

REFERENCE: BR-0093

PROJECT: 67093

SEE SHEET 3A FOR PLAN SHEET LAYOUT  
AT TIME OF INVESTIGATION

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

**ROADWAY**  
**SUBSURFACE INVESTIGATION**

COUNTY ROCKINGHAM  
PROJECT DESCRIPTION REPLACE BRIDGE 780035  
ON NC 770 OVER MAYO RIVER  
**INVENTORY**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0093	1	12

**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 PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

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

PERSONNEL

J. HOLLAND

J. ROSE

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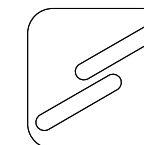
INVESTIGATED BY J. HOLLAND

DRAWN BY J. HOLLAND

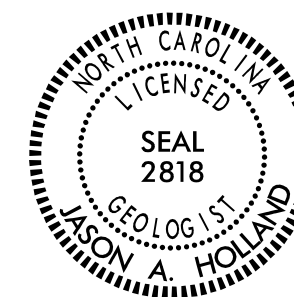
CHECKED BY J. CRENSHAW

SUBMITTED BY SCHNABEL ENG.

DATE DECEMBER 2022



**Schnabel**  
ENGINEERING



DocuSigned by:  
Jason Holland 02/28/2023  
DF-15142D0C8348A...  
SIGNATURE DATE

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

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

# SUBSURFACE INVESTIGATION

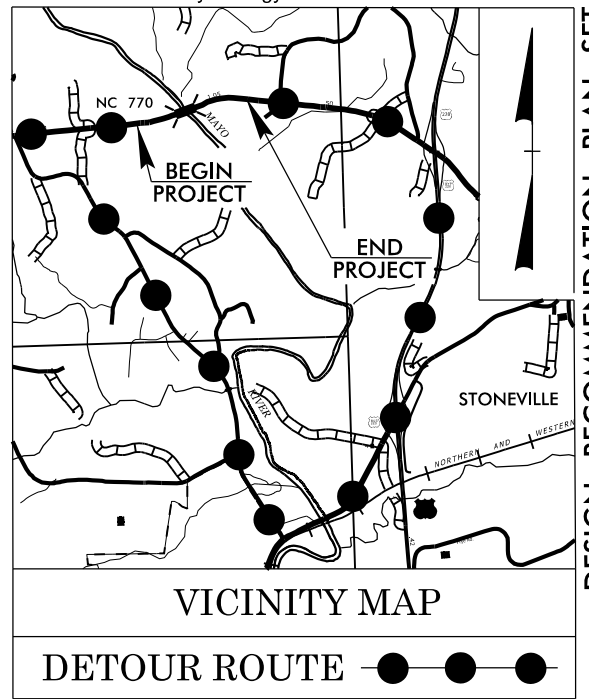
## SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																																																																																																																																													
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:										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.																																																																																																																																																																																																																																																													
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GRAVEL, AND SAND</td> <td>FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="2">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="2">HIGHLY ORGANIC SOILS</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td colspan="2">GEN. RATING AS SUBGRADE</td> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td>UNSATURABLE</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> </tr> <tr> <td colspan="2"></td> <td colspan="4">PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS &gt; LL - 30</td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2"></td> </tr> </table>										GENERAL CLASS.		GRANULAR MATERIALS (<= 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS				GROUP CLASS.	SYMBOL	A-1	A-3	A-2	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-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				SYMBOL		GRANULAR SOILS		SILT-CLAY SOILS		MUCK, PEAT												% PASSING #10 #40 #200		50 MX	30 MX	15 MX	25 MX	50 MX	10 MN	35 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			MATERIAL PASSING #40 LL PI		-	-	6 MX	NP	40 MX	41 MN	10 MX	10 MN	11 MN	11 MN	11 MN	11 MN	11 MN	11 MN	11 MN			GROUP INDEX		0	0	0	0	4 MX	8 MX	12 MX	16 MX	NO MX									USUAL TYPES OF MAJOR MATERIALS		STONE FRAGS. GRAVEL, AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS								GEN. RATING AS SUBGRADE		EXCELLENT TO GOOD				FAIR TO POOR				FAIR TO POOR	POOR	UNSATURABLE											PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30																				<p style="text-align: center;"><b>ANGULARITY OF GRAINS</b></p> <p style="text-align: center;">THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p> <p style="text-align: center;"><b>MINERALOGICAL COMPOSITION</b></p> <p style="text-align: center;">MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p style="text-align: center;"><b>COMPRESSIBILITY</b></p> <p style="text-align: center;">SLIGHTLY COMPRESSIBLE LL &lt; 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL &gt; 50</p> <p style="text-align: center;"><b>PERCENTAGE OF MATERIAL</b></p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT - CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE 1 - 10%</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE 10 - 20%</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME 20 - 35%</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>&gt; 10%</td> <td>&gt; 20%</td> <td>HIGHLY 35% AND ABOVE</td> </tr> </table> <p style="text-align: center;"><b>GROUND WATER</b></p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING</p> <p> STATIC WATER LEVEL AFTER 24 HOURS</p> <p> PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA</p> <p> SPRING OR SEEP</p> <p style="text-align: center;"><b>MISCELLANEOUS SYMBOLS</b></p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <tr> <td> ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION</td> <td> DIP &amp; DIP DIRECTION OF ROCK STRUCTURES</td> <td> SOIL SYMBOL</td> <td> TEST BORING</td> <td> SLOPE INDICATOR INSTALLATION</td> </tr> <tr> <td> ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT</td> <td> AUGER BORING</td> <td> INFERRED SOIL BOUNDARY</td> <td> CORE BORING</td> <td> CONE PENETROMETER TEST</td> </tr> <tr> <td> INFERRED ROCK LINE</td> <td> MONITORING WELL</td> <td> PIEZOMETER INSTALLATION</td> <td> SOUNDING ROD</td> <td> TEST BORING WITH CORE</td> </tr> <tr> <td> ALLUVIAL SOIL BOUNDARY</td> <td> SPT N-VALUE</td> <td colspan="3"></td> </tr> </table>										ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE 1 - 10%	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE 10 - 20%	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME 20 - 35%	HIGHLY ORGANIC	> 10%	> 20%	HIGHLY 35% AND ABOVE	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION	DIP & DIP DIRECTION OF ROCK STRUCTURES	SOIL SYMBOL	TEST BORING	SLOPE INDICATOR INSTALLATION	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT	AUGER BORING	INFERRED SOIL BOUNDARY	CORE BORING	CONE PENETROMETER TEST	INFERRED ROCK LINE	MONITORING WELL	PIEZOMETER INSTALLATION	SOUNDING ROD	TEST BORING WITH CORE	ALLUVIAL SOIL BOUNDARY	SPT N-VALUE				<p style="text-align: center;"><b>WEATHERING</b></p> <p>FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V 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, IF TESTED, WOULD YIELD SPT REFUSAL</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, IF TESTED, WOULD YIELD SPT N VALUES &gt; 100 BPF</p> <p>VERY SEVERE (V 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, IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</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> <p style="text-align: center;"><b>ROCK HARDNESS</b></p> <p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.</p> <p>MEDIUM HARD CAN BE GROUDED OR GOUGED 0.25 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT, CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.</p> <p>VERY SOFT CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGER NAIL.</p> <p style="text-align: center;"><b>FRACTURE SPACING</b></p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>&lt; 0.008 FEET</td> </tr> </table> <p style="text-align: center;"><b>BEDDING</b></p> <p style="text-align: center;">BENCH MARK: SEE NOTE BELOW</p> <p style="text-align: right;">ELEVATION: FEET</p> <p style="text-align: center;"><b>INDURATION</b></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>										TERM	SPACING	TERM	THICKNESS	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET	WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET	MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET	VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET			THINLY LAMINATED	< 0.008 FEET
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09/08/99

CONTRACT: TIP PROJECT: BR-0093

See Sheet 1A For Index of Sheets  
See Sheet 1B For Symbology Sheet



DESIGN RECOMMENDATION PLAN SET

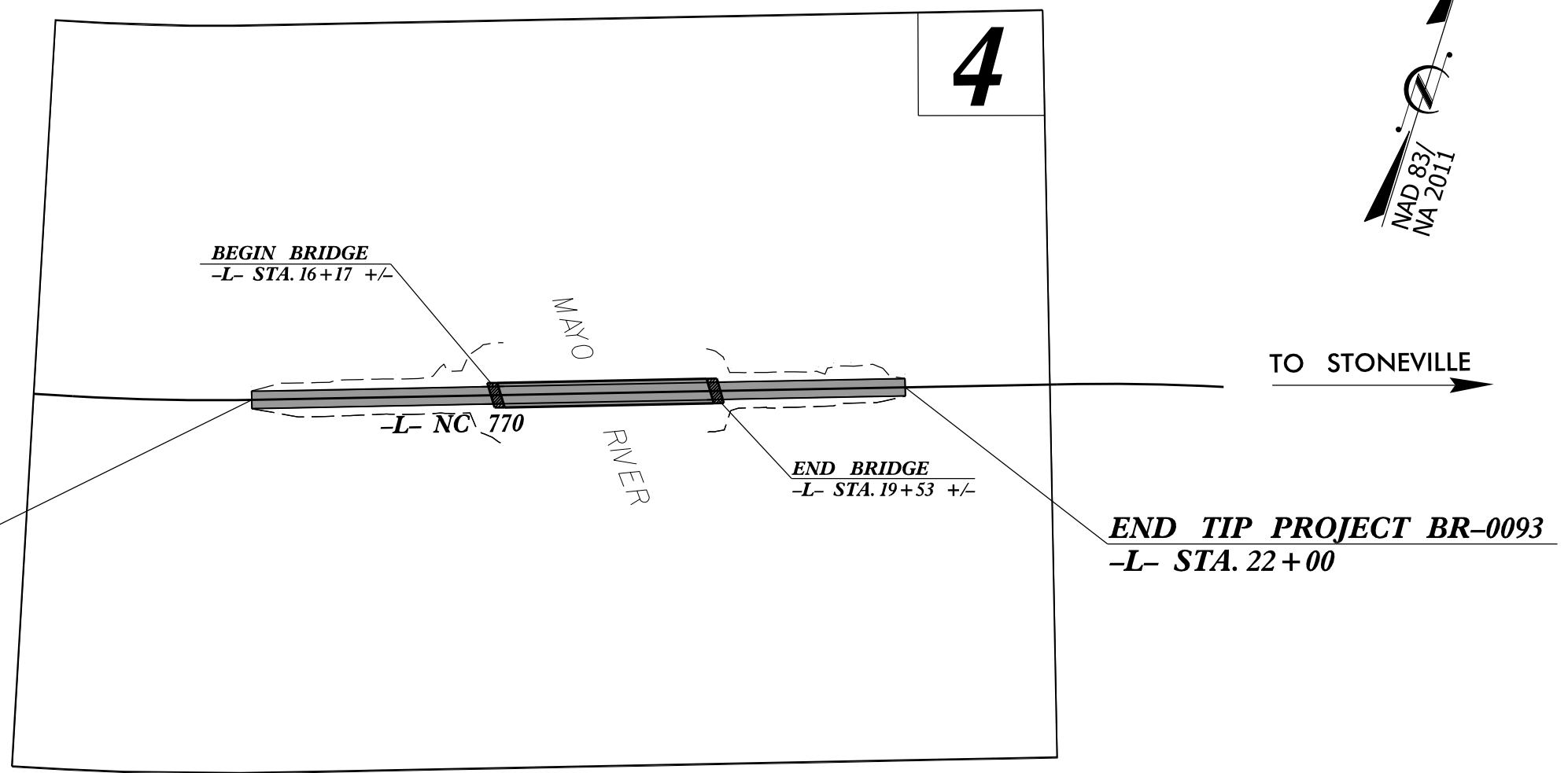
# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

## ROCKINGHAM COUNTY

LOCATION: *BRIDGE 780035 ON NC 770 OVER MAYO RIVER*

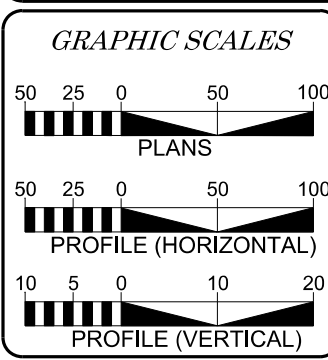
TYPE OF WORK: *GRADING, PAVING, DRAINAGE AND STRUCTURE*

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0093	3A	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
67093.1.1	N/A	PE	
67093.2.1	N/A	UTIL/RW	
67093.3.1	N/A	CONST.	



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

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



DESIGN DATA

ADT 2024 =	2,315
ADT 2045 =	2,800
K =	9 %
D =	65 %
T =	10 % *
V =	60 MPH
* TTST 4% DUAL 6%	
FUNC CLASS =	
MAJOR COLLECTOR	
REGIONAL TIER	

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT BR-0093 =	0.106 Mi.
LENGTH STRUCTURE TIP PROJECT BR-0093 =	0.064 Mi.
TOTAL LENGTH TIP PROJECT BR-0093 =	0.170 Mi.

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

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
FEBRUARY 17, 2023

LETTING DATE:  
FEBRUARY 20, 2024

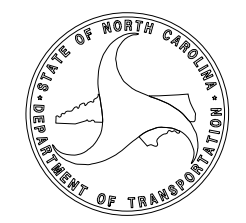
KRISTY W. ALFORD, PE	PROJECT MANAGER
JORDAN WOODARD, PE	ROADWAY GROUP LEAD
SHERRI E. CALHOUN, PE	ROADWAY TEAM LEAD

HYDRAULICS ENGINEER

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

ROADWAY DESIGN ENGINEER

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



CONTRACT: TIP PROJECT: BR-0093

December 19, 2022

**STATE PROJECT: 67093.1.1**

**TIP NUMBER: BR-0093**

**COUNTY: Rockingham**

**DESCRIPTION: REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER**

**SUBJECT: Geotechnical Roadway Inventory Report**

**Project Description**

The project consists of widening and improvements to the roadway approach for the replacement of Bridge 35 on NC 770 over Mayo River, located in Rockingham County, NC. The new roadway approach will consist of two 12-foot travel lanes and is approximately 0.12 miles long.

The field investigation was conducted in November of 2022 using hand tools. Hand augers were performed at selected locations along the project corridor. Representative soil samples were collected and forwarded to an approved testing facility for soil quality analysis, moisture content, and AASHTO classification.

**The following alignments were investigated**

Line	Station			Length (ft)
-L-	13+00	to	16+50	350
-L-	19+00	to	22+00	300
			Total=	650 feet (~0.12 miles)

**Physiography and Geology**

The project is located in the Inner Piedmont Physiographic Province. Rock in the area has been identified as Metamorphic and Metasedimentary rock consisting of Metagraywacke and Muscovite-Biotite Schist of the Cambrian Period. Saprolitic residual soils were encountered, displaying relic rock structure. No rock samples were collected. Topography along the project corridor moderately slopes to the east along the existing right of way. Natural ground elevations range from 696± feet above sea level along the existing roadway to 671± feet above sea level at the end of project limits.

**Soil Properties**

Soils encountered along the project corridor are divided into 2 categories based on origin: roadway embankment soils, and residual soils.

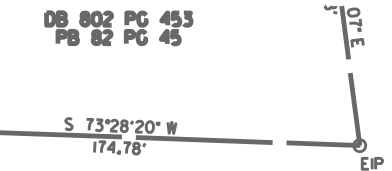
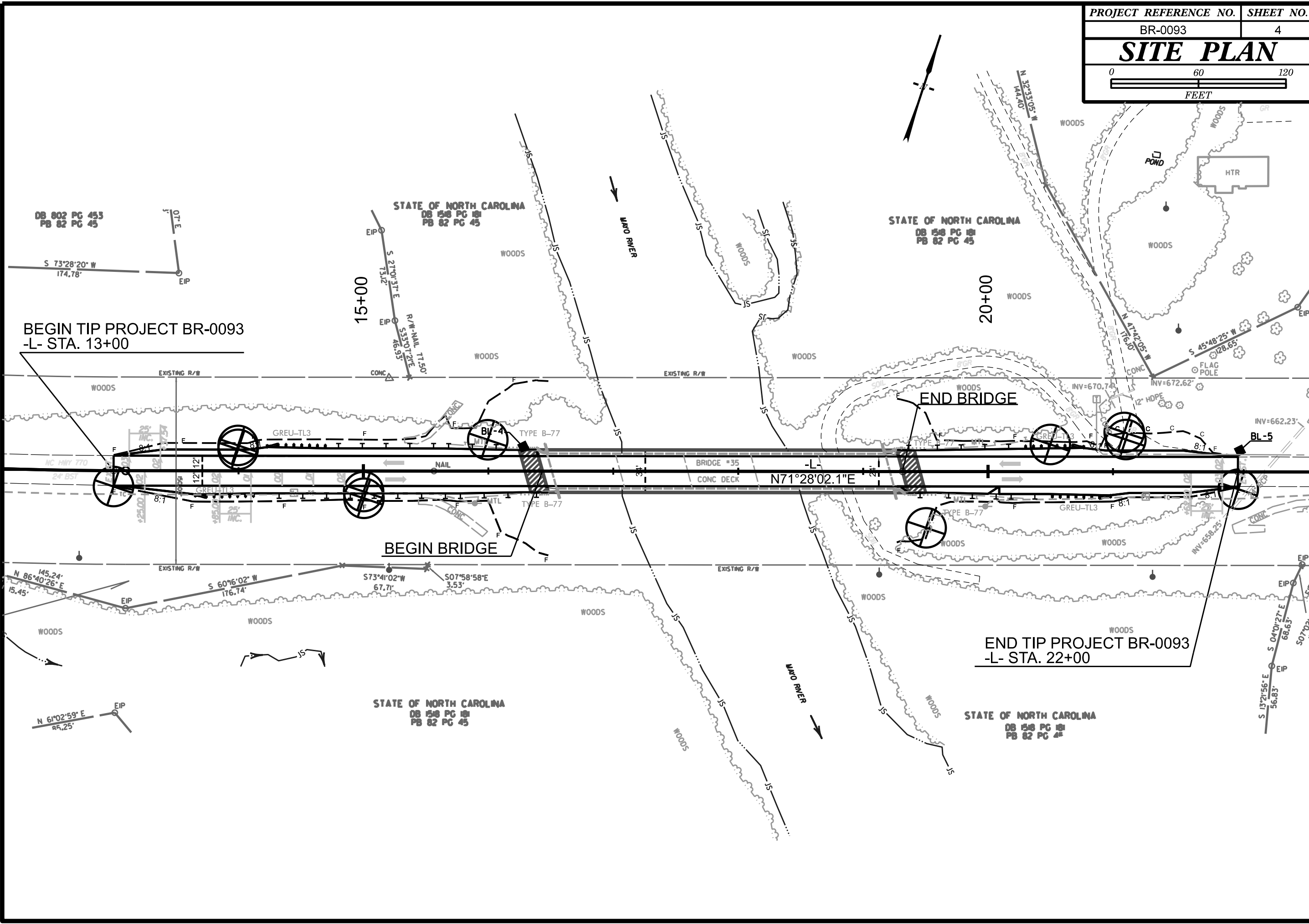
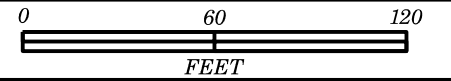
Roadway embankment soils consisting of medium dense to very dense, silty SAND, (A-2-4), soft to hard, sandy SILT (A-4), and medium stiff to very stiff, silty CLAY (A-7-5), were encountered along the -L- alignment. Soil moistures were typically moist. These soils varied in thickness from the ground surface to a maximum of 6.0 feet. Within the cohesive roadway embankment soils, moisture contents ranged from 16.0 to 26.0%. The plasticity index (PI) within the cohesive sediments ranged from 3 to 20.

Residual soils consisting of medium dense to very dense silty SAND (A-2-4), and medium stiff to hard, sandy SILT (A-4), were encountered along the -L- alignment. We encountered residual soils that were at least 9 feet thick in some parts of the project corridor. In several locations, we terminated the borings in residual material at less than 6 feet in depth due to hand auger refusal. Soil moistures were typically moist. Within the cohesive residual soils, moisture contents were not tested.

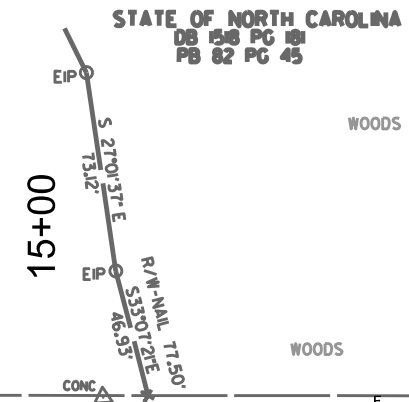
**Groundwater**

Groundwater data was collected in November of 2022, during a time of average precipitation. All borings were left open for a minimum of 24 hours to equilibrate with the surrounding conditions. All borings were found to be dry after remaining open for 24 hours.

# SITE PLAN



BEGIN TIP PROJECT BR-0093  
-L- STA. 13+00



BEGIN BRIDGE

END TIP PROJECT BR-0093  
-L- STA. 22+00



# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 67093.1.1		TIP BR-0093		COUNTY ROCKINGHAM		GEOLOGIST J. HOLLAND											
SITE DESCRIPTION REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER							GROUND WTR (ft)										
BORING NO. L_1300		STATION 13+00		OFFSET 13 ft RT		ALIGNMENT -L-											
COLLAR ELEV. 699.9 ft		TOTAL DEPTH 6.0 ft		NORTHING 991,557		EASTING 1,719,981											
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand Auger		HAMMER TYPE N/A													
DRILLER J. ROSE		START DATE 11/07/22		COMP. DATE 11/08/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
700															699.9	GROUND SURFACE	0.0
															698.9	ROADWAY EMBANKMENT STIFF TO HARD, DARK BROWN, SANDY SILT (A-4), CONTAINS GRAVEL, MICACEOUS	1.0
695															693.9	RESIDUAL MEDIUM DENSE, LIGHT BROWN, RED, WHITE, SILTY SAND (A-2-4(0)), WITH TRACE CLAY, CONTAINS ROCK FRAGMENTS, SAPROLITIC, MICACEOUS Boring Terminated at Elevation 693.9 ft in silty SAND (A-2-4)	6.0

WBS 67093.1.1		TIP BR-0093		COUNTY ROCKINGHAM		GEOLOGIST J. HOLLAND											
SITE DESCRIPTION REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER							GROUND WTR (ft)										
BORING NO. L_1400		STATION 14+00		OFFSET 20 ft LT		ALIGNMENT -L-											
COLLAR ELEV. 695.0 ft		TOTAL DEPTH 2.0 ft		NORTHING 991,620		EASTING 1,720,065											
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand Auger		HAMMER TYPE N/A													
DRILLER J. ROSE		START DATE 11/07/22		COMP. DATE 11/08/22		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
695															695.0	GROUND SURFACE	0.0
															693.5	ROADWAY EMBANKMENT MEDIUM STIFF TO STIFF, BROWN, SANDY SILT (A-4), CONTAINS GRAVEL, MICACEOUS	1.5
															693.0	RESIDUAL MEDIUM DENSE TO DENSE, LIGHT BROWN AND WHITE, SILTY SAND (A-2-4), CONTAINS ROCK FRAGMENTS, MICACEOUS, SAPROLITIC Boring Terminated by Auger Refusal at Elevation 693.0 ft in silty SAND (A-2-4)	2.0

# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 67093.1.1		TIP BR-0093		COUNTY ROCKINGHAM		GEOLOGIST J. HOLLAND	
SITE DESCRIPTION REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER							GROUND WTR (ft)
BORING NO. L_1400-A		STATION 14+00		OFFSET 17 ft LT		ALIGNMENT -L-	
COLLAR ELEV. 695.6 ft		TOTAL DEPTH 2.0 ft		NORTHING 991,617		EASTING 1,720,066	
						0 HR.	Dry
						24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A			DRILL METHOD Hand Auger			HAMMER TYPE N/A	
DRILLER J. ROSE		START DATE 11/07/22		COMP. DATE 11/08/22		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
700															
695														695.6	0.0
														693.6	2.0

**GROUND SURFACE**  
**ROADWAY EMBANKMENT**  
 MEDIUM STIFF TO STIFF, BROWN, SANDY SILT (A-4), CONTAINS GRAVEL AND ROOT FRAGMENTS, MICACEOUS  
 Boring Terminated by Auger Refusal at Elevation 693.6 ft in sandy SILT (A-4)

WBS 67093.1.1		TIP BR-0093		COUNTY ROCKINGHAM		GEOLOGIST J. HOLLAND	
SITE DESCRIPTION REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER							GROUND WTR (ft)
BORING NO. L_1500		STATION 15+00		OFFSET 22 ft RT		ALIGNMENT -L-	
COLLAR ELEV. 689.2 ft		TOTAL DEPTH 5.0 ft		NORTHING 991,612		EASTING 1,720,174	
						0 HR.	Dry
						24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A			DRILL METHOD Hand Auger			HAMMER TYPE N/A	
DRILLER J. ROSE		START DATE 11/07/22		COMP. DATE 11/08/22		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
690															
685														689.2	0.0
														688.2	1.0
														684.2	5.0

**GROUND SURFACE**  
**ROADWAY EMBANKMENT**  
 S-17 18%  
 SOFT TO MEDIUM STIFF, BROWN, SANDY SILT (A-4(0)), CONTAINS GRAVEL AND ROOT FRAGMENTS, MICACEOUS  
**RESIDUAL**  
 MEDIUM DENSE TO DENSE, LIGHT BROWN, BROWN, RED, AND WHITE, SILTY SAND (A-2-4), CONTAINS ROCK FRAGMENTS, MICACEOUS, SAPROLITIC  
 Boring Terminated by Auger Refusal at Elevation 684.2 ft in silty SAND (A-2-4)









# GEOTECHNICAL BORING REPORT

## BORE LOG

WBS 67093.1.1		TIP BR-0093		COUNTY ROCKINGHAM		GEOLOGIST J. HOLLAND													
SITE DESCRIPTION REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER							GROUND WTR (ft)												
BORING NO. L_2200		STATION 22+00		OFFSET 14 ft RT		ALIGNMENT -L-													
COLLAR ELEV. 675.3 ft		TOTAL DEPTH 6.0 ft		NORTHING 991,842		EASTING 1,720,835													
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand Auger			HAMMER TYPE N/A														
DRILLER J. ROSE		START DATE 11/07/22		COMP. DATE 11/08/22		SURFACE WATER DEPTH N/A													
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT					BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100	ELEV. (ft)	DEPTH (ft)							
680																			
675																	675.3	GROUND SURFACE	0.0
																	674.3	<b>ROADWAY EMBANKMENT</b>	1.0
																	672.3	MEDIUM STIFF TO VERY STIFF, BROWN AND RED, SANDY SILT (A-4), CONTAINS GRAVEL AND ROOT FRAGMENTS, MICACEOUS	3.0
670																	669.3	MEDIUM STIFF, RED, SILTY CLAY (A-7-5(10)), WITH SOME SAND, MICACEOUS	6.0
																		MEDIUM STIFF TO VERY STIFF, RED, BROWN, AND GRAY, SANDY SILT (A-4), WITH TRACE TO LITTLE CLAY, CONTAINS GRAVEL AND ROOT FRAGMENTS, MICACEOUS	
																		Boring Terminated at Elevation 669.3 ft In sandy SILT (A-4)	

NCDOT BORE DOUBLE BR-0093 ROCKINGHAM MAYO BRIDGE.GPJ NC\_DOT.GDT 12/5/22

**REPLACE BRIDGE 780035 ON NC 770 OVER MAYO RIVER**

<b>SOIL TEST RESULTS</b>															
<b>SAMPLE NO.</b>	<b>STATION</b>	<b>OFFSET</b>	<b>DEPTH INTERVAL</b>	<b>AASHTO CLASS.</b>	<b>L.L</b>	<b>P.I.</b>	<b>% BY WEIGHT</b>				<b>% PASSING (SIEVES)</b>			<b>% MOISTURE</b>	<b>% ORGANIC</b>
							<b>C. SAND</b>	<b>F. SAND</b>	<b>SILT</b>	<b>CLAY</b>	<b>10</b>	<b>40</b>	<b>200</b>		
S-25	13+00	13' RT	3.0-3.5	A-2-4(0)	39	4	37.1	34.1	20.3	8.5	83.9	77	31	13	-
S-17	15+00	22' RT	0.5-1.0	A-4(0)	36	3	25.7	33.8	29.3	11.2	92.0	86	43	18	-
S-08	20+50	22' RT	1.0-1.5	A-4(0)	31	3	30.9	32.4	24.3	12.5	81.8	82	39	16	-
S-06	21+10	26' RT	1.0-1.5	A-7-5(6)	43	13	17.8	30.8	21.9	29.6	96.5	91	54	23	-
S-03	22+00	14' RT	1.5-2.0	A-7-5(10)	53	20	19.8	25.8	13.5	40.9	99.5	90	56	26	-