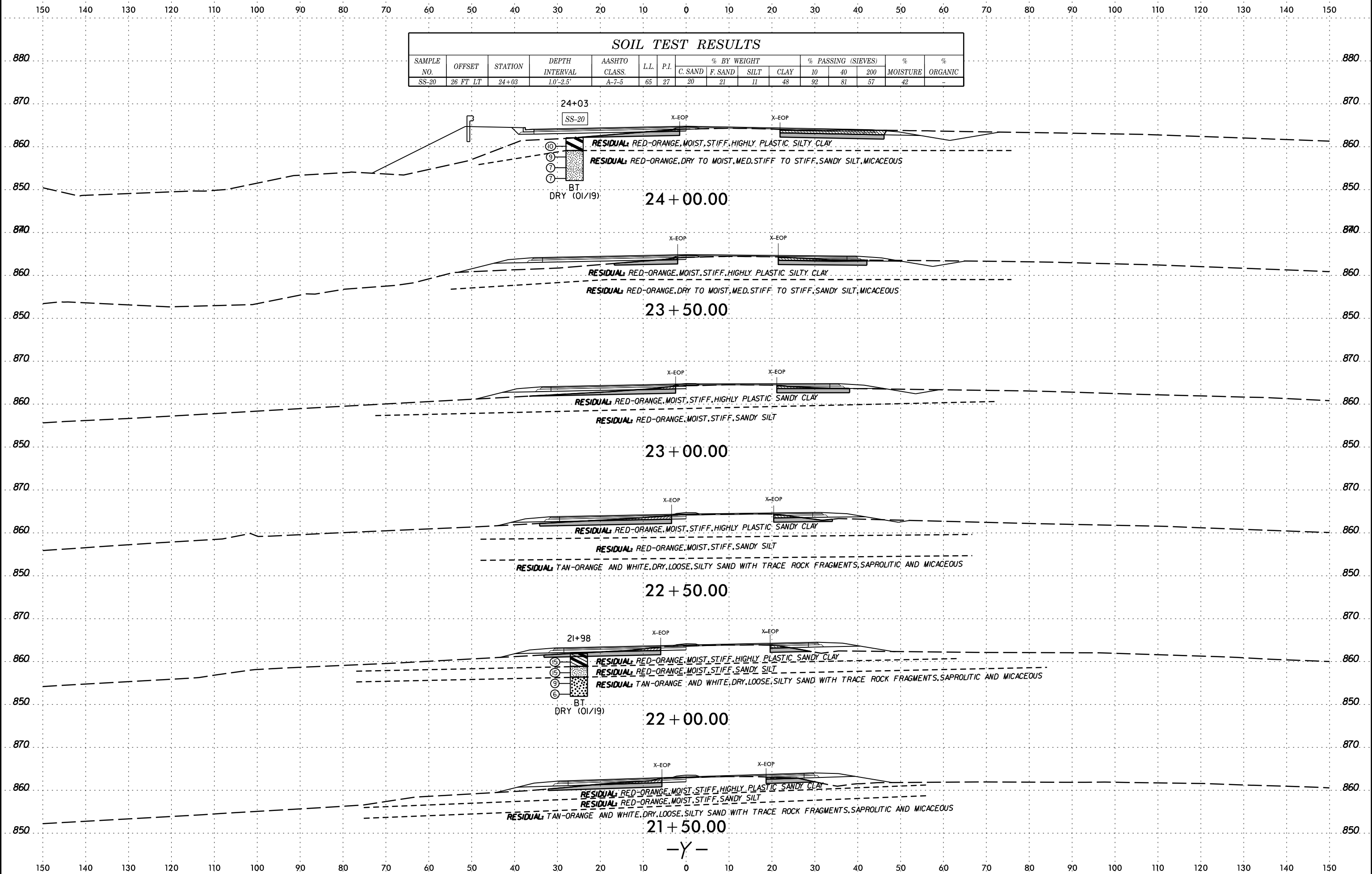
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 BEGIN SHALLOW UNDERCUT AT 19+25

-Y-

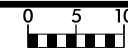


SOIL TEST RESULTS

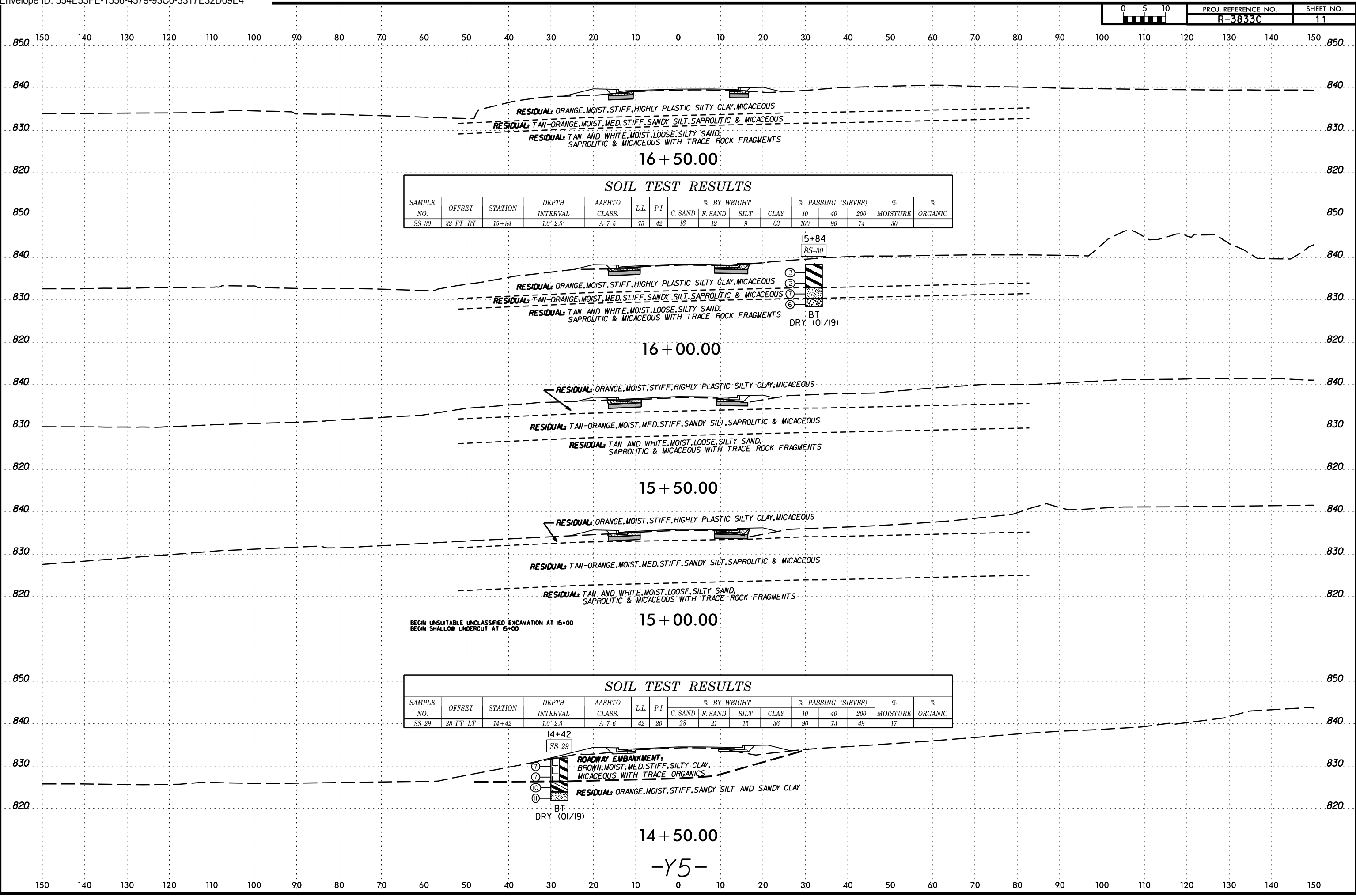
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							C. SAND	F. SAND	SILT	CLAY	10	40			200
SS-20	26 FT LT	24+03	1.0'-2.5'	A-7-5	65	27	20	21	11	48	92	81	57	42	-



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 6/23/16
 cadmachine



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-30	32 FT RT	15+84	1.0'-2.5'	A-7-5	75	42	16	12	9	63	100	90	74	30	-

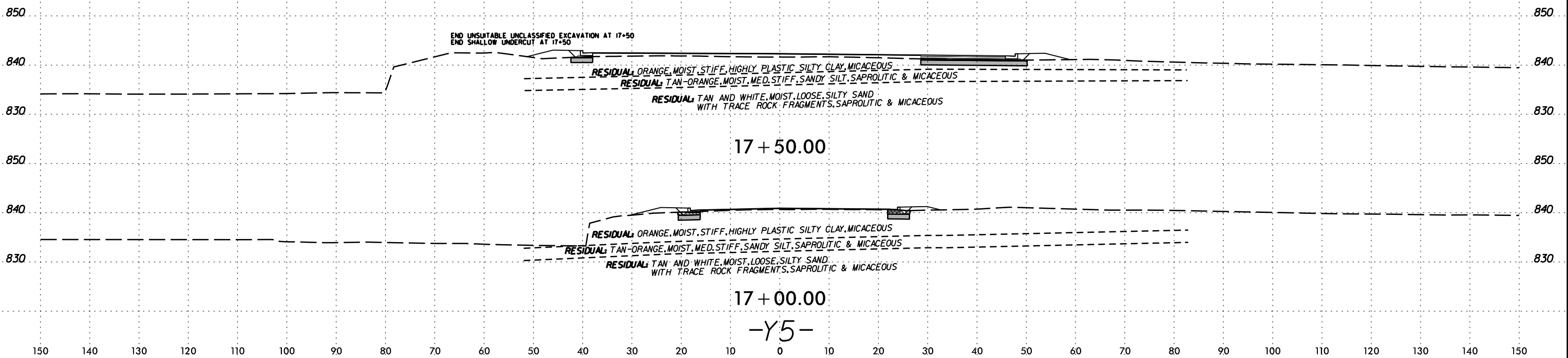
SOIL TEST RESULTS

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-29	28 FT LT	14+42	1.0'-2.5'	A-7-6	42	20	28	21	15	36	90	73	49	17	-

-Y5-



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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