STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

August 20, 2012

ADDENDUM #2

To: Plan Holders

From: Wanda H. Austin, PE
Proposals Engineer

RE:

Contract ID:	DN00077
County:	Transylvania
Letting Date:	August 28, 2012

Attached are the Geotechnical Reports for the above contract.

Please insert this letter into the proposal and sign the verification below. Thank you for your attention to this matter.

I, _____ representing _____
(SIGNATURE)

Acknowledge receipt of Addendum #2.

Fourteenth Division Office
Phone: (828)586-2141 *253 Webster Road, Sylva, North Carolina 28779* *Fax: (828)586-4043*

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

December 9, 2011

MEMORANDUM TO: J.B. Setzer, P.E.
Division 14 Engineer

ATTENTION: Joshua B. Deyton
Division 14 Bridge Manager

MEMORANDUM TO: Mr. G.R. Perfetti, P.E.
State Bridge Design Engineer

ATTENTION: Quang Nguyen, P.E.
Project Engineer

FROM: for Njoroge W. Wainaina, P.E.
State Geotechnical Engineer

STATE PROJECT: 45360.1.10(BD-5114J)

COUNTY: Transylvania

DESCRIPTION: Bridge No. 150 on SR 1327 over Shoal Creek

SUBJECT: Bridge Foundation Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and has prepared foundation design recommendations and presents the following project data:

☒ Bridge Inventory (11) pages

☒ Foundation Design Recommendations (4) pages

☐ Design Calculations () pages

☐ Special Provisions () pages

Please call John L. Pilipchuk, L.G., P.E. or John Fargher, P.E. at (704)-455-8902 if there are any questions concerning this memorandum.

NWW/JLP/JSF/DSG

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850
Fax: 919-250-4237
Website: www.ncdot.org./doh

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

FOUNDATION RECOMMENDATIONS

WBS 45360.1.10

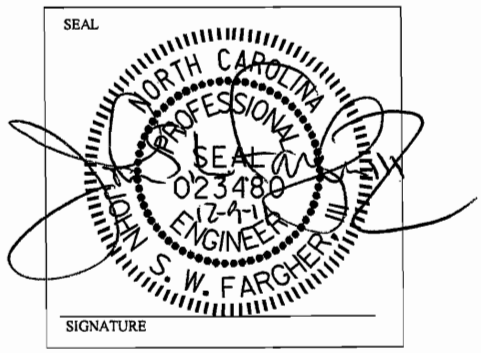
T.I.P. NO. BD-5114J

COUNTY Transylvania

STATION 11+97.923 -L-

DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek

	INITIALS	DATE
DESIGN	DSG	12/6/12
CHECK	MRB	12/8/11
APPROVAL	JSF	12-9-11



BENT	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS & DETAILS
END BENT 1	STA. 11+81.623-L-	Cap on HP 12x53 Steel Piles	65 tons/pile	Bottom of Cap El. = 2,878.6 ft ± Estimated Length of Pile = 10 ft Number of Piles =5
END BENT 2	STA. 12+14.222 -L-	Cap on HP 12x53 Steel Piles	65 tons/pile	Bottom of Cap El. = 2,879.3 ft ± Estimated Length of Pile = 10 ft Number of Piles = 5

NOTES ON PLANS & COMMENTS

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS HIGHWAY BUILDING PO BOX 25201 RALEIGH, NORTH CAROLINA 27611	SUBJECT: Bridge No. 150 on SR 1327 over Shoal	
	PREPARED BY: DSG	PROJECT: 45360.1.10
	DATE: 12/6/12	TIP: BD-5114J
	CHECKED BY: MRB	COUNTY: Transylvania
	DATE: 12/8/11	

FOUNDATION RECOMMENDATION NOTES ON PLANS

1) For Piles, See Section 450 of the Standard Specifications.

2) Piles at End Bent No. 1 are designed for a Factored Resistance of 65 Tons per Pile.

3) Pile excavation is required to install piles at End Bent No. 1. Excavate holes at piles locations to Elevation 2873.7 ft(LT), 2874.4 ft(RT). For pile excavation, see Section 450 of the standard Specifications.

4) Concrete or grout is required to fill holes for pile excavation at End Bent No. 1.

5) Piles at End Bent No. 2 are designed for a Factored Resistance of 65 Tons per Pile.

6) Pile excavation is required to install piles at End Bent No. 2. Excavate holes at piles locations to Elevation 2873.6 ft(LT), 2870.6 ft(RT). For pile excavation, see Section 450 of the standard Specifications.

7) Concrete or grout is required to fill holes for pile excavation at End Bent No. 2.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS HIGHWAY BUILDING PO BOX 25201 RALEIGH, NORTH CAROLINA 27611	SUBJECT: Bridge No. 150 on SR 1327 over Shoal	
	PREPARED BY: DSG	PROJECT: 45360.1.10
	DATE: 12/6/12	TIP: BD-5114J
	CHECKED BY: MRB	COUNTY: Transylvania
	DATE: 12/8/11	

FOUNDATION RECOMMENDATION COMMENTS

1) Please advise Western Regional Office, if factored resistance is less than max. factored structure load.

2) PDA will not be used to monitor driving stresses.

3) Re-strikes are not required.

4) End bent slopes of 1½:1 are ok with slope protection to berm and to 1¾: 1.

5) Bridge approach Fill - Sub Regional Tier is required at End Bent No. 1.

6) Bridge approach Fill - Sub Regional Tier is required at End Bent No. 2.

7) Please send Western Regional Design Engineer a half size copy of the final general drawing sheets, including the location sketch, plan notes and quantities, at the time they are submitted to the plan checking & review squad.

PILE PAY ITEM QUANTITIES

(Revised 07/16/08)

WBS ELEMENT 45360.1.10 DATE 12/6/2012

TIP NO. BD-5114J DESIGNED BY DSG

COUNTY Transylvania CHECKED BY MRB

STATION 11+97.923 -L-

DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek

NUMBER OF BENTS WITH PILES
NUMBER OF PILES PER BENT
NUMBER OF END BENTS WITH PILES 2
NUMBER OF PILES PER END BENT 5

Only required for "Pile Excavation" Pay Items.

	PILE PAY ITEM QUANTITIES						
				PILE EXCAVATION (per linear ft/m)			
BENT # OR END BENT #	PIPE PILE PLATES (yes/no/maybe)	STEEL PILE POINTS (yes/no)	PILE REDRIVES (per each)	IN SOIL	NOT IN SOIL	PDA TESTING (per each)	PDA ASSISTANCE (per each)
END BENT #1				0	25		
END BENT # 2				10	25		
TOTALS			0	10	50	0	0

Notes:
Blanks or "no" represent quantity of zero.

If pipe pile plates may be or are required, Structure Design should calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

If steel pile points are required, Structure Design should calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45360.1.10 BD-5114J	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45360.1.10 BD-5114J F.A. PROJ. _____

COUNTY TRANSYLVANIA

PROJECT DESCRIPTION BRIDGE NO. 150 ON SR 1327 OVER SHOAL CREEK

SITE DESCRIPTION _____

ID: BD-5114J

PROJECT: 45360.1.10

CONTENTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE 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 ENGINEERING UNIT AT (919) 250-4088. THE SUBSURFACE PLANS, FIELD BORING 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.

THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, OR THE 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.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

D.C. ELLIOTT

C.J. COFFEY

L.A. RIDDLE

DRAWN BY J.W. MANN

DRAWN BY _____

INVESTIGATED BY J.W. MANN

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE JULY 2011

NORTH CAROLINA LICENSED SEAL 1941 GEOLOGIST JOHN W. MANN 7/20/11

PROJECT REFERENCE NO.	SHEET NO.
45360.1.10 BD-5114J	2 OF 11

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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. 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	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		NP	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

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	<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 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	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	2.00	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
NONPLASTIC	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, 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.
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 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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
FIAD - FILLED IN AFTER DRILLING

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N XWL
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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 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, 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 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 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 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, AS SHALE, SLATE, ETC.

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

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

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

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

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

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

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

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

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

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: BM #2: 8" SPIKE SET IN BASE OF 42" OAK TREE
BL STATION 9+56 4.9' RT.
ELEVATION: 2885.53' FT.

NOTES:

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
45360.1.10 B-5114J	3 OF 11

SITE PLAN

0 50 100

FEET

BM #1
-BL- STA 5+31.15
15.99' LEFT
ELEV. 2881.34'

SKEW=~60°

NAD 83/NSRS 2007 NC GRID

46° 55' 14.8" E

-EL- TO NC 215

JS

SHOAL CREEK

GR

N 2° 14' 50.1" E

EB1-A

SPT

EB2-A

SRT

EB1-B

SPT

EB2-B

18' BST

SR 1327 - SHOAL CREEK ROAD

WOODS

-BL-4 11+37.05 PINC

-BL-2 7+25.42 PINC

BM #2
-BL- STA 9+56.21
4.91' RIGHT
ELEV. 2885.53'

N 18° 40' 20.0" W

-BL-3 9+09.32 PINC

N 42° 07' 01.5" E

TO GOVERNMENT RD.

-EL-

-BL-5 13+33.42 POT

PROJECT REFERENCE NO.	SHEET
45360.1.10 BD-5114J	4 OF 11

0 10 20
FEET
VE = 1

PROFILE 12' RT. OF EXISTING CENTERLINE

EXISTING -L-

2920
2910
2900
2890
2880
2870
2860
2850
2840
2830

EB1-B
9 RT

EB2-B
6 RT

EXISTING GROUND

EMBANKMENT
ALLUVIUM
WEATHERED ROCK (granitoid)
60/0.0
100/0.7
ABC, SAND, BOULDERS
SILTY CLAY
WATER SURFACE 06/11
CRYSTALLINE ROCK
GRAY-WHITE, FRESH, HARD GRANITOID
CRYSTALLINE ROCK
SLIGHTLY WEATHERED, HARD
BIOTITE GNEISS
BT
FIAD

EMBANKMENT
ALLUVIUM
SAPROLITE
WEATHERED ROCK
CRYSTALLINE ROCK
06/11
4
81
50/0.1
60/0.0
BT
ABC &
SILTY FINE SAND WITH
TRACE ROCK FRAGMENTS
FINE TO COARSE SAND
(granitoid)
GRANITOID

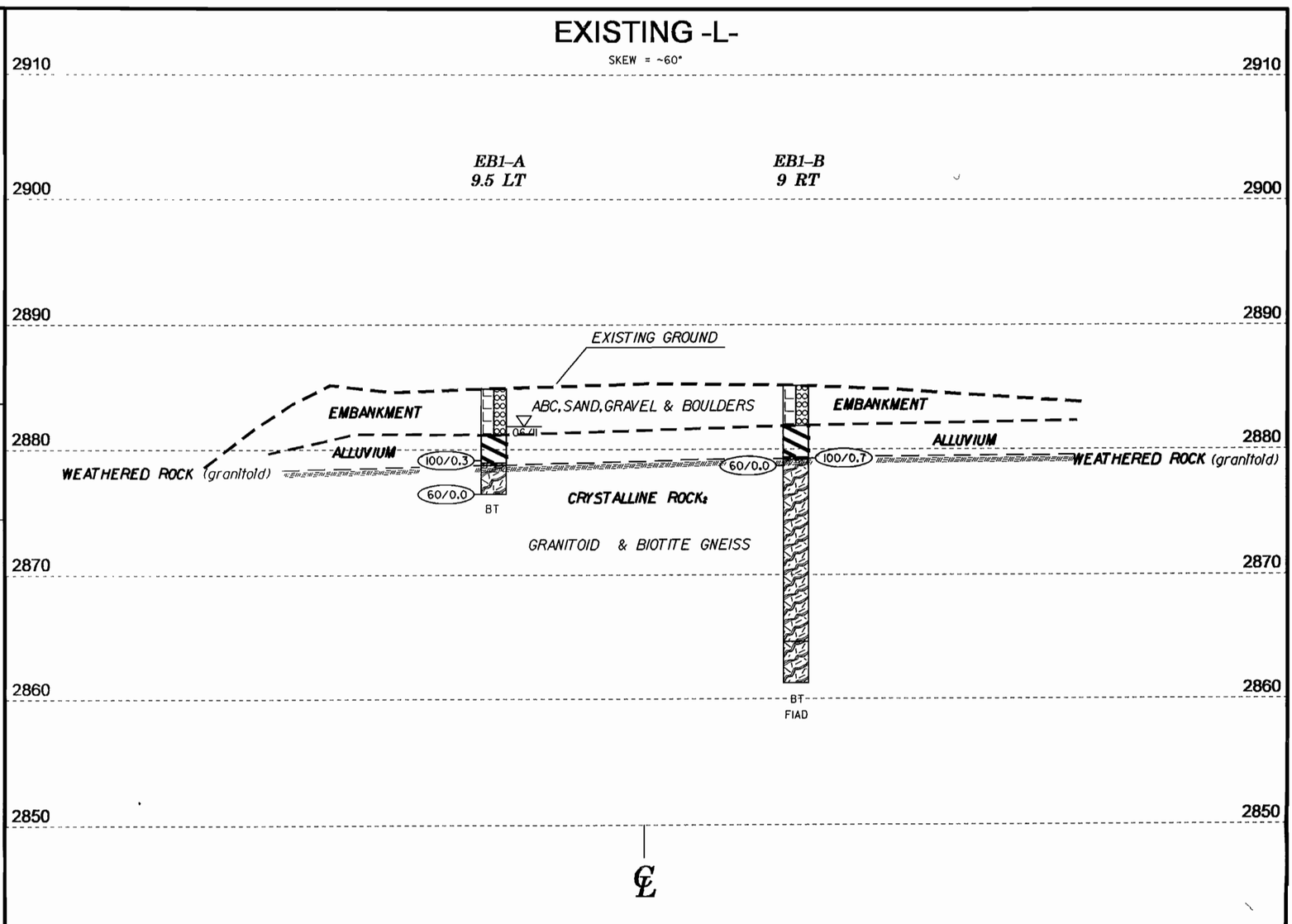
EXISTING -L-

SKEW = ~60°

HORIZ. SCALE (FEET) 0 10 20

VE = 1

SECTION THRU EB1 BORINGS



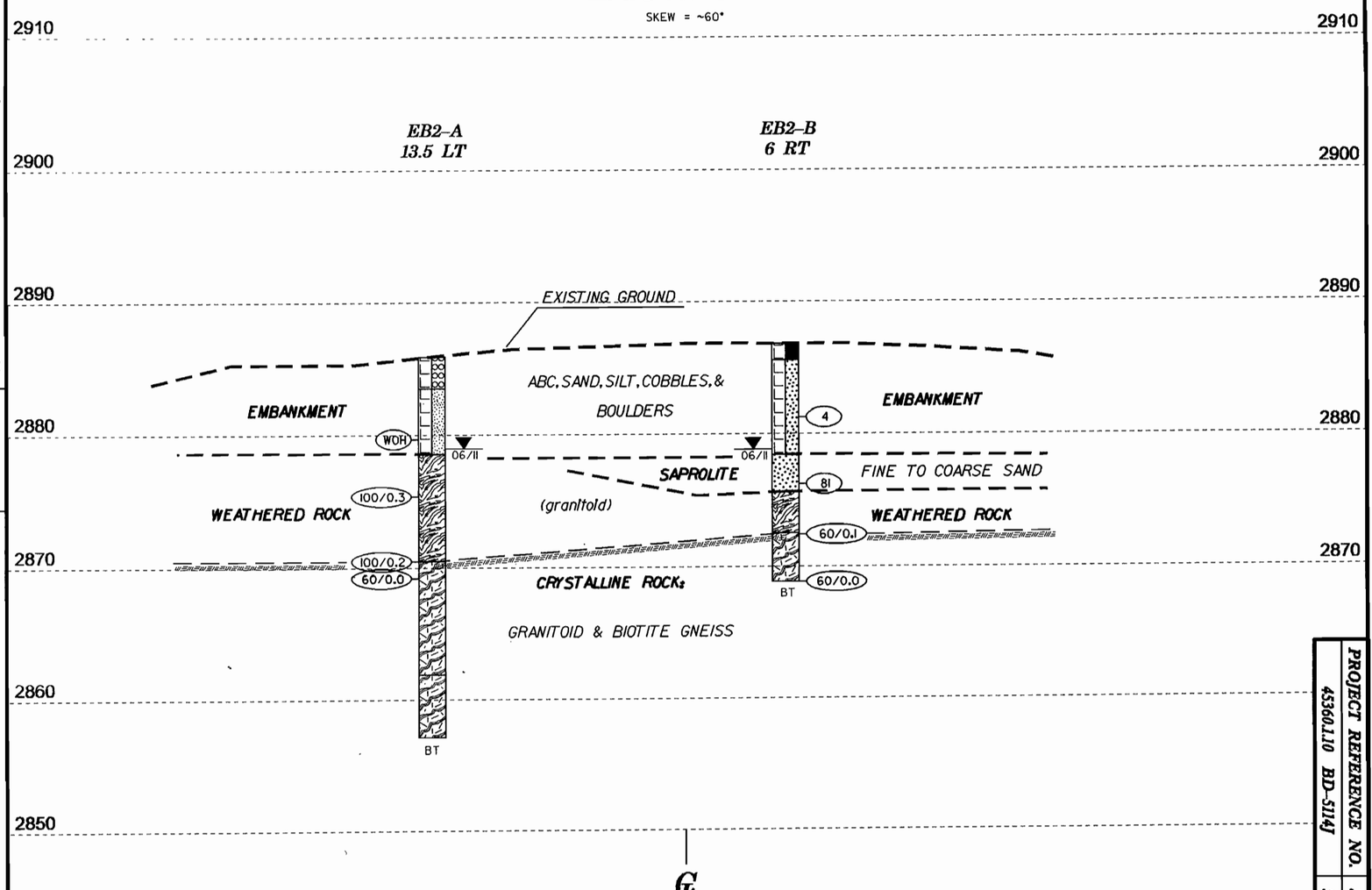
EXISTING -L-

SKEW = ~60°

HORIZ. SCALE (FEET) 0 10 20

VE = 1

SECTION THRU EB2 BORINGS



PROJECT REFERENCE NO.	SHEET
45360.110 BD-5114J	5 OF 11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** N/A	**OFFSET** 10 ft LT	**ALIGNMENT** Existing -L-	**0 HR.** 3.0
COLLAR ELEV. 2,884.8 ft	**TOTAL DEPTH** 8.4 ft	**NORTHING** 565,246	**EASTING** 847,982	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic
DRILLER Coffey, Jr., C.	**START DATE** 06/10/11	**COMP. DATE** 06/10/11	**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)
2885										2,884.8 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT ABC, SAND & GRAVEL	
										2,881.1	3.7
2880	2,880.1	4.7	WOH	WOH	100/0.3					ALLUVIAL Silty CLAY	
										2,878.9	5.9
						100/0.3				2,878.7 WEATHERED ROCK (granitoid)	6.1
	2,876.4	8.4	60/0.0			60/0.0				2,876.4 CRYSTALLINE ROCK GRANITOID	8.4
										Boring Terminated at Elevation 2,876.4 ft In Crystalline Rock: Granitoid	

NCDOT BORE SINGLE BD5114J GEO_BH_BRDG0150.GPJ NC_DOT.GDT 7/20/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** N/A	**OFFSET** 9 ft RT	**ALIGNMENT** Existing -L-	**0 HR.** Caved@3.8
COLLAR ELEV. 2,885.1 ft	**TOTAL DEPTH** 23.8 ft	**NORTHING** 565,266	**EASTING** 848,004	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/10/11	**COMP. DATE** 06/01/11	**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)
2890											
2885										2,885.1 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT ABC, SAND, BOULDERS	
										2,881.9	3.2
2880	2,880.0	5.1								ALLUVIAL Silty CLAY	
	2,878.7	6.4	WOH	100/0.2		100/0.7				2,879.4	5.7
			60/0.0			60/0.0				2,879.2 WEATHERED ROCK (granitoid)	5.9
2875										2,878.7 CRYSTALLINE ROCK GRANITOID	6.4
										CRYSTALLINE ROCK Gray-white, fresh, hard GRANITOID SREC=97% SRQD=84%	
2870											
2865										2,864.6	20.5
										CRYSTALLINE ROCK White-dark gray, slightly weathered, hard biotite GNEISS SREC=91% SRQD=61%	
										2,861.3	23.8
										Boring Terminated at Elevation 2,861.3 ft In Crystalline Rock: Gneiss	

NCDOT BORE SINGLE BD5114J_GEO_BH_BRDG0150.GPJ NC_DOT.GDT 7/20/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** N/A	**OFFSET** 9 ft RT	**ALIGNMENT** Existing -L-	**0 HR.** Caved@3.8
COLLAR ELEV. 2,885.1 ft	**TOTAL DEPTH** 23.8 ft	**NORTHING** 565,266	**EASTING** 848,004	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/10/11	**COMP. DATE** 06/01/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 17.4 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2878.67											Begin Coring @ 6.4 ft	
	2,878.7	6.4	2.4	*N=60/0.0* 0:55/1.0 1:21/1.0	(2.3) 96%	(2.0) 83%		(13.7) 97%	(11.8) 84%		2,878.7 CRYSTALLINE ROCK Gray-white, fresh, hard GRANITOID. Fracture spacing is generally moderately close. Rock is very weakly foliated with fractues sub-horizontal.	6.4
	2,876.3	8.8										
2875			5.0	0:23/0.4 1:04/1.0 1:11/1.0 1:05/1.0 1:16/1.0 1:13/1.0	(4.8) 96%	(4.1) 82%						
	2,871.3	13.8										
2870			5.0	1:10/1.0 1:16/1.0 1:20/1.0 0:56/1.0 1:13/1.0	(4.9) 98%	(4.0) 80%						
	2,866.3	18.8										
2865			5.0	1:20/1.0 0:57/1.0 1:08/1.0 1:19/1.0 1:04/1.0	(4.8) 96%	(3.8) 76%						
								(3.0) 91%	(2.0) 61%		2,864.6	20.5
	2,861.3	23.8									CRYSTALLINE ROCK White to dark gray, slightly weathered, hard biotite GNEISS. Fractures are along foliation @ 30° or less with spacing close to moderately close.	
											2,861.3	23.8
											Boring Terminated at Elevation 2,861.3 ft In Crystalline Rock: Gneiss	

NCDOT CORE SINGLE BD5114J_GEO_BH_BRDG0150.GPJ NC_DOT.GDT 7/20/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** N/A	**OFFSET** 14 ft LT	**ALIGNMENT** Existing -L-	**0 HR.** N/A
COLLAR ELEV. 2,885.9 ft	**TOTAL DEPTH** 28.8 ft	**NORTHING** 565,302	**EASTING** 847,968	**24 HR.** 6.9
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/07/11	**COMP. DATE** 06/07/11	**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)
2890											
2885										2,885.9 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT SAND, COBBLES, BOULDERS	
										2,883.5 ROADWAY EMBANKMENT Brown fine sandy SILT	2.4
2880	2,880.7	5.2	WOH	WOH	WOH	0				PDC = 2879.3 ft	
										2,878.6 WEATHERED ROCK (granitoid)	7.3
2875	2,875.7	10.2	100/0.3			100/0.3					
2870	2,870.7	15.2	100/0.2			100/0.2				2,870.5	15.4
	2,869.2	16.7	60/0.0			60/0.0				2,869.2 CRYSTALLINE ROCK GRANITOID	16.7
2865										CRYSTALLINE ROCK Gray-white, very slightly weathered to fresh, hard GRANITOID SREC=93% SRQD=71%	
										2,861.9	24.0
2860										CRYSTALLINE ROCK White-dark gray, very slightly weathered to fresh, hard biotite GNEISS SREC=98% SRQD=75%	
										2,857.1	28.8
										Boring Terminated at Elevation 2,857.1 ft In Crystalline Rock: Gneiss	

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** N/A	**OFFSET** 14 ft LT	**ALIGNMENT** Existing -L-	**0 HR.** N/A
COLLAR ELEV. 2,885.9 ft	**TOTAL DEPTH** 28.8 ft	**NORTHING** 565,302	**EASTING** 847,968	**24 HR.** 6.9
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/07/11	**COMP. DATE** 06/07/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 12.1 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2869.18											Begin Coring @ 16.7 ft	
	2,869.2	16.7	2.1	N=60/0.0	(2.0)	(1.5)		(6.8)	(5.2)		2,869.2 CRYSTALLINE ROCK	16.7
	2,867.1	18.8		0:55/1.0 0:53/1.0	95%	71%		93%	71%		Gray-white, very slightly weathered to fresh, hard GRANITOID. Fracture spacing is very close to moderately close. Rock is very weakly foliated with sub-horizontal fractures.	
2865			5.0	0:09/0.1	(4.6)	(3.5)						
				1:26/1.0 0:46/1.0 1:07/1.0 1:13/1.0 1:19/1.0	92%	70%						
	2,862.1	23.8									2,861.9	24.0
2860			5.0	1:28/1.0 1:15/1.0 1:16/1.0 1:09/1.0 1:25/1.0	(4.9) 98%	(4.1) 82%		(4.7) 98%	(3.6) 75%		CRYSTALLINE ROCK White-dark gray, very slightly weathered to fresh, hard biotite GNEISS. Fractures are along foliation @ 20° or less and are close to moderately close.	
	2,857.1	28.8									2,857.1	28.8
											Boring Terminated at Elevation 2,857.1 ft In Crystalline Rock: Gneiss	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** N/A	**OFFSET** 6 ft RT	**ALIGNMENT** Existing -L-	**0 HR.** N/A
COLLAR ELEV. 2,886.8 ft	**TOTAL DEPTH** 18.0 ft	**NORTHING** 565,327	**EASTING** 847,979	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/07/10	**COMP. DATE** 06/07/10	**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)
2890											
										2,886.8 GROUND SURFACE	0.0
2885										2,885.5 **ROADWAY EMBANKMENT** Aggregate Base Course	1.3
										ROADWAY EMBANKMENT Light brown silty fine SAND with trace rock fragments	
	2,882.2	4.6	1	2	2	4					
2880										2,878.4	8.4
	2,877.2	9.6	9	10	71	81				**SAPROLITE** Light gray to white-black fine to coarse SAND	
2875										2,875.6	11.2
	2,872.5	14.3	60/0.1			60/0.1				**WEATHERED ROCK** (granitoid)	
2870										2,872.5	14.3
	2,868.8	18.0	60/0.0			60/0.0				**CRYSTALLINE ROCK** GRANITOID	
										2,868.8	18.0
										Boring Terminated at Elevation 2,868.8 ft In Crystalline Rock: Granitoid	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 45360.1.10 TIP: BD-5114J COUNTY: TRANSYLVANIA

DESCRIPTION(1): Bridge No. 150 on SR 1327 over Shoal Creek

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) ____

Bridge No.: 150 Length: 26 Total Bents: 2 Bents in Channel: 2 Bents in Floodplain: 0
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None

Interior Bents: n/a

Channel Bed: None (rock channel)

Channel Bank: None noted

EXISTING SCOUR PROTECTION

Type(3): Vertical abutments

Extent(4): n/a

Effectiveness(5): Abutments are on rock

Obstructions(6): None noted

DESIGN INFORMATION

Channel Bed Material(7): Rock

Channel Bank Material(8): Silty Clay

Channel Bank Cover(9): Trees, bramble

Floodplain Width(10): ~100'

Floodplain Cover(11): Grass, trees, shrubs

Stream is(12): Aggrading ____ Degrading X Static ____

Channel Migration Tendency(13): Toward End Bent One

Observations and Other Comments: Channel flows against bottom of abutment

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS

Comparison of DSE to Hydraulics Unit theoretical scour:
Hydraulics BSR not available at time of project submittal

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

Form GEU-017e Revised 7/26/2007

Reported by: J,W. Mann **Date:** 6/22/2011

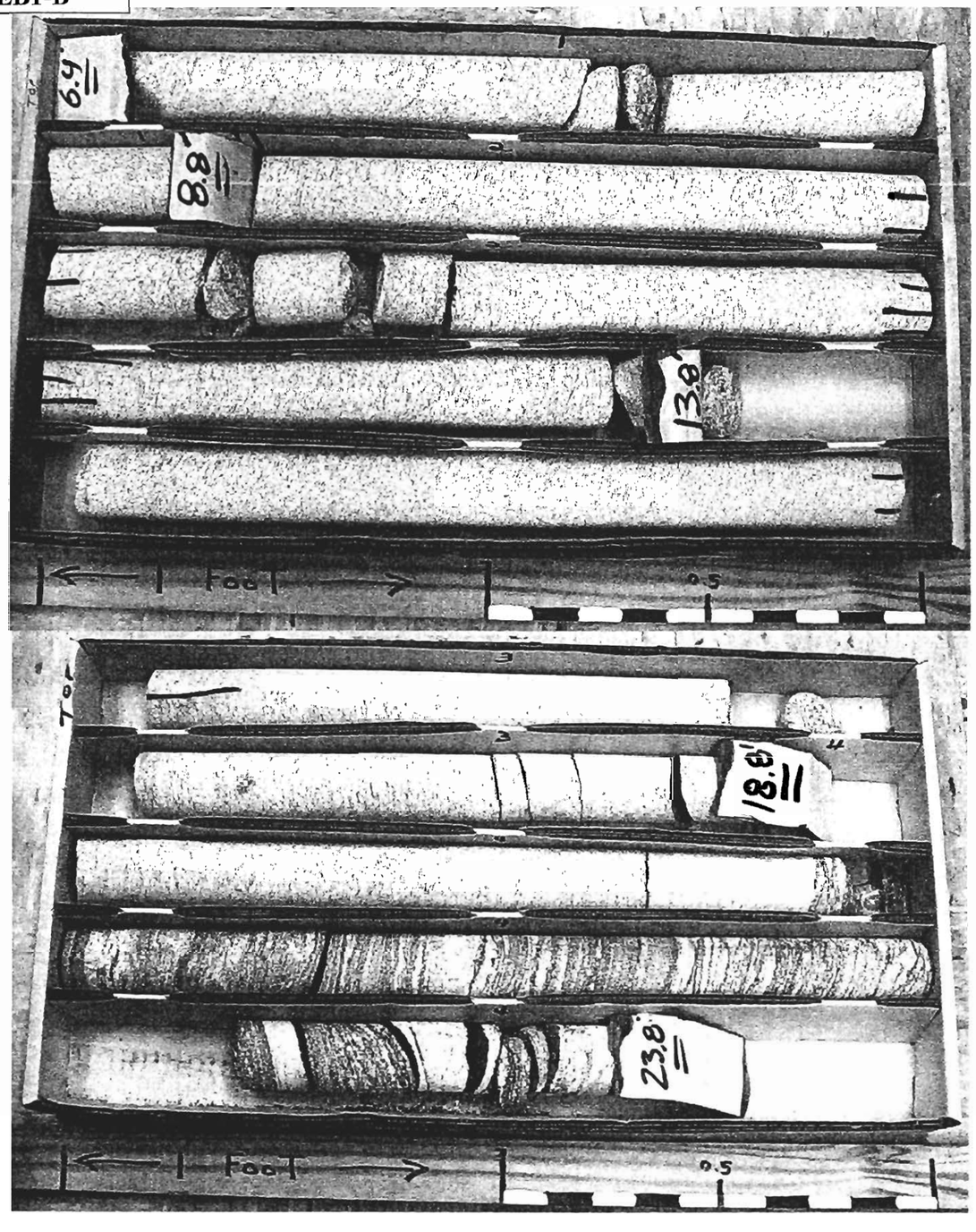
INSTRUCTIONS

1 Describe the specific site's location, including route number and body of water crossed.
2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
3 Note existing scour protection (e.g. rip rap).
4 Describe extent of existing scour protection.
5 Describe whether or not the scour protection appears to be working.
6 Note obstructions such as dams, fallen trees, debris at bents, etc.
7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
10 Determine the approximate floodplain width from field observation or a topographic map.
11 Describe the material covering the floodplain (e.g. grass, trees, crops).
12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

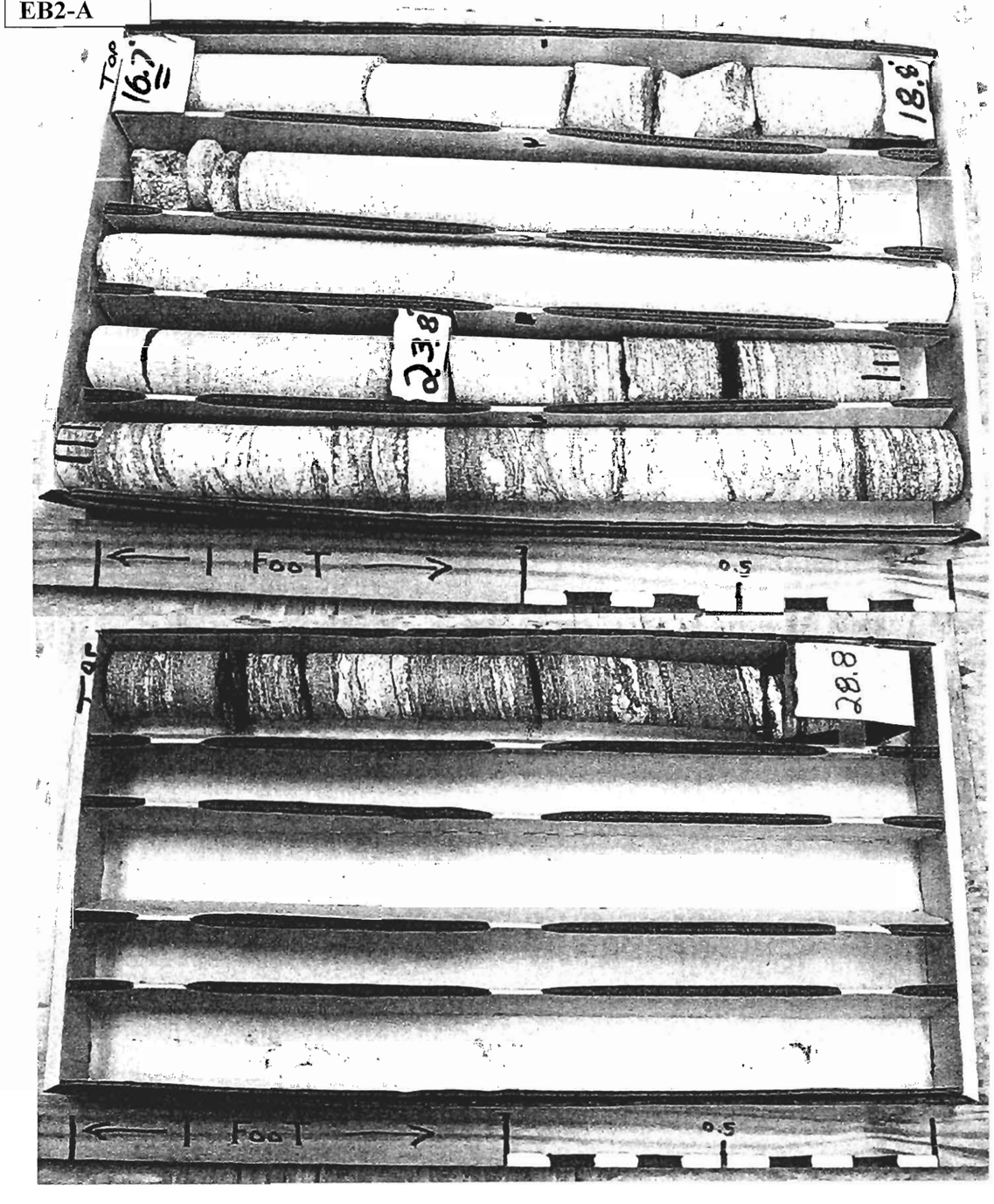
BD-5114J (B-4295)
TRANSYLVANIA COUNTY
BRIDGE # 150 ON SR 1327 OVER SHOAL CREEK

CORE PHOTOS

EB1-B



EB2-A



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

December 9, 2011

MEMORANDUM TO: J.B. Setzer, P.E.
Division 14 Engineer

ATTENTION: Joshua B. Deyton
Division 14 Bridge Manager

MEMORANDUM TO: Mr. G.R. Perfetti, P.E.
State Bridge Design Engineer

ATTENTION: Quang Nguyen, P.E.
Project Engineer

FROM: for Njoroge W. Wainaina, P.E.
State Geotechnical Engineer

STATE PROJECT: 45360.1.10(BD-5114J)

COUNTY: Transylvania

DESCRIPTION: Bridge No. 150 on SR 1327 over Shoal Creek

SUBJECT: Bridge Foundation Recommendations

The Geotechnical Engineering Unit has completed the subsurface investigation and has prepared foundation design recommendations and presents the following project data:

☒ Bridge Inventory (11) pages

☒ Foundation Design Recommendations (4) pages

☐ Design Calculations () pages

☐ Special Provisions () pages

Please call John L. Pilipchuk, L.G., P.E. or John Fargher, P.E. at (704)-455-8902 if there are any questions concerning this memorandum.

NWW/JLP/JSF/DSG

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850
Fax: 919-250-4237
Website: www.ncdot.org./doh

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

FOUNDATION RECOMMENDATIONS

WBS 45360.1.10

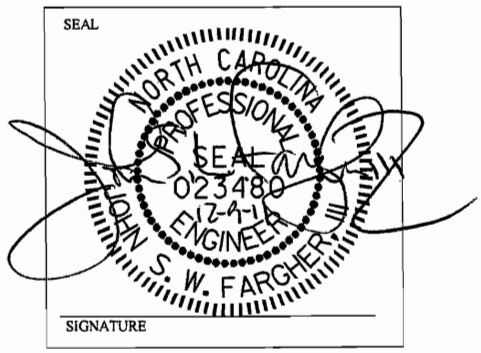
T.I.P. NO. BD-5114J

COUNTY Transylvania

STATION 11+97.923 -L-

DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek

	INITIALS	DATE
DESIGN	DSG	12/6/12
CHECK	MRB	12/8/11
APPROVAL	JSF	12-9-11



BENT	STATION	FOUNDATION TYPE	FACTORED RESISTANCE	MISCELLANEOUS & DETAILS
END BENT 1	STA. 11+81.623-L-	Cap on HP 12x53 Steel Piles	65 tons/pile	Bottom of Cap El. = 2,878.6 ft ± Estimated Length of Pile = 10 ft Number of Piles =5
END BENT 2	STA. 12+14.222 -L-	Cap on HP 12x53 Steel Piles	65 tons/pile	Bottom of Cap El. = 2,879.3 ft ± Estimated Length of Pile = 10 ft Number of Piles = 5

NOTES ON PLANS & COMMENTS

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS HIGHWAY BUILDING PO BOX 25201 RALEIGH, NORTH CAROLINA 27611	SUBJECT: Bridge No. 150 on SR 1327 over Shoal	
	PREPARED BY: DSG	PROJECT: 45360.1.10
	DATE: 12/6/12	TIP: BD-5114J
	CHECKED BY: MRB	COUNTY: Transylvania
	DATE: 12/8/11	

FOUNDATION RECOMMENDATION NOTES ON PLANS

1) For Piles, See Section 450 of the Standard Specifications.

2) Piles at End Bent No. 1 are designed for a Factored Resistance of 65 Tons per Pile.

3) Pile excavation is required to install piles at End Bent No. 1. Excavate holes at piles locations to Elevation 2873.7 ft(LT), 2874.4 ft(RT). For pile excavation, see Section 450 of the standard Specifications.

4) Concrete or grout is required to fill holes for pile excavation at End Bent No. 1.

5) Piles at End Bent No. 2 are designed for a Factored Resistance of 65 Tons per Pile.

6) Pile excavation is required to install piles at End Bent No. 2. Excavate holes at piles locations to Elevation 2873.6 ft(LT), 2870.6 ft(RT). For pile excavation, see Section 450 of the standard Specifications.

7) Concrete or grout is required to fill holes for pile excavation at End Bent No. 2.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS HIGHWAY BUILDING PO BOX 25201 RALEIGH, NORTH CAROLINA 27611	SUBJECT: Bridge No. 150 on SR 1327 over Shoal	
	PREPARED BY: DSG	PROJECT: 45360.1.10
	DATE: 12/6/12	TIP: BD-5114J
	CHECKED BY: MRB	COUNTY: Transylvania
	DATE: 12/8/11	

FOUNDATION RECOMMENDATION COMMENTS

1) Please advise Western Regional Office, if factored resistance is less than max. factored structure load.

2) PDA will not be used to monitor driving stresses.

3) Re-strikes are not required.

4) End bent slopes of 1½:1 are ok with slope protection to berm and to 1¾: 1.

5) Bridge approach Fill - Sub Regional Tier is required at End Bent No. 1.

6) Bridge approach Fill - Sub Regional Tier is required at End Bent No. 2.

7) Please send Western Regional Design Engineer a half size copy of the final general drawing sheets, including the location sketch, plan notes and quantities, at the time they are submitted to the plan checking & review squad.

PILE PAY ITEM QUANTITIES

(Revised 07/16/08)

WBS ELEMENT 45360.1.10 DATE 12/6/2012

TIP NO. BD-5114J DESIGNED BY DSG

COUNTY Transylvania CHECKED BY MRB

STATION 11+97.923 -L-

DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek

NUMBER OF BENTS WITH PILES
NUMBER OF PILES PER BENT
NUMBER OF END BENTS WITH PILES 2
NUMBER OF PILES PER END BENT 5

Only required for "Pile Excavation" Pay Items.

	PILE PAY ITEM QUANTITIES						
				PILE EXCAVATION (per linear ft/m)			
BENT # OR END BENT #	PIPE PILE PLATES (yes/no/maybe)	STEEL PILE POINTS (yes/no)	PILE REDRIVES (per each)	IN SOIL	NOT IN SOIL	PDA TESTING (per each)	PDA ASSISTANCE (per each)
END BENT #1				0	25		
END BENT # 2				10	25		
TOTALS			0	10	50	0	0

Notes:
Blanks or "no" represent quantity of zero.

If pipe pile plates may be or are required, Structure Design should calculate the quantity of "Pipe Pile Plates" as equal to the number of pipe piles.

If steel pile points are required, Structure Design should calculate quantity of "Steel Pile Points" as equal to the number of steel piles.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	45360.1.10 BD-5114J	1	11

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 45360.1.10 BD-5114J F.A. PROJ. _____

COUNTY TRANSYLVANIA

PROJECT DESCRIPTION BRIDGE NO. 150 ON SR 1327 OVER SHOAL CREEK

SITE DESCRIPTION _____

ID: BD-5114J

PROJECT: 45360.1.10

CONTENTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE 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 ENGINEERING UNIT AT (919) 250-4088. THE SUBSURFACE PLANS, FIELD BORING 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.

THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, OR THE 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.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

D.C. ELLIOTT

C.J. COFFEY

L.A. RIDDLE

DRAWN BY J.W. MANN

DRAWN BY _____

INVESTIGATED BY J.W. MANN

CHECKED BY W.D. FRYE

SUBMITTED BY W.D. FRYE

DATE JULY 2011

NORTH CAROLINA LICENSED SEAL 1941 GEOLOGIST JOHN W. MANN 7/20/11

PROJECT REFERENCE NO.	SHEET NO.
45360.1.10 BD-5114J	2 OF 11

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 TO BE THE 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 STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. 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	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		NP	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

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	<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 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	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	2.00	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
NONPLASTIC	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, 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.
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 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 WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%
MODERATELY ORGANIC	5 - 10%	12 - 20%
HIGHLY ORGANIC	>10%	>20%

OTHER MATERIAL	
TRACE	1 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
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 W/ CORE
- SPT N-VALUE
- REF — SPT REFUSAL

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
FIAD - FILLED IN AFTER DRILLING

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:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N XWL
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF 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 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, 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 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 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 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, AS SHALE, SLATE, ETC.

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

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

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

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

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

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

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

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

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

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: BM #2: 8" SPIKE SET IN BASE OF 42" OAK TREE
BL STATION 9+56 4.9' RT.
ELEVATION: 2885.53' FT.

NOTES:

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
45360.1.10 B-5114J	3 OF 11

SITE PLAN

0 50 100

FEET

BM #1
-BL- STA 5+31.15
15.99' LEFT
ELEV. 2881.34'

SKEW=~60°

NAD 83/NSRS 2007 NC GRID

46° 55' 14.8" E

-EL- TO NC 215

JS

SHOAL CREEK

GR

N 2° 14' 50.1" E

EB1-A

SPT

EB2-A

SRT

EB1-B

SPT

EB2-B

18' BST

SR 1327 - SHOAL CREEK ROAD

WOODS

-BL-4 11+37.05 PINC

-BL-2 7+25.42 PINC

BM #2
-BL- STA 9+56.21
4.91' RIGHT
ELEV. 2885.53'

N 18° 40' 20.0" W

-BL-3 9+09.32 PINC

N 42° 07' 01.5" E

TO GOVERNMENT RD.

-EL-

-BL-5 13+33.42 POT

PROJECT REFERENCE NO.	SHEET
45360.1.10 BD-5114J	4 OF 11

0 10 20
FEET
VE = 1

PROFILE 12' RT. OF EXISTING CENTERLINE

EXISTING -L-

2920
2910
2900
2890
2880
2870
2860
2850
2840
2830

EB1-B
9 RT

EB2-B
6 RT

EXISTING GROUND

EMBANKMENT
ALLUVIUM
WEATHERED ROCK (granitoid)
60/0.0
100/0.7
ABC, SAND, BOULDERS
SILTY CLAY
WATER SURFACE 06/11
CRYSTALLINE ROCK
GRAY-WHITE, FRESH, HARD GRANITOID
CRYSTALLINE ROCK
SLIGHTLY WEATHERED, HARD
BIOTITE GNEISS
BT
FIAD

EMBANKMENT
ALLUVIUM
SAPROLITE
WEATHERED ROCK
CRYSTALLINE ROCK
06/11
4
81
50/0.1
60/0.0
BT
ABC &
SILTY FINE SAND WITH
TRACE ROCK FRAGMENTS
FINE TO COARSE SAND
(granitoid)
GRANITOID

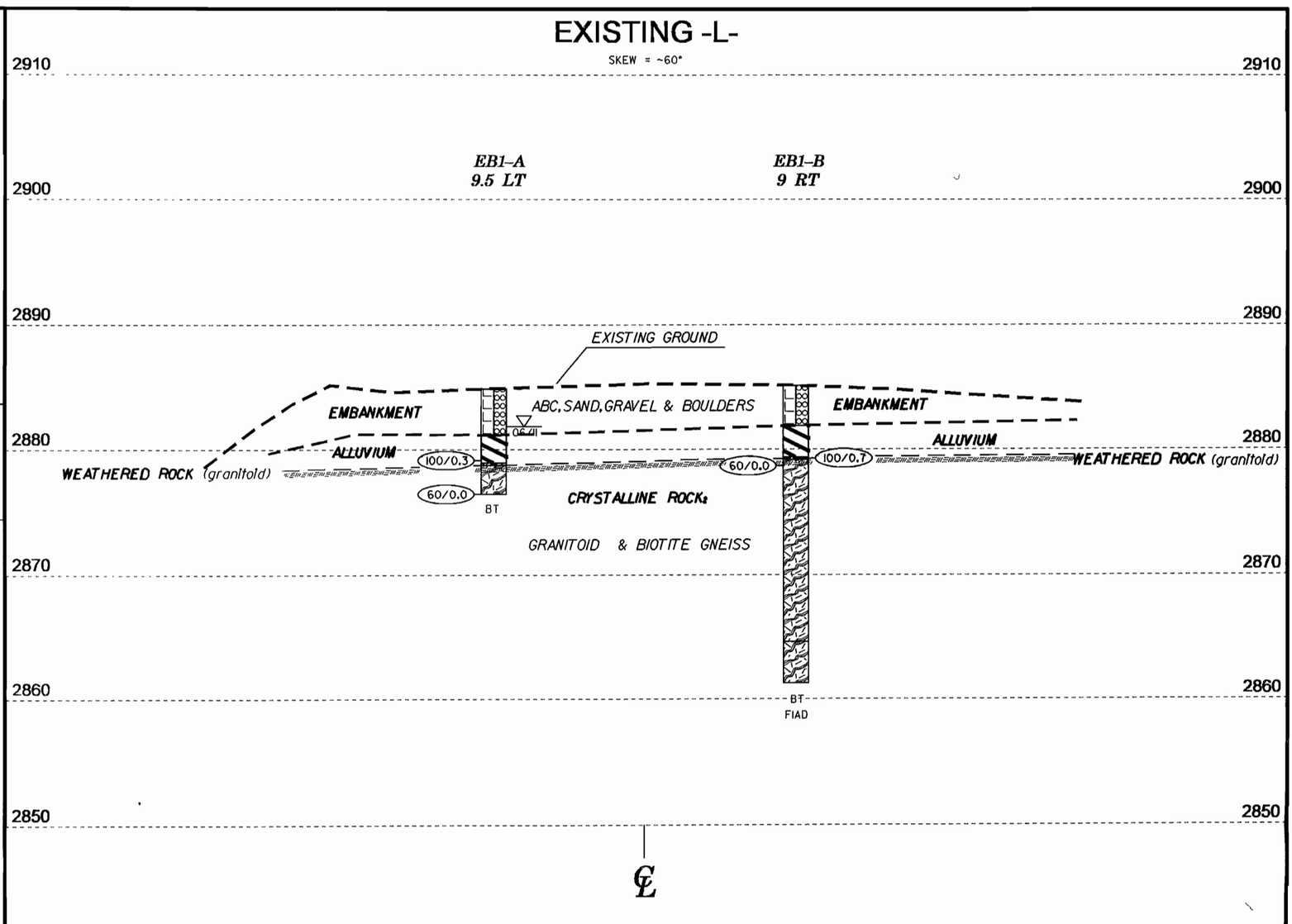
EXISTING -L-

SKEW = ~60°

HORIZ. SCALE (FEET) 0 10 20

VE = 1

SECTION THRU EB1 BORINGS



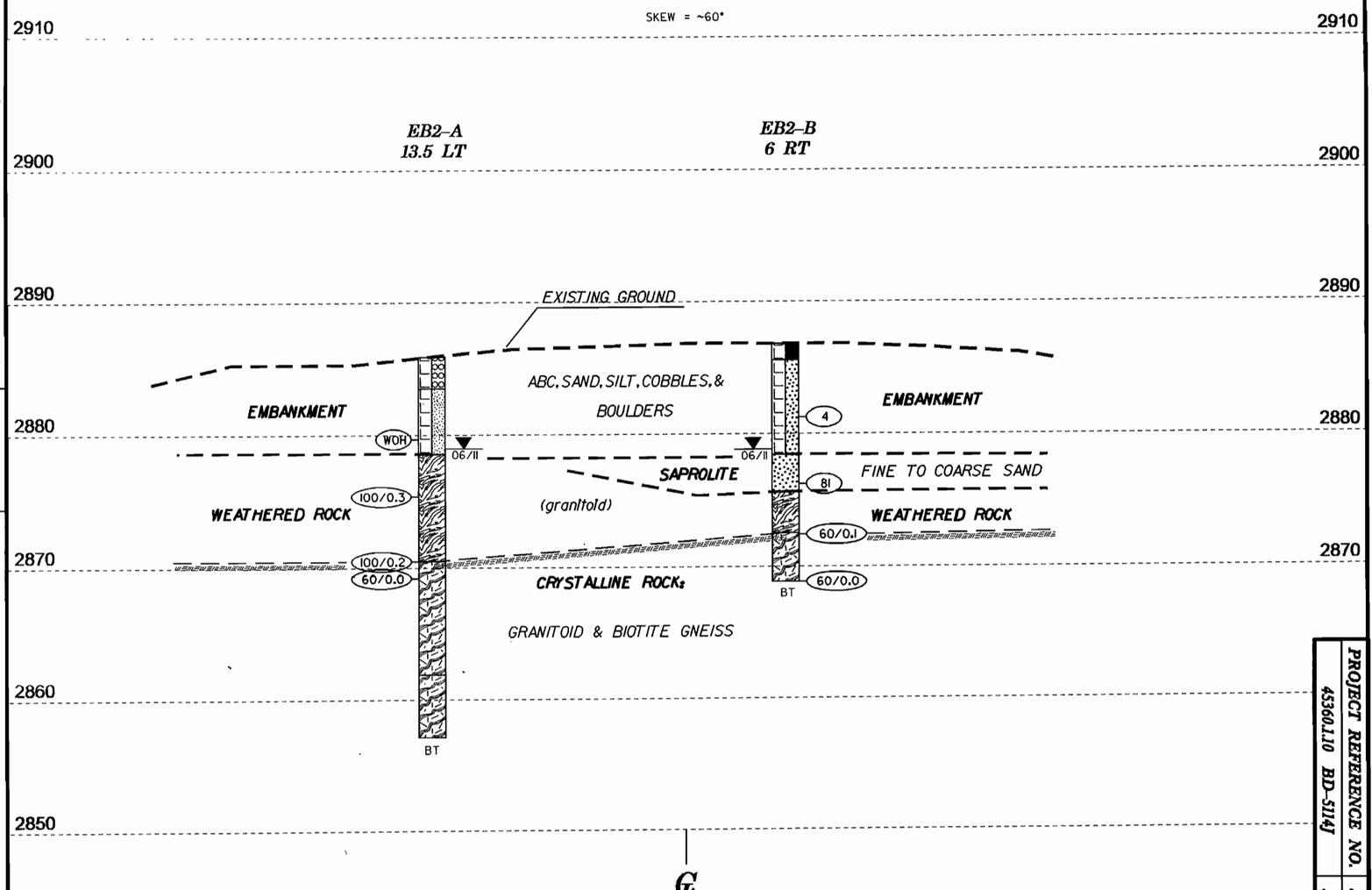
EXISTING -L-

SKEW = ~60°

HORIZ. SCALE (FEET) 0 10 20

VE = 1

SECTION THRU EB2 BORINGS



PROJECT REFERENCE NO.	SHEET
45360.110 BD-5114J	5 OF 11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** N/A	**OFFSET** 10 ft LT	**ALIGNMENT** Existing -L-	**0 HR.** 3.0
COLLAR ELEV. 2,884.8 ft	**TOTAL DEPTH** 8.4 ft	**NORTHING** 565,246	**EASTING** 847,982	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT		**HAMMER TYPE** Automatic
DRILLER Coffey, Jr., C.	**START DATE** 06/10/11	**COMP. DATE** 06/10/11	**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)
2885										2,884.8 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT ABC, SAND & GRAVEL	
										2,881.1	3.7
2880	2,880.1	4.7	WOH	WOH	100/0.3					ALLUVIAL Silty CLAY	
										2,878.9	5.9
						100/0.3				2,878.7 WEATHERED ROCK (granitoid)	6.1
	2,876.4	8.4	60/0.0			60/0.0				2,876.4 CRYSTALLINE ROCK GRANITOID	8.4
										Boring Terminated at Elevation 2,876.4 ft In Crystalline Rock: Granitoid	

NCDOT BORE SINGLE BD5114J GEO_BH_BRDG0150.GPJ NC_DOT.GDT 7/20/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** N/A	**OFFSET** 9 ft RT	**ALIGNMENT** Existing -L-	**0 HR.** Caved@3.8
COLLAR ELEV. 2,885.1 ft	**TOTAL DEPTH** 23.8 ft	**NORTHING** 565,266	**EASTING** 848,004	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/10/11	**COMP. DATE** 06/01/11	**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)
2890											
2885										2,885.1 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT ABC, SAND, BOULDERS	
										2,881.9	3.2
2880	2,880.0	5.1								ALLUVIAL Silty CLAY	
	2,878.7	6.4	WOH	100/0.2		100/0.7				2,879.4	5.7
			60/0.0			60/0.0				2,879.2 WEATHERED ROCK (granitoid)	5.9
2875										2,878.7 CRYSTALLINE ROCK GRANITOID	6.4
										CRYSTALLINE ROCK Gray-white, fresh, hard GRANITOID SREC=97% SRQD=84%	
2870											
2865										2,864.6	20.5
										CRYSTALLINE ROCK White-dark gray, slightly weathered, hard biotite GNEISS SREC=91% SRQD=61%	
										2,861.3	23.8
										Boring Terminated at Elevation 2,861.3 ft In Crystalline Rock: Gneiss	

NCDOT BORE SINGLE BD5114J_GEO_BH_BRDG0150.GPJ NC_DOT.GDT 7/20/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** N/A	**OFFSET** 9 ft RT	**ALIGNMENT** Existing -L-	**0 HR.** Caved@3.8
COLLAR ELEV. 2,885.1 ft	**TOTAL DEPTH** 23.8 ft	**NORTHING** 565,266	**EASTING** 848,004	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/10/11	**COMP. DATE** 06/01/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 17.4 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2878.67											Begin Coring @ 6.4 ft	
	2,878.7	6.4	2.4	*N=60/0.0* 0:55/1.0 1:21/1.0	(2.3) 96%	(2.0) 83%		(13.7) 97%	(11.8) 84%		2,878.7 CRYSTALLINE ROCK Gray-white, fresh, hard GRANITOID. Fracture spacing is generally moderately close. Rock is very weakly foliated with fractues sub-horizontal.	6.4
	2,876.3	8.8										
2875			5.0	0:23/0.4 1:04/1.0 1:11/1.0 1:05/1.0 1:16/1.0 1:13/1.0	(4.8) 96%	(4.1) 82%						
	2,871.3	13.8										
2870			5.0	1:10/1.0 1:16/1.0 1:20/1.0 0:56/1.0 1:13/1.0	(4.9) 98%	(4.0) 80%						
	2,866.3	18.8										
2865			5.0	1:20/1.0 0:57/1.0 1:08/1.0 1:19/1.0 1:04/1.0	(4.8) 96%	(3.8) 76%						
								(3.0) 91%	(2.0) 61%		2,864.6	20.5
	2,861.3	23.8									CRYSTALLINE ROCK White to dark gray, slightly weathered, hard biotite GNEISS. Fractures are along foliation @ 30° or less with spacing close to moderately close.	
											2,861.3	23.8
											Boring Terminated at Elevation 2,861.3 ft In Crystalline Rock: Gneiss	

NCDOT CORE SINGLE BD5114J_GEO_BH_BRDG0150.GPJ NC_DOT.GDT 7/20/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** N/A	**OFFSET** 14 ft LT	**ALIGNMENT** Existing -L-	**0 HR.** N/A
COLLAR ELEV. 2,885.9 ft	**TOTAL DEPTH** 28.8 ft	**NORTHING** 565,302	**EASTING** 847,968	**24 HR.** 6.9
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/07/11	**COMP. DATE** 06/07/11	**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)
2890											
2885										2,885.9 GROUND SURFACE	0.0
										ROADWAY EMBANKMENT SAND, COBBLES, BOULDERS	
										2,883.5 ROADWAY EMBANKMENT Brown fine sandy SILT	2.4
2880	2,880.7	5.2	WOH	WOH	WOH	0				PDC = 2879.3 ft	
										2,878.6 WEATHERED ROCK (granitoid)	7.3
2875	2,875.7	10.2	100/0.3			100/0.3					
2870	2,870.7	15.2	100/0.2			100/0.2				2,870.5	15.4
	2,869.2	16.7	60/0.0			60/0.0				2,869.2 CRYSTALLINE ROCK GRANITOID	16.7
2865										CRYSTALLINE ROCK Gray-white, very slightly weathered to fresh, hard GRANITOID SREC=93% SRQD=71%	
										2,861.9	24.0
2860										CRYSTALLINE ROCK White-dark gray, very slightly weathered to fresh, hard biotite GNEISS SREC=98% SRQD=75%	
										2,857.1	28.8
										Boring Terminated at Elevation 2,857.1 ft In Crystalline Rock: Gneiss	

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** N/A	**OFFSET** 14 ft LT	**ALIGNMENT** Existing -L-	**0 HR.** N/A
COLLAR ELEV. 2,885.9 ft	**TOTAL DEPTH** 28.8 ft	**NORTHING** 565,302	**EASTING** 847,968	**24 HR.** 6.9
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/07/11	**COMP. DATE** 06/07/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXWL	**TOTAL RUN** 12.1 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS ELEV. (ft)	DEPTH (ft)
2869.18											Begin Coring @ 16.7 ft	
	2,869.2	16.7	2.1	N=60/0.0	(2.0)	(1.5)		(6.8)	(5.2)		2,869.2 CRYSTALLINE ROCK	16.7
	2,867.1	18.8		0:55/1.0 0:53/1.0	95%	71%		93%	71%		Gray-white, very slightly weathered to fresh, hard GRANITOID. Fracture spacing is very close to moderately close. Rock is very weakly foliated with sub-horizontal fractures.	
2865			5.0	0:09/0.1	(4.6)	(3.5)						
				1:26/1.0 0:46/1.0 1:07/1.0 1:13/1.0 1:19/1.0	92%	70%						
	2,862.1	23.8									2,861.9	24.0
2860			5.0	1:28/1.0 1:15/1.0 1:16/1.0 1:09/1.0 1:25/1.0	(4.9) 98%	(4.1) 82%		(4.7) 98%	(3.6) 75%		CRYSTALLINE ROCK White-dark gray, very slightly weathered to fresh, hard biotite GNEISS. Fractures are along foliation @ 20° or less and are close to moderately close.	
	2,857.1	28.8									2,857.1	28.8
											Boring Terminated at Elevation 2,857.1 ft In Crystalline Rock: Gneiss	

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 45360.1.10	**TIP** BD-5114J	**COUNTY** TRANSYLVANIA	**GEOLOGIST** Elliott, D. C.	
SITE DESCRIPTION Bridge No. 150 on SR 1327 over Shoal Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** N/A	**OFFSET** 6 ft RT	**ALIGNMENT** Existing -L-	**0 HR.** N/A
COLLAR ELEV. 2,886.8 ft	**TOTAL DEPTH** 18.0 ft	**NORTHING** 565,327	**EASTING** 847,979	**24 HR.** 8.0
DRILL RIG/HAMMER EFF./DATE AFO0071 CME-550X 72% 09/03/2009		**DRILL METHOD** NW Casing w/ SPT	**HAMMER TYPE** Automatic	
DRILLER Coffey, Jr., C.	**START DATE** 06/07/10	**COMP. DATE** 06/07/10	**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)
2890											
										2,886.8 GROUND SURFACE	0.0
2885										2,885.5 **ROADWAY EMBANKMENT** Aggregate Base Course	1.3
										ROADWAY EMBANKMENT Light brown silty fine SAND with trace rock fragments	
	2,882.2	4.6	1	2	2	4					
2880										2,878.4	8.4
	2,877.2	9.6	9	10	71	81				**SAPROLITE** Light gray to white-black fine to coarse SAND	
2875										2,875.6	11.2
	2,872.5	14.3	60/0.1			60/0.1				**WEATHERED ROCK** (granitoid)	
2870										2,872.5	14.3
	2,868.8	18.0	60/0.0			60/0.0				**CRYSTALLINE ROCK** GRANITOID	
										2,868.8	18.0
										Boring Terminated at Elevation 2,868.8 ft In Crystalline Rock: Granitoid	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 45360.1.10 TIP: BD-5114J COUNTY: TRANSYLVANIA

DESCRIPTION(1): Bridge No. 150 on SR 1327 over Shoal Creek

EXISTING BRIDGE

Information from: Field Inspection X Microfilm ____ (reel ____ pos: ____)
Other (explain) ____

Bridge No.: 150 Length: 26 Total Bents: 2 Bents in Channel: 2 Bents in Floodplain: 0
Foundation Type: ____

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None

Interior Bents: n/a

Channel Bed: None (rock channel)

Channel Bank: None noted

EXISTING SCOUR PROTECTION

Type(3): Vertical abutments

Extent(4): n/a

Effectiveness(5): Abutments are on rock

Obstructions(6): None noted

DESIGN INFORMATION

Channel Bed Material(7): Rock

Channel Bank Material(8): Silty Clay

Channel Bank Cover(9): Trees, bramble

Floodplain Width(10): ~100'

Floodplain Cover(11): Grass, trees, shrubs

Stream is(12): Aggrading ____ Degrading X Static ____

Channel Migration Tendency(13): Toward End Bent One

Observations and Other Comments: Channel flows against bottom of abutment

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS

Comparison of DSE to Hydraulics Unit theoretical scour:
Hydraulics BSR not available at time of project submittal

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

Bed or Bank							
Sample No.							
Retained #4							
Passed #10							
Passed #40							
Passed #200							
Coarse Sand							
Fine Sand							
Silt							
Clay							
LL							
PI							
AASHTO							
Station							
Offset							
Depth							

Form GEU-017e Revised 7/26/2007

Reported by: J,W. Mann **Date:** 6/22/2011

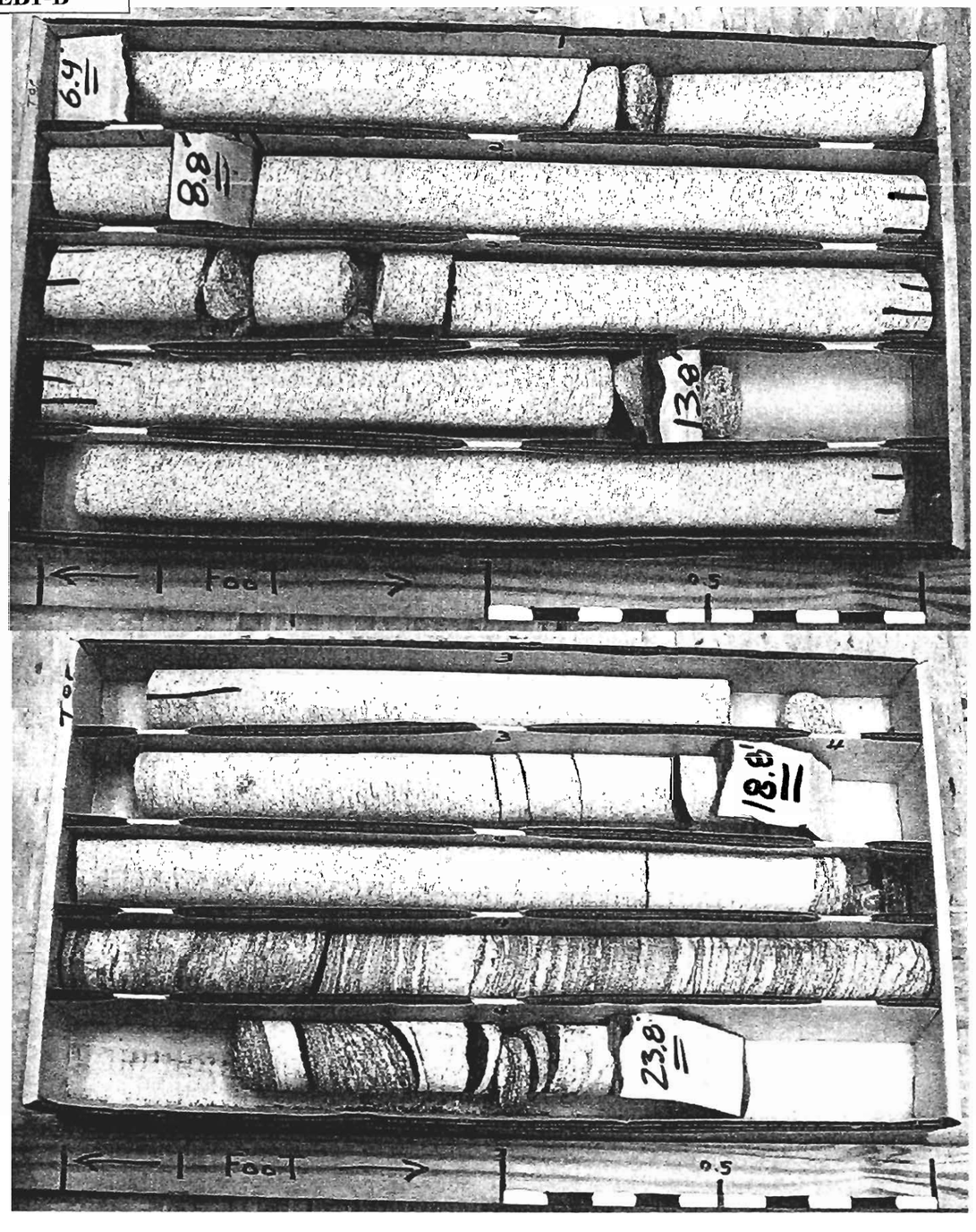
INSTRUCTIONS

1 Describe the specific site's location, including route number and body of water crossed.
2 Note scour evidence at existing end bents or abutments (e.g. undermining, sloughing, degradations).
3 Note existing scour protection (e.g. rip rap).
4 Describe extent of existing scour protection.
5 Describe whether or not the scour protection appears to be working.
6 Note obstructions such as dams, fallen trees, debris at bents, etc.
7 Describe the channel bed material based on observation and/or samples. Include any lab results with report.
8 Describe the channel bank material based on observation and/or samples. Include any lab results with report.
9 Describe the material covering the banks (e.g. grass, trees, rip rap, none).
10 Determine the approximate floodplain width from field observation or a topographic map.
11 Describe the material covering the floodplain (e.g. grass, trees, crops).
12 Use professional judgement to specify if the stream is degrading, aggrading, or static.
13 Describe potential and direction of the stream to migrate laterally during the bridge's life (approx. 100 years).
14 Give the design scour elevation (DSE) expected over the life of the bridge (approx. 100 years). This elevation can be given as a range across the site, or for each bent. Discuss the relationship between the Hydraulics Unit theoritical scour and the DSE. If the DSE is dependent on scour counter measures, explain (e.g. rip rap armoring on slopes). The DSE is based on the erodability of materials, giving consideration to the influence of joints, foliation, bedding characteristics, % core recovery, % RQD, differential weathering, shear strength, observations at existing structures, other tests deemed appropriate, and overall geologic conditions at the site.

BD-5114J (B-4295)
TRANSYLVANIA COUNTY
BRIDGE # 150 ON SR 1327 OVER SHOAL CREEK

CORE PHOTOS

EB1-B



EB2-A