STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4957	1	20

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *40149.1.1* F.A. PROJ. *BRSTP-1193(8)*

COUNTY *Guilford*

PROJECT DESCRIPTION *Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)*

ID: B-4957

PROJECT: 40149.1.1

CONTENTS

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) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE 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 THIS 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.

PERSONNEL

D. Racey

J. Gilchrist

S. Davis

D. Jenks

R. Rogers

INVESTIGATED BY *F&R, Inc.*

CHECKED BY *P. Alton, P.E.*

SUBMITTED BY *P. Alton, P.E.*

DATE *10/11*

NORTH CAROLINA PROFESSIONAL SEAL 033758 11-14-11 ENGINEER PATRICK ALTON

Patrick Alton

DRAWN BY: *D. Racey*

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.

PROJECT REFERENCE NO.	SHEET NO.
B-4957	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 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-7-6 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	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	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	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 LOOSE MEDIUM OENSE OENSE 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 0.50 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
PLASTIC RANGE (PI): LL — LIQUID LIMIT		
	- 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	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 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

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-55
- [ ] PORTABLE HOIST
- [ ] _____
- [ ] _____

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

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -N 03
- [ ] -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: TBM: BL-5: METAL DISK AT STA. 11+85.07
N: 801,035.0921 E: 1,717,552.9000
ELEVATION: 732.67 FT.

NOTES:

REVISED 09/23/09

BEGIN BRIDGE
–L– STA. 17 + 65 +/–

25' INC.
18'
.00
.01
.02
.02
.02
.029
+02.15
2' 18.2" E
20'
18'
20'
4' PS
24'
N 33° 47' 41.8" E
4' PS
GRAU 350
EB1-A
B1-A
B2-A
EB2-A
EB1-B
B1-B
B2-B
EB2-B
GRAU 350
GRAU 350
4' PS
4' PS
24'
22' EAST
EXISTING R/W
EXISTING R/W
200.00
125.00'
WOODS
WOODS
WOODS
WOODS
ROCK OUTCROPS
JS
JS
JS
JS
JS
JS
12" DI
15" RCP
EIP
EIP
EIP
W
W
E
E
E
E
E
E
-L- PC Sta. 19+45.70
20
SR 1193 BAKER RD
8" SOIL
30" CMP
SKEW=90°
TWO MILE CREEK
-L- POT Sta. 16+50.00=
-DRV- POT Sta. 11+45.58
-BL-5 PINC
END BRIDGE
–L– STA. 18 + 69 +/–
NAD 83/NSRS 2007

SCALE (FEET)
0 15' 30'
1"=30'

SINCE 1881
FROEHLING & ROBERTSON, INC.
Engineering Stability Since 1881
310 Hubert Street
Raleigh, North Carolina 27603-2302 USA
T 919.828.3441 F 919.828.5751
www.fandr.com

TEST SITE PLAN

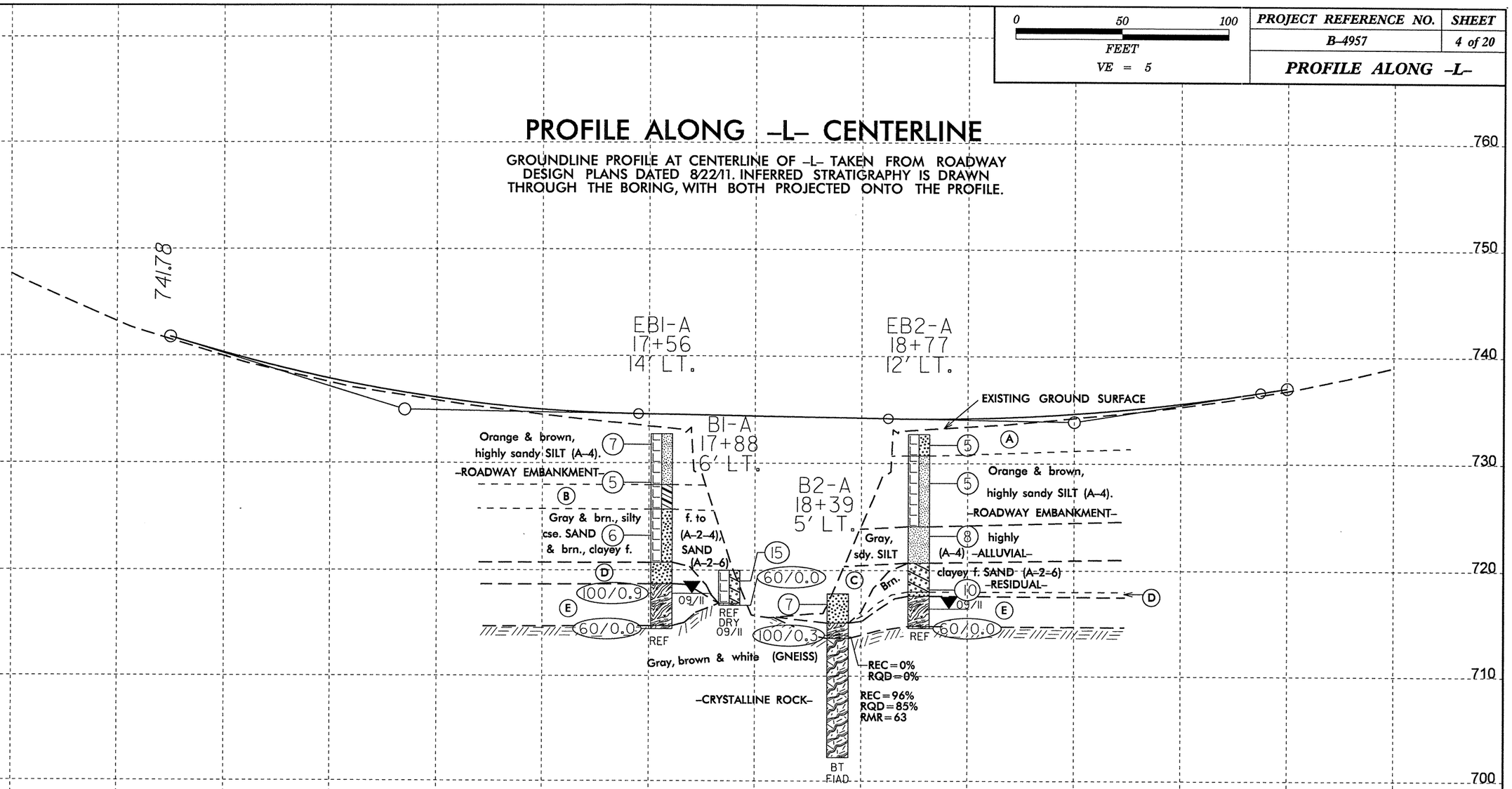
PROJECT REFERENCE NO.: 40149.1.1		F&R PROJECT NO.: 66N-0086
I.D. NO.: B-4957	F.A. PROJECT NO.: BRSTP-1193(8)	COUNTY: Guilford
PROJECT DESCRIPTION: Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)		
SITE DESCRIPTION: Bridge #56 on SR 1193 over Richland Crk. (Two Mile Crk.)		DRAWING No.: 1
DRAWN BY: D. Racey	CHECKED BY: P. Alton, P.E.	
DATE: October 2011	SCALE: 1"=30'	

0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
B-4957	4 of 20
PROFILE ALONG -L-	

PROFILE ALONG -L- CENTERLINE

GROUNDLINE PROFILE AT CENTERLINE OF -L- TAKEN FROM ROADWAY DESIGN PLANS DATED 8/22/11. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ONTO THE PROFILE.



(A) Gray & brown, silty fine to coarse SAND (A-2-4). -ROADWAY EMBANKMENT-

(B) Gray-brown, fine to coarse sandy CLAY (A-6(7)). -ROADWAY EMBANKMENT-

(C) Gray, brown & white, silty fine SAND (A-2-4). -ALLUVIAL-

(D) Gray, brown & white, silty fine SAND (A-2-4). -RESIDUAL-

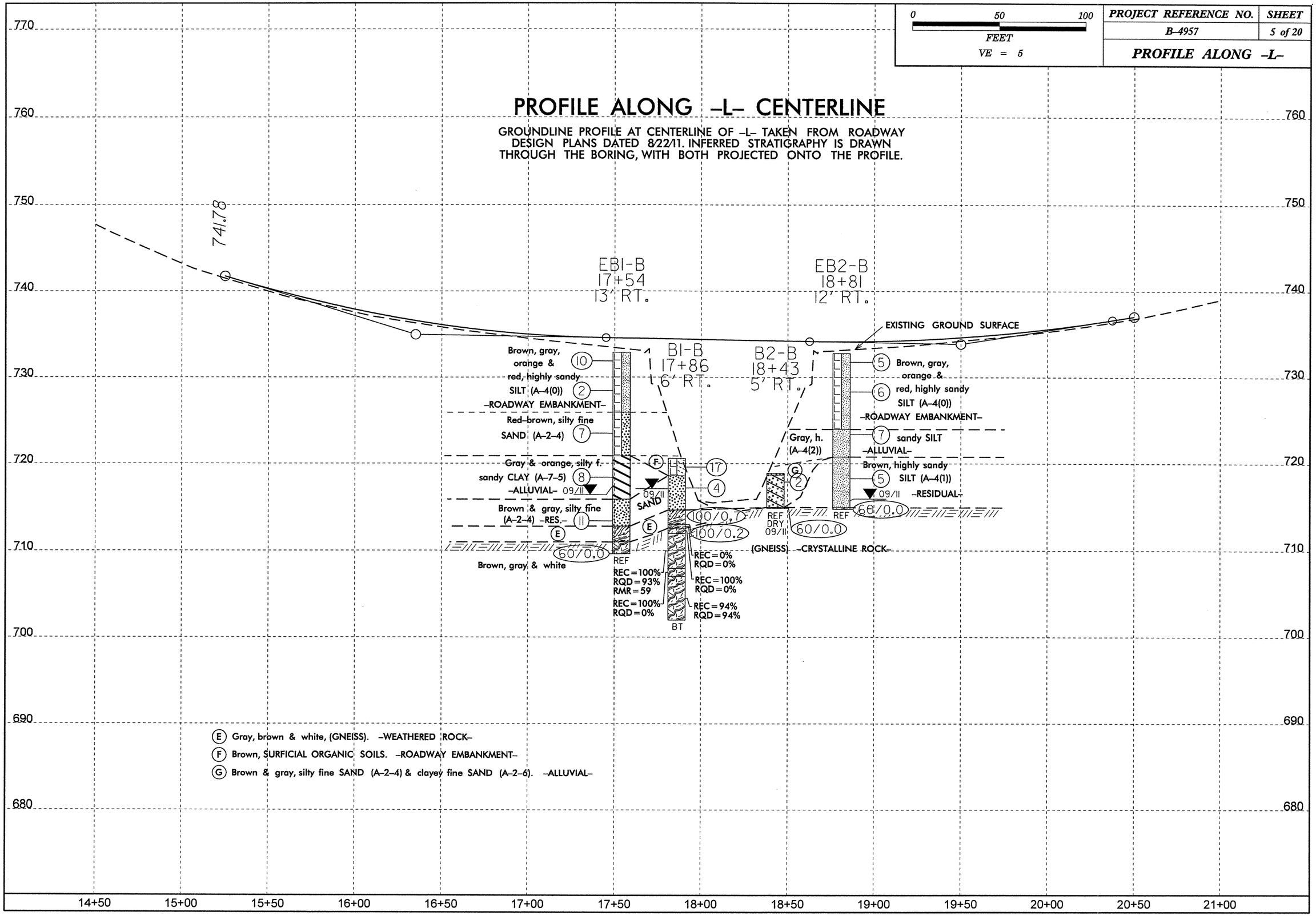
(E) Gray, brown & white, (GNEISS). -WEATHERED ROCK-

0	50	100
FEET		
VE = 5		

PROJECT REFERENCE NO.	SHEET
B-4957	5 of 20
PROFILE ALONG –L–	

PROFILE ALONG –L– CENTERLINE

GROUNDLINE PROFILE AT CENTERLINE OF –L– TAKEN FROM ROADWAY DESIGN PLANS DATED 8/22/11. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ONTO THE PROFILE.



(E) Gray, brown & white, (GNEISS). –WEATHERED ROCK–

(F) Brown, SURFICIAL ORGANIC SOILS. –ROADWAY EMBANKMENT–

(G) Brown & gray, silty fine SAND (A-2-4) & clayey fine SAND (A-2-6). –ALLUVIAL–

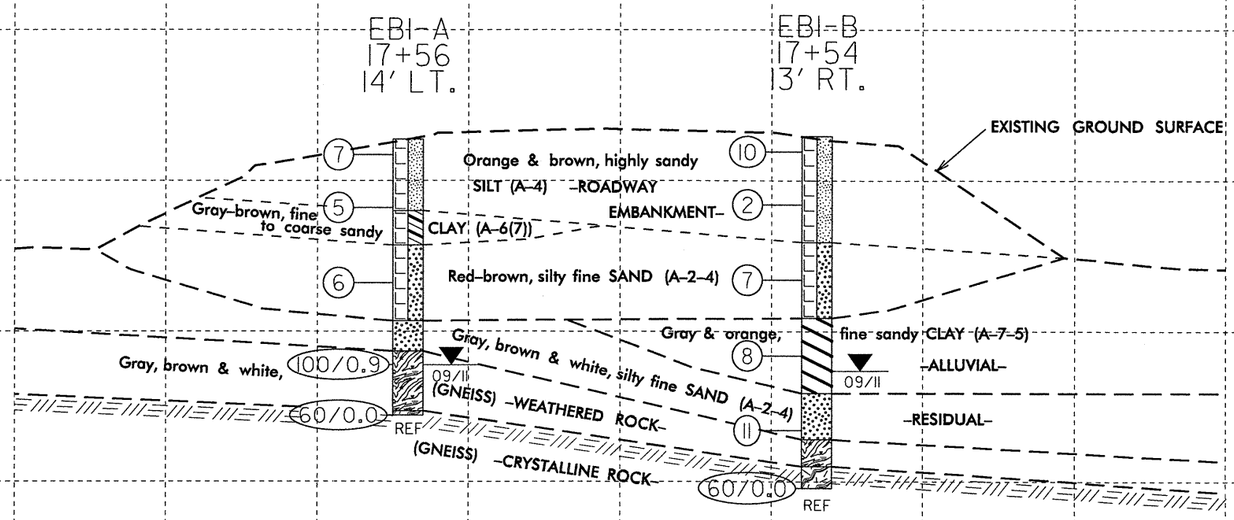
0	10	20
FEET		
VE = 0		

PROJECT REFERENCE NO.	SHEET
B-4957	6 of 20

PROPOSED END BENT 1

SECTION ALONG PROPOSED END BENT 1

GROUNDLINE AT –L– STATION 17+54.06 TAKEN FROM ROADWAY DESIGN PLANS DATED 8/22/11. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.



17+54.06

–L–

770 760 750 740 730 720 710 700 690 680

60 50 40 30 20 10 0 10 20 30 40 50 60 70

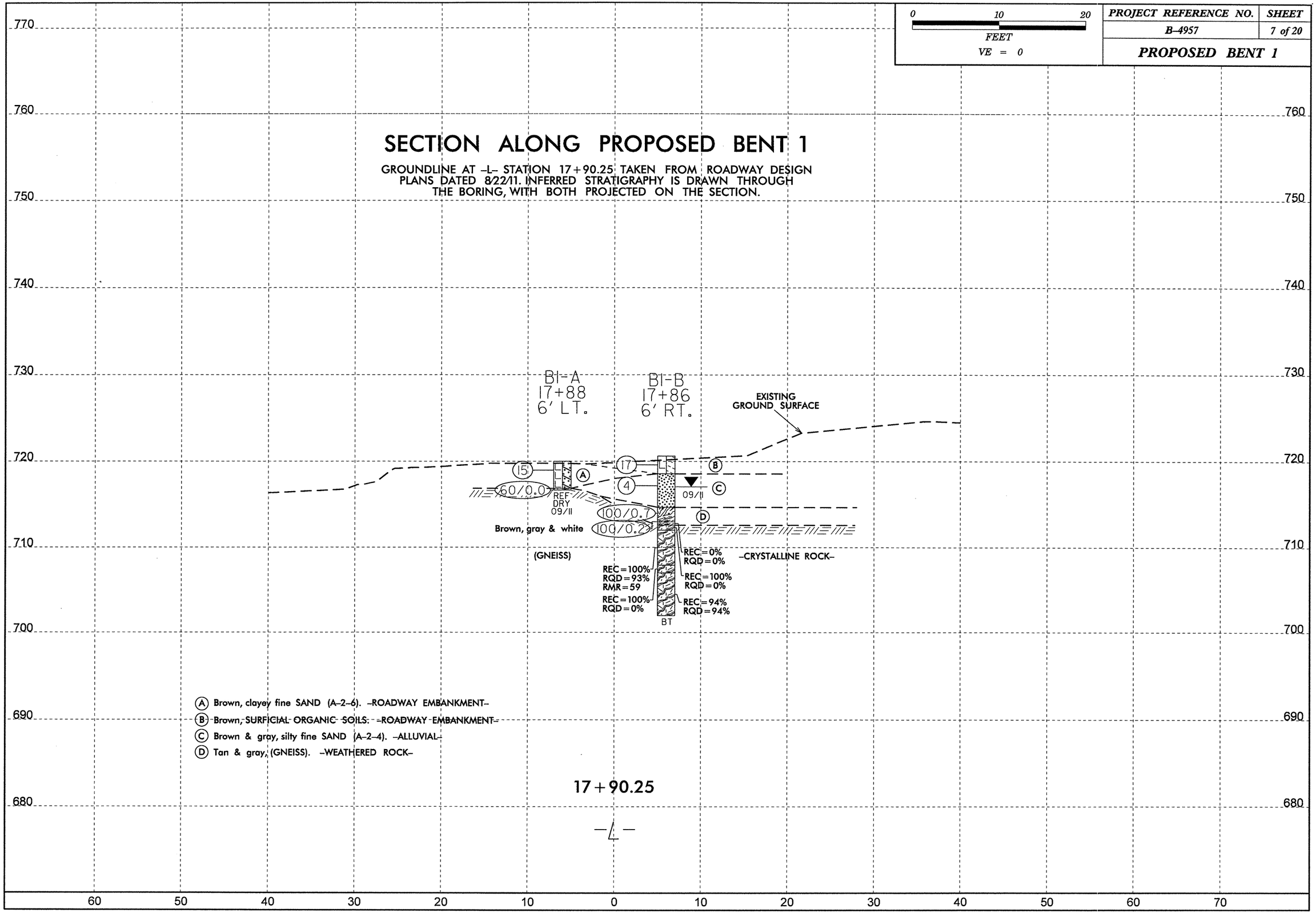
0	10	20
FEET		
VE = 0		

PROJECT REFERENCE NO.	SHEET
B-4957	7 of 20

PROPOSED BENT 1

SECTION ALONG PROPOSED BENT 1

GROUNDLINE AT –L– STATION 17+90.25 TAKEN FROM ROADWAY DESIGN PLANS DATED 8/22/11. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.



(A) Brown, clayey fine SAND (A–2–6). –ROADWAY EMBANKMENT–
(B) Brown, SURFICIAL ORGANIC SOILS. –ROADWAY EMBANKMENT–
(C) Brown & gray, silty fine SAND (A–2–4). –ALLUVIAL–
(D) Tan & gray, (GNEISS). –WEATHERED ROCK–

17+90.25

—L—

0	10	20

FEET

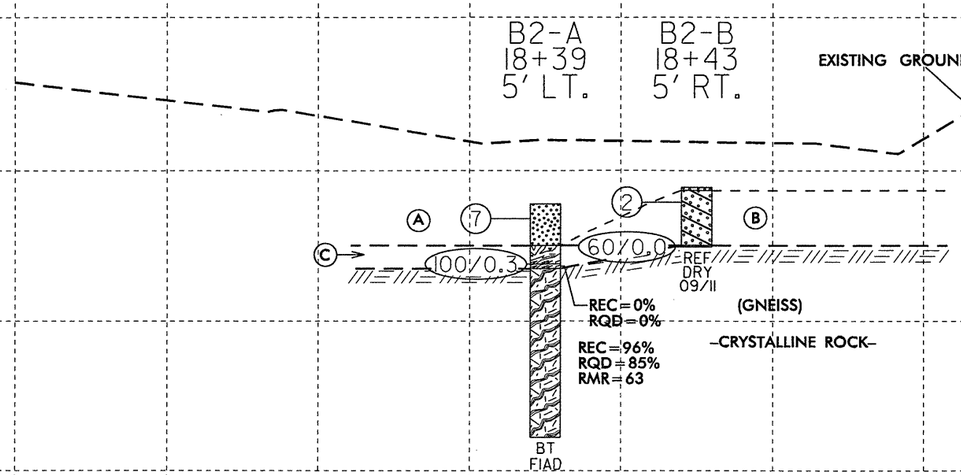
VE = 0

PROJECT REFERENCE NO.	SHEET
B-4957	8 of 20

PROPOSED BENT 2

SECTION ALONG PROPOSED BENT 2

GROUNDLINE AT –L– STATION 18+45.38 TAKEN FROM ROADWAY DESIGN PLANS DATED 8/22/11. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.



770
760
750
740
730
720
710
700
690
680

60 50 40 30 20 10 0 10 20 30 40 50 60 70

(A) Brown, silty fine SAND (A-2-4). –ALLUVIAL–

(B) Brown, clayey fine SAND (A-2-6). –ALLUVIAL–

(C) (GNEISS) –WEATHERED ROCK–

18+45.38

–L–

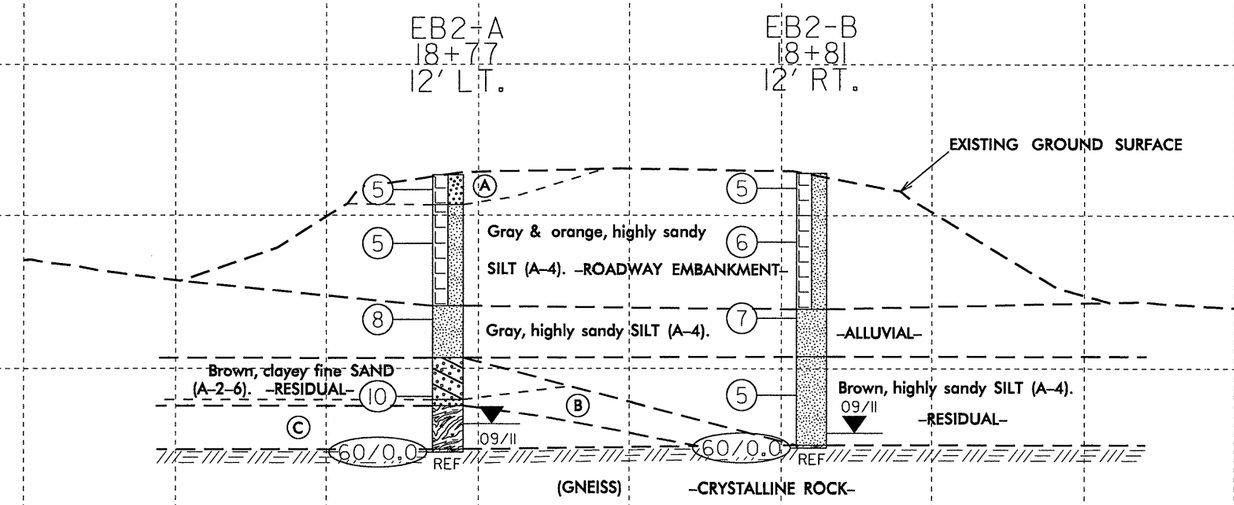
0	10	20
FEET		
VE = 0		

PROJECT REFERENCE NO.	SHEET
B-4957	9 of 20

PROPOSED END BENT 2

SECTION ALONG PROPOSED END BENT 2

GROUNDLINE AT -L- STATION 18+76.56 TAKEN FROM ROADWAY DESIGN PLANS DATED 8/22/11. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING, WITH BOTH PROJECTED ON THE SECTION.



770
760
750
740
730
720
710
700
690
680

60 50 40 30 20 10 0 10 20 30 40 50 60 70

Ⓐ Gray & brown, silty fine to coarse SAND (A-2-4). -ROADWAY EMBANKMENT-
Ⓑ Gray, brown & white, silty fine to coarse SAND (A-2-4). -RESIDUAL-
Ⓒ (GNEISS) -WEATHERED ROCK-

18+76.56

-L-

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 17+56	**OFFSET** 14 ft **LT**	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 732.7 ft	**TOTAL DEPTH** 18.3 ft	**NORTHING** 801,063	**EASTING** 1,717,538	**24 HR.** 14.9
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/12/11	**COMP. DATE** 09/12/11	**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)
735										
	732.7	0.0								732.7 GROUND SURFACE 0.0
			3	4	3	7		M		**ROADWAY EMBANKMENT** Orange & brown, highly sandy SILT (A-4), with trace gravel.
730										
	729.2	3.5	3	2	3	5	SS-8	22%		728.0 4.7 Gray-brown, silty fine to coarse sandy CLAY (A-6(7)), with some gravel.
725										725.7 7.0 Red-brown, silty fine SAND (A-2-4), with trace gravel.
	724.2	8.5	3	3	3	6		M		
720										720.7 12.0 **RESIDUAL** Gray, brown & white, silty fine SAND (A-2-4), with trace gravel, saprolitic.
	719.2	13.5	4	7	93/0.4	100/0.9				718.7 14.0 **WEATHERED ROCK** (Gray, brown & white, GNEISS)
715										
	714.4	18.3	60/0.0			60/0.0				714.7 18.0 / 714.4 18.3 **CRYSTALLINE ROCK** (GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 714.4 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) Field Professional indicates strata break in split spoon at a depth of 4.7'.
2) Driller indicates harder drilling at a depth of 18.0'.
3) Auger refusal at a depth of 18.3'.

NCDOT BORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 17+54	**OFFSET** 13 ft RT	**ALIGNMENT** -L-	**0 HR.** 19.2
COLLAR ELEV. 732.9 ft	**TOTAL DEPTH** 23.3 ft	**NORTHING** 801,046	**EASTING** 1,717,559	**24 HR.** 15.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/13/11	**COMP. DATE** 09/13/11	**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)
735										
	732.9	0.0								732.9 GROUND SURFACE 0.0
			3	5	5	10		M		**ROADWAY EMBANKMENT** Brown, orange & gray, highly sandy SILT (A-4(0)), with trace gravel & roots, little to some clay.
730										
	729.4	3.5	2	1	1	2	SS-18	21%		725.9 7.0 Red-brown, silty fine SAND (A-2-4).
725										
	724.4	8.5	2	4	3	7		M		
720										720.9 12.0 **ALLUVIAL** Gray & orange, silty fine sandy CLAY (A-7-5).
	719.4	13.5	2	4	4	8				715.9 17.0 **RESIDUAL** Dark brown & gray, silty fine SAND (A-2-4), with trace clay & mica.
715										
	714.4	18.5	5	6	5	11		W		712.8 20.1 **WEATHERED ROCK** (GNEISS)
710										711.0 21.9 **CRYSTALLINE ROCK** (GNEISS)
	709.6	23.3	60/0.0			60/0.0				709.6 23.3 Boring Terminated with Standard Penetration Test Refusal at Elevation 709.6 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 0.0-0.1' = Surficial Organic Soils
2) Driller indicates harder drilling at depths of 20.1' & 21.9'.
3) Auger refusal at a depth of 23.3'.

NCDOT BORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 17+88	**OFFSET** 6 ft LT	**ALIGNMENT** -L- — **0 HR.** Dry
COLLAR ELEV. 720.0 ft	**TOTAL DEPTH** 3.3 ft	**NORTHING** 801,085	**EASTING** 1,717,562 — **24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER J. Gilchrist	**START DATE** 09/13/11	**COMP. DATE** 09/13/11	**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)
720										720.0 GROUND SURFACE 0.0
	720.0	0.0	16	12	3	15		W		**ROADWAY EMBANKMENT** Brown, clayey fine SAND (A-2-6), with trace gravel.
	716.7	3.3	60/0.0			60/0.0				716.9 3.1 716.7 **CRYSTALLINE ROCK** (GNEISS) 3.3 Boring Terminated with Standard Penetration Test Refusal at Elevation 716.7 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 13.0' from top of bridge deck to ground surface.
2) 0.0-0.2' = Surficial Organic Soils
3) Driller indicates harder drilling at a depth of 3.1'.
4) Auger refusal at a depth of 3.3'.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 17+86	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 720.6 ft	**TOTAL DEPTH** 18.6 ft	**NORTHING** 801,077	**EASTING** 1,717,571	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/14/11	**COMP. DATE** 09/14/11	**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)
725										
	720.6	0.0								720.6 GROUND SURFACE 0.0
720			1	1	16	17		W		**ROADWAY EMBANKMENT** Brown, SURFICIAL ORGANIC SOIL, with high amount of rock fragments, trace metal shards. 718.6 2.0
	718.2	2.4	3	2	2	4				**ALLUVIAL** Brown & gray, silty fine SAND (A-2-4), with trace clay.
715	715.2	5.4	18	19	81/0.2	100/0.7				714.7 5.9 **WEATHERED ROCK** Tan & gray, GNEISS.
	713.2	7.4	100/0.2			100/0.2				713.0 7.6 (Tan & gray, GNEISS) 712.6 8.0 712.0 8.6 **CRYSTALLINE ROCK** (Brown, gray & white, GNEISS) (Gray & white, GNEISS)
710							RS-1			707.9 12.7 (Brown, gray & white, GNEISS) 707.0 13.6 (Gray & white, GNEISS)
705										702.0 18.6 Boring Terminated at Elevation 702.0 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 12.4' from top of bridge deck to ground surface.
2) 0 hr. water level not measured due to water introduced for coring.
3) Began coring at a depth of 7.6'.

NCDOT BORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 17+86	**OFFSET** 6 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 720.6 ft	**TOTAL DEPTH** 18.6 ft	**NORTHING** 801,077	**EASTING** 1,717,571	**24 HR.** 3.5
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/14/11	**COMP. DATE** 09/14/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ-3	**TOTAL RUN** 11.0 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
713											Begin Coring @ 7.6 ft
	713.0	7.6	1.6	9:54/1.0	(1.2) 75%	(0.6) 38%		(0.0) 0%	(0.0) 0%		713.0 **WEATHERED ROCK** (Tan & gray, GNEISS) 712.6 7.6 8.0
	711.4	9.2		2:24/0.6							712.0 8.6
			4.4	7:25/1.0	(4.4) 100%	(3.2) 73%		(0.6) 100%	(0.0) 0%		**CRYSTALLINE ROCK** Brown, gray & white, moderately severe to moderatately weathered, moderately hard to hard, (GNEISS), very close to close fracture spacing.
710				10:06/1.0				(4.1) 100%	(3.8) 93%		Gray & white, slightly to very slightly weathered, hard, (GNEISS), close to moderately close fracture spacing. $R_1 = 7$, $R_2 = 13$, $R_3 = 20$, $R_4 = 12$, $R_5 = 7$ RMR = 59 Rock Type = E
				7:50/1.0			RS-1				
				5:15/1.0							707.9 12.7 **RS-1: 11.5'-11.8' qu=11,243 psi**
	707.0	13.6		6:51/0.4				(0.9) 100%	(0.0) 0%		707.0 13.6 Brown, gray & white, moderately severe to moderatately weathered, soft to moderately hard, (GNEISS), very close to close fracture spacing.
			5.0	2:31/0.6	(4.7) 94%	(4.7) 94%		(4.7) 94%	(4.7) 94%		Gray & white, very slightly weathered to fresh, hard, (GNEISS), wide fracture spacing.
705				5:26/1.0							
				6:16/1.0							
				6:55/1.0							
				9:30/1.0							
	702.0	18.6		4:43/0.4							702.0 18.6 Boring Terminated at Elevation 702.0 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 12.4' from top of bridge deck to ground surface.
2) 0 hr. water level not measured due to water introduced for coring.
3) Began coring at a depth of 7.6'.

NCDOT CORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 18+39	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 717.8 ft	**TOTAL DEPTH** 15.6 ft	**NORTHING** 801,127	**EASTING** 1,717,591	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/15/11	**COMP. DATE** 09/15/11	**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)
720										
	717.8	0.0								717.8 GROUND SURFACE 0.0
			4	5	2	7		Sat.		**ALLUVIAL** Brown, silty fine SAND (A-2-4), with trace clay & roots.
715										715.0 2.8
	714.1	3.7	100/0.3			100/0.3				**WEATHERED ROCK** (GNEISS) 713.8 4.0
										(GNEISS) 713.5 4.3
710							RS-2			**CRYSTALLINE ROCK** (Gray & white, GNEISS)
705										702.2 15.6
										Boring Terminated at Elevation 702.2 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 15.1' from top of bridge deck to ground surface.
2) 0 hr. water level not measured due to water introduced for coring.
3) Driller indicates harder drilling at a depth of 2.8'.
4) Began coring at a depth of 4.0'.

NCDOT BORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 18+39	**OFFSET** 5 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 717.8 ft	**TOTAL DEPTH** 15.6 ft	**NORTHING** 801,127	**EASTING** 1,717,591	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** NW Casing W/SPT & Core	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/15/11	**COMP. DATE** 09/15/11	**SURFACE WATER DEPTH** N/A	
CORE SIZE NQ-3	**TOTAL RUN** 11.6 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
713.8											Begin Coring @ 4.0 ft
	713.8	4.0	1.6	4:54/1.0	(1.0) 63%	(0.3) 19%		(0.0) 0%	(0.0) 0%		713.8 **WEATHERED ROCK** 4.0
	712.2	5.6		1:43/0.6							713.5 (GNEISS) 4.3
			5.0	4:01/1.0	(4.8) 96%	(4.4) 88%		(10.8) 96%	(9.6) 85%		**CRYSTALLINE ROCK**
710				4:05/1.0							Gray & white, slightly weathered to fresh, hard, (GNEISS), close to moderately close fracture spacing.
				6:12/1.0			RS-2				R_1 = 7, R_2 = 17, R_3 = 20, R_4 = 12, R_5 = 7
				6:31/1.0							RMR = 63 Rock Type = E
				6:27/1.0							**RS-2: 7.8'-8.1' qu=12,606 psi**
	707.2	10.6									
			5.0	6:25/1.0	(5.0) 100%	(4.9) 98%					
705				6:10/1.0							
				6:49/1.0							
				6:02/1.0							
				6:48/1.0							
	702.2	15.6									702.2 15.6
											Boring Terminated at Elevation 702.2 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 15.1' from top of bridge deck to ground surface.
2) 0 hr. water level not measured due to water introduced for coring.
3) Driller indicates harder drilling at a depth of 2.8'.
4) Began coring at a depth of 4.0'.

NCDOT CORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)			**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 18+43	**OFFSET** 5 ft RT	**ALIGNMENT** -L- — **0 HR.** Dry
COLLAR ELEV. 718.9 ft	**TOTAL DEPTH** 4.0 ft	**NORTHING** 801,124	**EASTING** 1,717,602 — **24 HR.** Dry
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic
DRILLER J. Gilchrist	**START DATE** 09/13/11	**COMP. DATE** 09/13/11	**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)
720										
	718.9	0.0								718.9 GROUND SURFACE 0.0
			WOH	1	1	2		W		718.7 0.2 **ALLUVIAL** Brown, silty fine SAND (A-2-4), with trace gravel, grass & leaves. Brown, clayey fine SAND (A-2-6), with trace gravel & silt.
715	714.9	4.0	60/0.0			60/0.0				715.0 3.9 714.9 4.0 **CRYSTALLINE ROCK** (GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 714.9 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 14.0' from top of bridge deck to ground surface.
2) Field Professional indicates strata break in split spoon at a depth of 0.2'.
3) Driller indicates harder drilling at a depth of 3.9'.
4) Auger refusal at a depth of 4.0'.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 18+77	**OFFSET** 12 ft LT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 732.7 ft	**TOTAL DEPTH** 18.2 ft	**NORTHING** 801,162	**EASTING** 1,717,607	**24 HR.** 16.3
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/12/11	**COMP. DATE** 09/12/11	**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)
735	732.7	0.0	2	2	3	5		M		732.7 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** Gray & brown, silty fine to coarse SAND (A-2-4), with trace clay, asphalt fragments & gravel.
730	729.2	3.5	2	2	3	5		M		730.7 2.0 Gray & orange, highly sandy SILT (A-4). 724.1 8.6
725	724.2	8.5	4	4	4	8		M		**ALLUVIAL** Gray, highly sandy SILT (A-4), with trace organics. 720.7 12.0
720	719.2	13.5	4	3	7	10		M		**RESIDUAL** Brown, clayey fine SAND (A-2-6). 718.0 14.7 717.6 15.1 Gray, brown & white, clayey silty fine to coarse SAND (A-2-4), with trace gravel, saprolitic. **WEATHERED ROCK** (GNEISS)
715	714.5	18.2	60/0.0			60/0.0				714.7 18.0 714.5 18.2 **CRYSTALLINE ROCK** (GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 714.5 ft in CRYSTALLINE ROCK (GNEISS)

NOTES:

1) 0.0-0.3' = Surficial Organic Soils
2) Field Professional indicates strata breaks in split spoon at depths of 8.6' & 14.7'.
3) Driller indicates harder drilling at depths of 15.1' & 18.0'.
4) Auger refusal at a depth of 18.2'.

NCDOT BORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 40149.1.1	**TIP** B-4957	**COUNTY** GUILFORD	**GEOLOGIST** D. Racey	
SITE DESCRIPTION Bridge #56 on SR 1193 (Baker Rd.) over Richland Creek (Two Mile Creek)				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 18+81	**OFFSET** 12 ft RT	**ALIGNMENT** -L-	**0 HR.** Dry
COLLAR ELEV. 732.8 ft	**TOTAL DEPTH** 18.0 ft	**NORTHING** 801,152	**EASTING** 1,717,629	**24 HR.** 17.0
DRILL RIG/HAMMER EFF./DATE F&R2175 CME-55 88% 1/14/2011		**DRILL METHOD** H.S. Augers	**HAMMER TYPE** Automatic	
DRILLER J. Gilchrist	**START DATE** 09/13/11	**COMP. DATE** 09/13/11	**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)
735	732.8	0.0	2	2	3	5		M		732.8 GROUND SURFACE 0.0 **ROADWAY EMBANKMENT** Brown, gray, white & red, highly sandy SILT (A-4), with trace gravel & roots.
730	729.3	3.5	3	3	3	6		M		723.9 8.9
725	724.3	8.5	2	3	4	7	SS-15	21%		**ALLUVIAL** Gray, highly sandy SILT (A-4(2)), with some clay, little gravel. 720.8 12.0
720	719.3	13.5	2	2	3	5	SS-16	21%		**RESIDUAL** Brown, highly sandy SILT (A-4(1)), with some clay. 715.0 17.8
715	714.8	18.0	60/0.0			60/0.0				714.8 18.0 **CRYSTALLINE ROCK** (GNEISS) Boring Terminated with Standard Penetration Test Refusal at Elevation 714.8 ft in CRYSTALLINE ROCK (GNEISS)

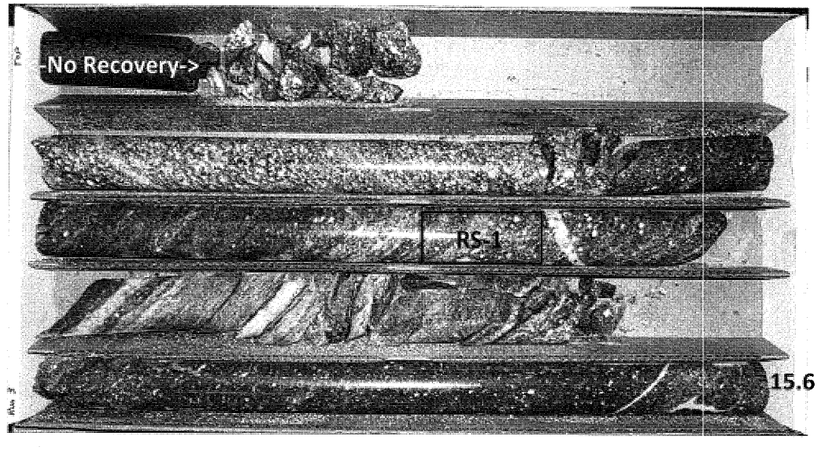
NOTES:

1) 0.0-0.2' = Surficial Organic Soils
2) Field Professional indicates strata break in split spoon at a depth of 8.9'.
3) Driller indicates harder drilling at a depth of 17.8'.
4) Auger refusal at a depth of 18.0'.

NCDOT BORE SINGLE B4957_GEO_BORELOGS_0056.GPJ NC_DOT.GDT 11/15/11

CORE PHOTOGRAPHS: Bridge No. 56 on SR 1193 over Richland Creek, B1-B: Station 17+86, 6 Feet Right

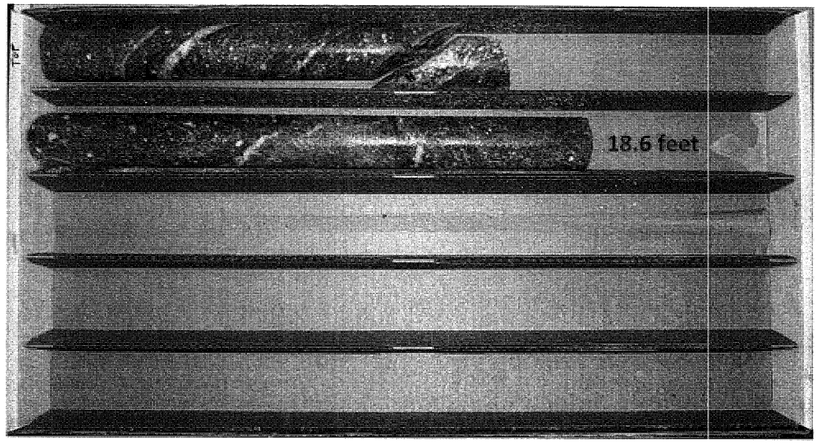
7.6 feet



0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

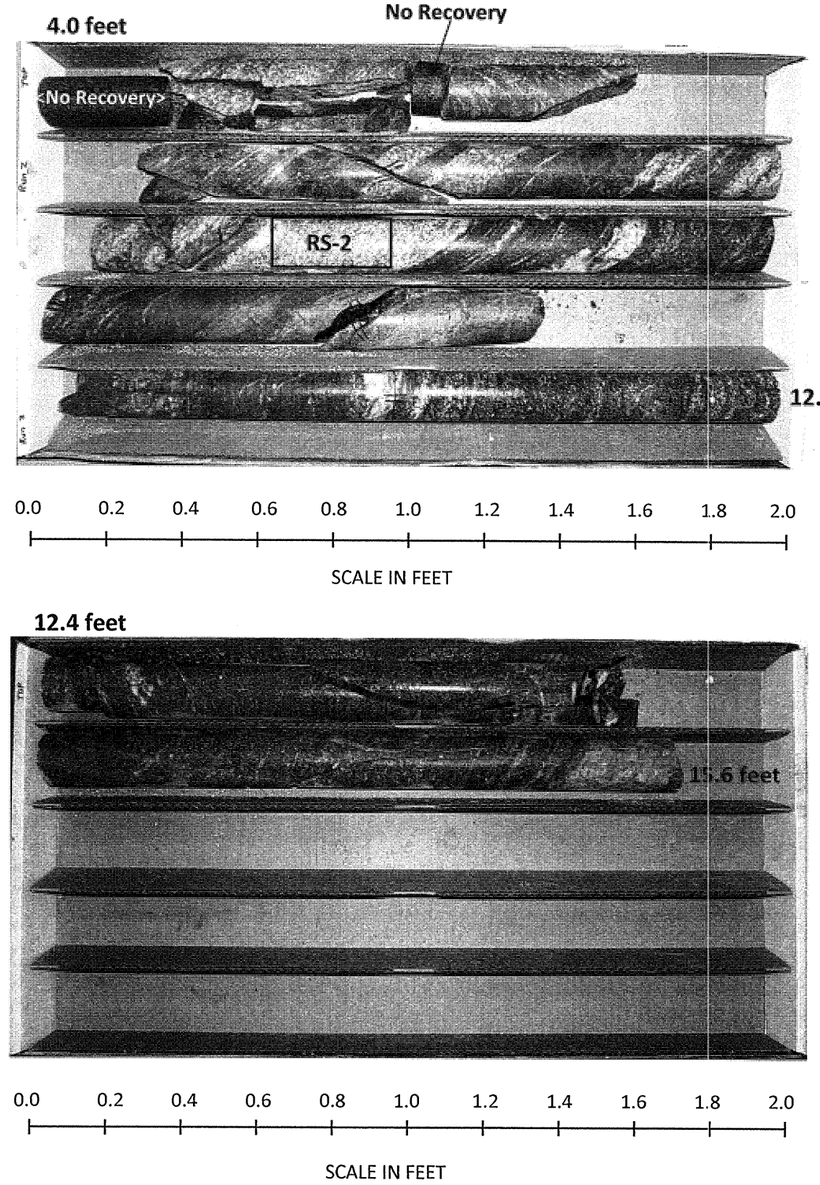
15.6 feet



0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

SCALE IN FEET

CORE PHOTOGRAPHS: Bridge No. 56 on SR 1193 over Richland Creek, B2-A: Station 18+39, 5 Feet Left



North Carolina Department of Transportation
Division of Highways
Materials and Test Unit
Soils Laboratory

T.I.P. ID NO.: B-4957
DESCRIPTION: Bridge No. 56 on SR 1193 (Baker Road) over Richland Creek

REPORT ON SAMPLES OF: SOIL FOR QUALITY

PROJECT: 40149.1.1
DATE SAMPLED: 9/11
SAMPLED FROM: -L-
SUBMITTED BY: W.P. Alton, PE

COUNTY: Guilford
RECEIVED: 9/20/11
REPORTED: 9/26/11
BY: D. Jenks Dave A. Jenks
Cert No. 101-02-0603

TEST RESULTS

PROJ. SAMPLE NO.	SS-8	SS-18	SS-15	SS-16	S-2									
BORING NO.	EB1-A	EB1-B	EB2-B	EB2-B	Crk Bank									
Retained #4 Sieve %	0.7	0.2	10.1	0.0	0.2									
Passing #10 Sieve %	96.3	97.5	86.8	100.0	99.2									
Passing #40 Sieve %	75.4	79.3	71.2	94.0	84.0									
Passing #200 Sieve %	54.0	50.2	47.2	55.5	18.4									
SOIL MORTAR - 100%														
Coarse Sand Ret - #60 %	29.0	28.0	26.1	15.9	39.9									
Fine Sand Ret - #270 %	18.1	24.7	23.5	33.2	45.5									
Silt 0.053 - 0.010 mm %	24.7	27.0	24.4	25.1	7.5									
Clay < 0.010 mm %	28.2	20.3	26.0	25.8	7.1									
L.L.	39	28	33	25	21									
P.L.	21	27	23	18	NP									
P.I.	18	1	10	7	NP									
AASHTO Classification	A-6 (7)	A-4 (0)	A-4 (2)	A-4 (1)	A-2-4 (0)									
Station -L-	17+56	17+54	18+81	18+81	18+10									
Offset	14' LT.	13' RT.	12' RT.	12' RT.	20' RT									
Depth (ft)	4.7	3.5	8.9	13.5	0.0									
to	5.0	5.0	10.0	15.0	0.5									
Moisture Content (%)	22.1	20.5	21.4	20.8	12.7									

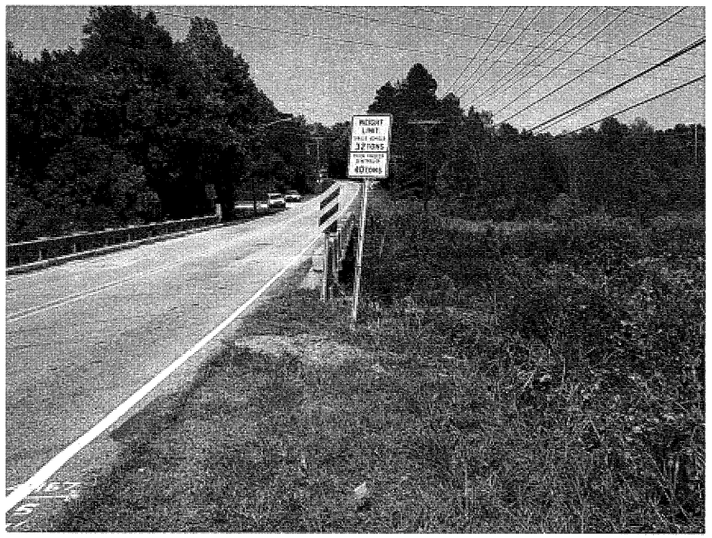
NP=Not plastic

W.P. Alton, P.E.
Soils Engineer

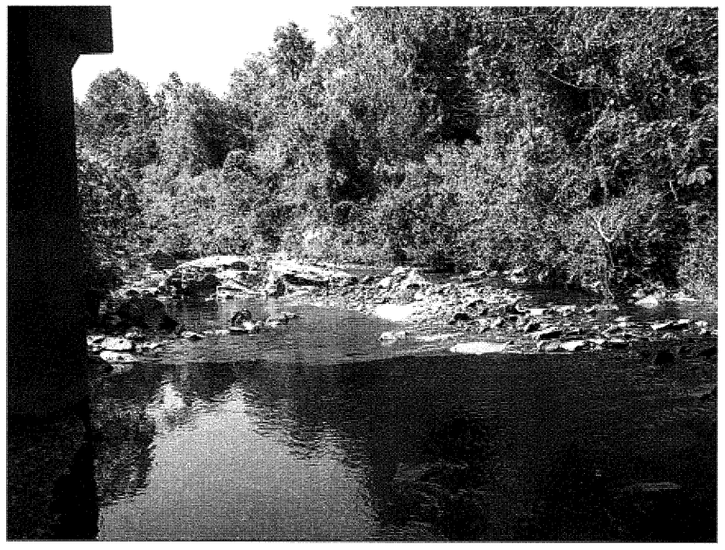
LABORATORY SUMMARY SHEET FOR ROCK CORE SAMPLES

PROJECT NO.: 40149.1.1
TIP NO.: B-4957
COUNTY: Guilford
DESCRIPTION: Bridge No. 56 on SR 1193 (Baker Road) over Richland Creek

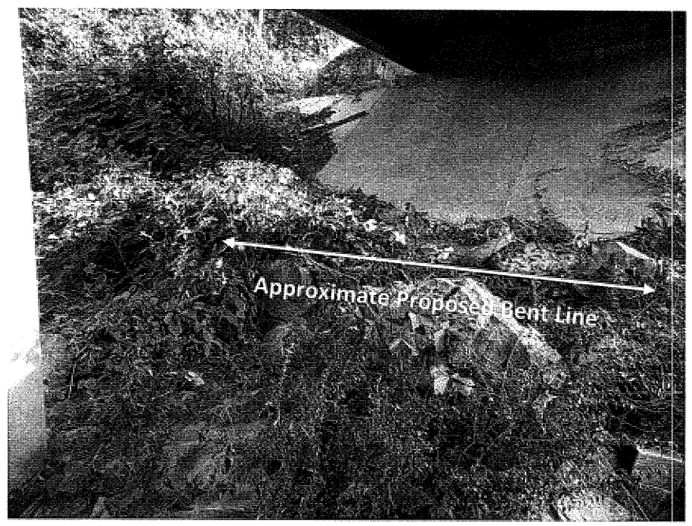
Sample #	Boring #	Depth (ft)	Rock Type	Geologic Map Unit	Run RQD	Length (in)	Diameter (in)	Unit Weight (pcf)	Unconfined Compressive Strength (psi)
RS-1	B1-B	11.5 - 11.8	Gneiss	CZg	73%	3.97	1.77	166.2	11,243
RS-2	B2-A	7.8 - 8.1	Gneiss	CZg	88%	3.97	1.77	172.5	12,606



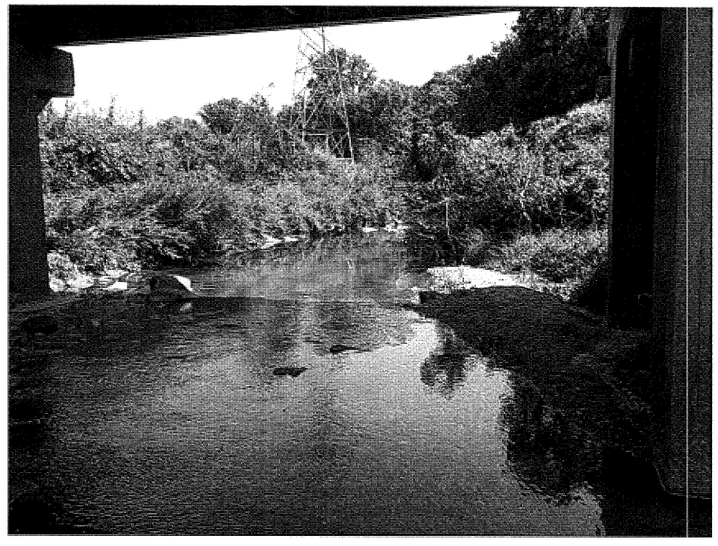
Photograph No. 1: General site view looking northeast along east side of existing bridge



Photograph No. 2: View looking west upstream at rock outcrops



Photograph No. 3: View looking north at proposed Bent 2, showing remnants of old rock & mortar structure. Similar remnants also observed at proposed Bent 1



Photograph No. 4: View looking southwest downstream at creek aggradation