REFERENCE: BR-0097

PROJECT: 67097

SEE SHEET 3 FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	PLAN	PROFILE
-L-	19+50.00 TO 45+00.00	4-6	N/A

CROSS SECTIONS

LINE	STATION	SHEETS
-L-	20+50 TO 44+50	7-25

APPENDICES

APPENDIX	TITLE	SHEETS
A	LABORATORY RESULTS	26-27

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

ROADWAY SUBSURFACE INVESTIGATION

COUNTY *ROCKINGHAM*

PROJECT DESCRIPTION *REPLACE BRIDGE 178 ON SR 1929 OVER US 29*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR-0097	1	29

CAUTION NOTICE

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

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

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO 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 ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

PERSONNEL

D. KUBINSKI

TRIGON EXPLORATION

INVESTIGATED BY *D. KUBINSKI*

DRAWN BY *T. WELLS*

CHECKED BY *D. KUBINSKI*

SUBMITTED BY *KLEINFELDER, INC.*

DATE *MAY 2022*

Prepared in the Office of:

KLEINFELDER
Bright People. Right Solutions.
422 GALLIMORE DAIRY ROAD, SUITE B
GREENSBORO, NORTH CAROLINA 27409
NC ENGINEERING FIRM LICENSE NO. F-1312

NORTH CAROLINA PROFESSIONAL SEAL 046042 ENGINEER DANIEL H. KUBINSKI

DocuSigned by:
Daniel H. Kubinski, PE 5/03/2022
AB2F7FFB7984411...
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
BR-0097	2

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 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 #40 #200	50 MX 30 MX 15 MX		50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX			— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
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)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
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
- [X] B-57 MOBILE
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

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 ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

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

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

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

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

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

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

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

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

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

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

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN 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: SEE NOTES

ELEVATION: N/A FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

ROADWAY BORING ELEVATIONS TAKEN FROM PROJECT TIN FILE BR0097_LS_TIN.TIN RECEIVED ON FEBRUARY 10, 2022.

BRIDGE BORINGS ELEVATIONS WERE SURVEYED BY SEPI, INC. WITH A SUB-CENTIMETER GPS.

DATE: 8-15-14

09/08/99

TIP PROJECT: BR–0097

CONTRACT:

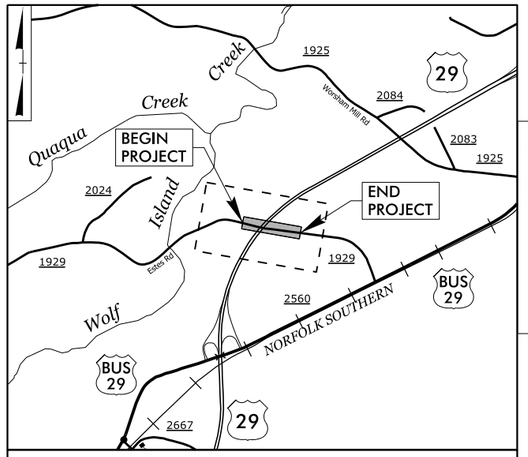
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ROCKINGHAM COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BR–0097	3	29
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
67097.1.1	N/A	PE	

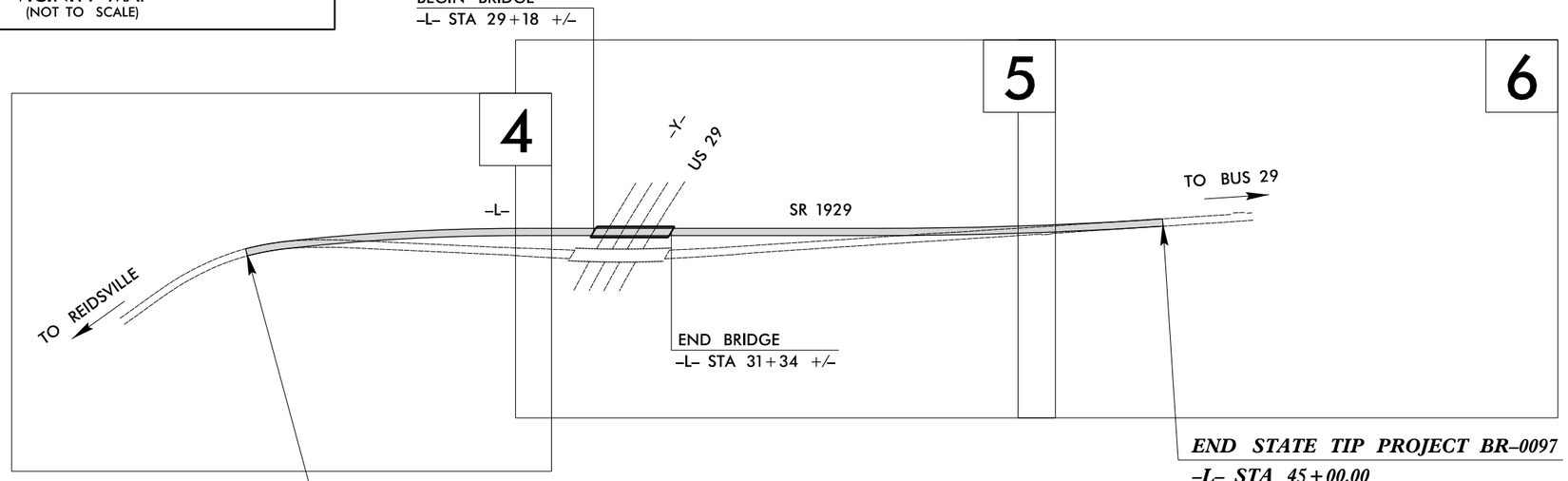
LOCATION: BRIDGE NO. 780178 ON SR 1929 (ESTES RD) OVER US 29

TYPE OF WORK: PAVING, GRADING, DRAINAGE, AND STRUCTURES



VICINITY MAP
(NOT TO SCALE)

25% PLANS



BEGIN STATE TIP PROJECT BR–0097
–L– STA 19+50.00

END STATE TIP PROJECT BR–0097
–L– STA 45+00.00

THERE IS NO CONTROL OF ACCESS ON THIS PROJECT.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II

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

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2023 = 240
ADT 2043 = 340
K = TBD %
D = TBD %
T = TBD % *
V = 60 MPH
* TTST =% DUAL %
FUNC CLASS =
LOCAL –
SUB–REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT BR–0097	=	0.442
LENGTH STRUCTURE TIP PROJECT BR–0097	=	0.041
TOTAL LENGTH TIP PROJECT BR–0097	=	0.483

Prepared for NCDOT In the Office of:
moffatt & nichol
4700 FALLS OF NEUSE ROAD, SUITE 300
RALEIGH, NORTH CAROLINA 27609
(919) 781-4626 VOICE (919) 781-4869 Fax
NC License NO.: F-0105

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
MAY 24, 2022

LETTING DATE:
MAY 16, 2023

TRENT HUFFMAN, P.E.
PROJECT ENGINEER

PAUL SCHULKEN, P.E.
PROJECT DESIGN ENGINEER

DAVID STUTTS, P.E.
NCDOT CONTACT

HYDRAULICS ENGINEER
moffatt & nichol
P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER
moffatt & nichol
P.E.
SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

5/27/2022
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TWells

May 27, 2022

STATE PROJECT: 67097.1.1 (BR-0097)
COUNTY: Rockingham
DESCRIPTION: Replace Bridge 780178 on SR 1929 over US 29

SUBJECT: GEOTECHNICAL REPORT - INVENTORY

PROJECT DESCRIPTION

This project consists of the realignment of SR 1929 (-L-) and replacement of Bridge No. 178 over US 29 (-Y-). At the project location, SR 1929 is a two-lane road consisting of one lane in each direction. Additionally, at the project location, US 29 is a four-lane road consisting of two lanes in both the northbound and southbound direction separated by a grass median. For replacement Bridge No. 178, fill slopes (measured from toe of slope to fill face grade point) will be approximately 24 feet and 34 feet tall at end bent no. 1 and end bent no. 2, respectively. Maximum cut and fill heights to achieve finished grade are anticipated to be approximately and 5 feet and 19 feet, respectively.

The geotechnical investigation was conducted in March and April 2022. Standard Penetration Test borings were advanced with a CME-55 drill rig with an automatic hammer. Hand Augers were also performed in areas where the use of a drill rig was restricted, or underground utility conflicts were observed. Representative soil samples were collected for visual classification in the field and selected samples were submitted for laboratory analysis by Kleinfelder, Inc and Geotechnics.

The following alignments, totaling 0.48 miles, were investigated. Plan sheets and cross sections of these alignments are included in this report.

LINE	STATIONS
-L-	19+50 to 45+00

PHYSIOGRAPHY AND GEOLOGY

The project is located in the Piedmont Physiographic Province. The project corridor is comprised primarily of residential and rural properties. The general topography along the project is flat to gently sloping.

Geologically, the project is located within the Milton Belt typically consisting of gneiss, schist, and metamorphosed intrusive rocks. Generally, the rocks of the Milton Belt are interpreted to have been part of a chain of volcanic islands. Specifically, two formations mapped within the Milton Belt at the site include Felsic Mica Gneiss (CZfg) and Biotite Gneiss and Schist (CZbg).

Surface water is drained from the corridor by the existing roadway ditches.

SOIL PROPERTIES

Soils encountered during this investigation are separated into two categories based on origin. They consist of roadway embankment and residual soil.

Roadway embankment is present along the proposed roadway on the project. The roadway embankment encountered generally consist of moist, soft to medium stiff, slightly to moderately plastic, clayey silts (A-5), silty clays (A-7) with trace gravel and mica and dry to moist, loose, non plastic, silty, fine to coarse sands (A-2-4) with trace gravel. The plasticity index of the roadway embankment silty clay (A-7) tested was 19.

The onsite residual soils are the product of the in-place chemical and mechanical weathering of the parent bedrock, and oftentimes maintain the same layering and lineation of the parent bedrock. Residual soils are derived from the weathering of underlying metamorphic rock consisting of Gneiss and Schist. The majority of the residual soil encountered consist of moist to saturated, soft to very stiff, slightly to highly plastic, clayey silts (A-5) and silty clays (A-7-5) with trace mica, moist to saturated, soft to hard, non plastic, coarse to fine sandy silts (A-4) with trace to little mica, and saturated, medium dense to very dense, non plastic, silty, coarse to fine and fine to coarse sands (A-2-4) with trace mica. The plasticity index of the residual sandy silts (A-4) tested were non-plastic. The plasticity index of the residual silty clays (A-7-5) tested ranged from 11 to 32.

ROCK PROPERTIES

Weathered rock was encountered along the proposed roadway (-L-) at elevations ranging from 552.8 to 565.6 feet (MSL). The weathered rock consists of Gneiss and Schist.

GROUNDWATER

Groundwater was encountered at elevations ranging from 598.2 to 607.1 feet. Typically, the groundwater depth is 9.5 feet below the existing ground surface on US-29 (-Y-) and ranges from 30.0 to 32.0 feet below the existing ground surface on SR 1929 (-L-), where encountered.

AREAS OF SPECIAL GEOTECHNICAL INTEREST

1) Highly Plastic Clays: Highly plastic clays (PI > 25) were encountered on the project at the following locations:

LINE	STATIONS	OFFSETS
-L-	36+00 to 40+00	LT to RT
-L-	42+00 to 44+00	LT to RT

Prepared by,

KLEINFELDER, INC.
NC License No. F-1312

Thomas R. Wells, PE
Senior Professional

Daniel H. Kubinski, PE
Project Professional

TRW/DHK:asp

KLEINFELDER 422 Gallimore Dairy Road, Suite B, Greensboro NC, 27409 p | 336.668.0093

Undisturbed Samples

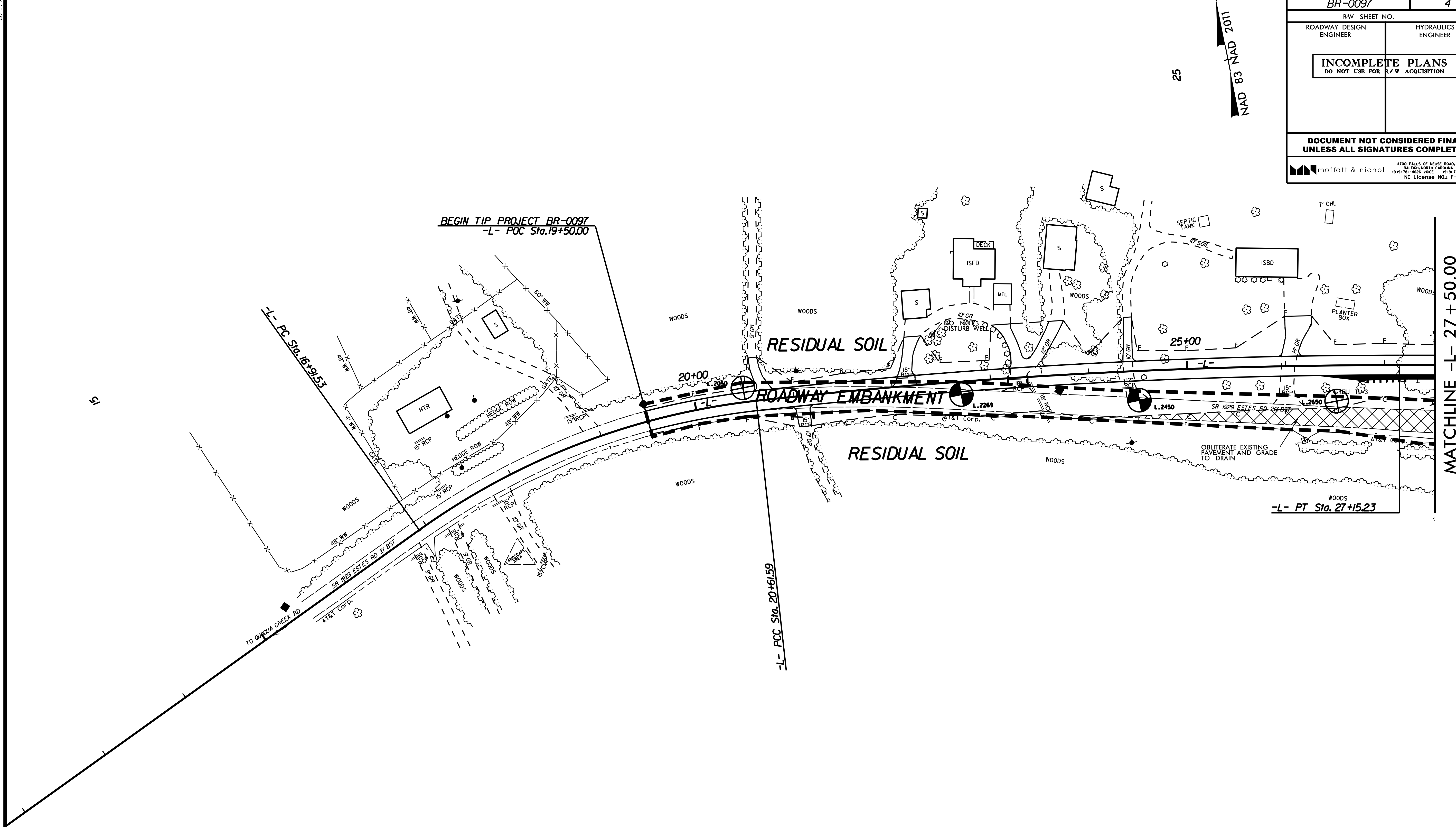
Sample No.	Alignment	Station No.	Offset	Depth (ft)	Tests Performed
ST-1	-L-	28+83	7’ LT	31.0 - 33.0	Consolidation, CU Triaxial
ST-2	-L-	28+62	20’ RT	21.0 - 23.0	N/A

PROJECT REFERENCE NO.	SHEET NO.
BR-0097	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

moffatt & nichol
4700 FALLS OF NEUSE ROAD, SUITE 300
RALEIGH, NORTH CAROLINA 27609
(919) 781-4626 VOICE (919) 781-4869 FAX
NC License NO.: F-0105



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PROJECT REFERENCE NO.	SHEET NO.
BR-0097	5
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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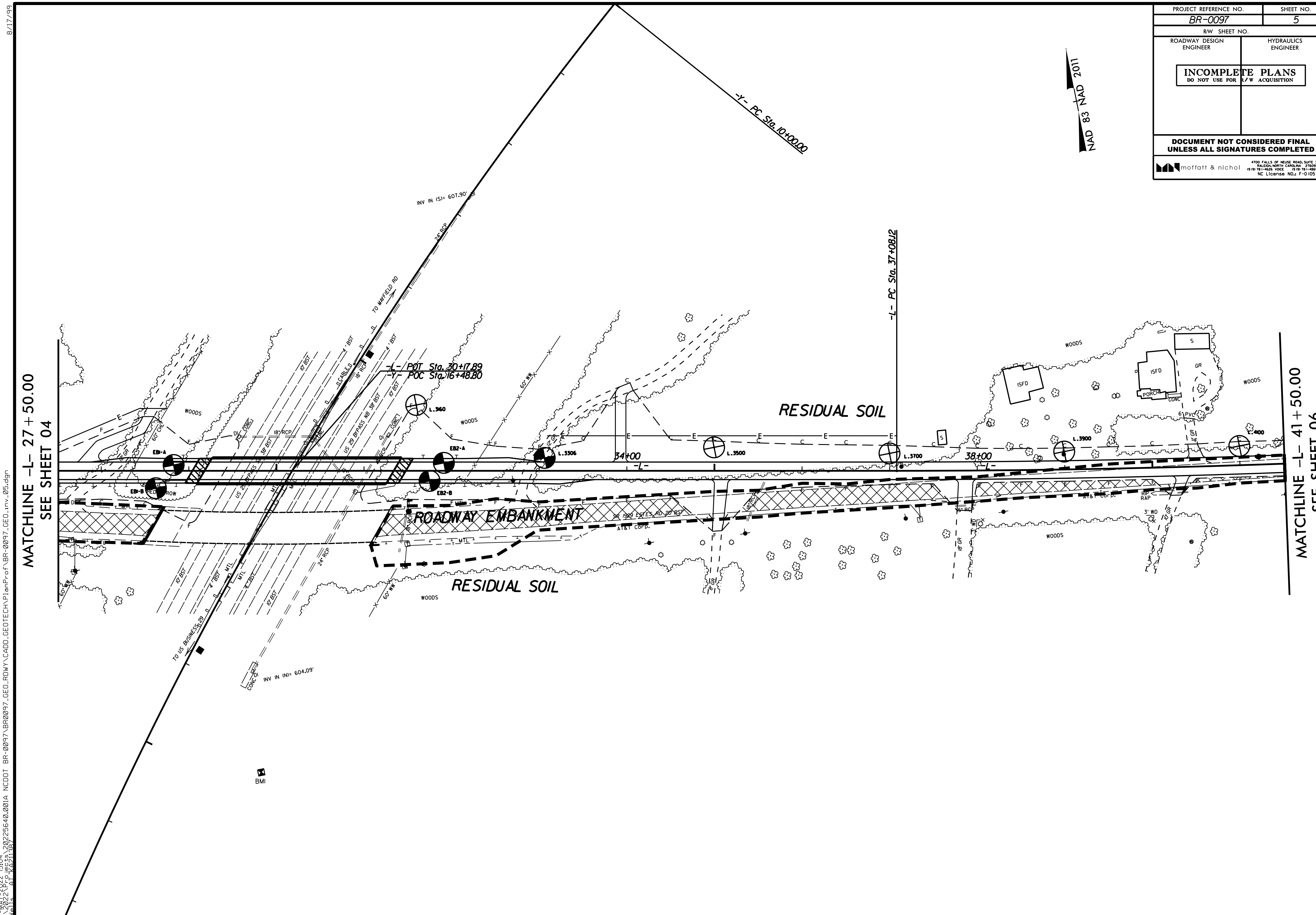

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PROJECT REFERENCE NO.	SHEET NO.
BR-0097	6

R/W SHEET NO.

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

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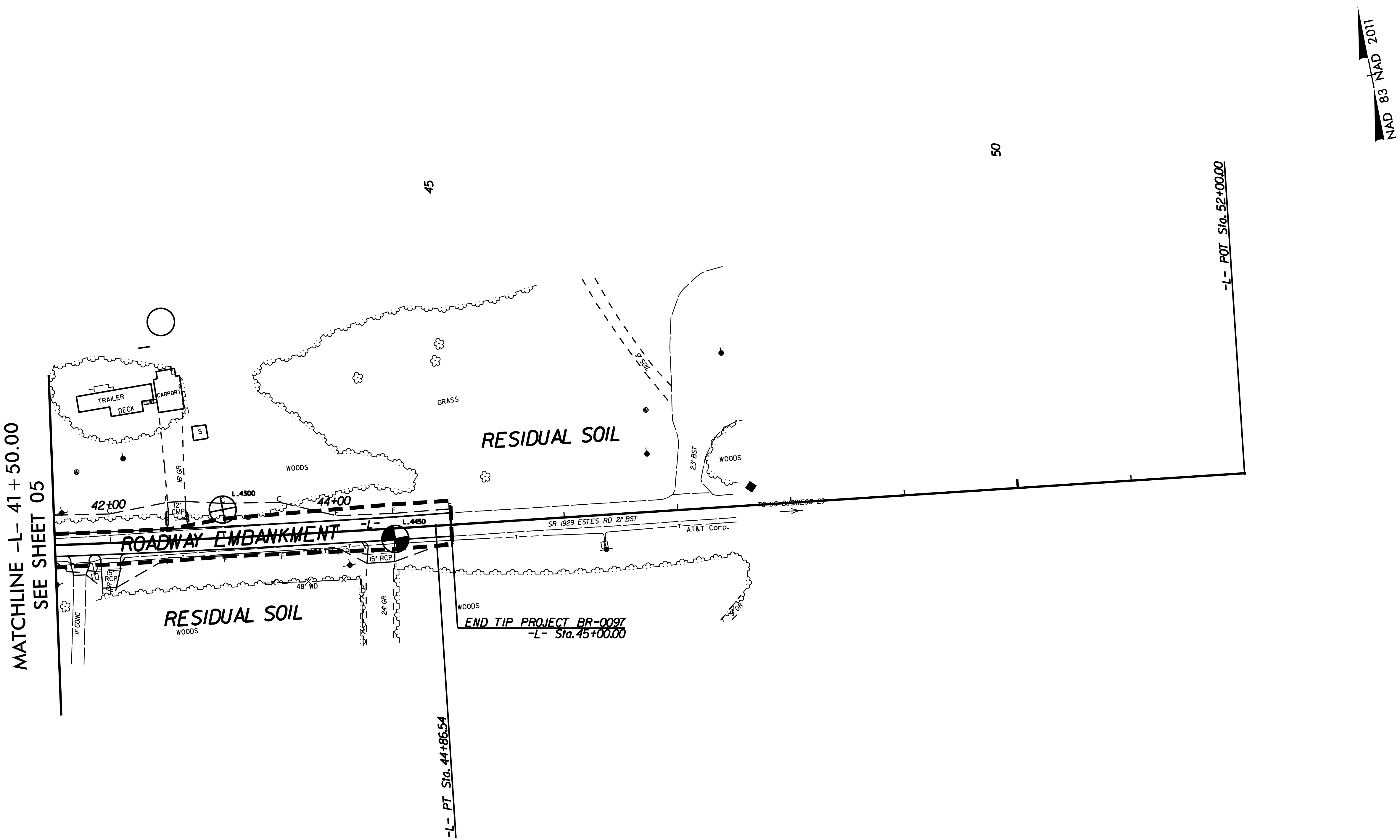

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TWells AT KA211387

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

620 610 600 590 580 570 560 550 540 530 520 510 500 490 480

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** MOIST, MEDIUM STIFF, REDDISH BROWN, SILTY CLAY (A-7) WITH TRACE GRAVEL

Ⓒ **ROADWAY EMBANKMENT:** MOIST, LOOSE, BROWN, SILTY, FINE TO COARSE SAND (A-2-4)

TIE TO EXISTING GROUND
SEE PLANS FOR EXACT LOCATION

DRIVEWAY

L_2050
20+50
15' LT

15% 25% 15% 10% 0.22% 2:1 2:1

Ⓑ Ⓒ Ⓐ

RESIDUAL:
MOIST, MEDIUM STIFF, REDDISH YELLOW TO RED, SILTY CLAY (A-7) TO CLAYEY SILT (A-5) TO COARSE TO FINE SANDY SILT (A-4) WITH TRACE TO LITTLE MICA

DRY
03/22

20+50.00

—L—

6/23/16

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Wells AT KA21387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	8

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

620 610 600 590 580 570 560 550 540 530 520 510 500 490

(A) **ROADWAY EMBANKMENT:** PAVEMENT

(B) **ROADWAY EMBANKMENT:** DRY, LOOSE, YELLOW, SILTY, FINE TO COARSE SAND (A-2-4) WITH TRACE GRAVEL

SS-1
L 2269
22+69
13' RT

2:1 3:1 3:1

19
9
4

B-1
DRY
03/22

RESIDUAL: MOIST, STIFF TO VERY STIFF TO SOFT, RED TO BROWN TO YELLOWISH BROWN, SILTY CLAY (A-7-5) TO COARSE TO FINE SANDY SILT (A-4) WITH TRACE MICA

22+50.00

—L—

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	9

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

630 620 610 600 590 580 570 560 550 540 530 520 510 500

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** DRY, LOOSE, YELLOW, SILTY, FINE TO COARSE SAND (A-2-4)
DRIVEWAY

RESIDUAL: MOIST, MEDIUM STIFF TO VERY STIFF, BROWN TO RED TO REDDISH BROWN, TO OLIVE, SILTY CLAY (A-7-5) TO COARSE TO FINE SANDY SILT (A-4) WITH TRACE TO LITTLE MICA

9.0% 15% 3% 2%

SS-2
L 2450
22+69
30' RT

Ⓐ Ⓑ

3.7' 3.1'

8 20 16 12

BT
DRY
03/22

24+50.00

—L—

6/23/16

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Wells AT KRZ11387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	10

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

640 630 620 610 600 590 580 570 560 550 540 530 520 510

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓐ **ROADWAY EMBANKMENT:** MOIST, SOFT, RED, CLAYEY SILT (A-5) WITH TRACE MICA AND GRAVEL

RESIDUAL: MOIST, SOFT, RED, SILTY CLAY (A-7-5)

S-3
S-4
L 2650
26+50
36' RT

Ⓐ Ⓑ

2:1 2:1

BT
DRY
03/22

26+50.00

—L—

6/23/16

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wells AT KA21387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	11

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

650 640 630 620 610 600 590 580 570 560 550 540 530 520 510

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

Ⓒ **RESIDUAL:** MOIST TO SATURATED, SOFT TO VERY STIFF, RED TO REDDISH YELLOW TO YELLOWISH BROWN, SILTY CLAY (A-7) AND COARSE TO FINE SANDY SILT (A-4)

Ⓓ **RESIDUAL:** SATURATED, MEDIUM DENSE TO VERY DENSE, OLIVE, BROWN, AND GREENISH GRAY, SILTY, COARSE TO FINE SAND (A-2-4) WITH TRACE MICA

EBI-B
28+62
20' RT

2:1 3:1 3:1

Ⓐ Ⓑ

ST-2

8 9 6 4 4 6 6 9 12 16 19 24 23 60 47 100/0.3 100/0.8 100/0.7

04/22

Ⓒ

Ⓓ

WEATHERED ROCK: YELLOWISH BROWN TO OLIVE GRAY AND YELLOWISH BROWN GNEISS

28+50.00

—L—

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	12

Ⓐ **RESIDUAL:** MOIST TO SATURATED,MEDIUM STIFF TO VERY STIFF,BROWN TO RED TO REDDISH YELLOW TO YELLOWISH BROWN TO OLIVE,SILTY CLAY (A-7) AND COARSE TO FINE SANDY SILT (A-4)WITH TRACE TO LITTLE MICA

Ⓑ **RESIDUAL:** SATURATED,DENSE TO VERY DENSE,OLIVE TO YELLOWISH BROWN AND GREENISH GRAY TO OLIVE AND WHITE,SILTY,COARSE TO FINE SAND (A-2-4)

Ⓒ **WEATHERED ROCK:** PALE OLIVE GNEISS

EBI-A
28+83
7' LT

2:1

2:1

14
14
8
6
7
5
7
04/22
ST-1
8
8
15
19
42
76
79
100/0.9
23
100/0.9
100/0.8
BT

Ⓐ

Ⓑ

Ⓒ

WEATHERED ROCK: YELLOWISH BROWN GNEISS

29+00.00

650 640 630 620 610 600 590 580 570 560 550 540 530 520 510

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

6/23/16

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Wells AT KRZ1387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	13

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

2:1

2:1

Ⓐ

Ⓑ

L 3160
31+60
75' LT

BT
DRY
03/22

RESIDUAL: MOIST, SOFT TO MEDIUM STIFF, YELLOWISH BROWN, COARSE TO FINE SANDY SILT (A-4) WITH TRACE MICA

31 + 50.00

650 640 630 620 610 600 590 580 570 560 550 540 530 520 510 500

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	14

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

Ⓒ **RESIDUAL:** MOIST TO SATURATED, MEDIUM STIFF TO HARD, RED TO REDDISH YELLOW TO YELLOWISH BROWN TO OLIVE TO OLIVE YELLOW TO OLIVE, SILTY CLAY (A-7), CLAYEY SILT (A-5) AND COARSE TO FINE SANDY SILT (A-4) WITH TRACE TO LITTLE MICA

Ⓓ **RESIDUAL:** SATURATED, DENSE TO VERY DENSE, OLIVE, SILTY, COARSE TO FINE SAND (A-2-4) WITH TRACE MICA

Ⓔ **RESIDUAL:** SATURATED, VERY DENSE, OLIVE, SILTY, FINE TO COARSE SAND (A-2-4) WITH TRACE MICA

WEATHERED ROCK: OLIVE, GREENISH BLACK TO OLIVE YELLOW SCHIST

SS-9 — EB2-A 31+91 9' LT — 2:1 — 04/22 — BT

SS-10 — EB2-B 31+75 12' RT — 2:1 — 03/22 — BT

32+00.00

—L—

6/23/16

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Wells AT KAZI387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	15

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

670 660 650 640 630 620 610 600 590 580 570 560 550 540 530

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

SS-11
L 3306
33+06
15' LT

2:1

2.50:1

Ⓐ Ⓑ

9
10
7
7

RESIDUAL: MOIST, STIFF TO MEDIUM STIFF, RED TO YELLOWISH BROWN, SILTY CLAY (A-7-5) TO CLAYEY SILT (A-5)

DT
DRY
03/22

33+00.00

—L—

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Wells AT KA21138

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

680 670 660 650 640 630 620 610 600 590 580 570 560 550 540

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

2:1

3:1

3:1

RESIDUAL: MOIST, STIFF TO MEDIUM STIFF, REDDISH BROWN TO ORANGE TO REDDISH YELLOW, SILTY CLAY (A-7-5) AND CLAYEY SILT (A-5)

35 + 50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

SR 1142 DRIVEWAY

L 3500
35+00
27 LT

DRIVEWAY

8%

2:1

15

3:1

3:1

8%

TIE TO EXISTING GROUND
SEE PLANS FOR EXACT LOCATION

RESIDUAL: MOIST, STIFF TO MEDIUM STIFF, REDDISH BROWN TO ORANGE TO REDDISH YELLOW, SILTY CLAY (A-7-5) AND CLAYEY SILT (A-5)

BT
BRH
03/22

35 + 00.00

—L—

6/23/16

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Wells AT KRZ1387

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	17

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

680
670
660
650
640

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

3:1 3:1 2:1 Ⓒ Ⓐ Ⓑ

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7)

36 + 50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

3:1 3:1 2:1 Ⓒ Ⓐ Ⓑ

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7)

36 + 00.00

-L-

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Wells AT KRZ1387

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

680 670 660 650 640 630 620 610 600 590 580 570 560 550 540

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

2:1 3:1 3:1 Ⓒ Ⓐ Ⓑ

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7)

37 + 50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

S-13
L -3700
37+00
20' LT

2:1 3:1 3:1 Ⓒ Ⓐ Ⓑ

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7)

60'
DRY
03/22

37 + 00.00

—L—

6/23/16
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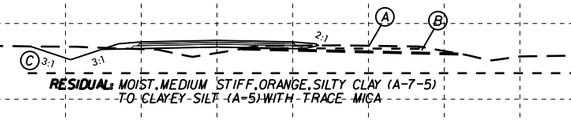
wells AT KA21387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	19

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

680
670
660
650
640

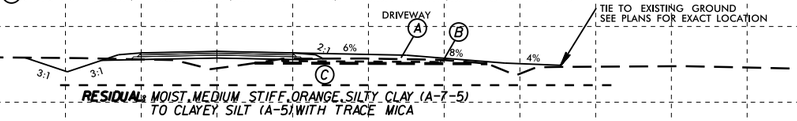
Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)



RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7-5) TO CLAYEY SILT (A-5) WITH TRACE MICA

38 + 50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)



RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7-5) TO CLAYEY SILT (A-5) WITH TRACE MICA

38 + 00.00

$-L-$

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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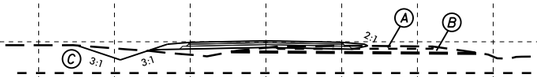
Wells AT KRZ11387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	20

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

680 670 660 650 640 630 620 610 600 590 580 570 560 550

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

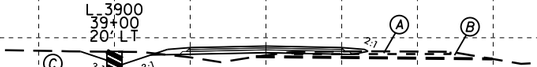


RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7-5) TO CLAYEY SILT (A-5) WITH TRACE MICA

39 + 50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

S-14
S-15
L 3900
39+00
20' LT



RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7-5) TO CLAYEY SILT (A-5) WITH TRACE MICA

BY
DRY
03/22

39 + 00.00

—L—

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	21

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

680
670
660
650
690
680
670
660
650

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)

DRIVEWAY DRIVEWAY

TIE TO EXISTING GROUND
SEE PLANS FOR EXACT LOCATION

2% 2:1 Ⓐ Ⓑ 2:1 5.50%

RESIDUAL: MOIST, MEDIUM STIFF, REDDISH BROWN TO ORANGE, SILTY CLAY (A-7-5) TO COARSE TO FINE SANDY SILT (A-4) WITH TRACE MICA

40+50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, REDDISH BROWN, SILTY CLAY (A-7-5)

Ⓐ 2:1 Ⓑ
Ⓒ 3:1 3:1

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7-5) TO CLAYEY SILT (A-5) WITH TRACE MICA

40+00.00

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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Wells AT KRZ1387

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	22

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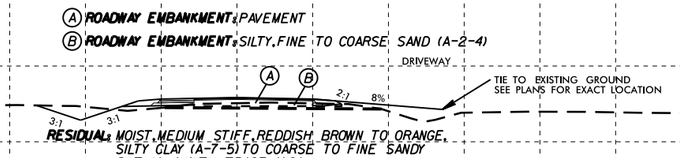
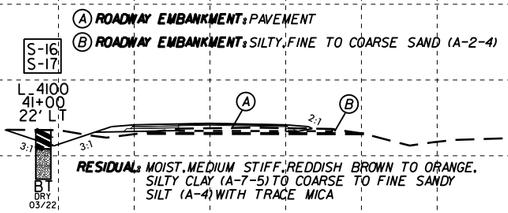
690 680 670 660 650 640 630 620 610 600 590 580 570 560



41+50.00



41+00.00

—L—

6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	23

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

700 690 680 670 660 650

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, RED, SILTY CLAY (A-7-5)

DRIVEWAY

5% 8% 2:1 2:1

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7) TO CLAYEY SILT (A-5)

42 + 50.00

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT
Ⓑ **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
Ⓒ **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, RED, SILTY CLAY (A-7-5)

DRIVEWAY

3:1 3:1 2:1 8% 4%

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7) TO CLAYEY SILT (A-5)

42 + 00.00

— L —

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

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Wells AT KRZ11387

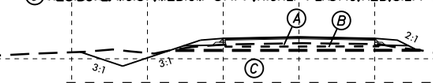
6/23/16

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
	BR-0097	24

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

700 690 680 670 660 650 640 630 620 610 600 590 580 570 560

(A) **ROADWAY EMBANKMENT:** PAVEMENT
(B) **ROADWAY EMBANKMENT:** MOIST, LOOSE, YELLOW, SILTY, FINE TO COARSE SAND (A-2-4), TRACE GRAVEL
(C) **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, RED, SILTY CLAY (A-7-5)

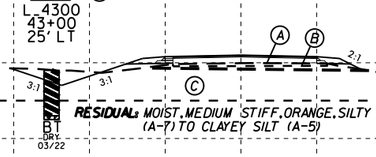


RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7) TO CLAYEY SILT (A-5), TRACE MICA

43+50.00

(A) **ROADWAY EMBANKMENT:** PAVEMENT
(B) **ROADWAY EMBANKMENT:** SILTY, FINE TO COARSE SAND (A-2-4)
(C) **RESIDUAL:** MOIST, MEDIUM STIFF, HIGHLY PLASTIC, RED, SILTY CLAY (A-7-5)

S-18
L 4300
43+00
25' LT



RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7) TO CLAYEY SILT (A-5)

43+00.00

—L—

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Wells AT KA21387

Ⓐ **ROADWAY EMBANKMENT:** PAVEMENT

Ⓑ **ROADWAY EMBANKMENT:** DRY, LOOSE, YELLOW, SILTY, FINE TO COARSE SAND (A-2-4) WITH TRACE GRAVEL

Ⓒ **ROADWAY EMBANKMENT:** MOIST, MEDIUM STIFF, RED, SILTY CLAY (A-7) WITH TRACE MICA

Ⓓ **RESIDUAL:** MOIST, HIGHLY PLASTIC, RED, SILTY CLAY (A-7)

L_4450
44+50
9' RT

DRIVEWAY

TIE TO EXISTING GROUND
SEE PLANS FOR EXACT LOCATION

2:1 2:1 4.50%

Ⓒ Ⓐ Ⓑ Ⓓ 7 13 9 7

RESIDUAL: MOIST, STIFF TO MEDIUM STIFF, RED TO REDDISH BROWN, CLAYEY SILT (A-5) TO COARSE TO FINE SANDY SILT (A-4), TRACE TO LITTLE MICA

B1
DRY
03/22

44+50.00

Ⓐ ROADWAY EMBANKMENT: PAVEMENT

Ⓑ ROADWAY EMBANKMENT: SILTY, FINE TO COARSE SAND (A-2-4)

Ⓒ RESIDUAL: MOIST, MEDIUM STIFF, HIGHLY PLASTIC, RED, SILTY CLAY (A-7-5)

2:1 Ⓐ Ⓑ 2:1

Ⓒ

RESIDUAL: MOIST, MEDIUM STIFF, ORANGE, SILTY CLAY (A-7) TO CLAYEY SILT (A-5)

44+00.00

-L-

6/23/16

27-MAY-2022 15:05
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Wells AT KRZ11387

PROJECT REFERENCE NO.	SHEET NO.
BR–0097	26

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

APPENDIX A
LABORATORY RESULTS

REFERENCE: BR–0097

PROJECT: 67097

Prepared in the Office of:
KLEINFELDER
Bright People. Right Solutions.
422 GALLIMORE DAIRY ROAD, SUITE B
GREENSBORO, NORTH CAROLINA 27409
NC ENGINEERING FIRM LICENSE NO. F-1312

LABORATORY SUMMARY SHEET FOR SOIL SAMPLES

WBS NO. (TIP NO.): 67097.1.1 (BR-0097)
PROJECT ID: 39271
COUNTY: ROCKINGHAM
DESCRIPTION: REPLACE BRIDGE 780178 ON SR 1929 OVER US 29

									Atterberg Limits			Gradation Results							
Sample No.	Boring Number	Alignment	Station	Offset	Sample Depth (ft.)	Natural Moisture Content (%)	AASHTO Class.	N-Value (blows/ ft.)	L.L.	P.L.	P.I.	Retained #4 Sieve	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
SS-1	L_2269	-L-	22+69	13' RT	3.5 - 5.0	31.5	A-7-5	19	68	44	24	1.0	99.0	98.1	86.4	2.9	16.5	19.9	60.6
SS-2	L_2450	-L-	24+50	30' RT	3.5 - 5.0	29.6	A-7-5	20	61	40	21	0.0	98.0	96.2	81.2	5.6	19.2	13.9	61.4
S-3	L_2650	-L-	26+50	36' RT	1.5 - 2.0	32.1	A-7-5	--	50	31	19	2.0	94.0	95.9	80.7	6.2	19.3	18.9	55.6
S-4	L_2650	-L-	26+50	36' RT	4.5 - 5.0	--	A-7-5	--	53	42	11	1.0	97.0	98.1	74.9	3.4	33.9	27.6	35.1
SS-5	B1-A	-L-	30+33	4' LT	13.3 - 14.8	--	A-4	6	NP	NP	NP	0.0	99.0	97.4	62.7	4.9	62.3	18.4	14.3
SS-6	B1-A	-L-	30+33	4' LT	28.3 - 29.8	--	A-4	17	NP	NP	NP	1.0	96.0	89.1	55.0	17.3	38.6	31.8	12.4
SS-7	B1-B	-L-	30+17	25' RT	18.5 - 20.0	--	A-4	7	NP	NP	NP	1.0	98.0	96.1	64.5	7.2	42.4	38.2	12.1
SS-8	B1-B	-L-	30+17	25' RT	38.5 - 40.0	--	A-4	72	NP	NP	NP	3.0	89.0	82.8	42.7	22.4	48.0	19.6	10.0
SS-9	EB2-A	-L-	31+91	9' LT	28.2 - 29.7	--	A-4	7	NP	NP	NP	0.0	98.0	96.3	50.0	9.6	67.5	8.6	14.2
SS-10	EB2-B	-L-	31+75	12' RT	13.4 - 14.9	--	A-4	5	NP	NP	NP	1.0	97.0	96.3	72.6	6.0	33.9	42.0	18.2
SS-11	L_3306	-L-	33+06	15' LT	0.0 - 1.5	--	A-7-5	9	55	35	20	2.0	96.0	96.6	80.3	5.9	15.9	23.0	55.2
S-12	L_3500	-L-	35+00	27' LT	1.0 - 1.5	35.9	A-7-5	--	67	42	25	0.0	98.0	98.7	89.1	2.5	12.6	11.5	73.4
S-13	L_3700	-L-	37+00	20' LT	1.0 - 1.5	39.0	A-7-5	--	62	35	27	0.0	96.0	98.4	87.8	3.3	12.9	19.8	64.0
S-14	L_3900	-L-	39+00	20' LT	0.5 - 1.0	34.7	A-7-5	--	69	38	31	0.0	93.0	98.7	89.4	2.6	11.7	13.9	71.8
S-15	L_3900	-L-	39+00	20' LT	3.5 - 4.0	--	A-7-5	--	63	48	15	0.0	100.0	99.3	83.4	1.9	21.4	27.2	49.5
S-16	L_4100	-L-	41+00	22' LT	1.2 - 1.7	37.9	A-7-5	--	66	50	16	0.0	96.0	98.8	86.2	3.0	15.6	18.4	63.0
S-17	L_4100	-L-	41+00	22' LT	2.5 - 3.0	--	A-4	--	NP	NP	NP	0.0	99.0	97.9	75.7	4.9	26.1	18.0	51.1
S-18	L_4300	-L-	43+00	25' LT	0.7 - 1.2	37.8	A-7-5	--	69	37	32	0.0	99.0	98.8	88.2	2.5	13.7	12.1	71.8
ST-1	EB1-A	-L-	28+83	7' LT	31.0 - 33.0	53.8	A-4	--	NP	NP	NP	0.0	99.9	97.0	49.0	7.9	52.0	23.3	16.8
ST-2	EB1-B	-L-	28+62	20' RT	21.0 - 23.0	50.5	A-7-5	--	64	46	18	0.2	99.8	97.0	70.5	5.4	31.7	39.5	23.4