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SUBSURFACE EXPLORATION REPORT INFILTRATION BASINS I-95 BUSINESS / US 301 FROM NC 87 SOUTH TO NC 59 CUMBERLAND COUNTY, NORTH CAROLINA WBS NO: 45849.1.FR1 TIP NO: W-5519 F.A. NO.: N/A S&ME Project No: 1305-15-073

Prepared for:



State of N.C. Department of Transportation Division of Highways Geotechnical Engineering Unit 1589 Mail Service Center Raleigh, North Carolina 27699-1589

Prepared By:



S&ME, Inc. 3201 Spring Forest Road Raleigh, North Carolina 27616

July 27, 2015 S&ME, Inc. N.C. PE Firm License No. F-0176



July 27, 2015

State of N.C. Department of Transportation Division of Highways Geotechnical Engineering Unit 1589 Mail Service Center Raleigh, North Carolina 27699-1589

Attention: Mr. Mohammed A. Mulla, P.E. CPM Contract and Statewide Services Manager

Reference: Subsurface Exploration Report Infiltration Basins I-95 Business/US 301 from NC 87 South to NC 59 Cumberland County, North Carolina WBS No: 45849.1.FR1 Tip No: W-5519 F.A. No: N/A S&ME Project No: 1305-15-073

Dear Mr. Mulla:

S&ME, Inc. (S&ME) has completed the authorized subsurface exploration for the above referenced project. The purpose of our investigation was to explore subsurface conditions at the site and provide soil profile descriptions, elevation of the seasonal high groundwater table and insitu saturated hydraulic conductivity testing. Our services were completed in general accordance with S&ME Proposal No.13-1500387 dated July 23, 2015. The North Carolina Department of Transportation (NCDOT) issued S&ME a verbal Notice to Proceed for our investigation July 16, 2015. This report presents the findings of the exploration. A hand auger boring location plan, soil profile descriptions, in-situ hydraulic conductivity test results, seasonal high water table elevations, are provided in the Appendix.

S&ME appreciates the opportunity to provide our professional services on this project. If you have any questions concerning information presented herein, please do not hesitate to contact us.

Respectfully submitted,

S&ME, Inc.



Not considered "FINAL" unless all signatures are completed.

Paul Masten, LSS Soil Scientist N.C. License Number 1329 Abner F. Riggs, Jr., PE Senior Geotechnical Engineer N.C. Registration Number 14155

PROJECT INFORMATION

On July 22, 2015, S&ME performed soil evaluations at 4 locations to assist NCDOT with design of stormwater best management practices (BMPs) associated with proposed roadway improvements to I-95 Business/US Highway 301 in Fayetteville, Cumberland County, North Carolina. NCDOT provided Mr. Abner Riggs, Jr., P.E. with S&ME coordinates for the test locations. All four of the test locations are located adjacent to existing roadways and are in the road median/shoulder with shallow, surface topsoil being the only fill observed.

Mr. Paul Masten, S&ME soil scientist, conducted an evaluation of the soils within the test areas identified by NCDOT. The soil scientist evaluation was conducted to evaluate the suitability of the soil properties relative to Stormwater Management permitted by the North Carolina Department of Environment and Natural Resources – Land Quality Section (NCDENR-LQS). S&ME visited the site on July 22, 2015 and performed the evaluation with hand auger borings at each test location to a depth of approximately 8 feet below the existing ground surface (bgs).

FIELD EXPLORATION

The soil scientist investigation was conducted to evaluate the seasonal high water table (SHWT) elevations and in-situ soil permeability rate (in-situ saturated hydraulic conductivity testing). S&ME personnel conducted four (4) in-situ saturated hydraulic conductivity (Ksat) tests on July 22, 2015 at field test locations identified by NCDOT.

Ksat measurements were performed with a compact constant-head permeameter. Hand augers were used to excavate soils for the SHWT evaluations and for the Ksat measurements.

SHWT AND KSAT TESTING RESULTS

Seasonal High Water Table (SHWT) Determination

The SHWT evaluations were performed by advancing hand auger borings to a depth of approximately 8 feet (bgs) at the proposed stormwater best management practice (BMP) areas. The locations of the SHWT evaluations were approximated in the field with a Trimble GeoXT handheld Global Positioning Unit on July 17, 2015. During the hand auger investigation, soils were evaluated by a Licensed Soil Scientist for evidence of SHWT influence. This evaluation involved observing the actual moisture content in the soil and observing the soil matrix and mottle colors. Depending on the soil texture, the soil color will indicate processes that are driven by seasonally high water table fluctuations, such as iron reduction and oxidation and organic matter staining.

SHWT evaluations are based on secondary evidence and not on direct groundwater level measurements. Groundwater levels fluctuate for numerous reasons and these findings do not indicate that groundwater levels have not or will not rise above the noted depths. The

attached roadway Plan Sheet No. 4, identifies the approximate SHWT test locations and Table 1 identifies the approximated SHWT depths.

Test locations IB-1 and IB-4 were located adjacent to the west of the southbound travel lanes of I-95 Business/US Highway 301. Test locations IB-2 and IB-3 were located east of the northbound travel lanes of I-95 Business/US Highway 301. Shallow topsoil surface fill was observed at each of the locations.

Test location IB-1 was located in the road median/shoulder on the west side of I-95 Business/US 301. Soils at IB-1 consisted of loamy sand topsoil (fill) from 0 to 3 inches underlain by four horizons of fine sand and loamy sand from 3 to 48 inches underlain by one horizon of sandy loam from 48 to 96 inches. The surface soil (fill) was identified with soil matrix Munsell colors of 10YR 3/2 (very dark grayish brown); the first subsurface horizon was 2.5Y 6/4 (light yellowish brown); the next subsurface horizon was 2.5Y 7/4 (pale yellow) with 10YR 5/6 (yellowish brown) and 2.5Y 6/3 (light yellowish brown) streaks; the next subsurface horizon was 2.5Y 6/4 (light yellowish brown); the next subsurface horizon was 2.5Y 6/6 (olive yellow); the next subsurface horizon was 10YR 5/6 (yellowish brown) with 2.5Y 6/3 (light yellowish brown) and 7.5YR 5/6 (strong brown) streaks. Evidence of a SHWT was observed not observed within 8 feet of the ground surface.

Test location IB-2 was located in the road median/shoulder on the east side of I-95 Business/US 301. Soils at IB-2 consisted of loamy sand topsoil (fill) from 0 to 4 inches underlain by fine sand from 4 to 33 inches and three horizons of sandy clay loam from 33 to 96 inches. The surface soil (fill) was identified with a soil matrix Munsell color of 10YR 3/2 (very dark grayish brown); the first subsurface horizon was 2.5Y 6/4 (light yellowish brown); the next horizon was 10YR 4/6 (yellowish brown); the next horizon was 7.5YR 5/8 (strong brown); the next horizon was 10YR 5/8 (yellowish brown) with 2.5YR 5/8 (red streaks). Evidence of a SHWT was not observed within 8 feet of the ground surface.

Test location IB-3 was located in the road median/shoulder on the east side of I-95 Business/US 301. Soils at IB-3 consisted of loamy sand topsoil (fill) from 0 to 5 inches. Soil beneath the fill consisted of fine sand from 5 to 37 inches, underlain by two horizons of sandy clay loam from 37 to 84 inches and sandy loam with plinthitic (dense, very hard) soil materials from 84 to 96 inches. The surface soil (fill) was identified with a soil matrix Munsell color of 10YR 3/2 (very dark grayish brown); the first subsurface horizon was 2.5Y 6/4 (light olive yellow); the next subsurface horizon was 10YR 4/6 (dark yellowish brown); the next two subsurface horizons were 10YR 5/8 (yellowish brown) with 10YR 6/2 (light brownish gray) redox depletions and 7/5YR 5/8 (strong brown) and 5YR 4/6 (red) redox concentrations. Evidence of a SHWT was observed at 43 inches below the ground surface.

Test location IB-4 was located in the road median/shoulder on the east side of I-95 Business/US 301. Soils at IB-4 consisted of loamy sand topsoil (fill) from 0 to 2 inches. Soil beneath the fill consisted of fine sand from 2 to 24 inches, underlain by two horizons of sandy clay loam from 24 to 80 inches and sandy loam with plinthitic (dense, very hard) soil materials from 80 to 96 inches. The surface soil (fill) was identified with a soil matrix Munsell color of 10YR3/2 (very dark grayish brown); the first subsurface horizon was 2.5Y 6/4 (light olive yellow); the next subsurface horizon was 10YR 4/6 (dark yellowish brown); the next subsurface horizon was 10YR 5/6 (yellowish brown) with 10YR 6/2 (light brownish gray) redox depletions and 2.5YR 4/6 (red) redox concentrations; the next subsurface horizon was 7.5YR 5/8 (strong brown) with 10YR 6/2 (light brownish gray) redox depletions and 2.5YR 5/8 (red) redox depletions. Evidence of a SHWT was observed at 30 inches below the ground surface.

The ground surface elevations at the test locations were determined by S&ME personnel using a tripod level scope and measuring rod and the elevation of nearby benchmark (BM PK Nail B9534 on Linwood Road: Elevation 194.06 feet) provided to S&ME by NCDOT on July 20, 2015.

	NCDOT I-95 Business/US Highway 301						
Test Location	Elevation Ground Surface (feet)	Seasonal High Water Table Depth (feet bgs)	Elevation Seasonal High Water Table (feet)				
IB-1	192.1	> 8	< 184.1				
IB-2	192.8	> 8	< 184.8				
IB-3	192.9	3.6	189.3				
IB-4	193.0	2.5	190.5				

Table 1: Seasonal High Water Table Determinations

Please note that the seasonal high water table conditions encountered at IB-3 and IB-4 may represent perched water table conditions.

Constant Head Permeameter Saturated Hydraulic Conductivity Testing

S&ME performed the in-situ hydraulic conductivity (Ksat) testing by utilizing a compact constant head permeameter at each of the test locations. S&ME performed Ksat tests on July 22, 2015.

For the Ksat testing, a hand auger boring was advanced at each Test Location with a 2 inch diameter bucket. The water dissipating unit of the permeameter was lowered to the bottom of the hole and water was dispensed from the permeameter. The water was allowed to move through the unit until steady-state flow was achieved and then flow rates were recorded. The last three measurements were averaged to achieve the most representative value to express the saturated hydraulic conductivity. The soils at the test location depths were observed to consist of naturally occurring sand, sandy loam and sandy clay loam typical of the Sandhills region.

The Ksat rates were variable depending on location and ranged from 0.22 inches per hour (in/hr.) at IB-4 to 9.3 in/hr. at IB-3. Table 2 below summarizes the measured hydraulic conductivities and testing depths for the test locations.

July 27, 2015

TEST LOCATION	TESTING HORIZON	TESTING INTERVAL (inches bgs)	HYDRAULIC CONDUCTIVITY RATE (in/hr.)
IB-1	Bt1	48 to 54 inches	4.22 in/hr.
IB-2	Bt1/Bt2	39 to 45 inches	1.55 in/hr.
IB-3	Е	20 to 26 inches	9.33 in/hr.
IB-4	Bt1	28 to 34 inches	0.22 in/hr.

Table 2: Calculated Hydraulic Conductivity Rates

The North Carolina Department of Environment and Natural Resources (NCDENR) Best Management Practices (BMP) Manual identifies a minimum infiltration rate of 0.52 inches per hour and a draw-down time of five days for stormwater runoff entering an infiltration system as well as a two-foot separation between the SHWT and the bottom of the infiltration device. However, NCDENR has issued draft Minimum Design Criteria (MDC) for stormwater treatment systems that identify a 72-hour draw down time to the bottom of an infiltration device, with no minimum infiltration rate and two-foot separation above SHWT with the option to reduce the separation to one foot if the applicant can show that the water table will return to its pre-storm elevation in five days or less. Although the MDC are still in draft form, they can be utilized at this time by following the Alternative Design Criteria provisions in 15A NCAC 2H .1008(h).

QUALIFICATIONS OF REPORT

This report has been prepared in accordance with generally accepted soil science and geotechnical engineering practice for specific application to this project. The findings contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, expressed or implied, is made.

The findings submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of subsurface variations between the locations evaluated may not become evident until construction. If variations appear evident, then the findings contained in this report may need to be re-evaluated.

SEE SHEET 2A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

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DESCRIPTION
TITLE SHEET
LEGEND
PLAN SHEET LAYOUT
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SOIL PROFILE DESCRIPTIONS
ABBREVIATION LEGEND
IN-SITU CONSTANT
HEAD CALCULATIONS

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

COUNTY CUMBERLAND

PROJECT DESCRIPTION 1-95 BUSINESS /US301 FROM NC87 SOUTH TO NC59

INFILTRATION BASINS

5849 4 PROIEC

519 S M. REFERENCE

Not considered "FINAL" unless all signatures are completed

STATE N.C

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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 LOCS, ROCK CORES AND SOLIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6850. THE SUBJURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOLI TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 CONSDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS DECLIDING TO CLIMATE OBCOMENTION AND WAY AND ACCOUNT AS WELL AS COMEN DATA CLIMATIC CONDITIONS INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS DECLIDING TO AND AS AND AS AND AND AND AND AS WELL AS COMEN DATA 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 UBSURFACE 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 OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO RESUCTIONS OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL COMPENSATION.

NOTES:

- TES: 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 REDUESTED 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

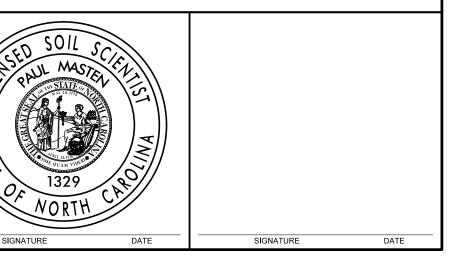
P. MASTEN

DRAWN BY <u>B.</u>RATTI

CHECKED BY ______A.F. RIGGS JR, P.E.

SUBMITTED BY _S&ME, INC.

DATE ______ *JULY 2015*



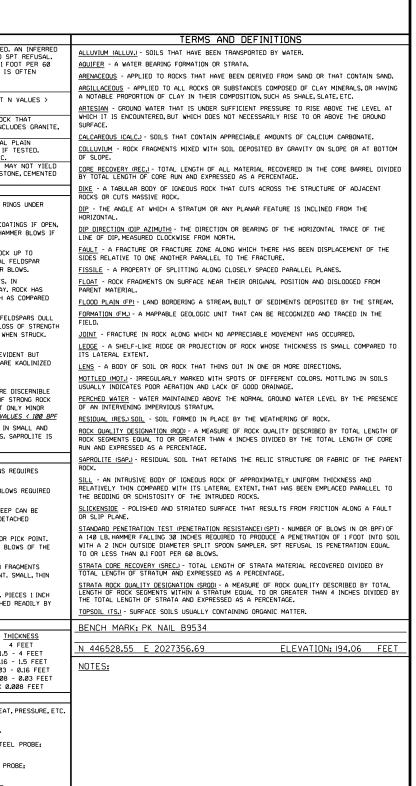
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

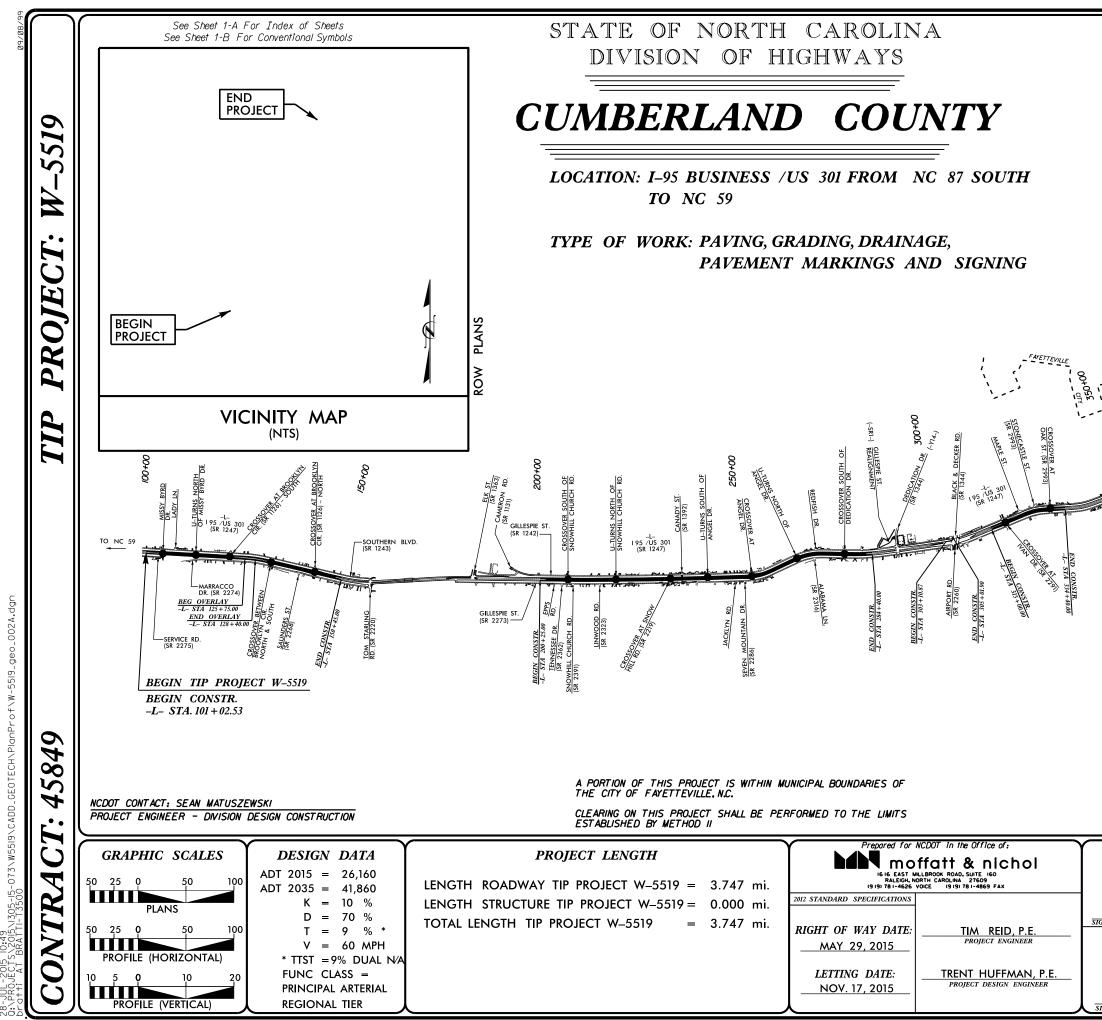
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

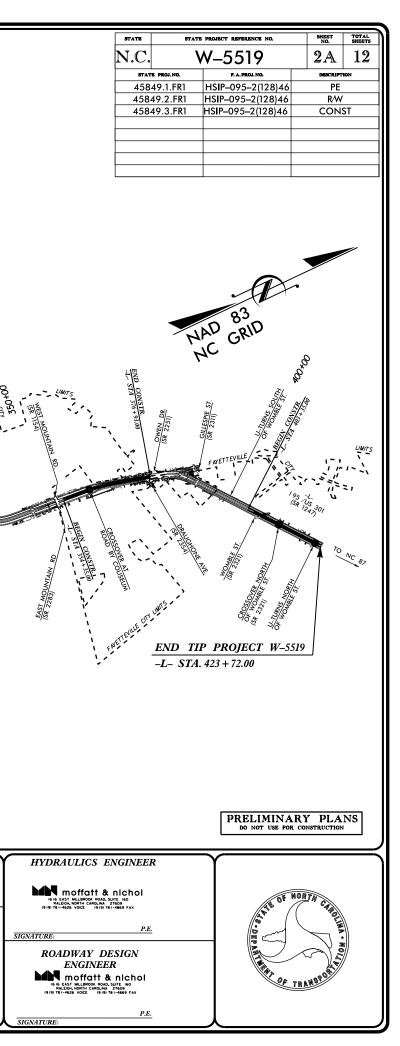
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RANGE <		- WET -	(W)	SEMISOLID; F)	FRAC FRACTURED, FRAC FRAGS FRAGMENTS	TURES	TCR - TRICONE W - MOISTURE			RECOMPACTED TRIAXIAL CALIFORNIA BEARING	FR	ACTURE	E SPA	CING	BEDDING
(PI) PL	_ PLASTIC LIMIT							HI HIGHLY		V - VERY			RATIO	TERM VERY WIDE			<u>SPACING</u> THAN 10 FEET	TERM VERY THICKLY BEDDED
	_ OPTIMUM MOISTURE _ SHRINKAGE LIMIT	- MOIST	- (M)	SOLID; AT O				DRILL UNITS:	ADVAN	INT USED UN S NCING TOOLS: CLAY BITS	JUBJELI	HAMMER T		WIDE MODERATELY CLOSE	CLOSE	3 1	TO 10 FEET TO 3 FEET 6 TO 1 FOOT	THICKLY BEDDED 1 THINLY BEDDED 0. VERY THINLY BEDDED 0.0
		- DRY -	(D)	REQUIRES A			0	CME-55		6 CONTINUOUS FLIGHT	AUGER	CORE SIZE		VERY CLOSE		LESS T	THAN 0.16 FEET	THICKLY LAMINATED 0.00 THINLY LAMINATED <
	I	PL	STICITY							8 HOLLOW AUGERS		в	П-н					RATION
		PLAST	ICITY INDEX	(PI)	DI	RY STREND		CME-550		HARD FACED FINGER B		□-N				, INDURAT		NING OF MATERIAL BY CEMENTING, HE
SLIGH	PLASTIC HTLY PLASTIC		0-5 6-15			VERY LOW SLIGHT	V	VANE SHEAR TEST		TUNGCARBIDE INSERT		HAND TOO	LS:	FRIABLE				BY HAMMER DISINTEGRATES SAMPLE.
	RATELY PLASTIC Y PLASTIC		16-25 6 OR MORE			MEDIUM HIGH		PORTABLE HOIST		TRICONEST	EEL TEETH		T HOLE DIGGER D AUGER	MODERAT	ELY INDUR	RATED	BREAKS EASIL	E SEPARATED FROM SAMPLE WITH ST Y WHEN HIT WITH HAMMER.
			COLOR					1 □			NGCARB.		NDING ROD	INDURATE	D			DIFFICULT TO SEPARATE WITH STEEL BREAK WITH HAMMER.
	ONS MAY INCLUDE COL IFIERS SUCH AS LIGH									CORE BIT			E SHEAR TEST DOZEMETER	EXTREME	LY INDURA	ATED		R BLOWS REQUIRED TO BREAK SAMPLI <s across="" grains.<="" td=""></s>

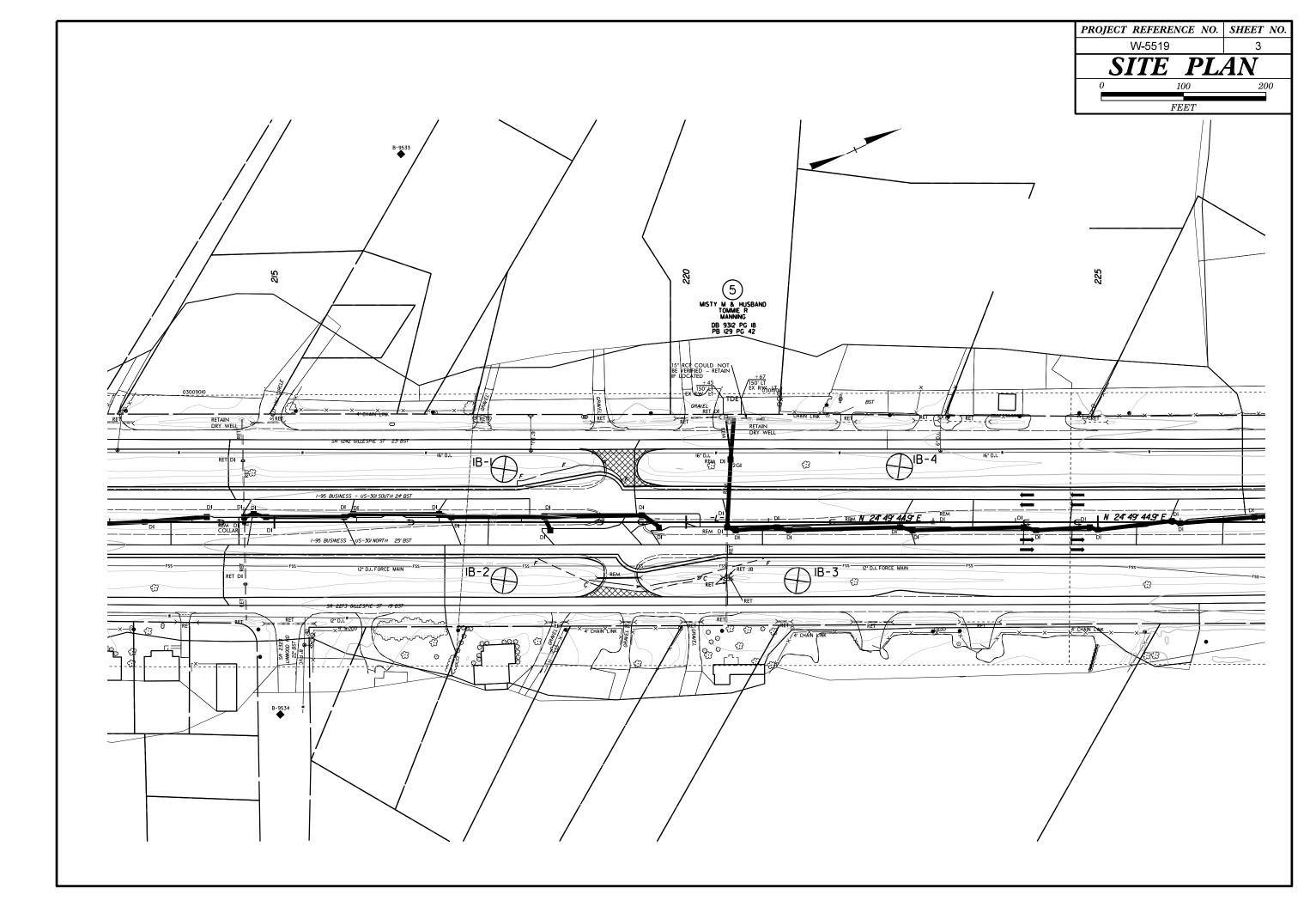
W-5519

DATE: 8-15-1-









Client:	NCDOT	Date:	7-22-15
Project Name:	I-95 Business/US 301 INFLPND	Project No.	W-5519
County:	Cumberland	State	NC
Location:	STA 217+80 64 FT LT -L-	Site/Field No.	IB-1
Soil Series:	Wagram		
Apparent Water Table:	>8 feet bgs	Seasonal High Water Table:	>8 feet bgs
Vegetation:	Grass	Slope:	1-2%
Hand Auger Boring Terminated at	8 feet bgs		

Horizon	Depth (ft)	Matrix	Mottles	Texture	Structure	Consistence	Notes
А	0-0.25	10YR 3/2		ls	gr	v fr	
E1	0.25 - 0.92	2.5Y 6/4		fs	sg	loose	
E/Bt	0.92 - 2.7	2.5Y 7/4	10YR 5/6	ls	gr	v fr	
			2.5Y 6/3				
E2	2.7 - 3.6	2.5Y 6/4		fs	sg	loose	
E3	3.6 - 4.0	2.5Y 6/6		fs	sg	loose	
Bt1	4.0 - 8.0	10YR 5/6	2.5Y 6/3	sl	msbk	ss, sp, fr	
			7.5YR 5/6				

COMMENTS:

DESCRIBED BY: Paul Masten DATE: 7-22-15

Client:	NCDOT	Date:	7-22-15
Project Name:	I-95 Business/US 301 INFLPND	Project No.	W-5519
County:	Cumberland	State	NC
Location:	STA 217+80 71 FT RT -L-	Site/Field No.	IB-2
Soil Series:	Wagram		
Apparent Water Table:	>8 feet bgs	Seasonal High Water Table:	>8 feet bgs
Vegetation:	Grass	Slope:	Flat
Hand Auger Boring Terminated at	8 feet bgs		

Horizon	Depth (ft)	Matrix	Mottles	Texture	Structure	Consistence	Notes
А	0-0.33	10YR 3/2		ls	gr	fr	
Е	0.33 – 2.8	2.5Y 6/4		fs	sg	loose	
Bt1	2.8 - 3.6	10YR 4/6		scl	wabk	ss, np, fr	
Bt2	3.6 - 6.6	7.5YR 5/8		scl	wsbk	ss, np, fr	
Bt3	6.6 - 8.0	10YR 5/8	2.5YR 5/8	scl	wsbk	ss, np, fr	

COMMENTS:

DESCRIBED BY: Paul Masten DATE: 7-22-15

Client:	NCDOT	Date:	7-22-15
Project Name:	I-95 Business/US 301 INFLPND	Project No.	W-5519
County:	Cumberland	State	NC
Location:	STA 221+35 71 FT RT -L-	Site/Field No.	IB-3
Soil Series:	Wagram		
Apparent Water Table:	>8 feet bgs	Seasonal High Water Table:	3.6 feet bgs
Vegetation:	Grass	Slope:	Flat
Hand Auger Boring Terminated at	8 feet bgs		

Horizon	Depth (ft)	Matrix	Mottles	Texture	Structure	Consistence	Notes
А	0-0.42	10YR 3/2		ls	gr	v fr	
Е	0.42 - 3.1	2.5Y 6/4		fs	sg	loose	
Bt1	3.1 - 3.6	10YR 4/6		scl	wsbk	fr	
Bt2	3.6 - 7.0	10YR 5/8	10YR 6/2	scl	mabk	firm	
			7.5YR 5/8				
Bx	7.0 - 8.0	10YR 5/8	10YR 6/2	sl	gr	v fr	Plinthitic soil materials observed
			5YR 4/6				

COMMENTS:

DESCRIBED BY: Paul Masten DATE: 7-22-15

SHEET 6

Client:	NCDOT	Date:	7-22-15
Project Name:	I-95 Business/US 301 INFLPND	Project No.	W-5519
County:	Cumberland	State	NC
Location:	STA 222+59 67 FT LT -L-	Site/Field No.	IB-4
Soil Series:	Wagram		
Apparent Water Table:	>8 feet bgs	Seasonal High Water Table:	2.5 feet bgs
Vegetation:	Grass	Slope:	Flat
Hand Auger Boring Terminated at	5.2 feet bgs		

Horizon	Depth (ft)	Matrix	Mottles	Texture	Structure	Consistence	Notes
А	0-0.17	10YR 3/2		ls	gr	v fr	
Е	0.17 – 2.0	2.5Y 6/4		fs	sg	loose	
Bt1	2.0 - 2.5	10YR 4/6		scl	mabk	s, p, fr	
Bt2	2.5 - 6.7	10YR 5/6	10YR 6/2	scl	mabk	ss, sp, fr	
			2.5YR 4/6				
Bx	6.7 - 8.0	7.5YR 5/8	10YR 6/2	sl	gr	v fr	Plintihic soil materials observed
			2.5YR 5/8				

COMMENTS:

DESCRIBED BY:	Paul Masten	DATE:	7-22-15

SHEET 7

S&ME Soil Prolife Descriptions Abbreviation Legend – I-95 Business/US Highway 301 Project No. 45849.1.FR1

SHWT

Texture

sandy loam	sl
loamy sand	ls
fine sand	fs
sandy clay loam	scl

Structure

weak, subangular blocky	wsbk
moderate, subangular blocky	msbk
moderate, angular blocky	mabk
granular	gr
single grain	sg

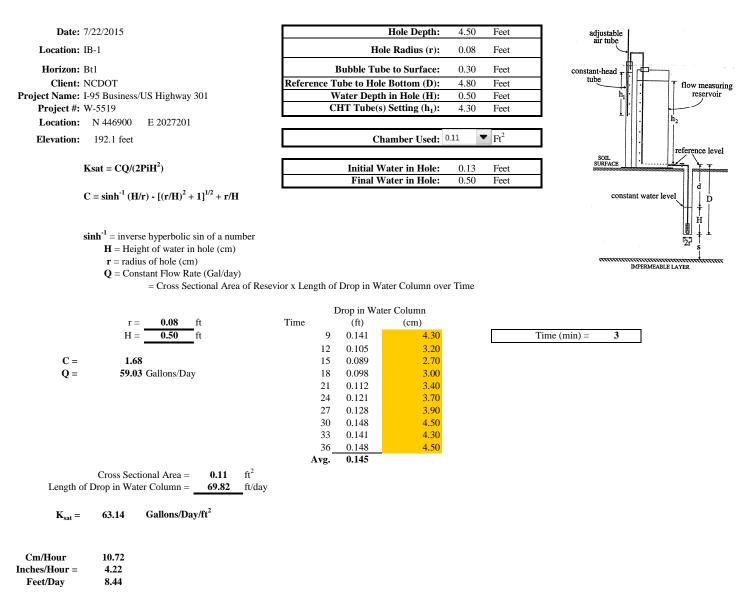
Consistence

very friable	v fr	
friable	fr	

Seasonal High Water Table

Munsell Colors

2.5YR4/6	red
2.5YR5/8	red
5YR4/6	yellowish red
2.5Y6/3	light yellowish brown
2.5Y6/4	light yellowish brown
2.5Y6/6	olive yellow
2.5Y7/4	pale yellow
7.5YR5/6	strong brown
7.5YR5/8	strong brown
10YR3/2	very dark grayish brown
10YR4/6	dark yellowish brown
10YR5/6	yellowish brown
10YR5/8	yellowish brown
10YR6/2	light brownish gray



Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

Date: 7/22/2015		H	lole Depth:	3.75	Feet	adjustable air tube
Location: IB-2		Hole	Radius (r):	0.08	Feet	
Horizon: Bt1/Bt2	Ві	ubble Tube	to Surface:	0.30	Feet	constant-head +
Client: NCDOT	Reference Tul	be to Hole B	ottom (D):	4.05	Feet	tube flow measuring
Project Name: I-95 Business/US Highway 301		ter Depth i		0.50	Feet	h ₁ ·
Project #: W-5519	СН	T Tube(s) S	etting (h ₁):	3.55	Feet	
Location: N 446844 E 2027323						
Elevation: 192.8 feet		Char	nber Used: 0.	11 🔻	Ft ²	reference level
$\mathbf{Ksat} = \mathbf{CQ}/(\mathbf{2PiH}^2)$		Initial Wat	er in Hole:	0.33	Feet	
		Final Wat	er in Hole:	0.50	Feet	
C = sinh ⁻¹ (H/r) - $[(r/H)^2 + 1]^{1/2} + r/H$						constant water level
$sinh^{-1}$ = inverse hyperbolic sin of a number						
$\mathbf{H} = \text{Height of water in hole (cm)}$						S S
\mathbf{r} = radius of hole (cm)						IMPERMEABLE LAYER
$\mathbf{Q} = \text{Constant Flow Rate (Gal/day)}$						
= Cross Sectional Area of Res	evior x Length of Dr	op in Water	Column over 1	ime		
]	Drop in Wate	er Column			
r = 0.08 ft	Time	(ft)	(cm)			
H = 0.50 ft	12	0.033	1.00			Time (min) = 3
	15	0.000	1.10			
$\mathbf{C} = 1.68$	18	0.000	1.00			
Q = 21.75 Gallons/Day	21	0.039	1.20			
	24	0.036	1.10			
	27 30	0.043	1.30			
	30 33	0.046 0.046	1.40 1.40			
	36	0.040	1.40			
	39	0.059	1.80			
	Avg.	0.054	1.00			
Cross Sectional Area = 0.11 ft ²						
Length of Drop in Water Column = 25.72 ft/day	7					
$K_{sat} = 23.26$ Gallons/Day/ft ²						
Cm/Hour 3.95						
nches/Hour = 1.55						

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

Prepared by: S&ME, Inc. Paul Masten

Feet/Day

3.11

Date: 7/22/2015]	Hole Depth: 2	2.17 Fee	
Location: IB-3		Hole	Radius (r): 0).08 Fee	air tube
Horizon: E	Ві	ıbble Tube	to Surface: 0).30 Fee	et constant-head
Client: NCDOT	Reference Tul	e to Hole	Bottom (D): 2	2.47 Fee	
roject Name: I-95 Business/US Highway 301	Wa	ter Depth	in Hole (H): 0	0.50 Fee	
Project #: W-5519	CH	T Tube(s)	Setting (h ₁): 1	.97 Fee	et iiii
Location: N 447167 E 2027473					<u> </u>
Elevation: 192.9 feet		Cha	mber Used: 0.11	\bullet Ft ²	reference level
$\mathbf{Ksat} = \mathbf{CQ}/(\mathbf{2PiH}^2)$		Initial Wa	ter in Hole: 0).33 Fee	et
				0.50 Fee	
$C = \sinh^{-1} (H/r) - [(r/H)^2 + 1]^{1/2} + r/H$					constant water level
$sinh^{-1}$ = inverse hyperbolic sin of a number					
\mathbf{H} = Height of water in hole (cm)					
\mathbf{r} = radius of hole (cm)					
$\mathbf{Q} = \text{Constant Flow Rate (Gal/day)}$					IMPERMEABLE LAYER
= Cross Sectional Area of Rese	vior x Length of Dr	op in Water	Column over Tin	ne	
r =ft	I Time	Drop in Wa (ft)	ter Column (cm)		
H = 0.50 ft	21	0.102	3.10		Time (min) = 1
	22	0.000	3.30		
C = 1.68	23	0.000	3.30		
Q = 130.48 Gallons/Day	24	0.108	3.30		
	25 26	0.102 0.102	3.10 3.10		
	26 27	0.102	3.30		
	27	0.108	3.30		
	28	0.108	3.30		
	30	0.105	3.20		
	Avg.	0.107	0.20		
Cross Sectional Area = 0.11 ft ²					
Length of Drop in Water Column = <u>154.33</u> ft/day					
K _{sat} = 139.57 Gallons/Day/ft ²					
Cm/Hour 23.70					

0.02

0.11

Inches/Hour = 9.33 Feet/Day 18.66

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

Prepared by: S&ME, Inc. Paul Masten

Date:	7/22/2015	Hole Depth: 2.83 Feet adjustable	
Location:		Hole Depth: 2.83 Feet adjustable air tube Hole Radius (r): 0.08 Feet	
Horizon:	Bt1	Bubble Tube to Surface: 0.30 Feet constant-head	
	NCDOT	Reference Tube to Hole Bottom (D): 3.13 Feet	
	I-95 Business/US Highway 301	Water Depth in Hole (H): 0.50 Feet h ₁ reservoir	
Project #:		CHT Tube(s) Setting (h ₁): 2.63 Feet	
	N 447337 E 2027400		
Elevation:	193.0 feet	Chamber Used: 0.11 V Ft ²	
	$Ksat = CQ/(2PiH^2)$	Initial Water in Hole: 0.42 Feet	
	C = sinh ⁻¹ (H/r) - $[(r/H)^2 + 1]^{1/2} + r/H$	Final Water in Hole: 0.50 Feet	
	$sinh^{-1}$ = inverse hyperbolic sin of a number H = Height of water in hole (cm)		
	\mathbf{r} = radius of hole (cm)	IMPERMEABLE LAYER	
	$\mathbf{Q} = \text{Constant Flow Rate (Gal/day)}$	IMPERMEABLE LAYER	
		vior x Length of Drop in Water Column over Time	
		Drop in Water Column	
	r = 0.08 ft	Time (ft) (cm)	
	H = 0.50 ft	3 0.098 3.00 Time (min) = 3	
C =	1.68	6 0.000 0.40 9 0.000 0.20	
C = Q =	3.11 Gallons/Day	12 0.007 0.20	
Q =	3.11 Ganons/Day	12 0.007 0.20 15 $ 0.010 0.30$	
		18 0.007 0.20	
		24 0.007 0.20	
		27 0.007 0.20	
		3000100.30_	
		Avg. 0.008	
	Cross Sectional Area = 0.11 ft ²		
Length of	f Drop in Water Column = 3.67 ft/day		
K _{sat} =	3.32 Gallons/Day/ft ²		
Cm/Hour	0.56		
Inches/Hour =	0.22		
Feet/Day	0.44		

Note: Ksat calculations are based on average drop in Water Column (ft) after equilibrium is reached.

0.02 0.11

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

<u>LINE</u>	<u>STATION</u>	<u>PLAN</u>	<u>PROFILE</u>	<u>XSECT</u>
-L-	105+00 TO 120+00	4	-	-
-L-	132+00 TO 147+00	5	-	-
-L-	205+00 TO 220+00	6	-	-
-L-	222+00 TO 237+00	7	-	-
-L-	239+00 TO 254+00	8	-	-
-L-	262+00 TO 277+00	9	-	15
-L-	279+00 TO 294+00	10	-	-
-L-	316+00 TO 331+00	П	-	-
-L-	356+00 TO 37I+00	12	-	-
-L-	393+00 TO 407+00	13	-	-
-SRI-	10+00 TO 21+00	10	14	-

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

COUNTY ____CUMBERLAND

PROJECT DESCRIPTION <u>I-95 BUSINESS</u> /US 301 FROM NC 87 SOUTH TO NC 59

INVENTORY

REFERENCE

SIGNATURE

STATE N.C

SHEETS

NO.

1

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PERSONNEL

A. S. PAUL

T. E. EVANS

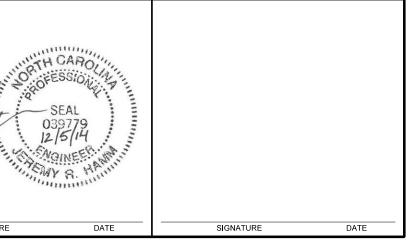
INVESTIGATED BY <u>A.</u> S. PAUL

DRAWN BY <u>ASP &</u> TEE

CHECKED BY J. R. HAMM

SUBMITTED BY _____FALCON

DATE DECEMBER 2014



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			SOIL C	ESCRI	PTION	1			T		GF	RADATION			1			ROCK	DESCRIPT	ION
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							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.						ROCK LINE	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TEST ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD				IN MATERIAL WOULD YIELD		
ACCORDIN	NG TO THE	STANDARD PEN	ETRATION TE	ST (AASHT	TO T 200	6, ASTM D1	586), SOIL CLAS	SIFICATION	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.						BLOWS IN N	NON - COA	STAL PLAIN	MATERIAL, THE		DUAL TO OR LESS THAN 0. BETWEEN SOIL AND ROCK
							R PERTINENT FA		ANGULARITY OF GRAINS THE ANGULARITY OF ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:									ATHERED ROCK. ' DIVIDED AS FO	DLLOWS:	
	ERY STIFF.G	RAY.SILTY CLAY.M	DIST WITH INT.	ERBEDDED	FINE SA	AND LAYERS,	HIGHLY PLASTIC, A-		THE ANGULARIT ANGULAR, SUBAN				ESIGNATED	BY THE TERMS:	WEATHERED ROCK (WR)				PLAIN MATERI ER FOOT IF TE	AL THAT WOULD YIELD SPI
GENERAL		DIL LEGE	ND AND NLS		-CLAY MATI				-	M	INERALOG	ICAL COMPOSI	TION			_	2.2	1		EOUS AND METAMORPHIC RC
CLASS.		≤ 35% PASSING *		_	5% PASSING		ORGANIC M					Z, FELDSPAR, MICA, T N THEY ARE CONSID			CRYSTALLIN ROCK (CR)	E		VOULD YIELD		IF TESTED. ROCK TYPE IN
	A-1 A-1-a A-1-b	A-3 A-2-4 A-2	A-2 -5 A-2-6 A-2-		A-5 A-	-6 A-7 A-7-5, A-7-6	A-1, A-2 A-4, A-3 A-6,					RESSIBILITY			NON-CRYSTA	LLINE				AMORPHIC AND NON-COASTA
SYMBOL 0				3							COMPRESSIBLE Y COMPRESSIB	LE	LL < 31 LL = 31		COASTAL PL	AIN		ROCK TYPE IN	NCLUDES PHYLL	ITE, SLATE, SANDSTONE, ETC CEMENTED INTO ROCK, BUT
% PASSING	300000000	••••••••••••••••••••••••••••••••••••••		Menoremot .			SIL	-	HIGHL	LY COM	PRESSIBLE		LL > 50		SEDIMENTAR (CP)				. ROCK TYPE I	NCLUDES LIMESTONE, SANDS
*40 3	0 MX 0 MX 50 MX						GRANULAR CLA SOILS SOIL	Y MUCK,			GRANULAR	GE OF MATER	IAL						EATHERING	
*200 15 MATERIAL	5 MX 25 MX	10 MX 35 MX 35	MX 35 MX 35 M	IX 36 MN 3	36 MN 36	MN 36 MN	561		ORGANIC MATERIAL TRACE OF ORGANIC M		SOILS	SILT - CLAY <u>SOILS</u> 3 - 5%	<u>OTH</u> TRACE	ER MATERIAL 1 - 10%	FRESH		FRESH, CRYST		JOINTS MAY SH	IOW SLIGHT STAINING. ROCK
PASSING #40							SOILS WITH		LITTLE ORGANIC MATT MODERATELY ORGANIC	TER	3 - 5% 5 - 10%	5 - 12% 12 - 20%	LITTLE		VERY SLIGHT	ROCK	GENERALLY F	RESH, JOINTS STA		NTS MAY SHOW THIN CLAY C
LL PI	- 6 MX		MN 40 MX 41 M MX 11 MN 11 M				LITTLE OR MODERATE	HIGHL Y	HIGHLY ORGANIC		> 10%	> 20%	HIGHLY		(V SLI.)		ALS ON A BR CRYSTALLINE		ACE SHINE BRI	GHTLY. ROCK RINGS UNDER H
GROUP INDEX	0	0 0	4 MX	8 MX 1	12 MX 16	MX NO MX	AMOUNTS OF	ORGANIC SOILS			GRO	UND WATER			SLIGHT					DLORATION EXTENDS INTO RO
	TONE FRAGS. GRAVEL, AND		OR CLAYEY	SILT		CLAYEY	ORGANIC MATTER		∇			BORE HOLE IMMEDIA		R DRILLING	(SLI.)					OID ROCKS SOME OCCASIONA ROCKS RING UNDER HAMMEF
MATERIALS	SAND	SAND GRAVE	l and sand	SOIL	5	SOILS						VEL AFTER 24			MODERATE (MOD.)					ON AND WEATHERING EFFECT: DISCOLORED,SOME SHOW CLA
GEN. RATING AS SUBGRADE		EXCELLENT TO GO	DO	F	AIR TO PO	JOR	FAIR TO POOR POOR	R UNSUITABL				SATURATED ZONE, OR	WATER BE	ARING STRATA	1100.7	DULL	SOUND UNDER			VIFICANT LOSS OF STRENGTH
	l	PLOF A-7-5 SUBG	IOUP IS ≤ LL	- 30 ; PI OF	A-7-6 SI	UBGROUP IS :	> LL - 30		- 0-111-	SPRI	ING OR SEEP				MODERATELY		FRESH ROCK. OCK EXCEPT	DUARTZ DISCOLOR	RED OR STAINED	. IN GRANITOID ROCKS.ALL F
		CON	SISTENC								MISCELLA	NEOUS SYMBO	DLS		SEVERE (MOD. SEV.)	AND D	ISCOLORED AM	D A MAJORITY S	HOW KAOLINIZA	ION. ROCK SHOWS SEVERE L ROCK GIVES "CLUNK" SOUND
PRIMARY S	OIL TYPE	COMPACTN CONSIS		PENETR		ESISTENCE	COMPRESSIV	UNCONFINED	L ROADWAY EMB							<u>IF TE</u> :	STED, WOULD	IELD SPT REFUS	AL	
		VERY L			(N-VALUE < 4		(TUN:	/FT ²)	┨╚╁	.SURIPT		SPT	_	SLOPE INDICATOR	SEVERE (SEV.)	REDUC	ED IN STRENG	TH TO STRONG S	OIL. IN GRANIT	. ROCK FABRIC CLEAR AND E DID ROCKS ALL FELDSPARS 4
GENERAL GRANULA	R	LOO MEDIUM	6E		4 TO 10 10 TO 3		N	/A	⊢ SOIL SYMBOL מיו		-	OPT OMT TEST BOP		INSTALLATION				OME FRAGMENTS (IELD SPT N VAL		K USUALLY REMAIN.
MATERIA (NON-COH		DEN	SE		30 TO 5	50			ARTIFICIAL FI			AUGER BORING) CONE PENETROMETER TEST	VERY	ALL R	OCK EXCEPT	DUARTZ DISCOLOR	RED OR STAINED	ROCK FABRIC ELEMENTS AF
		VERY (< 2		< 1	.25	INFERRED SOI	IL BOU		CORE BORING	•	SOUNDING ROD	SEVERE (V SEV.)	REMAI	NING. SAPROL	TE IS AN EXAMP	LE OF ROCK WE	JS, WITH ONLY FRAGMENTS O ATHERED TO A DEGREE THAT
GENERAL SILT-CL4		SOF MEDIUM	т		2 TO 4 4 TO 8		0.25	TO 0.5 TO 1.0	INFERRED ROOM		E MW) MONITORING WE	au 🔺	TEST BORING	COMPLETE					<u>STED, WOULD YIELD SPT N V</u> IBLE,OR DISCERNIBLE ONLY
MATERIA (COHESIV	L	STI VERY S	F		8 TO 19	5	1 T	02			-	PIEZOMETER	-	WITH CORE	CONTECTE	SCATT	ERED CONCEN			ENT AS DIKES OR STRINGERS
10012314	2/	HAF	D		> 30			4	ALLUVIAL SOI			INSTALLATION	C)— SPT N-VALUE		HL SU	AN EXAMPLE.	RUCI	K HARDNES	35
		T	EXTURE	<u>DR GR</u>	<u>AIN S</u>	SIZE						DATION SYMB			VERY HARD			HED BY KNIFE OR	SHARP PICK. E	REAKING OF HAND SPECIMEN
U.S. STD. SIE OPENING (MM		4	4 10 .76 2.00	40 0.42	60 0.25		270 0.053				UNCLASSIFIED UNSUITABLE W4		L*_≭ ACCE	ASSIFIED EXCAVATION - PTABLE, BUT NOT TO BE	HARD			VS OF THE GEOLO		DIFFICULTY. HARD HAMMER B
BOULDER		BLE GF	AVEL	COARSI		FINE	SILT	CLAY	SHALLOW UNDERCUT		UNCLASSIFIED ACCEPTABLE DI	EXCAVATION - EGRADABLE ROCK		IN THE TOP 3 FEET OF INKMENT OR BACKFILL	TIMINO		TACH HAND S		CK UNET WITH I	
(BLDR.)			GR.)	SAND (CSE. SE		SAND	(SL)	(CL.)			ABBI	REVIATIONS			MODERATELY HARD					GROOVES TO 0.25 INCHES DE HAND SPECIMENS CAN BE D
GRAIN MM	305	75	2.0		0.25	5	0.05 0	005	AR - AUGER REFUSAL			MEDIUM		- VANE SHEAR TEST			DERATE BLOW			
SIZE IN.	12	3 OIL MOIS							BT - BORING TERMINATED CL CLAY		MOD	 MICACEOUS MODERATELY 	γ -	WEATHERED UNIT WEIGHT	MEDIUM HARD	CAN B	E EXCAVATED	IN SMALL CHIPS		FIRM PRESSURE OF KNIFE O NCH MAXIMUM SIZE BY HARD
SOIL	MOISTURE		FIELD MO				TELD MOISTURE	DECODIDITION	CPT - CONE PENETRATION CSE COARSE	N TEST		NON PLASTIC ORGANIC		DRY UNIT WEIGHT	SOFT		OF A GEOLOG		BY KNIEF OR	PICK. CAN BE EXCAVATED IN
(ATTE	ERBERG LI	1ITS)	DESCRI	PTION			IELD MOISTURE	DESCRIPTION	DMT - DILATOMETER TES DPT - DYNAMIC PENETRA			PRESSUREMETER TE SAPROLITIC		AMPLE ABBREVIATIONS BULK		FROM	CHIPS TO SE		SIZE BY MODER	RATE BLOWS OF A PICK POIN
			- SATURA (SAT.				UID; VERY WET, THE GROUND W		e – VOID RATIO F – FINE			SAND, SANDY SILT, SILTY	SS	- SPLIT SPOON - SHELBY TUBE	VERY	CAN B	E CARVED WI	H KNIFE. CAN BE	E EXCAVATED RE	ADILY WITH POINT OF PICK.
		LIMIT _							FOSS FOSSILIFEROUS		SLI	SLIGHTLY	RS	- ROCK	SOFT	OR MO FINGEF		ESS CAN BE BRO	KEN BY FINGER	PRESSURE. CAN BE SCRATCH
RANGE <			- WET -	(W)			EQUIRES DRYINC MUM MOISTURE	TO	FRAC FRACTURED, FRAC FRAGS FRAGMENTS	TURES		TRICONE REFUSAL IDISTURE CONTENT		- RECOMPACTED TRIAXIAL - CALIFORNIA BEARING		FRAC	TURE SP	ACING		BEDDING
(PI) PL	PLASTI	LIMIT _							HI HIGHLY			ON SUBJECT		RATIO	VERY WI	٦F	MORE	SPACING THAN 10 FEET	VER	TERM Y THICKLY BEDDED
		M MOISTURE	- MOIST	- (M)	SOL	_ID;AT OR	NEAR OPTIMUM	MOISTURE	DRILL UNITS:	1	ANCING TOOLS:		HAMMER		WIDE MODERAT		3	TO 10 FEET TO 3 FEET	THI	CKLY BEDDED 1 NLY BEDDED 0.1
SL .	SHRINK	AGE LIMIT _					DITIONAL WATE	2 TO	CME-45C		CLAY BITS		AL	JTOMATIC MANUAL	CLOSE		0.	16 TO 1 FOOT	VER	Y THINLY BEDDED 0.0
			- DRY -	(D)			MUM MOISTURE		СМЕ-55		6' CONTINUOU	S FLIGHT AUGER	CORE S	IZE:	VERY CL	USE	LESS	THAN 0.16 FEE1		CKLY LAMINATED 0.00 NLY LAMINATED <
			PLA	ASTICI	TY						8"HOLLOW AU		В.	П-н					DURATION	
NON	PLASTIC		PLAST	ICITY IND Ø-5	JEX (PI)		DRY STF VERY		CME-550		HARD FACED		□-N .				UCKS, INDUR			ATERIAL BY CEMENTING,HE REES NUMEROUS GRAINS:
SLIG	HTLY PLAS			6-15			SLIC	нт	VANE SHEAR TEST		TUNGCARBIC	DE INSERTS W∕ ADVANCER	HAND T		FRIA	BLE				R DISINTEGRATES SAMPLE.
	RATELY P LY PLASTI		2	16-25 6 OR MOR	RE		MEDI HIC		PORTABLE HOIST			STEEL TEETH		DST HOLE DIGGER	MODE	RATELY	INDURATED			ED FROM SAMPLE WITH ST T WITH HAMMER.
			(COLOR							TRICONE	TUNGCARB.		AND AUGER DUNDING ROD	INDUS	RATED		GRAINS AF	RE DIFFICULT	TO SEPARATE WITH STEEL
DESCRIPTI	IONS MAY	NCLUDE COLO	R OR COLOR	COMBINA	TIONS (TAN, RED.	YELLOW-BROWN,	BLUE-GRAY).			CORE BIT			ANE SHEAR TEST		HILU			TO BREAK WI	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.							l			ESSLER DCP	EXTR	EMELY I	NDURATED		MMER BLOWS R REAKS ACROSS	EQUIRED TO BREAK SAMPLE GRAINS.				

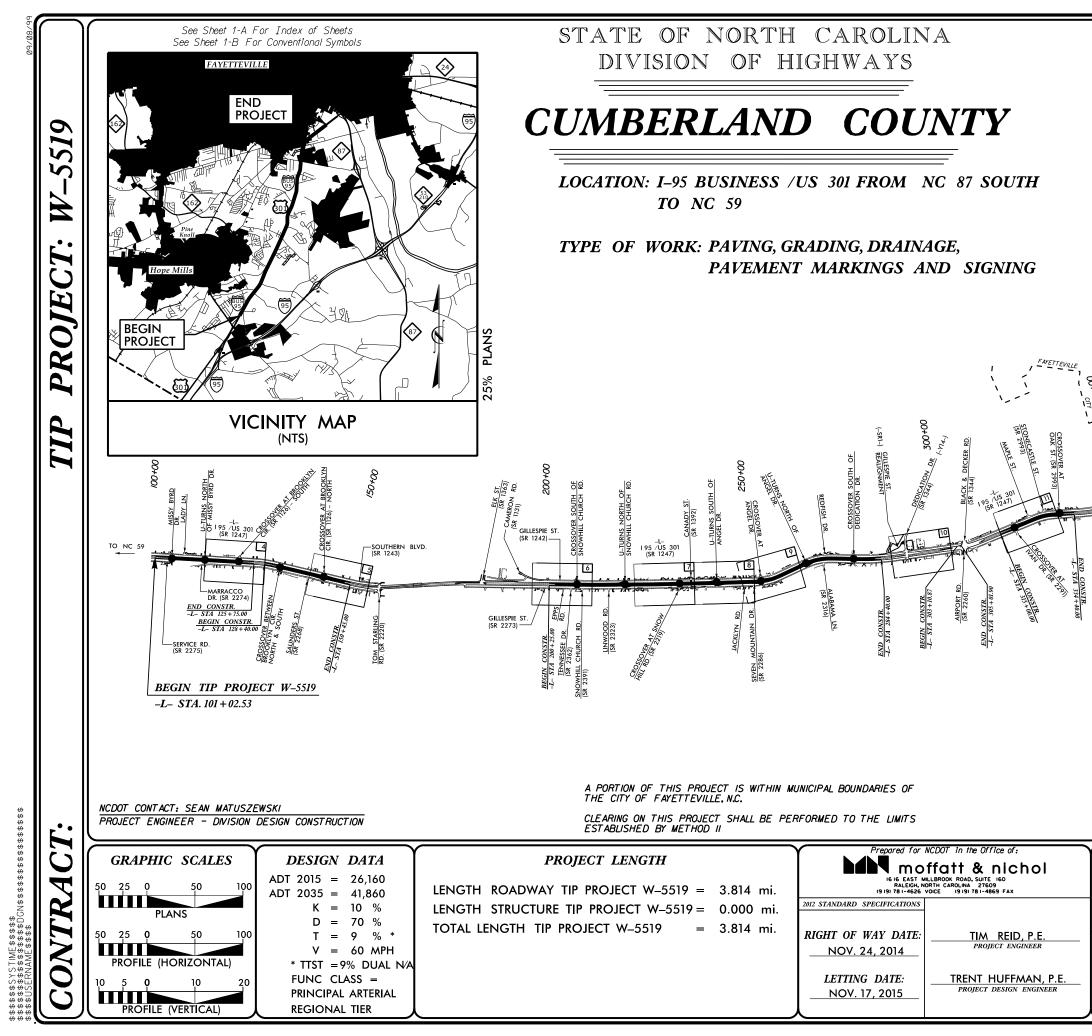
PROJECT REFERENCE NO.

W-5519



2

	TERMS AND DEFINITIONS
D. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
SPT REFUSAL. FOOT PER 60	ALLOVION VALLOV, - SUILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS OFTEN	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
N VALUES >	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
ICK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CLUDES GRANITE,	CALCAREOUS (CALC,) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
AL PLAIN IF TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
	OF SLOPE.
MAY NOT YIELD	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.
RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
OATINGS IF OPEN.	HORIZONTAL.
AMMER BLOWS IF	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
CK UP TO L FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
5. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
Y. ROCK HAS AS COMPARED	PARENT MATERIAL.
	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
ELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
OSS OF STRENGTH WHEN STRUCK.	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
VIDENT BUT	ITS LATERAL EXTENT.
ARE KAOLINIZED	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
E DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
F STRONG ROCK ONLY MINOR	<u>PERCHED WATER</u> - WATER MAINTAINED ABUVE THE NURMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
ALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
IN SMALL AND	ROCK DUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
S. SAPROLITE IS	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
S REQUIRES	ROCK.
	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
LOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
EEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
ETACHED	OR SLIP PLANE.
	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
R PICK POINT. BLOWS OF THE	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
DEDWO OF INE	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
T. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
PIECES 1 INCH	STRATA ROCK DUALITY DESIGNATION (SROD) - A MEASURE OF ROCK DUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EDUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
ED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
THICKNEES	BENCH MARK:
THICKNESS 4 FEET	BORING ELEVATIONS RETREIVED FROM ".TIN" FILES
.5 - 4 FEET	ELEVATION: FEET
16 - 1.5 FEET 3 - 0.16 FEET	NOTES:
08 - 0.03 FEET	FIAD - FILLED IMMEDIATELY AFTER DRILLED
0.008 FEET	
AT, PRESSURE, ETC.	
EEL PROBE;	
PROBE;	
	DATE: 8-15-14



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Roadway Subsurface Investigation Report - Inventory

I-95 Business / US-301 from NC 87 South to NC 59 Cumberland County, North Carolina TIP: W-5519 Falcon Project No.: G14025.00

> Prepared for: Moffatt and Nichol 1616 East Millbrook Road, Suite 160 Raleigh, NC 27608

Submitted by: Falcon Engineering, Inc. 1210 Trinity Road, Suite 110 Raleigh, North Carolina 27607 (919) 871-0800 www.falconengineers.com

December 5, 2014

PREFACE

This roadway subsurface investigation was conducted between September 30 and October 10, 2014 in general accordance with our Proposal to Provide Geotechnical Engineering Services, dated March 5, 2014. The recommendations provided in this report are based solely on our site reconnaissance, hand auger borings, laboratory test data, engineering evaluation of these data, and generally accepted soil engineering practices and principles.

A total of thirty-four (34) hand auger borings were performed for the new intersection improvements and service road alignment. Representative soil samples, collected from hand auger cuttings, were selected for laboratory testing to verify visual field classifications. In addition, one (1) bulk sample was collected for additional laboratory testing for use in our geotechnical engineering analyses.

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:

Allan Paul, PE Geotechnical Engineer

www.FalconEngineers.com Engineering | Inspection | Testing | Agency CM 1210 Trinity Road, Suite 110 | Raleigh, North Carolina 27607 | T 919.871.0800 | F 919.871.0803 Report Reviewed By:

Jeremy R. Hamm, PE Geotechnical Department Manager





TIP:	W-5519
COUNTY:	Cumberland
DESCRIPTION:	I-95 Business / US-301 from NC 87 South to NC 59
SUBJECT:	Roadway Subsurface Investigation – Inventory

PROJECT DESCRIPTION

This project consists of various intersection improvements along several miles of 1-95 Business in Cumberland County, North Carolina. Many of the intersection improvements will include new pavements for turn lanes and turn outs, while some intersections will only include removal of existing pavements. Site grading for construction of new pavements will be minimal and generally include less than 3 feet of cut and/or fill, with the majority of pavements to be constructed near existing site grades.

The following alignments, totaling approximately 30,200 feet (5.72 miles) were explicitly investigated.

Alignment	<u>Station</u>
-L- (I-95 Business)	101+02.53 - 125+75.00
	128+40.00 - 150+45.00
	200+25.00 - 284+40.00
	315+00.00 - 334+40.00
	354+35.00 - 374+66.00
	391+15.00 - 417+72.00
-SR1- (Dedication Lane)	14+00.00 - 21+57.71

Site plans and boring logs along these alignments are included in this report.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

The following sections contain cohesive and/or highly plastic soils which have the potential to cause embankment/subgrade and or slope stability problems during construction:

<u>Station</u>	
113+60 -L-	
139+00 -L-	
262+00 -L-	
266+00 -L-	

Groundwater was measured within the following area within 6 feet of existing grade and may cause groundwater related stability problems during construction:

<u>Station</u>	
262+00 -L-	

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- <u>Offset</u>
- Right
- Center
- Center
- Right
- <u>Offset</u>
- Center





PHYSIOGRAPHY AND GEOLOGY

The project site is in the western portion of the Coastal Plain Physiographic Province of North Carolina. According to the *Geologic Map of North Carolina* (1985), the site is underlain by the Black Creek Formation (Kb) and the Cape Fear Formation (Kc) of the Cretaceous age. The Black Creek Formation is noted to contain gray to black, lignitic clay with thin beds and laminae of fine-grained micaceous sand and thick lenses of cross-bedded sand. Glauconitic, fossiliferous clayey sandy lenses are present in the upper portions. The Cape Fear formation is noted to contain sandstone and sandy mudstone yellowish gray to bluish gray, mottled red to yellowish orange, indurated, graded and laterally continuous sand bedding, and blocky clay with faint cross-bedding.

The majority of new pavement construction New fills on the order of up to 3 feet are proposed along both left and right sides of the project within the right-of-way and for the relocation of Dedication Drive (-SR1-).

Existing site topography is relatively flat with moderate grade changes near low lying areas; typical of the coastal plains especially in flood plains. Predominantly wide and shallow drainage swales parallel existing roadway alignments, and carry roadway drainage toward various drainage features and natural creeks/swamps

SOIL PROPERTIES

The typical soils encountered along the project include existing roadway embankments and coastal plains deposits.

Roadway Embankment soils were encountered at the ground surface or beneath existing pavements in and adjacent to existing roadways and consisted of moist, slightly silty sand (A-1-b) and silty/clayey sand (A-2-4 and A-2-6).

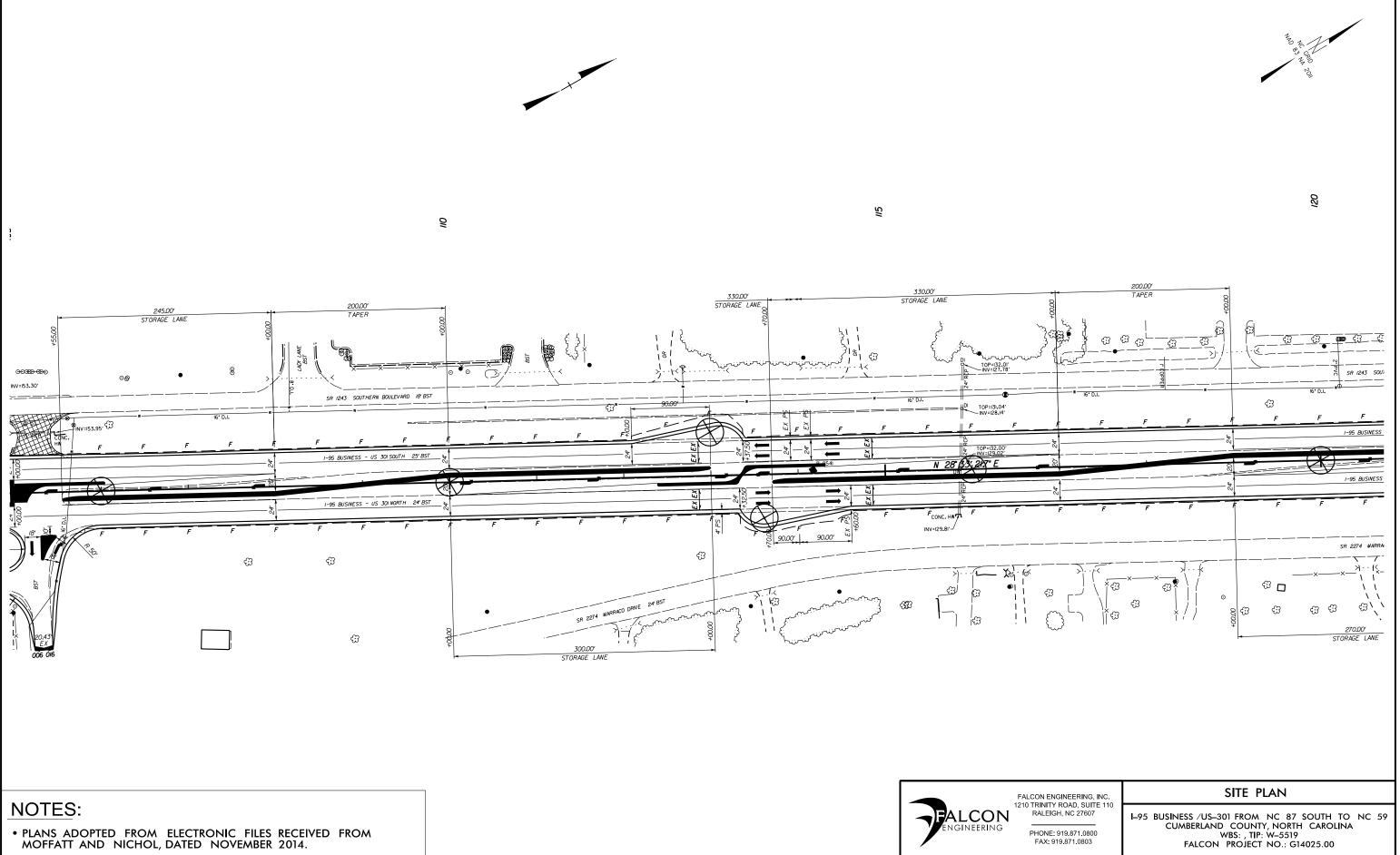
Coastal Plain soils were encountered at the ground surface and underneath roadway embankment. These soils consist of dry to saturated, sand (A-3), silty/clayey sands (A-2-4, A-2-6, A-2-7) and sandy clays (A-6,A-7).

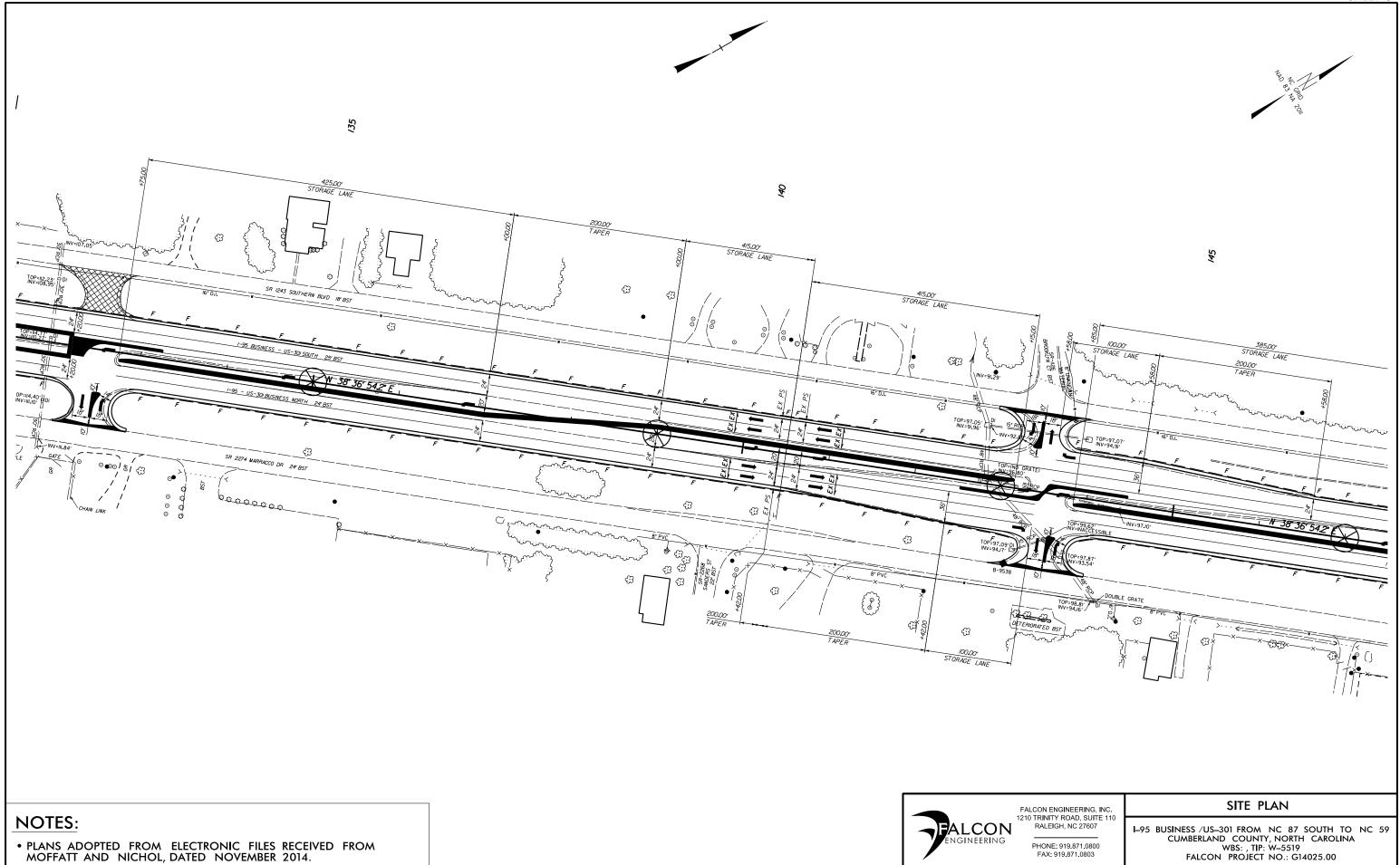
GROUNDWATER PROPERTIES

Groundwater levels were measured at the time of boring completion, and in some cases after a waiting period of at least 24 hours. Hand auger borings drilled within and in close proximity to existing roadways were backfilled immediately after completion due to safety considerations. Groundwater was observed at shallow depths near low lying areas and should be anticipated to be within 6 feet of finished roadway grades near Station 260+00 to 263+00 -L-. Detailed groundwater measurements are included in the attached boring logs.

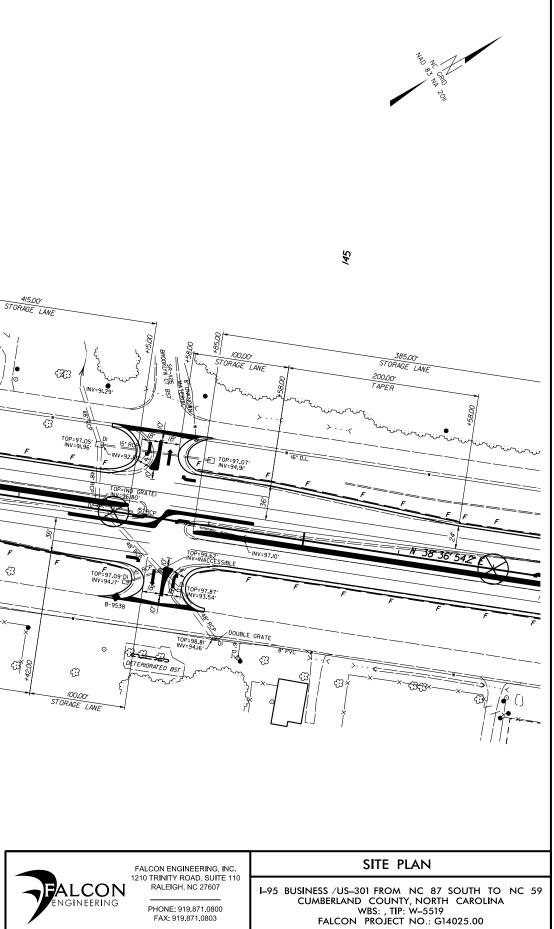
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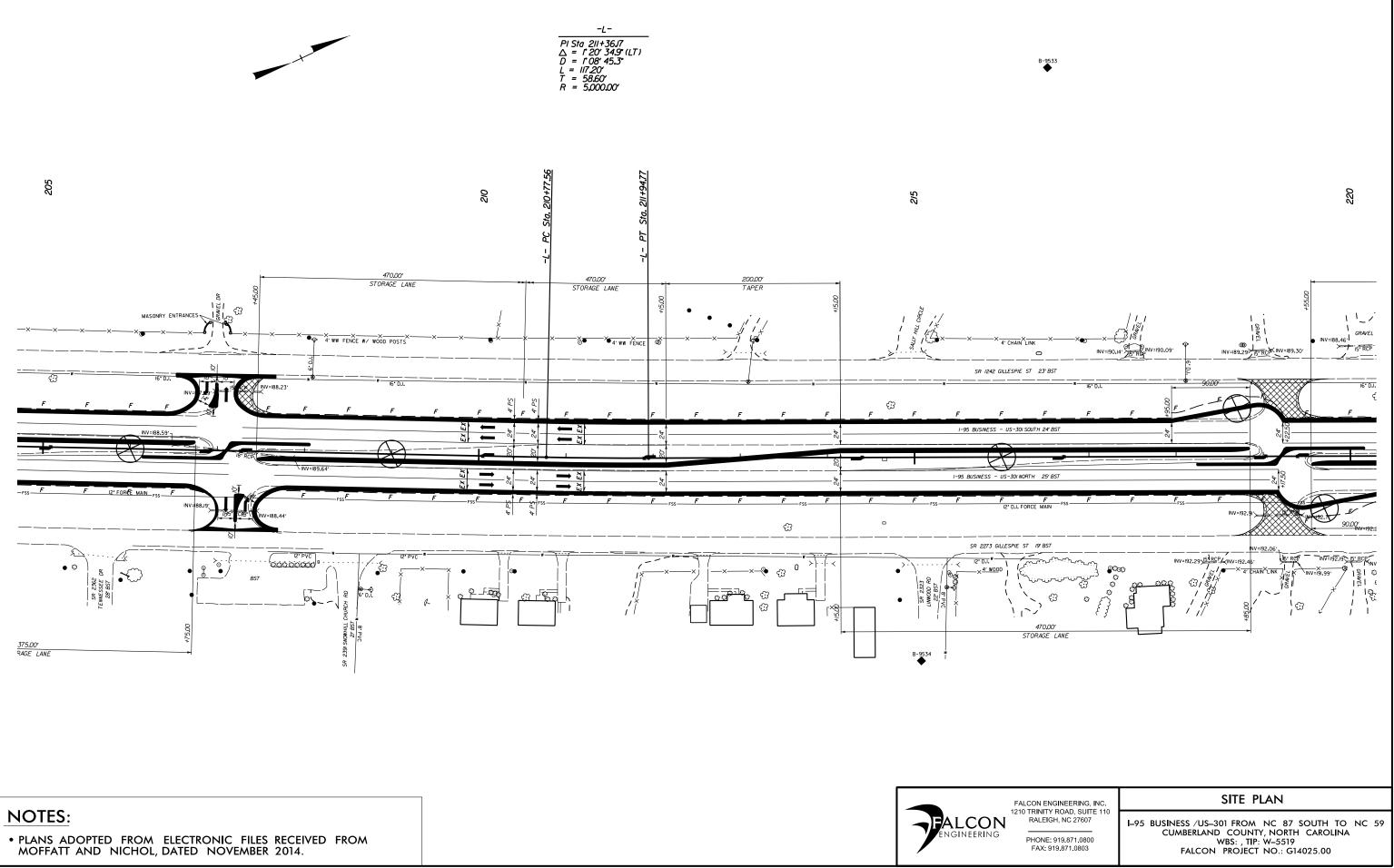




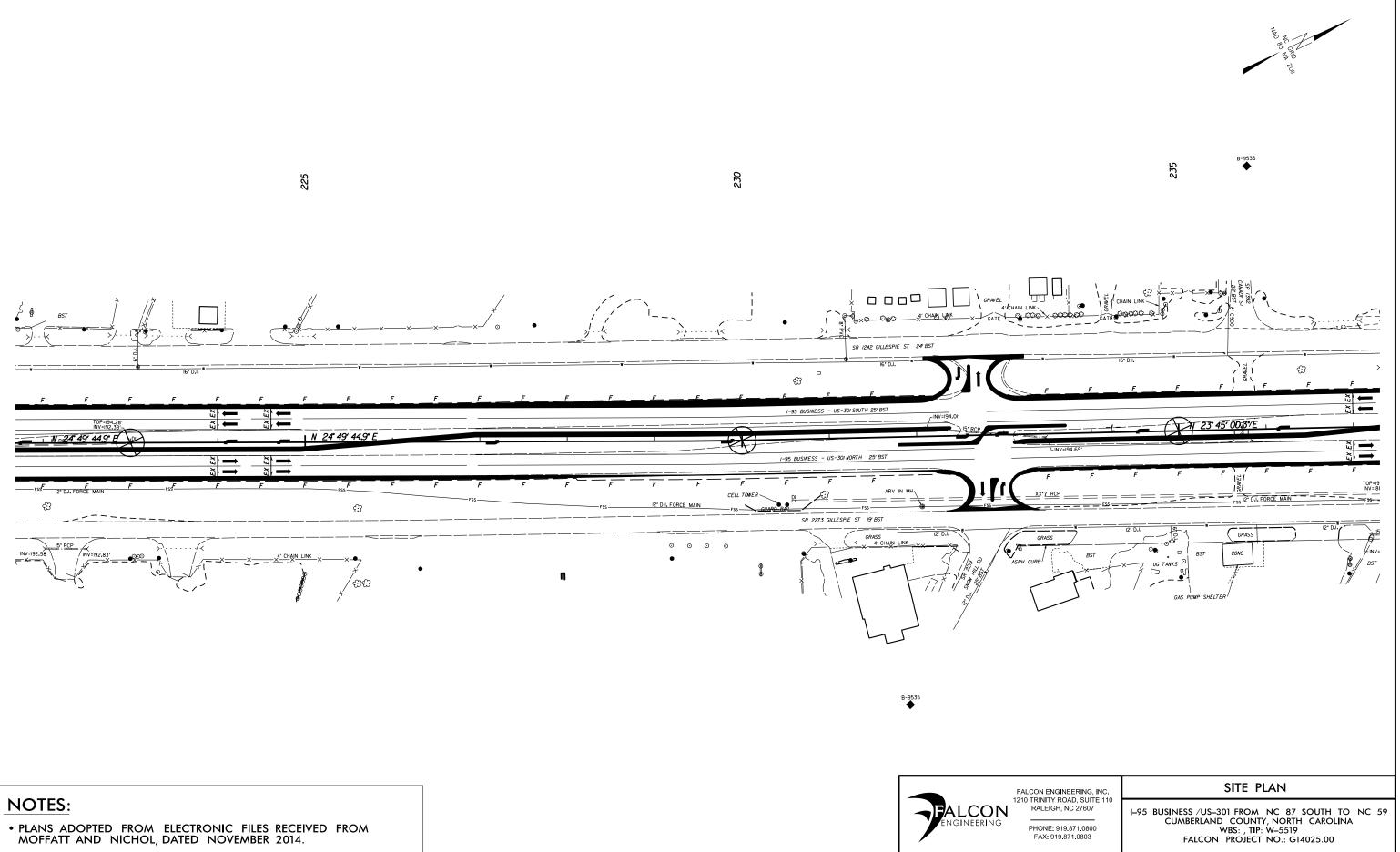


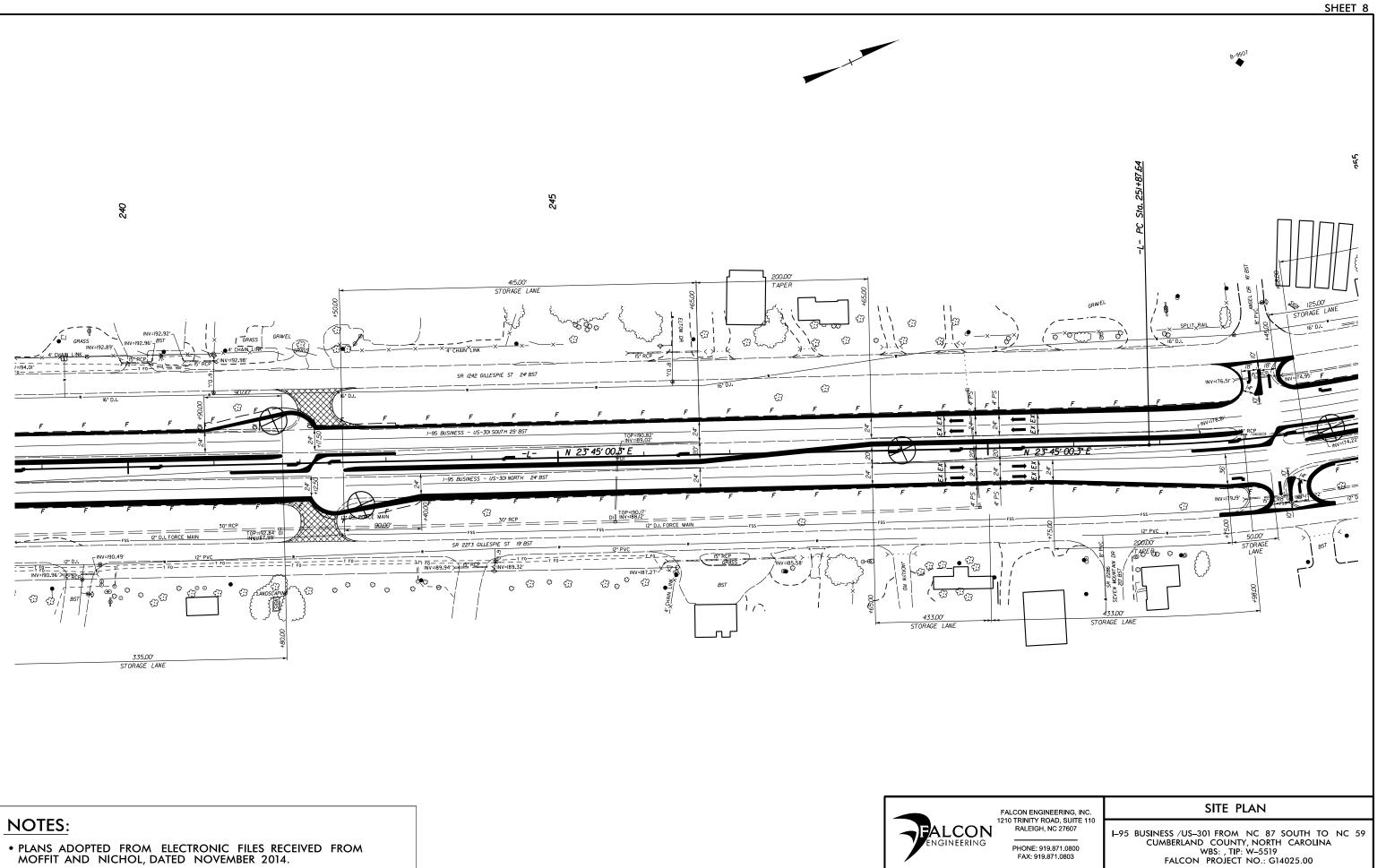


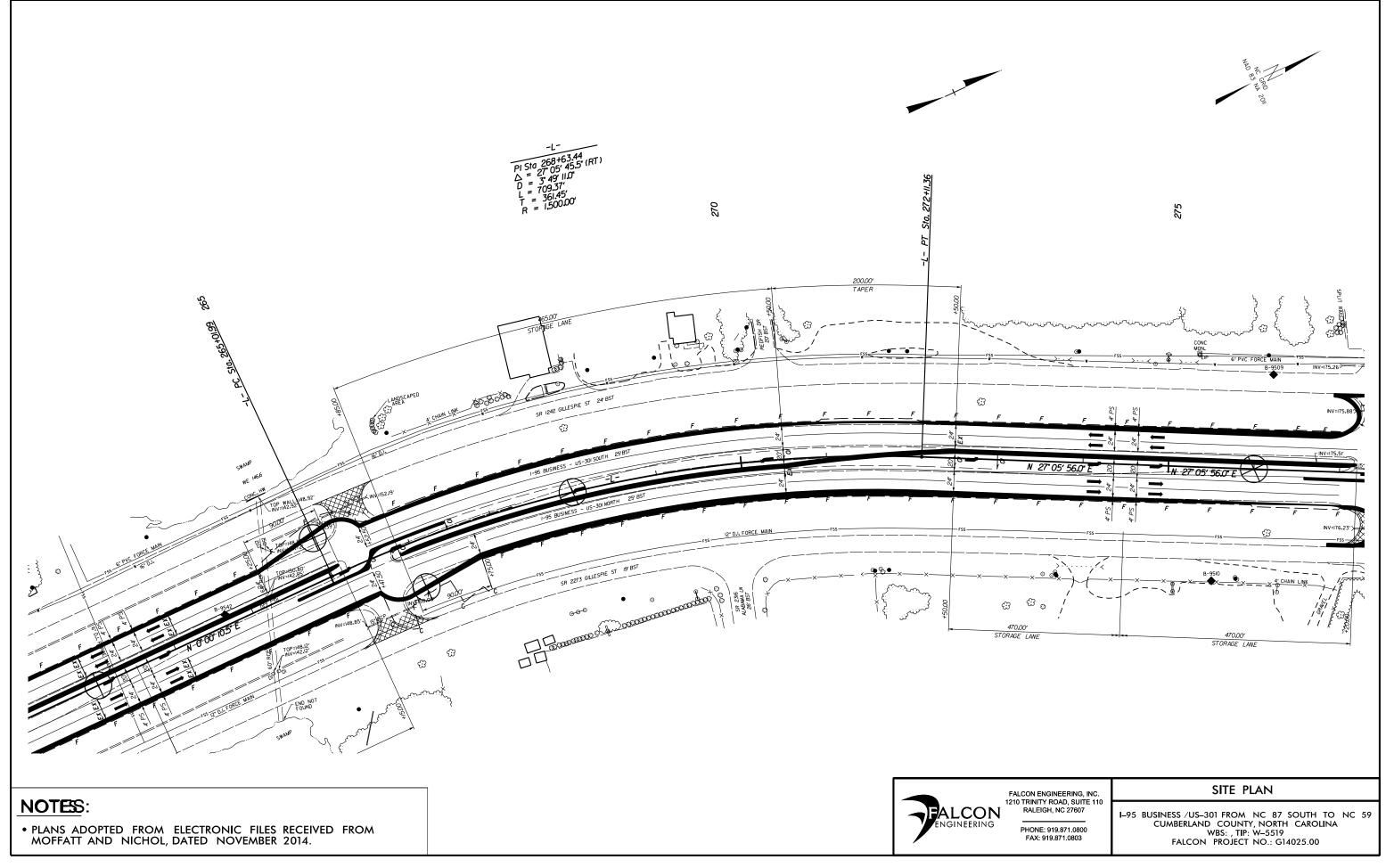


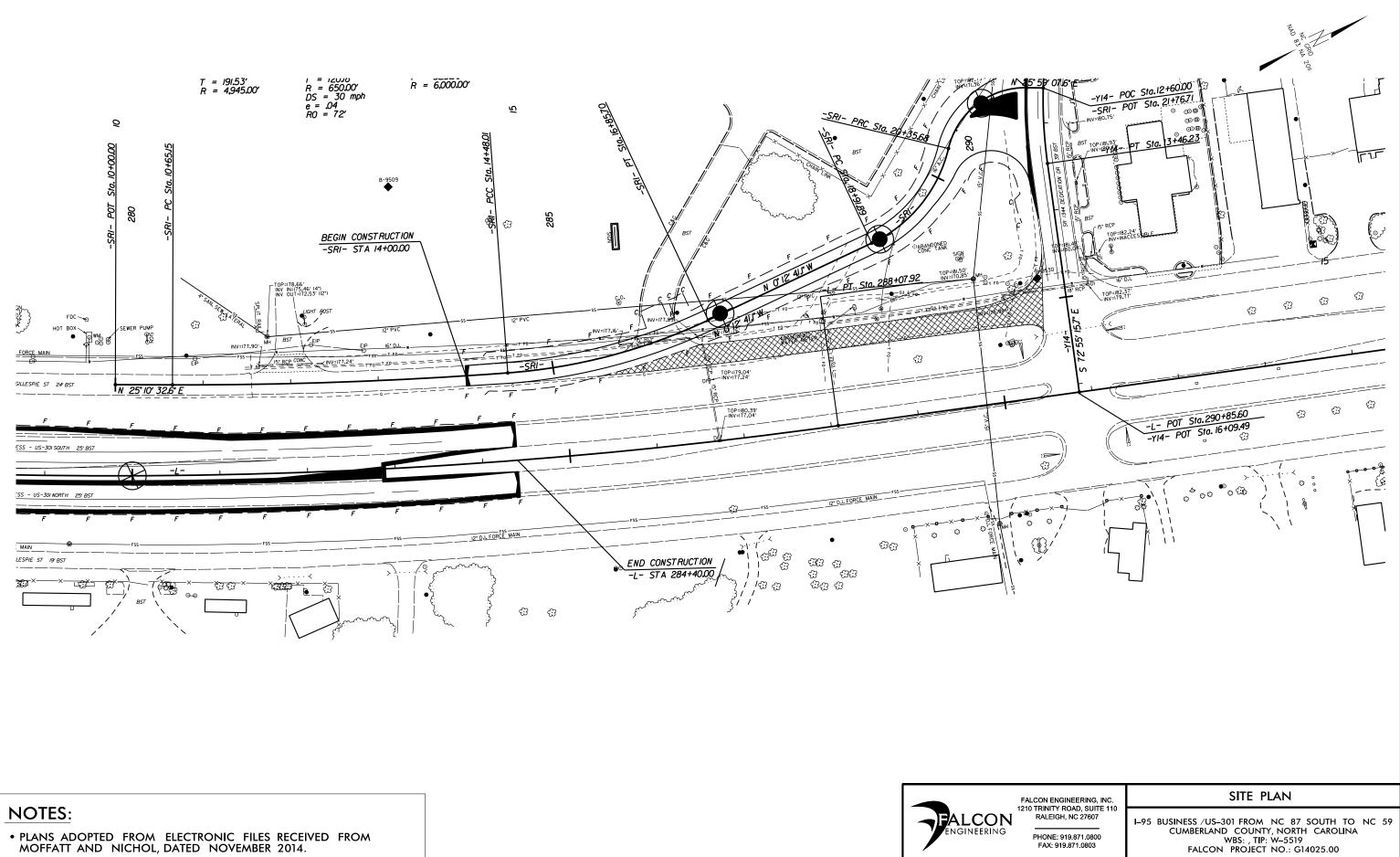




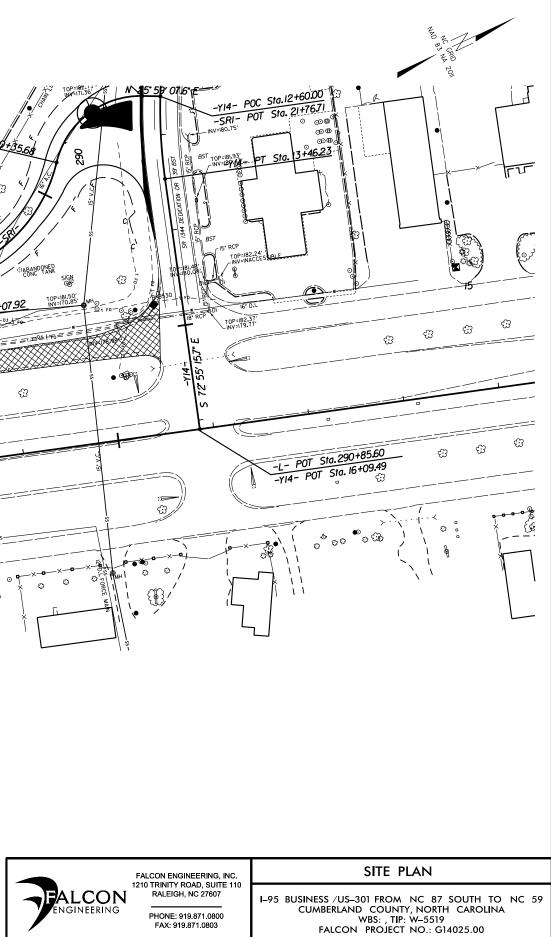


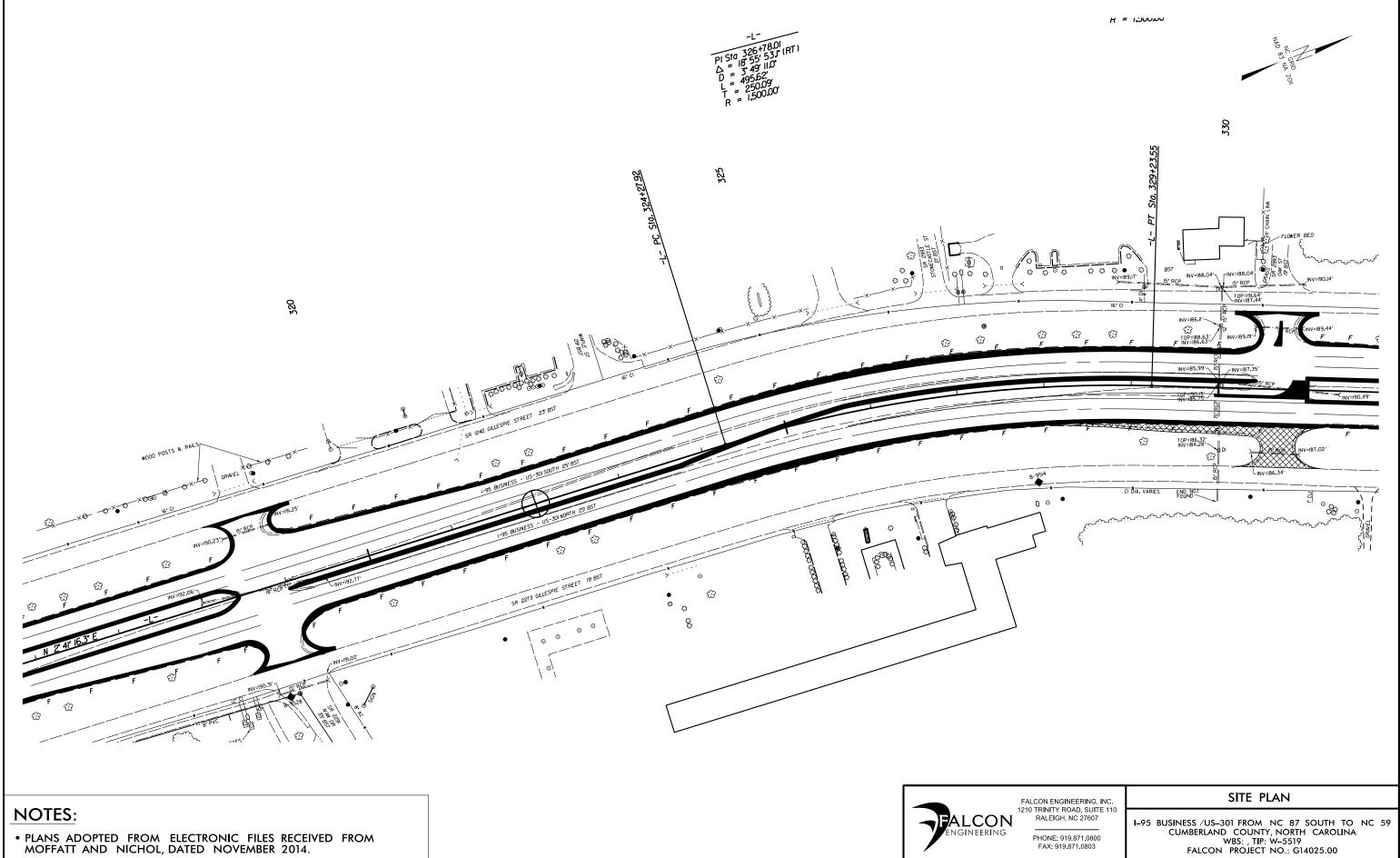


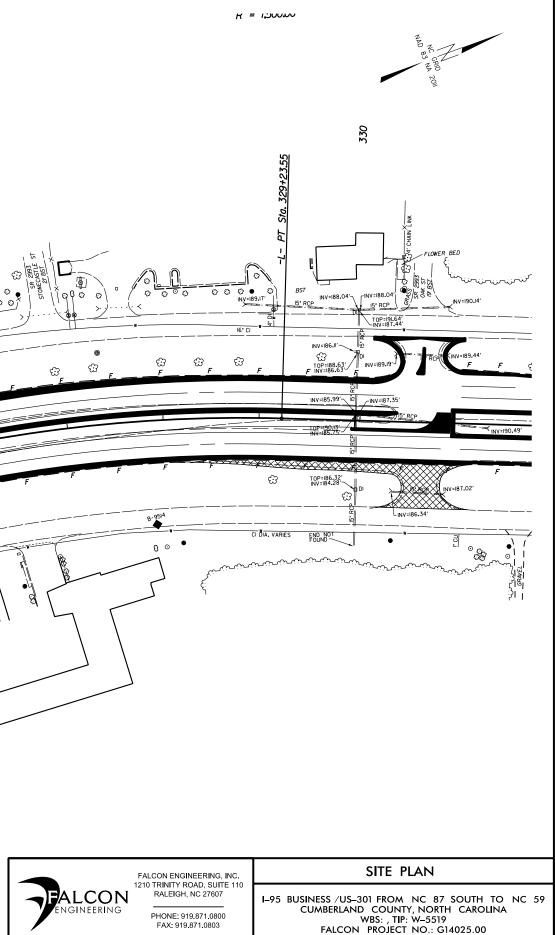


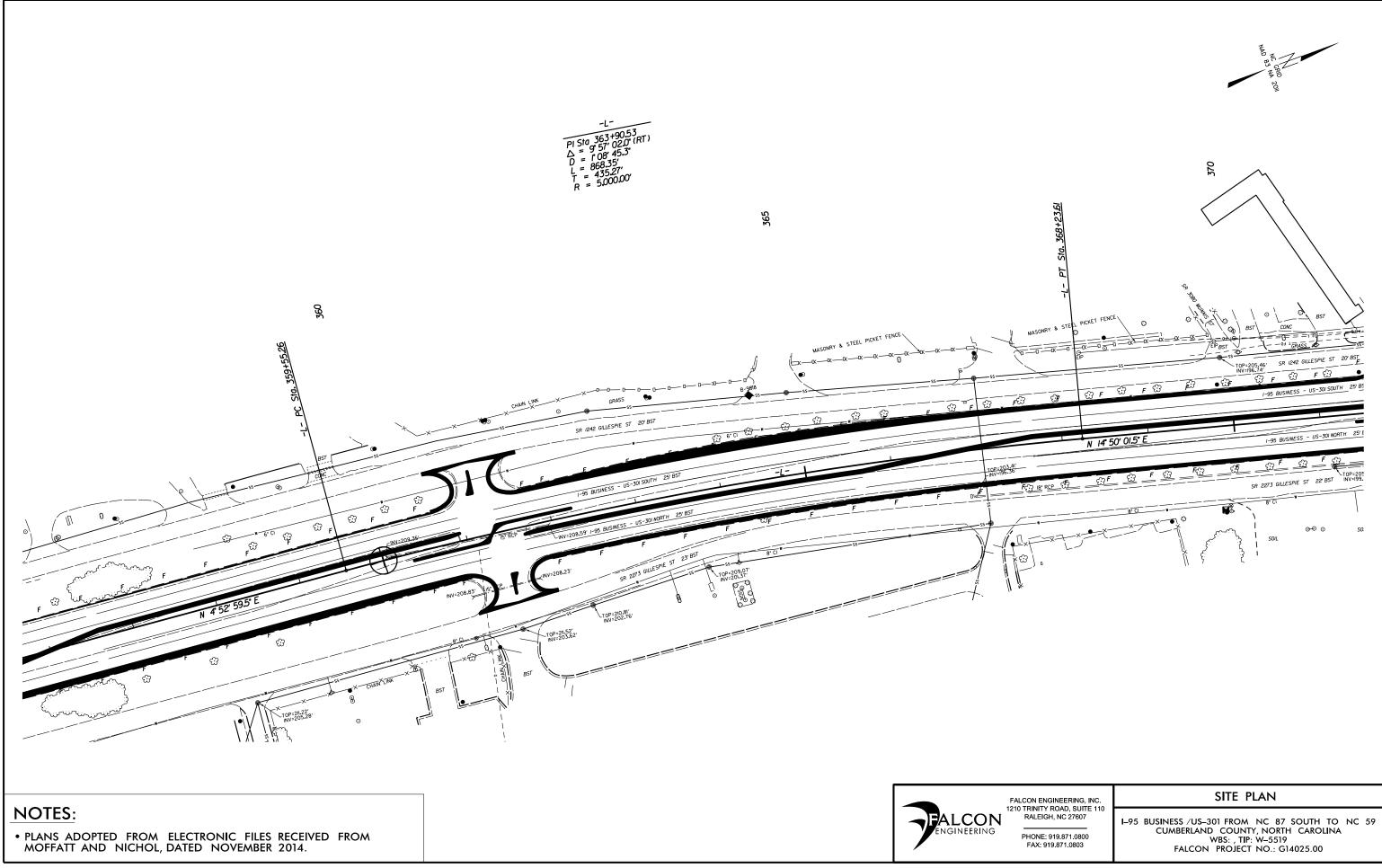


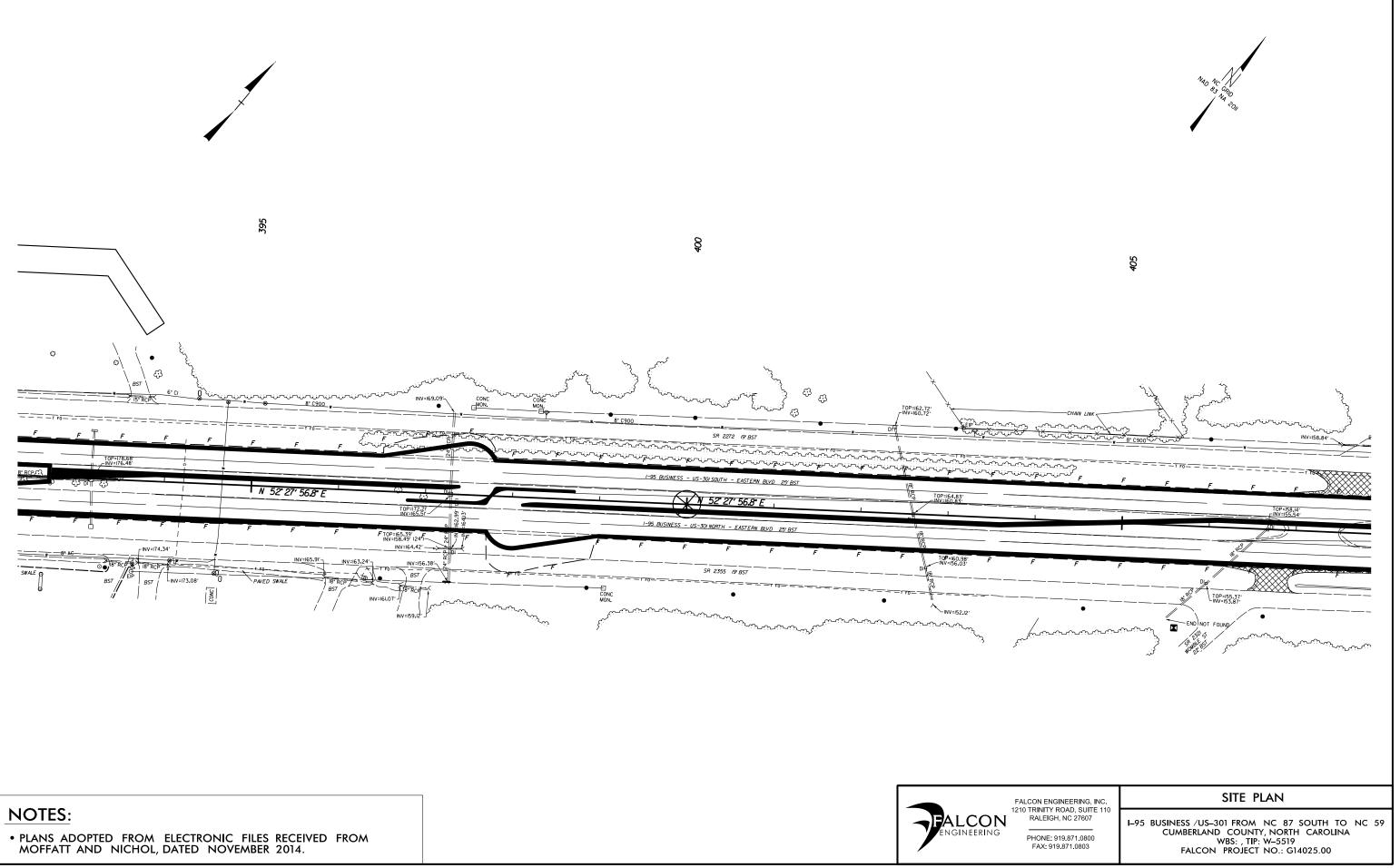




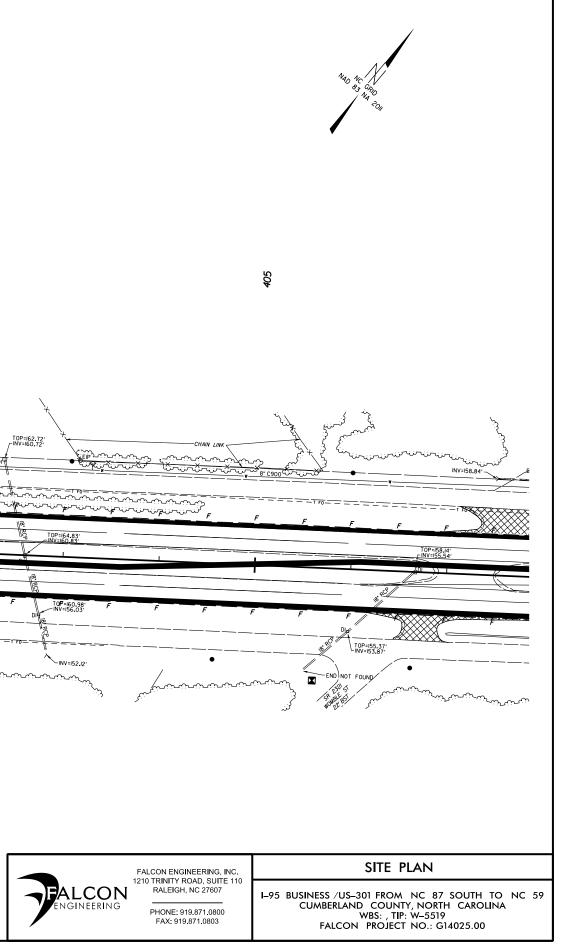




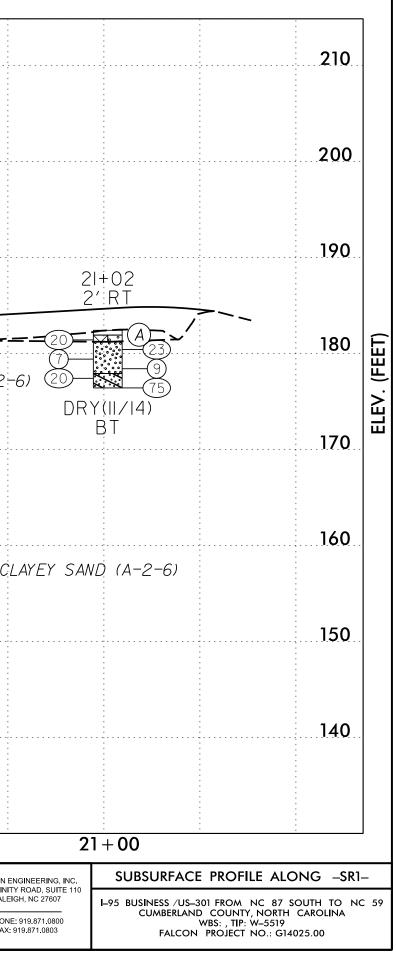




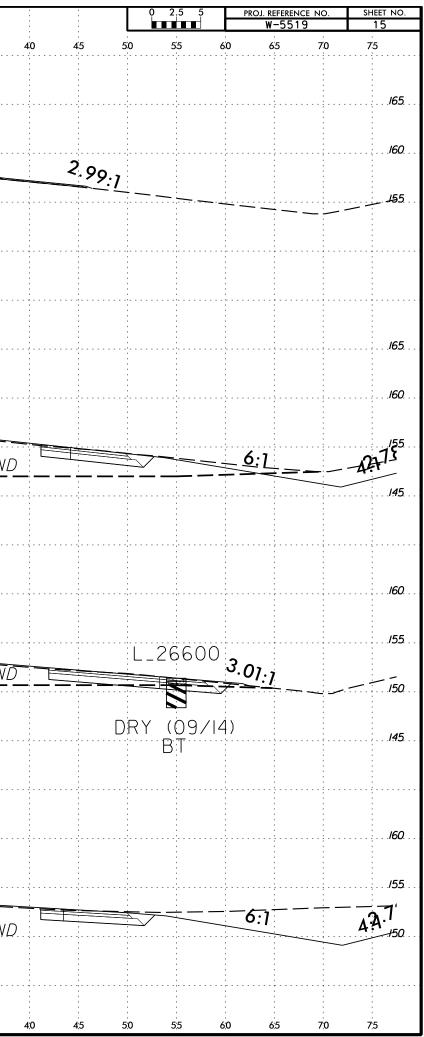




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ELEV. (FEET)		<u> </u>						TAN AND RU	(9)(4)			,SILTY AND (A-2-4,A-2
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FRO • INFI	OUNDLINE PRO M MOFFATT RRED STRATIO	OFILE OF -SR1- TAKEN AND NICHOL, DATED GRAPHY IS DRAWN 1 DJECTED ONTO THE	NOVEMBER, 2014. THROUGH THE BOR			VERTI 0	CAL SCALE 10 FEET	HORI 20 0	ZONTAL SC 50 FEET	ALE 100	PENC	FALCON 1210 TRIN 1210 TRIN GINEERING FAL



160		3:1			
			R	E: TAN AND GRAY, MOIST, SILTY SAND	
				267+00.00	
165.					
160		3:1			
/55					
	·			RE: TAN_AND_GRAY,	
145.				UCP: GRAY AND ORA 266+50.00	VGE, MOIST, CLAY
160					
/55		3:1			
				RE: TAN AND GRAY,	MOIST, SILTY SAI
150.				UCP: GRAY AND ORA	VGE,MOIST,CLAY
145.				0//.00.00	
				266+00.00	
160					
/55	3:1				
				RE: TAN AND GRAY,	MOIST, SILTY SAI
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NCDOT GEOTECHNICAL ENGINEERING UNIT



NCDOT GEOTECHNICAL ENGINEERING UNIT

WBS N/A TIP W-5519 COUNT	TY CUMBERLAND	EOLOGIST PAUL, A.	WB	SN/A		TIP W-5519	COU	NTY CUMBE	RLAND		GEOLOGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINESS / US-301 FROM NC 87 SOUTH	I TO NC 59	GROUND WTR (ft)	SIT	E DESCRIPTIO	I-95 BUSIN	IESS / US-301 FF	OM NC 87 SOUT	H TO NC 59				GROUND W	/TR (ft)
BORING NO. L_11300 STATION 113+00	OFFSET 50 ft LT	LIGNMENT -L- 0 HR. Dry	BO	RING NO. L_1	1360	STATION 1	13+60	OFFSET	50 ft RT		ALIGNMENT -L-	0 HR.	Dry
COLLAR ELEV. 141.3 ft TOTAL DEPTH 3.0 ft	NORTHING 437,755 E	ASTING 2,022,202 24 HR. Dry	CO	LLAR ELEV. 1	39.7 ft	TOTAL DEP	FH 3.0 ft	NORTHIN	G 437,760)	EASTING 2,022,318	24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A	DRILL METHOD Hand A	uger HAMMER TYPE N/A	DRIL	LL RIG/HAMMER E	FF./DATE N/A	•		•	DRILL ME	THOD Har	and Auger HAMM	ER TYPE N/A	
DRILLER PAUL, A. START DATE 09/30/14	COMP. DATE 09/30/14 S	URFACE WATER DEPTH N/A	DRI	LLER PAUL, A	\ .	START DAT	E 09/30/14	COMP. DA	ATE 09/30)/14	SURFACE WATER DEPTH N/	A	
ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOO		SOIL AND ROCK DESCRIPTION	ELE		H BLOW CO	UNT	BLOWS PER FC		SAMP.		SOIL AND ROCK DES	CRIPTION	
(ft) ELEV (ft) (ft) 0.5ft 0.5ft 0.5ft 0 25 50	75 100 NO. MOI G EL	EV. (ft) DEPTH (ft)		(ft) (ft)	0.5ft 0.5ft	0.5ft 0	25 50	75 100	⁰ NO.	MOI G			
145			140								GROUND SURF	ACE	0.0
				‡		· · · ·			<u>S-1</u>	22%	139.7 GROUND SURF. 139.4 TOPSOIL (4" - 137.5 ROADWAY EMBANI - 136.7 TAN AND GRAY, SILTY S UNDIVIDED COASTA) KMENT	<u></u> 2.2
			P T	‡							- 136.7 TAN AND GRAY, SILTY S UNDIVIDED COASTA	SAND (A-2-4)	
											ORANGE, CLAYEY SA Boring Terminated at Elev	ND (A-2-7)]]
		UNDIVIDED COASTAL PLAIN		1								alion 150.7 Il	
		BROWN, SILTY SAND (A-2-4) Boring Terminated at Elevation 138.3 ft		+							-		
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WBS N/A TIP W-5519 COUNTY	Y CUMBERLAND	GEOLOGIST PAUL, A.		WE	BS N/A		TI	IP W-5519	COUNTY CUMB	ERLAND	GEOL	OGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINESS / US-301 FROM NC 87 SOUTH	TO NC 59		GROUND WTR (ft)	SIT	E DESCRIP	FION I-95 BUSI	NESS /	US-301 FROM NC 87	SOUTH TO NC 59				GROUND W	/TR (ft)
BORING NO. L_11600 STATION 116+00	OFFSET CL	ALIGNMENT -L-	0 HR. Dry	BO	RING NO.	12000	S	TATION 120+00	OFFSET	CL	ALIG	NMENT -L-	0 HR.	Dry
COLLAR ELEV. 132.6 ft TOTAL DEPTH 3.0 ft	NORTHING 437,995	EASTING 2,022,389	24 HR. Dry	co	LLAR ELEV	. 124.7 ft	т	OTAL DEPTH 3.0 ft	NORTHI	NG 438,346	EAST	ing 2,022,581	24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A	DRILL METHOD Hand	Auger HAMM	ER TYPE N/A	DRI	LL RIG/HAMMI	ER EFF./DATE N/A	Α		·	DRILL METHOD	Hand Auger	НАМ	MER TYPE N/A	
DRILLER PAUL, A. START DATE 09/30/14	COMP. DATE 09/30/14	SURFACE WATER DEPTH N/	'A	DR	ILLER PAL	IL, A.	ST	TART DATE 09/30/14	COMP. I	ATE 09/30/14	SURF		I/A	
ELEV (ft) DRIVE ELEV (ft) DEPTH (ft) BLOW COUNT BLOWS PER FOOT 0 25 50	75 100 NO. MOI G E	SOIL AND ROCK DES	CRIPTION DEPTH (f		V DRIVE ELEV (ft)	EPTH BLOW CO (ft) 0.5ft 0.5ft	DUNT 0.5ft	BLOWS F 0 25 5		00 SAMP. NO. MOI	L O G	SOIL AND ROCK DE	SCRIPTION	
135		3중율 GROUND SURF	ACE	<u>12</u>	5			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		124.7 L	GROUND SUR TOPSOIL (2 ROADWAY EMBAI	") NKMENT	0.0
	· · · · · · · · · · · · · · · · · · ·	31.4 TOPSOIL (2"	') <u>1.</u> KMENT Y SAND (A-2-4) <u>3.</u> AL PLAIN (A-2-4)										SAND (A-2-4)	3.0



COLLAR ELEV. 111.5 ft TOTAL DEPTH 3.0 ft NORTHING 439,602 EASTING 2.023,393 24 HR. FIAD DRILL RIGHAMMER EFF./DATE NA DRILL METHOD Hand Auger HAMMER TYPE NA DRILL RIGHAMMER EFF./DATE NA DRILL METHOD Hand Auger HAMMER TYPE NA DRILL RIGHAMMER EFF./DATE NA START DATE 10/01/14 COMP. DATE 10/01/14 SURFACE WATER DEPTH NA ELEV DRIVE DEPTH BLOWS PER FOOT SAMP. V 0 SOIL AND ROCK DESCRIPTION BLOWS PER FOOT SAMP. NO NO MOI G ELEV. (tt) DRIVE DEPTH (tt) 0.5ft 0.5	WBS N/A	TIP W-5519 CC	UNTY CUMBERLAND	GEOLOGIST PAUL, A.		WBS	N/A			TIP W-5519	COUNTY CUMBE	RLAND	GEOLO	GIST PAUL, A.		
COLLAR ELEV. 111.5 ft TOTAL DEPTH 3.0 ft NORTHING 439,602 EASTING 2,023,393 24 HR. FIAD DRILL RIGHAMMER EFF./DATE NA DRILL METHOD Hand Auger HAMMER TYPE N/A DRILL RIGHAMMER EFF./DATE NA START DATE 10/01/14 COMP. DATE 10/01/14 SURFACE WATER DEPTH N/A DRILL RIGHAMMER EFF./DATE NA START DATE 10/01/14 COMP. DATE 10/01/14 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOOT SAMP. N/A SAMP. L SAMP. L SAMP. N/A SAMP. N/A G SOIL AND ROCK DESCRIPTION DEPTH (ft) BLOW COUNT BLOWS PER FOOT SAMP. N/A SAMP. N/A G SOIL AND ROCK DESCRIPTION DEPTH (ft) 0.5ft <	SITE DESCRIPTION I-95 BUSINES	SS / US-301 FROM NC 87 SO	UTH TO NC 59	GROUND WTR	(ft)	SITE	DESCRIPTI	ON 1-95	BUSINESS	S / US-301 FROM NC 87	SOUTH TO NC 59				GROUND	WTR (ft)
DRILL RIG/HAMMER EFF./DATE N/A DRILL METHOD Had Auger HAMMER TYPE N/A DRILL RIG/HAMMER EFF./DATE N/A START DATE 10/01/14 COMP. DATE 10/01/14 SURFACE WATER DEPTH N/A DRILL RIG/HAMMER EFF./DATE N/A START DATE 10/01/14 COMP. DATE 10/01/14 SURFACE WATER DEPTH N/A ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOOT SOIL AND ROCK DESCRIPTION DEPTH (ft) 0.5ft 0.5ft<	BORING NO. L_13500	STATION 135+00	OFFSET CL	ALIGNMENT -L- 0 HR.	Dry	BOR	ing no. L_	13900		STATION 139+00	OFFSET	CL	ALIGNN	IENT -L-	0 HR.	Dry
DRILLER PAUL, A. START DATE 10/01/14 COMP. DATE 10/01/14 SURFACE WATER DEPTH N/A ELEV DRIVE ELEV DRIVE (ft) DEPTH BLOWS OUNT BLOWS PER FOOT (ft) BLOWS PER FOOT (ft) SOIL AND ROCK DESCRIPTION (ft) CMP. DATE 10/01/14 SURFACE WATER DEPTH N/A 115 0 25 50 75 100 NO. MOI G ELEV. (ft) DEPTH(ft) BLOWS PER FOOT (ft) BLOWS PER FOOT (ft) SAMP. L 0.5ft 0.5ft 0.5ft<	COLLAR ELEV. 111.5 ft	TOTAL DEPTH 3.0 ft	NORTHING 439,602	EASTING 2,023,393 24 HR. FI	AD	COLI	LAR ELEV.	104.0 ft		TOTAL DEPTH 3.0 ft	NORTHIN	G 439,914	EASTIN	G 2,023,643	24 HR.	FIAD
LEV DRIVE FLEV DEPTH BLOW COUNT BLOWS PER FOOT SAMP. L SAMP. L C SAMP. L C SAMP. C	DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Ha	and Auger HAMMER TYPE N/A		DRILL	RIG/HAMMER	R EFF./DA	TE N/A		ŀ	DRILL METHOD	Hand Auger	НАМ	NER TYPE N/	/A
115 105 105 105 110 111.5 GROUND SURFACE 0.4 110 111.5 GROUND SURFACE 0.4 110 111.5 GROUND SURFACE 0.4 110 111.5 TOPSOIL (3") 0.00 110 110.5 0 0 110 102.0 ROADWAY EMBANKMENT 110 0 0 110 0 0 110.5 0 110.5 0	DRILLER PAUL, A.	START DATE 10/01/14	COMP. DATE 10/01/14	SURFACE WATER DEPTH N/A		DRIL	LER PAUL	., A.		START DATE 10/01/14	4 COMP. D	ATE 10/01/14	SURFA		/A	
115 105 105 105 110 111.5 GROUND SURFACE 0.4 110 111.5 GROUND SURFACE 0.4 110 111.5 GROUND SURFACE 0.4 110 111.5 TOPSOIL (3") 0.00 110 110.5 0 0 110 102.0 ROADWAY EMBANKMENT 110 0 0 110 0 0 110.5 0 110.5 0	ELEV DRIVE DEPTH BLOW COUN	T BLOWS PER		SOIL AND ROCK DESCRIPTION		ELEV	DRIVE FLEV	TH BL	OW COUNT	BLOWS F				SOIL AND ROCK DE	SCRIPTION	
10 1115 GROUND SURFACE 0.0 110 1115 GROUND SURFACE 0.0 110 1115 GROUND SURFACE 0.0 110 102.0 ROADWAY EMBANKMENT 0.0 110 102.0 ROADWAY EMBANKMENT 0.0 110 108.5 ORANGE, SAND (A-1-b) W/ SILT 3.0	(ft) (ft) (ft) 0.5ft 0.5ft 0	.5ft 0 25 50	75 100 NO. MOI G	ELEV. (ft) DEPTI	'H (ft)	(ft)	(ft) (1	^{it)} 0.5ft	0.5ft 0.5	5ft 0 25 5	50 75 10	0 NO. MOI	Ğ	001271112110011122		
10 111.5 GROUND SURFACE 0.0 110 111.5 GROUND SURFACE 0.0 110 111.5 GROUND SURFACE 0.0 110 102.0 ROADWAY EMBANKMENT 25% 101.0 DARK TAN, SAND (A-2-4) 3.0 102 GROUND SURFACE 0.0 102 ROADWAY EMBANKMENT 0.0 103 0 0 104 105 0 105 0 0 108.5 0 0 108.5 108.5																
110 111.5 GROUND SURFACE 0.0 110 111.5 GROUND SURFACE 0.0 110 102.0 ROADWAY EMBANKMENT 2.0 110 102.0 ROADWAY EMBANKMENT 3.0 110 101.0 0.0 0.0 110 101.0 0.0 0.0 110 101.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 110 0.0 0.0 0.0 100 0.0 0.0 100 0.0 0.0 100 </td <td>115</td> <td></td> <td></td> <td>_</td> <td></td> <td>105</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>104.0</td> <td>GROUND SUR</td> <td>FACE</td> <td>0.0</td>	115			_		105							104.0	GROUND SUR	FACE	0.0
110 1112 1112 1112 1112 073 110 1112 10PSOIL (3") 03 110 00 00 00 110 00 00 110 00 00 110 00														TOPSOIL (5	")	
Constrained Constrained Constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second constrained Image: Second					8.9		‡					<u>S-2</u> 25%	102.0	DARK TAN, SILTY SA	ND (A-2-4)	3.0
				ROADWAY EMBANKMENT	3.0								F \	UNDIVIDED COAST GRAY AND WHITE, C	al plain Lay (a-7-6)	
				Boring Terminated at Elevation 108.5 ft			‡						F	Boring Terminated at Ele	evation 101.0 ft	t
				-									F-			
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WBS N/A	TIP W-5519	COUNTY CUMBER	RLAND	GEOLOGIST PAUL, A.			WBS N/A		TIP W-5519 COU	NTY CUMBERLA	ND	GEOLOGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINES	SS / US-301 FROM NC 87	SOUTH TO NC 59			GROUND WTR	(ft)	SITE DESCRIPTION 1-95	BUSINESS	S / US-301 FROM NC 87 SOUT	TH TO NC 59			GROUND W	/TR (ft)
BORING NO. L_14300	STATION 143+00	OFFSET	CL	ALIGNMENT -L-	0 HR. I	Dry	BORING NO. L_14700		STATION 147+00	OFFSET CL		ALIGNMENT -L-	0 HR.	Dry
COLLAR ELEV. 99.5 ft	TOTAL DEPTH 3.0 ft	NORTHING	3 440,227	EASTING 2,023,892	24 HR. FI	AD	COLLAR ELEV. 99.8 ft		TOTAL DEPTH 3.0 ft		440,539	EASTING 2,024,142	24 HR.	FIAD
DRILL RIG/HAMMER EFF./DATE N/A	•	·	DRILL METHOD Har	nd Auger HAMM	IER TYPE N/A		DRILL RIG/HAMMER EFF./DAT	E N/A		D	RILL METHOD Han	d Auger HAMM	ER TYPE N/A	
DRILLER PAUL, A.	START DATE 10/01/14	4 COMP. DA	TE 10/01/14	SURFACE WATER DEPTH N	Ά		DRILLER PAUL, A.		START DATE 10/01/14	COMP. DATE	10/01/14	SURFACE WATER DEPTH N/	A	
ELEV (ft) DRIVE ELEV (ft) DEPTH BLOW COUN	IT BLOWS F .5ft 0 25 5	PER FOOT 50 75 100	SAMP. L NO. MOI G	SOIL AND ROCK DES	CRIPTION	⁻ H (ft)	ELEV DRIVE DEPTH BLC (ft) (ft) 0.5ft	OW COUNT 0.5ft 0.5	BLOWS PER FC		NO. MOI G	SOIL AND ROCK DES	CRIPTION	
						11 (10)								
100				-99.5 GROUND SURF	ACE	0.0	100					_99.8 GROUND SURF	ACE	0.0
		· · · · · · · · · · ·		99.2 TOPSOIL (4' 97.5 ROADWAY EMBAN	') <u>/</u>	0.3 2.0						99.5 TOPSOIL (4" 98.0 ROADWAY EMBAN 96.8 TAN AND RED. CLAYEY) KMENT	
				96.5 DARK TAN AND RED, S		2.7				<u>····</u>			SAND (A-2-6)	3.0
				UNDIVIDED COASTA								UNDIVIDED COASTA WHITE SAND (/	\ -3)	
				TAN, SILTY SAND GRAY, SANDY CLA								Boring Terminated at Ele	vation 96.8 ft	
				Boring Terminated at Ele								<u>.</u>		
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WBS N/A	TIP W-5519 C	OUNTY CUMBERLAND	GEOLOGIST PAUL, A.		WBS	S N/A		Т	IP W-5519 COU	TY CUMBE	RLAND	GEOL	OGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINE	ESS / US-301 FROM NC 87 SC	DUTH TO NC 59		GROUND WTR (ft)	SITE	E DESCRIP	TION I-95 BUS	INESS /	US-301 FROM NC 87 SOUT	H TO NC 59				GROUND	WTR (ft)
BORING NO. L_20600	STATION 206+00	OFFSET CL	ALIGNMENT -L-	0 HR. Dry	BOR	ring no.	L_20900	S	TATION 209+00	OFFSET	CL	ALIGN	IMENT -L-	0 HR.	Dry
COLLAR ELEV. 190.5 ft	TOTAL DEPTH 3.0 ft	NORTHING 445,809	EASTING 2,026,753	24 HR. FIAD	COL	LLAR ELE	/. 192.3 ft	Т	OTAL DEPTH 3.0 ft	NORTHIN	G 446,078	EAST	NG 2,026,885	24 HR.	FIAD
DRILL RIG/HAMMER EFF./DATE N/A	•	DRILL METHOD Har	d Auger HAMI	MER TYPE N/A	DRIL	L RIG/HAMN	ER EFF./DATE N	/A		•	DRILL METHOD	D Hand Auger		HAMMER TYPE N	/A
DRILLER PAUL, A.	START DATE 10/01/14	COMP. DATE 10/01/14	SURFACE WATER DEPTH	V/A	DRIL	LLER PA	JL, A.	S	TART DATE 10/01/14	COMP. DA	ATE 10/01/14	SURF	ACE WATER DEPT	ΓΗ Ν/Α	
ELEV (ft) DRIVE ELEV (ft) DEPTH (ft) BLOW COU 0.5ft 0.5ft 0.5ft	NT BLOWS PEF 0.5ft 0 25 50		SOIL AND ROCK DES			V DRIVE ELEV (ft)	EPTH BLOW C (ft) 0.5ft 0.5f	OUNT	BLOWS PER FC 0 25 50	OT 75 100	SAMP. NO. MOI		SOIL AND ROC	K DESCRIPTION	
(II) (II) 0.5ft 0.5ft 195 - - - 190 - -			ELEV. (ft)	3") NKMENT ND (A-2-4) TAL PLAIN D (A-2-4)	195 190	(ft)				· · · · · ·		G	TOPS ROADWAY E BROWN, SILT UNDIVIDED C TAN, SILTY	9 SURFACE SOL (4") IMBANKMENT Y SAND (A-2-4) SAND (A-2-4) T at Elevation 189.3 1	<u><u><u></u></u><u></u><u>2.0</u> <u>3.0</u> t</u>



WBS N/A TIP W-5519 COUNT	Y CUMBERLAND	GEOLOGIST PAUL, A.		WBS	S N/A			TIP W-5519 CC	DUNTY CUMBE	RLAND	GEOL	OGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINESS / US-301 FROM NC 87 SOUTH	TO NC 59	GROUND WT	R (ft)	SITE	E DESCRIPTIC	N 1-95	BUSINESS	S / US-301 FROM NC 87 SO	OUTH TO NC 59				GROUND	WTR (ft)
BORING NO. L_21600 STATION 216+00	OFFSET CL	ALIGNMENT -L- 0 HR.	Dry	BOR	RING NO. L_2	21870		STATION 218+70	OFFSET	55 ft LT	ALIG	NMENT -L-	0 HR.	Dry
COLLAR ELEV. 193.8 ft TOTAL DEPTH 3.0 ft	NORTHING 446,711	EASTING 2,027,184 24 HR.	FIAD	COL	LAR ELEV.	194.0 ft		TOTAL DEPTH 3.0 ft	NORTHIN	IG 446,979	EAST	ING 2,027,247	24 HR.	FIAD
DRILL RIG/HAMMER EFF./DATE N/A	DRILL METHOD Hand	Auger HAMMER TYPE N/A		DRIL	L RIG/HAMMER	EFF./DAT	E N/A		·	DRILL METHOD	Hand Auger	HA	MMER TYPE N	/A
DRILLER PAUL, A. START DATE 10/01/14	COMP. DATE 10/01/14	SURFACE WATER DEPTH N/A		DRIL	LLER PAUL,	A.		START DATE 10/01/14	COMP. D	ATE 10/01/14	SURF	ACE WATER DEPTH	N/A	
ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOO		SOIL AND ROCK DESCRIPTION		ELEV	DRIVE DEP	TH BLC	OW COUNT	BLOWS PER		SAMP.	L	SOIL AND ROCK D	ESCRIPTION	
(ft) ELEV (ft) (ft) 0.5ft 0.5ft 0 25 50	75 100 NO. MOI G E	ELEV. (ft) DEF	PTH (ft)	(ft)	(ft) (ft)) 0.5ft	0.5ft 0.5f	5ft 0 25 50	75 10	⁰ NO. MOI	G			
195		183-8 GROUND SURFACE	0.0	195	++						194.0	GROUND SU	RFACE	0.0
		TOPSOIL (4")	1.0								193.2 191.0	TOPSOIL	(9")	0.8
		191.9 190.8 BROWN, SILTY SAND (A-2-4)	3.0						••••	Ц	191.0	TAN, SILTY SAN	ID (A-2-4)	3.0
		UNDIVIDED COASTAL PLAIN TAN, SILTY SAND (A-2-4)									-	Boring Terminated at E	Elevation 191.0 f	ft
		Boring Terminated at Elevation 190.8 ft			1						Ē			
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WBS N/A	TIP W-5519	COUNTY CUMBER	RLAND	GEOLOG	GIST PAUL, A.			WBS	N/A			TIF	P W-5519	COUNTY C	UMBER	RLAND		GEOLOG	BIST PAUL, A.		
SITE DESCRIPTION 1-95 BUSINES	SS / US-301 FROM NC 87	SOUTH TO NC 59				GROUND W	/TR (ft)	SITE	DESCRI	PTION I	-95 BUSIN	NESS / I	US-301 FROM NC 8	37 SOUTH TO N	VC 59					GROUND	WTR (ft)
BORING NO. L_21970	STATION 219+70	OFFSET	60 ft RT	ALIGNM	ENT -L-	0 HR.	Dry	BOR	ing no.	L_22300	C	ST	TATION 223+00	OF	FSET	CL		ALIGNMI	ENT -L-	0 HR.	Dry
COLLAR ELEV. 193.6 ft	TOTAL DEPTH 3.0 ft	NORTHING	G 447,021	EASTING	G 2,027,394	24 HR.	FIAD	COL	LAR ELE	V. 194.1	1 ft	тс	OTAL DEPTH 3.0 f	t NO	RTHING	3 447,346		EASTING	3 2,027,478	24 HR.	FIAD
DRILL RIG/HAMMER EFF./DATE N/A		•	DRILL METHOD Ha	nd Auger	HAM	MER TYPE N/A		DRILL	RIG/HAM	MER EFF./I	DATE N/A	λ.		•		DRILL METH	HOD Ha	and Auger	HAI	IMER TYPE N	I/A
DRILLER PAUL, A.	START DATE 10/01/1	4 COMP. DA	TE 10/01/14	SURFAC		N/A		DRIL	LER PA	UL, A.		ST	TART DATE 10/01/	/14 CO	MP. DA	TE 10/01/1	14	SURFAC	E WATER DEPTH	N/A	
ELEV DRIVE DEPTH BLOW COUN	IT BLOWS I	PER FOOT	SAMP.		SOIL AND ROCK DE	SCRIPTION		ELEV	DRIVE ELEV	DEPTH	BLOW CO	DUNT		S PER FOOT		SAMP.			SOIL AND ROCK D	SCRIPTION	
(ft) ELEV (ft) 0.5ft 0.5ft 0	.5ft 0 25 5	50 75 100	NO. MOI Ğ	ELEV. (ft)			DEPTH (ft)	(ft)	(ft)	(ft) 0	.5ft 0.5ft	0.5ft	0 25	50 75	100	NO.	101 G				
195				-				195		-								194.1	GROUND SU	RFACE	0.0
				193.9	GROUND SUR TOPSOIL (+	4")	<u>0.0</u> 		1									<u>- 193.6</u> - <u>192.4</u> - 191.1	TOPSOIL UNDIVIDED COAS	(6")	<u> </u>
				190.6	ROADWAY EMBA BROWN, SILTY SA	NKMENT ND (A-2-4)	3.0									Ц	_	191.1	TAN, SILTY SAM	D (A-2-4)	<u>3.0</u>
					UNDIVIDED COAST TAN, SILTY SAN	TAL PLAIN	1												TAN, SILTY SAN Boring Terminated at E		ft
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NCDOT GEOTECHNICAL ENGINEERING UNIT

WBS N/A TIP W-5519 COUN	TY CUMBERLAND GE	DLOGIST PAUL, A.	WBS N/A	TIP W-5519 COUNTY CUMBE	RLAND	GEOLOGIST PAUL, A.
SITE DESCRIPTION I-95 BUSINESS / US-301 FROM NC 87 SOUTH	H TO NC 59	GROUND WTR (ft)	SITE DESCRIPTION I-95 BUSINES	SS / US-301 FROM NC 87 SOUTH TO NC 59	·	GROUND WTR (ft)
BORING NO. L_23000 STATION 230+00	OFFSET CL ALI	GNMENT -L- 0 HR. Dry	BORING NO. L_23500	STATION 235+00 OFFSET	CL	ALIGNMENT -L- 0 HR. Dry
COLLAR ELEV. 195.6 ft TOTAL DEPTH 3.0 ft	NORTHING 447,982 EAS	STING 2,027,771 24 HR. FIAD	COLLAR ELEV. 195.5 ft	TOTAL DEPTH 3.0 ft NORTHIN	G 448,439	EASTING 2,027,973 24 HR. FIAD
DRILL RIG/HAMMER EFF./DATE N/A	DRILL METHOD Hand Aug	er HAMMER TYPE N/A	DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand	HAMMER TYPE N/A
DRILLER PAUL, A. START DATE 10/01/14	COMP. DATE 10/01/14 SUI	RFACE WATER DEPTH N/A	DRILLER PAUL, A.	START DATE 10/01/14 COMP. DA	ATE 10/01/14	SURFACE WATER DEPTH N/A
ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOO			ELEV DRIVE DEPTH BLOW COUN	IT BLOWS PER FOOT	SAMP.	
(ft) (ft) (ft) 0.5ft 0.5ft 0.5ft 0 25 50	75 100 NO. MOI G ELEV	SOIL AND ROCK DESCRIPTION (ft) DEPTH (ft)	ELEV (ft) DRIVE ELEV (ft) DEPTH BLOW COUN (ft) (ft) 0.5ft 0.5ft 0	.5ft 0 25 50 75 100	NO. MOI G	SOIL AND ROCK DESCRIPTION
200			200			
	[- 185.6	GROUND SURFACE ຄຸລ				195.5 GROUND SURFACE 0.0
		TOPSOIL (4")				
		ROADWAY EMBANKMENT BROWN, SILTY SAND (A-2-4)				DARK RED, SILTY SAND (A-2-4)
		UNDIVIDED COASTAL PLAIN DARK TAN AND TAN, SILTY SAND				ORANGE, SILTY SAND (A-2-4) Boring Terminated at Elevation 192.5 ft
		(A-2-4)				Bonnig Terminated at Elevation 192.5 it
		Boring Terminated at Elevation 192.6 ft				
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WE	S N	/A				·	TIP \	V-551	9		CO	UNTY	CL	JMBE	RLAN	١D			GE	OLO	GIST	PAU	L, A.						WB	S N	I/A				т	TIP V	W-5519	9		со	UNTY	CUM	BERL	AND.				GEO	OLOG	GIST	PAU	L, A.				
SIT	E DE	SCR	PTION	I-95	BUS	INESS	/ US-	301 FI	ROM	NC 87	7 SOL	JTH 1		C 59					_						GRO	DUND	WTR	(ft)	SITE	E DE	SCRIF	TION	I-95	BUSI	NESS	/ US-	-301 FF	ROM	NC 87	7 SOL	ЈТН Т	O NC 5	59											GRO	UND W	VTR (ft)
во	RING	NO.	L_24	170		1	STAT	ON 2	241+7	70			OFF	SET	50 ft	t LT			AL	IGNM	IENT	-L-			ОН	IR.	I	Dry	BOF	RING	NO.	L_242	270		s	STAT	ION 2	242+7	0			OFFSE	T 50	0 ft R	Г			ALIG	GNM	ENT	-L-			0 HF	ર.	Dry
со	LLAF		V. 19	95.0 ft		-	ΓΟΤΑ		тн	3.0 ft			NOR	THIN	G 4	49,07	'3		EA	STIN	G 2,	028,1	97		24 H	IR.	FI	AD	COL	LLAR		/ . 19	95.2 ft		Т	ΓΟΤΑ		тн з	3.0 ft			NORTH	IING	449,	122			EAS	STING	G 2,0	028,33	33		24 HF	ર.	Dry
DRI	LRIG)/HAM	MER EF	F./DAT	E N/	A									DR	ILL M	ETHO) Ha	nd Aug	per				HAMN		PE N	I/A		DRIL	L RIG) HAMN	IER EF	F./DATI	E N/A	ـــــــــــــــــــــــــــــــــــــ									DRILL	METH	OD	Hand	d Auger	er				HAMN	ER TYP	E N/A	
			AUL, A				STAR		E 10	0/01/1	4		CON	IP. D							E W	TER	DEPT									UL, A.				STAR	T DAT	E 09	9/30/1	4		COMP.						<u> </u>		E WA	TER					
ELE		RIVE		BLO	DW C	OUNT			BL	OWS	PER F	-00T			SA	AMP.	▼/	L											ELEV			DEPTH	BLC	ow co	DUNT			BL	ows	PER I	=00T			SAM	P.	\sum										
(ft)		_Ev [ft]	(ft)	0.5ft	0.5f	t 0.51	t 0		25		50		75	10	1 0	NO.	<u>/мо</u>	G	ELE\	/. (ft)	30		JRUC	K DEC	SCRIPT	ION	DEPT	TH (ft)	(ft)	(_Ev (ft)	(ft)	BLC 0.5ft	0.5ft	0.5ft	t 0		25		50	7	′5	100	NO.	М		G			50		RUC	K DES	CRIPTI	UN	
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		-	-				μ.												192.0	<u>`</u> _ _	TAN A	AND G	RAY,	SILTY	SAND (A-2-4	(A-2-4	<u>•) </u>	3.0			ŧ																F	105.0			CD					0
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WBS N/A TIF	P W-5519 COU	ITY CUMBERLAND	GEOLOGIST PAUL, A.		WB	S N/A		TIF	P W-5519 COU	NTY CUMBE	RLAND	GEOLO	GIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINESS / U	US-301 FROM NC 87 SOUT	H TO NC 59	•	GROUND WTR (f	SITE	E DESCRIPTIO	I-95 BUSIN	IESS / I	US-301 FROM NC 87 SOU	TH TO NC 59		•		GROUND W	TR (ft)
BORING NO. L_24900 ST.	ATION 249+00	OFFSET CL	ALIGNMENT -L-	0 HR. Dr	BOF	RING NO. L_2	5400	ST	TATION 254+00	OFFSET	CL	ALIGN	MENT -L-	0 HR.	Dry
COLLAR ELEV. 185.5 ft TO	DTAL DEPTH 3.0 ft	NORTHING 449,721	EASTING 2,028,536	24 HR. Dr	COL	LLAR ELEV. 1	76.2 ft	тс	DTAL DEPTH 3.0 ft	NORTHIN	G 450,184	EASTIN	IG 2,028,724	24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Ha	nd Auger HAMN	MER TYPE N/A	DRIL	L RIG/HAMMER E	FF./DATE N/A	•		1	DRILL METHO	D Hand Auger	HAM	MERTYPE N/A	
DRILLER PAUL, A. ST.	ART DATE 09/30/14	COMP. DATE 09/30/14	SURFACE WATER DEPTH N	I/A	DRI	LLER PAUL,	۸.	ST	ART DATE 09/30/14	COMP. D	ATE 09/30/14	SURFA		I/A	
ELEV DRIVE DEPTH BLOW COUNT	BLOWS PER FC	OT SAMP.			ELE\	/ DRIVE DEPT	H BLOW COL	UNT	BLOWS PER F	тос	SAMP.				
(ft) (ft) (ft) 0.5ft 0.5ft 0.5ft	0 25 50	75 100 NO. MOI G	ELEV. (ft)	DEPTH		(ft) (ft)	0.5ft 0.5ft	0.5ft	0 25 50	75 10	0 NO. MC	ol G	SOIL AND ROOK DE		
LLCV ELEV DCF TITI 190 0.5ft 0.5ft 0.5ft 185 - - - - 185 - - - - - 186 - - - - - - 186 - - - - - - - 187 -		75 100 NO. MOI G	SOIL AND ROCK DES	FACE (2") AL PLAIN (A-2-4) ND (A-2-4)	<u>180</u> <u>2</u> 0		0.5ft 0.5ft 0.5ft 0.5ft	0.5ft		75 10 	0 NO. MO		GROUND SURI TOPSOIL (2 ROADWAY EMBA GRAY AND RED, SILTY YELLOW, SILTY SAN RED, SILTY SANE Boring Terminated at Ele	FACE ") IKMENT SAND (A-2-4) ND (A-2-4) (A-2-4)	

	N/A					P W-55			COUNT			AND			GEC	LOGIST PAUL, A.				S N/A			DUIG	P W-551			
				BUSIN		US-301 F			SOUTH														BUSIN			7 SOUTH	-
	NG NO.				_					OFFS					_			HR. Dry		RING NO				 TATION 2			0
					Т	DTAL DE	PTH	3.0 ft		NORT		450,9				TING 2,028,779		HR. 1.0		LAR EL				DTAL DEP	TH 3.0 ft		N
	RIG/HAM			N/A						1					and Auge			YPE N/A		L RIG/HAI			E N/A	 			<u> </u>
	LER PA				_						P. DAT	E 09/				FACE WATER DEPTH	N/A								E 09/30/		C
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLO 0.5ft	W COL 0.5ft		0	ВL 25		PER FOO	1 75	100	SAMP	мо	0	ELEV.	SOIL AND ROCK [ESCRIP		ELEV (ft)	, DRIVE ELEV (ft)	DEPTH (ft)	- BLC 0.5ft	OW COU 0.5ft	 0	BLOWS 25	50 PER FOC	75
	(11)						I	I							ELEV.	1()		DEPTH (ft)		(11)							
155																			155								
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150	-	-				• • •	• •				•••				149.7	TOPSOIL ROADWAY EME			150		‡						÷
	-	-										S-4	28%		- 148.5 -	- GRAY AND TAN, SIL	LA SANE	D (A-2-4)			‡				1		
	-	-													F	UNDIVIDED COA TAN AND GRAY,					ŧ						
	-	-													F	Boring Terminated at	Elevation	n 148.5 ft		-	ŧ						
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CUMBERL	AND			GEO	LOGIST PAUL, A.	_	_	
O NC 59							GROUN	ID WTR (ft)
OFFSET 5	0 ft LT			ALIG	NMENT -L-		0 HR.	Dry
NORTHING	451,27	79		EAS	FING 2,028,729		24 HR.	Dry
	DRILL M	ETHOD	Ha	nd Auger		HAMME	RTYPE	N/A
COMP. DAT				-		TH N/A	۸	
	SAMP.		L	_!				
75 100	NO.	моі	O G		SOIL AND ROC	K DESC	RIPTION	
				-				
1				152:8	GROUND	OIL (3")	(CE	84
				<u>150.8</u> 149.3	ROADWAY E	MBANK		
11	1				GRAY AND TAN, S TAN AND ORANGE	, SILTY	SAND (A	-2-4)
				-	Boring Terminated	at Eleva	ation 149.	3 ft
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WBS N/A	TIP W-5519 COUN	TY CUMBERLAND	GEOLOGIST PAUL, A.		WB	S N/A		TIF	P W-5519 CC	DUNTY CUMBE	RLAND	GE	OLOGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSIN	ESS / US-301 FROM NC 87 SOUTH	H TO NC 59		GROUND WTR (ft)	SITE	E DESCRIPTION	I-95 BL	JSINESS /	US-301 FROM NC 87 SC	OUTH TO NC 59				GROUND V	NTR (ft)
BORING NO. L_26600	STATION 266+00	OFFSET 55 ft RT	ALIGNMENT -L-	0 HR. Dry	BOF	RING NO. L_26	6800	ST	TATION 268+00	OFFSET	CL	AL	IGNMENT -L-	0 HR.	Dry
COLLAR ELEV. 152.7 ft	TOTAL DEPTH 3.0 ft	NORTHING 451,375	EASTING 2,028,837	24 HR. Dry	COL	LAR ELEV. 1	61.8 ft	тс	OTAL DEPTH 3.0 ft	NORTHIN	IG 451,577	EA	STING 2,028,809	24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A	•	DRILL METHOD	Hand Auger HAMN	MER TYPE N/A	DRIL	L RIG/HAMMER E	FF./DATE	N/A		•	DRILL METHO	D Hand Aug	er HAN	MER TYPE N/A	1
DRILLER PAUL, A.	START DATE 09/30/14	COMP. DATE 09/30/14	SURFACE WATER DEPTH N	I/A	DRI	LLER PAUL, A	A.	ST	TART DATE 09/30/14	COMP. D	ATE 09/30/14	SU	RFACE WATER DEPTH	N/A	
ELEV DRIVE DEPTH BLOW COU			SOIL AND ROCK DES		ELEV	/ DRIVE ELEV (ft) (ft)	H BLOW	COUNT	BLOWS PER	FOOT	SAMP.		SOIL AND ROCK DE	SCRIPTION	
(ft) ELEV (ft) 0.5ft 0.5ft	0.5ft 0 25 50	75 100 NO. MOI G	ELEV. (ft)	DEPTH (ft)	(ft)	(ft) (ft)	0.5ft 0	.5ft 0.5ft	0 25 50	75 10	0 NO. MC	DI G			
DOT TOOL 12011 0.0		· · · · · · 	GROUND SURF 152.0 TOPSOIL (3 149.7 TAN AND GRAVY EMBAN TAN AND GRAY, SILTY GRAY AND ORANGE, C Boring Terminated at Ele	FACE <u>8-5</u> ^{17"}) - 0.7 IKMENT SAND (A-2-4) 3.0 AL PLAIN CLAY (A-7-6)	165								TOPSOIL (3") NKMENT ′ SAND (A-2-4)	



WBS N/A	TIP W-5519 CC	OUNTY CUMBERLAND	GEOLOGIST PAUL, A.		W	BS N/A			TIP W-5519	COUNTY CUMB	ERLAND		GEOLOGIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINES	SS / US-301 FROM NC 87 SO	UTH TO NC 59		GROUND WTR (it) SI	TE DESCF	RIPTION 1-95	5 BUSINE	SS / US-301 FROM NC 87	SOUTH TO NC 59				GROUND W	/TR (ft)
BORING NO. L_27600	STATION 276+00	OFFSET CL	ALIGNMENT -L-	0 HR. D	ry BC	ORING NO	. L_28000		STATION 280+00	OFFSET	CL		ALIGNMENT -L-	0 HR.	Dry
COLLAR ELEV. 177.5 ft	TOTAL DEPTH 3.0 ft	NORTHING 452,310	EASTING 2,029,121	24 HR. D	ry CC	OLLAR EL	.EV. 181.0 ft	t	TOTAL DEPTH 3.0 ft	NORTHI	NG 452,668	}	EASTING 2,029,299	24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A	•	DRILL METHOD	Hand Auger HAN	IMER TYPE N/A	DR	RILL RIG/HA	MMER EFF./DA	TE N/A	•	·	DRILL ME	THOD Ha	nd Auger HAMI	IER TYPE N/A	
DRILLER PAUL, A.	START DATE 09/30/14	COMP. DATE 09/30/14	SURFACE WATER DEPTH	N/A	DF	RILLER F	PAUL, A.		START DATE 09/30/1	4 COMP. I	OATE 09/30	/14		/A	
ELEV DRIVE DEPTH BLOW COUN	T BLOWS PER		SOIL AND ROCK DE	ESCRIPTION	ELE		DEPTH BL (ft) 0.5f	OW COU	NT BLOWS	PER FOOT	SAMP.		SOIL AND ROCK DE	CRIPTION	
(ft) ELEV (ft) 0.5ft 0.5ft 0	.5ft 0 25 50	75 100 NO. MOI G	ELEV. (ft)	DEPTH	(ft)	⁽⁾ (ft)	(ft) 0.5f	t 0.5ft (0.5ft 0 25	50 75 1	0 NO.	MOI G			
180			L-		18	5	+						_		
			- - 177.5 GROUND SUF		Q.Q		‡						- -		
175			TOPSOIL (2 0 18	20	ŧ						GROUND SURI	ACE	8,g
			TAN, SILTY SAN	ID (A-2-4)	3.0		‡				S-5	9%	179.0 ROADWAY EMBA	IKMENT	
			Boring Terminated at E	levation 174.5 it			‡						- 178.0 ORANGE AND GRAY, - (A-2-4)	SILTY SAND	0.0
			<u>-</u>				‡						- UNDIVIDED COAST - YELLOW, SILTY SA	AL PLAIN ND (A-2-4)	
							‡						Boring Terminated at Ele		1
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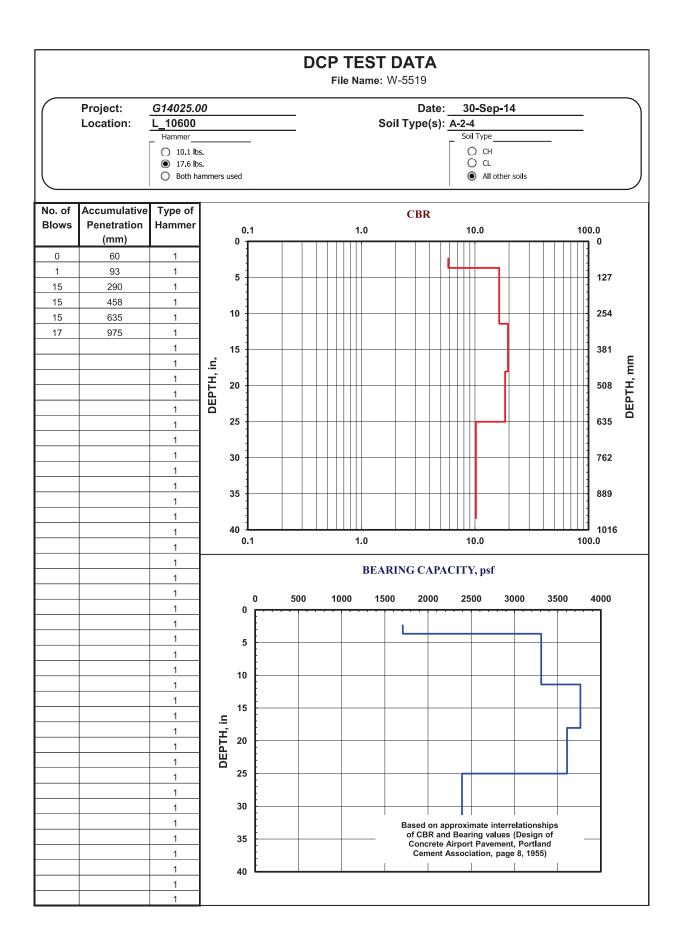


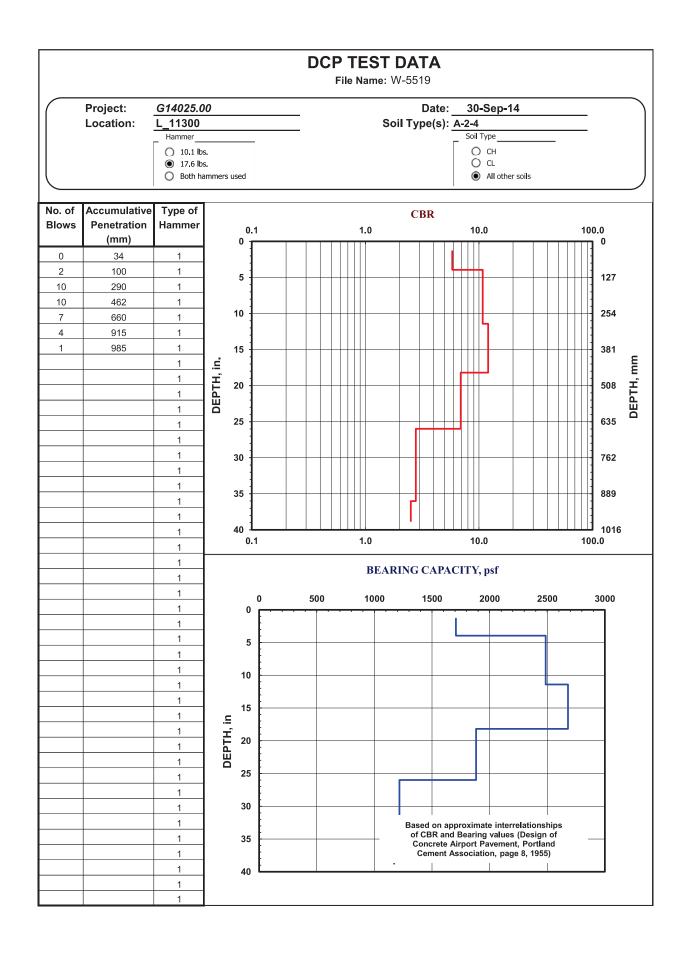
NCDOT GEOTECHNICAL ENGINEERING UNIT

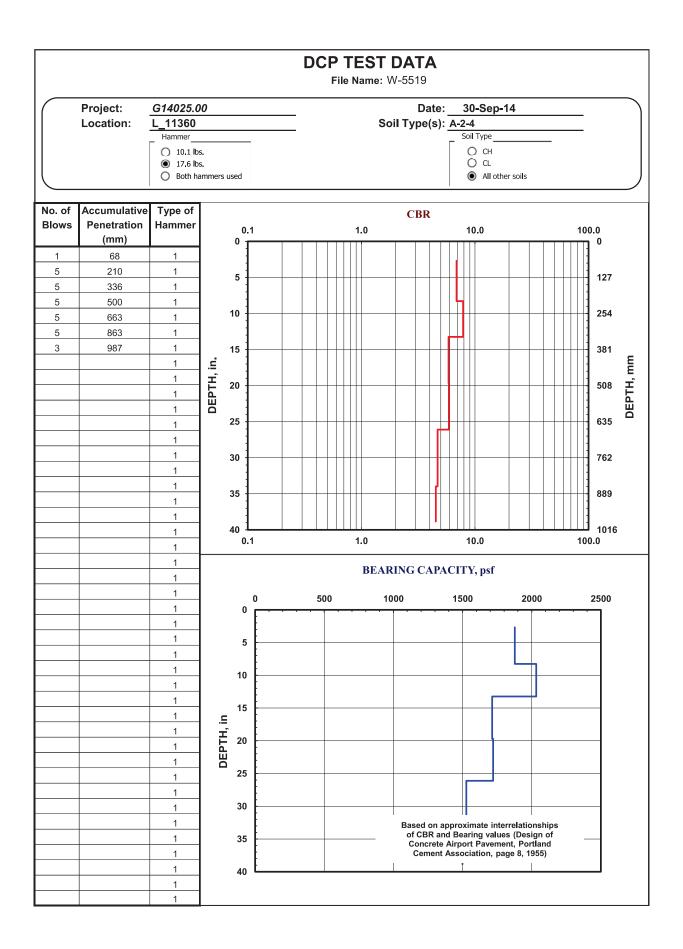
WBS N/A	TIP W-5519 COUN	ITY CUMBERLAND	GEOLOGIST PAUL, A.		V	NBS N	I/A			TIP W-5519	COUNTY CU	MBER	LAND		GEOLO	GIST PAUL, A.		
SITE DESCRIPTION I-95 BUSINES	S / US-301 FROM NC 87 SOUT	H TO NC 59		GROUND WTR	(ft) S	SITE DE	SCRIPTION	I-95 E	BUSINES	S / US-301 FROM NC 8	7 SOUTH TO NO	59					GROUND V	NTR (ft)
BORING NO. L_32200	STATION 322+00	OFFSET CL	ALIGNMENT -L-	0 HR.	Dry E	BORING	NO. L_36	000		STATION 360+00	OFF	SET (CL		ALIGNN	IENT -L-	0 HR.	Dry
COLLAR ELEV. 195.5 ft	TOTAL DEPTH 3.0 ft	NORTHING 456,732	EASTING 2,030,208	24 HR.	Dry C	COLLAR	R ELEV. 21	10.4 ft		TOTAL DEPTH 3.0 ft	NOR	THING	460,44	6	EASTIN	G 2,030,858	24 HR.	Dry
DRILL RIG/HAMMER EFF./DATE N/A		DRILL METHOD Hand A	Auger HAM	IMER TYPE N/A	D	ORILL RIG	HAMMER EF	F./DATE	N/A				DRILL ME	THOD	land Auger	HAN	IMER TYPE N/A	١
DRILLER PAUL, A.	START DATE 09/30/14	COMP. DATE 09/30/14	SURFACE WATER DEPTH	N/A	C	ORILLEF	R PAUL, A			START DATE 10/08/2	4 CON	IP. DA	FE 10/08	8/14	SURFA	CE WATER DEPTH	N/A	
ELEV DRIVE DEPTH BLOW COUN (ft) (ft) (ft) 0.5ft 0.5ft 0.	T BLOWS PER FC 5ft 0 25 50		SOIL AND ROCK DE			(ft)	RIVE LEV (ft)	BLOV	N COUNT	Г BLOWS 5ft 0 2 <u>5</u>	PER FOOT 50 75	100	SAMP. NO.			SOIL AND ROCK DI	ESCRIPTION	
ELEV DRIVE DEPTH BLOW COUN	T BLOWS PER FO	OT SAMP. V L 75 100 NO. MOI G EL - 18	SOIL AND ROCK DE .EV. (ft) . <u>E.5. GROUND SUR</u> TOPSOIL (ESCRIPTION DEPT RFACE (2") NKMENT D (A-2-4)				BLO		T BLOWS	PER FOOT 50 75		SAMP.	MOI G	210.4		ESCRIPTION RFACE INKMENT D (A-2-4)	0.0
							+ + +								Ę			

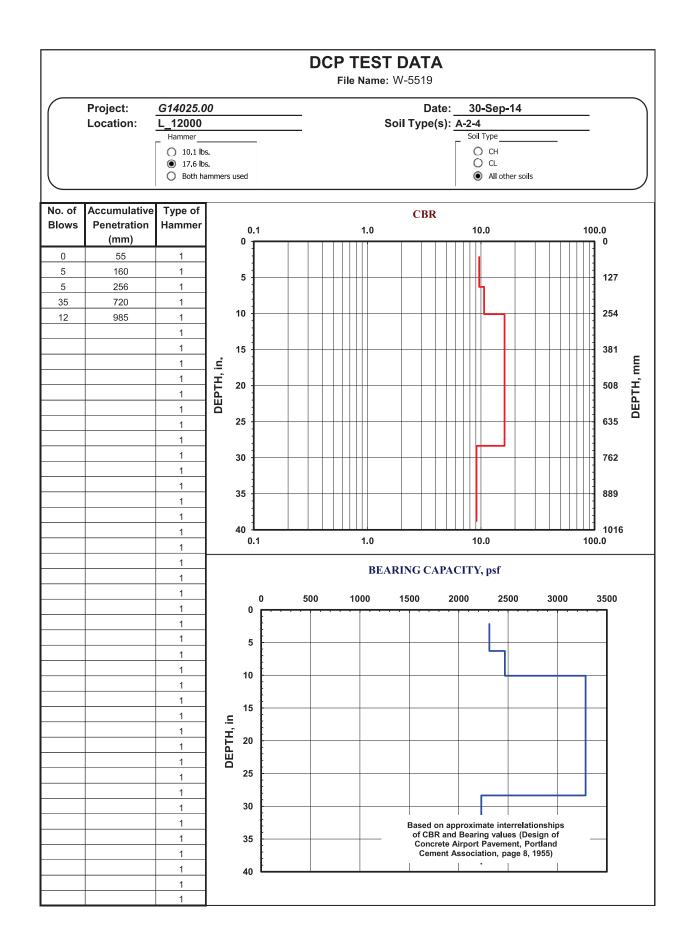


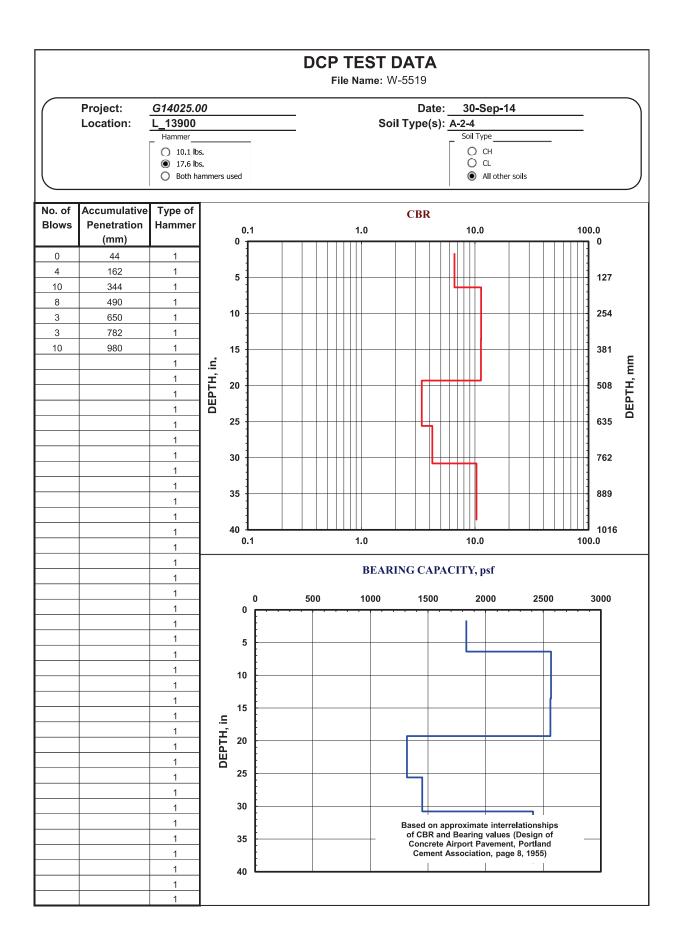
WBS N/	/A		Т	IP W-5519	COUNT	Y CUMBER	RLAND		GEOI	Logist Paul, A.			WBS	S N/A				TIP W-5	5519	cc	DUNTY CUM	BERLAN	D		GEOLO	OGIST PAUL	., A.		
SITE DES	SCRIPTION	I-95 E	BUSINESS	US-301 FROM NO	87 SOUTH	TO NC 59					GROUND W	TR (ft)	SITE	E DESCI	RIPTION	I-95 E	BUSINES	S / US-30	1 FROM	NC 87 SO	UTH TO NC 5	59						GROUND V	VTR (ft)
BORING	NO. L_400	000	s	TATION 400+00		OFFSET	CL		ALIG	NMENT -L-	0 HR.	Dry	BOR	RING NC) . SR1_	1701		STATION	N 17+01	1	OFFSE	T 1 ft R	т		ALIGN	MENT -SR1-		0 HR.	Dry
COLLAR	R ELEV. 16	9.4 ft	Т	OTAL DEPTH 3.0	ft	NORTHING	4 63,7	58	EAST	ING 2,032,733	24 HR.	Dry	COL	LAR EL	LEV. 18	0.3 ft			DEPTH	6.0 ft	NORTH	HING 45	3,354		EASTI	NG 2,029,41	4	24 HR.	FIAD
DRILL RIG/	HAMMER EF	F./DATE	N/A				DRILL N	IETHOD	Hand Auger	H	IAMMER TYPE N/A		DRIL	L RIG/HA	AMMER EF	F./DATE	N/A					DRI	L METH	HOD Ha	and Auger		HAMN	ER TYPE N/A	
	R PAUL, A.			TART DATE 10/0	8/14	COMP. DA									PAUL, A.			START D	DATE 1	1/21/14	COMP	DATE				CE WATER D			
			N COUNT		VS PER FOO		SAMP.													OWS PER		SA							
(ft) EL	EV (ft)	0.5ft	0.5ft 0.5ft	0 25	50	75 100	NO.		D G ELEV. (f	SOIL AND ROCK)EPTH (ft)	(ft)	ELEV	(ft)	0.5ft	0.5ft 0.5	5ft 0	25	50	75	100 N	o. 🖍	/ O /OI G		SOIL AND	ROCK DES	CRIPTION	
								Í	,											•									
170													185																
									168 <u>:4</u> 168 <u>:9</u>	GROUND S	SURFACE	0.0 /			+										-				
	‡								166.4		<u>′ SAND (A-2-4)</u>	ј _{3.0}			+										-				
	‡				·				1	YELLOW TAN AND	ORANGE, CLAYEY		180	180.3	$\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$	N/A	4 4	.							- 180.3		UND SURF		0.0
	±								Ę	Boring Terminated a		1		178.3	3 + 1.0 3 + 2.0 3 + 3.0	N/A	5 5						N	N	- 177.3		ILTY SAND		3.0
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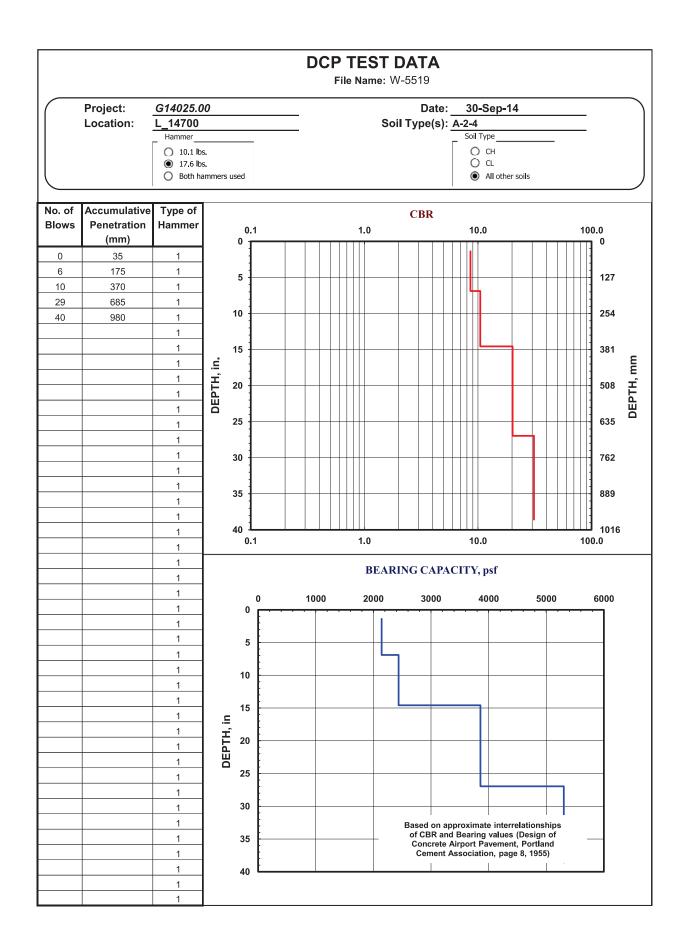


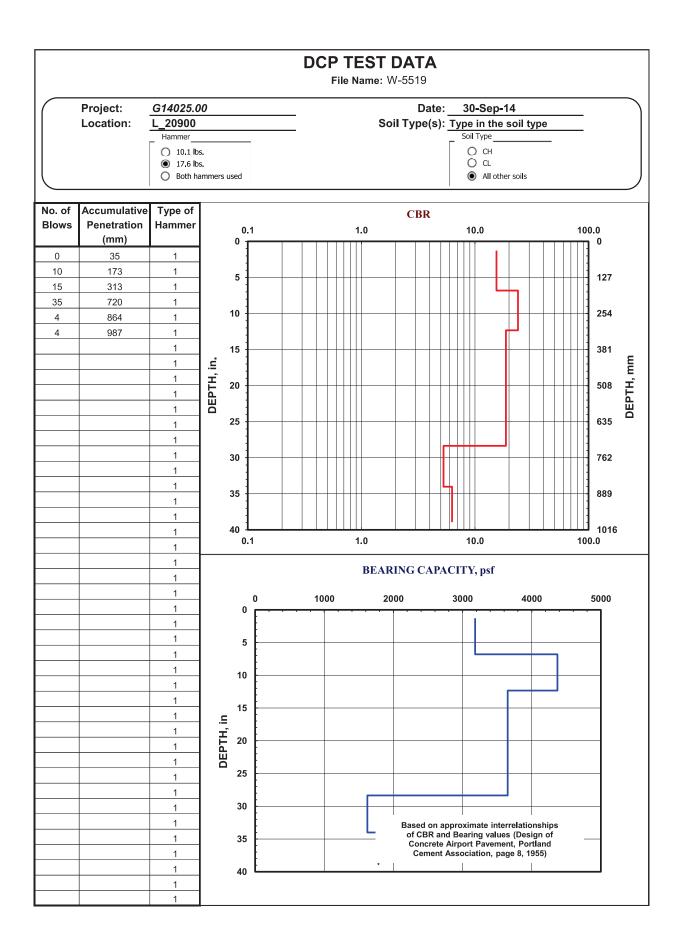


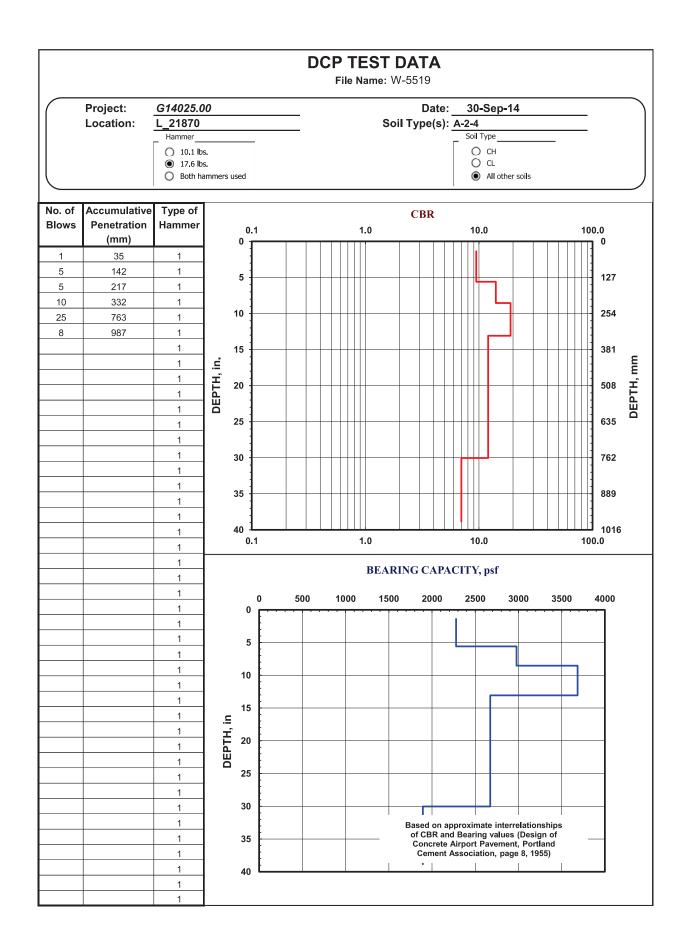


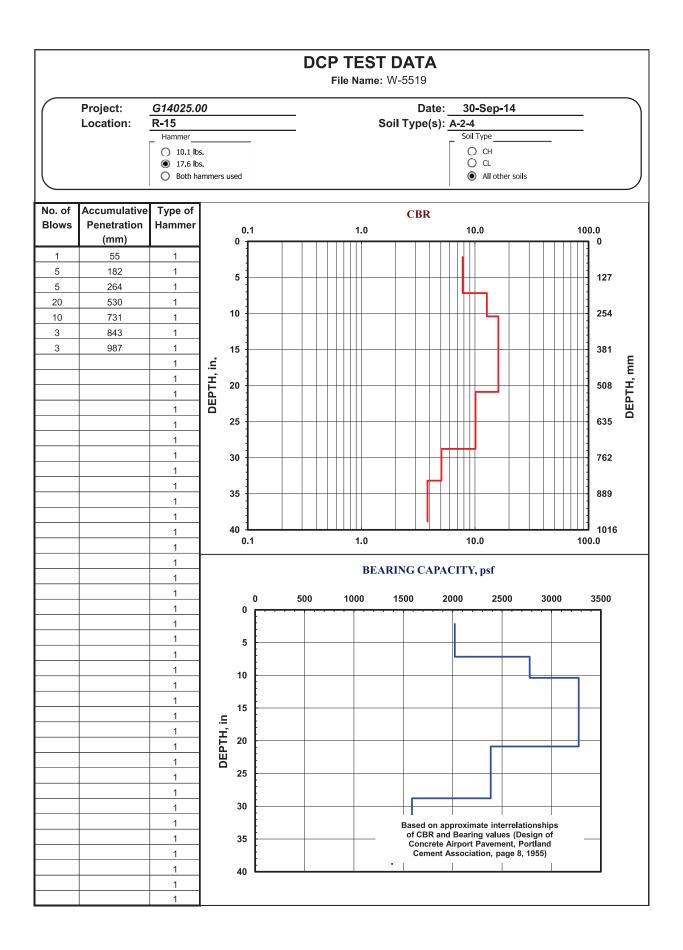


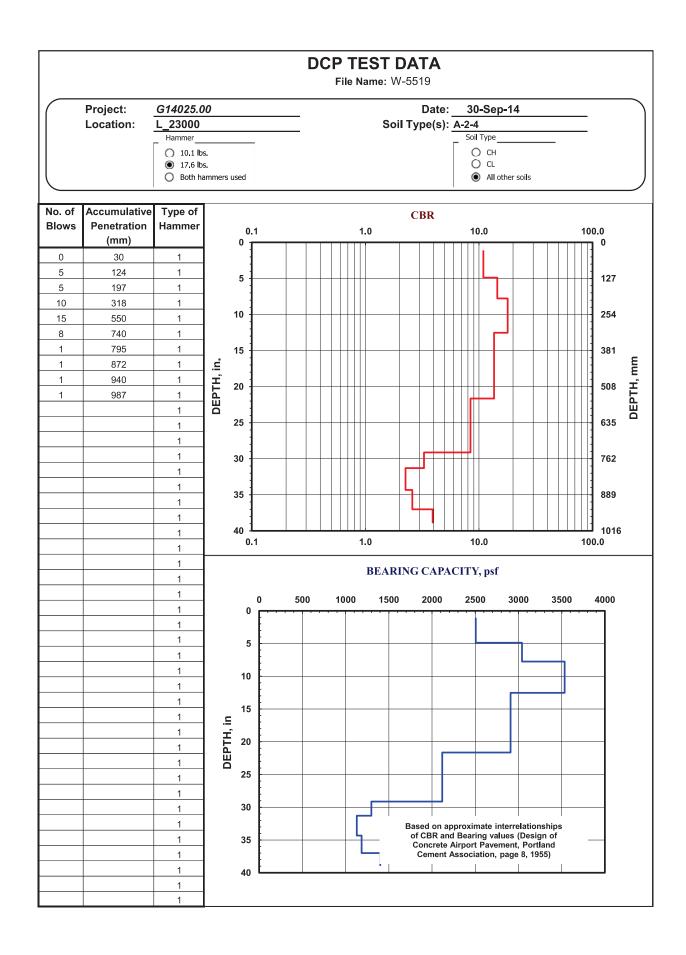


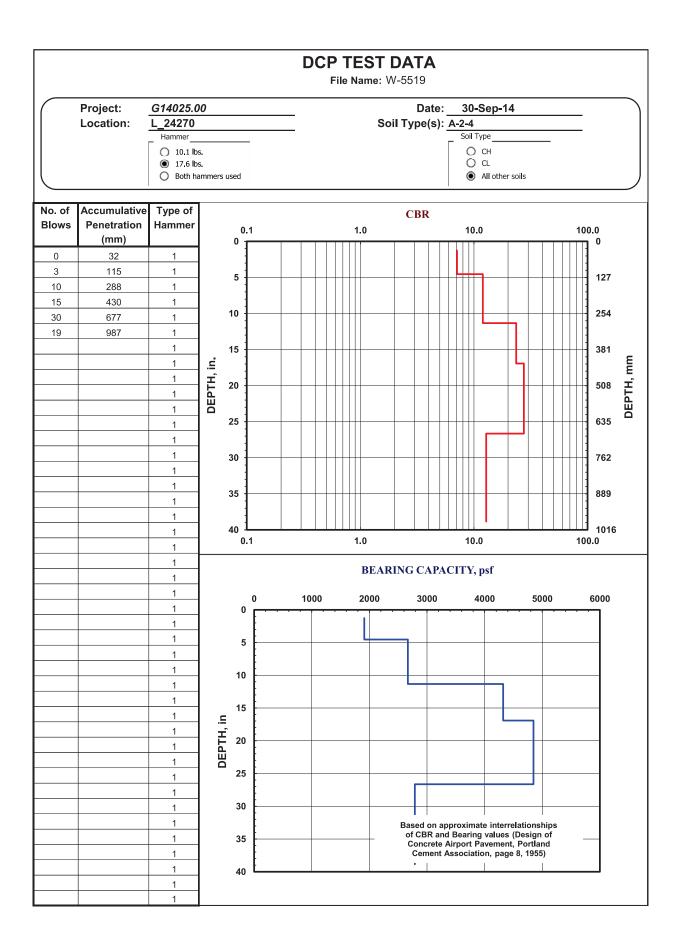


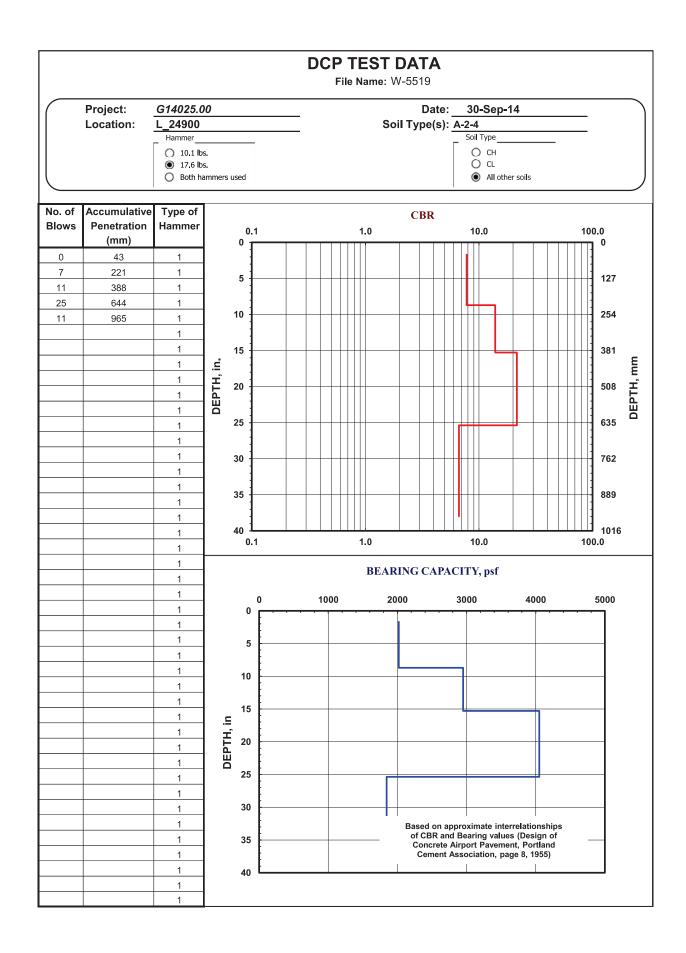


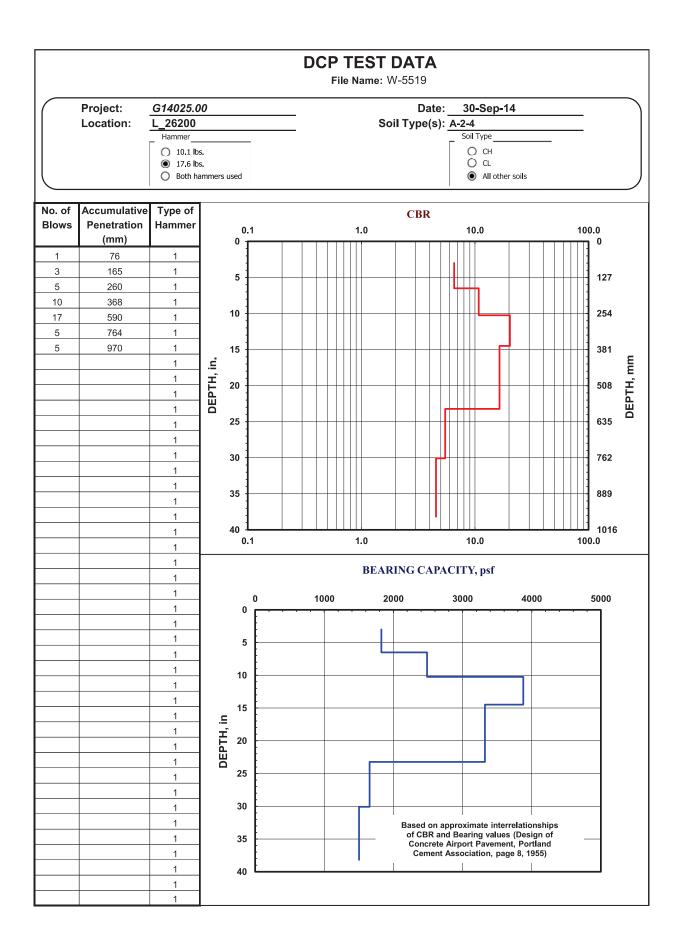


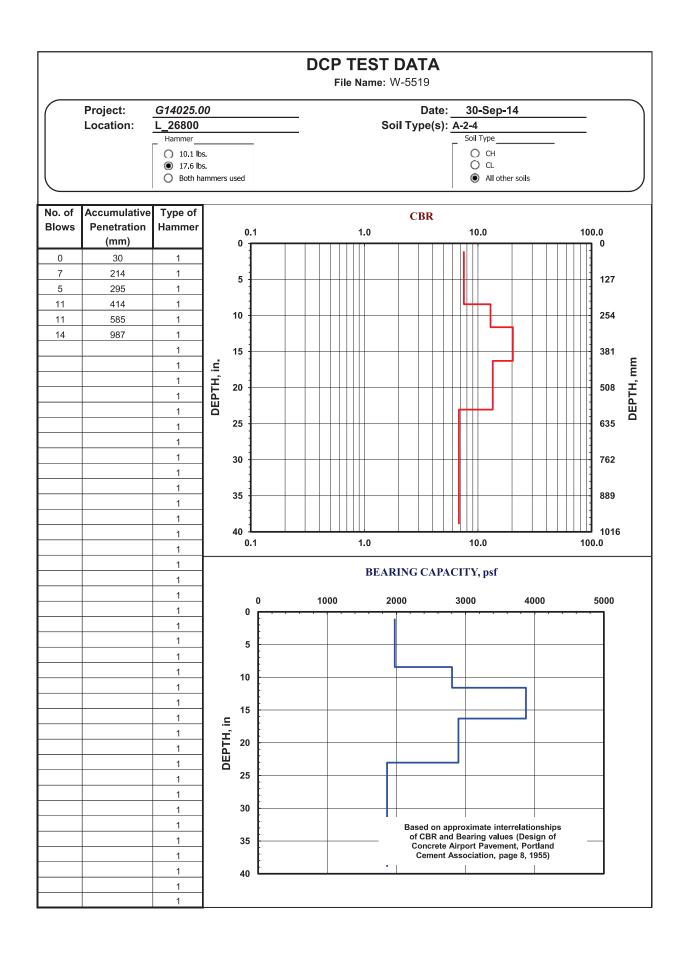


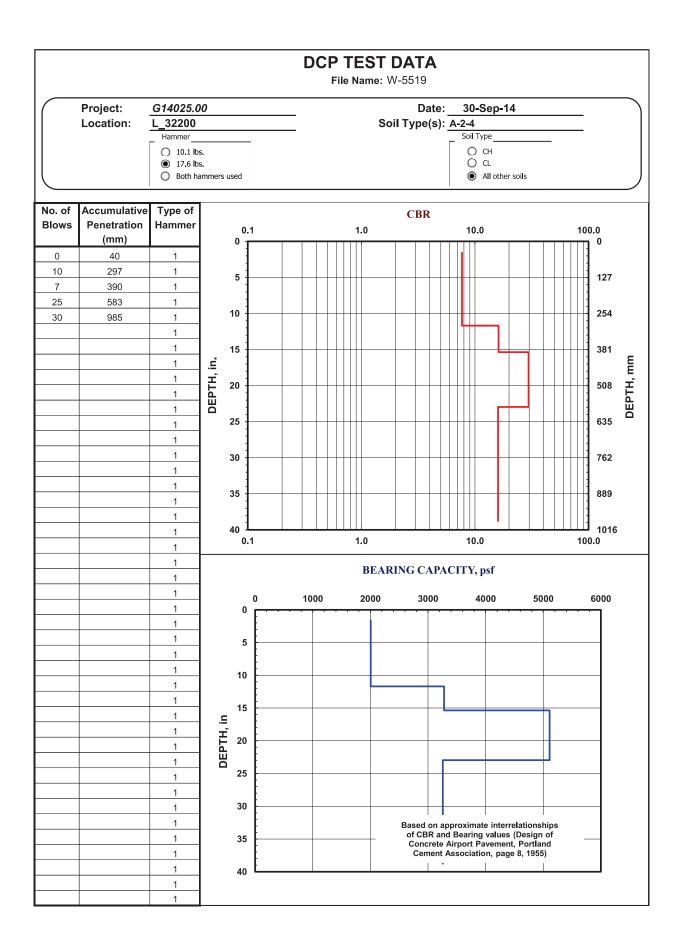


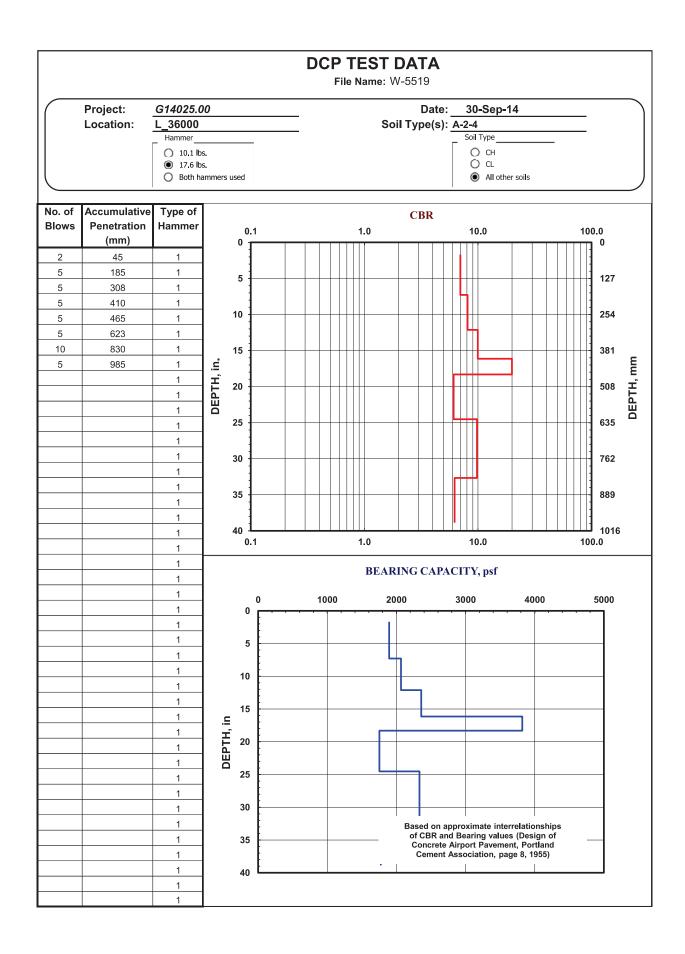


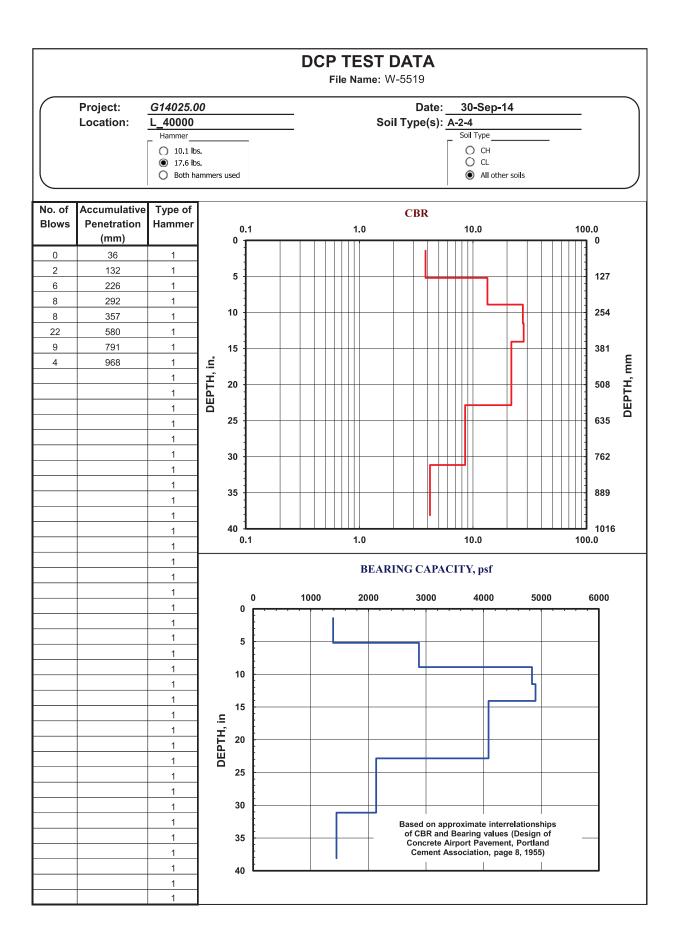












FALCON

AASHTO SOIL CLASSIFICATION AND GRADATION SHEET

I-95 BUSINESS / US 301 FROM NC 87 SOUTH TO NC 59

TIP: W-5519

CUMBERLAND COUNTY, NORTH CAROLINA FALCON ENGINEERING, INC. PROJECT NO: G14025.00

BOR	RING SHTO Classifica	SAMPLE		OTAL SAMP		Atterbe	rg Limit Test	Results	Natural Moisture Content	Organic Content	Corrected	Optimum Water Content	Max. Dry Density
STATION	OFFSET (FEET)	DEPTH (FEET)	#10	#40	#200	LL	PL	PI	%	%	CBR @ 0.1"	%	PCF
L_11	360	S-1											
	A-2-7(3)		99	66	35	51	26	25	21.7	-	-	-	-
113+60	50' RT	2.2-3.0											
L_13	3900	S-2											
	A-7-6(16)		99	78	63	53	25	28	25.4	-	-	-	-
139+00	CL	2.0-3.0											
L_23	3000	S-3											
	A-2-4(0)		100	68	24	17	11	6	9.5	-	-	-	-
230+00	CL	1.4-3.0											
L_26	6200	S-4											
	A-7-6(15)		99	79	57	57	26	31	27.6	-	-	-	-
262+00	CL	1.8-3.0											
L_28	3000	S-5											
	A-2-4(0)	-	99	68	15	16	0	NP	9.3	-	-	-	-
280+00	CL	0.3-2.0											
SR_1	1902	BS-1											
	A-2-4(0)		100	81	18	15	0	NP	7.9	-	21.0	11.3	120.0
19+00	CL	0.3-3.0											

The Sul SIGNATURE

LL PL

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Notes:

Liquid limitPlastic limit

= Plasticity index = LL - PL

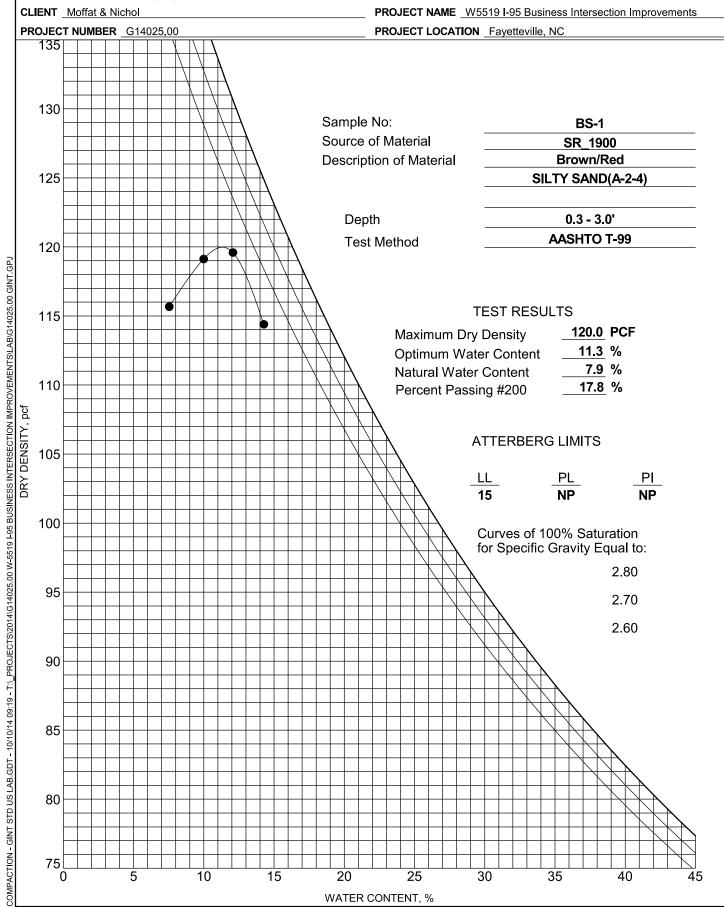
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Falcon Engineering, Inc. 1210 Trinity Rd., Suite 110 Raleigh, NC 27607

Telephone: (919) 871-0800 Fax: (919) 871-0803

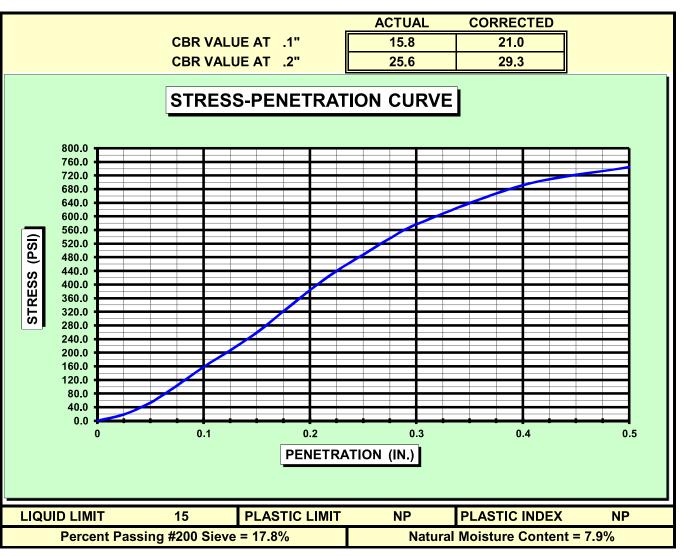
MOISTURE-DENSITY RELATIONSHIP



FALCON ENGINEERING

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL AASHTO T-193 \ ASTM D-1883

G14025.00		C	DATE:	10/13/2014
W5519 I-95 Busi	iness Intersectior	n Improvements		
SR_1900	SAMPLE:	BS-1 DE	EPTH:	0.3-3.0
I: Brown/Red SILTY SA	AND (A-2-4)			
ON METHOD	AASHTO T-99	SOAK		96 HRS.
DRY DENSITY	120.0 PCF	STRAIN RATE		.05 IN/MIN.
STURE CONTENT	11.3%	LOAD CELL		2500lb
TEST DATA		SURCHARGE WEIGHT		10 lb.
DENSITY	116.8 PCF	SURCHARGE PER SQUARE F	оот	51 lbs/sq.ft.
E CONTENT	11.3%	FINAL MOISTURE CONTEN	ΙТ	N/A
COMPACTION	97.3%	SWELL		-0.02%
	W5519 I-95 Busi SR_1900 I: Brown/Red SILTY S/ ON METHOD DRY DENSITY STURE CONTENT TEST DATA DENSITY E CONTENT	W5519 I-95 Business IntersectionSR_1900SAMPLE:SR_1900SAMPLE:SR_1900SAMPLE:SILTY SAND (A-2-4)ON METHODAASHTO T-99ORY DENSITY120.0 PCFSTURE CONTENT11.3%TEST DATADENSITY116.8 PCFE CONTENT11.3%	W5519 I-95 Business Intersection Improvements SR_1900 SAMPLE: BS-1 Di A: Brown/Red SILTY SAND (A-2-4) SOAK SOAK ON METHOD AASHTO T-99 SOAK DRY DENSITY 120.0 PCF STRAIN RATE STURE CONTENT 11.3% LOAD CELL TEST DATA SURCHARGE WEIGHT DENSITY 116.8 PCF SURCHARGE PER SQUARE F E CONTENT 11.3% FINAL MOISTURE CONTENT	W5519 I-95 Business Intersection ImprovementsSR_1900SAMPLE:BS-1DEPTH:SR_1900SAMPLE:BS-1DEPTH:It Brown/Red SILTY SAND (A-2-4)It Brown/Red SILTY SAND (A-2-4)It Brown/Red SILTY SAND (A-2-4)ION METHODAASHTO T-99SOAKON METHODAASHTO T-99SOAKORY DENSITY120.0 PCFSTRAIN RATESTURE CONTENT11.3%LOAD CELLTEST DATASURCHARGE WEIGHTDENSITY116.8 PCFSURCHARGE PER SQUARE FOOTE CONTENT11.3%FINAL MOISTURE CONTENT





STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PAT MCCRORY GOVERNOR

SUBJECT:

ANTHONY J. TATA SECRETARY

November 7, 2014

MEMORANDUM TO:	Judith Corley-Lay, P.E., Ph.D. State Pavement Management Engineer
	Glen W. Mumford, P.E. State Roadway Design Engineer
FROM:	J. L. Pilipchuk, P.E., L.G. State Geotechnical Engineer MAM John Pilipchuk
STATE PROJECT: F. A. PROJECT: COUNTY: DESCRIPTION:	45849.1.FR1 (W-5519) – DDC HSIP-095-2(128) 46 Cumberland I-95 Business / US 301 from NC 87 South to NC 59

Geotechnical Recommendations for Pavement Design

The proposed work consists of converting the existing left turn lanes to directional crossovers.

Soil Type: The predominant soil types on the project consist of undivided Coastal Plain soils silty sand (A-2-4) and fine sand (A-3).

Anticipated borrow will likely consist of sandy soils. The design soil type is silty sand (A-2-4) and fine sand (A-3).

The length of this project is 3.814 miles

TELEPHONE: 919-707-6850 FAX: 919-250-4237

WEBSITE: WWW.NCDOT.GOV

LOCATION: CENTURY CENTER COMPLEX ENTRANCE B-2 1020 BIRCH RIDGE DRIVE RALEIGH NC

DESIGN AND CONSTRUCTION RECOMMENDATIONS

I. Subgrade Stability

A. Aggregate Subgrade

Recommend a quantity of 500 cubic yards of shallow undercut to be included in the project contract as a contingency item.

- B. Geotextile for Soil Stabilization Recommend 1,500 square yards of Geotextile for Soil Stabilization to be included in the project contract as a contingency item.
- C. Class IV Subgrade Stabilization Recommend 1,000 tons of Class IV Subgrade Stabilization material to be included in the project contract as a contingency item.

II. Miscellaneous

A. Proof Rolling

It is recommended that proof rolling not performed on this project.

JLP/JBB

ATTACHMENT 1:	Core Evaluation Sheet	4
ATTACHMENT 2:	Core Photographs	7
ATTACHMENT 3:	Dynamic Cone Penetrometer Tests	24

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL ENGINEERING UNIT

Summary of Quantities

WBS Number:	45849.1.FR1	County:	Cumberland	Project Engineer:	
TIP Number:	W-5519	Field Office:	Central	Project Geologist:	J. B. Barfield

Description: I-95 Business/US 301 from NC 87 South to NC 59

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units / %
019600000-Е	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. A	Contingency	N/A	N/A	1,500	SY
-		То	tal Quan	tity of Geotext	tile for Soil S	tabilization =	1,500	SY
109950000-Е	Shallow Undercut	505 - Aggregate Subgrade	I. A	Contingency	N/A	N/A	500	CY
				Total Quant	ity of Shallov	w Undercut =	500	CY
109970000-Е	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	I. A	Contingency	N/A	N/A	1,000	TON
		Tot	al Quant	tity of Class IV	V Subgrade St	tabilization =	1,000	TON

PAVEMENT CORES FOR 45849.1.FR1.1.1, W-5519, Cumberland County

			LAYER		
LINE	STATION	ABC	THICKNESS	LAYERS	REMARKS
			(in)		
	106+00 SB LTL		4	S	3 lifts
-L-	10 1/2" Asphalt	-	2 1/2	I	1 lift, moderate severity stripping
	101/2 Aspirat		4	В	1 lift
-L-	113+50 NB OSS		5 3/4	S	4 lifts, lifts 3 and 4 have sandy matrix
-L-	11 1/2" Asphalt	_	4 3/4	В	1 lift, delaminated from surface, moderate severity stripping, missing 1" of base material
	113+50 NB OSL		2 3/4	S	2 lifts, tack coat top of lift 2
-L-		_	8 1/2	SD	1 lift, rounded agg., bottom up crack, horizontal break, high severity bleeding, tack coat top of
-L-	11 1/4" Asphalt		-	-	sand layer, missing 1 1/4" of material
	6 1/2" Concrete		6 1/2	С	1 lift, bottom up crack, sub-rounded limestone agg., matrix is highly weathered, traces of grout
	113+50 NB ISL		3 1/4	S	2 lifts, low severity stripping lift 2
-L-	14" Asphalt	-	7 1/4	SD	1 lift, rounded agg., bottom up crack, 2 horizontal breaks, high severity bleeding, tack coat top
				30	of sand layer, last 9 1/2" of core in pieces, missing 4 1/2" of material
-L-	113+50 SB OSS	_	6 1/2	S	5 lifts, lift 5 has sandy matrix, low severity stripping at contact of lifts 2 and 3
	10 1/4" Asphalt		3 3/4	В	1 lift
-L-	113+50 SB OSL	_	9	S	6 lifts, lift 5 has sandy matrix
	11 1/4" Asphalt		2 1/4	В	1 lift, low severity stripping
-L-	113+00 SB ISS	-	10	S	8 lifts, lift 6 and 7 have sandy matrix, low severity stripping
-	12" Asphalt	-	2		1 lift, low to moderate severity stripping
-L-	121+50 NB LTL		5 1/2	S	4 lifts, yellow line top of lifts 1 and 2, low severity stripping, low severity bleeding lift 3 and 4
-	8" Asphalt		2 1/2	I	1 lift, low severity stripping
-L-	133+00 SB LTL	_	5	S	3 lifts, low severity stripping at contact of lifts 2 and 3
-	11 1/4" Asphalt		6 1/4	В	1 lift, moderate severity stripping top 2 inches
-L-	142+50 NB LTL	-	4	S	3 lifts, low severity stripping at contact of lifts 2 and 3
	7" Asphalt		3		1 lift, high severity stripping and few missing agg. from bottom 1 inch
-L-	144+50 SB LTL	-	5		4 lifts
-	8 1/2" Asphalt		3 1/2	I	1 lift, moderate severity stripping
-L-	206+50 NB LTL	_	4 1/4	S	3 lifts, low severity stripping
	8" Asphalt	_	3 3/4	I	1 lift, low severity stripping bottom 1 inch
	208+00 SB LTL	-	4	S	3 lifts, lift 1 has low severity bleeding, yellow line top of lift 3, all lifts have low severity
-L-	8" Asphalt			,	stripping at lift contacts
			4	I	1 lift, low severity stripping
-L-	218+50 NB LTL	-	4 1/2		3 lifts
	12 1/2" Asphalt		8	В	1 lift, last 1" broken with few missing agg.
	220+25 SB LTL 9 1/4" Asphalt	-	4	S	3 lifts
-L-			3/4	I	1 lift
			4 1/2	В	1 lift
-L-	232+00 NB LTL	_	4 1/4	S	3 lifts, lift 3 has yellow line, lifts 2 and 3 have moderate severity stripping at lift contact
_	7 1/2" Asphalt		3 1/4	I	1 lift

PAVEMENT CORES FOR 45849.1.FR1.1.1, W-5519, Cumberland County

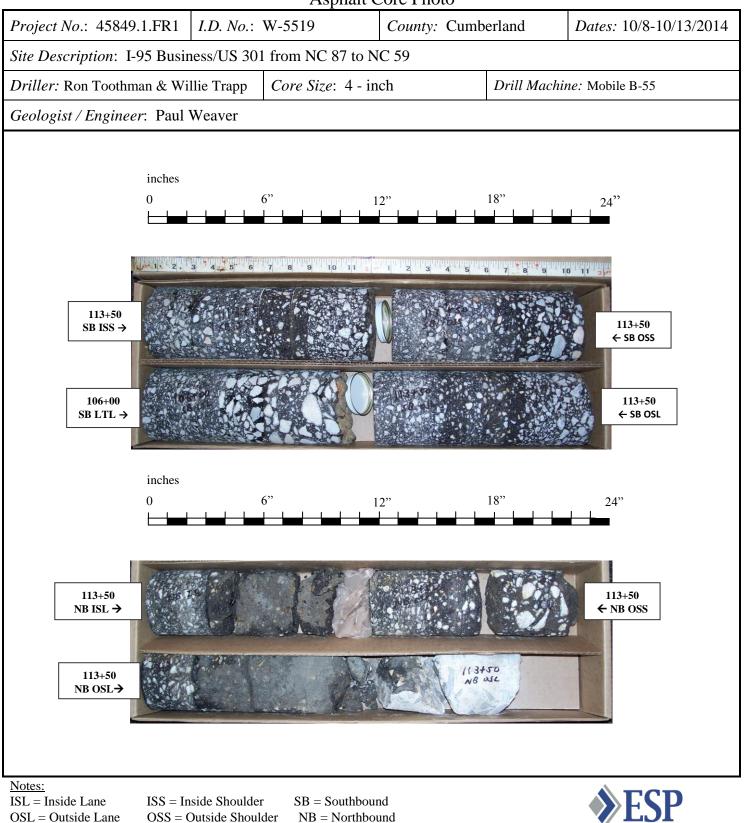
			LAYER		
LINE	STATION	ABC	THICKNESS	LAYERS	REMARKS
			(IN)		
-L-	233+75 SB LTL		4	S	3 lifts, low severity stripping at contacts of all lifts, yellow line between lift 2 and 3
-L-	7 3/4" Asphalt	-	3 3/4	Ι	1 lift, low severity stripping
-L-	241+50 SB OSS		6 1/4	S	4 lifts, low severity stripping lifts 3 and 4
-L-	10 1/2" Asphalt	-	4 1/4	В	1 lift, low severity stripping bottom 1 inch
	241+50 SB OSL		7 3/4	S	5 lifts, lifts 3-5 have sandy matrix and low severity stripping
-L-	241+30 3D 03L	_	3	Ι	1 lift, low severity stripping
- L-	12 3/4" Asphalt		2	SD	1 lift, sand asphalt, horizontal crack, moderate severity stripping
	7 1/2" Concrete		7 1/2	С	1 lift, large agg.
-L-	241+50 SB ISS		7 1/2	S	5 lifts, lifts 2 and 3 and lifts 4 and 5 are delaminated, lifts 3-5 have sandy matrix
-L-	11 1/2" Asphalt		4	В	1 lift, low severity stripping
-L-	243+00 NB OSS		7 1/4	S	5 lifts, lifts 3-5 have sandy matrix, low severity bleeding, and moderate severity stripping
-L-	11" Asphalt		2 3/4	В	1 lift, moderate severity stripping, missing few agg., missing 1 inch of material
-L-	243+00 NB OSL	_	7 3/4	S	5 lifts, lifts 3-5 have sandy matrix and moderate severity stripping, lift 5 has white line
-L-	11 1/4" Asphalt	_	3 1/2		1 lift, low severity stripping
-L-	243+00 NB ISL	_	8 3/4	S	6 lifts, lifts 3-5 have sandy matrix, low severity bleeding, and moderate severity stripping
-L-	11 1/4" Asphalt		2 1/2		1 lift, low severity stripping
-L-	252+25 NB LTL	_	3 3/4	S	2 lifts
L	9 1/4" Asphalt		5 1/2	В	1 lift, low severity stripping
-L-	254+00 SB LTL	_	3 1/2	S	3 lifts, lift 2 has low severity stripping
	6 1/4" Asphalt		2 3/4		1 lift, low severity stripping
-L-	264+75 NB LTL	-	5	S	3 lifts, low severity stripping lifts 2 and 3
	9" Asphalt		4	I	1 lift, low severity stripping bottom 1 inch
	266+00 SB LTL		3 1/4	S	2 lifts, low severity stripping at contact between lifts 1 and 2
-L-	10" Asphalt	-	2		1 lift, low severity stripping
			4 3/4	В	1 lift, some elongated and sub-rounded agg.
-L-	276+75 NB LTL	-	4 1/2	S	3 lifts
-	7 3/4 Asphalt		3 1/4	I	1 lift, moderate severity stripping last 1 inch
-L-	278+25 SB LTL	-	4	S	3 lifts, lift 3 has sandy matrix, lifts 2 and 3 delaminated
_	7 1/2" Asphalt		3 1/2	В	1 lift, low severity stripping
-L-	320+00 SB LTL	-	5 1/4	S	3 lifts, lift 2 has low severity stripping
-	7 3/4" Asphalt		2 1/2	В	1 lift
-L-	329+75 NB LTL	_	5	S	4 lifts
L	8" Asphalt		3	I	1 lift, low severity stripping bottom 1 inch
-L-	360+50 NB LTL	_	2 1/4	S	2 lifts, low severity stripping lift 2, yellow line top of lift 1
-L-	8 " Asphalt		5 3/4	В	1 lift, low severity stripping
-L-	362+30 SB LTL	-	1 1/2	S	1 lift
	7" Asphalt		5 1/2	В	1 lift, sub-rounded and elongated agg., bottom 1" broken
-L-	368+65 SB OSS	_	4		3 lifts, low severity stripping lift 1
	7" Asphalt	_	3	В	1 lift, sandy matrix, round to sub-rounded agg.

PAVEMENT CORES FOR 45849.1.FR1.1.1, W-5519, Cumberland County

LINE	STATION	ABC	LAYER THICKNESS (IN)	LAYERS	REMARKS
	368+65 SB OSL		4 1/4	S	4 lifts, lifts 2-4 have sandy matrix, low severity stripping
-L-	200+03 3B O3L	_	5 1/4	Ι	3 lifts, sub-rounded agg.
-L-	13" Asphalt	-	1 1/4	S	1 lift, 1 1/2" of surface missing, high severity stripping
	6" Concrete		6	С	concrete not recovered
-L-	368+65 SB ISL	_	5	S	4 lifts
-L-	11 1/2" Asphalt	_	6 1/2	Ι	2 lifts, sub-rounded agg.
-L-	368+65 NB OSS	_	3 1/4	S	2 lifts, lift 2 has sandy matrix and moderate severity stripping
-L-	7" Asphalt	_	3 3/4	В	1 lift, moderate severity stripping
-L-	368+65 NB OSL	_	4	S	2 lifts, lift 2 has sandy matrix, low severity stripping, moderately weathered
-L-	8 3/4" Asphalt	-	4 3/4	Ι	2 lifts, 4 3/4" bottom-up crack
-L-	368+65 NB ISL	_	6	S	3 lifts, lift 2 has sandy matrix and low severity stripping
-L-	9 1/4" Asphalt	_	3 1/4	Ι	2 lifts, very low severity stripping
	371+50 NB LTL		8	S	5 lifts, lifts 3-5 have sandy matrix and low severity stripping, contact of lift 2 and 3 has low
-L-	12" Asphalt	-	0		severity stripping, delamination between lift 4 and 5
	12 Asphalt		4	Ι	1 lift, moderate severity stripping
-L-	375+75 NB LTL	_	2 1/2	S	2 lifts
-L-	8" Asphalt		5 1/2	В	1 lift with rounded to sub-rounded quartz agg.
-L-	416+00 NB OSS	-	9 1/2	S	7 lifts, lifts 4 and 5 delaminated, lifts 4-7 have sandy matrix with moderate weathering
	13 1/2" Asphalt		4	В	1 lift, low severity stripping
			8 1/2	S	lifts are indistiguishable, top 4 1/2" has elongated agg., bottom 4" has sandy matrix with
	416+00 NB OSL			5	sub-rounded agg. and moderate stripping
-L-	14 3/4" Asphalt	-	2	SD	1 lift
			1 3/4	S	1 lift, high AC content, low severity stripping
			2 1/2	В	1 lift, moderate severity stripping
			8	S	7 lifts, lifts 4-7 have sandy matrix
-L-	416+00 NB ISL	_	2 1/4	SD	1 lift
-	15" Asphalt		2 1/4	S	2 lifts
			2 1/2		1 lift
-L-	416+00 SB OSS	-	9 3/4	S	8 lifts, lifts 4-8 have sandy matrix and subrounded quartz agg.
	13" Asphalt		3 1/4	В	1 lift, sandy matrix, over 1 1/2" large sub-rounded quartx agg.

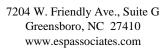
PAVEMENT CORES FOR 45849.1.FR1.1.1, W-5519, Cumberland County

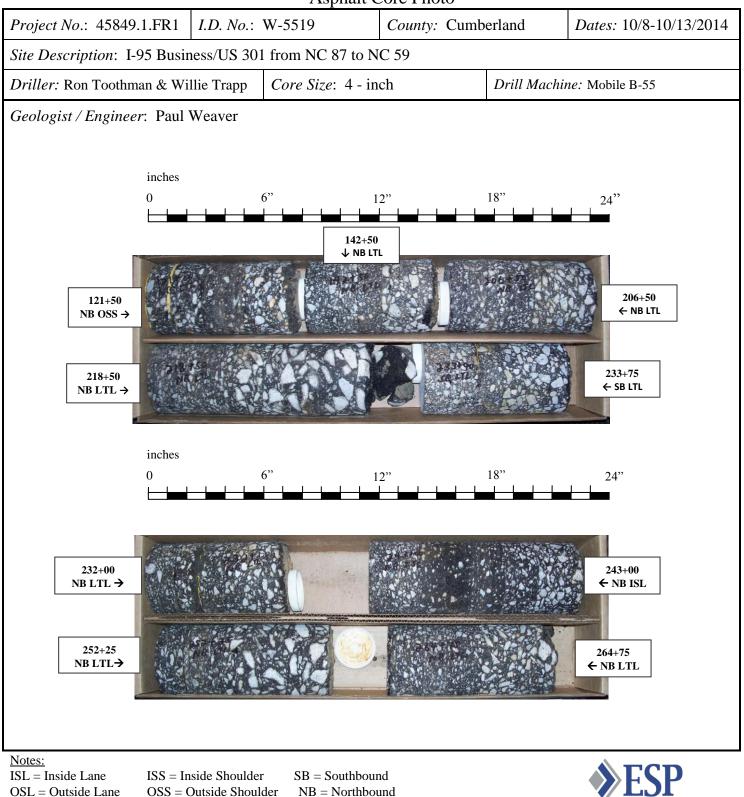
L	INE	STATION	ABC	LAYER THICKNESS (IN)	LAYERS	REMARKS
				8 1/4	S	6 lifts, lifts 4-6 have sandy matrix, sub-rounded quartx agg.
	-L-	416+00 SB OSL		1	SD	1 lift
	-L-	14" Asphalt		2 1/4	S	2 lifts
				2 1/2	Ι	1 lift, low severity stripping
		416+00 SB ISL		8 3/4	S	6 lifts, lifts 4-6 have sandy matrix, low severity stripping
· ·	-L-	14 1/2" Asphalt	-	1 3/4	SD	1 lift
				4	Ι	1 lift, low severity stripping



OSL = Outside Lane LTL = Left Turn Lane OSS = Outside Shoulder

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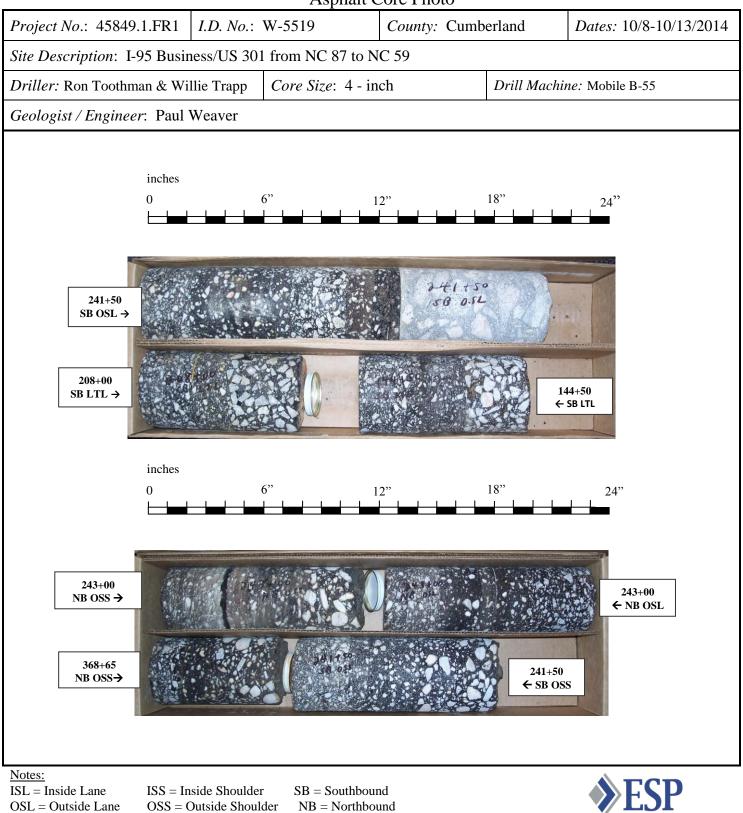


LTL = Left Turn Lane

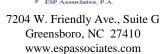


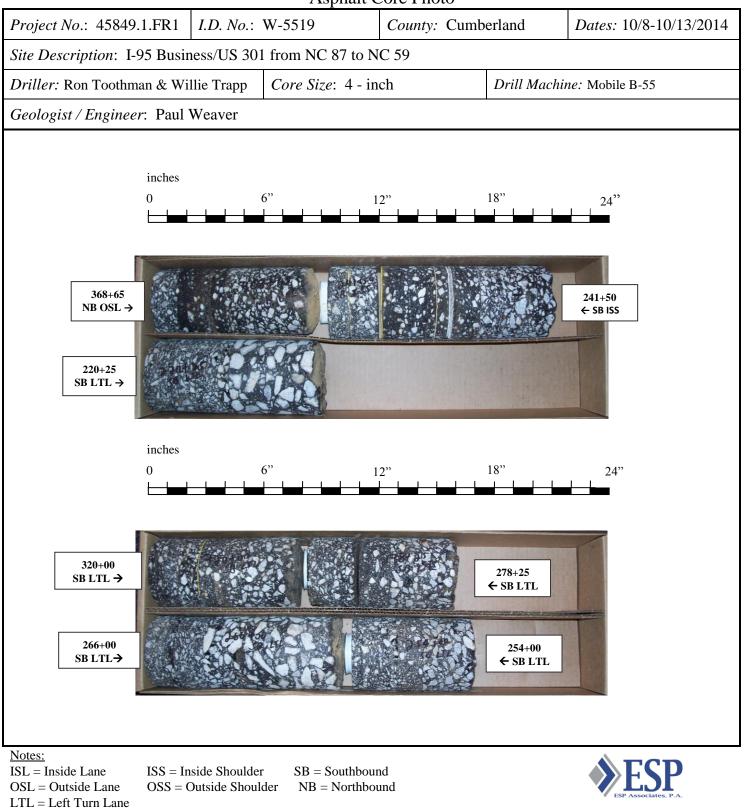
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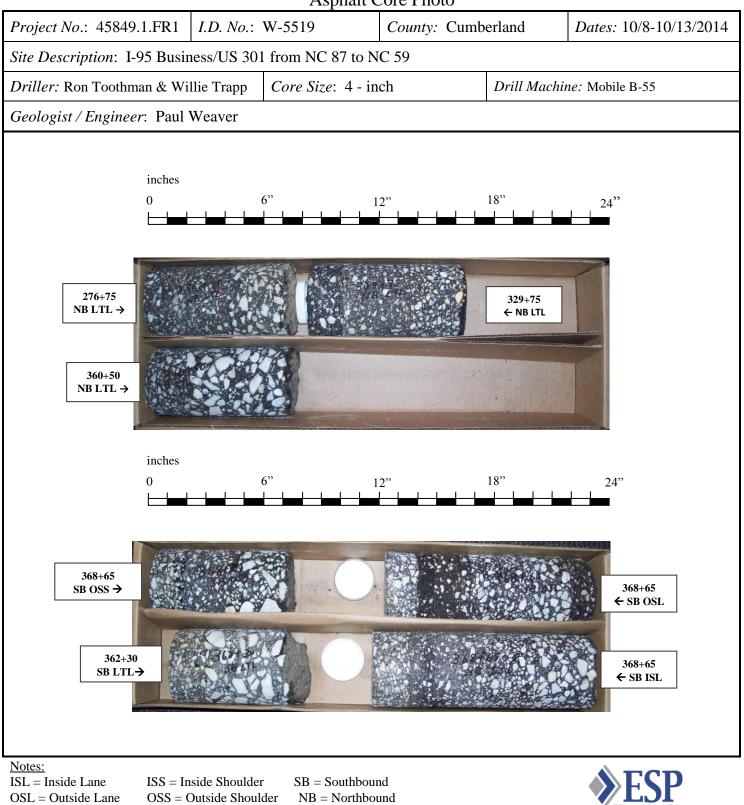
LTL = Left Turn Lane





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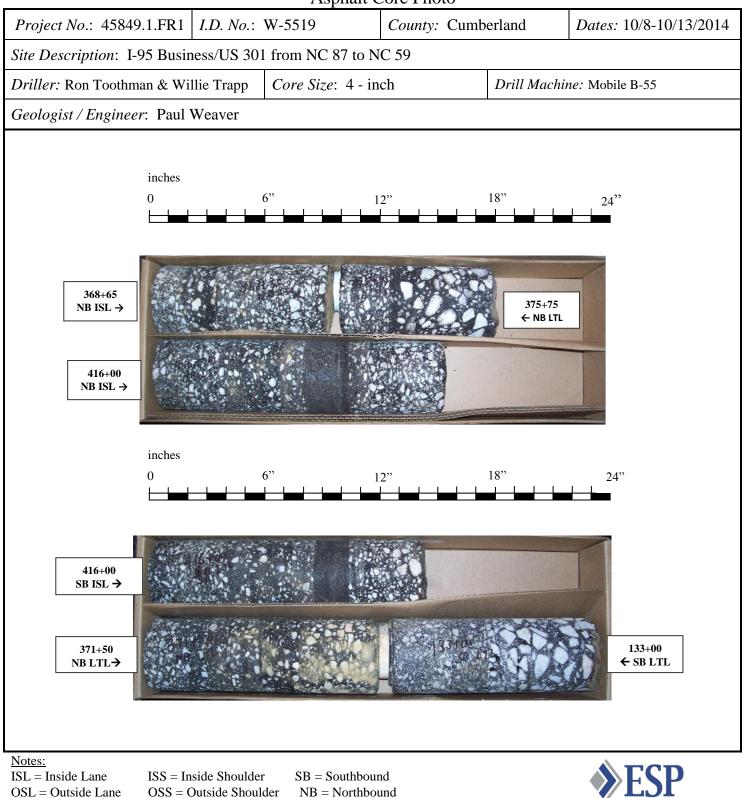
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LTL = Left Turn Lane



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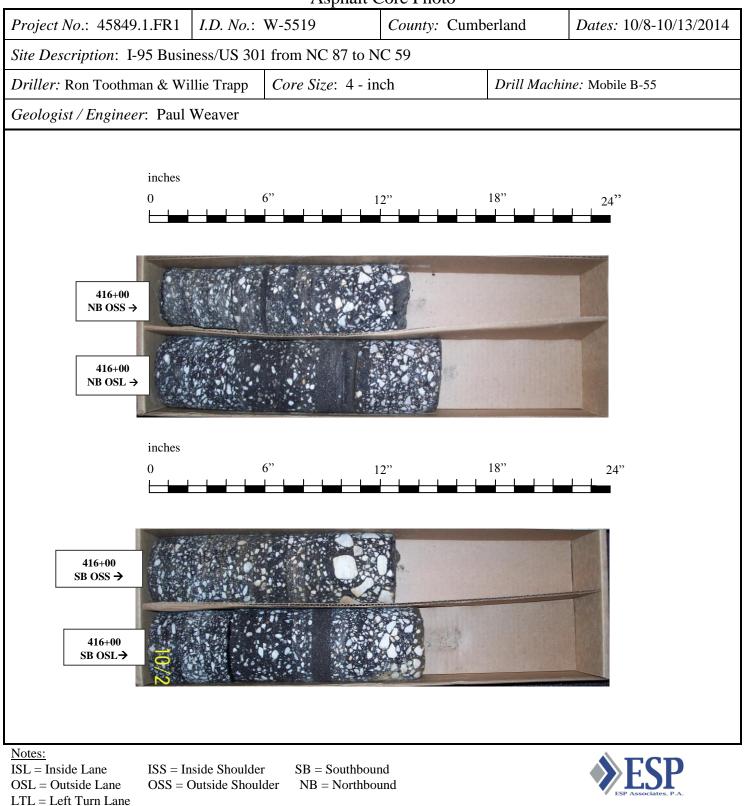


LTL = Left Turn Lane



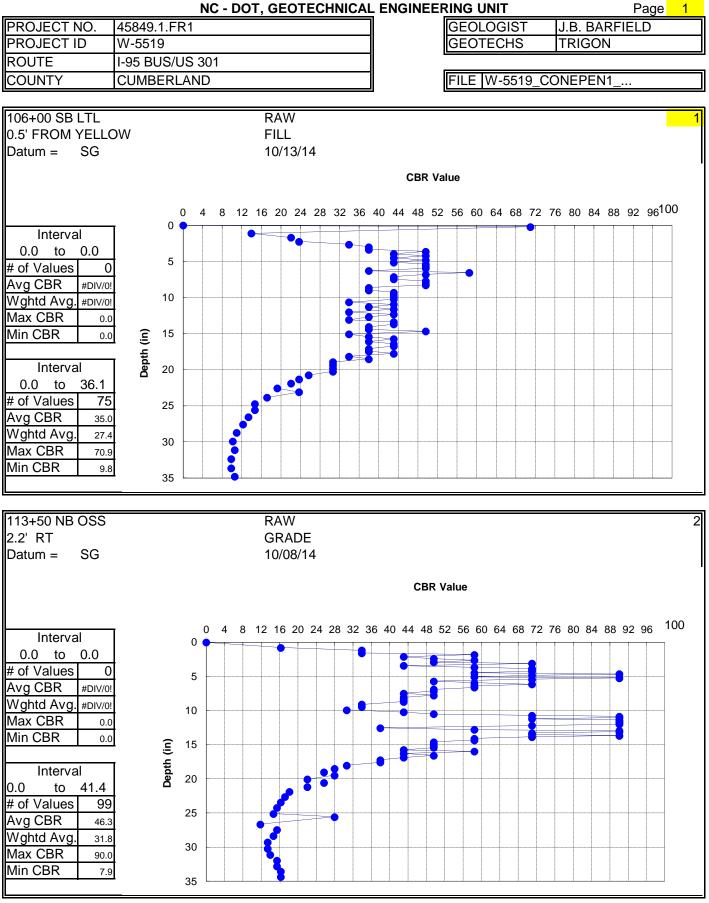
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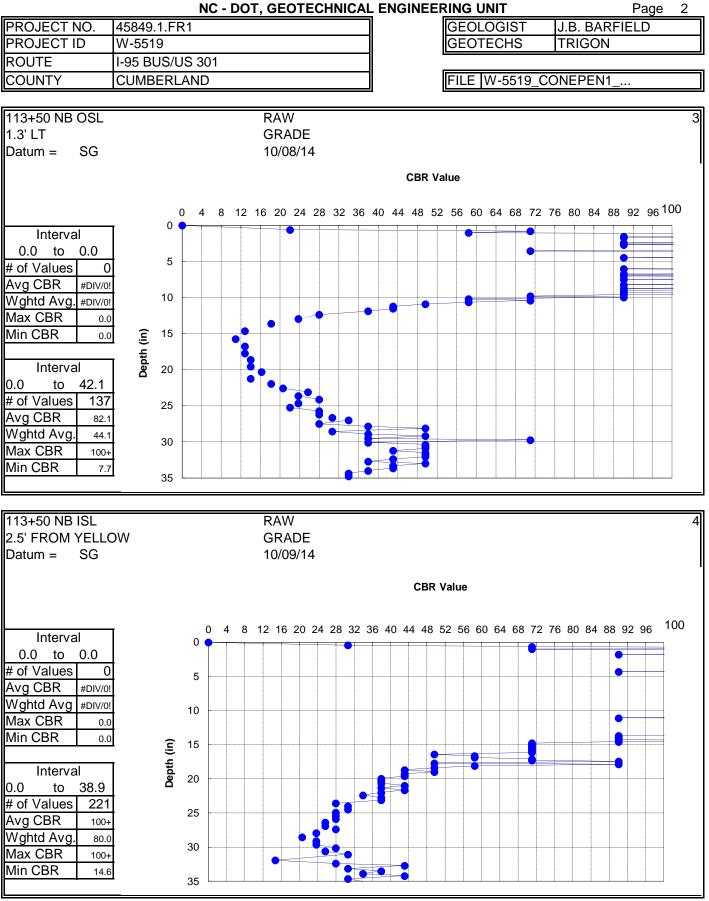
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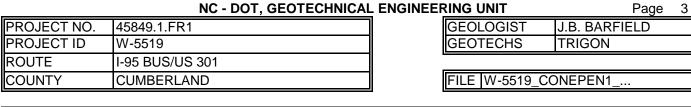
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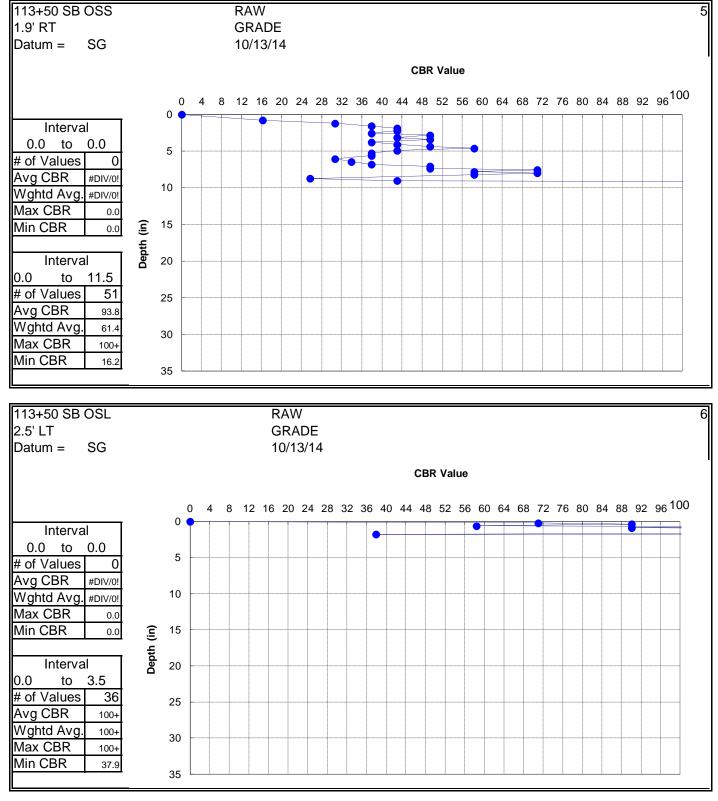


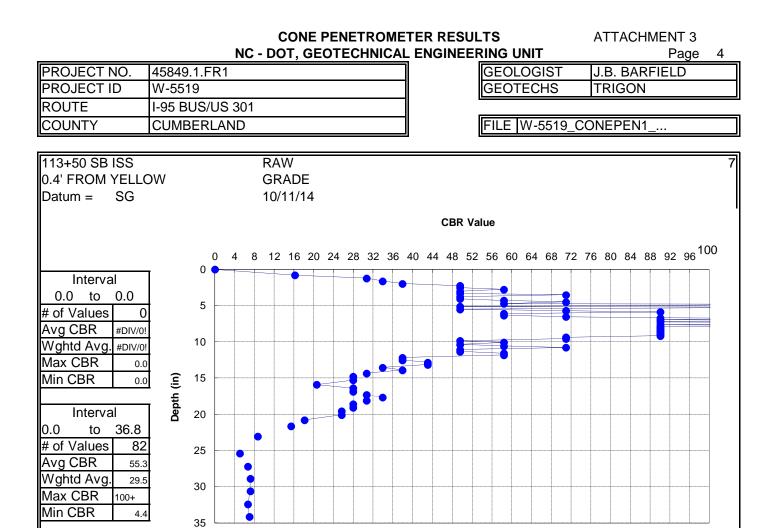


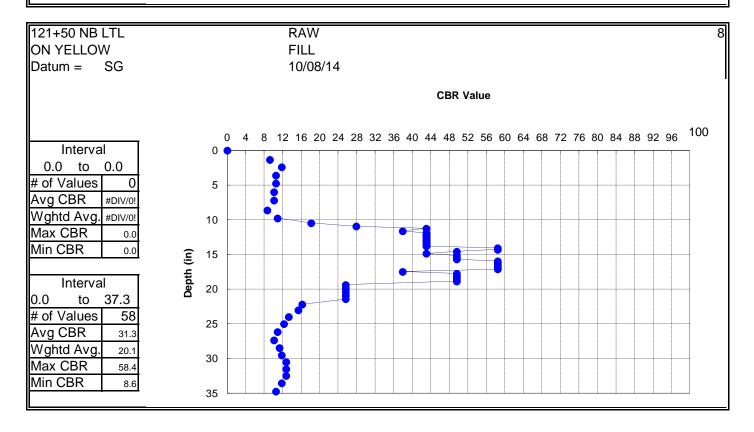
ATTACHMENT 3

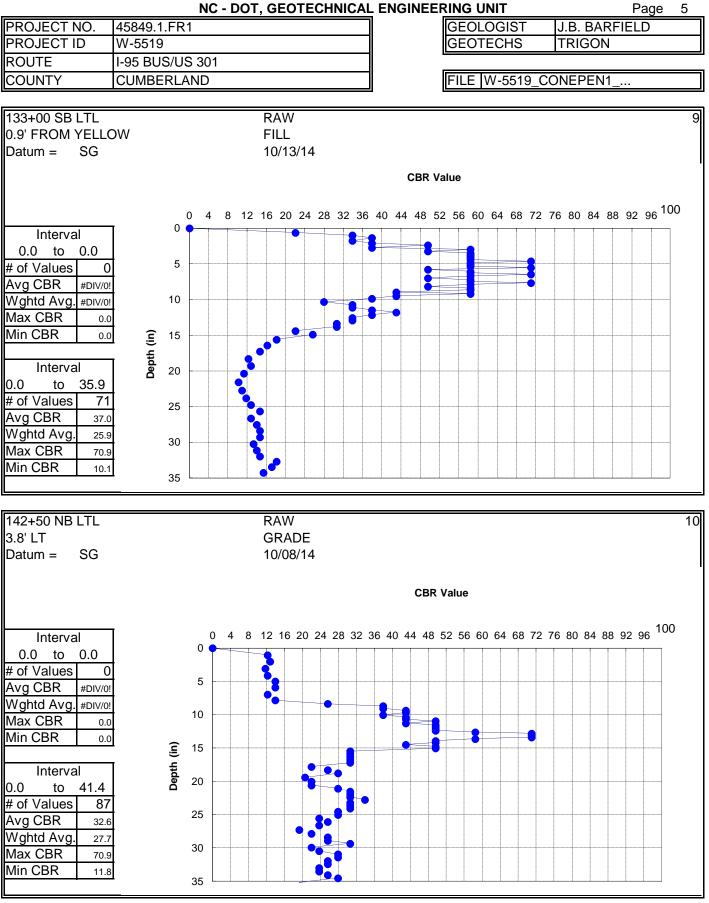
CONE PENETROMETER RESULTS

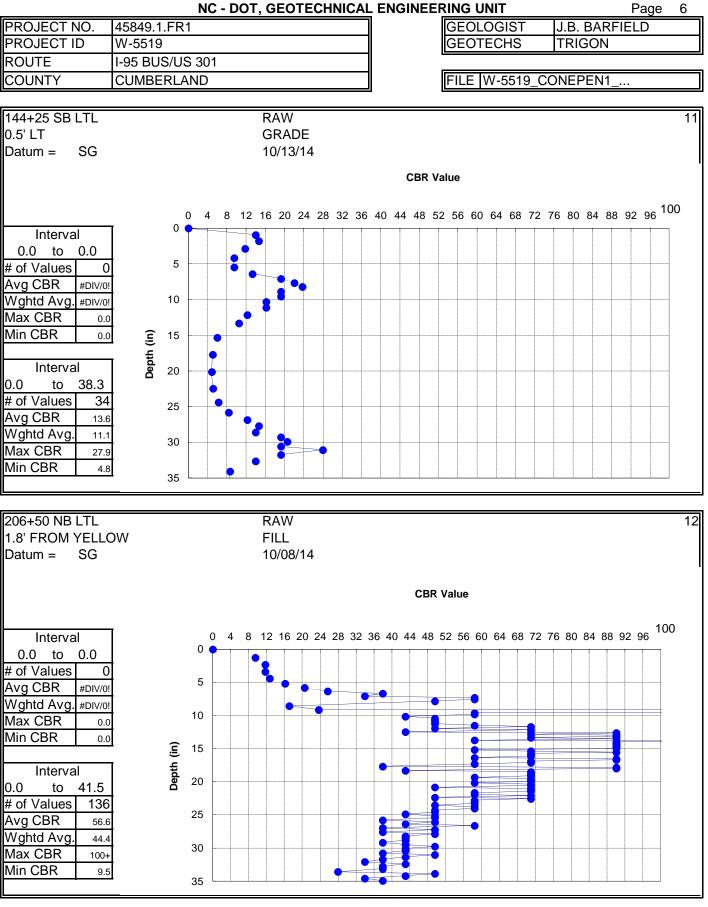


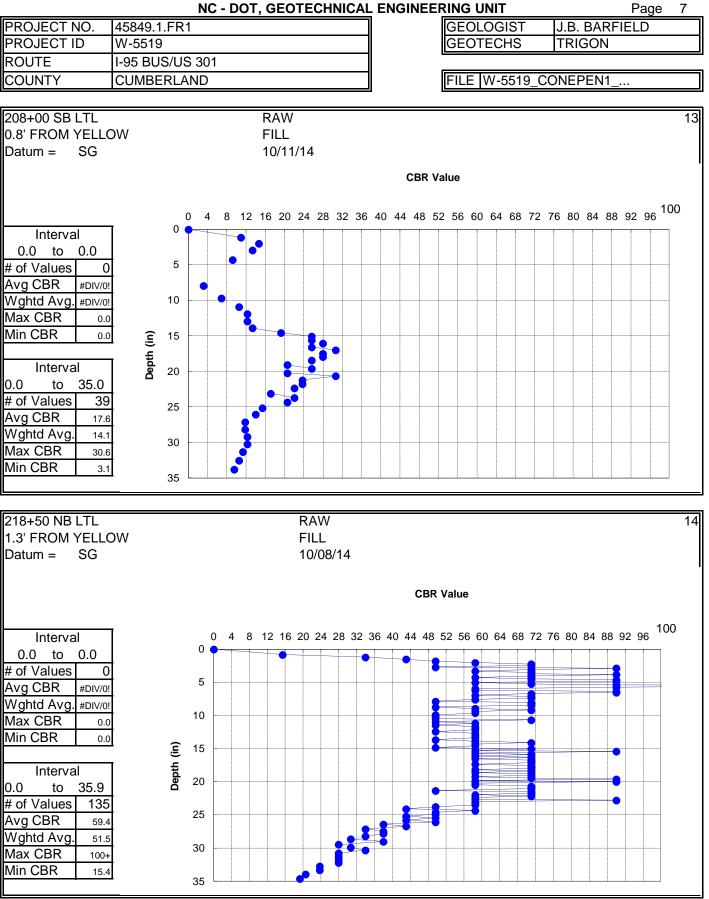


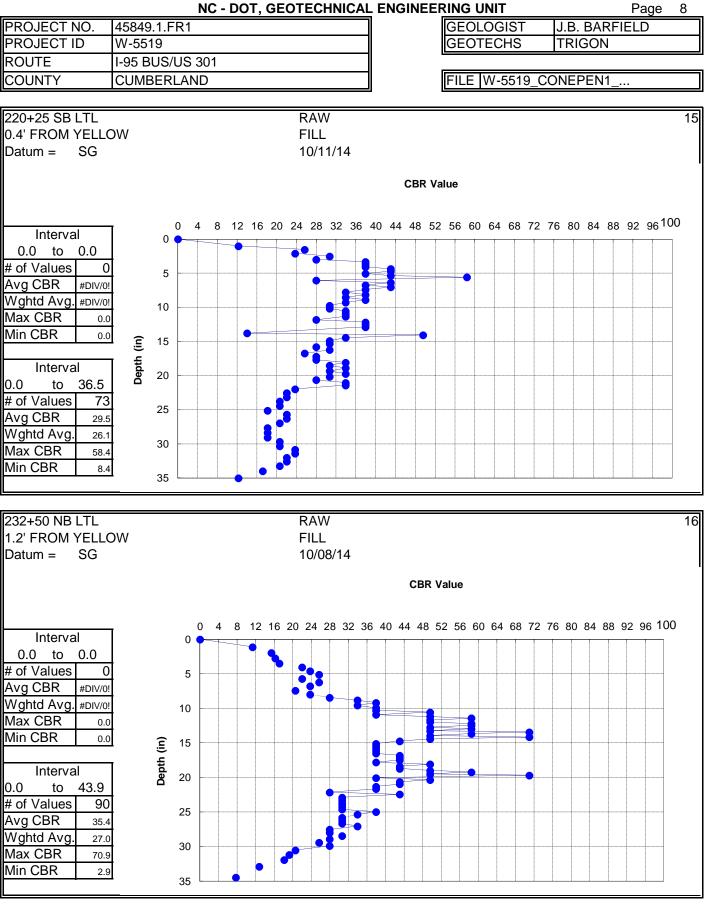


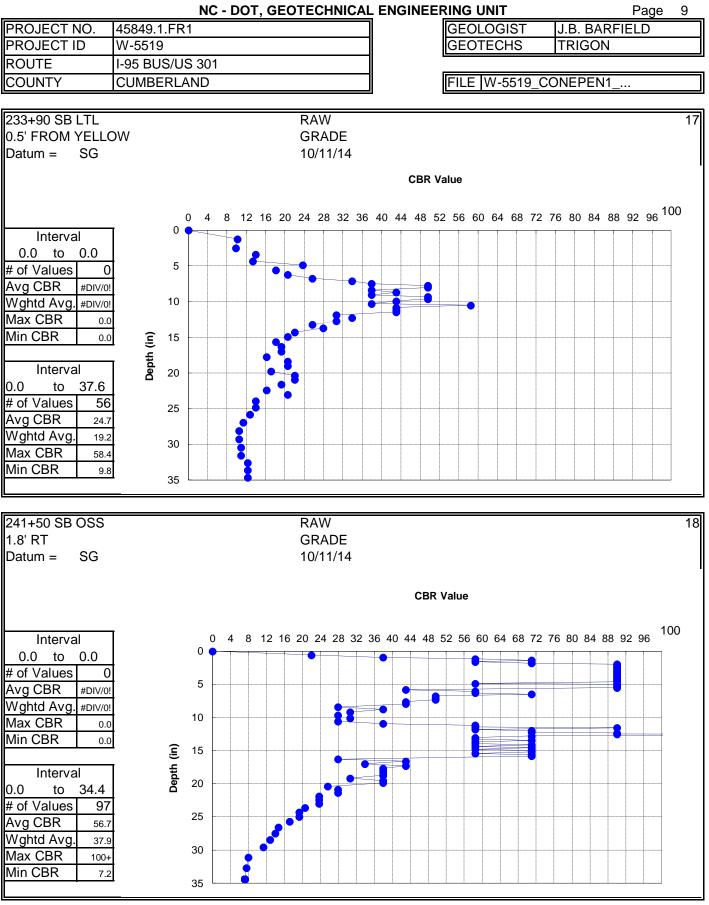


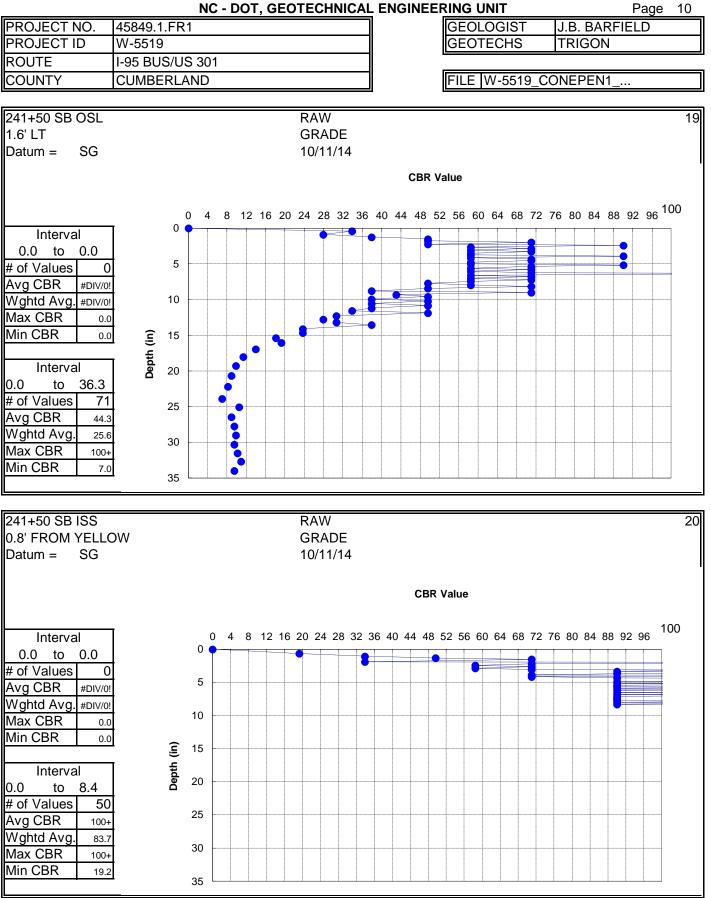








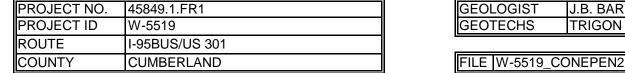


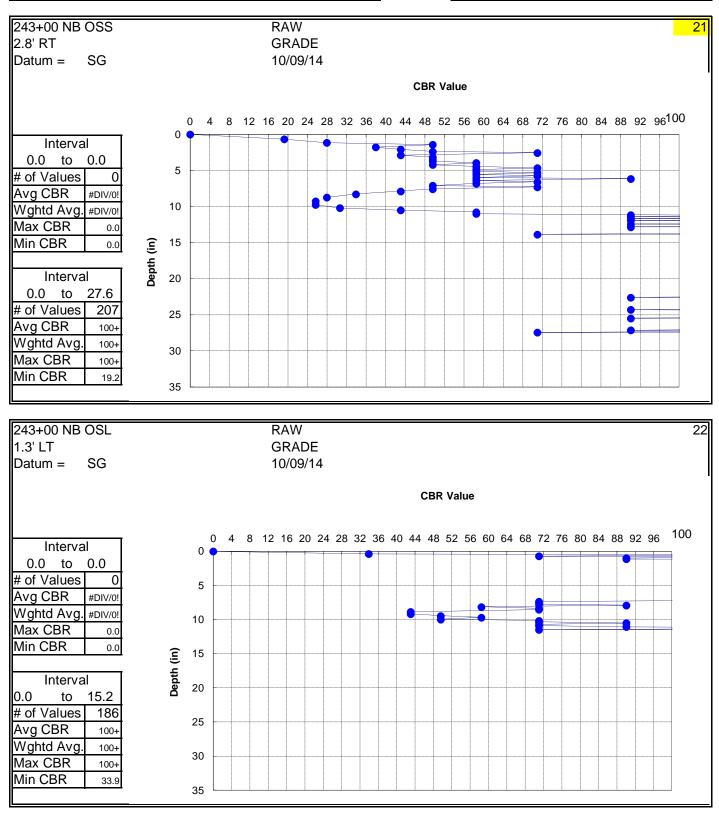


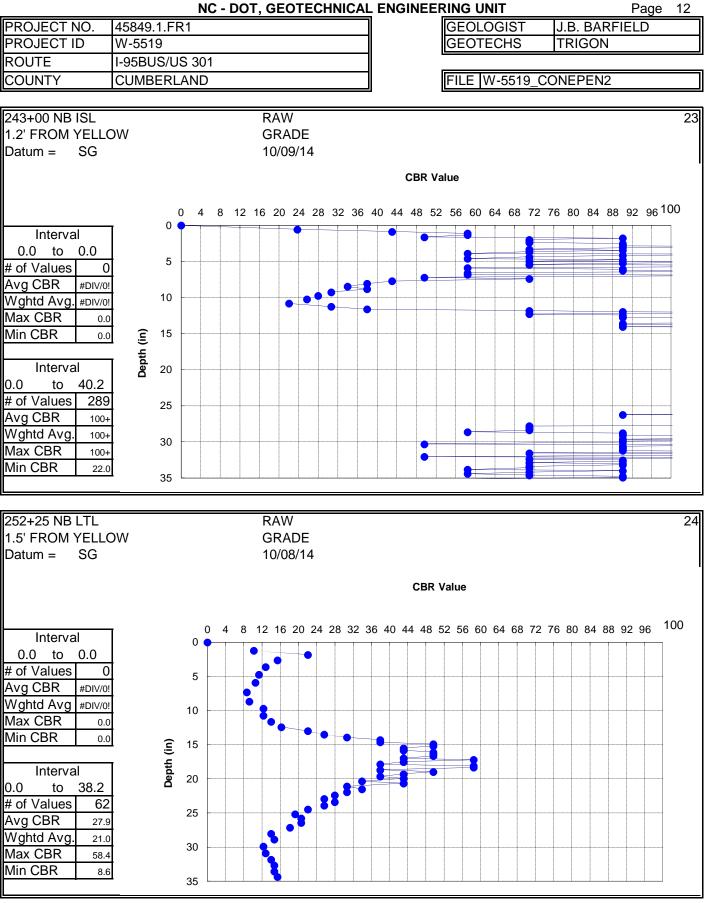
ATTACHMENT 3

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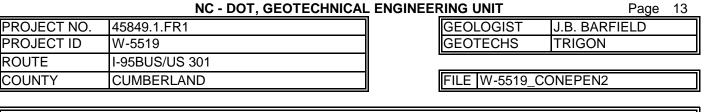


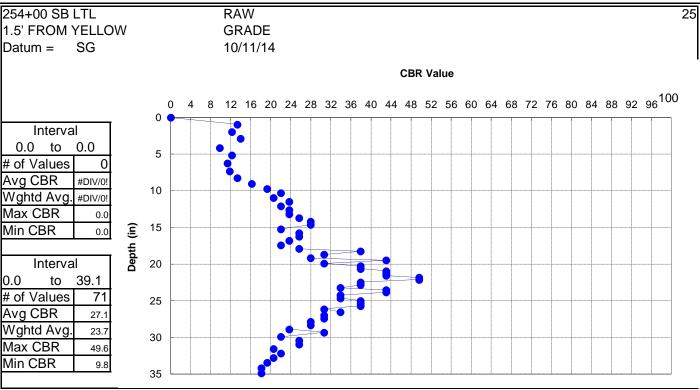


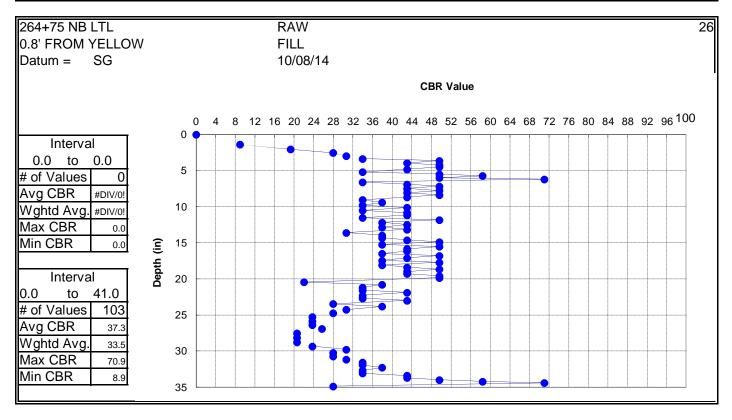


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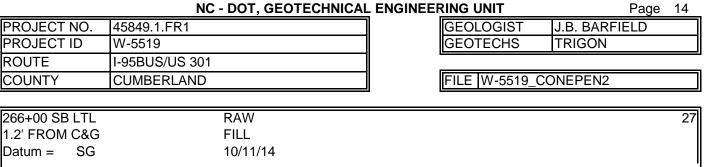
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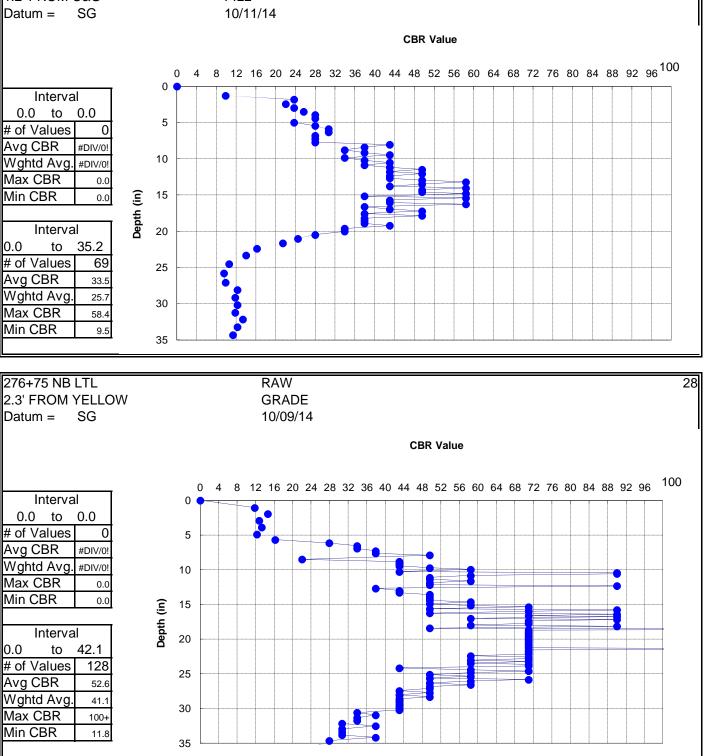


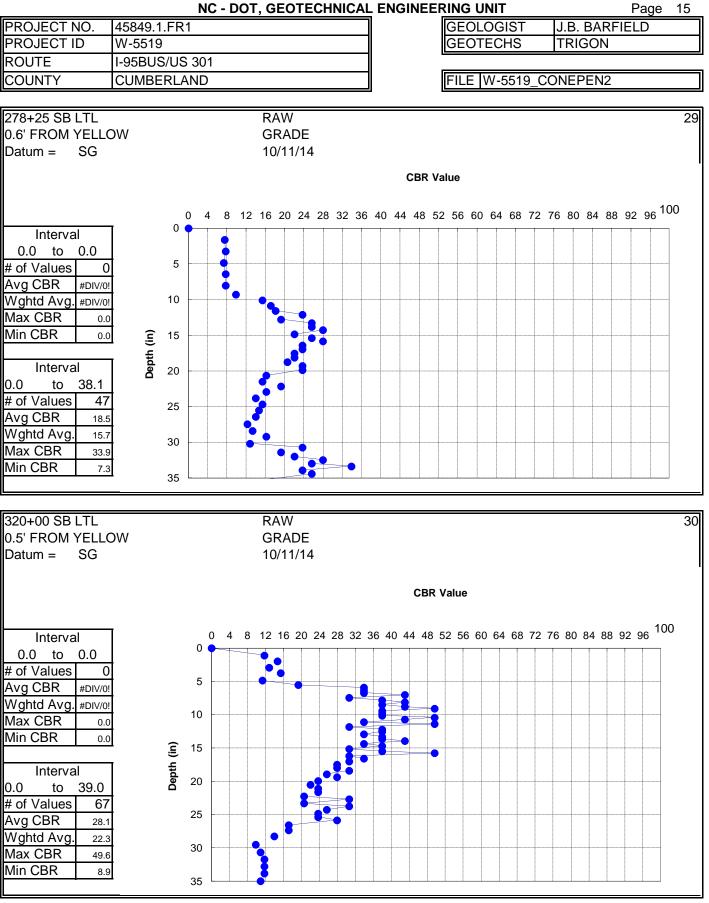


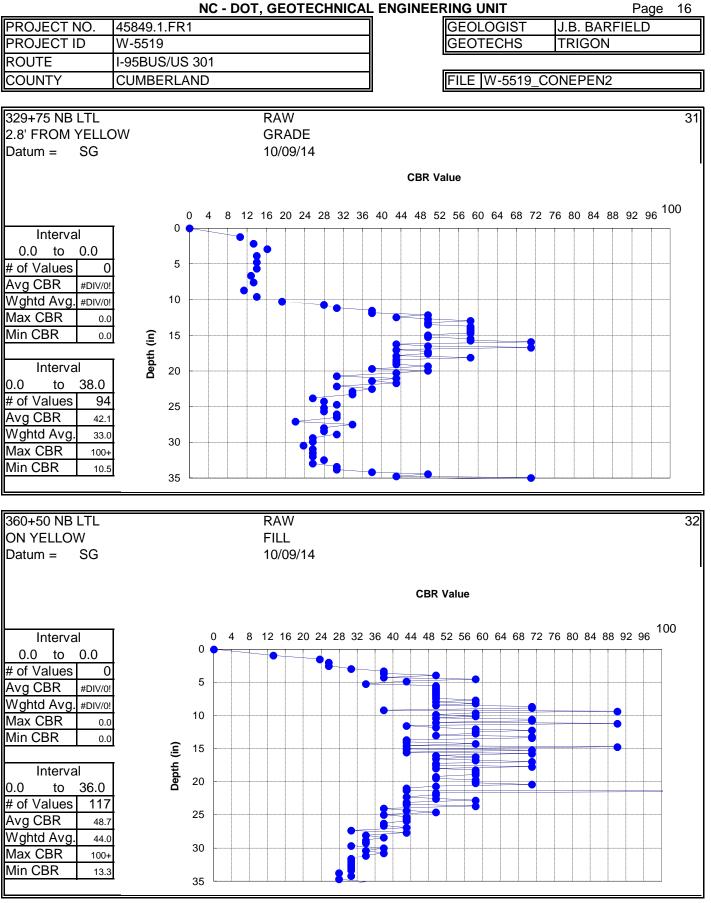


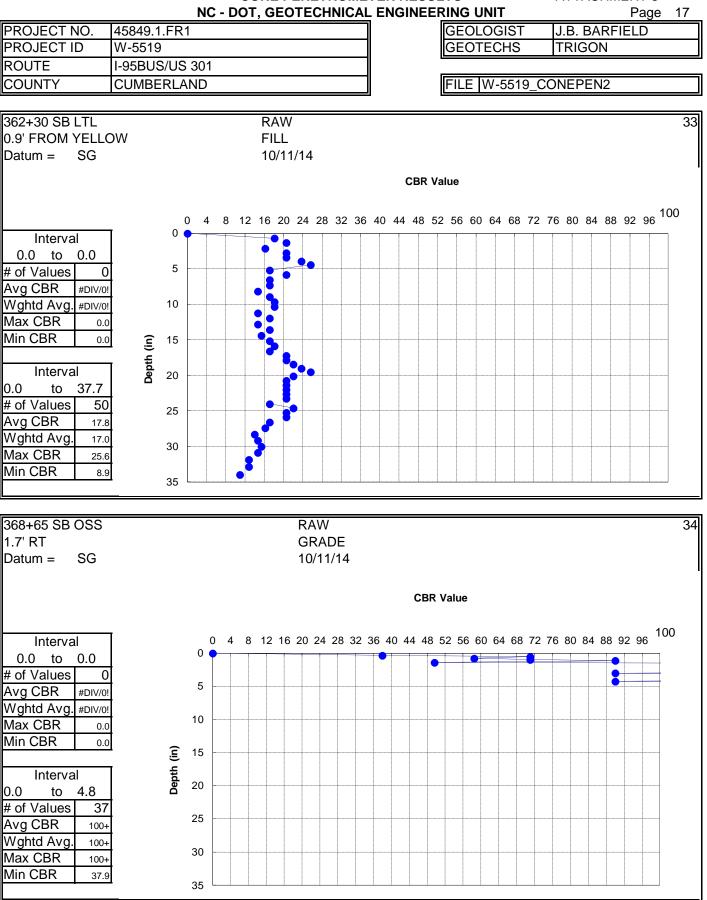
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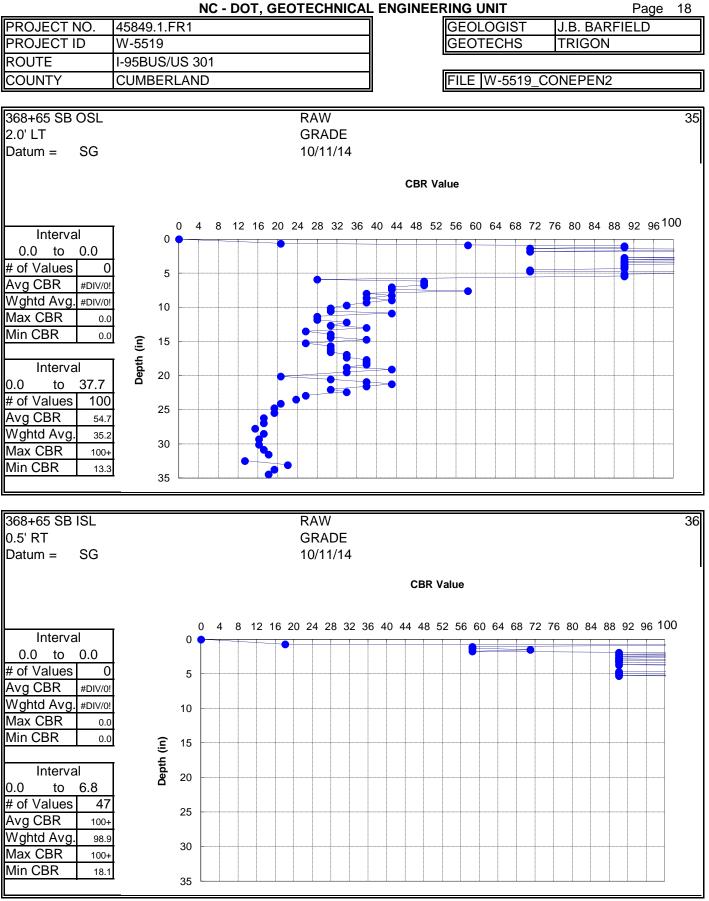


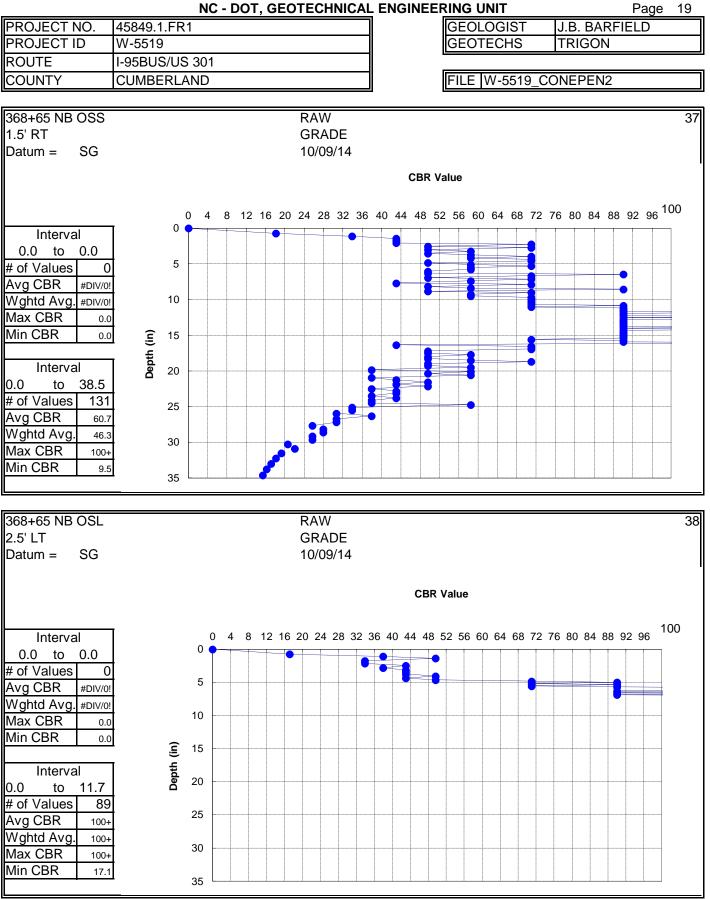


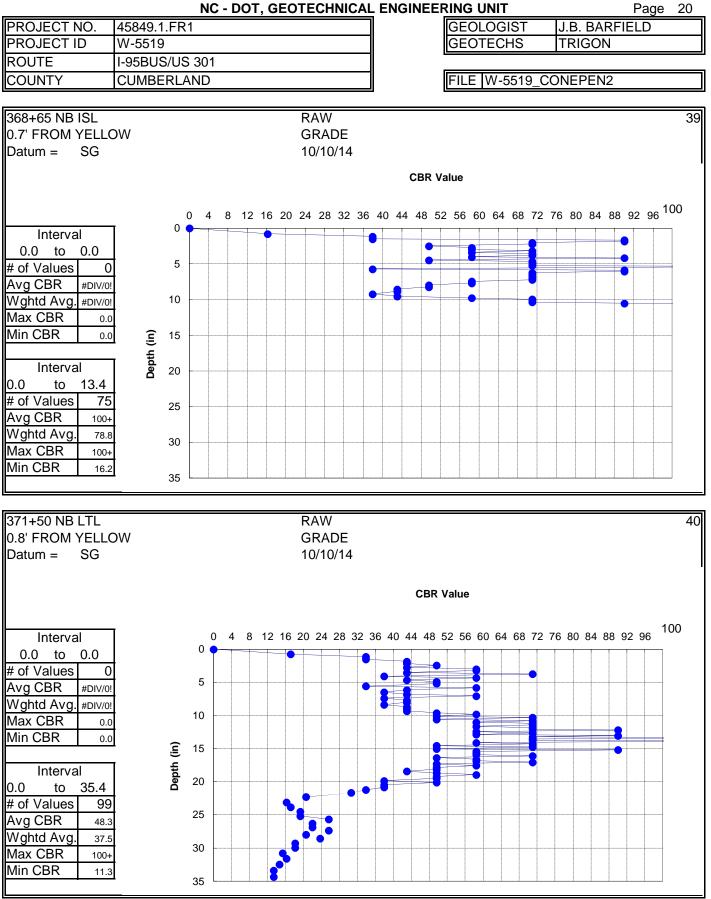


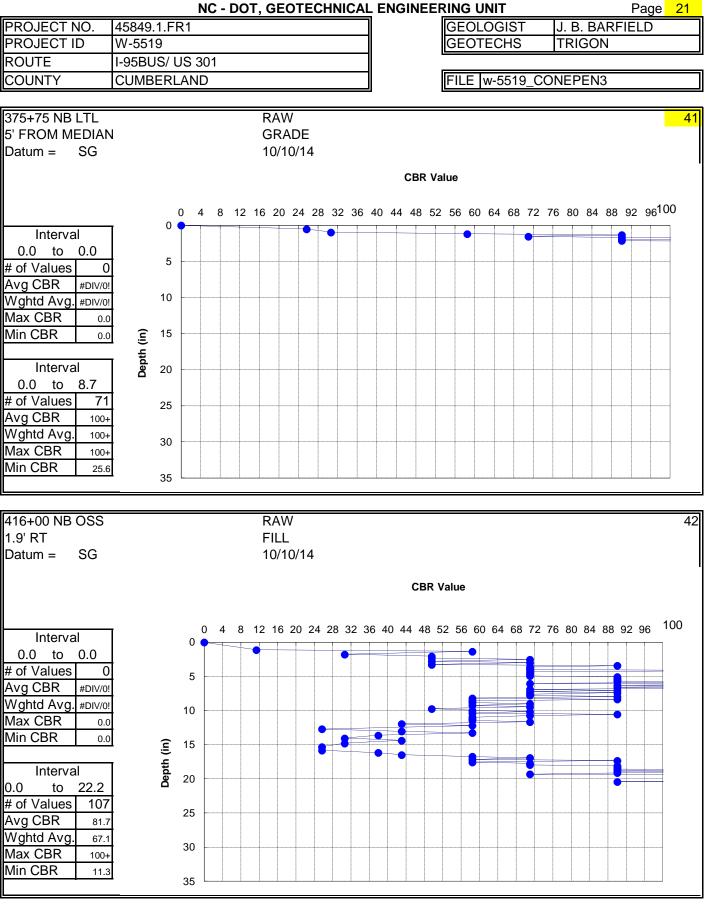


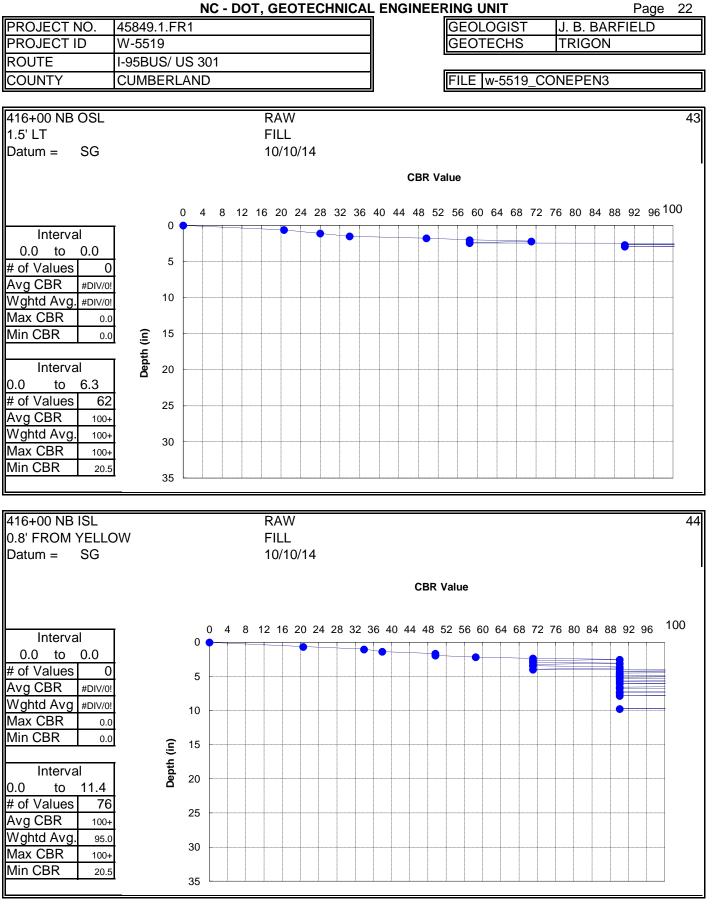


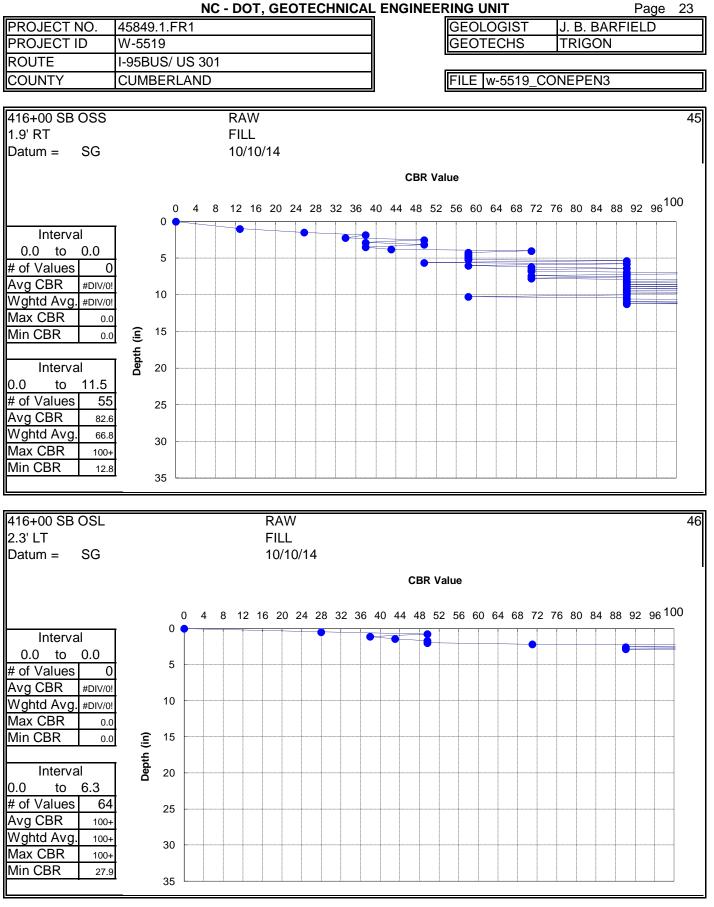




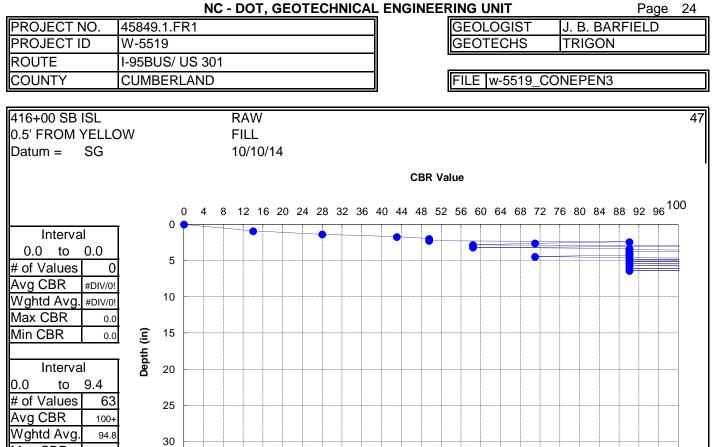








ATTACHMENT 3



Max CBR

Min CBR

100+

13.9

35

December 5, 2014



Mr. Trent Huffman, PE Moffatt & Nichol 1616 East Millbrook Road, Suite 160 Raleigh, NC 27608

Re:	Roadway Subsurface Investigation - Recommendations
TIP No.:	W-5519
County:	Cumberland
Project Description:	I-95 Business / US-301 from NC 87 South to NC 59
Falcon Project No.:	G14025.00

Dear Mr. Huffman,

As authorized, Falcon Engineering, Inc. (Falcon) has completed the geotechnical subsurface investigation for the above referenced project in Cumberland County, North Carolina. Our investigation was performed in general accordance with our Scope and Fee Estimate for Geotechnical Investigation and Engineering Services, dated January 30, 2014 (Falcon Proposal number F2014-004). This report includes roadway geotechnical recommendations for the preparation of final design, right of way plans, construction cost estimates, and construction procedures.

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

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

Sincerely,

FALCON ENGINEERING, INC.

Report Prepared By:

Thomas E. Evans, PE Geotechnical Engineer

Report Reviewed By:

Jeremy R. Hamm, PE

Geotechnical Department Manager

TIP:	W-5519
COUNTY:	Cumberland
DESCRIPTION:	I-95 Business / US 301 from NC 87 South to NC 59
SUBJECT:	Roadway Subsurface Investigation - Recommendations

I. <u>Slope/Embankment Stability</u>

A. Slope Design

Existing cut and fill slopes along I-95 Business are relatively flat, with little to no embankments. The existing slopes appear stable based on our site reconnaissance. Very little earthwork is proposed for this project, limiting proposed slopes to 3:1 and shallower and generally do not exceed 3 feet. It is recommended all roadway embankment fill and cut slopes be constructed at a 2:1(H:V) ratio or flatter for this project. The stability of all slopes is subject to the stabilization recommendations provided below, and additional stabilization of areas not specifically recommended but where similar subsurface conditions exist.

B. Geotextile for Soil Stabilization

It is recommended a quantity of 500 SY of Geotextile for Soil Stabilization be included in the project as a contingency to be used at the discretion of the Engineer.

II. <u>Subgrade Stability</u>

A. Subgrade Undercut

It is recommended that a quantity of 250 CY of Undercut for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

B. Geotextile for Soil Stabilization

It is recommended that a quantity of 250 SY of Geotextile for Soil Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

C. Aggregate Subgrade

Highly plastic material was encountered within 18" of proposed subgrade in the following area:

<u>Station</u>	<u>Offset</u>	<u>Depth</u>
265+67 to 266+65 -L-	RT	Up to 18"



Aggregate Subgrade is recommended to stabilize pavement subgrade in this area. It is recommended a quantity of 100 CY of Shallow Undercut, 100 SY of Geotextile for Soil Stabilization, and 200 tons of Class IV Subgrade Stabilization be included in the contract in conjunction with the area listed above.

It is recommended an additional quantity of 100 CY of Shallow Undercut, 100 SY of Geotextile for Soil Stabilization, and 200 tons of Class IV Subgrade Stabilization be included in the contract as a contingency to be used at the discretion of the Engineer.

D. Subsurface Drainage - Underdrains

Across the majority of the project groundwater was not encountered. An isolated occurrence of groundwater within 2 feet of subgrade was measured at station 262+00 -L-. Depending on modifications to site drainage and sensitivity of borrow material to moisture, the use of subsurface drains may be warranted in these areas. It is recommended a quantity of 1,000 LF of 6-inch perforated corrugated plastic pipe be included in the contract as a contingency to be used at the discretion of the Engineer. Construction of underdrains shall follow Standard Specifications, Section 815 "Subsurface Drainage", and Roadway Standard Drawing 815.03 "Pipe Underdrain and Blind Drain".

III. Borrow Specifications

A. Common Borrow

Common borrow for embankment fill shall meet the Exception to Statewide Criteria outlined in the Standard Specification, Article 1018-2, Section II (B).

B. Select Granular Material

It is recommended a quantity of 250 CY of Class II or III Select Granular Material be included in the contract as a contingency to be used at the discretion of the Engineer.

C. Shrinkage Factor

A shrinkage factor of 25 percent is recommended to be used in the earthwork computations for this project.



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION GEOTECHNICAL ENGINEERING UNIT

Summary of Quantities

WBS No.: <u>N/A</u> TIP No.: <u>W-5519</u> County: Cumberland

Field Office: Consultant

Project Engineer: Hamm, J. R.

Project Geologist: Paul, A. S.

Description: I-95 Business / US-301 from NC 87 South to NC 59

Pay Item No.	Pay Item/ Quantity Adjustment	Spec Book Section No. or Special Provision (SP) Reference	Report Section	Alignment	Begin Station	End Station	Quantity	Units
003600000-Е	Undercut Excavation	225 - Roadway Excavation	II. A	Contingency	N/A	N/A	250	CY
Total Quantity of Undercut Excavation =							250	CY
019500000-Е	Select Granular Material	265 - Select Granular Material	III. B	Contingency	N/A	N/A	250	CY
			Total	Quantity of S	elect Granula	ar Material =	250	CY
019600000-Е	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	I. B	Contingency	N/A	N/A	500	SY
019600000-Е	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. B	Contingency	N/A	N/A	250	SY
019600000-Е	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	-L-	265+67.00	266+65.00	100	SY
019600000-Е	Geotextile for Soil Stabilization	270 - Geotextile for Soil Stabilization	II. C	Contingency	N/A	N/A	100	SY
Total Quantity of Geotextile for Soil Stabilization =							950	SY
1099500000-Е	Shallow Undercut	505 - Aggregate Subgrade	II. C	-L-	265+67.00	266+65.00	100	CY
1099500000-Е	Shallow Undercut	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	100	CY
Total Quantity of Shallow Undercut =							200	CY
1099700000-Е	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. C	-L-	265+67.00	266+65.00	200	TON
1099700000-Е	Class IV Subgrade Stabilization	505 - Aggregate Subgrade	II. C	Contingency	N/A	N/A	200	TON
Total Quantity of Class IV Subgrade Stabilization =							400	TON
2044000000-Е	6" Perforated Subdrain Pipe	815 - Subsurface Drainage	II. D	Contingency	N/A	N/A	1,000	LF
Total Quantity of 6'' Perforated Subdrain Pipe =						1,000	LF	

These Items Only Impact Earthwork Totals								
N/A	Shrinkage Factor	235 - Embankments	III. C	N/A	N/A	N/A	25	%

0 SI S M_ REFERENCE

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

<u>LINE</u> **STATION** PLAN PROFILE XSECT -L-265+50 TO 267+00 3

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

COUNTY ____CUMBERLAND

PROJECT DESCRIPTION <u>I-95 BUSINESS</u> /US 301 FROM NC 87 SOUTH TO NC 59

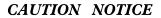
RECOMMENDATIONS

PROJECT

STATE N.C

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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 SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6850. THE SUBSIFFACE 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 CONSDERABLY WITH TWE ACCORDING TO CLIMATIC CONDITIONS INVESTIGATION CHANGE OBCORDING AND AND AND AS WELL AS COULD NOT CLIMATE 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 WARANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPNION 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 INVESTIGATION AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ON OF OR AN THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES

- TES: 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 REDUESTED 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

A. S. PAUL

T. E. EVANS

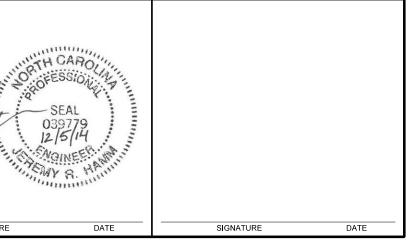
INVESTIGATED BY _____. S. PAUL

DRAWN BY <u>ASP</u> & TEE

CHECKED BY J. R. HAMM

SUBMITTED BY ______FALCON

DATE DECEMBER 2014

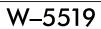


NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT SUBSURFACE INVESTIGATION

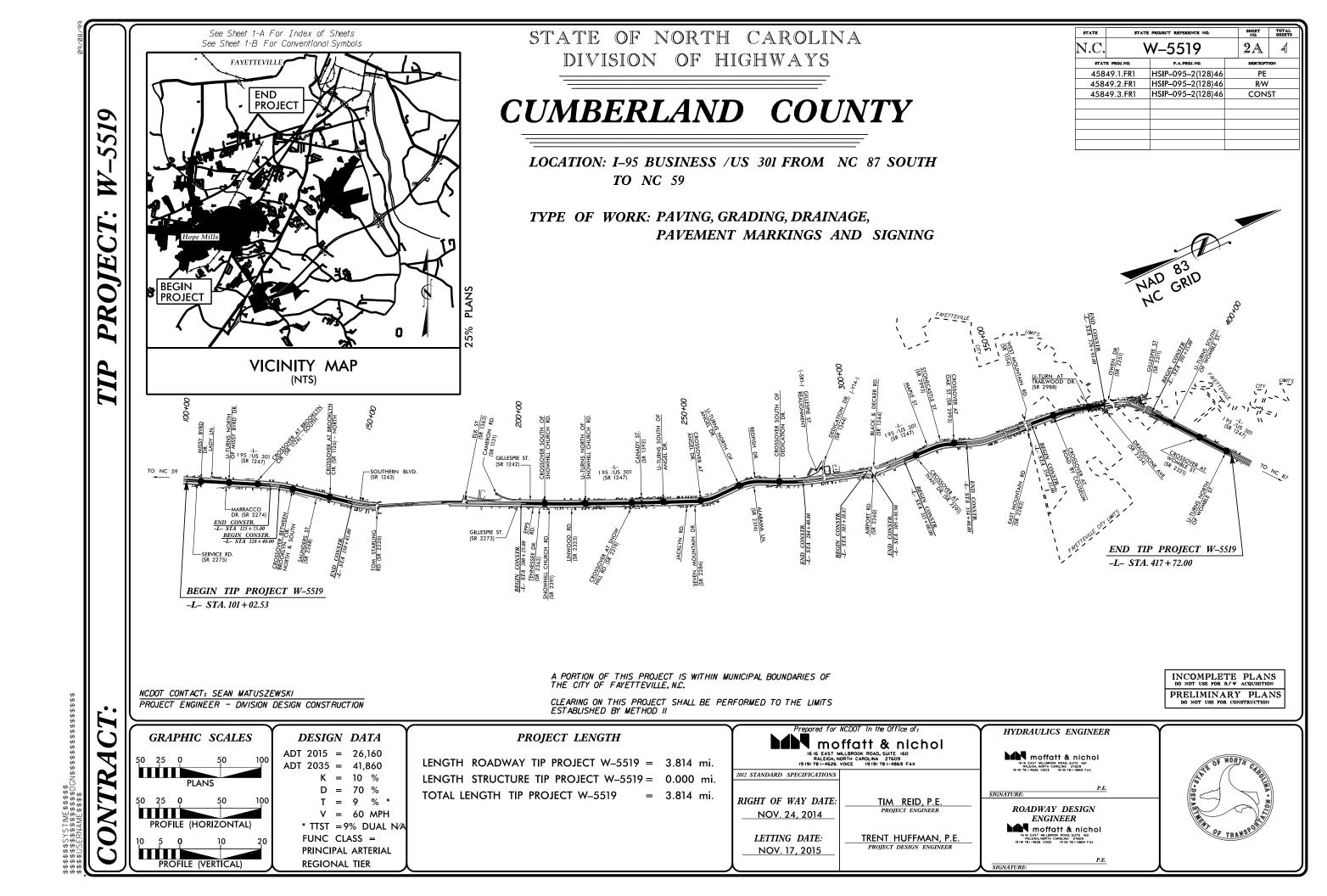
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	GRADATION <u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	ROCK DESCRIPTION HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED	TERMS AND DEFINITIONS ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.		
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	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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	ALLOVION (ALLOV) - SUIS THAT HAVE BEEN TRANSPORTED BY WATER.		
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.		
AS MINERAL COLOR, TECHNEL MOISTUIDE, HANTIC CLASSIFICATION, AND OTHER TECHNELM THE TAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OF ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	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.		
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR)	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT		
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS OPECANIC MATERIALS		CRYSTALLINE	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.		
ULASS. (\$ 35% PASSING *2001 (\$ 35% PASSING *2001	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SUMFALE. <u>CALCAREOUS (CALC.)</u> - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.		
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-6 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM		
SYMBOL 000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	ROCK (NCR) SEDIMENTATI NOCK THAT WOLD TELED SH TAPOSHE, THE TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	OF SLOPE.		
	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	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.		
*10 50 MX SILL - MUCK, *40 30 MX 50 MX 51 MN SOLLS COLLAY PEAT	PERCENTAGE OF MATERIAL		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT		
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN 36 MN	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE		
MATERIAL PASSING #40	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	HORIZONTAL.		
LL – – 40 MX 41 MN	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.		
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 10 MX 10 MX<	GROUND WATER	OF A CRYSTALLINE NATURE.	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE		
USUAL TYPES STONE FRACE	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.		
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOULS SOULS	▼STATIC WATER LEVEL AFTER <u>24</u> HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.		
CEN RATING	∇ PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIG:NAL POSITION AND DISLODGED FROM PARENT MATERIAL.		
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE	Spring or seep	DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.		
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30	-	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.		
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.		
PRIMARY SOIL TYPE COMPACTNESS OF PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	<u>IF TESTED, WOULD YIELD SPT REFUSAL</u>	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO		
		SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	ITS LATERAL EXTENT. L <u>ENS</u> - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.		
GENERALLY LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A	SOIL SYMBOL	TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS		
MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING ON CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.		
VERT DENSE > 50	I INFERRED SOIL BOUNDARY	SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK (V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.		
VERY SOFT < 2 < 0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.5		VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.		
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0 MATERIAL STIFF 8 TO 15 1 TO 2	INFERRED ROCK LINE MONITORING WELL WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE.OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. OUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF		
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTTTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER SPT N-VALUE	ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.		
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.		
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND		
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	HOED IN THE TOD O FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.		
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEEL OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	<u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT		
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.		
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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		
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY γ - UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.		
SOIL MOISTURE SCALE FIELD MOISTURE CUIDE FOR FIELD MOISTURE DESCRIPTION	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{ m d}$ - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY		
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.		
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	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		
	F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. <u>TOPSOIL (TS.)</u> - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.		
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING			
	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: BORING ELEVATIONS RETREIVED FROM ".TIN" FILES		
ON SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET		
OM _ OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C CLAY BITS AUTOMATIC MANUAL	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	NOTES:		
- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLED		
	CME-55	THINLY LAMINATED < 0.008 FEET			
		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.			
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW		RUBBING WITH FINGER FREES NUMEROUS GRAINS;			
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM		GENILE BLUW BY HAMMER DISINTEGRATES SAMPLE.			
HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE: BREAKS EASILY WHEN HIT WITH HAMMER.			
COLOR		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;			
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).		UIFFICULT TU BREAK WITH HAMMER.			
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14		
	• · · · ·	L			

PROJECT REFERENCE NO.



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5	RE: TAN AND GRAY, MOIST, SILTY SAND
	267+00.00
5	
o	END SHALLOW UNDERC
5	
5	UCP: GRAY AND ORANGE, MOIST, CLAY 266 + 50.00
o	
5	
	RE: TAN AND GRAY, MOIST, SILTY SA
o	UCP: GRAY AND ORANGE, MOIST, CLAY
5	BEGIN SHALLOW UNDEF 266+00.00
o	
5	
	RE: TAN AND GRAY, MOIST, SILTY SAI
	265+50.00
75 70 65 60 55 50 45 40 35	$-\underline{1}$ - -1

