

REFERENCE: HL-0025

PROJECT: 49491

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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

Table with 4 columns: STATE (N.C.), STATE PROJECT REFERENCE NO. (HL-0025), SHEET NO. (1), TOTAL SHEETS (14)

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APPENDICES

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ROADWAY SUBSURFACE INVESTIGATION

COUNTY MECKLENBURG PROJECT DESCRIPTION GREYLOCK RIDGE ROAD EXTENSION FROM E. JOHN STREET TO TANK TOWN ROAD IN MATTHEWS, NC 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.

- 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

CG2 GOODNIGHT, D. J.

INVESTIGATED BY FALCON ENG. DRAWN BY HUNSBERGER, W. S. CHECKED BY CROCKETT, S. C. SUBMITTED BY FALCON ENG. DATE DECEMBER 2023



DocuSigned by: W. Scott Hunsberger 5A469AC80FCD49E... 02/20/2024

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

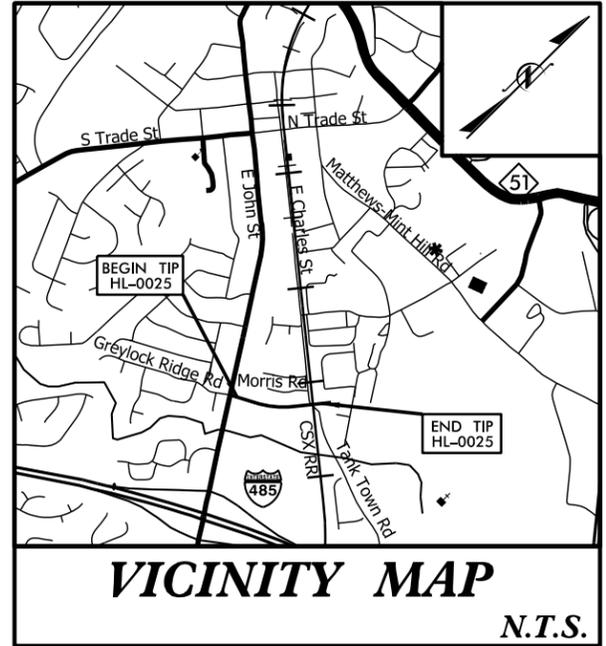
SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																								
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, 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><b>WELL GRADED</b> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. <b>UNIFORMLY GRADED</b> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. <b>GAP-GRADED</b> - 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><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 (ROD)</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 (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. <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 (SROD)</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.</p>																																																																																																																																																																								
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										<b>GROUND WATER</b>										<b>WEATHERING</b>										<b>FRESH</b>																																																																																																																																																																								
										<p>▽ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p>▽ STATIC WATER LEVEL AFTER 24 HOURS</p> <p>▽ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p>○ SPRING OR SEEP</p>										<p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (IV SLI) 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 (SLI) 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 &gt; 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 &lt; 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>										<b>MISCELLANEOUS SYMBOLS</b>										<b>ROCK HARDNESS</b>																																																																																																																																																														
										<p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</p> <p>SOIL SYMBOL</p> <p>ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</p> <p>INFERRED SOIL BOUNDARY</p> <p>INFERRED ROCK LINE</p> <p>ALLUVIAL SOIL BOUNDARY</p> <p>DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</p> <p>SPT TEST BORING</p> <p>AUGER BORING</p> <p>CORE BORING</p> <p>MONITORING WELL</p> <p>PIEZOMETER INSTALLATION</p> <p>SLOPE INDICATOR INSTALLATION</p> <p>CONE PENETROMETER TEST</p> <p>SOUNDING ROD</p> <p>TEST BORING WITH CORE</p> <p>SPT N-VALUE</p>										<b>RECOMMENDATION SYMBOLS</b>										<b>VERY HARD</b>																																																																																																																																																																								
										<p>UNDERCUT</p> <p>SHALLOW UNDERCUT</p> <p>UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE</p> <p>UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> <p>UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p>										<b>VERY HARD</b>										<b>HARD</b>																																																																																																																																																																								
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										<p>AR - AUGER REFUSAL</p> <p>BT - BORING TERMINATED</p> <p>CL - CLAY</p> <p>CPT - CONE PENETRATION TEST</p> <p>CSE - COARSE</p> <p>DMT - DILATOMETER TEST</p> <p>DPT - DYNAMIC PENETRATION TEST</p> <p>e - VOID RATIO</p> <p>F - FINE</p> <p>FOSS. - FOSSILIFEROUS</p> <p>FRAC. - FRACTURED, FRACTURES</p> <p>FRAGS. - FRAGMENTS</p> <p>HI. - HIGHLY</p> <p>MED. - MEDIUM</p> <p>MICA. - MICACEOUS</p> <p>MOD. - MODERATELY</p> <p>NP - NON PLASTIC</p> <p>ORG. - ORGANIC</p> <p>PMT - PRESSUREMETER TEST</p> <p>SAP. - SAPROLITIC</p> <p>SD. - SAND, SANDY</p> <p>SL. - SILT, SILTY</p> <p>SLI. - SLIGHTLY</p> <p>TCR - TRICONE REFUSAL</p> <p>w - MOISTURE CONTENT</p> <p>V - VERY</p> <p>VST - VANE SHEAR TEST</p> <p>WEA. - WEATHERED</p> <p>W - UNIT WEIGHT</p> <p>W<sub>G</sub> - DRY UNIT WEIGHT</p> <p>SAMPLE ABBREVIATIONS</p> <p>S - BULK</p> <p>SS - SPLIT SPOON</p> <p>ST - SHELBY TUBE</p> <p>RS - ROCK</p> <p>RT - RECOMPACTED TRIAXIAL</p> <p>CBR - CALIFORNIA BEARING RATIO</p>										<b>MODERATELY HARD</b>										<b>SOFT</b>																																																																																																																																																																								
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09/28/19

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**CONTRACT:** TIP PROJECT: HL-0025

See Sheet 1A For Index of Sheets  
See Sheet 1B For Conventional Symbols



30% ROADWAY PLANS  
DESIGN RECOMMENDATION PLANSET  
12 / 09 / 2021

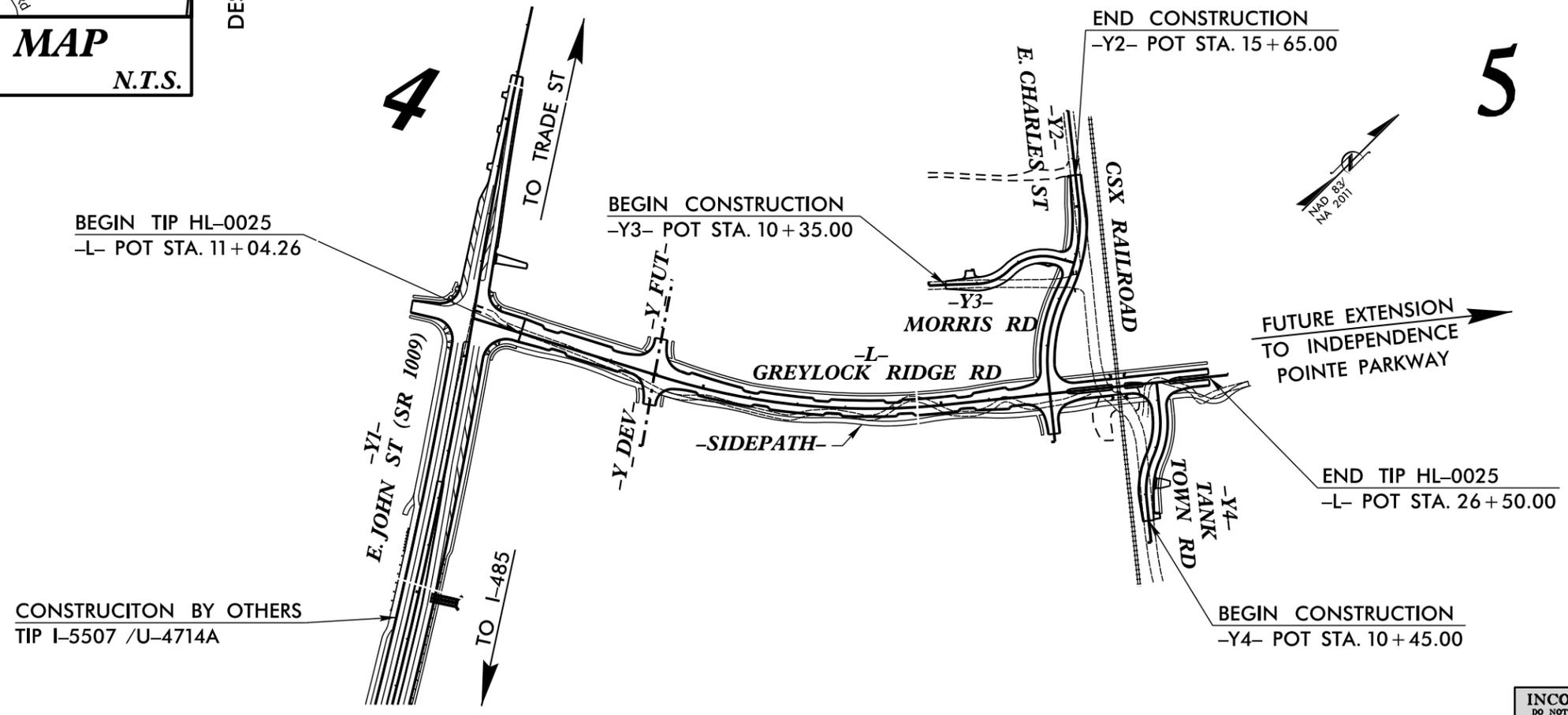
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**MECKLENBURG COUNTY**

LOCATION: GREYLOCK RIDGE ROAD EXTENSION  
FROM E. JOHN ST. TO TANK TOWN  
RD. IN MATTHEWS, NC

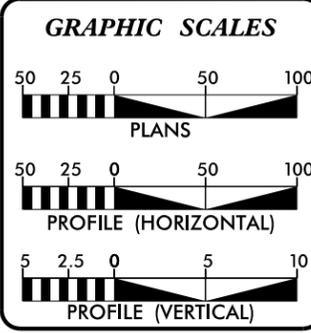
TYPE OF WORK: GRADING, DRAINAGE, AND PAVING

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	HL-0025	3	14
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
49490.1.1		PE	



- NOTES:  
 1. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.  
 2. THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF MATTHEWS.

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



**DESIGN DATA**

ADT 2023 =	9,050
ADT 2040 =	11,600
K =	9 %
D =	55 %
T =	3 % *
V =	30 MPH
* TTST =	1%
DUALS =	2%
FUNC CLASS =	LOCAL
SUB-REGIONAL TIER	

**PROJECT LENGTH**

LENGTH OF ROADWAY TIP PROJECT HL-0025	=	0.293 MILES
TOTAL LENGTH TIP PROJECT HL-0025	=	0.293 MILES

**PLANS PREPARED BY:**

A. MORTON THOMAS AND ASSOCIATES, INC.  
6131 FALLS OF NEUSE ROAD, SUITE 101, RALEIGH, NC 27609  
(919) 855-9989, NC LICENSE NO. P-1049  
WWW.AMTECHENGINEERING.COM

2018 STANDARD SPECIFICATIONS

**RIGHT OF WAY DATE:**  
SEPTEMBER 27, 2022

**LETTING DATE:**  
JULY 17, 2024

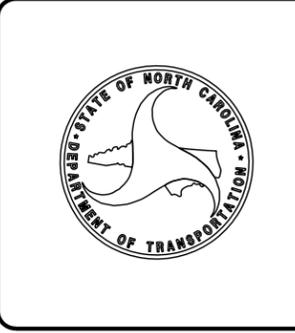
<b>MATTHEW LAMY, P.E.</b> PROJECT ENGINEER
<b>JOCELYN ADORNO, EI</b> PROJECT DESIGN ENGINEER
<b>DONALD GRIFFITH</b> NCDOT CONTACT - DIVISION 10

**HYDRAULICS ENGINEER**

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

**ROADWAY DESIGN ENGINEER**

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





**TIP:** HL-0025  
**WBS No.:** 49491.1.1  
**COUNTY:** Mecklenburg  
**DESCRIPTION:** Greylock Ridge Road Extension from E. John Street to Tank Town Road  
**SUBJECT:** Roadway Subsurface Investigation – Inventory

## Roadway Subsurface Investigation Report - Inventory

**Greylock Ridge Road Extension from E. John Street to Tank Town Road**  
**Mecklenburg County, North Carolina**  
**TIP: HL-0025 WBS: 49491.1.1**  
**Falcon Project No.: G23005.00**

**Prepared for:**  
NCDOT GEU  
1020 Birch Ridge Drive  
Raleigh, NC 27610

Submitted by:  
Falcon Engineering, Inc.  
1210 Trinity Road, Suite 110  
Cary, North Carolina 27513  
(919) 871-0800  
www.falconengineers.com

December 8, 2023

## PROJECT DESCRIPTION

This project consists of 3.2 miles of proposed new grading, realignment, and new roadway construction along Greylock Ridge Road in Mecklenburg County. A portion of Greylock Ridge Road will be extended from E. John Street to Tank Town Road. New tie-ins and minor improvements to Y-lines including new intersections at E. Charles Street and Tank Town Road with Greylock Ridge Road and other small drives are also included.

The investigation was conducted between January 30<sup>th</sup>, and September 30<sup>th</sup>, 2023. The information provided in this report are based solely on our site reconnaissance, soil test borings and laboratory test data, engineering evaluation of these data, and generally accepted soil and foundation engineering practices and principles.

A total of twelve (12) Standard Penetration Test (SPT) borings were performed for the proposed roadway alignments and retaining walls. All mechanical borings were drilled using a Mobil B-29 or CME 550x ATV rig equipped with 2 ¼-inch inside diameter hollow-stem augers, and SPT testing was performed with an automatic hammer. Representative soil samples, collected with a split-barrel sampler, were selected for laboratory testing to verify visual field classifications. In addition, bulk samples were collected for standard Proctor compaction and California Bearing Ratio (CBR) testing.



The following alignments, totaling approximately 0.44 miles were explicitly investigated. Other minor Y-lines and driveways are included on the project but improvements are not anticipated to be significant enough to warrant investigation.

<u>Alignment</u>	<u>Station (ft)</u>
-L- (Graylock Ridge Road)	11+04.26—26+50.00
-Y2- (E. Charles Street)	11+00.00—15+65.00
-Y4- (Tank Town Road)	10+45.00—13+36.85

### AREAS OF SPECIAL GEOTECHNICAL INTEREST

- I. Shallow ground water was not encountered in the areas explored.
- II. Alluvial soils were not encountered in the areas explored. Isolated alluvial soils may exist elsewhere on the site between borings in proximity to natural waterways.
- III. Artificial Fill associated with the existing greenway was encountered at the following location:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	18+01

- IV. Highly plastic soils, with PI of greater than or equal to 26, were encountered at the following locations within 6 feet of the proposed grade:

<u>Alignment</u>	<u>Station (ft)</u>
-L-	13+00 to 17+00
-L-	21+97

### PHYSIOGRAPHY AND GEOLOGY

The project site is in the Inner Piedmont Belt Physiographic Province of North Carolina. According to the **Geologic Map of North Carolina** (1985), the site is underlain by Metamorphosed Quartz Diorite (**PzZG**) – foliated to massive.

Existing site topography is typical of North Carolina's Foothills Region. The Foothills Region is a portion of the Western Piedmont that approaches the Mountain Region. Terrain is typically more rugged than the majority of the Piedmont, but with less overall elevation change than the Mountain Region. Topography along the project is generally rolling, with steeper ravines in the vicinity of streams or existing roadway cuts. The existing ground surface generally grades upward in the upstation direction, with elevations ranging from a high of around 715 feet to a low of around 673 feet.

Existing land use within the project corridor is undeveloped with an existing greenway running the length of the L line. On either side of the project corridor, the land is generally developed with residential areas, with some commercial development to the south of the corridor.

## SOIL PROPERTIES

A variety of soils were encountered along the project, including existing roadway embankments, residual soils, and weathered rock. Areas where soils at the ground surface are of a unique origin (i.e. not residual soils) are approximately delineated on the boring location plans based on subsurface conditions encountered in nearby borings, and various topographical, vegetative, or other visual surface features.

Topsoil and rootmat was encountered in grassy, brushy, and wooded areas ranging in thickness from 0.1 to 0.5 feet, and typically on the order of 0.2 feet.

Artificial Fill soils were encountered at the ground surface adjacent to the existing greenway. These consist of up to 2.0 feet of moist, loose, silty sands (A-2-4) with trace gravel.

Residual soils were encountered at the ground surface, or beneath roadway embankments. These soils consist of moist to wet, loose to dense, clayey and silty sands (A-2-4 and A-2-6) and medium stiff to hard, sandy clay and silt, clayey silt, and silty clays (A-4, A-5, and A-7).

Weathered Rock (WR) is a very hard material with properties intermediate of soil and rock. WR is classified as having an N-value of greater than 100 blows per one foot. WR encountered on the project generally consists of tan metamorphosed quartz diorite. WR was encountered at one location explored at approximately elevation 681.3 ft, msl.

## GROUNDWATER PROPERTIES

Groundwater levels were measured at the time of boring completion, and in many cases after a waiting period of at least 24 hours. Borings drilled within and in close proximity to existing roadways, and within residential or commercial areas likely to see pedestrian traffic were backfilled immediately after completion due to safety considerations.

Groundwater levels across the site were generally deep, with encountered depths greater than 10 feet below ground surface. An existing stream, a tributary to Fourmile Creek, runs parallel to the project corridor, approximately 500-600 feet to the south.

## ADDITIONAL LABORATORY TESTING

The following bulk samples were obtained:

<u>Sample</u>	<u>Location</u>	<u>Depth (ft)</u>	<u>Test</u>
BS-1	12+03, 9' LT, -L-	1.0-8.5	California Bearing Ratio, Standard Proctor
BS-2	20+02, 5' LT, -L-	1.0-8.5	California Bearing Ratio, Standard Proctor

Classification test results for bulk samples are included in the subsurface profiles and cross sections and Standard Proctor and California Bearing Ratio (CBR) data is attached in the Appendix.

## CLOSING

Falcon appreciates the opportunity to have provided our geotechnical engineering services for the above referenced project. If you have any questions concerning the contents of this report or need additional information, please do not hesitate to contact our office.

### FALCON ENGINEERING, INC.

Report Prepared By:



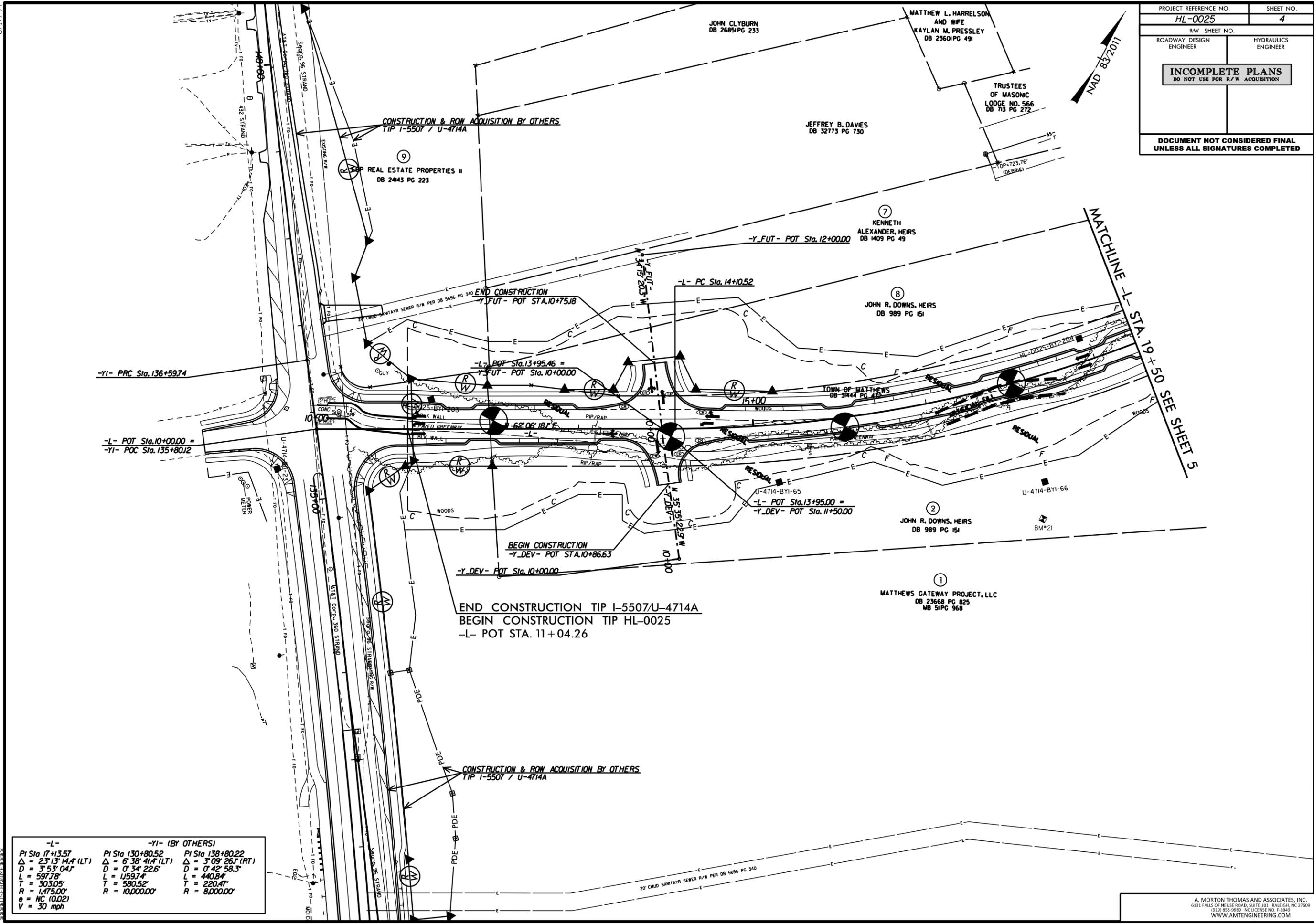
W. Scott Hunsberger, PE  
Geotechnical Engineer

Report Reviewed By:



Jeremy R. Hamm, PE  
Geotechnical Engineering Manager

PROJECT REFERENCE NO. <b>HL-0025</b>	SHEET NO. <b>4</b>
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	



-L-	-YI- (BY OTHERS)	
PI Sta 17+13.57	PI Sta 130+80.52	PI Sta 138+80.22
$\Delta = 23^{\circ}13'14.4"$ (LT)	$\Delta = 6^{\circ}38'41.4"$ (LT)	$\Delta = 3^{\circ}09'26.7"$ (RT)
D = 3'53'04.1"	D = 0'34'22.6"	D = 0'42'58.3"
L = 597.78'	L = 1159.74'	L = 440.84'
T = 303.05'	T = 580.52'	T = 220.47'
R = 1475.00'	R = 10,000.00'	R = 8,000.00'
e = NC (0.02)		
V = 30 mph		

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5/28/99

-L-

### SOIL TEST RESULTS

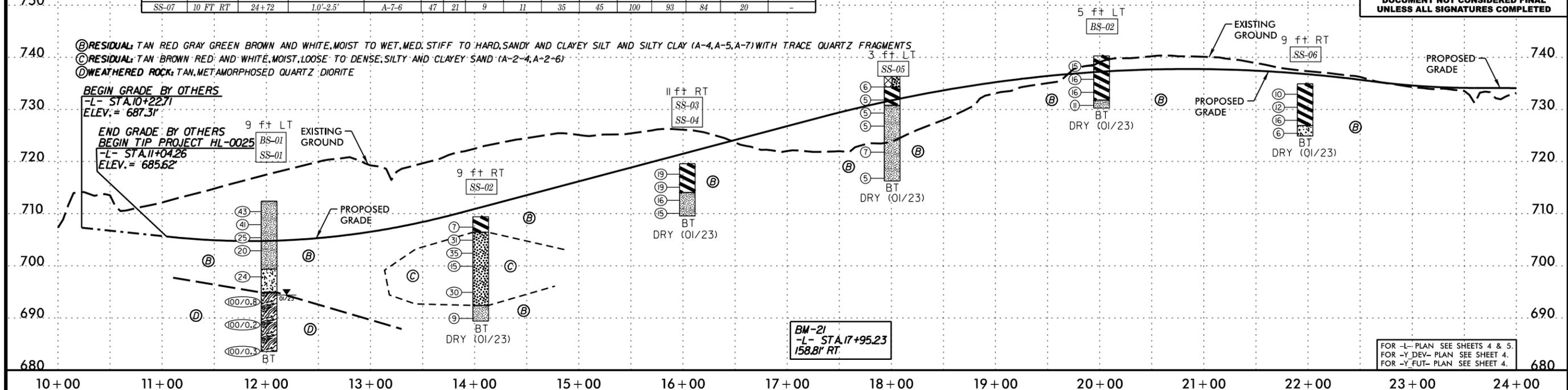
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	LL	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
BS-01	9 FT LT	12+03	1.0'-8.5'	A-4	25	4	17	22	42	19	97	87	65	11	-
SS-01	9 FT LT	12+03	13.5'-15.0'	A-5	41	4	8	21	58	13	96	91	75	18	-
SS-02	9 FT RT	14+06	1.0'-2.5'	A-7-6	53	26	6	13	32	49	99	95	86	24	-
SS-03	11 FT RT	16+04	1.0'-2.5'	A-7-5	67	26	1	6	38	55	99	99	95	34	-
SS-04	11 FT RT	16+04	3.5'-5.0'	A-7-5	57	14	3	14	50	33	100	98	89	39	-
SS-05	3 FT LT	18+01	3.5'-5.0'	A-7-5	70	24	5	9	35	51	100	98	99	50	-
BS-02	5 FT LT	20+02	1.0'-8.5'	A-7-5	51	15	8	7	40	45	99	93	86	23	-
SS-06	9 FT RT	21+97	1.0'-2.5'	A-7-5	58	26	11	9	27	53	99	91	83	24	-
SS-07	10 FT RT	24+72	1.0'-2.5'	A-7-6	47	21	9	11	35	45	100	93	84	20	-

PROJECT REFERENCE NO. <b>HL-0025</b>	SHEET NO. <b>6</b>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	

ⓑ **RESIDUAL:** TAN RED GRAY GREEN BROWN AND WHITE, MOIST TO WET, MED. STIFF TO HARD, SANDY AND CLAYEY SILT AND SILTY CLAY (A-4, A-5, A-7) WITH TRACE QUARTZ FRAGMENTS  
 ⓒ **RESIDUAL:** TAN BROWN RED AND WHITE, MOIST, LOOSE TO DENSE, SILTY AND CLAYEY SAND (A-2-4, A-2-6)  
 ⓓ **WEATHERED ROCK:** TAN, METAMORPHOSED QUARTZ DIORITE

**BEGIN GRADE BY OTHERS**  
 -L- STA. 10+22.71  
 ELEV. = 687.31'

**END GRADE BY OTHERS**  
**BEGIN TIP PROJECT HL-0025**  
 -L- STA. 11+04.26  
 ELEV. = 685.62'

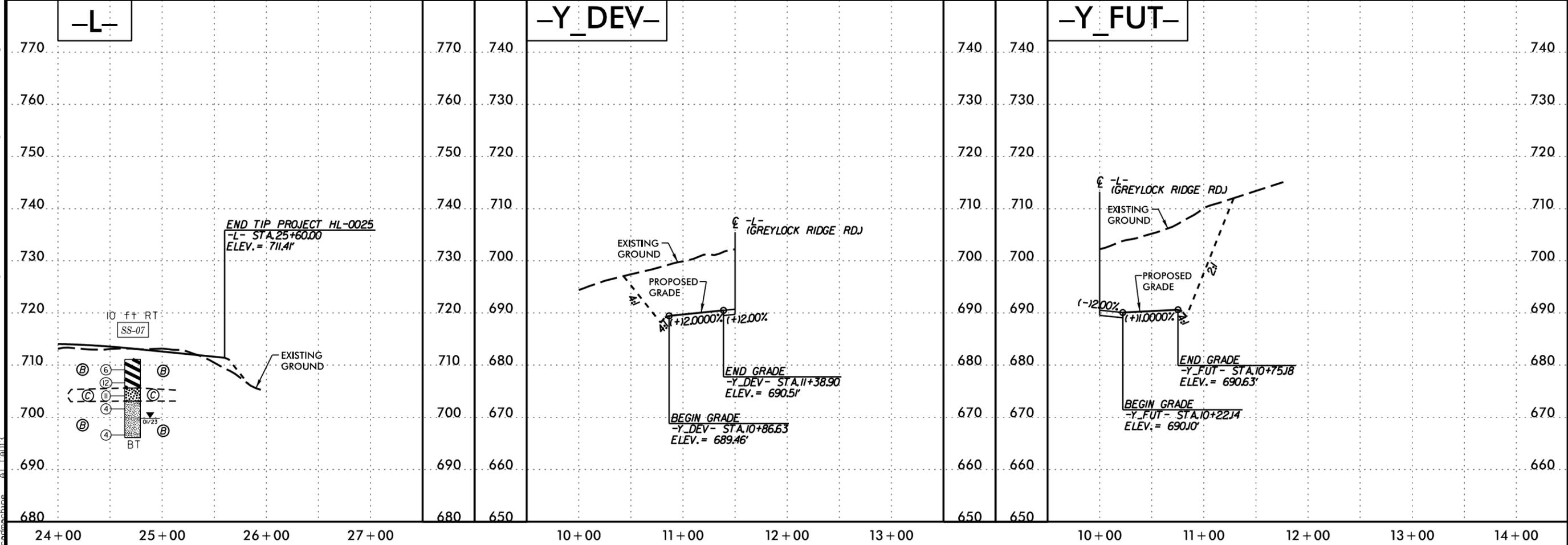


FOR -L- PLAN SEE SHEETS 4 & 5.  
 FOR -Y\_DEV- PLAN SEE SHEET 4.  
 FOR -Y\_FUT- PLAN SEE SHEET 4.

-L-

-Y\_DEV-

-Y\_FUT-



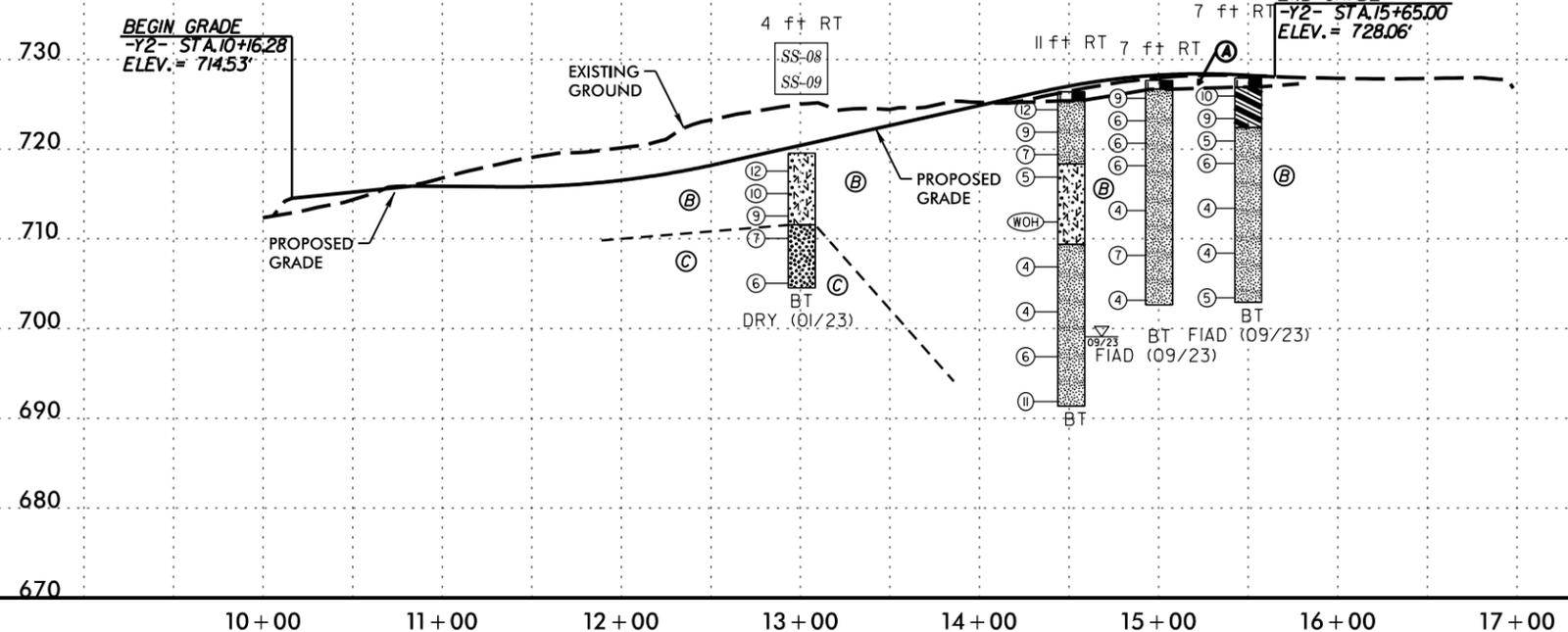
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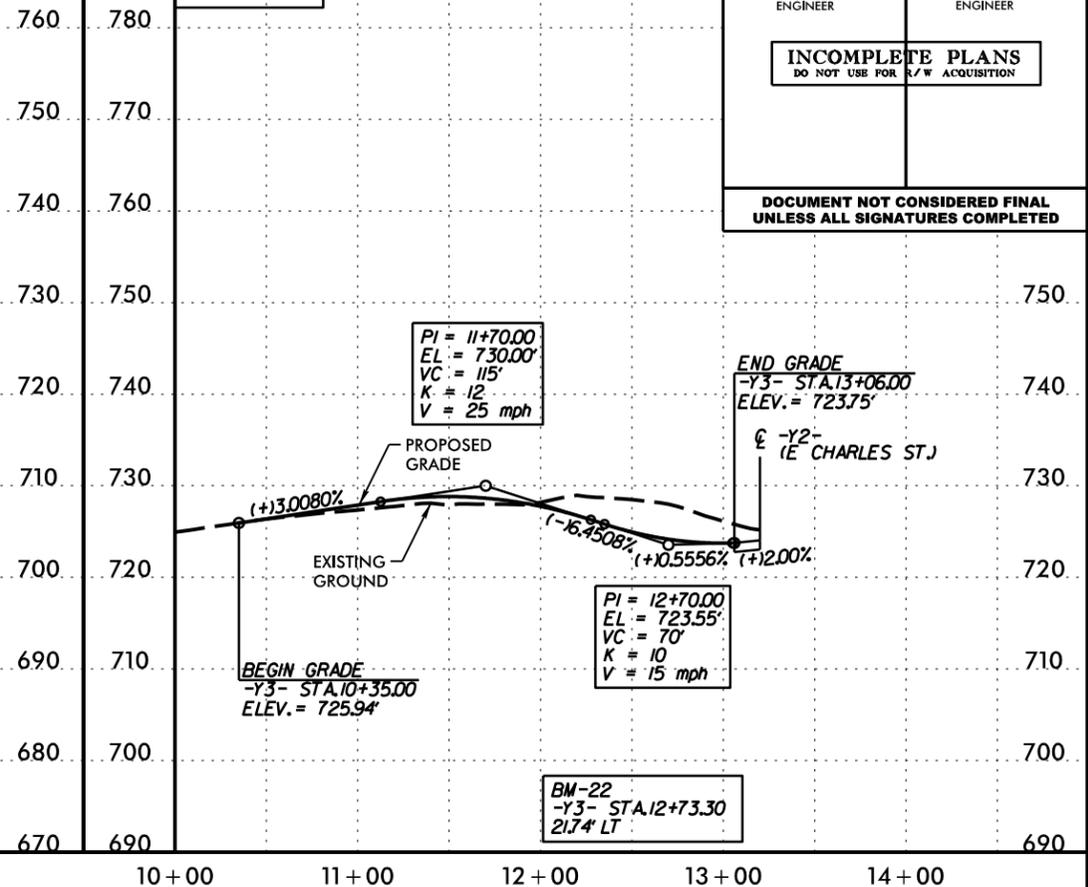
**-Y2-**

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-08	4 FT RT	13+01	1.0'-2.5'	A-5	52	8	22	15	26	37	99	83	67	28	-
SS-09	4 FT RT	13+01	3.5'-5.0'	A-5	48	4	19	14	36	31	100	87	71	26	-

(A) ROADWAY EMBANKMENT; PAVEMENT  
 (B) RESIDUAL: TAN RED GRAY GREEN BROWN AND WHITE, MOIST TO SAT., V. SOFT TO HARD, SANDY AND CLAYEY SILT AND SANDY CLAY (A-4, A-5, A-6) W/ TRACE QUARTZ FRAGMENTS  
 (C) RESIDUAL: TAN BROWN RED AND WHITE, MOIST, LOOSE TO DENSE, SILTY AND CLAYEY SAND (A-2-4, A-2-6)

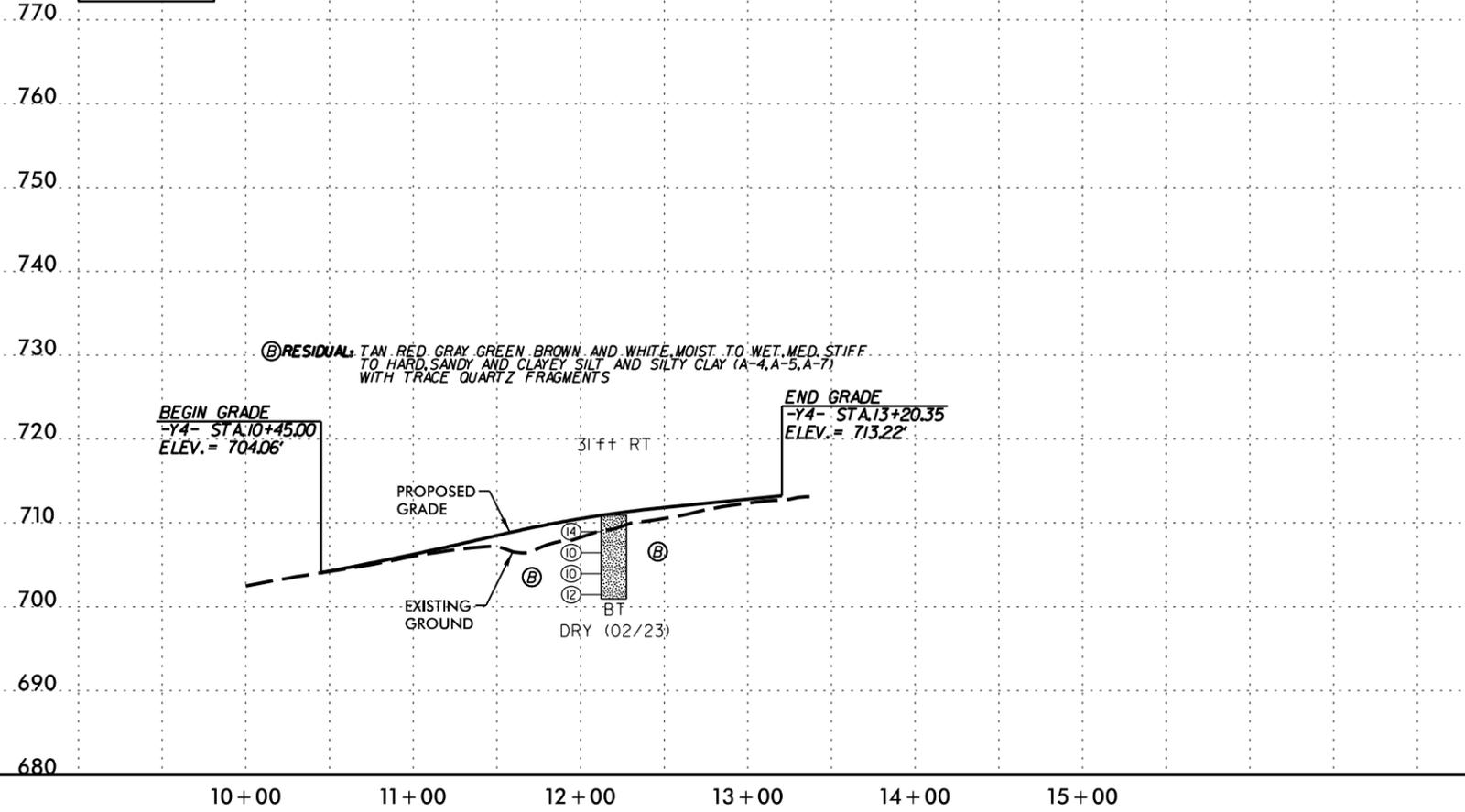


**-Y3-**



PROJECT REFERENCE NO. HL-0025	SHEET NO. 7
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>DOCUMENT NOT CONSIDERED FINAL</b> UNLESS ALL SIGNATURES COMPLETED	

**-Y4-**



FOR -Y2- PLAN SEE SHEET 5.  
 FOR -Y3- PLAN SEE SHEET 5.  
 FOR -Y4- PLAN SEE SHEET 5.

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

REFERENCE: HL-0025

PROJECT: 49491



**LABORATORY TEST RESULTS**  
**Greylock Ridge Road Extension**  
**Mecklenburg County, NC**  
**NCDOT Project: HL-0025**  
**Falcon Engineering Project No: G23005.00**

NO.	SAMPLE LOCATION	DEPTH INTERVAL	AASHTO CLASS.	ATTERBERG LIMITS		PERCENT BY WEIGHT				PERCENT PASSING SIEVE			MOISTURE (%)	BULK DENSITY (pcf)	ORGANICS (%)
				LL	PI	C.SAND	F.SAND	SILT	CLAY	#10	#40	#200			
SS-01	L_1200	13.5-15.0	A-5(5)	41	4	8	21	58	13	96	91	75	18	N/A	N/A
SS-02	L_1400	1.0-2.5	A-7-6(25)	53	26	6	13	32	49	99	95	86	24	N/A	N/A
SS-03	L_1600	1.0-2.5	A-7-5(33)	67	26	1	6	38	55	99	99	95	34	N/A	N/A
SS-04	L_1600	3.5-5.0	A-7-5(18)	57	14	3	14	50	33	100	98	89	39	N/A	N/A
SS-05	L_1800	3.5-5.0	A-7-5(29)	70	24	5	9	35	51	100	98	89	50	N/A	N/A
SS-06	L_2200	1.0-2.5	A-7-5(25)	58	26	11	9	27	53	99	91	83	24	N/A	N/A
SS-07	L_2450	1.0-2.5	A-7-6(19)	47	21	9	11	35	45	100	93	84	20	N/A	N/A
SS-08	Y2_1300	1.0-2.5	A-5(7)	52	8	22	15	26	37	99	83	67	28	N/A	N/A
SS-09	Y2_1300	3.5-5.0	A-5(5)	48	4	19	14	36	31	100	87	71	26	N/A	N/A

**Reviewed By**



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### CALIFORNIA BEARING RATIO TEST RESULTS

ASTM D1883 / AASHTO T193



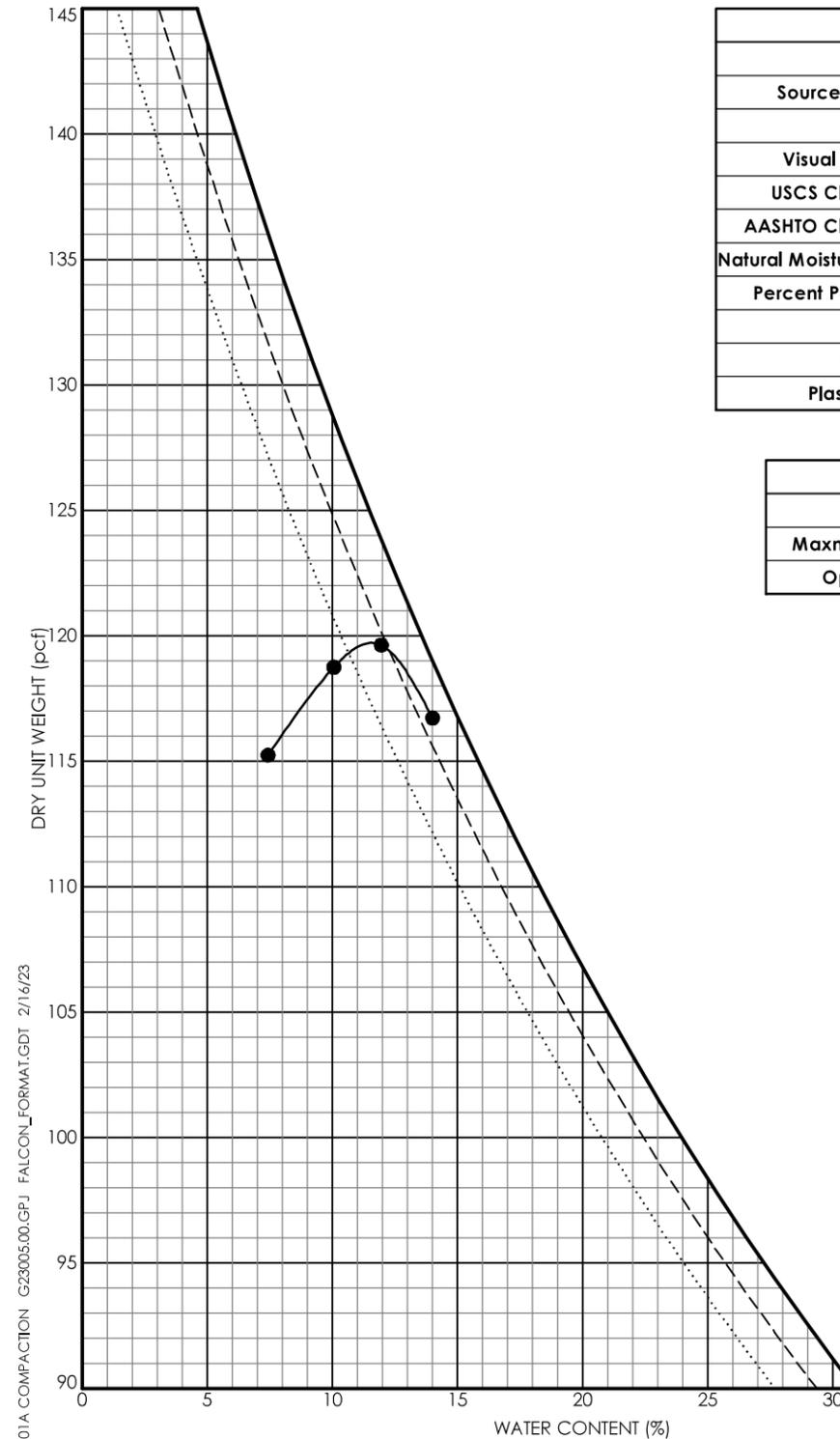
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### LABORATORY COMPACTION TEST RESULTS

Project No.: G23005.00  
Project Name: HL-0025 | Greylock Ridge Road Extension  
Project Location: Mecklenburg County, NC

Project No.: G23005.00		Tested By: J. Grabner		Test Date: 2023-16-02		
Project Name: HL-0025   Greylock Ridge Road Extension						
Boring ID: L_1200		Sample ID: BS-01		Sample Depth: 1.0-8.5 ft		
MOLDED SPECIMEN TEST DATA						
Wt. of Mold + Wet Soil:	20950 g	Moisture Content Before Molding	After Molding	Max. Dry Unit Weight:	119.7 pcf	
Wt. of Mold:	16495 g	Tare Wt.:	6.40 g	Optimum Moisture Content:	11.6%	
Wt. of Wet Soil:	4455 g	Wt. Tare + Wet Soil:	275.10 g	Percent Compaction:	98.1%	
Mold Volume:	0.0750 cf	Wt. Tare + Dry Soil:	247.50 g	Compaction Method:	698C	
Wet Unit Weight:	130.9 pcf	Moisture Content:	11.5%	Conversion Factors 1 lb = 453.6 gram    1 cu. foot = 1728 cu. inch		
Dry Unit Weight:	117.4 pcf	Average Moisture Content:	11.5%			
LOAD TEST DATA						
Penetration (in)	Load (lb)	Stress (psi)	Piston Calibration			
0.000	0	0.0	Strain Rate: 0.05 inch/minute			
0.025	68	22.7	Piston Diameter: 1.954 inch			
0.050	189	63.0	Piston Area: 2.999 sq. inch			
0.075	326	108.7	Swell Readings			
0.100	428	142.7	Soak Time: 96 hours			
0.125	516	172.1	Surcharge Weight: 10 lb			
0.150	585	195.1	Surcharge Stress: 51 psf			
0.175	642	214.1	Molded Sample Height: 4.584 inch			
0.200	702	234.1	Initial Dial Reading: 0.050 inch			
0.225	760	253.4	Final Dial Reading: 0.086 inch			
0.250	812	270.8	Percent Swell: 0.79%			
0.275	871	290.5	Additional Specimen Data			
0.300	915	305.1	Liquid Limit:	25	Percent Passing #4:	100%
0.400	1116	372.2	Plastic Limit:	21	Percent Passing #10:	97%
0.500	1311	437.2	Plasticity Index:	4	Percent Passing #40:	87%
Readings After Soak		Color: Yellowish Brown				
Wt. Mold + Soaked Soil:	21072.00 g	Visual Description:				
Wt. Tare:	206.70 g	USCS Classification: SANDY SILTY CLAY (CL-ML)				
Wt. Wet Soil + Tare:	450.40 g	AASHTO Classification: A-4 (6)				
Wt. Tare + Dry Soil:	417.30 g	BEARING RATIO				
Moisture Content:	15.7%	CBR at 0.1 inch: 16.0				
Wet Unit Weight:	134.5 pcf	CBR at 0.2 inch: 16.4				
Dry Unit Weight:	116.2 pcf					



SPECIMEN DATA	
Sample No:	BS-01
Source of Material:	L_1200
Color:	Yellowish Brown
Visual Description:	
USCS Classification:	SANDY SILTY CLAY (CL-ML)
AASHTO Classification:	A-4
Natural Moisture Content:	10.8 %
Percent Passing #200:	65.0 %
Liquid Limit:	25
Plastic Limit:	21
Plasticity Index:	4

TEST RESULTS	
Test Method:	AASHTO T-99
Maximum Dry Unit Weight:	119.7 pcf
Optimum Water Content:	11.6 %

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**CALIFORNIA BEARING RATIO TEST RESULTS**  
ASTM D1883 / AASHTO T193



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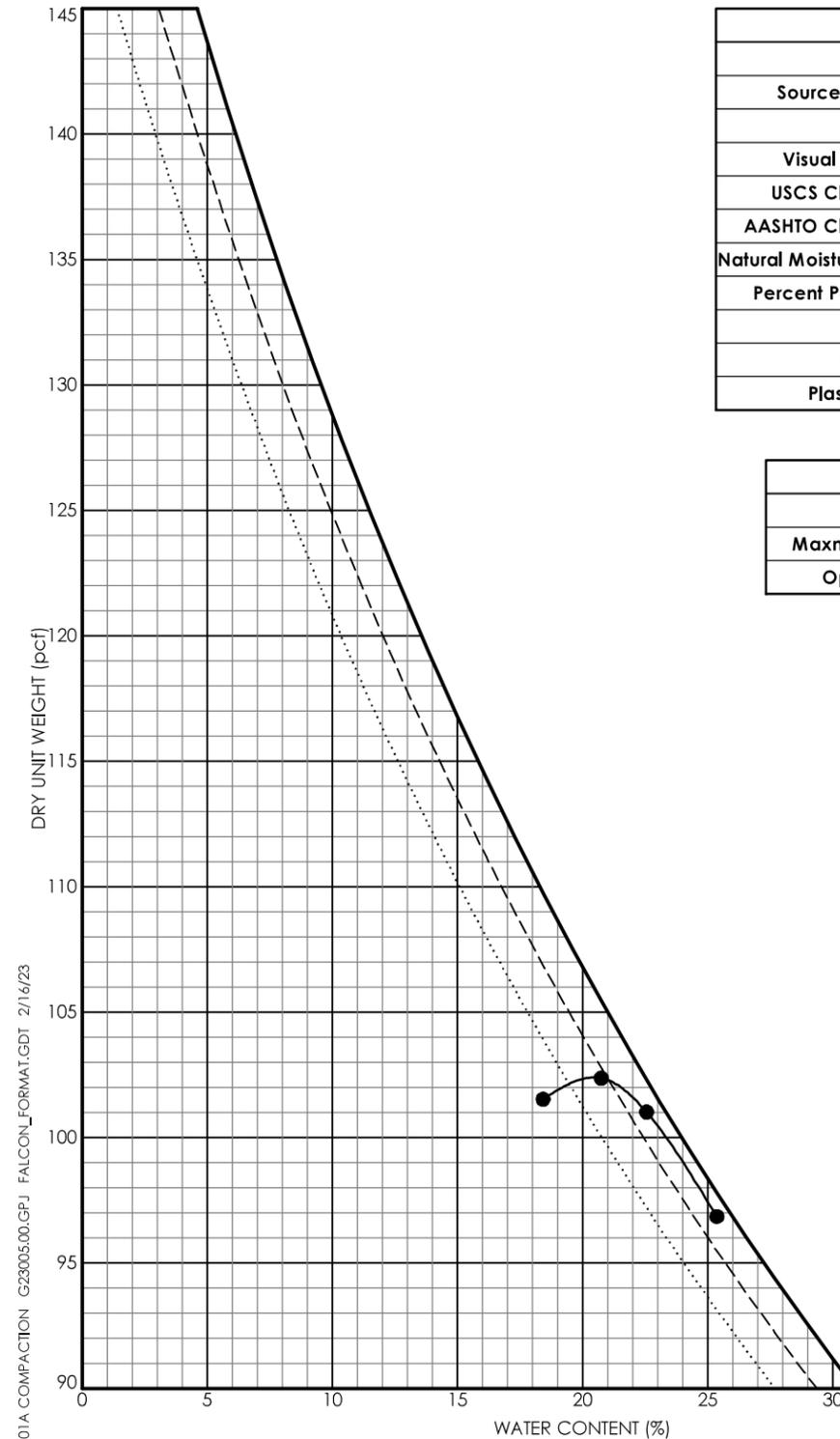
PHONE: 919.871.0800  
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**LABORATORY COMPACTION TEST RESULTS**

Project No.: G23005.00  
Project Name: HL-0025 | Greylock Ridge Road Extension  
Project Location: Mecklenburg County, NC

Project No.: G23005.00		Tested By: J. Grabner		Test Date: 2023-16-02	
Project Name: HL-0025   Greylock Ridge Road Extension					
Boring ID: L_2000		Sample ID: BS-02		Sample Depth: 1.0-8.5 ft	
MOLDED SPECIMEN TEST DATA					
Wt. of Mold + Wet Soil:	20575 g	Moisture Content Before Molding	After Molding	Max. Dry Unit Weight: 102.4 pcf	
Wt. of Mold:	16465 g	Tare Wt.:	6.30 g    6.40 g	Optimum Moisture Content: 20.5%	
Wt. of Wet Soil:	4110 g	Wt. Tare + Wet Soil:	401.50 g    306.30 g	Percent Compaction: 98.0%	
Mold Volume:	0.0749 cf	Wt. Tare + Dry Soil:	334.30 g    255.20 g	Compaction Method: 698C	
Wet Unit Weight:	121.0 pcf	Moisture Content:	20.5%    20.5%	Conversion Factors	
Dry Unit Weight:	100.4 pcf	Average Moisture Content:	20.5%	1 lb = 453.6 gram    1 cu. foot = 1728 cu. inch	
LOAD TEST DATA					
Penetration (in)	Load (lb)	Stress (psi)	Piston Calibration		
0.000	0	0.0	Strain Rate: 0.05 inch/minute		
0.025	53	17.7	Piston Diameter: 1.954 inch		
0.050	93	31.0	Piston Area: 2.999 sq. inch		
0.075	130	43.4	Swell Readings		
0.100	162	54.0	Soak Time: 96 hours		
0.125	187	62.4	Surcharge Weight: 10 lb		
0.150	208	69.4	Surcharge Stress: 51 psf		
0.175	228	76.0	Molded Sample Height: 4.579 inch		
0.200	245	81.7	Initial Dial Reading: 0.050 inch		
0.225	265	88.4	Final Dial Reading: 0.144 inch		
0.250	280	93.4	Percent Swell: 2.05%		
0.275	297	99.0	Additional Specimen Data		
0.300	313	104.4	Liquid Limit: 51    Percent Passing #4: 100%		
0.400	378	126.1	Plastic Limit: 36    Percent Passing #10: 99%		
0.500	441	147.1	Plasticity Index: 15    Percent Passing #40: 93%		
Readings After Soak		Additional Specimen Data			
Wt. Mold + Soaked Soil:	20713.00 g	Liquid Limit: 51    Percent Passing #4: 100%			
Wt. Tare:	184.90 g	Plastic Limit: 36    Percent Passing #10: 99%			
Wt. Wet Soil + Tare:	419.70 g	Plasticity Index: 15    Percent Passing #40: 93%			
Wt. Tare + Dry Soil:	367.90 g	Percent Passing #200: 86.1%			
Moisture Content:	28.3%	Color: Brownish Red			
Wet Unit Weight:	125.0 pcf	Visual Description:			
Dry Unit Weight:	97.4 pcf	USCS Classification: ELASTIC SILT (MH)			
BEARING RATIO		AASHTO Classification: A-7-5 (12)			
CBR at 0.1 inch: 5.4					
CBR at 0.2 inch: 5.4					

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SPECIMEN DATA	
Sample No:	BS-02
Source of Material:	L_2000
Color:	Brownish Red
Visual Description:	
USCS Classification:	ELASTIC SILT(MH)
AASHTO Classification:	A-7-5
Natural Moisture Content:	23.3 %
Percent Passing #200:	86.1 %
Liquid Limit:	51
Plastic Limit:	36
Plasticity Index:	15

TEST RESULTS	
Test Method:	AASHTO T-99
Maximum Dry Unit Weight:	102.4 pcf
Optimum Water Content:	20.5 %