PROJECT: 34927.1.1 ID: U-3331

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-3331	1	26
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34927.1.1	STP-1616(4)	P.E.	
		CONST.	

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34927.1.1 I.D. NO. U-3331

F.A. PROJECT STP-1616(4)

COUNTY NASH

PROJECT DESCRIPTION BRIDGE No. 112

ON SR 1616 OVER STONEY CREEK

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CAUTION NOTICE

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For Letting

INVESTIGATED BY S&ME, INC. PERSONNEL A. RIGGS

CHECKED BY A.F. RIGGS, JR. N. BRADLEY

SUBMITTED BY S&ME, INC. J. WHITE

DATE JULY 17, 2009 S. HARDEE

P. PHELPS

T. PEREZ

DRAWN BY: T. PEREZ

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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.

NORTH CAROLINA PROFESSIONAL SEAL 14155 ENGINEER ARTHUR F. RIGGS, JR. SEAL

SIGNATURE

PROJECT REFERENCE NO.	SHEET NO.
34927.1.1	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 WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤35% PASSING #200)							SILT-CLAY MATERIALS (>35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT	6 MX		N.P.	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

P.I. OF A-7-5 SUBGROUP IS ≤ L.L. - 30 ; P.I. OF A-7-6 SUBGROUP IS > L.L. - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
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 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.0	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F. SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12"	3"				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL - LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL - PLASTIC LIMIT		
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL - SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
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, YEL-BRN, BLUE-GRAY) MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT- CLAY SOILS
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 SEEPAGE

MISCELLANEOUS SYMBOLS

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

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
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

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [ ] CME-45
- [ ] DIEDRICH D-50
- [ ] PORTABLE HOIST
- [x] OTHER CME-750
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] DRAG BITS _____
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [x] CASING [ ] W/ ADVANCER
- [x] TRICONE 2-7/8 " STEEL TEETH
- [ ] TRICONE _____ " TUNG.-CARB.
- [x] CORE BIT
- [x] OTHER 3-1/4" H.S.A.

HAMMER TYPE:
- [x] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N WD4
- [ ] -H_____

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

ROCK DESCRIPTION

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

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V. SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR 8.P.F.) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.

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

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

TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

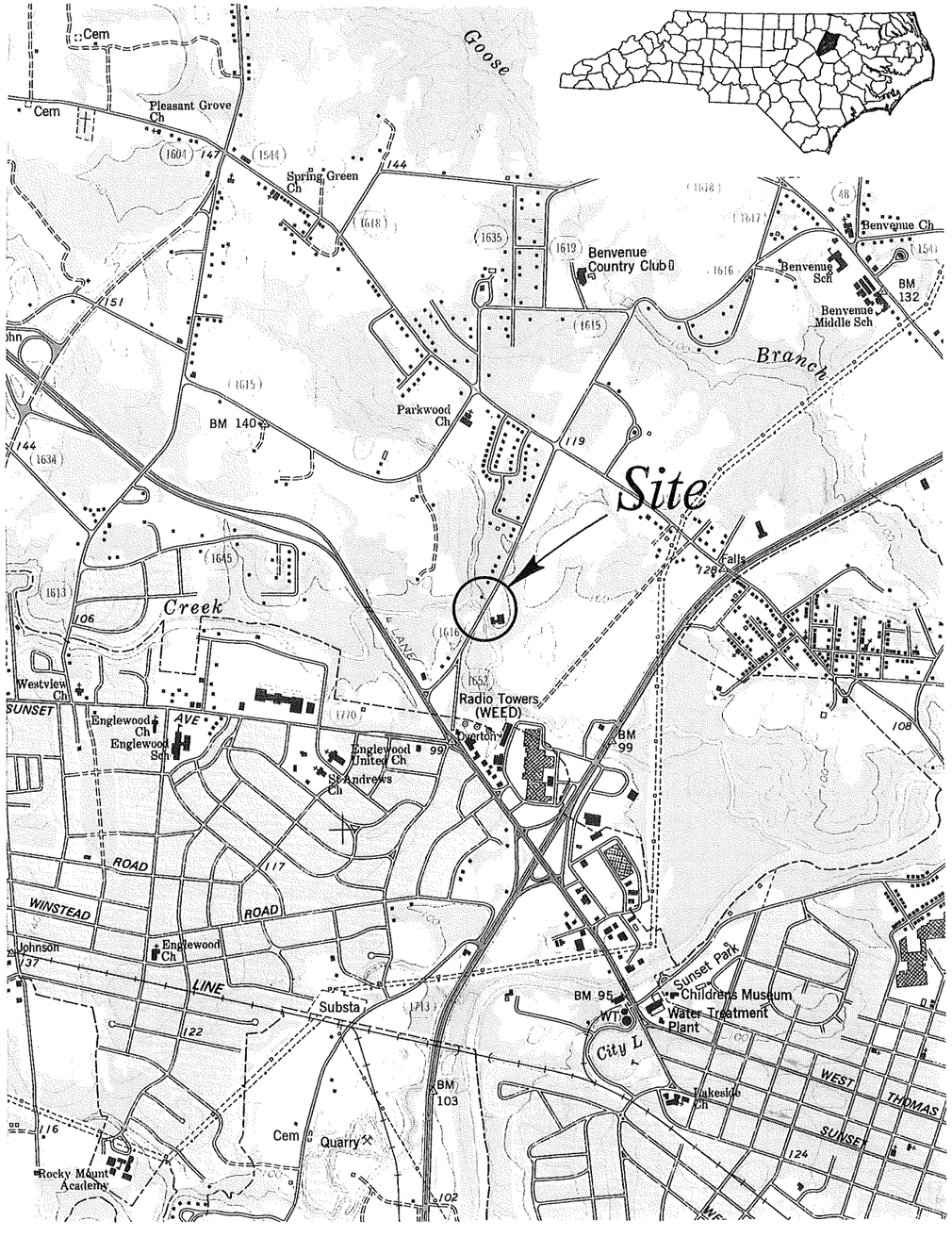
BENCH MARK: BM*251 - RR Spike in Base of 15" Swee Gum
Located at Station -BL- 18+93.6, 18' RT (-L- 31+21.21, 14.62' RT)
ELEVATION: 96.24'

BENCH MARK: BM*252 - RR Spike in Base of 36" Pine
Located at Station -BL- 22+28.18, 52.15 RT (-L- 34+56.96, 32.74 RT)
ELEVATION: 97.31'

NOTES:

REVISED 02/23/06

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
U-3331	34927.1.1	3	26



S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 -SITEVIC

SCALE:	1:24,000
CHECKED BY:	AFR
DRAWN BY:	TRP
DATE:	JULY 2009
JOB NO.	1051-09-154

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING • TESTING

SITE VICINITY MAP

BRIDGE No. 112 ON SR 1616
OVER STONEY CREEK
STATE PROJECT NO. 34927.1.1 TIP NO. U-3331
FEDERAL I.D. NO. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

WETLANDS

-L- 30+80
75' LT

30

STONEY CREEK

NAD 83/95

35

46

MH

ABANDONED

W/L T

38

MH

24" CONC.

SOIL

WETLANDS

SOIL

45

4" STL

EB1-A

B1-A

B2-A

B3-A

B4-A

EB2-A

REM 15" RCP

4" STL

SR 1616 (COUNTRY CLUB RD)

TO US 64 BUSINESS

MH ABANDONED

MH

10" METAL

SR-1

MH

10" METAL

8" DI

SR 1616 (COUNTRY CLUB RD)

TO US 64

EB1-B

B1-B

B2-B

B4-B

EB2-B

36

37

SR-2

41

42

43

40

MH

24" CONC.

SOIL

SOIL

-BL- 103

BM #251

STONEY CREEK

BM #252

2SBKBUS

LT

ISMTLBUS

0 50 100

SCALE IN FEET

BENCHMARK:
BM #251: RR SPIKE IN BASE OF 15" SWEET GUM
14.62' RT. OF STA 31+21.21 -L-
ELEV. 96.24'

BM #252: RR SPIKE IN BASE OF 36" PINE
32.74' RT. OF STA 34+56.96 -L-
ELEV. 97.31'

SKEW ANGLE FOR BENTS 120°00'00" (TYPICAL)

SCALE:	1" = 40'	APPROVED BY:	AFR
DATE:	JULY 2009	DRAWN BY:	TRP
JOB NO.	1051-09-154	FIGURE	4

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

BORING LOCATION PLAN

REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:\PROJECTS\2009\09-154\GEOTECH\CADD\U-3331 SITE PLAN.DGN

GENERALIZED SUBSURFACE PROFILE 32' LEFT OF -L-

TO US 64 BUSINESS

TO US 64

EB1–A
31+10
28ft LT –L–

B1–A
31+60
28ft LT –L–

B2–A
32+03
26ft LT –L–

B3–A
32+56
25ft LT –L–

B4–A
33+05
25ft LT –L–

EB2–A
33+55
23ft LT –L–

110′
100′
90′
80′
70′
60′
50′
40′
30′
20′

ASPHALT PAVEMENT

ALLUVIAL: LOOSE BROWN AND GRAY SILTY CLAYEY FINE TO COARSE SAND (M TO SAT.)

ALLUVIAL: MEDIUM STIFF TO SOFT BROWN-GRAY COARSE TO FINE SANDY SILTY CLAY (M TO W)

GROUND SURFACE

ALLUVIAL: VERY SOFT TO SOFT BROWN COARSE TO FINE SANDY CLAYEY SILT (W)

CREEK BOTTOM 6-10-09

ALLUVIAL: VERY LOOSE TO MEDIUM DENSE GRAY AND BROWN SILTY FINE TO COARSE SAND WITH TRACE OF CLAY AND QUARTZ GARVEL (M)

WEATHERED ROCK: (GRAY-BROWN GRANITE)

CRYSTALLINE ROCK: VERY HARD TO MODERATELY HARD MODERATELY SEVERE TO VERY SLIGHTLY WEATHERED GRAY GRANITE WITH MODERATELY CLOSE TO VERY CLOSE FRACTURE SPACING

CRYSTALLINE ROCK: HARD GRAY GRANITE

Vertical 20′ 10′ 0
Horizontal 0 20′

A ROADWAY EMBANKMENT FILL: STIFF BROWN COARSE TO FINE SANDY CLAY (M)

B ROADWAY EMBANKMENT FILL: MEDIUM DENSE GRAY SILTY FINE TO COARSE SAND WITH GRAVEL (M)

C ROADWAY EMBANKMENT FILL: MEDIUM STIFF TO SOFT BROWN FINE TO COARSE SANDY SILT CLAY (M)

D RESIDUAL: VERY DENSE GRAY SILTY CLAYEY FINE TO COARSE SAND (M TO SAT.)

E WEATHERED ROCK: MEDIUM HARD SEVERELY WEATHERED GRAY-BROWN GRANITE WITH HARD SLIGHTLY WEATHERED GRAY GRANITE SEAMS WITH CLOSE TO VERY CLOSE FRACTURE SPACING

NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

31+00 31+20 31+40 31+60 31+80 32+00 32+20 32+40 32+60 32+80 33+00 33+20 33+40 33+60

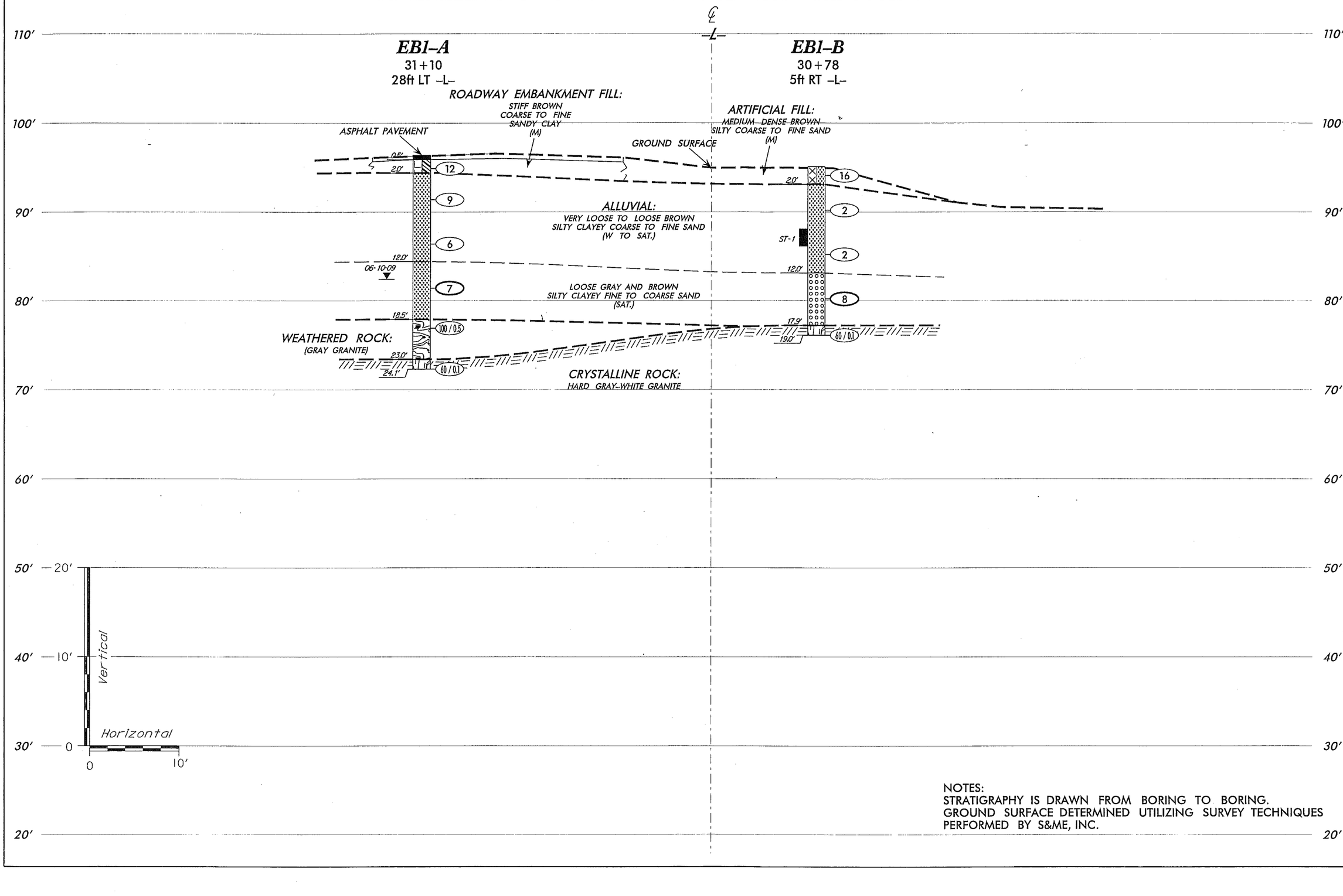
SCALE: (V) 1" = 10' (H) 1" = 20'
DATE: JULY 2009
JOB NO. 105 1-09- 154
APPROVED BY: AFR
DRAWN BY: TRP
FIGURE 5

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

GENERALIZED SUBSURFACE PROFILE 32' LEFT OF -L-
STATION 30 + 90 TO STATION 33 + 70
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP- 1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

GENERALIZED SUBSURFACE CROSS SECTION THROUGH END BENT No. 1



NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

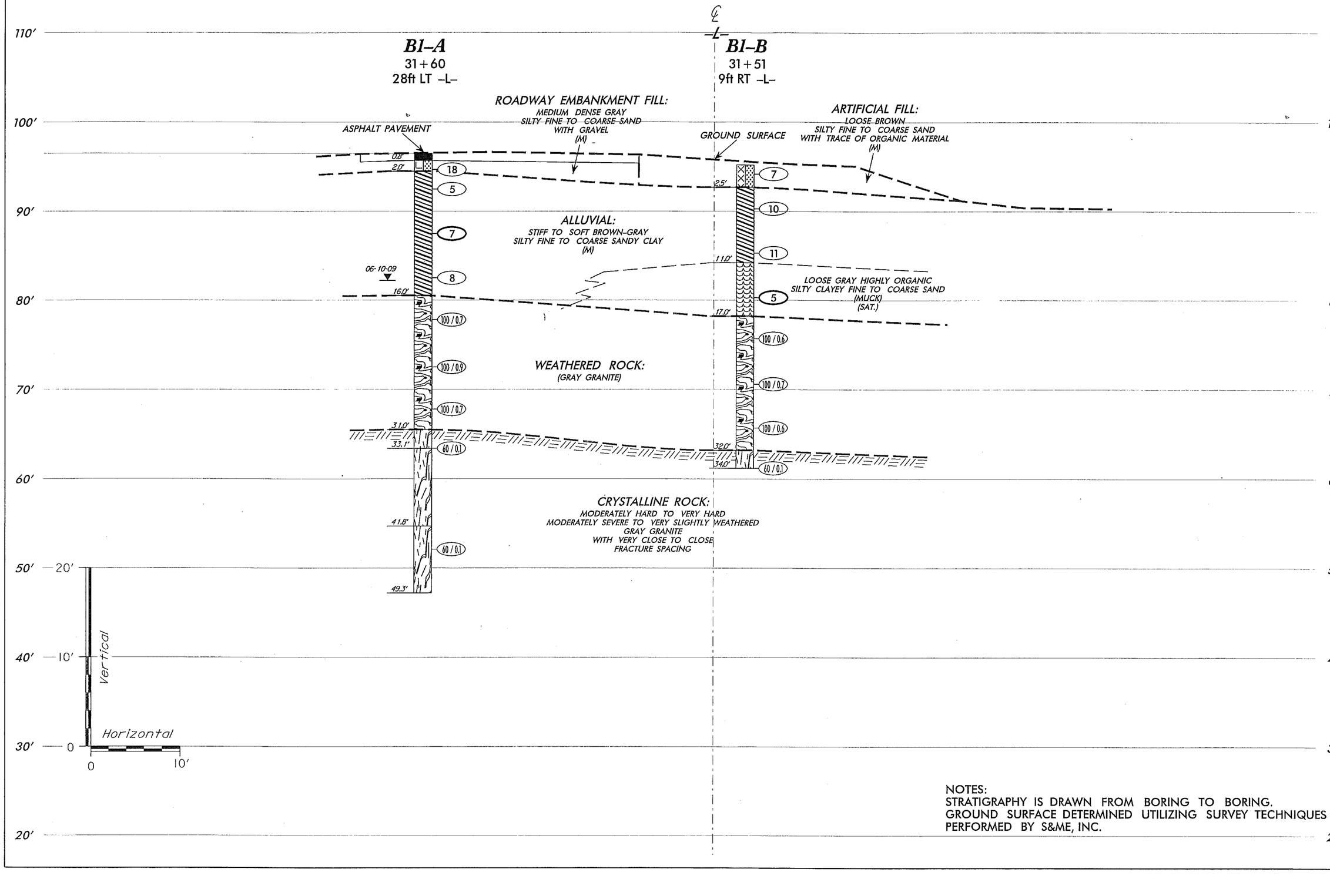
SCALE:	(V) 1" = 10' (H) 1" = 10'
DATE:	JULY 2009
JOB NO.	105 I-09-154
APPROVED BY:	AFR
DRAWN BY:	TRP
FIGURE	6A

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH END BENT No. 1
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

GENERALIZED SUBSURFACE CROSS SECTION THROUGH INTERIOR BENT No. 1



NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

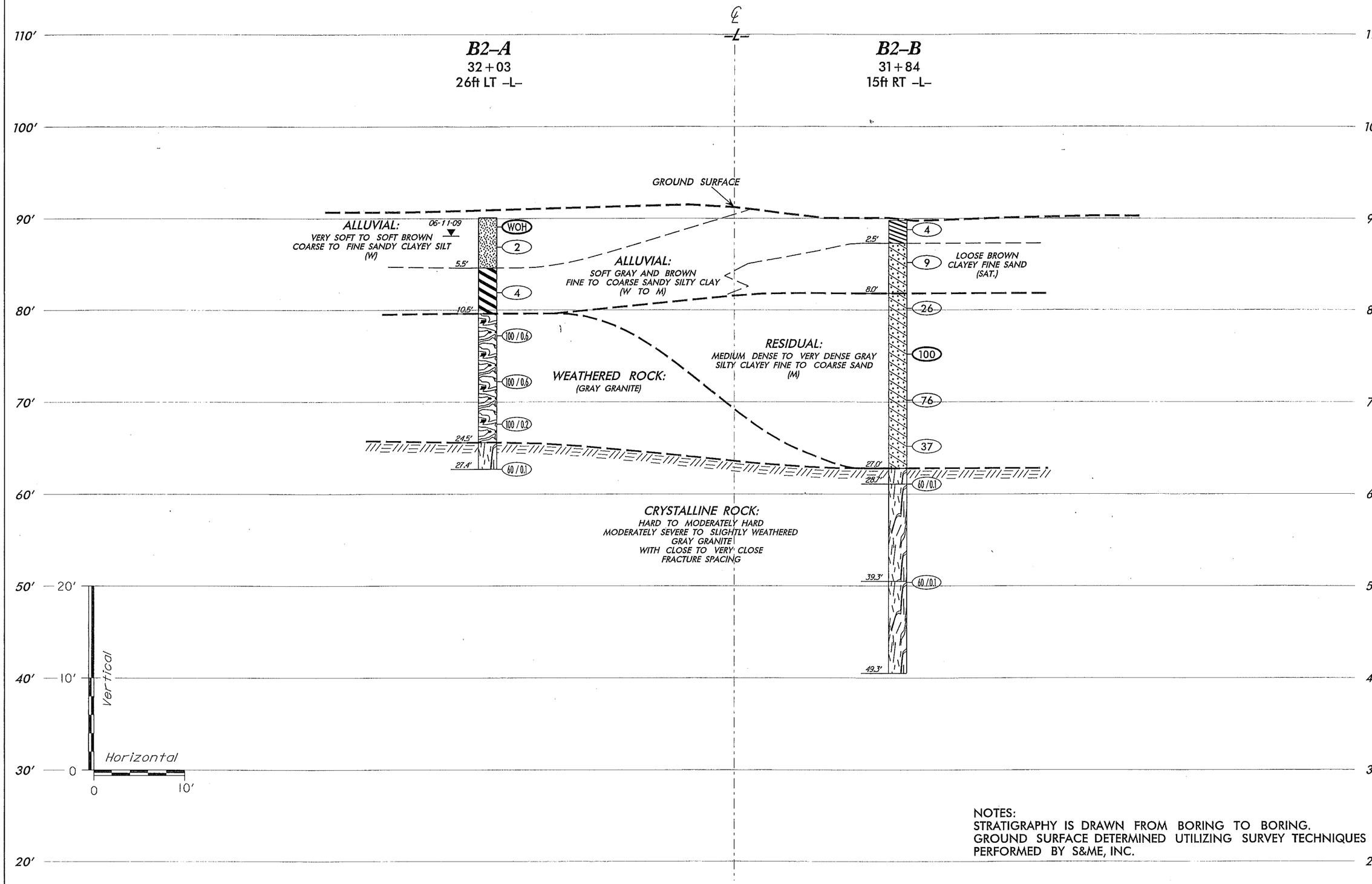
SCALE:	(V) 1" = 10' (H) 1" = 10'
APPROVED BY:	AFR
DATE:	JULY 2009
DRAWN BY:	TRP
JOB NO.	105 I-09-154
FIGURE	6B

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH INTERIOR BENT No. 1
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

GENERALIZED SUBSURFACE CROSS SECTION THROUGH INTERIOR BENT No. 2



NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

SCALE:	(V) 1" = 10' (H) 1" = 10'
DATE:	JULY 2009
JOB NO.	105 1-09- 154
APPROVED BY:	AFR
DRAWN BY:	TRP
FIGURE	6C

S&ME
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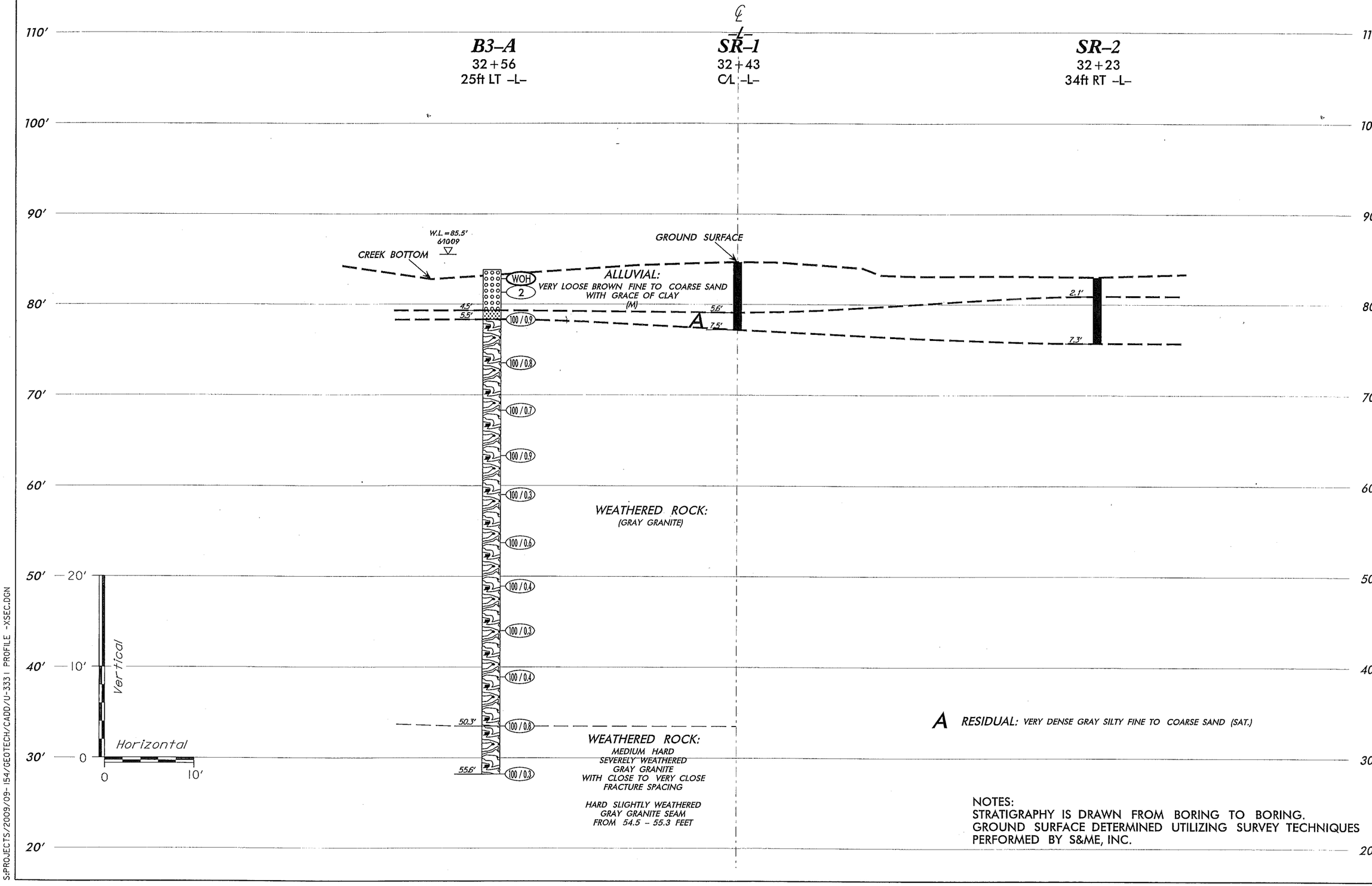
ENGINEERING · TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH INTERIOR BENT No. 2
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

GENERALIZED SUBSURFACE CROSS SECTION THROUGH INTERIOR BENT No. 3



A RESIDUAL: VERY DENSE GRAY SILTY FINE TO COARSE SAND (SAT.)

NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

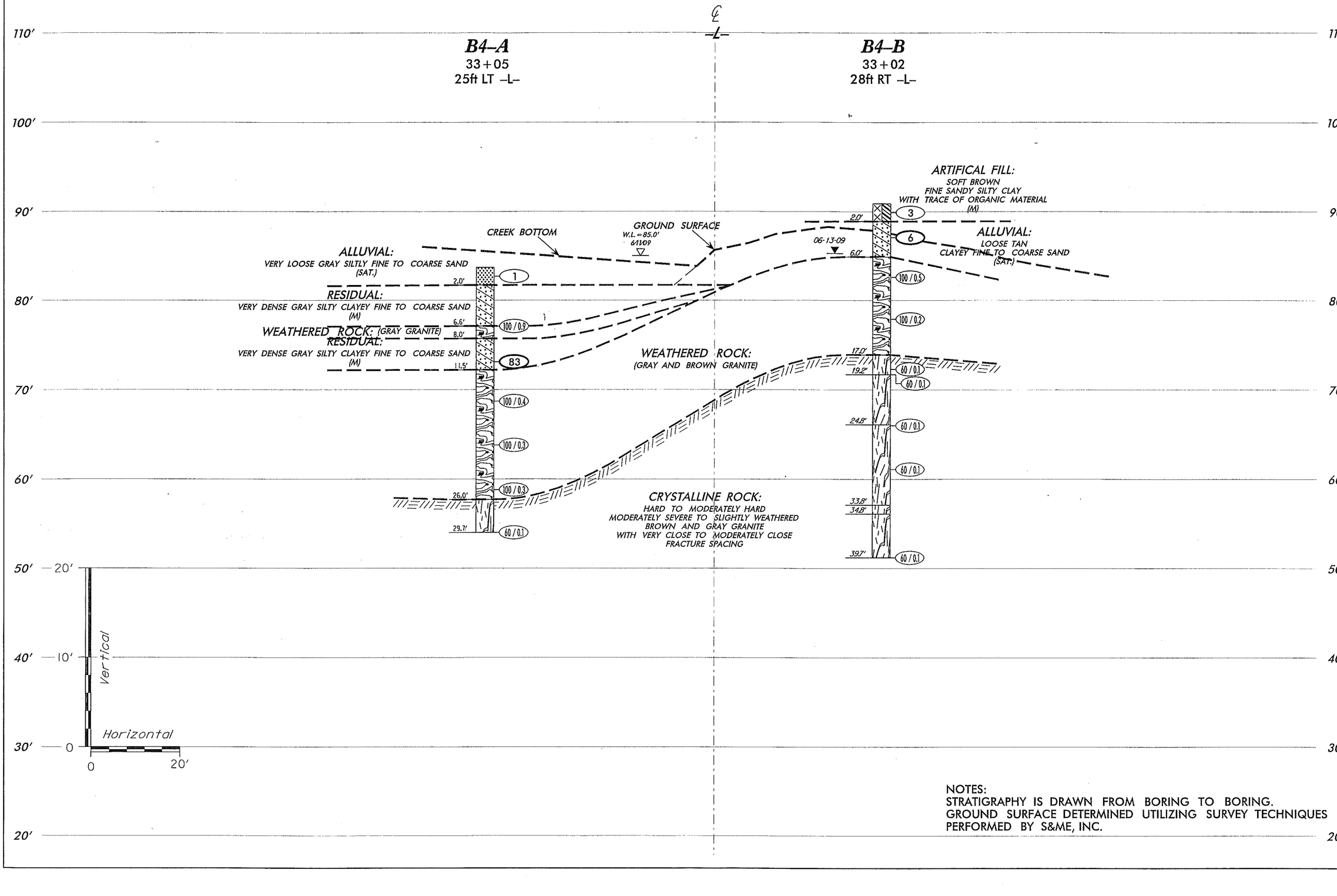
APPROVED BY:	AFR
DRAWN BY:	TRP
FIGURE	6D
SCALE:	(V) 1" = 10' (H) 1" = 10'
DATE:	JULY 2009
JOB NO.	105 I-09- 154

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH INTERIOR BENT No. 3
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

GENERALIZED SUBSURFACE CROSS SECTION THROUGH INTERIOR BENT No. 4



NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

SCALE:	(V) 1" = 10' (H) 1" = 20'
APPROVED BY:	AFR
DATE:	JULY 2009
DRAWN BY:	TRP
JOB NO.	105 1-09-154
FIGURE	6E

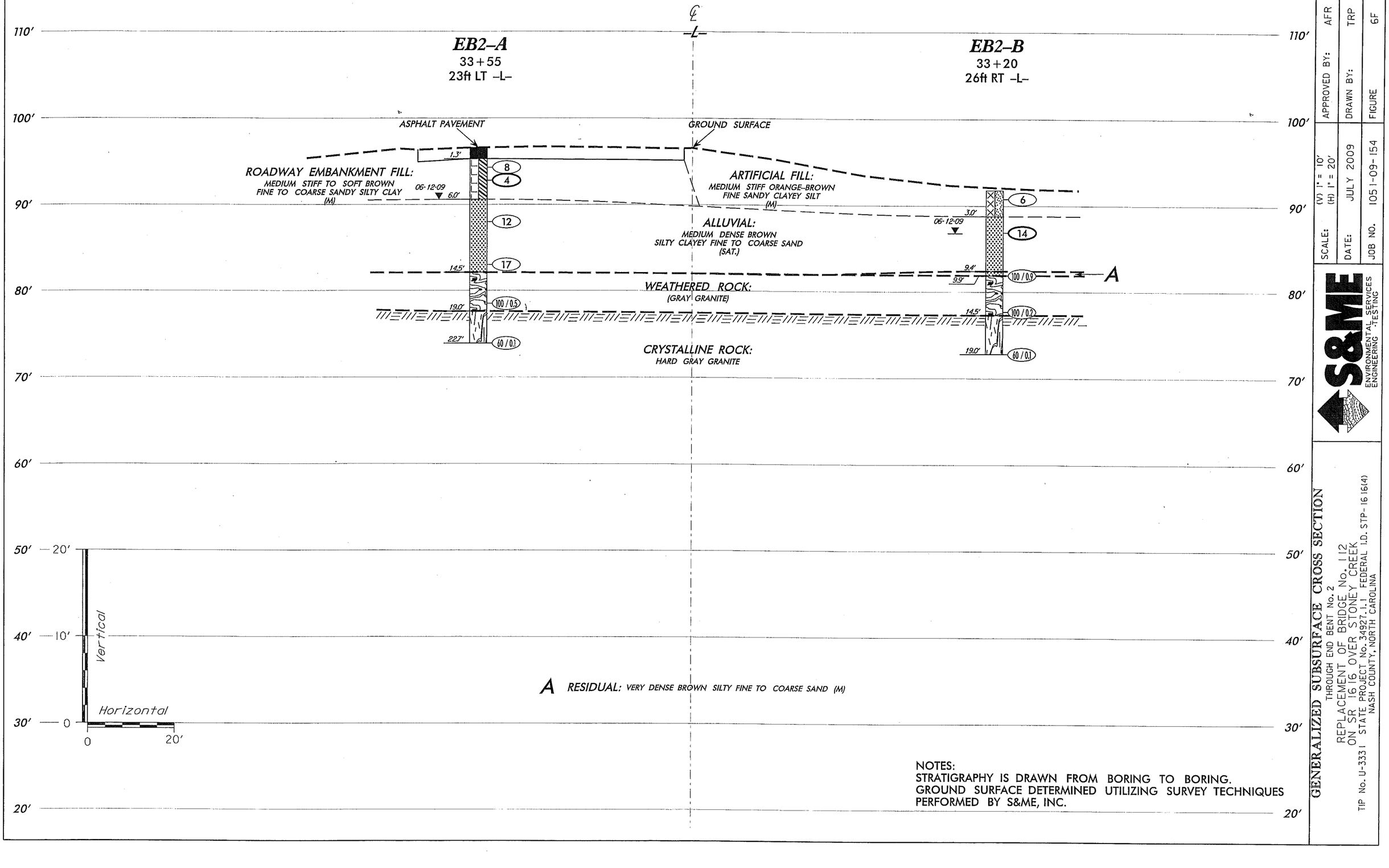
S&ME
ENVIRONMENTAL SERVICES
ENGINEERING TESTING

GENERALIZED SUBSURFACE CROSS SECTION

THROUGH INTERIOR BENT No. 4
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

GENERALIZED SUBSURFACE CROSS SECTION THROUGH END BENT No. 2



NOTES:
STRATIGRAPHY IS DRAWN FROM BORING TO BORING.
GROUND SURFACE DETERMINED UTILIZING SURVEY TECHNIQUES PERFORMED BY S&ME, INC.

APPROVED BY: AFR
DRAWN BY: TRP
FIGURE 6F
SCALE: (V) 1" = 10' (H) 1" = 20'
DATE: JULY 2009
JOB NO. 1051-09-154

S&ME
ENVIRONMENTAL SERVICES
ENGINEERING · TESTING

GENERALIZED SUBSURFACE CROSS SECTION
THROUGH END BENT No. 2
REPLACEMENT OF BRIDGE No. 112
ON SR 1616 OVER STONEY CREEK
TIP No. U-3331 STATE PROJECT No. 34927.1.1 FEDERAL I.D. STP-1616(4)
NASH COUNTY, NORTH CAROLINA

S:PROJECTS/2009/09-154/GEOTECH/CADD/U-3331 PROFILE -XSEC.DGN

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek			**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 31+10	**OFFSET** 28ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 96.4 ft	**TOTAL DEPTH** 24.1 ft	**NORTHING** 808,753	**EASTING** 2,347,209	**24 HR.** 14.0
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/09/09	**COMP. DATE** 06/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 23.0 ft	

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)
	100									
95	95.9	0.5								96.4 0.0 ASPHALT PAVEMENT SURFACE
			9	7	5	12				95.9 0.5 Asphalt Pavement (0.5 Feet)
	92.4	4.0						M		94.4 2.0 ROADWAY EMBANKMENT Stiff Brown Coarse to Fine Sandy CLAY (A-6)
90			5	3	6	9		M		ALLUVIAL Loose Brown Silty Fine SAND (A-2-4)
	87.4	9.0								
85			1	2	4	6		M		
	82.4	14.0								84.4 12.0 Loose Gray Silty Clayey Fine to Coarse SAND (A-2-4)
80			3	4	3	7		Sat.		
	77.4	19.0					SS-1			77.9 18.5 WEATHERED ROCK (Gray Granite)
75			100/0.5			100/0.5				
	72.4	24.0								73.4 23.0 CRYSTALLINE ROCK Hard Gray Granite
70			60/0.1			60/0.1				72.3 24.1 Boring Terminated with Standard Penetration Test Refusal at Elevation 72.3 ft in Crystalline Rock: Hard Gray Granite.
65										
60										1) Advanced NW casing to 4.0 feet. 2) Advanced 2-15/16" Tricone to 24.0 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Loss of drilling fluid observed.
55										
50										
45										
40										
35										
30										
25										
20										

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek			**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 30+78	**OFFSET** 5ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 95.1 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 808,709	**EASTING** 2,347,224	**24 HR** Caved 4.8'
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/08/09	**COMP. DATE** 06/08/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 17.9 ft	

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)
	100									
95	95.1	0.0								95.1 0.0 GROUND SURFACE
			7	10	6	16		M		93.1 2.0 ARTIFICIAL FILL Medium Dense Brown Silty Coarse to Fine SAND (A-2-4)
	91.2	3.9								ALLUVIAL Very Loose Brown Silty Clayey Fine SAND (A-2-4) With Gravel (1 Inch Diameter)
90			5	1	1	2		W		
	86.2	8.9						Sat.		
85			1	1	1	2				83.1 12.0 Loose Brown Fine to Coarse SAND (A-1-b) With Trace of Silt and Clay
	81.2	13.9						Sat.		
80			2	2	6	8	SS-2			77.2 17.9 CRYSTALLINE ROCK Hard Gray-White Granite
	76.2	18.9								76.1 19.0 Boring Terminated with Standard Penetration Test Refusal at Elevation 76.1 ft in Crystalline Rock: Hard Gray-White Granite.
75			60/0.1			60/0.1				
70										1) Advanced NW casing to 3.9 feet. 2) Advanced 2-15/16" Tricone to 18.9 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) No loss of drilling fluid observed. 6) Shelby tube pushed from 7 to 9 feet.
65										
60										Other Samples: ST-1 (7.0 - 9.0)
55										
50										
45										
40										
35										
30										
25										
20										

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek			**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 31+60	**OFFSET** 28ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 96.5 ft	**TOTAL DEPTH** 49.3 ft	**NORTHING** 808,797	**EASTING** 2,347,233	**24 HR.** 14.3
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/09/09	**COMP. DATE** 06/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.0 ft	

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)
	100									
95	95.7	0.8								96.5 — ASPHALT PAVEMENT SURFACE — 0.0
	93.5	3.0	15	12	6	18		M		95.7 — Asphalt Pavement (0.8 Feet) — 0.8
90			3	1	4	5		M		94.5 — 2.0
	88.5	8.0								ROADWAY EMBANKMENT Medium Dense Gray Silty Fine to Coarse SAND (A-2-4) With Gravel (1/2 Inch Diameter)
85	83.5	13.0	1	2	5	7	SS-3	19%		ALLUVIAL Medium Stiff Brown-Gray Silty Coarse to Fine Sandy CLAY (A-6)
80	78.5	18.0	4	4	4	8				80.5 — 16.0
75	73.5	23.0	39	61/0.2		100/0.7				WEATHERED ROCK (Gray Granite)
70	68.5	28.0	25	30	70/0.4	100/0.9				
65	63.5	33.0	67	33/0.2		100/0.7				65.5 — 31.0
60			60/0.1			60/0.1	RS-1			CRYSTALLINE ROCK Hard Gray Granite — 63.4 — 33.1 Hard to Moderately Hard Moderately Severe to Moderately Weathered Gray Granite with Close to Very Close Fracture Spacing, Vertical Fracture 40.0-40.7 Feet, 1 Joint at 70°, 4 Joints @ 80-90° Rock Sample RS-1 34.3-35.3 Feet
55										54.7 — 41.8
50	52.2	44.3	60/0.1			60/0.1				Hard to Very Hard Moderate to Very Slightly Weathered Gray Granite With Close to Moderately Close Fracture Spacing
45										47.2 — 49.3
40										Boring Terminated at Elevation 47.2 ft in Crystalline Rock: Hard Gray Granite. 1) Advanced NW Casing to 33.0 feet. 2) Advanced 2-15/16" Tricone to 33.0 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Some loss of drilling fluid observed. 6) Advanced NWD4 from 33.1 to 49.3 feet.
35										
30										
25										
20										

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

SHEET

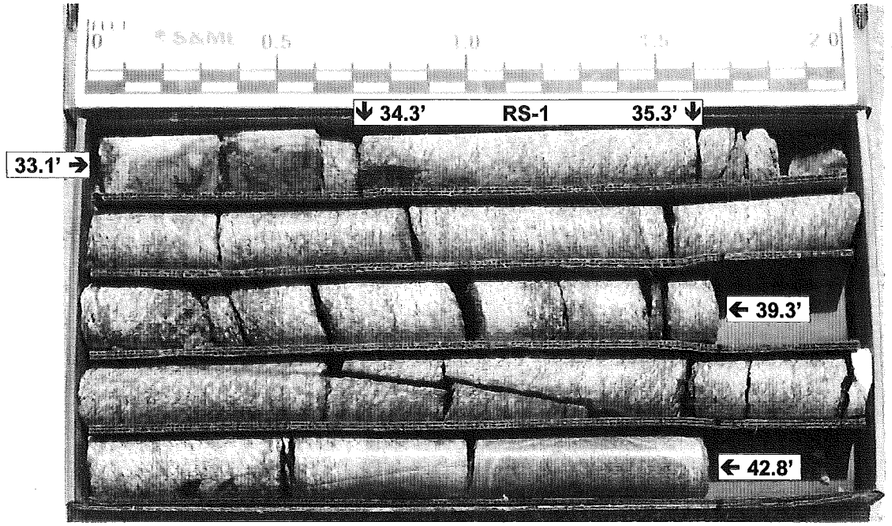
NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 31+60	**OFFSET** 28ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 96.5 ft	**TOTAL DEPTH** 49.3 ft	**NORTHING** 808,797	**EASTING** 2,347,233	**24 HR.** 14.3
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/09/09	**COMP. DATE** 06/09/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 31.0 ft	
CORE SIZE NWD4	**TOTAL RUN** 16.1 ft	**DRILLER** J.White		

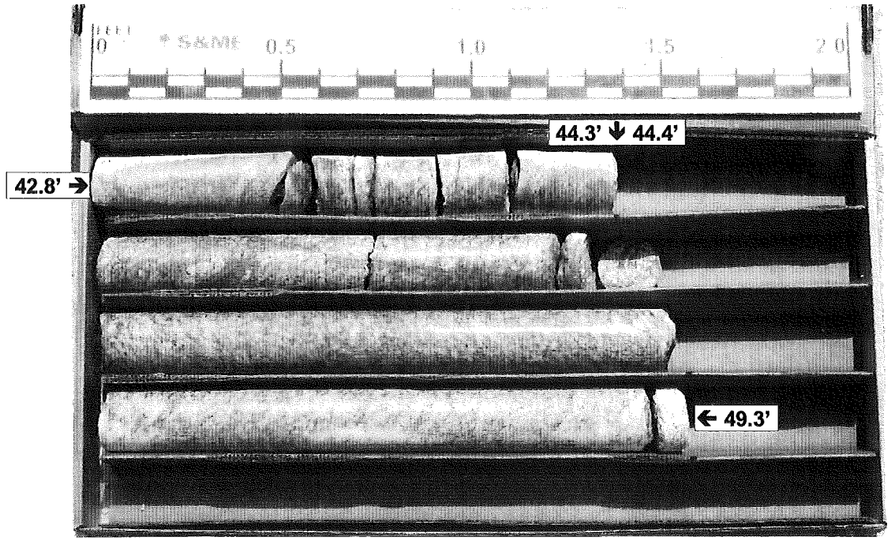
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
	63.4										Begin Coring @ 33.1 ft
	63.4	33.1	1.2	0:45	(0.7)	N/A		(14.7)	(10.3)		63.4 Hard to Moderately Hard Moderately Severe to Moderately Weathered Gray 33.1
	62.2	34.3	5.0	0:15/0.2	58%	(3.0)	RS-1	91%	64%		Granite with Close to Very Close Fracture Spacing, Vertical Fracture
60				1:00	(4.7)	60%					40.0-40.7 Feet, 1 Joint at 70°, 4 Joints @ 80-90°
				1:15	94%						Rock Sample RS-1
				1:15							34.3-35.3 Feet
	57.2	39.3		1:00							
			5.0	1:30	(5.0)	(3.3)					
55				1:30/0.8	100%	66%					
				1:15							
				1:30							
				1:30							
	52.2	44.3		1:00							54.7 41.8
	52.1	44.4	4.9	N=60/0.1	(4.3)	(4.0)					Hard to Very Hard Moderate to Very Slightly Weathered Gray Granite With
50				1:45	88%	82%					Close to Moderately Close Fracture Spacing
				2:00							
				2:00							
				1:45							
	47.2	49.3		1:00							47.2 49.3
45											Boring Terminated at Elevation 47.2 ft in Crystalline Rock: Hard Gray Granite.
											1) Advanced NW Casing to 33.0 feet.
											2) Advanced 2-15/16" Tricone to 33.0 feet.
											3) Creek water used as drilling fluid.
											4) Approximate drilling fluid density 62.4 pcf.
											5) Some loss of drilling fluid observed.
40											6) Advanced NWD4 from 33.1 to 49.3 feet.
35											
30											
25											
20											
15											
10											
5											
0											
-5											
-10											
-15											

CORE PHOTOS

Project No.: 34927.1.1	*ID No.:* U-3331	*Location:* Nash Co., NC	*Boring No.:* B1-A
Site Description: Replacement of Bridge No. 112 on SR 1616 over Stoney Creek			*Driller:* J. White
Collar Elev.: 96.5 ft.	*Core Size:* NWD4	*Equipment:* CME-750	*Geologist:* N. Bradley
Elev. at T.D.: 47.2 ft.	*Total Depth:* 49.3 ft.	*Total Run:* 16.1 ft.	*Date:* 6/9/2009



Box 1 of 2
Top of Box @ 33.1 feet; Bottom of Box @ 42.8 feet



Box 2 of 2
Top of Box @ 42.8 feet; Bottom of Box @ 49.3 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 31+51	**OFFSET** 9ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 95.2 ft	**TOTAL DEPTH** 34.0 ft	**NORTHING** 808,772	**EASTING** 2,347,262	**24 HR.** N/M
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/15/09	**COMP. DATE** 06/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 32.0 ft	

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)
100										
95	95.2	0.0								95.2 0.0 GROUND SURFACE
	91.3	3.9	5	4	3	7		M		92.7 2.5 **ARTIFICIAL FILL** Loose Brown Silty Fine to Coarse SAND (A-2-4) With Trace of Organic Material
90			2	4	6	10		M		**ALLUVIAL** Stiff Brown Fine to Coarse Sandy CLAY (A-6)
	86.3	8.9								
85			6	4	7	11		M		84.2 11.0 Loose Gray Highly Organic Silty Clayey Fine to Coarse SAND (Muck)
	81.3	13.9								
80			1	2	3	5	SS-4	Sat.		Organic Content 28.5%
	76.3	18.9								78.2 17.0 **WEATHERED ROCK** (Gray Granite)
75			56	44/0.1		100/0.6				
	71.3	23.9								
70			55	45/0.2		100/0.7				
	66.3	28.9								
65			84	16/0.1		100/0.6				
	61.3	33.9								63.2 32.0 **CRYSTALLINE ROCK** Hard Gray Granite 61.2 34.0
60			60/0.1			60/0.1				Boring Terminated with Standard Penetration Test Refusal at Elevation 61.2 ft in Crystalline Rock: Hard Gray Granite.
55										1) Advanced NW Casing to 8.9 feet. 2) Advanced 2-15/16" Tricone to 33.9 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) No loss of drilling fluid observed.
50										
45										
40										
35										
30										
25										
20										

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B2-A	**STATION** 32+03	**OFFSET** 26ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 90.1 ft	**TOTAL DEPTH** 27.4 ft	**NORTHING** 808,834	**EASTING** 2,347,255	**24 HR.** 2.0
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/10/09	**COMP. DATE** 06/10/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 24.5 ft	

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)
95										
90	90.1	0.0	WOH	WOH	WOH	WOH	SS-5	23%		90.1 0.0 GROUND SURFACE
	87.9	2.2						W		**ALLUVIAL** Very Soft to Soft Brown Coarse to Fine Sandy Clayey SILT (A-4)
85			1	1	1	2				84.6 5.5 Soft Gray Fine Sandy Silty CLAY (A-7-5)
	82.9	7.2						W		
80			3	2	2	4				79.6 10.5 **WEATHERED ROCK** (Gray Granite)
	77.8	12.3								
75			59	41/0.1		100/0.6				
	72.8	17.3								
70			63	37/0.1		100/0.6				
	67.8	22.3								
65			100/0.2			100/0.2				65.6 24.5 **CRYSTALLINE ROCK** Hard Gray Granite 62.7 27.4
	62.8	27.3								
60			60/0.1			60/0.1				Boring Terminated with Standard Penetration Test Refusal at Elevation 62.7 ft in Crystalline Rock: Hard Gray Granite.
55										1) Advanced NW Casing to 7.2 feet. 2) Advanced 2-15/16" Tricone to 27.3 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) No loss of drilling fluid observed. 6) Bridge deck to ground surface 6.3 feet.
50										
45										
40										
35										
30										
25										
20										
15										

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 31+84	**OFFSET** 15ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 89.8 ft	**TOTAL DEPTH** 49.3 ft	**NORTHING** 808,798	**EASTING** 2,347,283	**24 HR.** N/M
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/17/09	**COMP. DATE** 06/17/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 27.0 ft	

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)
	90										
	89.8	0.0	1	1	3	4		M		GROUND SURFACE	0.0
	87.3	2.5								Soft Brown Fine to Coarse Sandy CLAY (A-6)	
85	86.2	3.6	4	4	5	9		Sat.		Loose Brown Clayey Fine SAND (A-2-6)	
	81.8	8.0									
80	81.2	8.6	3	7	19	26		M		RESIDUAL Medium Dense to Very Dense Gray Silty Clayey Fine to Coarse SAND (A-2-6)	
75	76.2	13.6	26	40	60	100	SS-6	M			
70	71.2	18.6	24	32	44	76		M			
65	66.2	23.6	12	10	27	37		M			
	62.8	27.0								CRYSTALLINE ROCK	
60	61.2	28.6	60/0.1			60/0.1				Hard Gray Granite	28.7
	61.1	28.7								Hard to Moderately Hard Moderate to Moderately Severely Weathered Gray Granite With Close to Very Close Fracture Spacing, 1 Joint @ 50°, 5 Joints @ 60-70°, 5 Joints at 70-80°, 1 Joint @ 90°	
55											
50	50.5	39.3	60/0.1			60/0.1	RS-2			Hard to Moderately Hard Moderate to Slightly Weathered Gray Granite With Close to Very Close Fracture Spacing, Vertical Fracture 42.7-43.1 Feet, 44.6-45.9 Feet, 48.4-48.8 Feet, 1 Joint @ 30°, 1 Joint @ 60° Rock Sample RS-2 40.6-41.3 feet	39.3
45											
40	40.5	49.3								Boring Terminated at Elevation 40.5 ft in Crystalline Rock: Hard Gray Granite.	49.3
35										1) Advanced NW casing to 28.6 feet. 2) Advanced 2-15/16" Tricone to 28.6 feet. 3) Advanced NWD4 from 28.7 to 49.3 feet. 4) Creek water used as drilling fluid. 5) Approximate drilling fluid density 62.4 pcf. 6) Loss of drilling fluid observed.	
30											
25											
20											
15											
10											

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

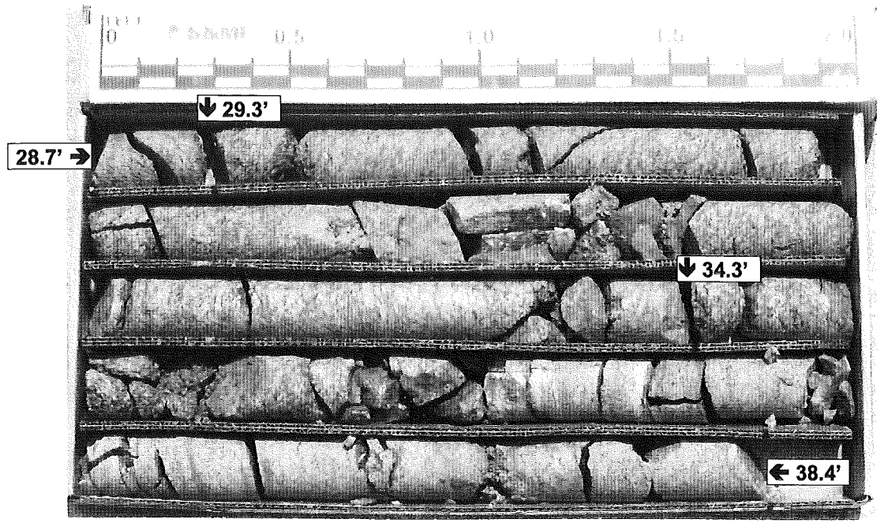
PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B2-B	**STATION** 31+84	**OFFSET** 15ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 89.8 ft	**TOTAL DEPTH** 49.3 ft	**NORTHING** 808,798	**EASTING** 2,347,283	**24 HR.** N/M
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/17/09	**COMP. DATE** 06/17/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 27.0 ft	
CORE SIZE NWD4	**TOTAL RUN** 20.5 ft	**DRILLER** J.White		

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)
	61.1										Begin Coring @ 28.7 ft	
60	61.1	28.7	0.6	1:15	(0.3)	N/A		(19.7)	(9.7)		61.1 Hard to Moderately Hard Moderate to Moderately Severely Weathered Gray Granite With Close to Very Close Fracture Spacing, 1 Joint @ 50° Joints @ 60-70°, 5 Joints at 70-80°, 1 Joint @ 90°	28.7
	60.5	29.3	5.0	1:30 1:30 1:15 1:15 1:30	50% (5.0) 100%	(2.7) 54%		96%	47%			
55	55.5	34.3	5.0	1:30 1:30 1:30 1:15 1:30	(4.6) 92%	N/A						
50	50.5	39.3									50.5	39.3
	50.4	39.4	4.9	N=60/0.1 1:15 1:30 1:30 1:15 1:30	(4.9) 100%	(4.2) 86%	RS-2				Hard to Moderately Hard Moderate to Slightly Weathered Gray Granite With Close to Very Close Fracture Spacing, Vertical Fracture 42.7-43.1 Feet, 44.6-45.9 Feet, 48.4-48.8 Feet, 1 Joint @ 30°, 1 Joint @ 60° Rock Sample RS-2 40.6-41.3 feet	
45	45.5	44.3	5.0	1:45 1:45 1:30 1:45 2:45	(4.9) 98%	(2.8) 56%						
40	40.5	49.3									40.5	49.3
35											Boring Terminated at Elevation 40.5 ft in Crystalline Rock: Hard Gray Granite. 1) Advanced NW casing to 28.6 feet. 2) Advanced 2-15/16" Tricone to 28.6 feet. 3) Advanced NWD4 from 28.7 to 49.3 feet. 4) Creek water used as drilling fluid. 5) Approximate drilling fluid density 62.4 pcf. 6) Loss of drilling fluid observed.	
30												
25												
20												
15												
10												
5												
0												
-5												
-10												
-15												

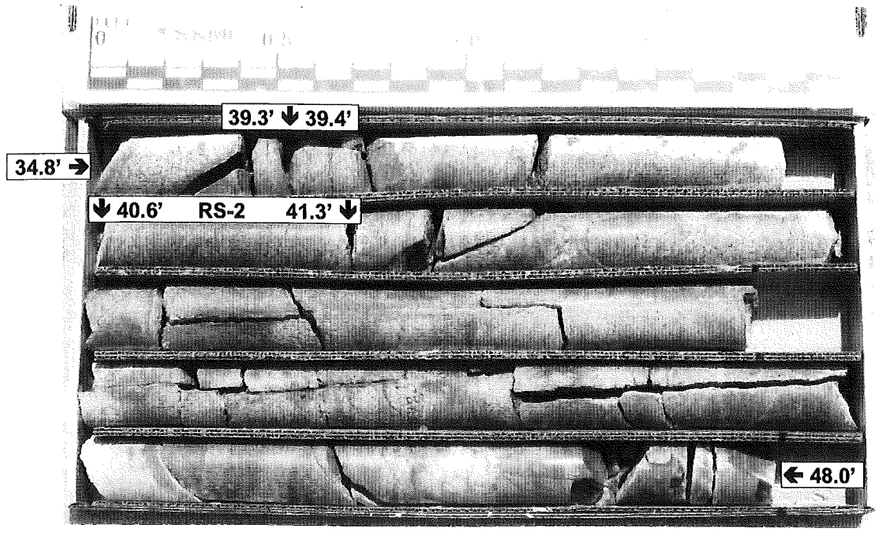
NCDOT CORE SINGLE 154D.GPJ NC_DOT.GDT 7/15/09

CORE PHOTOS

Project No.: 34927.1.1	*ID No.:* U-3331	*Location:* Nash Co., NC	*Boring No.:* B2-B
Site Description: Replacement of Bridge No. 112 on SR 1616 over Stoney Creek			*Driller*: J. White
Collar Elev.: 89.8 ft.	*Core Size:* NWD4	*Equipment:* CME-750	*Geologist*: N. Bradley
Elev. at T.D.: 40.5 ft.	*Total Depth:* 49.3 ft.	*Total Run:* 20.5 ft.	*Date*: 6/17/2009



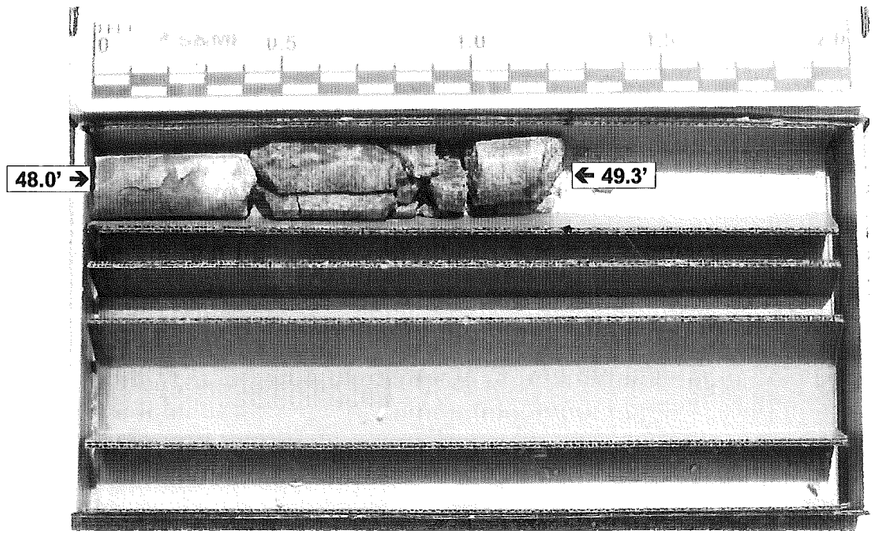
Box 1 of 3
Top of Box @ 28.7 feet; Bottom of Box @ 38.4 feet



Box 2 of 3
Top of Box @ 34.8 feet; Bottom of Box @ 48.0 feet

CORE PHOTOS

Project No.: 34927.1.1	*ID No.:* U-3331	*Location:* Nash Co., NC	*Boring No.:* B2-B
Site Description: Replacement of Bridge No. 112 on SR 1616 over Stoney Creek			*Driller*: J. White
Collar Elev.: 89.8 ft.	*Core Size:* NWD4	*Equipment:* CME-750	*Geologist*: N. Bradley
Elev. at T.D.: 40.5 ft.	*Total Depth:* 49.3 ft.	*Total Run:* 20.5 ft.	*Date*: 6/17/2009



Box 3 of 3
Top of Box @ 48.0 feet; Bottom of Box @ 49.3 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek			**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 32+56	**OFFSET** 25ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 83.8 ft	**TOTAL DEPTH** 55.6 ft	**NORTHING** 808,880	**EASTING** 2,347,281	**24 HR.** N/A
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic
START DATE 06/10/09	**COMP. DATE** 06/10/09	**SURFACE WATER DEPTH** 1.7ft	**DEPTH TO ROCK** 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)
	90									WATER SURFACE (06/10/09)
85	83.8	0.0								83.8 CREEK BOTTOM 0.0
	82.3	1.5	WOH	WOH	WOH	WOH	SS-7	Sat.		**ALLUVIAL** Very Loose Brown Fine to Coarse SAND (A-1-b) With Trace of Clay
80	79.3	4.5	1	1	1	2		Sat.		79.3 4.5
			21	29	71/0.4	100/0.9		M		78.3 5.5 **RESIDUAL** Very Dense Gray Silty Fine to Coarse SAND (A-2-4)
75	74.3	9.5								**WEATHERED ROCK** (Gray Granite)
			39	61/0.3		100/0.8				
70	69.3	14.5								
			24	46	54/0.2	100/0.7				
65	64.3	19.5								
			12	26	74/0.4	100/0.9				
60	59.3	24.5								
			100/0.3			100/0.3				
55	54.3	29.5								
			76	24/0.1		100/0.6				
50	49.3	34.5								
			100/0.4			100/0.4				
45	44.3	39.5								
			100/0.3			100/0.3				
40	39.3	44.5								
			100/0.4			100/0.4				
35	34.3	49.5								33.5 50.3 **WEATHERED ROCK** Medium Hard Severely Weathered Gray-Brown Granite With Hard Slightly Weathered Gray Granite Seam from 54.5-55.3 Feet With Close to Very Close Fracture Spacing
			25	75/0.3		100/0.8				
30	28.5	55.3					RS-3			28.2 55.6 Rock Sample RS-3 54.5-55.3 feet
			100/0.3			100/0.3				
25										Boring Terminated at Elevation 28.2 ft in Weathered Rock: (Gray Granite).
20										1) Advanced NW casing to 49.5 feet. 2) Advanced 2-15/16" Tricone to 49.5 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Some loss of drilling fluid observed. 6) Bridge deck to mudline 12.5 feet. 7) Advanced NWD4 from 50.3 to 55.3 feet.
15										
10										

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

SHEET

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

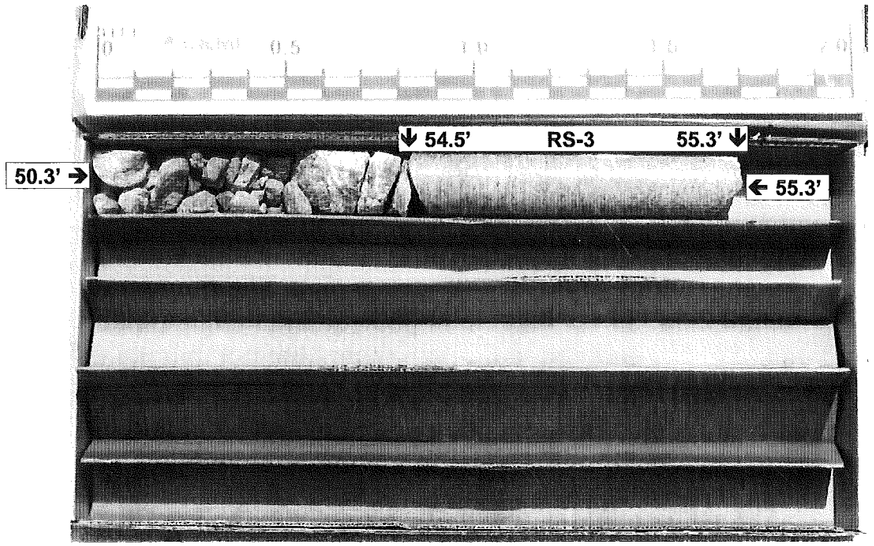
PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B3-A	**STATION** 32+56	**OFFSET** 25ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 83.8 ft	**TOTAL DEPTH** 55.6 ft	**NORTHING** 808,880	**EASTING** 2,347,281	**24 HR.** N/A
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/10/09	**COMP. DATE** 06/10/09	**SURFACE WATER DEPTH** 1.7ft	**DEPTH TO ROCK** N/A	
CORE SIZE NWD4	**TOTAL RUN** 5.0 ft	**DRILLER** J.White		

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
	33.5										Begin Coring @ 50.3 ft
	33.5	50.3	5.0	1:00 1:00 1:45 1:15 1:30	(1.7) 34%	(0.9) 18%		(1.7) 34%	(0.9) 18%		ELEV. (ft) 33.5 — DEPTH (ft) 50.3 **WEATHERED ROCK** Medium Hard Severely Weathered Gray-Brown Granite With Hard Slightly Weathered Gray Granite Seam from 54.5-55.3 Feet With Close to Very Close Fracture Spacing Rock Sample RS-3 54.5-55.3 feet
30	28.5	55.3		N=100/0.3			RS-3				ELEV. (ft) 28.2 — DEPTH (ft) 55.6 Boring Terminated at Elevation 28.2 ft in Weathered Rock: (Gray Granite).
25											1) Advanced NW casing to 49.5 feet. 2) Advanced 2-15/16" Tricone to 49.5 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Some loss of drilling fluid observed. 6) Bridge deck to mudline 12.5 feet. 7) Advanced NWD4 from 50.3 to 55.3 feet.
20											
15											
10											
5											
0											
-5											
-10											
-15											
-20											
-25											
-30											
-35											
-40											
-45											

NCDOT CORE SINGLE 154D.GPJ NC_DOT.GDT 7/17/09

CORE PHOTOS

Project No.: 34927.1.1	*ID No.:* U-3331	*Location:* Nash Co., NC	*Boring No.:* B3-A
Site Description: Replacement of Bridge No. 112 on SR 1616 over Stoney Creek			*Driller*: J. White
Collar Elev.: 83.8 ft.	*Core Size:* NWD4	*Equipment:* CME-750	*Geologist*: N. Bradley
Elev. at T.D.: 28.2 ft.	*Total Depth:* 55.6 ft.	*Total Run:* 5.0 ft.	*Date*: 6/10/2009



Box 1 of 1
Top of Box @ 50.3 feet; Bottom of Box @ 55.3 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek			**GROUND WTR (ft)**
BORING NO. B4-A	**STATION** 33+05	**OFFSET** 25ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 83.7 ft	**TOTAL DEPTH** 29.7 ft	**NORTHING** 808,923	**EASTING** 2,347,305	**24 HR.** N/A
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/11/09	**COMP. DATE** 06/11/09	**SURFACE WATER DEPTH** 1.3ft	**DEPTH TO ROCK** 26.0 ft	

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)
	85										
	83.7	0.0								83.7 WATER SURFACE (06/11/09)	0.0
			WOH	WOH	1	1		Sat.		81.7 **ALLUVIAL** Very Loose Gray Silty Fine to Coarse SAND (A-2-4)	2.0
80										**RESIDUAL** Very Dense Gray Silty Clayey Fine to Coarse SAND (A-2-6)	
	78.1	5.6								77.1	6.6
			32	44	56/0.4	100/0.9		M		75.7 **WEATHERED ROCK** (Gray Granite)	8.0
75	74.1	9.6								**RESIDUAL** Very Dense Gray Silty Clayey Fine to Coarse SAND (A-2-6)	
			9	16	67	83	SS-8	12%		72.2	11.5
70	69.1	14.6								**WEATHERED ROCK** (Gray-Brown Granite)	
			100/0.4			100/0.4					
65	64.1	19.6									
			100/0.3			100/0.3					
60	59.1	24.6									
			100/0.3			100/0.3					
55	54.1	29.6								57.7 **CRYSTALLINE ROCK** Hard Gray Granite	26.0
			60/0.1			60/0.1				54.0	29.7
50										Boring Terminated with Standard Penetration Test Refusal at Elevation 54.0 ft in Crystalline Rock: Hard Gray Granite.	
45										1) Advanced NW casing to 9.6 feet. 2) Advanced 2-15/16" Tricone to 29.6 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Some loss of drilling fluid observed. 6) Bridge deck to mudline 12.7 feet.	
40											
35											
30											
25											
20											
15											
10											
5											

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek			**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 33+02	**OFFSET** 28ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 90.9 ft	**TOTAL DEPTH** 39.7 ft	**NORTHING** 808,897	**EASTING** 2,347,349	**24 HR.** 5.6
DRILL MACHINE CME-750	**DRILL METHOD** 3-1/4" HSA/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/12/09	**COMP. DATE** 06/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 17.0 ft	

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)
	95										
	90.9	0.0								90.9 GROUND SURFACE	0.0
90			1	1	2	3		M		**ARTIFICIAL FILL** Soft Brown Fine Sandy Silty CLAY (A-6) With Trace of Organic Material	
	88.1	2.8				6	SS-9	Sat.		88.9	2.0
85			2	4	2					**ALLUVIAL** Loose Tan Clayey Fine to Coarse SAND (A-2-6)	
	83.1	7.8				100/0.5				84.9 **WEATHERED ROCK** (Brown Granite)	6.0
80			100/0.5								
	78.1	12.8				100/0.2					
75			100/0.2								
	72.4	18.5								73.9 **CRYSTALLINE ROCK** Hard Brown-Gray Granite	17.0
70	71.8	19.1	60/0.1			60/0.1				71.7 Hard Moderate to Moderately Severely Weathered Brown Granite With Close Fracture Spacing, 2 Joints @ 40°, 1 Joint @ 90°	19.2
	66.1	24.8	60/0.1							66.1 Hard to Moderately Hard Slight To Moderately Weathered Brown Granite With Close to Moderately Close Fracture Spacing, 2 Joints @ 30°, 2 Joints @ 60°	24.8
65											
	61.2	29.7	60/0.1			60/0.1				57.1	33.8
60										56.1 Moderately Hard Moderately Severe Weathered Gray Granite With Close to Very Close Fracture Spacing	34.8
55										Hard to Moderately Hard Slight To Moderately Weathered Brown Granite With Close Fracture Spacing, 1 Joint @ 30°	
	51.3	39.6	60/0.1			60/0.1				51.2	39.7
50										Boring Terminated with Standard Penetration Test Refusal at Elevation 51.2 ft in Crystalline Rock: Hard Brown-Gray Granite.	
45										1) Advanced 3-1/4" HSA to 2.8 feet. 2) Advanced 2-15/16" Tricone to 18.5 feet. 3) Advanced NWD4 from 19.2 to 39.6 feet. 4) Creek water used as drilling fluid. 5) Approximate drilling fluid density 62.4 pcf. 6) Loss of drilling fluid observed.	
40											
35											
30											
25											
20											
15											

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/17/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

SHEET

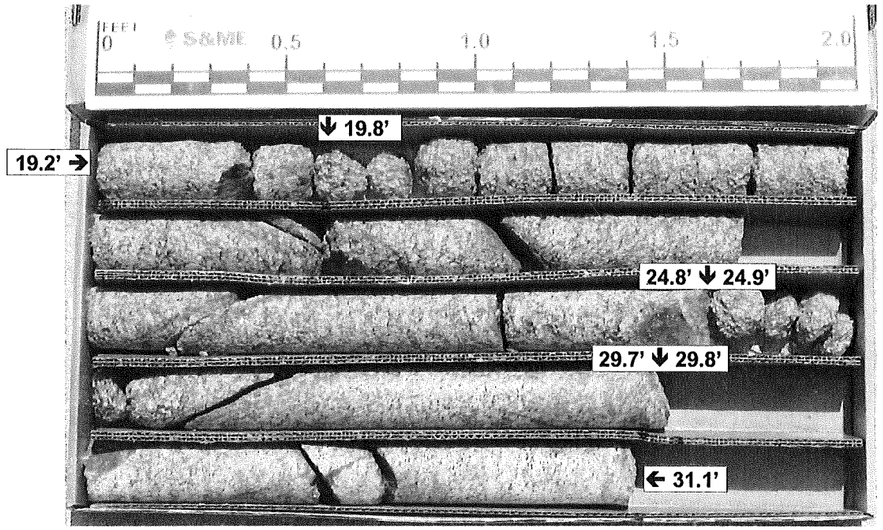
PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. B4-B	**STATION** 33+02	**OFFSET** 28ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 90.9 ft	**TOTAL DEPTH** 39.7 ft	**NORTHING** 808,897	**EASTING** 2,347,349	**24 HR.** 5.6
DRILL MACHINE CME-750	**DRILL METHOD** 3-1/4" HSA/2-15/16" Tricone/NWD4 Core		**HAMMER TYPE** Automatic	
START DATE 06/12/09	**COMP. DATE** 06/15/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 17.0 ft	
CORE SIZE NWD4	**TOTAL RUN** 20.2 ft	**DRILLER** J.White		

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
	71.7										Begin Coring @ 19.2 ft
70	71.7 71.1	19.2 19.8	0.6 5.0	1:00 1:15 1:00 1:00 0:45 1:00	(0.6) 100% (4.6) 92%	(0.4) 67% (2.8) 56%		(16.5) 81%	(10.6) 52%		ELEV. 71.7 Hard Moderate to Moderately Severely Weathered Brown Granite With Close Fracture Spacing, 2 Joints @ 40°, 1 Joint @ 90° — DEPTH 19.2
	66.1	24.8									ELEV. 66.1 — DEPTH 24.8
65	66.0	24.9	4.8	N=60/0.1 1:30 1:15 1:15 1:15 1:00/0.8	(1.8) 38%	(1.4) 29%					Hard to Moderately Hard Slight To Moderately Weathered Brown Granite With Close to Moderately Close Fracture Spacing, 2 Joints @ 30°, 2 Joints @ 60°
	61.2	29.7									
60	61.1	29.8	4.8	N=60/0.1 1:30 1:30 1:30 1:45 1:45/0.8	(4.8) 100%	(3.4) 71%					
	56.3	34.6									ELEV. 57.1 — DEPTH 33.8
55			5.0	1:30 1:15 1:30 1:30 1:30	(4.7) 94%	(2.6) 52%					Moderately Hard Moderately Severe Weathered Gray Granite With Close to Very Close Fracture Spacing — ELEV. 56.1 — DEPTH 34.8 Hard to Moderately Hard Slight To Moderately Weathered Brown Granite With Close Fracture Spacing, 1 Joint @ 30°
	51.3	39.6									ELEV. 51.2 — DEPTH 39.7
50				N=60/0.1							Boring Terminated with Standard Penetration Test Refusal at Elevation 51.2 ft in Crystalline Rock: Hard Brown-Gray Granite.
45											1) Advanced 3-1/4" HSA to 2.8 feet. 2) Advanced 2-15/16" Tricone to 18.5 feet. 3) Advanced NWD4 from 19.2 to 39.6 feet. 4) Creek water used as drilling fluid. 5) Approximate drilling fluid density 62.4 pcf. 6) Loss of drilling fluid observed.
40											
35											
30											
25											
20											
15											
10											
5											
0											
-5											

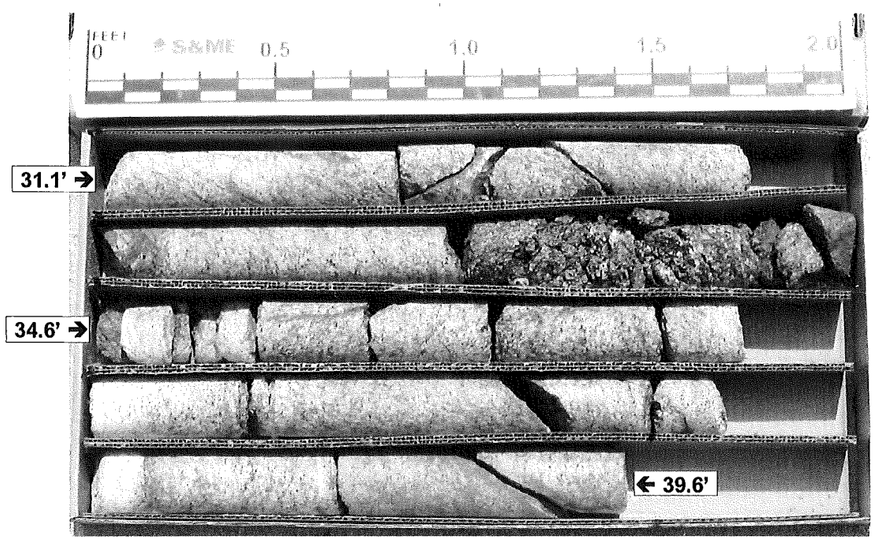
NCDOT CORE SINGLE 154D.GPJ NC_DOT.GDT 8/17/09

CORE PHOTOS

Project No.: 34927.1.1	*ID No.:* U-3331	*Location:* Nash Co., NC	*Boring No.:* B4-B
Site Description: Replacement of Bridge No. 112 on SR 1616 over Stoney Creek			*Driller*: J. White
Collar Elev.: 90.9 ft.	*Core Size:* NWD4	*Equipment:* CME-750	*Geologist*: N. Bradley
Elev. at T.D.: 51.2 ft.	*Total Depth:* 39.7 ft.	*Total Run:* 20.2 ft.	*Date*: 6/12/2009



Box 1 of 2
Top of Box @ 19.2 feet; Bottom of Box @ 31.1 feet



Box 2 of 2
Top of Box @ 31.1 feet; Bottom of Box @ 39.6 feet

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 33+55	**OFFSET** 23ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 96.6 ft	**TOTAL DEPTH** 22.7 ft	**NORTHING** 808,967	**EASTING** 2,347,329	**24 HR.** 6.0
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/11/09	**COMP. DATE** 06/11/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 19.0 ft	

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)
										96.6	0.0
										ASPHALT PAVEMENT SURFACE	
95	95.3	1.3								95.3	1.3
	93.8	2.8	4	4	4	8				Asphalt Pavement (1.3 feet)	
			2	2	2	4	SS-10	M 14%		**ROADWAY EMBANKMENT** Medium Stiff to Soft Brown Fine to Coarse Sandy Silty CLAY (A-6)	
90	89.0	7.6								90.6	6.0
			6	6	6	12		Sat.		**ALLUVIAL** Medium Dense Brown Silty Fine to Coarse SAND (A-2-4) With Quartz Gravel	
85	84.0	12.6									
			5	4	13	17		Sat.		82.1	14.5
80	79.0	17.6								**WEATHERED ROCK** (Gray Granite)	
			100/0.5			100/0.5				77.6	19.0
75	74.0	22.6								**CRYSTALLINE ROCK** Hard Gray Granite	
			60/0.1			60/0.1				73.9	22.7
70										Boring Terminated with Standard Penetration Test Refusal at Elevation 73.9 ft in Crystalline Rock: Hard Gray Granite.	
65										1) Advanced NW casing to 17.6 feet. 2) Advanced 2-15/16" Tricone to 22.6 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Some loss of drilling fluid observed.	
60											
55											
50											
45											
40											
35											
30											
25											
20											

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34927.1.1	**ID.** U-3331	**COUNTY** Nash	**GEOLOGIST** N.Bradley	
SITE DESCRIPTION Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 33+20	**OFFSET** 26ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 91.8 ft	**TOTAL DEPTH** 19.0 ft	**NORTHING** 808,913	**EASTING** 2,347,356	**24 HR.** 5.0
DRILL MACHINE CME-750	**DRILL METHOD** NW Casing/2-15/16" Tricone		**HAMMER TYPE** Automatic	
START DATE 06/11/09	**COMP. DATE** 06/11/09	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 14.5 ft	

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)
	95									91.8	0.0
	91.8	0.0								GROUND SURFACE	
			2	2	4	6		M		**ARTIFICIAL FILL** Medium Stiff Orange-Brown Fine Sandy Clayey SILT (A-4)	
90	87.9	3.9								88.8	3.0
			6	6	8	14	SS-11	Sat.		**ALLUVIAL** Medium Dense Brown Silty Clayey Fine to Coarse SAND (A-2-4)	
85	82.9	8.9								82.4	9.4
			3	32	68/0.4	100/0.9		M		**RESIDUAL** Very Dense Brown Silty Fine to Coarse SAND (A-2-4)	
80	77.9	13.9								81.9	9.9
			100/0.2			100/0.2				**WEATHERED ROCK** (Gray Granite)	
75	72.9	18.9								77.3	14.5
			60/0.1			60/0.1				**CRYSTALLINE ROCK** Hard Gray Granite	
70										72.8	19.0
65										Boring Terminated with Standard Penetration Test Refusal at Elevation 72.8 ft in Crystalline Rock: Hard Gray Granite.	
60										1) Advanced NW casing to 3.9 feet. 2) Advanced 2-15/16" Tricone to 18.9 feet. 3) Creek water used as drilling fluid. 4) Approximate drilling fluid density 62.4 pcf. 5) Some loss of drilling fluid observed.	
55											
50											
45											
40											
35											
30											
25											
20											
15											

NCDOT BORE SINGLE 154D.GPJ NC_DOT.GDT 8/11/09

SUMMARY OF LABORATORY TEST DATA

Soil Classification and Gradation

S&ME

S&ME Project #:	1051-09-154	Test Date(s):	6/12 - 6/17/09
State Project No.:	34927.1.1	County: Nash	Report Date: 6/17/2009
Federal ID No.:	STP-1616(4)	Tip No. U-3331	
Project Name:	Replacement of Bridge 112 on S.R. 1616 over Stoney Creek		
Client Name:	NCDOT		
Client Address:	Raleigh, North Carolina		

Boring No.	Sample No.	Sample Depth (feet)	AASHTO Classification	Total % Passing Sieve #					Total Mortar Fraction				LL	PL	PI	Moisture Content %
				10	40	60	200	270	Coarse Sand	Fine Sand	Silt	Clay				
EB1-A	SS-1	14.0-15.5	A-2-4 (0)	100	71	38	16.8	14.7	62	23	6	9	17	0	N.P.	ND
EB1-B	ST-1	7.0-9.0	A-2-4 (0)	95	69	45	33.0	28.3	55	17	14	14	21	15	6	15.2
EB1-B	SS-2	13.9-15.4	A-1-b (0)	75	8	5	3.2	2.8	93	3	1	3	20	0	N.P.	ND
B1-A	SS-3	8.0 - 9.5	A-6 (8)	100	100	97	72.9	63.8	3	33	28	36	32	18	14	19.5
B1-B	SS-4	13.9-15.4	A-2-4 (0)	100	77	42	19.0	16.6	58	25	7	10	24	0	N.P.	ND
B2-A	SS-5	0.0 - 1.5	A-4 (0)	100	99	90	46.8	36.4	10	54	20	16	19	18	1	22.6
B2-B	SS-6	13.6-15.1	A-2-6 (0)	88	47	38	22.5	16.8	57	24	7	12	36	25	11	ND
B3-A	SS-7	0.0-1.5	A-1-b (0)	100	31	5	1.9	1.6	95	3	0	2	22	0	N.P.	ND
B4-A	SS-8	9.6 - 11.0	A-2-6 (0)	75	38	32	20.0	17.0	58	19	9	14	40	25	15	ND
B4-B	SS-9	2.8-4.3	A-2-6 (0)	93	45	32	16.1	15.1	66	18	1	15	32	20	12	ND
EB2-A	SS-10	2.6 - 4.1	A-6 (5)	99	81	69	46.6	42.3	30	27	9	34	40	21	19	14.3
EB2-B	SS-11	3.9-5.4	A-2-4 (0)	96	54	29	10.8	8.8	70	21	3	6	19	0	N.P.	ND

Note: N.P.=Non-plastic

References:

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, AET		104-01-0703	Abner F. Riggs, Jr., P.E.	Senior Engineer
Technician Name:	*Signature*	*Certification #*	*Technical Responsibility:*	*Position*

S&ME, Inc. 3201 Spring Forest Road, Raleigh, NC 27616

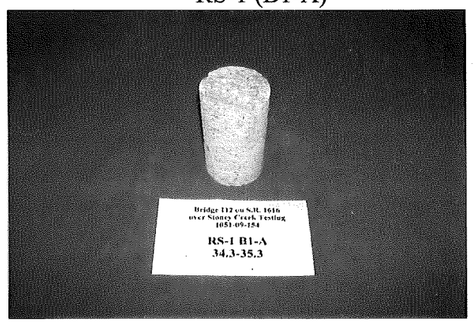
Summary Tables Combined.XLS

UNCONFINED COMPRESSION
(ASTM D 7012 Method C)

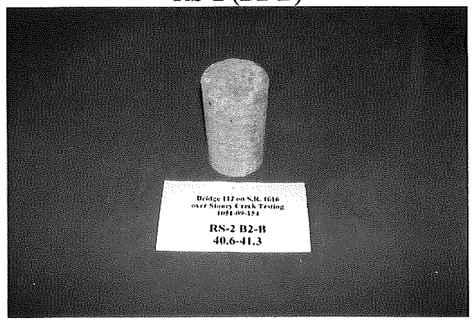
PROJECT: 34927.1.1 **TIP : U-3331 Description :** Replacement of Bridge No. 112 on S.R. 1616 over Stoney Creek
County: Nash
Date: 7/2/2009 **S&ME Job Number: 1051-09-154**
Tested by: TJW

Sample No.	Boring Location	Depth (ft)	Specimen Dimension, in.		Area (in^2)	Unit Wt. (lb/ft^3)	Loading Rate (psi/min)	Max. Load (lb)	Strength (psi)	Moisture (%)
			Length	Diameter						
RS-1	B1-A	34.3 - 35.3	4.34	2.05	3.30	157.4	1,220	12,410	3,761	0.5
RS-2	B2-B	40.6 - 41.3	4.43	2.04	3.27	159.4	1,337	18,580	5,682	1.1
RS-3	B3-A	54.5 - 55.3	4.38	2.05	3.30	163.3	1,543	40,320	12,218	0.1

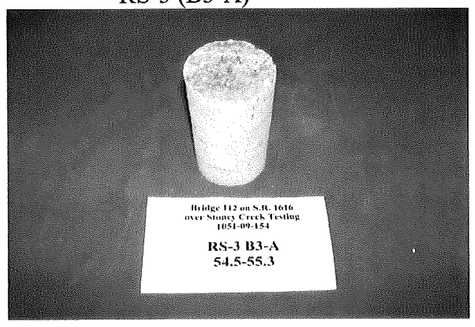
RS-1 (B1-A)



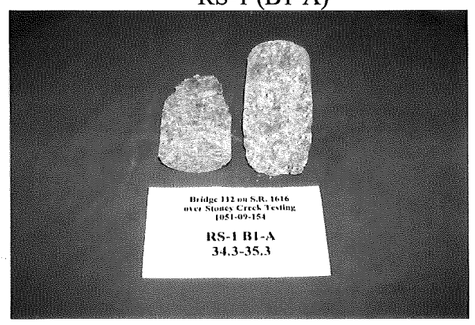
RS-2 (B2-B)



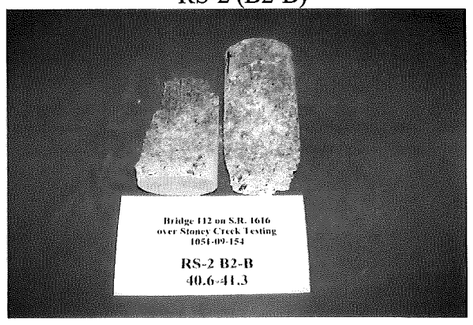
RS-3 (B3-A)



RS-1 (B1-A)



RS-2 (B2-B)



RS-3 (B3-A)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 34927.1.1 TIP: U-3331 COUNTY: Nash

DESCRIPTION(1): Replacement of Bridge No. 112 on S.R.1616 over Stoney Creek

EXISTING BRIDGE

Information from: Field Inspection x Microfilm ____ (reel ____ pos: ____)
Other (explain) Bridge Survey&Hydraulic Design Report

Bridge No.: 112 Length: 161' Total Bents: 5 Bents in Channel: 3 Bents in Floodplain: 2
Foundation Type: Concrete Piers and Battered Steel Piles

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: None observed at End Bent No. 1. Some minor erosion observed at End Bent No. 2

Interior Bents: Some minor scour around all interior bents

Channel Bed: Some minor scour along north side of creek

Channel Bank: Some minor scour observed along creek bank on south side

EXISTING SCOUR PROTECTION

Type(3): None (Exposed Soil)

Extent(4): Timber Abutment & Wingwalls

Effectiveness(5): Adequate

Obstructions(6): Debris along banks & at Interior Bent No.3 (upstream) side. Sand bar between Interior B1&B2

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.

DESIGN INFORMATION

Channel Bed Material(7): Gray&Brown Silty Fine to Coarse Sand With Trace of Clay (A-1-b)(0)

Channel Bank Material(8): Brown Coarse to Fine Sandy Clayey Silt (A-4)(0)
Tan Clayey Fine to Coarse Sand (A-2-6)(0)

Channel Bank Cover(9): Grass and trees with some rip rap

Floodplain Width(10): Approximately 250 feet south and 550 feet north

Floodplain Cover(11): Grass and trees

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

Channel Migration Tendency(13): North

Observations and Other Comments: Abandoned 10 inch metal sewer pipe on steel&concrete piers 10 to 15 feet east of bridge. Several large boulders in creek east (downstream) of bridge

Reported by: Abner F. Riggs, Jr. **Date:** 7/9/2009

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

BENTS B1	B2	B3	B4							
87.9	85.9	78.3	81.4							

Comparison of DSE to Hydraulics Unit theoretical scour:
The Geotechnical Engineering Unit agrees with the theoretical scour elevations for Bents One and Two as reported by the Hydraulics Unit on the Bridge Survey and Hydraulic Design Report dated September 3, 2008. The GEU has determined that the scour elevations for Bents Three and Four should be adjusted to the elevations as noted in the above table **DSE determined by:** Clinton Whitley **Date:** Aug 6, 2009

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

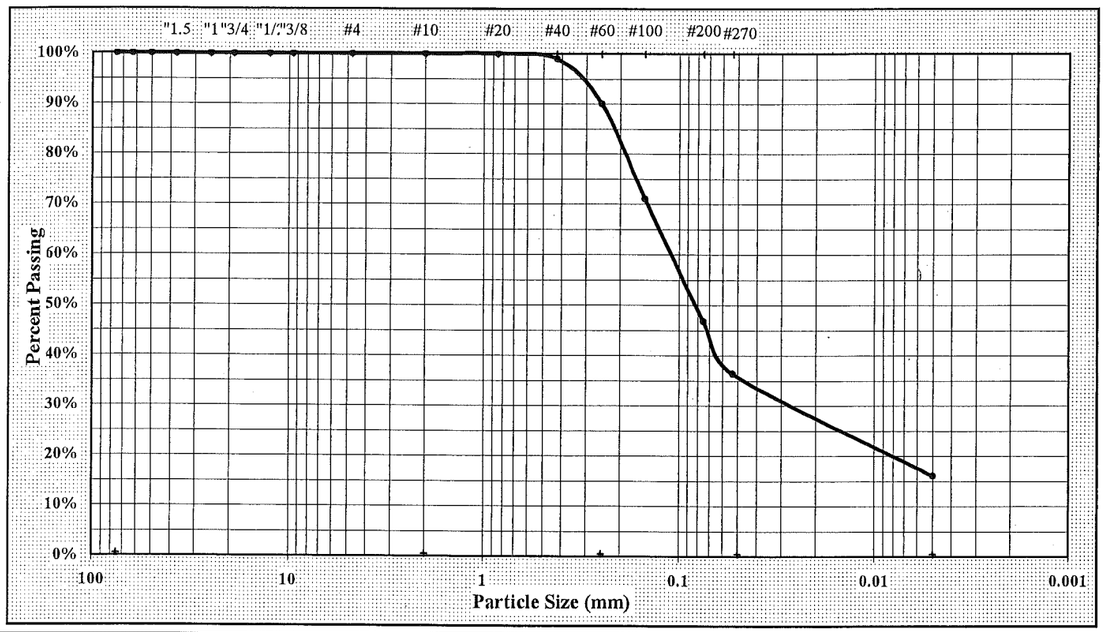
Bed or Bank	Bed	Bank	Bank				
Sample No.	SS-7	SS-5	SS-9				
Retained #4	0%	0%	0.50%				
Passed #10	100%	100%	93%				
Passed #40	31%	99%	45%				
Passed #200	1.90%	46.80%	16.10%				
Coarse Sand	95%	10%	66%				
Fine Sand	3%	54%	18%				
Silt	0%	20%	1%				
Clay	2%	16%	15%				
LL	22	19	32				
PI	N.P.	1	12				
AASHTO	A-1-b(0)	A-4(0)	A-2-6(0)				
Station	32+56	32+08	33+02				
Offset	25 ft LT	26 ft LT	28 ft RT				
Depth	0.0'-1.5'	0.0'-1.5'	2.8'-4.3'				

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #: **1051-09-154** Report Date: 6/17/2009
Project Name: **Bridge No. 112 on S.R. 1616 over Stoney Creek** Test Date(s): 06/12 - 06/16/2009
Client Name: NCDOT
Client Address: Raleigh, North Carolina
State Project #: 34927.1.1 F.A. Project No: STP-1616(4) TIP NO: U-3331 Nash Co.

Boring #: B2-A Sample #: SS-5 Sample Date: 6/10/09
Location: STA 32+56 Offset: 25 Ft. LT. Depth (ft): 0.0 - 1.5'
Sample Description: Brown Coarse to Fine Sandy Clayey SILT A-4 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#10	Coarse Sand	10%	Silt	20%
Gravel	0%	Fine Sand	54%	Clay	16%
Apparent Relative Density		Moisture Content		% Passing #200	46.8%
Liquid Limit	19	Plastic Limit	18	Plastic Index	1

Soil Mortar (-#10 Sieve)

Coarse Sand 10% Fine Sand 54% Silt 20% Clay 16%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T265: Laboratory Determination of Moisture Content of Soils
AASHTO T89: Determining the Liquid Limit of Soils
AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technician Name: Mal Krajan 104-01-0703 (Certification #)

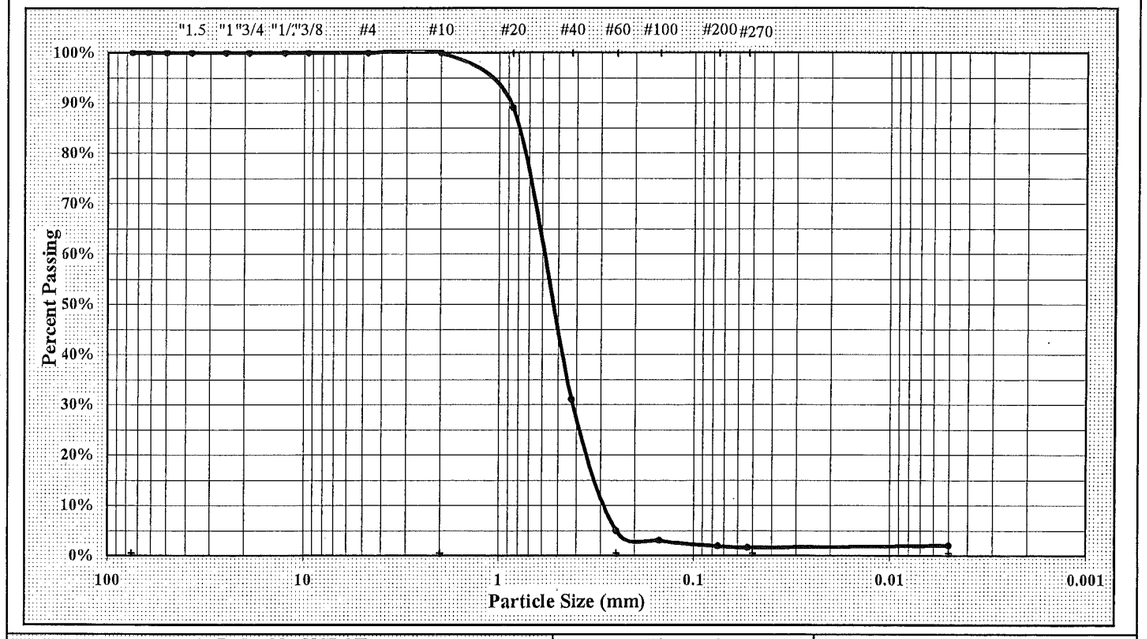
Technical Responsibility: Mal Krajan (Signature) Laboratory Manager (Signature)

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #: **1051-09-154** Report Date: 6/23/2009
Project Name: **Bridge No. 112 on S.R. 1616 over Stoney Creek** Test Date(s): 06/18 - 06/22/2009
Client Name: NCDOT
Client Address: Raleigh, North Carolina
State Project #: 34927.1.1 F.A. Project No: STP-1616(4) TIP NO: U-3331 Nash Co.

Boring #: B3-A Sample #: SS-7 Sample Date: 6/10/09
Location: STA 32+03 Offset: 26 Ft LT. Depth (ft): 0.0 - 1.5'
Sample Description: Brown Fine to Coarse SAND with trace of Clay A-1-b (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	95%	Silt	0%
Gravel	0%	Fine Sand	3%	Clay	2%
Apparent Relative Density		Moisture Content		% Passing #200	1.9%
Liquid Limit	22	Plastic Limit	0	Plastic Index	N.P.

Soil Mortar (-#10 Sieve)

Coarse Sand 95% Fine Sand 3% Silt 0% Clay 2%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT
AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T265: Laboratory Determination of Moisture Content of Soils
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AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technician Name: Mal Krajan 104-01-0703 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Manager (Signature)

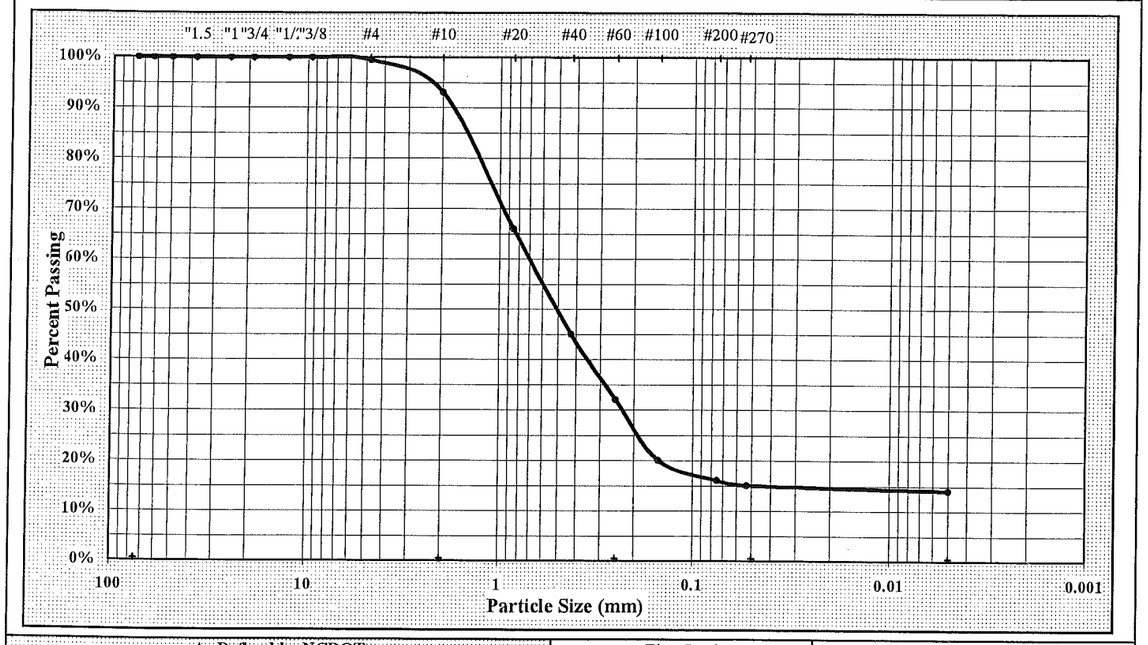
S&ME

Particle Size Analysis of Soils

AASHTO T 88 as Modified by NCDOT

S&ME Project #:	**1051-09-154**	Report Date:	6/23/2009
Project Name:	**Bridge No. 112 on S.R. 1616 over Stoney Creek**	Test Date(s):	06/18 - 06/22/2009
Client Name:	NCDOT		
Client Address:	Raleigh, North Carolina		
State Project #:	34927.1.1	F.A. Project No: STP-1616(4)	TIP NO: U-3331 Nash Co.

Boring #:	B4-B	Sample #: SS-9	Sample Date: 6/15/09
Location:	STA 33+02	Offset: 28 Ft. RT.	Depth (ft): 2.8' - 4.3'
Sample Description:		Tan Silty Clayey Fine to Coarse SAND	A-2-6 (0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and > 0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	3/8"	Coarse Sand	61%	Silt	1%
Gravel	7%	Fine Sand	17%	Clay	14%
Apparent Relative Density		Moisture Content	13.7%	% Passing #200	16.1%
Liquid Limit	32	Plastic Limit	20	Plastic Index	12

Soil Mortar (-#10 Sieve)

Coarse Sand	66%	Fine Sand	18%	Silt	1%	Clay	15%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT

AASHTO T87: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

AASHTO T265: Laboratory Determination of Moisture Content of Soils

AASHTO T89: Determining the Liquid Limit of Soils

AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils

AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Technician Name: Mal Krajan 104-01-0703 *Certification #*

Technical Responsibility: Mal Krajan *Signature* Laboratory Manager *Signature*

Photograph No. 1:
This photograph was taken from the south approach, along the -L- alignment, looking northeast.

Photograph No. 2:
This photograph was taken from the left side of the -L- alignment, looking southeast, across proposed End Bent No. 1.

Photograph No. 3:
This photograph was taken from the right side of the -L- alignment, looking northwest, across proposed End Bent No. 1.

Photograph No. 4:
This photograph was taken from the left side of the -L- alignment, looking southeast, across proposed Interior Bent No. 1.

Photograph No. 5:
This photograph was taken from the right side of the -L- alignment, looking northwest, across proposed Interior Bent No. 1.

Photograph No. 6:
This photograph was taken from the left side of the -L- alignment, looking southeast, across proposed Interior Bent No. 2.

Photograph No. 7:
This photograph was taken from the right side of the -L- alignment, looking northwest, across proposed Interior Bent No. 2.

Photograph No. 8:
This photograph was taken from the left side of the -L- alignment, looking southeast, across proposed Interior Bent No. 3.

Photograph No. 9:
This photograph was taken from the right side of the -L- alignment, looking northwest, across proposed Interior Bent No. 3.

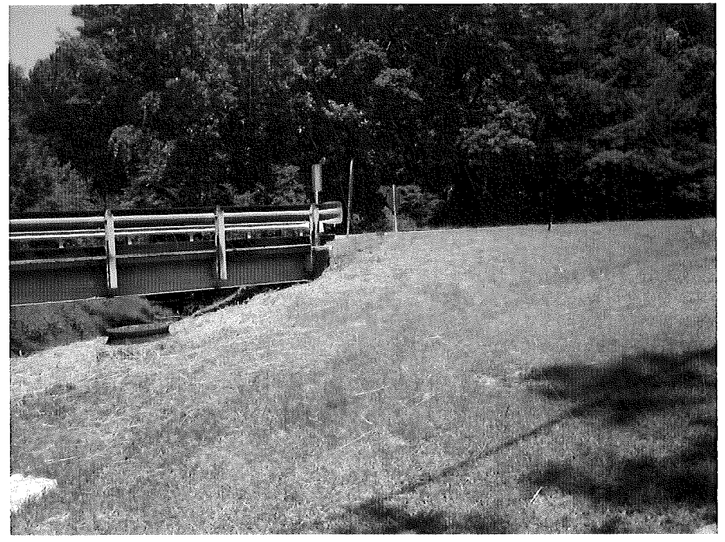
Photograph No. 10:
This photograph was taken from the left side of the -L- alignment, from the existing bridge deck, looking northwest (upstream).

Photograph No. 11:
This photograph was taken from the right side of the -L- alignment, from the existing bridge deck, looking southeast (downstream).

Photograph No. 12:
This photograph was taken from the left side of the -L- alignment, looking southeast, across proposed Interior Bent No. 4.

Photograph No. 13:
This photograph was taken from the right side of the -L- alignment, looking northwest, across proposed Interior Bent No. 4.

Photograph No. 14:
This photograph was taken from the left side of the -L- alignment, looking southeast, across proposed End Bent No. 2.



Photograph No. 15:
This photograph was taken from the right side of the -L- alignment, looking northwest, across proposed End Bent No. 2.

Photograph No. 16:
This photograph was taken from the north approach, along the -L- alignment, looking southwest.