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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	I-4400B 34232	1	32

REFERENCE: I-4400B

PROJECT: 34232

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION I-26 FROM US 64 (EXIT 49) TO US 25 BUSINESS (EXIT 44)

SITE DESCRIPTION BRIDGE 440212, I-26 OVER CLEAR CREEK

NOTE: UPDATED INVENTORY UTILIZING SUBSURFACE INFORMATION COMPLETED NOV/2001 BY TRIGON ENGINEERING CONSULTANTS

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-7	CROSS SECTIONS
8-30	ORIG. INVENTORY W/ BORE LOGS & CORE REPORTS
31-32	TEST RESULTS

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

NYLE HOTHEM, TRIGON

DAVID TEAGUE, TRIGON

INVESTIGATED BY NYLE HOTHEM, TRIGON

DRAWN BY

CHECKED BY

SUBMITTED BY JC KUHNE, NCDOT

DATE FEB/ 2019

NORTH CAROLINA LICENSED SEAL 1878 GEOLOGIST JODY C KUHNE

DocuSigned by:

4E9C0666A1BC400...

2/18/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-4400B 34232	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

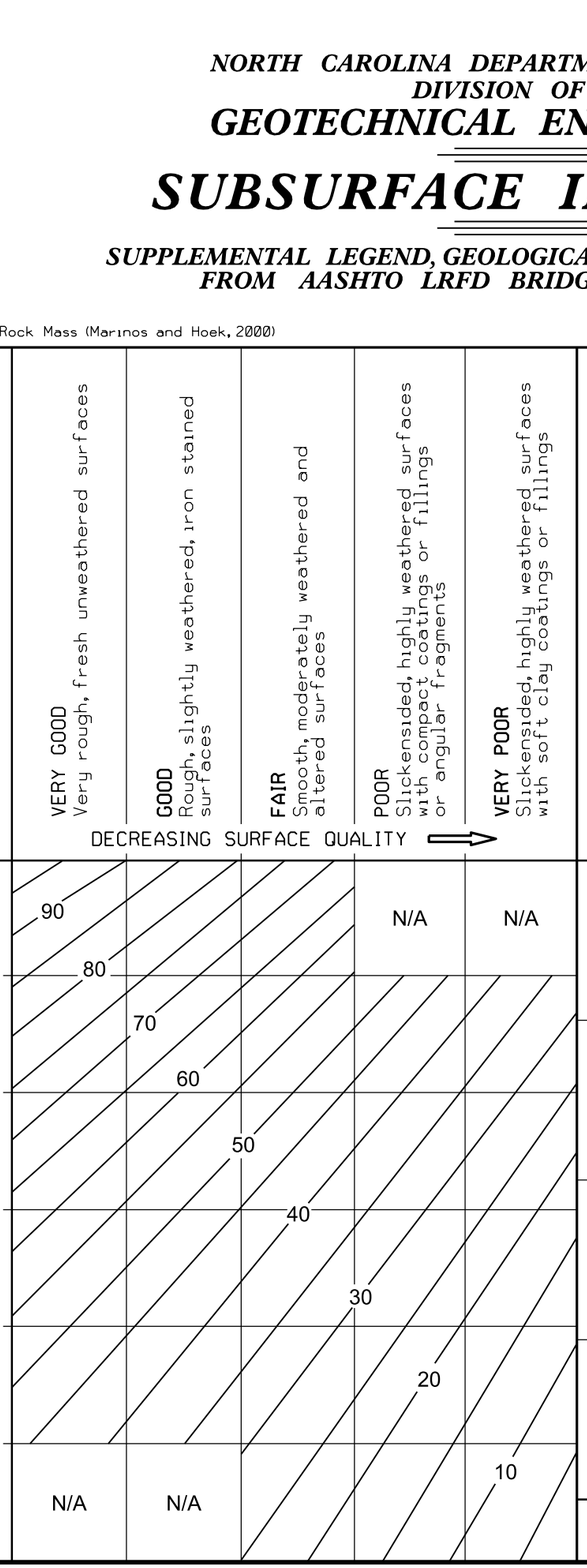
AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

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

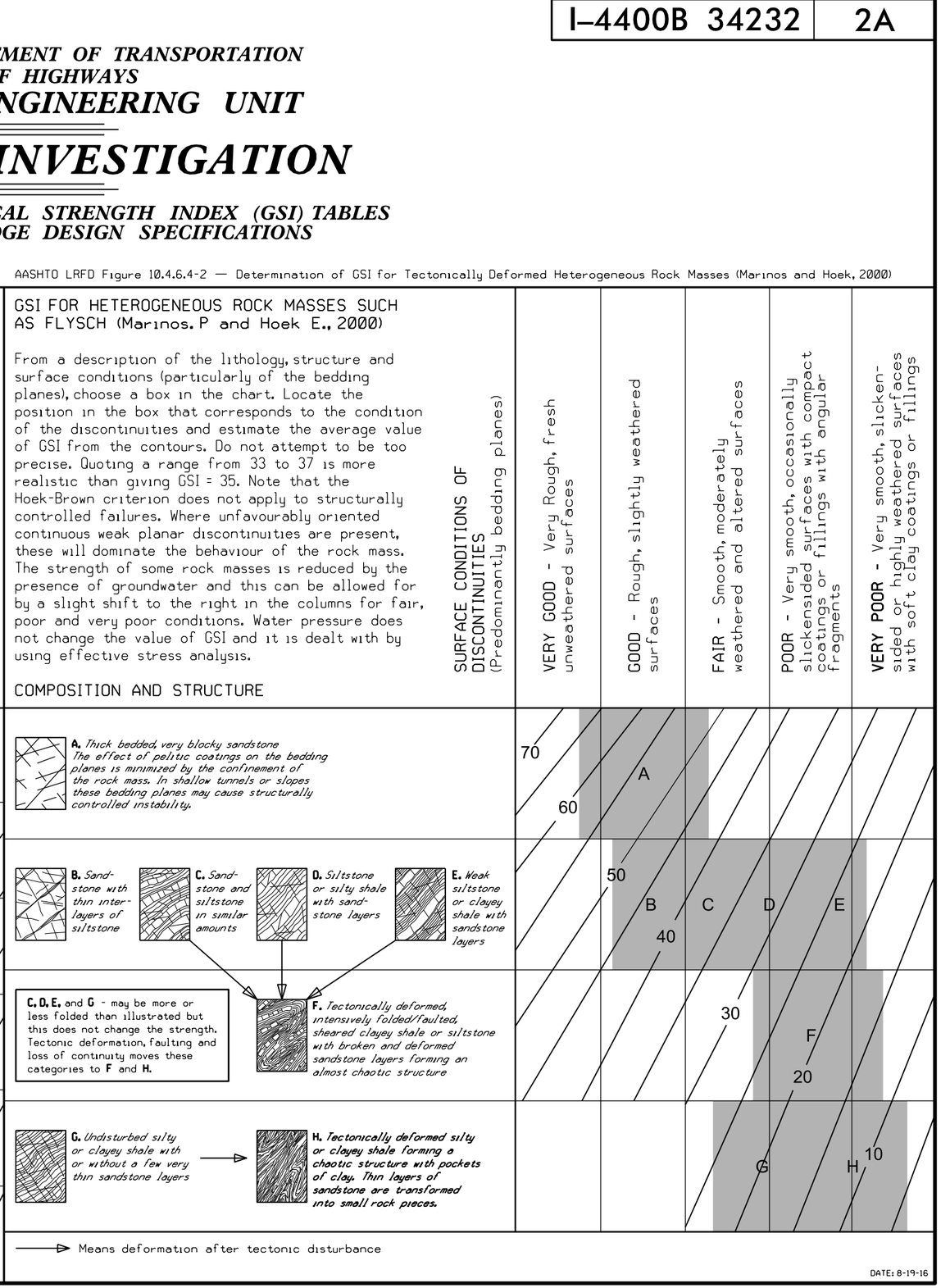


AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

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



DATE: 8-19-16

PROJECT REFERENCE NO.		SHEET NO.
I–4400B	STR. 440212	3

SITE PLAN

0 30 60
FEET

NAD 83

15" CMP

420

F

B–175
420 + 60
71′ LT

APPROX. LOC. BENT 1

JS

B–178
421 + 43
90′ LT

CLEAR CREEK

JS

B–181
422 + 02
81′ LT

B–184
422 + 88
81′ LT

F

CONC BRIDGE

MTL

B–176
420 + 65
21′ LT

B–179
421 + 51
14′ LT

JS

B–182
422 + 09
27′ LT

JS

B–185
422 + 82
29′ LT

CONC BRIDGE

B–174
419 + 87
38′ RT

B–177
420 + 47
30′ RT

B–180
421 + 46
29′ RT

JS

B–183
422 + 10
40′ RT

JS

B–186
422 + 95
39′ RT

END RETAINING WALL –RW4C–
–L– STA. 420 + 57.38, 3.00′ RT

END RETAINING WALL –RW4B–
–L– STA. 420 + 57.44
BEGIN RETAINING WALL –RW4C–
–L– STA. 420 + 57.44, 74.50′ RT

JS

APPROX. LOC. BENT 2

CONC

R/W
MON

F

0	20	40

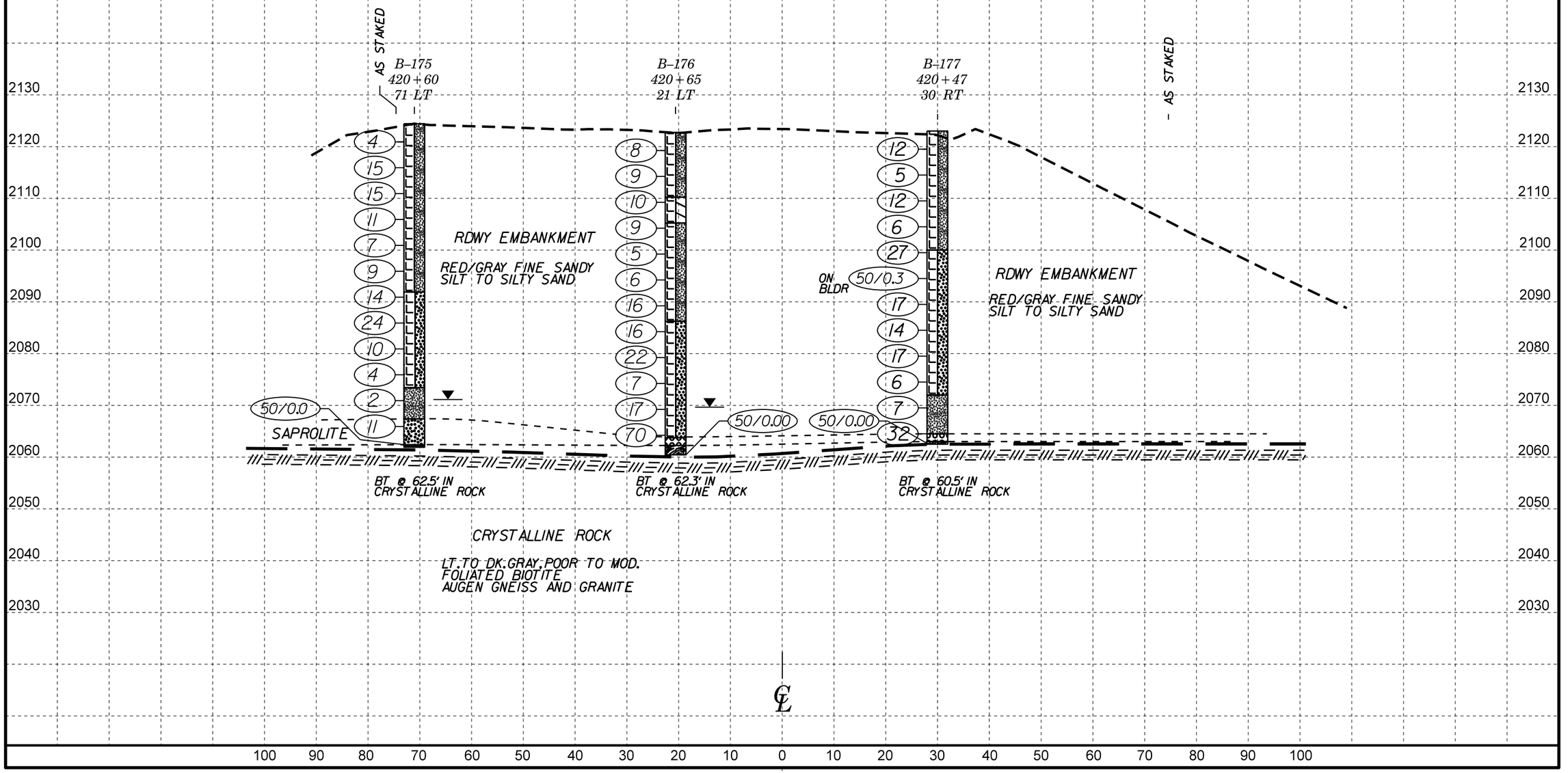
FEET

VE = 1:1

PROJECT REFERENCE NO.	SHEET NO.
I–4400B STR. 440212	4

SECTION THROUGH EB–1

SKEW APPROX 90



PROJECT REFERENCE NO.	SHEET NO.
I–4400B STR. 440212	5

SECTION THROUGH B–1

0 20 40
FEET
VE = 1:1

SKEW APPROX 90

2130 2120 2110 2100 2090 2080 2070 2060 2050 2040 2030

B–178
421+43
90 LT

B–179
421+51
14 LT

B–180
421+46
29 RT

AS STAKED

AS STAKED

EXISTING GROUND

PROPOSED B-1

EXISTING GROUND
ALONG BORINGS

2073.44
2072.90

14
2

ALLUVIUM
GRAY SILTY FINE TO COARSE SAND
W/ GRAVEL

12
100/.5

10
50/0.1
50/0.0

ALLUVIUM

WEATHERED ROCK

CRYSTALLINE ROCK

LT.TO DK.GRAY, POOR TO MOD.
FOLIATED BIOTITE
AUGEN GNEISS AND GRANITE

CRYSTALLINE ROCK

BT @ 33.5' IN
CRYSTALLINE ROCK

GSI = 70-80

BT @ 29.0' IN
CRYSTALLINE ROCK

GSI = 65-75

BT @ 34.3' IN
CRYSTALLINE ROCK

GSI = 30-40 TO 16'
GSI = 65-75, 16' TO 34.3'

℄

100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

PROJECT REFERENCE NO.	SHEET NO.
I–4400B STR. 440212	6

SECTION THROUGH B–2

0 20 40
FEET
VE = 1:1

SKEW APPROX 90

B–181
422+02
81 LT

AS STAKED

B–182
422+09
27 LT

B–183
422+10
40 RT

AS STAKED

EXISTING GROUND
PROPOSED B–2

EXISTING GROUND
ALONG BORINGS

ALLUVIUM

1

50/0.0

ALLUVIUM

50/0.1

GRAY/TAN SILTY FINE TO CSE SAND

6

70

50/0.1

ALLUVIUM

WEATHERED ROCK

CRYSTALLINE ROCK

BT @ 38.2' IN
CRYSTALLINE ROCK
GSI = 75-85

CRYSTALLINE ROCK

BT @ 28.6' IN
CRYSTALLINE ROCK
GSI = 75-85

CRYSTALLINE ROCK

LT.TO DK.GRAY,POOR TO MOD.
FOLIATED BIOTITE
AUGEN GNEISS AND GRANITE

BT @ 33.0' IN
CRYSTALLINE ROCK
GSI = 70-80

2130 2120 2110 2100 2090 2080 2070 2060 2050 2040 2030

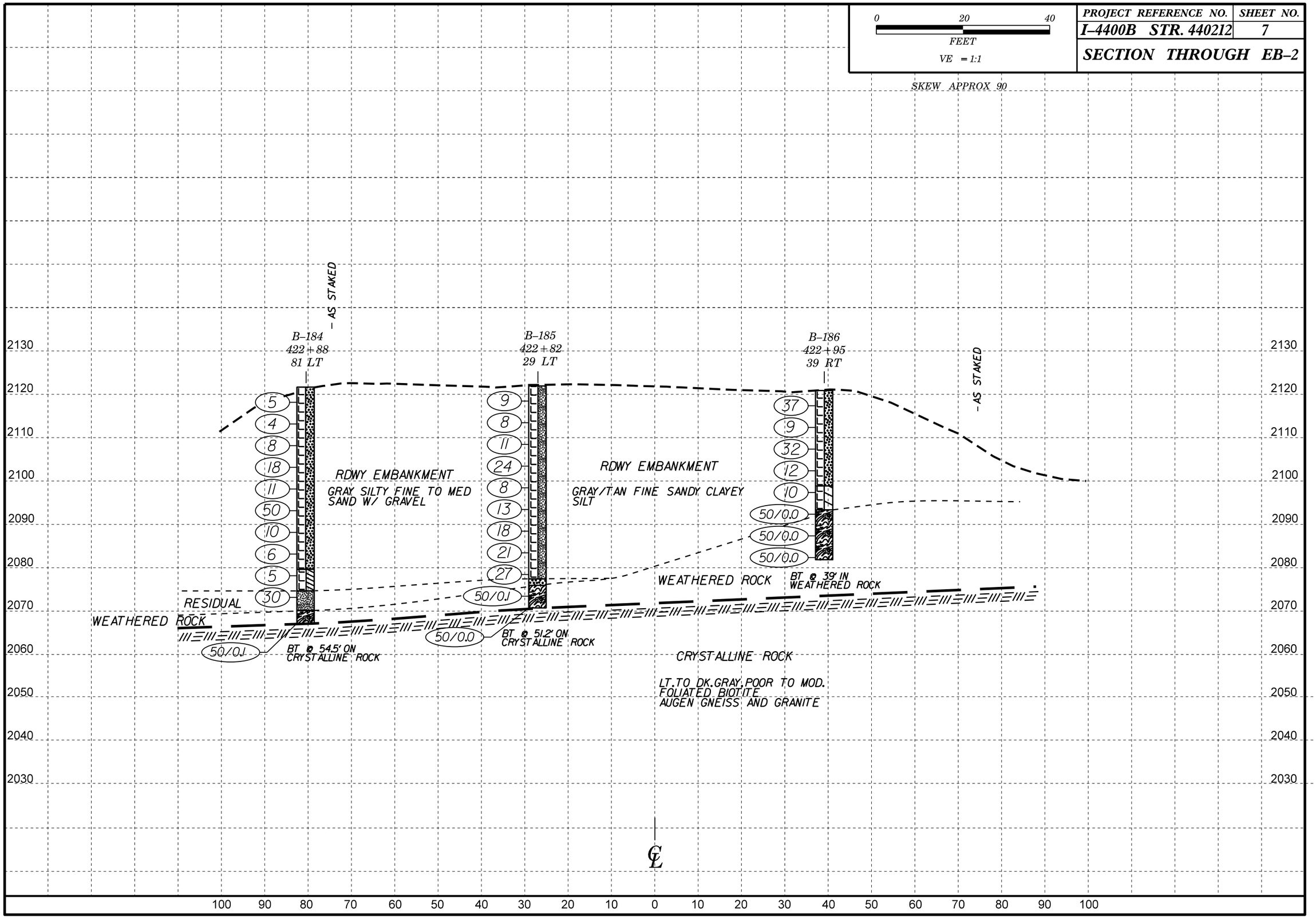
100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

PROJECT REFERENCE NO.	SHEET NO.
I–4400B STR. 440212	7

0 20 40
FEET
VE = 1:1

SECTION THROUGH EB–2

SKEW APPROX 90



PROJECT # 8.1952001 I-4400

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.		1	8
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
8.1952001	NHF-26-1-(62)23	P.E.	
		CONST.	

CONTENTS:

1. NCDOT GEOTECHNICAL UNIT SOIL AND ROCK CLASSIFICATION SHEET
2. SITE LOCATION PLAN (DRAWING 1)
3. BORING IDENTIFICATION DIAGRAM (DRAWING 2)
4. FINAL BORING LOGS WITH CORE BORING REPORTS AND ROCK CORE PHOTOS
5. AASHTO/ASTM SOIL TEST RESULTS
6. SUMMARY OF ROCK TEST DATA
7. SITE PHOTOGRAPHS

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 8.1952001 I.D. NO. I-4400

F.A. PROJECT NHF-26-1-(62)23

COUNTY HENDERSON

PROJECT DESCRIPTION I-26 FROM NC 225 (US 225 CONNECTOR) TO NC 280 IN HENDERSON AND BUNCOMBE COUNTIES

SITE DESCRIPTION DUAL STRUCTURES ON I-26 OVER CLEAR CREEK

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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 UNIT @ (919) 250-4088. THE SUBSURFACE PLANS, FIELDING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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.

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INVESTIGATED BY TRIGON PERSONNEL D.TEAGUE, W.WHICHARD, B. DUCLOS

CHECKED BY C.V.NORVILLE

SUBMITTED BY N.L. HOTHEM

DATE 2/01

NORTH CAROLINA PROFESSIONAL SEAL 025257 ENGINEER NYLE L. HOTHEM 2-28-01 SEAL

SIGNATURE

DRAWN BY: D.TEAGUE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
I-4400	8.1952001	2	PG 9

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. 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
LIQUID LIMIT	6 MX		N.P.	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 ≤ L.L. - 30 : P.I. OF A-7-6 > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YEL-BRN, 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
UNIFORM- INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED- INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 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 SEEPAGE

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- INFERRED SOIL BOUNDARIES
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP/DIP DIRECTION OF ROCK STRUCTURES
- ● - SOUNDING ROD
- SPT CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS
S- BULK SAMPLE
SS- SPLIT SPOON SAMPLE
ST- SHELBY TUBE SAMPLE
RS- ROCK SAMPLE
RT- RECOMPACTED TRIAXIAL SAMPLE
CBR - CBR SAMPLE

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
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☐ CME-45
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☒ OTHER CME-55
- ☒ OTHER CME-850

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 6" CONTINUOUS FLIGHT AUGER
- ☐ 8" HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☒ CASING ☐ W/ ADVANCER
- ☒ TRICONE 2.94 IN. STEEL TEETH
- ☐ TRICONE _____" TUNG.-CARB.
- ☒ CORE BIT
- ☒ OTHER 3.25 IN. ID HSA

HAMMER TYPE:
☒ AUTOMATIC CME-850 ☒ MANUAL CME-55

CORE SIZE:
- ☐ -B____
- ☒ -N Q2
- ☐ -H____

HAND TOOLS:
- ☐ POST HOLE DIGGER
- ☐ HAND AUGER
- ☐ SOUNDING ROD
- ☐ VANE SHEAR TEST
- ☐ OTHER _____

ROCK DESCRIPTION

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

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
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 ROCKS 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, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS 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 GEOLOGISTS 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 GEOLOGISTS 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 GEOLOGISTS 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 FEET
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 THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

CALCAREOUS (CALC.) - SOILS WHICH 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 (F.P.) - 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 SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (R.Q.D.) - 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 WHICH 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, WHICH 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 B.P.F.) 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 LESS THAN 0.1 FOOT PENETRATION WITH 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 (S.R.Q.D.) - 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 (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BL-41: MONUMENT SET IN MEDIAN

ELEVATION: 2119.62 FT.

NOTES:

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. 175	**BORING LOCATION** 420 +60	**OFFSET** 71ft. LT	**ALIGNMENT** -L-	**0 HR.** 53.00
COLLAR ELEV. 2124.67 ft	**NORTHING** 599845	**EASTING** 970 678		**24 HR.** 53.00
TOTAL DEPTH 62.50 ft	**DRILL MACHINE** CME 55 ATV	**DRILL METHOD** 3.25 in ID HSA	**HAMMER TYPE** 140 lb. manual
DATE STARTED 1/12/01	**COMPLETED** 1/12/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2124.67					Ground Surface Elev. 2124.67				2124.67 0.00
	3.50								Roadway Embankment: Medium Stiff to Stiff, Moist, Red, Fine Sandy SILT (A-4)
2120		2	1	3	4		M		
	8.50								
2115		4	6	9	15		M		
	13.50								
2110		5	7	8	15		M		
	18.50								
2105		4	5	6	11		M		
	23.50								
2100		3	3	4	7		M		
	28.50								
2095		4	4	5	9	SS-6	24.4		
	33.50								2092.17 32.50
2090		2	5	9	14		M		Roadway Embankment: Loose to Medium Dense, Moist, Gray, Silty Fine to Medium SAND (A-2-4)
	38.50								
2085		4	9	15	24		M		
	43.50								
2080		4	3	7	10		M		
	48.50								
2075		2	2	2	4		M		
	53.50								2073.67 51.00
2070		WOH	1	1	2	SS-11	41.9		Alluvial: Very Loose, Wet, Gray, Fine to Medium Sandy SILT (A-4)
	58.50								2067.67 57.00
2065		12	5	6	11		M		Residual: Medium Dense, Moist, Gray, Silty Fine SAND (A-2-4)
	62.50								2062.67 62.00
		50/0			50/0				2062.17 Hard Weathered Rock-Gray Henderson Gneiss 62.50
									Auger Refusal at 62.50 ft (EL 2062.17) on Hard Rock (Henderson Gneiss)

TEC-NCDOT_BORE_NEW 01i0013;2.GPJ NCDOT;2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-176	**BORING LOCATION** 420 +65	**OFFSET** 21 ft. LT	**ALIGNMENT** -L-	**0 HR.** 53.00
COLLAR ELEV. 2123.04 ft	**NORTHING** 599,880	**EASTING** 970,714		**24 HR.** 53.00
TOTAL DEPTH 62.30 ft	**DRILL MACHINE** CME 55 ATV	**DRILL METHOD** 3.25 in ID HSA	**HAMMER TYPE** 140 lb. manual
DATE STARTED 1/10/01	**COMPLETED** 1/11/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2123.04					Ground Surface Elev. 2123.04				2123.04 0.00
2120	3.50	3	4	4	8		M		Roadway Embankment: Medium Stiff to Stiff, Moist, Brown and Red, Clayey Fine to Medium Sandy SILT (A-4)
2115	8.50	2	4	5	9		M		
									2110.54 12.50
2110	13.50	5	5	5	10	SS-3	18.0		Roadway Embankment: Stiff Moist, Tan and Gray, Fine to Medium Sandy CLAY (A-7-6)
									2105.54 17.50
2105	18.50	3	4	5	9		M		Roadway Embankment: Medium Stiff to Very Stiff, Moist, Red, Fine Sandy SILT (A-4)
2100	23.50	3	2	3	5		M		
2095	28.50	2	2	4	6		M		
									2086.54 36.50
2090	33.50	5	6	10	16		M		Roadway Embankment: Loose to Medium Dense, Moist, Tan and Gray, Silty Fine to Medium SAND with Gravel (A-2-4)
2085	38.50	4	8	8	16		M		
2080	43.50	16	14	8	22		M		
2075	48.50	5	4	3	7		M		
2070	53.50	6	8	9	17		M		
2065	58.50	4	28	42	70	SS-12	W		2064.04 59.00
	62.30								2062.54 Alluvial: Very Dense, Wet, Tan, Fine to Coarse SAND with Gravel (A-1-b) 60.50
		50/0			50/0				2060.74 Hard Weathered Rock-Gray Henderson Gneiss 62.30
									Auger Refusal at 62.30 feet. (EL 2060.74) on Hard Rock (Henderson Gneiss)

TEC-NCDOT_BORE_NEW 01i00;32.GPJ NCDOT;2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-177	**BORING LOCATION** 420+47	**OFFSET** 30 ft. RT	**ALIGNMENT** -L-	**0 HR.** 56.00
COLLAR ELEV. 2123.05 ft	**NORTHING** 599,898	**EASTING** 970,765		**24 HR.** 56.00
TOTAL DEPTH 60.50 ft	**DRILL MACHINE** CME 55 ATV	**DRILL METHOD** 3.25 in ID HSA	**HAMMER TYPE** 140 lb. manual
DATE STARTED 1/11/01	**COMPLETED** 1/11/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2123.05					Ground Surface Elev. 2123.05				2123.05 0.00
2120	3.50	4	6	6	12		M		Roadway Embankment: Medium Stiff to Stiff, Moist, Red and Brown, Fine Sandy SILT (A-4)
2115	8.50	2	2	3	5		M		
2110	13.50	3	6	6	12		M		
2105	18.50	2	4	4	8		M		
2100	23.50	3	2	25	27		M		2100.05 23.00 Roadway Embankment: Loose to Medium Dense, Moist, Gray, Silty Fine to Medium SAND (A-2-4)
2095	28.50	50/.3			50/.3		M		Note: Boulder encountered from 26.00 to 27.00 ft. and from 28.50 to 29.50 ft.
2090	33.50	4	9	8	17		M		
2085	38.50	6	7	7	14		M		
2080	43.50	8	8	9	17		M		
2075	48.50	4	4	2	6		M		2072.05 51.00
2070	53.50	2	3	4	7	SS-11	36.2		Alluvial: Medium Stiff, Moist, Gray, Fine Sandy SILT (A-4)
2065	58.50	12	16	16	32	SS-12	M		2064.55 58.50
	60.50	50/0			50/0				2063.05 60.00 Residual: Dense, Wet, Tan and Gray, Silty Fine to Medium SAND with Rock Fragments (A-1-b) 60.50 Hard Weathered Rock-Gray Henderson Gneiss Auger Refusal at 60.50 feet (EL 2062.55) on Hard Rock (Henderson Gneiss)

TEC-NCDOT_BORE_NEW 01100132.GPJ NCDOT2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-178	**BORING LOCATION** 421+23	**OFFSET** 90 ft. LT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2073.60 ft	**NORTHING** 599900	**EASTING** 970611		**24 HR.** 5.50
TOTAL DEPTH 33.50 ft	**MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/15/01	**COMPLETED** 1/16/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2073.60					Ground Surface Elev. 2073.60				2073.60 0.00
2070	3.50	18	6	8	14	SS-1	19		Alluvial: Moist, Stiff Gray-Brown Fine to Medium Sandy SILT (A-4) NOTE: Boulder encountered from 1.8 to 3.5 feet
2065	8.50	1	1	1	2	SS-2	W		2067.60 6.00 Alluvial: Very Loose, Wet, Tan and Brown, Silty Fine to Medium SAND with Gravel (A-2-4)
2060	13.50	50/0			50/0				2061.60 12.00 2060.10 Hard Weathered Rock-Gray Henderson Gneiss 13.50
2055									Hard Rock- Very Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Wide Fracture Spacing. Strata REC=100% (20.0) Strata RQD=94% (18.7)
2050						RS-1			
2045									2040.10 33.50 Coring Terminated at 33.50 feet (EL 2040.10) in Hard Rock (Henderson Gneiss)

TEC-NCDOT_BORE_NEW 01100132.GPJ NCDOT2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 1 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B178	**BORING LOCATION** 421+43	**OFFSET** 90 ft. LT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2073.60 ft	**NORTHING** 600,012	**EASTING** 970,746	**24 HR.** 5.50
TOTAL DEPTH 33.5 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/15/01	**COMPLETED** 1/16/01	**SURFACE WATER DEPTH**	
CORE SIZE NQ2	**TOTAL RUN** 20.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2060.1	13.5								Begin Coring @ 2060.10 ft
		5.0	14:49	(5.0) 100%	(4.4) 88%		100%	94%	Hard Rock- Very Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Wide Fracture Spacing.
			2:08						Strata REC=100% (20.0)
			2:38						Strata RQD=94% (18.7)
			2:30						
			2:07						
2055.1	18.5								
		5.0	2:41	(5.0) 100%	(4.4) 88%				
			2:01						
			2:25						
			3:17						
			3:34						
2050.1	23.5								
		5.0	2:19	(5.0) 100%	(4.9) 98%				
			2:17						
			2:28			AS-1			
			2:41						
			2:31						
2045.1	28.5								
		5.0	3:16	(5.0) 100%	(5.0) 100%				
			4:14						
			4:35						
			5:04						
			4:58						
2040.1	33.5								2040.10

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

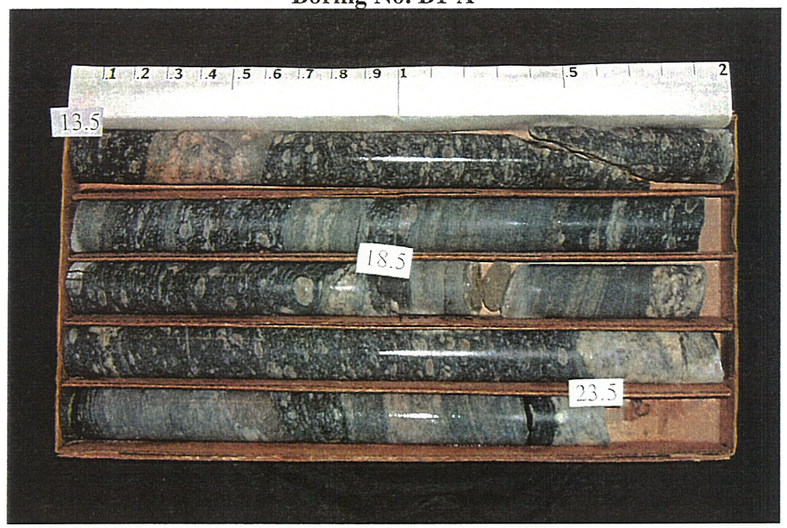
SHEET 2 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-178 **BORING LOCATION** 421+43		**OFFSET** 90 ft. LT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2073.60 ft	**NORTHING** 600,012	**EASTING** 970,746	**24 HR.** 5.50
TOTAL DEPTH 33.5 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/15/01	**COMPLETED** 1/16/01	**SURFACE WATER DEPTH**	
CORE SIZE NQ2	**TOTAL RUN** 20.0 ft	**DRILLER** W. Whichard	

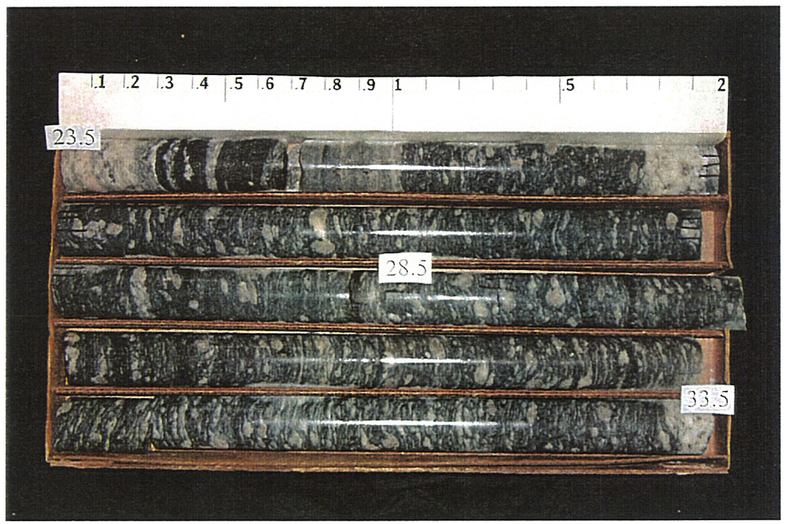
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2040.1	33.5								Continued from previous page
									Coring Terminated at 33.50 feet (EL 2040.10) in Hard Rock (Henderson Gneiss)

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B1-A



Box 1 of 2



Box 2 of 2

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	ID. I-4400	COUNTY Henderson	GEOLOGIST D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			GROUND WATER (ft)
BORING NO. B-179	BORING LOCATION 421+51	OFFSET 14 ft. LT	ALIGNMENT -L-	0 HR. N/M
COLLAR ELEV. 2068.28 ft	NORTHING 599952	EASTING 970667		24 HR. 0.20
TOTAL DEPTH 29.00 ft	DRILL MACHINE CME 850 Track	DRILL METHOD 2.94 in. Tricone		HAMMER TYPE 140 lb. auto
DATE STARTED 1/23/01	COMPLETED 1/23/01	SURFACE WATER DEPTH		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
2068.28					Ground Surface Elev. 2068.28				2068.28	0.00
	3.50								2066.28 Alluvial: Very Loose, Wet, Gray, Silty Fine to Medium SAND with Gravel (A-2-4)	2.00
2065		7	7	5	12		M		Residual: Medium Dense, Moist, Gray, Silty Fine to Coarse SAND with Rock Fragments (A-2-4)	
	8.50								2062.28	6.00
2060		100/.5			100/.5				Soft Weathered Rock-Gray Henderson Gneiss	
									2059.28	9.00
2055									Hard Rock- Very Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Wide Fracture Spacing.	
2050									Strata REC=100% (20.0) Strata RQD=87% (17.4)	
	15					RS-3				
2040									2039.28	29.00
									Coring Terminated at 29.00 feet (EL 2039.28) in Hard Rock (Henderson Gneiss)	

TEC- NCDOT _BORE_NEW_011 00132.GPJ NCDOT2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 1 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-179	**BORING LOCATION** 421+51	**OFFSET** 14 ft. LT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2068.28 ft	**NORTHING** 599,980	**EASTING** 970,678		**24 HR.** 0.20
TOTAL DEPTH 29.0 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto	
DATE STARTED 1/23/01	**COMPLETED** 1/23/01	**SURFACE WATER DEPTH**		
CORE SIZE NQ2	**TOTAL RUN** 20.0 ft	**DRILLER** W. Whichard		

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2059.3	9.0								Begin Coring @ 2059.28 ft
		5.0	3:09	(5.0) 100%	(4.1) 82%		100%	87%	Hard Rock- Very Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Wide Fracture Spacing.
			2:33						Strata REC=100% (20.0)
			2:16						Strata RQD=87% (17.4)
			2:36						
2054.3	14.0		2:16						
		5.0	1:51	(5.0) 100%	(3.3) 66%				
			1:38						
			1:24						
			2:41						
2049.3	19.0		2:36						
		5.0	2:02	(5.0) 100%	(5.0) 100%				
			2:01			RS-3			
			2:05						
			2:35						
2044.3	24.0		2:01						
		5.0	1:55	(5.0) 100%	(5.0) 100%				
			2:16						
			2:26						
			2:36						
2039.3	29.0		3:11						2039.28

29.00

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 2 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-179	**BORING LOCATION** 421+51	**OFFSET** 14 ft. LT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2068.28 ft	**NORTHING** 599,980	**EASTING** 970,678		**24 HR.** 0.20
TOTAL DEPTH 29.0 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto	
DATE STARTED 1/23/01	**COMPLETED** 1/23/01	**SURFACE WATER DEPTH**		
CORE SIZE NQ2	**TOTAL RUN** 20.0 ft	**DRILLER** W. Whichard		

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2039.3	29.0								Continued from previous page
									Coring Terminated at 29.00 feet (EL 2039.28) in Hard Rock (Henderson Gneiss)

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B1-C

Box 1 of 2

Box 2 of 2

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-I80	**BORING LOCATION** 421+46	**OFFSET** 29 ft. RT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2069.11 ft	**NORTHING** 599975	**EASTING** 970705		**24 HR.** 1.00
TOTAL DEPTH 34.30 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/22/01	**COMPLETED** 1/23/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2069.11					Ground Surface Elev. 2069.11				2069.11 0.00
	3.50								Alluvial: Very Loose, Wet, Gray, Silty Fine to Medium SAND with Gravel (A-2-4)
2065		4	3	7	10	SS-1	M		2065.11 4.00
	8.50								2063.61 Residual: Medium Dense, Moist, Gray, Silty Fine to Coarse SAND (A-2-4) 5.50
	9.30	50/.1			50/.1				Hard Weathered Rock-Gray Henderson Gneiss
2060		50/0			50/0	RS-2			2059.81 9.30
									Hard Rock- Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Very Close to Wide Fracture Spacing.
2055									2055.31 13.80
									Strata REC=85% (3.8) Strata RQD=71% (3.2)
									2051.81 Soft Weathered Rock-Gray Henderson Gneiss 17.30
2050									2049.81 Strata REC=29% (1.0) Strata RQD=14% (0.5) 19.30
									Hard Rock- Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Very Close to Wide Fracture Spacing.
2045									Strata REC=100% (2.0) Strata RQD=40% (0.8)
									Hard Rock- Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Moderately Close to Wide Fracture Spacing.
2040									Strata REC=100% (10.0) Strata RQD=91% (9.1)
2035									2034.81 34.30
									Coring Terminated at 34.30 feet (EL 2034.81) in Hard Rock (Henderson Gneiss)

TEC- NCDOT _BORE 11001 32.GPJ NCDOT2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 1 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-180	**BORING LOCATION** 421+46	**OFFSET** 29 ft. RT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2069.11 ft	**NORTHING** 599975	**EASTING** 970705		**24 HR.** 1.00
TOTAL DEPTH 34.3 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto	
DATE STARTED 1/22/01	**COMPLETED** 1/23/01	**SURFACE WATER DEPTH**		
CORE SIZE NQ2	**TOTAL RUN** 25.0 ft	**DRILLER** W. Whichard		

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2059.8	9.3								Begin Coring @ 2059.81 ft
		5.0	2:57 2:46 3:27 3:00 0:39	(4.1) 82%	(3.2) 64%	RS-2	85%	71%	Hard Rock- Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Very Close to Wide Fracture Spacing. Strata REC=85% (3.8) Strata RQD=71% (3.2)
2054.8	14.3								2055.31 — 13.80
		5.0	1:10 0:51 0:36 1:23 1:05	(2.7) 54%	(1.3) 26%		29%	14%	Soft Weathered Rock-Gray Henderson Gneiss Strata REC=29% (1.0) Strata RQD=14% (0.5)
2049.8	19.3								2051.81 — 17.30
		5.0	2:13 1:58 1:45 1:51 2:11	(5.0) 100%	(4.1) 82%		100%	40%	Hard Rock- Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Very Close to Wide Fracture Spacing. Strata REC=100% (2.0) Strata RQD=40% (0.8)
2044.8	24.3								2049.81 — 19.30
		5.0	3:12 2:55 2:25 1:54 1:43	(5.0) 100%	(5.0) 100%		100%	91%	Hard Rock- Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Moderately Close to Wide Fracture Spacing. Strata REC=100% (10.0) Strata RQD=91% (9.1)
2039.8	29.3								

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

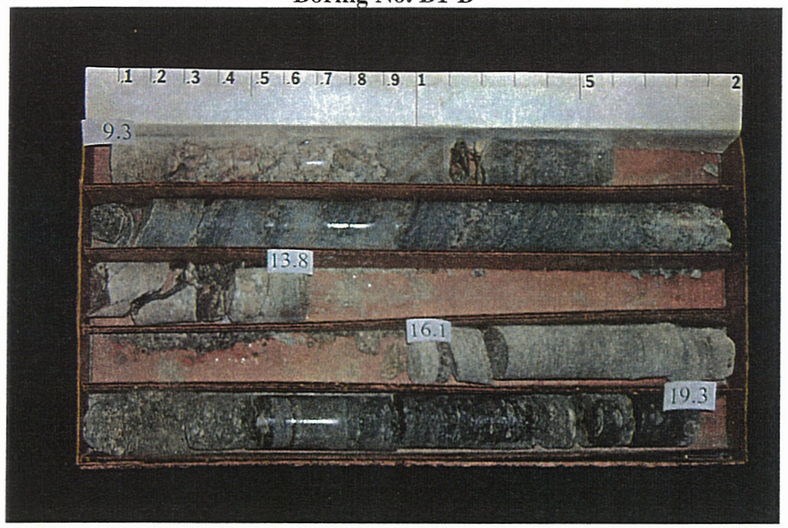
SHEET 2 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-180	**BORING LOCATION** 421+46	**OFFSET** 29 ft. RT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2069.11 ft	**NORTHING** 599975	**EASTING** 970705		**24 HR.** 1.00
TOTAL DEPTH 34.3 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto	
DATE STARTED 1/22/01	**COMPLETED** 1/23/01	**SURFACE WATER DEPTH**		
CORE SIZE NQ2	**TOTAL RUN** 25.0 ft	**DRILLER** W. Whichard		

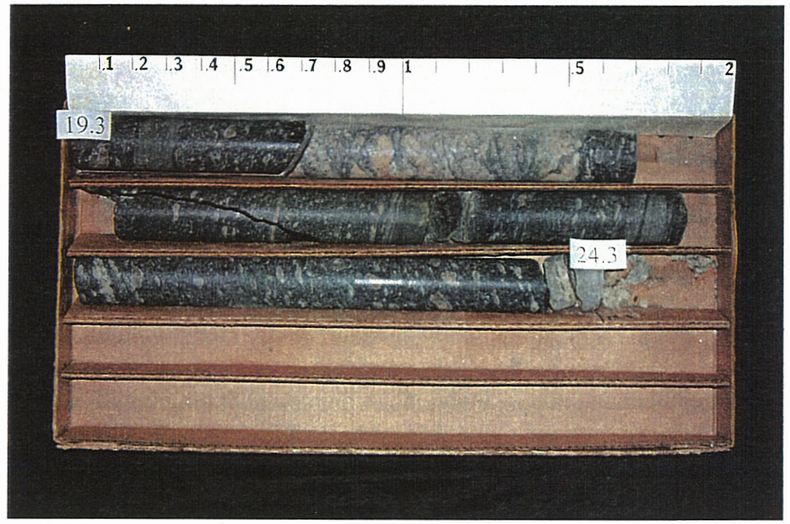
ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2039.8	29.3								Continued from previous page
		5.0	1:51 1:46 2:07 2:28 2:13	(5.0) 100%	(4.6) 92%				
2034.8	34.3								2034.81 — 34.30
									Coring Terminated at 34.30 feet (EL 2034.81) in Hard Rock (Henderson Gneiss)

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B1-B



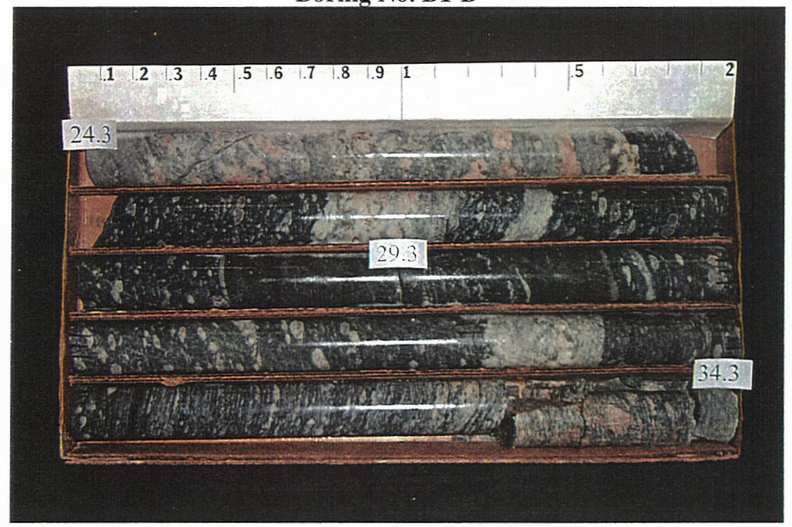
Box 1 of 3



Box 2 of 3

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B1-B



Box 3 of 3

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-181	**BORING LOCATION** 422+0 2	**OFFSET** 81 ft. LT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2074.42 ft	**NORTHING** 599952	**EASTING** 970 582	**24 HR.** 6.30
TOTAL DEPTH 38.20 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/29/01	**COMPLETED** 1/30/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2074.42					Ground Surface Elev. 2074.42				2074.42 0.00
	3.50								Alluvial: Very Loose, Moist to Wet, Gray, Silty Fine to Medium SAND (A-2-4)
2070		50/.2			50/.2		M		NOTE: Boulder encountered from 1.00 to 3.80 feet
	8.50								
2065		WOH	WOH	1	1	SS-2	W		2062.22 12.20
	13.20								2061.22 Hard Weathered Rock-Gray Henderson Gneiss 13.20
2060		50/0			50/0				Hard Rock- Fresh, Very Hard, Light to Dark Gray Henderson Gneiss with Wide Fracture Spacing. NOTE: Close Fracture Spacing from 20.0 to 20.3 feet.
2055						RS-4			Strata REC=100% (25.0) Strata RQD=99% (24.9)
2050									
2045									
2040									2036.22 38.20
									Coring Terminated at 38.20 feet (EL 2036.22) in Hard Rock (Henderson Gneiss)

TEC-NCDOT_BORE_N 1100132.GPJ NCDOT2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 1 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-I8I	**BORING LOCATION** 422+O2	**OFFSET** 8I ft. LT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2074.42 ft	**NORTHING** 599952	**EASTING** 97O582	**24 HR.** 6.30
TOTAL DEPTH 38.2 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/29/01	**COMPLETED** 1/30/01	**SURFACE WATER DEPTH**	
CORE SIZE NQ2	**TOTAL RUN** 25.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2061.2	13.2								Begin Coring @ 2061.22 ft
		5.0	5:46	(5.0) 100%	(5.0) 100%		100%	99%	Hard Rock- Fresh, Very Hard, Light to Dark Gray Henderson Gneiss with Wide Fracture Spacing. NOTE: Close Fracture Spacing from 20.0 to 20.3 feet.
			5:21						Strata REC=100% (25.0) Strata RQD=99% (24.9)
			6:12						
			4:25						
			3:56						
2056.2	18.2	5.0	4:08	(5.0) 100%	(4.9) 98%	RS-4			
			4:37						
			5:09						
			6:03						
			5:51						
2051.2	23.2	5.0	6:35	(5.0) 100%	(5.0) 100%				
			7:10						
			7:32						
			8:16						
			10:05						
2046.2	28.2	5.0	2:58	(5.0) 100%	(5.0) 100%				
			2:16						
			2:15						
			2:15						
			2:18						
2041.2	33.2								

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 2 OF 2

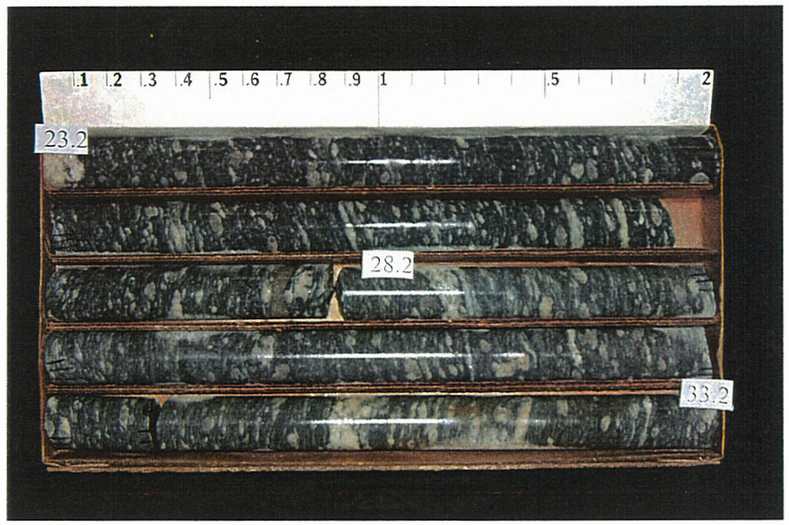
PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-I8I	**BORING LOCATION** 422+O2	**OFFSET** 8I ft. LT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2074.42 ft	**NORTHING** 599952	**EASTING** 97O582	**24 HR.** 6.30
TOTAL DEPTH 38.2 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/29/01	**COMPLETED** 1/30/01	**SURFACE WATER DEPTH**	
CORE SIZE NQ2	**TOTAL RUN** 25.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2041.2	33.2								Continued from previous page
		5.0	1:58	(5.0) 100%	(5.0) 100%				
			1:54						
			2:08						
			2:04						
			1:55						
2036.2	38.2								2036.22 38.20 Coring Terminated at 38.20 feet (EL 2036.22) in Hard Rock (Henderson Gneiss)

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B2-A

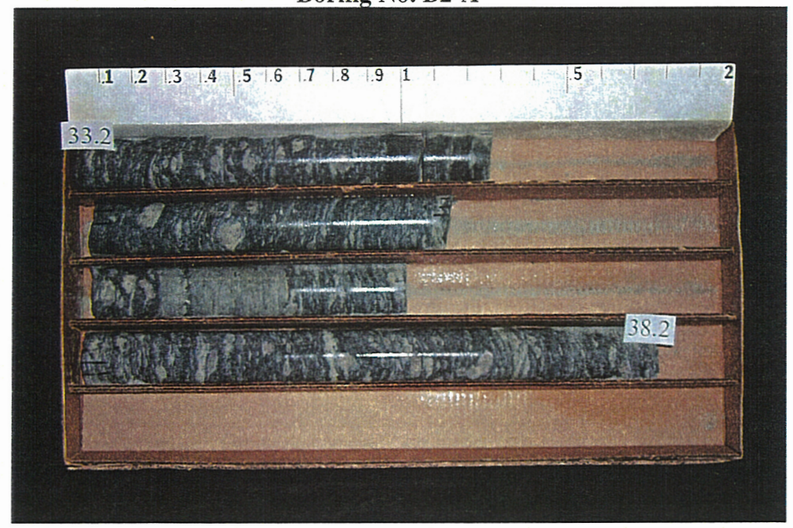
Box 1 of 3



Box 2 of 3

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B2-A



Box 3 of 3

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

JECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-182	**BORING LOCATION** 422+09	**OFFSET** 27 ft. LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2067.57 ft	**NORTHING** 599991	**EASTING** 970621		**24 HR.** N/A
TOTAL DEPTH 28.60 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/24/01	**COMPLETED** 1/29/01	**SURFACE WATER DEPTH** 0.5	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2068.07	-0.50 0.00				Water Surface Elev. 2068.07 Ground Surface Elev. 2067.57				2067.57 0.00
									Alluvial: Very Loose, Wet, Tan, Silty Fine to Coarse SAND with Gravel (A-2-4)
2065	3.50	50/.1			50/.1				2064.57 3.00
									2063.97 Hard Weathered Rock-Gray Henderson Gneiss 3.60
									Hard Rock- Slightly to Very Slightly Weathered, Moderately Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Moderately Close Fracture Spacing.
2060						RS-6			2058.97 8.60
									Strata REC=96% (4.8) Strata RQD=60% (3.0) Hard Rock- Fresh, Very Hard, Light to Dark Gray Henderson Gneiss with Very Wide Fracture Spacing
2055									Strata REC=100% (20.0) Strata RQD=100% (20.0)
2050									
2040									2038.97 28.60
									Coring Terminated at 28.60 feet (EL 2038.97) in Hard Rock (Henderson Gneiss)

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 1 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-182	**BORING LOCATION** 422+09	**OFFSET** 27 ft. LT **ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2068.07 ft	**NORTHING** 599991	**EASTING** 970621	**24 HR.** N/A
TOTAL DEPTH 28.6 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/24/01	**COMPLETED** 1/29/01	**SURFACE WATER DEPTH** 0.5	
CORE SIZE NQ2	**TOTAL RUN** 25.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2064.0	3.6								Begin Coring @ 2063.97 ft
		5.0	3:03	(4.8) 96%	(3.0) 60%		96%	60%	Hard Rock- Slightly to Very Slightly Weathered, Moderately Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Moderately Close Fracture Spacing.
			2:39						Strata REC=96% (4.8)
			1:57						Strata RQD=60% (3.0)
			3:06						
			1:11			RS-6			
2059.0	8.6								2058.97 8.60
		5.0	2:20	(5.0) 100%	(5.0) 100%		100%	100%	Hard Rock- Fresh, Very Hard, Light to Dark Gray Henderson Gneiss with Very Wide Fracture Spacing
			2:06						Strata REC=100% (20.0)
			2:15						Strata RQD=100% (20.0)
			2:56						
			2:31						
2054.0	13.6								
		5.0	1:45	(5.0) 100%	(5.0) 100%				
			1:54						
			2:31						
			3:15						
			2:59						
2049.0	18.6								
		5.0	2:39	(5.0) 100%	(5.0) 100%				
			3:25						
			3:29						
			3:26						
			3:44						
2044.0	23.6								

TEC- NCDOT _CORE#2 0[illegible]0132.GPJ NCDOT2GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 2 OF 2

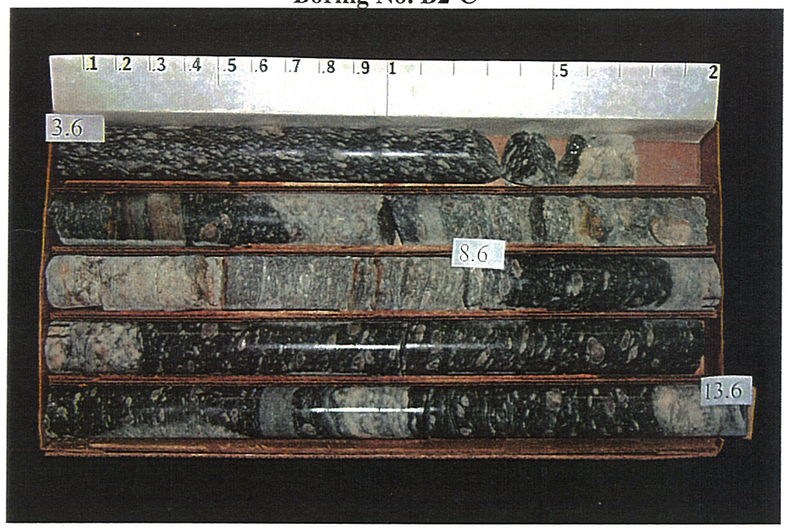
PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B2-C	**BORING LOCATION** 422+09	**OFFSET** 27 ft. LT **ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 2068.07 ft	**NORTHING** 599991	**EASTING** 970621	**24 HR.** N/A
TOTAL DEPTH 28.6 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/24/01	**COMPLETED** 1/29/01	**SURFACE WATER DEPTH** 0.5	
CORE SIZE NQ2	**TOTAL RUN** 25.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2044.0	23.6								Continued from previous page
		5.0	3:41	(5.0) 100%	(5.0) 100%				
			3:24						
			4:24						
			4:07						
			3:31						
2039.0	28.6								2038.97 28.60
									Coring Terminated at 28.60 feet (EL 2038.97) in Hard Rock (Henderson Gneiss)

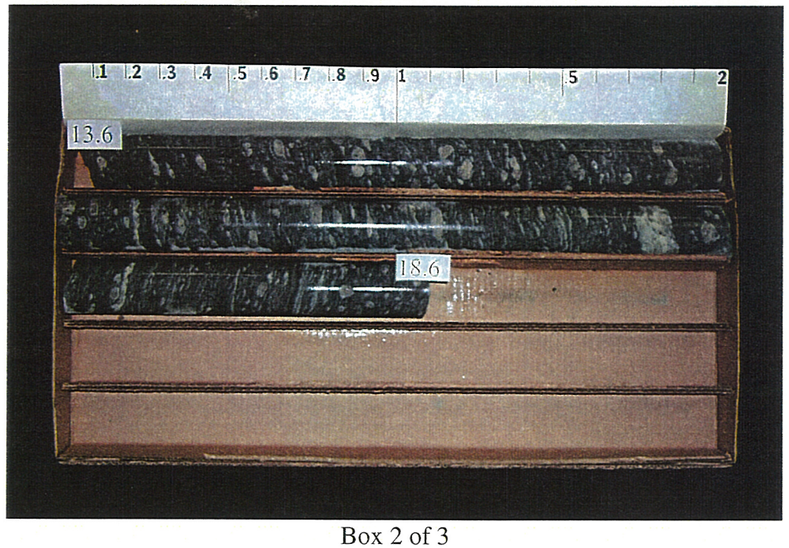
TEC-NCDOT_CORE#2 01100132.GPJ NCDOT2.GDT 2/27/01

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B2-C



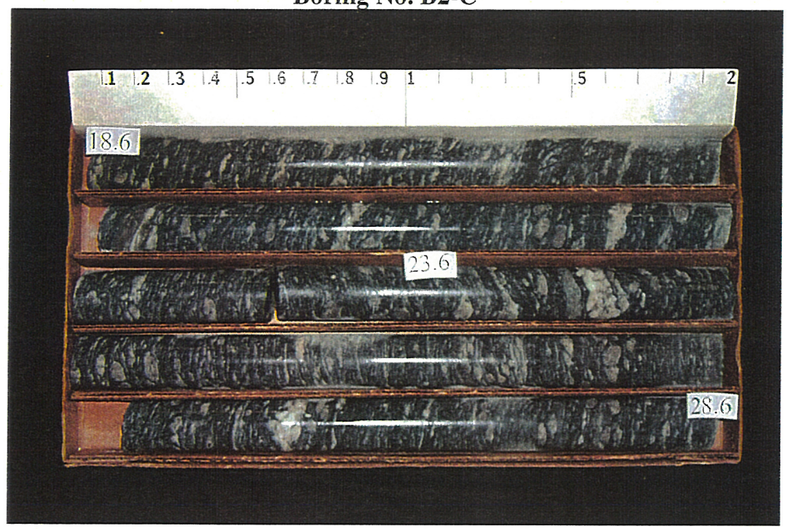
Box 1 of 3



Box 2 of 3

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B2-C



Box 3 of 3

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-I83	**BORING LOCATION** 422+IO	**OFFSET** 40 ft. RT	**ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2074.08 ft	**NORTHING** 600032	**EASTING** 97O675		**24 HR.** 6.00
TOTAL DEPTH 33.00 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto	
DATE STARTED 1/30/01	**COMPLETED** 1/31/01	**SURFACE WATER DEPTH**		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2074.08					Ground Surface Elev. 2074.08				2074.08 0.00
2070	3.50	7	1	5	6		M		Alluvial: Loose, Moist, Gray, Silty Fine to Medium SAND with Gravel (A-2-4) NOTE: Boulder encountered from 2.50 to 3.50 feet
2065	8.50	9	9	61	70		M		2064.58 9.50 2064.08 Residual: Very Dense, Moist, Tan and Gray, Silty Fine to Coarse SAND (A-2-4) 10.00 2061.08 Hard Weathered Rock-Gray Henderson Gneiss 13.00
2060	13.00	50/0			50/0				Hard Rock- Very Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Wide Fracture Spacing. Note: Core Would Not Break below 32.30 feet. Therefore, 32.30 feet to 33.00 feet left in hole. Strata REC=100% (20.0) Strata RQD=98% (19.6)
2055									
2050						RS-5			
2045									2041.08 33.00 Coring Terminated at 33.00 feet (EL 2041.08) in Hard Rock (Henderson Gneiss)

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 1 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-183	**BORING LOCATION** 422+1O	**OFFSET** 40 ft. RT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2074.08 ft	**NORTHING** 600032	**EASTING** 970675	**24 HR.** 6.00
TOTAL DEPTH 33.0 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/30/01	**COMPLETED** 1/31/01	**SURFACE WATER DEPTH**	
CORE SIZE NQ2	**TOTAL RUN** 20.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2061.1	13.0								Begin Coring @ 2061.08 ft
		5.0	3:35	(5.0) 100%	(4.7) 94%		100%	98%	Hard Rock- Very Slightly Weathered to Fresh, Hard to Very Hard, Light to Dark Gray Henderson Gneiss with Close to Wide Fracture Spacing. Note: Core Would Not Break below 32.30 feet. Therefore, 32.30 feet to 33.00 feet left in hole. Strata REC=100% (20.0) Strata RQD=98% (19.6)
			2:51						
			2:57						
			3:10						
2056.1	18.0		3:07						
		5.0	2:50	(4.0) 80%	(4.9) 98%				
			2:56						
			3:01						
			2:51						
2051.1	23.0		2:45						
		5.0	2:51	(5.0) 100%	(5.0) 100%	RS-5			
			2:16						
			2:41						
			3:25						
2046.1	28.0		3:17						
		5.0	4:28	(5.0) 100%	(5.0) 100%				
			4:24						
			4:10						
			4:25						
2041.1	33.0		4:18						2041.08

TEC-NCDOT_CORE#2 01100132.GPJ NCDOT2.GDT 2/27/01

TRIGON ENGINEERING CONSULTANTS, INC.
CORE BORING REPORT

SHEET 2 OF 2

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER** (ft)
BORING NO. B-183	**BORING LOCATION** 422+1O	**OFFSET** 40 ft. RT **ALIGNMENT** -L-	**0 HR.** N/M
COLLAR ELEV. 2074.08 ft	**NORTHING** 600032	**EASTING** 970675	**24 HR.** 6.00
TOTAL DEPTH 33.0 ft	**DRILL MACHINE** CME 850 Track	**DRILL METHOD** 2.94 in. Tricone	**HAMMER TYPE** 140 lb. auto
DATE STARTED 1/30/01	**COMPLETED** 1/31/01	**SURFACE WATER DEPTH**	
CORE SIZE NQ2	**TOTAL RUN** 20.0 ft	**DRILLER** W. Whichard	

ELEV. (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min./ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. %	STRATA RQD %	DESCRIPTION AND REMARKS
2041.1	33.0								Continued from previous page
									Coring Terminated at 33.00 feet (EL 2041.08) in Hard Rock (Henderson Gneiss)

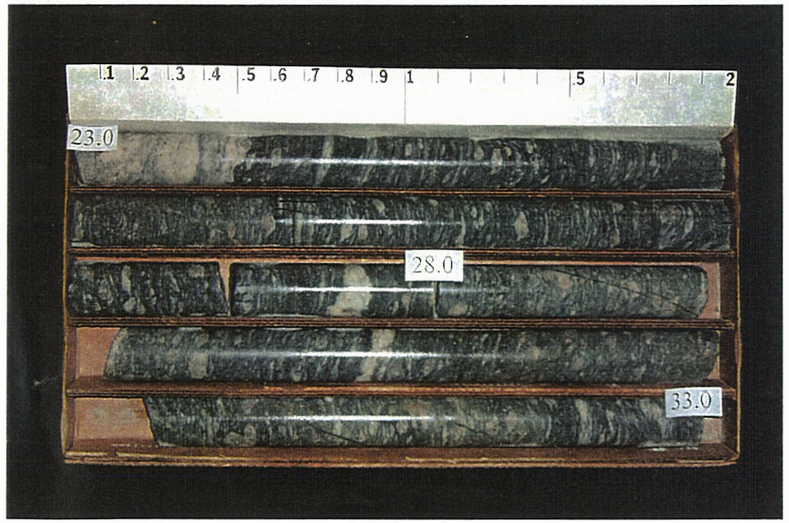
33.00

TEC-NCDOT_CORE#2 01100132.GPJ NCDOT2.GDT 2/27/01

ROCK PHOTOGRAPHS

Dual Structures on I-26 over Clear Creek
NCDOT Project 8.1952001 (I-4400)
Boring No. B2-B

Box 1 of 2



Box 2 of 2

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO B-184	**BORING LOCATION** 422+88	**OFFSET** 81 ft. LT	**ALIGNMENT** L-	**0 HR.** Dry
COLLAR ELEV. 2121.65 ft	**NORTHING** 600024	**EASTING** 970531		**24 HR.** Dry
TOTAL DEPTH 54.50 ft	**DRILL MACHINE** CME 55 ATV	**DRILL METHOD** 3.25 in ID HSA	**HAMMER TYPE** 140 lb. manual	
DATE STARTED 1/10/01	**COMPLETED** 1/10/01	**SURFACE WATER DEPTH**		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2121.65					Ground Surface El ev 2121.65				2121.65 0.00
2120	3.50	3	3	2	5		M		Roadway Embankment: Loose to Dense, Gray, Silty Fine to Medium SAND with Gravel (A-2-4)
2115	8.50	2	1	3	4		M		
2110	13.50	5	5	3	8		M		
2105	18.50	12	10	8	18		M		
2100	23.50	6	5	6	11		M		
2095	28.50	5	35	15	50		M		
2090	33.50	5	5	5	10		M		
2085	38.50	2	3	3	6		M		2079.65 42.00
2080	43.50	3	2	3	5	SS-9	15.8		Roadway Embankment: Medium Stiff, Moist, Brown and Gray, Fine to Medium Sandy CLAY (A-6)
2075	48.50	18	10	20	30	SS-10	19.3		2074.65 47.00 Residual: Very Stiff, Moist, Red and Gray, Fine to Medium Sandy SILT (A-4)
2070	53.50								2070.15 51.50 Hard Weathered Rock-Gray Henderson Gneiss
	54.50	50/.1			50/.1				2067.15 54.50 Auger Refusal at 54.50 ft. (EL 2067.15) on Hard Rock-Henderson Gneiss
		50/.1							

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-185	**BORING LOCATION** 422+82	**OFFSET** 29 ft. LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2121.92 ft	**NORTHING** 600049	**EASTING** 970576		**24 HR.** Dry
TOTAL DEPTH 51.20 ft	**DRILL MACHINE** CME 55 ATV	**DRILL METHOD** 3.25 in ID HSA	**HAMMER TYPE** 140 lb. manual	
DATE STARTED 1/9/01	**COMPLETED** 1/9/01	**SURFACE WATER DEPTH**		

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2121.92					Ground Surface El ev.2121.92				2121.92 0.00
2120	3.50	3	4	5	9		M		Roadway Embankment: Stiff to Very Stiff, Moist, Gray-Tan-Red, Fine to Medium Sandy Clayey SILT (A-4)
2115	8.50	4	4	4	8		M		Note: Boulder Encountered From 33.50 to 37.00 feet
2110	13.50	12	7	4	11	SS-3	16.7		
2105	18.50	7	8	16	24		M		
2100	23.50	8	4	4	8		M		
2095	28.50	6	6	7	13	SS-6	31.1		
2090	33.50	10	9	9	18		M		
2085	38.50	4	6	15	21		M		
2080	43.50	5	5	22	27		M		2077.42 44.50
2075	48.50	50/.1			50/.1				2075.92 46.00 Residual: Medium Dense, Moist, Gray, Silty Fine to Coarse SAND with Gravel (A-2-4) Hard Weathered Rock-Gray Henderson Gneiss
	51.20	50/0			50/0				2070.72 51.20 Auger Refusal at 51.20 ft. (EL 2070.72) on Hard Rock- Henderson Gneiss

TRIGON ENGINEERING CONSULTANTS, INC.
BORING LOG

SHEET 1 OF 1

PROJECT NO. 8.1952001	**ID.** I-4400	**COUNTY** Henderson	**GEOLOGIST** D.Teague
SITE DESCRIPTION Dual Structures on I-26 over Clear Creek			**GROUND WATER (ft)**
BORING NO. B-186	**BORING LOCATION** 422+95	**OFFSET** 39 ft. RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2120.90 ft	**NORTHING** 600099	**EASTING** 970624		**24 HR.** Dry
TOTAL DEPTH 39.00 ft	**DRILL MACHINE** CME 55 ATV	**DRILL METHOD** 3.25 in ID HSA	**HAMMER TYPE** 140 lb. manual
DATE STARTED 1/9/01	**COMPLETED** 1/9/01	**SURFACE WATER DEPTH**	

ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 20 40 60 80 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2120.90					Ground Surface Elev. 2120.90				2120.90 0.00
2120	3.50	4	7	30	37		M		Roadway Embankment: Loose to Dense, Moist, Gray, Silty Fine to Medium SAND with Gravel (A-2-4)
2115	8.50	5	5	4	9		M		
2110	13.50	4	24	8	32		M		
2105	18.50	7	6	6	12		M		
2100	23.50	3	5	5	10	SS-5	28.1		2098.90 22.00 Roadway Embankment: Stiff, Moist, Red, Fine Sandy Silty CLAY (A-7-6)
2095	28.50	50/.3			50/.3				2093.40 27.50 Soft Weathered Rock-Gray Henderson Gneiss
2090	33.50	21	28	72/.1	100/.6				
2085	38.50	100/.5			100/.5				2081.90 39.00 Boring Terminated at 39.00 feet (EL 2081.90) in Soft Weathered Rock-Henderson Gneiss

State Project No. 8.1952001
Federal Project No. NHF-26-1-(62)23
Dual Structures on I-26 over Clear Creek
Henderson County, North Carolina

SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth (ft)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (bpi)**	Atterberg Limits			Gradation Results							
						L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Pass #270 Sieve	Coarse Sand (Ret. #60) (%)	Fine Sand (%)	Silt (%)	Clay (%)
EB1-A	28.5-30.0	SS-6	24	A-4(0)	9	47	NP	NP	100	86	51	44	23	33	18	26
EB1-A	53.5-55.0	SS-11	42	A-4(1)	2	34	25	9	100	92	45	41	23	36	19	22
EB1-B	53.5-55.0	SS-11	36	A-4(1)	7	37	NP	NP	100	100	76	66	1	33	46	20
EB1-B	58.5-60.0	SS-12	-	A-1-b(0)	32	23	NP	NP	58	44	13	9	66	25	4	5
EB1-C	13.5-15.0	SS-3	18	A-7-6(5)	10	48	25	23	100	80	41	35	31	34	16	19
EB1-C	58.5-60.0	SS-12	-	A-1-b(0)	70	30	NP	NP	66	33	9	7	76	17	5	2
EB2-A	43.5-45.0	SS-9	16	A-6(3)	5	27	15	12	100	81	50	45	29	26	21	24
EB2-A	48.5-50.0	SS-10	19	A-4(0)	30	36	NP	NP	100	77	36	31	35	34	21	10
EB2-B	23.5-25.0	SS-5	28	A-7-6(23)	10	68	29	39	100	88	63	59	20	21	19	40
EB2-C	13.5-15.0	SS-3	17	A-4(0)	11	31	NP	NP	100	82	38	31	31	38	23	8

* SS = Split-Spoon Sample (ASTM-D-1586)
** bpi = Blows per increment of 1 foot
*** S = Bulk Sample
NP -- Non Plastic

TRIGON ENGINEERING CONSULTANTS, INC.
RALEIGH, NORTH CAROLINA
Trigon Job Number: 01100132
Page: 1 of 2

State Project No. 8.1952001
Federal Project No. NHF-26-1-(62)23
Dual Structures on I-26 over Clear Creek
Henderson County, North Carolina

SUMMARY OF LABORATORY TEST DATA

Boring No.	Sample Depth (ft)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (bpi)**	Atterberg Limits			Gradation Results							
						L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Pass #270 Sieve	Coarse Sand (Ret. #60) (%)	Fine Sand (%)	Silt (%)	Clay (%)
EB2-C	28.5-30.0	SS-6	31	A-4(0)	13	39	NP	NP	100	88	48	39	21	40	21	18
B1-A	3.5-5.0	SS-1	19	A-4(0)	14	44	NP	NP	100	80	47	42	29	29	18	24
B1-A	8.5-10.0	SS-2	-	A-2-4(0)	2	30	NP	NP	100	81	20	16	42	42	9	7
B1-B	3.5-5.0	SS-1	-	A-2-4(0)	10	30	NP	NP	74	57	23	15	53	32	4	11
B2-A	8.5-10.0	SS-2	-	A-2-4(0)	1	42	NP	NP	100	99	31	20	9	61	14	6

* SS = Split-Spoon Sample (ASTM-D-1586)
** bpi = Blows per increment of 1 foot
*** S = Bulk Sample
NP -- Non Plastic

TRIGON ENGINEERING CONSULTANTS, INC.
RALEIGH, NORTH CAROLINA
Trigon Job Number:01100132
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State Project No. 8.1952001
Federal Project No. NHF-26-1-(62)23
Dual Structures on I-26 over Clear Creek
Henderson County, North Carolina

LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

Sample Number	Boring Number	Depth (ft)	Rock Type	Run RQD (%)	Length (ft)	Diameter (Inches)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)
RS-1	B1-A	25.5-25.8	Henderson Gneiss	98	0.3	2.03	159.5	15,177
RS-2	B1-B	11.1-11.4	Henderson Gneiss	100	0.3	2.03	154.7	16,416
RS-3	B1-C	21.0-21.3	Henderson Gneiss	64	0.3	2.03	158.1	21,330
RS-4	B2-A	18.2-18.5	Henderson Gneiss	98	0.3	2.03	158.6	16,726
RS-5	B2-B	24.0-24.3	Henderson Gneiss	100	0.3	2.03	159.5	14,105
RS-6	B2-C	7.6-7.9	Henderson Gneiss	60	0.3	2.03	160.5	15,222

TRIGON ENGINEERING CONSULTANTS, INC.
RALEIGH, NORTH CAROLINA
Trigon Job Number: 01100132
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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34232	1	5

REFERENCE: I-4400

PROJECT: 34232

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *I-26 FROM US 64 (EXIT 49) TO US 25 BUSINESS (EXIT 44)*

SITE DESCRIPTION *RETAINING WALL RW7 VERTICAL ABUTMENT WALL FOR CLEAR CREEK RD BRIDGE OVER I-26 (440217)*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4	PROFILE
5	BORE LOGS

CAUTION NOTICE

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

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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

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INVESTIGATED BY *D.M. MULLEN*

DRAWN BY *DMM*

CHECKED BY *J.C. KUHNE*

SUBMITTED BY *J.C. JUHNE*

DATE *3/18/2019*

NORTH CAROLINA PROFESSIONAL SEAL PE # ENGINEER PE SEAL NAME

DocuSigned by:
D Matt Mullen
18909BD3CD5440C...

3/19/2019
SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
34232	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	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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:
- [X] CME-45C
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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: N/A ELEVATIONS DERIVED FROM DTM

ELEVATION: N/A FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-4400	3

SITE PLAN

0 40 80
FEET

NAD 83 NA 2011

BEGIN RETAINING WALL –RW7–
–L– STA. 437+77.00, 80.50' LT

END RETAINING WALL –RW7–
–L– STA. 439+51.00, 80.50' LT

B-12

B-14A

SR 1635
HYDER FARM RD
20' BST

I-26 EB 38' CONC

I-26 WB 38' CONC

MTL

BEGIN RETAINING WALL –RW6–
–L– STA. 438+79.00, 80.50' RT

END RETAINING WALL –RW6–
–L– STA. 440+65.00, 80.50' RT

B-16

B-17

SR 1503 CLEAR CREEK RD 24' BST

PROJECT REFERENCE NO.	SHEET NO.
I-4400B	4

PROFILE ALONG RETAINING WALL –RW7–

0 20 40
FEET
VE = 1H : 1V

BEGIN GRADE –RW7–
STA. 437+77.00
ELEV. = 2,128.27

STA. 438+36.20
ELEV. = 2,157.72

EB1–B
AS

–Y2–
℄

EB1–A
AS

STA. 438+96.48
ELEV. = 2,157.72

END GRADE –RW7–
STA. 439+51.00
ELEV. = 2,130.81

B–14A
–L– STA
438+37
100' LT

B–12
–L– STA
439+88.6
155.2' LT

2,160′
2,150′
2,140′
2,130′
2,120′
2,110′

A4 ROADWAY EMBANKMENT
A4 SAPROLITE
9
15
37
52
A2 SAPROLITE
A2 SAPROLITE
100/.7
60/0.0
A2 SAPROLITE WITH WR AND Mn0 SEAMS
A2 SAPROLITE WITH WR AND Mn0 SEAMS
WEATHERED ROCK – GNEISS
CRYSTALLINE ROCK – GNEISS
CRYSTALLINE ROCK – GNEISS
B.T. @ 24.5'
on C.R.

EXISTING GROUND

A2 ROADWAY EMBANKMENT
A7 ROADWAY EMBANKMENT
7
13
14
13
38
60/0.1
A2 SAPROLITE
A2 SAPROLITE
WEATHERED ROCK – GNEISS
CRYSTALLINE ROCK – GNEISS
B.T. @ 19.6'
in C.R.

438+00
439+00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-12	**STATION** 439+88.6	**OFFSET** 155.2 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,150.4 ft	**TOTAL DEPTH** 19.6 ft	**NORTHING** 601,542	**EASTING** 969,718	**24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 12/12/17	**COMP. DATE** 12/12/17	**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))
2155										
2150	2,150.4	0.0	1	2	2	4		W		2,150.4 / 0.0 GROUND SURFACE
	2,146.9	3.5	1	2	3	5		W		**ROADWAY EMBANKMENT** Brown, Clayey Silty Fine to Coarse SAND (A-2-4) with Trace Organics (Roots) 2,148.4 / 2.0 — Brown, Clayey Fine to Coarse SAND (A-2-6) with Trace Organics (Roots) and Little Gravel
2145										2,143.4 / 7.0 Gray-Brown, Fine Sandy CLAY (A-6)
	2,141.9	8.5	WOH	1	2	3		W		
2140										2,138.4 / 12.0 **RESIDUAL** Gray, Silty Fine to Coarse SAND (A-2-4)
	2,136.9	13.5	2	3	3	6		M		
2135										2,132.7 / 17.7 **WEATHERED ROCK** White-Gray (GNEISS)
	2,131.9	18.5	100/0.4			100/0.4				2,130.9 / 19.5 **CRYSTALLINE ROCK** White-Gray (GNEISS)
	2,130.9	19.5	60/0.1			60/0.1				2,130.8 / 19.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 2,130.8 ft in GNEISS (Crystalline Rock)

Note:
1. 0.0'-0.1' = SURFICIAL ORGANIC SOILS
2. Auger Refusal at 19.5'

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** Johnson, C. D.	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44), Clear Creek Bridge				**GROUND WTR (ft)**
BORING NO. B-14A	**STATION** 438+37	**OFFSET** 100 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 2,138.0 ft	**TOTAL DEPTH** 24.5 ft	**NORTHING** 601,422	**EASTING** 969,825	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO6744 CME - 45C 92% 07/31/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 11/16/18	**COMP. DATE** 11/16/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2140										
										2,138.0 / 0.0 GROUND SURFACE
2135	2,134.6	3.4	2	5	4	9				2,135.8 / 2.2 **ROADWAY EMBANKMENT** RED/BRN SANDY SILT
										SAPROLITE BRN CLAY-SILT-SAND W/ COARSE SAND LAYERS, MIC
2130	2,129.6	8.4	5	8	7	15				2,130.6 / 7.4 **SAPROLITE** WHT/GRAY SILTY SAND W/ MICA AND RK FRAGS. SEAMY WEATHERED ROCK STARTING 15.1' TO 23.4'
2125	2,124.6	13.4	3	10	27	37				
2120	2,119.8	18.2	37	25	27	WR SEAM 52				
2115	2,114.6	23.4	36	64/0.2		100				2,114.6 / 23.4 2,113.5 / 24.5 **WEATHERED ROCK** GRAY/WHT/BLK WEATHERED BIOTITE GNEISS
					60/0.0					Boring Terminated WITH STANDARD PENETRATION TEST REFUSAL at Elevation 2,113.5 ft ON GNEISS (CRYSTALLINE ROCK)

REFERENCE: I-4400

PROJECT: 34232

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34232	1	8

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *I-26 FROM US64 (EXIT 49) TO US25 BUSINESS (EXIT 44)*

SITE DESCRIPTION *RETAINING WALL RW12*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-8	PROFILE

CAUTION NOTICE

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

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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

C.D. JOHNSON

D.O. CHEEK

C.J. COFFEY

INVESTIGATED BY *D.M. MULLEN*

DRAWN BY *D.M. MULLEN*

CHECKED BY *J.C. KUHNE*

SUBMITTED BY *J.C. KUHNE*

DATE *3/20/2019*

NORTH CAROLINA PROFESSIONAL SEAL 029878 ENGINEER D.M. MULLEN

DocuSigned by:
D Matt Mullen
18909BD3CB944C...

3/21/2019

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
34232	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:
- [X] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [X] 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: N/A ELEVATIONS DERIVED FROM DTM

ELEVATION: N/A FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
34232	3

SITE PLAN

0 50 100
FEET

NAD 83
NA 2011

I-26 WB 38.5' CONC

BEGIN RETAINING WALL –RW12–
–Y7– STA. 19+97.00,
17.50' RT

END RETAINING WALL –RW12–
–Y7– STA. 25+75.00,
17.50' RT

B-197
B-198
B-199
B-200
B-201
RW-1
RW-2
RW-3

JS
SR 1534 NAPLES RD 24' BST
SUNSET VISTA RD 12' BST
10' BST
HOLLY OAK DR 15' BST
9' BST
10' GRVL

20
25

0	10	20

FEET

VE = 1H : 1V

PROJECT REFERENCE NO.	SHEET NO.
34232	4
I–4400 –RW12–	

BEGIN GRADE –RW12–
STA. 19+97.00
ELEV. = 2178.09

TOP OF WALL

EXISTING GROUND

BOTTOM OF WALL

B–197
20+00
CL
2168'

14
13
16

GRAY, LAYERED, MICACEOUS, CLAYEY,
SANDY SILT SAPROLITE WITH ROCK FRAGMENTS

BT @ 15.1'
IN SAPROLITE

MATCH TO SHEET 5
-L- STA 21+30

2,200'
2,190'
2,180'
2,170'
2,160'
2,150'
2,140'
2,130'

20+00
20+50
21+00
21+30

PROJECT REFERENCE NO.	SHEET NO.
34232	5
I–4400 –RW12–	

0 10 20
FEET
VE = 1H : 1V

2,200′
2,190′
2,180′
2,170′
2,160′
2,150′
2,140′
2,130′

TOP OF WALL

B–198
21+45
CL
2172’

BOTTOM OF WALL

RW–1
22+45
25’ RT
2163’

RED BROWN, MICACEOUS, CLAYEY SILT
ROADWAY EMBANKMENT WITH ROCK FRAGMENTS

EXISTING GROUND

GRAY, LAYERED, MICACEOUS, CLAYEY,
SANDY SILT SAPROLITE WITH ROCK FRAGMENTS

12
8
7
13
9

BT @ 24.9’
IN SAPROLITE

ROD SOUNDING
TERMINATED AT
16.1’

MATCH TO SHEET 4
-L- STA 21+30

MATCH TO SHEET 6
-L- STA 22+60

21+30 21+50 22+00 22+50 22+60

PROJECT REFERENCE NO.	SHEET NO.
34232	6
I–4400 –RW12–	

0 10 20
FEET
VE = 1H : 1V

2,200′
2,190′
2,180′
2,170′
2,160′
2,150′
2,140′
2,130′

TOP OF WALL
EXISTING GROUND
BOTTOM OF WALL

MATCH TO SHEET 5
-L- STA 22+60

MATCH TO SHEET 7
-L- STA 23+90

22+60
23+00
23+50
23+90

PROJECT REFERENCE NO.	SHEET NO.
34232	7
I–4400 –RW12–	

0 10 20
FEET
VE = 1H : 1V

2,200′
2,190′
2,180′
2,170′
2,160′
2,150′
2,140′
2,130′

B–199
24 + 34
26’ LT
2191’

RW–2
24 + 00
25’ RT
2162’

ASPHALT PAVEMENT
TOP OF WALL
EXISTING GROUND
RED BROWN, MICACEOUS, CLAYEY SILT
ROADWAY EMBANKMENT WITH ROCK FRAGMENTS
BOTTOM OF WALL
LIGHT BROWN SILTY SAND ALLUVIUM
GRAY, LAYERED, MICACEOUS, CLAYEY,
SANDY SILT SAPROLITE WITH ROCK FRAGMENTS

6
6
11
6
13
9
6
22

ROD SOUNDING
TERMINATED AT
7’

BT @ 39.7’
IN SAPROLITE

MATCH TO SHEET 6
-L- STA 23+90

MATCH TO SHEET 8
-L- STA 25+20

23+90 24+00 24+50 25+00 25+20

PROJECT REFERENCE NO.	SHEET NO.
34232	8
I–4400 –RW12–	

0 10 20
FEET
VE = 1H : 1V

2,200′
2,190′
2,180′
2,170′
2,160′
2,150′
2,140′
2,130′

END GRADE –RW12–
STA. 25+75.00
ELEV. = 2184.71

B–200
25+59
9’ LT
2189’

B–201
26+06
24’ RT
2187’

RW–3
25+45
26’ RT
2172’

TOP OF WALL

ASPHALT PAVEMENT

EXISTING GROUND

BOTTOM OF WALL

36
10
10

5
10
13

BT @ 14.9’
IN SAPROLITE

BT @ 14.8’
IN SAPROLITE

BROWN, MICACEOUS, CLAYEY, SANDY, SILT ROADWAY EMBANKMENT WITH LARGE ROCK FRAGMENTS

GRAY, LAYERED, MICACEOUS, CLAYEY, SANDY SILT SAPROLITE WITH ROCK FRAGMENTS

ROD SOUNDING TERMINATED AT 12.7’

MATCH TO SHEET 7
-L- STA 25+20

25+20
25+50
26+00

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34232	1	6

REFERENCE: I-4400B

PROJECT: 34232

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *HENDERSON*

PROJECT DESCRIPTION *I-26 FROM US 64 (EXIT 49) TO US 25 BUSINESS (EXIT 44)*

SITE DESCRIPTION *RETAINING WALL 6 VERTICAL ABUTMENT WALL FOR CLEAR CREEK RD BRIDGE OVER I-26 (440217)*

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4	PROFILE
5-6	BORE LOGS

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

S. WOODS

M. ARNOLD

S. DAVIS

INVESTIGATED BY *D.M. MULLEN*

DRAWN BY *D.M. MULLEN*

CHECKED BY *J.C. KUHNE*

SUBMITTED BY *J.C. KUHNE*

DATE *3/19/2019*

NORTH CAROLINA PROFESSIONAL SEAL 029878 ENGINEER D.M. MULLEN

DocuSigned by:
D Matt Mullen 3/19/2019
18909BD3C... SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
34232	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	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

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

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY), MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

RECOMMENDATION SYMBOLS

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

ABBREVIATIONS

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

SAMPLE ABBREVIATIONS

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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: N/A; ELEVATIONS DERIVED FROM DTM

ELEVATION: N/A FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
I-4400	3

SITE PLAN

0 40 80
FEET

NAD 83 NA 2011

BEGIN RETAINING WALL –RW7–
–L– STA. 437+77.00, 80.50' LT

END RETAINING WALL –RW7–
–L– STA. 439+51.00, 80.50' LT

B-12

B-14A

SR 1635
HYDER FARM RD
20' BST

I-26 EB 38' CONC

I-26 WB 38' CONC

MTL

BEGIN RETAINING WALL –RW6–
–L– STA. 438+79.00, 80.50' RT

END RETAINING WALL –RW6–
–L– STA. 440+65.00, 80.50' RT

B-16

B-17

SR 1503 CLEAR CREEK RD 24' BST

PROJECT REFERENCE NO.	SHEET NO.
I4400B	4

PROFILE ALONG RETAINING WALL –RW6–

0 20 40
FEET
VE = 1H : 1V

2190
2180
2170
2160
2150
2140
2130
2120
2110
2100
2090
2080
2070
2060

B–17
–L– STA
440+81.2
128.4' RT
2151.7'

END GRADE –RW6–
STA. 440+65.00
ELEV. = 2,133.21

STA. 440+23.25
ELEV. = 2,153.92

EB2–A
AS

–Y2–
℄

B–16
–L– STA
439+72.3
115.6' RT
2133.7'

EB2–B
AS

STA. 439+30.67
ELEV. = 2,155.16

BEGIN GRADE –RW6–
STA. 438+79.00
ELEV. = 2,129.55

EXISTING GROUND

A2 ROADWAY EMBANKMENT

A2 SAPROLITE

A4 SAPROLITE

A5 SAPROLITE

A7

A2 SAPROLITE

A4 SAPROLITE

A2 SAPROLITE

WEATHERED ROCK – GNEISS

A4 SAPROLITE

A2 SAPROLITE

A4 SAPROLITE

A5 SAPROLITE

A5 SAPROLITE

A5 SAPROLITE

CRYSTALLINE ROCK – GNEISS

CRYSTALLINE ROCK – GNEISS

B.T. @ 80'
in saprolite

B.T. @ 53.7'
in C.R.

440+60
440+00
439+40
439+00

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** M. Arnold	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-16	**STATION** 439+72.3	**OFFSET** 115.6 ft RT	**ALIGNMENT** -L-	**0 HR.** 27.6
COLLAR ELEV. 2,133.7 ft	**TOTAL DEPTH** 53.7 ft	**NORTHING** 601,626	**EASTING** 969,976	**24 HR.** 25.6
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/08/18	**COMP. DATE** 01/08/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2135									
	2,133.7	0.0							2,133.7 GROUND SURFACE 0.0
			1	3	4		M		**RESIDUAL**
2130	2,130.2	3.5							2,131.7 Red-Brown, Fine Sandy Clayey SILT (A-5) with Trace Mica and Organics (Roots) 2.0
			4	6	7		M		Red-Brown, Silty CLAY (A-6)
2125	2,125.2	8.5							2,126.7 7.0
			6	7	7		M		White-Tan-Brown, Fine Sandy SILT (A-4) with Trace Mica, Manganese Deposits, and Rock Fragments
2120	2,120.2	13.5							
			6	6	7		M		
2115	2,115.2	18.5							
			17	19	19		M		
2110	2,110.2	23.5							2,111.7 22.0
			4	6	5		M		Tan-Orange-Brown, Clayey SILT (A-5) with Trace Mica, Manganese Deposits, and Trace to Little Rock Fragments
2105	2,105.2	28.5							
			4	4	6		W		
2100	2,100.2	33.5							
			2	4	4		W		
2095	2,095.2	38.5							
			4	10	10		W		
2090	2,090.2	43.5							
			5	18	15		W		
2085	2,085.2	48.5							2,086.2 47.5
			60/0.1						**CRYSTALLINE ROCK** Orange-Brown (GNEISS)
2080	2,080.2	53.5							
	2,080.0	53.7	60/0.1						2,080.0 53.7
			60/0.0						Boring Terminated at Elevation 2,080.0 ft in GNEISS (Crystalline Rock)

Note:
1. 0.0'-0.2' = SURFICIAL ORGANIC SOILS
2. Auger Refusal at 53.7'

BLOWS PER FOOT: 0 25 50 75 100

NCDOT BORE DOUBLE I4400B_GEO_BH_RDWY_DRAFT.GPJ NC_DOT.GDT 3/18/19

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-17	**STATION** 440+81.2	**OFFSET** 128.4 ft RT	**ALIGNMENT** -L-	**0 HR.** 50.7
COLLAR ELEV. 2,151.7 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 601,732	**EASTING** 969,948	**24 HR.** 47.1
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/29/18	**COMP. DATE** 01/29/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION (ELEV. (ft) / DEPTH (ft))
2155										
	2,151.7	0.0								2,151.7 GROUND SURFACE 0.0
2150			1	6	8	14		M		**ROADWAY EMBANKMENT** Gray-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Gravel, Mica, and Asphalt
	2,148.2	3.5	4	5	5	10		M		
2145										
	2,143.2	8.5	2	2	2	4		M		
2140										
	2,138.2	13.5	2	3	2	5		W		
2135										
	2,133.2	18.5	3	6	6	12		M		2,129.7 22.0 **RESIDUAL** Orange-Tan, Silty Fine to Coarse SAND (A-2-4) with Trace Mica
2130										
	2,128.2	23.5	4	7	7	14		M		
2125										
	2,123.2	28.5	4	4	6	10		M		2,124.7 27.0 Gray-Tan, Fine Sandy SILT (A-4) with Trace Mica
2120										
	2,118.2	33.5	6	6	7	13		M		2,119.7 32.0 Gray-Tan-Brown, Silty Fine to Coarse SAND (A-2-4) with Trace Mica, Manganese Deposits, and Rock Fragments
2115										
	2,113.2	38.5	6	6	7	13		M		
2110										
	2,108.2	43.5	5	5	7	12		M		
2105										
	2,103.2	48.5	3	4	7	11		W		
2100										
	2,098.2	53.5	3	5	7	12		W		
2095										
	2,093.2	58.5	5	9	13	22		W		
2090										2,089.7 62.0 **WEATHERED ROCK** Brown (GNEISS)
	2,088.2	63.5	100/0.2			100/0.2				
2085										
	2,083.2	68.5	8	86	14/0.2	100/0.7				
2080										
	2,078.2	73.5	6	9	13	22		W		2,079.7 72.0 **RESIDUAL** Brown-Gray, Fine Sandy SILT (A-4) with Trace Mica and Manganese Deposits
2075										

WBS 34232.1.3	**TIP** I-4400B	**COUNTY** HENDERSON	**GEOLOGIST** S. Woods	
SITE DESCRIPTION I-26 from US 64 (Exit 49) to US 25 Business (Exit 44)				**GROUND WTR (ft)**
BORING NO. B-17	**STATION** 440+65	**OFFSET** 128.4 ft RT	**ALIGNMENT** -L-	**0 HR.** 50.7
COLLAR ELEV. 2,151.7 ft	**TOTAL DEPTH** 80.0 ft	**NORTHING** 601,732	**EASTING** 969,948	**24 HR.** 47.1
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 02/11/2017		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER S. Davis	**START DATE** 01/29/18	**COMP. DATE** 01/29/18	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
2075						Match Line				
	2,073.2	78.5	12	18	26	44		W		2,071.7 80.0 Boring Terminated at Elevation 2,071.7 ft in SILT (Residual)

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	34232.1.1	I-4400BB	1	5

REFERENCE: I-4400BB

PROJECT: 34232.1.1

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY HENDERSON

PROJECT DESCRIPTION I-26 FROM EXIT 49 (US 64) TO EXIT 44 (US 25)

SITE DESCRIPTION RETAINING WALL -RWIO- STA 637+28 TO 639+55

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	SITE PLAN
4-5	WALL PROFILE

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

DO CHEEK

CJ COFFEY

CD JOHNSON

INVESTIGATED BY JC KUHNE

DRAWN BY CD JOHNSON

CHECKED BY

SUBMITTED BY

DATE

NORTH CAROLINA LICENSED SEAL 1878 GEOLOGIST JODY C KUHNE

DocuSigned by:
Jody C. Kuhne
4F9C0666A1BC400...
SIGNATURE

1/21/2019
DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	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	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	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	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- 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:
- [X] CME-45C
- [X] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [ ] AUTOMATIC [ ] MANUAL

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

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: ELEVATIONS TAKEN FROM ROADWAY PLANS

ELEVATION: FEET

NOTES:

DATE: 8-15-14

PROJECT REFERENCE NO.		SHEET NO.
34232.1.1	I-4400BB	3

SITE PLAN

0 40 80

FEET

N

15

TO US 25
(ASHEVILLE HWY.)

SR 1534 (NAPLES RD)

END -RWII-
STA 640+91

EBI-A

EBI-C

EBI-B

-Y7-

640

BEGIN -RWII-
STA 638+98

GR

SR 1669 (OLD NAPLES RD)

638

I-26 EB 38' CONC

I-26 WB 38.5' CONC

END -RWIO-
STA 639+55

B-168

TO SR 1006
(HOWARD GAP RD.)

20

B-169

BEGIN -RWIO-
STA 637+28

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	4

PROFILE THROUGH –RW10–

0 10 20
FEET
VE = 1:1

2180
2170
2160
2150
2140
2130

END I GRADE –RW10–
STA. 639+55.00
ELEV. = 2,144.75

STA. 638+87.95
ELEV. = 2,177.75

TOP OF WALL

EXISTING GROUND

BOTTOM OF WALL

MATCH LINE TO STA 638+50

639+50
639+00
638+50

PROJECT REFERENCE NO.	SHEET NO.
I-4400BB	5

PROFILE THROUGH –RW10–

0 10 20
FEET
VE = 1:1

2180
2170
2160
2150
2140
2130

MATCH LINE TO STA 638+50

TOP OF WALL

STA. 637+83.61
ELEV. = 2,176.58

B–168
638+21.9
133' RT

B–169
637+59.2
134' RT

BEGIN GRADE –RW10–
STA. 637+28.00
ELEV. = 2,149.20

EXISTING GROUND

RDWY EMBNK:
BROWN-GREY, SL MIC.
CL-SND-SLT
w/COBBLES, RK FRAGS
ORGANICS (ROOTS)

STA. 638+31.47
ELEV. = 2,147.39

RESIDUAL:

SAPROLITIC,
GREY TO ORANGE-BRN
MIC. CL-SND-SLT
w/RK FRAGS
& MnO SEAMS

BOTTOM OF WALL

WEATHERED ROCK:

GREY MICACEOUS
(AUGEN GNEISS)

CRYSTALLINE ROCK: AUGEN GNEISS

6 8 37 15 62 100/0.3 60/0.1
23.0

9 16 26 28 15 22 64 60/0.0

638+50 638+00 637+50