REFERENCE: B-5716

PROJECT: 45672

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5716	1	

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY ROCKINGHAM

PROJECT DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)

CONTENTS

CAUTION NOTICE

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TRIGON

GOODNIGHT, D.J.

LANE, R.W.

INVESTIGATED BY FALCON ENG.

DRAWN BY HUNSBERGER, W.S.

CHECKED BY CROCKETT, S. C.

SUBMITTED BY FALCON ENG.

DATE MARCH 2024

NORTH CAROLINA PROFESSIONAL SEAL 36283 ENGINEER W. SCOTT HUNSBERGER

DocuSigned by:
W. Scott Hunsberger 4/2/2024
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SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
B-5716	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
MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ_d - UNIT WEIGHT
γ - 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
- [ ] B-57 MOBILE
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [X] -N 02

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] 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: BM-2 -L- 21+73.58, 151.71' LT

ELEVATION: 581.85 FEET

NOTES:

FIAD - FILLED IMMEDIATELY AFTER DRILLING

DATE: 1-XX-17

PROJECT REFERENCE NO.	SHEET NO.
B–5716	2A

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

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.

STRUCTURE

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

DECREASING INTERLOCKING OF ROCK PIECES ⇩

SURFACE CONDITIONS

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

DECREASING SURFACE QUALITY ⇨

90			N/A	N/A
80				
70				
60				
50				
40				
30				
20				
10				
N/A	N/A			

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

- **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.*
- **B.** *Sandstone with thin interlayers of siltstone*
- **C.** *Sandstone and siltstone in similar amounts*
- **D.** *Siltstone or silty shale with sandstone layers*
- **E.** *Weak siltstone or clayey shale with sandstone layers*
- **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*
- **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.***

——— Means deformation after tectonic disturbance

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

VERY GOOD	GOOD	FAIR	POOR	VERY POOR
Very Rough, fresh unweathered surfaces	Rough, slightly weathered surfaces	Smooth, moderately weathered and altered surfaces	Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings

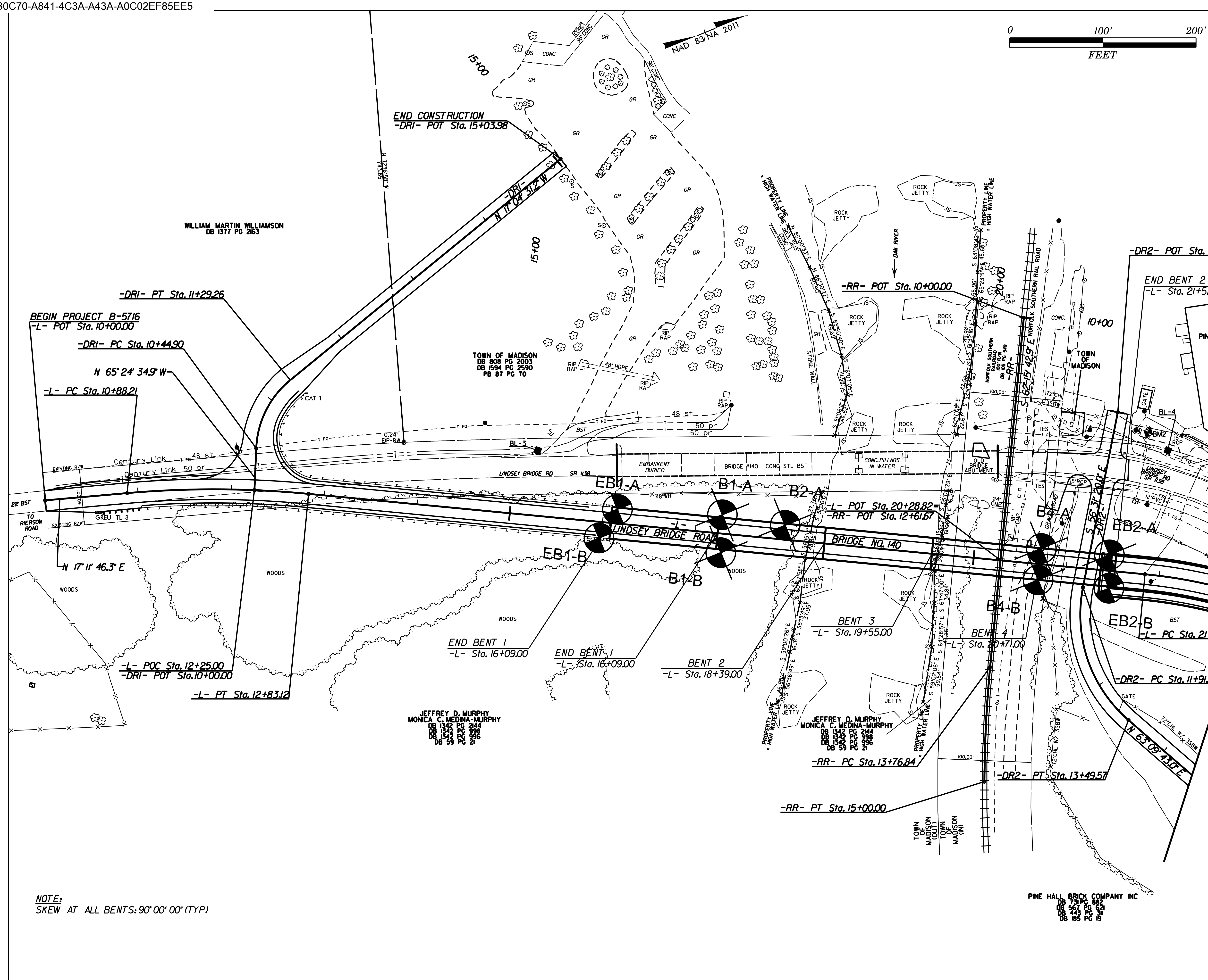
70	A			
60				
50		B	C	D E
40				
30				F
20				
10			G	H

DATE: 8-19-16

PROJECT REFERENCE	SHEET NO.
B-5716 – ROCKINGHAM 140	3
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
MOTT MACDONALD I& E, LLC LICENSE NO. F-0669	MOTT MACDONALD I& E, LLC LICENSE NO. F-0669

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of: MOTT MACDONALD, 7621 Purfoy Rd., Suite 115, Fuquay-Varina, NC 27526, www.mottmac.com



PROJECT REFERENCE	SHEET NO.
B-5716 – ROCKINGHAM 140	4

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

MOTT MACDONALD I & E, LLC
LICENSE NO. F-0669

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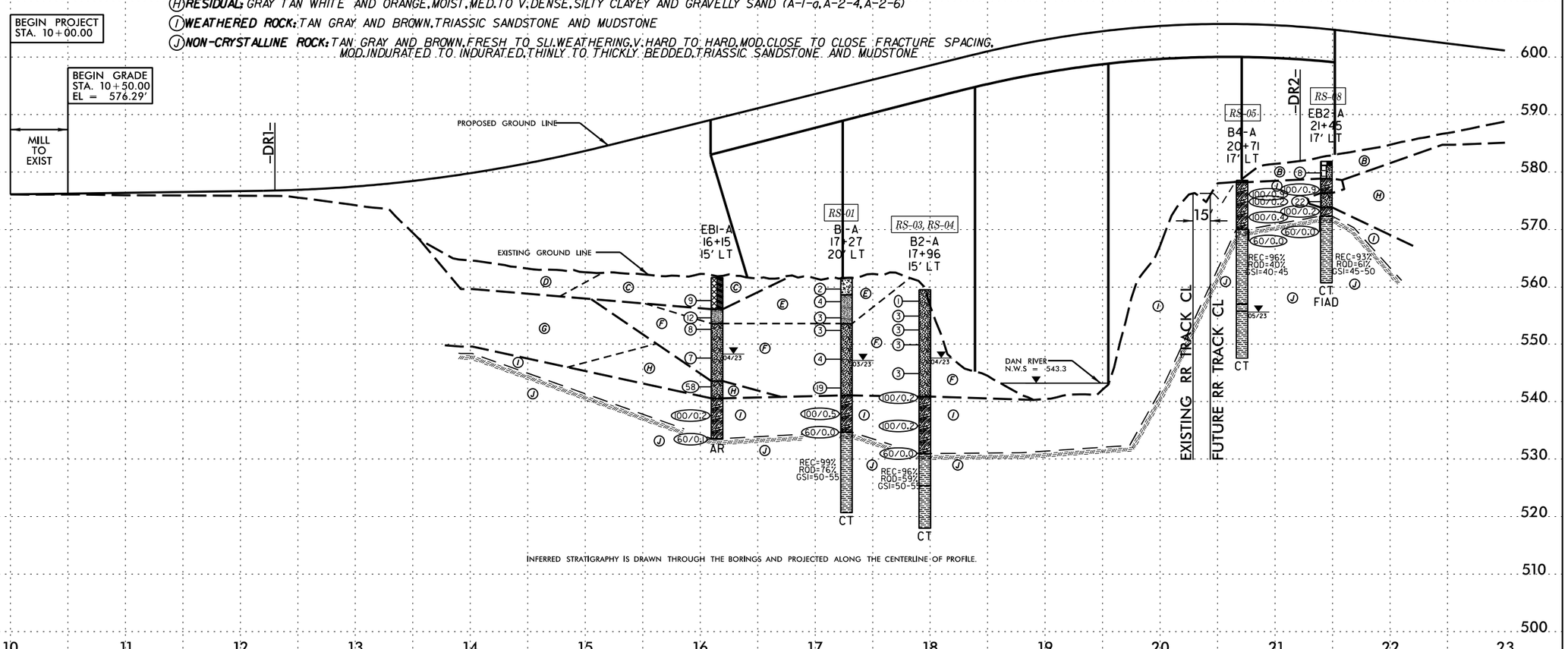
MOTT MACDONALD
7621 Parfoy Rd., Suite 115
Fuquay-Varina, NC 27526
www.mottmac.com

VERTICAL SCALE 5' 0 5' 10'
HORIZONTAL SCALE 25' 0 25' 50'

-L-

Ⓑ **ROADWAY EMBANKMENT:** TAN AND RED, MOIST, LOOSE, SILTY SAND (A-2-4)
Ⓒ **ARTIFICIAL FILL:** BROWN, MOIST, STIFF, SANDY SILT (A-6)
Ⓓ **ARTIFICIAL FILL:** BROWN, MOIST, LOOSE, SILTY SAND (A-2-4)
Ⓔ **ALLUVIAL:** ORANGE BROWN AND GRAY, MOIST TO SAT., SOFT TO MED. STIFF, SANDY CLAY AND SANDY AND CLAYEY SILT (A-4, A-5, A-6)
Ⓕ **ALLUVIAL:** GRAY BROWN AND ORANGE, WET TO SAT., V. LOOSE TO MED. DENSE, SANDY SILT (A-2-4)
Ⓖ **RESIDUAL:** TAN RED ORANGE BROWN AND GRAY, DRY TO MOIST, SOFT TO HARD, SANDY SILT AND SANDY AND SILTY CLAY (A-4, A-6, A-7)
Ⓗ **RESIDUAL:** GRAY TAN WHITE AND ORANGE, MOIST, MED. TO V. DENSE, SILTY CLAYEY AND GRAVELLY SAND (A-1-a, A-2-4, A-2-6)
Ⓘ **WEATHERED ROCK:** TAN GRAY AND BROWN, TRIASSIC SANDSTONE AND MUDSTONE
Ⓙ **NON-CRYSTALLINE ROCK:** TAN GRAY AND BROWN, FRESH TO SLI. WEATHERING, V. HARD TO HARD, MOD. CLOSE TO CLOSE FRACTURE SPACING, MOD. INDURATED TO INDURATED, THINLY TO THICKLY BEDDED, TRIASSIC SANDSTONE AND MUDSTONE



INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS AND PROJECTED ALONG THE CENTERLINE OF PROFILE.

TOHS PROJECT REFERENCE NO.	SHEET NO.
B-5716	5

BRIDGE NO. 140 ON SR 1138 (LINDSEY BRIDGE ROAD) OVER DAN RIVER

0 10 20
FEET
VE = 0

(A) **ARTIFICIAL FILL:** BROWN, MOIST, STIFF, SANDY CLAY (A-6)
(E) **ALLUVIAL:** BROWN, MOIST, STIFF, SANDY SILT (A-4,)
(F) **ALLUVIAL:** GRAY BROWN AND ORANGE, WET TO SAT., V. LOOSE TO MED. DENSE, SILTY SAND (A-2-4)
(H) **RESIDUAL:** GRAY AND BROWN, MOIST TO SAT., LOOSE TO V. DENSE, SILTY SAND AND SANDY GRAVEL (A-1-b, A-2-4)
(I) **WEATHERED ROCK:** GRAY AND BROWN, TRIASSIC MUDSTONE
(J) **NON-CRYSTALLINE ROCK:** GRAY, TRIASSIC MUDSTONE

EBI-A
16+15
15 FT LT

EBI-B
15+98
17 FT RT

ROADWAY EMBANKMENT

EXISTING GROUND LINE

600
590
580
570
560
550
540
530
520
510

60' LT 50' RT 40' LT 30' LT 20' LT 10' LT 0 10' RT 20' RT 30' RT 40' RT 50' RT 60' RT

16+09
END BENT #1

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD.

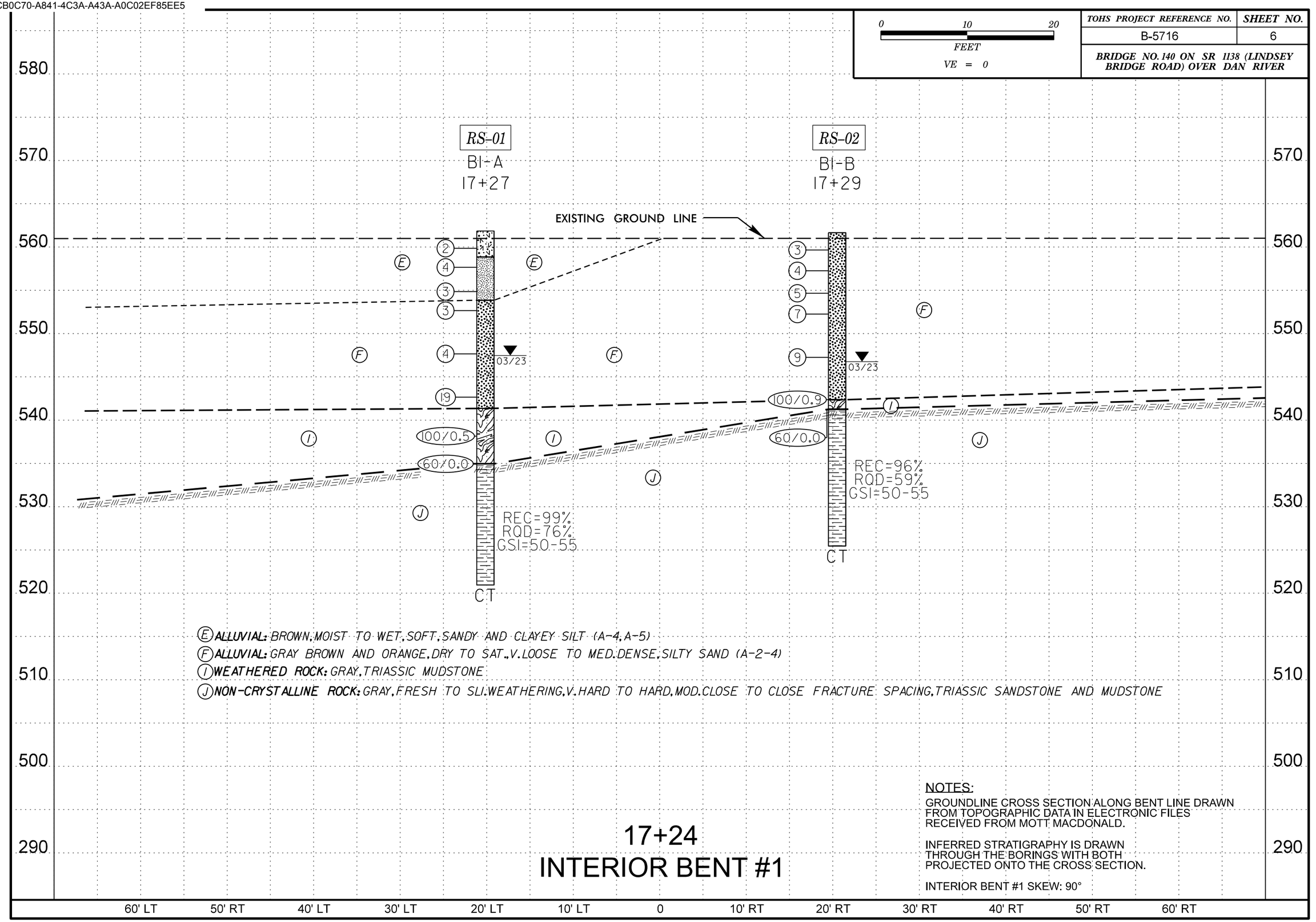
INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

END BENT #1 SKEW: 90°

TOHS PROJECT REFERENCE NO.	SHEET NO.
B-5716	6

BRIDGE NO. 140 ON SR 1138 (LINDSEY BRIDGE ROAD) OVER DAN RIVER

0 10 20
FEET
VE = 0



(E) **ALLUVIAL:** BROWN, MOIST TO WET, SOFT, SANDY AND CLAYEY SILT (A-4, A-5)
(F) **ALLUVIAL:** GRAY BROWN AND ORANGE, DRY TO SAT., V. LOOSE TO MED. DENSE, SILTY SAND (A-2-4)
(I) **WEATHERED ROCK:** GRAY, TRIASSIC MUDSTONE
(J) **NON-CRYSTALLINE ROCK:** GRAY, FRESH TO SLI. WEATHERING, V. HARD TO HARD, MOD. CLOSE TO CLOSE FRACTURE SPACING, TRIASSIC SANDSTONE AND MUDSTONE

17+24
INTERIOR BENT #1

NOTES:
GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

INTERIOR BENT #1 SKEW: 90°

60' LT 50' RT 40' LT 30' LT 20' LT 10' LT 0 10' RT 20' RT 30' RT 40' RT 50' RT 60' RT

TOHS PROJECT REFERENCE NO.	SHEET NO.
B-5716	7

BRIDGE NO. 140 ON SR 1138 (LINDSEY BRIDGE ROAD) OVER DAN RIVER

0 10 20
FEET
VE = 0

RS-03,
RS-04

B2-A
17+95
15 FT LT

EXISTING GROUND LINE

04/23

100/0.2
100/0.2
60/0.0

REC=100%
RQD=100%
GSI=50-55

REC=93%
RQD=82%
GSI=45-50

CT

580 570 560 550 540 530 520 510 500 490

(F) **ALLUVIAL:** BROWN, MOIST TO SAT., V. LOOSE, SILTY SAND (A-2-4)
(I) **WEATHERED ROCK:** GRAY, TRIASSIC MUDSTONE
(J) **NON-CRYSTALLINE ROCK:** GRAY, FRESH TO MOD. WEATHERED, HARD TO V. HARD, CLOSE FRACTURE SPACING, EXTEMELY INDURATED, TRIASSIC SANDSTONE AND MUDSTONE

18+39
INTERIOR BENT #2

NOTES:
GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

INTERIOR BENT #2 SKEW: 90°

60' LT 50' RT 40' LT 30' LT 20' LT 10' LT 0 10' RT 20' RT 30' RT 40' RT 50' RT 60' RT

TOHS PROJECT REFERENCE NO.	SHEET NO.
B-5716	8

BRIDGE NO. 140 ON SR 1138 (LINDSEY BRIDGE ROAD) OVER DAN RIVER

0 10 20
FEET
VE = 0

610
600
590
580
570
560
550
540
530
520

RS-05
B4-A
20+71
17 FT LT

RS-06,
RS-07
B4-B
20+71
17 FT RT

EXISTING GROUND LINE

(B)

(I)

100/0.9
100/0.2
100/0.4
60/0.0
REC=96%
RQD=40%
GSI=40-45
05/23
CT

100/0.7
100/0.3
60/0.0
REC=92%
RQD=61%
GSI=35-40
REC=92%
RQD=61%
GSI=40-45
CT
FIAD

(J)

(B) ROADWAY EMBANKMENT: TAN, MOIST, DENSE, SILTY SAND (A-2-4)

(I) WEATHERED ROCK: TAN AND BROWN, TRIASSIC SILTSTONE AND MUDSTONE

(J) NON-CRYSTALLINE ROCK: TAN GRAY ORANGE AND BROWN, FRESH TO MOD. WEATHERED, HARD TO V. HARD, CLOSE FRACTURE SPACING, EXTEMELY INDURATED, TRIASSIC SANDSTONE AND MUDSTONE

20+71
INTERIOR BENT #4

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

INTERIOR BENT #4 SKEW: 90°

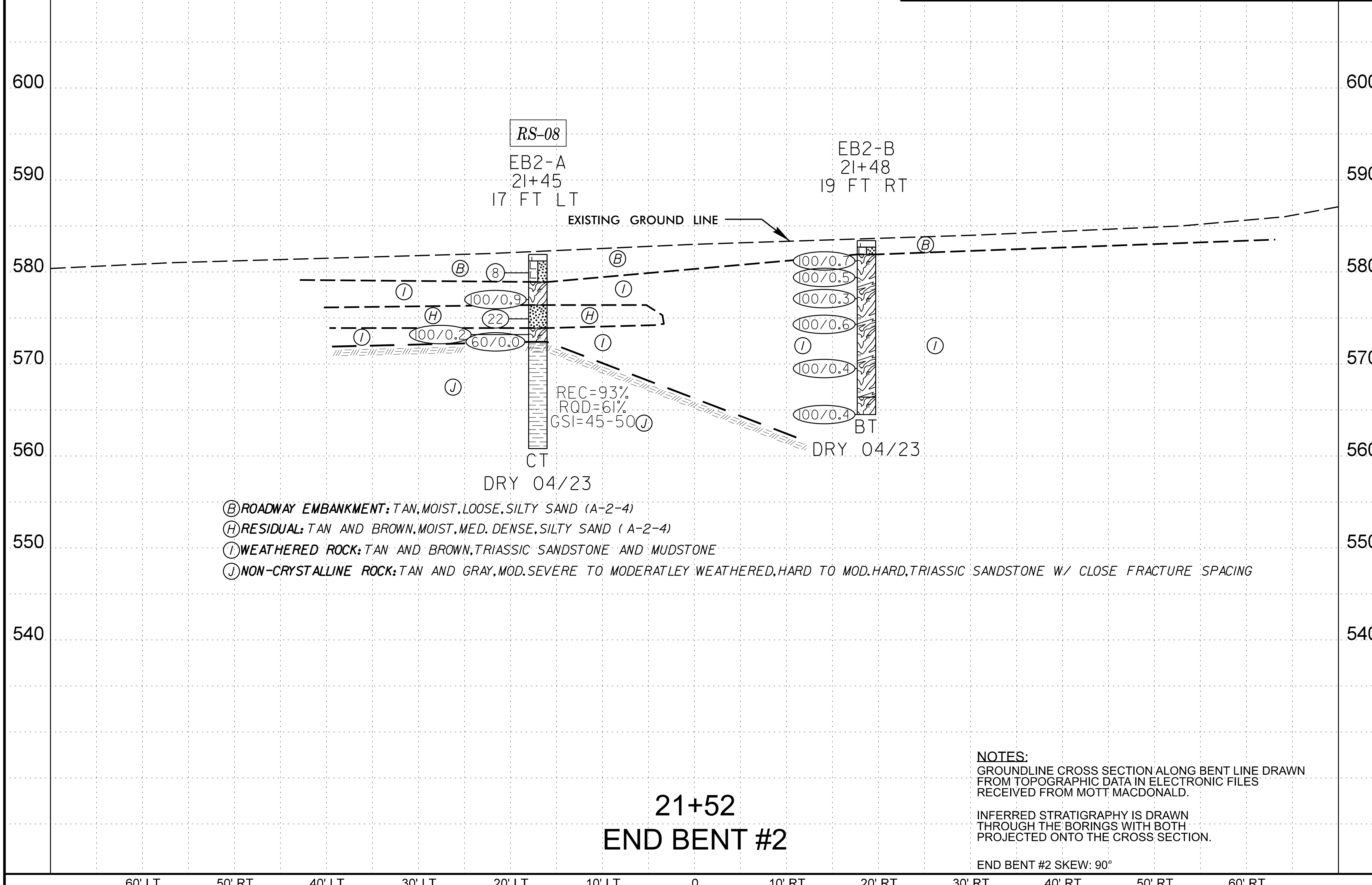
60' LT | 50' RT | 40' LT | 30' LT | 20' LT | 10' LT | 0 | 10' RT | 20' RT | 30' RT | 40' RT | 50' RT | 60' RT

TOHS PROJECT REFERENCE NO.	SHEET NO.
B-5716	9

BRIDGE NO. 140 ON SR 1138 (LINDSEY BRIDGE ROAD) OVER DAN RIVER

0 10 20 FEET

VE = 0



(B) **ROADWAY EMBANKMENT:** TAN, MOIST, LOOSE, SILTY SAND (A-2-4)

(H) **RESIDUAL:** TAN AND BROWN, MOIST, MED. DENSE, SILTY SAND (A-2-4)

(I) **WEATHERED ROCK:** TAN AND BROWN, TRIASSIC SANDSTONE AND MUDSTONE

(J) **NON-CRYSTALLINE ROCK:** TAN AND GRAY, MOD.SEVERE TO MODERATLEY WEATHERED, HARD TO MOD.HARD, TRIASSIC SANDSTONE W/ CLOSE FRACTURE SPACING

21+52
END BENT #2

NOTES:

GROUNDLINE CROSS SECTION ALONG BENT LINE DRAWN FROM TOPOGRAPHIC DATA IN ELECTRONIC FILES RECEIVED FROM MOTT MACDONALD.

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE CROSS SECTION.

END BENT #2 SKEW: 90°

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 16+15	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 1.9
COLLAR ELEV. 561.7 ft	**TOTAL DEPTH** 28.1 ft	**NORTHING** 956,509	**EASTING** 1,707,780	**24 HR.** 13.3
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/30/23	**COMP. DATE** 03/31/23	**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)
565											
										561.7	0.0
										0.3' TOPSOIL	
560										**ARTIFICIAL FILL**	
	558.7	3.0	5	4	5	9		M		BROWN, STIFF, SANDY CLAY (A-6)	
										UNABLE TO PERFORM 1.0' SPT DUE TO BRICKS AND DEBRIS IN TOP 2.5'	
	555.7	6.0	4	5	7	12		M		556.2	5.5
555										**ALLUVIAL**	
	553.7	8.0	4	3	5	8		W		BROWN, STIFF, SANDY SILT (A-4)	
										553.7	8.0
										BROWN, LOOSE, SILTY SAND (A-2-4)	
550										GRAVEL LAYER 17.0' TO 18.0'	
	548.7	13.0	2	3	4	7		Sat.			
545											
	543.7	18.0	29	20	38	58		M		543.7	18.0
										TRIASSIC RESIDUAL	
										GRAY, V. DENSE, SILTY SAND (A-2-4)	
540										TRACE ROCK FRAGS.	
										540.7	21.0
	538.7	23.0	100/0.2			100/0.2				**WEATHERED ROCK**	
										GRAY, TRIASSIC MUDSTONE	
535											
	533.7	28.0	60/0.1			60/0.1				533.7	28.0
										533.6	28.1
										NON-CRYSTALLINE ROCK	
										GRAY, TRIASSIC MUDSTONE	
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 533.6 ft IN NCR: MUDSTONE	

NCDOT BORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 15+98	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 4.0
COLLAR ELEV. 561.6 ft	**TOTAL DEPTH** 25.3 ft	**NORTHING** 956,479	**EASTING** 1,707,801	**24 HR.** 13.0
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/30/23	**COMP. DATE** 03/30/23	**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)
565											
										561.6	0.0
										0.3' TOPSOIL	
560	560.6	1.0	1	2	2	4		M		**ALLUVIAL**	
	558.3	3.3	3	4	5	9		M		BROWN, LOOSE TO MED. DENSE, SILTY SAND (A-2-4)	
	555.6	6.0	6	5	6	11		M			
555	553.0	8.6	3	5	4	9		M			
550	548.3	13.3	3	5	24	29		M		548.8	12.8
										TRIASSIC RESIDUAL	
										GRAY, MED. DENSE, SILTY SAND (A-2-4) W/ ROCK FRAGS.	
545	543.3	18.3	41	31	21	52		M		543.6	18.0
										GRAY AND BROWN, V. DENSE, SILTY GRAVEL (A-1-b)	
540	538.3	23.3	36	64/0.3		100/0.8				537.8	23.8
	536.3	25.3	60/0.0			60/0.0				**WEATHERED ROCK**	
										GRAY AND BROWN, TRIASSIC MUDSTONE	
										Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 536.3 ft ON NCR: MUDSTONE	

NCDOT BORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 17+27	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** 9.5
COLLAR ELEV. 561.7 ft	**TOTAL DEPTH** 40.9 ft	**NORTHING** 956,611	**EASTING** 1,707,828	**24 HR.** 14.4
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/27/23	**COMP. DATE** 03/28/23	**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)
565										
	561.7	0.0								561.7 0.2' TOPSOIL 0.0
560	560.7	1.0	WOH	1	1	2		M		**ALLUVIAL** BROWN, SOFT, CLAYEY SILT (A-5), MICA
	558.5	3.2	2	2	2	4		W		558.7 3.0 BROWN, SOFT, SANDY SILT (A-4), MICA.
555	555.7	6.0	1	1	2	3		W		
	553.5	8.2	1	2	1	3		Sat.		553.7 8.0 BROWN GRAY AND ORANGE, V. LOOSE TO MED. DENSE, SILTY SAND (A-2-4)
550										
	548.5	13.2	2	2	2	4		Sat.		
545										
	543.5	18.2	3	4	15	19		Sat.		541.2 20.5 **WEATHERED ROCK** GRAY, TRIASSIC MUDSTONE
540										
	538.5	23.2	100/0.5			100/0.5				
535	534.8	26.9	60/0.0			60/0.0				534.8 26.9 **NON-CRYSTALLINE ROCK** GRAY, FRESH TO SLI. WEATHERING, V. HARD TO HARD, MOD. CLOSE TO CLOSE FRACTURE SPACING, MOD. INDURATED TO INDURATED, THINLY TO THICKLY BEDDED, TRIASSIC SANDSTONE WITH MUDSTONE LAYERS, WITH VERTICAL FRACTURES AND A LAYER OF CONGLOMERATE FROM 40.3' TO 40.4' GSI = 50-55
530										
525							RS-01			520.8 40.9 Boring Terminated at Elevation 520.8 ft IN NCR: MUDSTONE

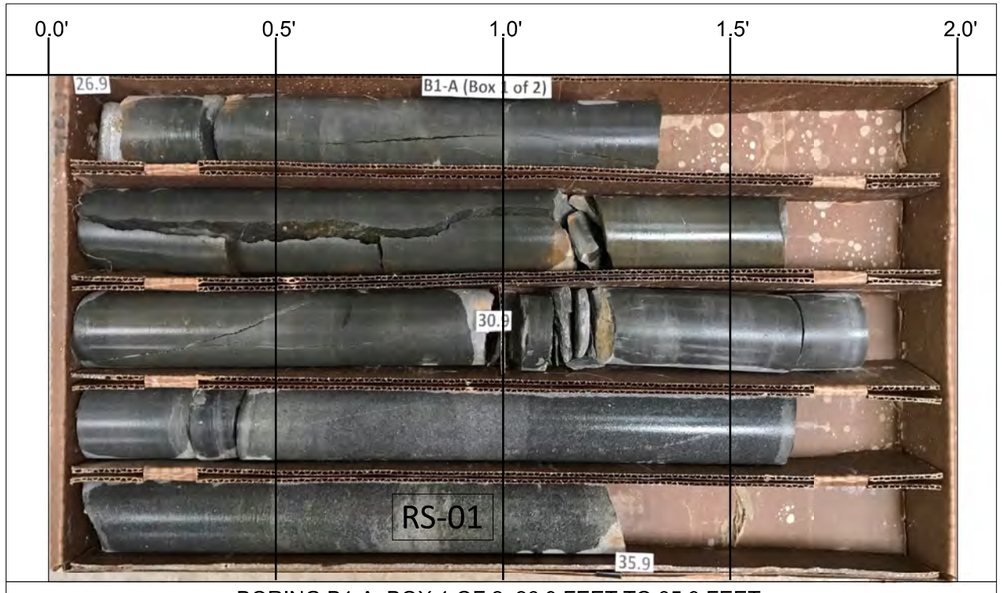
NCDOT BORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

GEOTECHNICAL BORING REPORT
CORE LOG

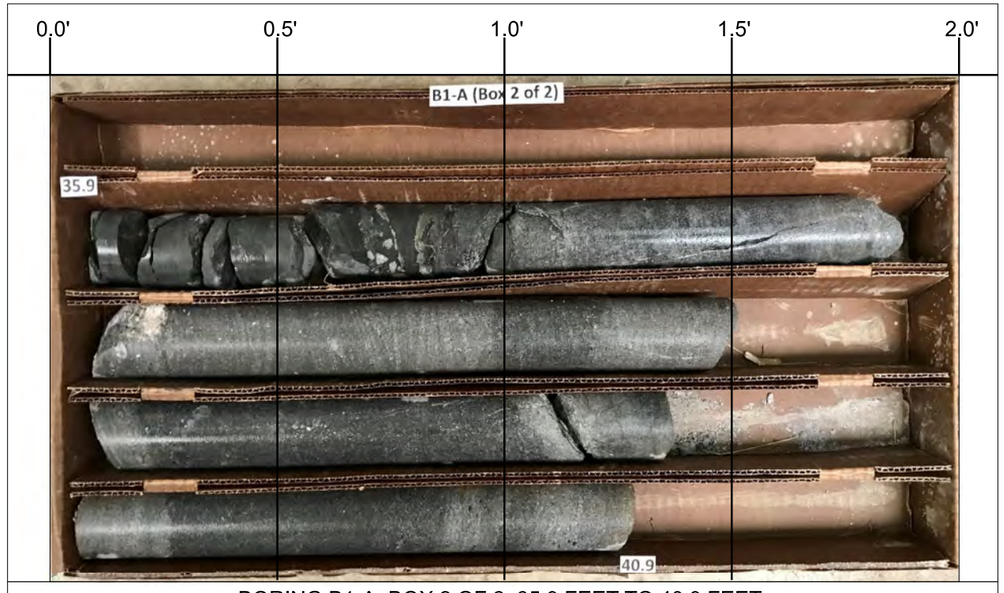
WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 17+27	**OFFSET** 20 ft LT	**ALIGNMENT** -L-	**0 HR.** 9.5
COLLAR ELEV. 561.7 ft	**TOTAL DEPTH** 40.9 ft	**NORTHING** 956,611	**EASTING** 1,707,828	**24 HR.** 14.4
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/27/23	**COMP. DATE** 03/28/23	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 14.0 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)
534.85											Begin Coring @ 26.9 ft
	534.8	26.9	4.0	6:37/1.0 5:46/1.0 4:09/1.0 7:02/1.0	(4.0) 100%	(2.4) 60%		(13.8) 99%	(10.7) 76%		534.8 **NON-CRYSTALLINE ROCK** 26.9 GRAY, FRESH TO SLI. WEATHERING, V. HARD TO HARD, MOD. CLOSE TO CLOSE FRACTURE SPACING, MOD. INDURATED TO INDURATED, THINLY TO THICKLY BEDDED, TRIASSIC SANDSTONE WITH MUDSTONE LAYERS, WITH VERTICAL FRACTURES AND A LAYER OF CONGLOMERATE FROM 40.3' TO 40.4' GSI = 50-55
530	530.8	30.9	5.0	6:05/1.0 9:01/1.0 3:56/1.0 4:01/1.0 3:54/1.0	(5.0) 100%	(4.2) 84%					
	525.8	35.9					RS-01				
525			5.0	5:18/1.0 4:54/1.0 5:42/1.0 4:20/1.0 22:05/1.0	(4.8) 96%	(4.1) 82%					
	520.8	40.9									520.8 40.9 Boring Terminated at Elevation 520.8 ft IN NCR: MUDSTONE

NCDOT CORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24



BORING B1-A, BOX 1 OF 2, 26.9 FEET TO 35.9 FEET.



BORING B1-A, BOX 2 OF 2, 35.9 FEET TO 40.9 FEET.

0 4" 8"
INCHES

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 140 OVER DAN RIVER ON
SR 1138 (LINDSEY BRIDGE ROAD)
ROCKINGHAM COUNTY, NORTH CAROLINA
TIP: B-5716 | WBS: 45672.1.1
FALCON PROJECT NO. G20014.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 17+29	**OFFSET** 21 ft RT	**ALIGNMENT** -L-	**0 HR.** 14.8
COLLAR ELEV. 561.5 ft	**TOTAL DEPTH** 36.2 ft	**NORTHING** 956,594	**EASTING** 1,707,865	**24 HR.** 14.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/29/23	**COMP. DATE** 03/29/23	**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)
565										
										561.5 0.2' TOPSOIL 0.0
560	560.5	1.0								**ALLUVIAL**
	558.1	3.4	1	2	1	3		D		BROWN, V. LOOSE TO LOOSE, SILTY SAND (A-2-4)
			3	2	2	4		W		
555	555.5	6.0								GRAVEL LAYER 18.4' TO 19.3'
	553.1	8.4	2	2	3	5		M		
			4	4	3	7		M		
550										
	548.1	13.4								
			3	5	4	9		W		
545										
	543.1	18.4								
			17	83/.04		100/0.9				542.2 19.3
	541.1	20.4	60/0.0			60/0.0				541.1 20.4
540										**WEATHERED ROCK**
										GRAY, TRIASSIC MUDSTONE
										NON-CRYSTALLINE ROCK
										GRAY, FRESH TO MOD. WEATHERING, V. HARD TO SOFT, MOD. CLOSE TO V. CLOSE FRACTURE SPACING, EXTREMELY TO MOD. INDURATED, THINLY BEDDED, TRIASSIC SANDSTONE WITH MUDSTONE LAYERS
535							RS-02			GSI = 50-55
530										525.3 36.2
										Boring Terminated at Elevation 525.3 ft IN NCR: MUDSTONE

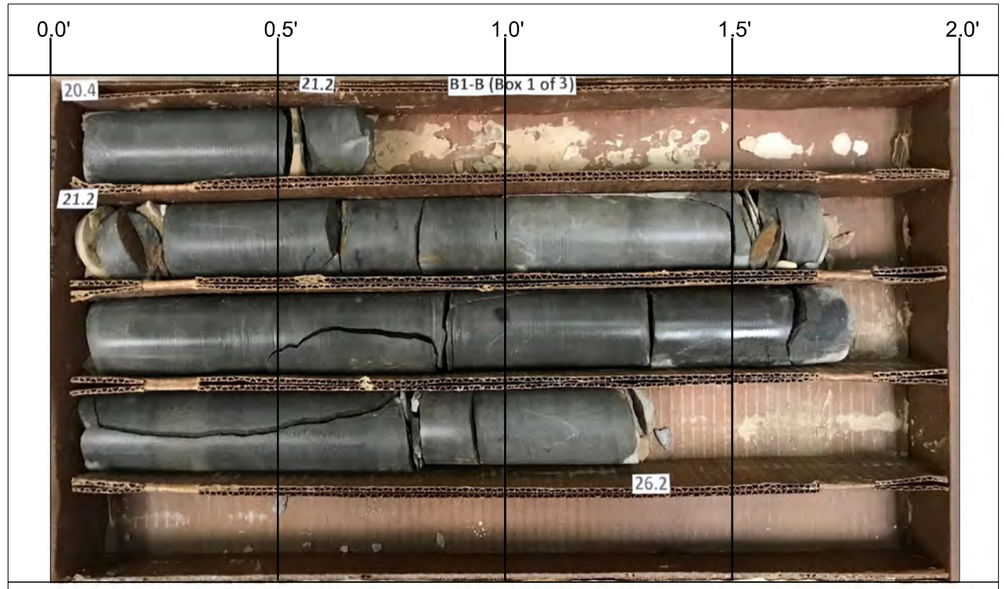
NCDOT BORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 17+29	**OFFSET** 21 ft RT	**ALIGNMENT** -L-	**0 HR.** 14.8
COLLAR ELEV. 561.5 ft	**TOTAL DEPTH** 36.2 ft	**NORTHING** 956,594	**EASTING** 1,707,865	**24 HR.** 14.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 03/29/23	**COMP. DATE** 03/29/23	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 15.8 ft			

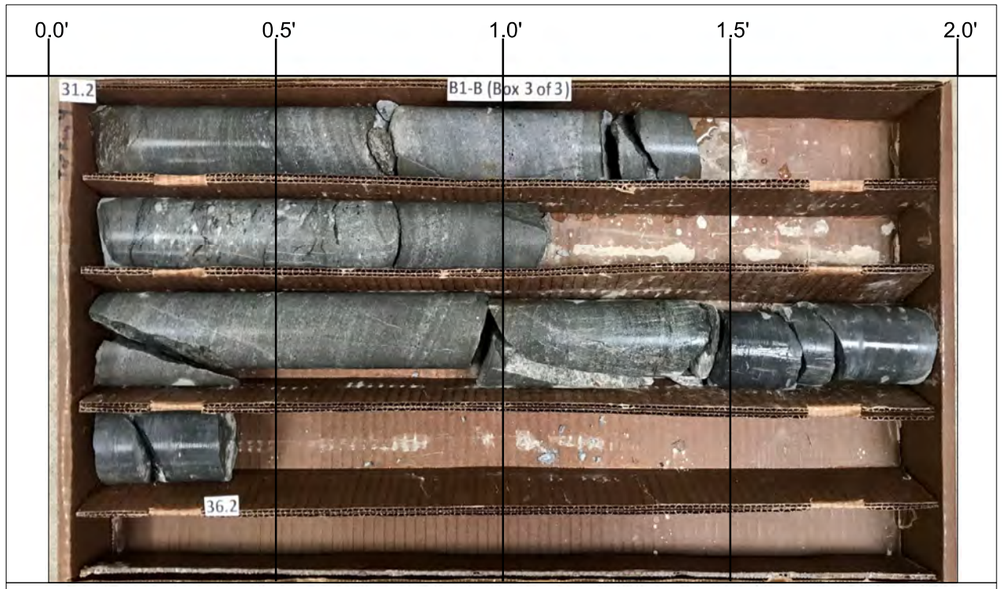
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
541.11											Begin Coring @ 20.4 ft
540	541.1	20.4	0.8	4:06/0.8	(0.7) 88%	(0.5) 63%		(15.2) 96%	(9.4) 59%		541.1 **NON-CRYSTALLINE ROCK** 20.4
	540.3	21.2	5.0	5:51/1.0 4:45/1.0 4:20/1.0 5:13/1.0 6:12/1.0	(4.8) 96%	(1.7) 34%					GRAY, FRESH TO MOD. WEATHERING, V. HARD TO SOFT, MOD. CLOSE TO V. CLOSE FRACTURE SPACING, EXTREMELY TO MOD. INDURATED, THINLY BEDDED, TRIASSIC SANDSTONE WITH MUDSTONE LAYERS GSI = 50-55
535	535.3	26.2	5.0	3:50/1.0 3:33/1.0 5:16/1.0 5:04/1.0 5:54/1.0	(4.8) 96%	(4.2) 84%	RS-02				
530	530.3	31.2	5.0	5:35/1.0 5:00/1.0 5:12/1.0 5:00/1.0 4:11/1.0	(4.9) 98%	(3.0) 60%					
	525.3	36.2									525.3 36.2
											Boring Terminated at Elevation 525.3 ft IN NCR: MUDSTONE

NCDOT CORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

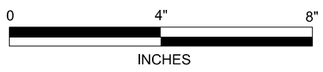


BORING B1-B, BOX 1 OF 3, 20.4 FEET TO 26.2 FEET.

BORING B1-B, BOX 2 OF 3, 26.2 FEET TO 31.2 FEET.



BORING B1-B, BOX 3 OF 3, 31.2 FEET TO 36.2 FEET.



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

BRIDGE NO. 140 OVER DAN RIVER ON
SR 1138 (LINDSEY BRIDGE ROAD)
ROCKINGHAM COUNTY, NORTH CAROLINA
TIP: B-5716 | WBS: 45672.1.1
FALCON PROJECT NO. G20014.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)			**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 17+95	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 12.0
COLLAR ELEV. 559.6 ft	**TOTAL DEPTH** 41.5 ft	**NORTHING** 956,669	**EASTING** 1,707,864	**24 HR.** 11.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic
DRILLER Toothman, R.	**START DATE** 04/06/23	**COMP. DATE** 04/06/23	**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)
560										559.6 0.0
	558.6	1.0	1	1	0	1		M		**ALLUVIAL** BROWN, V. LOOSE, SILTY SAND (A-2-4)
555	556.0	3.6	1	2	1	3		W		
	553.6	6.0	1	2	1	3		Sat.		
	551.0	8.6								
550			2	2	1	3		M		
	546.0	13.6	2	1	2	3		Sat.		
545										
	541.0	18.6	100/0.2			100/0.2				541.0 18.6 **WEATHERED ROCK** GRAY, TRIASSIC MUDSTONE
540										
	536.1	23.5	100/0.2			100/0.2				
535										
	531.1	28.5	60/0.0			60/0.0	RS-03			531.1 28.5 **NON-CRYSTALLINE ROCK** FRESH, HARD, GRAY, TRIASSIC SANDSTONE WITH MOD. CLOSE TO WIDE FRACTURE SPACING GSI = 50-55
530										
525							RS-04			525.5 34.1 FRESH TO SLI. WEATHERED, MED. HARD TO MOD. HARD, GRAY, MOD. INDURATED, THINLY BEDDED, TRIASSIC SANDSTONE WITH MUDSTONE LAYERS, WITH CLOSE TO MOD. CLOSE FRACTURE SPACING GSI = 45-50
520										518.1 41.5 Boring Terminated at Elevation 518.1 ft IN NCR: MUDSTONE

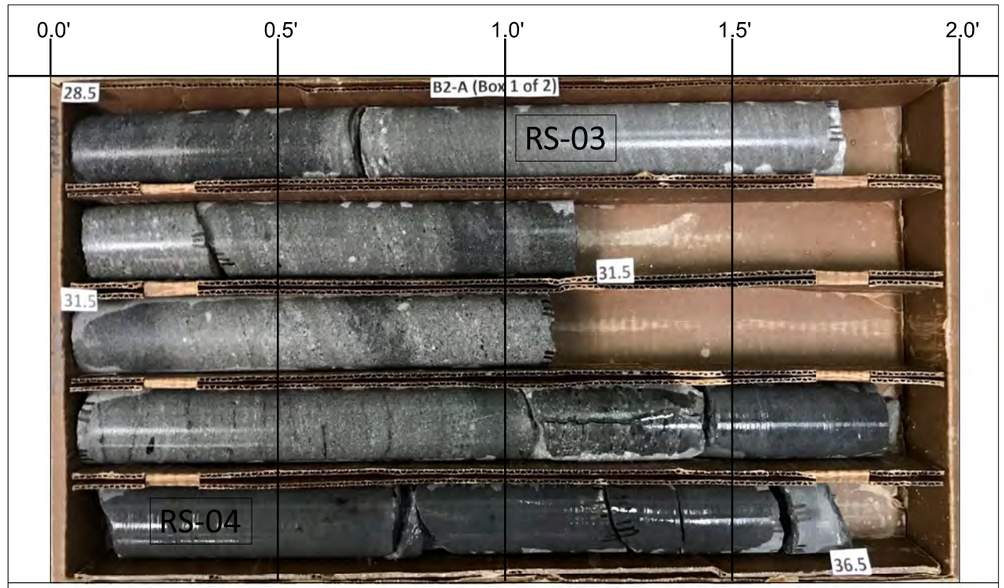
NCDOT BORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

GEOTECHNICAL BORING REPORT
CORE LOG

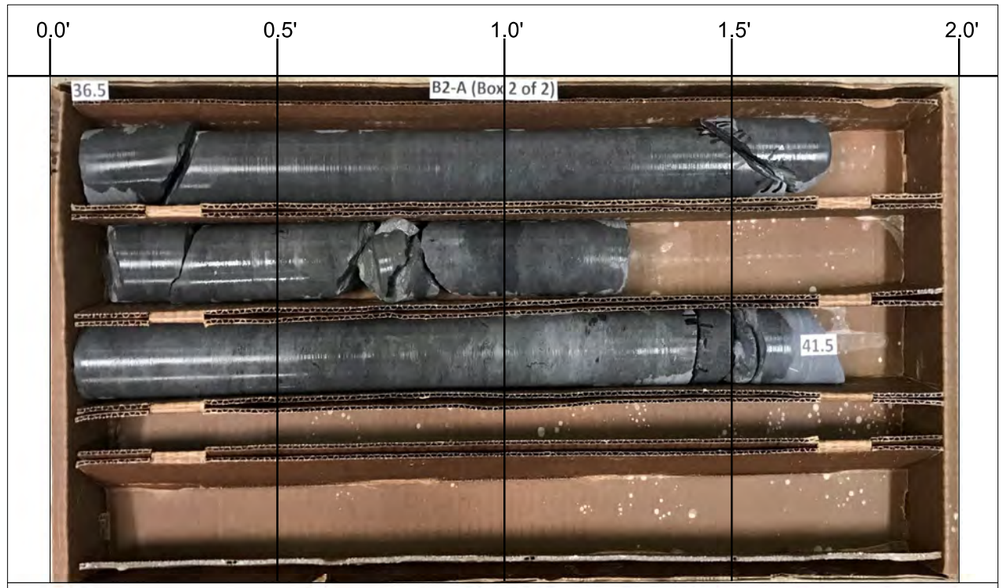
WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 17+95	**OFFSET** 15 ft LT	**ALIGNMENT** -L-	**0 HR.** 12.0
COLLAR ELEV. 559.6 ft	**TOTAL DEPTH** 41.5 ft	**NORTHING** 956,669	**EASTING** 1,707,864	**24 HR.** 11.9
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 04/06/23	**COMP. DATE** 04/06/23	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 13.0 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)
531.12											Begin Coring @ 28.5 ft
530	531.1	28.5	3.0	3:38/1.0 3:54/1.0 3:30/1.0	(3.0) 100%	(3.0) 100%	RS-03	(5.6) 100%	(5.6) 100%		531.1 28.5 **NON-CRYSTALLINE ROCK** FRESH, HARD, GRAY, TRIASSIC SANDSTONE WITH MOD. CLOSE TO WIDE FRACTURE SPACING GSI = 50-55
	528.1	31.5									
			5.0	4:28/1.0 3:31/1.0 6:35/1.0 8:44/1.0 10:58/1.0	(4.8) 96%	(4.6) 92%					
525											525.5 34.1
	523.1	36.5					RS-04	(6.9) 93%	(6.1) 82%		FRESH TO SLI. WEATHERED, MED. HARD TO MOD. HARD, GRAY, MOD. INDURATED, THINLY BEDDED, TRIASSIC SANDSTONE WITH MUDSTONE LAYERS, WITH CLOSE TO MOD. CLOSE FRACTURE SPACING GSI = 45-50
			5.0	10:13/1.0 9:22/1.0 11:06/1.0 11:56/1.0 6:13/1.0	(4.7) 94%	(4.1) 82%					
520	518.1	41.5									518.1 41.5 Boring Terminated at Elevation 518.1 ft IN NCR: MUDSTONE

NCDOT CORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24



BORING B2-A, BOX 1 OF 2, 28.5 FEET TO 36.5 FEET.



BORING B2-A, BOX 2 OF 2, 36.5 FEET TO 41.5 FEET.

0 4" 8"
INCHES

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

PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 140 OVER DAN RIVER ON
SR 1138 (LINDSEY BRIDGE ROAD)
ROCKINGHAM COUNTY, NORTH CAROLINA
TIP: B-5716 | WBS: 45672.1.1
FALCON PROJECT NO. G20014.00

GEOTECHNICAL BORING REPORT
BORE LOG

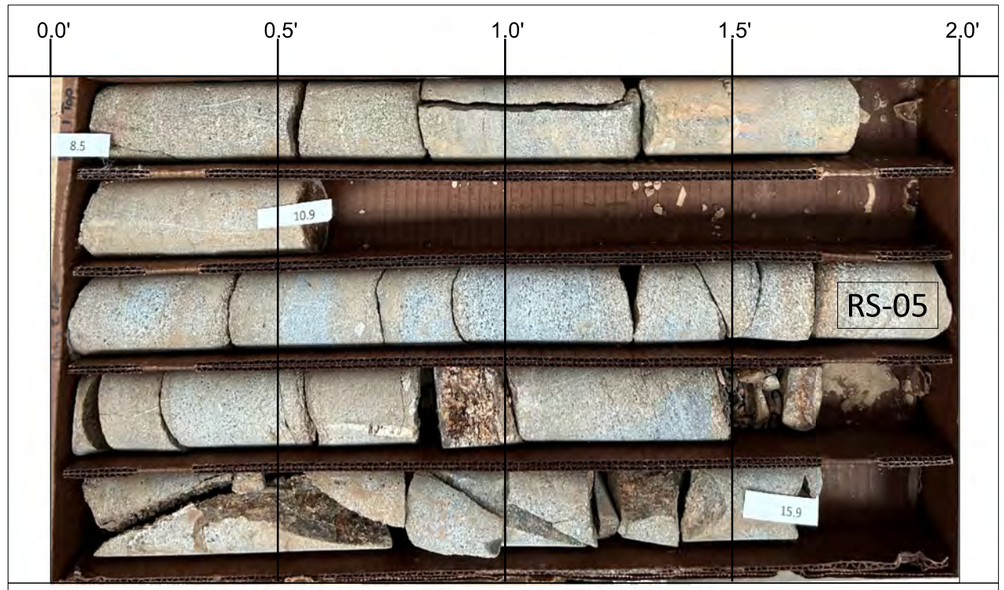
WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)			**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 20+71	**OFFSET** 17 ft LT	**ALIGNMENT** -L-	**0 HR.** 20.5
COLLAR ELEV. 578.6 ft	**TOTAL DEPTH** 30.9 ft	**NORTHING** 956,914	**EASTING** 1,707,991	**24 HR.** 22.9
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 87% 05/09/2022		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 05/16/23	**COMP. DATE** 05/16/23	**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)
580										
										578.6 0.0
	577.6	1.0								578.3 0.3
			21	54	46/0.4					0.1' BITUMINOUS CONCRETE 0.2' AGGREGATE BASE COURSE
575	575.1	3.5				100/0.9				**WEATHERED ROCK** TAN AND BROWN, TRIASSIC MUDSTONE
	572.6	6.0	100/0.2			100/0.2				
			100/0.4			100/0.4				
570	570.1	8.5	60/0.0			60/0.0				570.1 8.5
										NON-CRYSTALLINE ROCK GRAY, MOD. SEV. TO FRESH WEATHERING, SOFT TO V. HARD, EXTREMELY INDURATED, TRIASSIC SANDSTONE GSI = 40-45
565							RS-05			
560										
										557.1 21.5
555										555.9 22.7 GRAY, FRESH TO MOD. WEATHERING, HARD TO V. HARD, CLOSE FRACTURE SPACING, EXTREMELY INDURATED, TRIASSIC SANDSTONE WITH CONGLOMERATE
550										GRAY, FRESH TO MOD. WEATHERING, HARD TO V. HARD, CLOSE FRACTURE SPACING, EXTREMELY INDURATED, THINLY BEDDED, TRIASSIC MUDSTONE GSI = 45-50
										547.7 30.9
										Boring Terminated at Elevation 547.7 ft IN NCR: MUDSTONE

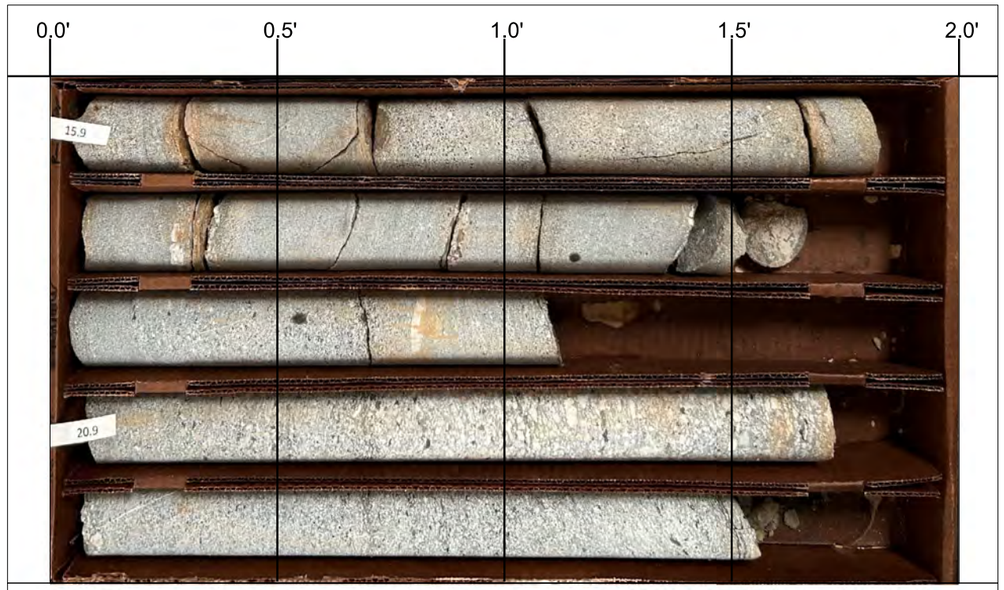
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 20+71	**OFFSET** 17 ft LT	**ALIGNMENT** -L-	**0 HR.** 20.5
COLLAR ELEV. 578.6 ft	**TOTAL DEPTH** 30.9 ft	**NORTHING** 956,914	**EASTING** 1,707,991	**24 HR.** 22.9
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 87% 05/09/2022		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 05/16/23	**COMP. DATE** 05/16/23	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 22.4 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)
570											Begin Coring @ 8.5 ft
	570.1	8.5	2.4	2:14/0.4 7:13/1.0 4:11/1.0	(2.3) 96%	(1.5) 63%		(12.5) 96%	(5.2) 40%		570.1 8.5 **NON-CRYSTALLINE ROCK** GRAY, MOD. SEV. TO FRESH WEATHERING, SOFT TO V. HARD, EXTREMELY INDURATED, TRIASSIC SANDSTONE GSI = 40-45
	567.7	10.9	5.0	3:45/1.0 4:00/1.0 3:09/1.0 2:55/1.0 3:17/1.0	(5.0) 100%	(1.3) 26%					
565	562.7	15.9	5.0	3:00/1.0 3:07/1.0 3:09/1.0 3:08/1.0 3:10/1.0	(4.7) 94%	(2.2) 44%	RS-05				
560	557.7	20.9	5.0	4:24/1.0 3:54/1.0 4:43/1.0 4:07/1.0 8:13/1.0	(5.0) 100%	(3.3) 66%		(1.2) 100%	(0.8) 67%		557.1 21.5 555.9 22.7 GRAY, FRESH TO MOD. WEATHERING, HARD TO V. HARD, CLOSE FRACTURE SPACING, EXTREMELY INDURATED, TRIASSIC SANDSTONE WITH CONGLOMERATE
555	552.7	25.9	5.0	4:50/1.0 4:36/1.0 4:42/1.0 6:05/1.0 6:44/1.0	(5.0) 100%	(3.2) 64%		(8.2) 100%	(5.3) 65%		GRAY, FRESH TO MOD. WEATHERING, HARD TO V. HARD, CLOSE FRACTURE SPACING, EXTREMELY INDURATED, THINLY BEDDED, TRIASSIC MUDSTONE GSI = 45-50
550	547.7	30.9									547.7 30.9 Boring Terminated at Elevation 547.7 ft IN NCR: MUDSTONE



BORING B4-A, BOX 1 OF 3, 8.5 FEET TO 15.9 FEET.



BORING B4-A, BOX 2 OF 3, 15.9 FEET TO 24.8 FEET.

BORING B4-A, BOX 3 OF 3, 24.8 FEET TO 30.9 FEET.

0 4" 8"
INCHES

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ROCK CORE PHOTOGRAPHS

BRIDGE NO. 140 OVER DAN RIVER ON
SR 1138 (LINDSEY BRIDGE ROAD)
ROCKINGHAM COUNTY, NORTH CAROLINA
TIP: B-5716 | WBS: 45672.1.1
FALCON PROJECT NO. G20014.00

GEOTECHNICAL BORING REPORT
BORE LOG

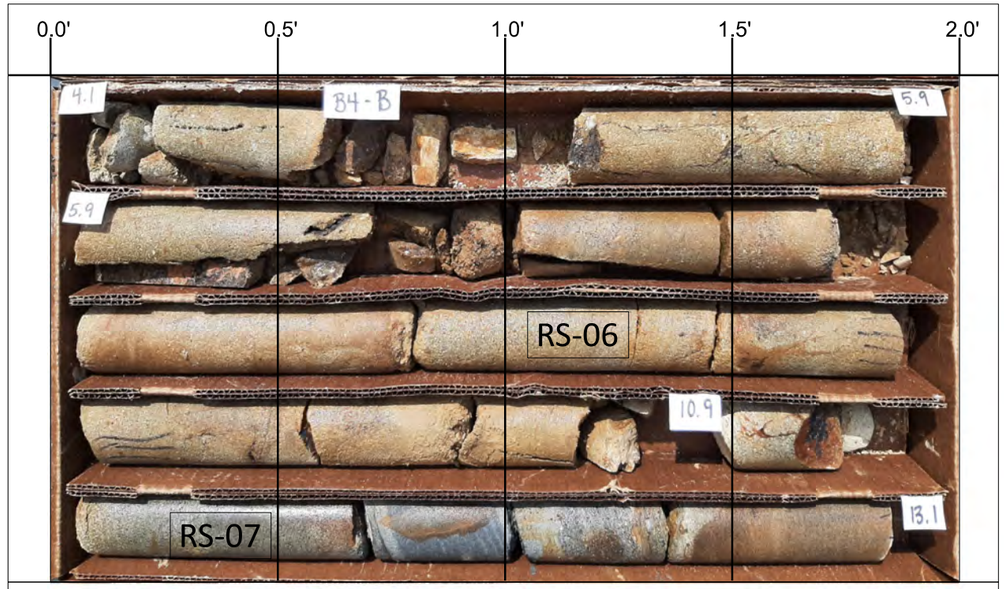
WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)			**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 20+71	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 19.3
COLLAR ELEV. 579.4 ft	**TOTAL DEPTH** 25.9 ft	**NORTHING** 956,898	**EASTING** 1,708,021	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 87% 05/09/2022		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 05/17/23	**COMP. DATE** 05/17/23	**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)
580										579.4 0.0
	578.4	1.0	31	69/0.2		100/0.7				0.4' GRAVEL
	576.4	3.0								578.4 1.0
575	575.3	4.1	100/0.3			100/0.3				**ROADWAY EMBANKMENT** TAN, DENSE, SILTY SAND (A-2-4)
			60/0.0			60/0.0				**WEATHERED ROCK** TAN, TRIASSIC SILTSTONE 575.3 4.1
570							RS-06			**NON-CRYSTALLINE ROCK** TAN ORANGE AND GRAY. V. SEVERELY TO MODERATELY WEATHERED, SOFT TO HARD, VERY CLOSE TO MODERATLEY CLOSELY FRACTURED, TRIASSIC SILTSTONE GSI = 40-45
							RS-07			
565										
										562.1 17.3
560										**WEATHERED ROCK** GRAY AND WHITE, TRIASSIC SILTSTONE 560.6 18.8
										NON-CRYSTALLINE ROCK BROWN AND GRAY, SEVERELY TO MODERATELY WEATHERED, SOFT TO HARD, VERY CLOSE TO CLOSELY FRACTURED, MOD. INDURATED, THINLY BEDDED, TRIASSIC SILTSTONE GSI = 40-45
555										553.5 25.9
										Boring Terminated at Elevation 553.5 ft IN NCR: SILTSTONE

GEOTECHNICAL BORING REPORT
CORE LOG

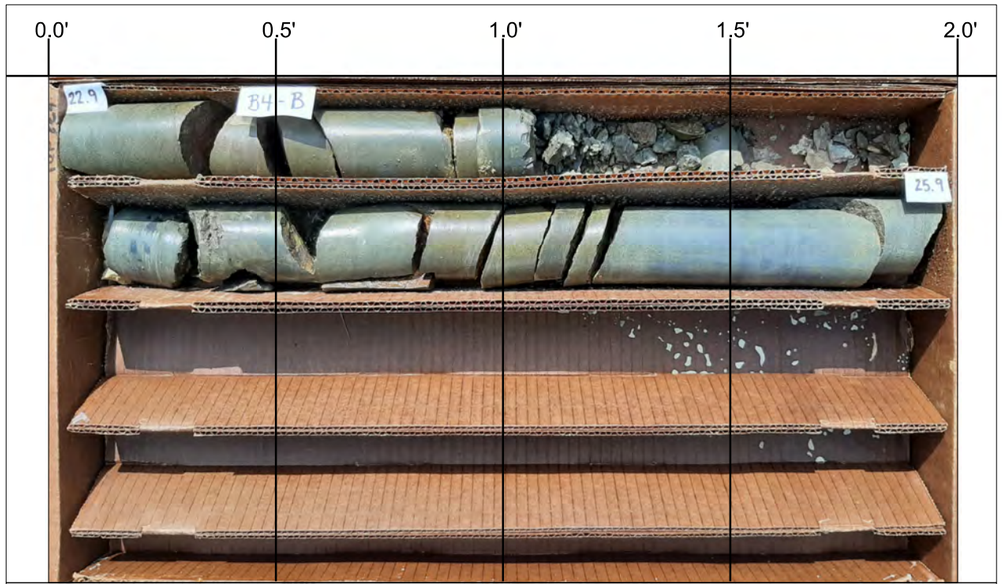
WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** Lane, R.W.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 20+71	**OFFSET** 17 ft RT	**ALIGNMENT** -L-	**0 HR.** 19.3
COLLAR ELEV. 579.4 ft	**TOTAL DEPTH** 25.9 ft	**NORTHING** 956,898	**EASTING** 1,708,021	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI9435 CME-55 87% 05/09/2022		**DRILL METHOD** Wash Boring	**HAMMER TYPE** Automatic	
DRILLER Estep, J. E.	**START DATE** 05/17/23	**COMP. DATE** 05/17/23	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 21.8 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)
575.26											Begin Coring @ 4.1 ft
	575.3	4.1	1.8	2:10/0.8 3:02/1.0	(1.5) 83%	(1.1) 61%		(12.1) 92%	(8.0) 61%		575.3 4.1 **NON-CRYSTALLINE ROCK** TAN ORANGE AND GRAY. V. SEVERELY TO MODERATELY WEATHERED, SOFT TO HARD, VERY CLOSE TO MODERATLEY CLOSELY FRACTURED, TRIASSIC SILTSONE GSI = 40-45
	573.5	5.9	5.0	2:25/1.0 2:44/1.0 2:49/1.0 3:31/1.0 2:17/1.0	(5.0) 100%	(2.5) 50%					
570							RS-06				
	568.5	10.9	5.0	2:12/1.0 3:55/1.0 2:26/1.0 2:17/1.0 2:48/1.0	(4.9) 98%	(3.3) 66%	RS-07				
565											
	563.5	15.9	5.0	3:15/1.0 2:46/1.0 2:23/1.0 6:51/1.0 6:39/1.0	(4.2) 84%	(1.1) 22%					562.1 17.3
560											560.6 18.8 **WEATHERED ROCK** GRAY AND WHITE, TRIASSIC SILTSTONE
	558.5	20.9						(6.7) 94%	(2.1) 30%		**NON-CRYSTALLINE ROCK** BROWN AND GRAY, SEVERELY TO MODERATELY WEATHERED, SOFT TO HARD, VERY CLOSE TO CLOSELY FRACTURED, MOD. INDURATED, THINLY BEDDED, TRIASSIC SILTSTONE GSI = 40-45
			5.0	4:28/1.0 3:15/1.0 7:00/1.0 6:52/1.0 4:56/1.0	(5.0) 100%	(1.6) 32%					
555	553.5	25.9									553.5 25.9 Boring Terminated at Elevation 553.5 ft IN NCR: SILTSTONE



BORING B4-B, BOX 1 OF 3, 4.1 FEET TO 13.1 FEET.

BORING B4-B, BOX 2 OF 3, 13.1 FEET TO 22.9 FEET.



BORING B4-B, BOX 3 OF 3, 22.9 FEET TO 25.9 FEET.

0 4" 8"
INCHES

FALCON ENGINEERING
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513
PHONE: 919.871.0800

ROCK CORE PHOTOGRAPHS

BRIDGE NO. 140 OVER DAN RIVER ON
SR 1138 (LINDSEY BRIDGE ROAD)
ROCKINGHAM COUNTY, NORTH CAROLINA
TIP: B-5716 | WBS: 45672.1.1
FALCON PROJECT NO. G20014.00

GEOTECHNICAL BORING REPORT
BORE LOG

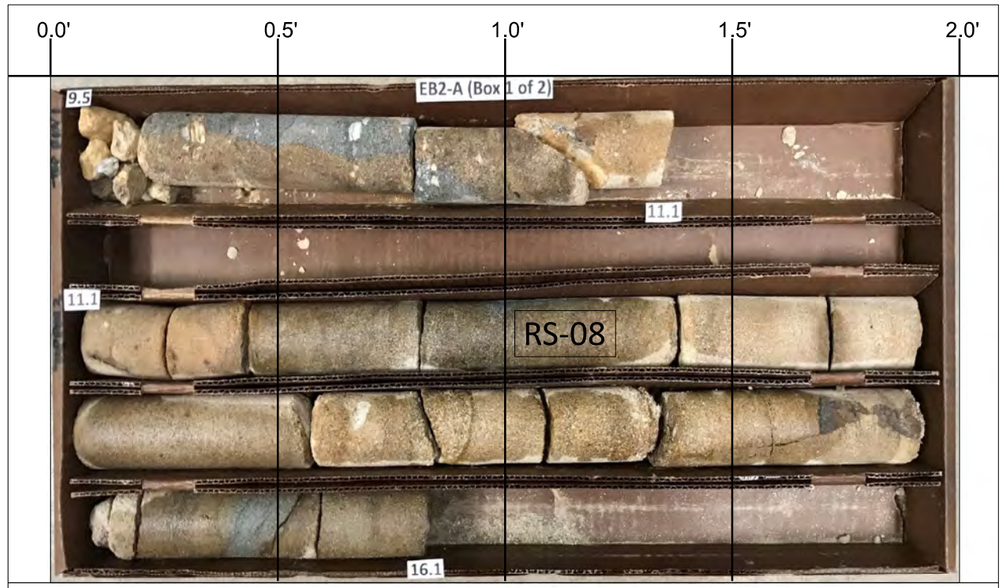
WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** GOODNIGHT, D. J.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+45	**OFFSET** 17 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 581.9 ft	**TOTAL DEPTH** 21.1 ft	**NORTHING** 956,979	**EASTING** 1,708,025	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 04/11/23	**COMP. DATE** 04/11/23	**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)
585										581.9	0.0
	580.9	1.0								581.2	0.7
580			4	4	4	8		M		0.3' BITUMINOUS CONCRETE 0.4' AGGREGATE BASE COURSE	
	578.4	3.5	25	49	51/0.4					578.9	3.0
	575.9	6.0				100/0.9				**ROADWAY EMBANKMENT** TAN, LOOSE, SILTY SAND (A-2-4) W/ TRACE GRAVEL	
575			8	12	10	22		M		576.4	5.5
	573.4	8.5								**WEATHERED ROCK** TAN, TRIASSIC MUDSTONE	
	572.4	9.5	100/0.2			100/0.2				573.9	8.0
			60/0.0			60/0.0				**TRIASSIC RESIDUAL** TAN AND BROWN, MED. DENSE, SILTY SAND (A-2-4)	
570										572.4	9.5
							RS-08			**WEATHERED ROCK** TAN, TRIASSIC SANDSTONE	
565										**NON-CRYSTALLINE ROCK** MOD. SEVERE TO MODERATE WEATHERING, HARD TO MOD. HARD, TAN AND GRAY, MOD. INDURATED, THINLY BEDDED, TRIASSIC SANDSTONE WITH CLOSE FRACTURE SPACING GSI = 45-50	
										560.8	21.1
										Boring Terminated at Elevation 560.8 ft IN NCR: SANDSTONE	

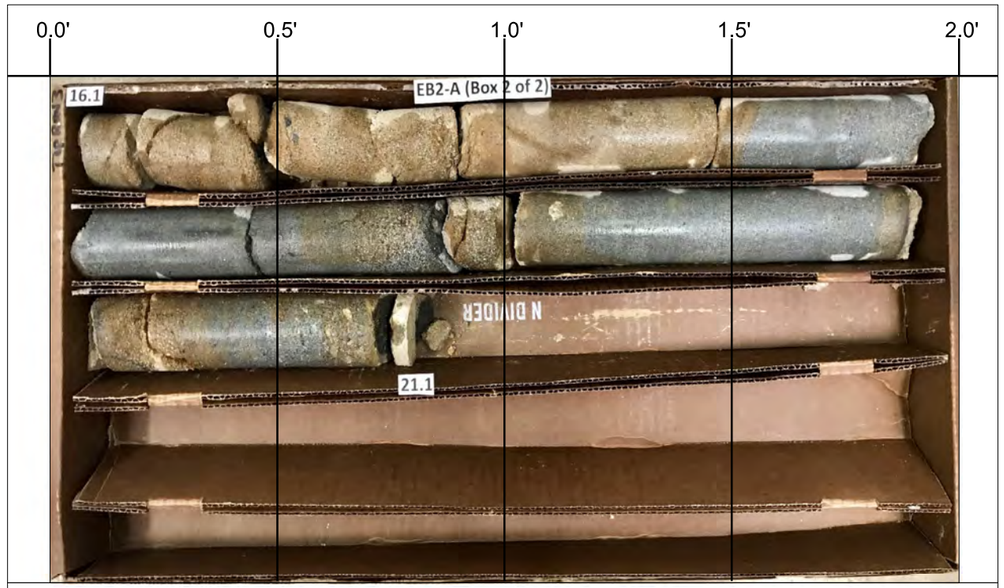
GEOTECHNICAL BORING REPORT
CORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** GOODNIGHT, D. J.	
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 21+45	**OFFSET** 17 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 581.9 ft	**TOTAL DEPTH** 21.1 ft	**NORTHING** 956,979	**EASTING** 1,708,025	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 04/11/23	**COMP. DATE** 04/11/23	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ2	**TOTAL RUN** 11.6 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)
572.44											Begin Coring @ 9.5 ft	
	572.4	9.5	1.6	2:28/0.6	(1.4)	(1.0)		(10.8)	(7.1)		572.4	9.5
570	570.8	11.1		5:21/1.0	88%	63%		93%	61%		**NON-CRYSTALLINE ROCK**	
			5.0	4:18/1.0 3:42/1.0 3:43/1.0 3:30/1.0 3:41/1.0	(4.7) 94%	(2.9) 58%	RS-08				MOD. SEVERE TO MODERATE WEATHERING, HARD TO MOD. HARD, TAN AND GRAY, MOD. INDURATED, THINLY BEDDED, TRIASSIC SANDSTONE WITH CLOSE FRACTURE SPACING GSI = 45-50	
	565.8	16.1										
565			5.0	2:52/1.0 3:18/1.0 3:27/1.0 3:29/1.0 3:20/1.0	(4.7) 94%	(3.2) 64%						
	560.8	21.1									560.8	21.1
											Boring Terminated at Elevation 560.8 ft IN NCR: SANDSTONE	



BORING EB2-A, BOX 1 OF 2, 9.5 FEET TO 16.1 FEET.



BORING EB2-A, BOX 2 OF 2, 16.1 FEET TO 21.1 FEET.

0 4" 8"
INCHES

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ROCK CORE PHOTOGRAPHS

BRIDGE NO. 140 OVER DAN RIVER ON
SR 1138 (LINDSEY BRIDGE ROAD)
ROCKINGHAM COUNTY, NORTH CAROLINA
TIP: B-5716 | WBS: 45672.1.1
FALCON PROJECT NO. G20014.00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 45672.1.1	**TIP** B-5716	**COUNTY** ROCKINGHAM	**GEOLOGIST** GOODNIGHT, D. J.
SITE DESCRIPTION BRIDGE NO. 140 OVER DAN RIVER ON SR 1138 (LINDSEY BRIDGE ROAD)			**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 21+48	**OFFSET** 19 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 583.4 ft	**TOTAL DEPTH** 18.9 ft	**NORTHING** 956,965	**EASTING** 1,708,058	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE TRI0055 CME-55 83% 05/09/2022		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Toothman, R.	**START DATE** 04/10/23	**COMP. DATE** 04/10/23	**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)
585											
										583.4	0.0
	582.4	1.0								582.7	0.7
			4	80	20/0.2	100/0.7				581.9	1.5
580	579.9	3.5	100/0.5			100/0.5				0.3' BITUMINOUS CONCRETE 0.4' AGGREGATE BASE COURSE **ROADWAY EMBANKMENT** TAN, LOOSE, SILTY SAND (A-2-4) W/ TRACE GRAVEL **WEATHERED ROCK** TAN, TRIASSIC SANDSTONE	
	577.4	6.0	100/0.3			100/0.3					
575	574.9	8.5									
			30	70/0.1		100/0.6					
570	569.9	13.5	100/0.4			100/0.4					
										566.4	17.0
565	564.9	18.5								TAN, TRIASSIC MUDSTONE	
			100/0.4			100/0.4				564.5	18.9
										Boring Terminated at Elevation 564.5 ft IN WR: TRIASSIC MUDSTONE	

NCDOT BORE SINGLE B5716.GPJ NC_DOT.GDT 4/2/24

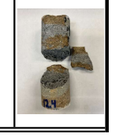
FALCON ENGINEERING 1210 TRINITY ROAD, SUITE 110, CARY, NORTH CAROLINA 27513

SUMMARY OF ROCK CORE TEST RESULTS

BRIDGE NO.140 ON SR 1138 (LINDSEY BRIDGE ROAD) OVER DAN RIVER

ROCKINGHAM COUNTY, NORTH CAROLINA

FALCON ENGINEERING, INC. PROJECT NO: G20014.00

Sample No.	Boring	Alignment	Station	Offset	Northing	Easting	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (ft)	Diameter (ft)	Unit Weight (PCF)	Unconfined Compressive Strength (PSI)	Geologic Strength Index (GSI)	Failure
RS-1	B1-A	-L-	17+27	20 ft LT	956,611	1,707,828	35.0-35.9	SANDSTONE	TRds	76%	0.37	0.16	165.5	17,800	50	
RS-2	B1-B	-L-	17+29	21 ft RT	956,594	1,707,865	26.3-26.7	SANDSTONE	TRds	59%	0.37	0.16	169.1	18,110	50	
RS-3	B2-A	-L-	17+96	15 ft LT	956,669	1,707,864	29.3-29.7	SANDSTONE	TRds	94%	0.37	0.16	166.5	18,790	55	
RS-4	B2-A	-L-	17+96	15 ft LT	956,669	1,707,864	35.0-35.4	MUDSTONE	TRds	82%	0.37	0.16	169.1	6,920	45	
RS-5	B4-A	-L-	20+71	17 ft LT	956,914	1,707,991	12.8-13.2	SANDSTONE	TRds	40%	0.35	0.17	160.5	6,290	40	
RS-6	B4-B	-L-	20+71	17 ft RT	956,898	1,708,201	8.6-9.0	SANDSTONE	TRds	60%	0.37	0.16	155.7	4,230	35	
RS-7	B4-B	-L-	20+71	17 ft RT	956,898	1,708,201	11.2-11.6	SANDSTONE	TRds	38%	0.37	0.16	163.4	12,280	40	
RS-8	EB2-A	-L'	21+45	17 ft LT	956,979	1,708,025	12.0-12.4	SANDSTONE	TRds	61%	0.38	0.16	161.2	10,850	45	

Note: Time to failure on all compression tests was between 2 and 15 minutes per ASTM-D7012.