

## **ATTACHMENT A – GEOTECHNICAL**

**The following Geotechnical Structure Subsurface Investigations are for information only and are not a part of this contract. This information is for investigation only and no accuracy is implied or guaranteed. No claim will be allowed as a result of the use of this information.**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45357.1.26 (BD-5111V)	1	15

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

# STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45357.1.26 (BD-5111V) F.A. PROJ. \_\_\_\_\_

COUNTY SURRY

PROJECT DESCRIPTION REPLACE BRIDGE NO. 244 ON -L-  
(SR 1809, OLD WESTFIELD RD) OVER SR 1856 (OLD US 52)

SITE DESCRIPTION \_\_\_\_\_

## CONTENTS

<u>SHEET</u>	<u>DESCRIPTION</u>
I	TITLE SHEET
2-2A	NCDOT DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SOIL AND ROCK LEGEND, TERMS, SYMBOLS AND ABBREVIATIONS
3-5	FOUNDATION RECOMMENDATIONS, PLAN NOTES AND PAY ITEM QUANTITIES
6	SITE PLAN
7-14	BORING LOGS, CORE LOGS AND CORE PHOTOS

APPENDIX - STRUCTURE FOUNDATION LOADS

## PERSONNEL

C. NORVILLE

J. R. HAMM

T. E. EVANS

TRIGON EXP.

INVESTIGATED BY T. E. EVANS

CHECKED BY J. R. HAMM

SUBMITTED BY FALCON ENG

DATE MARCH 2013

## 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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

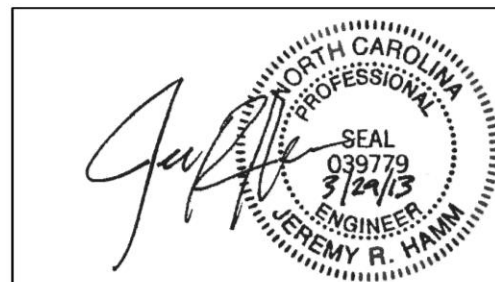
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACED) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

DRAWN BY: T. E. EVANS



REVISÉ 09/23/09

		PROJECT REFERENCE NO. 45357.I.26 (BD-SIIIV)	SHEET NO. 2A
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS			
ROCK DESCRIPTION		TERMS AND DEFINITIONS	
<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. 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, 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 DISLODGED 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 (RQD) - 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 ENPLACED 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 (SRCR) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - 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>WEATHERED ROCK (WR)</p>  <p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES &gt; 100 BLOWS PER FOOT IF TESTED.</p> <p>CRYSTALLINE ROCK (CR)</p>  <p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL, IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>NON-CRYSTALLINE ROCK (NCR)</p>  <p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>  <p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>			
WEATHERING			
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.		
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.		
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 FELDSPARS CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.		
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.		
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 "CLINK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>		
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. <u>IF TESTED, YIELDS SPT N VALUES &gt; 100 BPF</u>		
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, YIELDS SPT N VALUES &lt; 100 BPF</u>		
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.		
ROCK HARDNESS			
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.		
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.		
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.		
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 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.		
SOFT	CAN BE GROOVED 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.		
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.		
FRACTURE SPACING		BEDDING	
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 FEET	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
INDURATION			
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.			
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.		
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.		
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.		
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.		
		BENCH MARK:	
		ELEVATION: FT.	
		NOTES:	
		F.I.A.D. - FILLED IMMEDIATELY AFTER DRILLING	

REVISED 09/23/09

# FOUNDATION RECOMMENDATIONS

WBS # 45357.1.26 DESCRIPTION Replace Bridge No. 244 on SR 1809

T.I.P. NO. BD-5111V

COUNTY Surry

STATION 11+74.28 -L-

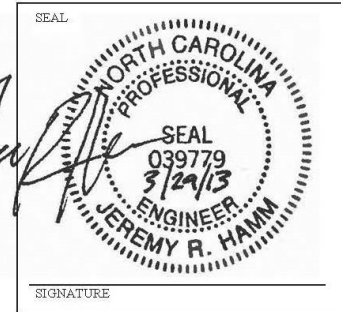
N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENG. UNIT-WRO

\_\_\_ ACCEPTED  
X ACCEPTED AS NOTED  
\_\_\_ RETURNED FOR CORRECTIONS  
\_\_\_ SEE LETTER

DESIGN	INITIALS	DATE
CHECK	JRH	3/29/2013
APPROVAL	CVN	3/29/2013

BY: Dean Hardister, PE

DATE: 04/12/2013



	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS DETAILS
END BENT NO. 1	12+93.65 -L-	Cap on HP 12x53 Steel Piles	90 tons/pile	Bottom of Cap Elev. = 1139.84 ft Length of Pile = 60 ft Number of Vertical Piles = 7 Pile Spacing = 8 feet 6 inches
BENT NO. 1	13+33.65 -L-	Footing on HP 14x73 Steel Piles	110 tons/pile	Bottom of Footing Elev. = 1113.5 to 1115.0 ft Length of Pile = 55 ft Footing Size = 7 ft x 7 ft Number of Vertical Piles Per Footing = 4 Number of Footings = 3
BENT NO. 2	13+83.65 -L-	Footing on HP 14x73 Steel Piles	100 tons/pile	Bottom of Footing Elev. = 1116.0 to 1117.5 ft Length of Pile = 60 ft Footing Size = 7 ft x 7 ft Number of Vertical Piles Per Footing = 4 Number of Footings = 3
END BENT NO. 2	14+23.65 -L-	Cap on HP 12x53 Steel Piles	85 tons/pile	Bottom of Cap Elev. = 1136.13 ft Length of Pile = 70 ft Number of Vertical Piles = 7 Pile Spacing = 8 feet 6 inches

TIP # BD-5111V

County Surry

SHEET 4

**FOUNDATION RECOMMENDATION NOTES ON PLANS**

1. For piles, see Section 450 of the Standard Specifications.
2. Piles at End Bent No. 1 are designed for a factored resistance of 90 tons per pile.
3. Drive piles at End Bent No. 1 to a required driving resistance of 150 tons per pile.
4. Piles at Bent No. 1 are designed for a factored resistance of 110 tons per pile.
5. Drive piles at Bent No. 1 to a required driving resistance of ~~180~~ tons per pile. **185**
6. Piles at Bent No. 2 are designed for a factored resistance of 100 tons per pile.
7. Drive piles at Bent No. 2 to a required driving resistance of ~~165~~ tons per pile. **170**
8. Steel H-pile points are required for steel H-piles at Bent No. 2. For steel pile points, see Section 450 of the Standard Specifications.
9. Piles at End Bent No. 2 are designed for a factored resistance of 85 tons per pile.
10. Drive piles at End Bent No. 2 to a required driving resistance of ~~140~~ tons per pile. **145**
- ~~11. Steel H-pile points are required for steel H-piles at End Bent No. 2. For steel pile points, see Section 450 of the Standard Specifications.~~
12. Testing piles with the PDA during driving, restriking, or redriving may be required. The Engineer will determine the need for PDA testing. For PDA see Section 450 of the Standard Specifications.

END BENT NO. 1, BENT NO. 1, BENT NO. 2, &amp; END BENT NO. 2

**N.C. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GEOTECHNICAL ENG. UNIT-WRO**

\_\_\_ ACCEPTED  
**X** ACCEPTED AS NOTED  
 \_\_\_ RETURNED FOR  
 CORRECTIONS  
 \_\_\_ SEE LETTER

BY: Dean Hardister, PEDATE: 04/12/2013**FOUNDATION RECOMMENDATION COMMENTS**

1. No waiting period is required.
2. Pile lengths shown are based on excavation for the footings prior to pile driving.



**PILE PAY ITEMS**

(Revised 8/15/12)

SHEET 5

WBS ELEMENT	45357.1.26	<input checked="" type="checkbox"/> ACCEPTED	DATE	3/29/2013
TIP NO.	BD-5111V	<input type="checkbox"/> RETURNED FOR CORRECTIONS	DESIGNED BY	JRH
COUNTY	Surry	<input type="checkbox"/> SEE LETTER	CHECKED BY	CVN
STATION	11+74.28 -L-	BY: <u>Dean Hardister, PE</u>		
		DATE: <u>04/12/2013</u>		
DESCRIPTION	Replace Bridge No. 244 on SR 1809 over SR 1856			

NUMBER OF BENTS WITH PILES	_____	} Only required for "Predrilling for Piles" & "Pile Excavation" pay items
NUMBER OF PILES PER BENT	_____	
NUMBER OF END BENTS WITH PILES	_____	
NUMBER OF PILES PER END BENT	_____	

Bent # or End Bent #	PILE PAY ITEM QUANTITIES						PDA Testing (per each)
	Steel Pile Points (yes/no)	Pipe Pile Plates (yes/no/maybe)	Predrilling For Piles (per linear ft)	Pile Redrives (per each)	Pile Excavation (per linear ft)		
					In Soil	Not In Soil	
End Bent No. 1	YES <del>no</del>						
Bent No. 1	YES <del>no</del>						
Bent No. 2	yes						
End Bent No. 2	yes						
TOTALS			0	0	0	0	1

Notes:

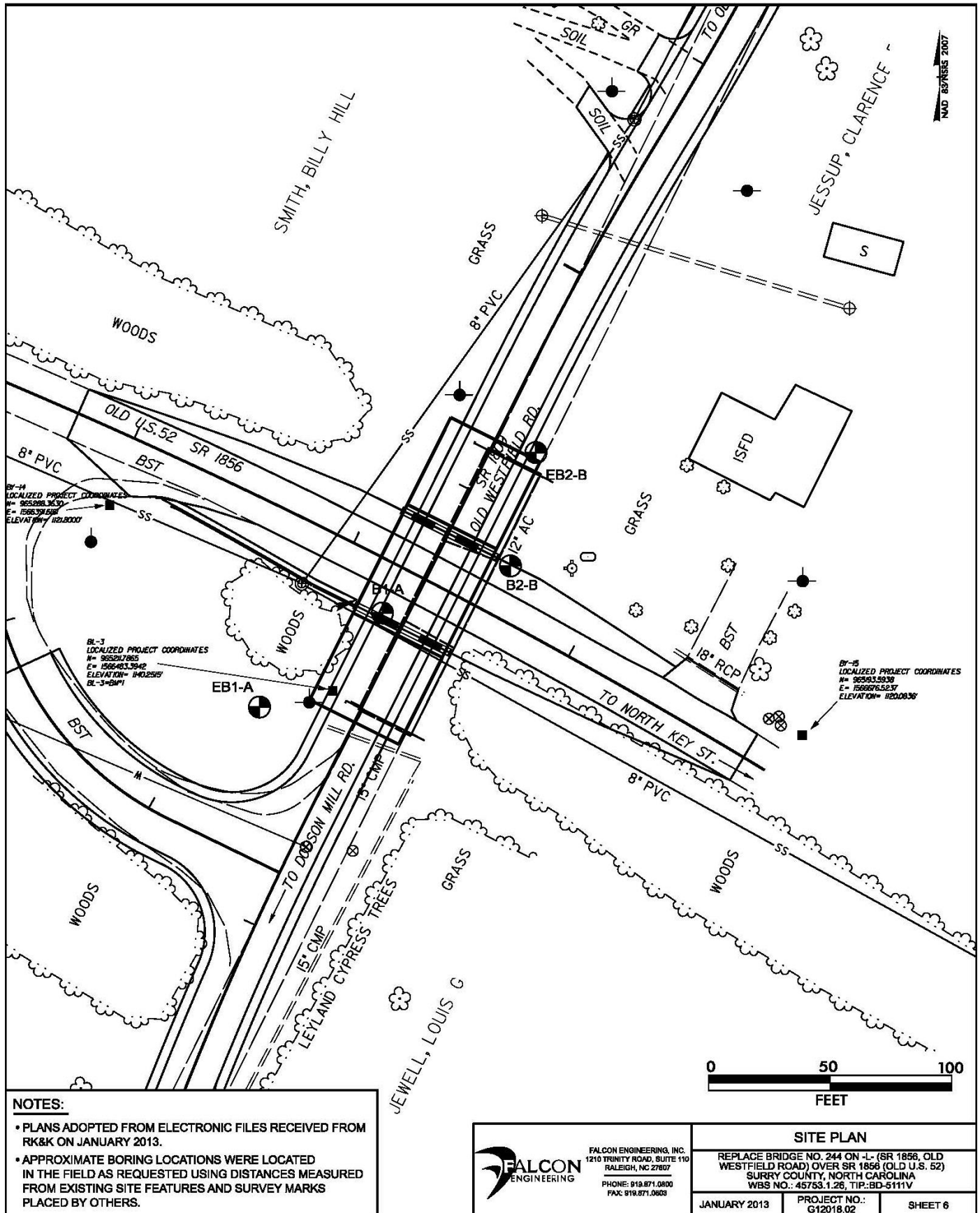
Blanks or "no" represent quantity of zero.

If steel pile points are required, calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

If pipe pile plates are or may be required, calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

Show quantity of "PDA Testing" on the plans as total only.

If quantity of "PDA Testing" is 3 or less, reference "Pile Driving Criteria" provision in PDA notes on plans and include "Pile Driving Criteria" provision in the contract.







# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 7

WBS 45357.1.26			TIP BD-5111V			COUNTY SURRY			GEOLOGIST T. Evans						
SITE DESCRIPTION REPLACE BRIDGE NO. 244 ON -L- (SR 1809, OLD WESTFIELD RD) OVER SR 1856 (US 52)									GROUND WTR (ft)						
BORING NO. EB1-A			STATION 12+81			OFFSET 38 ft LT			ALIGNMENT -L-			0 HR. 34.7			
COLLAR ELEV. 1,137.5 ft			TOTAL DEPTH 58.6 ft			NORTHING 965,205			EASTING 1,566,453			24 HR. 34.2			
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER S. Gower			START DATE 08/20/12			COMP. DATE 08/20/12			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
1140															
	1,136.0	1.5	4	4	6	10									
1135	1,134.0	3.5	5	5	6	11									
	1,131.5	6.0	2	4	4	8									
1130	1,129.0	8.5	3	5	5	10									
	1,124.0	13.5	3	4	5	9									
1125	1,119.0	18.5	6	10	9	19									
1120	1,114.0	23.5	5	6	6	12									
1115	1,109.0	28.5	6	6	4	10									
1110	1,104.0	33.5	2	5	8	13									
1105	1,099.0	38.5	2	4	6	10									
1100	1,094.0	43.5	3	7	11	18									
1095	1,089.0	48.5	6	8	12	20									
1090	1,084.0	53.5	10	21	70	91									
1085	1,082.5	55.0	100/0.2			100/0.2									
1080	1,079.0	58.5	60/0.1			60/0.1									

NCDOT BORE SINGLE REPLACE BRIDGE NO. 244 ON SR1809 OVER SR1856.GPJ NC DOT.GDT 12/13



## SHEET 8

NC DOT BORE SINGLE REPLACE BRIDGE NO. 244 ON SR1809 OVER SR1856.GPJ NC\_DOT.GDT 1/2/13



# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

SHEET 9


WBS 45357.1.26		TIP BD-5111V		COUNTY SURRY		GEOLOGIST T. Evans						
SITE DESCRIPTION REPLACE BRIDGE NO. 244 ON -L- (SR 1809, OLD WESTFIELD RD) OVER SR 1856 (US 52)							GROUND WTR (ft)					
BORING NO. B1-A		STATION 13+40		OFFSET 10 ft LT		ALIGNMENT -L-	0 HR. 20.2					
COLLAR ELEV. 1,124.5 ft		TOTAL DEPTH 70.5 ft		NORTHING 965,244		EASTING 1,566,504	24 HR. 18.4					
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011				DRILL METHOD HSA/Rotary Wash		HAMMER TYPE Automatic						
DRILLER S. Gower		START DATE 08/20/12		COMP. DATE 08/21/12		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 10.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
1064											Begin Coring @ 60.5 ft	
	1,064.0	60.5	5.0	3:00/1.0 2:55/1.0 2:40/1.0 2:45/1.0 2:22/1.0	(5.0) 100%	(2.0) 40%		(10.0) 100%	(5.9) 59%		DK. GRAY AND GRAY, MOD. SEV. TO SLI. WEATHERED, MOD. HARD, V. CLOSELY TO CLOSELY FRACTURED GNEISS	60.5
1060	1,059.0	65.5										
			5.0	2:21/1.0 2:33/1.0 2:10/1.0 2:13/1.0 2:44/1.0	(5.0) 100%	(3.9) 78%						
1055	1,054.0	70.5									Boring Terminated at Elevation 1,054.0 ft in Crystalline Rock: Gneiss	70.5

NCDOT CORE SINGLE REPLACE BRIDGE NO. 244 ON SR1809 OVER SR1856.GPJ NC\_DOT.GDT 1/2/13



**BORING B1-A, BOX 1 OF 1, 60.5 FEET TO 70.5 FEET.**



			<b>ROCK CORE PHOTO</b>		
<small>FALCON ENGINEERING, INC. 1010 TRINITY ROAD, SUITE 110 BALCON, NC 27607 PHONE: 919.871.0808 FAX: 919.871.0805</small>			<small>REPLACE BRIDGE NO. 244 ON -L- (SR 1856, OLD WESTFIELD ROAD) OVER SR 1856 (OLD U.S. 52) SURRY COUNTY, NORTH CAROLINA WBS NO.: 45763.1.26, TIP: BD-5111V</small>		
<small>JANUARY 2013</small>			<small>FALCON PROJECT NO.: G12018.02</small>		<small>SHEET 3 OF 3</small>



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 11

WBS 45357.1.26			TIP BD-5111V			COUNTY SURRY			GEOLOGIST T. Evans					
SITE DESCRIPTION REPLACE BRIDGE NO. 244 ON -L- (SR 1809, OLD WESTFIELD RD) OVER SR 1856 (US 52)										GROUND WTR (ft)				
BORING NO. B2-B			STATION 13+80			OFFSET 29 ft RT			ALIGNMENT -L-		0 HR. 21.8			
COLLAR ELEV. 1,122.5 ft			TOTAL DEPTH 76.3 ft			NORTHING 965,263			EASTING 1,566,556		24 HR. 21.2			
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011						DRILL METHOD HSA/Rotary Wash			HAMMER TYPE Automatic					
DRILLER S. Gower			START DATE 08/23/12			COMP. DATE 08/23/12			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1125														
1120	1,121.0	1.5	2	2	2									GROUND SURFACE 0.0
	1,119.0	3.5	1	1	2									RED BROWN AND TAN, F. SANDY SILT (A-4) W/ GRAVEL, LITTLE MICA 3.0
	1,116.5	6.0	2	1	2									TAN BROWN AND GRAY, SILTY SAND (A-2-4) SAPROLITIC, LITTLE MICA
1115	1,114.0	8.5	2	2	3									
	1,109.0	13.5	3	5	6									BROWN TAN AND BLACK, F. SANDY SILT (A-4) SAPROLITIC, HIGHLY MICACEOUS 13.0
1110	1,104.0	18.5	5	7	8									
	1,099.0	23.5	5	5	8									BLACK TAN AND GRAY, SILTY F. SAND (A-2-4) SAPROLITIC, HIGHLY MICACEOUS 23.0
1095	1,094.0	28.5	10	12	13									BLACK, TAN AND GRAY, F. SANDY SILT (A-4) SAPROLITIC, HIGHLY MICACEOUS 28.0
	1,089.0	33.5	4	6	11									BLACK AND TAN, SILTY F. SAND (A-2-4) W/ LITTLE TO SOME MICA, GRAVEL LAYERS 38.0
1085	1,084.0	38.5	14	10	16									
	1,079.0	43.5	16	28	34									BROWN TAN WHITE AND GRAY, SILTY F. SAND (A-2-4) SAPROLITIC, W/ TRACE MICA, ROCK FRAGMENTS 48.0
1075	1,074.0	48.5	12	19	28									
	1,069.0	53.5	5	26	57									
1065	1,064.0	58.5	9	25	20									
	1,059.0	63.5	72	28/0.0										WEATHERED ROCK 63.0
1055	1,056.2	66.3	60/0.0											GRAY WHITE AND BROWN GNEISS, W/ MICA AND ROCK FRAGMENTS 66.3
														CRYSTALLINE ROCK
														DK. GRAY AND GRAY, MOD. SEV. TO SEV. WEATHERED, MED. HARD TO SOFT, MOD. CLOSELY TO CLOSELY FRACTURED, MICA GNEISS
1050														
														Boring Terminated at Elevation 1,046.2 ft in Crystalline Rock: Gneiss 76.3

NCDOT BORE SINGLE REPLACE BRIDGE NO. 244 ON SR1809 OVER SR1856.GPJ NC DOT.GDT 12/13



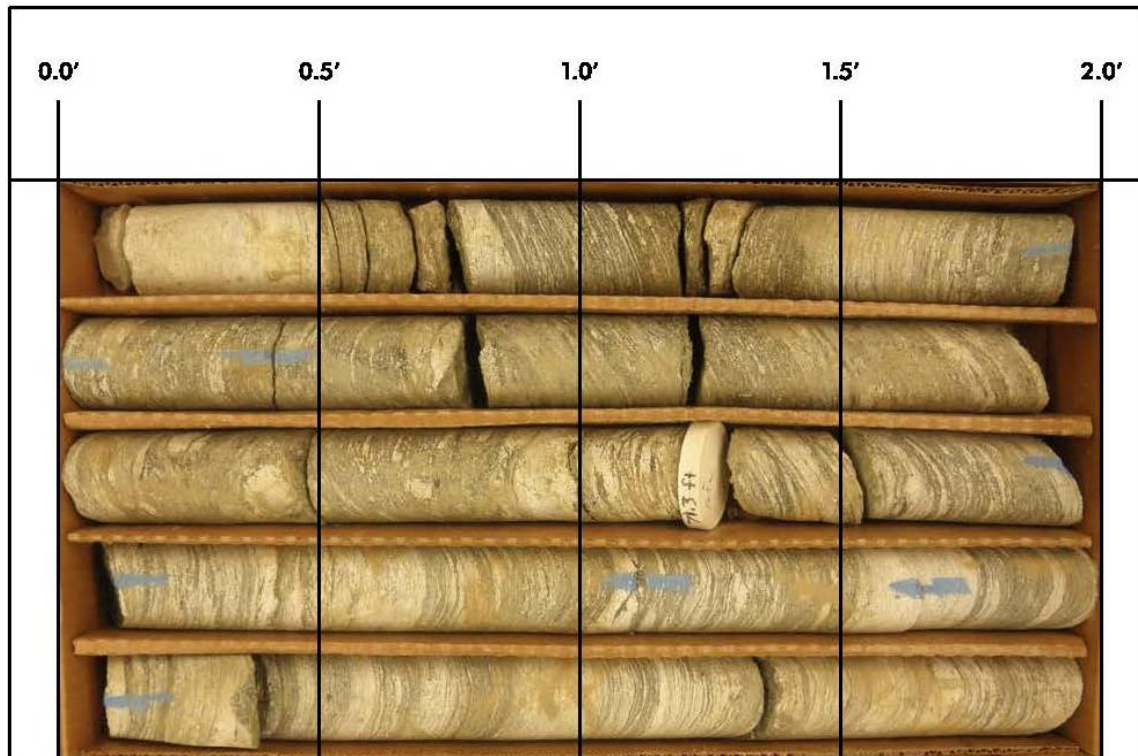


# NCDOT GEOTECHNICAL ENGINEERING UNIT CORE BORING REPORT

SHEET 12

WBS 45357.1.26		TIP BD-5111V		COUNTY SURRY		GEOLOGIST T. Evans						
SITE DESCRIPTION REPLACE BRIDGE NO. 244 ON -L- (SR 1809, OLD WESTFIELD RD) OVER SR 1856 (US 52)							GROUND WTR (ft)					
BORING NO. B2-B		STATION 13+80		OFFSET 29 ft RT		ALIGNMENT -L-	0 HR. 21.8					
COLLAR ELEV. 1,122.5 ft		TOTAL DEPTH 76.3 ft		NORTHING 965,263		EASTING 1,566,556	24 HR. 21.2					
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011				DRILL METHOD HSA/Rotary Wash		HAMMER TYPE Automatic						
DRILLER S. Gower		START DATE 08/23/12		COMP. DATE 08/23/12		SURFACE WATER DEPTH N/A						
CORE SIZE NQ2		TOTAL RUN 10.0 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
1056.2											Begin Coring @ 66.3 ft	
1055	1,056.2	66.3	5.0	8:47/1.0 4:36/1.0 5:13/1.0 6:03/1.0 5:29/1.0	(4.8) 96%	(4.0) 80%		(9.4) 94%	(8.3) 83%		1,056.2	66.3
	1,051.2	71.3									DK. GRAY AND GRAY, MOD. SEV. TO SEV. WEATHERED, MED. HARD TO SOFT, MOD. CLOSELY TO CLOSELY FRACTURED, MICA GNEISS	
1050			5.0	3:42/1.0 4:39/1.0 4:45/1.0 4:20/1.0 4:10/1.0	(4.6) 92%	(4.3) 86%						
	1,046.2	76.3									Boring Terminated at Elevation 1,046.2 ft in Crystalline Rock: Gneiss	76.3

NCDOT CORE SINGLE REPLACE BRIDGE NO. 244 ON SR1809 OVER SR1856.GPJ NC\_DOT.GDT 1/2/13



**BORING B2-B, BOX 1 OF 1, 66.3 FEET TO 76.3 FEET.**



	<b>ROCK CORE PHOTO</b>	
	REPLACE BRIDGE NO. 244 ON -L- (SR 1866, OLD WESTFIELD ROAD) OVER SR 1866 (OLD U.S. 82) SURRY COUNTY, NORTH CAROLINA WBS NO.: 45753.1.26, TIF-3RD-5111Y	
FALCON ENGINEERING, INC. 1010 TRINITY ROAD, SUITE 110 BALBOA, NC 27807 PHONE: 919.871.0808 FAX: 919.871.0805	JANUARY 2013	FALCON PROJECT NO.: G12018.02
		SHEET 3 OF 3



# NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

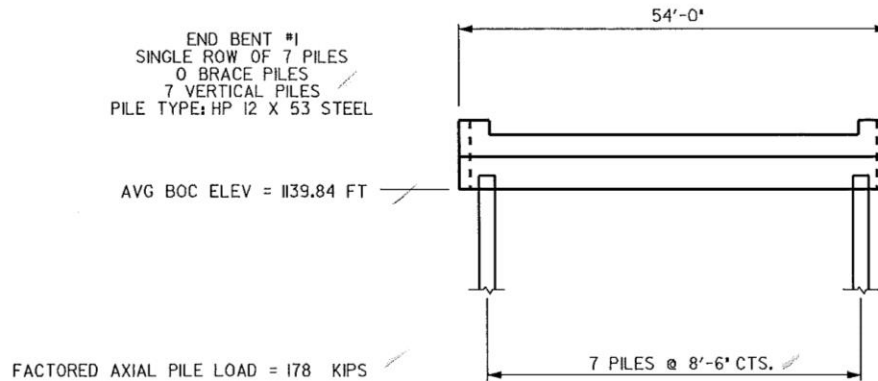
SHEET 14

WBS 45357.1.26			TIP BD-5111V			COUNTY SURRY			GEOLOGIST T. Evans					
SITE DESCRIPTION REPLACE BRIDGE NO. 244 ON -L- (SR 1809, OLD WESTFIELD RD) OVER SR 1856 (US 52)									GROUND WTR (ft)					
BORING NO. EB2-B			STATION 14+26			OFFSET 17 ft RT			ALIGNMENT -L-			0 HR. 39.2		
COLLAR ELEV. 1,138.5 ft			TOTAL DEPTH 74.4 ft			NORTHING 965,310			EASTING 1,566,567			24 HR. FIAD		
DRILL RIG/HAMMER EFF./DATE TRI8016 MOBILE B-57 93% 12/08/2011						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER S. Gower			START DATE 08/22/12			COMP. DATE 08/22/12			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
1140														
	1,137.0	1.5	2	3	2									PAVEMENT 0.0
														1,137.5 1.0
1135	1,135.0	3.5	2	1	2									6" BITUMINOUS CONCRETE
														6" AGGREGATE BASE COURSE
	1,132.5	6.0	WOH	WOH	2									ROADWAY EMBANKMENT
1130	1,130.0	8.5	WOH	1	2									RED-BROWN, MED. STIFF TO SOFT, F. SANDY CLAY (A-6) W/ SOME GRAVEL
														GRAVEL LAYER @ 12.0-13.0 FT
1125	1,125.0	13.5	3	1	1									1,125.5 13.0
														RED-BROWN AND TAN, SILTY CLAY (A-7) W/ GRAVEL
1120	1,120.0	18.5	4	4	7									1,119.0 19.5
														RESIDUAL
1115	1,115.0	23.5	4	4	4									RED-BROWN, SANDY CLAY (A-6) W/ TRACE MICA 23.0
														BLACK AND TAN, F. SANDY SILT (A-4) SAPROLITIC, W/ LITTLE MICA
1110	1,110.0	28.5	6	5	6									1,106.5 32.0
														TAN BLACK AND GRAY, SILTY SAND (A-2-4) SAPROLITIC, W/ TRACE MICA
1105	1,105.0	33.5	3	3	3									
1100	1,100.0	38.5	6	9	14									
1095	1,095.0	43.5	7	8	13									
1090	1,090.0	48.5	12	19	25									
1085	1,085.0	53.5	11	21	24									1,085.5 53.0
														BROWN BLACK AND TAN, F. SANDY SILT (A-4) SAPROLITIC, W/ SOME MICA
1080	1,080.0	58.5	36	26	34									1,080.5 58.0
														GRAY BROWN AND WHITE, SILTY SAND (A-2-4) SAPROLITIC, W/ CSE. SAND LAYERS
1075	1,075.0	63.5	10	17	26									1,075.5 63.0
														BROWN GRAY AND WHITE, F. SANDY SILT (A-4) SAPROLITIC, W/ SOME MICA
1070	1,070.0	68.5	27	69	31/0.2									1,069.5 69.0
														WEATHERED ROCK BROWN TAN AND BLACK MICA GNEISS
1065	1,065.0	73.5	33	67/0.4										1,064.1 74.4
														Boring Terminated at Elevation 1,064.1 ft in Weathered Rock: Gneiss

NCDOT BORE SINGLE REPLACE BRIDGE NO. 244 ON SR1809 OVER SR1856.GPJ NC DOT.GDT 12/13

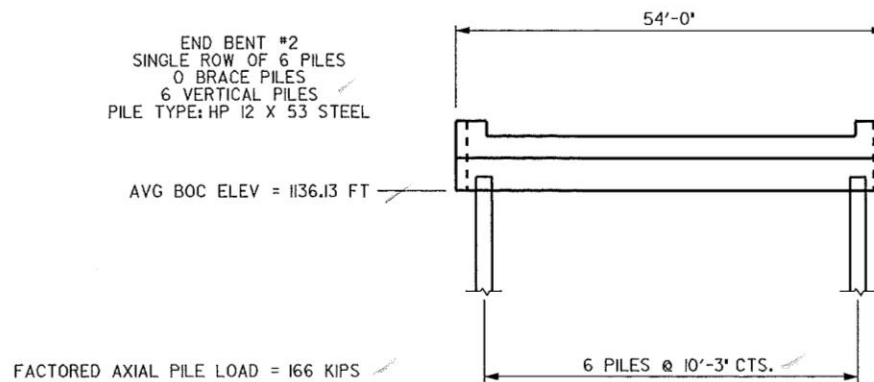
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 HIGHWAY BUILDING  
 P. O. BOX 25201  
 RALEIGH, NORTH CAROLINA 27611

SUBJECT FACTORED LOADS  
FOR END BENT PILES  
 PROJECT BD5111V  
 SURRY COUNTY  
 PREPARED BY STC DATE 02/2013 STATION 13+58.65 -L-  
12+33.21 -Y1-  
 CHECKED BY hplc DATE 3/20/13 STR NO #244 SHEET      OF       
 REPLCMNT



END BENT #1 SKETCH

NO SCALE

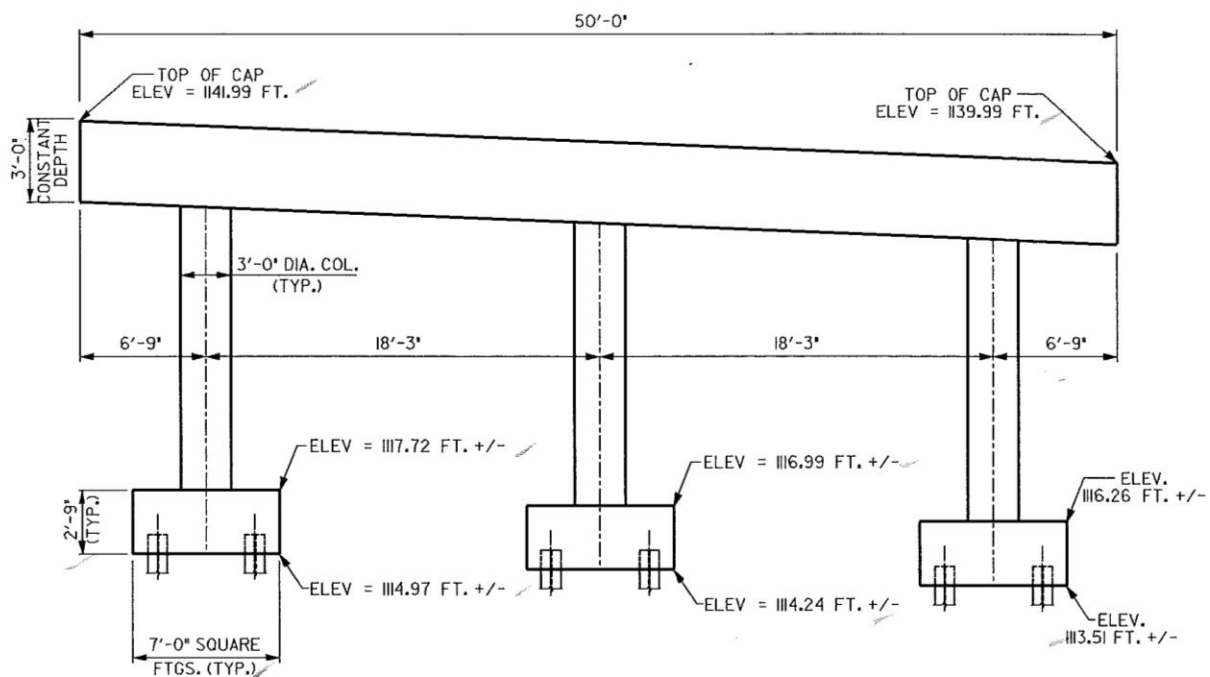


END BENT #2 SKETCH

NO SCALE

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
HIGHWAY BUILDING  
P. O. BOX 25201  
RALEIGH, NORTH CAROLINA 27611

SUBJECT FACTORED LOADS PROJECT BD5111V  
FOR FOOTING PILES, BENT #1 SURRY COUNTY  
PREPARED BY STC DATE 03/2013 STATION 13+58.65 -L-  
CHECKED BY HPK DATE 3/2013 STR NO 12+33.21 -Y1- SHEET OF  
BR. #244 REPLCMNT

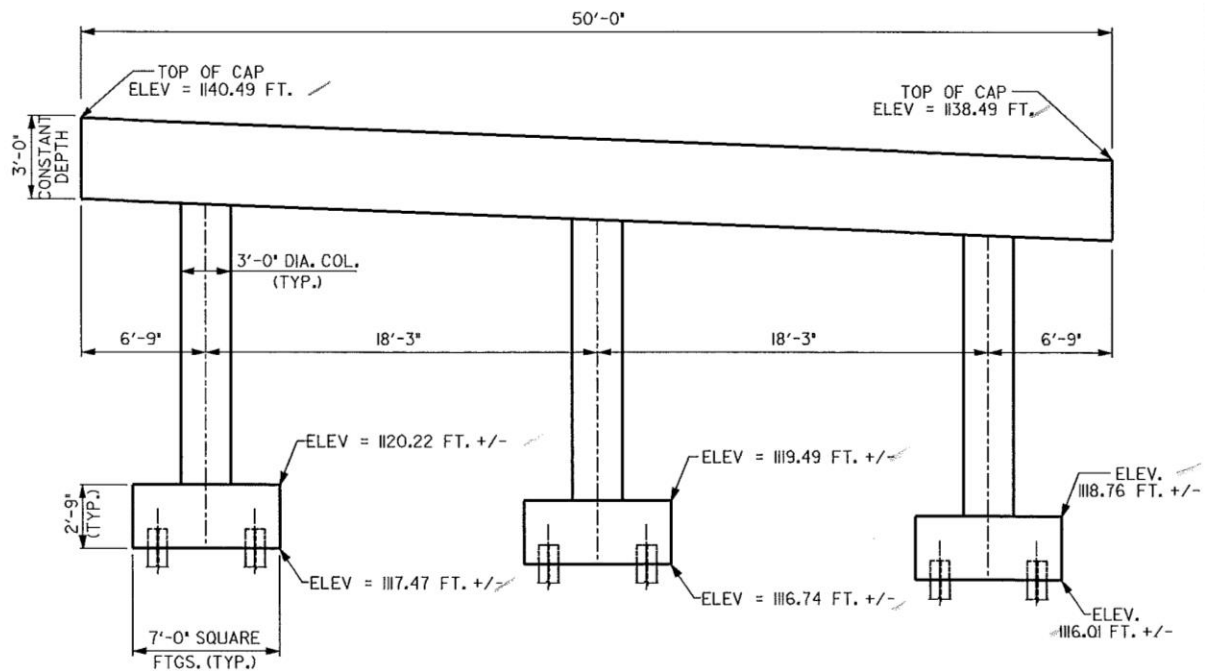


BENT #1  
R/C CAP ON 3 - 36" DIA.  
R/C COLUMNS ON  
R/C FOOTINGS ON  
HP 14 X 73 STEEL PILES;  
4 PILES EA. FOOTING  
ALL VERTICAL  
MAX. FACTORED PILE AXIAL LOAD = 211 KIPS



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
HIGHWAY BUILDING  
P. O. BOX 25201  
RALEIGH, NORTH CAROLINA 27611

SUBJECT FACTORED LOADS PROJECT BD5111V  
FOR FOOTING PILES, BENT #2 SURRY COUNTY  
PREPARED BY STC DATE 03/2013 STATION 13+58.65 -L-  
CHECKED BY upk DATE 3/14/13 STR NO 12+33.21 -Y1- SHEET OF  
BR. #244 REPLCMNT



BENT #2  
R/C CAP ON 3 - 36" DIA.  
R/C COLUMNS ON  
R/C FOOTINGS ON  
HP 14 X 73 STEEL PILES;  
4 PILES EA. FOOTING  
ALL VERTICAL  
MAX. FACTORED PILE AXIAL LOAD = 194 KIPS