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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	FA-740029	1	31

REFERENCE: FA-740029

PROJECT: 41665.3D

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY POLK

PROJECT DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER BRANCH OF LITTLE WHITE OAK CREEK

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SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3-7	SITE PLAN
8-26	BORE LOGS, CORE LOGS, AND CORE PHOTOS
27	LABORATORY TEST REULTS
28	SITE PHOTOGRAPHS

PERSONNEL

NORVILLE, C.V.

EVANS, T.E.

HAMM, J.R.

HUNSBERGER, W.S.

GOODNIGHT, D.J.

TRIGON

INVESTIGATED BY HUNSBERGER, W.S.

DRAWN BY CROCKETT, S.C.

CHECKED BY HAMM, J.R.

SUBMITTED BY FALCON

DATE DECEMBER 2018

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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NORTH CAROLINA PROFESSIONAL SEAL 39779 ENGINEER JEREMY R HAMM

DocuSigned by:
Jeremy R Hamm
ED7938089E22487...

12/11/2018

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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PROJECT REFERENCE NO.	SHEET NO.
FA–740029	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 1 OF 2)

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
MATERIAL PASSING #40 LL	—		—	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PI	6 MX		NP	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT PLASTIC RANGE (PI) PL — PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE SL — SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- UNDERCUT
- SHALLOW UNDERCUT
- UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE
- UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK
- UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [X] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N Q2

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

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PROJECT REFERENCE NO.	SHEET NO.
FA–740029	2A

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS (PAGE 2 OF 2)

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIG;NAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BL-3 EL STA. 20+53.37, 15.77' RT, N: 573617.6 E: 1068591.1

ELEVATION: 883.69 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING.

DATE: 8-15-14

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PROJECT REFERENCE NO.	SHEET NO.
FA–740029	2B

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 1 OF 2)

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

SURFACE CONDITIONS

VERY GOOD Very rough, fresh unweathered surfaces	GOOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings

DECREASING SURFACE QUALITY ⇨

STRUCTURE

DECREASING INTERLOCKING OF ROCK PIECES ⇩

STRUCTURE	VERY GOOD	GOOD	FAIR	POOR	VERY POOR
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90	80		N/A	N/A
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70	60		
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets			50		
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30	
DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces				20	10
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			

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PROJECT REFERENCE NO.	SHEET NO.
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

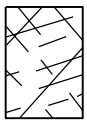
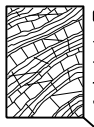
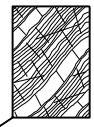
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken-sided or highly weathered surfaces with soft clay coatings or fillings
 **A.** *Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.*	70 / 60 / A				
B. *Sand-stone with thin inter-layers of siltstone*  **C.** *Sand-stone and siltstone in similar amounts* **D.** *Siltstone or silty shale with sand-stone layers*  **E.** *Weak siltstone or clayey shale with sandstone layers*	50	B 40	C	D	E
C, D, E, and **G** - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H.** **F.** *Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure*			30	F 20	
G. *Undisturbed silty or clayey shale with or without a few very thin sandstone layers* → **H.** ***Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.***				G	H 10

→ Means deformation after tectonic disturbance

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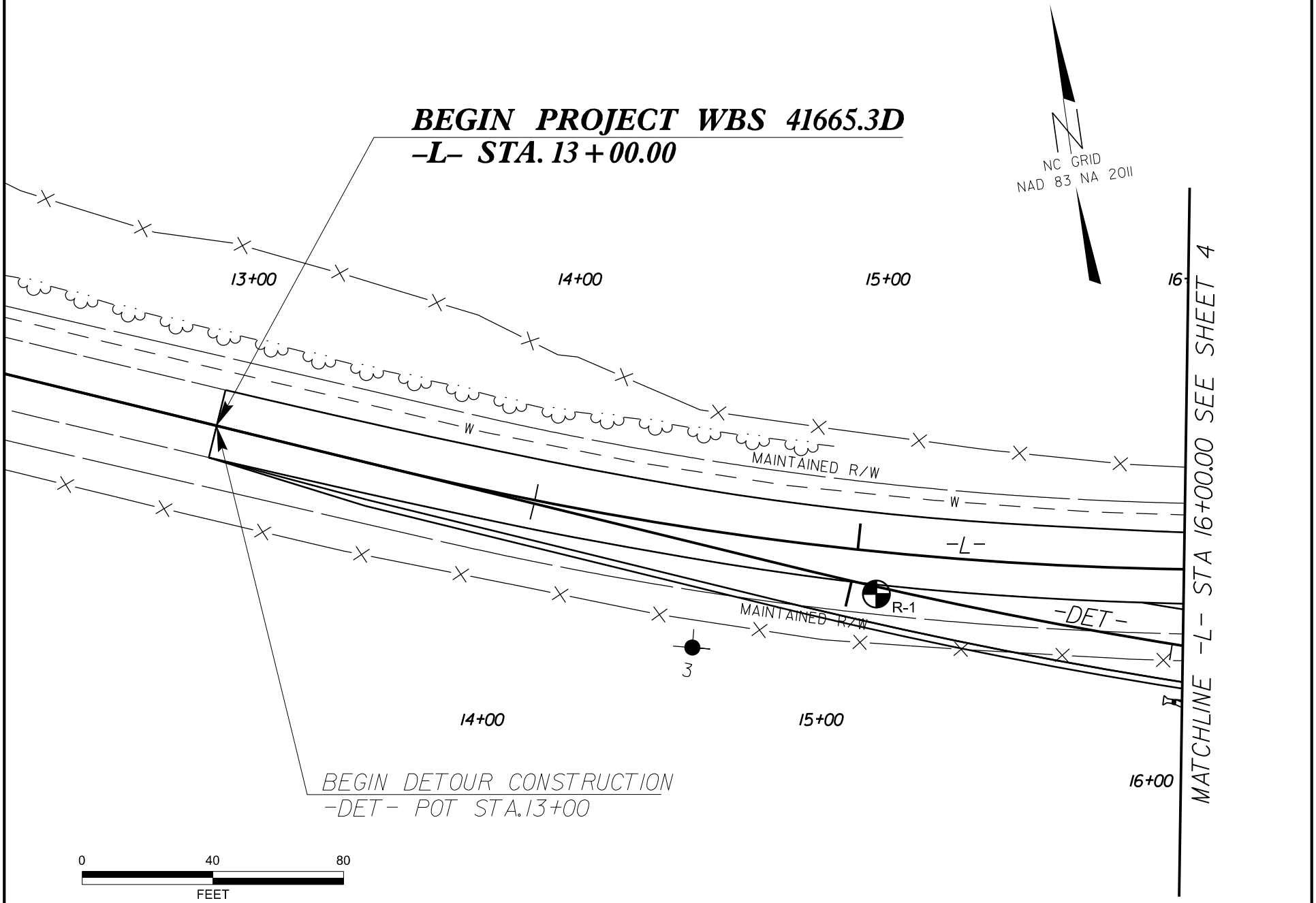

NOTES:

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FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513

PHONE: 919.871.0800

BORING LOCATION PLAN

BRIDGE NO. 29 ON NC 9
OVER SOUTH BRANCH OF LITTLE WHITE OAK CREEK
POLK COUNTY, NORTH CAROLINA
WBS NO.: 41665.3D | TIP NO.: FA-740029
FALCON PROJECT NO.: G18032.00

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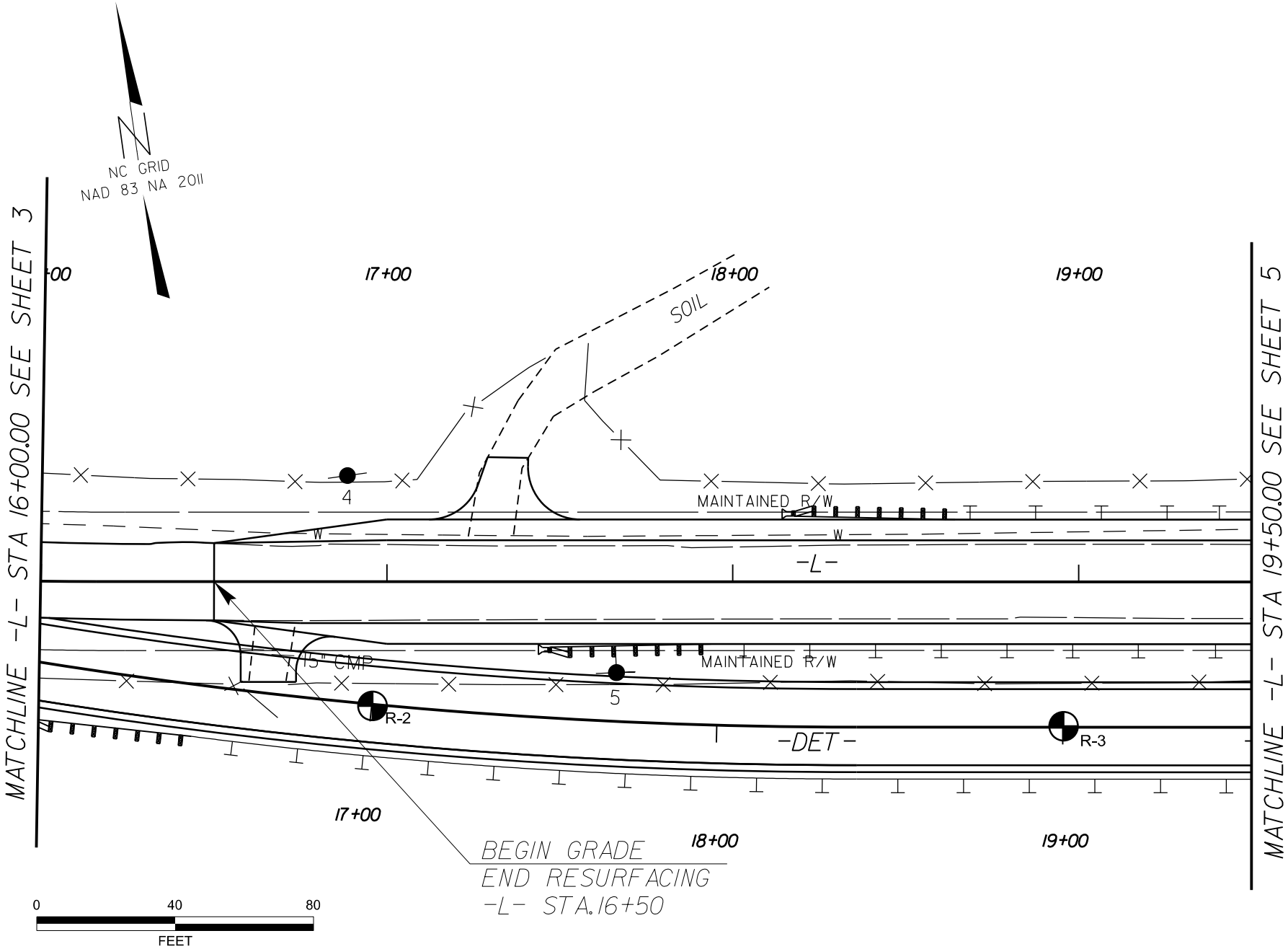

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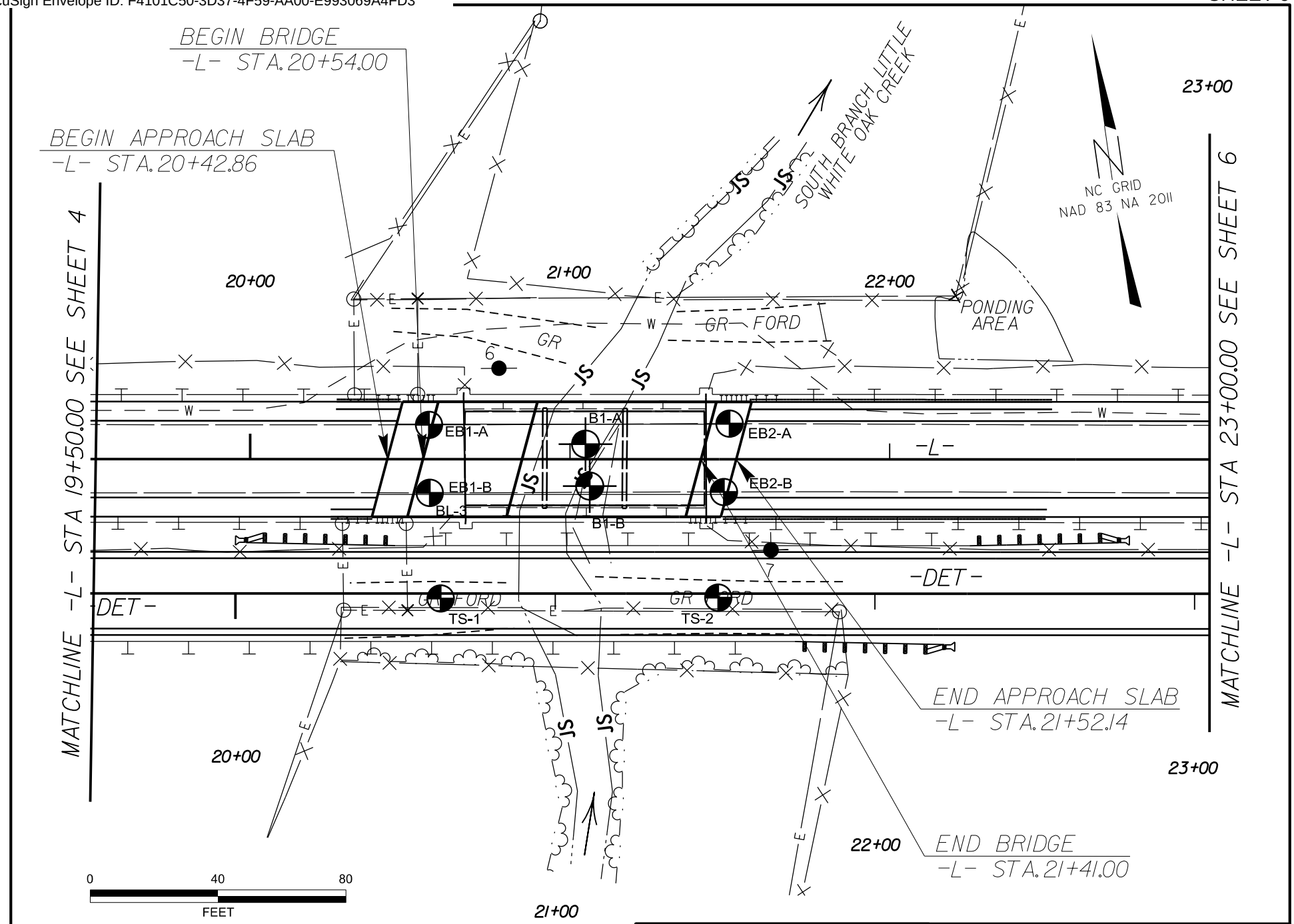

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BRIDGE SKEW: 75°

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BORING LOCATION PLAN

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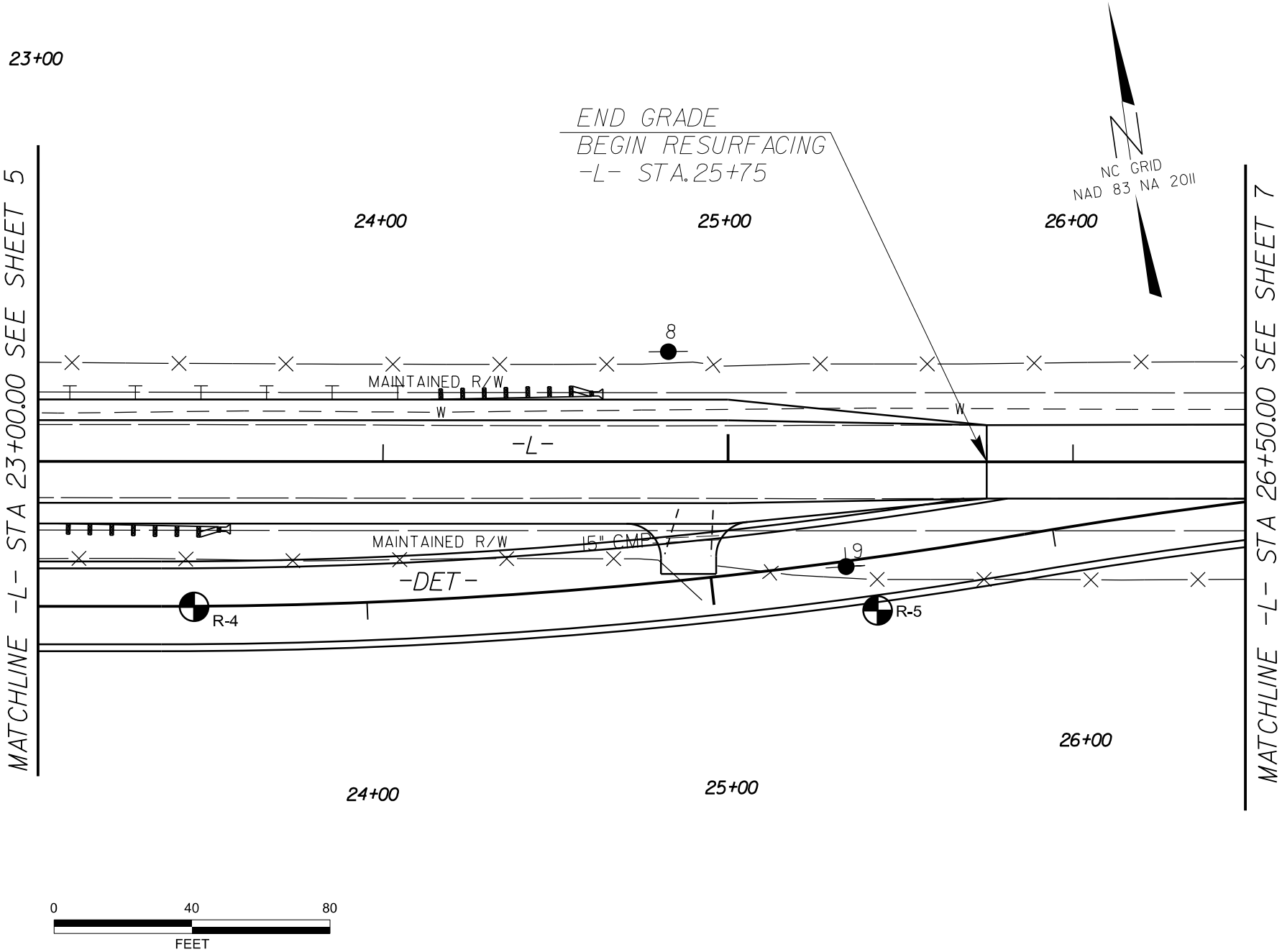

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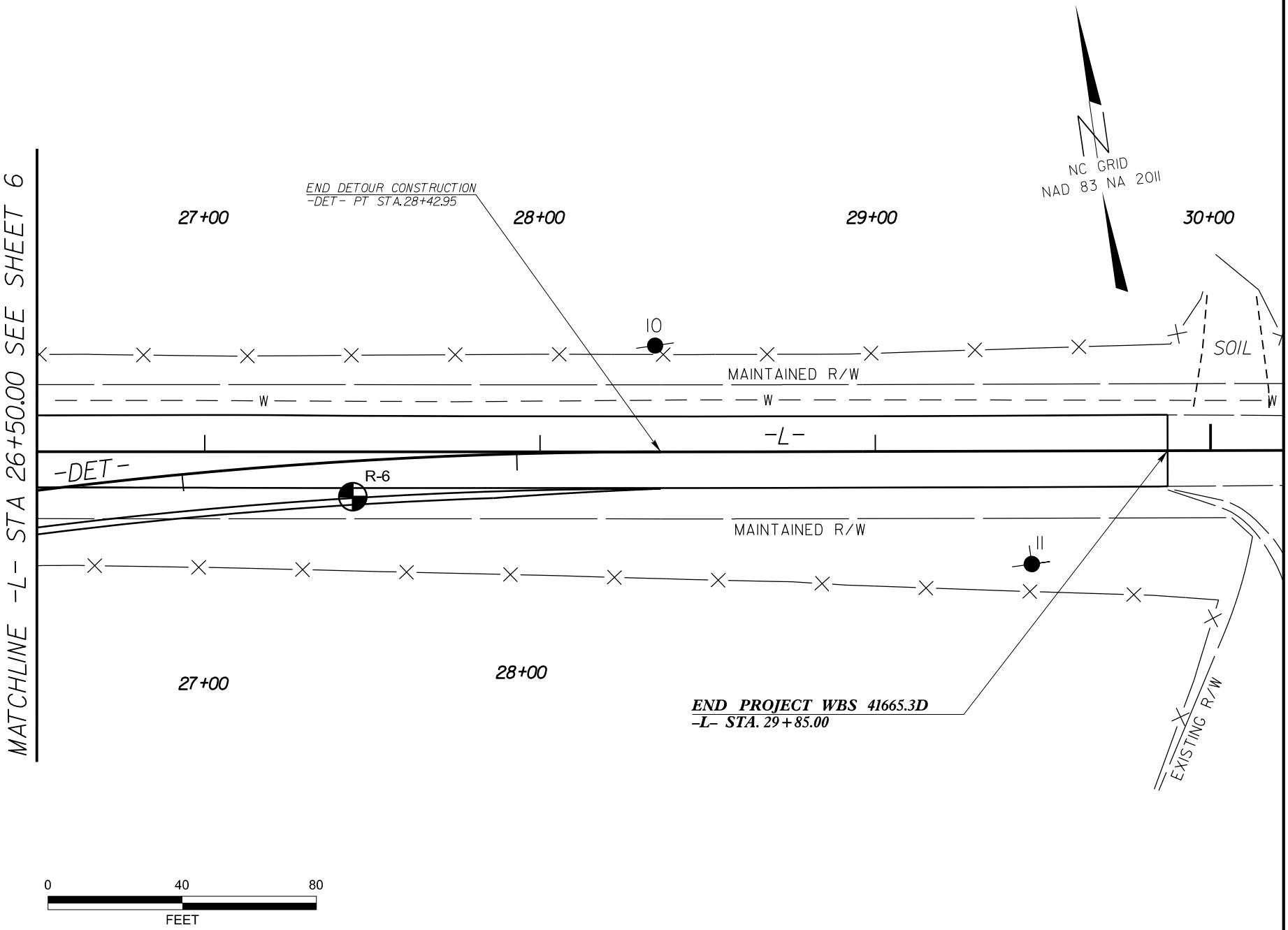

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BORING LOCATION PLAN

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OVER SOUTH BRANCH OF LITTLE WHITE OAK CREEK
POLK COUNTY, NORTH CAROLINA
WBS NO.: 41665.3D | TIP NO.: FA-740029
FALCON PROJECT NO.: G18032.00

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 20+56	**OFFSET** 11 ft LT	**ALIGNMENT** -L- — **0 HR.** 8.3
COLLAR ELEV. 884.3 ft	**TOTAL DEPTH** 53.9 ft	**NORTHING** 573,643	**EASTING** 1,068,597 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/13/13	**COMP. DATE** 03/13/13	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
885										884.3 GROUND SURFACE: 0.3' TOPSOIL	0.0
	883.3	1.0								**ROADWAY EMBANKMENT**	
			2	3	3	6		M		RED-BROWN, SANDY CLAY (A-6) W/ MICA	
880	880.8	3.5									
	879.3	5.0	1	1	2	3		W			
			1	WOH	1	1		M		877.3	7.0
875	875.6	8.7								BROWN, SANDY CLAY (A-6) W/ MICA	
			WOH	WOH	2	2		M		874.5	9.8
	871.2	13.1								**ALLUVIAL** BROWN AND GRAY, SILTY F. SAND (A-2-4)	
870			1	4	5	9		W		870.4	13.9
	866.1	18.2								**RESIDUAL** TAN AND GRAY, SILTY F. SAND (A-2-4)	
865			2	4	7	11		W		865.8	18.5
	861.1	23.2								RED AND ORANGE, SILTY SAND (A-2-4) W/ MICA	
860			3	5	11	16		W		860.3	24.0
	856.1	28.2								BROWN TAN AND WHITE, SILTY SAND (A-2-4) W/ MICA	
855			3	4	7	11		M			
	851.1	33.2									
850			7	13	13	26		M			
	846.1	38.2									
845			11	24	29	53		M			
	841.1	43.2									
840			14	39	61/0.3	100/0.8				839.8	44.5
										WEATHERED ROCK BROWN TAN AND WHITE, MICA GNEISS	
835	836.1	48.2	100/0.3			100/0.3					
	831.1	53.2	77	23/0.2		100/0.7				830.4	53.9
										Boring Terminated at Elevation 830.4 ft in WR: Mica Gneiss	

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 20+56	**OFFSET** 11 ft RT	**ALIGNMENT** -L-	**0 HR.** 9.8
COLLAR ELEV. 884.2 ft	**TOTAL DEPTH** 54.1 ft	**NORTHING** 573,622	**EASTING** 1,068,594	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/13/13	**COMP. DATE** 03/13/13	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
885										884.2 GROUND SURFACE: 0.3' TOPSOIL 0.0
	883.2	1.0								**ROADWAY EMBANKMENT**
			2	2	2	4		M		RED-BROWN, SANDY CLAY (A-6) W/ MICA, TRACE ORGANICS
880	881.0	3.2	1	2	2	4		M		
	878.4	5.8	1	1	2	3		M		877.9 6.3
										876.7 RED-BROWN, CLAYEY SAND (A-2-6) 7.5
875	875.4	8.8	WOH	1	2	3		W		874.4 TAN, SANDY CLAY (A-6) 9.8
										ALLUVIAL GRAY, SILTY CLAY (A-6)
870	870.4	13.8	1	1	1	2		W		870.2 14.0
										RESIDUAL TAN AND BROWN, SILTY CSE. SAND (A-2-4)
865	865.4	18.8	1	2	2	4		Sat.		
860	860.4	23.8	4	3	4	7		W		859.4 24.8
										857.2 TAN BROWN AND WHITE, SANDY SILT (A-4) W/ MICA 27.0
855	855.4	28.8	5	10	21	31		M		ORANGE BROWN AND WHITE, SILTY SAND (A-2-4) W/ MICA
850	850.4	33.8	12	20	29	49		M		
845	845.4	38.8	21	34	60	94		M		
840	840.4	43.8	31	50	50/0.4	100/0.9				839.0 45.2
										WEATHERED ROCK BROWN ORANGE AND WHITE, MICA GNEISS
835	835.4	48.8	74	26/0.1		100/0.6				
	830.4	53.8	100/0.3			100/0.3				830.1 54.1
										Boring Terminated at Elevation 830.1 ft in WR: Mica Gneiss

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 21+05	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 873.2 ft	**TOTAL DEPTH** 75.5 ft	**NORTHING** 573,630	**EASTING** 1,068,645	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** ROTARY WASH	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/14/13	**COMP. DATE** 03/14/13	**SURFACE WATER DEPTH** 0.3ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION — ELEV. (ft)	DEPTH (ft)
875											
										873.2 WATER SURFACE (03/14/13)	0.0
	872.2	1.0								**ALLUVIAL**	
870	870.4	2.8	1	3	1	4		Sat.		GRAY AND TAN, SILTY CSE. SAND (A-1-b)	
			4	3	2	5		Sat.		868.7	4.5
	867.3	5.9								TAN AND BROWN, SILTY SAND (A-2-4)	
865	864.7	8.5	5	6	4	10		W			
			WOH	WOH	2	2		W		863.7	9.5
										GRAY, SILTY F. SAND (A-2-4)	
860	860.5	12.7	3	4	4	8		W		859.8	13.4
										RESIDUAL	
										856.7 BLACK ORANGE AND BROWN, SILTY SAND (A-2-4) W/ MICA	16.5
855	855.5	17.7	2	4	5	9		M		GRAY BLACK AND WHITE, SILTY SAND (A-2-4) W/ MICA	
850	850.5	22.7	7	7	8	15		M		848.2	25.0
										WEATHERED ROCK	
845	845.5	27.7	35	65/0.4		100/0.9				GRAY BROWN AND WHITE, MICA GNEISS	
840	840.5	32.7	31	69/0.3		100/0.8				838.2	35.0
										RESIDUAL	
835	835.5	37.7	16	25	43	68		M		ORANGE WHITE AND BROWN, SILTY SAND (A-2-4) W/ MICA	
										832.2	41.0
										WEATHERED ROCK	
830	830.5	42.7	52	48/0.3		100/0.8				GRAY BLACK AND WHITE, MICA GNEISS	
825	825.5	47.7	40	60/0.3		100/0.8					
820	820.5	52.7	60/0			60/0				820.5	52.7
										CRYSTALLINE ROCK	
										816.7 WHITE AND BLACK, MOD. SEV. WEATHERED, MOD. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS	56.5
815										812.2 WHITE BLACK AND GREEN, MOD. WEATHERED, HARD, CLOSE TO MOD. CLOSELY FRACTURED, MICA GNEISS	61.0
810										809.5 BLUE GRAY TAN AND WHITE, MOD. SEV. WEATHERED, MED. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS	63.7
										807.9 DK. GRAY AND WHITE, MOD. SEV. WEATHERED, SOFT TO MOD. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS	65.3
805										799.5 BLUE-GRAY AND WHITE, SLI. WEATHERED , HARD, CLOSELY FRACTURED, GNEISS	73.7
800										798.3 BLUE-GRAY AND WHITE, MOD. SEV. WEATHERED, SOFT TO MED. HARD, V. CLOSELY FRACTURED, MICA GNEISS	74.9
										797.7 BLUE-GRAY AND WHITE, V. SLI. WEATHERED, HARD, CLOSELY FRACTURED, MICA GNEISS	75.5
										Boring Terminated at Elevation 797.7 ft in CR: Mica Gneiss	

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GEOTECHNICAL BORING REPORT
CORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 21+05	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 873.2 ft	**TOTAL DEPTH** 75.5 ft	**NORTHING** 573,630	**EASTING** 1,068,645	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** ROTARY WASH	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/14/13	**COMP. DATE** 03/14/13	**SURFACE WATER DEPTH** 0.3ft
CORE SIZE NQ2	**TOTAL RUN** 22.8 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))
820.5											Begin Coring @ 52.7 ft
820	820.5	52.7	3.8	0:23/1.0 1:50/1.0 1:46/1.0 1:30/0.8	(1.5) 39%	(0.0) 0%		(1.5) 39%	(0.0) 0%		820.5 / 52.7 **CRYSTALLINE ROCK** WHITE AND BLACK, MOD. SEV. WEATHERED, MOD. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS
	816.7	56.5									816.7 / 56.5
815			5.0	2:13/1.0 2:17/1.0 2:29/1.0 2:34/1.0 2:37/1.0	(5.0) 100%	(3.3) 66%		(4.5) 100%	(4.2) 93%		WHITE BLACK AND GREEN, MOD. WEATHERED, HARD, CLOSE TO MOD. CLOSELY FRACTURED, MICA GNEISS
	811.7	61.5									812.2 / 61.0
810			5.0	1:48/1.0 1:45/1.0 2:05/1.0 2:48/1.0 4:28/1.0	(5.0) 100%	(1.4) 28%		(2.7) 100%	(0.0) 0%		BLUE GRAY TAN AND WHITE, MOD. SEV. WEATHERED, MED. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS
								(1.6) 100%	(0.8) 50%		809.5 / 63.7 — 807.9 / 65.3 DK. GRAY AND WHITE, MOD. SEV. WEATHERED, SOFT TO MOD. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS
	806.7	66.5									
805			5.0	3:20/1.0 2:20/1.0 3:40/1.0 3:08/1.0 3:36/1.0	(5.0) 100%	(2.6) 52%		(8.4) 100%	(6.0) 71%		BLUE-GRAY AND WHITE, SLI. WEATHERED , HARD, CLOSELY FRACTURED, GNEISS
	801.7	71.5									
800			4.0	2:48/1.0 2:42/1.0 3:32/1.0 3:15/1.0	(4.0) 100%	(2.1) 53%					799.5 / 73.7
	797.7	75.5						(1.2) 100%	(0.0) 0%		798.3 / 74.9 — 797.7 / 75.5 BLUE-GRAY AND WHITE, MOD. SEV. WEATHERED, SOFT TO MED. HARD, V. CLOSELY FRACTURED, MICA GNEISS
								(0.6) 100%	(0.6) 100%		BLUE-GRAY AND WHITE, V. SLI. WEATHERED, HARD, CLOSELY FRACTURED, MICA GNEISS
											Boring Terminated at Elevation 797.7 ft in CR: Mica Gneiss

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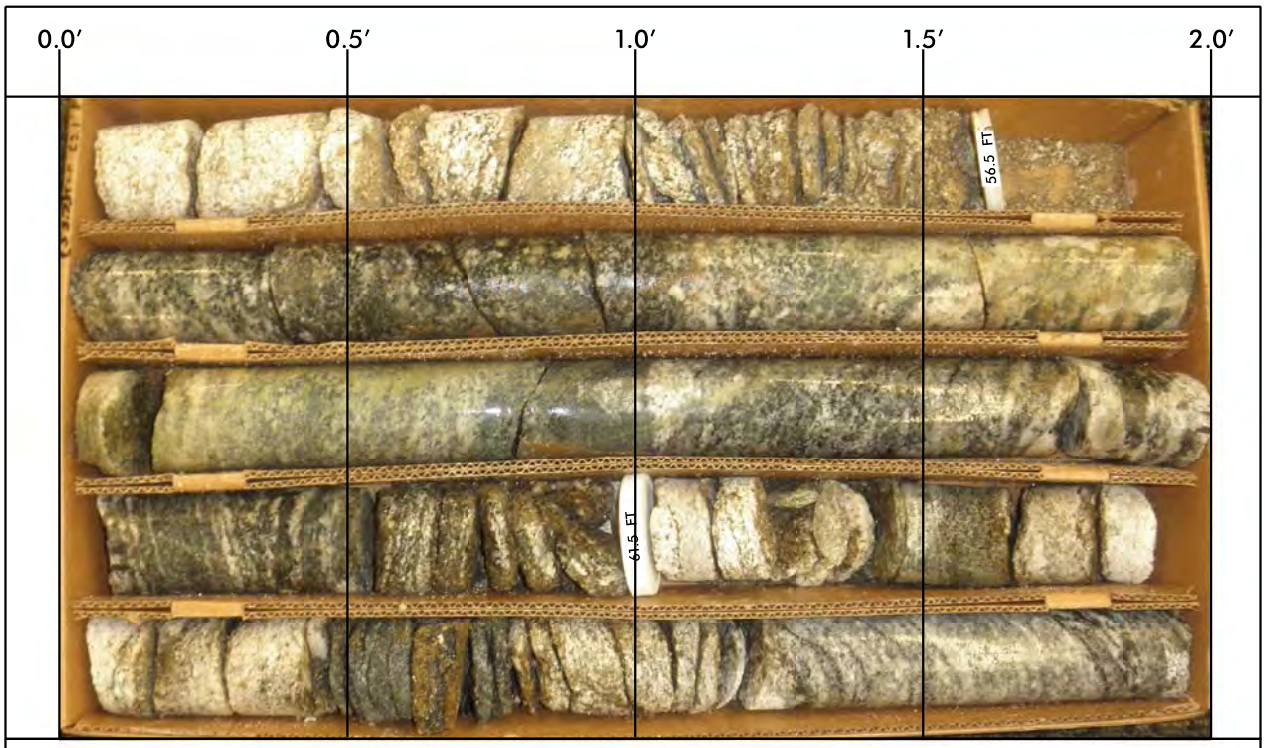
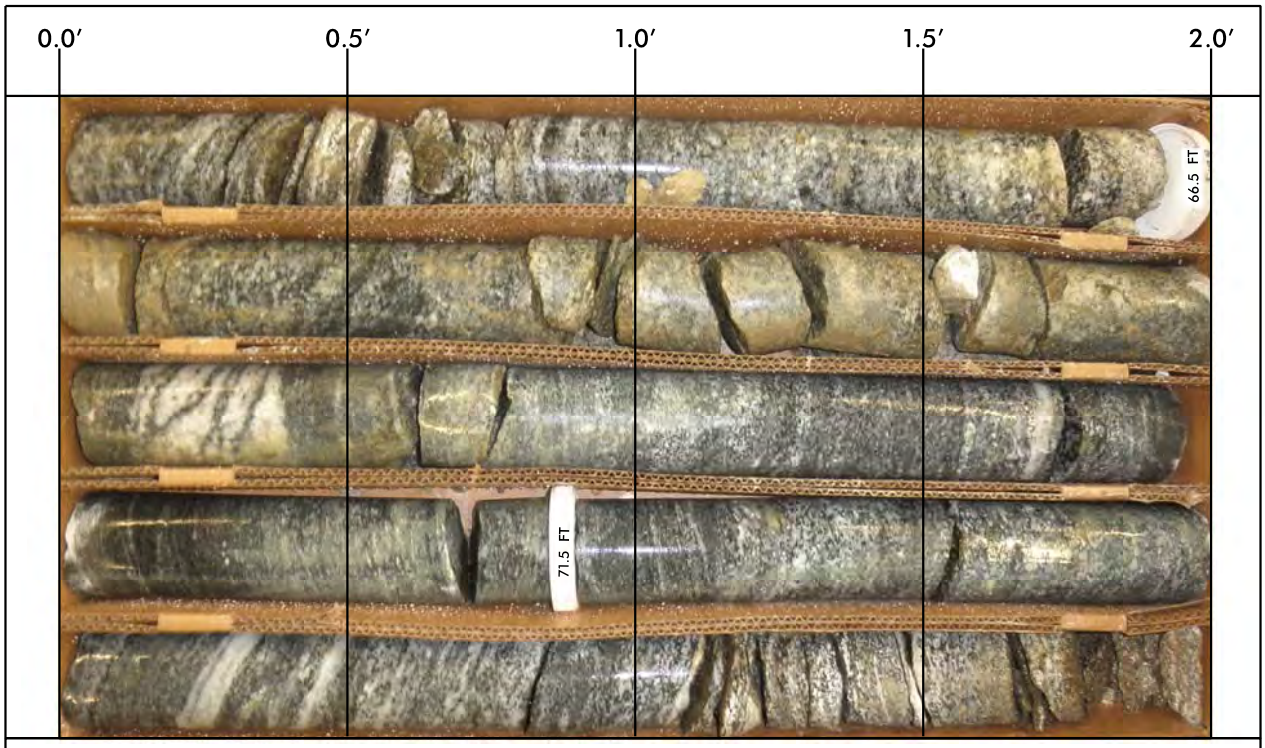


BORING B1–A, BOX 1 OF 3, 52.7 FEET TO 64.5 FEET.



BORING B1–A, BOX 2 OF 3, 64.5 FEET TO 74.0 FEET.

0 4″ 8″
INCHES

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607
PHONE: 919.871.0800
FAX: 919.871.0803

ROCK CORE PHOTOGRAPHS – B1–A (1)

BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF LITTLE WHITE OAK CREEK
POLK COUNTY, NORTH CAROLINA
WBS.: 41665.3D TIP.: FS–740029
FALCON PROJECT NO.: G13012.00

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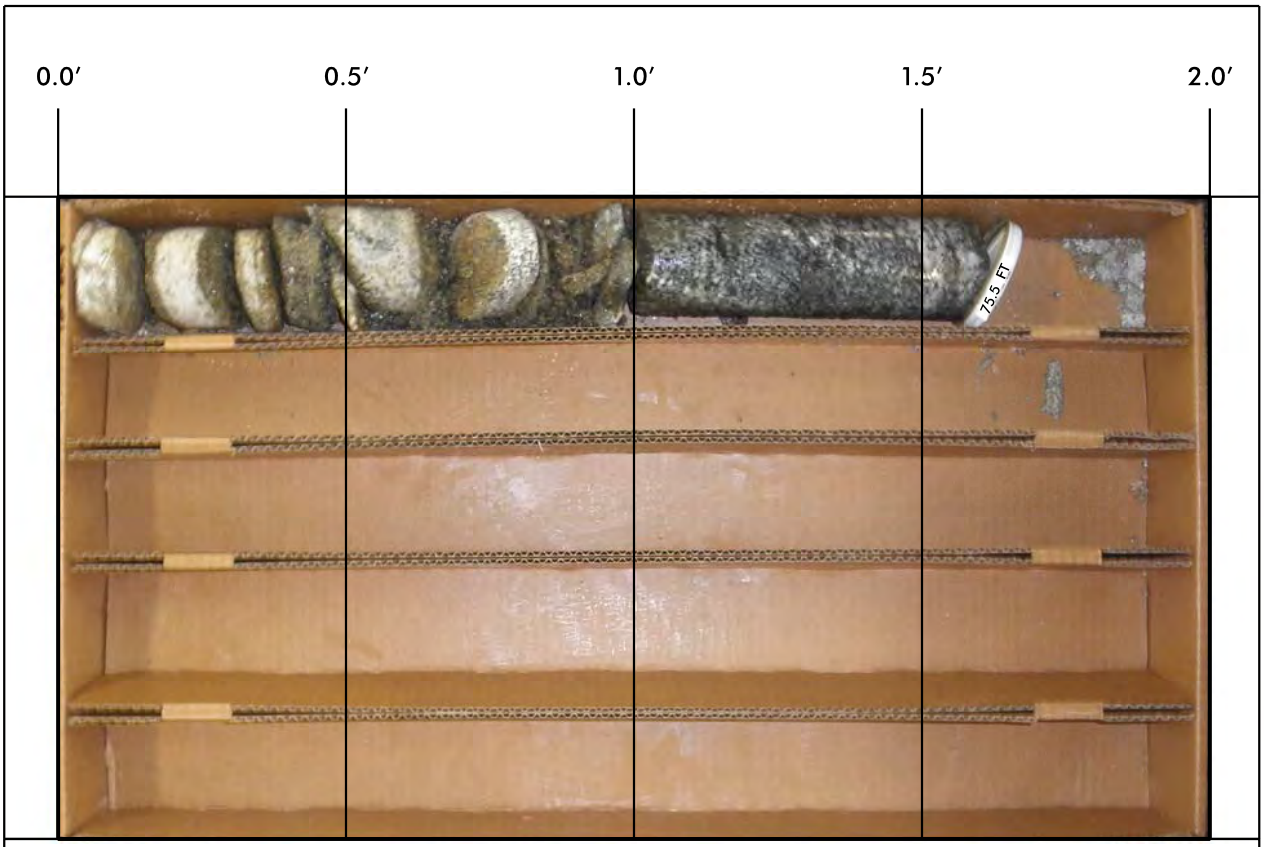

BORING B1–A, BOX 3 OF 3, 74.0 FEET TO 75.5 FEET.

0 4″ 8″
INCHES

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607
PHONE: 919.871.0800
FAX: 919.871.0803

ROCK CORE PHOTOGRAPHS – B1–A (2)

BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF LITTLE WHITE OAK CREEK
POLK COUNTY, NORTH CAROLINA
WBS.: 41665.3D TIP.: FS–740029
FALCON PROJECT NO.: G13012.00

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 21+06	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 873.2 ft	**TOTAL DEPTH** 69.5 ft	**NORTHING** 573,617	**EASTING** 1,068,644	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** ROTARY WASH	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/12/13	**COMP. DATE** 03/12/13	**SURFACE WATER DEPTH** 1.2ft

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
875										WATER SURFACE (03/12/13)	
										873.2 GROUND SURFACE	0.0
	871.2	2.0								871.7 **ALLUVIAL** TAN AND GRAY, SILTY CSE. SAND (A-1-b)	1.5
870	869.7	3.5	1	1	1	2		W			
			3	3	6	9		W		868.7 TAN, SILTY SAND (A-2-4)	4.5
	867.6	5.6								TAN AND GRAY, SILTY SAND (A-1-b)	
	866.1	7.1	16	28	9	37		W		866.2	7.0
865			20	13	8	21		W		TAN, SILTY SAND (A-2-4)	
										863.2 GRAY, SILTY F. SAND (A-2-4)	10.0
	861.1	12.1									
860			1	1	1	2		W			
										858.2 **RESIDUAL** BROWN TAN AND WHITE, SILTY SAND (A-2-4) W/ MICA	15.0
	856.1	17.1									
855			6	6	8	14		M			
	851.1	22.1									
850			10	13	12	25		M			
	846.1	27.1									
845			26	35	32	67		M			
	841.1	32.1									
840			24	39	25	64		M			
	836.1	37.1								836.2 **WEATHERED ROCK** TAN BROWN AND WHITE, MICA GNEISS	37.0
835			41	59/0.4		100/0.9					
	831.1	42.1									
830			67	33/0.1		100/0.7					
	826.1	47.1									
825			100/0.5			100/0.5					
	821.1	52.1									
820			100/0.4			100/0.4					
	818.3	54.9								818.3 **CRYSTALLINE ROCK** DK. GRAY AND WHITE, MOD. WEATHERED, MOD HARD, V. CLOSE TO MOD. CLOSELY FRACTURED, MICA GNEISS, W/ THIN SEV. WEATHERED LAYERS	54.9
			60/0			60/0					
815											
810										809.8	63.4
										808.7 BLACK TAN AND GRAY, MOD. SEV. WEATHERED, MED. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS	64.5
805										803.7 DK. GRAY AND WHITE, V. SLI. WEATHERED, MOD. HARD TO HARD, CLOSE TO MOD. CLOSELY FRACTURED, GNEISS	69.5

Boring Terminated at Elevation 803.7 ft in CR: Mica Gneiss

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GEOTECHNICAL BORING REPORT
CORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 21+06	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 873.2 ft	**TOTAL DEPTH** 69.5 ft	**NORTHING** 573,617	**EASTING** 1,068,644	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** ROTARY WASH	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/12/13	**COMP. DATE** 03/12/13	**SURFACE WATER DEPTH** 1.2ft
CORE SIZE NQ2	**TOTAL RUN** 14.6 ft		

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS (ELEV. (ft) / DEPTH (ft))
818.3											Begin Coring @ 54.9 ft
	818.3	54.9	4.6	4:25/1.0 4:10/1.0 5:00/1.0 4:04/1.0 2:45/0.8	(4.6) 100%	(3.5) 76%		(8.5) 100%	(7.1) 84%		818.3 / 54.9 **CRYSTALLINE ROCK** DK. GRAY AND WHITE, MOD. WEATHERED, MOD HARD, V. CLOSE TO MOD. CLOSELY FRACTURED, MICA GNEISS, W/ THIN SEV. WEATHERED LAYERS
815	813.7	59.5	5.0	3:43/1.0 3:15/1.0 3:00/1.0 2:50/1.0 2:45/1.0	(5.0) 100%	(2.8) 56%					
810	808.7	64.5	5.0	2:47/1.0 2:33/1.0 3:03/1.0 2:52/1.0 3:36/1.0	(5.0) 100%	(4.4) 88%		(1.1) 100% (5.0) 100%	(0.0) 0% (4.2) 84%		809.8 / 63.4 808.7 / 64.5 BLACK TAN AND GRAY, MOD. SEV. WEATHERED, MED. HARD, V. CLOSE TO CLOSELY FRACTURED, MICA GNEISS DK. GRAY AND WHITE, V. SLI. WEATHERED, MOD. HARD TO HARD, CLOSE TO MOD. CLOSELY FRACTURED, GNEISS
805	803.7	69.5									803.7 / 69.5 Boring Terminated at Elevation 803.7 ft in CR: Mica Gneiss

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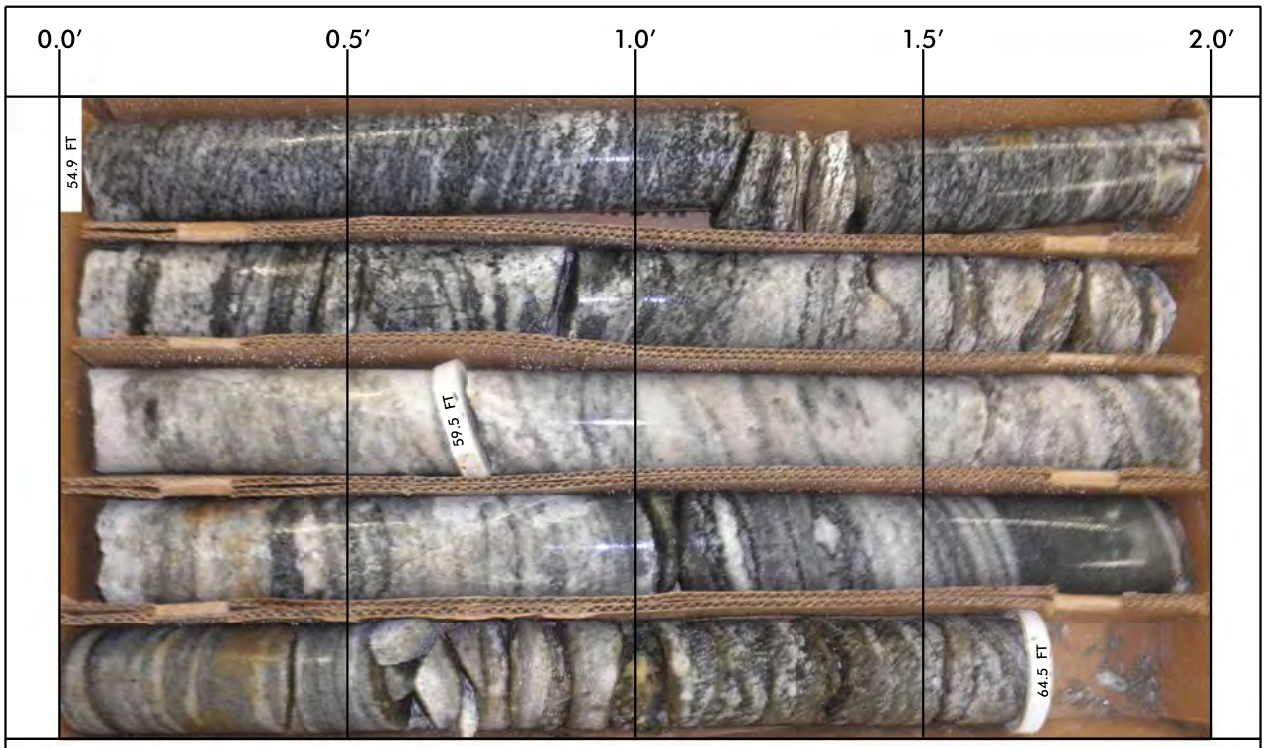
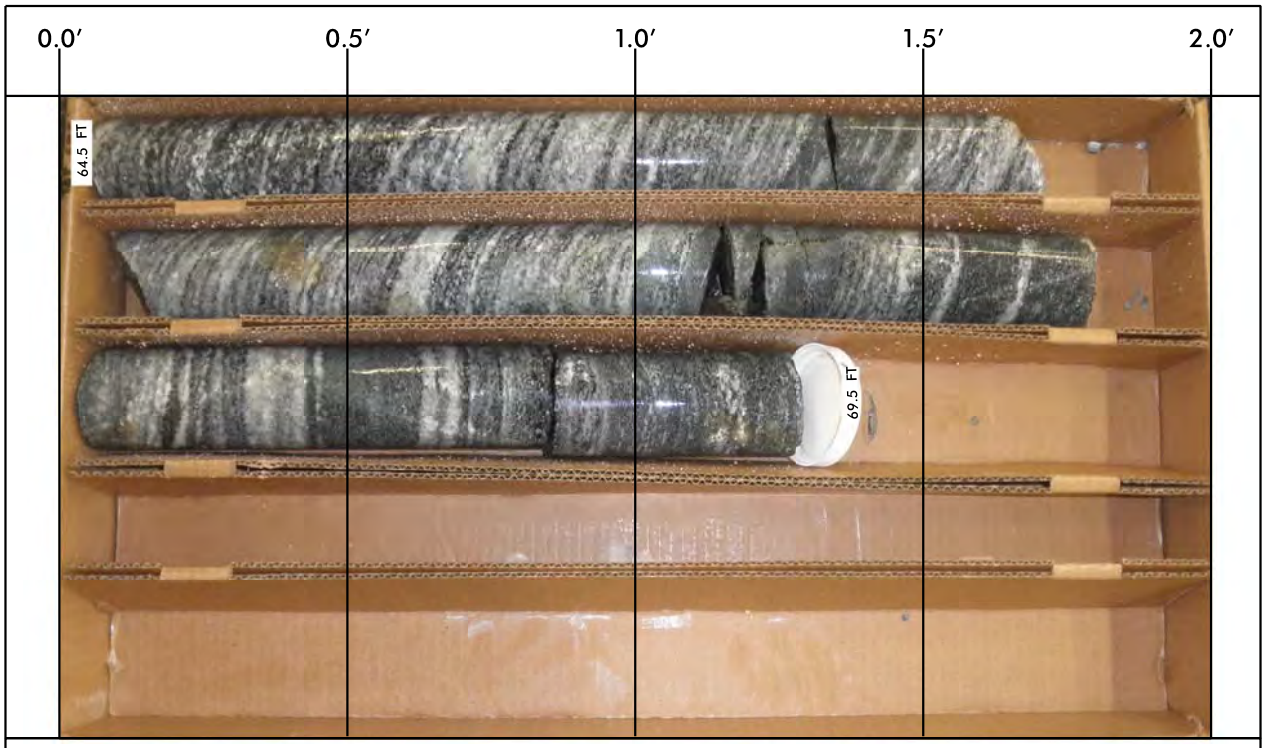


BORING B1–B, BOX 1 OF 2, 54.9 FEET TO 64.5 FEET.



BORING B1–B, BOX 2 OF 2, 64.5 FEET TO 69.5 FEET.

0 4″ 8″
INCHES

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607
PHONE: 919.871.0800
FAX: 919.871.0803

ROCK CORE PHOTOGRAPHS – B1–B

BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF LITTLE WHITE OAK CREEK
POLK COUNTY, NORTH CAROLINA
WBS.: 41665.3D TIP.: FS–740029
FALCON PROJECT NO.: G13012.00

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** S. HUNSBERGER
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+50	**OFFSET** 11 ft LT	**ALIGNMENT** -L-	**0 HR.** 9.7
COLLAR ELEV. 884.3 ft	**TOTAL DEPTH** 42.2 ft	**NORTHING** 573,630	**EASTING** 1,068,690	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/13/13	**COMP. DATE** 03/13/13	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
885										GROUND SURFACE: 0.3' TOPSOIL	884.3	0.0
	883.3	1.0								**ROADWAY EMBANKMENT**		
			1	1	3	4		M		RED-BROWN F. SANDY CLAY (A-6) W/ MICA		
880	880.9	3.4	1	1	2	3		M			879.0	5.3
	878.5	5.8	1	1	2	3		M		RED-BROWN, SILTY SAND (A-2-4)	876.2	8.1
875	875.8	8.5	1	WOH	1	1		W		**ALLUVIAL** GRAY AND BROWN, SILTY F. SAND (A-2-7)	870.6	13.7
870	870.0	14.3	WOH	WOH	WOH	0		W		GRAY, SILTY SANDY CLAY (A-7)	865.3	19.0
865	865.5	18.8	2	6	8	14		W		**RESIDUAL** GRAY AND TAN, SILTY SAND (A-2-4)	862.1	22.2
860	861.0	23.3	2	3	5	8		M		RED BROWN AND WHITE, SILTY SAND (A-2-4) W/ MICA		
855	856.5	27.8	2	3	3	6		M				
850	851.5	32.8	6	11	13	24		M				
845	846.5	37.8	15	34	36	70		M				
	842.1	42.2	60/0			60/0				Boring Terminated by Auger Refusal at Elevation 842.1 ft on CR: Mica Gneiss	842.1	42.2

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** T. EVANS
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 21+48	**OFFSET** 10 ft RT	**ALIGNMENT** -L-	**0 HR.** 10.0
COLLAR ELEV. 884.2 ft	**TOTAL DEPTH** 53.6 ft	**NORTHING** 573,609	**EASTING** 1,068,685	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 81% 02/07/2014		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER S. GOWER	**START DATE** 03/11/13	**COMP. DATE** 03/11/13	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
885										884.2 GROUND SURFACE: 0.3' TOPSOIL 0.0
	883.2	1.0	3	2	3	5		M		**ROADWAY EMBANKMENT** RED-BROWN, F. SANDY CLAY (A-6) W/ MICA
880	880.4	3.8	1	1	1	2		M		
	878.5	5.7	1	1	1	2		W		878.0 6.2
875	874.9	9.3	1	1	1	2		W		876.2 BROWN AND TAN, SILTY F. SAND (A-2-4) 8.0
870	870.8	13.4	WOH	WOH	WOH	0		Sat.		**ALLUVIAL** GRAY, SILTY F. SAND (A-2-4) W/ SANDY SILT LAYER @ 9.0-9.5 FT 872.2 12.0 GRAY AND TAN, SILTY CLAY (A-7) W/ GRAVEL
865	865.5	18.7	3	4	7	11		W		865.0 19.2 **RESIDUAL** GRAY AND TAN, SILTY SAND (A-2-4) W/ GRAVEL 861.7 22.5
860	860.1	24.1	3	4	5	9		M		BROWN TAN AND WHITE, SILTY F. SAND (A-2-4) SAPROLITIC, W/ ROCK FRAGS., MICA
855	855.1	29.1	4	5	6	11		M		
850	850.3	33.9	5	5	7	12		M		
845	845.4	38.8	6	10	15	25		M		
840	840.4	43.8	13	28	35	63		M		
835	835.7	48.5	25	45	43	88		M		
	830.7	53.5	60/0.1			60/0.1				830.7 53.5 830.6 53.6 **CRYSTALLINE ROCK** WHITE TAN AND BROWN, MICA GNEISS

Boring Terminated with Standard Penetration Test Refusal at Elevation 830.6 ft in CR: Mica Gneiss

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. TS-1	**STATION** 20+64	**OFFSET** 2 ft RT	**ALIGNMENT** -DET- / **0 HR.** 0.2
COLLAR ELEV. 875.6 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 573,589	**EASTING** 1,068,593 / **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/27/18	**COMP. DATE** 09/27/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
880										
875										875.6 GROUND SURFACE 0.0
	872.1	3.5	7	4	5	9		W		**ARTIFICIAL FILL** RED-BROWN, SANDY SILT (A-4) WITH SOME COBBLES AND GRAVEL — 872.6 / 3.0
870	869.6	6.0	1	2	2	4	SS-1	25%		**ALLUVIAL** BROWN AND TAN, FINE TO COARSE SILTY SAND (A-2-4)
	867.1	8.5	4	2	2	4		Sat.		
865										863.6 / 12.0
	862.1	13.5	1	2	3	5		Sat.		**RESIDUAL** TAN, SILTY SAND (A-2-4) WITH TRACE MICA, SAPROLITIC
860										
	857.1	18.5	2	3	6	9		W		855.6 / 20.0

Boring Terminated at Elevation 855.6 ft in Residual: A-2-4

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. TS-2	**STATION** 21+51	**OFFSET** 1 ft RT	**ALIGNMENT** -DET-
COLLAR ELEV. 876.6 ft	**TOTAL DEPTH** 20.0 ft	**NORTHING** 573,577	**EASTING** 1,068,679
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/26/18	**COMP. DATE** 09/26/18	**SURFACE WATER DEPTH** N/A

GROUND WTR (ft)	
0 HR.	2.0
24 HR.	FIAD

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
880											
										876.6 GROUND SURFACE	0.0
875										**ARTIFICIAL FILL** COBBLES AND BOULDERS (A-1-a) WITH SANDY SILT	
	873.1	3.5	2	1	2	3		M		873.6	3.0
										BROWN, SILTY SAND (A-2-4) WITH SOME COBBLES AND GRAVEL	
870	870.6	6.0	2	2	1	3		Sat.		871.1	5.5
	868.1	8.5	2	1	1	2	SS-2	32%		**ALLUVIAL** TAN, FINE TO COARSE SILTY SAND (A-2-4) 867.1	9.5
865										TAN AND GRAY, FINE SANDY CLAYEY SILT (A-5) WITH TRACE MICA 864.6	12.0
	863.1	13.5	6	4	3	7		Sat.		TAN, FINE TO COARSE SAND (A-1-b) WITH TRACE GRAVEL	
860											
	858.1	18.5	3	3	5	8		W		857.1	19.5
										856.6 **RESIDUAL** TAN AND WHITE, SILTY SAND (A-2-4) WITH TRACE MICA, SAPROLITIC	20.0

Boring Terminated at Elevation 856.6 ft in Residual: A-2-4

NCDOT BORE SINGLE 416653D_GEO_BRDG0029.GPJ NC_DOT.GDT 12/11/18

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. R-1	**STATION** 15+08	**OFFSET** 2 ft RT	**ALIGNMENT** -DET-	**0 HR.** Dry
COLLAR ELEV. 901.4 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 573,703	**EASTING** 1,068,050	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/27/18	**COMP. DATE** 09/27/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. ft / DEPTH ft)
905										
										901.4 GROUND SURFACE: 0.3' TOPSOIL 0.0
900	900.4	1.0	4	7	8	15		M		**RESIDUAL** RED-BROWN, SANDY SILT (A-4) WITH LITTLE MICA
	897.9	3.5	5	4	5	9		M		898.4 3.0 RED-TAN, SILTY SAND (A-2-4) WITH LITTLE MICA
895	895.4	6.0	2	4	4	8		M		
	892.9	8.5	2	3	4	7		M		891.4 10.0
										Boring Terminated at Elevation 891.4 ft in Residual: A-2-4

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. R-2	**STATION** 17+00	**OFFSET** CL	**ALIGNMENT** -DET-	**0 HR.** Dry
COLLAR ELEV. 890.3 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 573,648	**EASTING** 1,068,234	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/27/18	**COMP. DATE** 09/27/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
895											
890										890.3 GROUND SURFACE: 0.3' TOPSOIL	0.0
	889.3	1.0	2	3	3	6		M		**RESIDUAL** RED-BROWN, SANDY SILTY CLAY (A-7)	
	886.8	3.5	2	5	6	11		M			
885	884.3	6.0	4	5	6	11		M		884.8 RED-TAN, CLAYEY SANDY SILT (A-4)	5.5
	881.8	8.5	3	7	8	15		M		880.3	10.0

Boring Terminated at Elevation 880.3 ft in Residual: A-4

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. R-3	**STATION** 19+00	**OFFSET** CL	**ALIGNMENT** -DET-	**0 HR.** Dry
COLLAR ELEV. 880.3 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 573,614	**EASTING** 1,068,431	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/27/18	**COMP. DATE** 09/27/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
885											
880										880.3 GROUND SURFACE: 0.3' TOPSOIL	0.0
	879.3	1.0	3	2	3	5		M		**ARTIFICIAL FILL** BROWN, FINE SANDY CLAYEY SILT (A-5) WITH TRACE ROOTS	
	876.8	3.5	2	3	4	7	SS-3	38%		877.3 **ALLUVIAL** TAN, BROWN, AND GRAY, SILTY CLAY (A-7-5) WITH TRACE SAND AND ORGANICS	3.0
875	874.3	6.0	1	2	2	4		M			
	871.8	8.5	WOH	WOH	WOH	0		W		870.3 Boring Terminated at Elevation 870.3 ft in Alluvial: A-7-5	10.0

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. R-4	**STATION** 23+50	**OFFSET** CL	**ALIGNMENT** -DET- / **0 HR.** Dry
COLLAR ELEV. 882.7 ft	**TOTAL DEPTH** 15.0 ft	**NORTHING** 573,550	**EASTING** 1,068,876 / **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/26/18	**COMP. DATE** 09/26/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
885										
										882.7 GROUND SURFACE: 0.3' TOPSOIL 0.0
	881.7	1.0								**ARTIFICIAL FILL**
880			2	2	3	5		M		RED-BROWN, SILTY SAND (A-2-4) WITH SOME MICA
	879.2	3.5								879.7 3.0
			1	2	2	4	SS-4	54%		**ALLUVIAL**
	876.7	6.0								TAN-BROWN AND DARK GRAY, SILTY CLAY (A-7-5) WITH FINE SAND AND TRACE ORGANICS
875			2	1	1	2		M		
	874.2	8.5								
			1	2	2	4		W		
870										870.7 12.0
	869.2	13.5								GRAY, SILTY SAND (A-2-4) WITH TRACE MICA AND ORGANICS
			1	4	2	6		W		867.7 15.0
										Boring Terminated at Elevation 867.7 ft in Alluvial: A-2-4

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. R-5	**STATION** 25+47	**OFFSET** 15 ft RT	**ALIGNMENT** -DET- — **0 HR.** Dry
COLLAR ELEV. 895.9 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 573,521	**EASTING** 1,069,072 — **24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/26/18	**COMP. DATE** 09/26/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT (0 25 50 75 100)	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
900										
895										895.9 GROUND SURFACE: 0.3' TOPSOIL 0.0
	894.9	1.0	4	8	6	14	S-1	M		**RESIDUAL** RED-BROWN AND TAN, SANDY SILTY CLAY (A-7-5) WITH TRACE MICA
	892.4	3.5	3	4	4	8		M		
890	889.9	6.0	4	4	3	7		M		
	887.4	8.5	3	3	3	6		M		885.9 10.0

Boring Terminated at Elevation 885.9 ft in Residual: A-7-5

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GEOTECHNICAL BORING REPORT
BORE LOG

WBS 41665.3D	**TIP** FA-740029	**COUNTY** POLK	**GEOLOGIST** D. GOODNIGHT
SITE DESCRIPTION BRIDGE NO. 29 ON NC 9 OVER SOUTH BRANCH OF WHITE OAK CREEK			**GROUND WTR (ft)**
BORING NO. R-6	**STATION** 27+50	**OFFSET** 11 ft RT	**ALIGNMENT** -DET-	**0 HR.** Dry
COLLAR ELEV. 903.8 ft	**TOTAL DEPTH** 10.0 ft	**NORTHING** 573,522	**EASTING** 1,069,275	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 87% 03/19/2018		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER R. TOOTHMAN	**START DATE** 09/27/18	**COMP. DATE** 09/27/18	**SURFACE WATER DEPTH** N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
905										903.8 GROUND SURFACE: 0.3' TOPSOIL	0.0
	902.8	1.0								**RESIDUAL**	
			1	2	3	5		M		RED AND TAN, SILTY SAND (A-2-4)	
900	900.3	3.5									
			2	3	4	7		M			
	897.8	6.0									
			2	3	4	7		M			
895	895.3	8.5								895.8	8.0
			3	3	3	6		M		TAN, SANDY SILT (A-4) 893.8	10.0

Boring Terminated at Elevation 893.8 ft in Residual: A-4

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FALCON ENGINEERING

LABORATORY TEST RESULTS

Bridge 29 on NC9 - Little White Oak Cr.
Polk County, NC

Falcon Engineering Project No: G18032.00

SAMPLE		DEPTH	AASHTO	ATTERBERG LIMITS		PERCENT BY WEIGHT				PERCENT PASSING SIEVE			MOISTURE	BULK DENSITY	ORGANICS
NO.	LOCATION	INTERVAL	CLASS.	LL	PI	C.SAND	F.SAND	SILT	CLAY	#10	#40	#200	(%)	(pcf)	(%)
SS-1	TS-1	6.0-7.5	A-2-4(0)	24	0	64	25	1	10	98	59	13	25	N/A	N/A
SS-2	TS-2	8.5-10.0	A-2-4(0)	24	4	14	56	11	19	100	98	35	32	N/A	N/A
SS-3	R-3	3.5-5.0	A-7-5(25)	60	29	9	15	23	53	100	94	79	38	N/A	N/A
SS-4	R-4	3.5-5.0	A-7-5(43)	76	38	4	6	24	66	100	98	92	54	N/A	N/A
BS-1	R-5 (BULK)	1.0-7.0	A-7-5(4)	46	12	32	23	15	30	100	78	49	23	N/A	N/A

Reviewed By
Patrick Clark

Certification: 105-01-0803

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PHOTOGRAPH TAKEN FROM NEAR THE EAST SIDE OF EXISTING BRIDGE
LOOKING WEST TOWARDS END BENT ONE

PHOTOGRAPH TAKEN FROM APPROXIMATELY 30 FEET RIGHT OF THE ALIGNMENT
LOOKING DOWNSTREAM TOWARDS THE EXISTING STRUCTURE

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
RALEIGH, NC 27607
PHONE: 919.871.0800

SITE PHOTOGRAPHS

BRIDGE NO. 29 ON NC 9 OVER SOUTH
BRANCH OF LITTLE WHITE OAK CREEK
POLK COUNTY, NORTH CAROLINA
WBS.: 41665.3D TIP.: FS-740029
FALCON PROJECT NO.: G18032.00